DEEPWATER HORIZON OIL SPILL

LOUISIANA TRUSTEE IMPLEMENTATION GROUP

DRAFT

RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT #8: WETLANDS, COASTAL, AND NEARSHORE HABITATS

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Contents

List of Acronyms

AATC	Anti-Aircraft Training Center
ACRE	Applied Coastal Research and Engineering
APE	Area of Potential Effect
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BP	BP Exploration and Production, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPRA	Coastal Protection and Restoration Authority
CRMS	Coastwide Reference Monitoring System
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act of 1972
dBrms	Decibel Root Mean Square
DHP	Division of Historic Preservation
DIVER Explorer	Data Integration Visualization Exploration and Reporting Explorer
DOA	Division of Archaeology
DOI	U.S. Department of the Interior
DPC	Dredge Pipeline Corridor
DWH	Deepwater Horizon
DWH Trustees	Deepwater Horizon Oil Spill Natural Resource Trustees
E&D	Engineering and Design
EA	Environmental Assessment
EAC	Equipment Access Corridor
ECD	Earthen Containment Dike
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMU	Environmental Management Unit
EO	Executive Order
ESA	Endangered Species Act of 1973
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
GEBF	Gulf Environmental Benefit Fund
GMFMC	Gulf of Mexico Fishery Management Council
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway

HNC	Houma Navigation Canal
HSDRRS	Hurricane and Storm Damage Risk Reduction System
IHNC	Inner Harbor Navigational Canal
IPaC	U.S. Fish and Wildlife Service Information for Planning and Consultation
La. Rev. Stat.	Louisiana Revised Statute
LA TIG	Louisiana Trustee Implementation Group
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LOSCO	Louisiana Oil Spill Coordinator's Office
LTCC	Louisiana Tourism Coastal Coalition
LUMCON	Louisiana Universities Marine Consortium
MBTA	Migratory Bird Treaty Act
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAM	Monitoring and Adaptive Management
MC	Marsh Creation
MCY	Million Cubic Yards
MCA	Marsh Creation Area
MMPA	Marine Mammal Protection Act
MPH	Morris P. Hebert
MRGO	Mississippi River Gulf Outlet
MVN	New Orleans District US Army Corps of Engineers
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act of 1969
NFWF	National Fish and Wildlife Foundation
NGO	Non-Government Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOS	Notice of Solicitation
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment

NHPA	National Historic Preservation Act
OCM	Office of Coastal Management (LDNR)
OPA	Oil Pollution Act of 1990
PDARP	Programmatic Damage Assessment and Restoration Plan
PEIS	Programmatic Environmental Impact Statement
PEPC	Planning, Environment and Public Comment
PPT	Parts per Thousand
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act
RCG&A	R. Christopher Goodwin and Associates
ROD	Record of Decision
RP/EA	Restoration Plan/Environmental Assessment
S&I	Supervision and Inspection
SAV	Submerged Aquatic Vegetation
SBPG	St. Bernard Parish Government
SLECA	South Louisiana Electric Cooperative Association
SHPO	State Historic Preservation Office
SOP	Standard Operating Procedures
SP	Southern Perimeter
TIG	Trustee Implementation Group
TY	Target Year
URL	Uniform Resource Locator
U.S.C.	United States Code
USCG	United States Coast Guard
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOJ	U.S. Department of Justice
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordinance
WCNH	Wetlands, Coastal, and Nearshore Habitats

Executive Summary

On April 20, 2010, the Deepwater Horizon (DWH) mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of Mexico, resulting in a massive release of oil and other substances from the BP Exploration and Production, Inc. (BP) Macondo well and causing loss of life and extensive natural resource injuries. Initial efforts to cap the well following the explosion were unsuccessful, and for 87 days after the explosion, the well continuously and uncontrollably discharged oil and natural gas into the northern Gulf of Mexico. Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean (USDOJ, 2016). Oil spread from the deep ocean to the surface and nearshore environment from Texas to Florida. The oil came into contact with and injured natural resources as diverse as deep-sea coral, fish and shellfish, productive wetland habitats, sandy beaches, birds, sea turtles, other protected marine life, and services such as recreational use opportunities. Extensive response actions, including cleanup activities and actions to try to prevent the oil from reaching sensitive resources, were undertaken to try to reduce harm to people and the environment. However, many of these response actions had collateral impacts on the environment and on natural resource services. The oil and other substances released from the well, combined with these extensive response actions, together make up the DWH oil spill.

The DWH oil spill is subject to the provisions of the Oil Pollution Act (OPA) of 1990, which addresses preventing, responding to, and paying for oil pollution incidents in navigable waters, adjoining shorelines, and the exclusive economic zone of the United States. Under the authority of OPA, a council of federal and state Trustees (DWH Trustees[1]) was established to assess natural resource injuries resulting from the incident and to work to make the environment and public whole for those injuries. As required under OPA, the Trustees conducted a natural resource damage assessment (NRDA) to assess the natural resource injuries resulting from the spill and to determine the type and amount of restoration required to compensate the public for those injuries. The Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (Final PDARP/PEIS) summarizes these injuries and a suite of restoration alternatives (DWH Trustees, 2016).

In the Final PDARP/PEIS, the DWH Trustees determined that the injuries caused by the DWH oil spill affected such a wide array of linked resources over such an enormous area that the effects of the spill must be described as constituting an ecosystem-level injury. Consequently, the DWH Trustees' chosen alternative for restoration planning employs a comprehensive, integrated ecosystem approach to address the ecosystem-level injury. The Final PDARP/PEIS describes a comprehensive restoration plan at a programmatic level to guide and direct the ecosystem-level restoration effort, based on the following five programmatic restoration goals:

- Restore and conserve habitat
- Restore water quality
- Replenish and protect living coastal and marine resources
- Provide and enhance recreational opportunities
- Provide for monitoring, adaptive management, and administrative oversight to support restoration implementation

[1] The DWH Trustee Council comprises the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), U.S. Environmental Protection Agency (USEPA), and the states of Alabama, Florida, Louisiana, Mississippi, and Texas

The Final PDARP/PEIS also summarizes a suite of 13 restoration types that can be used to advance the Trustees' restoration goals (DWH Trustees, 2016, Figure 5.4-1). The "Wetlands, Coastal, and Nearshore Habitats" restoration type can advance the Trustees' restoration goal of "restore and conserve habitat." The DWH Settlement Decree with BP and the Final PDARP/PEIS include funding allocations for each restoration type and each Trustee as well as for monitoring, adaptive management, and administrative oversight. In total, these allocations include up to a total of $8.1 billion in over a 15-year period, and up to an additional $700 million for to address injuries to natural resources that are presently unknown but may come to light in the future, with $5 billion allocated to Louisiana through the Louisiana Trustee Implementation Group (LA TIG). These figures include funding that BP previously committed to pay for Early Restoration projects.

LA TIG Restoration Plan Environmental Assessment #8

The Louisiana Trustee Implementation Group (LA TIG) includes five Louisiana state Trustee agencies and four federal Trustee agencies: Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Environmental Quality (LDEQ), Louisiana Oil Spill Coordinator's Office (LOSCO), Louisiana Department of Wildlife and Fisheries (LDWF), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (USEPA). NOAA is the lead federal Trustee for preparing this "*Louisiana TIG Draft Restoration Plan/Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats*" (RP/EA). All federal agencies on the LA TIG are acting as cooperating agencies for the purposes of compliance with the National Environmental Policy Act of 1969 (NEPA). In accordance with 40 CFR §1506.3(a), each of the federal cooperating agencies (DOI, USEPA, and USDA) participating on the LA TIG will review the RP/EA for adequacy in meeting the standards set forth in its own NEPA implementing procedures and expects to adopt the Final EA by signature on a Finding of No Significant Impact (FONSI).

The LA TIG developed a reasonable range of restoration alternatives for this RP/EA by reviewing nearly 700 restoration project ideas submitted to the Trustee and Louisiana portals since 2010. Restoration project ideas have been submitted by the public, non-governmental organizations (NGOs), and local, state, and federal agencies. Programmatic restoration goals and restoration type-specific goals identified in the Final PDARP/PEIS (DWH Trustees, 2016), evaluation factors in the OPA regulations (15 CFR §990.54), and the availability of funds under the DWH NRDA settlement payment schedule were considered in selecting the reasonable range of alternatives.

In identifying preferred alternatives for this RP/EA, the LA TIG considered (1) the OPA NRDA regulations evaluation standards found at 15 Code of Federal Regulations 990.54, (2) specific goals identified by the DWH Trustees in the Final PDARP/PEIS under the Wetlands, Coastal, and Nearshore Habitats (WCNH) restoration type, (3) goals developed by the LA TIG for this restoration plan, (4) input from the public, and (5) the current and future availability of funds under the DWH oil spill NRDA settlement payment schedule.

For the purposes of this RP/EA, each proposed project is considered a separate alternative; therefore, the terms "project" and "alternative" are used interchangeably. Table 1 shows the reasonable range of alternatives. After the consideration of public input received during the 30-day public comment period, Table 1 will be updated to reflect the alternatives, noting those that are preferred and therefore

selected for funding (either construction and full implementation [construction][2] or Phase 1 engineering and design [E&D]) in this RP/EA.

Table 1: Reasonable Range of Alternatives

Alternative	Preferred/Non-Preferred	Type of Funding Request	Project Cost
Bayou Pointe-aux-Chenes Ridge Restoration and Marsh Creation	Non-Preferred	E&D	$4,736,900
East Orleans Landbridge Restoration	Preferred	E&D	$4,000,000
Raccoon Island Barrier Island Restoration	Preferred	E&D	$8,200,000
Bayou Dularge Ridge and Marsh Restoration	Preferred	Construction	$41,400,000
Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178)	Preferred	Construction	$21,200,000
Lake Lery Marsh Creation and Rim Restoration, Increment 3	Non-Preferred	Construction	$19,420,000

In this RP/EA, the LA TIG evaluates six different project-based alternatives as well as a "no action" alternative. The total cost of these six alternatives is estimated to be $98,956,900. Appendix D of this RP/EA includes draft Monitoring and Adaptive Management (MAM) plans for each of the preferred alternatives proposed for full construction. MAM Plans for those proposed for E&D only at this time would be prepared as part of any construction restoration plan.

The public is encouraged to review and comment on this RP/EA, available for 30 days following the release as specified in the public notice published in both the Federal and Louisiana Registers and as specified on the LA TIG website. Comments on the RP/EA can be submitted during the comment period by one of the following methods:

- Online: https://www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana
- By mail (hard copy), addressed to: U.S. Fish and Wildlife Service, P.O. Box 29649, Atlanta, GA 30345. Please note that personally identifiable information included in submitted comments (e.g., address, phone number, email address, etc.) may be made publicly available.
- Online during the public webinar.

The LA TIG will host a public webinar to facilitate the public review and comment process for this Draft RP/EA. Details regarding the public webinar can be found on the Trustee's website: https://www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana. After the close of the public comment period, the LA TIG will consider all input received during the public comment period and revise the RP/EA as necessary prior to publishing the Final RP/EA. A summary of comments received, the LA TIG's responses, and any changes made to the Draft RP/EA will be included in the Final RP/EA. If appropriate, NOAA will prepare a FONSI in accordance with NEPA regulations.

[2] For the purposes of this RP/EA, the terms 'construction and full implementation' and 'construction' are used interchangeably.

1.0 INTRODUCTION

The Louisiana Trustee Implementation Group[3] (LA TIG) prepared this draft restoration plan and integrated environmental assessment, "*Louisiana TIG Draft Restoration Plan and Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats*" (RP/EA) to continue the restoration of natural resources and the services they provide that were injured or lost as a result of the Deepwater Horizon (DWH) oil spill, to inform the public about the DWH Natural Resource Damage Assessment (NRDA) restoration planning efforts, and to seek public comment on the identified reasonable range of alternatives for restoration of injured resources. This RP/EA was prepared in accordance with the DWH Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS; DWH Trustees, 2016) and Record of Decision (ROD), the Oil Pollution Act of 1990 (OPA), and the National Environmental Policy Act of 1969 (NEPA).

Restoration activities, as presented in this RP/EA and discussed more broadly in the Final PDARP/PEIS (DWH Trustees, 2016), are designed to make the environment and the public whole for injuries resulting from the incident, both by returning injured natural resources and services to baseline conditions and by compensating for interim losses in accordance with the OPA and associated OPA NRDA regulations. The Final PDARP/PEIS and ROD can be found online at: http://www.gulfspillrestoration.noaa.gov/restorationplanning/gulf-plan.

In this RP/EA, the LA TIG identifies two preferred alternatives to for Engineering and Design and two preferred alternatives for full implementation (Construction) at a total estimated cost of $74,800,000.

This RP/EA focuses on alternatives to restore WCNH in the Louisiana Restoration Area. In this document, the LA TIG identifies its preferred alternatives, which the LA TIG believes would best help compensate the public for injuries caused by the DWH oil spill in the Louisiana Restoration Area at this time.

1.1 Background and Summary of the Settlement

On April 20, 2010, the DWH mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of Mexico, resulting in a massive release of oil and other substances from BP Exploration and Production, Inc.'s (BP's) Macondo well and causing pervasive natural resource injuries across the northern Gulf of Mexico. Extensive response actions, including cleanup activities and actions to try to prevent the oil from reaching sensitive resources, were undertaken to try to reduce harm to people and the environment. However, many of these response actions had collateral impacts on the environment and natural resource services. The breadth of injuries incurred from the incident are described in detail in Chapter 4 of the Final PDARP/PEIS.

Under the authority of OPA, a council of federal and state Trustees (DWH Trustees[4]) was established to assess natural resource injuries resulting from the incident and to work to make the environment and public whole for those injuries. In accordance with OPA NRDA regulations, in February 2016, the DWH

[3] The LA TIG comprises five Louisiana state trustee agencies and four federal trustee agencies: the Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Environmental Quality (LDEQ), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Oil Spill Coordinator's Office (LOSCO), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (USEPA).

[4] The DWH Trustees are the entities authorized under OPA to act as trustees on behalf of the public to assess the natural resource injuries resulting from the DWH oil spill and to develop and implement project-specific restoration plans to compensate for those injuries. Together with the members of the LA TIG, state trustees authorized by the governors of Florida, Alabama, Mississippi, and Texas compose, as a whole, the DWH Trustees.

Trustees issued a Final PDARP/PEIS, and subsequent ROD detailing a specific proposed plan to fund and implement restoration projects across the Gulf of Mexico region as restoration funds become available. In April 2016, the United States District Court for the Eastern District of Louisiana entered a Consent Decree resolving civil claims by the DWH Trustees against BP arising from the DWH oil spill. The Final PDARP/PEIS sets forth the process for DWH restoration planning to select specific projects for implementation and establishes a distributed governance structure that assigns a TIG for each of eight Restoration Areas[5]. The LA TIG makes all restoration decisions for the funding allocated to the Louisiana Restoration Area. Chapter 7 of the Final PDARP/PEIS provides detailed information on the DWH Trustees and the TIG governance structure. The Final PDARP/PEIS, ROD, and Consent Decree can be found online at the following URL: https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

1.2 Restoration Planning by the Louisiana Trustee Implementation Group to Date

Restoration planning from the DWH oil spill began in Louisiana under Early Restoration, which included projects in four of the five Early Restoration phases and continued by releasing 10 restoration plans following the 2016 settlement (Appendix A). The Final PDARP/PEIS identified five programmatic goals and 13 restoration types (see Figure 5.4-1 of the Final PDARP/PEIS). Table 2 shows the funds committed by the LA TIG to date by restoration type. The data regarding total commitments and commitments to restoration projects previously approved do not account for project modifications, terminations, or the availability of additional interest funds. As a result, amounts do not reflect available funds under each restoration type but, nevertheless, indicate the total committed through TIG resolutions to date. Section 6.5.5 of the DWH Administrative Record presents more information about project changes adopted by the LA TIG. For the most up-to-date information regarding project modifications, see NOAA's DIVER Explorer website (NOAA, 2021c).

Table 2: Allocation of Deepwater Horizon Settlement Funds for the Louisiana Restoration Area by Final PDARP/PEIS Restoration Goal and Type

Final PDARP/PEIS Programmatic Restoration Goals and Underlying Restoration Types	Louisiana Total Allocation	Committed through Prior TIG Resolutions as of 1/26/22
1. Restore and Conserve Habitat	**$4,318,688,400**	**$1,126,029,175**
Wetlands, Coastal, and Nearshore Habitats	$4,009,062,700	$843,575,177
Habitat Projects on Federally Managed Lands	$50,000,000	$22,828,298
Early Restoration (through Phase IV)	$259,625,700	$259,625,700
2. Restore Water Quality	**$20,000,000**	**$9,724,333**
Nutrient Reduction (Nonpoint Source)	$20,000,000	$9,724,333
3. Replenish and Protect Living and Coastal Marine Resources	**$343,311,600**	**$160,043,211**
Sea Turtles	$10,000,000	$0
Submerged Aquatic Vegetation	$22,000,000	$0
Marine Mammals	$50,000,000	$3,572,490

[5] Unknown Conditions, Regionwide, Open Ocean, Alabama, Florida, Louisiana, Mississippi, and Texas.

Birds	$148,500,000	$43,659,121
Early Restoration Birds	$71,937,300	$71,937,300
Oysters	$26,000,000	$26,000,000
Early Restoration Oysters	$14,874,300	$14,874,300
4. Provide and Enhance Recreational Opportunities	**$60,000,000**	**$60,000,000**
Provide and Enhance Recreational Opportunities	$38,000,000	$38,000,000
Early Restoration Recreational Opportunities	$22,000,000	$22,000,000
5. Monitoring, Adaptive Management, Administrative Oversight	**$258,000,000**	**$32,557,301**
Monitoring and Adaptive Management	$225,000,000	$23,540,397
Administrative Oversight and Comprehensive Planning	$33,000,000	$9,016,904

1.3 Oil Pollution Act and National Environmental Policy Act Compliance

As an oil pollution incident, the DWH oil spill is subject to the provisions of OPA (33 United States Code [U.S.C.] § 2701 et seq.). A primary goal of OPA is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving an oil discharge or substantial threat of an oil discharge. Federal Trustees must comply with NEPA, 42 U.S.C. § 4321 et seq., its regulations, 40 Code of Federal Regulations (CFR) § 1500-1508 (2020), and agency specific NEPA regulations when proposing restoration projects. The Final PDARP/PEIS was intended to be used to tier the NEPA analysis in the subsequent restoration plans prepared by the TIGs (40 CFR § 1502.20; see Chapter 6 of the Final PDARP/PEIS). A tiered environmental analysis is a project-specific analysis that focuses on project-specific issues and summarizes or references (rather than repeats) the broader issues discussed in a programmatic NEPA analysis, in this case the Final PDARP/PEIS. As authorized under NEPA at 40 CFR 1502.20, the NEPA analysis in this RP/EA tiers from the programmatic analysis in the Final PDARP/PEIS where appropriate.

1.4 Lead Agency, Cooperating Agencies, and Intent to Adopt

The Trustees are comprised of state and federal government entities authorized under OPA to act on behalf of the public to assess the injuries to natural resources resulting from the DWH oil spill. The DWH Trustee Council includes representatives of Florida, Alabama, Mississippi, Louisiana, Texas, and the U.S. Department of Commerce, represented by NOAA, DOI, EPA, and USDA. Federal and state agencies work in collaboration to assess natural resource injuries and develop and implement a restoration plan to compensate for those injuries. Table 7.2-1 of the Final PDARP/PEIS summarizes the division of responsibilities among the Trustee Council, TIGs, and individual Trustee agencies (DWH Trustees, 2016).

In accordance with 40 CFR § 1501.5(a), NOAA serves as the lead federal agency responsible for NEPA compliance for this RP/EA, ensuring its compliance with the Council on Environmental Quality's (CEQ) NEPA implementing regulations (40 CFR § 1501.5(a). Other federal and state agencies of the LA TIG act as cooperating agencies for the purposes of compliance with NEPA in the development of this RP/EA. Each federal cooperating agency (DOI, USEPA, and USDA) on the LA TIG will review the RP/EA for adequacy in meeting the standards set forth in its own NEPA implementing procedures and intends to adopt the NEPA analysis in this draft RP/EA. Each will review the analysis for adequacy in meeting the

standards set forth in its own NEPA implementing procedures and subsequently adopt the NEPA analysis, if appropriate (40 CFR §1506.3). Adoption of the EA will be completed via signature on the relevant NEPA decision document. More information about OPA and NEPA, as well as their application to DWH oil spill restoration planning, can be found in Chapters 5 and 6 of the Final PDARP/PEIS (DWH Trustees, 2016).

1.5 Purpose and Need

The LA TIG has developed this RP/EA to contribute to the restoration of natural resources and services injured in the Louisiana restoration area resulting from the DWH oil spill. The proposed alternatives are intended to restore or replace habitats, species, and services to their baseline condition and to compensate the public for interim losses from the time of the DWH spill until they recover to baseline conditions.

This RP/EA is consistent with and expands upon the Final PDARP/PEIS, which identifies extensive and complex injuries to natural resources and services across the Gulf of Mexico (DWH Trustees, 2016). More specifically, the alternatives proposed in this RP/EA address the programmatic restoration goal of restoring and protecting habitats in the Louisiana restoration area, focusing on the WCNH restoration type. Additional information about the overall purpose and need for DWH NRDA restoration can be found in Section 5.3.2 of the Final PDARP/PEIS (DWH Trustees, 2016).

Section 5.3 of the Final PDARP/PEIS identifies and describes five programmatic goals for restoration work (listed in Table 2). These programmatic goals work independently and together to benefit injured resources and services. The WCNH restoration type goal, outlined in Section 5.5.2.1 of the Final PDARP/EIS, is as follows:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.
- While acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

1.6 Proposed Action

To meet the purpose of restoring natural resources and services injured as a result of the DWH oil spill, the LA TIG proposes to undertake the planning and implementation of the proposed projects, listed in Table 3 to restore and protect WCNH using funds made available through the DWH Consent Decree.

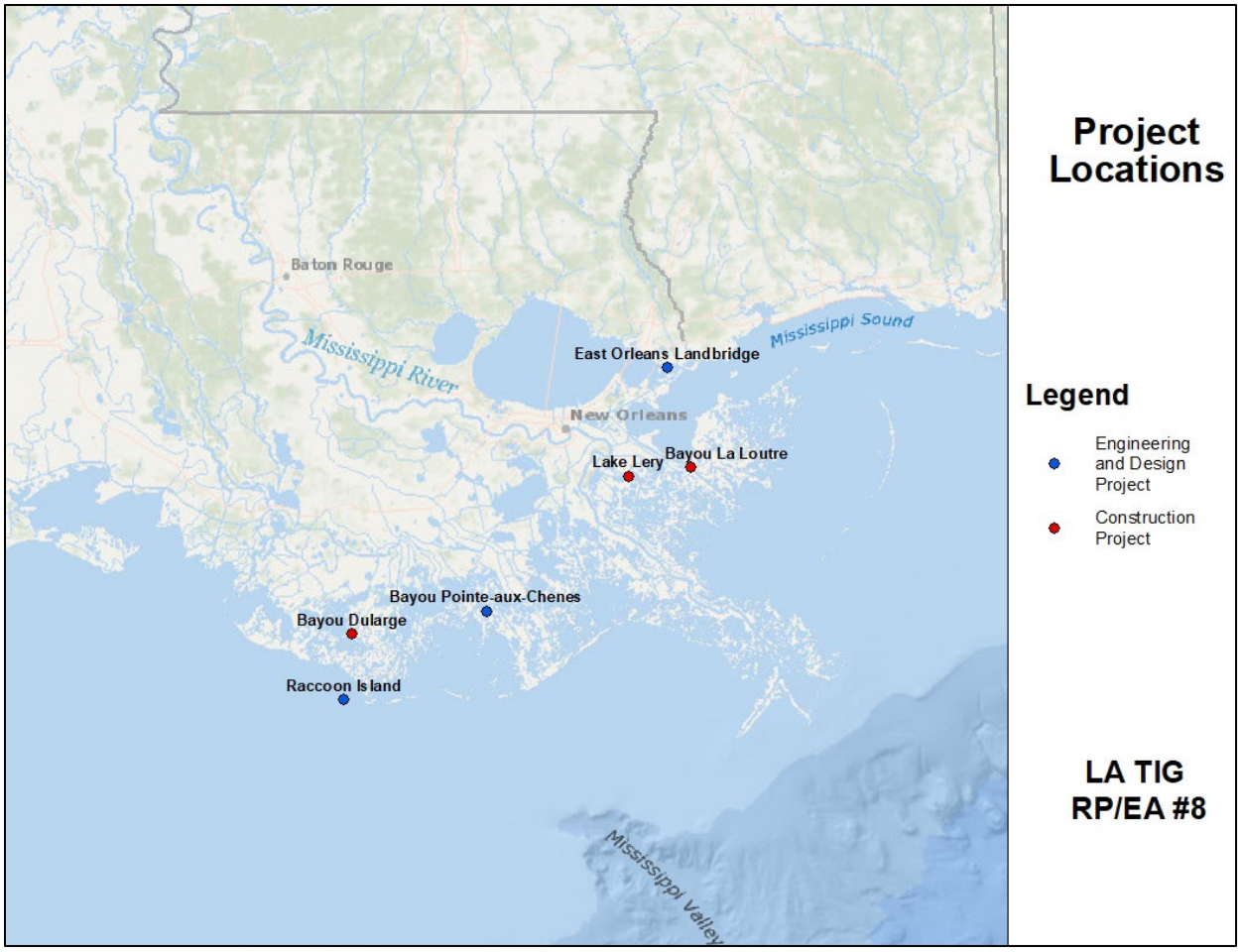
Table 3: RP/EA #8 Proposed Alternatives

Proposed Alternative	Type of Funding Request	Project Cost
Bayou Pointe-aux-Chenes Ridge and Marsh Creation	E&D	$4,736,900
East Orleans Landbridge Restoration	E&D	$4,000,000
Raccoon Island Barrier Island Restoration	E&D	$8,200,000

Bayou Dularge Ridge and Marsh Creation	Construction	$41,400,000
Bayou La Loutre Ridge Restoration and Marsh Creation	Construction	$21,200,000
Lake Lery Marsh Creation and Rim Restoration, Increment 3	Construction	$19,420,000

The locations of these proposed alternatives are shown in Figure 1. If implemented, this suite of proposed projects would use approximately $98,956,900 in DWH settlement funds for the WCNH restoration type, in accordance with the Consent Decree. If the proposed restoration alternatives are selected, there would be an approximate balance of $2,806,904,923 remaining for the WCNH restoration type.

Figure 1: Reasonable Range of Alternatives Project Locations



1.7 Public Involvement

Public input is an integral part of NEPA, OPA, and the DWH oil spill restoration planning effort. On October 1, 2010, the Trustees published a Notice of Intent (NOI) to Conduct Restoration Planning (75 Federal Register 60800), and on the Gulf Spill Restoration website (www.gulfspillrestoration.noaa.gov). Since then, the Trustees have sought restoration project ideas from the public through a variety of means. In addition, the Trustees implemented an extensive public outreach process as part of Final PDARP/PEIS development efforts; that process and associated public comments are described more fully

in Chapter 8 of the Final PDARP/PEIS (DWH Trustees, 2016). Public participation opportunities associated with this RP/EA are described below.

1.7.1 Louisiana Coastal Master Plan

During the development of the 2017 Louisiana Coastal Master Plan (CPRA, 2017), CPRA provided opportunities for coastal communities to provide input, both in person and online. Community conversations, along with the development of tools and materials to help communities understand coastal resiliency, placed citizens in the position to take active ownership in future adaptation decisions. After release of the draft Louisiana Coastal Master Plan, CPRA hosted four official public hearings and traveled across coastal Louisiana to participate in meetings, briefings, and presentations to receive feedback and comments from coastal citizens. In all, CPRA received over 1,300 public comments on the draft 2017 Louisiana Coastal Master Plan.

1.7.2 Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA)

The E&D phase of the Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178) was funded through the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) program. The project underwent public comment for the E&D phase as part of the environmental assessment (EA) process (USFWS, 2017). As part of this RP/EA, this project is being evaluated for construction phase funding by the LA TIG.

1.7.3 Public Involvement in the Development of this LA TIG RP/EA

On February 1, 2021, the LA TIG issued a notice of solicitation (NOS) on the NOAA Gulf Spill Restoration website (at the following URL: https://www.gulfspillrestoration.noaa.gov) requesting project ideas (Appendix B). On June 29, 2021, the LA TIG issued a notice of intent informing the public that it was initiating the drafting of a restoration plan to restore WCNH. After review and project screening (see Chapter 2), the LA TIG developed the reasonable range of alternatives presented in this RP/EA.

The public is encouraged to review and comment on this RP/EA. It is made available for public review and comment for 30 days following its release as specified in the public notice published in both the Federal and Louisiana Registers. Comments can be submitted by one of following methods:

- Online at: http://www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana
- By mail (hard copy) addressed to: U.S. Fish and Wildlife Service, P.O. Box 29649, Atlanta, GA 30345
- Online during the public webinar on April 5, 2022, Submissions must be postmarked no later than 30 days after the release date of this RP/EA.

1.7.4 Coordination with Other Gulf Restoration Programs

Because of the magnitude of the DWH Oil Spill, the DWH Trustees began planning for and implementing Early Restoration projects with funding from BP before the oil spill's injury assessment was complete and before the entry of the Consent Decree. Early Restoration occurred in five separate phases, during which the Trustees prepared Early Restoration plans and completed associated NEPA compliance. These Early Restoration activities are a subset of the extensive, continuing effort being undertaken to address complete restoration of injuries to natural resources resulting from the DWH oil spill. The 10 restoration plans released by the LA TIG following Early Restoration can be found on the Louisiana DWH website at: https://la-dwh.com/ and are discussed further in Appendix A. More details about coordination can be found in Section 1.5.6 of the Final PDARP/PEIS.

The DWH Trustees are committed to coordinating with other Gulf of Mexico restoration programs to maximize the overall ecosystem benefits from DWH NRDA restoration efforts. During the course of the restoration planning process, the LA TIG coordinates with other DWH oil spill and Gulf of Mexico restoration programs, including the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) program as implemented by the Gulf Coast Ecosystem Restoration Council; the Gulf Environmental Benefit Fund (GEBF) managed by the National Fish and Wildlife Foundation (NFWF); and other state and federal funding sources. Restoration efforts occurring in the Louisiana Restoration Area through other programs are further described at the following URL: http://coastal.la.gov/. For example, funds from CWPPRA are currently being used to construct the following projects:

- New Orleans Landbridge Shoreline Stabilization and Marsh Creation (PO-0169) Project
- Bayou Decade Ridge Restoration and Marsh Creation (TE-0138) Project

Additionally, funds from CWPPRA were recently used to construct:

- South Lake Lery Shoreline and Marsh Creation (BS-16) Project
- Lost Lake Marsh Creation and Hydrologic Restoration (TE-72) Project
- Raccoon Island Shoreline and Marsh Creation (TE-48) Project

Each of these projects are in the vicinity of and have similar features to projects evaluated in this RP/EA. Lessons learned from the design and construction of these projects and subsequent monitoring information collected for these projects will be used to inform the development of projects that result from this RP/EA.

These other restoration efforts that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives are also considered in the analysis of this RP/EA, which is discussed in Section 4.6.

This RP/EA has also been developed to be consistent with the Louisiana Coastal Master Plan. The Louisiana Coastal Master Plan uses the best available science to identify specific projects that would improve the long- term sustainability of Louisiana's coast (CPRA, 2017). The projects included in the Louisiana Coastal Master Plan are the result of extensive public input, review, and vetting. Continuing Louisiana's strategy for coastal restoration, Louisiana Governor John Bel Edwards issued Executive Order JBE 2016-09, which requires all State of Louisiana departments and agencies to "administer their regulatory practices, programs, projects, contracts, grants, and all other functions vested in them in a manner consistent with the Louisiana Coastal Master Plan and public interest to the maximum extent possible." As such, projects proposed in this RP/EA were evaluated for consistency with the goals and objectives of the Louisiana Coastal Master Plan, including implementation timelines (CPRA, 2017a).

1.8 Next Steps

The LA TIG will accept public comments and host a public webinar to facilitate the public review and comment process. After the close of the public comment period, the LA TIG will consider all input received during the public comment period and finalize this draft RP/EA, if appropriate. A summary of comments received and the LA TIG's responses (where applicable) will be included in the final RP/EA.

Permits (e.g., Clean Water Act Section 404 permits) may be required for selected alternatives prior to implementation, which could require additional environmental analyses. All environmental compliance requirements would be completed prior to any ground disturbance. If the outcome of environmental compliance reviews would necessitate a change in project scope, additional OPA and NEPA review, as appropriate, may be conducted to address those changes.

1.9 Severability of Projects

In this RP/EA, the LA TIG proposes four preferred restoration alternatives with a total funding of approximately $74,800,000. The restoration alternatives analyzed in this RP/EA are independent of each other and may be selected independently for implementation in this and/or future restoration plans by the LA TIG.

1.10 Administrative Record

Concurrent with publication of the 2010 NOI (pursuant to 15 CFR § 990.45), the DWH Trustees opened a publicly available Administrative Record for the DWH oil spill, which includes restoration planning activities. DOI is the lead federal Trustee for maintaining the Administrative Record, which can be found at https://www.doi.gov/deepwaterhorizon/adminrecord. The LA TIG also uses this Administrative Record site for DWH restoration planning.

Information about restoration project implementation is provided to the public through the Administrative Record and through other outreach efforts, including online at the following URL: https://www.gulfspillrestoration.noaa.gov.

1.11 Decision to be Made

This RP/EA is intended to provide the public and decision makers with information and analyses on the alternatives presented in this RP/EA. This RP/EA considers OPA and NEPA analyses and input from the public to help guide the LA TIG's selection of alternatives for implementation.

1.12 Document Organization

This document consists of Chapters 1 through 8, with five appendices. The overall organization of the document is as follows:

- **Executive Summary**: Brief summary of the document
- **Chapter 1 Introduction**: Introductory information and context for this RP/EA, background and summary of the settlement, restoration planning by the LA TIG, OPA and NEPA compliance, purpose and need, and proposed action
- **Chapter 2 Restoration Planning Process**: Information on the restoration planning process, screening of potential restoration alternatives, and selection of a reasonable range of alternatives to address the WCNH restoration types
- **Chapter 3 OPA NRDA Evaluation Criteria**: Evaluation of the reasonable range of alternatives against criteria set forth in OPA and selection of preferred alternatives
- **Chapter 4 NEPA Analysis**: Overview of the NEPA analysis approach, description of the affected environment and environmental consequences for each of the alternatives evaluated in this RP/EA, and description of the impacts of the alternatives when added to other past, present, and reasonably foreseeable future actions
- **Chapter 5 Compliance with Other Laws and Regulations**: Identification of other federal, state, and local laws that may apply to the preferred alternatives in this RP/EA

- **Chapter 6 List of Preparers and Agencies Consulted**: Identification of individuals who substantively contributed to the development of this RP/EA and agencies consulted
- **Chapter 7 List of Repositories**: List of facilities that received copies of this RP/EA for review by the public
- **Chapter 8 Literature Cited**: List of references used to write and support the analysis in this RP/EA
- **Appendix A Plans/Projects to Date**: List of each RP/EA released to date by the LA TIG
- **Appendix B Notice of Solicitation**: Notice of solicitation (NOS) for project ideas to be considered for this RP/EA
- **Appendix C Project Universe**: List of projects submitted to the Trustee and Louisiana portals
- **Appendix D MAM Plans**: MAM plans for preferred restoration alternatives that are planned for construction
- **Appendix E Guidelines for NEPA Impact Determinations**: Definitions of impact intensities from the Final PDARP/PEIS

2.0 RESTORATION PLANNING PROCESS

Following OPA NRDA regulations (15 CFR 990.53), and in accordance with guidance put forward in the Final PDARP/PEIS, the LA TIG developed a screening process to identify a reasonable range of restoration alternatives. Those alternatives are evaluated in this RP/EA and are consistent with the Trustees' selected programmatic alternative and the goals identified in the Final PDARP/PEIS. The restoration planning process was conducted in accordance with the Consent Decree, 2021 Trustee Council Standard Operating Procedures (SOP) for Implementation of the Natural Resource Restoration for the DWH oil spill (DWH Trustees, 2021), OPA NRDA regulations, and NEPA regulations.

2.1 Final PDARP/PEIS and Record of Decision

On February 19, 2016, the DWH Trustees issued the Final PDARP/PEIS which details a programmatic plan to allocate settlement funds paid by BP over 15 years to several restoration projects across the Gulf (DWH Trustees, 2016). The Trustees proposed a comprehensive, integrated ecosystem restoration approach based upon their assessment of impacts on the Gulf's natural resources. On March 29, 2016, in accordance with OPA and NEPA, the DWH Trustees published Notice of Availability (NOA) of a ROD for the Final PDARP/PEIS in the Federal Register (81 FR 17438) which selects Alternative A: Comprehensive Integrated Ecosystem Alternative (DWH Trustees, 2016).

2.2 Summary of Injuries Addressed in this RP/EA

Chapter 4 of the Final PDARP/PEIS summarizes the injury assessment and documents the nature, degree, and extent of injuries from the DWH oil spill to both natural resources and the services they provide. To help address these injuries, the LA TIG chose in this RP/EA to propose projects under the Wetlands, Coastal, and Nearshore Habitats restoration type, summarized below.

2.2.1 Injury to Wetlands, Coastal, and Nearshore Habitats

The DWH oil spill caused significant injuries to the nearshore marine ecosystem in Louisiana, which experienced the majority of oiled shoreline and most oiled wetland shorelines, compared to other Gulf states (DWH Trustees, 2016). Oiling caused multiple injuries to these habitats, including increased erosion of oiled shorelines, reductions in aboveground biomass and total plant cover in mainland herbaceous salt marshes, reductions in periwinkle snail abundance, reductions in shrimp and flounder growth rates, reduced reproductive success in forage fish, reduced amphipod survival, impacts to submerged aquatic vegetation (SAV) habitats, and reduced nearshore oyster cover. In addition to extensive injuries to these habitats and their dependent resources, Louisiana suffered extensive injuries to birds and their corresponding habitats (Strategic Framework for Bird Restoration Activities) (DWH Trustees, 2017). Additionally, some response actions resulted in unintended injury to resources, such as a reduction in diversity and percent cover of SAV (DWH Trustees, 2016).

As discussed in the Final PDARP/PEIS, "oiling has been documented to adversely affect coastal wetland vegetation and associated fauna. Oil can wash up at the marsh edge, oiling soil, and coating vegetation. It can also penetrate the marsh through tidal creeks and wash-over events and become stranded in the marsh interior where it can coat plant stems and soil" (DWH Trustees, 2016).

Shoreline oiling results in the loss of marsh vegetation, which "initiate[s] a cascade of trophic-level impacts to bacteria, invertebrates, plankton, and higher-level organisms" (DWH Trustees, 2016). Further, "marsh plants also play an important role in shoreline stabilization, holding and stabilizing soil and sediment, and helping to retain and accumulate soil in the marsh. The marsh serves a role in coastal flood protection by attenuating storm and wave energy" (DWH Trustees, 2016). Therefore, the injuries

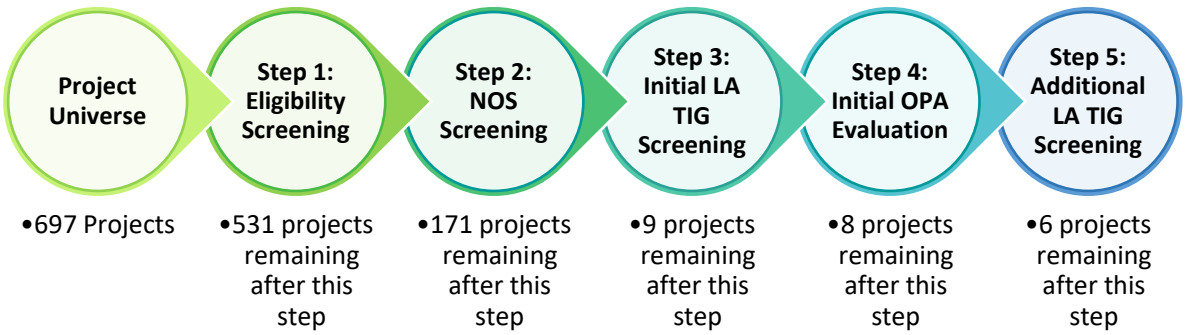
caused by the DWH oil spill have significantly contributed to the ongoing coastal crisis in Louisiana. The Trustees concluded that some of these losses are permanent, and some injuries, such as marsh edge erosion, can be addressed through the creation of new marsh land (DWH Trustees, 2016).

2.3 Project Screening and Reasonable Range of Alternatives

The goal of the LA TIG's screening process was to identify a reasonable range of alternatives suitable for addressing injuries to natural resources and their services caused by the DWH oil spill. To develop a reasonable range of alternatives, the LA TIG reviewed the Trustees' restoration goals specified in Sections 5.3 and 5.5 of the Final PDARP/PEIS. The LA TIG also considered other criteria identified in the Final PDARP/PEIS including the screening factors in the OPA NRDA regulations (15 CFR 990.54), input from the public, the current and future availability of funds under the DWH NRDA settlement payment schedule, projects already fully funded or proposed to be fully funded by the other DWH restoration funding sources (NFWF, GEBF and the RESTORE Act), and other non-DWH restoration funding sources.

The figure below summarizes the detailed screening steps that were undertaken, and the following sections describe the screening methodology in more detail.

Figure 2: Project Screening Process Summary



2.3.1 Project Universe

The LA TIG assembled a list of all 697 projects submitted to the Trustee and Louisiana portals on or before March 2, 2021 (Appendix C). Each project went through the multi-step screening process described in the following sections.

2.3.2 Step 1: Eligibility Screening

To be eligible for further consideration in this RP/EA, projects had to meet all three of the following eligibility screening criteria:

a) Is the project located in the Louisiana Restoration Area?
b) Does the project meet at least one of the goals outlined in the Final PDARP/PEIS to compensate for injuries resulting from the DWH oil spill?
c) Has the project not been previously funded or implemented in the Louisiana Restoration Area, and is it not duplicative with other efforts?

Of the 697 projects screened, 531 met the eligibility screening criteria and were carried forward to Step 2.

2.3.3 Step 2: NOS Initial Screening

The LA TIG next screened projects against the Notice of Solicitation (NOS) initial screening. For this RP/EA, the NOS required that projects fall under the WCNH restoration types. Of the 531 projects deemed eligible in Step 1, 171 WCNH projects passed the NOS screening were carried forward to Step 3.

2.3.4 Step 3: Initial LA TIG Screening

Step 3 captured the specific considerations the LA TIG values in identifying projects to include in this RP/EA. These criteria were developed by the LA TIG to aid in screening and are consistent with overall LA TIG program goals, taking into consideration prior and ongoing restoration activities of both the LA TIG and other restoration programs.

The LA TIG focused on projects that directly create or restore wetland habitats that would provide the greatest benefit to injured resources. Additionally, the LA TIG was interested in projects that would be construction ready in the near term and those that have sufficient planning to advance to engineering and design (E&D). Advancing construction-ready projects ensures that a habitat is restored or created quickly and moving projects through E&D would provide a pipeline of further defined projects for potential future implementation. A total of 171 WCNH projects were carried forward to this step.

In Step 3, WCNH projects had to meet each of the following criteria:

a) Does the project directly create or restore wetland, coastal, or nearshore habitats? 109 of the 171 projects met this criterion.
b) Does the project directly create or restore emergent habitat? 103 of the 109 remaining projects met this criterion.
c) Is the project located in the Barataria, Breton, Mississippi River Delta, Pontchartrain, or Terrebonne Basins? 94 of the 103 remaining projects met this criterion.
d) Is the project a marsh creation or barrier island restoration project? 50 of the 94 remaining projects met this criterion.
e) Is the project not a subset of a recent project or listed project? 32 of the remaining 50 projects met this criterion.
f) Is the project construction ready, or does it have sufficient planning completed to proceed to E&D in the near term? 26 of the remaining 32 projects met this criterion.
g) Does the project create or restore complex habitats (e.g., marsh and ridge; beach, dune, and marsh; marsh and living shoreline) within the nearshore ecosystem and therefore contribute to an integrated, connected food web? Project submissions that result in restoration of complex habitats are favored. 11 of the remaining 26 projects met this criterion.
h) Are there no other impediments to carrying the project forward as part of the reasonable range of alternatives designated for more detailed OPA and NEPA analysis (e.g., other funding source imminent, compliance, land rights, or legal issues)? 9 of the remaining 11 projects met this criterion.

Of the 171 WCNH projects that were screened in this step, the LA TIG identified a total of nine projects that were carried onto Step 4, including three projects as meeting the construction criterion and six projects as meeting the E&D criterion. These nine remaining projects moved to Step 4 of the screening process.

2.3.5 Step 4: Initial OPA Evaluation

The fourth screening step ensured that projects considered in this RP/EA were compliant with the six OPA NRDA evaluation standards provided at 15 CFR § 990.54 including:

a) The cost to carry out the alternative.
b) The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses.
c) The likelihood of success of each alternative.
d) The extent to which each alternative would prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative.
e) The extent to which each alternative benefits more than one natural resource and/or service.
f) The effect of each alternative on public health and safety.

These criteria are described further in Table 11. Projects at this step were evaluated based on the alternative's ability to meet the OPA criteria. There were eight WCNH projects progressed to Step 5 of the screening process.

2.3.6 Step 5: Additional LA TIG Screening Considerations

During the final screening step, the LA TIG asked four questions of the eight projects brought forth by Step 4. The following screening components were considered:

a) Is the project complementary to other restoration projects in the area?
b) Are there funds that can be leveraged with NRDA funds to allow for project implementation?
c) Does the scale of the proposed project fit within the expected NRDA cash flow for the implementing agency?
d) Would the implementation of the project be consistent with the state's Master Plan implementation schedule?

Following this final screening step, the LA TIG identified six WCNH projects (three construction projects and three E&D projects) and the "No Action" alternative to include in the reasonable range of alternatives for this RP/EA.

2.3.7 Summary of Screening Process

Implementation of the LA TIG's screening methodology provides a rigorous and comprehensive approach to identifying a reasonable range of alternatives for evaluation in this RP/EA. Overall, the process yielded three E&D projects and three construction projects for more detailed OPA and NEPA analyses. Table 4 lists and describes the five screening steps and criteria.

Table 4 : Screening Criteria Applied to the Project Universe

Step	Prescreening Criteria	Screening Notes
Step 0	Existing Project Universe	The LA TIG assembled a list of all 697 projects submitted to the Trustee and Louisiana portals March 2, 2021.
	a) Is the project located in the Louisiana Restoration Area?	To be eligible for further consideration, projects had to

Step 1: Eligibility Screening	b) Does the project meet at least one of the restoration types outlined in the PDARP/PEIS to compensate for injuries resulting from the DWH Spill?	meet all three eligibility screening criteria.
	c) Has the Project been previously funded or implemented in the Louisiana Restoration Area, or is it duplicative with other efforts?	
Step 2: NOS	Does the project fall under the WCNH restoration type?	The RP/EA #8 NOS required that projects fall under either the WCNH restoration types.
Step 3: TIG Specific Screening	a) Does the project directly create or restore wetland, coastal or nearshore habitat?	These criteria were developed by the LA TIG to aid in screening and are consistent with overall LA TIG program goals, taking into consideration prior and ongoing restoration activities of both the LA TIG and other restoration programs. The LA TIG focused on projects that directly create or restore wetland habitats that would provide the greatest benefit to injured resources. Additionally, the LA TIG was interested in projects that would be construction ready in the near term and those that have sufficient planning to advance to E&D. Advancing construction-ready projects ensures that habitat is restored or created quickly and moving projects through E&D would provide a pipeline of quality projects for future implementation.
	b) Does the project directly create or restore emergent habitat?	
	c) Is the project located in the Barataria, Breton, Mississippi River Delta, Pontchartrain, or Terrebonne basins?	
	d) Is the project a marsh creation or barrier island restoration project?	
	e) Is the project not a subset of recent project or listed project?	
	f) Is the project construction ready in the near term or does the project have sufficient planning and vetting to move into E&D in the near term	
	g) Does the project create or restore complex habitats (e.g., marsh and ridge; beach, dune, and marsh; marsh and living shoreline) within the nearshore ecosystem and therefore contribute to an integrated, connected food web? Project submissions that result in restoration of complex habitats are favored.	
	h) Are there no other impediments to carrying the project forward as part of the reasonable range of alternatives designated for more detailed OPA and NEPA analysis (e.g., other funding source imminent, compliance, land rights, or legal issues)?	
Step 4: Initial OPA Evaluation	a) The cost to carry out the alternative.	Projects at this step required an affirmative response to all six questions to move to Step 4.
	b) The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses.	
	c) The likelihood of success of each alternative.	
	d) The extent to which each alternative would prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative.	

	e) The extent to which each alternative benefits more than one natural resource and/or service.	
	f) The effect of each alternative on public health and safety.	
Step 5: Additional TIG Screening Criteria	a) Is the project complementary to other restoration projects in the area?	The LA TIG evaluated projects based on the need to provide restoration benefits across the many Louisiana basins impacted by the DWH oil spill, the current and future availability of funds under the DWH oil spill NRDA settlement payment schedule, and the availability of other resources (e.g., sediment, dredging equipment) required for project implementation.
	b) Are there funds that can be leveraged with NRDA funds to allow for project implementation?	
	c) Does the scale of the proposed project fit within the expected NRDA cash flow for the implementing agency?	
	d) Would the implementation of the project be consistent with the state's Master Plan implementation schedule?	

2.3.8 Summary of Alternatives Considered but Not Carried Forward

As described in Section 2.3.1, the LA TIG evaluated 697 projects against screening criteria. Projects that were not considered for further evaluation in this RP/EA did not meet the screening criteria discussed in Section 2.3. Projects not included in the reasonable range of alternatives, not identified as preferred at this time, or not selected for implementation may continue to be considered for inclusion in future restoration plans developed by the LA TIG.

2.3.9 Reasonable Range of Alternatives

Based on the screening process described in Section 2.3, the LA TIG identified a reasonable range of alternatives for further evaluation in this RP/EA, listed below.

E&D Alternatives:

- Bayou Pointe-aux-Chenes Ridge and Marsh Creation (Table 5)
- East Orleans Landbridge Restoration (Table 6)
- Raccoon Island Barrier Island Restoration (Table 7)

Construction Alternatives:

- Bayou Dularge Ridge and Marsh Creation (Table 8)
- Bayou La Loutre Ridge Restoration and Marsh Creation (Table 9)
- Lake Lery Marsh Creation and Rim Restoration, Increment 3[6] (Table 10)

Figure 1 shows the location of each project in the reasonable range of alternatives. Brief descriptions for the following projects are found in Table 5 through Table 10. More detailed project descriptions can be found in Section 3.5.

[6] The design documents for this project use the name "Lake Lery Marsh Creation and Rim Restoration Phase III". If constructed, it would be the third project of its kind surrounding Lake Lery, hence the connotation "Phase III" The LA TIG determined that the text "Phase III" could be confusing to the reader, as this and previous RP/EA's use the phrase "Phase 1" as the planning, engineering and design phase of a project and "Phase 2" as the construction phase of a project. For this reason, within this RP, the project name has been changed to "Lake Lery Marsh Creation and Rim Restoration, Increment 3".

The Final PDARP/PEIS provides for TIGs to propose restoration projects using a planning process that involves phasing restoration projects across multiple restoration plans. A TIG may propose funding a planning phase (e.g., initial E&D) in a restoration plan for a conceptual project. This allows a TIG to develop information needed to fully consider a subsequent implementation phase of the project in a future restoration plan (construction). In this RP/EA, the LA TIG considers alternatives to fund E&D for conceptual projects and also to fund projects for construction implementation.

Three of the alternatives would include only E&D activities. These proposed E&D projects allow the LA TIG to conduct a range of activities that would provide information necessary to consider a subsequent construction phase in a future restoration plan. LA TIG decisions regarding E&D alternatives are not a commitment to future construction of the project and are conditional on analysis in this RP/EA. While E&D alternatives would not directly restore natural resources or their services, they provide information needed to potentially effectively do so in the future. The remaining three alternatives being evaluated would include construction actions after all regulatory compliance and permitting requirements are met.

Table 5: Bayou Pointe-aux-Chenes Ridge and Marsh Creation Project

Project Element	Project Details
Project Phase	Engineering & Design
Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material and restore natural hydrology
Project Location	Terrebonne Basin; Lafourche and Terrebonne Parishes; N29.353874, W90.386358
Project Summary	The goal of the project is to perform engineering and design for a project that, if constructed in the future, would create new wetland habitat, and restore degraded marsh, provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the southern portions of Bayou Pointe-aux-Chenes. The proposed project would perform engineering and design for a project that, if constructed in the future, would be expected to create, and fortify approximately 31,910-ft. of ridge and create/nourish 473 acres of marsh by dredging sediment from designated borrow areas from sources in Lake Felicity or Lake Raccourci.
Cost Estimate	The total engineering and design project cost is estimated to be approximately $4,736,900.

Table 6: East Orleans Landbridge Restoration Project

Project Element	Project Details
Project Phase	Engineering & Design

Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material
Project Location	Pontchartrain Basin; Orleans Parish; N30.113516, W89.687500
Project Summary	The goal of the project is to perform engineering and design for a project that, if constructed in the future, would be expected to create and restore marsh habitat that separates Lake Pontchartrain from Lake Borgne and the Gulf of Mexico. The project would perform engineering and design for a project that, if constructed in the future, would be expected to include 1,563 acres of wetlands created using hydraulically dredged sediment from potential borrow areas in Lake St. Catherine/Bay Jaune and Lake Pontchartrain, and 21,597-ft. of living shoreline protection features.
Cost Estimate	The total engineering and design project cost is estimated to be approximately $4 million.

Table 7: Raccoon Island Barrier Island Restoration Project

Project Element	Project Details
Project Phase	Engineering & Design
Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material
Project Location	Terrebonne Basin; Terrebonne Parish; N29.051097, W90.926373
Project Summary	The goal of the project is to perform engineering and design associated with a project that, if constructed in the future, would be expected to create and enhance beach, dune, supratidal, intertidal, and subtidal habitats through seaward and landward sand fill placement and shoreline protection. Herbaceous and woody planting would be included to promote avian nesting and loafing habitat. The project would perform engineering and design associated with a project that, if constructed in the future, would be expected to also restore multiple types of coastal habitat, including approximately 33 acres of beach and dune, approximately 150 acres of marsh, and approximately 50 acres of upland habitat (mounds). The island is habitat for one of the 10 remaining brown pelican colonies in

	Louisiana and also provides habitat for piping plovers and ground nesters. If constructed, this project would create, enhance, and sustain an important area of productive bird nesting habitat.
Cost Estimate	The total engineering and design project cost is estimated to be approximately $8,200,000.

Table 8: Bayou Dularge Ridge and Marsh Creation Project

Project Element	Project Details
Project Phase	Construction
Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material
Project Location	Terrebonne Basin; Terrebonne Parish; N29.264793, W90.935788
Project Summary	The primary goals of the project are to create and nourish marsh on the south side of Bayou Dularge utilizing borrow material from Lake Mechant and to restore the ridge along the southern bank of Bayou Dularge. This project would create approximately 400 to 500 acres of marsh and nourish up to 30 acres of marsh and restore approximately 17,200-ft. to 19,860-ft. of ridge along Bayou Dularge.
Cost Estimate	The total construction estimate is approximately $41,400,000.

Table 9: Bayou La Loutre Ridge Restoration and Marsh Creation Project

Project Element	Project Details
Project Phase	Construction
Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material
Project Location	Lake Pontchartrain and Breton Sound Basins; St. Bernard Parish; N29.844179, W89.601784
Project Summary	The goals of the project are to utilize borrow material from Lake Borgne to create and nourish marsh along Lena Lagoon and to utilize materials dredged from Bayou La Loutre to restore the ridge along the southern bank of Bayou La Loutre. This project would create and nourish approximately 421 acres of marsh and restore approximately 28,855-ft. of ridge along Bayou La Loutre.

Cost Estimate	The total construction cost is approximately $21,200,000.

Table 10: Lake Lery Marsh Creation and Rim Restoration, Increment 3

Project Element	Project Details
Project Phase	Construction
Restoration Approach	Create or restore wetland, coastal, or nearshore habitats
Restoration Technique	Create or enhance coastal wetlands through placement of dredged material
Project Location	Breton Sound Basin; St. Bernard Parish; N29.81538, W89.8311
Project Summary	The primary goal of the project is to restore the northern shoreline of Lake Lery and counteract further degradation by re-establishing the lake rim through creating a shoreline embankment and creating and nourishing the surrounding marsh. The project could construct approximately 2.38 miles of lake rim protection and approximately 401 acres of marsh creation and nourishment using hydraulically dredged material from Lake Lery.
Cost Estimate	The total construction cost is approximately $19,420,000.

The Pointe-aux-Chenes Ridge Restoration and Marsh Creation Project was analyzed as a part of RP/EA #7. The project was proposed for E&D at the time, underwent preliminary OPA NRDA analysis and LA TIG screening, and was identified as a non-preferred alternative. When compared to the other selected alternative in RP/EA #7 (Bird's Foot Delta Hydrologic Restoration Project), the Pointe-aux-Chenes Ridge Restoration and Marsh Creation Project was smaller in scale than the Bird's Foot Delta Hydrologic Restoration project and was further from the epicenter of the spill, which resulted in less extensive injuries to natural resources at that location when compared to the selected alternative. It was noted in RP/EA #7 that the Pointe-aux-Chenes Ridge Restoration and Marsh Creation project could still be considered for E&D funding in subsequent restoration planning efforts by the LA TIG, depending on screening process of projects considered for subsequent RP/EAs.

The Lake Lery Marsh Creation and Rim Restoration, Increment 3 Project was originally screened as a part of RP/EA #6. The project was proposed for construction at the time, underwent initial OPA screening and LA TIG screening, but did not progress to the reasonable range of alternatives carried forward. Among the suite of projects considered at that time, the project did not progress to the Reasonable Range of Alternatives in RP/EA #6 because the other project alternative considered were in close proximity and therefore gave a greater overall benefit to nearshore habitats as a whole. Otherwise, the screening process deemed this project as meeting all other criteria and eligible for future consideration in subsequent RP/EAs. For this RP/EA #8, this project is complementary to the other projects in the area and therefore progressed to the Reasonable Range of Alternatives.

For this RP/EA, Step 5: Additional TIG Screening Criteria asks the question "Is the project complementary to other restoration projects in the area?", for which this project answers "yes", so this project scores the maximum number of points and progressed to the Reasonable Range of Alternatives.

Natural Recovery/No Action

The OPA NRDA regulations provide that "Trustees must consider a 'natural recovery alternative' in which no human intervention would be taken to directly restore injured natural resources and services to baseline" [40 CFR § 990.53(b)(2)]. Under a natural recovery alternative, the Trustees would not implement any restoration to accelerate the recovery of injured natural resources or to compensate for lost services. This could produce one of four outcomes for injured resources: (1) gradual recovery, (2) partial recovery, (3) no recovery, or (4) further deterioration.

Under the natural recovery alternative, even if injured resources could recover to baseline or near baseline conditions, recovery would take much longer compared to a scenario in which appropriate restoration actions were undertaken. As noted in the Final PDARP/PEIS, interim losses of natural resources, and the services they provide would not be compensated under a natural recovery alternative (DWH Trustees, 2016).

Since technically feasible restoration approaches are available, the Trustees rejected the option of natural recovery from further consideration in the Final PDARP/PEIS (DWH Trustees, 2016). Consistent with OPA regulations, the LA TIG has incorporated the natural recovery alternative in this RP/EA by reference; however, the LA TIG rejects the natural recovery alternative as a viable means of compensating the public for the injuries caused to WCNH by the DWH oil spill.

Pursuant to NEPA, a no action alternative is considered in Section 4 of this RP/EA as a basis for comparison of potential environmental consequences of the action alternatives.

3.0 OIL POLLUTION ACT (OPA) NRDA EVALUATION OF ALTERNATIVES

As summarized in Chapter 2, the LA TIG identified a reasonable range of restoration alternatives for more detailed evaluation. This chapter provides an overview of the OPA NRDA evaluation criteria and a detailed evaluation of each of the projects in the reasonable range of alternatives according to those criteria.

3.1 Summary of OPA NRDA Evaluation Standards

The OPA NRDA regulations (15 CFR § 990.54) provide a set of criteria that Trustees can use to evaluate a reasonable range of alternatives and identify preferred alternatives (Table 11). This chapter evaluates the reasonable range of alternatives against each of these six criteria. Three of the alternatives have already undergone E&D. For these alternatives, the OPA NRDA evaluation examined the project as currently designed against each of the OPA NRDA criteria. The OPA NRDA evaluation for the three E&D projects compares both the E&D activities and the conceptual projects, to the extent currently feasible, against each of the OPA NRDA criteria. Based on the detailed evaluation, LA TIG goals and objectives, and other considerations, this chapter also provides a summary of the Trustees' preferred and non-preferred alternatives.

Table 11: OPA NRDA Evaluation Criteria

Criteria	Criteria Description
Is the cost to carry out the project reasonable?	Consider estimate of costs provided in the submission and your knowledge of costs for similar projects.
Is the project expected to meet the DWH Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses?	The analysis for this criterion will address, among other factors, the restoration action's nexus to the resource injuries described in the Final PDARP/PEIS. Project readiness, including ability to comply with regulatory requirements or implement proposed activities in a timely manner, should be considered. This can include the time to derive benefits from planned activities.
Is the project likely to succeed?	Does the alternative contain restoration approaches or techniques that have been executed successfully previously? Is the restoration approach or technique routinely used? Can past experiences inform further development of the alternative to increase likelihood of success?
To what extent would the project prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative?	Can the alternative have direct or indirect collateral environmental impacts? These impacts can be in the immediate location, adjacent to the alternative location, or distant from the alternative location. The Final PDARP/PEIS restoration type NEPA analysis provides additional information to consider.
To what extent would the project benefit more than one natural resource and/or service?	Although an alternative or project may be funded exclusively from one restoration type allocation, the Trustees should consider the ability to provide multiple resource benefits.
What would the effect be on public health and safety?	Trustees should consider if there are any aspects of the project that could negatively affect public health and safety that cannot be mitigated.

3.2 Monitoring Requirements

Consistent with the OPA NRDA regulations, Trustees establish restoration objectives that are specific to the natural resources that were injured (15 CFR §990.55(b)(2)). These objectives should clearly specify the desired outcome, and the performance criteria by which successful restoration will be determined, including criteria that would necessitate corrective actions (15 CFR §990.55(b)(2)).

In the Final PDARP/PEIS, the DWH Trustees identified "Monitoring, Adaptive Management, and Administrative Oversight" as a programmatic restoration goal (DWH Trustees, 2016). As described in Chapter 5, Appendix E of the Final PDARP/PEIS, the Trustee Council has committed to a MAM Framework that incorporates the best available science into planning and design of the alternative, identifies and reduces key uncertainties, tracks and evaluates progress toward restoration goals, and determines the need for corrective actions (DWH Trustees, 2016). The MAM Framework provides a flexible, science-based approach to implement and monitor restoration.

The LA TIG developed MAM plans for the preferred construction alternatives identified in this RP/EA, included in Appendix D. These MAM plans outline the monitoring needed to evaluate each alternative's progress toward meeting site-specific objectives, the appropriate corrective actions, and adaptive management where applicable. These plans are consistent with the requirements and guidelines set forth in the Final PDARP/PEIS (DWH Trustees, 2016), the Trustee Council SOPs (DWH Trustees, 2021), and the Trustees' MAM Manual (DWH Trustees, 2017a). Monitoring goals, objectives, parameters, potential corrective actions, and monitoring schedules are included. The MAM plans are intended to be updated as needed to reflect changing conditions and to incorporate new information as it becomes available. For example, if initial data analysis indicates that the sampling design for the alternative is inadequate, or if any uncertainties are resolved or new uncertainties are identified during implementation and monitoring of the alternative, the plan may need to be revised. Updates to MAM plans and any additional details concerning the status of monitoring activities would be made publicly available through the NOAA Restoration Portal.

3.3 Project Costs

The LA TIG has developed estimated costs for each restoration alternative using information available at the time of developing this RP/EA. The estimated costs reflect all activities associated with implementing the alternative, potentially including but not limited to revising/finalizing E&D, acquiring supplies and materials, permitting, pilot studies, monitoring, Trustee oversight, construction, and contingencies.

3.4 Best Management Practices

As part of the environmental compliance process, federal regulatory agencies provide guidance on Best Management Practices (BMPs) including design criteria, lessons learned, expert advice, tips from the field, and more. DWH Trustees must incorporate appropriate BMPs into planning and design to avoid or minimize impacts on natural resources, including protected and listed species and their habitats. BMPs are identified in required permits, consultations, or environmental reviews, including those described in Appendix 6.A of the Final PDARP/PEIS (DWH Trustees, 2016).

3.5 Project Descriptions

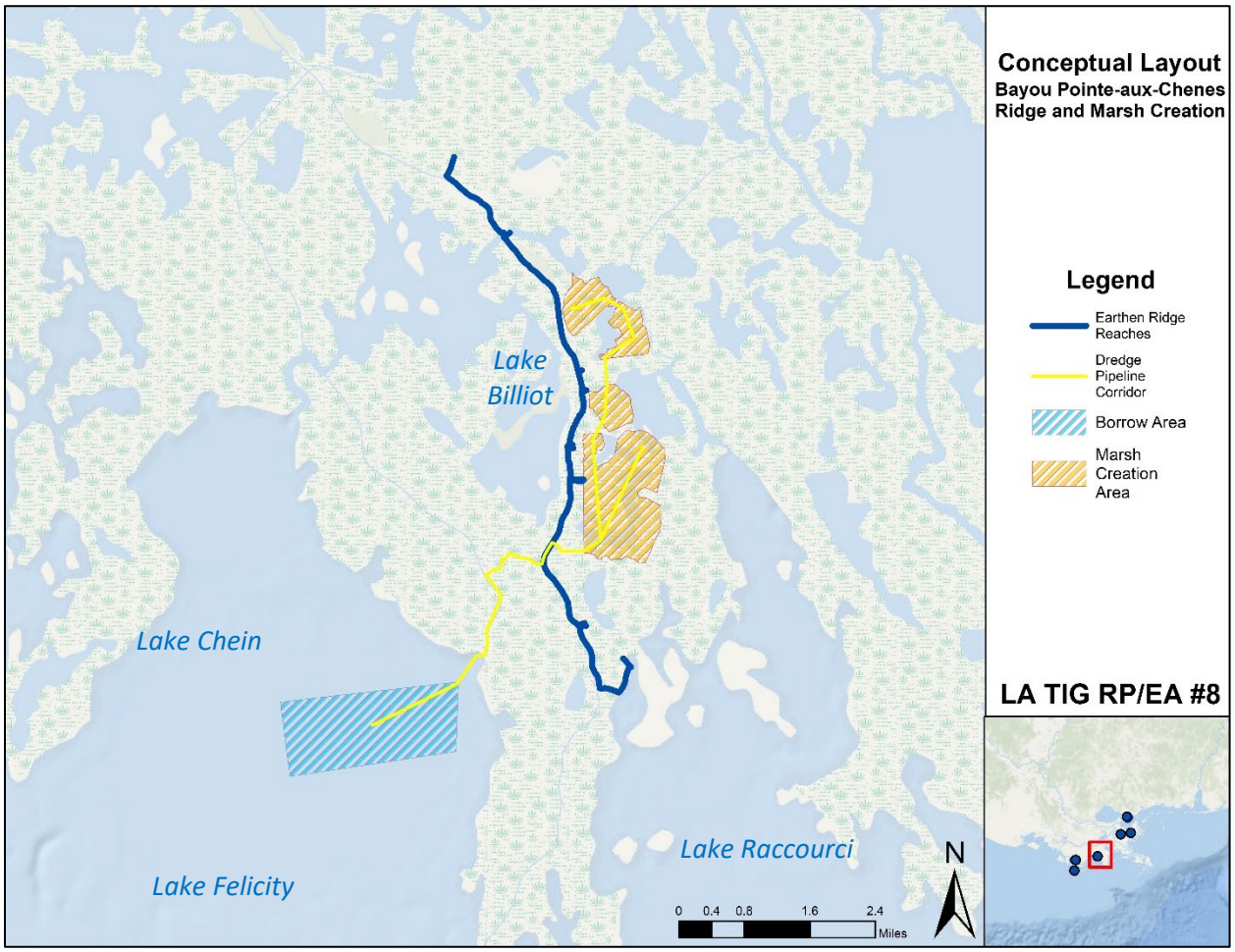
The LA TIG's screening process resulted in the identification of a reasonable range of alternatives, including three alternatives proposed for E&D and three alternatives proposed for construction. A

description of each alternative is provided in the below section, followed by the OPA evaluation of the alternatives in the next section.

3.5.1 Bayou Pointe-aux-Chenes Ridge and Marsh Creation (E&D)

The proposed project is to perform E&D for a potential future project that would be located in the Terrebonne Basin and spreads across Lafourche and Terrebonne Parishes. Pointe-aux-Chenes is located south of Houma. The project area is along Bayou Pointe-aux-Chenes within Lake Billiot, just east of Lake Chein and Lake Felicity, south of the twin pipelines on the western side of Bayou Pointe-aux-Chenes ridge. The approximate project area is located at N29.353874, W90.386358 (Figure 3).

Figure 3: Bayou Pointe-aux-Chenes Ridge and Marsh Creation Conceptual Layout



Background

Evaluation of historical aerial photography indicates significant marsh loss in the vicinity of the project area, particularly in the area between Bayou Pointe-aux-Chenes and Isle de Jean Charles. Subsidence, canal dredging, lack of freshwater input, saltwater intrusion, and altered hydrology are all factors contributing to marsh loss in the area. This proposed E&D project would include E&D of several project features to restore marsh and ridge features in the Pointe-aux-Chenes wetlands.

Goals and Objectives

The goal of the project is to develop a design that would, if constructed in the future, create new marsh habitat, restore degraded marsh, create coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the southern portions of Bayou Pointe-aux-Chenes.

Project Summary

The proposed project design would perform the engineering and design for a project that, if constructed in the future, would be expected to create and fortify approximately 31,910 linear feet of ridge and create/nourish approximately 473 acres of marsh by dredging material from borrow sources in Lake Felicity or Lake Raccourci (Figure 3). The borrow and conveyance footprint would consist of approximately 907 acres with a total of up to 15 million cubic yards of hydraulically dredged material. Containment features would be degraded or gapped as needed to promote tidal exchange after consolidation of the fill material. Approximately 50% of the newly created area would include vegetative plantings. The maximum pump distance is 7.25 miles, and the average pump distance is 5 miles. The assumed cut depth is 10-ft.

Restoration of the Pointe-aux-Chenes marshes and preservation of this critical landform would reduce the impacts of large-scale wetland loss across the Gulf Coast, to the benefit of the hundreds of fish and wildlife species that use these areas. The LA TIG decision regarding this proposed E&D alternative is independent of any future construction of the project, and is conditional on analysis in this RP/EA.

Schedule

It is estimated that E&D activities would be completed within three years.

Lead Implementing Trustee and Agencies and Non-Agency Partners

The lead implementing trustee would be the USEPA.

Monitoring and Maintenance Requirements

This project is currently being proposed for E&D and, therefore, does not include the development of a monitoring and adaptive management plan.

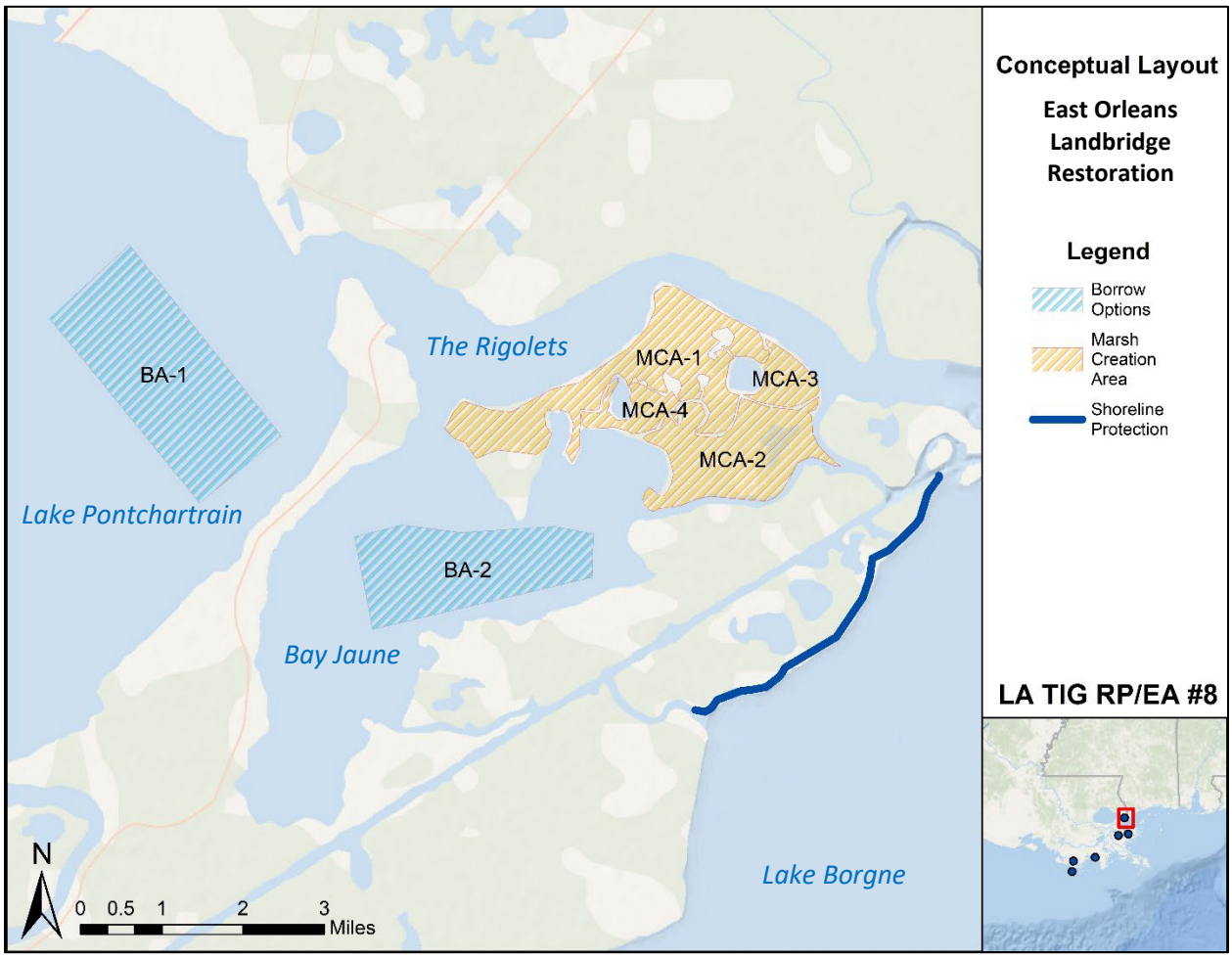
Project Cost Estimate

The total E&D cost is estimated to be approximately $4,736,900. This includes surveying, geotechnical investigations, sediment source investigations, coastal process analyses of the borrow and fill areas, design, environmental performance modeling, permitting, land rights, as well as other E&D supervision and administration.

3.5.2 East Orleans Landbridge Restoration

This proposed E&D project would provide final engineering and design for a project that, if constructed in the future, would be located in the Pontchartrain Basin in Orleans Parish, west of Lake Borgne, directly north of Bay Jaune and east of the Rigolets. The approximate project area is located at N30.113516, W89.687500 (Figure 4).

Figure 4: East Orleans Landbridge Restoration Conceptual Layout



Background

The wetlands surrounding the City of New Orleans are expected to face significant wetland loss over the next 50 years, with the potential to lose 32% of the land currently in the New Orleans East area, according to the Louisiana Coastal Protection and Restoration Authority (CPRA) (NFWF, 2020). Repetitive storms and sea level rise are causing continued rapid erosion of the brackish marsh along the East Orleans Landbridge. The coastal marshes of the landbridge are important habitat for hundreds of species of fish and wildlife. Shrimp and blue crabs use these marshes for protection in their juvenile phase and provide food sources for other fish like black drum, red drum, and speckled trout. Continued conversion of intertidal, emergent marshes to shallow, unvegetated open water would result in decreased fishery productivity for such estuarine-dependent species. In addition to fisheries, the proposed project area is also habitat for a multitude of species including migratory waterfowl, wading birds, shorebirds, mammals, reptiles, and amphibians. Continued loss of emergent marshes would negatively impact those species using this area.

Historically, communities around Lake Pontchartrain, including New Orleans, have had three natural barriers preventing Gulf surge from entering the lake: The Chandeleur Islands, Biloxi Marsh, and the East Orleans Landbridge. However, repetitive storm damage and sea level rise have caused massive degradation of the Chandeleur Islands and Biloxi Marsh, leading CPRA to remove these areas from the

Louisiana Coastal Master Plan. The East Orleans Landbridge is now the only project within the Louisiana Coastal Master Plan that provides a vital boundary between Lake Pontchartrain and Mississippi Sound/the Gulf of Mexico. Ongoing deterioration of the marshes on the East Orleans Landbridge also poses risks to the communities around Lake Pontchartrain that rely on a barrier between the Lake and the Gulf. Without healthy and dense marshes on the landbridge, the hurricane levees are at an increased risk for overtopping or breaching. Even if these worst-case scenarios do not happen, the lack of an effective landbridge would cause more wear and tear on the City's levee system, causing an increased burden on residents to finance maintenance of the system. Further deterioration of the East Orleans Landbridge poses serious risk to multiple communities on and around Lake Pontchartrain. For residents that live along the landbridge in the neighborhoods of Venetian Isle and Lake Catherine, the degradation of wetlands adjacent to their homes has already led to increased flooding and would continue to worsen without restoration action. The communities in this section of New Orleans East are all located outside the City's hurricane levee protection system and most homes are elevated 20+ ft. to prevent hurricane storm surge damage. All residents on the landbridge are required to evacuate when a hurricane approaches the city, and the frequency of the evacuations is likely to increase in coming years. The only route on and off the landbridge is via Highway 90, also known as Chef Menteur Highway, which floods frequently. Residents on the landbridge not only experience highway flooding during hurricane events but also deal with standing water on the highway, sometimes over a foot deep, simply from persistent wind events. Both acute flooding from hurricane events and the chronic flooding that is becoming more frequent have the potential to worsen without restoration of the surrounding wetlands that have historically buffered these effects.

The proposed E&D project would be expected to create a final design that, if constructed in the future, would be located in areas that have been identified as critical landscape features in the environmental impact statement (EIS) for the Mississippi River Gulf Outlet, Ecosystem Restoration Plan (USACE, 2012). The proposed project would perform E&D for a potential future project within the East Orleans Landbridge restoration area identified in the Louisiana Coastal Master Plan and would be consistent with the coastal goals identified in the City of New Orleans Resilience Strategy and the Orleans Parish Hazard Mitigation Plan. This area is identified as a critical landform by the interagency CWPPRA working group and contains important structural elements to maintain ecosystem function and reduce storm surge damage risk. While the need for restoration of the East Orleans Landbridge was identified in the Louisiana Coastal Master Plan, no specific project design has been initiated to date. The design of the Landbridge project would be critical to help advance restoration options at this important restoration site. Without the completion of this design, stakeholders risk further project deferral making implementation more expensive due to anticipated increasing sediment needs over time and making any future project derived from this E&D project less likely to be implemented.

Goals and Objectives

The goal of this project is to finalize engineering and design for a project that would, if constructed in the future, create and restore marsh habitat that separates Lake Pontchartrain from Lake Borgne and the Gulf of Mexico, providing protection for existing wetlands and nearby communities.

Project Summary

This project would conduct final E&D for the East Orleans Landbridge Restoration project (Figure 4), advancing engineering and design elements for use in the event the project is constructed in the future. The project design would have two potential components: marsh creation and shoreline protection. The marsh creation component of the project would be designed to create/restore approximately 1,563 acres of emergent marsh using hydraulically dredged sediment from potential borrow areas in Lake St.

Catherine/Bay Jaune and Lake Pontchartrain. The design would likely include approximately 45,838 linear feet of earthen containment dikes to facilitate the creation of the new marsh, and approximately 6 million cubic yards of sediment dredged and pumped from up to approximately 7 miles from potential borrow area options in Lake St. Catherine/Bay Jaune and Lake Pontchartrain. The project would also evaluate a shoreline protection component to protect existing or newly created marsh. The shoreline protection evaluation would also include whether a living shoreline product(s) for this application would be a viable option.

The final E&D phase would include the following tasks:

- Data collection, including geotechnical, surveying, and cultural resources
- Land rights, oyster leases, and oil/gas infrastructure investigation
- Design of the marsh creation fill areas, borrow areas, dredge pipeline corridors, and construction access
- Design of shoreline protection or living shoreline components, if determined feasible and effective
- Bid Documents, including Plans, Specifications, and an Engineer's Estimate of Probable Cost

Schedule

It is estimated that E&D activities would be completed within three years.

Lead Implementing Trustee and Agencies and Non-Agency Partners

The lead implementing state trustee for E&D would be CPRA with implementation/construction involvement from the City of New Orleans.

Monitoring and Maintenance Requirements

This project is currently being proposed for final E&D and, therefore, does not include the development of a monitoring and adaptive management plan.

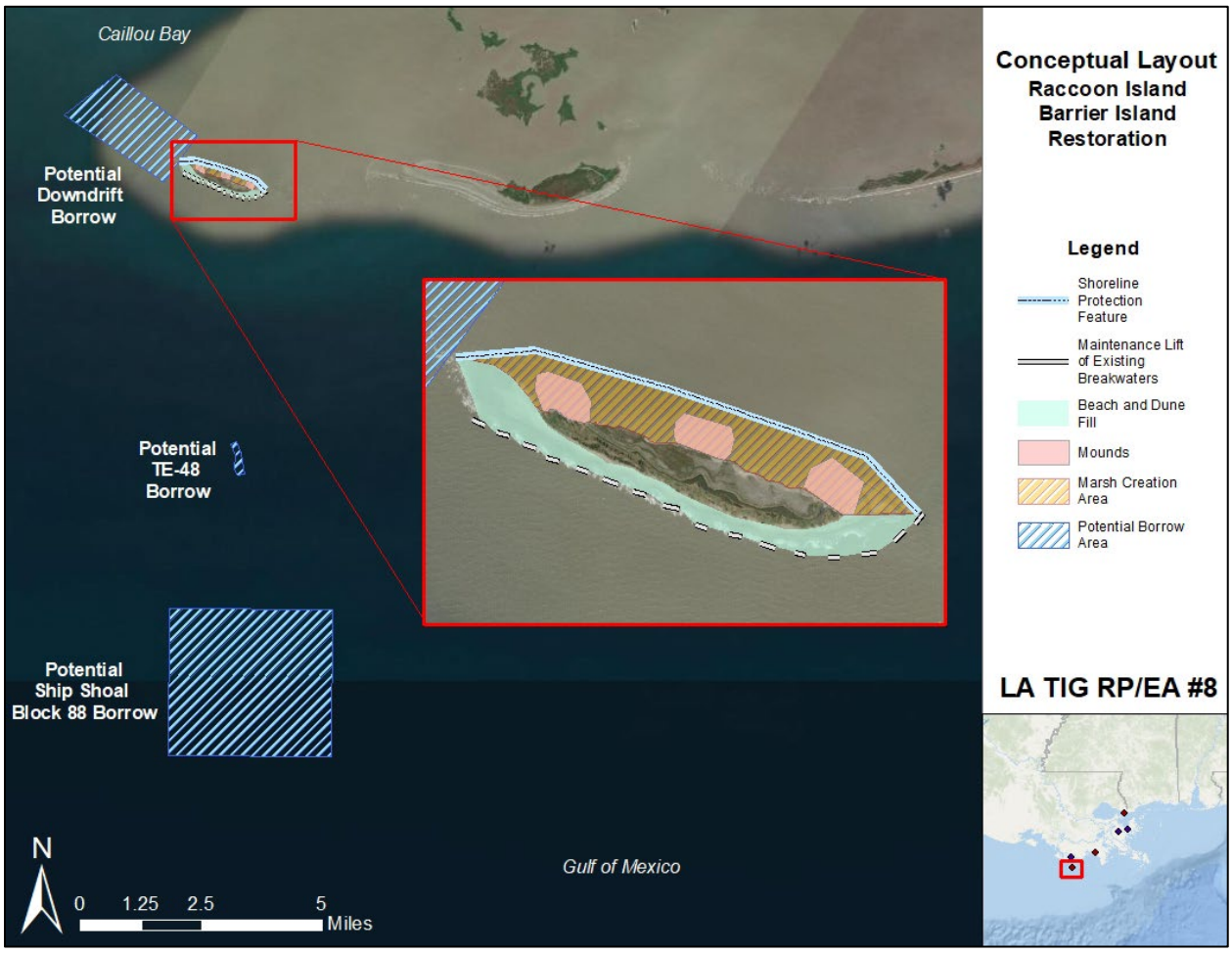
Project Cost Estimate

The proposed E&D project is currently estimated to cost approximately $4 million.

3.5.3 Raccoon Island Barrier Island Restoration

This proposed E&D project would be expected to create a design that, if constructed in the future, would be located in the Terrebonne Basin in Terrebonne Parish, specifically the western end of the Isle Dernieres Barrier Islands reach with the Gulf of Mexico to the south and Caillou Bay to the north. The approximate project area is located at N29.051097, W90.926373 (Figure 5).

Figure 5: Raccoon Island Barrier Island Restoration Conceptual Layout



Background

As part of an erosional barrier island arc, Raccoon Island is sediment-starved and has high shoreline recession and acreage losses even with various sediment, armoring, and planting activities implemented from 1994 to 2017. Regional sediment budgets and elevation change analyses suggest limited and decreasing sediment input to Raccoon Island from the updrift, including degradation of the Coupe Colin ebb-tidal shoal and depositional growth downdrift of the island (ACRE, 2020). The resulting steepened Gulf shoreface and lack of island migration limits the longevity of the breakwaters and the island. All of Raccoon Island is forecasted to disappear by 2050 without further restoration actions (USACE, 2010). Raccoon Island provides geomorphic function including frontline storm protection for Terrebonne Parish and ecosystem functions supporting unique transitional terrestrial and aquatic habitats between the marine and estuarine environments. Raccoon Island has environmental significance given that it is the western most limit of the Isle Dernieres Barrier Island Refuge and supports valuable avian nesting and fish habitat. It is one of the most productive avian nesting areas in the northern Gulf of Mexico and provides nesting habitat for multiple species of colonial waterbirds and ground nesters. Specifically, the island is one of the 10 remaining brown pelican colonies in Louisiana and provides foraging and nesting habitat for piping plovers. The island is also used by neotropical migrants for resting and feeding during migration. This proposed project would include E&D of several project features to restore Raccoon Island.

Goals and Objectives

The goal of the project is to develop a design that would, if constructed in the future, restore the Raccoon Island system geomorphologic integrity and support natural geomorphic processes; restore the Raccoon Island system ecological function; and support the natural processes of the barrier systems, prevent island breaching, and support a diversity of habitats.

This project would be expected to perform engineering and design for a project that, if constructed in the future, would provide multiple benefits to injured resources, including through supporting geomorphic processes such that the project would maintain the barrier island's protective function, prevent island breaching, and support the natural processes of the barrier island system. The proposed project would also be expected to design a project that, if constructed in the future, would restore multiple types of coastal habitat. These habitats include the following:

- Approximately 153 acres of back barrier marsh, including:
    - Approximately 50 acres of mounds to provide upland habitat
    - Approximately 103 acres of intertidal back barrier marsh.
- Approximately 91 acres of beach and dune, including:
    - Approximately 33 acres of dune
    - Approximately 58 acres of beach
- Approximately 81 acres of existing habitat that would not be filled.

Raccoon Island would be approximately 325 acres after construction including newly restored marsh and dune and existing habitat. The project would investigate at least three potential borrow sources: the previously used borrow area for the previously constructed Raccoon Island Shoreline Protection/Marsh Creation (TE-48) project, Ship Shoal Lease Block 88, and a down drift area located adjacent to the west side of the island. Such habitat restoration, if funded in the future, would support birds by providing more area suitable for nesting, loafing, and foraging. Fish and invertebrates would also benefit from the creation of productive marsh habitat if such a project were constructed in the future, and the project design would also maintain ecological connectivity on the island.

Project Summary

The project would design enhancements to Raccoon Island that, if constructed in the future, would provide geomorphic form and ecologic function and restore diversity of barrier island habitats. Design enhancements of project features could include the creation and/or enhancement of beach, dune, supratidal, intertidal, and subtidal habitats through seaward and landward sand fill placement and shoreline protection (Figure 5). The proposed engineering and design project would identify a restoration solution that would focus on sediment input either from outside the system or by replacing the transported-sediment from the western submerged shoal to promote resiliency in a sediment-starved system. It is anticipated that the following project features would be designed as a part of this project:

1. A dune to provide a barrier function and breach prevention. The E&D may evaluate alternatives including variations in heights and width to enhance habitat and geomorphological function.
2. Approximately 153 acres of marsh along the length of the north side of the island. This marsh area would include three mounds totaling approximately 50 acres, which would be created on top of the marsh fill to create, enhance, and/or sustain nesting bird habitat at elevations conducive for nesting success.

3. A shoreline protection feature along the bayside shoreline would be included to provide habitat while reducing shoreline erosion, improving resiliency, and maintaining geomorphic processes. An alternatives analysis would be performed to determine if a living shoreline to establish fringing reef, reduce wave energy, and maintain geomorphic processes would be a viable option.
4. Other features such as sand fencing, herbaceous planting of the dune, crushed aggregate for nesting substrate, and haybales may be included on the designed dune. Planting 50% of the emergent marsh and mounds with herbaceous and woody plants would be included. The planting layout would be developed during the design stage with a goal of promoting avian nesting and loafing habitat.

Conceptual design features were evaluated to scale the E&D cost. The E&D cost is based upon designing an approximate +8-ft. NAVD88 dune with an average crown width of 200-ft. and 10:1 slope on the north side and 30:1 slope on the south side. Inclusion of a dune is to provide barrier function, breach prevention, and habitat. The E&D may evaluate alternatives including variations in heights and width to enhance habitat and geomorphological function. It is expected that the E&D would result in a design to create approximately 33 acres of beach (of varying width) and dune extending south from the existing dunes beyond the existing Gulf rock breakwaters. Approximately 150 acres of marsh would be designed along the length of the north side of the island via unconfined fill placement to approximately +2.5-ft. NAVD88. Additionally, three mounds totaling 50 acres would be designed to approximately +6.0-ft. on top of the marsh fill to create, enhance, and/or sustain nesting bird habitat at elevations conducive for nesting success. The E&D phase cost assumes mining sand for the beach, dune, marsh, and mound construction from Ship Shoal Lease Block 88 approximately 10 miles south of the project site. In addition, as part of the proposed E&D project, the western submerged shoal and the previously used borrow area for the previously constructed Raccoon Island Shoreline Protection/Marsh Creation (TE-48) project would be investigated for partial and complete sediment fill volume needs and borrow impact assessments would be conducted for borrow area selection and design. One-time maintenance of all the existing Gulf rock breakwaters and periodic maintenance of signs may be included in the design, except for the easternmost structure on the island which may be repurposed. The design of a shoreline protection feature along the bayside shoreline may be included to provide habitat while reducing shoreline erosion, improving resiliency, and maintaining geomorphic processes. If feasible, the shoreline protection feature would be designed to be approximately 18-ft. wide at or below mean tide level and would integrate adaptive management to establish fringing reef, reduce wave energy, and maintain geomorphic processes. The design process would also evaluate whether a living shoreline is practical for this project.

Pending the publication of the LA TIG avian guidance that would be expected to help inform the proposed E&D project, one row of sand fencing may be included in the design with gaps and overlapping sections for passage of wildlife. Herbaceous planting of all the dune would be included in the design. Planting 50% of the emergent marsh and mounds with herbaceous and woody plants would also be included. The planting layout would be developed during the design to promote avian nesting and loafing habitat and crushed aggregate may be included for 10 acres of nesting substrate. Hay bales would be included in the design for wind protection and nesting material. The design would be synergistic with long term barrier island system maintenance and regional sediment management. The LA TIG decision regarding this proposed E&D alternative is independent of any future construction of the project, and is conditional on analysis in this RP/EA.

Schedule
This E&D project is expected to take three years from the award of funding.

Lead Implementing Trustee and Agencies and Non-Agency Partners
The lead implementing trustee would be NOAA. The state of Louisiana, particularly the CPRA and the LDWF will act as partnering agencies.

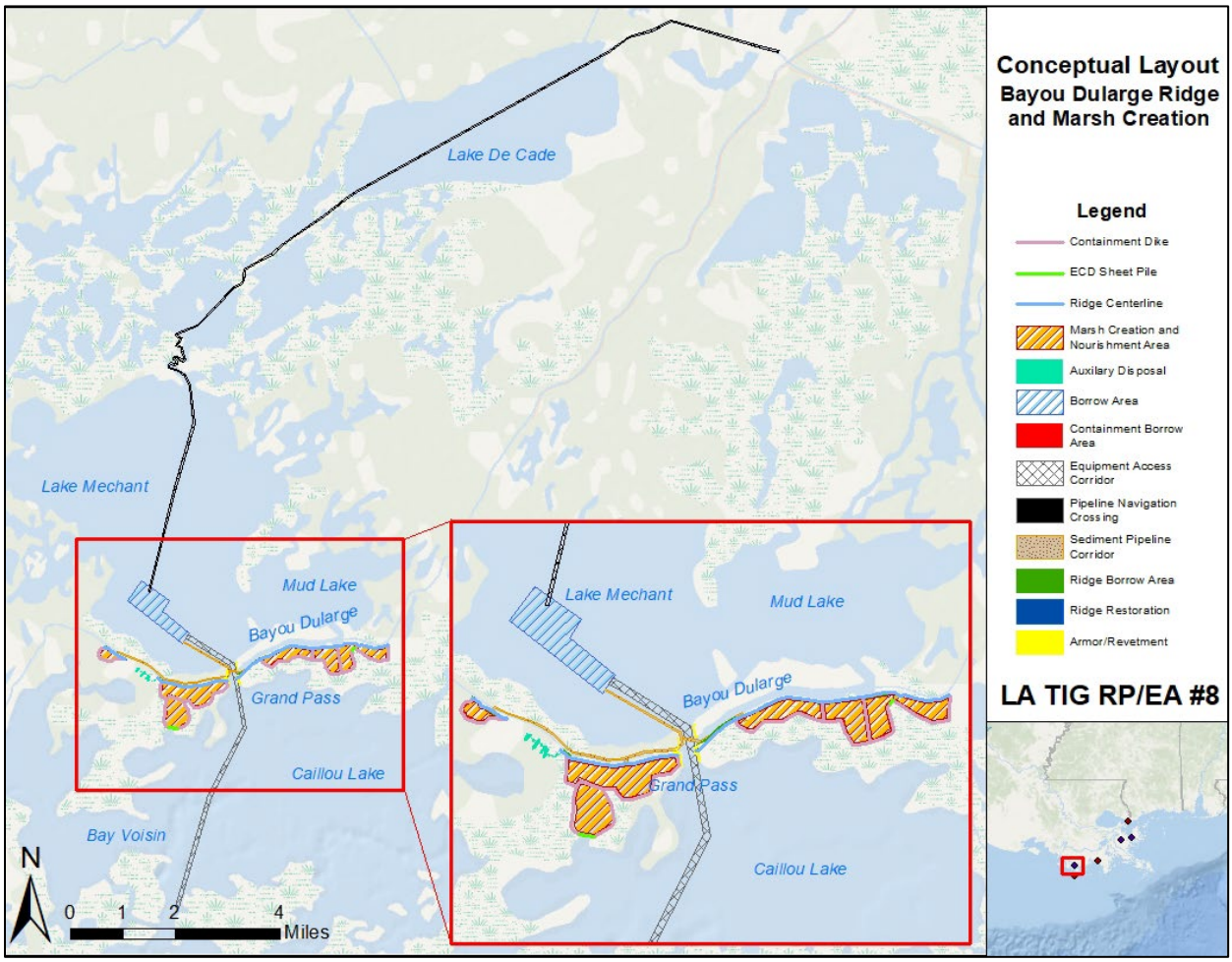
Monitoring and Maintenance Requirements
This project is currently being proposed for E&D and, therefore, does not include the development of a monitoring and adaptive management plan.

Project Cost Estimate
The total cost for this proposed E&D project is estimated to be approximately $8,195,334. This includes contingencies, surveying, geotechnical investigations, sediment source investigations, coastal process analyses of the borrow and fill areas, design, and environmental performance modeling, permitting, land rights, as well as other E&D and supervision and administration.

3.5.4 Bayou Dularge Ridge and Marsh Creation

This proposed project is located in the Terrebonne Basin in Terrebonne Parish, specifically in the Central Terrebonne marshes near Grand Pass and between Bayou Dularge and Caillou Lake. The approximate project area is located at N29.264793, W90.935788 (Figure 6).

Figure 6: Bayou Dularge Ridge and Marsh Creation Conceptual Layout



Background

The Bayou Dularge ridge areas and wetlands are an important natural resource and provide a buffer protecting vulnerable coastal communities in south Louisiana from storm surge. Due to many factors, such as insufficient fresh water and sediment supply, the Bayou Dularge area marsh has had a substantial land loss rate. In addition to sediment starvation due to preclusion of sediment inputs, high rates of land loss in the area can be attributed to natural subsidence, accelerated subsidence due to oil and gas exploration, saltwater intrusion, and boat traffic in Bayou Dularge and open passes. The loss of land area over time within the Terrebonne Basin in general, and the Bayou Dularge Ridge specifically, has increased the vulnerability of landward coastal communities to storm surge.

Ridge habitat consists of live oak/hackberry maritime forest which is utilized by trans-gulf migratory bird species as a first and last stop when crossing the Gulf of Mexico. Ridges act as a natural storm surge buffer, protecting landward habitat and communities. The integrity of the Bayou Dularge Ridge has been breached, and loss of this wetland buffer would expose the marshes north of Bayou Dularge to highly erosional winter storm events.

Along the eastern and western project limits, remnant marsh to the south of Bayou Dularge provided a buffer to erosion which has nearly eroded entirely. Much of the vegetative marsh, especially in the eastern portion of the project, has now converted into open water, accelerating ridge and marsh deterioration.

Goals and Objectives

The primary goals of the proposed project are to create and nourish saline marsh on the south side of Bayou Dularge utilizing borrow material from Lake Mechant, approximately 2,200,000 to 2,500,000 cubic yards, and to restore the ridge along the southern bank of Bayou Dularge.

The Bayou Dularge project would enhance marsh habitat and increase the resiliency of nearby wetland habitat and coastal communities. The project would restore much of the historical Bayou Dularge southern ridge, which would provide valuable habitat to migratory birds and provide protection to the marshes and communities north of Bayou Dularge. The project would also create marsh in these areas, which would serve to stabilize the project area with a healthy vegetative marsh environment and provide a buffer between the Bayou Dularge southern ridge and Caillou Lake. The project would contribute to habitat restoration by incorporating ridge restoration/marsh creation strategies which would restore and conserve the health, diversity, and resilience of key coastal, estuarine, and marine habitats of the lower Terrebonne Basin.

Project Summary

This project would restore, create, and/or nourish ridge and marsh features adjacent to Bayou Dularge (Figure 6). It is anticipated that the following project features would be constructed as part of the project:

1. Ridge Restoration: restore approximately 17,200-ft. to 19,860-ft. linear feet of ridge with an approximate +5-ft. to +6-ft. NAVD88 elevation, 15-ft. crest width, and 5:1 (H:V) side slopes.
2. Marsh Creation: create approximately 400 to 500 acres of marsh and nourish up to 30 acres of marsh with hydraulically dredged sediment from Lake Mechant.
3. Other features as needed, such as earthen plugs or bank improvements as necessary to prevent compromising the existing ridge and bayou bank line as a result of project features.

Lake Mechant sediments would be hydraulically dredged and pumped via pipeline to create approximately 400 to 500 acres and nourish up to 30 acres of marsh. The proposed design is to place the dredged material to a fill height conducive with marsh creation, approximately +1.3-ft. in elevation, with a 25-year project lifespan. After dewatering and compaction of dredged sediments to the designed elevation, intertidal emergent marsh would recolonize. The project would include perimeter containment dikes built with in-situ material to contain the hydraulically dredged sediment. Sheet pile may be used to assist with containment if necessary. Containment would not be constructed in areas where spoil banks currently exist or along the ridge alignment.

The project would restore the ridge using material excavated from the marsh fill area footprints to the fullest extent possible to minimize environmental impacts as these areas will be refilled during marsh construction. After both the creation and nourishment of the saline marsh, native intertidal marsh and ridge vegetation may be planted to help support and stabilize the rebuilt marsh habitat and environment. Sufficient time would be allowed (approximately 3 to 5 years) for the soil salinities and elevations to stabilize. Once the marsh platform has stabilized into the intertidal zone, indigenous vegetation would be planted to increase both the plant density and diversity of the marsh. Appropriate

bottomland hardwood species (seedlings and saplings) would be planted at appropriate elevations on the ridge feature approximately two years after material deposition is complete. Invasive plant control and maintenance plantings would be included in the project MAM Plan.

Consistent with the Trustee's approach to "Create, restore, and enhance coastal wetlands," the Bayou Dularge Ridge and Marsh Restoration project would create and restore brackish and saline marsh habitat that was impacted by the DWH oil spill. This project would also benefit multiple other resources impacted by the oil spill (e.g., birds, protected species, water quality, recreational use, etc.). This project would help ensure that ecosystem benefits would continue to be provided by the diverse habitats of coastal Louisiana well into the future.

Schedule

The estimated timeframe of the project is three years after funding approval. Eighteen months would be needed for final design, permitting, compliance, and bidding. The total estimated construction window is approximately sixteen months. Operations and maintenance as well as monitoring and adaptive management areas are expected to last ten years after the project is constructed. It is assumed that all design features will have a 25-year design life.

Lead Implementing Trustee and Agencies and Non-Agency Partners

The implementing state trustee would be the CPRA. The lead federal trustee would be the USDA, Natural Resources Conservation Service (NRCS).

Monitoring and Maintenance Requirements

After completion of the as-built (post-construction) survey, comprehensive surveys would be required, likely on an annual basis for the first four years to properly schedule and quantify remedial activities. Additional spoil bank gapping may be required during a future maintenance event if initial gapping or natural erosion prove insufficient. Vegetative plantings are recommended for implementation following construction during the operations and maintenance phase. Due to the time-based settlement of the hydraulic fill material, sufficient time must be allowed for the soil salinities and elevations to stabilize. Once the marsh platform has stabilized into the intertidal zone, native vegetation may be planted to increase both the plant density and diversity of the marsh (Sigma, 2021).

The degree to which the restoration objectives are met would be evaluated via measurements of five parameters: spatial extents of marsh and ridge creation, elevation of marsh and ridge areas, vegetative cover of marsh and ridge areas, invasive species cover of marsh and ridge area, and soil quality. Detailed methods and schedule of data collection are included in the Monitoring and Adaptive Management Plan, found in Appendix D.

Compliance and Permitting Requirements

Once the E&D phase reaches sufficient completion, permit applications would be submitted. Permits such as the Joint Permit Application for Coastal Use Permits, Clean Water Act, and Rivers and Harbors Act permits would be required. During the permitting process, coordination with USFWS, NMFS, LDWF, LDEQ, CPRA, and local levee districts would occur. A Section 106 cultural resources review would also be required. Project schedule allowances may also be made for consultation required during permitting.

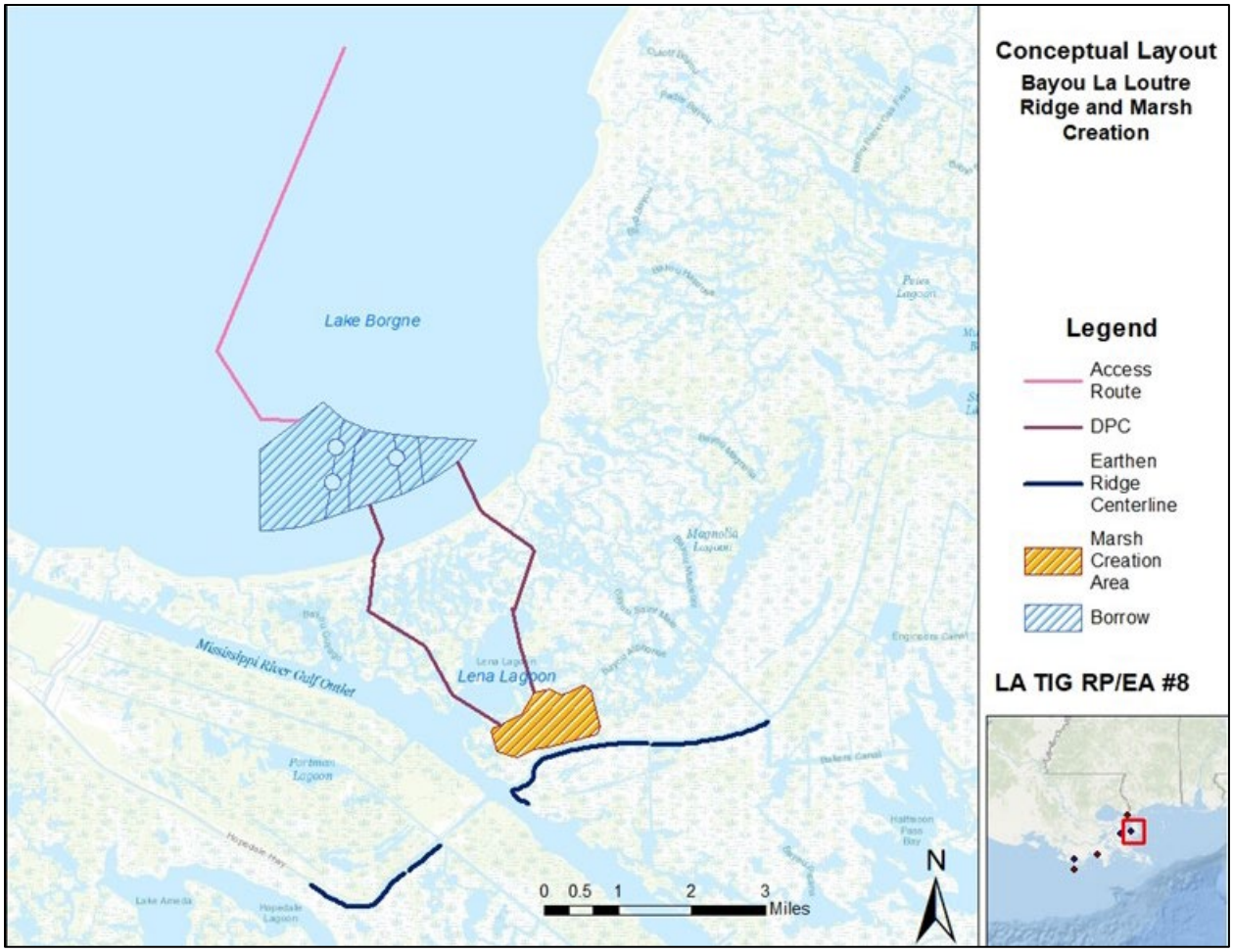
Project Cost Estimate

The total construction estimate is $41,390,000 including finalizing E&D, construction, contingency, agency costs, construction oversight, land rights, oyster leases, operations and maintenance, and monitoring and adaptive management.

3.5.5 Bayou La Loutre Ridge Restoration and Marsh Creation

The proposed project is located in the Pontchartrain and Breton Sound Basins in St. Bernard Parish. The project consists of two distinct components: marsh creation and ridge restoration. The marsh creation area would be located east of the Mississippi River Gulf Outlet (MRGO) and north of Bayou La Loutre near the MRGO closure. The ridge feature would be located along the southern bank of Bayou La Loutre. The approximate proposed project area is located at N29.844179, W89.601784 (Figure 7).

Figure 7: Bayou La Loutre Ridge Restoration and Marsh Creation Conceptual Layout



Background

The Bayou La Loutre habitats are an important natural resource, and the ridge is considered vital protective habitat. Historic and current ridge habitat loss occurs in the form of subsidence and shoreline erosion along Bayou La Loutre. Shoreline erosion has been caused by increased boat traffic diverted due to the closure of the MRGO channel. Interior marsh loss along Lena Lagoon is caused by subsidence, sediment deprivation, increased wave fetch, and construction of access and navigational canals. The integrity of the Lena Lagoon shoreline has been breached, and loss of this wetland buffer exposes the La

Loutre ridge to highly erosional winter storm events. The ridge habitat consists of live oak/hackberry maritime forest which is utilized by trans-gulf migratory bird species as a first and last stop when crossing the Gulf of Mexico. This critical habitat is rated as S1-Most Critically Imperiled (State Natural Heritage Program) and S2-priority by the State of Louisiana (CWPPRA, 2020).

Goals and Objectives

The primary goal of the proposed project is to create and nourish marsh along Lena Lagoon utilizing borrow material from Lake Borgne and Bayou La Loutre, restore the ridge along the southern bank of Bayou La Loutre, and to re-establish hydrologic connectivity with adjacent wetlands.

The Bayou La Loutre Project would enhance marsh habitat and increase the resiliency of nearby wetland habitat. The project would restore much of the Bayou La Loutre ridge, including live oak/hackberry maritime forest, which would provide valuable habitat to migratory birds. The project would also create marsh in these areas, which would serve to stabilize the project area with a healthy vegetative marsh environment and provide a buffer to the ridge against highly erosional winter storm events. The project would contribute to habitat restoration by incorporating ridge restoration/marsh creation strategies, which would restore and conserve the health, diversity, and resilience of key coastal, estuarine, and marine habitats of the Pontchartrain and Breton Sound Basins.

Project Summary

This project would create and nourish approximately 421 acres of marsh and restore approximately 28,855-ft. of ridge along Bayou La Loutre (Figure 7). It is anticipated that the following project features would be constructed as part of the project:

1. Ridge Restoration – restore approximately 5.46 miles (28,855-ft.) of ridge along the centerline along the bank of Bayou La Loutre. The ridge feature would be restored with material obtained by bucket dredging Bayou La Loutre.
2. Marsh Creation – create/nourish approximately 421 acres of marsh with hydraulically dredged sediment from Lake Borgne. The project would create approximately 163 acres of new marsh and nourish approximately 258 acres of existing marsh along Lena Lagoon (approximately 421 acres total).
3. Other Features – to control erosion on the bayou side of the ridge, grass seedlings, herbaceous plants, and woody species may be planted at appropriate times and elevations.

The ridge habitat would be built by bucket dredging Bayou La Loutre down to elevation -10-ft. NAVD88 with a side slope of 3:1 (H:V). Material would be placed on the existing remnant of the ridge at a ground elevation ranging from 0.8 to 1.8-ft., while a marsh buggy grades the ridge to the design cross section. The ridge would have elevations ranging from +5-ft. to +6-ft. NAVD88, 15-ft. crest width and 5:1 (H:V) side slopes. Additionally, the newly created ridge would include herbaceous and woody plantings with smooth cordgrass plantings along the toe.

The Lena Lagoon site would create and nourish approximately 421 acres of marsh using sediment hydraulically dredged from Lake Borgne down to bottom elevation -20-ft. NAVD88. Lena Lagoon would have a semi-confined south and east flank and a fully confined north flank. Containment would be degraded as necessary to re-establish hydrologic connectivity with adjacent wetlands.

The proposed borrow area, EAC and portions of the DPC for this project have been previously permitted for a separate project, PO-180 Lake Borgne Marsh Creation project. This project was included in the

Louisiana Trustee Implementation Group Draft Phase 2 Restoration Plan/Environmental Assessment #1.2: Spanish Pass Ridge and Marsh Creation Project and Lake Borgne Marsh Creation Project. This previously permitted borrow area, EAC and portions of the DPC were chosen because they have already undergone permitting, which could expedite the permitting process for the Bayou La Loutre project.

This project has the opportunity to coordinate and share the construction schedule with Lake Borgne Marsh Creation Project (PO-180), which would save time and cost.

Consistent with the Trustee's approach to "Create, restore, and enhance coastal wetlands," the Bayou La Loutre Ridge Restoration and Marsh Creation project would create and restore marsh habitat that was impacted by the DWH oil spill. This project would also benefit multiple other resources impacted by the oil spill (e.g., birds, protected species, water quality, recreational use, etc.). This project would help ensure that ecosystem benefits would continue to be provided by the diverse habitats of coastal Louisiana well into the future. The project would provide critical habitat for threatened and endangered bird species.

Schedule

E&D for this project has been completed to the 95% level under the Coastal Wetland Planning Protection and Restoration Act (CWPPRA). Project activities would include planning/designing, permitting, implementation, and monitoring.

An approximate construction duration was developed using the Center for Dredging Studies Dredge Production and Cost Estimation Software and Microsoft Project. Assuming a 24-inch hydraulic cutter head dredge and incorporating weather days, a total construction time from mobilization to demobilization is approximately 442 days. Grass seeding of the ridge would be completed under the construction contract; however, other vegetative plantings would be done under a separate contract in years following construction. Maintenance schedules and details are included in the Draft Operation, Maintenance and Rehabilitation Plan for Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178), included in Appendix D. The anticipated project lifespan of the project is 20 years.

Lead Implementing Trustee and Agencies and Non-Agency Partners

The implementing state trustee would be the CPRA. The lead federal trustee would be the USDA, NRCS.

Monitoring and Maintenance Requirements

The degree to which the restoration objectives are met would be evaluated via measurements of five parameters: spatial extents of marsh and ridge creation, elevation of marsh and ridge areas, vegetative cover of marsh and ridge areas, invasive species cover of marsh and ridge area, and soil quality. Detailed methods and schedule of data collection are included in the Monitoring and Adaptive Management Plan, found in Appendix D.

Compliance and Permitting Requirements

The borrow area in Lake Borgne, the dredge pipeline corridor (DPC), and the equipment access corridor (EAC) have been permitted under MVN-2018-00580-EG and C20190005 as part of a separate project, the Lake Borgne Marsh Creation project (PO-0180). Permits have been applied for using the Joint Permit Application for Coastal Use Permits, Clean Water Act, and Rivers and Harbors Act permits, under permit application number P20210285. During the permitting process, coordination with USFWS, NMFS, LDWF, LDEQ, CPRA, and local levee districts will occur.

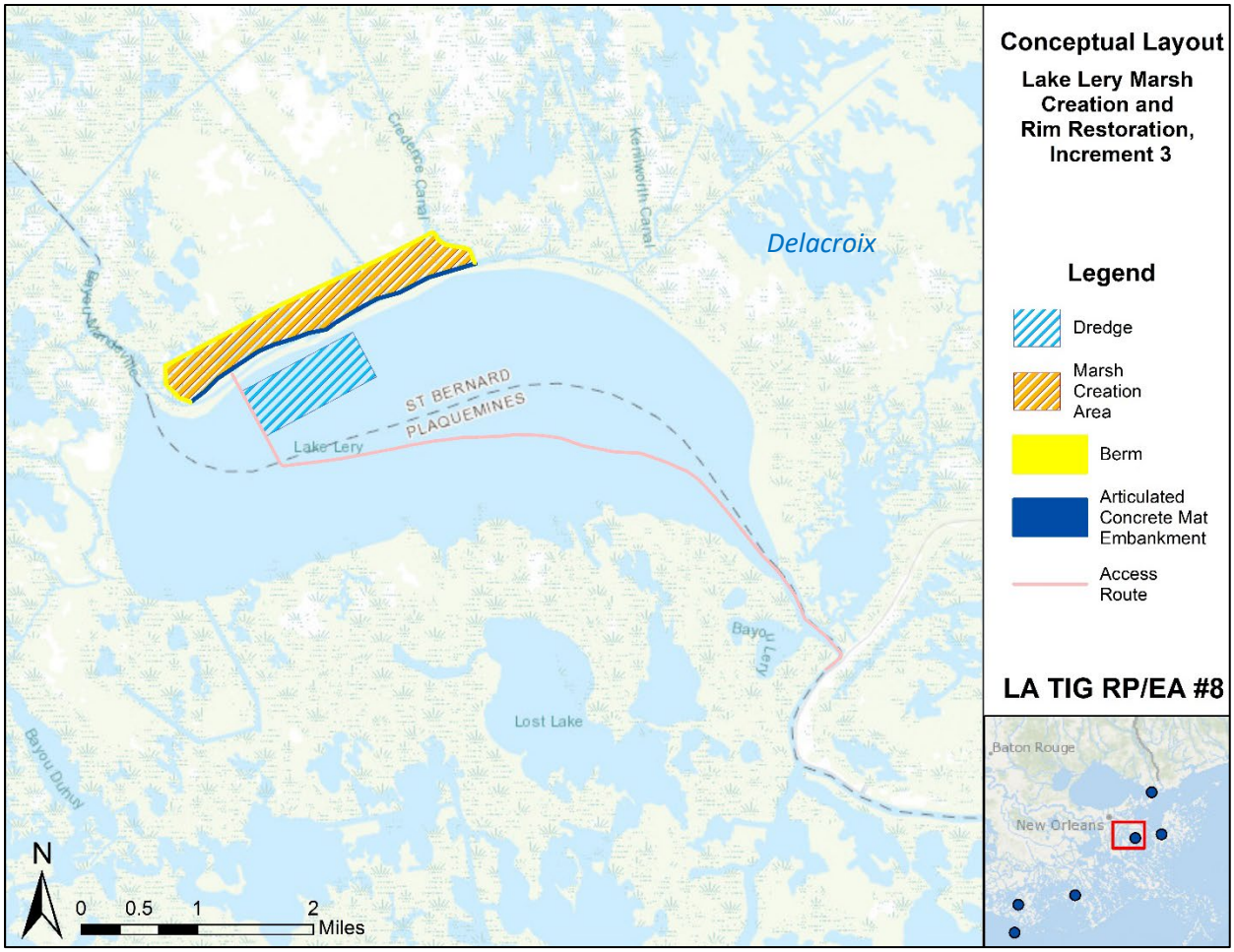
Project Cost Estimate

The probable construction cost estimated during initial project planning totaled approximately $21,168,137 including finalizing E&D, construction, contingency, agency costs, construction oversight, land rights, operations and maintenance, and monitoring and adaptive management.

3.5.6 Lake Lery Marsh Creation and Rim Restoration, Increment 3

The proposed project area is located within the Breton Sound Basin in St. Bernard Parish. The proposed project is specifically located south of the Caernarvon Freshwater Diversion Structure and west of the town of Delacroix, southeast of New Orleans. The proposed project is located at approximately N29.81538, W89.8311 (Figure 8).

Figure 8: Lake Lery Marsh Creation and Rim Restoration, Increment 3 Conceptual Layout



Background

The wetlands surrounding Lake Lery, located on the border of St. Bernard and Plaquemines Parish, have been heavily impacted by storm activity. The lake rim and surrounding marsh were damaged by Hurricane Katrina, leaving the marsh broken into multiple segmented pieces. As a consequence of the marsh damage due to storms, wave action has further impacted the lake rim and penetrated further into the existing marsh, causing additional damage and degradation to the marsh.

Several previous projects have been completed on the southern and eastern shores of Lake Lery to restore the lake rim and surrounding marsh. This project would restore the northern shore of Lake Lery in St. Bernard Parish by reestablishing the lake rim and restoring the eroded marsh.

Goals and Objectives

The primary goal of the proposed project is to restore the northern shoreline of Lake Lery by re-establishing the lake rim through creating a shoreline embankment and creating and nourishing the surrounding marsh.

Project Summary

This proposed project would create and restore lake rim and create and nourish marsh in Lake Lery (Figure 8). It is anticipated that the following project features would be constructed as part of the project:

1. Rim Restoration: construct approximately 2.38 miles of lake rim protection. An estimated 30-ft. crown width earthen berm armored with articulated concrete block mattresses would be constructed along the lake.
2. Marsh Creation and Nourishment: construct approximately 401 acres of marsh creation and nourishment using hydraulically dredged sediment from Lake Lery.

The approximate 401-acre marsh creation area would be bounded on three sides by earthen containment dikes and protected from Lake Lery by the permanent, armored earthen embankment (Figure 8). The marsh creation area would be constructed in three separate marsh creation cells. Each of the three cells would measure approximately 4,000 linear feet of shoreline. The internal marsh creation cells would be separated by earthen containment dikes, using the borrow areas located on the interior of the marsh creation area. To create the marsh, sediments would be hydraulically dredged from an approximate 5,000-ft. by 2,000-ft. borrow area located within Lake Lery approximately 0.25 to one mile from the project site. Target marsh fill elevation are estimated to be +3.0-ft. NAVD88.

The permanent armored embankment would measure approximately 12,665 linear feet. The armored embankment would be a combination of an estimated 30-ft. crown width earthen berm and articulated concrete block mattress for armoring. The embankment would be constructed to an estimated elevation of +4.0-ft. NAVD88 and extend approximately 100 linear feet beyond the newly created marsh to protect the area from wave action. The embankment borrow area will be located offshore of the armored embankment face. The southern slope adjacent to Lake Lery would be armored, while the earthen berm would be adjacent to the marsh creation area.

Consistent with the Trustee's approach to "Create, restore, and enhance coastal wetlands," the Lake Lery Marsh Creation and Rim Restoration, Increment 3 project would result in approximately 401 acres of combined created and nourished marsh. It would also protect the marsh into the future by including the approximate 2.38-mile permanent armored embankment. Implementation of this project would provide intermediate marsh habitat and would benefit multiple other resources impacted by the oil spill (e.g., birds, protected species, water quality, recreational use, etc.).

Schedule

The estimated construction duration is two years. This estimate is based on hydraulic dredge and bucket dredge production rates and the estimated construction duration to complete each marsh creation cell's containment and fill placement. The anticipated project lifespan is 20 years.

Lead Implementing Trustee and Agencies and Non-Agency Partners

The implementing state trustee would be the Coastal Protection and Restoration Authority (CPRA) of Louisiana. The lead federal trustee would be National Oceanic and Atmospheric Administration (NOAA). St. Bernard Parish would be a project implementation partner.

Monitoring and Maintenance Requirements

Monitoring and maintenance requirements are still being developed by the project team and will be further refined when construction funds become available.

Compliance and Permitting Requirements

Permits have been applied for using the Joint Permit Application for Coastal Use Permits, Clean Water Act, and Rivers and Harbors Act permits and were issued by the State of Louisiana Department of Natural Resources, Office of Coastal Management as Coastal Use Permit P2020531 and by the U.S. Department of the Army, Corps of Engineers, as MVN 2018-01345 ES.

Project Cost Estimate

The total construction phase project estimate is approximately $19,420,000, including contingencies.

3.6 OPA NRDA Evaluation of Reasonable Range of Alternatives

The LA TIG's OPA NRDA evaluation of the reasonable range of alternatives is summarized in Table 12. Three of the alternatives have already undergone E&D and are proposed for construction. For these alternatives, the OPA NRDA evaluation examined the project as currently designed against each of the OPA NRDA criteria. The LA TIG decision regarding proposed E&D projects are not a commitment to construction of the projects, and are conditional on the analysis in this RP/EA.

Table 12: Alternative Evaluation of OPA NRDA Criteria

Alternative	OPA NRDA Evaluation
Bayou Pointe-aux-Chenes Ridge and Marsh Creation (E&D)	Cost Effectiveness The total E&D cost is estimated to be approximately $4.7 million. This cost is consistent with similar E&D for restoration projects of this size. Furthermore, this investment in the E&D would help ensure that a cost-effective design is selected. Goals & Objectives E&D projects are consistent with the Trustee's restoration goals as planning projects "can increase the effectiveness and efficiency of habitat restoration" (DWH Trustees, 2016). The E&D phase would be complete in approximately 3 years. This project would develop a design that would create new marsh habitat, restore degraded marsh, create coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the southern portions of Bayou Pointe-aux-Chenes. If constructed, this project would create and fortify approximately 31,910 linear feet of ridge and create/nourish approximately 473 acres of marsh.

	While the proposed alternative would not directly restore natural resources or their services, it would provide information necessary to effectively doing so in the future if the project is constructed. Specifically, this proposed E&D project would further the restoration-type goals described in the Final PDARP/PEIS by establishing a feasible design that could 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016). <u>Likelihood of Success</u> E&D is likely to be successful as it involves standard and proven planning activities, including but not limited to field surveys, geotechnical investigations, and hydrologic modeling. Conducting E&D activities reduces the uncertainties for the construction phase to ensure the project could be constructed to maximize its likelihood of success. <u>Prevent Future Injury and Avoid Collateral Injury</u> E&D activities are minimally invasive and would employ BMPs to reduce any potential collateral injury, thus no future injuries or collateral injury are anticipated. If the design is ultimately constructed in the future, E&D would help ensure that the project could be constructed in a manner that would minimize collateral injury. <u>Benefits to Multiple Resources</u> While the proposed alternative would not directly benefit multiple resources because it is an E&D project, it would provide information necessary to effectively doing so in the future if the project is constructed. If constructed, the project would create and restore marsh habitat, provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation. These project features would benefit multiple resources by the following: creation of heterogeneous habitat for birds, aquatic fauna, fisheries, and protected species; improvement of hydrology and water quality in the project area within the Terrebonne Basin; reduction of coastal erosion; and enhanced flood protection.

	Public Health and Safety This proposed E&D project would neither benefit nor harm public health and safety. However, if constructed in the future, the LA TIG anticipates the constructed project would offer long-term benefits to public health and safety by reducing the effects of wave action, saltwater intrusion, storm surge, and tidal currents to the nearby inhabited areas. However, relative to the East Orleans Landbridge Restoration Project, the Public Health & Safety Benefits of this project are to a more sparsely populated area with less infrastructure.
East Orleans Landbridge Restoration (E&D)	Cost Effectiveness The estimated E&D cost is approximately $4 million. This cost is consistent with similar E&D for restoration projects of this size. Furthermore, this investment in the E&D would help to ensure that a cost-effective design is selected. Goals & Objective E&D projects align with the Final PDARP/PEIS, which recognizes that planning-type projects including E&D "can increase the effectiveness and efficiency of habitat restoration" (DWH Trustees, 2016). The E&D phase would be complete in approximately 3 years. If constructed, the East Orleans Landbridge Restoration project would restore and protect the landbridge that separates Lake Pontchartrain from Lake Borgne and the Gulf of Mexico. The design would include creating/restoring approximately 1,563 acres of emergent marsh and construction approximately 21,597 linear feet of shoreline protection features. While the proposed alternative would not directly restore natural resources or their services, it would provide information necessary to effectively doing so in the future if the project is constructed. Specifically, this proposed E&D project would further the restoration-type goals described in the Final PDARP/PEIS by establishing a feasible design that could 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016).

	Likelihood of Success E&D is likely to be successful as it involves standard and proven planning activities, including but not limited to field surveys, geotechnical investigations, and hydrologic modeling. These E&D activities are meant to reduce uncertainties during the construction phase to ensure the project could be constructed to maximize its likelihood of success if the project is selected for construction. Prevent Future Injury and Avoid Collateral Injury E&D activities are minimally invasive and would employ BMPs to reduce any potential collateral injury, thus no future injuries or collateral injury are anticipated. If the design is ultimately constructed in the future, E&D would help ensure that the project could be constructed in a manner that would minimize collateral injury. Benefits to Multiple Resources While the proposed alternative would not directly benefit multiple resources because it is an E&D project, it would provide information necessary to effectively doing so in the future if the project is constructed. If constructed, the project would reduce erosion along 4 miles of coast and would create roughly 1,500 acres of brackish marsh, providing habitat for marsh associated species, including hundreds of species of fish, migratory birds, mammals, and other wildlife. This area provides nursery and feeding habitat for commercially important species such as shrimp, blue crabs, black drum, red drum, and speckled trout. In addition to habitat and fisheries benefits, restoration of the Orleans Landbridge would restore a protective barrier between Lake Pontchartrain and the Gulf, which would increase resilience and decrease storm risk to communities in the project area. Public Health and Safety This proposed E&D project would neither benefit nor harm public health and safety. However, if constructed in the future, E&D would help ensure that the project could be constructed in a manner that would minimize collateral injury. If constructed, the LA TIG anticipates that this project would offer long-term benefits to public health and safety by restoring and preserving one of the remaining natural barriers preventing storm surge from entering Lake Pontchartrain. These barriers provide protection and reduce flood risk to communities on and around Lake Pontchartrain.
Raccoon Island Barrier Island Restoration (E&D)	Cost Effectiveness The total E&D cost is estimated to be approximately $8.2 million. This cost is consistent with similar E&D for barrier island restoration projects of this size. Furthermore, this investment in the E&D would help to ensure that a cost-effective design is selected.

	Goals & Objectives E&D projects align with the Final PDARP/PEIS, which recognizes that planning-type projects including E&D "can increase the effectiveness and efficiency of habitat restoration" (DWH Trustees, 2016). The E&D phase would be complete in approximately 3 years. This project, if constructed, would restore a critical barrier island and support the natural processes of the barrier system. Multiple habitat types would be restored, including approximately 33 acres of beach and dune, approximately 150 acres of marsh, and approximately 50 acres of upland habitat. This alternative has a strong nexus to WCNH injury as barrier islands in the northern Gulf were exposed and injured directly by the DWH oil and by the response activities (DWH Trustees, 2016). While the proposed alternative would not directly restore natural resources or their services, it would provide information necessary to effectively doing so in the future if the project is constructed. Specifically, this proposed E&D project would further the restoration-type goals described in the Final PDARP/PEIS by establishing a feasible design that could 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016). E&D projects align with the Final PDARP/PEIS, which recognizes that planning-type projects including E&D "can increase the effectiveness and efficiency of habitat restoration" (DWH Trustees, 2016). Likelihood of Success E&D is likely to be successful as it involves standard and proven activities including but not limited to field surveys, geotechnical investigations, and hydrologic modeling. Conducting E&D activities reduces the uncertainties for the construction phase to ensure the project could be constructed to maximize its likelihood of success. Prevent Future Injury and Avoid Collateral Injury E&D activities are minimally invasive and would employ BMPs to reduce any potential collateral injury, thus no future injuries or collateral injury are anticipated. If the design is ultimately constructed in the future, E&D

	would help ensure that the project could be constructed in a manner that would minimize collateral injury. Benefits to Multiple Resources While the proposed alternative would not directly benefit multiple resources because it is an E&D project, it would provide information necessary to effectively doing so in the future if the project is constructed. If constructed, the project would benefit multiple injured resources. By supporting geomorphic processes, the project would maintain the barrier island's protective function, prevent island breaching, and support the natural processes of the barrier island system. The project would also restore multiple types of coastal habitat, including approximately 33 acres of beach and dune, approximately 150 acres of marsh, and approximately 50 acres of upland habitat. The habitat restoration would support birds by providing more area suitable for nesting, loafing, and foraging. Fish and invertebrates would benefit from the creation of productive marsh habitat. The project would maintain ecological connectivity on the island. Relative to the other projects proposed for E&D in this plan, the Raccoon Island Barrier Island Restoration project, if constructed, would create the most diverse habitat benefiting the greatest number of resources. Public Health and Safety Impacts to public health and safety are not expected as E&D activities are minimally invasive and would employ BMPs to reduce any potential collateral injury. However, if constructed in the future, E&D would help ensure that the project could be constructed in a manner that would minimize collateral injury. Barrier islands are the first line of defense for the coastline against storms. This project would benefit coastal communities in Terrebonne Parish by increasing resilience to storms. If constructed, the LA TIG anticipates that this project would offer long-term benefits to public health and safety by increasing the barrier island stability and reducing the impacts of storm surges on nearshore wetlands, increasing storm mitigation.
Bayou Dularge Ridge and Marsh Creation (Construction)	Cost Effectiveness The total construction estimate is approximately $41.4 million. This cost includes finalizing E&D, construction, contingency, agency costs, construction oversight, land rights, oyster leases, operations and maintenance, and monitoring and adaptive management. This cost is comparable with the costs of similar marsh creation and ridge restoration alternatives (see previous projects at the following URL: https://cims.coastal.louisiana.gov/outreach/projects/) and are reasonable and appropriate according to the LA TIG. Goals & Objectives The project would restore approximately 22,736 linear feet of ridge and create/nourish approximately 516 to 625 acres of marsh. The restored

	marsh and ridge would provide valuable habitat for estuarine species, improvements to hydrology and water quality, and increase resiliency for surrounding coastal communities. This project has a nexus to the WCNH injury as the restoration benefits and project footprint are within the geographical footprint of the DWH oil spill. It would restore multiple habitat types which were injured, aligning with the Trustee's emphasis on restoring wetland complexes. Restoring wetland complexes is essential because they provide a wide range of ecological functions and services, including providing important habitat for fish and wildlife species, improving water quality, stabilizing shorelines, reducing storm-surge risk, and capturing and storing carbon in organic soils (DWH Trustees, 2016). These project features would meet the Trustee's programmatic restoration goals of restoring and conserving habitat. Specifically, this project would further the restoration-type goals described in the Final PDARP/PEIS to 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016). <u>Likelihood of Success</u> This project is likely to succeed. It has undergone planning phases and E&D is ongoing. The project alternatives have been evaluated based on acreage benefits, costs, and other factors. This project would use proven restoration techniques and established methods that have been successful for many previous marsh creation and ridge restoration projects, many implemented across Louisiana by CPRA and through the CWPPRA program. This documented success of previous projects demonstrates that this alternative would have a high likelihood of success. Post-construction monitoring would be conducted to ensure that the project is performing as expected. <u>Prevent Future Injury and Avoid Collateral Injury</u> The marsh creation and ridge restoration project features would help prevent future injuries to multiple habitats and estuarine-dependent resources and provide protection to vulnerable coastal communities. Implementation of this project would increase the longevity and self-sustainability of the marsh and surrounding wetlands. Construction of the

	project may result in impacts to some resources, but these would be temporary and localized to the construction area. In many cases, these impacts would be offset by beneficial restoration activities. BMPs would be implemented during construction to minimize impacts. Benefits to Multiple Resources The project would create and restore brackish and saline marsh habitat, as well as upland ridge habitats. This habitat restoration would benefit multiple resources impacted by the DWH oil spill, including migratory birds, protected species, water quality, recreational use, and coastal communities. The Bayou Dularge ridge and wetlands have historically provided a protective buffer to coastal communities in south Louisiana from storm surge. By restoring the integrity of these ridges and wetlands, this project would increase resilience in this area. Public Health and Safety: This project would create a benefit for public health and safety. Marsh creation and ridge restoration would benefit health and safety by restoring a protective buffer, which would mitigate storm damage and reduce wave-induced erosion in nearby marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks and does not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety protocols would be followed to protect workers during construction and monitoring activities. Restoration of ridge features is a critical component of the multiple lines of defense strategy being implemented to improve the resiliency of coastal ecosystems and communities against hurricane storm surge.
Bayou La Loutre Ridge Restoration and Marsh Creation (Construction)	Cost Effectiveness The total construction cost estimate is $21.2 million. This cost is comparable with the costs of similar marsh creation and ridge restoration alternatives (see previous projects at the following URL: https://cims.coastal.louisiana.gov/outreach/projects/) and are reasonable and appropriate according to the LA TIG. Goals & Objectives The project would restore approximately 28,855 linear feet of ridge and create/nourish approximately 421 acres of marsh, providing valuable marsh and upland habitat for wildlife, particularly migratory birds. The project would also provide improvements to hydrology and increased resiliency for surrounding coastal communities. This project has a nexus with WCNH injury from the DWH spill, as it is located within the Pontchartrain and Breton Sound Basins, both of which are interconnected with resources throughout the Gulf of Mexico that were among the most heavily oiled parts of the Gulf Coast. The project would restore multiple habitat types which were injured, aligning with the Trustee's emphasis on restoring wetland complexes. Restoring wetland complexes is essential

	because they provide a wide range of ecological functions and services, including providing important habitat for fish and wildlife species, improving water quality, stabilizing shorelines, reducing storm-surge risk, and capturing and storing carbon in organic soils (DWH Trustees, 2016). This proposed project would meet the Trustee's programmatic restoration goals of restoring and conserving habitat. Specifically, this project would further the restoration-type goals described in the Final PDARP/PEIS to 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities, 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016). <u>Likelihood of Success</u> This project is likely to succeed. It has undergone planning phases and E&D is nearly complete. The project alternatives have been evaluated based on acreage benefits, costs, and other factors. Post-construction monitoring would be conducted to ensure that the project is performing as expected. This alternative would use proven restoration techniques and established methods that have been successful for many previous marsh creation and ridge restoration projects, many implemented across Louisiana by CPRA and through the CWPPRA program. This documented success of previous projects demonstrates that this alternative would have a high likelihood of success. <u>Prevent Future Injury and Avoid Collateral Injury</u> The marsh creation and ridge restoration project features would help prevent future injuries to multiple habitats and estuarine-dependent resources and provide protection to vulnerable coastal communities. Implementation of this project would increase the longevity and self-sustainability of the marsh and surrounding wetlands. Construction of the project may result in impacts to some resources, but these would be temporary and localized to the construction area. In many cases, these impacts would be offset by beneficial restoration activities. BMPs would be implemented during construction to minimize impacts.

	<u>Benefits to Multiple Resources</u> This project would enhance marsh and ridge habitat and increase the resiliency of nearby existing wetland habitat. Imperiled live oak/hackberry maritime forest, which is utilized by migratory birds, would be restored. The ridge and marsh components would provide buffer against erosional winter storm events. Protected species, water quality, and recreational use resources would also benefit from implementation of this project. <u>Public Health and Safety</u> This project would create a benefit for public health and safety. Marsh creation and ridge restoration would benefit health and safety by restoring a protective buffer, which would mitigate storm damage and reduce wave-induced erosion in nearby marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks and does not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety protocols would be followed to protect workers during construction and monitoring activities. Restoration of ridge features is a critical component of the multiple lines of defense strategy being implemented to improve the resiliency of coastal ecosystems and communities against hurricane storm surge.
Lake Lery Marsh Creation and Rim Restoration, Increment 3 (Construction)	<u>Cost Effectiveness</u> The total cost of the proposed project is approximately $19.4 million. This cost is comparable with the costs of similar marsh creation and rim restoration alternatives (see previous projects at the following URL: https://cims.coastal.louisiana.gov/outreach/projects/) and are reasonable and appropriate according to the LA TIG. <u>Goals & Objectives</u> The project would restore the northern shoreline of Lake Lery by constructing approximately 12,665 linear feet of lake rim protection and creating/nourishing approximately 401 acres of marsh. Implementation of this project would provide intermediate marsh habitat and would benefit multiple other resources impacted by the oil spill, including birds, protected species, water quality, and recreational use. The rim restoration component of the project would protect the marsh into the future by including a permanent armored embankment. This project has a nexus with WCNH injury from the DWH spill, as it is located within the Breton Sound Basin, which is interconnected with resources throughout the Gulf of Mexico that were among the most heavily oiled parts of the Gulf Coast. The project would restore multiple habitat types which were injured, aligning with the Trustee's emphasis on restoring wetland complexes. Restoring wetland complexes is essential because they provide a wide range of ecological functions and services, including providing important habitat for fish and wildlife species, improving water

	quality, stabilizing shorelines, reducing storm-surge risk, and capturing and storing carbon in organic soils (DWH Trustees, 2016). These project features would meet the Trustee's programmatic restoration goals of restoring and conserving habitat. Specifically, this project would further the restoration-type goals described in the Final PDARP/PEIS to 1) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecological diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities, 2) restore for injuries to habitats in geographic areas where the injuries occurred while considering approaches that provide resiliency and sustainability, and 3) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area; consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats (DWH Trustees, 2016). <u>Likelihood of Success</u> This project is likely to succeed. It has undergone planning phases and E&D has been completed. The project's design alternatives have been evaluated in previous project phases based on acreage benefits, costs, and other factors. Post-construction monitoring would be conducted to ensure that the project is performing as expected. This alternative would use proven restoration techniques and established methods that have been successful for many previous marsh creation and rim restoration projects, including some constructed in Lake Lery. Several previous projects have been completed on the southern and eastern shores of Lake Lery to restore the lake rim and surrounding marsh. This documented success of previous projects demonstrates that this alternative would have a high likelihood of success. <u>Prevent Future Injury and Avoid Collateral Injury</u> The marsh creation and rim restoration project features would help prevent future injuries to multiple habitats and estuarine-dependent resources and provide protection to vulnerable coastal communities. Implementation of this project would increase the longevity and self-sustainability of the marsh and surrounding wetlands. Construction of the project may result in impacts to some resources, but these would be temporary and localized to the construction area. In many cases, these impacts would be offset by beneficial restoration activities. BMPs would be implemented during construction to minimize impacts.

	Benefits to Multiple Resources This project would enhance marsh and lake rim habitat in the project area and increase the resiliency of nearby existing wetland habitat. The lake rim and marsh components would provide habitat enhancements, including intermediate marsh and upland habitat, and would reduce storm surge risk. Implementation of this project would provide habitat that would benefit multiple other resources impacted by the DWH oil spill (e.g., birds, protected species, water quality, recreational use, etc.). Public Health and Safety This project would create a benefit for public health and safety. Marsh creation and rim restoration would benefit health and safety by restoring a protective buffer, which would mitigate storm damage and reduce wave-induced erosion in nearby marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks and does not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety protocols would be followed to protect workers during construction and monitoring activities.

3.7 OPA NRDA Evaluation Conclusions

The LA TIG has completed the OPA evaluation for six alternatives: three E&D alternatives and three construction alternatives. The evaluation of alternatives is based on the OPA NRDA evaluation criteria standards and on the LA TIG's specific goals and objectives for this RP/EA. A summary comparison of the OPA NRDA evaluation of the alternatives which resulted in the LA TIG's determination of preferred alternatives is presented below. The preferred projects are: East Orleans Landbridge Restoration (E&D), Raccoon Island Barrier Island Restoration (E&D), Bayou Dularge Ridge and Marsh Creation (construction), and the Bayou La Loutre Ridge Restoration and Marsh Creation (construction).

E&D Projects

E&D activities align with Final PDARP/PEIS' recognition that "preliminary planning…can increase the effectiveness and efficiency of habitat restoration." E&D investments in WCNH projects help to ensure that E&D for future projects are advanced and could, if selected for construction in the future, be constructed in a manner that would maximize the likelihood of success, minimize future and collateral injury, ensure best use of construction dollars, and meet the Trustees' goals and objectives.

Each of these alternatives has a nexus to the DWH oil spill injuries as the habitat that would benefit, if construction were to occur in the future, were directly affected by the DWH oil spill in Louisiana including marshes, barrier islands, and ridges. All three alternatives would use proven approaches and techniques with established methods and would be implemented at a cost that is reasonable, appropriate, and comparable to similar E&D projects. E&D projects do not provide benefits to natural resources or their services. However, if any of these projects are ultimately constructed, the LA TIG expects that each would provide benefits to multiple resources. E&D projects pose no risk to public health and safety. If any of these projects are ultimately constructed, The LA TIG expects that each would benefit public health and safety by increasing resiliency and protection.

As E&D activities are minimally invasive and would employ BMPs to reduce any potential collateral injury, all three alternatives would avoid collateral injury. Each of the E&D projects evaluated in this RP/EA would have components that would help prevent future injury if constructed.

Based on this analysis, all three E&D alternatives would achieve the restoration goals laid out by the Trustees in the PDARP/PEIS for the WCNH restoration type. However, two of the proposed E&D alternatives, East Orleans Landbridge Restoration and Raccoon Island Barrier Island Restoration, would potentially contribute further to public health and safety benefits than the proposed Bayou Pointe-aux-Chenes Ridge and Marsh Creation E&D project if constructed in the future. If constructed in the future, these two preferred E&D projects would both restore critical landforms that act as barriers reducing the impacts of storm surges on coastal communities and would provide more resiliency and sustainability, aligning them closer to the Trustee's restoration goals than the Bayou Pointe-aux-Chenes project. For these reasons, the LA TIG has determined, at this time, that East Orleans Landbridge Restoration and Raccoon Island Barrier Island Restoration proposed E&D projects are the preferred alternatives for this RP/EA. The Bayou Pointe-aux-Chenes proposed E&D project could still be considered for funding in subsequent restoration planning efforts by the LA TIG.

Construction Alternatives

The proposed construction projects would all provide benefits to WCNH with a strong nexus to that injury from the DWH spill. Creation of marshes, ridges, and lake rims which would enhance wetlands and would also restore a variety of interspersed and ecologically connected coastal habitats; restore for injuries to habitats, while including approaches that provide resiliency and sustainability; and restore habitats in combinations appropriate for the geographic area.

All three alternatives would use proven approaches and techniques with established methods and would be implemented at a cost that is reasonable, appropriate, and comparable to similar projects. All three alternatives would provide benefits to multiple resources and are not expected to pose any risk to public health and safety. If constructed, each of these projects would benefit public health and safety by increasing resiliency and protection.

The three proposed alternatives would help prevent future injuries and increase the longevity and self-sustainability of the marsh and surrounding wetlands. While construction may result in impacts to some resources, these would be temporary and localized to the construction area and in most cases, these impacts would be offset by project benefits.

Based on this analysis, all three construction alternatives would achieve the restoration goals laid out by the Trustees in the PDARP/PEIS for the WCNH restoration type. The Lake Lery Marsh Creation and Rim Restoration project alternative could still be considered for construction funding in subsequent restoration planning efforts by the LA TIG.

4.0 NEPA ANALYSIS

This section describes the affected environment and the anticipated environmental impacts of the reasonable range of alternatives. The NEPA analysis presented in this RP/EA is consistent with the Final PDARP/PEIS and incorporates by reference that document where applicable (DWH Trustees, 2016).

4.1 Overview of Approach

NEPA requires federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions. The Final PDARP/PEIS evaluates a range of restoration approaches, thus enabling narrower NEPA analyses for subsequent restoration plans, such as this RP/EA. Subsequent restoration plans typically include project-specific actions (programmatic actions may also be tiered to the PDARP/PEIS), which are presented in this RP/EA as the proposed alternatives. Consistent with 15 CFR 990.23, and 40 CFR 1500-1508 (2020) this RP/EA presents the NEPA evaluation of the reasonable range of alternatives as determined by the OPA evaluation in Section 3.

Incorporation by reference of relevant information from existing plans, studies, or other material is used in this analysis to streamline the NEPA process and to present a concise document that provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or Finding of No Significant Impact (FONSI), and to aid the federal Trustees of the LA TIG's compliance with NEPA (40 CFR § 1506.3, 40 CFR § 1508.9). Agencies should "focus on significant environmental issues" and, for other than significant issues, there should be "only enough discussion to show why more study is not warranted" (40 CFR §§ 1502.1 and 1502.2). All source documents relied upon for the NEPA analyses are available to the public and links are provided in the discussion of the environmental consequences where applicable.

This RP/EA follows the guidelines for impact intensity definitions presented in Table 6.3-2 of the Final PDARP/PEIS and reproduced in Appendix E. To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to the area of impacts (e.g., local, state-wide, etc.) and duration (e.g., whether they are short- or long-term impacts). Intensity refers to the severity of impact (e.g., minor, moderate, major) and could include the timing of the action (e.g., more intense impacts would occur during critical periods like high visitation or wildlife breeding/rearing, etc.). Intensity is also described in terms of whether the impact would be beneficial or adverse.

"Adverse" is used in this RP/EA only to describe the federal Trustees' evaluation under NEPA. That term is defined and applied differently in consultations conducted pursuant to the Endangered Species Act (ESA) and other protected resource statutes. Accordingly, there may be adverse impacts identified under NEPA; however, this does not necessarily mean that an action would be likely to "adversely affect" the same species because that term is defined and applied under protected resources statutes. The results of any completed protected resource consultations are included in the DWH Administrative Record.

The reasonable range of alternatives in this RP/EA includes three alternatives that are solely Phase 1 E&D projects (Table 13). The environmental consequences of these E&D activities are discussed in Section 4.2.1. Any alternative selected to undergo E&D would undergo further NRDA and NEPA analyses on its construction implementation analysis if it becomes part of a future restoration plan and would include additional opportunity for public comment.

The reasonable range of alternatives in this RP/EA also includes three alternatives that are proposed for construction (Table 14). The affected environment and environmental consequences for those alternatives are discussed in Section 4.3. The environmental consequences of the no action alternative are discussed in Section 4.4, and a comparison of the alternatives is provided in Section 4.5. The impacts of the alternatives, including the no action alternative, when added to other past, present, and reasonably foreseeable future actions (Cumulative Impacts) are discussed in Section 4.6.

4.2 Alternatives Proposed for Engineering and Design

As discussed in Chapter 6 of the Final PDARP/PEIS, a TIG may propose to fund an E&D phase, which may include planning, feasibility studies, alternatives analysis, design engineering, and permitting. This would allow the TIG to develop information needed to fully consider a subsequent implementation phase of that project in a subsequent restoration plan that would be published for public review and comment.

OPA evaluation for these E&D project alternatives is included in this RP/EA (Chapter 3). After review, the LA TIG determined that the environmental consequences associated with the three E&D projects (Table 13) fall within the range of impacts described in Section 6.4.14 of the Final PDARP/PEIS, which presents an evaluation of environmental consequences related to E&D activities. These environmental consequences are summarized in Section 4.2.1, and this RP/EA incorporates by reference the Final PDARP/PEIS NEPA analysis for E&D activities.

Table 13: Restoration Alternatives Proposed in this RP/EA for Phase 1 E&D

Restoration Alternative	Preferred/Non-Preferred
Bayou Pointe-aux-Chenes Ridge Restoration and Marsh Creation	Non-Preferred
East Orleans Landbridge Restoration	Preferred
Raccoon Island Barrier Island Restoration	Preferred

The alternatives ultimately selected to undergo E&D may be included in one or more future restoration plans for detailed OPA NRDA and NEPA analyses on the construction phases once sufficient information is provided through detailed planning and design development. Therefore, in this RP/EA, for these three alternatives, the LA TIG analyzed only the environmental impacts from activities associated with furthering E&D for each of the alternatives. Although information gathered may inform the future projects, the outcome of the preliminary phase does not commit the LA TIG to future actions.

4.2.1 Environmental Consequences

The three E&D alternatives that are included in this RP/EA primarily involve the production of plans and specifications, permitting, desktop investigation of land rights, hydrodynamic modeling, and cost estimation. They would also involve minimally intrusive field activities consistent with the activities described in Section 6.4.14 of the Final PDARP/PEIS such as: landowner and land rights investigation, identification of existing infrastructure, cultural resources investigation, delineation of borrow sources, identification of construction access and pipeline corridors, survey and geotechnical data acquisition/geotechnical engineering, delineation of earthen containment dikes, identification of construction marsh fill elevation, submission of permits, development of Monitoring and Adaptive Management (MAM) plans, and development of bidding documents. Such activities may also include researching historical conditions, modeling hydrologic response to the project, and creating maps and scale drawings of the project site. This may also include minimally intrusive field activities such as drilling into the soil or sediment with a soil auger, vibra-core, or hand probe to remove core samples for grain

size or chemical analysis; determining existing and predicted ground water levels and elevations; and performing geotechnical evaluations. E&D activities may also include archaeological studies at and around the project site, which often involve digging test pits and collecting and documenting historic features. Other activities associated with E&D that could occur include geophysical investigation, which could have short-term, adverse impacts on protected marine species in the Gulf of Mexico and surrounding waterbodies. Some data collection may also require permits, for example when collecting geotechnical samples in open water and wetlands.

Environmental consequences that may occur as a result of these actions are consistent with the consequences evaluated in the Final PDARP/PEIS. Specifically, environmental consequences may include highly localized, direct, short-term, minor impacts of fieldwork (e.g., removal of sediment samples), as well as short-term temporary disturbance of habitats and species; minor emissions from vehicles; and minor localized disturbance to terrestrial, estuarine, and marine environments. None of the environmental impacts for these E&D activities are expected to exceed short-term, minor, adverse impacts. Many activities would have no impact as they are desktop investigations and data gathering. The Final PDARP/PEIS recognizes that planning activities, such as those for the E&D alternatives proposed in this RP/EA, can increase the effectiveness and efficiency of restoration. Once the E&D phases have been completed, the LA TIG may propose to proceed with construction of these projects in a subsequent restoration plan.

After review, the Louisiana TIG determined that the environmental consequences of the data-gathering and educational activities included in these alternatives fall within the range of impacts described in Section 6.4.14 of the PDARP/PEIS. The complete project descriptions for these alternatives are provided in Chapter 2 (Section 2.3.9). No additional analysis on the environmental consequences of the data-gathering and educational activities is necessary.

4.3 Alternatives Proposed for Full Implementation

The reasonable range of alternatives in this RP/EA includes three alternatives that are proposed for full implementation (Table 14). The affected environment and environmental consequences are discussed in the following sections.

Table 14: Restoration Alternatives Proposed in this RP/EA for Full Implementation

Restoration Alternative	Preferred/Non-Preferred
Bayou Dularge Ridge and Marsh Creation	Preferred
Bayou La Loutre Ridge Restoration and Marsh Creation	Preferred
Lake Lery Marsh Creation and Rim Restoration, Increment 3	Non-Preferred

4.3.1 Bayou Dularge Ridge and Marsh Creation

The Bayou Dularge Ridge and Marsh Creation Project (Figure 6) is located in Terrebonne Parish, Louisiana on the lower end of Bayou Dularge between Lake Mechant and Caillou Lake and approximately 10 miles southwest of Theriot, Louisiana. The project consists of two distinct components. A ridge component would create approximately 17,200- ft. to 19,860-ft. of live oak/hackberry maritime forest. The marsh component would create approximately 400 to 500 acres and nourish up to 30 acres of marsh habitat. Approximately 29,044 to 34,851-ft. of earthen containment dikes would be constructed to contain the marsh fill material and approximately 1,000-ft. of 30-ft. long sheet pile will be installed to assist with containment, if necessary. It is anticipated that this project

would enhance wetland habitat and increase the resiliency of wetland habitat and coastal communities located inland of the project area.

Further details on the project are presented in Table 8. Much of the information in the sections below is derived from the *Bayou Dularge Ridge, Marsh and Hydrologic Restoration Final Design Report* (Sigma, 2021a). The construction activities proposed for this RP/EA differ from the original E&D scope that included hydrological restoration.

4.3.1.1 Physical Resources

4.3.1.1.1 Geology and Substrates

Affected Environment

The Bayou Dularge Ridge and Marsh Creation Project is located within the Terrebonne Basin. The Terrebonne Basin is bordered by Bayou Lafourche on the east, the Atchafalaya Basin floodway on the west, and the Gulf of Mexico on the south. Vessel traffic in the channels is a major source of erosion in wetland areas. These channels also provide an avenue for saltwater intrusion into fragile wetland areas, thereby changing the salinity and nature of these wetlands and leading to deterioration and conversion to open water. Subsidence occurs at different rates throughout the inactive deltaic plain as unconsolidated sediment dewaters and compacts. As subsidence occurs, flooding in wetlands increases, contributing to marsh loss. As the Timbalier subbasin is almost completely isolated from major freshwater and sediment inputs, it experiences substantial subsidence rates. Marsh and land loss rates are high due to the resulting lack of sediment input into the system, saltwater intrusion along the Houma Navigation Canal (HNC) and other canals, historic oil and gas activity, and deterioration of barrier islands. The barrier island deterioration contributes to the upland impacts as coastal tidal processes, including erosion, scour, and saltwater intrusion, contribute to land loss rates in the subbasin. The subbasin is rapidly converting to an open estuary. The land loss in this area has increased the vulnerability of coastal residents to storm surge and resulted in the loss of critical wetland habitat. Barrier islands have also been impacted by erosion. As these islands have absorbed the wave energy of the Gulf of Mexico, they have continued to erode (CWPPRA, 2021).

The project area is underlain by marsh deposits from the Holocene Age, consisting of very soft to soft clay with varying silt and sand contents. Underlying the layer of Holocene clay is a layer of Pleistocene clay and sandy clay deposits (Weindorf, 2008). The surface geology in this area generally consists of saline marsh and natural levee deposits of the Lafourche Lobe of the Mississippi River delta. This course of the river was abandoned between 1,000 and 3,000 years ago. As a result, some abandoned distributary deposits were encountered below the surficial geologic deposits. The Lafourche Lobe of the river is situated in the Maringouin Delta Complex, a region characterized by regional growth faulting, with faults dipping toward and into the Gulf of Mexico. These growth faults range in depth and in magnitude (Eustis, 2020).

According to Eustis' Geotechnical Data Collection Report, the near surface soils in the marsh fill areas consist of extremely soft to soft dark gray, gray and brown humus, and peat and organic clay within depths of 0 to 4-ft. below the mudline. These organic clays are underlain by extremely soft to soft gray clay and silty clay with interbedded strata of very loose to loose gray silty sand, clayey sand, and fine sand, and very loose to loose sandy silt and clayey silt to boring termination depths of 40-ft. below the mudline. These soil types were found throughout the project area and are generally fluid organic soils typically found in poorly drained and ponded areas. These soils support native vegetation and are considered well suited for wildlife habitat (Eustis, 2020).

Within the ridge restoration areas, near surface soils consist of extremely soft to medium stiff tan, gray, and dark gray clay, silty clay, and sandy clay with interbedded loose to medium dense gray fine sand and silty sand, to boring termination depths of 50-ft. below the mudline. The thickness of sands ranged from 1 to 5-ft. The Grand Pass soil borings indicated that soils in the area consist of very soft to soft brown and gray clays, silty clays, and sandy clays that extend approximately 10 to 15-ft. below the mudline. Below these materials, soft to stiff clay and silty clay is encountered to the terminal depths of 120-ft. below the mudline (Eustis, 2020).

The proposed borrow area is located in Lake Mechant and contains approximately 5.53 million cubic yards of very soft clays and silts with little sands. The design calls for an after-dredge elevation of -20-ft. NAVD88. The maximum width of the borrow area is 2,260-ft. and the maximum length of the borrow area is 6,070-ft. The borrow area encompasses approximately 238 acres (Sigma, 2021a).

Environmental Consequences

The project proposes to create marsh by hydraulically dredging material from a single borrow area located in Lake Mechant into marsh creation areas of approximately 400 to 500 acres and nourishment areas encompassing up to 30 acres of marsh on the south side of Bayou Dularge. A detailed review and interpretation of the collected and processed geophysical data indicated that there were no hazardous areas of concern located within the borrow area. No pipelines, well locations, common travel corridors, or no work / restricted zones appear to be impacted by the borrow area location. While some modern debris was identified within the survey area, there were no identified targets of potential environmental or hazardous concern within the borrow area identified. The borrow area maximum cut elevation was minimized during design to reduce the risk of potential hypoxia due to dredging.

This project would restore approximately 17,200-ft. to 19,860-ft. of ridge along the southern bank of Bayou Dularge. The dredge pipeline corridor (DPC) begins at the southern end of the borrow area and runs southeast to Grand Pass. At the northern end of Grand Pass, the DPC splits with one end of the DPC running southwest and one to the southeast. On the west side of Grand Pass, the DPC follows the northern shoreline of Bayou Dularge then crosses Bayou Dularge at the western marsh fill area. On the east side of Grand Pass, the DPC crosses Grand Pass and then follows the southern shoreline of Bayou Dularge into the eastern marsh fill area. The DPC is a total of 16,260-ft. or 3.1 miles and the width is 100-ft. (Sigma, 2021).

The project would result in short-term, minor, adverse impacts to substrates, such as localized soil disturbances or compaction resulting from heavy equipment during site preparation and project implementation within Bayou Dularge and Lake Mechant. Approximately 2,200,000 to 2,500,000 cubic yards of sediment from Lake Mechant would be dredged to obtain the fill materials for this project. The disturbance of soils and sediments during construction would temporarily contribute to localized erosion and lead to localized soil compaction, resulting in localized, small, detectable disturbances but not result in geologic changes. These impacts would be confined to small areas and would be offset by the beneficial restoration activities. Staging areas for construction equipment and materials are not finalized. The utilization of construction BMPs would help to minimize the impacts of construction. BMPs include the implementation of erosion controls, development of and adherence to a stormwater management plan, and ongoing construction monitoring.

The alternative would also result in long-term benefits to geology and substrates in Bayou Dularge by creating marsh, nourishing marsh, and creating a ridge feature which would restore and support natural

sediment dynamics, increase protection of the marshes from sea level rise, and reduce shoreline erosion. Marsh repaired along the Bayou Dularge shoreline can act as a buffer protecting vulnerable coastal communities from storm surge.

4.3.1.1.2 Hydrology and Water Quality

Affected Environment

The project area is located within the Terrebonne basin within two Terrebonne Parish Environmental Management Units (EMU). The borrow area is located within the Mechant/Decade EMU, and the marsh creation and nourishment area is within the Caillou Marsh EMU. The Atchafalaya River contributes a significant source of riverine-derived freshwater into the northern portion of the complex and the Grand Pass is the main source of gulf-derived salinity in the area. Over the past decades, as the Pass increased in size, the movement of salinity across the boundary has resulted in higher saline water penetrating deep in the fresh and intermediate marshes to the north causing a rapid break-up of these sensitive marshes (USDA, 2021).

Water levels in the project area are both tidal and wind driven. Caillou Lake provides a direct connection to the Gulf of Mexico through several inlet passages, which in turn, makes its way through the Grand Pass and directly into Lake Mechant. Prior to the opening of the Grand Pass, the gulf connections were mainly through a series of much smaller meandering bayous and tidal movements and salinity levels were much lower. More recently, the expanding Pass has allowed the area salinity to increase and tidal fluctuations to rapidly increase (USDA, 2021).

Terrebonne Parish is generally poorly drained. The channels of many of the streams, bayous, and canals are at or near sea level and gradients are too low to remove water effectively. The lower Atchafalaya River, the largest input of freshwater, flows along the western border of the parish. It brings sediment and freshwater from the Mississippi and Red River into the western part of the Parish and farther east via the Gulf Intracoastal Waterway (GIWW) (Terrebonne, 2000).

The Bayou Dularge project area consists of saline marsh south of Bayou Dularge and brackish marsh to the north of Bayou Dularge. The area is irregularly tidally flooded and is dominated by salt-tolerant vegetation. Brackish marsh salinity levels typically average about 8 parts per thousand, and saline marsh salinity levels typically averaging above 20 parts per thousand, but fluctuations are inevitable due to shifts in tidal inundation (Sigma, 2021).

LDEQ monitors surface water and groundwater water quality. Surface water management seeks to protect the quality of all waters throughout the state, including rivers, streams, bayous, lakes, reservoirs, wetlands, estuaries, and many other types of surface water. LDEQ issues a biennial integrated report of the status of Louisiana waters. LDEQ defines eight designated uses for surface waters: primary contact recreation (swimming), secondary contact recreation (boating), fish and wildlife propagation, drinking water supply, shellfish propagation, agriculture, outstanding natural resource waters, and limited aquatic and wildlife use (LDEQ, 2021). Each water body is evaluated as fully supporting, partially supporting, or not supporting of each of its designated use(s). The state reports water quality assessments by subsegments of each basin. The project site is within Subsegment LA120703_00 Bayou Dularge from 0.5 mile north of St. Andrews Mission to Caillou Bay and is defined as estuarine. The 2020 Louisiana Water Quality Inventory Integrated Report indicates the subsegment fully supports the designated use of swimming, boating, and oyster propagation, but does not support fish and wildlife propagation (LDEQ, 2021).

The project site is located within the Federal Emergency Management Agency (FEMA)-designated Flood Zone V21, based on the Preliminary Flood Insurance Rate Map (FIRM) issued on May 1, 1985. Based on the V21 classification, the site is subject to inundation by the 1-percent-annual chance flood event, with additional hazards due to storm-induced velocity wave action (FIRM Panel ID: 2252060650C) (FEMA, 1985).

Environmental Consequences

The marsh creation and nourishment areas would serve to stabilize the project area with a healthy vegetative marsh environment and provide a buffer between the Bayou Dularge southern ridge and Caillou Lake. The project would create approximately 400 to 500 acres of marsh and nourish up to 30 acres of marsh habitat. Marsh fill material used to construct the marsh restoration areas would be dredged hydraulically from the Lake Mechant Borrow Area. Earthen containment dikes would be constructed around the designated marsh creation areas (MCA) from native material excavated from borrow areas located within each marsh restoration area and sheet piles may be used to assist with containment if necessary. Three ridge features are proposed on the southern side of Bayou Dularge. Vegetative plantings would be implemented following construction during the MAM phase.

The Bayou Dularge marsh creation/nourishment borrow area is located between 1.0 and 2.1 miles northwest of Grand Pass and 1.2 miles north of the western marsh creation areas. The approximate center of the borrow area is located at - 29.2809330°,- 90.956977° (NAD83). Approximately 2,200,000 to 2,500,000 cubic yards of material will be borrowed from the Lake Mechant borrow area. In Lake Mechant, potential hypoxic conditions caused by previously dredged borrow areas were detected over short time periods, but these recovered relatively quickly. Oxygen levels in the Lake Mechant borrow area decreased, but they only reached hypoxic levels for brief periods of time spread throughout the observation period. Therefore, out of caution, the Bayou Dularge borrow area maximum cut elevation is limited to reduce the risk of potential hypoxia due to dredging. There would be short-term periods of increased turbidity in the borrow area during active dredging; however, turbidity would dissipate rapidly. The disturbance of soils and sediments and increases in erosion during construction could lead to increased turbidity and sedimentation in nearby wetlands and waterbodies, resulting in measurable changes to hydrology and detectable changes to water quality. However, these changes would be temporary and localized, quickly becoming undetectable, and would not result in an exceedance of state water quality standards or change wetland function. Construction and implementation of the alternative would not result in detectable changes to the natural floodplain.

The project would use dredge fill placement to create a marsh platform and reestablish historical ridges, which would alter the project area's surface conditions. The marsh creation area would be fully confined. Due to the installation of containment dikes, most of the dredge material should be contained within the marsh creation areas which would limit runoff. The natural establishment of vegetation would serve to stabilize soils and reduce soil loss. Once the marsh platform has consolidated and settled into an elevation that allows for tidal exchange, the containment dikes would be gapped to allow for tidal flow to enter the area. After both the creation and nourishment of the saline marsh, native intertidal marsh and ridge vegetation is recommended to be planted to help support and stabilize the rebuilt marsh habitat and environment (Sigma, 2021). Localized erosion and sediment transport are expected during fill material placement. Fill material placement would result in impacts to hydrology and water quality while impacts in the surrounding area should be minimal. Therefore, the project would result in short-term and long-term, minor adverse impacts to hydrology in the project area.

Some temporary, short-term, minor adverse impacts in the project area would occur during the creation of the ridge features. The proposed ridges follow the historical ridge except for locations where existing camps would be impacted during construction. Borrow material to construct the ridges would be excavated from the marsh fill area footprints to the fullest extent possible to minimize environmental impacts as these areas would be refilled during marsh construction. This minimizes environmental impacts resulting from the project and allows for efficient ridge constructability. Where in-situ borrow material is not available within a marsh restoration area, alternate borrow sources located in Bayou Dularge have been delineated. Woody vegetative plantings are proposed along the ridge to promote stability and provide erosion control. Localized increases in turbidity are expected in the borrow areas during excavation; however, turbidity would dissipate rapidly (Sigma, 2021).

Impacts associated with construction would result in short-term, minor, adverse impacts to water quality. Adverse effects to suspended particulates and turbidity, water current patterns, normal water fluctuations, and salinity gradients would be short-term, minor, and localized. There would be short-term periods of increased turbidity in the project area during active dredging; however, turbidity would dissipate rapidly. These impacts would be short-term and diminish as the marsh cells become vegetated. The use of barges, other vehicles, and equipment during implementation and monitoring could also result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. The construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Establishment of and adherence to BMPs during construction and restoration could minimize water quality impacts.

The long-term impacts of the project would be beneficial to the hydrology and water quality in the project area. Vegetation would establish in the restored and nourished marsh cells, and newly created and restored ridge would allow woody plantings to grow, which would enhance nutrient uptake, improving water quality and stabilizing soils; thus, improving hydrology.

4.3.1.1.3 Air Quality

Affected Environment

The USEPA established criteria for evaluating air quality in accordance with the 1990 Clean Air Act Amendments. The USEPA developed the National Ambient Air Quality Standards (NAAQS) that lists six atmospheric pollutants considered harmful to public health. The six pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The LDEQ is responsible for regulating and ensuring compliance with the Clean Air Act in Louisiana. For compliance purposes, geographic areas within the United States are classified as either in attainment or nonattainment for air quality. Geographic areas that have all six criteria pollutants below NAAQS are considered in attainment, whereas areas exceeding these levels are considered nonattainment areas. In nonattainment areas, USEPA requires states to develop and/or revise a state implementation plan to ensure the standards would be attained.

Air quality in the project area complies with NAAQS standards for all pollutants because it consists of mostly rural areas in the coastal region. The project area is located in Terrebonne Parish which received an attainment rating for 2013-2021 (USEPA, 2021). If the air quality in a geographic area meets or exceeds the national standard, it is called an attainment area.

The project area is uninhabited and is accessible by boat. Some recreational camps are located near the project area. As a result, air pollution sources are limited to boat traffic and pollutants that are

transported by winds and water to the project area. Potential sources of airborne pollutants include the sources from the limited development.

Environmental Consequences

The project would result in minimal to negligible effects on air quality. There may be short-term, minor, adverse impacts to air quality during construction due to exhaust from equipment and machinery and increased vessel activity. These localized, temporary impacts are not likely to increase any of the six primary pollutant levels above the NAAQS, even when considered cumulatively with other area emissions, nor would they have any measurable impact on greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide, and fluorinated gases) emissions. Although difficult to measure, the increase in marsh acreage would likely provide a long-term benefit to air quality for the area via carbon sequestration. Mitigation measures would be implemented using BMPs to limit temporary impacts during construction such as limiting idling time either by shutting equipment off when not in use or reducing the idling time and limiting the creation of dust-sized particles. An increase in vegetation could potentially provide a long-term benefit to air quality for the area.

4.3.1.1.4 Noise

Affected Environment

Noise is emitted from many sources including airplanes, factories, railroads, power generating plants, and highway vehicles. The Bayou Dularge Ridge and Marsh Restoration project is located in the coastal environment. The Final PDARP/PEIS (Chapter 6) states the primary sources of terrestrial noise in the coastal environment are transportation- and construction-related activities and natural sounds such as wind and wildlife.

The primary sources of ambient (background) noise in the project areas are recreational boating vessels and natural sounds such as wind and wildlife. The level of noise in the project areas vary, depending on the season, time of day, number and types of noise sources, and distance from the noise source.

Environmental Consequences

Noise impacts associated with the alternatives would be mainly from construction activities. The dominant noise sources from construction elements are expected to be dredging, earth-moving and dirt-hauling activities. General construction noise impacts would be limited to construction activities and would be short-term, adverse, and negligible to minor depending on proximity to construction activities. Short-term, minor construction noise would adversely affect nearby residents who inhabit the recreational camps.

4.3.1.2 Biological Resources

4.3.1.2.1 Habitats

Affected Environment

The wetlands in the vicinity of the Bayou Dularge project include brackish and saline marshes and coastal hardwood forest and serve as valuable habitat for wildlife, fish, and shellfish (Sigma, 2021). The soil types found throughout the project area are generally fluid organic soils typically found in poorly drained and ponded areas. These soils support native vegetation and are considered well suited for wildlife habitat (Eustis, 2020).

The Bayou Dularge project area consists of saline marsh south of Bayou Dularge and brackish marsh to the north of Bayou Dularge. The area is irregularly tidally flooded and is dominated by salt-tolerant

vegetation. For the purposes of this design, the Bayou Dularge Ridge and Marsh Creation project area was deemed a saline marsh (Sigma, 2021). Vegetation in the region typically consists of salt marsh cordgrass (*Spartina alterniflora*), marshhay cordgrass (*Spartina patens*), black needlerush (*Juncus roemerianus*), and coastal saltgrass (*Distichlis spicata*). Black mangrove (*Avicennia germinans*) occurs in a few areas, and some live oak is found along old natural levees (Omernik et al., 2008).

Environmental Consequences

The purpose of this project is to provide a plan to construct and restore ridge habitat and create and nourish saline marsh. This project would create approximately 400 to 500 acres of marsh and nourish approximately up to 30 acres of marsh and restore approximately 17,200-ft. to 19,860-ft. of ridge along Bayou Dularge. The Bayou Dularge project would enhance wetland habitat and increase the resiliency of nearby wetland habitat and coastal communities. The project would contribute to the primary comprehensive plan goal of habitat restoration by incorporating ridge restoration/marsh creation strategies which would restore and conserve the health, diversity, and resilience of key coastal, estuarine, and marine habitats of the lower Terrebonne Basin. The project would achieve the primary objective of enhancing and protecting critical coastal Louisiana habitats.

The integrity of the existing ridge is a concern due to erosion of the adjacent marshes. The position of the Bayou Dularge ridge and adjacent marshes form a significant landbridge that defines the landscape and hydrology within the lower basin. Maintaining the integrity of the landbridge is the key focal point of hydrologic influence that controls environmental conditions of vast areas of marsh to the north. Loss of this important landbridge would undermine efforts to restore the fresh and intermediate marshes to the north and eliminate an important landscape feature of critical importance to basin hydrology (USDA-NRCS, 2014). The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby marshes, thereby reducing long-term susceptibility to subsidence and sea level rise. Woody vegetative plantings are proposed along the ridge to promote stability and provide erosion control. Vegetative plantings are recommended for implementation following construction during the MAM phase. As identified in the CPRA Marsh Creation Guidelines “Louisiana coastal plant communities offer unmatched value in establishing and sustaining wetland ecosystems.” Therefore, construction unit 1 provides herbaceous ridge vegetative plantings to provide immediate stability and erosion control, and construction unit 2 consists of woody vegetative planting of the ridge feature and herbaceous planting of the marsh creation sites once construction consolidation has stabilized, which is estimated to occur within 3 to 5 years (Sigma, 2021a).

Along the eastern and western project limits, remnant marsh to the south that provided a buffer to erosion has nearly eroded entirely, and much of the vegetative marsh, especially to the east, has now converted into open water, accelerating ridge and marsh deterioration. Through comparison of aerial photographs over a 30-year span, the Bayou Dularge ridge and adjacent marsh have degraded over time. The project would create marsh in these areas, which would serve to stabilize the project area with a healthy vegetative marsh environment and provide a buffer between the Bayou Dularge southern ridge and Caillou Lake. The emergent wetlands created by the project would offset the loss of open water and submerged vegetated habitats through the life of the project and beyond. The marsh restoration would increase quantity and quality of emergent marsh habitat while also reducing habitat susceptibility to subsidence and sea level rise.

Dredging activities in the access routes and placement of the pipeline corridors and the use of boats and construction machinery would create short-term, minor, adverse impacts to marsh and ridge habitats due to localized soil and sediment disturbances and contamination from possible fuel and fluid leaks.

Any impacts to the benthic community in the access route and canal would be minor and short-term as benthic communities are quick to recover from disturbances, such as dredging (Dernie et al., 2003). The impacts from dredging would not have any long-term, adverse impacts on habitats in the project area.

Overall, the project would have short- and long-term adverse impacts on emergent marsh habitats. There would be short-term, minor, adverse impacts associated with construction in and around the restoration area during fill placement. There would be long-term, minor to moderate, adverse impacts to the aquatic habitats that are filled with dredged material. In the borrow area, there would be short-term, minor, adverse impacts on aquatic habitats above the lake bottom due to vehicle traffic, construction disturbances, and dredging. The project provides long-term, beneficial impacts to ridge and marsh habitats.

4.3.1.2.2 Wildlife

Affected Environment

The wetlands in the vicinity of the Bayou Dularge project include brackish and saline marshes and coastal hardwood forest and serve as valuable habitat for wildlife, fish, and shellfish. The eBird hotspot website lists 34 species observed at the Mud Lake site, which is the closest hotspot to the project vicinity (eBird, 2021). The highest counts include ducks, red-winged blackbirds, Brown Pelicans, Laughing Gulls, and White Ibis. All migratory species are protected under the Migratory Bird Treaty Act (MBTA; 40 Stat. 755, as amended; 16 U.S.C. 703 et seq.).

The area's fresh and intermediate marshes provide habitat for many resident and migratory non-game birds, white-tailed deer, swamp rabbits, American alligators, raccoon, nutria, mink, otter, muskrat, and numerous other furbearers. The unit's saline marsh provides habitat for wading birds, shorebirds, and seabirds (Terrebonne, 2000).

Environmental Consequences

The project would create short-term, minor, temporary displacement of birds and other wildlife during construction in the project area and the borrow area. Birds would need to find other areas to forage and loaf during this time, and mammals, reptiles, and amphibians would move to avoid construction activity and contact with workers; however, suitable habitats are available nearby. Following the restoration, wildlife would return quickly to the unoccupied new habitat. Impacts to nesting, foraging, and overwintering habitats resulting from construction would be short-term, moderate, and adverse. To minimize impacts to wildlife, especially birds, BMPs would be implemented to minimize the risk to wildlife. This would include bird abatement and a nesting shorebird field assessment as needed.

While creating marsh and ridge habitat comes at the expense of losing open water habitat, the project would result in long-term positive benefits by offsetting this loss by creating improved habitat conditions for migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts. New intertidal marsh and marsh edge would provide increased foraging opportunities for shorebirds and wading birds.

Woody vegetative plantings are proposed along the ridge to promote stability and provide erosion control. Restoration of the ridge would bring increased protection from storm surges and waves which would improve fish and wildlife habitat. The restoration would help maintain the health, stability, and function of the existing wetlands and provide a nursery and foraging habitat to a variety of fish and waterfowl. The project provides long-term, beneficial impacts to wildlife habitat.

4.3.1.2.3 Marine and Estuarine Fauna (Fish, Shellfish, Benthic Organisms)

Affected Environment

The project is in an area designated as essential fish habitat (EFH) for various life stages of federally managed species of shrimp, fish, and sharks. The project area is located within the estuarine habitat zone of Gulf EFH eco-region 4 and contains multiple categories of EFH that would be impacted by project implementation including emergent marshes, submerged aquatic vegetation, oyster reefs/hard substrate, sand/shell bottoms, mud/soft bottoms, and water column. In addition to being designated as EFH, estuarine wetlands and water bottoms in the project area provide nursery and foraging habitats for a variety of economically important marine fishery species, many of which serve as prey for other federally managed species. Wetlands in the project area also produce nutrients and detritus, important components of the aquatic food web, which contributes to the overall productivity of the coastal estuary.

Environmental Consequences

Construction of the marsh and ridge features would result in long-term, moderate, adverse impacts to open water habitat as the habitat would be converted from open water habitat to marsh and ridge habitat. The loss of EFH from creating the marsh cells and ridge habitat would be offset by an increase in marsh habitat and shallow-water shoreline. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts.

Dredging activities in the access route and placement of the pipeline corridors (Figure 6) would create short-term, minor adverse impacts to the fish fauna as turbidity increases when bottom sediments are disturbed during the dredging process. Species affected by the dredging activities would likely move to a more suitable habitat resulting in no long-term adverse impacts. Dredging activities within the borrow area may have several impacts on EFH, including disruption of prey sources, noise disturbances, and impacts to spawning and feeding habitats due to turbidity and siltation. Impacts from dredging and transport of material are expected to be minimized because of the short distance from the borrow area to the fill area. Impacts resulting from dredging the borrow source area would cause short-term, minor, adverse impacts to aquatic fauna, fisheries, and EFH.

Potential impacts to estuarine and aquatic fauna, managed fisheries, and EFH would be considered, avoided, and minimized to the extent practicable during design and construction. When impacts cannot be avoided, BMPs would be implemented with the intent of minimizing the potential magnitude and duration of impacts to aquatic fauna, managed fisheries, and EFH. BMPs during construction would help to avoid and minimize impacts when protected and managed species are expected to be present or when most vulnerable. They would also likely include standard erosion and sediment control measures to protect water quality and aquatic habitats from impacts resulting from construction and sediment runoff. EFH consultation guidance documents on the NMFS webpage provide additional best practices to avoid or limit project impacts to EFH. Specific BMPs for the protection of EFH would be identified and selected based on project elements and chosen construction methods during the final engineering design.

This project would have short-term, minor to moderate, adverse effects on fish fauna, EFH, crustaceans, mollusks, and other aquatic organisms due to construction activities. Additionally, there would be long-term loss of EFH along the footprint of the ridge feature from the conversion of wetland habitat to non-tidal elevations. However, there would be long-term, beneficial impacts to these species and EFH due to the improvement and enhancement of marsh habitats. Positive impacts to EFH include the nourishment

and creation of estuarine wetland habitat once the fill material has settled to elevations conducive for marsh vegetation, and after the containment has been gapped to restore tidal connectivity and fishery access. Negative impacts to EFH would be offset by the creation of approximately 400 to 500 acres of marsh and nourishment of up to 30 acres of marsh. Overall, the project is restorative in nature with positive benefits offsetting negative impacts to EFH, and it has been designed to minimize short term negative impacts and maximize long term positive impacts to EFH.

4.3.1.2.4 Protected Species

Affected Environment

Protected species include wildlife and plant species that are protected from harm or harassment by law. A list of federally threatened and endangered species and other species of special concern with the potential to occur within the project area was developed based on correspondence received from USFWS on April 9, 2021, from the USFWS Information for Planning and Consultation (iPaC) tool (USFWS, 2022), and from the NOAA Fisheries Species Directory (https://www.fisheries.noaa.gov/species-directory) (Table 15). Correspondence from USFWS, dated April 9, 2021, indicated a total of one threatened species on the USFWS list to have the potential to occur within the direct project vicinity: the West Indian manatee. There are two threatened species on the NOAA list to have a potential to occur within the direct project vicinity: the Loggerhead Sea Turtle and the Green Sea Turtle.

Table 15: Protected Species Under the Endangered Species Act with the Potential to Occur in the Project Area

Species	Status
West Indian Manatee	Threatened
Eastern Black Rail	Threatened
Monarch Butterfly	Candidate
Kemp's Ridley Sea Turtle	Endangered
Loggerhead Sea Turtle	Threatened
Green Sea Turtle	Threatened

The West Indian manatee (*Trichechus manatus)* is found in open marine waters, bays, and rivers with submerged aquatic beds or floating vegetation but is not commonly found in Louisiana. It has been known to visit the Pearl, Mermentau, Calcasieu, and Sabine Rivers and waterways of the Pontchartrain and Barataria basins. Major threats to the manatee include being struck by boats and barges, habitat loss and death due to flood control structures and extended periods of below freezing temperatures. It is not likely that the manatee would be found in the project area.

The eastern black rail (*Laterallus jamaicensis*) require dense overhead cover and are primarily associated with herbaceous, persistent, emergent wetland plants. Along portions of the Gulf Coast, eastern black rails can be found in higher elevation wetland zones with some shrubby vegetation. Impounded and unimpounded intermediate marshes (marshes closer to high elevation areas) also provide habitat for the subspecies. The primary threats to the eastern black rail are habitat loss and destruction, incompatible land management, sea-level rise and tidal flooding, and increasing storm intensity and frequency. Louisiana has few documented occurrences of eastern black rail, and these occurrences are concentrated in and around southwest Louisiana. Louisiana doesn't have a history of supporting eastern black rails consistently and are considered to be on the peripheries of known breeding areas (DOI, 2020). It is not likely that the eastern black rail would be found in the project area.

The monarch butterfly (*Danaus plexippus)* is currently being considered for federal listing under the Endangered Species Act. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

The loggerhead (*Caretta caretta*) sea turtle inhabits both shallow and deep marine water, especially with submerged seagrass beds, salt marshes, bays, tidal passes, and coastal dunes during nesting season, and has been known to nest on the Chandeleur Islands. Main threats to this species include the erosion of barrier islands where nesting occurs, the take of eggs, young, and adult turtles as food and incidental take by fishing and shrimping gear (Coastal Environments, 2012). The green (*Chelonia mydas*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles may be present within the project area because it is located within the known ranges of these species. Due to the project's distance from the Gulf of Mexico, it is highly unlikely that any of the sea turtle species would be found nesting in the project area as these species nest almost exclusively on ocean beaches (USFWS, 2018). The two other protected sea turtle species, the hawksbill sea turtle (*Eretmochelys imbricate*) and leatherback sea turtle (*Dermochelys coriacea*), are rarely observed in coastal Louisiana and would be unlikely to occur in the project area or associated borrow areas, as they lack the coral reef habitat preferred by the hawksbill sea turtle (NOAA, 2021a) and are too shallow for the leatherback sea turtle (NOAA, 2021b).

Bottlenose dolphins (*Tursiops truncates*) are not endangered or threatened under the ESA, but they are protected under the Marine Mammal Protection Act (MMPA). Bottlenose dolphins inhabit a wide variety of habitats, including gulfs, estuaries, and nearshore coastal waters. Bottlenose dolphins could occur in Lake Mechant, where the borrow site is located, but would be unlikely to occur in shallow marsh creation areas. Major threats include vessel strike, habitat loss, and exposure to biotoxins.

Environmental Consequences

Activities that could potentially affect West Indian manatees, eastern black rails, and monarch butterflies, loggerhead, Kemp's ridley, and green sea turtles, and bottlenose dolphins would include dredging, ridge and marsh fill, and placement of dredge pipelines. Temporary, localized, minor adverse impacts to these species are possible due to noise, entrapment, and collisions with watercraft and dredge equipment. They could also include impacts to water quality due to construction activities, which could affect adjacent waters within the borrow areas and project area. Impacts to these species would be unlikely due to the ability of these species to avoid disturbance.

The project would have minimal impacts to the loggerhead sea turtle, Kemp's ridley sea turtle, and the green sea turtle, which infrequently utilize the waters in the project area. Dredging activities in Lake Mechant associated with the project could result in disturbance/displacement of sea turtles that may be in the area during construction; however, any disturbance/displacement would be temporary and sea turtles would likely move to other open water habitat during dredging activities. Because the marsh restoration feature of the project area is fully confined by containment dikes accessibility by sea turtles would be unlikely during construction.

Migratory birds, roosts, and nests are protected by the Migratory Bird Treaty Act. As intermediate marsh habitats are favored by numerous species of migratory birds, coordination with USFWS may be required if project implementation is to occur during the breeding season. This may result in requirements to conduct pre-construction nesting bird surveys, nest removal and appropriate abatement measures, and/or bird monitoring during construction (ELOS, 2020). Nests of Bald and Golden Eagles are always

protected under the Bald and Golden Eagle Protection Act. Destruction of these nests requires a permit at all times, whether or not they are occupied.

Several BMPs would be implemented during construction to minimize or avoid impacts to protected species. For any in-water work, the project would follow appropriate BMPs described in section 6A.1.8.3 of the Final PDARP/PEIS and would implement measures from NMFS's *Protected Species Construction Conditions* (NMFS, 2021), *Measures for Reducing Entrapment Risk to Protected Species* (NMFS, 2012), and *Vessel Strike Avoidance Measures* (NOAA, 2021d) and United State Army Corps of Engineers' (USACE) *Standard Manatee Conditions for In-water Work* (USACE, 2011). These measures would minimize the potential for impacts to West Indian manatees.

4.3.1.3 Socioeconomic Resources

4.3.1.3.1 Socioeconomics and Environmental Justice

Affected Environment

The intent of an environmental justice evaluation under EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations is to identify communities and groups that meet environmental justice criteria and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of EO 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by federal agencies.

Approximately 112,054 people live in Terrebonne Parish, which covers 1,231 square miles, the fifth largest parish in Louisiana by area. The median income in 2019 was $48,747 with 20.6% of persons in poverty. Roughly 19.0% of the population is black or African American, 1.0% are Asian, and 0.1% are Native Hawaiian and other Pacific Islanders (U.S. Census Bureau, 2019). Most employment is within the educational services, health care, and social assistance labor category.

Environmental Consequences

By increasing ridge and marsh habitat and subsequently fish and wildlife resources, the project would help to maintain that portion of the local economy dependent upon recreational and commercial fish and wildlife resources within the project area. Project-area waterfowl hunting, recreational fishing, and wildlife observation are important components of the local economy, and the creation of emergent marsh and other fish and wildlife habitats could increase the ability of the project area to support these activities. Marsh repaired along the Bayou Dularge shoreline can act as a buffer for the ridge against highly erosional winter storm events. The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby emergent marshes, thereby reducing long-term susceptibility to subsidence and eustatic sea level rise. Restoration of the ridge would bring increased protection from storm surges and waves which would protect communities.

Implementation of the project would result in short-term benefits to the local economy via increases in the demand for employment and associated spending in the project area during construction. While some short-term closures to localized areas could occur during project construction, none of these are anticipated to disproportionately affect minority or low-income populations.

4.3.1.3.2 Cultural Resources

Affected Environment

Cultural resources are the tangible remains of the evidence and/or location of past human activity. These resources may include buildings, structures, prehistoric sites, historic or prehistoric objects, rock inscription, earthworks, canals, or landscapes. These non-renewable resources often represent the culture, values, heritage, and history of the group(s) of people traditionally associated with them. They may also contribute important information about past society and environments, which could ultimately provide solutions for modern day social or environmental challenges.

To date, there has been no comprehensive cultural resources investigation of the project area where construction may occur; however, there were analyses completed before geotechnical exploration. Natural Resources Conservation Service (NRCS) personnel reviewed the Louisiana Cultural Resources Map, an online GIS database maintained by the Louisiana Office of Cultural Development (OCD), Division of Archaeology (DOA). Together with the Division of Historic Preservation (DHP), the DOA is the State Historic Preservation Office (SHPO) for the State of Louisiana. The review identified two recorded cultural resources (16TR328 and 16TR55) potentially within the area of potential effect (APE). Five recorded cultural resources (16TR8, 16TR56, 16TR53, 16TR54, and 16TR335) either adjacent to, or in the vicinity of the APE were also identified. NRCS designated each site, with an additional 20-ft. perimeter buffer, as a "No Work Area" to prohibit access by all NRCS staff, contractors, and partners during design related field activities in correspondence dated September 2017.

NRCS later found that cultural resource 16TR328 was determined not eligible for inclusion in the National Register of Historic Places (NRHP) as the site was found to be severely eroded and the subaerial material observed there appeared to be dredge spoil, likely placed via multiple lifts. As a result, the No Work Zone that NRCS originally established in association with that site will no longer be required if the project field work proceeds. In addition, the original proposed project layout has since been revised to avoid impacts to 16TR8 and 16TR56. NRCS determined that with the above-described revisions, the field work would have no adverse effect on any cultural resource site due to the nature of the work, because it was performed by boat and/or airboat, and because No Work Areas were enforced to prevent intrusion upon the remaining known sites within or near the project area. Avoidance plans are currently being developed for the construction phase.

Consultation with the Jena Band of Choctaw Indians, the Sovereign Nation of the Chitimacha, the Coushatta Tribe of Louisiana, and the Tunica-Biloxi Tribe of Louisiana was conducted prior to E&D activities and would be required to continue throughout the completion of the design and construction phases.

CPRA would complete the design and permitting process and would be responsible for ensuring all Section 106 requirements are met prior to project implementation. DOI would be responsible for completing Section 106 compliance requirements.

Environmental Consequences

Consultation with the SHPO and interested federally recognized Indian tribes would be completed during the finalization of the design to ensure the project is compliant with Section 106 of the NRHP.

All projects implemented under restoration plans and tiered NEPA analyses consistent with the Final PDARP/PEIS must secure all necessary state and federal permits and ensure the project is following all applicable laws and regulations concerning the protection of cultural and historic resources (DWH

Trustees, 2016). A complete review under Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. § 306108) would occur before project implementation. If any culturally or historically significant resources are identified during finalization of design, such areas would be avoided during construction. Therefore, although the project would cause sediment and ground disturbance, it is anticipated that it would have no adverse effects on cultural resources as buffers would be maintained around identified potential submerged cultural resources.

4.3.1.3.3 Infrastructure

Affected Environment

There is limited infrastructure located throughout the coastal areas of Bayou Dularge. The project area is uninhabited and is accessible by boat. Some recreational camps are located near the project area. The project would occur in open water and fragmented marsh habitat.

The marsh creation area, Grand Pass, and Bayou Dularge magnetometer survey operations resulted in a total data collection of 19.9 nautical miles, 2.6 nautical miles, and 11.6 nautical miles, respectively. Eustis Engineering, LLC provided magnetometer surveys along crossing transects at each bore location. No anomalies or hazards were identified that indicate critical infrastructure, abandoned wellheads, or other potential project constraints (Sigma, 2021).

Surface features and infrastructure were surveyed by Sigma Consulting Group. There are 25 camp sites along the southern bank of Bayou Dularge and one additional camp within the project limits. The project considers these campsites as design constraints and were avoided when possible. Design features such as ridge restoration, ridge borrow, and marsh creation were adjusted to avoid direct impacts to the camps. Minor features such as wooden docks that provide access to open water behind the camps that would be cut off by the proposed ridge may be impacted. These impacts were considered during the project feature evaluation process (Sigma, 2021).

In addition to the private camps and structures, Sigma also identified the South Louisiana Electric Cooperative Association (SLECA) poles for the aerial electric power distribution line. SLECA is the only utility/pipeline identified in the project limits. SLECA owns the overhead power lines and submerged power lines east of Grand Pass. SLECA representatives requested that the submerged high voltage crossings be avoided during construction, including dredging operations. Also, the minimum offset from the overhead power lines is 15-ft. as directed from SLECA (Sigma, 2021).

Environmental Consequences

Implementing the project would not impact any infrastructure. An aerial and submerged power distribution line within the project area has been identified through a magnetometer survey and database search. The submerged high voltage crossings would be avoided during construction and dredging operations, and the minimum 15-ft. offset from the overhead power lines would be followed.

The design team would identify and contact owners to communicate about the project and avoid disturbing these areas. It is anticipated there would be no impacts to existing infrastructure due to this project.

4.3.1.3.4 Land and Marine Management

Affected Environment

The Coastal Zone Management Act (CZMA) is a federal act that encourages states to develop coastal management programs for preserving statewide coastal resources. Under this act, once a state develops a federally approved coastal management program, "federal consistency" requires that any federal actions affecting coastal land or water resources (the coastal zone) must be consistent with the state's program. In Louisiana, the LDNR Office of Coastal Management oversees the state's Coastal Zone Management (CZM) Program. The project area is within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012 (LDNR, 2012) and is subject to the regulations of the state's CZM Program.

The Terrebonne Parish CZM Program divided the parish into 13 EMUs (Terrebonne, 2000). The project is in the Mechant/Decade and the Caillou Marsh EMU's. Some of the goals for managing the coastal resources in these EMU's that align with the goals of this project include establishing and protecting ridge functions, sustaining wetlands, and shoreline protection and bank stabilization (Terrebonne, 2000).

Environmental Consequences

The project could result in short-term, minor, adverse impacts to land and marine management due to temporary partial or full closure of areas, public access restrictions, and/or interruption of interpretive programs (DWH Trustees, 2016). The project does support the EMU's goals and objectives within the Terrebonne Parish CZM and creates long-term, beneficial impacts to marsh and ridge habitat. The project would support the goals outlined in the Terrebonne CZM Program and would result in long-term, beneficial impacts to land and marine management due to the aim of restoring ridge and marsh habitats. All proposed improvements would conform to the requirements set forth in the Terrebonne Parish CZM Program.

4.3.1.3.5 Tourism and Recreational Use

Affected Environment

The project area, including its surroundings, is a popular destination for boating, birdwatching, fishing, hunting, and other recreational activities. The project area is accessible by boat. The surrounding lakes are very popular fishing destinations that draw recreational anglers. Most of the homes within the area are fishing and hunting camps, which see the population swell during the height of the fishing and hunting seasons. The full-time residents of the area make their living off the abundance of oysters, crab, and shrimp in the waters as well as fishing charter businesses. Tourism has gained importance over time in Terrebonne Parish, as individuals offer swamp tours, boats, and guides for charter fishing both inland and offshore, temporary rentals, and tours of historic homes (Terrebonne, 2000).

The Louisiana Universities Marine Consortium (LUMCON) is located in Cocodrie, Louisiana and serves as an academic and research destination for faculty and students. This facility was created in 1979 to increase society's awareness of the environmental, economic, and cultural value of Louisiana's coastal and marine environments by conducting research and education programs. LUMCON serves as a facility and network for all Louisiana schools with interest in marine research and education. The potential research and educational benefits of the restoration area would be of key interest to the LUMCON staff. The Mandalay National Wildlife Refuge, a national protected area, is also located within the parish.

Environmental Consequences

In the short term, the alternative may result in minor adverse impacts on tourism and recreation use if construction activities were to discourage visitors or limit LUMCON's research and educational activities. However, an increase in marsh and ridge habitat would likely result in long-term beneficial impacts to tourism and recreational use, such as hunting, fishing, and bird watching, by providing additional habitat for fish and wildlife populations in the project area.

4.3.1.3.6 Fisheries and Aquaculture

Affected Environment

Terrebonne, which means "Good Earth", has an abundance of seafood, wildlife, and natural resources and is open to recreational and commercial fishing. Oyster, shrimp, crabs, and fish are major seafood contributors to the economy. The wetlands in the vicinity of the Bayou Dularge project include brackish and saline marshes and coastal hardwood forest and serves as valuable habitat for wildlife, fish, and shellfish (Sigma, 2021). The parish is home to 69 lakes as well numerous miles of marshland with direct access to the Gulf of Mexico where an abundance of fish can be caught. Terrebonne Parish is referred to as the saltwater fishing capital of the world. Terrebonne Parish is in a unique location along the Gulf of Mexico; along an intercoastal waterway, there are lakes, canals, and bayous in addition to an abundance of coastal fishing areas as well as access to the Gulf itself (LTCC, 2021).

Oysters grow in the coastal waters of Louisiana and are an important economic resource. According to LDWF, the total annual economic impact of the commercial oyster industry is about $317 million, accounting for over 3,500 jobs. Oystermen harvest oysters from public oyster grounds and from bottom waters leased by private entities for oyster production. There are approximately 1.68 million acres available for public harvest and approximately 385,000 acres currently under lease (Banks et al., 2016). Terrebonne Parish had the second highest average annual volume of oysters landed between 2000 and 2009 (3.2 million pounds), valued at $7.1 million per year (LDWF, 2011). There are numerous oyster leases in the project area, as displayed in Figure 9.

Environmental Consequences

Several oyster leases (Figure 9) are present near the borrow area; however, impacts to these oyster leases are not presently anticipated (NRCS, 2021). If impacts to these leases become anticipated during construction, the footprint of the borrow area could be reduced to allow for buffer areas between the borrow area and the oyster leases.

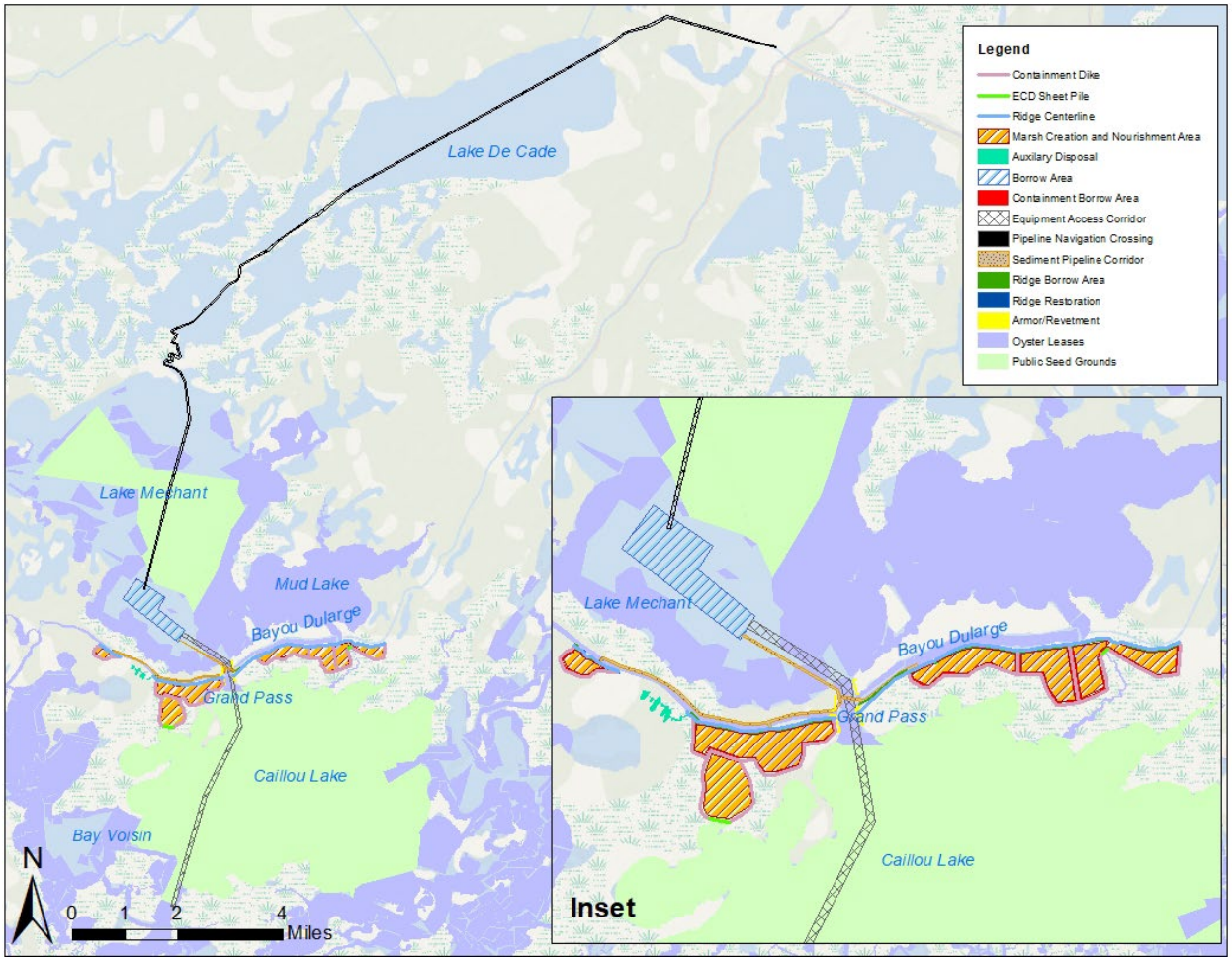
The design has two access corridors that are being evaluated to determine the quantity of dredging that will be required and the resulting impacts to oyster leases and oyster seed grounds. The dredging costs and impacts to oyster leases and oyster seed grounds will be used by the project team to determine if one access corridor is preferred over the other. Additionally, the dredge pipeline corridor crosses multiple private oyster leases.

An Oyster Assessment is presently ongoing. Fair market value of each potentially affected oyster lease will be established and holders of those oyster leases that are necessary to be extinguished will be compensated at the established fair market value.

Other impacts to oyster leases are not presently anticipated with the current design. The project could result in short-term, minor, adverse impacts to fisheries and aquaculture during construction. However, such impacts would be minimized through BMPs, and all stipulations and procedures outlined in the applicable permits would be followed accordingly. The impacts would be counteracted by long-term beneficial impacts on fisheries generated by the creation of new marshes and ridges. Temporary local

disturbances from dredging and increased traffic would have short-term, minor, adverse impacts on fisheries and aquaculture within and adjacent to the borrow areas.

Figure 9: Bayou Dularge Oyster Lease and Seed Ground Locations



4.3.1.3.7 Marine Transportation

Affected Environment

Navigation channels used by recreational and commercial vessels near the Bayou Dularge project site include the Houma Navigation Canal, Bayou Decade, Little Caillou Bayou, Bayou Terrebonne, Bush Canal, Terrebonne Bay, Madison Canal, Bayou La Cache, Bayou Portage, Lapeyrouse Canal, Bay la Fleur, and Bay Lucien.

Environmental Consequences

The project would not unreasonably interfere with or create obstructions to navigation on the surrounding waterways. The project creates marsh habitat in locations that are losing marsh habitat and are not within any navigable channel; however, marsh and ridge restoration construction would limit navigation across in areas that are currently open water. To the extent possible, disruption of navigation and marine transportation during project construction would be minimized. The project would result in short-term, minor adverse impacts to marine transportation because navigation would remain during and after construction, and only minor disruptions during construction may occur.

4.3.1.3.8 Aesthetics and Visual Resources

Affected Environment

The project area is bounded to the north by Lake Mechant and to the south by Caillou Lake. The primary visual features in the project area include a series of broken marsh, pipeline canals, and interconnected bayous that run throughout the marsh in the vicinity of the Bayou Dularge project. The Bayou Dularge project area consists of saline marsh south of Bayou Dularge and brackish marsh to the north of Bayou Dularge. The area is irregularly tidally flooded and is dominated by salt-tolerant vegetation (Sigma, 2021).

Environmental Consequences

The project would result in long-term, beneficial impacts to aesthetics and visual resources as the project would serve to restore ridges and marshes, which in turn would increase wildlife habitat, thereby enhancing the natural aesthetics and visual resources of the areas. There would be a short-term, minor, adverse impact from the presence of construction equipment in the project area during construction.

4.3.1.3.9 Public Health and Safety (Including Flood and Shoreline Protection)

Affected Environment

Public health and safety considered in this RP/EA include the health and safety of the public and personnel involved in activities related to the construction of the proposed project as well as flood and shoreline protection. The project would involve restoring ridges and marshes within the project area. The project would create new marsh habitat by filling areas dominated by open water and fragmented marsh with dredged sediment from Lake Mechant, and new ridge habitat using material dredged from the marsh creation area and from Bayou Dularge.

Environmental Consequences

These project features serve to stabilize the project area with a healthy vegetative marsh environment and provide a buffer between the Bayou Dularge southern ridge and Caillou Lake. The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby marshes, thereby reducing long-term susceptibility to subsidence and sea level rise. Marsh repaired along the Bayou Dularge shoreline can act as a buffer protecting vulnerable coastal communities from storm surge. Restoration of the ridge would bring increased protection from storm surges and waves which would protect communities. Therefore, the project would result in long-term, beneficial effects to public health and safety through the restoration and nourishment of existing ridges and marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, and do not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety protocols would be followed to protect workers during construction and monitoring activities. Implementation of this project would not increase shoreline erosion or create other health and safety concerns.

4.3.2 Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178)

The Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-178) (Figure 7) located in St. Bernard Parish, Louisiana 36 km east-southeast of Chalmette, where Bayou La Loutre is bisected by the Mississippi River Gulf Outlet (MRGO) canal. The project consists of two distinct components. The marsh creation portion is located southeast of Lena Lagoon and north of the confluence of Bayou La Loutre and the MRGO. The ridge restoration component extends along Bayou La Loutre to the southwest of the

MRGO and again to the northeast of the MRGO. The project will dredge material from Lake Borgne, which was previously cleared and permitted under the PO-180 Lake Borgne Marsh Creation Project, to create and nourish approximately 421 acres of marsh on the south side of Lena Lagoon and restore approximately 28,855 linear feet of ridge along Bayou La Loutre. Because of the proximity to the Lake Borgne Marsh Creation Project (PO-180), the design teams coordinated and the borrow areas of each project are located adjacent to one another.

Further details on the project are presented in Table 9. Much of the information in the sections below is derived from the *Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178): 95% Design Report.*

4.3.2.1 Physical Resources

4.3.2.1.1 Geology and Substrates

Affected Environment

The Bayou La Loutre Ridge Restoration and Marsh Creation Project is located within the Pontchartrain Basin and Breton Sound Basin. The Pontchartrain Basin is an abandoned delta generally bounded by the Pleistocene Terrace on the north and west, by Chandeleur Sound on the east, and by the Mississippi River and the disposal area of the MRGO on the south. The Mississippi River levees significantly limit the input of fresh water, sediment, and nutrients into the basin. This reduction in riverine input plays a part in the critical problem in the Pontchartrain Basin—increased salinity. Construction of the MRGO, which breaches the natural barrier of the Bayou La Loutre ridge and the Pontchartrain/Borgne land bridge, allowed saline waters to push farther into the basin. Other issues in the Pontchartrain basin include erosion along the MRGO caused by ship-induced waves, the potential loss of the land bridges where wetland soils are especially vulnerable to erosion, and several marshes in the basin are vulnerable to rapid loss (CWPPRA, 2021a). The Breton Sound Basin is the remnant of a Mississippi River delta lobe, the abandoned St. Bernard Delta. The natural processes of subsidence, saltwater intrusion, and erosion of wetlands along with the human effects of river levee construction and the oil and gas industry have caused major impacts to the Breton Sound Basin in recent decades. The two major wetland problems resulting from the natural processes and human intervention in the Breton Sound Basin are sediment deprivation and saltwater intrusion (CWPPRA, 2021b).

Sedimentation in this area has declined since the Mississippi River naturally abandoned the St. Bernard delta lobe approximately 2,000 years ago. Levee construction along the Mississippi River halted freshwater input into the Lower Pontchartrain subbasin. Construction of the MRGO canal, oil canals, and natural processes, such as sea-level rise and subsidence, have resulted in coastal erosion and saltwater intrusion within the basin. Historic and current ridge habitat loss occurs in the form of subsidence and shoreline erosion along Bayou La Loutre. The shoreline erosion is caused by increased boat traffic diverted due to the closure of the MRGO channel. Interior marsh loss along Lena Lagoon is caused by subsidence, sediment deprivation, increased wave fetch, and construction of access and navigational canals. The integrity of the Lena Lagoon shoreline has been breached, and loss of this wetland buffer would expose the Bayou La Loutre ridge to highly erosional winter storm events (NRCS, 2020).

Based on the USACE Geological Investigation, Yscloskey Quadrangle geologic map, a ridge feature lying along a historic abandoned channel with point bar and interdistributary deposits is present within the project area. Generally, the point bar deposits along the abandoned course consist of clays and sandy clays underlain by sands, clayey sands, and silty sands. Marsh deposits are mapped to the north of the

point bar and generally consist of organic clays underlain by inorganic clays with some clayey sands and silty sands (S&ME, 2020).

The dominant geomorphic unit in the project vicinity is interdistributary deposits, which are defined "primarily on the basis of the vegetative communities" they support. The ridge restoration portion of the study area is located on the Fausse soil association, while the marsh creation portion of the study area is located on the Lafitte-Clovelly soil association. The Fausse association is characterized as level, very poorly drained soils that are clayey throughout. Saline swamps and the Lafitte-Clovelly association are described as "level, very poorly drained soils that have a thick or moderately thick, mucky surface layer and clayey underlying material; in brackish areas" (Panamerican, 2020).

The geotechnical subsurface investigation and geotechnical engineering analyses for the MCA were conducted by S&ME, Inc. (S&ME) and by Geoengineers, Inc. (Geoengineers) for the borrow area as part of the Lake Borgne Marsh Creation Project (PO-0180) project. The borings taken along the existing ridge feature typically encountered a medium to stiff clay from the ground surface to depths varying from approximately 5 to 12-ft. Below the clay layer, there were granular materials (sand, silty sand, and clayey sand) which were encountered with pockets and layers of clay present to boring completion depth. The soil conditions in Bayou La Loutre were similar to the ridge. The soil borings in the MCA showed very soft to soft organic clay from the mudline to depths approximately 12 to 23-ft. below the mudline. After the organic layer, there was very soft to soft clay from depth 16 to 33-ft., followed by silt, sandy silt, silty sand, and sand to the maximum boring depth. The soil borings in the marsh creation borrow areas showed very soft fat and organic clays from the mudline to depths varying from approximately 8 to 16-ft. Below the soft clay, there were medium clays in broken layers with seams of silt (S&ME, 2020).

Environmental Consequences

The project proposes to create marsh by hydraulically dredging material from a borrow area located in Lake Borgne into one marsh creation area encompassing approximately 421 acres south of Lena Lagoon (Figure 7). The borrow area in Lake Borgne, the DPC, and the EAC have been permitted under MVN-2018-00580-EG and C20190005. The overall borrow area encompasses a total of 581 acres and would provide up to 9.8 MCY of material based on dredging depth down to bottom elevation -20-ft. This project would restore approximately 5.46 miles or 28,855-ft. of earthen ridge along the south bank of Bayou La Loutre. The materials would be borrowed from Bayou La Loutre using bucket dredging down to the elevation -10-ft. NAVD88 with a side slope of 3H:1V. The DPC extends from the MCA, passes through the permitted areas of the PO-0180 Lake Borgne Marsh Creation project area, and ends at the permitted borrow areas in Lake Borgne.

The project would result in short-term, minor, adverse impacts to substrates such as localized soil disturbances or compaction resulting from heavy equipment during site preparation and project implementation. Sediment from Bayou La Loutre and Lake Borgne would be dredged to obtain the fill materials for this project. The disturbance of soils and sediments during construction would temporarily contribute to localized erosion and lead to localized soil compaction resulting in localized, small, detectable disturbances but not result in geologic changes. These impacts would be confined to small areas and would be offset by the beneficial restoration activities. The utilization of construction BMPs would help to minimize the impacts of construction. BMPs include the implementation of erosion controls, development of and adherence to a stormwater management plan, and ongoing construction monitoring. This project has the opportunity to coordinate and share the construction schedule with

Lake Borgne Marsh Creation Project (PO-180). The shared DPC could lower the impacts to geology and substrates in the project area due to the need to only mobilize once.

The alternative would also result in long-term benefits to geology and substrates by creating marsh, nourishing marsh, and creating a ridge feature which would restore and support natural sediment dynamics, increase protection of the marshes from sea level rise, and reduce shoreline erosion. Marsh repaired along the Lena Lagoon shoreline can act as a buffer for the ridge against highly erosional winter storm events.

4.3.2.1.2 Hydrology and Water Quality

Affected Environment

The Project Area is located within the Lake Pontchartrain Basin and the Breton Sound Basin within two St. Bernard Parish EMU, the marsh creation area is located within the Bienvenue-Proctor Point Marsh EMU and Lake Borgne is located within the Lake Borgne EMU.

The Lake Pontchartrain Basin, located in southeastern Louisiana, consists of the tributaries and distributaries of Lake Pontchartrain, a large estuarine lake. The basin is bounded on the north by the Mississippi state line, on the west and south by the east bank Mississippi River levee, on the east by the Pearl River Basin, and on the southeast by Breton and Chandeleur Sounds. The Breton Sound Basin includes Lake Borgne, Breton Sound, Chandeleur Sound, and the Chandeleur Islands (LDEQ, 2021). Like the Pontchartrain Basin, the Breton Sound Basin is a remnant of the Mississippi River delta lobe, the abandoned St. Bernard Delta. The principal hydrologic features of the Breton Sound Basin include the Mississippi River and its natural levee ridges, the flood protection levee, abandoned delta distributaries, and the freshwater diversions at Caernarvon, White's Ditch, Bohemia, and Bayou Lamoque. The barrier islands, which make up the Breton National Wildlife Refuge are far offshore and thus provide minimal protection (CWPPRA, 2021b).

The hydrologic regime of St. Bernard Parish involves the movement of freshwater and saltwater masses through the region as a result of the interactions among river discharge, regional precipitation, winds and tides. This present hydrologic regime is influenced by both natural and man-made factors. Within the parish, the basic, natural hydrologic system is governed by the pattern of major abandoned distributary channels of the ancient Mississippi River delta complex (i.e., Bayous La Loutre and Terre aux Boeufs) and interdistributary basin channels that serve to drain swamps and marshes into the estuarine lakes, bays, the Chandeleur Sound, and the Breton Sound (Coastal Environments, 2012).

LDEQ monitors surface water and groundwater water quality. Surface water management seeks to protect the quality of all waters throughout the state including rivers, streams, bayous, lakes, reservoirs, wetlands, estuaries, and many other types of surface water. LDEQ issues a biennial integrated report of the status of Louisiana waters. LDEQ defines eight designated uses for surface waters: primary contact recreation (swimming), secondary contact recreation (boating), fish and wildlife propagation, drinking water supply, shellfish propagation, agriculture, outstanding natural resource waters, and limited aquatic and wildlife use (LDEQ, 2021). Each water body is evaluated as fully supporting, partially supporting, or not supporting of each of its designated use(s). The state reports water quality assessments by subsegments of each basin. The project site is within Subsegment LA042003_00 Bayou La Loutre- From MRGO to Eloi Bay and is defined as estuarine. The 2020 Louisiana Water Quality Inventory Integrated Report indicates the subsegment does not support the designated use of swimming, but fully supports boating, fish and wildlife propagation, and oyster propagation (LDEQ, 2021).

The project area consists of 58% saline marsh, 2% brackish marsh and 40% water; however, the area has recently transitioned to a brackish marsh community with the closure of the MRGO. The average salinity in this area is 6.6 ppt. after the closure of the MRGO (Sadid et al., 2020).

The project site is located within the Federal Emergency Management Agency (FEMA)-designated Flood Zone VE, based on the Preliminary Flood Insurance Rate Map (FIRM) issued on December 21, 2017. Based on the VE classification, the site is subject to inundation by the 1-percent-annual chance flood event, with additional hazards due to storm-induced velocity wave action (FIRM Panel ID: 22087C0825D) (FEMA, 2017).

The borrow area of PO-178 was defined to limit impacts to existing oyster leases and avoid areas of high magnetic anomaly density. The survey was also reviewed to identify the potential risk of encountering unexploded ordnance (UXO) material believed to be in the area from an Anti-Aircraft Training Center (AATC) that was in operation during World War II. The AATC provided training to Navy personnel by using various anti-aircraft weapons such as machine guns and cannons; thus, the potential to encounter UXO had to be addressed (Sadid et al., 2020).

Environmental Consequences

Some short-term, minor adverse impacts in the project area would occur during the creation of the marsh and ridge features. The marsh creation area would be fully confined. Due to the installation of containment dikes, most of the dredge material should be contained within the marsh creation areas which would limit runoff. The natural establishment of vegetation would serve to stabilize soils and reduce soil loss. Containment would be degraded as necessary to re-establish hydrologic connectivity with adjacent wetlands. No salinity change is expected with the project features (Sadid et al., 2020). The project involves fill placement to create a marsh platform and reestablish historical ridges, which would alter the project area's surface conditions. Localized erosion and sediment transport are expected during fill material placement and in the borrow area during excavation. Fill material placement would result in impacts to hydrology and water quality while impacts in the surrounding area should be minimal. Therefore, the project would result in long-term, minor adverse impacts to hydrology in the project area.

The survey did not identify any UXO in the designed borrow area, but the risk of encountering UXO cannot be ruled out entirely and risk reduction measures are recommended and are included in the project specifications (Sadid et al., 2020).

Impacts associated with construction would result in short-term, minor, adverse impact to water quality. Effects to suspended particulates and turbidity, water current patterns, normal water fluctuations, and salinity gradients would be short-term, minor, and localized. There would be short-term periods of increased turbidity in the project area during active dredging; however, turbidity would dissipate rapidly. These impacts would diminish as the marsh cells become vegetated. The use of barges, other vehicles, and equipment during implementation and monitoring could also result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. The construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Establishment of and adherence to BMPs during construction and restoration could minimize water quality impacts.

The long-term impacts of the project would be beneficial to the hydrology and water quality in the project area. Vegetation would establish in the restored and nourished marsh cells, and newly created ridge would allow herbaceous and woody plantings to grow which would enhance nutrient uptake and consequentially improve water quality and stabilizing soils, thus, improving hydrology.

4.3.2.1.3 Air Quality

Affected Environment

The USEPA established criteria for evaluating air quality in accordance with the 1990 Clean Air Act and Amendments. The USEPA developed the NAAQS that lists six atmospheric pollutants considered harmful to public health. The six pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The LDEQ is responsible for regulating and ensuring compliance with the Clean Air Act in Louisiana. For compliance purposes, geographic areas within the United States are classified as either in attainment or nonattainment for air quality. Geographic areas that have all six criteria pollutants below NAAQS are considered in attainment, whereas areas exceeding these levels are considered nonattainment areas. In nonattainment areas, USEPA requires states to develop and/or revise a state implementation plan to ensure the standards would be attained.

The project area is located in St. Bernard Parish which received a nonattainment rating for 2013-2021. St. Bernard Parish is currently below NAAQS for all pollutants except sulfur dioxide (USEPA, 2021).

The project area is uninhabited and is accessible by boat. As a result, air pollution sources are limited to boat traffic and pollutants that are transported by winds and water to the project area. Potential sources of airborne pollutants include the sources from the limited development and vehicular traffic along Hopedale Highway.

Environmental Consequences

The project would result in minimal to negligible effects on air quality. There may be short-term, minor, adverse impacts to air quality during construction due to exhaust from equipment and machinery and increased vessel activity. These localized, temporary impacts are not likely to increase any of the six primary pollutant levels above the NAAQS even when considered cumulatively with other area emissions nor would they have any measurable impact on greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide, and fluorinated gases) emissions. Although difficult to measure, the increase in marsh acreage would likely provide a long-term benefit to air quality for the area via carbon sequestration. Mitigation measures would be implemented using BMPs to limit temporary impacts during construction such as limiting idling time either by shutting equipment off when not in use or reducing the idling time and limiting the creation of dust-sized particles. An increase in vegetation could potentially provide a long-term benefit to air quality for the area.

4.3.2.1.4 Noise

Affected Environment

Noise is emitted from many sources including airplanes, factories, railroads, power generating plants, and highway vehicles. The Bayou La Loutre Ridge Restoration and Marsh Creation project is located in the coastal environment. The Final PDARP/PEIS (Chapter 6) states the primary sources of terrestrial noise in the coastal environment are transportation- and construction-related activities and natural sounds such as wind and wildlife.

The primary sources of ambient (background) noise in the project areas are recreational boating vessels and natural sounds such as wind and wildlife. The level of noise in the project areas vary, depending on the season, time of day, number and types of noise sources, and distance from the noise source.

Environmental Consequences

Noise impacts associated with the alternative would be mainly from construction activities. The dominant noise sources from construction elements are expected to be dredging, earth-moving, sheet-pile driving, and dirt-hauling activities. General construction noise impacts would be limited to construction activities and would be short-term and negligible to minor depending on proximity to construction activities. The project is approximately 4 miles east of the small community of Hopedale. Because this community is situated far enough from the project area, noise impacts from the site to nearby residents are not expected.

4.3.2.2 Biological Resources

4.3.2.2.1 Habitats

Affected Environment

The northern part of the Lake Pontchartrain Basin consists of wooded uplands both pine and hardwood forests. The southern portions of the basin consist of cypress-tupelo swamps, lowlands, and both brackish and saline marshes. The marshes of the southeastern part of the basin constitute the most rapidly eroding area along the Louisiana coast. Elevations in this basin range from -5-ft. at New Orleans to over 200-ft. near the Mississippi border (CWPPRA, 2021a).

The freshwater swampland flanking the backslopes of the natural levees historically supported cypress forests. The original stands of cypress were logged by the beginning of the twentieth century and the regenerated cypress forests outside the flood protection levees, north of the Bayou La Loutre ridge, were severely impacted by a combination of processes including subsidence, alteration of the natural hydrologic regime, and especially saltwater intrusion associated with opening of the MRGO in 1963. Typical species of trees found in the swamp forests include bald cypress (*Taxodium distichum*), swamp red maple (*Acer rubrum*), water oak (*Quercus nigra*), and tupelo gum (*Nyssa sylvatica*). Typical understory vegetation includes dwarf palmetto (*Sabal minor*), button bush (*Cephalanthus occidentalis*), groundsel bush (*Baccharis halimifolia*), and marsh elder (*Iva frutescens)*. Commonly occurring grasses include paille fine (*Panicum hemitomo*), sawgrass (*Cladium mariscus*), feather grass (*Nassella tenuissima*), and wiregrass (*Eleusine indica*) (Coastal Environments, 2012).

The brackish-to-saline marsh and estuary system provides habitat for crabs, shrimp, oysters, and a variety of fishes. The marsh habitat grades from brackish near Bayou Bienvenue to saline along the MRGO Canal and the eastern end of the unit. The saline marsh areas of the unit are less suitable habitat now than prior to construction of the MRGO for the species that produce fur hides such as nutria, raccoons, muskrat, and alligators. Migratory birds and waterfowl also use this area (Coastal Environments, 2012).

According to the marsh type survey, the project area is 58% saline marsh, 2% brackish marsh, and 40% water. Although the entire marsh creation area is classified saline, it has recently transitioned to a more brackish community with the closure of the MRGO. The average salinity in this area is 6.6 ppt. after the closure of the MRGO (Sadid et al., 2020). The marsh remains dominated by Spartina alterniflora (smooth cordgrass), but salinity conditions are favorable for transition to a more brackish vegetation assemblage. Ridge habitat consists of live oak/hackberry maritime Forest which is utilized by trans-gulf migratory bird

species as a first and last stop when crossing the Gulf of Mexico. This critical habitat is rated as S1-Most Critically Imperiled (State Natural Heritage Program) and S2 priority by the state of Louisiana (NRCS, 2020).

Environmental Consequences

The project would create a ridge feature, create approximately 163 acres of marsh, and nourish approximately 258 acres of marsh along Lena Lagoon. The marsh creation area would be fully confined. Containment would be degraded as necessary to re-establish hydrologic connectivity with adjacent wetlands. This project would restore approximately 28,855-ft. of earthen ridge along the south bank of Bayou La Loutre. Vegetative measures would be taken to prevent erosion of the bayou side slope of the ridge. Temporary grass seeding would occur immediately after construction and additional herbaceous cover would be planted using seashore paspalum (*Paspalum vaginatum*) and smooth cordgrass. Other various planting would occur during the construction year, through separate contracts, and during MAM of the project. The goal is to establish low, herbaceous cover before planting hardwood seedlings and saplings. Herbaceous cover would add organic material to the soil and help develop favorable environmental conditions for the seedlings. Tall herbaceous cover or woody growth is not desirable as they would compete with newly planted seedlings. Seashore paspalum and/or other appropriate species would be planted at a rate of 1,250 plants/acre. Paspalum plantings and natural recruitment of other species should provide adequate herbaceous cover after one or two years of growth (NRCS, 2020).

The emergent wetlands created by the project would offset the loss of open water and submerged vegetation habitats through the life of the project and beyond. The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby emergent marshes, thereby reducing long-term susceptibility to subsidence and eustatic sea level rise. The marsh restoration would increase the quantity and quality of emergent marsh habitat while also reducing habitat susceptibility to subsidence and sea level rise.

The use of boats and construction machinery would create short-term, minor, adverse impacts to marsh habitats due to localized soil and sediment disturbances and contamination from possible vehicle fuel and fluid leaks.

Dredging activities in the access route and placement of the pipeline corridors (Figure 7) would create short-term, minor adverse impacts. Any impacts to the benthic community in the access route and canal would be minor and short-term as benthic communities are quick to recover from disturbances, such as dredging (Dernie et al., 2003). The dredge pipeline would cross existing rock dikes along the Lake Borgne shoreline; thus, wooden mats would be placed over the existing rock dike to minimize any impacts. Pre-construction surveys of these crossings would be obtained and any deviations from existing conditions would be repaired post-construction. Similar to crossing of the rock dikes, wooden mats would be required wherever the equipment or dredge pipeline crosses existing marsh. Pre-construction surveys of these crossings would be obtained and if required, the areas would be nourished with borrow material from nearby waterway bottoms following mat removal. The impacts from dredging would not have any long-term, adverse impacts on habitats in the project area.

Overall, the project would have short- and long-term, beneficial impacts on emergent marsh habitats. There would be short-term, minor, adverse impacts associated with construction in and around the restoration area during fill placement. There would be long-term, minor to moderate, adverse impacts to the aquatic habitats that are filled with dredged material. In the borrow area, there would be short-term, minor, adverse impacts on aquatic habitats above the lake bottom due to vehicle traffic,

construction disturbances, and dredging. The project provides long-term, beneficial impacts to ridge and marsh habitats.

4.3.2.2.2 Wildlife

Affected Environment

Wildlife habitat in the project area is used by birds, mammals, reptiles, amphibians, shellfish, and waterfowl. The ridge habitat consists of live oak/hackberry maritime Forest which is utilized by trans-gulf migratory bird species as a first and last stop when crossing the Gulf of Mexico. This critical habitat is rated as S1-Most Critically Imperiled (State Natural Heritage Program) and S2 priority by the state of Louisiana. There is ongoing loss of historic maritime forest ridge habitat and important coastal avian habitat (PO-179, 2020). The eBird hotspot website lists 100 species observed at the Breton Sound Marina and Docks site (eBird, 2021). The highest counts include the Laughing Gull, European Starling, Lesser Scaup, Brown Pelican, Red-winged Blackbird, Great Egret, Forster's Tern, Royal Tern, Tricolored Heron, and Snowy Egret. All migratory species are protected under the Migratory Bird Treaty Act (MBTA; 40 Stat. 755, as amended; 16 U.S.C. 703 et seq.).

Environmental Consequences

The project would create temporary, minor displacement of birds and other wildlife during construction in the project area and the borrow area (Figure 7). Birds would need to find other areas to forage and loaf during this time, and mammals, reptiles, and amphibians would move to avoid construction activity and contact with workers; however, suitable habitats are available nearby. Following the restoration, wildlife would return quickly to the unoccupied new habitat. Impacts to nesting, foraging, and overwintering habitats resulting from construction would be short-term, moderate, and adverse. To minimize impacts to wildlife, especially birds, BMPs would be implemented to minimize the risk to wildlife. This would include bird abatement and a nesting shorebird field assessment as needed.

While creating marsh and ridge habitat comes at the expense of losing open water habitat, the project would result in long-term positive benefits by offsetting this loss by creating improved habitat conditions for migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts. New intertidal marsh and marsh edge would provide increased foraging opportunities for shorebirds and wading birds.

In ridge restoration areas, herbaceous cover would be established in the construction year before planting hardwood seedlings and saplings to add organic material to the soil and help develop favorable environment for the seedlings. Restoration of the ridge would bring increased protection from storm surges and waves which would improve fish and wildlife habitat. The restoration would help maintain the health, stability, and function of the existing wetlands and provide a nursery and foraging habitat to a variety of fish and waterfowl. The new ridge habitat would also create stopover habitat for trans-gulf migratory bird species resulting in a long-term, beneficial impact. These habitats are considered stopover habitats, being the first and last stop before migratory birds cross the Gulf of Mexico. These habitats are declining in Louisiana, reducing stopover habitats for migrating birds. The project would provide long-term, beneficial impacts to wildlife habitat.

4.3.2.2.3 Marine and Estuarine Fauna (Fish, Shellfish, Benthic Organisms)

Affected Environment

The project is in an area designated as essential fish habitat (EFH) for various life stages of federally managed species of shrimp, fish, and sharks. The project area is located within the estuarine habitat zone of Gulf EFH eco-region 3 and contains multiple categories of EFH that would be impacted by project implementation including emergent marshes, submerged aquatic vegetation, oyster reefs/hard substrate, sand/shell bottoms, mud/soft bottoms, and water column. In addition to being designated as EFH, estuarine wetlands and water bottoms in the project area provide nursery and foraging habitats for a variety of economically important marine fishery species, many of which serve as prey for other federally managed species. Wetlands in the project area also produce nutrients and detritus, important components of the aquatic food web, which contributes to the overall productivity of the coastal estuary.

Environmental Consequences

Construction of the marsh and ridge features would result in long-term, moderate, adverse impacts to open water habitat. While the project would reduce open water habitat for fish, the creation of intertidal marsh would more than offset these impacts with increased long-term benefits of nursery functions. Over the long-term, there would be a positive increase in EFH by implementing the project. The marsh creation area would have no access for aquatic organisms in TY 0 for the elevation of marsh platform and containment dikes but would be fully accessible at TY 3 due to settling of marsh platform, formation of tidal channels and gapping of containment dikes (NRCS, 2020). The loss of EFH from creating the marsh cells and ridge habitat would be offset by an increase in marsh habitat and shallow-water shoreline. While creating marsh and ridge habitat comes at the expense of losing open water habitat, the project would result in long-term positive benefits by offsetting this loss by creating improved marsh habitat conditions. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts.

Dredging activities in the access route and placement of the pipeline corridors would create short-term, minor adverse impacts to the fish fauna as turbidity increases when bottom sediments are disturbed during the dredging process. Species affected by the dredging activities would likely move to a more suitable habitat resulting in no long-term adverse impacts. Dredging activities within the borrow area may have several impacts on EFH, including disruption of prey sources, noise disturbances, and impacts to spawning and feeding habitats due to turbidity and siltation. Impacts from dredging and transport of material are expected to be minimized because of the short distance from the borrow area to the fill area. The access routes have been established to avoid oyster sites and confine the transport of dredge material. Therefore, impacts resulting from dredging the borrow source area would cause short-term, minor, adverse impacts to aquatic fauna, fisheries, and EFH.

Potential impacts to estuarine and aquatic fauna, managed fisheries, and EFH would be considered, avoided, and minimized to the extent practicable during design and construction. When impacts cannot be avoided, BMPs would be implemented with the intent of minimizing the potential magnitude and duration of impacts to aquatic fauna, managed fisheries, and EFH. BMPs during construction would help to avoid and minimize impacts when protected and managed species are expected to be present or when most vulnerable. They would also likely include standard erosion and sediment control measures to protect water quality and aquatic habitats from impacts resulting from construction and sediment runoff. EFH consultation guidance documents on the NMFS webpage provide additional best practices to avoid or limit project impacts to EFH. Specific BMPs for the protection of EFH would be identified and

selected based on project elements and chosen construction methods during the final engineering design.

This project would have short-term, minor to moderate, adverse effects on marine and estuarine aquatic fauna, EFH, crustaceans, mollusks, and other aquatic organisms due to construction activities. However, these negative impacts would be offset by the long-term, beneficial impacts to these species and EFH due to the improvement and enhancement of marsh habitats. Positive impacts to EFH include the creation and nourishment of 421 acres of estuarine wetland habitat once the fill material has settled to elevations conducive for marsh vegetation and after the containment has been gapped to restore tidal connectivity and fishery access. The project is restorative in nature and has been designed to minimize short term negative impacts to EFH and maximize long term positive impacts to EFH.

4.3.2.2.4 Protected Species

Affected Environment

Protected species include wildlife and plant species that are protected from harm or harassment by law. A list of federally threatened and endangered species and other species of special concern with the potential to occur within the project area was developed based on the USFWS Information for Planning and Consultation (IPaC) resource list (USFWS, 2021) and from the NOAA Fisheries Species Directory (https://www.fisheries.noaa.gov/species-directory) (Table 16).

Table 16: Protected Species Under the Endangered Species Act with the Potential to Occur in the Project Area

Species	Status
West Indian Manatee	Threatened
Eastern Black Rail	Threatened
Gulf Sturgeon	Threatened
Monarch Butterfly	Candidate
Kemp's Ridley Sea Turtle	Endangered
Loggerhead Sea Turtle	Threatened
Green Sea Turtle	Threatened

The West Indian manatee (*Trichechus manatus*) is found in open marine waters, bays, and rivers with submerged aquatic beds or floating vegetation but is not commonly found in Louisiana. Manatees have occasionally visited waterways of the Pontchartrain and Barataria basins. Major threats to the manatee include vessel strike, habitat loss and death due to flood control structures, and extended periods of below freezing temperatures. Manatee presence is unlikely within the project area.

The eastern black rail (*Laterallus jamaicensis*) require dense overhead cover and are primarily associated with herbaceous, persistent, emergent wetland plants. Along portions of the Gulf Coast, eastern black rails can be found in higher elevation wetland zones with some shrubby vegetation. Impounded and unimpounded intermediate marshes (marshes closer to high elevation areas) also provide habitat for the subspecies. The primary threats to the eastern black rail are habitat loss and destruction, incompatible land management, sea-level rise and tidal flooding, and increasing storm intensity and frequency. Louisiana has few documented occurrences of eastern black rail, and these occurrences are concentrated in and around southwest Louisiana. Louisiana doesn't have a history of supporting eastern black rails consistently and are considered to be on the peripheries of known breeding areas (DOI, 2020). It is not likely that the eastern black rail would be found in the project area.

The monarch butterfly (*Danaus plexippus)* is currently being considered for federal listing under the Endangered Species Act. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

The loggerhead (*Caretta caretta*) sea turtle inhabits both shallow and deep marine water, especially with submerged seagrass beds, salt marshes, bays, tidal passes, and coastal dunes during nesting season, and has been known to nest on the Chandeleur Islands. Main threats to this species include the erosion of barrier islands where nesting occurs, the take of eggs, young and adult turtles as food and incidental take by fishing and shrimping gear (Coastal Environments, 2012). The green (*Chelonia mydas*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles may be present within the project area because it is located within the known ranges of these species. The two other protected species, the hawksbill sea turtle (*Eretmochelys imbricate*) and leatherback sea turtle (*Dermochelys coriacea*), are rarely observed in coastal Louisiana and would be unlikely to occur in the project area or associated borrow areas, as they lack the coral reef habitat preferred by the hawksbill sea turtle (NOAA, 2021a) and are too shallow for the leatherback sea turtle (NOAA, 2021b). Due to the project's distance from the Gulf of Mexico, it is highly unlikely that any of the sea turtle species would be found nesting in the project area as these species nest almost exclusively on ocean beaches (USFWS, 2018).

Bottlenose dolphins (*Tursiops truncates*) are not endangered or threatened under the ESA, but they are protected under the MMPA. Bottlenose dolphins inhabit a wide variety of habitats, including gulfs, estuaries, and nearshore coastal waters. Bottlenose dolphins could occur in Lake Borgne, where the borrow site is located, but would be unlikely to occur in shallow marsh creation areas. Major threats include vessel strike, habitat loss, and exposure to biotoxins.

The project location overlaps the critical habitat for the Gulf sturgeon (*Acipenseriformes oxyrinchus*). Most records of the Gulf sturgeon have been in the Pearl, Bogue Chitto and Tchefuncte rivers, although it is likely to be found in any large river in the Lake Pontchartrain drainage basin. According to USFWS, critical habitat for the Gulf sturgeon exists in St. Bernard Parish, particularly in the Lake Borgne area. The single most important threat to this species is the incidental catch in trammel and gill nets (LDWF, 2021). The borrow area is located in a broad region designated as critical habitat for Gulf sturgeon under the Endangered Species Act, and the depths in Lake Borgne are suitable for Gulf sturgeon; however, previous studies indicate that Gulf sturgeon prefer foraging habitats with substrate composed of a higher percentage of sand (typically 80 percent or greater) than what is found in Lake Borgne (Ross et al., 2009). Soil classification studies conducted by S&ME, Inc. designated Lake Borne soils as soft fat and organic clays from the mudline to depths varying from approximately 8 to 16-ft., below the soft clay, there were medium clays in broken lays with seams of silt (S&ME, 2019). The pallid sturgeon (*Scaphirhynchus albus*) inhabits large rivers throughout the southeast United States and can be found in the Mississippi and Atchafalaya Rivers and the Lake Pontchartrain Basin. They are bottom-oriented, large river obligate fish and as such are unlikely to occur in the project area (Coastal Environments, 2012).

The ridge habitat within the project area consists of live oak/hackberry maritime Forest which is utilized by trans-gulf migratory bird species as a first and last stop when crossing the Gulf of Mexico. This critical habitat is rated as S1-Most Critically Imperiled (State Natural Heritage Program) and S2 priority by the state of Louisiana (NRCS, 2020).

Environmental Consequences

Project specific activities that could potentially affect West Indian manatees, eastern black rails, Gulf sturgeons, bottlenose dolphins, loggerhead, Kemp's ridley, and green sea turtles, and monarch butterflies would include dredging, ridge and marsh fill, and placement of dredge pipelines. Temporary, localized, minor impacts to these species are possible due to noise, entrapment, and collisions with watercraft and dredge equipment.

In-water construction activities could produce turbidity and siltation, thereby potentially creating short-term, localized water quality impacts to protected species identified in the project area. Turbidity could also cause adverse behavioral impacts to species and result in reduced productivity (ability of the ecosystem to produce and export energy). Behavioral impacts could include fleeing of the area and/or ceasing of feeding or spawning in the area. Siltation could result in displacement of mobile individuals or the mortality of individuals that cannot easily flee.

Excessive noise has the potential to cause temporary, adverse behavioral impacts or physical injury to protected species. Sources of project related in-water and in-air noise could include the use of pile drivers for sheet pile wall installations, earthmoving equipment, dredges, and vessels such as tugboats and service boats.

Vibratory installation of steel sheet pile walls could produce noise levels of up to 163 decibel root mean square (dBrms) at 32.8-ft. (10 m) from the source (CalTrans, 2020). Hydraulic cutterhead dredges typically produce underwater noise levels of 175 dB at 3.28-ft. (1 m) from the source (Reine and Dickerson, 2014). Tugboats could produce in-water noise levels of up to 175 dBrms at 32.8-ft. (10 m) from the source (Veirs et al., 2016). Excavators can result in in-water noise levels of up to 179 dBrms at 3.28-ft. (1 m) from the source. Earthmoving equipment and pile drivers would be used in shallow water environments where noise does not propagate effectively (WSDOT, 2020) and would be limited by the adjacent land. It is therefore anticipated that all in-water noise within shallow water environments, would be negligible. In-water project related noise could result in avoidance of the immediate construction area. Any species that leave the immediate construction area due to noise disruptions would be anticipated to return once construction has ended. In-water noise impacts are anticipated to be minor and temporary.

Pile drivers could produce in-air noise levels of up to 101 dBA at 50-ft. from the source (FWHA, 2006). Excavators could produce noise levels of up to 81 dBA at 50-ft. from the source (FWHA, 2006). Tugboats could produce noise levels of up to 87 dBA at 50-ft. from the source (Epsilon Associated Inc., 2006). Hydraulic dredges could produce noise levels of up to 80 dBA at 50-ft. from the source (Columbia Association, 2016). In-air project related noise could result in species avoiding the immediate construction area. Any species that leave the immediate construction area due to noise disruptions would be anticipated to return once construction commences. In-air noise impacts are anticipated to be minor and temporary.

Because of proximity of this project and the Lake Borgne Marsh Creation Project, the design teams worked out synergies for the borrow area in Lake Borgne. The required quantity for the marsh creation would be borrowed from Lake Borgne for both projects. Coordination with federal agencies, including ESA Consultation was completed as a part of PO-0180 Lake Borgne Marsh Creation project. The original determinations are being reviewed to ensure that they are still valid.

Several BMPs would be implemented during construction to minimize or avoid impacts to protected species. For any in-water work, the project would follow appropriate BMPs described in section 6A.1.8.3 of the Final PDARP/PEIS and would implement measures from NMFS's *Protected Species Construction Conditions* (NMFS, 2021), *Measures for Reducing Entrapment Risk to Protected Species* (NMFS, 2012), and *Vessel Strike Avoidance Measures* (NOAA, 2021d) and USACE's *Standard Manatee Conditions for In-water Work* (USACE, 2011). Other project specific BMP's include: avoiding working in riverine critical habitats where Gulf sturgeon are likely to be present (April to October), operating dredge equipment in a manner to avoid risks to Gulf sturgeon (e.g., disengage pumps when the cutter head is not in the substrate; avoid pumping water from the bottom of the water column), and avoiding driving over the wrack line or areas of dense seaweed as these habitats may contain sea turtle hatchlings that are difficult to see.

Migratory birds, roosts, and nests are protected by the Migratory Bird Treaty Act. As intermediate marsh habitats are favored by numerous species of migratory birds, coordination with USFWS may be required if project implementation is to occur during the breeding season. This may result in requirements to conduct pre-construction nesting bird surveys, nest removal and appropriate abatement measures, and/or bird monitoring during construction (ELOS, 2020). Nests of Bald and Golden Eagles are always protected under the Bald and Golden Eagle Protection Act. Destruction of these nests requires a permit at all times, whether or not they are occupied.

With the proposed avoidance and minimization measures the project may affect but is not likely to adversely affect west Indian manatees, eastern black rails, monarch butterflies, and Gulf sturgeon. While many of the expected short-term, adverse impacts associated with this project on protected species and resources would be temporary due to construction, the overall ecosystem in the project area would benefit from the marsh creation and ridge restoration, which would be expected to outweigh the potential impacts.

4.3.2.3 Socioeconomic Resources

4.3.2.3.1 Socioeconomics and Environmental Justice

Affected Environment

The intent of an environmental justice evaluation under EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations is to identify communities and groups that meet environmental justice criteria and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of EO 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by federal agencies.

Approximately 47,244 people live in St. Bernard Parish, which covers 377.4 square miles. The median income in 2019 was $44,661 with 19.2% of persons in poverty. Roughly 24.0% of the population is black or African American, 2.3% are Asian, and 0.9% are Native American (U.S. Census Bureau, 2019). Most employment is within the educational services, health care, and social assistance labor category.

Environmental Consequences

By increasing ridge and marsh habitat and subsequently fish and wildlife resources, the project would help to maintain that portion of the local economy dependent upon recreational and commercial fish

and wildlife resources within the project area. Project-area waterfowl hunting, recreational fishing, and wildlife observation are important components of the local economy, and the creation of emergent marsh and other fish and wildlife habitats could increase the ability of the project area to support these activities. Marsh repaired along the Lena Lagoon shoreline can act as a buffer for the ridge against highly erosional winter storm events. The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby emergent marshes, thereby reducing long-term susceptibility to subsidence and eustatic sea level rise. Restoration of the ridge would bring increased protection from storm surges and waves which would protect communities.

Implementation of the project would result in short-term benefits to the local economy via increases in the demand for employment and associated spending in the project area during construction. While some short-term closures to localized areas could occur during project construction, none of these are anticipated to disproportionately affect minority or low-income populations.

4.3.2.3.2 Cultural Resources

Affected Environment

Cultural resources are the tangible remains of the evidence and/or location of past human activity. These resources may include buildings, structures, prehistoric sites, historic or prehistoric objects, rock inscription, earthworks, canals, or landscapes. These non-renewable resources often represent the culture, values, heritage, and history of the group(s) of people traditionally associated with them. They may also contribute important information about past society and environments, which could ultimately provide solutions for modern day social or environmental challenges.

In 2020, a report was prepared discussing the findings of a Phase I Cultural Resource Evaluation which was conducted on the marsh creation area, ridge restoration, and Bayou La Loutre by Pan-American Consultants (Pan-American, 2020). Findings revealed three previously recorded archaeological sites within the ridge restoration portion of the project area (16SB92, 16SB93 and 16SB189) and the identification of one newly recorded site (16SB207); all are within the ridge restoration project area. Sites 16SB92, 16SB93, 16SB189 and 16SB207 are recommended not eligible for the NRHP. Based on the phase I cultural resources survey investigation of the marsh creation cell, no new archaeological sites were identified within the marsh creation areas. From the remote sensing survey, one anomaly, located along the western portion of the proposed ridge feature, was considered potentially significant and was designated for avoidance with a recommended 30-meter buffer zone (Pan-American, 2020). The Louisiana SHPO determined that if sonar contact is avoided with a 30-meter buffer, then no historic properties would be affected for the portions of the project that were surveyed and discussed in this report.

The borrow area was surveyed by Morris P. Hebert (MPH) as part of the Lake Borgne Marsh Creation project (PO-0180) between January 2018 and May 2019 (RCG&A, 2020). The data gathered were used by R. Christopher Goodwin and Associates (RCG&A) for analysis of submerged cultural resources. The analysis did not determine any magnetic anomalies indicative of submerged cultural resources or any relict geomorphic features likely to contain archaeological deposits within the borrow area or along the conveyance corridors. RCG&A issued a Remote Sensing Survey and Archival Research Report for the project area and recommended a finding of “No historic properties affected” (36 CFR 800.4[d]) (RCG&A, 2020). Concurrence with this recommendation is currently under review by the Louisiana DOA.

Environmental Consequences

Although the project would cause sediment and ground disturbance, it is anticipated to have no effect on cultural resources as surveys have found no evidence of cultural resources in the project area. A 30-meter buffer is recommended near the anomaly found in the remote sensing survey, located along the western portion of the proposed ridge feature, unless further investigation is completed to determine its nature. Consultation with the SHPO and interested, federally recognized Indian tribes is underway to ensure the area is compliant with Section 106 of the NHPA. The SHPO recommended that an Unanticipated Discoveries Plan be developed for implementation during excavation of the marsh creation containment dike. As the containment dike borrow ditches may be up to 10-ft. deep, there is the potential to encounter buried archaeological sites. These would primarily be manifest by concentrations of Rangia shell, and if such deposits are encountered during excavation, work should cease in that immediate area and consultation initiated with SHPO (SHPO, 2020). The assessment of the project's borrow area in Lake Borgne is addressed as a part of the Lake Borgne Marsh Creation Project and is currently under review by SHPO.

All projects implemented under subsequent restoration plans and tiered NEPA analyses consistent with the Final PDARP/PEIS must secure all necessary state and federal permits and ensure the project is following all applicable laws and regulations concerning the protection of cultural and historic resources (DWH Trustees, 2016). If any culturally or historically significant resources are identified during project preparations or predevelopment surveys, a complete review under Section 106 of the NHPA (54 U.S.C. § 306108) would be initiated and such areas would be avoided during construction.

4.3.2.3.3 Infrastructure

Affected Environment

There is little infrastructure within the project area. The closest substantial infrastructure is along LA Highway 624 and LA Highway 46, the closest road, which is approximately 4 miles west of the project area. The project would occur in open water and fragmented marsh habitat. The magnetometer survey for the project verified the location of one pipeline adjacent to the marsh creation boundary (Fugro, 2019).

Environmental Consequences

The dredge pipeline corridor would extend from the marsh creation borrow area through the PO-180 Lake Borgne Marsh Creation Project Area to the marsh creation area near Lena Lagoon. Implementing the project would not impact any infrastructure. A pipeline within the project area has been identified through a magnetometer survey and database search.

Mitigation measures have been identified in the engineering phase to minimize any potential infrastructure impacts. These measures include all infrastructure (pipelines, power lines, etc.) that is located within 150-ft. of the borrow area and project features shall be surveyed and marked at a minimum of 50-ft. intervals and all points of inflection during the pre-construction survey. The owner has executed temporary easement, servitude, or right-of-way agreements required to perform the work at the project site from the landowners and utilities and pipeline operators. No access, excavation, anchors, or spuds shall be permitted within 50-ft. of any pipeline or utility and no dredging shall be permitted within 500-ft. of any existing pipeline or utility in the borrow areas. It is anticipated there would be no impacts to existing infrastructure due to this project.

4.3.2.3.4 Land and Marine Management

Affected Environment

The CZMA is a federal act that encourages states to develop coastal management programs for preserving statewide coastal resources. Under this act, once a state develops a federally approved coastal management program, "federal consistency" requires that any federal actions affecting coastal land or water resources (the coastal zone) must be consistent with the state's program. In Louisiana, the LDNR Office of Coastal Management oversees the state's Coastal Zone Management Program. The design alternatives are located within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012.

The project area is within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012 (LDNR, 2012) and is subject to the regulations of the state's CZM Program.

The St. Bernard Parish CZM Program divided the parish into 15 EMUs (Coastal Environments, 2012). The project is in the Lake Borgne and Lower La Loutre Wetlands EMU's. Some of the goals for managing the coastal resources in this EMU that align with the goals of this project include protecting stable wetlands, reducing land loss in deteriorating wetlands; creating and restoring wetlands where practicable; reducing shoreline erosion to preserve wetlands and preserve shallow estuarine areas and protect water-dependent development outside of fastlands (land surrounded by publicly-owned, maintained, or otherwise validly existing levees or natural formations); and restoring wetlands, including marshes and where feasible cypress swamps, using sustained freshwater diversions and dredged material near levees for additional protection from storms (Coastal Environments, 2012).

Environmental Consequences

The project could result in short-term, minor, adverse impacts to land and marine management due to temporary partial or full closure of areas, public access restrictions, and/or interruption of interpretive programs (DWH Trustees, 2016). The project does support the EMU's goals and objectives within the St. Bernard Parish CZM Program and creates long-term, beneficial impacts to marsh and ridge habitat. The project would support the goals outlined in the St. Bernard CZM Program and would result in long-term, beneficial impacts to land and marine management due to the aim of restoring ridge and marsh habitats. All proposed improvements would conform to the requirements set forth in the St. Bernard Parish CZM Program.

4.3.2.3.5 Tourism and Recreational Use

Affected Environment

The natural environment of St. Bernard Parish is a true sportsman's paradise because the potential for wetlands and water-based recreation is almost unlimited. The many waterways and their easy access provide an outlet for boating, bird watching, trapping, fishing, and hunting activities in the wetlands. In addition to the numerous private camps and boat launches, there are approximately 25 local, state, and federal parks, monuments, and playgrounds; one state wildlife management area; and one national wildlife refuge in the parish. The state and parish parks are located on the natural levees of the parish within fastlands and provide baseball fields, tennis courts, picnic areas, and barbecue pits year-round for the parish residents and visitors. The numerous local marinas serve as the gateway to fishing in both the parish waters and the Gulf of Mexico for fishermen in the Greater New Orleans and Baton Rouge Metropolitan Areas. (Coastal Environments, 2012).

St. Bernard Parish provides recreation potential in its many bayous and small lakes in protected areas and in larger bayous and vast lakes, open marsh areas, the remote Chandeleur Islands, and ultimately the Gulf of Mexico on both its eastern and southeastern exposures. The parish land area contains scenic sites, streams, and other areas unique to the region. Louisiana Highway 47 is a designated scenic highway that the parish is promoting as a corridor for sightseeing and partaking of the parish's natural and cultural opportunities including historic sites and museums (Coastal Environments, 2012).

Continued development of marinas, overnight accommodations, boat ramps and bait shops, fishing charter boat operations, ecotourism guide operations and other water-oriented activities in St. Bernard Parish provides opportunities for residents from the parish, the Greater New Orleans Metropolitan Area and tourists to access the wetlands and waterways for recreation and education. The parish's rich cultural heritage and historic role in the Nation's development are also prominent features worthy of further promotion as a tourist destination (Coastal Environments, 2012).

Environmental Consequences

In the short term, the alternative may result in minor adverse impacts on tourism and recreation use if construction activities were to discourage visitors. However, an increase in marsh and ridge habitat would likely result in long-term beneficial impacts to tourism and recreational use, such as hunting, fishing, and bird watching, by providing additional habitat for fish and wildlife populations in the project area.

4.3.2.3.6 Fisheries and Aquaculture

Affected Environment

Fishing is an important part of Louisiana residents' quality of life, as well as an important source of income, for many residents of St. Bernard Parish. The Pontchartrain estuarine unit of which St. Bernard is a major component ranks second in total harvest in Louisiana only to the Barataria Basin area. Louisiana produces 27 percent of the fisheries tonnage of the entire United States. Despite the problems of saltwater intrusion, subsidence, and land loss, estuarine areas of the parish still serve as important nursery grounds and grow-out areas for many species of fish and shellfish. The extensive wetlands of St. Bernard Parish are extremely productive for commercially and recreationally harvested oysters, shrimp, crabs, and fish and contribute to making Louisiana the premier state in the annual production of fisheries products. Some of these aquatic species require marsh and shallow water fresh-to-estuarine environments during their entire life cycle. For others, this type of habitat is only important during specific stages of their life cycle (Coastal Environments, 2012).

The project's wetland areas provide essential nursery habitat for commercially and recreationally important fishes and shellfishes. The project area is open to recreational and commercial fishing. Fishers in the project area primarily harvest oysters, shrimp, hard and soft-shell crabs, fish bait, and commercial finfish. The largest acreages in private oyster leases in Louisiana are found in St. Bernard and Plaquemines Parishes. With increases in lake salinity following construction of the MRGO, larger expanses of firmer substrate along the shore of the two lobes of the lake have been leased to as private oyster grounds. The LDWF reserved most of the remaining portion of the Lake Borgne EMU as public oyster grounds. (Coastal Environments, 2012).

Environmental Consequences

Construction activities could result in short-term, minor, adverse impacts to fisheries in the project area. Such impacts would be minimized by BMPs. These would include practices necessary for control of erosion and sedimentation due to construction, dredging, and the delivery of dredge material from Lake

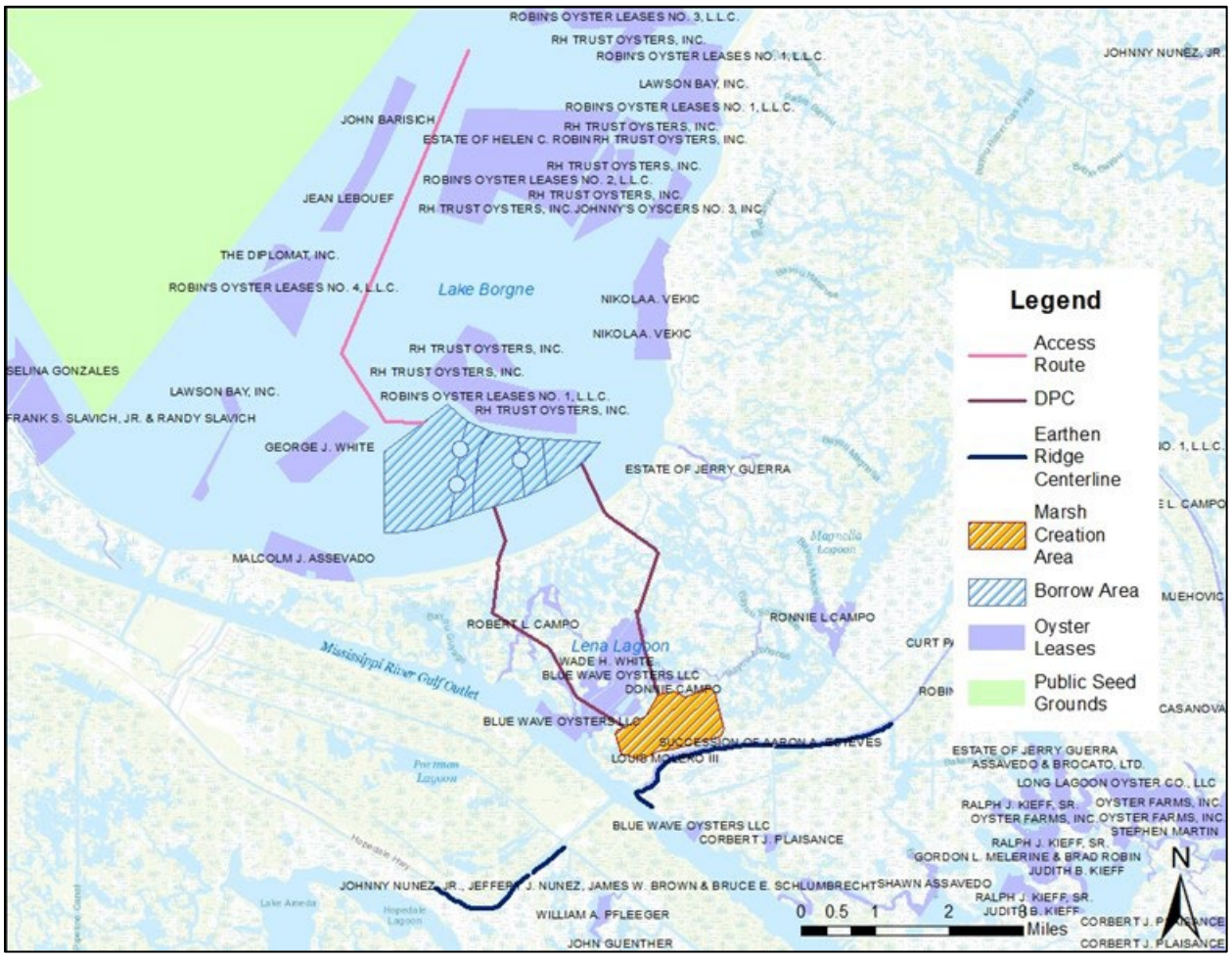
Borgne, thereby protecting fisheries and aquaculture. The project would provide long-term beneficial impacts by improving habitat for estuarine-dependent fish.

Oyster lease investigation in the borrow area was performed as part of the Lake Borgne Marsh Creation Project (PO-180). Three oyster leases were identified in the borrow investigation area in Lake Borgne. The borrow area has been modified to maintain a minimum 150-ft. buffer from an existing oyster lease to the west (LA TIG, 2020).

T. Baker Smith performed a preliminary oyster lease assessment in 2018 as a part of this project. The assessment was conducted within a 1,500-ft. radius of the project area named as the study area. The direct impact area is defined as all oyster lease acreage that would be impacted by the construction of the project and was determined by the investigator as 150-ft. from the project area (Sadid et al., 2020).

No existing oyster lease was identified within the MCA; however, oyster leases are located within the 1,500-ft. study area. Oyster leases were discovered in the eastern portion of Bayou La Loutre within the 150-ft. direct impact area of the earthen ridge. Existing oyster leases in the Bayou La Loutre along the Earthen Ridge feature would be acquired prior to the construction. Oyster leases were also discovered within the proposed DPC. Oyster leases that are within the direct impact area of the project site would be purchased before construction of the project. Activities such as dewatering of the marsh creation area during construction would not be performed to the north to avoid any potential impacts to the leases. The contractor would be required to avoid any additional impacts to oyster resources during construction (Sadid et al., 2020). Oyster leases are displayed in Figure 10.

Figure 10: Bayou La Loutre Oyster Lease and Seed Ground Locations



4.3.2.3.7 Marine Transportation

Affected Environment

The principal natural waterway serving St. Bernard Parish is the Mississippi River. Navigational channels used by recreational and commercial vessels reaching the Lake Borgne project site include Bayou Bienvenue, Bayou Yscloskey, Bayou St. Malo, Bayou La Loutre, MRGO, and the Gulf Intracoastal Waterway.

The MRGO channel is no longer a United States Coast Guard (USCG) designated navigable waterway. The channel was dredged between 1958 and 1968 across existing waterways and through wetlands to provide a shorter route to New Orleans and to enhance shipping interests in the area. After 2005, the USACE ceased dredging the MRGO to maintain deep draft navigation. In 2009, the MRGO was dammed south of the Bayou La Loutre south bank natural levee thus preventing the channel's use by ocean-going ships. A second closure on the MRGO was in place by 2011 with construction of the flood wall across the MRGO south of its crossing of Bayou Bienvenue as part of the Inner Harbor Navigation Canal (IHNC) Lake Borgne Surge Barrier Project (Coastal Environments, 2012).

There are numerous dredged canals that cross the wetlands at various locations in St. Bernard Parish. These canals were constructed for a variety of purposes including navigation, exploration, extraction

and transport of petroleum and natural gas resources, drainage, such as Baker's Canal associated with proposed reclamation projects within the big bend of Bayou La Loutre, water access to plantations (e.g., Creedmore Canal, Kenilworth Canal, Olivier Canal radiating north from Lake Lery) and as a borrow location for the MRGO back retention levee. These canals, as well as small natural waterways, are used by shallow draft boats largely for recreational purposes associated with fishing throughout the St. Bernard wetlands (Coastal Environments, 2012).

Environmental Consequences

The project would not unreasonably interfere with or create obstructions to navigation on the surrounding waterways. The project creates marsh habitat in locations that are losing marsh habitat and are not within any navigable channel; however, marsh and ridge restoration construction would limit navigation across areas that are currently open water. To the extent possible, disruption of navigation and marine transportation during project construction would be minimized. The project would result in short-term, minor, adverse impacts to marine transportation because navigation would remain during and after construction, and only minor disruptions during construction may occur.

4.3.2.3.8 Aesthetics and Visual Resources

Affected Environment

The primary visual features in the project area include open waters of Lake Borgne, marsh within Lena Lagoon, and open water and ridges within Bayou La Loutre. Other nearby visual resources include natural waterways, local roadways, levees, and man-made canals.

Environmental Consequences

The project would result in long-term, beneficial impacts to aesthetics and visual resources as they would serve to restore ridges and marshes, which in turn would increase wildlife habitat, thereby enhancing the natural aesthetics and visual resources of the areas. There would be a short-term, minor, adverse impact from the presence of construction equipment in the project area during construction.

4.3.2.3.9 Public Health and Safety (Including Flood and Shoreline Protection)

Affected Environment

Public health and safety considered in this RP/EA include the health and safety of the public and personnel involved in activities related to the construction of the proposed projects as well as flood and shoreline protection. The project would involve restoring ridges and marshes within the project area. The project would create new marsh habitat by filling areas dominated by open water and fragmented marsh with dredged sediment from Lake Borgne, and new ridge habitat from Bayou La Loutre.

Environmental Consequences

Ridges and marshes act as a buffer to reduce the effects of wave action, saltwater intrusion, storm surge, and tidal current. Marsh repaired along the Lena Lagoon shoreline can act as a buffer for the ridge against highly erosional winter storm events. The ridge habitat would mitigate storm surges and reduce wave-induced erosion in nearby emergent marshes, thereby reducing long-term susceptibility to subsidence and eustatic sea level rise. Restoration of the ridge would bring increased protection from storm surges and waves which would protect communities. Therefore, the project would result in long-term, beneficial effects to public health and safety through the restoration and nourishment of existing ridges and marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, and do not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety

protocols would be followed to protect workers during construction and monitoring activities. Implementation of this project would not increase shoreline erosion or create other health and safety concerns.

4.3.3 Lake Lery Marsh Creation and Rim Restoration, Increment 3

The Lake Lery Marsh Creation and Rim Restoration, Increment 3 Project (Figure 8) is located in St. Bernard Parish and encompasses the northwestern part of Lake Lery. The project area runs parallel to the shoreline for 1.75 miles from the Plaquemines and St. Bernard Parish boundary line and stops at the Gulf South Pipelines Canal. This marsh area is tidally influenced by Lake Lery and Breton Sound to the southeast. The marshland project area is south of the New Orleans area levee system known as the Hurricane and Storm Damage Risk Reduction System (HSDRRS). The Caernarvon diversion that is connected to the Mississippi River is to the northwest of the project area with the diversion canal adjacent to the west of the project area (ELOS, 2021).

The project area has been significantly damaged over time due to various circumstances. Hurricane Katrina altered the existing lake rim and surrounding marsh by separating the existing contiguous marsh into multiple broken segments. The broken marsh has allowed interior wave action on an unprotected lake rim to penetrate deeper into the existing marsh causing further damage and degradation (SBPG, 2016). The project consists of two distinct components to counteract further degradation by establishing 2.42-miles of permanent lake rim along the southern perimeter of the project area, while hydraulically dredging material to restore 401.2-acres of broken marsh (All South, 2020).

4.3.3.1 Physical Resources

4.3.3.1.1 Geology and Substrates

Affected Environment

The Lake Lery Marsh Creation and Rim Restoration, Increment 3 project is in the Breton Sound Basin. The Breton Sound Basin is the remnant of a Mississippi River delta lobe, the abandoned St. Bernard Delta. The natural processes of subsidence, saltwater intrusion, and erosion of wetlands along with the human effects of river levee construction and the oil and gas industry have caused major impacts to the Breton Sound Basin in recent decades. The two major wetland problems resulting from the natural processes and human intervention in this basin are sediment deprivation and saltwater intrusion (CWPPRA, 2021b).

The parish is entirely within the Mississippi River Delta. The natural levees of the Mississippi River and its distributaries are dominated by firm, loamy, and clayey soils. These soils make up about one-tenth of the total land area of the parish. An extensive system of manmade levees protects these soils from flooding. The remaining nine-tenths of the Parish consists mainly of ponded and frequently flooded, mucky, and clayey soils in marsh and swamp habitats. They are used mainly as habitat for wetland wildlife and for recreation. Large acreages of former marsh and swamp habitat have been drained and developed for urban use (ELOS, 2021).

The USDA NRCS's Web Soil Survey shows that two soil types exist in the project area: Lafitte muck and Clovelly muck. Lafitte muck and Clovelly muck soils are both generally found in topographic dips in marshes. Both mucks are very poorly drained and very frequently flooded (NRCS, 2021).

The Beta Group performed geotechnical investigation services including onsite sampling, testing, and analysis of the results to determine key features of the Lake Lery Marsh Creation and Rim Restoration,

Increment 3 project design. The borrow area soil borings indicate a layer of very soft, dark organic clay generally from 2-ft. to 6-ft. below the ground surface, followed by soft, black peat up to the 12-ft. depth. This layer is underlain by soft gray organic clay and clays with silt through the termination of the borings. The marsh area soil borings indicate an initial 2-ft. layer of soft, black peat following by soft, gray organic clays. The variation of this clay is dependent upon the boring location (Beta, 2020).

Environmental Consequences

The project proposes to create marsh by hydraulically dredging material from a single borrow area located in Lake Lery into three marsh creation areas encompassing approximately 401.2-acres bounded on three sides by earthen containment dikes and protected from Lake Lery by a permanent, armored earthen embankment. The marsh creation area would be divided into three cells with 4,000-ft. of shoreline each. The 5,000-ft. by 2,000-ft. marsh creation borrow area is located offshore of the permanent armored embankment within Lake Lery at a minimum 750-ft. offset and a maximum depth of elevation -20-ft. (All South, 2020). The permanent armored embankment required for the lake rim restoration measures 12,665-ft. in length, and the southern slope would be armored by articulated mat against potential wave action. Due to the existing marsh landscape, portions of the proposed lake rim would be constructed along existing marsh, while others would be constructed in relatively open water. The temporary containment dikes would bound the marsh creation area on the three remaining sides and separate internal marsh cells. These dikes would have borrow areas located on the interior of the marsh creation area. These borrow areas would be infilled during hydraulic dredging operations. Construction access would be via Bayou Lery from the southeastern corner of Lake Lery (All South, 2020).

The project would result in short-term, minor, adverse impacts to substrates such as localized soil disturbances or compaction resulting from heavy equipment during site preparation and project implementation. The disturbance of soils and sediments during construction would temporarily contribute to localized erosion and lead to localized soil compaction resulting in localized, small, detectable disturbances but not result in geologic changes. These impacts would be confined to small areas and would be offset by the beneficial restoration activities. The utilization of construction BMPs would help to minimize the impacts of construction. BMPs include the implementation of erosion controls, development of and adherence to a stormwater management plan, and ongoing construction monitoring.

The alternative would also result in long-term benefits to geology and substrates by creating marsh and rim features which would restore and support natural sediment dynamics, increase protection of the marshes from sea level rise, and reduce shoreline erosion. Marsh vegetation would help stabilize soils and reduce soil loss due to erosion in the long term. The foreshore containment would be armored by articulated mat to provide protection from wind driven wave erosion caused by prevailing southeast winds. Overall, the project would have a long-term beneficial impact on geology and substrates.

4.3.3.1.2 Hydrology and Water Quality

Affected Environment

The project area is located within the Breton Sound Basin within the Lake Lery Marsh St. Bernard Parish EMU. The principal hydrologic features of the Breton Sound Basin include the Mississippi River and its natural levee ridges; the flood protection levee; the MRGO south disposal bank; Bayou Terre aux Boeufs and River aux Chenes (abandoned delta distributaries); and the freshwater diversions at Caernarvon, White's Ditch, Bohemia, and Bayou Lamoque (CWPPRA, 2021b).

The hydrologic regime of St. Bernard Parish involves the movement of freshwater and saltwater masses through the region due to the interactions among river discharge, regional precipitation, winds, and tides. This present hydrologic regime is influenced by both natural and man-made factors. Within the parish, the basic, natural hydrologic system is governed by the pattern of major abandoned distributary channels of the ancient Mississippi River delta complex (i.e., Bayous La Loutre and Terre aux Boeufs) and interdistributary basin channels that serve to drain swamps and marshes into the estuarine lakes, bays, the Chandeleur Sound, and the Breton Sound (Coastal Environments, 2012).

Lake Lery is the dominant water body in the EMU. The natural drainage patterns of the marsh have been modified by drainage canals, pipeline canals, and flood protection levees along the northern perimeter of the unit. Operation of the Caernarvon Freshwater Diversion structure introduces substantial amounts of fresh water into the unit to the extent that saltwater intrusion is being reversed. The diversion also delivers sediments into the natural system as 250,000 tons of fine silts and clays annually flow through the diversion structure. If optimally managed for diverting available sediments during periods of peak river flow, considerably more sediments are available. Governmental agencies estimated that approximately 750,000 tons of sediments were diverted through the structure in 2009 (Coastal Environments, 2012).

LDEQ monitors surface water and groundwater water quality. Surface water management seeks to protect the quality of all waters throughout the state including rivers, streams, bayous, lakes, reservoirs, wetlands, estuaries, and many other types of surface water. LDEQ issues a biennial integrated report of the status of Louisiana waters. LDEQ defines eight designated uses for surface waters: primary contact recreation (swimming), secondary contact recreation (boating), fish and wildlife propagation, drinking water supply, shellfish propagation, agriculture, outstanding natural resource waters, and limited aquatic and wildlife use (LDEQ, 2021). Each water body is evaluated as fully supporting, partially supporting, or not supporting of each of its designated use(s). The state reports water quality assessments by subsegments of each basin. The project site is within Subsegment LA042105_00 Bayou Lake Lery and is defined as estuarine. The 2020 Louisiana Water Quality Inventory Integrated Report indicates the subsegment fully supports the designated use of swimming, boating, fishing, and oyster propagation.

Salinity and vegetation are both heavily weighed for classification of marsh types. The habitat designation for the project area was determined to be intermediate marsh. During portions of the year, salinity levels in the surface water drop below 2 ppt which would meet a freshwater marsh characteristic. However, this is likely due to the Caernarvon Freshwater Diversion which is approximately 4.5 miles northeast of the project site and creates an influx of freshwater to the region. There are spikes of salinity, up to 15 ppt, measured over years of data that would likely kill or deter the growth of vegetation associated with freshwater marsh (ELOS, 2020).

The project site is located within the FEMA-designated Flood Zone VE, based on the Preliminary FIRM issued on December 21, 2017. Based on the VE classification, the site is subject to inundation by the 1-percent-annual chance flood event, with additional hazards due to storm-induced velocity wave action (FIRM Panel ID: 2208C0765D) (FEMA, 2017a).

Environmental Consequences

Some temporary, short-term, minor adverse impacts in the project area would occur during the creation of the marsh and rim features. Due to the installation of containment dikes, most of the dredge material should be contained within the marsh creation areas which would limit runoff. The foreshore

containment would be armored by articulated mat to provide protection from wind driven wave erosion caused by prevailing southeast winds. This foreshore containment would remain, while the balance of the containment features would be gapped to marsh fill elevation upon stabilization of the marsh creation and nourishment footprint. Gaps would be placed throughout the marsh cells to promote hydraulic conductivity between Lake Lery and the interior marsh. The natural establishment of vegetation would serve to stabilize soils and reduce soil loss. The project involves fill placement to create a marsh platform and reestablish historical ridges, which would alter the project area's surface conditions. Localized erosion and sediment transport are expected during fill material placement. Fill material placement would result in impacts to hydrology and water quality while impacts in the surrounding area should be minimal.

Impacts associated with construction would result in short-term, minor, adverse impact to water quality. Effects to suspended particulates and turbidity, water current patterns, normal water fluctuations, and salinity gradients would be short-term, minor, and localized. There would be short-term periods of increased turbidity in the project area during active dredging; however, turbidity would dissipate rapidly. These impacts would diminish as the marsh cells become vegetated. The use of barges, other vehicles, and equipment during implementation and monitoring could also result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. The construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Establishment of and adherence to BMPs during construction and restoration could minimize water quality impacts.

The alternative would also result in long-term benefits to hydrology and water quality by creating marsh and rim features which would counteract further degradation. Armored containment would provide protection from wind driven wave erosion and the natural establishment of marsh vegetation would help stabilize soils and reduce soil loss due to erosion in the long-term, which would protect the shoreline and reduce erosion, thus, improve water quality and improve hydrology. Gaps would be placed throughout the marsh cell perimeters to promote hydraulic conductivity between Lake Lery and the interior marsh. Water quality benefits would come, in part, from nutrient uptake within the restored marsh parcels. The long-term impacts of the project would be beneficial to the hydrology and water quality in the project area.

4.3.3.1.3 Air Quality

Affected Environment

The USEPA established criteria for evaluating air quality in accordance with the 1990 Clean Air Act and Amendments. The USEPA developed the NAAQS that lists six atmospheric pollutants considered harmful to public health. The six pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The LDEQ is responsible for regulating and ensuring compliance with the Clean Air Act in Louisiana. For compliance purposes, geographic areas within the United States are classified as either in attainment or nonattainment for air quality. Geographic areas that have all six criteria pollutants below NAAQS are considered in attainment, whereas areas exceeding these levels are considered nonattainment areas. In nonattainment areas, USEPA requires states to develop and/or revise a state implementation plan to ensure the standards would be attained (USEPA, 2021).

The project area is located in St. Bernard Parish which received a nonattainment rating for 2013-2021. St. Bernard Parish is currently below NAAQS for all pollutants except sulfur dioxide.

There are no roads or railroads in this EMU; thus, restricting primary transportation modes to boats. Commercial and recreational vessels can reach the area through Bayou Mandeville lying east of Big Mar, Lake Lery and Bayou Terre aux Boeufs. A series of relict drainage canals radiating northward from Lake Lery provide access throughout much of the marsh between the northern flood protection levee and Lake Lery (Coastal Environments, 2012).

The project area is uninhabited and is accessible by boat. As a result, air pollution sources are limited to boat traffic and pollutants that are transported by winds and water to the project area. Potential sources of airborne pollutants include the sources from the vehicular traffic along Delacroix Highway and boat traffic.

Environmental Consequences

The project would result in minimal to negligible effects on air quality. There may be short-term, minor, adverse impacts to air quality during construction due to exhaust from equipment and machinery and increased vessel activity. These localized, temporary impacts are not likely to increase any of the six primary pollutant levels above the NAAQS even when considered cumulatively with other area emissions nor would they have any measurable impact on greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide, and fluorinated gases) emissions. Although difficult to measure, the increase in marsh acreage would likely provide a long-term benefit to air quality for the area via carbon sequestration. Mitigation measures would be implemented using BMPs to limit temporary impacts during construction such as limiting idling time either by shutting equipment off when not in use or reducing the idling time and limiting the creation of dust-sized particles. An increase in vegetation could potentially provide a long-term benefit to air quality for the area.

4.3.3.1.4 Noise

Affected Environment

Noise is emitted from many sources including airplanes, factories, railroads, power generating plants, and highway vehicles. The Lake Lery Marsh Creation and Rim Restoration, Increment 3 project is in the coastal environment. The Final PDARP/PEIS (Chapter 6) states the primary sources of terrestrial noise in the coastal environment are transportation- and construction-related activities and natural sounds such as wind and wildlife.

The primary sources of ambient (background) noise in the project areas are recreational boating vessels and natural sounds such as wind and wildlife. The level of noise in the project areas vary, depending on the season, time of day, number and types of noise sources, and distance from the noise source.

Environmental Consequences

Noise impacts associated with the alternatives would be mainly from construction activities. The dominant noise sources from construction elements are expected to be dredging, earth-moving, and dirt-hauling activities. General construction noise impacts would be limited to construction activities and would be short-term and negligible to minor depending on proximity to construction activities.

4.3.3.2 Biological Resources

4.3.3.2.1 Habitats

Affected Environment

The marsh environment is rather homogeneous with the most abundant species being three-cornered grass (*Schoenoplectus americanus*) and wiregrass (*Spartina patens*). The estuarine water bodies provide

nursery habitat for fish, crabs, shrimp, and oysters in the southeastern portion of the unit. Both commercial and game fish species inhabit this area along with wading birds, alligators, and other reptiles. Commercial fur-bearing animals such as muskrat, nutria, and raccoons are still abundant. Operation of the Caernarvon Freshwater Diversion structure has restored intermediate marsh habitat throughout the unit and enhanced freshwater conditions in the northwestern portion of the unit to the extent that the area supports excellent freshwater fishing, especially for LDWF-stocked Florida bass. Wintering waterfowl concentrations have increased also with operation of the diversion and habitat has improved for the American alligator (Coastal Environments, 2012).

Salinity and vegetation are both heavily weighed for classification of marsh types. The habitat designation for the project area was determined to be intermediate marsh. During portions of the year, salinity levels in the surface water drop below 2 ppt which would meet a freshwater marsh characteristic. However, this is likely due to the Caernarvon Freshwater Diversion which is approximately 4.5 miles northeast of the project site and creates an influx of freshwater to the region. There are spikes of salinity, up to 15 ppt, measured over years of data that would likely kill or deter the growth of vegetation associated with freshwater marsh. Data collected as part of the Coastwide Reference Monitoring System (CRMS) in the vicinity of the project area shows a good mix of freshwater and intermediate marsh vegetation species (ELOS, 2020).

Environmental Consequences

The project would involve restoration of marsh and rim habitats through the placement of dredged fill material. The Lake Lery Marsh Creation and Rim Restoration, Increment 3 project would create approximately 401.2-acres of marsh, and 12,665-ft. of lake rim protection that would be armored using articulated concrete block mattresses on the lake side of the proposed 30-ft. crown width earthen berm (All South, 2020). Currently, the northwestern shoreline has become so damaged that the interior emergent marshes that are still intact are being exposed to damaging waves, further exacerbating increased losses of emergent marsh habitat (St. Bernard Parish, 2016). Marsh restoration would increase the quantity and quality of marsh habitat in the project area. The restored lakeside shoreline would support plantings and reduce wave impact erosion on the embankment. The marsh created by the project would offset the loss of open water and submerged vegetation habitats through the life of the project and beyond.

Lake Lery's surrounding marsh habitat is intermediate marsh due to the combined influence of natural salinity levels and the influx of freshwater from the adjacent Caernarvon Freshwater Diversion. This habitat is home to a wide variety of plant and animal species; however, the likelihood appears low that this project would impact any protected species or habitats. It is noted that coordination with the NMFS would be required based on dredging operations near existing marine habitats (All South, 2020).

There would be some short-term impacts related to construction of the project. The use of boats and construction machinery would create short-term, minor, adverse impacts to marsh habitats due to localized soil and sediment disturbances and contamination from possible vehicle fuel and fluid leaks.

Dredging activities in the access route and placement of the pipeline corridors would create short-term, minor impacts. Any impacts to the benthic community in the access route and canal would be minor and short-term as benthic communities are quick to recover from disturbances, such as dredging (Dernie et al., 2003). The impacts from dredging would not have any long-term, adverse impacts on habitats in the project area.

Overall, the project would have short- and long-term, beneficial impacts on emergent marsh habitats. There would be short-term, minor, adverse impacts associated with construction in and around the restoration area during fill placement. There would be long-term, minor to moderate, adverse impacts to the aquatic habitats that are filled with dredged material. In the borrow area, there would be short-term, minor, adverse impacts on aquatic habitats above the lake bottom due to vehicle traffic, construction disturbances, and dredging. The project provides long-term, beneficial impacts to marsh habitats.

4.3.3.2.2 Wildlife

Affected Environment

Wildlife in the project area consists of birds, mammals, reptiles, amphibians, shellfish, and waterfowl. Intermediate marshes can host species with both freshwater and saltwater habitat requirements and often provides important habitat for many bird species, including large numbers of wintering waterfowl, and critical nursery habitat for larval marine organisms. With the Caernarvon freshwater diversion, the area once again supports freshwater fishing and large concentrations of wintering waterfowl (Coastal Environments, 2012).

Environmental Consequences

Short-term, minor, adverse impacts to wildlife would result from temporary displacement of birds and other wildlife during construction in the project area and the borrow area. Birds would need to find other areas to forage and loaf during this time, and mammals, reptiles, and amphibians would move to avoid construction activity and contact with workers; however, suitable habitats are available nearby. Following the restoration, wildlife would return quickly to the unoccupied new habitat. Impacts to nesting, foraging, and overwintering habitats resulting from construction would be short-term, moderate, and adverse. To minimize impacts to wildlife, especially birds, BMPs would be implemented to minimize the risk to wildlife. This would include bird abatement and a nesting shorebird field assessment as needed.

While creating marsh habitat comes at the expense of losing open water habitat, the project would result in long-term positive benefits by offsetting this loss by creating improved habitat conditions for migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts. New intertidal marsh and marsh edge would provide increased foraging opportunities for shorebirds and wading birds.

4.3.3.2.3 Marine and Estuarine Fauna (Fish, Shellfish, Benthic Organisms)

Affected Environment

Environmental Consequences

Construction of the project would result in short-term and long-term, minor to moderate, adverse impacts to marine and estuarine fauna and associated EFH. While the project would reduce open water habitat for fish, the creation of intertidal marsh would offset these impacts with increased long-term benefits of nursery functions. There would also be a long-term loss of EFH and reduction in fisheries access through the creation of permanent earthen shoreline berm with armoring; although, there would be some improved habitat along the intertidal shoreline interface. Over the long-term, there would be a positive increase in EFH by implementing the project once the fill material has settled to elevations conducive to marsh vegetation and fisheries access is restored through gapping of containment dikes.

While creating marsh and constructing the armored shoreline berm comes at the expense of losing open water habitat, the project would result in long-term positive benefits by offsetting this loss by creating improved marsh habitat conditions. Marsh would be restored in areas that have deteriorated and converted to open water, resulting in long-term, beneficial impacts.

Dredging activities in the access route and placement of the dredge fill pipeline would create short-term, minor adverse impacts to the fish fauna as turbidity increases when bottom sediments are disturbed during the dredging process. Species affected by the dredging activities would likely move to a more suitable habitat resulting in no long-term adverse impacts. Dredging activities within the borrow area may have several impacts on EFH, including disruption of prey sources, noise disturbances, and impacts to spawning and feeding habitats due to turbidity and siltation. Impacts from dredging and transport of material are expected to be minimized because of the short distance from the borrow area to the fill area. The access routes have been established to avoid oyster sites and confine the transport of dredge material. Therefore, impacts resulting from dredging the borrow source area would cause short-term, minor, adverse impacts to aquatic fauna, fisheries, and EFH.

Potential impacts to estuarine and aquatic fauna, managed fisheries, and EFH would be considered, avoided, and minimized to the extent practicable during design and construction. When impacts cannot be avoided, BMPs would be implemented with the intent of minimizing the potential magnitude and duration of impacts to aquatic fauna, managed fisheries, and EFH. BMPs during construction would help to avoid and minimize impacts when protected and managed species are expected to be present or when most vulnerable. They would also likely include standard erosion and sediment control measures to protect water quality and aquatic habitats from impacts resulting from construction and sediment runoff. EFH consultation guidance documents on the NMFS webpage provide additional best practices to avoid or limit project impacts to EFH. Specific BMPs for the protection of EFH would be identified and selected based on project elements and chosen construction methods during the final engineering design.

This project would have short-term and long-term, minor to moderate, adverse effects on marine and estuarine aquatic fauna, EFH, crustaceans, mollusks, and other aquatic organisms due to construction activities. Long-term adverse impacts would be associated with the permanent armored shoreline berm, which would also reduce fishery access. However, there would be long-term, beneficial impacts to these species and EFH due to the improvement and enhancement of marsh habitats once the fill material has settled to intertidal elevations, and containment has been gapped to restore tidal connectivity and fishery access. Negative impacts to EFH would be offset by the creation and nourishment of approximately 401 acres of marsh. Overall, the project is restorative in nature, and would be designed to minimize short-term negative impacts and maximize long-term positive impacts to EFH.

4.3.3.2.4 Protected Species

Affected Environment

Protected species include wildlife and plant species that are protected from harm or harassment by law. A list of federally threatened and endangered species and other species of special concern with the potential to occur within the project area was developed based on the USFWS Information for IPaC resource list (USFWS, 2021) and from the NOAA Fisheries Species Directory (https://www.fisheries.noaa.gov/species-directory) (Table 17).

Table 17: Protected Species Under the Endangered Species Act with the Potential to Occur in the Project Area

Species	Status
West Indian Manatee	Threatened
Eastern Black Rail	Threatened
Monarch Butterfly	Candidate
Kemp's Ridley Sea Turtle	Endangered
Loggerhead Sea Turtle	Threatened
Green Sea Turtle	Threatened

The manatee is found in open marine waters, bays, and rivers with submerged aquatic beds or floating vegetation but is not commonly found in Louisiana. It has been known to visit the Pearl, Mermentau, Calcasieu, and Sabine Rivers and waterways of the Pontchartrain and Barataria basins. Major threats to the manatee include being struck by boats and barges, habitat loss and death due to flood control structures and extended periods of below freezing temperatures. It is not likely that the manatee would be found in the project area.

The eastern black rail (*Laterallus jamaicensis*) require dense overhead cover and are primarily associated with herbaceous, persistent, emergent wetland plants. Along portions of the Gulf Coast, eastern black rails can be found in higher elevation wetland zones with some shrubby vegetation. Impounded and unimpounded intermediate marshes (marshes closer to high elevation areas) also provide habitat for the subspecies. The primary threats to the eastern black rail are habitat loss and destruction, incompatible land management, sea-level rise and tidal flooding, and increasing storm intensity and frequency. Louisiana has few documented occurrences of eastern black rail, and these occurrences are concentrated in and around southwest Louisiana. Louisiana doesn't have a history of supporting eastern black rails consistently and are considered to be on the peripheries of known breeding areas (DOI, 2020). It is not likely that the eastern black rail would be found in the project area.

The monarch butterfly (*Danaus plexippus)* is currently being considered for federal listing under the Endangered Species Act. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

The loggerhead (*Caretta caretta*) sea turtle inhabits both shallow and deep marine water, especially with submerged seagrass beds, salt marshes, bays, tidal passes, and coastal dunes during nesting season, and has been known to nest on the Chandeleur Islands. Main threats to this species include the erosion of barrier islands where nesting occurs, the take of eggs, young, and adult turtles as food and incidental take by fishing and shrimping gear (Coastal Environments, 2012). The green (*Chelonia mydas*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles may be present within the project area because it is located within the known ranges of these species. Due to the project's distance from the Gulf of Mexico, it is highly unlikely that any of the sea turtle species would be found nesting in the project area as these species nest almost exclusively on ocean beaches (USFWS, 2018). The two other protected sea turtle species, the hawksbill sea turtle (*Eretmochelys imbricate*) and leatherback sea turtle (*Dermochelys coriacea*), are rarely observed in coastal Louisiana and would be unlikely to occur in the project area or associated borrow areas, as they lack the coral reef habitat preferred by the hawksbill sea turtle (NOAA, 2021a) and are too shallow for the leatherback sea turtle (NOAA, 2021b).

Bottlenose dolphins (*Tursiops truncates*) are not endangered or threatened under the ESA, but they are protected under the MMPA. Bottlenose dolphins inhabit a wide variety of habitats, including gulfs, estuaries, and nearshore coastal waters. Bottlenose dolphins could occur in Lake Lery but would be unlikely to occur in shallow marsh creation areas. Major threats include vessel strike, habitat loss, and exposure to biotoxins.

Environmental Consequences

Activities that could potentially affect West Indian manatees, eastern black rails, monarch butterflies, loggerhead, Kemp's ridley, and green sea turtles, and bottlenose dolphins would include dredging, ridge and marsh fill, and placement of dredge pipelines. Temporary, localized, minor impacts to these species are possible due to noise, entrapment, and collisions with watercraft and dredge equipment. They could also include impacts to water quality due to construction activities, which could affect adjacent waters within the borrow areas and project area. The likelihood of this project impacting habitat or individual protected species is low due to the location of Lake Lery and the indirect route required to access Lake Lery from the Gulf of Mexico.

Migratory birds, roosts, and nests are protected by the Migratory Bird Treaty Act. As intermediate marsh habitats are favored by numerous species of migratory birds, coordination with USFWS may be required if project implementation is to occur during the breeding season. This may result in requirements to conduct pre-construction nesting bird surveys, nest removal and appropriate abatement measures, and/or bird monitoring during construction (ELOS, 2020). Nests of Bald and Golden Eagles are always protected under the Bald and Golden Eagle Protection Act. Destruction of these nests requires a permit at all times, whether or not they are occupied.

Several BMPs would be implemented during construction to minimize or avoid impacts to protected species. For any in-water work, the project would follow appropriate BMPs described in section 6A.1.8.3 of the Final PDARP/PEIS and would implement measures from NMFS's *Protected Species Construction Conditions* (NMFS, 2021), Measures for Reducing Entrapment Risk to Protected Species (NMFS, 2012), and Vessel Strike Avoidance Measures (NOAA, 2021d) and USACE's Standard Manatee Conditions for In-water Work (USACE, 2011). These measures would minimize the potential for impacts to sea turtles and West Indian manatees.

While many of the expected adverse impacts associated with this project on protected species and resources should be temporary, long-term impacts should be considered beneficial as habitat is restored.

4.3.3.3 Socioeconomic Resources

4.3.3.3.1 Socioeconomics and Environmental Justice

Affected Environment

The intent of an environmental justice evaluation under EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations is to identify communities and groups that meet environmental justice criteria and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of EO 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate

impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by federal agencies.

Approximately 47,244 people live in St. Bernard Parish, which covers 377.4 square miles. The median income in 2019 was $44,661 with 19.2% of persons in poverty. Roughly 24.0% of the population is black or African American, 2.3% are Asian, and 0.9% are Native American (U.S. Census Bureau, 2019). Most employment is within the educational services, health care, and social assistance labor category.

Environmental Consequences

By increasing marsh habitat and subsequently fish and wildlife resources, the project would help to maintain that portion of the local economy dependent upon recreational and commercial fish and wildlife resources within the project area. Project-area waterfowl hunting, recreational fishing, and wildlife observation are important components of the local economy, and the creation of emergent marsh and other fish and wildlife habitats could increase the ability of the project area to support these activities. Marsh repaired along the Lake Lery shoreline can act as a buffer for the ridge against highly erosional winter storm events. The lake rim would counteract further damage and degradation and protect the newly created marsh area from wave action.

Implementation of the project would result in short-term benefits to the local economy via increases in the demand for employment and associated spending in the project area during construction. While some short-term closures to localized areas could occur during project construction, none of these are anticipated to disproportionately affect minority or low-income populations.

4.3.3.3.2 Cultural Resources

Affected Environment

Cultural resources are the tangible remains of the evidence and/or location of past human activity. These resources may include buildings, structures, prehistoric sites, historic or prehistoric objects, rock inscription, earthworks, canals, or landscapes. These non-renewable resources often represent the culture, values, heritage, and history of the group(s) of people traditionally associated with them. They may also contribute important information about past society and environments, which could ultimately provide solutions for modern day social or environmental challenges.

Correspondence received from SHPO on November 30, 2020, indicated a Phase I Cultural Resource Survey should be performed. In 2021, a report was prepared discussing the findings of The Phase I Cultural Resource Survey which was conducted on the marsh creation area, rim restoration, and within and along the shorelines of Lake Lery by ELOS Environmental, LLC (ELOS) (ELOS, 2021). While several surveys have been conducted in the vicinity of the APE, additional information regarding possible archaeological resources within the lake were examined due to the remote nature of the project location. Findings revealed one archaeological site within the direct APE (16SB59), no historic structures, and one Phase I Survey with five distinct areas of interest within the APE. The results of the Phase I and pedestrian surveys yielded no new archaeological sites, cultural resources, or isolated finds within the APE (ELOS, 2021).

Environmental Consequences

Although the project would cause sediment and ground disturbance, it is highly unlikely to result in adverse impacts to cultural resources. Correspondence received from SHPO on February 25, 2021, indicated, “Based on the description of the APE, the proposed ground-disturbing activities, and the identification of historic properties within the APE, our office concurs with the assessment that no

properties listed in or eligible for listing in the NRHP would be affected by this project. Our office has no further concerns for this project."

During the construction phase of this project, should intact cultural resources be detected, all work would be halted, and an archaeologist would be notified immediately to determine the significance of the cultural resources. If any human remains are uncovered, all ground-disturbing activities in the area would be halted immediately, local law enforcement would be notified within 24 hours of a discovery, and the Louisiana DOA would be notified within 72 hours.

4.3.3.3.3 Infrastructure

Affected Environment

There is little infrastructure in the project area. Delacroix Highway (LA 300) runs approximately one mile to the east of Lake Lery. There are few local businesses located on this highway. There are no roads or railroads within the project area; thus, the primary transportation mode is boats.

Land rights and existing utility infrastructure in the area were also identified as part of this effort. Four pipelines are within the project vicinity; these pipeline owners include Plains Pipeline, American Midstream Partners, Colonial Pipeline, and Boardwalk Pipeline Partners. Of these, only Boardwalk Pipeline Partners assets directly interact with the marsh creation area. All other assets cross the project through proposed access corridors only. These asset interactions have been identified and addressed in greater detail in the final design plans and specifications for this project (All South, 2020).

Environmental Consequences

Implementing the project would not impact any infrastructure. A pipeline within the project area has been identified. The final configuration of the marsh creation area should not be affected by the location of the Boardwalk pipeline. Boardwalk Pipeline Partners has agreed that plugs can be placed over the pipeline where the embankments cross it. The pipeline canal within the marsh creation area would then be filled with hydraulic dredge material (All South, 2020).

The project would be constructed in undeveloped areas, and infrastructure would be avoided whenever possible. There would be no impacts to any structures along LA 300. It is anticipated there would be no impacts to existing infrastructure due to this project.

4.3.3.3.4 Land and Marine Management

Affected Environment

The CZMA is a federal act that encourages states to develop coastal management programs for preserving statewide coastal resources. Under this act, once a state develops a federally approved coastal management program, "federal consistency" requires that any federal actions affecting coastal land or water resources (the coastal zone) must be consistent with the state's program. In Louisiana, the LDNR Office of Coastal Management oversees the state's Coastal Zone Management Program. The design alternatives are located within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012.

The project area is within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012 (LDNR, 2012) and is subject to the regulations of the state's CZM Program.

The St. Bernard Parish CZM Program divided the parish into 15 EMUs (Coastal Environments, 2012). The Project Area is located within the Lake Lery Marsh EMU.

Some of the goals for managing the coastal resources in this EMU that align with the goals of this project include restoring and maintaining the marshes north of Lake Lery and restoring and protecting the northern shoreline of Lake Lery from erosion (Coastal Environments, 2012).

Environmental Consequences

The project could result in short-term, minor, adverse impacts to land and marine management due to temporary partial or full closure of areas, public access restrictions, and/or interruption of interpretive programs (DWH Trustees, 2016). The project does support the EMU's goals and objectives within the St. Bernard Parish CZM and creates long-term, beneficial impacts to marsh habitat and the shoreline of Lake Lery. The project would support the goals outlined in the St. Bernard CZM Program and would result in long-term, beneficial impacts to land and marine management due to the aim of restoring marsh habitats. All proposed improvements would conform to the requirements set forth in the St. Bernard Parish CZM Program.

4.3.3.3.5 Tourism and Recreational Use

Affected Environment

The natural environment of St. Bernard Parish is a true sportsman's paradise because the potential for wetlands and water-based recreation is almost unlimited. The many waterways and their easy access provide an outlet for boating, bird watching, trapping, fishing, and hunting activities in the wetlands. In addition to the numerous private camps and boat launches, there are approximately 25 local, state, and federal parks, monuments, and playgrounds; one state wildlife management area; and one national wildlife refuge in the parish. The state and parish parks are located on the natural levees of the parish within fastlands and provide baseball fields, tennis courts, picnic areas, and barbecue pits year-round for the parish residents and visitors. Approximately 10 marinas and boat launching facilities were rebuilt by 2011, primarily along LA HWY 47, the Shell Beach-Yscloskey-Hopedale area, and along Bayou Terre aux Boeufs in the vicinity of Delacroix (Coastal Environments, 2012).

St. Bernard Parish provides recreation potential in its many bayous and small lakes in protected areas and in larger bayous and vast lakes, open marsh areas, the remote Chandeleur Islands, and ultimately the Gulf of Mexico on both its eastern and southeastern exposures. The parish land area contains scenic sites, streams, and other areas unique to the region. Louisiana Highway 47 is a designated scenic highway that the parish is promoting as a corridor for sightseeing and partaking of the parish's natural and cultural opportunities including historic sites and museums. (Coastal Environments, 2012).

The Lake Lery Marsh EMU is an important estuarine area within the Caernarvon Freshwater Diversion outfall area. The area has become a very popular recreational fishing and hunting site due to the reintroduction of fresh water and the growth of freshwater game fish, such as the Florida strain of largemouth bass and higher concentrations of wintering waterfowl. The interest in recreational fishing is expected to continue to increase as the recreational support infrastructure is rebuilt and fishing rodeos and competitions return to the parish (Coastal Environments, 2012).

Continued redevelopment of marinas, overnight accommodations, boat ramps and bait shops, fishing charter boat operations, ecotourism guide operations, and other water-oriented activities in St. Bernard Parish provides opportunities for residents from the parish, the Greater New Orleans Metropolitan Area, and tourists to access the wetlands and waterways for recreation and education. The parish's rich

cultural heritage and historic role in the nation's development are worthy of further promotion as a tourist destination (Coastal Environments, 2012).

Environmental Consequences

In the short term, the alternative may result in minor adverse impacts on tourism and recreation use if construction activities were to discourage visitors. However, an increase in marsh habitat would likely result in long-term beneficial impacts to tourism and recreational use, such as hunting, fishing, and bird watching, by providing additional habitat for fish and wildlife populations in the project area.

4.3.3.3.6 Fisheries and Aquaculture

Affected Environment

Fishing is an important part of Louisiana residents' quality of life, as well as an important source of income, for many residents of St. Bernard Parish. The Pontchartrain estuarine unit of which St. Bernard is a major component ranks second in total harvest in Louisiana only to the Barataria Basin area. Louisiana produces 27 percent of the fisheries tonnage of the entire United States. Despite the problems of saltwater intrusion, subsidence, and land loss, estuarine areas of the parish still serve as important nursery grounds and grow-out areas for many species of fish and shellfish. The extensive wetlands of St. Bernard Parish are extremely productive for commercially and recreationally harvested oysters, shrimp, crabs, and fish and contribute to making Louisiana the premier state in the annual production of fisheries products. Some of these aquatic species require marsh and shallow water fresh-to-estuarine environments during their entire life cycle. For others, this type of habitat is only important during specific stages of their life cycle (Coastal Environments, 2012).

The estuarine water bodies provide nursery habitat for fish, crabs, shrimp, and oysters in the southeastern portion of the unit. There were approximately 173 acres of leased oyster grounds in the area in 2007; however, operation of the Caernarvon Freshwater Diversion structure makes this EMU unsuitable for further expansion of oyster growing areas. Both commercial and game fish species inhabit this area along with wading birds, alligators, and other reptiles. The area supports excellent freshwater fishing, especially for LDWF-stocked Florida bass. Wintering waterfowl concentrations have increased also with operation of the diversion and habitat has improved for the American alligator (Coastal Environments, 2012).

Environmental Consequences

Construction activities could result in short-term, minor, adverse impacts to fisheries. Such impacts would be minimized by BMPs. These would include practices necessary for control of erosion and sedimentation due to construction, dredging, and the delivery of dredge material from Lake Lery, thereby protecting fisheries and aquaculture. NMFS coordination may result in project limitations on turbidity, sediment migration, and timing of dredging operations to avoid spawning (ELOS, 2020). No existing oyster leases were identified within the project area; thus, impacts to oysters are not anticipated. The project would provide long-term beneficial impacts by improving habitat for intermediate marsh fish.

4.3.3.3.7 Marine Transportation

Affected Environment

The principal natural waterway serving St. Bernard Parish is the Mississippi River. Commercial and recreational vessels can reach the area through Bayou Mandeville lying east of Big Mar, Lake Lery and Bayou Terre aux Boeufs. A series of relict drainage canals radiating northward from Lake Lery provide

access throughout much of the marsh between the northern flood protection levee and Lake Lery (Coastal Environments, 2012).

There are numerous dredged canals that cross the wetlands at various locations in St. Bernard Parish. These canals were constructed for a variety of purposes including navigation, exploration, extraction and transport of petroleum and natural gas resources, drainage, such as Baker's Canal associated with proposed reclamation projects within the big bend of Bayou La Loutre, water access to plantations (e.g., Creedmore Canal, Kenilworth Canal, Olivier Canal radiating north from Lake Lery) and as a borrow location for the MRGO back retention levee. These canals, as well as small natural waterways, are used by shallow draft boats largely for recreational purposes associated with fishing throughout the St. Bernard wetlands (Coastal Environments, 2012).

Environmental Consequences

The project would not unreasonably interfere with or create obstructions to navigation on the surrounding waterways. The project creates marsh habitat in locations that are losing marsh habitat and are not within any navigable channel; however, marsh and rim restoration construction activities would limit navigation across in areas that are currently open water. To the extent possible, disruption of navigation and marine transportation during project construction would be minimized. The project would result in short-term, minor, adverse impacts to marine transportation because navigation would remain during and after construction, and only minor disruptions during construction may occur.

4.3.3.3.8 Aesthetics and Visual Resources

Affected Environment

The primary visual features in the project area include open waters and marsh surrounding Lake Lery. The marsh environment is rather homogeneous with the most abundant species being three-cornered grass and wiregrass. Other nearby visual resources include natural waterways, a series of relict drainage canals radiating northward from Lake Lery, levees, and other man-made canals.

Environmental Consequences

The project would result in long-term, beneficial impacts to aesthetics and visual resources as they would serve to restore marsh, which in turn would increase wildlife habitat, thereby enhancing the natural aesthetics and visual resources of the areas. There would be a short-term, minor, adverse impact from the presence of construction equipment in the project area during construction.

4.3.3.3.9 Public Health and Safety (Including Flood and Shoreline Protection)

Affected Environment

Public health and safety considered in this RP/EA include the health and safety of the public and personnel involved in activities related to the construction of the proposed projects as well as flood and shoreline protection. Currently, the northwestern shoreline has become so damaged that the interior emergent marshes that are still intact are being exposed to damaging waves, further exacerbating increased losses of emergent marsh habitat (St. Bernard Parish, 2016). The project would involve restoration of marsh and rim habitats through the placement of dredged fill material. The Lake Lery project would create approximately 401.2-acres of marsh, and 12,665-ft. of lake rim protection that would be armored using articulated concrete block mattresses on the lake side of the proposed 30-ft. crown width earthen berm (All South, 2020).

Environmental Consequences

The project would restore and support natural sediment dynamics, increase protection of the marshes from sea level rise, and reduce shoreline erosion. Marsh vegetation would help stabilize soils and reduce soil loss due to erosion in the long term. The foreshore containment would be armored by articulated mat to provide protection from wind driven wave erosion caused by prevailing southeast winds. Restoration of the marsh and rim would bring increased protection from storm surges and waves which would protect communities. Therefore, the project would result in long-term, beneficial effects to public health and safety through the restoration and nourishment of existing ridges and marshes. The project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, and do not represent disproportionately high and adverse environmental health or safety risks to children in the United States. All relevant health and safety protocols would be followed to protect workers during construction and monitoring activities. Implementation of this project would not increase shoreline erosion or create other health and safety concerns.

4.4 No Action Alternative

A no action alternative is included in the NEPA analysis as a basis for comparison of potential environmental consequences of the action alternatives. The No Action alternative was analyzed at a programmatic level in the Final PDARP/PEIS and determined to cause much longer recovery rates for many resources, and in some cases no recovery at all. In this case, no action would be to continue with the present course of action. Under the No Action Alternative, the LA TIG would not, at this time, select and implement the alternatives related to WCNH in this RP/EA intended to compensate for lost natural resources or their services resulting from the DWH oil spill. The LA TIG would not implement the Bayou Dularge Ridge and Marsh Restoration, Bayou La Loutre Ridge Restoration and Marsh Creation, or the Lake Lery Marsh Creation and Rim Restoration, Increment 3 projects. Additionally, studies and E&D would not be implemented, and no data would be gathered to help ensure effective, focused restoration. The Bayou Pointe-aux-Chenes Ridge Restoration and Marsh Creation Project, East Orleans Landbridge Restoration, and Raccoon Barrier Island Restoration projects would not be implemented.

The No Action Alternative would have no beneficial impacts to and no direct adverse effects on physical, biological, or socioeconomic resources; however, taking no action would indirectly allow some ongoing effects on resources to continue, or new effects to occur. This is summarized in the below sections.

4.4.1 Physical Resources

The No Action alternative would not have any direct adverse effects to physical resources; however, taking no action would indirectly allow some ongoing effects to continue and new effects to occur, including the following:

- Geology and Substrates- Continued subsidence, marsh, ridge, and rim deterioration, shoreline erosion, and failure to protect the area with marshes, ridges, and rims would lead to long-term, moderate, adverse effects on geology and substrates. The No Action alternative would not protect the surroundings from sea level rise, reduce shoreline erosion, act as a buffer protecting vulnerable coastal communities from storm surge, create and restore marsh, restore natural sediment dynamics, or stabilize soils. The No Action Alternative would not result in any beneficial effects to geology, soils, or substrates that may occur from implementation of the alternatives; these beneficial effects include features that would prevent or reduce existing erosion conditions (e.g., breakwater, ridge and marsh restoration features that help reduce coastal erosion).
- Hydrology & Water Quality- Continued reductions in marsh and ridge features and erosion would lead to long-term, minor, adverse impacts on hydrology and water quality, natural

sediment dynamics, and erosion. The No Action alternative would not create, restore, and nourish marsh and ridge, enhance nutrient uptake, or reduce erosion. The alternatives are intended to reduce erosion and sedimentation from entering receiving waterbodies and to improve overall hydrologic cycling in the nearshore environment, which would benefit water quality. Additionally, infrastructure features in the alternatives would result in reducing long-term erosion and sedimentation of receiving waterbodies (e.g., placement of shoreline protection, vegetated ridge, and marsh creation to reduce erosion in coastal areas). These benefits would not be realized under the No Action Alternative.

4.4.2 Biological Resources

The No Action alternative would not have any direct adverse effects to biological resources; however, taking no action would indirectly allow some ongoing effects to continue and new effects to occur, including the following:

- Habitats- Continued erosion would lead to long-term, moderate, adverse effects on habitats. The No Action alternative would not create, restore, and nourish marsh habitat, increase the resiliency of nearby wetland habitat, mitigate storm surge, reduce wave-induced erosion, and restore and conserve the health, diversity, and resilience of key coastal, estuarine, and marine habitats. The alternatives are intended to reduce erosion and land loss in coastal areas, increase the quantity and quality of emergent marsh habitat, and reduce habitat susceptibility to subsidence and sea level rise which would benefit and increase available high-quality habitats. The No Action Alternative would not result in direct effects to terrestrial, coastal, nearshore, or marine habitats because no restoration activities proposed in this RP/EA would occur under the alternatives.
- Wildlife- Continued erosion and deterioration of marsh and ridge habitat and conversion to open water would lead to long-term, moderate, adverse effects on wildlife. The No Action Alternative would not result in direct effects to terrestrial wildlife or migratory birds because no activities proposed in this RP/EA would occur under the alternative. Some alternatives may have indirect benefits to wildlife and birds, particularly those alternatives that result in reducing erosion and land loss in coastal areas such as marsh edge and stop-over habitat that provide habitat for many species. Marsh creation in nearshore habitats would benefit wildlife and migratory birds by improving areas for resident waterfowl, shorebirds, wading birds, and furbearers and help maintain the health, stability, and function of the existing wetlands and provide a nursery and foraging habitat to a variety of fish and waterfowl. Under the No Action Alternative, potential benefits to wildlife and migratory birds would not occur.
- Marine and Estuarine Fauna- The No Action Alternative would not result in direct effects to marine and estuarine fauna because no activities proposed in this RP/EA would occur under the alternative. Some alternatives may have indirect benefits to these species, particularly alternatives that result in reducing erosion and sedimentation of waterbodies that provide habitat for coastal, nearshore, marine, and estuarine species. Under the alternatives, marsh creation would improve areas that may be presently used by marine and estuarine fauna for feeding, breeding, or resting. Under the No Action Alternative, potential benefits to these coastal, nearshore, marine, and estuarine species would not occur.
- Protected Species- The No Action Alternative would not result in direct effects to protected species because no activities proposed in this RP/EA would occur under the alternative. Some alternatives may have indirect benefits to protected aquatic species by reducing erosion and improving habitat quality. In addition, creation of marsh habitats under the alternatives would provide habitat for protected species by improving water quality and by increasing available

habitat upon which some protected aquatic species rely on for foraging, spawning, and resting. Under the No Action Alternative, potential benefits to these protected aquatic species would not occur.

4.4.3 Socioeconomic Resources

The No Action alternative would not have any direct adverse effects to socioeconomic resources; however, taking no action would indirectly allow some ongoing effects to continue and new effects to occur, including the following:

- Infrastructure- The No Action Alternative may result in long-term, minor adverse impacts to infrastructure as a result of ongoing coastal erosion and land loss. Many of the alternatives include activities to address coastal land loss and erosion that may affect infrastructure in the future. Under the No Action Alternative, potential benefits to infrastructure from alternatives that would provide protection to coastal areas would not occur, and these potential benefits would not be realized.
- Land and Marine Management- The No Action Alternative would not support the EMU's goals and objectives and would not create long-term, beneficial impacts to marsh and ridge habitats.
- Tourism and Recreational Use- Continued degradation of the ridge and marsh areas would continue to cause long-term, moderate, adverse impacts to tourism and recreational resources as land loss would continue to occur. The No Action Alternative would have no effect on tourism and recreational use including fishing, hunting, and birdwatching. Some of the alternatives could result in improved recreational access and use. Under the No Action Alternative, these recreational use benefits would not be realized.
- Fisheries and Aquaculture- The No Action Alternative would not provide long-term beneficial impacts by improving habitat for intermediate marsh fish. Long-term, moderate, adverse effects on habitat caused by continued erosion and degradation would result in loss of marsh and ridge habitat that is important for fisheries and aquaculture.
- Aesthetics and Visual Resources- The No Action Alternative would not provide long-term, beneficial impacts to aesthetics and visual resources. The No Action Alternative would not restore marsh, which in turn would not increase wildlife habitat or enhance the natural aesthetics and visual resources of the areas.
- Public Health and Safety (Including Flood and Shoreline Protection)- The No Action Alternative may result in long-term, moderate adverse impacts to public health and safety because of the ongoing coastal erosion and land loss. The alternatives may provide benefits to coastal populations and infrastructure through improved shoreline protection, thereby improving coastal resiliency to the local areas where alternatives would be implemented. Under the No Action Alternative, these potential benefits to public health and safety would not be realized.

4.5 Summary of Environmental Consequences of Alternatives

Alternatives proposed for E&D only (Bayou Pointe-aux-Chenes, East Orleans Landbridge, Raccoon Island Barrier Island Restoration) could cause short-term, temporary, adverse impacts through associated fieldwork, however, these impacts would be very minor, localized to the project site, and would result in no effects beyond those described in the Final PDARP/PEIS. The no action alternative would result in short- and long-term, minor to moderate, adverse impacts.

The NEPA analysis found that the two alternatives proposed for construction would result in some short-term, minor, adverse impacts and some long-term, moderate, adverse impacts to certain resources. These adverse impacts would be offset by the beneficial impacts that these alternatives would generate.

Implementing Trustees would conduct due diligence to ensure that no unanticipated effects to listed species and habitats would occur. Adverse impacts would be minimized by following mitigation measures, BMPs, and other guidance developed during the permitting process, environmental reviews, consultation process, and other relevant regulatory requirements. The Louisiana TIG would also consider best practices referenced in Section 6.15 and Appendix 6.A of the PDARP/PEIS (DWH Trustees 2016).

A summary of impacts for the E&D alternatives, each restoration alternative proposed for full implementation, and the no action alternative is provided in Table 18. For each alternative and resource category, beneficial or no effects are noted, as is the longest duration and most severe adverse effect level, as applicable.

Table 18: Summary of Environmental Consequences for Alternatives

Resource	E&D Alternatives	Bayou Dularge Ridge and Marsh Creation	Bayou La Loutre Ridge Restoration and Marsh Creation	Lake Lery Marsh Creation and Rim Restoration, Increment 3	No Action Alternative
Geology and Substrates	Short-term, minor, adverse effect	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Long-term, moderate, adverse effect
Hydrology and Water Quality	Short-term, minor, adverse effect	Short-term and long-term, minor adverse & long-term, beneficial effects	Short-term and long-term, minor adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Long-term, minor, adverse effect
Air Quality	Short-term, minor, adverse effect	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	No Effect
Noise	No Effect	Short-term, minor, adverse effects	Short-term, minor, adverse effects	Short-term, minor, adverse effects	No Effect
Habitats	Short-term, minor, adverse effect	Short-term and long-term, minor to moderate adverse & short-term and long-term	Short-term and long-term, minor to moderate adverse & short-term and long-term	Short-term and long-term, minor to moderate adverse & short-term and long-term	Long-term, moderate, adverse effect

		beneficial effects	beneficial effects	beneficial effects	
Wildlife	Short-term, minor, adverse effect	Short-term, minor to moderate, adverse & long-term beneficial effects	Short-term, minor to moderate, adverse & long-term beneficial effects	Short-term, minor to moderate, adverse & long-term beneficial effects	Long-term, moderate, adverse effect
Marine and Estuarine Fauna	Short-term, minor, adverse effect	Short-term and long-term, minor to moderate, adverse & long-term beneficial effects	Short-term and long-term, minor to moderate, adverse & long-term beneficial effects	Short-term and long-term, minor to moderate, adverse & long-term beneficial effects	No Effect
Protected Species	Short-term, minor, adverse effect	Short-term, minor, adverse	Short-term, minor, adverse & long-term beneficial effects	Short-term, minor, adverse & long-term beneficial effects	No Effect
Socioeconomic and Environmental Justice	No Effect	Short-term, beneficial effects	Short-term and long-term beneficial effects	Short-term, beneficial effects	No Effect
Cultural Resources	No Effect	No Effect	No Effect	No Effect	No Effect
Infrastructure	No Effect	No Effect	No Effect	No Effect	Long-term, minor, adverse effect
Land and Marine Management	No Effect	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	No Effect
Tourism and Recreational Use	No Effect	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Long-term, moderate, adverse effects
Fisheries and Aquaculture	No Effect	Short-term, minor, adverse &	Short-term, minor, adverse &	Short-term, minor, adverse &	Long-term, moderate,

		long-term, beneficial effects	long-term, beneficial effects	long-term, beneficial effects	adverse effects
Marine Transportation	No Effect	Short-term, minor, adverse effect	Short-term, minor, adverse effect	Short-term, minor, adverse effect	No Effect
Aesthetics and Visual Resources	No Effect	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	Short-term, minor, adverse & long-term, beneficial effects	No Effect
Public Health and Safety	No Effect	Long-term, beneficial effects	Long-term, beneficial effects	Long-term, beneficial effects	Long-term, moderate, adverse effects

4.6 NEPA Cumulative Impacts Analysis

CEQ regulations require the assessment of reasonably foreseeable environmental trends and planned actions impact (also known as a cumulative impacts analysis) in the decision-making process for federal projects, plans, and programs. This analysis was conducted consistent with Section 6.6.2 of the Final PDARP/PEIS, which followed a multistep process: 1) identify resources affected, 2) establish the boundaries of analysis, 3) identify a cumulative action scenario, and 4) conduct a cumulative impacts analysis (DWH Trustees 2016a)

The other restoration efforts that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives, are also considered in the analysis of this RP/EA. The LA TIG determined that the conditions and environmental impacts described in the Final PDARP/PEIS are valid and relied upon the cumulative impacts analysis therein for the alternatives analyzed in this draft RP/EA, where applicable. Considering context and intensity, the LA TIG considers resources with negligible to minor direct and indirect impacts described in this draft RP/EA as sufficiently analyzed cumulatively in the Final PDARP/PEIS (DWH Trustees, 2016).

The following analysis discloses impacts associated with each alternative when combined with other reasonably foreseeable environmental trends and planned actions. Cumulative impact findings from Section 6.6.5 of the Final PDARP/PEIS analysis are also incorporated by reference (DWH Trustees 2016). Future activities considered in the Final PDARP/PEIS include implementation activities associated with: 1) DWH oil spill–related restoration projects, 2) Other Resource Stewardship Activities, 3) Energy Activities, 4) Dredging and Marine Mineral Mining, 5) Coastal Development and Land Use, 6) Fisheries and Aquaculture, 7) Marine Transportation, 8) Military Operations, and 9) Recreation and Tourism. The actions presented in Tables25-27 and considered below include projects from implemented through Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), National Fish and Wildlife Federation (NFWF), DWH NRDA, State of Louisiana Wetland Conservation and Restoration Program Act (State Surplus), and the Water Resources Development Act.

4.6.1 Cumulative Impacts for E&D Projects

Section 4.2 and Table 18 summarize the environmental consequences of the alternatives proposed for E&D. The impacts of those E&D activities are negligible. As described above, the LA TIG only considers negligible to minor, direct and indirect impacts described in this draft RP/EA as sufficiently analyzed cumulatively in the Final PDARP/PEIS, which found no significant cumulative impacts.

4.6.2 Cumulative Impacts for Bayou Dularge Ridge and Marsh Creation Project

As summarized in Table 18, the only resources for which impacts of the Bayou Dularge Ridge and Marsh Creation project were found to be more severe than "minor" are habitats, wildlife, and marine and estuarine fauna. Accordingly, the cumulative impacts analysis was restricted to those three resources.

Based on the existing and pending projects whose footprints or areas of influence intersect a 2-mile buffer around the project area, the types of past, present, and reasonably foreseeable projects and actions in the vicinity of Bayou Dularge Ridge and Marsh Creation Project include marsh creation and hydrologic restoration (Table 19).

The Bayou Dularge Ridge and Marsh Creation project is expected to create positive cumulative effects for the natural resources in the project area by producing an incremental improvement to the hydrology, water quality, habitats, wildlife, and marine and estuarine fauna. Many of the other projects in the cumulative impacts scenario include restoration projects designed to further restore and enhance habitat and are expected to result in long-term, synergistic benefits.

Adverse impacts of the Bayou Dularge Ridge and Marsh Creation project on wildlife are expected to be short-term and moderate and associated with construction activities. Adverse impacts of the project on marine and estuarine fauna are expected to be long-term and moderate and associated with filling of open water areas. Of the other projects in the cumulative impacts scenario, the North Lake Mechant Landbridge Restoration Project, Lost Lake Marsh Creation and Hydrologic Restoration, and the Increase Atchafalaya Flow to Terrebonne are also designed to fill open water areas, which would increase the cumulative impacts to marine and estuarine fauna. However, the aquatic fauna disturbed and displaced by these projects would likely find refuge in nearby suitable habitats, and the creation of marsh habitat would offset the loss of open water habitat.

The specific projects considered in the cumulative impacts scenario are summarized in Table 19.

Table 19: Bayou Dularge Ridge and Marsh Creation Project Cumulative Impacts

CPRA Program	Project Name	State Project Number	Project Type	Federal Sponsor	Construction Completion	Project Description
NFWF	Increase Atchafalaya Flow to Terrebonne	TE-0110	Sediment Diversion	State Only	Pending	The project intends to dredge the GIWW east of the Atchafalaya and install a bypass structure at Bayou Boeuf Lock to increase freshwater and sediment flows from Atchafalaya River to Terrebonne marshes in St. Mary and Terrebonne parishes.

CWPPRA	North Lake Mechant Landbridge Restoration	TE-0044	Marsh Creation	USFWS	2009	The project helped to maintain and restore the North Lake Mechant landbridge in Terrebonne Parish (Lake Mechant north shoreline and the Small Bayou La Pointe Ridge) by creating and nourishing 604 acres of marsh using 5.1 million cubic yards of sediment dredged from North Lake Mechant.
CWPPRA	Penchant Basin Natural Resources Plan, Increment 1	TE-0034	Hydrologic Restoration	NRCS	2011	The project diverts freshwater flow within the Penchant Basin in Terrebonne Parish from northwestern to southeastern sub-project areas coupled with protection measures to reduce inundation of fragile marsh areas in overall Penchant Basin in Terrebonne Parish.
CWPPRA	Lost Lake Marsh Creation and Hydrologic Restoration	TE-0072	Marsh Creation and Hydrologic Restoration	USFWS	2017	This project created approximately 465 acres of marsh along the north and west shorelines of Lost Lake in Terrebonne Parish using sediment dredged from Lost Lake. Other project features include 30,000 linear feet (22 acres) of earthen terraces north of Bayou DeCade and the installation of four variable-crest weirs along Carencro Bayou and Rice Bayou to restore the hydrology within the western marsh creation cell.

4.6.3 Cumulative Impacts for Bayou La Loutre Ridge Restoration and Marsh Creation

As summarized in Table 18, the only resources for which impacts of the Bayou La Loutre Ridge Restoration and Marsh Creation project were found to be more severe than "minor" are habitats, wildlife, and marine and estuarine fauna. Accordingly, the cumulative impacts analysis was restricted to those three resources.

Based on the existing and pending projects whose footprints or areas of influence intersect a 2-mile buffer around the project area, as identified in Table 20, the types of past, present, and reasonably foreseeable projects and actions in the Bayou La Loutre Ridge Restoration and Marsh Creation Project include marsh creation, hydrologic restoration, and shoreline protection.

The Bayou La Loutre Ridge Restoration and Marsh Creation project is expected to create positive cumulative effects for the natural resources in the project area by producing an incremental improvement to the hydrology, water quality, habitats, wildlife, and marine and estuarine fauna. Many

of the other projects in the cumulative impacts scenario include restoration projects designed to further restore and enhance habitat and are expected to result in long-term, synergistic benefits.

Adverse impacts of the Bayou La Loutre Ridge Restoration and Marsh Creation project on wildlife are expected to be short-term and moderate and associated with construction activities. Adverse impacts of the project on marine and estuarine fauna are expected to be long-term and moderate and associated with filling of open water areas. Of the other projects in the cumulative impacts scenario, the Lake Borgne Marsh Creation – Increment 1 project is also designed to fill open water areas, which would increase the cumulative impacts to marine and estuarine fauna. However, the aquatic fauna disturbed and displaced by both projects would likely find refuge in nearby suitable habitats, and the creation of marsh habitat would offset the loss of open water habitat.

The specific projects considered in the cumulative impacts scenario are summarized in Table 20.

Table 20: Bayou La Loutre Ridge and Marsh Creation Project Cumulative Impacts

CPRA Program	Project Name	State Project Number	Project Type	Federal Sponsor	Construction Completion	Project Description
NRDA	Lake Borgne Marsh Creation – Increment 1	PO-0180	Marsh Creation	DOI	Pending	This project will create approximately 2,816 acres of marsh along approximately four miles of the southern rim of Lake Borgne in St. Bernard Parish (extending from Shell Beach to Lena Lagoon) using sediment dredged from Lake Borgne.
State of Louisiana Wetland Conservation and Restoration Program Act (State Surplus)	MRGO Closure Structure	PO-0038-SF	Hydrologic Restoration	USACE	2009	This project closed the Mississippi River Gulf Outlet with a rock dike
CWPPRA	Lake Borgne Shoreline Protection	PO-0030	Shoreline Protection	EPA	2009	This project maintains the integrity of the narrow strip of marsh that separates Lake Borgne from the Mississippi River Gulf Outlet (MRGO), with a continuous nearshore rock breakwater. This land helps protect the communities of Shell Beach, Yscloskey, and Hopedale from direct exposure

						to lake wave energy and storm surges.
State of Louisiana Wetland Conservation and Restoration Program Act (State Surplus)	Biloxi Marsh Shoreline Protection Project	PO-0072	Shoreline Protection	State Only	2013	This project involved the construction of approximately four miles of shoreline protection along the southeastern shoreline of Lake Borgne in St. Bernard Parish.

4.6.4 Cumulative Impacts for Lake Lery Marsh Creation and Rim Restoration, Increment 3

As summarized in Table 18, the only resources for which impacts of the Lake Lery Marsh Creation and Rim Restoration, Increment 3 project were found to be more severe than "minor" are habitats, wildlife, and marine and estuarine fauna. Accordingly, the cumulative impacts analysis was restricted to those three resources.

Based on the existing and pending projects whose footprints or areas of influence intersect a 2-mile buffer around the project area, as identified in Table 21, the types of past, present, and reasonably foreseeable projects and actions in the Lake Lery Marsh Creation and Rim Restoration, Increment 3 Project include sediment diversion, freshwater introduction, and marsh creation.

The Lake Lery Marsh Creation and Rim Restoration, Increment 3 project is expected to create positive cumulative effects for the natural resources in the project area by producing an incremental improvement to the hydrology, water quality, habitats, wildlife, and marine and estuarine fauna. Many of the other projects in the cumulative impacts scenario include restoration projects designed to further restore and enhance habitat and are expected to result in long-term, synergistic benefits.

Adverse impacts of the Lake Lery Marsh Creation and Rim Restoration, Increment 3 project on wildlife are expected to be short-term and moderate and associated with construction activities. Adverse impacts of the project on marine and estuarine fauna are expected to be long-term and moderate and associated with filling of open water areas. All projects in the cumulative impacts scenario are also designed to fill open water areas, which would increase the cumulative impacts to marine and estuarine fauna. However, the aquatic fauna disturbed and displaced by these projects would likely find refuge in nearby suitable habitats, and the creation of marsh habitat would offset the loss of open water habitat.

As such, the Louisiana TIG concluded that although some of the projects may have an incremental contribution to adverse cumulative impacts, the contribution would not be substantial over the long-term. Each of the alternatives has the potential to provide long-term beneficial cumulative impacts to physical, biological, and socioeconomic resources. Thus, the Louisiana TIG concludes that the WCNH alternatives in this RP/EA would not contribute substantially to adverse cumulative impacts when added to past, present, or reasonably foreseeable future actions.

The specific projects considered in the cumulative impacts scenario are summarized in Table 21.

Table 21: Lake Lery Marsh Creation and Rim Restoration, Increment 3 Project Cumulative Impacts

CPRA Program	Project Name	State Project Number	Project Type	Federal Sponsor	Construction Completion	Project Description
NFWF	Mid - Breton Sediment Diversion	BS-0030	Sediment Diversion	State Only	Pending	The Mid-Breton Sediment Diversion is a large-scale, complex civil works and ecosystem restoration project. When operated 50,000 cubic feet per second (cfs) of sediment-laden fresh water would be diverted from the Mississippi River to the Breton Sound Basin to reconnect and re-establish the deltaic sediment deposition processes between the Mississippi River and Breton Sound. See Attachment A for a list of Project features/components
CWPPRA	Terracing and Marsh Creation South of Big Mar	BS-0024	Marsh Creation	USFWS	Pending	This project would create approximately 70,000 linear feet (46 acres) of terraces using in situ material in the shallow open water areas south of Big Mar within the Caernarvon Diversion outfall area in Plaquemines Parish to reduce wave erosion and promote vegetative growth. Marsh creation is also proposed to reestablish the western shoreline of Lake Lery in association with the Lake Lery Shoreline Restoration Project.
Water Resources Development Act	Caernarvon Freshwater Diversion	BS-0008	Freshwater Diversion	USACE	1991	This project diverts freshwater and its accompanying nutrients and sediment from the Mississippi River to coastal bays and marshes in Breton Sound for fish and wildlife enhancement. This project can divert up to 8,000 cubic feet per second.
CWPPRA	South Lake Lery Shoreline and Marsh	BS-16	Marsh Creation	USFWS	2017	This project created of 396 acres of marsh and restored approximately 32,000-ft. of the southern Lake Lery shoreline in Plaquemines Parish using 3.7

	Restoration					million cubic yards of sediment dredged from Lake Lery.

4.6.5 Cumulative Impacts for the No Action Alternative

Under the No Action Alternative described in Section 4.4, none of the alternatives presented in this draft RP/EA would be implemented. Although other environmental stewardship actions would occur in the project areas, this alternative would delay and may reduce the cumulative benefits to resources including geology and substrates, hydrology and water quality, habitats, wildlife, infrastructure, tourism and recreational use, and public health and safety. The No Action alternative would also provide no restoration benefits to compensate for adverse impacts of other actions in the project areas.

5.0 COMPLIANCE WITH OTHER LAWS AND REGULATIONS

In addition to the requirements of OPA and NEPA, other laws may apply to the proposed alternatives in this RP/EA. The LA TIG would ensure compliance with these relevant federal, state, and local laws and regulations, which are listed in Sections 5.1 and 5.2. Whether, and to what extent, an authority applies to a future alternative depends on the specific characteristics of a particular alternative and the presence of specific resources.

Projects involving in-water work would require a Section 404 permit, pursuant to the CWA. Any work in U.S. waters, including wetlands, associated with this alternative would be coordinated with the USACE pursuant to Section 404 of the CWA. Coordination with USACE and final authorization pursuant to CWA and RHA would be completed prior to final design and construction.

Wherever existing consultations or permits are present, they will be reviewed to determine if the consultations/permits are still valid or if re-initiation of any consultations or permits are necessary. Implementing Trustees are required to implement alternative-specific mitigation measures (including BMPs) identified in the RP/EA, BE forms and completed consultations/permits. Oversight, provided by the Implementing Trustees, would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. As noted above, pursuant to the CZMA, federal activities must be consistent to the maximum extent practicable with the federally approved coastal management programs for states where the activities would affect a coastal use or resource. Federal Trustees are submitting consistency determinations for state review coincident with public review of this document.

Federal environmental compliance responsibilities and procedures are addressed in the Trustee Council SOPs, which are laid out in Section 9.4.6 of that document (DWH Trustees, 2021). Where there is a discrepancy between federal or state statutes and the SOP's, the statutes will prevail. Following this SOP, the Implementing Trustees for each alternative would ensure that the status of environmental compliance (e.g., completed versus in progress) is tracked through the DWH project portal. The Implementing Trustees would keep a record of compliance documents (e.g., ESA letters, permits) and ensure that they are submitted for inclusion in the administrative record. The current status of environmental compliance can be viewed at any time on the Trustee Council's website, which can be accessed via the following URL: https://www.gulfspillrestoration.noaa.gov/environmental-compliance/.

5.1 Compliance with Additional Federal Laws

Examples of applicable federal and state laws or federal executive orders (EOs) include those listed in this section. Additional federal laws may apply to the alternatives considered in this RP/EA. Legal authorities applicable to restoration alternative development are fully described in the context of the DWH restoration planning in the Final PDARP/PEIS, Section 6.9, Compliance with Other Applicable Authorities, and Final PDARP/PEIS Appendix 6.D, Other Laws and Executive Orders, which are incorporated by reference in this section. Additional federal laws, regulations, and EOs that may be applicable include but are not limited to:

- Endangered Species Act (16 U.S. Code [U.S.C.] § 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (16 U.S.C.§1801 et seq.)
- Marine Mammal Protection Act (16 U.S.C. § 1361 et seq.)
- Coastal Zone Management Act (16 U.S.C. § 1451 et seq.)
- National Historic Preservation Act (16 U.S.C. § 470 et seq.)

- Coastal Barrier Resources Act (16 U.S.C. § 3501 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. § 703 et seq.)
- Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. § 668 et seq.)
- Clean Air Act (42 U.S.C. § 7401 et seq.)
- Federal Water Pollution Control Act (Clean Water Act, 33 U.S.C. § 1251 et seq.) and/or Rivers and Harbors Act (33 U.S.C. § 401 et seq.)
- Marine Protection, Research, and Sanctuaries Act (16 U.S.C. § 1431 et seq. and 33 USC § 1401et seq.)
- Estuary Protection Act (16 U.S.C. §§ 1221–1226)
- Archaeological Resource Protection Act (16 U.S.C. §§ 470aa–470mm)
- National Marine Sanctuaries Act (16 U.S.C. § 1431 et seq.)
- Farmland Protection Policy Act (7 U.S.C. §§ 4201–4209)
- EO 11988: Floodplain Management (now as augmented by EO 13690, January 30, 2015)
- EO 11990: Protection of Wetlands
- EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- EO 12962: Recreational Fisheries
- EO 13007: Indian Sacred Sites
- EO 13112: Safeguarding the Nation from the Impacts of Invasive Species
- EO 13175: Consultation and Coordination with Indian Tribal Governments
- EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13693: Planning for Federal Sustainability in the Next Decade

5.2 Compliance with State and Local Laws

The LA TIG would confirm compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the State of Louisiana. Additional laws and regulations are listed below:

- Archeological Finds on State Lands (Louisiana Revised Statute [La. Rev. Stat.] 41:1605)
- Coastal Wetlands Conservation and Restoration Authority (La. Rev. Stat. 49:213.1)
- Coastal Wetlands Conservation and Restoration Plan (La. Rev. Stat. 49:213.6)
- Louisiana State and Local Coastal Resources Management Act (La. Rev. Stat. 49:214.21 –214.42)
- Louisiana Oil Spill Prevention and Response Act (La. Rev. Stat. 30:2451 et seq.)
- Management of State Lands (La. Rev. Stat. 41:1701.1 et seq.)
- Louisiana Coastal Resources Program (Louisiana Administrative Code [La. Admin. Code] 43:700et seq.)
- Louisiana Surface Water Quality Standards (La. Admin. Code 33.IX, Chapter 11)
- Management of Archaeological and Historic Sites (La. Rev. Stat. 41:1605)
- Oyster Lease Relocation Program (La. Admin. Code 43:I, 850-859, Subchapter B)
- Louisiana Scenic Rivers Program (La. Rev. Stat. 56:1856)

5.3 Summary and Next Steps for Preferred Alternatives

The LA TIG would ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the proposed restoration alternatives. The LA TIG is currently working through technical assistance reviews with the appropriate regulatory agencies to identify any compliance issues. Table 22 reflects the current status of the LA TIG's reviews and approvals for the two construction projects and two E&D projects as of this draft RP/EA. This table will be updated in the Final

RP/EA to reflect the current compliance statuses at that time. All compliance will be completed prior to implementation of the projects.

Table 22 : Current Status of Federal Regulatory Compliance for All Projects under the Preferred Alternative

Project	ESA Section 7 (NMFS)	ESA Section 7 (USFWS)	BGEPA (USFWS)	Essential Fish Habitat (NMFS)	MMPA (NMFS)	MMPA (USFWS)	Rivers and Harbors Act/Clean Water Act (USACE)	Section 106 of the National Historic Preservation Act	Coastal Zone Management Act	Migratory Bird Treaty Act (USFWS)	Coastal Barrier Resources Act (USFWS)
East Orleans Landbridge Restoration (E&D)	N/A	N/A	N/A	N/A	N/A	In Progress	N/A	N/A	N/A	In Progress	In Progress
Raccoon Island Barrier Island Restoration (E&D)	N/A	N/A	N/A	N/A	N/A	In Progress	N/A	N/A	N/A	In Progress	In Progress
Bayou Dularge Ridge and Marsh Creation (Construction)	In Progress (Not Likely to Adversely Affect)	In Progress (Not Likely to Adversely Affect)	N/A	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
Bayou La Loutre Ridge Restoration and Marsh Creation (Construction)	In Progress (Not Likely to Adversely Affect)	In Progress (Not Likely to Adversely Affect)	N/A	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress

Implementing Trustees would implement the BMPs discussed in Chapter 4 of this RP/EA as well as alternative-specific mitigation measures or terms and conditions identified through consultations or issuance of permits. Implementing Trustees would oversee due diligence to ensure no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

6.0 LIST OF PREPARERS AND AGENCIES CONSULTED

Agency/Firm	Name	Position
CPRA	Maury Chatellier	DWH Oil Spill Program Administrator
CPRA	Chris Barnes	Attorney
CPRA	Beth Golden	Coastal Resources Program Specialist
CPRA	Caitlin Glymph	Coastal Resources Scientist Supervisor
CPRA	Todd Folse	Coastal Resources Scientist Manager
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LDWF	Matthew Weigel	Biologist Program Manager
NOAA	Mel Landry	Restoration Area Lead
NOAA/ERT	Brittany Jensen	Marine Habitat Restoration Specialist
NOAA/ERT	Courtney Schupp	Marine Habitat Restoration Specialist
NOAA	Ramona Schreiber	NOAA DWH NEPA Coordinator
NOAA	Christy Fellas	DWH NRDA Program Compliance Coordinator
DOI	Sarah Clardy	Fish and Wildlife Biologist
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Moffatt & Nichol	Mindy Joiner	Project Scientist

Moffatt & Nichol	Meg Goecker	Senior Scientist
Moffatt & Nichol	Taylor Meyers	Staff Scientist

7.0 LIST OF REPOSITORIES

Library	Address	City	Zip Code
St. Tammany Parish Library	310 W. 21st Avenue	Covington	70433
New Orleans Public Library,Louisiana Division	219 Loyola Avenue	New Orleans	70112
St. Bernard Parish Library	2600 Palmisano Blvd.	Chalmette	70043
Plaquemines Parish Library	8442 Highway 23	Belle Chasse	70037
Jefferson Parish Library, East Bank Regional Library	4747 W. Napoleon Avenue	Metairie	70001
Jefferson Parish Library, West Bank Regional Library	2751 Manhattan Boulevard	Harvey	70058
Terrebonne Parish Library	151 Library Drive	Houma	70360
Martha Sowell Utley Memorial Library	314 St. Mary Street	Thibodaux	70301
South Lafourche Public Library	16241 E. Main Street	Cut Off	70345
East Baton Rouge Parish Library	7711 Goodwood Boulevard	Baton Rouge	70806
Alex P. Allain Library	206 Iberia Street	Franklin	70538
St. Martin Parish Library	201 Porter Street	St. Martinville	70582
Iberia Parish Library	445 E. Main Street	New Iberia	70560
Vermilion Parish Library	405 E. St. Victor Street	Abbeville	70510
Mark Shirley, LSU AgCenter	1105 West Port Street	Abbeville	70510
Calcasieu Parish Public Library Central Branch	301 W. Claude Street	Lake Charles	70605

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Appendix A Plans/Projects to Date

Appendix A Plans/Projects to Date

Restoration in Louisiana to compensate for injuries from the DWH spill began prior to the consent decree, when an initial round of projects was funded under four phases of Early Restoration. Since completion of the Final PDARP/PEIS, the LA TIG has released the following restoration plans to the public:

- Louisiana Trustee Implementation Group Final Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; and Birds, which selects six restoration alternatives for E&D: two bird island projects, three coastal wetlands projects, and one habitat project on federally managed lands (LA TIG, 2017).
- Louisiana Trustee Implementation Group Phase 2 Restoration Plan/Environmental Assessment #1.1: Queen Bess Island Restoration was prepared to restore habitat for birds injured by the DWH oil spill by providing suitable colonial waterbird nesting and brood-rearing habitat on Queen Bess Island (LA TIG, 2019).
- Louisiana Trustee Implementation Group Phase 2 Restoration Plan/Environmental Assessment #1.2: Spanish Pass Ridge and Marsh Creation Project and Lake Borgne Marsh Creation Project (LA TIG 2020) was prepared to analyze design options for alternatives for restoration of Wetlands, Coastal, and Nearshore Habitats that were originally selected in Louisiana Trustee Implementation Group Final Restoration Plan #1 (LA TIG, 2017).
- Louisiana Trustee Implementation Group Final Restoration Plan/Environmental Assessment #1.3: Rabbit Island Restoration Project & Shoreline Protection at Jean Lafitte National Historical Park and Preserve Project was prepared to restore habitat on Rabbit Island for birds injured by the DWH oil spill and to provide shoreline protection at Jean Lafitte to improve habitat for submerged aquatic vegetation (LA TIG 2020a). Both projects were approved for E&D in Louisiana Trustee Implementation Group Final Restoration Plan #1 (LA TIG, 2017).
- Louisiana Trustee Implementation Group Final Restoration Plan/Environmental Assessment #2: Provide and Enhance Recreational Opportunities, reallocated the Early Restoration funds earmarked for Louisiana Marine Fisheries Enhancement, Research, and Science Center to four projects intended to provide and enhance recreational use (LA TIG, 2018a).
- Louisiana Trustee Implementation Group Strategic Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats in Barataria Basin, Louisiana was prepared to identify a restoration strategy that would help prioritize future decisions regarding project selection and funding in Barataria Basin, Louisiana (LA TIG, 2018).
- Louisiana Trustee Implementation Group Final Phase II Restoration Plan and Environmental Assessment #3.3: Large-Scale Barataria Marsh Creation: Upper Barataria Component (BA-207) (LA TIG, 2020b) was prepared to contribute to the restoration of wetlands, coastal, and nearshore habitat resources and services injured by the DWH Oil Spill, specifically in Barataria Basin, Louisiana. This plan tiers from the Final Strategic Restoration Plan and Environmental Assessment #3 (LA TIG, 2018).
- Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #4: Nutrient Reduction (Nonpoint Source) and Recreational Use was prepared to improve water quality by reducing nutrients from nonpoint sources to and compensate for recreational use services lost as a result of DWH oil spill (LA TIG, 2018b).
- Louisiana Trustee Implementation Group Final Restoration Plan/Environmental Assessment #5: Living Coastal and Marine Resources (LCMR) - Marine Mammals and Oysters (LA TIG, 2020c) was prepared for the restoration of marine mammals and oysters.

- Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #6: Restore and Conserve Wetlands, Coastal, and Nearshore Habitats was prepared to create or restore marsh, beach, and dune habitat and protect more than 11.5 miles of shoreline through the implementation of three projects (LA TIG, 2020d).Page A-2 Table A-1 provides a list of the projects included in the LA TIG restoration plans detailed above as well as early restoration (ER), administrative (Adm), monitoring and adaptive management (MAM), and marine mammal (MM) allocations.
- Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #7: Wetlands, Coastal, and Nearshore Habitats and Birds was prepared to restore the Wetlands, Coastal, and Nearshore Habitats and Birds restoration types through the implementation of five projects. Three Wetlands, Coastal, and Nearshore Habitat projects were selected, including: Grande Cheniere Ridge and Marsh Creation, Terrebonne Basin Ridge and Marsh Creation Project, and the Bird's Foot Delta Hydrologic Restoration. Two bird projects were selected, including: Isle au Pitre Restoration and Terrebonne Houma Navigation Channel Island Restoration (LA TIG, 2020e).

Table A-1 provides a list of the projects included in the LA TIG restoration plans detailed above as well as early restoration (ER), administrative (Adm), monitoring and adaptive management (MAM), and marine mammal (MM) allocations

Table A-1: LA TIG Allocations by Project

Restoration Projects	RP	Project Allocation
Lake Hermitage Marsh Creation	ER Ph 1	$13,200,000
Oyster Cultch and Hatchery	ER Ph 1	$14,874,300
Louisiana Outer Coast Restoration	ER Ph 1	$318,363,000
RP #1 - Phase II Restoration Planning	1	$1,134,242
Shoreline Protection at Jean Lafitte National Historical Park and Preserve (E&D and Construction)	1	$20,448,556
Terrebonne Basin Ridge and Marsh Creation Project: Bayou Terrebonne Increment (E&D)	1	$5,345,000
Barataria Basin Ridge and Marsh Creation: Spanish Pass Increment (E&D and Construction)	1	$100,290,142
Lake Borgne Marsh Creation: Increment One (E&D and Construction)	1	$114,642,153
Queen Bess Island Restoration (E&D and Construction)	1	$19,210,000
Rabbit Island Restoration (E&D and Construction)	1	$16,440,000
RP #2 - Restoration Planning 2	2	$500,000
Artificial Reefs	2	$6,000,000
Pointe-aux-Chenes WMA-Island Road Fishing Piers	2	$2,400,193
Elmer's Island Access Project	2	$5,500,000
Lake Charles Science Center and Education Complex	2	$7,000,000
Barataria Basin Habitat Strategic Restoration Plan and Mid-Barataria Sediment Diversion Planning	2	$7,795,437
Barataria Basin Marsh Creation & Ridge Restoration - Planning	3	$241,273
Large Scale Marsh Creation - Upper Barataria Component	3	$176,000,000

RP #3.3 - Large-Scale Marsh Creation-Phase II Restoration Planning	3	$254,067
RP #4 - Restoration Planning	4	$706,255
Atchafalaya Delta Wildlife Management Area Campground	4	$3,248,000
Middle Pearl Boat Launch	4	$575,000
Atchafalaya Delta Wildlife Management Area Projects	4	$920,450
Pass-a-Loutre WMA Crevasse Access	4	$1,568,000
Pass-a-Loutre WMA Campgrounds Projects	4	$1,624,000
Pointe-aux-Chenes WMA-Recreational Use Enhancements	4	$5,012,000
Rockefeller Refuge Piers & Signage	4	$690,000
Bayou Segnette State Park Improvements	4	$2,126,724
Cypremort Point State Park Improvements	4	$4,477,338
Grand Isle State Park Improvements	4	$6,126,967
St. Bernard State Park Improvements	4	$1,098,625
Sam Houston State Park Improvements	4	$2,425,250
Nutrient Reduction on Dairy Farms in St. Helena and Tangipahoa Parishes	4	$1,500,000
Nutrient Reduction on Dairy Farms in Washington Parish	4	$1,500,000
Nutrient Reduction on Cropland and grazing Land in Bayou Folse	4	$3,000,000
Winter Water Holding - Vermilion and Cameron Parishes Plus Agricultural Best Practices	4	3,500,000
Grand Avoille Boat Launch Improvements	4	$247,426
Belle Chasse Walker Road Boat Launch Improvements	4	$250,000
Wetlands Harbor Activities Recreational Facility Phase 1	4	$995,000
Chitimacha Boat Launch	4	$649,262
RP #5 - Restoration Planning	5	606,143
Increasing Capacity and Expanding Partnerships along the Louisiana Coastline for Marine Mammal Stranding Response	5	$3,095,628
Cultch Plant Oyster Restoration	5	$10,070,000
Enhancing Oyster Recovery Using Brood Reefs	5	$9,701,447
Hatchery-based Oyster Restoration	5	$5,850,000
RP #6 - Restoration Planning	6	$521,000
Biloxi Marsh Living Shore	6	$66,600,000
West Grand Terre Beach Nourishment and Stabilization	6	$92,500,000
Golden Triangle Marsh Creation	6	$50,000,000
RP #7 - Birds and Wetlands, Coastal and Nearshore Habitats Restoration Planning	7	$817,580
Grande Cheniere Ridge Marsh Creation	7	$65,000,000
Terrebonne Basin Ridge and Marsh Creation Project: Bayou Terrebonne Increment	7	$157,000,000
Bird’s Foot Delta Hydrologic Restoration	7	$6,000,000
Isle au Pitre Restoration	7	$3,500,000
Terrebonne HNC Island Restoration	7	$3,100,000
East Orleans Landbridge Restoration	8	$4,000,000
Raccoon Island Barrier Island Restoration	8	$8,195,334
Bayou Dularge Ridge and Marsh Restoration	8	$41,390,000

Bayou La Loutre Ridge Restoration and Marsh Creation Project (PO-0178)	8	$21,168,137
Administrative Oversight and Comprehensive Planning	Adm	$7,266,438
LA TIG - Monitoring and Adaptive Management Planning	MAM	$2,119,915
Louisiana Marine Mammal Abundance, Distribution & Density	MAM	$402,183
Louisiana Coastwide Fish and Shellfish Monitoring Program	MAM	$6,071,192
Louisiana Colonial Waterbird Monitoring	MAM	$430,287
Louisiana Secretive Marsh Bird Habitat Relationships and Distributions in Selected Coastal LA Marshes	MAM	$1,441,421
Assessment of Marine Mammal Physiological Responses to Low Salinity Exposure	MM	$249,272

Appendix B Notice of Solicitation

Appendix B Notice of Solicitation

The Louisiana Trustee Implementation Group is continuing restoration planning to address injuries caused by the Deepwater Horizon oil spill and we would like your input regarding natural resource restoration opportunities in Louisiana. We will consider a range of restoration activities under the "Restore and Conserve Wetlands, Coastal, and Nearshore Habitats" restoration types.

You can find information on these restoration types and criteria we use to evaluate project ideas in the Trustees' Programmatic Restoration Plan and its "Restoring Natural Resources" chapter.

You may submit new project ideas, or revise something you've already submitted, through the Trustee Council or Louisiana project idea submission portals by March 2, 2021.

- Trustee Council Portal: If you have already submitted ideas for these restoration types to the Trustee Council portal, you are not required to resubmit them. You can edit your existing project idea in the Trustee database at any time by following steps listed there.
- Louisiana Portal: If you have already submitted project ideas to the Louisiana portal in connection with other Louisiana restoration planning efforts, including the Louisiana Coastal Master Plan and Deepwater Horizon restoration planning efforts, you do not need to resubmit those ideas either. Instead, email LATIG@LA.gov, and simply reference the project name and date of submittal of your previous proposal(s), and we will consider them in this planning effort.
- Projects submitted after the deadline will be considered in future restoration planning efforts.

We will consider projects that address the restoration types listed above and may develop one or more draft restoration plans. We may also develop our own restoration projects for consideration. The public will be given the opportunity to review and provide input on a draft restoration plan, including specific projects proposed for implementation. After the public comment period ends, we will review, consider, and incorporate public comments, as appropriate, before releasing a final restoration plan. Please contact us at LATIG@LA.gov if you have any questions. We look forward to considering your restoration project ideas.

Appendix C Project Universe

Project Name	Project Description	Estimated Project Cost
Marine Mammal Conservation Medicine and Health Assessment Program	Marine mammal populations in the Gulf of Mexico (GOM) are at risk from natural and man-made threats that can cause illness and death and limit recovery. This project would develop and implement a marine mammal conservation medicine and health assessment program to identify risks for illness and death for these species and mitigate potential impacts, focusing on dolphins in the waters of Louisiana, including Bay/Sound/Estuary and coastal stocks. This project will coordinate with federal and state agencies to identify new capabilities that need to be developed by the marine mammal stranding network (MMSN) and its partners, and health assessment researchers to help identify causes of illness and death in both stranded and free-ranging marine mammals and identify knowledge gaps. Specifically, this project will develop a working group to identify LA specific risks for illness and death, including possible impacts from natural (e.g., Brucella, toxoplasmosis, biotoxins, etc.) and man-made threats (chemical and oil spills, etc.), and assess and implement future health intervention techniques, such as vaccination against common outbreak causing diseases (e.g., morbillivirus), development of rapid point of care tools, and improved real-time diagnostic capabilities (such as remotely deployed electrocardiogram [ECG] tags to detect heart abnormalities and/or tools/tags for remotely collecting blood for diagnostics). Additionally, this project will establish regular training sessions and workshops to train the MMSN and health assessment researchers in advanced health monitoring techniques and capabilities, and disseminate information about causes of illness and death and new health monitoring techniques in marine mammals with LA partners. Lastly, this project will develop and implement a study plan for live capture/release health assessments of free-ranging cetaceans, including pelagic species using special offshore capture techniques (hoop-netting), by establishing both case and control study sites to evaluate population level health changes over time and emergence of new threats and diseases. By identifying, monitoring, and mitigating natural and man-made threats to marine mammals this project could minimize the number of animals that become ill or die due to these threats and lead to increased recovery of marine mammal species.	$0
Marine Mammal Disaster Response Program for Louisiana	This project aims to develop new and enhance pre-existing technical and infrastructure capabilities within the Gulf of Mexico (GOM) region, and specifically within Louisiana, to respond to marine mammal disasters from natural and anthropogenic causes. First, an information-gathering and coordination phase will be conducted, working with federal and state agencies to determine existing and identify new capabilities to be developed by the Louisiana marine mammal stranding network and its partners to identify impacts of disasters on marine mammals and improve rapid response to those threats. Phase 2 will involve developing new partnerships and enhancing existing ones to address gaps identified in Phase 1. Both Phase 1 and 2 will involve development of guidance documents, including response plans and standardized response protocols. Phase 3 will be to train the marine mammal stranding network through workshops in the new standardized response techniques and capabilities. The stranding network will also receive information about newly identified threats and the efficacy of various response options to those threats. Finally, in Phase 4 we will work with partners to disseminate resources throughout Louisiana related to the standardized response techniques and capabilities and continue the coordination with those partners. Specifically, the project is the development of an overarching disaster response program, focused on improving effective and efficient responses to marine mammal stranding and health events or disasters. This program would be implemented across the state, and benefit all stocks of marine mammals by increasing and improving the effectiveness of marine mammal response during a disaster in the GOM. One focus of the work would be on planning and preparedness for future oil spills, identifying vulnerability and response planning needs for spills of different types of products, different quantities of products, and different locations, such as those in the far offshore environment. Once needs were identified, the second focus would be on developing a response plan to inform and guide the marine mammal stranding network and response partners, and integration of these planning and protocol	$0

	documents into existing efforts such as Area and Regional Contingency Plans. Not limited to oil spills, we also envision the need for responses to mitigate impacts to marine mammals from natural disasters such as hurricanes, freshwater inundation events, harmful algal blooms, and other types of natural and anthropogenic crises that may be identified in Phase 1 and 2 of outreach and communication with our partners. As response plans are developed, we will implement the necessary training, including drills and exercises, to fully test the plans and then iteratively improve them as needed. The plans, partnerships, protocols, training and drills developed in this disaster response program will lead to a more timely and effective responses to marine mammals following a disaster, which will improve survivorship of animals during and following these events.	
Sea Turtle Inwater Monitoring and Development of Gulf Wide Survey	Data collected from trawl samples are frequently used for fisheries population monitoring throughout the Gulf of Mexico. Sea turtle monitoring utilizing trawl gear as a capturing technique has been ongoing in the South Atlantic region for many years (South Carolina Department of Natural Resources, 2009). This project proposes to institute a pilot program for the Gulf of Mexico similar to the SCDNR marine sea turtle monitoring program (http://www.dnr.sc.gov/marine/sturtles/index.html). In order to develop the sampling design, and transfer information and protocols from the pilot program to a larger, Gulf-wide initiative, LDWF met with Gulf fisheries managers and other partners to request input for the project. A meeting between prospective partners and others helps to guarantee the validity of results from the project. LDWF will request training from the already established trawl program located in the Southeast Atlantic. This revised project proposes to test the viability of sampling using a trawl net in areas of possible sea turtle high density (space and time). Areas of sampling will include stratified sampling (3 “seasons”) and will be designed around ship shoal, a submerged barrier island resulting from delta abandonment. Detectability issues will be addressed as proposed in the above-mentioned meeting. Ultimately, the pilot program may indicate that monitoring for an index of abundance of sea turtles through trawl sampling in the Gulf of Mexico is viable. Initially, this project proposes to sample in areas and times that we believe may be a high abundance. An index of abundance over time in the Gulf of Mexico will improve the conservation efforts for sea turtles.	$2,312,382
Bottlenose Dolphin Health Assessment Program	Coastal and Bay, Sound and Estuary (BSE) populations of bottlenose dolphins in the Gulf of Mexico (GOM) and waters of Louisiana are at risk from natural and man-made threats, such as biotoxins, pollution runoff, and increased freshwater exposure, that can cause illness and death and limit recovery. This project aims to develop and implement a health assessment program to identify risks for illness and death for these dolphin stocks and mitigate potential impacts. This project will coordinate with federal and state agencies to identify new capabilities that need to be developed by the marine mammal health assessment community to help identify causes of illness and death in free-ranging coastal and BSE bottlenose dolphins and identify knowledge gaps. Specifically, this project will develop and implement a bottlenose dolphin health assessment program to identify illness and death risks including impacts from natural (e.g., Brucella, toxoplasmosis, biotoxins, etc.) and man-made threats (e.g., chemical and oil spills). This project will develop and implement a study plan for live capture/release health assessments of free-ranging bottlenose dolphins along the Louisiana coast by establishing both case and control study sites, where possible, to evaluate population level health changes over time and emergence of new threats and diseases. Additionally, this project will work with the marine mammal conservation medicine program to assess and implement future health intervention techniques, such as morbillivirus vaccination, development of rapid point of care tools, improved real-time diagnostic capabilities such as remotely deployed electrocardiogram ECG tags to detect heart abnormalities, and deployment of salinity sensors in remote satellite tags to detect real-time salinity fluctuations, etc. By utilizing these new techniques this project will also enhance the capabilities of marine mammal health assessment researchers to rapidly diagnose causes of marine mammal illness and death and evaluate the impacts of these threats, including freshwater disease. By identifying, monitoring, and	$0

	mitigating natural and man-made threats to bottlenose dolphins this project could minimize the number of animals that become ill or die due to these threats and lead to increased recovery of coastal and BSE bottlenose dolphins.	
New Harbor Island Restoration	New Harbor Island (Breton National Wildlife Refuge). New Harbor Island remains one of the state's most important rookeries within the Chandeleur Islands. However, natural and manmade impacts with emphasis placed on the Deepwater Horizon oil spill (hereafter the Spill) has resulted in significant natural resource injury. Project proposes to increase existing island size by ~100 acres utilizing dredged sediment. Project will increase nesting habitat availability and quality for colonial waterbirds (e.g., brown pelicans, wading birds, terns, skimmers and gulls) among other species impacted by the Spill.	$28
Woodlands Trail - Greenway Corridor Project	Lower Coast of Algiers and the Belle Chasse areas expand, it is prudent to plan for recreational opportunities and the preservation of the ecosystem of wetlands and greenspace; and WHEREAS, wildlife species decline rapidly when trapped between "islands" of development; and WHEREAS, the preservation of low-lying open space serves as a natural "sponge" for stormwater runoff; and WHEREAS, Orleans Parish has set aside 132-acres of wild magnolia forest as English Turn Wilderness Park; and WHEREAS, Plaquemines Parish has set aside 609-acres as Woodlands Trail and Park Bird Sanctuary; and WHEREAS, Woodlands Trail and Park was formed as a nonprofit organization in 2001 to unite the river communities of Orleans and Plaquemines Parish with a series of educational, recreational and historical greenways and trails in one of our regions' last stands of bottomland hardwoods; and WHEREAS, proactive plans to connect contiguous corridors of low-lying greenspace not only serve to protect habitat for wildlife but encourages development to occur on higher grounds; and WHEREAS, Woodlands Trail and Park has been included in the City of New Orleans Master Plans for Transportation, Recreation and Open Space, Riverfront Vision 2005 and included in the United New Orleans Plan for District 13; and WHEREAS, during America's Wetlands Month, May, 2006, the Louisiana Wildlife Federation and the New Orleans City Council proclaimed support of Woodlands Trail and Park in its implementation of conservation efforts that will protect and improve the environment for the future well-being of our children and the wildlife we treasure; and WHEREAS, with the exception of one parcel of low-lying wetland area in Orleans Parish, there is a contiguous corridor of public and quasi-public land that forms a vital habitat corridor within one of Southeastern Louisiana's last stands of bottomland hardwoods in the peninsula formed by Orleans and Plaquemines Parish. THEREFORE, BE IT RESOLVED that the Louisiana Wildlife Federation supports the preservation of the last remaining low-lying land between English Turn Golf Course and English Turn Wilderness Park and urges the New Orleans City Planning Commission to zone this tract as Parks and Open space.	$2,100,000
Aquaculture Building Communities-Restocking the Gulf and Louisiana Marshlands	Project Goals 1. Restock Gulf of Mexico and coastal marshlands with indigenous fish grown to the fingerling stage and released into the environment. 2. Build an enclosed recirculating aqua system that would produce species of fish indigenous to coastline and Louisiana wetlands such as: Speckled Trout, Red Drum, and Sheep Head 3. Design the facility to double as an on-going aquaculture research center that will work with researchers and Louisiana State University Aquaculture Department to provide data and share new research information on positive effects of restocking natural waterways. 4. The facility will also produce 250,000 lbs. of fully grown indigenous fish every eight months to sell in market place contributing to the sustainability of the project. 5. For five years 1,000,000 fingerlings will be released in strategic locations throughout the Gulf and Louisiana wetlands each year. Rate of restocking may vary and will be determined by research information gathered on impact of fish population 6. Local community residents will be trained and employed in project technology from construction site to discharge of fingerlings into the Gulf and Louisiana wetlands.	$0
Clovelly	The total property available (approximately 10,000 acres total) consists of at least 5,000 acres of land for marsh restoration (brackish and saltwater) and an additional at least 5,000 acres of land suitable for preservation. Within the 5,000 acres suitable for restoration there is a 500 acre parcel for which the detailed feasibility and design work has	$0

	already been completed. The 500 acre parcel is “shovel-ready” and could potentially be developed sooner than the rest of the bank. It should also be noted that this restoration project would also include some element of hurricane protection and would be large enough for a bird sanctuary or other wildlife refuge. Finally, because of the project’s scale, the cost on a per-acre basis would be significantly lower than it might be for smaller projects.	
Restoring Small Islands in Barataria Bay: Providing Habitat for Nesting Birds	Bay Ronquille area; This project addresses the restoration of a single six acre island and doubling it to a 12 acre size. This island belongs to Plaquemines Parish.	$2,647,540
Restoring a Small Island in Barataria Bay: Providing Habitat for Nesting Birds	Bay Ronquille	$10,590,160
Black Lake Marsh Creation	5,000 acres permitted and ready to go. He is permitted for marsh creation, terracing or levee building.	$0
Timbalier Bay Abandoned Canal Hurricane Protection	USA	$0
Caminada Pass Bridge Fishing Pier Restoration	-	$
Terrebonne | Lafourche Barrier Islands Segmented Breakwaters Concept	Construct segmented breakwaters along each of the islands in the Terrebonne Barrier Island Chain from Raccoon Point to Belle Pass.	$240,000,000
Restoration Gulf Coast	-	$0
Fourchon Breakwaters Shoreline Protection	Fourchon-Gulf of Mexico; extend segmented breakwaters along Caminada Headland east past Bay Champagne.	$0
Gulf Saver™ Solutions	Gulf Saver Bags is a package of native marsh grasses with its own supply of natural nutrients and billions of oil eating micro-organisms to protect, feed and support marsh grasses plugged into the Bag, to take root, survive and flourish. Gulf Saver Bags also support an accreting environment by slowing down the water, which allows sediment to drop, and adding nutrientrich biomass to the soil. Gulf Saver Bags provide for greater stabilization, higher survivability and integration of diverse species back into challenging wetland sites, and in particular in areas where dredging has been done and material for berms and terracing have been deposited. Gulf Saver Bags offer an innovative technology and application designed to increase project success of habitat and wetland restoration.	$0
LL&E South Lafourche Marsh Restoration and Levee Protection	Galliano; The project is on the wet-side of the east and west banks of the Parish levees protecting the South Lafourche community and surrounding area. This area, easily visible on attached satellite photographs, has converted from marsh and cypress swamp over the last century to shallow, open water areas. Phase One has approximately 650 acres of marsh restoration. Phase Two has approximately 636 acres of marsh restoration and Phase Three has approximately 560 acres of marsh restoration. In order to convert the site to its historic condition, RS will permit the dredge, pump, and placement of material into the restoration area from sources previously permitted for dredging located near each phase. The placement and planting with natural and appropriate vegetation will provide a natural barrier to storm and wave attenuation at the toe of the Parish levee, which is now open water.	$0
Bayou Pattasat Corridor Improvements	The Bayou Pattasat and Slidell Old Town area are in an excellent position to address drainage, stream and habitat improvement, water quality, recreation, and economic revitalization that will benefit the community and environment. Bayou Pattasat can be the pedestrian corridor that links these areas while improving drainage and water quality. Plan	$17,000,000

	features to promote water quality include: Lower elevation of stream corridor, increase stormwater storage, decrease velocity and turbidity; Recreate stream sinuosity and slope; Replant with native vegetation to filter pollutants; Integrate recreation/education trail on higher elevation.	
Ekogrown™ Native Trees for Barrier Islands Restoration	-	$10,000-$20,000/acre
Fritchie Marsh Terracing and Marsh Creation	Slidell, LA; construct a 550 acre marsh platform and approximately 100,000 feet of terraces within the Fritchie Marsh watershed near the northshore of Lake Pontchartrain.	$26,000,000
Twin Pipeline Canal Ridge Restoration and Fringe Marsh Creation	Midpoint near pipeline canal intersection with Bayou Pointe Au Chien, South of Pointe Au Chien, LA. It is roughly estimated that this project may create up to 500 acres of marsh and 300 acres of ridge, nourish an estimated 200 -400 acres of marsh, and protect an additional 200 – 400 acres of marsh.	$0
Bayou Bonfouca Marsh Creation	Slidell, LA. Recreate approximately 418 acres of low salinity brackish marsh in open water areas adjacent to Bayou Bonfouca, nourish 42 acres, and repair several breaches along the Lake Pontchartrain shoreline.	$22,000,000
Northshore Marsh Creation	Lacombe, LA. Create approximately 450 acres of emergent marsh and nourish approximately 300 acres of marsh in the open water areas immediately behind the shoreline within Big Branch NWR to maintain the lake-rim function along this section of the north shore of Lake Pontchartrain.	$16,000,000
Unknown Pass to Rigolets	Orleans Land Bridge. Foreshore rock (four miles) dike along the Lake Borgne shoreline from Unknown Pass to Rigolets.	$12,000,000-24,000,000
Northshore Marsh Shoreline Repair|Marsh Creation	Slidell. Create bottom elevations conducive to the creation of approximately 30-40 acres of brackish/intermediate marsh by dredging nearby Lake Pontchartrain water bottom and hydraulically depositing it in contained target areas; Protect several hundred additional acres of interior marsh by creating marsh in strategic locations in Lake Pontchartrain shoreline breaches; Create approximately 3600 feet of shoreline support/breach repair.	$2,200,000
Amite River Diversion	Head of Island, LA. Construction of gaps in the embankments of the Amite River Diversion Canal.	$0
Convent Diversion	Convent, LA. The objective of this diversion is to provide additional freshwater, nutrients, and fine sediment from the Mississippi River into Maurepas Swamp and its surrounding areas. Construction of the Mississippi River levee has effectively stopped annual spring flooding that, in the past, had nourished the Maurepas Swamp with sediment, nutrients and freshwater.	$0
Mississippi River Diversion (Hope Canal Area)	Reserve, LA. 1,500-2,000 cfs diversion into Hope Canal; outfall management structures to move water through Maurepas Swamp.	$0
Restoring Finfish of Importance to Louisiana Waters Via Private Industry	-	$0
PPL20 - Lake Lery Marsh Restoration	Caernarvon, St. Bernard Parish, LA	$20,000,000-25,000,000
Bayou Chevreuil La NRDA Response Site	The Site is located within Sections 9, 10, 15, 16, 21, 22, 23, 25, 26, 27, 28, 33, 34, 35, and 36, Township 13 South, Range 17 East in St. James and Lafourche Parishes, Louisiana. Hydrologic rehabilitation activities (2,733.97 ACRES) through spoil bank breaking and implementation of water control structures and vegetative rehabilitation activities (804.31 ACRES) through planting bottomland hardwood and cypress/tupelo seedlings.	$0

Lake Maurepas Land Protection Effort	Lake Maurepas - Livingston/ Tangipahoa Parishes. The Conservation Fund seeks funding for the acquisition and permanent protection of 16,000 +/- acres of Louisiana coastal wetlands along the north shore of Lake Maurepas. The targeted tracts provide a final link into the green infrastructure network already in place across this landscape. The protection of this acreage will not only provide multiple public benefits, but it will complement at least two multi-million dollar restoration projects to restore hydrology, being led by the U. S. Army Corps of Engineers, and the Louisiana Office of Coastal Protection & Restoration within the Maurepas Swamp.	$0
Atchafalaya Basin Protection Effort	Atchafalaya Basin. The Conservation Fund seeks funding to add up to 5,000 acres to the current protected land base within the Atchafalaya Basin, in south Louisiana. The protection would ensure increasingly valuable filtered surface water flows, for the long-term health of the Gulf of Mexico. In addition to protecting water quality for the Gulf, this source for significant quantities of surface water flow has provided the only significant sediment accretion forming wetlands within the Louisiana Coastal Zone. Further, this area provides critical stopover, foraging and breeding habitat for numerous migratory birds. Sherburne Wildlife Management Area, located in the Morganza Flood way system of the Atchafalaya Basin, is situated in the lower and upper portions of Pointe Coupee, St. Martin, and Iberville Parishes respectively, between the Atchafalaya River and the East Protection Guide Levee. The Sherburne WMA, Atchafalaya National Wildlife Refuge and the U.S. Army Corps of Engineers lands combine to form nearly 50,000 acres of protected lands. The Louisiana Department of Wildlife and Fisheries owns 12,000 +/- acres, the U.S. Fish and Wildlife Service owns 15,800 acres and the remaining acreage is owned by the U.S. Army Corps of Engineers.	$0
ASEG	Gulf Coastline	$0
Grand Isle and Vicinity Barrier Islands Protection and Enhancement	SE Louisiana	$0
Lake Pontchartrain Shoreline Restoration	-	$1,000,000
Bay Jimmy Marsh Restoration	Northern Barataria Bay; Bay Jimmy and surrounding marshes. Propagation tubes are sediment filter barriers containing a fiberized bagasse growing medium, specially designed for oil-impacted marshes. The fiberized bagasse is intended to benefit the remediation process by absorbing and encapsulating any remaining hydrocarbons and acting as a host for microbial activity. The propagation tubes should reduce shoreline loss of sediment during re-vegetation and provide a clean substrate where the plant materials can grow, take root, and expand vegetatively into the marsh. Marsh restoration typically relies on a few genotypes of Smooth Cordgrass cultivated for easier propagation. However, Smooth Cordgrass is an ecosystem engineer that influences its environment in diverse ways. Population genotype can determine marsh properties. For this reason, the 1.1M linear feet of bagasse-filled propagation tubes used in this restoration project will contain root cuttings from native, site-specific genotypes best adapted to local conditions.	$0
Bioworld Louisiana Gulf Coast Bioremediation	Coastwide	$2,000 - $6,000/acre
Oyster Rejuvenation	-	$0
Various	See federal project # 356	$0
Parish Shoreline Stabilization	East and west bank	$58,000,000
Commercial Based Restoration of Finfish of Importance to Coastal Louisiana	Entire coast	$3,000,000

Calcasieu Pine Savanna	Lake Charles, LA region	$6,800,000
United Houma Nation Culture Center	Houma, LA	$4,500,000-$7,000,000
Chef Menteur Restoration	East Orleans Land Bridge. Ecosystem Investment Partners (EIP), one of the nation's leading private investment firms specializing in land conservation and restoration for mitigation, is the owner of the property known as Chef Menteur Pass. EIP acquired this property through its second investment fund, a $181 million private equity fund established in May 2012 to invest in large scale restoration projects across the US. This tract of land covers 16,471 acres and comprises 63% of the East Orleans Land Bridge, which separates Lake Pontchartrain from Lake Borgne and the open waters of the Gulf of Mexico. There are few properties in and around the Gulf Coast of Louisiana with more strategic value from an ecological and risk reduction perspective. However, this property is subsiding and eroding, and provides the opportunity for restoration of over 15,000 acres, including the filling and replanting of 7400 acres of open water, along with significant marsh enhancement and shoreline restoration.	$0
UAV Detection of Residual Oil in Coastal Marshes	Multiple	$0
Mississippi River Long Distance Sediment Pipeline/Marsh Creation - NRDA Increment	Eastern portion of lower Barataria Basin	$0
Lake Hermitage Marsh Creation - EML NRDA Increments	Additional fill areas north of BA-42	$0
North Turner's Bay Mitigation Area	Construct exterior levees around an approximately 275 acre area of open water just off the north end of Calcasieu Lake. Interior baffle levees will probably be used as spoil from surrounding dredge projects is pumped into the site to create 275 acres of emergent marsh. After the project area is filled to marsh elevation and de-watered, Spartina and other brackish marsh species will be planted. Creating this 275 acres of vegetated marsh will directly benefit estuarine species of all types as well as shore birds, waterfowl, fur-bearers, etc. This project will also slow storm surge and add protection to inland areas.	$0
Replenish and Protect Living Coastal and Marine Resources—Birds	-	$0
Protection of Natural Resources in the Louisiana Coastal Zone: Risk Assessment of Oil & Gas Wells in Barataria Basin	This restoration project is aimed at protecting sensitive coastal resources, especially those impacted and/or newly-restored after the Deepwater Horizon oil spill (DWH), and affected by relative sea level rise and coastal development, as well as human health and safety, from ongoing and potential future releases from approximately 15,000 oil and gas wells in the Barataria Basin, including Barataria Bay. Protection and conservation of habitats and living coastal and marine resources is an essential part of the DWH Natural Resource Damage Assessment Final Restoration Plan for the Gulf of Mexico. One approach to restoration is to actively manage to protect against threats. This project identifies a major threat and a methodology to prioritize mitigation efforts that will most reduce the threat. The project involves analyzing risk from abandoned, orphaned, and currently active wells by quantifying the probabilities of releases, along with the ongoing and potential future ecological and human health and safety impacts of releases. The risks posed by remediation measures will also be incorporated into the analysis. Conducting a systematic risk assessment will provide a means to identify wells that present the greatest risk, so that they can be prioritized for monitoring, mitigation, and remediation	$910,000

	efforts. Wells identified as highest risk will be included in a field monitoring and sampling program. The well risk assessment will be synthesized into a decision-making tool that can be applied in the future as existing producing wells are plugged and abandoned, or as needed for future conditions.	
Synthesis of Environmental Data in Barataria Basin to Assess Restoration Outcomes	The US Geological Survey proposes a multi-disciplinary project that provides science-based technical assistance to the Louisiana Trustee Implementation Group (TIG) for the integration of monitoring, assessment, synthesis, and reporting of current and future Restoration Approaches that seek to create sustainable coastal wetlands and/or preserve Mississippi River processes, including Mississippi River diversions. This project directly builds on the Systemwide Assessment and Monitoring Program (SWAMP; Steyer et al., 2003; Steyer et al., 2006; Hijuelos and Hemmerling 2016) and the Programmatic Adaptive Management Plan described in the 2017 Coastal Master Plan (Hijuelos and Reed 2016), and will aim to leverage other ongoing monitoring and adaptive management efforts in the region. The project entails three interrelated tasks, described more fully below: 1) develop and apply an approach for integrating project-level monitoring identified by the LA TIG (or others, as appropriate) for Mississippi River diversions into the existing SWAMP network or other monitoring programs within the region, 2) develop analytical methods for evaluating restoration outcomes across resources and habitats that can be used to evaluate project performance, status, and trends at multiple scales, and 3) develop methods for synthesizing and communicating information as part of the adaptive management feedback loop to inform project-level operations, as well as future project planning and implementation. This approach aims to fill in the missing piece of the SWAMP and the Adaptive Management cycle by orchestrating cross-resource analytical evaluations and reporting mechanisms for project, basin scale, and Restoration Type outcomes. Project team members will work closely with the LA TIG on all phases of this project to ensure product milestones and deliverables align with the expectations and needs of the LA TIG.	$714,000
Adaptive Management with the Native Southern Ribbed-Mussel for a Sustainable Coast	The state of Louisiana has been investing in artificial reefs by way of the evaluation of stabilized gypsum-based material for the reefs as well as cultch for bolstering oyster habitat. In this project proposal idea, site selections for such artificial reefs and natural shoreline locations will be made cooperatively with the state, with one such location near #LA-0008. The PIs will develop and set reef structures, culture and set the mussels, monitor survival and success at colonization, growth, and nekton recruitment over two years. A mussel physiology study into filtration processes and clearing rates relative to the Eastern oyster will form the basis for further work addressing hypotheses relevant to coastal science.	$0
Informing Barrier Island and Dune Habitat Restoration by Quantifying Dune Vegetation and Elevation Linkages and Evolution	The project will (1) acquire data and develop monitoring techniques that can be incorporated in the System-Wide Assessment and Monitoring Program (SWAMP); and (2) create methods of predicting dune evolution that can be incorporated in and/or complement tools within the Louisiana Integrated Compartment Model. The project will improve barrier island restoration by informing: the types and density of natural or planted vegetation that promotes dune building via Aeolian transport; the relationship of potential restoration designs, including both the physical template and planted vegetation, on island resiliency and sustainability; and considerations of how characteristics of the full restoration template (e.g., beach width) influences the dune growth and resiliency. The project will also improve adaptive management of barrier island restoration projects by enabling quantitative prediction of the response of a restored barrier island to short- and long-term drivers (Aeolian transport, storms, etc.). The observed evolution of a restored system can then be benchmarked against these predictions and, if the project is not evolving as expected, corrective action could be taken (for example, additional vegetation planting; dune fencing; or other alternatives). Ultimately, the monitoring and predictive tools developed in this project would have application to barrier island restoration efforts throughout Louisiana and Gulf-wide.	$1,716,000
Plant Marsh Grass and Trees in Louisiana's	Coastal Louisiana including Northshore of lake Pontchartrain in marsh creation areas. Coalition to Restore Coastal Louisiana to partner with US FWS, Lake Pontchartrain Basin Foundation, Cameron Parish, and Vermillion Parish. Plant marsh grass and trees along the Gulf coast.	$1,050,000

Coastal Zone Using Volunteers		
Vermilion Parish Working Lands, Water and Wildlife Partnership	Conserve wetlands in Vermilion Parish, south of Abbeville, adjacent to the Vermilion River and Intracoastal Waterway	$8,700,000
The Wharf Project	Development of the Wetland Harbor Activity and Recreational Facility east of Bayou Segnette and north of Jean Lafitte State Park on the old Westwego Airport property.	$28,000,000
Lake Fields and Lake Long Water Quality Restoration Plan	The Lake Fields/Lake Long Water Quality Restoration Plan includes channel constrictions and/or shoreline stabilizations while allowing boat passage at three locations in Lake Fields and two locations in Lake Long: · channel constrictions/shoreline stabilization in lower Bayou Dumar (which empties into Lake Fields) south of Commercial Canal · channel constrictions/shoreline stabilization of lower Bayou Folse opening into Lake Fields · shoreline stabilization of Company Canal opening into Lake Fields · channel constriction/shoreline stabilization of Company Canal opening into Lake Long · channel constriction/shoreline stabilization of Hollywood Canal opening into Lake Long. The purpose of these channel constrictions/shoreline stabilizations is to reduce the inflow of turbid, nutrient enriched water from the upper Bayou Folse watershed into Lake Fields and Lake Long. The primary goals of the restoration plan are to improve water quality, stimulate or maintain current SAVs, and enhance waterfowl and fishery resources.	$700,000
Implementation of Nutrient Management Conservation Practices and Innovative Nutrient Reduction Measures on Working Ag Lands in the Ouachita River Basin to Reduce Nutrient Loading to the Gulf of Mexico	This project seeks to help achieve both the Restore Water Quality Goal of the Trustee's plan and the goals of the Gulf Hypoxia Action Plan by reducing nutrient loading to the Gulf from key source watersheds in northeast Louisiana. These watersheds have yields of nitrogen and phosphorus that show up in significant levels in the U.S. Geological Survey's (USGS) SPARROW Model for the Mississippi/Atchafalaya River Basin. Because of the particular hydrology of the Ouachita-Tensas-Black River system, which drains into the Red River and then the Atchafalaya River, these nutrient loads have a direct flow path to the Gulf of Mexico through the mouth of the Atchafalaya and Wax Lake Outlet. This project will build upon past and current conservation, management, and restoration efforts in watersheds in the Northeast Louisiana Delta/Ouachita River Basin by federal and state agencies, local conservation districts, landowners, and non-governmental organizations. The Office of Soil & Water Conservation will work with partner agencies and organizations, landowners, and other stakeholders to identify gaps in previous conservation efforts along with opportunities for expansion of innovative activities to further reduce nutrient loading to tributary waterbodies that drain into the Atchafalaya River and the Gulf. USDA/NRCS agricultural conservation practices that are scientifically sound and have been proven effective across the Gulf coastal plain and Lower Mississippi River Alluvial Valley will be the primary tools for achieving reductions of working-land nutrient loading contributions to tributary waterways. Both core and supporting conservation practices that enable higher levels of targeted nutrient application, retention, and utilization will be offered, along with a set of targeted innovations in crop management, drainage, and other techniques.	$3,000,000
Promote Public Access and Recreational Use through Hydrologic Restoration of Bayou Sauvage Channel, Bayou Sauvage NWR	Bucket dredging to restore the channel of Bayou Sauvage, Bayou Sauvage National Wildlife Refuge, Orleans Parish. Dredge spoil to be used beneficially to restore cypress and live oak along bayou shoreline.	$1,800,000
Recreational Use Improvements at Barataria Preserve	This project will provide enhanced recreational opportunities by planning, designing, and implementing infrastructure, access, and education projects in the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve. The Preserve provides public access to coastal and marine habitats and resources for urban communities in the New Orleans metro area. Annual visitation is typically 50,000 visitors whereby proposed education and outreach programs will develop	$9,350,000

	a conservation ethic and encourage environmental stewardship of coastal natural and cultural resources. In addition to enhancing recreational opportunities, components of this project will provide the added benefit of protecting bottomland hardwood, swamp, and fresh marsh habitats from impacts due to high visitor use.	
Coastal Vegetation Types in Louisiana in 2018	The 2018 aerial survey will be conducted from a helicopter using the same techniques as historical surveys. The survey covers coastal marshes from the Texas State line to the Mississippi State line and included all marsh lands in the coastal zone. At each of the marsh stations, plant species present will be listed and the cover estimated using a modified Braun-Blanquet cover scale (75%). Based on species composition and cover each sampling station will be assigned a marsh type (fresh, intermediate, brackish, or saline marsh). These classified stations will be used to draw boundaries between marsh types, using hydrologic boundaries (waterways and upland) as much as possible.	$400,000
Informing sea turtle restoration and management by creating a baseline health index based on skin microbiomes	The proposed project would characterize the skin microbiomes of the 4 affected species of turtles (green, loggerhead, hawksbill, kemp's Ridley) providing critical baseline data. Comparisons would be made between Gulf of Mexico turtles with potential for past oil exposure and individuals from the same species in the Atlantic. This would allow determination of regional differences in skin microbiomes and potentially allow identification of any lasting effects from the oil spill on Gulf turtles. This study addresses a relevant data gap, i.e., the lack of a health index which could be used to monitor these turtle species for disease or sub-lethal impacts in the case of future oil spills, climate change, etc. Development of this health index supports existing conservation efforts by ensuring consistency (via a health index metric) with recovery plans and recovery goals for each of the sea turtle species. Further, having available baselines will provide the necessary benchmarks against which future samples can be compared, allowing detection of impacts and providing a guideline for restoration. Host-associated microbes are sensitive indicators of health and environmental change and may allow earlier recognition of sub-lethal stress on these threatened or endangered species. This work helps guide restoration, because without having an index to define the health status of turtles, it is impossible know if you have restored back to the healthy state or instead created a shifted baseline of 'better but not fully functioning.' This work can be easily added as a component to ongoing, already permitted studies (via the collection of one additional tissue punch when turtles are assessed), and constitutes a valuable missing piece that can further management knowledge to advance restoration in the future.	$500,000
Pontchartrain Beach Restoration Plan	South shore of Lake Pontchartrain within New Orleans. 10,700 CY of sand were staged at Pontchartrain Beach in 2016. Final placement of the sand is to be completed, ideally, after the two other permitted activities are completed. This includes removal of a damaged metal sheet pile groin and construction of a new offshore breakwater. Altogether, these three amendments will help stabilize the sand and shore.	$2,782,500
Assessment of impact and development of advanced monitoring techniques for Chandeleur Islands seagrasses	The Chandeleur Islands, Louisiana lost a total of 271 acres (110 hectares) of seagrass due to oil. This project will continue the assessment of the impact and recovery from oil exposure on seagrasses in the Chandeleur Islands to complement on-the-ground restoration projects, including by determining where seagrass restoration efforts should be focused and how to most effectively monitor success. The rapid loss of seagrass resources on the Chandeleur Islands underscores needs to advance monitoring capabilities through use of emerging technologies to inform restoration efforts and priorities and monitor success. Specifically, this proposed effort will: 1) analyze imagery acquired in 2013-2016 using an object based image analysis approach to determine habitat coverage changes occurring since 2012; 2) collect and analyze sediment and plant for a subset of NRDA sample sites from 2012; and 3) explore advanced seagrass monitoring techniques using emerging technology, including UAS data collection, camera sampling designed for shallow turbid waters, and optical satellite imagery. Components of the methodology used in this effort should be scalable for monitoring other areas	$850,000
Identifying and Prioritizing Locations for Submerged Aquatic	This project will build on the recent development of a likelihood occurrence model for SAV and advanced remote SAV techniques to identify priority areas and techniques for SAV restoration across Louisiana's estuaries. This proposed work would provide tools to identify areas likely to support SAV across the salinity gradient found within Louisiana estuaries as	$0

Vegetation (SAV) Restoration/SAV Monitoring, Prediction and Site Prioritization	well as recommendations for restoration techniques most likely to succeed. We will develop an approach to remotely identify high priority sites for SAV restoration using a combination of field, aerial photography, and spatial analyses of environmental data. The results and tools developed in this effort will help to create clear, science-driven plans to ensure a successful restoration for SAV and enable easy monitoring and modeling of SAV in the future.	
Oyster Recruitment and Connectivity Tool	Across the gulf coast, we have limited understanding of spatial and temporal variation in oyster recruitment, and even more limited understanding of reef connectivity. Thus, a priority need to ensure future successful restoration of our oyster resources, involves (1) addressing our lack of understanding of oyster recruitment and reproduction, including sources and variation in larval recruitment and their causes, and (2) developing tools to identify and quantify connectivity between oyster beds/reefs through larval dispersal. Our proposed work would increase our understanding of recruitment trends (spatial and temporal), provide a tool that couples all stages of the oyster life cycle, habitat setting and hydrodynamic-sediment modeling allowing the determining of priority locations to maximize the effectiveness of providing either "spawning populations" (i.e., add hatchery produced oysters, or cultch locations), and "recruitment locations" (i.e., building reef to ensure substrate for recruitment). While our proposed work would apply coast-wide and provide critical information on spatial and temporal recruitment across all Louisiana bays, we propose to focus initially on one of the areas deemed most significantly injured from the oil spill, Barataria Bay oyster resources.	$0
Biloxi Marsh Oyster Reef (LA CMP 001.OR.01a)	Eastern side of Indian Mound Bay, west side of Chandeleur Sound. Creation of approximately 104,400 feet of oyster barrier reef to a design elevation of 2 feet NAVD88 along the eastern shore of Biloxi Marsh to provide oyster habitat, reduce wave erosion, and prevent further marsh degradation.	$204,300,000
New Orleans East Landbridge Restoration - Increment 1	Between Lake Borgne/Mississippi Sound and Lake Pontchartrain. Creation of approximately 11,600 acres of marsh in the New Orleans East Landbridge to create new wetland habitat and restore degraded marsh.	$396,000,000
Bayou Terre Aux Boeufs Ridge Restoration (CMP 2017 001.RC.100)	Along Bayou Terre aux Boeufs, between Lake Lery and Black Bay. Restoration of approximately 91,200 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou Terre aux Boeufs.	$15,100,000
Bayou La Loutre Ridge Restoration (LA CMP 001.RC.01)	South of Lake Borgne (near Yscloskey) east to near Eloi Bay. Restoration of approximately 108,900 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou LaLoutre.	$20,100,000
Expand and Improve Marine Mammal Stranding Response and Monitoring Capabilities in Louisiana	This project requests sufficient long-term resources for the two designated Marine Mammal Health and Stranding Response Program (MMHSRP) network members in Louisiana to monitor the effectiveness of restoration efforts through enhanced surveillance, response, investigation, and, where possible, recovery and rehabilitation of stranded marine mammals from populations in Louisiana nearshore and offshore waters that were directly impacted by the Deepwater Horizon (DWH) oil spill. Nearly every population of marine mammals that inhabits the nearshore and offshore waters of Louisiana suffered quantifiable injuries due to the Deepwater Horizon oil spill. Response to stranded marine mammals and the collection of biological information from those animals is critical to obtaining an understanding of natural and human-caused factors that are either contributing to or impeding the restoration of DWH-impacted populations. The primary objectives of this project are to 1) increase surveillance efforts to identify stranded marine mammals, 2) ensure timely response to reports or sightings of live- and dead-stranded marine animals, 3) conduct timely and thorough examinations of live- and dead-stranded animals, and 4) collect, analyze, maintain, and disseminate consistent, standardized, high quality information from stranded animals and stranding events. This project also would facilitate the integration of stranding data with other biological and environmental information to highlight and understand the connections between oceanography, ecosystem processes, and marine mammal health via the Marine Mammal Health Monitoring and Analysis Platform (Health MAP). Additional benefits of this project are the ability to augment the	$0

	resources and response capability across networks that serve other impacted marine wildlife species, such as sea turtles and sea birds.	
Development of Oyster-Focused, Ecological-Support Tools for Determining Restoration Potential, Benefits, or Impacts for Louisiana Estuaries	This project will assess ecological variables which have suspected relations to oyster survival to determine variable importance, degree of variable interactions, and complexity of those interactions. Biological, chemical, and physical variables will be quantitated in repeated sampling events over an oyster-density gradient across 40 sites divided among four locations along the Louisiana coast: Sabine, Calcasieu, and Sister Lakes, and Barataria Bay. Biological metrics (e.g., measures of macroinvertebrate, phytoplankton, or fish species richness, tolerance to disturbance, or feeding traits, and measures of oyster health), chemical constituents (e.g. water nutrients, salinity, dissolved oxygen) and physical variables (e.g. water current velocity and variability, and sediment substrate size and degree of compaction) will be compared to oyster density. Metrics with strong relations to oyster density will be combined to develop an ecological restoration index (ERI). The ERI, which can be used as a surrogate for oyster vitality, can then be applied to gage and monitor site-restoration potential and to indicate when ecological conditions are imbalanced at previously restored sites. As additional tools to inform managers how future changes in climatic, hydrologic, and trophic states will affect areas being considered for oyster restoration, two models will be constructed—a hydrodynamic-sediment transport-water quality model and an oyster population (dynamic) model. When coupled, these models will define how oyster population characteristics (e.g. growth, mortality, health, and recruitment) and environmental characteristics support adaptive management strategies for oyster habitat restoration under various environmental scenarios. This project will identify the ecological variables with the strongest relationships with oyster sustainability and will provide insight into overall ecosystem health (at monitored sites and future monitoring locations). The project also will provide important, scientific information that will be communicable to a wide range of the public who desire to have a better understanding of the ecological conditions necessary to sustain oysters (i.e. general public, oyster producers, and resource managers).	$4,300,000
Bottlenose Dolphin Photo-Identification Studies to Monitor Restoration Effectiveness in Louisiana	Centralized large-scale, collaborative photo-identification catalogs for bottlenose dolphins and other species have been established (e.g., the Gulf of Mexico Dolphin Identification System, or GoMDIS), providing a basis for tracking movements of individual animals beyond project study sites and detecting range shifts in response to environmental changes. Existing data systems need to be assessed, refined, and expanded to facilitate upload and analysis of a large number images and to improve data access and sharing by a diverse group of field researchers and partner organizations in Louisiana and throughout the Gulf to better determine connectivity and movements of bottlenose dolphins within and between adjacent water bodies. Periodic workshops are needed to ensure standardized methods for image acquisition and processing are being used and revised as necessary. Multi-year studies need to be expanded to include additional study areas in Louisiana and across the Gulf, particularly coastal and offshore areas affected by the oil spill. Further research is needed on: (1) the development of software to enable more effective and timely analysis and comparison of still and video images, (2) the potential for high-resolution aerial imaging systems to augment or replace traditional aerial and/or vessel surveys, and (3) the use of unoccupied aircraft systems (UASs) or drones to collect images of marine mammals independently or during traditional vessel surveys or other surveillance operations.	$0
Address Gaps and Enhance Capacity in the Current Capabilities of the Marine Mammal Stranding Network in Louisiana to Improve Timeliness of Response	This project will coordinate with federal and state agencies to identify what standardized protocols, training, support, data collection and analysis, equipment, and/or other resources are necessary to improve existing MMSN coverage and capabilities (i.e., conduct a gap analysis). After gaps are identified, the project will develop new partnerships, improve existing partnerships, and support resources and personnel to improve stranding response and data collection. It will focus on improving the capabilities and capacity for MMSN partners to conduct "routine" activities, as well as to respond to unusual or emergency events (e.g., mass strandings/Unusual Mortality Events). In addition, there will be an emphasis on improving stranding response in remote locations or locations with limited response capabilities. The identification and development of federal, state and local partnerships will facilitate access to resources (e.g., landing sites for dead	$0

and Diagnosis of Illness and Cause of Death	floating whales, disposal of carcasses, towing). The project will also place emphasis on improving triage capabilities for live stranded animals (including mass strandings), such as diagnostic equipment and live animal triage training, to increase animal survival. Additionally, development of region-wide standards and protocols, and implementing training, will improve data consistency and address how MMSN partners can support restoration efforts. As part of these efforts, a forensic toolkit will be created to identify and document human-related injuries and deaths in marine mammals, which could lead to possible mitigation measures for management. The project will also support the MMSN to archive, analyze, and track samples collected from stranded animals, which will improve diagnosis of illness and cause of death (may include barcode, organizational system, information management system, etc.). It may also increase capacity for the MMSN to conduct active surveillance to enhance detection of live and dead stranded, injured, or entangled marine mammals and for improved mortality estimates (e.g., boat surveys, beach surveys). This project will establish regular training sessions and workshops to maintain the MMSN's capabilities over time and through personnel turnover, as well as share information across the network about new threats and the efficacy of various response actions to those threats. Addressing gaps and enhancing capacity in the current capabilities of the MMSN will serve to improve timeliness of response and diagnosis of illness and cause of death in Louisiana. This project is anticipated to have positive impacts on the survival of many marine mammal species in the GOM, but in particular on coastal and estuarine stocks of bottlenose dolphins. Other offshore species that are subject to mass strandings or die-offs may also benefit, such as short-finned pilot whales and rough-toothed dolphins.	
Improve the Ability of Stranding Network Partners to Detect and Rescue Free-Swimming Marine Mammals That are Entangled, Entrapped or Out-Of-Habitat	This project aims to develop new and enhance pre-existing infrastructure capabilities within the Gulf of Mexico (GOM) region to respond to marine mammals that are entangled, entrapped, or out of habitat. It will involve coordination with federal, state, and marine mammal stranding network (MMSN) agencies to develop standardized protocols and identify training, support, equipment, and/or other resources that are necessary to establish rapid response teams (rescue personnel and vets) and equipment around the GOM for interventions on entangled, entrapped, or out of habitat marine mammals. Region specific standard operating procedures and protocols for these types of animals will allow for region-wide consistency in response, as well as the ability to respond rapidly to these events, thus enhancing survivability. The focus will be to identify, train, and support rapid response team members for entangled, entrapped or out of habitat animals to ensure timely response. This includes a rapid response team training workshop that covers all aspects of a live animal intervention (net handling, animal handling, boat maneuvering around nets, tagging, tracking of tagged animals) and travel support for MMSN partners to attend dolphin live capture/release health assessments for training in live animal capture and handling techniques. Additionally, this project will purchase equipment, including catch boat and net(s) to be staged strategically throughout the GOM (2-3 locations). There will also be funding, including vessel and personnel support, for pre-capture photo-id monitoring of entangled, entrapped, or out of habitat animals to monitor animal condition, determine extent of injury/entanglement, and ensure animals can be located on day of rescue. This project will also support the development of boat based disentanglement tools and techniques, to increase opportunities for intervention when a net capture and disentanglement isn't practical (e.g., animal isn't likely to be resighted or animal is in water too deep to safely capture). Also included in this project are satellite and or VHF monitoring tags that will applied as appropriate and support for post release tracking efforts (personnel and vessel). Improved post-release tracking is critical for understanding the survival of disentangled or relocated animals and for informing future intervention/release decisions.	$0
Monitoring the Response of Shorebirds and Their Prey to Louisiana Barrier Island Restoration to	Coastal Louisiana. This project would provide 1.) a means of determining the benefit of barrier island beach restoration to shorebirds, an injured resource, and 2.) a decision support tool for identifying optimal restoration sites with regards to benefits to shorebirds.	$2,000,000

Inform a Decision Analytical Framework to Guide Restoration		
Marine Mammal Conservation Aerial Outreach Banners	The use of aerial banners (small plane pulling long banner) to relay important educational messages to target audiences has proven an effective outreach tool; banners can be used to educate beach-goers and motorized & non-motorized (jet skis, surfers, paddle boarders, etc.) vessel operators about presence of marine mammals and laws protecting them in the Southeast U.S. This project will reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities which are known to occur in Louisiana because target audiences will become aware that these activities are harmful and illegal. The project may also reduce injury and mortality of marine mammals from vessel collisions by making vessel operators aware of the presence of whales and way to avoid vessels strikes. A banner with the message "Don't Feed Wild Dolphins, It's Illegal" has been flown over areas where this harmful and illegal dolphin interaction is known to occur but also in areas where there are large numbers of tourist. These banners have reached over 300,000 people during one flight alone; this is common during spring break and other peak seasons. Banners have also been used when whales are seen close to shore and in areas where there are large numbers of motorized or non-motorized vessels near whales; the banners have made vessel operators aware of the presence of the whale(s) to avoid vessel strikes and harassment. This project involves flying aerial outreach banners in 2 coastal areas in Louisiana, Mississippi, Alabama, where illegal feeding and harassment activities are known to occur. The customized banners will educate people below to make them aware that these activities are harmful and illegal. Banners will be flown on 10 days each year per location; season, historic tourism numbers, and events will be considered when choosing which days the banners are flown. Banners could also be flown at times when other marine mammals (i.e., orcas, Bryde's whales) are seen within practical flight distance from shore and in areas where vessels are near to inform those vessel operators of the presence of whales and tips on how to avoid them. This project will continue for 2 years.	$20,000
Marine Mammal Conservation Print Ads in Tourism & Trade Magazines	Print ads in tourism magazines can sometimes be effective in reaching large audiences with the desire to interact with marine mammal in the wild. Unfortunately, magazines offering discounted or probono ad space usually means small ads in the back of a magazine that will most likely be overlooked. This project includes funding a contract with a marketing agency to produce and coordinate full or half page color ads with premium locations within the tourism and trade magazine that are widely distributed throughout Louisiana and national readers that my visit Louisiana. Large colorful ads would attract readers and ensure these important messages are conveyed to target audiences. By choosing tourism and specific trade magazines to reach target audiences about these important issues effecting marine mammals in Louisiana and aid in their recovery, this project will: Reduce injury and mortality to bottlenose dolphins from hook-and-line fishing gear by educating fisherman about ways to avoid interactions with dolphins while fishing and provide them with Dolphin Friendly Fishing Tips; Increase bottlenose dolphin survival though better understanding of cause of illness and death as well as early detection and intervention of anthropogenic and natural threats because this audience would know how to help a stranded, injured or entangled marine mammal and to report these animals to the appropriate stranding network immediately; Reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because audiences will better understand the harm and consequence of these activities. They will learn how to recognize dolphin behaviors that are signs of harassment and also how to responsibly view dolphins in the wild; Reduce injury and mortality of marine mammals from vessel collisions by educating mariners about marine mammal viewing guidelines and precautions they can take to avoid vessel strikes.	$100,000
Printing and Distribution of Marine Mammal	Partners currently assist NOAA Fisheries with the distribution of dolphin conservation outreach materials and signs installation throughout the Gulf States. While these efforts are appreciated, outreach is inconsistent and often opportunistic; therefore lacking in Louisiana. This project would fund a full-time educator (2 years) to implement a	$200,000

Conservation Outreach Materials & Signs	thorough distribution plan and coordinate the installation of dolphin conservation signs Louisiana. The educator would document the distribution of all materials and message, as well as plot the installation of all signs on a map	
Reduce Bycatch of Dolphins in Shrimp Trawls through Characterization of Risk Factors	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips & Rosel 2014; Read et al. 2006). Dolphins are captured in shrimp trawls or entangled in the lazy line, with hundreds of mortalities estimated per year in the Gulf of Mexico otter trawl portion of the fishery (Soldevilla et al. 2015, 2016). Dolphins often interact with gear by directly pulling out and feeding on fish from the shrimp trawl net, foraging within the trawl net itself, and rubbing on and foraging around the lazy lines. For fishermen, interactions may cause frustration over potential lost catch and damaged gear. For dolphins, interactions may cause entanglement/capture in the trawl and lazyline, and potential retaliation by fishermen (Vail 2016; DOJ 2013). The nature of dolphin-trawl interactions may vary based on several factors, including gear type (e.g. otter vs skimmer trawl), gear configurations and fishing practices, location, and dolphin behavior. Therefore, identifying factors that increase the risk of dolphin entanglement/capture is crucial to informing conservation measures that will reduce related interactions and bycatch in the gear (Soldevilla et al. 2015; Hataway & Foster 2015). This project will conduct research to: (1) fully characterize the risk factors of dolphin entanglements/captures in both skimmer and otter trawls and other sources of interactions (e.g. fishermen retaliation); and (2) explore ways to reduce these risk factors (i.e. depredating gilled fish from trawl net). This project will collaborate with commercial fishermen by chartering four skimmer and four otter trawl vessels from different ports to document and characterize dolphin interactions with the gear in various locations. Underwater imaging devices (e.g. DIDSON, ARIS) will be used to image bottlenose dolphin interactions with the gear, along with detailed observations of dolphin behavior including number of animals observed per tow, when the animals appear during the fishing process, and if possible, the individual dolphin identities. Based on identified risk factors and types of interactions observed, conservation measures will be identified to evaluate and implement. This project will enhance survivorship and resiliency of bottlenose dolphins by identifying, evaluating, and implementing conservation measures to reduce dolphin bycatch and related mortalities	$550,000
Improve Bycatch Reduction by Enhancing and Expanding the Gulf of Mexico Shrimp Trawl Fishery Observer Program	This project will develop the information needed to reduce the bycatch of bottlenose dolphins in the shrimp fishery by enhancing: (1) observer coverage of both the skimmer and otter trawl portions of the fishery, and (2) observer data collection protocols. Specifically, observer coverage will be increased in inshore state waters of Louisiana, including non-federally permitted vessels and skimmer trawls (e.g. expand federal coverage into state waters, implement new program consistent with federal program, etc.). This will provide information on bycatch rates, estimate the distribution of fishery effort as it relates to estuarine stocks, and characterize patterns between dolphin interactions and spatiotemporal fishery distribution and gear type usage. Observer data collection protocols will also be enhanced by collecting: (1) genetic and photographic samples of bycaught animals and retaining the carcass for necropsy to improve species identification; and (2) additional information on trawl gear materials and configurations that may contribute to dolphin-gear interactions (e.g. lazy line, turtle excluder device descriptions) (Soldevilla et al; 2015, 2016). This project will enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects to reduce lethal dolphin bycatch in shrimp trawl gear. The observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions.	$14,100,000
Protect Wild Dolphin Billboards	This project will reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities known to occur in Louisiana because residents and visitors would become aware that these activities are harmful and illegal. Reducing injury, harm, and mortality to bottlenose dolphins will thus aid in their recovery. Billboards would be used to reach large audiences with important educational messages on highly traveled roads taken by residents and visitors to coastal areas of Louisiana. Billboard advertisements have the largest impact on the greatest number of people and are the most cost effective method for reaching target audiences.	$150,000

Chandeleur Islands Maintenance and Re-Vegetation		$3,500,000
Systematic Observer Coverage of the Menhaden Fishery to Improve Bycatch Reduction Efforts	This project includes design, print, install, and rent for media space for billboards. Billboard would convey brief but important educational messages and images about the harm in illegally feeding and harassing wild dolphins. Locations of 4 billboards will be determined by traffic patterns and distance to popular coastal area where illegal feeding and harassment has been known to occur. Billboards will be maintained in these 4 locations for 2 years to ensure constant and consistent educational messaging in a cost effective manner.	$2,500,000
Reduce Dolphin Bycatch in Gillnets through Enhanced Observer Program and Behavioral Observations	St. Bernard, Louisiana. The proposed project consists of four distinct strategic interventions: (1) revegetation from the wrack line to the foredune of the islands; (2) installation of sand fencing and vegetation form behind the sand fence to the barrier flats; (3) re-vegetation along the back bay flat to the intertidal zone of the islands; and (4) re-establishment of the extirpated species marsh-elder (Iva frutescens) and seashore-elder (Iva imbricata) on existing dunes that are +5 feet in height. Sand Live Oak may also be installed on the dunes at a later date. The cumulative benefits of these interventions will be the facilitation of sand retention and the promotion of accretion on the Chandeleur Islands, which will sustain habitat, encourage biodiversity, and maintain the islands as a barrier to storm surge. No dredging is proposed in conjunction with the proposed project.	$1,200,000
Evaluate and Implement Trap Pot Gear Modifications to Reduce Dolphin Bycatch	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips & Rosel 2014; Read et al. 2006). Although there is currently no systematic observer coverage of the Gulf of Mexico menhaden purse seine fishery, historic and recent bycatch events of bottlenose dolphins have been reported. An observer program operating between 1992 and 1995 in the Gulf of Mexico, estimated as many as 172	$400,000
Reduce Harm to Dolphins by Determining Scope of Hook and Line Fishing Gear Interactions and Fishermen Attitudes	dolphins were caught with up to 57 animals killed (Waring et al. 2015). A pilot observer program in 2011, documented three bycaught dolphins (Waring et al. 2015). Finally, fishermen reported 13 dolphin mortalities in their gear between 2000 and 2013 (Waring et al. 2015). A systematic observer program is crucial to determine statistically reliable estimates of bottlenose dolphin bycatch in the fishery and by dolphin stock. It will also characterize patterns of marine mammal interactions, spatiotemporal fishery	$1,200,000
Reducing Bycatch of Bottlenose Dolphins in Louisiana Commercial and Recreational Fisheries	distribution, and gear type usage. The menhaden fishery operates mainly in coastal and state waters of the Gulf, with the majority of effort occurring off Louisiana and Mississippi. The fishery operations are challenging to systematically observe with traditional observer coverage and in the way needed to	$0
Sea Turtle Conservation through Louisiana Shrimp Fishery Engagement	statistically estimate serious injury and mortality of marine mammals incidental to the fishery.	$1,228,639
Increase Capacity and Infrastructure to Improve Marine Mammal Response, Rehabilitation, Research Capabilities, and Public Awareness along the Louisiana Gulf Coast	Therefore, this project will develop, conduct, and implement systematic observer coverage of the menhaden purse seine fishery in a manner that overcomes the challenges with traditional observer coverage. This may include using alternative observer techniques combined with exploring the use of innovative technologies (e.g. drones, aerial observer in fishery spotter plane, etc.) to enhance observer coverage efforts. This project will enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects to reduce dolphin bycatch in menhaden purse seine gear. Conducting a systematic observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions.	$2,266,586

Increase Capacity and Infrastructure to Improve Sea Turtle Response, Rehabilitation, Research Capabilities, and Public Awareness along the Louisiana Gulf Coast	This project will develop information needed to further characterize and determine the magnitude and nature of dolphin interactions with gillnet gear operating in Alabama and Louisiana state waters by: (1) exploring the use of alternative methods, such as electronic monitoring, to overcome existing observer program challenges and enhancing/expanding observer coverage on state-documented commercial gillnet vessels in state waters. This information is needed to refine and enhance our understanding of fishing effort, catch, bycatch and interactions with bottlenose dolphins and conduct estimates of dolphin bycatch. (2) Conducting fine-scale behavioral observations of dolphins in areas where interactions are known to occur to further characterize the nature of their interactions with gillnets. This information will be used to identify, develop, test, and implement ways to prevent and reduce lethal interactions (e.g. testing gear and fishery practice modifications). This project will enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects for reducing dolphin bycatch in gillnet gear. Voluntary adoption of any gear modifications and fishery practice changes would be monetarily incentivized. Conducting a systematic observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions.	$985,465
Adaptive Management and Decision Support Tools for Oyster Reefs and Submerged Aquatic Vegetation in the Gulf of Mexico	This project will reduce dolphin bycatch in trap pots by conducting research to: (1) characterize and understand trap pot gear use, modifications, and performance in different geographic regions in Louisiana; and (2) examine the feasibility and effectiveness of potential gear and fishery practice modifications in collaboration with fishermen. The project will determine the feasibility of the specific trap pot gear modifications and its potential impact on fishing practices, gear performance and costs, as well as considering its performance in various environmental conditions and geographic areas. Potential effectiveness of reducing dolphin interactions/entanglements will be evaluated by observing whether any dolphin interactions and/or entanglements were documented with the gear (control and experimental) and at what frequency. The gear modification(s) and/or fishery practice change(s) that demonstrate the most bycatch reduction potential while be operationally feasible will be promoted to the fishery. Voluntary adoption of any gear modifications and fishery practice changes would be monetarily incentivized. This project will enhance survivorship and resiliency of bottlenose dolphins by identifying, evaluating, and implementing conservation measures to reduce dolphin bycatch in trap pot gear.	$12,173,500
Bottlenose Dolphin Health Assessments to Monitor Restoration Effectiveness in Louisiana	This project will reduce lethal impacts to dolphins from hook-and-line fishing related interactions known to occur within Louisiana waters by: (1) Conducting systematic surveys to determine the magnitude and extent of dolphin and hook-and-line gear interactions and characterize the nature of these interactions (e.g., mapping fishery effort distribution, identifying factors leading to dolphin-gear interactions, detecting hot-spot sites, etc.). (2) Conducting social science studies (e.g., surveys, focus groups, interviews) to characterize fishermen's attitudes and perceptions towards dolphins and fishing gear interactions, their likelihood to take various actions (both preventative and retaliatory) and their responses to various outreach messages and approaches. This project will survey anglers and for-hire boat captains/owners and their patrons. It will include fishermen fishing from both vessels and piers, fishing in a variety of habitats (i.e., coastal and estuarine), and targeting various fish species using different gear configurations in all coastal state waters. Project results will help identify what gear factors may increase the likelihood of interactions, the frequency of dolphin and gear interactions and approximate risk of lethal injury from interactions, and whether there are hot-spot areas where interactions are more likely to occur. We will then work with stakeholders to identify, develop, and evaluate conservation measures to reduce interactions (e.g., potential gear or fishing practice modifications, safe and effective deterrence techniques, etc). This project will enhance survivorship and resiliency of bottlenose dolphins by reducing lethal impacts resulting from fishing interactions between dolphins and rod and reel fishing gear. Repeating systematic surveys, social science studies and evaluating stranding data may be used for project monitoring.	$0

A Marsh Bird Monitoring and Assessment Program for Louisiana	Effort is needed in the following areas: · Increased levels of observer coverage on the above-mentioned fisheries/gear types/target species (particularly the shrimp trawl and gillnet fisheries) to provide better estimates of marine mammals injured or killed incidental to commercial fishing activities. Expanded observer coverage would also provide additional information needed by managers to determine factors associated with bycatch, such as gear type, time of day, bait type, fishing methods, areas fished, etc., and to identify, test, and implement measures to reduce bycatch. · Research and field studies to identify and test alternative observation methods that could be used to supplement or replace traditional human observers. Such methods may include, but are not limited to, the use of: remote observation platforms, underwater cameras, electronic monitoring, and unoccupied aircraft systems (UASs). · The identification of measures that can be used to reduce bycatch of marine mammals while maintaining the economic viability of those fisheries. Measures to investigate and test could include, but are not limited to, alternative fishing gear and fishing methods, time-area restrictions, and removal of lost or derelict fishing gear (i.e., traps, pots, and gillnets). 2 · The development of economic incentives for reducing marine mammal bycatch through, for example, incentive-based fishery bycatch measures. · Research on the ecological effects of fishing on marine mammals, their prey species, and the Gulf of Mexico marine ecosystem.	$0
Targeted Enhancement of the Chandeleur Island Chain: An ecosystem approach	Audubon Nature Institute's Gulf United for Lasting Fisheries (G.U.L.F.) team will partner with LGL Consulting to analyze historical data on inshore shrimp fishery efforts and tow time length, install Electronic Logbooks (ELBs) on skimmer vessels to determine how/if shrimp effort in Louisiana waters has changed since 2011, educate fishermen about methods that minimize sea turtle capture though direct outreach and workshops, and if there is a change in adherence to tow time regulations. G.U.L.F.'s role in this project is outreach and education to the industry; LGL will be responsible for ELB installation, data collection, and analysis.	$32
Improving Decision Support Tools for Restoration Planning in the Chandeleur Islands Ecosystem	The Coastal Wildlife Network (CWN), coordinated by Audubon Nature Institute in New Orleans, Louisiana, takes a comprehensive and proactive approach to wildlife response in Louisiana. The Louisiana Department of Wildlife and Fisheries (LDWF) is the primary response agency for stranded marine mammals in the state of Louisiana, and CWN serves as the primary response partner for the rescue, response, and rehabilitation of marine mammals in Louisiana. Audubon is seeking funding to increase Audubon's capacity to be a stronger partner to LDWF, support enhancement needs of Audubon's marine mammal rehabilitation program, and develop a permanent, emergency-ready network to provide coordinated response throughout the Gulf Coast.	$800,000
South Louisiana Wetlands Discovery Center	The Coastal Wildlife Network (CWN), coordinated by Audubon Nature Institute in New Orleans, Louisiana, takes a comprehensive and proactive approach to wildlife response in Louisiana. The Louisiana Department of Wildlife and Fisheries (LDWF) is the primary response agency for stranded sea turtles in the state of Louisiana, and CWN serves as the primary response partner for the rescue, response, and rehabilitation of sea turtles in Louisiana. Audubon is seeking funding to increase Audubon's capacity to be a stronger partner to LDWF, support enhancement needs of Audubon's sea turtle rehabilitation program, and develop a permanent, emergency-ready network to provide coordinated response throughout the Gulf Coast.	$8,200,000
Woodlands Trail Interpretive Center - Belle Chasse, Louisiana	One of the primary focus of our proposed study is to develop models and decision support tools to identify the optimal locations for restoration actions at our study sites but also elsewhere in the Gulf of Mexico for future projects. Required technologies for Adaptive Resource Management (ARM) include theoretical and mathematical expertise in the development of appropriate models of system dynamics and with the implementation of formal decision science methodologies for integrating restoration objectives, hypotheses of system behavior, monitoring and learning into a comprehensive and logical analytic framework. The proposed study would use monitoring information from ongoing studies (e.g., Barataria Bay, St. Andrew Bay, and Lone Cabbage Reef). Models of population dynamics will be developed for the study systems. We intend to use integrated population models of oysters implemented with a Bayesian approach	$6,377,110

	to implement these models. SAV communities will be modeled with a multistate modeling approach. Spatial optimization methods will consider uncertainty in population dynamics and environmental changes associated with climate change. Our models will incorporate information about wave energy, salinity and other key variables that can affect the structure and distribution of these systems.	
Recreational Riverfront Greenway Plaquemines Parish	There is a continued need for periodic health assessments of bottlenose dolphins in Barataria Bay, Mississippi Sound, and reference populations in Sarasota Bay to monitor the effectiveness of, and potential impacts from, restoration activities being conducted in Louisiana waters. The health assessments would follow the same protocols and procedures that have been developed and implemented previously in Louisiana waters. The future vision is to obtain more information from remote sampling of bottlenose dolphins injured by the oil spill, including biopsy, breath, and tagging. This would minimize the need for capture-release health assessments because they represent higher risk to dolphins and to the team, and because of the difficult logistics and high costs. We also need coordinated data management, mapping, and spatial/temporal analysis to maximize the information gained from available samples.	$6,291,715
Bayou Terre Aux Boeufs Ridge Restoration and Armoring	Coastal Louisiana. The purpose of this project is to (1) create a coast-wide monitoring program for coastal marsh birds in Louisiana that will track broad scale patterns of species occurrence, (2) provide occurrence and abundance data (and other data as needed) at restoration sites to assist in evaluating restoration efforts in an adaptive management framework, and (3) assess the cumulative effects of all marsh restoration projects to achieve a sustainable environment for marsh birds coast-wide.	$32,500,000
Bayou La Loutre Ridge Restoration	Chandeleur Island Chain - Breton National Wildlife Refuge. Louisiana Trustees propose targeted sediment renourishment (~140 acres) within the southern end of the Chandeleur island chain to create/enhance barrier island habitats including beach, dune, and back barrier marshes. In tandem, vegetative plantings and sand trapping techniques (e.g. sand fencing) will be implemented within the project location to bolster habitat diversity, improve water quality and increase the island's overall lifespan. Finally, seagrass plantings (select species) will be implemented in support of increasing available foraging, nursery and refugia habitats and benefits thereof for endemic and migratory species.	$16,500,000
Lake Lery Marsh Creation	Chandeleur Islands. The objective of the proposed project is to develop a spatially-explicit, decision-support tool to help resource managers evaluate potential restoration investments that will maximize benefits across multiple resources in the Chandeleur Islands and support monitoring and adaptive management needs.	$21,000,000
Louisiana Oyster Cultch (Phase 2)	The South Louisiana Wetlands Discovery Center aims to revolutionize how we think, teach, and learn about Louisiana's	$4,078,400
Acquisition and Restoration of Forested Wetlands in the Barataria Basin Plaquemines Parish	disappearing coast. This innovative project, which began in 2003, will be located in the heart of the Barataria-Terrebonne	$5,871,000
Enhancing Capacity for Marine Mammal Stranding Response in Louisiana	National Estuary. As a STEM educational center, it will enable students and adults aff ected by the BP oil spill to connect with	$2,240,400
Lower Atchafalaya River Outlet Canal Will Generate a New Lobe in the Atchafalaya Basin	our natural surroundings in a more meaningful way than traditional schools or museums. More importantly, it will provide	$0
Mississippi Sound Protection Project	our youth with the skill set necessary to adapt to a changing environment while also providing a recreatioon opportunity	$30,000,000

Due Diligence for Louisiana Land Conservation	for the whole family. The Wetlands Discovery Center will be built on 2.4 acres near the Main Branch Library in Houma, LA and will be constructed in four phases with a total cost of $8.2 million. The Construction Documents for the fi rst phase have already been completed. Phase I is ready to be constructed and has a cash match, but lacks the funds necessary for completion. Once completed, our organizaton will finally have the capacity to expand our existing educational programs and develop new opportunities	$150,000
Fifi Island Ridge	for students to learn about fishing, cast netting, kayaking, boating safety and other recreational activities. The Wetlands Nature Exhibit will be developed as Phase I of this project representing over 17,000 square feet of manmade wetlands that will be used for hands-on learning and recreation. Components of this phase include a half-acre pond, two fi shing piers, parking, an educational pavilion with restrooms and a boardwalk. This phase is estimated to cost $1.3 million. More information about our future home and our programs can be found on our website at www.slwdc.org.	$7,437,000
Bayou Lafourche Marsh Creation	Woodlands Conservancy has managed 650 acres of contiguous forested wetlands in Plaquemines Parish, known as Woodlands Trail and Park Bird Sanctuary for the past fourteen years. With support from the owners of the property, Plaquemines Parish Government, Woodlands Conservancy is in the process of acquiring the property to ensure that it is protected in perpetuity. Upon a small footprint within the forest, we seek to build and nurture a dynamic public interpretive center that will provide visitors and scheduled school groups with the opportunity to learn about the environmental and cultural history of the surrounding area. With our growing presence and momentum towards both expanding land holdings and intensified restoration efforts in the bottomland hardwood forests of Plaquemines and Orleans Parishes, creating and populating such a facility is the next critical step in our commitment towards restoring and stewarding this vital but fast disappearing Louisiana landscape. This center will serve as a natural history museum and visitor welcome facility for those recreating on the lands managed by Woodlands Conservancy. It will also provide the jumping off point for field trips and environmental education activities for K-12 students and provide a gathering place for interest groups who seek to be inspired by the tranquil surroundings of a bottomland hardwood forest. Finally it will provide us with a physical home to house our long-term applied research efforts and equipment directed at halting invasive species and reforesting this region of coastal Louisiana.	$30,400,000
Atchafalaya Resilience Lab at Morgan City, LA	The Recreational Riverfront Greenway project will allow the acquisition from a willing seller of 509.7 acres that are adjacent to Woodlands Trail, an existing recreational facility in Plaquemines Parish. The combined properties will provide over 1100 acres of a contiguous greenway corridor for wildlife habitat, storm attenuation and recreational access. The property is a combination of bottomland hardwoods, wetland areas, open areas and WWII Ammunition Magazines. The acreage will allow low impact public recreational access to the riverfront, open areas for picnicking and open wetland areas for wildlife viewing. The property lends itself for interpretive opportunities to educate the public about WWII history, the Korean War, Fort St. Leon Planation, Fort St. Leon and the English Turn historical event of 1699. Future projects should address invasive species removal and habitat enhancement.	$50,800,000
Atchafalaya Resilience Lab at Morgan City, LA	Delacroix, Louisiana. St. Bernard Parish Government (SBPG) is requesting that the Louisiana Natural Resource Damage Assessment (NRDA) Trustee Implementation Group (LTIG) consider funding the engineering/design and construction of the Bayou Terre aux Boeufs Ridge Restoration and Armoring project. The proposed project consists of approximately twenty (20) miles of ridge restoration and 3.42 miles of shoreline protection (armoring) along the bayou in St. Bernard and Plaquemines parishes. The scope of work is similar to what has been included in Louisiana's Comprehensive Plan for a Sustainable Coast (2017 State Master Plan) and the SBPG Coastal Strategy Document (2016; 2018). The total project budget is estimated to be $32.5 million. Since the proposed project would restore valuable habitat for many bird species adversely impacted by the BP Oil Spill, SBPG proposes that it be classified as a bird habitat restoration effort.	$50,800,000
Atchafalaya Resilience Lab at Morgan City, LA	Hopedale, Louisiana. St. Bernard Parish Government (SBPG) is requesting that the Louisiana Natural Resource Damage Assessment (NRDA) Trustee Implementation Group (LTIG) consider funding the engineering/design and construction of	$50,800,000

	additional phases of the Bayou La Loutre Ridge Restoration project. The remaining phases of the proposed project consist of approximately fifteen (15) miles of ridge restoration along the bayou. The scope of work is similar to what has been included in multiple iterations of Louisiana's Comprehensive Plan for a Sustainable Coast (State Master Plan) (2012; 2017) and the SBPG Coastal Strategy Document (2016; 2018). The total project budget is estimated to be $16.5 million. Since the proposed project would restore valuable habitat for many bird species adversely impacted by the BP Oil Spill, SBPG proposes that it be classified as a bird habitat restoration effort.	
Zero Wash-Away of Marshes in Louisiana project	Delacroix, LA. SBPG is in the process of completing engineering/design for Lake Lery Marsh Creation, Phase 3 on the northern banks of Lake Lery, and is requesting that the Louisiana Natural Resource Damage Assessment (NRDA) Trustee Implementation Group (LTIG) consider funding the construction of the project. The proposed project consists of the creation or nourishment of nearly four hundred (400) acres of marsh and the protection of approximately 2.5 miles of shoreline along the northern banks of Lake Lery. The scope of work is consistent with what has been included in Louisiana's Comprehensive Plan for a Sustainable Coast (2017 State Master Plan) and the SBPG Coastal Strategy Document (2016; 2018). The total construction budget is estimated to be approximately $19.7 million. Since the project would provide valuable habitat to many bird species adversely impacted by the BP Oil Spill, SBPG proposes that it be classified as a bird habitat restoration effort.	$380,000,000
Scaled Down Test of Mid-Barataria Area Sediment Collection 10,000 To 1	Oyster productivity in the Breton Basin, south of the Mississippi River Gulf Outlet (MRGO), has suffered as a result of the BP Oil Spill, the introduction of freshwater from the Mississippi River at Mardi Gras Pass, and other environmental factors. Consequently, it is critical that stakeholders capitalize on the ideal conditions that exist in much of the eastern Biloxi Marsh Complex and facilitate oyster productivity in the area to the extent possible. The success of the Louisiana Oyster Cultch project (2013, Natural Resource Damage Assessment Early Restoration) in Drum Bay and other locations in the Biloxi Marsh is evidence that the Louisiana Natural Resource Damage Assessment (NRDA) Trustee Implementation Group (TIG) is capable of successfully investing recovery funds in projects that directly benefit fisheries impacted by the BP Oil Spill. St. Bernard Parish Government (SBPG) is requesting that the Louisiana TIG consider funding the installation of an additional twelve hundred (1,600) acres of cultch on four sites located in the Biloxi Marsh Complex. The proposed scope of work for the project is consistent with the previous Louisiana Oyster Cultch project, although based on recent consultation with local commercial oyster fishermen, some modifications have been included.	$34,000
Caernarvon Diversion Testing Plants Inside and Outside Site	The Acquisition and Restoration of Forested Wetlands in the Barataria Basin will allow the acquisition from a willing seller of 509.7 acres that are adjacent to Woodlands Trail, an existing 650-acre forested wetland in the Orleans/ Plaquemines Parish peninsula. The combined properties will provide over 1100 acres of a contiguous greenway corridor for wildlife habitat, storm attenuation and educational/recreational access within the New Orleans Metropolitan Area. The property is a combination of bottomland hardwoods, wetland areas, open areas and several historical sites.	$30,000
Restoration of Raccoon Island, LA	On average, there are approximately 81 cetacean (whale and dolphin) strandings along the coast of Louisiana each year. Of these, 86% are bottlenose dolphins. However, in 2019 (January 1- May 31), there have already been more than 90 bottlenose dolphin strandings, straining the current capacity of the MMSN. This project aims to address gaps and enhance capacity in the current capabilities of the MMSN in Louisiana to improve timeliness of response, enhance survival, and improve diagnosis of illness and cause of death in cetaceans to better understand natural and anthropogenic threats, which will inform restoration planning, monitoring and adaptive management. This project will fund a Stranding Coordinator for Louisiana to coordinate with federal and state agencies, improve existing partnerships, and identify additional partners and resources to enhance capacity for stranding response. The Stranding Coordinator will develop those partnerships to improve existing MMSN coverage. This project will also fund equipment and resources to allow the Stranding Coordinator to respond and/or facilitate the response to and investigate stranded animals until other partners can be trained, authorized, and are able to function independently. The project also funds additional resource	$94,255,000

	needs (e.g., equipment, supplies, etc.) for authorized stranding network partners in the State. Addressing gaps and enhancing capacity in the current capabilities of the MMSN will serve to improve timeliness of response and diagnosis of illness and cause of death in Louisiana. This project is anticipated to have positive impacts on the survival of many marine mammal species in the GOM, but in particular on coastal and estuarine stocks of bottlenose dolphins, through enhancing activities such as responding to stranded dolphins, rescuing out of habitat, entrapped, or entangled dolphins, and improving reporting among the general public. In addition, this project will increase understanding of natural and anthropogenic threats to dolphins, which will inform restoration activities. Other offshore species that are subject to mass strandings or die-offs may also benefit, such as short-finned pilot whales and rough-toothed dolphins due to enhanced capacity and rapid response.	
Isle Au Pitre Restoration	Below Morgan City installed at Cutoff Island location. An ARO (Atchafalaya River Outlet) canal concept for reducing flood waters in mid-south Louisiana by adding a small canal or adding a larger canal example: 8 mile 500 ft wide canal on the lower Atchafalaya River as a parallel connection near cutoff Island to approximately sea level elevation. Flood waters will drop 6 to 12 inches in the example and may remove need for the future 150,000 CFS diversion on the lower Atchafalaya River and remove need for a flood gate in Bayou Chene. Avoca Island Cutoff south of Morgan City, La.	$41,808,000
Terrebonne Bay Houma Navigation Canal (HNC) Island Restoration	Three Mile Bay. 100+ acres of land creation. The land will be created with geo-tube containment and protected by surrounding the entire mass with articulated concrete mats. Vegetation and fossilized shell boulders will be placed on the new land. 100-200 acres of cultch (oyster habitat) using crushed concrete. Entire cultch plant surrounding the island will be seeded with 2000 baskets of seed oysters on shell. Total net benefit up to 300 acres not including extended water quality benefits.	$20,000,000
Atchafalaya Resilience Lab and Interpretive Center at Morgan City, LA: Restoring and Protecting Coastal Habitats for Birding Experiences	The Partnership for Gulf Coast Land Conservation (Gulf Partnership), is a network of 28 non-profit land conservation organizations trusts working in the Gulf of Mexico Region. Through this project, the Gulf Partnership seeks to support the Louisiana Trustee Implementation Group's (LATIG) efforts to create, restore, and enhance coastal wetlands. Through the Due Diligence for Louisiana Land Conservation Project (Due Diligence Project), we can also aid the LATIG in achieving its other restoration goals, including restoring and protecting bird habitat, and reducing nutrients in coastal waters as well as restoring oysters, sea turtles, and marine mammals by improving water quantity and quality. We are requesting $150,000 over 3 years for a matching grants program for due diligence costs for projects located in Louisiana. These funds will be used to provide small grants to Gulf Partnership member organizations to allow them to develop high quality land conservation projects that will help Louisiana meet its coastal restoration goals. The small grants will be between $5,000 - $25,000 and will be used to complete appraisals, appraisal reviews, title exams, environmental and baseline studies, surveys, closings and other due diligence for land acquisition and conservation easement projects. These dollars will be matched 1:1 with funds from the Gulf Partnership's Gulf Coast Land Conservation Project Assistance Fund (PAF). The PAF is an existing matching grant program that helps land trusts develop and pay for the upfront costs associated with land conservation projects proposed for Deepwater Horizon (DWH) oil spill funds in the Gulf region. The Due Diligence Project is designed to increase the pace and scale of land conservation in coastal Louisiana. Louisiana is making huge investments in coastal protection projects through the Coastal Master Plan. Land conservation can be a key strategy in protecting those investments by ensuring that the land and water that connects to rebuilt land is conserved and properly managed.	$50,800,000
Lower Mississippi River Silt to The Marshes	The objective of the Fifi Island Ridge Project is to create habitat and protect the Barrier Islands, particularly Grand Isle, through the construction of approximately 22 acres of ridge. A 5,916 foot forested, coastal ridge would be constructed along the north bank of Bayou Rigaud. The coastal ridge would be planted with appropriate woody vegetation with the goal of restoring coastal live oak-hackberry forest which is rated as State imperiled (S1S2) priority by the State of Louisiana. The coastal ridge habitat would provide critical habitat for trans-gulf migratory bird species including threatened and endangered species and species and types of habitat that were directly impacted by the Deepwater	$150,000

	Horizon Oil Spill. The ridge will function as a barrier to further protect against impacts on Louisiana's only accessible and inhabited barrier island by reducing storm surge in Caminada Bay. Previous storms have demonstrated that a forested ridge on Fifi Island protects infrastructure on Grand Isle during a storm especially when faced with winds and surge coming from the north. This project will have a synergistic effect on the previous and proposed efforts of the Grand Isle Levee District, Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) and others to construct rock dikes and shoreline protection around the perimeter of Fifi Island.	
Grande Cheniere Ridge Marsh Creation	The Bayou Lafourche Marsh Creation (BLMC) Project area is located in the Barataria Basin in Lafourche Parish, Louisiana within CPRA's 2017 Master Plan. The proposed marsh creation cells will be located east of Bayou Lafourche and south of the Larose to Golden Meadow Hurricane Protection System. The fill areas consist of two primary locations totaling 433 acres. The proposed borrow source for the BLMC Project will be from dredged material within Bayou Lafourche.	$65,000,000
Central Wetlands Hydrological Restoration and Marsh Creation	The Atchafalaya Resilience Lab (ARL) would document, complement, and field-test thework of the Consortium for Resilient Communities in assessing the health, social, and economic wellbeing of Gulf coastal communities. An ARL at Morgan City provides apermanent facility dedicated to the health and viability of Gulf Waters. In the publication, Morgan City and Berwick: Building the Foundation for a new Economy along the Atchafalaya River, The Urban Land Institute, a global organization in land use planning recommended building a resilience lab at Morgan City. The lab would add a structural presence for first-hand mitigation against additional coastal impacts. Duplicative efforts imperil vulnerable populations. With an ARL, collaboration between organizationsoptimizes multi-organizational and interdisciplinary approaches resulting in a concertedresponse to impacted populations. Populations of the Gulf coast are diverse. One cannot rely on generational fisherman as many have become weary waiting forfishing stocks to repopulate. Each population brings their own nuances and responses tothe event. A presence in the diverse coastal community is warranted. As the Gulf continues to recover from the Deepwater Horizon event, learning needs to adjust to accommodate and expedite its recovery. Foran example of where knowledge gaps exist, Morgan City is the location of the SouthLouisiana Community College – Young Memorial Campus and it has a proven marinetraining center. The college offers courses in Advance Ship Handling and Apprentice Steersman. To advance Gulf Recovery, addendum skills impacting marine animalavoidance can be incorporated into these courses increasing mariner performance to benefit Gulf Marine Life. The school houses a simulator for avoidance steering and routeplanning. The resilience lab would monitor and survey the impact of this workforce development.	$60,000,000
Pointe Aux Chenes Ridge Restoration and Marsh Creation	The Atchafalaya Resilience Lab (ARL) would document, complement, and field-test thework of the Consortium for Resilient Communities in assessing the health, social, and economic wellbeing of Gulf coastal communities. An ARL at Morgan City provides apermanent facility dedicated to the health and viability of Gulf Waters. In the publication,Morgan City and Berwick: Building the Foundation for a new Economy along the Atchafalaya River, The Urban Land Institute, a global organization in land use planning recommended building a resilience lab at Morgan City. The lab would add a structural presence for first-hand mitigation against additional coastal impacts. Duplicative efforts imperil vulnerable populations. With an ARL, collaboration between organizationsoptimizes multi-organizational and interdisciplinary approaches resulting in a concertedresponse to impacted populations. Populations of the Gulf coast are diverse. One cannot rely on generational fisherman as many have become weary waiting forfishing stocks to repopulate. Each population brings their own nuances and responses tothe event. A presence in the diverse coastal community is warranted. As the Gulf continues to recover from the Deepwater Horizon event, learning needs to adjust to accommodate and expedite its recovery. Foran example of where knowledge gaps exist, Morgan City is the location of the SouthLouisiana Community College – Young Memorial Campus and it has a proven marinetraining center. The college offers courses in Advance Ship Handling and Apprentice Steersman. To advance Gulf Recovery, addendum skills impacting marine animalavoidance can be incorporated into these courses increasing mariner performance to benefit Gulf Marine	$45,000,000

	Life. The school houses a simulator for avoidance steering and routeplanning. The resilience lab would monitor and survey the impact of this workforce development.	
Bayou Terre Aux Boeufs Ridge Restoration and Marsh Creation	The Atchafalaya Resilience Lab (ARL) would document, complement, and field-test the work of the Consortium for Resilient Communities in assessing the health, social, and economic well being of Gulf coastal communities. An ARL at Morgan City provides apermanent facility dedicated to the health and viability of Gulf Waters. In the publication,Morgan City and Berwick: Building the Foundation for a new Economy along the Atchafalaya River, The Urban Land Institute, a global organization in land use planning recommended building a resilience lab at Morgan City. The lab would add a structural presence for first-hand mitigation against additional coastal impacts. Duplicative efforts imperil vulnerable populations. With an ARL, collaboration between organizationsoptimizes multi-organizational and interdisciplinary approaches resulting in a concertedresponse to impacted populations. Populations of the Gulf coast are diverse. One cannot rely on generational fisherman as many have become weary waiting forfishing stocks to repopulate. Each population brings their own nuances and responses tothe event. A presence in the diverse coastal community is warranted. As the Gulf continues to recover from the Deepwater Horizon event, learning needs to adjust to accommodate and expedite its recovery. Foran example of where knowledge gaps exist, Morgan City is the location of the SouthLouisiana Community College – Young Memorial Campus and it has a proven marinetraining center. The college offers courses in Advance Ship Handling and Apprentice Steersman. To advance Gulf Recovery, addendum skills impacting marine animalavoidance can be incorporated into these courses increasing mariner performance to benefit Gulf Marine Life. The school houses a simulator for avoidance steering and routeplanning. The resilience lab would monitor and survey the impact of this workforce development.	$150,000,000
New Orleans Landbridge East Marsh Creation and Nourishment	Zero Wash-Away Of Marshes in Louisiana (ZWOM) and this concept will exceed all diversions land building capability along the Mississippi River, I.E. almost no-bed load (rocks and sand) will flow off the continental shelf and zero cost for diversion structures because they won't be built. One fourth of Louisiana Marshes will remain stable in terms of zero washing-away and three fourths of the other marshes can also fulfill this statement. Below 2019 scientific article supported (implied) proceeding with major diversions near the Bird Foot Delta and holding off on upstream diversions (unconsciously) such as Mid-Barataria and Mid-Breton Projects. Sixty three (63) times more nutrients will be sent into marshes for upstream major projects as compared to existing known small diversion and plant root system will fail to support these marshes during hurricanes. Marsh wash-away from hurricanes has occurred with Small diversions, therefore major systems should not be located too far north of Venice because many of these marshes will receive nutrients weakening their root systems from holding to soil. Louisiana should follow known science of rivers/wetlands restoration or there is a grave chance of washing-away much of Louisiana marshes in the next hurricane.	$370,000,000
Southeast Marsh Island Marsh Creation and Nourishment	Please see my drawings, SK-1, 2,3,4,5 and Cal-1, with past publicized major diversions located close to the Bird Foot Delta. Nutrients will least not affect marshes north of the delta and longshore-transport of sand/sediment along the coast will support land building on much of Southeast Louisiana coast. Upstream marshes will have no wash-away from these diversions (River tie-ins can also be located below Venice). SK-4 shows dredged pumped sediment from the river and also sediment from the coast to replenish marshes having subsidence. Also it removes essentially all sources of nutrient waters that result in wash away of marshes and save over $2 Billion on diversions. SK-5 has an example sediment catch basin for maximum draw of sediment from the Mississippi River.	$170,000,000
Impacts of Overwash on Sea Turtle and Shorebird Populations on Louisiana Barrier Islands and Headlands	Carlise, Location for the Mid-Barataria Diversion Project. Perform a scaled down test of ZMOM 10,000 to 1. Ref, previous sent Zero Wash-Away of Marshes in Louisiana (ZWOM) project.	$1,779,286

Terrebonne Basin Ridge and Marsh Creation Project: Bayou Terrebonne Increment	Carlise, Location for the Mid-Barataria Diversion Project. Before installing diversions below New Orleans along the Mississippi River, field test should be completed similar to Sk-7, 8, 11, and 12 by testing 42 acres lost in small diversions with comparison to non-nutrient flooded marshes.	$176,000,000
Bird-Foot Delta Hydrologic Restoration Project	Region III, Terrebonne Basin, Terrebonne Parish, Isle Dernieres Barrier Islands Refuge (LDWF ownership). Construct approximately 230 acres (20 acres dune habitat to a post-construction elevation of 6' NAVD 88, 120 acres supratidal habitat to a post-construction elevation of 4' NAVD 88, and 90 acres tidal/subtidal habitat to a post-construction elevation of 3' NAVD 88) supporting nesting brown pelicans, terns, skimmers, gulls, egrets, and herons (wading birds).	$165,000,000
New Orleans East Landbridge Restoration Increment 1	St. Bernard Parish, LA/Chandeleur Sound. The marshes of St. Bernard Parish and Chandeleur Sound are home to numerous small bird rookeries. Natural and manmade forces have contributed to the erosion of this rookery. Isle au Pitre is an important rookery in this basin however pelicans no longer nest on this island due to loss of quality habitat due to loss of elevation. This project proposes to utilize dredged sediment to enlarge and restore elevation of the island to improve the quality and quantity of nesting habitat for a number of colonial nesting waterbirds including brown pelicans, wading birds, terns, and gulls. Isle au Pitre used to be an important colonial bird rookery in St. Bernard Parish. It once was large in size and sufficient in elevation and supported high numbers of nesting birds. The island is currently 12.8 acres in size, but suitable nesting habitat on the island is limited to a few terns, skimmers, and gulls and is less than 2 acres in size. Island area has decreased by approximately 73% in the past 16 years. If this island is not restored or protected it will likely erode to open water and suitable nesting habitat on the island will be lost. Bird species that currently depend on this island for nesting habitat include rail, skimmers, and sea gulls.	$0
Oyster Shell Recycling to Support Coastal Restoration and Resilience	Terrebonne Bay. Terrebonne Bay Houma Navigation Canal (HNC) Island (HNC Island) is an important bird rookery within the State of Louisiana's coastal zone. However, natural and manmade impacts, with emphasis placed on the Deepwater Horizon oil spill (DWH or the Spill), have resulted in significant natural resource injury. Project is designed to enlarge (~29.7 acres to ~50 acres) and elevate (+1.5 to 3.5 NAVD88, final elevation) the island utilizing beneficial dredged sediment. Project will increase nesting habitat availability and quality for colonial waterbirds (e.g., brown pelicans, wading birds, terns, skimmers, and gulls) and other species impacted by the Spill.	$0
Saving the Gulf Coast One Bale at a Time.	The goals of the project are: 1) to provide a resilience lab in an optimum locale (Siting of project 5.27) for protecting and restoring coastal estuaries and habitats in the wake of the DWH oil spill and during heightened coastal erosion and sedimentation response, and 2) to provide an interpretive center that restores bird populations and provides confidence that birds and the estuaries that support the population are recovering and being monitored.	$250,000
Louisiana Gulf Coast Oyster Shell Recycling	Carlise, Location for the Mid-Barataria Diversion Project. A Concept for Preventing Marsh wash-away in the Lower Mississippi River Valley; Marsh Gold Is Light Sediment (Silt) with removed Man-Made Fertilizer (Marsh Poison). Mineral sediment is needed to build and sustain strong marsh soils that can withstand storm surge. Sand dredged from the river bottom can and is being used to restore wetlands, but only dredging this material is not enough. SK-Flow and SK-5A is Pumped flow of Heavy and light sediment only (no fertilizers) to our marshes.	$8,000,000
Woodlands Trail - Greenway Corridor Project (031105-262)	Barataria Basin, Plaquemines Parish. The primary goal is to re-create marsh habitat in the open water areas and nourish marsh along the eastern side of the Bayou Grande Cheniere ridge. Specific goals of the project are: 1) Create approximately 500 acres of marsh with dredged material from the Mississippi River; 2) create 10,820 linear feet of forested coastal ridge habitat. As a secondary benefit this project will help build a southern land bridge in the Barataria Basin. Riverine sediments will be hydraulically dredged and pumped via pipeline to create/nourish approximately 500 acres of marsh. Containment dikes will be constructed, as necessary. Tidal creeks will be dredged, as needed, to promote hydrologic activity and healthy marsh growth. Approximately 10,820 linear feet of forested coastal ridge will be	$8,680,000

	constructed along Bayou Grande Cheniere. The current proposal is to create the ridge using material dredged from the Mississippi River. Herbaceous plantings (e.g., seashore paspalum) will occur after construction.	
Chenier Ronquille Barrier Island Restoration Project	St. Bernard Parish: Central Wetlands near Violet Siphon and North to Bayou Bienvenue area. Dedicated dredging of sediments from the Lake Borgne or Mississippi River (or other source) will be used to create emergent marsh adjacent to the headwaters of Bayou Bienvenue. The project would benefit 500-600 acres of wetlands by converting open water into marsh and nourishing existing marsh remnants. Restoration of the hydrology by making strategic cuts in the spoil banks would benefit the wetlands by restoring tidal exchange, increasing soil strength, and counteracting storm surge. Additionally, vegetation would benefit from periods of drying to allow the vegetation time to recover from waterlogged conditions.	$35,000,000
Woodlands Trail - Interpretive Center (031105-264)	Terrebonne Parish: on the parish line between Terrebonne and Lafourche Parishes. The proposed project would create and fortify 31,907 linear feet of ridge. The proposed project will create/nourish 473 acres of marsh by dredging sediment from designated borrow sources in Lake Raccourci or Lake Felicity. Containment features would be degraded or gapped as needed to promote tidal exchange after consolidation of the fill material. 50% of the newly created area will include vegetative plantings.	$2,029,850
Acquisition of At-Risk Landscape and Developing Independent Science-Based Priority Measures for America's Delta	Bayou Terre aux Boeufs begins near the town of Delacroix; straddles the St. Bernard/Plaquemines Parish line. Create approximately 90,000 linear feet of ridge along Bayou Terre aux Boeufs (north section 28387 ft; central section 28218 ft; south section 30912 ft) to provide coastal upland habitat, restore natural hydrology, provide storm surge attenuation, and improve local community resilience. Create/nourish approximately 1500 acres emergent marsh (north section 770 acres; central section 286 acres; south section 443 acres).	$100,000,000
Rawhead Island Living Shoreline Protection Project	The proposed project would create and nourish approximately 4,000 acres of marsh on the eastern end of the land bridge near Rabbit Island, northwest to Goose Pond and west to Bayou Bay Jaune. This project would create and nourish marsh that would maintain the separation between The Rigolets and Lake St. Catherines. Creating and nourishing the marsh in the project location would support the New Orleans landbridge as the last line of defense for the New Orleans metro area. The Chandeleur Islands and Biloxi marsh serve as the first and second lines of defense, respectively.	$1,200,000
Keelboat Island Living Shoreline Stabilization Project	The project would utilize hydraulic dredging from an offshore borrow site (potentially the same one used for TV-21) to create/nourish approximately 3200 acres of emergent marsh by completely filling in open water and deteriorated areas and use unconfined or limited confinement techniques allowing finer material to flow through the interior marsh areas and provide nourishment. Borrow material will be targeted from the state offshore area to limit water quality impacts and minimize impacts to potential oyster bed areas. This project would complement the constructed Marsh Island Hydrologic Restoration (TV-14) and the East Marsh Island Marsh Creation (TV-21) projects on the east-end of Marsh Island.	$300,000
Early NRDA Restoration Louisiana Delta	Inundation occurs from overwash of beaches during extreme high tide or storm events and/or from a rising water table and can impact habitats in multiple ways. Direct mortality of eggs can occur when nests are washed away or if eggs sit in water for long periods of time thereby drowning developing embryos. However, inundation can have many indirect effects such as altering habitat, increasing predation risk, and reducing or altering available habitat. To address uncertainty related to overwash/inundation and aid in implementing the objectives identified in the PDARP to improve habitats for survival and productivity, we propose the following objectives: 1. Evaluate risk of inundation to habitats on Louisiana barrier islands and headlands; 2. Evaluate the impact of inundation on sea turtles and birds; 3. Evaluate restoration projects in relation to inundation risk.	$0

Bioremediation of Estuaries and Oil Affected Intertidal Areas	The purpose of the Terrebonne Basin Ridge and Marsh Creation Project is to restore ridge and marsh habitat impacted in the State of Louisiana as a result of the Deepwater Horizon (DWH) oil spill. The project as currently envisioned would restore 70 acres of earthen ridge and create 1,499 acres of marsh.	$0
Vessels of Opportunity	This proposal is a request for engineering and design funds to design a project to restore the hydrology of the Mississippi River Bird-foot Delta. To accomplish this, we propose dredging Pass-a-Loutre, South Pass, and Southeast Pass in order to reconnect the Mississippi River with the marshes of the Eastern and central bird-foot delta. The project seeks to accomplish four goals: 1. Restore riverine processes to enhance natural marsh accretion via existing small sediment diversions (crevasses) – creating approximately 750 acres of tidal wetlands; 2. Build and enhance over 1,500 acres of subtidal mudflats and submerged aquatic weed beds; 3. Use dredged sediment beneficially to create over 1,000 acres of new fresh and brackish marsh; 4. Use dredged sediment to create approximately 20 acres of beach habitat for colonial nesting water-birds such as terns, skimmers, and solitary shore birds.	$0
Codfish Point Living Shoreline Stabilization Project	This project will restore approximately 1200 acres of emergent herbaceous wetland and construct approximately 20,000 linear feet of living shoreline.	$1,800,000
Drum Bay Island Living Shoreline Stabilization Project	We are seeking $3.675 million over 3 years to support and expand CRCL's Oyster Shell Recycling Program (OSRP) to advance coastal restoration across Louisiana. With this level of support, working with existing and new partners, we would collect more shell, seed more cultch, and build more reefs and living shorelines. OSRP expansion includes: expanding existing shell recycling operations, establishing shell collection programs in additional population centers, cultivating shell recycling networks in rural coastal parishes, and building community-scale reefs across the coast.	$750,000
Comfort Island Living Shoreline Stabilization Project	We are a Louisiana Non-Profit 501(c)(3) Corporation (pending) devoted to preservation and reclamation of the Gulf Coast. We have developed and perfected the use of locally grown hay and wheat straw to mitigate, prevent, and ultimately reverse coastal erosion. Our process not only stops erosion, it also restores nesting and colonization sites for the countless species of birds that are native to the Louisiana Gulf Coast, including the Brown Pelican. When fully deployed, our process will clean and restore existing habitats while literally creating new wildlife havens to be enjoyed by future generations. Our process uses round hay bales produced by American farmers and delivered by American truckers. The environmental benefits of using hay instead of toxic chemical dispersants are plainly obvious. Hay is the only truly "green" solution available to preserve, restore and reclaim our Gulf coast. Hay has incredible natural absorption capacity and has proven ability to stop and even reverse coastal soil erosion. We propose to purchase large quantities of hay and wheat straw from regional farmers, paying them a favorable price-per-ton for delivery to established distribution points along the Gulf Coast. 1000 pound plus round hay bales will serve as barriers along the coastal areas and wetlands around the gulf region. Our market research shows a fully adequate supply of hay is readily available. In particular, there is 200,000 to 400,000 acres of winter wheat planted in Louisiana alone each year. We would like to create a market for the farmers by baling the straw that is leftover after the wheat is harvested. This leftover straw is usually just burned in the field. LSU and the Wildlife and Fisheries Department have expressed interest in coming in behind our barriers to plant marsh grasses and mangrove trees. They feel that they will get an additional 2-3 years of protection from our plan. In time the wicking of the hay will collect and create sediments and form a natural barrier. This plan is just a larger scale of what is used in construction sites along the highway systems when small square bales are used to control erosion. Our ultimate goal is to provide a lucrative market for hay grown and produced by American Farmers and to use that hay for cleaning, preserving, and reclaiming our treasured Gulf Coast. In turn, any profits earned will be donated to other coastal and wildlife preservation organizations and agriculture related organizations.	$0
Clovelly Project	The objective of this project is to develop a cost effective program on the Louisiana Gulf Coast to recycle oyster shell from consumers (restaurants, shucking houses, oyster fisherman, individuals who purchase oysters by the sack, etc.) that can	$230,000,000

	then be used to restore and enhance shellfish habitat destroyed or damaged as a result of the Deepwater BP Oil Spill. An effective program will require educating consumers on the importance of recycling and encouraging their participation in a program that recycles oyster shell for use in replenishing natural oyster beds and stabilizing shorelines. Suitable substrate is critical to developing a viable reef, and the substrate material (cultch) preferred by oyster larvae is oyster shell. Since the early 1900s, agencies of the various Gulf states have been depositing cultch material, mainly native shell, on public oyster grounds to build and enhance reefs. Currently a significant amount of the shell produced by consumers is deposited in landfills. Because much more shell is removed from public oyster grounds than is returned for habitat development and enhancement, the Gulf of Mexico is experiencing a shell deficit. This project is designed to reduce that deficit by recycling shell that would otherwise end up in landfills. The additional recycled shell will then be available for current or future oyster reef and shoreline restoration projects. Developing a cost-effective program to recycle shell for use in reef-building will be crucial to coastal restoration projects in the Gulf of Mexico. Similar programs have already produced positive results in Chesapeake Bay as well as in coastal areas of North Carolina, South Carolina, New Hampshire, and Texas. The project proposed here will use information from those state programs to develop an effective program for recovering oyster shell produced by Louisiana Gulf Coast consumers.	
Lake Fortuna/Machais Living Shoreline Stabilization Project	Woodlands Trail - Greenway Corridor Project was first entered into the Regional Restoration Program data base in March 2005. Woodlands Conservancy has worked for the past decade to promote smart growth and preserve, restore, and enhance habitat for wildlife and neotropical migratory birds in the peninsula formed by Orleans and Plaquemines Parish. The focus of Woodlands Trail - Greenway Corridor Project was to acquire 189 acres of land in Orleans Parish and conduct Ecosystem Restoration for resident wildlife and neotropical migratory birds. On December 19, 2012, Woodlands Conservancy acquired this 190 acre tract of land and has begun restoration planning with USFWS. The current modification of this project is to reduce the number of acres to be acquired to 16 which will provide a connection to managed land in Plaquemines Parish and increased community access in Orleans. Additionally, the project is being modified to include the Wetlands Education and Research Center complex to: a) serve as a visitor welcome facility for those recreating on lands owned and/or managed by Woodlands, 2) provide a jumping off point for field trips and environmental education activities for K-12 students and provide a site for undergraduate intern students seeking service learning activities in environmental science/disaster recovery, and 3) provide a physical home to house our long-term wetland restoration and applied research efforts directed at halting invasive species and reforesting this region of coastal Louisiana. The funding requested includes a contribution of 3 million to the Woodlands Conservancy Endowment Fund at the Greater New Orleans foundation to ensure restoration management and education funds in perpetuity. Restoration Description: The forested land that is the subject of this project proposal was severely impacted by Hurricane Katrina. Although it remains forested, the area is in need of invasive vegetation removal and enhancement of habitat by reforesting with native species. USFWS, State Private Lands Coordinator's office has committed technical and financial assistance as a Federal partner to Woodlands Conservancy to implement restoration work for bird habitat. Monitoring of rehabilitation and enhancement activities will be done by both USFWS and Woodlands Conservancy in partnership with California State University Channel Islands, Oregon State University, and local educational institutions with whom Woodlands has worked for the past several years. Data provided by the Louisiana Department of Wildlife and Fisheries shows resident and migratory birds that utilize this habitat. The previously submitted birding survey shows birds identified at the Woodlands site along with notations of those species identified as Species of Conservation Concern in Louisiana Comprehensive Wildlife Conservation strategy (Wildlife Action Plan), those identified as Species of Continental Importance by Partners in Flight as well as those oiled birds captured live and/or found dead following the Deepwater Horizon blowout. Woodlands will work with the Mayor's Office of Environmental Affairs and Louisiana Culture, Recreation and Tourism to develop an interpretive program to educate others of the project's value for mitigation for	$4,800,000

	natural resource impacts, flyway enhancement, science and research, coastal education, storm retention, water quality, recreation, and habitat for wildlife.	
Deployment of New Turtle Excluder Devices in Shrimp Fisheries	Located within the Barataria Basin of Plaquemines Parish, Chenier Ronquille Island is approximately 11,600 linear feet along the Gulf of Mexico shoreline. The sandy beach face is very narrow thus exposing the back-barrier marsh to increased erosion and deterioration. This segment of the barrier island chain suffers some of the highest shoreline retreat rates in the nation. Given the loss of shoreline integrity, several breaches have opened which has resulted in discontinuous marsh and development of large open water areas. Due to the dilapidated state of the island and inadequate supply of sandy sediment, natural processes continue to result in a net loss of sediment and subaerial acreage. Through a partnership between NOAA and the State of Louisiana, this project is currently under design to restore back barrier marsh habitats and protective dune using offshore borrow material. This project compliments several existing barrier island projects that together are reestablishing Louisiana's barrier island system, which in part serves as a first line of defense against storms. The design includes 2.69 MCY of sediment to be mined from borrow areas offshore (see attached map), including a marsh platform to be constructed to approximately +2.0 ft NAVD88. Native herbaceous vegetation and dune stabilizing fencing will be installed post-consolidation of the fill sites. The initial fill site is 411 acres above 0.00 ft NAVD88. This preferred design alternative maximizes the marsh platform while providing the minimal footprint of protective dune necessary to protect the back marsh for the projected life of the project. NOAA has partnered with the State of Louisiana for over twenty years through the Coastal Planning, Protection, and Restoration Act (CWPPRA), and has long supported and provided technical expertise into the design and reconstruction of barrier islands. The design and hydrodynamic modeling that is part of this project has taken into consideration the multiple factors contributing to project performance, including long-term storm probability and associated wave heights. Because of the modeling involved with determining an optimal design, coupled with prior experience conducting this type of restoration in Louisiana, NOAA is confident that this project is feasible and likely to accomplish trustee goals.	$10,800,000
Case Manager/Shrimper	Woodlands Conservancy has worked with Louisiana State University, School of Architecture, Office of Community Design and Development for the past three years to plan and design an Interpretive Center and Interpretive program elements for Woodlands Trail and Park. Complimented by a regional greenway corridor for wildlife and resident and neotropical migratory birds, the Interpretive Center will be located within one of Southeastern Louisiana's last remaining coastal forests on land that is currently 6 miles from open Gulf water. With the current rate of wetland loss in combination with the increase in expected hurricane activity and sea level rise, the location is well-suited to provide an amenity for locals and tourists in this growing community. The Interpretive Center is designed to have low or no carbon footprint and will be a teaching structure in both its state-of-the-art design as well as the contents which it will house. Water will be warmed by power grids and bathroom facilities will be self-contained. Power grids will provide energy for the entire interpretive center and its outside lighting. The physical structure will be located adjacent to a constructed wetland area that will provide habitat for area wildlife and migratory birds. The structure overlooks a canal that provides a large viewing area for wildlife and birds. The canal also provides an area for fishing for local visitors. The interpretive program will include educational print and displays focusing on the function and value of wetlands, eradication of non-native, invasive species, cultural and military history of the area, environmental history and mitigation restoration activities and functions. The facility will serve as a site for education and recreation activities. Costs include construction $1,429,850 and program development and operation $600,000.	$0
Lake Eloi and Lake Athanasio Living Shoreline Stabilization Project	I'm a credentialed coastal ecologist, with ten years as a faculty member at LSU and 18 years as a coastal policy advisor to five Louisiana governors. My recommendation for allocating Louisiana's portion of the early installment of the CWA funding was described in some detail in an essay published here: http://lacoastpost.com/blog/?p=32499. What follows here is a concise summary. The Louisiana coastal restoration program has long suffered from many problems, not least	$5,250,000

	the fact that elected officials suffer from appalling ignorance of and disregard for coastal science. For example, they deny anthropogenic climate change and accelerated sea level rise from global warming. They also lack the political courage to overrule local opposition to large river diversion projects (the only realistic long term solution to land loss) and they support environmentally damaging, expensive, and unsustainable continuous massive earthen levees (such as Morganza-to-the-Gulf) as a primary means of protection against gulf storms. Given this reality I predict with great confidence that allowing Louisiana funds to be subdivided into separate specific projects will become so politicized as to make every project meaningless and a waste of money. Therefore I recommend that Louisiana's $100 million be allocated for two very specific exclusive purposes: (1) acquiring property rights for at-risk landscape; and (2) developing independent science-based priority measures. $75 to 80 million should be used exclusively to purchase surface rights and/or easements to coastal property characterized by: (a) low population density; (b) subject to high subsidence rates and imminent inundation; and/or (c) particularly effective for storm energy absorption, such as privately owned coastal forests that could otherwise be logged. $15-20 million should be used to commission an independent team of geophysical scientists, oceanographers, hydrologists, ecologists, and social scientists to develop, within one year, a set of priority measures that could realistically sustain specific portions of America's Delta (all of SE Louisiana) into the future.	
Ocean Floor Recovery Project	Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize shorelines and help restore and sustain valuable and sensitive estuarine ecosystems and to prevent segmentation of Rawhead Island and exposure of fragile shoreline to open water and tidal erosion. Rawhead Island is recognized by the Louisiana Department of Wildlife and Fisheries as a historic bird rookery. This project will stabilize approximately 1700' of shoreline by installing cost-efficient and effective vertical breakwater technology called ReefBlk. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bio-engineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. Additionally, concrete aggregate cultch may be spread 4-8 inches deep from a point approximately 50' offshore up to the bank with the typical marsh edge sub-tidal undercut filled by cultch or bags of cultch to prevent sloughing of marsh edge. Preliminary Data: Salinity: 12.3ppt Depth and Bottom Consistency Measurements: Shoreline 0.8ft Hard (Break in Shoreline) 5ft 1.2ft Hard 25ft 2.5ft Med Hard 50ft 2.9ft Med Hard 100ft 4.2ft Med Soft These proven living shoreline and erosion control methods are currently inducing the growth of bio-engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent oyster grounds and leases, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The overall goals of the project include reef construction, shoreline stabilization, marsh regrowth, and faunal utilization. Fabrication and staging for the projects will occur in St Bernard Parish creating jobs to offset the negative economic impact suffered by the commercial fisheries industry of the parish. The oyster is the keystone organism for the estuary, and the vertical reefs will contribute spat to nearby oyster leases and increase the robustness of the marine habitat in general. Organization Name: Coastal Environments Inc for St. Bernard Parish. This project also falls within the goals and objectives of The Nature Conservancy as submitted under NRDA for Louisiana. Activity(s): Protection Restoration Maintenance/Management Habitat(s): Subtidal (Nearshore/Offshore) Marine/Estuarine Wetlands Status Property/Resource Acquisition: Procedure and legal requirements established in previous projects; would initiate upon request or with approval of project. Project Planning/Design: Preliminary water bottom, salinity and geological analysis performed. Project Permitting: Procedure and legal requirements established in previous projects; would initiate upon request or with approval of project. Time to	$0

	Implementation: 3-5 months. Time to Project Completion: 1-2 years. Included in Master Plan? Yes. Cost Estimated Cost: US$1,200,000. Funding Available: Partners: Organization The Nature Conservancy as potential partner.	
Treasure Bay Living Shoreline Stabilization Project	Project Description: Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize eroding shoreline and help restore and sustain valuable and sensitive estuarine ecosystems on Keelboat Island in the Biloxi Marsh estuary. This project will stabilize up to 750' of shoreline by creating intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk and cultch application. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bioengineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. The applied cultch provides additional shoreline armoring and habitat for spat attachment and oyster reef development. Keelboat Island received extensive oiling and was under STR cleanup until completion in April of 2011. Over 142,000 lbs. of oil and oiled debris was removed from the island. Keelboat is recognized as a historic rookery by the Louisiana Department of Wildlife and Fisheries. ReefBlk living shoreline and erosion control methods are currently inducing the growth of bioengineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent pubic oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. CEI proposes to design, fabricate and install a patented artificial oyster reef system, ReefBlk along the eastern edge of Keelboat Island to forestall further erosion within a well art iculated erosional zone and to create a lagoon-like condition to encourage marine nursery activity. The overall goals of the project include reef construction, shoreline stabilization and armoring, marsh regrowth and faunal utilization. The project includes installation of approximately 750' of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100' from the shoreline. The project can be developed and implemented in shovel-ready fashion. CEI's experienece obtaining permits for The Nature Conservancy's Lake Eloi ReefBlk project and establishing landowner protocols combined with easily expandable current ReefBlk operations in Hopedale, La, ensures rapid approval and implementation of the project. The fabrication and staging for this project will occur in St Bernard Parish creating jobs to offset the negative impacts of the Deepwater Horizon Spill to the fisheries industry of the region. This project is one of a number of critical living shoreline projects for St Bernard Parish described more generally under NOAA's NRDA project list as "Use induced high vertical profile oyster reefs to stabilize critical areas of shoreline erosion, and to enhance habitat conditions with living shoreline geometries". It will also be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	$900,000
Restoring Finfish of Importance to the Northern Gulf of Mexico	Early NRDA Recommendations June 25, 2011 Coalition to Restore Coastal Louisiana Environmental Defense Fund Lake Pontchartrain Basin Foundation National Audubon Society National Wildlife Federation The Nature Conservancy Planning for restoration in Louisiana was well-advanced prior to the BP Deepwater Horizon Oil Spill. We support efforts to use early NRDA funding to advance projects that are ready to be implemented and which are based upon tested techniques that have had proven success in achieving restoration goals for the Mississippi River delta, and for addressing damages caused by the spill. Delta building sediment diversions-- We nevertheless recognize that the projects listed below fail to address the underlying, systemic impediment to long term coastal ecosystem restoration in the impact area, which is the separation of the Mississippi River from its delta. It is unfortunate that no pulsed sediment diversion and sub-delta building projects are either ready to be implemented, or able to be scaled and phased to the restoration funds available. We encourage the Trustees to consider combining NRDA funding streams in out years to construct one or more of the pulsed sediment diversion projects now advancing through the planning and compliance process, such as White's Ditch	$5,000,000

	or Myrtle Grove. Consideration should also be given to funding diversions that would sustain deteriorating interior freshwater ecosystems, such as the Violet Canal Diversion and the Convent/Blind River Diversion. NRDA Design Changes--While the projects suggested below are in many cases long-standing proposals taken from existing program lists, the special circumstances of NRDA restoration suggest that the phases of projects proposed and other features of the projects should be chosen to offset damage to specific natural resources damaged by the spill. These would include colonial nesting birds; migratory shorebirds; marsh nesting birds and other marsh organisms (blue crabs, brown and white shrimp, etc.); beach nesting birds, sea turtles and beach dependent crabs, mollusks and other organisms; oysters and oyster reef dependent fauna; as well as Threatened and Endangered Species including Least Terns and Piping Plovers. Examples of measures that might enhance the NRDA specific goals of these restoration projects include: Use of artificial oyster reef in place of or along with rock for shoreline protection; Rebuilding colonial bird (terns, gulls, pelicans) nesting barrier islands in the Timbalier, Dernieres, and Breton island chains; Armoring with reef block and adding sediment (where appropriate) to colonial nesting islands (pelicans, spoonbills, herons, egrets, oystercatchers) on disappearing islets on the baysides of the barrier chains, as at Bay Ronquille (e.g. Cat/Mangrove Island) and in Chandeleur and Breton Sounds; Enhancing barrier spits and overwash fans, and designing barrier island and barrier headland restoration projects to incorporate topographic and habitat diversity to benefit migratory shorebirds, nesting Wilson's Plovers and Least Terns, and wintering Piping Plovers. Offshore Marine Restoration--The projects proposed herein are coastal restoration projects. We recognize that much of the natural resource damage caused by the BP spill affected populations of organisms in the marine environment for which there are no ready counterparts for the kinds of physical projects herein proposed. However, we encourage the Trustees to examine actions like enhanced monitoring, artificial reefs, increased enforcement, temporary closures of fisheries (with compensation for affected interests), buy-outs for unsustainable fisheries, and either temporary or permanent marine sanctuaries as measures that might help restore affected resources. Project Substitution - The projects suggested below are often smaller appropriately scaled components of larger landscape level authorizations with broader ecosystem objective - barrier island and headland restoration a s at Terrebonne and Barataria; land bridge projects as at Bayou Dupont; or parts of larger ecosystem restoration projects as at Biloxi Marsh. Trustee agencies should evaluate which segments of these larger projects can be efficiently coupled with other projects for maximum benefit for both NRDA and long-term restoration. For instance, where possible projects should be coupled with CWPPRA or CIAP projects underway to avoid mobilization and de-mobilization costs, or to utilize existing infrastructure such as sediment pipelines. Where savings in time and cost can be achieved by substituting project segments or phases that achieve comparable ecosystem and NRDA benefits to those suggested below, we support such substitutions. Project Selection--The following list of potential projects for utilization of early NRDA funding by the State of Louisiana and the Trustees are based upon our assessment of: OPA early screening criteria (see Appendix A); State selection criteria for early restoration (see Appendix A); Strategic restoration objectives as reflected in the shared vision and campaign goals of our organizations, as well as in Louisiana's Comprehensive Master Plan for a Sustainable Coast, the LCA, and other planning documents. (see Appendix B) Projects: A) Pontchartrain-Breton MRGO Ecosystem Restoration The Mississippi River Gulf Outlet Ecosystem Restoration Plan, still in development, is a multi-component plan designed to ameliorate and reverse some of the damage done as a consequence of the dredging of and failure to maintain channel dimensions of the MRGO. 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 upon 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. Orleans Land Bridge Alligator Bend Marsh Restoration and Shoreline Protection This project will restore approximately 300 acres of marsh on the Orleans Land Bridge by use of marsh creation. It will provide shoreline protection for	

	approximately nine miles of the northwest shoreline of Lake Borgne. The proposed protection will consist of a foreshore rock dike and possible terracing and vegetative plantings in specific areas. B) Barataria LCA Barataria Basin Barrier Shoreline The goals of this project include: restoring dune and marsh habitat as well as stabilizing remaining un-vegetated portions. The project consists of beach, dune, and back barrier marsh habitat creation to restore the physical form and function of the Barrier Island and shoreline and provide critical habitat, and long-term sustainability of these features of the estuary. CWPPRA BA-76 Cheniere Ronquille Barrier Island Restoration The project consists of constructing 11,000 linear feet of dune/beach and 259 acres of marsh platform contiguous with the northern side of the Gulf of Mexico shoreline on Cheniere Ronquille in Plaquemines Parish. Specific NRDA enhancements to this project could include armoring and adding material to colonial birds nesting islands in Bay Ronquille and Bay Long using living reef where appropriate. CWPPRA BA-48 Bayou Dupont Marsh and Ridge Creation Project The project consists of creating/nourishing 300 acres of marsh and associated edge habitat through pipeline sediment delivery from the Mississippi River, and creating 11,000 linear feet of ridge along a portion of the southwestern shoreline of Bayou Dupont in Jefferson Parish. It complements the future Myrtle Grove Sediment Diversion Project now being studied. CWPPRA BA-68 Grand Liard Marsh and Ridge Restoration The project consists of creating/nourishing 468 acres of marsh and associated edge habitat for aquatic species through pipeline sediment delivery, and restoring 14,500 linear ft 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, Louisiana. C) Terrebonne LCA Terrebonne Basin Barrier Shoreline 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. Raccoon Island Restoration and Protection Raccoon Island is 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. TNC TE-67 Maintain Land Bridge between Caillou Lake and Gulf of Mexico. In an effort to protect the land bridge between Caillou Lake and the Gulf of Mexico, approximately 21 miles of artificial oyster reef will be constructed and placed along shorelines most in danger of being lost. This project will be executed in three separate phases and will employ proven engineered reef technology as the means of attenuating wave energy and as a substrate upon which oysters will attach and grow. (See Appendix C) D) Department of Interior Breton National Wildlife Refuge Chandeleur Islands Restoration Sediment pipeline delivery to continue restoration of the main island to build upon 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 and/or East Breton to speed up re-emergence of critical colonial bird nesting islands. Delta National Wildlife Refuge Pass a Loutre Dredging, Beneficial Use, and Crevasse Opening The project would re-open Pass a Loutre to flow by dredging the channel, beneficially placing the sediments in Delta Refuge and Pass a Loutre WMA, and by opening crevasses.	
Joyce Wildlife Management Area	For more information, request resume. Project Type Mitigation of polluted waters through filtration by mussel clusters. Overview, Abstract My work and research in bioremediation began in a most unusual manner. (1987). Working alone in a remote area of SA's Eastern Wild Coast I noticed one day a group of naked African ladies clad only in panty hose. They had filled their leggings with crushed mussels, and stood waist deep in the surf, chatting merrily away. Periodically one would waddle up the beach with crayfish festooned and claw attached to the human bait bags. Into a bucket went the lobsters, and back serious to fishing went the Mammas. With my interest piqued I called for a beach meeting. Long and short of it, we began a Ladies Club to find ways of farming fresh vegetables, mussel, and crayfish. The seaside area known as (Mbotyi) had become seriously over harvested. The impact caused by the subsistence family need for a rich protein source, and dumb tourists who'd buy undersized lobster, being main the contributing factors. Our implements consisted of old ropes and onion sacks clad over rocks. Ropes attached to coke bottle floats with brick anchors in the local estuary,	$250,000

	and panty hose converted to lines, anchored in rocky dive holes became the tools of our industry. Naked panty hose fishing went on none the less. (It was a social thing, I guess). Our activity worked well until the Katima P oil tanker hit the bed rock bottom off the Mozambique Coast some 2000 miles north away. The warm south current had huge globs of crude disgorged all over our beach within days. Help from local authorities was a joke, uTata Mandela's release taking priority. On study of the oil debacle I noticed that tiny mussel spat on our rock covers, and on lines in the estuary had survived. In areas immediate to our farming, sea grasses and sea weeds seemed far less affected. Rocks with mussel cover cladding cleaned up oil rapidly in comparison with unclad intertidal areas. Reeds immediate to our lines in the estuary survived and flourished. Crab, prawn, mullet fry and sea worm proliferated in areas of mussel cluster. Our project continued, and until the violent political issues of the time intervened, we made rustic strides in aquaculture, taking the project to a new level where crushed mussel shell fertilized home gardens, and steamed mussel meat fed poultry. Suffice to say, we eat well. Unbeknown to me then, I'd unwittingly pioneered an African subsistence food source methodology, and without due intention had made use of available junk, allowing a lifetime passion and study of filtration at work. Our project was of a highly rudimentary nature. The modern form of the activity is best explained by Swedish experts Odd Lindahl and Sven Kollberg at; http://www.bioscience-explained.org/ENvol5_1/pdf/musseleng.pdf This natural process of mitigating your oil degraded ecosystems will prove slow, yet highly effective. There is no 'quick fix'. In an innovative and cost effective manner, bioremediation of petro carbons becomes a natural process through filtration, wherein nature is assisted, and allowed to do its work. Accordingly may I suggest a project with the involvement of the fantastically innovative ladies of (Matter of Trust. Org), who have stock piles of nylon and a commendable panache for getting things done. (A copy of this mail is forwarded to them). I am happy to project manage the venture, being in a 'go to position', where my time and enthusiasm are at your disposal. My motto is "Shut up, put up, and get the job done". The analogy being that as oil users, I am equally to blame. Project Suggestions A project name. Driven by an NGO. Under guidance and autonomy of NOAA. Suggested timeframe (three years). A series of projects in identified affected areas. A local community participation at project sites. Local area school project participation. School and community donations for items in kind. Requirements of the writer Assistance with a USA Volunteer Visa. Relocation to site. Basic living and travel stipend x project duration. Permission to undertake research. Vehicle. Camper trailer. Boat with outboard.	
Live Oak Bay Living Shoreline Stabilization and Oyster Enhancement Project	Hire local fishing boats to collect long-term data on the environmental impacts of the spill. Find out if the tar on the bottom is being digested by natural organisms and identify which ones. Figure out the rate that the tar and oil is biodegrading. Do definitive research on whether dispersants are safe for the environment or do they do more damage than the original spill? Do experiments on different types of bio-remediation on the beaches and in the wetlands to see whether they are effective. If they work use them on a large scale.	$800,000
Brush Island Bird Rookery Conservation Project	Project Description: Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize shorelines and help restore and sustain valuable and sensitive estuarine ecosystems in the Bayou La Loutre headland in St. Bernard Parish. This project will stabilize up to 5700' of shoreline by restoring intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bioengineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. Oyster cultch will be spread within the project area to further retard erosion and enhance oyster and related estuarine habitat. ReefBlk is a proven living shoreline and erosion control method currently inducing the growth of bio-engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent public oyster grounds, thus increasing an area's	$750,000

	economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The proposed use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. The cultch application will consist of #57 concrete aggregate or limestone spread 4-8" thick to a distance between 50-100' from the shoreline within the project area. The project will provide effective long-term erosion reduction for a remnant headland that provides crucial natural services through maintenance of the hydrologic regime necessary to commercial and sports fisheries of the southern Biloxi Marsh and by serving as a significant natural storm surge barrier for fishing communities in eastern St. Bernard and Plaquemines Parishes. St. Bernard Parish sees this project as an important element of a larger effort to fortify shorelines throughout the Biloxi Marsh as part of the parish's long-term coastal management plan. An STR was issued for the project area by GCIMT with cleanup completed in the spring of 2011. The area was cleaned of thick tar at various shoreline locations. The project area is recognized by the Louisiana Department of Wildlife and Fisheries and U.S. Fish and Wildlife for its value to migratory and wintering shorebirds including the federally listed Piping Plover. This project falls within the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	
Low-Cost, 10km-Range Oil Spill Sensor and Spread-Predictive Sensor Deployment	N29.920408, -89.260139 N29.918289, -89.261200 Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize Drum Island shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent public oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth that serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. This project will stabilize up to 1100' of highly eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100' from the shoreline. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in a portion of the protected area to facilitate overall marine nursery activity. This project can be considered almost fully shovel ready. Staging and logistics for the project can be implemented immediately upon grant approval by expanding the current ReefBlk operation at Hopedale, Louisiana now servicing The Nature Conservancy project for Lake Eloi. Permitting for the Drum Bay Island project also is facilitated by having obtained permits previously for this type of activity within the subject area and by having established landowner protocols. The shoreline in the project area was cleaned under STR 4-003 for mats in the middle and upper tidal zones and patties in the lower tidal zone. Drum Island is identified as a historic pelican and wading bird rookery. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	$350,000
Gulf of Mexico Community-Based Restoration Partnership	29 49' 25.45, 89 15' 4.19 to 29 49' 26.74, 89 14' 47.65 Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize Comfort Island shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh	$1,500,000

	platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. This project will stabilize up to 1450' of highly eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100 from the shoreline. This project can be shovel ready shortly after the funding award. Staging can be achieved by expanding current ReefBlk operations at Hopedale, La, and previous ReefBlk permitting and attendant land owner protocols in the area will facilitate and speed permit acquisition. The shoreline in the project area was cleaned under STR 3-17 for pooled oil, patties, and oiled debris in the middle and upper tidal zones. Comfort Island is identified as a historic rookery by LDWF. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	
Keelboat Island Living Shoreline Stabilization Project	The total property available for the Clovelly Project (approximately 9,500 acres total) consists of approximately 5,000 acres of land for marsh restoration (brackish and saltwater) and an additional approximately 4,500 acres of land suitable for preservation. Within the 4,500 acres suitable for restoration there is a 500 acre parcel for which the detailed feasibility and design work has already been completed. The 500 acre parcel is "shovel-ready" and could potentially be developed sooner than the rest of the bank. It should also be noted that this restoration project would also include some element of hurricane protection and would be large enough for a bird sanctuary or other wildlife refuge. Finally, because of the project's scale, the cost on a per-acre basis would be significantly lower than it might be for smaller projects. In addition we would like to highlight: (1) Flexibility of project size: If an initial project of less than 9,500 acres is desired, the balance can be subject to a reasonable option for further development at a later date. Also, if the possibility of a project larger than 9,500 acres is desired, adjoining landowners have expressed an interest in cooperating by providing expansion options. (2) Sustainability of recreated marsh: The proposed project will have superior strength and longevity provided by two factors not readily available elsewhere: (a) mineral soil to elevate the sunken marsh and (b) salt-tolerant fresh water plants to provide additional organic material needed to overcome sea-level rise. (3) Enhanced sea life food web: The brackish marsh created by this project will provide the recognized superior detritus forming the base of the sea life food web for plankton, minnows, shrimp, crabs, and oysters. The value of this detritus can be enhanced by optimizing the use of selected brackish marsh plants in the restoration process. The USGS, which has already successfully generated the salt tolerant fresh water plants currently in u se, has expressed interest in pursuing a detritus optimizing study for this and future brackish marsh projects.	$700,000
Deepwater Pass Living Shoreline Stabilization	Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize shoreline situated in Lakes Fortuna and Marchais and to help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercut of the marsh platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds and leases, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural	$700,000

	armoring occurs throughout the project area. This project will stabilize up to 2.81 miles of eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100 from the shoreline. Cultch would be used strategically to forestall erosion at the most critical points within the project footprint, estimated at 15-40% of the total project shoreline. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in particular locations. This project will work in concert with a currently funded ReefBlk project in Lake Marchais to prevent the erosional loss of marsh islands that obstruct the northward encroachment of open water conditions into fragile interior shoreline estuary of the historic Bayou Terre aux Boeufs distributary marsh. This project is shovel ready and will integrate with The Nature Conservancy's and NOAA's Lake Fortuna/Machais project now underway. Permit approval has already been received for the proposed project for installation of ReefBlk under the permit obtained for The Nature Conservancy/NOAA project. Staging and logistics can be implemented immediately upon grant receipt by expanding the current ReefBlk operation at Hopedale, Louisiana. This project is one of a number of critical living shoreline projects for St Bernard Parish described more generally under NOAA's NRDA project list as "Use induced high vertical profile oyster reefs to stabilize critical areas of shoreline erosion and to enhance habitat conditions with living shoreline geometries".	
Increased Catch and Effort Reporting for the Gulf of Mexico's Marine Recreational Fishery Based on 1-Month Waves	The objective of this project is to provide a complete set of new Turtle Excluder Devices (TEDs) to all shrimp fishing vessels required to use TEDs in the Gulf and South Atlantic including skimmer trawls, if required. The benefits of this project will be to increase the overall effectiveness of public and private sector efforts to protect and restore endangered and threatened species of sea turtles and other species of concern. Endangered and threatened populations of sea turtles that forage and nest throughout the Gulf and South Atlantic region were adversely impacted by the oil spill and by the clean-up activities, including the use of dispersants and controlled burns. These impacts reduced the overall effectiveness of long-standing public and private sector efforts in the US and internationally to protect and restore these sea turtle populations throughout the Atlantic basin. A major component of these efforts is the use of TEDs in the US shrimp fishery. TEDs are highly effective in reducing injury and mortality of sea turtles and other species of concern, including various species of coastal sharks. The effectiveness of TEDs to exclude sea turtles and other species decreases over time with constant use, even with maintenance. The cost of new TEDs and maintenance is high relative to the financial condition of the shrimp fishery, and this serves as a disincentive to replace or maintain old, less effective gear. This can reduce the level of sea turtle protection achieved by the fishery. The full deployment of new TEDs on all shrimp vessels required to use TEDs would reduce sea turtle injury and mortality, increase the effectiveness of public and private efforts to protect and restore threatened and endangered sea turtles, and contribute to the mitigation of the adverse impacts of the spill and clean-up activities on these species. Please see attached project cost estimate analysis.	$10,000,000
Electronic Video Monitoring of Commercial Catch and Discards at Sea	Oil Clean-up	$741,960
Mechanically Produced Thermocline (Hurricane Barrier)	Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize Lake Eloi shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercut of the marsh platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along	$82,500,000

	estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through sub-tidal and shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. The project will stabilize approximately 3.43 miles of eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100 from the shoreline. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in a portion of the protected area to facilitate overall marine nursery activity. Cultch would be used strategically to forestall erosion at the most critical points within the project footprint, estimated at 10-20% of the total project shoreline. Project implementation is recommended as a critical measure to prevent the northern encroachment of open water conditions deep into the heart of the Biloxi Marsh should the project shorelines continue to erode at present rates. This project is shovel ready and will integrate with The Nature Conservancy's and NOAA's Lake Eloi ReefBlk project now underway. Permits for the proposed project has already been approved for the installation of ReefBlk. Staging and logistics can be implemented immediately upon grant receipt by expanding the current ReefBlk operation at Hopedale, Louisiana. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale, which is also listed under NOAA NRDA projects.	
Grand Pass Living Shoreline Stabilization Project	Build large vacuum cleaners to pipe up the oil that is laying just below the ocean floor. The oil can be pumped and filtered into tankers. It's right there. Scoop it up it up. It's money in the bank. I don't want a dime. I would just like to give money made to 5 charities and the people who clean up the gulf.	$650,000
Enhancements to Marine Charter For-Hire Fishing Surveys	The project will stabilize approximately 3300' of shoreline by creating intertidal oyster reef habitat using ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100' from the shoreline. The ReefBlk units and cultch function as substrate for oyster spat attachment and allow growth of an intertidal reef. The project shoreline received heavy oiling in the MC 252 event. This project will stabilize impacted shoreline of this critical geologic framework feature which influences hydrologic conditions in the highly productive oyster grounds of Christmas Camp Lake and Treasure Bay; it also buffers the southern Biloxi Marsh from open water conditions and provides storm surge protection for St Bernard Parish. This project can be considered 75% shovel ready. Staging and logistics for the project are in place at the current ReefBlk operation at Hopedale, Louisiana now servicing The Nature Conservancy project for Lake Eloi and Lake Fortuna. Coastal permits obtained and landowner protocol agreements developed for The Nature Conservancy's nearby Lake Eloi project create a simple template to obtain the necessary permits for this project within four months. All current production activities can be expanded quickly to implement this project. Coastal Environments, Inc and partners will fabricate and install bio-induced oyster reefs to stabilize shorelines and help restore and sustain valuable and sensitive estuarine ecosystems in the Biloxi Marsh. This project will stabilize the shoreline by restoring intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bioengineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. These proven living shoreline and erosion control methods are currently inducing the growth of bio-engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent oyster grounds and leases, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The proposed use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. The oyster is the keystone organism for the estuary, and the vertical reefs will	$5,000,000

	contribute spat to nearby oyster leases and increase the robustness of the marine habitat in general. Fabrication and staging for the project will occur in St Bernard Parish creating jobs to offset the negative economic impact suffered by the commercial fisheries industry of the parish. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale, which is also listed under NOAA NRDA projects. The project is a specific element of the shoreline stabilization NRDA request submitted by The Nature Conservancy.	
Coastal Land and Marsh Protection	Aqua Green, LLC is an established aquaculture firm located in Perkinston, MS. The company is involved in production of freshwater and marine finfish for food as well as for restoration purposes. The following juvenile marine finfish species can be produced by Aqua Green to help restore northern Gulf of Mexico coastal waters (prices/species available upon request): red drum (Sciaenops ocellatus), spotted seatrout (Cynoscion nebulosus), cobia (Rachycentron canadum), southern flounder (Paralichthys lethostigma), Florida pompano (Trachinotus carolinus), and Atlantic croaker (Micropogonias undulates). In addition to the company's operational status with completed facilities, Aqua Green has established working relationships with the following partners: Auburn University, Gulf Coast Research Laboratory, Louisiana State University, Louisiana Universities Marine Consortium, Mississippi Dept. of Marine Resources, Mississippi State University, Mote Marine Laboratory, Southern University, and USDA. Aqua Green can provide immediate impact to the restoration of finfish of importance to northern Gulf of Mexico inshore and nearshore waters.	$0
N&P Pollution Control, and Restoring Clean Water	Historical modification: The building of a railway and a parallel highway bisected wetlands eliminating the east to west flow of water through the Joyce Wildlife Management area and surrounding wetlands. Additionally, the dredging of a slough canal adjacent to the management area blocked input of freshwater from the upland watershed with the placement of the spoil on the south side. Explicit goals and objectives: Benefits and or goals include: reconnection of freshwater flow to the Joyce WMA and surrounding wetlands; remove nutrients from wastewater treatment plants upstream; and improve current delivery system to include water control structures for flood/drawdown pulsing. Type of restriction impeding or preventing historical hydrological flows: Road Railroad Design strategy to address issue: Water control structures (i.e., gates and weirs) Top three ecological benefits: Improved habitat longevity and sustainability Adaptation or accommodation of sea level rise Improved ground water and surface water quality.	$0
BP Deepwater Horizon Oil Spill Restoration Evaluation and Monitoring Program	The project will stabilize a marsh/shell ridge that forms a protective reach for the northern Drum Bay shoreline and is under severe erosional threat of segmentation. It is an important geologic framework element for the conservation of the Conkey Cove remnant ridge complex. The complex is among the most important of the barrier island chain in St Bernard Parish. Contiguous light to moderate oiling stretched for over seven miles along the complex's shoreline. The project will stabilize approximately 1900' of shoreline by creating intertidal oyster reef habitat using ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-150' from the shoreline. The ReefBlk units and cultch function as substrate for oyster spat attachment and allow growth of an intertidal reef. This project can be considered 75% shovel ready. Staging and logistics for the project can be implemented immediately upon grant and permit approval by expanding the current ReefBlk operation at Hopedale, Louisiana now servicing The Nature Conservancy project for Lake Eloi. A standard template for permitting and landowner protocols has been established as an outcome of the Lake Eloi project and thus permitting can be expected to proceed without undue delay. Coastal Environments, Inc and partners will fabricate and install bio-induced oyster reefs to stabilize shorelines and help restore and sustain valuable and sensitive estuarine ecosystems in the Biloxi Marsh. This project will stabilize the shoreline by restoring intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bioengineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. These proven living shoreline and erosion control methods are currently inducing the growth of bio-	$0

	engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent oyster grounds and leases, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. Fabrication and staging for the projects will occur in St Bernard Parish creating jobs to offset the negative economic impact suffered by the commercial fisheries industry of the parish. The oyster is the keystone organism for the estuary, and the vertical reefs will contribute spat to nearby oyster leases and increase the robustness of the marine habitat in general. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale, which is also listed under NOAA NRDA projects. The project is a specific element of the shoreline stabilization NRDA request submitted by The Nature Conservancy.	
Habitat Mapping for Improved Stock Assessments and Developing an Integrated Habitat Restoration Approach for Marine Habitats	Brush Island is recognized by the Louisiana Department of Wildlife and Fisheries as a rookery for a variety of bird species. Pelicans, sea gulls, terns, American Oyster Catchers and Piping Plover among other species inhabit the island. The island provides a combination of oyster ridges and marsh/shell island platform conducive for nesting of these species. However, the island shoreline has deteriorated significantly as a result of high energy storm and normal wave erosion. The project will create a shoreline protection barrier beginning on the northwestern corner of the island and extending approximately one-quarter mile down the southeastern shoreline utilizing vertical oyster reefs (ReefBlk) and oyster cultch. ReefBlk units will be deployed and #57 concrete aggregate will be spread in strategic locations to a thickness of 4-8 inches extending from the shoreline at mean high tide into the water for a distance of 50-150'. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercut of the marsh platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the project area. Brush Island received heavy oiling along the project shoreline and was cleaned under STRs issued by Unified Command and its successors. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	$0
Evaluating the Effectiveness of Restoration Projects as Waterbird Habitat Along the Gulf Coast	This project will establish a low-cost, remote oil spread monitoring system with the following features: - Oil Sensor Design: There is an urgent need for inexpensive, weather-robust oil spill sensors that can wirelessly report oil data. Existing oil spill sensing technologies have the following drawbacks: (1) Inaccuracy: Infrared thermal sensing and ultrasonic wave / pulse cannot accurately detect oil existence and oil thickness levels because the temperature, weather, and water current can greatly change their readings. (2) High-cost: SAR imaging and laser fluorosensors use heavy, expensive, large-size devices, and thus are not suitable to large area monitoring. (3) Power inefficiency: Although some wireless sensors can use low-cost light array sensors to detect oil thickness, their chip designs have not emphasized low-power circuit layout. More importantly, it does not have long-distance wireless transmission capability due to its use of common, low-sensitivity antenna (to be discussed in next item). In this research, we will design a low-power, low-cost, weather-robust oil spill sensor and its corresponding sensor operation control software (such as sampling rate adjustment and sleep/wake control). - 10-km oil sensing data transmission: The harsh sea conditions necessitate 10-km-transmittable oil sensors. Due to the large area monitoring of sea surface, the existing wireless sensors cannot be used	$2,000,000

	here due to their short RF communication range (typically less than 100 m). The windy sea weather and harsh water current could make any two neighboring sensors separate from each other for a distance of >100 meters (even though the proposed sensors are adhesive to the oil). In this project, we will use our unique ferrite miniature antenna technology to achieve a 10-km RF communication distance and 1-km neighbor communication range. If an oil sensor cannot use its neighbors to relay the sensing data, it can directly send signals to a wireless base station. Those floatable base stations are pre-deployed sporadically on the sea surface. A sensor can communicate with its neighbors or 10-km away base stations. - Oil spread boundary estimation: It is important to build an accurate oil spread trend estimation model based on the analysis of the data from oil spill sensors. Such a boundary estimation model can be used to guide the deployment of new sensors (ty	
Barataria Basin Barrier Shoreline Restoration: Caminada Headland, LA	The Gulf of Mexico Community-based Restoration Partnership (GCRP) is a regional multi-year partnership that was established in 2001 between the NOAA Community-based Restoration Program (CRP), the EPA Gulf of Mexico Program Gulf Ecological Management Sites (GEMS) Program, and the Gulf of Mexico Foundation. The purpose of the partnership is to strengthen conservation efforts by supporting on-the-ground projects to restore coastal marine habitats, benefit living marine resources, and foster local stewardship of the sites. This successful collaboration will help to expand restoration of habitats that are critical to the sustainability of natural resources in the Gulf of Mexico, and to continue to expand public education and outreach efforts to broaden participation in restoration activities, further developing a conservation ethic at the community level. To date, the GCRP has funded 76 community-based restoration projects. These projects occurred in a number of habitat types. In total more than $3 million has been funded by the Gulf of Mexico Foundation towards these restoration projects, of which an additional $5.5 million has been leveraged in matching contributions from project partners. This match includes nearly 50,000 contributed volunteer hours. In total, more than 15,000 acres of coastal habitat have been restored as part of these partnership projects. A multi-agency steering committee works effectively to guide the partnership in soliciting and developing projects, reviewing, and selecting projects for funding, ensuring required permits and assurances are acquired, and monitoring project progress and compliance. There is a broad diversity of groups involved in the partnership projects, including school children and other community volunteers, universities, nonprofit groups, business and industry, and coastal planning organizations, such as NEPs and NERRs. Collaboration between the partners, many of which have their own public outreach programs to link with the GCRP, will result in long-term stewardship of the restored resources and help generate a community conservation ethic. The GMF will lead further development of the GCRP in a manner that best addresses a regional approach to restore coastal marine habitats and benefit the natural resources of the Gulf of Mexico. Our goal is to take action towards reversing the downward trend in habitat loss and increase the attention on the growing need to preserve and protect America's Gulf Coast.	$220,000,000
Algal Community Characterization and Photosynthetic Performance to Evaluate Deepwater Horizon Recovery	ReefBlk living shoreline and erosion control methods are currently inducing the growth of bioengineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent public oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The proposed use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. The project includes installation of approximately 750' of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-75 from the shoreline. The orientation will create a lagoon-like area of calmer water favorable for creation of marine nursery habitat. The project area has experienced shoreline erosion and was impacted significantly by oil from the BP spill. The area was included in an STR for cleanup of Keelboat Island that generated over 140,000 lbs. of oil and oiled debris. Keelboat is recognized as a historic rookery by	$375,000

	the Louisiana Department of Wildlife and Fisheries. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	
Proposed Emergency Seagrass Restoration	Project Description: 30° 0'38.74"N, 89°12'51.92"W 30° 0'43.79"N, 89°12'59.14"W Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize the shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. The project will prevent breaching of the narrow marsh/shell shoreline and resultant exposure of the interior bay to high energy open water conditions. Such a breach would accelerate island deterioration. This project will stabilize up to approximately 800' of shoreline by restoring intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk combined with cultch spreading. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bio-engineered structure dampens and dissipates wave energy to protect the estuarine marsh from erosion. These proven living shoreline and erosion control methods are currently inducing the growth of bio-engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent public oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The proposed use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. The project includes installation of approximately 800' of ReefBlk units aligned parallel to the shore and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-100' from the shoreline. The project area is recognized as a historic rookery by the Louisiana Department of Wildlife and Fisheries. SCAT reported light oiling in the region. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	$500,000
Wetlands Plant Nursery	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. Fishery closures amount to lost ecosystem services or human uses of resources that the Natural Resource Trustees are required to estimate and offset through appropriate compensatory restoration projects. One strategy for compensating the angling public for lost fishing access is making investments in fishery management tools that help keep fishery resources healthy and available to anglers. One such tool is the Marine Recreational Fisheries Statistics Survey (MRFSS), which collects data on recreational fisheries data used to estimate total catch. The public can be compensated for lost access to fishing grounds during the 2010 Deepwater Horizon BP oil spill by establishing a one month survey reporting waves versus the current two month reporting waves of MRFSS. A more timely reporting system would benefit the public by lowering the likelihood of overfishing and accountability measures (i.e., penalties), which if triggered, could result in a shorter fishing season. Increased data collection and reporting periods will lead to more precise and timely catch estimates. MRFSS in the Gulf of Mexico does not produce timely fishery catch and effort estimates required by managers. The MRFSS catch and effort estimates are based on a two month data collection waves with estimates produced up to 45 days after the end of a wave. For reporting to be on one month waves, with sufficient precision for management, an increase in sampling will need to occur. MRIP proposes to meet this goal; however a concurrent increased funding allotment has not been secured. Survey costs, on average, will need to double from the current level of funding. The National Research Council's 2006 Review of Recreational Fisheries Survey Methods recommended for one month reporting of catch and effort estimates be implemented. The Marine Recreational Information Program (MRIP) is redesigning the MRFSS survey to accomplish this task. As an example, the red snapper season, as currently defined, closes well before the estimates are produced. The current estimation methodology has inadvertently allowed the recreational fishery to overharvest red snapper in twelve of the last twenty years and has	$46,500

	triggered fishery accountability measures such as shorter red snapper seasons for recreational anglers. A timely and accurate recreational data reporting system will allow fishery managers to be proactive in the Gulf of Mexico, improving their ability to predict fishing trends and prevent overfishing.	
Aerating the Dead Zone	Many reef fish and pelagic fish species were exposed to oil from BP's Macondo well and to chemical dispersants used in the response effort. Fish populations affected by the disaster will need to be monitored closely in the years ahead for oil-related impacts. Electronic video monitoring (EM) uses technology to better understand fishing-related impacts on the Gulf ecosystem. EM will increase the accuracy of the number of each species retained or discarded. Data derived from EM will help scientists detect population-level changes (both initial declines and subsequent recovery) and will enable managers to make responsive decisions in the fishery. By better capturing both the number of fish that commercial fishing activity removes from the Gulf and where these removals occur, we can dramatically improve fishery stock assessments and our ability to successfully manage Gulf fisheries using the best available information. Fishing vessels provide data that may be the canary in the coal mine and our first indication of population-level impacts from the Deepwater Horizon BP oil spill. Upgrading our fishery monitoring systems to allow accurate, near real-time capture and reporting of this information will be critical to our ability to monitor short and long-term impacts of the Deepwater Horizon event on Gulf fishery species and populations. There is potential for fleet-wide implementation of electronic video monitoring (EM) - a system of onboard closed circuit video cameras, GPS, hydraulic pressure sensors, data storage and user interface - in the commercial reef fish fishery to greatly advance data collection and fishery monitoring in the Gulf of Mexico. The use of EM to audit self-reported commercial fishing logbooks would provide valuable and cost-effective estimates and/or validation of retained catch and at-sea releases as well as greater insight into spatially-explicit catch and discard rates and relative abundance. Better understanding fishery removals - by number and by area - will provide better fishery stock assessment information and help track the health of Gulf fisheries in the wake of the BP oil disaster. In addition, this level of data enhancement and fishery monitoring will lead to more adaptive and responsive fishery management if and when scientists show fish populations have been harmed by the Deepwater Horizon BP oil spill. For instance, the success of EM in other fisheries with similar characteristics shows that fleet-wide application of EM to capture essential at-sea fishery information is achievable and necessary. In fully documented (100% fleet-wide EM or fishery observer coverage), managers can use more surgical, species-specific regulations to address the catch of fish with a large quota that co-occur with a species of concern. Approximately 40 commercial and federally permitted vessels would be involved.	$0
Blowout Preventer Backup Safety System (2nd Project-Oil Containment Barrier Boom I & II)	The Gulf of Mexico is expected to be Oxygen depleted for the next ten years due to the accelerated bacterial activity feeding on the oil in the deep. We propose a system to oxygenate the surface waters and increasing the available food at the bottom of the food chain by promoting phytoplankton growth. The Mechanically Produced Thermocline Based Ocean Temperature Regulatory System is a system to pump cold water from a depth sufficient enough to produce a thermocline on the surface of the ocean. The difference in temperature and salinity between the surface water and the water pumped up from the deep keeps the two from mixing. The temperature and salinity differences between the water from a depth of 2000 to 3000 ft and the water on the surface in most tropical and subtropical seas is sufficient to create a thermocline. The system to create the thermocline consists of a floating pump surrounded by a separation barrier, with a feed tube attached to the bottom of the pump. The pump in the system that we have designed is powered by ocean currents, but the concept is not limited to the use of our pump. The pump we have designed is a floating vessel with turbines set into each of its two sides. The turbines are directly geared to an impeller. The impeller pumps water from the top of the column of water in the feed tube. The feed tube is open at the bottom. The water that is replacing the water that is being pumped is coming up from depths up to 2000-3000 ft. The water that is pumped off of the top of the column of water overflows the pump and is caught by the separation barrier. The feed tube is a flexible membrane that is	$1,000,000

	seamed into the shape of a tube which is open on each end. The feed tube is suspended from the bottom of the pump and hangs down into the deep water. The feed tube is kept open with rings which are attached to the inside of the tube at regular intervals. The tube is kept in a vertical position by lines which are attached to the bottom of the pump, ha ng down the length of the tube, inside the tube, and are attached to a weighted ring, which is attached to the bottom of the feed tube. The separation barrier is a flexible membrane attached to the perimeter of the pump, above the level of the turbines. The separation barrier extends out to an inflated ring, to which it is attached. The separation barrier catches the water that is pumped up. The separation barrier prevents mixing of the pumped up water and the water below it. The barrier allows the water to flow out smoothly over the surface of the water as the pumped up water overflows the inflated ring. The thermocline is beneficial in many ways. The mass of cold water promotes phytoplankton growth, increasing food available for fish. The increased growth of phytoplankton sequesters CO2 which can then be consumed by zoo-plankton in the form of carbohydrates. The zoo-plankton sequesters the carbohydrates into calcium carbonates and calcium bicarbonates. The calcium carbonates and bicarbonates sink and are sequestered into the depths of the ocean, potentially for thousands of years. A larger scale thermocline can be created by the use of multiple pumps in strategic groupings. These large-scale created thermoclines can be positioned to work as a cold water barrier to hurricanes and tropical storms.	
Deployment of Visnir DRS For Rapid, On-Site Quantification of Total Petroleum Hydrocarbons	30° 6'10.14"N, 89°14'56.01"W 30° 6'17.84"N, 89°14'57.60"W Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize shorelines and help restore and sustain valuable and sensitive estuarine ecosystems in the Biloxi Marsh. This project will stabilize the shoreline by restoring intertidal oyster reef habitat using a cost-efficient and effective vertical breakwater technology called ReefBlk. The ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that provides both shoreline protection and habitat for estuarine organisms. As oyster growth progresses and the reef unit becomes more dense, the bioengineered structure dampens and dissipates wave energy and protects the estuarine marsh from erosion. These proven living shoreline and erosion control methods are currently inducing the growth of bio-engineered and self-sustainable living oyster reefs that expand both linearly and vertically to buffer wave action and retard erosion along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. High vertical profile oyster reefs also enhance species habitat diversity and provide oyster larvae for recruitment to adjacent public oyster grounds, thus increasing an area's economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. The proposed use of cultch to armor the shoreline through oyster shell accretion and deposition within the ReefBlk area will add to the proven benefits of ReefBlk. The project will stabilize approximately 800' of shoreline by restoring intertidal oyster reef habitat using ReefBlk units and the application of #57 concrete aggregate as cultch 4-8" thick to a distance between 50-75 from the shoreline. The ReefBlk units and cultch function as substrate for oyster spat attachment and allow growth of an intertidal reef. The project area has experienced shoreline erosion and the narrow marsh ridge proposed for stabilization currently threatens to breach into an interior bay. SCAT reported light to very light oil impact in the project reach, but including the project reach, there was contiguous shoreline oiling for over six miles in this area. This project will be a part of the overall scope of education and research contemplated for the Oyster Research Center at Hopedale which is also listed under NOAA NRDA projects.	$405,154
Siphon	Make enhancements to the charter for-hire telephone fishing effort survey for improving fisheries management. Link to Injury: Members of the public who hire charter boats to fish offshore lost access to a considerable portion of federal and state waters in the northern Gulf of Mexico that were closed to fishing during the BP oil disaster. Charter boats provide access to offshore fishery resources for members of the public who do not own vessels themselves. Benefit and Rationale: A telephone survey is the primary method used by fishery managers to collect charter for-hire fishing effort, which helps track quota usage. Making enhancements to the survey, such as increasing frequency and sample size, would	$0

	result in more effective monitoring of fishing effort, improved management and possibly longer fishing seasons. Better data from enhanced 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 for-hire telephone survey in summer 2010 increased the precision of catch and effort estimates that allowed, in part, the red snapper fishery to reopen in the fall of 2010 after a summer closure.	
Mitigation of Polluted Waters Through Filtration by Mussel Clusters	This is a general recommendation, not tied to a specific project: Instead of habitat restoration, focus instead on purchasing lands in fee title or in easement to protect these fragile and ecologically important areas that are threatened by future development while they still exist. As you know, land development usually causes conditions that are irreversible. By protecting these areas in perpetuity, we would permanently protect these areas and the ecological services they provide for a multitude of coastal terrestrial and aquatic species. By doing so, we not only protect habitat for many species, but also prevent future damage to human structures as a result of climate change (severe weather events such as hurricanes, sea level rise, etc.). It is my personal opinion that protecting as much currently undeveloped land as is possible from future land development, especially in coastal areas that typical exhibit a more rapid growth rate than in other areas, is the single most important thing we should be doing with available funding. To me it is a more valuable use of dollars than habitat restoration, which is very costly and may or may not be successful.	$0
Drum Bay/Fishing Smack Bay Living Shoreline	We have a "SLOW", dissolving-in-water 1 kilo log, which can be dropped by helicopter or by hand into any water area. The Log contains a patented formula of Fertilizer, which allows the DIATOMS to bloom and become the dominant algae and clean up the water. 1 log will clean approx. 1 million gallons.	$9,000,000
Cranetown Bay Living Shoreline Stabilization Project	The Natural Resource Damage Assessment regulations make clear that final Restoration Plans should include a monitoring component so that the effectiveness of restoration measures can be evaluated. Given that BP is providing $1 billion for early restoration projects before completion of a Deepwater Horizon Restoration Plan, some of these funds should be used to establish a restoration evaluation and monitoring program. 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. An early and steady flow of information on the recovery status of specific natural resources and ecosystem services generated through this program would help managers make responsive management decisions. Without this information, less effective restoration may result, potentially requiring managers to restrict human uses of these resources. Specifically, a restoration evaluation and monitoring program is needed to: 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. Establishing a restoration evaluation and monitoring program for early restoration can be adapted as restoration needs change and transition into a longer-term program. On behalf of the Deepwater Horizon Oil Spill Trustee Council, NOAA, in cooperation with the Department of Interior (USFWS), is in the best position to establish and administer a Deepwater Horizon Oil Spill restoration evaluation and monitoring program. Together, NOAA and USFWS have the experience and existing infrastructure to coordinate monitoring across state-federal boundaries. Both agencies would serve as joint custodians of this program. This structure will facilitate the efficient gathering of data that will allow comprehensive monitoring of the full range of restoration activities. Regardless of the entity implementing monitoring, this program will require coordination among trustee agencies and possibly some new data gathering. Each year NOAA	$2,500,000

	and USFWS would produce a report on the results of restoration measures, recovery of injured species, and newly discovered injuries.	
Cranetown Bay Living Shoreline Stabilization	Habitat mapping will facilitate comparisons of species distributions and abundances across like habitats, allowing scientists to better stratify fishery-independent sampling by habitat type and improve the quality of information used to assess the health of fish populations. Habitat mapping is critical following the BP Deepwater Horizon disaster because fishery scientists will need the maximum amount of spatial precision to detect changes in abundance of fish exposed to or injured by oil or chemical dispersants. This information would also reduce the scientific uncertainty used to define catch limits and would improve managers' ability to aid the recovery of injured fish species through suitable measures. A better understanding of habitat types and distributions generated through habitat mapping would also help the Deepwater Horizon BP Trustee Council identify habitats for restoration that would provide services of the same type and quality and of comparable value to those lost. Results of habitat mapping could be used in an Integrated Habitat Restoration Approach, which is a comprehensive plan based on restoration of key habitats that, together, will benefit the range of different resources injured by the release of Deepwater Horizon BP oil or related response effort. This project will also lay the foundation for broader research and management applications of habitat mapping and has the potential to be integrated with additional information systems. For example, coordination with oceanographic data (Gulf Coastal and Ocean Observing System) or the development a fishing vessel data collection system habitat maps could be incorporated into real-time management and research tools. The cost of this project is scalable, depending on the size of area and degree of resolution selected for mapping. Prioritizing habitat mapping activities can be done in consultation with the Southeast Fisheries Science Center whose stock assessment scientists would be among the primary users of this information. Time to implementation is six months to one year.	$2,000,000
Door Point and Pelican Point Living Shoreline Stabilization Project	Many construction and restoration projects have been conducted on the Gulf of Mexico to create and restore areas for use by wading birds and shorebirds. However, many of these projects have not been adequately evaluated to determine the actual success relative to providing appropriate habitat for different bird species. The time that projects are useful as habitats is also not well known. Differences in physical and other characteristics of different projects may lead to differential use by birds and affect their useful life. It would be useful to determine what the effectiveness of different restoration projects are for different bird species so as to better construct or restore for conditions that are the most favorable in creating nesting habitat. For example, are some projects only used for resting and loafing versus nesting? Is the density of particular nesting species different on different projects because of the different characteristics created in different islands? The Gulf Coast Bird Observatory proposal presented here would be to develop and implement a standardized Gulf Coast-wide protocol to evaluate all restoration efforts to date to define the best restoration practices that can then be applied to new restoration efforts relative to establishing bird habitat.	$3,500,000
The Gulf Restoration Fund	Restoration of the Caminada Headland would consist of dune, shoreline, chenier ridge and marsh creation across 13 miles. One component of this restoration is a project on the easternmost segment known as Elmer's Island which consists of approximately 2 miles of dune restoration and marsh creation. The restoration strategies should maintain the headland without disrupting the natural hydrologic patterns; preserve the integrity of the headland by closing existing breaches; sustain and improve shoreline, dune, and interior marsh habitat quality for fish and wildlife; and provide a natural storm buffer. Restoration of the headland may also help to protect Port Fourchon and local and State highways, including the only hurricane evacuation route in the region. (scalable)	$0
Restoring Critical Habitats in The Gulf of Mexico Marine Protected Area Network	Currently DH oil is trapped at the 500m contour, with sloshing bringing oil over the 300m contour. It is likely that the magnitude of this oil movement will increase as it becomes lighter, resulting in greater movement into shallower waters. Critical habitats occur in the 50-150 m contour, particularly micro- and macro-algae. These plants serve as a food resource that is passed trophically to higher consumers, provides refugia for various life stages of fish and shellfishes, and	$50,000

	also is critical for sediment stabilization and nutrient recycling. Changes in composition of these primary producers can impact food web function. We propose the analysis of macroalgae and microalgae in terms of standing stock (species) as well as photosynthetic performance. We propose collection of sites along the 40-110 m depth contour at six banks (Flower Gardens west, Sonnier, Rezak, Stetson, Alderdice, Rankin) having long term macroalgal distributional studies (TAMU-CC, USL-Lafayette). We will augment this work examining microalgal distribution (diatoms) for taxonomic diversity from these same locations and compare to epiphytes of herbarium specimens of macroalgae collected from these same sites. Photophysiology will be assessed by pigment assessment (HPLC), PAM fluorescence theoretical yield, as well as elemental composition of plants (ICP-MS). This data will allow direct correlation of impacts to potential alterations in physiology (short term response) and changes in community composition (long term effects). It is our opinion that the movement of oil onto shallow areas of the continental shelf will occur- the more important issue is to understand the timing and impact of this movement. Coupling taxonomy and physiological experimentation will provide rapid methods of assessment of this eventuality.	
Exploratory Committee to Examine the Possibility of a Class Action Civil Law Suit Against British Petroleum	Per descriptive information in documents entitled A Concise Environmental Assessment (EA) for Emergency Restoration of Seagrass Impacts from the Deepwater Horizon Oil Spill Response, the following ideas can address and deal with the Overview of OPA - Emergency Restoration Requirements; (para. 2.3.1 - Items # (3) and (5). I am suggesting that Aquatic Weed Harvester equipment be considered to methodically remove aquatic weeds & vegetation (i.e. - seagrass) that has been impacted by the oil spill and continues to contain oil residues. This process is not to dig out the weeds, but to harvest those weeds that continue to maintain oil residues...essentially, HARVESTING those designated weeds without impacting their root systems, thus allowing them to continue to thrive and grow, but without the oil residues on the newly growing vegetation. Aquatic weed harvesting is a known technology and can be accomplished at a reasonable cost. Item 3.2.1 - Description of Proposed Action. The Aquatic Weed Harvesters are basically shallow draft (under 12 inches), twin-pontoon (catamaran type) boats are propelled by twin hydraulically driven/reversible/variable speed paddle wheels. The weeds to be harvested are cut by reciprocating sickle knives (they can cut up to 12 ft wide and to variable depths of 6 ft.), and the weeds then land on and come up open mesh wide conveyors, then load into the vessels storage areas, where they can be further accumulated via storage bed conveyors. Once fully loaded, the Harvester can back up to shore areas, where they can be matched up & aligned w/ conveyorized Shore Conveyors that move the harvested weeds to dump trucks, etc. for offsite removal. The entire operation will avoid causing the same kind of damage to the seagrasses that response boats caused Item 3.2.2 Site Identification and Characterization This Item indicates depth contours of less than one meter depth, certainly within the operating capability of the Weed Harvesters. The operator's elevated position enables a clear sight of the areas to be harvested, thus virtually eliminating the likelihood of injury to the seagrass beds...i.e. this is a very methodical operation. Considering that areas to be harvested are tidal, the Harvesters pontoons can be outfitted w/ hydraulically powered cleats to enable the vessel to operate during periods of very shallow tide.	$0
Informed Restoration: Assessing the Uptake of Deepwater Horizon-Derived Heavy Metals and Organic Contaminants by Coastal Molluscan Species in the Gulf of Mexico	Founded in 2007, Bayou Rebirth is a non-profit whose mission is coastal restoration and education through action oriented and volunteer-driven programs. These programs include wetland plant nurseries, wetlands restoration plantings, interdisciplinary educational programs, rain garden installation and neighborhood nurseries. All of these components complement and drive our main mission of coastal restoration. The Mississippi River and South Louisiana's deltaic wetlands are a vital nursery habitat for wildlife and migratory birds, and fill critical cultural, economic, and protective roles for inland communities and the nation. Coastal Louisiana loses an average of 34 square miles of marshland per year; thus it is vital to carry out restoration projects. Bayou Rebirth is a conduit through which local residents, students, and visiting volunteers learn about and participate directly in the restoration of our wetlands. In order to perform the activities stated above it is necessary that we are able to grow our own plant materials, which is why Bayou Rebirth is looking to create a new nursery. This nursery will be used by Bayou Rebirth to grow out	$90,000

	approximately 20,000 plugs of native marsh grasses and 4,000 hardwood trees that will either be transplanted by Bayou Rebirth into Southeastern Louisiana's wetlands. The new nursery will provide the facilities to grow all plant materials used in Wetlands Restoration Program, in which volunteers will be able to germinate trees from collected seeds and propagate marsh grasses at over double the current propagation rate. Over time, this nursery will increase Bayou Rebirth's capacity so that it will no longer need to purchase plants from outside vendors, thus significantly lowering overhead and increasing the sustainability of Bayou Rebirth. This nursery is intended to be part of the Urban Farm and Nursery Program at the Federal City in Algiers. Bayou Rebirth will be assembling and maintaining a wetland plant nursery on 2 acres (87,120 sq. feet). This program was born out of the decision of the federal government to reduce the footprint of their Naval Support facilities and repurpose the surrounding federal land to private businesses, housing, parks, schools, and projects like the wetlands nursery. Other projects include urban farms and a tree nursery. The goals of these other projects are to increase food access and security, provide a platform for environmental education and workforce development, and promote coastal and urban ecological restoration. Bayou Rebirth fulfills a fundamental part of the program's goals and will use this nursery to assist in their mission of coastal restoration and environmental education, by providing much needed native plant materials as well as an interactive classroom, with which local and out-of-town volunteers can be taught creatively and productively. This nursery will benefit the native wetlands surrounding New Orleans, while providing the opportunity for natives and non-natives alike to partake in a hands-on wetlands restoration.	
The Development of the Advanced Real Time GNSS and Physical Atmosphere and Ocean Observing System within the Gulf of Mexico	Begin near the mouth of the Mississippi River and install compressors to pump air into a network of pipelines to oxygenate the water from every oil platform in the area. Keep expanding outward into the Dead Zone and only run the operation during the rainy season. Adding oxygen, like all the delta catfish farmers do, will counter the effects of the depleted oxygen. The aerated surface turbulence will also help to rapidly evaporate hydrocarbons from any future oil spills. Eliminating the Dead Zone would be a much larger benefit to the USA than many of the other research and shoreline restoration plans submitted so far. The oil industry has thousands of miles of pipelines for their 4,000 oil platforms. If each platform had a few air compressors and an air hose pipeline with diffusor heads in a network spreading out two square miles you would have 8,000 square miles of quality water during the months of June, July, and August. The Dead Zone estimate for this year is only 7,000 square miles. Compressors could be powered by something renewable or by the gas burn-off on the towers. Figure out how to do one and then it is a simple replicating process. The infrastructure would last for many years and the Dead Zone would rapidly disappear as nature rejuvenates itself into a highly productive, job creating, sustainable region. This may be a larger infrastructure project than you are ready to tackle but I am sure the US Army Corps of Engineers would be up to the task and complete it very fast. They can figure out how much it would cost. I believe the offshore oil industry might contribute also to prove they are good stewards of the environment. Maybe next year we can start harvesting from the former dead zone.	$16,000,000
Jesuit Bend Coastal Wetland Site and Bank	Copies of Utility patents pending available.	$32,000,000
Blue Crab Trap Removal	Visible near infrared diffuse reflectance spectroscopy (VisNIR DRS) has been proven effective at on-site quantification of total petroleum hydrocarbons (TPH). The non-destructive, proximal sensing technology uses visible and near infrared light to assess hydrocarbon levels. Soil samples containing hydrocarbon reflect less light (a spectral absorbance) than non-contaminated soils of similar composition. This reduction in reflection can be precisely measured via both wavelength and intensity of returned spectral scans and correlated with established levels of TPH through computer algorithms. The approach provides multiple benefits over traditional sampling/labwork: 1) results are returned to the investigator, on-site instantly, 2) linked with GPS, data from the scans can be used to produce spatial variability maps of contamination or document temporal reductions in contaminant levels in response to remediation techniques deployed, 3) the process is non-destructive allowing for sample preservation for future comparisons, and 4) minimization or	$10,000,000

	elimination of traditional laboratory analyses saves considerable money over long periods of deployment. Through three rounds of evaluation, the technique has been successfully demonstrated to the US Coast Guard and members of the BP HITT team. Furthermore, the technique was featured on the July/August 2010 cover of the Journal of Environmental Quality, a high level, peer-reviewed journal of environmental science. What remains to be done is full scale deployment of this technique across contaminated areas of the Gulf Coast for rapid TPH quantification. The objectives of this proposal are to define the following: 1) scope of work germane to implementation of VisNIR DRS for TPH quantification on the Gulf Coast, 2) definition of the roles of various partners in the implementation, 3) establish deliverables of the project, 4) establishment of a tentative timeline for implementation and, 5) costs/budgets associated with deployment of this technology.	
Enhancements to Marine Private Recreational Fishing Surveys	As the dispersants were expected to sink oil sediments, I recommend using existing filtration systems with an adaptation to filter sea waters at its greatest depths.	$0
Integrated Approach to Wetland Damage Assessment, Vegetation Monitoring, and Restoration Tracking in The Gulf of Mexico	This project consists of mitigation of polluted waters through filtration by mussel clusters.	$3,000,000
Monitoring Survival of Post Hooking Events in Reef Fish Encountered in the Recreational Fishery Using Barbed and Barbless Circle Hooks.	Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The project is an important aspect of maintaining the area's salinity regime for oyster production and preserving the storm buffering capacity of the Biloxi Marsh. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh platform. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. This project will stabilize highly eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8’ thick to a distance between 50-100 from the shoreline at strategic locations. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in a portion of the project area to facilitate overall marine nursery activity.	$6,800,000
Outreach, Implementation and Assessment: Using Descending Devices to Reduce Post-Release Mortality of Reef Fishes in the Gulf of Mexico Recreational Fishery	Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize Cranetown Bay shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh platform. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. This project will stabilize eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete	$4,550,000

	aggregate as cultch 4-8" thick to a distance between 50-150' from the shoreline. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in a portion of the protected area to facilitate overall marine nursery activity. The project can be developed and implemented in shovel-ready fashion. CEI's experienece obtaining permits for The Nature Conservancy's Lake Eloi ReefBlk project and establishing landowner protocols combined with easily expandable current ReefBlk operations in Hopedale, La, ensures rapid approval and implementation of the project. The fabrication and staging for this project will occur in St Bernard Parish creating jobs to offset the negative impacts of the Deepwater Horizon Spill to the fisheries ind ustry of the region.	
Observing Protected Species Interactions in Gulf of Mexico Recreational Fisheries	The project includes installation of approximately ReefBlk units and the application of #57 concrete aggregate as cultch 4-8” thick to a distance between 50-150 feet from the shoreline. The orientation will create a lagoon-like area of calmer water favorable for creation of marine nursery habitat. Coastal Environments, Inc and partners propose to fabricate and install bio-induced oyster reefs to stabilize Drum Island shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through both the attenuation of wave energy utilizing ReefBlk vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile ReefBlk units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh platform. ReefBlk also enhances species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds, thus increasing an area’s economic value as related to commercial and recreational fishing, oyster harvesting and ecotourism. ReefBlk technology is successfully in use along estuarine shorelines in Texas, Louisiana, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area. This project will stabilize up to 1100' of highly eroding shoreline by strategic alignment of ReefBlk units and the application of #57 concrete aggregate as cultch 4-8” thick to a distance between 50-100 from the shoreline. Given appropriate bottom conditions, alignment of the ReefBlk units will create a lagoon-like habitat in a portion of the protected area to facilitate overall marine nursery activity.	$2,300,000
Upper Barataria Terracing Project	This project provides for the fabrication and installation of bio-induced oyster reefs to stabilize Door Point and Pelican Point shoreline and help restore and sustain valuable and sensitive estuarine ecosystems. Shoreline stabilization will be accomplished through the attenuation of wave energy utilizing vertical profile oyster reefs and shoreline armoring utilizing aggregate cultch. The vertical profile units function as a substrate for oyster spat attachment and allow growth of an intertidal oyster reef that expands linearly and vertically. This reef dampens and dissipates wave action thereby retarding erosion and undercutting of the marsh platform. Vertical reef units also enhance species habitat diversity and provides oyster larvae for recruitment to adjacent oyster grounds. ReefBlk vertical reef technology is successfully in use in St Bernard Parish and along other estuarine shorelines in Louisiana, Texas, Alabama, and Florida. The use of cultch substrate provides immediate shoreline armoring and similarly induces oyster growth which serves to create long-term armoring through shoreline oyster shell accretion and deposition within the project area. This form of natural armoring occurs throughout the Biloxi Marsh area.	$1,112,500
East Bank Sediment Transport Corridor to Delacroix Island	The Gulf Restoration Fund supports organizations and individuals working on the restoration of the coastal and marine ecosystems of the Gulf of Mexico. The Gulf of Mexico is the ninth largest body of water in the world and home to over 15,000 different species of plants and animals. While the damages and impact of the BP Deepwater Horizon explosion and subsequent spill are still being assessed, this fund focuses on the other 80% of the Gulf that has been destroyed by decades of coastal development projects, agricultural runoff, overfishing and pollution.	$33,550,000
East Bank Sediment Transport Corridor to	In April 2011, the Rookery Bay National Estuarine Research Reserve (RBNERR) hosted a two-day workshop in Naples, Florida, with funding support from NOAA's Marine Protected Area (MPA) Center, that brought representatives from four	$98,570,000

Delacroix Island and Marsh Creation near Delacroix Island	key agencies managing MPAs in the Gulf together to discuss collaborative efforts. NOAA's NERRs and NMS, and DOI's NPS and NWRs were represented. Outcomes of the workshop included a commitment from the Gulf MPA partners to work together to build a framework for regional response to catastrophic events such as the Deepwater Horizon spill, share information and technology relating to climate science, and to seek regional opportunities to advance common stewardship goals of MPAs such as habitat restoration. A regional approach to restoring critical marine and coastal habitats within the Gulf of Mexico MPA Network has significant benefits: -Gulf MPAs already have long-term monitoring and GIS capabilities that can effectively track changing environmental conditions correlating with restoration success, such as water quality. -Gulf MPAs have on-the-ground programs in place designed to provide protection and increase awareness of the need to conserve resources, such as law enforcement, education, outreach and training, visitor use management, and active community-based volunteer programs. -Gulf MPAs have a diverse range of critical marine and coastal habitats within their designated boundaries (e.g. corals, seagrasses, oyster reefs, mangroves, saltmarshes) including offshore submerged resources, that link directly to the life cycles and migratory patterns observed in economically important marine species including various species of sportfish, shrimp, and crabs. Envisioned is a three-year regional collaborative restoration project that builds on the strengths of the newly established Gulf of Mexico MPA Network noted above. RBNERR, with support from NOAA, is currently working on developing the initial framework and communications/training support for the Gulf Network. The proposed regional habitat restoration project would have three components: (1) Year I: Gulf MPAs will work collaboratively within the Network to identify high priority habitats suitable for restoration that meet criteria for regional linkages, and develop a regional scope of work for restoring habitats within 8 - 10 MPAs. (2)Year II: Gulf MPAs initiate site restoration projects, engaging community volunteers as appropriate and monitoring progress. (3) Year III: Gulf MPAs complete site restoration projects, continue monitoring efforts, and conduct targeted outreach to raise awareness of value of restored Gulf habitats.	
Biorestore®	Establish an exploratory committee to examine the possibility of a class action civil law suit against British Petroleum for the damage done by the BP Horizon Gulf oil spill. This would replace lost revenue for affected business and funds to restore polluted wetlands and diminished wildlife. The purpose is to supplement government fines and penalties.	$300,000
8029 Acres Mitigation , Marsh Creation, Coastal Restoration	The Deepwater Horizon oil spill, which dumped more than 600,000 tons of crude oil into the Gulf of Mexico (GOM) between April and August 2010 is the largest accidental spill in history. While immediate environmental impacts of the spill, such as direct and fatal fouling of wildlife and the physical contamination of coastal areas were easily observed, long-term effects of the spill are still being determined. Efforts to restore impacted areas and species of the GOM, in fact the GOM ecosystem itself, must begin with informative assessments of the initial and ongoing impacts. Toward that goal, we have been monitoring the impact of the spill on a variety of molluscan species (shellfish) in coastal areas of the GOM, including the commercially important oyster Crassostrea virginica, since May 2010. Other species include the mussel Geukensia demissa and marsh periwinkle (snail) Littoraria irrorata. Monitoring has consisted of examination of both the shells and soft-tissues of specimens collected from May through August 2010, searching for reliable indicators of exposure to and incorporation of crude oil components, namely specific heavy metals such as vanadium, lead, nickel and chromium, and particular organic polycyclic aromatic hydrocarbons (PAHs). We have compared specimens of C. virginica collected in Louisiana and Alabama prior to landfall of the spill and those that were exposed during the entire spill interval, as well as specimens collected outside of direct spill impact in Florida, and outside of the GOM from off the southeastern United States. Additionally, we are examining the shells of specimens collected in the GOM from the period 1880-2000 to establish baseline levels of contamination unrelated to the Deepwater Horizon spill. We propose that any restoration efforts of the coastal ecosystem of the GOM will be aided greatly by detailed understanding of the less visible impacts of the spill and the potential for long-term effects of the spill. Our specific research goals are: 1. Determine which crude oil components, both metallic and organic, are being incorporated into shells and tissues of the three species. We	$0

	will also examine soft-tissues histologically to determine whether exposure to crude oil induces tissue pathologies. 2. Model the potential distribution of these components into the broader GOM food web by examining predators of these species as well as data on predation intensity and interaction strengths. This goal will be used as a tool for further prediction of potential long-term bio-accumulation in higher trophic level marine species, including commercially important crustaceans and fish. To-date we have completed analyses of specimens of C. virginica collected in the 20th century, and May and August 2010. We have confirmed, using inductively coupled laser mass spectrometry, that specimens collected in August 2010, after exposure to the spill, have significantly higher concentrations of vanadium, lead and chromium in their shells. Furthermore, examination of soft tissues shows that vanadium, lead, and cobalt are present in significantly higher concentrations in gill and muscle tissues of August 2010 specimens. We therefore propose to continue and extend this work by: 1. Conducting similar work with additional 20th century and 2010 specimens of C. virginica to test current results. 2. Extending those analyses to include PAH (using gas chromatographic mass spectrometry) and histological analyses of the soft-tissues. 3. Expand the work to include other molluscan species for which we have relevant collections, namely G. demissa and L. irrorata. 4. Continue the collection and monitoring of those three species for the next two years. This extended monitoring will allow us to cover at least three reproductive cycles for each species and determine if there is a decline in the rates at which contaminants are being incorporated. Furthermore, we will be able to coordinate our efforts with those of other groups working on different species in other parts of the GOM food web.	
Gulf Saver Solutions® Wetlands Restoration Initiative	The Development of The Advanced Real Time GNSS and Physical Atmosphere and Ocean Observing System within the Gulf of Mexico Conrad Blucher Institute for Surveying and Science Texas A&M University-Corpus Christi; University Corporation for Atmospheric Research Boulder, CO; Center for Space Research University of Texas at Austin Introduction: The ability to observe our environment in real time significantly increases our capacity to anticipate and respond to changing conditions that may increase the risk of injury and property damage. The installation of a network of instrumentation clusters is proposed for the Gulf of Mexico. The primary instrument of each cluster will be a geodetic quality Global Navigation Satellite System (GNSS) receiver. Observations derived from this network will promote research on ocean-atmosphere interactions; hurricane intensity forecasting; sea level and coastal subsidence monitoring; and storm surge modeling. Each of these topics was given high priority in a recent survey of the oil and gas industry operating in the Gulf . It is anticipated that equipment can be deployed on both fixed and floating platforms, significantly improving the observational capability of the region. The deployment of this instrumentation on offshore platforms would allow these research topics to be addressed and combined in a unified measurement system throughout the Gulf region. Advances in GNSS analysis techniques now enable the continuous positioning of mobile instrumentation to less than a few centimeters. The precision of this measurement can be used for continuous monitoring of sea surface height, tides, and wave motion. The addition of both temperature thermistor strings and underwater acoustic instrumentation provides a link to sea surface temperatures and ocean bathymetry. These same analysis techniques are able to measure the delay of GNSS signals as they pass through the atmosphere. This delay can then be related to the integral of atmospheric water vapor. This establishes a link between the sea surface temperatures and the latent heat in the atmosphere that contributes to hurricane intensity changes. The recent environmental disaster following the sinking of the Deepwater Horizon offshore drilling rig has highlighted the need for more ocean observing systems to better measure the physical processes occurring in the Gulf of Mexico. Scientific measurements in this harsh offshore environment are difficult to obtain and cannot be undertaken without access to the large number of offshore platforms owned and operated by the offshore industry. This white paper proposes a partnership between the private offshore industry and the scientific community to collect critical physical data to enhance our knowledge of the atmospheric and oceanographic processes that drive the forces that interrupt our ability to manage the vast economic and natural	$1,000,000

	resources of the Gulf of Mexico. A collaborative research group, consisting of academic and governmental researchers, has expressed interest in the establishment of this Gulf network. The members of the group have diverse expertise and research interests, ensuring that there would be broad application of these data if available.	
Marine Finfish Hatchery for Stock Enhancement of Important Recreational Species Affected by the Oil Spill	Restoration Systems has proposed the Jesuit Bend Coastal Protection and Wetland Mitigation Bank in Plaquemines Parish, Louisiana, to the Corps of Engineers and other agencies as mitigation bank to compensate for the rebuilding of the New Orleans levees post-Katrina. The project can easily be retasked as NRDA restoration project for the BP oil spill. The proposed Jesuit Bend Mitigation Bank (JBMB) encompasses approximately 338 363 acres of open water, wooded berm, emergent marsh, and cypress swamp. Nearly all of the JBMB site has mitigation potential in the form of re-establishment, rehabilitation, and preservation of freshwater marsh and cypress-tupelo gum swamp, including a fishery habitat and bayou. The entire site will be preserved and protected by a conservation servitude. Finally, there is the potential for the bank to increase in size to ±1000 acres if once adjacent land is can be acquired from current owners. An additional 25 acre parcel is the process of being acquired. Site Location JBMB occurs in Plaquemines Parish (Figure 1). The site lies approximately one-half mile west of the Mississippi River at Jesuit Bend; site photographs as provided as Appendix 1a. Site coordinates are 29.74197° N latitude and -90.03363° W longitude in Township 15 South, Range 24 East, Sections 14,15,16, and 17. The site occurs in the East Central Louisiana Coastal Water Basin in the United States Geological Survey eight-digit cataloguing unit 08090301 and Louisiana Department of Environmental Quality's (DEQ) Barataria basin (Figure 2). The approximately 338-acre site is bounded on the east by the Plaquemines Parish Flood Protection Levee (also known as the Plaquemines 2 non-federal levee-PL2, IPET 2009); south by another inundated site; west by pipeline canals and their associated low berms; and on the north by over 20 23 inundated parcels of land. JBMB may be accessed from the Plaquemines Levee by way of the Ollie Pump Station site that is located at the west end of Ollie Road in unincorporated Jesuit Bend, LA (Figure 3). The Plaquemines Levee is bounded on its east by the Parish Canal and to its east by a Jesuit Bend neighborhood of single-family residences. The land immediately north and south of the site is of the same character as the JBMB site: shallow open-water ponds. The Ollie Canal lies immediately south of the south-adjoining parcel. The lands to the west are the large expanses of freshwater and transitional marsh of the Barataria landbridge, which are separated from JBMB by a pipeline canal. Project Goals and Objectives The goals of JBMB are to restore and preserve the natural community functions of approximately 277 and 51 acres, respectively, of freshwater and cypress-tupelo gum swamp at JBMB that have been degraded due to anthropogenic activities, natural land subsidence, sediment deprivation from the Mississippi River, wave fetch, and the wind, flood and saltwater damages associated with a series of recent hurricanes. The site will be restored by importing river sediments to the site to return it to natural wetland grade and replanting (Figure 4). The post-mitigation wetlands will be freshwater marshes and cypress-tupelo gum swamps. There will be a transitional forested zone at the eastern edge of the cypress-tupelo gum swamp where it meets the PL-2. JBMB is uniquely strategically located and capable of restoring a variety of biotic and physical functions to the watershed. Therefore, the objectives of JBMB are multiple. - Wetland - Long-term loss of wetland functions at this site will be restored be reversing the causes of the site's degradation. -Physical - New sediment will be brought into the system. This will provide greater flood protection and flood storage, as well as extend the Barataria land bridge. -Biotic - Marsh and swamp habitat functions will be restored and enhanced; sensitive fishery functions (red drum, white and brown shrimp, as well as gulf menhaden, Atlantic croaker.	$50,000,000
Giving Gulf Wetlands A Future	Crab traps are a significant problem in the Gulf of Mexico, having negative impacts on habitat and species. Derelict gear such as blue crab traps can cause a number of problems since throughout the Gulf of Mexico, more than 250,000 traps are thought to be added to the derelict population each year (Guillory 2001). The most significant is that they continue to catch and kill a variety of species, in a process called ghost fishing. Traps can also damage habitat, interact with threatened and protected species, and introduce debris into the food web. They also hinder commercial operations such	$0

	as shrimp fishing and can result in damage to boats and injuries to people. Derelict gear can persist for decades once it is lost. These traps can be physically removed during winter months due to the shallow water depths at that time of year. This is a "shovel-ready" project that would involve both state partners as well as local fishermen who would be contracted to conduct the removal. Based on estimated annual trap losses, including increased loss rates due to hurricanes and storms, it is estimated that this project could retrieve 500,000 derelict crab pots if fully funded. States have derelict trap programs that are habitually compromised by inconsistent budgets and participation rates. There are no NEPA concerns, with the only legal requirement being coordination with State agencies for short-term closures to facilitate removal activities. Removal will positively impact species by minimizing bycatch, including more than 20 species of fish and 6 species of invertebrates. The number of derelict traps in the Gulf of Mexico is currently unknown. There are, however, some annual estimates of trap disposal and overall trap loss; the latter also includes trap loss due to theft. Estimates of annual trap loss on a percentage basis for each Gulf state range widely: 30%-50% in Florida; 20%-50% in Alabama; 20%-30% in Mississippi; and up to 100% in Louisiana (Guillory 2001). Rolling fishery closures, coordinated closely with the most appropriate agency in each state, will allow for the physical collection of derelict or lost blue crab traps. States independently manage their own existing trap removal efforts, and this restoration project will have strong education and outreach. Traps will be removed from the coastal environment and recycled to avoid waste contribution to landfills. Local fishermen and personnel will be consulted to determine the regions most in need of cleanup.	
Woodlands Trail - Phase I (031105-261)	Make enhancements to the marine private recreational fishing survey to improve timeliness and spatial resolution of catch and fishing effort data for better management. 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. Therefore, the angling public must be compensated for lost access to fishing as a service. Benefit and Rationale: Improving the private recreational survey 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 recreational anglers from exceeding their quotas and incurring penalties. These improvements would benefit the public by lowering the likelihood of overfishing and accountability measures, which, if triggered, could result in shorter fishing seasons in the future.	$6,667,000
Response and Recovery of the Periphyton in the Near-Shore Habitats of the Gulf of Mexico	Problem Statement: Tidal wetlands bordering the Gulf of Mexico, including Federal wetlands in National Wildlife Refuge (NWR) areas, are at risk of being impacted by the oil that continues to wash ashore. A comprehensive and accurate determination of the impact over vast remote areas is not feasible with traditional survey methods. In order to identify and implement the most cost-effective solutions necessary for remediation/restoration; a unified, systematic approach using airborne remote sensing coupled with land-based restoration technologies can be implemented to 1) efficiently identify the extent of impacted wetlands, 2) effectively guide the remediation/restoration process from planning to completion, and 3) provide a calibrated measurement of the effectiveness of the remediation/restoration efforts over the long-term. Proposed Solution: SpecTIR proposes to provide comprehensive monitoring and restoration services along the Gulf coast using a proven combination of commercially available aerial remote sensing applications and innovative assessment and monitoring techniques that will promote program efficiency and cost-effectiveness. The team will use a scalable, phased approach that will identify impacted wetlands and allow for the prioritization, planning, and performance of restoration efforts. Additionally, the proposed methodology will provide a consistent and scientific means for accurate and quantitative post-restoration monitoring. The first phase of the proposed approach is to provide a baseline for restoration by collecting airborne hyperspectral imagery or, in the case of many Gulf coast NWR wetlands, assessment of the hyperspectral data already collected prior to impact from oil. Guided by initial analysis of the airborne data, ground truthing verification and validation of the wetlands will then be performed. SpecTIR will provide the existing 2000 sq km of pre-oil, baseline hyperspectral data collected from Gulf coast NWR areas prior to the oil entering the	$850,000

	wetlands. The use of hyperspectral imagery for the discovery of hydrocarbons in the wetlands has been proven in the NASA funded VNIR study of an oil spill in Swanson Creek MD in 2000. The current instruments now include the SWIR portion of the spectra which brings an even higher degree of accuracy to the identification of the vegetative stress and community structure. Data and analysis will be collected into a GIS platform and be disseminated online to effectively guide restoration planning and implementation. Post restoration remote sensing monitoring will be performed to track changes in restoration success relative to the baseline data as well as coincidently identified non-impacted sites. This data will be supported with ground truthing, data verification, and sampling by qualified field teams. Once the levels of impact to the wetland vegetation has been ascertained and prioritized, the information can be used to assist in the formulation of remediation and restoration plans. Going forward, progress can be monitored with the identical methodologies and technologies used in the initial assessment.	
Sodium Percarbonate Dead Zone Oxygen Replacement	This project will contribute to the restoration of open ocean reef fish populations by reducing post hooking mortality. Post hooking mortality in recreational fisheries is one of the largest deterrents of larger quotas and fishing season days in the GOM reef fish fishery. Numerous stock assessments from New England to the West Pacific Islands have indicated the need to reduce post hooking mortality in recreational fisheries due to stress inflicted while dehooking and releasing undesired fish. Barbless hooks have been demonstrated to reduce handling time through ease of removing the hook, thereby decreasing associated mortality (Cooke et al., 2001) (Casselman 2005). Significant mortality factors were: use of natural bait, removing hooks from deeply hooked fish, use of J-hooks (vs circle hooks), deeper depth of capture, warm water temperatures, and extended playing and handling times. Barbed hooks had marginally higher mortality than barbless hooks. (Bartholomew A., Bohnsack J 2005) The goal of this project will be to compare the post hooking mortality of reef fish caught using barbed and barbless circle hooks by monitoring acoustically tagged fish. The year-one pilot study will be conducted on two study-site reefs. Acoustic receivers will be placed at each reef to ensure complete coverage and to monitor movement and survival of tagged fish. We will fish during the closure of the red snapper fishery to help minimize additional fishing pressure on our study area. The fishing effort will consist of two fishermen fishing with a two hook (top and bottom) drop rig. Each fisherman will fish alternating hook locations i.e. one rig top hook barbless and bottom hook barbed while the other rig being top hook barbed and bottom hook barbless. We will place acoustic tags into an equal number of fish for each hook type. Reef sites will be located in 30 meters to balance the need for cooler bottom temperatures and the need for shallower water to combat barotrauma. As depth of the water increases the risk of mortality, fish will be released by means of a fish descender. A go pro camera mounted to the fish descender will be used to record the immediate release of the fish. The acoustic receivers will be programmed to record data for approximately 40 days. After the first year, we will expand our coverage area and fishing effort. Outreach with the recreational fishing sector must be done on continual basis after year two and will take two to three personnel each year to accomplish this task. Outreach should be done with but not limited to fishing clubs, schools, fishing tournaments, outdoor writers, fishery councils, fishery commissions, and law enforcement groups. One of the positive benefits of using barbless circle hooks is that individual animals should be able to rid themselves of the barbless circle hook more quickly and easily should they break off or be released by cutting the line as close as possible. (PIFCS, NMFS, NOAA). Given the advantages of using barbless circle hooks, this technology has significant benefits for interactions with protected species, i.e. sea turtles, marine mammals, and sea birds, and could potentially expand to other fisheries where these interactions might occur.	$10,000,000
Testing and Assessment of Archaeological Sites Impacted by the Deepwater BP Oil Spill	This proposed project will provide descending devices to recreational anglers (private and for-hire) and conduct educational outreach on best practices and the proper use of these devices throughout the Gulf of Mexico. In addition, the Southeast Region Headboat Survey (SRHS) will implement a monitoring and fish tag/recapture program on headboats participating in the survey in order to collect information on the utility, effectiveness and impacts of descender devices	$180,000

	on post-release mortality in the Gulf of Mexico headboat fishery. Recreationally important species with high release mortality, including red snapper, gag grouper, vermilion snapper, red grouper; as well as strictly regulated species such as goliath grouper, speckled hind, Warsaw grouper and Nassau grouper, will be the focus of this program. Additionally, the effectiveness of descending devices on reducing dolphin depredation will be evaluated. In order to raise public awareness on the problem of fish barotrauma and the benefits of using descending devices, outreach will be conducted at boat shows, fishing tournaments, fishing clubs, and civic events from FL to TX. Outreach will include distributing educational DVDs “Downscope: Saving Snapper and Grouper from Barotrauma” and descending devices to anglers that may otherwise not obtain or purchase these items. The implementation and monitoring component of this project incorporates a design that includes the SRHS electronic logbook (eLog) system, SRHS dockside sampling and at-sea observers. In addition to utilizing existing SRHS infrastructure and capabilities, the addition of at-sea observers will provide • total number of fish discarded • lengths of fish from a subsample of discards • number of fish descended on devices • the ability to tag a subsample of fish descended and fish not descended, for subsequent analysis of recapture rates. Partners in this project include Sea Grant, Gulf States Marine Fisheries Commission, recreational fishing associations, and state agencies. This collaboration ensures regional coverage and makes this project well-suited for promoting best practices and the proper use of descending devices, along with monitoring and evaluating the impacts on reducing post-release mortality and improving post-release mortality estimates.	
GOM Marine Sanctuaries	Interactions between protected species such as sea turtles and marine mammals have been documented, but levels are largely unknown. This project proposes to put fishery observers on the recreational for-hire sector (headboats and large charter vessels) to observe incidental capture of sea turtles, as well as marine mammals, sea birds, and non-target fishes. This project addresses the PDARP sea turtle restoration approach "Reduce sea turtle bycatch in recreational fisheries through development and implementation of conservation measures" and PDARP marine mammal restoration approach "Reduce injury and mortality of bottle nose dolphins from hook-and-line fisheries. The project will also address Resource-level Monitoring and scientific support for adaptive management by providing information about threats to sea turtles and bottlenose dolphins. The project objective is to conduct systematic surveys of recreational fisheries to understand the scale, scope, and frequency of hook-and-line interactions with protected species. We plan to quantify the level of bycatch seen in the Gulf of Mexico recreational fishery sector, documenting spatial and temporal bycatch patterns, gear characteristics, and other potential contributing factors. This information could be used to focus outreach and voluntary conservation measures within the recreational fishing community. Observers will be deployed throughout the Gulf of Mexico from western Florida through Texas during the spring and summer seasons for 5-7 years. Observers will be contracted to collect data on for-hire vessels from larger ports with multiple for-hire vessels or vessels with enough demand to fish daily to enhance the likelihood for success and ensure logistical feasibility will not be a limitation (e.g., lodging and proximity to large metropolitan area). Contracted vessels operating in areas of high private vessel density could be a secondary priority and serve as a proxy for private boat bycatch rates in those areas Project deliverables include (1) minimum estimates of interaction rates of sea turtles, marine mammals, and sea birds in the for-hire sector; (2) bycatch hotspot maps; and (3) an analysis of gear characteristics to identify patterns in the factors associated with bycatch. This project budget is scalable depending on the spatial extent and number of years of desired coverage. (Proposed budget is $2,300,000 for 5 years of coverage - $3,200,000 for 7 years; less than 5 years is option).	$0
Louisiana Reef Restoration	This project consists of the restoration of degraded and lost wetland habitat, including the construction of earthen terraces, in Barataria Basin south of the town of Lafitte near the Barataria Waterway (Dupre Cut) and Bayou Dupont. This area has been identified as having experienced a high rate of marsh fragmentation and shoreline erosion, and much of the historical emergent marsh has been converted to open water. Marsh terracing within the project area would restore degraded remnant marsh by reducing the rate of erosion and allowing for sediment accretion. In addition, terraces would	$77,000,000

	restore marsh habitat in open water areas where they have been lost, counteract existing marsh fragmentation, and increase sediment accumulation within the entire project area.The proposed terrace field will create approximately 15,200 linear feet of terraces, which will in turn restore approximately 380 acres of marsh habitat, including 155 acres of current open water habitat that was historically marsh. Terraces would be built from on-site material and stabilized with native marsh vegetation. A total of approximately 270,000 cubic yards of materials will be excavated and placed within the project site as part of this project. Detailed project drawings are attached to this proposal, including the terrace field layout, terrace plan, and terrace cross section.The terrace platforms and their associated marsh edge will help to capture sediments, provide stable substrate for the creation of emergent marsh, and protect valuable habitat from wind and wave erosion. Emergent marsh vegetation can provide nesting, foraging, loafing, and roosting habitat for herons, waterfowl, and other wetland bird species. Increased marsh edge from the terraces will provide additional habitat for water birds. Terraces will also promote the growth of submerged aquatic vegetation (SAV), which will benefit wintering waterfowl. In addition, they will provide habitat for a variety of estuarine-dependent fish and shellfish species.Furthermore, the project will work in synergy with completed and planned efforts to protect a critical landbridge in the Barataria Basin. This project is located in the footprint of the receiving basin of CPRA's Mid-Barataria Sediment Diversion (BA-0153), which is expected to benefit from future sediment input. Once operational, this diversion will help to provide valuable sediment into the marsh system to build new habitat and keep pace with sea level rise. The terraces constructed as part of this project will provide the protection and structure for capturing and stabilizing these sediments.In addition to habitat directly restored, the proposed project will complement the Long-Distance Sediment Pipeline Project, a CPRA project (BA-0043) which involved nourishment of approximately 415 acres of marsh using 3.8 million cubic yards of sediment dredged from the Mississippi River. The project helpedto establish a reusable corridor for future restoration projects and began restoration of the Barataria Landbridge. The proposed project will also provide a buffer for an upcoming NRDA project supported by NOAA and CPRA (BA-0207) located directly to the north of the project site that will restore approximately 1,400 additional acres of marsh habitat near the south shore of The Pen.Through this project, the Parish would add another feature in its multiple lines of defense system to increase its overall resiliency and protection from coastal storms. It would stabilize and increase marsh which is the lifeblood of the waterfowl, fish and shellfish communities that benefit the local economy. Access to the project site is available to the public from open water. Habitat created by this project would enhance recreational fishing and hunting opportunities currently taking place in the area along with the commercial guiding economy that supports fishing and hunting in this area.	
Lake Fields Hydrologic Restoration	The full East Bank Sediment Transport Corridor (EBSTC) project involves the creation of a raised permanent dredge pipeline corridor (DPC) which will extend approximately 12.5 miles from the Mississippi River through the Breton Sound and terminate near Delacroix Island at full build-out. The DPC would be constructed with a 75-ft wide crest set to an elevation of +3.5' NAVD88, would be created from sediment hydraulically dredged and pumped from the Mississippi River, and would be gapped at navigable waterways and trenasses to ensure that fish access, tidal exchange, and general navigability is not impeded.Unlike traditional means of sediment re-location, which utilize in-system borrow sources from lake waterbottoms such as Grand Lake or Lake Lery, the EBSTC, once constructed, would provide a cost-effective and reusable pathway for transporting renewable, out-of-system sediment to desired marsh restoration locations within the Breton Sound. This way, renewable, out-of-system sediment can be introduced to sediment-starved areas so that former marshes, which have recently been converted to open water, can be restored thus providing their former environmental, recreational, and protection benefits.The engineering and design, environmental compliance, landowner identifications, operation / maintenance planning, and cultural resources investigation has been performed to the preliminary (30%) design-level milestone via joint funding of the St. Bernard Parish Government and the Coastal Protection and Restoration Authority (CPRA). Funding to complete engineering and design of the EBSTC has been identified at this time. Additional	$0

	funding for construction of the EBSTC to the third Phase terminus near Delacroix Island and a constructed length of 12.5 miles, estimated to cost $31,000,000. The estimated total cost is $33,550,000.	
Sustaining Louisiana's Seafood Industry and Preserving Ecosystem Services through Oyster Culture Budget: $15 Million over 5 Years	$2,550,000 Engineering and Design of EBSTC	$15,000,000
Sustaining Alabama's Working Waterfront through Oyster Aquaculture	$31,000,000 Estimated Cost of Construction of EBSTC to Phase III	$13,000,000
Bird Friendly City Initiative	$33,550,000 Estimated Total Cost	$0
Marshland Purification Project	The full East Bank Sediment Transport Corridor (EBSTC) project involves the creation of a raised permanent dredge pipeline corridor (DPC) which will extend approximately 12.5 miles from the Mississippi River through the Breton Sound and terminate near Delacroix Island at full build-out. The DPC would be constructed with a 75-ft wide crest set to an elevation of +3.5' NAVD88, would be created from sediment hydraulically dredged and pumped from the Mississippi River, and would be gapped at navigable waterways and trenasses to ensure that fish access, tidal exchange, and general navigability is not impeded.Unlike traditional means of sediment re-location, which utilize in-system borrow sources from lake waterbottoms such as Grand Lake or Lake Lery, the EBSTC, once constructed, would provide a cost-effective and reusable pathway for transporting renewable, out-of-system sediment to desired marsh restoration locations within the Breton Sound. This way, renewable, out-of-system sediment can be introduced to sediment-starved areas so that former marshes, which have recently been converted to open water, can be restored thus providing their former environmental, recreational, and protection benefits.The engineering and design, environmental compliance, landowner identifications, operation / maintenance planning, and cultural resources investigation has been performed to the preliminary (30%) design-level milestone via joint funding of the St. Bernard Parish Government and the Coastal Protection and Restoration Authority (CPRA). Funding to complete engineering and design of the EBSTC has been identified at this time. Additional funding for construction of the EBSTC to the third Phase terminus near Delacroix Island and a constructed length of 12.5 miles, estimated to cost $31,000,000, is required.In addition to the construction of the EBSTC, this project would involve the engineering, design, permitting, and construction of approximately 650 acres of marsh east of Delacroix Island. This area and its corresponding marshes have been deteriorating due to factors such as subsidence, sea-level rise, historical damage from the Mississippi River Gulf Outlet (MRGO), canal dredging, leveeing of the Mississippi River, and erosional forces from seasonal storms and has very little chance for recovery without intervention. This area was included within CPRA's 2017 Coastal Master Plan for marsh creation. It is estimated that the engineering, design, and permitting for 650 acres of marsh would cost approximately $2,520,000. Construction required to restore the marsh utilizing sediment hydraulically dredged and pumped from the Mississippi River would cost approximately $62,500,000.	$0
Using Dredged Sediments to Remediate Oil-Contaminated Coastal Marshes	Estimated Cost:	$0

Use Induced High Vertical Profile Oyster Reefs to Stabilize Critical Areas of Shoreline Erosion, and to Enhance Habitat Conditions with Living Shoreline Geometries	$2,550,000 Engineering and Design of EBSTC	$4,000,000
Submersible Concrete Barge Surge Breaker Project along East Biloxi Marshes Shoreline Barrier Zone, Pilot	$31,000,000 Estimated Cost of Construction of EBSTC to Phase III	$4,500,000
Develop a Finfish Hatchery and Submersible Concrete Barge Fingerling Growout Tanks.	$2,520,000 Engineering and Design of Marsh Creation Area	$2,000,000
Develop Plan and Design to Upgrade Infrastructure in Working Waterfront Communities of Eastern St. Bernard.	$62,500,000 Construction of Marsh Creation Area	$500,000
Operating Costs for Hopedale Oyster Reef and Fishing Grounds Restoration Center	$98,570,000 Estimated Total Cost	$200,000
Cultch Spreading to Stabilize Denuded Muddy Shoreline and Near-Shore Areas and Enhance Oyster Production.	BioRestore® will contribute to help mitigating marine resource status quo. BioRestore® is a process based on the Capture and Culture of Post-larvae (PCC) marine animals. The idea is to effectively "rescue" a small proportion of post-larval fish before predation, then rear and release them to boost marine ecosystem recovery. Restocking can thus be achieved for a wide range of coastal fish species, and pre-release juveniles are conditioned to survive in the wild before restocking. We feed them on live food, and a patented "halfway house" is created placed in the nursery where the fish can become familiar with them. Pieces of the "halfway house" are then released in the same area as the fish, thus reducing stress and encouraging the juveniles to settle at that location. BioRestore® is a 3-step "all inclusive" marine restoration process in full accordance with the maritime status quo and the regulatory context. It simultaneously aims to monitor biodiversity losses, to mitigate impacts and help rebuild stock of local species. This process is being used in the Mediterranean Sea.	$4,000,000
Restore Bird Islands (Rookeries) with Combination of Cultch Spreading and Induced High Vertical Profile Oyster Reefs.	Cameron parish http://www.blacklakelandco.com fresh and brackish water impoundments coastal restoration mitigation credit potential marsh and open water prior owner BP - AMMACO permitted for 5000 acres terraces under marsh management plan approved by state and core permitted for marsh creation.	$2,000,000

Develop an Oyster Hatchery and Off-Bottom Growout Technology	Example: Restoration of 500 acres of oil soiled wetlands working with WLF at Pass Loutre wildlife management area, Venice, LA Many other sites/projects are scoped as well that would benefit from Gulf Saver bags. www.gulfsaversolutions.com Gulf Saver Bags is a package of native marsh grasses with its own supply of natural nutrients and billions of oil eating micro-organisms to protect, feed and support marsh grasses plugged into the Bag, to take root, survive and flourish. Gulf Saver Bags also support an accreting environment by slowing down the water, which allows sediment to drop, and adding nutrient-rich biomass to the soil. Gulf Saver Bags provide for greater stabilization, higher survivability, and integration of diverse species back into challenging wetland sites, and in particular in areas where dredging has been done and material for berms and terracing have been deposited. Gulf Saver Bags offer an innovative technology and application designed to increase project success of habitat and wetland restoration. Gulf Saver Bags are assembled and deployed by volunteers coordinated by well-established organizations like Common Ground Relief, Inc. A Solution for Habitat and Wetland Restoration Gulf Savers wetlands initiatives and programs also provide opportunities for collaborations with environmental scientists, and agencies, community based volunteer organizations and school groups providing wetlands education and awareness. Regulatory Acceptance and Endorsed by: Louisiana Department Wildlife and Fisheries National Oceanic & Atmospheric Administration U.S Fish and Wildlife Service LSU Dept of Oceanography & Coastal Science US Army Corps of Engineers Restore Americas Estuaries Common Ground Relief Inc. Coalition to Restore Coastal Louisiana Global Green New Orleans For the Bayou Bayou Rebirth For more information: www.gulfsaversolutions.com.	$1,000,000
Develop a Marine Technology Program at Nunez Community College	Provide funds to construct and operate a Marine Finfish Hatchery for the culture and release of important marine finfish species such as spotted seatrout, red drum, flounder, and blue fin tuna. The uncertainty about the effects of the oil spill on the impact of the eggs and larvae of the 2010 spawn in the Gulf necessitate the need for stock enhancement of these important recreational fish species.	$2,500,000
Develop Plan and Design for Violet Safe Harbor	I propose that low coastal uplands surrounding the Gulf of Mexico be protected now so that 1. Tidal wetlands damaged by the spill but that cannot recover can be recompensed by future wetlands 2. Tidal wetlands for which mitigation is attempted but fails can likewise be recompensed, and 3. Total tidal wetland area along the Gulf coast is maintained as close to existing area in the face of subsidence and sea-level rise. Tidal wetlands in the Gulf of Mexico are being lost to subsidence caused in part by oil and gas exploration and development. Additional tidal wetlands will probably be lost due to sea-level rise resulting from climate change, for which the consumption of fossil fuels including oil and gas is responsible. Even at present low rates of sea-level rise, substantial coastal landscape evolution is occurring as coastal forests retreat, wetlands migrate up-slope, and open water replaces tidal wetlands. These effects will become more significant as the rate of sea-level rise accelerates. At present, low coastal uplands provide a destination for migrating wetlands but in decades to come these uplands will be developed, defended, and otherwise unavailable to tidal wetlands. The benefit of protecting such low uplands now is high because developed lands will not be undeveloped for the sake of wetland migration. The economy provides an opportunity to protect low coastal uplands at a considerable savings. I suggest that a planning horizon of 50 years guide the protection of low coastal uplands. Fee-simple purchases and conservation easements could sunset if the rate of sea-level rise observed by then, or predicted with very high confidence by expert models, are found within the natural adaptive range of tidal wetlands to maintain themselves in place.	$400,000
Lake Pontchartrain Shoreline Protection	Woodlands Trail - Phase I was first entered into the Regional Restoration Program data base in March 2005 identified as: Woodlands Trail - Phase I (031105-261) (See previous information and additional local, regional and national partnerships) Woodlands Conservancy, a nonprofit 501(c) (3) organization, previously known as Woodlands Trail and Park, Inc. (Fed. Tax I.D: 72-1506708) has worked for the past decade to promote smart growth and preserve, restore and enhance habitat for wildlife and neotropical migratory birds in the 10,000-acre peninsula formed by Orleans and	$14,400,000

	Plaquemines Parish. The focus of Woodlands Trail - Phase I continues to include funding needs for Operations and Maintenance (150K x 10 years) and Ecosystem Restoration ($600K spread over five year period; afterward it would fall into a maintenance phase) on 609-acres known as Woodlands Trail and Park Bird Sanctuary. Woodlands Conservancy has spent over a half of a million dollars on this project to develop hiking trails, conduct ecosystem restoration work; develop an interpretive program and other property improvements on property dedicated for the development of Woodlands Trail by a Plaquemines Parish Government Ordinance in 2002. Considering that land ownership is currently in dispute on a portion of the property, acquisition, based on market value is being added to this project 4,567,000 (actual cost subject to appraisal meeting federal standards). RESTORATION BENEFITS: The devastation wrought by Hurricane Katrina raised the awareness that water flows inward from the river and thereby increased the level of understanding that it is imperative that we preserve low-lying areas as open space to encourage development on higher, i.e., safer ground. In the peninsula formed by Orleans and Plaquemines Parish, smart growth is still possible. The Woodlands Trail and Park Bird Sanctuary in Plaquemines Parish is connected to public land owned by the federal government that connects to the City of New Orleans Wilderness Park. Woodlands Conservancy's restoration work on the 609-acres will ensure healthy, vital habitat for wildlife and both resident and neotropical migratory. Acquisition will ensure that this habitat will serve wildlife, migratory birds, and the community's right to enjoy this natural area in perpetuity. With the nation's highest wetland loss being that of coastal forests being lost to conversion to development and fragmentation degrading its habitat value, the time for action is critical. In an effort to enhance the habitat for wildlife and migratory birds, assessment and ecosystem restoration work was initiated in 2007. Annual assessments have been conducted for five years and treatment was initiated in 2010 with funding from Barataria-Terrebonne National Estuary Program and other private sources. Phase II of Ecosystem Restoration will encompass 60-acres to be initiated in April 2011 with funding from the National Wildlife Federation Oil Spill Relief Fund. Phase III will target Ecosystem Restoration adjacent to trails and waterways with funding resulting from a recent consent decree resulting from Clean Water Act violations (SEP) The benefits of continuing the restoration on these 609-acres includes: - Provide a vital habitat corridor for neotropical migratory birds whose "refueling" areas along the coast have been damaged by the Deepwater Horizon well blowout - The low-lying area serves as a filtering ground for pollution and a natural sponge to absorb storm water runoff - The greenway area will be restored in order to continue serving as a wind buffer to protect the surrounding residences and businesses - Provides an "outdoor classroom" for educating school children and the public at large of the function and value of wetlands - Provide a low-impact educational and recreational facility that connects to the MRT - Provide a quality of life characteristic that attracts Fortune 500 executives who are considering relocating to a new community.	
Quantitative Fish and Habitat Assessment and Monitoring, Using Scientific Acoustics	Periphyton play an important ecological role on seagrass leaves: 1) as primary producers in a seagrass system; 2) as sources of food for consumers; 3) as a source of sediments (calcareous algae); 4) as an indicator of environmental indicator of water quality; and 5) as a `UV-B filter for the seagrass leaves. This research will focus on the response of periphyton on seagrass leaves in by looking at physiological characteristics (short-term response) of the algal community and taxonomic shifts or losses in the community (long-term) in areas that have been impacted versus unimpacted areas throughout the Gulf of Mexico. Several stressors on seagrass communities have led to their worldwide decline, including an increase in nutrients, higher salinity, and increased wave energy. A new threat came from the weathered oil and chemical dispersants from the Deepwater Horizon oil spill that could be impacting seagrass in coastal areas. Although entire seagrass beds may have been completely lost or their density may have been reduced, it is also important to understand that periphyton associated with the seagrass is a vital component of the seagrass ecosystem. The periphyton may buffer the seagrass from some of the moderate effects on the seagrass community. The various single-celled organisms that are part of the periphyton may also serve as sentry organisms; their physiological response to stress can signal an early warning of more substantial impacts to the ecosystem or that recovery is underway. Standardized	$45,000

	protocols for sampling seagrass leaves will be used (such as certain distance for the growing tip) for sample collection. The number of replicates and the number of locations will be determined in coordination with work being performed by other researchers. A database will be created that identifies the organisms (images of species), physiological status, and community structure indices at key locations. This information will be collected across seasons to understand natural variability, and through time, to determine the impacts to the ecosystem.	
SAV-E: SAV Establishment Plan.	Dispense Sodium Percarbonate tablets into the area that will become the season's dead zone just as the rainy season washes the nutrients into the area. Each tablet would represent a missing plant on the seabed and supply dissolved oxygen for a month. Similar to salting the highway in winter this inexpensive "oxygen pill" might keep the fisheries and related industries open. Stop dropping these pills when the annual algae bloom finishes it's cycle. Drop drop fiz fiz oh what a cheap relief it is. http://www.runyoutech.com/percarbonate_spec.htm.	$0
Atchafalaya basin/ Atchafalaya National Wildlife Refuge	More than a year after the Deepwater BP Oil Spill, the immediate and long-term impacts on archaeological sites in the coastal zone remain unknown. Archaeological sites are unique and endangered sources of information on several thousands of years of human-environmental interactions along the Gulf Coast. Monitoring and remediation have documented the presence of oil at many sites, but there has been no systematic attempt to assess the effects on archaeological resources or conservation. Restoration of coastal landscapes and ecosystems will further impact archaeological sites, which are intrinsic cultural components of the natural environment. Testing and assessment of previously recorded sites in Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard parishes will address the impacts on archaeological resources in terms of archaeometric techniques such as neutron activation analysis, absorbed residue analysis, and accelerator mass spectrometry, taphonomic and site formation processes, and archaeological conservation. Sites to be assessed will be selected from those impacted by the Deepwater BP Oil Spill and recorded as potentially eligible for listing on the National Register of Historic Places. Field methods will consist of systematic surface collection, mechanized and hand-operated coring and augering, and excavation of 1-by-1-meter test units to record stratigraphic profiles and obtain archaeological samples. The goals of restoration will be served through damage assessment and recommendations of best methodologies for remediation and conservation.	$0
Maurepas Swamp/ Joyce WMA - Lake Maurepas Land Protection Effort	Funds and Trustee influence should be used to promote the legislative effort to expand the marine sanctuaries in the GOM to cover all the natural reef systems as well as the bridging artificial reefs. Protecting this important habitat may help to offset some of the fisheries impacts of the oil spill.	$0
Marshalling the Mussel for Shoreline Stabilization	Approximately 85% 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 (50-89% 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 project will create approximately 74.8 miles (more accurate that the estimate of 91 miles given on this site) of substrate upon which oyster larva can attach, grow, and reproduce. The three locations of these reefs are the Biloxi Marshes in St. Bernard Parish, sites at the northern and southern end of Barataria Bay, and two locations in Terrebonne Bay. In Louisiana, TNC has installed nearly three miles of artificial oyster reef and is currently building just over an additional mile 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/accretion, fisheries response, and cost effectiveness. These projects are rigorously monitored with a standard protocol that allows for cross-project comparison. Constructed reefs are growing oysters and reducing wave energy reaching the shoreline; initial observations indicate that sediment is	$155,592

	beginning to accrete between the reefs and shoreline. The requested funding would allow for the construction of 74.8 additional miles of oyster reef, 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. Artificial oyster reef installation in Louisiana Cameron, Terrebonne & St. Bernard Parishes, LA protection/accretion, fisheries response, and cost effectiveness. These projects are rigorously monitored with a standard protocol that allows for cross-project comparison. Constructed reefs 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 the construction of 70 additional miles of oyster reef, 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. Oyster reefs were one of the most affected near-shore marine resources as a result of the spill. This project proposes to significantly increase the amount of oyster reef habitat while simultaneously providing important marsh and fisheries benefits. The proposed project would place artificial oyster reef/shoreline protection projects in five coastal parishes: St. Bernard, Plaquemines Jefferson, Lafourche, and Terrebonne. The Biloxi Marsh portion is proposed as a significant expansion of the Conservancy's existing reef restoration project and all locations will protect strategically important coastal islands and marshes that serve as a first line of defense for interior marshes and uplands in all five parishes.	
Big Branch Marsh National Wildlife Refuge	Lake Fields is located due west of Lockport, south of U.S. Highway 90, and north of the Gulf Intracoastal Waterway in Lafourche Parish and is approximately 2,000 acres in size. Prior to the early 1960s, Lake Fields was known for clear water, profuse submergent vegetation, and excellent sport fish and waterfowl populations. However, sport fish and waterfowl populations have declined dramatically in the lake proper in association with declining water quality and physical habitat. The lake is currently characterized by low water clarity, high nutrient levels, periodic algal blooms, and a virtual absence of ecologically important submergent aquatic vegetation. The deterioration of the Lake Fields ecosystem can largely be attributed to major physical modifications in the watershed. During the 1800s, Lake Fields was a semi-isolated freshwater lake with a small and undeveloped watershed and surrounded by continuous fresh marsh. Upper watershed water via Bayou Dumar and upper Bayou Folse once largely bypassed Lake Fields by flowing into Bayou Folse and eventually into Company Canal south of Lake Fields (see www.lafourchegfc.org/preservefigures.html). Bayou Dumar entered Lake Fields in the northwest corner, but a significant portion of Bayou Dumar capacity flowed into Commercial Canal and then into lower Bayou Folse. By the 1960s, however, various hydrological and physical changes rerouted an increased proportion of flow entering Lake Fields from lower Bayou Folse to the east and from Bayou Dumar to the north. Several specific physical watershed modifications contributed to this increased inflow into Lake Fields. The first was the erosion / subsidence of the west bank of lower Bayou Folse, which created a substantial opening into Lake Fields. The second was the decrease in water depths and water capacity of lower Bayou Folse due to the accumulation of sediments and organic materials. The decrease in the flow capacity of lower Bayou Folse significantly altered drainage basin hydrology: a significant portion of water from upper Bayou Folse was diverted through Commercial Canal into Bayou Dumar and eventually Lake Fields; and, more upper Bayou Dumar flowed southward directly into Lake Fields rather than through Commercial Canal into lower Bayou Folse. The increased inflow of nutrient-laden, poor quality water from the upper watershed resulted in immediate and long-term adverse impacts on water quality and physical habitats in Lake Fields. Periodic algal blooms and a dramatic decline in submergent aquatic plants occurred as water became more turbid and	$0

	nutrient enriched. The Lafourche Parish Game and Fish Commission is promoting a restoration plan to improve water quality and increase submergent vegetation in Lake Fields, which will result in increased sports fish and waterfowl populations. The initial restoration plan included several different components. One major component involved the dredging of lower Bayou Folse south of Commercial Canal to deepen the channel and increase flow capacity; this component will be completed in the near future through a cooperative project with the North Lafourche Levee District. However, several additional projects are needed to further restrict the inflow of degraded water into Lake Fields: - Restriction of the large opening into Lake Fields through the western shoreline of lower Bayou Folse - Restriction of the channel in lower Bayou Dumar to redirect water flow into Commercial Canal, Bayou Folse, and Company Canal Plantings of appropriate emergent vegetation are recommended to stabilize the spoil.	
Restore Historic Gulf Sturgeon Spawning Grounds	Louisiana Sea Grant and the Louisiana Department of Wildlife and Fisheries recently reestablished the State's oyster larvae and seed production facility to replenish the natural oyster populations damaged by storms and the BP spill and to launch off-bottom oyster farming in Louisiana. We would like to expand this effort to include a large number of coastal residents, interested in pursuing oyster farming both as environmentally and economically sustainable jobs as well as contributing significant numbers of oysters to restoration projects throughout the coastal waters of Louisiana. Our goal is to establish several land based oyster seed production facilities (nurseries) and several water based Enterprise Zones. Participating coastal residents will be provided training and start-up grants to produce oysters for the coastal restoration and for the food market. Participants will be paid to produce juvenile oysters (seed) for introduction onto public oyster grounds, private oyster leases and in areas closed to shellfish harvest, but where the oyster reef ecosystem services are needed. Within 5 years, 500 million juvenile oysters will be added to public and private oyster beds in the region. The intent of this project is to assist State resource agencies in restoring the oyster populations that were lost due to the BP oil spill mitigation efforts and related freshwater events. The enhancement of natural oyster reef structure and oyster abundance will provide for critical ecosystem services through improved water quality, increased biodiversity, and creation of more diverse habitat. In addition to creating jobs for participants at nursery sites, the oyster seed produced at a state supported hatchery will be transitioned to the private sector. Oyster farming will also be encouraged through this program by establishing a State program for off bottom culture of oysters. We will establish several water-based Enterprise Zones in coastal Louisiana for the off bottom farming of oysters; fisherman will be provided start-up grants to produce adult oysters for the food market. The Zones will support independently operated 5-acre oyster farms capable of generating additional income through sales of premium oysters. These resultant large single oysters command prices at the higher end of the current market thereby providing greater income for the oyster producers and also reducing pressure on natural oyster resources. Regionalization We strongly encourage the implementation of this approach throughout the Gulf region. Parallel efforts are currently underway in Alabama where Mississippi/Alabama Sea Grant has partnered with us over the past several years in the refinement oyster hatchery and nursery operations as well as pilot off bottom culture. The proposed work has environmental benefits, is economically viable and culturally compatible.	$3,000,000.00
Bayou Villars Shoreline Stabilization	Auburn University has partnered with Mississippi-Alabama Sea Grant Consortium and Alabama Cooperative Extension to launch off-bottom oyster farming in Alabama. Here we propose to expand this effort to include a large number of coastal residents, pursuing oyster farming both as environmentally and economically sustainable jobs as well as contributing significant numbers of oysters to restoration projects throughout the coastal waters of Alabama. 1. Enhancement of public oyster reefs by seeding with juvenile oysters Provide 50 million juvenile oysters per year (set on varying sizes of cultch) for seeding onto public oyster beds to enhance the public fisheries within Alabama, raised by local oyster farmers and in partnership with Alma Bryant High School's aquaculture program. Within 5 years, 250 million juvenile oysters will be added to public oyster beds in the region. For context, public reefs have a density of 2-5 oysters per square meter or 8,000-20,000 oysters per acre. The intent of this project is to assist state resource agencies in implementing existing	$10,000,000

	oyster management strategies where a percent of the oysters on public reefs are harvested and the remainder provide critical fisheries habitat. Assuming 20% survival to market size, this stock enhancement could yield over 6,000 daily limits of eight sacks (AL limits) per year (with 200 market size oysters per sack), providing much needed income to the region, while also providing environmental services. The enhancement of natural oyster reef structure and oyster abundance will also provide for critical ecosystem services through improved water quality, increased biodiversity, and creation of more diverse habitat. In addition to educating high school students and creating jobs for watermen at nursery sites, the oyster seed produced at a state supported hatchery will be transitioned to the private sector. 2. Development of off-bottom oyster aquaculture in the region Establish 2 100-acre oyster aquaculture parks in Alabama, where watermen are provided start-up grants to produce adult oysters for the food market and juvenile oysters to supplement oyster reef restoration. The two parks will support 40 independently operated 5-acre oyster farms capable of generating at least $2.5 million per year of combined income within 5 years through sales of premium oysters. These oysters command higher prices than those oysters traditionally produced from the oyster reefs in Alabama thereby providing greater income for the oyster producers and also reducing pressure on natural oyster resources. Initial research suggests that a 5-acre operation would allow an oyster farmer to raise 400,000 oysters per year, potentially yielding a gross annual income (with a conservative 80% survival) of over $80,000. This would be a significant increase in annual income for the typical oyster catcher who might currently earn $20,000/year. Regionalization We strongly encourage the implementation of these approaches throughout the Gulf region. Parallel efforts are currently underway in Louisiana where Louisiana Sea Grant has partnered with Louisiana State University. The proposed work has environmental benefits, is economically viable and culturally compatible.	
Coordinated Strategy for Sea Turtle Recovery in the Gulf	Establish a grant program that would provide funds or awards to towns along the gulf coast that establish bird friendly initiatives. A non-profit could be tasked with defining what qualifies as bird friendly and establish the program. I believe beach towns along the gulf coast would be willing to establish bird friendly measures if there was some funding involved. Such measures could include fencing dunes areas for least tern nesting sites, establish dog leash laws, establishing clear beach access points to beach that avoids dunes and nesting habitat, leaving the wrack alone, etc.	$58,600,000
Deep Seafloor Habitat Restoration	By using shallow water boats equipped with sprayers and tanks, apply EPA approved bioremediation agents, BAAD Bugs (generic is Biorem 2000) and Oil Digester if need be into any oil soiled marsh land areas without disrupting the natural habitat in any way. Test for hydrocarbon presence in a week and reapply if necessary. The project may be implemented under our guidance, using employees from the State, Federal or Local government, displaced BP workers or displaced fishermen. The bioremediation agent is the only agent that is from all naturally occurring microbes from the ocean, is completely safe for animals and humans and remediates on impact. Estimated cost is 5000 dollars per acre plus testing, including labor and boat usage.	$11,825,000
LL&E South Lafourche Marsh Restoration and Levee Protection Project	The BP Horizon oil spill resulted in millions of gallons of oil being discharged into the Gulf of Mexico. Despite the best efforts of many, oil remains in vast areas of Louisiana's wetlands. Removing oil from these fragile wetlands is a difficult - if not impossible - task. One viable alternative is to cover oil-contaminated wetlands and shallow sediments with clean dredged sediment. Sediment can be sprayed across the wetland surface in thin layers with conventional dredging technology or pumped into the upper reaches of the marsh and used to restore any damage associated with ingress. Both are proven approaches for marsh restoration with numerous examples of success. Sequestered in the salt and brackish marshes will reduce, and possibly eliminate, impacts to inland fresh and intermediate marshes that are more difficult, if not impossible, to clean using other technologies. Additionally, wetlands along Louisiana's coast have been subsiding due to the lack of marsh accretion; thus, the addition of sediment has other potential advantages. Previous research has shown that coastal wetlands revegetate quickly (within a single growing season) when covered with dredged sediments of modest thicknesses. There is also well-established science demonstrating the effectiveness of covering contaminated	$0

	sediments with a clean sediment cap to isolate contamination, preventing transport and ecological exposure. A synthesis of existing information suggests that placing dredged sediments on the wetlands should be an effective remedial approach. The general approach of using dredged sediments to nourish and raise wetlands is also well established. There are many successful examples of using dredged sediment to beneficially augment existing wetlands or establish viable wetlands in areas where the pre-existing bathymetry was too deep. There are, however, unique characteristics of the Louisiana Coast that will require further study. These include viable dredged sediment sources (spatial and temporal availability, sediment quality, etc.), logistics of dredged sediment transfer, innovative sediment retention measures, placement measures to minimize sediment loss, best application rates for oil sequestration, ecological sustainability and marsh longevity, and monitoring programs to evaluate best practices. Capping has also been successful at isolating contaminated sediment at many sites, but this particular application requires some additional study. These include testing different depths of mud layers for their effectiveness of immobilizing the oil and restoring natural benthic communities, the effect of dense vegetation on contaminant isolation effectiveness, enhanced degradation that might result from the plant root mass, and the potential for additives to expedite oil degradation below the cap layer. Project Summary: This project will provide a comprehensive assessment of the use of dredged sediments for restoring oil contaminated marsh. It will evaluate important logistical components including sources and volumes of available sediment, sediment transfer and placement, sediment spraying, and equipment availability. The project will also evaluate and test innovative sediment retention measures. Several modular designs have recently been proposed that also allow for ecological exchange, but these designs have not been tested. Field and laboratory tests will also be conducted on the effectiveness of dredged sediment caps to isolate contamination with thick vegetation, the role of vegetation in long-term biodegradation of the trapped oils, the thickness of sediment layers necessary to isolate contamination while allowing the marsh to quickly recover, and the value of biodegradation enhancement beneath the cap. Project Benefits: This project will provide the basis for using dredged sediment to rapidly restore the ecological function of Gulf Coast marshes. The results of this effort will help guide the development of a comprehensive, effective, and timely restoration plan through reliable information on the applicability of this approach and the availability of sediment to implement it. The project will provide a roadmap for navigating the logistics of obtaining sediment, transferring it to the site, placement approaches, and retention alternatives. Most importantly, the project will provide reliable data on the ability of sediment to safely sequester the surface oils from the environment and estimate the design life for that sequestration.	
Calcasieu River Hardwood and Cypress Restoration	The St. Bernard Parish Government has in place a cooperative project with The Nature Conservancy, an international non-profit conservation organization, to fabricate, deploy and monitor 2.15 miles of induced high vertical profile oyster reefs in the Oyster Zone of the Eastern St. Bernard Estuarine Ecosystem. The currently funded 2.15-mile portion of the project is part of a larger action for which a permit was acquired for construction of 4.54 miles of artificial reef along segments of shoreline in Lake Fortuna, Lake Machais, Lake Athanasio, Lake Eloi and Eloi Bay. The project was selected for American Recovery and Reinvestment Act funding by NOAA as part of the Gulf of Mexico marine habitat stimulus program in 2009. Emplacement of the artificial reef in St. Bernard Parish was delayed by the BP Macondo event, but was re-started in May 2011 and is being mobilized from Hopedale. The NOAA-TNC project is intended to be the beginning of a far reaching reef building program for the Eastern St. Bernard Estuarine Ecosystem. The project employs a reef building technique utilizing ReefBlkTM that has been proven in projects from Texas to Florida. Individual reef units consist of a welded frame of steel rods that form a triangular column. The nits are 5 feet along each leg of the triangle and are typically 2 feet high but may be higher depending on site conditions. The frames hold 9 aquaculture type mesh containers (e.g. bags). When filled the 9 bags hold 300 pounds of shell. The welded frame weight 70 pounds for a total individual ReefBlkTM unit weight of 370 pounds. The units are typically placed in a saw-tooth pattern parallel to an eroding shore or bank. The units immediately reduce wave energy and turbidity. Oyster larvae become attached to the shells in the	$1,700,000

	ReefBlkTM. where they become spat that grow rapidly . Under average favorable conditions the oysters grow rapidly and within 12 to 18 months the oysters in one unit produce approximately one ton of new shell. Sediment usually collects behind the new reef. ReefBlkTM units have a solid frame, which when interlocked form a stable structure with a broad footprint. They are light in weight when deployed but gain weight and stability from rapid oyster growth. The units have a large reef face to mass ratio, with approximately 50 square feet of reef exposure. This feature has the dual advantage of not requiring large volumes of shell and providing maximum habitat for marine organisms. Because the cultch shell is loosely packed, water and food flows through the reef unit panels accelerating oyster growth and providing favorable habitat for innumerable species of reef attracted organisms. The ReefBlkTM structure provides shelter for larger fish. The individual units are like Lego pieces in that they can be configured for different erosion control and estuarine sculpturing applications. Most importantly the ReefBlkTM units provide a favorable framework onto which living oysters can grow and produce large volumes of shell. Some shells remain on and around the unit and the shells become cemented together to produce a true high vertical profile living reef. Other living oysters and shells are ejected by growth or beak off from the units and are carried toward shore by waves and tides resulting in development of cluster growths of living oysters or an accumulation of finer shell particles that accumulate along the inner shoreline as beaches and oyster banks. One of the most effective geometries for the induced reefs is the "barrier and lagoon." The centerline of the reef is parallel to the shore and 75 to 100 feet from it. Small tidal gaps, 25 to 30 feet wide are left in the reef at intervals of about 110 feet. As trapped sediment and shell accumulates behind the reef tombolos join the reef segments with the shore leaving oval lagoons about acre in extent, where submerged aquatic grass beds can be planted. Shell beaches develop along the shore behind the lagoons. This design creates a wide range of habitat diversity for oysters, larval shrimp and finfish, crabs, shore birds and wading birds, small mammals, and mature finfish and shellfish. The oysters in the induced reefs are not for harvest, however oyster farmers like the reefs because by reducing erosion they reduce turbidity, which may smother growing oysters in the bottom beds. They also produce billions of free swimming larvae, many of which settle on neighboring oyster beds in leased oyster plots that are harvested. Recreational fishermen love the reefs, as they attract finfish. Construction of artificial oyster reefs using ReefBlkTM units has advanced beyond the demonstration phase to the production phase. Nine projects have been completed successfully in Texas, Louisiana, Alabama, and Florida. The first phase of the NOAA-TNC project in Louisiana involved installation of 1200 ReefBlkTM units (6000 feet) on the bay side of Grand Isle.	
Addressing Marine Debris to Expedite Recovery along the Gulf Coast	One solution to the construction of artificial barrier islands and breakwaters in high wave energy areas is the use of submersible concrete barge technology. The St. Bernard Parish Government, in a resolution of May 18, 2010, proposing construction of the East Biloxi Marshes Shoreline Barrier Zone in the BP oil impacted area supports the use of submersible concrete barge surge breakers as a major component of the barrier. While the merits of this approach are recognized, it is yet to be tested. Because of the urgency for finding a practical, cost effective solution to construction of barriers this pilot project is proposed. A local manufacturer has custom-designed and built submersible concrete barges as platforms for oil and gas field production facilities for decades. The barges are built of reinforced concrete on a land-based drydock and floated to the operation site where they are submerged and rest on the bottom of the gulf, coastal bays, or lakes. A crushed rock bed is usually placed on the water bottom at the deployment site. It is not uncommon, after decades of service, to re-float a barge, update the production equipment and use the barge at a new location. Some of the barges have been in operation for more than 40 years and the barges have survived surge and waves from the most severe storms. Large barges are 200 x 70 x 14 feet and can be floated in 6 feet of water. A vertical extension can be added above the barge to increase its effective height for blocking surge and waves. For applications in the construction of the East Biloxi Marshes Shoreline Barrier smaller 80 x 24 x 15 feet barges equipped with an additional 3 foot high breakwall and a draft of 5.5 feet may be used. Advantages of the barges are that they can be standardized for efficient	$10,000,000

	manufacture at an onshore facility. They can be moved to deployment areas through inland navigation channels by tug boats. They can usually be placed without dredging an access channel. They do not sink into the substrate. They are supportive of oyster growth and other marine encrusting organisms. If conditions change the barges can be floated and re-deployed. The barges are a cost effective alternative to the use of heavy rocks, massive concrete structures, and dredging of buried sand deposits.	
GULF OF MEXICO HATCHERY AND FISHERIES RESTORATION CONSORTIUM	Proven aquaculture technology exists for hatchery produced and controlled growout of key coastal species of finfish, specifically speckled trout, and red fish. The neighboring state of Texas has a program for controlled growout and release of these species. Red fish and hybrid striped bass have been successfully grown in coastal waters of Louisiana and marketed to restaurants in the state as a private enterprise. Submerged concrete barges can be used as finfish growout tanks. Funds are requested to develop these facilities.	$60,000,000
Long-Term Recovery of Gulf Shorebirds and Waterbirds	The fishing villages of eastern St. Bernard include Reggio, Delacroix, Yscloskey, Shell Beach, Ft. Beauregard, Hopedale, and Delacroix. They are linear communities aligned along highways that follow bayous. They are as close to the rich estuarine resource base as road access will permit, but they lie outside of the protection of the hurricane and flood protection levees. They are characterized by boat launching and docking facilities, seafood off-and loading areas intermixed with houses and trailers perched on high foundations and pilings. Water front recreational communities are part of the mix. They are the staging area for commercial and recreational fishers with a sprinkling of support for oil and gas field personnel. They were devastated by Hurricane Katrina and were in the recovery mode only to be set back by the BP oil event. Infrastructure is not as well developed here as in the more densely populated urban corridor of St. Bernard, but there is electricity, roads and bridges, public water supply, as well as police fire and other emergency protection. The lower-elevated landscape is subject to flooding from storm surge and building construction must meet rigorous new standards for base floor elevations and resistance to hurricane force winds. The fishing village area needs long term planning for further development of its infrastructure to accommodate present and future uses. Economically and culturally, this is an important part of St. Bernard Parish. It is proposed that funding be provided to develop a comprehensive plan for the area.	$71,900,000
GULF OF MEXICO HATCHERY AND FISHERIES RESTORATION CONSORTIUM	During the BP Oil event it was found to be necessary to establish a temporary center for the Unified Command at Hopedale, Louisiana to coordinate and implement emergency measures. Hopedale is literally at the end of the road and the jumping off area for the vast eastern St. Bernard Estuarine area. At the peak of the response 2500 people were working at the center. It was a small city with hundreds of boats and vehicles. At the end of the crisis, the center was de-mobilized. As we move into the evaluation and restoration phase of the oil event as well as into other environmental restoration projects in the area such as the Mississippi River Gulf Outlet (MRGO) ecosystem restoration program, it has become apparent that a smaller command and marshalling center is needed at Hopedale. Use of the command center building constructed during the oil spill is being made available as an oyster and fishing grounds restoration center by the owners. It will serve as a staging area for NRDA evaluation, restoration, and remediation and ongoing environmental research and restoration of oyster reefs and fishing grounds. In addition to the St. Bernard Parish coastal restoration program, a number of non-government conservation organizations, including The Nature Conservancy and the Audubon Society, have expressed interest in utilizing the facility for research, sponsored restoration projects educational program and field trips. It is anticipated that universities and colleges in Southeastern Louisiana will utilize the facility, as well as state agencies such as the Louisiana Department of Wildlife and Fisheries. The facility will become a tangible focal point for coastal restoration. No such facility presently exists in the tidal area of the coastal zone east of the Mississippi river. The large fully functional building is being provided without rental charges. However, operating expenses are needed for utilities, janitorial and routine maintenance, security, etc. are needed.	$60,000,000

Gulf of Mexico Hatchery and Fisheries Restoration Consortium	The spreading of cultch on existing bottom reefs and oyster bottoms is an established technique for enhancing oyster productivity. The cultch is usually brought to the deployment area on oyster luggers or barges and washed over the side with a high pressure hose. Clean oyster shells are the preferred material but crushed and size-graded concrete and other artificial cultch materials may also be used. Because oyster shells are scarce, St. Bernard oyster fishermen have recently begun to use crushed concrete as a substitute material. Large quantities of concrete are available in the St. Bernard area from slabs of homes destroyed by hurricane Katrina. Gravel-sized particles of crushed concrete have proven to be an acceptable substitute for the attachment of oyster larvae. St. Bernard oyster fishermen are a very skilled manpower source for applying cultch at designated sites throughout the shallow water areas of eastern St. Bernard because this is a commonly used method for enhancing oyster production on their privately owned leases.	$60,000,000
New Marketing Tool for BP to Generate Sales for Local Merchants and Consumers Along Gulf Coast	A number of St. Bernard Parish's water bird nesting areas were oiled. Bird island can be restored using cultch spread and induced high vertical profile oyster reefs as described above. The Audubon Society has expressed an interest in undertaking restoration of bird islands in the area and being an active participant in the Hopedale Oyster Reef Restoration Center. It is proposed that this restoration be supported by BP funding with active participation of the Audubon Society.	$0
Spill oil picking up System	Because of the low spat counts in the eastern St. Bernard estuarine area since the BP oil event a supply of disease resistant, fast growing live larvae is needed as an important component of oyster reef and fishing grounds restoration. Dr. John Supan of the L.S.U. Sea Grant program has developed and is operating an oyster hatchery at the Louisiana Department of Wildlife and Fisheries Facility located at Grand Isle, Louisiana. Part of Dr. Supan's program is to foster advanced technology, off-bottom grow out techniques and to help introduce these techniques to the oyster fishers. Dr. Supan has made a commitment to participate in the Hopedale Oyster Reef and Fishing Grounds restoration program. Funds are requested to move this essential component of restoration of the oyster grounds and industry.	$3,000,000
5-Year Increase in Gulf of Mexico Fishery Observer Coverage for Monitoring Marine Mammals, Sea Turtles, and Bluefin Tuna	Coastal restoration and flood protection in St. Bernard Parish is a multi-billion dollar industry. Much of the program is water or marine based. Operation of vessels in inland waters is an important part of the cultural heritage of St. Bernard Parish. Navigation, boat operation and maintenance, and all of the required skills are traditionally handed down from father to son. With the advent of satellite communication and navigation and advances in marine technology, a more formal program for these and other skills related to design, construction, operation and maintenance of ecosystem management projects would both help prepare the youth of the parish for desirable jobs, and also provide a trained workforce to implement the program as it continues to develop during this and future decades. For these reasons, we proposed immediate funding of a program for marine technology development at the Nunez Community College located in Chalmette, Louisiana. The first step should be an economic evaluation to identify work force requirements for short-term and long-term coastal restoration and related activities of fisheries and oil and gas. Concurrently an evaluation of marine technology education in other coastal states should also be made. Pilot courses should be developed immediately.	$6,500,000
Delacroix Island Protection and Restoration: A Hurricane Protection and Community Resilience Project	The Violet Canal is an important water gateway from the east bank of the Mississippi River to Lake Borgne via Bayou Dupre. It has been proposed by the U.S. Army Corps of Engineers as a route for a diversion channel to deliver water from the Mississippi into the MRGO channel and Lake Borgne. Near its northern Bayou Dupre end it crosses through floodgates in the flood protection levees and thence crosses the MRGO channel before entering Lake Borgne. Historically it has been a harbor for fishing boats. During Hurricane Katrina a large part of the St. Bernard fishing fleet took refuge in the canal and survived the storm. This is currently the only "safe harbor" in the eastern end of the parish. Until recently there was a shrimp cannery along the canal, but it was closed after Hurricane Katrina. The function of this important canal and the land adjacent to it is in serious need for re-evaluation. Because of the importance of this canal to the fishing industry of	$1,200,000

	St. Bernard it is recommended that funds be provided to conduct a comprehensive economic and land use evaluation and to develop a plan.	
Pelican Island Restoration Project	This is a Shoreline Protection Project that will consist of segmented breakwaters constructed of large stone. These breakwaters will be constructed 200' to 500' off shore with 50' wide openings (Fish Dips). Erosion is currently claiming from 8' to 14' of shoreline annually. The purpose of this project is to arrest this erosion. The projected cost of this project has more than doubled due to the finding of many subsurface stumps and logs that must be removed from the site - also the occurrences of Hurricanes Katrina, Gustav and the BP Oil Spill have escalated material costs far beyond our original estimates.	$2,500,000
Shrimp Restoration	A suite of tools that can be used from virtually any vessel of opportunity for collection of acoustic data and analysis software for assessment of substrate and habitat characteristics - as well as fish abundance and distribution in deeper waters. The BioSonics DT-X Digital Scientific Echosounder system is used for quantitative assessment of substrate class, submersed aquatic vegetation (SAV; location, density, canopy height), and fish biomass (distribution and quantity). The calibrated, portable system can be deployed from virtually any vessel and data can be analyzed by trained personnel to provide unbiased, quantitative assessment of biological and physical environmental variables. BioSonics provides hardware, software, training, support, and technical services. Clients include NOAA/NMFS, Bureau of Reclamation, Tribes, Universities, and private consultants. Additional information available on web site.	$0
Increase the Pace, Quality and Permanence of Voluntary Land and Water Conservation through the Partnership for Gulf Coast Land Conservation	SAV (Submersed aquatic vegetation) are #1 for fisheries habitat. While a focus in fisheries resources has been on marshes and marsh edge as valuable habitat, abundance of nekton is even higher in SAV (Rozas and Minello). This resource does not receive planning, restoration, or grant support mainly because it has not been inventoried in the muddy waters of the northern Gulf coast (Merino et al.). Whereas other states that have inventoried sea grasses, recognize, and support their fishery resource through state management plans, the northern Gulf state most affected by the oil spill has not. Louisiana, having the majority of the nation's deltas, has the greatest potential for SAV that would aid in water quality and fisheries habitat. These functions are well recognized and supported in the Chesapeake Bay area. These functions help offset those caused by oil spills, both the DWH and future events. 1.) Survey the resource 2.) Convene a panel of experts to establish a plan, based on the areas and opportunities of need 3.) Provide guidance for community-based restoration on execution 4.) Get the state and restoration in the northern gulf to implement the plan along with other restoration programs, such as the CWPPRA, LCA, and CIAP.	$1,000,000
Lake Hermitage Marsh Creation Additional Increment	This effort would add up to 5,000 acres to the current protected land base within the Atchafalaya Basin, in south Louisiana. The protection would ensure increasingly valuable filtered surface water flows, for the long-term health of the Gulf of Mexico. In addition to protecting water quality for the Gulf, this source for significant quantities of surface water flow has provided the only significant sediment accretion forming wetlands within the Louisiana Coastal Zone. Further, this area provides critical stopover, foraging and breeding habitat for numerous migratory birds. Sherburne Wildlife Management Area, located in the Morganza Flood way system of the Atchafalaya Basin, is situated in the lower and upper portions of Pointe Coupee, St. Martin, and Iberville Parishes respectively, between the Atchafalaya River and the East Protection Guide Levee. The Sherburne WMA, Atchafalaya National Wildlife Refuge and the U.S. Army Corps of Engineers lands combine to form nearly 50,000 acres of protected lands. The Louisiana Department of Wildlife and Fisheries owns 12,000 +/- acres, the U.S. Fish and Wildlife Service owns 15,800 acres and the remaining acreage is owned by the U.S. Army Corps of Engineers.	$13,200,000
Finish the Cleanup Underseas	16,000 +/- acres of critically important Louisiana coastal wetlands within the Lake Maurepas/ Pontchartrain Basin. The three targeted tracts are a link into the green infrastructure network already in place across this landscape/ basin. The protection of this acreage will not only provide multiple public benefits, but it will complement at least two multi-million	$0

	dollar restoration projects to restore hydrology, being led by the U. S. Army Corps of Engineers, and the Louisiana Office of Coastal Protection & Restoration within the Maurepas Swamp.	
Lake Hermitage Marsh Creation Additional Increment	Louisiana's coastal land loss is significant and well-documented. Hard structure has been used for decades to deter erosion with limited success and high cost. In particular, hard structures designed to recruit and grow oysters are popular and currently being tested in several locations for improved shoreline resiliency. While oysters are often cited as key species and critical bio-engineers for shallow water coastal ecosystems, they may not be the best choice since (1) building hard-structure for oyster recruitment is costly, (2) there are limited locations with suitable water access and vessel access, and (3) the oyster's primary value to many is from its harvest value, which involves removal of oysters from the system and runs counter to the goals of developing non-harvest oyster reefs for shoreline restoration and protection. An alternative to building hard structure for oyster reef creation would be to use a different native bivalve ecosystem engineer which does not require hard structure and is not harvested for its economic value. Such an organism is the native ribbed mussel, Geukensia demissa, which is found across the estuarine landscape in areas similar to where the oyster is found. As with all mussel species, ribbed mussels attach by byssal threads or beards and can be found attached as clusters to marsh grass stalks. Enhancing ribbed mussel populations may provide increased marsh shoreline resiliency by enhancing shoreline structure. At the same, as suspension-feeding bivalves, these mussels would provide many of the same ecosystem benefits as oysters, including water filtration and habitat provision. The advantage of mussels is clear in that hard structure is not required for their populations to thrive, significantly decreasing the cost associated with shoreline restoration and protection, and reducing the need to locate materials suitable for providing a reef base (i.e., limestone rock, cement structure, shell cultch). Furthermore, a s ribbed mussels are not a species of economic harvest value, political debates as to the protection from harvest of these shoreline structures would be unnecessary, and issues related to restoration of these bivalves in areas closed to harvest would no longer be a concern as has been recently around the country. Lastly, culture methods are well known, and larvae may be reared at the Sea Grant Bivalve Hatchery at the LDWF Marine Research Laboratory on Grand Isle in large numbers (50 million /week production capacity during hatchery season). These hatchery-produced pediveligers could then be remote set at selected shorelines. As ribbed mussels are not a species of economic interest, little is known about their ecology and range within coastal Louisiana, or the survival and deployment of hatchery- produced stocks. This project proposes to: (1) identify areas suitable for ribbed mussel growth and shoreline enhancement in coastal Louisiana, (2) from wild-stock, use the hatchery to produce ribbed mussel pediveligers, and (3) conduct preliminary tests at selected marsh locations of deploying hatchery-produced pediveligers as a means to restore oiled shorelines and increase shoreline resiliency in interior marshes. This project would provide a viable and politically feasible alternative to the use of oyster reefs for shoreline protection. Objectives: This project proposes to: (1) Spatially survey existing ribbed mussel populations in the Barataria estuary relative to tidal height, energy (fetch) and vegetation community along a salinity transect to identify areas suitable for ribbed mussel growth and shoreline enhancement in coastal Louisiana; (2) From wild-stock, document the gametogenesis of native Geukensia demissa populations for developing broodstock conditioning protocols and produce 50 million mussel pediveliger larvae/year for two years at the hatchery; and, (3) Use the hatchery-produced pediveligers and remote setting to test the effectiveness of larval mussel deployment, survival and growth at marsh sites along a salinity gradient as a means to increase shoreline resiliency in interior marshes. Methodology In the Fall of 2011, Geukensia demissa populations will be located and surveyed along salinity transects. Locations will be placed on a survey map, and information on salinity, water temperature, tidal height, vegetation community, shoreline position and orientation and population density and size will be quantified. From these surveys, a minimum of 6 paired control and test sites, 30 m in length, will be selected for remote setting of hatchery-reared larvae. Sites will be selected along the salinity gradient, along shorelines with different orientations. As much as possible, vegetation community will be similar between all sites	$13,200,000

	to be used for testing. Adults will be collected monthly from these sites for histological evaluation of gametogenesis. Adults will also be collected in Winter 2011-12 and Spring 2012 to develop a conditioning protocol to produce ripe gonadal condition at the hatchery for subsequent spawning and larval rearing during the Summers of 2012 and 2013 using standard hatchery techniques. Remote setting at the selected marsh test sites will be conducted during high tide using standard methods. Random quadrat sampling along the marsh edge will be conducted monthly for number and size of mussel populations. Temperature, salinity, sediment soil properties and vegetation community data will also be collected during this time period. Data will be statistically tested comparing mussel number, size, and growth between treated and untreated shorelines, and by salinity and shoreline orientation. If necessary, co-variates of vegetation or sediment properties will be included in the model. Rationale Shoreline restoration and protection are critical tools in the fight against coastal erosion, yet most protection methods are very costly due to materials handling and deployment. Enhancing ribbed mussel populations may be a low cost alternative to traditional shoreline protection (rocks), and created oyster reefs using bio-engineered materials, since mussel larvae are easily moved from a hatchery using standard remote setting techniques. Increasing mussel populations to create mussel mats may prove to be a viable option for increasing shoreline resiliency, while also providing added ecosystem benefits of water filtration and habitat provision. This proposed project addresses restoring the function and productivity of Louisiana's degraded ecosystem by focusing on a strategy to restore damaged and lost wetlands to the functional equivalent of natural ecosystems based on realistic ecological metrics, hydrologic requirements, and design criteria.	
Pelagic Longline Fishing Vessel and Permit Buyback in the Gulf of Mexico	Acquisition of 1,500 +/- acres, in multiple parcels, of coastal emergent habitat intermixed with open water/ marsh habitats. These parcels are inholdings within the existing federal ownership at Big Branch National Wildlife Refuge, which sits adjacent to Lake Pontchartain and Lake Borgne, in southeast Louisiana. The protection of this acreage would also provide an opportunity for important coastal restoration of this coastal wetland system.	$0
Northern Gulf of Mexico Super Project	Remove the sills on Bogue Chitto River at the Pearl River Lock and dam canal and on Pearl River at Pools Bluff. If there is too much political pressure to not remove them, install fish ladders capable and practical for adult Gulf Sturgeon to move upstream of the sills to return to historic spawning grounds. There were over 28 individuals killed as a result of the Temple Inland release. Temple Inland or any purchaser of the mill including International Paper should fund the entire project.	$120,000,000
A Low-Cost Solution for a Cleaner Gulf	Location: The project is located in Region 2, in the Barataria Basin. The project site is located along the east portion of Lake Salvador near the Barataria Preserve of Jean Lafitte National Historical Park and Preserve (JLNHP&P) and lands south of Bayou Villars in Jefferson Parish, Louisiana. Communities in the immediate vicinity of the project include Jean Lafitte, Barataria and Crown Point. These communities depend on commercial and recreational fishing, ecotourism, and the oil and gas industry for their economic stability and were highly impacted by the BP oil spill. One key feature of this project is the protection for these local communities and adjacent infrastructure and two very important Federal assets. The project site is located in a critical area 15 miles south of New Orleans that provides one of the last lines of defense against storm surge coming toward the Metropolitan Area from Lake Salvador and the Barataria Bay. The project also prevents Lake Salvador from continuing to break through into the Gulf Intracoastal Water Way (GIWW) and protects the JLNHP&P from erosion. In addition, oil and gas infrastructure in the immediate area would be protected. Problem: Within the past 50 years, the project area has lost more than 650 acres of wetlands along the east shore of Lake Salvador. The opening of Bayou Villars at Lake Salvador has retreated approximately 5,100 feet into the GIWW. Shoreline retreat and wetland loss were accelerated by winds and storm surge caused by Hurricanes Katrina and Rita. Within the project area, these storms eroded the shoreline 100 feet in places and interior marsh was compacted or torn apart creating open water ponds. Flooding of Crown Point, Jean Lafitte, and Barataria communities may be partially attributed to these high wetland losses. Stabilizing the shoreline and protecting the remaining marsh would protect natural coastal resources, communities, and	$0

	infrastructure. The average shoreline retreat in the project area is ap proximately 38 feet year. Some areas have a shoreline retreat as great as 89 feet/year. The shoreline retreat along the southern bank of Bayou Villars is encroaching on the GIWW. Currently the opening at the GIWW is at 2,000 linear feet. The opening at Bayou Villars has the potential to open to approximately 10,000 linear feet in 20 years once the islands to the south of Bayou Villars are lost to shoreline retreat. Proposed Project Features: 1. Install approximately 31,000 tons of rock along 5,500 linear feet of shoreline from existing pipeline crossing north of Bayou Villars the north bank of the mouth of Bayou Villars 2. Install approximately 44,000 tons of rock along 8,000 linear feet of shoreline from existing pipeline crossing south of Bayou Villars the south bank of the mouth of Bayou Villars.	
Field of Dreams	NFWF and its partners, including managers from all five Gulf States, USFWS, NOAA, and NPS, as well as NGOs and science institutions, propose to restore Gulf populations of sea turtles through the following 3 strategies. This work builds on $3.8M in previous investments NFWF has made to bolster Gulf sea turtle populations since June 2010. 1) Bycatch Reduction - This two-part strategy is projected to save the reproductive equivalent of a minimum of 3,000 nesting females over five years: a) NFWF will provide free vouchers for 7,000 Turtle Excluder Devices (TEDs) to LA and AL fishermen to cover 100% of this fishery, and work with state managers to offer training and assistance on TED installation, and inspections and usability follow-up testing. b) NFWF will convene state and federal agents to standardize enforcement, data collection and reporting processes to create a Gulf-wide database; invest in the capacity of states to enforce the use of TEDs; and evaluate the results of increased enforcement. 2) Nesting Beach Restoration - This three-part strategy is projected to save the reproductive equivalent of 2,400 nesting females over five years: a) Predator Control: NFWF will establish a fund to invest $100,000 annually in predation reduction efforts on high density nesting beaches in FL and AL to maintain predation levels at or below 30% in perpetuity. b) Light Pollution Reduction: NFWF and the Sea Turtle Conservancy (STC) will minimize light pollution on 600 of the highest priority public and private properties along high density nesting beaches, and train county code enforcement staff to address lighting problems. c) Habitat Protection: NFWF and USFWS will protect 2.5 miles of priority nesting habitat (1,300 nests annually) within Archie Carr and Hobe Sound NWRs. NFWF, STC and U of FL will also pilot a new conservation easement to [strengthen protection of] existing nesting habitat on developed properties. 3) Critical Gaps in Science/Management - NFWF will mobilize scientists to address two critical research gaps that impact turtle recovery efforts: a) coordination of a 5-year study to identify priority habitats in the Gulf and to identify overlaying threats; and b) a pilot program to test new methods for turtle-friendly beach nourishment.	$8,000,000
Bird-Friendly Lighting on Oil and Gas Platforms in the Gulf	Oil products from MC252 have covered a vast area of the deep seafloor, which may have sterilized the benthic habitat. Normal sedimentation rate in this area is appx.1 cm/yr. Assuming burrowing organisms occupy the vertical space of -60 cm into the sediments, full habitat recovery might require 60 years of sediment deposition to isolate the oiled layer from the biota. A habitat restoration project of 25 km2 is proposed to provide vertical attachment surfaces above the oiled seafloor for occupation by endemic biota. The recommended substrate consists of a 4 m length of black iron pipe 3-inch diameter with 3- 1/2-inch holes spaced 70 cm apart starting at the top of the pipe. The bottom of the pipe is flared and embedded 10-inches into a conical-shaped, concrete drive-point 6-inch diameter X 24-inch length. At a density of 1 pipe/1,000 m2, 25,000 pipes are fabricated, loaded onto a barge, and dropped into the Gulf using GPS coordinates for the project location grid. The force of gravity drives the descending pipe into the seafloor (>1,000 m BSL), allowing appx 3 m of pipe to extend above the oiled layer. Monitoring of the deep seafloor habitat grid (plus 60,000 acres adjacent) is performed for 10 years by a scientific team using ROVs (e.g., detached motorized submersibles or gliders) deployed from a research vessel. Telemetry data from the ROV is analyzed for species colonization of the pipe surface and the benthos, and pipe integrity (useful life estimated at 50 yrs.). cost/pipe= $25 $625,000 delivery dockside $3 $75,000 Vessel transport DWH $5 $125,000 Total cost/pipe $33 $825,000 Scientific Team 1y $300,000 Deep Submersible ROV $500,000	$0

	Ship Time 60 days/yr $300,000 1 yr monitoring cost $1,100,000 1st yr total $1,925,000 9 yr monitoring cost $9,900,000 1 0 yr Total Project Cost $11,825,000 Cost/km2= $473,000 Cost/m2= $0.47.	
Upgrades to the Electronic Logbook Program for the Offshore and Inshore Commercial Shrimp Fishery for a 5-Year Period	North Carolina based Restoration Systems (RS) proposed a very promising project to the South Lafourche Levee District that can feasibly be implemented for Natural Resource Damage Assessment compliance in 180 days from Notice to Proceed. The project described is the LL&E South Lafourche Marsh Restoration and Levee Protection Project. RS describes is a Full-Delivery, bonded restoration and mitigation banking company. The company has 22,000 acres of restored, preserved, and enhanced wetlands and ecosystems at 40 locations in seven states. In Plaquemines Parish, RS is permitting the Jesuit Bend Wetland Mitigation and Coastal Protection Mitigation Bank. That project is identified in the Master List of restoration projects under consideration for Trustee finding pursuant to the BP oil spill Early Restoration Agreement. RS has the right to acquire permanent conservation servitudes on the project areas upon completion of the five year-monitoring phase, or before if required. The company has agreed to allow Restoration Systems to make this proposal contingent on contract completion which is expected within the next month. Habitat improvement activities will be bonded and monitored for success over a five-year period or longer if required by the Trustees. RS has completed nearly 35 successful projects bonded for success in a similar manner. The company will utilize only A+ Rated surety companies which require substantial capital and assurance of implementation according to contract. The project is on the wet-side of the east and west banks of the Parish levees protecting the South Lafourche community and surrounding area. This area, easily visible on attached satellite photographs, has converted from marsh and cypress swamp over the last century to shallow, open water areas. Phase One has approximately 650 acres of marsh restoration. Phase Two has approximately 636 acres of marsh restoration and Phase Three has approximately 560 acres of marsh restoration. In order to convert the site to its historic condition, RS will permit the dredge, pump, and placement of material into the restoration area from sources previously permitted for dredging located near each phase. The placement and planting with natural and appropriate vegetation will provide a natural barrier to storm and wave attenuation at the toe of the Parish levee, which is now open water. Perhaps more importantly for the Trustees, the restoration will also re-establish a number of important and increasingly threatened sporting opportunities and historic ecological communities for local citizens and visitors, including Essential Fish Habitat and nursery for recreational and non-game fish, shrimp, shellfish, and other aquatic species. The project is immediately adjacent to CWPPRAs PPL21 Bayou L'Ours Terracing project and will complement the work that location. Figure 1 shows the planned Bayou L'Ours project location, the area of which is also shown as RS Exhibit B. Also included are other photos of representative projects in the area with the same landowner. The implementation of this project has the support of the South Lafourche Levee District and also enthusiastic local citizen support. It is literally in the backyard of thousands of Lafourche residents whose recreational opportunities are increasingly limited by degradation of this significant habitat before and as a result of the Deepwater Horizon spill. Please let Restoration Systems know what additional information regarding this project that I can provide to the Trustees Council or other appropriate parties.	$6,650,000
Gulf of Mexico Ecosystem Assessment: The Role of and Possible Oil Spill Impacts to Menhaden as a Keystone Species	1,000 acres on each side of Calcasieu River in in Allen and Jefferson Davis Parishes, Louisiana.	$0
Reef Fish	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. This type of restoration project, conducted as part of NRDA in the past, will reduce	$0

	future injury to protected species - both marine mammals and sea turtles - and their habitats through the reduction of existing marine debris as well as the prevention of future introduction of hazards. By preventing preventable future injuries, this project will enhance the capacity for species and habitat recovery and the time of impact to recovery will be shortened. 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. 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, AL, and coordinated as a NOAA partnership project with the NOAA Marine Debris Program as lead coordinator, this project will engage all five states, maintain and improve partnerships with state and local organizations, and strengthen public engagement across the Gulf. This project t is specifically targeted to involve and educate Gulf Coast communities how marine mammals, sea turtles, and habitat will all directly benefit from debris prevention and removal. The project will also look to identify targeted areas for debris removal that will have the most impact to improve the ecological health of the Gulf. 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 select communities where English is not the first language - and broaden awareness through effective beach clean-ups, fish rodeos, etc. This project will incorporate powerful Public Service Announcements, print materials, and technology to effectively raise the 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-term.	
Reef Fish Restoration	GULF OF MEXICO HATCHERY AND FISHERIES RESTORATION CONSORTIUM Problem: The Deepwater Horizon Oil Release (DWH) caused environmental and economic damage to fisheries in the northern Gulf of Mexico. America must employ novel and effective approaches to restore both economic and environmental well being of the affected fisheries. In addition, habitat destruction caused by hurricanes and other man-made causes (over-fishing, erosion and spills) have led to significant decrease in Gulf fish populations during the last decade. Solution: Marine aquaculture of key species can be employed to restore fisheries through restocking and to restore economic vitality through technology transfer and stimulation of small businesses resulting in job creation. This effort should be highly collaborative involving institutions in all five Gulf States as well as other national and international institutions, public and private, with significant hatchery technologies. Implementation Team: Gulf of Mexico Hatchery and Fisheries Restoration Consortium. - Gulf Coast Research Laboratory/University of Southern Mississippi (GCRL; lead institution) - University of Texas Marine Science Institute (UTMSI) - Louisiana University Marine Consortium (LUMCON); - Auburn University (AU) - Mote Marine Laboratory (MML) - University of Maryland- Baltimore (UMB) These institutions are leaders in marine aquaculture and stock enhancement research, implementation, and technology transfer for the northern GOM. The consortium is built on established relationships and will employ the highest quality science and economic approaches to implement, and transfer the technology to raise significant numbers of fish for fishery restoration and to stimulate private sector small business development. In addition to the implementation team, the consortium has established scientific, governmental agency and commercial advisory teams. Implementation Plan: The technology for aquaculture and fishery restoration of marine fis h varies among species. This necessitates the collaborative involvement of these 6 leading institutions that have conducted research on over 10 of the most economically and ecologically important Gulf fish species. Among the species are those for which the technology to implement stocking, technology transfer, and business stimulation already exists. The species targeted for immediate implementation of stocking and technology transfer include Red Drum, Spotted Sea Trout, Red Snapper, White Shrimp, Bull Minnows, Croaker, Florida Pompano, Cobia, Greater Amberjack and Southern Flounder. Projected Results: The work of the consortium will result in advanced technologies for use by Gulf States fishery agencies and private industry. Similar efforts in the Mediterranean Sea led to a $1 Billion industry in 10	$0

	years. The 2007 NOAA aquaculture plan projects 75,000 jobs created for every million tons of seafood produced by aquaculture. It is estimated that aquaculture of Gulf fish species would double the seafood output of the Gulf of Mexico ($700 Million in 2008). Additionally the recreational fishing industry (>$12 Billion in 2008) would realize expanded employment and business opportunities as natural populations are restocked with hatchery produced fingerlings.	
Leasing Commercial Red Snapper IFQ Shares to Restore the Gulf	This collaborative proposal supports three strategies that contribute to the full recovery of shorebird and coastal waterbird populations impacted by the oil spill, while ensuring such gains are sustained over the long-term. Specifically, the work proposed will: 1) Create and maintain nearly 28,000 acres of seasonal freshwater wetland habitat that completely address the habitat conservation 'gaps' for five important shorebird species, as well as provide demonstrable benefits to an additional 41 species of shorebirds, waterbirds, and waterfowl affected by the oil spill. 2) Increase the regional breeding populations of 37 species of beach and island nesting waterbirds and shorebirds that were directly impacted by the oil spill by 10,000-16,000 birds by improved management of critical nesting and stopover habitat along the Gulf and Atlantic coasts. 3) Ensure bird population gains are sustained through long-term stewardship of their key habitats, thereby avoiding a common shortcoming of conservation actions - that is, diminishing returns over time because of lack of resources to maintain those initial gains. The plan proposed below will ensure the long-term recovery and health of Gulf Coast shorebird and other waterbird populations affected by the Deepwater Horizon oil spill. These strategies are meant to complement, not duplicate, other activities (e.g., coastal marsh and barrier island restoration) that are likely to be undertaken by others and funded through the NRDA process. Key partners include the National Audubon Society, U.S. Fish & Wildlife Service, Ducks Unlimited, American Bird Conservancy, Manomet, Coastal Bird Conservation/Conservian, and Gulf Coast Bird Observatory. In 2010 and 2011, NFWF directed more than $13 million in the Gulf region towards conservation of birds that were likely to be negatively affected by the oil spill. Those innovative investments, developed and implemented collaboratively with federal, state, and private partners, resulted in unprecedented gains in habitat enhancement, restoration, and protection; direct augmentation of affected bird populations; and increased capacity for regional recovery of imperiled species. This proposal builds directly upon those initial investments.	$0
Oil Re Mediation	Problem: The Deepwater Horizon Oil Release (DWH) caused environmental and economic damage to fisheries in the northern Gulf of Mexico. America must employ novel and effective approaches to restore both economic and environmental wellbeing of the affected fisheries. In addition, habitat destruction caused by hurricanes and other man-made causes (over-fishing, erosion and spills) have led to significant decrease in Gulf fish populations during the last decade. Solution: Marine aquaculture of key species can be employed to restore fisheries through restocking and to restore economic vitality through technology transfer and stimulation of small businesses resulting in job creation. This effort should be highly collaborative involving institutions in all five Gulf States as well as other national and international institutions, public and private, with significant hatchery technologies. Implementation Team: Gulf of Mexico Hatchery and Fisheries Restoration Consortium. - Gulf Coast Research Laboratory/University of Southern Mississippi (GCRL; lead institution) - University of Texas Marine Science Institute (UTMSI) - Louisiana University Marine Consortium (LUMCON) - Auburn University (AU) - Mote Marine Laboratory (MML) - University of Maryland- Baltimore (UMB) These institutions are leaders in marine aquaculture and stock enhancement research, implementation, and technology transfer for the northern GOM. The consortium is built on established relationships and will employ the highest quality science and economic approaches to implement, and transfer the technology to raise significant numbers of fish for fishery restoration and to stimulate private sector small business development. In addition to the implementation team, the consortium has established scientific, governmental agency and commercial advisory teams. Implementation Plan: The technology for aquaculture and fishery restoration of marine fish varies among species. This necessitates the collaborative invo lvement of these 6 leading institutions that have conducted research on over 10 of the most	$0

	economically and ecologically important Gulf fish species. Among the species are those for which the technology to implement stocking, technology transfer, and business stimulation already exists. The species targeted for immediate implementation of stocking and technology transfer include Red Drum, Spotted Sea Trout, Red Snapper, White Shrimp, Bull Minnows, Croaker, Florida Pompano, Cobia, Greater Amberjack and Southern Flounder. Projected Results: The work of the consortium will result in advanced technologies for use by Gulf States fishery agencies and private industry. Similar efforts in the Mediterranean Sea led to a $1 Billion industry in 10 years. The 2007 NOAA aquaculture plan projects 75,000 jobs created for every million tons of seafood produced by aquaculture. It is estimated that aquaculture of Gulf fish species would double the seafood output of the Gulf of Mexico ($700 Million in 2008). Additionally the recreational fishing industry (>$12 Billion in 2008) would realize expanded employment and business opportunities as natural populations are restocked with hatchery produced fingerlings.	
Shoreline, Marsh Restoration and Recovery	Problem: The Deepwater Horizon Oil Release (DWH) caused environmental and economic damage to fisheries in the northern Gulf of Mexico. America must employ novel and effective approaches to restore both economic and environmental wellbeing of the affected fisheries. In addition, habitat destruction caused by hurricanes and other man-made causes (over-fishing, erosion, and spills) have led to significant decrease in Gulf fish populations during the last decade. Solution: Marine aquaculture of key species can be employed to restore fisheries through restocking and to restore economic vitality through technology transfer and stimulation of small businesses resulting in job creation. This effort should be highly collaborative involving institutions in all five Gulf States as well as other national and international institutions, public and private, with significant hatchery technologies. Implementation Team: Gulf of Mexico Hatchery and Fisheries Restoration Consortium. - Gulf Coast Research Laboratory/University of Southern Mississippi (GCRL; lead institution) - University of Texas Marine Science Institute (UTMSI) - Louisiana University Marine Consortium (LUMCON) - Auburn University (AU) - Mote Marine Laboratory (MML) - University of Maryland- Baltimore (UMB) These institutions are leaders in marine aquaculture and stock enhancement research, implementation, and technology transfer for the northern GOM. The consortium is built on established relationships and will employ the highest quality science and economic approaches to implement and transfer the technology to raise significant numbers of fish for fishery restoration and to stimulate private sector small business development. In addition to the implementation team, the consortium has established scientific, governmental agency and commercial advisory teams. Implementation Plan: The technology for aquaculture and fishery restoration of marine fish varies among species. This necessitates the collaborative involvement of these 6 leading institutions that have conducted research on over 10 of the most economically and ecologically important Gulf fish species. Among the species are those for which the technology to implement stocking, technology transfer, and business stimulation already exists. The species targeted for immediate implementation of stocking and technology transfer include Red Drum, Spotted Sea Trout, Red Snapper, White Shrimp, Bull Minnows, Croaker, Florida Pompano, Cobia, Greater Amberjack and Southern Flounder. Projected Results: The work of the consortium will result in advanced technologies for use by Gulf States fishery agencies and private industry. Similar efforts in the Mediterranean Sea led to a $1 Billion industry in 10 years. The 2007 NOAA aquaculture plan projects 75,000 jobs created for every million tons of seafood produced by aquaculture. It is estimated that aquaculture of Gulf fish species would double the seafood output of the Gulf of Mexico ($700 Million in 2008). Additionally the recreational fishing industry (>$12 Billion in 2008) would realize expanded employment and business opportunities as natural populations are restocked with hatchery produced fingerlings.	$0
Treat Subsurface Contamination	We have a new viral marketing platform to submit to your PR/Marketing Department for review. The program will help the merchants realize a tool that will help them generate sales and is cost effective for your firm. The merchant will offer a discount for their business on behalf of BP! This Platform developed for The New Economy, works in conjunction with a client's website or Facebook page, handles mobile marketing (free mobile app), provides tools for print publications (auto	$0

	generates QR Codes), video commercial Indexed on search engines and social media broadcasting. Bp will be able to regulate a discount offer the merchant can promote to market their business. This marketing tool can be branded to BP and also to the merchant's business. Please contact Ken Dugas at 985-518-1388 or email us for more information info@mediaadgroup.com.	
Louisiana Wetlands Redux	This project is of ENHANCEMENT type. Comparing to the Golf accident in the 2010 ant the damage and costs which followed it, there is a huge need to have a system which enables to protect both the sea and shore if an accident occurs. Introducing this system is not even comparable with costs we had at the Gulf occasion, it costs much less. The project is intended to prevent large spread of spill oil in case of an offshore accident. In the project, the equipment has been designed that all together make a protecting system , actually, it limits the spill oil to spread over large surface all around an accident place. We have started from point of view that offshore accidents are always possible to occur. More or less we are witnesses after an accident occurs that impacts to environments are inevitable and restoration projects cost very much and take long time. Here we have designed and composed a system that do limit on oil spread, then make it possible to pick up all oil, up to the last drop in the literal sense of the word. This works even at a rough sea, gales and so. How to achieve the goals and perform the actions from the statement above? That is the matter what this Project deals with. The word Project denotes both the System and its application. How to manage with picking up of the spread oil in all sea conditions? The principle used in the System is not to defeat a rough sea, but opposite to take advantage of the sea forces. The meaning is to work together with the sea. To stress importance and efficiency of the Project, freely said, it is a long-term seen strategy. By using the high professional approach to the problem and composition of, already on market existing, and new designed equipment the Project finds how to cope with permanent existing problem which threats to destroy the environment. It is harm that this system has not been applied at Mexico Gulf accident. There would not be so much impact as it was. If the rig were surrounded from beginning of th e accident by sufficient long booms designed for this system there would not be oil spread at all. The description of the system is available on demand. All described parts of equipment are presented on simplified drawings available on the link at the end of this chapter.. For this moment, here, we line up briefly only the chapters and equipment list. More information we will present after you, or some other institution shows an interest for it. System description Part one 1 Floating booms (Very special design) 2 Anchor 3 Buoy and inflation device 4 Floating Pump 5 Hoses 6 Wet oil processing plant (separates oil and water) 7 Working Boat 8 Oil Boat, a large vessel. 9 Spilit Oil Part two 1. Strategy and realization 2. Information about an accident 3. Monitoring and getting started 4. Crew Part three 1. Scope of supply 2. Know-How The system is very interesting for use in many other purposes: cleaning of harbors, wet oil processing ... Due to the System is subject of a patent protection procedure we do not give any more written details in this suggestion. But we are very ready to do in live our fully presentation on request. You are kindly asked to give us an opportunity to do the presentation. We are confident that after such one presentation we'll do a deal. We are looking forward for your response, Sincerelly yours Marko Kljaic In the link below you will found more information about the system. Please open the link by Copy and paste! The up to date description differs from that one in the linked document, there have been some improvements . The scope of supply does not include working and oil boat. https://www.dropbox.com/s/4440xnxbaj5nt2j/SOPS%20-%201115%20r1%203.ppt?dl=0 If the figures and text not sufficient visible open it in the PowerPoint.	$750,000
GSMFC Cooperative Regional Monitoring Project	Temporary (5-year) increase of 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. 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	$27,578,000

	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 limiting recovery from DWH oil spill injuries. Additional biological samples gathered through observers could reveal lingering sub-lethal injuries resulting from oil exposure and help scientists detect impacts on marine mamma, sea turtle or bluefin tuna populations still recovering from the DWH 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 for analysis of hydrocarbon and/or 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 marine mammal and sea turtle fishery interactions. Note that the estimated cost of $6.5 million is per year over five years. The estimated cost is based on the amount allocated to the Southeast Regional observer program in FY2009.	
Project Space Mop	Proposed by Land Trust for Southeast Louisiana to Louisiana NRDA November 17, 2011 Delacroix Island or Delacroix is an unincorporated town in St. Bernard Parish, Louisiana, United States. Land Trust for Southeast Louisiana proposes to use NRDA restoration funds to: 1. acquire (through fee simple purchase) nearly 1300 acres of marsh beginning at the confluence of the western bank of Bayou Terra Buffs and the southern bank of Bayou Gentilly 2. perform baseline assessments, develop, and implement an Ecological Restoration Plan following standards set forth by Society for Ecological Restoration 3. manage and monitor the property in perpetuity to maintain conservation and restoration values as set forth in the Plan HISTORICAL OVERVIEW OF DELACROIX AND PROJECT NEED In the 1780s, Spanish Canary Islanders, or Isleños, settled in the area after being given land grants from Spain. After selling their land grants to the planters, the Isleños frequently worked on the plantations they helped to create. Some began to resettle in the easternmost reaches of St. Bernard parish around the 1820s resulting in the firm establishment of Delacroix Island fishing community before the Civil War. By the 1900s, Yscloskey, Louisiana and Shell Beach, Louisiana near Lake Borgne were thriving communities. Seafood harvested by these fishermen in the 1800s and 1900s supplied New Orleans restaurants with a seemingly inexhaustible supply of shrimp, fish, and crabs. Previously connected to the outside world by boat, in the 1930s a road was constructed to "the island" (in reality an inland area surrounded by marsh and bayous). Since the 20th century, Delacroix has been regionally famous for fishing and trapping. Like much of the region, Delacroix was devastated by Hurricane Katrina and its storm surge in 2005. The entire area was flooded, and the majority of buildings completely destroyed. Also destroyed was much of the area's fishery along with commercial and recreational fishing fleets, seafood and fuel docks. By 2010, much of this fishing town had been reconstructed, with most new construction elevated high on piers. The fisheries, however, took another devastating blow April 20, 2010 with the explosion of Deepwater Horizon which drilled on the BP operated Macondo Prospect. From this point forward the lives of many of those families that had for generations reaped the bounties of seafood in the waters of Southeast Louisiana, would be changed forever. The spill caused extensive damage to marine and wildlife habitats and to the Gulf's fishing and tourism industries. Skimmer ships, floating containment booms, anchored barriers, sand-filled barricades along shorelines, and dispersants were used in an attempt to protect hundreds of miles of beaches, wetlands, and estuaries from the spreading oil. Scientists also reported immense underwater plumes of dissolved oil not visible at the surface as well as an 80-square-mile (210 km^2) "kill zone" surrounding the blown well. In late November 2010, 4,200 square miles (11,000 km^2) of the Gulf were re-closed to shrimping after tar balls were found in shrimpers' nets. The amount of Louisiana shoreline affected by oil grew from 287 miles (462 km) in July to 320 miles (510 km) in late November 2010. In January 2011, an oil spill commissioner reported that tar balls continue to wash up, oil sheen trails are seen in the wake of fishing boats, wetlands marsh grass remains	$200,000,000

	fouled and dying, and crude oil lies offshore in deep water and in fine silts and sands onshore. A research team found oil on the bottom of the seafloor in late February 2011 that did not seem to be degrading. On May 26, 2011, the Louisiana Department of Environmental Quality extended the state of emergency related to the oil spill. By July 9, 2011, roughly 491 miles (790 kilometers) of coastline in Louisiana, Mississippi, Alabama, and Florida remained contaminated by BP oil, according to a NOAA spokesperson. In October 2011, a NOAA report shows dolphins and whales continue to die at twice the normal rate. PROPOSED SCOPE OF WORK The Delacroix Project is designed to protect and restore 1300 acres that will: fortify hurricane protection for the town of Delacroix; enhance community resilience; improve wildlife habitat, especially waterfowl; improve estuarine habitat essential to early life stages of commercial and recreational fishery; create jobs for local residents, especially those related to duck hunting and fishing habitat for sportsman worldwide; enhance nature-based tourism opportunities. The project calls for fee simple purchase of nearly 1300 acres of marsh beginning at the confluence of the western bank of Terre Aux Boeufs and the southern bank of Bayou Gentilly. This land mass represents the remaining land barrier for the town of Delacroix from south and western tidal surge. Land Trust for Southeast Louisiana has negotiated a "bargain sale" which means that the owner will sell the property below appraised value and contribute the difference as match for grant program funding. Two events in recent history have caused some habitat loss on the property: a fire along the ridge adjacent to Terre Aux Boeufs caused significant loss of live oaks and other hardwoods shortly after Hurricane Katrina. Hurricane Katrina also caused physical damage to the western marsh of this property bordering a waterway known as the Graveyard. An aggressive Ecological Restoration Plan would be developed and implemented once the land is purchased. The Plan would include: reforestation of live oak, associated hardwood species and cypress - shoreline restoration on the property's western boundary would include soil replacement and planting of native grasses LTSL will utilize its volunteer base as well as partnering with both state and federal governmental agencies and other NGOs to insure both success and compliance. Once the project is completed the town of Delacroix will have a restored and healthy landmass for future hurricane protection, enhanced community resilience and a continued economy sustained by commercial fishing, sports hunting, and fishing and nature-based tourism. About the Land Trust for Southeast Louisiana: The Land Trust is a 501C3 that works with community partners to create a healthy and sustainable natural environment by conserving and protecting valuable natural areas and agricultural lands of southeast Louisiana. We preserve ecosystem and landscape values through conservation easements, land acquisition and community engagement. The way we choose to conduct our business is clear: we build meaningful relationships with landowners and citizens in our service area by adhering to core values: - Commitment to "in perpetuity" Community: working collaboratively - Decision-making through consensus - Integrity - Respect for the rights of individuals, private property owners and government regulations - Sustainability LTSL is a member of the Land Trust Alliance; we are guided by its national standards and have included LTA accreditation in our strategic plan. We are committed to "in perpetuity" as the bar for LTSL financial planning and legal authority to manage lands and easements.	
Marsh/Shoreline Remediation & Restoration	This project will restore the key Brown Pelican and other waterbird nesting islands in Barataria Bay, Louisiana, that were worst affected by the oil spill. The project will use heavy machinery to place rock riprap around the eroding islands, and to fill this with dredge material to secure the islands and expand the amount of bird nesting habitat. The project will be implemented in partnership with the locally-based Barataria Terrebonne National Estuary Program. A virtually identical project carried out to restore the nearby Queen Bess Island in the early 1990s was hugely successful and that island has since withstood hurricane Katrina and still has all the key bird nesting habitat intact (see: http://lacoast.gov/reports/pr/ba19prg2.pdf).	$0
Multi-Function Vessel -- Aquatic Weed Harvester,	We believe we have a very unique hatchery. We have been in the R&D stage for three years and believe we are the only commercial hatchery in the U.S. that has had success raising domestic shrimp at the hatchery level. As a Florida company, Scientific Associates is very concerned about the health of the gulf seafood industry including the fishermen, the	$1,500,000

Marine Trash Skimmer, Oil/Muck Dredge	processing plants, restaurants, and all those local businesses that depend on a thriving shrimp industry. Given the recent dramatic falloff in wild shrimp catch in the Gulf of Mexico, (which may or may not be related to the effects of the BP oil spill), there is a need to replenish the wild stocks in time for the 2012 harvest. Scientific Associates of Florida has perfected hatchery techniques so that they can produce hundreds of millions of post larval shrimp (PL's, i.e. baby shrimp) , typically transported at the 10 days into the larval phase (PL10's). They have been raised in a closed, fully recirculating system that has now been in continuous operation for three years. There are no antibiotics used. The shrimp are free of disease. The PL's are first generation offspring coming from brood stock (mom and dad) taken directly from the Gulf of Mexico waters. With this technique, the shrimp can be raised in appropriate water conditions for the locations where they would be released, i.e. similar pH and salinity to maximize survival rates. This is an opportunity to restock the estuaries with hundreds of millions of viable larval shrimp and bring the Gulf shrimp industry back to health. This restocking program can be for a short duration or on-going. The available species are Litopenaeus setoffrus (gulf white shrimp) and Fartantepenaeus Duorarum (gulf pink shrimp). In order to change production to produce this product for Spring 2012, arrangements would need to be agreed fairly soon. Please feel free to contact me with any questions or suggestions and please feel free to pass this e-mail along to appropriate individuals. Dave Brockwell President of Scientific Associates LLC 239-677-8914 or e-mail at dave@scientificassociates.us.	
Development and Distribution of Gear Technology to Improve Fuel Economy and Reduce Bycatch in the Gulf Shrimp Fishery	The Partnership for Gulf Coast Land Conservation Project The Partnership for Gulf Coast Land Conservation (PGCLC) is a new coalition of local, regional state and national land conservation organizations devoted to advancing land and water conservation in the Gulf of Mexico region. This initiative is organized under the auspices of the non-profit Land Trust Alliance (Alliance) and is patterned after other successful land trust coalitions across the country. Today our membership consists of 25 national, regional, and local land trusts operating in the Gulf States. The Partnership's mission is to work together across the five Gulf of Mexico states to increase the pace, quality and permanence of voluntary land and water conservation in the coastal region. Land trusts are community-based non-profit organizations that work with landowners to permanently conserve forests, rivers, farms, ranches, and other natural areas critical to a sustainable environment and healthy, thriving communities. Through this project, the Partnership proposes to: 1. Increase the effectiveness and efficiency of land trusts in the Gulf Region. 2. Develop and promote a public policy agenda which will reduce the barriers to private sector conservation efforts and increase funding for acquisition and restoration. 3. Develop collaborative projects that will enable the land trust community and supporters to implement landscape scale conservation measures in the region. Collaborative projects may be built around water quality, critical habitat, or other criteria. 4. Participate in landscape-scale conservation planning in collaboration with other conservation partners (resource agencies and other non-government organizations) that prioritizes habitat for endangered and threatened species, improvements to water quality, connectivity to other protected lands, trust resources and important cultural and recreational features. 5. Participate in and coordinate our efforts with other ongoing conservation planning and implementation activities through entities such as the Gulf of Mexico Alliance and the Gulf of Mexico Foundation and others.	$1,500,000
Introduction and Evaluation of New Designs of Propellers and Nozzles in the Gulf Shrimp Fishery for Enhanced Efficiency and Fuel Economy	The Lake Hermitage Marsh Creation - NRDA Early Restoration Project involves the creation of marsh within a project footprint known as the "Lake Hermitage Marsh Creation Project" developed for and funded through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Program. This proposal substitutes approximately 104 acres of created brackish marsh for approximately 5-6 acres of earthen terraces that would otherwise have been constructed within the CWPPRA project boundary. CWPPRA provides over $80 million per year for planning, design and construction of coastal restoration projects in Louisiana. Each year, a list of projects is selected for implementation, and funds are approved for engineering and design. The Lake Hermitage Marsh Creation Project (BA-42) was funded in 2006 as part of CWPPRA Priority Project List #15. The Lake Hermitage Marsh Creation Project is located within the Barataria Hydrologic Basin in Plaquemines Parish, Louisiana, to the west of the community of Pointe a la Hache, and northwest of	$750,000

	the community of Magnolia (Figure 5). This basin was identified as a priority area for coastal restoration, and has been the focus of extensive study and project design and implementation. The primary goals of the Lake Hermitage Marsh Creation base CWPPRA Project are (1) to restore the eastern Lake Hermitage shoreline to reduce erosion and prevent breaching into the interior marsh and (2) to re-create marsh in the open water areas south and southeast of Lake Hermitage. Specific objectives of the CWPPRA project are to: (1) create 549 acres of marsh by filling open-water areas and fragmented marsh with dredged material; (2) restore approximately 6,106 linear feet of the eastern Lake Hermitage shoreline; and (3) create 5 acres of emergent habitat by constructing 7,300 linear feet of earthen terraces. The proposed terrace field consists of approximately 104 acres. Throughout the engineering and design phases of the CWPPRA project, the project team considered incorporating an additional 104 acres of marsh creation in the footprint of the terrace field. However, due to funding constraints, the project team completed final design of the CWPPRA project with the 7,300 linear feet of earthen terraces (Figure 6). The Lake Hermitage Marsh creation - NRDA Early Restoration Project is designed to create that additional 104 acres of brackish marsh in lieu of the earthen terraces included in the final design of the base CWPPRA project (Figure 7). Marsh areas would be constructed entirely within the base project's terrace boundary. Sediment would be hydraulically dredged from a borrow area in the Mississippi River, and pumped via pipeline to create new marsh in the project area. Over time, natural dewatering and compaction of dredged sediments should result in elevations within the intertidal range which would be conducive to the establishment of emergent marsh. The 104-acre fill area would be planted with native marsh vegetation to accelerate benefits to be realized from this project. The estimated cost to implement the Lake Hermitage Marsh Creation - NRDA Early Restoration Project is $13,200,000.	
Continued Shrimp Fishing Effort Data Collection Through the Use of an Electronic Logbook System in the Gulf of Mexico	I've heard nothing about BP finishing the job of cleaning all the oil off the bottom of the seabed - there is still an oil slick out there lying on the bottom of the Gulf at least 5 miles square - when are they going to clean that up????	$500,000
Final Fridayze: Restoration Festivals for Youth Impacted by Tragedy	The Lake Hermitage Marsh Creation - NRDA Early Restoration Project involves the creation of marsh within a project footprint known as the "Lake Hermitage Marsh Creation Project" developed for and funded through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Program. This proposal substitutes approximately 104 acres of created brackish marsh for approximately 5-6 acres of earthen terraces that would otherwise have been constructed within the CWPPRA project boundary. CWPPRA provides over $80 million per year for planning, design, and construction of coastal restoration projects in Louisiana. Each year, a list of projects is selected for implementation, and funds are approved for engineering and design. The Lake Hermitage Marsh Creation Project (BA-42) was funded in 2006 as part of CWPPRA Priority Project List #15. The Lake Hermitage Marsh Creation Project is located within the Barataria Hydrologic Basin in Plaquemines Parish, Louisiana, to the west of the community of Pointe a la Hache, and northwest of the community of Magnolia (Figure 5). This basin was identified as a priority area for coastal restoration and has been the focus of extensive study and project design and implementation. The primary goals of the Lake Hermitage Marsh Creation base CWPPRA Project are (1) to restore the eastern Lake Hermitage shoreline to reduce erosion and prevent breaching into the interior marsh and (2) to re-create marsh in the open water areas south and southeast of Lake Hermitage. Specific objectives of the CWPPRA project are to: (1) create 549 acres of marsh by filling open-water areas and fragmented marsh with dredged material; (2) restore approximately 6,106 linear feet of the eastern Lake Hermitage shoreline; and (3) create 5 acres of emergent habitat by constructing 7,300 linear feet of earthen terraces. The proposed terrace field consists of approximately 104 acres. Throughout the engineering and design phases of the CWPPRA project, the project team considered incorporating an additional 104 acres of marsh creation in the footprint of the terrace field.	$625,000

	However, due to funding constraints, the project team completed final design of the CWPPRA project with the 7,300 linear feet of earthen terraces (Figure 6). The Lake Hermitage Marsh creation - NRDA Early Restoration Project is designed to create that additional 104 acres of brackish marsh in lieu of the earthen terraces included in the final design of the base CWPPRA project (Figure 7). Marsh areas would be constructed entirely within the base project's terrace boundary. Sediment would be hydraulically dredged from a borrow area in the Mississippi River, and pumped via pipeline to create new marsh in the project area. Over time, natural dewatering and compaction of dredged sediments should result in elevations within the intertidal range which would be conducive to the establishment of emergent marsh. The 104-acre fill area would be planted with native marsh vegetation to accelerate benefits to be realized from this project. The estimated cost to implement the Lake Hermitage Marsh Creation - NRDA Early Restoration Project is $13,200,000.	
Shine Light	The Gulf of Mexico is the only known spawning area for the western population of Atlantic bluefin tuna and the Deep Water Horizon spill occurred at the peak of the spawning season covering approximately 20% of the historic spawning area. The Gulf is home to dozens of other marine fish and wildlife that were impacted by the spill. All of these species are impacted by the pelagic longline (GOM PLL) fishery which encounters approximately 80 non-target marine species, including endangered sea turtles, and depleted sharks, bluefin tuna, and billfish. Government catch data from 2007-2009 indicates the fishery killed 43,245 non-target animals, including 6,009 lancetfish, 5,844 dolphinfish, 2,747 escolar, 1,745 sharks and rays, 858 wahoo, 794 billfish (marlin, sailfish, spearfish), 612 bluefin, and 169 bigeye tuna, and interacted with 137 leatherback and 17 loggerhead sea turtles. Actual mortality is much greater as only an average of 22% of the hooks set were observed, e.g., an estimated 423 bluefin are killed annually. A voluntary vessel and permit buyback program for the GOM PLL fleet would, depending on participation, significantly reduce the mortality caused by the fishery and help mitigate spill damage to bluefin and other finfish. To spur participation, establishment of a gear transition program would provide remaining PLL fishermen with funding and training to switch from PLL to green stick and swordfish buoy gear which would allow fishermen to continue targeting yellowfin tuna and swordfish, while significantly reducing bycatch mortality of other species. Finally, new rules to prohibit the use of PLL fishing gear in the Gulf would ensure that surface longlining does not return and negate the biological benefits achieved through a buyback and gear transition. The cost of a complete buyout of the fishery's 84 vessels and permits will depend on the structure of the buyout program. The environmental benefits of eliminating all PLL fishing in the GOM are more straightforward to calculate. According to government data, more than 14,415 animals would be protected annually by eliminating PLL; including overfished, protected, and otherwise depleted marine species, including 50 leatherbacks, 6 loggerheads, 552 sharks, and 265 billfish. Ending this source of mortality will promote the recovery of these and other animals that suffered injury because of the oil spill. This concept enjoys the support of PLL fishermen, recreational anglers, and environmentalists.	$250,000
Erosion Prevention, Marsh Creation and Land-Building	Goal of the project is to enhance habitat and augment wild stocks through an aquaculture base project. To bring together all of the current educational resources of the Gulf Coast to create an educational mecca for ocean studies programs. To create a large consortium of stake holders in the Gulf to share resources that can be received through the restoration efforts and BP funding to super utilize and maximize the restorative process. Currently, there are near 700 projects requesting funding from the BP settlement grants that have been allocated. Many of these projects are redundant, not in the materials or siting, but in the logistical requirements needed to complete them. I believe that in combining asset requirements, and through proper scheduling and project resources, that it will be possible to greatly reduce cost, while increasing efficiency and longevity of the selected projects. Working in unison will also encourage communication and cooperation between all the separate entities involved. Example: after reading through the project lists, there are no less than 100 separate projects that either stipulate the acquisition of a vessel through purchase or leasing a vessel for a specified period of time. Some of these are purely scientific research endeavors, others are involved in delivery or deployment of reef materials. Vessels are an expensive proposition for any project, in most cases they are the most	$0

	important and expensive line item, in any project. To let them sit idle is to still incur the cost, while representing a loss of valuable production time. Leasing a vessel gains that vessel for a preset period, but for long term ongoing projects, represents cost with no equity. To utilize one vessel capable of the versatility of handling a multitude of projects and tasks, would increase efficiency on many levels. Having the ability to load modular equipment on to a deck, complete the project, return, and in a matter of hours be refitted for a completely different project, and the duties that are included, would mean that the funding dollars that would have only served one particular endeavor, can now accomplish twenty. Resources to manage the vessel are kept to a minimum, crew familiarity with the vessel is at a maximum, and in turn operating and maintenance cost are reduced as well, substantially. The funding not duplicated on repetitive vessels would mean the number of separate projects could be quadrupled with the same amount of funding. This would ensure that the restorative effort gains the most from each dollar put forth and would also give a larger amount of projects the longevity they need to be accomplished. Using the network of sharing the vessels would create, different projects and groups would also be exposed to each other and be able to share both data, and expertise gathered through the entire restoration projects course. Extending the beneficial cycle of the restorative effort indefinitely to aide in the education of the coming generation most affected by this spill.	
Fishsmart: Building Sustainability in the Snapper and Grouper Recreational Fisheries and Associated Industry in the Gulf of Mexico	Clean up bays and estuaries by paying fishermen to bring in garbage. This is from a Brazilian architect who has been a mayor and a governor in Brazil and has won awards for his "green" activities and ideas: http://readersupportednews.org/off-site-opinion-section/60-60/9217-low-cost-solutions-for-a-sustainable-world Of course, there might be some haggling about how much to pay for the garbage, but if you set up an ENDOWMENT with some of the restoration money, you could use some of that, in perpetuity, to keep the program going.	$20,000,000
A Gulf-Wide Multi-Year Research Project to Determine Best Practices for Minimizing Barotrauma Effects on Red Snapper Following Capture and Release	Terrebonne Parish is one of the largest providers of workers in the State of Louisiana to both the Oil & Gas Industry and the Seafood Industry. Terrebonne is also one of the largest seafood providers in this state. Therefore it goes without saying that Terrebonne Parish was hit very hard by the BP Oil Spill. The quality of life was compromised for the residents of Terrebonne Parish along with the economy. The fishermen and oil workers in this parish suffered severely. Terrebonne Parish Recreation touches the lives of everyone in this parish. There is no better way to stimulate an economy and enhance quality of life than to hold regional sporting events in a community. Unfortunately, Terrebonne Parish doesn't have a facility conducive to lure regional sporting events to this area. As a lifelong resident of Terrebonne Parish I recognize the need for a Regional Sports Complex in this parish. For years, this concept has been discussed but funds have not been available. I, along with a group of concerned citizens, am requesting BP to participate in the funding of the construction of a Regional Sport Complex. The parish has identified land for this construction, had it professionally assessed and are ready to embark on a master planning process. The property is located in a strategic area of the parish for easy access by out of town teams as well as local teams. We are not only looking for financial help but also asking for BP's involvement during the entire process. This will involve a great deal of public input through a series of community meetings throughout the parish. BP can be front and center and the face of a project that is near and dear to hearts of most of the residents in this parish. Funding a Sport Complex will do two things for BP. First and foremost it will touch the lives of almost every resident in this parish through their children. There is no better way to make people smile than to allow them to watch their kids and grandkids play organized sports. Secondly, this can be a great public relations project for BP and have a very long lasting "Good Neighbor" effect in this region. BP will be the center of what is near and dear to everyone for many years to come. It will serve as a good gesture towards the wellbeing and quality of life for the residents of Terrebonne. This will be something everyone can enjoy both young and old. In conclusion, a small investment now can go a long way towards a lasting effect to the residents of Terrebonne Parish. The whole community will be behind this and be grateful to BP for making this happen.	$2,000,000

Replace Lights on Oil Rigs with Bird Friendly Lights	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 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. Replace white (tube lights) and orange (sodium high pressure) lighting on oil and gas platforms with lights low in spectral red.	$1,000,000
Houma's 1st Adaptive Park	Project: Upgrade the Gulf of Mexico shrimp fishery electronic logbook (ELB) program in order to improve the precision of shrimp fishing temporal-spatial effort and estimation of red snapper and sea turtle bycatch in the shrimp fishery. Specifically, this project will purchase new ELB units and make program enhancements necessary to expand ELB coverage up to 100 percent of the offshore shrimp fleet and a higher percentage of the inshore shrimp fleets for a period of 5 years. Link to Deepwater Horizon Oil Spill Injury: In 2010, the estuarine and offshore waters upon which shrimp species depend were oiled, offshore and nearshore shrimp fisheries were closed, and visibly oiled sea turtles were collected alive and dead from northern Gulf. Sharp declines in shrimp catch in SE Louisiana in 2011 may be related to habitat damage or adult or post-larval mortality caused by exposure to Deepwater Horizon oil or 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: Inshore and offshore shrimp fisheries in the Gulf of Mexico are known to interact with sea turtles and juvenile red snapper. These two species' populations may have been detrimentally affected by the DWH oil spill in 2010. Sea turtle strandings in the Gulf of Mexico increased significantly since 2010 and have continued to rise since the BP oil disaster. More than 5,000 dead or weakened turtles washed ashore, or have been stranded, since the BP oil disaster. More than 460 sea turtles were found visibly oiled during oil spill response efforts and an unknown number died as a direct result of the disaster. ELB analysis provides fine-scale spatial data that can help identify sea turtle/shrimp fishery interaction hot spots. These data can assist managers in reducing the number of interactions and related sea turtle mortalities through such means as time/area closures while potentially avoiding broad management measures like complete fishery closure. Shrimp fishing effort data recorded by ELBs are also a proxy for estimating red snapper bycatch mortality in the offshore shrimp fishery. Bycatch mortality estimates are important for determining whether management measures are needed to help red snapper populations exposed to oil recover from potential injury. 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. Expanding ELBs to the entire offshore fleet and making them available on a voluntary basis to a greater portion of the inshore fleet will improve the precision of sea turtle bycatch estimates needed to facilitate and track recovery of impacted sea turtle populations in the Gulf of Mexico. The recent increase in offshore shrimp fishing effort and potentially higher number of sea turtle interactions that could result also underscore the importance of ELBs in estimating sea turtle bycatch for developing mitigation and recovery strategies going forward. Description: Implemented through a joint reef fish/shrimp management plan amendment in February 2008, a statistically valid sample of shrimp vessel permit holders are randomly selected and must report shrimp fishing effort via an ELB. A simple ELB that records spatio–temporal fishing effort is currently used by approximately one-third of the federally permitted offshore shrimp fleet. Researchers have found these devices to be a reliable method for estimating sea turtle interaction and red snapper bycatch mortality in the Gulf of Mexico offshore shrimp fishery. NOAA has been making the ELBs available to members of the inshore shrimp fleet. A bout 150 inshore shrimp vessels use ELBs on a voluntarily basis. Upgrading this program to expand coverage in the offshore and inshore fleets will generate a wealth of fine scale spatial data. These data will allow	$140,000

	scientists to better characterize the shrimp fishery's effort and classify overlapping areas of fishing effort in regard to sea turtle and juvenile red snapper habitat areas. Determination of where and when this fishery interacts with sea turtle and red snapper populations may allow more fine-scale management of the fishery (versus the need for broader management measures) while reducing bycatch mortality, which in turn would offset injuries caused by the oil spill and help affected populations recover more rapidly.	
Lead by Example -- Use Non-Petroleum Motor Fuels to Prevent Future Oil Spills	Description: This multi-year, interdisciplinary research project would aim to clarify questions about the role of Gulf menhaden in the ecosystem and whether and how its 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. Link to Injury: Menhaden's offshore spawning and subsequent egg/larval drift into the estuaries in the northern Gulf coincided with the DWH 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 life history stage was exposed to the oil or chemical dispersants. Brown pelican and other species whose diets include menhaden were 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 that DWH oil may affect the future health and ecological role of its population. Gulf menhaden is a significant part of 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 for 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 their decline and elucidate the factors that driver their 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.	
Increase Amount of Assessments for Potentially Impacted Finfish Species	I believe that the BP/NRDA process should explore the option of leasing commercial red snapper shares that will remain in the water to help ensure a healthy and vibrant red snapper fishery for years to come . By leaving a certain percentage of the fish in the water to spawn and reproduce will help ensure any damage to the red snapper fishery will be mitigated through a long-term leasing option. However, you would not want to lease too many fish as it will disrupt the processor/wholesaler industry and would negate any gains made by leaving spawning fish in the water to aggregate. I feel that this was imperative and will create a win win situation for both the BP/NRDA process and the stakeholders as a whole.	$150,000,000
Supplement and Expand Fishery-Independent Surveys	Fishermen along the Louisiana coast are seeing far less juvenile red snapper, as well as fewer juveniles in the grouper fishery since the BP oil spill of 2010. Because of the increased incidence of lesions and other problems we are seeing in the Gulf of Mexico I feel the NRDA program should have a policy to ensure the health of these fish stocks. Considering the issues of hatchery programs and other ideas which seem to have produced no positive results, some fishermen along the Gulf coast propose that NRDA lease a percentage of reef fish for a five year period. The current IFQ system allows leasing allocation of these fish to participants who are not commercial fishermen. Not harvesting these fish would allow them	$150,000,000

	time to reproduce. This would be very conducive to restoring the health of our fishery in the Gulf of Mexico for the future of the United States.	
Marine Sea Oil Spill Cleanup	For 40 years, I Russell Underwood have been a commercial Snapper fisherman. My livelihood depends on a healthy and abundant gulf, full of red snapper and many other species of fish. As we are all aware the BP oil spill has done much environmental damage to the ecology of the gulf and no telling what adverse things we could see down the road. We have seen that hatchery programs are not the best route to go as they do not seem to work. Being on many fisheries advisory councils and committees over the past years I have learned that there must be a certain amount of the snapper left in the water to spawn and reproduce, to ensure a healthy and abundant snapper population. I have not heard of any positive recovery plan for the reef fish in the gulf, therefore I propose that ep/nrda consider leasing a percentage of red snapper allocation IFQ shares that will remain unfished for five years to give the snapper time to spawn and reproduce abundantly. It is my belief that this would be to everyone's advantage, commercial and recreational, to protect both resources and our livelihoods. This would ensure a healthy red snapper population for future generations and a viable Gulf of Mexico. As an IFQ shareholder I am willing to lease a percentage of my allocation to aid the gulf restoration project. Thank You, Russell Underwood.	$800,000,000
Gulf of Mexico Fishery Management Restoration Priorities	I have a Product called Oil Digester that was approved to re mediate tar balls, Oil, Toxins etc. from the GULF. Go to web site www.bioremediationinc.com and this will give you more information on the green products we sell. This is a microbe that turns into water and carbon dioxide. Will not harm animal life not human life. I discussed with Senator Crowe to get a coalition together with Bio Companies and work together to remedy this situation.	$0
Worldwide Consortium for any Dangerous Manufacturing Processes	Install RZHO filled TECH Units with grass and trees Includes all labor, equipment, insurance, and management. Completed Projects: Project location: Pass a Loutre Louisiana - Technical design advisory and provider of RootZone Humus blend RZHO for GS Bags (special container fill & consultation as to scientific accuracy of specific oleophilic microbes and ecological correctness/safety of container contents and container materials) (latitude: 29.069608, longitude: -89.230950). Mississippi coastal restoration projects which include shore areas from Pass Christian, MS to Ocean Springs beach and inland coastal areas. Projects in Hancock, Harrison, and Jackson Counties of Mississippi. Chief Scientist John Wear, Trident Environmental Services & Technologies, Inc., serves as lead consultant, designer, advisor for the Mississippi projects and developer of methods which ensure bioremediation and vertical accretion for marshlands plant growth, with strong root development and nature-cooperative land building that includes tidal and river flow sediment capture.	$0
10-Year Enhancement for Improving Gulf of Mexico Sea Turtle Stranding Network Response and Science Capacity	In wetlands, oil exists below the surface of the sediments. Inject MicroSorb microbes into subsurface to degrade oil. Below beaches, oil is floating on the groundwater. With horizontal drilling, injection wells and recovery wells can be placed. Inject MicroSorb microbes with seawater into the injection wells. Mobilize the oil and recover oil in recovery wells. Separate oil and use recovered water to mix with microbes and inject into injection wells. If there are still oiled oyster beds, install parallel aeration systems on each side of the bed. Inject MicroSorb microbes onto the beds. The aeration systems will supply oxygen to the microbes and improve the growth of oysters. The microbes will destroy remaining oil. In deep water where there are plumes on the seabed, install an aeration system and apply MicroSorb microbes. MicroSorb Environmental Products, Inc. is in part owned by Oppenheimer Biotechnology, Inc. The Oppenheimer Formula was the best microbial product in the BP Biochem Strike Team Report on NCPPL products conducted by Dr. Portier of LSU. The Oppenheimer Formula is capable of destroying PAHs as well as light ends in crude oil. I have a patent pending on subsurface aeration systems. Oil in sediments, on oyster beds and in subsurface plumes can be treated and destroyed more quickly than nature can provide. If you would like more information, please contact me. William E. Baird, PE MicroSorb Environmental Products, Inc. 104 Longwater Drive, Norwell, MA wbaird65@aol.com.	$1,000,000
Pay Dirt Mitigation Bank	Coastal Erosion Abatement and Wetland Remediation Gary Holland Gary Holland Louisiana Wetlands Redux Project The Post-Civil War era brought about the creation of The U.S. Army Corps of Engineers and their initial efforts to gain control	$0

	of The Mississippi River. Through the building of massive levee systems, the Mississippi River no longer overflowed its banks during the seasonal Spring river floods and was contained within the built-up, higher banked and levied channel. During this era, the advancement of ship powering transitioned from wind, to steam, to diesel, within a few decades. This advancing technology gave rise to larger ships requiring deeper and deeper drafts. Corps Engineer, Robert Eads, responded to the necessity of deeper water and clear passages with the design of a jetty system at the River's mouth. The natural delta mouth no longer slowed the River's current and the jetty kept the nutrient rich sediments not only within the River's channel but now, held these sediments in suspension into deeper waters, requiring less dredging not only in the River channel but at its terminus at The Gulf of Mexico. This engineered system literally turned off the spigot for Louisiana's natural land building, losing rich sediments which had naturally maintained the now diminishing delta. Tidal, wave action and storm erosion of The Louisiana Marsh Coastline ensued. This exposed entire habitats, ecosystems, and a growing human population to an increasing danger by the uncontested onslaught of Gulf waters. The results of this manipulation of River flood control along with the advent of pumps to drain the marsh increased the attraction to the New Orleans basin for development. This dependence on fabricated structures and systems allowed for a false sense of "safety" from flooding. Technological changes weren't limited to River transportation as The American Industrial Revolution demanded increasing oil exploration in So. Louisiana, resulting in the dredging of thousands of miles of new "coastline" to accommodate pipelines that carried drilled oil and natural gas to refineries and shipping depots throughout the Louisiana marshland. This action resulted in creating more erosion prone shoreline and allowed for the inundation of saltwater into habitats naturally established to flourish in fresh and brackish water conditions. The result was the accelerated death and loss of marsh grasses, Swamp Cypress and all marsh flora and fauna due to this salt-water invasion into the swamp eco-system. The object of the Louisiana Wetlands Redux Project is to stop Mississippi Delta erosion and allow the river system to rebuild land in a restored, natural methodology. We will accomplish this rebuilding of wetland area through the deployment of collapsible concertainers, lined with heavy-duty, degradable fabric and filled with locally available, dredged sediments, with the eventual development of a pipeline to deliver these sediments, pumped in place from the on-going dredging at the mouth of The River. The Louisiana Wetlands Redux Project will use stable barriers in concert with other proven successful applications and configurations to make use of these dredged sediments for fill material, abate the ongoing erosion and begin natural land-building processes and wetland remediation. These structures will be distributed initially at the most "at risk" sites and provide necessary feedback for future in order to develop ever more successful application. These concertainers will be constructed, lined, and put in-place all by a local workforce. The Project will focus close attention to allowing natural tidal ebb and flow and the egress of bayou waters with a system, which will allow natural water movement. Louisiana Wetlands Redux are consulting with botanists and etymologists along with our lead scientists to determine how these new sediments will be best planted yet we already know the black mangrove, swamp cypress and marsh grasses will play integral roles, thus establishing a robust rooted and biologically active habitat where there is now open water. This Project will create new training and jobs for our Coastal Parish Boat Captains, their boats, equipment, and crews, who have lost not only revenue due to storm surges from Katrina's devastation as well as threats from the BP DWH-type catastrophes. Louisiana Wetlands Redux will also help restore a proud heritage and culture of watermen and women, unique to The Louisiana Wetlands environment. Our project will enable our watermen and women to return to their heritage of working in the swamp and marsh which will be empowering as they actively stop the erosion processes and regain lands lost from over a hundred years of unabated erosion and neglect. We will form a frontline barrier to stop pollutants from reaching delicate coastal marshlands and use a variety of microbial treatments should any toxins reach our barriers. This system will also be used to rebuild the vanishing barrier islands. Our system has the capability to also rebuild our lost oyster reefs by using oyster shells as fill in the concertainers, which the oyster "spat", will attach to, and begin rebuilding their own reefs. We would request a test	

	area of coastal wetland shoreline to evaluate the most effective implementation of these applications and a "fleshing out period" to develop the most efficient methodology based on the varied coastal conditions All systems will be assembled, distributed and disembarked at "on-site" locations along with manufacturing for seaward facing bric-a-brac material which ensures less undercutting thus employing a varied and voluminous workforce to sustain this on-going project. The Implication: The implication going forward with this systemic application would cause a cessation of the current land erosion, the creation of a land building process starting immediately and accelerated land building over time. This plan incorporates the redeployment of local B oat Captains, boats, equipment, and crew members who will be put back to work in the environment they are accustomed. These men and women would now be working to save and recreate habitats for creatures great and small during this long-term construction. Our workers will help save lives in the process as the barrier walls would continue to expand farther and farther outward from of the recovered shoreline and immediately protect this delicate habitat which is now defenseless to the inundation of both naturally occurring and man-made erosion and catastrophic toxins. The land-building properties of this, The Louisiana Wetlands Redux Project, will ensure more and more safety for not only the growing human population of the Louisiana Coastline but also the marsh habitats and estuaries against storm surges through the rebuilding of a sustainable landmass which will match the coastline of Louisiana's pre-Civil War shoreline. Gary Holland Director Louisiana Wetlands Redux 2266 Glastonbury Road Westlake Village, CA 91361 Phone (818)-489-9819 Email- drdaddyeaux@mac.com.	
Reef Innovations Reef Ball Regional Production Sites	When the BP drilling rig Deepwater Horizon exploded approximately 50 miles southeast of the mouth of the Mississippi River on April 20, 2010, it caused significant damage to the waters of the Gulf of Mexico. In order to effectively assess the long-term effects of this event, there needs to be a coordinated regional approach in monitoring the status and health of the marine resources in the Gulf of Mexico. The Gulf States Marine Fisheries Commission (GSMFC) is uniquely poised to provide such an approach. Established by both state and federal statutes in July 1949, the GSMFC is an organization of the five states (Texas, Louisiana, Mississippi, Alabama, and Florida) whose coastal waters are the Gulf of Mexico. It has as its principal objective the conservation, development, and full utilization of the fishery resources of the Gulf of Mexico to provide food, employment, income, and recreation to the people of the United States. One of the most important functions of the GSMFC is to serve as a forum for the discussion of various challenges and programs of marine resources management, industry, research, etc. and to develop a coordinated approach among state and federal partners to address those issues for the betterment of the resource for all who are concerned. The GSMFC has a long history of successfully coordinating and administering cooperative, regional programs such as the Southeast Area Monitoring and Assessment Program (SEAMAP), Interjurisdictional Fisheries Program (IJF), Sportfish Restoration Program (SFRP), Fisheries Information Network (FIN), Economics Program (EP) and the Marketing, Traceability and Sustainability components of the Oil Disaster Recovery Program (ODRP). One of the reasons the GSMFC has been so successful is that it is a vertically-integrated organization that provides products and services that satisfy a common need to both its state and federal partners throughout the Gulf of Mexico. In addition, the GSMFC has sole-source authority, under the Magnuson Fishery Conservation and Management Act, Title IV, Sec 402(d), which will expedite the distribution of funds and quickly allow these important activities to commence. Outlined below are the various activities, by GSMFC program, that can be accomplished if the requested funding is provided. It is important to note that these activities will augment the existing long-term work (totaling $5,530,000) already being conducted and funded through the GSMFC. The total annual cost for all of the proposed GSMFC activities is $2,418,000. The duration of this proposed project is 10 years. With inflationary increases over a ten-year time period, the total cost of this project is $27,578,000. EXISTING & PROPOSED ANNUAL FUNDING REQUEST, BY PROGRAM EXISTING PROPOSED INTERJURISDICTIONAL FISHERIES PROGRAM $230,000 $434,000 SPORTFISH RESTORATION PROGRAM $200,000 $834,000 FISHERIES INFORMATION NETWORK $5,100,000 $1,150,000 GRAND ANNUAL TOTAL $5,530,000 $2,418,000 INTERJURISDICTIONAL FISHERIES PROGRAM (IJF)	$3,340,000

	Introduction: The Interjurisdictional Fisheries Act (IFA) of 1986, as amended (Title III, P.L. 99-659), was established by Congress to: (1) promote and encourage state activities in support of the management of interjurisdictional fishery resources; and (2) promote and encourage management of interjurisdictional fishery resources throughout their range. Overview of Current Interjurisdictional Fisheries Activities: The IJF Program is the cornerstone of the fishery management programs for the states and has provided the support for long-term databases for shrimp and juvenile finfish in the Gulf of Mexico, which would otherwise not be available. In recent years, it has provided for regional planning efforts, by states, to manage nearshore resources similar to the Magnuson Fishery Conse rvation and Management Act of 1976. In essence, the IFA is to the states what the Magnuson Act is to the nation and the benefits of sound management under these acts do not accrue separately. The IFA is probably the single most important Congressional act to professionalize the states' scientific staff within the marine resource agencies. Proposed Activities: Activity 1. Expand Existing Management Plan Development: Task 1 - Creation of Management Plan Specialist Position. The GSMFC's IJF program must hold technical task force meetings to complete its current FMP workload in a timely fashion. At any point in time, the IJF staff is either developing or revising three or four FMPs simultaneously. FMPs initiated in a given year are carried over and completed in subsequent years; thus more than one management planning effort is ongoing in each year of the program. There currently is not adequate staff to maintain all the FMPs that are out-of-date and begin development for those species identified by the states not yet under regional management. A Management Plan Specialist position is needed to assist in the development of additional FMPs, profiles and revisions. Task 2 - Support Task Forces and Subcommittees. Following completion of the FMPs, task forces and subcommittees need to be maintained and kept active to ensure new and relevant issues in each IJF fishery are identified, review the status of the fisheries on a regular basis as required in the FMP process, and to coordinate regional management strategies that match the dynamics of these fisheries. Task 3 - Coordination of Fish "Age-And-Growth" Activities. The GSMFC continues the coordination of fish "age-and-growth" activities in the region through the Otolith Workgroup, in support of the Fisheries Information Network (FIN). The biological sampling activities under FIN are in direct support of both state and federal stock assessments which are in the FMP development process. There is a need to de velop additional methodologies and standardized techniques for species common to the five Gulf States. Task 4 - Support of Law Enforcement Committee. The GSMFC's IJF program has always supported its Law Enforcement Committee as funds have permitted. These activities continue with only administrative support and include participation with the Gulf of Mexico Fishery Management Council. The ability to provide financial support for GSMFC enforcement-related activities is severely limited. Task 5 - Support of Habitat Activities. The Habitat Program, which directly contributes to the development of FMPs under IJF, links the states' habitat components with fishing activities. The Habitat Program also coordinates and provides input to local and regional development activities that have an impact on important fisheries habitats. With additional funding, this program would provide distinct habitat descriptions and GIS output on the distribution of life history stages associated with specific life history requirements and habitat components of fisheries under current and future IJF management. Activity 2. Creation of a Stock Assessment Program (GDAR): Task 1 – Implementation of the GDAR Program. The Gulf Data, Assessment, and Review (GDAR) is intended to support the development of inshore, regional assessments required in the Commission's fishery management plans (FMPs). The GDAR is designed to mirror the federal assessment process (SEDAR - SouthEast Data, Assessment, and Review) to develop reliable fishery stock assessments for the Gulf of Mexico not evaluated through the federal SEDAR program. GDAR relies on the expertise available in the state marine agencies to develop an assessment through a transparent, open process. The completed stock assessments undergo a rigorous and independent scientific review to ensure consistent and appropriate use of all the available data pertinent to a specific fishery and establish population targets and thresholds for regiona l management. Upon completion of each assessment, the results will be incorporated into the FMP for use in future management by the five Gulf States' marine agencies based upon the	

	goals determined and recommended by the TTFs and various species subcommittees in the FMP. Each assessment requires three meeting components which include the associated TTF and state marine agency analysts. Assessments are completed using three workshops; 1) the Data Workshop (DW) where datasets are documented, analyzed, and reviewed and the data required for conducting assessment analyses are compiled and standardized. 2) The Assessment Workshop (AW) where quantitative population analyses are developed and refined and population parameters are estimated. 3) The Review Workshop (RW) where a panel of independent experts reviews the data and final assessment model and recommends the most appropriate values of critical population measures. Task 2 - Support for GDAR/Creation of Stock Assessment Scientist Position. The GSMFC has created a program through IJF that mirrors the federal SEDAR (Southeast Data Assessment and Review) program in an effort to complete regional assessments of state managed species. The IJF Program is presently combining the GDAR (Gulf Data, Assessment, and Review) with the TTF meetings, but as more assessments are needed, the ability to continue funding GDAR is questionable. To assist with assessments and the GDAR Program, the GSMFC needs to create a Stock Assessment Scientist position to develop the regional stock assessments and assist the states with their analytical activities. This individual would coordinate and process the states' fishery data and work with the Stock Assessment Team to develop and integrate new models for stock assessment in the Gulf. Task 3 - Support of Stock Assessment Team. The GSMFC's Stock Assessment Team currently has no funding for regional stock assessments in support of FMP development.	
Expand and Improve Gulf of Mexico Marine Mammal Stranding Response and Science Capacity	There are still vast underwater plumes of oil in the gulf to this day, killing everything in their path as they migrate around. These plumes are vast in size and should not be underestimated as to their continuing devastating effect on gulf wild-life eco-systems. The remaining oil in the gulf needs to be completely accurately mapped using NASA satellite imaging and environmental deflecting technology. With accurate maps in hand, then crews need to be dispatched to go underwater with long siphons and siphon up the oil plumes to waiting tankers that will take the oil ashore for reprocessing. This reclaimed oil can be used to help fill the national strategic oil reserve and help to drive the price of fuel down a bit. Once the oil is all "mopped up" then biologists can go into the areas that were saturated and assess the true environmental damage and remedies.	$45,000,000
Channel Marker Reef Ball Micro-Habitats	Our solution for remediation, restoration and recovery is a holistic offering. In the plan, we include berm stabilization and sustainable, natural land building. Marshlands remediation and stabilizing are part of our plan. Our solutions include "dead zone" control. Our plan addresses pressing needs of: Fishing Industry (generally and specifically) Ecological Systems Marine Habitats and we include a variety of services to other stakeholders. Our plan works sustainably because we cooperate with nature, applying services, techniques, product, and Gulf Coast experience. Materials: USACE approved "biodegradable units" (24' x 28') filled with RZHO blends which absorb and adsorb hydrocarbons. In the approved containers, RZHO microbial values continually protect plant life, joining forces with existing in-situ decomposers. The "biodegradable units" are plugged with native marsh grasses and trees. The RZHO protects the sensitive pneumatophores of black mangrove to allow survival, should they be subject to contamination. Methodology: Units are strategically placed along shorelines at the water line, stabilized to endure tidal dynamics. The high performance grasses and trees are able to stand strong, owing to the physical design of the containers and the container content. In some areas of deployment, we use biodegradable stakes which maintain strength and hold for several months, allowing strong rooting and grow-in for the plants. With a 100% of proven growth.	$613,500
Increased Support Urgently Needed to Manage New Emerging Sea Turtle Threats in Texas and Louisiana	Detailed Features - Proposed Multi-Function Vessel The multi-function vessel design for applications in the Gulf Coast Wetlands will be basically that of Alpha Boats Unlimited (ABU) Aquatic Weed Harvester(s) and/or Trash Skimmer(s)-(refer to ABU's website: http://www.alphaboats.com)..modified to contain the following features: 1. The HULL will be a "Mono Hull", rather than the traditional & conventional twin pontoon units previously designed and built for Aquatic Weed Harvesters & Trash Skimmers. Considering the added weight of larger engines, added fuel capacity & specially designed	$19,215,000

	operating features necessary to deal with a wide variety of debris & materials anticipated to be found in the wetlands, they will be larger, more effective, and able to be deployed in shallow wetland waters. 2. Rather than using paddle wheels for propulsion and steering, this unit would be equipped with a set of light weight individual rubber "twin tracks" (much like those used on "tanks"), each equipped with flights and each positioned along and outside of each side of the Mono Hull. We feel that traditional paddle wheels and propellers (which could cause "blowholes") are too restrictive to be as versatile as we wish, for this concept. Each "track" could be individually (and independently) raised and lowered (hydraulically) to enable these shallow-draft vessels to continue operating in "mud flats" when floating or when the hull bottoms out as the tide "goes out". The modifications to ABU's standard Aquatic Weed Harvester (and Trash Skimmer) would basically entail enlarging the Mono Hull to deal with the added weight of tracks, a larger higher horsepower engine (w/ sufficient HP to operate all systems), sufficient hydraulic pumping systems (to operate all systems), additional fuel capacity, increased debris load, the addition of an all-weather, 2-man cab (operator + 2nd person for safety reasons) w/ heating & air conditioning (able to operate in all seasons & under all weather conditions), etc., plus fabricating the Mono Hull pontoons of stainless steel (instead of a conventional steel hull with zinc anodes as an option) to deal with the salinity of the tidal water. Obviously, when the tide goes out, the tracks, which would be individually reversible and have variable speed in both directions, would take over both precise steering and propulsion when the hull bottoms out. 3. The "multi-function" unit will be equipped with INTERCHANGEABLE/COMPATIBLE "HEADS" with "universal" mechanical connections to the main front lifting conveyor + quick-connect hydraulic connections to supply power to these systems, and with the capability of: a) harvesting aquatic vegetation and recovering floating trash & debris, plus b) the ability to mechanically & hydraulically dredge "oily muck" in the weed infested wetland areas' designed with a horizontal hydraulically powered auger-cutter (w/ left & right auger flights) to move materials from sides to the center head mounted slurry pump...to move the material to a barge or shore disposal site, the auger will be shrouded to confine turbidity and equipped with cutting bars to chop vegetation into pieces small enough for pumping. c) accumulate "oily water" liquids (both drainage and/or disposal) that will undoubtedly drain through the on-board storage areas on both the weed harvester(s), trash skimmers and/or the transport barges during operations. d) high pressure hosing systems to enable clearing of mud, weeds & debris from under permanently rooted vegetation and/or trees or plants. 4. OTHER CONSIDERATIONS: There is also the possibility of equipping the vessels with a twin propeller, hydrostatically-driven system for moving quickly back and forth from work sight to offloading sites. The prop systems would operate independently of the side mounted "track" systems and be able to be raised & lowered in order to get them out of the water when pulling out on land. Also, the units will be able to independently operate in both direction & speed, allowing for easy and precise maneuverability. NOTE: Both the "twin-track" and propeller systems, combined with the different "heads", will enable precise (horizontal & vertical) cutting and/or removal of materials. SUPPORT EQUIPMENT: Both the Harvesters & Trash Skimmers will have compatibly sized Support Equipment ("click" on the photos on ABU's homepage, http://www.alphaboats.com) to enhanced performance: a) Shore or Pier Conveyors - for offloading weeds at shorelines (down embankments or over a pier). b) Transport Shuttle Barges - to transfer weeds (or debris) from multiple Harvester(s) or Trash Skimmers while out in the water, thus eliminating non-productive round trip down time, should these vessels have to go back & forth to shore to offload recovered materials. c) Transport Tilt-Deck Trailers - to launch & retrieve Harvesters & Trash Skimmers & haul them over the highway from site to site. It is anticipated that the final design, even with an enlarged Mono Hull, will still enable the vessels to be easily launched and retrieved (on a ramp or at shorelines) and transported over the highways, which will be advantageous in flexibly designating its usage to high priority locations. With 100's of pieces of these types of equipment in operation worldwide modification of the special Weed Harvester (or Trash Skimmer) unit(s) with interchangeable "heads", modified hulls, the addition of tracks and a larger diesel engine, etc., will not be a major undertaking.	

Dock and Sea Wall Reef Ball® Habitat	The offshore shrimp trawl fishery accounts for a significant portion of landings in the Gulf of Mexico. Due to a multitude of events (i.e. hurricanes, oil spill, imports), the fishery has seen a substantial decline in fishing effort while operating costs have continuously risen. With increasing fuel prices, fuel saving technologies are a logical avenue to assist in reducing operating expenses. A paucity of information exists documenting the effect of gear technologies on fuel consumption. Cambered trawl doors are currently being utilized by some fishermen in the southeastern United States. These trawl doors have evolved significantly over the past decades, but until recently have not received much attention in the southern shrimp fishery. Evaluations of these doors have yielded promising potential to reduce fuel consumption in the shrimp fishery. Several door sizes have been evaluated, but cambered trawl doors, 50% smaller than the traditional wood or aluminum doors, are documented to have fuel savings of 25-30% during actual fishing conditions. Additionally, bycatch reduction remains a high priority issue in the southeast. Reducing incidental bycatch has been shown to improve catch quality and reduce fuel consumption. We propose to conduct a series of experiments aimed at documenting the fuel savings achieved by cambered trawl doors and continue to improve the bycatch reduction capability already in use in the fishery. More specifically we aim to: 1) Evaluate cambered door gear technology within the southeastern shrimp trawl fishery; 2) Continue to elicit industry participation in evaluating more complex bycatch reduction devices (BRDs); and 3) Conduct result demonstration and dissemination activities of the newly documented gear (doors & BRDs) to shrimp fishermen throughout the southeast to increase the acceptance and use of these gears. Through years of experience, we have found that informal meetings are an optimal forum for information dissemination, providing less volatility from industry and allowing for an effective one-on-one exchange of ideas. As such, we will convene a series of informal meetings throughout the southeastern US to disseminate the results of this study. By continuing our research and development efforts to reduce bycatch within the shrimp trawl fisheries, commercial fishermen will become actively involved in BRD research and development and will be more accepting of those devices tested.	$1,000,000
The Marinovich Proposal	A combination of increased operating expenses and reduced ex-vessel prices for catch has created a perfect storm of economic hardship in the Gulf Shrimp Fishery. The fishing industry has worked to reduce costs of operation, but unfortunately, few new avenues for this exist. One major cost to the shrimp industry is fuel and there are potential avenues to reduce fuel consumption aboard vessels. One of these is improved propellers and nozzles for propulsion. A recent collaborative evaluation aboard one vessel by Texas A&M Sea Grant researchers and a shrimp company showed that fuel consumption was reduced by approximately 28% when replacing a traditional Kaplan propeller with a Rice Speed Propeller and match Speed Nozzle. These results closely resembled that of a similar study performed in Australia where 25% fuel savings was achieved. An older study showed a 5% reduction in fuel by changing only a Kaplan style propeller with a skewed propeller design without modification of the propeller nozzle. The scope of this project will involve rigging out several collaborating vessels throughout the Gulf of Mexico with new designs of propellers and nozzles (different from the traditional Kort nozzle). Evaluations of fuel savings potential during actual fishing conditions will be performed utilizing fuel flow meters. As many offshore trawlers are now encountering fuel bills of over $200,000 per year, demonstrations with this new technology could provide significant savings to the industry and contribute to our nation's goal to reduce fuel consumption. The results of this project will be shared with the fishing industry throughout the Gulf through printed reports, local workshops, and through direct contact with industry.	$0
Capacity Building, Disaster Preparedness, And Sustaining Fishing Communities in the Gulf after the BP Oil Spill	Because the red snapper stock of the Gulf of Mexico is classified as overfished, the National Marine Fisheries Service has regulated the directed commercial (IFQ system) and recreational (size and trip limits and closed seasons) red snapper fisheries to reduce mortality of large juvenile and adult fish. To reduce the fishing mortality of small juvenile fish, the NMFS has also regulated the shrimp trawl fishery; a fishery that is thought to bottleneck adult populations. Disagreement has existed regarding the magnitude, age composition, and monthly distribution of shrimp trawl red snapper bycatch in time and space. The Foundation completed a research study that augmented the collection of electronic logbook (ELB)	$500,000

	data through the use of observers in the fishery. The goal was to enable the fishing industry to evaluate and address fishery management issues, including the estimation of shrimp fishing effort and bycatch. The ELB was developed by LGL Ecological Research Associates, Inc., to directly measure shrimp fishing effort, thereby reducing the dependence on modeling to provide better estimates of effort and red snapper bycatch. Over the course of a 3 year pilot study, ELB systems were placed onboard commercial shrimp fishing vessels to collect fishing effort data. Results from this study indicated that the ELB system accurately estimated the fishing practices of a vessel on a per trip basis and that individual tows could be identified. Currently, shrimp fishing effort data recorded by ELBs are used as a proxy for estimating red snapper bycatch mortality in the offshore shrimp fishery. We propose to continue the Foundation's ELB observer program that collects data with the ELB system and observers to make the results of the previous work more robust. Importantly, this will increase the data available to verify models used by scientists to compute red snapper bycatch levels within the fishery. Specifically: 1) Complement an electronic logbook (ELB) study with onboard observers to collect data on fishing effort, red snapper bycatch, and shrimp landings within the Gulf of Mexico; 2) Analyze all observer collected data to further ensure that ELB landings estimates are accurate and defensible; and 3) Determine the spatiotemporal abundance of juvenile red snapper, compute a total mortality (Z) estimate for shrimp-trawl red snapper bycatch, and conduct a formal cohort analysis (VPA) on all observer collected red snapper data. The ELB program is vital to managing the shrimp and red snapper fisheries in the Gulf and needs to be continuously funded, especially as the impacts of the Deepwater Horizon oil spill become better understood.	
Stabilized Soil Shorelines along Barrier Islands	YOUTHanasia Foundation has been working with children of parents rendered unemployed as a result of the oil spill. Most of these parents worked for seafood restaurants, tourism industry entities, etc. People think unemployment only affects the emotional state of adults, but their kids are affected too. Thus, YOUTHanasia Foundation created "Final Fridayze", a series of self-esteem festivals & citywide, emotional uplift activities for kids. Final Fridayze has been held since the disaster occurred. These mental wellness events have been funded largely out of the pockets of individuals, because we didn't know we could apply for grant funding from BP. So many are concerned with the coastal restoration, but YOUTHanasia Foundation is restoring the lives of children and their families. When kids lose hope, they begin to act out (sometimes violently) hurting themselves and/or others. If you would like to see our work live and in color, attend TALENTED YOUTHFEST 2012 on July 21, 2012 at Oakwood Center Mall. 12 noon - 7pm. It is an all-day feel good celebration of kids who want to express their inner emotions through singing, rapping, dance, music, etc. Oakwood Center Mall is located at 197 Westbank Expressway, Gretna, LA 70053.	$15,000,000
Chef Menteur to Rigolets Restoration & Protection	The idea is based on a research article which underscores the importance of light penetration in productive lakes(ref 1). Since many lakes, water bodies suffer have limited light penetration due to pollutants ,natural conditions, or external factors like oil spills ,we need to think about "reversing " it. The idea "Shine light" proposes to rectify the situation by shining light underneath the lake using a solar concentrators-fiber optic systems. We can station floating "shine-light" systems which provide pockets of light underneath the water (like a underwater light house)..In addition this system can be used to aerate the water as well providing a local environment for the microorganisms to thrive and drive the natural Lake ecosystem.	$100,000,000
Coastal Ecosystem Health: American Oystercatcher as an Indicator of Exposure and Effects of Pollutants on Breeding Birds on the Gulf Coast	Shoreline and Marsh erosion prevention and land building, with new designed geotextile containment units (GEO-TECH-Jetti), with planted native plants and grass in RZHO. GEO-TECH Units are spiked with XX Heavy Duty PVC Pipe for stabilization. This is help Shoreline Erosion Control, Stabilization, Accretion, and Habitat Assurance and "coast building." This new concept will co-inside with the two other projects submitted. Confirmation #'s WPXWHOC2 and 2KE7KQ8Q Would like to summit Power Point Presentation, please send email address.	$4,800,000

Conservation and Evaluation of Limiting Factors for American Oystercatchers along the Gulf Coast	Justification: The Deepwater Horizon Oil Spill substantially impacted recreational fisheries and their supporting industry in the Gulf of Mexico. Responses to a questionnaire following the spill indicated that nearly all surveyed fishing equipment retailers experienced reductions in their monthly sales, with the majority reporting losses of greater than 50%. Bookings for charter fishing trips and other associated recreational businesses plummeted. Even though some fish stocks such as red snapper are now showing signs of rebounding, NOAA Fisheries noted that as the population grows and the fish get bigger, recreational fishermen are likely to catch their quota faster, resulting in even shorter fishing seasons. This will translate into reduced recreational fishing trips, further reductions in tackle and equipment sales, fewer bookings for charter business, and generally lower economic viability for many recreational fishery-related businesses still trying to recover from the oil spill. Mandatory catch and release due to regulations will result in a slower stock rebuilding process and be a continuing drag on the recreational industry if anglers are not engaged to adopt “Best Practices” (tools and techniques to avoid catching fish that must be released combined with tools and techniques to improve the survival of recreationally caught and released fish). Objective: To increase angler adoption of “Best Practices” thereby advancing the sustainability of fish stocks and potentially extending fishing opportunities, anglers must be aware of practices that have proven successful. In four Gulf states alone (Florida, Louisiana, Mississippi, and Alabama) anglers released more than 4 million snappers (1.5 million of these red snapper) in 2011. Using conventional release techniques, between 15% and 40% of released red snapper do not survive, depending on depth at which they were caught, water temperature, and other factors. Increasing the survival of these by a few percent will result in a tremendous conservation benefit to fish stocks and eventually increase sustainable fishing opportunities and economic benefits from recreational fishing. Since 2008, anglers have been required by Federal fisheries authorities to use release devices and to “vent” fish (remove gases from the fishes’ body to enable it to return to habitat depth on its own) that they release in an effort to improve survival. However, recent findings of the “2012 FishSmart Workshop on Improving the Survival of Released Fish” concluded that use of recompression (returning a fish to depth without invasive procedures involved with venting) may be equally effective in improving the survival of released fish. Whether venting or recompressing, it is imperative that anglers are knowledgeable of the best scientifically-based information and implement Best Practices that minimize interaction with the fish that must be released and maximize the survival of those fish that are caught and released. This is not only a sound conservation practice; it is also good for business since reductions in mortality will eventually be reflected in longer seasons and/or larger bag limits that provide more angling opportunities. However, increasing survival is dependent on educating the anglers who interact with and handle the fish. Approach: The project will consist of four primary aspects to educate anglers to implement Best Practices, measure results, and potentially increase fishing seasons and the economic returns to coastal communities: o A survey of anglers in the Gulf states to develop a baseline for awareness of Best Practices. To accomplish this, 8-10 focus groups will be conducted across the Gulf states to assess the knowledge of and attitudes toward Best Practices. These focus groups will allow baseline information to be gathered on responses of anglers to test messages in each region of the Gulf community. Following this, a telephone survey to anglers will be conducted to ascertain the general knowledge across the regional angler base before the multi-media campaign is initiated. o A 3 year multi-media awareness/education campaign to inform anglers of the need for implementing Best Practices and drive them to online information sources. The TV/Radio and Digital Media communications will be conducted in segmented markets of Alabama, western Florida, Louisiana, Mississippi, and Texas coordinated through the Recreational Boating and Fishing Foundation (RBFF). RBFF was established for the sole purpose of communicating messages to anglers to affect behavior and fishing participation rates. o Development and delivery of online content on Best Practices and gear. Information gained from the 2012 FishSmart Gulf of Mexico/South Atlantic workshop on Best Practices and messaging will provide the basis for a communications and media campaign. This information will be assembled into on-line delivery mechanisms for anglers. o Effectiveness Evaluation: A follow up survey of anglers in the	$5,800,000

	Gulf states to determine effectiveness of and response to the multi-media awareness campaign and online education material. Cost: Approximately $20 - $20.5 million ($15 million of this for creative ad campaign development, media buys, and ad placements covering 5 states). Expected Results: Measurement of success will be the adoption of Best Practices and tools by anglers reached through the multimedia campaign. Statistics will be available on extent of reach and demographic characteristics, increases in web traffic to information sources, and effectiveness of the campaign in changing angler behavior. Ultimately, increased survival of fish will translate into enhanced fishing opportunities, increases in angler opportunities, and Increases in retail traffic to stores to purchase appropriate gear. A similar effort in Australia to encourage anglers to adopt "fish friendly" tackle (known as FishSmart tackle in the USA) and techniques had 59% recall with 35% of anglers saying that it helped change their practices. Sales of some fish friendly tackle increased 20-50% in the outlets surveyed. Other Considerations: The FishAmerica Foundation is the conservation and research foundation of the American Sportfishing Association and an early supporter of the FishSmart program. FishSmart is a program driven by the angling community, not a top-down government program, to identify best release practices and communicate those to anglers. FishSmart utilizes several approaches consisting of; 1) expanding our knowledge and understanding of released fish survival; 2) developing new technologies and equipment to enhance released fish survival, 3) promoting the adoption of careful release techniques, and; 4) developing an angler communication infrastructure to disseminate best practices to increase the survival of released fish.	
Rabbit Island Restoration	Proposed Restoration Project: The project would clarify the effects of barotrauma on red snapper and better define expected rates of discard mortality in the Gulf of Mexico. Additionally, the project will determine, through stakeholder involvement, methods, and devices best fit to increase post-release survivorship of red snapper in Gulf fisheries. A detailed understanding of barotrauma and its effects on red snapper will inform efforts to help the recovery of fish populations impacted by the Deepwater Horizon (DWH) oil disaster. Link to Injury: The DWH oil disaster footprint overlapped with portions of the geographic range and spawning period of many reef fish species, including red snapper (Lutjanus campechanus). The eggs and larvae of red snapper and other finfish spawning at the time, in addition to adult fish, were exposed to petroleum hydrocarbons and chemical dispersants. Acute mortality of fish eggs and larvae and sublethal effects on adult fish could affect year class strength and population levels. Benefit and Rationale: Red snapper is an iconic and popular recreational and commercial fish species in the Gulf. In 2011, commercially landed red snapper had an ex-vessel value of $11.5 million. The recreational fishery generates millions of dollars as well. Red snapper are known to suffer from barotrauma related injuries and mortality. Barotrauma is the condition that results when a fish is brought up from depth rapidly and the change in ambient pressures can cause potentially lethal internal injuries. Most red snapper barotrauma studies have been regional , and have not encompassed the full geographical, depth and temperature ranges in which the red snapper fishery is prosecuted. Increasing the post-release survival rate of red snapper Gulfwide would reduce the impacts of fishing and allow the population to recover from the DWH injury. Description: Red snapper are susceptible to barotrauma. Barotrauma can cause internal injury (e.g., gas bladder rupture, hemorrhaging, etc.) and positive buoyancy (i.e. floating). These injuries may not allow the fish to return to depth upon release or cause behavioral effects that can increase the risk for predation. Mortality caused by barotrauma hinders rebuilding of overfished populations of red snapper and could deter recovery from DWH impacts. Overall, fishery managers lack data on the post-release mortality of many reef fish species, including red snapper. This prevents accurate prediction of discard mortality in commercial and recreational fishery harvest estimates and stock assessments. Lack of confidence in release mortality may lead to increased management uncertainty. Accurate prediction of post-release survival is integral to setting appropriate annual catch limits of affected species in order to meet conservation goals. This project barotrauma would follow the established protocols (e.g., Jarvis and Lowe) , modified as necessary for red snapper, for both field (e.g., cages, release devices, etc.) and laboratory procedures (e.g., hyperbaric chambers and	$7,000,000

	underwater acoustic tags). In general, these protocols focus on and characterize internal/external signs of barotrauma, physiological status, and short/long term post release mortality of the species. Stakeholder participation will define their needs and will assist in development of best release practices for this species. Preliminary studies have demonstrated recompression devices have great potential to increase fish survival from barotrauma related injuries. Though promising new methods are available to fishermen, including recompression devices (e.g. Seaquilizer , Shelton Fish Descender , etc.), information of their real world applicability has yet to be determined in great detail. Identifying recompression devices most effective at reducing post release mortality and determining the ones best suited to anglers through active involvement of stakeholders will guide outreach efforts to increase their acceptance and use among fishermen. This is especially important for those species affected by the DWH disaster, potentially offsetting DWH impacts by allowing these populations to recover at a faster rate than if these devices went untested and unused. Results of this research project will add to the state of knowledge regarding methods of survivability for reef fish species. Data derived from this pilot study will help managers determine tools that can aid the recovery of red snapper populations impacted by DWH and are suitable for wider use in Gulf of Mexico fisheries. These data will also increase the accuracy of discard mortality estimates and improve annual catch calculations. This project could generate significant support and interest in the recreational fishing community. Location of Project: To be determined, but likely in multiple Gulf of Mexico locations (depending on fishermen interest).	
Analysis of the productivity dynamics and ecosystem health of the Gulf of Mexico using the sentinel species Gulf menhaden	I don't know the details at all, but it would be easy to find out. There has been some research on migrating birds hitting the lights on oil rigs. Ben Raines had a story in the Mobile Register (Gulflive.com online) about the fish that hung around waiting for the dead birds. Just changing the lights on the rigs to a different kind would stop the birds from being attracted to the lights. These oil companies are not going to do anything that is bird-friendly without being forced to. If some of the restoration money could be used to buy and install the correct lights, that would make a huge difference.	$1,400,000
Economics and the Gulf Coastal States	Houma's 1st Adaptive Park will be a park for ALL children, regardless of disability can access. Children who are in wheelchairs, have walkers or braces, and those children who are 'typical' can come and play. The park offers ramps with handrails, activity panels along the sides of the structure, monkey bars, climbing walls, short and tall slides, etc. There is something for every child! As a mom of 2 handicap children, this project is near and dear to my heart. They deserve a chance to play and have fun with other children.	$5,000,000
Analysis of the Productivity Dynamics and Ecosystem Health of the Gulf of Mexico Using the Sentinel Species Gulf Menhaden	Every ship, boat, truck, car, and aircraft engaged in the response to this oil spill and all restoration activities to date have used vehicles powered by a liquid petroleum-based motor fuel. This fact is not only ironic, but symbolic of the fundamental challenge faced by Florida citizens who would prefer to not be a party to future oil spills. This restoration effort can, and should, demonstrate how the risk of future leaks, spills and releases of petroleum-hydrocarbons can be minimized, if not completely eliminated, by the use of commercially available natural gas and electric motor fuels in all types of vehicles. This action is relevant because, under current federal policy and industry practices, boaters and drivers in Florida have no choice but to purchase and use a liquid petroleum-based motor fuel to power all of their motor vehicles. Non-petroleum motor fuels, such as methane and electricity, are cheaper, cleaner, and widely available, but are not easily used to power motor vehicles or boats. This means that restoration activities will contribute to the risk of a future oil spill and will do nothing to mitigate the risk of future spills. In effect, this contradicts Administration policy that instructs federal agencies to take action, where possible, to reduce petroleum consumption and reduce pollution created by the use of fossil fuels. When used to power motor vehicles alternative motor fuels, such as methane and electricity, completely eliminate the risk of hydrocarbon leaks, spills and releases from the supply chain and use in the vehicle; risk of petroleum releases are eliminated, both during routine operations and in the event of an accident. I propose to develop a program to advise recipients of monies under this program that use of natural gas and electric motor fuels in most types	$1,400,000

	of vehicles is both technically feasible and, in many applications, commercially available from local vendors. Use of these fuels, however, requires education and behavior change. To change behavior I propose that specifications for funded projects that use of boats, cars, trucks, and heavy equipment include the requirement that those vehicles be powered by a non-petroleum motor fuel when technically feasible. Natural gas and electricity are commercially available throughout the Gulf Region. Given sufficient demand, natural gas and electric motor fuels can be supplied to land or marine vehicles used to support administrative and restoration work. Many types of land vehicles powered by electricity or natural gas are commercially available; some of these vehicles operate in the Florida Panhandle today. Suppliers are standing by, waiting, for the opportunity to make these vehicles fuels available to help restore Gulf resources. Marine engines can be modified to operate on natural gas; natural gas motor fuels can be stored on boats in either compressed or liquid form. There are no technical barriers to using natural gas to power boats, only perception. Natural gas retails at prices that are 50% to 75% cheaper than the price of gasoline or diesel fuel. Natural gas is now the fuel of choice for waste trucks, transit buses and other high-fuel consuming vehicles. In the marine sector, natural gas has become the fuel of choice for a variety of work boats, including harbor craft and ocean going ferry boats. Tampa Bay Watch operated a natural gas outboard 15-years ago. There are absolutely no technical barriers to the use of this non-petroleum motor fuel. The only barrier to the use of natural gas motor fuels is perception that this non-petroleum motor fuels is not practical or available; in other words, barriers are cultural, institutional, and bureaucratic. Cultural, institutional, and bureaucratic caused the Deepwater Horizon disaster; these are the very behaviors that these monies are intended to overcome. Widespread use of cheaper, cleaner, domestically produced natural gas and electric motor fuels and vehicles will create jobs, save consumer s money, stimulate local economies, and break the market power of OPEC, thus enhancing the economic security of this Nation.	
Conduct Tagging and Tracking of Large Marine Vertebrates in the Gulf of Mexico to Monitor their Status, Distribution, and Changes in Habitat Use	Proposed Restoration Project: Conduct more frequent stock assessment updates for overfished or near overfished Gulf finfish species and first-time stock assessments for lesser known, unassessed finfish species that were potentially impacted by the Deepwater Horizon (DWH) oil disaster. The information will be used to inform adaptive management of fisheries and promote recovery of populations impacted by DWH. Link to Injury: Many commercially and recreationally fished species in the Gulf of Mexico were exposed to oil or dispersants during the DWH disaster. As a result, potentially injured reef fishes, highly migratory pelagics, and sharks require closer monitoring for the next several years in order to help managers better track population status and trends and set catch quotas consistent with recovery from the DWH disaster. Benefit and Rationale: Finfish contribute to regional seafood sales totaling $17 billion and support a thriving recreational fishing industry, which generates nearly $10 billion in economic activity and supports 92,000 jobs in the Gulf of Mexico. Therefore, knowing the status of finfish populations through assessments is critical for effective management of fisheries and maintaining the health of the ecosystem and the fishing-related industries that depend on it. The 2010 DWH disaster may have affected the year-class strength of exposed Gulf fish species by reducing survival of eggs and larvae, or it could have reduced the spawning population itself through lethal or sublethal impacts. Sublethal exposure to oil and dispersants could, for instance, compromise the immune system of affected fish, and signs of compromised immunity in the form of external lesions and abnormal markings on fish (e.g., red snapper) have been documented by researchers at LSU and USF. The population status of Gulf species is assessed through the Southeast Data, Assessment and Review (SEDAR) process, which is the stock assessment process established by the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils. These three Councils are all served by the Southeast Fisheries Science Center within NOAA Fisheries. All three Councils rely heavily on SEDAR assessments for generating science-based management advice for NOAA Fisheries. However, due to the large volume of managed species in the Southeastern U.S., only a small fraction of managed species is assessed in any given year, and many have never been assessed. Assessed species are managed through multi-year population projections in years between assessments, but episodic events such	$3,500,000

	as hurricanes, red tides, or oil spills can affect the population in ways that can reduce the usefulness of the population size projections, potentially leading to inappropriate management decisions. For species that are nearing an overfished condition or are overfished, the DWH disaster may have further negatively affected population health. More frequent status updates are needed to ensure that these species do not become overfished or if a species is already overfished that rebuilding is on track. There are currently four species in the Gulf that are in rebuilding plans: red snapper, gag grouper, greater amberjack, and gray triggerfish. More frequent assessment updates for gag grouper may have been able to prevent the population from deteriorating from a near overfished condition in 2005 to severely overfished in 2009 (due to a 2006 episodic mortality event that reduced the spawning stock biomass by 18 percent). More frequent status updates may have also been able to detect the lack of progress in greater amberjack rebuilding and prevent missing the rebuilding deadline. Species impacted by DWH that have not been assessed present a unique challenge to fishery managers because less is known about their population status and how DWH might have affected populations. Managers need accurate population size estimates to detect changes in abundance that might be influenced by sub- lethal effects resulting from DWH. This information will facilitate adaptive management and recovery and help managers prevent overfishing while achieving optimum yield. Specifically, an evaluation of available data-poor assessment methods and application of the most suitable ones to unassessed, undermanaged Gulf species is needed. An additional need is a method for annually setting catch limits for these species that is based on feedback control to adjust for errors in our perception of population status and changes in abundance trends. Alternative catch setting methods, based either on results from simple assessment methods or empirical data, can be tested using simulations through the management procedure approach. Employing this approach would enable managers to choose the method that is expected to best meet management goals and to respond appropriately to any changes in population trends that may arise from DWH impacts. Description: Annual or biennial update assessments would be performed for previously assessed, managed Gulf species that have been determined to be overfished or are nearing an overfished condition. These updates would be done in house by the Southeast Fisheries Science Center or responsible state management agency without the physical, public workshop required by the more involved “standard” or “benchmark” assessment. Doing more frequent update assessments will require additional stock assessment expertise as well as additional data processors and analysts. For species requiring more frequent assessments, updating the data time series that go into the model would become a routine annual process that is performed by the responsible data curators. For minor, unassessed species, a series of workshops modeled after the SEDAR process would be held to evaluate current assessment methods for data-limited fisheries and apply the appropriate one(s) to Gulf fish species with unknown status. This project would consist of a workshop for assembling available data, a series of webinars for applying and evaluating alternative assessment methods, a series of webinars for constructing and testing alternate management procedures (empirical and model-based), and another workshop for review of the process. To produce the best results, these workshops would incorporate many of SEDAR’s characteristics such as transparency, openness to public participation and independent review and would involve the Center for Independent Experts (CIE). A university with relevant expertise and capacity would lead this project, with the involvement of federal, state, university, and NGO scientists, fishery managers and local fishery representatives. Every five years over a 10-year period, webinars and a workshop will be held to review and, if necessary, adjust management procedures.	
Bayou Sale Shoreline Protection (TV-20)	Proposed Restoration Project: Expand current fishery-independent surveys, develop new surveys, and expand data collection to better track population trends and recovery of managed fish species and support an ecosystem approach to management. Link to Injury: Many commercially and recreationally fished species, including reef fishes, highly migratory pelagic fishes, sharks, and invertebrates, in the Gulf of Mexico were exposed to oil or dispersants during the 2010 BP Deepwater Horizon (DWH) oil disaster. As a result, the status of some species requires closer monitoring to track	$18,000,000

	population trends and recovery to assist in managing fisheries for those species and impacts on associated ecosystems. Benefit and Rationale: Abundance and ecosystem data (such as age and growth, hydrographic/oceanographic, predator-prey relationships, habitat, and genetic data) from fishery-independent surveys are a vital input in stock assessments which are used to assess the status of managed species in the Gulf and allow managers to make management decisions that will achieve the legally mandated goals of preventing overfishing and allowing the fishery to take optimum yield. Stock assessments can be and are performed without reliable long-term fishery-independent indices of abundance, but results from those assessments are often more uncertain from the ones that do use good fishery-independent (FI) survey data. Existing FI surveys in the Gulf, while providing essential information for management, suffer from several limitations. Low sample sizes, year-to-year variation in sampling effort, and inadequate spatial coverage result in high sampling variance for many surveys, which limits our ability to detect population biomass trends even for commonly targeted species. For many less common species there is no suitable FI index of abundance at all, and as a consequence, the status of these species is currently unknown, and catch quotas have been set based on recent landings. The DWH oil disaster added an additional component of uncertainty to Gulf fisheries management. This uncertainty stems from acute oil and dispersant-related mortality of adults and spawning products, long-term population-level impacts, and food web and habitat impacts. When unknown to management, the negative effect of these impacts can be magnified, as exemplified by the 2006 episodic mortality event that reduced the gag grouper spawning stock biomass by 18 percent. This population reduction was not detected until three years later, and consequently, projected allowable catch limits in the meantime were too high, and the gag population ended up in a severely overfished situation. In addition to short-term impacts, the unknown long-term effect of the disaster on population trends and food web dynamics may invalidate some assumptions made in previous models to predict the future condition of the resource, and it may undermine the assumptions on which current catch control rules for unassessed species are based. Expanded and additional fishery-independent surveys will help reduce uncertainty about current stock status and likely future condition of living marine resources and the ecosystem in response to human activities. They will enable scientists to track impacts and recovery of Gulf species and their environment, allowing managers to set management measures to aid species recovery, not unknowingly undermine it. Description: A number of different FI data collection programs exist in the Gulf, led by federal and state management agencies as well as universities. Many of these existing surveys could benefit from spatial and temporal expansion in sampling as well as increased sample sizes and expansion of the kinds of data collected to improve survey precision and support an ecosystem approach to management. This project would expand existing SEAMAP, NOAA Fisheries, and select university surveys to attain adequate sampling coverage (CVs of 20% or less for the dominant species) and collect and analyze additional data such as reproduction and gut content, age and growth, genetic, habitat, and hydrographic data. Preference would be given to surveys that provide information which has been identified by stock assessment panels and scientific advisers as being critical to Gulf stock assessments. In addition, this project would fund new surveys in the Gulf of Mexico, such as the new reef fish video and acoustic biomass surveys. Any data collected and analyzed as part of this project would need to be made available to the public as an annual or summary report. Individual geospatial data layers would also be posted to a central website and made publicly available following QA and QC.	
A Comprehensive Examination of Bottlenose Dolphin (Tursiops Truncatus) Stock Structure and Habitat Characteristics in	through cleanup marine oil spills, like the one in nigeria niger delta bonga oil spills,chevron nigeria oil spills, niger delta nigeria oil spills,using modern technology,if giving me the opportunity, I will done the beat of it.	$10,000,000

the North Central Gulf of Mexico		
Ecosystem Based Restoration Project Management and Decision Support System	At the October 29 - November 1, 2012 Gulf Council Meeting in Gulfport Mississippi, the Gulf of Mexico Fishery Management Council (hereafter: Council) discussed data needs to priorities for restoration activities in response to the Deepwater Horizon oil spill. The Council discussed potential impacts to important stocks, critical habitat, and humans due to lost fishing opportunities etc. The Council requests that upon settlement or through early restoration the following activities are given the highest priority: • Increase and fund frequency and number of stock assessments. • Enhance and fund fishery independent surveys, both federal and state. • Work with MRIP to decrease the frequency to two week waves for high profile species. • Develop and fund a more robust observer program. • Enhance/create and fund oyster restoration projects and coastal reef fish habitat. • Development of and funding for data collections programs for the headboat and for-hire sector and a charterboat electronic data collection system. • Research and fund projects on barotrauma tools for reductions in bycatch mortality. Each of these activities are critical to improving conservation and management efforts of federally managed fish species and associated habitat necessary to provide maximum benefit to the nation as required by the Magnuson-Stevens Fishery Conservation and Management Act.	$0
Linear Wetlands Park	1% from each company to fund research and to be able to stop contain or diffuse dangerous situations that can become harmful to the planet and its beings, i.e., Valdez Oil Spill, Fukashima, BP, Chernoble, 3 mile island. For the future of this planets sake.	$15,000,000
West End Park Lagoon Habitat	Proposed Restoration Project: The project will augment resources available to the Sea Turtle Stranding and Salvage Network (STSSN) in the Gulf, led by NOAA, and help participating entities respond to and learn from future sea turtle strandings and thus increase the survival of rescued animals and the recovery of populations impacted the Deepwater Horizon (DWH) oil disaster. Link to Injury: Sea turtles were exposed to petroleum hydrocarbons resulting from the Deepwater Horizon oil disaster and likely to chemical dispersants used during DWH response. More than 450 visibly oiled, live sea turtles and 18 visibly oiled, dead sea turtles were recovered during DWH response from April 2010 through February 2011. Another 500+ stranded sea turtles with no visible external signs of oiling were also reported during this period. Animal autopsies revealed that the cause of death for a subset of non-visibly oiled sea turtles was consistent with drowning, but whether and how the DWH disaster contributed to strandings of non-visibly, dead sea turtles remains under investigation. Benefit and Rationale: NOAA leads the STSSN in the Gulf of Mexico, but depends on employees of federal and state agencies, universities, non-governmental organizations to run on-the-ground operations and foot response. In some cases, STSSN participating entities receive limited or inconsistent institutional support and conduct STSSN activities using their own limited time and funding. However, they are often the first to respond to sea turtle strandings, a key function in maximizing the survival of live-stranded animals and could do more with dedicated funding to help support monitoring and response to strandings. Since April 2010, the number of sea turtle strandings in the northern Gulf has approached 2,000 animals, far exceeding the historical average. Stranded sea turtles would not be located, rescued, and rehabilitated were it not for the Network and the participating organizations. Rehabilitated animals released back into the wild are given another opportunity to reproduce and thus contribute to the recovery of populations impacted by episodic events like the DWH disaster. Sea turtles, among other species, are the ocean's 'canary in the coal mine,' and stranding networks, through tissue sampling or post-mortem exams, collect valuable information on the condition of animals that can not only help scientists understand the cause of illness or death but detect subtle or significant changes in ecosystem condition or function. The collection of biological information from stranded animals is critical to understanding more clearly the long-term effects of the DWH disaster and other human activities on Gulf sea turtles. Description: This project would increase capacity for sea turtle stranding programs at the state or regional level such that they are in a better position to respond to strandings, maximize survival of recovered animals, and improve the	$200,000

	consistency and quality of pathological information collected from tissue samples or post mortems. Specifically, this project would increase capacity across Gulf STSSN programs in the field by making investments in the following operational areas: 1) developing and implementing uniform animal detection and data collection methods; 2) equipment (including vehicles); 3) supplies (including fuel); 4) collection, banking, shipment and analysis of samples (necropsies); 5) data entry, management and synthesis for scientific use and public consumption and 6) rehabilitation facilities (including salary support and other administrative costs such as coordination with other networks and resolving permit problems). In regard to #1, this project would cover the cost of developing uniform animal detection and data collection methods, which are important for understanding how stranded turtles represent the entire population. Hiring experienced researchers and veterinarians from other regions to train local responders in the activity of collecting information from stranded animals is needed to ensure that information collected from stranded animals is consistent across stranding networks in the Gulf, integrated with other health assessment studies, contributes to a better understanding of the impacts of the DWH disaster on Gulf sea turtles, and informs sea turtle recovery strategies going forward. Note: Specific program needs will vary on a state by state basis and therefore should be determined by in-state coordinators. Note: This proposal was prepared by Ocean Conservancy, with input from stranding network members. Ocean Conservancy is not s seeking funding for this project, nor does it anticipate receiving funds, if approved and adopted in whole or in part, by the Trustees, the Gulf states, the National Fish and Wildlife Foundation, the Restore Council, or any other funding entity.	
Breakwater Park West End	To create a wetlands mitigation bank from the portion of the Pay Dirt LLC properties currently designated as forested wetlands.	$50,000,000
Process Model for Intertidal and Salt Marsh Contaminant Prediction	Restore Act's has created a wide area multi county combination of projects that are: restoring coastal habitat, creating oysters, or restoring oysters, creating new snorkeling reefs, improving coastal living shoreline, and adding deep water habitats along the coast of the Gulf of Mexico. Many projects have been proposed to deploy artificial reef modules with various objectives, rather than each community, county or non-profit organization having to work out a purchasing agreement this project would provide local jobs building the Reef Ball modules for deployment. The Reef Ball Regional Production Site is designed, to create local jobs, and reduce the overall cost of production and delivery of reef modules thus becoming more cost efficient. Rather than numerous projects having to handle the purchases of product, they would be allotted a portion of the production from the RPS. If production exceeds the immediate demand, product would be stockpiled for distribution over the next several years. This project provides employment for 4 to 6 local laborers over 3 to 10 years and provide a continuous supply of reef modules to be used by the 24 impacted counties in Florida. Depending on the quantity of product that is needed, state funds from the 5 States could support production at additional Reef Ball Regional Production sites, thus reducing the delivery cost even more. Reef Innovations has years of experience setting up worldwide remote production sites. Reef Innovations would be responsible for setting up, and the quality control of Reef Ball production site using local labor. Funds drawn from the grant would be the amount of the sales price of the actual number of modules produced during that week. Reef Innovations would contract from a labor force of local workers. Reef Innovations would set up and manage the production site. Monitoring Projects supplied with Reef Balls will be monitored recording items such as site location objectives. Verification of deployment site, numbers of units and objectives. 1. All sites using Reef Balls are expected to provide monitoring. A link to Monthly summaries by the organization in charge of the project will be made available during the first year and a yearly survey summary provided for the next 5 years. 2. Reef Innovations will maintain the right to monitor on a yearly basis or have it monitored by their designee. Results of the monitoring of each project site will be compiled for presentations at the 5 and 10 year mark. 3. A database will be established to be available for research and evaluation. Technical Feasibility 1. Building Reef Balls close to the deployment site can reduce the unit cost when projects are using large quantities of Reef Balls. 2. This is the most feasibly way to provide Reef Ball modules to various areas around the 5 Gulf State. 3. By stockpiling the modules for	$350,000

	distribution to approved environmental groups, county Artificial Reef, and Breakwater projects this can become an ongoing project lasting many years. Production Sites and Use of Reef Balls will 1. make the communities a better place to live and help to restore the health of the Gulf of Mexico. 2. add local ownership to the projects 3. allow ecosystem services to obtain materials as projects are placed on the table Creation and preservation of jobs because of the Reef Ball Production Site 1. 4 - 6 local labor workers per site and a Reef Innovations foreman for quality control. 2. Increased work for a Concrete Company, Drivers and support personnel 3. The community economic benefits will include house rental, grocery stores, restaurants, barge, and boat operators, etc. 4. Product from the site will benefit fishing, as well as in some projects adding resilience to shoreline, or increasing relief for oyster restoration projects. Supplemental materials are available by contacting Larry Beggs Larry@reefinnovations.com.	
"BP" the Blue Print For Restoring the Gulf's Fisheries	Proposed Restoration Project: The project will augment resources available to the Marine Mammal Health and Stranding Response Program (MMHSRP) network members in the Gulf, helping them respond to and learn from future marine mammal strandings and thus increase the survival of rescued animals and the recovery of populations impacted by the Deepwater Horizon (DWH) oil spill. Added benefits from this project are the ability to augment the resources and response capability across networks that serve other impacted marine wildlife species, such as sea turtles and sea birds. Link to Injury: Marine mammals (whales, dolphins, and manatees) inhabit the northern Gulf and likely were exposed to petroleum hydrocarbons and impacted by cleanup activities resulting from the Deepwater Horizon oil spill. Aerial surveys conducted under the Natural Resource Damage Assessment observed 6 species of whales or dolphins swimming in surface oil in offshore waters. Two dolphins were rescued after being trapped behind oil booms in Alabama during the spill event. Live dolphin health assessments conducted in Barataria Bay in 2011 showed that animals in this highly impacted region were exhibiting signs of severely compromised immune systems -- symptoms consistent with those seen in other mammals exposed to oil. Approximately 930 marine mammal strandings (almost entirely bottlenose dolphin) have been reported as of 7 April 2013 as part of an ongoing Unusual Mortality Event that began in February 2010 in the northern Gulf. Strandings in 2010-2012 far exceeded the historical average (Figure 1). The majority of the strandings occurred in Louisiana, followed by Mississippi, Alabama, and the Florida panhandle (Figure 2). Scientists are still investigating the cause of the strandings. The potential for long-term impacts exists for marine mammals that were exposed to contaminants but may take many years to be realized. Benefit and Rationale: The collection of biological information from stranded marine mammals is critical to understanding more clearly the long-term effects of the DWH oil spill and to ensuring the recovery of affected populations. Prior to the spill, stranding response efforts were patchy and inconsistent in many portions of the region, especially Louisiana and Alabama. Response capabilities increased in certain areas during the spill with funding from the Natural Resource Damage Assessment; however, long-term funding is needed across the Gulf because it is not known where or when delayed strandings related to the DWH spill may arise in the future. Institutional funding is variable but generally inadequate to provide the level of response needed for ongoing injury assessment. Limited global expertise in marine mammal veterinary care and diagnosis underscores the need to recruit and retain properly trained specialists in the impacted region. MMHSRP network members are often the first and only responders to marine mammal strandings in the Gulf region. Rapid response to live- and dead-stranded animals is key to collecting the high quality samples necessary to determine cause of death and to monitor the health status of wild populations. The availability of trained and qualified stranding responders, technicians, and veterinarians is essential in providing effective medical and forensic response. The unusually high number of sick and dead marine mammals recovered in the northern Gulf since the DWH oil spill underscores the importance of network members in responding to, rescuing, and rehabilitating stranded marine mammals. Often, MMHSRP network members participate also in response efforts for other injured or dead marine wildlife, including sea turtles and seabirds. Although none of the marine mammals rescued during the DWH event could be released back into the wild, other live-stranded marine animals (e.g.,	$8,000,000

	seabirds and sea turtles) were rescued and rehabilitated by network members and typically were released. There is an ongoing need to treat and successfully release stranded dolphins, whales, and manatees back to the Gulf. Released animals are then able to reproduce and contribute to the recovery of the wild population. Follow-up monitoring of released animals via tagging and resightings will provide data on the success of rehabilitation efforts and assist in adaptive management of rehabilitation and release techniques. Marine mammals, among other species, are the ocean's "canaries in the coal mine," and MMHSRP network members, through biological sampling and post-mortem examinations, collect high value information on the condition of animals that can help scientists not only understand the cause of illness or death, but also detect subtle or significant changes in ecosystem condition and function. Stranding response complements on-water observational studies of free-swimming wild animals, which provide a means to measure population vitality, births, juvenile survival, visual health indicators, and incidences of injury or harassment by human activities (e.g., vessel strikes and fisheries interactions). Description: This project would maximize the survival and recovery of marine mammals affected by the DWH oil spill by increasing the capacity of Gulf marine mammal health and stranding response program network members, with emphasis on areas affected by the spill, to 1) respond to reports or sightings of live- and dead-stranded marine animals, 2) support facilities and personnel involved in rehabilitation and release of stranded marine mammals, 3) conduct timely and thorough examinations of live- and dead-stranded animals, and 4) collect, analyze, maintain, and disseminate consistent and high quality information from stranded animals and stranding events. Specifically, this project would increase capacity within the existing MMHSRP network across the Gulf, particularly in the areas more heavily affected by the spill, over a 10-year period. The project emphasizes investments in the following operational areas: 1) salary support for stranding coordinators, veterinarians, and technicians to respond to strandings, conduct examinations, and collect and organize samples and data; 2) equipment, supplies, and contracted services needed to locate and respond to strandings, conduct examinations, and collect and store biological samples; 3) laboratory analyses of biological samples; 4) operation and maintenance of necropsy and rehabilitation facilities; and 5) training of stranding responders. Adequate resources for existing Gulf MMHSRP network members would ensure that information collected from stranded marine mammals is consistent throughout the Gulf and with other U.S. regions. This vital work is integrated with other health assessment studies and contributes to a better understanding of the impacts of the DWH oil spill on Gulf marine mammals to inform marine mammal recovery strategies going forward. Enhancing capacity and long-term consistency of the MMSHRP network in the Gulf region will also augment response efforts that focus on other impacted species of wildlife. Location of Project: The project would increase capacity for MMHSRP network members throughout the Gulf, emphasizing investments in areas most heavily affected by the spill (Louisiana, Mississippi, Alabama, and the western edge of the Florida panhandle). Funding Source/Mechanism: Funding for this project would come primarily from funds awarded by the court or an out-of-court settlement under the Oil Pollution Act Natural Resource Damage Assessment to restore injured natural resources and services to pre-spill conditions. Other sources of funds could include funds from state trustee agencies, the National Fish and Wildlife Foundation, and/or the Gulf Coast Ecosystem Restoration Council. NOAA, as the lead Trustee for marine resources, is in the best position to administer and coordinate the allocation of funds for this project. Designated network members (see list below and the attached map) would work in close partnership with the project administrator to determine the type of enhancements needed at their facilities. NOAA and other state and federal trustees, as appropriate, would determine the amount of funding for each network member based on restoration scaling; that is, the level of funding would be based on nexus to injury and the number and type of strandings (i.e., injuries) that occurred or are likely to occur in each network member's area of responsibility (see attached map). Network members in the primary DWH oil spill impact zone: - Audubon Aquarium of the Americas (New Orleans, LA; Suzanne Smith) - Louisiana Department of Wildlife and Fisheries (Grand Isle, LA; Mandy Tumlin) - Institute for Marine Mammal Studies (Gulfport, MS; Moby Solangi/Delphine Vanderpool) - Dauphin	

	Island Sea Lab (Dauphin Island, AL; Ruth Carmichael) - Emerald Coast Wildlife Refuge (Fort Walton Beach, FL; Amanda Wilkerson/Steve Shippee) - Gulf World (Panama City Beach, FL; Ron Hardy) Network members in other areas of the Gulf potentially affected by the spill: - Texas Marine Mammal Stranding Network and authorized designees (Galveston, TX; Heidi Whitehead) - Marine Mammal Conservancy (Key Largo, FL; Art Cooper, Jr.) - Florida Fish and Wildlife Conservation Commission Marine Mammal Pathobiology Laboratory (Saint Petersburg, FL; Andy Garrett) - Florida Fish and Wildlife Conservation Commission Southwest Field Laboratory (Port Charlotte, FL; Denise Boyd) - Florida Aquarium (Tampa, FL; Kristen Aanerud) - Mote Marine Laboratory (Sarasota, FL; Gretchen Lovewell) - Clearwater Aquarium (Clearwater, FL; Mike Hurst) Cost Estimate: Approximately $45 million over 10 years.	
Chenier Ronquille Island Shoreline Protection & Sea Rise	States, Counties, and municipalities have channel markers they are responsible for maintaining under their USCG channel marker permit. Deployment of a Reef Ball® on each channel marker would provide increased micro habitat for finfish and invertebrate recruitment throughout the Gulf of Mexico. Production of Reef Balls is provided by Reef Innovations in Sarasota, FL., or the regional production sites (RPS) proposed for the area. This project can be run through the Reef Ball Foundation which is a 501(c) 3 publicly supported nonprofit and international environmental NGO working to rehabilitate marine reefs. This has proven beneficial where nonprofit organization involvement is desirable. The Reef Ball Foundation's mission is to rehabilitate our world's ocean reef ecosystems and to protect our natural reef systems using Reef Ball artificial reef technologies. A proposal has been submitted for funds to set up “Reef Ball Production Sites” in the Panhandle and Big Bend regions in Florida as well as proposals for sites in Texas and Mississippi. This would reduce the cost of deliver modules to the various projects in the region and reduce the cost per microhabitat unit. For this project, a crew of 3 workers could work their way across the state or region installing the micro habitats over a period of 3 to 10 years, or the units and deployment training could be supplied to the individual county for implementation. Reef Innovations would provide the product and quality control of the project. Local port authority could provide the labor with a crew normally installing markers. Reef Innovations could provide a foreman to work with locally hired crews. Reef Modules used depend upon the water depth, piling diameter and relief desired. As you move toward deeper water it is suggested to increase the size Reef Ball. Monitoring during the initial survey, objectives will be established for the microhabitat including expected species recruitment. Initial Survey Reef Innovations Government Organization… Permitting Follow up Survey Reef Innovations has the right to make a full survey yearly, or an approved researcher appointed by Reef Innovations Government organization will provide survey reports to Reef Innovations on a yearly basis. Government organization will provide a 10 year survey report, and summary of project. A database of locations and observations will be established for the monitoring of the project results. Presentations will be prepared for at conferences at the 5 and 10 year point. There are three protocols for placing the units: 1. Unit incorporation during marker replacement as part of the regular maintenance 2. Lowering the Reef Ball over an existing channel marker piling 3. Placing a two piece unit around the piling of an existing marker Environmental Benefits Reef Balls have a proven track record for providing habitat for juvenile finfish and invertebrate recruitment. These units located along deep water channels will provide increased habitat for the movement of both finfish and invertebrates species in and out of coastal estuaries. They also provide increased settlement substrate for sessile oysters, corals and macroalgae. A supplemental document is available breaking down the costs and identifying the process. Contact Larry Beggs for that document Larry@reefinnovations.com The project can be implemented locally, the cost projection on this description is a yearly cost for 10 years, across multiple regions of the Gulf.	$7,822,392
West Whiskey Island Shoreline Protection	Newly emerging issues regarding stranded sea turtles in Texas are currently taxing the resources of state and federal managers, as well as rehabilitation and STSSN partners, unsustainably. Since strandings have surged in number in recent years and many of the issues are new, framework and funding levels set in place over 9 years ago are drastically insufficient to respond to, manage, or investigate stranding causes, putting sea turtles at risk. During 2010-2019, annual	$2,990,560

	stranding numbers in Texas are 4 times higher than during the 10 previous years and are 4.5 times higher than in the three northern Gulf states combined. Two emerging issues are 1: Mexican lancha crews fishing illegally in the waters of the United States – which has led to increased strandings of large juvenile loggerheads, adult, and near-adult Kemp's ridleys, and green sea turtles, as well as illegal take of sharks and red snapper. 2: Management issues associated with rapidly increasing numbers of juvenile green sea turtles recruiting from offshore pelagic habitats into nearshore areas with many human-related threats. With support of local, federal, state, and private stakeholders, these emerging issues can be managed in a way to properly protect all five species of sea turtles impacted. We propose to increase staff and equipment for partners to allow for additional boat patrols to detect, intercept, and apprehend lanchas and board other fishing vessels to monitor compliance. Second, we propose to reduce illegal harassment of turtles by members of the public and dogs, including harassment and capture of sea turtles at jetties and beaches in south Texas, which has recently been documented at an alarming rate. To do this, we propose to increase staff for management and education at areas where increasingly large numbers of sea turtles are being harassed regularly. They will also assist with debris removal, maintain signage, and distribute educational materials. Entanglement in abandoned fishing gear is a common cause of death for turtles in these areas. Mortality will be investigated via necropsy. Additionally, we proposed the following research to better understand juvenile green turtles rapidly recruiting to and utilizing Packery Channel (PC), as well as other areas on the Texas and Louisiana coast for foraging/developmental habitat. The PC has a high density of juvenile green sea turtles and the active recruitment to this hotspot is on a scale that has never been documented before. This research is critical to assess the impacts of hypothermic stunning, vessel-strike, incidental take, harassment, entanglement, and entrapment at PC to aid recovery efforts for local and regional green turtle populations. The broad aim of this study is to assess juvenile green turtles to inform recovery and restoration efforts for western and northwest Gulf of Mexico green turtle populations. The following objectives to address this aim. 1: Determine spatiotemporal patterns of turtle movements/distributions through acoustic and satellite tracking, genetic analysis, and stable isotope analysis for green sea turtles in the PC, upper Laguna Madre, and other areas of Texas and Louisiana. 2: Determine residency /relative population size of turtles in PC through a mark-recapture study to determine cumulative impacts on individuals/population. The area of concern for this project is the GOM shore, nearshore waters, and associated bays and estuaries in Texas and Louisiana.	
Breton Island Shoreline Protection	Docks and seawall have historically been viewed a significant developmental impacts to the coastal environment. These areas generally have a lower overall species diversity and abundance of finfish, invertebrates, and aquatic plants when compared to surrounding natural areas. The general characteristics of seawalls is a high energy zone where water continually scours the bottom restricting natural community formation, while docks have been shown to dramatically reduce the available sunlight and increase sedimentation. These types of environments are not conducive to increasing natural community structures. The addition of Reef Ball® habitat to approved docks, piers, and seawalls not only provide physical protection in the event of seasonal storms but can increase the recruitment and survivability of juvenile finfish and invertebrate populations. These structures have also been shown to provide ideal settlement substrates bivalves, corals, and macroalgae increasing natural nutrient cycling and reducing turbidity. Cleaner less turbid waters have been correlated to increased species diversity and abundance worldwide and could constitute a significant step in the conversion of sterile manmade structures into a more natural living shoreline. Addition of these habitats could help mitigate shoreline development that would normally not be directly used by native finfish and invertebrates. Starting with Phase I, Reef Innovations would provide a crew to survey public docks and piers determine suitability for the individual areas for enhancement. The criteria for suitability will be developed in conjunction with the regulatory agency ensuring compliance with local, state, and federal guidelines. Reef innovations will develop a site plan for each deployment based on the site criteria and deploy the units to maximize structural protection and species recruitment.	$2,129,900

	The addition of the Reef Ball Habitat units will immediately reduce water flows through these areas and provide settlement areas for the finfish and invertebrate community. The extent and makeup of the community will depend on the area. Phase 2 expands this program to private property owners following the criteria used for public docks and seawalls. These homeowners would finance their own projects thus saving the government money and giving the homeowners vested interest in marine conservation and restoration. Science has shown a need for increased restoration efforts in estuarine habitats. Shareholder involvement is a vital component to establishing a living shoreline and helps to create sustainability along our coastline through habitat restoration. Reef Innovations and/or their approved contractors can handle all parts of Phase I and Phase II activities. Funding requests grant will be based on size of project, distance of travel, cost of modules, used, and transportation of modules to the deployment site. Additional Information, Pictures, and Pricing on within attached file updated Jan 2017. The project could be a small community project or combined as a large area wide project, in the packet it identifies a 10 year progression for the project.	
Barataria Bay Rim Shoreline Protection	Why Pertaining to the adult shrimp coming out of the gulf. Protect the adult shrimp coming out of gulf to spawn so they will be able to reproduce without be caught up by trawl. Change (tweak) the shrimp laws to close the season from last week in March do not open until last week in June; Re-closed in August not reopened end of three week into September. This may fix a failing industry and bring back multitudes of jobs (increase shrimp population cut down on drag time for fisherman which will make trip shorter and less fuel. (More shrimp for fish to eat for red snapper, speckled trout).	$1,556,400
Conservation Educational Outreach Program (CEOP)	In the wake of the interconnected cultural, socio-economic, and environmental effects of the BP Oil Spill, Gulf fishing communities are facing unprecedented short- and long- term challenges in sustaining their traditional lifeways. Our two years of ethnographic research investigating traditional cultural communities and properties in the Gulf during the BP Oil Spill and response efforts has demonstrated the intimate and vulnerable cultural relationships these communities have with their surrounding environments. This research also illustrated the need for more inclusivity of fishing community traditional ecological knowledge (TEK) in implementing innovative capacity building strategies and the development of effective conservation and sustainability plans. McGoodwin (2001) has importantly pointed out that: Over the course of its development, much of fisheries-management science, both in theory and in practice, has had a misplaced emphasis. Whereas its first concerns should have been the human beings who utilize fisheries resources, its cornerstones were instead…the conservation of important marine-biological species…[and] allocating fisheries resources and maximizing the economic benefits from them. The aftermath of the BP Oil Spill has particularly elucidated the need to emphasize and better understand the human aspects of fisheries and the roles fishing communities play in producing and promoting sustainable fishery environments. In this context and in conjunction with mandates presented by the Magnuson-Stevens Act and National Standards 8 regarding the need for fishing community consideration in fishery conservation and management decision making, this proposed project seeks to establish capacity building strategies inclusive of fishing community perspectives, values, beliefs, and TEK in: (1b) the development of community sustainability and management plans; (1c) the creation of fishery conservation networks; and (1d) the development of inter-generational and entry level access to and inclusion in fisheries. Methods: Participatory Learning and Action (PLA) is a method that promotes community interfacing and provides a vehicle for people to share, discuss, and expand their knowledge related to particular contexts and situations as well as to effectively prioritize, monitor, plan, and act at the community level. With each participating fishing community, the project team will organize a PLA workshop by collaborating with community members, educational institutions, and other local institutions. The workshops will be held in public facilities (where possible) at times most convenient for fisher communities and will extend over the course of three days. These workshops will provide structured as well as open interactive forums and activities where communities can present their concerns and needs, identify solutions to meet those needs, and develop community action plans and best practices related to sustainability and management programs; the creation of fishery conservation networks; and the development	$3,750,000

	of intergenerational and entry level access to fisheries. The process of working in partnership with fishing communities to develop inclusive, feasible, desirable, and sustainable programs will contribute to innovative capacity building strategies that can aid the short- and long-term interests and needs of these communities in confronting the conservation and sustainability management challenges as well as the social and cultural impacts of the BP Oil Spill. Project Outcome(s): Anticipated short-term outcomes of the PLA workshops include: 1) wider community participation in capacity building activities, 2) community specific fishery TEK exchanges that can help strengthen capacities of communities to identify local fishing community needs, build community consensus, and develop appropriate strategies to meet those needs, 3) the development of culturally informed fishing community sustainability plans, and 4) establishment of Fishing Community Sustainability Planning Committees. Each of these steps will help initiate community ownership of sustainable and conservation planning processes and help build local accountability. Long term utility of this project will help integrate local fishing community needs and perspectives into management and conservation strategies related to the BP Oil Spill and response and will help meet goals established by the Magnuson-Stevens Act and National Standards 8 mandating consideration for the impacts of conservation and management practices on fishing communities. It will also provide baseline data of the management challenges related to the BP Oil Spill as well as present a path forward for future research needs regarding the integration and use of fishing community perspectives and TEK into conservation and sustainability strategies outlined in the Magnuson-Stevens Act and National Standards 8. Proposed Activities: The project team has two years of experience working directly with the fishing communities listed above. The tasks necessary for identifying community stakeholders, building trust, and developing working relationships have already been established. The following are the steps the project team will take to successfully organize and implement PLA workshops with the identified fishing communities: 1. Follow-up with community leaders and government representatives to ensure community participation; 2. Work with community leaders and government representatives to establish PLA workshop logistics and participant recruitment strategies; 3. Directly engage and recruit fishing community members on the ground in coordination with community leaders and representatives; 4. Hold PLA workshops with participating fishing community members and stakeholders; 5. Analyze results from PLA workshops; 6. Present PLA workshop results back to participating fishing communities; 7. Select members for Fishing Community Sustainability Planning Committees in coordination with community leaders and representatives; 8. Work with Fishing Community Sustainability Planning Committees in using PLA workshop results to draft Fishery Conservation and Sustainability Plans inclusive of fishing community values, beliefs, and TEK; 9. Provide Fishing Community Sustainability Planning Committees with Fishery Conservation and Sustainability Plan drafts for review; 10. Author final Fishery Conservation and Sustainability Plan Report and submit to Fishing Community Sustainability Planning Committees, NFWF, and other agencies overseeing NRDA. Measure of Success: We will measure progress and success of the PLA workshops through the percent of the participating target populations, including the active participation of multigenerations, support agencies, and institutions (e.g. educational, governmental, NGOs) as well as those seeking entry level access to fisheries. We will measure progress and success of the Fishery Conservation and Sustainability Plan through a recording and accounting for identified management challenges related to the BP Oil Spill and response, how TEK can assist in sustaining fishing community lifeways while abiding by the parameters of the Magnuson - Stevens Act and National Standards 8, and development of an action plan that can be implemented by individual fishing communities as well as through fishing community networks and partnerships in the context of these events and regulatory requirements. All progress and success, as well as new challenges and obstacles, of Fishery Conservation and Sustainability Plans will be monitored in conjunction with Fishing Community Sustainability Planning Committees. Funding for future research and program implementation will assist effective monitoring of progress and success of Fishery Conservation and Sustainability Plans and will be sought by the project team.	

iSnapper Electronic Charter For-Hire Logbook Reporting System	Barrier Islands are an important feature necessary to protect the coastline from further erosion. It is a great idea to reconstruct these barrier islands using native materials, but if the material doesn't stay in-place after a hurricane storm surge passes it has served no purpose except to delay coastal erosion. However, if native materials were stabilized with reagents along the perimeter edges of the restored barrier islands, the barrier islands stand a much better chance to not erode away. Stabilized edges along the perimeter of restored barrier islands will be strong enough to withstand storm surges and keep the native non-stabilized material in-tact. The stabilized perimeter can also serve as access to remove any oil or tar balls that resurface from the spill. Stabilized soil or spoils have a much lower unit weight than regular clay and will not soften even in immersed conditions. Let's protect our work with stabilized shorelines to avoid expensive rework that will occur after the storm.	$500,000
Recreational Fisheries Data Enhancements	The Conservation Fund (TCF), and its project partner Ecosystem Investment Partners, are pursuing funding to complete the full restoration of this 16,500 +/- acres of coastal marsh intermixed with marine/ estuarine habitats. Upon restoration, TCF expects the tract could be donated to a State, or Federal agency, or another non-profit, for public use and long-term stewardship. This tract represents approximately half of the land bridge area which is the interface between the marine environment within the Lake Borgne/ Gulf of Mexico, and the estuarine system within Lake Pontchartrain. This coastal wetland complex supports a significant local fishing industry, as well as hunting and other recreation based tourism. With significant frontage (approximately 14 miles) along Lake Borgne/ Gulf of Mexico, this tract provides important aquatic habitat, as well as critical migratory bird habitat on the front line of the Gulf of Mexico. Louisiana's 2012 Comprehensive Master Plan for a Sustainable Coast calls for 8,510 acres of marsh creation to occur on this site. This complex contains a variety of coastal wetland components, including salt and brackish marshes, lagoons, canals, cheniers (former beach fronts) and natural bayous. The marshes along Lakes Pontchartrain and Borgne serve as estuarine nurseries for various fish species, crabs, and shrimp. These diverse habitats meet the needs of up to 340 bird species during various seasons of the year. Peak waterfowl populations of up to 25,000 use these wetland areas during the fall, winter, and early spring months. In addition, wading birds, shorebirds, brown & white pelicans, raptors, a variety of mammals, along with numerous reptiles and amphibians are found within the habitats provided.	$1,500,000
Gulfcoastrestaurants.Com Website	The Gulf Coast of Mexico is one of the most important regions in North America for bird-watching and outdoor activities. Bird conservation along the Gulf Coast is of primary importance because it contributes to the conservation of natural resources but also because it provides economic incentives to the coastal communities by increasing tourism, including bird-watchers and nature lovers to the region. Thus, maintaining healthy bird populations along the coast is important from an economic and ecological standpoint. Fish-eating birds are at the top of the food chain and often accumulate more contaminants than other species at lower trophic levels. American oystercatchers feed on bivalves which are also consumed by humans. This study could be used to assess general ecosystem health and potential impacts of contaminants in bivalves on human health. This research project will address the impacts of environmental contaminants on aquatic birds breeding along the Gulf Coast, using the American Oystercatcher (Haematopus palliatus palliatus) as an indicator species. Coastal wetland areas, estuaries, and islands along the Gulf of Mexico coast constitute a primary nesting and feeding ground for many North American birds. Most of the species nesting on these areas are waterbirds which nest in colonies and feed on aquatic vegetation, invertebrate organisms, and fish. Exposure to environmental contaminants in these species can occur through the diet, but also directly through dermal absorption, preening, and inhalation. To our knowledge, up until now, there has not been a complete assessment of the potential impacts that environmental contaminants in the Gulf of Mexico could have on many aquatic birds, including species of special concern and in need of protection. The results of this research can also be used to determine the health of coastal areas and their potential associated impacts on other species of concern, i.e. fish, shellfish, and humans.	$0

Gulf Accesses-Land Formation	The American Oystercatcher (Haematopus palliatus) is the most widely distributed of the four oystercatcher species found in the Western Hemisphere with a range stretching from the northern U.S. Atlantic Coast to the tip of South America. The total population is estimated to be 43,000 with the subspecies found in the U.S. (H.p. palliatus) making up 20,000 of that total. The U.S. population is estimated to be 11,000. American Oystercatchers are restricted to the narrow band of the coastal zone throughout their range where they feed mainly on oysters and other bivalves. The threats to their survival are many and include a low overall population size, low reproductive success, and delayed breeding (3+ years of age). Productivity rates from the Atlantic Coast range from .30 to .50. Nests are subject to a whole host of mammalian, avian, and even reptilian egg and chick predators and are also subject to overwash from high tides and tropical storm events. Chicks can starve to death during high tide events when the adults are unable to find enough food. Because oystercatchers nest in the coastal zone, disturbance from human recreation is common and exacerbates other natural threats. Sea level rise is major threat to oystercatcher survival. The U.S. Shorebird Conservation Plan lists the American Oystercatcher as a species of high concern, it is a National Fish and Wildlife Foundation (NFWF) priority species, and it is included on the list of Texas Parks and Wildlife Department's priority species. The majority of projects associated with the American Oystercatcher have been along the Atlantic seaboard with limited focus on Gulf Coast populations. In 2011, the Gulf Coast Bird Observatory embarked on a multi-year study to fill information gaps on Gulf Coast oystercatchers. We have learned much from our work so far but there are still many unknowns. We have only begun to scratch the surface of understanding of oystercatcher conservation however as there remain many unanswered questions. Our primary focus would be to determine how and why eggs go missing from nests and how vegetation aids in chick survival. It appears the vegetation provides chicks with critical refugia from predation, but we do not have a complete picture of what type of vegetation works best. We propose to expand oystercatcher nest monitoring throughout the Gulf to determine if other Gulf oystercatchers have similar productivity and threats as Texas oystercatchers. We propose to deploy motion activated video cameras to capture egg predation events and determine without question what is causing them so that we can counteract this with appropriate conservation measures. Thirdly, we propose to conduct a detailed vegetative analysis of oystercatcher nesting islands to determine which type of vegetation provides the best chick refugia. Without this information we cannot successfully create more oystercatcher nesting habitat.	$0
Buyout of Longliners' Use of the Gulf of Mexico During the Bluefin Tuna Spawning Season	The purpose of the Rabbit Island West Cove Calcasieu Lake Beneficial Use Restoration Project is to provide improved habitat for nesting birds in the West Cove of Calcasieu Lake in Calcasieu Parish, Louisiana through the beneficial use of dredged material. Rabbit Island has historically been a rookery for a large number of pelicans and colonial birds and serves as the westernmost rookery in the state of Louisiana. This restoration will ensure Rabbit Islands remains a viable rookery for the brown pelican as well as other nesting birds. It has been observed that nests on Rabbit Island frequently fail from flooding by tides and waves. Higher tidal amplitudes from larger volumes of water coming up the Calcasieu Ship Channel are a primary cause for the more frequent flooding on Rabbit Island. Part of the flooding is also due to larger wind-generated waves caused by increased fetch as more marsh is lost along the fringe of West Cove. The low elevation and lack of shrubbery on the island causes pelicans to nest on the ground and periodic high water drowns the nests, resulting in failed breeding attempts. The amplified tides are the primary cause for the more frequent flooding on Rabbit Island. The erosion has also been expedited by previous hurricane storm surges, subsidence, sea-level rise, wave processes, and low topography at or below sea level. These impacts have diminished the Island's historic topographic elevation and shoreline characteristics to the point that the Island's ability to function as a viable rookery is in jeopardy. Features of the Rabbit Island Restoration project for the Brown Pelican will include: nearness to open water; separation from the mainland; approximately 20% of nesting areas with dune/shrub habitat; and approximately 2500 feet of shoreline protection. The topography of the island will be elevated and contoured to include those features critical to	$10,000,000

	successful nesting of pelican and colonial birds. This habitat will add an important dimension to the resources of the lake and will help to broaden the range of nesting areas for the brown pelican. When the restoration is complete, Rabbit Island will be not only the western-most rookery but also the premier rookery for the brown pelican in the state of Louisiana, adding significant habitat for the pelican and other colonial birds and helping to preserve these valuable resources. By using dredged spoil from the Calcasieu Ship Channel, elevations on the Island will be raised and the topography sculpted to enhance the nesting areas and build a world class rookery for colonial birds and the brown pelican. In 2003 it was observed that there were 8 nests of pelicans on Rabbit Island that resulted in 5 young birds. In 2010, 500 nests produced over 1,000 young. Over 100 rehabilitated pelicans impacted by the Deepwater Horizon Incident have been relocated to Rabbit Island. Daily morning monitoring of the status of these rehabilitated birds indicate that 1,000 to 3,000 pelicans are using the island for refuge. Thousands of shoreline and colonial birds also benefit from the refuge and habitat provided by Rabbit Island. Implications The use of dredged spoil from the Calcasieu Ship Channel, elevations on the island can be raised and the topography can be sculpted to enhance the nesting areas and build a world class rookery for colonial birds and the brown pelican. Restoration of the island adds an important dimension to the resources of the Calcasieu Lake, helps broaden the range of nesting areas for the brown pelican, and is an excellent example of the beneficial use of dredged material. With many barrier island nesting grounds under attack due to coastal erosion and environmental impacts, the Rabbit Island rookery will be even more important in demonstrating the value of beneficial use of dredge material.	
Improving Gulf Fisheries.	The Gulf of Mexico (GOM) is a dynamic and productive region that provides a variety of ecosystem services. However, it is subject to a range of chronic and episodic natural and anthropogenic impacts. In order to understand what ecosystem targets managers should strive to attain, an understanding of the long-term ecosystem conditions is necessary. In this proposal we will derive an informative indicator of ecosystem health will be developed using Gulf menhaden (Brevoortia patronus) as a sentinel species. NOAA Fisheries in cooperation with the commercial fishing industry, maintain a biological archive of Gulf menhaden scales (1964 to 2012, approximately 4,600 to 16,800 for each year). We will analyze these scales by subsampling the scales and determining their temporally- and spatially specific stable isotopic signatures (carbon 13, nitrogen 15, and oxygen 18). Using this information we will reconstruct the historic productivity and temperature cycles in the GOM. Because of the applicability of this information to management, academicians, industry, and conservation representatives, the deliverables of this work are expected to have a broad, immediate, and profound impact. One application of the ecosystem health indicator will be to understand the external drivers of fishery dynamics. For example, both the blue crab stock and the gulf menhaden stock exhibit a reduction in productivity in 1995. It is likely that these departures indicate a “regime” shift in the environment. The proposed analysis would be invaluable because the relatively poor fits of many assessment models remains a substantial hurdle in the management process.	$0
A Way to Clean Some of Oil Out of The Gulf	The objective is to collect economic data for the Gulf Coast fishermen, Anglers, processors, charter for hire and businesses that rely on our Nations marine resource to provide food and jobs for our Nation. This project will attempt to capture the true value of our Gulf of Mexico States marine resources and seafood to the Nation as a whole. Activities include the collection of economic data which will include mail out surveys, email surveys, phone calls to various users of our resources to validate the data collected from the mail out surveys. We will also meet face to face with many of our businesses. We will collect economic data from the products harvested throughout the entire seafood supply chain. We have never collected the true value to regional businesses benefitting from Gulf seafood. In most surveys they only show the x-vessel price. We will do a literature review to make sure we have included all value from the fish to the plate and all the jobs that depend on our Marine resource and all revenue that our nation receives. One example is Menhaden is used for making oil, fertilizer, dog and cat food. The oil is used as the primary ingredient in WD forty. This example is to show how the value chain comes into play and the many jobs that are created through the value chain. The outcome is to have	$0

	a social and economic survey that will help capture the true value of the commercial seafood industry to the Nation as a whole. We will also provide the other businesses that depend on the seafood from the Gulf of Mexico to make their living. This data has never been collected before. If a Disaster should strike again, we will have the true value and as an extra bonus of this proposal .Our science center will have the information and so will our fishery management councils that use this type of information in their management plans.	
Bayside Segmented Breakwaters at Grand Isle, LA	The Gulf of Mexico (GOM) is a dynamic and productive region that provides a variety of ecosystem services. However, it is subject to a range of chronic and episodic natural and anthropogenic impacts. In order to understand what ecosystem targets managers should strive to attain, an understanding of the long-term ecosystem conditions is necessary. In this proposal we will derive an informative indicator of ecosystem health will be developed using Gulf menhaden (Brevoortia patronus) as a sentinel species. NOAA Fisheries in cooperation with the commercial fishing industry, maintain a biological archive of Gulf menhaden scales (1964 to 2012, approximately 4,600 to 16,800 for each year). We will analyze these scales by subsampling the scales and determining their temporally- and spatially specific stable isotopic signatures (carbon 13, nitrogen 15, and oxygen 18). Using this information we will reconstruct the historic productivity and temperature cycles in the GOM. Because of the applicability of this information to management, academicians, industry, and conservation representatives, the deliverables of this work are expected to have a broad, immediate, and profound impact. One application of the ecosystem health indicator will be to understand the external drivers of fishery dynamics. For example, both the blue crab stock and the gulf menhaden stock exhibit a reduction in productivity in 1995. It is likely that these departures indicate a “regime” shift in the environment. The proposed analysis would be invaluable because the relatively poor fits of many assessment models remains a substantial hurdle in the management process.	$5,000,000
Mississippi River Long Distance Sediment Pipeline Phase II	Satellite-based tags or radio transmitters will be used to track the movement, habitat use and status of marine mammals, sea turtles, and marine birds impacted by the Deepwater Horizon (DWH) oil spill. The information would be used for the following: 1) monitor species’ exposure to areas of lingering DWH oil; 2) detect important changes in habitat use, distribution, or life history of species/stocks that may be a result of the spill; 3) help determine the rate of recovery since the DWH event; and 4) inform recovery strategies. Link to Injury: Surface oil directly impacted marine mammals, sea turtles and marine birds, as documented through aerial surveys, at-sea observations, and animal recovery efforts for the DWH Oil Spill Natural Resource Damage Assessment. Six cetacean species were observed swimming in surface oil in offshore waters and hundreds of bottlenose dolphin strandings have been reported during an Unusual Mortality Event that began in February 2010 in the northern Gulf. More than 450 visibly oiled, live sea turtles and 18 visibly oiled sea turtle carcasses were also recovered during DWH response from April 2010 through February 2011. Another 500+ stranded sea turtles with no visible external signs of oiling were also reported during this period. A number of visibly oiled live and dead marine birds were also recovered during DWH response. Benefit and Rationale: Satellite-linked tags and radio transmitters attached to marine animals can provide a wealth of information on habitat use, foraging behavior, distribution, and exposure to hydrocarbons. These data are transmitted via satellite or radio waves in virtual real time to scientists. Satellite-based tags, in particular, are useful for helping scientists track the movement of marine animals with wide-ranging, offshore distributions. Tags also enable scientists to pinpoint animals for follow-up visual and photographic assessments of health and reproductive success (i.e., calf presence) following episodic events like DWH. Between 2010 and 2012, scientists initiated tagging of oceanic marine mammals (e.g., sperm whales) in the Gulf, estuarine and coastal/shelf dolphins, and loggerhead and Kemp’s ridley turtles as part of injury assessments conducted for the DWH Oil Spill Natural Resource Damage Assessment (NRDA). Expanded and, in some cases, continued monitoring of cetaceans, sea turtles, and marine birds impacted by the DWH oil spill using satellite or radio transmitters is important for tracking trends in the status, species’ rates of recovery of species and the overall health of the Gulf ecosystem. Studying the responses of animals at high trophic levels to ecosystem change like a major oil spill can shed light on the health and	$84,000,000

	stability of the marine food webs that support them. Food webs themselves are challenging to monitor directly. Monitoring populations at high trophic levels, such as femal sperm whale social aggregations, with modest home ranges, could be an effective way of comparing known affected areas with those that are more like "control regions." By tagging and tracking wide-ranging large marine vertebrates and comparing their collective movements to oceanographic conditions over time, scientists are in a much stronger position to learn whether or where ecosystem change is occurring (see www.gtopp.org). For example, pattern changes in the movements of sentinel species derived from satellite tracks could be a sign that the abundance or distribution of prey is shifting, perhaps in response to environmental drivers such as habitat degradation, climate disruption, or other stressors. This information can help resource managers fine-tune recovery strategies. Description: Scientists familiar with the species of marine mammal, sea turtle and marine birds impacted by the DWH oil spill will decide which species are appropriate for tagging, whether for the first-time or as part of on-going studies initiated under NRDA injury studies. The duration of the tagging and tracking will be determined by the lead PIs but should continue for 5 to 10 years to account for inter-annual variability and so that sufficient data for animals with long life spans can be obtained. The project is broken down into three phases. During Phase 1, scientists identify priority species (see below) for tagging, define research objectives and sample size, obtain required permits, and execute field work (e.g., radio, satellite tagging). During Phase 2, scientists collect geospatial animal tracking data and conduct vessel-based health assessments of tagged animals to include tissue sampling (e.g., remote biopsy, live capture/release) and visual documentation of individuals and offspring when possible. During Phase 3, data from Phase 2 is analyzed, interpreted, reported, synthesized for the public, and published in the scientific literature. One or more of these phases would repeat as necessary if, for example, tags are non-responsive (broken or lost) or additional tagging is needed to maintain an acceptable sample size or time series data for identifying trends. The data from tagging studies will be evaluated against historical and other baseline data, as available, on habitat use, foraging behavior, distribution, and abundance. Observed changes from baseline will be used to assess DWH impacts on population status and rate of recovery and inform restoration strategies going forward. Priority species and geographies for tagging and tracking (representing marine species that were either oiled or exposed to oil): Marine mammals: Estuarine populations of bottlenose dolphin in Barataria Bay, Mississippi Sound and Sarasota Bay (control site), coastal/shelf populations of delphinids (with emphasis on bottlenose dolphins), and endangered sperm whales, Bryde's whale and other species of oceanic delphinid that were documented in oiled waters or in the oil spill impact zone. Sea turtles: Nesting female Kemp's ridley along the Texas coast and loggerhead sea turtles in NW Florida, Peninsular Florida (e.g., Pinellas County) and in SW Florida (e.g., Dry Tortugas). Pelagic sea birds: Gulf of Mexico pelagic populations of northern gannets, Audubon's shearwaters, and royal terns will be tagged at their breeding colonies (i.e., gannets at north Atlantic colonies, shearwaters at Caribbean Island colonies, and terns at island beach colonies in the northeast Gulf of Mexico). Nearshore populations of brown pelicans and black skimmers will be tagged in the northeast Gulf of Mexico. Location of Project: Gulfwide Likely Implementing Entity(ies): The entities listed next to each of the animal groups have experience in tagging and tracking wildlife; many were PIs on studies initiated under the DWH Oil Spill NRDA and are in a position to continue leading such studies. Marine mammals - NOAA National Marine Fisheries Service Office of Protected Resources and Southeast Fisheries Science Center - NOAA National Ocean Service National Centers for Coastal Ocean Science and Hollings Marine Laboratory (Charleston, SC) - Oregon State University (Corvallis, OR) - Sarasota Dolphin Research Program (Sarasota, FL) - Ocean Alliance (Gloucester, MA) Sea Turtles - Kemp's ridley: National Park Service - Loggerhead: U.S. Geological Survey, U.S. Fish and Wildlife Service, National Park Service Marine Birds - U.S. Fish and Wildlife Service - U.S. Geological Survey-Coop Unit - Clemson University - Audubon Society - Memorial University of Newfoundland Cost Estimate: Marine Mammals Approximately $1.5 million per study, which would include a sufficient sample size of animals from one or more species, depending on co-occurrence and ease of tagging multiple species under a single study. Cost	

	includes price of tags, vessel charter costs, fuel, renting of satellite/ARGOS, and data processing and analysis. Sea Turtles $1 million/year over 10 years Marine Birds Below estimates are based on tagging 50-100 birds per species. DATA COLLECTION, COST PER SPECIES Tags ($3500/tag) $175-350K Data Access ($100/mon per tag, 2 years) $120-240K Airfare (5 at $1K) $5K Vehicle rental and gas ($150/day, 10-20 days) $1.5-3K Food ($200/person, 5 people for 10-20 days) $1-2K Field Salaries ($200/day for 5 people, 10-20 days) $10-20K Shipping and excess baggage $1K Total (per species) $313.5-621K Indirect costs (about 40%) $125-248K TOTAL WITH INDIRECT COSTS (per species) $438.500-869K DATA ANALYSIS FOR 5 SPECIES Analysis planning, reporting, and presentations $7-15K Postdoctorate salaries (2-4 people, 50 K/year, 3 years) $300-600K GIS and analysis software (for 2-3 computers) $5-10K Dedicated computers (2-3, different locations) $3-9K Field materials, computer supplies, etc. $10-20K Total $325-654K Indirect costs (about 40%) $130-262K TOTAL WITH INDIRECT COSTS (5 SPECIES) $455- $916K GRAND TOTAL (for 5-year study) $2.6 to 5.3 million* *Funding is also needed to analyze brown pelican and black skimmer tagging data that was previously collected by Clemson University with NRDA funding. Funding in the amount of $150,000 would support a postdoctoral scientist for two years, as they analyzed those data and produced 2-4 papers.	
West Grand Terre Beach Nourishment and Stabilization	This project is listed under the CWPPRA program as project number TV-20, http://lacoast.gov/reports/managers.asp?projectNumber=TV-20 Eroding shoreline at an estimated rate of 13.5 ft/year has been caused by the open water fetch and resulting wave energy from East Cote Blanche Bay. The resulting shoreline has resulted in a substantial loss of live oak forest, emergent wetlands and critical habitat used by a multitude of fish and wildlife species including the endangered black bear. The goal of this project is to reduce and/or reverse shoreline erosion and create marsh between the breakwater and existing shoreline. The project was originally envisioned as a rubble mound dike, up to seven miles in total length. However, the presence of known oil and gas infrastructure and a large number of magnetic anomalies makes rock construction unfeasible. The team has identified a possible solution, using a product such as the OysterBreak (http://www.wayfarertech.com/oysterbreak/oyster-reef-building). Such a structure could be constructed with shallow draft equipment such as conventional barges or specialty vessels available in the area, thereby eliminating the need to dredge access channels. This option would allow the floating construction equipment to safely pass over known pipelines and unidentified magnetic anomalies. It is understood that no oysters would grow on the structure; the OysterBreak would function as a concrete armor unit breakwater. In summary, this proposal consists of up to approximately seven miles of the OysterBreak Shoreline Protection System, with gaps as appropriate to allow fisheries access, and to avoid known pipelines and unidentified magnetic anomalies.	$65,000,694
Fifi Island Rock and Restoration Project	The Mississippi Sound supports one of the largest estuarine bottlenose dolphin populations in the world; however, the lack of a current stock assessment and subsequent poorly understood stock structure and habitat use within the region make this area ripe for study. Furthermore, the longest running unusual mortality event (UME) in the history of the northern Gulf of Mexico has resulted in more than 750 bottlenose dolphin strandings with over 250 occurring along the Mississippi coast. Gauging the effects of the UME and potential causative factors associated with unprecedented mortality requires an accurate understanding of stock structure and environmental factors controlling movement within the region. This purpose of this project is to conduct long-term, comprehensive monitoring of population dynamics and habitat characteristics of bottlenose dolphins in the north central Gulf of Mexico. Transects spanning the entire Mississippi Sound will be surveyed multiple times each season to generate population estimates based on distance sampling theory. Additionally, photo identification survey routes will be traveled within the study area several times each season to make population estimates using mark-recapture statistics. Photo identification data will also provide critical insight into stock structure within the region as it will elucidate home ranges, site fidelity, and seasonal movement patterns of individual dolphins. Intensive water quality sampling at regular intervals at established locations throughout the Mississippi Sound will accompany line transect and photo identification studies to gauge the effects of environmental	$35,000,000

	factors (e.g., temperature, salinity, dissolved oxygen, etc.) on the species. Additionally, potential prey items will be sampled in selected areas within the region to better understand feeding ecology of bottlenose dolphin stocks. Bottlenose dolphins are apex predators that can reliably indicate overall ecosystem health. Thus, monito ring bottlenose dolphin habitat use in response to environmental variation is crucial for understanding the health of the Mississippi Sound and the larger north-central Gulf of Mexico. This work will be augmented with population dynamics and environmental data collected by IMMS over the last ten years and will be critical for understanding the effects of recent disturbances and promoting recovery and enhanced management of this sentinel species.	
Removal of Derelict Gear and Marine Debris in Northern Gulf of Mexico	As multiple restoration projects are implemented in the northern Gulf of Mexico, there is a need to understand and quantify impacts on the ecosystem. Furthermore, there is risk that interactions across projects may have "unintended consequences". For example, changes in water quality such as salinity and sediment load may adversely impact desired habitat conditions (e.g., oyster reefs and marsh restoration. This could result from freshwater diversions and changes in circulation with barrier island construction. Consequently, a method that informs ecosystem based management is needed. This proposal is to develop and deploy a placed-based decision support system (DSS) for scientific assessments of synergistic interactions of multiple restoration projects. The DSS will be built using existing technologies and data for conducting scenario analyses and simulations. Existing models and ongoing ecosystem assessments will used to develop a place-based DSS. Projects and their alternative will be assessed using Multi-Criteria Decision Analysis (MCDA). MCDA provides a systematic tool for identifying a preferred course of action when considering multiple forms of dissimilar information and differing value judgments among stakeholders. The DSS will allow managers to evaluate impacts of multiple projects on the overall quality of the ecosystem in the northern Gulf of Mexico and provide science based assessments for adaptive management as restoration projects develop over time. Enhanced assessment techniques will be used to evaluate the stability and sustainability of projects during construction and post construction. The project will be a collaborative effort with engineers and scientists from Mississippi State University (MSU) and the University of Southern Mississippi (USM) and will be coordinated with state and Federal agencies conducting restoration in the northern Gulf of Mexico. Emphasis will be placed on projects in the Mississippi Sound and Lower Mississippi River. More detailed proposal is available upon request.	$0
Elmer's Island Restoration	Located along Breakwater Drive on the south shore of Lake Pontchartrain in the historic maritime district of West End in New Orleans, the non-profit organization - The Friends of West End - seeks to construct a linear wetlands park in conjunction with the Municipal Yacht Harbor Management Corporation and the Lake Pontchartrain Basin Foundation. Consisting of dredge and spoil material used to construct a marsh ecosystem that would benefit the health of Lake Pontchartrain and downstream waterways by creating a new shoreline breeding habitat. Further, the project would include a boardwalk and educational kiosks seeking to educate the New Orleans public on the need for a healthy Lake Pontchartrain. This project has been approved via a master planning process coordinated by the Regional Planning Commission.	$26,200,000
Caminada Headlands Back Barrier Marsh Creation - 1 (BA-171)	Located in historic West End Park in New Orleans, the East Lagoon is in need of shoreline stabilization, stocking, and culvert repair to re-establish water transit between itself and Lake Pontchartrain.	$31,000,000
Caminada Headlands Back Barrier Marsh Creation - 2	The proposed Breakwater Park at the historic West End of New Orleans will consist of large greenspaces on the shores of Lake Pontchartrain. The park has undergone the planning process through the Louisiana Regional Planning Commission. Funding needs consist of fill, vegetation, shoreline stabilization, bikeways, beach fill, parking, restrooms, small outdoor pavilion, boardwalk, electrical & plumbing, lighting, sidewalks, parasailing launch area, catamaran launch area, etc. Located in the largest population center directly affected by the oil spill, this project seeks to return the public to the	$20,900,000

	shores of Lake Pontchartrain as well as improve the health of the entire Lake Pontchartrain Basin ecosystem via shoreline breeding habitats and marine bird habitats.	
Grand Pierre Island Restoration	Background The introduction, deposition, and remobilization of contaminants in salt marshes are driven by hydrodynamics. There are multiple scales for these processes, which complicates attempts to elucidate the fundamental processes behind a given set of observations. There are at least three levels of interaction between chemical and physical mechanisms: (1) the intertidal marsh; (2) estuaries; and (3) basin-scale. The flow within a salt marsh is localized and occurs within both flats and channels with significant impacts from the canopy. This problem is not restricted to local circulation within bays but can also reflect far-field processes because of the variability in the Loop Current, which can lead to the introduction of pollutants from the Caribbean Sea. The introduction of basin-scale contaminants is the subject of much interest of late because of potential for seepage from deep-water oil platforms. This recognition has been made available through web-based applications. In addition to the tidal and cold-front impacts on shoreline circulation and geochemistry, it is important to consider the infrequent occurrence of tropical cyclones, which cause greater changes over short times. The impacts of tropical cyclones are more erratic. Coastal bays and lakes contain storm layers that can remobilize soil-bound pollutants. Storms are a major factor in the long-term management of coastal features like barrier islands in the Gulf of Mexico, and these coastal features share common growth cycles that will impact future pollution studies. These storms are a major cause of exchange between the inner shelf and coastal wetlands, and their contribution to the movement of organic matter has been quantified. These physical processes are being documented and preliminary quantitative tools are being developed to represent the morphological changes. It is, however, necessary to relate these physical changes to the expected pollutant transport processes. Work has been completed on the interrelationship between the Mississippi River and marsh geochemistry. A similar approach should be integrated into a marine shoreline geochemical model. These physical and geochemical processes must be understood in terms of the long-term evolution of the Mississippi-Atchafalaya shoreline/marsh system if potential errors in coastal planning are to be avoided. Many pieces of the northern Gulf of Mexico ecological puzzle already exist. There are also multiple efforts underway to merge these into a comprehensive program. The recently formed Gulf of Mexico Research Initiative (GoMRI) is intended to be a research support mechanism for independent research at academic institutions. The overall development of a comprehensive approach to this problem has been described on the GoMRI web page using five themes: (1) Physical distribution, dispersion, and dilution of petroleum under the action of physical oceanographic processes, air-sea interactions, and tropical storms; (2) Chemical evolution and biological degradation…and subsequent interaction with coastal, and deep-water ecosystems; (3) Environmental effects…and the science of ecosystem recovery; (4) Technology developments…; and (5) Impact on public health. These themes are being pursued in a number of research projects. The fate of organic carbon in coastal wetlands is being investigated by Wang at LS. Ecosystem level effects of oil have been documented by ongoing studies on carbon dynamics and the impact of petroleum on the ecosystem. These investigator studies have been supplemented by large grants to consortia to develop more extensive research programs that fall into eight projects with underlying objectives as follows: (1) petroleum impacts and degradation in seawater and seafloor sediments; (2) oil distribution, impacts, and degradation on Louisiana shelf and wetlands; (3) integration of numerical models from plume to shelf scales; (4) experimental and model studies for oil degradation; (5) measurement and modeling study of oil impacts, transport and deposition in Desoto Canyon; (6) small-scale physical, chemical, and biological degradation of oil; (7) oil behavior at DWH site; and (8) multiscale numerical model integration with observations and particle tracking, supported by experimentally determined mixing parameters. Objective It is not possible to study every possible interaction in an ecosystem as large as the wetlands of the northern Gulf of Mexico. Previous and ongoing work demonstrates the complexity of the marine and coastal environment. These studies tend to fall into different categories that are best described by physics and scale. The scale being predominantly	$18,600,000

	studied depends to a large extent on the physics being considered. The physical processes in the GoM are mostly studied at space scales > 1 km. Studies of higher resolution problems tend to be isolated from basin scale studies. Gulf of Mexico Research Initiative (GoMRI) projects aim to address this issue, but the specific models used (i.e., Plume Model-ROMS-SUNTANS) may not be well suited for integration from the deep to intertidal ocean. The problem is not so much in the integration of the circulation models, but in the lack of an environmental model to make use of the hydrodynamics. The part of this puzzle that is missing is a numerical model that integrates the small-scale chemical/biological processes with the larger scale hydrodynamic processes represented in typical coastal modeling approaches, like those proposed in projects (1) and (8). The key to this integration is the use of ecological or water-quality models. This work would adapt such a model to the coastal wetlands ecosystem in order to span the time and space scales that govern the long-term response of this environment to short-term events like storms and oil spills. Characterization of flow patterns within estuaries is mostly a function of understanding the relationship between meteorological, oceanographic, biological, and geological phenomena.	
Bayside Segmented Breakwaters at Caminada	This program will allow Fishers and NMFS to test and address some of the possible management strategies that the fishing industry has recommended to Gulf of Mexico Fishery Management Council since the Oil Spill. It will contain the basic blue print of those recommendations. It will help to address the needs of the commercial reef fish fishermen in the Gulf of Mexico with their by catch of regulatory discards. This will benefit the fishery by having those fish available to the market place instead of being thrown back into the Gulf Waters. This provides benefit to the fisherman, the consumer of the resource, the coastal communities, and the living marine resource. This program will allow the fisherman a way to participate at a cost that may not be available to them now. Plus it would help distribute the fishery resource among the coastal states and the profit from the product to the local community. This program will lease fish from Red Snapper and Grouper Allocation holders and make them available at a reduced price to those that presently have a commercial reef fish permit and do not presently hold adequate allocation to address their by catch. There will be the necessary safe guards build into the lease so that those purchasing the leased fish will have to fish them. The second phase will have a working group meet to discuss the success they have had with a fish tagging system and various ways to administer the program in a such a way that there may be additional benefits to such a program. There are methods the states could use to administer the program so that there is no added cost for the states should such a program be done as management in the future. This second phase of the program will help to also address the needs of the charter for hire and special tournament needs for the private angler and the private angler that has not been able to fish due to close seasons and disasters. This program would be done through a fish tagging program and will require the fisherman, the states, the science center, and NMFS coming on board. This would be done at an extra cost to the program for the second phase. This program would help to address the regulatory discards in the recreational community and will benefit the coastal communities through tourism. The charter for hire could use their fish tags when it was beneficial to their business and community and the Tournament caught fish will allow the private angler the opportunity to fish out of season when their season is closed, as well as the private angler that has not had the opportunity to fish during closed seasons and disasters. These programs will help the managers with the recommendation they make for management for the future. These programs will be protecting the fishery by reducing by catch while producing income and food for the Nation. This "Blue Print for Restoring the Gulf Fisheries brings Opportunities" that will be lost if not funded!	$4,500,000
Barataria Bay Rim Marsh Creation	We have designed and patented a system that will help control effects of sea rise. Our system will provide shoreline protection, will enhance building of habitat, and will assure land building. Designed to replace rock jetty, our new concept (Geo-TECH-Jetti) is installed above the water line, considering projected sea rise (as determined by official government determinations) Our Geo-TECH-Jetti units are filled with dredged material sourced from near the installation. Within a prepared area on top of the Geo-tech containers are Root-Zone Humus-filled, (RZHO), biodegradable containers. The	$14,200,000

	RZHO-filled containers are planted with mature native marsh grasses and other select native plants. Our specialized method, proven in several previous deployments, ensures highly energetic and sustained plant growth, while providing shoreline force and sea-rise protection. Once set in place the Geo-TECH-Jetti units are stabilized with XX heavy duty PVC pipe, driven down 7 feet for firm hold, there are stainless steel rings on the bottom of units in three locations for PVC pass through. The PVC stabilization devices are designed so that they can be retrieved at a future time, when it may be determined that plant rooting and accretion has been achieved and our "hold" feature is no longer needed. Our proven methods allow for replacement of rock as stabilization means. Using our proven methods, we ensure rapid reestablishment of habitat. Shellfish, fin-fishes, invertebrates, and other vital coastal organisms are able to reestablish populations. Installing our Geo-TECH-Jetti units, we accomplish rapid rebuilding of the entire food-web, by providing the multiple benefits. (1) We provide protection from sea-rise. (2) We ensure rapid establishment of native plants along shorelines, making possible rapid habitat establishment. (3) Our methods assure accretion, as the long, well-set units of Geo-TECH-Jetti prevent erosion. (4) The Geo-TECH-Jetties also provide protection from surface and sub-surface oil encroachment on shorelines and into adjacent marshes. (5) Shoreline areas of land, (marshes or barrier island shores), behind the rows of Geo-TECH-Jetti units are filled with dredged material has our process continues, the filled RZH and RZHO are applied to ensure fertility. The Geo-TECH-Jetti is set in place from barges. Our Geo-TECH-Jetti Placement System makes it possible for us to position units efficiently, one in front of the other, and over lapping with space between them allowing existing habitat to continue functions as installation is accomplished. If it is decided that marsh or shoreline is not to be filled in some areas where Geo-TECH-Jetties are being installed, our units are set next to each other and can be used to serve as solid shoreline protection without back-filling. Drawings can be provided.	
Bay Dogris Marsh Creation	Install 1,548 Geo-TECH-Jetti Units above the water line, (as determined by official government determinations) Our Geo-TECH-Jetti units are filled with dredged material sourced from near the installation. Within a prepared area on top of the Geo-tech containers are Root-Zone Humus-filled, (RZHO), biodegradable containers. The RZHO-filled containers are planted with mature native marsh grasses and other select native plants. Our specialized method, proven in several previous deployments, ensures highly energetic and sustained plant growth, while providing shoreline force and sea-rise protection. Once set in place the Geo-TECH-Jetti units are stabilized with XX heavy duty PVC pipe, driven down 7 feet for firm hold, there are stainless steel rings on the bottom of units in three locations for PVC pass through. The PVC stabilization devices are designed so that they can be retrieved at a future time, when it may be determined that plant rooting and accretion has been achieved and our "hold" feature is no longer needed. Our proven methods allow for replacement of rock as stabilization means. Using our proven methods, we ensure rapid reestablishment of habitat. Shellfish, fin-fishes, invertebrates, and other vital coastal organisms are able to reestablish populations. Installing our Geo-TECH-Jetti units, we accomplish rapid rebuilding of the entire food-web, by providing the multiple benefits. (1) We provide protection from sea-rise. (2) We ensure rapid establishment of native plants along shorelines, making possible rapid habitat establishment. (3) Our methods assure accretion, as the long, well-set units of Geo-TECH-Jetti prevent erosion. (4) The Geo-TECH-Jetties also provide protection from surface and sub-surface oil encroachment on shorelines and into adjacent marshes. (5) Shoreline areas of land, (marshes or barrier island shores), behind the rows of Geo-TECH-Jetti units are filled with dredged material has our process continues, the filled RZH and RZHO are applied to ensure fertility. The Geo-TECH-Jetti is set in place from barges. Our Geo-TECH-Jetti Placement System makes it possible for us to position units efficiently, one in front of the other, and over lapping with space between them allowing existing habitat to continue functions as installation is accomplished. If it is decided that marsh or shoreline is not to be filled in some areas where Geo-TECH-Jetties are being installed, our units are set next to each other and can be used to serve as solid shoreline protection without back-filling.	$18,300,000

Goose Bayou	Install 976 Geo-TECH-Jetti Units above the water line, (as determined by official government determinations) Our Geo-TECH-Jetti units are filled with dredged material sourced from near the installation. Within a prepared area on top of the Geo-tech containers are Root-Zone Humus-filled, (RZHO), biodegradable containers. The RZHO-filled containers are planted with mature native marsh grasses and other select native plants. Our specialized method, proven in several previous deployments, ensures highly energetic and sustained plant growth, while providing shoreline force and sea-rise protection. Once set in place the Geo-TECH-Jetti units are stabilized with XX heavy duty PVC pipe, driven down 7 feet for firm hold, there are stainless steel rings on the bottom of units in three locations for PVC pass through. The PVC stabilization devices are designed so that they can be retrieved at a future time, when it may be determined that plant rooting and accretion has been achieved and our "hold" feature is no longer needed. Our proven methods allow for replacement of rock as stabilization means. Using our proven methods, we ensure rapid reestablishment of habitat. Shellfish, fin-fishes, invertebrates, and other vital coastal organisms are able to reestablish populations. Installing our Geo-TECH-Jetti units, we accomplish rapid rebuilding of the entire food-web, by providing the multiple benefits. (1) We provide protection from sea-rise. (2) We ensure rapid establishment of native plants along shorelines, making possible rapid habitat establishment. (3) Our methods assure accretion, as the long, well-set units of Geo-TECH-Jetti prevent erosion. (4) The Geo-TECH-Jetties also provide protection from surface and sub-surface oil encroachment on shorelines and into adjacent marshes. (5) Shoreline areas of land, (marshes or barrier island shores), behind the rows of Geo-TECH-Jetti units are filled with dredged material has our process continues, the filled RZH and RZHO are applied to ensure fertility. The Geo-TECH-Jetti is set in place from barges. Our Geo-TECH-Jetti Placement System makes it possible for us to position units efficiently, one in front of the other, and over lapping with space between them allowing existing habitat to continue functions as installation is accomplished. If it is decided that marsh or shoreline is not to be filled in some areas where Geo-TECH-Jetties are being installed, our units are set next to each other and can be used to serve as solid shoreline protection without back-filling.	$650,000
Goose Bay Shoreline Protection	This project is to protect shoreline with 740-Geo-TECH-Jetti's Units. The project is a nominee PPL24 with CWPPRA, to create 232 acres of marsh with dredge material. The South shoreline is open to wide open water and should be protected with a barrier. We propose to install 740 Geo-TECH-Jetti Units above the water line, (as determined by official government determinations) Our Geo-TECH-Jetti units are filled with dredged material sourced from near the installation. Within a prepared area on top of the Geo-tech containers are Root-Zone Humus-filled, (RZHO), biodegradable containers. The RZHO-filled containers are planted with mature native marsh grasses and other select native plants. Our specialized method, proven in several previous deployments, ensures highly energetic and sustained plant growth, while providing shoreline force protection. Our proven methods allow for replacement of rock as stabilization means. Using our proven methods, we ensure rapid reestablishment of habitat. Shellfish, fin-fishes, invertebrates, and other vital coastal organisms are able to reestablish populations. Installing our Geo-TECH-Jetti units, we accomplish rapid rebuilding of the entire food-web, by providing the multiple benefits. (1) We can provide protection from sea-rise. (2) We ensure rapid establishment of native plants along shorelines, making possible rapid habitat establishment. (3) Our methods assure accretion, as the long, well-set units of Geo-TECH-Jetti prevent erosion. (4) The Geo-TECH-Jetties also provide protection from surface and sub-surface oil encroachment on shorelines and into adjacent marshes. (5) Shoreline areas of land, (marshes or barrier island shores), behind the rows of Geo-TECH-Jetti units are filled with dredged material has our process continues, the filled RZH and RZHO are applied to ensure fertility. The Geo-TECH-Jetti is set in place from barges. Trident plans to hire all local personnel for project.	$675,000
Little Lagoon Multiple Site Living Shoreline Restoration	The Soft Skills Training Institute of Florida and its strategic partners will develop a program involving cooperative efforts in cultural and natural resource conservation training and education program or projects related to trail development and maintenance, historic, cultural, and native habitat restoration, and rehabilitation. CEOP is a hands-on, environmental	$950,000

	education program that teaches young people valuable lessons about wildlife management, conservation, leadership, team-building, citizenship, and communication. As a participant in CEOP, you will gain a greater understanding of the value of land and how it can be managed to benefit much wildlife and fish species. Participants will use their skills and knowledge to create better habitats for wildlife now and in the future, and be open to perhaps a career as a wildlife professional, a landowner, or an active volunteer in their community to help teach others to become good stewards of their natural resource environment. The team will promote and stimulate public purposes such as education, job training, development of responsible citizenship, productive community involvement and furthering the understanding and appreciation of natural and cultural resources through the involvement of youth and young adults in the care and enhancement of public resources SSTI will enhance the longstanding efforts of state parks to provide opportunities for public service, youth education and training programs for minority and underrepresented youth and young adults development and participation in accomplishing conservation-related opportunities to learn and be stewards of natural resources. Youth and young adults will learn: 1. About different kinds of wildlife, what they eat, and where they live. 2. Wildlife terms and ideas. 3. How to attract different wildlife species. 4. How to judge the quality of wildlife habitat. Other CEOP activities include: Wildlife Identification – Participants are tested on their ability to identify pre-determined wildlife species. Twenty photographs of wildlife species, which clearly show a juvenile, adult, male, or female of the species is presented to the participants. General Wildlife Knowledge – Participants are tested on their knowledge of topics ranging from wildlife habitat for select species to management practices that benefit wildlife. Wildlife Management Practices – Participants compete are taken to an outdoor site with defined boundaries and are asked to evaluate the quality of habitat for select wildlife species. Based on each participant's site evaluation, he or she is asked to recommend wildlife management practices that will benefit each select wildlife species. Written Wildlife Management Plan – Participants will participate on a team and will write a two-page management plan for an outdoor site with defined boundaries that meets objectives established in a field conditions sheet provided to each team. Oral Defense of Written Plan – Each participant completes an activity individually; the individual score counts toward their final team score for the written plan. Each individual team member appears before a panel of two to three judges and answers questions over a five-minute period about their written plan, as well as general wildlife questions.	
GSMFC Cooperative Regional Monitoring Project	This one year grant will fund an iSnapper electronic logbook (ELB) reporting system and validation pilot program for charter for-hire vessels at multiple ports throughout Texas. This project would complement a previous project by expanding coverage in the pilot to federally permitted boars and state permitted boats and by increasing the level of validation of self-reported, electronic fisheries data. Federal managers need near-real time fisheries data to meet conservation goals, and state managers will need to adhere to these goals if regional fisheries management is implemented by individual states. The iSnapper electronic logbook (ELB) program is a cost-effective and user friendly technology that allows fishermen to report their information in near real time. More efficient, precise reporting enables managers to make more timely management decisions and gives charter boats a catch history.	$33,910,000
Understanding the Use of Fish Aggregating Devices to Enhance the Conservation of Tunas and Protected Species	This project would provide labor, equipment, and funding to expand the collection, processing, analysis, and dissemination capacity of recreational fishing data by Texas Parks and Wildlife's Coastal Fisheries Division. Texas primarily collects and analyzes recreational fishing data according to methods designed to optimize resources during high and low use periods. Different methods of capture and transmission of fishing data for federally managed species (like red snapper and greater amberjack) will help the Gulf transition to more real-time science and management of these popular species. These Gulf fisheries improvements will support sustainable fishing opportunities for popular reef fish species and sustain the coastal economies that rely on fishing. The estimated project cost is 1.5m over a 5 year period.	$400,000

Pelagic Longline Gear and Vessel Transition Program in the Gulf of Mexico	Promote tourism in the Gulf Coast Region on GulfCoastRestaurants.com through featured content-rich restaurant and chef profiles of the restaurants along the Gulf Coast that prepare and serve fresh Gulf Seafood. The Restaurant profiles will include details of the Gulf seafood dishes they serve, and the origin of the seafood used to prepare it.	$0
Estimating Vital Rates of Loggerheads in the Northern Gulf of Mexico Using Traditional Mark-Recapture and Genetics	Are there to many gulf accesses or openings? Over many years accesses were made to the gulf that might slow down the land build up processes. Should several of these openings be closed off allowing sediment to be kept from being distributed into the Gulf! How were the land exteriors islands formed 50 or 100 years age? Did several openings exist? Also, are fresh water diversions operated properly? Are salinity levels monitored? The diversions should be opened and closed with spring flooding of the Mississippi River with fluctuation of flow rates. Creation of more recycled oyster shell reef will help trap sediment and create land with the ebb and flow of tides and fresh water diversions. Monitored salinity levels will keep existing oyster reef alive. In other words, the system must be closely balanced. Could portable bulkheads with tidal openings be build and encircled certain land areas, as sediment is trapped and land is built the bulkheads lifted and moved. Recycled oyster shells then could be placed close to shore up new land formation and prevent new land from eroding away again!	$1,270,970
Recovery of the Northern Gulf of Mexico Recovery Unit of Loggerhead Turtles: Recruitment of Juveniles to Reproductive Adults	I suggest that in distributing funds ($2.4 billion) received from the settlement of British Petroleum's Deepwater Horizon oil blowout, consideration be given to recovery of the marine organism whose population, while already dangerously close to extinction, was the most directly and severely affected by the disaster – the bluefin tuna. I believe the best way to do this is to close the entire Gulf of Mexico to commercial fishing for highly migratory species (HMS) during the period when adult western North Atlantic bluefin are using the area for spawning (late April through early June of each year) and to pay commercial vessels not to fish in the closed area each year for 10 years until a full recovery of the population to a healthy level can be demonstrated. The amount to be disbursed to each vessel with a demonstrated history of recent landings of HMS species during April through June at ports in the Gulf of Mexico (including Miami) could be based on average net revenue of the fleet during the closure period plus an annual inflation adjustment. The annual allocation of funds (following each year's closed season) could be made as a lump sum to the Blue Water Fishermen's Association, which represents all the involved fishing vessel operators. Violators could be sanctioned by suspension of their HMS permits for an appropriate period of time. North Atlantic bluefin tuna spawn only in the Mediterranean Sea and in the Gulf of Mexico. They are two separate and distinct populations. The South Atlantic bluefin tuna population was extirpated by commercial fishing in just 10 years (1960-1970) once its spawning area off Brazil was discovered. The western North Atlantic population spawns each May in the north central Gulf of Mexico. Many of its eggs and larvae would thus have been carried by the Loop Current directly into the Deepwater Horizon's plume of toxic petroleum and toxic dispersants where they would die. Because of overfishing on this the world's most valuable fish, the western North Atlantic population - "our" bluefin tuna - has declined in abundance by about 98% since 1960 (for the details, see my website, www.BigMarineFish.com/bluefin.html). As a result, on May 24, 2010, the Center for Biological Diversity petitioned the U.S. federal government to "list" the North Atlantic bluefin as "threatened" or as "endangered" and to protect it under authority of the Endangered Species Act. If the adult bluefin can be protected where they are concentrated in a relatively small area for spawning, we should be able to reverse the recent succession of poor year class formation thus allowing the population to recover and providing much greater value in increased catch through time for both recreational and commercial fishing interests. The closure would also reduce mortality of severely depleted Atlantic blue marlin, white marlin, a variety of sea turtles and the great number of other non-targeted marine life which are caught and die particularly during this season on longlines set for the "money fish" (swordfish and yellowfin tuna). Accordingly, such a program should have the support of bluewater (HMS) commercial fishermen, commercial fisheries businesses, chefs, offshore sport fishermen, conservationists, and the public. Economic benefits to both the commercial and sport fishing industries of increased survival of populations of not only bluefin tuna but also other premiere big game	$600,000

	fish (e.g., blue marlin, swordfish, white marlin, sailfish, etc.) would be many times the annual cost to fund the proposed longliners' buyout.	
Presence, Potential Sources, Behavior and Fate of Endocrine Disrupting Chemicals in Northern Gulf of Mexico Estuarine Systems	Improving fisheries by growing plankton. How to do that? Bringing up deep waters that are inherently rich in nutrients, which in turn will feed phytoplankton at the bottom of the food chain at the surface. Surface waters are low in dissolved silica (~1uM), having been used up by the phytoplankton, and then rises below the photic zone (>200uM). Phosphates are low (C106-H263-O110-N16-P + 138O2 ("The Oceanic Phosphorus Cycle", by Adina Paytan, and Karen McLaughlin in 2007) Phosphate is rate limiting ingredient, then nitrogen. Dissolved silica doesn't show here but is quite important for siliceous diatoms If ocean water from let's say around 1-2km is pumped up, it would feed phytoplankton and thereby aid all fisheries (fish, and all plankton eaters, corrals, shellfish) I propose that oil rigs in abatement (after oil production, but before they are destroyed, work with Bureau of Safety and Environmental Enforcement), those in 1km or deeper water, be used. Power for the rig will come from Gulf currents (~30cm/s in top 300m) be used to power air compressors. High pressure hoses will be needed to pipe the compressed air down to 1-2km. Pressure needed is ~100atm/km and is quite reasonable. Put the equivalent of aquarium bubblers on the end of the air hose. Attached the air hose to one of the mooring lines for the oil rig. This will 1) aerate/oxygenate the anoxic deep water; 2) entrain deep water to the surface. Smaller bubbles entrain more water and oxygenate better. One side effect is the coldness from the deep water will lower humidity in the Gulf, which will lessen hurricane strength since they are powered by humidity (correlated to surface temperatures). A second side effect will be the increased dimethyl sulfide produced by more phytoplankton (upon their eventual death) which is a cloud condensation nuclei (CCN). There is a possibility of more cloud cover downwind from where the plankton growth will be. A third side effect will be absorption of CO2 into biomatter. There are other ways to bring the deep water to the surface, and using compressed air is the least expensive, upfront cost method until it is a proven method. There are other ways such as using a "siphon", with a tube going down 1km brought up into the top 300m. We allow the low-pressure wake of the tube from the Gulf current to siphon the waters up with no power needed to move the water. That tube will cost more upfront, however.	$2,000,000
Close-Kin Mark Recapture as a Tool for Estimation of Spawning Biomass in the Gulf of Mexico Bluefin Tuna Population	fisherman catch tar ball in their nets .they rake this tar balls back into water. So instead of them raking the tar ball back into water give them some kind of storage container to put the tar balls in to give them an incentive to do this pay them by the pound or container. This how we feel some of oil can be removed from gulf.	$350,000
Quantify the efficacy of fish descender devices on reducing discard mortality in red snapper and other reef fishes	The purpose of this project is to reduce erosion on the bay side of Grand Isle, the only inhabited Barrier Island in Louisiana. Sixteen (16) 350-foot breakwaters (approximately 1.1 miles) are proposed for construction on the back-bay side of Grand Isle on state water bottoms. The sixteen (16) breakwaters are proposed between existing breakwaters to the east and west that were previously constructed. In 2014, nine (9) breakwaters were constructed to the immediate west of the proposed project with $3.3 million of Jefferson Parish's direct Coastal Impact Assistance (ClAP) allocation. In 1994, the U.S. Corps of Engineers constructed 13 breakwaters to the immediate west of the CIAP-funded breakwaters, and in 1995, the state funded construction of 8 breakwaters to the immediate east of the proposed project. Grand Isle beaches were heavily oiled with MC252 from the Deepwater Horizon oil spill over a period of several years, and this shoreline protection project would help mitigate those natural resource damages. The proposed project is designed, permitted, and shovel-ready, and the project's construction should be completed under NRDA's Early Restoration program, completing the protection of Grand isle from back-bay erosion. The proposed project will protect the bayside shoreline of Grand Isle; 304 acres of marsh, serving as habitat for migratory birds; the La. Dept. of Wildlife and Fisheries Research Laboratory and the Sea Grant Oyster Hatchery, the port of Grand Isle and the entire community of Grand Isle.	$0

Targeted Research to Assess Habitat-Specific Invasive Lionfish Distribution, Interactions with Native Reef Fishes, and Effective Mitigation Measures	This project is a westward extension of a successful project to construct a long-distance pipeline corridor for conveying Mississippi River sediments for land building (marsh and ridge) to strategic areas of the central Barataria Basin. The LDSP project from the Mississippi River to Lafourche parish north of Little Lake was included in the Future Without Action for Louisiana's Coastal Master Plan as it was an existing CIAP project. However, funding constraints limited construction to only the eastern segment. Phase I of the project, to construct the corridor from the Mississippi River westward to the Barataria Waterway, is currently under construction with funding being contributed from the State of Louisiana and three coastal parishes, Jefferson, Lafourche, and Plaquemines. Funding of the LDSP Phase II project, which would continue westward construction of the corridor from the Barataria Waterway into Lafourche Parish, is needed to complete the pipeline corridor. Completion of the LDSP project would advance hydrologic restoration in the central Barataria basin, as it would help to replace the historic function of the Barataria landbridge and the Barataria ridge, which was severed by construction of the Barataria Bay Waterway. This project is major component of restoration of the Barataria landbridge, which separated the freshwater dominated upper portion of the Barataria Basin from the saline and brackish marshes in the lower basin. The primary goal of this project is to establish a long distance pipeline capability for conveying Mississippi River sediments for land building (marsh and ridge) to strategic areas of the central Barataria Basin. The secondary goal of this project is to restore marsh, the amount of which will be defined during the engineering and design process. The currently envisioned 12 to 20 mile pipeline route/corridor begins in the Myrtle Grove-Alliance area (Plaquemines Parish) and extend across Jefferson Parish to the west and northwest of Little Lake (in Lafourche Parish) and would be sufficient to support a 30 inch slurry pipeline. Phase I from the Mississippi River to the Barataria Bay Waterway is currently under construction. Phase II would complete the pipeline corridor establish reuse strategies and infrastructure for future, larger-scale, systemic-benefit marsh and ridge restoration and creation projects in the central Barataria Basin portions of Plaquemines, Jefferson, and Lafourche parishes. Funding for Phase I, approximately $66 million, include State of Louisiana CIAP funds, State of Louisiana Surplus Funds, and local CIAP funds ($1M each) from Plaquemines, Jefferson, and Lafourche parishes. Phase II has not been funded. However, Jefferson Parish has compiled existing data into a conceptual design report and identified affected landowners to inform the permitting process. The Phase II project would utilize the same river sediment source as Phase I and initial research for the LDSP include an alternative analysis of alignments from the river to Lafourche parish; existing data and reports should help to reduce the time needed to permit.	$0
Open Water Restoration for Nesting Fisheries, Water Birds, and Foraging Waterfowl	The objectives of the proposed West Grand Terre Beach Nourishment and Stabilization project are to restore and enhance dune and back barrier marsh habitat to provide storm surge and wave attenuation, thereby addressing the issues of gulf shoreline erosion, diminished storm surge protection, and subsidence of back barrier marshes. This project is estimated to build 12,700 feet of beach and dune with an area of 235 acres. In addition, up to 66 acres of back barrier marsh will be restored and a rock revetment will be constructed to protect the restored marsh. The project will increase the width of the island and maintain shoreline integrity through the introduction of sediment in order to increase island longevity. The project will promote community resilience and reduce risk to infrastructure by providing storm surge and wave attenuation and will protect and restore nesting and migratory bird habitat, including wintering habitat of the endangered piping plover (Charadrius melodus, Haig and Oring 1985). Restoration of West Grand Terre will also protect Fort Livingston, which was constructed in 1841 and is listed on the National Register of Historic Places. West Grand Terre is also recognized as a State Commemorative Area and will protect Grand Isle, the only inhabited barrier island in Louisiana.	$21,000,000
Habitat Mapping and Identification of Species Abundance and	The project is located adjacent to Bayou Rigaud, on the northern side of Grand Isle in Jefferson Parish, Louisiana. The long-term goal for the restoration of Fifi Island is to restore maritime forest and wetlands as features of the island. Given the extensive erosion caused by hurricanes, storm surges, frontal passages, and other natural sources the actual land	$0

Distribution for Deep-Water Coral Communities Inside and Outside the De Soto Canyon Area to Clarify Genetic Connectivity Among Populations and Guide Restoration Priorities	mass of Fifi Island has significantly decreased over many years. In order to restore Fifi Island, the Grand Isle Independent Levee District (GIILD) has developed a Master Plan, which includes the installation of rock dike on the southern side of Fifi Island to completely encompass the island, and later fill the encompassed area, utilizing dredged material from Bayou Rigaud and Barataria Bay, in a manner to create wetlands and a maritime forest as features of the island. The full rock dike project includes approximately 5,975 lineal feet of rock dike to be constructed to +8 feet, in addition to 1,400 lineal feet of existing rock dike to be improved to +8 feet. In 2014, the GIILD, Jefferson Parish and the State of Louisiana allocated $6.0 M for Phase 1 of the rock armament on the south side of Fifi Island. This Phase is now under construction and consists of the construction of approximately 3,400 lineal feet of new rock dike beginning at the western terminus of the existing rock dike and extending in a westerly direction along the permitted alignment. The second phase of this project is permitted and awaiting funding to proceed to construction. When completed Fifi Island will be armored on all 4 sides with rocks revetment and will be built up to +8.0' elevation on the South side and 3.5' elevation on the North side using "beneficial use" dredge material or dedicated dredging from Bayou Rigaud and the Barataria Bay Waterway. This project has a high level of local support from stakeholders such as the Town of Grand Isle, Grand Isle Port Commission, Jefferson Parish Marine Fisheries Advisory Board, Jefferson Parish Coastal Stakeholders Group, and residents of Grand Isle.	
Large-scale tagging program to understand post-release mortality, migration, and movement in highly migratory and coastal migratory fish species	Implement a large scale project for removal of floating, partial, or fully submerged derelict fishing gear or other human-caused marine debris across the northern Gulf of Mexico that could otherwise cause harm to marine life. Use contractors to identify, via aircraft and/or vessel, areas that may accumulate debris or are known to have existing debris (or survey boat/ship captains and crew that frequent the Gulf). Could follow program logistics such as those used in Florida http://myfwc.com/media/316331/stepscrabtrapcleanup.pdf with a larger scale effort. Create a temporary hotline for recreational boaters to call in location coordinates if they encounter a large source of debris. Use additional contractors with collection vessels (some with divers and/or ROVs) and barges to coordinate a large scale removal effort out of multiple ports over a short amount of time (few days or weeks?). Include a caveat that the removal of debris should only occur if it will not cause more harm to the environment or animals. Ensure quality data collection for debris type, amount, etc. This could be a long-term mitigation project with annual repetition. It could also be coordinated with a large scale public beach cleanup effort.	$0
Expand Monitoring and Research Efforts, and Develop and Implement a Best Fishing Practices Program at Sentinel Sites to Enhance Conservation of Shallow-, Mid-, And Deep-Water Coral Communities in the Gulf of Mexico	As part of an erosional headland, Elmer's Island is dominated by marine processes including overwash. The island has narrowed and decreased in elevation escalating the rate of overwash and breaching near the confluence with the headland as well as along Caminada Pass. As the island has become more vulnerable from overwash and breaching, island habitat has been lost and protection of mainland marsh and infrastructure has diminished. Sand fencing efforts are helping portions of the island maintain hummocky dunes. Extension of the spit into Caminada Pass and periodic closures of Bayou Thunder von Tranc at the Gulf (and siltation throughout) is altering the hydrologic connection of the lagoon and marshes north of Elmer's island. The spit along the pass is breached. Although sediment transport will continue across the breach supporting extension of the spit towards Caminada Bay, the breach is likely to persist and worsen without corrective actions. The 1985 to 2009 Port Fourchon subunit loss rate is -0.49% per year. The proposed project goals are: 1) habitat, 2) hydrology, and 3) protection. The proposed features include approximately 26 acres of spot dune repair at sites where overwash and breaching is reoccurring; breach closure, and 300 acres of back barrier marsh creation. Sediment for marsh creation would be mined offshore of the headland at a distance to avoid inducing shoreline erosion. Sand is necessary for the spot dune repair and the breach closure. Mining the newly developing portions of the spit may be targeted. If so, spit habitat losses are expected to be temporary as re-growth is expected over time. Maintenance dredging of Bayou Thunder (if adequate sand content) and offshore mining (if sand is available without infrastructure constraints) also would be considered as alternative sources for dune construction material. Mining of the spit may	$0

	temporarily re-establish historic hydrology as could dredging the bayou. The spot dune repair and breach closure would be planted with dune vegetation and the marsh platform would be planted with marsh vegetation. Various design alternatives will be considered for the breach closure. A rock core with sand capping tentatively is assumed. Consideration will be given to directly or indirectly create tidal flats to replace those that exist now but would be filled with the dune and marsh restoration.	
Modification of the Pearl River Navigation Project to Restore Access to Spawning Habitat for Gulf Sturgeon. Phase I: Engineering, Design, and Transfer of Ownership from United States Army Corps of Engineers.	The Caminada Headland has experienced some of the highest shoreline retreat rates in Louisiana. Historically the shoreline has migrated landward at about 40 feet per year. Between 2006 and 2011, shoreline migration increased dramatically, exceeding 80 feet per year in near Bay Champagne and 110 feet per year in the Bayou Moreau area. The increased losses occurred in the wake of Hurricanes Katrina and Rita in 2005 as the breaches remained open for an extended length of time. The losses were exacerbated by Tropical Storm Fay and Hurricanes Gustav and Ike in 2008. Significant prolonged breaches greatly increase the net export of sediment from the headland. In addition to the shoreline migration, the area is also experiencing high loss rates of interior marshes. As the beach and dune continue to migrate landward, overwashed sediment will be lost into newly formed open water and land loss rates will be exacerbated. The continued deterioration of Caminada headland threatens thousands of acres of wetland habitat as well as critical infrastructure, including Port Fourchon, LA Highway 1, and the lower Lafourche levee system. The goals of this project are to: 1) Create and/or nourish 430 acres of back barrier marsh, by pumping sediment from an offshore borrow site; 2) Create a platform upon which the beach and dune can migrate, reducing the likelihood of breaching, improving the longevity of the barrier shoreline, and protecting wetlands and infrastructure to the north and west. The proposed project is expected to slow the current trend of degradation in the headland. This project would create 300 acres of back barrier inter-tidal marsh and nourish 130 acres of emergent marsh behind 3.5 miles of the Caminada beach using material dredged from the Gulf of Mexico. The marsh creation and nourishment cells are designed to minimize impacts on existing marsh and mangroves. Assuming some natural vegetative recruitment, vegetative plantings are planned at 50% density, with half planned at project year one and half planned at project year 3. Containment dikes will be degraded or gapped by year three to allow access for estuarine organisms.	$2,000,000
Migratory Species Studies	The Caminada headland has experienced some of the highest shoreline retreat rates in Louisiana, measuring between 55 and 65 feet per year from 1998 to 2010 (historically, up to 100 feet per year). At the same time, the area is also experiencing extremely high loss rates of interior marshes. As the barrier headland continues to retreat, overwashed sediment will be lost into newly formed open water and these land loss rates will be exacerbated. The project would create 257 acres and nourish 256 acres of emergent marsh using sediment form an offshore borrow site. This material would be placed behind approximately 4 miles of Caminada beach as the front containment, while using as much of the existing pipe canal levees and healthy mangrove marsh as feasible for containment. In areas where the use of the existing marsh is not possible, other tactics may be employed, such as the use of hay bales or a sheet pile. Where open water exists over longer distances along the proposed containment, borrow from the outside of the cell may be used. Total constructed containment (including earthen, hay bales, and sheet pile) will total 7,411 feet. Vegetative planting will occur on 50% of the project area. The marsh created will serve as a platform for the overwashed beach sediment to fall back against, rather than losing the sediment to open water.	$1,200,000
Assessing the Ecological Connectivity of Gulf Environments	This area is undergoing shoreline erosion, interior wetland loss, overwash, and breakup. The Gulf shoreline erosion rate has doubled from 1988 to 2006. Project area marshes also are being eroded at -11.8 ft/yr between 2003 to 2006 as well as being converted to open water from internal breakup. This project is the missing link in restoring the 14 mile barrier island complex. This project was initially brought forward as a potential project for CWPPRA PPL24. The project would restore 127 acres of beaches and dunes and create/nourish 229 acres of marsh. The project would use existing near-shore borrow areas, with a projected need of 1.45 million cubic yards. The purpose of the Project is to restore the missing	$1,300,000

	link in the barrier island complex by restoring 127 acres of beaches and dunes and nourishing/creating 229 acres of marsh. The completion of this project would complete the restoration of nearly 14 miles of barrier islands in the Gulf which protect the rest of the Barataria Basin as a first line of defense for storm surge. The project will reduce the impacts of storm events on the Barataria Basin. Grand Pierre Island also provides important habitat for nesting shorebirds as well as migratory birds.	
Nutrient Reduction Pilot Projects in the Mississippi Valley	The back-bay side of Grand Isle, Louisiana's only inhabited barrier island, is subject to wave action from strong north winds during winter cold fronts and when tropical storms and hurricanes make landfall east of the island. Breakwaters have been constructed along adjacent segments of the north side of the island to protect residential and commercial development. The existing breakwaters have been shown successful in eliminating erosion and actually benefiting the island by creating sandbars. The proposed project seeks to reduce erosion of the wetland marsh areas on the bay side of Grand Isle by installing 2.4 miles of 12,000 linear foot-long segmented rock breakwaters along the perimeter of the wetlands. The project will continue protection provided by existing segmented breakwaters to the east and complete back bay side protection for Grand Isle—the only inhabited barrier Island in the State of Louisiana.	$0
Gulf of Mexico Menhaden Purse Seine Fishery Observer Program	Historic wetland loss in the area occurs in the form of shoreline erosion along Barataria Bay and interior marsh loss. The interior loss is caused by subsidence, sediment deprivation, and construction of access and pipeline canals. Based on analysis conducted by USGS, loss rates in the area are estimated to be -0.615% per year for the period 1984 to 2011. Shoreline erosion along the northeast shore of Barataria Bay, in the area proposed to be addressed by this project, is approximately 3 to 4 feet per year. While this rate may not seem excessive, this reach of shoreline is very narrow and loss of this shoreline would connect Barataria Bay to a large lagoon, greatly altering the hydrology of the marsh. The proposed project would create approximately 232 acres and nourish approximately 322 acres of marsh using sediment dredged from Barataria Bay. The dredged material would be fully contained. Containment dikes will be degraded as necessary to reestablish hydrologic connectivity with adjacent wetlands. In case the area does not re-vegetate on its own, the maintenance cost estimate will include funds to plant 25% of the created marsh at Year 3. The anticipated land loss rate reduction through the area of direct benefits of the project totals over 50% over the life of the project. The project would help to stabilize the very fragmented and vulnerable northern rim of Barataria Bay. The communities of Lafitte and Barataria lie to the north of this important landmass, which provides a buffer to these communities against the impacts of surge from tropical weather events. Vital oil & gas infrastructure would also benefit from the reduced land loss in the area.	$750,000
Revision of the Seagrass Guidelines Document: A Support Tool for Restoration of Seagrass Impacts in the Gulf of Mexico	Historic wetland loss in the area occurs in the form of interior marsh loss and shoreline erosion along Turtle Bay and Little Lake. The interior loss is caused by subsidence, sediment deprivation, and construction of access and pipeline canals. The Little Lake Coast 2050 mapping unit land loss rate for the period of 1983 to 1990 was 1.6% per year. The proposed project would create approximately 213 acres and nourish approximately 441 acres of marsh using sediment dredged from Little Lake. The dredged material would be fully contained. Containment dikes will be degraded as necessary to reestablish hydrologic connectivity with adjacent wetlands. In case the area does not re-vegetate on its own, the maintenance cost estimate will include funds to plant 25% of the created marsh at Year 3. The anticipated land loss rate reduction through the area of direct benefits of the project totals over 50% over the life of the project. The project would help to stabilize the very fragmented and vulnerable land mass that separates Barataria Bay from Little Lake. The communities of Lafitte and Barataria lie to the north of this important landmass, which provides a buffer to these communities against the impacts of surge from tropical weather events. Vital oil & gas infrastructure would also benefit from the reduced land loss in the area.	$700,000
Predicting Oiled-Marsh Erosion through	Restore the west bank above 'The Pen' south of Hwy 90 with Bayou Backer. All areas which are not suited to rock or any hard, heavy and costly methods are now approachable. Long strips of 40 mil plastic are shoved into the mud bottom 1.5	$950,000

Integration of Field Observations, Hydrodynamic Modeling and Remote Sensing of Coastal Wetlands	to 2 feet deep. This leaves two 6 inch wide by 3 to 4 foot long 'blades sticking up from the bottom. Placed 2 foot apart the collective 'plugs' damp waves, catch sediments and aquatic plants. These plants can begin to take root and build up habitat. Cost, simplicity and effectiveness are the primary advantage for using Bayou Backer. Please go yo my website for pictures and history! Thanks. Joe	
Ecological Responses to Freshwater Diversions in Barataria Bay and Surrounding Areas	Restore the west bank above 'The Pen' south of Hwy 90 with Bayou Backer. All areas which are not suited to rock or hard heavy methods are now approachable. Ten to fourteen foot by six inch wide strips of 40 mil plastic are pulled from a roll, folded in half, and shoved into the mud bottom 1.5 to 2.5 feet deep in to the mud. This leaves two 6 inch wide by 3 to 4 foot long 'blades' sticking up from the bottom and forms a 'plug'. The plugs are spaced 2 feet apart in swaths 16' to 24' wide eight to twenty feet from shore running the full distance. The plugs provide up to 60% wave energy damping, catch sediments and aquatic plants. The plants enhance shore protection and build up habitat. Cost, simplicity, and effectiveness are the primary advantage for using Bayou Backer. I have an LSU wave tank study, a couple of test sites and a new State Coastal Use Permit for Little Vermilion Bay terraces.	$1,360,000
Development of Tools to Operate the Mid-Barataria Sediment Diversion for Maximum Sediment Delivery and Minimum Freshwater Input	Living shoreline quantity and quality in Little Lagoon has been severely impacted by ever increasing population density and property modifications such as bulkheads and piers. Coastal expert Scott Douglas has estimated over 50% of Little Lagoon has a hardened shoreline. Of the remaining 50% of Little Lagoon that remains unhardened, 2/3 can be found within the boundary of Bon Secour National Wildlife Refuge (BSNWR). Ultimately, the Lagoon is showing signs of stress due to the reduction of natural shorelines, inadequate flushing, high bacteria levels in parts of the Lagoon, and increasingly frequent and dense harmful algal blooms (HABs) throughout the Lagoon. Nutrient sources are significant and should be remediated. Flushing is part of the solution, but another is nutrient removal via natural vegetation and filter feeders, such as mussels, that can both be found in functioning living shorelines. Shoreline loss/erosion is another chronic issue for properties along the Lagoon. Although efforts to keep oil out of the Lagoon during the Deepwater Horizon (DWH) oil spill were successful, some unintended consequences were noted. Heavy rainfall during the latter part of the multiple pass closure period resulted in high water and infrastructure damage (sea walls/bulkheads, piers, roads, etc.). An opportunity exists to improve water quality in the lagoon, return shorelines to a natural state, repair roads/shorelines and "showcase" methods to improve the health of the Lagoon and remediate problems. Little Lagoon Preservation Society, the City of Gulf Shores, and the BSNWR would like to work in partnership to conduct several shoreline restoration projects: 1) restore .3 miles of shoreline along the south west corner and the south shore of the Lagoon within the BSNWR and on State owned water bottom. Pine Beach Road is nearly in the water along that potion of the Lagoon due to shoreline erosion and few viable options exist to move/repair the road due to adjacent Alabama beach mouse and wetland habitats. Pine stumps and degraded shoreline vegetation in the water and along that waterfront are ample evidence of eroding shoreline. Restoration would include a combination of evaluation, planning and implementation of a living shoreline project. The specifics of the living shoreline project would be finalized during the evaluation and planning process. However, the living shoreline restoration project is likely to include, but is not limited to, shoreline grass planting (Spartina alterniflora and Juncus roemerianus), wave attenuation structure (reef balls), a graded bottom slope, and possibly mussel seeding in the shoreline grasses. 2) Construct a living shoreline at the City of Gulf Shores property at Moe's Landing Boat Launch. The water front there also is severely eroded and parts of it are hardened with deteriorating bulkheads. The same or a similar restoration method would be used at the Moe’s Landing Boat Launch site. Both the Moe's Landing and BSNWR sites would provide very visible "showcases" of natural shoreline restoration for the public and could be a catalyst for future return of more hardened shorelines in the Lagoon to a natural state.	$3

Marsh Loss in Barataria Bay Due to the Deepwater Horizon Oil Spill	To effectively assess the long-term effects of the Deepwater Horizon event, there needs to be a coordinated regional approach in monitoring the status and health of the marine resources in the Gulf of Mexico. The Gulf States Marine Fisheries Commission (GSMFC) is uniquely poised to provide such an approach. The GSMFC is an organization of the five Gulf States that has a long history of coordinating and administering cooperative, regional programs. The Sport Fish Restoration Administrative Program provides coordination of recreational fisheries programs in the five Gulf States. The Deepwater Horizon oil spill has underlined the fact that we need to collect baseline data on the vast artificial reef areas in the Gulf of Mexico. This project will establish baseline data on artificial habitats that would be used in making effective management decisions about these habitats and the fish populations they support. This would allow the states to gear their artificial reef programs to maximize the restoration of those species and allow them to assess impacts to their artificial reefs and the associated fish populations. Standardized monitoring protocols and the gear types utilized in this project will match those used in long-term monitoring of natural reef areas by SEAMAP. This program would provide funding to acquire all the necessary standardized sampling equipment and to carry out the sampling trips in the five Gulf States. And this project would provide standardized data on habitats that are rarely monitored in existing programs for commercially and recreationally important species for use in more accurate stock assessments. The Fisheries Information Network is a state-federal cooperative program to collect, manage, and disseminate statistical data on the marine commercial and recreational fisheries and is the sole data source on the age structure of recreational catches available to stock assessment scientists. This project will collect trip and gear characteristics, lengths and weights, and hard parts from species observed in the recreational fishery from dock-side interviews and at-sea observation. Hard parts will be aged, and data will be provided for use in age-based stock assessments. The goal is to continue the collection of fisheries-dependent data that is needed to: (1) assess the recovery of offshore fisheries with restoration efforts, and (2) improve single-species stock assessments for managed fishes.	$550,000
Gulf Metacode (GMEC): Next Gen Census and Long-Term Monitoring of Florida's Gulf Biodiversity	The Gulf of Mexico and Atlantic Ocean provide habitat for protected species such as sharks and the commercially and ecologically important species of bigeye and yellowfin tunas. Fish aggregating devices (FADs) are man-made floating objects consisting of a raft, synthetic netting, and plastic buoy that are deployed on the ocean to aggregate skipjack tuna for purse seine fishing vessels. FADs can be used in unlimited numbers, driving unsustainable fishing of juvenile bigeye and yellowfin tunas, and contributing to fishing mortality on sharks. These species are caught incidentally when purse seine nets are set around FADs. Because most FADs are not recovered by fishing vessels, they contribute to ghost fishing and can entangle sea turtles and marine mammals before sinking in the ocean or washing ashore, adding to marine debris. FADs deployed by vessels in the Atlantic have been found washed ashore on the coast of Gulf States including Texas. This project would enable data to be gathered electronically on FADs deployed in commercial tuna fisheries in the Atlantic. FADs already transmit data to industry that indicates the numbers of FADs used, their locations and movement, and their fate (recovered, beached, and/or lost). The project partners, Pew and Quick Access Computing (QAC), have proven this data can be transmitted to a third party in near real-time and at no additional cost to industry. In 2016, eight countries in the Western and Central Pacific Ocean began using a software system designed by QAC to implement a FAD tracking and data collection effort that is generating new knowledge on the use of thousands of FADs in that region. In the Atlantic, precise information on FADs is not required to be reported to the international fishing management body. Data gathered by this project will improve scientific understanding on the effects of FADs on the marine ecosystem in the Atlantic, where bigeye is overfished and experiencing overfishing. Analysis of the data could lead to more effective conservation for tunas and protected species, which could improve their recovery from the Gulf oil spill. Studies showed juvenile yellowfin exposed to oil developed heart defects; other species such as dolphins developed chronic adrenal gland and lung disease. QAC, a respected Australia-based software organization, will develop software to receive and manage data from FADs in the Atlantic and manuals for the system. Pew will work with international fishery managers, industry,	$939,000

	and scientists to build the institutional arrangements to enable the system to benefit science and management. (A brief description of the proof of concept to create a FAD tracking and data gathering system in the Pacific can be viewed at http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2014/09/electronic-tracking-of-fish-aggregating-devices).	
Reduce Vessel Collisions with Marine Mammals	The Gulf of Mexico is the primary spawning ground of the western Atlantic bluefin tuna population, a stock depleted to just 55 percent of the 1970 level. The oil spill occurred at the peak of the 2010 spawning season in the bluefin's northeastern Gulf spawning hotspot. Scientists estimate that the spill degraded 10 to 50 percent or more of the bluefin's known Gulf of Mexico habitat and further study has since confirmed that the spill damaged Atlantic bluefin tuna health, particularly among the early life history stages. The Gulf of Mexico pelagic longline fishery results in harmful bycatch of bluefin tuna and approximately 80 other species, including billfish, endangered sea turtles, and depleted sharks. Government catch data from 2007-2009 indicates the fishery killed 43,245 non-target animals, including 6,009 lancetfish, 5,844 dolphinfish, 2,747 escolar, 1,745 sharks and rays, 858 wahoo, 794 billfish (marlin, sailfish, spearfish), 612 bluefin, and 169 bigeye tuna, and interacted with 137 leatherback and 17 loggerhead sea turtles. Actual mortality is much greater as only an average of 22% of the hooks set were observed. Based on their shared habitat preferences with bluefin tuna, it is possible that many of these species also suffered similar interactions with and injury from the spill. A voluntary pelagic longline gear and vessel transition program can help mitigate such impacts to the benefit of Gulf fishermen. The program will provide fishermen with selective alternatives to PLL, including green stick gear and swordfish buoy gear, as well as training and financial assistance to help them learn to fish and optimize application of these gears in the Gulf of Mexico. Fishermen would also have the opportunity to retire their current PLL fishing vessels in favor of smaller, more fuel efficient boats more appropriate for use with the alternative gears. These efforts would be complemented by a strong monitoring program to record catch, effort, and economic data, and, ultimately, to measure the benefits of this project over time. This concept enjoys broad support from PLL fishermen, recreational anglers, and environmentalists. Project Cost: The cost of the project depends on how many Gulf of Mexico pelagic longline fishermen participate. The cost of a gear transition is undetermined at this time. The estimated cost for a vessel transition is approximately $450,000 to $550,000 per vessel.	$5,000,000
Model Open-Ocean Marine Mammal Habitats to Guide Their Protection and Conservation	The Western Atlantic population of loggerhead turtles (Caretta caretta) is one of the world's largest, with nesting activity that ranges from Virginia south to the Gulf Coast of Texas (NMFS and USFWS 2008). Genetic studies have divided this population into 5 Recovery Units (RUs; TEWG 2007) and 10 distinct management units (Shamblin et al. 2012) with varying reproductive output by group (Hart et al. 2010; Tucker 2010; Lamont et al. 2012). Current estimates of abundance for these loggerhead subpopulations (Richards et al. 2011) were derived using nest abundance, clutch frequency, and breeding interval; however for nesting groups where these data were not available, such as the northern Gulf of Mexico, estimates from other subpopulations were used. However, recent studies have highlighted differences among these subpopulations (Lamont et al. 2012, Hart et al. 2013, Hart et al. 2014), which suggests that these estimates may not be accurate. Although critical for population modeling and management, vital rates are still lacking for many nesting groups. Recent studies have highlighted the challenges to population modeling for this nesting group (Lamont et al. 2014). Hart et al. (2013) used satellite tracking to show that individuals in this subpopulation exhibit relatively low nesting site fidelity and make frequent long-distance movements within the entire region. Because of the intensity of effort, high costs, and increasingly difficult logistics involved in saturation tagging and due to the low site fidelity expressed by this nesting group, we propose that saturation tagging alone is not the best method to assess vital rates for this subpopulation. Again, nightly tagging of individuals is still necessary; mark-recapture data provide more than vital rates and these projects allow access to biological samples that give us information on health, genetics, and foraging behavior of these individuals (Shamblin et al. 2012, Vander Zanden et al. 2015). However, we suggest that combining genetic sampling with a	$5,000,000

	shortened tagging season will provide the most accurate estimates of vital rates for this nesting group of loggerheads. Eggs sampled within a day of oviposition yield maternal genomic DNA and permit genetic tagging of individual females through microsatellite genotyping (Shamblin et al. 2011). This method alleviates the need to physically intercept females and makes it possible to sample over large geographical areas that would be logistically impossible to cover with night patrols. Genetic tagging provides reproductive parameter data analogous to flipper tagging, permitting subpopulation wide estimates of nesting female population size, clutch frequency, and nest site fidelity in the short-term. Long-term genetic tagging can address remigration and adult female annual survival with the added bonus of directly assessing recruitment through matching daughters to their mothers. The genetic tagging approach has identified nesting females for ~99% of clutches sampled on Northern Recovery Unit beaches since 2010, so it is a robust alternative to physical tagging over large nesting ranges. The objective of this study is to initiate a genetic mark-recapture project for the northern Gulf of Mexico loggerhead nesting group to determine demographics of the subpopulation Proposed activities: 1. Hold a workshop to educate permit holders on sea turtle nesting beaches 2. Permit holders on all nesting beaches will collect one, freshly laid egg from all loggerhead nests deposited on beaches in Northwest Florida, Alabama, and Mississippi beaches. 3. Each egg will be placed in a plastic baggie and frozen for storage. 4. Upon completion of the nesting season (September 30), all samples will be gathered by Dr. Shamblin and transported back to his laboratory at the University of Georgia. 5. Genetic analyses will be conducted; microsatellites will be examined to identify samples by individual.	
Resource Mapping of Marine Habitats Important to GOM Sea Turtles which were Affected by the Deepwater Horizon Oil Spill	The purpose of this project is to determine the genetic composition of the juvenile loggerhead assemblage using Northern Gulf of Mexico (GoM) waters and assess connectivity with the Northern GoM Recovery Unit. We also propose to identify habitat use of these juveniles. By identifying juveniles from the Northern GoM Recovery Unit and describing their habitat use, we can better target management efforts for this life-stage thereby positively impacting the most important life-stage in the recovery of this nesting group (Crouse et al. 1984). The Northwestern Atlantic population of loggerhead turtles (Caretta caretta) is one of the largest in the world and recent data suggest this population is in decline (Witherington et al. 2009). It was hypothesized that one reason for this decline may be a decrease in recruitment of large, juvenile loggerheads to the adult population (TEWG 2009, Witherington et al. 2009). The Western Atlantic population has been divided into 5 Recovery Units. One of the smallest of those units, with an estimated 323-634 individuals, is the Northern Gulf of Mexico Recovery Unit which has also experienced declines in nest abundance of more than 50% since 1994 (Richards et al. 2011, Lamont et al. 2012). Currently, there are very few studies that provide any information on genetic connectivity or habitat use of juvenile loggerheads in the Northern GoM (see Bowen et al. 2004). Without knowing where these juveniles are and what threats they face in their habitats, it is difficult to provide the management necessary to promote recruitment to reproductive adults. In order to target protection of Northern GoM juvenile loggerheads to support recovery of this nesting group, we must first identify where these individuals are and what habitats they are using. The objectives of this project are to identify the origin and habitat use of juvenile loggerheads using Northern GoM waters. These objectives will be met using genetic techniques and satellite telemetry. Genetics-Skin biopsy and blood samples will be collected from juvenile loggerheads captured in nearshore waters of the Northern GoM (NW FL, AL, MS, and LA). In addition, approximately 30 samples previously collected by Dr. Lamont from individuals captured in these bays will be available for analyses. In year 3 of the study, all samples will be transferred to Dr Shamblin at the University of Georgia for analyses. Dr. Shamblin has extensive experience identifying genetic connectivity among loggerhead groups in the Northwestern Atlantic population (Shamblin et al. 2011, 2012, 2014). Satellite telemetry-Fifteen juvenile loggerheads captured in the Northern GoM will be fitted with satellite tags during each year of this study. All turtles will be captured and tagged following standard protocols identified in Dr. Lamont's NMFS permit (#17183) and FWC permit (#118). Individuals will be measured and weighed, and biological samples including skin biopsies and blood	$4,524,474

	will be collected. In addition, photographs of each individual will be taken. Wildlife Computers Splash tags will be used; these tags provide depth and location information for each individual. Depth data will provide information on habitat use in addition to the location data provided by the tag. Location data from satellite tags will be filtered using Satellite Tracking and Analysis Tool (STAT; available on www.seaturtle.org). We will use Switching State Space Modeling to identify behaviors such as migrating and foraging. Kernel density estimation (KDE) will used to identify one or more areas of disproportionately heavy use (i.e., core areas) within a home range boundary, with appropriate weighting of outlying observations. We will use the Home-Range Tools for ArcGIS extension and fixed-kernel least-squares cross-validation smoothing factor (hcv) for each KDE following Hart et al. (2012, 2014).	
Advancements in Florida's Sea Turtle Conservation Research Data Collection, Analyses, and Communication	This project will conduct the first detailed sediment, surface water, suspended organic matter, and sediment pore water assessment of northern Gulf of Mexico estuarine systems to identify the presence, potential sources, and physicochemical mechanisms controlling the behavior and fate of complex mixtures of known or suspected endocrine disrupting chemicals (EDCs) in these systems. EDCs are natural or synthetic compounds which, even at trace exposure levels, can alter early development in vertebrates and invertebrates and cause serious effects later in life or even in successive generations. Known or suspected EDCs include many compounds used in or produced during oil and gas exploration/production; some of the more recalcitrant compounds associated with raw crude oil are known/suspected EDCs. EDCs can easily pass into ecological systems and are often persistent; moreover, the consequences of exposure are markedly different from how we usually think of exposure to environmental contaminants. At the levels found in natural systems, EDCs do not destroy cells or attack DNA. Rather, they target a developing organism's chemical messengers (hormones) and the messaging network (endocrine system). Organisms living in estuaries are particularly vulnerable to the effects of EDCs, mainly because estuaries are natural sinks for contaminants transitioning from terrestrial to marine ecosystems. Estuaries are among the most productive biomes on earth; nearly 50% of the world's population lives or works in close proximity to estuaries. Consequently, estuaries are under increasing threat from both natural and anthropogenic stressors (including EDCs). Little is known about the types, behavior, and ultimate fate of the vast number of potential EDCs entering estuaries, although it is known that some EDCs are present in these systems and that some estuarine organisms show signs of EDC exposure. Very few field-based studies have considered EDC behavior and fate in estuaries. Of these, most have considered a limited number of sampling locations, a single sampling event, or both. Moreover, most did not consider mixtures of EDCs likely to be encountered in estuaries, nor were their methods of chemical analysis capable of detecting or quantifying EDCs at trace levels. Also, none considered sediment pore water as a partitioning phase, and none attempted to quantitatively link EDC partitioning behavior to spatiotemporal distributions of multiple EDCs within real estuarine systems. The proposed project will significantly advance our abilities to detect and quantitate mixtures of EDCs at trace concentrations in complex estuarine samples and will provide the first quantitative mechanistic evidence linking the behavior of EDC mixtures (transport and partitioning) to their fate (spatiotemporal accumulation, sequestration, and resuspension) as a function of dynamic estuary system conditions (hydrodynamics, water quality parameters, physicochemical conditions of partitioning phases). The results of this project will provide the first detailed, data-driven assessment of the scope of EDC contamination in northern Gulf of Mexico estuarine systems, provide a basis for examining ecological and human risks posed by EDCs in these ecosystems, and inform potential restoration actions to address these risks.	$885,156
Reduce Impacts of Anthropogenic Noise on Marine Mammals	The western Atlantic bluefin tuna (WBFT) population sustained injuries from the Deepwater Horizon (DWH) oil spill since the Gulf of Mexico is its only major spawning ground and the spill occurred in one of the spawning hotspots during the peak spawning season. The DWH Damage Assessment estimated that billions of bluefin larvae were killed, in part due to documented cardiotoxicity, with injury up to 4 million kg for large tunas. As part of the restoration plan, adaptive management has been prioritized, including collection of fishery-independent data to better understand status and	$5,000,000

	trends. Close-kin mark recapture (CKMR) is a new method which uses next generation genetic techniques to match parents and offspring to estimate spawning abundance in situations where traditional assessment methodologies are highly uncertain. This is certainly the case for WBFT. The method proceeds as follows: randomly sample juveniles and adults, use next-generation sequencing to obtain a unique genetic signature for each parent and each juvenile, and count the number of matches, or Parent–Offspring Pairs (POPs). Traditional mark-recapture population estimation methods then can estimate the number of adults in the population. Fewer POPs indicates a larger spawning population. By repeating the sampling over several years, one can obtain an updated abundance estimate, greatly improve the precision of the population estimate and estimate survival of parents when their progeny are identified over multiple years. To deal with sampling complexities in cases like WBFT, it is also necessary to look for Half-Sibling Pairs among juvenile samples. A pilot project is underway to collect samples of larval, juvenile, and adult WBFT to determine the best approaches for sample collection and genetic analyses. In this study, we propose to collect the remaining number of required samples (estimated at 1500 young and 1500 adults) and conduct the full CKMR by using modern reduced-representation high-throughput genotyping methods to count the number of POPs. This information will give us an accurate count of the number of individual adult WBFT for the first time, helping scientists and managers to determine how to successfully rebuild this depleted population, which sustained further injury from the DWH spill. The CKMR results will be incorporated in the management strategy evaluation being developed by an international team to design a more effective and efficient harvest strategy that will benefit both the stock and fishery, commercial and recreational alike. This approach has already been applied for southern bluefin tuna and is in progress for Pacific bluefin tuna.	
Reduce Marine Mammal Bycatch in Commercial Fishing Gear	Red snapper and reef fishes are susceptible to barotrauma when caught and brought to the surface, and mortality caused by barotrauma hinders rebuilding of overfished red snapper populations and could deter recovery from DWH impacts. Preliminary studies have demonstrated that recompression devices have great potential to increase fish survival from barotrauma related injuries. Initial information indicates that devices utilizing pressure-activated release once a certain depth is reached by the device (i.e., SeaQualizer) are considered the most promising from scientists and the most reliable from the majority of fishermen. Though recompression devices are promising, detailed information on their real-world applicability has yet to be determined, especially for specific species. This project will make use of SeaQualizer fish descender devices in a sample of charter for-hire fisheries across the Gulf to study the effects of barotrauma on released red snapper and reef fishes, and to quantify the reduction in fish mortality obtained in different species and environmental conditions by employing conventional or acoustic tags to estimate immediate and delayed mortality of fish after return-to-depth versus surface release. An integral component of this project will be the use of instruments for geospatial verification of fishing activity installed onboard participating fishing vessels to efficiently track their fishing effort and spatiotemporal distribution while actively fishing and releasing fish. The information collected through this technology will help to provide more accurate estimations of fishing effort within the study area and for the entire project duration so that the benefits of using fish descender devices in the for-hire reef fish fisheries across the Gulf of Mexico can be better modeled and quantified. This project will also help determine best practices for anglers using fish descender devices on specific species through active involvement of for-hire fi shermen. This stakeholder engagement will guide subsequent outreach efforts to increase descender device acceptance and use among fishermen. Stakeholders will define species-specific needs and will assist in development of best release practices for these species. This is especially important for those species affected by the DWH oil disaster, potentially offsetting DWH impacts by allowing these populations to recover at a faster rate than if these devices went untested and unused. The NMFS Southeast Fisheries Science Center has offered to provide technical guidance during various phases of the project, from the identification of best use of fish descender devices to the collection of information and data needed to advance fishery management of red snapper and reef fish. This assistance will help ensure that the data generated are of maximum use	$3,000,000

	to fishery scientists for stock assessments and fisheries management decisions. Results of this research project will add to the state of knowledge regarding methods ensuring highest post-release survivability for reef fish species. Data derived from this study will help managers determine tools that can aid the recovery of red snapper and reef fish populations impacted by DWH oil disaster and that are suitable for wider use in Gulf of Mexico fisheries. These data will also increase the accuracy of discard mortality estimates across the Gulf and improve annual catch calculations.	
Passive Acoustic Monitoring for Open-Ocean Marine Mammal Restoration in the Gulf of Mexico	Reef fish species injured by the DWH are in need of comprehensive monitoring, including physical habitat description, to help managers better estimate population status, rebuild injured populations, and set catch quotas consistent with recovery from the DWH oil spill. Invasive lionfish are an additional stressor to reef fishes due to increased interspecific competition and predation on juveniles, which can also reduce the ability of injured reef fish populations to rebuild. A better understanding of habitat types, distributions and abundance estimates of different life stages of reef fish species and co-occurring lionfish, and spatial overlap between reef fish species and lionfish will provide more targeted monitoring of the lionfish impact and will inform restoration activities at sites important to reef fishes recovery. This information would help to clarify changes in reef fish populations, support the development of mitigation strategies for lionfish (e.g., targeted removal at priority reef fish sites), and support adaptive management to assist recovery of injured reef fishes. With the aid of higher resolution habitat maps and video analyses, more accurate information on reef fish and lionfish habitat characteristics, abundance and distribution, and spatial overlap between reef fish species and invasive lionfish can be collected to help managers better assess the impact of lionfish on native reef fishes and guide management interventions for lionfish. Similarly, habitat mapping and video analyses can make possible comparisons of species distributions and abundances across habitats, allowing scientists to sample more precisely by habitat type, and improve the quality of information used to assess the health of reef fish populations. This project will make use of sonar technologies (e.g., side-scan, multi-beam, or splitbeam) and high-resolution underwater video-cameras (e.g., towed cameras or ROVs) that can be deployed from research or charter fishing vessels to survey selected natural reef habitats in the Gulf of Mexico. Sonar technologies enable remote collection of high-resolution seafloor habitat maps, with habitat distributions groundtruthed via towed camera systems or ROVs. Through the use of these technologies, this project would collect more accurate information on the physical characteristics of habitat for lionfish and for post-settlement life stages of native reef fishes. Advanced video-recording technology allows better estimation of species densities across sampled areas and provides more accurate information on fish abundance and distribution. The data collected will be synthesized into high-resolution habitat and fish distribution maps based on species and life stages for different reef fish species. Similarly, the project would collect habitat type and abundance and distribution information on lionfish. This information will be used to understand and model the spatial overlap of lionfish with native reef fishes, which could be employed to estimate the impact of lionfish on reef fish distribution, ecology, and population dynamics. Specifically, habitat mapping and species density assessments conducted in this project would support the following: • Monitoring efforts and habitat maps of lionfish that help clarify the interactions of this invasive species with reef fish species and result in more accurate estimates of fish mortality in injured reef fish, including red snapper and gag/grouper species; • More rigorous, quantitative habitat and species density assessments that enable NMFS to more efficiently and effectively identify and protect EFH and HAPCs from stressors that could impede the recovery of reef fishes from the DWH oil disaster; • Better estimates of reef fish populations, enhanced stock assessment, and improved certainty around fisheries quotas of reef fisheries affected by the DWH oil disaster; and • More effective habitat or fisheries restoration projects that enhance reef fish production.	$5,000,000
Gulf-Wide Investigation of Juvenile Gulf Sturgeon	Construct a dedicated dredge fill of open water lands on private lands west of Lake Rd with possible terrace inclusion. Plant marsh grasses in new fill area and on terraces. Interior ponding and, to a lesser extent shoreline erosion, are the major causes of wetland loss in the project area. From 1974 to 1990 marsh loss rates averaged approximately 35	$1,150,000

Dynamics and Estuarine Habitat Use	acres/year. Those high loss rates are associated with hydrologic alterations which allowed saltwater to penetrate the fresher marshes. In addition, the passage of Hurricane Katrina also contributed to the loss of as much as 3.6 square miles of wetlands within the project area. During the transition to a more brackish plant community coupled with the storm events of 2005, large ponds have formed. A narrow strip of land separates those ponds from Lake Pontchartrain. Although the shoreline erosion rates are relatively low, the shoreline is already breached in several areas, and marsh loss in the interior ponds is expected to increase as the shoreline is breached. The primary goal is to re-create marsh habitat in the open water areas and nourish adjacent deteriorating marsh. This project will afford the communities along the north shore, such as Lacombe, storm surge protection. The project size could be scaled differently if needed. Borrow material might be taken from Lake Pontchartrain. The area can support a large number of wintering waterfowl, including horned grebe and common loon, various gulls, terns, herons, egrets, and rails. The area has been designated as an Important Bird Area by the American Bird Conservancy. Restoring these marshes in private lands within Big Branch Marsh NWR along the north shore will help to protect fish and wildlife trust resources dependent on marsh habitats, particularly at-risk species such as the diamondback terrapin, black rail, reddish egret, brown pelican and the Louisiana eyed silkmoth; and migratory waterfowl which are dependent on those marsh habitats. Containment dikes would be constructed to achieve target elevations. Up to 16 million cubic yards could be used in the area to create marsh habitat to fill a target elevation of 1.4 feet NAVD88.	
Gulf of Mexico Dolphin Identification System (GOMDIS)	Several deep-water coral species and communities, including Lophelia spp. and Paramuricea biscaya, were exposed to oil flowing out of the Macondo wellhead, and also to dispersant and synthetic-based drilling mud, which led to various degrees of negative impact on these deep-water coral communities in the northern Gulf of Mexico. Overall, these negative impacts could have increased deep-water coral mortality and reduced population and genetic connectivity to levels that might not maintain sufficient population size and genetic diversity in these populations, affecting the recovery of injured corals. Therefore, there is a need to clarify the role and extent of genetic connectivity among deep-water coral communities in the Gulf, which can help identify important natural corridors for larvae to maintain sufficient population size and genetic diversity in these populations. This information will allow scientists and managers to better estimate the status of coral populations, which can clarify how deep-water coral communities cope with stressors, such as the DWH disaster, and support significant fisheries species. The De Soto Canyon is a large deep-water area adjacent to the well location that, depending on the site and its distance from the Macondo wellhead, was less affected by the oil disaster. Healthy coral communities found in the canyon could be managed as a seed stock to restore injured coral populations in the impacted area if the genetic composition and dispersal pathways are compatible with restoration objectives. Detailed information on the presence and locations of deep-water coral communities in the Gulf of Mexico is scattered or limited. Due to inherent difficulties and high cost in conducting deep-sea explorations, scientists oftentimes make coarse predictions of where corals might occur on the seafloor based on models and available data. There is an urgent need for high-resolution mapping based on direct observations of coral that can increase the power of model predictions to make better management decisions in the Gulf, and particularly in the area of the De Soto Canyon. A better understanding of the extent of deep-water coral communities inside and outside the De Soto Canyon area and their species composition, abundance, and habitat characteristics is critical to prioritizing management interventions that can enhance recovery of injured corals and support their long-term survival. In this regard, there is a critical need to clarify the extent of genetic connectivity in deep-water coral populations through innovative approaches. The information collected from surveys can then be integrated into coral restoration strategies and approaches. This project will deploy side-scan sonar from research vessels to characterize mesophotic and deep-sea benthic habitats for different coral communities inside and outside the De Soto Canyon area. This information will be used to develop high-resolution habitat maps and habitat suitability models for various coral communities that can advance knowledge on coral distribution and essential habitat	$600,000

	features for these populations. Moreover, ROV and C-BASS (the latter only for mesophotic communities) will be deployed to produce high-resolution video-recordings. This information will be used to provide more accurate estimates of coral communities' composition, distribution, density, and habitat characteristics. Collectively, these results will provide managers with a better understanding of habitat characteristics and population connectivity in deep-water corals in the De Soto Canyon and surrounding area. In turn, this information will be of significant value to advancing the recovery of coral communities impacted by the DWH disaster by enabling resource managers to identify, prioritize and plan restoration and conservation actions for both injured and healthy deep-water corals in the northern Gulf of Mexico.	
Health, Contaminant Concentrations, Ranging, and Dive Patterns of Dolphins Inhabiting the West Florida and Mississippi-Alabama Shelves	Pelagic highly migratory (HMS) and coastal migratory (CMS) fish species are important for the Gulf commercial and recreational fisheries. The DWH oil spill may have impacted these pelagic fish populations in many ways through direct oil exposure, which can alter the heart development and cardiac function of larvae and reduce swimming performance in juvenile life stages. Hence, larvae and juveniles of pelagic fish species that spawned in the area impacted by the DWH disaster may represent a loss of fitness in early life stages that could have affected year-class strength and population levels and overall species reproductive success. A decline in pelagic fish populations would require a better understanding of species responses to stressors and reduction in more clearly identified stressors (e.g., fishing mortality) in adult spawners. Several pelagic migratory fish species are prohibited to fisheries or subjected to strong management measures and size restriction limits to allow populations to rebuild. Hence, these species are commonly released when caught by commercial and recreational fisheries. However, such approach can be inadequate without detailed knowledge of the species post-release survival. This knowledge is critical to enhance the species conservation both within the Gulf and the persistence of populations Atlantic-wide. There is still a knowledge gap for the full impact of fishing and post-release mortality for nearly all of these species. Also, there are gaps in knowledge for their migration, movement and connectivity inside and outside the Gulf. Hence, there is a need to clarify the role of incidental fishing mortality and post-release mortality, and the migratory behavior and habitat use for the non-target component of these species that are incidentally caught and commonly released from commercial and recreational pelagic fisheries in the Gulf. In turn, this information will help the restoration community: 1) better understand the impact of fisheries on the survival of HMS and CMS; 2) prioritize strategies to reduce bycatch and rebuild fish populations; and 3) adaptively manage restoration projects for pelagic species to improve project results and track the overall population recovery. This project will investigate the level of post-release mortality from commercial and recreational fisheries in HMS and CMS by using pop-up satellite tags (i.e., survivorship tags) specifically developed to study species survival after release from fishing gears. Species targeted for this effort will be adult individuals of bluefin tuna, yellowfin tuna, and blue marlin for HMS, and mahi-mahi for CMS. Conventional pop-up satellite tags will also be used to study the migration, movement, and connectivity of these species inside and outside the Gulf. The target fisheries for this project will be the commercial pelagic longline (PL) and recreational rod-and-reel (RAR) fisheries in offshore waters of the northern Gulf, from Texas to Florida, where these species are commonly caught and released. For survivorship tags, a pre-evaluation methodology (e.g., power analysis) will be used to estimate the minimum number of fish that would be needed for each species and for each fishery (i.e., PL and RAR) to allow robust quantification of post-release mortality in tag-and-release fish. This pre-evaluation component will help in quantifying cost estimates to achieve project goals. Results of this project will address data gaps on the impact of post-release mortality in various pelagic fish species incidentally caught and released in pelagic fisheries in the Gulf, and support monitoring and adaptive management activities of relevant restoration projects (e.g., Oceanic Fish Early Restoration Project) to improve project results. The information collected will also fill data gaps in species' habitat use and migratory behavior. This information can help inform better management for these species and help advance the recovery of injured populations	$5,000,000

Development of a Tool for Tagging Free-Swimming Small Cetaceans	Shallow-, mid- and deep-water coral communities in the northern Gulf of Mexico provide critical habitats for associated fish and other marine wildlife species and help support a productive marine ecosystem and important fisheries in the Gulf. Many of these coral species and communities, including Lophelia spp. and Paramuricea biscaya, were exposed to oil and chemical dispersants as a consequence of the DWH oil disaster. Overall, the negative impacts of oil exposure likely increased coral mortality and reduced population and genetic connectivity to levels that might not maintain sufficient population size and genetic diversity in these coral populations, potentially slowing their recovery. Despite their recognized ecological importance, there is still a lack of understanding on what a healthy Gulf coral reef ecosystem looks like. Hence, there is the urgent need to continue monitoring and research on the health of northern Gulf coral communities and track their recovery from injuries sustained through the DWH oil disaster, which will better inform restoration activities and improve understanding on how chronic and future threats affect recovery rates and overall health of these communities, as well as impacting their resiliency. Monitoring and research of coral sentinel sites, consisting of injured and non-injured (reference sites) coral communities, can help restoration managers understand recovery rates of coral communities relative to those injuries and how their genetic diversity and connectivity are affected by chronic or emerging stressors (e.g., fishing, changes in pH). This proposed project would expand monitoring and research activities at selected coral sentinel sites at various depths across the northern Gulf of Mexico to collect needed information on the status and condition of both injured and healthy (reference) coral communities. The information collected can help to improve understanding of coral recovery, promote their long-term survival in the fac e of other threats, and determine the level of effectiveness of restoration measures at injured coral reefs and sites. Hence, coral populations at sentinel sites would be a control for comparative studies with other reefs injured by the DWH disaster. Within this context, the project would make use of recently developed techniques to provide better understanding of the level of genetic connectivity across reefs in the Gulf, and in particular for mesophotic and deep-water coral populations injured by the DWH disaster. Additionally, enhanced conservation of coral communities can be achieved by offering voluntary courses for fishermen in which they acquire knowledge of best fishing practices within or around ecologically sensitive coral sites. This type of program can help reduce the negative impact of fishing practices on coral communities and support their recovery. Moreover, graduation from such training courses could lead to the development of an endorsement program, allowing fishermen who have taken the course and agree to certain requirements to fish in buffer areas that would otherwise be restricted to fishing. This proposed project will develop and implement a program to train commercial (e.g., golden crab and red shrimp) and recreational (e.g., snapper and grouper) fishermen in adopting best fishing practices when navigating or fishing within or around sensitive areas for corals. The aim is that fishermen would use these best practices to reduce deleterious impacts on coral communities at different depths, although mainly in shallow- and mid-water (	$285,000
Designation of Desoto and Mississippi Canyons as Marine Protected Areas	The Pearl River Navigation Project (PRNP) was completed in 1956. It includes three navigation locks, two low-head dams, and an overflow. The project is currently non-functional. The primary objective for this project is to remove the two low head dams associated with the project that have blocked access to critical spawning habitat in the Pearl and Bogue Chitto Rivers for the past 60 years and severely limit reproductive success of Gulf sturgeon. These structures represent the most significant impediment to recovery for one of the most depressed Gulf sturgeon populations in the Gulf of Mexico. As long as these structures remain in place, the Pearl River Gulf sturgeon population will remain in decline and likely unsustainable. Removing those dams can re-establish reproductive resilience and has been the top recovery action sought by USFWS Fisheries Program, The Louisiana Department of Wildlife and Fisheries (LDWF), recovery scientists, and many NGOs for decades. It represents a logical and strategic restoration effort that is sustainable, minimizes uncertainty, and can be reasonably translated into a quantifiable increase in Gulf sturgeon numbers attributable to this action. The project has a great deal of potential to transform other features of the existing navigation project so that they provide	$0

	economic and recreational benefits to the surrounding communities. The LDWF intends to improve and maintain the defunct navigation channel as showcase recreation area for fishing, watersports, and access to the Bogue Chitto NWR. Improved safety is also a welcome benefit since multiple accidents have resulted in more than five lost lives due to the dangerous navigation conditions created by the dams. Commercial and recreational fishermen traverse the dams in order to access large segments of the river that would be completely and safely accessible if these structures were removed. As many as 18 other locally and regionally migratory species would benefit from the renewed access to upstream resources that are currently out of reach. Public access via the rivers would be re-established for much of the Bogue Chitto National Wildlife Refuge and the Pearl River Wildlife Management Area where it is currently limited due to the dams. In 2016 the US Congress officially "decommissioned" the project and directed the USACE to transfer ownership of the entire project to a willing recipient. The LDWF was integral in de-authorization and has interest in ownership of the project. This proposal requests funds and Open Ocean TIG support to complete engineering and design to remove two dams, including OPA and NEPA compliance, public scoping, preparation of appropriate hydrodynamic, geomorphic, and toxicological assessments, as well as all relevant permits. It will establish a predicted area of impact and characterize the nature of physical and environmental change associated with dam removal. It will also provide for assessments to define the potential influence that those changes might have on private property, municipalities, commercial interests, and ecological function. Conceptual alternatives will also be developed for compatible recreational features associated with the transformation of the project. Implementation of the project will ultimately depend on the successful transfer of ownership to a willing recipient. The LDWF has actively pursued ownership throughout this process and remains the apparent future owner of the bulk of the current project features and holdings. Phase I will include coordination among USACE, the State of Louisiana, and the Federal Trustees in developing a strategic plan for transfer of ownership of the project to the state of Louisiana. It will also include design specifications for the securely modifying the remaining structures to prevent failure and to ensure public safety.	
Centralized Database for Marine Turtle Flipper and PIT Tags	Expand Gulf of Mexico Migratory Species Pathways Mapping and Conservation Project with emphasis on migratory connectivity modeling, threats assessment, and the identification of habitat restoration needs including pelagic habitat. a. Objectives: Understand the most significant migratory pathways of fish, Sea Turtles, Marine Mammals, and birds in the Gulf of Mexico large marine ecosystem, and the habitats that their populations need to continue being viable; identify the most important threats to those pathways and habitats. b. Species group/habitat: Fish and Water Column Invertebrates, Sea Turtles, Marine Mammals. c. Description: Migratory species rely on multiple habitats to complete their life cycles. This project should: i. Assess the threats to species while migrating (along their pathways) in the Gulf of Mexico ii. Develop an optimized habitat portfolio using GIS and migratory connectivity models that identify the essential habitats to maintain migratory species populations throughout their life cycle and to guide habitat restoration and protection. iii. Support technological advancements in the development of biological tracking and oceanographic monitoring networks, such as acoustic monitoring networks, gliders including the development of migratory movement tracking networks and infrastructure across the Gulf. To do that it should fund: current or new establishment of scientific and management networks of practitioners assessing the movements of marine organisms (e.g., iTAG network of acoustic telemetry) and synthesis of a collaborative strategy for a Gulf of Mexico Animal Tracking Network. The project continues work previously completed and published by The Nature Conservancy to map the migration routes of 26 bird, fish, marine mammal, and turtle species in the Gulf of Mexico (Brenner et al. 2016). We believe that this research revealed the great importance of species migration to the Gulf ecosystem as well as the importance of continuing to com pile and analyze migratory pathways as an important decision-making tool for Gulf restoration. This project would accomplish the next phase of this work with particular emphasis on threat assessment and identification of the most critical migratory pathways for protection for their habitats. (Brenner, J., C. Voight, and D. Mehlman, 2016 Migratory	$624,030

	Species in the Gulf of Mexico Large Marine Ecosystem: Pathways, Threats, and Conservation. The Nature Conservancy, Arlington, VA. 93 pp.).	
Delta National Wildlife Refuge Hydrologic, Shoreline, and Estuarine System Restoration	Assess the role of ecological connectivity in the Gulf including between the nearshore and offshore marine environments, for anadromous fish, and among coral reefs. and evaluate the role of nearshore habitats as nursery and foraging areas for offshore fish, water column invertebrates and turtles, of anadromous fish runs in the past and future Gulf ecosystems, and the relationships among coral reefs. a. Objectives: Identify the near-shore, freshwater, and coral reef environments that are most critical to protect and sustain populations of a variety of Gulf species that spend part or all of their life cycle in the open ocean. b. Species group/habitat: Fish, water column invertebrates and sea turtles. c. Description: It is critical to integrate the linkages between the near-shore, freshwater, and offshore environments in the design, development, and monitoring of coastal and offshore habitat restoration investments. To do that studies should: i. identify and prioritize protected waters and nearshore environments (e.g., bays, estuaries, etc.) that contribute in maintaining populations of offshore endangered, commercial, and recreationally important species. This project should merge oceanographic and coastal biophysical, use and management information and develop a model of interactions (linkages) and produced scenarios to guide marine use and conservation planning. ii. Evaluate the potential for and impact of restoring anadromous fish runs in Gulf rivers including the potential for increasing the forage base for offshore fish. Historical accounts suggest that anadromous fish runs on Gulf rivers contributed significant amounts of forage fish to the overall Gulf ecosystem including for open ocean predators. This project has three parts: 1) Conduct historical research to verify the magnitude, location and species composition of anadromous fish runs in Gulf rivers, 2) Evaluate impediments to fish passage on Gulf tributaries with historically large fish runs and propose strategies for reducing or removing those impediments where cost-effective, 3) Propose other actions to restore historic populations of anadromous fish. iii. Study coral larvae connectivity. The objective of this study element is to understand the interdependence of important mesophotic and deep coral communities and their ecological connectivity for sustaining shallow water coral reef systems. The Gulf of Mexico is an important area for mesophotic and deep-sea coral communities, especially along the edge of the continental shelf (e.g., offshore banks). This project should assess the similarities, connectivity, and threats to these communities in the northern Gulf. To do that it is necessary to: compile multiple sets of biophysical data for these areas, assess the ecological relationships among their species composition and with shallow water coral reef species, understand structural aspects of these communities using GIS modeling of benthic terrain, assess the ecological relationship of mesophotic coral species to shallow water coral species, and assess the importance of mesophotic and deep sea corals as essential fish habitat for commercially, recreationally and ecologically important species. Outcomes of this project should include indicators of diversity, structural complexity, threats, and recommendations for their conservation.	$10,000,000
Restoration in Place Strategy for the Deep-Sea Soft-Bottom Benthos: Long-Term Monitoring to Support Restoration Efforts	The Nature Conservancy is engaged in a large scale project to reduce nutrient inputs to the Mississippi River. The project is a multi-faceted effort involving TNC Chapters in the whole Mississippi Basin. In this portion of the project we would conduct one or more nutrient reduction pilot projects in the Mississippi Valley as prototypes for reducing nutrient flows into the Gulf and, thus, the size of the Dead Zone a. Objective: Demonstrate cost-effective and practical methods of agricultural nutrient reduction that can be replicated in the Mississippi Valley. b. Species group/habitat: Fish and Water Column Invertebrates, Marine Mammals. c. Description: Evidence suggests that the Gulf Dead Zone impacts the health of Fish and water column invertebrates and, potentially, marine mammals in a large area south and west of the Mississippi River Delta. The Dead Zone is caused primarily by agricultural nutrients flowing into the Mississippi River and then into the Gulf. While there have been long-standing efforts to reduce nutrient runoff, progress in reducing the size and duration of the Dead Zone is not evident. The Nature Conservancy is currently involved in activities across the entire Mississippi Valley to reduce nutrients. Large scale pilot projects are needed to demonstrate new on-field and edge of field	$52,000,000

	reduction techniques. In addition, there is increasing evidence that floodplain and wetland restoration removes nutrients in tributary rivers. This project would create a large-scale pilot project on a Mississippi tributary in Louisiana or Mississippi to test a broad range of strategies for nutrient reduction that could be measured, described, and then be replicated elsewhere.	
Facilitating Open Ocean Project Support: Peer Review, Project Evaluation, Stakeholder Facilitation, and Administrative Services for Bird Restoration in Deepwater Horizon Trustee Implementation Groups	Through this project NOAA seeks to develop, test, and implement an effective observer program for the GOM menhaden purse seine fishery, including assessment of the placement/viewing locations for observers aboard the fishing vessels, alternative platform observer coverage, video monitoring, e-logbooks, or other remote monitoring to effectively monitor protected resource interactions with this fishery. This project will build upon the pilot observer effort that occurred in 2011, and lessons learned regarding how to appropriately observe for sea turtles in this fishery. This fishery operates in bays, sounds, and nearshore coastal waters along the GOMX coast. The majority of the fishing effort is concentrated off Louisiana and Mississippi, with lesser effort in Alabama and Texas state waters. This fishery overlaps with critical foraging areas for sea turtles, especially endangered adult, and juvenile Kemp's ridley sea turtles. This project would improve our understanding of sea turtle interactions with the menhaden fishery and help inform the direction of future bycatch reduction conservation measures. This project may also benefit marine mammals. This project can be scaled based on available costs. Estimated 250K/year for 3 years for observer coverage, for total cost of 750K.	$1,511,725
Impact of Exotic/Invasive Scale on Estuarine Phragmites Marsh on Delta NWR	The 1998 seagrass guidelines document has emerged as a foundation reference guide for use by regulatory agencies and applicants in the Gulf of Mexico (GOM) and worldwide. Frequently, regulatory guidance is quoted directly from the document. As such, it is critically important to the successful management of the GOM seagrass resource that such a decision support tool provides the best science. However, this document is now significantly out of date (approaching 20 years), and a revision is required. Moreover, ~85% of the seagrasses in the conterminous U.S. lie within the waters of the GOM, making the need for updated information in the GOM especially pressing. Since 1998, over 2,000 seagrass-related papers have been published, with 366 reporting directly on seagrass restoration. Much of this work has fundamentally changed our understanding of seagrass biology and ecology and how seagrass restoration is approached. This information needs to be synthesized and unified with the previous guidance to provide an up-to-date and state-of-the-art seagrass restoration guidance document for the GOM. For the revision, emphasis will be placed on "how-to" guidance, including addressing frequently asked questions of policy, planning, methods, monitoring, and evaluation of success. This will be achieved by revising the 1998 document structure as well as through consultation with stakeholders, including practitioners and state and federal regulatory staff throughout the GOM region. Through that consultation, the addition of instructive case studies and call-outs highlighting instances of particular relevance will be provided throughout the text. Similarly, the document outline and content plan will be reviewed by key stakeholders. The core task is straightforward but also requires the most effort—namely reading, interpreting, and synthesizing the literature (both previous and new since 1998) and writing the revised document. Special assistance is requested for the genetics review. Notably, the lead author for the 1998 landmark publication is the lead author proposed here, and he has had extensive experience editing, reviewing, and writing peer reviewed publications related to seagrass restoration and ecology. He continues to be an expert and leader in the field of seagrass ecology and restoration. His role as the lead author provides this proposed revision with a unique level of practical experience and continuity. This project deliverable will meet standards of peer review and modern delivery avenues. Peer review will be conducted by soliciting reviews of limited sections of the document from professionals and experts in the field of seagrass restoration, both nationally and internationally. The final product will be made freely available from CSA's website and through appropriate government websites. Promulgation of the revised decision tool will also be made through direct engagement with regulatory personnel and the public, including training seminars. A diverse plan of social media utilization (magazines, Twitter, Facebook, websites) is also proposed.	$0

Monitoring Bryde's Whales in Near Real Time from Autonomous Platforms to Reduce Anthropogenic Threats	Currently there are no predictive tools that can be used to assess and predict the long-term impact of the oil spill on marsh edge erosion and wetland shoreline stability. One of the reasons for the absence of a predictive model for oiled-marsh erosion is the disparity and disconnect between the physical, biological, and chemical data as well as various studies. From coastal restoration and protection perspective, there is a critical need to improve the fundamental understanding of marsh edge erosion under various physical and ecological conditions such as wave energy, soil strength and vegetation biomass to develop a more robust predictive tool for the Coastal Master Plan. The goal of the proposed project is to synthesize and integrate field observations, numerical modeling results and remote sensing data aimed at developing a reliable model for the prediction of oiled-marsh edge erosion, which will serve as a useful tool for assessing the long-term resilience of coastal marshes in Louisiana and beyond. To achieve this goal, three objectives are formulated for the proposed project: 1) to collect and integrate wetland soil, vegetation, hydrodynamic, marsh edge geometric, and shoreline retreat data from various sources as well as to fill critical data gaps; and 3) to correlate the hydrodynamic forcing, soil shear strength, vegetation characteristics, soil biogeochemistry and marsh retreat rate, and develop a predictive model for marsh edge erosion of oiled wetlands for assessing the long-term impact of the oil spill on coastal wetlands in the northern Gulf of Mexico. We hypothesize that 1) coastal wetlands particularly in the marsh fringe zone negatively impacted by the oil spill reduce the shear strength of soil and vegetation or the resistance capacity against wave-induced erosion, 2) the accelerated, permanent marsh edge erosion reduces the sediment trapping capability of small marsh islands and increases wetland loss; and 3) the oiled-marsh edge retreat rate is controlled by the driving force of wave action, the resistance force of vegetation and soil, and erosion mechanism and progression. We will select four sites with oiled and non-oiled marsh edge along Barataria Bay for this study. We will 1) measure in situ salt marsh soil shear strength and other marsh soil geotechnical properties using field vane inspection tester and piezocone penetrometer; 2) measure belowground biomass and soil physical and ecological parameters such as organic matter and bulk density; 3) conduct detection of remotely sensed shoreline erosion rate and aboveground biomass (using Synthetic aperture radar (SAR) imagery) and then link to belowground biomass and soil strength to remote sensing derived aboveground biomass; 4) monitoring and modeling wave energy dissipation in shallow water systems and marsh morphological dynamics using coupled SWAN wave model and Delft3D morphology model; and 5) develop a wave-vegetation-soil-driven shoreline erosion model. The project outcomes will include improved consideration of wetland soil processes (i.e., relationship between marsh edge erosion, in situ soil shear strength, belowground biomass, soil organic matter, habitat types, plant cover, and clay-silt fraction) in predictive models, high-spatial resolution (~1 m) of marsh erosion and wave characteristics, and a more robust wetland morphology model that is incorporated in the Louisiana Master Plan modeling system. This will improve our ability to forecast the impact of coastal protection and restoration projects and assist in managing Louisiana's coastal resources. This project will directly tie to the NRDA Programmatic Damage Assessment and Restoration Plan (PDARP) and LA TIG responsibilities: "Goal: restore and conserve habitat. Restoration Types: wetlands, coastal, and nearshore habitats; habitat projects on federally managed lands".	$750,000
An Acoustic Stranding Alert System for the Gulf Coast	Louisiana is moving forward with the design, engineering, and construction of several large-scale sediment diversions adjacent to the Mississippi River. More information is needed to understand the nature and degree of ecological changes that can occur in receiving estuarine environments and for such predictions. We propose to assess estuarine health at sites near Fort Saint Phillip where passive breaches in the Mississippi River levy have resulted in large influxes of freshwater into the lower sections of Breton Sound. Biological, chemical, and physical (habitat) characteristics will be measured in response to the long-term influx of freshwater and sediment from the Mississippi River, as opposed to sites isolated from any direct river water influx. Conditions at these sites will be compared to those adjacent to, and downstream of, the proposed outfall of the mid-Barataria diversion. The intent of our multi-parameter, inter-disciplinary design is twofold: (1) to document and compare the conditions at estuarine sites receiving freshwater and (2) to	$900,000

	document baseline conditions for the Barataria Bay estuary. Moreover, by way of these observations across the fresh- to salt water gradients, models will be applied to the data for use in predicting the likelihood of changes for other estuaries receiving diverted freshwater. The null hypothesis is that biological, chemical, and physical conditions will not change substantially at estuarine sites receiving diverted freshwater and sediment. Site conditions encountered at sites located across the fresh- to salt water gradient will be compared using integrated data and ecological modeling. Over a period of 3 years, 12 sites, approximately split between the eastern and western Mississippi River will be sampled. Monthly data will be collected on nutrients, suspended sediment, and chlorophyll a. with concurrent field readings on dissolved oxygen, pH, salinity, conductivity, and turbidity. Sediment accumulation will be measured, and samples analyzed for organic compounds and metals, annually. Each spring and fall (under similar tidal conditions), water current (direction and velocities) will be measured with Acoustic Doppler Current Profilers (ADCPs) at transects to determine hydrologic characters that can influence water quality. Depth profiles by the ADCPs will generate bathymetry parameters over the period of study. Fish, benthic (infaunal and epifaunal) invertebrates, and bacteria (measured using metabolic activity in water and sediment) metrics will be compared to chemical and physical measures and will be used as ecological end points. Suspended sediment and chlorophyll a data collected for this study will be used to develop algorithms for estimating those constituents using remote sensing techniques. This project also will build upon a recently developed hydrodynamic-water quality-oyster population coupled modeling system for Breton Sound that can help provide understanding for how oyster population characteristics (growth, mortality, recruitment) and other characteristics support adaptive management strategies for future restoration projects. This project is complimentary to several other ongoing projects and plans in Louisiana. It addresses several specific research needs listed in the Research Strategy identified in the RESTORE Act which are relevant to the Louisiana's Coastal Master Plan. Our sampling strategy will be more intense and cover a smaller area than SWAMP and CRMS. Adherence to quality control and assurance protocols, and specific standardized operating procedures, ensures that our project will provide data valuable to SWAMP and to CRMS. Results will tie directly to the Trustee approach of broad perspective, ecosystem-level considerations. Such process-driven, systematic modeling approaches have not yet been applied in coastal master plan applications but is envisioned as a pathway forward for coastal master plan development.	
Assessing the Human Dimensions of Marine Mammal Management	The mid-Barataria Sediment Diversion will reconnect the Mississippi River to the adjacent estuary. This area of freshwater and brackish marshes has been degrading since the construction of levees along the Mississippi River that has reduced inputs of freshwater and sediment to these wetlands. The combination of subsidence and regional sea-level rise has resulting in the loss of land and habitat. Input of sediment and freshwater from the diversion is anticipated to reduce and in places reverse these losses. The diversion management goals are to maximize sediment movement while minimizing the amount of water diverted. The diversion project is scheduled for completion in 2022, at a cost of $1.3B. The effectiveness of the diversion is dependent upon many issues and processes. Most importantly, the project must enhance mineral sediment deposition in marshes brought about by increased sediment delivery to the basin while minimizing potential negative impacts to belowground plant production brought about by increased flooding and nutrient loading. Studies of prior diversions indicate that the impact area of increased water levels may greatly exceed that of deposited sediment. Many marshes consist of high-porosity organic material and additions of mineral-based sediment may infiltrate pore space (thereby increasing bulk density), rather than create an immobile layer on the marsh surface that contributes to vertical accretion. Freshwater marshes are sensitive to saltwater intrusion, while brackish and saltmarshes can be vulnerable to prolonged periods (a week or more) of continuous flooding. Moreover, inputs of diverted nutrients into warm, shallow bays could help facilitate nuisance algal blooms and possibly hypoxic conditions in addition to be detrimental to below-ground productivity of marsh vegetation in unpredictable ways. While diverted river water may impact the estuary and marshes in the above described ways, nutrient transport directly to the northern Gulf of Mexico	$150,000

	could be reduced and possibly result in a reduction of the areal extent of the hypoxic zone. The current science available thus suggests that benefits of the mid-Barataria diversion may be optimized by maximizing sediment delivery while simultaneously minimizing the duration and extent of freshwater inflow. Purpose and Scope: This project intends to (1) provide tools for informing the timing, magnitude and duration of diversion operations to maximize sediment delivery with minimal freshwater influx, and (2) provide baseline data on flux of material materials through the basin to help assess the diversion's impact to these fluxes and the spatial extent of these fluxes once the diversion becomes operational. The proposed work and tools developed will complement and improve existing monitoring programs by the Louisiana Coastal Protection Restoration Authority such as the Louisiana's System-wide Assessment and Monitoring Program (SWAMP) and the Coastwide Reference Monitoring System (CRMS). The information obtained will be critical to the project's adaptive management program, which could include outfall management measures to optimize flow routing through the system. The first phase of the project will assess the flux of freshwater, sediment, and nutrients through the basin that is currently (prior to diversion operations) driven by astronomical tides and wind. These baseline data will be necessary to quantify impacts of the diversion to nutrient fluxes through the tidal passes to the northern Gulf of Mexico. Only through informed adaptive management can diversion operations be tuned to maximize land building and marsh habitat restoration and productivity while minimizing potential adverse effects of excessive nutrients and inundation. The approach described here will be transferable to future diversion projects (e.g., mid-Breton).	
Unified Gulf of Mexico Benthic Habitat Map	Substantial coastal wetland loss caused by the Deepwater Horizon (DWH) oil spill were not included Natural Resource Damage Assessment. Studies published in 2016 and 2017 proved that DWH oiling dramatically heightened shoreline erosion, erosion magnitude increased with oiling severity, and oil related erosion distinctly differed from storm related shoreline erosion. These first-time findings were provided by a designed operational mapping system which used Synthetic Aperture Radar (SAR) data within a remote sensing and GIS processing structure. That system delivered a holistic representation of spatial and temporal trends of shoreline lateral movement that were not obtainable from ground measurements. A separate study also published in 2016 uncovered a pattern of backshore marsh density decrease that aligned spatially with shorelines that were heavily oiled the previous year. These results document substantial wetland loss due to DWH oil spill and possible latent detrimental response of marsh exposed to moderate oiling. While the mapping demonstration was highly successful, the extent and temporal duration were limited. The goal of this proposed project is to fully document marsh degradation and loss due to DWH oil in Barataria Bay from 2010 to 2016, and to chronic and storm erosion. In order to accomplish that goal, the project region will be extended from the northeast corner to include all of Barataria Bay exposed to DWH oil in 2010. The first project objective is to compile all needed field and image data to carry-out all mapping. SAR images used to conduct the previous studies were collected yearly of the Bay from 2009 (pre-spill year without storms) to 2016. Yearly SAR marsh density mapping will be based on calibrations performed with 2010 to 2012 field data collections. The second objective is to produce high-fidelity 2-m ground resolution SAR images that are then mosaicked to form yearly 2009 to 2016 georeferenced maps of the Bay. The third objective is to produce yearly SAR-based shoreline vectors and calculate a reference vector from which to measure shoreline movement throughout the Bay. The fourth objective is to setup and apply a GIS procedure for automated measurement of shoreline lateral movement from year to year. The fifth objective is to create yearly maps of marsh density and year-to-year change maps. Produced maps, tables and analyses will substantially increase the direct morphological impacts of the oil spill, expanding the possibilities of long-term environmental consequences. The comprehensive accountability of marsh degradation and loss will directly record the vulnerability and resilience of natural coastal wetlands to man-made and natural disasters and chronic and storm erosion. This direct record will increase the ability to anticipate and better protect the wetlands from immediate and long-term consequences promoting sustainability of the coastal ecosystem.	$500,000

Stock Assessment Development to Inform Gulf Sturgeon Population Status and Trends as a Baseline to Measure PDARP Actions	There are roughly 10,600 species of fish and invertebrates known from the Gulf of Mexico, over 9,000 of which are invertebrates. Although initiatives are providing an organized taxonomic and biogeographic framework to increase knowledge on the constituents of the Gulf of Mexico's faunal communities—i.e., what species are there and where they occur—there is not a centralized initiative that will link this framework to applied ecological and management research. The link would be expertly identified voucher specimens with associated DNA sequence data, and the most efficacious applied biodiversity and fisheries research would involve using environmental sampling and metabarcoding to rapidly monitor biodiversity. This monitoring would inform policymakers on changes in species composition and relative abundance of the ecosystem through time. The two objectives of this project are: 1) to produce a DNA sequence library to identify species, and 2) to use this resource and new technology to rapidly assess biodiversity of Gulf communities at standardized spatial and temporal intervals. DNA barcoding has been useful in various scientific studies such as detecting seafood fraud, biodiversity assessments, and metabarcoding studies. The applicability of these data has spurred large-scale initiatives to census biodiversity (Moorea Biocode Project and the International Barcode of Life Initiative). Building a DNA sequence library would involve using existing natural history collection material [FWRI and the Florida Museum of Natural History (FLMNH)] and comprehensive field sampling to census the Gulf of Mexico's biodiversity. Preliminary data from the east coast of Florida indicate that roughly 80 percent of species cannot be identified using existing DNA sequence databases. Most marine invertebrates have planktonic larvae and the east and west coasts of Florida have similar faunas that are probably equally represented in terms of available DNA sequence coverage. Given these assumptions, 80 percent of the Florida Gulf Coast fauna has likely not been sequenced. This project seeks support to build a DNA sequence library using two or three molecular markers per species. Invertebrates will be targeted but gaps in sequence data of fish will be filled as well. The census will advance all aspects of biodiversity and fisheries research in perpetuity as a rapid identification tool of the Gulf's fauna—prey items, cryptic species and other difficult to identify species, etc. The library and associated voucher and locality data will be linked to existing cyberinfrastructure including BOLD, OBIS, Genbank, and iDigBio for dissemination. Furthermore, the library will enhance the second component of the proposed project: monitoring Florida's Gulf communities using environmental metabarcoding. Metabarcoding is a new method to rapidly assess biodiversity of an ecosystem from environmental samples. Whole samples, such as fish gut contents or plankton tows, can be extracted, mass amplified, and sequenced using high through-put, next generation sequencing. The outcome is a list of sequences found in the sample—e.g., biodiversity of prey items in a red snapper's gut—useful for measuring species composition and relative abundance. The proposed project hinges on the development of the aforementioned DNA sequence library for identification of environmental DNA. It also hinges on four standardized environmental sampling methods: fish gut contents, sediment samples, Autonomous Reef Monitoring Structures (ARMS), and plankton tows. Using all of these methods, combined with traditional biodiversity sampling to build a DNA sequence library, will provide system-wide, rapid data across trophic levels, habitats, and other environmental gradients through time, yielding a comprehensive picture of biodiversity in a system.	$340,000
The Complete Picture Using High Resolution Digital Imagery	This project will restore open-ocean marine mammals by reducing their collisions with vessels in the Gulf of Mexico. A program will be developed to understand the nature of marine mammal and vessel collisions and strategies to avoid them. Use of passive acoustic data, predictive modeling, and animal tagging data will inform better understanding of the causes of ship strikes and their threats to each population of marine mammals. A collaborative partnership with NOAA and the shipping industry will be developed to assess changes in vessel routing that could reduce the risk of marine mammal and vessel collisions and/or voluntary speed restrictions that would help reduce the probability of vessel collisions. Recreational boater education and awareness will be another issue addressed by this project. Bryde's whales (Balaenoptera edeni) are the only resident baleen whale species in the Gulf of Mexico (GoMx), where they are extremely rare, and have a distribution restricted to the eastern Gulf of Mexico. Vessel collisions may be a major factor in their	$5,000,000

	restricted distribution and small population size. Tagging data suggest that these whales have shallow nocturnal diving patterns with 88% of their nighttime spent near the surface within the draught depths of most large commercial vessels. Better understanding of how to protect Bryde's whales from vessel collisions will be one goal of this project.	
Turtle Connections: Gulf-Wide Sea Turtle Nesting Beach and Foraging Area Connectivity	Detailed scientific data are lacking for many species of offshore marine mammals in the Gulf of Mexico, so restoration activities will require an incremental approach including initial data collection and monitoring, that will vary by species and stock. To identify priority threats there is an additional need for population monitoring, and spatial habitat definition. Population assessment, monitoring and habitat characterization is needed for offshore marine mammal populations due to the substantial gaps in our understanding of these difficult to study species. The detailed offshore distribution of most offshore marine mammal species is poorly understood. A better understanding of offshore marine mammal prey dynamics is also needed. To address these limitations, all existing data on offshore marine mammals will be used to construct models of their distribution and habitat. These models will be refined and validated by targeted data collection. Additional data collection may involve visual, acoustic, tagging, and other methods. Areas of overlap between critical marine mammal habitat and potential injury from anthropogenic activities will be selected as the focus for zones of study. Population monitoring and habitat modeling are further required to assess the effectiveness of restoration strategies.	$1,023,000
Informing Deep-Benthic and Mesophotic Habitat Restoration by Characterizing Baseline Coral Microbiomes	Sea turtles are highly migratory species with complex life cycles. They use a variety of marine habitats that range from the surface-ocean to sea floor ecosystems. The Deepwater Horizon (DWH) oil spill damaged surface and benthic marine habitats that are critical to Gulf of Mexico sea turtles. The proposed project would focus on two such habitats that are of critical importance to sea turtle conservation: 1) Sargassum drift habitats of juvenile sea turtles and 2) the deep-benthic and hardbottom (mesophotic reef) habitats used by juvenile and adult loggerheads. Specific project objectives are outlined below; those specific to surface-pelagic studies are preceded by [SP] and objectives specific to WFS benthic habitat studies are preceded by [BH]. • [SP] Identify and monitor Sargassum drift habitat within the in the Gulf of Mexico and nearby Atlantic and Caribbean waters as part of a regional, collaborative monitoring program. • [SP] Monitor juvenile sea turtle occurrence, density, and seasonality within regional sites using on-water transect techniques. • [SP] Link Sargassum habitat extents with measured juvenile sea turtle densities (from captures and transects). • [SP] Validate Sargassum habitat estimates using satellite imagery and field observations. • [SP] Investigate usage of surface-pelagic habitats by sea turtles during fall, winter, and spring through a temporal expansion of survey effort. • [SP] Understand the threat of marine debris to surface-pelagic turtles through an examination of diet samples and by developing a method for quantifying debris found within surveyed habitat. • [SP] Assemble remotely sensed observations to produce a spatiotemporal representation of surface-pelagic habitat in the Gulf of Mexico. • [SP] Map the estimated abundance and distribution of surface-pelagic juvenile turtles in the Gulf of Mexico based on the occurrence of surface-pelagic habitat and the behavior and movements of observed and telemetered turtles. • [BH] Describe the distribution, habitat use, and foraging behavior of loggerheads on the WFS within the eastern Gulf of Mexico. • [BH] Identify the isotopic signature of the WFS loggerhead residence area based on ratios of carbon, nitrogen, and sulfur stable isotopes of skin and scute samples. • Use new data, existing datasets, and density estimates (from vessel and aerial transects) to describe potential intersections between sea turtles and anthropogenic threats within the Gulf of Mexico (e.g., fisheries and oil spills). • Characterize habitat use and movement ecology using satellite telemetry. • Conduct analyses of diet and habitat use by assessing esophageal lavage, fecal samples, and stable isotope ratios of tissue samples. • Develop and enhance regional, on-water disaster response and rescue capabilities based on findings of the current study and existing data including Sargassum habitat forecasting, resource preparedness, and streamlined information sharing strategies.	$5,029,000

Science Exchange for Sea Turtle Research and Management	The response efforts and damage assessments surrounding the Deepwater Horizon Oil Spill (DWH) were challenged by limitations of conservation data and information. The DWH highlighted several opportunities to improve the collection of and access to sea turtle research and monitoring information. During the response phase, rapid access to sea turtle nesting and strandings data and information was critical. A complete assessment of damage to northern Gulf of Mexico sea turtles caused by the spill required demographic and distributional information that is available but not yet synthesized for the affected area. We propose to develop and implement a sea turtle research and monitoring data management plan for Florida. Our plan would include solutions to increase access to sea turtle research and monitoring data collected within Florida. This effort would also streamline data collection methods and identify data gaps. The proposed project would significantly enhance the data reporting, analyses, and communication of results for all of our research and monitoring efforts. This would be accomplished by using centralized database into which data would be entered via web and/or mobile data reporting tools where appropriate. Results and summaries of data would be shared with the public and our partners using novel web-based data summarization and reporting tools. We would work with our federal, state, and local sea turtle conservation partners to ensure that our data management plan is synthesized with their sea turtle data needs. For example, we would streamline the information exchange between the Florida and Federal STSSN databases. Our data management plan would also focus on the timely delivery of quality-controlled sea turtle data and summaries to our conservation management colleagues. This project would benefit Gulf of Mexico sea turtle conservation in several ways: 1) Online data sharing and communication of analytical results would provide conservation managers with improved access to the research and monitoring data that is essential to their work. 2) Streamlined web- and mobile-based reporting would be deployed when needed to ease data entry, reduce reporting errors, reduce the time needed for QA/QC efforts and provide researchers with more time to analyze data due to the reduction in data management tasks. 3) Using a centralized database for Florida's sea turtle data would offer a secure and efficient data storage and analysis environment. Our data management approach would be designed to allow other regions within the Gulf of Mexico and northwestern Atlantic to join or replicate our protocol. Objectives • Develop and implement a secure sea turtle conservation research and monitoring data management plan for Florida's sea turtle research program. • Develop online and mobile data entry applications where such tools would streamline data entry and improve data accuracy. • Collaborate with the National Marine Fisheries Service to ensure that our STSSN data management protocol is compatible with their regional data management efforts. • Increase and expedite sea turtle data and information sharing by developing web-based reports and summarized data sets geared towards satisfying conservation management data needs. • Increase data analytical activities and reduce staff data management efforts by establishing a centralized sea turtle research data environment. • Establish a secure and accessible sea turtle data and information archive to house records produced by legacy research and monitoring projects.	$250,000
Gear Management and Outreach for Sea Turtle Conservation	The goal of this project is to identify the sources of ocean noise and map their relative influence as stressors of offshore marine mammals, and to propose means for noise mitigation. Ocean noise in the GOM has reached the highest levels measured at any open-ocean location, owing to anthropogenic noise from commercial activities related to oil exploration and production and commercial shipping. Calibrated passive acoustic monitoring data will be used to characterize the spectral, temporal, and spatial distribution of anthropogenic noise throughout the GOM and determine areas of overlap between high noise levels and marine mammal habitat. Long-term passive acoustic data have been collected throughout shelf, slope, and deep-ocean waters. These data will be used to make geospatial models of noise distribution and their overlap with marine mammal habitat. In addition, the source levels of individual noise sources (seismic airguns, commercial ships, oil platforms) will be measured to provide model input. Collaborative partnerships (NMFS, NOAA Sanctuaries, NGOs) will be developed to identify, test, and implement strategies to reduce noise impacts from sources of	$2,900,000

	commercial shipping, and seismic exploration and extraction noise, with priority for noise reduction in areas of overlap between high noise levels and high animals densities.	
Characterizing Gulf Sturgeon Spawning Habitat and Habitat Use in the Pearl and Pascagoula River Systems	Bycatch in fishery gear is a leading source of mortality for marine mammals; however annual mortality of marine mammals in the Gulf of Mexico from fisheries bycatch is not well understood. Gulf of Mexico fisheries with known or potential marine mammal bycatch include: pelagic longline, shrimp trawl, gillnet, and purse seine. Bycatch in fishery gear will be addressed as a collaborative project with NOAA and the fishing industry. Offshore Gulf of Mexico stocks that are known to be impacted include spotted dolphins, as well as shelf and three stocks of coastal bottlenose dolphins. Expanded and enhanced fisheries observer coverage will be supported and better understanding of the circumstances that lead to cetacean bycatch will be obtained. A strategy will be developed to address marine mammal bycatch in commercial fisheries, including potential modifications to fishing hardware and methods.	$350,000
Acoustic Telemetry Array to Support Tracking of Gulf Sturgeon, Sea Turtles, Marine Mammals, and Fish Species in the Northeast Gulf of Mexico	An array of five passive acoustic monitoring recorders have been deployed continuously since 2010 in the Gulf of Mexico, in response to the Deepwater Horizon oil spill. These instruments allow monitoring of marine mammal populations for a variety of species (e.g. sperm whales, beaked whales, delphinids, Bryde's whales). Our proposed project would extend the temporal sampling and expand the spatial coverage of passive acoustic monitoring to include the entire GOM, to allow monitoring for marine mammal restoration efforts including habitat modeling and the study of impact assessment from anthropogenic noise and vessel collisions. Current long-term Passive Acoustic Monitoring (PAM) efforts in the Gulf of Mexico consist of five sites that were designed for damage assessment following the Deepwater Horizon oil spill. These sites have been operating continuously since summer 2010 and are collecting data using High-frequency Acoustic Recording Packages (HARPs). The High-frequency Acoustic Recording Package is uniquely capable of collecting continuous broadband acoustic data suitable for marine mammal density estimation for the full range of species. No other autonomous acoustic monitoring hardware is available that can match the HARP's capabilities for bandwidth and deployment duration. Likewise, the Scripps Institution of Oceanography has unique capabilities for collecting, processing, and analyzing large acoustic data sets for marine mammal calls. Our project partners, University of St Andrews Centre for Research into Ecological and Environmental Modeling (CREEM), have world-leading capabilities for providing density estimates from long-term passive acoustic monitoring datasets. Together, we have been working with NMFS SEFSC to use these density estimates as part of a habitat model, integrating both visual and acoustic data into the final model. Our vision for this project is to create a passive acoustic monitoring network that includes sensor coverage for the entire US Gulf of Mexico. The rationale for this plan is to allow robust estimates of marine mammal populations, sufficient spatial coverage for habitat modeling, and detailed models of soundscape including both broadband and directional information. Density estimation using passive acoustic data requires supplementary information on animal sound production rates (cue rate), source levels and behavior. We have been working to develop density estimates for deep diving cetaceans, delphinids, and Bryde's whales in the Gulf of Mexico. As a component of the overall project, we propose to collect data on animal diving and vocal behavior using suction-cup attached acoustic recording tags, in addition to constructing acoustic tracking arrays at selected monitoring sites. These data will provide the supplementary information (detection distance, call production rates) needed to expand the range of species that are amenable to density estimation.	$1,500,000
Informing Sea Turtle Restoration and Management by Creating a Baseline Health Index Based on Skin Microbiomes	A multitude of restoration projects have been proposed within the footprint of estuarine critical habitat for the federally protected Gulf Sturgeon (GS), thereby triggering regulatory provisions of the Endangered Species Act. Estuaries serve as winter foraging habitat for juvenile sturgeon, yet relatively little is known about the spatiotemporal patterns of estuarine habitat use, or the degree of preference for mesohabitats such as oyster reefs, seagrass beds, or mud flats. This information is critical for guiding projects through the Federal regulatory process, and for determining effective strategies for estuarine restoration to benefit the GS. Also unknown are patterns of recruitment, growth, and survival of juvenile	$500,000

	GS, yet this information is fundamental to quantifying the success of Gulf-wide restoration efforts. Following an approach recently demonstrated in the Apalachicola River system, we propose to conduct a multi-year assessment of 1) the spatiotemporal trends in estuarine habitat use by juvenile GS via sonic telemetry and habitat mapping, and 2) trends in Age-1 juvenile sturgeon recruitment, growth, genetics, and survival using proven fisheries techniques across the following 5 GS populations and estuaries: Pearl, Pascaguola, Escambia, Apalachicola, and Suwannee. Most importantly, this project will provide the data necessary to evaluate the impact of restoration projects proposed within the critical estuarine habitat of GS. Also of great importance, this project will establish the necessary baseline for determining whether restoration projects succeed at increasing the production of Gulf Sturgeon, and/or improving the growth rates and survival of juvenile GS in populations affected by the Gulf Oil Spill- the ability to directly measure the effect of restoration projects is critical. This project will also reveal the effective number of spawning adults that successfully contribute to the next generation. This metric will help to evaluate the outcome of restoration activities like fish passage/barrier removal projects. This project will be coordinated by a dedicated USFWS biologist, and executed through a cooperative partnership with state, federal, and academic institutions across the northern Gulf of Mexico. The project will leverage the resources of existing projects involving passive telemetry arrays, such as those currently deployed in Lake Pontchartrain and the Pearl River system. Funding for this project will provide the resources and will yield the knowledge and commitments necessary to continue monitoring juvenile GS in these systems into the future, thereby achieving the ultimate goal of assessing effects attributable to Gulf-wide restoration efforts over the long-term. Furthermore, the project will greatly advance our understanding of juvenile GS dynamics and environmental relationships within estuarine habitats, a key objective for recovery of this federally-protected, iconic species.	
2018/19 Update of NRDA Mesophotic Reef ROV Studies	The Deepwater Horizon (DWH) oil spill and a prolonged Unusual Mortality Event(s) (UMEs) in the northern Gulf of Mexico made it exceedingly clear that knowledge of bottlenose dolphins in much of the region is insufficient to be able to provide optimal protection as mandated under the Marine Mammal Protection Act. Stock boundaries have been largely assigned arbitrarily for management purposes based on geography rather than on dolphin biology. Abundance estimates are out of date for many putative Gulf stocks and are unusable for stock assessments. In the absence of ranging information, it was difficult for managers to assign specific mortalities or health conditions during the DWH and UMEs to specific stocks. These shortfalls complicated efforts to assess the impacts of large scale environmental or mortality events, and inadequate baselines currently exist for accurately evaluating recovery or preparing for future large-scale events. A concerted effort has been made since 2012 to rectify some of these issues by developing a collaborative tool to combine dolphin photographic identification catalogs from around the Gulf. Utilizing the OBIS-SEAMAP photo identification application as an end product, the Gulf of Mexico Dolphin Identification System (GoMDIS) is a Gulf-wide effort to compile available photo-ID catalog images and data from collaborating researchers to document movements of dolphins, through web-based comparisons of regional catalogs. It is a central repository and archival location for identification photos and associated metadata, providing the basis for detecting large-scale movements of individual dolphins among the relatively limited study areas of the individual investigators. To better assist managers with decision-making, collaborators will be asked for additional information. By incorporating data on adverse human interactions, areas of NOAA concern can be better identified, for increased law enforcement or education. A communication gap bet ween the stranding network and photo-ID programs can be bridged by building a platform utilizing a cloud system to make GoMDIS more ‘real-time,’ facilitating incorporation and dissemination of stranding data in a more timely, efficient manner to all interested parties. Priority searches for stranded animals among compiled photo-ID catalogs will expeditiously provide vital information to identify where management actions might be required. Incorporation of a new system for automating the fin matching process will expedite the process.	$3,825,000

Microscale Landers on Mesophotic Reefs	Many questions remain regarding the environmental effects of the Deepwater Horizon oil spill (DWH) petroleum/dispersant system on Gulf ecosystems. Cetaceans, as top predators, are an important component of Gulf of Mexico (GoM) ecosystems and can act as sentinel species for ocean health. However, outside of research in bays, sounds, estuaries and associated coastal waters, where they were found to have serious health conditions consistent with exposure to petroleum products, dolphins have received very little research attention with regards to the impacts of the DWH petroleum/dispersant system (PDS). The West Florida Shelf (WFS) and Mississippi-Alabama Shelf (MAS) occupy much of the eastern GoM. Two cetacean species regularly inhabit these shelves, bottlenose dolphins (Tursiops truncatus) and Atlantic spotted dolphins (Stenella frontalis). Based on the documented distribution of these animals in shelf waters of the northern GoM, and their year-round occurrence, individuals or populations of these species were likely exposed to PDS, and they could be exposed to future spills as well. Accurate assessment of the potential impacts of exposure, as well as the ability to monitor recovery, requires detailed knowledge of the ecology and health of these animals. Unfortunately, little is known about shelf dolphins. The proposed research will be the first-ever systematic tagging, tracking, and health assessments of dolphins in GoM shelf waters. The overarching goal is to apply existing and developing tools and approaches to address gaps in existing knowledge of the effects of exposure to PDS for shelf dolphins. The specific objectives for the proposed research include: 1) Improve understanding of stock structure through tagging, tracking, and genetic sampling; 2) Establish baseline data on environmental contaminant concentrations in dolphin tissues; 3) Obtain baseline dolphin health data; 4) Evaluate potential relationships between lung disease and respiration and diving patterns; and 5) Develop and refine tools for remote dolphin health assessment. The proposed project will apply a suite of tested and new tools under the novel situation of the deep water of the WFS to meet these objectives. The project will involve capture-release health assessments, tagging with satellite-linked, time-depth-recording transmitters, and biopsy dart sampling.	$2,250,000
Unmanned Underwater Vehicles - U.S. Navy / NOAA Collaboration	There is a strong need to learn about the ranging and dive patterns of small cetaceans in the Gulf of Mexico waters. Satellite-linked telemetry has advanced greatly in recent decades, to the point where small tags can reliably provide such data for periods of months, with little risk to the animals. The limiting factor for collecting the needed information is acquiring the animals for tagging. In shallow inshore waters, capture-release techniques exist for accessing small groups of bottlenose dolphins for such tagging. However, in deeper offshore waters, capture opportunities are limited to hoop-netting individual small cetaceans. There is a strong need for a technique that would allow safe deployment of satellite-linked transmitters without needing to capture the dolphins. It would be very desirable to develop a technique for attaching standard satellite-linked tags to small cetaceans that ride below the bow of small vessels. Preliminary designs have been developed, but production and testing are required.	$9,320,000
Gulf of Mexico Pelagic Ecosystem Technical Advisory Group	DeSoto and Mississippi Canyons provide important habitat for Bryde's whales and sperm whales, respectively, as well as for other oceanic marine mammals and deep-sea coral communities. The northern Gulf of Mexico stock of Bryde's whales inhabits DeSoto Canyon and adjacent continental slope waters extending east and south of the Canyon, and Bryde's whales are the only regularly occurring baleen whale in the Gulf (Rosel and Wilcox 2014, Rosel et al. 2016). The northern Gulf of Mexico stock of sperm whales also represent a distinct stock in the Gulf. Sperm whales are found throughout offshore waters of the Gulf, but the Mississippi Canyon represents an important feeding area (Jochens et al. 2008). Both species of large whales were impacted by the Deepwater Horizon (DWH) oil spill, with estimates of 17 percent of the Bryde's whale population killed and 6 percent of the sperm whale population killed (DWH MMIQT 2015). Mississippi Canyon was subject to intense and prolonged oiling below and at the surface during the spill (Stout et al. 2015). DeSoto Canyon was less heavily contaminated but also experienced oiling at the surface and seafloor (Brooks et al. 2015). Other marine mammals found regularly or occasionally in these areas include Atlantic spotted dolphins, Blainville's beaked whales, Cuvier's beaked whales, Gervais' beaked whales, dwarf and pygmy sperm whales, oceanic and continental shelf	$2,000,000

	stocks of bottlenose dolphins, pantropical spotted dolphins, Risso's dolphins, rough-toothed dolphins, short-finned pilot whales, spinner dolphins, and striped dolphins (Waring et al. 2013). Less is known about the distribution of other oceanic marine mammals within these areas, such as Clymene's dolphins, Fraser's dolphins, killer whales, false killer whales, melon-headed whales, and pygmy killer whales. The designation of marine protected areas was noted by the DWH Trustees as a mechanism for addressing key threats to mesophotic and deep benthic communities (PDARP/PEIS Section 5.5.13.3). However, no information was provided in the PDARP/PEIS on what specific areas in the Gulf the Trustees might be considering for such designation. The Commission believes that areas that provide protection for multiple species, including marine mammals, should be priorities for designation. Habitat density maps for sperm whales, Bryde's whales, and other marine mammal species that occur in these areas of the Gulf can be found at: http://seamap.env.duke.edu/models/Duke-EC-GOM-2015/ References: Brooks, G.R., et al. 2015. Sedimentation pulse in the NE Gulf of Mexico following the 2010 DWH blowout. PLoS ONE 10(7):e0132341. DWH MMIQT (Marine Mammal Injury Quantification Team). 2015. Models and analyses for the quantification of injury to Gulf of Mexico cetaceans from the Deepwater Horizon oil spill. DWH Marine Mammal NRDA Technical Working Group Report. Jochens, A., et al. 2008. Sperm whale seismic study in the Gulf of Mexico: Synthesis Report. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, Louisiana; OCS Study MMS 2008-006, 323 pp. Rosel, P.E., and L.A. Wilcox. 2014. Genetic evidence reveals a unique lineage of Bryde's whales in the northern Gulf of Mexico. Endangered Species Research 25:19–34. Rosel, P.E., et al. 2016. Status Review of Bryde's Whales (Balaenoptera edeni) in the Gulf of Mexico under the Endangered Species Act. NOAA Technical Memorandum NMFS-SEFSC-692. 133 pp. Stout, S.A., et al. 2015. Spatial extent ("footprint") and volume of Macondo oil found on the deep-sea floor following the Deepwater Horizon oil spill. (CHEM_TR.16). DWH Natural Resource Exposure NRDA Technical Working Group Report. Waring, G.T., et al. (eds). 2016. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2015, 501 pp.	
Saturation Diving Capability - U.S. Navy / NOAA Collaboration	Objectives: • Maintain the Cooperative Marine Turtle Tagging Program (CMTTP) • Initiate and maintain an online comprehensive inventory of PIT tags Many programs supporting the management and conservation of sea turtle populations in the Gulf of Mexico and northwest Atlantic waters rely on tagging sea turtles with flipper tags and/or PIT (passive integrated transponder) tags. These tagging efforts are worthless if recovered tags cannot be matched with data from the original tagger. Almost all flipper tags in the Gulf of Mexico and northwest Atlantic waters are issued through the Cooperative Marine Turtle Tagging Program (CMTTP), which was established by the National Marine Fisheries Service (NMFS) to provide a centralized tag database for management purposes (NMFS reserves the right to access the CMTTP database) and to prevent loss of data and duplication of identification codes. In April 1999, the management of the CMTTP was transferred from the Miami Laboratory of the Southeast Fisheries Science Center to the Archie Carr Center for Sea Turtle Research (ACCSTR) at the University of Florida. In recent years, 127 organizations have received flipper tags from the CMTTP. About 10,000 tags are distributed each year. For example, 13,750 flipper tags and 82 tag applicators were distributed in 2016. All flipper tags have a University of Florida return address. The centralized flipper tag database now has 139,680 entries. The use of PIT tags is increasing because of their extremely low loss rate (approaching zero) compared with loss of flipper tags. However, coordinating data from PIT tags is a greater challenge than flipper tags because PIT tags, unlike flipper tags, do not carry a return address and are not distributed in numerical sequence. An online comprehensive inventory of PIT tags is needed so that if a turtle with a PIT tag is found, the group that tagged the turtle can be identified and data exchanged. When PIT tag data are submitted to the CMTTP, they are entered into a PIT tag database. That database now has 55,640 entries, but this is a fraction of the PIT tags inserted into turtles. There is still a need for a PIT tag database that lists all PIT tag codes with the contact information for the tag originators. The CMTTP is the contact for unscrambling encrypted PIT tags within NMFS. We are submitting this idea proposal to maintain the	$29,100,000

	Cooperative Marine Turtle Tagging program and to initiate and maintain an online comprehensive inventory of PIT tags. We have submitted a 3 year estimated budget.	
Establishing and Monitoring Sentinel Sites for Gulf of Mexico Coralline Mesophotic and Deep Benthic Communities	The Mississippi River birdsfoot delta provides habitat for a wide array of estuarine and open ocean dependent species of birds, fish, and invertebrates. Hydrologic disruptions and coastal erosion of the estuarine marshes have led to large losses of this important habitat. This loss is expected to increase with the recent arrival of an invasive scale insect which attacks roseau cane (Phragmites spp.). The major passes or channels of the delta have infilled with material for a number of reasons and now prevent the seaward flow and deposition of river sediments into receiving ponds and bays. Project would dredge the major passes which bisect the delta, restoring hydrologic flow and sediment transport, and deposit that material in a manner which rebuilds and stabilizes eroding shorelines on the seaward edge of the delta. Project would enhance transport and natural deposition of river sediments while protecting existing shorelines and estuarine marshes. Newly created shoreline/islands provide nesting, loafing, and wintering habitat for a number of colonial nesting seabirds, shorebirds, and other estuarine dependent species of birds. Protection of marshes and interior ponds and bays will serve to promote growth of submerged aquatic vegetation and emergent marsh vegetation which provide spawning and nursery habitat for a number of coastal and open ocean species of fish and invertebrates including several commercially important species such as white and brown shrimp and blue crab. Project can be easily scaled up or down during each phase based on available funding and project contract costs. Project would be constructed in phases over the course of 10-15 years and would include areas on both Delta National Wildlife Refuge (USFWS) and Pass-a-Loutre Wildlife Management Area (Louisiana Department of Wildlife and Fisheries). Phase 1 would place material along approximately 4 miles of shoreline beginning at the north bank of Pass-a-Loutre pass at the south-east boundary of the refuge. Material would be placed in a linear band to a width of 400 feet and initial pump height of 5-7 feet along the centerline. Material would be placed unconfined and allowed to seek natural slope. Each mile of material placed in this configuration would create approximately 50 acres of subaerial habitat for a total construction of approximately 200 acres of subaerial habitat. In addition tidal and subtidal mudflats and shallow water habitats would be created on each side of the band as pumped material slopes outward. Protective shoreline would decrease wave fetch and promote the establishment and growth of submerged aquatic vegetation in interior bays and ponds. Fish passage features would be created at predetermined intervals, interval, and design to be determined in consultation with NOAA National Marine Fisheries staff. Future phases would create up to 40 miles of similar features/habitat over the course of next 15 years if funded during future funding cycles.	$3,712,840
Assessing recovery rates of deepwater organisms in the northern Gulf of Mexico through multigear examinations of species assemblages, community structures, distributions, trophic relationships and interannual variability in abundances.	The Deepwater Horizon (DWH) incident in the northern Gulf of Mexico (GOM) occurred on April 20, 2010 at a water depth of 1525 meters, in Mississippi Canyon Block 252, releasing an estimated 3.19 million barrels of oil over the following 87 days. As part of the Natural Resource Damage Assessment (NRDA) process, a study comprising three field surveys (2010, 2011, and 2014) was conducted to identify effects of the spill on the deep-sea, soft-bottom benthos and sediment quality. Results revealed a zone of severe to moderate impacts on biodiversity linked to the DWH wellhead that persisted through 2014. Thus, an obvious restoration goal for the deep sea is to return biodiversity and other key benthic attributes to normal reference-range conditions. It is hypothesized that burial of the damaged habitat by natural deposition processes will cap the damaged sediment and restore the benthos to background conditions. The obvious question is: how much sediment is needed to cap the DWH contamination, and long will this take? Based on the NRDA studies, 95% of the benthos is within the top 10 cm of sediment. A recent examination of deep-sea sediments in the area of the 1979 Ixtoc spill, found 4 cm of fresh sediment on top of the damaged sediment. Using this rate, it is hypothesized that it will take another 65 years to have a total of 10 cm at the Ixtoc site, which implies it takes about 100 years for deep-sea sediments to recover naturally. Thus, the restoration strategy for deep-sea soft-bottom benthos must be a long-term study to monitor the recovery rate and verify that this assumption is correct. Now is the time to begin planning specific	$18,000,000

	projects for the open ocean and deep-sea benthos, because the Damage Assessment and Program Restoration (DARP) report is complete and the Open Ocean Restoration activities are being developed. However, two challenges exist: (1) rates of change in the deep sea are very slow, and (2) we know very little about temporal dynamics in the deep sea Gulf of Mexico. Until we understand basic temporal dynamics, it will be difficult, if not impossible, to ascertain if change is a result of recovery, seasonal dynamics, or year-to-year variability. Thus, the proposed sampling strategy includes both a long-term monitoring strategy to measure recovery and a short-term experiment to identify temporal dynamics. A third component of the strategy is to analyze archived samples of opportunity collected in 2015, 2016, and 2017 during Gulf of Mexico Research Initiative (GOMRI) funded cruises, where analyses of the benthic samples were not funded. The long-term monitoring study would include sampling 34 NRDA stations bi-annually (every 2 years) until recovery occurs (or for the length of the RESTORE program, which-ever occurs first). The 34 stations consist of 20 moderately and severely impacted sites, and 14 non-impacted sites. Spatial coverage across the treatment categories is necessary as a basis for comparing impacted versus non-impacted areas. The temporal dynamics experiment would entail quarterly sampling over two years at six stations. Quarterly sampling is necessary to identify if seasonality exists, and a two-year cycle is required to confirm that the patterns are repeatable. Three stations in the heavily impacted zone and three stations from non-impacted zone would be sampled in order to determine recovery based on whether spatial differences between treatments are distinguishable from natural temporal dynamics. The analysis of archived GOMRI samples will extend the NRDA time series and act as a segue to RESTORE funded monitoring. The GOMRI project was funded to perform the benthic analyses at the Ixtoc oil spill site, but additional samples were collected in the northern GOM near the DWH spill site.	
Restoration and Assessment at Post-Disturbance Recovery for Deep Water Coral Habitats	Executive summary: Restoration programs exact an adherence to statutory obligations as well as public accountability, transparency, and participation in the process itself. Terra Mar Applied Sciences, LLC, proposes to adopt and apply an administrative model used effectively by the Exxon Valdez Oil Spill Trustee Council to furnish peer-review, project evaluation, and other support services for program components of the Open Ocean (and potentially other) Trustee Implementation Groups (TIGs) that oversee bird restoration after the Deepwater Horizon incident. Scope for these services would cover primarily those injured bird species that do not nest in Gulf states. Project period would run at least five (5) years, be implemented in stages using standards of peer expertise, accountability, and transparency, and rely substantially on existing stakeholder networks to enhance synergies for optimizing long-term restoration success. Roles and responsibilities for Terra Mar would include: 1) designing and conducting an independent, expert peer review system for avian monitoring, research, and/or restoration projects on behalf of TIG(s); 2) evaluating the recurring or completed bird restoration projects on behalf of TIG(s); 3) building and facilitating a network of practitioners to work collaboratively towards the TIGs' identified restoration goals; and 4) organizing and/or hosting workshops, symposia, or conference sessions to report out the TIGs' restoration achievements in publicly-accessible venues. All decision-making authority for restoration projects and funding allocations would reside solely with the TIGs. Terra Mar would furnish regular, expert guidance to TIGs about priority-setting methodology, furnish design input on crafting requests for proposals (RFPs), and help craft criteria for proposal evaluation, make recommendations to improve project quality, and facilitate a participatory administrative and project selection process that fosters wide public involvement and encourages a broad sense of ownership in the restoration outcomes for open ocean bird species. Rationale: Dimensions of the Deepwater Horizon blow out and the subsequent oil spill, both temporally and spatially, were such that birds and their habitats were affected over an unprecedented geographic scale. Consequently, achieving restoration under these particular conditions is fraught with substantial logistical obstacles: 1) the daunting scope and scale of the Gulf ecosystem itself as well as the range of open ocean bird species affected; (2) the very large number of partners, stakeholders, and kinds of expertise that are involved, including collaboration with international teams; and (3) the amount of funding ultimately needed to	$2,950,000

	successfully design and implement a comprehensive, Gulf-wide avian monitoring program (e.g., GoMAMN 2017). Of the 25 species identified as primarily offshore and targeted for restoration (Table 4.7-3 of the Final Programmatic Damage Assessment and Restoration Plan), some 15 of those species breed entirely or mostly outside the jurisdictions of the five Gulf states affected by the spill, or outside the jurisdiction of the U.S. entirely. Consequently, the types and diversity of professional expertise required to implement a truly comprehensive restoration program must, necessarily, involve many actors, organizations, types of research specialties, and working beyond U.S. borders.	
Expanding Seabird Observer Placements in Support of the Gulf of Mexico Marine Assessment Program for Protected Species (GOMMAPPS)	The Mississippi River birdsfoot delta provides habitat for a wide array of estuarine and open ocean dependent species of birds, fish, and invertebrates. Hydrologic disruptions and coastal erosion of the estuarine marshes have led to large losses of this important habitat. This loss is expected to increase and accelerate with the recent arrival of an invasive scale insect which attacks roseau cane (Phragmites spp.). Roseau cane is the dominant vegetation type over many tens of thousands of acres on Delta National Wildlife Refuge (refuge) and throughout large portions of coastal Louisiana. These marshes stabilize and protect the muck soils found in many areas and consist of a matrix of both submerged aquatic vegetation and emergent marsh vegetation. These habitats provide spawning and nursery habitat for a number of coastal and open ocean species of fish and invertebrates including several commercially important species such as white and brown shrimp and blue crab. Project is in an area and marsh type directly impacted by the Gulf Spill. This project would build upon a three (3) year study completed in the fall of 2016 which tracked the growth and health of roseau cane in select areas within the refuge. These areas have recently been invaded by the scale insect and represent a unique opportunity to track the fate and potential recovery of roseau cane through both pre- and post-infestation data. Project would provide for 2 aerial overflights to map extent and possible future spread of impacted areas. It would also provide for the collection and analysis of 3 years of vegetation data designed to track the health, growth, fate, and possible early recovery rates of impacted marshes. Initial study was funded by private industry and through in-kind contributions of NOAA and the USFWS. Contributions toward initial study included: Private Industry - $100,000.00 NOAA - In-kind services of personnel for field investigation, project design, sampling protocols review USFWS - in-kind services of personnel.	$72,436
Restoration of Gulf of Mexico Fisheries through Enhanced Monitoring and Assessment	The Gulf of Mexico is home to a resident population of Bryde's whales that currently numbers less than 40 individuals and is being considered for listing as an endangered species. Gulf of Mexico Bryde's whales are subject to a number of anthropogenic threats, including ship strikes and the adverse effects of oil and oil dispersant exposure during oil spills. Effective mitigation of these threats will require a better understanding of their distribution in the northeastern Gulf of Mexico, and a means to assess their occurrence in near real time. The Woods Hole Oceanographic Institution (WHOI) has developed technology to detect, classify, and report the sounds of marine mammals in near real time from a variety of autonomous platforms, including Slocum gliders, wave gliders, and moored buoys (Baumgartner and Mussoline 2011, Baumgartner et al. 2013, Baumgartner et al. 2014). Since 2012, this technology has been used extensively on the U.S. and Canadian east coasts and in the U.S. Arctic to monitor and study marine mammals. Recent evaluations suggest that analyst-verified detections from this system are nearly 100% correct when estimating the presence of baleen whales in near real time. Detection data are immediately available on the publicly accessible robots4whales.whoi.edu website, as well as by text, email, and tweet (@Robots4Whales). WHOI and NOAA are working closely with the U.S. Coast Guard to distribute these data via the Whale Alert app (www.whalealert.org), Coast Guard CG1View software, and AIS so that mariners have access to whale presence information. The objectives of the proposed project are to (1) demonstrate and evaluate near real-time detection of Bryde's whales from mobile autonomous platforms and (2) characterize the distribution and habitat of Gulf of Mexico Bryde's whales using acoustic detections from these platforms. The project seeks to use Slocum and/or wave gliders equipped with the WHOI-built near real-time acoustic monitoring system to survey the outer shelf and continental slope (100-2000 m) of the northeastern Gulf of Mexico during 2018-2019. Two surveys will be conducted per year, with each survey lasting 3-4 months. In addition to detecting Bryde's whales in near	$15,000,000

	real-time, broadband audio will be recorded continuously from the vehicles to facilitate detection of other species after platform recovery. Detection data will be manually verified in near real time and distributed to the public and numerous stakeholders (including scientists, federal and state protected resource managers, Coast Guard, and the shipping industry) via robots4whales.whoi.edu, text, email, Twitter, and the Whale Alert app. After recovery of a vehicle, the recorded audio will be manually reviewed for Bryde's whale calls, and the results of this review will be compared to the detections made in near real time to determine the accuracy of the near real-time occurrence estimates. Additionally, associations between Bryde's whale acoustic detections and observations of remotely sensed sea surface temperature, surface chlorophyll, depth, and depth gradient will be statistically examined to characterize the species' habitat in the northeastern Gulf of Mexico. If of interest, the WHOI system can be expanded to include near real-time detection of endangered sperm whales with modest development funding. References: Baumgartner, M.F. and S.E. Mussoline. 2011. A generalized baleen whale call detection and classification system. Journal of the Acoustical Society of America 129:2889-2902. Baumgartner, M.F., D.M. Fratantoni, T.P. Hurst, M.W. Brown, T.V.N. Cole, S.M. Van Parijs, and M. Johnson. 2013. Real-time reporting of baleen whale passive acoustic detections from ocean gliders. Journal of the Acoustical Society of America 134:1814-1823. Baumgartner, M.F., K.M. Stafford, P. Winsor, H. Statscewich, and D.M. Fratantoni. 2014. Glider-based passive acoustic monitoring in the Arctic. Marine Technology Society Journal 40(5):40-51.	
Restoration of Gulf of Mexico Pelagic and Broad Scale Fisheries: Addressing Movement Ecology Data Needs	Marine mammal strandings occur regularly in the Gulf of Mexico, but stranding rates increased substantially after the Deep Water Horizon (DWH) oil spill. Post-DWH, stranded odontocetes (toothed whales and dolphins) were in poor health and often presented with adrenal and lung disease, consistent with exposure to DWH petroleum products (Schwacke et al. 2014, Venn-Watson et al. 2015). Restoration of odontocete populations in the Gulf of Mexico could significantly benefit from an improved response to strandings. The Woods Hole Oceanographic Institution (WHOI) is developing an odontocete stranding alert system based on the digital acoustic monitoring (DMON) instrument that detects, classifies, and reports the sounds of marine mammals in real time (Baumgartner and Mussoline 2011, Baumgartner et al. 2013, 2014). WHOI's DMON instrument has been implemented in acoustically quiet moored buoys, which have been used successfully since 2015 to detect the presence of baleen whales in near real time (see robots4whales.whoi.edu for current buoy locations). The system is now being adapted to detect the whistles of odontocetes, and with NOAA Sea Grant support (proposal pending), an odontocete acoustic detection buoy will be tested in Wellfleet (Cape Cod), Massachusetts during 2018 as an early warning system for stranding events. A near-complete Sea Grant-funded WHOI study is demonstrating that whistles recorded just outside of Wellfleet Harbor occur reliably prior to mass strandings. Using advance warning from a near real-time acoustic detection system, animal rescue teams can significantly decrease response times and improve health outcomes by either (1) preventing animals from stranding (i.e., herding back to sea) or (2) ministering more quickly to recently beached animals. The objective of this proposal is to field, test and evaluate two odontocete stranding alert systems on the Gulf Coast. Exact locations of the proposed systems are to be determined in consultation with local stranding networks, but known or recent stranding hotspots (e.g., Hog Island, near Everglades City, FL) are likely candidates. Near real-time detection information from the buoys will be manually reviewed, and odontocete presence information will be publicly accessible at robots4whales.whoi.edu. Stranding networks and the NOAA Southeast Regional stranding coordinator and staff will be alerted to the presence of odontocetes automatically by text message and email immediately after detection. Members of the stranding network will evaluate the efficacy of the early warning system by comparing outcomes before and after installation of the acoustic monitoring buoys. References: Baumgartner, M.F. and S.E. Mussoline. 2011. A generalized baleen whale call detection and classification system. Journal of the Acoustical Society of America 129:2889-2902. Baumgartner, M.F., D.M. Fratantoni, T.P. Hurst, M.W. Brown, T.V.N. Cole, S.M. Van Parijs, and M. Johnson. 2013. Real-time reporting of baleen whale passive acoustic detections from ocean gliders. Journal of the Acoustical Society of America 134:1814-1823. Baumgartner, M.F., K.M. Stafford, P. Winsor, H.	$5,000,000

	Statscewich, and D.M. Fratantoni. 2014. Glider-based passive acoustic monitoring in the Arctic. Marine Technology Society Journal 40(5):40-51. Schwacke, L.H. et al. 2014. Health of common bottlenose dolphins (Tursiops truncatus) in Barataria Bay, Louisiana, following the Deepwater Horizon oil spill. Environmental Science & Technology 48:93-103. Venn-Watson, S. et al. 2015. Adrenal gland and lung lesions in Gulf of Mexico common bottlenose dolphins (Tursiops truncatus) found dead following the Deepwater Horizon oil Spill. PLoS ONE 10(5):e0126538.	
Linking Seabird Colonies to Pelagic Use Areas in the Gulf of Mexico	In the wake of the widespread environmental and ecological destruction caused by the BP oil spill, there can be no higher priority than ensuring the health and well-being of marine mammals, fish, and other wildlife populations from this point forward. Just as these populations are monitored and managed according to the use of proper science and the best available data, so too should the human dimensions of marine mammal management (i.e., how humans interact with species, awareness of proper behavior around marine wildlife, knowledge of laws to prevent problematic interactions, etc.) be assessed methodically and scientifically. Human dimensions data collection can be accomplished through the use of focus groups and scientific, probability-based surveys, which are effective and commonly used tools for gauging the human dimensions component of resource management. It is recommended that NOAA and other resource agencies avail themselves of these methods in order to develop and evaluate communications, campaign messages, and outreach strategies designed to curb harmful interactions with marine wildlife. Ongoing human dimensions data collection can reveal trends in attitudes and opinions and identify gaps in knowledge and awareness -- such data are critical to understanding the effectiveness and impact of communications, messages, and outreach strategies, ensuring the wise allocation of funds and resources.	$500,000
Restoring the Offshore, Open Ocean Seagrass Beds of the Chandeleur Islands	Habitat maps of varying quality and coverage exist in different federal, state, industry, and academic repositories, yet habitat mapping coverage in the Gulf of Mexico – particularly of deepwater areas – is far from complete. Traditional acoustic mapping techniques (e.g., multibeam and sidescan sonar, LIDAR, other remote sensing), groundtruthing, and other direct benthic data collection and processing methods have been deployed sporadically and opportunistically in the Gulf of Mexico, due in large part to their high cost. DWH injury assessment and restoration have created a new urgency for, and new partnerships around habitat mapping. This project will bring together an inventory of existing data, and establish a community through which we can share, reprocess, digitize and modernize this information in support of a single baseline map to serve as source information for activities to come (including a collaborative partnership or community of practice for data sharing and prioritization of future habitat mapping efforts).	$3,500,000
Restoring Leatherback Sea Turtle Abundance by Reducing Negative Interactions with Fisheries	The Gulf of Mexico Sturgeon Acipenser oxyrinchus desotoi “Gulf sturgeon” was federally listed under the US Endangered Species Act in 1991 by NOAA and USFWS (56FR 49653). Current management units for Gulf sturgeon include seven river systems and adjacent marine habitats across the northern Gulf of Mexico. Based on PDARP review (section 5.5.7) large numbers of Gulf sturgeon were exposed to Deepwater Horizon oil, and these fish were affected by exposure. Section 5.5.7.1 of the PDARP states that to address impacts to sturgeon, restoration goals will focus on improving access to spawning areas and increasing reproductive success of Gulf sturgeon. The 2009 Gulf Sturgeon Stock Assessment completed by W. Pine and S. Martell (see https://goo.gl/RAJAH2) with funding from NOAA & USFWS was the first effort to synthesize available Gulf sturgeon population data to determine stock status and trends. We propose to update this stock assessment to re-evaluate stock status of Gulf Sturgeon following recent events that could affect sturgeon populations including hurricanes, extreme droughts, and the Deepwater Horizon oil spill. This update will include data collected as part of the NRDA response monitoring to provide a baseline of Gulf sturgeon stock status and trend in each of the seven rivers. Phase 1 (cost ~$82000): This assessment will be useful for (1) prioritizing river systems in which to direct restoration efforts to reduce risk of population jeopardy, (2) providing baseline information from which to measure Gulf Sturgeon population responses to restoration actions or future perturbations such as oil spills or hurricanes, (3) meet Gulf Sturgeon Recovery Plan goals to use population models to inform restoration and management options. Phase 2	$2,400,000

	(cost ~$260000): We will develop an electronic data entry and management system to facilitate data collection, improve data accuracy and archiving, and increase data sharing opportunities among members of the Gulf sturgeon working group. These tools will increase data accuracy and reduce handling time making analyses more accurate and time efficient. This will enhance feedback loops between evaluating Gulf Sturgeon population responses to restoration actions under the PDARP while meeting DOI guidelines for best data management practices.	
Visual and Passive Acoustic Monitoring to Determine the Population Status of the GoMx Bryde's Whale	High resolution digital Imagery has the ability to fill data gaps and research needs in a wide variety of subject areas in a very quick and efficient way. In the past 9 months, 3 surveys have been carried out in the New York offshore planning area, an area covering 43,000 km2. Two of those surveys have complete datasets georeferenced and partially available to view through a publicly available web portal (https://remote.normandeau.com/nys_public_data.php). Information in the public view includes locations of over 15,000 birds, their flight height and direction of travel when flying, and locations and direction of travel of over 2000 marine mammals, 600 turtles, 1000 large bony fish, 900 cartilaginous fish, and nearly 7000 fish shoals. All are mapped and information is available to be filtered by species, making it possible to associate species presence with sea depth and other important covariates. Jelly fish are visible in the imagery, and also collected and mapped are images of boating traffic. In the fall survey, active gill net, trawler, commercial shell fishing, and recreational vessels were identified and mapped. Although these are not available in the public view, they contribute a key piece of the puzzle of what is where and why. These kinds of data are exactly what are needed in the Gulf of Mexico, to form a complete picture of how the Gulf is being used. Data collected now can be used to monitor the future success or failure of the many projects that are currently targeted to improve the overall health of the ecosystem and maintain and increase the diversity and density of animals using the Gulf of Mexico. This is the basis of this project idea. A BOEM study completed in 2013 (https://www.boem.gov/ESPIS/5/5272.pdf) found that turtle densities were under-recorded by between 4x and 10x when data were collected by visual methods using low altitude aircraft or boats. Primary reasons for this were repulsion from the survey vessel (i.e. the animals dived), and opacity of the water column from an oblique view (boat observers can't see down). The behavior of marine mammals is also influenced by vessel traffic. The same study found that estimated densities of dolphins were potentially inflated by attraction to the boat survey vessel. The camera technology available today provides massive megapixel sensors and allows for ultra-high resolution, revolutionizing imagery as an efficient data collection method. The recent New York study is identifying over 90% of birds to species, and even finding flight heights for around 70% of flying birds (https://remote.normandeau.com/docs/NYSERDA%20Fall%202016_Taxonomic%20Analysis%20Summary%20Report.pdf). Marine mammal and turtle identifications are also high, with success influenced primarily by subsurface depth obscuring important diagnostic features of similar species (i.e. beaked whales). It takes 9 days to collect data across the New York offshore planning area (https://remote.normandeau.com/nys_overview.php). Vast areas of the Gulf of Mexico could have essential, very detailed data collected very quickly and efficiently. The use of high altitude (1360 feet) and high resolution (1.5 cm or better) allows detailed surveys to be provided across state and federal borders, with results highlighting patterns across the entire Gulf of Mexico. Using zigzag transect design and stopping at strategic coastal airport locations en route, the entire area from Florida to Texas could be relatively easily and quickly surveyed depending on the percent coverage deemed appropriate. Multiple seasonal surveys in a year would allow observation of variations in interseasonal and interannual density, diversity and distribution as well as identifying hotspots of foraging activity, prey locations, and anthropogenic use. The method would provide much needed data in places where data are not only sparse but frequently absent.	$579,600
Using Unmanned Aerial Systems (UAS; AKA Drones) to Assess and	Sea turtle monitoring is biased toward nesting aggregations. Whereas this approach provides valuable information about sea turtle nesting populations, it does not address the foraging locations, which is where sea turtles spend the majority of their time. The programmatic restoration plan highlights the need for robust monitoring both to track restoration	$1,731,063

Monitor the Health of Individual Bryde's and Sperm Whales in the Northern Gulf of Mexico	projects and address critical information gaps such as spatiotemporal distribution and movements. We propose a Gulf-wide effort to enhance foraging area monitoring by sampling sea turtles at the nesting beach and using intrinsic markers to determine foraging area origin. This effort can permit long-term tracking of foraging area abundance trends without having to monitor the in-water populations directly. Identifying origins can also help identify the spatial overlap between foraging area hotspots and threats such as commercial fisheries. Tissue samples collected from nesting females with a non-invasive protocol will be analyzed for stable isotopes, which are biological markers that can be used to reveal information about the habitats used by organisms without having to observe them directly. The most commonly used isotopes in marine studies are carbon and nitrogen. Both of these elements are incorporated by primary producers at the base of the food web and are then transferred through trophic levels. Because of baseline differences in the isotope signals from different regions in the ocean, stable isotope concentrations can reflect location and can be used for tracking marine animal movements. A stable isotope approach to determining origin has been validated in a number of sea turtle populations around the world, and in the Gulf of Mexico (GoM), spatial patterns in the stable isotope composition of loggerhead tissues have been mapped using an isotopic landscape, or isoscape, approach. The method was validated in the GoM to be able to assign nesting loggerheads to a foraging area origin with high accuracy. Thus, stable isotope analysis will be a very powerful tool to effectively determine geographic origin for large numbers of untracked nesting sea turtles in the GoM. The proposed project addresses the need for information on sea turtle spatiotemporal distribution, migration patterns, and habitat use highlighted in the programmatic restoration plan. In turn, these data may also be used to assess progress toward recovery goals. We propose that these stable isotope tracking efforts be supported for three species (loggerheads, green turtles, and Kemp's ridleys) on a Gulf-wide basis. The work will consist of two primary objectives: 1. Create species-specific isoscapes: A previously published isoscape is available for loggerhead turtles in the GoM (Vander Zanden et al. 2015) but must be developed for green turtles and Kemp's ridleys. In order to create these isoscapes, tissue samples are required from known-origin individuals. Therefore, we will obtain samples from satellite-tracked or in-water turtles by working with various teams that are currently deploying satellite telemetry units. The isotope data will be mapped and interpolated in a geospatial framework to develop new isoscapes for green turtles and Kemp's ridleys using a similar protocol that was used for the loggerhead isoscape. 2. Long-term nesting beach monitoring: We propose long-term sample collection in conjunction with nest beach monitoring programs already in operation for the three species. Skin samples will be collected on an annual basis for each of the three species, and foraging area origin will be determined with the isoscapes from the previous step. The estimated budget will provide three years of project support, but monitoring should be continued for a minimum of ten years in order to examine any trends that may occur as a result of Gulf-wide restoration efforts and highlight geographic regions of high use that may coincide with anthropogenic activities.	
Restoration and Assessment of Post-Disturbance Recovery for Deep Water Coral Habitats	The human microbiome project has made it mainstream news that our microbes are a critical part of our biology–linked to nutrition, physical and mental health. Corals also have many associated microbes that are an integral part of their biology. It is critical to have a baseline for Gulf of Mexico (GOM) coral microbiomes in order to improve understanding of mesophotic and deep-sea communities to address critical uncertainties, inform management, and ensure resiliency. Microbes are the most quickly-adaptable part of coral, responding to environmental changes and stressors long before effects are visible. Having available baselines will provide the necessary benchmark against which future samples can be compared, allowing detection of impacts, and providing a guideline for restoration. These coral-associated microbes are sensitive indicators of coral health and without knowing what a healthy microbiome looks like, it is impossible know if you have restored back to the healthy state or instead created a shifted baseline of 'better but not fully functioning.' Currently, the only baseline microbiome data available for deep-sea corals in GOM are for Lophelia pertusa (Kellogg et al., 2009, DOI: 10.1128/AEM.02357-08; Kellogg et al., 2017, doi: 10.3389/fmicb.2017.00796). Flocculent material associated	$2,950,000

	with Deepwater Horizon impacted octocorals impacted was examined (Simister et al., 2015, DOI: 10.1016/j.dsr2.2015.01.010i), but the closest comparisons available for healthy baseline microbiomes for octocoral species come from outside the GOM and may have regional differences that make them less useful for determining local impacts (Gray et al., 2011, DOI: 10.1111/j.1574-6941.2010.01033.x; Lawler et al., 2016, DOI: 10.3389/fmicb.2016.00458; Kellogg et al., 2016, DOI: 10.7717/peerj.2529). New microbiome data would be made available to the larger restoration, management, and research community via NCBI's Sequence Read Archive, an internationally recognized public data repository maintained by the US Federal Government. The proposed project would require a ship and remotely-operated vehicle (ROV) for proper collections. Samples would be preserved onboard; microbiomes would be sequenced using Illumina MiSeq. To reduce expenses and sample collections, this project could be combined with studies that require coral samples such as population genetics/connectivity, coral health assays, coral age/growth rate, or restoration. This could include sharing ship/ROV time and coral samples to maximize the information garnered per collection. Target areas for sampling include areas impacted by the oil spill and control sites. Mesophotic sites: Alabama Alps, Roughtongue Reef, Yellowtail Reef, Coral Trees and Madison-Swanson South. Deep sites: Green Canyon (GC852), Mississippi Canyon (MC297, MC344, MC507, MC203), Viosca Knoll (VK826), and West Florida Slope.	
Enhancement to the GOMMAPPS Aerial Surveys	We propose a biennial science exchange for researchers and managers working with sea turtles in the Gulf of Mexico. The objectives of the project are to: 1) Provide a venue for exchange of current approaches to restoration, monitoring, and research of all sea turtle species found in the Gulf of Mexico. 2) Promote collaborative interactions and synergies among groups receiving restoration funds earmarked for sea turtles. As settlement funds will be allocated over a 15-year period, we propose to gather the Gulf of Mexico sea turtle community every other year during the duration of the settlement period. This will help the community evaluate the status of monitoring and adaptive management in order to help determine if restoration objectives are being met, as outlined in the Final PDARP. The format of the science exchange will differ from a traditional scientific meeting in that presentations will be limited in time, and longer periods will be devoted to discussion and group interactions. Registered participants will be asked to give 5-minute lightning talks highlighting progress on their restoration projects, followed by 10-minute question and answer periods. Longer blocks of time will be devoted to facilitated group discussions so that the community can identify continued priorities, pinpoint gaps in restoration activities, and target future goals with a comprehensive vision. The budget will provide funds for two science exchanges of two days in duration within a three-year period, with the idea that biennial meetings will continue into the future. The location would rotate among the Gulf states. Meals will be provided in a community setting to promote interactions and networking among participants. Groups with active sea turtle restoration funding would be encouraged to participate and supported under the project, while any other attendees would be welcome.	$1,000,000
Using Sperm Whales as Indicators of Deep-Water Gulf Ecosystem Health and Recovery	NOAA's proposed rule to require Turtle Excluder Devices (TEDs) in skimmer boats is expected to be finalized during the summer of 2017. TED specifications will differ from the normal design, and net shops are waiting for the final rule to begin manufacturing. Due to the lack of existing TEDs (3-inch spacing for smaller sea turtles), NOAA has stated that the requirement will likely include a phased-in approach. Purchasing TEDs for fishermen will encourage usage at an earlier time period, and subsequently increase conservation effects. LDWF will create a grant program for the purchase of TEDs; the program will target shrimp fisherman who have reported landings from Louisiana waters using skimmer net gear. TED specifications, such as bar space, will follow all federal regulations. Grant recipients will be required to participate in an outreach training program. Training will include proper usage of TEDs, sea turtle handling techniques and regulations, updates on sea turtle populations and other critical information geared toward compliance, recovery, and restoration. Benefits of this project include implementing TED regulations before the required phased-in deadline, the proper training of fishermen on using TEDs, increase of TED compliance and a subsequent decrease in sea turtle mortalities. Purchasing TEDs for fishermen will make implementation more efficient and will increase conservation efforts. Background All five	$775,000

	species of sea turtles found in coastal Louisiana have been listed under the Endangered Species Act (ESA) since the early 1970s. Kemp's ridley (Lepidochelys kempii), hawksbill (Eretmochelys imbricata) and leatherback (Dermochelys coriacea) sea turtles are classified as endangered, whereas green (Chelonia mydas mydas) and loggerhead (Caretta caretta) sea turtles are classified as threatened. Multiple life stages including post-pelagic juvenile, sub-adult and mature adult individuals are all known to occur in and use a variety of habitats including inshore bays and marshes in Louisiana's nearshore waters. Louisiana waters are widely accepted as foraging areas for sea turtles; little nesting occurs on Louisiana beaches. The commercial shrimp industry has often been identified as the most significant contributor to the fishing mortality of sea turtles, although several factors may adversely impact sea turtle populations. NMFS's latest biological opinion on sea turtle conservation applicable to shrimp trawling was published in April 2014. Multiple sources of data including observer data, TED testing, Sea Turtle Stranding and Salvage Network data and estimates of shrimp trawling effort were analyzed and extrapolated to estimate the number of sea turtle captures and mortalities attributable to the shrimp trawl industry. An estimated 19,810 captures and 1,893 mortalities were attributed to the inshore skimmer trawl fishery in Louisiana, Mississippi, and Alabama for 2012 (NMFS 2014). NMFS acknowledged the estimates of captures and mortalities are highly uncertain; however, they are based on available data. As a result, several regulatory measures have been implemented in an attempt to reduce captures and mortality. Federal law currently requires that shrimpers fishing with trawls in the Gulf of Mexico equip them with TEDs. This TED requirement includes an exemption for skimmer nets, butterfly (wing) nets, and pusher-head trawls. In lieu of TEDs, shrimpers fishing with these gears must limit the time they tow their nets. Compliance with tow time restrictions has not been universal. Otter trawls and skimmer nets are the most common gears used to harvest shrimp in Louisiana in federal and state waters, respectively. NMFS is preparing to issue a Final Rule in Summer 2017 that will require use of TEDs in boats 26 feet and larger. This rule is expected to impact 920 full-time and 1,993 part-time vessels which use skimmer nets.	
Adaptive Management Approach to Diadromous Open-Ocean Fishes Restoration	Information on the location and extent of spawning habitat, and patterns of accessibility and use of this habitat by adult Gulf Sturgeon is extremely limited for the Pearl and Pascagoula River systems, where populations are believed to comprise only a few hundred remaining individuals. This critical information deficit impedes our ability to identify restoration projects that target spawning habitat with active manipulation or protection approaches. In the Pearl system, 2 low-head dams (i.e., sills) impede access to upstream reaches thought to contain the necessary hard-bottom substrates suitable for sturgeon spawning. Removal of these barriers is THE highest priority for Gulf Sturgeon restoration, yet knowledge of where adult fish will go to spawn once the barriers are removed is lacking. Identifying spawning habitat in the Pearl system is not only important to monitoring the success of dam removal, but this information is essential to guiding regulatory actions and species recovery within this basin. In the Pascagoula River, this knowledge gap is likewise essential to Gulf sturgeon restoration planning and implementation. We propose to use methods developed and demonstrated by this author to map and characterize potential sturgeon spawning habitat throughout the entire navigable, upstream portions of both the Pearl and Pascagoula rivers and associated tributaries (Kaeser et al. 2012, Litts and Kaeser 2016). Once identified, passive telemetry arrays will be established to investigate patterns of adult fish access and utilization of these habitats. To confirm spawning, high use areas will be targeted for the collection of eggs using methods proven to be effective for Gulf sturgeon. This study will result in maps that quantify the extent of available habitat for spawning in both river systems. This much-needed information will directly inform future threats assessments and decisions associated with restoration or protection of these habitats. The importance of recovering the Pearl and Pascagoula populations to overall species recovery cannot be overstated; the 2 populations are genetically distinct from those to the east, occupy different estuarine and marine habitats, exhibit behaviors and seasonal migratory patterns that are unique, and are faced with different threats. Given the high priority assigned to spawning habitat restoration, this	$500,000

	project represents a fundamental first step toward achieving the overarching goal of improving the status of Gulf Sturgeon in the two populations most likely to have been affected by the Gulf Oil Spill.	
Connectivity Patterns of Blue Crabs in the Gulf of Mexico: Defining Stock Boundaries of a Migratory Species to Inform Restoration, Assessment, and Management	Multiple researchers and agencies are conducting acoustic telemetry studies on Gulf sturgeon. Within the framework of the Gulf Sturgeon Working Group, researchers have standardized telemetry equipment, and established a coordinated set of passive receivers that monitor entry and exit from natal rivers. Concurrently, there is a Gulf-wide collaborative multi-species telemetry group (iTAG) to share acoustic receiver data and encourage collaboration in receiver array distribution and deployment. Several areas across the Southeastern Gulf have established receiver arrays, and more arrays are being established over time. However, across the Northeastern Gulf, there is a large gap in offshore coverage between the Tampa Bay region and Lake Pontchartrain. We propose to work with state, university, and federal agencies and researchers to increase and augment acoustic receiver coverage until there is a seamless series of receiver arrays from the Dry Tortugas to the Mississippi River. Such an array would be valuable not only for Gulf sturgeon researchers, but also sea turtle, sharks, marine mammals, and fish researchers. Large-scale acoustic receiver arrays exist along the Atlantic and Pacific coasts of North America from the US through Canada, and around Australia. NRDA funding created a dispersed array from Louisiana to Cedar key, FL in 2010 and 2011, so there is empirical knowledge as to field-tested deployment methods and results in this region. These large-scale arrays and collaborative networks have enabled new discoveries about movements of marine animals. By working within the established collaborative group, and with the existing arrays, we would facilitate communication of data, and interactive planning of projects. By working with many researchers across large areas, we would facilitate multi-species spatial analysis, examining animals habitat use across a wide range of temporal and environmental variation. Large-scale data acoustic tracking data would be able to info rm the scale and success of restoration planning and design efforts from Louisiana to Florida.	$1,000,000
Mapping Species Distributions and Bycatch Hotspots Using a Comprehensive Survey Database and Geostatistical Models	As sea turtles surface to breathe, they have the potential for exposure to surface oil slicks. Sea turtles go ashore to lay eggs, giving them another route for exposure if they come ashore in an area of oiled coastline. Whether water-borne or washed up on beaches, if turtles were exposed to oil, it could have altered their skin microbiome. How long this change would persist is unknown. Skin is both a critical barrier and interface between an animal and its environment. The unique bacterial microbiome associated with skin is just beginning to be explored in humans and is largely unknown in other animals. What little focus there has been on turtle skin has been restricted to lesions, particularly fibropapillomas linked to herpes viruses. A preliminary study was able to establish a core bacterial community present on humpback whale skin, but with variation linked to geographic area and metabolic state of the animals (Apprill et al., 2014, DOI: 10.1371/journal.pone.0090785). This study concluded that whale skin microbiome was connected to the animals' health and immunity status and could potentially be used as a monitoring index. The proposed project would characterize the skin microbiomes of the 4 affected species of turtles (green, loggerhead, hawksbill, Kemp's Ridley) providing critical baseline data. Comparisons would be made between Gulf of Mexico turtles with potential for past oil exposure and individuals from the same species in the Atlantic. This would allow determination of regional differences in skin microbiomes and potentially allow identification of any lasting effects from the oil spill on Gulf turtles. This study addresses a relevant data gap, i.e., the lack of a health index which could be used to monitor these turtle species for disease or sub-lethal impacts in the case of future oil spills, climate change, etc. Development of this health index supports existing conservation efforts by ensuring consistency (via a health index metric) with recovery plans and recovery goals for each of the sea turtle species. Further, having available baselines will provide the necessary benchmarks against which future samples can be compared, allowing detection of impacts, and providing a guideline for restoration. Host-associated microbes are sensitive indicators of health and environmental change and may allow earlier recognition of sub-lethal stress on these threatened or endangered species. This work helps guide restoration, because without having an index to define the health status of turtles, it is impossible know if you have restored back to the	$1,500,000

	healthy state or instead created a shifted baseline of 'better but not fully functioning.' This work can be easily added as a component to ongoing studies (via the collection of one additional tissue punch when turtles are assessed) and constitutes a valuable missing piece that can further management knowledge to advance restoration in the future.	
Filling in the Gap: Habitat Utilization, Range, and Movements of the Eastern Subgroup of Barataria Bay Bottlenose Dolphins	In 2010, 2011 and 2014, USGS WARC researchers conducted ROV cruises at a series of mesophotic reefs along the NE Gulf shelf edge, from Louisiana to Florida. Changes in fish and invertebrate communities were documented post-Deep Water Horizon, compared to ROV footage obtained at the same reefs between 1997 and 2003. This data was the basis of the PDARP Mesophotic reef section. In 2011 and 2014, detailed images were made of individual corals denoted with anchored markers. It would be necessary, in order to design restoration efforts for mesophotic reefs, to revisit the same sites in 2018/19, to document changes in fish and invertebrate fauna and density, and compare and contrast to the 2011, 2012, and 2014 data. If the reefs are recovering on their own, then active restoration will not have to be undertaken, necessitating only continued monitoring of the system. If, on the other hand, revisiting the sites shows that some components of the ecosystem are not returning on their own, then restoration targets will be able to be set, and plans for active restoration made.	$600,000
Effects of Hypoxia on Plankton Distributions and Pelagic Food Web Dynamics in the Northern Gulf of Mexico: Obtaining Reference Points for Restoration Initiatives on Fish Populations	Documenting fish and invertebrate communities on mespohotic reefs using traditional oceanographic ROV's and research vessels, while successful, is an expensive undertaking. Doing so using deep diving techniques adds a large degree of personnel risk. There may, however, be a faster, cheaper, smaller methodology that may yield comparable results with much lower cost and less risk. Several recent convergences in technology have created the possibility of creating small, easily deployable mini-observatories that would detect telemetered marine life, while recording visual, audio, and physical data over a period of time before being recovered, at a relatively low cost. Vemco Amarix builds an acoustic telemetry receiver with a built in acoustic release (VR2AR). Meanwhile, multiple sources, such as the Rasberry Pi Foundation, produce minicomputers which would be adaptable to the requirements of an ocean observatory. Mated together (embedding a cased Rasberry Pi, cameras, and sensors into a float around the VR2AR), would create a miniaturized, highly flexible, reusable ocean observatory capable of 500 m deployment, able to be hand launched and recovered from small craft, at a cost of around $6000 each. By keeping the cost low, it would be possible to deploy landers in an array, greatly increasing the amount of data collected and increasing redundancy. Sport fishing charter boats are now capable of handling most wave conditions at speeds over 60 knots. By utilizing fast, stable charter boats, micro-rovs, and hand-launchable and recoverable micro-observatories, researchers could instrument many more mesophotic reefs at much lower costs. By designing the micro-landers around an open-source architecture system, incorporating a standard power package, open-source software, and easily sourced hardware, individual researchers could add whatever sensors they needed to their landers. Working in conjunction with the University of Florida Department of Computer and Electrical Engineering MIST Center, USGS would design, create, and test a basic observatory system, with add-on potential for use by other researchers. By deploying many small mulit-sensor landers on mesophotic reefs, we would be able to monitor recovery at longer time scales over larger areas than can be accomplished via ROV missions, at lower cost and with more flexibility.	$2,500,000
Modpod: A Pilot Study to Enhance Deep Coral and Fish Abundance in the Mesophotic Zone Using a Modular Portable Artificial Reef Design	Restoration efforts for mesophotic and deep benthic communities will rely on accurate maps of deep coral sites. Due to the depths involved, acoustic bathymetric mapping from surface vessels is not possible at a resolution sufficient to confirm coral presence. The use of Unmanned Underwater Vehicles (UUVs) is needed to obtain the sub-meter resolution required. Many projects in the mesophotic and deep benthic sector will employ UUVs explicitly for the purpose of high resolution mapping of known and suspected coral sites. Creating a centralized pool of multiple UUV assets with supporting infrastructure and expertise will provide; (1) an economy of scale to reduce costs and (2) standardization of data resolution, mapping and processing protocols, and gear configurations which will allow significantly more effective coordination between projects. The National Unmanned Systems Shared Resource Center (NUSSRC) is located in Panama	$5,000,000

	City, FL. The NUSSRC operates a fleet of 13 vehicles with depth capabilities to 600m and through Memoranda of Agreement/Understanding (MOAs/MOUs) has unrestricted access to vehicles with depth capabilities to 6000m. Available sensor packages include sidescan sonar (SSS), multibeam sonar (MBES), synthetic aperture sonar (SAS), visual and oceanograhic. Existing contracts and relationships with vendors allow rapid acquisition of sensors and/or vehicles to meet nearly all demands foreseeable in mesophotic and deep benthic community research and restoration. NUSSRC offers a completely turn-key solution to the need for high resolution mapping of deep coral systems; equipment, operators, pre-mission planning, post-mission data processing and field and laboratory infrastructure is available from this single source. Section 5.5.13 of the PDARP clearly describes desired restoration activities; nearly all of which will require or greatly benefit from UUV operations producing extremely high resolution bathymetric maps. The leading edge technology existing and under development at NUSSRC will allow many of the PDARP goals to be achieved. Certain capabilities may not even be known to scientists proposing research activities. For example, cm-scale resolution SAS mapping could allow monitoring of coral growth rates on restoration models thus obviating the need for expensive ROV surveys. The use of NUSSRC assets will be offered to all NRDA-funded mesophotic and deep benthic projects. NUSSRC's location in a coastal city on the central Gulf of Mexico will enable rapid and economical deployment to any Gulf Coast port deploying NRDA missions. It is anticipated many NRDA-funded restoration activities will have similar deep water mapping requirements. The most logical and parsimonious solution to these needs is a centralized asset pool. The economy of scale, standardization of mapping and turn-key synchronicity of all operational and analytical functions provided by NUSSRC makes it an excellent choice for this asset pool. This project idea is based upon NUSSRC providing 100 days at sea per year with 100m, 600m or 1000m depth-rated vehicles, 10 days at sea per year with 6000m depth-rated vehicles, launch and recovery equipment, and sufficient fully qualified personnel to provide 24 hour operations. NUSSRC will also provide at-sea first order data processing (of sufficient quality to select next day ROV dive sites) and shore-based final data processing. Clear deliverables and performance metrics are easily described for this project. Fully processed maps and imagery will be the primary deliverables. Performance metrics will be the area mapped (total area and area per unit time), the number of missions conducted annually, and the response rate to eligible mapping requests.	
Bryde's Whale Movements and Habitat in the Northeastern Gulf of Mexico	We propose to create a technical group focusing on the Gulf of Mexico pelagic Ecosystem. The new technical group will be charged with the development of a draft ecosystem management plan to restore, enhance, and manage shared (between US, Mexico, and Cuba) pelagic resources within the Gulf of Mexico Ecosystem. The group will provide the management plan as an input to the technical advisory processes of the International Commission for the Conservation of Atlantic Tunas, the Convention on the Conservation of Migratory Species of Wild Animals, Inter-American Convention (IAC) for the Protection and Conservation of Sea Turtles, the International Whaling Commission and the US Gulf of Mexico EIA process. The technical group will focus on the use of advanced population modelling and simulation to assess the effectiveness of current management measures aimed at restoring highly migratory resources in the Gulf of Mexico and will work closely with the different international conventions to define which management strategies are currently in used and which alternative strategies may be proposed.The group will also evaluate the active restoration projects funded by the Gulf restoration projects.	$550,000
A Multi-Tiered Approach to Restoring Gulf Sturgeon and Anadromous Open Ocean Fishes	Considerable resources will be dedicated to restoration activities in the mesophotic and deep benthic communities affected by DWH. Projects should be planned using technologies that factor in efficiency and capabilities, not only total cost. Saturation diving will allow mesophotic and deep benthic projects to greatly expand their capabilities over unmanned systems, yet at equivalent or lower cost to more-traditional ROV systems. Utilizing Saturation Divers on the bottom will provide unmatched capabilities to meet the goals outlined in Section 5.5.13 of the PDARP, particularly the approach of placing hard ground substrate and transplanting coral for direct restoration actions. Other listed approaches such as community characterization (including genetic studies), improved understanding of foodweb dynamics and	$1,000,000

	trophic connectivity would also be greatly enhanced by the superior collection capabilities offered by Saturation Divers compared to ROVs. The U.S. Navy is eager to support mesophotic and deep benthic projects with the Saturation Fly-Away Diving System (SAT FADS). This system provides manned Saturation Diving capability using a mobile Saturation Diving system to conduct diving operations at depths up to 300 msw for 30 consecutive days using a 6 man dive team conducting continuous Saturation Diving operations. Efficiency is gained through unlimited bottom time and rapid relocation and deployment to multiple project sites within each 30 day Saturation Dive. Extensive communication capability provides real time video and audio transmission between divers and topside scientists to coordinate on-bottom activities. The Navy's SATFADS system is based at the Navy Experimental Diving Unit (NEDU) in Panama City, FL, near the center of expected activities for NRDA mesophotic and deep benthic activities, making mobilization/ demobilization cost effective as well. The use of SATFADS will be offered to all NRDA-funded mesophotic and deep benthic projects. The elimination of ROV leasing costs for Saturation Diving-supported projects will significantly reduce the individual cost of those projects while the enhanced capabilities of Saturation Divers over machines will greatly increase the efficiency and range of activities undertaken at depth. The program-wide savings will more than offset the SAT FADS costs. NEDU also houses the Ocean Simulation Facility (OSF), a shore based hyperbaric training and testing facility. The OSF may be used to train Navy divers on the assembly, disassembly and service of instrumentation arrays and coral restoration modules deployed by other NRDA-funded mesophotic and deep benthic restoration projects. Much like NASA's training of astronauts in their Neutral Buoyancy Lab prior to space flights, pre-deployment training of Saturation Divers and testing of equipment and procedures will greatly enhance the likelihood of mission success. The Navy is committed to working with scientists from NRDA-selected projects to maximize mission success. This project idea is based upon the Navy providing up to four 30 day Saturation Diving missions per year (consisting of 180-240 days at sea, to include pre and post mission phases) to NRDA-selected mesophotic and deep benthic community projects. NRDA will supply a vessel meeting Navy specifications for load carrying capacity, dynamic positioning capability and the provision of required services (power, berthing, meals, etc.). Saturation Dives may be conducted individually or consecutively, consecutive Saturation Dives require two weeks between each mission.	
Long Term Acoustic Monitoring of Colonial Waterbirds and Shorebirds	Establishing and monitoring sentinel sites is an important Restore Act objective related to assessing long-term effects of the BP oil spill. With regards to Open Ocean Restoration objectives, coralline mesophotic and deep benthic habitats are essential fish habitats for sustaining population vigor for numerous NOAA management species (e.g., groupers and snappers) and those habitats have been identified as principle objectives for the Open Ocean Restoration. Establishing long-term sentinel sites will be based on locations for past study sites (e.g., NOAA FRV OKEANOS EXPLORER projects, RV FALKOR Streich et al. 2017, Kahng et al. 2010, Silva et al. 2016) and from sites assessed during NOAA/NMFS/SEFSC reef fish surveys (video footage, bottom mapping, species diversity). Sentinel sites will be located along the entire Gulf of Mexico outer continental shelf/slope and based on proximity to the BP oil spill location (flanking sites) and the distribution of known coralline deep benthic habitats (areas with more coralline habitat will be proportionally allocated more study sites; also based on sea day allocations). A Remotely Operated Vehicle (ROV) will be used to visually assess habitat characteristics; when possible established abundance assessment methods will be used (e.g., fish MinCount, NOAA/NMFS/SEFSC/Mississippi Laboratories Reef Fish Unit). Past studies that utilized ROVs (e.g., Streich et al. 2017) have established important experimental protocols applicable to the sentinel site proposal. Utilizing a ROV has several advantages; broader areal coverage, no habitat damage, articulating robotic clamps for collecting sessile fauna, accessory components provide detailed fine-scale mapping. The proposed project provides an assessment metric for BP oil spill recovery and future episodic events. Project supports PEIS Comprehensive Restoration Plan Section 5. Restoring Natural Resources; 5.5; Alternative A: Comprehensive Integrated Ecosystem Restoration (Preferred Alternative; p 5-20); 5.5.2;	$580,000

	Restoration Type: Wetlands, Coastal, and Nearshore Habitats; Key Aspects of the Injury That Informed Restoration Planning; Fish and Invertebrates section (p 5-22).	
Restoring Gulf of Mexico Bryde's Whales by Monitoring and Mitigating Fishery Entanglements	The Deep Water Horizon (DWH) exploratory well was located in the northern Gulf of Mexico 65 km off the shore of Louisiana in approximately 1,600 m water depth. This region, while relatively close to shore, is not easily sampled due to the water depth and the resultant requirements for the sampling equipment and ships. These difficulties have resulted in infrequent sampling efforts in these deepwater habitats especially in the context of fisheries independent surveys. Thus, when the DWH accident occurred there was a paucity of information relative to the affected communities, particularly in regards to time-series information that would have lent themselves to analysis of impacts to deepwater organisms. In an attempt to characterize the population dynamics and ecology of deepwater ecosystems in the northern Gulf of Mexico, we propose a survey that will deploy a suite of gear types at randomly selected sites between depths of 200 – 2000 m. As this project aims to examine all biological components of these poorly known and infrequently sampled habitats, we propose to deploy multiple gear types to collect information from the surface to the seafloor. Selected gears types will include trawls, longlines, traps, video arrays, water samplers, acoustics and sediment grabs. All captured specimens will be identified to the lowest possible taxa, enumerated and measured. Specimens and water samples will be retained for life history, diet, genetic, environmental DNA, and toxicology analyses. In addition to randomly sampled locations, transects will be run in eight cardinal directions (i.e. N, NE, E, SE, S, SW, W and NW) from the location of the DWH spill site in an effort to determine long-term spatial impacts of the event on deepwater ecosystems. To meet this goal, an unimpacted reference site will be selected from outside of the influence of the DWH oil spill (e.g. western Gulf of Mexico) and metrics will be developed upon which to compare with impacted locations at and in pr oximity to the DWH wellhead along the transect lines. Metrics will include categories such as abundance, biomass, trophic composition, diversity of invertebrates and fishes, and habitat mapping characterization and quality. An index of biotic integrity will be calculated for each sampling location that will quantify the degree of site-specific impacts and allow for tracking of recovery rates for each site.	$11,250,000
Aerial Imaging Surveys to Identify Sea Turtle Nesting Beaches in the Northern Gulf of Mexico	Deep-water corals (DWC) occur throughout the Gulf of Mexico at depths > 50 m [1,2]. Benthic communities are distinct between shelf edge (80-100m; dense octocorals, black corals and sponges, with occasional stony corals), slope (>300m; including stony coral Lophelia pertusa thickets and reefs; fig 1), and bathyal (2000m; octo- and black corals) habitats. Corals and sponges provide complex habitat for diverse fauna, some of which are economically valuable [3]. DWC are usually long lived and slow growing, with low recovery potential [3]. The 'footprint' of the DWH spill covered a large swath of the northern GOM, including several known areas of deep-water coral habitat, for ~90 days [4]. Post-spill surveys of some sites showed oil damage (fig 2) to octocoral colonies at bathyal [5,6], and shelf edge depths [7,8], but the slope-depth Lophelia ecosystem located between these two sites, did not appear to be impacted [5]. Proposed activities at 6 study sites (Fig. 3,4) 1. Survey DWC communities in these 3 habitat types, from oil-exposed and unexposed sites to describe a) distribution and population demographics of dominant coral and sponge species; b) benthic and fish community structure; c) human impacts 2. Collect samples to assess health, reproductive strategy, and population genetic structure of dominant DWC. 3. Evaluate habitat enhancement as restoration tool, by measuring coral recruitment and community succession on replicated carbonate transplant units. These will be deployed using elevators and placed near the reef using divers or ROVs. 4. Corals will be collected in insulated bins, fragmented, and re-deployed on transplant units near reef habitat (using divers or ROVs) to assess their value as restoration tools for DWC habitats. Restoration outcomes: In accordance with recommended phased approach and intent to enhance conservation and management of deep benthic resources, we propose initial assessment and feasibility study comparing current status of oil-ex posed vs unexposed communities in 3 depth habitats and evaluating benefit of artificial hard substrates to enhance recruitment/recovery potential. This information is pre-requisite to determine potential benefits of conventional reef	$3,000,000

	restoration approaches. Results will also create tools for effective management (placement of MPAs, regulation of commercial and recreational activities) via predictive models for DWC/sponge distributions, larval dispersal, and vulnerability assessment.	
Regional Training for Standardized Marine Mammal and Sea Turtle Data Collection and Reporting	Executive summary: A modest funding request of ~$72K to the Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS) is requested to more than double spatial and temporal coverage in year 1 of this inter-agency program to better inform restoration actions and decisions for at least 25 injured seabirds listed as "offshore" in Table 4.7-3 of the Final Programmatic Damage Assessment and Restoration Plan (PDARP). Supplemental funding would increase total days surveyed from 90 to 190 in the first full program year and would be leveraged with up to ~$200K already granted annually for 3 years from Bureau of Ocean Management (BOEM) to the GoMMAPPS component for vessel-based seabird surveys. Proposed work conforms to all protocols and requirements under a GoMMAPPS Seabird Science Plan, and the interagency agreement established between BOEM and U.S. Fish & Wildlife Service (USFWS). Data collected will be used by BOEM to inform NEPA analyses, Exploration Plans (EPs), Development Operations Coordination Document (DOCDs), oil spill risk assessment (OSRA) models, and by the USFWS for Section 7 consultations and planning of O&G activities in the Outer Continental Shelf (OCS) to reduce or mitigate associated impacts to offshore seabirds. Supplemental funding for seabird observers is requested for GoMMAPPS program year 1 only, after which time the principal investigators will re-evaluate (and likely scale back) the scope of seabird observer placement during program years 2 and 3. Background: The Gulf of Mexico (GoM) region is critically important in affording breeding, staging, and wintering habitats for North America's migratory avian resources. Despite the numbers of energy-related platforms and cumulative level of oil and gas activity in the northern GoM region exceeding all other Bureau of Ocean Energy Management regions combined, limited information is still available about the species composition, distribution, and abundance of birds Gulfwide, particularly for offshore seabirds. Consequently, such information is important for assisting the science foundation and regulatory decision-making by Department of Interior agencies (BOEM, USFWS, U.S. Geological Survey) in relation to offshore resource extraction in an effort to mitigate potential effects to avian resources. Upon completion, the GoMMAPPS Seabird Project is anticipated to be the most spatially and temporally extensive avian research effort in the northern GoM, and is intended to document avian distribution, abundance, and diversity to better inform regulatory decisions that influence conservation of migratory birds.	$750,000
Marine Vertebrates: Monitoring Restoration Actions and Environmental Stressors Using Mark-Recapture Analyses	The overarching restoration outcome this project aims to facilitate is the replenishment and protection of Gulf of Mexico fisheries through improved data collection, stock assessment, and management. While a multitude of fish and invertebrate populations were likely affected by the spill, only a handful can be restored through direct actions to reduce fishing and bycatch mortality. We suggest that a more comprehensive approach is required to facilitate ecosystem-scale recovery. Accordingly, this project involves a dramatic increase in the quantity and quality of fisheries-independent data for managed fish and invertebrate populations, their potential prey, habitat quality and abundance, and physicochemical oceanographic parameters throughout the eastern Gulf of Mexico. Although focused on Florida waters we will coordinate sampling activities with the other Gulf states as well as NOAA Fisheries. Existing surveys will be expanded spatially, sampling intensity will be increased, and survey design and sampling methods will be standardized among partners. In the short term, this project will increase the accuracy and reduce the variability of estimates of key population parameters that are critical for single-species stock assessment, including age-specific relative abundance, size/age composition, size/age at maturity, spawning stock biomass, size/age at transition, sex ratio, and fecundity. This project also proposes to continue the significant and meaningful expansion of the collection of fisheries-dependent data in the northern and eastern GOM that was initiated following the Deepwater Horizon oil spill. Fishery dependent data are necessary to continue to assess the recovery of offshore recreational and commercial fisheries in association with restoration efforts, improve and expand single-species stock assessments for managed fishes, and improve timeliness	$1,500,000

	and precision of data used to sustainably manage recreational fisheries with Annual Catch Limits. The objectives are to build upon and enhance existing fisheries dependent monitoring programs in Florida, in collaboration with federal and regional partners, that are compatible with fishery-independent sampling efforts in the region and that foster improved ecosystem-based assessment and management capabilities, and develop a long-term time-series from integrated surveys that fully address monitoring and stock assessment data needs specific to offshore fisheries. Data from this project will contribute to increased accuracy and reduced uncertainty in stock assessments of species managed by the Gulf of Mexico Fishery Management Council.	
Use of Drone and Geo-Referenced Full Motion Video (FMV) to Maintain Cost-Effective Long Term Surveillance of Stranding Events within Coastal Marsh and Shoreline Habitats.	This project will use multiple tracking technologies, as well as the Integrated Tracking of Aquatic Animals in the Gulf of Mexico network (iTAG-n) and research group (iTAG-r) to collect important data, difficult or impossible to assess with traditional capture-based methods. The focal species will be: yellowfin tuna (Thunnus albacares), greater amberjack (Seriola dumerili), cobia (Rachycentron canadum), red drum (Sciaenops oscellatus), gag grouper (Mycteroperca microlepis) and red snapper (Lutjanus campechanus). The DWH oil spill occurred in the northern GoM during the spring and summer of 2010, which would overlap in space and time with either the spawning or early life stages of these species. This is of special concern with water column pelagic spawners, as where and when they reproduce (i.e., spawn) and consequent dispersal dynamics affect offspring survival in ways not seen in most terrestrial species. In addition, larval cardiotoxicity is documented for several of these species, resulting in heart-related abnormalities that could impact long-term stock productivity, especially in stocks already highly impacted by fishing and anthropogenic stressors. All focal species support important fisheries and are considered overfished, have decreasing landings or stock assessment scientists or fishermen are concerned about the stocks' health. Specific concerns associated with the focal species include: (1) yellowfin tuna landings are decreasing and deepwater oil rigs may change natural migratory behavior and spawning site selection and consequently reproductive success; (2) the greater amberjack stock is overfished and not rebuilding as expected, and there is a need to better understand how artificial reefs affect spawning site selection and fidelity; (3) the recent cobia stock assessment was inconclusive due an incomplete understanding of stock structure and connectivity and fishermen are expressing concern at low catch levels; (4) red drum were affected locally by the oil spill demonstrating anemia and presumed decreased fitness and impaired reproduction but we do not have the needed understanding of spawning migrations and connectivity to assess how this would impact the Gulfwide stock; and (5) both gag grouper and red snapper are assumed to have been impacted by the DWH oil spill—and increased lesions were observed in adult red snapper—but estimates of abundance and measures of recovery are hampered for both species due to a lack of movement data and cryptic mortality which may vary with habitat type, depth, and sex. This study will work closely with fishermen and integrate a series of Gulf-wide tracking projects that focus on evaluating depredation/release mortality and the effect of habitat (natural and artificial) on migratory behavior and spawning site selection. Data on migratory behavior is needed to distinguish between decreases in landings due to changes in catchability associated with changed movement behavior versus lower abundance due to the oil spill and overfishing. We propose to use multiple tagging approaches: pop-up satellite tags, archival implant tags, and acoustic telemetry tags, drawing on both the benefits of large scale tracking and the higher resolution data obtained through acoustic and archive tags. Data from this project will provide critical information needed to assess the effects of the DWH oil disaster and to predict stock resilience to spatial disturbances in the future. This in turn will support the adaptive management of NRDA fisheries projects.	$580,000
Filling the Southern Gulf of Mexico Gap: Assessments of Marine Mammal and Seabird	Our understanding of the linkages between use areas of seabirds in the Gulf or Mexico and their breeding colonies is poor, and until this relationship is described our ability to accurately implement restoration efforts will be inhibited. We propose to deploy tracking devices on a suite of pelagic seabirds that use the Gulf of Mexico as a means to identify the explicit links between colonies and the pelagic and coastal waters of the Gulf. Our research team has experience tracking	$11,000,000

Distribution, Abundance, and Habitats on a Gulf-Wide Scale for Effective Monitoring of Restoration Impacts	seabirds in the Gulf of Mexico, Caribbean, and Atlantic and we have a network of colleagues in each of these regions that can collaborate with us to create an efficient and effective tracking study. Furthermore, we have preliminary tracking data from seabirds in the Gulf and Caribbean that can be used to inform project development, and we are currently leading efforts to conduct vessel-based surveys in the Gulf that also can be paired with tracking data to enhance our understanding of use area in the Gulf. We propose that tracking efforts include at a minimum the following species: Audubon's Shearwater, Black-capped Petrel, Masked and Red-footed Booby, and Magnificent Frigatebird. Our team has successfully deployed tracking devices on each of these species and we are therefore familiar with the challenges each poses. Expected results would provide a much improved understanding of the linkages between breeding colonies and the pelagic waters used by these species in the Gulf.	
Monitoring the Effects of Restoration Activities on Gulf of Mexico Bay, Sound and Estuary Common Bottlenose Dolphins Using Index Sites	Seagrasses are variably and sometimes negatively affected by exposure to oil, likely depending on the duration and directness of the exposure (Fonseca et al. 2017). During the DWH event, the offshore seagrass beds of the Chandeleur Islands were subjected to extensive and direct oiling that resulted in over 100 acres of probable seagrass loss (Kenworthy et al. 2017). Those losses, coupled with ongoing instability of the Chandeleur Islands (Handley et al. 2007) and attempts at stabilization (http://www.mississippiriverdelta.org/files/2015/11/Chandeleur-Isl-Post-berm-Rpt-UNO_Apr_27_2015v3_withApendix-FINAL.pdf), albeit short-lived, provide an opportunity to test new technology that has been developed and applied for the creation of seagrass habitat in wave-dominated environments in order to provide longer-lasting resource stability. Here, we propose to install specially engineered, free-standing wave attenuation devices designed for high wave environments and maintaining vertical position (i.e., not dependent on supporting seafloor) to provide a lasting nucleus of physical stability, especially on southern on portions of the Chandeleur Island chain where oiling impacts to seagrasses occurred. Using previous and ongoing assessments of both island stability (e.g., Thomson et al. 2010) and seagrass dynamics and open ocean wave modeling, we will emulate an approach utilized in North Carolina where we placed a large break in a dynamic and patchy seagrass environment to create wave attenuation and foster seagrass bed coalescence and stability, sand accretion, and marsh and beach formation. By combining this novel technology with the strong foundation of information regarding the status and dynamics of the Chandeleur Island chain, we will select appropriate, replicate areas for application of the permanent shoreline stabilization structure and design appropriate assessment and monitoring to report on performance, generating dozens of acres of new seagrass habitat. Through careful surveys and application of regional restoration knowledge, final site selection will seek to enhance a variety of habitat types that also confer physical stability, such as mangrove and marshes to act in concert with the seagrasses and wave attenuation structures. Creation of new, stable seagrass acreage in this most oceanic of seagrass beds in the Gulf of Mexico will support a wide variety of wildlife, including foraging seabirds, fishes, and invertebrates, many of which are economically prized both recreationally and commercially in the Chandeleur Island chain. References: Fonseca, M.S., Piniak, G. and Cosentino-Manning, N. 2017. Effect of the Cosco Busan oil spill on the ecology of eelgrass, Zostera marina in San Francisco Bay. Marine Pollution Bulletin. http://www.sciencedirect.com/science/article/pii/S0025326X1630950X Handley, L., Altsman, D., and DeMay, R., eds., 2007, Seagrass Status and Trends in the Northern Gulf of Mexico: 1940–2002: U.S. Geological Survey Scientific Investigations Report 2006–5287, 267 p. This reference includes a section on the Chandeleurs Kenworthy WJ, Cosentino-Manning N, Handley L, Wild M, Rouhani S (2016) Seagrass response following exposure to Deepwater Horizon oil in the Chandeleur Islands, Louisiana (USA). Mar Ecol Prog Ser. https://doi.org/10.3354/meps11983 Thomson, G., Miner, M., Wycklendt, A., Rees, M. Swigler, D., 2010. MRGO Ecosystem Restoration Feasibility Study – Chandeleur and Breton Islands. Boca Raton, Florida: Coastal Planning & Engineering, Inc. 96p. (Report prepared for USACE under contract to URS).	$24,000,000

Improved and/or Expanded Assessments of Trans-Boundary Marine Mammal Stocks	Fisheries interact with sea turtles at a disproportionate rate in the northern Gulf of Mexico (nGOM) because the nGOM is extremely productive for a variety of commercially important species (e.g., tunas, snappers, and others), and recent satellite telemetry research has shown that the nGOM is a high-use foraging area for leatherback sea turtles (Aleksa et al. in prep). In the Atlantic, sea turtles often interact with open ocean fronts; however, it has been recognized that the temperature difference at the front can spatially separate turtle foraging and fishing effort, with turtles concentrated on the warm side and fishing on the cold side, thereby reducing sea turtle bycatch, with no adverse effects on fish catches (NOAA unpublished data). A similar process could be occurring in the nGOM, but we currently do not know how the turtles behave in relation to oceanographic parameters. One critical step towards reducing negative interactions between sea turtles and fisheries is to better describe how their movements and behaviors are coupled to physical and biological oceanographic conditions. Leatherback sea turtles, in particular, have wide-ranging, open ocean habitats, but recent analysis of satellite tracking data suggests that they forage in areas close to the shelf edge and slope, presumably because there are higher concentrations of food in these areas (Fossette et al. 2010; Aleksa et al. in prep). These areas also strongly overlap spatially with pelagic longline fishing effort (Garrison and Stokes 2014). Leatherbacks exclusively consume gelatinous animals (also known as "jellies"), but jellies are notoriously difficult to sample accurately because they are destroyed in plankton nets, and many zooplankton surveys do not extend into the shelf-slope transition zone that the turtles consistently inhabit. Here, we propose to use a mesozooplankton imaging system, known as the In Situ Ichthyoplankton Imaging System (ISIIS), to map the vertical and horizontal distributions of gelatinous animals, along with synoptic measurements of physical oceanographic parameters, to determine what kinds of habitats and ocean conditions are utilized by leatherback sea turtles. We will couple this information to real-time tracks of leatherback sea turtles in the area and define the types of behaviors displayed by the turtles in the different oceanographic habitats. This detailed information on the turtle habitat use patterns and oceanographic drivers can then be applied to slightly modify shipping or fishing tracks that will reduce the probability of accidental collisions or entanglement and snaring in pelagic longline fisheries (e.g., bycatch), ultimately reducing anthropogenic turtle mortality with negligible impact on economic and fishing activities. The results from this project will produce detailed descriptions of where leatherbacks forage in relation to the distribution of potential prey items. This has direct applications to policy, particularly the precise location of pelagic longline fishing activity that will maximize catch while minimizing the chances to accidentally encounter a leatherback sea turtle. The dataset produced by the ISIIS will be analyzed for gelatinous animals and larval fishes. In addition to these research activities, the image data are complex and contain information on multiple trophic levels, which will create opportunities for researchers interested in all aspects of marine plankton ecology in this physically dynamic oceanographic that has little related field data. Specifically, the data will show the exact location of larval fishes and their relationship to other zooplankton, which would provide insights into the fisheries oceanography of the shelf slope frontal region in the nGOM. We also plan to partner with the University of Southern Mississippi Marine Education Center to give public talks and seminars about the coupling of oceanography to sea turtles and other charismatic animals in the nGOM.	$0
Bycatch Mitigation	The DHS (Deepwater Horizon Spill) impacted the GoMx Bryde's whale population significantly with an estimated 17% mortality, this equates to 5 animals out of an already depleted population of 33 (best abundance from a 2009 survey). The PBR (potential biological removal) is only 1 animal every 33 years so it is surmised that the spill had catastrophic effects on this population and as such immediate action is deemed necessary to put in place measures to protect this potentially endangered species. It is proposed that in light of the moratorium being lifted on the EPA (Eastern Planning Area) in 2022 which could potentially impact upon the remaining stronghold for the Bryde's whale, it would be advisable to collect as much information on population numbers and behavior to support the proposal that the Desoto canyon and surrounding area (to be determined) be categorized as Critical habitat. To designate the area as Critical habitat would	$0

	give Bryde's whale protection from oil and gas development and any other potentially detrimental activities providing the area is large enough to support the physical and biological needs of the population. A survey both visual and passive acoustic monitoring around the Desoto canyon and surrounding area would help establish the number of animals in the population. Passive acoustic monitoring records the vocalizations of whales. Previous recordings have been made of this particular sub species these will be used for comparison and identification purposes. Visual monitoring will back up a positive identification to determine whether it is a Bryde's whale. I would propose to do two surveys a year in the area for the next 5 years to collect a robust data set to support the claim that Desoto Canyon is indeed Critical habitat. Previous surveys have identified this area as the predominant area for sightings with the GoMx Bryde's whale rarely being seen elsewhere.	
Restoration of Mesophotic and Deep Sea Reefs Using Novel Method, and Maximum Cost Efficiency	Large whales in the Gulf of Mexico (GOM) are vulnerable to a number of direct threats including ship strikes, entanglement in fishing gear, and catastrophic events, such as a Deepwater Horizon (DWH) oil spill. They are also susceptible to more insidious threats such as harmful algal blooms, lack of available food, and long-term accumulation of anthropogenic pollutants. Small populations are particularly vulnerable to these threats. The resident GoM Bryde's whales exhibit dangerously low abundance (n=33) and the GoM sperm whale abundance is only 763. Sustaining and recovering these populations demands monitoring and maintaining the health of individuals. However, monitoring the health of whales is difficult, expensive, and dangerous. This project employs unmanned aerial systems (UAS) for remote and non-invasive health assessment of the two large whales in the GoM by quantifying body condition and analyzing microbial communities in exhaled respiratory condensate, or "blow". The project also provides standard protocols and workflows for a sharable, easily deployable, remote health assessment toolbox for monitoring and adaptive management of other cetaceans. Using a custom unmanned hexacopter (Aerial Imaging Systems) launched from a research vessel, we will collect high-resolution aerial photographs and blow samples of whales during two seasons every year (3-4 wks each) for four years (2018 to 2021). High-resolution photographs collected at a known altitude will be analyzed to accurately quantify body size parameters (i.e., girth) and examine animals for skin lesions, scars, and parasites – key indicators of health (Miller et al. 2011, Miller et al. 2012, Durban et al. 2016). Photogrammetric analyses will follow methods and standards developed at NOAA (Durban et al. 2015). Our goal is to collect measurements and samples for 15-20 animals per year from each species. The respiratory tract is a common site of infection in marine mammals. Analyses of exhaled humpback w hale blow collected using UAS obtained enough DNA for microbiome analysis (Apprill et al. In Prep-b). This project will use UAS to collect respiratory blow samples for microbial tests using two approaches (Apprill et al. In Prep-a): 1) identifying bacterial constituents in the blow via sequencing a ribosomal RNA barcode gene (Apprill et al. 2015), and 2) a meta-genomic approach to detect all microbes - including protists, bacteria, and DNA viruses (Nakamura et al. 2009). Variation in respiratory microbiome community will be compared between individuals, species, seasons, and body condition (similar to Apprill et al. 2014). Potential pathogen data will be examined using a custom database developed in Apprill's lab (Langille et al. 2013, Gupta et al. 2014). The PIs on this proposal have employed these methods to collect similar data from blue whales, right whales, and humpback whales. Because of the low abundance of GoM Bryde's whales, we will first test for disturbance before attempting to collect blows. Photo identification will be conducted to avoid repeated sampling of the same animals in a season. This proactive project fills essential gaps in methods and establishes monitoring protocols for the Natural Resource Damage Assessment (NRDA) process. It also directly contributes to "increasing marine mammal survival through better understanding of causes of illness and death as well as early detection and intervention for anthropogenic and natural threats" a stated goal of the Open Ocean Trustee Implementation Group. Furthermore, it meets the explicitly priorities of the Group to: 1) Replenish and Protect Living Coastal and Marine Resources, and 2) Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation Bibliography Removed for Length Considerations - Available on Request.	$3,260,000

Establish or Expand Fisheries Observer Coverage to Assess Marine Mammal Bycatch	Deep-water corals (DWC) occur throughout the Gulf of Mexico at depths > 50 m [1,2]. Benthic communities are distinct between shelf edge (80-100m; dense octocorals, black corals and sponges, with occasional stony corals), slope (>300m; including stony coral Lophelia pertusa thickets and reefs; fig 1), and bathyal (>1000m; octo- and black corals) habitats. Corals and sponges provide complex habitat for diverse fauna, some of which are economically valuable [3]. DWC are usually long lived and slow growing, with low recovery potential [3]. The 'footprint' of the DWH spill covered a large swath of the northern GOM, including several known areas of deep-water coral habitat, for ~90 days [4]. Post-spill surveys of some sites showed oil damage (fig 2) to octocoral colonies at bathyal [5,6], and shelf edge depths [7,8], but the slope-depth Lophelia ecosystem located between these two sites, did not appear to be impacted [5]. The DWH spill served to highlight many data gaps for GOM ecosystems, particularly those in offshore/deep sea areas. Proposed Sites (Fig. 3,4) Habitat type Oil-Exposed sites Unexposed sites Shelf edge 1. Pinnacles (80-100 m) 4. Madison Swanson (80-100 m) Slope 2. Viosca Knoll 826 (450-500 m) 5. Many Mounds (450 m) Bathyal 3. DeSoto Canyon 673 (2,300 m) 6. Large Mound (2000 m) Proposed Activities 1. Survey DWC communities in these 3 habitat types, from oil-exposed and unexposed sites to describe a) distribution and population demographics of dominant coral and sponge species; b) benthic and fish community structure; c) human impacts 2. Collect samples to assess health, reproductive strategy, and population genetic structure of dominant DWC. 3. Evaluate habitat enhancement as restoration tool, by measuring coral recruitment and community succession at multiple reefs within each site using replicated restoration modules. Modules will be constructed from carbonate rock and design will be optimized for coral recruitment using best practices from shallow reef restoration techniques. Modules will be deployed using elevators and placed near the reef in a replicated design using divers or ROVs. 4. Corals will be collected in insulated bins, fragmented, and re-deployed on transplant units near reef habitat (using divers or ROVs) to assess their value as restoration tools for DWC habitats. Survival and growth of transplants will be assessed during annual cruises. Data Applications Visual survey data will be compared with pre-spill (baseline) surveys, which exists for all except bathyal sites. Time series data from exposed vs unexposed sites will provide information on post-spill recovery rates and natural spatial/temporal variation in community structure, demographics, and human impacts. Health assessments of corals from exposed vs unexposed sites will be used to assess recovery and natural variability among species. Reproduction and population connectivity data is not available for most of the corals at these sites and will support predictive models and protected area planning. Coral recruitment, community development and transplant success using artificial substrates will enable assessment of habitat enhancement as a restoration tool for deep coral ecosystems. Restoration Outcomes In accordance with recommended phased approach and intent to enhance conservation and management of deep benthic resources, we propose initial assessment and feasibility study comparing current status of oil-exposed vs unexposed coral communities in 3 depths and evaluating benefit of artificial hard substrates to enhance recruitment/recovery potential. This information is pre-requisite to determine potential benefits of conventional reef restoration approaches in deep water. Results will also create tools for effective management (placement of MPAs, regulation of commercial and recreational activities) via predictive models for DWC/sponge distributions, larval dispersal, and vulnerability assessment.	$0
Acoustic Stressor Assessment for Bottlenose Dolphin Populations in Barataria Bay and Similar Gulf of Mexico Bay Habitats	BOEM collects data on resources in offshore waters to inform decisions on oceanic energy activities and uses information on abundance and distribution of protected resources to address NEPA, ESA and MMPA requirements. AMAPPS In 2010, BOEM implemented the Atlantic Marine Assessment Program for Protected Species (AMAPPS) and began collecting information in the Atlantic Ocean along the East Coast with the following goals (A Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in U.S. Waters of the western North Atlantic Ocean, 2010): 1) Collect broad-scale data over multiple years on the seasonal distribution and abundance of marine mammals (cetaceans and pinnipeds), marine turtles, and sea birds using direct aerial and shipboard surveys of coastal U.S. Atlantic Ocean waters; 2) Collect similar data at finer scales at several (~3) sites of particular interest to NOAA	$1,200,000

	partners using visual and acoustic survey techniques; 3) Conduct tag telemetry studies within surveyed regions of marine turtles, pinnipeds and seabirds to develop corrections for availability bias in the abundance survey data and collect additional data on habitat use and life-history, residence time, and frequency of use; 4) Explore alternative platforms and technologies to improve population assessment studies; 5) Assess the population size of surveyed species at regional scales; and 6) Develop models and associated tools to translate these survey data into seasonal, spatially-explicit density estimates incorporating habitat characteristics. GOMMAPPs BOEM will begin a similar sampling regimen, Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS), in the Gulf of Mexico starting in 2017. This type of monitoring is essential for the monitoring and adaptive management (MAM) aspect of restoration projects. Key tasks for GOMMAPPS include: • Conducting aerial surveys over continental shelf waters • Conducting ship-board surveys on the shelf and out to EEZ • Conducting satellite tracking of tagged animals • Performing genetic analyses for composition and connectivity • Developing spatially- and temporally-explicit species density models. (https://www.boem.gov/GOMMAPPS/) Proposed Project: Historically, data collected from aerial surveys depends on observers to locate, count, and identify species of marine mammals and sea turtles. This program proposes to include the collection of high-resolution imagery during each of the aerial surveys; these methods have proven to be more efficient than observers for counting sea turtles, birds, fish, and marine mammals according to a pilot program funded by BOEM. The collection of digital images can reduce observer bias, provides a historical record that can be referenced, and allows further opportunity for species identification among other benefits. A comparison between the two methods indicated the following: "The overarching conclusion of this study is that high-resolution digital aerial imaging does, indeed, represent a safe, scientifically robust, and cost-effective solution to the offshore wildlife data collection needs of BOEM and the U.S. offshore wind energy industry" and goes on to say that "Digital methods yield more accurate density calculations", with the one exception for baleen whales (Normandeau Associates, Inc., 2012). Alternative image collection methods have been successful at collecting useful data on baleen whales and also assessing the difference between sighting data recorded by visual observers and digital image analysts (Koski et al. 2013). Collecting this information would fill knowledge gaps across resource types and provide data for abundance, distribution, and population modeling. This information is essential for adaptive management of resources.	
Adaptive Management for Sustainable Fisheries and Ecosystem Restoration in the Gulf of Mexico.	Oregon State University has used Argos (satellite-monitored) radio tags to track endangered Gulf of Mexico sperm whales (Physeter macrocephalus) since 2001 (2001-2005 BOEM-funded baseline studies and 2010-2013 BP/NOAA-funded post-DWH studies). Results from 2011 and 2013 archival tags provided high-resolution whale dive profiles, measures of foraging effort and locations. By inference from these data, prey was patchy and often near the seafloor. Since the spill, there has been a 4,000+ km2 low-use area (LUA) for tagged sperm whales, including the DWH site that correlates with contaminated sediments. One 2013-tagged whale crossed the LUA in 3 days with 95% less foraging effort than its weeks of activity outside the LUA. We believe this is related to a trophic cascade in which sperm whales do not use the LUA regularly because the squids they commonly eat near the bottom cannot support themselves on reduced numbers of bottom-dwelling species due to the impacts of oiled sediments. We do not believe this response suggests toxicity issues in the water column. New long-duration, dive-monitoring (DM) satellite tags are the same size as tags we used to track sperm whales for >1 year but transmit near-real-time dive and foraging summaries. DM tag deployments in 2016 on blue and fin whales produced dive and foraging data for up to 110 days and 7,480 dives/tag. We propose deploying these DM tags on sperm whales adjacent to the LUA every 5 years to determine how long it takes for the benthic communities to recover sufficiently for sperm whales to forage there. The first two taggings will be July-August 2018 and 2023 (8 and 13 years post-spill and 5 and 10 years since our last [2013] data). This is the very first time that a long-term impact to an endangered whale has been well documented, including pre-impact "control" observations, to identify the duration of habitat loss important for predicting oil-related cumulative impact. We suggest tracking whales every 5 years to	$1,800,000

	document this recovery until it is complete. During tagging, we will biopsy whales to determine sex, genetic relationships (kinship), PHC levels from blubber (for possible bio-accumulation close to the LUA) and reproductive hormones to determine ovulating, pregnant or lactating females. Photo-identification and DNA profiling will integrate long-term individual records of Gulf sperm whales. We will collaborate with benthic scientists working to describe relevant ecological relationships (species, sediment PCHs and broader issues to understand the sequence of expected benthic recovery). Ixtoc oil-spill follow-up studies have shown slow sedimentation rates, suggesting that full recovery of benthic "support" species may take 100 years. We seek to estimate "functional" Gulf recovery as demonstrated by the return of an apex predator that integrates the food web literally from bottom to top and in that process transports benthic nutrients to the surface through defecation, enhancing productivity in the photic zone. With each whale consuming 4% of its body weight/day, the hundreds of Gulf sperm whales, weighing 30+ tons are an unusually large transport mechanism for nutrients. We expect smaller sperm whale post-spill home ranges as LUA females pack into still productive adjacent habitats. We also expect a density-dependent effect on carrying capacity with lower fecundity (calving) rates. Home range and fecundity values should normalize as the LUA recovers. Summary: Tagged sperm whales appear to avoid a 4,000+ km2 area with DWH-oiled bottom sediments. By tagging 15 whales close to this area every 5 years, we will document recovery of a trophic cascade (benthic, mid-water and apex predators) in the deep-water Gulf ecosystem to better inform recovery and restoration efforts as well as identify cumulative impact issues if additional spills occur.	
Restoration through Education: Raising Awareness about the Largest Habitats of the Gulf of Mexico - the Deep-Sea	Many open ocean fishes use freshwater rivers during their life history. This connectivity makes these fishes important to open ocean, coastal and inland ecosystems. Notable examples of these species include Alabama Shad, Striped Bass, Gulf Sturgeon, and American Eel. Many of these species have populations at a fraction of historic levels or are imperiled due to freshwater habitat limitations. Habitat limitations fall into 4 broad hypotheses where habitat is: 1) unavailable or limited for varying life stages 2) available but environmental conditions exceed physiological tolerances 3) unavailable due to in stream barriers 4) unavailable due to in stream barriers and environmental conditions exceed physiological tolerances The 4 hypotheses represent structural uncertainty in how habitat influences diadromous fish populations and the best restoration action in terms of population responses likely depends on the hypothesis with the most evidentiary weight. Adaptive management (AM) is a decision making approach that can be used to resolve structure uncertainly by iteratively applying management actions. Restoration of diadromous fishes is needed, but true adaptive management approaches, ones that formalize learning by comparing predictions from hypotheses to monitoring and then updating evidentiary weight using Bayesian updating to adapt decisions given learning are rare. Therefore the goal of this study is to develop an AM framework for diadromous fish restoration. The Pearl and Pascagoula River systems will be used to develop the AM approach due to the importance of these river systems to a number of these species and proposed restoration projects. A significant component to any AM framework is the development of models that will predict the outcome of potential restoration actions for competing hypotheses and couple to monitoring data such that uncertainty around competing hypotheses can be reduced (i.e., learning). The objectives of this project are to: Objective 1: Develop an adaptive management framework to evaluate restoration options for diadromous fish population restoration in the Pearl and Pascagoula River systems This objective will identify restoration objectives and actions, additional hypotheses representing key uncertainties, and monitoring designs. Objective 2: Develop models to predict the likely population response to restoration actions accounting for structural uncertainty. In the context of the 4 hypotheses previous identified models need to be developed that predict habitat use and physiological tolerance. Therefore, we will develop models that predict habitat use and of Gulf Sturgeon and diadromous fishes through trace element and strontium isotopes (P. Allen and B. Pracheil), as well as movement and genetics studies (M. Anders, M. Peterson; G. Constant; A. Kaeser). Bioenergetic models will be developed to predict the likelihood of restoration actions to produce the environmental conditions (e.g., temperature, dissolved oxygen, and salinity) within physiological tolerances. A	$1,000,000

	bioenergetics model would be created based on physiological and movement studies by P. Allen and B. Pracheil as well as existing capture recapture data when available for Gulf Sturgeon as a model species due to the focused efforts on this species. Together these models will be used to predict habitat use, limitations, and likely outcomes of restoration actions. These predicted outcomes will then be used to identify optimal restoration actions and then population response (i.e., monitoring) compared to predictions to update understanding of the system and in turn make smarter restoration decisions over time. Activities: Develop an AM framework to identify key uncertainties, potential restoration alternatives and optimal restoration actions given restoration objectives. Outcomes: Identify most beneficial restoration and monitoring actions Benefits: Ecosystem health, robust fisheries, energy transfer between ecosystems.	
Assessment of Anthropogenic Stressors in Holopelagic Sargassum Nursery and Foraging Areas in Support of Multispecies Restoration Objectives	Blue crabs support a valuable fishery in the Gulf of Mexico (GOM), worth over $73 million in 2015. Despite active management, many states have seen declines in harvest in recent years, which could be indicative of declines in spawning stock abundance, larval abundance, and/or postlarval recruitment. Blue crabs have a migratory life cycle, inhabiting different estuarine and offshore habitats at different life history stages. These migrations result in both spawning females and larvae occurring offshore in large numbers, dispersing long distances, and crossing management boundaries. Management, assessment, and restoration strategies are most effective at a geographic scale that matches the geographic scale and boundaries of the stock. The modern stock concept describes units of a population that can be considered homogeneous for management purposes and can inform the scale of stock assessments and management/restoration actions. In the GOM, stock identification for blue crabs has only recently been undertaken. Difficulties in assessing stock structure and boundaries have arisen due to a lack of information on connectivity patterns and unclear and often conflicting population genetic information. Understanding how physical and biological factors influence connectivity is necessary for marine fisheries management and restoration, especially in the face of environmental stressors such as climate change and oil spills. This is especially critical for species with migratory life cycles, such as blue crabs, whose offshore distribution of spawning females and larvae results in a high probability of encountering oil from a spill such as the Deepwater Horizon oil spill. For the most recent Gulf-wide stock assessment, the Gulf States Marine Fisheries Commission was forced to draw stock boundaries based on one state's tagging study, unclear genetic data, the stock structure of other species, and generic ocean current patterns. This exercise revealed that a basin-wide understanding of population structure and stock boundaries is a priority research need of both state and regional management agencies. The goal of this research program is to fill this knowledge gap. Developing a more complete understanding of connectivity patterns and stock boundaries will allow managers to develop adaptive management, assessment, and restoration plans for this species. The overarching objective of this study is to transform our understanding of connectivity patterns and stock structure of blue crabs in the GOM. We will work closely with managers to accomplish the following objectives: (1) To map the distribution of spawning females and larvae in offshore waters, assess reproductive output and future reproductive potential, and identify important spawning grounds. Information from existing Gulf-wide trawl and plankton surveys will be enhanced by collection of detailed reproductive data and targeted surveys in likely spawning areas. (2) To simulate interannual variability in transport of blue crab larvae between spawning grounds and estuary mouths and estimate Gulf-wide connectivity patterns by applying a Gulf-wide larval transport model. The three-dimensional larval transport model will integrate results of trawl and plankton studies with results from previous mark-recapture studies to estimate transport and connectivity in ten years of model simulations. (3) To synthesize observations, model predictions, and recent genetic information to provide integrated and actionable results for state and federal fisheries managers in the Gulf region. By including fisheries managers in this research, responding to their information needs, and directly disseminating integrated results to them, this research will support improved future stock assessments, management decisions, and restoration plans while promoting a better understanding of the stock structure of this ecologically and economically important species.	$6,500,000

Gulf-Wide Restoration of Fish and Invertebrate Populations through Enhanced Monitoring and Assessment	As part of a Florida RESTORE Act Centers of Excellence Program (FLRACEP) project, researchers at the University of Miami (UM) compiled a comprehensive survey database including nearly all fishery dependent and independent sources of information on the distribution, density and size-frequency of fish and other species in the Gulf of Mexico (GOM), along with corresponding environmental data. The UM team, along with collaborators at NOAA Fisheries, applied geostatistical modeling techniques to generate seasonal maps for many species, life stages and functional groups, primarily for use as inputs to ecosystem simulation models and to improve monitoring survey design. The proposed project will build on this work to generate predictive maps that will allow fishers to focus their effort on times and places that have high catch rates of target species and life stages while avoiding areas with high bycatch of undersized individuals, spawning fish, or unwanted or protected species. Hotspots of catch and bycatch may be areas where biological and physical conditions cause a species or life stage to be concentrated, such as areas with preferred benthic habitat, eddies, or frontal zones where prey species are concentrated, spawning aggregation sites, or migration corridors. The project will develop improved metrics of the physical environment including ocean heat content and distance to fronts inferred from satellite data. Applying geostatistical models to the data from the comprehensive survey database will increase the sample size and precision of estimates of the spatial distributions and the environmental conditions that influence these distributions. We will apply multivariate models, because the distributions of many species are correlated with each other based on similar habitat preferences or predator/prey interactions. This project will primarily focus on species that are of interest to pelagic and bottom longline fishers and are priorities for restoration, including juveniles and adults of billfish, swordfish, tunas, and reef fishes, as well as prohibited species such as sea turtles and sea birds. Also, although many broadcast-spawning species in the GOM aggregate to spawn, the locations of spawning aggregations and the geomorphological or environmental conditions that favor spawning aggregations are not well known. Thus, we will map the locations of high densities of spawners of species for which the identification of spawning aggregation sites has been identified as a priority by the Gulf of Mexico Fishery Management Council, including gag, Goliath, yellowedge, and black grouper. For predictions of bycatch hotspots to be useful to help fishers avoid bycatch, the models must have a high predictive accuracy. Thus, we will evaluate how bycatch rates vary across space and time, and how well they are predicted by environmental data. We will use the historical data to estimate how much total bycatch could have been reduced if fishers had avoided areas predicted to have high bycatch according to our predictive models. This will allow us to determine whether and to what extent fishers could reduce bycatch either by avoiding areas that the model predicts will have high bycatch, or simply by moving when they encounter high bycatch rates. To evaluate whether improved data collection would allow for more sophisticated methods to avoid bycatch, we will also use a longline simulator developed by NOAA Fisheries to simulate increased bycatch data and alternative bycatch avoidance scenarios. Because this project focuses on synthesizing existing biological and physical data, we will be able to produce useful maps fairly quickly, and also identify species, life stages and regions for which data are lacking. We will be able to test whether current data are sufficient to make useful predictions about bycatch, and also make recommendations for future data collection to improve bycatch mitigation.	$200,000,000
Targeted Enhancement of the Chandeleur Island Chain: An Ecosystem Approach	Sediment diversions along the lower Mississippi River are currently being considered as a method to create new marsh habitat in Barataria Bay, LA. These diversions will input mass amounts of fresh water into a primarily saline environment that host a variety of fauna, including the Barataria Bay bottlenose dolphins (Tursiops truncatus). It is thought there are three distinct sub-population of bottlenose dolphins in Barataria Bay. Previous research on the western and southern sub-populations have illustrated high sight fidelity towards Barataria Bay and exhibit minimal movements outside of the Bay. However there is little data on habitat utilization, range, and movements of the eastern subgroup, which are most likely to be affected by the freshwater diversion. We propose to assess population size, habitat utilization and range of the eastern-most subgroup of the Barataria Bay bottlenose dolphins. These data will be compared to currently existing	$30

	data on Barataria Bay dolphins to fill in a known data gap for this unique group. Seasonal and temporal habitat utilization, habitat range, and environmental data will be collected by placing longer-term temporary satellite telemetry data loggers such as SPOTs on individual dolphins (n≤50). Data loggers will be placed on a select number of dolphins during each summer and winter season over a 2 year period (total of 4 deployments). These loggers will transmit data via satellite link during each surfacing for near real-time tracking and monitoring. Four deployments are proposed to account for equipment malfunction or mortality so there will be working data loggers throughout a 2-year period. To obtain a population density estimates of the eastern subgroup, individual dolphins will be identified using a photo capture-mark-recapture techniques from a vessel-based platform. Capture-mark-recapture operations will be conducted every two weeks over a pre-described line transect throughout the study area. All dolphins spotted during the survey will be photographed for photo-ID purposes and data will be collected on their behavior, group size, heading, direction, etc. Site condition data will be collected at each sighting to assess sighting rates (i.e., wind speed and direction, glare, wave height, etc.) and water quality parameters (i.e., salinity and temperature). These will aid in determining percentage of error in sighting rates and potential site affinities with regards to salinity and temperature changes. This project is necessary to fill in a vital data gap regarding site fidelity of the eastern subgroup of Barataria Bay bottlenose dolphins. It addresses several specific research needs including the early detection and intervention for anthropogenic and natural threats and monitoring, as well as adaptive management activities to address relevant data gaps to inform restoration plans. We will adhere to quality control and assurance protocols and use previously set standard operating and analysis procedures to ensure these results are comparable with previous research in Barataria Bay, LA and are valuable to NMFS and other key stakeholders.	
Relationship between the Nearshore Habitat and Sea Turtle Nest Site Selection	Justification- Numerous large-scale restoration projects have been proposed in the northern Gulf of Mexico (nGOM), many of which may alter physical processes in coastal waters (e.g., discharge rates, nutrient inputs) affecting biological processes (e.g., planktonic food webs, fisheries recruitment dynamics). Regarding fisheries, natural variation in the biophysical environment across a wide range of spatiotemporal scales can directly affect the survival of planktonic larval fishes (the most vulnerable life stage), subsequently influencing stock recruitment and population sustainability. However, the degree to which these processes affect larval fish mortality remains poorly understood. Historically, biological sampling of lower trophic levels (i.e., plankton) has been performed at relatively coarse scales (e.g. 10-20 m vertically, 100s of meters horizontally), which has limited our ability to quantify the relative importance of the different causes of variation in larval fish survivorship, and account for this variability in effective monitoring of restoration plans. The Open Ocean Trustee Implementation Group has stated that the initial priorities for the restoration of fish and water column invertebrates involve “fill data gaps and information needs”. To be effective, restoration plans require a clear understanding of natural variation in ecosystem processes, resources, and stressors that affect the target species or habitats. Inadequate understanding of the impacts of environmental variation leads to uncertainties in the reference point state of the system, which is needed to evaluate restoration initiatives. Approach – Here we propose combining high-resolution field sampling (in situ imaging), lab experiments, and modeling to assess the effects of hypoxia on three poorly described aspects of plankton ecology that can have a substantial impact on fisheries production: (1) habitat use and spatiotemporal distribution of larval fish, their prey, and their planktonic predators, (2) predatory impact of gelatinous zooplankton on fish larvae, and (3) larval fish growth and condition. We hypothesize that hypoxia will affect predator-prey interactions by limiting the distributions of plankton (vertical and horizontal), consequently increasing encounter rates between larval fishes and their zooplankton predators (i.e., gelatinous zooplankton). Thus, we anticipate a negative impact on larval fish survivorship due to hypoxia-driver increased predation rates, with net positive or minimal impact on organisms with lower metabolic rates (e.g., gelatinous zooplankton). Our focus on hypoxia (an anthropogenic perturbation) allows for a comparative approach to examine the impact of environmental stressors on food web	$900,000

	dynamics, habitat quality and quantity, and the monitoring of impacts related to coastal restoration efforts. Lastly, relatively small changes in larval fish mortality rates can have large repercussions for recruitment success; therefore, our emphasis on the biological and physical drivers of larval fish survival is directly related the factors governing strong recruitment success in fish. Our project deliverables will directly benefit our understanding of the nGOM ecosystem, which will lead to an understanding of processes tied to population variability of key fish species (e.g., Red Snapper, Spanish Mackerel, Atlantic Bumper). We will also develop ecosystem-based management metrics through static and dynamic scenario analyses, in which scenarios will be used to elucidate changes in the production of all functional groups to varying intensity levels of hypoxia. Our proposed work directly benefits practitioners by improving our understanding of the underlying variability in ecosystem processes.	
Reducing Red Snapper Discards Using a Collaborative Fishermen's Quota Bank	This proposal supports restoration of mesophotic zone reef ecosystems in the 50-150 m depth zone in the northern Gulf of Mexico, specifically the re-population of reef fishes (Anthiinae, Lutjanidae) and octocorals (Alcyonacea) through placement and recovery of new hard bottom substrate onto the seafloor in the mesophotic reef environment that is 'seeded' with live captured, laboratory grown octocoral fragments and monitored for growth, recruitment, and reproduction. The 5 year pilot study extent will extend over the Pinnacle Trend in the northern Gulf of Mexico. Octocorals of the species known to be damaged by the spill (Swiftia exserta, Hypnogorgia pendula, Thesea nivea) will be captured from areas of high abundance using technical divers, analyzed genetically for a 'native' haplotype, fragmented in the lab, grown to size, and then redeployed adjacent to reef environments. The fragments will be affixed to removable plates hanging on semi-conical cage structures and grown to maturity in-situ. The reef structures will be surveyed every six months by ROVs and/or technical divers to document rates of growth, recruitment, and larval export.	$8,500,000
Regional & Open Ocean Research to Reduce HMS Mortality & Advance Recovery	Bryde’s whales occur in 100 – 400m water depth in the NE Gulf of Mexico (GoMx). The population is certainly	$447,480
Assessing the Incubation Environment for Sea Turtle Nests in the Northern Gulf of Mexico	Successful restoration of Gulf Sturgeon populations requires knowing more about the movements and habitat use of juvenile sturgeon to make sure the right habitats are selected for conservation and restoration activities. Juvenile sturgeon is especially important for increasing populations because mortality during this portion of life can be very high, thus increasing survival is the most direct strategy for rapid population recovery. We propose to direct restoration activities on Gulf Sturgeon through addressing three research questions: 1) How, when, and where do juvenile Gulf Sturgeon move? 2) What limits Gulf Sturgeon populations, particularly juveniles? and 3) What conservation and restoration actions can be done to increase Gulf Sturgeon populations? Question 1: How, when, and where do juvenile Gulf Sturgeon move? Juvenile sturgeon is notoriously difficult to track and catch through traditional fisheries techniques because of their small size and cryptic habitat use. However, through using state-of-the-art trace element chemistry, we can determine the kinds of habitats juvenile sturgeon use through collecting fin samples from juveniles to adults, without harming fish. Sturgeon fins are analogous to the “black box” in an airplane by recording the water chemistry of the surrounding water as fish grow. Moreover, sturgeon fins form rings on them, like rings of a tree, that let us determine their age. In combining the rings in the fins with the chemistry information, we can figure out where a fish lived and moved at any age. Because juvenile fish grow more than adults, these techniques are especially useful for reconstructing movement and habitat information for juveniles when relatively large amounts of fin tissue are grown quickly. Preliminary studies have shown that the water chemistry is different within the Pearl River System and likely between river systems. Further, studies in our laboratories have shown the usefulness of this technique in Gulf Sturgeon. Therefore, determining fin chemistry is useful for assessing movements and habitat selection. We will use new and archived sturgeon fins collected in these rivers in collaboration with the US Fish and Wildlife Service, University of	$1,100,000

	Southern Mississippi Gulf Coast Research Laboratory, and the US Army Corps of Engineers to determine how, when, and where juvenile sturgeon move. Question 2: What limits Gulf Sturgeon populations, particularly juveniles? Sometimes good habitats for Gulf Sturgeon are blocked by dams or other barriers creating limited access to places that could help juvenile sturgeon thrive. Through identifying these habitats through a suite of physical conditions in the rivers such as water salinity, substrate type, and water flow, we can pinpoint actual locations where juvenile Gulf Sturgeon could be, and potentially are, living. We will use a combination of physiological tolerance experiments, habitat measurements from known points of juvenile Gulf Sturgeon presence, and hydrologic and species distribution modelling to determine where in the Pearl and Pascagoula rivers juvenile Gulf Sturgeon may be living. This information can be used to prioritize efforts to protect and conserve Gulf Sturgeon critical habitat and identify important conditions for restoration. Question 3: What conservation and restoration actions can be done to increase Gulf Sturgeon populations? Juvenile Gulf Sturgeon may not be found at all locations meeting their habitat requirements. This can happen for a variety of reasons including watershed alterations or barriers to movement that make a site less desirable or inaccessible. We will use information generated in addressing questions 1 and 2 to come up with a prioritized list of restoration actions including mapped locations where possible, that can be used for determining future resource allocations. We will also use data generated in this project to help generate and test hypotheses as part of an adaptive management plan.	
Adaptive Management of Marine Mammals Effected by the Freshwater and Sediment Diversion Projects in Southern Louisiana	Colonial waterbirds, including several listed species and species of local and regional concern, nest in large colonies along the shorelines and islands of the entire Gulf coast. These colonies are typically established within proximity to good foraging sites in suitable nesting substrate (trees, shrubs, ground) that are not excessively disturbed and provide protection from, or absence of, predators. Threats to these colonies include human disturbance, overcrowding, nesting habitat degradation, and depredation. Changes in water levels and water chemistry due to climate change presents and additional consideration when managing and protecting colonies. Colony collapse can occur if foraging sites collapse which is often tied directly to water levels at critical rearing stages. Water levels can also affect colony access by humans and by predators. Typical surveys are expensive due to the human resource needs and aerial survey needs. While these surveys are necessary, they provide snapshots of colony activity and do not provide accurate timing of events over long (decades) monitoring periods. Particularly in light of climate change, slight changes in the timing of nesting and fledgling could have profound population effects over the long term. Acoustic monitoring of colonies provides a cost-effective, continuous (24 h) record of all colony activities. Acoustic cues can pinpoint episodic events such as colony predators (not all of which occur during observable, daylight hours) and natural or human disturbance; or it can provide timing information on arrival, colony establishment, chick feeding, and abandonment. Additionally, there have been several studies that have demonstrated that colony abundance can be correlated to acoustic activity. We recommend establishing a long term acoustic monitoring program in each of the Gulf states that will supplement ongoing surveys to better establish strong correlations between traditional survey methods and acoustic methods. The program can be modified as necessary to include additional colonies, areas that are under-surveyed, or areas that are part of a restoration program. A minimum of four colonies (two tree/shrub nesting and two ground nesting) in each Gulf state will be instrumented with 1 to 3 (depending on colony size) autonomous acoustic recorders prior to nesting season. Recording will be continuous until collection after nesting season. At least four sites will be equipped with iPAM™ software such that near real-time data will be sent to a web-based user portal where events can be monitored. Acoustic data will be processed for ambient sound levels, spectral content, episodic acoustic events over the average ambient levels and vocal behavior. Environmental data, survey data, and acoustic data will be analyzed for correlations specific to nesting success or failure at each site and as a whole along the Gulf Coast. We propose an initial 5-year, 5-state, 20-site program. This long term approach provides for continuous monitoring and increases sampling effort during nesting seasons throughout the Gulf Coast.	$900,000

Establishing an Acoustic Network across the Northern Gulf of Mexico for Multiple Marine Species	The Gulf of Mexico Bryde's whale (Balaenoptera edeni) is the only resident baleen whale species in the northern Gulf of Mexico (GoMx) and is extremely rare, with an estimated abundance of 33 individuals (CV = 1.07) in U.S. waters in 2009. Currently, they occur almost exclusively in the northeastern GoMx in waters from100-500m deep. In addition to their extremely low population abundance and restricted range, they exhibit a unique evolutionary lineage, low genetic diversity, and have potentially experienced a range contraction. The population is currently being evaluated for potential listing as endangered under the U.S. Endangered Species Act. This already small population was the most impacted offshore cetacean during the extensive Deepwater Horizon oil spill in 2010 with an estimated 48% of their habitat oiled and an estimated 22% population decline as a result of the spill. Reducing the probability of the loss of any individual GoMx Bryde's whale is critical to their restoration and recovery. Fishery entanglements are a major source of mortality for most baleen whales. Recent research indicates the GoMx Bryde's whale population may be at risk of fishery entanglements from the GoMx reef-fish bottom longline fishery because this fishery has considerable effort, an estimated 1,533 + 961 total sets per year (range 507 to 3,094), within the Bryde's whale habitat in the northeastern GoMx. Further, a tagged Bryde's whale exhibited diel diving behavior with diurnal deep dives and foraging lunges at or near the sea-floor. If bottom or near-bottom feeding is a normal feeding strategy for these whales, there is significant potential for gear-entanglements with the bottom longline gear. Currently, observer coverage of this fishery is relatively low (5 %) and much higher levels of coverage are needed to observe extremely rare events, such as the loss of one of 33 whales. Increasing observer coverage within GoMx Bryde's whale habitat to approach 100% for bottom longline fishers operating there could provide the necessary data to determine whether rare fishery interactions occur. If they do, gear modifications and geospatial mitigation measures would be an important restoration technique to reduce anthropogenic mortalities for this species.	$2,500,000
Reduce Impact to Sea Turtles in the US Gulf of Mexico	The Northern Gulf of Mexico (GoM) subpopulation of Northwest Atlantic loggerheads (Caretta caretta) is one of the smallest nesting groups in this larger population (Richards et al. 2011). Although the number of loggerheads nesting in the northern GoM is close to 1/10th the number that nests on Florida's east coast, this small nesting group plays a critical role in maintaining the overall population. Peripheral populations are often disproportionately important for protecting genetic diversity relative to their size (Lesica and Allendorf 1995). Ehrlich (1988) stated that "The loss of genetically distinct populations within species is, at the moment, at least as important a problem as the loss of entire species." Environments continually change; to survive, organisms must have genetic variability that allow them to evolve (Frankel and Soule 1981; Beardmore 1983; Gilpin and Soule 1986). Available evidence suggests that peripheral populations are often genetically and morphologically divergent from central populations. Distinct traits found in subpopulation may be crucial to the species, allowing adaptation in the face of environmental change (Lesica and Allendorf 1995). Chauvenet et al. (2010) reported that, in most cases, subpopulations that are smaller and less efficient to manage should receive more money than those that are more efficient to manage, due to higher investment needed to reduce extinction risk. One of the restoration approaches listed in the PDARP for sea turtles is to "Enhance sea turtle hatchling productivity and restore and conserve nesting beach habitat" (page 5-61). However, without a complete knowledge of where turtles are nesting in the northern Gulf of Mexico, this restoration approach cannot be fully implemented. Recent research shows that loggerheads that nest in the northern Gulf of Mexico exhibit low site fidelity to nesting beaches and this suggests that they may have a more flexible nesting strategy than previously believed (Tucker 201 0, Lamont et al. 2012, Hart et al. 2013). Because of this, loggerheads may be nesting in areas currently considered unused by nesting females. For example, surveys along the Chandeleur Islands, LA by personnel at the Louisiana Department of Wildlife (LDWF) and Fisheries and by personnel at the US Geological Survey suggest greater use of these islands by nesting loggerheads than previously reported (M. Tumlin, LDWF personal communication). To address this restoration approach, we propose to	$340,000

	conduct aerial imaging surveys from Pinellas County, FL to the Texas/Louisiana border to identify the extent of sea turtle nesting in the northern GoM.	
Marine Mammal Photo-Identification and Research	Marine mammals, sea turtles, fish, and invertebrates can be affected by episodic and chronic events stemming from natural cause (e.g. hurricanes), human-related causes (e.g. oil spills, ocean noise, fishing, marine debris), and combinations of the two (e.g. sea level rise, ocean acidification, erosion of protective wetlands). In all cases, in order to accurately assess the type and amplitude of any stressor, monitoring and data collection must take place over the long term. However, often the data collected on marine species is highly dependent upon the context in which that data was collected. This often leaves potentially significant data out of critical analyses when data were not collected in way that maximizes use and utility across projects; or results in missed opportunities to collect supplementary data. There are several databases available and used for government, university, and private surveys, the most notable being the OBIS system. While data centralization is critical for maximum use and access, equally important, is data collection standardization that includes training. This project will assess the past, present, and future data collection requirements for marine mammals, sea turtles, sea birds, and whale sharks in the Gulf of Mexico. The main focus will be science- and mitigation-based surveys that are either designed for scientific data collection through surveys for one or more of the select species groups (e.g. NMFS/BOEM stock surveys and University research); or are considered platforms of opportunity for specific industry purposes that could benefit from improved scientific data collection (e.g. seismic mitigation, dredging observation, fisheries observers, Navy observers). The project will create minimum Gulf-wide data collection standards for visual, passive acoustic, and photographic data collection that will be designed to be included, as recommendations, in all activity permits. A comprehensive, on-line data collection training prog ram will be developed with user credentials and expectations established over progressive modules. Specific modules for training spill-related personnel will be developed. From here, data acquisition “apps” such as SeaScribe will be enhanced to capture the larger data collection opportunities in “citizen science” programs or bridge watch programs, but still based on a robust data standard. The benefits from this project is that it establishes data standards that can be cross-referenced throughout the Gulf of Mexico regardless of the project. Standardized data collection, including metadata, will allow States can better coordinate management and assessment of wide-ranging species. While the data will still provide the project-specific information needed, a minimum standard will maximize the utility and sharing of that data. States can better coordinate management and assessment of wide-ranging species. The basis of the project will be a working group made up of researchers, governmental, and industry personnel involved in assessing or managing the species groups in the Gulf of Mexico.	$0
Baseline Health Assessments for Sea Turtles in the Gulf of Mexico	Restoration activities in the Gulf of Mexico are aimed at aiding in recovery of injured species and habitats. However, monitoring the impacts of those activities to the affected populations can be a challenge. In addition to human activities, marine vertebrate populations, such as sea turtles, sturgeon, and marine mammals, are affected by environmental drivers such as red tide or extreme cold events, both of which can lead to mortality. One method to assess impacts of human activities and environmental stressors to marine vertebrate populations is through mark-recapture analyses of core vital rates. The core vital rates for marine vertebrate populations include: 1. Annual survival rates 2. Annual breeding rates 3. Movement rates specific to different population processes such as: Comparisons of these rates among populations, time periods, or habitats are possible because rates are estimated from a sample of individuals, independent of population size. Examining vital rates across time periods provides information on specific population processes: an environmental event, stressor, or management action can drive a change in survival, reproduction, and/or movements that consequently results in changes in abundance and distribution. Understanding how these mechanisms affects marine vertebrate populations allows managers to target actions and assessments to appropriate processes. For example, beach building projects are being conducted as part of restoration. The impacts of these projects on nesting	$900,000

	turtles will be difficult to assess using only count data (i.e. nest abundance, number of hatchlings produced, etc.). However, by comparing annual survival rates for turtles prior to initiation of these projects (using historic mark-recapture data) to annual survival rates after initiation of these projects and by including beach building data into the mark-recapture model as a covariate, impacts to the population can be estimated. Scientists at the USGS currently have appropriate, long-term, mark-recapture data sets for a variety of marine vertebrates including sea turtles, sturgeon, Diamondback terrapins and manatees.	
Reduction of Anthropogenic Noise to Restore Injuries to Gulf of Mexico Marine Mammals, Fish, and Invertebrates	Post-DWH spill, significant efforts were expended to detect and identify injured or dead marine wildlife. Much of the potentially oiled wildlife was located within marsh habitats where access was difficult and routine monitoring nearly non-existent. There was question regarding some records, of marine mammals in particular, as to whether the increase in stranding records was the result of oil spill effects or an increased level of search effort. This project proposes to establish a remote survey methodology along roughly 500km of remote marsh and shoreline habitat that are not routinely surveyed by any systematic means or has a low potential of public encounters where stranding reports would be expected. The project will systematically produce a standardized methodology using fixed-wing and multirotor drones equipped with full motion video (FMV) cameras which allows accurate geographic mapping from video taken at any angles (i.e, the image does not need to be taken directly below the camera to be geo-referenced). Establishing this methodology will accomplish three goals: 1) it will provide baseline information regarding stranding events in the deep marsh regions of LA; 2) it will establish, optimized, standardized methodologies of remote surveying and data delivery that can be incorporated for long term monitoring of marine mammal and bird populations in remote regions; and 3) it will provide a proven method to employ for impact surveillance in any future disasters, natural or man-made.	$10,000,000
Establish Passive Acoustic Task Force and Monitoring Network in the Gulf of Mexico for Cross-Taxa Restoration through Noise Mitigation and for Fish and Marine Mammal Restoration Monitoring	The Gulf of Mexico (GoMx) is a Large Marine Ecosystem comprised of the exclusive economic zones of the U.S. in the north, and Mexico and Cuba in the south. The oceanic GoMx (>200m deep) is inhabited by a variety of seabird species and 21 species of cetaceans, including the ESA-listed sperm whale and the GoMx Bryde's whale (ESA status under review), and most cetacean species were significantly impacted by the Deepwater Horizon (DWH) oil spill. Oceanic cetacean assessments have been conducted primarily in the U.S. GoMx but little is known about the distributions, abundance, and stock structure of cetaceans and seabirds in the southern GoMx. For example, the stock structure of GoMx oceanic cetaceans is assumed to comprise one GoMx-wide stock per species, but this assumption has not been tested. Most of these species have distributions that cover the entire GoMx and are impacted by anthropogenic stressors on a GoMx-wide scale. The lack of information from the southern GoMx (60% of GoMx waters), is a significant data gap that makes it difficult to distinguish trends in abundance from changes in the distributions of cetaceans and seabirds. To effectively assess and monitor the impacts of restoration activities on GoMx oceanic cetaceans and seabirds injured by the DWH oil spill, concurrent surveys in both the northern and southern waters must be conducted. Therefore, multi-year seasonal GoMx-wide assessments in oceanic waters are proposed and consist of summer and winter southern GoMx surveys that include visual cetacean and seabird transect surveys, acoustic transect surveys, cetacean biopsy sampling for stock structure analyses, and hydrographic sampling; and the strategic deployment of acoustic moorings to better understand the year-round occurrence of cetaceans including Bryde's whales, sperm whales, and beaked whales. Four southern GoMx ship surveys would be conducted in conjunction with similar NMFS northern GoMx ship surveys. Year 1 would consist of a winter and summer survey, followed by either winter or summer surveys in Years 5 and 10. The end-products would be GoMx-wide seasonal species abundance estimates, trends in abundance for high density species, and spatially explicit habitat maps of density for cetacean and seabird species for the oceanic GoMx that can be evaluated for changes to assess and monitor recovery and restoration. These are all well-established methodologies that have successfully been used in U.S. waters and elsewhere.	$25,000,000

Monitoring of Sea Turtle Fibropapillomatosis and Chelonid Herpesvirus 5 in the Gulf of Mexico	Cetacean stocks in all Gulf of Mexico (GoMx) habitats [bays, sounds, and estuaries (BSE), coastal, continental shelf, and oceanic] were injured by the DWH oil spill. Common bottlenose dolphin stocks inhabiting BSE waters impacted by oil were found to have reduced survival and reproductive rates and suffered negative health effects. As a result, these stocks were predicted to have population declines ranging from 31–62%. To monitor recovery and the effectiveness of restoration efforts, and to target adaptive management efforts, similar studies at four BSE index sites are proposed over the period of restoration. The index sites would be selected to include sites with differing levels of oiling ranging from heavily oiled to no oil for comparison, and include sites expected to be targets of restoration efforts. The study techniques proposed are well established and were used successfully in the DWH NRDA: capture-recapture photo-identification (photo-ID), biopsy sampling, and capture release health assessments. At each index site, a complete suite of similar studies would be conducted every 3 years for 12 year (4 replicate studies/site) with each consisting of: (1) A series of capture-recapture surveys to monitor and measure survival rates. (2) Pregnancy of individuals would be evaluated during health assessments and by biopsy sampling of free-ranging dolphins. Reproductive success would be measured by follow-on photo-ID surveys during the next 12 months. (3) Health assessments would monitor among others weight, adrenal status (sufficiency/insufficiency), and lung condition to follow changes in health impacts documented from DWH. These studies would benefit the injured stocks by evaluating the success of restoration and potentially retargeting/changing restoration techniques. The work would be a large collaborative effort with Federal and State partners most of who were involved in the DWH NRDA and have experience with these techniques. A comprehensive report comparing results from all aspects of the studies from each index site would be prepared after each replicate as well as a final report at the conclusion of all the replicates. Results will be compared to effects documented during and just after the spill to evaluate changes in status as restoration occurs.	$516,438
Restore Gulf of Mexico Ecosystem Injuries by Protecting Open Ocean Habitat	Many marine mammal stocks that occur in U.S. waters also range or migrate into international waters of Mexico, Cuba, and the Caribbean. Assessing trans-boundary marine mammal stocks is particularly challenging because they can be distributed widely and be taken (disturbed, injured, or killed) by fisheries, energy development, vessel strikes, and/or other human activities throughout their range. Assessment of total abundance for such stocks can require substantial survey capacity, and assessment of fishery interactions and other types of takes of such stocks requires the exchange of information with foreign or international organizations and/or governmental agencies. Complete assessment of trans-boundary stocks that were injured as a result of the Deepwater Horizon spill is essential for their recovery and restoration. Priority should be given to those stocks that are endangered or threatened, hunted, or known to interact significantly with fisheries or other human activities in international or foreign waters.	$10,000,000
Reducing Bycatch of Marine Mammals in Commercial and Recreational Fisheries	This idea is proposed under the Open-Ocean TIG restoration project. It is a project that will support restoration through reducing bycatch and bycatch mortality of billfish and sea turtles. The long term goal of this project is to replenish these marine resources, expand to other marine resources, and at the same time enhance recreational opportunities. To achieve this goal the project aims to: 1. use bycatch mitigation strategies and safe-handling measures of billfish that have been identified (such as circle hooks); 2. use bycatch mitigation measures that either prevent capture or promote escape in commercial fisheries using gillnet, longline, and purse seine gears, and 3. implement safe-handling measures to increase survivability post-capture (such as Turtle excluder devices for turtles). This project is innovative in nature as it aims to use outcomes and information from two existing projects: a. a recent inventory conducted of best available science on bycatch mitigation measures across taxa for gears through the review of gear and fishing practice modifications and post-capture release procedures to determine effectiveness in reducing bycatch and increasing post-capture survivability of marine species; and b. an inventory of existing data collection programs in ICCAT fisheries of the Caribbean/Central America States and to improve data reporting in artisanal fisheries in the region. This information will	$0

	increase the success of the project, reduce collateral damage from implementation, and build from benefits that may be used in a number of species.	
Comprehensive Stewardship of Breeding Waterbirds across Barrier and Nearshore Islands in the Gulf (Alabama – Texas)	Deep sea and mesophotic reefs were negatively impacted by the DWH spill. Restoring populations of corals, and other important fish habitat structure-forming benthic fauna is a massive undertaking, given the geographic area to be restored in the deep sea. Reef restoration using coral transplants, artificial structures, or both has been attempted in tropical (shallow) reefs with limited success. Coral restoration in the deep sea, or mesophotic zones presents even greater challenges, and potential costs, because of the inaccessibility and equipment required to work in the 50-1,000 meter seafloor. In order to overcome these challenges, and maximize the potential impact of restoration costs, new technologies need to be developed and implemented, from site selection and transplanting, to logistics, and monitoring. Coramyd is a patent pending technology that integrates artificial reef structures, which are non-toxic, and can replace hundreds, or even thousands of corals within a week of ship time. The artificial reef structures used in Coramyd are not prone to corrosion and can provide means of deploying coral transplants efficiently and successfully in large numbers. Structures are resistant to currents and are less likely to snag fishing gear than other artificial reef structures. Structures are seeded with coral transplants and are lowered to the seafloor using a small crane. Project scope is limited to restoration of populations of corals which were impacted by DWH spill over areas with especially sensitive and valuable fish populations. Please contact for more details and methods.	$10,000,000
Research to Determine Gulf of Mexico Soundscape and Effects of Sound on Marine Mammals	There are several commercial fisheries operating in the Gulf of Mexico that have been determined by the National Marine Fisheries Service (NMFS) to have frequent or occasional serious injuries or mortalities of marine mammals. Fisheries are identified as Category I or II fisheries, respectively, under the Marine Mammal Protection Act, and include: • Atlantic Ocean, Caribbean, Gulf of Mexico large pelagics longline fishery; • Gulf of Mexico gillnet fishery; • Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl fishery; • Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fishery; and • Gulf of Mexico menhaden purse seine fishery. Bycatch of marine mammals in Gulf commercial fisheries has the potential to prevent the recovery and restoration of nearshore and offshore populations that have been reduced due to the oil spill - primarily bottlenose dolphins but also other species such as Atlantic spotted dolphins, pantropical spotted dolphins, pilot whales, Risso's dolphins, and pygmy sperm whales. An expansion of current observer coverage levels is necessary to provide better estimates of marine mammals injured or killed incidental to commercial fishing activities. Expanded observer coverage would also provide additional information needed by managers to determine factors associated with bycatch, such as gear type, time of day, bait type, fishing methods, areas fished, etc., and to identify, test, and implement measures to reduce bycatch. Research and field studies are also needed to identify and test alternative observation methods that could be used to supplement or replace traditional human observers. Such methods may include, but are not limited to, the use of: remote observation platforms, underwater cameras, electronic monitoring, and unoccupied aircraft systems (UASs).	$0
Mississippi Pier Based by Catch Reduction for Sea Turtle Restoration	Gulf of Mexico estuary, bay and sound stocks of bottlenose dolphins are considered genetically distinct populations. These semi-isolated, small populations are vulnerable to impacts like oil spills. Studies of Barataria Bay dolphins following the Deepwater Horizon spill indicate that the stock was severely affected, and animals continue to present poor health. Animals who have compromised immunity are more susceptible to cumulative biological and anthropogenic stressors in the environment. These stressors include noise from human activities. This study proposes to instrument Barataria Bay and two other Gulf bays containing a similar estuarine stock of dolphins, to measure the soundscapes and characterize the source, sound levels, and temporal-spatial context of noise these populations are experiencing. These data, correlated with population survey data, may provide insight into the potential impact noise stressors have on both healthy and compromised bottlenose dolphin stocks. The general study plan would deploy acoustic recorder instruments and water quality sensors in Barataria Bay and at two additional locations. Specific instruments would be dependent	$4,528,000

	upon budget and final study design but may include both stationary and mobile units. The selection of two additional bay habitats would include one that is known to experience high levels of anthropogenic noise and where there are good population survey data (e.g. Galveston Bay); and a second that is less commercially impacted, but also has good survey data and a similarly sized dolphin population (~120-150 animals), for example St. Andrew Bay. Beyond the direct acoustic influence of these noise levels on bottlenose dolphins, a soundscape approach to predator/prey relationships, breeding & rearing behavior, and interaction with other local ecological factors that may contribute to the health of the population will be investigated. Hydrophones capable of detecting anthropogenic noise, dolphin vocalizations and prey fish, can be deployed with oceanographic sensors in these bays for several months spanning two years with four, 6-month deployments within each Bay. Sensors will measure noise and biological/chemical variables (e.g. temperature, pollutants). Identification of stressors, and the relative contribution of each of these stressors, will inform management decisions for stocks that may already be compromised and can act as a model for similar habitats throughout the Gulf coast.	
High Resolution Mapping of Mesophotic Reefs in the Gulf of Mexico	Conventional single-species stock assessments determine if a fish stock is experiencing excessive fishing mortality (known as overfishing), if the stock has been reduced to low abundance (known as overfished) and forecast a sustainable fishing mortality rate. A sustainable harvest policy is prescribed by combining this rate with a forecast of fish abundance. However, projections from single-species assessments may not adequately capture uncertainty when, for instance, targeted species are co-caught by fishing gear and interact strongly, as in a reef fish assemblage. These shortcomings may be significant impediments to effective management of depleted and recovering stocks. In order to improve management decisions targeting long-term sustainability of ecosystems and fisheries in the Gulf of Mexico, we propose to develop decision support tools that are rooted in decision theory: structured decision making (SDM) and adaptive resource management (ARM) in particular. SDM (note that ARM is a special case of SDM for dynamic decisions, with scientific uncertainty) includes at least five components: management objectives, potential management actions, model of system behavior (which project consequences of management actions on the system), a monitoring program to monitor the system state and finally an optimization method to identify decision that are optimal relative to the management objectives (e.g., Martin et al. 2011). We propose a SDM/ARM framework to assist managers with identification of optimal harvest policies that balance competing management objectives (socio-economic, ecological sustainability and impact on ecosystems). We will consider multiple fish populations; specifically we intend to focus on the grouper-snapper complex. The SDM tools will be developed as extensions to stock synthesis models (Methot and Wetzel 2013), thereby integrating the SDM tools with the stock assessment and inheriting the same data uncertainties and population dynamics. We will also leverage existing Gulf of Mexico ecosystem models to project consequences of potential management actions on the system, including both Atlantis (Ainsworth et al. 2015) and Ecopath with Ecosim (Chagaris et al. 2015) models. We will additionally evaluate the performance of our decision support tool in a simulation environment using management strategy evaluation (MSE). This process will also inform data collection programs and may help end users (i.e., natural resource managers from FWC and NOAA) prioritize research to fill critical data gaps and characterize the key sources of error associated with monitoring. Specifically we would discuss how to reduce errors associated with imperfect detection and spatial autocorrelation. Our approach will require a multi-disciplinary effort to engage stakeholders and will require elicitation of socio-economic values associated with the consequences of potential management actions. Therefore, we propose to include a human dimension component to our project. We would apply concepts of behavioral economics to gain insights into stakeholders' behavior and to help improve the effectiveness of outreach programs. This could in turn increase voluntary fisheries-related actions to increase fish biomass. Additionally, Co-PI Dr. Luiz Barbieri will serve as the primary interface with the Gulf of Mexico Fishery Management Council, ensuring this research is aligned with the current needs of the council. This research meets the criteria for being appropriate under	$5,000,000

	the Oil Pollution Act of 1990 (OPA) as it is intended to help return injured natural resources and services to baseline by supporting the development of methods which will result in increasing biomass of injured fish species (Deepwater Horizon NRDA Trustees 2016). This research will explicitly aim to reduce overfishing and bycatch of reef fishes while simultaneously achieving higher catches in the medium and long term compared to the status quo.	
Impact of Oil and Gas on Offshore Pelagic and Benthic Ecosystems	The deep sea (>200 m) represents by far the largest habitat of the Gulf of Mexico, yet it is often overlooked by resource managers, scientists and the general public, who are often unaware that rich and diverse ecosystems can thrive in deep-water environments under the right conditions. While deep-sea ecosystems are out of sight and out of mind to most people, they are not immune to anthropogenic impacts, as they are threatened by oil and gas exploration, deep-sea trawling, and ocean acidification much more than their shallow-water counterparts. Improving the management, conservation, and protection of the Gulf of Mexico, will ultimately require an increased appreciation for the value of its ecosystems by diverse stakeholders, and education and outreach are integral to this effort. We therefore propose to conduct a coordinated outreach and education campaign to raise awareness about deep-sea ecosystems of the Gulf of Mexico. The campaign will target both informal, as well as formal educators at the K-12 level, via the development of educational films, curricula, lesson plans and seminars. Through this targeted campaign we seek to bring the deep-sea of the Gulf of Mexico into classrooms nationwide, and thereby help restore the largest ecosystems of the Gulf.	$8,000,000
Mesophotic Reef Habitat Enhancement.	Background: Sargassum is a critical but understudied habitat in open ocean waters of the Western Central Atlantic (including the Gulf of Mexico, Caribbean and South Atlantic Bight) that provides refuge and food resources for a large animal community, including over 145 species of invertebrates, 100 species of fish, and 4 species of sea turtles. Sargassum is thought to be a nursery area for the juvenile stages of many fish species (e.g., Mahi Mahi, Gray Triggerfish) and sea turtles. It is also a foraging ground for the adult stages of these same fishes and turtles, as well as many species of sea birds, including Sargassum "specialists" like Audubon's Shearwater, Royal Tern, and Bridled Tern. For these reasons, Sargassum has been designated as Essential Fish Habitat in the South Atlantic, but currently it does not have the same status in the Gulf of Mexico. Assessment Needs: There are many stressors that potentially impact Sargassum communities as a result of human activities, including restoration actions. Oceanographic processes aggregate Sargassum with other floating material. This was evident during the Deepwater Horizon oil spill, when large mats of Sargassum and associated animals were oiled. A more pervasive and ongoing problem is marine debris (including microplastics) and the associated toxins that accumulate in Sargassum. Several studies have examined the consumption of plastics by sea birds, fishes, and sea turtles, therefore an understanding of the impacts of marine debris within Sargassum foraging areas is critical. Further, predicted increases in atmospheric carbon dioxide may increase Sargassum growth, yet the subsequent increases in ocean acidification may have negative effects on organisms. Little is known about the impacts of these multiple stressors acting in concert within marine environments. And, numerous large-scale restoration projects have been proposed in the northern Gulf of Mexico, many of which may alter physical processes in neritic waters (e.g., nutrient inputs), which in turn may affect Sargassum habitat quality, growth, and distribution. Objectives: Using field surveys, remote sensing, and both in situ and mesocosm experiments, our objectives are to quantify: 1) natural and anthropogenic factors that control Sargassum growth and 'bloom' dynamics in the Western Central Atlantic; 2) the impacts of increased atmospheric carbon dioxide and resulting ocean acidification on the growth and condition of Sargassum and associated fauna; and 3) the impacts of marine debris and associated toxins on Sargassum and associated fauna. Relevance: This work spans multiple Restoration Priorities: Birds, Sea Turtles, and Fish and Water Column Invertebrates. The National Academy of Sciences notes that "to be effective, restoration plans need to account for variation in ecosystem processes, resources, and stressors that are likely to affect restoration objectives for the target species or habitats. Inadequate understanding of the impacts of such environmental variation leads to uncertainties in the planning of projects and to unfavorable outcomes". Here we propose a program designed to better understand the	$9,700,000

	role of Sargassum in the marine environment, and how Sargassum communities will respond to anthropogenic perturbations and restoration/management actions. Benefits: We will "address relevant data gaps" for Birds, Sea Turtles, and Fishes. Our work will provide data relevant to the "restore and conserve bird nesting and foraging habitat" priority. For Sea Turtles, we will address the "primary threats in marine and terrestrial environments" priority. And for Fishes we will fill "information needs" for "reef fish, highly migratory species, ... and coastal migratory species." The work proposed here will build on previous and current works and leverage existing surveys to examine multiple stressors on pelagic Sargassum and associated fauna, and the implications for effective restoration efforts.	
Minimizing Effect of Human Sources of Sound on Gulf of Mexico Marine Mammals	The overarching restoration goal of this 15-year project is to facilitate the sustainability and protection of Gulf of Mexico fish and invertebrate populations through improved data collection, stock and ecosystem assessments, and management by filling data gaps that limit our ability for ecosystem restoration. Only a handful of impacted fish and invertebrate populations can be restored by reducing fishing and bycatch mortality. A more comprehensive approach is required to facilitate ecosystem-scale recovery. Accordingly, this project involves a dramatic increase in the quantity and quality of fishery independent data for managed fish and invertebrate populations, their potential prey, and associated habitat quality and abundance throughout the Gulf of Mexico. Through collaborative expansion of the long-running Southeast Area Monitoring and Assessment Program (SEAMAP), a formalized partnership among the five Gulf States, NOAA Fisheries, and the Gulf States Marine Fisheries Commission, existing SEAMAP surveys will be expanded, sampling intensity will be increased, and survey design and sampling methods will be optimized. Concomitantly, the collection and processing of life history data (e.g., age and growth, reproduction, genetics, trophodynamics) will be expanded significantly. In the short term, this project will increase the accuracy and reduce the variability of estimates of key population parameters that are critical for single-species stock assessment. Accordingly, data from this project will contribute to more accurate and timely assessments and implementation of management measures when required, ultimately resulting in restoration of stocks. In the long term, these data will facilitate the transition from single-species management to more holistic ecosystem-level approaches to management, while also enhancing our ability to detect population changes and impacts of restoration efforts at varying spatial scales. To address the most critical needs for assessment and management, proposed project efforts will include enhanced habitat mapping efforts, expanded monitoring of reef fish and their associated habitats, expanded monitoring of groundfish populations, expanded monitoring of plankton, expanded monitoring of large demersal and pelagic fishes, incorporation of fisheries acoustics into ongoing surveys, directed sampling and analysis of life history data, and comprehensive statistical and modeling analyses of single-species and multispecies data.	$0
Assessing Recovery Rates of Deepwater Organisms in the Northern Gulf of Mexico through Multigear Examinations of Species Assemblages, Community Structures, Distributions, Trophic Relationships, and Interannual Variability in Abundances.	As a result of the Deepwater Horizon oil spill (hereafter the Spill), marine and estuarine ecosystems from Louisiana to Florida, and potentially beyond, were at risk of exposure to and injury from oil discharged from the wellhead as well as injury from a wide variety of Response actions (e.g., chemical dispersants, booming, berm construction, in-situ burning, organized cleanup activities) (PDARP). Within Louisiana, this and related injury was well documented throughout the Breton National Wildlife Refuge specifically within the Chandeleur Island chain. The refuge comprises one of the state's most ecologically diverse coastal communities (e.g., expansive sea grass beds , isolated beaches, abundant seasonal prey base, wide-ranging bird nesting opportunities) which broadly supports a host of endemic and migratory birds and other wildlife species (Appendix A), many of which Trustees documented as impacted in relation to the Spill (PDARP). Examples include: 1.) Critical wintering habitat for various endangered and threatened piping plover subspecies and important wintering and stopover habitat for the threatened red knot; 2.) Only known breeding location of Chandeleur gull (Herring and Kelp Gull hybrid); 3.) Supports the largest breeding colonies of sandwich terns in the world ; and 4.) A primary wintering ground for redheads which forage in GOM sea grass beds. Further, this barrier island chain serves as an important nursery and foraging habitat for many living coastal and marine resources such as birds, turtles, marine	$18,000,000

	mammals, finfish, shellfish, and invertebrates (PDARP, Section 5.3.1). Given these and many other beneficial ecological services, Louisiana Trustees propose implementation of multiple restorative approaches within a targeted section of the Chandeleur Island chain; a strategy that clearly addresses the Trustees' overall goal of replenishing and protecting living and coastal resources impacted by the Spill (PDARP). Under a Memorandum of Understanding, Louisiana Department of Wildlife and Fisheries (LDWF) and the United States Fish and Wildlife Service (hereafter FWS or the Service) manage several state-owned barrier islands are managed as part of Breton NWR. Proposed Restoration for Open Ocean TIG Building on previous and more recent efforts, Louisiana Trustees propose targeted sediment renourishment (~140 acres) within the southern end of the Chandeleur island chain to create a variety of barrier island habitats including beach, dune, and back barrier marshes. Collectively these restoration approaches support stated restoration goals to address bird injury by facilitating additional production opportunities (e.g. terns, skimmers, pelicans, reddish egret, Chandeleur gull etc.), restoring and protecting habitats on which injured birds (e.g. piping plover, red knot, redhead, etc.) heavily rely upon (e.g., beaches, dunes, sea grass beds, backbarrier marshes, etc.) within an area that has historically provided some of greatest avian benefits within the entire Gulf of Mexico (PDARP, Section 5.5.12.1, Remsen et al., 2015). Further, the proposed restoration location will provide additional protection and enhancement for New Harbor Island; the state's easternmost brown pelican and reddish egret rookery and, a potential future restoration location to further address Louisiana's expansive bird injury. In tandem with these efforts, vegetative plantings, and sand trapping techniques (e.g. sand fencing) will be implemented within the restoration location as a means to bolster habitat diversity and the island's overall lifespan. Such projects and restoration approaches have been shown to result in positive sand accumulations (up to 4') in some locations, providing short-term elevation increases and thereby creating safer bird nesting areas. Further, these approaches will provide enhancement of critical bird habitats including the Chandeleurs' ecologically valuable sea grass beds.	
Remediation from Organic Loading in Deepwater Marine Sediments	Fidelity to a nesting site is an evolutionary strategy to increase reproductive success by nesting in an area that has already proven itself successful. It is generally accepted that all marine turtles exhibit some level of fidelity towards nesting beaches both on a regional scale and a local scale. The location of a turtle nest is a primary determinant of egg survival since poor site selection cannot be compensated for by actions of the parents. Because of this fidelity, loss of nesting habitat may result in fewer nests deposited thereby reducing reproductive output and threatening population recovery of these threatened and endangered species. As coastlines change due to sea level rise and human alteration, understanding the factors that contribute to nest site selection in loggerhead turtles and their ability to respond to loss of habitat is critical to their conservation and population recovery. Studies have shown that characteristics of the nearshore environment can influence the location of turtle emergence onto the nesting beach. At one nesting beach in Northwest Florida, it was determined that areas of relatively dense nesting were found in locations that had a relatively strong alongshore current, relatively small waves, a steep offshore slope, and the largest historical rates of erosion. Areas of relatively dense nesting also corresponded to areas of low nesting success (number of nesting crawls/total number of crawls). This study has not been conducted on other nesting beaches however to determine if the characteristics identified in the previous study are site specific or general to the region. We propose to expand the previous study to include additional nesting beaches in Northwest Florida and Alabama. This information can help managers identify threats in the nearshore environment that may result in reduced reproductive output for nesting sea turtles. One Recovery Approached established for sea turtles in the PDARP is to "Enhance sea turtle hatchling productivity and restore and conserve nesting beach habitat." This project will directly address that approach by identifying characteristics of the nesting beach habitat that are critical to sea turtles at various nesting beaches. For example, habitat characteristics that are important on the St. Joseph Peninsula may play such a large role in nest site selection for turtles nesting in Alabama.	$850,000

	Without a complete understanding of the habitat characteristics used by nesting turtles, it is difficult to improve nesting habitat and thereby increase hatchling production.	
A Management Strategy Evaluation Framework to Effectively Plan and Monitor Recovery of Marine Mammal Shelf and Oceanic Populations	This project uses an existing Quota Bank to quantify and avoid red snapper bycatch in the commercial grouper-tilefish fishery. The Deepwater Horizon event harmed red snapper, resulting in 55-220 tons of foregone production through direct kills and in longer-term injuries, from decreased reproduction to tissue lesions. Commercial fishermen are working with managers to protect red snapper while the spill's impacts play out. But it'll be difficult to rebuild this fishery without a complete accounting for bycatch in the quota system. This project provides up-to-date data about red snapper bycatch to incorporate into quota-setting. Together with commercial fishermen, managers can proactively reduce red snapper killed through bycatch so the population can continue to recover from the spill. Red snapper managers lack reliable data on red snapper bycatch in the grouper-tilefish fishery, instead extrapolating from observer and self-reported data. This is problematic in light of commercial grouper-tilefish discards. Since red snapper's historical base was in the western Gulf, some eastern Gulf fishermen can't get allocation to retain their red snapper catch. Since discard mortality rates for commercial hook/line fisheries are 55-95%, this means red snapper quotas don't cover all red snapper killed. In order to set quotas accurately and maintain a positive rebuilding trajectory, bycatch in the commercial grouper-tilefish fishery must be accounted for. By quantifying bycatch and discards, this project ensures these dead snapper count toward the quota and are no longer wasted catch. The PDARP specifies that quota banks "can help return injured natural resources and services to baseline and compensate for interim losses by reducing reef fish discards." In 2015, the Gulf of Mexico Reef Fish Shareholders' Alliance launched the first and only Quota Bank in the Gulf. The Quota Bank partners with qualified grouper fishermen in the Eastern Gulf to cover their red snapper bycatch and assist young red snapper fishermen. There is a growing nationwide movement of permit banks. The Cape Cod Fisheries Trust, in partnership with UMass Dartmouth, proved their scallopers had minimal flounder bycatch in a newly-opened area. Permit banks in three fishing towns provide quota to cover bycatch and spatial management plans through the California Groundfish Collective. Evidence suggests Collective fishermen have less bycatch than non-participants. The Maine Coast Fishermen's Association's building a "risk pool" to help fishermen avoid and account for cod catch. While quota banks are new to the Gulf, they're a well-established tactic for helping fishermen address bycatch. This project uses the Quota Bank to quantify and avoid red snapper bycatch in the grouper-tilefish fishery. It provides up to 100,000 lbs of red snapper allocation to fishermen to cover bycatch, incentivizing participation in bycatch reduction programs, like gear research/modification and hotspot identification, and collecting bycatch data through electronic video monitoring, electronic logbooks, effort-level data collection, and NMFS observer coverage. This is a big incentive- many grouper-tilefish fishermen see discards as a serious inefficiency they're eager to address. The study provides managers with accurate, timely bycatch data. By leasing quota to cover bycatch so red snapper aren't discarded, incidental mortality will decrease, leaving fewer unknown variables for managers. In 2016, the Quota Bank leased nearly 60,000 pounds of red snapper to 20 fishermen in the Gulf. That's nearly 60,000 pounds of red snapper folded into catch shares, no longer discarded at sea. Because mortality levels are so high for commercial hook/line fisheries, if it weren't for the Quota Bank, those 60,000 pounds of red snapper likely would've died and wouldn't have been covered by the quota. The Quota Bank will train participating fishermen in best practices and develop ways to address their bycatch.	$220,000
Artificial Reef Creation Off the Alabama Coast	The Billfish Foundation (TBF) is a science-based, non-profit, charitable (501) (c) (3) organization, based in Ft. Lauderdale, Florida with constituents around the world, including a strong base in Gulf of Mexico states. TBF's priorities include research, education and advocacy for responsible use and conservation of billfish (marlin, sailfish, spearfish). TBF proposes to use dart tags, a cost-effective tool deployed by volunteer anglers and captains, as a tool for conservation, education, and research to increase release of billfish & bluefin. An increase in releases means a reduction in mortality, improvement in data collection that contributes to improving stock assessments of Atlantic marlin, sailfish and North	$0

	Atlantic bluefin tuna. Increasing crucial tag and recapture data in the Gulf of Mexico and the Caribbean Sea will improve stock assessments upon which management and conservation decisions depend. Improved stock assessment analyses will support improved management needed to recover overfished stocks. The Gulf of Mexico and Caribbean Sea regions are recommended because the movements of the species from and into the tropical North Atlantic waters include ingress and egress of both regional waters. Tagging in the Caribbean Sea should result in higher recapture rates in the Gulf and those deployed in the Gulf should lead to more recaptures along the east coast and possibly in the central and eastern Atlantic Ocean. With the drop in tagging reports, due, in large part, to volunteers not wanting to pay for tags, tag sticks and applicators, a vigorous outreach and education campaign is essential to generate participation needed to gain the best data return on a grant investment. Several tools are recommended, including a 3 minute video for social media, an informative card for wide distribution that includes text that explains why an increase in tagging data is needed, a call for volunteers and how tagging data will be used. The text will also clearly state that free tags are available for distribution through TBF thanks to a grant from the Gulf Spill Restoration Fund. The goals and parameters of the project, the geographic regions in which tags are to be deployed, how to obtain free tags, how data can be submitted and how to receive subsequent tag allotments all will be included on the card. If awarded 6 year grant, TBF proposes to distribute 35,000 free tags in packs of 5. The first year's distribution goal is 10,000 tags, followed by 5,000 during each subsequent year. The majority of the tags will be distributed in the Gulf of Mexico where an abundance of volunteers is available. In the Caribbean Sea our initial distribution goal will be 1,000 tags initially in the Caribbean Sea. In subsequent years, our goal will be to increase the tag distribution in each of the two regions. If a vessel has a strong tag reporting history with TBF, 15 tags will be allocated the first year. Subsequent year distribution will be based on reporting of tag data for 3 of any combination of blue marlin, white marlin, sailfish and/or bluefin tuna from the previous year's allotment. If any tags remain undistributed at the end of the research period, distribution in the same manner will continue. A 6 year research period provides ample time over which recaptures should be made and reported. The time frame also provides scientists the opportunity to compare numbers of recaptures to recaptures during previous time frames, and the time needed to compare current/last year's or next year's stock assessment results with subsequently scheduled assessments. With bluefin tuna, the time frame for comparing might be best to wait until the 2023 assessment for assessment are more frequent than for billfish. ICCAT Stock Assessment Schedules Blue Marlin White Marlin Sailfish Bluefin Tuna 2018 2018 2016 2017 + 6 yrs - 2024 + 6 yrs – 2024 +9 yrs - 2025 + 3 yrs – 2020 & 2023.	
Research and Outreach to Understand and Minimize Human-Dolphin Interactions	As the climate changes, predicted increases in temperatures could affect sex ratios of sea turtles, potentially resulting in single sex cohorts which may eventually lead to population extinction. Conservation actions for threatened and endangered sea turtle populations must take incubation temperatures into consideration as long-range management plans are developed. Because of its small size, alterations to critical life-history traits in Northern Gulf of Mexico loggerheads, such as sex ratio, may serve as a serious threat population recovery. Nest and sand temperatures from sites across Northwest Florida were collected in the late 1990's and early 2000's. Results of that study indicated clutches incubating in the Northern Gulf of Mexico may be producing a significant number of males. Combined with Atlantic coast nesting beaches north of Florida (i.e. North and South Carolina, Georgia), these males may help balance the large number of females being produced on Florida's Atlantic coast. As the climate warms however, changes to this incubation environment may occur. Monitoring of these same beaches and inclusion of new sites nearly two decades later will help identify potential threats to the incubation environment for turtles nesting on Northern Gulf beaches. We propose to deploy temperature data-loggers into the sand at select sites across Northwest Florida and Alabama. Data from this study will be compared to data from the previous study conducted from 1999-2004 along Northwest Florida nesting beaches. Long-term monitoring of sand temperatures, coupled with long-term data collection of loggerhead turtle incubation rates, has provided statistically significant trends in the past and is necessary for recovery of these species. This project	$0

	directly addresses the Recovery Approach for sea turtles in the PDARP to "Enhance sea turtle hatchling productivity and restore and conserve nesting beach habitat." Particularly as the climate changes and restoration activities alter nesting beaches (i.e. nourishment and beach building projects), baseline information on the incubation environment for sea turtle eggs in this region is necessary. It is difficult to restore nesting beach habitat without first knowing what the beach should be restored to (i.e., baseline).	
Gulf of Mexico Deep Water Column Monitoring Program	Planned coastal restoration activities including Mississippi River diversion projects are a key component to the state of Louisiana's masterplan to rebuild the coastline. These coastal restoration activities could have an effect on resident bottlenose dolphin populations in Barataria Bay, Lake Borgne, and Breton Sound. It is estimated that 2,000 dolphins call Barataria Bay home, and about 800 reside in the Breton Sound area. This adaptive management plan will monitor the health of the marine mammals, including the bottlenose dolphin, that reside in Lake Borgne, Barataria Bay, and Breton Sound. Audubon Nature Institute's Coastal Wildlife Network (CWN) is an excellent partner to monitor the health of the bottlenose dolphins effected by the Mississippi River diversion projects. CWN serves as the primary response partner for Louisiana Department of Wildlife and Fisheries (LDWF) for rehabilitating marine mammals (dolphins, whales, manatees) and sea turtles in the state of Louisiana. CWN is the only entity in the state of Louisiana responsible for the rehabilitation of live marine mammals and also monitors and collects data to investigate the cause of illness and death. Currently, CWN staff participates in NOAA dolphin health assessments and will participate in an upcoming tagging study in conjunction with LDWF and CPRA. Through this project, CWN would use adaptive management techniques to monitor bottlenose dolphin populations and their health in areas where bottlenose dolphins reside and could be affected by the Mississippi River diversion projects.	$6,900,000
Evaluating the Benefits of Restoration Projects and Informing Restoration Design by Using Passive Acoustic Telemetry in Gulf	Assessing the distributions and habitat use of marine vertebrates is a challenge. These species are difficult to catch and range over entire ocean basins. Use of tracking tags has provided insight into these questions. Satellite tags are frequently used because they do not require recovery of the tag however satellite tags are expensive and typically have a life-span of less than one year. Acoustic tags are less expensive, smaller and have life-spans greater than 5 years; the greatest limitation of this technology however is the need for acoustic receivers to document tag locations. Most often, receiver arrays are limited to one localized area; for organisms that utilize the entire Gulf of Mexico (GoM) these arrays only provide information at one life-stage. However, because marine organisms are likely to converge on the same oceanographic features, targeting receivers in those areas would increase the likelihood of detection. One area that serves as a convergence site for multiple marine species is structures. Man-made structures such as artificial reefs have been shown to increase the biomass of marine organisms. Structures serve as settling habitat for invertebrates which in turn serve as a prey base for higher trophic levels including reef fish, sharks, and turtles. Sea turtles in the GoM are frequently observed foraging on structures including oil rigs, shipwrecks, and artificial reefs. Kemp's ridleys and loggerheads eat invertebrates such as crabs, snails and fish associated with these structures while green turtles forage on algae that grows on structures found in shallower waters. Because of their heavy use by marine vertebrates, deploying acoustic receivers on structures would increase the detection rates for tagged marine vertebrates. In addition, these man-made structures are often maintained as part of organized programs, such as local or state parks or federal Rigs-to-Reef program. Because of this, data downloading and receiver maintenance may be coupled with regular activities conducted by the reef manager, or these activities may be shared by researchers who species utilize the structures thereby spreading the work-load over multiple groups. We propose to bring together a multi-agency group to deploy and maintain acoustic receivers on man-made structures in the GoM. This array would benefit multiple species groups including reef fishes, tarpon, sharks, sturgeon, and sea turtles.	$250,000

Pilot Project Linking Offshore to Onshore Water Quality Monitoring	Audubon Nature Institute will work to reduce the impact to sea turtles in the US Gulf of Mexico through turtle excluder device (TED) education and implementation assistance in the shrimp fishery. Funding of this project will contribute to the continued recovery of sea turtles, especially Kemp's ridleys, in the Gulf of Mexico, by reducing the impact of fisheries on these populations. A major threat to the sea turtle population in the Gulf of Mexico is unintended catch by fisheries. Sea turtle habitats overlap with the Gulf of Mexico shrimp fishery and incidental capture of sea turtles in shrimp trawls has been cited as one of the many threats to their recovery. Since the 1980s, TEDs have been required in otter trawls that fish offshore, but not in skimmer trawls that typically fish in shallower waters. TEDs have been proven to reduce sea turtle mortality and NOAA studies indicate proper compliance with the upcoming TED regulations will lead to as many as 2,500 turtles protected annually (NOAA 2016). As part of this project, Audubon Nature Institute's Gulf United for Lasting Fisheries (G.U.L.F.) plans to host industry workshops to educate fisherman about the new rule, and coordinate dock days to ensure TEDs are installed properly to increase the number of sea turtles protected in the Gulf of Mexico.	$3,000,000
Benthic Invertebrate Community Response and Recovery Rates Following Barrier Shoreline Restoration Projects in Northern Gulf of Mexico and Potential Impacts to the Habitats of the Threatened Piping Plover (Charadrius Melodus) and Other	Photo-identification studies are a type of capture-mark-recapture study used to detect known (marked) and unknown individuals over time to estimate population size and vital rates. They are also used to provide information on distribution, seasonal movements, habitat use, behavior, and body condition and health of individuals. Centralized large-scale, collaborative photo-identification catalogs for bottlenose dolphins and other species have been established (e.g., the Gulf of Mexico Dolphin Identification System, or GoMDIS), providing a basis for tracking movements of individual animals beyond project study sites and detecting range shifts in response to environmental changes. Existing data systems need to be assessed, refined, and expanded to facilitate upload and analysis of a large number images and to improve data access and sharing by a diverse group of field researchers and partner organizations. Periodic workshops are needed to ensure standardized methods for image acquisition and processing are being used and revised, as necessary. Multi-year studies need to be expanded to include additional study areas across the Gulf, particularly coastal and offshore areas affected by the oil spill. Further research is needed on: (1) the development of software to enable more effective and timely analysis and comparison of still and video images, (2) the potential for high-resolution aerial imaging systems to augment or replace traditional aerial and/or vessel surveys, and (3) the use of unoccupied aircraft systems (UASs) or drones to collect images of marine mammals independently or during traditional vessel surveys or other surveillance operations.	$1,470,000
Flux of Nutrients and Sediments from the Outlet of the Mississippi River to Nearshore Gulf of Mexico Waters	In 2010, the Deepwater Horizon oil spill greatly impacted the northern Gulf of Mexico (GoM); however a lack of baseline data on habitat use and health of sea turtles in the GoM hampered the recovery response and, a continued lack of these data, makes impacts to sea turtles from future events impossible to define. In their review of lessons learned from the Exxon Valdez oil spill, Paine et al. (1996) highlighted the need for better baseline data and suggested that future studies focus on long-lived species and organisms. Sea turtles are long-lived animals that are often considered sentinel species: if habitat degrades, it will be evident in sea turtle distribution, growth rates, abundance, and health. The health of wildlife populations is being impacted by human population explosion, habitat degradation and fragmentation, and increased proximity to humans and their domesticated pets. These threats are occurring on a global scale which is creating opportunities for disease to have a broad-scale negative effect on wildlife populations and their habitats (Deem et al. 2001). The viability of a population is inseparable from the population's health (Karesh and Cook 1995). By establishing baseline health and then monitoring health over time, the effects of various disturbances (i.e. ecotourism, oil and gas activities, commercial fishing) can be assessed and comparisons can be made among populations. Long-term research programs operated by the USGS capture and sample adult and juvenile turtles of multiple species throughout the GoM; these projects provide biological samples available for health analyses. These long-term projects have resulted in an archived bank of blood samples awaiting funding for analyses. The USGS maintains an archive of blood samples from loggerheads, greens, Kemp's ridleys, and hawksbills (adult and juveniles; males and females). Analyses of these archived	$1,200,000

	samples can occur immediately upon receipt of funds. Additional sampling will be conducted to provide long-term baselines and fill gaps in archived samples.	
Development of Non-Invasive Techniques to Monitor Natural and Anthropogenic Threats to Florida Manatee Health	The DWH oil spill injured many species of marine mammals, sea turtles, fish, invertebrates, and corals in the Gulf of Mexico. All of these taxa use sound for important life functions. Ambient noise levels in the oceans are rising as human activities like commercial shipping, pile driving, and oil and gas seismic surveys become more pervasive. Increasing noise levels impact these species' survival and degrade critical habitat. Quieter technologies exist for all these major noise sources and noise reduction mitigation can be an effective restoration technique. Collaborative task forces of resource managers and industrial stakeholders are needed to determine, implement, and monitor the most effective noise mitigation techniques. This project will develop three collaborative noise mitigation task forces to investigate and incentivize the adoption of best noise reduction technologies in the Gulf of Mexico: 1) a geological and geophysical task force for seismic survey noise-reducing technologies; 2) a commercial shipping noise mitigation task for shipping noise reduction; and 3) a marine construction task force for pile-driving noise reduction technologies. Noise-reducing seismic technologies could include marine vibroseis, low frequency acoustic sources, deep-towed acoustic/geophysical systems, low-frequency passive seismic methods, and fiber optic receivers allowing smaller airguns. Ship owners and ports could adopt Green Marine noise mitigation recommendations including frequent hull cleaning and propeller blade maintenance; determining cavitation inception speeds; adapting quieting technologies during new construction or by retrofitting; measuring vessel noise and mitigating noisiest vessels; initiating research to understand habitat locations and ship routing options; and establishing listening stations for vessels to measure noise levels. Noise-reducing pile-driving technologies could include double-walled piles, zero Poisson's ration pile, cofferdams, and hydrosound dampers. Project funding will cover task force development, studies to determine most effective mitigation measures, and funding to incentivize adoption of best mitigation technologies. While this project could focus on the DWH oil spill region, anthropogenic noise is pervasive throughout the Gulf of Mexico, and Gulf-wide noise mitigation could also improve recovery for wide-ranging oceanic Gulf of Mexico cetaceans that were impacted by the oil spill.	$250,000
Mitigation Plan for Leaking Oil and Gas Infrastructure to Compensate for Open Ocean Injuries	The DWH oil spill injured many species of marine mammals, sea turtles, fish, and corals in the Gulf of Mexico (GOM). All of these species use sound for important life functions. Ambient noise in the GOM is rising due to commercial shipping, pile driving, and oil/gas seismic surveys, and increasing noise levels impact species' survival and degrade critical habitat. Noise mitigation can be an effective restoration technique. It requires passive acoustic monitoring (PAM) for baseline noise characterization to design effective noise mitigation projects and ongoing noise monitoring to evaluate effectiveness of implemented projects. PAM also provides data that can be used to monitor cetacean and soniferous fish distributions, seasonal movements, and densities. Recent advances have produced trend estimates at finer temporal resolution than possible for standard survey methodologies (Taylor et al 2016; Sveegaard et al 2015), providing trends in density or abundance of marine mammals at the scales needed to evaluate the effectiveness of restoration efforts. This project intends to restore the acoustic habitat of marine mammals, sea turtles, fish, and invertebrates of the GOM. Additionally, the project allows for monitoring of these organisms to assess the efficacy of this and other restoration projects. To monitor noise and marine mammal and fish population densities for baseline levels and changes due to restoration activities, we will develop a GOM PAM task force and a soundscape monitoring strategy to determine priority species and habitats for population monitoring of restoration activities and for noise-reduction. The goal is to (1) keep quiet areas quiet and reduce noise in priority habitats; and (2) collect and analyze calibrated PAM data for baseline conditions and adaptive management to achieve these goals. The task force will assess current PAM data availability; determine temporal, spatial and taxa-based data gaps to be filled; and develop fixed-instrument PAM survey design and standards, including documentation of protocols for equipment and analytical methods to ensure comparability of data collection and analysis across GOM PAM projects. Based on these task-force assessments, this project will implement	$700,000

	data collection at a network of long-term PAM monitoring index sites for restoration monitoring; implement data collection from movable PAM arrays for short-duration, high-resolution studies of noise or restoration activity effects; and implement focused surveys/studies to obtain acoustic behavior parameters needed to estimate density (e.g., fish and delphinid species classification, acoustic tracking, behavioral tagging studies). A project-level clearinghouse for ongoing PAM projects and a data archive for raw acoustic recordings and metadata will be developed to enhance collaboration and coordination across research groups and taxa. Data will be collected at long-term monitoring sites throughout the restoration period, while focused movable arrays and behavioral studies will be implemented as needed to answer restoration project questions. PAM data analyses will characterize diel, seasonal, and interannual changes in the soundscape; produce dynamic maps of ocean noise and hotspots in biotic sound production; characterize changes in noise levels from anthropogenic sources over the restoration period; characterize the seasonal distribution of marine mammals and soniferous fish, and estimate trends in density of marine mammals over the restoration period to evaluate mitigation effectiveness. Further, the task force will use results from baseline soundscape monitoring and analyses to identify priority habitats for noise reduction and major noise sources to be mitigated. This information will be used to guide and monitor effectiveness of separate noise mitigation projects, such as the "Reduction of Anthropogenic Noise to Restore Injuries to Gulf of Mexico Marine Mammals, Fish, and Invertebrates" project idea.	
Temporal Dynamics of Eukaryotic Plankton Diversity at Northern GOM Deep Benthic Coral Communities	The chelonid herpesvirus 5 (ChHV5) is an alphaherpesvirus associated with the neoplastic disease fibropapillomatosis (FP) in sea turtles. FP occurs worldwide, mostly in green turtles, but has been documented in all of the sea turtle species. FP causes external fibropapillomas or internal fibromas, and can lead to immunosuppression, secondary bacterial infections, and death (Work, 2004). It has been suggested that the presence of FP in marine turtles may act as sentinels of ecosystem health (Aguirre & Lutz, 2004), and in Florida, FP is the leading cause of green turtle strandings (Foley et al., 2005). Although the etiology of FP remains elusive, co-factors such as environmental contamination or compromised immune systems have been implicated as triggers to induce FP (Herbst & Klein, 1995; Van Houtan et al., 2010; Alfaro-Nunez et al., 2016). Oil may be a particularly detrimental contaminant, as even short exposures to crude oil may damage skin layers, opening routes for infection by ChHV5, which is known to target skin tissues (Kang et al., 2008). Unfortunately, attempts to isolate and culture the virus have been unsuccessful, therefore impeding more traditional, controlled studies of pathogenesis and tumorigenesis. However, the USGS has developed a simple, inexpensive long-range PCR amplicon resequencing strategy that targets the majority of the ChHV5 genome (Morrison et al., in prep), allowing for detailed typing of geographic strains. Since there is no clear, practical understanding of how genetic differences between alphaherpesviruses instruct pathogenesis, the detailed examination of viral genomes is likely to lead to an increased understanding of the origins, pervasiveness, and flexibility of viral functions, and the factors that have shaped viral evolution through time. The use of this practical diagnostic tool proposed here will complement on-going field-based sea turtle ecological research in the GOM, providing for more complete health status monitoring of Gulf marine turtles. The goal of this proposed research is to utilize an efficient virus sequencing strategy to obtain detailed genomic data for strains of ChHV5 circulating within different sea turtle species in the GOM and Caribbean (e.g. Buck Island Reef National Monument, St. Croix, US Virgin Islands). This sequence database will allow for fast and accurate monitoring of the prevalence of virus strains and over time in the GOM, and how viral infections relate to oil contamination in the environment. The database will be made publicly available through public databases such as GenBank, the ViPR Virus Pathogen Resource, and/or USGS Sciencebase. This work will link directly to on-going turtle sampling in several sites in the GOM that are led by and permitted through K. Hart (USGS WARC). The opportunity to integrate this component of research into questions centered on 'what is a healthy sea turtle' is of paramount importance in the GOM.	$5,121,868

Integrative Data Infrastructure for Gulf of Mexico Mesophotic and Deep-Benthic Habitat Assessment and Restoration	The Deepwater Horizon oil spill was the largest man-made disaster ever and will have long-lasting impacts on the Gulf of Mexico ecosystem, including marine mammals, sea turtles, and pelagic and benthic fish and invertebrates. Large-scale ecosystem impacts require large-scale restoration efforts. The most effective method for improving damaged ecosystems is by setting aside and protecting habitat from anthropogenic impacts. This restoration idea is to set aside large (thousands of square kilometer) regions in the Gulf of Mexico to protect and enhance recovery of all impacted taxa by protecting the ecosystem from all anthropogenic activities, for example by creating marine protected areas or similar habitat protections. Priority habitats to protect might include the only known Bryde's whale habitat of the northeastern Gulf of Mexico, the productive foraging habitat of sperm whales near the Mississippi Canyon, the potential calving habitat of sperm whales off the Dry Tortugas, expanding the area of the reef ecosystem habitat protections of the Flower Garden Banks sanctuary, or creating similar habitat protections for deep coral reefs throughout the northern Gulf of Mexico. Ecosystem damage at never-before-seen spatial scales requires ecosystem protection at similarly large scales and must be included as part of the restoration projects to encourage ecosystem recovery.	$10,000,000
Maximizing Restoration Impacts Using Full Annual Cycle Models for Migratory Bird Populations Injured in the Deepwater Horizon Oil Spill	Marine mammal bycatch refers to any marine mammal adversely affected as a result of being unintentionally entangled, entrapped, ensnared, or caught by nets, lines, traps, or hooks, or otherwise impacted by fishing gear. Bycatch is the greatest direct cause of marine mammal injury and death in the United States and around the world. Bycatch of marine mammals in Gulf of Mexico commercial fisheries has the potential to prevent the recovery and restoration of marine mammals that have been reduced as a result of the Deepwater Horizon oil spill, including bottlenose dolphin (all stocks), Atlantic spotted dolphins, pantropical spotted dolphins, pygmy sperm whales, Risso's dolphins, and short-finned pilot whale. Fisheries of particular concern include the menhaden purse seine, shrimp trawl, shark gillnet, pelagic longline, reef fish, and charter boat/headboat fisheries. Studies are needed in the following areas: • The identification of measures that can be used to reduce bycatch of marine mammals in high priority Gulf of Mexico commercial and recreational fisheries while maintaining the economic viability of those fisheries. Measures to investigate and test could include, but are not limited to, alternative fishing gear and fishing methods, time-area restrictions, and removal of lost or derelict fishing gear (i.e., traps, pots, and gillnets). • Ways to create economic incentives for reducing marine mammal bycatch through, for example, incentive-based fishery bycatch measures. • The ecological effects of fishing on marine mammals, their prey species, and the Gulf of Mexico marine ecosystem.	$611,689
Understanding the Cause of Spontaneous Abortions in Cetaceans after DWH	Waterbirds were disproportionately injured during the Gulf oil spill in 2010, particularly on barrier and bay islands. We propose to restore some of the species, including Gull-billed, Least, Common, Caspian, Royal, and Sandwich Tern, Reddish Egret, Brown Pelican, American Oystercatcher, Snowy Plover, and Wilson's Plover. National Audubon Society and partners will increase production of birds, reduce mortality, and concomitantly restore and protect habitats on which injured species rely. We will use an adaptive management framework to assess threats, implement strategies to address those threats, monitor success, and adapt both within season where appropriate, and across seasons. We will work on the four key priorities for bird restoration outlined in the PDARP. Priority 1: Restore and conserve bird nesting and foraging habitat. Objectives: At key sites, implement stewardship activities to alleviate dominant threats and improve productivity. Activities: Direct protection of nesting colonies and solitary nesters Predator control Vegetation management Erosion control Outreach and education to increase community cooperation and acceptance Expected Outcomes: Increased productivity of injured birds Priority 2: Establish or re-establish breeding colonies Objectives: Attract colonial nesting species to new or restored islands Activities: Social attraction techniques, including use of decoys and playback of vocalizations Expected Outcomes: Increased number of nesting colonies of injured species Increased probability of region-wide population persistence Priority 3: Prevent incidental bird mortality Objectives: Reduce incidental mortality of coastal waterbirds of all species. Activities: Set up recycling for monofilament line. Educate fishers about dangers of entanglement and reduce barriers to recycling. Expected outcomes: Fishers have increased awareness	$300,000

	and compliance with monofilament recycling. Bird mortality from entanglement in monofilament reduced Priority 4: Address relevant data gaps Objectives: Using the objectives hierarchy established by the Gulf of Mexico Avian Monitoring Network, develop monitoring to fill key knowledge gaps. Activities: Develop standardized protocols for monitoring bird populations and productivity Conduct studies to ascertain the effects of predators, habitat use, and sediment type on bird productivity Expected Outcomes: Improved understanding of Gulf-wide population dynamics Gain knowledge required to prioritize areas for restoration and to develop comprehensive management plans Benefits to Public: Improved management of birds nesting on bay and barrier islands will allow for better balance between species of birds, potentially reducing human-bird conflicts. Recent studies have linked the reduction in coastal birds, led by the reduction in many of these species of waterbirds, to an explosion in populations of Menhaden, along with a decrease in oil content, quality, and economic value of this important prey species. Restoring balance to this ecosystem by restoring predatory birds will improve livelihoods for fishers and help restore fisheries. Restoring the species harmed during the spill will improve public perception of our coasts as ideal landscapes for living, working, and recreating. It will also improve access to recreation such as bird watching. Benefits to Environment: These species are important as both predators and prey in coastal environments, thus restoring populations of waterbirds will help restore balance to marine fish community structure. Furthermore, the proposed actions will provide benefits to ecosystem services by restoring native vegetation and dune structure and by removing introduced predators that prey on other native vertebrate species. They also disperse aquatic invertebrates, change benthic species composition and abundance, change sediment composition, and improve water quality.	
Establishment of a Gulf Sperm Whale (Pelagic Ecosystem) Nation Marine Sanctuary, Sperm Whale and Pelagic Ecosystem Interpretive Center, Gulf Sperm Whale and Pelagic Ecosystem Research Vessel	The Gulf is one of the most heavily industrialized bodies of water in the world, with numerous sound-producing human activities, including commercial shipping, oil and gas development (including seismic studies), platform removals (including the use of explosives), coastal construction (including pile driving), and military operations and training. Excessive sound can cause disruption of important marine mammal behaviors, and—at close range—physiological injury. Excessive sound can also mask biologically important sounds, including communication calls between individuals of the same species. Research is needed to determine: • The Gulf of Mexico "soundscape" - sources of sound in the Gulf and associated sound levels and how they vary spatially and temporally. • The effects of bathymetry, temperature, and other oceanographic features on sound propagation. • The direct, indirect, and cumulative effects of human-caused sound on marine mammals and their prey species.	$70,000,000
Institution of a Laboratory Information Management System	Since 2010, the northern Gulf of Mexico has observed a significant increase in sea turtle strandings, with the highest numbers occurring along coastal Mississippi. The majority of these strandings were juvenile Kemp's ridley sea turtles, and these data along with recent research has supported the conclusion that the Mississippi Sound is an important developmental habitat for this species. Occurring to a lesser extent with these strandings, over 400 juvenile Kemp's ridleys have been incidentally captured by recreational hook and line fishermen in Mississippi. The state has approximately 200 public access points, including fishing piers, fishing bridges, boat launches, and marinas. Recreational fishing is a popular activity of visitors and coastal county residents and represents an important economic vehicle for this region. The proposed project aims to enhance the capabilities of the State of MS to respond to these fishery interactions, understand what contributes to these interactions, and learn how these interactions can be mitigated. The trustee will conduct the following activities in MS: • Conduct pier based outreach/education. o Talk to fishermen during shifts about methods that promote avoiding sea turtle interactions (e.g., properly discarding bait) and importance of reporting interactions. o Pass out informational pamphlets and cards that explain what fishermen should do should they experience a sea turtle interaction as well as installing pier signage. Information will include how anglers should properly handle an interaction and who to contact for help or to report an encounter, as required by federal law. • Conduct pier-based surveys, data collection, and analyses: o Participate in an ongoing collaborative study with NMFS Pascagoula and	$400,000

	IMMS to study recreational fishing behavior at monitored piers in Mississippi. o Utilize an already developed survey that collects such information as frequency of fishing, bait used, type, and size of hooks used, and possible past sea turtle interactions. Characterize pier parameters (e.g., height, hydrology, and association with artificial reefs). o Conduct surveys year round at different times of the week to examine fishing effort on a weekly and yearly basis. o Compile and analyze collected data (e.g. biological data collected, pier characteristics, reef location, and survey information). Spatial analysis will be used to provide insights into patterns or trends that may help explain or model turtle behavior. These survey efforts will fill a knowledge gap concerning fishing behavior and sea turtle interactions at fishing piers. The results will be organized into a manuscript, which will be submitted for peer-review publication.	
Design and Initiation of an In-Water Sea Turtle Monitoring Network in the Gulf of Mexico	Understanding the detailed quality, quantity and spatial distribution of marine habitats enhances our ability to manage human and natural resource activities to support sustainability, conduct restoration and maintain system function. Maps have a wide range of applications in management, planning, policy, research, and restoration. Prior to DWH, map products, such as high resolution bathymetry and habitats were top priority for all Gulf of Mexico natural resource agencies in the Gulf of Mexico. This remains top priority after DWH. NOAA, led by NCCOS, and other federal and state partners will establish a habitat mapping prioritization and implementation plan. This proposal will fully leverage with the NOAA/ USGS led Habitat and Water Quality monitoring network currently funded by the RESTORE Council. The plan involves three tiers: 1) develop a prioritization tool to target unmapped or poorly mapped areas in the Gulf of Mexico, 2) develop a standardized approach to map the identified targets and 3) implement mapping activities. Gaps in habitat data collection will be strategically identified and coordinated with regional state and federal mapping policies and master plans. Processes will be developed for mapping, assessment, and monitoring of numerous parameters describing the seafloor (e.g., depth, topography, and geomorphology), upstream, estuarine/coastal habitats, and associated benthic communities. While habitat mapping is a valuable stand-alone product, it is also a foundational platform upon which other research and management programs can be built. Additionally, it is expected that the oil and gas industry will significantly increase deep water exploration and the location and status of biological communities are poorly understood. Data tools and portals, such as NRDA DIVER and ERMA, developed in response to DWH are potentially being used for the phase 1 habitat/mapping synthesis. It is intended that the prioritization tool and new data will be used for storage, query, dissemination, and visualization. Additional tools will be customized for Deep Sea Coral habitat restoration, mitigation, and protected area siting.	$800,000
Leatherback Behavior and Use of the Gulf of Mexico	Oil and gas released in offshore ecosystems can have multiple impacts on organisms in the water column and on the sea floor. Research in the Gulf since the Deepwater Horizon oil spill has revealed some of the ways that oil and gas can affect the biological communities of offshore waters, and how the carbon from oil and gas (petrocarbon) can penetrate into and travel through the food webs of offshore ecosystems. We propose two related lines of research: 1. A focused series of measurements of oil and gas impacts around natural seeps via water column and benthic sampling coupled with deployment of time-series sediment traps to capture sinking particles and aggregates, including oil-snow. We will use stable and radioisotope measurements to assess the assimilation of petrocarbon by organisms and transfer of petrocarbon through the pelagic and benthic food webs. We will use genomic approaches to characterize microbial communities and the ways they're altered by exposure to oil and gas. These measurements will be complemented by experimental work to resolve the mechanisms of oil and gas movement into the biota, and the role of biological processes in promoting the vertical sedimentation of oil and oil-derived particles. 2. Benthic surveys to track the distribution and fate of sedimented oil, both around natural seeps and in regions affected by the Deepwater Horizon spill. We will carry out photographic surveys to assess benthic megafauna community composition, density, and health. We will carry out coring surveys to assess the fate of sedimented oil, its impacts on benthic organisms, and its role in supporting sedimentary microbial communities through a combination of geochemical characterization (stable and	$300,000

	radiocarbon measurements) and laboratory experiments. The ultimate goal of this research program is to provide basic understanding of the ways that oil and gas alter the composition and function of offshore communities of microbes, phytoplankton, zooplankton, and benthic fauna. This study is timely and will provide critical insights into ecosystem responses to inform future responses to offshore drilling accidents.	
Wetlands Education Project	The 2010 Deepwater Horizon (DWH) oil spill in the Gulf of Mexico (GOM) is one of the largest industrial accidents ever to occur in US waters. Extensive decontamination activities, fisheries closures, mobilization of environmental assessment resources, and restoration efforts also make this one of the most costly accidents in US history. The DWH oil spill impacted key deep-reef fish "sentinel" species, roughtongue bass, Pronotogrammus martinicensis, and tattler, Serranus phoebe, but almost nothing is known about possible long term effects and possible recovery. In addition there are several other important commercially and recreationally valuable species that were also affected (red snapper, vermilion snapper, greater amberjack, gag, and scamp) that reside on these deep water mesophotic reefs that are close (50 to 100 km) to the DWH spill site. The primary objectives of this project will be to enhance and restore deep water reef fishes by substantially increasing reef habitat through a large artificial reef deployment program and provide a robust assessment of the effectiveness of this habitat enhancement effort. One of the most promising approaches to mitigate the reduction in reef fishes caused by the DWH oil spill event is to increase habitat for ecologically and commercially important reef fish species through an extensive and effective artificial reef program. Such habitat enhancement may also increase the resilience of these valuable resources to future disturbances. On the MS-AL continental shelf there has been an extensive artificial reef enhancement program that has been tremendously successful, but there have been few attempts at such enhancements of deeper water mesophotic reef habitats. This project will make a restore effort of such mesophotic reef habitats by adding an unprecedented number (504) of large-sized, long-lasting artificial reefs ("super-reefs" = 25 ft. tall pyramid reefs) to the Pinnacles reef zone in the northeast Gulf of Mexico adjacent to the DWH spill site. Artificial reef placement, particularly distance between reefs can have profound influence on the effectiveness of any given artificial reef program. Therefore the habitat enhancement of this project will be tightly coupled with quantification of the effects of reef spacing on a number of critical metrics including natural and fishing related mortality, condition, growth, abundance, biomass, production, diet, and movement of several important reef fish species (e.g., roughtongue bass, tattler, red snapper, vermilion snapper, greater amberjack, gag, and scamp) as well as community characteristics such as species richness, evenness, and diversity. This will be accomplished through application of a wide array of proven methods, each of which have been developed and optimized for this system by the Auburn University Marine Fish Lab over the last 26 years. Methods include standardized hook-and-line and trap sampling, ROV surveys, hydroacoustic surveys, fine-scale passive acoustic tracking, stomach content analysis with DNA barcoding, otolith aging techniques, genomic studies, parasitology, and microbiology studies. These methods will provide a comprehensive combination of data on population and community characteristics, individual condition and growth, individual movement, and resource use, and will allow an unprecedented assessment of the effectiveness of the artificial reef deployment at different levels of reef spacing. Most importantly, this project will provide stable reef habitat for increased production of important mesophotic reef fish species. We will use a combination of field and laboratory studies to examine spatial and temporal patterns in population level (age, growth, sex ratio, and genetic population structure), individual level (toxicopathic lesions and pathogens), and molecular level (genomic expression) impacts along a gradient of exposure to polycyclic aromatic hydrocarbons (PAH).	$800,000
Gulf of Mexico Open Ocean Trophic Ecology Program	Excess sound levels have the potential to prevent the recovery and restoration of marine mammal populations that have been reduced as a result of the Deepwater Horizon oil spill, particularly sperm whales, Bryde's whales, and bottlenose dolphins. Measures have been identified for mitigating the effects of anthropogenic sources of sound from coastal construction (pile driving), oil and gas exploration and decommissioning (seismic airguns and explosives for platform	$475,000

	removals), and military training activities (sonar and explosives), but the effectiveness of those measures has not been fully tested and verified. Research and testing are needed to develop effective and reliable mitigation measures for activities that are particularly harmful or for which no measures currently exist. Mitigation should be tested for the different species and operating conditions that occur in the Gulf. Measures could include, but are not limited to, ship quieting technologies, bubble curtains and double piles (for pile driving), marine vibroseis (as an alternative to seismic airguns), and non-explosive decommissioning options (for platform removals). Also needed are effective and reliable acoustic aids (such as passive acoustic monitoring) for use in detection of marine mammals in low light or nighttime conditions.	
Genetic and Chemical Indicators of Population Health, Recovery, and Resilience in the Gulf of Mexico	The Deep Water Horizon (DWH) exploratory well was located in the northern Gulf of Mexico 65 km off the shore of Louisiana in approximately 1,600 m water depth. This region, while relatively close to shore, is not easily sampled due to the water depth and the resultant requirements for the sampling equipment and ships. These difficulties have resulted in infrequent sampling efforts in these deepwater habitats especially in the context of fisheries independent surveys. Thus, when the DWH accident occurred there was a paucity of information relative to the affected communities, particularly in regard to time-series information that would have lent themselves to analysis of impacts to deepwater organisms. In an attempt to characterize the population dynamics and ecology of deepwater ecosystems in the northern Gulf of Mexico, we propose a survey that will deploy a suite of gear types at randomly selected sites between depths of 200 – 2000 m. As this project aims to examine all biological components of these poorly known and infrequently sampled habitats, we propose to deploy multiple gear types to collect information from the surface to the seafloor. We would conduct the survey over 45 days using NMFS RV Southern Journey. Selected gears types will include trawls, longlines, traps, video arrays, water samplers, acoustics, and sediment grabs. All captured specimens will be identified to the lowest possible taxa, enumerated, and measured. Specimens will be retained for life history, diet, genetic, and toxicology analysis. Water samples will be retained to conduct environmental DNA analyses. In addition to randomly sampled locations, transects will be run in eight cardinal directions (i.e. N, NE, E, SE, S, SW, W and NW) from the location of the DWH spill sight in an effort to determine long-term spatial impacts of the event on deepwater ecosystems. To meet this goal, three unimpacted reference sites will be selected from outside of the influence of the DWH oil spill (e.g. western Gulf of Mexico) and metrics will be developed upon which to compare with impacted locations at and in proximity to the DWH wellhead along the transect lines. Metrics will include categories such as abundance, biomass, trophic composition, diversity of invertebrates and fishes, and habitat mapping characterization and quality. An index of biotic integrity will be calculated for each sampling location that will quantify the degree of site-specific impacts and allow for tracking of recovery rates for each site. Deliverables: • Assess spatial variability in degree of impact of DWH and provide a mechanism to quantify recovery of deep water ecosystems (trawls, longlines, traps, optical, eDNA). • Index of biotic integrity (trawls, longlines, traps, optical, eDNA) • Abundance trends (trawls, longlines, traps, optical) • Species diversity of fish and invertebrates (trawls, longlines, traps, optical, eDNA) • Trophic relationships (diet data, DNA). • Biomass estimates (EK80 broadband acoustics) • Bathymetric mapping (multibeam) • Habitat ground-truthing and characterization (optical, sediment grabs) Performance metrics: • Cruise reports • Annual data inventory, summarization, and project status report • Annual project review and improvement webinar • Final project report • Presentation of results at regional and national meetings • Peer review publications.	$2,400,000
Developing a Standardized Monitoring Plan for Deep Coral Communities	There is a need to address the remediation of marine sediments that have been subjected to excessive loading with organic compounds, particularly in deepwater environments where biodegradation processes are slowed due to low temperature. Organic loading may alter benthic communities by increasing sediment anoxia through microbial biodegradation. Instances of organic loading include the near vicinity to a deepwater seafloor oil spill such as the DWH and around sites where drill cuttings from non-aqueous based drilling mud systems have been discharged, such as	$500,000

	decommissioned oil production platforms. Also shallow water, decommissioning of well sites / derelict sites with obstacle avoidance capabilities. Given the problem and the inherent difficulties associated with addressing it, we initiated a joint mechanical and biological technology application program to develop a mitigation methodology that could be applied in these situations. A concept that utilizes proven subsea technology and known scientific principles has been developed. The result and major deliverable of this project will be the further development and proof of concept of a deep-sea bioremediation protocol and the design and validation of the equipment to carry out the process. Our approach is to devise a methodology to accelerate the recovery rate of marine sediments from organic loading. To do this we will integrate biological technology for biodegradation of organic compounds with a mechanical delivery system that can be effectively used in deepwater environments. Our approach is to mechanically inject oxygenated water, as well as having the option of injecting a formulation containing nutrients and biodegradation bacteria seed into the sediments that have been contaminated. This injection will enhance and rejuvenate the biodegradation process with the consequence of reduced recovery time. The takeoff point for development throughout the Phases is that a "mechanical overturning" of the damaged soil, along with an injection of oxygenated water and the option of a biological agent at the appropriate time and position will be very effective in accelerating the soil's recovery process. This "mechanical overturning" is achieved by the use of an industry-standard crawling remotely operated vehicle (ROV) as the host. The "soil overturning" part of the system would consist of water jets to undercut the damaged soil below the layer of damage and removing deeper uncontaminated sediment as a slurry. This slurry would then be pumped to discharge in a controlled manner over the top of the contaminated sediment. The sediment particles carried in this slurry will settle over the top of the contaminated sediment, effectively "overturning" the sediment. The biological agent could be injected into the covering slurry or independently, whichever proves to be the most desirable. Initially, we propose to answer these questions: • Will the addition of oxygen stimulate more rapid biodegradation, and if so, which is the best delivery method? • Is nutrient amendment required for marine sediments? • Is bioaugmentation required, i.e. will the addition of organisms enriched from one site stimulate degradation at another site (over the natural population)? This study will evaluate the utility of these remediation techniques and provide actionable guidance for their implementation if found to be successful.	
Gulf of Mexico Survey of Fishing Pier Related Sea Turtle Interactions	This project addresses the current priority of monitoring and adaptive management activities to inform restoration, including the development of tools to support restoration planning. This proposal also addresses the following PDARP/PEIS needs: Develop effective planning and monitoring strategies; evaluate effectiveness of restoration measures/projects; develop an adaptive management framework that can be updated periodically with new data. Restoration goals identified for marine mammals (MMs) aim to restore injured populations and improve their resilience to anthropogenic and natural stressors (PDARP/PEIS 2016). MMs are protected in US waters and managed as demographically independent stocks (MMPA 1972). Of approximately 55 Gulf of Mexico MM stocks, 22 are continental shelf and oceanic MM stocks (hereafter Sh-Oc stocks). These stocks are subject to multiple stressors (natural and anthropogenic), potentially with cumulative effects on MM populations. Because MM are long-lived with slow growing populations, inferring the effects of stressors (or restoration projects) on populations strictly based on outcomes from monitoring surveys could compromise recovery of these stocks. Creating an approach that allows the trustees to predict/estimate recovery of MM populations is essential not only to assist with planning (e.g. identify most vulnerable, high-priority stocks), but also to evaluate effectiveness of restoration in a manner that periodically incorporates new data collected in monitoring activities and allows adjusting restoration measures, if needed, following an adaptive management approach. Such a framework (or tool) should also help understand the effects of critical gaps and uncertainties associated with MM populations (or with the effects of stressors) on the ability to achieve conservation/restoration goals for MM populations. Abundance is a key metric to assess and monitor MM populations, to	$400,000

	understand the population level impact of stressors and, ultimately, to evaluate the performance of restoration measures (National Academy of Sciences 2016). However, MMs, especially Sh-Oc stocks, are highly mobile, which combined with the large area to be surveyed, tends to yield abundance estimates with low precision for these stocks. For example, precision of abundance estimates reported in 2015 Stock Assessment Reports for Sh-Oc stocks was on average three times lower than the NOAA recommended benchmark. Likewise, estimating mortality for these 22 Sh-Oc stocks from human activities can be challenging, as strandings of carcasses from offshore are rare and observer coverage to detect bycatch in fisheries is low or nonexistent. Improving data availability and quality, including increased precision of abundance estimates, can be achieved by increasing survey effort/coverage. However, maintaining high levels of monitoring for Sh-Oc stocks over decades can be cost prohibitive. Thus, a framework is needed to evaluate monitoring strategies and identify the most cost effective strategy to meet restoration goals. This project proposes to develop a Management Strategy Evaluation (MSE) modeling framework tailored specifically for shelf and oceanic stocks that allows: • Supporting decisions regarding allocation of sampling to optimize monitoring efforts; • Incorporating uncertainty associated with key estimates (e.g. abundance, mortality) to examine the effect on achieving conservation/restoration objectives using performance measures; • Examining population level impacts of multiple stressors on Sh-Oc stocks to help prioritize mitigation measures; • Evaluating trade-offs of restoration measures based on performance metrics and restoration objectives for Sh-Oc stocks that can be updated as more data becomes available following an adaptive management approach. MSE, a risk assessment framework that integrates population dynamics with the management system, has been widely used in managing fisheries and marine mammals, including in the US.	
Estimated Bycatch of Protected Species (Marine Mammals and Sea Turtles) in Menhaden Purse Seine Hauls.	This project will enhance fish habitat by sinking a ship to create an artificial reef approximately 50 miles off the Alabama coast. ADCNR will acquire and sink a suitable ship that is at least 200 feet long. This effort would be coordinated with similar efforts in Florida and Mississippi.	$800,000
Supporting Protection and Management of Deep Benthic Communities by Understanding Coral Population Connectivity	Many areas of the Gulf coast are populated with both tourists and bottlenose dolphins. Interactions between people and dolphins are damaging to the dolphins' natural behavior and put both humans and dolphins at risk for illness, injury, and death. When humans interact with (closely approach and feed) bottlenose dolphins, it causes them to become "conditioned". When dolphins are conditioned, they withdraw from their natural behaviors necessary for survival and instead beg from people for food. Panama City, Florida, is an example of one area where commercial tour operators and recreational boaters regularly interact with dolphins. Commission-funded research has found that interactions between people and dolphins have increased in Panama City over the past 15 years despite education, outreach, and pulsed enforcement efforts. Scientific studies are needed to understand the factors causing an increase in human-dolphin interactions in the Gulf and to identify measures that can effectively minimize those interactions. Those studies should focus on areas such as Panama City where dolphin-watch tours are offered or where human-dolphin interactions routinely occur. Increased outreach efforts are needed to emphasize the harm caused by feeding and harassment of bottlenose dolphins. Those efforts should be directed at tour operators, commercial and recreational fishermen, and recreational boaters, particularly in areas like Panama City with documented high levels of human-dolphin interactions. Economic incentives for responsible tour operations should be encouraged through programs such as Dolphin Smart (http://sanctuaries.noaa.gov/dolphinsmart/). Federal and state enforcement officers should work with resource managers to develop and implement a consistent and effective enforcement strategy targeted at intentional harassment events and repeat offenders.	$0
Exploratory Cruises to Locate New Sites of	The Deepwater Horizon Oil Spill (DWHOS) highlighted the lack of baseline data for deep-ocean ecosystems in the Gulf of Mexico (GoM). Of the GoM open ocean habitats, the deep water column is by far the largest affected by the DWHOS.	$15,000,000

Deep-Sea Coral Abundance	Long-term monitoring of the diversity and abundance of the pelagic fauna (0-1500 m) of the open GoM, including oceanic fish larvae and the microbial flora, is essential for evaluating impacts of natural and anthropogenic events. We propose multi-year expansion of knowledge as a restoration tool. “Research as restoration” is an approach with precedence, enacted after the Exxon Valdez oil spill and pursued subsequent to the DWHOS event. A 3-year (to start) sampling and analysis project that follows the methods developed during an intensive NOAA NRDA program in 2010-11 (ONSAP) and continued during 2015-2017 (DEEPEND Consortium) is envisioned. Analyses of these time series have revealed that the abundance of pelagic fishes decreased nearly an order of magnitude between 2011 and 2016. This substantial change was not obvious shortly after the spill and supports the importance of a long-term approach. Time-series investigations are known to be critical for assessment of ecosystem variability and recovery. We propose an integrated program that includes discrete-depth sampling and water collections simultaneously with acoustical sensing. With respect to surveys of economically important fishes (e.g., billfishes, tunas, dolphinfishes, swordfish), continuation of a long-term epipelagic survey of ichthyoplankton conducted during the primary spawning periods of many taxa is essential. Epipelagic and deep pelagic surveys can be merged logistically and provide insight on the vertical coupling of pelagic communities found from the surface to >1000 m. Remote sensing information and physical modeling will be used to direct the locations of at-sea sampling. We suggest that identical sampling procedures and gear used in prior surveys be adopted for future monitoring to eliminate methodological bias. In addition, a focus will be given on the continental shelf break/slope of the GoM, a region of enhanced benthopelagic coupling (e.g., sonic scattering layers intersecting benthic habitats) as well as primary foraging grounds for marine mammals and seabirds. It is also the transition area for material exchange between oceanic to continental shelf domains. The rationale for the project stems from the recent discovery that that over half of all fish species in the GoM spend all or part of their lives in the open ocean. In terms of total GoM fish abundance, deep-pelagic fishes are the most numerous. Endangered toothed whales, seabirds, and epipelagic game fishes rely on deep-pelagic fishes, squids, and shrimps as prey. Further, the transfer of energy through open ocean food webs is higher than typically assumed, suggesting a much greater role for of deep-pelagic animals in oceanic ecosystems. In short, the deep-sea animals are a key component of the GoM open ocean ecosystem. A key element of the proposed project is tight linkage with NOAA to help inform restoration planning, implementation, and evaluation. We suggest using ecosystem modeling approaches to achieve this result. The project suggested here has been endorsed by the principals at NOAA who supported the initial NRDA surveys and utilized these data in the NRDA. This restoration project aligns with Water Column Fish and Invertebrates, Mesophotic and Deep Reef Communities, Marine Mammals, Birds, and Monitoring and Adaptive Management.	
Fragmentation and Transplantation of Deep-Sea Corals	Restoration projects oyster reefs, SAV beds, barrier island enhancement, living shorelines, marsh creation, and water quality improvements can have a broad array of ecological benefits. Demonstrating those benefits to biological resources that were injured in the spill is an important part of the restoration process and obligation as outlined in the Programmatic Damage Assessment and Restoration Plan (PDARP). For mobile species like Gulf sturgeon, turtles, birds, reef fish, and others, utilizing restored habitats or trends in response to environmental changes are important measures of restoration success. Trends in occupancy of restored habitats by certain species can improve confidence regarding the restoration benefits, making prioritization of restoration more effective and transparent. Measuring habitat use can also be an important feedback mechanisms for adaptive management. However, it can be difficult to document habitat specific occupancy or project use for those species without continuous surveillance and comprehensive habitat information. Multiple proposals have submitted plans to use passive acoustic telemetry as a cost effective and tested technology than can be strategically designed to evaluate habitat specific occupancy at various scales. While the technology has been proven beneficial, careful attention to detail in hypothesis formulation and array configuration is important. With the increasing interest in using this technology to document response to restoration, a preliminary	$15,000,000

	assessment of the appropriate uses and applications for this technology is warranted. Trustee Implementation Groups would benefit from a broad assessment of potential utility, opportunities to avoid redundancy, or ineffectiveness of independent and uncoordinated efforts. We propose that a coordinated effort across restoration resources and funding sources is an appropriate and cost effective initial step in considering the limitations and utility of acoustic telemetry. Over the course of a year, the coordinated effort would engage all restoration interests at the state level to develop a list of species for which this technology could be used to inform or evaluate restoration. It would conclude with a Gulfwide summary or options for monitoring. Because efficiency of scope and scale can be realized if telemetry surveillance is designed with the specific function at multiple scales, the assessment would characterize the appropriate spatial scale of surveillance and the resolution of data collection for all types of restoration efforts. It would detail the use of high resolution technology to track occupancy of very specific habitats that are spatially uneven in distribution and as small as 10 meters in size like oyster reefs, small SAV beds, or artificial fish reefs. It would also outline the general requirements for large scale monitoring needed for evaluating response or use of larger scale habitats or environmental conditions like changes in hypoxia, temperature and salinity gradients, or freshwater flows. The need for both exists and fit into various facets of the Monitoring and Adaptive Management protocol for the Gulf. The U. S. Fish and Wildlife Service and the Louisiana Department of Wildlife and Fisheries is currently designing and deploying an acoustic telemetry array in the Pearl River and Lake Pontchartrain, LA. which could be modified to proof monitoring of existing restoration project in that area.	
Direct Restoration of Deep-Sea Coral Habitats with Artificial Substrates	Coastal Louisiana's ecosystems are affected by various stressors, including wetland loss, riverine nutrient loading, hypoxia, oil pollution and climate change. For example, an estimated quarter of Louisiana's wetlands have been lost due to a variety of natural and anthropogenic factors, including erosion caused by the Deepwater Horizon oil spill (DWH; McClenachan et al. 2013, Turner et al. 2016). Large summertime hypoxic zone in the Louisiana's coastal waters causes large-scale spatial population displacements and reduction in growth and reproduction rates of commercially important fish and shrimp species (Craig et al. 2001, Rabalais et al. 2001, Justic et al. 2017). Further, the DWH oil spill caused negative health effects on fish (Dubansky et al. 2013, Incardona et al. 2013), shifts in phytoplankton and microbial communities (Ozhan et al. 2014), and possible stimulation of harmful algal blooms (Bargu et al. 2016). Louisiana's Coastal Master Plan (CPRA 2017) identified a number of river diversion projects that could have multiple potential restoration benefits, including mitigation of wetland loss, improvement of offshore water quality (including mitigation of hypoxia) through enhanced wetland nutrient retention, and protection of wetlands from oil exposure. However, currently there is no monitoring in place to assess water quality changes in the Louisiana nearshore coastal region (barrier islands to shelf). This region is a key intersect for the interactive effects of multiple ecosystem change drivers (e.g., restoration projects, riverine nutrient loading, hypoxia, oil pollution, climate change) on living resources in the North-Central Gulf of Mexico. The objective of this project is to fill the critical water quality monitoring gap by establishing a monitoring transect extending from Barataria Pass, Louisiana, to the inner shelf. Extending the monitoring to this region is vitally important for understanding of: 1) baseline conditions, 2) inshore to offshore water quality dynamics, 3) changes in extent and severity of hypoxia, and 4) far-field effects of restoration projects. This project will serve as a pilot project to investigate the connection between inshore and offshore water quality across a federal-state boundary. The project will monitor nitrogen (NO3, NH4, TN), phosphorous (PO4, TP), silicate (SiO3), dissolved oxygen, temperature, salinity, chlorophyll a, total suspended solids, turbidity, and pH (see map). The monitoring transect will be an open-water complement to the CPRA's estuarine SWAMP program (Hijuelos and Hemmerling 2016). The transect will provide, on an expanded scale, data for isohaline mapping of water quality parameters, and will be invaluable for calibration and validation of riverine, estuarine, and coastal numerical models to support management decisions and adaptive management of water quality and fish resources. Bargu, S., Baustian, M.M., Rabalais, N.N., Del Rio, R., Von Korff, B. and Turner, R.E., 2016. Influence of	$20,000,000

	the Mississippi River on Pseudo-nitzschia spp. Abundance and Toxicity in Louisiana Coastal Waters. Estuaries and Coasts, 39(5), pp.1345-1356. Coastal Protection and Restoration Authority (CPRA) of Louisiana. 2017. Louisiana's Comprehensive Master Plan for a Sustainable Coast. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA. Craig, K., L. B. Crowder, C. D. Gray, C. J. McDaniel, T. A. Henwood, and J. G. Hanifen. 2001. Ecological effects of hypoxia on fish, sea turtles, and marine mammals in the northwestern Gulf of Mexico. Pages 269–291 in Rabalais NN, Turner RE, eds. Coastal Hypoxia: Consequences for Living Resources and Ecosystems (Coastal and Estuarine Studies 58). Washington (DC): American Geophysical Union. Dubansky, B., Whitehead, A., Miller, J.T., Rice, C.D. and Galvez, F., 2013. Multitissue molecular, genomic, and developmental effects of the Deepwater Horizon oil spill on resident Gulf killifish (Fundulus grandis). Environmental Science.	
Reducing Sea Turtle and Fish Bycatch in the Southeast Offshore Shrimp Fishery through Development and Implementation of Turtle Excluder Devices (TED) Designed to Exclude Small Turtles	The proposed study would address the RESTORE objective to replenish and protect living coastal and marine resources in the nearshore habitats. Barrier islands provide nesting, foraging, and resting habitat for migratory shorebirds, including two federally listed species (Piping Plover, Red Knot) and numerous additional species of concern. Intertidal benthic invertebrates represent critical food resources for migrating and overwintering shorebirds. Enhancement of barrier island beaches represents an increasingly utilized component of Gulf of Mexico restoration efforts, yet the short- and long-term effects of sediment placement on intertidal invertebrate communities and, in turn, the migratory birds that rely on those communities are not known and thus a cause for concern. There is a current need to understand the factors affecting recolonization by intertidal invertebrate populations and the response by shorebirds following barrier island beach enhancement activities. Understanding the impacts of beach enhancement on the benthic invertebrate prey base, the primary factor limiting migratory shorebird populations, is needed to determine appropriate avoidance, minimization, and mitigation practices. Abundance and composition of benthic invertebrate communities are influenced by numerous environmental factors including microalgae and other food resources, sediment grain size, salinity, and total organic content, all of which may be affected by beach enhancement activities. Sediment placement may negatively affect benthic invertebrate populations by changing sediment characteristics, leading to modification of invertebrate community structure, and by increasing sediment compaction, which may lead to invertebrate mortality and population declines. Published data suggest that recovery of benthic invertebrates may take 6-24 months, or longer, following beach enhancement. Factors affecting benthic invertebrate population recovery, however, likely depend on the sources of app lied sediments, and invertebrate taxa-specific dispersal, reproduction, and recolonization potential. To evaluate relationships among benthic invertebrates (prey), shorebirds (predators), and key environmental covariates (e.g., sediment particle size) in the context of beach enhancement, we will quantify biomass and diversity of intertidal benthic invertebrates and species-specific density of foraging shorebirds as a function of time since restoration and environmental factors. We will use the following suite barrier island study sites in Texas and Louisiana, which vary in time since restoration: Texas Rookery Islands- Dickson Bay II, Dressing Point, Rollover Bay, and Smith Point Islands and the Louisiana Outer Coast Restoration- Shell, Chenier Ronquille, Whiskey and Caillou Lake Headlands, and North Breton Islands. At each study site we will collect benthic samples at randomly-placed sampling stations during fall, winter, and spring periods of all years (2018-2020) At each station, 3 types of core samples will be collected: macroinvertebrates, sediment characteristics, and benthic microalgae. Within each sampling station, we will collect benthic invertebrate samples in the midswash zone, which we define here as the wet area of the intertidal zone between where waves break and the leading edge of moving water. Collected sediment cores will be used to measuring variables relevant to invertebrates such as grain size, soil moisture, total organic content (TOC), and salinity. We will survey shorebirds twice each month (alternating weeks) from August through May of both years (2017-2018 and 2018-2019) at each study site. We will identify to species and enumerate all shorebirds encountered within the survey area, and record locality	$12,100,000

	coordinates (latitude-longitude), habitat, and activity for a suite of species that forage in the swash zone. Results of this study may provide adaptive management strategies that can be used to restore shorebird habitats.	
Sea Turtle and Mammal Mortality Locations	The proposed study addresses the NRDA objective to restore water quality by quantifying nutrient and sediment delivery to Gulf waters. The project will aid in guiding nutrient reduction strategies ultimately aimed at reducing hypoxic zones in the Gulf and improving water quality of nearshore waters. Addressing habitat restoration approaches to protect and conserve marine, coastal, estuarine, and riparian habitats is critical to achieving NRDA restoration objectives. As coastal restoration continues in the Gulf, the need to measure critical water-quality parameters directly at the outlet of the Mississippi River distributaries is becoming increasingly important. Gulf hypoxia is linked to influx of the Mississippi River nutrients and will require a better data record of water quality and quantity inputs into coastal zones at and near the outlet of the Mississippi River to inform restoration. Because many natural and planned diversions of river water will be in the lower-most portion of the Mississippi River, using data from the furthest station downstream on the Mississippi River that currently collects water quality information routinely, at Belle Chasse, is not sufficient to determine chemical and physical changes in the water column near the mouth of the river and fluxes of chemical constituents to nearshore waters. The development of water-quality monitoring to determine the contributions of nutrients and sediments in these areas to nearshore and offshore environments is vital to adaptively manage nutrient reduction efforts to the Gulf. The purpose of this work is to quantify the distribution and relative flux of nutrients and sediments to near shore environments off of the mouth of Mississippi River. The project has two main objectives: 1) extending monitoring of flow, sediment and water-quality downstream from Belle Chase to the mouth of the Mississippi River; and 2) quantitatively and qualitatively distinguishing the river water that enters shallow waters east of the Mississippi River for example Breton Sound from that flowing south and west through the main passes. On its eastern side, a longer portion of the Mississippi River is without levees and there is widespread leakage of river water into the adjacent estuarine waters. Little is known about the quantity and quality of this water. The shallow estuaries east of the Mississippi River were an area of widespread environmental damage from the Deepwater Horizon oil spill and understanding water-quality and quantity of this area is fundamental to all restoration activities here, including critical wetland habitats and diverse biota for example the endangered sturgeon. Moreover, understanding how much water and associated sediments and nutrients flow south and west are important to understanding hypoxia formation in offshore waters. We will use a combination of gage installations measuring continuous discharge, turbidity and nitrate and a series of synoptic measurements of these variables at differing stages of the Mississippi river. We will include in these surveys the major distributaries and exit routes of Mississippi River water. Synoptics at high water will focus on the quantity of river water exiting the system. At low water, the distribution of nitrate along vertical transects will be a primary focus, with partitioning into sink and source terms with depth. While installation of a single super-gage on the main channel near the mouth of the river will be considered, we believe using a combination of synoptic measurements at many sites paired with continuous data collection at one or two sites not directly on the main channel will provide a better chance of success for achieving project objectives.	$375,000
Monitoring Sea Turtle abundance and distribution	A major challenge in marine mammal management is to know if, and when, a disturbance is measurably affecting individuals and/or populations. To effectively assess the effects of any disturbance event, there needs to be reliable baseline data so that deviations can be monitored and detected. Florida manatees live almost exclusively in the southeastern United States - particularly along the Gulf Coast of Florida but are also found as far as Texas. As a predominately coastal species living near humans, manatees are often used as sentinels for emerging threats to the ocean environment and human health (Bonde et al., 2004). Manatees are vulnerable to insidious and cumulative anthropogenic and environmental pressures that are often recognized too late to prevent or contain population declines and are challenging to investigate. Identifying and quantifying physiologic responses to threats before deleterious	$50,000,000

	population consequences are observed could greatly enhance management and/or mitigation efforts. Our team at the New England Aquarium specializes in determining physiological stress mechanisms of marine mammals, and we have partnered with Florida Fish and Wildlife Conservation Commission and the U.S. Geological Survey to develop this novel approach for manatees. The objective of our proposed study is to develop much-needed noninvasive techniques to monitor manatee health by validating and measuring a panel of vital biomarkers (including cortisol, aldosterone, and thyroid hormone) in fecal samples. Excretion of hormones in feces provides an accessible, noninvasive approach with enormous value for understanding health and monitoring the impact of environmental and anthropogenic factors. This approach using fecal stress hormones has been increasingly effective for investigating natural and anthropogenic disturbance in other marine mammals (e.g. Nth Atlantic right whales, Rolland et al. 2012; killer whales, Ayres et al. 2012; dugongs, Burgess et al. 2013). This project will establish comprehensive physiological data for wild manatees, which will enable early-warning deviations in health to be assessed and detected with minimal disturbance to the animals; or so that unknown causes of death can be better understood. To launch this study, we already have more than 100 fecal samples collected from manatees in western Florida that have been archived by management agencies for this purpose. These archived samples will be used to validate and develop this technique, since they reflect a broad spectrum of threats experienced by manatees - including chronic stress due to cold stress syndrome; serious morbidity associated with unusual mortality events; acute stress due to boat strike; and apparently healthy manatees (baseline normal levels). We hypothesize that concentrations of hormones measured in feces will accurately reflect vital stress responses of manatees and provide a valuable index of health state. Our next objective will be to apply these developed physiologic tools in a prospective study to understand the health status of manatee populations along the Gulf Coast. Florida manatees are a key species for linking physiological monitoring to management action to mitigate the impacts of disturbance and will provide a model system with which to advance our understanding of population consequences of disturbance in marine mammals (PCoD approach; Fleishman et al., 2016). To effectively assess the long-term effects of the Deepwater Horizon event, there needs to be innovative approaches towards monitoring the indirect effects of major ecosystem disturbances, and cumulative effects of multiple stressors on the status and health of marine species. This study is in direct alignment with the Deepwater Horizon Natural Resource Damage Assessment Trust's priority to advance the science needed for early detection and intervention for anthropogenic and natural threats to marine mammals and better understanding impacts on health.	
Monitoring Sea Turtle Encounter Rates with the Commercial Shrimp Trawl Fishery	This restoration project would protect open ocean as well as nearshore species injured by the Deepwater Horizon oil spill (DWH) from continuing and future oil and gas releases from the hundreds of oil and gas wells and pipelines in the Outer Continental Shelf (OCS) and nearshore areas of the Gulf of Mexico. Some of these installations are leaking periodically or chronically, and others may soon begin to leak. Present and future chronic or episodic leakage from wells and pipelines may affect critical habitats that are already stressed from the larger impacts from the Macondo MC252/Deepwater Horizon (BP) spill or may even reverse the benefits of restoration projects conducted in the aftermath of that spill. Protection and conservation of habitats and living coastal and marine resources is an essential part of the DWH Natural Resource Damage Assessment (NRDA) Final Restoration Plan for the Gulf of Mexico. One approach to restoration is to actively manage to protect against threats. This project identifies a major threat and a methodology to prioritize mitigation efforts that will most reduce the threat. The project involves analyzing risk from abandoned, orphaned, and currently-active wells and associated pipelines by quantifying the probabilities and causal mechanisms of releases, along with the ongoing and potential future ecological effects of releases in metrics analogous to those used for the DWH injury quantification, allowing benefits of remediation to be measured. Conducting a systematic risk assessment will provide a means to identify wells and pipelines that present the greatest risk, as well as those where responsible parties cannot be identified, so that they can be prioritized for monitoring, mitigation, and remediation efforts. Preventing releases of oil	$28,300,000

	that forms slicks and sheens would be beneficial to early life history stages of fish and invertebrates (e.g., eggs and larvae of tunas, mahi, snappers, sea trouts), among the most vulnerable of open ocean biota, as well as wildlife (birds, mammals, sea turtles). Assessment of leakage probability for each of the wells and pipelines would be based on expert analyses of available data on well characteristics (e.g., well age, water and well depth, operator(s) through time, hydrocarbon encounter, hydrocarbon characteristics, brine production, acid gas production, completion status, reservoir pressure and temperature through time, geological formation, drive mechanism, tree and wellbore type, and original well type [e.g., exploratory]). Potential effects of discharges of oil and/or gas of different rates and volumes will be analyzed by oil fate and effects modeling, injury quantification and scaling, such as those conducted for NRDA. These metrics, and the protection of offshore and coastal species most injured by the DWH, provides a strong nexus for compensatory restoration.	
Ecosystem Restoration by Decreasing Gulf Menhaden Catch and Effort	The Deepwater Horizon oil spill in 2010 caused injury to the entire ecosystem in the northern Gulf of Mexico. Despite playing important ecological roles, the small (less than 2 mm), cryptic eukaryotic species that make up the plankton remain a poorly documented component of marine ecosystems (Leray & Knowlton 2016), especially in the deep Gulf of Mexico (GOM). Long-term time-series datasets have shown that plankton are sensitive indicators of environmental change, often having a non-linear response that can amplify otherwise subtle environmental disturbances (Hays et al., 2005). As such, establishment of biological baselines are necessary in order to quantify changes in biodiversity over time and to predict the impacts community shifts may have on sensitive deep benthic communities. In the last decade, metabarcoding and high-throughput sequencing (HTS) have radically improved our understanding of microscopic eukaryotic diversity, including unicellular and small multicellular species- groups that have been challenging for taxonomists due to lack of diagnostic features and an inability to be cultured. Importantly, such approaches have been used to document environmental impacts to shallow-water benthic microbial eukaryote communities following the Deepwater Horizon oil spill (Bik et al., 2012). We propose to sample benthic planktonic communities monthly using instrumented moorings or benthic landers, and use metabarcoding techniques and high throughput sequencing (HTS) to characterize biodiversity, to assess deep sea coral larval supply, and to identify key planktonic contributors to carbon export from surface waters that sustain sensitive benthic communities. Environmental DNA will be screened for target select GOM eukaryotic plankton (e.g. protists, foraminiferans, zooplankton, coral larvae, fishes), using taxon-selective amplicon libraries and HTS sequencing (Illumina) following molecular methods utilized in the TaraOceans project (DeVargas et al., 2015 and/or Thomsen et al., 2012). Amplicon libraries will also be created for several mitochondrial genes that are likely to provide increased taxonomic resolution for mesozooplankton, Comparable sequence data will be generated for taxa known from these habitats from previously collected vouchered specimens, creating barcode libraries that will allow for comparisons to the marine barcode of life database (MarBOL; http://www.marinebarcoding.org/) and will be made publicly available. Seasonal water sampling using an ROV or AUV at deep coral habitats will complement the temporal benthic eDNA sampling, allowing for freshly preserved samples for both visual species identifications and metabarcoding. Additionally, repeated plankton tows or sampling with an AUV water filtering device will target certain water column depths (e.g. surface, and below thermocline and nutricline) that will be determined by water column temperature profiles using a CTD. The cost of this research could be reduced considerably (by upwards of $4,000,000) by sharing ship and ROV/AUV time with complementary studies of deep coral habitats, such as assays of coral microbiomes and health, hydrodynamics, nutrient dynamics, and restoration.	$75,000,000
Sea Turtle Restoration Through Soak Time Reduction in the Eastern	Objectives: • Build, enhance, and expand upon existing federal data management infrastructure for mapping, video analysis, and habitat suitability modeling of deep-sea corals to better support understanding and restoration of mesophotic and deep-benthic biogenic habitats. • Support the collection and analysis of new information from Gulf restoration studies and provide tools to guide and help coordinate deepwater surveys and restoration efforts. Rationale:	$10,600,000

Gulf of Mexico Bottom Longline Reef Fish Fishery	Mesophotic and deep-sea coral habitats represent rare, valuable, and vulnerable communities in the Gulf of Mexico. Both mesophotic (50-150 m) and dep-sea coral (1500-1800 m) habitats were damaged during the DWH oil spill and will be a focus of restoration activities. NOAA's Deep Sea Coral Research & Technology Program is Congressionally-mandated inter-alia to: identify existing research on, and known locations of, deep sea corals; map locations of deep sea corals; conduct research on deep-sea corals, including survey techniques. The program works across NOAA Line Offices to implement studies and has developed a national database of deep-sea corals and sponges and an on-line map portal (https://deepseacoraldata.noaa.gov/). The proposed activities support both objectives of the PDARP through data analysis, advanced habitat suitability modeling, and management of relevant data: (1) Protect and manage mesophotic and deep benthic coral communities – The first priority is to understand the current or potential distribution of these communities. (2) Place hard ground substrate and transplant coral – The success of these restoration efforts will depend upon an understanding of the habitat and environmental factors that determine where such restoration activities are most likely to succeed. Key actions and deliverables: • Establish a Gulf of Mexico Mesophotic and Deep-Benthic Analysis & Data Management Team – Initial focus on Corals and Sponges and associated environmental data layers • Build capacity and supporting data management framework for image & video analysis of new and pre-existing benthic surveys – including image capture, analysis, and display of density, diversity, presence and absence measures for mesophotic and deep-sea corals and sponges • Develop a DSC Research Clearing House (or link to relevant existing clearing houses) with bibliographies, reports, and data summaries • Enhance the capacity of the Deep Sea Coral and Sponge Database (www.deepseacoraldata.noaa.gov) or develop new database(s) to include additional taxonomic groups and support restoration planning and monitoring. • Develop and support a state-of-the art display for data visualization and analysis (DSCRTP Map-Portal v.2), including interactive graphics and quality assurance tools. This would build on existing data infrastructure to integrate both biological (presence & absence data for coral and sponge taxa) and habitat/environmental data (multibeam mapping layers, habitat suitability modeling, oceanographic conditions). • Establish or enhance interoperability with key NOAA data systems already supporting Gulf science and restoration, including NCEI's Ocean Archive System and Office of Response and Restoration's DIVER system. • Advanced habitat suitability modeling for key taxa of restoration interest (e.g., Coral taxa identified as injured in mesophotic habitats (e.g., Swiftia exserta - Etnoyer et al. 2016, Silva et al. 2015) and deep benthic habitats (e.g., Paramuricea spp - White et al. 2012, Fisher et al. 2014). • Develop additional tools to support restoration o Animal identification guides o Data visualization tools through online map portal o Custom environmental data packages geared towards habitat modelers o Provide climatological values from the World Ocean Atlas or existing models (e.g., ROM, AEC, NCOM) o Provide multi-beam or bathymetric digital elevation models (DEMs).	
Reducing Protected Species Bycatch in Gulf of Mexico and SE Atlantic Fisheries; Gillnet, Pot/Trap, and Trawl Fisheries	Nearly 300 species of birds rely on the abundant coastal forests, barrier islands, beaches, marshes, and open water of the Gulf of Mexico (GOM) for all or a part of the year. The 2010 Deepwater Horizon (DWH) oil spill caused unprecedented large-scale destruction and degradation of GOM ecosystems, including extensive and pervasive harm to numerous bird species. The Open Ocean Restoration Area addresses the repair of harm to migratory populations that spend part of their lives in the GOM, including implementation of restoration activities outside of the GOM. This mission implies that restoration activities implemented outside of the GOM, but within the geographic range of the migratory species, may be the most efficient means to repair harm done to GOM populations. Yet, prioritizing restoration actions for migratory birds that can move thousands of miles between wintering areas in the GOM and breeding areas throughout North America, is challenging for two primarily two reasons. First, understanding how wintering populations are connected to breeding areas, migratory connectivity, is an essential first step toward identifying where to implement restoration actions. Second, understanding how changes or events during one season can affect populations of migratory species is challenging because processes often interact in such a manner that no single period can be understood outside the	$15,200,000

	context of the entire cycle. Therefore, we propose to address this relevant data gap to inform restoration by developing full annual cycle models to understand how and why GOM population abundances change over time and space. Specifically, these approaches can identify which seasonal vital rates contribute to population growth and this information can be used to maximize the effectiveness of restoration efforts. Given that migratory birds face seasonally and geographically specific threats, population models are a tool to identify the drivers of population dynamics and determine effective management opportunities. Integrated population models (IPMs) are a powerful framework for combining multiple data sources to improve estimation of vital rates and their contribution to population growth. Until recently, IPMs for migratory species have focused solely on population dynamics during a single stage of the annual cycle. Members of our research group recently developed a novel full annual cycle IPM that integrates seasonal demographic and environmental processes to elucidate the factors that limit and regulate migratory bird populations across the annual cycle. By integrating data collected across seasons for linked populations, this framework is able to examine the contribution of seasonal demographic processes to variation in population growth rate. We are proposing to apply this full annual cycle IPM framework to four GOM migratory bird species injured by the DWH oil spill. The results from these models can be directly applied toward prioritizing which alternative management actions during breeding, wintering, or migratory seasons are most likely to have a positive influence on population growth of migratory bird populations injured by the DWH oil spill as outlined in the PDARP/PEIS. Here, we propose a two-year proof-of-concept for four species injured by the DWH oil spill for which the necessary data is available or is currently being collected, American White Pelican, Northern Gannet, Common Loon and Piping Plover. We propose to collaborate with The Gulf of Mexico Marine Assessment Program for Protected Species to incorporate aerial and vessel winter survey data into our IPMs. Piping Plover are not likely to be detected on these marine surveys, but their over-winter survival and abundance has been studied for the U.S. Gulf coast. Where applicable, we would seek collaboration with groups studying these species regionally to make use of unpublished data.	
Establish Additional Deep Water Coral Sentinel Species and Use as: Part of a Gulf-Wide Monitoring Network, to Monitor Coral Health in Protected Areas, or to Monitor Direct Coral Transplant Projects, and/or as Tools to Detect and Quanti	The proposed project seeks to better understand the physiological mechanism that resulted in spontaneous abortions of small cetaceans after the Deep Water Horizon event. The project will require access to archived tissues from stranded cetaceans. The lab analyses will include analysis of disease causing pathogens as well as baseline measurements of the endocrine and body composition of the stranded specimens.	$4,000,000
A Demonstration Project to Reduce Bluefin and Sea Turtle Bycatch Increasing the Set Depth in the Gulf of Mexico (GOM) Pelagic Longline Fishery.	An establishment of a Gulf Sperm Whale/Pelagic Ecosystem National Marine Sanctuary of significant size This sanctuary will serve as a truly pelagic sanctuary for the remaining estimated 700 resident sperm whales in the Gulf of Mexico, providing safe haven for the Gulf's largest and most endangered marine mammal species, which is the most dependent on the full spectrum of depths and habitats in the offshore water column. Sperm whales rest at the surface, dive to and feed in depths over one mile, and are most frequently found associated with the interface between cold-core and warm-core eddies along the 1,000m isobath. B. The creation of the Sperm Whale and Pelagic Ecosystem Interpretive Center on-shore A specialized, high tech facility provided for the interpretation to the public of sperm whale life histories and population dynamics, and of the pelagic environment generally, creates the capacity to educate the American public about the complex pelagic environment that very few people are ever able to directly witness. The offshore Gulf has	$2,500,000

	fueled the economy through fisheries (tuna to anchovies), shipping, and oil and gas. People need to understand why, as well as what animals live there and how humans impact them. The depths of the Gulf are generally unknown to the public. The lives of sperms whales are extreme by any measure of comparison to other animals on earth and in the ocean. C. Design, development, and commissioning of the Gulf Sperm Whale and Pelagic Ecosystem research vessel, an offshore vessel dedicated to studying marine mammal population growth in the pelagic environment. The study of the pelagic environment takes specialized talents and technologies and is truly multidisciplinary. With the establishment of the Gulf Sperm Whale National Marine Sanctuary there must be a mechanism for the natural resource managers, researchers, and others to access the sanctuary and the pelagic environment of the northern Gulf. It will be necessary to invest substantial time in assessing the growth or decline of populations, health of the marine mammals (fecundity and mortality and dispersion) and learn further about the life histories of the sperm whales and other marine mammals in the Gulf. D. Review of the proposed monetary allocation by the NRDA of $144 million for the restoration of marine mammals. This allocation should be adjusted by adding an allocation of $70 million for the sole purpose of establishing and managing the Gulf Sperm Whale National Marine Sanctuary, and adding a $100 million endowment dedicated to sustained research, restoration, and adaptive management in the Gulf Sperm Whale National Marine Sanctuary, lasting at least the life time of an average sperm whale, bringing the total to $314 million in funds to restore the marine mammals of the northern Gulf.	
NOAA Technological and Logistical Support of the FAO/GEF Project "Sustainable Management of Bycatch in Latin America and Caribbean Trawl Fisheries" (REBYC-II LAC)	This project, instituting a biorepository Laboratory Information Management System (LIMS), addresses restoration Monitoring and Adaptive Management needs by providing infrastructure for efficiently cataloging project samples. This technologic tool provides support to restoration projects, assuring quantitative and qualitative sample inventory details necessary for compliance with laboratory Quality Control and Assurance needs. A biorepository LIMS is an enterprise solution that can provide real-time inventory data to maximize agency efficiency of sample management, facilitating intra- and interagency collaboration and determining geographic gap analysis across multiple taxa (marine mammals, sea turtles, fish, corals, etc.). Simply, LIMS is a database specifically designed to manage samples in a field and laboratory setting, assigning barcoded labels that facilitate automation, tracking, database updates, queries, and reducing labeling errors, improving accuracy and longevity of samples for analyses and use in reference collections. While the launch of a LIMS would begin in the southeast region, it is configurable and web-based with the flexibility to be expanded to other regions and customized to program requirements and needs. There is a great likelihood of success in the implementation of a LIMS product; for example its current use in NOAA line offices including PIFSC and NIST Marine Environmental Specimen Bank as well as other federal agencies (e.g., USDOJ-DEA, CDC, US Military HIV research program) to successfully manage sample inventory and data analysis. As an agency enterprise solution, LIMS would replace a diverse mix of inefficient in-house desktop or antiquated solutions of databases, spreadsheets or log books, which compromise service continuity and viability of institutional reference collections. A deficiency was made apparent during the Deepwater Horizon injury investigation as a lesson learned in the management of greater than 40,000 samples tracked including associated, chain of custody, and results. Deficiencies including but not limited to restricted system capacity limits and problematic sample queries encumbered a system not designed to manage the requirements associated with physical and chronological laboratory sample tracking to assure sample integrity and best practices. The institution of LIMS in support of restoration projects that have a sample management need will greatly that enhance the success of the projects.	$3,200,000
Predictive Habitat Modeling for Paramuricea Biscaya	Consistent data on estimates of abundance, population-specific vital rates, detectability, movements and connectivity, habitat use, and prey base for sea turtles in the Gulf of Mexico (GoM) are lacking. This gap in knowledge hampers understanding and management of anthropogenic impacts on these species (e.g., fishery bycatch, energy exploration/extraction, coastal development). A network of in-water surveys at multiple representative sites in the GoM	$1,000,000

	will address these needs and provide an understanding of connectivity and movement, which are critical to put the impacts of anthropogenic effects on sea turtle species in context. These data are critical to the monitoring and adaptive management (MAM) component of long-term restoration assess the effectiveness both at a project and resource level for sea turtle populations in the GoM. To address these data gaps for MAM purposes, we propose to partner with state and federal agencies (NOAA, USGS, FWC/FWRI), non-governmental organizations (NGOs), and academic partners to design and pilot an in-water monitoring network for GoM hard-shelled sea turtles (Kemp's ridley, green, and loggerhead). The participating agencies are directly involved in sea turtle research and the development and implementation of management actions for sea turtles and will oversee the survey design phase of this program. This project is intended to (1) develop a statistically sound, long-term, sea turtle in-water monitoring program in the GoM; and (2) initiate in-water projects and broaden our partnerships with researchers conducting field work in the GoM. Because aerial surveys effectively estimate relative abundance for sea turtles near- and offshore with carapace length >40cm, but are not appropriate for smaller turtles that are difficult to spot from an aircraft, we will focus this study on smaller, neritic and pelagic turtles in bays, sounds, estuaries, and nearshore and offshore oceanic habitats. This project directly addresses the need for MAM activities to address data gaps and inform restoration by monitoring sea turtle distribution in the GoM in relation to threats, as well as working to standardize and integrate data set for efficient use by managers to monitor the success of combined restoration efforts. By partnering with known experts collecting data in the field and designing a standardized approach to data collection and management, this project has a high likelihood for success in informing long-term restoration monitoring needs.	
Finfish Restoration Through Development and Socialized Implementation of Bycatch Reduction Devices (BRD) in the Gulf of Mexico Commercial Shrimp Trawl Fishery	This project is designed to fill data gaps essential to monitoring and adaptive management (MAM) performance evaluation and to better understand when and where restoration should occur. It also informs the implementation of PDARP approach "Reduce sea turtle bycatch in commercial fisheries through identification and implementation of conservation measures: Commercial PLL Fishing Gear." There are spatial and temporal gaps in our understanding of leatherback distribution, migration, and habitat use in the Gulf of Mexico (GoM). Filling these gaps will help characterize the overlap between leatherbacks and the pelagic longline fishery (PLL) to identify areas of greatest bycatch concern, which will enable us to identify focal regions for implementing restoration bycatch reduction projects to evaluate, develop and implement mitigation measures. The GoM is an area of especially high interaction with the PLL, as ~ ½ of interactions for leatherbacks occur there. Satellite tracks from nesting and in-water captured leatherbacks and genetic analysis of by-caught leatherbacks suggests that GoM leatherbacks are largely from the Panama/Costa Rica nesting population, the only one in the north Atlantic which is declining (TEWG 2009). Understanding leatherback distribution, habitat use, and movement in the GoM will help in assessing anthropogenic impacts (e.g., commercial fisheries, oil/gas exploration/drilling, oil spills) to fill MAM needs in restoring the species. The SEFSC proposes to satellite tag leatherbacks from the pelagic longline fishery as well as leatherbacks captured in-water to compare differences in annual survival, behavior, habitat use, and movement between the two groups. We will then combine these data with remote sensing and meteorological data and circulation models to create predictive models for leatherbacks in the GoM. An understanding of leatherback use of the GoM and their role in the ecosystem will enable NOAA to better assess and monitor leatherback restoration, particularly by guiding bycatch reduction efforts. The project has a high likelihood of success, as the SEFSC has experience tagging leatherbacks and has worked with captains willing to board fishery caught leatherbacks. Additionally, we have developed similar models for survival and space use for hard-shell turtles using telemetry data. This project would allow the SEFSC to develop models of leatherback use areas in the GoM to reduce bycatch as prioritized in the PDARP.	$6,500,000
Reduction of Marine Mammal Fishery	Audubon Nature Institute will develop the Wetlands Education Project to share the importance of coastal wetlands loss and the impact on the environment, emphasize coastal restoration and protection priorities, and encourage students to	$4,000,000

Interactions through Demonstration and Implementation of Better Materials for Constructing Trawl Components	take action to improve the environment. The new educational program will be shared with classrooms across the country and will highlight that "Louisiana's wetlands loss is the nation's wetlands loss." The biggest conservation threat in the U.S. is virtually unknown outside of most coastal areas of the country. The Wetlands Education Project will raise awareness of this critical issue and is the key to sustaining the state's rich natural bounty, fueling and moving the nation—and preserving coastal Louisiana. The Wetlands Education Project builds on Audubon Nature Institute's successes in sharing wetlands-themed standards-based education programs that educate the public about the value of coastal and wetland habitats. The Wetlands Education Project includes three components: curriculum focused on coastal environments for students of all ages, reaching a broad, diverse audience; educator guides that dive deep into conservation, creating opportunities for hands-on, interactive experiences for learners of all ages; and virtual teacher professional development and classroom programs around the country to have in-classroom access to coastal and wetland educational content. Increased awareness through the Wetlands Education Project will support national efforts to preserve coastal and wetlands habitats, benefiting coastal communities and the entire country. The Wetlands Education Project's curriculum will raise awareness about various coastal habitats and introduce students to native species, conservation projects, and natural and human-created hazards to these habitats. With a focus on making an impact across broad, diverse audiences of all ages, the program will foster an appreciation and respect for wildlife and a lifetime commitment to improving the environment by encouraging hands-on learning, creativity, teamwork, and a sense of stewardship towards the environment. Audubon Nature Institute is a leader in family entertainment in southern Louisiana and has been offering education programming for more than 25 years. Audubon's education initiatives reach tens of thousands of people each year, inspiring passion for nature and instilling a sense of environmental responsibility.	
Directed Energy Systems for Remediation of the Invasive Lionfish	The objective of this project is to examine in detail the trophic connections of fishes, cephalopods, and crustaceans (nekton, collectively) inhabiting the epi-, meso-, and bathypelagic regions of the GoM using stable isotope, fatty acid and metabarcoding analyses. The specific goal of this study is to use natural dietary tracers and metabarcoding analysis to examine the trophic ecology of meso- and bathypelagic nekton and to elucidate vertical food web structure (0 to 1500 m depth) patterns in order to quantify trophic connectivity in the northern GoM. Stable isotope, fatty acid, and metabarcoding analyses have been used successfully to examine food web structure in many systems. In this study samples collected during previous sampling efforts (NRDA Offshore Sampling and Analysis Program and DEEPEND, www.deependconsortium.org) as well as proposed sampling efforts (please see Gulf of Mexico Deep Water Column Monitoring Program project suggestion) will be analyzed for stable isotopes of carbon (δ13C) and nitrogen (δ15N) to evaluate food web structure, examine flow of organic matter and determine trophic relationships of target organisms collected in the GoM. Analysis of polyunsaturated fatty acids (PUFA) will serve as indicators of dietary sources, allow for the reconstruction of dietary histories, and provide additional data that may not have been elucidated through previous stomach content or stable isotope analyses. Because gut contents of many deep-sea taxa are difficult to due to mastication, metabarcoding, which allows for the identification of prey taxa by extracting species-specific DNA sequences, will be used to identify stomach contents of deep-sea crustaceans and cephalopods. Additionally, we propose to incorporate tissue analyses from upper level predators (large fishes, sharks, mammals) already collected in the GoM from colleagues over a similar spatial and temporal period. Bayesian mixing models (e.g., mixSIAR) designed for stable isotope and fatty acid data will be used to estimate prey contributions to predators. All trophic analyses will be focused on key "model species" which will include both vertically migratory and non-migratory fish and invertebrate species with multiple feeding strategies. By examining stable isotopes, fatty acids, and gut contents of migrating and non-migrating fauna this project will shed light on the nature of energy and carbon transfer across vertical ocean zones and describe trophic connectivity in the region of the GoM where the DWHOS occurred. Results of this study will provide important information on the role of different migratory and non-migratory prey types to predators in the GoM allowing	$350,000

	researchers to identify species or taxonomic groups that may serve as "vectors" between functional groups or to commercially valuable fisheries stocks, sea birds, and protected oceanic cetaceans, all of which rely on deep-pelagic nekton as prey. The detailed elucidation of feeding dynamics within the major taxa of nekton will allow for multidisciplinary studies based on the larger-scale distribution of biomass. Finally, by describing vertical and horizontal patterns in the trophic structure of deep-pelagic nekton this project will provide baseline trophic data that can be used to inform spatially explicit ecosystem models that will provide insight into the structure and functioning of the northern GoM pelagic ecosystem.	
Coastal Passive Monitoring of Teleost Populations	The primary goal of this project idea is to continue monitoring population health of water column fish and invertebrate communities from the open ocean (0-1500 m) on both short (generational) and long (evolutionary) timescales, using genetic and analytical chemical methods. This information is critical for understanding the recovery, resilience, and long-term consequences of the DWHOS on key deep-pelagic species. Genetic diversity is often used as a proxy to measure population health. This measurement is intimately tied to an organism's ability to survive and adapt to a changing environment. Genetic diversity can be reduced by rapid declines in population sizes following a major disturbance event. Low genetic diversity has severe consequences within a population, such as increased extinction risks and reduced recovery rates. A second metric often used to infer population, and ultimately ecosystem, health is "population connectivity," or the amount of genetic information shared and/or exchanged between populations. For this reason, determining how genetic diversity is shared and exchanged within and across the GoM has huge implications for the recovery and resilience of a species and the ecosystem. Alongside estimates of genetic diversity and connectivity, chemical analyses of deep-pelagic fauna can be measured to assess the persistence of oil-derived hydrocarbons in the environment and their potential impacts on the community. Within crude oil mixtures, PAHs (polycyclic aromatic hydrocarbons) are highly soluble in water and are relatively easily taken up by oil-exposed biota. PAHs in the water can cause lethal and sublethal effects (e.g. endocrine disruption, growth inhibition, genetic damage) to marine organisms via ingestion and/or absorption through the skin. We propose conducting a robust ten-year time series analysis that characterizes changes in genetic diversity, connectivity, and PAH exposure in deep-pelagic GoM communities. Over the past 7 years we have collected and analyzed samples of invertebrate and fish from before DWHOS, immediately following the spill (ONSAP cruises 2010-11), and 5-7 years post-spill (DEEPEND cruises 2015-17). To date, we have found several intriguing results: 1) a general increase in crustacean genetic diversity from 2011-16, suggesting possible species' recovery following the DWHOS 2) GoM populations have unique genetic diversity, suggesting possible "oil" resistance 3) genetic connectivity may be linked to life history, suggesting recovery and resilience potential may be predictable 4) elevated PAHs in deep-sea fishes following the DWHOS suggesting higher intake rates compared to clearance rates 5) a recovery to baseline levels in 2015-2016 in only some biota groups (octopus) 6) continued high PAH levels in eggs, potentially affecting the long-term stability of the deep-pelagic community. We propose a continued 3-year program that builds upon our genetic and PAH datasets collected over the past seven years. First, we will continue to monitor genetic diversity and PAHs across select crustacean and fish taxa, as a measure of population health. We will use established methods implemented during the DEEPEND project, but also integrate new applications that will test for genomic signatures of population reduction or expansion and persistence of hydrocarbons in the pelagic biota. Recovery and resilience will be measured by estimating genetic connectivity within and across the GoM, capitalizing on previous and future sampling expeditions. A key element of the proposed project is tight linkage with NOAA to help inform restoration planning, implementation, and evaluation. We suggest integrating the genetic diversity estimates into population/ecosystem modeling approaches, which has rarely been used in these applications. The restoration topics with which the suggested project align include Water Column Fish and Invertebrates, and Mesophotic and Deep Reef Communities.	$2,000,000

Monitoring Sea Turtle Abundance and Distribution	Conducting research and restoration in deep coral communities (ranging in depth from 50-2000 m) is costly and difficult. NCCOS proposes to implement its expertise in developing pre and post restoration monitoring programs and partner with funded agencies to conduct restoration in the Gulf of Mexico. NCCOS will leverage its current activities with the RESTORE Council by developing best practices and synthesizing information from all monitoring programs in the Gulf of Mexico as well as capitalize on research being conducted for the RESTORE Science Program, which is sponsored by NCCOS.	$48,400,000
Monitoring Sea Turtle Encounter Rates with the Commercial Shrimp Trawl Fishery	This restoration project focuses on reducing bycatch of sea turtles in pier-based recreational fisheries. We propose to implement multi-year angler surveys on fishing piers in the Gulf of Mexico, including education/outreach to rec anglers. This project could be scaled to one state or implemented in multiple states throughout the GOM. NOAA has developed a set of pier survey forms for national implementation. The forms are currently undergoing approval by OMB under the Paper Reduction Act. We propose to use existing forms, once PRA is complete, to initiate implementation of this survey. Each pier would also be characterized, and local stranding networks would collect specific data on the nature of sea turtle captures when they occur, for comparison to the survey data. Survey results and turtle incidental capture data would help shape the development, testing, and voluntary implementation of mitigation measures to reduce sea turtle bycatch at fishing piers. Education can help reduce mortalities so outreach efforts would include placing signs with stranding responder contact information, monofilament line recycling bins, and development of an app that can report incidental captures and strandings, provide instructions on what to do if you catch a turtle, the hotline number for the closest stranding network responder, and a way to report the interaction. Background: Sea turtle incidental capture by recreational anglers is on the rise nationwide (STSSN). Since 2010, 1,094 sea turtles, primarily juvenile Kemp's ridleys, were incidentally caught in Mississippi alone. In response to captures, a pilot survey to collect data on angler fishing practices and sea turtle interactions was conducted in 2013. Anglers were asked questions about fishing practices, turtle observations and captures. Outreach was a key component of the project and was conducted at the end of each survey. The MS STSSN also collected data (bait, gear type, outcome) on every sea turtle incidental capture for comparison between angler practices and turtle interactions. Preliminary results yielded a high willingness to participate and valuable information was obtained. During and after the survey period, we noticed an increase in reported incidental captures, which could possibly be attributed to our outreach efforts. Success could be measured by a decrease in stranded turtles with fishing gear, successful rehab & release, and implementation of mitigation measures.	$25,300,000
Life History, Trophic Dynamics, Habitat Utilization, Trends in Abundance, Discards and Bycatch Reduction of Large Pelagic Fishes in the Northern Gulf of Mexico	This project addresses sea turtle PDARP approach: "Reduce sea turtle bycatch in commercial fisheries through identification and implementation of conservation measures- Technique 3: Expand existing or develop new observer programs and enhance analytical capacity within the program, as well as the marine mammal PDARP approach: "Reduce commercial fishery bycatch through collaborative partnerships." Menhaden purse seine hauls have been documented to catch marine mammals and sea turtles. There is no reliable assessment of the species, abundance, size, frequency of bycatch for the fleet at sea. Safety considerations prevent placing observers on haulback vessels. The project will use Unmanned Aerial Vehicles (UAV) (e.g., hexicopters) to videotape bycatch of protected species and large fish in Gulf of Mexico menhaden purse seine hauls. A fishery independent vessel would track the menhaden fleet and randomly fly a UAV camera to videotape number, size, and potential fate of marine mammals, sea turtles, and large fish (e.g., jacks, shark) and other protected species caught during haul back at sea during in randomly selected purse catches. This is a one year proof of concept pilot project. Bycatch data for species composition, frequency-of-occurrence, abundance, and size will be analyzed and reported for the fishery. Data could help to inform future restoration (e.g., estimated bycatch reduction credit caused by another proposed project intended to reduce bycatch and restore ecosystem function by reducing total landing by 30% over 5 years). Project benefits include the ability to measure bycatch reduction and total protected species bycatch for restoring injured populations of sea turtles, marine mammals, and fishes. This project to expand fishery observer capability, particularly given the difficulty of obtaining observer data using traditional methods,	$35,000,000

	through new technological approaches has a high likelihood for success given the proven use of UAV hexicopters to accurately document sea turtles and marine mammals in other projects.	
Improving Restoration for Highly Migratory Species in the Gulf of Mexico: Applying Innovative Technologies to Inform Stock Assessment and Establish Monitoring	This project addresses the fundamental question: To what degree are populations of deepwater corals connected throughout the Gulf of Mexico? With continued anthropogenic threats, there is an urgent need to make decisions that will lead to the effective management and conservation of vulnerable marine ecosystems. In the Gulf of Mexico (GoM) deepwater corals play a foundational role by generating habitat for diverse and abundant invertebrate and fish communities, including refuge, foraging, and breeding grounds for commercially valuable fisheries. As such, the GoM Fishery Management Council is currently designating some of these sites as Habitat Areas of Particular Concern and the Flower Garden Banks NMS has proposed an expansion to encompass additional deepwater coral sites. These management activities align well with restoration goals: The establishment and management of protected areas is one of the key restoration approaches for deep benthic communities impacted by human disturbances (PDARP, 2016). To help guide management activities, this project aims to address crucial gaps in our understanding of population connectivity patterns in habitat-forming Deepwater corals in the GoM, including species directly impacted by the Deepwater Horizon oil spill. Knowledge of the factors that promote or impede the connectivity of discrete Deepwater benthic communities is essential to ensure their resilience and sustainability. The most effective way to estimate connectivity patterns in Deepwater populations is through population genomic approaches, which reveal patterns of dispersal in virtually any species. The project objectives are to: 1) Define spatial scales of coral population genetic structure; 2) Infer the relative rate and directionality of genetic exchange among coral populations to reveal source/sink populations. To achieve these objectives, this project would quantify population connectivity in Deepwater coral species through the integration of ROV field sampling and state-of-the-art population genomic analyses. This project explicitly links basic research that would enhance the understanding of GoM ecosystems with concrete restoration and conservation initiatives to ensure recovery of degraded Deepwater benthic communities. A handful of studies have investigated the patterns of gene flow among a limited number of populations of Deepwater corals on the upper continental slope (350-800 m) in the northern GoM (Morrison et al. 2011, Quattrini et al. 2015, Cardona et al. 2016, Ruiz-Ramos et al. 2016). However, the degree of connectivity among populations outside of this depth range in the GoM is unknown. Herrera and Quattrini have a proposal that has been supported by the NOAA RESTORE Act to conduct a smaller-scale connectivity study focusing on 6 known populations of two deepwater coral species that occur at two depth ranges: Callogorgia delta (upper continental slope 400-1100 m) and the spill-impacted Paramuricea biscaya (lower continental slope 1300-2400 m). This will provide preliminary data on the connectivity of these species, but does not include all known sites, or sites that have yet to be discovered through other Restoration mapping and exploratory work. Under-sampling populations can generate bias in the estimates of genetic connectivity in wide-ranging species (Koen et al 2013). This project aims to significantly expand the scope of that study by studying all known and soon-to-be-discovered populations of these coral species in the GoM. This augmented effort is essential to gain a comprehensive understanding of the connectivity networks among deep benthic communities in the GoM, which will provide the information necessary to focus conservation efforts on the most important sites for maintaining existing populations of these species and contributing to the restoration of the P. biscaya populations that were impacted during the spill.	$5,000,000
Open Ocean Deepwater Fauna of the Northern Gulf of Mexico: Assessment of Intermediate Trophic	Paramuricea biscaya is a deep-sea octocoral that has a broad distribution. It was the most common species among those that showed clear impacts from the Deepwater Horizon oil spill. The first deepwater coral site to show these impacts was found in lease block Mississippi Canyon 294 in November 2010. Since then, 3 more sites were found to be impacted, with damage documented to those populations to varying degrees. During the search for these communities, other P. biscaya populations were discovered. Most of the sites in the immediate vicinity (< 25 nautical miles) of the Deepwater Horizon contained relatively small populations of P. biscaya, on the order of 100 colonies or less. A larger population was first	$3,401,120

Level Fishes and Invertebrates	observed in 2009 along the northern end of the Florida Escarpment, just to the south of the opening to the DeSoto Canyon, and then was further explored in subsequent cruises. One other population of 50-100 P. biscaya colonies is known from Green Canyon 852, much further to the west. In order to properly conduct direct restoration actions that would help to replenish the impacted populations and restore their ecosystem function, or conduct compensatory restoration in the form of protections for significant existing and healthy populations, a more complete assessment of the existing population structure of this species in the Gulf of Mexico is required. The sites listed above are certainly not the only places that P. biscaya exists in the Gulf of Mexico. In this proposal, we describe a plan to discover additional P. biscaya sites and to assess the size and population structure at these locations. There are two ways to predict new sites of P. biscaya populations, through predictive habitat modeling and This will help to suggest areas that fit what we know of P. biscaya's niche in the Gulf of Mexico. These models will not be followed blindly, but their quantitative assessment of habitat suitability will be used to select the most probably sites from our long list of potential sites based on more qualitative assessments of depth, hard substrata, and bathymetry that have been used over the years to discover all of the deep-sea coral sites known so far from the Gulf. Once sites are selected, two cruises will be carried out to ground-truth these locations. First, we will conduct preliminary surveys using the AUV Sentry on a cruise of approximately 30 days. Targets will be selected for high-resolution (< 50 cm scale resolution) bathymetry from the Sentry AUV obtained at a height of 20 m above the seafloor. Then, the most high-probability targets will be selected for photo surveys at a height of 5 m above the seafloor. If these specific targets within each site are fairly large, this will consist of parallel transects with closely spaced but non-overlapping lines and images. If it is a small area (< 50 m on a side), then the entire area will be photographed with overlapping photos to ensure complete coverage of the target. All of photos will be analyzed and any visible coral colonies will be scored. Corals will be identified to the lowest possible taxonomic level. Any sites with P. biscaya colonies or octocoral colonies of unresolved identification will be visited on the next cruise with an ROV. This cruise will also be approximately 30 days and will utilize a large scientific ROV with precise navigation, a 7-function manipulator, and high resolution cameras set up in stereo mode for scale. This will provide the direct ground-truth of P. biscaya presence and abundance for all of the downstream studies to be conducted. Funds are estimated for 1 cruise per year for 5 years at approximately $3M per cruise.	
Resiliency of Fishes to Changes in Food Web Following Deepwater Horizon Oil Spill	This proposal describes the most direct form of restoration for deep-sea corals, fragmentation, and transplantation of coral colonies. There were four impacted sites, with approximately 300 coral colonies affected by the spill. It would take a large effort to replace all of these colonies directly, and since this has never been attempted before in the deep sea, a pilot study is required to see if this method will be an effective strategy. The pilot study will be conducted to ensure that the result of this project is a net gain of coral structure rather than a loss due to smaller colony sizes and increased mortality. Initially, two different large populations will be targeted as a source of the corals. One branch will be trimmed from each of six large colonies using custom coral cutters on an ROV manipulator and transported to the surface in insulated bioboxes. Source colonies will be marked with a physical marker and will be carefully imaged before and after sampling. From previous work, we know that careful sampling of branches from P. biscaya does not harm the source colony, but we will monitor these colonies to document our impact. On the surface, the base of the fragments will be placed inside a small length of tubing and this will be mounted on a larger platform for deployment. There are two options – either onto a rack that can be easily mounted on the artificial substrates (if this restoration strategy is also selected), or onto a larger concrete block that can still be picked up and deployed from an ROV. Three of the colonies will be returned to the site they were collected from and three will be placed at the other collection site (reciprocal transplant design). Large physical markers will be placed along with them, so they are easily relocated. Transplanted colonies will be monitored using up-close imagery during annual ROV cruises to evaluate their progress. These cruises will be planned and carried out in collaboration with other Restoration projects in order to maximize the efficiency of these	$20,000,000

	operations. Costs include annual ROV cruises to evaluate the progress of the corals. These could be combined with other projects and reduce the total cost.	
Submerged Aquatic Vegetation Enterprise (SAV-E)	Deep-sea corals provide a number of ecosystem services for the Gulf of Mexico and are inexorably linked to the broader Gulf ecosystem. They provide habitat for a diverse community, including shelter from predators and breeding grounds for mobile fish and squid species. They are also responsible for significant amounts of carbon sequestration and the remineralization of nutrients. These nutrients can then be upwelled into the surface waters, or transferred via interactions with diel vertical migrators, and fuel the productivity of offshore planktonic communities. Therefore, the loss of deep-sea corals can have repercussions for the entire Gulf of Mexico large marine ecosystem. There were four primary sites of impact to the deep-sea corals of the Gulf of Mexico. These are found within a radius of approximately 25 km from the Deepwater Horizon, and are dominated by the octocoral species, Paramuricea biscaya. Direct restoration of these communities would be the most rapid and effective way to replace their ecosystem function and services. Placement of appropriate substrata for the establishment of new populations in pathways of connectivity would be an effective means to achieve these restoration goals. Deep-sea octocorals rely on hard substrata with sufficient biofilms for settlement and successful metamorphosis. Hard substrata that have been colonized by deep-sea corals in the area include natural authigenic carbonates, shipwrecks, and oil drilling infrastructure. The most significant populations of P. biscaya are found on near-vertical carbonate and granite substrata. The best strategy for placement of artificial substrata would be to mimic the habitat where the most abundant known populations are present. Therefore, we propose to use structures similar to the concrete "reef balls" that have been successfully employed for coral restoration in shallow waters. These are spherical, reinforced concrete structures with holes placed in them, similar in appearance to a large whiffle ball. These would be placed in areas near existing populations that can serve as a source of propagules for the establishment of these restored communities, and along existing corridors of connectivity, as determined by other Restoration work. The areas of seafloor selected for deployment will be surveyed prior to placement to ensure that they do not contain sensitive habitats that could be disturbed by this placement. Individual reef balls would be lowered to the seafloor on a wire and released just over the seafloor to minimize disturbance. There would be 4-5 structures placed at each site. One of these per site will be instrumented with oceanographic sensors, in collaboration with other restoration projects. These will be monitored for colonization by visitations with an ROV on an annual basis. This ship time would be best utilized by combining this study with additional work that would occur at the same sites and use similar submersible assets. In the first year of the study, only 2-3 of these would be deployed very close to a large population of P. biscaya as a pilot study. We know that colonization of metal structures takes at least 6-7 years based on surveys of oil rigs and platforms of known age, but the concrete carbonates should be colonized earlier. We can also decrease the time to colonization by incubating the structures in natural seawater in order to begin the process of biofilm growth. If coral colonization is revealed in the first 1-2 years of deployment, then this project could be scaled up to additional sites, as determined by other genetic connectivity and predictive habitat modeling studies.	$3,000,000
Improving Restoration through an Integrative Approach Toward the Understanding of Trophodynamics in the Northern Gulf of Mexico	This project addresses PDARP approaches: "Reduce sea turtle bycatch in commercial fisheries through identification and implementation of conservation measures"; "Reduce…through enhanced training and outreach to the fishing community"; and "Reduce known sources of mortality to fish populations that occur in open ocean habitat." The goal of this project would be to develop, evaluate, and implement reduced bar spacing TEDs designed to exclude small sea turtles in the Southeast offshore shrimp fishery and foreign shrimp fisheries occurring in the Caribbean Sea and Atlantic that import wild caught shrimp to the U.S. This would be done in three phases: cooperative target catch retention/sea turtle exclusion evaluations, domestic fishery implementation through financial incentives, and foreign fishery technology transfer. This project will contribute to the restoration of both sea turtle and fish populations through reducing primary threats and known sources of mortality. Under current southeast shrimp fishery regulations, the minimum spacing	$2,000,000

	between deflector bars must not exceed 4". However, federal observers have documented Kemp's ridley and green turtles captured in trawls after passing through TED grids. Size distribution data for these turtles indicates that TED bar spacing needs to be reduced to approximately 2.5" to protect turtles of this size. A limited SA and GOM study comparing performance of 2.5" and 4" bar spacing TEDs reported 93% bycatch reduction rates for incidentally caught Atlantic sharpnose sharks and 75% for mixed species of skates/rays. The conservation benefit of this project has the potential to significantly contribute to the restoration of sea turtle and fish populations with a high likelihood of success. Sea turtle restoration success will be measured through (1) documenting changes in sea turtle take rates and reduced bar spacing TED use by utilizing expanded NMFS observer coverage and the NMFS GMT and (2) measuring improvements of sea turtle exclusion rates through NMFS Small Turtle TED Testing. Fish restoration success will be measured by documenting changes in bycatch rates with target catch retention TED testing, bycatch rates with expanded coverage of the NMFS Observer Program, and reduced bar spacing TED use by NMFS GMT fishery monitoring. Fishery restoration will be measured by adding survey questions to existing Federal Shrimp Permit Survey and documenting reduced bar spacing TED use.	
Broadscale Habitat Mapping and Monitoring of the Northern Gulf of Mexico	This project will increase sea turtle survival through enhanced mortality investigation and early detection of and response to anthropogenic threats. Strandings are often the only early warning indicator for at-sea mortality of sea turtles and can be used to help identify mortality sources (ex. fisheries interactions & vessel strikes). However, documented strandings only represent a percentage of total at-sea mortality, because many factors influence whether or not a carcass will strand and be reported. These factors include, time of year, geographic location, decomposition rate and oceanographic conditions. We propose to deploy effigies, which closely mimic drift characteristics of sea turtle carcasses, in federal and state waters at ~30 locations from Texas-Florida to determine the percent of carcasses that actually strand on GOM beaches during March-July which is peak stranding season in the Gulf. Deployments will occur in areas with documented sea turtle occurrence and known shrimping effort or in areas of other potential mortality sources (i.e. ship traffic). Effigies will be deployed twice a month for five months. This project is scalable by location & duration. This methodology is successfully being used in Mississippi (Early Restoration), and expansion to other regions of the GOM is recommended. Existing ocean models are fairly adequate on a large scale; but models show major discrepancies when used to backcast small objects such as sea turtles at fine scales. The effigies are required to provide invaluable data specifically on the behavior of sea turtle carcasses in various ocean conditions in the GOM, and will be directly used for interpretation of strandings, measures of % recovery, and raw data available to the ocean modeling community to further ground truth and modify ocean models. We will also develop a web based portal that can be used by Stranding Networks, managers, and enforcement to input stranding data and to provide real time back cast model outcomes. If a spike in strandings is observed, the probable area of the mortality as determined by the back casting model can be used to help direct the efforts of the NOAA Gear Monitoring Team and state/Federal enforcement. Success will be determined by a reduction in strandings, use of program and feedback from users. This carcass drift work is focused on sea turtles, but the program could be modified to include marine mammals.	$20,000,000
Big Fish: Cooperative Monitoring and Restoration of a Regional Network of Multi-Species Fish Spawning Aggregations	This project will provide fundamental data for monitoring the in-water population of sea turtles in the GOM to inform adaptive management within the restoration process, as well as to directly address PDARP Approach 1: Reduce Sea Turtle Bycatch in Commercial Fisheries through Identification and Implementation of Conservation Measures. The goal of this project is to develop an optical/acoustic shrimp trawl as a tool to conduct seasonal monitoring of sea turtles from near shore to the continental shelf in the GOM. The gear would employ a digital camera and a high-frequency acoustic camera mounted in a shrimp trawl with a TED. The system will be used to conduct stratified, random fishery-independent surveys to determine sea turtle species, abundance and distribution. Survey data will be used to monitor population recovery as the result of various restoration approaches. Resultant data will identify turtle "hotspots" to direct a fishery from the	$20,000,000

	densest concentrations of turtles to reduce interactions. The project benefits will be to: (1) Address critical information gaps helping to inform the temporal and spatial implementation of future restoration projects; abundance estimates would allow monitoring and adaptive management within the restoration process. (2) Survey data could prevent fishery overlap with the densest concentrations of turtles to reduce bycatch. The likelihood of success is high given that a preliminary 2013 evaluation of the system by the SEFSC MS Labs successfully demonstrated the feasibility of this technique for imaging turtles within a trawl.	
Socioeconomic Impact Analysis of Potential Marine Protected Area Implementation	This project will provide fundamental data for monitoring the in-water population of sea turtles in the GOM to inform adaptive management within the restoration process, as well as to directly address PDARP Approach 1: Reduce Sea Turtle Bycatch in Commercial Fisheries through Identification and Implementation of Conservation Measures. The goal of this project is to develop an optical/acoustic shrimp trawl as a tool to conduct seasonal monitoring of sea turtles from near shore to the continental shelf in the GOM that is directed by time and location by the active shrimp trawl fishery. The gear would employ a digital camera and a high-frequency acoustic camera mounted in a shrimp trawl with a TED. The system will improve the accuracy and precision of the estimated rate of sea turtle interactions in the SE shrimp trawl fishery. Resultant data will provide a better assessment of the impact of the fishery on existing populations; identify turtle "hotspots" to direct a fishery from the densest concentrations of turtles to reduce interactions; and provide important information on TED efficacy as it relates to different turtle age classes, informing TED design refinements to improve exclusion of all turtle sizes. The project benefits will be to: (1) Address critical information gaps helping to inform the temporal and spatial implementation of future restoration projects; abundance estimates would allow monitoring and adaptive management within the restoration process. (2) Knowledge of the abundance, distribution and depth of sea turtles obtained by this fishery-dependent-directed sampling will improve accuracy and precision of the estimated rate of sea turtle interactions in the shrimp fishery, providing a better assessment of the impact of the fishery on existing turtle populations. (3) Reduce sea turtle bycatch in commercial fisheries by improving TED exclusion rates for all species and age classes of turtles. The survey will could prevent fishery overlap with the d ensest concentrations of turtles to reduce bycatch. The likelihood of success is high given that a preliminary 2013 evaluation of the system by the SEFSC MS Labs successfully demonstrated the feasibility of this technique for imaging sea turtles within a trawl.	$500,000
Modeling the Impacts of Anthropogenic Stressors on Injured Large Whales Populations.	The Gulf menhaden is forage for a wide diversity of fish, bird, and marine mammal populations that inhabit the Gulf of Mexico, its estuaries, wetlands, and tributaries. Annually, the purse seine fishery targeting this species removes about 1 billion pounds (450,000 metric tons, mt) of living biomass from the ecosystem. While that biomass is dominated by gulf menhaden, substantial quantities of commercially-, recreationally-, and ecologically-important species are also extracted as bycatch. In addition, deleterious fishery interactions with protected species occur, such as with bottlenose dolphin and sea turtles. Hundreds of billions of larval menhaden (and relatives) were likely killed as a result of the DWH oil spill (PDARP 2017). This project seeks to produce ecosystem benefits via a short-term, voluntary, company-specific quota program for a specified period. Proposed is "purchase" of the fleet's future expected annual landings beyond 300,000 metric tons for a 5-yr period, which would represent about a 33% decrease in pre-oil spill (i.e., 2005-2009) landings. This initial offer would total $75M for: (1) the two menhaden reduction companies to hold themselves to a 5-yr voluntary total allowable catch (TAC) of 300,000 metric tons; and (2) development and implementation of a multi-species/fishery monitoring and assessment program with which to quantify impacts. Compensation would be allocated between the two companies (Omega Protein and Daybrook) based on their 2005-2009 landings. The compensation would add significant profits to current operations, as the companies would not have operating costs for that portion of the 'landings' beyond the 300,000 mt TAC. Given the diversity of living resources and fisheries that are predicted to benefit, and the magnitude of those benefits, this action may be a viable, cost-effective, and potentially transformative opportunity to implement ecosystem restoration in the Gulf of Mexico. Project benefits include (1) restoring the eco system-level prey base for	$4,500,000

	multiple injured taxa, including marine mammals, sea turtles, sea birds, and fish; (2) enhancing restoration of marine mammals by ensuring sufficient availability of food resources for recovering populations (e.g., damage assessment data indicate low body-weights of Barataria Bay bottlenose dolphin after the spill); (3) reducing bycatch of sea turtles, marine mammals, and non-targeted fishes; and (4) enhancing recreational and commercial fishing opportunities by allowing other fish species and fisheries to indirectly benefit from the increased availability of forage fish that will allow for their faster growth and greater total reproduction (e.g., red drum, king mackerel, and several reef fishes). Project impacts will be quantified through analysis of data routinely collected in fishery-independent and fishery-dependent surveys conducted by state and federal scientists. The expectation is that indices of recruitment, cohort strength, reproduction and body condition of multiple taxa will increase after project implementation, as rates commensurate with each taxon's life history.	
Restoring Gulf of Mexico Cetaceans through Place-Based Management	This project addresses PDARP approach: "Reduce sea turtle bycatch in commercial fisheries through identification and implementation of conservation measures". The project will restore sea turtles by socializing gear soak time reductions in the eastern Gulf of Mexico bottom longline (BLL) reef fish fishery. Benefits include: (1) Restoration of injured fish species that occur in open ocean areas throughout the Gulf of Mexico; (2) Increase in health of fisheries by providing fishing communities with methodologies and incentives to reduce impacts to fishery resources; (3) Restoration of sea turtles in open ocean areas throughout the GOM. The bycatch of non-target species, including sea turtles in the BLL fishery is of particular concern. To address sea turtle mortality in the fishery, NOAA Fisheries has implemented a time area closure and hook number limitations on the fishery. The hook number restriction (750) minimizes the amount of time needed to set and haul the gear, limiting the hook soak time and decreasing the likelihood that captured sea turtles will drown. Research conducted by the NOAA Fisheries, Harvesting Systems Unit in the BLL fishery shows that reducing the hook soak times not only has the potential to reduce sea turtle mortality, but may also reduce turtle catch rate (Foster et al. 2017 in review). The current soak times in the fishery are much longer than needed to effectively harvest the targeted grouper. A reduction in soak time will give the fishers opportunities to make additional sets per day and therefore increase their effectiveness at harvesting grouper while restoring loggerhead sea turtle populations. We propose to financially compensate vessels to reduce the number of hooks deployed to 400 per set. In addition, there will be a time limit placed on the setting and hauling process. We estimate that a mean soak time of 55 minutes (50% less than the standard) can be achievable with this approach. Vessels will be compensated on a per-set bass es for sets that meet the soak time threshold. Fishery observers or video monitoring systems will be placed on participating vessels to monitor and validate compensable sets. Observers will document the catch of target and bycatch species during the compensated sets. These catch rates will be compared to the general fishery during mandatory observer coverage for monitoring of the project and adaptive management.	$5,500,000
Develop Rapid Response Techniques and Advanced Technologies to Enable Rapid Assessment of Deep-Sea Coral Community Ecology.	This project addresses PDARP approaches: "Reduce sea turtle bycatch in commercial fisheries through identification and implementation of conservation measures"; "Reduce…through enhanced training and outreach to the fishing community"; and "Reduce known sources of mortality to fish populations that occur in open ocean habitat." This project reduces primary threats and known sources of mortality for sea turtles and fish. There is potential for sea turtle interactions with GOM gear types: wing nets, bait shrimp and fish trawls, gillnets, and crab traps, yet little is known about interaction rates. This project would identify potential measures such as gear and fishing practice modifications and/or temporal and spatial fishery management measures to reduce sea turtle interactions. This will increase the health of fisheries by providing fishing communities with methods and incentives to reduce impacts to fishery resources. The Harvesting Systems Unit has significant experience in the development and evaluation of gear/methods for reducing fisheries bycatch (e.g., TEDs, BRDs, circle hooks, weak hooks). This expertise will be directed to other fisheries which impact GOM populations. The project will develop solutions for bycatch with a multi phased approach: (1) Fishery	$11,000,000

	Characterization- a comprehensive study of fishing operations and gear and assessment of interaction rates for each fishery, (2) Development of Gear Modifications/Changes in Fishing Tactics - fishery-dependent and independent testing to assess effects on target catch and sea turtle catch rates, and (3) Gear Incentives, Fishery Outreach and Management Strategy Development- a comprehensive fishery outreach program including gear use incentives for new fishing methods to reduce sea turtle bycatch. The project will require coordination and collaboration with State and Federal managers, fisheries offices, commercial fishing associations, and academic research partners. Success will be measured by documenting changes in sea turtle bycatch rates in targeted fisheries, documenting modified gear uptake, and measuring improvements of sea turtle TED exclusion rates of investigated trawl fisheries. Fish restoration will be measured by documenting conservation gear use through GMT fishery monitoring and continued engagement with the industry by cooperative gear performance monitoring/evaluations/surveys to obtain feedback on new gear and/or methodologies that encourage participatory innovation.	
Bycatch Reduction in the GOM Bottom Longline Reef Fish Fishery	In the aftermath of the DWH spill, several communities of deep water corals were discovered that had been impacted by the spill. Initial identification and quantification of the impact was difficult because of the lack of background data on undisturbed deep coral communities. Predicting recovery is also hampered by the lack of data on normal deep water coral recovery patterns and rates. However, an intensive effort aimed primarily at two Paramuricea species has proven the efficacy of using high resolution imaging techniques to document and quantify both impact and recovery of octocorals with this type of growth form. Planar octocorals (including the taxa Calcaxonia, Holaxonia, and Scleraxonia in particular) are excellent sentinel organisms because their morphology allows quantification of impact, they are normally very long lived, their skeleton is normally completely covered with living tissue, their exposed tissues interact directly with epibenthic water for their nutrition and respiratory needs, and since they are attached, damaged of killed colonies remain in place providing a record of deleterious impact that can persist after the affecting agent has dissipated or if no residue is left on the seafloor. The research following the DWH spill, particularly the data from non-impacted communities, has provided sufficient baseline data to establish Paramuricea biscaya and Paramuricea sp. xxx as robust sentinel species for detection of anthropogenic impact. However, to date we have only established monitoring sites in a relatively small area of the GoM and these two Paramuricea species are only present between about 1000 and 1800 m depth. We propose to expand the use of these types of corals to include additional robust sentinel species and monitor other depths and regions of the GoM. In addition to providing robust sentinels for anthropogenic impact at the specific locations chosen for monitoring, this effort will provide the background data needed to use additional species across a wide depth range to detect and quantify potential future impacts in other locations and to assess success of restoration efforts with respect to recovery, natural mortality and growth rates. The cost of this effort is scalable depending on the number of new sites established, their depths, whether they are currently well enough known to allow immediate work, and the frequency of monitoring. Discovery of a new site, including confirmation of the presence of corals in a specific area and depth range averages about 4 days of AUV operations at depths of about 1,000m. Establishing a monitoring site, at a known location with over 50 individual colonies to be monitored will take about 2 days of ROV operations. Repeat monitoring of an established site can be accomplished with 24 hrs of ROV operation. A minimum effort to expand the number of known sites with appropriate sentinel species at additional depth ranges would require a minimum of 1 month of AUV operations with a Sentry type of AUV (approximately $1million), followed by one month of ROV operations (approximately $1.6million) to establish the sites and acquire images to initiate the monitoring. A smaller effort aimed at only known sites would not need AUV operations. Repeat visits every 2 -3 years (or when needed), could be accomplished with about 3 weeks of ROV time each (approximately $1.2million). All ROV time should be used collaboratively for other funded sampling of deep water corals and associated communities. Other costs associated with the data acquisition, processing, and analysis specific to this project would be approximately $400K /yr during	$200,000

	establishment of a total of about 10 new sites and monitoring of 6 established sites which would decrease to about $300k/yr associated with ongoing monitoring. Additional sites, geographic areas, or intensity within a given area would require additional support.	
Constraining the Oceanographic Conditions and Food Supply at Deep-Sea Coral Habitats	The proposed project will restore of both bluefin tuna and sea turtles through the reduction on bycatch in the pelagic longline fishery. The GoM has become an area of concern due to the bycatch mortality of spawning bluefin tuna in the directed yellowfin tuna longline fishery. As a result there have been several management measures to mitigate the bycatch of bluefin, including the required use of weak hooks in 2011 and the implementation of Individual Bluefin Quotas (IBQs) in 2015. Research conducted by NOAA Fisheries in 2012 shows that setting longlines deeper than typically fished can reduce bluefin interactions with longline gear and likely increase the catch of targeted yellowfin tuna. During the study researchers deployed hook timer and temperature/depth recorders (TDRs) on the longline to determine when and at what depth yellowfin and bluefin become hooked on the longline. Researchers also deployed satellite (PSAT) tags on both yellowfin and bluefin to learn about water column utilization during the daylight period (the period when tuna are caught on longlines). TDR data showed that 70% of fishing effort occurred between 60 and 110m in depth (primary fishing zone). Results also showed a strong correlation between the proportion of tuna time spent in the primary fishing zone (from PSAT data) and CPUE. PSAT data also showed that bluefin spend a higher portion of daylight time in the primary fishing zone (near the thermocline) than do yellowfin. Results suggest that sets deployed greater than 110m have the potential to reduce the bluefin interactions while potentially increasing yellowfin catch. Research in other fisheries has also shown that deeper setting of longline gear also can reduce sea turtle bycatch. Based on these results we propose to conduct a demonstration project within the GoM pelagic longline fishery to contract vessels to make alternating sets between their normal fishing depth and sets at greater depth. If the indications from the previous research are accurate, fishers industry wide will be incentivized to fish PLL gear at greater depths due to the increase in yellowfin tuna catch. Results of the demonstration project will be decimated to the fishery through a series of workshops throughout the GoM longline fishery. The project will be monitored by observers on the project vessels. Dissemination of project results will prompt changes in general fishing practices GoM wide, which will be monitored through the mandatory observer program.	$9,000,000
Documenting Temporal Change in Deep-Sea Coral Sediment Community Structure and Function in order to Track Long-Term Responses to Natural and Anthropogenic Disturbance and Inform Future Restoration Activities	The project will restore finfish and sea turtles by providing technological and logistical support to the FAO/GEF project entitled “Sustainable management of bycatch in Latin America and Caribbean trawl fisheries” (REBYC-II LAC). One of the primary objectives of the project is to develop cost-effective solutions and effective incentives to minimize the bycatch of juveniles, species at risk, and discards. The NOAA Fisheries Service, Harvesting Systems Unit (HSU), is a research partner in the REBYC-II project. HSU personnel are providing technical support for this project by assisting in the development of mitigation technology. However, NOAA Fisheries has no designated funds to support the project. REBYC-II project countries are Brazil, Colombia, Costa Rica, Mexico, Suriname, and Trinidad & Tobago. The objective for Mexico will focus on the Mexican waters of the GoM, where there is no Bycatch Reduction Device (BRD) requirement or usage. As with the previous REBYC project the goal for Mexico is to develop and implement BRD technology into MX GoM fleet. One of the project goals of the country of Suriname is to develop and implement Turtle Excluder Device (TED) technology into their fish trawl fishery. They have formally requested assistance from the HSU to address this component of the project. The HSU has a unique set of gear technology development capabilities that the project countries do not have. The Unit has a skilled team of divers experienced in making in-situ observations. The Unit also has a designated NMFS research vessel capable of conducting prototype “proof of concept” testing. The proof of concept testing approach allows the Unit to conduct small pilot studies of many BRD and TED designs prior to full scale testing on commercial vessels. DWH restoration funding will allow the NOAA, HSU to fully support the REBYC-II project by providing in situ observations of prototype trawls, proof of concept testing, and provide in country guidance on gear development and outreach. This level	$10,000,000

	of participation will greatly enhance the probable success of the REBYC-II project and will result in the implementation of state of the art BRD technology into the MX GoM shrimp fishery. It will also result in the restoration of sea turtle populations by the implementation of a NOAA TED design into the Suriname fish trawl fishery. One component of this DWH restoration project will be to test the most promising BRD designs in the US GoM shrimping fleet.	
Developing Innovative Soundscape Metrics for Tracking the Health of Deep-Sea Coral Communities in the Gulf of Mexico	The Deepwater Horizon oil spill released an unprecedented quantity of oil directly into the deep sea, and also resulted in the introduction of large amounts of dispersants and drilling sediments into the northern Gulf of Mexico (Camilli et al. 2011; Barron 2012). Subsequent research has uncovered extensive damage to deep-sea habitats, most notably to cold-water coral communities dominated by Paramuricea species. Paramuricea is an ecologically important genus in the deep Gulf of Mexico, providing critical three-dimensional habitat structures for a large number of associated species. Following the spill, Paramuricea colonies in the vicinity of the Macondo wellhead were found to be covered with a brown flocculent material containing Macondo-fingerprinted oil, and exhibited signs of stress and mortality including excess mucus production, tissue sloughing, and hydroid colonization (White et al. 2012, Fisher et al. 2014). Based on the severity of the damage to these long-lived and slow-growing corals, there is an urgent need to develop a comprehensive restoration plan to ensure the future of these communities throughout the northern Gulf of Mexico. One of the foremost obstacles to designing a comprehensive restoration plan for Paramuricea is the extreme paucity of baseline observational data. Therefore, we propose to integrate species distribution models, an exploratory cruise, and a comprehensive population genetic analysis to more fully characterize the distribution and connectivity of Paramuricea communities throughout the northern Gulf of Mexico. Species distribution models statistically couple species occurrences with a suite of environmental factors to predict suitable habitat and quantify niche space (e.g., Georgian et al. 2014). The ability of these models to predict novel distributions in unsurveyed areas will be used during an exploratory cruise to guide the discovery of new, uninjured communities that are ideal candidates for protection. At each new Paramuricea site discovered, benthic surveys will be conducted, monitoring sites will be established, and genetic samples will be collected to analyze the population structure of Paramuricea within the Gulf of Mexico. Model results, field observations, and genetic data will be incorporated into a spatially explicit restoration plan that includes the design of effective marine protected areas. In addition, these results will provide important insights into the magnitude of the initial damage caused to these communities by the Deepwater Horizon oil spill and will help identify and prioritize sites for future research and remediation efforts. Costs for this project do not include ship time for validation, which would fall under other proposed projects. Salary for a biogeographer and support to integrate new datasets are included.	$5,500,000
Gulf of Mexico Molecular Biology Initiative	This project will contribute to the restoration of various species of finfish by reducing sources of mortality in the commercial shrimp trawl fishery in the open ocean restoration area throughout the Gulf of Mexico (GOM). Through cooperative research, innovative Bycatch Reduction Devices (BRD) and BRD combinations will be developed and federally certified. Fishers will then be provided economic incentives to use new BRDs or BRD combinations for the project period. While one BRD is currently required in these fisheries, further reducing finfish bycatch with the use of BRD combinations will assist restoration of fish populations in the GOM. Recent collaborative testing in North Carolina identified several new BRD combinations that exceeded 40% reduction of finfish bycatch relative to a control (standard 4-inch bar spacing TED, fisheye BRD, and a 1 ½ " codend). These reduction rates exceed currently accepted standards set by state and federal fishery managers. Transferring this technology to the GOM shrimp fishery could prove invaluable to the restoration of numerous fish stocks impacted by the DWH oil spill. Additionally, shrimp loss associated with the use of the BRD combinations evaluated was minimal, which should facilitate industry acceptance of the gear in the Gulf. Collaborations for this project will include the gear monitoring team (GMT – HSU), NMFS-SEFSC observers (Galveston, TX), Sea Grant, and commercial fishing organizations and industry representatives. There will be two primary components of this project including independent proof of concept testing and commercial comparative testing aboard federally	$50,000,000

	permitted GOM shrimp trawl vessels. Simultaneous, monetary incentives to implement new BRDs will be offered to a portion (20%) of the federally permitted fleet. This project will occur in the open ocean restoration area throughout the GOM. Collectively, this project will facilitate increased communication among GOM fishermen and gear researchers concerning BRD performance (design, usability, functionality). This feedback mechanism will allow for adaptive project management and refinement of BRD designs through an iterative process focusing on regional performance and functionality.	
40 Meters and Landward: Assessment, Monitoring, and Adaptive Management for Gulf of Mexico Coastal Ocean, Estuarine, and Riparian Habitat	This project is designed to decrease interactions of marine mammals with commercial shrimp trawling gear. Dolphins are occasionally captured in shrimp trawls or entangled in the lazyline as a result of predation on gilled fish in the trawl, with hundreds of mortalities estimated per year in the Gulf of Mexico shrimp otter trawl fishery. Further, this predation results in extensive trawl damage, creating hours of work to repair the nets and these interactions have resulted in dolphins being injured or killed by fishers out of frustration. The majority of shrimp nets used in the GOM shrimp fishery are made from standard polyethylene webbing. In recent years, material such as Dyneema and Spectra have been introduced into the fishery but have yet to gain widespread use. NOAA Fisheries research suggest that these stronger materials sustain fewer dolphin bite holes compared to polyethylene nets. However, shrimp fishers are unlikely to make the investment to adopt these new net materials unless they know that comparable catch rates can be achieved. This project will compare and quantify target catch rates and dolphin bite damage between polyethylene netting (control) and stronger netting (experimental) aboard commercial trawlers rigged to pull two nets. Additionally, the project will determine the optimal material and fishing configuration for trawl lazylines to reduce dolphin entanglement. A comparison of different lazyline materials will be conducted to determine if increasing line stiffness will decrease the likelihood of marine mammal entanglement. Drones, optical cameras, and acoustic cameras (DIDSON/ARIS) will be used to observe which materials have fewer dolphin interactions. This project will consist of four different objectives - • Compare the finfish bycatch and shrimp catch rates of Dyneema nets to identical nets made from polyethylene webbing. • Compare the amount of dolphin interactions, by counting number of dolphin bite holes for identical Dyneema and Polyethylene nets. • Compare dolphin interaction rates between lazylines made from differing materials using drones, optical cameras, and acoustic cameras. • Outreach, distribution, and monetary incentives to fishers to use improved fishing gear. Once gear evaluations are complete the gear that demonstrates the least dolphin interactions will be promoted to the fishery. Improved lazylines or trawls will be given away to a limited number of fishers along with monetary incentives with the requirement of either observer coverage or reporting. Additionally, to ensure fishers are using the gear, NMFS GMT will conduct at sea monitoring of the gear. Once fishers become aware of the benefits of these materials, dolphin/fishermen conflicts should decline resulting in fewer dolphin mortalities in shrimp trawling gear. Additional outreach will be conducted at workshops for upcoming TED regulations where these new materials will be promoted.	$5,000,000
Enhanced Observer Coverage in the GOM and South Atlantic Shrimp Fisheries and Expanding Observer Coverage to Unobserved Sectors of the Fisheries	Acoustics + Imaging Innovations, Inc. (AI3) has developed multiple methods for safely defeating individual and grouped Lionfish. Based on specific biological features associated with the fish, AI3 takes advantage of the transmission medium to safely and precisely target individual and large nested shoals of Lionfish on reefs and in water. Several variants of directed energy systems (patent pending) have been prototyped for test and evaluation. This project request seeks to improve and optimize the prototype directed energy systems into commercially viable tools for sports fishermen and divers. The system allows for programmable output capable of incapacitating or barotraumatically defeating Lionfish at ranges between 1 and 100 meters with no kinetic (e.g. spear or bang stick) effects.	$2,340,000
Electronic Monitoring/Electronic Reporting Project to Improve Timeliness and	Passive monitoring of the soundscape can be used as a relatively inexpensive means of assessing the local health of the ocean. Many important species of the game and commercial fisheries market vocalize or generate unintended radiated emissions (URE) via schooling or general motion. The advent of invasive species such as Lionfish adds additional vocalizations to the soundscape, which can provide further clues to the population of such unwanted species. Langouste	$800,000

Accuracy of Fishing Effort Data for the Shrimp Fleet	lobster and sea urchins contribute, as well as the more well-known marine mammals. Finally, anthropogenic noise sources provide an impressive addition to the noise floor, occasionally providing highly negative impacts to the local areas from which they originate. This project seeks to take advantage of recent advances in passive listening. the ability to incorporate kinematics - the range, bearing, depth and general track of a source - with conventional identification techniques in the spectral domain into a compact (less than 1 cubic foot) format was recently shown for red hind grouper in the Florida Atlantic University Doctoral Thesis by the author (Tonal and Vector Acoustic Properties of Red Hind Grouper Vocalizations, published and trademarked C. Matthews, FAU). The thesis also demonstrated a means of accurately estimating the mass of individual fish through cyclostationary analysis of the pressure data associated with the true vector data of fish vocalizations. The ability to separate multiple fish sounds, track each individual source, and estimate the sources' mass and identity offers a substantial opportunity to persistently track the fish populations in the Gulf of Mexico (GOMEX) with stationary record-only Acoustic Vector Sensors (AVS). this project seeks to build and deploy over 50 passive listening stations in 10 to 100s of meters of water and generate accurate measurements of the local soundscape, fish populations, and individual acoustic fingerprints of each fish within the listening posts' vicinity (depth and species dependent but accurately estimated to be 50 to 5000 meters from the emplaced system). for each fingerprint, the mass of each fish will be estimated, yielding estimates within 1% to 3% of the exact measure with a 99.5% confidence interval. the data will be made public for consumption, primarily assumed to be researchers and academia.	
Restore the Gulf of Mexico Bryde's Whale by Reducing the Probability of Lethal Vessel Strikes	This project will provide fundamental data for monitoring the in-water population of sea turtles in the GOM to inform adaptive management within the restoration process, as well as to directly address PDARP Approach 1: Reduce Sea Turtle Bycatch in Commercial Fisheries through Identification and Implementation of Conservation Measures. The goal of this project is to develop an optical/acoustic shrimp trawl as a tool to conduct seasonal monitoring of sea turtles from near shore to the continental shelf in the GOM. The gear would employ a digital camera and a high-frequency acoustic camera mounted in a shrimp trawl with a TED. The system will be used to conduct stratified, random fishery-independent surveys to determine sea turtle species, abundance, and distribution. Survey data will be used to monitor population recovery as the result of various restoration approaches. Resultant data will identify turtle "hotspots" to direct a fishery from the densest concentrations of turtles to reduce interactions. The project benefits will be to: (1) Address critical information gaps helping to inform the temporal and spatial implementation of future restoration projects; abundance estimates would allow monitoring and adaptive management within the restoration process. (2) Survey data could prevent fishery overlap with the densest concentrations of turtles to reduce bycatch. The likelihood of success is high given that a preliminary 2013 evaluation of the system by the SEFSC MS Labs successfully demonstrated the feasibility of this technique for imaging turtles within a trawl. This project would conduct four annual surveys using four vessels to cover the Gulf of Mexico. It can be scaled down by reducing the number of annual surveys. The total cost over ten years for four annual surveys is $48,400,000. The total cost can be reduced to $38,532,000 for three annual surveys and $27,900,000 for two annual surveys.	$500,000
Age Dating and Growth Rates of Deepwater and Mesophytic Corals	This project will provide fundamental data for monitoring the in-water population of sea turtles in the GOM to inform adaptive management within the restoration process, as well as to directly address PDARP Approach 1: Reduce Sea Turtle Bycatch in Commercial Fisheries through Identification and Implementation of Conservation Measures. The goal of this project is to develop an optical/acoustic shrimp trawl as a tool to conduct seasonal monitoring of sea turtles from near shore to the continental shelf in the GOM that is directed by time and location by the active shrimp trawl fishery. The gear would employ a digital camera and a high-frequency acoustic camera mounted in a shrimp trawl with a TED. The system will improve the accuracy and precision of the estimated rate of sea turtle interactions in the SE shrimp trawl fishery. Resultant data will provide a better assessment of the impact of the fishery on existing populations; identify turtle "hotspots" to direct a fishery from the densest concentrations of turtles to reduce interactions; and provide	$70,000

	important information on TED efficacy as it relates to different turtle age classes, informing TED design refinements to improve exclusion of all turtle sizes. The project benefits will be to: (1) Address critical information gaps helping to inform the temporal and spatial implementation of future restoration projects; abundance estimates would allow monitoring and adaptive management within the restoration process. (2) Knowledge of the abundance, distribution and depth of sea turtles obtained by this fishery-dependent-directed sampling will improve accuracy and precision of the estimated rate of sea turtle interactions in the shrimp fishery, providing a better assessment of the impact of the fishery on existing turtle populations. (3) Reduce sea turtle bycatch in commercial fisheries by improving TED exclusion rates for all species and age classes of turtles. The survey will could prevent fishery overlap with the densest concentrations of turtles to reduce bycatch. The likelihood of success is high given that a preliminary 2013 evaluation of the system by the SEFSC MS Labs successfully demonstrated the feasibility of this technique for imaging sea turtles within a trawl. This project would use four vessels to conduct sampling during the brown, white and pink shrimp seasons at a total cost for ten years is $25,300,000. The total cost can be reduced to $19,500,000 by using three vessels each year. This would reduce sampling effort and coverage of the surveys.	
Sea Turtle Entanglement Reduction through the Prevention and Removal of Recreational Fishery-Based Marine Debris	We propose a comprehensive sampling program for highly migratory species (tunas and billfish) and large pelagic species (mackerel and dolphin fish). Sampling would include a fishery-independent monitoring survey, at-sea observer commercial sampling and dock side/tournament recreational sampling. Two 45 day pelagic longline cruises will be conducted in the northern Gulf of Mexico during the spring and fall of each year. The sampling universe will be defined as waters extending from the 200 m isobath to the furthest extent of the EEZ. Fifteen days of survey operations will be conducted in each of three regions biannually. A stratified random sampling design will be employed based on factors known to cause the patchy distribution of pelagic fishes (e.g., areas of localized high primary productivity and ephemeral oceanographic features). Up to four longline sets will be conducted each day for a total of 40 stations per region or 120 stations per cruise. Data collected during surveys will be used to assess trends in abundance, hook selectivity, effects of soak time/temperature/depth on mortality rates, movement patterns, abiotic factors driving distribution and abundance, species assemblages, relative abundance, and habitat preferences. Biological samples will be taken for age and growth studies, otolith micro-constituent analysis, reproductive studies, diet/trophic studies, and genetic analysis. Additionally, we will deploy 100 pop up satellite tags on selected species each year to further examine movement patterns, residency times and habitat use of pelagic fishes. There is currently no fisheries independent data to monitor trends in abundance of pelagic fishes. This study would provide these much needed data and allow for enhanced monitoring of recovery rates of pelagic fishes. Deliverables include: indices of abundance, identification of fishing related sources of mortality (at-vessel and post release), information of impacts such as gear selectivity and the effects of soak time, temperature, and depth of capture on mortality rates. Knowledge of these impacts will help monitor reductions in bycatch and assist in the recovery rates of impacted populations. Identification of habitat (e.g. spawning grounds), movement and distribution patterns will assist in the recovery process. Biological samples will be used to determine length and age composition, calculate growth curves, estimate maturity and fecundity, estimate natural mortality, identify natal origin, and examine food habitats and trophic dynamics. Performance metrics include: cruise reports, annual progress reports, SEDAR and the HMS stock assessment reports and the HMS annual Stock Assessment and Fisheries Evaluation (SAFE) Report, as well as through presentations at scientific meetings and peer reviewed publications. The proposed project directly addresses three Programmatic Trustee Goals for Fish and Water Column Invertebrates, as listed in the PDARP, specifically, 1) Replenish and Protect Living Coastal and Marine resources, 2) Provide and Enhance Recreational Opportunities, and 3) Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation.	$1,000,000

Dolphin Conservation Mobile Education / Outreach Exhibit	Our project will apply innovative molecular technologies to highly migratory species such as tunas and billfishes to 1) fill significant information gaps in stock assessments thus reducing mortality through enhanced management and 2) develop robust monitoring techniques allowing a rigorous application of the MAM approach to the restoration effort. In order to develop a viable restoration process we must establish baseline data (i.e., indices of abundance) for target species. Restoration actions can then be monitored against these baseline data and adapted as needed. Highly migratory species are inherently difficult to monitor due to their behavior and ecology, thus baseline abundance data for many of these species in the Gulf of Mexico are lacking. As an alternative to fishery dependent data, multi-year surveys of ichthyoplankton abundance can be used to track temporal changes in adult biomass. We propose to implement innovative molecular techniques in order to identify larvae of highly migratory species (i.e., tunas and billfishes) and develop larval indices for the Gulf of Mexico. We will process older (1982 to 2008) formalin-preserved SEAMAP samples by implementing and expanding upon methods that were developed by the Alaska Fisheries Science Center's Auke Bay Laboratory. To process more recent (2009 to present) ethanol-preserved SEAMAP samples, we will use high resolution melting analysis (HRMA) combined with a fast, minimally invasive DNA isolation protocol. The application of these innovative molecular techniques to process existing samples is a cost effective way to develop fishery independent indices of abundance for several highly migratory species, providing an efficient alternative to costly surveys of adult fishes. This project will also serve as an investment in the improvement of future processing. This project will also have direct applications to the restoration. By developing novel larval indices, this project will aid in the reduction of mortality of highly migratory species by enhancing stock assessments, and it will create a historical record against which the restoration of highly migratory species can be robustly monitored and assessed. This project will also allow a more rigorous application of the MAM approach to the restoration effort. We expect this project to advance the utilization of monitoring techniques that can be used to assess future vulnerabilities to anthropogenic environmental perturbations and to enhance regional restoration efforts. This project meets several restoration goals including: (1) reduce mortality among Highly Migratory Species and other oceanic fishes and (2) develop Monitoring and Adaptive Management techniques.	$500,000
Marine Mammal Aerial Outreach Banners	The project assesses the relative abundance and distribution of Gulf of Mexico outer-continental shelf and deep ocean fishes and invertebrates; specifically intermediate trophic level fauna (typically mesopelagic species) that constitute the prey base for various species addressed by NOAA/NMFS management objectives (e.g., cetaceans, sea turtles, billfishes, tunas, coastal migratory species, sea birds). The proposed project fills a scientific data gap addressing open-ocean ecosystem modeling for intermediate and high trophic level species; currently there are on-going projects addressing mesotrophic nekton and high trophic level predators (e.g., cetaceans), however, intermediate trophic level species that are the predator/prey link are not research objectives. DWH injury is demonstrated by overlap between the DWH oil spill and intermediate fauna distributions (fishery independent surveys NOAA/NMFS/ Mississippi Laboratories (MSL); http://spo.nmfs.noaa.gov/mfr724/mfr7242.pdf). The likelihood of success is high considering MSL has an extensive history of outer-continental shelf and deep ocean faunal assessments (bottom and mid-water trawling), and is well-staffed for scientific, vessel, gear and IT specialists. mid-water trawling for intermediate trophic-level fauna will be conducted both on the continental shelf and in deep ocean and will include, in part, areas with high trophic level species that prey on intermediate trophic level fauna; Bluefin Tuna spawning and large cetacean aggregation areas (B, C, attached chart); the area of DWH surface oiling overlaps the proposed survey area. The annual project satisfies a Restoration objective for sentinel sight monitoring since population dynamics of the intermediate trophic level fauna can be used as a metric for assessing effects of future episodic oil spill events and for Gulf of Mexico ecosystem management related to the causes of population changes for high trophic level species. The survey also provides numerous sampl ing opportunities for trophic level stable isotope analysis and biological tissue sampling related to the residual effects of the	$180,000

	DWH oil spill. There are several applicable sections of the PDARP/PEIS Comprehensive Restoration Plan Section 5; of particular importance is Restoring Natural Resources, Alternative A: Comprehensive Integrated Ecosystem Restoration (5.5), fish and invertebrates (5.5.2), mesophotic communities (5.5.13), sea turtles (5.D.4.6), cetaceans (5.D.5.3) and sea birds (5.D.6.1.1).	
Printing and Distribution of Marine Mammal Conservation Outreach Materials & Signs	We propose to conduct a life history review and resiliency analysis for economically important Gulf of Mexico (GOM) teleost species including the shelf and offshore teleost species (PDARP, Table 4.4-9) to determine the impacts from Deepwater Horizon oil spill (DWH). The review of the life history information would focus on age, growth, natural mortality, reproductive parameters, and diet, since these parameters would most likely be affected by changes to the food web provided direct and indirect mortalities following the DWH. In addition to the literature review, the collection of biological samples (otoliths, stomachs, reproductive and muscle tissues) will support standard life history research, as well as, conduct analysis of stable isotopes (determine trophic level), model species-specific bioenergetics (aid in predator-prey interactions), and monitor the species population stability and recovery. Of the five shelf and offshore teleost species (PDARP, Table 4.4-9), three examples cover all species from the genera Seriola spp. (4 species GOM), Coryphaena spp. (1 species GOM), and Thunnus spp. (7 species global distribution). There are limited published research on S. fasciata, S. rivoliana, S. zonata, and C. hippurus; thus, conducting a review of literature and even collecting biological samples maybe difficult and possibly ineffective. Therefore, we propose to gather historical fishing conditions, landings, size composition and ephemeral environmental events available from difficult to obtain reports, interviews, films, and particularly newspaper articles. This historical information can provide insights into abundance estimates and environmental perturbations such as algal blooms, weather and upwelling/oceanographic induced fish kills, and seismic events. In addition, for these species, novel approaches are needed for collecting biological samples, since past and current sampling programs have not produced substantial information. Novel approaches would include carcass collections, observers on recreational vessels, and fishery independent surveys specifically targeting these pelagic species. This proposal's success requires the cooperation from state and federal fishery dependent sampling programs and fishery independent surveys, and new sampling schemes and surveys.	$275,000
Protect Wild Dolphin Billboards	We propose a Submerged Aquatic Vegetation (SAV) center to provide nearshore habitat stock. Scalable and flexible, the concept can be adopted across several restoration types, and linked to numerous funds due to implications to wildlife, water quality, shoreline, research, mapping, monitoring, and others. For example, when marsh is created, SAV is often buried in the shallow waters that are replaced with marsh. Both SAV and marsh are EFH for several species and life stages. Perceived as sparsely and erratically occurring for the non-marine species where marsh is created, the impacts to SAV are unmitigated for those actions. So, adding a harvest pre-construction, and/or planting post construction would tie to habitat restoration projects both from NRDA funds, but also with any existing program, so it could be implemented immediately. A suggested primary objective is to establish and maintain a source of SAV species for such use; expand the species being grown (mostly Vallisneria americana, which was most damaged by the DWH spill), and maintain a seed source. Specific objectives are (1) Harvest SAV from marsh construction locations prior to marsh construction, and seed from Rockefeller Refuge Ruppia-managed units, (2) Harvest Ruppia maritima plants from Rockefeller, and transplant to Jean Lafitte, (3) Maintain SAV in tanks, and propagate with growth chambers, and (4) Provide plant source within 3 years for repeat planting events at Chandeleur Is. and/or Jean Lafitte. This project will also select and initiate annual surveys of a subset of sites for long-term monitoring/observation from those of a recently completed 3-year baseline survey of the northern Gulf of Mexico that included 384 sites with 38% plant presence. This project addresses multiple restoration types including wetlands, coastal, and nearshore; habitat on federal lands; nutrient reduction; water quality; fish and water column inverts; submerged aquatic veg; sea turtles: marine mammals: and birds due to the broad use of SAVs. The activity will address impacts through restoration (create, enhance or restore an injured resource or habitat); protection	$530,000

	(shoreline stabilization, remove from threat of other restoration activates and relocate the habitat); maintain and manage the habitat; and education of any targeted group about how SAV tie to all resources damaged. (Update).	
Marine Mammal Conservation Print Ads in Tourism & Trade Magazines	The proposed project aims to apply an integrative approach, using a combination of traditional (e.g., numerical and volumetric quantification of stomach content through visual identification methods) and novel approaches (e.g., genetic identification of stomach contents, compound-specific isotopic analyses), to improving our understanding of trophodynamics in the northern Gulf of Mexico. Project efforts will maximize cost-effectiveness by collecting samples from ongoing surveys funded by the Southeast Area Monitoring and Assessment Program (SEAMAP). Project results will then be incorporated into new and existing ecosystem models to explore direct and indirect linkages among key species and trophic guilds, as well as assess ecosystem-level impacts of various management alternatives and environmental perturbations (e.g., red tide, hypoxia, oil spills). At the outset of the project, all existing trophodynamics data for the northern Gulf of Mexico will be compiled. Depending on the quantity of data available for a given species or life history stage, analyses will include species accumulation curves to assess how effectively overall diet composition has been characterized, as well as additional analyses to assess the temporal and spatial stability of the relative importance of key prey taxa. Results from these analyses will be used to prioritize the subsequent collection and processing of stomach contents. Stomach contents will primarily be collected opportunistically through ongoing SEAMAP research surveys. The vast majority of samples will come from summer and fall groundfish trawl surveys, which capture several hundred species of fish annually. Additional samples, primarily of managed fishes, will come from bottom longline and vertical longline surveys, although focused sampling efforts may be required for certain taxa and/or life history stages. A subset of stomach contents will be processed using traditional visual-based identification techniques. Supplementation and support of stomach content analyses is proposed through the use of compound specific stable isotope analyses. This approach provides greater precision in determining trophic level and likely enable the identification of basal resource (e.g., phytoplanktonic vs. benthic). Diet data will be integrated into existing models (EwE in the eastern Gulf of Mexico, Atlantis) and used to develop new models (EwE in the western Gulf of Mexico). The proposed research herein will focus on filling significant information gaps by determining food web structure and dynamics, trophic linkages, and predator-prey relationships in order to develop ecosystem models to enhance stock and community assessments, therefore, aiding in the MAM approach to the restoration effort.	$500,000
Reduce Bycatch of Dolphins in Shrimp Trawls Through Characterization of Risk Factors	Primary objectives are to map and characterize habitats of the U.S. Gulf of Mexico (GOM) from the continental shelf break shoreward to less than 10m depth as well as determining species associations and community structures. Modern technology supported by statistically-based groundtruthing will be used to supply cost effective determinations of bathymetry and habitat data in U.S. GOM from depths of 500m and shallower. An estimated 10-15% of U.S. waters will be mapped to 500m depth by strip transects spaced approximately every 10km throughout the GOM. Little of the GOM has been mapped with enough resolution to accurately locate and quantify the hard/live bottom habitats as well as artificial reefs. Accurate and comprehensive habitat maps are essential for ecosystem based fisheries management and marine spatial planning. This project intends to expand upon recent efforts to catalog and prioritize mapping in the GOM with at sea mapping and sampling to fill data gaps and provide region wide assumptions about fisheries habitat, species associations, and community structure. In response to the DWH oil spill, the Trustees determined that injuries to reef fish communities occurred but were not quantified (PDARP 5.5.6.4). Enhanced fishery-independent data collection methods, such as increased spatial and temporal effects for fishery-independent surveys are recommended as part of the Monitoring Plan. It is also noted that “habitat associations could improve restoration outcomes” and “information that increases our understanding of densities of organisms in geography over time, ecosystem functioning, and trophic relationships can be used to inform restoration project planning, design, and evaluation”. This project intends to bridge gaps in knowledge on the distribution of offshore habitats and their species associations. Community structure	$550,000

	information will be critical in expanding ongoing and future fisheries independent surveys to allow for pre- and post-stratification. By refining surveys by habitat, variance will be greatly reduced for indices of abundance and lead to more accurate stock assessments. A suite of advanced remote sensing technologies will be utilized, including towed and AUV mounted side scan and synthetic aperture sonars, multibeam echosounders, ROVs, and other optical sensors. Mapping in the GOM has increased in the last decade; however, there has not been a unified large scale effort across the entire depth range of the continental shelf. This project intends to: 1) expand upon current and previous mapping efforts from nearshore to 500m throughout the U.S. Gulf, 2) characterize essential habitats for benthic organisms and their habitat associations, 3) quantify and characterize estimates of hard bottom and artificial reef habitats. Imagery will be used to produce classifications which will be scalable to the Coastal and Marine Ecological Classification Standard (CMECS). In all cases of surface and subsurface mapping, care will be taken to avoid duplication of previous efforts. Deliverables will include completed high resolution habitat maps and GIS products, scalable habitat estimations by region, groundtruthing imagery, species/community structure information, and an online data portal to access and download data products. Initial and ongoing monitoring of these systems will support adaptive management strategies and provide more accurate information on landscape scale habitat distribution patterns as well as connectivity throughout the GOM. Stock assessments with detailed information regarding amount, distribution, and contributions of various types benthic habitat will reduce uncertainty as well as allow for more efficient and accurate population surveys. Baseline information will allow for pre- and post- analyses of habitat change due to events such as hurricanes, contaminant spills, coastal erosion, and restoration activities as well as informing decision-making processes of the latest research findings.	
Sea Turtle Rehabilitation Facility National Coordinator	The wider Gulf of Mexico (GOM) supports the livelihoods of tens of millions of people that depend directly or indirectly on commercial and for-hire recreational fisheries and marine tourism industries worth billions. The GOM includes a vast and complex network of habitats and ecosystems that are vastly productive yet vulnerable to natural and anthropogenic stressors. Restoring and maintaining the sustainability of the system requires understanding the interconnections between species, habitats and ecosystem processes that are not well understood presently. Most of the valuable fishes harvested by commercial and recreational fisheries include groupers, snappers, drums, and croakers. All of these groups reproduce in multi-species fish spawning aggregations (FSAs). FSAs serve as productivity hotspots: small areas of the ocean that are dictated by the interactions between physical forces and geomorphology that attract multiple species to reproduce in large numbers. These marine oases also attract a wide diversity of apex predators that feed on aggregating fishes and planktivores that feed on the highly concentrated source of protein-rich eggs. The objectives of the proposed program are to provide quantitative monitoring of multispecies FSAs in both inshore and offshore environments and to use those data to assess the impacts of natural and anthropogenic stressors on these habitats. The research will clarify the role of FSAs as nexus points that are critical to unlocking a more holistic understanding of ecosystem structure and function, species and habitat connectivity, and recruitment and productivity of key species in the GOM. We propose to establish 10 sentinel sites in the waters of the US, Cuba, Mexico, and Belize. Sites will be selected from those that are already known and characterized, where local teams are in place to lead monitoring and where intensive research will rapidly inform managers. These will include both snapper/grouper FSAs on offshore shelf edges, and croaker/drum FSAs in coastal estuarine passes. Sites will be monitored continuously and simultaneously following a comprehensive and standardized protocol for the GOM that we developed with RESTORE funding. Monitoring will include a combination of advanced (e.g. hydroacoustics, passive acoustics, telemetry) and traditional (underwater surveys, biological sampling, genetic analyses, data sondes) approaches to quantify and characterize the timing, abundance, size structure, movement patterns, reproductive activity, productivity, connectivity and distribution of fishes in relation to physical and environmental variations. As part of these efforts, all sites will be instrumented with a suite of in situ biological and physical oceanographic monitoring equipment (e.g. acoustic data loggers, VR2Ws, ADCPs. We hypothesize that	$1,000,000

	protected, multi-species FSA sites will demonstrate measurable increases in the number of species and the number of individuals of each species that reproduce there, thus maximizing reproductive output. This proposal supports most of the main goals of the NRDA Trustees including: restore and conserve habitat, replenish and protect living coastal and marine resources, provide and enhance recreational opportunities, and provide for monitoring and adaptive management. The proposal also supports exploration and characterization of new sites. The project will be led by a diverse group of co-PIs representing private business, federal government, and academia from the wider GOM. By working cooperatively with stakeholders from multiple countries including fishermen, managers, and scientists, and broadly sharing results via multi-media communications we will engender shared ownership of this long-term, large-scale applied research and management program. This integrated ecosystem restoration approach will translate results into actionable policy recommendations to protect spawning fish and contribute to marine ecosystem resilience.	
Sea Turtle Stranding Probability Assessment Tool	This project will support socioeconomic analyses necessary to evaluate the impact of the establishment and implementation of proposed or potential marine protected areas in the northern Gulf of Mexico. These include the expansion of the Flower Garden Banks NMS and Mesophotic/Deepwater Habitat Areas of Particular Concern (HAPC).	$175,000
Improve Bycatch Reduction by Enhancing & Expanding the Gulf of Mexico Shrimp Trawl Fishery Observer Program	Sperm whales and Bryde's whales in the Gulf of Mexico were injured during the Deepwater Horizon event. Both species are also exposed to a suite of anthropogenic stressors including noise, shipping traffic, and interactions with commercial fisheries. Reducing the impacts of these stressors will be key to effective restoration. Information on both acute and chronic exposure to stressors and how they influence population dynamics and species recovery is a key data gap needed for adaptive management and selection of most effective restoration techniques. The Population Consequences of Disturbance (PCoD) model is an effective impact assessment framework for evaluating the effects of acute and chronic impacts of noise and other stressors on marine mammal populations. Key parameters for the PCoD model include 1) stage-specific survival rates, 2) maturation and reproductive rates, 3) metrics of disturbance caused by anthropogenic stressors, and 4) metrics of the bioenergetic cost of disturbance responses. To develop an accurate PCoD model, directed studies to measure these key demographic population parameters are needed for sperm whales and Bryde's whales in the Gulf of Mexico as these populations are distinct from other global populations and have unique features that may limit the relevance of population parameters derived from other regions. This project includes a series of large vessel cruises to collect data to estimate these key parameters. Photo-identification capture-recapture studies will be conducted to estimate survival rates. Biopsy samples will be collected from animals to collect tissues to measure pregnancy hormones, stress hormones, fatty acid profiles, and other parameters. Photogrammetry from unmanned aerial systems will be used to derive visual metrics of animal health. Finally, animal borne telemetry tags will be deployed to measure feeding behaviors, dive profiles, and swimming energetics. Data collection, model parameterization and implementation, and the elicitation of expert opinion would be guided by a working group including experts in large whale health, population biology, and PCoD model implementation. The outcome of this project will be a well parameterized model that can provide a quantitative basis for planning restoration projects and environmental impact assessments and improve the capability to restore these injured species by identifying key stressors that limit population growth and recovery.	$14,000,000
Reducing Sea Turtle Bycatch at Shore-Based Recreational Fishing Sites	Physiographic and hydrographic features that tend to concentrate prey or transport primary production from continental shelf waters into oligotrophic pelagic habitats support persistent aggregations of multiple species of cetaceans within defined regions. Potential anthropogenic threats to both marine mammals and their habitats are also frequently concentrated in particular regions. When there is spatial overlap between these activities and key habitats for cetaceans, there is an increased probability of negative effects through direct interactions (e.g., vessel strikes or fisheries entanglements), chronic exposure to stress (e.g., long term noise pollution), or damage to habitats (e.g., removal of prey resources). Recently, historical data on cetacean abundance and spatial distribution were integrated into spatially and	$1,000,000

	temporally explicit density maps to inform assessments of exposure to noise and other stressors associated with energy exploration and military activities. Large-scale surveys are being conducted over the next several years by NMFS and BOEM to update these analyses and produce current maps of cetacean density throughout the U.S. Gulf of Mexico. However, these projects will not provide detailed assessments of habitat features at small spatial and temporal scales. These data are necessary to develop spatial management approaches to restoration of injured marine mammals. In this project, we propose to conduct focused studies to 1) identify key habitats that support high density and diversity of cetacean species, 2) evaluate the importance of these regions for population dynamics of target species, 3) characterize the anthropogenic threats within these areas, and 4) conduct detailed assessments of habitat, cetacean occurrence, and prey resources within key areas. A suite of platforms will be used to evaluate habitats at fine spatial and temporal scales including moored passive acoustic units, autonomous underwater vehicles that can conduct fine acoustic scale surveys, and vessel surveys to conduct detailed assessments of physical, hydrographic, and biotic features of key cetacean habitats. These studies will focus on species that were injured during the DWH oil spill. Resulting habitat and species occurrence models will provide a basis for the implementation of restoration actions and an evaluation of the efficacy and characteristics of marine protected areas that could support long term restoration of injured marine mammals.	
Capacity and Infrastructure Development to Support Research, Education, and Restoration Activities for Mesophotic and Deep Benthic Communities	Deep-sea sediment fauna (infauna) represent important components of benthic biodiversity, and provide essential ecosystem functions including sediment bioturbation, organic matter decomposition, and energy transfer. However, due to their sedentary lifestyles and low mobility, infauna are vulnerable to disturbance, including hydrocarbon contamination and organic enrichment. Impacts associated with contaminants from the DWH spill resulted in changes in infaunal composition, diversity, and abundance. While these data represent a useful baseline for tracking post-spill changes, the long-term response of these deep-sea communities remains unclear. Sediment community assessments have traditionally used taxonomic methods for identification of fauna and diversity estimation. However, these methods are time intensive. Recent advances in high throughput environmental sequencing have enabled assessment of a wide range of metazoan taxa present in deep-sea sediments using molecular methods. Environmental sequencing has been successfully used to assess biodiversity and genetic connectivity of deep-sea and coastal sediment communities and characterize pre- and post-spill beach sites affected by heavy oiling during the DWH spill. Environmental sequencing may elucidate connectivity among GOM habitats, potentially identifying critical habitats for biodiversity maintenance, which is important for successful recovery of impacted communities. Comparison between DNA-based data sets and taxonomic results will provide quantitative metrics to ground-truth the utility of molecular analyses in future rapid assessments. This type of DNA-based method will be useful for understanding the effectiveness of restoration efforts by providing rapid quantification of infaunal community changes with disturbance, and potentially the identification of new indicator species for future disturbance events. Sediment cores will be collected adjacent to deep-sea corals (healthy and impacted sites) and sediment fractions will undergo standard meiofaunal extraction procedures for both taxonomic and environmental sequencing. Environmental DNA will be obtained from the extract, followed by amplification and sequencing on the Illumina MiSeq platform. This methodology has been extensively tested and validated for high-throughput environmental DNA sequencing. Processing and analysis of high-throughput data will be carried out using the appropriate software tools and bioinformatic workflows. Data collected will represent a combination of high-throughput sequencing methods and traditional taxonomic approaches, providing valuable information from which to track the recovery of impacted deep-sea coral infaunal communities, guide long-term monitoring programs of deep-sea environments, and help inform the development of future restoration plans. Samples collected will be processed for environmental analysis to provide a rapid assessment of sediment communities, to identify changes in their community structure, and to isolate species-specific responses to oil spills versus other types of disturbance. This research will provide the data required for impact assessments and to measure the success of mitigations developed through adaptive	$50,000,000

	management for the protection of natural resources. The cost of this effort is a function of the number of sites examined and temporal frequency of collections. Initially, this work will investigate 3 impacted and 3 healthy deep-sea coral environments where baseline information exists, on 1 cruise/year for 5 years. Other costs will include expenses for sample processing and data analysis. Additional funding would allow this work to include additional monitoring sites, including areas adjacent to coral transplants and within protected areas, which would require additional support. An ROV is required, but ship/ROV operations can be conducted in concert with other studies examining these environments. Costs, including shiptime: $11M/5yrs.	
Region-Wide Bottlenose Dolphin Health Assessment Program	This project will assess status of existing bycatch reduction measures, including existing time/area closures for the GOM Bottom Longline Reef Fish Fishery. Building on research results focused on soak time and recent results from sea turtle telemetry studies indicating the importance of SW Florida area as a foraging area for adult loggerhead turtles, this project will develop and implement new measures to reduce bycatch in this critically important loggerhead foraging area. Assess observer methodologies, including video monitoring, e-logbooks or other remote monitoring to improve assessment of sea turtle bycatch and inform bycatch reduction strategies.	$0
Systematic Observer Coverage of the Menhaden Fishery to Improve Bycatch Reduction Efforts	Deep-sea environments and the Mississippi River watershed are physically, chemically, and biologically linked. Whether changes to the Mississippi River watershed will lead to improved health of downstream deep-sea ecosystems is unknown and requires long-term monitoring. This study will provide a unique and future-focused approach to assessing the recovery and restoration of impacted deep-sea coral habitats. Organic input from surface waters (food supply), specific hydrodynamic characteristics (e.g., current regime), and other abiotic and biotic factors are believed to limit distribution of these high-density, high diversity communities. Specifically, near-bed currents can inhibit sediment deposition on corals and provide the food that corals need for survival. Changes in phytoplankton production in the upper water column may influence deep-sea coral communities, including survival, growth, and reproduction. This work seeks to understand the environmental baseline conditions necessary for the long term resilience of deep-sea coral sites, including ocean circulation, surface production, organic flux to seafloor, and larval supply. The research will quantify and measure temporal changes in the hydrological conditions around the impacted and reference deep-sea coral habitats through the use of instrumented moorings, and utilize biomarkers to track changes in nutrient dynamics, including variations in quality, quantity, and source (e.g., whether surface-derived or from seeps). Instrumented moorings will be deployed at the impacted and reference sites, adjacent to deep-sea coral habitats, in each of the five study years. Each mooring will be equipped with a rotating sediment trap to preserve particulate material, including coral larvae, at monthly intervals, an Acoustic Doppler Current Profiler (ADCP) to measure the speed and direction of ocean currents, and CTD with dissolved oxygen optode and chlorophyll (CDOM) fluorescence probe providing continuous records of physical properties (e.g., temperature, salinity, DO) for 5 years of the study. Other instruments may be included for additional costs. The deployment and recovery of the moorings will follow protocols developed by the PIs for deep-sea studies in the GoM, Mid-Atlantic Canyons, and the Caribbean. Sediment trap samples will be processed for zooplankton, 210Pb, bulk density, grainsize, % organic carbon, nitrogen, pigments, organic biomarkers, and stable isotopes in order to measure the quality and quantity of organic matter fluxing to the deep sea. This will provide information on the source and variability of food for the corals, as well as identifying the trophic and energetic links form the watersheds to the deep sea. Sediment trap material will also be analyzed for environmental DNA to screen for select GoM taxa (fishes, zooplankton, coral larvae, and microbes). See project description entitled: Temporal dynamics of eukaryotic plankton diversity at northern GOM deep benthic coral communities (USGS-Morrison) for more details. Data from the ADCP, CTD, and sensors will provide monthly measurements of the oceanographic environment. Sediment trap and instrument data will improve understanding of the transport, fate, seasonality, and sources of nutrients to deep-sea corals and associated deep-water circulation that can influence the larval supply to the hardbottom environments. Following this baseline	$3,000,000

	profiling, rapid assessment of changes in nutrient delivery and food sources to the deep sea following human-triggered events will be possible. Costs associated with this project include shiptime (1 x 15 day cruise/yr for 5 yrs), instruments and landers, including maintenance costs for each deployment and analyses costs. Total cost: $9M/5 years, with shiptime. An ROV is required for instrument placement, but ship/ROV operations can be conducted in concert with other studies examining these environments.	
Marine Mammal Conservation Medicine and Health Assessment Program	Benthic fauna provide essential ecosystem services, including nutrient cycling, biomass production, and sediment bioturbation, and a loss of benthic biodiversity has been correlated with an exponential decline in ecosystem services. Sediment macro- and meiofauna (infauna) represent important indicators of natural and anthropogenic disturbance primarily due to their sedentary lifestyle and their rapid response to change; thus, examining these communities has proven useful in impact assessments of coastal and deep-sea communities. For example, in the wake of the DWH oil spill, immediate impacts were detected in benthic communities including sediments adjacent to deep-sea corals. Annual collections of sediment adjacent to the impacted corals are tracking changes in these communities with time since the spill (2010-2016). While long-term impacts to these habitats are unknown, recovery rates are predicted to be slow with DWH derived contaminants remaining in biologically active sediments for many years. Coral-associated sediments contain benthic communities that differ from other soft sediments in the GoM, and thus recovery trajectories at these locations may differ as well, making regional generalizations inaccurate. Without the knowledge of the natural trajectory for recovery of communities, we will be unable to apply remediation tactics to restore these habitats. This research will characterize infaunal community structure at several deep-sea coral sites. Sediment cores will be collected adjacent to corals to assess infaunal abundance, diversity, evenness, and composition in ecosystems affected by different stressors. Sediment also will be processed for total organic carbon and nitrogen, hydrocarbon and metal concentrations, particle size analyses and redox conditions. Similarities and differences in benthic communities will be examined using non-metric multidimensional scaling; pairwise comparisons will be made between sites in order to estimate the percent comm unity dissimilarity/similarity and the taxa responsible for differences among coral sites. RELATE and DISTLM multivariate statistics will be used to analyze and model the relationship between the infaunal assemblage data and the environmental variables. This work will provide traditional taxonomic data that is comparable to existing datasets available at impacted and non-impacted deep-sea coral sites, and regionally for northern GoM soft-sediments, and natural hydrocarbon seeps including the environmental parameters for these habitats. This work also links to proposed research examining the environmental sequencing of sediment communities entitled: Develop rapid response techniques and advanced technologies to enable rapid assessment of deep-sea coral community ecology (USGS-Demopoulos). These comparisons will quantify community changes since the spill, estimate resilience, and determine whether these systems have recovered to comparable community structures near healthy reference areas. Assessing the community composition and biodiversity at selected deep-sea coral sites will provide baseline data for community response to contaminant exposure and critical data for future restoration projects. The cost of this effort is directly related to the number of sites examined and temporal frequency of collections. Initially, this work will investigate 3 impacted and 3 healthy deep-sea coral environments where baseline information exists, on 1 cruise/year for 5 years. Other costs will include expenses for sample processing and data analysis. Additional funding would allow this work to include additional monitoring sites, including areas adjacent to coral transplants and within protected areas, which would require additional support. An ROV is required, but ship/ROV operations can be conducted in concert with other studies examining these environments. Costs, including shiptime: $10M total for 5 years.	$0
Reduce Dolphin Bycatch in Gillnets through Enhanced Observer	The Deepwater Horizon spill event was responsible for changes at all levels of the Gulf of Mexico large marine ecosystem, leading to shifting baselines within these environments. The short-term impact of the spill on deep-sea coral (DSC) habitats has been well documented. However, uncertainty remains regarding the long-term dynamics and ultimate	$1,200,000

Program & Behavioral Observations	recovery of populations and communities. Establishing the baseline health DSC remains a primary goal, and the appropriate tools used to quantify health continue to be developed. DSC that were impacted by the spill are slow growing, with some estimated to be > 500 years old, and require long time scales for recovery. Understanding the response of DSC and associates to disturbance is necessary to successfully develop restoration efforts that will assist in the ecological recovery of the Gulf. Moreover, there is an immediate need for innovative tools to rapidly assess future impacts. DSC are remote, difficult to sample, and require specialized gear to investigate. Visual surveys and discrete collections at deep reefs are time consuming and spatially and temporally limited. An alternative approach used to monitor shallow-water coral reef environments is the characterization of reef soundscapes. Reef organisms create sounds, which can indicate the presence of particular taxa and of specific biological processes (e.g., spawning, foraging behavior). Linkages among sound, coral cover/species richness and fish assemblages have been observed for shallow reefs, where the diversity of sound types may serve as a proxy for reef fish assemblage structure. In addition, acoustic diversity indices, which essentially reduce complex acoustic data to discrete metrics, have been used to infer community biodiversity. Soundscape measurements and acoustic diversity indices for DSC habitats do not exist. Monitoring the soundscape produced in healthy and impacted coral habitats in concert with visual surveys of the benthic community will help establish the relationship between reef sounds and community assemblages, with the potential to detect habitat changes and track coral health over different temporal and spatial scales. This project will combine visual observations, acoustic monitoring, and develop acoustic indices to elucidate the health, recovery, and resilience of deep-sea coral habitats for the first time. Research will focus on the deep-sea coral reefs formed by Lophelia pertusa (400-600 m), and the coral gardens formed primarily by Paramuricea biscaya (> 1000m). Lophelia pertusa reefs have a similar structure to the shallow-water reefs where acoustical monitoring has been applied, while the deeper coral gardens are the locations of the most severe impacts of the DWH spill. The objectives include characterizing the soundscape at healthy and impacted DSC habitats by (a) measuring the temporal, spatial, and spectral pattern of the acoustic environment at different scales (short vs. long-term, within and among sites) and (b) testing existing acoustic diversity indices and developing new indices based on measured soundscapes to help infer community biodiversity. Visual surveys quantifying the benthic community structure and abundance will be compared to the acoustic surveys in order to assign identity to the various contributors to the soundscape at deep-sea coral sites. Instruments will be deployed for short (1 week) and long (1 year) term data collection and will be redeployed up to 4 times. Instruments may be deployed on other landers monitoring the oceanographic conditions around the impacted corals. For more information, see project submission entitled: Constraining the oceanographic conditions and food supply at deep-sea coral habitats (USGS-Demopoulos). An ROV is required, but ship/ROV operations can be conducted with other deep-sea coral studies. Costs ($5.5M) include instrumenting 6 landers, maintenance for recovery/deployment, shiptime (1x15 day ROV cruise/yr, 5 cruises), and analysis.	
Evaluate & Implement Trap Pot Gear Modifications to Reduce Dolphin Bycatch	Establish a regional laboratory that focuses on providing enterprise-level, high-throughput molecular biological analytical services to support southeast region environmental management programs. The laboratory would serve as a Center of Excellence, regional resource, and collaborative partnership/focal point for federal, state, and local governments, academic institutions, and the private sector. This project would offset reductions in employment owing to the Deepwater Horizon oil spill, reduce the costs associated with processing environmental samples to support restoration and resource management, and serve as a center of advanced technologies in the region. Molecular biology (which involves such areas as Environmental DNA, RNA:DNA ratios, mitochondrial DNA for close kin analyses, DNA barcoding for identifying species, stomach contents, invasive detections, etc.) has become a mature and important transformational technology that is underutilized in fisheries and the southeast. These techniques can help streamline species identifications, reveal the actual species a given animal has consumed, assess the physiological condition of an organism,	$400,000

	estimate how many females contributed to a given year class and perhaps what the population size is. They can allow us to monitor changes in diversity, shifts on gene frequencies arising from climate-drive selection, and provide better information on just what lives in the Gulf ecosystem (i.e., we don't know all the vertebrates that occur in the Gulf, let alone the inverts). These products are the core informational needs required for Ecosystem Based Fisheries Management, the development of foodwebs and useful ecosystem models, and detecting the impacts from accidents and climate change. This information would enable much more advanced approaches to restoration, monitoring, and ecosystem status. The primary objective of this project is to establish a regional capability – a dedicated laboratory - similar to that provided by the Canadian Centre for DNA Barcoding. The project would be a partnership across stakeholders and would have as primary missions: 1) advancing the technological capabilities of the region; 2) integration with marine, estuarine, and coastal monitoring, assessment, and management programs; 3) achieving cost reduction and better data for monitoring programs; 4) and training to move the southeast region to the forefront of applied environmental molecular biology in the United States.	
Baseline Survey of Gulf of Mexico Rod and Reel Fishing Gear Interactions with Protected Species	This project uses novel satellite technology to provide classified habitat shoreward of approximately 40 meters water depth across the Gulf of Mexico. Because satellites pass over any location regularly, this unique project will create a time series of spatial habitat data thus allowing rapid identification of where and when change occurs. Such data are invaluable for effective, targeted restoration planning, project monitoring, and observing how the region responds to a variety of pressures. Many open ocean fish, invertebrates, marine mammals, and turtles injured during Deepwater are dependent on both nearshore and estuarine habitats. Indeed, central to many restoration planning discussions leading to the pDARP were the linkages between offshore and nearshore or estuarine habitats. This is because the most viable - and pragmatic - open ocean restoration often has a nearshore or estuarine focus. However, nearshore and estuarine habitats were also injured by the Deepwater Horizon oil spill and are further degraded by channelization, energy development, subsidence, and sea level rise. These processes will present challenges into the foreseeable future. Mitigating such losses - or even reversing them - would be most effectively achieved if one understands how and where change is most rapid. Advanced satellites now offer the capability to rapidly collect bathymetric and categorical habitat data to water depths as deep as forty meters. This capability means that broadscale maps of habitat and bathymetry covering large swaths of the continental shelves can be developed quickly and efficiently. Further, repeated satellite passes over any given area allows one to measure habitat and landform change through time. These techniques offer distinct advantages in coverage and speed over the piecemeal approaches deployed today that use aircraft, sidescan and multibeam sonars. The work will provide refined habitat data for the Gulf of Mexico, support improvements in circulation models that all rely on bathymetric data and offer a means to monitor change in critical habitat from 40 meters up into terrestrial environments across the Gulf of Mexico. This project will use recent developments in satellites and classification analyses to provide habitat-categorized maps of the coastal zone (inshore of the riparian out to a water depth of 40m depending on water quality). The satellite-derived timeseries of habitat data will be examined to identify those areas that are stable and those that are undergoing rapid change in elevation of habitat type. The information will be useful for states planning geoengineering, restoration personnel preparing for marsh and seagrass projects, and biologists interested in the habitats of fishes, cetaceans, and turtles.	$750,000
Sea Turtle Nesting Beach Coordinator	The Sea Turtle Early Restoration Project provides enhanced observer coverage in the shrimp otter trawl fishery by adding 300 observer sea days per year. In 2017, the project was implemented, and in 5 months' time, observations of turtle interactions increased 150%. Information from these interactions is critical to understanding effectiveness of TEDs. Additional observer coverage is needed on otter trawl and on non-otter trawl vessels (e.g. bait shrimp trawlers, wing-net vessels, inshore skimmers, etc.) to better understand the frequency and location of sea turtle interactions in the shrimp	$875,000

	fishery. The goal of the project idea is to gather additional information on sea turtle interactions in currently under or un-observed sectors of the fishery for a minimum of 3 years.	
Reduce Harm to Dolphins by Determining Scope of Hook & Line Fishing Gear Interactions & Fishermen Attitudes	Cellular Electronic Logbooks (cELBs) provide a precise means of estimating shrimp fishing effort which is used to improve bycatch estimation. The cELBs provide data on fishing effort and location and improve the accuracy and precision of the data being collected in the shrimp fishery. Vessel location is recorded every 10 minutes and is stored until the data can be transmitted via cellular signal. This project would purchase cELBs and install them on federally and state-permitted otter trawls and skimmer vessels in the GOM. There are approximately 4200 state permitted otter trawls, 3800 state permitted skimmer trawls, and 1500 federally permitted otter trawls. Currently ~460 units are installed on federally permitted otter trawls (32% coverage). There is a critical need for timely effort data from the inshore and skimmer portions of the fishery. The cELBs would provide near-real time data for these portions of the fishery as they are frequently in range of cell towers. The project would also include sample design and data analysis.	$1,200,000
Marine Mammal Disaster Response Program for the Gulf of Mexico	Bryde's whales in the northern Gulf of Mexico are an extremely small, isolated population with fewer than 50 individuals confined primarily to the northeastern Gulf. They were injured by the DWH oil spill with 48% of their known habitat impacted by surface oil. Due to the small population size and high injury due to the spill, restoration actions to protect Gulf of Mexico Bryde's whales are urgently needed. One confirmed source of mortality is strikes by large vessels. Behavioral data collected from a telemetry tag deployed in 2015 demonstrated that these whales frequently occur in near surface waters and are vulnerable to ship strikes, particularly during night-time hours. In addition, it is probable that noise resulting from the transit of large vessels can result in behavioral changes or other disturbances that can influence behavior and population dynamics. In this project, we propose to evaluate the level of risk of vessel strikes in the Bryde's whale habitat and evaluate potential strategies to reduce fatal vessel strikes including vessel routing measures and speed reductions. Spatial habitat and vessel data, including AIS data, are currently collected and will be analyzed to evaluate vessel classes, speeds, and traffic patterns and the degree of overlap with Bryde's whales to identify high risk areas. This information can then be used to identify possible alternative vessel routes that could be evaluated to determine if it is possible to reduce risk to whales while maintaining safety of navigation. Similar projects have been successfully conducted to reduce risks to North Atlantic right whales and blue whales. Reduced vessel speed decreases the mortality rate of vessel strikes when they do occur. Mortality rates for North Atlantic right whales are reduced when large commercial vessels travel at speeds less than 10 knots. Thus, we propose to evaluate current vessel speeds and identify regions of highest risk to Gulf of Mexico Bryde's whales. We will build upon existing and anticipated data collected on the spatial distribution and habitat requirements of these whales. This project will evaluate the risk of vessel strikes and explore alternative strategies to reduce vessel strikes to support restoration.	$0
Broad Scale Aerial Survey to Monitor Sea Turtle Trends in the Gulf of Mexico	This plan addresses ageing of deepwater and mesophotic corals to assess injuries to natural resources stemming from the May 2010 Macondo Well blowout that led to the Deepwater Horizon oil spill. Targeted reefs included Alabama Alps Reef and Roughtongue Reef, both large high-relief platform reefs within the Pinnacles reef tract, northeastern Gulf of Mexico (NEGOM), Yellowtail Reef, a lower relief Pinnacles Trend reef near Roughtongue Reef, as well as Coral Trees Reef (CTR) located on the West Florida shelf edge, and Madison-Swanson South Ridge (MSSR). Information on growth-rates and life-spans of mesophotic deep-sea (> 65 m) and deepwater corals is important for understanding the vulnerability of these organisms to both natural and anthropogenic perturbations, as well as the likely duration of any observed adverse impacts. Results from Prouty et al. (2011) indicate that deep-sea black coral Leiopathes sp. have been growing continuously for at least the last two millennia, and results from Prouty et al. (2016) suggest continuous life spans of over 600 years are possible for the deep-sea octocoral Paramuricea sp. These demonstrated slow growth-rates of deep-sea corals suggest that it may take centuries for certain deep-sea coral species to recover from negative impacts. However, there are no published values for growth rates or ages for azooxanthellate gorgonians mesophotic corals from the Gulf of	$3,000,000

	Mexico. Therefore, information on growth rates and life spans is essential for understanding the life history and ecology of these habitat-forming corals. Gorgonian octocorals such as Paramuricea rely on a surface-derived food source (i.e., particulate organic carbon) rather than sedimentary or dissolved organic carbon (Druffel et al., 1995; Roark et al., 2006). As a result, the 14C-derived age estimates of gorgonians corals are assumed to be unaffected by feeding upon old resuspended sedimentary carbon because these organisms acquire their carbon from surface-water organic matter after rapid transport to depth (Roark et al., 2009). Therefore, robust 14C-derived chronologies and known surface ocean 14C reservoir age constraints in the Gulf of Mexico provide reliable calendar ages to the collection of gorgonian mesophotic corals. The objective of this analysis plan is to use both "bomb" produced radiocarbon over the last approximately 60 years and conventional 14C ages (based on the known radioactive decay rate) calibrated with reservoir corrections to calculate calendar ages, as well as growth rates for mesophotic corals collected in the northeastern Gulf of Mexico. Specifically, the objective is to assess coral ages of mesophotic gorgonian octocorals in genera Hypnogorgia, Swiftia, Bebryce, and Paramuricea and mesophotic black corals in genera Stichopathes and Antipathes. The methodology for preparing, radiocarbon dating, and determining age and growth rates for the coral samples is described in detail in Prouty et al. (2011; 2016) where this technique has been used successfully used with samples collected in the Gulf of Mexico. A cross-sectional disc will be prepared from the base (trunk) of each coral specimen. A transect across this disc will be sampled and analyzed to include polyp, tissue layer, center (inner), middle and outer portions across the radial transects. Therefore, when sufficient skeletal material is present, each coral specimen will yield approximately 5 radiocarbon measurements. This information will aid in the calculation of maximum ages and growth rates of a particular specimen. In addition, tips and polyps from the coral specimens will be analyzed in order to capture the radiocarbon signal in the most recently accreted material. Each subsample of skeletal and tissue material will be prepared for Accelerator Mass Spectrometry (AMS) radiocarbon (14C) dating at the Keck Carbon Cycle AMS laboratory at UC Irvine (KCCAMS).	
Leave No Trace and Rehabilitation Coordinator	The goal of the project is to reduce sea turtle injury and mortality from exposure to and entanglement in discarded or lost recreational fishing gear. Sea turtle exposure to, and entanglement in, discarded or lost recreational fishing gear, such as monofilament line and cast net material, is an important, and growing problem. This project idea includes the following: 1) Identify problem "hotspots" for sea turtle entanglement at state and regional levels across the Gulf of Mexico. Project locations would be selected and prioritized based on intensity of use for recreational fishing, known co-location with sea turtles (e.g., foraging areas), and frequency of entanglement/ingestion-related strandings. Based on location-specific patterns of entanglements and/or entanglement risk, determine priority management needs for each hotspot. 2) Reduce the number of, and potential for, entanglement incidents at identified hotspots through a suite of possible techniques, including site clean-ups (recovery of gear and debris from hot spot areas), increasing proper monofilament disposal areas, reduction of the amount of monofilament from waterways, especially in key sea turtle nesting and foraging areas, coordination with partners to draft and disseminate key messages to educate the public on the dangers of entangling wildlife and the proper disposal of monofilament. This project would be implemented by NOAA and the Gulf States and could be scalable both in duration and cost. It is envisioned that this project would be implemented in each of the Gulf States. Project locations would be selected and prioritized based on intensity of use for recreational fishing, known co-location with sea turtles (e.g., foraging areas), and frequency of entanglement/ingestion-related strandings. This project could potentially also benefit marine mammals. This project could be scaled based on available funds.	$350,000
Address Gaps and Enhance Capacity in the Current Capabilities of the Marine Mammal Stranding Network	This project involves developing a mobile outreach and education exhibit that would travel throughout the Gulf States to educate residents and visitors about dolphin conservation issues. The audience includes recreational fisherman, beach-goers, motorized and non-motorized recreational vessel operators, and the general public. By educating these audiences and distributing outreach materials at fishing piers, marinas, and events, this project will: - Reduce injury and mortality to bottlenose dolphins from hook-and-line fishing gear by educating fisherman about ways to avoid interactions with	$0

throughout the Gulf of Mexico to Improve Timeliness of Response and Diagnosis of Illness and Cause of Death	dolphins while fishing and provide them with Dolphin Friendly Fishing Tips. - Increase bottlenose dolphin survival though better understanding of cause of illness and death as well as early detection and intervention of anthropogenic and natural threats because this audience would know how to help a stranded, injured or entangled marine mammal and to report these animals to the appropriate stranding network immediately. - Reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because audiences will better understand the harm and consequence of these activities. They will learn how to recognize dolphin behaviors that are signs of harassment and also how to responsibly view dolphins in the wild. - Reduce injury and mortality of marine mammals from vessel collisions by educating mariners about marine mammal viewing guidelines and precautions they can take to avoid vessel strikes. A large van would be purchased and wrapped with colorful, eye catching dolphin graphics and bold educational messages. Not only would this attract people during outreach, but the wrap would also serve as a rolling billboard that has the potential to reach thousands when traveling throughout the Gulf States. The inside of the van would be a customized exhibit illustrating and educating audiences about the topics above. The budget includes funds to purchase and customize the vehicle, as well as funds for salary of an educator/driver, fuel, per diem (food/lodging), outreach materials, and insurance & maintenance of the vehicle for at least 3 years.	
Reduce Vessel Collisions by Characterizing Spatio-Temporal Overlap Between Vessel Traffic and Marine Mammals	The use of aerial banners (small plane pulling long banner) to relay important educational messages to target audiences has proven an effective outreach tool; banners can be used to educate beach-goers and motorized & non-motorized (jet skis, surfers, paddle boarders, etc.) vessel operators about presence of marine mammals and laws protecting them in the Southeast U.S. This project will reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because target audiences will become aware that these activities are harmful and illegal. The project may also reduce injury and mortality of marine mammals from vessel collisions by making vessel operators aware of the presence of whales and way to avoid vessels strikes. A banner with the message "Don't Feed Wild Dolphins, It's Illegal" has been flown over areas where this harmful and illegal dolphin interaction is known to occur but also in areas where there are large numbers of tourist. These banners have reached over 300,000 people during one flight alone; this is common during spring break and other peak seasons. Banners have also been used when whales are seen close to shore and in areas where there are large numbers of motorized or non-motorized vessels near whales; the banners have made vessel operators aware of the presence of the whale(s) to avoid vessel strikes and harassment. This project involves flying aerial outreach banners in 10 coastal areas throughout Texas, Louisiana, Mississippi, Alabama, and Florida where illegal feeding and harassment activities are known to occur. The customized banners will educate people below to make them aware that these activities are harmful and illegal. Banners will be flown on 10 days each year per location; season, historic tourism numbers, and events will be considered when choosing which days the banners are flown. Banners would also be flown at times when other marine mammals (i.e., orcas, Bryde's whales) are seen within practical flight distance from shore and in areas where vessels are near to inform those vessel operators of the presence of whales and tips on how to avoid them.	$300,000
Mitigating Vessel Strike Mortality through the Identification of Vessel Interaction Hot Spots	Partners currently assist NOAA Fisheries with the distribution of dolphin conservation outreach materials and signs installation throughout the Gulf States. While these efforts are appreciated, outreach is inconsistent and often opportunistic; therefore lacking in many areas. This project would fund a full-time educator (2 years) to implement a thorough distribution plan and coordinate the installation of 800 dolphin conservation signs throughout Texas, Louisiana, Mississippi, Alabama, and Florida. The educator would document all distribution efforts and plot the installation of all signs on a map. By distributing outreach materials at fishing piers, marinas, businesses, tourism & education centers and at events, and by installing signs on waterways, piers, docks, and in marinas, this project will: - Reduce injury and mortality to bottlenose dolphins from hook-and-line fishing gear by educating fisherman about ways to avoid interactions with dolphins while fishing and provide them with Dolphin Friendly Fishing Tips. - Increase bottlenose dolphin survival	$300,000

	though better understanding of cause of illness and death as well as early detection and intervention of anthropogenic and natural threats by informing audiences about how to help a stranded, injured or entangled marine mammal and to report these animals to the appropriate stranding network immediately. - Reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because audiences will better understand the harm and consequence of these activities. They will learn how to recognize dolphin behaviors that are signs of harassment and also how to responsibly view dolphins in the wild. - Reduce injury and mortality of marine mammals from vessel collisions by educating mariners about marine mammal viewing guidelines and precautions they can take to avoid vessel strikes. Outreach materials include: (pdf of these materials: http://sero.nmfs.noaa.gov/protected_resources/outreach_and_education/index.html) - Protect Dolphins brochures - Southeast U.S. Marine Mammal and Sea Turtle Viewing Guidelines brochures - Marine Mammal Viewing Guidelines/ How to Help a Stranded Marine Mammal cards - Dolphin Viewing Guidelines stickers - How Can You Help a Stranded Marine Mammal? Southeast U.S. Marine Mammal Stranding Network brochures - Dolphin & Whale 911 App/ SEE & ID Dolphins & Whales App cards - Dolphin Friendly Fishing and Viewing Tips/ Don't Feed Wild Dolphins cards - Cast with Care cards and stickers Signs include: (pdfs of these signs: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html) - Save Sea Turtles and Dolphins - Help Stranded Marine Mammals - Protect Wild Dolphin (Harassment) - Don't Feed Wild Dolphins - Dolphin Friendly Fishing Tips.	
Develop and Implement Tools and Techniques to Identify Possible Mass Stranding Situations Before They Occur and to Avert Animals from Mass Stranding	This project will reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because residents and visitors would become aware that these activities are harmful and illegal. Billboards would be used to reach large audiences with important educational messages on highly traveled roads taken by residents and visitors to coastal areas throughout Texas, Louisiana, Mississippi, Alabama, and Florida. Billboard advertisements have the largest impact on the greatest number of people and are the most cost effective method for reaching target audiences. This project includes design, print, install, and rent for media space for billboards. Billboard would convey brief but important educational messages and images about the harm in illegally feeding and harassing wild dolphins. Locations of 20 billboards will be determined by traffic patterns and distance to popular coastal area where illegal feeding and harassment has been known to occur. Billboards will be maintained in these 20 locations for 2 years to ensure constant and consistent educational messaging in a cost effective manner.	$0
DWH Long-Term Planning Action Analysis: Ocean Use Mapping	Print ads in tourism magazines can sometimes be effective in reaching large audiences with the desire to interact with marine mammal in the wild. Unfortunately, magazines offering discounted or pro bono ad space usually means small ads in the back of a magazine that will most likely be overlooked. This project includes funding a contract with a marketing agency to produce and coordinate full or half page color ads with premium locations within the tourism and trade magazine that are widely distributed throughout Texas, Louisiana, Mississippi, Alabama, and Florida. Large colorful ads would attract readers and ensure these important messages are conveyed to target audiences. By choosing tourism and specific trade magazines to reach target audiences, this project will: - Reduce injury and mortality to bottlenose dolphins from hook-and-line fishing gear by educating fisherman about ways to avoid interactions with dolphins while fishing and provide them with Dolphin Friendly Fishing Tips. - Increase bottlenose dolphin survival though better understanding of cause of illness and death as well as early detection and intervention of anthropogenic and natural threats because this audience would know how to help a stranded, injured or entangled marine mammal and to report these animals to the appropriate stranding network immediately. - Reduce injury, harm, and mortality to bottlenose dolphins by reducing illegal feeding and harassment activities because audiences will better understand the harm and consequence of these activities. They will learn how to recognize dolphin behaviors that are signs of harassment and also how to responsibly view dolphins in the wild. - Reduce injury and mortality of marine mammals from vessel collisions by educating mariners about marine mammal viewing guidelines and precautions they can take to avoid vessel strikes.	$3,000,000

Reduce Vessel Collisions through Research and Monitoring to Spatially Identify Interaction Hot Spots	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips & Rosel 2014; Read et al. 2006). Dolphins are captured in shrimp trawls or entangled in the lazy line, with hundreds of mortalities estimated per year in the Gulf of Mexico otter trawl portion of the fishery (Soldevilla et al. 2015, 2016). Dolphins often interact with gear by directly pulling out and feeding on fish from the shrimp trawl net, foraging within the trawl net itself, and rubbing on and foraging around the lazy lines. For fishermen, interactions may cause frustration over potential lost catch and damaged gear. For dolphins, interactions may cause entanglement/capture in the trawl and lazyline, and potential retaliation by fishermen (Vail 2016; DOJ 2013). The nature of dolphin-trawl interactions may vary based on several factors, including gear type (e.g. otter vs skimmer trawl), gear configurations and fishing practices, location, and dolphin behavior. Therefore, identifying factors that increase the risk of dolphin entanglement/capture is crucial to informing conservation measures that will reduce related interactions and bycatch in the gear (Soldevilla et al. 2015; Hataway & Foster 2015). This project will conduct research to: (1) fully characterize the risk factors of dolphin entanglements/captures in both skimmer and otter trawls and other sources of interactions (e.g. fishermen retaliation); and (2) explore ways to reduce these risk factors (i.e. depredating gilled fish from trawl net). This project will collaborate with commercial fishermen by chartering four skimmer and four otter trawl vessels from different ports to document and characterize dolphin interactions with the gear in various locations. Underwater imaging devices (e.g. DIDSON, ARIS) will be used to image bottlenose dolphin interactions with the gear, along with detailed observations of dolphin behavior including number of animals observed per tow, when the animals appear during the fishing process, and if possible, the individual dolphin identities. Based on identified risk factors and types of interactions observed, conservation measures will be identified to evaluate and implement. This project will enhance survivorship and resiliency of bottlenose dolphins by identifying, evaluating, and implementing conservation measures to reduce dolphin bycatch and related mortalities.	$450,000
Develop Standardized Protocols to Characterize Vessel Collisions with Marine Mammals	The responsibilities of this position, to be established within the U.S. Fish and Wildlife Service, would include sea turtle rehabilitation facility oversight, real-time assessments of rehabilitation facility capacity and needs, development of 'intake through release' tracking system for sea turtles in rehabilitation facilities integrated with the Sea Turtle Stranding and Salvage Network (STSSN) database, coordination with state STSSN coordinators on rehabilitation, oversight/coordination of movement of animals among/between rehabilitation facilities, coordination/management of sea turtle during unusual stranding events, development of rehabilitation guidelines, development of conservation education messaging. This project would result in standardizing information collected from sea turtles entering rehabilitation and ensuring integration of these data with other stranding-related data; would promote compliance with husbandry and veterinary care standards; would upgrade rehabilitation capacity and capability as needed; would maintain preparedness for emergency response including greatly enhancing our ability to quickly and effectively place and rehabilitate sea turtles; and would foster greater communication and coordination among sea turtle rehabilitation facilities.	$600,000
Improve the Ability of Stranding Network Partners to Detect and Rescue Free-Swimming Marine Mammals that are Entangled, Entrapped, or Out of Habitat	Through this project, NOAA would work to develop a model and user interface that would provide stranding probability maps for a queried time and place along the coastline of the Gulf of Mexico. The product would be user friendly and could assist NOAA and our partners with the investigation of the causes of at-sea mortality of sea turtles, particularly when managers don't have specific expertise in physical oceanography. This project would integrate existing data from GOM drift studies and other oceanographic resources. Stranding probability would be calculated daily from accumulated runs of a sea turtle carcass drift model using output of surface winds, currents, and sea temperature from several ocean models and provide the result as a web viewable and downloadable map. This resource would provide a more scientifically informed assessment of stranding trends and mortality factors. It would also allow stranding personnel to watch specific coastline areas at times when they are exhibiting a high probability of strandings. Data collected from	$0

	stranded sea turtles are one of the few empirical sources of information on mortality and threats to sea turtles. Wind and oceanographic conditions strongly influence stranding probability, (i.e. the likelihood that a carcass will ultimately strand on the coastline), which has been shown to vary over fine temporal and spatial scales. This tool would significantly enhance adaptive management capabilities that rely on information obtained from strandings, such as detection of the effects of bycatch reduction efforts.	
Increase Access to Health Information from Stranded Marine Mammals by Supporting Regional Databases	Mean annual bycatch mortality estimates in the Gulf of Mexico portion of the shrimp otter trawl fishery indicate hundreds of dolphins are killed per year (Soldevilla et al. 2015, 2016). Estimates of mortality exceed 10% of sustainable levels for some coastal stocks of bottlenose dolphins and could be above sustainable levels for some estuarine stocks. Observer data is crucial to accurately determine the magnitude of dolphin bycatch in the shrimp trawl fishery and inform efforts to identify, evaluate, and implement ways to reduce bycatch. However, existing bycatch mortality estimate results are subject to numerous data limitations and biases (Soldevilla et al. 2015, 2016). In particular, for estuarine waters where mortalities may exceed sustainable levels, estimates are based on bycatch rates from coastal nearshore waters because of extremely limited observer coverage in estuarine waters. Shrimp fishery interactions with dolphins in estuarine waters have been documented, and this source of mortality needs to be accurately estimated to effectively monitor any restoration conservation measures to reduce bycatch. Further, critical information is needed to understand the shrimp trawl effort distribution in inshore waters as it relates to estuarine stocks of bottlenose dolphins. Therefore, this project would develop the information needed to reduce the bycatch of bottlenose dolphins in the shrimp fishery by enhancing: (1) observer coverage of both the skimmer and otter trawl portions of the fishery, (2) observer data collection protocols, and (3) collection of fishery effort data in inshore waters. Specifically, observer coverage would be increased in inshore state waters of Alabama, Louisiana, Mississippi, and Texas, including non-federally permitted vessels and skimmer trawls (e.g. expand federal coverage into state waters, implement new program consistent with federal program, etc). Enhancing collection of inshore fishery effort data could include use of electronic logbook data within the inshore fishery or increasing/improving coordination and consistency in effort data collection across Gulf states. This would provide information on bycatch rates, estimate the distribution of fishery effort as it relates to estuarine stocks, and characterize patterns between dolphin interactions and spatiotemporal fishery distribution and gear type usage. Observer data collection protocols would also be enhanced by collecting: (1) genetic and photographic samples of bycaught animals and retaining the carcass for necropsy to improve species identification; and (2) additional information on trawl gear materials and configurations that may contribute to dolphin-gear interactions (e.g. lazy line, turtle excluder device descriptions) (Soldevilla et al; 2015, 2016). This project would enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects to reduce lethal dolphin bycatch in shrimp trawl gear. The observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions. This project is scaleable.	$0
Derelict Fishing Gear (Including Boat Anchor Lines) Clean-Up at Popular Nearshore Artificial Reef Fishing Sites.	This project idea focuses on addressing bycatch of sea turtles at shore-based locations that concentrate recreational fishing (fishing sites), such as fishing piers, bridges, and other shoreline structures, and would restore for injured sea turtles by reducing this bycatch. The goal of the project would be to identify factors (e.g., bait type, hook type, discarded bait in the area, pier lighting, depth of pier, fishing time, etc.) contributing to the incidental capture of sea turtles at fishing sites and to then implement voluntary programs to reduce captures from occurring. This could be accomplished through the following: 1) Create an inventory of fishing sites in the GOM and characterize the sites relative to variables that may influence bycatch of sea turtles (e.g., night fishing, fish cleaning stations, bait types, hook types, etc.). 2) Characterize bycatch of sea turtles at fishing sites through angler surveys, the collection of standardized information from incidentally captured turtles reported to the STSSN, and assessment of gear recovered, to better understand co-factors influencing sea turtle bycatch, 3) Develop and implement a comprehensive educational effort to the recreational fishing	$250,000

	community to promote reporting of incidental captures to trained responders to reduce injury to bycaught sea turtles, and 4) Develop, test, and implement a pilot program to reduce sea turtle bycatch at fishing sites through implementation of voluntary fishing practices; this could involve voluntary measures such as bait type, hook type, or other identified co-factors. The project is envisioned as a 5-year project, but it could be scaled up or down based on funds available. It is envisioned to be implemented in each of the 5 gulf states, with potential variations to implementation based on an individual state's needs. Some of this work has been initiated by NOAA and/or by the STSSN already, and the project would be designed to build on existing knowledge and efforts. NOAA and the Gulf states could jointly implement this project.	
Expanding Observer Coverage to Unobserved Sectors of the Non-Shrimp Trawl Fisheries	The trustees should evaluate the full range of options for providing or developing the capacities and infrastructure necessary to implement the programmatic scope of research, education, and restoration activities anticipated for mesophotic and deep benthic communities under the DWH NRDA. These range from acquiring short turn-around capabilities through the development of scopes of work and bid packages to provide on-the-spot contracted vessel, instrument/vehicle, personnel, and shore-side data processing/lab support for high priority actions such as wide-ranging, high-resolution bathymetric habitat mapping and ground-truthing, to undertaking longer-term planning, engineering and design, and build-out/retrofit of purpose-built infrastructure (vessels, other offshore working platforms [e.g., from dynamically positioned ocean-going barges to platforms like the MDA/USN's SBX-1], ROVs/AUVs, technical/saturation diving teams and equipment, submersibles, moored buoy arrays, cabled instrumentation arrays, shore-side research and or education/science interpretation center(s) and personnel, submersible technology or coral propagation facilities and personnel, etc.) for work that will continue through the multi-decadal lifespan of the DWH restoration. This evaluation should give consideration to the potential to sequence sourcing these capacities and infrastructure and should incorporate existing inventories of assets with potential for application such as those identified in NOAA's 2016-2019 DSCRTP Priority Scoping Workshop Report, as well as existing, underutilized facilities throughout the region (e.g., former TMMSN facility footprint adjacent to FGBNMS headquarters and neighboring vacant TAMUG Fort Crockett campus). This evaluation should also consider needed capacities that are minimal or lacking regionally or entirely, such as mesophotic or deep-sea coral, sponge, or benthos community taxonomic or genetics expertise, and should provide for the means to develop those capacities at the scale needed to fulfill the ecosystem-scale goals of the DWH restoration.	$500,000
Provide 2.5” Bar-Spacing TED Grids to Non-Skimmer Trawl Operators	Coastal and Bay, Sound and Estuary (BSE) populations of bottlenose dolphins in the Gulf of Mexico (GOM) are at risk from natural and man-made threats, such as biotoxins, pollution runoff, and increased freshwater exposure, that can cause illness and death and limit recovery. This project aims to develop and implement a health assessment program to identify risks for illness and death for these dolphin stocks and mitigate potential impacts. This project will coordinate with federal and state agencies to identify new capabilities that need to be developed by the marine mammal health assessment community to help identify causes of illness and death in free-ranging coastal and BSE bottlenose dolphins and identify knowledge gaps. Specifically, this project will develop and implement a bottlenose dolphin health assessment program to identify illness and death risks including impacts from natural (e.g., Brucella, toxoplasmosis, biotoxins, etc.) and man-made threats (e.g., chemical and oil spills). This project will develop and implement a study plan for live capture/release health assessments of free-ranging bottlenose dolphins by establishing both case and control study sites to evaluate population level health changes over time and emergence of new threats and diseases. Additionally, this project will work with the marine mammal conservation medicine program to assess and implement future health intervention techniques, such as morbillivirus vaccination, development of rapid point of care tools, improved real-time diagnostic capabilities such as remotely deployed electrocardiogram ECG tags to detect heart abnormalities, and deployment of salinity sensors in remote satellite tags to detect real-time salinity fluctuations, etc. By utilizing these new techniques this project will also enhance the capabilities of marine mammal health assessment	$500,000

	researchers to rapidly diagnose causes of marine mammal illness and death and evaluate the impacts of these threats, including fresh water disease. By identifying, monitoring, and mitigating natural and man-made threats to bottlenose dolphins this project could minimize the number of animals that become ill or die due to these threats and lead to increased recovery of coastal and BSE bottlenose dolphins.	
Enhanced Observer Coverage in the Gulf of Mexico Reef Fish Fishery	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips & Rosel 2014; Read et al. 2006). Although there is currently no systematic observer coverage of the Gulf of Mexico menhaden purse seine fishery, historic and recent bycatch events of bottlenose dolphins have been reported. An observer program operating between 1992 and 1995 in the Gulf of Mexico, estimated as many as 172 dolphins were caught with up to 57 animals killed (Waring et al. 2015). A pilot observer program in 2011 documented three bycaught bottlenose dolphins (Waring et al. 2015). Finally, fishermen reported 19 bottlenose dolphin mortalities in their gear between 2000 and 2018. A systematic observer program is crucial to determine statistically reliable estimates of bottlenose dolphin bycatch in the fishery and by dolphin stock. It will also characterize patterns of marine mammal interactions, spatiotemporal fishery distribution, and gear type usage. The menhaden fishery operates mainly in coastal and state waters of the Gulf, with the majority of effort occurring off Louisiana and Mississippi. The fishery operations are challenging to systematically observe with traditional observer coverage and in the way needed to statistically estimate serious injury and mortality of marine mammals incidental to the fishery. Therefore, this project would develop, conduct, and implement systematic observer coverage of the menhaden purse seine fishery in a manner that overcomes the challenges with traditional observer coverage. This may include using alternative observer techniques combined with exploring the use of innovative technologies (e.g. drones, aerial observer in fishery spotter plane, etc.) to enhance observer coverage efforts. This project would enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects to reduce dolphin bycatch in menhaden purse seine gear. Conducting a systematic observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions.	$900,000
Increase Marine Mammal Survival through the Development of Standardized Protocols	Marine mammal populations in the Gulf of Mexico (GOM) are at risk from natural and man-made threats that can cause illness and death and limit recovery. This project would develop and implement a region-wide marine mammal conservation medicine and health assessment program to identify risks for illness and death for these species and mitigate potential impacts. This project will coordinate with federal and state agencies to identify new capabilities that need to be developed by the marine mammal stranding network (MMSN) and its partners, and health assessment researchers to help identify causes of illness and death in both stranded and free-ranging marine mammals and identify knowledge gaps. Specifically, this project will develop a working group to identify GOM specific risks for illness and death, including possible impacts from natural (e.g., Brucella, toxoplasmosis, biotoxins, etc.) and man-made threats (chemical and oil spills, etc.), and assess and implement future health intervention techniques, such as vaccination against common outbreak causing diseases (e.g., morbillivirus), development of rapid point of care tools, and improved real-time diagnostic capabilities (such as remotely deployed electrocardiogram [ECG] tags to detect heart abnormalities and/or tools/tags for remotely collecting blood for diagnostics). Additionally, this project will establish regular training sessions and workshops to train the MMSN and health assessment researchers in advanced health monitoring techniques and capabilities and disseminate information about causes of illness and death and new health monitoring techniques in marine mammals with GOM partners. Lastly, this project will develop and implement a study plan for region-wide live capture/release health assessments of free-ranging cetaceans, including pelagic species using special offshore capture techniques (hoop-netting), by establishing both case and control study sites to evaluate population level health changes over time and emergence of new threats and diseases. By identifying, monitoring, and mitigating natural and man-made	$0

	threats to marine mammals this project could minimize the number of animals that become ill or die due to these threats and lead to increased recovery of marine mammal species.	
Enhance Knowledge of Large Whales Species in Offshore Waters of the Gulf of Mexico	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips and Rosel 2014; Read et al. 2006). Dolphins are known to become incidentally entangled in gillnet gear resulting in mortality and serious injury. In 2012, federal observer coverage was initiated to better characterize fishing effort, catch, and bycatch and interactions with protected species on state-documented commercial gillnet vessels operating within Alabama, Mississippi, and Louisiana state waters (Mathers et al. 2016). Use of commercial gillnet gear is permitted in Alabama, Mississippi, and Louisiana state waters but prohibited in Texas and Florida. To date, there have been no observed takes of bottlenose dolphins in the observer program, but dolphin interactions with gillnets were documented. In Alabama, 46% of observed gillnet sets had observations of bottlenose dolphins present during haul back, with dolphins feeding out of the net during 7% of sets and sometimes swimming into the circle of the strike net to feed (Mathers et al. 2016). In Louisiana, dolphins were present during 2% of observed sets, and there were no observations of dolphins around sets in Mississippi (Mathers et al. 2016). Dolphins commonly depredate on gillnet gear and use nets as a foraging strategy, which leads to an increased risk of lethal entanglement. Recently, strandings data of bottlenose dolphins in Alabama show lesions on the carcasses that are characteristic of entanglement in gillnet gear and these have occurred where commercial gillnet effort is known to concentrate. The lack of an observed take of dolphins in Mathers et al. (2016) could be the result of low observer coverage, but since state gillnet fishers are not required to carry logbooks, it is difficult to measure the level of observer coverage, overall gillnet fishing effort and the impact to bottlenose dolphins. Therefore, this project will develop information needed to further characterize and determine the magnitude and nature of dolphin interactions with gillnet gear operating in Alabama and Louisiana state waters by: (1) exploring the use of alternative methods, such as electronic monitoring, to overcome existing observer program challenges and enhancing/expanding observer coverage on state-documented commercial gillnet vessels in state waters. This information is needed to refine and enhance our understanding of fishing effort, catch, bycatch and interactions with bottlenose dolphins and conduct estimates of dolphin bycatch. (2) Conducting fine-scale behavioral observations of dolphins in areas where interactions are known to occur to further characterize the nature of their interactions with gillnets. This information will be used to identify, develop, test, and implement ways to prevent and reduce lethal interactions (e.g. testing gear and fishery practice modifications). This project will enhance survivorship and resiliency of bottlenose dolphins by reducing critical uncertainties and providing information needed to plan and implement restoration projects for reducing dolphin bycatch in gillnet gear. Voluntary adoption of any gear modifications and fishery practice changes would be monetarily incentivized. Conducting a systematic observer program is also a critical tool for directly monitoring and adaptively managing bycatch reduction solutions.	$0
Implementation of Flower Garden Banks NMS Management Plan	Bycatch in fishing gear is a leading source of mortality among marine mammals and one of the main threats identified for bottlenose dolphins in the Gulf of Mexico (Phillips and Rosel 2014; Read et al. 2006). Fishing with trap pot gear is ubiquitous in all Gulf coastal state waters, and entanglements of bottlenose dolphins in trap pot gear are documented within each state. Based on stranding data records from 2002-2015 in the Gulf, 18 bottlenose dolphins stranded with trap pot gear attached (NOAA National Marine Mammal Health and Stranding Response Database unpublished data; accessed 2 May 2016). Stranding numbers may be up to three times higher because only a portion of animals that strand are detected and recovered (Peltier et al. 2012; Wells et al. 2015; Williams et al. 2011). Dolphins are known to become entangled in the buoy line of the trap pots when foraging in (e.g. pot-tipping to get at bait inside) and around the pots, tugging on the buoy lines, and swimming in close proximity to the pots. Existing recommendations for preventing lethal entanglements in the pot's buoy lines from these interactions include trap pot gear modifications (e.g., modified bait	$70,000,000

	wells, stiffer buoy lines) and fishery practice changes (e.g., modifying buoy line lengths and bait type) (Noke & Odell 2002; McFee et al. 2006; McFee et al. 2007; Haymans 2005). Therefore, this project will reduce dolphin bycatch in trap pots by conducting research to: (1) characterize and understand trap pot gear use, modifications, and performance in different geographic regions and states in the Gulf; and (2) examine the feasibility and effectiveness of potential gear and fishery practice modifications in collaboration with fishermen. The project will determine the feasibility of the specific trap pot gear modifications and its potential impact on fishing practices, gear performance and costs, as well as considering its performance in various environmental conditions and geographic areas. Potential effectiveness of reducing dolphin interactions/entanglements will be evaluated by observing whether any dolphin interactions and/or entanglements were documented with the gear (control and experimental) and at what frequency. The gear modification(s) and/or fishery practice change(s) that demonstrate the most bycatch reduction potential while be operationally feasible will be promoted to the fishery. Voluntary adoption of any gear modifications and fishery practice changes would be monetarily incentivized. This project will enhance survivorship and resiliency of bottlenose dolphins by identifying, evaluating, and implementing conservation measures to reduce dolphin bycatch in trap pot gear.	
High Resolution Multibeam Mapping and Groundtruthing of Mesophotic and Deepwater Corals in Northern GOM	This project would gather baseline information necessary to inform future restoration to reduce lethal interactions between rod and reel fishing gear and protected species (i.e., sea turtles and marine mammals). The project would survey recreational anglers and for-hire vessels using rod and reel fishing gear in the Gulf of Mexico to determine the magnitude of protected species interactions with rod and reel gear. Fishing interactions between rod and reel gear and protected species are increasing in the Southeast. These interactions are problematic for both the anglers and the animals. For anglers, interactions may result in a decrease in catch, damage to gear, or frustration. For the animals, interactions cause an increased risk of death or serious injury from entanglement in or ingestion of gear, illegal retaliation from anglers, and changes in natural behaviors. For example, when a dolphin is fed, this leads to changes in the dolphin's foraging behavior, and teaches it to associate anglers with food. NOAA seeks to reduce injury and mortality to sea turtles and marine mammals from interactions with rod and reel fishing gear by fully understanding the frequency, location, and nature of interactions in the Gulf of Mexico. In this study, we will conduct systematic surveys of anglers and for-hire boat captains/owners and their patrons that fish region-wide in all coastal Gulf states, including Texas, Louisiana, Mississippi, Alabama, and Florida. The survey sampling frame will be informed by Marine Recreational Information Program Fishing survey modes. Anglers and for-hire boat captains/owners and their patrons will be asked standardized questions to inform restoration efforts, such as where they have seen protected species while fishing, describe the animals' observed behaviors, and share details about interactions. Data on rod and reel gear interactions with protected species are limited to a few research studies, strandings records, and anecdotal reports by fishermen. Strategic data collection on rod and reel gear interactions is needed to fully understand the frequency, geographic extent, and mode of interaction between protected species and fishing gear. Understanding the impacts, as well as where and how often these interactions occur, is vital to informing restoration efforts to reduce and prevent such interactions for the benefit of anglers and protected species. Estimated costs for this project are ~150K/state survey. Assume one survey per state for a total cost of 750K to be conducted over a 3-5 year period.	$5,000,000
Open Ocean Deepwater Fauna of the Northern Gulf of Mexico: Assessment of Intermediate Trophic Level Fishes and Invertebrates	The project would establish and fund a Coordinator position to coordinate sea turtle conservation and monitoring activities on nesting beaches throughout the Gulf of Mexico. This would be accomplished in close coordination with the relevant states as well as DOI entities. The responsibilities of this position would include coordination with the states regarding annual nesting survey efforts, survey needs, and data archival/availability, coordination of lighting assessments/needs, development of training materials, assessment of data gaps and development/implementation of plans to fill data gaps (e.g., hatchling orientation assessments), and development of best practices and protocols. This position will result in a better coordinated Gulf-wide program to enhance sea turtle hatchling production and restore and	$6,802,240

	conserve nesting beach habitat. This enhanced coordination of nesting beach surveys across the states and development of best practices, combined with gap assessments and focused approaches to fill gaps will result in more effective protection of nesting sea turtles, nests, and hatchlings, as well as integrated information across the Gulf to inform restoration needs and adaptive management. Estimated cost is 175K per year, estimated for purposes of this submission for a 5-year period.	
Fulfilling the Necessary Scientific Requirements to Take Care of Our Planet	Fishing interactions between hook-and-line (rod and reel) gear and bottlenose dolphins occur throughout the Gulf and are increasing (Powell & Wells 2011; Shippee et al. 2011). Rod and reel gear is used by either for-hire fishing vessels (e.g., charter and head boats) or anglers. Dolphin interactions with the gear largely result from dolphins taking the bait or catch directly off a hook (e.g., depredation) or eating discarded fish (e.g., scavenging) (Powell & Wells 2011; Read 2008; Zollett & Read 2006). These behaviors are likely propagated by illegal feeding of wild dolphins which teaches the animals to associate anglers with food (Christiansen et al. 2016). Interactions may result in lost or damaged gear and fishermen frustration from dolphin depredation and scavenging behaviors. For dolphins, it may cause lethal injuries from fishing gear entanglements or ingestions, and related mortalities (e.g., fisher retaliation by shooting). Based on Gulf stranding data records from 2002-2015, 97 bottlenose dolphins stranded with hook-and-line gear attached (NOAA National Marine Mammal Health and Stranding Response Database unpublished data; accessed 2 May 2016). Stranding numbers may be up to three times higher because only a portion of animals that strand are detected and recovered (Peltier et al. 2012; Wells et al. 2015; Williams et al. 2011). There have also been federally investigated and prosecuted cases of fishermen retaliating against dolphins out of frustration for the dolphin's depredation behaviors (Vail 2016; Department of Justice 2007). Therefore, this project will reduce lethal impacts to dolphins from hook-and-line fishing related interactions known to occur within Gulf waters by: (1) Conducting systematic surveys to determine the magnitude and extent of dolphin and hook-and-line gear interactions and characterize the nature of these interactions (e.g., mapping fishery effort distribution, identifying factors leading to dolphin-gear interactions, detecting hot-spot sites, etc.). (2) Conducting social science studies (e.g., surveys, focus groups, interviews) to characterize fishermen's attitudes and perceptions towards dolphins and fishing gear interactions, their likelihood to take various actions (both preventative and retaliatory) and their responses to various outreach messages and approaches. This project will survey anglers and for-hire boat captains/owners and their patrons. It will include fishermen fishing from both vessels and piers, fishing in a variety of habitats (i.e., coastal and estuarine), and targeting various fish species using different gear configurations in all coastal Gulf state waters. Project results will help identify what gear factors may increase the likelihood of interactions, the frequency of dolphin and gear interactions and approximate risk of lethal injury from interactions, and whether there are hot-spot areas where interactions are more likely to occur. We will then work with stakeholders to identify, develop, and evaluate conservation measures to reduce interactions (e.g., potential gear or fishing practice modifications, safe and effective deterrence techniques, etc.). This project will enhance survivorship and resiliency of bottlenose dolphins by reducing lethal impacts resulting from fishing interactions between dolphins and rod and reel fishing gear. Repeating systematic surveys, social science studies and evaluating stranding data may be used for project monitoring.	$0
Grand Isle Butterfly Dome	This project aims to develop new and enhance pre-existing technical and infrastructure capabilities within the Gulf of Mexico (GOM) region to respond to marine mammal disasters from natural and anthropogenic causes. First, an information-gathering and coordination phase will be conducted, working with federal and state agencies to determine existing and identify new capabilities to be developed by the stranding network and its partners to identify impacts of disasters on marine mammals and improve rapid response to those threats. Phase 2 will involve developing new partnerships and enhancing existing ones to address gaps identified in Phase 1. Both Phase 1 and 2 will involve development of guidance documents, including response plans and standardized response protocols. Phase 3 will be to train the stranding network through workshops in the new standardized response techniques and capabilities. The	$20,000

	stranding network will also receive information about newly identified threats and the efficacy of various response options to those threats. Finally, in Phase 4 we will work with partners to disseminate resources throughout the GOM states related to the standardized response techniques and capabilities and continue the coordination with those partners. Specifically, the project is the development of an overarching disaster response program, focused on improving effective and efficient responses to marine mammal stranding and health events or disasters. This program would be implemented across the GOM and benefit all stocks of marine mammals by increasing and improving the effectiveness of marine mammal response during a disaster in the GOM. One focus of the work would be on planning and preparedness for future oil spills, identifying vulnerability and response planning needs for spills of different types of products, different quantities of products, and different locations, such as those in the far offshore environment. Once needs were identified, the second focus would be on developing a response plan to inform and guide the marine mammal stranding network and response partners, and integration of these planning and protocol documents into existing efforts such as Area and Regional Contingency Plans. Not limited to oil spills, we also envision the need for responses to mitigate impacts to marine mammals from natural disasters such as hurricanes, freshwater inundation events, harmful algal blooms, and other types of natural and anthropogenic crises that may be identified in Phase 1 and 2 of outreach and communication with our partners. As response plans are developed, we will implement the necessary training, including drills and exercises, to fully test the plans and then iteratively improve them as needed. The plans, partnerships, protocols, training, and drills developed in this disaster response program will lead to a more timely and effective responses to marine mammals following a disaster, which will improve survivorship of animals during and following these events.	
Fishing Pier at Fontenot Boat Launch, Berwick LA	This project would entail broad-scale aerial surveys of the Gulf of Mexico to monitor long-term trends in abundance of large juvenile and adult loggerheads, Kemp's ridleys, and leatherback turtles. The survey would incorporate recommended survey design/methodologies from the recently convened NOAA in-water workshop. Survey methodologies would be specifically designed and implemented to ensure a robust sample design that would yield long-term trend data. This project would contribute to establishing statistically rigorous and biologically meaningful baseline abundance data and would allow for long-term monitoring of trends in abundance over time. The project would be part of a broader in-water monitoring program and would provide information not only on trends in abundance, but on distribution to help inform restoration planning and monitoring. The cost is estimated as 1M/survey year, total costs will be dependent of survey design and survey frequency. For purposes of this submission, three survey years are initially anticipated. This project could also benefit marine mammals.	$275,000
Fishing Pier at Fontenot Boat Launch, Berwick LA	Leave No Trace and Rehabilitation Coordinator - this would be a new position, to be housed with the Service's Southeast Sea Turtle Coordinator. The position will include two aspects of sea turtle recovery and restoration. 1. Reducing human-related nesting beach obstructions and 2. Rehabilitation facility coordination. 1. Reducing human-related sea turtle disturbances on the beach will be accomplished by analyzing the data collected on nesting and hatchling obstructions in real-time to target activities and areas that cause disturbances. This will include collaborating with local counties and municipalities to implement 'Leave no Trace' Programs. The first aspect of the program will include workshops throughout the Gulf of Mexico that will focus on educating the residents and visitors on the impacts of leaving recreational equipment on the beach during nesting and hatching season. The second aspect of the program will work with hotels, condos, restaurants, and other establishments to provide incentives to be labelled a "Sea Turtle Friendly" building. Criteria for this labeling will include lighting reduction, reducing use of plastics, best practices for recreational activities, and removing recreational equipment from the beach during nesting and hatching season. 2. Rehabilitation Facility Coordinator –The responsibilities of this position will include: i. Coordination with the state STSSN coordinators on sick or injured sea turtles brought in to facilities. ii. The development of a tracking system (integrated with STSSN database) from intake at rehabilitation facility through final release. iii. Access needs and capacity of rehabilitation	$592,340

	facilities. iii. Coordinate with each rehabilitation facility to ensure that the education message is consistent to benefit the conservation of sea turtles in the wild.	
Vermilion Parish Working Lands, Water and Wildlife Partnership	The Marine Mammal Stranding Network (MMSN) was formalized by the 1992 Amendments to the Marine Mammal Protection Act (MMPA) and volunteer MMSNs exist throughout all coastal states to respond to marine mammal strandings. For cetaceans in the Gulf of Mexico (GOM), 15 MMSN organizations/facilities are currently authorized under the MMPA to respond to live or dead stranded marine mammals. However, due to disparate levels of training, funding, and resources, MMSN organizations have different capabilities and increasing existing capacity and expanding networks to additional areas would help fill gaps in capabilities and coverage along the GOM coastline. On average, there are approximately 400 cetacean strandings along the U.S. Coast of the GOM each year. This project aims to address gaps and enhance capacity in the current capabilities of the MMSN throughout the GOM to improve timeliness of response and improve diagnosis of illness and cause of death in marine mammals to better understand population health. Initially, this project will coordinate with federal and state agencies to identify what standardized protocols, training, support, data collection and analysis, equipment, and/or other resources are necessary for each region to improve existing MMSN coverage and capabilities (i.e., conduct a gap analysis). After gaps are identified, the project will develop new partnerships, improve existing partnerships, and support resources and personnel to improve stranding response and data collection. It will focus on improving the capabilities and capacity for MMSN partners to conduct "routine" activities, as well as to respond to unusual or emergency events (e.g., mass strandings/Unusual Mortality Events). In addition, there will be an emphasis on improving stranding response in remote locations or locations with limited response capabilities. The identification and development of federal, state, and local partnerships will facilitate access to resources (e.g., landing sites for dead floating whales, disposal of carcasses, towing). The project will also place emphasis on improving triage capabilities for live stranded animals (including mass strandings), such as diagnostic equipment and live animal triage training, to increase animal survival. Additionally, development of region-wide standards and protocols, and implementing training, will improve data consistency and address how MMSN partners can support restoration efforts. As part of these efforts, a forensic toolkit will be created to identify and document human-related injuries and deaths in marine mammals, which could lead to possible mitigation measures for management. The project will also support the MMSN to archive, analyze, and track samples collected from stranded animals, which will improve diagnosis of illness and cause of death (may include barcode, organizational system, information management system, etc.). It may also increase capacity for the MMSN to conduct active surveillance to enhance detection of live and dead stranded, injured, or entangled marine mammals and for improved mortality estimates (e.g., boat surveys, beach surveys). This project will establish regular training sessions and workshops to maintain the MMSN's capabilities over time and through personnel turnover, as well as share information across the network about new threats and the efficacy of various response actions to those threats. Addressing gaps and enhancing capacity in the current capabilities of MMSN will serve to improve timeliness of response and diagnosis of illness and cause of death in the GOM region. This project is anticipated to have positive impacts on the survival of many marine mammal species in the GOM, but in particular on coastal and estuarine stocks of bottlenose dolphins. Other offshore species that are subject to mass strandings or die-offs may also benefit, such as short-finned pilot whales and rough-toothed dolphins.	$17,400,000
Oil Containment Barrier Boom	Vessel collisions are a known source of anthropogenic mortality for most large whales species (Laist et al. 2001) and other smaller marine mammals. Factors affecting collision mortality risks are the likelihood of a collision (i.e., overlapping spatial distribution of major shipping lanes and high species densities) and the severity of the trauma (higher speeds and/or larger vessels) (Andersen et al. 2008; Constantine et al. 2015; Jensen & Silber 2004; Laist et al. 2001; Vanderlaan & Taggart 2007). In order to address one of the primary factors affecting collision mortality risks - the likelihood of a collision - this project idea focuses on addressing overlapping spatial distribution. The goal is to develop a spatio-	$1,250,000

	temporal characterization of vessel traffic overlaid with appropriately-scaled marine mammal distribution information and predictive models. This project is meant to compile and utilize existing vessel traffic data from AIS/VMS data sources, as well as updated data on nearshore and offshore marine mammal densities and distributions from surveys, passive acoustics, and tagging efforts. Through the compilation and characterization process, this project will also identify data gaps in spatial and temporal vessel traffic and marine mammal distributions. As additional marine mammal biological information becomes available along with technological advancements in vessel traffic data, the spatio-temporal characterization can be reevaluated every 3-5 years. This project will enhance the survivorship and resiliency of marine mammals by reducing the likelihood of vessel collision mortality by identifying areas of high spatial and temporal overlap along the inshore, coastal, and offshore waters of the Gulf of Mexico. This project is a critical tool for evaluating and adaptively managing vessel interactions with marine mammals.	
Water Storm Surge and Flood Backflow Prevention	Vessel collisions are a leading source of anthropogenic mortality for many marine mammal species. Unfortunately, a large portion of vessel strike mortalities go undetected or unreported when they occur in remote areas or when carcasses drift out to sea, thus stranding records are minimum estimates of ship strike occurrences (Jensen & SIlber 2004). By identifying "hot spot" areas where vessel collisions are most likely to occur and implementing mitigation measures in those locations, the likelihood of interactions between vessels and marine mammals could be reduced at the source. This goal of this project is to conduct a risk assessment to identify vessel interaction hot spots to target mitigation and restoration efforts. The risk assessment will utilize previously developed characterizations of vessel traffic data and marine mammal densities and distributions and incorporate spatial and temporal factors. The risk assessment will also consider species' specific vessel avoidance behaviors to identify sensitive, more vulnerable species at greater risk of vessel strike. As hot spots are identified through the risk assessment exercise, mitigation measures can be implemented to help reduce the risk of vessel collisions in these areas. The identification of these areas may also need to be reevaluated as updated data becomes readily available to incorporate into the risk assessment. This project can increase the survivorship of marine mammals in coastal and offshore habitats by proactively planning, implementing, and managing mitigation measures to reduce the likelihood of a vessel interaction in a high priority location.	$1,250,000
Improvements to Grand Avoille Boat Launch	Mass strandings of pelagic offshore marine mammal species (e.g., short finned pilot whales, false killer whales, rough-toothed dolphins, offshore bottlenose dolphins) occur on an annual or biannual basis in the Gulf of Mexico (GOM). Responses to these events have been hampered in the past by a lack of early warning of pelagic marine mammal species coming near-shore and effective hazing techniques to prevent animals from stranding. This project aims to develop and implement tools and techniques to identify possible marine mammal mass stranding situations before they occur and to avert animals from mass stranding. This project will coordinate with federal and state agencies to identify what standardized protocols, training, support, data collection and analysis, equipment, and/or other resources are necessary for each state to improve existing marine mammal mass stranding network coverage and capabilities (i.e., conduct a gap analysis). Additionally, this project will collaborate with BOEM on deploying more passive acoustic monitoring devices (PAMs) to increase monitoring (ideally in real-time) of offshore marine mammal species occurrence on the continental shelf or in-shore prior to mass stranding events. Lastly, this project will develop rapid response and intervention techniques to respond to marine mammal mass strandings. Specifically, this project will develop real time warnings of the presence of offshore marine mammal species that are out-of-habitat by deploying PAMs in specific hot spots around the GOM. This project will develop and improve upon existing hazing techniques to herd offshore species prior to mass stranding. Additionally, priority areas will be identified to stage equipment caches for rapid response (assessment, mitigation, intervention, and response) to mass stranding events. Lastly, this project will identify, develop, and support partnerships and resources for rapid response (assessment, mitigation, intervention, and response) to mas s stranding events. By preventing or mitigating mass stranding events of offshore marine mammals this project may aid in minimizing	$247,426

	the number of animals that die or re-strand during these events leading to increased recovery of offshore marine mammal species.	
Nutrient Reduction Project for the Bayou Folse Watershed Complex in the Barataria Terrebonne Estuary	Conduct participatory workshops with regional ocean experts to capture community perspectives about ocean space and to create maps of past and current ocean uses across three distinct sectors: non-consumptive, fishing, and industrial/military. Develop GIS data, map and analytical products, and web-based interactive viewers to guide NRDA efforts. Benefits: 1. Provides critical information about ocean uses to help guide and prioritize future emergency response and cleanup activities in order to minimize impacts and injuries to users. 2. Captures wide range of community perspectives about ocean space (i.e. how it is used, governed, and managed) to complement other mapping approaches designed to document physical ocean features/properties (e.g. species distribution, biodiversity indicators, ecosystem health) 3. Provides a more complete baseline of human uses for future oil spill assessments related to lost use compensation and restoration. 4. Provides a unique and comprehensive planning resource to identify, design, prioritize and evaluate restoration projects for the efficient use of recovered funds aimed at replacing lost uses and values. 5. Provides a long-term information resource to inform broader coastal planning and management priorities that take into account current and emerging ocean uses of the ecosystem, including investment in future recreational opportunities. 6. Provides, for the first time, a comprehensive linkage between ecosystem features, functions and services and the ocean uses they support. 7. Provides the baseline data to explore linkages between existing ocean uses and documented economic values of coastal activities. Products: 1. Spatial GIS data on each ocean use and sector. 2. Analytical products illustrating patterns in ocean use, including identification of existing ocean uses at risk from spills or response activities. 3. Interactive online viewer allowing remote visualization and analysis of GIS data. Desired Outcomes: strengthened and more efficient planning for emergency response, assessment, and restoration. ● Interactive holistic mapping product utilizable by multiple planning agencies ● Useful mechanism for integration with existing resources ● Planning product utilizable across sectors and uses.	$2,500,000
Highway 90 Boat Launch	Physical examination of marine mammals through live capture and release health assessments, necropsies of stranded animals, or photo-identification body condition data can help to identify threats to marine mammals and provide links to potential environmental and anthropogenic stressors. Vessel interactions are a type of anthropogenic stressor that can often be recognized on marine mammals from physical examination. Typically, interactions will result in serious injury or mortality due to either penetrating injuries from propeller cuts (the severity of which depends on the species, the individual, the location of the cut, and the depth of penetration) or from blunt force trauma from colliding with the hull of a vessel (leading to bone fractures, organ damage, and/or internal hemorrhaging) (Andersen et al. 2008). Vessel interactions are more likely to occur in areas where marine mammal distribution patterns overlap with high vessel traffic densities. This project focuses on an alternative method to identify vessel interaction hot spots. The goal is to analyze strandings, health assessments, and photo-identification data to spatially identify areas where cases of boat strike animals tend to be more prevalent and congregated. This analysis will not only help identify a specific hot spot and/or type of habitat vessel collisions are more likely to occur, but also quantify the number or percentage of animals with evidence of vessel collision injuries. This project serves as a baseline of pre- and post-restoration efforts. The locality of strandings data, health assessments, and photo-identification can be identified for the past 5 years and reevaluated after mitigation efforts have been implemented, such that this project is intended to be a multi-year effort continually being updated. Continual data entry, maintenance, and analysis of a region-wide boat strike database will help to keep this effort updated, such that vessel collision hot spots may be newly identified, modified, or eliminated. This project will enhance marine mammal survivorship by further understanding specific locations or habitats where vessel collisions occur and proactively implementing mitigation measures to reduce the likelihood of an interaction.	$2,650,404

Florida Parishes of Louisiana – Lake Pontchartrain Basin Nutrient Reduction Project	Health assessments, necropsies, and photo-identification body condition data can help to identify health threats to marine mammals and provide links to potential environmental and anthropogenic stressors. However, if the type of information collected varies among research groups and stranding networks between animals and locations, it is difficult to make general, region-wide comparisons among cases. The goal of this project is to develop a standard protocol for the MMSN and photo-identification programs to identify, characterize, and document evidence of vessel stuck animals, such that they can be compared and analyzed on a region-wide scale. The protocol would include watercraft forensic analyses to determine the types of vessels that are most commonly interacting with marine mammals. Standardized data collection of wound characteristics (i.e. depth, length, location, etc.) would help to identify information about the propeller, vessel type, and vessel speed that interacted with the animal. This project will support consistency, efficiency, and coordination of data collection and analysis of vessel strike animals in the coastal and offshore waters of the Gulf of Mexico. This project will increase marine mammal survival through an increased understanding of the nature of interactions between vessels and marine mammals that will augment mitigation and restoration techniques.	$1,000,000
Des Allemands Boat Launch	Marine mammals can become entangled with gear from commercial and recreational fishing, as well as from marine debris. In the absence of intervention, untreated wounds resulting from such entanglements can lead to serious injuries including massive blood loss, infections, impaired mobility, and death (PDARP). Animals entrapped (e.g., due to levee construction), out of habitat, or displaced by severe weather or oceanographic events (e.g., hurricanes) may also need intervention, if they cannot return to suitable habitat on their own and/or when their health is compromised (PDARP). This project aims to develop new and enhance pre-existing infrastructure capabilities within the Gulf of Mexico (GOM) region to respond to marine mammals that are entangled, entrapped, or out of habitat. It will involve coordination with federal, state, and marine mammal stranding network (MMSN) agencies to develop standardized protocols and identify training, support, equipment, and/or other resources that are necessary to establish rapid response teams (rescue personnel and vets) and equipment around the GOM for interventions on entangled, entrapped, or out of habitat marine mammals. Region specific standard operating procedures and protocols for these types of animals will allow for region-wide consistency in response, as well as the ability to respond rapidly to these events, thus enhancing survivability. The focus will be to identify, train, and support rapid response team members for entangled, entrapped or out of habitat animals to ensure timely response. This includes a rapid response team training workshop that covers all aspects of a live animal intervention (net handling, animal handling, boat maneuvering around nets, tagging, tracking of tagged animals) and travel support for MMSN partners to attend dolphin live capture/release health assessments for training in live animal capture and handling techniques. Additionally, this project will purchase equipment, including catch boat and net(s) to be staged strategically throughout the GOM (2-3 locations). There will also be funding, including vessel and personnel support, for pre-capture photo-id monitoring of entangled, entrapped, or out of habitat animals to monitor animal condition, determine extent of injury/entanglement, and ensure animals can be located on day of rescue. This project will also support the development of boat based disentanglement tools and techniques, to increase opportunities for intervention when a net capture and disentanglement isn't practical (e.g., animal isn't likely to be resighted or animal is in water too deep to safely capture). Also included in this project are satellite and or VHF monitoring tags that will applied as appropriate and support for post release tracking efforts (personnel and vessel). Improved post-release tracking is critical for understanding the survival of disentangled or relocated animals and for informing future intervention/release decisions.	$1,841,115
Joyce Wildlife Management Area - Land Acquisition	The Marine Mammal Stranding Network plays a critical role in diagnosing illness and cause of death in stranded marine mammals to better understand population health. This includes identifying evidence of human interaction, outbreaks of diseases, and new and emerging threats impacting marine mammals. Currently, the only stranding data available in a regional or national database are the "Level A" data, that describe the basic occurrence information – the "who, what,	$5,500,000

	when and where" aspects of the stranding, but not the cause of stranding or death. More detailed health level aspects of a stranding case are typically held at each stranding organization's individual facility, in a variety of formats including individual facility databases. These data are more useful if they are available to managers and marine mammal health experts to evaluate patterns across areas/regions, determine emerging or ongoing threats, and develop potential mitigation measures or interventions. Thus, it is important to develop and maintain regional databases to manage marine mammal health data and make it readily accessible for those who may need to use it. There is currently a pilot database (GulfMAP) developed under the NFWF Gulf Environment Benefit Fund in partnership with NOAA to house and visualize marine mammal health data from the Gulf of Mexico; however, there are limited fields currently programmed in the database and few funds to support the database long term. This project would increase access to information from stranded marine mammals by supporting regional databases (such as the GulfMAP) and personnel to enter, QA/QC data, and maintain databases. These data could be used to provide a better long-term understanding of the causes of marine mammal illness and death in the Gulf of Mexico to mitigate natural and anthropogenic threats.	
Florida Parishes of Louisiana – Lake Pontchartrain Basin Nutrient Reduction Project	Recovery of submerged gear that presents an entanglement/ingestion hazard. Locations would be selected and prioritized based on intensity of use for recreational fishing, known co-location with sea turtles (e.g., foraging areas), and frequency of entanglement/ingestion-related strandings. The issue of sea turtle entanglements on derelict recreational fishing gear at artificial reef sites is one we have become increasingly aware of and has the potential to be a significant source of sea turtle mortality (see NOAA Technical Memorandum NMFS-SER-5, January 2017). This project could potentially also benefit marine mammals. •Restoration linkages: Gear that is accidentally or intentionally left in the environment by recreational fishers is a persistent threat to sea turtle and is the form of marine debris that most often causes sea turtle stranding in the GOMX. This gear significantly contributes to sea turtle bycatch resulting from recreational fishing and tends to accumulate on artificial reefs targeted as recreational fishing sites.	$1,000,000
Characterization and Trends of Existing Coastal Louisiana Historical Data on Nutrient Enrichment	Additional observer coverage is needed throughout the Gulf on non-shrimp otter trawls (e.g. sheepshead/black drum trawl fishery in LA, blue crab trawl fishery, "cat food" fish trawl fishery, etc.). While these trawl fisheries are small, sometimes only a handful of boats, they do not use TEDs and we have no information on sea turtle takes. The goal of the project idea is to gather additional information on sea turtle interactions in currently under or un-observed trawl fisheries and develop and implement new conservation measures if necessary, to reduce sea turtle bycatch and mortality. The project costs are reflective of a 3-year program to identify the non-shrimp trawl fisheries, initiate observer programs, and observe the fisheries. After the 3-year period the data would be evaluated to determine the need for an ongoing observer program. • Restoration linkages: reduce sea turtle bycatch in commercial fisheries through development and implementation of conservation measures; Monitoring and adaptive management activities to address relevant data gaps to inform restoration.	$1,200,000
Coastal Wetlands Education Center at Audubon Nature Institute	There is currently a proposed rule to require skimmer trawls to use TED grids with smaller bar spacing under an upcoming rule. However, non-skimmer trawls fishing for shrimp in the Gulf of Mexico are required to use grids with 4" bar spacing. An examination of sea turtle sizes in the coastal waters where those shrimp trawls operate show that sea turtles small enough to slip between the 4" spaces of the current grids may occupy those areas. Providing free 2.5" bar-space grids to non-skimmer trawl fishers willing to voluntarily use those grids has the potential to save sea turtles and it provides a cost savings to trawlers who need to replace their old grids. • Restoration linkages: reduce sea turtle bycatch in commercial fisheries through implementation of conservation measures.	$10,750,000
Town of Lafitte Kayak & Pirogue Recreational Building and Education Program	The Gulf of Mexico Reef Fish Fishery consists of approximately 800 federally permitted vessels; approximately 65 use longline gear and the remainder use vertical line (bandit reel-electric or hydraulic, and handlines). In recent years (i.e., 2013-2015), the Gulf reef fish fishery observer program has observed on average approximately 4% of total sea days, all gear types combined. The current practice is to augment coverage in the vertical line component of the Gulf reef fish	$250,000

	fishery at least once every three years, thus coverage levels in vertical line on non-augmented coverage years are only approximately 2%. In years with augmented coverage in the vertical line component, funding for bottom longline coverage is reduced. This project will allow us to improve coverage levels in the vertical line component of the Gulf reef fish fishery annually to better understand and manage sea turtle impacts. This proposal would increase observer coverage for the vertical line component of the fishery by up to 200 sea days per year for the next three years ($300k/year; $900k total). • Restoration linkages: reduce sea turtle bycatch in commercial fisheries through implementation of conservation measures; Monitoring and adaptive management activities to address relevant data gaps to inform restoration also to ensure current conservation measures are followed. This project will also allow NMFS to better apply conservation measures to different sectors of the fishery (i.e. vertical line vs long line).	
Assessment of Impact and Development of Advanced Monitoring Techniques for Chandeleur Islands Seagrasses	In the Gulf of Mexico, there are numerous diverse parties conducting marine mammal-related activities. Some of these parties include research groups conducting health assessments and stock abundance surveys, rapid response groups investigating natural and anthropogenic impacts on animals, and also laboratories performing biological, chemical, and statistical anaylses on marine mammal data/samples. However, not every party involved in marine mammal-related activities has the same level of training, resources, and/or funding, such that each organization may have disparate capabilities and may be collecting and analyzing information differently. To be able to analyze data on a region-wide scale, there is a need to develop consistent and standardized protocols. This project focuses on developing tools, protocols, training, and infrastructure to support standardized and integrated data collection and analysis, region-wide. To support this effort, web portals and archival systems can be developed to facilitate rapid dissemination of information. This project idea supports planning for all parties working on marine mammal-related activities, it supports monitoring to ensure that data collected can be easily integrated into the broader analysis and management system, and builds capacity through the region by enabling other parties working on marine mammal-related activities to contribute their work in a meaningful and integrated fashion. This project idea increases the survivorship and resiliency of marine mammals in the Gulf of Mexico by developing consistent and standardized protocols that will aid in the restoration, management, and monitoring of marine mammal species.	$850,000
Drone and Ground Based Monitoring of Areas of Critical Land Change in Southeast Louisiana	There is still much to learn about large whale species such as sperm whales and Bryde's whales in the offshore waters of the Gulf of Mexico. Information about their distribution, movement patterns, habitat use, feeding patterns, and population demography is still limited. Enhanced understanding of this information can help to evaluate species' co-occurrence with human-related activities and assess the impacts of these activities on the species. A large effort to collect this type of information will be conducted through GoMAPPS. However, GOMAPPS is projected to collect data for three years. This goal of this project is to augment GoMAPPS and continue data collection of large whale species in the offshore waters of the Gulf of Mexico. Due to the life history patterns of these large whale species, it often takes many years to be able to distinguish changes in their population status. This continued data collection is particularly important since sperm whales and Bryde's whales were two species that experienced high mortality rates after the DWH oil spill. It is crucial to the survivorship of these species to continue research efforts beyond the scope of GoMAPPS and continue to monitor their population status, particularly due to the high amount of anthropogenic activities occurring in the Gulf of Mexico.	$528,000
Enhancing Louisiana's Blue Crab Fishery Through Cost Effective Removal of Derelict and Abandoned Crab Traps	As outlined in the DWH PDARP, a potential restoration strategy is the establishment of Marine Protected Areas. In 2012, the Flower Garden Banks National Marine Sanctuary (FGBNMS) released a Management Plan, within which Action Plans (APs) outlined activities supporting the existing areas within the FGBNMS, as well as APs for Sanctuary Expansion, Education and Outreach, Research and Monitoring, Resource Protection, Visitor Use, and Operational and Administration. Potentially relevant DWH restoration activities were included within these Action Plans. Since the release of the 2012 Management Plan, the FGBNMS has actively pursued the Sanctuary Expansion AP, through the release of a Notice of Intent, and subsequent Draft Environmental Impact Statement (DEIS) which includes five alternatives for	$600,000

	Sanctuary Expansion. As a direct result of DWH, the scope of the potential Sanctuary Expansion as outlined in the DEIS was increased to include mesophotic habitats directly impacted by DWH, as well as regional mesophotic and deepwater coral communities threatened by the event. Alternative 5 is identified in the FGBNMS DEIS as the environmentally preferred alternative, and while the agency's Preferred Alternative identified in the DEIS was Alternative 3, this was limited based on current FGBNMS operational capacity. The Action Plans identified in the 2012 Management Plan are directly relevant to the management of an area such as identified in Alternative 5 of the DEIS. It is important to note that the sanctuary's current management paradigm relies heavily on extramural partnership and funding support for the implementation of the sanctuary action plans, and we anticipate this will remain the case in any potential expanded sanctuary. The DWH NRDA trustees should consider partnering in and providing funding support to implement any actions from the sanctuary management plan that are relevant for DWH restoration, both in the current sanctuary and in any potential areas to which the boundaries may be expanded. The annual cost of implementation of Alternative 5 is estimated at $7M. For sake of discussion, we have estimated the costs forward for 10 years and estimated expected level funding of the current sanctuary at approximately $1,000,000 per year.	
Enhancing Oyster Recovery and Marsh Stabilization through Use of Brood Reefs in the Biloxi Marsh and Chandeleur Sound	Multibeam mapping and groundtruthing of seafloor features are critical steps in understanding and protecting biological resources in the marine habitat. These data are crucial for managers and agencies to take steps to delineate areas for protection. Federal Agencies and partners, primarily National Marine Fisheries Service, Gulf of Mexico Fisheries Management Service, Bureau of Ocean Energy Management, and National Marine Sanctuaries will utilize these data for future management actions. Potential sanctuary expansion boundaries, habitat maps, assessment of HAPC and BOEMs No-Activity Zones are examples of uses of these high resolution products. While the FGBNMS has invested extensive resources over the last 20 years to map and groundtruth locations in the northwestern Gulf of Mexico, there are significant mesophotic and deepwater coral sites in the northern Gulf of Mexico lacking in multibeam coverage, and subsequent groundtruthing. As part of the groundtruthing activities, there is a need to define high density coral coverage for different depths – this term is used consistently in management and science applications but is rarely defined. In regard to this, it will be valuable to have knowledgeable experts in the areas of spatial applications, and general familiarity with the biology in these depth ranges. There may be a need to develop this capacity. The DWH NRDA trustees should consider partnering in and providing funding support to obtain full coverage of multibeam bathymetry of areas of interest, as well as support to conduct groundtruthing surveys to discern the biological resources within these areas, including defining "high density" terminology, and developing expertise capacity for key biology. These areas include the full extent of the areas encompassed by the five alternatives evaluated in the 2016 DEIS for sanctuary expansion of the FGBNMS, the full extent of the areas considered by the Gulf of Mexico Fishery Management Council for potential designation of deep coral HAPCs, and the full extent of BOEM No Activity Zones, related buffer zones, and lease blocks, topographic features, or seismic anomalies identified in various OCS leasing stipulations as triggers for biological review and setback.	$1,000,000
A Marsh Bird Monitoring and Assessment Program for Louisiana	The project assesses the relative abundance and distribution of Gulf of Mexico outer-continental shelf and deep ocean fishes and invertebrates; specifically intermediate trophic level fauna (typically mesopelagic species) that constitute the prey base for various species addressed by NOAA/NMFS management objectives (e.g., cetaceans, sea turtles, billfishes, tunas, coastal migratory species, sea birds). The proposed project fills a scientific data gap addressing open-ocean ecosystem modeling for intermediate and high trophic level species; currently there are on-going projects addressing mesotrophic nekton and high trophic level predators (e.g., cetaceans), however, intermediate trophic level species that are the predator/prey link are not research objectives. DWH injury is demonstrated by overlap between the DWH oil spill and intermediate fauna distributions (fishery independent surveys NOAA/NMFS/ Mississippi Laboratories (MSL); http://spo.nmfs.noaa.gov/mfr724/mfr7242.pdf). The likelihood of success is high considering MSL has an extensive	$0

	history of outer-continental shelf and deep ocean faunal assessments (bottom and mid-water trawling), and is well-staffed for scientific, vessel, gear, and IT specialists. Mid-water trawling for intermediate trophic-level fauna will be conducted both on the continental shelf and in deep ocean and will include, in part, areas with high trophic level species that prey on intermediate trophic level fauna; Bluefin Tuna spawning and large cetacean aggregation areas (B, C, attached chart); the area of DWH surface oiling overlaps the proposed survey area. The annual project satisfies a Restoration objective for sentinel sight monitoring since population dynamics of the intermediate trophic level fauna can be used as a metric for assessing effects of future episodic oil spill events and for Gulf of Mexico ecosystem management related to the causes of population changes for high trophic level species. The survey also provides numerous sampling opportunities for trophic level stable isotope analysis and biological tissue sampling related to the residual effects of the DWH oil spill. There are several applicable sections of the PDARP/PEIS Comprehensive Restoration Plan Section 5; of particular importance is Restoring Natural Resources, Alternative A: Comprehensive Integrated Ecosystem Restoration (5.5), fish and invertebrates (5.5.2), mesophotic communities (5.5.13), sea turtles (5.D.4.6), cetaceans (5.D.5.3) and sea birds (5.D.6.1.1).	
Nearshore Oyster Reef Restoration in Barataria Basin Using Recycled Shell	Building scientific awareness of ocean and protecting it for our future It needs to be predicted to protect our ocean for our future The answer lies with psychic science to ensure our oceans health Basically take psychic precautions Ensure and predict water safety	$2,630,000
Artificial Enhanced Transport of Atmospheric Oxygen into Gulf Water to Eliminate Hypoxia RxHYPOXIA-the Conceptual Approach	The Grand Isle Butterfly Dome was first erected over 15 years ago with funds from private and corporate donations. It is a 42 foot diameter geodesic structure, covered with greenhouse shadecloth. The structure contains flowers and plants specifically chosen to maintain native butterflies. It has been an extremely popular attraction for local residents, tourists, and school tours. Most of our donations for its upkeep came from petroleum related companies, whose contributions are no longer forthcoming.	$0
Non-Destructive Removal of Oil/Gas Infrastructure	This proposed project entails the construction of a Fishing Pier for pedestrian use on the Atchafalaya River side of the protective peninsular at the Jessie Fontenot Boat Launch south of Berwick, LA, in St Mary Parish. The boat launch is used by thousands of sport fisherman annually accessing the gulf region. The pier would provide recreational opportunities for those without boats, especially those with accessible needs, to access the benefits of outdoor recreational fishing. The proposed fishing pier on the Atchafalaya River side of the peninsular is part of a sixth phase of a multi-phase Master Plan for this boat launch. The Jessie Fontenot Boat Launch was once a small State facility that was taken over by the St Mary Parish Gov't to develop and implement a long range plan of improvements. A Master Plan was developed with input from the local boating community and state agencies. In time the Master Plan was revised and redeveloped to include a large vessel mooring facility, fishing pier and additional wharves, parking, and camping facilities. The Parish has the initial phases of the site permitted and is in the process of permitting the entire site for the proposed long-range development. As an early part of the planning process, the Parish had commissioned Dr. Morris Coats, Professor of Economics at Nichols State University, to conduct a feasibility study of the expanded Master Plan to evaluate the elements proposed for inclusion. The first four phases of this multi-phase project have been completed with funding from the Wallop-Breaux Program, and the fifth phase, the peninsular upgrade and the large vessel mooring facility were completed with funding from the Katrina/Rita Fisheries Infrastructure Program of the LRA and Louisiana Department of Community Develop.	$0
Migratory Species Conservation in the Gulf of Mexico: Assessment	This proposed project entails the construction of a Fishing Pier for pedestrian use on the Atchafalaya River side of the protective peninsular at the Jessie Fontenot Boat Launch south of Berwick, LA, in St Mary Parish. The boat launch is used by thousands of sport fisherman annually accessing the gulf region. The pier would provide recreational opportunities for those without boats, especially those with accessible needs, to access the benefits of outdoor recreational fishing. The	$500,000

for Restoration and Online Tools	proposed fishing pier on the Atchafalaya River side of the peninsular is part of a sixth phase of a multi-phase Master Plan for this boat launch. The Jessie Fontenot Boat Launch was once a small State facility that was taken over by the St Mary Parish Gov't to develop and implement a long range plan of improvements. A Master Plan was developed with input from the local boating community and state agencies. In time the Master Plan was revised and redeveloped to include a large vessel mooring facility, fishing pier and additional wharves, parking, and camping facilities. The Parish has the initial phases of the site permitted and is in the process of permitting the entire site for the proposed long-range development. As an early part of the planning process, the Parish had commissioned Dr. Morris Coats, Professor of Economics at Nichols State University, to conduct a feasibility study of the expanded Master Plan to evaluate the elements proposed for inclusion. The first four phases of this multi-phase project have been completed with funding from the Wallop-Breaux Program, and the fifth phase, the peninsular upgrade and the large vessel mooring facility were completed with funding from the Katrina/Rita Fisheries Infrastructure Program of the LRA and Louisiana Department of Community Develop.	
New Orleans City Park to Sell Couba Island	The "Vermillion Parish Working Lands, Wildlife and Water Partnership" project aims to permanently conserve working lands, with substantial natural resource value, through the purchase of conservation easements. Live Oak Farm, the project focus, is under threat of conversion, with potential for loss of wildlife habitat and further water quality degradation, which are critical to the economy and environment both locally and across the Gulf of Mexico. Live Oak Farm, a 5,800 acre property producing rice, crawfish, cattle, and alligator, is recognized as one of the southernmost remaining rice farms in Louisiana. The producers at Live Oak have taken active measures to improve water quality and reduce runoff. It is also a significant resource for migratory birds, with up to 70,000 waterfowl wintering on this acreage annually. A conservation easement would protect the use of the site as working lands and would allow for continued stewardship of the property, contributing to the conservation solution for the region. The project has secured $2M in funding and is seeking an additional $1M to match and leverage those funds for the completion of a Phase 1 easement acquisition. Subsequent phases of the project will be completed with separate funds. The target area is part of the Vermilion-Teche River Basin and the Vermilion Watershed (HUC 08080103). Live Oak Farm is located within the 060802 sub-segment. Louisiana's 2014 Water Quality Integrated Report indicated that this sub-segment was not meeting the designated use standards for Primary Contact Recreation, Secondary Contact Recreation, or Fish & Wildlife Propagation due to high levels of nitrate/nitrites, fecal coliform, and low DO. The producers at Live Oak Farm have implemented Best Management Practices (BMPs) to reduce non-point source pollutant runoff and protect sensitive wetland and riparian areas within the property. A significant investment has been made in a tail water recovery system that effectively minimizes water run-off of nutrient loads into local waterways. Tailwater recovery systems retain runoff on the agricultural landscape, thereby reducing the amount of sediment and nutrients entering downstream but require continued investment for effective ongoing operation. In addition to farming BMPs, the owner has invested significant resources into the restoration and continued management of the sites' wetlands and marshes. It is our intention to preserve working lands like Live Oak Farm as an example of best practices for agricultural production and operational management that reduce non-point source pollution into Louisiana's coastal waterways. With approximately 4 miles of frontage along the Vermilion River and adjacency to the Intracoastal Waterway, Live Oak Farm is at risk for subdivision or future conversion to industrial uses. An easement would permanently preserve the current use of the site as working lands, and the proceeds to the family would allow for continued stewardship and execution of best management practices for agricultural production and protection of downstream water quality. Conversion to another use, or allowing the fields to turn fallow, would have a negative effect on downstream water quality. Vermilion Parish has seen a 46% decrease in rice field acreage in the last 20 years. This trend represents a significant threat to the migratory birds that now rely heavily on flooded rice fields for wintering habitat. While the Gulf Coast remains one of the nation's most wetland-rich regions, it has suffered staggering losses of habitat to development and coastal erosion. In the past 50 years,	$0

	Louisiana has lost nearly 1mil acres of highly productive coastal wetlands and could lose an estimated 630,000 acres of wetlands over the next 50 years. Flooded rice fields compensate for this loss and provide critical resting and feeding habitat for migrating and wintering waterfowl. Working lands easements ensure the perpetual protection of this critical habitat.	
South Louisiana Wetlands Discovery Center	Oil Containment Barrier Boom for Shorelines/Marshes/Wetlands (Patents No. US 8,696,243 B2) Project Information Project Title OIL CONTAINMENT BARRIER BOOM & SURGE/FLOOD BACKFLOW PROTECTION Project Address or Location TEXAS WATERWAYS AND GULF OF MEXICO SHORELINE Congressional District Watershed/Basin COASTAL Project Summary Project #1 & 1a --- Boom Barrier Containment I & II existing Patents constitute a 95% recyclable system to trap, absorb and detoxify floating oil or hydrocarbon products preventing entry into marshes, wetlands and shorelines and damage to the habitat. This product is placed along shorelines with varying depths and slopes or as a flotation device. This is a Bermuda straw bale wrapped in burlap with an optional cork bottom and a hinged double wrapped filter oil blanket that can be deployed in an extended mode preventing oil and tar balls from going over and or under the Boom Barrier. These 36 inch modules can be quickly deployed by shallow draft work boats and linked together to form a linear or curvilinear barrier along shorelines of all contours and depths. This concept prevents destruction of plant and wildlife at and beyond shorelines, wetlands, and the marshes while utilizing oil eating microbes within the Burlap to naturally biodegrade the trapped hydrocarbon material. This product becomes part of the landscape and does not transfer trapped material to the environment, even if the product is washed away by a hurricane. The plan is to manufacture and stock these bales in strategic locations so that distribution occurs expediently after a spill. This is a unique and natural way to save the coast, waterways, shorelines and beaches from contamination and prolonged cleanup after an event. Project /Resource Acquisition Time to Complete Project 12.00 months Project Costs Total Project Cost $1,250,000 Requested Amount $100.	$1,300,000
Post Hurricane Harvey Coastal Assessment, Chenier Plain Louisiana	Water (Storm) Surge and Flood Backflow Prevention-- In areas with levee protection and pumping stations, this patented system can prevent flooding of inhabited areas, levee overtopping, and washed out or inoperative pumping stations caused by hurricanes, heavy rain events or storm surge in conjunction with rising sea levels. This system includes variable speed drive pumps to adjust pump power needs to the storm severity and has automatic shutoff valves which adjust to tide and surge levels attached to an alternate bypass system that allows continuous operation even under heavy surge and or tidal conditions. Also allowed is the ability to pump water into existing aquifers during storms or during routine exercising of the pump system resulting in an environmentally sound replenishing of valuable aquifer levels. Project Type Project /Resource Acquisition Time to Complete Project 12.00 months Project Costs Total Project Cost $1,250,000 Requested Amount $100.	$170,000
Assessment and Mitigation of Lionfish Impacts on Exploited and Non-Exploited Reef Fishes in the Northern Gulf of Mexico	Remove broken concrete and or rip-rap and shape subgrade for ramp. Install 25’ x 30’ concrete boat ramp and 20’ x 40’ concrete apron of 6” reinf concrete. Install 8’ wide timber mooring docks along each side of boat ramp. Grade existing shell/limestone parking to establish drainage and install 8” compacted limestone for parking.	$1,500,000
Expand Monitoring and Research at Coral Reef Sentinel Sites, and Develop and Promote Best Fishing Practices in Cooperation with	The primary goal of this project is to protect and restore water quality in the Barataria Terrebonne Estuary. Reducing nutrient loading into impaired watersheds by avoiding nutrient loss through enhanced nutrient management on private working lands including sugarcane, soybeans, and grazing operations. Project Type: Nutrient Reduction restoration type Total Funding Requested: $2,500,000 Project Description/Summary This project will restore resources injured by the DWH oil spill as outlined in the DWH PDARP/PEIS following the Natural Resource Damage Assessment process. This project is included within the following restoration goal, restoration type, restoration approach, restoration technique,	$0

Industry to Enhance the Recovery of Coral Communities in the Gulf of Mexico	TIG, and restoration plan: ● Restoration goal: Restore Water Quality ● Restoration type: Nutrient Reduction (Non-point source) ● Restoration approach: Reduce nutrient loads to coastal watersheds ● Restoration techniques: Agricultural conservation practices ● TIG: Louisiana Restoration Area This project will be carried out through a partnership between the USDA-Natural Resources Conservation Service, Barataria Terrebonne National Estuary Program, Louisiana Department of Environmental Quality, Louisiana Department of Agriculture and Forestry-Office of Soil and Water Conservation, and local Soil and Water Conservation Districts. The Barataria-Terrebonne Estuary is a dynamic working system that supports the people of southeast Louisiana and a diversity of flora and fauna. Farmland runoff containing fertilizers and livestock waste is the main source of the nitrogen and phosphorus, which stimulate an overgrowth of algae that sinks and decomposes in the water. The resulting low oxygen levels are insufficient to support most marine life and habitats in near-bottom waters, posing a serious threat to the Gulf's fisheries. However, anthropogenic alterations to nutrient budgets with the estuary are coupled to an array of ecological impacts, and nutrient-induced degradation of estuarine and near-shore marine habits. This project will implement a well-planned and implemented nutrient management strategy to protect and restore this ecologically, economically, and socially important ecosystem. The primary goal for the nutrient reduction project is water quality improvement through nutrient and sediment reduction. The health of the Gulf of Mexico depends upon the health of its estuaries, and the health of those coastal waters is influenced by land uses in the watersheds of its tributaries. In the five Gulf States, over 80 percent of the acreage is in private ownership (USDA-NRCS 2014) and is used for forestry and agriculture. This watershed-scale project restores water quality impacted by the DWH oil spill by reducing nutrients and the sediments carrying them into coastal waters. Runoff from cropland, pasture, grassland, and forest contributes nutrients and sediments that adversely affect the health of coastal waters of the Gulf. The USDA-NRCS will provide technical assistance to voluntary participants (landowners), especially on the most vulnerable acres in the watersheds, to develop conservation plans and would use all available conservation practices typically planned and funded by USDA-NRCS programs. The project proposes to implement clusters of projects within the smallest watershed practicable with the goal of making a measurable difference in water quality at the watershed level. The proposed conservation practices would reduce nutrient losses from the landscape, reduce nutrient loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could provide benefits to marine resources and benefits to coastal watersheds. Priority conservation treatment for this watershed would be erosion and sediment control structures on cropland.	
Large-Scale Tagging Program to Understand Post-Release Mortality, Migration, and Movement in Highly Migratory and Coastal Migratory Fish Species	The Highway 90 Boat Launch project involves the design and construction of a new boat launch facility in Luling, Louisiana to provide enhanced recreational opportunities. The launch will be situated on 2.74 acres of leased, undeveloped land and located south of U.S. Highway 90 East near the St. Charles/Jefferson Parish boundary line. The design of the launch will be in accordance with States Organization for Boating Access (SOBA) regulations and the development features the construction of the following elements: four boat launch ramps with bulkhead, 37 parking spaces designed for vehicles hitched to trailers, six single vehicle spaces, two ADA compliant parking spaces, a wetland nature trail with eight small pavilions, playground, benches, signage, lighting, and an access road from Highway 90. The proposed Highway 90 Boat Launch will improve public access to the surrounding waterways for recreational boaters and anglers. Surrounding waters include Lake Cataouatche, Lake Salvador and other Barataria Basin Waterways all located to the south of the launch and Lake Des Allemands to the west. These bodies of water are highly utilized for various recreational activities such as: fishing, hunting, trapping, frogging, trawling, skiing, recreational boating, swimming, camping, and sightseeing. However, St. Charles Parish lacks adequate boat launch facilities to service the demand of the region and is committed to resolving this deficiency with the proposal of two new launches, which includes the Highway 90 Boat Launch in Luling.	$0
ARTIFICIAL ENHANCED TRANSPORT OF	The primary goal is to protect and restore water quality while conserving critical habitat within the Lake Pontchartrain Basin and the lower Louisiana Coastal Zone. The ultimate objective of restoring, protecting, and improving water	$0

ATMOSPHERIC OXYGEN INTO GULF WATER TO ELMINATE HYPOXIA	resources and associated habitat value will be achieved by implementing Comprehensive Nutrient Management Planning and Conservation Practices that will improve waste management on dairy operations in the Pontchartrain Basin. Total Funding Requested: $1,000,000 Project Description/Summary This project will restore resources injured by the DWH oil spill as outlined in the DWH PDARP/PEIS following the Natural Resource Damage Assessment process. This project is included within the following restoration goal, restoration type, restoration approach, restoration technique, TIG, and restoration plan: ● Restoration goal: Restore Water Quality ● Restoration type: Nutrient Reduction (Non-point source) ● Restoration approach: Reduce nutrient loads to coastal watersheds ● Restoration techniques: Agricultural Conservation Practices ● TIG: Louisiana Restoration Area There are over 100 active diaries in the Lake Pontchartrain Basin (which including Tangipahoa, Washington, St. Helena, and St Tammany Parishes). Typically, these dairies are currently managing the waste component of their respective operations through waste treatment systems that were constructed in the early 1990's. The effluent waste application systems of these diaries are obsolete or marginal at best. This program will reduce the discharge of sediments and pollutants from agricultural operations and improve the tributary streams, rivers and groundwater that drain to the Gulf of Mexico. The ecosystems in the project area provide habitat for numerous threatened and endangered plants and animals, which will benefit from the proposed land treatments. The USDA-NRCS will provide technical assistance to voluntary participants (landowners), especially on the most vulnerable acres in the watersheds, to develop conservation plans and would use all available conservation practices typically planned and funded by USDA-NRCS programs. The project proposes to implement clusters of projects within the smallest watershed practicable with the goal of making a measurable difference in water quality at the watershed level. The proposed conservation practices would reduce nutrient losses from the landscape, reduce nutrient loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could provide benefits to marine resources and benefits to coastal watersheds. All Conservation Practices implemented will meet USDA, NRCS standards and specifications. A representative within the NRCS Field Office, LDAF and SWCD staff will provide technical assistance to participants in designing and implementing Conservation Practices and assist in providing follow-up technical assistance to project participants for the duration of the project. The SWCD will maintain all appropriate project records. It is estimated that this would result in the development (or modification) of comprehensive nutrient management plans for 15-20 active dairies within the watershed. Nutrient reductions can enhance overall ecosystem health by benefitting water quality in estuaries that are integral habitat for providing food, shelter, and nursery grounds for many of the Gulf's ecologically and economically important species impacted by DWH.	
Establishment of a Marine Monitoring, Energy and Environmental Research, Science Education, and Training (MMEERSET) Station in the Gulf of Mexico	The Des Allemands Boat Launch project involves the design and construction of a new boat launch facility in Des Allemands, Louisiana to provide enhanced recreational opportunities. The launch will be situated on 3.01 acres of donated, undeveloped land and located off LA Highway 632, which links to US Highway 90 in Des Allemands and LA Highway 631 in Bayou Gauche. The design of the launch will be in accordance with States Organization for Boating Access (SOBA) regulations and the development is proposed in phases. The first phase will feature the construction of the following elements: four 12' wide boat launch ramps, 23 parking spaces designed for vehicles hitched to trailers, six single vehicle spaces, two ADA compliant parking spaces, signage, lighting, fishing piers, bulkheads, and an access road from LA 632. The next phase(s) will feature: 37 parking spaces designed for vehicles hitched to trailers, a restroom building, a pavilion, and additional lighting. The proposed Des Allemands Boat Launch will improve public access to the surrounding waterways for recreational boaters and anglers. Surrounding waters include Lake Des Allemands to the northwest of the launch; Petit Lake Des Allemands, Bayou Gauche, Lake Salvador and Lake Catouatche to the southeast; and other Barataria Basin waterways in Southeast Louisiana. These bodies of water are highly utilized for various recreational activities such as: fishing, hunting, trapping, frogging, trawling, skiing, recreational boating, swimming, camping, sightseeing, and can also be used for traveling to and from the communities of Des Allemands and Bayou Gauche.	$4,000,000

	However, St. Charles Parish lacks adequate boat launch facilities and is committed to resolving this deficiency with the proposal of two new launches, which includes the Des Allemands Boat Launch.	
Quantify the Efficacy of Fish Descender Devices on Reducing Discard Mortality in Red Snapper and Other Reef Fishes	The Conservation Fund is working in partnership with the Louisiana Department of Wildlife & Fisheries to acquire 2,975 +/- acres, as an addition to the Joyce Wildlife Management Area (WMA). This acreage is located in Tangipahoa & St. Tammany Parishes, and provides a variety of habitat types, from emergent wetlands, to coastal forested wetlands, to a substantial impoundment, and a smaller upland component. The addition of this tract would complement the existing recreation opportunities, providing expanded hunting and fishing opportunities within the substantial wetland complex, and it would provide recreation on the upland acreage which does not currently exist on this WMA. During the 2016/ '17 hunting season, 4,378 hunters were documented to visit Joyce WMA. The addition of the 2,975 +/- acres to Joyce WMA would enhance access, as it will provide road access from Louisiana Highway 22. Currently, no drive in access is available at Joyce WMA, so this project would likely increase annual visitorship at this WMA. In addition to hunting, trapping, and fishing, other common activities to be provided include sightseeing, boating, birdwatching, and frogging. The most sought after game animals on Joyce WMA include white-tailed deer, waterfowl, rabbit, and squirrel. Freshwater fish, including largemouth bass, sunfish, and catfish are also pursued on the area. Alligators and a variety of other herpetofauna are common on this WMA. Bald eagles and osprey nest in and around the WMA. Numerous other species of birds, including neotropical migrants, utilize this coastal forest during fall and spring migrations. Resident waterfowl, including wood ducks, mottled ducks, hooded mergansers, and black-bellied whistling ducks, are found on the area year-round. This project will also support the health of the Lake Pontchartrain Basin, through the permanent protection of coastal wetlands, which will continue to filter freshwater flows from the Tangipahoa River.	$0
Backfilling to Restore Louisiana's Canals	The primary goal is to protect and restore water quality while conserving critical habitat within the Lake Pontchartrain Basin and the lower Louisiana Coastal Zone. The ultimate objective of restoring, protecting, and improving water resources and associated habitat value will be achieved by implementing Comprehensive Nutrient Management Planning and Conservation Practices that will improved waste management on dairy operations in the Pontchartrain Basin. Total Funding Requested: $1,000,000 Project Description/Summary This project will restore resources injured by the DWH oil spill as outlined in the DWH PDARP/PEIS following the Natural Resource Damage Assessment process. This project is included within the following restoration goal, restoration type, restoration approach, restoration technique, TIG, and restoration plan: ● Restoration goal: Restore Water Quality ● Restoration type: Nutrient Reduction (Non-point source) ● Restoration approach: Reduce nutrient loads to coastal watersheds ● Restoration techniques: Agricultural Conservation Practices ● TIG: Louisiana Restoration Area There are over 100 active diaries in the Lake Pontchartrain Basin (which including Tangipahoa, Washington, St. Helena, and St Tammany Parishes). Typically, these dairies are currently managing the waste component of their respective operations through waste treatment systems that were constructed in the early 1990's. The effluent waste application systems of these diaries are obsolete or marginal at best. This program will reduce the discharge of sediments and pollutants from agricultural operations and improve the tributary streams, rivers and groundwater that drain to the Gulf of Mexico. The ecosystems in the project area provide habitat for numerous threatened and endangered plants and animals, which will benefit from the proposed land treatments. The USDA-NRCS will provide technical assistance to voluntary participants (landowners), especially on the most vulnerab le acres in the watersheds, to develop conservation plans and would use all available conservation practices typically planned and funded by USDA-NRCS programs. The project proposes to implement clusters of projects within the smallest watershed practicable with the goal of making a measurable difference in water quality at the watershed level. The proposed conservation practices would reduce nutrient losses from the landscape, reduce nutrient loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could provide benefits to marine resources and benefits to coastal watersheds. All Conservation Practices implemented will meet USDA, NRCS standards	$3,000,000

	and specifications. A representative within the NRCS Field Office, LDAF and SWCD staff will provide technical assistance to participants in designing and implementing Conservation Practices and assist in providing follow-up technical assistance to project participants for the duration of the project. The SWCD will maintain all appropriate project records. It is estimated that this would result in the development (or modification) of comprehensive nutrient management plans for 15-20 active dairies within the watershed. Nutrient reductions can enhance overall ecosystem health by benefitting water quality in estuaries that are integral habitat for providing food, shelter, and nursery grounds for many of the Gulf's ecologically and economically important species impacted by DWH.	
Restoration of Piping Plover and Other Overwintering Shorebirds through Reductions in Anthropogenic Stressors	Louisiana coastal environments are impacted by nutrient inputs and despite nutrient reduction restoration efforts, concentrations of nitrogen and phosphorus in Gulf waters have increased over the last 50 years (Dagg and Breed, 2003). Excess nutrient inputs to Louisiana's coastal estuaries are associated with harmful algal blooms and oxygen depleted waters – "dead zones". Algal blooms and hypoxic zones in turn negatively impact the spawning habitats and food sources on which the region's economically valuable fisheries rely. The annual summer hypoxic zone in the northern Gulf is the second largest human-caused coastal hypoxic area in the world, typically extending from the outlet of the Mississippi River west along the Louisiana and East Texas coastal shelf. Its size is attributed to the amount of nitrate delivered to the northern Gulf from the Mississippi-Atchafalaya River Basin (MARB) in the spring (Turner et al, 2006). In response, the Louisiana Nutrient Reduction Task Force has identified three coastal ecoregions (Upper and Lower Mississippi Alluvial Plains and Southern Plains Terrace and Flatwoods) on which to focus nutrient reduction restoration. While much work has been done on nutrients within the MARB, a lack of information on long-term trends in nitrogen and phosphorus loads and concentrations in Louisiana's coastal waters limits managers' ability to determine the degree to which changes in land use, management practices, and water diversions have had an effect on riverine and estuarine water quality. A recent analysis of nutrient concentrations by the Louisiana Department of Environmental Quality (LDEQ, 2015) identified upland nutrient trends and land use contributions to coastal basins at LDEQ stations. To improve management decisions targeting nutrient reduction efforts, it is critical to determine the status of not just of current nutrient conditions in uplands but also in these coastal environments and whether changes in water quality attributable to restoration activities can been detected over time. Historical monitoring of water quality conditions by LDEQ, US Geological Survey (USGS), US Environmental Protection Agency (EPA), and others in these basins has consisted of sampling data at locations that coincide with streamflow, discrete sampling for nutrients, and continuous monitoring of salinity and other properties. These data will be used to develop temporal and spatial characterizations nutrient dynamics within these near-shore basins. USGS analysts with expertise in advanced trend analyses such as Generalized Additive Models (GAMs) and the Weighted Regressions on Time, Discharge, and Season (WRTDS) method will examine both long-term and more recent changes in water quality over time. The USGS SPARROW (Spatial Regressions on Watershed attributes) model for the Lower Mississippi Major River Basin will be updated with annualized loadings obtained in this effort and used to support on-going targeting tools such as the EPA Risk Evaluation Tool. When used together, trend analysis and the spatial referencing method afforded by SPARROW are powerful data interpretation tools to evaluate the potential effects of nutrient reduction efforts on downstream water quality. Such understanding is critical to successful adaptive management of Louisiana coastal drainage basins and will be a pilot for other Gulf Coast estuaries. By collaborating closely with regional natural resource managers, we can use these results to help target basin locations and characteristics where restoration practices may have the greatest detectable effects as well as locations that are in need of additional monitoring in order to determine nutrient reduction effects.	$2,000,000
Chandeleur Islands Holistic Ecosystem Restoration	With a proven track record of interweaving the stories of wildlife, culture, and economy through award-winning exhibitry and immersive educational experiences, Audubon Nature Institute is uniquely positioned to showcase the story of Louisiana's coast to millions annually. Audubon has unmatched abilities to reach a diverse audience from within the	$147,000,000

	region and across the country to share the crisis facing our state and convey the devastating effect it will have far beyond our state. Two million guests of all ages and backgrounds visit Audubon destinations each year, including internationally-known influencers like Mark Zuckerberg and Justin Timberlake and world-renowned foundations like the Leonardo DiCaprio Foundation. In addition, Audubon has access to 180+ million annual visitors to accredited zoos and aquariums (more than NFL, NBA, NHL, and MLB annual attendance combined!). Audubon proposes to develop engaging exhibitry and effective educational programming to teach the public about the role Louisiana plays in the nation's economic vitality and the critical importance of protecting and restoring Louisiana's coast. Three core, scalable concepts are proposed to bring the story of Louisiana's coast to life and inspire action: 1. Audubon Aquarium of the Americas Louisiana Wetlands Gallery: Named #4 Aquarium in the United States in 2017, Audubon Aquarium is the top-ranked aquarium in the region and welcomes one million guests each year, roughly half of which are tourists or visitors from outside the Greater New Orleans area. Audubon will leverage the Aquarium's existing infrastructure, access to a geographically diverse audience, and proven experience in creating engaging exhibitry to create a new gallery focused on Louisiana's coast. Positioned directly overlooking the Mississippi River, the new 7,450 square-foot gallery will exhibit the vast bio-diversity of Louisiana's coast while conveying the urgency of its fragile state and inspiring guests to take action to protect and restore our coastal ecosystem. The gallery will interweave live animal exhibits and hands-on educational experiences to tell the story of Louisiana's coast and what each of us can do to make a difference. 2. Audubon Zoo Louisiana Swamp Exhibit: Audubon Zoo, named #9 Zoo in the United States in 2017, welcomes one million guests each year with an emphasis on reaching Louisiana families and school children. The Zoo's Louisiana Swamp exhibit has received national acclaim for its innovative exploration of the relationships between Louisiana's people and ecosystem. After more than 30 years, it is time to carefully consider the most compelling way to exhibit the ecological and economic importance of Louisiana's coastal wetlands to our visitors and communicate the devastating effect its destruction will have across the country. Audubon will refocus interpretive exhibitry at the Louisiana Swamp and utilize this remarkable asset to inspire visitors to take action to preserve and restore coastal Louisiana. The revitalized Louisiana Swamp will provide an entirely immersive experience designed to transport visitors to Louisiana's coast. Opportunities to consider include small-scale replicas of coastal restoration and protection projects that will allow the public up-close knowledge of the work to restore and protect our coast. 3. Traveling Exhibit: A traveling exhibit will raise national awareness about the broad impact of the crisis facing Louisiana's coast. Audubon's leadership role in the Association of Zoos and Aquariums provides access to 232 accredited facilities with more than 180+ million visitors annually. Audubon has a history of success with traveling exhibits, which are popular with museums, zoos, and aquariums. The traveling exhibit will echo that of Aquarium Wetlands Gallery, with the ability to adapt exhibit components regionally. A traveling exhibit will generate millions of media impressions in each city, further increasing national awareness.	
Development of a Decision Support System to Address Management of Nutrient and Sediment Loads Entering Bays and Estuaries from Gulf Watersheds.	Jefferson Parish is committed to connecting its citizens to its coast. The best way to learn and get up close and truly appreciate Jefferson's Barataria Basin, is to put a paddle in your hand, and discover the historic swamps of the Pirate Lafite, by pirogue or Kayak. The Town of Lafitte is unique and cultural significant to not only Jefferson Parish, but the State of Louisiana and our nation. This community was greatly affected during the 2010 Deepwater Horizon Oil Spill, directly damaging the fisheries, the most important natural resource that literally feeds this town, and all associated industries. Jefferson is excited to submit our recreation project to the Trustee Council, as it will provide water recreation access to the surrounding marsh to the citizens of Lafitte, and the whole of Jefferson Parish. The project concept includes the design and construction of small water sport rental and storage building, the purchase of canoes, pirogues and equipment, and the funding to develop a safety and education program, and man the rental facility for the first 5 years. This project recreation building will tie in with the Jean Lafitte Nature Study Park Wetland Trace built 12 years ago. This nature boardwalk is a 41-acre site through the moss covered cypress swamp. Trails include covered pavilions, benches,	$4,000,000

	and scenic overlooks for viewing wildlife – from herons to alligators and turtles – and marsh plant species, such as Louisiana iris, lilies, and orchids. This trail and future recreation building are located over the levee and steps from the Lafitte Municipal Auditorium, an elementary school, a high school, a library, and a church. Additionally, the Town of Lafitte is working on the funding for a Wetland Center that would connect with this nature board walk. In 2016, the State of Louisiana Office of Community Development kicked off the LA SAFE Program with the following mission: "Working together for community resilience, economic prosperity and a better quality of life for all in Louisiana." This recreation project fits this mission, and kayaking access and rental facilities have been supported by their public outreach. LA SAFE will provide funding for projects like this to Jefferson and Lafitte and is a great program for them to support.	
Chandeleur Islands Holistic Ecosystem Restoration	The Chandeleur Islands, Louisiana lost a total of 271 acres (110 hectares) of seagrass due to oil. This project will continue the assessment of the impact and recovery from oil exposure on seagrasses in the Chandeleur Islands to complement on-the-ground restoration projects, including by determining where seagrass restoration efforts should be focused and how to most effectively monitor success. The rapid loss of seagrass resources on the Chandeleur Islands underscores needs to advance monitoring capabilities through use of emerging technologies to inform restoration efforts and priorities and monitor success. Specifically, this proposed effort will: 1) analyze imagery acquired in 2013-2016 using an object based image analysis approach to determine habitat coverage changes occurring since 2012; 2) collect and analyze sediment and plant for a subset of NRDA sample sites from 2012; and 3) explore advanced seagrass monitoring techniques using emerging technology, including UAS data collection, camera sampling designed for shallow turbid waters, and optical satellite imagery. Components of the methodology used in this effort should be scalable for monitoring other areas.	$147,000,000
Quantifying Water Availability and Quality from Submarine Discharge Points into Gulf Estuaries	Drone and ground based monitoring of Areas of critical land change in Southeast Louisiana Land change in coastal Louisiana occurs continuously but is temporally and spatially variable. Much of Louisiana is undergoing land change in the form of wetland conversion to open water. However, a few areas are undergoing land gain in the form of open water conversion to wetlands. Two areas where this is occurring are in the vicinity of the Caernarvon Diversion and Mardi Gras Pass. In both cases, the land gain id due to flow of Mississippi River discharge carry sediment that is being deposited in open water which later became vegetated. This process is natural, and critical to understanding the future performance of proposed diversions the Louisiana Coastal Master Pan. There is a need to understand these areas of deltaic land-building to optimize performance of future diversions. High-resolution photographs are useful to map land change but also to map other changes such as vegetation type. Aerial photography is very useful but is not available frequently or is not during the best season to capture the full dynamic of the land change process. Drone photography couple with direct ground-truthing, may provide an inexpensive and highly accurate method to define and change and a new level of spatial and temporal scale. Two target areas are proposed and would include acquisition twice a year for three years. Images would be stitched and georeferenced. Field observations of land-water boundaries and vegetation type will be incorporated into an interpretation within the discharge footprint of the two river outlets. LPBF will provide overall project management and the field collections. LPBF has a high-resolution RTK Trimble Geoexplorer that will be sued for field mapping. LPBF has already produced numerous technical report of hydrology and geomorphology of both proposed areas of investigation. University of New Orleans will provide drone equipment and oversee drone acquisition of photography. UNO's Canizaro - Livingston Gulf States Center for Environmental Informatics (GulfSCEI) has the capacity for surveying large areas using the SenseFly eBee Plus fixed-wing drone. The drone team has been professionally trained and includes an FAA-certified pilot. The eBee Plus has a maximum flight time of 59 minutes per battery charge and is capable of mapping 2.2 km2 in a single flight at 400 ft altitude. Different sensors are available depending on the purpose of the mission. The standard S.O.D.A. camera can take 20 MP RGB images with a precision of 2.9 cm/px at 400 ft. The 4-band Parrot Sequoia sensor can capture Red Edge and Near IR frequencies (useful, for instance, in determining vegetation quality). Finally, the thermoMAP sensor can use thermal imaging with 0.1 °C, 14 cm/px resolution to sample heat-	$3,000,000

	sensitive targets (e.g. solar installations, anomaly detection, etc.). All flights are digitally-planned using the latest eMotion 3 software suite. This means flights can be conducted in any environment so long as an adequate takeoff vector and a suitable landing space are available. Extremely accurate mosaics and 3D point clouds can then be generated using Pix4D software utilizing depth inference and feature detection. These mosaics are fully orthonormalized to correct distortion and the resulting images are suitable for making measurements. Two Dell PowerEdge servers each with 320 GB RAM are setup to efficiently compute and render the image output. The center's capable machine learning staff can then analyze the resulting images against various artificial intelligence models to find trends, extrapolate patterns, and make predictions. Equipped with these technologies, GulfSCEI can collect samples for a vast range of applications and flight scenarios.	
Stock Structure, Abundance, and Habitat of Common Bottlenose Dolphins in the Mississippi Sound Region	Derelict crab traps are a form of marine debris, that are specifically crab traps that have become discarded, lost, or abandoned in the marine environment. The Derelict Crab Trap Rodeos (DCTR) program in Louisiana was initiated in 2004 by Louisiana Department of Wildlife and Fisheries (LDWF) to remove derelict traps and to reduce the environmental and economic impact of derelict crab traps on the state and its' communities. LPBF participated in rodeos in 2016 and 2017 and in 2017, LPBF released a report on the impact of derelict traps and the opportunity to enhance fishery by greatly accelerating removal of traps (Lopez, 2017). LPBF's estimates that the Pontchartrain Basin (east of the Mississippi River) has between 39,000 and 125,000 visible derelict crab traps remaining, and the entire Louisiana Coastal Zone may still contain between 121,000 and 390,000 visible derelict crab traps (Lopez, 2017). Coast wide, these traps may cause mortality of 3 to 10 million crabs per year, causing an economic impact to the crab fishery worth of $15 to $47 million over three years. Since 2004, the derelict crab trap rodeos have averaged recovery of 2,500 derelict traps per year, which is just 2% of the lowest LPBF estimate of remaining derelict crab traps (0.6% of the maximum estimate). Louisiana's derelict crab trap problem is solvable and presents an opportunity to enhance our crab fishery and the coastal estuary in general. However, this requires a dramatically increased and renewed focus in efforts to recover derelict crab traps. Primarily because of specialized boats used to retrieve derelict traps more efficiently, the cost to retrieve traps decreased from ~$20/ trap in 2016 to ~$9/trap in 2017 (Lopez, 2017). Using a retrieval cost of $12/trap, LPBF's estimates that the cost to remove all derelict traps in the Louisiana Coastal Zone to be $1.5 to $4.6 million. Based on the potential retail value of the saved crab resource, this suggests a 10-fold positive return on investment; that is, every $1 invested to retrieve derelict traps may return $10. It seems clear that the opportunity to accelerate the removal of decades of accumulated derelict traps is a sound investment. A more thorough NOAA (2016) study of derelict crab traps in the Chesapeake Bay also concluded that derelict crab trap removal is highly cost effective: "Targeted pot removals in heavily-fished areas would be a highly cost-effective way to increase catch efficiency and reduce bycatch mortality." (NOAA, 2016) Scheld et al (2016) found that the $4.2 million investment to remove crab traps in Chesapeake Bay provided an enhanced blue crab harvest of $21.3 million. This implies an ROI of 5 to 1, in spite of the fact, that the cost to remove traps during this period exceeded $100 per trap (Pers. Comm. Donna M Bilkovic – Virginia Institute of Marine Studies). Based on our analysis and the Chesapeake Bay, it is very likely there is a strong positive return on investment to retrieve derelict traps in Louisiana, especially with the higher efficiency demonstrated in 2017 at just 10% of cost to retrieve traps compared to Chesapeake Bay. Proposed Activity LPBF will work closely with the LA Department of Wildlife and Fisheries to accelerate removal of derelict crab traps in the Pontchartrain Basin for three consecutive years. Best practices will be used from past rodeos to keep cost for removal to less than $10/trap. A target of 18,000 traps per year is likely to outpace the introduction of derelict crab traps, and therefore actually reduce the inventory. Retrieval of traps will be during designated closures for trap removal. Emphasis will be on using large commercial flat boats for trap retrieval due to the significant efficiency and cost savings. Biological surveys will be conducted and tracking of trap retrieval will be	$7,000,000

	recorded. A final report will be produced of the overall success of the program and with recommendations to further enhance the program.	
Algae Bottle	Oyster habitat and commercial oyster harvest exists in the Biloxi Marsh and Chandeleur Sound, in southeast Louisiana. Because of the closure of a large shipping channel known as the Mississippi River Gulf Outlet (MRGO) in 2009 surface water salinity appears to have improved in this region for the propagation of oysters. LPBF has released two reports of the evaluation of suitability of oysters in this region (2013 to 2016) and have identified the so-called "sweet spot" for oyster propagation. It appears that massive investments of cultch are being made in this region. Landings from private leases has been very good. However, stocks on the public seed ground are at record lows. One contributing cause of low stocks is likely the seasonally hypoxia observed in Chandeleur Sound. LPBF has discussed this situation with La Department of Wildlife and Fisheries, and it has been suggested that brood reefs would be a key to accelerating the recovery of oysters in this region. A brood reef in this case would be sites approximately ½ acre in size composed of cultch on the bottom and vertical reef material (2-4 ft.) on the perimeter (possibly reef balls). The brood reef would be within the public seed ground and within the "sweet spot" identified by LPBF. The small brood reefs would be "red-lined" for no-harvest. The brood reefs would be aligned in two directions. One set of reefs would be down the salinity gradient. The other would be aligned along the marsh edge and roughly parallel to a zone of uniform salinity at any time of year. These reefs would also be close to the commercial private oyster leases. The brood reefs could develop as sites of concentration of large mature oyster that produce spat. The vertical reef structure provides some insurance the reefs will survive bottom hypoxia. Placement down the salinity gradient is to account for unpredictable seasonal variation in salinity, so that there is some assurance that at least some reef sites will be in an optimum location. LPBF is discussing specific site location with local commercial oyster fishers. The initial program is to place and monitor 20 brood reefs. The land loss of the Biloxi Marsh is largely due to shoreline erosion. Enhancement of oyster propagation through brood reefs should also enhance the shell budget. More shell adds mineral detritus to the marsh, and also provides hardening of the shorelines. Oysters are the key to the longer term sustainability of the Biloxi Marsh. The Biloxi marsh is identified as a critical landscape feature by the Corps because it helps reduce storm surge in both Louisiana and Mississippi.	$10,000
Acoustic Discrimination of Yellowfin Tuna as an Aid to Mitigating Catch of Too Small Tuna and Rebuilding YFT Stock Status	Louisiana contains approximately 40% of the coastal salt marshes in the continental United States but accounts for approximately 80% of the nation's coastal wetland loss. Marsh birds are considered important for conservation purposes, may serve as good indicators of marsh health, and provide economic opportunities for bird-watching recreational use, but they represent a group of species that are difficult to observe directly. Oil that occurred on marsh edges and penetrated deeper into interior marsh contaminated habitat used by a variety of marsh birds, including rails, seaside sparrows, waterfowl, wading birds, gulls, pelicans, shorebirds, and black skimmers. More than 8,500 individuals representing nearly 100 bird species associated with oil-affected habitats were collected dead or impaired throughout the five Gulf Coast states during wildlife rescue response and NRDA operations. More than 3,500 additional birds, across numerous species, were also observed with external oiling. Although mortality was not estimated beyond the marsh edge, tens of thousands of birds were at risk of oil exposure within this habitat. The purpose of this project is to (1) create a coast-wide monitoring program for coastal marsh birds in Louisiana that will track broad scale patterns of species occurrence, (2) provide occurrence and abundance data at restoration sites to assist in evaluating restoration efforts in an adaptive management framework, and (3) assess the cumulative effects of all marsh restoration projects to achieve a sustainable environment for marsh birds coast-wide. This data will support project-level evaluations while simultaneously creating a comprehensive system to evaluate cumulative effects coast-wide, as opposed to project-by-project monitoring. The nested design of this effort will result in data that is scalable. This proposed monitoring project would fulfill the TIGs commitment to, as defined in the Trustee Council's Standard Operating Procedures, project-level monitoring for all projects, while also supporting the evaluation of all Bird Restoration Type projects by providing for	$500,000

	consistent monitoring protocols that allow one to synthesize data to evaluate Restoration Type success. This project could be funded through phases. In the first phase of the program, sites will be co-located with: (1) existing coastal marsh reference sites in Louisiana (Coast-wide Reference Monitoring System [CRMS], 390 sites) and (2) existing and planned DWH marsh restoration projects (DWH sites in LA-26). During Phases 2 and 3 of the program, additional sites will be established throughout coastal Louisiana as part of a comprehensive coastal monitoring framework that is connected to the broader System-Wide Assessment and Monitoring Program (SWAMP). This monitoring will be conducted at two scales to address different questions. At the landscape scale, automated audio recording units (ARU) will be installed at a large number of sites in coastal marshes to provide the monitoring data necessary to understand how occupancy dynamics are changing for the marsh bird species along the Gulf coast. These data will be used to determine the status and trends of marsh bird species, as well as information about the habitat relationships of these birds and their landscape-scale distribution. This information will be important for cumulative evaluation of marsh restoration projects using marsh birds as a metric of success and for species conservation. At a finer scale, traditional marsh bird monitoring point count protocols involving human observers and call playback techniques will be used to estimate abundance of marsh bird species. These sites will be used to monitor the response of birds to restoration, and could be used as part of the monitoring and assessment of a structured decision making adaptive management approach that will allow managers to repeatedly evaluate which marsh restoration methods have the greatest effect for marsh birds.	
Point Aux Marchettes Living Coastal and Marine Resources Replenishment and Protection (Phase 1)	The Coalition to Restore Coastal Louisiana (CRCL) proposes creating a nearshore living shoreline in Louisiana's Barataria Basin in an area highly suitable for oyster reef restoration and alongside marsh that would benefit from shoreline protection. Leveraging our existing Oyster Shell Recycling Program, CRCL will collect oyster shell from New Orleans-area restaurants and return it to our coastal waters as cultch. Recycled oyster shell and limestone will be placed into flexible Gabion mats or long, flat Gabion baskets and arranged to contour the marsh edge, spanning from fringing to nearshore habitat. As oyster larvae present in the water column attach to the provided cultch structure and grow, the reef will become a living shoreline. Project Description CRCL proposes to the Louisiana Trustee Implementation Group creating a mile-long near-shore oyster reef composed of recycled oyster shell for installation in the Barataria Basin, a watershed that was acutely impacted by the Deepwater Horizon Oil Spill. We assessed habitat suitability to identify a general target area for this reef and a specific potential reef location that would be likely to sustain oyster populations over 10-50 years (considering that proposed sediment diversions of the Mississippi River begin within this timeframe), support the recovery of oyster resources, and have a high impact on ecosystem resiliency. The target location lies adjacent to the Public Seed Grounds in Hackberry Bay, thus as a living shoreline, the project will increase the availability of oyster larvae to a strategic location. As oyster larvae attach to the provided cultch structure and grow, the reef will become a living shoreline that can provide marsh, submerged aquatic vegetation, and nearshore benthic habitat, and that will filter nitrogenous waste from water, all helping to restore ecological function to shellfish, fish, bird, and other marine communities. Restored ecological function will further benefit the local economy by supporting recreational and commercial fishing industries. The reef will also attenuate wave energy, thus slowing the erosion of the shoreline behind it. As a living shoreline, the reef will also be able to adapt to environmental changes, such as growing vertically to keep pace with sea level rise. Objectives 1. Restore a smaller oyster reef that spans an elevational gradient 2. Enhance oyster abundance and spawning stock adjacent to Public Seed Grounds 3. Reduce shoreline erosion to help maintain hydrological separation from bays to the south affected by oyster predators 4. Restore ecological function to shellfish, fish, bird, and other marine communities by creating/protecting various habitats including marsh, submerged aquatic vegetation, and nearshore benthos 5. Engage the public in oyster restoration activities Measurable Outcomes • Protect 1 mile of shoreline • Establish 1.5-2 acres of oyster reef habitat with cultch • Fortify 12 acres of marsh habitat • Return 2,000 cubic yards of shell to Louisiana's coastal waters • Engage 250 volunteers in coastal resiliency work.	$24,000,000

Integrated Restoration and Recovery of Oyster Resources in Calcasieu Lake (LA)	Dr. Louis J. Thibodeaux, Emeritus Professor, Department of Environmental Science [Emeritus Chemical Engineering], LSU Baton Rouge. thibod@lsu.edu PI. Dr. David W. Constant, Chaired Professor and Chair of Department Biological and Agricultural Engineering, LSU Baton Rouge. DConstant@agcenter.lsu.edu Students: Schexnayder, Amelia; Nickles, Lauren; Brown, Seth; Theiessen, Maureen; Haque, Samuel; Mixon, Allison; Wells, Jasemaine. Faculty Consultants: Li, Chunyan (DOCS); Rabalais, Nancy (DOCS); Turner, Eugene (DOCS); Malveaux, Charles (BAE); Cramer, Gail (AgCENTER); Muley, Panjali (BAE); Whittemore, Raymond (CEE, UMaine); Financial Support: Biological Agriculture Engineering; Department Chemical Engineering; Environmental Science Department; Office Research Economic Development. ABSTRACT A vast hypoxic zone develops every summer and lies along the Louisiana coastline. Termed 'the Dead Zone,' it is considered the second largest in the world. Measured oxygen (O2) profiles obtained yearly demonstrate the problem in the Gulf of Mexico. Water density stratification in the shallow shelf water restricts efficient O2 downward movement from the atmosphere to the sea bed. Our theoretical model for O2 movement indicates that specific subsurface layers are resisting its transport rate. Coupled with the field measurements, the model is used to identify the layer depth, thickness and its O2 resistance contribution. The model-generated transport parameters and flux data concerning O2 behavior provide valuable information and insight about its mobility. The patterns and characteristics reflected in the model-derived data and then used to guide a proposed solution and a design procedure. Mechanical water mixing is an effective O2 re-aeration technology is common use. We are showing its effectiveness in laboratory experiments breaking density stratification at depth in the water column. This report is a brief overview of the research progress on the RxHYPOXIA project, both laboratory experiments and theoretical model studies. Our laboratory is located in Biological and Agricultural Engineering (BAE), 101 Aquaculture Research Building, E. B. Doran Hall, Louisiana State University Campus. INTRODUCTION. RxHYPOXIA is an alternative chemical approach, aimed at enhancing oxygen transport a twenty meter (~35 feet/~10 meters) travel distance. The ongoing chemical approach is aimed at diverting nitrogen-containing waters from entering the Mississippi River along its entire length ~1,000 miles (1,600,000 meters), travel distance. The enhanced aeration devices required for the RxHYPOXIA solution will obtain power from sea surface wind machines, solar energy, wave-energy generators, etc. Abandoned, existing in-situ, and re-located oil and gas offshore equipment may be used as well. These and alterative devices and procedures enhancing the downward transport of atmospheric, molecular oxygen (O2) to relieve the ongoing demand on the Gulf seabed (aka hypoxia) must be developed. It has been noted that the current efforts to reduce nitrates in the river from agriculture fertilizer runoff are voluntary and not being done on a large scales, there are many social and political hurdles. The current approach may eventually prove effective but a locally developed, funded, and controlled one, in the short-term is needed now to maintain marine life so vital to the Louisiana fishing industry, tourism, etc. The hypothesis: The targeted, downward, mechanical, mixing destruction of selected, thin, stratified, water layers causing high-resistance to O2 downward transport in the marine water column will significantly ventilate the Gulf shelf bottom waters and relieve hypoxia. Earth's atmosphere is the source of gulf oxygen. The atmosphere is the primary source of molecular oxygen, O2.	$5,000,000
Comprehensive Research and Conservation of Black Skimmers across the Gulf Coast	Rather than exploding obsolete oil and gas infrastructure, with the contaminant death of fish, turtles, etc., these structures can be cut and either left in place or removed. It is more costly than blowing up rigs, but it has the direct restoration benefit that the fish that would otherwise have been killed are not killed.	$4,500,000
Enhancing Capacity for Marine Mammal Stranding Response in Louisiana	This proposal directly supports restoration planning by distributing different restoration strategies across multiple restoration areas – such as those for fish, sea turtles and marine mammals. It will use the criteria and goals identified in the Strategic Frameworks for Restoration as guidance for project selection, scale, and implementation. We propose to further analyze the migratory movements of species in these groups and the threats for restoring their populations and synthesize this knowledge in a series of apps in the publicly available Blueways ConservationSDSS. This project will	$2,240,400

	advance the activities and investments of the Open Ocean TIG by: • Further defining the most important migratory pathways in the Gulf for species damaged by the Deepwater Horizon Oil Spill • Identifying the most significant threats to those pathways • Designing strategies for addressing those threats which can then be implemented using Open Ocean Natural Resource Damage Funds This project will use existing national and international databases (e.g., presence, presence-absence, movement, nesting), to conduct an expanded migratory pathways assessment and use a spatial optimization model to identify the most important blueways along coastal (including estuarine and nearshore) and offshore ecosystems in the Gulf of Mexico (including the pelagic habitat) that we should prioritize for different restoration strategies.	
Canal Backfilling in Terrebonne, Lafourche, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes	The New Orleans City Park Improvement Association received a donation of approximately 3,900 acres of land known as Couba Island in 1995. The purpose of this donation was to allow New Orleans City Park to derive revenue from the land in terms of oil and gas exploration. In November of 1995, the Association leased virtually the entire site to the Louisiana Department of Wildlife and Fisheries to establish the Timken Wildlife Management Area for a 25 year period. That lease expires in three years. The southern, western, and eastern shoreline of Couba Island has been experiencing land loss (documented by LDWF) due to erosion for more than a decade. While LDWF has proposed an armoring project to control the erosion, it has not been funded by the State. Since the original purpose of the donation to generate revenue for the Park has not been realized in many years, the Park wishes to sell the land. The goal is two-fold: to generate badly needed income for City Park and for another entity to take stewardship of Couba Island and hopefully prevent its loss due to storm surge and erosion.	$250,000,000
Trinity Island Backbarrier Marsh, Beach, and Dune Restoration	The South Louisiana Wetlands Discovery Center aims to revolutionize how we think, teach, and learn about Louisiana's disappearing coast. This innovative project, which began in 2003, will be located in the heart of the Barataria-Terrebonne National Estuary. As a STEM education center, it will enable students and adults affected by the BP oil spill to connect with our natural surroundings in a more meaningful way than traditional schools or museums. More importantly, it will provide our youth with the skill set necessary to adapt to a changing environment while also providing a recreation opportunity for the whole family. The Wetlands Discovery Center will be built on 2.4 acres near the Main Branch Library in Houma, LA and will be constructed in four phases with a total cost of $8.2 million. The property has already been secured and construction documents for the first phase have been completed. The property and construction documents have a value of $1.2 million that we have already invested. Phase I is ready to be constructed and has a cash match of $192,000 and $250,000 in Louisiana State Capital Outlay funds pledged. Even with $442,000 secured, we still lack the funds necessary for completion. Total cost of Phase I is $1.3 million. Once completed, our organization will finally have the capacity to expand our existing educational programs and develop new opportunities for students to learn about fishing, cast netting, kayaking, boating safety and other recreational activities. The Wetlands nature Exhibit will be developed as Phase I of this project representing over 17,000 square feet of manmade wetlands that will be used for hands-on learning and recreation. Components of this phase include a half-acre pond, two fishing piers, parking, an educational pavilion with restrooms and a boardwalk. More information about our future home and our programs can be found on our website at www.slwdc.org. This proposal is requesting funding to complete Phase I at $1 million. If other funds are available, we are ready to move forward with the other phases of the project. Total cost of this project is $8.2 million, but we are planning to build it in phases as the funds become available.	$0
Non-Explosive Removal of Oil Platforms	In July 2017, the USGS St. Petersburg Coastal and Marine Science Center (SPCMSC), in collaboration with the Louisiana Coastal Protection and Restoration Authority (CPRA), conducted a high-resolution bathymetric survey from Marsh Island Louisiana to Sabine Texas. Using shallow water vessels the nearshore was surveyed from the shoreline out to 2 km. The study is part of the CPRA Barrier Island Comprehensive Monitoring (BICM) project, and will include a bathymetric and shoreline change assessment, as the Chenier Plain shoreline is one of the highest eroding shorelines in the country. On	$0

	month later in August 2017 hurricane Harvey made landfall to the west of the study area. The storm then headed offshore and made a second landfall within the study area, between Lake Calcasieu and Lake Sabine. This provides a rare opportunity to capture the impact of a landfalling tropical storm on a highly sensitive coastal environment. The project proposes re-occupying the survey conducted in July 2017, between Lakes Calcasieu and Sabine to measure the bathymetric and shoreline change that occurred during the storm. This information is also necessary for any management or restorative action. The SPCMSC will provide the vessels, equipment, and technicians to collect and process the data, and publish the results.	
Biloxi Marsh Living Shoreline Project (Po-174) - Construction	This project will fill an important data gap for restoring native reef fishes injured by the Deepwater Horizon Oil Spill (DWH) by assessing the abundance and distribution of lionfish and their spatiotemporal proximity to and interactions with native reef fishes and identifying deep water refugia habitats available to native reef fish for targeted lionfish trapping and removal. This applied research will be conducted on reefs in the northern Gulf of Mexico (nGOM) exposed to oil from DWH, which had significant effects on the nGOM food web and native reef fish communities. In turn, declines in native piscivores following the spill likely aided the establishment of lionfish given similar trophic niches occupied. Traps designed specifically for lionfish capture and removal will be deployed to remove lionfish in deep-water refugia (>50 meters). Impacts of trapping on native reef fish composition and densities (e.g., bycatch) also will be evaluated for possible scaled-up deployment of traps in strategic areas. The project will be adaptively managed to monitor, mitigate, and minimize incidental catch of reef fish in traps (or observable habitat impacts resulting from traps) through changes in trap deployment practices or siting. Habitat characterization will be conducted at areas surveyed for lionfish and reef fish to better understand levels of lionfish and reef fish co-occurrence at a range of habitat types. This research will be conducted cooperatively with charter/for-hire vessels that were themselves impacted by the DWH. Project results will clarify interactions between lionfish and native reef fishes, elucidate population dynamics and trophic structure of reef fishes and communities, and inform broader implementation of traps for restoring native fish communities impacted by DWH. Methods: Geographic focus will be the nGOM, including portions of the West Florida Shelf, at sites both exposed and unexposed to DWH oil. Baseline information on community composition and abundance of lionfish and reef fish and habitat characteristics at surveyed sites will be determined through sonar technologies (e.g., side-scan, multi-beam, or split-beam) and underwater video cameras (e.g., towed cameras or remotely operated vehicles). Traps will be experimentally deployed at designated sites, and researchers will monitor treatment sites and control sites for lionfish and native reef fish densities pre- and post-treatment. Modeling exercises will be performed to assess the tradeoffs between bycatch of small demersal reef fishes (SDFRs) in lionfish traps versus the benefit of removing lionfish biomass from the nGOM. Biological samples collected from SDRFs will be utilized to examine their population dynamics, as well as the trophic structure and sources of organic C to lower trophic levels of nGOM reef food webs. The results of this applied field research will include estimates of trap efficacy, densities of lionfish across the nGOM shelf, and native reef fish densities pre and post trap deployment. Survey data will be synthesized into high-resolution habitat and fish distribution maps for reef fish species and lionfish to be of maximum use to fisheries managers. Field data will be utilized to better inform and parameterize an existing Ecosim with Ecopath model of the nGOM to estimate lionfish population dynamics with and without deep-water removals likely effects on SDRF population trends. Jointly, information collected will be used to understand and model the spatial overlap of lionfish with native reef fishes, as well as to estimate the impact of lionfish on reef fish distribution, ecology, and population dynamics. Recommendations will be made to guide future lionfish removal efforts in refuge areas or habitats important to the recovery of reef fish populations injured by DWH.	$57,719,731
Grand Bayou Freshwater Reintroduction	This project would enhance monitoring, research, and conservation of coral reef communities (sentinel sites) in order to promote their recovery from the Deepwater Horizon (DWH) oil disaster and long-term survival in the face of other threats. Coral communities are biologically diverse and productive habitats that support numerous marine species and	$6,400,000

	commercial and recreational fisheries. Key coral sentinel sites would be monitored and researched to assess their status compared to those injured by the DWH oil disaster. This type of control and reference site design will allow restoration managers to track and assess how coral communities are recovering and how environmental changes are affecting recovery rates. Understanding both recovery and ongoing environmental stressors will help restoration planners understand if management interventions are needed to speed recovery. The Northern Gulf of Mexico Sentinel Site Cooperative Program is a potential model for how to use research and monitoring to improve conservation and restoration management tools. The recovery and conservation of coral communities, particularly for the mesophotic and deep- water components, will also be fostered through the development of best fishing practices (e.g., training, manuals) for fishermen and related outreach aimed at reducing interactions with and deleterious impacts on coral communities that were either injured by the DWH oil disaster or are needed to help recolonize injured sites. The synergistic effects of monitoring, research, and promotion of best fishing practices at coral sites would directly support restoration efforts conducted in the Gulf of Mexico to address the injury of corals impacted by the DWH oil disaster. Shallow-, mid-, and deep-water coral communities in the Gulf of Mexico provide critical habitats for associated fish, marine mammals, rays and sharks, sea turtles, invertebrates, and other marine wildlife species. It's important that we keep a watchful eye on the health of northern Gulf corals to track their recovery from injuries sustained through the DWH oil disaster as well as how chronic and future threats affect recovery rates and overall health. Sentinel sites consisting of injured and non-injured (reference sites) coral communities need to be the focus of monitoring and research in order to help the scientific community understand recovery rates relative to those injuries and how their genetic diversity and connectivity are affected by chronic or emerging stressors such as fishing, changes in pH or depleted oxygen. Similarly, increased research is needed to understand and characterize how the various types of stressors, including energy development, fisheries, and environmental change, affect coral community sentinel sites. Several sentinel sites for shallow and mesophotic coral reefs have been identified in the northern Gulf of Mexico. One key area is the Flower Garden Banks (FGB) National Marine Sanctuary, which provides critical habitats for shallow and mesophotic coral reefs and associated fish and marine wildlife species. Sites proposed for inclusion in the FGBNMS might be appropriate candidates for long-term monitoring and research (LTMR) that provide information on recovery and status relative to DWH oil spill injuries and other stressors that might impede recovery and affect their productivity as EFHs. Additionally, this project will develop best fishing practices through manuals, training materials and extension efforts intended for commercial (e.g., golden crab and red shrimp) and recreational (e.g., snapper and grouper) fishermen who wish to avoid impacting sensitive corals.	
Golden Triangle Marsh Creation (PO-163) - Construction	The project will quantify the extent of delayed mortality after release for several pelagic highly migratory (HMS) fish species injured by the Deepwater Horizon oil spill that are caught in commercial and recreational fisheries. A potential vehicle for implementing tagging in the commercial fishery is through the existing Pelagic Longline Bycatch Reduction (PLL) Project for which tagging is identified as an "additional monitoring" activity in the PLL Project monitoring plan. Data collected would directly support PLL project management by recording changes in the survival, behavior, and movement of fishes following release that can help improve project success through modifications in project design or implementation. A parallel tagging effort would be conducted in the recreational fishery on a cooperative research basis to understand post release survival in a fishery whose participation is expanding. Findings would improve scientific knowledge of migratory behavior and connectivity of pelagic fishes inside and outside the Gulf of Mexico. The project will make use of pop-up satellite tags specifically developed to study species survival after release from fishing gears (i.e., survivorship tags). Additionally, conventional pop-up satellite tags will be used to study the migration, movement, and connectivity of tagged species. Addressing gaps in the current knowledge of the impact of post-release mortality and habitat use in various HMS fishes incidentally caught and released in commercial and recreational pelagic fisheries in the Gulf will improve scientists' understanding of species' survival and interactions with fisheries. In turn, this information	$56,662,930

	can help restoration and fishery managers increase the effectiveness of the PLL project by making improvements to alternative fishing gear and developing other viable management strategies to help the recovery of populations injured by the DWH oil disaster. The information gathered through this project will help resto ration decision makers and fisheries managers and scientists: 1) better understand differences in survival and behavior following release from traditional and alternative gears (or at different set depths) in the PLL fishery and support adaptive management of the DWH NRDA PLL project; 2) better characterize post-release survival and movement in the recreational fishery;; 2) prioritize strategies to reduce bycatch or incidental catch and rebuild fish populations through possible changes in fishing gear or practices; 3) build relationships, trust and awareness in commercial and recreational fishermen through cooperative research; and 4) detect changes in ocean conditions that potentially affect the behavior and productivity of highly migratory fishes.	
West Grand Terre Beach Nourishment and Stabilization (BA-197) - Construction	THE CONCEPTUAL APPROACH Dr. Louis J. Thibodeaux, Emeritus Professor, Department of Environmental Science [Emeritus Chemical Engineering], LSU Baton Rouge. thibod@lsu.edu Dr. David W. Constant, Chaired Professor and Chair of Department Biological and Agricultural Engineering, LSU Baton Rouge. DConstant@agcenter.lsu.edu A vast hypoxic zone develops every summer and lies along the Louisiana coastline. Termed 'the Dead Zone,' it is considered the second largest in the world. Measured oxygen (O2) profiles obtained yearly demonstrate the problem in the Gulf of Mexico. Water density stratification in the shallow shelf water restricts efficient O2 downward movement from the atmosphere to the sea bed. Our theoretical model for O2 movement indicates that specific subsurface layers are resisting its transport rate. Coupled with the field measurements, the model is used to identify the layer depth, thickness and its O2 resistance contribution. The model-generated transport parameters and flux data concerning O2 behavior provide valuable information and insight about its mobility. The patterns and characteristics reflected in the model-derived data and then used to guide a proposed solution and a design procedure. Mechanical water mixing is an effective O2 re-aeration technology is common use. We showing its effectiveness in laboratory experiments breaking density stratification at depth in the water column. This report is a brief overview of the research progress on the RxHYPOXIA project, both laboratory experiments and theoretical model studies. Our laboratory is located in Biological and Agricultural Engineering, 101 Aquaculture Research Building, E. B. Doran Hall, Louisiana State University Campus. RxHYPOXIA is an alternative chemical approach, aimed at enhancing oxygen transport a twenty meter (~35 feet/~10 meters) travel distance. The ongoing chemical approach is aimed at diverting nitrogen-containing waters from entering the Mississippi River along its entire length ~1,000 miles (1,600,000 meters), travel distance. The enhanced aeration devices required for the RxHYPOXIA solution will obtain power from sea surface wind machines, solar energy, wave-energy generators, etc. Abandoned, existing in-situ, and re-located oil and gas offshore equipment may be used as well. These and alterative devices and procedures enhancing the downward transport of atmospheric, molecular oxygen (O2) to relieve the ongoing demand on the Gulf seabed (aka hypoxia) must be developed. It has been noted that the current efforts to reduce nitrates in the river from agriculture fertilizer runoff are voluntary and not being done on a large scales, there are many social and political hurdles. The current approach may eventually prove effective but a locally developed, funded and controlled one, in the short-term is needed now to maintain marine life so vital to the Louisiana fishing industry, tourism, etc. INTRODUCTION. The atmosphere is the primary source of molecular oxygen, O2, and its consumption in the seabed each fall season that impacts the extent of hypoxia in the benthic boundary layer. Almost all measured vertical oxygen profiles (2015 data) show high O2 concentration levels at the air/water interface and in mixed layer which range from ~5.0 to 6.3 mg/L. The low levels above the bed sediment are 0.0 to 2.0 mg/L. A very few surface values upward to ~8 to 9 mg/L suggest algal growth respiration may be contributing O2 to the water. See Figure 1. Such vertical measured steady-state O2 profiles are present for weeks to a month along the shallow depth [5-20 m.], ~240 km length, and ~30 km wide	$75,107,243

	"footprint" along the northern Gulf of Mexico shelf area. It extends westward from the mouth or the Mississippi River to the Louisiana-Texas state line and beyond.	
South Louisiana Flooding Minimized by Reducing Flow Resistance with an Atchafalaya River Outlet Canal	The Gulf of Mexico Outer Continental Shelf (OCS) region hosts the highest concentration of energy exploration, development, and production facilities in U.S. OCS waters with >2,400 platforms. As such, monitoring, research, education, training, and response capabilities are essential – particularly in the Northern Gulf of Mexico, the primary focus of the NRDA Deepwater Horizon Restoration efforts. These needs have been clearly identified during the spill response by former NOAA Administrator Jane Lubchenco (Voosen, 2010), and afterwards in the NRDA PDARP and EIS, as well as other national and regional plans and scientific articles (National Research Council, 2011; Liu, Weisberg, Hu, and Zheng, 2011; Lubchenco et al., 2012; Murawski and Hogarth, 2013; National Research Council, 2014a; National Research Council, 2014b; Gulf of Mexico Coastal Ocean Observing System, 2015; Love et al., 2015; National Research Council, 2015; Watson et al., 2016; and the Ocean Research Advisory Panel, 2017). After the spill response, the National Research Council published a Special Issue to summarize the science used in the response to DWH and the gaps that remain, with a primary finding that insufficient baseline information on the functioning of the Gulf as a Large Marine Ecosystem severely limited spill response efforts (Lubchenco et al., 2012). As the NRDA Trustees documented in the Final PDARP and PEIS for the DWH spill, scientific information was essential for injury assessment - with hundreds of scientific studies implemented 2010 – 2015. However, in the absence of actual scientific information, scientific inferences were sometimes necessary to estimate the impacts of the DWH spill and prepare the restoration plan. To help provide the baseline information necessary for future effective preparedness and response, and to reduce the need for inferences to restore damaged resources in the future, the Marine Monitoring, Energy and Environmental Research, Science Education, and Training (MMEERSET) Station is proposed. The proposed project consists of leasing and efficiently converting one or more existing oil and gas platforms already slated for decommissioning in the area most affected by the DWH spill into a monitoring and research station. The project is an effective, efficient approach to concurrently address preparedness, response, and restoration that will capitalize on an existing structure in a priority area of the OCS with habitat for many of the PDARP's 13 restoration types (e.g., sturgeon, fish and water column invertebrates, mesophotic and deep benthic communities, birds, sea turtles, and marine mammals). Education and Training: The station can provide opportunities for professional educators and educational institutions to have real-time underwater video and other information on the offshore environment. Plans include an underwater lab/classroom. Proposed activities: Proposed activities include: 1) Converting an existing oil and gas platform in the Gulf of Mexico slated for decommissioning into a marine research and monitoring station; and 2) Operating that platform for its new purposes. Data applications: The potential applications of the data collected from a MMEERSET station are numerous and include, for example: baseline conditions, spill trajectory modeling, restoration, fish habitat research and monitoring, marine mammal monitoring, seabird monitoring, physical oceanography/structural design/energy, renewable energy testing, hurricane prediction modeling, mariculture research, underwater operations, climate change, ocean observing, air quality, education and ecotourism. Restoration outcome: The proposed project will provide critical information on locations and restoration types identified in DWH PDARP and PEIS. The information can be used for assessment of restoration activities and adaptive management. It will also provide scientific information necessary to help respond to future events and meet future restoration needs.	$0
Gulf and Freshwater Plant and Algae Restoration	Red snapper and reef fishes are susceptible to barotrauma when caught and brought to the surface, and mortality caused by barotrauma hinders rebuilding of overfished red snapper populations and could deter recovery from DWH impacts. Preliminary studies have demonstrated that recompression devices have great potential to increase fish survival from barotrauma related injuries. Initial information indicates that devices utilizing pressure-activated release once a certain depth is reached by the device (i.e., SeaQualizer) are considered the most promising from scientists and the most reliable from the majority of fishermen. Though recompression devices are promising, detailed information on their real-world	$500,000

	applicability has yet to be determined, especially for specific species. This project will make use of SeaQualizer fish descender devices in a sample of charter for-hire fisheries across the Gulf to study the effects of barotrauma on released red snapper and reef fishes, and to quantify the reduction in fish mortality obtained in different species and environmental conditions by employing conventional or acoustic tags to estimate immediate and delayed mortality of fish after return-to-depth versus surface release. An integral component of this project will be the use of instruments for geospatial verification of fishing activity installed onboard participating fishing vessels to efficiently track their fishing effort and spatiotemporal distribution while actively fishing and releasing fish. The information collected through this technology will help to provide more accurate estimations of fishing effort within the study area and for the entire project duration so that the benefits of using fish descender devices in the for-hire reef fish fisheries across the Gulf of Mexico can be better modeled and quantified. This project will also help determine best practices for anglers using fish descender devices on specific species through active involvement of for-hire fishermen. This stakeholder engagement will guide subsequent outreach efforts to increase descender device acceptance and use among fishermen. Stakeholders will define species-specific needs and will assist in development of best release practices for these species. This is especially important for those species affected by the DWH oil disaster, potentially offsetting DWH impacts by allowing these populations to recover at a faster rate than if these devices went untested and unused. The NMFS Southeast Fisheries Science Center has offered to provide technical guidance during various phases of the project, from the identification of best use of fish descender devices to the collection of information and data needed to advance fishery management of red snapper and reef fish. This assistance will help ensure that the data generated are of maximum use to fishery scientists for stock assessments and fisheries management decisions. Results of this research project will add to the state of knowledge regarding methods ensuring highest post-release survivability for reef fish species. Data derived from this study will help managers determine tools that can aid the recovery of red snapper and reef fish populations impacted by DWH oil disaster and that are suitable for wider use in Gulf of Mexico fisheries. These data will also increase the accuracy of discard mortality estimates across the Gulf and improve annual catch calculations.	
Hugelkultur Beds with Hi-Uptake Carex & Sagittaria Lined Ditches for Toxins Retention	Canals have caused most of Louisiana's landloss. Backfilling canals both prevents and restores land loss, and there are 27,483 potential canals on land available for backfilling if the money and political will prevails. Many canals are supposed to be backfilled upon abandonment but are not. The absence of a State or Federal backfilling program is a huge missed opportunity to conduct cost-effective restoration that could be done at a relatively low cost (Baustian et al. 2009). The vast majority of coastal wetland is privately owned, with the remainder in various public agencies including School Boards, non-Governmental Agencies, State and Federal Lands. It may take some organized and low-key persuasion, but canals could be backfilled within a program that was positively promulgated by State government. A State bundling of many backfilled sites within one effort would probably have economies of scale that doing one at a time do not; backfilling success is partially dependent on operator skill (Neill and Turner 1987), and a systematic monitoring and hypothesis testing program would advance restoration knowledge and future attempts. The price of backfilling (without sediment) was $9,266 per ha ($22,897 per acre) in 2005, and $12,224 per ha ($30,206 per acre) in 2018 when adjusted for inflation. The rough approximation of filling in all abandoned canals is, therefore, about $335 million dollars, or one fifth of the cost of one river diversion. The total crude oil production since 1900 in the southern region was $613 billion at $60 per barrel, or 0.05% of the cost to restore all of the now abandoned or plugged canals on land in the same region. The State restoration plan is a minimum of $50 billion dollars over the next 50 years. Can 0.67% of that money be spent to reverse/restore the cause of the land lost?	$1
Kemp's Ridley Stock Assessment	The impact of habitat loss on shorebirds may be exacerbated by disturbance from human recreational use, which further reduces the amount of coastal habitat that is functionally available. This can have consequences for the condition of individual birds or for population processes, both of which should be considered in strategies to reduce conflict between	$250,000

	shorebirds and recreational users of coastal habitat. Our objectives were to implement measures to mitigate the negative impacts from human recreational use, coastal habitat modifications to Piping Plover (Charadrius melodus) body condition and demography. Also applies to additional overwintering bird species. The condition of these overwintering species may influence reproductive output, through cross-seasonal effects and areas that are heavily disturbed can result in reduced reproductive output from affected individuals (Gibson et al. 2018).	
Testing Gear Modification to Reduce Bycatch Impacts in the Gulf of Mexico Swordfish and Tuna Fisheries	The Chandeleur Islands ("Chandeleurs") form an iconic island chain in the northern Gulf of Mexico included in the Breton National Wildlife Refuge, the second oldest refuge in the system. The Chandeleurs are essential for protecting coastal communities; providing habitat for wildlife, including threatened and endangered species and migratory birds (protected species); and for promoting both recreational and commercial fisheries. We propose using natural coastal sediment dispersal processes as tools to restore the Chandeleurs. Wave driven currents run parallel to the Chandeleurs eroding sand from islands and transporting it to "sand sinks" north and south of the islands. Hewes Point, a submerged sand spit, is one of these "sand sinks" that consists of sand eroded from the island chain. The sand at Hewes Point can be mechanically returned to the central part of the system, extending the island lifespan by centuries. We propose: ● Mining sand from Hewes Point and strategically placing sand reserves behind the center of the island chain (see figure 1B); ● Mimicking a natural process by allowing shoreline erosion to slowly feed sand from the reserves to the beaches, replenishing sand lost on the beach; ● Protecting sand reserves from storms by placing them mostly below the mean water line where the destructive forces of storms are minimal; ● Using tidal passes and low areas in the dune as pathways to ensure that sand is retained within the system, maximizing the longevity of this restoration; and ● Using sediment to restore New Harbor Island which is an important bird rookery. Replenishing the Chandeleurs' depleted sand reserves will promote large scale holistic ecosystem restoration by: ● Adding longevity (centuries) to the island and seagrass beds and the fishes, sea turtles, and birds that rely upon them; ● Preserving and create additional habitat for protected species; ● Creating sand reserves behind the islands that will provide a growing platform for ma rsh grasses and black mangroves, which will provide habitat for marshbirds, colonial waterbirds, shorebirds, and other wetland organisms; and ● Creating a self-sustaining system that could carry benefits for coastal communities, fisheries, and protected species over the long term (centuries). - Barrier island restoration projects usually require regular maintenance and quickly erode (decadal).	$750,000
Oyster Restoration: A Solution and a Large Scale Prototype for National and International Markets	This project will build an online Decision Support System (DSS) that will allow managers to run scenarios by altering identified sources of nutrients or sediment within Gulf watersheds to see the downstream effects of those scenarios on nutrient and sediment loads entering bays and estuaries across the Gulf. The DSS will be based on development of Total Nitrogen, Total Phosphorus, and Suspended Sediment Spatially-Referenced Regressions on Watershed Attributes (SPARROW) models for the entire Gulf. In addition, display of model results in the DSS can help managers target watershed areas with high nutrient loads to better locate Best Management Practice implementation. Nutrient load estimates from the models entering bays and estuaries can also be used as nutrient inputs to available hydrodynamic models to identify potential hot spots across the Gulf for Harmful Algal Bloom outbreaks. Sediment models can help locate hot spot areas for high sediment loads within Gulf watersheds, which could be important to manage wetland restoration.	$50,000,000
Ecosystem Modeling and Chandeleur Island Restoration Engineering and Design	The Chandeleur Islands ("Chandeleurs") form an iconic island chain in the northern Gulf of Mexico included in the Breton National Wildlife Refuge, the second oldest refuge in the system. The Chandeleurs are essential for protecting coastal communities; providing habitat for wildlife, including threatened and endangered species and migratory birds (protected species); and for promoting both recreational and commercial fisheries. We propose using natural coastal sediment dispersal processes as tools to restore the Chandeleurs. Wave driven currents run parallel to the Chandeleurs eroding sand from islands and transporting it to "sand sinks" north and south of the islands. Hewes Point, a submerged sand spit,	$8,000,000

	is one of these "sand sinks" that consists of sand eroded from the island chain. The sand at Hewes Point can be mechanically returned to the central part of the system, extending the island lifespan by centuries. We propose: ● Mining sand from Hewes Point and strategically placing sand reserves behind the center of the island chain (see figure 1B); ● Mimicking a natural process by allowing shoreline erosion to slowly feed sand from the reserves to the beaches, replenishing sand lost on the beach; ● Protecting sand reserves from storms by placing them mostly below the mean water line where the destructive forces of storms are minimal; ● Using tidal passes and low areas in the dune as pathways to ensure that sand is retained within the system, maximizing the longevity of this restoration; and ● Using sediment to restore New Harbor Island which is an important bird rookery. Replenishing the Chandeleurs' depleted sand reserves will promote large scale holistic ecosystem restoration by: ● Adding longevity (centuries) to the island and seagrass beds and the fishes, sea turtles, and birds that rely upon them; ● Preserving and create additional habitat for protected species; ● Creating sand reserves behind the islands that will provide a growing platform for marsh grasses and black mangroves, which will provide habitat for marshbirds, colonial waterbirds, shorebirds, and other wetland organisms; and ● Creating a self-sustaining system that could carry benefits for coastal communities, fisheries, and protected species over the long term (centuries). - Barrier island restoration projects usually require regular maintenance and quickly erode (decadal).	
Enhancing Sea Turtle Nesting Beach Resiliency by Identifying and Prioritizing Measures to Restore Natural Coastal Processes	As resource managers continue to understand the effects of water availability and quality from freshwater systems that drain to Gulf estuaries and bays, one source that is typically unaccounted for comes from submarine outcrops from near-shore aquifers. The USGS has recently updated the Coastal Lowlands Aquifer System (CLAS) groundwater model which can be used to estimate groundwater flow and quantify estimates of water quality/nutrient loads from submarine discharges. Specifically, this project will utilize the updated CLAS model to address groundwater and groundwater/surface-water issues along the Gulf coast to: 1. develop an approximate water budget of groundwater flow to/from the coast; 2. evaluate subsidence related to groundwater withdrawals; 3. evaluate changes in groundwater withdrawals and effects on water budget and water levels which can be used to evaluate scenarios related to increases in GW withdrawals for public-supply, industrial, and irrigation water use; 4. evaluate potential saltwater intrusion; and 5. use groundwater flow quantities and water chemistry data to estimate nutrient loads into Gulf estuaries from submarine waters sources (which can then provide a better understanding of Harmful Algal Boom hotspots across the Gulf). This project could leverage an existing project by the University of Southern Mississippi that is already underway funded by a grant from the Mississippi Water Resources Institute that focuses on identification of groundwater seeps within the Mississippi Sound. Also, this project is indirectly related to priorities of the Water Resources Priority Issues Team of the Gulf of Mexico Alliance to better understand occurrence and distribution of HAB outbreaks in nearshore areas around the Gulf.	$650,000
Region-Wide Impacts of Anthropogenic Noise on Marine Mammals	Common bottlenose dolphins in the Mississippi Sound region were injured by the Deepwater Horizon oil spill. To effectively monitor the status and recovery of dolphins in this region, population structure needs to be assessed, and abundance periodically estimated throughout the region. Additionally, dolphin habitat use and how it varies with salinity needs to be assessed. This body of research is critical for informing restoration planning and implementation, and monitoring/evaluating restoration effectiveness. Common bottlenose dolphins are abundant (~3000 – 4000 dolphins) and widely distributed in Mississippi Sound and adjacent waters (Mississippi Sound region) including Lake Borgne, Bay Boudreau, and the coastal Gulf of Mexico. Dolphins occur in a wide range of physiographic habitats in this region (e.g., barrier islands, open water, marsh, natural and man-made channels) where salinity varies both spatially and temporally from near fresh to marine. Currently, bottlenose dolphins in the Mississippi Sound region are managed as one population or stock. However, because of the large area and the diversity of habitats, this area could likely be made up of two or more demographically-independent populations. During first 3 years of this 10-year project, remote biopsy sampling will	$500,000

	be conducted throughout the Mississippi Sound region during winter and summer. The sampling design and sample numbers will be sufficient to allow for subsequent analysis to define the population structure. The abundance of bottlenose dolphins will be estimated from capture-recapture or line-transect surveys during summer and winter every 2–3 years to monitor trends in abundance. Monthly or seasonal distribution surveys will be conducted to collect location data to model dolphin distribution with respect to physiography, and salinity, water temperature and other environmental parameters.	
Addition to Rockefeller Refuge - Cameron Parish, LA - Land Acquisition	My project idea is to take algae and make it into plastic that we can use to make bottles, containers, and anything else plastic. That way if we leave it out in the elements it'll dissolve back into algae and won't hurt the ecosystem.	$10,000,000
Atchafalaya Resilience Lab at Morgan City, LA	Background Acoustics represent an indispensable fishing tool, that fishers use to detect tunas, evaluate the amount and to catch it. If acoustic equipment used by fishers had the ability to discriminate the species and sizes of tunas present at sea, fishers could avoid areas where non-desired species and sizes of tunas represent the majority of the catch. However, the knowledge needed to discriminate tuna species using acoustics is not available yet as few studies have addressed acoustic properties of tropical tunas. To properly interpret the acoustic information from the fish it is necessary to know previously the acoustic properties of the species present at sea. In particular, in order to assess the abundance of any species it is fundamental to have an estimation of its mean Target Strength (TS) value and its TS-length relationship. TS values allow determining sizes and frequency response allows discriminating species before fishing, thus aiding a more selective fishing. Apart from using this acoustic information for selective fishing, direct biomass estimations of the species could be done with scientific purposes, as it is already done in other fisheries to support and complement stock assessment. ISSF (International Seafood Sustainability Foundation) with the aim of developing acoustic methodologies to help discrimination of tropical tuna species, has recently organized research cruises in the Pacific Ocean and in the Atlantic Ocean onboard purse seine vessels, to provide TS of Skipjack, Bigeye tuna and Yellowfin tuna. Although TS of Skipjack and Bigeye were obtained, revealing a distinct frequency response between them, it was not possible to encounter pure aggregations of yellowfin at sea which is fundamental to measure their TS. Project proposal In order to find monospecific schools of Yellowfin tuna and to analyze its TS a different strategy needs to be followed: conduct ex-situ TS measurements in an offshore cage. In coordination with the IATTC laboratory of Achotines in Panamá (where they have ready access to a provision of yellowfin tuna along the year) an offshore cage will be used, with yellowfin tunas inside to measure ex-situ TS. Although a previous experiment was performed in Achotines, there is a need to obtain more data on Yellowfin tuna´s acoustic properties. Expected outcome Knowing the acoustic properties (TS-length, TS-frequency) of a given species is essential to recognize it before fishing takes place. These fundamental information remains unknown for scientists and fishers. Obtaining TS of yellowfin tuna would allow fishers the ability to avoid undesired catches of yellowfin tuna but would also open up an important source of data for scientist. Acoustic tools are also used by scientist to study species´ behavior, movements, and abundance as long as the acoustic properties of the species under study are known. This project would allow the fundamental step towards the use of acoustics to (i) avoid undesired catches and (ii) to study yellowfin tuna by acoustic means. The knowledge acquired in this study will be also shared with fishers (throughout the ISSF skipper workshops), scientists (peer-review paper), and echo-sounder and sonar manufacturers to ensure that the acoustic selectivity of yellowfin tuna is achieved in the near future. In combination, these actions can mitigate unintended catches of too small yellowfin and thus assist in rebuilding stock status of Atlantic yellowfin (as well as other stocks) which is the dominant tropical tuna in the Gulf of Mexico.	$50,800,000
Bayou La Loutre Ridge and Marsh Restoration	The Biloxi Marsh Complex is a 210,000-acre network of wetlands located in St. Bernard Parish, Louisiana between Lake Borgne (west) and the Chandeleur Sound (east). The landform extends northward toward Mississippi and functions as a storm surge barrier for both the New Orleans metropolitan area and western coast of Mississippi. The Biloxi Marsh	$31,000,000

	Complex also provides a vast and productive ecosystem for fish and wildlife, including water column invertebrates such as ribbed mussels (Geukensia demissa). Although the landform experienced significant damage during Hurricane Katrina (2005) and the BP Oil Spill (2010), the Biloxi Marsh Complex is more geologically stable than other similarly situated deltaic complexes (T. Baker Smith, Inc., 2006). The prior success of the Louisiana Oyster Cultch project (2013, Natural Resource Damage Assessment Early Restoration) in the Biloxi Marsh is evidence that Natural Resource Damage Assessment (NRDA) funding may be successfully invested in impactful projects that mitigate the damage sustained by fish and water column invertebrates during the BP Oil Spill. However, shoreline erosion also poses a serious threat to the integrity of the Biloxi Marsh Complex and the health of area habitat. Shoreline erosion rates are particularly high along the western, Lake Borgne side of the landform near the Biloxi Marsh Wildlife Management Area (WMA) at Point aux Marchettes. Erosion rates at that location have historically ranged from 10 feet/year to 90 feet/year. The referenced stretch of shoreline is critical to the overall health of the Biloxi Marsh Complex because it protects approximately 500 acres of marsh in the WMA and serves as critical habitat for a number of fish and wildlife species. (St. Bernard Parish Government, 2016; 2018) St. Bernard Parish Government (SBPG) is requesting that the NRDA Open Ocean Trustee Implementation Group (OOTIG) consider funding the engineering/design and installation of approximately 20,000 linear feet of living shoreline products along Point aux Marchettes in the Biloxi Marsh Complex. The purpose of the project is to replenish living coastal and marine resources in the area, particularly fish and water column invertebrates, while also protecting critical shoreline habitat along one of the most vulnerable stretches of the landform. The proposed installation would ultimately replenish and protect habitat for ribbed mussels, fish, shrimp, and crabs. The scope of work for the project is consistent with Louisiana's Comprehensive Plan for a Sustainable Coast (2017 State Master Plan) and the SBPG Coastal Strategy Document (SBPG, 2016; 2018). The total budget for Phase 1 of the project is estimated to be $24 million. Since the project would mitigate the damage sustained by fish and water column invertebrates during the BP Oil Spill, SBPG proposes that it be classified as an OOTIG (replenish and protect living and coastal marine resources, fish, and water column invertebrate) restoration effort. Preliminary cost estimates for the engineering/design and installation of approximately 20,000 linear feet of living shoreline were performed using previous estimates generated during the Coastal Wetlands Planning, Protection and Restoration Act Project Priority List 27 process (2017), in which the subject project was a nominee and finalist for Phase 1 (engineering/design) funding. It is estimated that Phase 1 of the project would cost approximately $24 million.	
Audubon Coastal Bird Stewardship	For a suite of reasons, oysters (as a habitat and a fishery) have heavily declined in Calcasieu Lake (southwest Louisiana) over the past decade. Since 1991 stock estimates have peaked at nearly 1,300,000 sacks of seed (less than 3") and sack (greater than 3") oysters each, but from 2012 to the present estimates have averaged closer to 100,000 sacks. This loss represents both the significant reduction of oysters as an important commercial fishery in southwest Louisiana and a loss of the aerial coverage of oysters as an essential estuarine habitat. Both the value of oyster resources as a habitat and fishery and linked and must be considered together when planning for and executing their restoration and recovery (this is true everywhere in the Gulf). As a habitat, healthy, mature oyster reefs protect adjacent shorelines from erosion by abating/deflecting wave energy and acting to accumulate sediment between the shoreline and reef; serve as a complex, structural habitat for many species if shrimp, crabs and fish that rely of reefs as a source for refuge and/or forage for some of all of their life history; and improve or maintain estuarine water quality as oysters filter water in order to feed. As a fishery oyster harvest are a traditional and needed source of income to the communities around Lake Calcasieu; part of the social fabric of these communities; and could also become the source of cultch materials (shell) needed for the long-term maintenance of the fishery. In Calcasieu Lake one of the most limiting factors to the restoration and recovery of oyster resources is available substrate upon which oysters can settle, grow, and reproduce. (It should be noted that "restoration" here has two meanings - 1) restoring a viable, self-sustaining habitat and 2) putting cultch material on	$15,000,000

	existing reefs, or making a new cultch plant, that will be harvested.) Currently the state of Louisiana plant cultch material (normally lime rock) in areas that are conducive to oyster growth. Often when these areas are harvest the cultch is lost or because it is close to the grade of the sediment, is buried. Also, reefs and cultch material that have little to no vertical relief are more subject to a higher salinity regime and lower dissolved oxygen - both with bode poorly for long term survival. The project description then is this - 2 to 3 miles of intertidal 6'x6'x1' gabions baskets with rock will be place along the shoreline in West Cove in Calcasieu Lake. The Nature Conservancy already has 1 mile of reef structure using this design in place and has another 2 miles already permitted. Plus the permit can be amended to include additional coverage. The TNC project was installed in the summer of 2017 and monitoring of the site indicates that oysters are growing, and that shoreline loss is being abated. In addition a 50 acre cultch plant would be placed in a nearby, subtidal location. The height of this plant would be 12" on average - that will allow for oysters to establish and grow in a salinity and oxygen environment that is more favorable than a cultch plant of lesser height. After this reef has an established, self-sustaining population of oysters it will be made available to harvest by tonging (while not included in the budget of this project ancillary work should be done to retain much of the shell harvested from this reef so that it can be put back on this reef for the long-term maintenance of the site and to reduce or eliminate the need and cost of bringing in lime rock from offsite). The final piece of this project is the siting of an "aquaculture park" that would allow for the off-bottom, cage culture of oysters for commercial sale. This project is designed to recover oyster resources as both a fishery and a habitat. Establishment of aquaculture gives harvest more options for production and increasing the habitat will increase local larval supply and shell availability which is good for habitat and fishery needs.	
Vessel Activity Monitoring within Nearshore and Inshore Northern Gulf Waters	Audubon and partners organizations across the Gulf will follow a coordinated survey effort in order to assess population size, distribution, and productivity of breeding Black Skimmers. This information will be used to identify areas in need of habitat restoration because of island erosion, or areas in need of management as a result of nest and chick depredation or frequent human disturbance. Habitat creation and/or management will be implemented in partnership with site managers in each state and will focus on areas identified during the research phase.	$3,040,000
Louisiana Oyster Cultch Plants	The Marine Mammal Stranding Network (MMSN) was formalized by the 1992 Amendments to the Marine Mammal Protection Act (MMPA) and volunteer MMSNs authorized by NOAA Fisheries exist throughout all coastal states to respond to marine mammal strandings. In Louisiana, two MMSN organizations, Louisiana Department of Wildlife and Fisheries (LDWF) and Audubon Aquarium are currently authorized under the MMPA to respond to live or dead stranded marine mammals (LDWF and Audubon) and rehabilitate marine mammals (Audubon). Both organizations are limited in response capabilities for such a large, complex coastline in Louisiana. Therefore, there is a need to increase existing capacity and expand networks and partnerships to additional areas to help fill gaps in capabilities and coverage along the Louisiana coastline. On average, there are approximately 81 cetacean (whale and dolphin) strandings along the coast of Louisiana each year. Of these, 86% are bottlenose dolphins. However, in 2019 (January 1- May 31), there have already been more than 90 bottlenose dolphin strandings, straining the current capacity of the MMSN. This project aims to address gaps and enhance capacity in the current capabilities of the MMSN in Louisiana to improve timeliness of response, enhance survival, and improve diagnosis of illness and cause of death in cetaceans to better understand natural and anthropogenic threats, which will inform restoration planning, monitoring and adaptive management. This project will fund a Stranding Coordinator for Louisiana to coordinate with federal and state agencies, improve existing partnerships, and identify additional partners and resources to enhance capacity for stranding response. The Stranding Coordinator will develop those partnerships to improve existing MMSN coverage. This project will also fund equipment and resources to allow the Stranding Coordinator to respond and/or facilitate the response to and investigate stranded animals until other partners can be trained, authorized, and are able to function independently. The project also funds additional resource needs (e.g., equipment, supplies, etc.) for authorized stranding network partners in the State.	$6,000,000

	Addressing gaps and enhancing capacity in the current capabilities of the MMSN will serve to improve timeliness of response and diagnosis of illness and cause of death in Louisiana. This project is anticipated to have positive impacts on the survival of many marine mammal species in the GOM, but in particular on coastal and estuarine stocks of bottlenose dolphins, through enhancing activities such as responding to stranded dolphins, rescuing out of habitat, entrapped, or entangled dolphins, and improving reporting among the general public. In addition, this project will increase understanding of natural and anthropogenic threats to dolphins, which will inform restoration activities. Other offshore species that are subject to mass strandings or die-offs may also benefit, such as short-finned pilot whales and rough-toothed dolphins due to enhanced capacity and rapid response.	
Louisiana Broodstock Reefs	Project Location Many locations in Terrebonne, Lafourche, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes Problem Tens of thousands of oil and gas canals were dredged to support oil and gas exploration and production in coastal Louisiana. These canals directly destroyed hundreds of thousands of acres of wetlands, indirectly destroyed or degraded millions of acres of wetlands, and continues to cause ongoing indirect degradation and loss of extremely large areas of wetlands. Indirect degradation and loss are caused by alteration of hydrology, including increased water flow through the canals, saltwater intrusion, impoundment of wetlands via spoil banks, etc. See Turner and McClenachan (2018), and many others (see References in Turner and McClenachan (2018)). Proposed Solution It has been clearly demonstrated that backfilling oil and gas canals in coastal Louisiana is relatively easy and cheap, using small construction equipment (e.g. marsh buggy/backhoe). Turner and McClenachan (2018) estimated it may cost $335 million to backfill all abandoned oil and gas canals in coastal Louisiana. Since this request is limited to Terrebonne, Lafourche, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes, this proposal arbitrarily limits the proposed budget of this project to one-half the estimate of Turner and McClenachan (2018), $168 million, plus an additional 50% for landrights, engineering and design, permitting, administration, contingencies, and monitoring ($84 million), or a total budget of $252 million. I propose the project be implemented by the LCPRA, with advice from NPS and Dr. R.E. Turner and colleagues of LSU. The project can be easily scaled down or up. Project Benefit Backfill approximately 34,000 acres of canals within 10 years. Backfill approximately 13,500 miles of canals within 10 years. Convert approximately 240,000 acres of upland spoil bank habitat to emergent wetlands within 15 years. Convert approximately 13500 acres of open water (canal) to emergent wetlands by year 15. Convert approximately 120000 acres of open water (canal) to shallow water habitat by year 15. Increase SAV cover from 10% to 59% in 120,000 acres of open water by year 15. Convert 360,000 acres of canal and spoil bank to emergent wetlands or shallow water habitat by year 15. Partially restore hydrology to over 21 million ac of emergent wetlands.	$3,000,000
A Comprehensive Marine Debris Intervention Strategy to Help Restore Sea Turtles in the Gulf of Mexico	Restoration Approach Create, restore, and enhance barrier and coastal islands and headlands. Restore and enhance dunes and beach. Project Location Terrebonne, Lafourche, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes Problem All the Terrebonne Basin barrier islands are in an advanced stage of degradation. They serve important functions by protecting landward wetlands and estuaries from higher Gulf energy. They are critical components of any effort to restore the Terrebonne Coastal Basin. A number of barrier island restoration efforts are ongoing. CWPPRA has restored Trinity Island in the past, but this was a limited effort, and the island has lost area and volume since then, California Canal was not filled, and no backbarrier marsh was restored. Proposed Solution One approach that has been used on Whiskey Island, but not on Trinity, is to provide a large backbarrier marsh for the beach, dune, and supratidal habitat to roll over onto as the island retreats landward. This project proposes to create a broad expanse of backbarrier marsh on the landward side of Trinity Island, fill California Canal, and reinforce the beach, dune, and supratidal habitat with additional sand. Finally, the project will install sand fences and vegetative transplants. Project Benefit This project would add over 700 acres of backbarrier marsh and up to one hundred acres of beach, dune, and supratidal habitat. The project would prolong the life of the island.	$5,500,000

Health and Stock Assessments for Louisiana Marine Mammal Populations	Rather than blowing up platforms, simply remove them non-destructively by cutting. Or leave them in place as fishing reefs to restore lost fishing opportunities. It is very easy to credit, there is already a BOEM-funded study to evaluate impacts of destructive reef removal. The study estimated that high enough numbers of many reef fish are on reefs so that simply not killing them by explosive removal could make up a substantial creditable biomass.	$5,000,000
Coordinated Monitoring of Birds for Restoration and Conservation Across the Northern Gulf of Mexico	The purpose of this project is to create bio-engineered, marsh-fringing oyster reefs to promote the formation of self-sustaining living shoreline protection structures. The project will create functional oyster barrier reef along the shore of the Biloxi Marsh to reduce wave erosion, provide oyster habitat and prevent further marsh degradation. The Biloxi Marsh system is an important storm buffer for the Lake Pontchartrain Basin, including the Greater New Orleans Metropolitan Area and North Shore communities. The marshes are experiencing high rates of shoreline erosion caused by wind driven wave action. These living shoreline breakwaters will provide a buffer to wave action, reducing wave driven erosion rates in the project area.	$18,700,000
Region-Wide Dolphin Health Assessment and Conservation Medicine Program	The project area is located in the Terrebonne Basin in Lafourche Parish. The freshwater influence area includes all of Grand Bayou from the confluence with the Gulf Intracoastal Waterway (GIWW) to Margaret's Bayou and much of the marsh found both on the east and west banks. The primary goal of this project is to increase the flow of fresh water down Grand Bayou Canal from the GIWW. This water would lower salinities and add nutrients to the wetlands south of the GIWW along the east and west banks of Grand Bayou Canal. Specific goals: • Increase the flow of fresh water from the GIWW into Grand Bayou Canal from approximately 600 cfs to 1,600 cfs; • Redirect much of the freshwater from Grand Bayou Canal into the marshes east and west of Grand Bayou Canal; • Create 112 acres of fresh marsh and nourish an additional 14 acres of intermediate marsh west of Grand Bayou near Hwy 24. This project would increase the Grand Bayou cross-section and increase the flow of freshwater with the use of a bucket dredge. Material dredged from the channel would be placed along the existing shoreline embankment. Along the west bank of the channel a rock plug would be replaced with a 5-48" flap-gated culvert water control structure, an increase of 122 cfs. Along the east bank an earthen plug would be removed to allow freshwater to flow directly into the marshes to the east down Margaret's Bayou, an increase in 385 cfs. Without restoration, this region will continue to see the breakup of marshes and the conversion of low salinity marshes to brackish and saline marsh. More than 16,000 acres of marsh have been lost in this area since 1949, and a significant amount of this land loss may be attributed to direct removal and altered hydrology from canal dredging. Altered hydrology remains a current cause of land loss along with high rates of subsidence, which are estimated to be between 2.1 and 3.5 feet/century (LCWCRTF 1999). Between 1932 and 1990, it is estimated that land loss in these two units (North Bully Camp Marsh and St. Louis Marsh) was 12,840 and 3,450 acres, respectively. A major cause of land loss in these units has been adverse effects of altered hydrology, subsidence, and direct removal of material via canal dredging. Canal dredging also caused greater tidal scour and saltwater intrusion. In the southern portion of the unit, wind related erosion has been and continues to be fairly extensive. Despite the large amount of marsh loss that has occurred in the southern and eastern portions of these two units, the marshes found in the more northern reaches have, until recently, stayed intact. However, the northern marshes have recently begun to show increased loss rates. (LCWCRTF 1999). Currently, the interior marshes in the proposed project area provide buffer to residents and businesses along Hwy 24, oil and gas infrastructure, and the South Lafourche levee system, which protects the town of Golden Meadow. Because the amount of freshwater input into the area has become so limited, the increase in salinities has caused an extensive amount of wetland loss and has reduced the buffer that these marshes provided. By allowing increased freshwater into the area, the salinity in the area will be controlled and reduced, and the health of the marsh that provides protection from storm surge and flooding will improve. Lafourche Parish is requesting funding for construction of the Grand Bayou Freshwater Reintroduction project (03a.HR.100 in the 2017 Master Plan). Lafourche Parish has received the grant award from the U.S. Department of Treasury for $79,870 and has allocated this amount to complete preliminary	$6,000,000

	engineering and design as described in the scope of work. Additional funding through the CPRA Parish Matching Opportunities program of $412,722, as well as an additional $195,277 of local RESTORE funds, has been secured for 100% engineering and design. This project will be engineered and ready for bid by December 2020.	
Developing a Gulf-Wide Bird Population Database to Inform Restoration Planning	The Golden Triangle Marsh Creation Project, located near the confluence of the Mississippi River Gulf Outlet shipping channel and the Gulf Intracoastal Waterway, is in an area badly damaged by saltwater intrusion and erosion that followed the dredging of the MRGO, oil and gas canals, and a flood wall. The area is known as "the funnel", due to the catastrophic, deadly funnel effect of storm surge in this area during Hurricane Katrina. This project plays a critical role in multiple lines of defense for New Orleans, as it is the wetland buffer for a linchpin in the HSDRRS system. The 600 acres project will be constructed by dredging and pumping sediment from Lake Borgne to a fill site approximately 16 miles away. Containment dikes would then be built to facilitate construction of the marsh. Construction is estimated to take four years. The Golden Triangle Marsh Creation project will restore and protect wetland, fish, and wildlife habitat in Lake Borgne and Mississippi Sound as well as enhance community resilience in New Orleans. The Golden Triangle area is part of the Bayou Sauvage National Wildlife Refuge, and restoration will enhance habitat for the wide variety of species that utilize the refuge. The restored marsh will work with a nearby shoreline protection and marsh creation funded by the Coastal Impact Assistance Program(CIAP) to help buffer the newly constructed IHNC Surge Barrier, which is essential to the Greater New Orleans' flood protection. The project has undergone technical analysis completed by the Corps and the State of Louisiana through the MRGO Ecosystem Restoration Plan authorized in WRDA 2007. The project area has a signed Chief's Report and a completed Programmatic EIS. The project is important not only for its obvious marsh creation benefits, but also for the citizens of the area who use the area located so close to the city of New Orleans. This project enjoys much public support (tens of thousands of public comments have been submitted during various planning processes in support of this project area) and will increase the resilience of surrounding communities. This project is within the boundaries of a larger Coastal Master Plan project, which aims to restore 4200 acres of marsh in the Golden Triangle. We hope this 600 acres project can be leveraged to reach that larger-scale goal for restoration.	$1,200,000
Modeling Bird Populations Across the Gulf of Mexico to Inform Restoration Planning	From CPRA proposal to RESTORE Council for project design request, with numbers adjusted based on revised PLATS (1 March 2019): The objectives of the proposed West Grand Terre Beach Nourishment and Stabilization project are to restore and enhance dune and back barrier marsh habitat to provide storm surge and wave attenuation, thereby addressing the issues of gulf shoreline erosion, diminished storm surge protection, and subsidence of back barrier marshes. Without action, it is predicted that West Grand Terre will disappear by 2044 (Martinez et al. 2009); however, the West Grand Terre Beach Nourishment and Stabilization project would result in significant improvements conserving and replenishing existing and created marsh and beach/dune habitat. This project is estimated to build 14,500 feet of beach and dune with an area of [approximately] 200 acres, plus an additional [approximately] 500 acres of water bottoms to stabilize the island. In addition, up to [approximately] 90 acres of back barrier marsh will be restored, and a rock revetment will be constructed to protect the restored marsh. The project will increase the width of the island and maintain shoreline integrity through the introduction of sediment in order to increase island longevity. Constructed dune heights will range from +6.0 to 8.0 ft. NAVD88 with the back barrier marsh constructed to +3.0 ft. NAVD88. The borrow areas south of Quatre Bayou Pass mostly consists of sands, silts, and other sandy and clayey fill material that is suitable for beach/dune and marsh creation. Earthen containment dikes will be constructed to facilitate the construction of the Marsh, and a rock dike structure is also proposed to provide additional protection to West Grand Terre Island and Fort Livingston. The estimated timeline for this project is 24 months of construction. Measures of success for the West Grand Terre Beach Nourishment and Stabilization project include the restoration of beach, dune, and back-barrier marsh habitat for storm surge and wave attenuation. This project will also include the removal of the facilities of the abandoned LDWF Lyle St. Amant Marine Laboratory.	$1,500,000

Impacts of Overwash on Sea Turtle and Shorebird Populations	An ARO (Atchafalaya River Outlet) canal concept for reducing flood waters in mid-south Louisiana by adding a small canal or adding a larger canal example: 8 mile 500 ft wide canal on the lower Atchafalaya River as a parallel connection near cutoff Island to approximately sea level elevation. Flood waters will drop 6 to 12 inches in the example and may remove need for the future 150,000 CFS diversion on the lower Atchafalaya River and remove need for a flood gate in Bayou Chene. Avoca Island Cutoff south of Morgan City, La. T. A small area (Height X Width) ARO (Atchafalaya River outlet) canal 8 miles long to be connected at the Atchafalaya River to Atchafalaya Bay at sea level or a larger ARO as shown below. Small diversions can be connected to east side of the ARO and flow into the marshes. The ARO will scour and area (HXW) will increase rapidly capturing more of the Atchafalaya River and not a concern because the Lower Atchafalaya is marsh and a parallel canal only helps in terms of drainage, marsh building, salt water push back and land addition to lower Louisiana. The possible future 150,000 diversion in the lower Atchafalaya Basin will not be needed because east connecting diversions will accomplish what this diversion was intended plus there will be lower water levels in south-central Louisiana during Mississippi River flooding. Because of this lower levels, the Gate at Bayou Chene may not be needed and sinking a barge when needed until the ARO is operating.	$1,835,831
Enhancement of the NOAA Fisheries Gear Monitoring Team (GMT) in the Southeast Atlantic	One thing that surprised me, when researching agriculture in the seaweed industry, is how the seaweed soaks up nutrients very quickly. San Diego and Southern California once had problems with red tide, but they no longer seem to. What has changed recently is their efforts to restore their kelp forests. I live in Sarasota, Florida; and I've heard that people want to do something about algal blooms that are caused by page amounts of nutrients in the water. I also recently realized the true cause of red tide, which is basically the disintegration of one species of seaweed. I may be wrong about that, but that species is the only species that washes ashore in bulk in Sarasota! Therefore, I wish to create a project that will plant seagrass and native seaweeds in the Gulf of Mexico that will outcompete that seaweed, though possibly with the exception of sargussum to avoid the negative connotations with that. In Freshwater systems, I wish to plant Freshwater plants and healthy Algae that will outcompete the Freshwater blooms. If successful, I think that the planting of coral on rocks could result in proliferation as well that was native as a future project. Also, it could be possibly that the red tide seaweed fields could need to be removed, but that is a last resort.	$4,500,000
Trophically-Integrated Environmental Variability in the Gulf of Mexico: Marine Birds as Ecosystem Sentinels	Hi! I do not in any way wish to waste your time. Up here in New England I have begun a test plot using Hugelkultur Beds & a ditch planted to Carex & Sagittaria to trap and take up excess nutrients and heavy metals, in this case from possible site compromise by upslope automotive repair facility. If you are not familiar with Hugelkultur Beds, when properly constructed they are trenched into the ground and will act as surface water traps. The construct of wood fill becomes a carbon filter/sink with enhanced biotic decomposition. The raised bed allows for planting phototropic species for extended seasonal action or the targeting of species with characteristics resistant to toxins. Successive beds are hypothesized to progressively filter the discharge. A Hugelkultur bed settles as its core is decomposed and after six to twelve years the area may be contoured into a single unit, or it the base stratum is deemed above limits, treated according to safe protocols. Planting the drain ditches to Carex and Sagittaria offers a final wash of the flow through with some of the best species for absorbing excess nutrients and heavy metals. These species are also attractive to wildlife and migratory species and will not load with toxic levels. These species do not have the invasive traits noted by some of the phragmites. My sincere hope is that these ideas may echo plans already in process or spur a connect of thoughts into a successful recovery. ** the peer reviewed literature on Hugelkulture is scant. I know. I have a literature reading paper of secondary research to indicate that Hugelkultur Beds demonstrate properties shown to support the above actions. I can forward this if it is deemed helpful. The experimental site is my attempt to bring a level of scientific process to the topic. dave thompson Lincoln Vermont.	$4,975,253

Chandeleur Islands Restoration Engineering and Design - Phase I	On October 17, 2018, the Gulf States Marine Fisheries Commission (GSMFC) hosted a special session on the Kemp's ridley sea turtle during their Annual Meeting, held at South Padre Island, Texas. The aim of this session was to update the GSMFC on the present state of knowledge on the ecology and population status of the Kemp's ridley sea turtle. From the presentations by 7 experts on Gulf of Mexico sea turtles and recently published syntheses on trends in reproductive output (e.g., Gallaway et al. 2016a,b; Caillouet et al. 2016, 2018) it was clear that the present state of knowledge was insufficient to draw firm conclusions on the status of the Kemp's ridley population. Annual nest counts, the only index of the Kemp's ridley population, were steadily climbing prior to 2010 but continued recovery of the population has not been indicated. In fact, in the past two years large declines in nesting have been seen. Preliminary indications are that more than two times as many nests would be needed to reach the 25,000 nest benchmark that was set for downlisting. Whether this represents mortality in nesting females or reduced body condition so that fewer nests are laid is not known. Regardless, it means that reproductive output of Kemp's ridley has dropped. What will this mean for Kemp's ridley in the future? What are the implications for fishermen? Waiting to see what happens next year is not the answer. With the large drop in nesting over the past two years, even if nesting increased each of the next four years it would be nearly impossible to gauge whether this represented resumed population growth. The lack of continued growth is a concern and determining the causes should be prioritized. Despite the present uncertainty, it is also apparent that developing a mechanistic understanding of spatiotemporal variation in Kemp's ridley abundance and its role in population dynamics is within reach. We propose conducting a Kemp's ridley stock assessment to identify the principle anthropogenic and environmental drivers of Kemp's ridley population dynamics and generate mechanistic predictions of future variability and trends. Without a rigorous quantitative assessment, understanding the efficacy of recovery efforts for Kemp's ridley will be impossible.	$8,000,000
New Harbor Island Restoration	Our project aims to demonstrate the effectiveness of modifications to traditional pelagic longline gear whereby bycatch and discard mortality are minimized, and target catch abundance and quality is maintained (or even increased). We have developed experimental gear in collaboration with partners in the commercial fishing industry and NOAA Fisheries in which pelagic longlines have been modified. The primary modification is limiting the length of the gear, these "Pelagic Limited Gear Lines" (P-LGLs) are more than 75% shorter than the 30-mile pelagic longlines typically used. These shorter lines allow specific oceanographic features to be targeted, potentially pinpointing areas where target catch can be maximized, and bycatch can be avoided. Moreover, the shorter length means that lines can be tended throughout the duration of the set. Tending the lines could benefit catch if taking target fish off the lines sooner increases product quality and, by replacing hooks that caught fish, increases the potential to catch other fish at the same location. For non-target species, the benefit of tended lines is to decrease discard mortality by removing animals more quickly. The team we have assembled has the unique capabilities to undertake this valuable research. Our team of partners comprises commercial fishermen, the seafood industry, NOAA Fisheries, and research scientists. Testing this new gear is an important step towards long-term sustainability of Gulf of Mexico fisheries. If this experimental gear proves promising for achieving target catch while minimizing discard mortality and bycatch, this project could revolutionize longline fishing throughout the Gulf of Mexico and even into the North Atlantic. Such an outcome could help restore the Gulf by reducing negative impact to sea turtles, marine mammals, bill fishes, and other priority species.	$30,000,000
Identifying Sea Turtle Interaction Hotspots in the Gulf of Mexico Shrimp Fishery Using Passive Acoustics	Our group has developed two materials to attract, settle and grow diploid oysters in an economical and green tech fashion. We would like to partner with a range of organizing to implement this material on a large scale for the installation of oyster parts. One of our materials (NEC = nutrient enriched concrete) has been described in a recent publication (Manning, MTS). It releases a chemical cue that attracts diploid spat, provides nutrients to start a bacterial mat and to feed the oysters early in their life cycle, provides protein needed for the oyster to attach to the surface, and also releases molecular species such as vitamins, and amino acids that are essential for healthy oysters. We have also	$3,200,000

	demonstrated that the natural chemical defense system in fresh cut wood (pine slabs) repels settlement by oysters and, to some degree, barnacles. When the wood is treated properly and the correct geometry utilized, wood can be used to selectively settle wild diploid oyster spat (images available). Both the NEC and treated wood can be used to control shoreline erosion, revive ecosystems, and increase the quality of water via filtration. Both materials are economical, can be produced in various shapes and sizes and can easily be used for customized approaches, from contributing to living shorelines to adapting to various bottom compositions (hard, muck, etc). It is possible to settle oyster on the materials in one location and move to another location. They do NOT depend on the use of oyster shells, involve a large, heavy structure, incorporate plastic, and can be produced locally. We have a coral restoration permit from NOAA for FKNMR and have oyster grow-outs near Savannah. We would like to mail copies of our recent paper and additional images. This is in part an education and business development opportunity where others can copy/duplicate this approach. This proposal is outlining a collaborative group effort in which these materials are us ed on a large scale in the impacted areas. In addition to working towards an economical and green solution, the goal is to provide a framework for how a large scale oyster restoration project can be conducted to solve these problems internationally. The facets of the project are: The large scale production of NEC and wood surfaces for large scale applications; site selections determined in a coordinated effort with private, corporate, federal, state, and local entities. The sites emphasize different aspects of oyster restoration including the control of shoreline erosion in salt and brackish environments, the use of oysters to restore habitats in a range of ecosystems, and the use of oysters to help control water quality. It takes advantage of natural resources already located in the southeast and would spur on the development of additional intellectual property as well as a new technology. Considering the demise of oysters worldwide and the critical role they could play in battling the impacts of climate change, some types of pollution and ecosystems that support critical fisheries, the use of the right materials coupled with the correct engineering could launch a new marine based green industry. Yr Site selection and deployment of small scale materials to ensure spat present in local ecosystem. Develop and test manufacturing and deployment methods. Outline and clearly define the role of each partner. Finalize IP (patents) related to the materials. Year 2. The first large deployment in diverse ecosystems. Each oyster bar would be 100-200 meters in length and represent a solution for that specific location. Year 3-6. The continued identification and deployment of large scale oyster bars in selected impacted areas. Existing sites are monitored by university and government scientists and reported to the national and international scientific communities as well as local, state, and national government entities. In addition, the industrial sector and expertise that have been developed in this process would be formalized and seek projects in other U.S. and International communities. For example, areas such as the Apalachicola Bay (Fl), Chesapeake Bay, and New York City Harbor represent large scale projects.	
Reduce Harmful and Lethal Impacts to Dolphins from Illegal Feeding Activities	The first component of this project is an Integrated Ecosystem Modeling effort to unify the modeling being conducted within each state and focused on Alabama's Dauphin Island, the Mississippi barrier islands, and Louisiana Coastal Master Plan projects, among others. The intent of the integrated modeling is to build off these significant investments and connect them, so we understand not only the individual contribution of landscape features locally but also within a broader regional framework. These analyses will identify key landscape features to inform future development of individual projects by highlighting their system-level impact, identify specific points of synergy and leverage among projects (mutually supporting restoration activities in space and time), and highlight potential conflicts among projects to avoid or resolve. Most of the restoration projects in this region have been designed and implemented in relative isolation from other projects. Modeling at this scale will provide insights into how projects may be influenced by one another which would enhance our ability to protect the investments we've already made, as well as contribute to integrated understanding of the factors influencing key system aspects of the Pontchartrain Basin-Chandeleur Sound-Mississippi Sound system to influence future restoration planning. The second, complementary and distinct component is the	$1,500,000

	engineering and design (E&D) for restoration of the Chandeleur Islands, a 50-mile long island chain in the northern Gulf of Mexico that includes a large portion of Breton National Wildlife Refuge. The Chandeleurs protect coastal communities (and the ocean economies they rely on) from the effects of storms; promote oyster habitat and fisheries; and provide habitat for wildlife, including threatened and endangered species and nesting and migratory birds. Unfortunately, the Chandeleurs have lost 87% of their area since 1855 and now are projected to disappear by 2037. Restoration is urgently needed to maintain the Chandeleurs and the natural resource benefits they provide to this entire system. The envisioned restoration project on the Chandeleurs would dredge sand and strategically place it on and around the portions of the islands where the sand budget has been depleted. This approach harnesses natural processes (particularly overwash and along-shore currents for sediment transport) to facilitate restoration. Reliance on the natural forces inherent in this type of system has been previously used on similar projects in the Gulf of Mexico to produce sustainable results. Preliminary modeling suggests this strategy could extend the life of the Chandeleurs by a century or more. The E&D will resolve uncertainties by validating sediment budgets and transport models and identifying strategic sand placement scenarios that maximize the ecosystem benefits of greatest interest to the (co-)sponsoring agencies.	
Isle Au Pitre Restoration with Living Shoreline Protection	As climate change progresses, infrastructure projects (e.g., shoreline stabilization measures) adjacent to sea turtle nesting beaches are likely to become increasingly urgent as pressures from sea-level rise, increased storm frequency and coastal development increases over time. However, concern exists on how these infrastructure projects (e.g. coastal armoring) may affect sea turtle nesting beach morphology and nesting habitat availability. Thus, to identify, prioritize and inform implementation measures to reduce impacts to sea turtles as a result of infrastructure projects, this project will use well-tested wave runup and coastal erosion models as well as conservation planning and decision-support tools to: 1) identify high-priority beaches (high risk from climate change and ecological importance) which may benefit from targeted interventions, and 2) describe how current or proposed infrastructure projects may alter sea turtle nesting habitat and drive the risk of sea turtle habitat from climate change. The outputs of this project will facilitate planning and prioritization of site-level interventions and has the potential to improve hatchling production through reduced embryonic mortality. We will work with local counties and municipalities to include our results into Beach Management Programs/Plans. This will enhance the resilience of coastal areas, including sea turtle nesting beaches and lead to significant gains to sea turtle population.	$25,000,000
Reducing Injury and Mortality of Bottlenose Dolphins from Hook and Line Fishing Gear	The Gulf of Mexico has the highest sustained levels of anthropogenic underwater noise of any region measured to date. These high noise levels result from high levels of commercial shipping and seismic surveys. This project would continue underwater sound monitoring on the continental shelf in the region of the DWH oil spill. In addition, the project would use existing marine mammal survey and acoustic monitoring data to produce habitat maps for marine mammals. The overlap between these marine mammal habitat maps and noise maps would identify locations where potential reductions in noise could benefit the recovery of region-wide marine mammal populations. Significant declines in marine mammal populations have been documented for the GOM region-wide area of the DWH oil spill, and noise abatement is one approach for helping with their recovery.	$1,500,000
Avian Health Monitoring to Target Bird Restoration and Assess Progress Toward Restoration Goals	This project involves the conservation purchase of a 13,100-acre tract directly adjacent to the Rockefeller Wildlife Refuge, in Cameron Parish, Louisiana. The preservation of these coastal lands will provide critical stopover, breeding and wintering resources for migratory and resident bird species, support local fisheries, provide migration support to sea turtles (Kemp's Ridley and Green) and manatees, and offer increased recreational opportunities to the public. This addition is expected to support approximately 86% of bird species injured by the Deepwater Horizon spill, many of which utilize the project area's habitats for nesting (e.g., Mottled Duck, Clapper Rail, Seaside Sparrow) and/or foraging during one or more stages of their annual cycles (e.g., Least, Black, Royal and Sandwich terns, Little Blue Heron, Roseate Spoonbill). The permanent protection and long-term management of this tract is anticipated to support over 200 species	$5,055,000

	of birds, including 48 species of greatest conservation need identified by the Louisiana Wildlife Action Plan - including several species listed above as well as King, and possibly Black Rail, American Oystercatcher, Wilson's and Piping plovers, Red Knot, Reddish Egret, White-tailed Kite, and Le Conte's and Nelson's sparrows. The permanent protection of this acreage is a top priority of Louisiana Department of Wildlife & Fisheries for the benefits to the public and the addition of significant acreage to the Rockefeller Refuge, increasing its size by 18%. This would be the most significant addition to this protected land base since the Refuge was originally established by the Rockefeller Foundation, almost 100 years ago. Additionally, this acquisition could leverage interest and funding to continue the shoreline protection project currently under construction on the Rockefeller Refuge, but projected to stop at the refuge's current property line.	
Baseline Assessment of Coastal Wetland Vegetation Salinity Zones along the Northern Gulf of Mexico	Need the Atchafalaya Resilience Lab (ARL) would document, complement, and field-test the work of the Consortium for Resilient Communities in assessing the health, social, and economic wellbeing of Gulf coastal communities. Medium and long-term effect analysis: An ARL at Morgan City provides a permanent facility dedicated to the health and viability of Gulf Waters. In the publication, Morgan City and Berwick: Building the Foundation for a new Economy along the Atchafalaya River, The Urban Land Institute, a global organization in land use planning recommended building a resilience lab at Morgan City. The lab would add a structural presence for first-hand mitigation against additional coastal impacts. Multi-organizational and interdisciplinary approaches: Duplicative efforts imperil vulnerable populations. With an ARL, collaboration between organizations optimizes multi-organizational and interdisciplinary approaches resulting in a concerted response to impacted populations. Diverse vulnerable populations: Populations of the Gulf coast are diverse. One cannot rely on generational fisherman as many have become weary waiting for fishing stocks to repopulate. Each population brings their own nuances and responses to the event. A presence in the diverse coastal community is warranted. Knowledge gaps remain: As the Gulf continues to recover from the Deepwater Horizon event, learning needs to adjust to accommodate and expedite its recovery. For an example of where knowledge gaps exist, Morgan City is the location of the South Louisiana Community College – Young Memorial Campus and it has a proven marine training center. The college offers courses in Advance Ship Handling and Apprentice Steersman. To advance Gulf Recovery, addendum skills impacting marine animal avoidance can be incorporated into these courses increasing mariner performance to benefit Gulf Marine Life. The school houses a simulator for avoidance steering and route planning. The resilience lab would monitor and survey the impact of this workforce development. MULTI-AGENCY SUPPORT Locating the ARL at Morgan City protects the USACE's' dual purpose of preserving the habitat of the nation's largest and oldest river-basin swamp and the Lower Atchafalaya being able to pass floodwater of 1.5m cubic feet per second. The lab would provide real time presence hydrology analysis and marine habitat monitoring during increased coastal restoration projects. In a December 2018, Dr. Scott Hemmerling, of The Water Institute of the Gulf, charted a cumulative economic well-being index across the last 60 years in coastal LA. He notes that the next phase of research will be on key communities for ethnographic data. St. Mary Parish (Morgan City) is noted as a key community for data collection. The ARL would play an instrumental role for communities shifting in use of waterways beyond oil and gas exploration and toward increased healthy Gulf ecosystems.	$1,829,545
Avian Nesting Colony Photographic Census	Bayou la Loutre begins in Yscloskey and extends into the southeastern Biloxi marshes. Bayou la Loutre ridge is actually two parallel natural levees flanking old Bayou la Loutre (Otter Bayou), which is part of the structural underpinning of the Biloxi marshes. Construction of the MRGO, in the 1950s, breached the ridges and dramatically altered the hydrology of the area and leading to saltwater intrusion and extensive wetland loss. The rock dam built across the MRGO in 2009 helped restore the hydrology but not the actual, previously lost marsh or ridge habitat. The ridge has suffered from subsidence, saltwater intrusion, and canal breaches. The project will use dredged sediment, likely from Bayou la Loutre, to reestablish the ridge. This will add elevation to the ridge and help improve hydrology, provide storm surge protection, decrease saltwater intrusion, and provide important resting habitat for migratory birds.	$687,000

Baseline Survey of Gulf of Mexico Recreational Interactions with Sea Turtle and Marine Mammals	Beach-nesting birds across the Gulf of Mexico encounter a wide array of challenges to successful reproduction. Because of this, a multidisciplinary, adaptive approach is needed to address ever-changing conditions and threats like human disturbance, unbalanced predator populations, habitat loss, sea-level rise, and increased storm intensity. This multifaceted approach to beach-nesting bird conservation has been proven successful in the recovery efforts of Piping Plovers on the Atlantic Coast over the last 30 years, and can be applied to many other species that still face substantial challenges and declining populations, including those along the northern Gulf of Mexico. Building on a successful foundation already created by the National Audubon Society, a sustained region-wide coastal bird stewardship program will include monitoring for reproductive success and assessing threats, community engagement, education, habitat and predator management, policy action, and law enforcement training and support. Audubon's vision for beach-nesting bird management includes buy-in from and collaboration with a coalition of partners including federal and state agencies, local municipalities, public and private land managers, and other conservation organizations. Guided by the work of the Deepwater Horizon Natural Resource Damage Assessment Trustees, the Trustee Implementation Groups, and the RESTORE Council, Audubon is proposing a region-wide Coastal Bird Stewardship Program. Such a program will be able to implement most of the restoration approaches identified in the Deepwater Horizon Oil Spill Natural Resource Damage Assessment – Strategic Framework for Bird Restoration Activities (June 2017) that guides the restoration efforts for birds. These approaches include the restoration and conservation of bird nesting and foraging habitat (a priority for this restoration plan), establishing or restoring breeding colonies, preventing incidental bird mortality from predators and humans, re storing and enhancing dunes and beaches, enhancing barrier and coastal islands, and protecting and conserving coastal habitats. Through a region-wide, comprehensive approach informed by local management needs, this program would maximize effectiveness, efficiency, and benefits to injured bird species. Community engagement and strategic partnerships with community leaders will be key to the success of this program. Specifically, this program will also engage youth and school groups, veterans, and diverse communities in bird conservation efforts throughout the Gulf Coast. Audubon's Coastal Bird Stewardship Program is designed to build on and unify current programs within each state, as well as the efforts from early restoration projects like the Department of the Interior's Enhanced Management of Avian Breeding Habitat Injured by Response Activities in the Florida Panhandle, Alabama and Mississippi, which was completed in 2017. The vast number of individuals, diversity of species, broad ranges of habitats and threats, and specific life history requirements of birds injured by the BP oil spill necessitate a portfolio of restoration approaches to adequately address injuries across the region. The types of activities that can be conducted via the Coastal Bird Stewardship Program include: - stewarding nesting and foraging areas with public outreach and education; - increasing the availability of foraging and nesting habitat; - restoring and enhancing dunes and beaches by planting vegetation to protect the dunes; - supporting the strategic renourishment of beaches through sediment addition; - using acoustic vocalization playbacks and decoys to attract breeding adults to restoration sites; - protecting dune systems from overuse by humans; - monitoring for reproductive success; - conducting targeted predator management as needed; and - reducing human disturbance around sensitive nesting areas.	$750,000
Gulf of Mexico Avian Mortality Monitoring	The proposed work would produce accurate assessments of vessel activity within focused regions and time periods to advise sea turtle mortality investigations. This would be achieved by developing and implementing a technique to estimate vessel activity using high resolution imagery collected by aerial or satellite platforms. Areas of interest in the northern Gulf of Mexico would be predetermined and would focus on areas where sea turtle strandings are likely to originate. Surveys would be conducted annually and during time periods when sea turtle events typically occur. A survey protocol using high resolution imagery would provide scientifically robust estimates of vessel activity within nearshore and inshore regions of the northern Gulf of Mexico that are of interest to sea turtle mortality investigations. Such imagery has a high cost of acquisition, low temporal resolution, and low areal coverage. Lower resolution sensors (e.g., synthetic	$1,000,000

	aperture radar or Landsat) have been evaluated and cannot provide the level of detail necessary for this work. Results would fill critical data gaps by providing activity estimates for classes of vessels that are not covered by other monitoring programs (e.g., AIS, fishery observer programs).	
Improved Understanding of GOM Shrimp Inshore Effort through Electronic Monitoring/Reporting to Reduce Bycatch	The project is intended to compensate the public for injury to oysters by placing cultch material onto Louisiana public oyster areas, including public oyster seed grounds (POSGs) and public oyster seed reservations (POSRs). Cultch plants with higher vertical relief, or even a mix of larger cultch at the bottom, and smaller cultch on top: Morgan Harbor, Three mile Bay, Drum Bay, Karako Bay, Sister Lake, totaling appx 200 acres. Oyster production benefit other species, including spawning oysters that could interchange spat between MS/AL. Having vertical relief cultch plant may help with hypoxic and sedimentation issues.	$800,000
Sea Turtle Nesting Beach Restoration	This project would restore for oysters in the following areas of Louisiana: Biloxi Marsh, East of Breton Sound area, Barataria Basin, Sister lake. Each broodstock reef would be 10 acres each with reef balls (non-harvestable areas). The benefits of the project include increasing spawning connectivity, and larvae/spat on water column, creating habitat for other species, and exchange of larvae among reefs and the bordering states.	$549,300
Shoreline Surveys for Bird Mortality	Overarching Goals Related to Nexus to Injury Contribute to the recovery of sea turtle populations injured by the BP oil disaster by addressing the anthropogenic threat of marine debris and derelict fishing gear. This threat would be ameliorated through the removal, reduction and prevention of marine debris and ghost fishing gear, effectively decreasing barriers to nesting sites, enhancing sea turtle nesting opportunity and productivity, and lowering the risk of hatchling, sub-adult and adult entrapment or entanglement in derelict fishing gear. Additional goals are: 1) to build capacity and understanding within the recreational and commercial fishing sectors across the Gulf of Mexico to reduce loss of, and minimize risks and biological impacts resulting from ghost fishing gear; and 2) to engage and educate members of the consumer packaging and product industry to support and advance upstream, private sector intervention strategies or policies to reduce macroplastic inputs to the Gulf of Mexico. The project would be developed and implemented to maximize benefits for injured avifauna and marine mammal populations affected by marine debris and ghost fishing gear. Project Overview In collaboration with local conservation organizations, scientists and fishing communities throughout the Gulf of Mexico, Ocean Conservancy proposes a comprehensive marine debris intervention strategy to help restore sea turtles in ocean waters impacted by the Deepwater Horizon (DWH) oil disaster. This work is centered on four specific objectives, each advanced by a suite of integrated activities. This work leverages our institutional expertise through the International Coastal Cleanup and Global Ghost Gear Initiative, new scientific research, and our successful effort to secure a framework and funding for Gulf restoration following the BP event to advance measurable conservation outcomes and management decisions. Ocean Conservancy's decentralized volunteer infrastructure will allow local organizations to plan and conduct cleanups more strategically and effectively and allocate effort where conservation impact is likely to have the greatest benefit. This body of work builds on key relationships in Gulf Coast states that Ocean Conservancy has developed over the last two decades, including with the fishing community and numerous ICC partners. The work is informed by new research findings from Ocean Conservancy’s extensive marine debris database to identify marine debris hotspots both in the United States and internationally (e.g., Mexico and Caribbean). Objective 1: Identify geospatial marine debris hotspots, estimate vulnerability and identify intervention opportunities Objective 2: Reduce impact on marine wildlife by removing macroplastic marine debris and derelict fishing gear at strategic times and locations on beaches, at piers and in offshore habitats Objective 3: Inform the recreational and commercial fishing communities on how to best reduce lost/derelict fishing gear to better protect marine wildlife Objective 4: Build political and private sector understanding and support from the largest contributing sources/cities/businesses for upstream intervention strategies NOTE: Detailed information on project background, activities for each objective listed above, potential contractors and partners, potential deliverables, monitoring and	$600,000

	adaptive management, metrics of success, cost effectiveness, likelihood of success, benefits to other natural resources, and project consistency with DWH NRDA Trustee Council goals can be found in the attached project description (pdf). A detailed budget is also available upon request.	
Determining How Sea Turtle Stranding Rates Relate to Total Mortality in the Northern Gulf of Mexico	The Northern GoM includes 3 coastal stocks & 31 bay, sound, & estuary (BSE) stocks of common bottlenose dolphins (BND). Stock assessment reports have been completed for 5 BSE stocks; however, little information has been obtained for the remaining stocks. These data gaps need to be addressed in order to maximize restoration efforts for marine mammals across the GoM. All of these stocks are at risk due to a variety of natural & man-made threats that can cause injury, illness, or death. Identification of stocks of BND throughout the BSE & coastal systems of the GoM is important for assessing dolphin populations, & it is critical information necessary for planning restoration & recovery activities & will provide baseline data if future impacts are realized. A region-wide approach that includes collaboration of state & federal agencies & NGOs is necessary to restore BND impacted by the Deepwater Horizon (DWH) oil spill. This region-wide approach will allow for consistent methodology, data collection, & analysis for all stocks across the Gulf, & the data will play a key role in the recovery & restoration of stocks impacted by DWH to pre-spill levels. An accurate assessment of BND BSE stocks in the GoM will be performed using photographic identification (photo-ID). This method has been successfully utilized in recent research efforts occurring in Barataria Bay (BB) and Terrebonne Bay–Timbalier Bay (TTB). Photo-ID capture-recapture surveys will allow researchers to estimate abundance of each of the following BSE stocks: Sabine Lake, Calcasieu Lake, Vermilion Bay/West Cote Blanche Bay/Atchafalaya Bay, & MS River Delta as these do not currently have individual stock assessment reports. Additionally, a portion of Lake Borgne will be surveyed. Surveys will be conducted in spring/summer & fall/winter for each stock/area, & will cover the marsh, open water, & barrier islands, which will aid in documenting animals from the northern & western coastal stocks. Remote biopsy collection will be implemented with the photo-ID work or as a second phase. This sampling technique is an effective method of collecting tissue (skin and blubber) from live dolphins for a number of analyses including immunohistochemistry & hormone analysis. These samples can also be used to determine contaminant concentrations in an individual. Analyses may provide insight into the potential impacts suffered by marine mammals from DWH & allow biologists the ability to better manage these populations. Health assessments will be conducted in BSE (encirclement) & coastal stocks (encirclement or hoop netting) to determine overall health on the MS Sound, Lake Borgne, & Bay Boudreau (BSE) stock. This stock spans from Lake Borgne (west) to Mobile Bay (east), & includes LA, MS, & AL waters, & lends itself nicely to a region-wide health assessment project. This area was impacted by DWH & the damage assessment projected that dolphins in this area suffered a 62% decline in population size (DWH MMIQT 2015; Schwacke et al. 2017). Information obtained from these health assessments will be valuable for identifying & mitigating potential impacts or risks to a particular stock. Health assessments can provide growth rates, environmental contaminants levels, fecundity, age, lung & heart condition, & a suite of other vital information for evaluating overall health. Handled animals will be satellite tagged for identifying home ranges & for future fecundity surveys. Fecundity surveys will be performed to assess reproductive outcomes comparing results to other study sites such as BB & Sarasota Bay. These results may be used to determine if the population is recovering from potential impacts of DWH. Health assessment efforts allow marine mammal researchers to identify & monitor potential threats to BND & to work towards developing resources such as vaccines or other leading edge diagnostics which could aid survivability of these stocks & aid in recovery of BSE & coastal BND impacted by DWH.	$300,000
Seabird Colony Registry and Atlas for the Northern Gulf of Mexico	Birds are a conspicuous and remarkable natural resource of the Gulf of Mexico with hundreds of species and billions of individuals supported at some point during their annual lifecycle by barrier islands, beaches, marshes, and coastal forests across the Gulf ecosystem. While birds are an indicator of ecosystem health and natural resources on which humans rely across the region, the Deepwater Horizon (DWH) oil spill affected 93 species and potentially over 100,000 individuals through oil exposure to individuals and their habitats. Impacts on global populations are likely greatest on the 45 injured	$150,000

	species, which make up many lost individuals that breed within habitats located in the five Gulf States. Reduced breeding members or limited nesting habitat can substantially limit recruitment, thereby undermining state and federal recovery efforts. Understanding bird-habitat associations and responses to management efforts can drastically improve and inform restoration planning. The ability to monitor injured species across the Gulf states would be instrumental in assessing past restoration efforts (i.e., birds recovered per project investment), which is crucial to implementing successful future restoration projects. The lack of adequate pre-DWH spill data to inform decision-makers and provide a robust assessment of realized damages and planned restoration efforts for birds highlighted the need for region-wide monitoring. Our primary objective is to collect information that will establish a baseline of the status and trends of avian populations in a changing coastal landscape, as well as provide a better assessment of damages to avian resources after a future natural or anthropogenic disaster. Data collection will be used to answer pressing questions related to how populations respond to management actions, such as restoration, vegetation plantings, prescribed fire, and ecological processes, such as hurricanes, habitat succession, predation, that have been identified as high priorities (i.e., high uncertainty and high impact on populations) through a structured decision-making process. To provide crucial data on injured bird species along the northern Gulf Coast, we plan to implement our monitoring strategy over three distinct phases. Phase 1 would involve: (1) coordinating with state, federal, and NGO partners around the northern Gulf coast to leverage existing avian and abiotic datasets (e.g., NOAA Sentinel Site Program, USFWS Inventory & Monitoring program), (2) collating the available disparate datasets and determining common links that can be used to reduce uncertainty related to avian populations, (3) linking existing datasets to query the data needed to address uncertainty, (4) assessing potential sites and logistics for on-the-ground monitoring in each state. Phase 2 would be an on-the-ground effort to assess the status and trends of injured avian resources and habitats during the breeding season in each Gulf state. This would use a network of a minimum of 5 nodes to achieve spatially uniform regionwide coverage, where we will monitor the species-specific number of individuals in each area and, when possible, breeding parameters. Each sampling node will consist of an 80 km radius around one of the NOAA Next Generation Radar stations, which leverages the spatially largest and temporally longest running biological data set in North America to assess avian populations via remote sensing as well as covers important bird habitats on public lands and allows a concerted effort in a spatially manageable area. Phase 3 would focus on-the-ground efforts at assessing the success of restoration projects to determine return on investment for breeding avian resources (i.e., birds/dollar spent) within the 5 sampling nodes, which would focus more specifically on TIG-funded restoration projects. Budget Range Phase 1: 2 years - $950,000 to $1,000,000 Phase 2: 5 years - $7,800,000 to $8,100,000 Phase 3: 5 years - $9,250,000 to $9,600,000.	
Micro-Refugia for Shorebirds and Seabirds - an Incentive Based Project	Addressing the Restoration goal to “Increase Marine Mammal Survival through Better Understanding of Causes of Illness and Death as Well as Early Detection and Intervention of Anthropogenic Threats”, we propose a Region-wide Dolphin Health Assessment and Conservation Medicine Program. Conservation medicine programs have been successfully implemented for endangered terrestrial species (e.g., mountain gorillas, see Cranfield and c 2007) as well as marine mammal species (e.g., Hawaiian monk seals). Such programs rely on multidisciplinary collaborations among field biologists, wildlife epidemiologists, veterinarians, medical specialists, and resource managers to identify priority threats for target populations, and then implement stressor mitigation and/or intervention when possible. The Deepwater Horizon (DWH) Natural Resource Damage Assessment (NRDA) as well as subsequent research through the Gulf of Mexico Research Initiative (GoMRI) identified numerous health issues related to the DWH oil exposure in bottlenose dolphin populations of the northern Gulf of Mexico (Schwacke et al. 2014, Smith et al. 2017). In addition, this research has identified disease/injury endpoints related to other anthropogenic stressors in the northern Gulf of Mexico, including recreational fishery entanglement, boat interaction, low salinity exposure, infectious pathogen exposure, and embedded buckshot presumably from gunshot. We propose a conservation medicine program based on temporary capture-release	$500,000

	health assessments to conduct health interventions where possible, and where interventions are not feasible, at least identify and prioritize the stressors for key dolphin stocks. The identification and prioritization of specific stressors for these key stocks will allow resource managers to directly address source point exposures/impacts, implement outreach efforts using proven NMFS outreach strategies where possible, and/or allow for the implementation of new conservation psychology projects where alternative approaches are needed. In addition to supporting the restoration of healthy dolphin populations, the recent advancements in dolphin health modeling make it possible to directly linked health measures to expected population vital rates (survival and reproductive success), thus providing a very relevant approach for evaluating performance measures for the proposed, as well as alternative, restoration activities. We propose bi-annual health assessments for key bottlenose dolphin stocks that were most significantly impacted by the DWH oil spill to include the Northern Coastal Stock (ranging across Florida Panhandle, Alabama, Mississippi, and Louisiana coasts), and Bay, Sound, and Estuary (BSE) stocks in Mississippi Sound and Barataria Bay. Other BSE stocks, either from DWH impacted areas or reference sites, could be integrated into the health assessment schedule as deemed necessary by resource managers. Existing capture-release approaches for hands-on health assessment could be used for the BSE stocks and Northern Coastal Stock individuals in shallow waters close to shore, and alternative approaches (e.g. hoop-netting) could be implemented for deeper water stocks. Supplemental remote biopsy, remote tagging, visual assessment, and/or remote tissue collection could be integrated as new health assessment technologies become available. We propose the application of population risk assessment models, such as those implemented for the NRDA to predict recovery trajectories (Schwacke et al. 2017) and those proposed by the recent National Academies Committee on the Assessment of Cumulative Effects of Anthropogenic Stressors on Marine Mammals (NASEM 2016) to evaluate the impacts of differing stressors and guide appropriate management actions.	
Implementation of Marine Mammal Disaster Response Program for the Gulf of Mexico	Across the Gulf of Mexico, bird communities and the habitats that support them are threatened by many concurrent and synergistic threats including human development, disturbances such as oil spills, and climate change. A central challenge to developing the understanding of bird status and distributions needed to inform effective restoration planning has been the lack of a central database to house and share regionwide survey data. Extensive bird occurrence and abundance data have been collected across the Gulf of Mexico prior to and following the Deepwater Horizon oil spill. These data include observations from multi-decadal monitoring programs that provide a historical context for current bird distribution and abundance. Yet currently data are scattered across many proprietary databases, if they exist in a database at all, stored in a multitude of data structures and formats. This prevents the integration, or even awareness, of data needed to achieve restoration planning goals. Therefore, we will compile available avian count and occurrence datasets in a central relational data warehouse to facilitate subsequent analyses and make these data available to land managers and restoration planners. Extensive semi-structured community science data (i.e., data collected by volunteers) are available for Gulf of Mexico bird species through monitoring programs and databases including eBird, National Audubon Society's Christmas Bird Count, U.S. Geological Survey's Breeding Bird Survey, and state-level colonial waterbird surveys. By comparison, structured data rely on more intensive sampling and standardized protocols that provide the additional information necessary to account for imperfect detection and produce accurate abundance estimates. Multiple structured datasets also exist for suites of birds across the Gulf of Mexico, including the Gulf of Mexico Marsh Bird Atlas and Audubon Coastal Bird Survey. Moreover, many other individuals and entities possess Gulf of Mexico bird occurrence and abundance data, including Natural Resource Damage Assessment oiled bird surveys; targeted surveys that focus on a single species, guild, or site such as National Audubon Society Least Tern and Piping Plover monitoring; and academic research. Audubon has already begun compiling structured and semi-structured data for species included in this proposal. We will expand this collection by working with resource managers and the Gulf of Mexico Avian Monitoring Network (GoMAMN) to coordinate discovery and access of additional public and private datasets. To transfer	$0

	project findings to resource managers, compiled data will be migrated to a central warehouse and integrated with tools that give conservation and resource managers easy access to a wide variety of data updated regularly. We propose to leverage and expand the work of the Avian Knowledge Network to build the technical infrastructure to easily and rapidly describe datasets, integrate the bird data into a data catalog using newly developed ingestion and translation tools, and develop new data exploration tools. The proposed data management developments will house counts as well as associated sampling details and metadata (e.g., date, time of day, and weather). A publicly accessible interface will enable users to create customizable queries, to download data, or to view summaries and maps of raw data across protocols. We will integrate data upload and transfer abilities to enable data submission throughout and after the project's tenure. This centralized database will provide resource managers the data they need to develop informed management actions in conservation areas. By compiling all available bird data into a single location with an interactive interface, resource managers will be able to identify gaps within bird distributions where targeted restoration efforts would increase suitability for focal bird species. Moreover, by providing a Gulf-wide view, resource managers would have access to the landscape-scale information they need to ensure the connectivity among restoration and natural sites needed to increase the likelihood of restoration success. This information will enable resource managers to prioritize allocation of resources where they will have the greatest impact and make informed decisions about which management strategies will best support birds today and in the future. This database would be a huge first step that explicitly aligns with the Gulf of Mexico Avian Monitoring Network (GoMAMN) Strategic Monitoring Plan (Adams et al., in press). If funded, this becomes a foundational piece that would not only support bird conservation in the Gulf, but also has the potential to inform Restoration Planning and Restoration Evaluation.	
Removal of Derelict Fishing Gear	Robust assessments of bird population trends and their drivers are essential to inform selection of priority species and habitats for conservation and restoration. Resource managers need to know which species are declining as well as which habitats and regions are resilient to future change in order to make informed decisions that protect birds, their habitats, and their communities. Furthermore, this information must be shared with resource managers in an accessible format that enables them to make efficient and timely management and conservation decisions. Therefore, we propose to model and project the effects of climate and land cover change on the sustainability and resiliency of bird communities across the Gulf of Mexico. Traditional analytical methods utilize data from single surveys, none of which have sufficient spatial and temporal coverage for robust modeling. We will resolve this issue and provide the accurate, high-resolution models needed to inform Gulf conservation by implementing a recently-developed integrated modeling technique. To maximize inference from across a wide range of research and monitoring projects, we will develop Bayesian integrated hierarchical models that can effectively combine data across multiple structured and semi-structured protocols. We will use these methods to produce robust estimates of population trends and distributions for multiple landbird, shorebird, and marsh bird species, while accounting for uncertainty. By incorporating powerful forecasting of land cover change across the Gulf we will be capable of describing how current bird distributions and trends will change in the future. Species-specific maps of current and future distributions will be created from this effort and provided to resource managers. These distribution/abundance models will incorporate a suite of remotely-sensed land cover and climate predictors variables used in recent Gulf-wide habitat modeling efforts (Lankford et al. 2018) to model environmental relationships. These may include proportional cover of estuarine and palustrine wetland, shoreline, agriculture, grassland, shrubland, and developed habitats; landscape metrics such as patch size or connectivity of land cover types; length of sandy beach; annual spatially-interpolated climate variables; elevation; and distance to coast or other important habitats or features. The precise suite of environmental predictors will be selected on a species-specific basis based on ecology and life-history characteristics to ensure biologically-relevant predictors are included and increase model performance. The projected distribution maps will be produced at a high spatial resolution for multiple time periods	$10,000,000

	spanning the 1960s through the 2050s. These projected distribution maps should be particularly useful to resource managers, including for identifying: 1) future priority areas to conserve or restore, 2) areas that can serve as corridors connecting current and future bird habitat, 3) areas where management efforts can be conducted that will help transition the land cover from its current form (e.g., agricultural field) to a habitat type that will support birds in the future (e.g., a wetland), and 4) strongholds that are important today and will continue to be important in the future, and conserving or restoring those areas as needed. Our primary goal is to empower resource managers and policy-makers to make informed conservation, restoration, and policy decisions based on knowledge of historic, current, and future bird distributions, as well as the environmental processes driving these trends.	
Recovery of Oyster Resources in Calcasieu and Caillou Lakes, Louisiana	The Deepwater Horizon (DWH) oil spill injured many different taxa that utilize shoreline habitats along the northern Gulf of Mexico (GoM) coast. Sea turtles and birds are two taxa groups that overlap in habitat use in the Gulf ecosystem and both can benefit from increased survival and productivity. For sea turtles, one Restoration Approach identified in the Programmatic Damage Assessment and Restoration Plan is to "Enhance sea turtle hatchling productivity and restore and conserve nesting beach habitat", while similarly for birds the approach is "Restore and conserve bird nesting and foraging habitat." However, proper restoration planning needs to understand how beach geomorphology influences investment return in terms of injured resource survival and productivity. A significant threat to breeding, which can be detrimental to nest production and survival, on beaches across the GoM is inundation. Inundation occurs from overwash of beaches during extreme high tides or storm events or from a rising water table and can impact habitats in multiple ways. Direct mortality of eggs can occur when nests are washed away or if eggs sit in water for long periods of time thereby drowning developing embryos. However, inundation can have many indirect effects such as altering habitat, increasing predation risks, reducing available habitat, and increasing exposure from artificial lighting. To address this threat and aid in implementing the objectives identified in the PDARP to improve habitats for survival and productivity, we propose the following objectives: 1. Evaluate risk of inundation to nesting beaches across the GoM Methods: Multiple study sites will be selected and analyzed to capture regional variability in barrier island characteristics potentially relevant to nest site selection and success. Extensive readily available elevation data exist for GOM barrier islands. Historical data will be used to identify and characterize island geomorphologic features following established approaches. In addition to metrics that characterize island state based on observations at a single point in time, such as beach slope and width, hydrodynamic data will be used to evaluate dynamic classification metrics (e.g., inundation frequency) relevant to beach nesting. Likely nest inundation events will be identified as times when the total water level exceeds elevations associated with estimated nest site locations following protocols developed as part of the Mississippi Coastal Improvements Program. We will also identify overwash impacts using satellite imagery to produce custom habitat maps for dates with temporally aligned aerial or satellite imagery and LIDAR data. 2. Evaluate the impact of inundation on sea turtles and birds Methods: We will combine historic nesting and habitat use data with current data collection efforts to address inundation impacts. Historic data will be used to evaluate species occupancy and nest loss on beaches of varying inundation risk, assess changes in spatial distribution of individuals and nests relative to changes in geomorphology and habitat of beaches due to inundation, and determine indirect impacts to nests and individuals from inundation, such as increased predation risk. Additional field work will involve evaluating sand temperatures and incubation lengths of nests, documenting spatial distribution of nests, and gathering nest productivity data at each site as well as occupancy and activities of breeding individuals. 3. Evaluate impacts of inundation on sea turtle and shorebird populations Methods: We will use population modeling simulations to examine how different levels of reproductive output resulting from overwash affect populations of shorebirds and turtles. We will focus on one bird (to be determined) and one turtle species (loggerhead sea turtles) and will use data collected as part of long-term studies on both species.	$20,000,000

Establishing Oyster Brood Reefs in Mississippi Sound	This project addresses the restoration approach "Reducing Sea Turtle Bycatch in Commercial Fisheries through Enhanced Training and Outreach to the Fishing Community." The NMFS Gear Monitoring Team (GMT) has demonstrated success in sustaining high TED compliance rates within the SE shrimp fishery through regular outreach efforts to fishers, net shops, and marine enforcement groups. Enhancement of the GMT has been facilitated through an Early Restoration project, establishing an additional two mobile teams for the GOM. This project will provide enhanced GMT outreach and education in the Southeast Atlantic states (NC, SC, GA, and FL), through the establishment of a full-time SE Atlantic team consisting of a team leader and two team assistants. The expanded SE Atlantic GMT is intended to provide direct benefits to the recovery of GOM sea turtles during SE Atlantic migratory periods by decreasing the likelihood of capture mortality in shrimp trawls. The project will increase capacity for education and outreach to the shrimp fishing community to improve compliance with existing federal TED regulations. TED outreach and training events will be performed with attention to pre-season dockside courtesy inspections and off-season TED workshops. Atlantic GMT staff will provide training to State and Federal marine enforcement to ensure inspections are conducted in an accurate and consistent manner. GMT vessels will serve as training platforms for marine enforcement and to enable the team to conduct courtesy TED inspections at-sea. The GMT will also work closely with the Observer Program and the STSSN to identify specific areas of bycatch concern within the SE Atlantic and provide locally targeted TED outreach and inspections. Fisheries such as gillnets, fish trawls and traps will be included in the GMT outreach program as turtle mitigation technologies are developed. The project is designed to enhance coordination with other State and Federal agencies, and fishery associations. The actions will provide additional support and resources that are needed to increase compliance with TED regulations. The project will provide information on turtle interactions with fishing activities which will help target, refine, and improve management decisions for protecting and recovering populations. The project will utilize the GOM enhanced GMT program plan which has shown positive results with regard to TED compliance, and thus will have a high likelihood of success.	$850,000
Oyster Reef Network: Boosting Broodstock from Louisiana to Mississippi	The northern Gulf of Mexico provides important habitat for millions of birds representing a wide-array of migratory bird species throughout their full life-cycle. As such, it is imperative that managers have a thorough understanding of how habitat restoration efforts influence bird populations: including seabird and their associated prey species. In that, while restoration efforts may result in benefits to bird populations (i.e., more birds) generally, it is difficult to determine how injured species of seabirds in particular, that breed both within and outside the Gulf, respond to prey resources within the northern Gulf ecosystem. In general, seabird data in the Gulf of Mexico, particularly pelagic seabirds, is lacking and/or temporally and spatially limited. We hypothesize that variability in prey resources explain variation in distribution and abundance of seabirds in the northern Gulf of Mexico across seasons. Preliminary data from the Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS), suggests a pretty major divergence in seabird's species composition and abundance in spring-summer compared to fall-winter. In the fall-winter for example, Common Loons (Gavia immer) and Northern Gannets (Morus bassanus) are commonly observed in shallow waters of the northern Gulf, presumably foraging on Gulf menhaden. Their numbers decline into the spring and both species are virtually absent in the summer. Many species of seabirds that breed along the northern Gulf of Mexico coast are thought to utilize Gulf menhaden as a primary forage fish. For those seabirds that utilize the upper shelf waters of the Gulf, Gulf menhaden (Brevoortia patronus) distribution and abundance may be a very important food resource. For more pelagic species in deeper marine waters of the Gulf, flying fish (Exocoetidae) may be an important food resource, at least for some species. Unfortunately, for species other than the Brown Pelican (Pelecanus occidentalis) our understanding of seabird diets, energetics, and food-web dynamics and the ecological processes that affect these mechanisms is deficient. There is a myriad of natural and anthropogenic factors (and their interactions) that may influence ecological relationships and processes (i.e., food-web dynamics) driving seabird population response. Seabirds may be responding to all of these	$7,150,000

	factors, as well using environmental and social cues to maximize foraging efficiency, all in the backdrop of Gulf restoration efforts. This proposal intends to address the following objectives: (1) document inter-annual variability and trends in abundance and distribution of >20 avian species; (2) document foraging effort (e.g., foraging distances, foraging sites, foraging intervals, and foraging trip duration) for 3-4 representative seabirds (GoMAMN Birds of Conservation Concern and that were injured by the DWH oil spill; see Table 4.7-3) that can serve as proxies or indicators for species with different foraging strategies in the Gulf's various open water habitats; and (3) determine environmental and individual factors that are most strongly related to changes (temporal and spatial) in trophic position, pathways, and/or diets using biomarkers such as stable isotopes and fecal DNA for seabirds. We are requesting $4,975,253 over the 5 year span of this project. For an ecosystem-level monitoring and management project that features 25-30 marine bird species, strives to achieve a large spatial coverage of the Gulf of Mexico (and beyond), and pursues a mechanistic understanding of Gulf ecosystem food web dynamics using a strong inter-disciplinary approach, this budget is considered reasonable. The budget includes the following major components: (1) USFWS aerial surveys, (2) At-sea surveys aboard NOAA Vessels of Opportunity, (3) Satellite telemetry of select nearshore and pelagic seabirds, (4) Stable isotope, food web analysis, and energetic mapping, and (5) Gulf menhaden assessment.	
Gulf Oyster Recycling Project	The Chandeleur Islands form an iconic island chain near the Mississippi – Louisiana state line in the northern Gulf of Mexico and comprise the Breton National Wildlife Refuge, the second oldest refuge in the system. The Chandeleur Islands are essential for protecting coastal communities of Mississippi and Louisiana and providing habitat for their shared wildlife and fisheries resources. The Chandeleur Islands have lost approximately 87% of their subaerial area since the 1850s, with accelerated erosion rates associated with hurricanes over the past 20 years. The Chandeleur Island chain is one of the most important locations for nesting colonial waterbirds in the northern Gulf of Mexico, hosting over 20,000 Sandwich Tern nests, 9,000 Royal Tern nests, and 1,300 Black Skimmer nests in 2018. The islands also host regionally-important numbers of breeding Brown Pelicans and Least, Gull-billed, Caspian, and Common terns. These colonial waterbirds nest exclusively on remote coastal islands, which are limited and thus critical for maintaining current populations. For example, Louisiana, which hosts regionally significant breeding populations of colonial waterbirds, has lost approximately half of its Brown Pelican breeding colonies since the early 1990s. Additional loss of colonies is expected in the northern Gulf of Mexico, which will likely result in region-wide, negative consequences for colonial waterbird populations. In addition to supporting breeding birds, the Chandeleur Islands provide important habitat for the federally threatened Piping Plover and Red Knot during the nonbreeding season. The islands attenuate waves, which enables the existence of some of the only seagrass beds in the region. These seagrass beds provide foraging habitat for the federally-listed Loggerhead, Green, and Kemp's Ridley sea turtles and the West Indian Manatee and serve as nursery habitat for many commercially and recreationally important fish and shellfish species during critical life stages. Importantly, the islands represent one of the only documented sea turtle nesting sites in the region. By providing a barrier between brackish and higher-salinity Gulf waters, the Chandeleur Islands are important in preserving lower salinities in the Mississippi and Chandeleur sounds, which promotes oyster fisheries east of the Mississippi River in Mississippi and Louisiana and preserves habitat for estuarine-dependent species. Restoration of the Chandeleur Island chain will be a monumental effort, much larger than could be accomplished through the current Region-wide TIG's (September 24, 2019) Notice of Opportunity (NOO). The proposed project will initiate engineering and design efforts in the broader context of utilizing dredged sediment to raise the elevation and expand the current footprint of Chandeleur Islands, consistent with the strategic frameworks for bird and sea turtle restoration activities and with the restoration approaches and techniques prioritized in the current NOO for birds and sea turtles. The engineering and design phase could also be used to explore new and innovative restoration techniques such as using natural coastal sediment dispersal processes to restore the Chandeleur Islands. Restoration of the Chandeleur Island chain will benefit birds and sea turtles	$7,100,000

	at a region-wide scale. Despite state boundaries, the islands are a shared resource of Mississippi and Louisiana, and the entire northern Gulf of Mexico region. The Chandeleur Island chain serves as a source population for Brown Pelicans, terns, and skimmers within the shared Mississippi Sound – Chandeleur Sound area. Brown Pelicans, which may travel 20-80 km from nests daily for foraging, emphasize the insignificance of political boundaries for these shared resources. Proposed restoration activities will add longevity to the island chain and its ability to support SAV, sea turtles, and marine mammals, and would utilize a restoration technique employed by all 5 state trustees.	
Oyster Restoration in the Gulf of Mexico	Colonial waterbirds such as Brown Pelicans, Reddish Egrets, Royal and Sandwich Terns, and Black Skimmers nest exclusively on remote coastal islands, habitats that are limited and thus critical for maintaining current populations. The very attributes that make these nesting islands high-quality breeding habitats, i.e., their remote and isolated localities with little disturbance and few predators, also place them at the forefront of coastal erosion and land loss. For example, Louisiana, which hosts regionally significant breeding populations of colonial waterbirds, has lost approximately half of its Brown Pelican breeding colonies since the early 1990s. Additional loss of colonies is expected in the northern Gulf of Mexico, which will likely result in region-wide, negative consequences for colonial waterbird populations. New Harbor Island is one of the most important Brown Pelican breeding colonies in the northern Gulf of Mexico region, hosting over 4,000 Brown Pelican nests in 2018. New Harbor Island also hosts breeding Great Egret, Tricolored Heron, Laughing Gull, Forster's, Royal, and Sandwich terns, and Black Skimmer. Restoration of New Harbor Island represents a critical and urgent need in the effort to maintain the remaining viable colonies in the northern Gulf of Mexico region. The proposed project will deposit dredged sediment to raise the elevation of the existing island, followed by replanting with vegetation conducive to Brown Pelican nesting (e.g., matrimony vine, marsh elder). The project is consistent with the Strategic Framework for Bird Restoration Activities and with the bird restoration approaches and techniques prioritized in the Region-wide TIG's September 24, 2019 Notice of Opportunity. Restoration of New Harbor Island will benefit birds at a region-wide scale. The locality is approximately the same distance from Mississippi's barrier islands and Louisiana's mainland, and represents a source population for Brown Pelicans, wading birds, gulls, terns, and skimmers within the shared Mississippi Sound – Chandeleur Sound area. Brown Pelicans, for example, may travel 20-80 km from nest sites daily while foraging (Walter et al. 2014), emphasizing the insignificance of political boundaries for these shared wildlife resources. This project would utilize a restoration technique accepted and employed by all five state Trustees.	$70,000,000
Conservation of Wading Bird Rookery Sites in the Northern Gulf	In the southeastern U.S. shrimp fishery, Turtle Excluder Devices (TEDs) have been shown to be 97% effective at excluding turtles. However, the effectiveness of TEDs largely dependent on fisher compliance with proper installation and operational maintenance of the devices. To ensure proper TED compliance, NOAA) developed a Gear Monitoring Team (GMT) program, which operates in the Gulf States out of the NMFS Pascagoula Lab. The GMT works with the fishing industry to improve their knowledge and understanding of how to effectively build, use, and maintain TEDs. This is achieved through fisher workshops and courtesy dock-side and at-sea TED inspections. The GMT also works closely with the Observer Program to identify specific areas of bycatch concern within the Gulf. However, turtles' interactions with shrimp trawls are seldom detected by onboard observers because most are expelled from the mouth of the trawl or slide out of the TED escape opening (alive or dead) during haul-back. Therefore, the GMT is often times forced to be reactive and focus outreach efforts to areas where stranding events have occurred. Sea turtle restoration efforts in the shrimp fishery could greatly benefit from a better understanding of the spatial and temporal distribution of sea turtle interactions. This would allow the GMT to be proactive and strategically target outreach efforts in "hotspot" areas where and when high frequencies of sea turtle interactions are likely to occur. Hotspot identification could also be used to inform the STSSN and predict areas of increased likelihood of vessel strikes. NOAA researchers based in Pascagoula Mississippi, have discovered that sea turtles, due to their hard shells, make a distinctive sound when they come into contact with the aluminum bars of the TED, as compared to other marine organisms. We propose to place autonomous	$20,000,000

	passive acoustic recorders (Ocean Instruments Sound Trap) on TEDs during commercial trawling operations in conjunction with the mandatory observer program and enhance analytical capacity within the program. The acoustic recordings will be used along with electronic logbooks to calculate the time and positions where interactions occur. This methodology will provide a cost effective way to identify spatial and temporal sea turtle hotspots to inform GMT outreach efforts and TED inspections, management, and future restoration projects.	
Funding to Build Multi-Purpose Response Vessel	It has been well documented for more than 20 years that illegally feeding wild dolphins can lead to a variety of high risk situations that place both dolphins and people in danger (Cunningham-Smith et al., 2006; NMFS 1994; Orams et al., 2002; Samuels & Bejder, 2004). When dolphins learn to associate people with food, unnatural behaviors such as begging for handouts disrupt their natural foraging patterns and become an abnormal and risky feeding strategy (NMFS 1994; Powell & Wells, 2011). Fed dolphins approach boats more readily looking for handouts, thus increasing the animals' risk for boat strike or gear entanglement (Bechdel et al., 2009; Powell & Wells, 2011; Samuels & Bejder, 2004; Wells & Scott, 1997). Fed dolphins can also become targets for human acts of retaliation, including fishers who become frustrated by dolphins begging, removing bait or catch from their lines, or scavenging on undersized throw-backs. Begging behaviors can be passed through a dolphin population via social learning, thus perpetuating and increasing the prevalence of the problem over time (Donoghue et al., 2002; Wells, 2003; Whitehead et al., 2004). Calves of provisioned mothers are at increased risk for compromised developmental and social learning skills, predation, and insufficient hunting experience due to neglect while mothers are seeking handouts from humans (Foroughirad & Mann, 2013; Mann & Barnett, 1999; Mann & Kemps, 2003). Illegal feeding of wild dolphins has been documented or reported in every Gulf state, with several areas being considered hot-spots, and by various water users (i.e. tourism vessels, commercial and recreational fishermen etc.). Therefore, the goal of this project is to reduce lethal impacts to dolphins from illegal feeding activities known to occur in Gulf state waters by effectively changing human behaviors through a targeted outreach and education strategy in a phased approach: (1) Review outcomes from social science studies previously conducted for dolphin-human interactions (e.g., Duda et al. 2013; Responsive Management, 2011 and 2013), evaluate additional needs, and conduct additional social science studies (e.g., focus groups, surveys) to fully characterize the nature and extent of illegal feeding by user group, their motivations/perceptions/attitudes, and receptiveness to different messages and tools; (2) based on the social science studies, develop a comprehensive and targeted outreach plan to effectively educate and inform target audiences about the harm of feeding wild dolphins and how to help promote dolphin conservation; (3) partner with states and local stakeholders to widely distribute and communicate educational tools and messages to reach targeted user groups; (4) Repeat the social science studies to evaluate the use of informed and targeted outreach/education to effectively change human behaviors.	$15,000,000
Commercial Algae Bloom and HAB Remediation Projects along the Gulf of Mexico	Colonial waterbirds such as Brown Pelicans, Reddish Egrets, Royal and Sandwich Terns, and Black Skimmers nest exclusively on remote coastal islands, habitats that are limited and thus critical for maintaining current populations. The very attributes that make these nesting islands high-quality breeding habitats, i.e., their remote and isolated localities with little disturbance and few predators, also place them at the forefront of coastal erosion and land loss. For example, Louisiana, which hosts regionally significant breeding populations of colonial waterbirds (Remsen et al. 2019), has lost approximately half of its Brown Pelican breeding colonies since the early 1990s (Louisiana Dept. of Wildlife and Fisheries, unpublished). Additional loss of colonies is expected in the northern Gulf of Mexico, which will likely result in region-wide, negative consequences for colonial waterbird populations. Isle au Pitre is a rapidly-deteriorating colonial waterbird breeding island located in Chandeleur Sound; its current area is only 12% of what it was in 1998, only 20 years ago. The island remains an important Brown Pelican colony, hosting over 600 nests in 2018. Isle au Pitre also hosts breeding colonies of Royal and Sandwich terns and Black Skimmer. Restoration of Isle au Pitre represents a critical and urgent need in the effort to maintain the remaining viable colonies in the northern Gulf of Mexico region. The proposed project will	$0

	deposit dredged sediment to raise the elevation of the existing island, followed by replanting with vegetation conducive to Brown Pelican nesting (e.g., matrimony vine, marsh elder). The project will include a living shoreline component to dissipate wave energy and facilitate oyster reef development. The project is consistent with the Strategic Frameworks for bird and oyster restoration activities and with the restoration approaches and techniques prioritized in the Region-wide TIG's September 24, 2019 Notice of Opportunity for both resources. Restoration of Isle au Pitre will benefit birds at a region-wide scale. Located on the fringe of Louisiana marsh, at the edge of Chandeleur Sound near the Louisiana-Mississippi state line and only 11 miles from the Mississippi mainland, Isle au Pitre may serve as a source population for Brown Pelicans, terns and skimmers within the shared Mississippi Sound – Chandeleur Sound area. Brown Pelicans, which may travel 20-80 km from nest sites daily while foraging (Walter et al. 2014), emphasize the insignificance of political boundaries for these shared wildlife resources. This project would utilize a restoration technique accepted and employed by all five state Trustees.	
Zero Wash-Away of Marshes in Louisiana	Interactions between bottlenose dolphins and hook and line (e.g., rod and reel) gear occurs throughout the Gulf of Mexico and are increasing (Powell & Wells 2011; Shippee et al 2011). Hook and line (e.g. rod and reel) gear is used by both for-hire (e.g. charter, headboats) and recreational anglers. Dolphin interactions with the gear largely result from: (1) dolphins taking the bait or catch directly off the gear (e.g., depredation) or scavenging discarded fish (e.g., scavenging) (Powell & Wells 2011; Read 2008; Zollet & Read 2006); and (2) illegally feeding dolphins that causes them to associate anglers with food (Christiansen et al. 2016). These interactions are known to result in lethal injuries from entanglement in and/or ingestion of the gear (Hayes et al. 2016; Maze-Foley and Garrison 2016a-d; Barco et al. 2010; Wells et al. 1998; Stolen et al. 2012), as well as related mortalities (e.g., fisher retaliation by shooting) (DOJ 2006, 2007). Based on stranding data records from 2002-2017 in the Gulf, 108 bottlenose dolphins stranded with hook-and-line gear attached; these occurred in almost every Gulf state. Stranding numbers may be up to three times higher because only a portion of animals that strand are detected and recovered (Peltier et al. 2012; Wells et al. 2015; Williams et al. 2011). There have also been federally investigated and prosecuted cases of fishermen retaliating against dolphins out of frustration for the dolphin's depredation behaviors (Vail 2016; Department of Justice 2007). This technique would reduce lethal impacts to dolphins from hook and line gear interactions in the following phased approach: 1.a.) Conducting systematic fishery surveys of hook and line anglers fishing from piers and vessels (both recreational and for-hire) and fishing in a variety of habitats (i.e., coastal and estuarine) to characterize the fishery and determine the frequency and geographic extent of dolphin interactions in Gulf of Mexico State waters, supplementing what is known from strandings data and related characteristics of the entangling gear. Project results would help identify what gear factors may increase the likelihood of interactions, the frequency of dolphin and gear interactions and approximate risk of lethal injury from interactions, and whether there are hot-spot areas where interactions are more likely to occur. 1.b.) Conducting human dimension social science studies (e.g., focus groups, interviews) to characterize anglers' attitudes towards dolphins and interactions with their gear, their likelihood to take various actions (both preventative and retaliatory), and identify ways to reduce interactions. (2). Working with stakeholders to identify, develop, and evaluate conservation measures to reduce interactions (e.g., potential gear or fishing practice modifications, safe and effective deterrence techniques, etc.). (3) Implementing developed actions to safely and effectively reduce dolphin and hook and line gear interactions. Implementation could include partnering with stakeholders to widely distribute and communicate actions. This project will enhance survivorship and resiliency of bottlenose dolphins by reducing lethal impacts resulting from fishing interactions between dolphins and rod and reel fishing gear. Repeating systematic surveys, social science studies and evaluating stranding data may be used for project monitoring.	$380,000,000
Save the World from Plastics!	Information on both the status and trends of the health of bird species across different foraging guilds is useful to assessing the benefits from restoration actions being implemented in the northern Gulf of Mexico. Avian health would	$0

	also inform restoration planning by identifying issues that affect bird health and survival and through identifying geographic areas where bird health is poor. We recommend that the Region-wide TIG implement this project to understand baseline health so that we can evaluate trends and variability in avian health metrics resulting from our restoration efforts. In 2018, the U.S. Fish and Wildlife Service and several partners submitted a proposal to the NOAA RESTORE Science Program to assess avian health in the northern Gulf of Mexico. The project had four primary objectives: (1) synthesize existing avian health data; (2) document trends and variability in avian physiological health measures; (3) document cause of death in localized avian mortality events; and (4) increase awareness of avian health among stakeholders and provide them with a structured framework, SOPs and assessment tools to facilitate future assessments and decision making. The project proposed to evaluate avian health at 32 paired restored and non-restored sites across the northern Gulf of Mexico. The results of this effort will help the Trustees and resource managers to better understand not only trends and variability in avian health metrics, but also system health. The results will also inform restoration planning by identifying issues that affect bird health and survival and through identifying geographic areas where bird health is poor. Altogether, this will be valuable to informing restoration planning and evaluation as the Trustees collectively work towards holistic ecosystem restoration in the northern Gulf of Mexico. The cost of this five-year project was estimated at $5,055,000.	
Mystic Angle	Coastal wetlands along the U.S. Gulf of Mexico can be broadly classified into four vegetation types based on prevailing salinity (that is, fresh, intermediate, brackish, saline), which differ in productivity and value to fish and wildlife resources. Coastal zone managers and researchers often require detailed information regarding salinity zonation of coastal wetlands for modeling habitat capacities and needs of marsh-reliant wildlife (such as, waterfowl and alligator). Coastal wetland vegetation salinity zones have been mapped about every five to 10 years in coastal Louisiana since 1968 by using transect-based helicopter surveys. A recent effort expanded this effort to coastal wetlands from south Texas to Perdido Bay, Alabama for 2010 (https://pubs.er.usgs.gov/publication/sim3336). Coastal wetland salinity zones are not static and change dynamically in response to drought, hydrologic modifications, and storm impacts. Thus, there is a critical need to implement a repeatable methodology for mapping and monitoring the change of salinity zones along the Gulf of Mexico. The objective of this project is to update the existing map of coastal wetland vegetation salinity zones of the western to central Gulf of Mexico from the Texas/Mexico international border to the Florida/Alabama border. Results from this project would benefit marsh restoration efforts Gulf-wide, particularly within the arena of planning species-specific restoration targets based on salinity zonation. Further, these data may improve projections of landscape change, provide information necessary to advance regional-scale natural resource planning, and serve as a baseline for detecting future changes resulting from chronic and episodic stressors. While the helicopter surveys and wetland maps have been conducted regularly by the Louisiana Coastwide Reference Monitoring System, yet the upcoming collection is currently not planned to occur due to programmatic funding limitations. This project would continue the data collection and products that many partners working in coastal restoration and protection in Louisiana have relied on and provide a critical update to the data and products for Texas, Mississippi, and Alabama. Lastly, the project is scalable in several ways, including extending to entire Gulf of Mexico and increasing temporal scale. Project Objectives: 1) Collect coastal wetland vegetation community information via a transect-based helicopter survey from the western to central Gulf of Mexico from the 2) Texas/Mexico international border to the Florida/Alabama border. 2) Produce a map of coastal wetland vegetation salinity zones by using remote-sensed imagery and other ancillary data. 3) Use the coastal wetland vegetation salinity zones to extend the salinity zones to water bodies with an emphasis on small marsh ponds that are important to marsh-reliant wildlife. Anticipated Science Needs for Project Development: 1) Survey of coastal wetland vegetation along transects via helicopter. 2) Coastal wetland mapping from satellite sensors with spatial resolutions spanning 10 m to 30 m; processing required including freely-available Sentinel-2 data from the European Space Agency and Landsat	$0

	multispectral satellite data. 3) Mapping of vegetation salinity zones by using a machine learning algorithm (for example, random forest, support vector machine) with helicopter survey data, satellite data, and landscape position information, such as elevation and relative topography. Implementation Timeframe: This project is envisioned as a three-year effort. Year 1: data collection (vegetation survey) in Louisiana and initial data processing. Year 2: data collection (vegetation survey) in Texas, Mississippi, and Alabama and data analysis for Louisiana. Year 3: finalization of data analyses, reporting of results.	
Oyster Reef Habitat Restoration Project in the Gulf of Mexico	The Deepwater Horizon oil spill Trustees are responsible for restoring the tens of thousands of colonial waterbirds killed by the spill. To meet that responsibility, the Trustees are investing hundreds of millions of dollars in the creation and/or enhancement of bird nesting islands for breeding colonies. Monitoring the success of these restoration projects to determine if the projects are delivering the intended benefit, or if adaptive management is warranted, is also an obligation of the Trustees. Because of the transient nature of birds, monitoring at the project level may not provide an accurate assessment of restoration success for bird nesting colony creation or enhancement. Specifically project level monitoring will not determine if bird populations are increasing or if birds are simply moving between colonies. Therefore, a comprehensive assessment of the numbers of nesting birds across the northern Gulf of Mexico is required to truly determine restoration success. As part assessing bird injuries caused by the spill, the Trustees conducted an annual photographic census from 2010 to 2013 of all coastal waterbird nesting colonies in the northern Gulf of Mexico. Each year's surveys consisted of separate surveys conducted in both May and June. During each survey, several high resolution photographs were taken of every known colony between Vermillion Bay, Louisiana, and Apalachicola, Florida. The photographs were later processed (annotated) to enumerate the numbers of nest per species, condition of the nest, occurrence of eggs and juvenile birds, etc. These surveys provided accurate and comparable assessment of the numbers of colonial nesting birds and nests in the northern Gulf of Mexico each year. Colonies were again photographed in 2015, but the photos were not processed (i.e., birds counted). The Louisiana TIG repeated the colony photographic census in 2018 on a smaller scale. These initial surveys provided a comprehensive assessment of pos t-spill (pre-restoration) condition for colonial nesting birds in the northern Gulf of Mexico. Repeating these surveys on a regular basis (annual or biannual) would allow the Trustees to characterize the collective success of restoration projects designed to create or enhance bird nesting colonies. This type of monitoring will also reveal bird benefits (both direct and indirect) from most other restoration projects that have been, or will be implemented, in the northern Gulf of Mexico regardless of what resource type that the project was designed. As such, monitoring of the colonial nesting birds will provide an opportunity for the Trustees to assess progress toward the stated goal of "comprehensive integrated ecosystem restoration."	$3,500,000
Bayou Dularge Ridge, Marsh and Hydrologic Restoration	This project would gather baseline information necessary to inform future restoration to reduce bycatch/interactions between hook/line fishing gear and protected species (i.e., sea turtles and marine mammals). The project would survey recreational anglers and for-hire vessels in the Gulf of Mexico to determine the magnitude of protected species interactions with recreational gear. Fishing interactions between hook/line gear and protected species are increasing in the Southeast. These interactions are problematic for both the anglers and the animals. For anglers, interactions may result in a decrease in catch, damage to gear, or frustration. For the animals, interactions cause an increased risk of death or serious injury from entanglement in or ingestion of gear, illegal retaliation from anglers, and changes in natural behaviors. For example, when a dolphin is fed, this leads to changes in the dolphin's foraging behavior, and teaches it to associate anglers with food. This project would inform efforts to reduce injury and mortality to sea turtles and marine mammals from interactions with rec hook and line fishing gear by fully understanding the frequency, location, and nature of interactions in the Gulf of Mexico. We will conduct systematic surveys of anglers and for-hire boat captains/owners and their patrons that fish region-wide in all coastal Gulf states, including Texas, Louisiana, Mississippi, Alabama, and Florida. The survey sampling frame will be informed by Marine Recreational Information Program Fishing survey modes.	$52,000,000

	Anglers and for-hire boat captains/owners and their patrons will be asked standardized questions to inform restoration efforts, such as where they have seen protected species while fishing, describe the animals' observed behaviors, and share details about interactions. Data on interactions with protected species are limited to a few research studies, strandings records, and anecdotal reports by fishermen. Strategic data collection on rod and reel gear interactions is needed to fully understand the frequency, geographic extent, and mode of interaction between protected species and fishing gear. Understanding the impacts, as well as where and how often these interactions occur, is vital to informing restoration efforts to reduce and prevent such interactions for the benefit of anglers and protected species. Estimated costs for this project are ~150K/state survey. Assume one survey per state for a total cost of 750K to be conducted over a 3-5 year period.	
Testing Assumptions and Uncertainty in Avian-Oriented Restoration Projects: Impacts on Habitat Use of Nesting Colonial Waterbirds	Systematic surveys of bird mortality in coastal areas (primarily in area with little to no vegetation like beaches, island perimeters, exposed shorelines and mudflats, river and creek mouths, exposed points and spits, etc.) can provide important information for the management of coastal birds. Such surveys can establish baseline or background estimates of bird mortality and deposition rates. Surveys may provide information for the detection of mortality due to algal blooms and associated toxins (i.e., red tides), avian disease outbreaks, lead ingestion, oil spills, or other anthropogenic contaminants. The identification of cause-specific mortality events (and cause-of-death) and geographic places with either high rates of mortality or high frequency mortality events, i.e., hot spots', would be valuable to inform restoration planning (where) and restoration assessment (how many); thus, increasing efficacy of restoration efforts for injured bird resources. Over time with repeated sampling of sites (study design is critical component of initial efforts), one would be able to estimate mortality trends and such data would be a critical comparison between 'natural' levels of mortality in the case of future oils spills or chemical discharges. Coastal bird surveys may further function as a proxy for the Gulf of Mexico ecosystem health. Given the northern Gulf of Mexico has the highest level of oil and gas infrastructure (wellheads, platforms, pipelines, storage facilities, helicopter and vessel traffic, etc.) of anywhere in North America, it is a bit surprising that no systematic and/or programmatic avian mortality survey has ever been established in the Gulf of Mexico. Conversely, systematic dead-bird surveys are routinely conducted along the Atlantic (SEANET) and Pacific (COASST) coasts. It is recommended here that the RW TIG establish a program for monitoring avian mortality at a number of strategically selected sites within each of the Gulf-facing states. Such an effort would require a Coordinator and rely heavily on trained citizen scientists to carry-out surveys. Establishment of such an effort would follow processes, procedures, training materials, survey protocols, and other methodologies as has been employed by SEANET; refer to the link here https://vet.tufts.edu/wp-content/uploads/seanet_protocol.pdf. It is suggested the RW TIG initiate a five-year project to conduct systematic surveys for dead and sick birds across a number of sites across the northern Gulf of Mexico. Site selection would be done using the EPA 40-sq km hexagons and use GRTs sampling for plot selection. To address how many transects are needed, length of transects, and sampling frequency within plots, a power analysis would first be conducted. In establishing plots, effort would be proportional to the amount of 'bare shoreline' available that is accessible by foot. For example, given the length of their respective coastlines, FL and TX would require more plots, transects, effort, and people. Other sites, like islands, requiring boat access would be evaluated on a case-by-case basis. As an example within plots, we might consider 2-3, 1 or 2km transects surveyed biweekly (2x/month). At this time, this proposed idea suggests a total 14 teams (5 in FL and TX, 2 in LA, and 1 each in MS and AL) with surveys likely conducted twice monthly. It is assumed here that systematic surveys of 5, 2km transects could be completed daily. Surveys would follow the protocols developed for the Beached Bird Surveys conducted as part We anticipate some input and assistance through GoMAMN Community of Practice (CoP) and various federal, state, NGO, and academic partners to implement this effort. There is likely existing capacity and expertise within the GoMAMN CoP to relatively easily conduct initial plot	$572,719

	selection and transect selection within plots, as well as the power analysis. Proposed Budget: $250,000/yr or $1,000,000 5-yr.	
Spill Oil Picking Up System	Cellular Electronic Logbooks (CELBs) provide an improved means of understanding the spatial and temporal extent and patterns of fishing effort. This project would improve our understanding of the spatial and temporal effort and patterns of shrimp fishing by expanding the Gulf of Mexico shrimp fishery electronic logbook (ELB) program in the inshore fishery. This enhanced understanding of fishing effort, available in a timely manner, will allow NOAA to prioritize the efforts of the Gear Monitoring Teams to conduct courtesy inspections and provide assistance and training to fishermen to help them comply with Turtle Excluder Device (TED) requirements to help reduce bycatch of sea turtles. The cELBs provide data on fishing effort and location and improve the accuracy and precision of the data being collected in the shrimp fishery. Vessel location is recorded every 10 minutes and is stored until the data can be transmitted via cellular signal. This project would purchase cELBs and install them on federally and state-permitted otter trawls and skimmer vessels in the GOM. There are approximately 4200 state permitted otter trawls, 3800 state permitted skimmer trawls, and 1500 federally permitted otter trawls. Currently ~460 units are installed on federally permitted otter trawls (32% coverage). There is a critical need for timely effort data from the inshore and skimmer portions of the fishery. The cELBs would provide near-real time data for these portions of the fishery as they are frequently in range of cell towers. The project would also include sample design and data analysis.	$3,000,000
Add a provision similar to Section 7 of the Endangered Species Act to the Marine Mammal Protection Act	The Gulf of Mexico is home to five species of threatened or endangered sea turtles. Although aquatic throughout their life histories, female sea turtles must come ashore to nest. This fact suggests that, regardless of what in-water programs resource managers implement, sea turtles are critically dependent upon functioning nesting beaches for their survival. At the same time, many beaches are currently at risk from erosion, subsidence, sea-level rise, and/or development. This project would support future restoration planning by identifying sea turtle nesting beaches throughout the Gulf of Mexico that are currently eroding and potential sand sources and develop a prioritization methodology to schedule vulnerable beaches for restoration in future restoration plans. The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta), for example, states, "Placing sand on highly eroded beaches, especially those with a complete absence of dry beach, can benefit nesting turtles if conducted properly. Sea turtle concerns must be considered in project planning to ensure the sand source is compatible with naturally occurring beach sediments in the area (in terms of grain size, shape, color, etc.) and that remediation measures are incorporated into the project to allow for successful nesting, nest incubation, and hatchling emergence..." These principles would benefit other sea turtle species as well. Techniques used to select the sand source and to place the sand would be consistent with sea turtle nesting beach protection. Such measures would include: • work would only take place during the day, • outside of nesting season, • sand would come from a source compatible to the native beach, • placement would mimic the native beach profile, • would include measures to reduce compaction and escarpment formation after construction, • conduct artificial light assessments afterwards and retrofit with wildlife friendly lighting where needed. A DOI project team would: 1) Identify key nesting beaches that are currently eroding or not being adequately restored by natural processes and the amount of sand needed for each beach. 2) Identify near-by sand sources, including BOEM sediment sources and potential beneficial reuse projects, and the amount and type of sand available from each source. 3) Develop prioritization criteria to schedule beach restoration using the most suitable sand resources. The prioritization criteria would be based on a combination of the status and functionality of each beach, future risk, amount and type of material, frequency of restoration needed, distance to replacement material, cost of moving material, and expected resource benefits of the project. 4) Produce a database of prioritized projects for the use of restoration planners. This project would also benefit shorebirds and other natural resources that use beach and beach/dune habitat.	$10,000

Gulf Winter Stewardship - Louisiana	Systematic surveys of bird mortality in coastal areas can provide important information for the restoration and management of coastal birds, habitats, and resources. These surveys can establish normal rates of bird mortality and deposition on beaches. Such information is important for the detection of unusual mortality events (UMEs) due to algal toxins, disease outbreaks, oil spills, or contaminant releases. The identification of causes of mortality or geographic mortality "hot spots" would enable the Trustees to more effectively target restoration. Data generated through systematic coastal surveys also provides important baseline information for the assessment of natural resource injuries in future oils spills or chemical discharge events. Coastal bird surveys can further serve as indicators of ecosystem health and may provide insights to recovery of the northern Gulf ecosystem. Systematic beach surveys for dead or impaired birds are conducted along the Atlantic coast by the Seabird Ecological Assessment Network (SEANET) and the Coastal Observation and Seabird Survey Team (COASST) on the Pacific coast. No such programs have been established for the northern coast of the Gulf of Mexico. We recommend the RW TIG establish a systematic surveys of dead and impaired birds on at a number of strategically selected beaches in the northern Gulf of Mexico. The systematic surveys could also collect data on the occurrence and frequency of mortality of other living coastal and marine resources. The current recommendation is to initiate a three-year pilot study for systematic beach surveys. The proposal is to have 10 teams (two per State) survey five transects twice monthly (total of 50 transects and 1,200 surveys/year). It is assumed that the survey of the five two-kilometer transects could be completed in one day. The teams would consist of two individuals from State or federal land management or natural resource agencies. Surveys would follow the protocols developed for the Beached Bird Surveys conducted as part of the Deepwater Horizon NRDA. Personnel cost would represent the largest cost in this effort. Each team would require 4 person-days for the monthly surveys, or 48 days per year. An additional person day would also be provided each month, or 12 days per year, for survey preparation and data management. A total of 600 days would be required for all ten teams. Additionally, one person would spend half of their time each year (130 days) overseeing the teams, managing data from all teams, and preparing a reports of survey findings. In all, a total of 730 days would be needed to conduct surveys, manage data, and prepare reports. It is also estimated that each team would need $1,000 per year ($10,000 for all teams) for supplies, gas, and other materials. The overall cost of the Shoreline Surveys would depend on salary costs of the personnel that participating agency would dedicate to this effort. It would be expected that agencies would assign junior (i.e., lower paid) staff to the surveys. For the sake of project costs estimation, the salary of a Federal GS-11, step 5 employee was used to estimate costs. The cost of a full time GS-11/5 (salary plus benefits and indirects) is slightly less than $200,000 per year ($196,862). One person-year, or Full Time Equivalent (FTE) is 260 days. Therefore, 2.8 FTEs (730 divided by 260) would be needed for the project each year. Under this assumption, the annual cost of this effort would be slightly less than $600,000. Again, this estimate is assumed to be high.	$520,000
South Salmen Marsh creation project	The goal of this project would be to expand on previous drift modeling work conducted by NOAA in the northern Gulf of Mexico to the eastern Gulf to enhance mortality investigations. Sea turtle strandings are often used as an indicator for at-sea mortality. Stranding data are critical to identify mortality sources (especially anthropogenic), areas of concern, and trends. However, the number of documented sea turtle strandings only represents a minimum measure of mortality, as the probability of a carcass stranding varies greatly depending on time of year, geographic location, decomposition rate as well as oceanographic and atmospheric conditions. This project idea would involve deploying effigy's offshore with satellite tags to determine drift patterns based on water depth, currents, and other oceanographic features, and to determine the probability of carcasses stranding. Previous work was conducted by NOAA's Southeast Fisheries Science Center in MS. This project would inform mortality investigations for sea turtles. The project could be scaled. The project would be implemented by NOAA with partners from state agencies and the STSSN.	$18,000,000

Pointe aux Chenes Ridge Restoration and Marsh Creation	Seabird species (and other taxa) associated with coastal and marine habitats in this region are experiencing population declines due to multiple stressors (e.g. sea-level rise, habitat loss, predation, human disturbance) disproportionately to many other species and habitats within the Region Specifically, the great majority of these species (74 of 84 assessed in the State of Birds report 2010) have medium or high vulnerability to climate change. Currently, however, there is no atlas or database of seabird nesting sites for the northern Gulf of Mexico to support inventory, monitoring, management, disaster response, or research. The Deepwater Horizon oil spill highlighted the critical need for such a product. An atlas also would be valuable for marine spatial planning issues including, but not limited to sighting wind turbines, scheduling and sighting sand-dredging and beach nourishment operations, managing recreation and human access and disturbance mitigation planning, and land/marine conservation planning. Overall, these data are needed by States, NWRs and National Park Service land managers who collectively are responsible for the management of the majority of the known seabird resources in the Southeast. The product also would benefit recently funded LCC research on effects of sea-level rise on seabirds and shorebirds in the SE US. Lastly, the development of seabird colony registries worldwide was recommended as action outcome of the first- ever, World Seabird Conference held in 2010. For seabirds that nest in the northern Gulf, one of the highest priorities for addressing gaps in data for status and trends is the development of a registry or colony atlas that is region-wide and accessible to the broader avian conservation community. Although each state collects some level of data on abundance of breeding seabirds, the timing, frequency, type, and protocols associated with surveys are not consistent, inhibiting effective and efficient regional assessments. For example, infrequent or irregular colony surveys or surveys that are uncoordinated among states may fail to capture shifts in colony sizes among locations either within or among states, resulting in potentially misleading data. The registry and atlas would include a suite of data including, but not limited to: colony location, spatial coordinates, contact people and agencies, recent and historical nest counts by species, permitting requirements and laws regarding colony entry, logistical issues regarding access (e.g., locations of boat ramps, tidal currents, anchoring), citations of reports and papers associated with the colony site, and photographs (recent and historic where available). Once compiled, the data would be developed into an online atlas (i.e., maps) and registry (data and meta-data) that could be accessed freely through a public facing website, e.g., GoMAMN, Atlantic Seabird Working Group. Data from previous colony aerial overflight surveys (post-DWH) and future such surveys could/should be included herein. The completed atlas and registry would serve as a launching-point for the future development of an online and annually updated database that would serve the needs of the USFWS, GoMAMN, and myriad of conservation partners. All of the proposed work would occur in coordination with ongoing efforts of the World Seabird Union (of which Dr. Pat Jodice is a key member) to develop World Seabird Colony Registers (i.e., we would ensure compatibility between the products). This effort would leverage experience, expertise, and personnel from both GoMAMN and the Atlantic Seabird Working Group, as well as federal, state agencies, and NGOs. Where and when possible inclusion or incorporation of existing datasets would be a priority. This was identified as a priority with the GoMAMN Strategic Avian Monitoring Plan for the Northern Gulf of Mexico (Chapt. 6). For more information on the Atlantic Seabird Registry and Atlas, refer to the following link https://www.atlant icseabirds.org/atlas-general Proposed Budget: $150,000-200,000 Period of Performance: 24-36 months.	$45,000,000
East Bank Sediment Transport Corridor to Breton Land Bridge and Marsh Creation of Northern Lake Lery	The Gulf Coast has clearly been identified as incredibly important for shorebirds and seabirds with threats of habitat destruction from coastal storms, sea level rise, and human factors continuing to impact their populations. Human populations and tourism activities continue to grow along the Gulf Coast limiting habitat availability for shorebirds and waterbirds. Much attention has been placed on increasing nesting opportunities for many species breeding species through habitat restoration and stewardship initiatives. However, less emphasis has been placed on the wintering and migratory periods when there is an influx of tourists to the Gulf region. This has greatly impacted where birds can feed and roost to maintain their condition and prepare them for migration. Carry-over effects that sub-optimal habitat in	$71,630,000

	wintering areas and migration stopovers can be substantial to populations particularly those already suppressed or when northern sites are also diminished (e.g. Delaware Bay). This project aims to increase the number of year-round refugia (protected areas) in the Gulf Coast region with incentive-based conservation. Public and private shorelines are major destinations for recreational use and the closure of those areas comes at some cost to the landowners. Funding is needed to incentivize the closure of small portions of beach to offset the cost of the closure. The small areas to be identified are modeled after Fort De Soto County Park, Pinellas County, FL where the park has set aside a "Shorebird Habitat Area" where there is no entry. With a mere 300 meters of beach closed, this area has become a destination for large flocks of shorebirds and seabirds to rest and feed when sub-tidal sand flats and spits are covered during high tides. This is one of the only places in the immediate region that red knot flocks have been consistently recorded for nearly 12 months out of the year as one example of the success of this strategy. This "micro-refugia" could be a low- cost/high-reward strategy if employed judiciously throughout the Gulf. There are key characteristics that make this a potentially powerful strategy if replicated gulf-wide. This include: • Public and private shorelines that that have high human use • Is or is in close proximity to existing resources foraging areas such that it provides feeding and/or roosting opportunity • Ease of enforcement The first phase of this project would be to work with partners to identify sites that would be targeted for incentive-based refugia. The second phase would be to determine the annual cost that is necessary and reasonable to offset public use of beaches on public and/or private lands. Finally, implementation would be to establish 2-3 year agreements with agencies and private landowners to evaluate the bird response and measure success of the program for future funding.	
East Bank Sediment Transport Corridor to Breton Land Bridge and Marsh Creation of Western Breton Land Bridge	This project aims to develop new and enhance pre-existing technical and infrastructure capabilities within the Gulf of Mexico (GOM) region to respond to marine mammal disasters from natural and anthropogenic causes. Other initiatives are currently underway to gather information and coordinate with Federal and state agencies to determine existing and identify new capabilities to be developed by the stranding network and its partners to identify impacts of disasters on marine mammals and improve rapid response to those threats. This project will closely coordinate with those initiatives to implement identified actions, including improving response capabilities for marine mammal disasters in Gulf of Mexico coastal states. We will develop and enhance partnerships and trainings for the stranding network through workshops in the new standardized response techniques and capabilities. Expert response resources will also be identified and obtained. The stranding network will also receive information about newly identified threats and the efficacy of various response options to those threats. Finally, we will work with partners to disseminate resources throughout the GOM states related to the standardized response techniques and capabilities and continue the coordination with those partners. Specifically, the project is the implementation of an overarching disaster response program, focused on improving effective and efficient responses to marine mammal stranding and health events or disasters. This program would be implemented across all the coastlines of the GOM and benefit all stocks of marine mammals by increasing and improving the effectiveness of marine mammal response during a disaster in the GOM. One focus of the work would be on implementation of plans developed to be prepared for future oil spills, as well as responses to mitigate impacts to marine mammals from natural disasters such as hurricanes, freshwater inundation events, harmful algal blooms, and other types of natural and anthropogenic crises that may be identified in these or other initiatives based on outreach and communication with our partners. As response plans are developed, we will implement the necessary training, including drills and exercises, to fully test the plans and then iteratively improve them as needed. Additional assets may also be identified and acquired, including but not limited to expert and experienced responders and specialized equipment including necropsy trailers. The plans, partnerships, protocols, training, and drills developed in the full implementation of a marine mammal disaster response program will lead to a more timely and effective responses to marine mammals following a disaster, which will improve survivorship of animals during and following these events.	$73,680,000

Buras Bayou Marsh Restoration Delta NWR	The intent of this project idea is a coordinated effort (e.g., among state Trustees, non-government organizations, other interested parties) to detect, remove, and properly dispose of derelict fishing gear (DFG), including derelict crab traps and other commercial fishing gear (e.g., trawls, gill nets, long lines), as well as recreational fishing line. In addition to contributing to ghost-fishing mortality of commercially- and recreationally-valuable finfish and blue crabs, DFG is an important source of mortality for sea turtles, marine mammals, and birds. Derelict fishing gear represents a region-wide problem, and the proposed project idea would be best executed in a region-wide fashion with coordinated efforts in multiple states. This project idea could include funding volunteer-type events, such as derelict crab trap clean-up rodeos, coordinated efforts to conduct side scan sonar and/or bottom grappling to detect DFG, and/or distribution and maintenance of monofilament fishing line repositories (e.g., at public fishing sites, boat launches, marinas). This project idea is consistent with the Strategic Frameworks for bird, marine mammal, and sea turtle restoration activities and with the restoration approaches and techniques prioritized in the Region-wide TIG's September 24, 2019 Notice of Opportunity for bird, marine mammal, and sea turtle restoration types.	$25,000,000
Hydrologic Restoration of Bayou Sauvage	Both Calcasieu and Caillou Lakes have been consistently productive for oyster recruitment, growth, and reproduction. These areas represent public grounds that have not been adversely impacted by the flooding from the Mississippi River in 2019 or previous years when the Bonnet Carre spillway has been opened. As such these lakes are a reliable source of commercial production and also for the creation of larvae which can seed other reefs in Louisiana after a mortality event. This proposal aims to support and strengthen the ability of these two lakes to anchor and stabilize the state's public grounds through the creation of brood stock reefs associated with adjacent harvestable reefs. Brood stock reefs would be placed in intertidal areas along the shorelines of these lakes. These reefs would not be available for harvest, but the oysters growing on them would produce a regular, reliable larval supply to adjacent harvested reefs. Additionally, these reefs will protect the shorelines from erosion, will help to maintain and improve water quality, and will serve as an important structural habitat for many species of shrimp, crabs, and finfish. Protecting adjacent shorelines and slowing or stopping land loss is key to protecting a number of species that rely on salt marsh for their survival. Specifically, in Calcasieu Lake, brood stock reefs will be place around Rabbit Island. The island represents the only brown pelican nesting area west of the Mississippi River in Louisiana and also serves as the nesting area for a number of other species including terns, herons, and gulls. The adjacent, harvestable reefs in these lakes would be more like traditional cultch plantings and would be wholly subtidal. These reefs would be created with enough material that their vertical component is such that they do not become buried by sediment, and that they occupy enough of the water column so that the flow of water is increased around the reefs to improve the oysters ability to both feed and transport larvae. Part of this effort will be the retention and recycling of some of the shell that comes from these reefs to maintain the height and long-term viability of the harvestable reefs. Additionally, these reefs (both intertidal and subtidal) are a boon for recreational fishing interests. In Calcasieu Lake these brood stock - harvestable reef associations will be located in West Cove (along the shoreline and around Pelican Island) and along the southeastern shore of the lake. In Caillou Like they will be placed along the southern shoreline of the lake between Bayou Dularge and Grand Caillou. In total there will be approximately 8 linear miles of brood stock reef and 150 acres of harvestable reef. Materials for brood stock reefs will be contained in gabion cages. This method performs very in protecting adjacent shoreline and promoting the settlement and growth of oysters, and well as attracting a diversity of reef-associated species. For the harvestable reefs, a base of large rock/concrete chunks will be used, and the interstitial spaces filled with smaller rock and shell. The large base will help maintain the vertical component of the reef and will be resistant to degradation from harvest equipment. This project is regionally relevant because the conditions for oysters to grow and survive exist at these sites and are anticipated to exist into the future making those water bodies reliable sites for production. This is important when periods of drought and flooding devastate oyster populations in other parts of the Gulf as it can ensure the availability of oysters to processors and	$15,000,000

	dealers and can act as a source of larvae as conditions allow damaged reefs to rebound. The elements of this proposal are wholly consistent with LDWF's resource management aims and the State of Louisiana's Coastal Master Plan. The effort addresses both the environmental and economic damages realized from the spill and is of regional importance.	
Terracing open water ponds within Delta NWR	The Lake Pontchartrain Basin Foundation and the Louisiana Dept of Wildlife and Fisheries are currently building four sub-tidal reefs in Louisiana. Two of these sites are in Mississippi Sound are expected to propagate oysters based on a salinity regime established after closure of the Mississippi River Gulf Outlet. A combination of materials is being used including oyster shell, limestone boulders and reef balls. In addition, LDWF will be placing live spat on cultch at all four reef sites. All of this work will be completed in 2019. This phase 1 of treatment to the permitted sites (four acres each), will allow for future additional material. The two sites in Mississippi Sound are in Louisiana waters but could benefit spat recruitment in both Louisiana and Mississippi. The two sites are merely 3.5 and 2.1 miles from Mississippi state water bottoms. The area of the sound where the reefs are located is known to be tidally very active and should enhance dispersal of larvae in both states. The proposal here is to enhance the two Mississippi Sound sites with addition of hard strata material to expand the quantity and quality of these brood reefs. The two brood reefs are located on public seed ground and will be prohibited from any harvesting of oysters. We anticipate that the brood reefs will release larvae that would readily drift within portions of the sound in both states. The reefs are currently permitted but would need to be amended to add additional material. LDWF would also spat on cultch on the newly treated portions of the two reefs.	$5,000,000
Gulf Shoreline Protection Rockefeller Refuge	Summary We propose a network of 6 oyster reefs along the northwestern fringes of Louisiana's Biloxi Marsh near the Mississippi border. The reefs would be strategically designed to enhance the propagation of a robust oyster population and increase the oyster shell budget in the 1,000 sq mi of Biloxi Marsh estuary in southeast LA and coastal MS. The project used the Oyster Habitat Suitability Index (HSI), Hydrocoast Maps, and benthic characterization to target strategic reef restoration areas. The network will include a diverse set of protected broodstock reefs that: 1) span habitat gradients, 2) use various materials and technologies, and 3) are supplemented by hatchery-raised larvae. This strategy reduces the risk of simultaneous detrimental impacts from salinity changes, sea level rise, predation, poaching, or other perturbations. Establishing spawning oyster populations within this hydrological unit will facilitate larval transport, benefitting the region from the Biloxi Marsh to the Mississippi Sound. Description Historically, vast barrier oyster reefs dominated the Biloxi Marsh estuary. The listed partners propose restoring resilience to oyster populations in this region by establishing diverse oyster reefs that functions as both protected habitat for marine organisms and as oyster spawning stock. We updated the latest Oyster HSI to identify target areas that have experienced good suitability for 5 of the past 6 years and that also have a sufficiently firm benthic substrate. Less than 10 miles from the border with MS, this area is well-positioned to benefit the region; establishing reproductive subpopulations will facilitate larval export along circulation currents to the metapopulation of the Mississippi Sound. Two spawning reefs will be subtidal, 3-D structures of 4 acres each that are designed to serve as non-harvestable broodstock. They will consist of 180 reef balls interspersed with cultch—a combination that adds vertical relief and habitat diversity while also deterring poaching as dredges cannot work through reef balls. The cultch will include crushed limestone and recycled oyster shell from CRCL's Oyster Shell Recycling Program. Oyster recruitment will be enhanced through the remote setting of diploid spat-on-shell raised by LDWF's oyster hatchery, dispersed across the reef following deployment. LDWF's hatchery operation is supported in part by NRDA funds, so this project will leverage an existing priority resource. Four reefs will be positioned as intertidal living shorelines spanning ~0.25 miles each. Also not-for-harvest, these will serve as broodstock, shoreline protection, and habitat structures. Their intertidal position—including fringing to nearshore habitat—will provide resistance to predators. Composition will be recycled oyster shell or shell/rock mix placed in Gabion mats, mattresses, or baskets. As oyster larvae in the water column attach to the cultch and grow, the reefs will become living shorelines. Diploid spat-on-shell will enhance oyster recruitment, as described above. The 4 reefs will be sited along a salinity gradient, with the goal of	$20,000,000

	achieving at least one spawning population at all times in various and unpredictable future scenarios of flooding, diversions, disease, predation, and sea level rise. These reefs will provide subtidal, nearshore, and fringing benthic habitat, and support marsh wetlands and submerged aquatic vegetation. The oysters that grow will filter nitrogenous wastes, become a food source, and provide structure, restoring ecological function to marine communities. The living shorelines will attenuate wave energy, slowing the erosion of the shoreline behind them. The reefs can self-repair and adapt to sea level rise by growing vertically. The local economy will benefit through enhanced recreation and commercial fishing. The public interface via CRCL's recycling and volunteer programs will add educational, engagement, and promotional opportunities.	

Appendix D MAM Plans

Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Bayou Dularge Ridge and Marsh Restoration Project

November 1, 2021

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1 Introduction

The Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (TIG)[1] developed this Monitoring and Adaptive Management Plan (Plan) for the Bayou Dularge Ridge and Marsh Restoration (TE-0170) project (Project) which was engineered and designed utilizing funds from the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act). This project will be constructed using funds associated with the Deepwater Horizon Natural Resource Damage Assessment (NRDA).

The purpose of this Monitoring and Adaptive Management (MAM) Plan is to identify monitoring activities that will be conducted to evaluate and document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action (15 CFR 990.55(b)(1)(vii)). Where applicable, the MAM Plan identifies key sources of uncertainty and incorporates monitoring data and decision points that address these uncertainties. It also establishes a decision-making process for making adjustments where needed.

There are three primary purposes for MAM Plans:

1. Identify and document how restoration managers will measure and track progress towards achieving restoration goals and objectives
2. Increase the likelihood of successful implementation through identification, before a project begins, of potential corrective actions that could be undertaken if the project does not proceed as expected
3. Ensure the capture, in a systematic way, of lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. For example, the MAM Plan may need to be revised should the project design change, if initial data analysis indicates that the sampling design requires adjustment, or if any uncertainties are resolved or new uncertainties are identified during project implementation and monitoring. Any future revisions to the MAM Plan will be made publicly available through the Restoration Portal (at the following URL: https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (at the following URL: https://www.gulfspillrestoration.noaa.gov/).

1.1 Project Overview

The Bayou Dularge Ridge and Marsh Restoration project is located in the Terrebonne Basin, Terrebonne Parish, Louisiana on the lower end of Bayou Dularge between Lake Mechant and Caillou Lake, also known as Sister Lake, and about 15 miles southwest of Theriot. The approximate center of the project area is located at 29.264793° North and 90.935788°W (Figure 1). The project will use material from Lake Mechant to create and nourish approximately 530 to 700 acres of marsh on the south side of Bayou Dularge and restore approximately 15,925 to 27,875 linear feet of ridge along the south bank of Bayou Dularge (Figure 11). The elevation of the marsh and ridge will be determined in the Final Design Report, which has not been developed as of this version of the MAM Plan. However, it is anticipated that the constructed marsh fill elevation of

[1] The LA TIG includes the following members: Louisiana State Trustees include the Louisiana Coastal Protection and Restoration Authority (CPRA); Louisiana Department of Environmental Quality (LDEQ); Louisiana Department of Wildlife and Fisheries (LDWF); and Louisiana Department of Natural Resources (LDNR); Louisiana Oil Spill Coordinator's Office (LOSCO). Federal Trustees include Department of the Interior (DOI), the National Oceanic and Atmospheric Administration (NOAA), United States Environmental Protection Agency (USEPA), and United States Department of Agriculture (USDA).

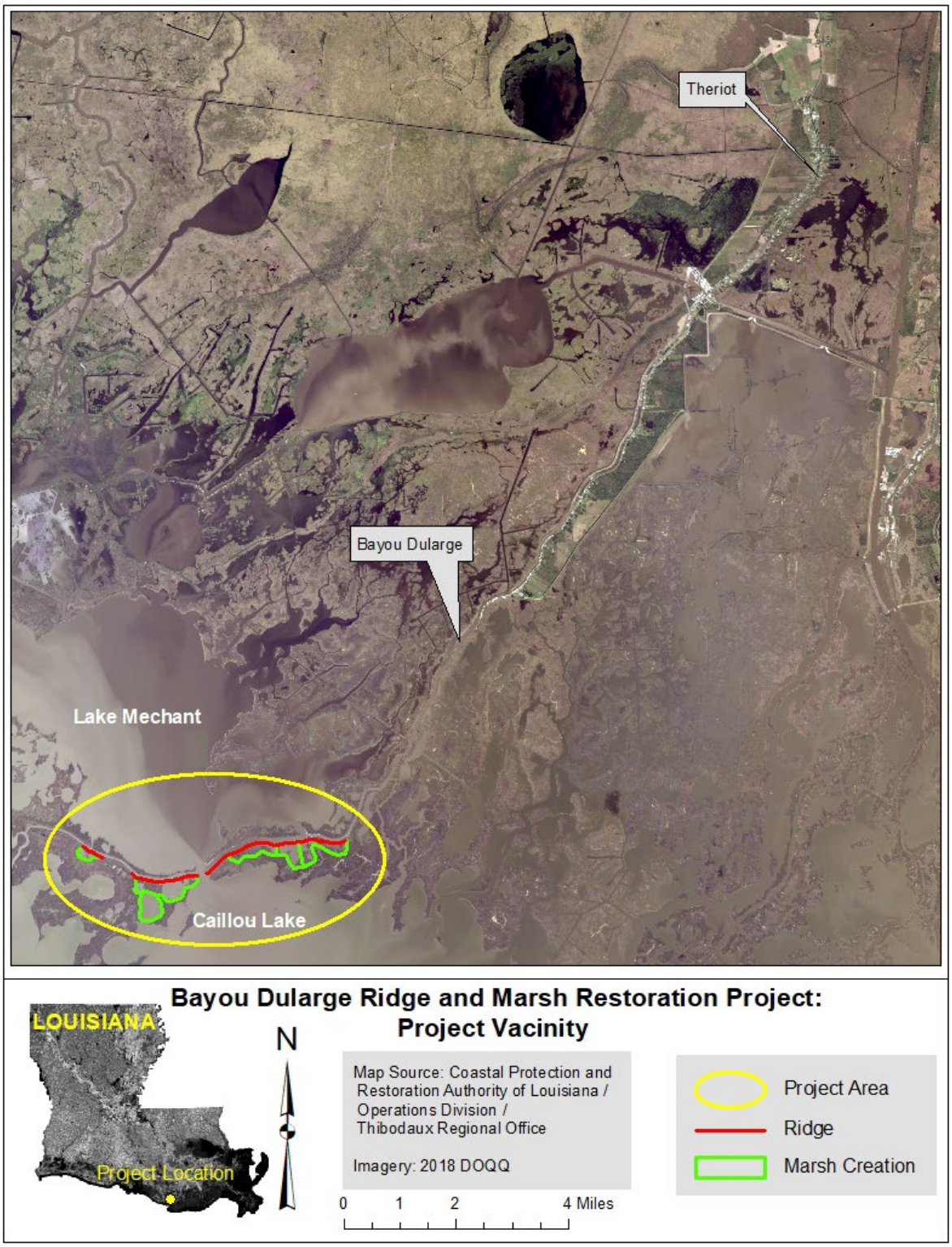

Figure 1. Bayou Dularge Ridge and Marsh Restoration Project vicinity map.

the marsh platform may be range between +1.3 and +1.5 feet whereas the ridge will be +5.0 – 6.0 feet (Geoid12B, NAVD88). Sediment for the marsh will be dredged from the southwest corner of Lake Mechant whereas the material used for the ridge will be from the interior marsh prior to filling the marsh creation units. Upon completion of the Project, suitable native shrub/woody vegetation will be planted on the ridge. It is anticipated that herbaceous vegetation will naturally establish within the first few years of the Project. However, vegetative plantings on the marsh platform may occur if natural succession does not occur as anticipated (see Section 5 on corrective actions).

This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the Programmatic Damage Assessment and Restoration Plan /Programmatic Environmental Impact Statement (PDARP/PEIS) (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016). Per the PDARP/PEIS, the project falls into the following restoration categories:

- **Programmatic Goal:** Restore and Conserve Habitat
- **Restoration Type:** Wetlands, Coastal, and Nearshore Habitats
- **Restoration Approach:** Create, Restore, and Enhance Coastal Wetlands
- **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material
- **Trustee Implementation Group:** LA TIG
- **Restoration Plan:** 8

The implementing state trustee is the Coastal Protection and Restoration Authority (CPRA) of Louisiana. The implementing federal trustee is the United States Department of Agriculture, represented by the Natural Resources Conservation Service (NRCS).

1.2 Restoration Type Goals and Project Restoration Objectives

The goal for the Project is to create and restore wetlands, coastal and nearshore habitats in the Louisiana Restoration area, specifically in the Terrebonne Basin. This area has been degraded due insufficient fresh water and sediment supply, sea level rise, land subsidence, and storm events. In restoring these coastal habitats, the Trustees envision that the Project will compensate, in part, for wetlands, coastal and nearshore habitat losses associated with the DWH oil spill.

1.2.1 Restoration Type Goals

As summarized in the PDARP/PEIS, Chapter 5, the restoration goals for injuries to coastal habitats are as follows:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill.
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.
- Restore habitats in appropriate combinations for any given geographic area. Design factors, such as connectivity, size, and distance between projects, are considered to

address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

The restoration objectives for the Bayou Dularge Ridge and Marsh Restoration project will help the Trustees accomplish these identified restoration type goals.

1.2.2 Restoration Objectives

To help meet the restoration goals for injuries to coastal habitats, the Project's restoration objective is to create and nourish up to 700 acres of marsh and up to 27,875 linear feet of ridge habitats in the Project area of the Terrebonne Basin, which has been degraded due to insufficient fresh water and sediment supply, sea level rise, land subsidence, and storm events. The degree to which this restoration objective is met will be evaluated via measurements of the following parameters:

- Parameter #1: Spatial Extent (acres) of marsh and linear feet of ridge creation
- Parameter #2: Elevation of marsh and ridge areas
- Parameter #3: Vegetative Cover of marsh and ridge areas
- Parameter #4: Invasive Species Cover of marsh and ridge areas
- Parameter #5: Soil Quality

These parameters will be monitored according to the monitoring schedule summarized in Section 2.

During the final design process, project team members, including the Coastal Protection and Restoration Authority (CPRA), National Oceanic and Atmospheric Administration (NOAA), and the NRCS will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified/implemented to determine restoration success or the need for corrective action in accordance with (15 CFR 990.55(b)(1)(vii)). Specific, measurable performance criteria are defined for monitoring parameters associated with each of the restoration objectives in Section 5.

1.3 Conceptual Setting and Anticipated Outcomes

The Bayou Dularge Ridge and Marsh Restoration project is located in Terrebonne Basin, Terrebonne Parish, Louisiana on the lower end of Bayou Dularge between Lake Mechant and Caillou Lake and about 10 miles southwest of the community of Theriot. Much of the marsh loss in this part of the Terrebonne Basin has been attributed insufficient freshwater and sediment input, sea level rise, subsidence, and storm impacts. Marsh creation and ridge projects like the one proposed here will help to build and maintain these habitats through time. Additional information about the conceptual setting for the Project is summarized in Section 3.5 of RP/EA #8 and is incorporated here by reference.

1.3.1 Sources of Uncertainty

Although the likelihood of project success is evaluated under the OPA regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting, from unknown conditions in the future, or from project elements that do not perform as anticipated (e.g., sediment compaction or vegetation success). For the Project, the uncertainties summarized in Table 1 could affect project success and could therefore be key drivers of corrective actions or adaptive management decisions.

Sections 2 and 3 summarize project monitoring protocols and describe how this information will be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve stated project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to PDARP/PEIS Restoration Type MAM sections (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016), Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0 (*Deepwater Horizon* (DWH) Trustee Council, 2019), and other documents. Select monitoring activities can then be implemented to inform these uncertainties and to select appropriate corrective actions in the event the TE-0170 project is not meeting its performance criteria (Table 1).

Table 1. Key Uncertainties.

Reference Number	Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
1	Sea level rise, subsidence, sediment compaction	Excessive flooding of the marsh platform could reduce the growth and cover of herbaceous plant species; species diversity could decline as more flood tolerant species such as *Typha domingensis* and *Phragmites australis* create monotypic habitat; marsh could transition to open water habitat; inadequate ridge elevation and resultant increased flooding could prevent shrub/woody establishment or cause the habitat to convert to herbaceous marsh.
2	Soil composition of the ridge feature	High soil salinity (if in-situ borrow material is used) or pH outside of the optimal growing range may present challenges to the establishment of woody species
3	Success of vegetation establishment/plantings	Lack of vegetation establishment through natural recruitment and high planting mortality would limit or delay the creation of the desired habitat.
4	Herbivory	Young tender plants are desired by some species as a source of food. If Nutria Excluder Devices are not used to protect planted seedlings/saplings, herbivory may result in additional plantings and a delay in the establishment of a forested ridge habitat.
5	Extreme Weather Events	Tropical storm activity could adversely impact the growth of both ridge and marsh vegetation by the deposition of wrack on plants, increased salinity, erosion, and destruction of woody species on the ridge due to wind. Drought may adversely affect planting success of ridge species and/or reduce growth once established.
6	Disease	Any type of disease, pests and/or fungus, may kill or reduce growth of plants. Spraying of appropriate insecticides or fungicides may be necessary.

2 Project Monitoring

This MAM Plan was developed to evaluate project performance, key uncertainties, and potential corrective actions, if needed, for the first 10 years after the project's construction. The data

collected during this 10-year period will also be used to predict the project's performance during the remaining 10 years of the project's 20-year design life. For each of the monitoring parameters, information is provided on the intended purpose, monitoring methods, timing and frequency, duration, sample size, and sites. These parameters will be monitored to demonstrate how the restoration project is trending toward the performance criteria and to inform the need for corrective actions (see Section 5, Project-Level Decisions).

The *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (DWH-NRDA trustees, 2017) recommends project-level monitoring be conducted at reference or control sites. The CPRA currently maintains a monitoring program that provides ecological data and research to support the planning, design, construction, evaluation, and adaptive management of Louisiana's wetland restoration projects (Folse et al., 2020). The Coast-wide Reference Monitoring System-Wetlands (CRMS) program was developed and implemented to improve the evaluation of individual restoration projects, as well as the evaluation of the combined effects of multiple projects, by providing a network of reference sites where data are collected on a regular basis (Steyer et al., 2003). Several coastal restoration projects have been constructed or going to construction with marsh and ridge components in southeastern Louisiana. Data on vegetation, water level, salinity, elevation, and/or habitat mapping or land-water analysis, from these projects will provide information regarding performance. Data for the Project will be collected similarly for comparison and data results from the projects will be used to compare project performances. The projects that have been constructed or going to construction in southeastern Louisiana with marsh and ridge components include, but not limited to, Grand Liard Marsh and Ridge Restoration (BA-0068), Bayou DuPont Marsh and Ridge Restoration (BA-0068), Spanish Pass Marsh and Ridge Restoration (BA-0202), Bayou DeCade Marsh and Ridge Restoration (TE-0138), and Terrebonne Basin Ridge and Marsh Creation – Bayou Terrebonne Increment (TE-0139).

Although additional measures may be implemented to more fully characterize the performance of the Project, the LA TIG proposes the continued implementation of the following proven and established monitoring methodologies:

Objective #1: To create and nourish up to 700 acres of marsh and up to 27,875 linear feet of ridge.

- Parameter #1: Spatial Extent (acres) of marsh and linear feet of ridge creation
    a) Purpose: To determine how many acres of marsh and linear feet of ridge were created
    b) Method: Acquire and orthorectify high-resolution, near-vertical aerial imagery
    c) Timing, Frequency, and Duration: Imagery will be collected immediately prior to construction, and in the fall for years (YRs) 0 (as-built), 3, 6, and 10 post-construction.
    d) Sample Size: Aerial imagery will be acquired for the entire project area and some surrounding areas
    e) Sites: Project area
- Parameter #2: Elevation of marsh and ridge areas
    a) Purpose: To determine whether the average marsh and ridge elevations are achieved per the design specifications for construction, to compare the marsh and ridge elevations to the settlement curves at YRs 3 and 10 post-construction,

and to assess whether the marsh has settled to an elevation within the intertidal zone.

b) Method: LiDAR and/or RTK topographic surveys

c) Timing, Frequency, and Duration: Surveys will be conducted during construction (before and after sediment placement) and at YRs 0, 3, and 10 post-construction.

d) Sample Size: Construction surveys will be conducted on transects spaced every 250 feet apart or as specified in the construction documents. The ridge centerline will also be surveyed. YR 0 may utilize LiDAR and/or RTK as little to no vegetation is expected. The survey transects for YRs 3 and 10 will be spaced at a greater distance (likely at 500 ft), but the exact spacing has yet to be determined.

e) Sites: Project area

- Parameter #3: Vegetative Cover

a) Purpose: To determine the percent cover of vegetation in the marsh and on the ridge.

b) Method:

i. Ridge: Ocular estimates of percent cover of vegetation will be determined using plots established on the ridge. Plot size will be determined once the ridge design specifications have been finalized. Monitoring includes total percent cover and percent cover of each species present.

ii. Marsh: Ocular estimates (Folse et al., 2020) of percent cover of vegetation will be determined using 2 meter by 2 meter plots randomly placed along transects through the project area. Monitoring includes total percent cover and percent cover of each species present.

c) Timing, Frequency, and Duration:

i. Ridge: First growing season after planting and two or three growing seasons after planting, and at year 10 after construction. Sampling will occur between mid-August and October with the target being September/early October

ii. Marsh: First growing season after planting, if planting is required, and YRs 3, 6 and 10 post-construction or after planting; Sampling will occur between mid-August and mid-November with the target being September/October

d) Sample Size: To be determined

e) Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references

- Parameter #4: Invasive Species Cover

a) Purpose: To determine invasive species percent cover in the marsh and on the ridge

b) Method:

i. Ridge: Ocular estimates of percent cover of vegetation will be determined using plots established on the ridge. Plot size will be determined once the

ridge design specifications have been finalized. Monitoring includes total percent cover and percent cover of each species present.

ii. Marsh: Ocular estimates (Folse et al., 2020) of percent cover of vegetation will be determined using 2 meter by 2 meter plots randomly placed along transects through the project area. Monitoring includes total percent cover and percent cover of each species present.

c) Timing, Frequency, and Duration:

i. Ridge: Same as Parameter #3: Vegetative Cover

ii. Marsh: Same as Parameter #3: Vegetative Cover

d) Sample Size: Will be the same vegetation stations as those established for Parameter #3.

e) Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references

- Parameter #5: Soil Quality

  This parameter may be collected but will not be used as a performance criterion. Louisiana has not constructed many coastal restoration projects with a ridge component and the few that have been constructed were recently completed. Therefore, there are few available data for this parameter or component performance.

  a) Purpose: To determine soil pH, soil salinity, bulk density, soil moisture, percent organic matter, wet/dry volume, and potentially percent sand, silt and clay of ridge soils. Results will be used to guide the timing of ridge plantings and assess differences in vegetative growth along the ridge.

  b) Method:

  i. Collection: The collection of soils will follow CRMS protocol (Folse et al., 2020).

  ii. Analytical: Samples will be sent off to a laboratory for testing. Analyses will be conducted following CRMS protocol.

  c) Timing, Frequency, and Duration: If necessary, samples will be collected between mid-August and October for the first five years after construction unless soils are conducive for planting prior to the third year (Table 3).

  d) Sample Size: To be determined

  e) Sites: Project ridge component

3 Adaptive Management

Monitoring information collected at the project-level can be used to adaptively manage the project to improve restoration outcomes. Within the LA TIG, an adaptive management framework has been developed that identifies and characterizes the four main phases and is illustrated within a representative management cycle (Figure 2).

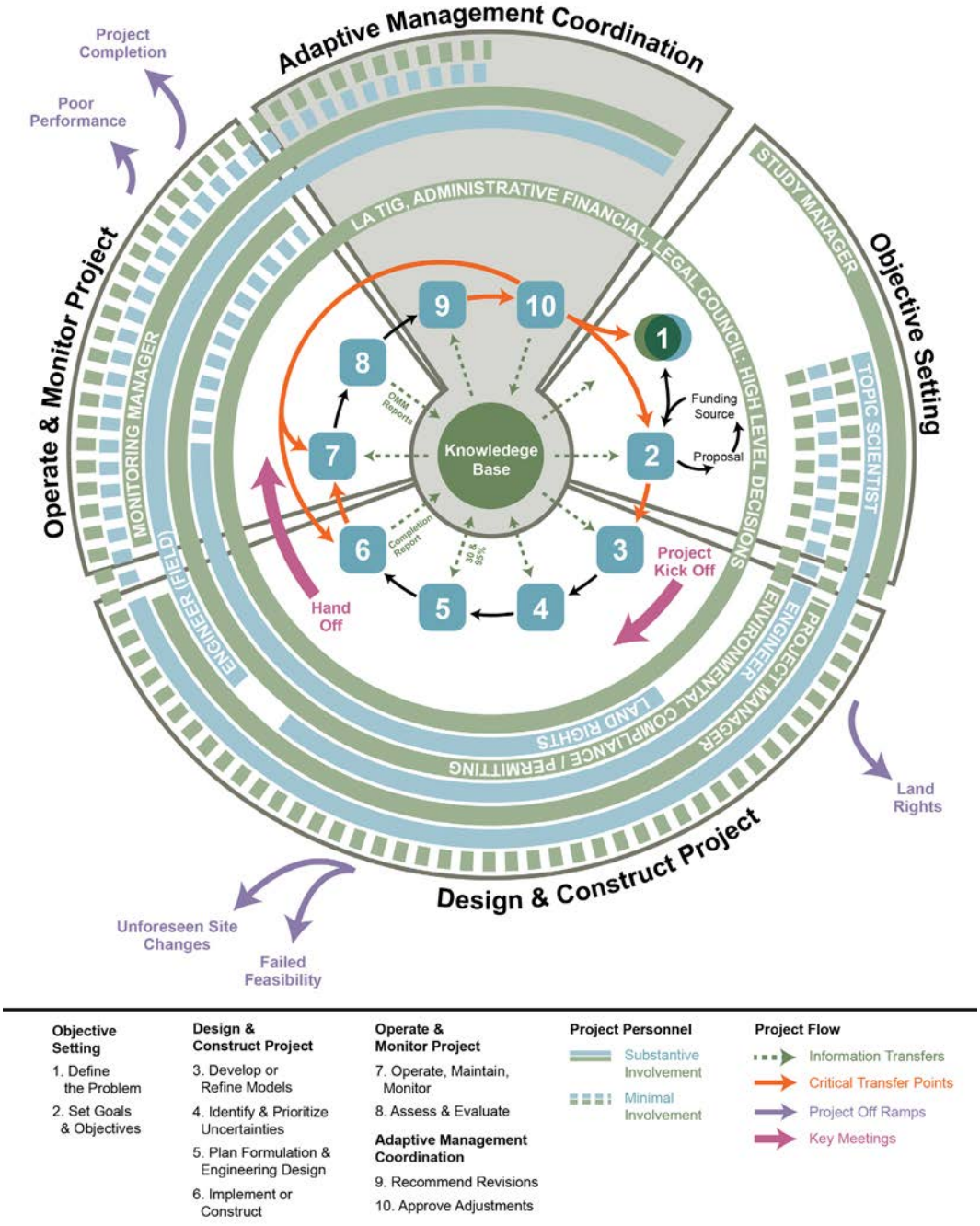

Figure 2. LA TIG Adaptive Management Cycle (Source: The Water Institute of the Gulf, 2020).

- Objective-Setting Phase: Problem is identified or defined, and project goals and objectives are established based on multiple sources, including lessons learned, data and associated synthesis, and applied research from previous projects and from the knowledge base as a whole. For the Bayou Dularge Ridge and Marsh Restoration project, the goal setting phase is already complete – the problem of marsh loss has been defined through the PDARP/PEIS as well as through Louisiana's Coastal Master Plan process, and the goals and objectives of restoration are as described in the restoration plan that accompanies this MAM Plan.

- Design and Construct Phase: Project advances through select steps, including model development or refinement, identification and prioritization of uncertainties, plan formulation, engineering, design, and project construction. For this project, the elements of a preliminary design have already been described within the Restoration Plan, incorporating available data on water depths, intertidal range for nearby marsh, and local subsidence rates. As the project advances to more advanced phases, the design may be modified as needed to incorporate any new information that could affect the preliminary design.
- Operate and Monitor Phase: Project's operations, maintenance, and monitoring plans are developed, and project assessment and evaluation criteria are identified. Note that for this and other marsh creation projects, the opportunities for adaptive management post-construction may in some cases be limited. For example, if the marsh platform does not achieve the proper elevation post-settlement, re-mobilizing a dredge to modify the marsh platform elevation is generally cost-prohibitive. However, supplemental vegetative plantings can be used to improve vegetative cover if the marsh platform is already at the proper elevation.
- Adaptive Management Coordination Phase: Encompasses steps for recommending and approving project revisions so that revisions can achieve one or both of the following:
    - Result in alterations and redesign of project elements or changes to project operation
    - Provide input to either the understanding of the overall problem statements or the refinement of attainable or realistic goals and objectives for future projects

Where gaps in scientific understanding exist, project information collected (see Section 2, Project Monitoring) and evaluated (see Section 4, Evaluation) may be utilized by the LA TIG to reduce key uncertainties and/or other analyses that inform the selection, design, and optimization of future restoration projects (Framework).

4 Evaluation

Evaluation of monitoring data is needed to assess the project implementation and performance in meeting restoration objectives, resolving uncertainties to increase understanding, and determining whether corrective actions are needed.

As part of the larger decision-making context, the evaluation of monitoring data from individual projects could also be compiled and assessed at the restoration type and LA TIG level, and the results would be used to update the knowledge base to inform decisions such as future LA TIG project prioritization and selection, implementation techniques, and the identification of critical uncertainties. Reports, presentations, and/or lesson learned meetings are potential avenues of transferring information to the LA TIG and other agency personnel about project performance.

The results of these analyses would be used to answer the following questions and would be included within the reports described in Section 8:

- Were the project restoration objectives achieved? If not, is there a reason why they were not met?
- Did the restoration project produce unanticipated effects?
- Were there unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?

- Were any new uncertainties identified?

Proposed analysis methods are grouped by monitoring parameters:

Parameter #1: Spatial Extent (acres) of marsh and linear feet of ridge

Analysis: As-built (YR 0) aerial imagery and topographic data will be used to determine the spatial extent of the constructed project and assess whether it met the construction requirements. These data will be used in future years to assess near-term project sustainability. Vegetation data will be analyzed to determine marsh and ridge habitat development and evolution.

Parameter #2: Elevation of marsh and ridge areas

Analysis: The Project's Final Design Report will establish the desired target elevation of the marsh and ridge features to best support the appropriate herbaceous or woody species. The report will also include settlement curves for both of these features. The constructed target elevations for marsh and ridge habitats will be determined using the methodology in CPRA's Marsh Creation Design Guidelines (2017). Topographic surveys will be used to determine if the project was built to the specified construction elevation and if settlement of the marsh and ridge is occurring as predicted by the settlement curves. At YRs 3 and 10, topographic data will be analyzed to determine if the marsh is within the optimal inundation range.

Mapping products such as triangulated irregular network (TIN) models will be generated in Geographical Information System (GIS) software packages along with digital elevation models (DEM) to show the elevation and elevation change across the project area.

Parameter #3: Vegetative Cover

Analysis: General descriptive statistical analyses may include, but are not limited to, means of total % cover, % cover by vegetative layer (herbaceous, shrub, tree), % cover by species and height of dominant species. Data will be evaluated to determine existing habitat types and assess transition of the vegetative community. Vegetative data sets from other coastal restoration projects will be analyzed for comparative performance purposes.

Parameter #4: Invasive Species Cover

Analysis: Percent cover of invasive species will be assessed at each plot during vegetation surveys. Total cover of invasive species, as well as cover by individual species, will be measured.

Parameter #5: Soil Samples

Analysis: Soil percent organic content, bulk density, pH and salinity will be analyzed to determine potential limiting factors for vegetative establishment, growth, and succession. Analysis will follow CRMS protocol (Folse et al., 2020).

5 Project Level Decisions: Performance Criteria and Potential Correction Actions

The LA TIG describes how updated knowledge gained from the evaluation of monitoring data will be used at the project-level to determine whether the Project is considered successful or whether corrective actions are needed. A project may not be achieving its intended objectives because of previously identified key uncertainties, unanticipated consequences, previously unknown conditions, or unanticipated environmental drivers. The decision to implement (or not implement) corrective actions is one type of decision within the larger adaptive management decision-making framework.

Learning through monitoring allows for corrective actions to be made to achieve desired outcomes. Table 2 identifies performance criteria, monitoring parameters, and potential corrective actions that could be taken if the performance criteria are not met (as defined in NRDA regulations (15 CFR 990.55(b)(1)(vii)). Other corrective actions may be identified post-implementation and included in an operations and maintenance (O&M) plan. The decision of whether or not a corrective action should be implemented for the Project should consider the overall outcomes of the restoration project (i.e., looking at the combined evaluation of multiple performance criteria) in order to understand why project performance deviates from the predicted or anticipated outcome. Corrective action may not be taken in all cases based on such considerations. The knowledge gained from this process could inform future restoration decisions such as the selection, design, and implementation of similar projects.

Table 2. List of the Project Monitoring Parameters, Performance Criteria, and Potential Corrective Actions.

Table Notes: [1] The land loss rate of 0.37 acres per year was determined from a 1,653-acre polygon that encompasses the project area from 1984 to 2011 (unpublished WVA spreadsheet for the CWPPRA PPL24 Bayou Dularge project). [2] The project is currently gathering data to make the final determination. The Final Design Report is scheduled for 2020.

Monitoring Parameter	**Final Performance Criteria Used to Determine Project Success**	**Potential Corrective Actions**
Spatial Extent	There will be no more than the equivalent of 0.37acres annual land loss rate between year 0 and 10 post-construction.[1]	Planting of appropriate species
Elevation	The target elevations stated in the Final Design Report for marsh and ridge at the time of construction.[2]	Addition or regrading of sediments
Vegetation Cover – Marsh Platform	Mean live vegetative cover is ≥ 65% at year 10.	Planting of herbaceous species
Vegetation Cover – Ridge	Mean live % cover of woody species is ≥ 30% at year 10.	Plant woody species if soil conditions support its growth
Invasive Species Cover	Mean live vegetative cover of invasive species is ≤ 25% at year 10.	Mechanical removal or herbicide application

6 Monitoring Schedule

The project monitoring schedule (Table 3) is separated by monitoring parameters. Pre-execution monitoring will occur before any project construction activities occur, if applicable. Execution Monitoring will occur when the construction activities have been deemed complete. Post-Execution (Performance) Monitoring will occur in the years following construction (YRs 0-10).

Table 3. Monitoring Schedule.

Table Notes: X are required data acquisitions; O are optional. [1] It is anticipated that woody species for the ridge will be planted in year 3 post-construction; however, plantings will occur when soil conditions are conductive for establishment and growth. Monitoring will be adjusted accordingly; however, three sampling efforts are budgeted for occurrence. [2] Depending on the length of construction, this survey may take place as part of construction; however, this survey will be included in the monitoring budget for planning purposes. [3] The timing of this survey may be adjusted based on when the settlement curves during engineering and design anticipate the marsh platform to become intertidal. [4] Soil testing is optional. Testing will be based on field observations related to plant growth and soil testing results

Monitoring Parameters	**Pre-Execution Year -1**	**Execution (initial) As-built (Year 0)**	**Post-Execution (ongoing) Year 1**	**Post-Execution Year 2**	**Post-Execution (ongoing) Year 3**	**Post-Execution (ongoing) Year 4**	**Post-Execution (ongoing) Year 5**	**Post-Execution (ongoing) Year 6**	**Post-Execution (ongoing) Year 7**	**Post-Execution (ongoing) Year 8**	**Post-Execution (ongoing) Year 9**	**Post-Execution (ongoing) Year 10**	**Post-Execution (ongoing) Year 11**
Vegetation Survey (marsh)	n/a	n/a	X	n/a	X	n/a	n/a	X	n/a	n/a	n/a	X	n/a
Vegetation Survey (ridge plots)	n/a	n/a	n/a	n/a	X[1]	n/a	n/a	X[1]	n/a	n/a	n/a	X	n/a
Elevation Survey	n/a	X[2]	n/a	n/a	X[3]	n/a	n/a	n/a	n/a	n/a	n/a	X	n/a
Aerial Imagery Acquisition	X	X	O	O	X	O	O	X	O	O	O	X	n/a
Soil Testing[4]	n/a	O	O	O	O	O	O	n/a	n/a	n/a	n/a	n/a	n/a
Reporting	n/a	n/a	n/a	X	n/a	X	n/a	n/a	X	n/a	n/a	n/a	X

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7 Data Management

7.1 Data Description

To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hard copy datasheets, notebooks and photographs will be retained by the implementing Trustee.

Relevant project data that are handwritten on hard copy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. Electronic data files should be named with the date on which the file was created and should include a ReadMe file that describes when the file was created and by whom and any explanatory notes on the file contents. If a data file is revised, a new copy should be made and the original preserved.

All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data were collected, quality assurance/quality control [QA/QC] procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format—can reference different documents).

7.2 Data Review and Clearance

Data will be reviewed for QA/QC in accordance with the *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (*Deepwater Horizon* (DWH) Trustee Council, 2019), and any errors in transcription will be corrected. Implementing Trustees will verify and validate data and information and will ensure that all data are entered or converted into agreed upon/commonly used digital format and labeled with metadata following FGDC/ISO standards to the extent practicable and in accordance with implementing Trustee agency requirements.

After all identified errors are addressed, data are considered to be cleared. The implementing Trustee will give the other LA TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, co-implementing Trustees shall confirm with one another that the package is approved for submission.

7.3 Data Storage and Accessibility

Once data have been cleared, they will be submitted to the Restoration Portal.

Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than 1 year from when data are collected. Data storage and accessibility would be consistent with the guidelines in Section 3.1.3 of the MAM Manual (DWH Trustee Council, 2019).

7.4 Data Sharing

Data will be made publicly available in accordance with the Federal Open Data Policy through the DIVER Explorer Interface within 1 year of when the data collection occurred. Also, data will be made available through the Coastal Protection and Restoration Authority's Coastal Information Management System (CIMS) database (can be accessed via the following URL: https://cims.coastal.louisiana.gov/default.aspx). Larger datasets such as LiDAR will be made available through portals appropriate for handling the associated file sizes.

8 Reporting

Based on the Project's monitoring schedule (Section 4), associated reporting will be submitted in post-construction YRs 2, 4, 7, and 11 which represents one year after data collection efforts in YRs 1,3, 6, and 10. Each of these reports will primarily focus on answering the questions presented in Section 4, Evaluation. The YR 2, 4, and 7 reports will be more progress related reports, whereas the YR 11 report will be comprehensive in nature and answer whether or not the Project met each of the performance criteria (PC). If the Project did not meet a PC, then an explanation will be provided. For each report, if corrective actions are required then a corrective action plan would be generated, and variables would continue to be monitored.

The reports will follow the template recommended in the *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (*Deepwater Horizon* (DWH) Trustee Council, 2019), Appendix D. MAM reports and lessons learned from the monitoring activities will be disseminated to the LA TIG through relevant portals, and information will be more broadly disseminated at conferences to reach a larger audience.

The DWH Trustees, as stewards of public resources under OPA, should inform the public on the restoration project's progress and performance. Therefore, the Louisiana TIG would report the status of the proposed project via the DIVER Restoration Portal, as outlined in Chapter 7 of the Final PDARP/PEIS (DWH Trustees, 2016).

9 Roles and Responsibilities

The LA TIG is responsible for addressing MAM objectives that pertain to their restoration activities and for communicating information to the Trustee Council or Cross-TIG MAM work group. CPRA is the implementing Trustee for the Project. The U.S. Department of the Agriculture will be the lead federal agency for conducting the environmental evaluation review for implementation. The implementing Trustees' roles include:

- Data collection
- Data analysis
- Report composition
- Ensuring corrective action activities are performed, if necessary
- Providing project progress information to the LA TIG
- Submitting MAM data and project information into the DIVER Restoration Portal

10 Monitoring and Adaptive Management Budget

The overall budget for the Project monitoring and adaptive management plan is $1,750,000 and covers the activities identified in Table 3 as well as data analysis, report composition, and project management.

11 References

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12 MAM Plan Revision History

Table 4. MAM Plan Revision History.

Old Version #	Revision Date	Changes Made	Reason for Change	New Version #
-	-	-	-	-

Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Bayou La Loutre Ridge and Marsh Restoration Project

August XX, 2021

Prepared By:

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Coastal Protection and Restoration Authority (CPRA) of Louisiana

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1 Introduction

The Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (TIG)[1] developed this Monitoring and Adaptive Management Plan (Plan) for the Bayou La Loutre Ridge and Marsh Restoration project (Project) which was engineered and designed utilizing funds from the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA Act). This project will be constructed using funds associated with the Deepwater Horizon Natural Resource Damage Assessment (NRDA).

The purpose of this Monitoring and Adaptive Management (MAM) Plan is to identify monitoring activities that will be conducted to evaluate and document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action (15 CFR 990.55(b)(1)(vii)). Where applicable, the MAM Plan identifies key sources of uncertainty and incorporates monitoring data and decision points that address these uncertainties. It also establishes a decision-making process for making adjustments where needed.

There are three primary purposes for MAM Plans:

1. Identify and document how restoration managers will measure and track progress towards achieving restoration goals and objectives
2. Increase the likelihood of successful implementation through identification, before a project begins, of potential corrective actions that could be undertaken if the project does not proceed as expected
3. Ensure the capture, in a systematic way, of lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. For example, the MAM Plan may need to be revised should the project design change, if initial data analysis indicates that the sampling design requires adjustment, or if any uncertainties are resolved or new uncertainties are identified during project implementation and monitoring. Any future revisions to the MAM Plan will be made publicly available through the Restoration Portal (at the following URL: https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (at the following URL: https://www.gulfspillrestoration.noaa.gov/).

1.1 Project Overview

The Bayou La Loutre Ridge and Marsh Restoration project is located in Pontchartrain Basin, St. Bernard Parish, Louisiana. The marsh creation area will be created east of the Mississippi River Gulf Outlet (MRGO) and north of Bayou La Loutre near the MRGO closure structure while the ridge will be constructed along the south bank of Bayou La Loutre east and west of the MRGO. The approximate center of the project area is located at 29° 50’ 15” North and 89° 35’ 27W (Figure 1). The project will use material from Lake Borgne to create and nourish approximately 421 acres of marsh on the south side of Lena Lagoon and restore approximately 27,471 linear feet of ridge along the Bayou La Loutre (Figure 1). The elevation of the marsh and ridge will be determined in the Final Design Report, which has not been developed as of this version of the MAM Plan. However, it is anticipated that the constructed marsh fill elevation of

[1] The LA TIG includes the following members: Louisiana State Trustees include the Louisiana Coastal Protection and Restoration Authority (CPRA); Louisiana Department of Environmental Quality (LDEQ); Louisiana Department of Wildlife and Fisheries (LDWF); and Louisiana Department of Natural Resources (LDNR); Louisiana Oil Spill Coordinator’s Office (LOSCO). Federal Trustees include Department of the Interior (DOI), the National Oceanic and Atmospheric Administration (NOAA), United States Environmental Protection Agency (USEPA), and United States Department of Agriculture (USDA).

Figure 1. Bayou La Loutre Ridge and Marsh Restoration Project vicinity map.

the marsh platform may be range between +2.0 and +3.0 feet whereas the ridge will be +5.0 – 6.0 feet (Geoid12B, NAVD88). Sediment for the marsh will be dredged from the southwest corner of Lake Borgne whereas the material used for the ridge will be from Bayou La Loutre. When soils are suitable after the completion of the Project, appropriate native shrub/woody vegetation will be planted on the ridge. It is anticipated that herbaceous vegetation will naturally establish on the marsh platform within the first few years of the Project. However, vegetative plantings on the marsh platform may occur if natural succession does not occur as anticipated (see Section 5 on corrective actions).

This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the Programmatic Damage Assessment and Restoration Plan /Programmatic Environmental Impact Statement (PDARP/PEIS) (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016). Per the PDARP/PEIS, the project falls into the following restoration categories:

- **Programmatic Goal:** Restore and Conserve Habitat
- **Restoration Type:** Wetlands, Coastal, and Nearshore Habitats
- **Restoration Approach:** Create, Restore, and Enhance Coastal Wetlands
- **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material
- **Trustee Implementation Group:** LA TIG
- **Restoration Plan:** 8

The implementing state trustee is the Coastal Protection and Restoration Authority (CPRA) of Louisiana. The implementing federal trustee is the United States Department of Agriculture, represented by the Natural Resources Conservation Service (NRCS).

1.2 Restoration Type Goals and Project Restoration Objectives

The goal for the Project is to create and restore wetlands, coastal and nearshore habitats in the Louisiana Restoration area, specifically in the Pontchartrain Basin. The marsh in this area has been degraded due to subsidence, sediment deprivation, increased wave fetch, and construction of access and navigational canals while the current ridge habitat along Bayou La Loutre has been experiencing subsidence and an increase in erosion due to more boat traffic as a result of the MRGO closure (NRCS 2016). In restoring these coastal habitats, the Trustees envision that the Project will compensate, in part, for wetlands, coastal and nearshore habitat losses associated with the DWH oil spill.

1.2.1 Restoration Type Goals

As summarized in the PDARP/PEIS, Chapter 5, the restoration goals for injuries to coastal habitats are as follows:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill.
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

- Restore habitats in appropriate combinations for any given geographic area. Design factors, such as connectivity, size, and distance between projects, are considered to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

The restoration objectives for the Bayou La Loutre Ridge and Marsh Restoration project will help the Trustees accomplish these identified restoration type goals.

1.2.2 Restoration Objectives

To help meet the restoration goals for injuries to coastal habitats, the Project's restoration objective is to create and nourish up to 421 acres of marsh and up to 27,471 linear feet of ridge habitats in the Project area of the Pontchartrain Basin, which has been degraded due to subsidence, sediment deprivation, increased wave fetch, and construction of access and navigational canals while the current ridge habitat along Bayou La Loutre has been experiencing subsidence and an increase in erosion due to more boat traffic as a result of the MRGO closure (NRCS 2016). The degree to which this restoration objective is met will be evaluated via measurements of the following parameters:

- Parameter #1: Spatial Extent (acres) of marsh and ridge creation
- Parameter #2: Elevation of marsh and ridge areas
- Parameter #3: Vegetative Cover of marsh and ridge areas
- Parameter #4: Invasive Species Cover of marsh and ridge areas
- Parameter #5: Soil Quality

These parameters will be monitored according to the monitoring schedule summarized in Section 2.

During the final design process, project team members, including the Coastal Protection and Restoration Authority (CPRA), National Oceanic and Atmospheric Administration (NOAA), and the NRCS will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified/implemented to determine restoration success or the need for corrective action in accordance with (15 CFR 990.55(b)(1)(vii)). Specific, measurable performance criteria are defined for monitoring parameters associated with each of the restoration objectives in Section 5.

1.3 Conceptual Setting and Anticipated Outcomes

The Bayou La Loutre Ridge and Marsh Restoration project is located in Pontchartrain Basin, St. Bernard Parish, Louisiana east of the Mississippi River Gulf Outlet (MRGO) and north of Bayou La Loutre near the MRGO closure structure. Much of the marsh loss in this part of the Pontchatrain Basin has been attributed to insufficient freshwater and sediment input, sea level rise, subsidence, wave fetch, construction of canals, and storm impacts. Marsh creation and ridge projects like the one proposed here will help to build and maintain these habitats through time. Additional information about the conceptual setting for the Project is summarized in Section 3.5 of RP/EA #8 and is incorporated here by reference.

1.3.1 Sources of Uncertainty

Although the likelihood of project success is evaluated under the OPA regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting, from unknown conditions in the future, or from

project elements that do not perform as anticipated (e.g., sediment compaction or vegetation success). For the Project, the uncertainties summarized in Table 1 could affect project success and could therefore be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information will be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve stated project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to PDARP/PEIS Restoration Type MAM sections (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016), Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0 (*Deepwater Horizon* (DWH) Trustee Council, 2019), and other documents. Select monitoring activities can then be implemented to inform these uncertainties and to select appropriate corrective actions in the event the Project is not meeting its performance criteria (Table 1).

Table 1. Key Uncertainties.

Reference Number	**Key Uncertainty**	**Description on How the Uncertainty Could Impact Project Success and/or Decision-Making**
1	Sea level rise, subsidence, sediment compaction	Excessive flooding of the marsh platform could reduce the growth and cover of herbaceous plant species; species diversity could decline as more flood tolerant species such as *Typha domingensis* and *Phragmites australis* create monotypic habitat; marsh could transition to open water habitat; inadequate ridge elevation and resultant increased flooding could prevent shrub/woody establishment or cause the habitat to convert to herbaceous marsh.
2	Soil composition of the ridge feature	High soil salinity (if in-situ borrow material is used) or pH outside of the optimal growing range may present challenges to the establishment of woody species
3	Success of vegetation establishment/plantings	Lack of vegetation establishment through natural recruitment and high planting mortality would limit or delay the creation of the desired habitat.
4	Herbivory	Young tender plants are desired by some species as a source of food. If Nutria Excluder Devices are not used to protect planted seedlings/saplings, herbivory may result in additional plantings and a delay in the establishment of a forested ridge habitat.
5	Extreme Weather Events	Tropical storm activity could adversely impact the growth of both ridge and marsh vegetation by the deposition of wrack on plants, increased salinity, erosion, and destruction of woody species on the ridge due to wind. Drought may adversely affect planting success of ridge species and/or reduce growth once established.
6	Disease	Any type of disease, pests and/or fungus, may kill or reduce growth of plants. Spraying of appropriate insecticides or fungicides may be necessary.

2 Project Monitoring

This MAM Plan was developed to evaluate project performance, key uncertainties, and potential corrective actions, if needed, for the first 10 years after the project's construction. The data collected during this 10-year period will also be used to predict the project's performance during the remaining 10 years of the project's 20-year design life. For each of the monitoring parameters, information is provided on the intended purpose, monitoring methods, timing and frequency, duration, sample size, and sites. These parameters will be monitored to demonstrate how the restoration project is trending toward the performance criteria and to inform the need for corrective actions (see Section 5, Project-Level Decisions).

The *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (DWH-NRDA trustees, 2017) recommends project-level monitoring be conducted at reference or control sites. The CPRA currently maintains a monitoring program that provides ecological data and research to support the planning, design, construction, evaluation, and adaptive management of Louisiana's wetland restoration projects (Folse et al., 2020). The Coast-wide Reference Monitoring System-Wetlands (CRMS) program was developed and implemented to improve the evaluation of individual restoration projects, as well as the evaluation of the combined effects of multiple projects, by providing a network of reference sites where data are collected on a regular basis (Steyer et al., 2003). Several coastal restoration projects have been constructed or going to construction with marsh and ridge components in southeastern Louisiana. Data on vegetation, water level, salinity, elevation, and/or habitat mapping or land-water analysis, from these projects will provide information regarding performance. Data for the Project will be collected similarly for comparison and data results from the projects will be used to compare project performances. The projects that have been constructed or going to construction in southeastern Louisiana with marsh and ridge components include, but not limited to, Grand Liard Marsh and Ridge Restoration (BA-0068), Bayou DuPont Marsh and Ridge Restoration (BA-0068), Spanish Pass Marsh and Ridge Restoration (BA-0202), Bayou DeCade Marsh and Ridge Restoration (TE-0138), Terrebonne Basin Ridge and Marsh Creation – Bayou Terrebonne Increment (TE-0139), and Bayou Dularge Ridge and Marsh Restoration (TE-0170).

Although additional measures may be implemented to more fully characterize the performance of the Project, the LA TIG proposes the continued implementation of the following proven and established monitoring methodologies:

Objective #1: To create and nourish up to 421 acres of marsh and up to 27,471 linear feet of ridge.

- Parameter #1: Spatial Extent (acres) of marsh and ridge creation
    a) Purpose: To determine how many acres of marsh and ridge were created
    b) Method: Acquire and orthorectify high-resolution, near-vertical aerial imagery
    c) Timing, Frequency, and Duration: Imagery will be collected immediately prior to construction, and in the fall for years (YRs) 0 (as-built), 3, 6, and 10 post-construction.
    d) Sample Size: Aerial imagery will be acquired for the entire project area and some surrounding areas
    e) Sites: Project area
- Parameter #2: Elevation of marsh and ridge areas

a) Purpose: To determine whether the average marsh and ridge elevations are achieved per the design specifications for construction, to compare the marsh and ridge elevations to the settlement curves at YRs 3 and 10 post-construction, and to assess whether the marsh has settled to an elevation within the intertidal zone.

b) Method: LiDAR and/or RTK topographic surveys

c) Timing, Frequency, and Duration: Surveys will be conducted during construction (before and after sediment placement) and at YRs 0, 3, and 10 post-construction.

d) Sample Size: Construction surveys will be conducted on transects spaced every 250 feet apart or as specified in the construction documents. The ridge centerline will also be surveyed. YR 0 may utilize LiDAR and/or RTK as little to no vegetation is expected. The survey transects for YRs 3 and 10 will be spaced at a greater distance (likely at 500 ft), but the exact spacing has yet to be determined.

e) Sites: Project area

- Parameter #3: Vegetative Cover

a) Purpose: To determine the percent cover of vegetation in the marsh and on the ridge.

b) Method:

i. Ridge: Ocular estimates of percent cover of vegetation will be determined using plots established on the ridge. Plot size will be determined once the ridge design specifications have been finalized. Monitoring includes total percent cover and percent cover of each species present.

ii. Marsh: Ocular estimates (Folse et al., 2020) of percent cover of vegetation will be determined using 2 meter by 2 meter plots randomly placed along transects through the project area. Monitoring includes total percent cover and percent cover of each species present.

c) Timing, Frequency, and Duration:

i. Ridge: First growing season after planting and two or three growing seasons after planting, and at year 10 after construction. Sampling will occur between mid-August and October with the target being September/early October

ii. Marsh: First growing season after planting, if planting is required, and YRs 3, 6 and 10 post-construction or after planting; Sampling will occur between mid-August and mid-November with the target being September/October

d) Sample Size: To be determined

e) Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references

- Parameter #4: Invasive Species Cover

a) Purpose: To determine invasive species percent cover in the marsh and on the ridge

b) Method:

i. Ridge: Ocular estimates of percent cover of vegetation will be determined using plots established on the ridge. Plot size will be determined once the ridge design specifications have been finalized. Monitoring includes total percent cover and percent cover of each species present.

ii. Marsh: Ocular estimates (Folse et al., 2020) of percent cover of vegetation will be determined using 2 meter by 2 meter plots randomly placed along transects through the project area. Monitoring includes total percent cover and percent cover of each species present.

c) Timing, Frequency, and Duration:

i. Ridge: Same as Parameter #3: Vegetative Cover

ii. Marsh: Same as Parameter #3: Vegetative Cover

d) Sample Size: Will be the same vegetation stations as those established for Parameter #3.

e) Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references

- Parameter #5: Soil Quality

  This parameter may be collected but will not be used as a performance criterion. Louisiana has not constructed many coastal restoration projects with a ridge component and the few that have been constructed were recently completed. Therefore, there are few available data for this parameter or component performance.

  a) Purpose: To determine soil pH, soil salinity, bulk density, soil moisture, percent organic matter, wet/dry volume, and potentially percent sand, silt and clay of ridge soils. Results will be used to guide the timing of ridge plantings and assess differences in vegetative growth along the ridge.

  b) Method:

  i. Collection: The collection of soils will follow CRMS protocol (Folse et al., 2020).

  ii. Analytical: Samples will be sent off to a laboratory for testing. Analyses will be conducted following CRMS protocol.

  c) Timing, Frequency, and Duration: If necessary, samples will be collected between mid-August and October for the first five years after construction unless soils are conducive for planting prior to the third year (Table 3).

  d) Sample Size: To be determined

  e) Sites: Project ridge component

3 Adaptive Management

Monitoring information collected at the project-level can be used to adaptively manage the project to improve restoration outcomes. Within the LA TIG, an adaptive management framework has been developed that identifies and characterizes the four main phases and is illustrated within a representative management cycle (Figure 2).

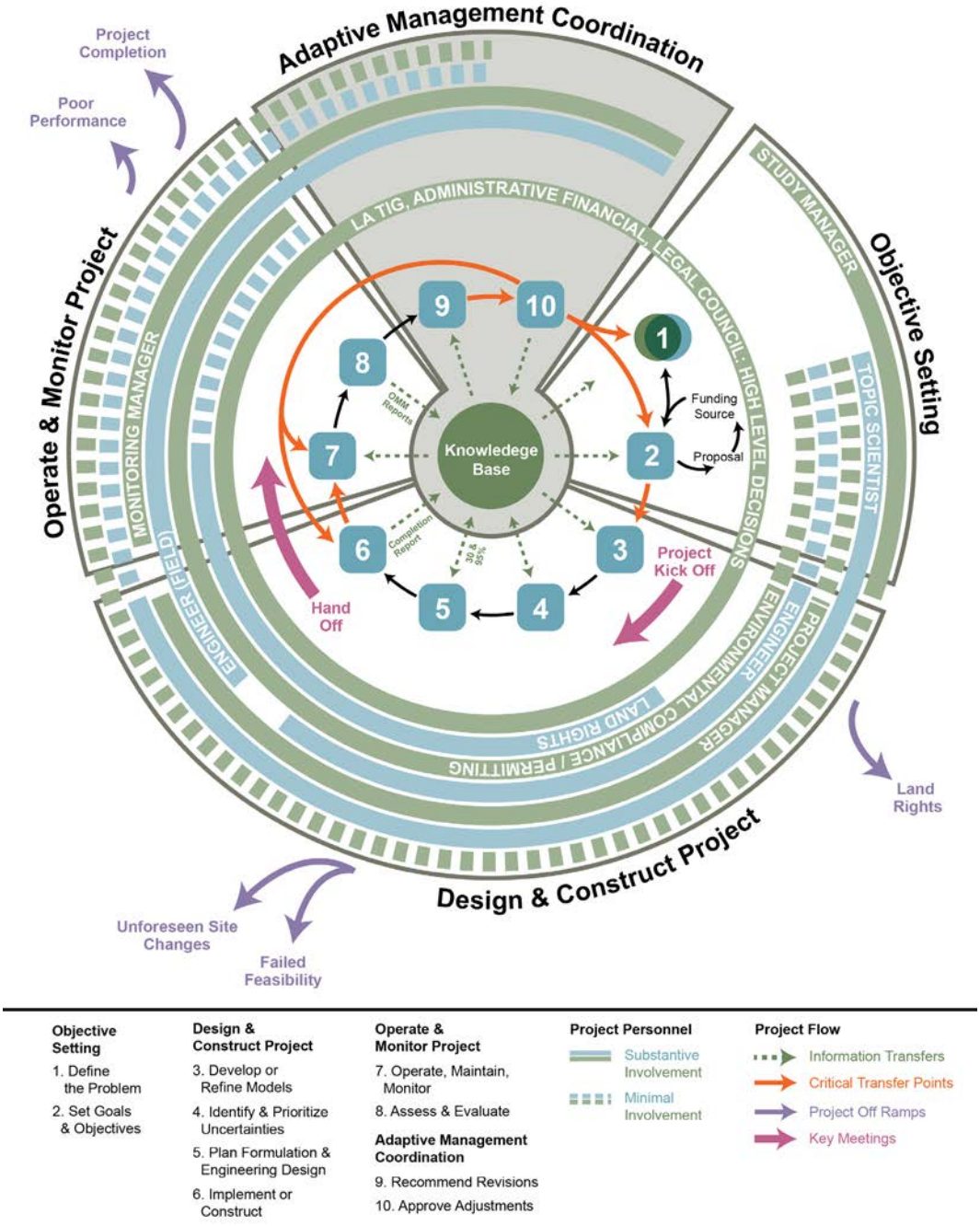

Figure 2. LA TIG Adaptive Management Cycle (Source: The Water Institute of the Gulf, 2020).

- Objective-Setting Phase: Problem is identified or defined, and project goals and objectives are established based on multiple sources, including lessons learned, data and associated synthesis, and applied research from previous projects and from the knowledge base as a whole. For the Bayou La Loutre Ridge and Marsh Restoration project, the goal setting phase is already complete – the problem of marsh loss has been defined through the PDARP/PEIS as well as through Louisiana's Coastal Master Plan process, and the goals and objectives of restoration are as described in the restoration plan that accompanies this MAM Plan.

- Design and Construct Phase: Project advances through select steps, including model development or refinement, identification and prioritization of uncertainties, plan formulation, engineering, design, and project construction. For this project, the elements of a preliminary design have already been described within the Restoration Plan, incorporating available data on water depths, intertidal range for nearby marsh, and local subsidence rates. As the project advances to more advanced phases, the design may be modified as needed to incorporate any new information that could affect the preliminary design.
- Operate and Monitor Phase: Project's operations, maintenance, and monitoring plans are developed, and project assessment and evaluation criteria are identified. Note that for this and other marsh creation projects, the opportunities for adaptive management post-construction may in some cases be limited. For example, if the marsh platform does not achieve the proper elevation post-settlement, re-mobilizing a dredge to modify the marsh platform elevation is generally cost-prohibitive. However, supplemental vegetative plantings can be used to improve vegetative cover if the marsh platform is already at the proper elevation.
- Adaptive Management Coordination Phase: Encompasses steps for recommending and approving project revisions so that revisions can achieve one or both of the following:
    - Result in alterations and redesign of project elements or changes to project operation
    - Provide input to either the understanding of the overall problem statements or the refinement of attainable or realistic goals and objectives for future projects

Where gaps in scientific understanding exist, project information collected (see Section 2, Project Monitoring) and evaluated (see Section 4, Evaluation) may be utilized by the LA TIG to reduce key uncertainties and/or other analyses that inform the selection, design, and optimization of future restoration projects (Framework).

4 Evaluation

Evaluation of monitoring data is needed to assess the project implementation and performance in meeting restoration objectives, resolving uncertainties to increase understanding, and determining whether corrective actions are needed.

As part of the larger decision-making context, the evaluation of monitoring data from individual projects could also be compiled and assessed at the restoration type and LA TIG level, and the results would be used to update the knowledge base to inform decisions such as future LA TIG project prioritization and selection, implementation techniques, and the identification of critical uncertainties. Reports, presentations, and/or lesson learned meetings are potential avenues of transferring information to the LA TIG and other agency personnel about project performance.

The results of these analyses would be used to answer the following questions and would be included within the reports described in Section 8:

- Were the project restoration objectives achieved? If not, is there a reason why they were not met?
- Did the restoration project produce unanticipated effects?
- Were there unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?

- Were any new uncertainties identified?

Proposed analysis methods are grouped by monitoring parameters:

Parameter #1: Spatial Extent (acres) of marsh and ridge

Analysis: As-built (YR 0) aerial imagery and topographic data will be used to determine the spatial extent of the constructed project and assess whether it met the construction requirements. These data will be used in future years to assess near-term project sustainability. Vegetation data will be analyzed to determine marsh and ridge habitat development and evolution.

Parameter #2: Elevation of marsh and ridge areas

Analysis: The Project's Final Design Report will establish the desired target elevation of the marsh and ridge features to best support the appropriate herbaceous or woody species. The report will also include settlement curves for both of these features. The constructed target elevations for marsh and ridge habitats will be determined using the methodology in CPRA's Marsh Creation Design Guidelines (2017). Topographic surveys will be used to determine if the project was built to the specified construction elevation and if settlement of the marsh and ridge is occurring as predicted by the settlement curves. At YRs 3 and 10, topographic data will be analyzed to determine if the marsh is within the optimal inundation range.

Mapping products such as triangulated irregular network (TIN) models will be generated in Geographical Information System (GIS) software packages along with digital elevation models (DEM) to show the elevation and elevation change across the project area.

Parameter #3: Vegetative Cover

Analysis: General descriptive statistical analyses may include, but are not limited to, means of total % cover, % cover by vegetative layer (herbaceous, shrub, tree), % cover by species and height of dominant species. Data will be evaluated to determine existing habitat types and assess transition of the vegetative community. Vegetative data sets from other coastal restoration projects will be analyzed for comparative performance purposes.

Parameter #4: Invasive Species Cover

Analysis: Percent cover of invasive species will be assessed at each plot during vegetation surveys. Total cover of invasive species, as well as cover by individual species, will be measured.

Parameter #5: Soil Samples

Analysis: Soil percent organic content, bulk density, pH and salinity will be analyzed to determine potential limiting factors for vegetative establishment, growth, and succession. Analysis will follow CRMS protocol (Folse et al., 2020).

5 Project Level Decisions: Performance Criteria and Potential Correction Actions

The LA TIG describes how updated knowledge gained from the evaluation of monitoring data will be used at the project-level to determine whether the Project is considered successful or whether corrective actions are needed. A project may not be achieving its intended objectives because of previously identified key uncertainties, unanticipated consequences, previously unknown conditions, or unanticipated environmental drivers. The decision to implement (or not implement) corrective actions is one type of decision within the larger adaptive management decision-making framework.

Learning through monitoring allows for corrective actions to be made to achieve desired outcomes. Table 2 identifies performance criteria, monitoring parameters, and potential corrective actions that could be taken if the performance criteria are not met (as defined in NRDA regulations (15 CFR 990.55(b)(1)(vii)). Other corrective actions may be identified post-implementation and included in an operations and maintenance (O&M) plan. The decision of whether or not a corrective action should be implemented for the Project should consider the overall outcomes of the restoration project (i.e., looking at the combined evaluation of multiple performance criteria) in order to understand why project performance deviates from the predicted or anticipated outcome. Corrective action may not be taken in all cases based on such considerations. The knowledge gained from this process could inform future restoration decisions such as the selection, design, and implementation of similar projects.

Table 2. List of the Project Monitoring Parameters, Performance Criteria, and Potential Corrective Actions.

Table Notes: [1] The land loss rate of -0.47% per year was determined from a 5,842-acre polygon that encompasses the project area from 1984 to 2016 (NRCS 2016). [2] The project is currently gathering data to make the final determination. The Final Design Report is scheduled for 2021.

Monitoring Parameter	**Final Performance Criteria Used to Determine Project Success**	**Potential Corrective Actions**
Spatial Extent	There will be no more than the equivalent of -0.47% per year land loss rate between year 0 and 10 post-construction.[1]	Planting of appropriate species
Elevation	The target elevations stated in the Final Design Report for marsh and ridge at the time of construction.[2]	Addition or regrading of sediments
Vegetation Cover – Marsh Platform	Mean live vegetative cover is ≥ 65% at year 10.	Planting of herbaceous species
Vegetation Cover – Ridge	Mean live % cover of woody species is ≥ 30% at year 10.	Plant woody species if soil conditions support its growth
Invasive Species Cover	Mean live vegetative cover of invasive species is ≤ 25% at year 10.	Mechanical removal or herbicide application

6 Monitoring Schedule

The project monitoring schedule (Table 3) is separated by monitoring parameters. Pre-execution monitoring will occur before any project construction activities occur, if applicable. Execution Monitoring will occur when the construction activities have been deemed complete. Post-Execution (Performance) Monitoring will occur in the years following construction (YRs 0-10).

Table 3. Monitoring Schedule.

Table Notes: X are required data acquisitions; O are optional. [1] It is anticipated that woody species for the ridge will be planted in year 3 post-construction; however, plantings will occur when soil conditions are conductive for establishment and growth. Monitoring will be adjusted accordingly; however, three sampling efforts are budgeted for occurrence. [2] Depending on the length of construction, this survey may take place as part of construction; however, this survey will be included in the monitoring budget for planning purposes. [3] The timing of this survey may be adjusted based on when the settlement curves during engineering and design anticipate the marsh platform to become intertidal. [4] Soil testing is optional. Testing will be based on field observations related to plant growth and soil testing results

Monitoring Parameters	**Pre-Execution Year -1**	**Execution (initial) As-built (Year 0)**	**Post-Execution (ongoing) Year 1**	**Post-Execution Year 2**	**Post-Execution (ongoing) Year 3**	**Post-Execution (ongoing) Year 4**	**Post-Execution (ongoing) Year 5**	**Post-Execution (ongoing) Year 6**	**Post-Execution (ongoing) Year 7**	**Post-Execution (ongoing) Year 8**	**Post-Execution (ongoing) Year 9**	**Post-Execution (ongoing) Year 10**	**Post-Execution (ongoing) Year 11**
Vegetation Survey (marsh)	n/a	n/a	X	n/a	X	n/a	n/a	X	n/a	n/a	n/a	X	n/a
Vegetation Survey (ridge plots)	n/a	n/a	n/a	n/a	X[1]	n/a	n/a	X[1]	n/a	n/a	n/a	X	n/a
Elevation Survey	n/a	X[2]	n/a	n/a	X[3]	n/a	n/a	n/a	n/a	n/a	n/a	X	n/a
Aerial Imagery Acquisition	X	X	O	O	X	O	O	X	O	O	O	X	n/a
Soil Testing[4]	n/a	O	O	O	O	O	O	n/a	n/a	n/a	n/a	n/a	n/a
Reporting	n/a	n/a	n/a	X	n/a	X	n/a	n/a	X	n/a	n/a	n/a	X

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7 Data Management

7.1 Data Description

To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hard copy datasheets, notebooks and photographs will be retained by the implementing Trustee.

Relevant project data that are handwritten on hard copy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. Electronic data files should be named with the date on which the file was created and should include a ReadMe file that describes when the file was created and by whom and any explanatory notes on the file contents. If a data file is revised, a new copy should be made and the original preserved.

All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data were collected, quality assurance/quality control [QA/QC] procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format—can reference different documents).

7.2 Data Review and Clearance

Data will be reviewed for QA/QC in accordance with the *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (*Deepwater Horizon* (DWH) Trustee Council, 2019), and any errors in transcription will be corrected. Implementing Trustees will verify and validate data and information and will ensure that all data are entered or converted into agreed upon/commonly used digital format and labeled with metadata following FGDC/ISO standards to the extent practicable and in accordance with implementing Trustee agency requirements.

After all identified errors are addressed, data are considered to be cleared. The implementing Trustee will give the other LA TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, co-implementing Trustees shall confirm with one another that the package is approved for submission.

7.3 Data Storage and Accessibility

Once data have been cleared, they will be submitted to the Restoration Portal.

Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than 1 year from when data are collected. Data storage and accessibility would be consistent with the guidelines in Section 3.1.3 of the MAM Manual (DWH Trustee Council, 2019).

7.4 Data Sharing

Data will be made publicly available in accordance with the Federal Open Data Policy through the DIVER Explorer Interface within 1 year of when the data collection occurred. Also, data will be made available through the Coastal Protection and Restoration Authority's Coastal Information Management System (CIMS) database (can be accessed via the following URL: https://cims.coastal.louisiana.gov/default.aspx). Larger datasets such as LiDAR will be made available through portals appropriate for handling the associated file sizes.

8 Reporting

Based on the Project's monitoring schedule (Section 4), associated reporting will be submitted in post-construction YRs 2, 4, 7, and 11 which represents one year after data collection efforts in YRs 1,3, 6, and 10. Each of these reports will primarily focus on answering the questions presented in Section 4, Evaluation. The YR 2, 4, and 7 reports will be more progress related reports, whereas the YR 11 report will be comprehensive in nature and answer whether or not the Project met each of the performance criteria (PC). If the Project did not meet a PC, then an explanation will be provided. For each report, if corrective actions are required then a corrective action plan would be generated, and variables would continue to be monitored.

The reports will follow the template recommended in the *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0* (*Deepwater Horizon* (DWH) Trustee Council, 2019), Appendix D. MAM reports and lessons learned from the monitoring activities will be disseminated to the LA TIG through relevant portals, and information will be more broadly disseminated at conferences to reach a larger audience.

The DWH Trustees, as stewards of public resources under OPA, should inform the public on the restoration project's progress and performance. Therefore, the Louisiana TIG would report the status of the proposed project via the DIVER Restoration Portal, as outlined in Chapter 7 of the Final PDARP/PEIS (DWH Trustees, 2016).

9 Roles and Responsibilities

The LA TIG is responsible for addressing MAM objectives that pertain to their restoration activities and for communicating information to the Trustee Council or Cross-TIG MAM work group. CPRA is the implementing Trustee for the Project. The U.S. Department of the Agriculture will be the lead federal agency for conducting the environmental evaluation review for implementation. The implementing Trustees' roles include:

- Data collection
- Data analysis
- Report composition
- Ensuring corrective action activities are performed, if necessary
- Providing project progress information to the LA TIG
- Submitting MAM data and project information into the DIVER Restoration Portal

10 Monitoring and Adaptive Management Budget

The overall budget for the Project monitoring and adaptive management plan is $1,750,000 and covers the activities identified in Table 3 as well as data analysis, report composition, and project management.

11 References

Coastal Protection and Restoration Authority of Louisiana. 2017. Marsh Creation Design Guidelines – Marsh Creation Projects. Available at the following URL: https://cims.coastal.louisiana.gov/RecordDetail.aspx?Root=0&sid=21477

Deepwater Horizon Natural Resource Damage Assessment Trustees. 2016. Deepwater Horizon oil spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic

Environmental Impact Statement. Available at the following URL: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

Deepwater Horizon (DWH) Natural Resource Damage Assessment Trustees. 2017. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December. Available at the following URL: https://www.gulfspillrestoration.noaa.gov/sites/default/files/2018_01_TC_MAM_Procedures_Guidelines_Manual_12-2017_508_c.pdf

Deepwater Horizon Trustee Council (DWH TC). 2016. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill. November 15, 2016. Available at the following URL: https://www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/DWH-SOPs.pdf

Deepwater Horizon Trustee Council (DWH TC). 2019. Monitoring and Adaptive Management (MAM) Procedures and Guidelines Manual Version 1.0. Available at the following URL: https://www.gulfspillrestoration.noaa.gov/sites/default/files/2019-08%20MAM_Manual_FULL_Updated%202019.pdf

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Louisiana Trustee Implementation Group. 2017. Final Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands, and Birds. January.

Natural Resources Conservation Service. 2016. Bayou La Loutre Ridge Restoration and Marsh Creation , Final Project Information Sheet for Wetland Value Assessment.

Steyer, G.D., C.E. Sasser, J.M. Visser, E.M. Swensen, J.A. Nyman, and R.C. Raynie. 2003. A proposed coast-wide reference monitoring system for evaluating wetland restoration trajectories in Louisiana. Environmental Monitoring and Assessment 81:107-117.

The Water Institute of the Gulf. 2020. Louisiana Adaptive Management Status and Improvement Report: Vision and Recommendations. Prepared for the Coastal Protection and Restoration Authority (CPRA) and the Louisiana Trustee Implementation Group (LA TIG), funded by the LA TIG. Task Order 50.2, Contract No. 2503-12-58 Baton Rouge, LA (202 pp).

12 MAM Plan Revision History

Table 4. MAM Plan Revision History.

Old Version #	Revision Date	Changes Made	Reason for Change	New Version #
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Appendix E Guidelines for NEPA Impact Determinations

Appendix E Guidelines for NEPA Impact Determinations

Resource	Impact Duration	Minor Impact Intensity Definitions	Moderate Impact Intensity Definitions	Major Impact Intensity Definitions
Geology and Substrates	Short-term: During construction period. Long-term: Over the life of the project or longer.	Disturbance to geologic features or soils could be detectable but could be small and localized. There could be no changes tolocal geologic features or soil characteristics. Erosion and/orcompaction could occur in localized areas.	Disturbance could occur over local and immediately adjacent areas. Impacts to geology or soils could be readily apparent and result in changes to the soil character or local geologic characteristics. Erosion and compaction impacts could occur over local and immediately adjacent areas.	Disturbance could occur over a widespread area. Impacts to geology or soils could be readily apparent and could result in changes to the character of the geology or soils over a widespread area. Erosion and compaction could occur over a widespread area. Disruptions to substrates or soils may be permanent.
Hydrology and Water Quality	Short-term: During construction period. Long-term: Over the life of the project or longer.	Hydrology: The effect on hydrology could be measurable, but it could be small and localized. The effect could only temporarily alter the area's hydrology, including surface and ground water flows. Water quality: Impacts could result in a detectable change to water quality, but the change could be expected	Hydrology: The effect on hydrology could be measurable, but small and limited to local and adjacent areas. The effect could permanently alter the area's hydrology, including surface and ground water flows. Water quality: Effects to water quality could be observable over a relatively large area. Impacts could result in a change to water quality that could be readily detectable	Hydrology: The effect on hydrology could be measurable and widespread. The effect could permanently alter hydrologic patterns including surface and ground water flows. Water quality: Impacts could likely result in a change to water quality that could be readily detectable and widespread.

		to be small and localized. Impacts could quickly become undetectable. State water quality standards as required by the Clean Water Act could not be exceeded. Floodplains: Impacts may result in a detectable change to natural and beneficial floodplain values, but the change could be expected to be small and localized. There could be no appreciable increased risk of flood loss including impacts on human safety, health, and welfare. Wetlands: The effect on wetlands could be measurable but small in terms of area and the nature of the impact. A small impact on the size, integrity, or connectivity could occur; however, wetland function could not be affected, and natural restoration could occur if left alone.	and limited to local and adjacent areas. Change in water quality could persist; however, it could likely not exceed state water quality standards as required by the Clean Water Act. Floodplains: Impacts could result in a change to natural and beneficial floodplain values and could be readily detectable but limited to local and adjacent areas. Location of operations in floodplains could increase risk of flood loss, including impacts on human safety, health, and welfare. Wetlands: The action could cause a measurable effect on wetlands indicators (size, integrity, or connectivity) or could result in a permanent loss of wetland acreage across local and adjacent areas. However, wetland functions could only be permanently altered in limited areas.	Impacts could likely result in exceedance of state water quality standards and/or could impair designated uses of a water body. Floodplains: Impacts could result in a change to natural and beneficial floodplain values that could have substantial consequences over a widespread area. Location of operations could increase risk of flood loss, including impacts on human safety, health, and welfare. Wetlands: The action could cause a permanent loss of wetlands across a widespread area. The character of the wetlands could be changed so that the functions typically provided by the wetland could be permanently lost.
Air Quality	<u>Short-term:</u> During	The impact on air quality may be measurable, but	The impact on air quality could be measurable and	The impact on air quality could be measurable over

	construction period. Long-term: Over the life of the project or longer.	could be localized and temporary, such that the emissions do not exceed the USEPA's de minimis criteria for a general conformity determination under the Clean Air Act (40 CFR § 93.153).	limited to local and adjacent areas. Emissions of criteria pollutants could be at USEPA's de minimis criteria levels for general conformity determination.	a widespread area. Emissions are high, such that they could exceed USEPA's de minimis or a general conformity determination.
Noise	Short-term: During construction period. Long-term: Over the life of the project.	Increased noise could attract attention, but its contribution to the soundscape would be localized and unlikely to affect current user activities.	Increased noise could attract attention and contribute to the soundscape including in local areas and those adjacent to the action but could not dominate. User activities could be affected.	Increased noise could attract attention and dominate the soundscape over widespread areas. Noise levels could eliminate or discourage user activities.
Habitats	Short-term: Lasting less than two growing seasons. Long-term: Lasting longer than two growing seasons.	Impacts on native vegetation may be detectable but could not alter natural conditions and could be limited to localized areas. Infrequent disturbance to individual plants could be expected but would not affect local or rangewide population stability. Infrequent or insignificant one-time disturbance to locally suitable habitat could occur, but sufficient habitat could remain functional at both the local and regional scales to maintain the viability of the species.	Impacts on native vegetation could be measurable but limited to local and adjacent areas. Occasional disturbance to individual plants could be expected. These disturbances could affect local populations negatively but could not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species	Impacts on native vegetation could be measurable and widespread. Frequent disturbances of individual plants could be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affect rangewide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the

		Opportunity for increased spread of non-native species could be detectable but temporary and localized and could not displace native species populations and distributions.	could be detectable and limited to local and adjacent areas but could only result in temporary changes to native species population and distributions.	species both locally and throughout its range. Actions could result in the widespread increase of non-native species, resulting in broad and permanent changes to native species populations and distributions.
Wildlife Species (Including Birds)	<u>Short-term:</u> Lasting up to two breeding seasons, depending on length of breeding season. <u>Long-term:</u> Lasting more than two breeding seasons.	Impacts to native species, their habitats, or the natural processes sustaining them could be detectable, but localized, and could not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, migrating, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat could remain functional at both the local and rangewide	Impacts on native species, their habitats, or the natural processes sustaining them could be measurable but limited to local and adjacent areas. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and	Impacts on native species, their habitats, or the natural processes sustaining them could be detectable and widespread. Frequent responses to disturbance by some individuals could be expected, with negative impacts to feeding, reproduction, migrating, or other factors resulting in a decrease in both local and rangewide population levels and habitat type. Impacts could occur during critical periods of reproduction or in key habitats and could result in direct mortality or loss of habitat that might affect the viability of a species. Local population

		scales to maintain the viability of the species. Opportunity for increased spread of non-native species could be detectable but temporary and localized, and these species could not displace native species populations and distributions.	limited to local and adjacent areas but could only result in temporary changes to native species population.	numbers, population structure, and other demo-graphic factors might experience large changes or declines. Actions could result in the widespread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.
Marine and Estuarine Fauna (Fish, Shellfish, Benthic Organisms)	<u>Short-term:</u> Lasting up to two spawning seasons, depending on length of season. <u>Long-term:</u> Lasting more than two spawning seasons.	Impacts could be detectable and localized but small. Disturbance of individual species could occur; however, there could be no change in the diversity or local populations of marine and estuarine species. Any disturbance could not interfere with key behaviors such as feeding and spawning. There could be no restriction of movements daily or seasonally. Opportunity for increased spread of non-native species could be detectable but temporary	Impacts could be readily apparent and result in a change in marine and estuarine species populations in local and adjacent areas. Areas being disturbed may display a change in species diversity; however, overall populations could not be altered. Some key behaviors could be affected but not to the extent that species viability is affected. Some movements could be restricted seasonally. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas but could only result in	Impacts could be readily apparent and could substantially change marine and estuarine species populations over a widescale area, possibly river-basin-wide. Disturbances could result in a decrease in fish species diversity and populations. The viability of some species could be affected. Species movements could be seasonally constrained or eliminated. Actions could result in the widespread increase of non-native species resulting in broad and

		and localized and these species could not displace native species populations and distributions.	temporary changes to native species population and distributions.	permanent changes to native species populations and distributions.
Protected Species	Short-term: Lasting up to one Breeding/growing season. Long-term: Lasting more than one breeding/growing season.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, but small and localized, and could not measurably alter natural conditions. Impacts could likely result in a "may affect, not likely to adversely affect" determination for at least one listed species.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of protected species or occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local and adjacent population levels. Impacts could occur in key habitats, but sufficient population numbers or habitat could remain functional to maintain the viability of the species both locally and throughout their range. Some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts could likely result in a "may affect, likely to adversely affect" determination for at	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, widespread, and permanent. Substantial impacts to the population numbers of protected species, or interference with their survival, growth, or reproduction could be expected. There could be impacts to key habitat, resulting in substantial reductions in species numbers. Results in an "is likely to jeopardize proposed or listed species/adversely modify proposed or designated critical habitat (impairment)" determination for at least one listed species.

			least one listed species. No adverse modification of critical habitat could be expected.	
Socioeconomics and Environmental Justice	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions. Actions could not disproportionately affect minority and low-income populations.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions. Actions could disproportionately affect minority and low-income populations. However, the impact could be temporary and localized.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily detectable and observed, extend over a widespread area, and have a substantial influence on social and/or economic conditions. Actions could disproportionately affect minority and low-income populations, and this impact could be permanent and widespread.
Cultural Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	The disturbance of a site(s), building, structure, or object could be confined to a small area with little, if any, loss of important cultural information potential.	Disturbance of a site(s), building, structure, or object not expected to result in a substantial loss of important cultural information.	Disturbance of a site(s), building, structure, or object could be substantial and may result in the loss of most or all its potential to yield important cultural information.
Infrastructure	Short-term: During construction period.	The action could affect public services or utilities, but the impact could be	The action could affect public services or utilities in local and adjacent areas and the impact could require the acquisition of	The action could affect public services or utilities over a widespread area

	Long-term: Over the life of the project or longer.	localized and within operational capacities. There could be negligible increases in local daily traffic volumes resulting inperceived inconvenience to drivers but no actual disruptions to traffic.	additional service providers or capacity. Detectable increase in daily traffic volumes (with slightly reduced speed of travel), resulting in slowed traffic and delays, but no change in level of service (LOS). Short service interruptions (temporary closure for a few hours) to roadway and railroad traffic could occur.	resulting in the loss of certain services or necessary utilities. Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in LOS to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways or railroad traffic could occur.
Land and Marine Management	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could require a variance or zoning change or an amendment to a land use, area comprehensive, or management plan, but could not affect overall use and management beyond the local area.	The action could require a variance or zoning change or an amendment to a land use, area comprehensive, or management plan, and could affect overall land use and management in local and adjacent areas.	The action could cause permanent changes to andconflict with land uses or management plans over a widespread area.
Tourism and Recreational Use	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be partial developed recreational site closures to protect public safety. The same site capacity and visitor experience could remain unchanged after construction.	There could be complete site closures to protect public safety. However, the sites could be reopened after activities occur. There could be slightly reduced site capacity. The visitor experience could be slightly changed but still available.	All developed site capacity could be eliminated because developed facilities could be closed and removed. Visitors could be displaced to facilities over a widespread area and visitor experiences could

		The impact could be detectable and/or could only affect some recreationists. Users could likely be aware of the action but changes in use could be slight. There could be partial closures to protect public safety. Impacts could be local. There could be a change in local recreational opportunities; however, it could affect relatively few visitors or could not affect any related recreational activities.	The impact could be readily apparent and/or could affect many recreationists locally andin adjacent areas. Users could be aware of the action. There could be complete closures to protect public safety. However, the areas could be reopened after activities occur. Some users could choose to pursue activities in other available local or regional areas.	no longer be available in many locations. The impact could affect most recreationists over a widespread area. Users could be highly aware of the action. Users could choose to pursue activities in other available regional areas.
Fisheries and Aquaculture	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts could besmall and localized. Theseimpacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily detectable and observed, extend over a widespread area, and could have a substantial influence on social and/or economic conditions.
Marine Transportation	Short-term: During construction period.	The action could affect public services or utilities, but the impact could be localized and within operational capacities.	The action could affect public services or utilities in local and adjacent areas, and the impact could require the	The action could affect public services utilities over a widespread area resulting in the loss of

	Long-term: Over the life of the project or longer.	There could be negligible increases in local daily marine traffic volumes, resulting in perceived inconvenience to operators but no actual disruptions to transportation.	acquisition of additional service providers or capacity. Detectable increase in daily marine traffic volumes could occur (withslightly reduced speed of travel), resulting in slowedtraffic and delays. Short service interruptions could occur (temporary delays for a few hours).	certain services or necessary utilities. Extensive increase in daily marine traffic volumes could occur (with reduced speed of travel), resulting in extensive service disruptions (temporary closure of one day or more).
Aesthetics and Visual Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be a change in the viewshed that was readily apparent but could not attract attention, dominate the view, or detract from current user activities or experiences.	There could be a change in the viewshed that was readily apparent and attracts attention. Changes could not dominate the viewscape, although they could detract from the current user activities or experiences.	Changes to the characteristic views could dominate and detractfrom current user activities or experiences.
Public Health and Safety, Including Flood and Shoreline Protection	Short-term: During construction period. Long-term: Over the life of the project or longer.	Actions could not result in 1) soil, ground water, and/or surface water contamination; 2) exposure of contaminatedmedia to construction workers or transmission line operations personnel; and/or 3) mobilization and migration of contaminants currently in the soil, ground water, or surface water at levels that could harm the workers or general public.	Project construction and operation could result in 1) exposure, mobilization and/or migration of existing contaminated soil,ground water, or surface water to an extent that requires mitigation; and/or 2) could introduce detectable levels of contaminants to soil, ground water, and/or surface water in localizedareas within the project boundaries such that mitigation/remediation is	Actions could result in 1) soil, ground water, and/or surface water contamination at levels exceeding federal, state, or local hazardous waste criteria, including those established by 40CFR § 261; 2) mobilization of contaminants currently in the soil, ground water, or surface water, resulting in exposure of humans or other sensitive receptors

		Increased risk of potential hazards (e.g., increased likelihood of storm surge) to visitors, residents, and workers from decreased shoreline integrity could be temporary and localized.	required to restore the affected area to the preconstruction conditions. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be sufficientto cause a permanent change in use patterns and area avoidance in local and adjacent areas.	such as plants and wildlife to contaminant levels that could result in health effects; and 3) the presence of contaminated soil, ground water, or surface water within the project area, exposing workers and/or the public to contaminated or hazardous materials at levels exceeding those permitted by the federal Occupational Safety and Health Administration (OSHA) in 29 CFR § 1910. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be substantial and could cause permanent changes in use patterns and area avoidance over a widespread area.