DRAFT
DAMAGE ASSESSMENT AND RESTORATION PLAN
AND
ENVIRONMENTAL ASSESSMENT

SHELL - GREEN CANYON BLOCK 248 OIL SPILL

Prepared by:

National Oceanic and Atmospheric Administration
United States Department of the Interior, Fish and Wildlife Service
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Louisiana Department of Natural Resources
Louisiana Department of Wildlife and Fisheries
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EXECUTIVE SUMMARY

On May 12, 2016, Shell Offshore, Inc. ("Shell") reported a crude oil spill of 2,100 barrels (bbl) (later revised to 1,926 bbl) from Green Canyon Block 248 in the Gulf of Mexico (GC248; herein referred to as "the Incident" or "the spill"). The release from the Glider 4 Jumper (pipeline) near Shell's Brutus Platform occurred sub-surface, more than 1,000 meters (m) (3,300 feet (ft)) below the surface, approximately 90 miles offshore of Eastern LA.

A large surface slick resulted from the spill, moving over the surface of the water over the course of 5 days. In all, the spill is estimated to have swept through 3,300 square kilometers (km^2) (1,274 square miles (mi^2)) over the five days that it persisted on the surface.

This Draft Damage Assessment and Restoration Plan/Environmental Assessment (DARP/EA) was prepared by the United States Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA), the United States Department of the Interior (USDOI), represented by the United States Fish and Wildlife Service (USFWS or Service), the Louisiana Oil Spill Coordinator's Office, Department of Public Safety (LOSCO); the Louisiana Department of Environmental Quality (LDEQ); the Louisiana Department of Natural Resources (LDNR); the Louisiana Department of Wildlife and Fisheries (LDWF); and the Coastal Protection and Restoration Authority of Louisiana (CPRA), collectively acting as Trustees for the restoration of natural resources, their services, and public use services that were exposed to and/or injured by the unauthorized discharge of oil as a result of the Incident. This Draft DARP/EA is issued to inform the public about the Trustees' authorities and responsibilities under the Oil Pollution Act of 1990 (OPA) (33 United States Code [U.S.C.] 2701 et seq.), the Louisiana Oil Spill Prevention and Response Act of 1991 (OSPRA) (Louisiana Revised Statute [L.R.S.] 30:2451 et seq.), and the National Environmental Policy Act (NEPA) (83 Stat. 852; 42 U.S.C. 4321 et seq.); and to allow the Trustees to solicit and consider public comment on proposed alternatives to restore resources injured by the Incident.

Additionally, in this Draft DARP/EA, the Trustees evaluate potential restoration alternatives, which exhibit sufficient nexus to the natural resources injured by the Incident, and would provide resource services to compensate the public for natural resource losses resulting from the discharged oil.

This Draft DARP/EA provides information on:

- the Incident, spill response, a description of natural resource injuries, restoration to pre-spill baseline conditions, and legal authorities (Chapter 1);
- a description of past and proposed involvement of the responsible parties in the assessment (Chapter 1);
- the natural resources found in the area affected by the Incident (Chapter 2);
- the nature and extent of the natural resources exposed and/or injured and the lost public uses resulting from the Incident (Chapter 3);
- a summary of the injury assessment procedures used (Chapter 3);
- the goals and objectives of restoration (Chapter 4);

- the range of potential restoration alternatives identified by the Trustees under OPA, NEPA and OSPRA to restore the natural resources and resource services affected by the Incident (Chapter 4);
- a description of monitoring for documenting restoration effectiveness, including performance criteria that will be used to determine the success of restoration or need for interim corrective action (Chapter 4); and,
- the analysis of potential environmental consequences of the potential restoration alternatives considered by the Trustees which helped determine the preferred restoration alternative (Chapter 5).

ACRONYMS

AQCR	Air Quality Control Region
AR	Administrative Record
BUDMAT	Beneficial Use of Dredge Material Program
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CPRA	Coastal Protection and Restoration Authority
CUP	Coastal Use Permit
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
CZMA	Coastal Zone Management Act
DARP	Damage Assessment and Restoration Plan
DNA	Deoxyribonucleic Acid
DWH	Deepwater Horizon Oil Spill
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELS	Early Life Stages
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FPEIS	Final Programmatic Environmental Impact Statement
GC248	Green Canyon Block 248
GMFMC	Gulf of Mexico Fishery Management Council
GIWW	Gulf Intercoastal Waterway
GOM	Gulf of Mexico
HAPC	Habitat Areas of Particular Concern
HARPs	High-frequency Acoustic Recording Packages
HMS	Highly Migratory Species
HNC	Houma Navigation Canal
LAC	Louisiana Administrative Code
L.R.S.	Louisiana Revised Statute
LCA	Louisiana Coastal Area
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, Department of Public Safety and Corrections
LCWCRTF	Louisiana Coastal Wetlands Conservation and Restoration Task Force
MMPA	Marine Mammals Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MtDNA	Mitochondrial Deoxyribonucleic Acid
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resource Damage Assessment
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OPA	Oil Pollution Act
OSPRA	Oil Spill Prevention and Response Act
PAHs	Polycyclic Aromatic Hydrocarbons
PALWMA	Pass-a-Loutre Wildlife Management Area
PAM	Passive Acoustic Monitoring
PCR	Polymerase Chain Reaction (PCR also appears in Table 1 and represents Primary Contact Recreation (swimming)
PDARP	Programmatic Damage Assessment and Restoration Plan
PLL	Pelagic Longline
REA	Resource Equivalency Analysis
RP	Responsible Party
RRP	Regional Restoration Planning
SEFSC	Southeast Fisheries Science Center
Shell	Shell Offshore, Inc.
SNP	Single Nucleotide Polymorphism
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers, Mississippi River Valley New Orleans Division
U.S.C.	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USDOI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
WCRA	Wetlands Conservation and Restoration Authority

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1.0 INTRODUCTION

1.1 Summary of the Incident

On May 12, 2016, Shell Offshore Inc. (Shell) discharged an estimated 1,926 bbl of crude oil from Green Canyon Block 248 (GC248). The release from the Glider 4 Jumper (pipeline) near Brutus Platform occurred sub-surface, more than 1,000 m (3,300 ft) below the surface, approximately 90 miles offshore of Eastern LA (Figure 1).

Figure 1. Shell Green Canyon Block 248 Incident location.

1.1.1 Summary of Response Actions

A large surface slick resulted from the spill, moving over the surface of the water over the course of 5 days. Daily overflights occurred to locate and describe the slick. Numerous photos were taken by USCG for the duration of the persistence of the surface slick. Marine Spill Response Corporation was the spill contractor for Shell and produced hand-drawn maps. Shell also acquired satellite data for the 5 days for which surface oil persisted. Even though the spill occurred far off shore, skimmers were deployed. During the initial few days of the spill, conditions for skimming were relatively favorable. Once high winds moved through the area, the response was unable to locate recoverable oil. Approximately 1,828 bbl of oil was not recovered and either evaporated or was mixed into the water column. In all, the spill is estimated to have swept through 3,300 km^2 (1,274 mi^2) over the five days that it persisted on the surface.

1.2 Purpose and Need for Restoration

The purpose and need for the proposed restoration alternatives evaluated in this Draft Damage Assessment and Restoration Plan and Environmental Assessment (DARP/EA) is to restore natural resources injured by the GC 248 oil spill consistent with the Oil Pollution Act of 1990 (OPA) (33 U.S.C. 2701 *et seq.*) and its implementing regulations (15 C.F.R. Part 990). This DARP/EA is intended to inform members of the public about the natural resource injuries caused by the unauthorized discharge of oil resulting from Shell's Green Canyon Block 248 subsea oil production system (herein referred to as the "Incident" or the "spill") in the Gulf of Mexico, approximately 97 miles off the coast of Louisiana, as well as potential restoration alternatives the natural resource trustees considered for the purposes of compensating the public for those injuries. This document is part of the Natural Resource Damage Assessment (NRDA) process being performed pursuant to the OPA and the Louisiana Oil Spill Prevention and Response Act of 1991 (OSPRA), by the Natural Resource Trustees (Trustees) for the GC248 oil spill, which include the Louisiana Oil Spill Coordinator's Office, Department of Public Safety (LOSCO); the Louisiana Department of Environmental Quality (LDEQ); the Louisiana Department of Natural Resources (LDNR); Louisiana Department of Wildlife and Fisheries (LDWF); the Coastal Protection and Restoration Authority (CPRA); the USDOI, represented by USFWS); and the United States Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA). This Draft DARP/EA also serves as a draft Environmental Assessment under the National Environmental Policy Act (NEPA), evaluating the reasonably foreseeable impacts of the preferred restoration actions on the quality of the physical, biological, and cultural environment in the Mississippi River watershed.

The purpose of the Trustees' proposed restoration actions, as outlined in this Draft DARP/EA, is to make the public whole for injuries to natural resources, their services, and public use services resulting from the Incident by returning the injured natural resources and related services to their "baseline" condition (i.e., the condition that would have occurred but for the spill) and compensating for associated interim losses. Shell was identified as the Responsible Party (RP) for the Incident under OPA and OSPRA. The Trustees settled Shell's natural resource damage liability at the site for $3,871,169.54. From the total settlement amount, $246,169.54 went

towards natural resource damage assessment costs incurred by the Trustees and $3,625,000 was recovered for the Trustees to jointly plan, implement, oversee, and monitor natural resource restoration. The United States District Court of the Eastern District of Louisiana entered the Consent Decree representing this settlement on August 27, 2018.

This Draft DARP/EA presents information about the affected environment (Chapter 2), the Trustees' estimates of exposure and/or injury and service losses to natural resources caused by the Incident (Chapter 3), the potential restoration alternatives (Chapter 4), and an analysis of the potential environmental consequences of those potential alternatives which helped the Trustees determine a preferred restoration action (Chapter 5). The Trustees are seeking comments on the restoration alternatives evaluated in this Draft DARP/EA, including the Trustees' preferred restoration alternative. These comments will be considered in developing the Final DARP/EA. With the settlement funds received from Shell, the Trustees will implement restoration projects and/or oversee implementation of restoration projects that are consistent with the Final DARP/EA and the Consent Decree.

1.3 NRDA Authority and Legal Requirements

The Federal Trustees for this NRDA process are the USDOI, represented by the USFWS, and the United States Department of Commerce, represented by NOAA. Each of these agencies is a designated natural resource Trustee under Section 1006(b) of OPA (42 U.S.C. § 2706(b)), and the National Contingency Plan (NCP) (40 C.F.R. § 300.600), for natural resources injured by the Incident. State Trustees for Louisiana are designated by the Governor of Louisiana pursuant to Section 1006(b) of OPA (42 U.S.C. § 2706(b)), the NCP (40 C.F.R. § 300.605) and OSPRA (R.S. 30:2451 et seq.), and include the LOSCO, LDEQ, LDNR, LDWF, and CPRA. The Trustees are working together under a Memorandum of Understanding. Each designated Trustee is authorized to act on behalf of the public to assess and recover natural resources and resource services injured or lost as the result of a discharge or discharges of oil.

1.3.1 Overview of OPA and OSPRA Requirements

The NRDA process conducted pursuant to OPA and OSPRA and the corresponding regulations promulgated thereunder at 15 C.F.R. Part 990 and LAC 43:XXIX.101 et seq., consists of three phases: (1) Preassessment; (2) Restoration Planning; and (3) Restoration Implementation. OPA authorizes federal, state, and tribal natural resource trustees to initiate a damage assessment, among other requirements, when natural resources may have been injured and/or natural resource services impaired as a result of discharges of oil. OPA regulations provide specific definitions for the following terms:

- "Injury" is "an observable or measurable adverse change in a natural resource or impairment of a natural resource service";
- "Natural resources" are "land, fish, wildlife, biota, air, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any state or local government, or Indian tribe"; and

- "Natural resource services" are "functions performed by a natural resource for the benefit of another resource and/or the public"(15 C.F.R. § 990.30).

During the Preassessment Phase, the Trustees determined that the provisions and determinations of OPA and OSPRA applied to the Incident discharge including: (1) one or more incidents has occurred, as defined by the OPA NRDA regulations; (2) the discharge was not from a public vessel; (3) the discharge was not from an onshore facility subject to the Trans-Alaska Pipeline Authority Act; (4) the discharge was not permitted under federal, state, or local law; and (5) natural resources under the trusteeship of a trustee may have been injured as a result of the incident (15 CFR 990.41(a)). In the Restoration Planning Phase, the Trustees evaluated and quantified the nature and extent of injuries to natural resources and services, and determined the need for, type of, and scale of appropriate restoration actions. Using the information developed during the Restoration Planning Phase, the Trustees developed this Draft DARP/EA for public comment.

The first component of the Restoration Planning Phase was injury assessment. The Trustees evaluated injury to: (1) water column; (2) marine mammals; and (3) birds. As provided at 15 C.F.R. § 990.14(c)(1), the Trustees invited Shell to participate in the injury assessment component of the NRDA (see also Section 1.3.3). Shell was involved in the design, performance, and funding of several Preassessment activities to collect ephemeral data. The Trustees' assessment used data from the Trustees, Shell (when validated), and other sources. The Trustees' assessment produced relevant information for determining the nature and extent of injuries to natural resources.

The second component of the Restoration Planning Phase is restoration selection. Considering the nature and extent of exposure and/or injuries to natural resources caused by the Incident, the Trustees developed a plan for restoring the injured resources and services, which is set forth in this Draft DARP/EA. The Trustees identified reasonable restoration alternatives and evaluated those alternatives to determine the preferred restoration actions among them. As a part of this process, the Trustees considered the extent to which the potential restoration alternatives provide benefits to more than one natural resource and/or service, as well as the cost-effectiveness of the alternatives.

1.3.2 National Environmental Policy Act Compliance

Restoration of natural resources under OPA involving federal actions that may significantly impact the human environment must comply with NEPA, as amended (42 U.S.C. 4321 et seq.), and its implementing regulations (40 C.F.R. § 1500-1508)[1]. In compliance with NEPA and its implementing regulations, the Federal Trustees evaluate the environmental consequences of a reasonable range of restoration alternatives in this Draft DARP/EA, identify potential restoration

[1] The EA portion of this document is being prepared using the 1978 CEQ NEPA Regulations. NEPA reviews initiated prior to the effective date of the revised CEQ NEPA regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020. This review began on July 25, 2018 when the Trustees issued the Notice of Intent to Conduct Restoration Planning for the NRDA, and therefore, the agencies have decided to proceed under the 1978 regulations.

alternatives, describe the purpose and need for the action, and provide for public participation in the decision-making process. The information on environmental consequences will be used in making a threshold determination as to whether the proposed restoration alternatives will have a significant impact on the quality of the human environment necessitating the preparation of an Environmental Impact Statement (EIS). If Federal Trustees conclude that the proposed restoration alternatives will not have a significant impact on the quality of the human environment, the Trustees will finalize the Draft DARP/EA after consideration of public comment and will issue a Finding of No Significant Impact (FONSI).

Additionally, if there is a significant change to any of the restoration projects selected in the Final DARP/EA, the Trustees will consider the need to develop additional environmental analysis in accordance with NEPA regulations. These regulations typically require a supplemental NEPA analysis be prepared if new information arises that would substantively impact previous decision-making or if there is a significant change to a selected restoration project (40 C.F.R § 1502(9)(c)). The decision as to whether a change is significant considers both the context and intensity of the proposed change (40 C.F.R. § 1508.27). Project changes that are not deemed significant could be outlined in a supplemental information report for posting to the Administrative Record.

Under 40 C.F.R. §§ 1501.5 and 1501.6, for the purposes of this NEPA analysis, NOAA is the lead agency and USDOI is a cooperating agency.

1.3.3 Coordination with Responsible Party

The OPA and OSPRA regulations (15 C.F.R. Part 990 and OSPRA at LAC 43:XXIX.101 et seq.) require the Trustees to invite the responsible party to participate in the NRDA process. The Trustees invited Shell to participate in the NRDA process and Shell formally accepted the Trustees' invitation on September 26, 2016.

Information collected by all parties was shared, as were the results of analyses undertaken independently by the Trustees and Shell. Coordination between the Trustees and Shell reduced duplication of effort, increased the cost-effectiveness of the assessment process, and increased sharing of information. While proceeding with the injury assessment for the Incident, the Trustees also participated in settlement negotiations with Shell. These actions are consistent with the OPA regulations, and are intended, in part, to facilitate settlement of damage claims without litigation. As required by the regulations at 15 C.F.R. § 990.14 (c)(4), the Trustees retain final authority to make determinations regarding injury and restoration.

1.3.4 Public Participation

On July 20, 2018, the Trustees published a Notice of Intent to Conduct Restoration Planning and Notice of Availability of a Consent Decree for Natural Resource Damages in the Louisiana Register (Vol. 44., No. 07, pgs. 1401-1403) and in *The Advocate* (Baton Rouge, LA) on July 25th. The Notice stated that, based on Preassessment findings, Trustees were proceeding with restoration planning under OPA and OSPRA, opening an Administrative Record to facilitate public involvement in the restoration planning process,and seeking 30-day public review and

comment on the proposed Consent Decree. The Trustees did not receive any comments. Additionally, the U.S. Department of Justice published a Notice of Lodging of Proposed Consent Decree under the Oil Pollution Act in the Federal Register (Vol. 83, No. 134, pgs. 32329-32330) on July 12, 2018, seeking 30-day public review and comment of the proposed Consent Decree. The Department of Justice did not receive any comments

This Draft DARP/EA provides information about the nature and extent of natural resource injuries resulting from the Incident and identifies preferred restoration actions to address those injured resources. Public review of the Draft DARP/EA is an integral component of the restoration planning phase. Public comment is consistent with all federal and state laws and regulations that apply to the natural resource damage assessment and restoration process, including Section 1006 of OPA, the NRDA regulations at 15 C.F.R. Part 990, Section 2480 of OSPRA, the OSPRA regulations at LAC 43:XXIX.101 *et seq*., and NEPA, as well as associated implementing regulations.

This Draft DARP/EA is available to the public for a 30-day comment period, which will begin on the date of the public notice announcing availability of the Draft DARP/EA. After the public comment period has ended, all comments received from the public will be evaluated by the Trustees and all significant comments will be summarized and responded to in the Final DARP/EA. An additional opportunity for public review will be provided in the event that the Trustees decide to make significant changes to the Draft DARP/EA based on the initial public comments.

Comments on this Draft DARP/EA should be sent to:

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1.3.5 Administrative Record

The Trustees have maintained an Administrative Record (AR) to document the information considered by the Trustees as they developed this Draft DARP/EA. This Administrative Record facilitates public participation in the assessment process. Additional information and documents, including public comments received on the Draft DARP/EA, and other related restoration planning documents are also part of the AR. The AR for this Incident also includes the references cited in Chapter 8. Arrangements to obtain copies of documents contained in the AR should be made in advance by contacting John Barco at the address provided below.

NOAA Restoration Center, Southeast Region
Attn: John Barco
263 13th Ave South

St. Petersburg, FL 33701
john.barco@noaa.gov
(727)-824-5384

1.3.6 Summary of Natural Resource Injuries

The Trustees reviewed information gathered from response activities, Preassessment, and the Restoration Planning Phase to help determine potential natural resource injuries. The Trustees identified a number of resources injured by the Incident. These resources (as categorized by the Trustees for the purpose of this assessment) include water column, marine mammals and birds. Since the spill happened in the offshore waters of the Northern Gulf of Mexico at a similar time of year to the Deepwater Horizon Oil Spill (DWH), and oil composition was relatively similar to DWH oil, some of the data collected and/or assembled during the DWH Response and NRDA is applicable to the GC248 spill. Therefore, the Trustees and Shell agreed to an expedited assessment approach that used both information collected from the GC248 spill and information collected during the injury assessment process for the DWH Oil Spill. Natural resource injury estimates are provided in Table 1.

Table 1. Summary of the natural resource injuries caused by the Incident.

Injured Resources/Services	**Injury Estimate**
Water Column	
Early Life Stage offshore larval fish killed	Lower 5.28E+09 Upper 1.62E+10
Early Life Stage offshore Planktonic inverts killed	Lower 9.90E+10 Upper 1.85E+11
Mean biomass lost (injury plus production foregone) for select offshore species	Red snapper (*Lutjanus campenchanus*): 458kg Large tunas (*Thunnus* spp.): 8,184kg Mahi-mahi (*Coryphaena* spp.): 4,193kg
Marine Mammals	17 Pantropical Spotted dolphins (*Stenella attenuata*) observed during overflights within the slick and exposed to the oil spill
Birds	Discounted bird years: 240 for gulls, 11,500 for terns, and 1,200 for boobies

1.3.7 Summary of Proposed Restoration Actions

The goal of restoration under OPA and OSPRA is to restore injured natural resources to the conditions that existed prior to the Incident and to compensate the public for interim losses. The Trustees evaluated a range of restoration actions with the potential to compensate for the natural resource and resource service losses resulting from the Incident. As indicated in Table 2, the Trustees propose to select restoration actions directed at water column, marine mammals and birds to compensate for those losses.

Table 2. Proposed restoration actions for injured resources and services associated with the Incident.

Injured Resources/Services	Proposed Restoration Actions
Water Column	Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline project.
Marine Mammal	Pantropical spotted dolphin genetic stock assessment
Birds	Creation/enhancement of a bird nesting island and crevasse splay clean-out

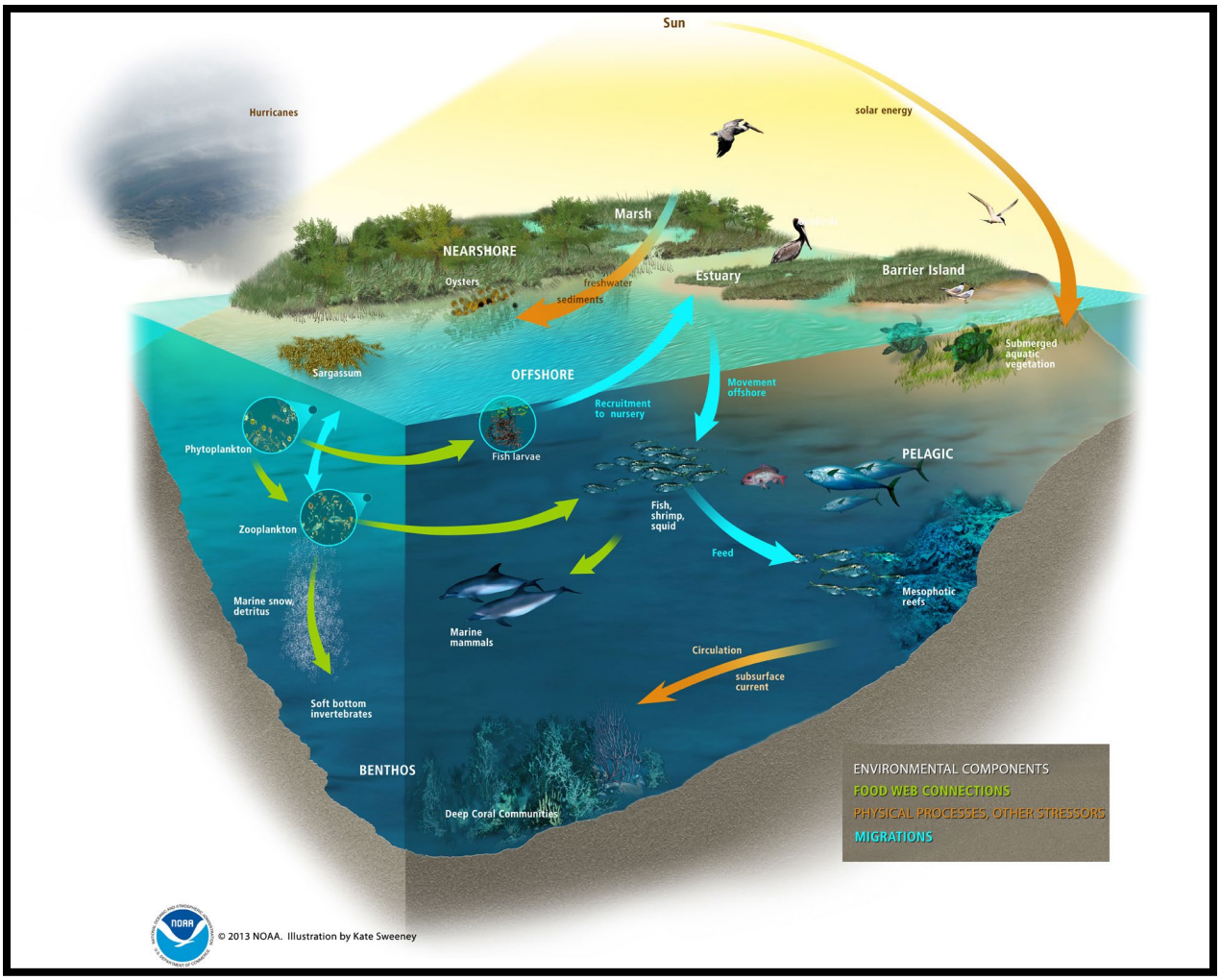
2.0 AFFECTED ENVIRONMENT

The Affected Environment section describes the existing environmental resources of the areas that would be affected if any of the alternatives were implemented. This section also provides a general description of the environment affected directly or indirectly by the Incident. Specifically, this section describes the offshore waters of the northern Gulf of Mexico and the nearshore environments of Calcasieu Lake and the Bird's Foot Delta. This section describes environmental resources that are relevant to the decision making process, as required by NEPA.

As described in the Deepwater Horizon Oil Spill NRDA Programmatic Damage Assessment and Restoration Plan (PDARP)/EIS (DWH Trustees 2016), the resources and habitats of the northern Gulf of Mexico are linked through physical processes and biological relationships, including:

- Food web dynamics that affect the transfer of energy and matter from primary producers to consumers to apex predators.
- The movement of organisms between habitats.
- The transport of nutrients, sediments, and organic matter (including marine organisms and their reproductive elements) between nearshore and offshore habitats and between surface waters and the sea bottom.

These processes and relationships play important roles in the structure and function of the northern Gulf of Mexico ecosystem. Physical processes also provide connectivity across northern Gulf of Mexico habitats. The physical and biological connectivity of the northern Gulf of Mexico ecosystem results in a complex web, wherein physical processes and biological interactions in one location may have an important impact on populations of organisms in other locations (Figure 2).



Source: *Kate Sweeney for NOAA.*

Figure 2. The northern Gulf of Mexico ecosystem is connected through food webs, physical processes, the movement of organisms, and the flow of nutrients.

The proposed restoration activities for aquatic and bird injures would be located in Regions 2 and 4 of Louisiana's Regional Restoration Planning Program (RRP Program)[2]. Regional boundaries are described in Section 5.0 of the RRP Program Final Programmatic Environmental Impact Statement (FPEIS) (NOAA et al. 2007). Restoration for marine mammals would be located in offshore waters of the northern Gulf of Mexico.

[2] Federal and Louisiana natural resource trustees developed the statewide RRP Program to assist the natural resource trustees in carrying out their NRDA responsibilities for discharges or substantial threats of discharges of oil. The goals of this statewide Louisiana RRP Program are to: 1) expedite and reduce the cost of the NRDA process; 2) provide for consistency and predictability by describing in detail the NRDA process, thereby increasing understanding of the process by the public and industry; and 3) increase restoration of lost trust resources and services. Attainment of these goals will serve to make the NRDA process as a whole more efficient in Louisiana.

2.1 Physical Environment

2.1.1 Climate and Air Quality

Situated along the northern Gulf of Mexico between 29 and 33 degrees north latitude, Louisiana's climate is humid, subtropical. The average annual temperature for southeastern Louisiana is 67 degrees Fahrenheit (°F), with mean monthly temperatures ranging from 82°F in August to 52°F in January, and average annual precipitation is 57 inches (USACE 2016). During the summer months, prevailing southerly and southeasterly winds transport warm, moist air from the Gulf of Mexico across the coast. From September to May, more variable and moderate weather conditions prevail as arctic and polar air masses associated with extratropical storms periodically inundate the state and produce cooler and drier conditions. In addition to precipitation, these storms can produce significant changes in water level in the coastal bays and marshes over relatively short periods of time. Louisiana is also susceptible to tropical weather systems such as tropical waves, tropical depressions, tropical storms, and hurricanes. These weather systems can produce significant amounts of precipitation over a very short period of time and are often accompanied by strong winds, tornadoes, and storm surges along the coastal areas.

The Clean Air Act Amendment of 1990 directed the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for all regulated air pollutants. Federal air quality standards have been established for six criteria air pollutants:

- Carbon monoxide (CO);
- Nitrogen dioxide (NO2);
- Ozone (O3);
- Sulfur oxides (commonly measured as sulfur dioxide [SO2]);
- Lead (Pb);
- Particulate matter no greater than 2.5 micrometers (μm) in diameter (PM2.5); and
- Particulate matter no greater than 10 μm in diameter (PM10).

The USEPA classifies air quality by Air Quality Control Region (AQCR). The Clean Air Act defines an AQCR as a contiguous area where air quality, and thus air pollution, is relatively uniform. AQCRs often correspond with airsheds and may cross parish and state lines. Each AQCR is treated as a unit for developing pollution control strategies to achieve (NAAQS). An AQCR or portion of an AQCR may be classified as attainment, nonattainment, or unclassified. A classification of "attainment" indicates that criteria air pollutants within the region are within NAAQS values; a "nonattainment" classification indicates that air pollution levels persistently exceed the NAAQS values; and a classification of "unclassified" indicates that air quality within the region cannot be classified (generally due to lack of data). A region designated as unclassified is treated as an attainment region.

The USEPA's AirData interactive map and database (https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors) contains measurements of air pollutant concentrations for the much of the United States. A query of the AirData database was conducted within the

area of restoration alternatives, which shows the area in attainment for all six criteria air pollutants.

2.1.2 Hydrology and Water Quality

Offshore Waters of the Northern Gulf of Mexico
The Gulf of Mexico is the ninth largest waterbody in the world (NOAA, 2008a) with a surface area of approximately 600,000 square miles, and containing approximately 584,000 cubic miles of water. The northern Gulf of Mexico is dominated by inputs from the Mississippi River Basin, which drains 41% of the contiguous United States (USEPA 2021), while the offshore waters are further influenced by the Loop Current that enters the Gulf of Mexico from the south, carrying warm Caribbean waters into the Gulf. The offshore waters and associated water column can be categorized into three layers, based on depth: The epipelagic zone extends from the ocean surface to a depth of about 650 feet (200 meters); The mesopelagic zone, extends from about 650 to 3,300 feet (200 to 1,000 meters) below the ocean surface; The bathypelagic zone depths are from 3,300 to 13,120 feet (1,000 to 4,000 meters) where there is no light penetration.

In the open waters of the Gulf of Mexico, pH ranges from approximately 8.1 to 8.3 at the surface (Gore, 1992). The pH decreases to approximately 7.9 at a depth of 700 m (2,297 ft), and in deeper waters, it increases again to approximately 8.0 (Gore, 1992). The salinity at the sea surface in the offshore central Gulf of Mexico is generally 36 parts per thousand (ppt) (Gore, 1992). Lower salinities are characteristic nearshore where freshwater from the rivers mix with Gulf waters. Salinity varies seasonally, generally higher in the fall and winter, then decreasing in the spring and summer due to increased freshwater input. Temperatures in the Gulf of Mexico vary seasonally. The average summer surface temperature is approximately 84 ºF (Gore, 1992). In winter, seawater is well mixed vertically, with an average temperature in the northern Gulf of Mexico of 65 ºF (Gore, 1992). Below 1,000 m (about 3,300 ft), temperatures are the coldest in the Gulf at <4.4 ºC (40 ºF).

Nearshore Environment While the Incident occurred approximately 97 miles off the coast of Louisiana in the Green Canyon Block 248 in the Gulf of Mexico, there is direct linkage to the nearshore environment. Specifically, through the movement and transport of organisms and nutrients, the nearshore ecosystem is linked to and supports the health and productivity of the offshore ecosystem.

Nearshore waters of the northern Gulf of Mexico are comprised of diverse and interconnected habitats from upland terrestrial habitats to the open ocean environment. The nearshore environment is associated with the postglacial rise in sea level that began approximately 12,000 years before present. In general, the rise in sea level caused sediments that had previously been deposited during the Pleistocene to erode and become submerged. These biologically diverse habitats in this nearshore ecosystem include coastal marshes, barrier islands, oyster reefs, subtidal and intertidal mudflats. These nearshore habitats provide spawning, nursery, and feeding grounds for the many commercial and recreational fish and shellfish species that depend on the estuary to complete their lifecycles. They also are home to many species of birds, sea turtles, and mammals.

Estuarine dependent species affected by the Incident utilize the lower Calcasieu River, Calcasieu Lake and West Cove as part of their life history. Calcasieu Lake is a drowned river valley that acted as a sink for material deposited by riverine discharge from the Calcasieu River prior to the construction of the ship channel. Calcasieu Lake is approximately 16 miles in length and varies in width. West Cove is located on the western side of Calcasieu Lake and is flanked by an extensive saline and freshwater marsh complex and Sabine National Wildlife Refuge. The hydrology of the coastal marshes near Calcasieu Lake have been altered by numerous access canals and the Gulf Intracoastal Waterway. In addition to altered hydrology, subsidence and sea level rise also contribute to wetland loss and approximately 0.25 inches per year in water level rise.

As part of its surface water monitoring program, the LDEQ routinely monitors 25 parameters on a monthly or bimonthly basis using a fixed station, long-term network (LDEQ 2018). Based upon those data (i.e., Monitored Assessments) and the use of less-continuous information, such as fish tissue contaminants data, complaint investigations and spill reports (i.e., Evaluated Assessments), the LDEQ has assessed water quality fitness for the following uses: primary contact recreation (swimming), secondary contact recreation (boating), fish and wildlife propagation (fishing), drinking water supply and shellfish propagation (LDEQ 2018). Based on the 2018 Louisiana Water Quality Inventory: Integrated Report, Calcasieu Lake and the Calcasieu River are both impaired for fish and wildlife propagation, oyster propagation, and primary contact recreation. In addition, the Mississippi River from Head of Passes to Mouth of Passes, which includes all passes in the Bird's Foot Delta, is impaired for oyster propagation. Table 1 lists the impaired use and suspected cause and source of impairments for these waterbodies.

Table 3. Calcasieu River, Calcasieu Lake, and Mississippi River impaired waterbodies by subsegment taken from Appendix A of the 2018 Water Quality Integrated Report (LDEQ 2018).

Subsegment Number	Subsegment Description	PCR	SCR	FWP	OYS	Impaired Use for Suspected Cause	Suspected Causes of Impairment	Suspected Sources of Impairment
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	FWP	Dioxin - fish consumption advisory	Industrial point source discharge
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	FWP	Furan compounds	Industrial point source discharge
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	FWP	PCBS - fish consumption advisory	Industrial point source discharge
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	OYS	Fecal coliform	Natural sources
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	OYS	Fecal coliform	On-site treatment systems (septic systems and similar decentralized systems)
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	PCR	Enterococcus	Natural sources
LA030401_00	Calcasieu River-From below Moss Lake to the Gulf of Mexico; includes Ship Channel and Monkey Island Loop (Estuarine)	N	F	N	N	PCR	Enterococcus	On-site treatment systems (septic systems and similar decentralized systems)
LA030402_00	Calcasieu Lake	N	F	N	N	FWP	Dioxin - fish consumption advisory	Industrial point source discharge
LA030402_00	Calcasieu Lake	N	F	N	N	FWP	Furan compounds	Industrial point source discharge
LA030402_00	Calcasieu Lake	N	F	N	N	FWP	PCBS - fish consumption advisory	Industrial point source discharge
LA030402_00	Calcasieu Lake	N	F	N	N	OYS	Fecal coliform	Natural sources

LA030402_00	Calcasieu Lake	N	F	N	N	OYS	Fecal coliform	On-site treatment systems (septic systems and similar decentralized systems)
LA030402_00	Calcasieu Lake	N	F	N	N	PCR	Enterococcus	Natural sources
LA030402_00	Calcasieu Lake	N	F	N	N	PCR	Enterococcus	On-site treatment systems (septic systems and similar decentralized systems)
LA070401_00	Mississippi River Passes-Head of Passes to Mouth of Passes; includes all passes in the birdfoot delta (Estuarine)	F	F	F	N	OYS	Fecal coliform	Marina/boating sanitary on-vessel discharges
F = Fully supporting designated use N = Not supporting designated use PCR = Primary Contact Recreation (swimming) SCR = Secondary Contact Recreation (boating) FWP = Fish and Wildlife Propagation (fishing) OYS = Oyster Propagation								

2.1.3 Noise

The Noise Control Act establishes coordination of federal noise-control activities and provides information to the public regarding noise emissions. There are many different sources of noise in and near the proposed restoration project areas including but not limited to commercial and recreational boats, automobiles and trucks; aircraft; and industry-related noise (such as oil and gas facilities).

In the offshore marine environment, underwater sound spreads out in space, and is reflected, refracted (changed in direction), and absorbed. Several important factors affecting sound propagation in water include spreading loss, absorption loss, scattering loss, and boundary effects of the ocean surface and the bottom (Greene 1995). Natural sources of noise in the Gulf of Mexico marine environment include wind and waves, seismic noise from volcanic and tectonic activity, precipitation, and marine biological activities (Greene 1995). A wider range of ambient noise levels occurs in water depths less than 600 feet (shallow water) than in deeper water. In addition to ambient noise, some sounds are also introduced into ocean environments from anthropogenic sources. These may include transportation (e.g., aircraft, small and large vessels, and hovercraft), construction activities (e.g., dredging, tunnel boring, and pile-driving), hydrocarbon and mineral-related activities (e.g., oil and gas exploration, drilling and production), geophysical surveys (e.g., air guns, sleeve guns, or vibroseis), the use of sonar and pingers for navigation and target detection, explosions (e.g., military ordnance, ship and weapons testing, and offshore demolition), and the conduct of ocean science studies (e.g., seismology, acoustic propagation, and acoustic thermometry).

The primary sources of noise in the nearshore environment are transportation and construction related activities. Transportation noise includes traffic noise from automobiles, trucks, and motorcycles; railway transportation services; and aircraft (including helicopters) take-offs,

landings, and overflights from public and private airfields. Construction noise is created during a variety of activities, including but not limited to, construction and demolition projects, site preparation (e.g., land clearing, grading, excavation), and repair and maintenance activities. These actions can result in relatively high noise levels within several hundred feet of the activity. Noise levels generated can fluctuate depending on the type, number, and duration of use of heavy equipment for construction activities and can differ in effect by the type of activity, existing site conditions (vegetation to buffer sound) and existing ambient noise levels.

2.2 Biological Environment

The northern Gulf of Mexico contains a range of habitats that support diverse and productive ecosystems, with both nursery and feeding grounds for ecologically and economically important species (GCERTF 2011). The diverse organisms in the northern Gulf of Mexico, including plankton, contain more than a thousand known fish species at different life stages (Felder & Camp 2009), mobile invertebrates (such as shrimp, crabs, and squid), sea turtles, seabirds, and marine mammals. These organisms serve as prey or predators in the food web, and they cycle and transport nutrients both horizontally (between nearshore and offshore areas) and vertically (between the surface and deep water). Predator-prey relationships are dynamic and create an interconnected web of organisms, with energy flowing from primary producers, such as phytoplankton, through a number of trophic linkages to top predators, such as tuna. Estuarine-dependent species are important vectors in the movement of energy from the nearshore to shelf and offshore systems.

2.2.1 Threatened and Endangered Species

The Endangered Species Act (ESA; 16 U.S.C. §§ 1531–1544) was established to protect species vulnerable to extinction, as well as their environments. Marine organisms are under the jurisdiction of the NOAA Fisheries, while terrestrial and freshwater organisms are overseen by USFWS. The ESA defines "endangered" as a species in danger of extinction in all or a significant portion of its range. "Threatened" is then defined as a species that is likely to become endangered in the foreseeable future. Section 7(a)(2) of the ESA of 1973 (16 U.S.C. § 1536(a)(2)) as amended, requires:

> *Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried, out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species…*

All federally listed threatened and endangered species that have potential habitat or known occurrence in the Action Area are described in further detail below. The Action Area is defined as all areas that may be affected directly or indirectly by the Federal action (i.e. implementation of the Preferred Alternative). It includes not only the immediate area involved in the proposed action but encompasses the geographic extent of environmental changes (i.e., the physical, chemical, and biotic effects) that would result directly and indirectly from the action. It is typically larger than the area directly affected by the Proposed Action (i.e. proposed restoration

projects) itself and is intended to include species or critical habitat that may be present in the entire potentially affected area.

2.2.1.1 Offshore Waters of the Northern Gulf of Mexico

Federally listed threatened and endangered species of marine mammals and sea turtles that have potential habitat or known occurrence in the Action Area within the offshore waters of the northern Gulf of Mexico are described in further detail below.

Table 4. Federally listed threatened and endangered species that may occur in the offshore restoration project areas

Species	**Federal Status**	**State Status**
Sperm whale (*Physeter macrocephalus*)	Endangered	SZ[2]
Bryde's whale (*Balaenoptera edeni*)	Endangered	------
Green sea turtle (*Chelonia mydas*)	Threatened[1]	S1N[3]
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered[1]	SZ[2]
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Endangered[1]	S1B[4], S3N[5]
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered[1]	SZ[2]
Loggerhead sea turtle (*Caretta caretta*)	Threatened[1]	S1B[4], S3N[5]

[1] The USFWS and the National Marine Fisheries Service share consultation authority for these species.
[2] SZ = transient species in which no specific consistent area of occurrence is identifiable,
[3] S1N = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation: the occurrence is nonbreeding.
[4] S1B = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation: the occurrence is breeding.
[5] S3N = rare and local throughout the state or found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations): the occurrence is nonbreeding.

Marine Mammals

Twenty-two species of marine mammals are known to routinely inhabit United States waters of the Gulf of Mexico (Würsig 2017). Oceanic waters, including the waters around Green Canyon, are inhabited by 21 cetacean species that include sperm whales (*Physeter microcephalus)*, dwarf (*Kogia sima*) and pygmy (*Kogia breviceps*) sperm whales, beaked whales, and large (e.g., Killer whales (*Orcinus orca*)) and small (e.g., Clymene (*Stenella clymene*) dolphin species (Mullin & Fulling, 2004; Roberts et al., 2016). Two large whale species that occur in the Gulf of Mexico

are listed as threatened or endangered: Gulf of Mexico Bryde's whale (*Balaenoptera edeni*), and Sperm whale (*Physeter microcephalus*). These whales are all protected under both the ESA and the Marine Mammal Protection Act (MMPA; 16 U.S.C. §§ 1361-1423h).

The MMPA requires that marine mammals be assessed and managed as population stocks. To properly assess anthropogenic impacts on a stock-basis, it is critical that stocks be identified and accurately delineated. For example, if only one stock is defined for an area when in fact multiple stocks exist, a localized anthropogenic impact could seriously impact one stock but this impact could be grossly underestimated by the combined stock abundance estimate. In shelf and oceanic waters of the Gulf of Mexico, only two of the cetacean species (common bottlenose dolphins, Atlantic spotted dolphins) have been examined for stock structure and in both cases, significant partitioning of populations was identified (Wells 2003, Viricel & Rosel, 2014; Vollmer & Rosel, 2017).

Marine mammal populations are influenced by various natural factors and human activities. These factors affect marine mammal populations directly by injuring or inducing mortality or indirectly by reducing survival (e.g. lowering reproductive success). Human impacts on marine mammals include but are not limited to oil spills, gear entanglement and bycatch from fisheries, ship strikes and noise stressors.

Sea Turtles

All species of sea turtles of the Gulf of Mexico are highly migratory and have wide geographic ranges. There are five sea turtle species found within the northern Gulf of Mexico, all of which are listed under the Endangered Species Act: the green turtle (*Chelonia mydas*), the hawksbill (*Eretmochelys imbricata*), the loggerhead (*Caretta caretta*), the Kemp's ridley (*Lepidochelys kempi*), and the leatherback (*Dermochelys coriacea*). Throughout their life history, sea turtles rely on both marine and terrestrial habitats and, thus, connect ocean and land.

There are four developmental stages in a sea turtle's life: hatchling, juvenile, sub-adult, adult. Hatchling turtles move immediately from beach nests to the sea after hatching. Most species of hatchling turtles choose to stay near *Sargassum*, moving through the ocean current systems before maturing into juveniles and adults that can be found actively swimming in nearshore and open ocean areas.

2.2.1.2 Nearshore Waters

Federally listed threatened and endangered species that have potential habitat or known occurrence in the Action Area within the nearshore waters of the northern Gulf of Mexico are described in further detail below.

Table 5. Federally listed threatened and endangered species that may occur in the nearshore restoration project areas.

Species	Federal Status	State Status
West Indian manatee (*Trichechus manatus*)	Threatened	S1N[3]
Piping plover (*Charadrius melodus*)	Threatened	S2N[4]
Red knot (*Calidris canutus rufa*)	Threatened	S2N[4]
Gulf sturgeon (*Acipenser oxyrhynchus desotoi*)	Threatened[1]	S1[5]
Pallid sturgeon (*Scaphirhynchus albus*)	Endangered	S1[5]
Shovelnose sturgeon (*Scaphirhynchus platorynchus*)	Threatened (S/A)[2]	S4[6]
Smalltooth sawfish (*Pristis pectinata*)	Endangered	S1[5]

[1] The USFWS and the National Marine Fisheries Service share consultation authority for these species.
[2] S/A = Similarity of Appearance. For law enforcement purposes shovelnose sturgeon are classified as "Threatened due to Similarity of Appearance" wherever they coexist with the endangered pallid sturgeon. They are biologically neither endangered nor threatened but this designation extends the ESA take prohibitions to shovelnose sturgeon, shovelnose-pallid sturgeon hybrids, and their roe when associated with a commercial fishing activity.
[3] S1N = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation: the occurrence is nonbreeding.
[4] S2N = imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extirpation; the occurrence is nonbreeding.
[5] S1 = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation
[6] S4 = apparently secure in Louisiana with many occurrences (100 to 1000 known extant populations)
[4]

Manatee

The threatened West Indian manatee is known to occasionally occur in Lakes Pontchartrain and Maurepas and their associated coastal waters and streams. It also can be found less regularly in other Louisiana coastal areas, most likely while the average water temperature is warm. Manatees may also infrequently be observed in the Mississippi River and coastal areas of southwestern Louisiana. Cold weather and outbreaks of red tide may adversely affect these animals. However, human activity is the primary cause for declines in species number due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution.

Fish

The Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), federally listed as a threatened species, is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. The

present range of the Gulf sturgeon extends from Lake Pontchartrain and the Pearl River system in eastern Louisiana and western Mississippi east to the Suwannee River in Florida. The proposed restoration projects are not within the current range of the Gulf sturgeon.

The federally endangered smalltooth sawfish (*Pristis pectinate*) was historically common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to North Carolina. The smalltooth sawfish is often found in sheltered bays, estuaries and river mouths. In the Gulf of Mexico, the smalltooth sawfish is currently found only along the peninsula of Florida. Therefore, the proposed restoration projects are not within the current range of the smalltooth sawfish.

Birds

The piping plover (*Charadrius melodus*) is a migratory bird; in the spring and summer it breeds in the northern United States and Canada, and in the fall it migrates south and winters along the coast of the Gulf of Mexico or other southern locations (USFWS 2015). This species is federally listed as threatened with critical habitat designated along the Louisiana coast. The piping plover winters in Louisiana and Alabama, feeding at intertidal beaches, mudflats, and sand flats with sparse emergent vegetation. The species arrives from their breeding grounds as early as late July and remains until late March or April, approximately 8 to 10 months (USFWS 2015). Primary threats to this species are destruction and degradation of winter habitat, habitat alteration through shoreline erosion, woody species encroachment of lake shorelines and riverbanks, and human disturbance of foraging birds.

The red knot (*Calidris canutus rufa*) is a migratory shorebird that breeds in the Canadian Arctic and migrates annually between its breeding grounds in the arctic and several wintering regions, including the Northeast Gulf of Mexico (USFWS 2014). In December 2014, the red knot was listed under the ESA as threatened throughout its range, which includes the entirety of the Gulf of Mexico coastline (USFWS 2014). No critical habitat is currently designated for this species.

2.2.2 Essential Fish Habitat

Commercial and recreational fisheries resources in the federal waters of the Gulf of Mexico are managed by the Gulf of Mexico Fishery Management Council (GMFMC) and NOAA Fisheries under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The GMFMC and NOAA Fisheries have identified waters and substrate necessary to fish for spawning, breeding, feeding, and growing to maturity as Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition extends to habitat specific to an individual species or group of species; whichever is appropriate within each Fishery Management Plan.

MSA also authorizes the designation of Habitat Areas of Particular Concern (HAPC) for marine fisheries. These areas are subsets of EFH that are rare, susceptible to human degradation, ecologically important or located in an ecologically stressed area. Any Federal agency that proposes any action that potentially affects or disturbs any EFH must consult with the Secretary of Commerce and Fishery Management Council authority per the MSA, as amended.

Virtually the entire northern coast of the Gulf of Mexico to a depth of about 600 ft (183 m) has been identified as EFH for at least one species.

2.2.2.1 Offshore Waters of the Northern Gulf of Mexico

EFH has been designated for several groups of managed fishes in offshore waters of the northern Gulf of Mexico, including coastal migratory pelagics, reef fish, shrimp, and highly migratory species. Pelagic EFH is the water column itself, apart from associated benthic or structural features, providing EFH for many species. Neritic and coastal waters occur above the continental shelf and roughly encompass the top 600 ft (200 m) of the ocean known as the photic zone, where sunlight can penetrate and photosynthesis can occur. All waters from the surface to the ocean floor (but not including the ocean bottom) are part of the marine water column. The water column is particularly important for planktonic life stages (eggs and larvae) and all life stages of planktivorous species. The Loop Current in the northern Gulf of Mexico provides critical transport of larvae and floating *Sargassum*, connecting populations in the Gulf of Mexico, the Caribbean Sea, and the Atlantic Ocean (BOEM 2012).

Table 6. EFH fish species that may occur in the offshore waters restoration project areas.

Species	**Life Stage**	**Essential Fish Habitat**
Almaco jack (*Seriola rivoliana)*	Early and late juvenile	Drift algae
	Adult	Pelagic
Lesser amberjack (*Seriola fasciata)*	Early and late juvenile	Drift algae
	Adult	Hard bottom
Greater amberjack (*Seriola dumerili)*	All life stages	Pelagic
Cobia (*Rachycentron canadum)*	All life stages	Pelagic
King mackerel (*Scomberomorus cavalla)*	All life stages	Pelagic
Golden Tilefish (*Caulolatilus chrysops)*	Eggs and larval	Pelagic
	Early/late Juvenile	Soft and hard bottoms
	Adults	Soft and hard bottoms

Lane snapper (*Lutjanus synagris)*	Eggs and larval	Pelagic
	Early/late Juvenile	Soft bottom, mangrove, SAV and sand shell
	Adults	Shoal banks and sand shell
Red snapper (*Lutjanus campechanus)*	Eggs and larval	Pelagic
	Early/late Juvenile	Soft and hard bottoms
	Adults	Hard bottom and sand shell
Gray snapper (*Lutjanus griseus)*	Adults	Shoal banks, soft/hard bottoms and emergent marsh
Vermilion snapper (*Rhomboplites aurorubens)*	Early/late Juvenile	Hard bottom
	Adults	Hard bottom
Warsaw grouper (*Epinephelus nigritus)*	Eggs and larval	Pelagic
	Adults	Hard bottom
Yellowedge grouper *(Epinephelus flavolimbatus)*	All life stages	Pelagic and hard bottom
Gray triggerfish *(Balistes capriscus)*	All life stages	Drift algae, mangrove and sand shell
Wenchman (*Pristipomoides aquilonaris)*	Eggs and larval	Pelagic
	Adults	Hard bottom

Of the many Highly Migratory Species (HMS) with EFH in Ecoregion 4, the Atlantic yellowfin tuna (*Thunnus albacres*), Atlantic Bluefin tuna (*Thunnus thynnus),* bonnethead shark (*Sphyrna*

tiburo), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), Silky shark (*Carcharhinus falciformis*) and Bull shark (*Carcharhinus leucas*) are most likely to overlap with the proposed restoration projects.

2.2.2.2 Nearshore Waters

Proposed restoration projects within West Cove of Calcasieu Lake, the Bird's Foot Delta and open waters of the northern Gulf of Mexico are located within an area identified as EFH by the MSA.

The 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council identifies EFH in the project area to be estuarine emergent wetlands, submerged aquatic vegetation, estuarine water column, and mud, sand, shell, rock substrates and *Sargassum*. Under the MSA, wetlands and associated estuarine waters in the project area are identified as EFH for postlarval/juvenile and subadult brown shrimp; postlarval/juvenile and subadult white shrimp; and postlarval/juvenile, subadult, and adult red drum. Table 7 provides a more detailed description of EFH within the project area.

Table 7. EFH managed species that may occur in the nearshore restoration project areas.

Species	**Life Stage**	**Essential Fish Habitat**
Brown shrimp (*Crangon crangon*)	post-larval/ juvenile	marsh edge, SAV, tidal creeks, inner marsh
	subadult	mud bottoms, marsh edge
White shrimp (*Litopenaeus setiferus*)	post-larval/ juvenile, subadult	marsh edge, SAV, marsh ponds, inner marsh, oyster reefs
Red drum (*Sciaenops ocellatus*)	post-larval/ juvenile	SAV, estuarine mud bottoms, marsh/water interface
	subadult	Mud bottoms, oyster reefs
	adult	Gulf of Mexico and estuarine mud bottoms, oyster reefs

2.2.3 Benthic Resources

The northern Gulf of Mexico supports complex food webs composed of a wide range of aquatic and terrestrial biota, from bacteria and microscopic plankton to dolphins and whales. Spanning from the continental shelf to the deep sea, the northern Gulf of Mexico marine benthic ecosystem

is composed of diverse and abundant habitats, including soft-bottom habitats consisting of sand or mud, hard substrate habitats, mesophotic reefs, and deep-sea coral communities. The diversity of communities in the water column, the sometimes shifting trophic linkages, and the wide variety of interactions mean that perturbations—such as an injury to one or more components of the food web—may have broader direct, indirect, and sometimes non-intuitive ecological consequences (Fleeger et al. 2003; Fodrie et al. 2014; Peterson et al. 2003; Pimm et al. 1991; Tarnecki et al. 2015).

In the northern Gulf of Mexico, the majority of the ocean floor is soft-bottom habitat, characterized by a mixture of sand, clay, and silt sediments (Rowe & Kennicutt II 2009). This habitat supports a diverse assemblage of organisms living within or on the sediment, including crustaceans, gastropods, bivalves, and worms, as well as many larger animals such as fish, crabs, and sea cucumbers, which live and feed on the sea floor (MMS 2006).

Hard substrate habitat is comprised of artificial reefs, oil and gas platforms, and natural reef or rock substrates. Hard substrate habitat supports a wide variety of marine life, with species differences reflecting depth and other environmental factors.

2.2.4 Plankton

Plankton (phytoplankton, zooplankton, and ichthyoplankton (fish and invertebrate eggs and larvae) are the most abundant organisms in the open waters of the northern Gulf of Mexico. The plankton community consists of both permanent members and transient larval forms of fishes and invertebrates (Johnson and Allen 2005). Plankton and marine invertebrates in the open waters of the northern Gulf of Mexico are the basis of the food web that supports fish, birds, sea turtles, and marine mammals and provides recreation and economic benefits to people.

Ecological processes such as predation and competition also influence the abundance and distribution of planktonic organisms. Lower trophic level communities are characterized by mixed species assemblages of phytoplankton, zooplankton, and ichthyoplankton, as well as pelagic invertebrates. These organisms are predominately moved passively within water masses, although some have limited swimming abilities. Phytoplankton and zooplankton provide the nutritional support for essentially all of the important fish species in the Gulf of Mexico. Some important fish species, such as Gulf menhaden and bay anchovy, rely on plankton food throughout their life history (Patillo et al. 1997). Larval stages of virtually all of the important finfish and shellfish species consume plankton.

Ichthyoplankton (fish and invertebrate eggs and larvae) make up a substantial portion of the zooplankton community, as most fishes in the Gulf of Mexico have pelagic larval stages (BOEM 2012). Distribution and abundance of ichthyoplankton is a function of adult movement, spawning season, currents and other physical and biological parameters that vary spatially and temporally. Seasonal patterns of ichthyoplankton composition in nearshore waters are strongly influenced by the spawning cycles of coastal fish species, while further offshore composition is influenced by the spawning cycles of pelagic and migratory species. The Mississippi River discharge plume and the Loop Current have widespread influence over patterns of

ichthyoplankton abundance throughout the Gulf of Mexico. In general, larval densities are lowest during winter, increase during the spring, peak during the summer, and decline during the fall.

2.2.5 Marine Vegetated Communities

Sargassum is brown algae (*Sargassum natans* and *S. fluitans*) that is free-floating and forms dense mats in the Gulf of Mexico. Pelagic *Sargassum* supports a diverse assemblage of marine organisms, including hydroids, copepods, fish, crabs, gastropods, polychaetes, anemones, sea spiders, stages of sea turtles, and numerous marine birds. *Sargassum* is a source of primary production and provides habitat and food for sea turtles, marine birds, fish, and invertebrates. *Sargassum* also provides nursery habitat for many important fishery species (e.g., dolphinfish, billfishes and tunas) and for ecologically important forage fish species (e.g., butterfishes) (Powers 2012). Distribution and movement of pelagic *Sargassum* in the Gulf of Mexico typically has higher concentrations in the northwest Gulf of Mexico from March to June (Gower and King 2011).

2.2.6 Wetlands

The northern Gulf of Mexico is recognized for its vast coastal tidal wetlands, which are estimated to represent half of the total saltwater intertidal wetland habitat in the lower 48 states (Dahl & Stedman 2013). Louisiana alone contains nearly 40 percent of coastal wetlands in the continental United States (USGS 2015). These marshes play a critically important role in buffering coastal areas against storm and wave damage and attenuating flooding. They also help protect water quality by capturing suspended sediment and removing excess nutrients and pollutants from upland environments (Bricker et al. 1999; Fisher & Acreman 2004).

The marsh edge, in particular, serves as a critical and highly productive transition zone between the emergent marsh vegetation and open water. It is important for the movement of organisms and nutrients between intertidal and subtidal estuarine environments (Levin et al. 2001), and supports high densities of fish and crustacean species at its interface (Baltz et al. 1993; Minello et al. 2008; Minello & Rozas 2002; Peterson & Turner 1994). Marshes are also important habitats for terrestrial animals, including amphibians, reptiles, and mammals, and support extraordinary bird species diversity. These habitats are especially important for birds, because many different species nest and/or forage in the varying types of marshes in the northern Gulf of Mexico. Also, three major bird flyway corridors (routes between wintering grounds and summer nesting grounds)—the Central, Mississippi, and Atlantic—occur within the Gulf, whose marshes migratory species use either as winter habitat or as stopover as they migrate further south.

2.2.7 Oysters

Oyster reefs provide a broad variety of ecosystem services, including water quality improvement, shoreline stabilization (and associated habitat protection), carbon burial, habitat provisioning for fish and mobile invertebrates (including commercially and recreationally important species), habitat for epibenthic fauna, diversification of the landscape, and oyster production for commercial and recreational harvest (Grabowski et al., 2012).

Oysters filter sediments, phytoplankton, and detrital particles from the water column, potentially reducing turbidity and improving water quality (Dame and Patten, 1981). Nearshore oyster reefs can reduce erosion and stabilize coastal shorelines through sediment trapping and accretion, and by adding hard substrate adjacent to marsh edges (Grabowski et al., 2012). Intertidal oyster beds provide foraging sites at low tide, when the shellfish are accessible to American oystercatchers, a shorebird. Oyster beds above mean high tide serve a critical function for oystercatchers by providing foraging and high-quality, high tide roost sites.

Calcasieu Lake contains a large variety of mollusk species, including American Oyster. Oyster reefs comprise the majority of hard substrate found in Louisiana's coastal waters and a multitude of estuarine organisms are associated with these reefs. Many animals including fish, crabs, worms, and meiofauna use oyster reefs as both a foraging and shelter resource (LDWF 2013). All of Calcasieu Lake is designated as a State Oyster Seed Ground, and the LDWF manages the oyster resource on the public grounds by closely monitoring the size and health of oysters within this area. Southern Calcasieu Lake has been open to oyster harvest using hand-tongs since 1975. Based on 2008 and 2011 side-scan sonar data, the acreage of suitable oyster habitat in southern Calcasieu Lake is estimated at 5,350 ac, or 2,165 ha (LDWF 2020). Oyster management on these public grounds includes activities such as setting oyster seasons, monitoring harvest levels, and cultch planting (reef building) projects. Typically, the oyster industry utilizes the public oyster grounds as a source of seed oysters (< 3 " shell height) for transplant to private leases. The public grounds also yield a supply of market-size (sack-size) oysters (≥ 3" shell height) and these oysters may be taken directly to market.

2.2.8 Subtidal and Intertidal Flats

Subtidal and intertidal flats are typically ephemeral areas of unconsolidated organic and sand or mud deposits that occur in low wave and tidal energy areas. Although subtidal and intertidal flats are typically non-vegetated, algal mats may form on them. Benthic microalgae are also found in the top few centimeters of sediment. Where significant wave action occurs along the bayside margin of the barrier headland or island, fine sand may be reworked into small beaches and sandy intertidal flats. Waves keep silts and clays suspended until they eventually settle in deeper water or on protected intertidal mud flats. Sand flats are the preferred habitats of various invertebrates, crustaceans, and mollusks.

2.2.9 Fisheries

The Bird's Foot Delta and Calcasieu Lake, where restoration is proposed, support a diverse assemblage of estuarine-dependent fishes. Abundance and diversity of species present in the Bird's Foot Delta and Calcasieu Lake are influenced by river flood stage, salinity levels, and season. During low-salinity periods, species such as Gulf menhaden, blue crab, white shrimp, and striped mullet may be present in the area. During high-salinity periods, more salt-tolerant species such as seatrout, black drum, red drum, Atlantic croaker, sheepshead, southern flounder, and brown shrimp may move into the area. Wetlands throughout the area also support small resident fishes and shellfish such as least killifish, sheepshead minnow, sailfin molly, and grass shrimp. Those species are typically found along marsh edges or among submerged aquatic vegetation, and provide forage for a variety of fish and wildlife.

2.2.10 Birds

Birds found in the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial water birds, shorebirds, marsh-dwelling birds, and passerines. Many Gulf birds use a broad range of habitats at different life and migratory stages, from feeding and resting in the open water to nesting and rearing young in estuarine and marsh, as well as beach and dune, habitats.

Offshore birds utilize open water environments. Offshore birds include boobies, shearwaters, storm petrels, and several species of terns. Some of these species, such as Audubon's shearwater and masked booby, are frequently found in offshore areas of the northern Gulf of Mexico (Davis et al. 2000; Ribic et al. 1997), but do not nest within the northern Gulf of Mexico. Offshore birds feed in flight on fish and zooplankton as the prey swim to the surface. Free-floating mats of *Sargassum* algae are also an important offshore habitat feature (Haney 1986). Offshore birds feed on fish and other organisms that these mats attract and also use *Sargassum* mats as resting spots. A large number of birds also migrate across the Gulf of Mexico.

Calcasieu Lake and the Bird's Foot Delta provide important habitat for several species of waterbirds including waterfowl, wading birds and shorebirds. The Bird's Foot Delta provides wintering habitat for migratory dabbling ducks including gadwall, blue-winged teal, green-winged teal, American widgeon, and northern shoveler. Diving duck species, which utilize the area, include lesser scaup and ring-necked ducks. The resident mottled duck, which nests in fresh to brackish marshes, is found in the area throughout the year. Common wading bird species which utilize the Bird's Foot Delta include the great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis. Mudflats and shallow-water areas provide habitat for numerous species of shorebirds and seabirds. Shorebirds include the American avocet, willet, black-necked stilt, dowitchers, and various species of sandpipers. Seabirds include brown and white pelicans, herring gull, laughing gull, and several species of terns. Migratory and resident non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, osprey, belted kingfisher, and marsh wrens, also utilize the Bird's Foot Delta. Important gamebirds found in the area include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl.

2.2.11 Mammals and Reptiles

Mammals found within the Bird's Foot Delta and Calcasieu Lake area include nutria, muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Reptiles and amphibians are fairly common in the low-salinity brackish and intermediate marshes found within the area. Reptiles include the American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle. Amphibians expected to occur in the area include the bullfrog, southern leopard frog, and Gulf coast toad.

2.3 Historic and Cultural Resources

Cultural resources include archaeological sites (prehistoric and historic; terrestrial and marine), historic standing structures, objects, districts, traditional cultural properties, and other properties that illustrate important aspects of prehistory or history or have important long-standing associations with established communities or social groups. Significant archaeological and architectural properties are usually defined by eligibility criteria for listing on the National Register of Historic Places (NRHP) and in consultation with the Louisiana Office of Cultural Development, Division of Historic Preservation, which functions as the State Historic Preservation Office (SHPO) in Louisiana.

Various cultural resources occur throughout the Louisiana coastal zone, including both prehistoric and historic sites. Ever since the early 1600s when the French explorer René-Robert Cavelier, Sieur de La Salle, successfully reached the mouth of the Mississippi River, the delta has become widely known as an area with an abundance of fish and wildlife resources. A variety of cultures have existed in the region, including Native American, Spanish, French, British, Acadian (Cajun), Creole, and African.

2.4 Economic and Human Use Resources

Lands within coastal Louisiana are directly used for agriculture, residential, commercial, and industrial development. Forested and emergent wetlands are regularly used for commercial and recreational crabbing, trapping, hunting, and fishing. Ecotourism (e.g., bird and wildlife viewing) is also increasing in importance. Oil and gas exploration and production also occur throughout the region.

Emergent wetlands provide essential nursery habitat for commercially and recreationally important fishes and shellfishes such as Gulf menhaden, red drum, spotted seatrout, southern flounder, brown shrimp, white shrimp, blue crab and others. National Marine Fisheries Service (NMFS) statistics indicate that coastal Louisiana contributes approximately 20 percent of the nation's total commercial fisheries harvest (Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) and the Wetlands Conservation and Restoration Authority (WCRA) 1998). In 2016, commercial fishery landings in coastal Louisiana exceeded 1.2 billion pounds with a dockside value of over $426 million (NOAA 2017).

The extensive emergent marsh wetlands, water bodies, beaches, and barrier islands of Louisiana's coastal area also are well suited for outdoor recreational activities. The biological productivity of these natural resources supports many native plant and animal species, and maintains a variety of recreational pursuits. Example recreational activities include recreational angling, hunting, boating, hiking and beachcombing, camping, and bird and wildlife viewing.

Another economic use of the northern Gulf of Mexico and Louisiana (i.e. offshore and inland), is oil and gas exploration, production and processing. The northern Gulf of Mexico is one of the most important regions for energy resources in the United States and the most important for coastal and offshore oil and gas production (NOAA 2016). Offshore oil and gas exploration and production activity in state waters occurs inshore of the state/federal boundary. Activity on the

Federal OCS takes place from this boundary to the outer limit of the Exclusive Economic Zone, approximately 200 mi (322 km) from shore. Until recently, most activity has been concentrated on the continental shelf off Texas and Louisiana but future activity is expected to extend into progressively deeper water.

Inland oil and gas infrastructure includes gas processing plants, navigation channels, oil refineries, pipelines and pipeline landfalls, storage yards, platform fabrication yards, separation facilities, service bases, terminals, and industry-related installations such as landfills and disposal sites for drilling and production waste. In addition to onshore service and support facilities, offshore oil and gas facilities have an extensive development of bottom-founded pipelines, surface platforms, caissons, well protectors, and casing stubs (wellhead structures from temporarily plugged and abandoned wells).

3.0 INJURY ASSESSMENT AND QUANTIFICATION

This chapter describes and quantifies the nature, degree, and extent of injuries to natural resources and services resulting from the Incident. The chapter begins with an overview of data collected during the Preassessment phase of the NRDA process. The following section describes the Trustees' assessment strategy, including the approaches used to identify, determine, and quantify potential injuries. The remainder of the chapter presents the results of Trustee injury assessments for the specific resources affected by the Incident.

3.1 Preassessment Activities and Findings

The Trustees initiated Preassessment activities for the discharge shortly after notification of the Incident. The Trustees focused on collecting ephemeral data that would address three criteria defined by OPA (15 C.F.R. § 990.42) and OSPRA (LAC 43:XXIX.101 et seq.), whether:

- Injuries have resulted or probably will result from the Incident;
- Response actions have not adequately addressed or are not expected to address the injuries resulting from the Incident; and,
- Feasible primary and/or compensatory restoration actions exist to address the potential injuries.

The initial spill impact area was delineated by the Trustees and Shell concurrent with ongoing emergency response actions. Information collected during the Preassessment phase of the Incident is summarized below.

3.1.1 Surveys

Surface oil was documented using a combination of remote sensing platforms, aircraft and satellite, and ship based observations collected by the response vessels. The response conducted daily overflights to locate and generally describe and map the slick for response operations. Hand-drawn maps generated from observations conducted during overflights were used in conjunction with digital photos to examine the characteristics of the oil slick. Numerous photos

were taken by USCG for the duration of the persistence of the surface slick and these photos documented both the general nature of the slick as well as some of the potentially impacted resources such as birds and dolphins. Shell also acquired satellite data for the 5 days for which surface oil persisted, however the acquired imagery did not always cover the location of the moving spill. In addition, high winds and natural seeps in the Green Canyon region further complicated tracking of the oil spill slick.

3.1.2 Water Column

During the Response, a joint Response-NRDA cruise was attempted in order to document the concentrations of oil below the oil spill slick. Unfortunately, mechanical problems with the contracted research vessel delayed the on-scene arrival of the vessel. The vessel arrived on scene as the winds were rapidly increasing and the slick was mixing into the water column making it difficult to locate and sample the slick. The sampling was ultimately of limited utility for documenting and quantifying concentrations under the floating oil or the concentrations in the water after the oil had mixed into the ocean surface from the high winds.

3.1.3 Birds

Spill responders during the Incident did not report bird observations and no birds were recovered during response operations. Surveys in the general vicinity of the spill by trained observers after response operations were terminated observed a total of 59 birds representing six bird species (CSA 2016a and 2016b). The most common species included laughing gull, Audubon's Shearwater, and cattle egret (Table 8). Data were not reported in a manner that allowed calculation of bird densities.

Shipboard surveys conducted in the northwest Gulf in 2010-11 as part of the Deepwater Horizon Oil Spill NRDA documented the occurrence and seasonal abundance of at least 45 species of migratory birds in offshore waters of the northern Gulf of Mexico (Haney 2011). Species occurrence and abundance varied seasonally. During late May, 2011, offshore surveys in the northwestern Gulf from May 14 to May 26 observed a total of 157 birds representing at least 13 bird species (Table 8). The most common species included black tern, laughing gull, and cattle egret. Data were collected in a manner that allowed calculation of bird density.

Table 8. Species and numbers of birds observed on ship-based surveys in the northwestern Gulf of Mexico

Common Name	**Scientific Name**	May 14-26, 2011[1]	May 16-17, 2016
Terns			
black tern	*Chlidonias niger*	93	
common tern	*Sterna hirundo*	1	
royal tern	*Thalasseus maximus*	6	
Pelagic Seabirds			
brown booby	*Sula leucogaster*	2	
masked booby	*Sula dactylatra*	4	

Audubon's shearwater	*Puffinus lherminieri*		18
storm petrel; unidentified	*Oceanodroma* sp.		1
Gulls			
laughing gull	*Leucophaeus atricilla*	14	13
herring gull	*Larus argentatus*		1
Shorebirds			
sandpiper; unidentified	*Calidris* sp.	7	
Waterfowl			
blue-winged teal	*Anas discors*	1	
Wading Birds			
cattle egret	*Bubulcus ibis*	19	18
great egret	*Ardea herodias*	2	
Land Birds			
barn swallow	*Hirundo rustica*		8
common nighthawk	*Chordeiles minor*	1	
cuckoo; unidentified	*Coccyzus* sp.	1	
red-winged blackbird	*Agelaius phoeniceus*	1	
passerine; unidentified		7	
Unknown			
unknown		1	
TOTAL		156	59

[1] May 17, 2011, was omitted from consideration.

3.2 Injury Assessment Methodology

3.2.1 Assessment Strategy

The goal of injury assessment under OPA and OSPRA is to determine the nature, degree, and extent of injuries, if any, to natural resources and services at the spill site in order to provide a technical basis for evaluating and scaling restoration actions. After identifying the injured resources, the Trustees considered the factors outlined in Section 1.3.1 of this document to select appropriate injury assessment procedures. The development of these procedures was primarily based on:

1. information gathered during the response and Preassessment phases of the Incident;
2. relevant peer-reviewed literature; and
3. best professional judgment of the Trustees and other experts familiar with the effects of crude oil in similar environments.

Since the spill happened in the offshore waters of the Northern Gulf of Mexico at a similar time of year to the DWH, and oil composition was relatively similar to DWH oil, some of the data collected and/or assembled during the DWH Response and NRDA is applicable to the GC248 spill. Therefore, the Trustees and Shell agreed to explore an expedited assessment approach that would use both information collected from the GC248 spill and information collected during the injury assessment process for the Deepwater Horizon Oil Spill. While the Trustees and Shell were not able to reach technical agreement on all of the components of the assessment, the expedited approach allowed the parties to evaluate potential impacts and develop potential types of restoration that could offset injuries resulting from the spill.

3.2.2 Assessment Methods

The Trustees identified the overall extent of the spill as a key factor for assessing injuries to potentially affected resources. Fish, birds, marine mammals, plankton, *Sargassum* and other offshore resources were all potentially impacted by the slick as it was transported across the surface of the water by wind and surface currents.

In determining the areal extent of surface waters impacted by oil, the Trustees used the available observations to generate an area swept by oil during the spill. Hand drawn interpretations of observations of oil on the water were available from the response and were used as one of the primary ways of documenting the size and movement of the slick. The Trustees used satellite data to augment the overflight maps. However, due to poor spatial coverage of the acquired satellite imagery (i.e. the acquired imagery did not track probable movement of the spill but remained focused on the original spill location) as well as the equivocal nature of the acquired imagery due to low and high winds, and the potential interference of seep oil, the satellite imagery did not provide a complete representation of the extent of the slick. Photographs of the oil slick were further used to fill in gaps between hand drawn maps and satellite imagery. While additional, in-depth analyses could be conducted to further refine the swept area and address equivocal satellite and photographic observations (e.g. aerial photographs of dark oil correspond to a feature in the satellite image that is to the south of the main spill area), Figure 3 represents a

swept area that is sufficient to scope the injuries resulting from surface oil exposure. The Trustees estimated the total swept footprint of the spill from May 11 to May 15, 2016 to encompass 3,300 square kilometers.

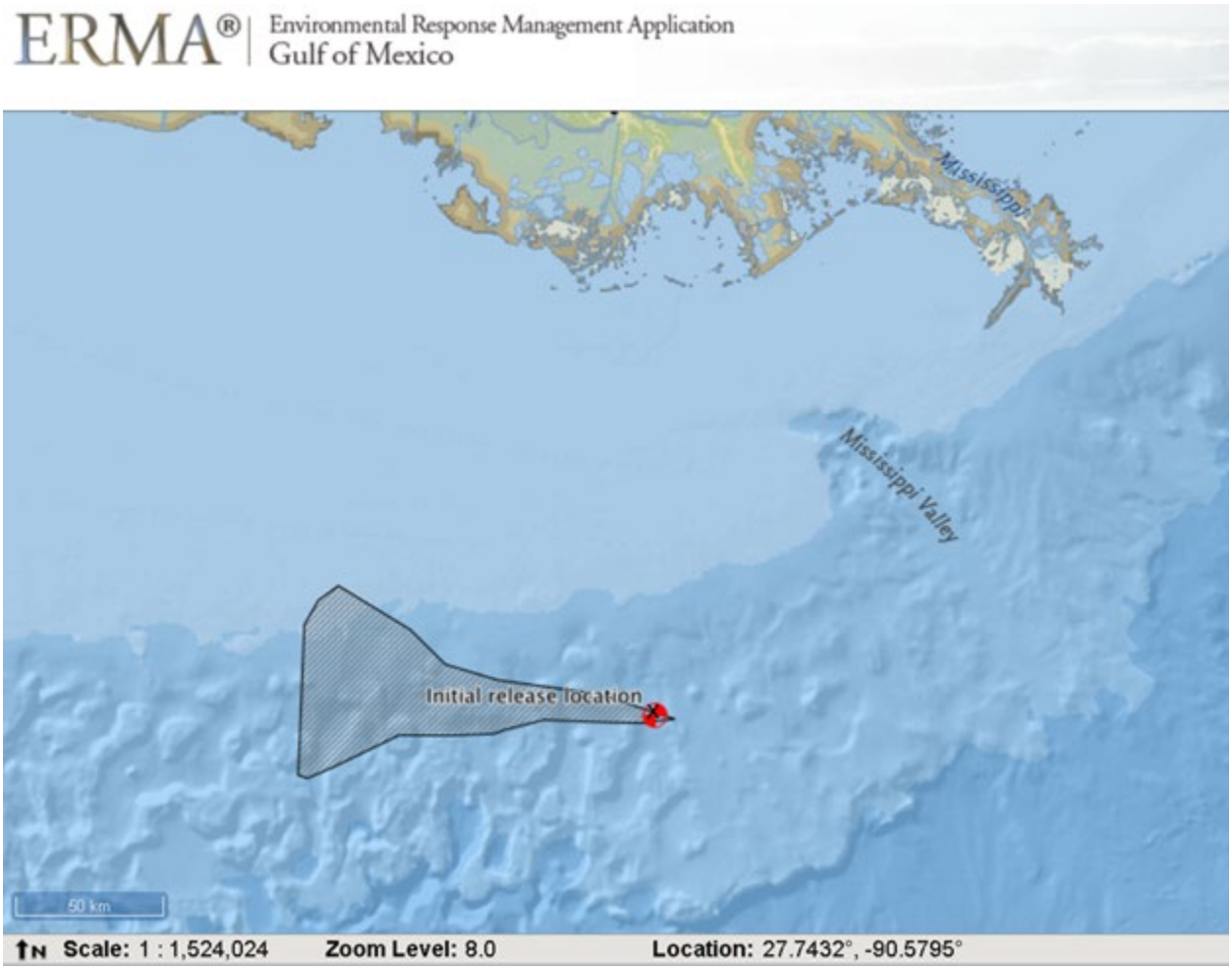


Figure 3. GC248 swept area, in grey, used for scoping of injuries for water column.

3.3 Injury Assessment and Quantification

3.3.1 Water column

To estimate and scale the size of the injury for water column organisms, the Trustees focused on planktonic early life stages (ELS) of fish and invertebrates. This water column assessment does not include injuries to older life stages of fish, injuries to *Sargassum* and associated *Sargassum* communities that also inhabit the offshore water column.

Polycyclic Aromatic Hydrocarbons (PAHs) in the water column have been shown to be toxic at very low levels to ELS of fish. Thin oil sheens are also toxic to fish embryos. Toxicity is enhanced in the presence of ultraviolet (UV) light and thus the effects concentration for PAHs is

lower near the surface than deeper in the water column where UV light has been attenuated. Key pieces of information for this approach are the areal extent of surface oiling, the concentrations of oil below the slick, and the biological distribution of planktonic organisms interacting with the oil from the spill.

As previously mentioned, because the spill happened in the offshore waters of the Northern Gulf of Mexico at a similar time of year to DWH, and oil composition was relatively similar to DWH oil, some of the data collected and/or assembled during the DWH Response and NRDA is applicable to the GC248 spill. Attenuation of UV light is expected to be similar in the offshore waters of Green Canyon as compared to the offshore waters further to the north and east. The distribution and abundance of planktonic organisms in the offshore waters are expected to be sufficiently represented by the longer-term data compiled during DWH NRDA and, based on similarity of winds (Figure 4) the vertical mixing of ELS is also assumed to be similar. Since the GC248 spill-specific concentrations below the slick could not be obtained, the Trustees used surrogate data from the DWH as these data constitute the most comprehensive set of below-slick data for PAHs to the Trustees' knowledge. Given the similar time of year, the similarity in the distribution of winds (Figure 4), and the similarity of oil chemistry, the Trustees used the entire DWH under-slick data set for screening the water column injury. Based on the sufficiency of these data for estimating impacts to early life stages, injury estimates scale directly to the areal extent of the oil.

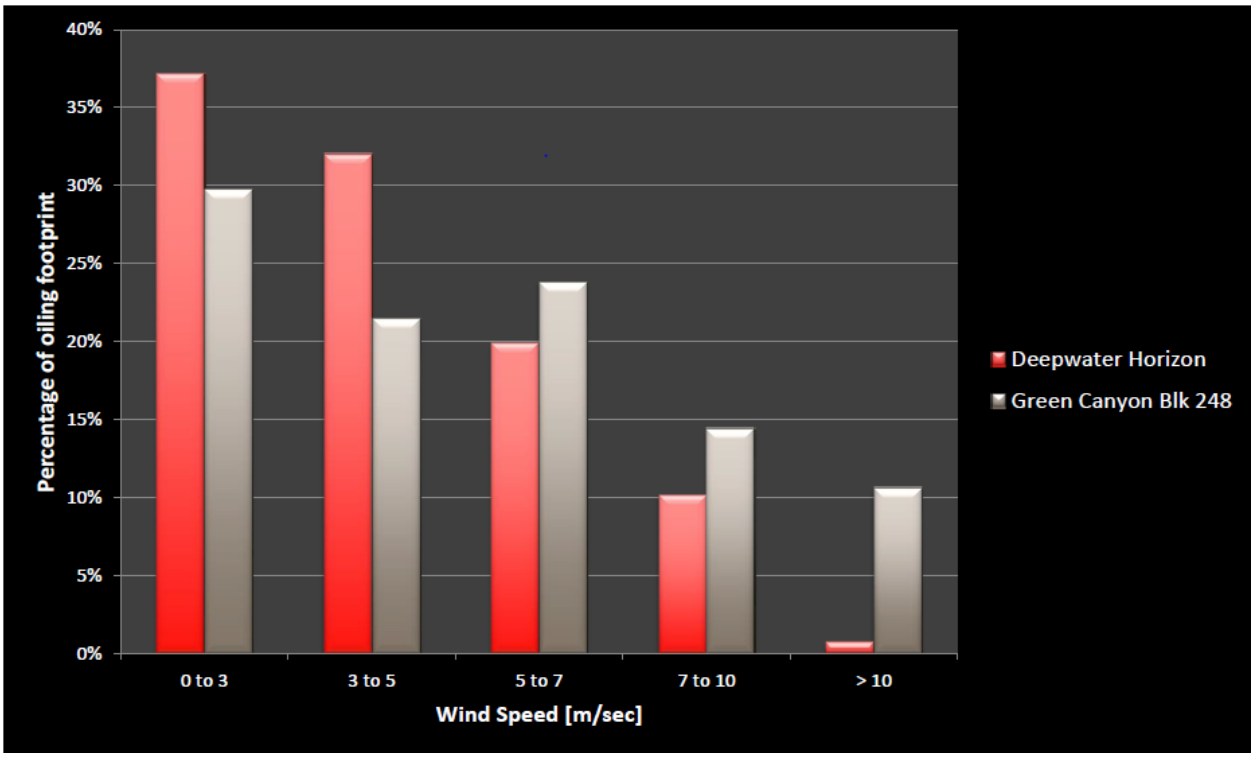


Figure 4. Comparison of wind speeds at Brutus platform with winds over the footprint of oil during DWH.

Vertical distribution of ELS fish:
Many oceanic fish have buoyant eggs found in the upper mixed layer of the ocean. These eggs were likely exposed to oil mixed into the water column as well as the surface slick itself. The vertical distribution of eggs in the upper water column depends on the wind speed, egg diameter and density. Calmer conditions result in higher concentrations of eggs near the surface while higher wind speeds tend to mix eggs deeper into the water column. The model VertEgg can be used to estimate the static distribution of eggs in the water column. Since VertEgg estimates the static distribution, it does not simulate the movement of eggs over time (Ådlandsvik 2000; Wobus et al. 2015). Since the general patterns of wind speed were similar between GC248 and DWH (Figure 4), the vertical distributions of eggs are taken as similar for the purposes of this injury assessment and were not rerun.

UV Toxicity:
Biota near the ocean surface are exposed to sunlight and this enhances the toxicity of oil. Compared to toxicity tests without UV, the average summertime UV light in the Gulf of Mexico can increase oil toxicity by approximately 10 to 100 times. An example of the relationship between LC20 and depth considering UV attenuation is given in Figure 5. LC20 is the Lethal Concentration at which 20% of the organisms in the toxicity testing experiment died. Toxicity values below are from the DWH PDARP. The sum of 50 individually measured PAH chemicals is referred to as TPAH50 (NOAA 2016).

For the UV-adjusted toxicity, the low and high sensitivity fish and invertebrate species are bay anchovy (14-fold increase), mahi-mahi (15-fold increase), copepod (27-fold increase), and blue crab (27-fold increase). UV-adjusted dose-response curves were used to estimate the percent mortality for these species.

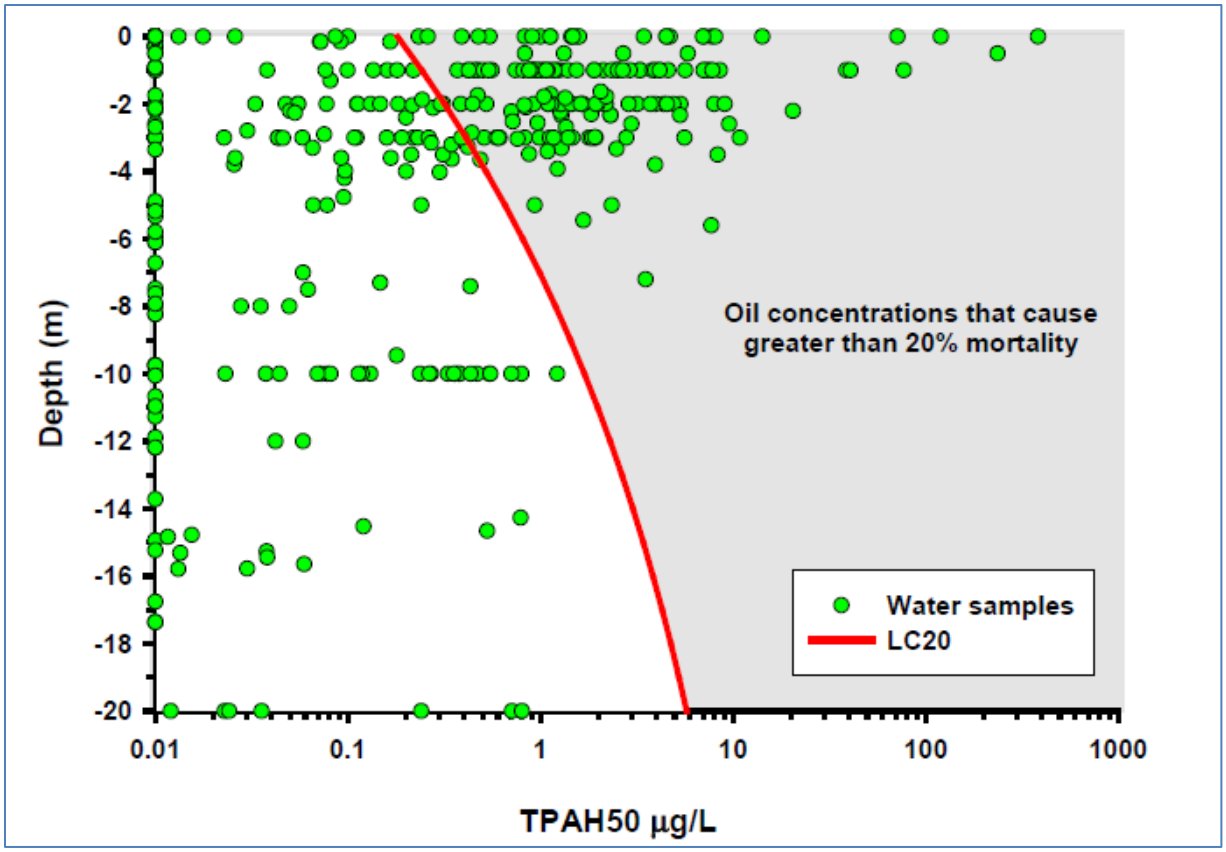


Figure 5. Example of UV enhanced toxicity of TPAH50 to ELS fish. The data pictured is the DWH water samples collected below oil slicks (as determined by satellite remote sensing). Since UV exposure is inversely related to depth, very few samples at deeper depths are toxic.

Deeper in the water column, in the absence of UV light the more sensitive bay anchovy (*Anchoa mitchilli*) and the less sensitive red drum (*Sciaenops ocellatus*) have LC20 values of 1.3 and 21.9 µg/L TPAH50, respectively (based on 48 and 72 hour tox tests). For invertebrates, LC20 values for the copepod (*Arcartia tonsa*; LC20 = 33.5 µg/L TPAH50 based on a 96-hour test) and blue crab (*Callinectes sapidus*; LC20 = 79.0 µg/L TPAH50 based on a 48-hour test), were used.

Although GC248 and DWH differed greatly in volume and duration, the similarities described above allow injury scoping for water column biota to be conducted using the same approach. Since location, timeframe, oil properties, and winds are all generally similar, the injury to ELS fish and invertebrates can be estimated proportionally to DWH based on the swept area estimated for GC248 compared to the full offshore extent of DWH. Table 9 and Table 10 below show the number of organisms impacted and biomass injury estimates for select water column organisms based on this approach. While further refinement could certainly be done such as constructing Generalized Additive Models (GAMs) for the specific environmental conditions during the GC248 spill to better reflect inter-annual variation in environmental conditions and their relationship to the distribution and abundance of organisms – the expedited approach taken allows for estimation of injury and determination of the appropriate type and scale of restoration. Looking across all impacted species, the Trustees estimated the total mean lost fish production to be approximately 21,583 kg.

Table 9. Injury estimates for water column Early Life Stage (ELS) fish and invertebrates impacted by the GC248 oil spill estimated from the GC248 Swept Area 2 (as shown in Figure 3 - 1274 mi^2, 3300 square km^2).

Offshore larval fish killed		Offshore Planktonic inverts killed	
lower	upper	lower	upper
5.28E+09	1.62E+10	9.90E+10	1.85E+11

Table 10. Biomass lost (injury plus production foregone) for select offshore species, and all species, impacted by the GC248 oil spill based on GC248 Swept Area 2.

Taxon or group	Lower estimate (kg)	Upper estimate (kg)	Mean (kg)
Red snapper (*Lutjanus campenchanus*):	134	537	458
Large tunas (*Thunnus* spp.):	2,685	1,0740	8,184
Mahi-mahi (*Coryphaena* spp.):	215	5,370	4,193
All Species Combined	15,916	28,687	21,583

3.3.2 Marine Mammals

To assess potential injuries to marine mammals, the Trustees used some of the same information that they used for water column organisms. Namely, the extent of the area swept by the floating oil slick and photos and other observations from aircraft. During overflights, dolphins were observed in and around the oil slick, and photographed by the responders. While not a comprehensive account of all of the marine mammals that were potentially exposed, the photographs serve to document that dolphins were exposed to the spilled oil, were likely impacted by this exposure, and that developing restoration options specific to addressing marine mammal impacts was warranted.

By closely examining the photos taken during overflights, the Trustees were able to identify a minimum of 17 dolphins, likely Pantropical Spotted dolphins (*Stenella attenuata*), swimming and surfacing within the oil slick. Since overflights only capture a snapshot in time, it is likely that additional marine mammals were exposed to the oil as it swept through the area over the 5 days. Nonetheless, the Trustees were able to document, at a minimum, 17 dolphins within the slick and exposed to the oil spill.

3.3.3 Birds

Oil spills are widely understood to injure birds. Examples include *Deepwater Horizon* (DWH NRDA Trustees 2016), *Exxon Valdez* (Iverson & Esler 2010; Munilla et al. 2011; Piatt & Ford 1996), *Prestige* (Munilla et al. 2011), *Cosco Busan* (Cosco Busan Oil Spill Trustees 2012), *Luckenbach* (Luckenbach Trustee Council 2006), *Kure* (CDFG & USFWS 2008), *New Carissa* (USFWS 2006), *Apex Houston* (CDFG et al. 2007; USFWS et al. 2011), and *Bean Stuyvesant*

(CDFG et al. 2007). Marine and coastal birds are highly susceptible to oil spill effects because of their use of the water surface, where oil tends to concentrate because of its buoyancy. Bird feathers absorb oil, which leads to ingestion through preening, loss of thermoregulation, and reductions in flight performance and buoyancy. Finally, birds are susceptible to ingestion of oil-contaminated prey, sediment, or water.

The Trustees estimated the number of birds potentially exposed to, and injured by the Incident using an exposure probability model outlined in Haney et al. (2017). The exposure probability model requires three parameters to estimate bird mortality: 1) spatial extent of the oil slick, 2) density of birds in the affected area, and 3) proportionate bird mortality due to oiling. Mortality is calculated through multiplication of these three parameters. As discussed in Section 3.2.2, the total swept footprint of the spill from May 11 to May 15, 2016, was estimated to encompass 3,300 square kilometers

Bird observation data from shipboard surveys conducted in the northwest Gulf from May 14 to 26, 2011 as part of the DWH NRDA were used to estimate bird densities in the area affected by the GC248 (Figure3). One observation day during this period, May 17, occurred primarily on the continental shelf close to Texas. Pelagic bird surveys conducted as part of Deepwater Horizon NRDA found that bird assemblages on the continental shelf differed from those off the shelf. Therefore, data collected on this day were not considered representative of offshore bird assemblages or densities. Consequently, data collected on May 17 were not included in the estimation of offshore bird densities. These surveys documented the occurrence and seasonal abundance of at least 13 species of migratory birds in offshore waters of the northern Gulf of Mexico (Table 6). Several observed species, including sandpiper, nighthawk, great egret, cattle egret, and several passerine species, were likely trans-Gulf migrants and were believed to be at low risk of encountering oil on the water surface. Consequently, these species were not included in the estimation of bird densities for the Incident. Accordingly, the Trustee's bird injury estimate is based on potential exposure to oil by terns, gulls, and pelagic birds (boobies). Based on surveys conducted from May 14 to 26, 2011 (excluding May 17), the expected densities of gulls, terns, and boobies is 0.05, 0.04, and 0.02 individuals per square kilometer (km^2), respectively, in the offshore areas of the Incident area.

Due to their feeding habits (foraging in water) and ability to rest on the water surface, terns, gulls, and boobies that occurred within the footprint of the spill were assumed to have a high probability of exposure to oil on the water surface. Pelagic birds are highly transitory and there is a possibility that birds occurring within the impacted area may leave prior to exposure. However, the Trustees assumed that there was an equal chance that birds may have entered the area and been exposed.

The effect of oil to birds largely depends on the bird species and the severity of the exposure. As part of the DWH NRDA, USFWS convened an expert panel to predict the fate of several bird species and guilds that were externally exposed to oil (Dobbs et. al, 2015). The panel based their fate estimates on existing literature for birds exposed to oil. Four external oiling rate categories were considered, including: trace (less than 5 % of the body surface), light (5 to 20 %), moderate (21 to 40 %), and heavy (greater than 40 %). Terns, gulls, and pelagic birds exposed to oil as the result of the GC248 were likely oiled at various degrees, spanning from trace to heavy.

However, the Trustees are not aware of data from the Incident regarding the frequency of oiling among the four categories. For the purposes of injury estimation, it is assumed that birds had an equal probability of falling into each category. Accordingly, 25% of the estimated numbers of birds were assigned to each of the four oiling rate categories.

Dobbs et al. (2015) estimated the probability of mortality of oiled birds for several bird guilds and, as appropriate, bird species. Seasonal influences to bird fate were also considered. To estimate avian injury for the GC248, we used the spring fate estimates for laughing gulls and terns for each of these respective groups provided in Table 11. Dobbs et al. (2015) did not provide fate estimates for boobies, therefore we used the fate estimates for northern gannets, another avian species of the *Sulidae* family, as a proxy. For each bird guild, Dobbs et al. (2015) provided fate estimates as ranges of the probability of mortality. Due to the variability in the fate estimate, we estimated a mortality range using the first quartile (low), second (mid-range), and the third quartile (high) of the overall fate range estimate for that species or group (Table 11).

Mortality estimates ranged from approximately 32 to 57 gulls, 76 to 99 terns, and 36 to 47 boobies. Resource Equivalency Analysis (REA) was used to scale restoration requirements for these mortality estimates. The mid-point of the mortality ranges above was used to estimate bird losses (i.e., 44, 88, and 41 gulls, terns, and boobies, respectively). The results of the REA are reported in bird years. A bird year is defined as one bird living for one year. Total lost bird year estimates consider number of years all affected birds and their offspring would have been expected to survive, but for the Incident. To account for time preferences, bird-years were converted into a total present value for the year 2019 using a three percent social discount rate, resulting in an injury estimate in discounted bird years (DBY). The resulting DBY lost due to the Incident were approximately 240 for gulls, 11,500 for terns, and 1,200 for boobies.

Table 11. Mortality estimates for birds oiled as a result of the Incident.

Species/Guild	oiling category	mortality range (%)	1st Quartile (25%) mortality estimates		2nd Quartile (50%) mortality estimates		3rd Quartile (75%) mortality estimates	
			(%)	no.	(%)	no.	(%)	no.
Gulls	trace	0-5	1.25	0.5	2.5	1	3.75	1.4
	light	0-25	6.25	2.4	12.5	4.8	18.75	7.2
	mod.	0-50	12.5	4.8	25	9.6	37.5	14.4
	heavy	50-100	62.5	24.1	75	28.9	87.5	33.7
	Total			**31.8**		**44.3**		**56.8**
Terns	trace	0-30	7.5	2.7	15	5.4	22.5	8.0
	light	20-80	35	12.5	50	17.9	65	23.2
	mod.	70-100	77.5	27.7	85	30.4	92.5	33.1
	heavy	90-100	92.5	33.1	95	34.0	97.5	34.9
	Total			**76**		**87.6**		**99.2**
Boobies	trace	0-40	10	1.7	20	3.3	30	5.0
	light	30-80	42.5	7	55	9.1	67.5	11.1
	mod.	70-100	77.5	12.8	85	14.0	92.5	15.3
	heavy	80-100	85	14	90	14.9	95	15.7
	Total			**35.5**		**41.3**		**47**
TOTAL				**143.2**		**173.1**		**203**

4.0 RESTORATION ALTERNATIVES

The goal of restoration under OPA is to compensate the public for injuries to natural resources and their services resulting from an oil spill. This goal is achieved through the return of the injured natural resources and their services to baseline conditions and compensation for interim losses from the date of the incident until recovery. To fulfill this purpose, this section introduces potential restoration actions to restore the natural resources and resource services injured by the Incident and identifies the Trustees' preferred restoration plan.

The assessment completed by the Trustees and described in Chapter 3 quantified the amount of restoration needed to compensate for the injury to resources (e.g. biomass lost, marine mammals injured and DBY's). The process of "scaling" restoration actions involves determining the size of the restoration action(s) needed to provide resource and service gains equal to the value of interim losses due to the release of hazardous substances (NOAA 1997, 1999). Because the duration of the injury differs from the lifespan of the restoration action(s), equivalency is calculated in terms of the present discounted value of services lost due to resource injuries and gained due to restoration. Restoration actions must restore the equivalent of the injured resources by providing resources and services of the same type and quality and of comparable value as those injured.

The REA used by the Trustees to compare the lost natural resource services resulting from the Incident (debit calculation) to the anticipated natural resource service benefits of potential restoration projects (credit calculation) informed the development of restoration alternatives and are described in each alternative. Based on the Trustees' best estimates of the timeframes for

realizing the benefits of the preferred restoration actions and the anticipated degree of improvements in habitat values, the Trustees determined the preferred restoration actions would restore the loss of services calculated in the injury assessment.

4.1 Restoration Strategy

Restoration actions are defined as primary or compensatory. Primary restoration actions are actions that restore injured natural resources and services to their baseline condition (that is, their condition prior to the release of oil). Compensatory restoration addresses interim losses of natural resource services from the time of initial injury until full recovery of natural resources to their baseline condition. Natural recovery, in which no human intervention is taken to restore the injured resources where the injured resources would recover relatively quickly without human intervention, is considered a primary restoration alternative. The scale of the primary and compensatory restoration projects depends on the nature, extent, severity, and duration of the resource injury.

Upon completion of the Trustees' assessment activities, the Trustees determined that primary and compensatory restoration would restore the natural resources and related services injured by the GC248 oil spill. For compensatory restoration, OPA and OSPRA regulations clearly establish Trustee authority to seek compensation for interim losses if technically feasible, cost-effective alternatives exist. Since technically feasible, cost-effective restoration alternatives exist, the Trustees proceeded with identifying restoration alternatives that accomplish both primary and compensatory restoration for the injured resources discussed in Chapter 3 of this document.

4.2 Restoration Project Selection

Both OPA and NEPA require the Trustees to develop reasonable restoration alternatives before selecting their preferred alternative(s). Each alternative must be designed so that, as a package of one or more actions, the preferred alternative would make the environment and public whole. Only those alternatives considered technically feasible and in accordance with applicable laws, regulations, or permits may be considered. Once Trustees have developed reasonable restoration alternatives, they must evaluate the proposed restoration actions based on the criteria found in regulations 15 C.F.R. § 990.54:

1. Project cost and cost effectiveness (i.e. cost to carry out each alternative);
2. Nexus to natural resource injuries and services losses (i.e. the extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and their services to baseline and/or compensating for interim losses);
3. Likelihood of success of each alternative;
4. Avoidance of adverse impacts (i.e. extent to which each alternative will prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative);
5. Multiple resource and service benefits (i.e. extent to which each alternative benefits more than one natural resource and/or service); and
6. Public health and safety (i.e. effect of each alternative on public health and safety).

The Trustees then select a preferred restoration alternative(s) based on these factors. Additionally, the Trustees must evaluate the potential environmental consequences of any proposed restoration under NEPA.

4.2.1 Evaluation of Restoration Types

To streamline the process of developing reasonable restoration alternatives and proposing a preferred alternative for implementation for each of the injury categories described in Chapter 3, the Trustees looked first to the restoration types identified in the Louisiana Regional Restoration Planning (RRP) Program FPEIS.[3] The restoration types in Louisiana's RRP Program include the following seven broad categories:

1. Creation/enhancement of habitat;
2. Physical protection of habitat;
3. Acquisition/legal protection of resources and services;
4. Stocking of fauna;
5. Physical protection of fauna;
6. Restoration of recreational resource services; and
7. Restoration of cultural resource services.

Next, the Trustees selected a subset of appropriate restoration types by identifying those that had a strong nexus to the injured natural resources and their services (Table 12). This would ensure that the restoration alternatives considered would provide services of the same type, quantity, and of comparable values as those lost.

Through this process, the Trustees identified eight restoration types with a strong nexus to the injured resource as their preferred restoration types for this case:

1. Creation/enhancement of beaches and shorelines;
2. Physical protection of beaches and shorelines;
3. Acquisition/legal protection of beaches and shorelines;
4. Creation/enhancement of coastal herbaceous wetlands;
5. Physical protection of coastal herbaceous wetlands;
6. Acquisition/legal protection of coastal herbaceous wetlands;
7. Creation/enhancement of coastal oyster reefs (and other reefs);
8. Acquisition/legal protection of coastal oyster reefs (and other reefs)

The Trustees selected these preferred restoration types for the following reasons:

1. Under the RRP Program these are appropriate and scalable restoration types for compensating for interim losses of ecological services resulting from the Incident; and

[3] Restoration types are described in section 4.2.3 of the Louisiana Regional Restoration Planning Program Final Programmatic Environmental Impact Statement (NOAA et al. 2007).

2. These restoration types are proven, cost-effective, and successful restoration approaches for increasing the types of natural resources, habitats and resource services that were injured as a result of the Incident.

In addition to the use of the RRP Program, the Trustees evaluated offshore restoration types with nexus to the injured natural resources and their services, specifically, pelagic fisheries and pantropical spotted dolphins.

Table 12. Restoration types that would compensate for injured natural resources.

COASTAL			POTENTIALLY INJURED RESOURCES/SERVICES								
			Herbaceous Wetlands	Forested Wetlands	Beach/Shoreline/ Streambed	Oyster Reefs (& other)	Water Column Org.	Birds	Wildlife	Recreational	Cultural
RESTORATION TYPES	C/E[1]	Coastal Herbaceous Wetlands	√	√		√	√	√	√	√	
		Coastal Forested Wetlands	√	√			√	√	√	√	
		Coastal Beach/Shoreline/Streambed			√		√	√	√	√	
		Coastal Oyster Reefs (& other)				√	√	√	√	√	
		Coastal Artificial Reefs				√	√	√	√	√	
		Coastal SAV	√			√	√	√	√	√	
	PP[2]	Coastal Herbaceous Wetlands	√	√		√	√	√	√	√	
		Coastal Forested Wetlands	√	√			√	√	√	√	
		Coastal Beach/Shoreline/Streambed			√		√	√	√	√	
	Ac/LP[3]	Coastal Herbaceous Wetlands	√	√		√	√	√	√	√	
		Coastal Forested Wetlands	√	√			√	√	√	√	
		Coastal Beach/Shoreline/Streambed			√		√	√	√	√	
		Coastal Oyster Reefs (& other)				√	√	√	√	√	
		Coastal SAV	√				√	√	√	√	
	S[4]	Coastal Water Column Org.					√			√	
		Coastal Oyster Reefs (& other)				√	√			√	
		Birds						√		√	
		Wildlife							√	√	
	PF[5]	Birds						√		√	
		Wildlife							√	√	
		Recreation								√	
		Cultural									√

(1) Creation/Enhancement
(2) Physical Protection of Habitat
(3) Acquisition/Legal Protection
(4) Stocking of Fauna
(5) Physical Protection of Fauna

4.2.2 Identifying Potential Restoration Actions

Following the identification of the preferred restoration types, the Trustees conducted an initial screening of potential restoration actions available to address the injured resources. Fifty-nine (59) preliminary restoration actions matched one or more of the preferred restoration types for the injured resources in RRP coastal regions (Appendix A). Additionally, three offshore restoration actions were screened. All of the actions were submitted by or obtained from the public and government agencies. The Trustees screened these restoration actions to identify the most appropriate options for this case.

Among the Trustees' goals was to identify restoration actions that could compensate for multiple injured natural resources and resource services. In reviewing the potential restoration actions, the Trustees considered whether the type and scale of restoration would compensate for injuries to aquatic, bird and marine mammal resources.

4.2.3 Preferred Restoration Actions

Based on the initial evaluation of potential restoration types and projects, the Trustees identified three distinct restoration actions to compensate the public for natural resource injuries: living shoreline and marsh protection restoration actions for the water column injury; the creation/enhancement of a bird nesting island and crevasse splay clean-out for the bird injury; and pantropical spotted dolphin genetic stock assessment for the marine mammal injury.

4.3 Evaluation of Potential Restoration Alternatives

4.3.1 Preferred Alternative - Suite of Restoration Actions, including (1) the Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline Project, (2) South Pass Bird Island (MR-172) Project and (3) Genetic Stock Assessment of Pantropical Spotted Dolphin

Using the restoration types identified, the Trustees identified the following three restoration actions from the initial list of projects that have nexus to the injured resources and could potentially restore for injuries to water column, birds and marine mammals:

1. Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline (RRP #883)
2. South Pass Bird Island (MR-172) Project (RRP #897)
3. Genetic Stock Assessment of Pantropical Spotted Dolphins

The Trustees used the OPA criteria listed in Section 4.2 above and the following RRP Program-specific criteria during the screening process to identify a suite of preferred restoration actions (i.e. the Preferred Alternative): (a) ability to implement project with minimal delay; (b) degree to which project supports existing strategies/plans; and, (c) project urgency. The Trustees also considered the stage of development of the potential projects; the extent to which the projects would support, or are consistent with national, regional, and/or local restoration initiatives including Louisiana's Comprehensive Master Plan for a Sustainable Coast (CPRA 2017); the ability of the restoration project to be integrated into an existing resource management program

or larger project; and the ability of the restoration action to be added to a project already under consideration (i.e. partnering).

4.3.2.1 Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline

This project is to create up to two miles of living shoreline in West Cove, Calcasieu Lake along Sabine National Wildlife Refuge (NWR) in Cameron Parish, Louisiana (see Figure 6). The living shoreline would be implemented through a partnership with The Nature Conservancy (TNC) and would entail the construction of galvanized gabion units (6' x 6' x 1' with 1.5" x 1.5" mesh) filled with limestone and placed by barge mounted crane. The primary goal of the living shoreline project is to address the water column injury. The proposed project would protect critical coastal marsh, which supports a high diversity of fish and wildlife populations in Sabine NWR. The proposed project would also create habitat for important estuarine species, promote oyster growth, enhance estuary water quality, and slow shoreline retreat by abating wave energy.

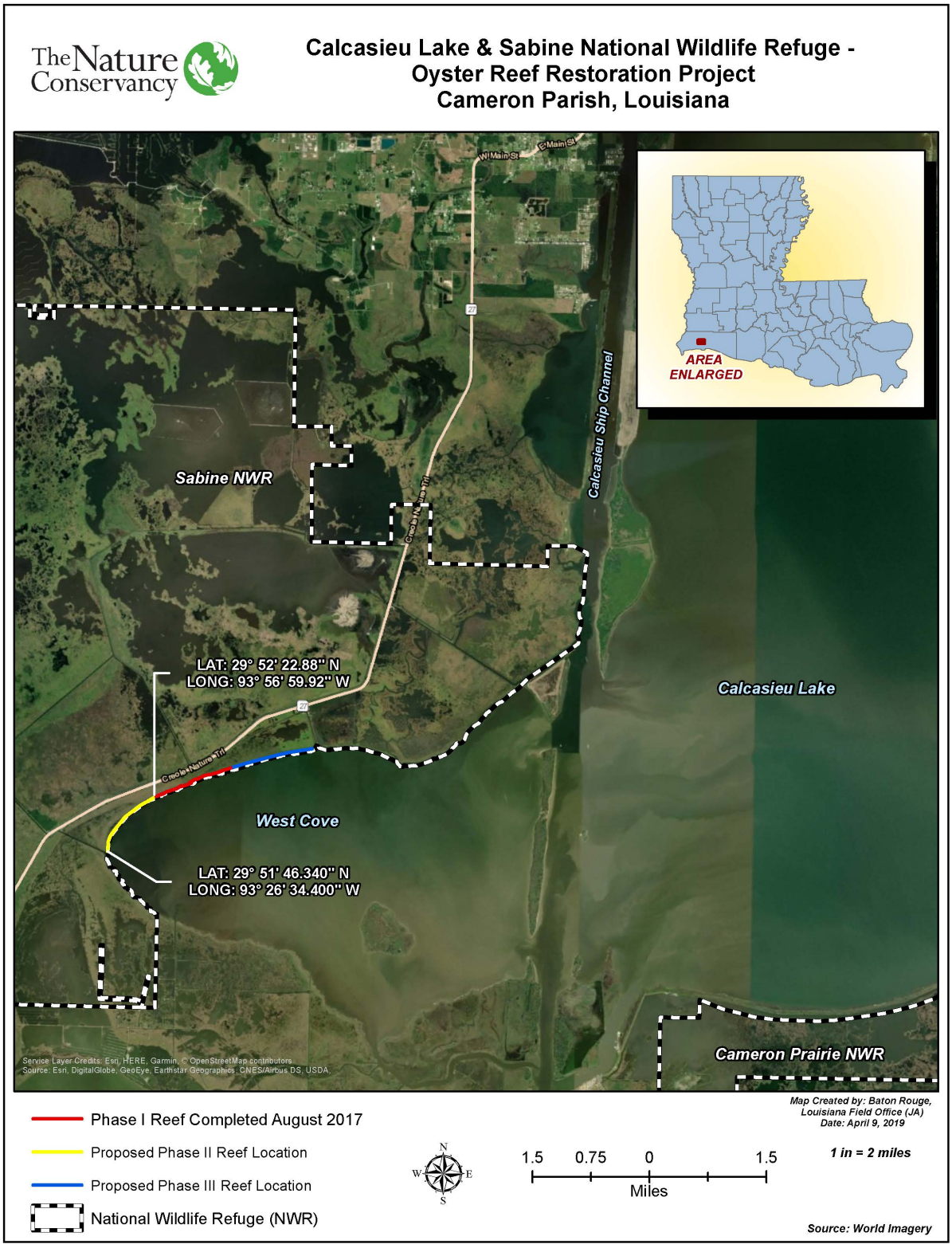


Figure 6. Location of proposed living shoreline project.

The Trustees assumed a 20-year project lifespan with a 10% trophic transfer from the estuarine environment to open ocean. Productivity estimates for two miles of reef created would produce 2,332 kg of pelagic fish biomass over 20 years (Peterson et al, 2003). Additionally, estuarine dependent fish injured would also be offset directly by this production with 23,320 kg of estuarine dependent fish. The living shoreline would also serve to reduce erosion of coastal marsh. The marsh is currently functioning but is eroding at a rate of approximately 1 foot per year. The coastal marsh complex in West Cove has been identified by Louisiana as a focus area for restoration (CPRA 2017). The proposed living shoreline restoration project would also serve as an oyster reef and provide additional benefits to pelagic species.

In 2017, TNC's Louisiana Chapter successfully created a one-mile portion of the 3-mile permitted living shoreline in West Cove. That project was Phase I of a large-scale, three-mile living shoreline restoration project that is permitted and shovel ready[4].

Similar to Phase I design and implementation, the proposed living shoreline project would entail oyster reef segments with an average length of 480 linear feet each with approximately 25-foot gaps between each segment to allow for fish passage and water flow between adjacent segments. The living shoreline project would offset the aquatic injury by directly producing pelagic biomass from the oyster reef, as well as produce pelagic biomass associated with the protection of currently eroding marsh.

For the proposed living shoreline project, the Trustees would conduct monitoring consistent with the Oyster Habitat Restoration Monitoring and Assessment Handbook (Baggett et al. 2014) and NOAA's Tier 1 metrics for oyster restoration. Specifically, the Trustees would monitor the following metrics:

1) Within 3 months post construction - Reef areal dimensions
    a) Project/Site footprint
    b) Reef area

2) Within 3 months post construction and two recruitment phases - Reef height (minimum, mean, and maximum)

3) Years 1 and 2 post construction - Oyster density
    a) Mean live oyster density (including oyster recruits)
    b) Mean original (planted) oyster seed density (if applicable)

4) Years 1 and 2 post construction - Oyster Size-Frequency Distribution (shell height) (recruit density may be extrapolated from this data);

5) Continuous monitoring that leverages Louisiana's Coastwide Reference Monitoring System (CRMS) for years pre-construction and years 1 and 2 post construction - Environmental Variables (annual minimum and maximum)
    a) Water Temperature
    b) Salinity

[4] Approved permits: Coastal Use Permit: CUP P20170016; US Army Corps of Engineers: MVN-2017-00118-WPP; State Lands: Class B Permit No. 726.

4.3.2.2 South Pass Bird Island (MR-172)

This project would create a colonial bird nesting island on Pass-a-Loutre Wildlife Management Area (PALWMA) in the Mississippi River Bird's Foot Delta utilizing sediment from two nearby crevasses (Figure 7). The primary goal of the project is to enhance the reproductive success of colonial nesting birds. The project would also enhance marsh habitat used by birds. These benefits would be sufficient to compensate the public and the environment for birds injured in the Incident and provide both biological and geographic nexus to the injured resources.

The project is located in East Bay in lower Plaquemines Parish approximately 16 miles south southeast of Venice, Louisiana on PALWMA. It is the primary component of the MR-172 project, which also includes dredging (cleanouts) of two crevasses that extend off the west bank of South Pass and discharge into East Bay. Crevasses are an ideal source of sediment that have been used to create nesting habitat for a variety of waterbird species that breed along coastal Louisiana. Ground-nesting waterbirds, including various species of terns and skimmers, as well as gulls, often nest on islands where their eggs and young are safe from mammalian predators. Sediment acquired from crevasses can be pumped to enhance pre-existing islands by increasing their size and elevation. Larger islands can sustain larger breeding colonies, and islands of sufficient elevation will be longer-lived due to greater resilience to flooding and erosion. Sediment from crevasse cleanouts is considered a "replenishable resource" as the borrow area will be refilled over a few years from sediment in the Mississippi River. By cleaning out the crevasses, the Trustees anticipate restoring its land building capability benefiting many of the aforementioned resources and species. Additional partnering funds from LDWF[5] and LDNR/Office of Coastal Management[6] would also be used to partially fund the MR-172 project. An additional project called the South Pass Crevasse Spur project[7] would be implemented concurrently with the MR-172 project using funds from a separate NRDA settlement.

[5] LDWF agreed to contribute approximately $128,000 of State and Tribal Wildlife Grants Program (SWG) funds towards the MR-172 bird island project. SWG grants provide federal funding to the states for conservation of nongame species and their habitat.

[6] LDNR/Office of Coastal Management agreed to dedicate $500,000 of Beneficial Use Program funds towards the MR-172 bird island project. The Beneficial Use Program funding consists of moneys collected from an application for a coastal use permit or a general permit authorization for an individual activity that involves 25,000 cubic yards or more of dredging when the primary purpose of the proposed dredging is to facilitate the movement or mooring of vessels. The LDNR/ Office of Coastal Management utilizes these funds by selecting projects that have all been thoroughly evaluated and piggy-backs on to approved restoration projects that are ready to be constructed but that may need additional funds to complete the project or may have additional areas for marsh creation.

[7] The South Pass Crevasse Spur project involves a partial cleanout of the southernmost crevasse of the MR-172 project and making a small cut in the left descending bank that will extend south into an adjacent receiving basin. This project has a Section 404 Clean Water Act and Section 10 Rivers and Harbors Act permit (Permit No. MVN-2018-01112-MM) and a Coastal Zone Consistency conditional permit (Permit No. C20180143) pursuant to 15 C.F.R. § 930.4(a)(1).

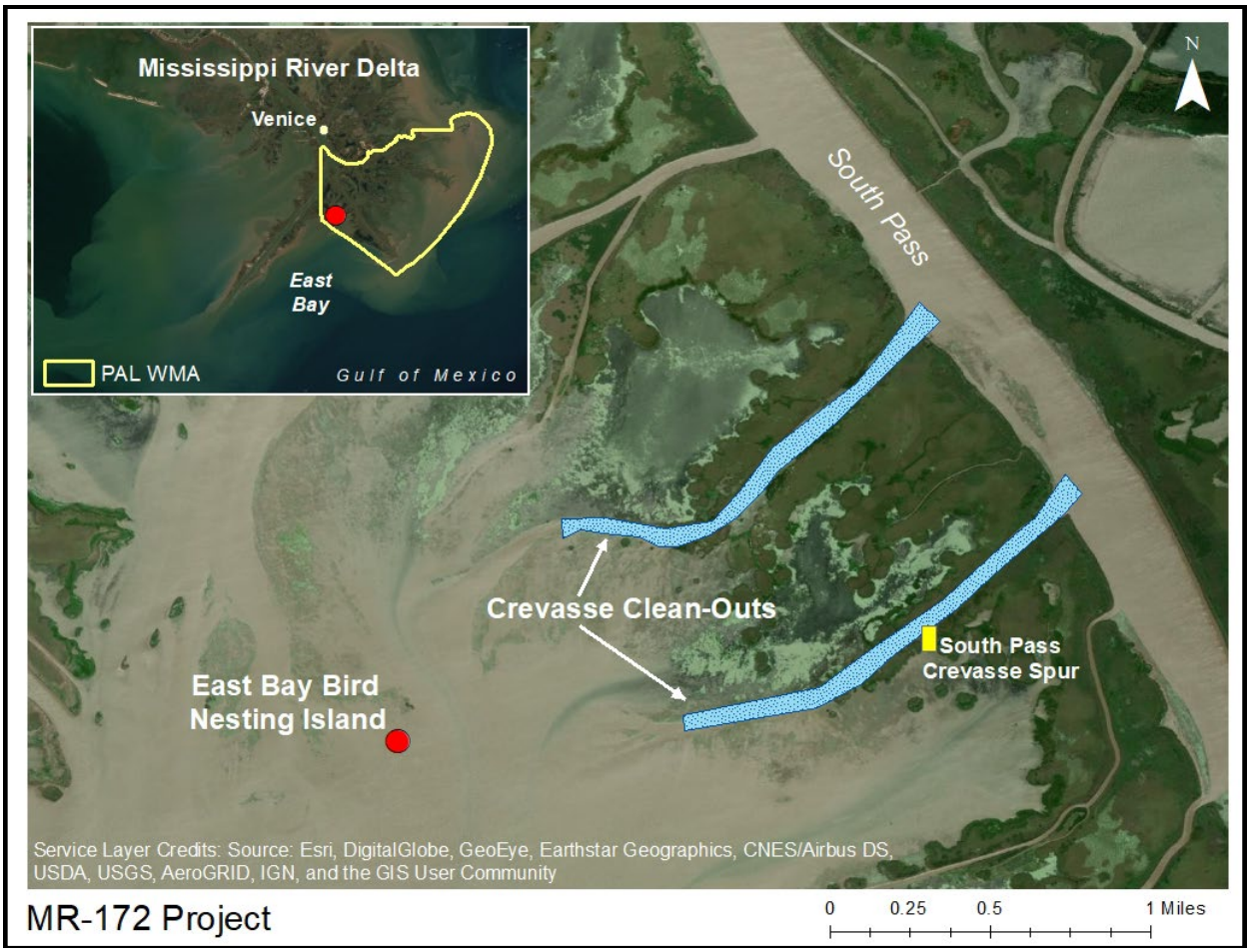


Figure 7. Location of the South Pass Bird Island (MR-172) project.

The project would be constructed to an elevation of approximately +6.0 feet North American Vertical Datum of 1988 (NAVD 88) (with a one-year post construction settlement elevation of +5.0 feet NAVD 88) and 20H:1V side slopes. Final elevations would depend on the quality of the borrow material. The island would be approximately five acres in size and constructed on the remnants of a smaller bird island that was previously constructed in 2017. In order to construct the island, containment dikes would be built at the location in East Bay and borrow material would be hydraulically dredged from two existing crevasses (i.e. crevasse cleanouts). Sediments would be transported via pipeline along two dredge corridors spanning approximately 13,000 linear feet. The Trustees estimate that up to 500,000 cubic yards of material would be necessary to create the new island. Some sediment dredged for the proposed bird nesting island project may be placed on adjacent wetlands just above the tidal elevation to provide nesting habitat for a number of wetland species, such as secretive marsh birds and mottled ducks. The proposed project has a Section 404 Clean Water Act and Section 10 Rivers and Harbors Act permit (Permit No. MVN-2014-02578-ES) and a Coastal Zone Consistency conditional permit (Permit No. C20140219) pursuant to 15 C.F.R. § 930.4(a)(1).

The Trustees assumed the project would have a 10-year project lifespan with erosion rates increasing over the project life as containment dikes erode and the island subsides. Based on

observations by LDWF on a previous nesting island created at this location, the East Lake Bird Nesting Island is estimated to support approximately 125 gull nests and 188 tern nests per acre of island habitat. Other bird species are expected to also benefit. For example, LDWF estimates that each acre of island habitat would also support approximately 500 black skimmer nests. The corresponding discounted bird years generated over the life of the project is estimated at approximately 1,490 for gulls and 8,725 for terns per acre of island habitat. These gains are expected to more than offset losses of gulls and terns resulting from the Shell Green Canyon Oil Spill, estimated at approximately 240 and 11,500 DBY, respectively. Boobies are not expected to directly benefit from this project.

Performance monitoring would be conducted for 5 years to provide an assessment of project progress and help guide corrective actions, if any, to meet the project's goals and objectives. The project's success would be determined by comparing quantitative monitoring results to pre-determined performance standards. Performance standards are criteria developed by the Trustees that define the minimum physical or structural conditions of the restoration project deemed to represent acceptable growth and development. This project would have the following performance criteria: the creation of at least 5 acres of bird nesting habitat, at least 3.75 acres of bird nesting habitat remains at year 5, and the existence of birds nesting on the island during the monitoring period. An aerial photograph taken prior to island creation would be used to determine the baseline for measurement of future erosion of the island. Aerial photographs, drone imagery and/or ground surveys would be taken periodically during the five-year period to quantify the spatial extent of the island footprint and determine whether birds are nesting on the island. If the performance criteria are satisfied during the monitoring period, then the Trustees are confident, based on previous experience, that the project would be successful and no further monitoring would be required. Should one or more of the performance criteria not be met, corrective actions would be considered to remedy the situation. Corrective actions to be considered include: monitoring for an additional period of time to see if the project begins to match predicted trends in nesting and habitat erosion.

4.3.4 Genetic Stock Assessment of Pantropical Spotted Dolphins

The Trustees propose to implement a genetic stock assessment project to inform management decisions through assessing pantropical spotted dolphin population structure by a) conducting a large-vessel biopsy survey to collect tissue samples from pantropical spotted dolphins; and b) performing a genetic assessment of population structure for pantropical spotted dolphins in the northern Gulf of Mexico. An improved understanding of whether the species is spatially structured in the oceanic waters of the United States Gulf of Mexico would greatly enhance efforts to estimate abundance for these species and would lead to improved assessment capabilities leading to more effective management. It is essential to have both an understanding of stock structure and accurate estimates of population size for a stock in order to appropriately manage for anthropogenic impacts on cetacean stocks. In addition, an analysis of pantropical spotted dolphin stock structure would provide insights into potential stock structure boundaries of other Gulf of Mexico oceanic delphinids and whether we should expect further differentiation of other delphinids.

The first component of the proposed marine mammal restoration project is to conduct a large-vessel biopsy survey. Remote biopsy samples of Gulf of Mexico oceanic delphinids (Sinclair et al., 2015) have been collected opportunistically during ship-based line-transect assessment surveys conducted in the Gulf of Mexico since 1990 (e.g., Fulling, Mullin, & Hubard, 2003; Mullin, 2007; Mullin & Fulling, 2004). Most of these samples have been collected from bow-riding species (e.g., Würsig, Lynn, Jefferson, & Mullin, 1998) and a number of samples have been collected from pantropical spotted dolphins because they are the most abundant cetacean in the oceanic Gulf of Mexico and they routinely ride the bow of ships. However, biopsy opportunities on assessment surveys are only taken when time commitments, staff numbers, and staff biopsy expertise are all sufficient. Currently, the biopsy sampling distribution for pantropical spotted dolphins is highly skewed towards the eastern Gulf of Mexico and additional biopsy samples from the central and western Gulf of Mexico are necessary for adequate coverage (Figure 8). Hence, there is the need for a dedicated biopsy cruise for this species.

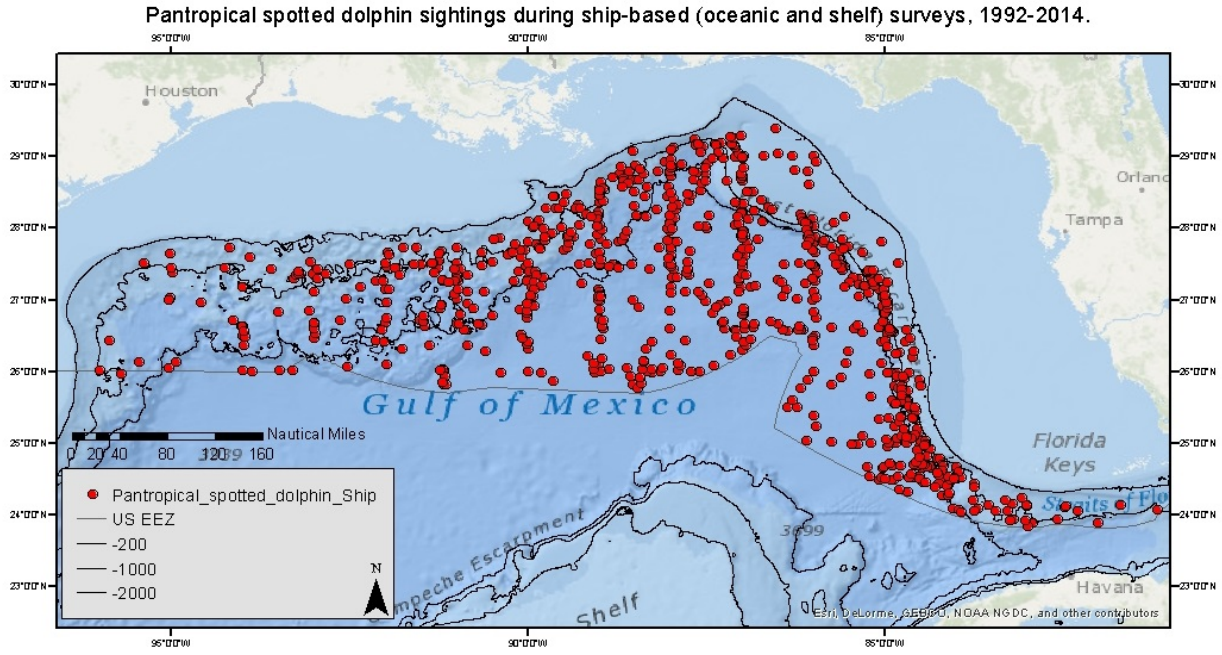


Figure 8. Locations of sightings of groups of pantropical spotted dolphins during Southeast Fisheries Science Center (SEFSC) line-transect surveys conducted from 1992 to 2014.

A 30-day dedicated biopsy sampling survey effort in the north-central and western Gulf of Mexico is proposed that would focus on oceanic United States Gulf of Mexico waters (200–2000 m deep) west of the Mississippi River Delta. A ship is required for this survey for safety reasons and to meet the sampling objectives (e.g., accommodate 7 scientists and pedestal-mounted binoculars). The timing of implementation of this restoration project would be dependent on the availability to secure the necessary vessel and time. During the survey, the area would be surveyed with about 5000 km of trackline that uniformly covers this area. Depending on results, the trackline could be modified to maximize encounters of groups of pantropical spotted dolphins. Surveys would be conducted similar to standard visual line-transect surveys (e.g., Mullin & Fulling, 2004) that include searching for dolphin groups with 25 x 150 mm binoculars

from the ship's flying bridge during daylight hours. When pantropical spotted dolphins are sighted, the ship would be diverted to allow the dolphins to ride the bow. Biopsy samples[8] would be collected from the bow of the ship using a tethered dart propelled with an air rifle. A maximum of two samples would be collected per group. Data collection and sample processing will follow standard protocols (Sinclair et al., 2015).

The second component of the proposed marine mammal restoration project is the genetic assessment of population structure for pantropical spotted dolphins in the northern Gulf of Mexico using previously collected samples and samples collected during the proposed biopsy survey cruise. The genetic assessment would utilize three datasets: mitochondrial DNA (mtDNA) sequence data, nuclear microsatellite data and nuclear single nucleotide polymorphism (SNP) data. Each data type provides a different focus on the degree to which pantropical spotted dolphins may comprise multiple demographically independent populations. The mtDNA sequence data focuses on matrilineal relationships and the degree of female-mediated gene flow occurring while the microsatellite and SNP data provide information on both male- and female-mediated gene flow. Female-mediated population structure is a feature of many small dolphin populations and so investigating whether this is also a feature for pantropical spotted dolphins is critical to a comprehensive understanding of the source and degree of spatial structuring of the species in the Gulf of Mexico. The microsatellite and SNP datasets provide course and fine-scale investigation of demographic independence due to the number of markers available and power to detect population differentiation.

Currently, around 115 biopsies have been previously collected (Figure 9) and DNA has already been extracted. DNA would be extracted from the new biopsies collected during the biopsy survey cruise. Sex would be determined for all biopsies following Rosel (2003).

[8] Biopsy samples would be collected under the authority of MMPA permit 21938 issued to the SEFSC.

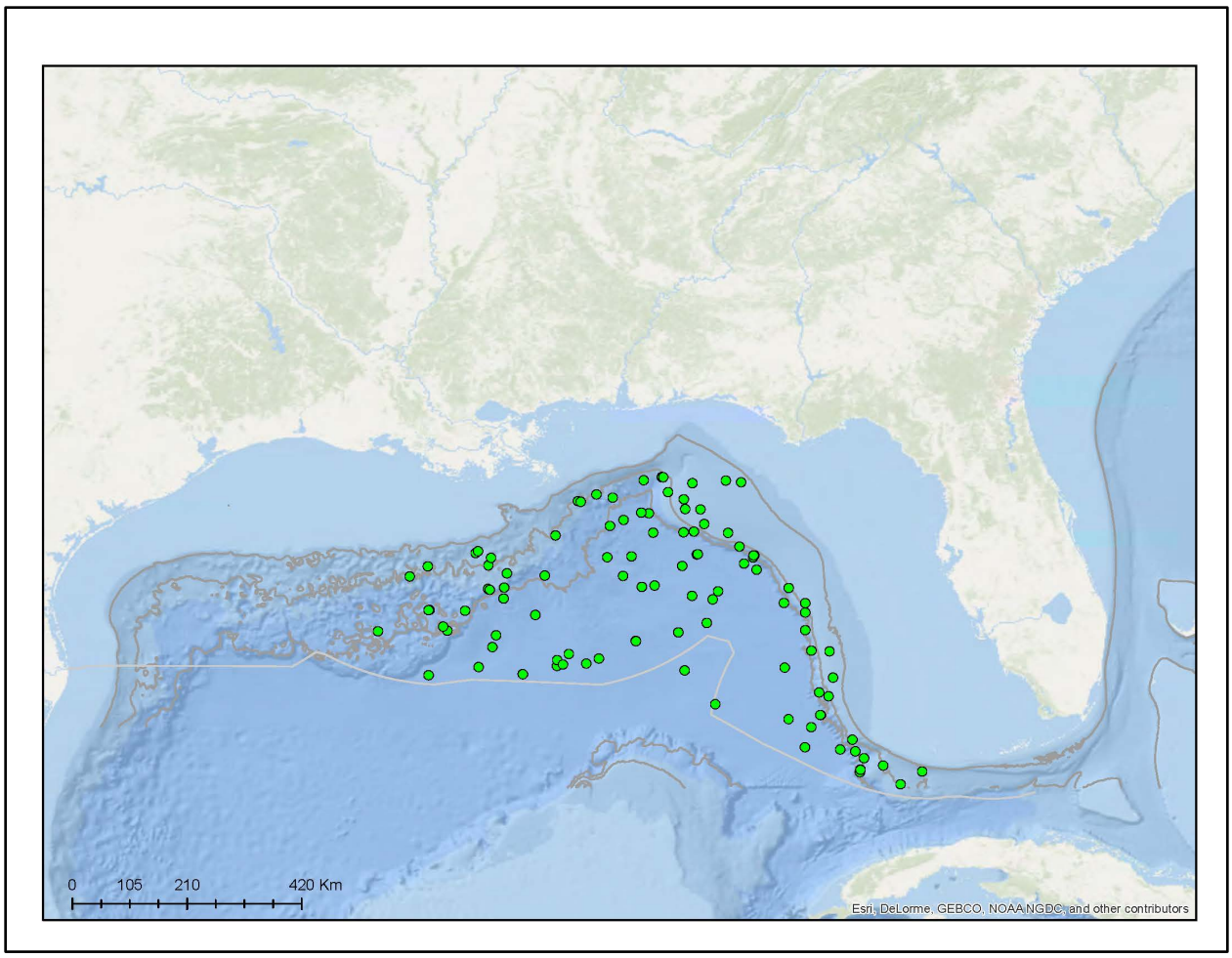


Figure 9. Locations of biopsy samples (n = 115) from pantropical spotted dolphins in the northern Gulf of Mexico (200, 1000 and 2000-m isobaths and EEZ are shown).

For the mtDNA, the 5′ end of the control region would be amplified via the polymerase chain reaction (PCR) and sequenced. This mitochondrial region is highly variable and commonly used in population studies of marine mammals, including delphinids (e.g., Martien et al., 2012; Rosel, Hansen, & Hohn, 2009; Rosel et al., 2017; Viricel & Rosel, 2014). The pantropical spotted dolphin mitochondrial DNA sequence data would be examined for levels of genetic diversity and for genetic relationships among all Gulf of Mexico haplotypes and among worldwide haplotypes using sequence data available in the public database GenBank.

For the microsatellite data, 42 microsatellite loci would be developed and optimized for the pantropical spotted dolphin. All biopsy samples would then be genotyped at these 42 loci. Evidence for spatial population structure will be investigated using standard analytical tools, (e.g., Viricel & Rosel, 2014; Vollmer & Rosel, 2017). If evidence for demographically independent populations is found, the degree of differentiation among those populations would be evaluated and the level of demographic exchange would be estimated in order to understand how many migrants may be moving between the populations.

Finally, a next generation sequencing platform would be used to identify thousands of single nucleotide polymorphism markers in pantropical spotted dolphins for a higher resolution evaluation of spatial structuring in the Gulf of Mexico and western North Atlantic. SNP markers have the advantage of the high number of markers that can be obtained, increasing the power to detect lower levels of population structure (Davey & Blaxter, 2010). Restriction-site-Associated DNA Sequencing (RAD-Seq) data would be combined with analyses similar to those performed for pantropical spotted dolphins in the Pacific Ocean (Leslie & Morin, 2016). Given the large population size of pantropical spotted dolphins and potential for low levels of divergence, this dataset would add a critical component to the analyses.

Together the three datasets are expected to provide a comprehensive examination of population structure. This information would inform decisions to better manage the species. Specifically, the goal of the MMPA is to maintain each stock at an abundance level that allows it to remain a functioning part of the ecosystem. Under the MMPA, stock abundance must be maintained at or above the optimal sustainable population (OSP) level, which is the number of animals that results in the maximum productivity of the population stock. Accurate population delineation is important for assessing stock abundance, distribution, seasonal movements, stressors, and impacts of those stressors. Furthermore, identifying stocks and stressors would inform future restoration actions that could address future impacts and restore populations.

4.4 Alternatives Considered But Eliminated From Further Consideration

4.4.1 Pelagic Long Line Project

To address the water column injury, the Trustees considered a restoration project to reduce bluefin tuna bycatch by increasing the set depth in the Gulf of Mexico pelagic longline (PLL) fisheries. The Gulf of Mexico has become an area of concern due to the bycatch mortality of spawning bluefin tuna that is associated with the yellowfin tuna PLL fishery. PLL fishing gear is primarily composed of a mainline, which can vary from five to 40 miles in length, with approximately 20 – 30 hooks per mile. The average number of hooks for pelagic longline sets targeting yellowfin tuna is typically 600 – 700 hooks. The depth of the mainline is determined by ocean currents and the length of the floatline. Each individual hook is connected by a gangion to the mainline. In general, longlines targeting tunas are set in the morning and hauled back in the evening.

The PLL project would build from research conducted by NOAA Fisheries in 2012 in the Gulf of Mexico to evaluate a new "weak" hook design on catch and bycatch of yellowfin and bluefin tuna in the PLL. Results of the study showed a strong correlation between the proportion of time gear was deployed in the primary fishing zone and catch rates. Yellowfin tuna appeared to be utilizing more of the water column (30 – 200 m), while bluefin tuna appeared to be utilizing mid-depths near the thermocline between 50 – 110 m. The results of the study suggest that longline sets deployed at greater depths (below the thermocline) have the potential to reduce bluefin tuna interactions and associated bycatch. Therefore, the Trustees considered funding 1-2 commercial PLL vessels to fish in the Gulf of Mexico during the bluefin tuna spawning season between April and June for up to four years to reduce Bluefin tuna bycatch. Sets would be made consistent with the current practice for shallow water sets with the deeper end of the longline deployed at

depths greater than 110m. Hook timers and temperature/depth recorders would be deployed on all longline sets to record fishing depth and temperature at 1 – 2 min intervals. The floatline length and/or gangion length would be increased so that the fishing depth of the gear is 110-120 meters. The gangion length would be increased to at least 120% of the floatline length to be consistent with current federal regulations.

During the course of the restoration planning to identify a reasonable range of alternatives to meet the purpose and need (see Section 1.2), the Deepwater Horizon Open Ocean Trustee Implementation Group released the Final Open Ocean Restoration Plan 2 that included a more robust PLL project (Open Ocean Trustee Implementation Group. 2019. Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Open Ocean Trustee Implementation Group, Final Restoration Plan 2/Environmental Assessment: Fish, Sea Turtles, Marine Mammals, and Mesophotic and Deep Benthic Communities). Therefore, the Trustees have eliminated this smaller scale restoration project from further consideration as it would not yield additional benefits above and beyond those expected to result from the DWH project.

4.4.2 Passive Acoustic Monitoring Project

To understand the local density trends of marine mammal species in the Green Canyon area, as well as how these trends relate to GOM-wide density trends, the Trustees considered a project to conduct continuous broad-band passive acoustic monitoring (PAM) at a fixed site near Green Canyon for 5 years. The SEFSC and Scripps Institution of Oceanography have been collaboratively conducting a smaller scale long-term PAM program at five GOM sites, including one near Green Canyon, since 2010 to monitor the density trends of cetaceans. High-frequency Acoustic Recording Packages (HARPs) deployed at the five sites have been continuously recording ambient noise and other acoustic events in the 10 Hz to 100 kHz frequency range since 2010 and will continue through May 2020. The first eight years of near-continuous recordings are being analyzed to better understand distribution and density trends of cetaceans. The long-term HARP data provide crucial information for understanding seasonal, interannual, and decadal trends in density of multiple marine mammal species and for future habitat modeling if combined with data from additional PAM sites. Further, they provide data on the complete soundscape and its temporal variation, information needed to understand the long-term changes in natural sources of oceanic sound, as well as human-made sound and its potential to impact marine mammals.

The proposed PAM restoration project objective would be to maintain the long-term Green Canyon PAM site to collect data for analyzing soundscape data for marine mammal (e.g. pantropical spotted dolphins) density trends and anthropogenic noise levels and sources, and to identify a strategic approach to prevent and reduce noise in this area. Long-term, broad-coverage PAM is a highly effective tool for assessing seasonal, interannual, and decadal patterns in marine mammal density when a robust design is used, while single-site PAM can provide data on high-resolution temporal density patterns for a specific local site of interest.

During the course of the restoration planning to identify a reasonable range of alternatives to meet the purpose and need (see Section 1.2), a funding decision was made by NOAA's RESTORE Science Program to fund the PAM program at all five of the GOM sites, including

the Green Canyon HARP, from January 2020 to December 2024. For more information about the specific project and funding decision, see NOAA RESTORE Science Program's website at https://restoreactscienceprogram.noaa.gov/projects/marine-mammals-and-acoustics. The Trustees have therefore eliminated the proposed PAM restoration project from further consideration, as it is currently being implemented under another program.

4.5 Evaluation of No Action/Natural Recovery Alternative

NEPA requires the Trustees to consider a "no action" alternative, and the OPA regulations require consideration of the "natural recovery" option. In this case, these options are equivalent. Under this alternative, the Trustees would take no direct action to restore injured natural resources or compensate for lost services pending environmental recovery. Instead, the Trustees would rely on natural processes for recovery of the injured natural resources. The principal advantages of this approach are the ease of implementation and cost-effectiveness. However, the no action/natural recovery alternative is rejected for restoration because OPA and OSPRA clearly establish Trustee responsibility to seek compensation for interim losses pending recovery of the natural resources. Compensatory restoration cannot be addressed through a no-action alternative.

The Trustees' assessment of natural resource injuries indicates that losses have occurred due to the Incident. Response actions undertaken will allow the injured resource to recover, but these actions will not compensate the public for the resource services lost over time during the period of recovery from the Incident. Such compensation serves to make the public and the environment whole. OPA allows the public to be compensated for such losses based on actions that restore, replace, or provide services equivalent to those lost. As evidenced by the restoration alternatives identified in developing this plan, there are feasible and appropriate opportunities to restore, replace, or provide services equivalent to those lost due to the release and natural resource injuries. Under the no-action alternative, restoration needed to make the environment and public whole for its losses would not occur. This is inconsistent with the goals of the natural resource damages provisions of OPA. Thus, the Trustees determined that the no-action alternative (i.e., no restoration) should be rejected on that basis.

4.6 Summary of Preferred Restoration Alternative

Based on the analysis provided in the previous sections, the Trustees' proposed preferred restoration alternative for addressing natural resource injuries resulting from the Incident include the following three projects:

1. Create up to two miles of living shoreline in West Cove, Calcasieu Lake along Sabine NWR in Cameron Parish, Louisiana;
2. Create colonial bird nesting habitat in the PALWMA utilizing sediment from nearby crevasse clean-outs that would also enhance the ecological function of marsh; and
3. Implement a genetic stock assessment project to inform management decisions through assessing pantropical spotted dolphin population structure by a) conducting a large-vessel biopsy survey to collect tissue samples from pantropical spotted dolphins; and b)

performing a genetic assessment of population structure for pantropical spotted dolphins in the northern Gulf of Mexico.

5.0 POTENTIAL ENVIRONMENTAL IMPACTS OF UNDERTAKING THE RESTORATION ALTERNATIVES

NEPA requires that the environmental impacts of a proposed federal action be considered before implementation (42 U.S.C. § 4321; 40 C.F.R. Parts 1500-1508). This section addresses the potential environmental consequences of the Trustees' proposed restoration actions. In addition, the Trustees considered the environmental impacts of the no action alternative, as required by NEPA (40 C.F.R. § 1502.14(d). Generally, when it is uncertain whether an action would have a significant impact, federal agencies would begin the NEPA planning process by preparing an Environmental Assessment (EA). Federal agencies may then review public comments prior to making a final determination. Depending on whether an impact is considered significant, an environmental impact statement (EIS) or a FONSI would be issued.

In undertaking their NEPA analysis, the Trustees evaluated the potential significance of proposed actions, considering both context and intensity (40 C.F.R. § 1508.27). For the actions considered in this Draft DARP/EA, the appropriate context for considering potential significance of the action is at the local or regional level, as opposed to national, or worldwide. Intensity refers to the severity of impact. This Draft DARP/EA, in its entirety, is intended to accomplish NEPA compliance by summarizing the current environmental setting of the selected restoration, describing the purpose and need for restoration actions, identifying alternative actions, assessing the environmental consequences of the proposed action(s), and providing an opportunity for public participation in the decision-making process.

Overall, the proposed restoration actions included in this Draft DARP/EA will enhance the functionality of the ecosystem in the area impacted by the Incident by: 1) improving aquatic habitat and water quality, 2) improving bird nesting and foraging habitats, and 3) improving the understanding of stock structure and population size to appropriately manage for anthropogenic impacts on pantropical spotted dolphins. There could be some short-term and localized negative impacts, though not significant, from the preferred restoration actions, as described below.

After considering the environmental consequences of the proposed restoration actions, the Trustees believe that the proposed restoration actions described in this Draft DARP/EA will not cause significant impacts to the environment, or to natural resources or the services they provide. None of the proposed actions to be implemented by the Trustees are controversial, have highly uncertain impacts or risks, or are likely to violate any environmental protection laws. Further, the Trustees do not believe the proposed projects will adversely affect the quality of the human environment or pose any significant adverse environmental impacts.

When determining the nature and likely impacts associated with the proposed restoration actions, the Trustees evaluated impacts to the physical, biological, and socio-economic environments. The results are discussed below.

5.1 Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline

5.1.1 Sound, Visual, and Air Quality

No Action
There would be no construction activities associated with no action and as such, there would be no adverse impacts to sound, visual and air quality conditions from construction activities. Similarly, there would be no noise above the ambient levels because there would be no construction activities. Erosion to the marsh along West Cove would continue, possibly diminishing the aesthetics of a natural environment. Air quality conditions would remain as they are.

Preferred Alternative
Machinery and equipment used during construction of the living shoreline (e.g. placement of the barge and crane used to place the gabion baskets) and other restoration activities (e.g. filling the gabion baskets with limestone) could generate sound and air emissions that could temporarily disturb fish, wildlife and humans near the construction activity. Adverse impacts on mobile species (e.g., fish, birds and mammals) are expected to be minor, consisting of short-term displacement as they volitionally move away from the restoration activity. Air emissions from equipment and/or machinery may temporarily increase emissions in the immediate area, but such effects would be similar to emissions of nearby vehicle or boat traffic and would not result in an overall increase in air emissions. There may be temporary and localized minor adverse visual impacts during implementation of the proposed action associated with construction activities (e.g. barge with limestone). Once the living shoreline is completed, users of the area are expected to perceive the project areas as having improved aesthetics.

5.1.2 Water and Sediment Quality

No Action
There no action alternative would not involve any construction activities and as such, there would be no short-term adverse impacts to water or sediment associated with construction activities. However, the West Cove of the Calcasieu is experiencing marsh erosion from wave action generated from ship or boat wakes, as well as wind driven wave action. This erosion creates localized increases in turbidity through the conversion of the marsh to intertidal, unvegetated mudflats which has a long-term negative impact on terrestrial and aquatic species through reducing the food web. Not implementing the living shoreline would not protect the existing marsh from erosion and therefore, long-term benefits to water and sediment quality such as turbidity reduction would not occur.

Preferred Alternative
For the Gulf of Mexico, sea level rise has been measured at 2.10 ± 0.26 mm/year at the NOAA tide gauge 8729840 in Pensacola, Florida (NOAA 2008a). This tide gauge lies on a geologically stable platform. Relative sea level rise consists of eustatic sea level rise and subsidence. Eustatic sea level change is defined as the global change in oceanic water level relative to a fixed vertical datum (e.g. NAVD88). Subsidence is defined as a local decrease in land elevation relative to a

fixed vertical datum. Relative sea level change would include both sea level change (eustatic) and relative subsidence. It is well known through numerous studies that a high rate of relative sea level change is resulting in significant land loss along the Louisiana coast. The rate of relative sea-level rise can be estimated from local tide gauges because they measure water levels relative to a fixed datum, reflecting the combined influence of subsidence and eustatic sea level rise. The 1947-2006 record from NOAA Tide Gauge 8761724 at Grand Isle, Louisiana shows a relative sea-level rise rate of 9.24 (±0.59) mm/yr (NOAA 2008b). This would suggest that relative sea-level rise at this location is mainly due to subsidence. Given the adaptability of oysters to sea level rise, the implementation of the proposed living shoreline project would reasonably be expected to recruit at a level sufficient to adjust to any sea level changes.

As previously described, the West Cove of the Calcasieu River is experiencing marsh erosion from wave action generated from ship or boat wakes, as well as wind driven wave action. Through the implementation of the proposed living shoreline project, erosion would be substantially reduced, thereby reducing suspended sediment associated with marsh erosion and improving water quality, and retaining the important ecological role of the marsh for both terrestrial and aquatic species.

Impacts resulting from the construction of the proposed living shoreline project would reasonably be expected to have temporary, minor adverse effects to surface water quality and intertidal and subtidal sediment quality through the placement of living shoreline material. By placing the material from a barge, the disturbance would be minimized. The construction of the proposed living shoreline project is expected to enhance benthic habitat in the intertidal zone through the reduction of wave action and erosion, thus, providing long-term beneficial impacts to benthic resources.

5.1.3 Endangered and Threatened Species

No Action
The no action alternative would not involve any construction activities and as such, there would be no beneficial or adverse impacts to species listed as threatened or endangered under the Endangered Species Act (16 U.S.C. 1531 et seq.).

Preferred Alternative
Gulf sturgeon is the only threatened fish species in the northern Gulf of Mexico within Louisiana. Gulf sturgeon inhabit riverine and estuarine environments in the spring during breeding, and either move offshore or parallel to shore between adjacent estuary systems during winter months. The West Cove of the Calcasieu River is not known to contain Gulf sturgeon and therefore the proposed living shoreline project would have no effect on Gulf sturgeon.

While the proposed living shoreline project area does not contain suitable nesting habitat for sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback and Loggerhead) these species could be present in the open waters adjacent to the project area. Therefore, the proposed project could result in potential impacts to sea turtles. Potential indirect effects to protected aquatic species, such as sea turtles, would be temporary and minor and would result from the temporary, localized impacts to water quality due to construction activities, which could affect the adjacent

waters. In order to reduce these potential impacts, the project would follow all applicable state and federal permit conditions, such as Section 404 Clean Water Act permit conditions.

Piping Plovers and Red Knots seasonally occur in coastal areas in Louisiana. Piping Plover habitat includes intertidal portions of ocean beaches, wash over areas, mudflats, sand flats, algal, flats, shoals, wrack lines, sparse vegetation, shorelines of coastal ponds, lagoons. ephemeral pools, and areas adjacent to salt marshes but not within the salt marsh. Red Knot habitat includes intertidal marine habitats near coastal inlets, estuaries, and bays, or along resting formations. Piping Plover or Red Knot wintering habitat do not occur or are sparse in the proposed project area. Therefore, the proposed project is not expected to adversely affect these species.

5.1.4 EFH, Wetlands, Subtidal and Intertidal Flats and Oysters

No Action
EFH in the living shoreline project area of West Cove is estuarine emergent wetlands, submerged aquatic vegetation, estuarine water column, and mud, sand, shell and rock substrates. Under the MSA, wetlands, subtidal and intertidal habitat in the living shoreline project area are identified as EFH for postlarval/juvenile and subadult brown shrimp; postlarval/juvenile and subadult white shrimp; and postlarval/juvenile, subadult, and adult red drum. With no action, there would be no restoration that protects and enhances EFH, specifically wetlands, subtidal habitat and shell substrate (i.e. oyster recruitment on the living shoreline). Because EFH within West Cove provides important production for estuarine dependent fisheries injured as a result of the Incident, no action would not provide the necessary restoration needed for the respective fisheries.

Preferred Alternative
The implementation of the proposed living shoreline project would have immediate and long-term positive benefits to EFH, specifically marsh, subtidal habitat and shell substrate. The placement of gabions associated with the living shoreline in intertidal and subtidal waters would be de minimis in the context of the Calcasieu River watershed. The existing marsh within West Cove provides valuable marsh edge, which serves as a critical and highly productive transition zone between the emergent marsh vegetation and intertidal habitat. The marsh is important for the movement of organisms and nutrients between intertidal and subtidal estuarine environments, and supporting high densities of fish and crustacean species at its interface. Through the implementation of the proposed living shoreline project, marsh erosion would be substantially reduced, thereby maintaining important marsh edge habitat and slowing the conversion of marsh to intertidal and subtidal habitat. Additionally, the living shoreline would serve to recruit oysters onto the placed substrate. All of Calcasieu Lake is designated as a State Oyster Seed Ground, and the LDWF manages the oyster resource on the public grounds by closely monitoring the size and health of oysters within this area. The living shoreline and associated oyster recruitment would provide a suite of ecosystem services, including water quality improvement, shoreline stabilization (and associated habitat protection), carbon burial, habitat enhancement for fish and mobile invertebrates, habitat for epibenthic fauna, and oyster production (Grabowski et al., 2012).

5.1.5 Fisheries

No Action
No action would not protect valuable marsh habitat or provide additional substrate for oyster recruitment. The Trustees do not anticipate any net ecological benefits associated with no action and there would be no increase in fisheries productivity needed to compensate for fisheries injured by the Incident.

Preferred Alternative
The implementation of the proposed living shoreline project would both protect existing marsh, as well as provide suitable substrate for oyster recruitment and production. The functional value of marsh is well documented in the scientific literature to have a positive effect on water and sediment quality (e.g., increased water filtration and sediment suitable for a variety of benthic invertebrates), as well as improving the estuarine food web. The living shoreline project would protect and provide valuable habitat that support a diverse assemblage of estuarine-dependent fishes, shellfishes and EFH species by protecting marsh edges and create an oyster reef that would benefit fisheries.

5.1.6 Wildlife

No Action
With no action, there would be a continued loss of wildlife habitat associated with marsh erosion and habitat loss. The loss of this habitat would reasonably be expected to displace wildlife and reduce the associated food web. Potential wildlife species that would be negatively impacted over time due to the loss of marsh habitat include nutria, muskrat, mink, river otter, raccoon, American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle, bullfrog, southern leopard frog, and Gulf coast toad.

Preferred Alternative
Machinery and equipment used during construction of the living shoreline could temporarily disturb wildlife near the construction activity. Impacts on mobile species (e.g., birds, mammals) are expected to be minor, consisting of short-term displacement. Overall, the proposed living shoreline project would reasonably be expected to provide indirect benefits to wildlife species that utilize the marsh and prey on benthic invertebrates and fisheries that will benefit from the implementation of the proposed living shoreline project.

5.1.7 Public Access and Recreation

No Action
Under this alternative, there would be no change in current public access and recreation. However, over time, no action is expected to reduce fisheries productivity and marsh edge habitat in the area, which would reasonably diminish recreational fishing experiences through reduced catch rates.

Preferred Alternative

The implementation of the proposed living shoreline project would reasonably be expected to have short-term, localized, minor adverse impacts to public access to West Cove via the waterway during construction. These impacts would only occur during construction and would be isolated to the active construction area. There is no public access via land, so no impacts to public access would occur.

Short-term adverse impacts to recreational fishing and other water related recreation (e.g. kayaking) is expected to occur during construction. As previously described, the construction of the living shoreline would take place from a barge and associated noise from the placement of the oyster reef could diminish the enjoyment of recreational fishing and soundscape during construction. However, upon completion of construction, long-term improvements to recreational uses of West Cove (e.g. fishing and nature-based recreation) is expected. Specifically, the created oyster habitat will support National Saltwater Recreational Fisheries Policy goals and will provide natural protection to a rapidly eroding marsh shoreline. High quality estuarine habitats such as oyster reefs are essential for supporting reproduction, growth, and productivity for fish that are typically targeted by recreational fishing (e.g. red drum). Additionally, the marsh is an important component of the fisheries food web and also provides important edge habitat for fisheries that, both of which contribute to fisheries production.

5.1.8 Historic and Cultural Resources

No Action
No action would not result in impacts to historic and cultural resources, as ground-disturbing work that could impact such resources would not occur.

Preferred Alternative
The proposed living shoreline project is not expected to have impacts to historic and cultural resources, as no resources are known to be present within the project footprint. Additionally, the proposed living shoreline project has approved permits, which include analysis of potential impacts to historic and cultural resources pursuant to Section 106 of the Historic Preservation Act. See Coastal Use Permit: CUP P20170016; US Army Corps of Engineers: MVN-2017-00118-WPP; State Lands: Class B Permit No. 726 for additional details.

5.1.9 Other (e.g., economic, land use, transportation)

No Action
Land use would change under the no action alternative due to continued erosion. The land loss could reduce the marsh between Highway 27 and West Cove and make Highway 27 more susceptible to impacts from flooding and erosion, which could in turn create economic losses associated with reduced transportation and necessary road repairs. Additional economic impacts associated with land loss would be lost marsh and a diminished fisheries productivity that could affect recreational fishing opportunities.

Preferred Alternative
The proposed living shoreline project is not expected to have an effect on other resources such as land use and transportation. The implementation of the proposed project would protect existing

marsh and would not require private or public landowner access (e.g. easements) or necessitate land use changes or modifications. Because the project area is well outside the Calcasieu navigation channel, there are no expected impacts to navigation.

By implementing habitat improvements associated with the proposed living shoreline project, existing natural resource services, including recreational fishing would be enhanced, conserved, and available into the future.

5.2 South Pass Bird Island (MR-172)

5.2.1 Sound, Visual, and Air Quality

No Action
There would be no noise above the ambient levels because there would be no construction activities associated with no action. There would be no changes to the viewscape under no action. Air quality conditions would remain as they are, and there would be no adverse impacts to air quality from construction activities.

Preferred Alternative
Machinery and equipment used during the clean out of existing crevasses and the construction of the bird nesting island is expected to increase sound in the near proximity of construction but is anticipated to be less than 30 working days. During construction, the increase in sound could disturb wildlife and human use near the construction site. However, given the short duration of the earth moving work needed to create a crevasse, the increase noise and potential air emissions are considered de minimis. Additionally, due to the geography of the PALWMA, the creation of a crevasse that mimics natural processes is not expected to produce adverse impacts to the visual or aesthetic environment.

5.2.2 Water and Sediment Quality

No Action
There would be no short-term adverse impacts to water and sediment quality associated with construction with no action. However, not implementing the clean out of existing crevasses and the construction of the bird nesting island would not enhance the functional value of the existing splay marshes, which would reasonably be expected to be converted to open water through land loss from subsidence and/or erosion over time and, therefore, long-term benefits to water quality such as nutrient reduction would not occur.

Preferred Alternative
The construction of a crevasse to create a splay marsh is modeled after natural fluvial geomorphic processes. Because of this natural process of creating marsh, the Trustees do not anticipate any short-term or long-term adverse impacts associated with the construction or maintenance of the crevasse splay to water and/or sediment quality. In fact, the construction of a crevasse is intended to trap suspended sediment within the splay, which will in turn increase the elevation to become suitable for the natural recruitment of marsh vegetation. The functional value of herbaceous wetlands (i.e. marsh) is well documented in the scientific literature to have a

positive effect on water and sediment quality (e.g. increased water filtration and sediment suitable for a variety of benthic invertebrates), as well as improving the estuarine food web.

5.2.3 Endangered and Threatened Species

No Action
The no action alternative would not involve any construction activities and as such, there would be no beneficial or adverse impacts to species listed as threatened or endangered under the Endangered Species Act (16 U.S.C. 1531 et seq.).

Preferred Alternative
The proposed bird nesting island project actions are anticipated not likely to adversely affect the following species: the terrestrial and marine life stages of the hawksbill, Kemp's ridley, leatherback and loggerhead sea turtles. This is based on numerous years of similar restoration implementation and monitoring that have not encountered these species and the determination that site conditions have not changed in a material manner that would provide suitable nesting habitat for all the sea turtles in the proposed project action area. While the proposed project is not anticipated to yield direct or indirect impacts to these species at broader spatial and temporal scales within and beyond the action area due to the localized and temporary nature of the proposed dredging activities, there is a chance any of the listed species could be present during construction.

These species of sea turtles are known to use large channels along the Gulf of Mexico, however they are not likely to be present in the South Pass (proposed restoration project action area), emergent marsh or open water of the proposed restoration action area. The proposed restoration project's activities will involve the use of a floating bucket dredge to create a crevasse. While dredging activities associated with the crevasse clean out could result in temporary increases in turbidity, the turbidity would be within the open water and emergent marsh targeted for restoration (i.e. not South Pass). Construction noise would also be localized and temporary. South Pass does not harbor extensive sea grass beds that may be used as foraging habitats, thus foraging habitat loss is not an expected impact.

The Gulf sturgeon can occur in river systems and nearshore bays and estuaries depending upon the life stage of the species and season. The pallid sturgeon is found in large, turbid, free-flowing riverine habitats including the Mississippi River and the Atchafalaya watershed. The proposed project action area is located at the coastal end of the Mississippi River in tidally influenced riverine waters. Potential temporary and localized direct impacts for these sturgeons from the proposed project activities include potential temporary avoidance of the immediate project vicinity due to construction noise and activities. Although the proposed project activities may temporarily increase local turbidity, increased turbidity is not anticipated to adversely affect this species.

The proposed project is located in a parish where the West Indian manatee may occur (LDWF 2018). The same localized temporary impacts of turbidity and noise from the dredging activities are anticipated for the West Indian manatee; that may result in temporary avoidance of the proposed project action area.

Piping Plovers and Red Knots seasonally occur in coastal areas in Louisiana. Piping Plover habitat includes intertidal portions of ocean beaches, wash over areas, mudflats, sand flats, algal, flats, shoals, wrack lines, sparse vegetation, shorelines of coastal ponds, lagoons, ephemeral pools, and areas adjacent to salt marshes but not within the salt marsh. Red Knot habitat includes intertidal marine habitats near coastal inlets, estuaries, and bays, or along resting formations. Piping Plover or Red Knot wintering habitat do not occur or are sparse in the proposed project area. Therefore, the proposed project is not expected to adversely affect these species.

Best management practices would be utilized, where appropriate, to minimize and avoid any potential impacts to threatened or endangered species within the proposed restoration project action area.

5.2.4 EFH, Wetlands, Subtidal and Intertidal Flats

No Action
EFH in the East Bay nesting island and crevasse clean out project area is estuarine emergent wetlands, submerged aquatic vegetation, estuarine water column, and mud, sand, shell and rock substrates. Under the MSA, wetlands and associated estuarine waters in the crevasse cleanouts and the construction of the bird nesting island project area are identified as EFH for postlarval/juvenile and subadult brown shrimp; postlarval/juvenile and subadult white shrimp; and postlarval/juvenile, subadult, and adult red drum. With no action, there would be no restoration that enhances EFH via the clean out of crevasses that extend their associated functional values as emergent wetlands and would not create an island that enhances edge habitat for fisheries species.

Preferred Alternative
The cleanout of existing crevasses is expected to have short-term impacts to EFH during construction. Short-term impacts include displacement of EFH species during the crevasse cleanouts, as well as a short-term increase in turbidity above normal levels. However, the crevasse cleanouts would have long-term benefits to EFH, as the cleanouts are intended to extend the functional value of the crevasses by continuing to trap suspended sediment within the splay, which will in turn increase the elevation to become suitable for the natural recruitment of marsh vegetation. The functional value of herbaceous wetlands (i.e. marsh) is well documented in the scientific literature to have a positive effect on water and sediment quality (e.g., increased water filtration and sediment suitable for a variety of benthic invertebrates), as well as improving the estuarine food web. The crevasse cleanouts would continue to provide valuable habitat that support a diverse assemblage of estuarine-dependent fish, shell-fishes and EFH species by providing marsh edges and forage for a variety of fish and wildlife. Example fisheries species that would benefit from the crevasse splay cleanouts are red drum, blue crab, brown shrimp and white shrimp.

The construction of the bird nesting island would have short-term adverse impacts to intertidal and/or subtidal mud flats through the direct placement of dredged material. EFH species would be displaced during construction. However, the establishment of a new island would create edge habitat important for EFH species.

5.2.5 Fisheries

No Action
With no action, there would be long-term adverse impacts to fisheries, as productivity improvements associated with the crevasse splay cleanouts would not extend the splay marsh functions. Additional edge habitat created by the construction of the bird nesting island would not occur, which would not increase fisheries habitat and productivity.

Preferred Alternative
The cleanout of existing crevasses is expected to have short-term impacts to fish in the project area during construction. Short-term impacts include displacement of fish species during the crevasse cleanouts, as well as a short-term increase in turbidity above normal levels. However, the crevasse cleanouts would have long-term benefits to fisheries, as the cleanouts are intended to extend the functional value of the crevasses by continuing to trap suspended sediment within the splay, which will in turn increase the elevation to become suitable for the natural recruitment of marsh vegetation. This in turn would have a positive effect on water and sediment quality. The crevasse cleanouts would continue to provide valuable habitat that support a diverse assemblage of estuarine-dependent fish by providing marsh edges and forage for a variety of fish and wildlife.

The construction of the bird nesting island would have short-term adverse impacts to intertidal and/or subtidal mud flats through the direct placement of dredged material, which would displace fish in the project area. However, the establishment of a new island would create edge habitat important for fish species.

5.2.6 Birds

No Action
With no action, there would be long-term adverse impacts to birds, as habitat improvements needed to restore for injured resources resulting from the Incident would not be implemented.

Preferred Alternative
The proposed bird nesting island would provide approximately 125 gull nests and 188 tern nests per acre of island habitat, with other bird species also benefiting (e.g approximately 500 black skimmer nests). Because the current project area is intertidal and/or subtidal, there are no anticipated impacts associated with the placement of material to create the bird nesting island. However, there may be short-term adverse impacts to birds in the form of displacement at the crevasse splay clean outs during construction. The Trustees anticipate long-term benefits to birds at the crevasse clean outs based on the enhanced and extended functions of the crevasses, such as improved food web for birds.

5.2.7 Wildlife

No Action

With no action, there would be a loss of wildlife habitat associated with marsh erosion over time and habitat loss. The loss of this habitat would reasonably be expected to displace wildlife and reduce the associated food web. Potential wildlife species that would be negatively impacted over time due to the loss of marsh habitat include nutria, muskrat, mink, river otter, raccoon, American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle, bullfrog, southern leopard frog, and Gulf coast toad.

Preferred Alternative
Machinery and equipment used during the clean out of crevasses could temporarily disturb wildlife in the vicinity. Impacts on mobile species are expected to be minor, consisting of short-term displacement. No wildlife impacts are anticipated during construction of the bird nesting island. Overall, the proposed crevasse clean outs and bird nesting island project would reasonably be expected to provide direct benefits to wildlife species that currently utilize the splay marsh and that could utilize the constructed bird nesting island. Wildlife species that prey on benthic invertebrates and fisheries would benefit from the increased fisheries productivity associated with edge habitat at the bird nesting island and continued habitat functions at the crevasse splays.

5.2.8 Public Access/Recreation

No Action
No action would have no effect to public access or recreation, as the public would still have access to PALWMA, with continued recreational uses.

Preferred Alternative
Habitat improvements associated with the crevasse clean outs and bird nesting island creation in the PALWMA are expected to have a short-term impact on recreation, namely fishing, in the near proximity of construction. Given the vast size of the PALWMA, the small size of the anticipated construction and ample fishing opportunities, the Trustees do not anticipate more than minor adverse impacts to recreation associated with the crevasse clean out and construction of the bird nesting island. Recreational fishing could reasonably be expected to improve in the proximity of the crevasse splay as the marsh forms and begins to properly function. Specifically, the marsh is expected to improve productivity and access for fish, both of which could enhance recreational fishing opportunities.

There are no anticipated impacts to public access of the levees that would be breached during construction, as access to the levees is by boat only. Fishing from levees in the more remote areas of the PALWMA is not a preferred technique, when compared to boats.

5.2.9 Historic and Cultural Resources

No Action
No action would not result in impacts to historic and cultural resources, as ground disturbing work that could impact such resources would not occur.

Preferred Alternative

The Louisiana Department of Culture, Recreation and Tourism maintains catalogues of cultural resource sites. A review by the Louisiana Office of Cultural Development, Division of Archeology indicated that archaeological sites are not located within the proposed project areas. The Federal Trustees will review this project under Section 106 of the National Historic Preservation Act to complete any necessary consultation.

5.3 Genetic Stock Assessment of Pantropical Spotted Dolphins

The proposed pantropical spotted dolphin genetic stock assessment restoration actions included in this Draft DARP/EA would occur in the open ocean of the United States Gulf of Mexico. There could be some short-term and localized impacts associated with capturing pantropical spotted dolphins for genetic sampling, though not significant, as described below. Other offshore natural resources (e.g., fisheries, plankton, marine vegetated communities) are not expected to be impacted.

5.3.1 Sound, Visual, and Air Quality

No Action
No action would not impact sound, visual or air quality, as no survey work would occur that could raise ambient noise levels, temporarily alter the open ocean viewscape or change air quality conditions.

Preferred Alternative
Survey vessels and equipment associated with the proposed pantropical spotted dolphin genetic stock assessment project would utilize vessels that already operate in the Gulf of Mexico regularly. An increase in noise associated with the proposed project is not expected. Additionally, the vessels would operate offshore and not diminish the visual quality of the open ocean in the Gulf of Mexico. However, the vessels used for the proposed project would reasonably be expected to emit a variety of air pollutants, including nitrogen oxides, sulfur oxides and carbon monoxide from combustion of fossil fuels for propulsion and power generation. Due to the limited extent and duration of the proposed project, the amount of air pollutants generated would be minor and all vessels would follow existing federal compliance requirements. Additionally, emissions would be distributed over a broad area in the Gulf of Mexico generally far from shore and likely would not result in any elevated pollutant concentrations exceeding air quality standards.

5.3.2 Water and Sediment Quality

Because the proposed project would occur in the open ocean of the Gulf of Mexico, there are no anticipated impacts to water and sediment quality under the no action and preferred alternatives.

5.3.3 Endangered and Threatened Species

No Action
No action would not result in beneficial or negative impacts to species listed as threatened or endangered under the Endangered Species Act (16 FWSC. 1531 et seq.).

Preferred Alternative
The proposed pantropical spotted dolphin project would entail a 30-day dedicated biopsy sampling survey effort in the north-central and western Gulf of Mexico waters (200–2000 m deep). The proposed project may have short-term, minor adverse impacts on protected species as project activities include nonlethal takes of pantropical spotted dolphins associated with biopsy sampling. However, the proposed project is expected to benefit these species by providing a comprehensive examination of population structure. The proposed project would inform decisions to better manage the species. Specifically, the goal of the MMPA is to maintain each stock at an abundance level that allows it to remain a functioning part of the ecosystem. Under the MMPA, stock abundance must be maintained at or above the optimal sustainable population level, which is the number of animals that results in the maximum productivity of the population stock. Accurate population delineation is important for assessing stock abundance, distribution, seasonal movements, stressors, and impacts of those stressors. Furthermore, identifying stocks and stressors would inform future restoration actions that could address future impacts and restore populations. All proposed work would be consistent with the MMPA research permits held by the NOAA Southeast Fisheries Science Center.

Because the proposed project is specifically focused on pantropical spotted dolphins, there are no anticipated adverse impacts to EFH or other ESA species described in Section 2 of this Draft DARP/EA.

5.3.4 Public Access/Recreation

Because the proposed project would occur from a research vessel in the open ocean of the Gulf of Mexico, there are no anticipated impacts to public access or recreation.

5.3.5 Historic and Cultural Resources

Because the proposed project would occur from a research vessel in the open ocean of the Gulf of Mexico, there are no anticipated impacts to historic or cultural resources.

5.4 Cumulative Impacts

Under NEPA, federal agencies are required to consider the cumulative effects of their proposed actions within the affected environment. Cumulative impacts are the collective result of the incremental impacts of an action that, when added to the impacts of other past, present, and reasonably foreseeable future actions, would affect the same resources, regardless of what agency or person undertakes those actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 C.F.R. § 1508.7). Although the impacts of individual actions taken separately might be minor, the impact of those same actions taken together may be significant for one or multiple resources.

A cumulative impacts analysis focuses on the resources rather than the planned action and considers impacts that take place on both spatial and temporal scales. On a spatial basis, impacts must be considered both within and outside the proposed project area. Time scales for a cumulative impacts analysis are generally longer than project-specific analysis of impacts.

The Trustees have reviewed potential past, present, and reasonably foreseeable actions to assess the potential for cumulative impacts. In this Draft DARP/EA, the Trustees considered the potential cumulative impacts of both the No-Action Alternative and the Preferred Alternative in light of restoration planning efforts and opportunities in the region.

5.4.1 No Action

No action would contribute to the cumulative loss of aquatic and terrestrial habitat (e.g. marsh and bird nesting habitat) resources throughout coastal Louisiana. Although there are many efforts underway throughout coastal Louisiana through various programs, such as CWPPRA and other NRDA efforts such as Deepwater Horizon, no action would contribute to a degrading baseline which would reasonably be expected to cause adverse impacts to aquatic and terrestrial resources. Additionally, no action would not provide important species information for pantropical spotted dolphins that would enable the resource managers to make informed decisions for the benefit of the species. Relative to the magnitude of adverse ecological impacts that currently exist in the affected area, the adverse cumulative impacts of the No Action Alternative are not expected to be significant.

5.4.2 Preferred Alternative

The preferred restoration actions taken together will be cumulative in the sense that creation and enhancement of aquatic and terrestrial resources will provide ecological services into the future. Additionally, the genetic stock assessment of pantropical spotted dolphins will enhance management of the species throughout the northern Gulf of Mexico. Because these restoration actions are intended to compensate the public for resource injuries caused by the Incident, their cumulative impacts are expected to be long-term and beneficial. Based on the environmental analysis conducted herein, the Trustees do not anticipate any negative cumulative impacts as a result of implementing the proposed restoration action. Cumulative project impacts would not be significant or occur at a regional scale.

5.5 Preliminary Finding of No Significant Impact

Based on the analysis of the available information presented in this document, the Federal Trustees have preliminarily concluded that implementation of the preferred restoration actions, as proposed herein, would not significantly impact the quality of the human environment. All potential beneficial and adverse impacts have been considered in reaching this conclusion. Unless information indicating the potential for significant impacts is revealed through the public review and comment process on this Draft DARP/EA, an EIS will not be prepared for the proposed restoration action. Issuance of a FONSI based upon a Final Environmental Assessment would fulfill and conclude all requirements for compliance with NEPA by the Federal Trustees.

6.0 COMPLIANCE WITH OTHER AUTHORITIES

6.1 Laws

The following federal, state, and local laws, regulations, and policies may affect completion of the preferred restoration actions. All project sponsors that receive natural resource damage funding will be responsible for obtaining necessary permits and complying with relevant local, state, and federal laws, policies, and ordinances.

6.1.1 Federal Laws

Coastal Zone Management Act (CZMA), 16 U.S.C. § 1451, et seq., and CZMA Regulations, 15 C.F.R. Part 923

The goal of the CZMA is to preserve, protect, develop and, where possible, restore and enhance the nation's coastal resources. The federal government provides grants to states with federally approved coastal management programs. Section 1456 of the CZMA requires that any federal action inside or outside of the coastal zone shall be consistent, to the maximum extent practicable, with the enforceable policies of approved state management programs. No federal license or permit may be granted without giving the state the opportunity to concur that the project is consistent with the state's coastal policies. The regulations outline the consistency procedures that will be followed by the Trustees. The Trustees believe that the restoration projects selected for implementation will be consistent with the Louisiana CZMA program, and will seek concurrence from the state.

Federal Water Pollution Control Act, 33 U.S.C. § 1251 et seq. (also known as the Clean Water Act or CWA)

The CWA is intended to protect surface water quality, and regulates discharges of pollutants into waters of the United States. All selected projects will comply with CWA requirements, including obtaining any necessary permits for proposed restoration actions. Restoration actions that move material in or out of waterways and wetlands, or result in alterations to a stream channel, typically require CWA Section 404 permits. The implementing entity will be required to obtain the appropriate permits before any such restoration work begins.

As part of the Section 404 permitting process, consultation under the Fish and Wildlife Coordination Act, 16 U.S.C. § 661 et seq. generally occurs. This act requires that federal agencies consult with the Service, the (NMFS), and state wildlife agencies to minimize the adverse impacts of stream modifications on fish and wildlife habitat and resources.

Compliance with the Rivers and Harbors Act, 33 U.S.C. §401 et seq., generally occurs as part of the Section 404 permitting process. The Rivers and Harbors Act prohibits unauthorized obstruction or alteration of navigable waters. Any required permits under the Rivers and Harbors Act are generally included with the Section 404 permitting process.

Clean Air Act (CAA) of 1970, as amended, 42 U.S.C. § 7401 et seq.

The CAA regulates air emissions from stationary and mobile sources to protect human health and the environment. Any activities associated with the proposed restoration actions that result

in air emissions (such as construction projects) will be in compliance with the CAA and any local air quality ordinances.

Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. § 1531 et seq.
The federal ESA was designed to protect species that are threatened with extinction. It provides for the conservation of ecosystems upon which these species depend and provides a program for identification and conservation of these species. Federal agencies are required to ensure that any actions are not likely to jeopardize the continued existence of a threatened or endangered species. Federally listed endangered, threatened, and candidate species that would occur in the proposed restoration locations are listed in Section 3 along with a discussion of how the proposed actions might affect them in Section 5.

Fish and Wildlife Conservation Act, 16 U.S.C. § 2901 et seq.
The Fish and Wildlife Conservation Act authorizes financial and technical assistance to state governments to develop, revise, and implement conservation plans and programs for nongame fish and wildlife. The Trustees will seek to coordinate their restoration efforts with relevant conservation plans and programs in the State of Louisiana.

Fish and Wildlife Coordination Act, 16 U.S.C. § 661 et seq.
The Fish and Wildlife Coordination Act authorizes the involvement of the Service in evaluating impacts to fish and wildlife from proposed water resource development projects. Federal agencies that construct, license, or permit water resource development projects are required to consult with the Service, and in some instances with NMFS, concerning the impacts of a project on fish and wildlife resources and potential measures to mitigate these impacts. The Trustees will engage in coordination if relevant to any of their restoration actions.

Information Quality Act of 2001 (guidelines issued pursuant to Public Law 106-554)
As the lead federal natural resources Trustee for this document, the Service confirms that this information product meets its Information Quality Act guidelines, which are consistent with those of the USDOI and the Office of Management and Budget.

Magnuson-Stevens Act Fishery Conservation and Management Act, as amended, 16 U.S.C. § 1801 et seq.
Coordination with the NMFS and preparation of an Essential Fish Habitat (EFH) Assessment signifies compliance with the EFH provisions of the Magnuson-Stevens Act. The Trustees will engage in coordination if relevant to any of the proposed restoration actions.

Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1326, 1371-1384 note, 1386-1389, 1401-1407, 1411-1418, 1421-1421h.
The MMPA prohibits the "take" of marine mammals, with certain exceptions, in waters under United States jurisdiction and by United States citizens on the high seas. Under Section 3 of the MMPA, "take" is defined as "harass, capture, hunt, kill, or attempt to harass, capture, hunt, or kill any marine mammal." "Harassment" is defined as "any act of pursuit, torment, or annoyance that has the potential to injure marine mammal stock in the wild; or has the potential to disturb marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering." NOAA's SE Fisheries Science Center

would conduct the proposed marine mammal project pursuant to MMPA permit 21938 issued to the SE Fisheries Science Center.

Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. § 703−712
The Migratory Bird Treaty Act protects all migratory birds and their eggs, nests, and feathers and prohibits the taking, killing, or possession of migratory birds. The proposed restoration actions will not result in the taking, killing, or possession of any migratory birds.

Migratory Bird Conservation Act, 16 U.S.C. § 715 et seq.
The Migratory Bird Conservation Act established a commission and conservation fund to promote the conservation of migratory waterfowl and offset or prevent serious loss of important wetlands and other waterfowl habitat. The Migratory Bird Conservation Fund could potentially provide a source of additional funding to expand on Trustee efforts to conserve or restore migratory waterfowl habitat.

National Historic Preservation Act (NHPA) of 1966, as amended, 16 U.S.C. § 470 et seq.
NHPA is intended to preserve historical and archaeological sites. Compliance with the NHPA will be undertaken through consultation with the Louisiana State Historic Preservation Office. If an eligible historic property is within the area of a proposed restoration project, then an analysis will be made to determine whether the project will have an adverse effect on this historic property. If the project will have an adverse effect on historic properties, then the Trustees proposing the restoration action will consult with the State Historic Preservation Office to minimize the adverse effect.

Occupational Safety and Health Act (OSHA) of 1970, as amended, 29 U.S.C. §651 et seq.
OSHA governs the health and safety of employees from exposure to recognized hazards, such as exposure to toxic chemicals, excessive noise, mechanical dangers, and unsanitary conditions. All work conducted on the selected restoration actions will comply with OSHA requirements.

Watershed Protection and Flood Prevention Act as amended, 16 U.S.C. 1001 et seq.
Floodplain impacts were considered prior to the Trustees' identification of the preferred restoration actions and are expected to be positive. As required for permits, final project design plans will be submitted to state and federal regulators.

6.1.2 State Laws

Louisiana Oil Spill Prevention and Response Act (OSPRA) (La. Rev. Stat. §30:2451 et seq.)
Louisiana's OSPRA established LOSCO, created the position of Oil Spill Coordinator as the state's lead administrator on oil spill matters, and charged that office with the authority to assess natural resources damages. Designated state natural resource trustees under OSPRA are LOSCO, LDEQ, LDNR, LDWF, CPRA. These agencies are jointly responsible for assessing injuries to natural resources and services resulting from unauthorized discharges of oil, and ensuring that the public is made whole for the losses of natural resources and services through the restoration, replacement, or acquisition of the equivalent of the injured resources. The Trustees have conducted this assessment in accordance with the OPA and OSPRA regulations.

Management of State Lands (La. Rev. Stat. §41:1701.1 et seq.)
This statute provides authority for the management of state lands. This statute creates provisions regarding permitting, land reclamation, and usage of land and water bottoms belonging to the state. The Trustees will coordinate with these agencies as necessary regarding the construction of any proposed restoration actions on state owned lands and water bottoms.

Archaeological Finds on State Lands (La. Rev. Stat. §41:1605)
This statute provides for the permitting of all activities that fall within sites of archaeological importance on state lands. No activity shall commence within these sites without obtaining a permit from the Louisiana Department of Culture, Recreation, and Tourism. The Trustees will ensure permits are obtained where required.

Act 8 of the First Extraordinary Session of 2005 (Act 8) (La. Rev. Stat. §49: 214.1 et seq.)
This Act mandated the integration of hurricane protection activities (e.g., levee construction) and coastal restoration activities (e.g., river diversions or marsh creation) and the creation of a Coastal Master Plan setting forth a comprehensive planning approach for these activities in order to address the needs of the whole coastal system. Act 8 also created the Coastal Protection and Restoration Authority (CPRA) and tasked it with oversight of these activities. The Office of Coastal Protection and Restoration (OCPR) was designated as the implementation arm of the CPRA. To avoid confusion, the 2012 Louisiana Legislature changed the name of the state agency from OCPR to CPRA. The CPRA Board, with the assistance of CPRA, is also required by Act 523 of the 2009 Regular Legislative Session, amended by Act 604, to produce an Annual Plan that inventories projects, presents implementation schedules for these projects, and identifies funding schedules and budgets.

Louisiana State and Local Coastal Resources Management Act (SLCRMA) (La. Rev. Stat. §49:214.21 et seq.)
The purpose of this Act is to protect, develop, and, where feasible, restore or enhance the resources of the state's coastal zone. Under SLCRMA, the Office of Coastal Management (OCM) of LDNR is charged with implementing the Louisiana Coastal Resources Program (LCRP). The LCRP strives to balance conservation and resource use, aids in resolving user conflicts, encourages coastal zone recreational value, and determines the future course of coastal development and conservation. The statutes below are of particular interest to project planning and construction within the coastal zone.

- **Special Areas, Projects, and Programs (La. Rev. Stat. §49:214.29)**
  Special areas are designations by LDNR that have unique or valuable characteristics requiring special management practices. Special areas may include beaches, barrier islands, shell deposits, salt domes, or other geological areas of interest both to coastal habitat and infrastructure. The LDNR may set priorities to these areas, specifically for funding available under Section 308 of the federal CZMA (P.L. 92-583 as amended by P.L. 94-370). The Trustees will, to the maximum extent practicable, identify these sites for special consideration as they may pertain to the proposed restoration actions.

- **Coastal Use Permit (CUP) (La. Rev. Stat. §49:214.30)**

This statute stipulates that no entity shall commence a coastal use of state or local concern without acquiring a CUP through the LDNR/OCM. Parishes with an approved local program under La. Rev. Stat. § 49:214.28 can permit coastal activities of local concern. State permitting authority is still retained over uses of state concern in the coastal zone. The permit process is a means to ensure that project activities, especially dredging and filling, are done in accordance with the LCRP. Like most permits, the CUP provides for a public comment period and a public hearing. The Trustees will ensure that proper actions are taken to obtain if a CUP is needed for any of the proposed restoration.

- **Consistency Determination (La. Rev. Stat. §49:214.32)**
  This statute provides for the regulation of projects constructed within the coastal zone to be consistent with guidelines established under the CZMA (16 U.S.C. § 1451 et seq.) and SLCRMA (La. Rev. Stat. § 49:214 et seq.). Consistency determinations are provided by LDNR/OCM. The Trustees will ensure that no restoration moves forward without a favorable consistency determination, and complies with approved federal, state, and local coastal zone programs.

Title 56 (La. Rev. Stat. 56)
This title outlines the duties and authorities of LDWF. In addition, the Wildlife and Fisheries Commission is created within the Executive Branch, and is responsible for determining policy and rules governing the wildlife and fisheries populations throughout the state.

- **Fish Restoration and Management Projects (La. Rev. Stat. §56:25)**
  This statute provides that the state adhere to the provisions of 16 U.S.C. § 777 et seq., which requires the federal government to aid states in fish restoration and management projects. Furthermore, the Louisiana Wildlife and Fisheries Commission is authorized, empowered, and directed to perform such acts as may be necessary to conduct fish restoration projects as defined and stipulated by the Act. The Trustees will conduct restoration planning in accordance with this Act.

- **Civil Penalties for Restitution of Value of Wildlife and Aquatic Life (La. Rev. Stat. §56:40 et seq.)**
  This statute provides that LDWF may impose penalties on parties responsible for injury to, or unlawful capture of, wildlife and aquatic life. Furthermore, the Louisiana Wildlife and Fisheries Commission shall create procedures for determining the value of said injuries. The Trustees will ensure, to the greatest extent practicable, that selected restoration projects do not inflict injury on surrounding wildlife and aquatic life.

- **Wildlife Management Areas (La. Rev. Stat. §56:109)**
  This statute provides that LDWF establish, manage, and regulate use of wildlife management areas, preserves, refuges, and sanctuaries. Commercial activities and project construction within these areas are allowed at the consent of the department. The Trustees will coordinate with the department regarding any project activities that may fall within these designated areas.

- **Oysters and Oyster Industry (La. Rev. Stat. §56:421 et seq.)**

This section establishes the Oyster Task Force and regulations of the industry. In addition, this section establishes authority under LDWF to create a private leasing program within state water bottoms for the purpose of oyster cultivation. Lessee notification is required for any coastal activity located in close proximity to leased water bottom. The Trustees will coordinate with LDWF and/or private lessees regarding any part of the selected project that may impact private or public oyster grounds.

- **Management of Natural and Scenic River Systems (La. Rev. Stat. §56:1841 et seq.)** This statute provides for the establishment of the Natural and Scenic Rivers System under the authority of LDWF. This system is administered for the purposes of preserving, protecting, developing, reclaiming, and enhancing the wilderness qualities, scenic beauties, and ecological diversity of certain free-flowing streams. This statute provides criteria for classifying a scenic river system, and calls for the creation of a management plan for each system. The LDWF is responsible for plan implementation, and for reviewing permit requests to determine consistency with management objectives. The Trustees will coordinate with LDWF in regards to project planning in the vicinity of designated scenic river systems.

- **Threatened or Endangered Species Conservation (La. Rev. Stat. §56:1901 et seq.)** This section provides for LDWF to designate and conserve endangered or threatened species pursuant to the federal ESA (16 U.S.C. § 1531 et seq.). Species listed under this act are federally and state protected from unlawful sale, trade, or capture. Furthermore, the state has the authority to draft regulations regarding the permitting of such activities that may be harmful to listed species or their habitat. The Trustees will coordinate with LDWF regarding any part of the proposed restoration that may impact endangered or threatened species.

Water Quality Control (La. Rev. Stat. §30:2074 et seq.)

Under this statute, the LDEQ has the authority to manage and regulate discharges of waste materials and pollutants into any waters within the state. Furthermore, LDEQ provides water quality certifications for all activities involving discharge of fill material into state waters. This certification is required prior to construction and is granted in accordance with Section 404 of the federal CWA. Other water permits may be required for project construction depending upon the nature of the activity. The regulations governing the permitting process through LDEQ are provided under La. Admin. Code 33.I.1701. The Trustees will ensure that all appropriate permits are obtained prior to any project construction.

Louisiana Surface Water Quality Standards (LAC 33.IX, Chapter 11)

These regulations establish standards used as the basis for implementing water quality programs, including the procedures that LDEQ follows regarding the permitting of wastewater discharge into state waters. Permitting procedures follow general permitting guidelines stated under La. Admin. Code 33.I.1701, and are pursuant to La. Rev. Stat. § 30:2074 et seq. The Trustees will ensure that all appropriate permits are obtained prior to any project construction.

Coastal Management Regulations (LAC 43:I Chapter 7)

Pursuant to SLCRMA (La. Rev. Stat. § 49:214.21 et seq.), the LCRP regulations provide specific coastal use guidelines, rules, and procedures for CUPs and mitigation, regulations for development, approval, and consistency review of local coastal programs, and procedures for the designation, utilization, and management of special areas. The Trustees will ensure that these state provisions are adhered to and that any appropriate permits and determinations are acquired.

Oyster Lease Relocation Program (LAC 76:VII, Section 531).
The purpose of this Program is to reduce conflict between public coastal restoration projects and private oyster leases that may be impacted by the projects. The Program is voluntary and establishes four options from which the lessee may choose. A matrix determines relocation costs and the lease is reverted back to the state. The Trustees will investigate these regulations for its pertinence to the proposed restoration, and will consider any conflicts that may arise with private oyster leases as a result of these restoration actions.

6.2 Policies and Directives

6.2.1 Federal Policies and Directives

The following federal policies and Presidential Executive Orders may be relevant to the selected restoration projects in the proposed alternative:

Fish and Wildlife Service Mitigation Policy (Fish and Wildlife Service Manual, 501 FW 2)
This policy of the Service seeks to ensure "no net loss" of fish and wildlife habitat as a result of Service actions. The Trustees do not anticipate that any of the selected projects will result in adverse impacts to habitat.

Executive Order 11514 – Protection and Enhancement of Environmental Quality, as Amended by Executive Order 11911 Relating to Protection and Enhancement of Environmental Quality
These Executive Orders require federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the Nation's environment. These Executive Orders also require agencies to inform the public about these activities and to share data on environmental problems or control methods, as well as to cooperate with other governmental agencies. The actions described in this DARP/EA address the intent of these Executive Orders.

Executive Order 11593 - Protection and Enhancement of the Cultural Environment
Coordination with the State Historic Officer will signify compliance. Consultation is incorporated into the CWA Section 404 and 401 permitting process.

Executive Order 11988, 24 May 1977 amended by Executive Order 12148, 20 July 1979 – Floodplain Management
This Executive Order directs federal agencies to avoid the occupancy, modification, and development of floodplains, when there is a practical alternative. For all projects, the Trustees will work to ensure that any floodplain impacts are minimized. Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a)(2). Consultation is incorporated into the CWA Section 404 and 401 permitting process.

Executive Order 11990 – Protection of Wetlands

This Executive Order instructs federal agencies to avoid adverse impacts associated with destruction or modification of wetlands. The Trustees will work to ensure that projects minimize any wetlands impacts. Public notice of the availability of this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b). Consultation is incorporated into Sec. 404 and 401 permitting process.

Executive Order 12898 – Environmental Justice

This Executive Order instructs federal agencies to assess whether minority or low-income populations will be disproportionately impacted by agency actions. In January 2021, the Executive Branch of the United States issued Executive Orders relating to Environmental Justice, and at the time of this writing, these Executive Orders are being reviewed and will be considered as the Trustees move forward in developing and implementing the restoration projects. The Trustee agencies have not identified any disproportionate adverse impacts on human health or the environment for any environmental justice populations due to the implementation of the selected projects.

Executive Order 12962 – Aquatic Systems and Recreational Fisheries

This Executive Order requires that federal agencies, where practicable and permitted by law, work cooperatively to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities. The Trustee agencies worked cooperatively to identify potential projects that will benefit aquatic resources and recreational fishing opportunities, in compliance with the intent of this Executive Order.

Executive Order 13007 - Accommodation of Sacred Sites

This Executive Order is not applicable unless on federal lands, then agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

Executive Order 13045 - Protection of Children from Environmental Health Risks and Safety Risks

The selected projects in this Draft DARP will not create a disproportionate environmental health or safety risk for children.

Executive Order 13112 – Invasive Species

This Executive Order requires that federal agencies, where practicable and permitted by law, should identify any actions that may affect the status of invasive species and take actions to address the problem within their authorities and budgets. Agencies also are required not to authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species, unless a determination is made that the benefits of actions outweigh potential harms and measures are taken to minimize harm. None of the selected restoration projects will promote the introduction or spread of invasive species and several will reduce invasive species.

Executive Order 13186 – Protection of Migratory Birds

This Executive Order requires federal agencies to evaluate the effects of their actions on migratory birds, to take actions to avoid or minimize the impacts of their actions on migratory birds, and to help promote conservation of migratory birds if actions are likely to have a measurable negative effect on migratory bird populations. None of the projects selected are expected to have a negative effect on migratory bird populations.

Executive Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA (11 August, 1980)
Not applicable since the selected projects do not involve or impact agricultural lands.

DOI Departmental Manual, Parts 517 and 609 – Pesticides and Weed Control
Implementation of any of the projects described in this DARP/EA will be consistent with USDOI policy to use integrated pest management strategies for control of insect and weed pests. Pesticides or herbicides will only be used after a full consideration of other control alternatives; the material selected and method of application will be the least hazardous of available options.

DOI Departmental Manual, Part 518 – Waste Management
If implementation of any alternatives generates waste, the Trustees will comply with all relevant USDOI directives and policies.

DOI Departmental Manual, Part 602 – Land Acquisition, Exchange, and Disposal
If the federal government acquires any real property through implementation of these restoration projects, appropriate pre-acquisition standards – particularly the American Society for Testing and Materials standard for Environmental Site Assessments for Commercial Real Estate – will be complied with.

6.2.2 State and Local Policies

Selected restoration projects will consider and comply with other relevant state and local policies and directives.

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APPENDIX A: POTENTIAL RESTORATION ACTIONS CONSIDERED

Count	Project ID	Project Name	Parish	Region
1	225	Edward Wisner Marsh Creation	Lafourche	R2
2	246	Martin Shoreline Protection and Marsh Creation	Lafourche	R2
3	295	Goose Lake GIWW Armoring	Calcasieu	R4
4	296	Shell Ditch Restoration	Cameron	R4
5	320	Clovelly	Lafourche	R2
6	364	Freshwater Bayou Marsh Creation (ME-0031)	Vermilion	R4
7	373	La Branche East Marsh Creation (PO-0075)	St Charles	R1
8	475	Timbalier Bay Abandoned Canal Hurricane Protection	Lafourche, Terrebonne	R3
9	480	LL&E South Lafourche Marsh Restoration and Levee Protection	Lafourche	R2
10	484	Twin Pipeline Canal Ridge Restoration and Fringe Marsh Creation	Lafourche, Terrebonne	R2, R3
11	493	PPL20 - Lake Lery Marsh Restoration	St Bernard	R1, R2
12	500	Grand Isle and Vicinity Barrier Islands Protection and Enhancement	Jefferson, Lafourche	R2, R3
13	501	Lake Pontchartrain Shoreline Restoration - Little Woods area	Jefferson, Orleans, St Tammany, Tangipahoa	R1
14	502	Lake Pontchartrain Shoreline Restoration - South Shore	Jefferson, Orleans, St Tammany, Tangipahoa	R1
15	503	Lake Pontchartrain Shoreline Restoration - canal restoration Madisonville to Manchac	Jefferson, Orleans, St Tammany, Tangipahoa	R1
16	504	Bay Jimmy Marsh Restoration	Plaquemines	R2
17	535	Joyce Wildlife Management Area	Tangipahoa	R1
18	558	Restoration of finfish of importance to coastal Louisiana	Coastwide	CW
19	560	Marsh Restoration Project at Point Au Fer	Terrebonne	R3
20	571	Pelican Island Restoration Project	Plaquemines	R2
21	572	Delacroix Island Protection and Restoration: A Hurricane Protection and Community Resilience Project	St Bernard	R2

22	608	Big Branch Marsh National Wildlife Refuge	St Tammany	R1
23	622	Chef Menteur Restoration	Orleans	R1
24	632	Cameron Meadows Marsh Creation and Terracing (CS-0066)	Cameron	R4
25	633	No Name Bayou Marsh Creation and Nourishment (CS-0078)	Cameron	R4
26	635	South Grand Chenier Marsh Creation - Baker Tract (ME-0032)	Cameron	R4
27	636	North Turner's Bay Mitigation Area	Cameron	R4
28	637	Price Lake Marsh Nourishment		R4
29	752	Mississippi River long distance sediment pipeline/marsh creation - NRDA increment	Plaquemines	R2
30	803	Tchefuncte River Lighthouse Habitat Restoration & Shoreline Protection	St Tammany	R1
31	804	Sabine Marsh Creation Cycles 6 & 7 (CS-0081)	Cameron	R4
32	805	West Cove Marsh Creation and Nourishment (R4-CS-02)	Cameron	R4
33	811	Barataria Basin Ridge and Marsh Creation Project: Spanish Pass Increment (BA-0203)	Plaquemines	R2
34	812	LCA BUDMAT HNC Marsh Creation (Fill Area 1)	Terrebonne	R3
35	814	East Leeville Marsh Creation and Nourishment (BA-0194)	Lafourche	R2
36	815	Barataria Bay Rim Marsh Creation and Nourishment (BA-0195)	Jefferson, Plaquemines	R2
37	817	LaBranche Central Marsh Creation (PO-0133)	St Charles	R1
38	818	New Orleans Landbridge Shoreline Stabilization and Marsh Creation (PO-0169)	Orleans	R1
39	819	Fritchie Marsh Terracing and Marsh Creation (PO-0173)	St Tammany	R1
40	820	Bayou La Loutre Ridge Restoration and Marsh Creation (PO-0178)	St Bernard	R1
41	821	St. Catherine Island Marsh Creation and Shoreline Protection (PO-179)	Orleans	R1

42	822	North Catfish Lake Marsh Creation (TE-0112)	Lafourche	R3
43	823	Island Road Marsh Creation and Nourishment (TE-0117)	Terrebonne	R3
44	824	West Fourchon Marsh Creation (TE-0134)	Lafourche	R3
45	825	Bayou DeCade Ridge and Marsh Creation (TE-0138)	Terrebonne	R3
46	827	Bayou Grand Cheniere Marsh and Ridge Restoration (BA-0173)	Plaquemines	R2
47	828	Terracing and Marsh Creation South of Big Mar (BS-0024)	Plaquemines	R2
48	859	Protection, Establishment, and Restoration of Bird Nesting Islands and Colonies - Wax Lake Delta	Terrebonne	R3
49	866	Oyster Scaffold	Jefferson, Lafourche, Plaquemines, St Bernard, Terrebonne	R1, R2, R3
50	868	Northeast Turtle Bay Marsh Creation and Critical Area Shoreline Protection (BA-0206)	Jefferson	R2
51	870	Mangrove Bayou	Cameron	R4
52	872	South Pass Crevasse Cleanout and Spur	Plaquemines	R2
53	880	North Mud Lake Marsh Creation (PPL26 Candidate)	Cameron	R4
54	882	Oyster Lake Marsh Creation (CS-0079)	Cameron	R4
55	883	Calcasieu Lake & Sabine National Wildlife Refuge Living Shoreline	Cameron	R4
56	885	Wetlands Creation by Beneficial Use of Dredged Material, Port Fourchon	Lafourche	R2, R3
57	895	Bay St. Elaine Proposed Salt Marsh Restoration Project	Terrebonne	R3
58	896	Long Point Bayou Mash Creation (CS-0085)	Cameron	R4
59	897	South Pass Bird Island (MR-172)	Plaquemines	R2