APPENDIX T: USFWS COORDINATION ACT REPORT (CAR)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Louisiana Ecological Services
200 Dulles Drive
Lafayette, Louisiana 70506

January 20, 2021

Virginia Fay
Assistant Regional Administrator
NOAA Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701

Dear Ms. Fay:

Attached is the Draft Fish and Wildlife Coordination Act Report on the "Mid-Barataria Sediment Diversion Project". This report does not constitute the 2(b) report of the Fish and Wildlife Service (Service). The Service has incorporated your agency's comments into the draft report prior to its submission to the U.S. Army Corps of Engineers. Should your staff have any questions regarding this report, please have them contact Catherine Breaux (504/862-2689) of this office.

Sincerely,

Joseph A. Ranson
Field Supervisor
Louisiana Ecological Services

Attachment

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Louisiana Ecological Services
200 Dulles Drive
Lafayette, Louisiana 70506

January 20, 2021

Jack Montoucet
Secretary
Louisiana Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, Louisiana 70898-9000

Dear Mr. Montoucet:

Attached is the Draft Fish and Wildlife Coordination Act Report on the "Mid-Barataria Sediment Diversion Project". This report does not constitute the 2(b) report of the Fish and Wildlife Service (Service). The Service has incorporated your agency's comments into the draft report prior to its submission to the U.S. Army Corps of Engineers. Should your staff have any questions regarding this report, please have them contact Catherine Breaux (504/862-2689) of this office.

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Field Supervisor
Louisiana Ecological Services

Attachment

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Louisiana Ecological Services
200 Dulles Drive
Lafayette, Louisiana 70506

January 20, 2021

Colonel Murphy
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Murphy:

The Coastal Protection and Restoration Authority of Louisiana (CPRA) is proposing to construct, operate, and maintain the proposed Mid-Barataria Sediment Diversion Project (MBSD). The proposed project consists of a multi-component river diversion system intended to convey sediment, freshwater, and nutrients from the Mississippi River to the mid-Barataria Basin at River Mile (RM) 60.7 near the town of Ironton, Plaquemines Parish, Louisiana.

This report contains a description of existing fish and wildlife resources in the project area, discusses the Applicant's Preferred Alternative and the No Action Alternative habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MBSD project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) has coordinated with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF). Their comments have been incorporated into the draft report.

We appreciate the cooperation of your staff on this project. Should your staff have any questions regarding the enclosed report, please have them contact Ms. Catherine Breaux (504/862-2689) of this office.

Sincerely,

Joseph A. Ranson
Field Supervisor
Louisiana Ecological Services

Enclosures

cc: Environmental Protection Agency, Dallas, TX
CEMVN-PM-R
National Marine Fisheries Service, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
Coastal Protection and Restoration Authority (CPRA), Baton Rouge, La
Natural Resources Conservation Service, Alexandria, LA

Draft Fish and Wildlife Coordination Act Report
For the
MID-BARATARIA SEDIMENT DIVERSION PROJECT

SUBMITTED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
AND
COASTAL PROTECTIONS AND RESTORATION AUTHORITY

PREPARED BY
CATHERINE BREAUX
FISH AND WILDLIFE BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA
JANUARY 2020

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The Coastal Protection and Restoration Authority of Louisiana (CPRA or the Applicant) is proposing to construct, operate, and maintain the proposed Mid-Barataria Sediment Diversion Project (proposed MBSD Project or Project). The proposed Project consists of a multi-component river diversion system intended to convey sediment, freshwater, and nutrients from the Mississippi River to the mid-Barataria Basin. The Project would be located at River Mile (RM) 60.7 near the town of Ironton, Plaquemines Parish, Louisiana. After passing through a proposed intake structure complex at the confluence of the Mississippi River and the proposed intake channel, the sediment-laden water would be transported through a conveyance channel to an outfall area in the mid-Barataria Basin located in Plaquemines and Jefferson Parishes.

The regulatory authority of the U.S. Army Corps of Engineers (USACE) includes, but is not limited to, Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (CWA) (collectively referred to as "Section 10/404"). Those Acts authorize the Secretary of the Department of the Army (DA), acting through the Chief of Engineers, to regulate: (1) activities and structures in navigable waters of the U.S., including construction, excavation, or deposition of materials in, over, or under such waters, or any work that would affect the course, location, condition, or capacity of those waters; and (2) the discharge of dredged or fill material into wetlands and other waters of the U.S. at specific disposal sites. In addition, Section 408 of the Rivers and Harbors Act of 1899 authorizes the DA, through the Chief of Engineers, to grant permission for the alteration, occupation, or use of a USACE civil works project, if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project.

This report contains a description of existing fish and wildlife resources in the project area, discusses the future with the Applicant's Preferred Alternative or APA and the future with the No Action Alternative or NAA habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MBSD project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) has coordinated with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF). Their comments are incorporated into the draft report.

As currently described, the Applicant's Preferred Alternative (APA) consists of a controlled sediment and freshwater intake diversion structure in Plaquemines Parish on the right descending bank of the Mississippi River at RM 60.7, with a conveyance channel that would discharge sediment, freshwater, and nutrients from the Mississippi River into the Mid-Barataria Basin in Plaquemines and Jefferson Parishes (Figure 2). An outfall transition feature would be included that gradually transitions the conveyance channel to the natural ground within the basin, which would help facilitate sediment dispersal away from the diversion and reduce velocities to limit scour at the end of the structure. The conveyance channel would cross Louisiana Highway 23 (LA

23) and the New Orleans Gulf Coast (NOGC) Railroad, and alter a portion of the Mississippi River and Tributaries (MR&T) Project, Mississippi River Levee (MR Levee), and the future New Orleans to Venice, Louisiana Non-Federal Levee (NOV-NFL). When operational, the APA could discharge up to 75,000 cfs of sediments, freshwater, and nutrients into the mid-Barataria Basin during periods when Mississippi River flows exceeds 450,000 cfs at Belle Chasse, Plaquemines Parish, Louisiana. The structure is designed to discharge 75,000 cfs when the Mississippi River flow is at 1,000,000 cfs. When Mississippi River flows are below 450,000 cfs at Belle Chasse, the proposed APA would maintain a background (base) flow of up to 5,000 cfs to protect, sustain, and maintain newly vegetated or recently converted fresh, intermediate, and brackish marshes near the diversion outflow.

Coastal marshes are considered by the Service to be aquatic resources of national importance due to their increasing scarcity and high habitat value for fish and wildlife within Federal trusteeship (i.e., migratory waterfowl, wading birds, other migratory birds, threatened and endangered species, and interjurisdictional fisheries).

The MBSD project anticipates benefiting the Barataria Basin with a basin wide increase of 12,684 marsh acres and near field (e.g., close proximity to the outfall) increase of 13,151 marsh acres (3,848 AAHUs) over the 50-year period of analysis. The near field area (13,151 acres) focuses on a smaller lower-salinity portion of the basin (primarily an area of wetland gain) near the diversion outfall. The larger basin benefits (12,684 net marsh acres) include the lower basin brackish and saline marsh losses, which offsets some of the fresh/intermediate gains seen in the diversion outfall area resulting in an overall smaller net wetland gain across the basin than when compared to the near field area alone.

The APA would directly impact 182.9 acres of jurisdictional wetlands and 266.3 acres of vegetated shallows (SAV) and other waters of the U.S. As previously mentioned for unavoidable impacts, compensatory mitigation is required to replace the loss of jurisdictional wetland function and area. Of the 182.9 acres (-135.7 Average Annual Habitat Units (AAHUs)) of total permanent direct wetland impacts, 21.6 acres (-12.1 AAHUs) are of bottomland hardwood forest, 151 acres (-102.4 AAHUs) are of wet pasture, and 10.3 acres (-21.2 AAHUs) are of scrub/shrub (Table 4). The Project is expected to benefit (nourish and restore) 13,151 acres (3,848 AAHUs) of marsh. Project benefits far outweigh the permanent loss in existing wetland function; thus offsetting the need for compensatory mitigation.

Because sediments, freshwater, and nutrients transported by the Mississippi River would be diverted up river from the Birdfoot Delta of the Mississippi River, the Birdfoot Delta would experience an additional projected indirect loss of 2,891 acres of wetlands by 2070 when compared with the No Action alternative. Changes in land area in the Birdfoot delta between the Applicant's Preferred Alternative and the No Action Alternative would be relatively minor (3 to 6 percent in operational years 2030 to 2060). The expected total project benefits would far outweigh the indirect negative impacts to the Birdfoot Delta. However, of the loss to the Birdfoot Delta a portion, 926 acres of marsh is projected to be lost in the Delta National Wildlife Refuge (Delta NWR) and 37 acres of marsh on the Pass-A-Loutre Wildlife Management Area (PAL

WMA) because of the reduced sediment being delivered to the area.

The Service supports the MBSD project provided that the following fish and wildlife recommendations are carried out concurrently with project implementation:

1. The Service recommends the construction of crevasse projects that may include terracing to offset the indirect loss of 926 acres on the Delta NWR and 37 acres on the Pass-A-Loutre (PAL) WMA. Funding for these crevasse projects is currently available from a variety of sources, including the Coastal Wetland Planning, Protection and Restoration Act ("CWPPRA"), but should funding not be available through those sources to implement the crevasse projects, funding should be secured through Operations and Maintenance costs associated with the project or set aside in the Monitoring and Adaptive Management Plan to ensure wetlands losses in Delta NWR and PAL WMA will be addressed. Any CWWPPRA funding for these crevasse projects should be in addition to, and should not displace, CWPRRA funding that would otherwise be used to implement crevasse projects in Delta NWR and PAL WMA. The Service recognizes that the Birdfoot Delta Hydrologic Restoration Project, the Engineering and design of which were funded pursuant to Deepwater Horizon Oil Spill, Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #7: Wetlands, Coastal and Nearshore Habitats and Birds (November 2020), will, if funded for implementation, provide further benefits to the Delta NWR and PAL WMA and offset the indirect losses on those resources from the MBSD. For additional information on possible projects/plans, associated permits, and for all activities occurring on the Delta NWR, please coordinate with this office and the Southeast Louisiana Refuges by contacting Barret Fortier (985.882.2011, barret_fortier@fws.gov), and for similar information on any activities planned for Pass a Loutre WVA contact LDWF, Mr. Vaughan McDonald 225-765-2708, atvmcdonald@wlf.la.gov).

2. The impacts to Essential Fish Habitat should be discussed with the NMFS to determine if the project complies with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Magnuson-Stevens Act; P.L. 104-297, as amended) and its implementing regulations.

3. In order to better coordinate and consider the overall health of the Barataria basin, the Service recommends that a basin-wide operations and basin monitoring data repository be developed. The data and conclusions should be readily available to help in the general coordination among diversion operators, within their authorizations, and to understand both adverse and beneficial impacts to the overall basin. The Service and other natural resource agencies should be involved in reviewing and commenting on this data repository.

4. Monitoring of the Davis Pond and Caernarvon Diversions indicated that some contaminants were being introduced into the receiving areas from the Mississippi River.

To address potential impacts of future contaminants on fish and wildlife resources, the Service recommends that pre and post sampling of fish and shellfish, from the outfall area and the Mississippi River be undertaken. The Service recommends that CPRA, in coordination with the Service, develop a list of contaminants to be analyzed. The list of contaminants to be analyzed would be taken from the most recent EPA Priority Pollutants and Contaminants of Concern (COC) list. Periodic post-operational sampling should start after sufficient time for potential contaminants to accumulate (i.e., 3 to 5 years) and the frequency of subsequent periodic sampling (e.g., 3 to 5 years) would be predicated upon levels of contaminants detected. Expansion of sampling to local nesting bald eagles, (e.g., fecal and blood samples analyzed for the same contaminants) would also be predicated upon the type and level of contaminants detected. If high levels of contaminants are found, the Service and other resource agencies should be consulted. This adaptive sampling plan should be developed in cooperation with the Service and other natural resource agencies and implemented prior to operation.

5. The Service recommends that consideration be given to operating the diversion in a manner that would prevent or minimize adverse impacts to wetlands due to prolonged inundation and focus on the overall enhancement of the entire project area to the greatest extent possible.

6. The Service recommends development of a detailed Monitoring and Adaptive Management (MAM) Plan to inform operational decisions in order to minimize adverse impacts where possible. The MAM plan should be developed through coordination with the Service, NMFS, and other resource agencies. At a minimum, the MAM Plan should address the following issues:

    a. Receiving area water levels should be monitored to minimize any potential adverse impacts such as inundation impacts (refer to Services' recommendation 5, which should be included as part of the MAM plan).
    b. The operational plan should include provisions for water level triggers to mitigate effects from coastal flood advisories during operation.
    c. Implementation of water quality sampling for concentrations of nutrients and dissolved oxygen prior to and during operation to help determine impacts from diverted water on nutrient concentrations and resulting water quality effects.
    d. Concentrations of EPA Priority Pollutants and Contaminants of Concern (COC) should be sampled in fish and shellfish from the outfall area and Mississippi River prior to and following operation to determine potential adverse effects to fish and wildlife. The frequency, intensity, and potential expansion of the sampling should be predicated upon contaminant levels detected (refer to the Services' Recommendation 4 which should be included in the MAM plan).
    e. There should be monitoring of below- and above- ground biomass to understand inundation and salinity effects on wetland health.
    f. Measurement of sediment accretion (water bottom and on the marsh surface) and bulk density should be conducted throughout the receiving area to provide the data

needed to optimize sediment delivery and distribution to receiving area wetlands.

g. MAM plan results (i.e., sedimentation, fishery, water quality monitoring, etc.) should be used to refine and improve future operations (refer to the Services' Recommendation 3).

7. The Service recommends adaptively managing the diversion outfall area to minimize stage increases and to maximize distribution and capture of suspended sediments within the immediate outfall area. This is needed to prevent the loss of diversion efficiency should diverted water attempt to circumvent the wetlands and flow directly into Wilkinson Canal or the Barataria Bay Waterway rather than flow over marsh where it will do the most good and ensure achieving project goals. Dredged material associated with achieving this recommendation should be beneficially used to create, restore, or enhance marsh within the basin or surrounding areas.

8. A report documenting the status of implementation, operation, maintenance and adaptive management measures should be prepared every three years by the managing agency and provided to the USACE, the Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Louisiana Department of Natural Resources, Louisiana Coastal Protection and Restoration Authority, and the Louisiana Department of Wildlife and Fisheries. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

9. Further detailed planning of project features and any adaptive management and monitoring plans should be developed in coordination with the Service and other State and Federal natural resource agencies so that those agencies have an opportunity to review and submit recommendations on work addressed in those reports and plans.

10. The pallid sturgeon is found in the Mississippi River and is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Entrainment associated with the diversion of river water to coastal estuaries is a potential effect that should be addressed in coordination with the Service. The Service recommends consultation under the Endangered Species Act (ESA) with this office for pallid sturgeon.

11. West Indian manatees occasionally enter Louisiana coastal waters and streams during the warmer months (i.e., June through September). During in-water work in areas that potentially support manatees all personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and state law. Additionally, personnel should be instructed not to attempt to feed or otherwise interact with manatees, although passively taking pictures or video would be acceptable. For more detail on avoiding contact with manatees refer to the Endangered and

Threatened Species section of this document and contact this office. Should a proposed action directly or indirectly affect the West Indian manatee, further consultation with this office will be necessary.

12. If implementation of the proposed action has the potential to directly or indirectly affect the red knot, piping plover, and eastern black rail or their habitat, further consultation with this office will be necessary.

13. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of project features and timing of construction. During project construction, a qualified biologist should inspect the proposed construction site for the presence of documented and undocumented wading bird nesting colonies and bald eagles.

    a. All construction activity during the wading bird nesting season (February through October 31 for wading bird nesting colonies, exact dates may vary) should be restricted within 1,000 feet of a wading bird colony. If restricting construction activity within 1,000 feet of a wading bird colony is not feasible, CPRA should coordinate with FWS to identify and implement alternative best management practices to protect wading bird nesting colonies.
    b. During construction activities, if a bald eagle nest is within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

14. The Service recommends that CPRA and the USACE contact the Service and LDWF for additional consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat, 3) the action is modified in a manner that causes effects to listed species or designated critical habitat, or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made or finalized.

We appreciate the cooperation of your staff on this project and look forward to our continued coordination to further protect fish and wildlife resources. Provided that the above recommendations are included in the project report and related authorizing documents, the Service fully supports the construction and implementation of the MBSD project. If you need additional assistance or have questions regarding this report, please contact Cathy Breaux (504/862-2689) of this office.

INTRODUCTION

The Coastal Protection and Restoration Authority of Louisiana (CPRA or the Applicant) is proposing to construct, operate, and maintain the proposed Mid-Barataria Sediment Diversion Project (proposed MBSD Project or Project). The proposed Project consists of a multi-component river diversion system intended to convey sediment, freshwater, and nutrients from the Mississippi River to the mid-Barataria Basin. The Project would be located at River Mile (RM) 60.7 near the town of Ironton, Plaquemines Parish, Louisiana. After passing through a proposed intake structure complex at the confluence of the Mississippi River and the proposed intake channel, the sediment-laden water would be transported through a conveyance channel to an outfall area in the mid-Barataria Basin located in Plaquemines and Jefferson Parishes.

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This report contains a description of existing fish and wildlife resources in the project area, discusses the future with the Applicant's Preferred Alternative or APA and the future with the No Action Alternative or NAA habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MBSD project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) has coordinated with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF). Their comments are incorporated into the draft report.

DESCRIPTION OF THE PROJECT AREA

The structural features of the proposed Project are located in south Louisiana on the west bank of the Mississippi River at RM 60.7 just north of the town of Ironton, and the anticipated outfall area for sediment, freshwater, and nutrients conveyed from the river is located within the mid-Barataria Basin (Figures 1 and 2). The proposed Project, located in parts of Jefferson, Plaquemines, and Lafourche Parishes, Louisiana, comprises the area within the hydrologic boundaries of the Barataria Basin, which is bounded by the Mississippi River on the east, Bayou

Lafourche on the west, and the Gulf of Mexico to the south. The Mississippi River itself beginning near RM 60.7 and extending to the mouth of the River is also included in the Project area. The adjacent Mississippi River Delta (or Birdfoot Delta) at the mouth of the Mississippi River is at the most southern part of the project area.

Wetlands in the upper part of the basin include swamp and forested wetlands around Lake Des Allemands, fresh marsh around Lake Salvador, and isolated stands of bottomland hardwoods along relict distributary ridges such as Bayou Barataria. Intermediate marsh is encountered south of Lake Salvador, and extends southward to the northern shoreline of Little Lake where brackish marsh becomes the dominant marsh type. Typically, toward the northern edge of Barataria Bay, those marshes grade into saline marsh. A chain of barrier islands and barrier headlands separates the Barataria Basin from the Gulf of Mexico.

The Barataria Basin was formed over 1,000 years ago as part of the Lafourche delta complex and is a sub-estuary within the Mississippi River deltaic plain (U.S. Fish and Wildlife Service [USFWS] 1987). Historically, wetlands in the Barataria Basin were nourished by the sediments, freshwater, and nutrients delivered via overbank flooding of the Mississippi River and through its many distributary channels such as Bayou Lafourche, Bayou Barataria, and Bayou Grand Cheniere. As the flow of sediments and freshwater from the Mississippi River was restricted by the construction of flood protection levees in the 1930s and the closure of Bayou Lafourche in 1904 (Conner et al. 1986), the basin began to gradually deteriorate from saltwater intrusion, subsidence, wave action, and sediment deprivation. Historically, Bayou Perot, and the longer, narrower Bayou Dupont-Bayou Barataria-Bayou Villars channels provided limited hydrologic connection between the upper and lower basin. The hydrologic connections between the upper and lower Barataria Basin are much greater today, due to the Barataria Bay Waterway, Bayou Segnette Waterway, Harvey Cutoff, and substantial erosion and interior marsh loss along Bayous Perot and Rigolettes. The frequency of high salinity events has also increased in the Barataria Basin (Swenson and Turner 1998), probably because of the increased tidal connectivity. From 1932 to 2016, the Barataria Basin lost -1,120 (square kilometers) km2 **(**over 276,000 acres) of wetland area (Couvillion, et al. 2017) and from 1978 to 1990 it experienced the highest rate of wetland loss along the entire Louisiana Coast (Barras et al. 2007).

The Mississippi River's influence on the basin has been reduced to freshwater diversion projects including the Davis Pond Freshwater Diversion Project, the Naomi Siphon, the West Point a la Hache Siphon, and the periodic opening of locks, which connect the river to navigation channels (e.g., Harvey Canal Lock). The MBSD Project most likely will have the most significant impact on the wetlands of the Barataria Basin since federal flood protection levees were constructed along the Mississippi River in the early 1900s. The diversion would benefit the basin by providing increased suspended sediment, freshwater, and nutrient, and providing the added benefit of water movement and flow-through the mid-basin.

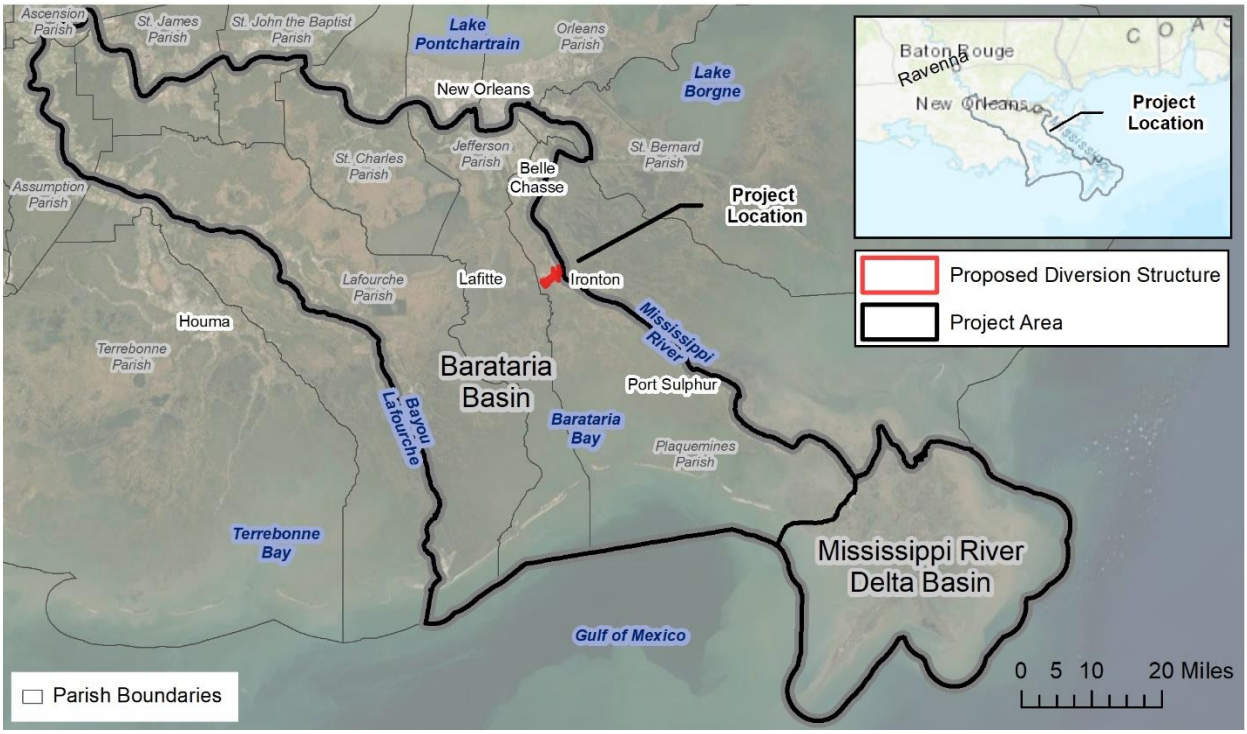

Figure 1. Location of Project Area (Barataria Basin and Western Portion of the Lower Mississippi River Delta Basin).

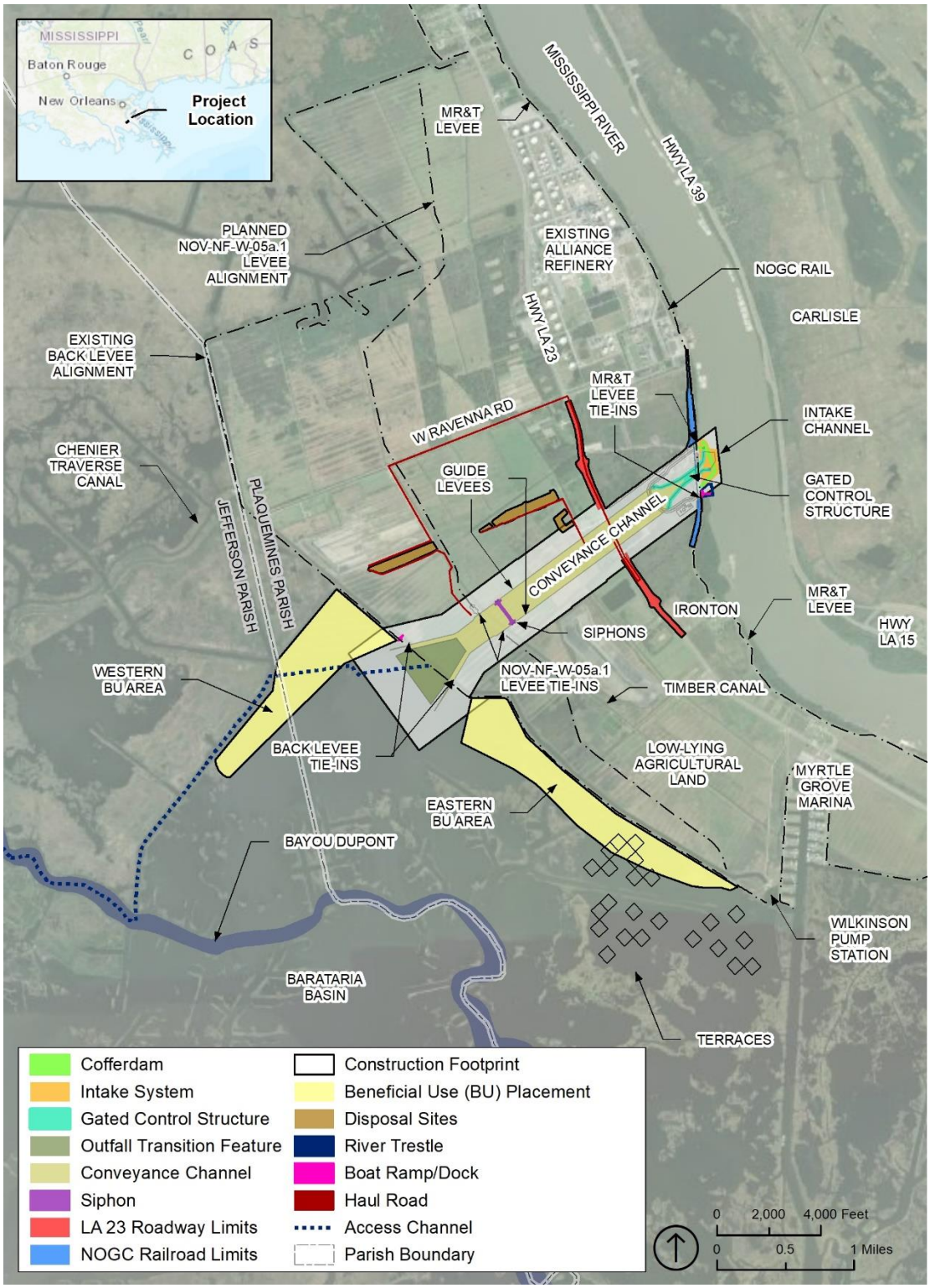

Figure 2. Project Design Features and Construction Footprint.

DESCRIPTION OF APPLICANT'S PREFERRED ALTERNATIVE

CPRA (the Applicant) seeks to construct a large-scale sediment diversion connecting the Mississippi River with the adjoining Barataria Basin. Sediment diversions are intended to divert sediment, freshwater, and nutrients from a river into an adjacent basin via gated control structures and associated conveyance channels in an effort to reintroduce deltaic deposition of sediments and thereby create, restore, and sustain wetlands.

Since the 1990s, several previous studies, under varied agencies and authorities, have explored the concept of diverting sediments, freshwater, and nutrients from the river to the Barataria Basin. Below is a brief overview of some of these various studies that, in part, led to the development of the proposed Project. The below-listed studies are not part of the currently proposed Project:

- Myrtle Grove Freshwater Diversion (Siphon) (BA-24) (1996-1998). The Myrtle Grove Freshwater Diversion was moved forward under CWPPRA for further study with NMFS as the federal sponsor. Conceptual design consisted of a multiple pipe system capable of delivering up to 2,100 cubic feet per second (cfs) of water from the Mississippi River to the back marsh area west of Myrtle Grove.
- Myrtle Grove Ecosystem Restoration Project—Coast 2050 (1997-1998). The 15,000 cfs delta-building diversion at Myrtle Grove was identified for near-term implementation (1-5 years) following completion of the Mississippi River Sediment, Nutrient, and Freshwater Redistribution (MRSNFR) Feasibility Study.
- The Mississippi River Sediment, Nutrient, and Freshwater Redistribution Feasibility Study (MRSNFR Study). A Myrtle Grove Sediment Diversion with a capacity of 15,000 cfs through gated culverts at the Mississippi River. Draft report & environmental resources document dated July 2000.
- Coast 2050: Toward a Sustainable Coastal Louisiana (Coast 2050) restoration strategy 15,000 cfs sediment diversion at Myrtle Grove (2000-2005).
- The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) funded the 2,500 cfs to 15,000 cfs Delta Building Diversion at Myrtle Grove Project (CWPPRA Project BA-33). It was de-authorized in 2008 (2001-2008).
- The LCA Ecosystem Restoration Study Report and Programmatic EIS (USACE-CEMVN 2004), and the subsequent 2005 Chief's Report and Title VII of the Water Resources Development Act (WRDA) of 2007 authorized the 2,500 to 15,000 cfs Medium Diversion at Myrtle Grove with Dedicated Dredging Project (MDMG Project). (2008-2014).
- The Mississippi River Hydrodynamic and Delta Management Study (MRHDM) included diversions ranging from 35,000-75,000 cfs in the mid, and/or lower Barataria and Breton basins. This project was suspended and closed out in 2017.
- Louisiana's Comprehensive Master Plan (2012 and 2017 CMP) for a Sustainable Coast included the 50,000 cfs Mid-Barataria Sediment Diversion be located at Myrtle Grove.

The design elements of the Applicant's Preferred Alternative are based on 30% engineering and design (E&D) for the proposed Project and are illustrated in Figure 2, 3 and listed in Table 1. The Applicant's Preferred Alternative (APA) consists of a controlled sediment and freshwater intake

diversion structure in Plaquemines Parish on the right descending bank of the Mississippi River at RM 60.7, with a conveyance channel that would discharge sediment, freshwater, and nutrients from the Mississippi River into the mid-Barataria Basin in Plaquemines and Jefferson Parishes (Figure 2 and 3). An outfall transition feature would be included that gradually transitions the conveyance channel to the natural ground within the basin, which would help facilitate sediment dispersal away from the diversion and reduce velocities to limit scour at the end of the structure. The conveyance channel would cross Louisiana Highway 23 (LA 23) and the New Orleans Gulf Coast (NOGC) Railroad, and alter a portion of the Mississippi River and Tributaries (MR&T) Project, Mississippi River Levee (MR Levee), and the future New Orleans to Venice, Louisiana Non-Federal Levee (NOV-NFL). When operational, the APA could discharge up to 75,000 cfs of sediments, freshwater, and nutrients into the mid-Barataria Basin during periods when Mississippi River flows exceeds 450,000 cfs at Belle Chasse, Plaquemines Parish, Louisiana. The structure is designed to discharge 75,000 cfs when the Mississippi River flow is at 1,000,000 cfs. When Mississippi River flows are below 450,000 cfs at Belle Chasse, the proposed APA would maintain a background (base) flow of up to 5,000 cfs to protect, sustain, and maintain newly vegetated or recently converted fresh, intermediate, and brackish marshes near the diversion outflow.

Construction of the conveyance channel would require that a portion of LA 23 and the NOGC Railroad be raised and relocated over the conveyance channel (Figures 2 and 3). A number of other public and private facilities and utilities would also require relocation due to the construction, operation, and maintenance of the MBSD Project, including a crude oil pipeline, electrical transmission line and distribution line, and a parish water line. The MBSD Project would require an inverted drainage siphon below the diversion structure to maintain drainage flows to the Wilkinson Canal Pump Station.

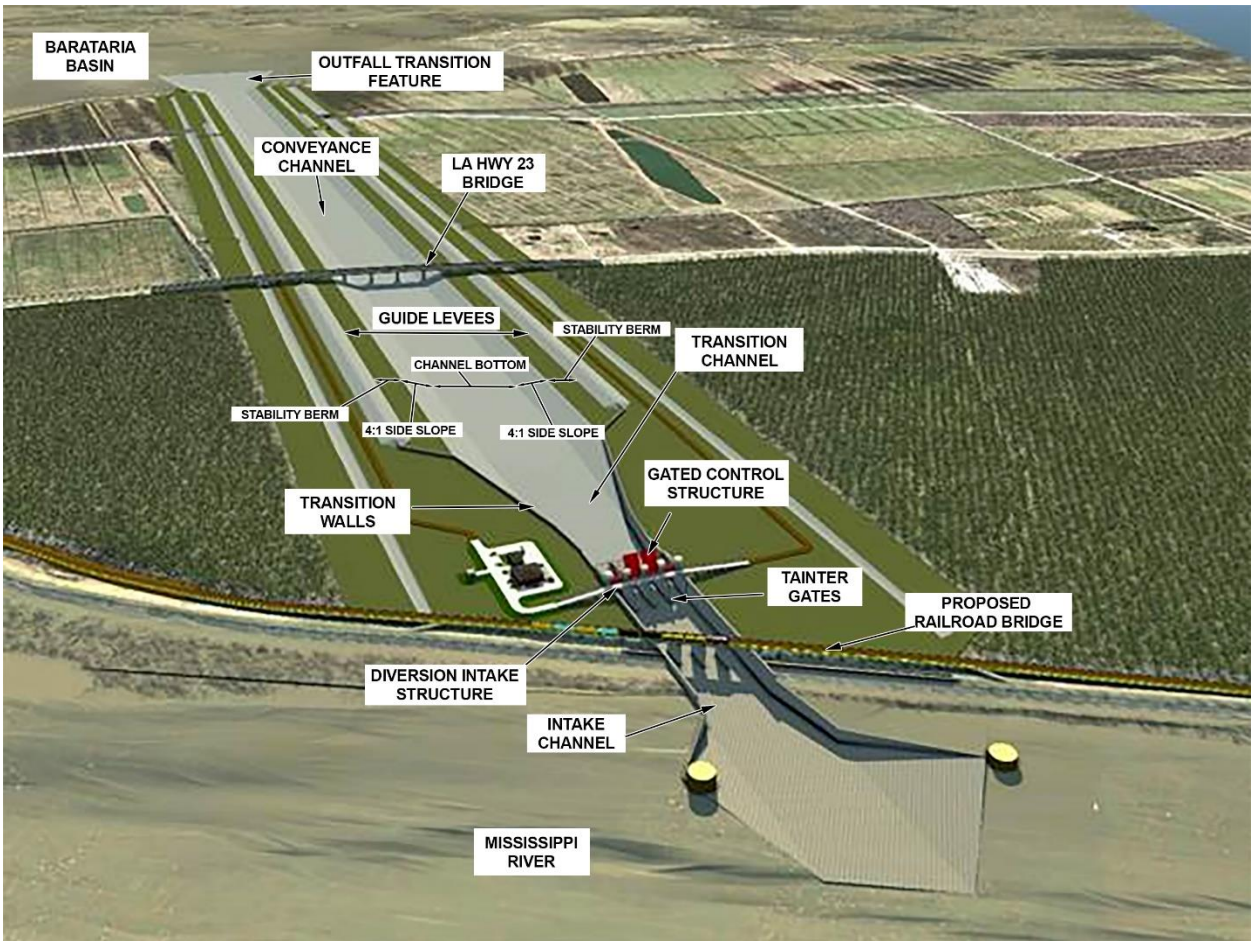

Figure 3. Proposed MBSD Structure Intake System and Conveyance Channel.

Table 1. Project Design Elements

Project Design Elements

The diversion complex (sometimes referred to generally as diversion structure) includes the following:
• Intake system (or headworks) which includes:
  ○ intake structure (or channel)
  ○ flared training walls in the Mississippi River
  ○ gated control (or gate) structure
  ○ transition channel
• Conveyance channel
• Guide levees for the conveyance channel
• Stability berms

The outfall area is where sediment and fresh water would be dispersed into the Barataria Basin during Project operations (as defined by the Delft3D Basinwide model for each alternative).
• The immediate outfall area includes the following design elements:
  ○ Outfall transition feature
  ○ Barge access channels for delivery of construction materials through the basin
  ○ Beneficial use placement area east and beneficial use placement area west
  ○ Marsh terraces (for three of the action alternatives)
  ○ Beneficial use pipeline conveyance routes

Auxiliary features are Project elements that accommodate existing or future services and infrastructure.
• Auxiliary features include the following:
  ○ Permanent site features including reservation site, administration building, access roads, boat ramps
  ○ Drainage system/siphon (or drop structure)
  ○ LA Hwy 23 modifications
  ○ NOGC railroad modifications
  ○ Utility relocations

Temporary features are Project elements that would be necessary during construction but would be removed once construction is complete.
• Temporary features during construction include the following:
  ○ Cofferdam
  ○ Concrete manufacturing plant
  ○ Contractor yards (or staging areas)
  ○ Haul roads
  ○ Disposal areas
  ○ River trestle/dock

Reasonable range of alternatives carried forward for detailed analysis in this EIS included the following:

Alternative 1: Variable flow up to 75,000 cubic feet per second (cfs) maximum sediment diversion (APA)
Alternative 2: Variable flow up to 75,000 cfs maximum sediment diversion including marsh terrace outfall features
Alternative 3: Variable flow up to 50,000 cfs maximum sediment diversion
Alternative 4: Variable flow up to 50,000 cfs maximum sediment diversion including marsh terrace outfall features
Alternative 5: Variable flow up to 150,000 cfs maximum sediment diversion
Alternative 6: Variable flow up to 150,000 cfs maximum sediment diversion including marsh terrace outfall features

The primary difference between these alternatives and the APA is the target maximum diversion

discharge of either 75,000 cfs, 50,000 cfs, or 150,000 cfs, depending on the diversion alternative and the addition of terracing in the outfall area (Table 2).

Table 2. Range of Alternatives Carried Forward for Analysis

Alternative	Location (RM)	Trigger (Belle Chasse gage)	Base Flow[1]	Maximum Flow	Outfall Features[2]
1	60.7	450,000 cfs	5,000 cfs	75,000 cfs	OTF
2	60.7	450,000 cfs	5,000 cfs	75,000 cfs	OTF + Marsh Terracing
3	60.7	450,000 cfs	5,000 cfs	50,000 cfs	OTF
4	60.7	450,000 cfs	5,000 cfs	50,000 cfs	OTF + Marsh Terracing
5	60.7	450,000 cfs	5,000 cfs	150,000 cfs	OTF
6	60.7	450,000 cfs	5,000 cfs	150,000 cfs	OTF + Marsh Terracing

[1] Depending on river flow and head differential
2 OTF = Outfall Transition Feature

FISH AND WILDLIFE RESOURCES

See Appendix A for a list of scientific names.

Description of Habitats

Existing conditions

Louisiana supports the largest area of coastal marsh in North America (Coleman and Huh 2004, Couvillion et al. 2017). Habitat types in the project area include fresh, intermediate, brackish, and saline marshes, forested wetlands (i.e., swamps and/or bottomland hardwoods), and open water. The wetlands and waters of the Barataria Basin are enormously high in biological productivity (Day et al. 1982). They serve as vital nursery areas for fish and shellfish (Chambers 1980, Van Sickle et al. 1976), and wildlife habitat (Lowery 1974a, 1974b). Wetlands within the project area provide plant detritus to adjacent coastal waters and thereby contribute to the production of commercially and recreationally important fishes and shellfishes. Wetlands in the project area also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In addition, coastal wetlands buffer storm surges reducing their damaging effect to man-made infrastructure within the coastal area.

The following description of each habitat type is based on classification by USGS 2013 habitat-type mapping (Sasser et.al 2014), Draft MBSD Project Draft Environmental Impact Statement (EIS) Chapter 3 (USACE 2020), field trips for various projects in the Barataria Basin from 2000 through 2018, raw data collected at three swamp sites (Jean Lafitte, Fleming, and Treasure Island) over a four year period from August 2004 to July 2007 (Krauss et al. 2009, and Conner et al. 1986) and Coastwide Reference Monitoring System (CRMS) data from stations throughout the basin (CPRA 2019).

There are swamps in the upper Barataria Basin west of the Davis Pond diversion structure and its ponding area, surrounding Lac des Allemands, as well as along the Bayou Lafourche ridge (Figure 4). Bottomland hardwoods (BLH) and swamps are found in isolated areas along relict distributary ridges such as Bayou Barataria. Swamp habitat in the project area consists primarily of cypress, tupelo, and red maple. Other tree species commonly found in this habitat include pumpkin and green ash. BLH habitat in the project area consists of red maple, black willow, Chinese tallow, green ash, American elm, sweet gum, water oak, hackberry, and slippery elm. The wooded understory of BLH is composed mainly of red maple and box elder saplings with the most common herbaceous plants and vines being poison ivy, pepper vine, and Virginia creeper.

Marshes within the upper portion of the Barataria Basin are largely classified by USGS 2013 habitat-type mapping (Sasser et.al 2014) as freshwater marsh (Figure 4). The freshwater marshes in the Barataria Basin can be divided into floating (flotant) and non-floating types. Flotant marsh vegetation (as described by Sasser and Gosselink 1984) is composed of a dense mat of vegetation dominated by maidencane growing on a detritus layer held together by a matrix of living roots. This mat of vegetation appears to be firmly anchored to the soil, but in reality is floating. Other flotant marsh plants also include marsh fern, royal fern, deerpea, spikerush, and smartweed (Conner et al. 1986). The freshwater marsh community is made up of maidencane, cutgrass, spike rush, bulltongue, cattail, marshhay cordgrass, and smooth cordgrass and the floating aquatic plants American lotus, water hyacinth, *salvinia*, alligator weed, smartweed, dollar weed, duckweed, and water lily.

The 2013 USGS vegetative type map (Sasser et al. 2014) classified the portion of the project area around Bayou Perot and Bayou Rigolettes as intermediate marsh (Figure 4). The intermediate marsh community of the project area is dominated by marshhay cordgrass and smooth cordgrass and is also made up of bulltongue, deerpea, loosestrife, three-cornered grass, spike rush, dodder vine, perennial saltmarsh aster, marsh morning-glory, alligator weed, and smartweed. The intermediate marshes are somewhat intact but experiencing some loss.

The 2013 USGS vegetative type map (Sasser et al. 2014) classifies the portion of the project area south of Larose to Myrtle Grove as brackish marsh (Figure 4). The brackish marsh community is dominated by marshhay cordgrass. Other species include smooth cordgrass, black needlerush, three-cornered grass, leafy three-square, deerpea, marshelder, eastern baccharis, marsh morning-glory, spikerush, paspalum, saltgrass, and dodder vine. The overall appearance of the marsh is very fragmented with pedestalled clumps of marshhay cordgrass indicative of a degrading marsh.

Marine processes, with barrier islands, saline marsh, tidal channels, and large bays and lakes, dominate the lower portion of the basin (Figure 4). The saline marshes of this basin are dominated by smooth cordgrass and marshhay cordgrass, saltgrass, and black needlerush. The saline marshes of the Barataria Basin are experiencing interior loss as well as shoreline erosion. The greatest loss of wetlands in the Barataria Basin is in the saline and brackish marshes (Couvillion et al. 2017, Gagliano and Van Beek 1970, Adams et al. 1976, Boesch 1982, Dozier et al. 1983).

Wetland pasture is often found between the distributary ridges and in marshes altered by spoil deposition, drainage projects, or agriculture. Typically, it is bordered by marsh at lower elevations and by active agriculture lands, scrub-shrub habitat, or residential development at higher elevations. Typical wetland pasture vegetation includes maidencane, paspalum, Bermuda grass, camphorweed, marshmallow, spikerush, soft rush, dewberry, waterprimrose, smartweed, and alligator weed. Some wetland pasture consists of marsh that is used for grazing cattle. Within the project area, wetland pasture occurs along the development/marsh interface or adjacent to the existing hurricane protection system.

Open water of various sizes and depths (ponds, lakes, bayous, and canals) are interspersed throughout the project area (Figure 5). The major open water areas include a portion of the Gulf Intracoastal Waterway (GIWW), Lake Cataouache, Lake Salvador, Bayou Perot and Bayou Rigolettes, Little Lake, Turtle Bay, Barataria Bay Waterway and Barataria Bay. As wetland loss continues, open water is expected to increase.

Submerged aquatic vegetation (SAV) is found in lakes, ponds, canals, and bayous throughout the project area though are generally more abundant in fresher habitats. Species of SAV include coontail, wild celery, widgeongrass, southern naiad, Eurasian watermilfoil, alligator weed, smartweed, and pondweeds. SAV has been described as "the most significant form of complex cover for aquatic animals in the Barataria Basin" (LDWF 2015). SAV supports a diverse biota, exports organic matter and nutrients into the water column, oxygenates the water column, and stabilizes bottom sediments by reducing current velocity and wave energy. SAV species distributions and biomass are influenced by salinity, water depth, turbidity, as well as other variables. SAV declines in the middle and upper Barataria Basin have been attributed to saltwater intrusion associated with hurricanes and flood control activities while increases in the upper and middle basin SAV have been coincident with the Davis Pond Freshwater Diversion Project.

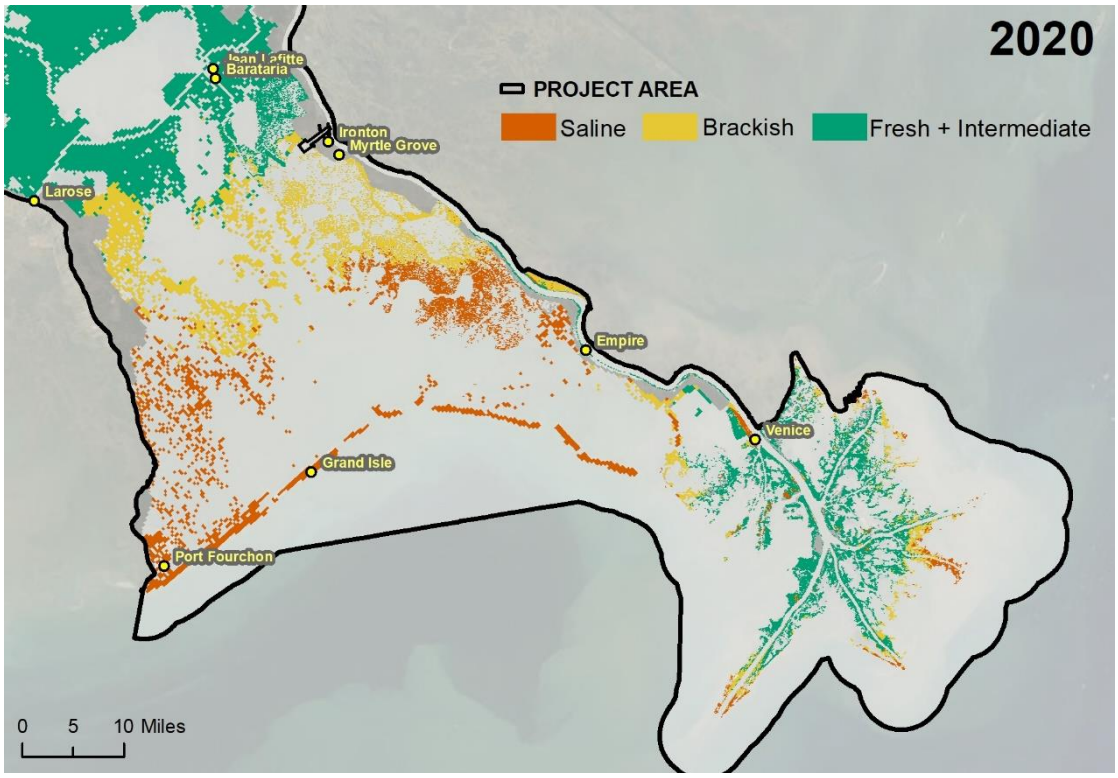

Figure 4. Mid-Barataria Sediment Diversion Project Area and Habitat Types in year 2020 based on Delft 3D model results (Messina et al. 2019).

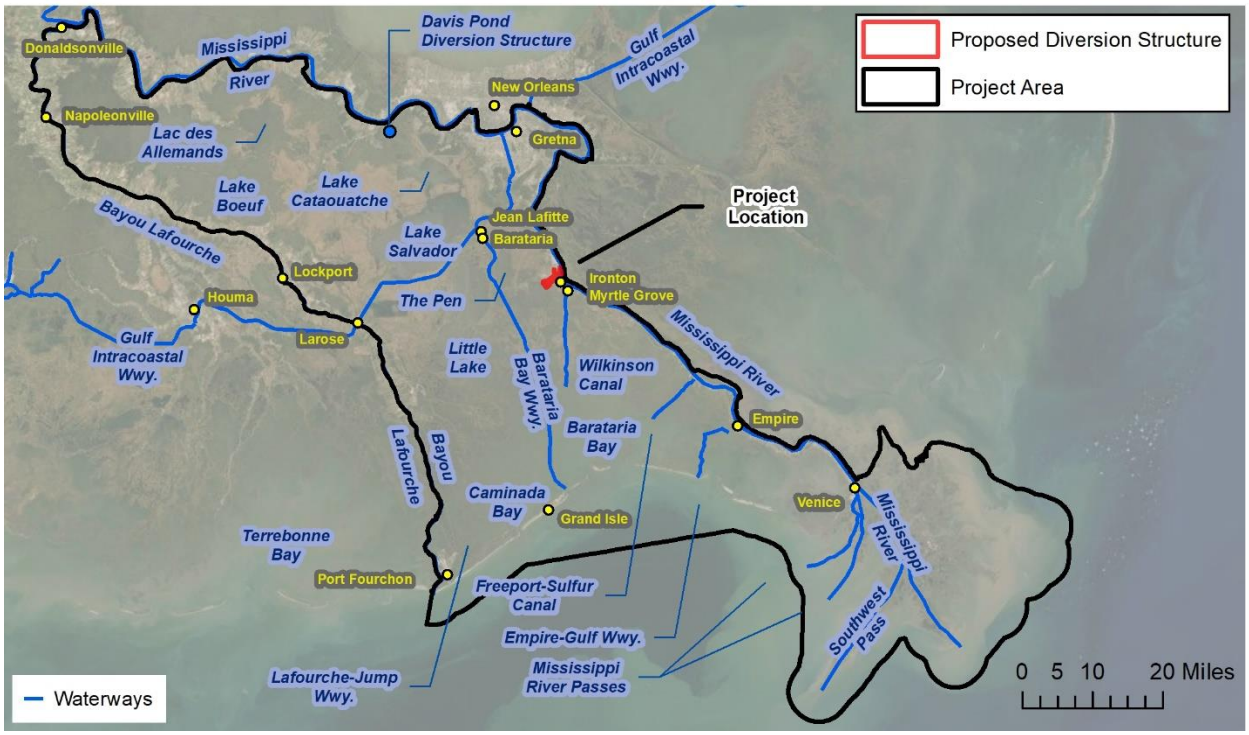

Figure 5. Major Waterbodies in the Project Area.

No Action Alternative

Under the NAA, and as projected by the Delft3D Basinwide Model results (Messina et al. 2019), approximately 298,235 acres (80.4 percent) of wetlands would be lost over a 50-year period (2020 to 2070) in the Barataria Basin as saltwater inundation of wetlands continues. It is expected that the more stable upper basin would have more remaining wetlands in 50 years than the mid or lower basin, though loss would occur throughout the basin. In the Birdfoot Delta the loss of wetlands would continue. A projected 52,525 acres (89.1 percent) of wetlands in the Birdfoot Delta would be converted to open water. The greatest wetland losses across the Project area would occur near the end of the analysis period between 2060 and 2070, when impacts from sea-level rise and subsidence would likely be greatest. Smooth cordgrass would likely become the dominant plant species.

Fishery/Aquatic Resources

Existing conditions

Estuaries are among the most productive habitats in the world because they support high primary and fisheries production (Whittaker and Likens 1973, Walme 1972). The majority of the Mid-Barataria Sediment Diversion project area is considered estuarine habitat. Most of the economically important saltwater fishes and crustaceans harvested in Louisiana spawn offshore and then use estuarine areas for nursery habitat (Herke 1995). Marine fishes penetrate inland to fresher habitats, while freshwater species are sometimes found in intermediate or brackish environments. In addition, the lower reaches of freshwater streams may serve as nursery areas for the young of some marine species.

The project area supports fresh, estuarine, and marine fishes and shellfishes. Freshwater fishes present in the project area include largemouth bass, crappie, bluegill, redear sunfish, redspotted sunfish, channel catfish, blue catfish, yellow bullhead, freshwater drum, bowfin, carp, buffaloes, and gars. Estuarine and marine fishes include sheepshead, anchovies, scaled sardine, Gulf menhaden, striped mullet, white mullet, black drum, red drum, spot, spotted seatrout, sand seatrout, Atlantic croaker, gaff-topsail catfish, southern flounder, Gulf killifish, longnose killifish, sheepshead minnow, fat sleeper, gobies, alligator gar, and rough silverside. The dominant crustaceans expected to occur in the project area include white shrimp, brown shrimp, and blue crab.

Other invertebrates found in the project area include the Eastern oyster. The Eastern oyster is indigenous to coastal Louisiana, and provides a rich ecological and important commercial resource. Oyster reefs are a category of EFH for federally managed red drum. The Eastern oyster thrives in waters with a salinity of between 5 and 15 parts per thousand (ppt). When water temperatures rise, oysters are less able to cope with the physiological stress of both high-water temperatures and low salinities and oyster mortality events often occur (Dugas and Perret 1975, Dugas and Roussel 1983, Dugas 1991).

No Action Alternative

Factors that will strongly influence future fish resource conditions include freshwater input and loss of coastal wetlands. Having been cut off from the Mississippi River freshwater inputs, Barataria Basin marshes receive freshwater primarily from local rainwater/runoff and a few Mississippi River diversions and siphons (Davis Pond, Naomi, and West Point a la Hache). Even though extensive areas of marsh have been lost in coastal Louisiana, commercial harvest and recreational catches of most estuarine fishery species have not diminished (NMFS 2019). One hypothesis to explain continued high fisheries production is that as marshes have deteriorated, tremendous amounts of organic detritus have been released into the estuarine system, resulting in high levels of primary productivity (Browder et al. 1985, Browder et al. 1989, Minello and Rozas 2002). High primary productivity increases the resources available for secondary productivity. Additionally, an increase in marsh to water interface (i.e., marsh edge), and the formation of shallow, protected ponds, has resulted in areas prime for growth and development of estuarine species (Browder et al. 1985, Browder et al. 1989, Minello and Rozas 2002). At the same time, saltwater intrusion has increased the amount of estuarine area available to estuarine and marine fishery species (Chesney et al. 2000, Zimmerman et al. 2000). However, this intrusion can exacerbate marsh loss (Chabreck and Linscombe 1982, McKee and Mendelssohn 1989).

While the largest proportion of marsh in the Project area is fresh at the beginning and end of the analysis period, the Delft3D Basinwide Model projects a loss or conversion of about a 172,500 acre (74 percent) of fresh marsh, 65,300 acre (92 percent) of brackish marsh, and 60,500 acre (91 percent) loss of saline marsh acreage between 2020 and 2070 (Table 7, in the Project Impacts Section). With the continued land loss and degradation of the basin marshes, it is expected that fisheries in the long-term would see a substantial decline.

Essential Fish Habitat

Existing conditions

The project is located within an area identified as Essential Fish Habitat (EFH) by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA, Magnuson-Stevens Act; P.L. 104-297). The updated and revised 2006 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, soft bottom, sand, shell, oyster reef, and hard bottom substrates, and estuarine water column. Under the MSFCMA, wetlands and associated estuarine and nearshore waters in the project area are identified as EFH for various Federally managed species including larvae/postlarvae and juvenile brown and white shrimp; eggs, larvae/postlarvae, juvenile, and adult red drum; larvae and juvenile lane snapper; juvenile and adult gray snapper; adult and juvenile King mackerel (nearshore); and all stages of cobia (nearshore) and cobia eggs and larvae in estuaries. The 2017 Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan should be consulted for additional information on habitats identified as shark EFH (https://www.federalregister.gov/documents/2017/09/07/2017-18961/atlantic-highly-migratory-

species-essential-fish-habitat).

In addition to being designated as EFH for these species, water bodies and wetlands in the project area provide nursery and foraging habitats supportive of a variety of economically important marine fishery species, such as striped mullet, Eastern oyster, pinfish, spot, Gulf killifish, bay anchovy, Atlantic croaker, Gulf menhaden, spotted seatrout, sand seatrout, southern flounder, black drum, white and brown shrimp, and blue crab. Some of these species also serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (i.e., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (i.e., billfishes and sharks.

No Action Alternative

Although marsh loss would continue in the future under the No Action Alternative (NAA), the project area may continue to support a diverse assemblage of estuarine-dependent fishery species though there is expected to be a continued decrease in abundance. Estuarine marsh is the primary type of EFH impacted by continued wetland loss and deterioration. As wetlands continue to subside, some emergent marsh would be converted to shallow open water (i.e., mud bottom) over the modeled analysis period. Wetland Value Assessment (WVA) evaluates the model-predicted area of direct impact for sediment accretion rather than the entire basin. The WVA was used to quantify anticipated direct and indirect project impacts to fish and wildlife resources. Based on the WVA, we expect to see an overall decline in percent of shallow open water from 33% to 44% under current conditions (varies depending of habitat type) to between 3% to 8% at the end of the NAA 50-year analysis period. Although an increase in some types of EFH (i.e., mud bottom and estuarine water column) would occur, adverse impacts would occur to more productive types of EFH (i.e., estuarine emergent wetlands). Under the No Action Alternative, approximately 300,000 acres (80 percent) of existing marsh vegetation in the Barataria Basin would convert to shallow water between year 2020 and 2070, with the greatest percentage of freshwater and brackish losses (or conversion to more saline marsh) occurring near the end of the analysis period (2060 to 2070), when impacts from sea-level rise and subsidence would likely be greatest. The loss of estuarine emergent wetlands would result in negative impacts to postlarval/juvenile and subadult brown shrimp, postlarval/juvenile and subadult white shrimp, juvenile and adult gray snapper, and postlarval/juvenile and adult red drum.

Coverage of submerged aquatic vegetation (SAV), another important type of EFH, is expected to decrease with projected land loss, especially fresh and intermediate wetland loss, over the period of analysis. Though there would be some conversion of marsh to shallow open water, which may contribute to SAV growth, it is expected that over time there would be more deep open water created and increased wave fetch, thus reducing the overall suitability for SAV. Based on the WVA, we expect to see an overall decline in percent of SAV from 9% to 2% (Table 8) under the No Action Alternative. Species affected by reduced SAV would be juvenile white shrimp and brown shrimp, larvae and juvenile lane snapper, juvenile, gray snapper, and larvae, juvenile and adult red drum.

Harvest of oysters in Louisiana has been relatively stable for the last 50 years. There has been

variation between dependencies from public seed grounds versus private leases, especially in the last 10 years, where private leases maintained the overall production above or at the long-term average for Louisiana landings (LDWF 2018). The Louisiana oyster industry has been experiencing many stressors over the past several decades that threaten the long-term sustainability of both the industry and the resource. Declines in salinities at public oyster grounds have been a contributing factor to reductions in production from these areas. Other environmental factors, including changes in sedimentation rates, have contributed to decreased oyster productivity in the Gulf of Mexico (Powell et al. 2015 and Soniat et al. 2012). Under No Action, oyster production may shift to the upper basin from mid-basin because of the increased salinities due to SLR. For example, shifts from Hackberry Bay to Little Lake public oyster seed grounds might be expected.

Wildlife Resources

Existing conditions

The project area provides important habitat for numerous species of wildlife, including waterfowl, wading birds, shorebirds, neotropical migratory birds, mammals, reptiles and amphibians. Most wildlife species have been stable or increasing in the upper basin with some declines in the mid and lower basin as wetlands have been lost (Coast 2050 1999).

The Barataria Basin wetlands support a variety of birds including millions of neotropical migrants and other resident and migratory avian species such as rails, coots, gallinules, shorebirds, wading birds, waterfowl, hawks, owls, and numerous other landbirds (including warblers, sparrows, thrushes, vireos, buntings, flycatchers, chickadees, titmouse, wrens, and swallows). Around 325 species of breeding, transient, and nonbreeding species of birds have been recorded in the Barataria Basin from 2017-2018 (CornellLab of Ornithology 2020). Louisiana coastal forested and shrub scrub wetlands provide neotropical migratory birds essential stopover habitat where they can forage and rest, and these coastal habitats provide nesting habitat for hundreds of thousands of birds each year. Also important during migration and winter, Louisiana's coastal habitats support exceptionally high numbers of shorebirds, waterfowl, and other waterbirds that depend on this ecosystem (Ramsen et al. 2019).

Mammals known to occur in the project-area wetlands include manatee, dolphin, mink, raccoon, nutria, river otter, muskrat, nine-banded armadillo, Virginia opossum, cotton mouse, house mouse, hispid cotton rat, eastern cottontail rabbit, swamp rabbit, fox squirrel, grey squirrel, bobcat, and white-tailed deer (Lowery 1974b, O'Neil and Linscombe 1975).

Amphibians such as the southern dusky salamander, dwarf salamander, eastern newt, three-toed amphiuma, lesser siren, Gulf coast toad, northern cricket frog, green treefrog, squirrel treefrog, spring peeper, eastern narrow-mouthed toad, bullfrog, green frog, pig frog, and southern leopard frog are expected to occur in freshwater upper basin project-area wetlands (Dundee and Rossman 1989).

Reptiles such as the American alligator, diamondback terrapin, eastern mud turtle, red-eared slider, snapping turtles, green anole, broadhead skink, little brown skink, mud snake, eastern black kingsnake, rat snake, Gulf Coast ribbon snake, cottonmouth, common garter snake, and watersnakes are expected to occur in the project-area wetlands (Dundee and Rossman 1989). American alligator abundance has been increasing in the upper portions of the basin and declining in the lower portions, but overall has declined as the preferred fresh marsh and intermediate marsh has converted to brackish marsh.

Wildlife with Conservation Concerns

Louisiana supports the largest area of coastal marsh in North America (Coleman and Huh 2004, Couvillion et al. 2017). As observed by Ramsen et al. (2019), the richness and abundance of birds of Louisiana's coastal marshes is matched nowhere in the United States. Louisiana supports large populations of many obligate marsh bird species as well as marine bird species that require islands for breeding sites (Ramsen et al. 2019). The coastal wetlands of Louisiana serve as wintering habitat for about 3 million ducks and 400,000 geese annually and thus is one of the most important wintering waterfowl areas on the continent. The area supports 19% of the United States (US) wintering population of 14 species of ducks and geese, including more than 60% of the US population for three species (mottled duck, gadwall, and blue-winged teal) and more than 20 percent for nine species (Michot 1996). Ramsen et al. (2019) estimates that 73% of the United States population of Sandwich Tern breeds in Louisiana, and comparable estimates range from 24 to 55% for Mottled Duck, Clapper Rail, Tricolored Heron, Wilson's Plover, Royal Tern, Black Skimmer, and Seaside Sparrow.

Large populations of migratory waterfowl, including teal, wigeons, mottled ducks, pintails, and mallards, are present during winter primarily in fresh and intermediate marshes. Resident species expected to occur in that area include mottled duck and wood duck. Waterfowl are typically found in greatest densities in intermediate marshes. The 1986 *North American Waterfowl Management Plan* (Secretary, U.S. Department of the Interior and Canada Minister of the Environment 1986) identified the preservation and maintenance of critical over-wintering habitats as a key factor in preventing the further decline in the continental waterfowl population. The Barataria Basin is at the terminus of the Mississippi Flyway, which is the largest waterfowl migration route in North America. The coastal marshes of Louisiana provide winter habitat for more than 50 percent of the duck population of the Mississippi Flyway.

Migratory birds that utilize the project-area forested wetlands include waterfowl (i.e., wood duck, mallard), landbirds, some of which are recognized by the Service as birds of conservation concern (i.e., prothonotary warbler, Swainson's warbler, golden-winged warbler https://www.fws.gov/migratorybirds/pdf/management/BMCFocalSpecies.pdf), raptors, and wading birds.

Wading birds (herons and egrets) typically inhabit fresh to saline marsh, swamps, and shrub habitat located along spoil banks and will form nesting colonies in stands of trees and where shrubs are available throughout these habitats. With 17 species of wading birds that regularly

occur, Louisiana is thought to have more wading birds than any other state. The importance of Louisiana's coast to many species of both breeding and nonbreeding birds is significant and hosts up to two-thirds of the regional and global abundance of some species (Ramsen et al. 2019).

No Action Alternative

Under the No Action alternative, the project area would continue to provide habitat for a multitude of species including migratory waterfowl, wading birds, shorebirds, mammals, reptiles, and amphibians. Increases in salinity would reduce the overall diversity of the Barataria Basin, as species reliant on fresh and intermediate marsh would have fewer acres of available habitat. The continued loss of emergent wetlands in the mid and lower basin would negatively impact those species, which utilize that part of the basin. Intertidal marsh and shallow isolated ponds and associated submerged aquatic vegetation are utilized by those species for foraging, resting, or nesting habitat. Conversion of that habitat type to large, unvegetated open-water areas would diminish habitat value for all wildlife species. Due to SLR and saltwater intrusion, gradual conversion of BLH to swamp, and swamp to marsh will reduce habitat acres in the upper basin and consequently is expected reduce wildlife populations. The continued loss of wetlands in the Barataria Basin via conversion to open water would decrease the habitat available for species that use both wetland and upland habitats for breeding, foraging, and migration. Further, the continued loss of wetlands would also decrease protection of upland habitats; as wetlands are lost or degraded, these inshore habitats would be subjected to higher pressures from storm surges and overwash.

Endangered and Threatened Species

Within the project area, there are the following threatened or endangered species under the Federal jurisdiction of the USFWS and/or the NMFS: West Indian manatee, pallid sturgeon, red knot, piping plover, several sea turtle species, and the eastern black rail.

The Service recommends that prior to construction, the applicant contact the Service regarding the Endangered Species Act (ESA) determination to ensure that new species have not been listed, new critical habitat has not been designated, or that no new information has been gained that could change the results of the consultation thus triggering re-initiation of ESA consultation.

West Indian manatee

The threatened West Indian manatee is known to regularly 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. Based on data maintained by the Louisiana Wildlife Diversity Program, approximately 84% percent of reported manatee sightings (1990-2019) in Louisiana have occurred from the months of June through December. Manatee occurrences in Louisiana are increasing, and they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw rivers and in canals and bayous within the adjacent coastal marshes of southeastern Louisiana including Bayou Lafourche.

Manatees may also infrequently be observed in the Mississippi River and coastal areas of southwestern Louisiana. Threats to this species include collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals. Should a proposed action directly or indirectly affect the West Indian manatee, further consultation with this office will be necessary.

The following are conditions that should be implemented to avoid impacts to manatee. All contract personnel associated with the project should be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973 and State laws. All construction personnel are responsible for observing water-related activities for the presence of manatees. Temporary signs should be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work area), and at least one sign should be placed where it is visible to the vessel operator. Siltation barriers, if used, should be made of material in which manatees could not become entangled and should be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions should be implemented, including, but not limited to: no operation of moving equipment within 50 feet of a manatee; all vessels should operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, should be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations should be resumed. Any manatee sighting should be immediately reported to the U.S. Fish and Wildlife Service (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Wildlife Diversity Program (337/735-8676).

Pallid sturgeon

The pallid sturgeon is an endangered fish found in Louisiana, in the Atchafalaya, Mississippi, and Red Rivers (with known concentrations near the Old River Control Structure Complex). The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Detailed habitat requirements of this fish are not known, but it is believed to spawn in Louisiana. Habitat loss through river channelization and dams has adversely affected this species throughout its range. Entrainment issues associated with dredging operations in the Mississippi and Atchafalaya Rivers and through diversion structures off the Mississippi River are two potential effects that should be addressed in analyzing current project effects. Should the proposed project directly or indirectly affect the pallid sturgeon or its habitat, further consultation with this office will be necessary. The Service recommends consultation under the Endangered Species Act (ESA) with this office for pallid sturgeon.

Red Knot

The red knot is federally listed as a threatened species. In Louisiana, the red knot can be found in marine and estuarine habitats during spring and fall migrations and the winter months (generally September through March). During migration and on their wintering grounds, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks. Observations along the Texas coast indicate that red knots forage on beaches, oyster reefs, and exposed bay bottoms, and they roost on high sand flats, reefs, and other sites protected from high tides. In wintering and migration habitats, red knots commonly forage on bivalves, gastropods, and crustaceans. Coquina clams, a frequent and often important food resource for red knots, are common along many Gulf beaches. Major threats to this species along the Gulf of Mexico include the loss and degradation of habitat due to erosion, shoreline stabilization, and development; disturbance by humans and pets; and predation. If implementation of the proposed action has the potential to directly or indirectly affect the red knot or its habitat, further consultation with this office will be necessary.

Piping Plover

The piping plover, federally listed as a threatened species, is a small (7 inches long), pale, sand-colored shorebird that winters in coastal Louisiana and may be present for 8 to 10 months annually. Piping plovers arrive from their northern breeding grounds as early as late July and remain until late March or April. They feed on polychaete marine worms, various crustaceans, insects and their larvae, and bivalve mollusks that they peck from the top of or just beneath the sand. Piping plovers forage on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation. They roost in unvegetated or sparsely vegetated areas, which may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. They also forage and roost in wrack (i.e., seaweed or other marine vegetation) deposited on beaches. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependent on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the Service designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132); a map and descriptions of the seven critical habitat units in Louisiana can be found at https://www.fws.gov/plover/FR_notice/finalchnotice-91-95%20Louisiana.pdf. Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The physical and biological features (PBFs) for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. The PBFs are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide. Important components of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely

vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

Eastern Black Rail

The eastern black rail is the smallest of North America's rail species and is federally listed as threatened. This species, although extremely rare, has a broad, disjunct distribution in higher elevations of tidal marshes and freshwater wetlands throughout the continent. The eastern black rail breeds from New York to Florida along the Atlantic coast and in Florida and Texas along the Gulf coast. Nesting, though suspected, has yet to be confirmed for Louisiana. Little is known of the spring and fall migration or wintering distribution of the eastern black rail, but it has been documented during the winter on the Gulf Coast from Texas to Florida. In Louisiana, occurrences have been documented throughout the year in higher elevation brackish marshes vegetated with salt grass, sea oxeye, and marshhay cordgrass. It may also occur in working wetlands such as rice fields. The degradation of suitable habitat is a major threat to eastern black rails.

Sea turtles

Endangered and threatened sea turtles forage in the nearshore waters, bays and sounds of Louisiana. The National Marine Fisheries Service (NMFS) is responsible for aquatic marine threatened or endangered species. Please contact Kelly Shotts (727/824-5312) at the NMFS Regional Office in St. Petersburg, Florida, for information concerning those species in the aquatic environment.

When sea turtles leave the marine environment and come onshore to nest, the Service is responsible for those species. Two species, the threatened loggerhead sea turtle and the endangered Kemp's ridley sea turtle could potentially nest in Louisiana during a protracted period from May through November. Historical records indicate that loggerheads nested on the Chandeleur Islands and more recently on Grand Isle. In 2015, two loggerhead nests were identified on Grand Isle Beach, and false crawls were noted on Elmer's Island in Lafourche Parish. Other "crawls" have been noted in recent years where a sea turtle emerges onto the beach (presumably to search for a nest site) and returns to the water without constructing a nest. It is plausible that sea turtles may eventually use Elmer's Island as a nesting area (LDWF 2016). The Kemp's ridley is known to nest in coastal Texas and Alabama; thus, nesting attempts could possibly occur in Louisiana. The primary threats to nesting beaches include coastal development and construction, placement of erosion control structures and other barriers to nesting, beachfront lighting, vehicular and pedestrian traffic, sand extraction, beach erosion, beach nourishment, beach pollution, removal of native vegetation, and planting of non-native vegetation (USFWS 2007). We recommend that you contact this office if your activities would occur on coastal beaches during the sea turtle nesting season (i.e., May through November).

At-Risk Species

At-risk species are defined by the Service's Southeast Region as those species that are: (1) proposed for listing as threatened or endangered under the Endangered Species Act, (2) candidates for listing, or (3) have been petitioned by a third party for listing. These species, along with those identified as priority species by the Gulf Coast Joint Venture are species of management concern. The Service's goal is to work with private and public entities on proactive conservation to conserve these species, thereby precluding the need to federally list as many at-risk species as possible.

Because the proposed Project would restore deltaic processes and improve the sustainability of marshes in the diversion outfall, this sediment diversion may indirectly benefit several at-risk species including reddish egret, golden-winged warbler, saltmarsh topminnow, diamond-backed terrapin, and eastern black rail. The saltmarsh topminnow, however, will see an initial loss of suitable habitat within the immediate diversion outfall area but will have a potential increase in suitable habitat in the long term.

Saltmarsh Topminnow

The saltmarsh topminnow is a small (approx. 1-2 inches), coastal fish, considered a resident species of coastal marsh, and closely related to other killifish species such as the Gulf killifish. It occurs sporadically in low-salinity (but can range from 0 ppt to 31.4 ppt.) smooth cordgrass or black rush marshes from Galveston Bay, Texas to Escambia Bay, Florida (Lopez et al. 2011). Small rivulets are important for access to interior marsh areas. For Louisiana, the species is most likely to occur in the coastal parishes of Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, St. Bernard, Orleans, and St. Tammany. Threats include loss of coastal brackish and salt marsh habitat from natural causes (i.e., subsidence and storms) and human activities (i.e., development).

Reddish Egret

The reddish egret nests in mixed species colonies amidst shrubby or herbaceous vegetation. Reddish egrets forage primarily along sandy beaches or shallow ponds near the coast or on barrier islands. Nesting is restricted to islands. The reddish egret is threatened by coastal land loss, decreases in the quantity of suitable habitat, beach development (especially in Florida), and entanglement in fishing nets and lines. Human disturbance may also lead to nest abandonment.

Golden-winged warbler

The golden-winged warbler relies on early successional forests with sparse trees and shrubs with an herbaceous understory of grasses and forbs in either wetland or upland settings. In Louisiana, it uses forested habitats during spring and fall migrations. It depends on these forested habitats along the Gulf Coast to provide food and water resources before and after trans-Gulf and circum-Gulf migration. Population declines are associated with both loss of habitat owing to succession and reforestation and the expansion of the blue-winged warbler, with which it hybridizes, into the range of the golden-winged warbler. The loss of wintering habitat in Central and South America, along with migratory stopover habitat, may also contribute to its decline.

Diamond-backed terrapin

The diamond-backed terrapin is restricted to saline or brackish habitats. They favor seagrass beds, marshes and estuaries (especially those bordered by mangroves). In Louisiana, barrier island and mainland marshes and seagrass beds on the bayside of islands are important areas for the species. Nesting habitat occurs on barrier islands, shell embankments, and the outer fringe of marsh, though interior marsh nesting habitat is limited. Threats to the species include poor water quality (pollution), human disturbance of nesting areas, direct mortality from entrapment in derelict crab traps, habitat loss and alteration by dredging and siltation, and coastal land loss of nesting beaches and brackish and saline marsh.

Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA)

There are several species found throughout the project area that are protected under the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and/or the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d), including bald eagle, brown pelican and other colonial nesting birds, and most native bird species.

Colonial nesting birds

The proposed project would be located in an area where colonies of nesting waterbirds may be present. Based on LDWF's 2017 nesting colony survey data, the Barataria Basin has supported >150 colonies since the early 1980s and of those 2 are near the project footprint. Colonies may be present that are not currently listed in the database maintained by LDWF. Though the waterbird colony database is extensive and updated often, colony nesting site locations are very fluid, particularly, in marsh habitats where late nesters or new colonies can be established between surveys. Due to the difficult nature of documenting all nesting colonies, the Service recommends that a qualified biologist inspect the proposed construction site for the presence of documented and undocumented nesting colonies during the nesting season of each year that project construction is ongoing.

To minimize disturbance to colonial nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills, anhingas, and cormorants), all construction activity occurring within 1,000 feet of a nesting colony should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). If restricting construction activity within 1,000 feet of a wading bird colony is not feasible, CPRA should coordinate with FWS to identify and implement alternative best management practices to protect wading bird nesting colonies. In addition, during construction activities we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests and how to avoid disturbance of birds and their colonies.

Brown pelicans were delisted (due to recovery) on December 17, 2009, and are no longer protected under the ESA, but they are still protected by the Migratory Bird Treaty Act (MBTA). Brown pelicans may occasionally feed in the shallow estuarine waters found within the project

area. One of the largest brown pelican colonies in Louisiana and the Gulf Coast occurs on the Queen Bess Island in southern Barataria Bay.

Bald Eagle

The proposed project area forested wetlands may provide nesting habitat for the bald eagle, which was officially removed from the List of Endangered and Threatened Species as of August 8, 2007. However, the bald eagle remains protected under the MBTA and BGEPA. Based on LDWF 2017/2018 Bald Eagle nesting survey data, approximately 130 eagle nests have been detected in the Barataria Basin since 2000. Although no known eagle nest occurs within the project footprint, approximately 10 nests occur within 5 miles of the footprint. Because the project area includes suitable habitat for nesting and foraging bald eagles and because eagles may build new nests each nesting season, we recommend contractors be mindful of nesting eagles during project construction. Bald eagles typically nest in large trees located near coastlines, rivers, or lakes that support adequate foraging from October through mid-May. In southeastern Louisiana parishes, eagles typically nest in mature trees (i.e., baldcypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water.

During project construction, on-site personnel should be informed of the possible presence of nesting bald eagles near the project boundary, and should identify, avoid, and immediately report any such nests to this office. If an active or inactive eagle nest is discovered within 1,500 feet of the project footprint, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary.

Refuges and Wildlife Management Areas and CWPPRA Projects

The Service administers 10 National Wildlife Refuges (NWR) encompassing more than 301,700 acres in coastal Louisiana. The 49,000 acre Delta NWR is located in the Birdfoot Delta of the project area. The Jean Lafitte National Historical Park and Preserve, administered by the National Park Service, is a national historical park protecting 20,000 acres of wetlands in the Barataria Basin.

The Louisiana Department of Wildlife and Fisheries operates 17 refuges, preserves, and wildlife management areas (WMA) in coastal Louisiana, comprising more than 572,000 acres. There are three state WMAs including Salvador WMA which encompasses 30,179.5 acres of wetlands in the upper basin, Lake Boeuf WMA with 800 acres east of Bayou Lafourche just north of Raceland in the upper basin, and Elmer's Island Wildlife Refuge with 1,145 acres south of Louisiana Highway 1 near Grand Isle located in the lower basin. Timken WMA is a 2867-acre preserve on Cuba Island managed by Orleans City Park Improvement Association. The Louisiana Department of Culture, Recreation and Tourism, Office of State Parks operate bayou Segnette and Grand Isle State Parks. The Louisiana Office of State Lands operates the 800 acre E.A. Maier Family Donation located on portions of Beauregard Island (North of Grand Isle) and lands near

Bayou St. Dennis. In the Birdfoot Delta, Pass a Loutre WMA is a 115,000 acre WMA located at the mouth of the Mississippi River, approximately 10 miles south of Venice, Louisiana.

There are 20 CWPPRA projects that have been constructed in the project area including hydrologic restoration, marsh creation and nourishment, outfall management, vegetative planting, barrier island restoration, and shoreline protection projects. These projects will work in synergy with Mid-Barataria Sediment Diversion to help restore wetlands in the basin (CWPPRA 2019).

EVALUATION METHODOLOGY

To quantify anticipated indirect project impacts to fish and wildlife resources, the Service used the 2017 (version 2) USACE Approved Wetland Value Assessment (WVA) fresh/intermediate and brackish coastal marsh models. The WVA model was developed to evaluate restoration projects proposed for funding under Section 303 of the Coastal Wetlands Planning, Protection and Restoration Act and was modified through the USACE approval process for use in the USACE planning process. These models are approved for regional use on USACE Civil Works projects. Further information on this model may be obtained from the U.S. Army Corps of Engineers, New Orleans District, Regional Planning and Environmental Division South at https://ecolibrary.planusace.us/ (use the search term "WVA").

WVAs are similar to the U.S. Fish and Wildlife Service's Habitat Evaluation Procedures (HEP), in that habitat quality and quantity are measured for baseline conditions and predicted conditions for the No Action Alternative (NAA) future and the future with the Applicants Preferred Alternative (APA). Instead of the species-based approach of HEP, each WVA model utilizes an assemblage of variables considered important to the suitability of that habitat type for supporting a diversity of fish and wildlife species. As with HEP, the WVA allows a numeric comparison of each future condition and provides a quantitative estimate of project-related impacts to fish and wildlife resources.

The WVA models operate under the assumption that optimal conditions for fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated and expressed using mathematical models developed specifically for each wetland type. Each model consists of: 1) a list of variables that are considered important in characterizing fish and wildlife habitat; 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Index) and different variable values; and 3) a mathematical formula that combines the Suitability Indices for each variable into a single value for wetland habitat quality, termed the Habitat Suitability Index (HSI). The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources.

HSI values are determined for each target year (TY). Target years, determined by the model user, represent significant changes in habitat quality or quantity that are expected during the 50-year period of analysis, under future with-project and future without-project conditions for each alternative and the NAA. In this project, target years of 0, 1, 10, 20, 30, 40 and 50 are evaluated.

The product of an HSI value and the acreage of available habitat for a given target year is known as the Habitat Unit (HU). The HU is the basic unit for measuring project effects on fish and wildlife habitat. Future HUs change according to changes in habitat quality and/or quantity. Results are annualized over the period of analysis to determine the Average Annual Habitat Units (AAHUs) available for each habitat type.

The change (increase or decrease) in AAHUs between future projections of the APA and the NAA provide a measure of anticipated impacts. A net gain in AAHUs indicates that the project is beneficial to the habitat being evaluated; a net loss of AAHUs indicates that the project is damaging to that habitat type. In determining future with APA conditions, all project-related direct (construction) impacts were assumed to occur in Target Year 1.

The Fresh/Intermediate and Brackish Marsh WVAs consists of six variables:
1) Variable V1 - Percent of wetland area covered by emergent vegetation;
2) Variable V2 - Percent of open water area covered by aquatic vegetation;
3) Variable V3 - Marsh edge and interspersion;
4) Variable V4 - Percent of open water area $\leq$ 1.5 feet deep in relation to marsh surface;
5) Variable V5 - Salinity; and
6) Variable V6 - Aquatic organism access;

Changes in each variable are predicted for existing and future projections of the NAA and APA over a 50-year period of analysis.

A Habitat Evaluation Team (HET) was formed to assist with and concur on the methodology and quantification of environment impacts. See WVA Assumptions Document (USFWS 2020 https://ecos.fws.gov/ServCat/DownloadFile/187390).

The Delft 3D hydrodynamic numerical model was used to project potential impacts on hydrodynamics, sediment transport, and water quality in the Barataria Basin and the Birdfoot Delta due to implementation of the project alternatives (Messina et al. 2019). The project alternatives would divert freshwater and associated sediment from the Mississippi River into the Barataria Basin, directly affecting salinity, water surface elevations, above and belowground biomass, and organic and inorganic matter accretion (bed elevation). The available scientific literature found that each of these variables plays a role in the establishment, growth, and maintenance of coastal wetlands in the Mississippi River Deltaic Plain, and the combination of these factors influences the wetland losses and gains in the project area over time. Effects of the Delft-projected physical changes in salinity, hydrology, and elevation outputs (including inundation, subsidence, and sea-level rise) from the Delft hydrodynamic and sediment transport model were used to provide input to the vegetation and ecosystem models to project vegetation

cover types and extent over the 50-year analysis period (2020 to 2070). This was based on assumptions regarding the range of abiotic conditions (variations in salinity and inundation) that each wetland plant species can tolerate. Further, the Delft vegetation model used plant species dominance to categorize wetlands by type (saline marsh is based on smooth cordgrass; brackish on marshhay cordgrass; fresh and intermediate on bulltongue, arrowhead, Roseau cane, cattail, and giant cutgrass). There is no way to accurately predict future conditions, but these analyses serve as a useful comparison tool to evaluate general effects from various diversion flows.

The results of the Delft modeling as they relate to wetland impacts were used as inputs into the WVA for V1 - percent marsh, V4 - percent of shallow open water, and V5 – salinity.

Projections for V2 – percent submerged aquatic vegetation (SAV) were developed by using changes in turbidity, water depth, exposure, and salinity, obtained from the Delft 3D model, combined with the premises developed through the SAV Likelihood of Occurrence Model (or SLOO) model (DeMarco et al. 2018). Baseline or existing conditions for SAV were determined by using Remotely Sensed SAV predictive modeling data developed by USGS (Couvillion, pers. comm. 2019).

The marsh-water interspersion variable (V3) is open to best professional interpretation and difficult to determine at basin-level scale, so the HET agreed to hold V3 constant at a Class 3 for all alternatives to reduce the influence of V3. The V6 - Aquatic access value was kept constant and fully optimal for all alternatives. There was no expectation that any alternatives would restrict fish access differently than without the action in any way.

The purpose of the WVA polygons is to provide the modelers with an area where model outputs are needed for use in the WVA analysis. Those polygons were determined as the model-predicted area of diversion related sediment accretion (Figure 6). By using these polygons, the HET attempted to capture direct diversion impacts associated with the accretion benefits to all substrates including subaqueous, intertidal, and existing wetlands.

By using these polygons, the major near field impacts (land building, land maintenance, land changes due to nutrient inputs, inundation impacts, and others) are captured to the greatest extent in the WVA model. Lesser far field diversion impacts are captured through other modeling and evaluation efforts such as Fish and Wildlife HSIs.

Figure 6. Mid-Barataria Sediment Diversion Project operations footprint at the end of the period of analysis (50 years) for three diversion sizes used in the Wetland Value Assessment.

Further explanation of how impacts/benefits are assessed within the WVA process and an explanation of the assumptions affecting HSI values for each target year are available for review at the Fish and Wildlife Service's (Service) Lafayette, Louisiana, field office.

PROJECT IMPACTS

Under the Clean Water Act (CWA) Section 404(b)(1) Guidelines, mitigation for impacts is a three-tiered system: avoidance, minimization, and compensatory mitigation. These guidelines dictate that a CWA Section 404 permit can only be issued if the applicant has taken all appropriate and practicable measures to minimize potential adverse impacts on the aquatic ecosystem. "Practicable" means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Avoidance of impacts on aquatic resources involves selecting the least-damaging project type, spatial location, and extent compatible with achieving the purpose of the project. Minimization involves managing the severity of a project's impact on resources. If impacts cannot be avoided or minimized, compensatory mitigation should be provided.

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation

recommended by Service biologists will be consistent with the fish and wildlife resource values involved.

> Resource Category 2 are habitats of high value for evaluation species and are relatively scarce or becoming scarce on a national basis or in the ecoregion section. The mitigation goal for habitat in this category is that there should be no net loss of in-kind habitat value.
>
> Resource Category 3 are habitats of high to medium value for evaluation species and are relatively abundant on a national basis. FWS's mitigation goal here is that there be no net loss of habitat value while minimizing loss of in-kind habitat value.

The 75,000 cfs Alternative was designed and selected by the Applicant as its Preferred Alternative from other reasonable alternatives to minimize incidental environmental impacts while meeting the purpose and need for the project. The construction footprint by design is constrained to minimize excavation and fill activities in the Mississippi River riparian wetland area. In the Barataria Basin, the selected construction access routes (to allow access channels for vessels, equipment, and material transport) would be designed to avoid or minimize wetland impacts to the greatest extent practicable, along with minimizing the excavation footprint and subsequent volume of material displaced. The placement of spoil adjacent to channel excavation would be done in a manner to minimize the disruption of water circulation and material would be left in place as habitat enhancement or backfilled into the impacted access channel.

After all potential adverse impacts are first avoided or minimized, Section 404 of the Clean Water Act and in following the 2008 Final Rule – Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Part 332), and the Service's Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) requires any remaining unavoidable impacts on jurisdictional wetlands or special aquatic sites to be offset with compensatory mitigation.

The USACE approved WVA (discussed above in the Evaluation Methodology Section) is an accepted standardize tool used to determine and compare both project impacts and benefits in a consistent manner.

Direct Construction-Related Impacts

Wetlands within the proposed construction footprint were documented by wetland delineation surveys conducted by CPRA and later approved by USACE. The USACE approved surveys determined that the construction footprint included forested, wet pasture, and marsh wetland types. Forested wetlands in the construction footprint are dominated by invasive Chinese tallow and native species commonly found in disturbed, early successional forested wetlands, such as black willow, rather than high-quality bottomland hardwood wetlands. Also present, to a lesser extent, was boxelder and red maple (<10%). Smartweed, Bermuda grass, and cattail dominate emergent wetlands in the project footprint. These wetlands would be permanently lost.

Figure 7 and Table 3 show the delineated wetlands within the project construction footprint. Non-jurisdictional habitat is indicated as Uplands. In Figure 7, permanent wetland impacts within the construction footprint are indicated in the yellow boxes. White boxes indicate potential areas for beneficial placement of excess fill material but that if used would have temporary impacts to existing wetlands. Table 3 shows the delineated wetland acres by the type of impacted (Permanent or Temporary if used).

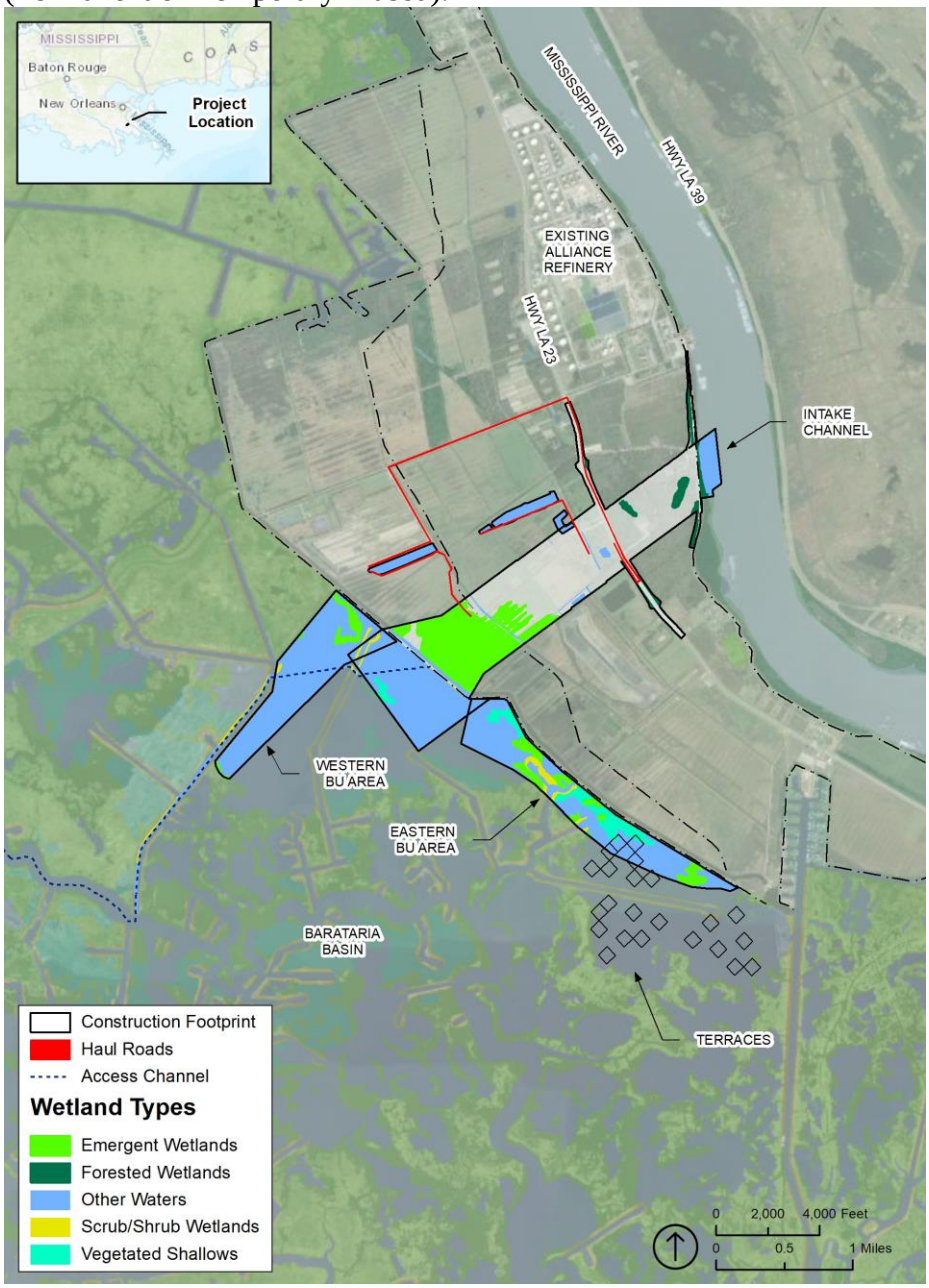

Figure 7. Permanent wetlands impacted within the construction footprint (yellow boxes) of the MBSD project. White boxes indicate the area that will potentially be used beneficially to place excess material from APA construction, but that if used would have temporary impacts to existing wetlands.

Table 3. Delineated Waters of the US by Habitat (Acres) in HUC8. Habitat is further separated by the type of impacts (Permanent or Temporary if used).

Area[1] of Permanent Impact from Construction of APA (Acres)	Waters of the US				
	Waters acres		Wetland acres		
	Other Waters	Vegetated shallows (SAV)	Forested	Emergent Wetlands (Scrub/Shrub)	Emergent Wetlands (Wet Pasture)
Access channels and their disposal areas	37.0	-	-	5.1	-
Haul Road	1.2	-	-	-	-
Trestle	0.7	-	0.2	-	-
Construction Footprint	221.3	6.1	21.4	5.2	151.0
Total	**260.2**	**6.1**	**21.6**	**10.3**	**151.0**

Area of Possible Temporary Impacts (Acres) TBD	Waters of the US				
	Waters acres		Wetland acres		
	Other Waters	Vegetated	Forested	Scrub/Shrub	Emergent Wetlands
Disposal Sites	39.2	-	-	-	-
Beneficial Use Sites	375.0	44.2	-	14.5	55.6
Total	**414.2**	**44.2**	**0.0**	**14.5**	**55.6**

[1] See to Figure 7 for refered to Areas

The APA would directly impact 182.9 acres of jurisdictional wetlands and 266.3 acres of vegetated shallows (SAV) and other waters of the U.S. As previously mentioned for unavoidable impacts, compensatory mitigation is required to replace the loss of jurisdictional wetland function and area. Of the 182.9 acres (-135.7 Average Annual Habitat Units (AAHUs)) of total permanent direct wetland impacts, 21.6 acres (-12.1 AAHUs) are of bottomland hardwood forest, 151 acres (-102.4 AAHUs) are of wet pasture, and 10.3 acres (-21.2 AAHUs) are of scrub/shrub (Table 4). The Project is expected to benefit (nourish and restore) 13,151 acres (3,848 AAHUs) of marsh. Project benefits far outweigh the permanent loss in existing wetland function; thus offsetting the need for compensatory mitigation.

Table 4. Wetland Value Assessment of project impacts and benefits for the Mid-Barataria Sediment Diversion Project.

Wetland Type	Impacts	
	Acres	AAHUs
Forested wetlands	21.6	-12.1
Emergent Wetlands (Wet Pasture)	151.0	-102.4
Emergent Wetlands (Marsh/scrub/shrub)	10.3	-21.2
Total Project Impacts	**182.9**	**-135.7**
Project Benefits	**13,151**	**3,848**
Difference	**12,968**	**3,712**

The WVA demonstrates that the long-term project benefits, a net increase of 13,151 marsh acres and 3,848 AAHUs in 50 years, would more than account for the short-term adverse impacts (-131.4 acres and 182.8 AAHUs) experienced during construction of the APA (Table 4). The expected benefits, however, would occur over 50 years while the direct construction impacts would occur during the construction phase of the project. The Service acknowledges there will be a temporal delay to offset project impacts however believe the project's longterm benefits will significantly outweigh the temporal losses that will occur.

Considering the high value of emergent marsh wetlands and their relative scarcity, marshes are usually designated as Resource Category 2 habitats, the mitigation for which is no net loss of in-kind habitat value. In this case only low lying scrub/shrub, SAV, and open water were included in the marsh evaluation. The APA operations will significantly benefit similar (in-kind) emergent marsh with well over the 10 acres lost to construction activities (Table 4).

Wet pastures are placed in Resource Category 3 due to their reduced value to wildlife, fisheries, and lost/degraded wetland functions. The mitigation goal for Resource Category 3 habitats is no net loss of habitat value. The project's wet pasture impacts are located within the protected side of the existing nonfederal levee and are primarily adjacent to agriculture lands. The habitat functions and values of wet pasture are most like fresh marsh. Because the 151 acres (-102.4 AAHUs) of direct wet pasture impacts have a resource category 3 habitat goal, the similar but out-of-kind project benefits (13,151 acres, 3,848 AAHUs) outweigh the impacts.

The forested wetlands in the construction and trestle footprint have been hydrologically altered (they are found between the river levee and highway 23 and are no longer exposed to natural flooding events) and have characteristics of regrowth colonizing and non-native species typically found in disturbed, early successional forested wetlands (such as black willow and Chinese tallow) rather than true bottomland hardwood forest (HDR, 2014). Forested wetlands are typically categorized as a resource category 2, however, given their low quality, these 21.6 acres of impacted forested wetlands are placed in a resource category 3 thus, this habitat can be mitigated for out-of-kind in habitat value. In this case, the USACE has determined that in-kind replacement is not desirable or possible, thereby allowing the substitution of other kinds of habitats (referred to as out-of-kind habitats) so that the value of the lost habitat is replaced. By replacing habitat value losses with different habitats, populations of species will be different, depending on the ecological attributes of the replacement habitat. This will result in no net loss of total habitat value, but may result in differences in fish and wildlife populations.

The 21.6 acres of the low quality forested wetlands would be accounted for out-of-kind through the large amount of emergent marsh being created and preserved. Furthermore it is expected, though unconfirmed by upper basin modeling, that impacts to the low quality forested wetland habitats will also be compensated by the benefits of projected reduced salinity impacts of existing forested and ridge wetlands in the upper Barataria Basin.

A review of the northern most water quality station, CRMS3985 (Figure 8) just south of Lake Salvador and the Gulf Intracoastal Waterway (GIWW), shows an overall decrease in salinities for most months of between about 0 to 2 ppt (CRMS3985) throughout the period of analysis (Table 5). Decreases in wetland growing season (March through November) salinities due to the Project range from 0.5 to 1 ppt. Toward the end of the period of analysis, when SLR is assumed to have the greatest impact to saltwater intrusion, growing season salinities are reduced at the northern gauge by at least 1ppt. Though a 1ppt difference does not seem like much difference, it can be significant in regard to impacts to the fresh forested wetlands. Forested wetlands can be harmed by salinities above 0.5ppt and can have massive degradation and tree mortality if over 2ppt. Although Delft modeling did not evaluate changes to the forested wetlands of the upper basin, it is reasonable to assume a similar reduction in salinities would occur north of GIWW and Highway 90 thus benefiting the forested wetland habitats by maintaining a tolerable salinity range for forested wetland survival. All modeled salinity numbers reviewed are based on the 2011 hydrograph modeled as part of the Delft simulations.

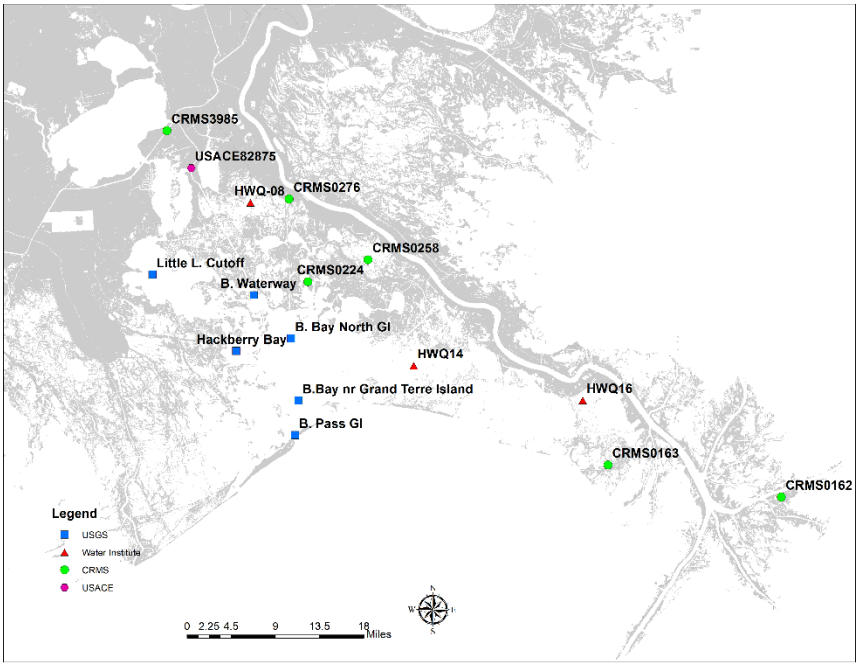

Figure 8. Water quality stations used in Delft modeling for the Mid-Barataria Sediment Diversion Project.

Table 5. Projected monthly salinities in parts per thousand (ppt) for the No Action Alternative, the Applicant's Preferred Alternative, and the difference between the two by target year over the period of analysis.

Future Without Project (FWOP) Monthly Average Salinity (ppt)														Minimum Salinity (ppt)	Maximum Salinity (ppt)	Avg growing season (March through November) Salinity (ppt)
Station Name	Target Year	January	February	March	April	May	June	July	August	September	October	November	December			
CRMS 3985	1	0.2	0.1	0.1	0.4	1.0	1.1	0.7	0.6	0.2	0.2	0.1	0.1	0.1	1.1	0.5
CRMS 3985	10	0.2	0.1	0.1	0.6	1.2	1.2	0.9	0.7	0.3	0.2	0.1	0.1	0.1	1.2	0.6
CRMS 3985	20	0.3	0.2	0.2	0.9	1.6	1.5	1.1	0.9	0.4	0.2	0.1	0.1	0.1	1.6	0.8
CRMS 3985	30	0.4	0.4	0.3	1.3	1.6	1.5	1.2	0.8	0.3	0.2	0.2	0.2	0.2	1.6	0.8
CRMS 3985	40	0.7	1.0	0.6	1.6	1.6	1.6	1.3	1.0	0.5	0.4	0.4	0.4	0.4	1.6	1.0
CRMS 3985	50	1.3	2.5	1.6	2.3	2.1	2.3	1.1	0.5	0.4	0.5	0.9	1.2	0.4	2.5	1.3

Future With Project (FWP) Monthly Average Salinity (ppt)														Minimum Salinity (ppt)	Maximum Salinity (ppt)	Avg growing season (March through November) Salinity (ppt)
Station Name	Target Year	January	February	March[1]	April	May	June	July	August	September	October	November	December			
CRMS 3985	1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1
CRMS 3985	10	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.0
CRMS 3985	20	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
CRMS 3985	30	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0
CRMS 3985	40	0.9	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.9	0.1
CRMS 3985	50	1.6	1.9	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.4	0.1	1.9	0.2

Difference (FWP-FWOP) Monthly Average Salinity Difference (ppt)														Minimum Salinity (ppt)	Maximum Salinity (ppt)[2]	Avg growing season (March through November) Salinity (ppt)
Station Name	Target Year	January	February	March	April	May	June	July	August	September	October	November	December			
CRMS 3985	1	0.0	0.0	0.0	-0.4	-1.0	-1.0	-0.7	-0.5	-0.2	-0.1	0.0	0.1	-1.0	0.1	-0.4
CRMS 3985	10	0.0	0.0	0.0	-0.6	-1.2	-1.2	-0.9	-0.7	-0.3	-0.1	0.0	0.0	-1.2	0.0	-0.5
CRMS 3985	20	0.0	0.0	-0.1	-0.9	-1.5	-1.5	-1.1	-0.9	-0.4	-0.2	-0.1	-0.1	-1.5	0.0	-0.7
CRMS 3985	30	0.0	-0.1	-0.2	-1.3	-1.6	-1.5	-1.2	-0.8	-0.3	-0.2	-0.1	-0.1	-1.6	-0.1	-0.8
CRMS 3985	40	0.2	-0.3	-0.4	-1.6	-1.6	-1.6	-1.3	-0.9	-0.5	-0.3	-0.2	-0.3	-1.6	-0.2	-0.9
CRMS 3985	50	0.3	-0.6	-0.9	-2.2	-2.0	-2.2	-1.0	-0.5	-0.3	-0.4	-0.4	-0.8	-2.2	-0.3	-1.1

[1] = diversion open

[2] Note: January outlires were removed from Minimum Salinity Difference (FWP-FWP) portion of the table.

In addition to the jurisdictional wetlands shown in Figure 7 there is a relatively large (154.9-acre) forested area within the proposed diversion complex footprint (between the MR&T levee and LA 23) that does not meet the characteristics to be considered a jurisdictional wetland that would require compensatory mitigation by USACE's wetland regulatory program. USACE's Regulatory Program utilizes the 1987 Corps of Engineers Wetlands Delineation Manual and Regional Supplements to define wetlands under the Clean Water Act Section 404 permit program. A potential wetland must meet the criteria for soil, vegetation, and hydrology to be considered a jurisdictional wetland subject to their regulations. The Service classifies the area of non-jurisdictional wetland as dry bottomland hardwood (dry BLH) habitat because it is in a site that formerly would have supported wet bottomland hardwoods but has been leveed and placed under pump such that it no longer experiences its former hydrology. Nonetheless, the vegetation and location still affords some of the functions and values of a bottomland hardwood forest. The Service presents the 154.9 acreage of forested habitat loss to provide an accounting of those unmitigated habitat losses.

There are expected to be some scouring impacts in the north west of the outfall area due to operations. The estimated quantity of scour impacts are unknown at this time. Scouring is avoided to the greatest extent possible but some unavoidable scour is still expected to occur. Indirect construction-related impacts (such as sedimentation due to runoff) could result in temporary minor impacts to wetlands adjacent to the Project construction footprint.

Beneficial Use of Dredged Material

In addition to the overall purpose of the Project, which includes restoration of marshes within the Barataria Basin, CPRA proposes to potentially use three disposal sites (previously borrow pits) and two beneficial use areas within and alongside the diversion outfall area (figure 7). Material excavated for construction of the conveyance channel and the outfall transition feature would, if suitable, first be used for construction of Project components. Any remaining dredged material not already used or disposed of would be used beneficially by first targeting the disposal sites followed by the proposed beneficial use areas. The excess material would be used beneficially at appropriate locations to create features to be disposed of in a way to promote habitat improvements (such as wetland creation, wetland nourishment, shallow aquatic habitat, or other beneficial features such as ridges or terraces).

Because the total amount of materials placed in these areas has yet to be determined nor were they quantified in the Delft model or benefits analysis (WVA), the benefits cannot be calculated. If all disposal and beneficial areas were used fully, the temporary impacts to existing wetlands would be a maximum of 119.9 acres while the initially created marsh could benefit up to 526.2 acres (406.3 + 119.9, Table 2). Though these acres were not captured in the WVA analysis, they will provide some small additional benefits within the project area if constructed. The material, however, would be used beneficially to the maximum extent practicable to create from zero up to 500 acres of marsh.

Diversion Operation Impacts

Diversion operation impacts, as determined through the WVA analysis, are presented in Table 6, which includes the AAHUs and net acres for each alternative by fresh/intermediate marsh and brackish marsh habitat types. The general trend with each of the alternatives is a decrease in brackish marsh over the 50-year period of analysis and an increase in fresh and intermediate marsh. This outcome is expected, as the brackish marshes would freshen under the influence of the diversion alternatives, causing vegetation communities to transition from brackish to fresh/intermediate over time. Net acres and AAHUs increase with the larger discharge diversion alternatives as more sediment is introduced and captured with larger capacity diversions. However, larger diversions and their corresponding increase in freshwater would have a greater risk of negative inundation impacts to wetlands. Construction of terraces in the diversion outfall area would result in a relatively slight increase in net acres (except with the 150,000 cfs diversions) and no significant difference in AAHUs.

The APA, 75,000 cfs alternative, would benefit wetlands in the Barataria Basin by sustaining or creating wetlands through the increased input of sediment, nutrients, and fresh water. The indirect impacts from operation and maintenance of the APA on wetlands would result in a net gain of 13,151 acres and 3,848 AAHU of coastal wetlands within the WVA polygon. While this

alternative would sustain and create wetlands in the project area, significant wetland loss across the region due to subsidence and sea-level rise would be ongoing. Note that 2070 is the end date of the 50-year period of analysis; however, additional benefits beyond this date are anticipated, albeit at a reduced rate of increase given the effects of increasing sea-level rise over time.

Table 6. WVA results for Mid-Barataria Sediment Diversion Project Alternatives.

Alternatives	NET ACRES[1]			AAHUs[2]		
	Fresh/Intermediate	Brackish	TOTAL	Fresh/Intermediate	Brackish	TOTAL
MBSD 50,000cfs	10869	-1441	9428	6703	-4264	2439
MBSD 50,000cfs + Terraces	11062	-1445	9617	6782	-4266	2516
MBSD 75,000cfs	14772	-1620	13151	10108	-6260	3848
MBSD 75,000cfs + Terraces	15121	-1620	13501	10093	-6256	3837
MBSDv 150,000cfs	30765	-2099	28667	18651	-9741	8909
MBSD 150,000cfs + Terraces	30708	-2098	28609	18556	-9667	8890

[1] Net Acres = APA (and other alternatives) acres minus the NAA acres at the end of the period of analysis (2070).

[2] AAHUs = Average Annual Habitat Units, which is a measure of the quality and quantity of habitat.

Barataria Basin and Birdfoot Delta Impacts

Habitat Types

Diversion operations would result in net positive direct and indirect wetland impacts throughout the Barataria Basin. In the Birdfoot Delta, however, suspended sediment inputs would be reduced resulting in net negative impacts.

Table 7. Predicted marsh habitat type acres for No action and the Applicant's Preferred Alternative (75,000 cfs). Results of Vegetation Modeling and Projected Wetland Acreage, by Decade and Wetland Type, for the entire project area.

Preferred Alternative	Wetland Cover Type	2020	2020 Net Acres	2030	2030 Net Acres	2040	2040 Net Acres	2050	2050 Net Acres	2060	2060 Net Acres	2070	2070 Net Acres
Barataria Basin	Fresh/ Intermediate Marsh	270,016	36,398	270,684	42,884	253,388	44,309	207,339	30,505	144,930	22,966	77,703	16,596
	Brackish Marsh	58,098	-12,518	54,115	-15,578	30,851	-19,948	16,635	-8,716	4,532	-6,188	1,713	-3,627
	Saline Marsh	42,932	-23,847	21,263	-21,714	15,076	-12,063	10,394	-5,137	7,040	366	6,047	-285
	Total	**371,046**	**33**	**346,062**	**5,592**	**299,315**	**12,298**	**234,368**	**16,652**	**156,502**	**17,144**	**85,463**	**12,684**
Birdfoot Delta	Fresh/ Intermediate Marsh	43,950	-487	34,216	-1,671	19,836	670	12,564	-183	8,272	-662	1,808	-3,466
	Brackish Marsh	10,526	6,376	3,808	292	3,174	-1,648	3,815	97	1,269	18	1,505	495
	Saline Marsh	4,445	-54,485	1,793	-131	1,454	-58	911	-34	293	2	201	80
	Total	**58,921**	**-9**	**39,817**	**-1,510**	**24,464**	**-1,036**	**17,290**	**-120**	**9,834**	**-642**	**3,514**	**-2,891**
Total Project Area		**429,967**	**24**	**385,879**	**4,082**	**323,779**	**11,262**	**251,658**	**16,532**	**166,336**	**16,502**	**88,977**	**9,793**

No Action Alternative	Wetland Cover Type	2020	2020 No Action	2030	2030 No Action	2040	2040 No Action	2050	2050 No Action	2060	2060 No Action	2070	2070 No Action
Barataria Basin	Fresh/ Intermediate Marsh	233,618		227,800		209,079		176,834		121,964		61,107	
	Brackish Marsh	70,616		69,693		50,799		25,351		10,720		5,340	
	Saline Marsh	66,779		42,977		27,139		15,531		6,674		6,332	
	Total	**371,013**		**340,470**		**287,017**		**217,716**		**139,358**		**72,779**	
Birdfoot Delta	Fresh/ Intermediate Marsh	44,437		35,887		19,166		12,747		8,934		5,274	
	Brackish Marsh	10,343		3,516		4,822		3,718		1,251		1,010	
	Saline Marsh	4,150		1,924		1,512		945		291		121	
	Total	**58,930**		**41,327**		**25,500**		**17,410**		**10,476**		**6,405**	
Total Project Area		**429,943**		**381,797**		**312,517**		**235,126**		**149,834**		**79,184**	

Tables 6 and 7 will have different net acres because the WVA (Table 6, 13,151 net acres) looked at a smaller lower-salinity portion of the basin near the diversion outfall while Table 7 (12,684 net acres) looked at net acres over the entire basin. With the APA compared to the NAA, brackish and saline marsh losses offset some of the fresh/intermediate gains resulting in an overall smaller net wetland gain across the basin than when the WVA area alone (primarily an area of wetland gain) is considered.

Based on the CWPPRA BA-164 (Bayou Dupont Sediment Delivery – Marsh Creation and Terracing #3) project WVA site visits, which directly overlaps (BA-164 cell #1) with the APA outfall feature, there is very little SAV (0 to 5%) present. Therefor there would little or no direct affected (lost) to SAV by construction activities. Although SAV abundance generally varies throughout the year, and from year to year, increased turbidity (a predictor of SAV presence, Demarco et al. 2018) near the diversion when operating above base flow, may decrease the continued potential for the low levels of SAV growth in the outfall area.

Hillmann et al. (2016) indicated that fresher marshes of the Barataria Basin, on average, had higher species richness and biomass of SAV when compared to intermediate, brackish, and saline sites; saline sites had the lowest species richness and biomass of SAV. Salinity is predicted to be consistently lower at the end of the period of analysis with the APA compared to the NAA except in the birdfoot delta where salinities would slightly increase over time with sea-level rise increases and subsidence. With increased freshwater and changes to bottom elevations with the addition of sediments over time, a larger area of the mid-basin would become available for SAV growth with the APA compared to the NAA while more saline areas in the lower basin would continue to lose suitable SAV habitat. Further, the Applicant's Preferred Alternative would result

in lowered wave action near areas of created or maintained wetlands, which would result in a more conducive environment for SAV growth over time (DeMarco et al. 2018). Work done for the WVA on SAV indicates there would be a net increase of about 2% (1,500 acres) of SAV in the fresh/intermediate portion of the project area at the end of the period of analysis (Table 8). This estimate is thought to be conservative. The overall increase in SAV would counter the minor lost SAV due to construction impacts.

Table 8. Percent SAV in Fresh/Intermediate water based on SAV remotely sensed data for baseline estimates and projections for the No Action Alternative (NAA) and Applicant's Preferred Alternative (APA).

YEAR	NAA SAV	APA SAV
2020	8.9%	
2030	4.5%	6.8%
2040	3.9%	4.2%
2050	3.5%	7.4%
2060	2.4%	4.7%
2070	1.7%	3.8%

The purpose of the APA is to build, sustain, and maintain wetlands in an area that has been largely isolated from the once naturally occurring inputs from the Mississippi River. Sediment accretion would raise the land elevation in submerged areas to allow wetland vegetation to establish and grow (Figure 9). Nutrients transported as part of the project could contribute to increased primary production (above and belowground plant biomass) (Darby and Turner 2008, Deegan et al. 2012, Howes et al. 2010, Swarzenski et al. 2008). Additionally, reductions in average annual salinity would allow for the establishment and expansion of fresh and intermediate wetlands. While on the other hand, brackish wetland acreage may be reduced by conversion of brackish and saline marsh to fresher marsh types.

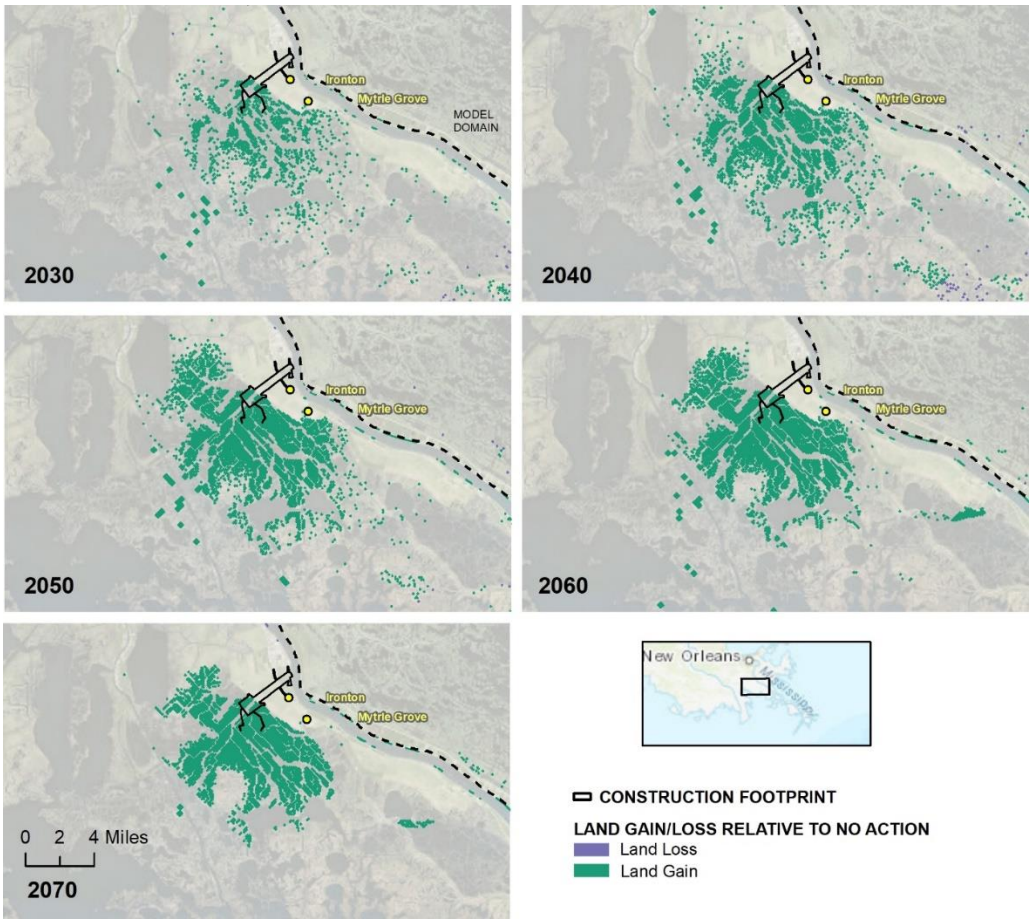

Figure 9. Predicted outfall area net Land Loss and Gain under the Applicant's Preferred Alternative (75,000 cfs) for years 2030, 2040, 2050, 2060, and 2070.

In a review of studies on storm related marsh loss with a focused look at soil bulk density data and root characteristics of marshes in diversion or river influence areas (Howes et al. 2010, Swarzenski et al., 2008, Chabreck and Palmisano 1973, Hatton et al., 1983, Nyman and DeLaune 1991, and Nyman et al., 2006), information suggests that in the early years of diversion operation, the fresher marshes may become more susceptible to erosive forces. However, with continued accretion of diverted mineral sediments, the once organic marsh soils become more mineral rich and the ability of those lower salinity marshes to resist erosive forces may substantially improve. To ensure that such a transition occurs it is important that adaptive management be incorporated into the diversion plans. That management should maximize the introduction of suspended sediments and ensure that over marsh flows would disperse those sediments across the outfall area as opposed to such flows remaining in the waterways. However, diversion operations should when and where possible, avoid prolonged inundation of area marshes as prolonged inundation may result in adverse impacts to emergent vegetation.

Birdfoot Delta

Historically, Mississippi River overbank flooding deposited sediment, fresh water, and nutrients into the Barataria Basin during annual flooding cycles, nourishing and sustaining wetland habitats. Alterations to the Mississippi River changed natural sediment transport from the river into the basin thus increasing the sediment load traveling to and available to the Birdfoot Delta. However, because of current maintenance of deep draft navigation, much of the Mississippi River's sediment load is lost to the deep Gulf of Mexico. Wetlands within the Birdfoot Delta would receive less sediment from the Mississippi River due to the diversion of freshwater and sediment back into the Barataria Basin (Table 7 and Figure 10). Given the sediment loss via the navigation channel, sediments would be more effectively used to sustain wetlands when reintroduced into the Barataria Basin via the diversion. However, because sediments, freshwater, and nutrients transported by the project would be diverted up river from the Birdfoot Delta, the delta would experience a project-related net loss of -2,891 acres of wetlands by 2070 when compared with the No Action alternative (Table 7). It should be noted that almost all wetlands in the Birdfoot Delta would be lost under either No Action or Applicant's Preferred Alternative (Table 5). The Birdfoot Delta currently has nearly 59,000 acres. Without the project, in 50 years, it would have about 6,450 acres (10%) remaining compared to 3,514 acres (6%) remaining with the project.

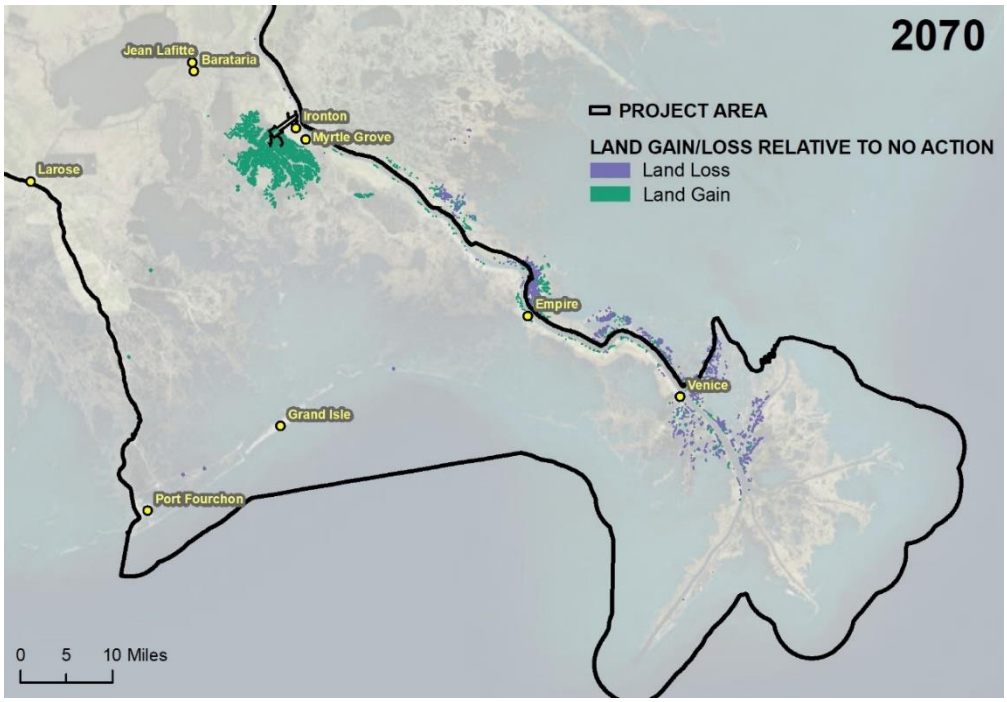

Figure 10. Predicted project area net Land Loss and Gain at 2070 under the Applicant's Preferred Alternative.

Delta National Wildlife Refuge and Pass-A-Loutre Wildlife Management Area

The Delta National Wildlife Refuge (Delta NWR) is located within the Birdfoot Delta north of Pass a Loutre, and Pass-A-Loutre Wildlife Management Area (PAL WMA), mostly south of Pass-A-Loutre. Like the other wetlands in the Birdfoot Delta, wetlands on Delta NWR and PAL WMA are dependent on the sediments received and deposited by the Mississippi River. However, wetlands in the Delta NWR are unique compared to other wetlands because they are managed by the FWS as part of the National Wildlife Refuge System to provide wintering habitat and sanctuary for waterfowl. A net 926 acres and 37 acres of wetlands are projected to be lost in the Delta NWR and PAL WMA, respectively, as a result of the Project due to reduced sediment being delivered to the area over 50 years.

To offset these indirect losses, there are several opportunities. One such opportunity is building crevasses to create wetlands, such as the crevasses built under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Delta Wide Crevasse Project, which began in 1999 and has seen successful land gains in the Birdfoot delta during its 20-year project life. Crevasses are cuts in the natural levees of the rivers' distributaries that allow for overbank flow and deposition of sediments in adjacent open water areas. The crevasse project is currently being evaluated for formal extension through the CWPPRA program and has a high chance of continued success. Creating additional crevasses to create wetlands would be ideal for aiding the Delta NWR and PAL WMA to counter the indirect losses due to the MBSD project.

Another option for offsetting wetland loss in Delta NWR and PAL WMA would be constructing terracing in conjunction with building crevasses. Terraces are a series of segmented earthen ridges strategically placed in ponds or outfall areas to take advantage of trapping the particulates of sediment-laden water to create additional marsh. Terraces, when compared with open water areas, are thought to reduce fetch and wave energy and are known to slow marsh erosion, decrease pond depth, increase vegetation expansion, increased marsh edge, increase the suitable conditions for SAVs, promotes denser nekton production, and increase waterbird density and species richness (O'Connell 2006). Terracing has proved to be extremely beneficial to restoration efforts tied to crevasse projects in the past.

The Service recommends the construction of new, additional, crevasse projects that may include terracing to offset the indirect loss of 926 acres on the Delta NWR and 37 acres on the PAL WMA. Funding for these crevasse projects is currently available from a variety of sources, including the Coastal Wetland Planning, Protection and Restoration Act ("CWPPRA"), but should funding not be available through those sources to implement the crevasse projects, funding should be secured through Operations and Maintenance costs associated with the project or set aside in the Monitoring and Adaptive Management Plan to ensure wetlands losses in Delta NWR and PAL WMA will be addressed. Any CWWPPRA funding for these crevasse projects should be in addition to, and should not displace, CWPRRA funding that would otherwise be used to implement crevasse projects in Delta NWR and PAL WMA. The Service recognizes that the Bird's Foot Delta Hydrologic Restoration Project, the Engineering and design of which were funded pursuant to Deepwater Horizon Oil Spill, Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #7: Wetlands, Coastal and Nearshore Habitats

and Birds (November 2020), will, if funded for implementation, provide further benefits to the Delta NWR and PAL WMA and offset the indirect losses on those resources from the MBSD. For additional information on possible projects/plans, associated permits, and for all activities occurring on the Delta NWR, please coordinate with this office and the Southeast Louisiana Refuges by contacting Barret Fortier (985.882.2011, barret_fortier@fws.gov), and for similar information on any activities planned for Pass a Loutre WVA contact LDWF, Mr. Vaughan McDonald 225-765-2708, atvmcdonald@wlf.la.gov).

Fishery Resources

Under the APA, construction of the outfall channel would result in a permanent loss of benthic habitat with the channel footprint (Figure 7). Adjacent to the footprint of the outfall channel, deposition of suspended sediments from dredging could smother benthos and sedentary species. Based on the MBSD Draft EIS (USACE-CEMVN 2020), Eastern oysters are sensitive to burial, and the APA is expected to result in sediment deposition across 1933 ha (4,778 ac) at the Little Lake Public Oyster Seed Grounds (POSG), which could mean a loss of oyster habitat due to burial of substrate and loss of existing oysters that provide broodstock for other areas. If this amount of sediment were delivered rapidly to oyster grounds, it would potentially smother oysters. However, the projected 25 cm would be deposited over the course of 50 years (an average 5 mm per year). It is noted by Dunnington (1968) and Karel (1999) that oysters can cope with gradual sediment deposition of 1-2 cm per event. Delft modeling indicates that in most (approximately 97%) existing public seed grounds or reserves and private leases that sediment deposition will increase by less than 10 cm over 50 years of MBSD operation. While Little Lake POSG is not productive currently, it is also expected to be a site with sediment deposition that may gradually cover existing suitable substrate over time. Other public oyster grounds are farther from the diversion and predicted to experience sediment deposition rates comparable to existing rates and within the range that oysters can tolerate. While oysters may tolerate minimal increases in sediment deposition, it is possible that oysters may not be experiencing optimal growth or settlement conditions under the APA due to increased turbidity in the water column.

In general, diversion operations are expected (depending on actual River flows) to operate between base flows (up to 5,000 cfs) and peak flows (75,000 cfs) between December and July each year, with base flows typically occurring during August through November when the head differential between the river and the basin permits base flow to occur. Operation of the diversion will affect water quality conditions throughout central Barataria Basin. Water quality changes will result in indirect effects to some species of fish and oysters due to changes in temperature, salinity, and suspended sediments during operation at or near peak flow from April to July. This will especially have an impact during spring larval recruitment and corresponding high river events. According to Heilmayer et al. (2008), the combination of salinity and temperature has a synergistic effect on oysters. This synergistic effect can result in higher mortality rates due to low salinity concentrations (<5 ppt) when temperatures are higher (>25°C).

As freshwater pushes the salinity gradient further south, habitat for estuarine fisheries may

become compressed between diverted freshwater and the Gulf. Both adverse and beneficial fisheries impacts may result from changing isohalines in the receiving area. There would be a reduction in suitable habitat in the mid-Barataria Basin for several fishery species that cannot tolerate areas of lower salinity, while species that thrive in fresher areas would benefit over an expanded fresh area. Estuarine species would also benefit from indirect increases in the primary productivity from increased marsh and SAV presence under the APA compared to the No Action Alternative.

In addition, salinities may fluctuate throughout the year between times of potential high flow (approximately December through July when the river is expected to be high) versus during base flow from approximately August through November (typical low river months) as well as from year to year. If changing isohalines cause fishery species to move to habitats providing less protection from predation or less supportive in terms of growth and survival, reduced fishery production of that species could result. Both with the APA and NAA, there would be continued coastal erosion within the Barataria Basin, increasing salinity impacts (in areas minimally affected by the diversion), marsh loss, and increasing water levels over time, which will adversely impact fisheries. Under APA, these processes will continue within portions of the basin not influenced or influenced to a minor degree by the diversion. As a whole, the basin will experience adverse fisheries impacts from marsh loss and saltwater intrusion with RSLR but these impacts will be to a lesser extent under the APA than under the NAA.

Factors that will strongly influence future fisheries resource conditions include freshwater input and loss of coastal wetlands. The WVA estimated there would be an additional 13,151 net acres (Table 6) of wetlands available at the end of the 50-year period of analysis with the APA to provide marsh edge, refugia, and plant detritus, which contributes to the production of fishes and shellfishes. With the continued land loss and degradation of the basin marsh under the NAA, it is expected that fisheries in the long-term would see a decline. Without the proposed project, Delft 3D Basinwide modeling estimated 80% or nearly 300,000 acres of marsh in the Barataria basin would be lost over the 50-year period of analysis (Table 7). The loss of such a large percentage of the basin's marsh vegetation across all wetland types would constitute a major loss of faunal protection and nursery habitats for aquatic species that utilize marsh in each salinity range. Under the APA, a reduction in land loss may help fisheries remain relatively stable or reduce the anticipated decline in fisheries production. Wetlands in the project area also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In the future with the APA, freshwater fisheries would expand with the expanded fresh and intermediate habitat.

Essential Fish Habitat Assessment

Estuarine emergent wetland is the primary type of EFH that would increase significantly under the proposed plan compared to the No Action alternative. Table 7 indicates nearly 4,000 less acres of brackish and saline wetlands and over 16,500 more acres of fresh and intermediate

wetlands in the Barataria Basin under the APA compared to the NAA in 50 years. Some of this is due to habitats shifting from more saline to fresher habitat types while some is lost from inundation because of RSLR. Over all, there is a net increase in estuarine emergent wetlands that would exist at the end of 50 years with the proposed project. Coverage of SAV is also expected to increase. Increases in those habitat types would benefit white shrimp; and postlarvae, larvae, juvenile and adult red drum. Brown shrimp, however, are expected to lose habitat suitability due to lower salinities (LA TIG 2020).

The creation of estuarine emergent wetlands would result in the loss of mud bottom and estuarine water column as emergent marsh would replace those habitat types. Although adverse impacts would occur to some types of EFH, more productive types of EFH (i.e., estuarine emergent wetlands) would be created and enhanced with the proposed project. With continued land loss occurring beyond the diversion influence area, there would be plenty of remaining open water and mud bottoms.

For eastern oysters, there would be a reduction in habitat suitability in the mid-Barataria Basin due to lower monthly salinity and increased suspended sediments under the Applicant's Preferred Alternative. The spawning season for eastern oysters is from May through June and from September through October and requires salinity >10 ppt or an optimal range between 13 and 20 ppt (La Peyre et al. 2009, Miller et al. 2017, Stanley and Sellers 1986). If there is a significant reduction in salinity within the spawning season, spawning may not occur or larvae may not survive, thus reducing the recruitment potential within the various public oyster grounds. As mentioned above, increased sedimentation is not expected to smother but may stress oysters in Little Lake POSG and other areas of the mid and lower Barataria Basin. As the diversion continues to operate, reductions in salinity may reduce the oyster survival, reproduction and/or growth rates. In general, oysters located near the barrier islands would be outside of the primary effects of freshwater input to the Barataria Basin from the diversion.

Wildlife

The applicant's preferred alternative would result in improved habitat conditions for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, marsh birds, and furbearers. The conversion of open water to mudflat, and later to marsh, would result in beneficial impacts on bird species that use wetland habitats, such as waterfowl, shorebirds, wading birds, and marsh birds. In addition, the project is anticipated to curtail the continued loss of wetlands. Upland vegetation in the upper basin and near Lafitte, could experience some continued or increased protection from storm surge and overwash as existing wetlands are protected and/or new wetlands are established. The expanded fresher wetlands would greatly benefit a diverse range of species that use fresh and intermediate wetlands and/or upland habitats for breeding, foraging, and migration, including wildlife such as many neotropical migratory birds, colonial waterbirds, alligators, lizards, frogs, mink, river otter, muskrat, and more. Fresh marshes provide greater plant species richness and food availability for waterfowl and other wildlife than more saline wetlands. Fresh marshes are considered to be the most valuable marsh to waterfowl, followed by intermediate and brackish marsh (GCJV 2002). With the APA, overall loss of brackish and saline marsh is nearly 4,000 acres more than with the NAA at the end of the

period of analysis (2070), while fresh and intermediate marsh will increase by nearly 16,600 acres (Table 7).

Migratory waterfowl utilizing the project area would benefit from a greater freshwater food supply resulting from the increased abundance and diversity of emergent, submerged, and floating-leaved species. Habitat for the resident mottled duck would also improve considerably as the marsh platform would provide more desirable nesting habitat.

Intertidal marsh and marsh edge would also provide increased foraging opportunities for shorebirds and wading birds. Small fishes and crustaceans are often found in greater densities along vegetated marsh edge (Castellanos and Rozas 2001, Rozas and Minello 2001), and many of those species are important prey items for wading birds such as the great blue heron, little blue heron, great egret, black-crowned night-heron, and snowy egret. Mudflats and shallow water habitat created by the diversion-related sediment deposition would provide increased foraging opportunities for shorebirds such as least sandpipers, killdeer, and the American avocet. Those species feed on tiny invertebrates and crustaceans found on mudflats, which are exposed at low tide and in shallow-water areas of the appropriate depth.

Furbearers (such as the nutria and muskrat) which feed on vegetation would benefit from the increased marsh acreage in the project area. Furbearers such as the mink, river otter, and raccoon have a diverse diet and feed on many different species of fishes and crustaceans. Those species often feed along vegetated shorelines, which provide cover for many of their prey species.

Threatened and Endangered Species

The USACE is responsible for determining whether the proposed Project is likely (or not likely) to adversely affect any listed species and/or critical habitat, and for requesting the Service's concurrence with that determination. If USACE determines, and the Service concurs, that the selected alternative is likely to adversely affect listed species and/or critical habitat, a request for formal consultation in accordance with Section 7 of the ESA should be submitted to the Service. That request should also include USACE's rationale supporting their determination.

Migratory Bird Treaty Act (MBTA) and Bald and Eagle Protection Act (BGEPA)

During project construction, the Service recommends that on-site contract personnel be informed of the need to identify nesting bald eagles and colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

In Louisiana, bald eagles are known to nest near, and occur in areas with large waterbodies, expansive marsh, and riverine systems. Historically, the introduction of environmental contaminants to the eagle's food resource resulted in eggshell thinning and, ultimately, reduced reproductive success (USFWS 1989). Although there are prohibitions of certain pesticides, a diversion of this size will introduce agricultural runoff, which may lead to subsequent declines in water quality in the Barataria Basin, which may impact eagle food resources. To ensure that

future contaminants introduced do not lead to adverse impacts to bald eagle, the Service recommends that pre and post sampling of fish and shellfish, from the outfall area and the Mississippi River be undertaken. The Service recommends that CPRA, in coordination with the Service, develop a list of contaminants to be analyzed. The list of contaminants to be analyzed would be taken from the most recent EPA Priority Pollutants and Contaminants of Concern (COC) list. Periodic post-operational sampling should start after sufficient time for potential contaminants to accumulate (i.e., 3 to 5 years) and the frequency of subsequent periodic sampling (e.g., 3 to 5 years) would be predicated upon levels of contaminants detected. Expansion of sampling to local nesting bald eagles, (e.g., fecal and blood samples analyzed for the same contaminants) would also be predicated upon the type and level of contaminants detected. If high levels of contaminants are found, the Service and other resource agencies should be consulted. This adaptive sampling plan should be developed in cooperation with the Service and other natural resource agencies and implemented prior to operation.

At-Risk Species and Gulf Coast Joint Venture

Because the Project would restore deltaic processes and improve the sustainability of marshes in the diversion outfall, this restoration strategy may indirectly benefit Gulf Coast Joint Venture priority species and several at-risk species including reddish egret, golden-winged warbler, saltmarsh topminnow, and diamond-backed terrapin by slowing the loss of Barataria Basin wetlands. The saltmarsh topminnow, however, will see an initial loss of suitable habitat within the immediate diversion outfall area but will have a potential increase in suitable habitat in the long term.

FWS Concerns

The re-introduction of riverine waters into the coastal estuary affects a number of complex and inter-related processes. While there are potentially many benefits to a diversion, such as land building and reducing land loss, there are also the potential for unintentional deleterious impacts. Studies indicate that increases in water level on vegetation may lead to substantial reductions in productivity and organic accretion in receiving areas when utilizing river diversions for delta restoration (Snedden et al. 2015). Increased flooding frequency and duration stresses marsh vegetation and can result in mortality. As indicated by the Delft 3D Basinwide model (Messina et al. 2019), some locations in the outfall area, may have prolonged inundation due to freshwater transported by the proposed Project resulting in adverse impacts on wetland vegetation during the 50-year analysis period. Potential inundation stress would be greatest in the mid-basin nearest the diversion structure outfall, and would diminish with distance from the outfall. On the other hand, nutrient, sediment, and freshwater inputs from a diversion without prolonged inundation can help with wetland growth, reduce stressors, enhance sediment capture and retention, enhance food web productivity, and increase submerged aquatic vegetation just to name a few. The level of inundation due to the diversion operation can potentially positively impact vegetative accretion, elevation gain, the rate of aboveground and belowground production (Cahoon et al. 2011). The Service recommends that consideration be given to operating the diversion in a manner that

would prevent or minimize adverse impacts to wetlands due to prolonged inundation and focus on the overall enhancement of the entire project area to the greatest extent possible.

The Mississippi River Birdfoot Delta and the Delta NWR and PAL WMA located therein, are dependent on the sediments received and deposited in the delta. An indirect impact resulting from the diversion is the future loss of sediment being delivered to the Birdfoot Delta resulting in a net loss of 926 marsh acres to the Delta NWR and 37 marsh acres to the PAL WMA. The construction of crevasse projects that may include terracing to offset the indirect loss of 926 acres on the Delta NWR and 37 acres on the PAL WMA. Funding for these crevasse projects is currently available from a variety of sources, including the Coastal Wetland Planning, Protection and Restoration Act ("CWPPRA"), but should funding not be available through those sources to implement the crevasse projects, funding should be secured through Operations and Maintenance costs associated with the project or set aside in the Monitoring and Adaptive Management Plan to ensure wetlands losses in Delta NWR and PAL WMA will be addressed. Any CWWPPRA funding for these crevasse projects should be in addition to, and should not displace, CWPRRA funding that would otherwise be used to implement crevasse projects in Delta NWR and PAL WMA. The Service recognizes that the Bird's Foot Delta Hydrologic Restoration Project, the Engineering and design of which were funded pursuant to Deepwater Horizon Oil Spill, Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #7: Wetlands, Coastal and Nearshore Habitats and Birds (November 2020), will, if funded for implementation, provide further benefits to the Delta NWR and PAL WMA and offset the indirect losses on those resources from the MBSD. For additional information on possible projects/plans, associated permits, and for all activities occurring on the Delta NWR, please coordinate with this office and the Southeast Louisiana Refuges by contacting Barret Fortier (985.882.2011, barret_fortier@fws.gov), and for similar information on any activities planned for Pass a Loutre WVA contact LDWF, Mr. Vaughan McDonald 225-765-2708, atvmcdonald@wlf.la.gov).

In order to better coordinate and consider the overall health of the Barataria basin, the Service recommends that a basin-wide operations and basin response data repository be developed. The data and conclusions should be readily available to help in the general coordination among diversion operators, within their authorizations, and to understand both adverse and beneficial impacts to the overall basin. The Service and other natural resource agencies should be involved in reviewing and commenting on this data repository.

Monitoring of the Davis Pond and Caernarvon Diversions indicated that some contaminants were being introduced into the receiving areas from the Mississippi River. To address potential impacts of future contaminants on fish and wildlife resources, the Service recommends that pre and post sampling of fish and shellfish, from the outfall area and the Mississippi River be undertaken. The Service recommends that CPRA, in coordination with the Service, develop a list of contaminants to be analyzed. The list of contaminants to be analyzed would be taken from the most recent EPA Priority Pollutants and Contaminants of Concern (COC) list. Periodic post-operational sampling should start after sufficient time for potential contaminants to accumulate (i.e., 3 to 5 years) and the frequency of subsequent periodic sampling (e.g., 3 to 5 years) would be predicated upon levels of contaminants detected. Expansion of sampling to local nesting bald eagles, (e.g., fecal

and blood samples analyzed for the same contaminants) would also be predicated upon the type and level of contaminants detected. If high levels of contaminants are found, the Service and other resource agencies should be consulted. This adaptive sampling plan should be developed in cooperation with the Service and other natural resource agencies and implemented prior to operation.

The purpose of the proposed diversion is to build, sustain, and maintain wetlands. The Service has concerns about inadvertent inundation impacts, introduced contaminants, and the overall health of the Barataria Basin. A detailed Adaptive Management Plan will be important to inform operational decisions in order to minimize adverse impacts where possible.

SERVICE POSITION AND RECOMMENDATIONS

Coastal marshes are considered by the Service to be aquatic resources of national importance due to their increasing scarcity and high habitat value for fish and wildlife within Federal trusteeship (i.e., migratory waterfowl, wading birds, other migratory birds, threatened and endangered species, and interjurisdictional fisheries).

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved.

> Resource Category 2 are habitats of high value for evaluation species and are relatively scarce or becoming scarce on a national basis or in the ecoregion section. The mitigation goal for habitat in this category is that there should be no net loss of in-kind habitat value.
>
> Resource Category 3 are habitats of high to medium value for evaluation species and are relatively abundant on a national basis. FWS's mitigation goal here is that there be no net loss of habitat value while minimizing loss of in-kind habitat value.

The MBSD project anticipates benefiting the Barataria Basin with a basin wide increase of 12,684 marsh acres and near field (e.g., close proximity to the outfall) increase of 13,151 marsh acres (3,848 AAHUs) over the 50-year period of analysis. The near field area (13,151 acres) focuses on a smaller lower-salinity portion of the basin (primarily an area of wetland gain) near the diversion outfall. The larger basin benefits (12,684 net acres) include the lower basin brackish and saline marsh losses, which offsets some of the fresh/intermediate gains seen in the diversion outfall area resulting in an overall smaller net wetland gain across the basin than when compared to the near field area alone.

The APA would directly impact 182.9 acres of jurisdictional wetlands and 266.3 acres of vegetated shallows (SAV) and other waters of the U.S. As previously mentioned for unavoidable impacts, compensatory mitigation is required to replace the loss of jurisdictional wetland function

and area. Of the 182.9 acres (-135.7 Average Annual Habitat Units (AAHUs)) of total permanent direct wetland impacts, 21.6 acres (-12.1 AAHUs) are of bottomland hardwood forest, 151 acres (-102.4 AAHUs) are of wet pasture, and 10.3 acres (-21.2 AAHUs) are of scrub/shrub (Table 4). The Project is expected to benefit (nourish and restore) 13,151 acres (3,848 AAHUs) of marsh. Project benefits far outweigh the permanent loss in existing wetland function; thus offsetting the need for compensatory mitigation.

Because sediments, freshwater, and nutrients transported by the Mississippi River would be diverted up river from the Birdfoot Delta of the Mississippi River, the Birdfoot Delta would experience an additional projected indirect loss of 2,891 acres of wetlands by 2070 when compared with the No Action alternative. Changes in land area in the birdfoot delta between the Applicant's Preferred Alternative and the No Action Alternative would be relatively minor (3 to 6 percent in operational years 2030 to 2060). The expected total project benefits would far outweigh the indirect negative impacts to the Birdfoot Delta. However, of the loss to the Birdfoot Delta a portion, 926 acres of marsh is projected to be lost in the Delta National Wildlife Refuge (Delta NWR) and 37 acres on the Pass-A-Loutre Wildlife Management Area (PAL WMA) because of the reduced sediment being delivered to the area.

The Service supports the MBSD project provided that the following fish and wildlife recommendations are carried out concurrently with project implementation:

1. The Service recommends the construction of crevasse projects that may include terracing to offset the indirect loss of 926 acres on the Delta NWR and 37 acres on the Pass-A-Loutre (PAL) WMA. Funding for these crevasse projects is currently available from a variety of sources, including the Coastal Wetland Planning, Protection and Restoration Act ("CWPPRA"), but should funding not be available through those sources to implement the crevasse projects, funding should be secured through Operations and Maintenance costs associated with the project or set aside in the Monitoring and Adaptive Management Plan to ensure wetlands losses in Delta NWR and PAL WMA will be addressed. Any CWWPPRA funding for these crevasse projects should be in addition to, and should not displace, CWPRRA funding that would otherwise be used to implement crevasse projects in Delta NWR and PAL WMA. The Service recognizes that the Birdfoot Delta Hydrologic Restoration Project, the Engineering and design of which were funded pursuant to Deepwater Horizon Oil Spill, Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #7: Wetlands, Coastal and Nearshore Habitats and Birds (November 2020), will, if funded for implementation, provide further benefits to the Delta NWR and PAL WMA and offset the indirect losses on those resources from the MBSD. For additional information on possible projects/plans, associated permits, and for all activities occurring on the Delta NWR, please coordinate with this office and the Southeast Louisiana Refuges by contacting Barret Fortier (985.882.2011, barret_fortier@fws.gov), and for similar information on any activities planned for Pass a Loutre WVA contact LDWF, Mr. Vaughan McDonald 225-765-2708, atvmcdonald@wlf.la.gov).

2. The impacts to Essential Fish Habitat should be discussed with the NMFS to determine if the project complies with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Magnuson-Stevens Act; P.L. 104-297, as amended) and its implementing regulations.

3. In order to better coordinate and consider the overall health of the Barataria basin, the Service recommends that a basin-wide operations and basin monitoring data repository be developed. The data and conclusions should be readily available to help in the general coordination among diversion operators, within their authorizations, and to understand both adverse and beneficial impacts to the overall basin. The Service and other natural resource agencies should be involved in reviewing and commenting on this data repository.

4. Monitoring of the Davis Pond and Caernarvon Diversions indicated that some contaminants were being introduced into the receiving areas from the Mississippi River. To address potential impacts of future contaminants on fish and wildlife resources, the Service recommends that pre and post sampling of fish and shellfish, from the outfall area and the Mississippi River be undertaken. The Service recommends that CPRA, in coordination with the Service, develop a list of contaminants to be analyzed. The list of contaminants to be analyzed would be taken from the most recent EPA Priority Pollutants and Contaminants of Concern (COC) list. Periodic post-operational sampling should start after sufficient time for potential contaminants to accumulate (i.e., 3 to 5 years) and the frequency of subsequent periodic sampling (e.g., 3 to 5 years) would be predicated upon levels of contaminants detected. Expansion of sampling to local nesting bald eagles, (e.g., fecal and blood samples analyzed for the same contaminants) would also be predicated upon the type and level of contaminants detected. If high levels of contaminants are found, the Service and other resource agencies should be consulted. This adaptive sampling plan should be developed in cooperation with the Service and other natural resource agencies and implemented prior to operation.

5. The Service recommends that consideration be given to operating the diversion in a manner that would prevent or minimize adverse impacts to wetlands due to prolonged inundation and focus on the overall enhancement of the entire project area to the greatest extent possible.

6. The Service recommends development of a detailed Monitoring and Adaptive Management (MAM) Plan to inform operational decisions in order to minimize adverse impacts where possible. The MAM plan should be developed through coordination with the Service, NMFS, and other resource agencies. At a minimum, the MAM Plan should address the following issues:

    a. Receiving area water levels should be monitored to minimize any potential adverse impacts such as inundation impacts (refer to Services' recommendation 5, which should be included as part of the MAM plan).

b. The operational plan should include provisions for water level triggers to mitigate effects from coastal flood advisories during operation.
c. Implementation of water quality sampling for concentrations of nutrients and dissolved oxygen prior to and during operation to help determine impacts from diverted water on nutrient concentrations and resulting water quality effects.
d. Concentrations of EPA Priority Pollutants and Contaminants of Concern (COC) should be sampled in fish and shellfish from the outfall area and Mississippi River prior to and following operation to determine potential adverse effects to fish and wildlife. The frequency, intensity, and potential expansion of the sampling should be predicated upon contaminant levels detected (refer to the Services' Recommendation 4 which should be included in the MAM plan).
e. There should be monitoring of below- and above- ground biomass to understand inundation and salinity effects on wetland health.
f. Measurement of sediment accretion (water bottom and on the marsh surface) and bulk density should be conducted throughout the receiving area to provide the data needed to optimize sediment delivery and distribution to receiving area wetlands.
g. MAM plan results (i.e., sedimentation, fishery, water quality monitoring, etc.) should be used to refine and improve future operations (refer to the Services' Recommendation 3).

7. The Service recommends adaptively managing the diversion outfall area to minimize stage increases and to maximize distribution and capture of suspended sediments within the immediate outfall area. This is needed to prevent the loss of diversion efficiency should diverted water attempt to circumvent the wetlands and flow directly into Wilkinson Canal or the Barataria Bay Waterway rather than flow over marsh where it will do the most good and ensure achieving project goals. Dredged material associated with achieving this recommendation should be beneficially used to create, restore, or enhance marsh within the basin or surrounding areas.

8. A report documenting the status of implementation, operation, maintenance and adaptive management measures should be prepared every three years by the managing agency and provided to the USACE, the Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Louisiana Department of Natural Resources, Louisiana Coastal Protection and Restoration Authority, and the Louisiana Department of Wildlife and Fisheries. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

9. Further detailed planning of project features and any adaptive management and monitoring plans should be developed in coordination with the Service and other State and Federal natural resource agencies so that those agencies have an opportunity to review and submit recommendations on work addressed in those reports and plans.

10. The pallid sturgeon is found in the Mississippi River and is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant

state of change. Entrainment associated with the diversion of river water to coastal estuaries is a potential effect that should be addressed in coordination with the Service. The Service recommends consultation under the Endangered Species Act (ESA) with this office for pallid sturgeon.

11. West Indian manatees occasionally enter Louisiana coastal waters and streams during the warmer months (i.e., June through September). During in-water work in areas that potentially support manatees all personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and state law. Additionally, personnel should be instructed not to attempt to feed or otherwise interact with manatees, although passively taking pictures or video would be acceptable. For more detail on avoiding contact with manatees refer to the Endangered and Threatened Species section of this document and contact this office. Should a proposed action directly or indirectly affect the West Indian manatee, further consultation with this office will be necessary.

12. If implementation of the proposed action has the potential to directly or indirectly affect the red knot, piping plover, and eastern black rail or their habitat, further consultation with this office will be necessary.

13. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of project features and timing of construction. During project construction, a qualified biologist should inspect the proposed construction site for the presence of documented and undocumented wading bird nesting colonies and bald eagles.

    a. All construction activity during the wading bird nesting season (February through October 31 for wading bird nesting colonies, exact dates may vary) should be restricted within 1,000 feet of a wading bird colony. If restricting construction activity within 1,000 feet of a wading bird colony is not feasible, CPRA should coordinate with FWS to identify and implement alternative best management practices to protect wading bird nesting colonies.
    b. During construction activities, if a bald eagle nest is within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

14. The Service recommends that CPRA and the USACE contact the Service and LDWF for additional consultation if: 1) the scope or location of the proposed project is changed

significantly, 2) new information reveals that the action may affect listed species or designated critical habitat, 3) the action is modified in a manner that causes effects to listed species or designated critical habitat, or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made or finalized.

We appreciate the cooperation of your staff on this project and look forward to our continued coordination to further protect fish and wildlife resources. Provided that the above recommendations are included in the project report and related authorizing documents, the Service fully supports the construction and implementation of the MBSD project. If you need additional assistance or have questions regarding this report, please contact Cathy Breaux (504/862-2689) of this office.

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APPENDIX A

SCIENTIFIC NAMES FOR SPECIES DISCUSSED IN REPORT

Vegetation

Trees

Cypress	*Taxodium distichum*
Tupelo	*Nyssa aquatica*
Red maple	*Acer rubrum* var. *drummondii*
Black willow	*Salix nigra*
Chinese tallow	*Triadica sebifera*
Green ash	*Fraxinus pennsylvanica*
American elm	*Ulmus americana*
Sweet gum	*Liquidambar styraciflua*
Water oak	*Quercus nigra*
Hackberry	*Celtis laevigata*
Slippery elm	*Ulmus rubra*
Sycamore	*Platanus occidentalis*
Box elder	*Acer negundo*
Pumpkin ash	*Fraxinus profunda*

BLH and Swamp understory

Poison ivy	*Rhus radicans*
Pepper vine	*Ampelopsis arborea*
Virginia creeper	*Parthenocissus quinquefolia*

Emergent Marsh

Bulltongue	*Sagittaria lancifolia*
Arrowhead	*Sagittaria latifolia*
Cattail	*Typha latifolia*
Roseau cane	*Phragmites australis*
Smooth cordgrass	*Spartina alternaflora*
Maidencane	*Panicum hemitomon*
Cutgrass	*Leersia hexandra*
Giant cutgrass	Zizanipsis miliacea
Spikerush	*Eleocharis* spp.
soft rush	*Juncus effusus*
Marshhay cordgrass	*Spartina patens*
Loosestrife	*Lythrum lineare*
Marsh fern	*Thelypteris palustris*
Royal fern	*Osmunda regalis*
Deerpea	*Vigna luteola*
Three-cornered grass	*Schoenoplectus americanus*
Dodder vine	*Cuscuta indecora*
Perennial saltmarsh aster	*Symphyotrichum tenuifolium*
Marsh morning-glory	*Ipomoea sagittata*
Black needlerush	*Juncus roemerianus*

Leafy three-square	*Schoenoplectus robustus*
Marshelder	*Iva* sp
Eastern baccharis	*Baccharis* halimifolia
Paspalum	*Paspalum vaginatum*
Saltgrass	*Distichlis spicata*
Bermuda grass	*Cynodon dactylon*
Camphorweed	*Heterotheca subaxillaris*
Marshmallow	*Hibiscus* spp
Dewberry	*Rubus spp*
Waterprimrose	*Ludwigia peploides*

Floating Aquatics

American lotus	*Nelumbo lutea*
Water hyacinth	*Eichhornia crassipes*
Alligator weed	*Alternanthera philoxeroides*
Smartweed	*Polygonum punctatum*
Dollar weed	*Hydrocotyle* spp.
Duckweed	*Lemna minor*
Water lily	Nymphaeaceae
Coontail	*Ceratophyllum demersum*
Wild celery	*Vallisneria Americana*
Widgeongrass	*Ruppia maritime*
Southern naiad	*Najas guadalupensis*
Eurasian watermilfoil	*Myriophyllum spicatum*
Salvinia	*Salvinia* sp.

Threatened and Endangered Species and Species of Federal Concern

West Indian manatee	*Trichechus manatus*
Pallid sturgeon	*Scaphirhynchus albus*
Red knot	*Calidris canutus rufa*
Piping plover	*Charadrius melodus*
Eastern black rail	*Laterallus jamaicensis*
Bald eagle	*Haliaeetus leucocephalus*
Brown pelican	*Pelecanus occidentalis*
Reddish egret	*Egretta rufescens*
Saltmarsh topminnow	*Fundulus jenkinsi*
Diamond-backed Terrapin	*Malaclemys terrapin*
Golden-winged warbler	*Vermivora chrysoptera*
Loggerhead sea turtle	*Caretta caretta*
Kemp’s ridley sea turtle	*Lepidochelys kempii*

Fish

Alligator gar	*Lepisosteus spatula*
Anchovies	*Anchoa mitchilli*
Atlantic croaker	*Micropogon undulatus*
Bigmouth buffalo	*Ictiobus cyprinellus*
Bowfin	*Amia calva*
Brown shrimp	*Farfantepenaeus aztecus*
Black crappie	*Pomoxis nigromaculatus*
Black drum	*Pogonias cromis*
Blue catfish	*Ictalurus furcatus*
Blue crab	*Callinectes sapidus*
Bluegill	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Coquina clams	*Donax variabilis*
Eastern oyster	*Crassostrea virginica*
Fat sleeper	*Dormitator maculatus*
Freshwater drum	*Aplodinotus grunniens*
Gaff-topsail catfish	*Bagre marinus*
Gobies	*Gobioides* spp
Grass carp	*Ctenopharyngodon idella*
Gulf killifish	*Fundulus grandis*
Gulf menhaden	*Brevoortia patronus*
Gulf stone crab	*Menippe adina*
Lane snapper	*Lutjanus synagris*
Largemouth bass	*Micropterus salmoides*
Longnose gar	*Lepisosteus osseus*
Longnose killifish	*Fundulus similis*
Redear sunfish	*Lepomis microlophus*
Red drum	*Sciaenops ocellata*
Rough silverside	*Membras martinica*
Sand seatrout	*Cynoscion arenarius*
Scaled sardine	*Harengula pensacolae*
Sheepshead minnow	*Cyprinodon variegatus*
Shortnose gar	*Lepisosteus platostomus*
Smallmouth buffalo	*Ictiobus bubalus*
Southern flounder	*Paralichthys lethostigma*
Spot	*Leiostomus xanthurus*
Spotted gar	*Lepisosteus oculatus*
Spotted seatrout	*Cynoscion nebulosus*
Striped mullet	*Mugil cephalus*

Warmouth	*Lepomis gulosus*
White crappie	*Pomoxis annularis*
White mullet	*Mugilcurema*
White shrimp	*Litopenaeus setiferus*
Yellow bullhead	*Ameiurus natalis*

Amphibians

American bullfrog	*Lithobates catesbeianus*
Dusky salamander	*Desmognathus fuscus*
Dwarf salamander	*Eurycea quadridigitata*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Eastern newt	*Notophthalmus viridescens*
Green frog	*Lithobates clamitans*
Green treefrog	*Hyla cinerea*
Gulf Coast toad	*Incilius nebulifer*
Lesser siren	*Siren intermedia*
Northern cricket frog	*Acris crepitans*
Pig frog	*Lithobates grylio*
Southern leopard frog	*Lithobates sphenocephalus*
Spring peeper	*Pseudacris crucifer*
Squirrel treefrog	*Hyla squirella*
Three-toed amphiuma	*Amphiuma tridactylum*

Reptiles

American alligator	*Alligator mississipppiensis*
Broadhead skink	*Plestiodon laticeps*
Cottonmouth	*Agkistrodon piscivorus*
Eastern mud turtle	*Kinosternon subrubrum*
Garter snake	*Thamnophis sirtalis*
Green anole	*Anolis carolinensis*
Little brown skink	*Scincella lateralis*
Gulf coast ribbon snake	*Thamnophis proximus orarius*
Mud snake	*Farancia abacura*
Rat snake	*Elaphe obsoleta*
Red-eared slider	*Trachemys scripta*
Alligator snapping turtle	*Macroclemys temminckii*
Eastern black kingsnake	*Lampropeltis nigra*
Watersnakes	*Nerodia* spp.

Birds

American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American kestrel	*Falco sparverius*
American wigeon	*Mareca americana*
Anhinga	*Anhinga anhinga*
Barred owl	*Strix varia*
Black-crowned night-heron	*Nycticorax nycticorax*
Black-bellied plover	*Pluvialis squatarola*
Black-necked stilt	*Himantopus mexicanus*
Black Skimmer	*Rynchops niger*
Blue-winged teal	*Anas discors*
Buntings	*Passerina* sp.
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thryothorus ludovicianus*
Cattle egret	*Bubulcus ibis*
Clapper rail	*Rallus crepitans*
Common gallinule	*Gallinula chloropus*
Eastern screech-owl	*Megascops asio*
Double-crested cormorant	*Phalacrocorax auritus*
Eastern phoebe	*Sayornis phoebe*
Gadwall	*Mareca strepera*
Geese	Family: Anser
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Green heron	*Butorides virescens*
Green-winged teal	*Anas carolinensis*
Killdeer	*Charadrius vociferus*
King rail	*Rallus elegans*
Laughing gull	*Leucophaeus atricilla*
Least sandpipers	*Calidris minutilla*
Little blue heron	*Egretta caerulea*
Mallard	*Anas platyrhynchos*
Mottled Duck	*Anas fulvigula*
Northern harrier	*Circus hudsonius*
Northern pintail	*Anas acuta*
Purple gallinule	*Porphyrula martinica*
Prothonotary warbler	*Protonotaria citrea*

Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Roseate spoonbill	*Platalea ajaja*
Royal Tern	*Thalasseus maximus*
Sandwich Tern	*Thalasseus sandvicensis*
Snowy egret	*Egretta thula*
Sora	*Porzana carolina*
Seaside sparrow	*Ammodramus maritimus*
Sparrows	Family: Passerellidae
Swallows	*Hirundinidae* sp.
Swainson's warbler	*Limnothlypis swainsonii*
Thrushes	Family: Turdidae
Tufted titmouse	*Baeolophus bicolor*
Tricolored heron	*Egretta tricolor*
Warblers	*Parulidae* sp.
White-eyed vireo	*Vireo griseus*
White ibis	*Eudocimus albus*
Wilson's Plover	*Charadrius wilsonia*
Wood duck	*Aix sponsa*
Yellow-crowned night-heron	*Nyctanassa violacea*

Mammals

Armadillo	*Dasypus novemcinctus*
Bobcat	*Lynx rufus*
Cotton mouse	*Peromyscus gossypinus*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Gray fox	*Urocyon cinereoargenteus*
Fox squirrel	*Sciurus niger*
Grey squirrel	*Sciurus carolinensis*
Hispid cotton rat	*Sigmodon hispidus*
House mouse	*Mus musculus*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethicus rivalicius*
Northern raccoon	*Procyon lotor*
Nutria	*Myocaster coypus*
Red fox	*Vulpes vulpes*
River Otter	*Lutra canadensis*
Swamp rabbit	*Sylvaligus aquaticus*
Virginia opossum	*Didelphis virginiana*
White-tailed deer	*Odocoileus virginianus*