UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

January 13, 2014

David Bernhart
Assistant Regional Administrator for Protected Resources
NOAA Fisheries Service, Southeast Regional Office
263 13th Avenue South
Saint Petersburg, Florida 33701

Re: DWH-ERP-Request for section 7 Endangered Species Act Informal Consultation for *Deepwater Horizon* Oil Spill Phase III Early Restoration Plan Living Shoreline projects (a total of 2) in Mississippi and Alabama; *Hancock County Marsh Living Shoreline and Swift Tract Living Shoreline*

Dear David,

The National Oceanic and Atmospheric Administration (NOAA) Restoration Center requests informal consultation with your office, under section 7 of the Endangered Species Act (ESA), for impacts from two living shoreline projects. These projects have the potential to affect the following federally listed species administered by NOAA Fisheries:

Sea Turtles (Green-T, Hawksbill-E, Leatherback-E, Loggerhead-T, Kemp's Ridley-E)

Gulf sturgeon-T and Critical Habitat (critical habitat is only at the Hancock County project site)

The NOAA Restoration Center, a Lead Federal Agency, is requesting consultation on behalf of the Natural Resource Trustees for *Deepwater Horizon* Oil Spill. Enclosed please find Biological Assessments and NMFS ESA Checklists for these Phase III Early Restoration Projects. It is our expectation that the proposed projects will have a significant net benefit to the Gulf of Mexico ecosystem.

For further questions about the project, please contact Jamie Schubert of our staff at 409-621-1248.

Thank you for your assistance.

Sincerely,

Leslie Craig

Supervisor, Southeast Region, NOAA Restoration Center
NOAA Fisheries Office of Habitat Conservation

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NMFS Endangered Species Act Section 7 Checklist for Federal Action Agencies

A) Project Identification

Lead Action Agency: NOAA/Mississippi Dept. of Environmental Quality

Agency Contact: (Phone, E-mail) Jamie Schubert, jamie.schubert@nooa.gov, ph (409) 621-1248; Prepared by Stephen Parker (representing MSDEQ), sparker@adaptivemngmt.com, ph (228) 224-9057

Applicant Name: Mississippi Department of Environmental Quality

Project Name & ID #: Hancock County Marsh Living Shorelines
SEE ATTACHED MEMORANDUM: Supplemental Information for HCMLS; Gulf Sturgeon Migration Patterns in the Mississippi Sound
(SEE PROJECT INFORMATION SUMMARY FOR ADDITIONAL INFORMATION)

B) Project Location

1. Address and description of property (i.e., public, residential, commercial, industrial, etc.):

This marsh complex is part of the extensive Pearl River Mouth estuary where the land is largely in public ownership and managed by the Mississippi Department of Marine Resources as part of the Coastal Preserves of the State of Mississippi, although private parcels do exist in terrestrial habitats within the study area.

2. Latitude & Longitude:
   i. Decimal Degrees and Datum [e.g., 27.71622° N, 80.25174° W (NAD83)]
   ii. Online conversion: http://transition.fcc.gov/mb/audio/bickel/DDDMMSS-decimal.html

Bounding Coordinates: West -89.530339 W, 30.184 N; South: -89.462 W, 30.169 N; East: -89.415 W, 30.233 N; North: -89.53 W, 30.184 W. Centroid = -89.457 W, 30.19 N

3. Waterbody:
   i. Name of the body of water on which the project is located (e.g., St. Johns River, Tampa Bay, Suwannee River)
   ii. If riverine or estuarine, approximate navigable distance from marine environment (e.g., Atlantic, Gulf of Mexico)

Mississippi Sound near mouth of Pearl River. Approximately 3.5 miles NNW to Ansley, MS from project centroid.

C) Project Description

1. Existing Structures: (Describe current and historical structures in project area.)
   i. Marina, seawall, riprap, dock, etc.
   ii. Number of slips, size (area of overwater structures), liner footage, location, orientation, etc.

There are no structures

2. Existing Conditions: (Describe the project area.)
   i. Substrate type, water quality, depth, current, etc.

The shoreline proposed for this project is located in western Hancock County, Mississippi between Bayou Caddy and the mouth of the East Pearl River. This marsh complex is part of the extensive Pearl River Mouth estuary. The 5,900 acres of marsh in the area include tidal channels, lagoons, and bays. The area receives an abundance of freshwater inflow from the Pearl River and is also influenced by tidal action. Substrates from East Pearl River to Heron Bay include very soft to soft silty clays with an interbedded layer of loose silty sands. From Heron Bay northeastward the sediments are primarily very soft to soft silty clays with a loose silty sand starting at a depth of about 35 feet to at least 40 feet (terminal depth of boring data). Substrate data was collected from a geotechnical survey in April 2013. Bathymetry in the study area ranges from approximately 0-12 ft. below MLLW, although the living shoreline, oyster deployment, and marsh creation areas range roughly from 1-4 ft. below MLLW.

3. Seagrasses & Other Marine Vegetation:

i. If a benthic survey was conducted , provide date of survey and a copy of the report.
ii. Species area of coverage estimates and density of species coverage (percentage) estimates.
iii. Location relative to proposed structures. Provide detailed sketch of action area and location of seagrasses.

There is no known SAV habitat in the area.

4. Mangroves:

i. Species (red, black, or white)
ii. Area (square footage and linear footage). Provide detailed sketch of action area and location of mangroves.

No mangroves are present.

5. Corals:

i. Species area of coverage estimates (percentage) and density of species estimates.
ii. Location relative to proposed structures. Provide detailed sketch of action area and location of corals.

No corals are present.

D) Project Construction Methods

1. Methods:

i. Construction methodology (Please provide detail)
ii. Demolition/removal of existing structures/debris
iii. Location of work (e.g., barge, upland, or both)

Construction Process – Based on the MLLW elevation of 0.00' NAVD88 and 1.68' NAVD88 for MHW, construction of submerged reefs will be in very shallow water. Minimum depth of water is assumed to be 3' for the St. Joseph's Point Submerged Reef and 1.5' for the Pearl River to Heron Bay Submerged Reef to MLLW. Construction will require various types of shallow draft vessels and equipment to get into work areas.

The alignment and limits of the submerged reefs will be surveyed in with the outer limits of the submerged reef being marked with poles driven into the bottom and extended approximately 3' above the water surface. Elevation controls along the alignment will be established. Prior to working in an area, existing bottom elevations along the alignment will be surveyed. Height of submerged reef along the alignment will be constructed based on bottom elevations and the submerged reef's crest elevation (0.87' NAVD88 – Mean Tide Level). Barriers, navigation warning signs (lighted and unlighted), etc. will be established along the work area to protect boaters. These will be maintained throughout the project until permanent markers are established.

St. Joseph's Point Area Submerged Reef – This area has deeper water (3' – 4.6' depth, on average) and a soft bottom. It is anticipated that one or more work barges with a backhoe with a long reach will be positioned along the seaward side of the submerged reef. The work barge(s) will be selected to safely meet the draft requirements in this area. A material barge will be positioned seaward of the work barge in sufficient depth of water, but within reach of the backhoe. The material barge will be loaded so as not to exceed the draft requirements in the work area. Barges will be operated and maintained in sufficient draft to the extent practical.

Pearl River to Heron Bay Submerged Reef – This area has shallower water (1.5' – 3.1' depth, on average) and a soft bottom. It is anticipated that a tracked backhoe with a long reach or mounted on a marsh buggy will be positioned along the alignment of the submerged reef. The material barge will be positioned seaward of the submerged reef in sufficient depth of water, but within reach of the backhoe. The material barge will be loaded so as not to exceed the draft requirements in the work area. Barges will be placed and maintained in sufficient draft to the extent practical.

Assuming that the submerged reef will have an initial settlement of 1.5', the core of the submerged reef may be constructed with gabion baskets filled with 165-lb. per cubic foot granite rip rap. The gabion baskets will be constructed either on the material barge, then filled with rip rap or on-shore then loaded onto the material barge(s). The material barge(s) will then be moved into position along the submerged reef alignment for placement by the backhoe.

Prior to placement of the gabion baskets for the core of the submerged reef, a settlement plate will be positioned at designated locations to monitor settlement of the submerged reef. Gabion baskets will then be placed by the backhoe to construct the core of the submerged reef.

A second work barge with backhoe or tracked backhoe will place loose rip rap over and around the gabion baskets to complete the construction of the rip rap core of the submerged reef. The loose rip rap will be placed on material barge(s) delivered to the work area. Placement of the loose rip rap will be monitored to insure the submerged reef dimensions, slopes and crest elevation is achieved.

After the rip rap core of the submerged reef has been confirmed to be complete, bags of shell will be placed over the rip rap core to provide the shell veneer. The bags of shell will be placed, by hand, from shallow draft boats. Bags of shell will be prepared on-shore, loaded onto material barges and delivered to the work area. The material barges will be anchored in deeper water. The skiffs will return to the work barge to obtain more bags of shell for deployment. Placement of bags of shell will be monitored to insure the bags are

properly placed and the shell veneer requirements have been met.
Final construction of the submerged reefs will be surveyed (alignment, elevation, representative cross-sections, settlement plates, etc.). Permanent navigation signage will be installed in accordance with safety requirements. The project may utilize flotation channels dug to get the work barges into the work area. These barges will parallel the alignment of the living shoreline structure with channels dug periodically along the alignment and at each end to get the work barges in and out of the work area. The spoil will be cast on the seaward side of the flotation channel so that it will fill naturally back in over time. The bottom elevation of the flotation channel will be -10' to accommodate barge draft. The bottom width of the flotation channel will be 80' with 3H:1V side slopes. The length of the flotation channel will be about 10,000' in length west of Heron Bay and approximately 19,500' in length east of Heron Bay, plus periodic flotation channels along alignment and at end of each alignment. The other option is to float barges in and out at high tides.

Oyster Reefs in Heron Bay: Water depths in proposed reef areas seem to be 4'-5' (MLLW) and 5.67' – 6.67' (MHW). The limits of the oyster reef(s) will be established with buoys or poles driven into the bottom. Deployment of oyster shells will consist of a barge mounted crane with clam shell bucket. A material barge will be loaded with the oyster shells and attached to the seaward side of the work barge. The oyster shell will be deployed by the crane with clam shell bucket. A GPS reading will be taken for each bucket load deployed. A download of all GPS readings will be made daily and provided to MDEQ. Deployment will continue until the entire oyster reef area(s) has received one inch to no more than a 6" layer of oyster shell. Upon completion of the deployment, an "after deployment" survey of the oyster reef area(s) will be conducted in situ. As a construction alternative, water jetting of loose shell off of a material barge could be used depending on depths. This method may not be applicable in shallow areas.

Marsh Creation at St. Joseph's Point: After the submerged reef along St. Joseph's Point has been installed, selected areas landward of the submerged reef will be filled with dredge material obtained from a suitable offshore area near St. Joseph's Point. A dike will be constructed at the seaward extent of the marsh utilizing a tracked backhoe or backhoe mounted on a marsh buggy. The dike will be constructed by excavating existing material from the landward side of the dike. Once an area of the marsh is diked, the area landward of the dike will be filled with dredged material beginning at the most landward extent of the marsh and filling toward the dike. This will allow the area between the dredged material and dike to serve as a sediment pond. Filling with dredge material will continue until final marsh grades are achieved. Pumps and sediment controls will remain in place throughout the dredging and filling process. Once the entire marsh area(s) are constructed, the area will be monitored for re-vegetation through natural processes.

2. Docks:

i. Is this a fishing pier? (public or private)
    1. If so, how many people are expected to fish per day?
    2. How do you plan to address hook and line captures?

ii. Type of decking
    1. Grated (In Florida) -
        Dock Guidelines - http://sero.nmfs.noaa.gov/pr/endangered%20species/Section%207/DockGuidelines.pdf
        Dock Key - http://sero.nmfs.noaa.gov/pr/endangered%20species/Section%207/DockKey.pdf
        a. Grating type/design
        b. Manufacturer's name and address
        c. Percent light transmittance (%LT)
    2. Wooden planks or composite planks
        a. Proposed spacing between boards (0.50-inch, 0.75-inch, etc.)

ii. Height above Mean High Water (MHW) elevation
iii. Directional orientation
iv. Shading impacts (calculate square footage)
v. Sea Turtle and Smalltooth Sawfish Construction Conditions, dated March 23, 2006
http://sero.nmfs.noaa.gov/pr/endangered%20species/Sea%20Turtle%20and%20Smalltooth%20Sawfish%20Construction%20Conditions%203-23-06.pdf

N/A

3. Pilings & Sheetpiles

i. Construction methodology (i.e., pile driving, vibratory hammer, jetting).
ii. Must provide piling size, material, and number of pilings.
iii. Have potential impacts to species been adequately addressed (including marine vegetation)?

N/A

4. Boat Slips

i. Number and size of new slips, change from existing
ii. High-and-dry boat storage: vessel storage capacity
iii. Estimated shadow effect of the boat (square footage of shaded area beneath boat)

N/A

5. Boat Ramp

i. Number of ramps and size of ramps
ii. Number of vessels that can be moored (i.e., staging area)
iii. Trailer parking lot capacity

N/A

6. Shoreline Armoring: Seawalls, jetties, etc.

i. Project description, linear footage, square footage, material, etc. Provide detailed sketch of action area and location of structure.

Two living shoreline structures:

• Pearl River to Heron Bay Submerged Reef: This stretch of reef is anticipated to be 1.9 miles long with a crest width of 15 feet and a total height of approximately 2.5 feet (to +0.87 ft, NAVD). Reef is proposed to have a 9-inch (0.75-foot) bagged shell veneer. Average water depth is assumed to be -1.5 NAVD (1.5 feet to Mean Low Water, 3.1 feet to Mean High Water). The calculated volume of material is 18,752 cu. yd. riprap and 5,045 cu. yd. shell. A footprint of approximately 10.95 acres of fine-grained sediment will be covered with a riprap core and shell veneer.

• St. Joseph's Point Area Submerged Reef: This stretch is anticipated to be 4 miles long with a crest width of 15 feet and total height of approximately 4 feet (to +0.87 ft, NAVD). Reef is proposed to have a 9-inch (0.75- foot) bagged shell veneer. The average water depth is assumed to be -3 feet NAVD (3 feet to Mean Low Water, 4.6 feet to Mean High Water). The calculated volume of material is 66,442 cu. yd. riprap and 12,513 cu. yd. shell. A footprint of approximately 4.21acres of fine-grained sediment will be covered with a riprap core and shell veneer. The footprint and placement of the structure may change during the iterative design process.

7. Dredging

i. Dredge type (hopper, cutterhead, clamshell, etc.)
ii. Depth of cut
iii. Area (square feet) to be dredged
iv. Volume of material (cubic yards)
v. Spoil disposition plans (i.e., where is dredged material being disposed of? Location of disposal area (upland/openwater/ beneficial use site), sediment type at disposal area, thickness of fill placement)
vi. Hydrodynamic description (i.e., average current speed/direction)

Flotation channels may be dug to facilitate working barges that will deploy living shoreline structures, oyster cultch, and sediment for marsh creation. These barges will parallel the alignment of the living shoreline structure with channels dug periodically along the alignment and at each end to get the work barges in and out of the work area. The spoil will be cast on the seaward side of the flotation channel so that it will fill naturally back in over time. The bottom elevation of the flotation channel will be -10' below water surface to accommodate barge draft. The bottom width of the flotation channel will be 40' with 3H:1V side slopes. The length of the flotation channel will be about 10,032' in length west of Heron Bay and approximately 21,120' in length east of Heron Bay, plus periodic flotation channels along alignment and at end of each alignment. The other option is to float barges in and out at high tides if feasible. Bottom sediments from the East Pearl River to Heron Bay s are very soft to soft silty clays with an inter-bedded layer of loose silty sands. From Heron Bay northeastward the sediments are primarily very soft to soft silty clays with a loose silty sand starting a at a depth of about 35 feet to at least 40 feet (terminal depth of the boring).

8. Blasting

i. Explosive weights
ii. Blasting plan

N/A

9. Artificial Reefs

Please refer to the Section 7 Checklist procedures for directions on how to complete this question. For additional information and detailed guidance on artificial reefs, please refer to the *Guidelines and Management Practices for Artificial Reef Siting, Use, Construction, and Anchoring in Southeast Florida* http://www.dep.state.fl.us/coastal/programs/coral/reports/MICCI/MICCI_18_19.pdf

N/A

10. Construction Schedule

i. In-water work

ii. Number of days/weeks/months

Construction Start: May-October 2016
Construction Complete: Fall 2017

11. Mitigation/ Protective Measures:

Will the project follow the August 2001 (2008 Revision) Dock Construction Guidelines?	N/A
Will the project follow the October 2002 Johnson's Seagrass Key?	N/A
Will the project follow the March 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions?	N/A

If NO, please explain why the deviation is necessary for this project.

Not applicable in state of Mississippi

E) Effects of the Project

1. Listed Species and Critical Habitat within the Action Area (see effects determination guidance)

Not Likely to Adversely Effect	Green Sea Turtles	
Critical Habitat	Not in Critical Habitat	
Not Likely to Adversely Effect	Hawksbill Sea Turtles	
Critical Habitat	Not in Critical Habitat	
Not Likely to Adversely Effect	Kemp's Ridley Sea Turtles	
Critical Habitat	No Critical Habitat	
Not Likely to Adversely Effect	Leatherback Sea Turtles	
Critical Habitat	Not in Critical Habitat	
Not Likely to Adversely Effect	Loggerhead Sea Turtles	
Critical Habitat	No Critical Habitat	
Species Not in Action Area	Olive Ridley Sea Turtle	
Critical Habitat	No Critical Habitat	
Species Not in Action Area	Smalltooth sawfish	
Critical Habitat	Not in Critical Habitat	
Species Not in Action Area	Largetooth sawfish	
Critical Habitat	No Critical Habitat	
Species Not in Action Area	Shortnose sturgeon	

Critical Habitat | No Critical Habitat

Species Not in Action Area | Atlantic sturgeon

Critical Habitat | No Critical Habitat

Not Likely to Adversely Effect | Gulf sturgeon

Critical Habitat | NLAA - Unit 8 - Lake Pontchartrain - Mississippi Sound

Species Not in Action Area | Johnson's seagrass

Critical Habitat | Not in Critical Habitat

Species Not in Action Area | Staghorn coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Elkhorn coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Pillar coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Lobed star coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Mountainous star coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Knobby star coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Rough cactus coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Lamarck's sheet coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | Elliptical star coral

Critical Habitat | No Critical Habitat

Species Not in Action Area | North Atlantic right whales

Critical Habitat | Not in Critical Habitat

Species Not in Action Area | Humpback whales

Critical Habitat | No Critical Habitat

Species Not in Action Area | Blue whales

Critical Habitat | No Critical Habitat

Species Not in Action Area | Fin whales

Critical Habitat | No Critical Habitat

Species Not in Action Area | Sei whales

Critical Habitat | No Critical Habitat

2. Effects to Species

i. Explain potential effects to each species checked above
ii. Consider vessel traffic impacts, speed zones (if present), anchoring impacts, keel/propeller impacts
iii. Noise impacts from construction (i.e., pile driving, blasting, etc.)

i. We do not expect any effects from sea turtle species checked above. No sea turtle nesting habitat exists in the area. In Mississippi, the leatherback is observed sporadically. Observations of green turtles and hawksbills in state coastal water are very rare. The loggerhead occasionally nests on Mississippi's offshore barrier islands and are regularly seen around offshore oil rigs. The rarest species of sea turtle globally, the Atlantic (or Kemp's) ridley is the sea turtle most frequently encountered in Mississippi's coastal waters. Ridleys do not nest in

Mississippi but juveniles are regularly seen in the Mississippi Sound. Project components will be constructed very close to the shoreline and are not expected to impede transitory routes. The sea turtles listed are highly mobile marine species and are capable of swimming away from impacted areas. Awareness of sea turtle presence in the project area will result in a stop work order until species are observed leaving the area.
The project is not likely to adversely affect the Gulf sturgeon or its critical habitat. There will be no long term impacts to primary constituent elements identified or individual fish. All restoration activities will take place in shallow waters near the shoreline allowing sufficient area for passage of individuals. Nonetheless, to avoid disturbance, the project aims to construct restoration features from May-October while the species occupies riverine habitat. This provides ample opportunity for Gulf sturgeon to migrate through the immediate area. Moreover, if any Gulf sturgeon species are observed in the project area, a stop work order will be implemented until the species leaves the area. Additionally, the benthic habitat in the project area is not preferred foraging habitat for Gulf sturgeon. It is expected that living shoreline habitat will provide benefit to the species through enhanced water quality from oyster productivity.
See memorandum (Supplemental Information for Hancock County Marsh Living Shorelines Project; Gulf Sturgeon Migration Patterns in the MS Sound)

ii. Work barges and skiffs will initially impact bottom sediments, but impacts will be temporary. Vessel impacts are not expected post-construction.

iii. Noise from construction activities will be minimal. Placement of living shoreline structures and oyster cultch are not expected to adversely affect species due to noise harassment.

3. Effects to Critical Habitat:

i. Identify which essential feature(s) are present, if they will be impacted, and how they will be impacted
ii. Size of area affected (square footage) - Mangroves (linear footage of shoreline)
iii. How will the habitat be changed/altered as a result of the action

i. Gulf sturgeon critical habitat features:
1) Abundance of prey items in estuarine and marine environments: the benthic habitat in the project area is not preferred foraging habitat for Gulf sturgeon. Well oxygenated, clear water with sandy substrates are primarily used for feeding by the species. Benthic habitat in the project footprint is largely composed of soft, silty substrates with turbid waters. Additionally, the project features will be constructed in shallow water (1-4 ft.). Gulf sturgeon typically forage in depths greater than 6 ft. 2) Water Quality: Placement of material (osyter shell, riprap) is expected to produce some degree of turbidity in excess of normal conditions. Impacts from sediment disturbance during construction are expected to be temporary and minimal. Suspended particles are expected settle in a short time frame with no measurable effects on water quality. No changes in temperature, salinity, pH, hardness, oxygen content or other chemical characteristics are expected. 3) Sediment Quality: Modification of sediment composition may only occur in areas where dredged spoil material will be placed for marsh restoration activities and areas where oyster cultch will be placed for reef restoration. Oyster material will be likely be placed in areas where historical oyster beds have been documented. Additionally, given the close proximity of the project area to the Pearl River, natural sedimentation processes are expected nourish the area over time. 4) Migratory Pathways: Within Unit 8, subadult and adult Gulf Sturgeon move from the rivers through estuarine and marine areas to feeding areas. Unit 8 is known to support migratory pathways for Gulf sturgeon sub-populations (e.g. Pearl River population) and it is likely that the species use the project area during intra-annual migrations. Restoration activities will occur in very shallow water (1-6 ft) allowing sufficient area for passage of individuals. Construction working dates will be managed to work around migration seasons.

ii. Project footprint (permanant impact) is 107 acres including 10.95 acres for St. Joe's Point submerged reef; 4.21 acres for Pearl River to Heron Bay submerged reef 46 acres of created tidal marsh; and 46 acres of oyster reefs in Heron Bay.
The temporary construction footprint includes potential flotation channels that would parallel the living shoreline structures. Approximately 31, 152 feet of channel would be dredged at an 80 ft surface width and 40 ft bottom width. Acreage impact for dredging operations equals approximately 57 acres.

iii. The purpose of the project is to protect, create, and enhance coastal and marine habitat. Living shoreline structure footprints will cover the current water bottom habitat at the 2-4 ft contour from the Pearl River to Heron Bay and the 3-6 foot contour at the St. Joe's Point location. Bottom width of structures is expected to be approximately 25 ft. Approximately 15.2 acres of benthic habitat will be converted from soft sediments to riprap and oyster shell. It is expected that these hardened structureswill become living shorelines with thriving biological communities. An oyster cultch deployment will be placed on historic reef areas in Heron Bay. Forty-six acres of cultch will be planted to replace the current habitat. This area once supported large patches of oyster habitat. Dredge spoil will be used to create 46 acres of marsh habitat in areas that currently experience extremely high erosion rates. Material will be placed in between the living shoreline at St. Joe's Point and the marsh edge to restore lost marsh habitat. This area is currently composed of soft to very soft silty clays. We expect the adverse impact to species to be short in duration and anticipate transition to intermediate and long term benefit to species through increased biological productivity and habitat preservation.

Memorandum:
Date: June 13, 2013
From: MDEQ-NOAA Project Development Team
To: NOAA Protected Resource Division

Re: Supplemental Information for Hancock County Marsh Living Shorelines Project; Gulf Sturgeon Migration Patterns in the Mississippi Sound

Purpose: The memorandum is provided to supplement the Hancock County Marsh Living Shoreline-NMFS Endangered Species Act Section 7 Checklist for Federal Action Agencies. It is a summary of literature on Gulf Sturgeon seasonal movements in the Mississippi Sound. A summary of measures to minimize impacts to Gulf Sturgeon is also provided.

Project Area: Restoration proposed for this project is located in western Hancock County, Mississippi between Bayou Caddy and the mouth of the East Pearl River (Figure 1). This marsh complex is part of the extensive Pearl River Mouth estuary which encompasses ~ 5,900 acres of marsh, tidal channels, lagoons, and bays. The marine environment in the study area is a shallow system increasing in depth to over 12 ft. toward St. Joe's Pass which is periodically used as a passage channel by large vessels. The benthic habitats can be divided into two classes including intertidal and subtidal. Intertidal zones (typical tidal range of 0.5 ft.) in the area are composed of mud flats, small areas of natural sand beach, and a small number of Native American shell middens. Recent geotechnical sampling of the benthic habitat in the project footprint found substrates to be composed of very soft to soft silty clays with an inter-bedded layer of loose silty sands from East Pearl River to Heron Bay. From Heron Bay northeastward the sediments are primarily very soft to soft silty clays. Bathymetry in the study area ranges from approximately 0-12 ft. below MLLW, although the living shoreline, oyster deployment, and marsh creation areas range roughly from 1-4 ft. below MLLW. Bathymetric survey data and engineering designs are provided as an attachment to this memorandum.

Gulf Sturgeon Migration Studies: The principal section 7 concern in the project area is compliance with Gulf sturgeon critical habitat regulation. We have identified four primary constituent elements (PCEs) in the area and described potential effects to each in the NMFS checklist. The PCEs include abundance of prey items, water quality, sediment quality, and safe and unobstructed migratory pathways. In addition, the projectwould not adversely affect any of the PCEs identified. The project sponsors intend to manage construction activities to avoid seasonal migration pathways in and out of the adjacent Pearl River mouth.

Numerous studies in the northern Gulf have documented habitat use and seasonality of Gulf sturgeon movement from spawning areas in riverine habitat to foraging grounds in the nearshore environment (Fox et al., 2002; Heise et al., 2004, 2005; Rogillio et al., 2007; Ross et al., 2009; Havrylkoff et al., 2012). Telemetry data from Gulf sturgeon that are natal to the Pearl River drainage system show clear seasonal migration patterns. Movement chronologies show summer habitat use upriver to take place between April and November and winter habitat use at Cat, Ship, Horn, and Petit Bois islands in the Mississippi Sound to occur between November and early March (Rigillio et al., 2007). Data from two separate telemetry studies in the Pearl River area (Rigillio et al., 2007; Ross et al., 2009) document Gulf sturgeon migrating to and from the Rigolets Pass to the west of the Pearl River mouth in high concentrations before heading toward spawning and foraging grounds upriver and nearshore at the barrier islands, respectively (Figure 2). Ross et al. (2009) noted that in March and April, the majority of tagged fish

began to move from offshore waters to the Rigolets Pass near the mouth of the Pearl River, their movement continuing upstream into the river system through June. Telemetry data from 2010 and 2011 extracted from the GulfTOPP (Tagging of Pelagic Predators Gulf of Mexico) website show Gulf sturgeon movement in waters off of the Hancock County Pearl River marsh in March and November at depths greater than six feet. Given the dates associated with the tags, the fish were likely migrating to the Rigolets Pass in March before heading upriver and to the Mississippi barrier islands in November for foraging on sandy substrates.

Although the living shoreline project footprint exists within Gulf sturgeon critical habitat and is located adjacent to a migratory river system, the project is not likely to adversely impact the species or PCEs/critical habitat. All restoration activities will take place in shallow waters near the shoreline allowing sufficient area for passage of individuals. Nonetheless, to avoid migration disturbance, the project aims to construct restoration features from May-October while the species occupies riverine habitat. We feel that this provides ample opportunity for Gulf sturgeon to migrate through the immediate area. Moreover, if any Gulf sturgeon species are observed in the project area, a stop work order will be implemented until the species leaves the area. Additionally, the benthic habitat in the project area is not preferred foraging habitat for Gulf sturgeon. Well oxygenated, clear water with sandy substrates are primarily used for feeding by the species (Fox et al., 2002; Ross et al., 2009). Benthic habitat in the project footprint is largely composed of soft, silty substrates with turbid waters. Potential water quality impacts as a result of dredging and disposal have also been considered. Dredging and disposal is expected to produce turbidity levels in excess of natural conditions, however sediment disturbance during these operations are expected to be temporary and minimal. If floatation channels are created for work barges, dredging will likely impact benthic invertebrates. These impacts are primarily short-term in nature, consisting of a temporary loss of populations in the footprint of the channel. The shallow areas and substrate type that the channels may be constructed in are not considered suitable foraging habitat for sturgeon, therefore we do not expect any effect to abundance of prey items for the Gulf sturgeon.

Summary of Measures to Minimize Impacts: The following statements summarize project characteristics and outline measures to minimize impacts to Gulf sturgeon in the area

- Project restoration features will be built close the shoreline in shallow water (1-4 ft) and will not impede any migratory paths
- Project components will be constructed in the months of May-October to avoid inter-riverine migration movements
- Project construction activities will be subject to a stop work order if the species is observed in the project footprint. Work will continue once the species leaves the area
- Benthic substrates in the project area are composed of soft, silty sediments and are not preferred winter foraging habitat for Gulf sturgeon
- Water quality impacts will be temporary and will occur while the species occupies riverine habitat

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360–374.

Figures

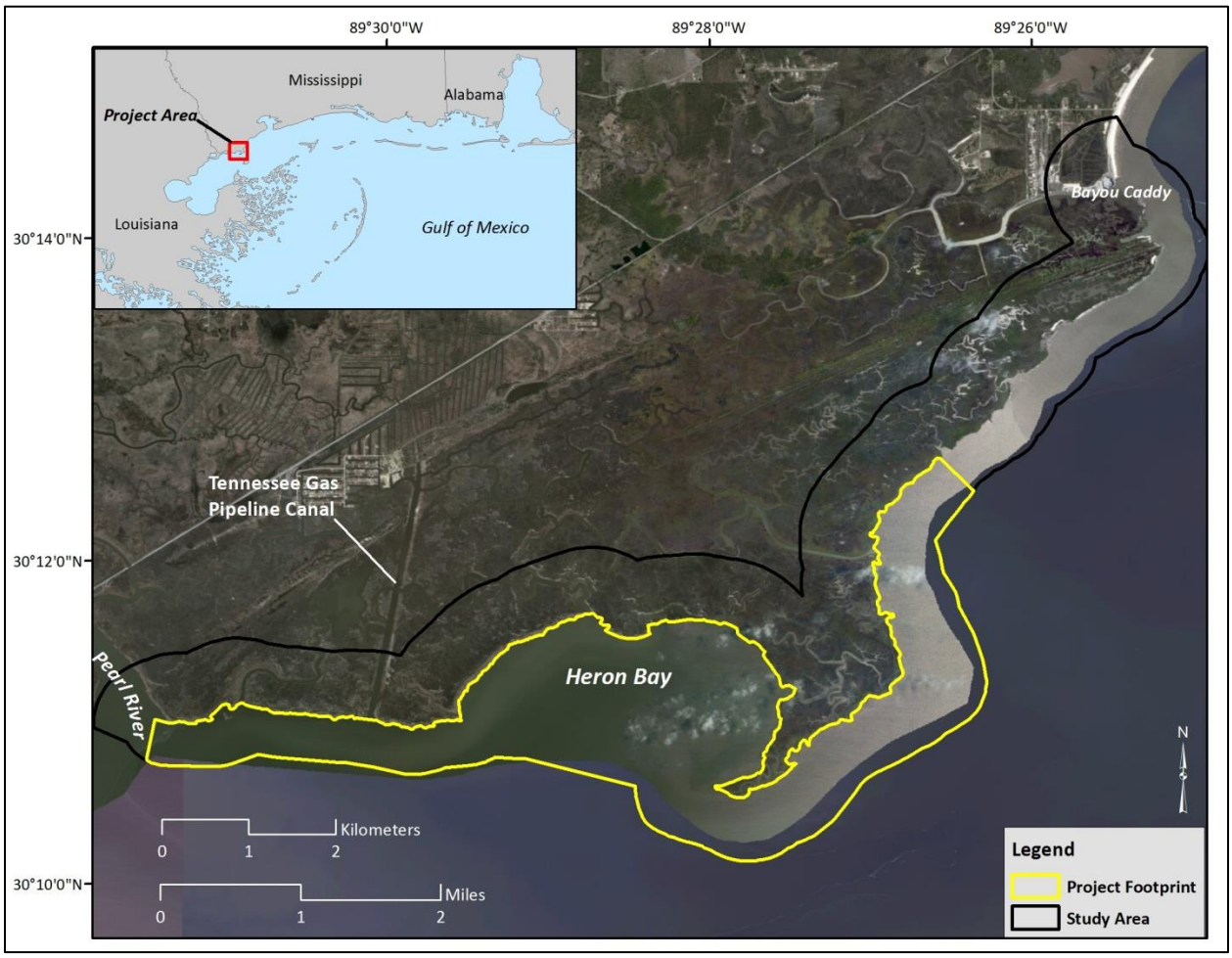


Figure 1. Location map of project area. Project footprint represents area where construction activities for restoration will take place and may impact habitats. The study area includes habitat that is expected to benefit long-term from restoration activities. The bottom portion of the project footprint shares the boundary with the study area.

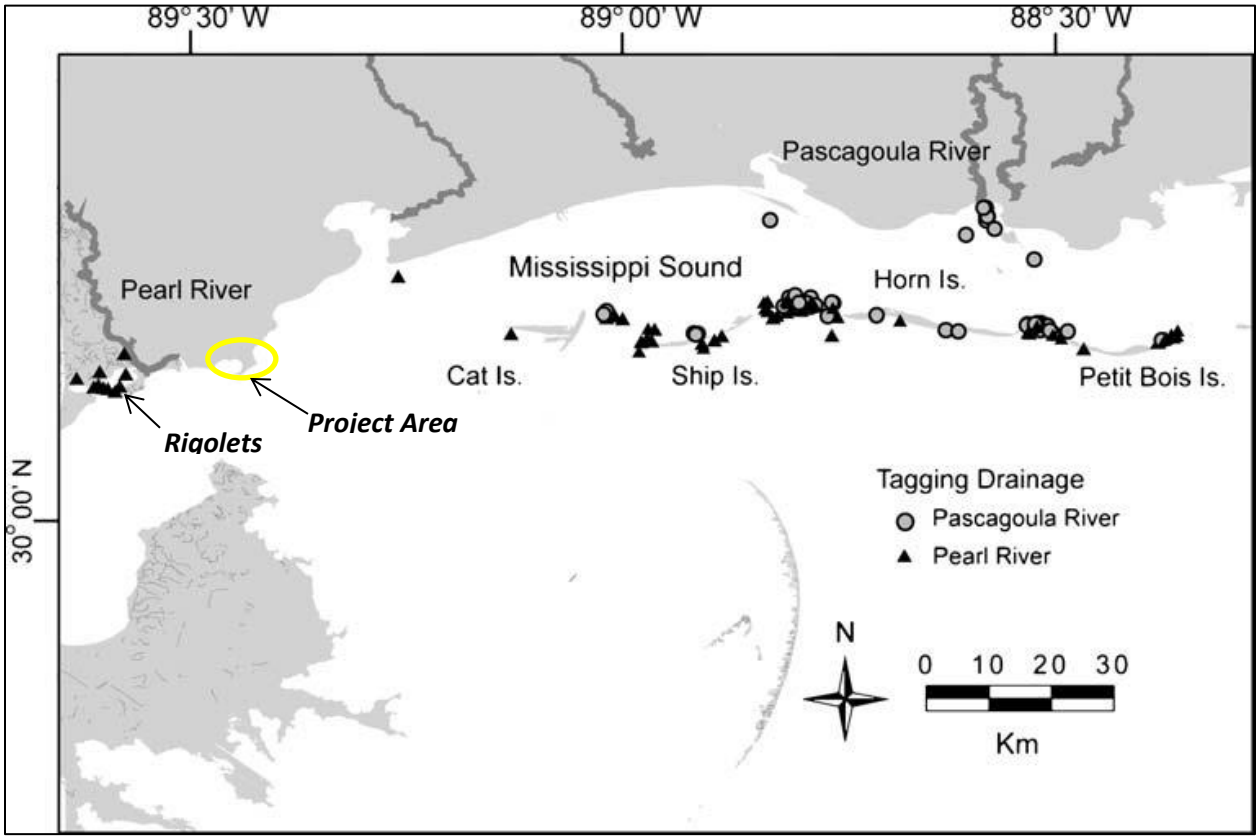
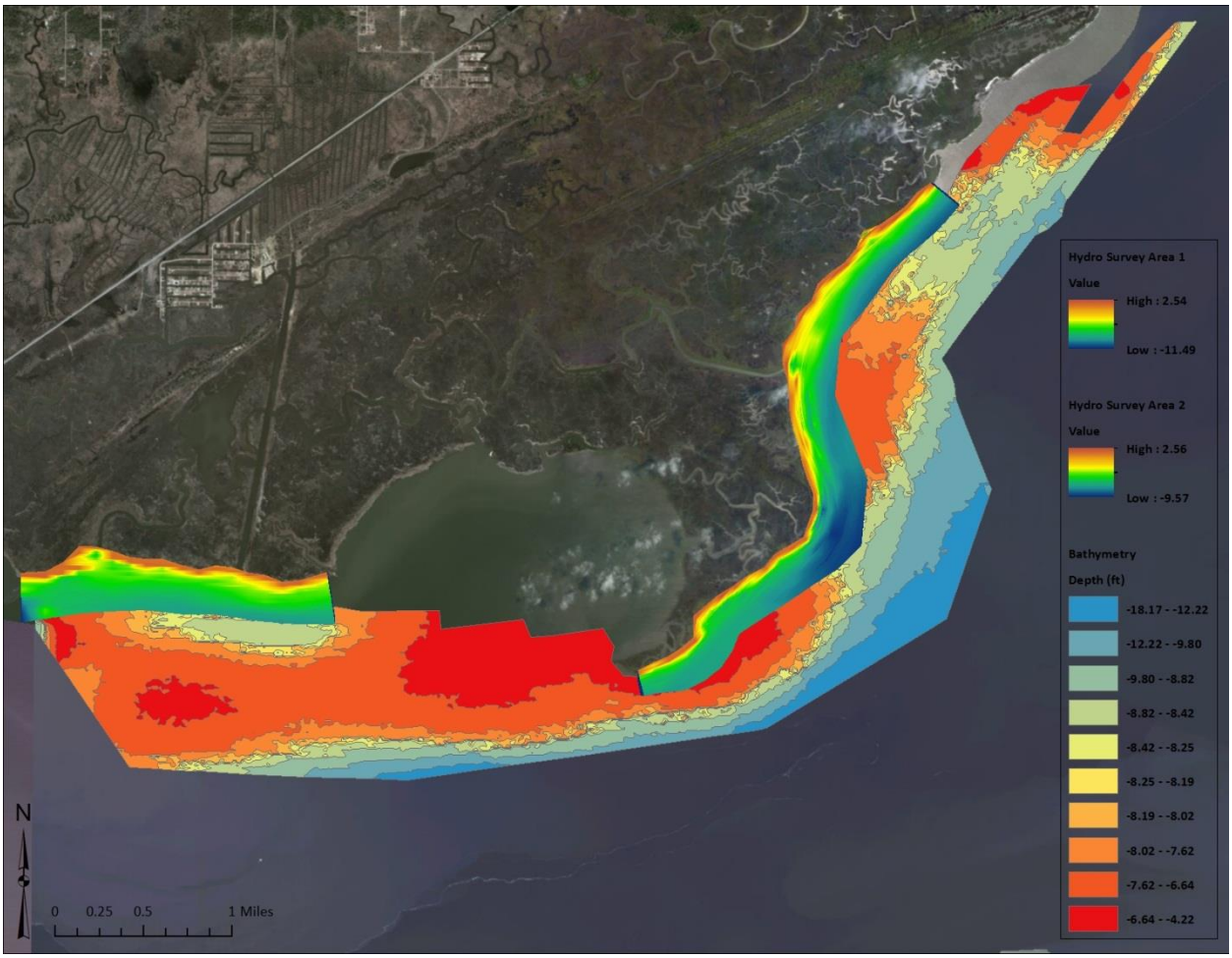


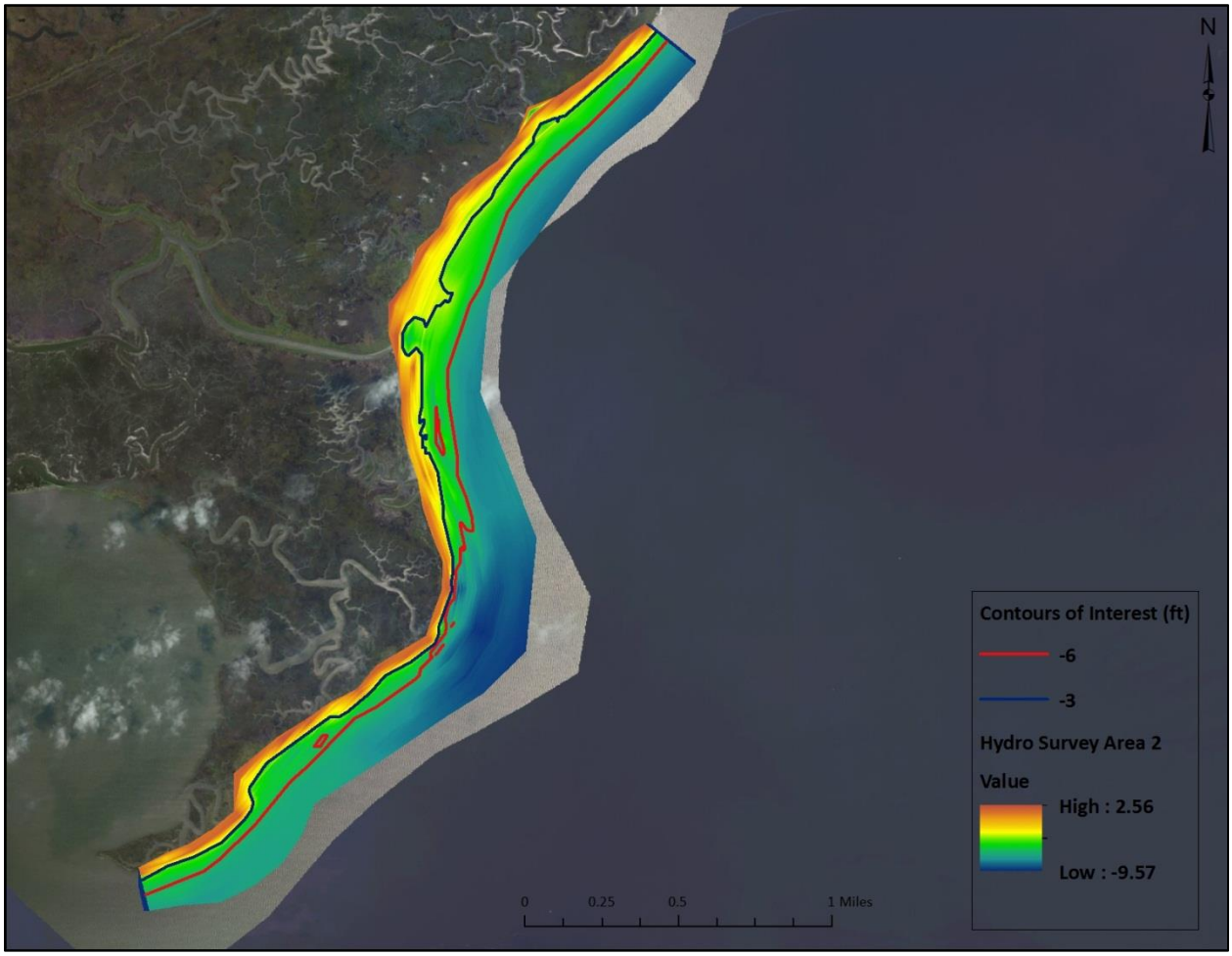
Figure 2. Telemetry locations of Gulf sturgeon in the estuarine and marine environment. Note that no telemetry locations in this study were found in the project area. Modified from Ross et al., 2009.

ATTACHMENT: Bathymetry and Engineering Design

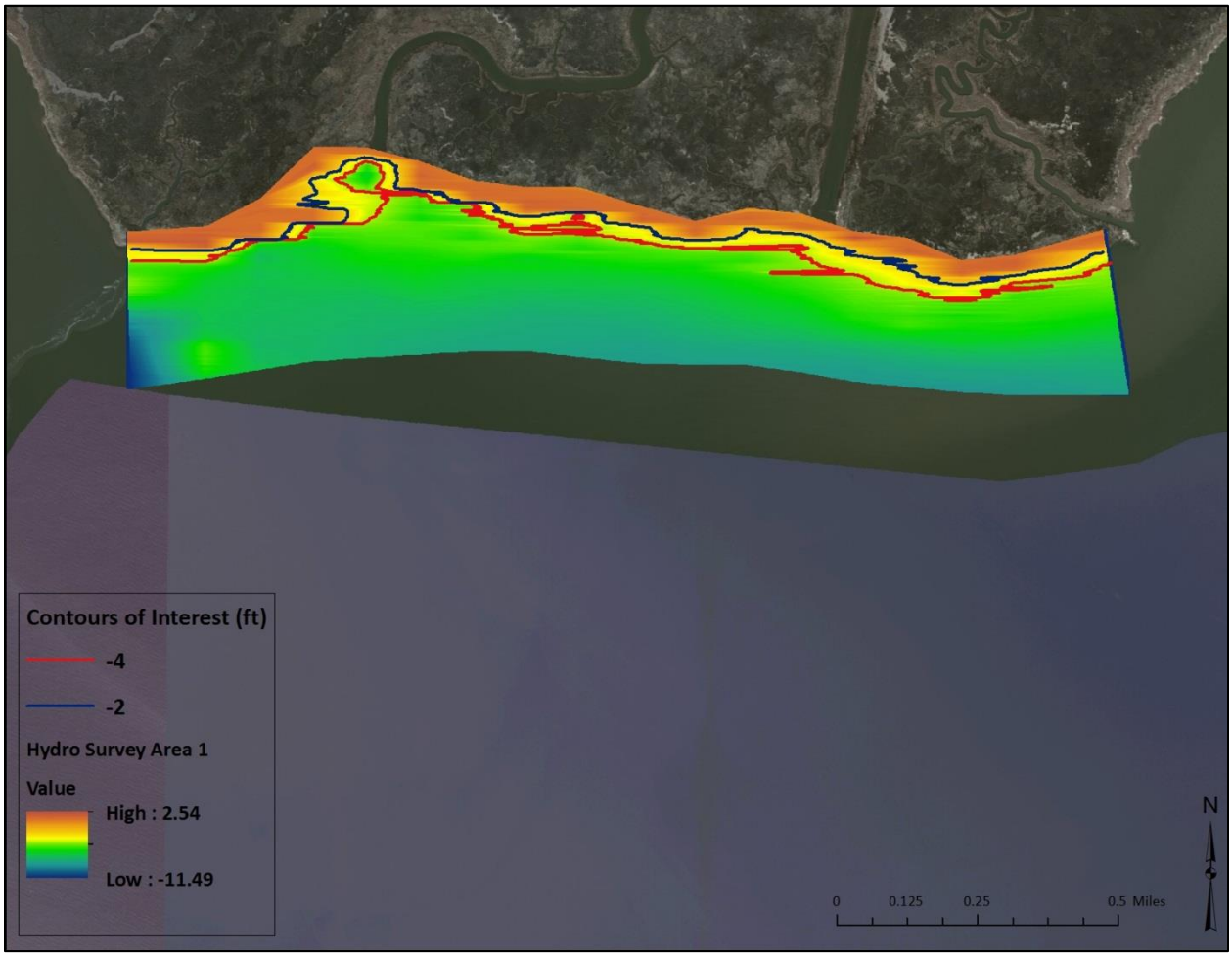
Bathymetry Survey Data



St. Joe's Pass Living Shoreline Bathymetry. Placement of the structure is planned within the 3 and 6 ft isobaths pictured in the map below.



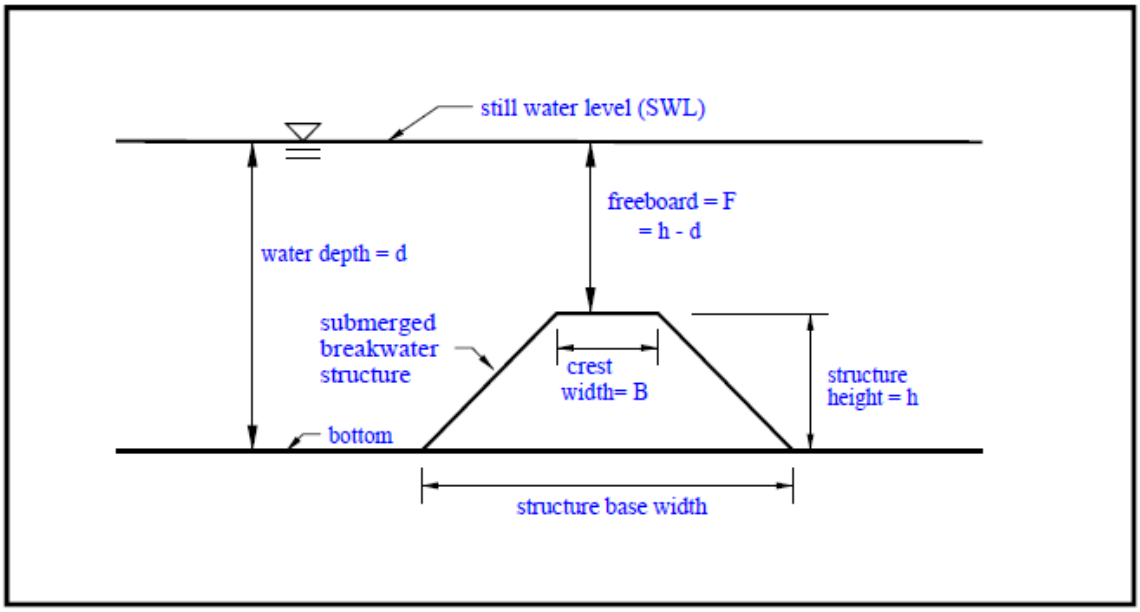
Pearl River to Heron Bay Living Shoreline Bathymetry. Placement of the structure is planned within the 2 and 4 ft isobaths pictured in the map below.



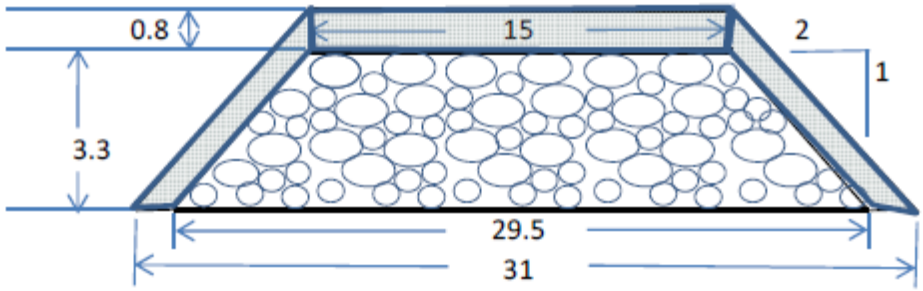
Engineering Design

The transmission coefficient is dependent upon the available freeboard, structure height, and crest width, wave height, wave length, and material diameter.

$$K_t = 1 - \left[e^{0.65(F/H) - 1.09(H/B)} - 0.047\left(\frac{BF}{LD_{n50}}\right) + 0.067\left(\frac{FH}{BD_{n50}}\right)\right]$$



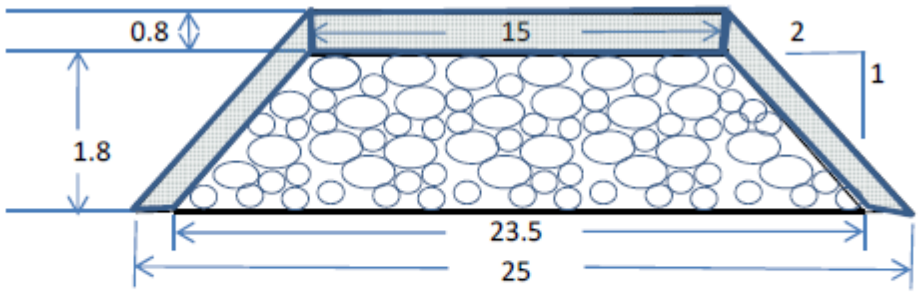
Material Quantity Estimate - St. Joseph's Point
Mississippi



Inputs

Top Width =	15	ft	
Side Slopes =	2	h : 1 v	
Average water depth below MLLW =	3	ft	
MTL to MLLW Difference =	0.87	ft	
Initial Depth =	4.0	ft	
Estimated Immediate Settlement =	1.5	ft	
Project Length =	20,889	feet =	3.96 miles
Depth of Shell Veneer =	0.75	ft	
Breakwater Distance from Shoreline (Y_b) =	100	feet	
Length of each breakwater (L_b) =	70	feet	
Length of each breakwater gap (L_g) =	25	feet	
Density of Material =	165	lb/ft^3	

Material Quantity Estimate - Pearl River to Heron Bay
Mississippi



Inputs

Top Width =	15	ft	
Side Slopes =	2	h : 1 v	
Average water depth below MLLW =	1.5	ft	
MTL to MLLW Difference =	0.87	ft	
Initial Depth =	2.5	ft	
Estimated Immediate Settlement =	1.5	ft	
Project Length =	9,965	feet =	1.89 miles
Depth of Shell Veneer =	0.75	ft	
Breakwater Distance from Shoreline (Y_b) =	100	feet	
Length of each breakwater (L_b) =	70	feet	
Length of each breakwater gap (L_g) =	25	feet	
Density of Material =	165	lb/ft^3	

Hancock County Marsh Living Shoreline Biological Assessment

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Hancock County Marsh Living Shorelines Project Biological Assessment

1.0 Introduction

On April 20, 2011, DOI, the National Oceanic and Atmospheric Administration (NOAA) and the Trustees for the five Gulf states affected by the Oil Spill entered into an agreement with BP, a responsible party for the Oil Spill, under which BP agreed to provide $1 billion for early restoration projects in the Gulf to address injuries to natural resources caused by the Oil Spill. The above-referenced project is being evaluated by the Trustees as a potential early restoration project. If the project is proposed in a draft restoration plan, and then selected by the Trustees, after publication of the plan and consideration of public comment, and final agreement is reached with BP, it will be implemented by the Mississippi Department of Environmental Quality (the Trustee) and NOAA. DOI, acting through the Service, will be a co-Trustee for the project, if it is selected and implemented.

The proposed Hancock County Marsh Living Shoreline project is intended to employ living shoreline techniques that utilize natural and/or artificial breakwater material to reduce shoreline erosion by dampening wave energy while encouraging reestablishment of habitat that was once present in the region. In areas that have experienced erosion, marsh creation and subtidal oyster reefs would be used in combination with the breakwater structures. The project would provide for construction of up to six miles of breakwaters. An additional component includes, approximately 46 acres of marsh would be constructed to protect and enhance the existing shoreline and 46 acres of sub-tidal oyster reef would be created in Heron Bay to protect the shallow bay and increase oyster production in the area. The project would include reduction of shoreline erosion, re-establishment of oyster habitat, enhanced fisheries resources and marsh habitat.

Table 1 summarizes affect determinations for threatened and endangered species that have the potential to exist at the project site that are under the purview of the National Marine Fisheries Service (NMFS) for ESA Section 7 compliance.

Table 1. Summary of affect determinations for threatened and endangered species.

SPECIES/ CRITICAL HABITAT	DETERMINATION		
	NE	NLAA	AA
Green turtle		x	
Gulf sturgeon		x	
Critical Habitat Gulf sturgeon		x	
Kemp's ridley		x	
Leatherback turtle		x	
Loggerhead turtle		x	

SPECIES/ CRITICAL HABITAT	DETERMINATION		
	NE	NLAA	AA
Hawksbill sea turtle		x	

2.0 Project Description

Oyster breakwater/living shorelines would be constructed along the marsh shoreline in two locations: from the eastern limit of Heron Bay to approximately 4 miles to the northeast towards Bayou Caddy (eastern reach), and from the western limit of Heron Bay to approximately 1.9 miles to the mouth of the Pearl River (western reach). Construction activities could include placement of linear structures that may utilize artificial and/or shell-based materials within the -3 to -5 foot Mean Lower Low Water contour. Approximately 46 acres of marsh would be constructed in the St. Joseph's point area to protect and restore marsh areas that experience the historical rates of erosion. A total of 46 acres of subtidal oyster reef would be created using oyster shell in northeastern Heron Bay to protect the shallow embayment and to increase oyster production in the area.

2.1 Project Location

The proposed project is located in Hancock County, Mississippi (Bounding Coordinates: West -89.530339 W, 30.184 N; South: -89.462 W, 30.169 N; East: -89.415 W, 30.233 N; North: -89.53 W, 30.184 W. Centroid = -89.457 W, 30.19 N). The Hancock County marsh is a 13,570-acre preserve managed by the Mississippi Department of Marine Resources (MDMR) and is the second largest continuous marsh area in the state. The preserve includes adjoining marshlands bordering the Mississippi Sound from the Pearl River to St. Joseph's Point.

The Hancock County marsh area is composed largely of estuarine emergent marsh and estuarine shallow water intertwined by a network of tidal creeks. The benthic habitats can be divided into two classes including intertidal and subtidal. Intertidal zones (typical tidal range of 0.5 ft.) in the area are composed of mud flats, small areas of natural sand beach, and a small number of Native American shell middens. The nearshore subtidal benthic habitat is composed mostly of unconsolidated bottom types including sand, muddy sand, and mud bottom (Wieland 1994). Bathymetry in the study area ranges from approximately 0-12 ft. below MLLW, although the breakwater, oyster deployment, and marsh creation areas range roughly from 1-4 ft. below MLLW.

Estuarine emergent plants dominate the southernmost regions of the Pearl River marsh adjacent to the Mississippi Sound. Elevation and tidal inundation influence the zonation and distribution of these plants. The estuarine areas are composed of low, mid, and high marsh zones. In the low marsh areas, regularly flooded by tidal activity, the mesohaline habitat consists of smooth cordgrass (*Spartina alternaflora)*. The intermediate-marsh zone is irregularly flooded by tidal activity and is typically dominated by black needlerush (*Juncus roemerianus*), which can be intermixed with salt grass (*Distichlis spicata*) in

oligohaline areas. In higher elevation areas, it is not uncommon to observe numerous species intermixed including salt grass, black needlerush, and salt meadow cordgrass (*Spartina patens*).

Palustrine habitats occur on high relief areas in the vicinity of the project area and consist of a dominant overstory of live oak (*Quercus virginiana)* with some slash pine (*Pinus elliottii)*. A variety of understory species are found with wax myrtle (*Myrica cerifera)* and yaupon holly (*Ilex vomitoria)* as the dominant species. Often, the salt-tolerant shrubs marsh elder (*Iva frutescens)* and saltbush (*Baccharis halimifolia)* border these areas. Saw palmetto (S*erenoa repens*) is also found at higher elevations outside of the tidal boundary.

A recent survey of SAV and oysters in Heron Bay noted that SAV presence was primarily documented in very shallow waters along the fringe of the marsh edge growing on eroded submerged marsh platform. Sparse amounts of *Ruppia maritima* were found growing in a matrix of mud and relict plant rhizomes. Oyster shell locations were present primarily in the northern and middle sections of Heron bay. Presence was documented in areas that had been delineated as supporting historic oyster reefs by the MDMR. Most of the shell was dead and silted in below the bottom surface.

Gulf sturgeon is the only critical habitat that exists in the project footprint (Figure 1).

2.2 Action Area

The action area includes the shoreline of the Hancock County marsh from the mouth of the Pearl River on the west to approximately 1.9 miles past the heel of St. Joseph's Point, including Heron Bay. Oyster breakwater/living shorelines would be constructed along the marsh shoreline in two locations: from the eastern limit of Heron Bay to approximately 4 miles to the northeast towards Bayou Caddy (eastern reach), and from the western limit of Heron Bay to the mouth of the Pearl River (western reach).On the seaward side, the project area extends approximately to the -8 ft. contour from the proposed breakwater to incorporate potential impacts from temporary flotation channels that will be utilized by work barges during construction (Figure 2).

2.3 Proposed Action

The Hancock County Marsh Living Shoreline project will include shoreline/marsh protection, marsh creation, restoration and increased benthic secondary productivity. Specifically, the proposed project consists of three restoration components (Figure 2):

- Use of living shoreline techniques that utilize natural and/or artificial breakwater material to reduce shoreline erosion by dampening wave energy while encouraging reestablishment of habitat that was once present in the region.
- Creation of 46 acres of salt marsh habitat in areas that have experienced high rates of shoreline and marsh habitat erosion.
- Placement of 46 acres of oyster cultch in areas that have historically supported oyster habitat.

Living Shorelines (Breakwaters)

A breakwater can be defined as linear structures that may utilize artificial and/or shell-based materials placed parallel to the shore in medium to high energy open-water environments for the purpose of dissipating wave energy to reduce shoreline erosion. The breakwaters would be constructed at two locations: along St. Joseph's Point (eastern reach) and from Pearl River to Heron Bay (western reach).

- **St. Joseph's Point Breakwater (eastern reach):** The conceptual design for the breakwater would be approximately four miles long, extending from Heron Bay to approximately four miles to the northeast, which includes openings throughout, with a crest width of approximately 15.0 ft. and total height of approximately 4.0 ft. (to +0.87 ft., North American Vertical Datum [NAVD]). The breakwater would have a footprint of approximately 14.4 acres and would be placed on a substrate of fine-grained sediment. It would be composed of a core of riprap and some or all could be covered by a 9-inch-thick layer of bagged oyster shell.
- **Pearl River to Heron Bay Breakwater (western reach):** This conceptual breakwater would be approximately 1.9 miles long, with openings throughout, with a crest width of 15.0 ft. and a total height of approximately 4.0 ft. (to +0.87 ft., NAVD). Its design and sediment substrate are to be similar to the St. Joseph's Point breakwater. The Pearl River to Heron Bay breakwater project area footprint would be approximately 5.5 acres, consisting of fine-grained sediment. The conceptual design is subject to refinement.

Creation of Marsh in the Vicinity of St. Joseph's Point

A total of 46 acres of marsh would be created in one to several locations. Salt marshes are defined as transitional marsh areas between land and water that occur in coastal areas at salinities at or approaching that of ocean water. Typical vegetation in salt marsh habitat includes species such as smooth cordgrass (*Spartina alterniflora*), black needlerush (*Juncus romerianus*), and saltgrass (*Distichlis spicata*). The area behind the constructed breakwater at St. Joseph's Point would be backfilled with dredged material and allowed to re-vegetate by natural colonization of estuarine marsh species. Dredged fill material would be obtained through the Mississippi Beneficial Sediment Use Program as available or excavated from a suitable borrow source. Dredged material would be hydraulically placed to obtain the target elevation.

Placement of Oyster Reef Cultch in Heron Bay

Oyster cultch would be deployed over 46 acres in Heron Bay in areas that currently support or previously supported oyster production. Oyster reefs are typically colonial aggregations of living oysters and other bi-valves that can have subtidal as well as intertidal portions and that provide habitat for a community of other species. Oyster cultch deployment would occur generally in water depths of approximately -3 to -5 ft. MLLW. The reef(s) would be sited based on data gathered from an oyster presence survey and would consist of an approximately 6- to 9-inch-thick layer of oyster shell or limestone placed on the marsh platform.

Construction and Installation

Construction methods and activities are included in order to assess the impact on the environment. Actual construction methods and activities would be determined after final design and would likely be comparable to activities described below. It is expected that actual construction methods would be similar to those presented in this section.

Living Shorelines (Breakwaters)

The specific breakwater construction elevation was selected to maximize shoreline protection (see Table 2). Construction could include placement of linear structures that would utilize artificial and/or shell-based materials. The alignment and limits of the breakwaters would be surveyed; the outer limits of the breakwaters would be marked with poles driven into the bottom and extended approximately 3 ft. above the water surface. The height of the breakwaters along the alignment would be constructed based on bottom elevations and the reef's crest elevation (0.87 ft. NAVD88 – Mean Tide Level). Barriers, navigation warning signs (lighted and unlighted), and other safety devices would be installed along the work area to protect boaters.

Table 2. Preliminary living shoreline (breakwater) specifications for the Hancock County Marsh Living Shoreline project.

Living Shoreline (Breakwater) Design Data	St. Joseph's Point Breakwater (eastern reach)	Pearl River to Heron Bay Breakwater (western reach):
Total project length	Approx. 4 miles	Approx. 1.9 miles
Total project acreage	14.4 acres	5.5 acres
Crest width	15.0 ft.	15.0 ft.
Base width	30 ft.	30 ft.
Assumed bottom elevation	-3.5 MLLW	-3.5 MLLW
Total structure height	3.75 ft.	3.75 ft.
Bagged shell veneer thickness	9 inches	9 inches
Riprap core volume	51,600 cubic yards	16,900 cubic yards
Bagged shell volume	16,400 cubic yards	6,300 cubic yards
Depth of material (riprap/marine mattress)	3 ft.	3 ft.
Estimate initial settlement	1 ft.	1 ft.
Design side slopes	2v:1h	2v:1h
Breakwater distance from shoreline	30 – 90 ft.	30 – 90 ft.
Reach of each breakwater	75 ft.	75 ft.
Length of each gap between breakwater	25 ft.	25 ft.

The dimensions for the breakwaters would be approximately 30 ft. wide at the base and approximately 15 ft. wide at the crest (Table 2).

The riprap core of the breakwaters would either be constructed using loose boulders or "marine mattresses," which would consist of 2- to 6-inch-diameter rocks assembled on land. The core material would be transported to the work area on barges and installed by a crane located on a separate barge. Placement of the riprap core would be monitored to ensure the breakwater dimensions, slopes, and crest elevations are achieved. After installation of the riprap core, some or all could be covered with bags of shell. The deployment of the breakwaters may extend over a period of ten to twelve months; construction activities would be limited to the months of May to October. Total installed volumes would be as follows:

- ***St. Joseph's Point Breakwater (eastern reach):*** The target depth for deployment is approximately -3.5 ft. MLLW, but could be between -3.0 and -5.0 ft. MLLW. The volume of placed material would be approximately 51,600 cubic yards of riprap and 16,400 cubic yards of

shell. The breakwater would cover a footprint of approximately 14.4 acres of fine-grained sediment.

- ***Pearl River to Heron Bay Breakwater (western reach):*** The target depth for deployment is approximately -3.5 MLLW, but could be between -2.0 ft. and -5.0 ft. MLLW. The volume of placed material would be approximately 16,900 cubic yards of riprap and 6,300 cubic yards of shell. The breakwater would cover a footprint of approximately 5.5 acres of fine-grained sediment.

The project is designed to use temporary flotation channels (Table 3) to facilitate access for work barges into the work area. A channel would be excavated parallel to the alignments of the two breakwaters (Figure X). Additional channels would be excavated perpendicular to these channels to provide access from the Mississippi Sound to allow work barges entry and exit for the project area. The excavated dredged material would be cast on the seaward side of the channels so they naturally fill back in after construction. The depth of the channels would be 8 ft. below MLLW to accommodate barge draft. The bottom width of the channels would be approximately 80 ft. with 3H:1V side slopes. The entry locations for the channels would be determined by analyzing the shortest distance from the breakwaters to the appropriate depth of -8 ft. and excavated using best management practices (BMPs) to minimize environmental impacts. For the purposes of project planning, the preliminary temporary flotation channel footprint was calculated based on an estimate of a heavily loaded barge. Proposed temporary flotation channel dimensions are summarized in Table 3.

Table3. Preliminary temporary flotation channel footprint for the Hancock County Marsh Living Shoreline project.

COMPONENT	DIMENSION
Channel Length	55,008 ft.
Barge Draft	8 ft.
Channel Width	80 ft.
Area Temporarily Impacted	101 acres

After completion of construction, the breakwater structure would be surveyed and permanent navigation signs would be installed in accordance with safety requirements.

Creation of Marsh in the Vicinity of St. Joseph's Point

After the breakwater along St. Joseph's Point has been installed, selected areas landward of the breakwater would be filled with dredged material obtained from the MDMR Beneficial Use of Sediment Program if material is available, or a suitable borrow source. It is anticipated that a dike would be constructed at the seaward extent of the marsh. Upon location of suitable material, the dike would be constructed by excavating existing material from the landward side of the proposed dike location, but not borrowing from the existing marsh. Once an area of the marsh is diked, the area landward of the dike would be filled with dredged material until final marsh grades are achieved. Sediment would be pumped through a floating pipeline from a hydraulic dredge located where suitable fill material is available. Pumps and sediment controls would remain in place throughout the dredging and filling

process and after initial settling has occurred. Once the entire marsh area(s) is constructed, the area would be monitored for natural re-vegetation.

Placement of Oyster Cultch in Heron Bay
Oyster cultch would be deployed in Heron Bay in water depths of -3 to -5 ft. MLLW in areas that currently support or previously supported oyster production. An oyster presence survey has been completed that identified suitable areas. The cultch would be deployed as a 6- to 9-inch-thick layer of oyster shell or limestone. Prior to deployment, the limits of the oyster cultch deployment area(s) would be marked with buoys or poles. Oyster shells would be deployed by a barge-mounted crane with a clam shell bucket. A material barge loaded with oyster shells would be moored to the crane barge. As a construction alternative, water jetting of loose shell off of a material barge may be used in case of water-depth constraints. Upon completion, the deployment area would be surveyed.

Operations and Maintenance

Anticipated pre- and post-construction monitoring activities
Monitoring activities would be performed prior to construction and for up to seven years after construction. Monitoring activities would include:

- Topographic/bathymetric surveys
- Vegetation surveys (species composition and percent cover)
- Oyster and other invertebrate monitoring (density and biomass)

The project would incorporate a mix of monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring efforts would occur in a subsequent period, where corrective action could be taken.

Post-construction performance monitoring would be conducted to observe the performance of the physical breakwater structures (breakwater height, structural integrity, settling rate, etc.) and marsh (elevation, settling rate, etc.) to allow for corrective action as needed or as defined by the Trustees.

Post-construction performance monitoring would also evaluate the project's performance over time with respect to the agreed-upon restoration goals and objectives. Specifically, this monitoring would evaluate the production and support of organisms on the breakwater (e.g., secondary productivity) and the performance of the created marsh and the reduced erosion rate of the existing shoreline. Monitoring parameters would include the following: water quality (e.g., salinity, dissolved oxygen); vegetative monitoring; and invertebrate infauna and epifauna composition and biomass.

Anticipated short-term maintenance activities
Within four years following construction, it may be necessary to add more riprap or shell material on the breakwater structure as a maintenance activity. The breakwater is anticipated to experience the greatest consolidation of the subgrade in the first years following construction. The need for additional placement of rock and/or shell on the breakwater would be assessed during the regular monitoring.

Maintenance construction methods would be similar to the construction methods of the original breakwater structure.

3.0 Description of Species and Habitat

Fish

T- Gulf sturgeon- (*Acipenser oxyrinchus desotoi*)

Turtles

T- Green sea turtle - (*Chelonia mydas*)

E- Kemp's ridley sea turtle - (*Lepidochelys kempii*)

E- Leatherback sea turtle - (*Dermochelys coriacea*)

T- Loggerhead sea turtle - (*Caretta caretta*)

E- Hawksbill sea turtle – (*Eretmochelys imbricata)*

3.1 Gulf Sturgeon

Life History/Distribution

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*), also known as the Gulf of Mexico sturgeon, was listed as threatened throughout its range in 1991 (56 FR 49653). The Gulf sturgeon is a subspecies of *Acipenser oxyrinchus*, which also includes the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). The Gulf sturgeon is distinguished from the Atlantic sturgeon based upon geographical restrictions, morphological characteristics, and genetic differences (Vladykov 1955; Wooley 1985; King et al. 2001).

The Gulf sturgeon's status and protection is collaboration between the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries. Due to its anadromous nature and migration patterns, the sturgeon spends time in freshwater, estuarine, and marine habitats. NMFS is responsible for all consultations regarding Gulf sturgeon and critical habitat in marine units. The USFWS is responsible for all consultations regarding Gulf Sturgeon and critical habitat in riverine units. Responsibility for estuarine units is divided based upon the action agency involved. The USFWS consults with the Department of Transportation, Environmental Protection Agency, U.S. Coast Guard (USCG), and Federal Emergency Management Agency. NMFS consults with the Department of Defense, U.S. Army Corps of Engineers, Bureau of Ocean Energy Management (formerly Minerals Management Service) and any other Federal agencies not mentioned explicitly. Any Federal projects that extend into the jurisdiction of both the Services will be consulted on by the USFWS with internal coordination with NOAA Fisheries.

The following information regarding Gulf sturgeon is summarized from the final critical habitat designation (68 FR 13370 and references within) unless otherwise stated. The Gulf sturgeon is a nearly cylindrical primitive fish embedded with bony plates or scutes. The head has a hard, extended snout. The mouth is inferior and protrusible (capable of being thrust outward) and is preceded by four conspicuous barbels. The caudal fin (tail) is heterocercal (upper lobe is longer than the lower lobe). Adults range from 1.2 to 2.4 m (4 to 8 ft.) in length, with adult females larger than males. The Gulf sturgeon is an anadromous species spending 6-8 months in freshwater to reproduce and rest and the remaining time over wintering in estuaries, bays, and the Gulf of Mexico. Historically, the Gulf sturgeon occurred from the Mississippi River east to Tampa Bay. Presently, the Gulf sturgeon can be found in most river systems spanning from Lake Pontchartrain, Louisiana east to the Suwannee River in Florida. Sporadic occurrences have been recorded as far west as the Rio Grande River bordering Texas and Mexico, and as far east and south as Florida Bay in the Florida Keys (Wooley and Crateau 1985; Reynolds 1993).

Gulf sturgeon are long-lived, with some individuals reaching at least 42 years in age (Huff 1975). Age at sexual maturity ranges from 8 to 17 years for females and from 7 to 21 years for males (Huff 1975). As with any long-lived, slow-maturing and wide-ranging species, an exact population estimate is difficult to obtain because life history characteristics necessitate long-term datasets and sampling and estimation methods differ over time and across the range of the species. There are currently spawning populations in seven rivers across its range, all of which are designated as critical habitat: (1) Pearl River, (2) Pascagoula River, (3) Escambia River, (4) Yellow River, (5) Choctawhatchee River, (6) Apalachicola River, and (7) Suwannee River. Critical habitat was designated in all seven of these spawning rivers partly because gene flow is low in Gulf sturgeon stocks (i.e., each stock exchanges less than one mature female per generation) (Waldman and Wirgin 1998). The estimated subpopulation size is presented by river system in Table 4. Each subpopulation is currently considered stable or slightly increasing in all systems except the Pearl and Pascagoula rivers where the trend is unknown due to a lack of survey data.

Gulf sturgeon use a variety of freshwater, estuarine, and marine habitats for breeding, foraging, and resting. In the spring, generally March to May, most adult and subadult Gulf sturgeon return to their natal freshwater rivers, where sexually mature sturgeon spawn (Odenkirk 1989; Foster 1993; Clugston et al. 1995; Fox et al. 2000). Spawning occurs over bedrock, cobble, clean gravel, marl, soapstone, or hard clay substrates (Sulak and Clugston 1999).

After spawning, most sturgeon move downstream to a resting or holding area and remain there until October or November. Adults and subadults are not distributed uniformly throughout the river, but show a preference for these discrete holding areas (Hightower et al. 2002). These resting or holding areas are generally in the lower and middle reaches of the river often near natural springs (but not within the spring itself). They range from shallow areas (2 m) to deep holes (19 m) (6.6 to 62.3 feet), and contain substrates of limestone and sand, sand and gravels, or sandy substrate (Clugston et al. 1995; Foster and Clugston 1997; Hightower et al. 2002; Wooley and Crateau 1985; Morrow et al. 1998; Ross et al. 2001a, b; Craft et al. 2001). In the Suwannee river, young of the year disperse widely downstream of spawning sites, using extensive portions of the river as nursery habitat (Sulak and Clugston 1999). Suwannee River young of the year are typically found in open sand-bottom habitat away from the shoreline and vegetated habitat and may also remain near the river mouth and estuary during the winter and spring (Randall and Sulak 1999; Clugston et al. 1995). Information on young of the year Gulf sturgeon from other river systems is not available.

Most subadult and adult Gulf sturgeon spend cool months (October or November through March or April) in estuarine areas, bays, or in the Gulf of Mexico near unvegetated sandy shorelines, shallow shoals, and other areas containing mostly sand with benthic prey items (such as barrier islands) at depths ranging from 1.5 m to 6 m deep (Odenkirk 1989; Foster 1993; Clugston et al. 1995; Parauka et al. 2001; Ross et al. 2001a; Fox et al. 2002; Harris et al. 2005; Craft et al. 2001; Rogillio et al. 2001). Gulf sturgeon will migrate along barrier islands and are often found in passes between islands or in deep holes near the passes (Ross et al. 2001a; Rogillio et al. 2001). Ninety-one percent of subadult Gulf sturgeon (ages 4 to 7) in Choctawhatchee Bay (91%) remained in the bay or a connecting bay the entire winter (USFWS 1998c); while, adult Gulf sturgeon were more likely to overwinter or spend extended periods of time in the Gulf of Mexico (Fox and Hightower 1998; Fox et al. 2002). Subadults from the Suwannee River subpopulation remain in the mouth of the Suwannee River over winter while adults are known to migrate into the nearshore waters, where they remain for up to two months and then depart to unknown feeding locations in the open Gulf of Mexico (Carr et al. 1996; Edwards et al. 2003). Sonic-tracking evidence suggests that Gulf sturgeon target and share certain wintering grounds. A summary of Gulf sturgeon wintering habitat is presented in Table 5.

Table4. Estimated size of known reproducing subpopulations of Gulf sturgeon.

River System	**States**	**Estimated Subpopulation Size*** (95% Confidence Interval)	**Source**
Pascagoula	MS	216 (124-429)	Ross et al. 2001b
Pearl	LA, MS	430 (323-605)	Rogillio et al. 2001
Escambia	AL, FL	451 (338-656)	USFWS 2007
Yellow	AL, FL	1,036 (724-1348)	Herrington and Kaeser 2013
Choctawhatchee	AL, FL	3,314**	Herrington and Kaeser 2013
Apalachicola	FL	1,292 (525-1,968)	Herrington and Kaeser 2013
Suwannee	FL	14,000**	Sulak et al. 2009

* Estimates refer to numbers of individuals greater than a certain size, which varies between sources depending on sampling gear, and in some cases, to numbers of individuals that use a particular portion of the river (e.g., a summer holding area or one migratory pathway among several). Estimates are not necessarily comparable between researchers due to key differences in methods and assumptions.
** Confidence interval not reported.

Table 5. Summary of known Gulf sturgeon wintering areas.

Subpopulation	**Wintering sites**	**Source**
Pascagoula	Barrier Islands, Mississippi Sound, Pascagoula Estuary	Ross et al. (2009)
Pearl	The Rigolets, Barrier Islands, Mississippi Sound	Ross et al. (2009)
Choctawhatchee	Choctawhatchee Bay, Escambia Bay, nearshore Gulf of Mexico, Santa Rosa Sound, Pensacola Bay	Fox et al. (2002); Duncan et al. (2011)
Escambia	Pensacola Bay, Santa Rosa Sound, nearshore Gulf of Mexico	Parauka et al. (2011); Duncan et al. (2011)
Yellow	Pensacola Bay, Santa Rosa Sound, nearshore Gulf of Mexico	Parauka et al. (2011); Duncan et al. (2011)
Apalachicola	Apalachicola Bay, nearshore Gulf of Mexico, Saint Vincent Sound	Parauka et al. (2011); Sulak et al. (2009)
Suwannee	Suwannee Sound, nearshore Gulf of Mexico	Sulak et al. (2009)

The Gulf sturgeon is a benthic (bottom dwelling) suction feeder. Gulf sturgeon subadults and adults primarily feed in estuaries, bays, and other marine habitats and do not feed significantly in freshwater (Wooley and Crateau 1985; Mason and Clugston 1993; Clugston et al. 1995; Gu et al. 2001). Adult and subadult Gulf sturgeon are thought to forage opportunistically (Huff 1975), primarily on benthic invertebrates including: brachiopods, brittle stars, amphipods, lancelets, polychaetes, gastropod mollusks, shrimp, isopods, bivalve mollusks, and crustaceans (Huff 1975; Mason and Clugston 1993; Carr et al. 1996; Heard et al. 2000; Fox et al. 2000; Fox et al. 2002; Harris et al. 2005). We presume that adult and subadult sturgeon begin feeding immediately upon leaving the river of summer residency having spent at least six months in the river fasting. If so, the bays at the mouths of the river systems where Gulf sturgeon occur are especially important because they offer the first opportunity for feeding and to regain the weight lost while in the river system. To maintain positive growth on a yearly basis, adults and subadults need to consume sufficient quantities of prey while in estuarine and marine waters outside of the spawning season. Young of the year sturgeon overwinter in the freshwater systems for 10 to 12 months, where they feed on aquatic invertebrates (including aquatic insects, worms, and bivalve molluscs) and detritus (Huff 1975; Mason and Clugston 1993; Sulak and Clugston 1999).

Threats

In the late 19th and early 20th centuries, Gulf sturgeon were an important commercial fishery, providing eggs for caviar, flesh for smoked fish, and swim bladders for isinglass (Huff 1975; Carr 1983). Gulf sturgeon numbers declined due to overfishing throughout most of the 20th century. The decline was exacerbated by habitat loss associated with the construction of dams and sills (low dams), mostly after 1950, which severely restricted access to historic migration routes and spawning areas (Wooley and Crateau 1985; McDowall 1988). Directed harvest is no longer a threat to the species since all directed fisheries of the sturgeon have been closed since 1972 in Alabama, 1974 in Mississippi, 1984 in Florida, and 1990 in Louisiana.

Continuing and new or potential threats to the Gulf sturgeon include: construction of dams, modifications to habitat associated with dredging, dredged material disposal, de-snagging (removal of trees and their roots) and other navigation maintenance activities; incidental take by commercial fishermen; poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; hurricanes, red tides, boat collisions, climate change, aquaculture and incidental or accidental introductions of non-native species; and the Gulf sturgeon's long maturation and limited ability to recolonize areas from which it is extirpated (USFWS 1991; USFWS and NMFS 2009).

These threats persist to varying degrees in different portions of the species range. In recent years, dredging for channel maintenance and beach nourishment has resulted in death and injury of a few Gulf sturgeon in the marine environment. Trawling has also resulted in the capture of several Gulf sturgeon. Collisions with boats traveling at high speeds have occurred on numerous occasions in the Suwannee and Choctawhatchee rivers. A sturgeon colliding with a boat can occur when the fish leaps out of the water towards the boat or when the sturgeon is physically struck by the boat propellers. Shallow waters will increase the likelihood of a ship strike to sturgeons due to the lack of buffer space between boat and fish (USFWS and NMFS 2009).

Gulf Sturgeon Critical Habitat

NOAA Fisheries and USFWS jointly designated Gulf sturgeon critical habitat on April 18, 2003 (68 FR 13370, March 19, 2003). The term "critical habitat" is defined in section 3(5)(A) of the Endangered Species Act (ESA) as (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary. Critical habitat for the Gulf sturgeon within the project vicinity is identified as Unit 8 (approximately 881,280 acres), Lake Pontchartrain, (east of causeway), Lake Catherine, Little Lake, the Rigolets, Lake Borgne, Pascagoula Bay, and Mississippi Sound systems in Louisiana and Mississippi, and sections of the state waters within the Gulf of Mexico.

This unit provides juvenile, subadult and adult feeding, resting, and passage habitat for Gulf sturgeon from the Pascagoula and the Pearl River subpopulations (68 FR 13395). One or both of these subpopulations have been documented by tagging data, historic sightings, and incidental captures as using Pascagoula Bay, the Rigolets, the eastern half of Lake Pontchartrain, Little Lake, Lake St. Catherine, Lake Borgne, Mississippi Sound, within one nautical mile of the nearshore Gulf of Mexico adjacent to the barrier islands and within the passes (Reynolds, 1993; Morrow et al., 1998; and Ross et al., 2001). Substrate in these areas range from sand to silt, all of which contain known Gulf sturgeon prey items (Menzel, 1971; Abele and Kim, 1986; and American Fisheries Society, 1989). Incidental captures and recent studies confirm that both Pearl River and Pascagoula River adult Gulf sturgeon winter in the Mississippi Sound, particularly around barrier islands and barrier islands passes (Reynolds, 1993 and Ross et al., 2001). Gulf sturgeon exiting the Pascagoula River move both east and west, with telemetry locations as far east as
Dauphin Island and as far west as Cat Island and the entrance to Lake Pontchartrain, Louisiana (Ross et al., 2001a). Tagged Gulf sturgeon from the Pearl River subpopulation have been located between Cat Island, Ship Island, Horn Island, and east of Petit Bois Island to the Alabama state line (Rogillio et al., 2002). Habitat used by Gulf sturgeon in the vicinity of the barrier islands is 6.2 to 19.4 feet deep (average 13.8 feet), with clean sand substrata (Heise et al., 1999 and Ross et al., 2001). Inshore locations where Gulf sturgeon were located were 6.2 to 9.2 feet deep and all had mud (mostly silt and clay) substrata (Heise et al., 1999), typical of substrates supporting known Gulf sturgeon prey.

The primary constituent elements essential for the conservation of the Gulf sturgeon are those habitat components that support foraging, water quality, sediment quality, and safe unobstructed migratory pathways. The Mississippi Sound provides: foraging, water quality, sediment quality, and migration habitat for Gulf sturgeon.

Foraging: Unit 8 provides foraging habitat for the Gulf sturgeon. Little data is available on Gulf sturgeon feeding habitats. Their threatened status limits sampling efforts. Generally, adults and subadults could be described as opportunistic benthivores typically feeding on benthic marine invertebrates including amphiopods, lancelets, polychaetes, gastropods, shrimp, isopods, mollusks, and crustaceans. The benthic community noted by Vittor and Associates (1982) within Mississippi Sound provides suitable forage habitat for adult and subadult fish. As Gulf sturgeon feed principally on benthic invertebrates, potential impacts to the foraging constituent element would be confined to possible impacts to the benthic community. Vittor and Associates (1982) classified the benthic community in a study of Mississippi Sound and selected sites in the Gulf of Mexico. In the Sound, a total of 437 taxa were

collected at densities ranging from 1,097 to 35,537 individuals per square meter. Generally, densities increase from fall through the spring months since most of the dominant species exhibit a late winter to early spring peak in production. Species diversity, evenness, and species richness (number of taxa) demonstrate only minor inconsistent temporal fluctuations. Biomass per unit area also increases from fall to spring, primarily as a result of higher densities. Vittor and Associates (1982) named several opportunistic species that are ubiquitous in Mississippi Sound and nearshore Gulf of Mexico. These species, though sometimes low to moderate in abundance, occur in a wide range of environmental conditions. They are usually the most successful at early colonization and thus tend to strongly dominate the sediment subsequent to disturbances. These species include *Mediomastus spp*., *Paraprionospio pinnata, Myriochele oculata, Owenia fusiformis, Lumbrineris spp., Sigambra tentaculata,* the *Linopherus-Paraphinome* complex, and *Magelona cf. phyllisae*. The phoronid, *Phoronis sp*., and the cumacean, *Oxyurostylis smithi*, also fit this category. *M. oculata* and *O. fusiformis* are predominate species in Mississippi Sound. The numerically dominant species collected during the study, were *Mediomastus californiensis* and *Paraprionospio pinnata*.

Water Quality: The "water quality" constituent element is of concern to Gulf sturgeon critical habitat. Temperature, salinity, pH, hardness, turbidity, oxygen concentrations, and other chemical characteristics must be protected in order to preserve normal behavior, growth, and viability of all Gulf sturgeon life stages. If water quality is severely degraded, adverse impacts to Gulf sturgeon and its critical habitat may result. Water quality within the Mississippi Sound is influenced by several factors, including the discharge of freshwater from rivers, seasonal climate changes, and variations in tide and currents. The primary driver of water quality is the rivers, including the Pascagoula River that feed into the Sound. Freshwater inputs provide nutrients and sediments that serve to maintain productivity both in the Sound and in the extensive salt marsh habitats bordering the estuaries of the Sound. The salt marsh habitats act to regulate the discharge of nutrients to coastal waters and serve as a sink for pollutants. Suspended sediments enter the Sound from freshwater sources, but are hydraulically restricted due to the barrier islands. The barrier islands, combined with the Sound's shallow depth and mixing from wind, tides, and currents, promote re-suspension of sediments. These suspended sediments give Mississippi Sound a characteristic brownish color (MDEQ, 2006).

Sediment Quality: The "sediment quality" constituent element is listed to ensure sediment suitable (i.e. texture and other chemical characteristics) for normal behavior, growth, and viability of all life stages. In addition, sediment quality is of a concern to support a viable benthic community in order to allow the Gulf sturgeon continual foraging of the area.

Migration Habitat: The "migration habitat" constituent element is concerned with ensuring safe unobstructed passage for the species. It is intended primarily for the more confined areas near the river mouths or the rivers themselves. Gulf sturgeon exiting the Pascagoula River move both east and west, with telemetry locations as far east as Dauphin Island and as far west as Cat Island and the entrance to Lake Pontchartrain, Louisiana (Ross et al., 2001). Tagged Gulf sturgeon from the Pearl River subpopulation have been located between Cat Island, Ship Island, Horn Island, and east of Petit Bois Island to the Alabama state line (Rogillio et al., 2002). The species could potentially migrate through the project area. (Figure 3).

3.2 Green Sea Turtle

Life History/Distribution

Although green sea turtles are found worldwide, this species is concentrated primarily between the 35° North and 35° South latitudes. Green sea turtles tend to occur in waters that remain warmer than 68° F; however, there is evidence that they may be buried under mud in a torpid state in waters to 50° F (Ehrhart 1977; Carr et al. 1979).

This species migrates often over long distances between feeding and nesting areas (Carr and Hirth 1962). During their first year of life, green sea turtles are thought to feed mainly on jellyfish and other invertebrates. Adult green sea turtles prefer an herbivorous diet frequenting shallow water flats for feeding (Fritts et al. 1983). Adult turtles feed primarily on seagrasses, such as *Thalassia testudinum*. This vegetation provides the turtles with a high fiber content and low forage quality (Bjorndal 1981a).

In the Gulf of Mexico, principal foraging areas are located in the upper west coast of Florida (Hirth 1971). Nocturnal resting sites may be a considerable distance from feeding areas, and distribution of the species is generally correlated with grassbed distribution, location of resting beaches, and possibly ocean currents (Hirth 1971). Major nesting areas for green sea turtles in the Atlantic include Surinam, Guyana, French Guyana, Costa Rica, the Leeward Islands, and Ascension Island in the mid-Atlantic. Historically in the U.S., green turtles have been known to nest in the Florida Keys and Dry Tortugas. Yet, these turtles primarily nest on selected beaches along the coast of eastern Florida, predominantly Brevard through Broward Counties. However, they probably nested along the Gulf Coast before their decline. In the southeastern U.S., nesting season is roughly June through September. Nesting occurs nocturnally at 2, 3, or 4-year intervals. Only occasionally do females produce clutches in successive years. Estimates of age at sexual maturity range from 20 to 50 years (Balazs 1982; Frazer and Ehrhart 1985) and they may live over 100 years. Immediately after hatching, green turtles swim past the surf and other shoreline obstructions, primarily at depths of about 8 inches or less below the water surface, and are dispersed both by vigorous swimming and surface currents (Balzas 1980). The whereabouts of hatchlings to juvenile size is uncertain. Green turtles tracked in Texas waters spent more time on the surface, with fewer submergences at night than during the day, and a very small percentage of the time was spent in the federally maintained navigation channels. The tracked turtles tended to utilize jetties, particularly outside of them, for foraging habitat (Renaud et. Al. 1993).

Threats

Most green turtle populations have been depleted or endangered because of direct exploitation or incidental drowning in trawl nets (King 1981). A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and meat. In Florida, the nesting population was nearly extirpated within 100 years of the initiation of commercial exploitation (King 1981). Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. These tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens become severely debilitated and die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from commercial fishing operations.

<u>3.3 Kemp's Ridley Turtle</u>

Life History/Distribution

The Kemp's ridley occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean with occasional individuals reaching European waters. Adults of this species are generally confined to the Gulf of Mexico, although some adults are sometimes found on the east coast of the U.S. Females return to their nesting beach about every other year with nesting occurring from April into July and usually limited to the western Gulf of Mexico. The mean clutch size for this species is about 100 eggs per nest and an average of 2.5 nests per female per season.

Benthic immature turtles have been found along the eastern seaboard of the U.S. and in the Gulf of Mexico. In Gulf, studies suggest that immature turtles stay in shallow, warm, nearshore waters in the northern Gulf until cooling waters force them offshore or south along the Florida coast (Renaud 1995). Little is known of the movements of the post-hatching stage (pelagic stage) within the Gulf. Studies have indicated that this stage varies from 1 to 4 or more years and the benthic immature stage lasts about 7 to 9 years (Schmid and Witzell 1997). The maturity age of this species is estimated to be 7 to 15 years.

Threats

Of the seven extant species of sea turtles, the Kemp's ridley has declined to the lowest population level. However, recent studies have indicated that increased nesting activities and suggest that the decline in ridley population has stopped and the population is now increasing (USFWS 2000). A period of steady increase in the benthic immature turtles has been occurring since 1990 and suggests a result of increased hatchling production and survival rates of the immature turtles. The increased survival of immature individuals is believed to be in part a result of the use of turtle exclusion devices (TEDs) in the commercial shrimping fleets. Future threats to the species include interaction with fishery gear; marine pollution; destruction of foraging habitat; illegal poaching; and impacts to nesting beaches associated with rising sea level, development, and tourism pressure.

<u>3.4 Leatherback Turtle</u>

Life History/Distribution

The leatherback sea turtles are the largest of all sea turtles. These turtles may reach a length of about 7 feet and weigh as much as 1,600 pounds. The carapace is smooth and is colored gray, green, brown, and black. The plastron is yellowish white. Juveniles are black on top and white on the bottom.
This species is highly migratory and is the most pelagic of all sea turtles (NMFS and USFWS 1992). They are commonly found along continental shelf waters (Pritchard 1971; Hirth 1980; Fritts et al. 1983). Leatherback sea turtles' range extends from Cape Sable, Nova Scotia, south to Puerto Rico and the U.S. Virgin Islands. Leatherbacks are found in temperate waters while migrating to tropical waters to nest (Ross 1981). Distribution of this species has been linked to thermal preference and seasonal fluctuations in the Gulf Stream and other warm water features (Fritts et al. 1983). General decline of this species is attributed to exploitation of eggs (Ross 1981).

Leatherback sea turtles are omnivorous. Leatherbacks feed mainly on pelagic soft-bodied invertebrates, such as jellyfish and tunicates. Their diet may also include squid, fish, crustaceans, algae, and floating seaweed. Highest concentrations of these prey animals are often found in upwelling areas or where ocean currents converge. They will also ingest plastic bags and other plastic debris, which are commonly generated by oil drilling rigs and production platforms in coastal Florida, Alabama, Mississippi, and

Louisiana (Fritts et al. 1983). Nesting of leatherback sea turtles is nocturnal with only a small number of nests occurring in the United States in the Gulf of Mexico (Florida) from April to late July (Pritchard 1971; Fuller 1978; Fritts et al. 1983). Leatherback sea turtles prefer open access beaches possibly to avoid damage to their soft plastron and flippers. Unfortunately, such open beaches with little shoreline protection are vulnerable to beach erosion triggered by seasonal changes in wind and wave direction. Thus, eggs may be lost when open beaches undergo severe and dramatic erosion. The Pacific coast of Mexico supports the world's largest known concentration of nesting leatherbacks. There is very little nesting in the U. S. (Gunter 1981).

Threats

Disturbance of the nesting grounds is the most serious threat to leatherback sea turtles. Although the flesh of this sea turtle is not eaten, the population has been threatened by egg-harvesting in countries, such as Malaysia, Surinam, the Guianas, the west coast of Mexico, Costa Rica, and in several Caribbean islands. Leatherbacks were killed in the past for the abundant oil they yield, which was used for oil lamps and for caulking wooden boats. Ingesting plastic bags and other plastic wastes are another cause of death for leatherbacks turtles. The sea turtles confuse plastic wastes with one of their favorite foods jellyfish. When swallowed, plastics can clog a turtle's throat, esophagus, and intestines.

3.5 Loggerhead Turtle

Life History/Distribution

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Gulf of Mexico, Pacific, and Indian Oceans. This species may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, and the mouths of large rivers. In shallow Florida lagoons, loggerheads were found during the morning and evening, leaving the area during mid-day when temperatures reached 87° F. At dusk, turtles moved to a sleeping site and remained there until morning, possibly in response to changes in light or water temperature (Nelson 1986). Loggerhead turtles are essentially carnivores, feeding primarily on sea urchins, sponges, squid, basket stars, crabs, horseshoe crabs, shrimp, and a variety of mollusks. Their strong beak-like jaws are adapted for crushing thick-shelled mollusks. Although loggerhead sea turtles are primarily bottom feeders, they also eat jellyfish and mangrove leaves obtained while swimming and resting near the sea surface. Presence of fish species such as croaker in stomachs of stranded individuals may indicate feeding on the by-catch of shrimp trawling (Landry, 1986). Caldwell et al. (1955) suggest that the willingness of the loggerhead to consume any type of invertebrate food permits its range to be limited only by the presence of cold water.

As loggerheads mature, they travel and forage through nearshore waters until their breeding season, when they return to the nesting beach areas. The majority of mature loggerheads appear to nest on a two or three year cycle. Major nesting beaches for loggerheads include the Sultanate of Oman, southeastern United States, and eastern Australia. From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to the nesting aggregation on Masirah Island, Oman. This species nests within the U.S. from Texas to Virginia, although the major nesting concentrations are found along the Atlantic coast of Florida, Georgia, South Carolina, and North Carolina. About 80 percent of all loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and

Broward Counties). Total estimated nesting in the U.S. is approximately 50,000 to 70,000 nests per year. Nesting in the northern Gulf outside of Florida occurs primarily on the Chandeleur Islands in Louisiana and to a lesser extent on adjacent Ship, Horn, and Petit Bois Islands in Mississippi (Ogren 1977). Ogren (1977) reported a historical reproductive assemblage of sea turtles, which nested seasonally on remote barrier beaches of eastern Louisiana, Mississippi, and Alabama. Loss or degradation of suitable nesting habitat may be the most important factor affecting the nesting population in northern Gulf of Mexico.

Loggerhead sea turtles are considered turtles of shallow water. Juvenile loggerheads are thought to utilize bays and estuaries for feeding, while adults prefer waters less than 165 feet deep (Nelson 1986). Aerial surveys suggest that loggerheads (benthic immature and adults) in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico. During aerial surveys of the Gulf of Mexico, the majority (97 percent) of loggerheads was seen off the east and west coasts of Florida (Fritts 1983). Most were observed around mid-day near the surface, possibly related to surface basking behavior (Nelson 1986). Although loggerheads were seen off the coast of Alabama, Mississippi, and Louisiana, they were 50 times more abundant in Florida than in the western Gulf. The majority of the sightings were in the summer (Fritts et al. 1983). An individual tagged in Perdido Bay, Alabama was recaptured one year later only about a mile from the original capture site. Loggerheads are frequently observed near offshore oil platforms, natural rock reefs, and rock jetties along the Gulf Coast. Large numbers of stranded turtles were observed inshore of such areas (Rabalais and Rabalais 1980). In a recent tracking study, loggerheads spent more than 90 percent of the time underwater, tended to avoid colder water, and spent much of the time in the vicinity of oil and gas structures, such as those found offshore of Mississippi and Alabama.

Threats

Overall the loss of nesting beaches, hatchling disorientation from artificial light, drowning in fishing and shrimping trawls, marine pollution, plastics, and styrofoam have led to the decline of loggerheads.

3.6 Hawksbill Sea Turtle

Life History/Distribution

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries and lagoons, in water depths of less than 70 feet. Similar to green sea turtles, hatchlings are sometimes found floating in masses of pelagic marine algae (NFWL 1980). When they reach a carapace length of approximately 20 to 25 centimeters, hawksbill juveniles reenter coastal waters. Coral reefs are widely recognized as the resident foraging habitat of juveniles, sub-adults, and adults. This habitat association is likely related to their diet of sponges, which need solid substrate for attachment. Hawksbills are omnivorous and prefer invertebrates, especially encrusting organisms, and will feed on plant material such as algae, seagrasses and mangroves (Carr 1952; Rebel 1974; Pritchard 1977; Musick 1979; Mortimer 1982). Hawksbills also occur around rocky outcrops and high energy shoals, which are also optimum sites for sponge growth.

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS 2013d). On the basis of limited information, nesting

migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Threats

Hawksbill sea turtles are typically tracked nesting and foraging in warm Caribbean waters (Seaturtle.org 2009) and the Yucatan Peninsula of Mexico. The Hancock County Living Shoreline project area does not provide appropriate foraging substrate since Hawksbill turtles typically feed on coral related organisms such as sponges and encrusting organisms, which are not found in coastal Mississippi. Given the range and the observed traveling distances of some Hawksbill turtles, it is possible that they would forage in the Hancock County Living Shoreline project area; however, due to the lack of appropriate food sources and the absence of direct observation of hawksbill sea turtles in coastal Mississippi, their occurrence within the action area is highly unlikely.

4.0 Environmental Baseline in Action Area

Status of the Species and Critical habitat in the Action Area

The sea turtle species that may be affected by the proposed action are all highly migratory and individual animals of any of the species are likely to be year-round residents of the action area. Individuals will enter the project area during migrations as well as other areas of the northern Gulf, Atlantic, and Caribbean, therefore, the range-wide status and distribution as discussed above most accurately indicates the status in the action area.

The Gulf sturgeon is found in the Gulf of Mexico primarily from Tampa bay, FL to the mouth of the Mississippi River. Gulf sturgeon are not likely to be present in the action area during summer months (May-September) when they are occupying riverine habitat for spawning. Numerous studies in the northern Gulf have documented habitat use and seasonality of Gulf sturgeon movement from spawning areas in riverine habitat to foraging grounds in the nearshore environment (Fox et al., 2002; Heise et al., 2004, 2005; Rogillio et al., 2007; Ross et al., 2009; Havrylkoff et al., 2012). Telemetry data from Gulf sturgeon that are natal to the Pearl River drainage system show clear seasonal migration patterns. Movement chronologies show summer habitat use upriver to take place between April and November and winter habitat use at Cat, Ship, Horn, and Petit Bois islands in the Mississippi Sound to occur between November and early March (Rogillio et al., 2007). Data from two separate telemetry studies in the Pearl River area (Rogillio et al., 2007; Ross et al., 2009) document Gulf sturgeon migrating to and from the Rigolets Pass to the west of the Pearl River mouth in high concentrations before heading toward spawning and foraging grounds upriver and nearshore at the barrier islands, respectively (Figure 2). Ross et al. (2009) noted that in March and April, the majority of tagged fish began to move from offshore waters to the Rigolets Pass near the mouth of the Pearl River, their movement continuing upstream into the river system through June. Unit 8 of the Gulf sturgeon critical habitat includes Lake Pontchartrain (east of causeway), Lake Catherine, Little Lake, the Rigolets, Lake Borgne, Pascagoula Bay

and Mississippi Sound systems in Louisiana and Mississippi, and sections of the state waters within the Gulf of Mexico. The action area represents a very small acreage when considering the total area of Unit 8.

Factors Affecting Species' Environment in Action Area

Sea turtles found in the action area are not year-round residents and may travel widely throughout the Gulf of Mexico and other water bodies. Therefore, individuals found in the action area can potentially be affected by activities anywhere within their range of distribution. Gulf sturgeon critical habitat Unit 8 is a defined area that includes foraging and migratory habitat for subpopulations. Designated critical habitat includes areas that are known to contain primary constituent elements (PCE's) essential to the survival of the species. Upland activities could impact water quality in the unit.

There are no known Federal activities that have taken place in the action area that would have impacted listed species, however there are impacts outside of the project area. NOAA has commenced numerous ESA section 7 consultations to address the impact of federally permitted fisheries on threatened and endangered sea turtles in an effort to reduce adverse effects from several types of fishing gear. Additionally, potential adverse effects from Federal marine vessels and their operations throughout sea turtle ranges including operations from the Navy, Coast Guard, USACE, and NOAA have resulted in formal consultations. In coastal areas, sea-turtles have been affected by entrainment in cooling water systems at power generating plants that have Federal oversight.

Hydropower plants with Federal oversight can impact Gulf sturgeon. Sturgeon migrating up and down river systems can be adversely impacted by entrainment in cooling water systems. Additionally, larvae can be impacted by heated water discharge. Incidental catch of Gulf sturgeon by state and federally regulated fisheries, particularly the shrimping fishery, has been documented and can impact populations.

Private-entity activities can also an adverse effect on threatened and endangered species in the action area. Commercial and recreational boat traffic can have an adverse effect on sea turtles and Gulf sturgeon via propeller and vessel strike damage. Private vessels use the area for fishery resources including crab, shrimp, and game fish. A number of activities that may indirectly affect the listed species and critical habitat in the action area include wastewater discharge, nutrient loading, and other pollutants from upland sources.

5.0 Effects of Proposed Action

During construction of the breakwater, marsh, and oyster cultch deployment, the fine-grained soft bottom habitat would be altered by the placement of breakwater materials. The footprint of the combined project is approximately, 212.9 acres (Table 6). Approximately 111.9 acres would be filled for construction of project elements including breakwater construction (19.9 acres), marsh creation (46 acres) and oyster reef creation (46 acres), resulting in a long-term, moderate impact to a relatively small project footprint. In addition, the flotation channels would be constructed to transport the barges carrying the fill material (approximately 101 acres). The sidecast material from the construction of the flotation channels would temporarily alter the seafloor morphology until waves naturally push the sidecast material back into excavated channels after construction over several months, possibly longer. To the extent possible, materials from the flotation channel may be used beneficially to create marsh.

Table 6. Summary of proposed action.

Project Activity	Acreage Impacted	Habitat	Nature of Impact Improvement
Living Shoreline (Breakwater)	19.9 acres	intertidal sediments off marsh edge; -3 to 6 ft. contour.	Covering sediments with breakwater; establishment of a high relief reef/living shoreline
Marsh Creation	46 acres	~0-4 ft. subtidal and intertidal Open water/marsh edge; soft sediments landward of submerged reef;	Beneficial use of dredge material or sediment from other sources to back fill and create a marsh on the shoreline side of the living shoreline
Oyster Reef	46 acres	Hard bottom substrate; previous oyster reefs	Cultch deployment of 46 acres of high relief oyster reef
Flotation Channel	101 acres	Soft sediment	Dredge and side cast a 55,008 ft. of channel 80 ft. wide facilitating a barge draft of 8 ft.
Total	212.9 acres		

<u>Gulf Sturgeon</u>

All activities will take place in shallow waters near the shoreline allowing sufficient area for passage of individuals. Gulf sturgeon are highly mobile and will likely avoid the area due to project activity and noise. Normal behavior patterns of Gulf sturgeon are not likely to be disrupted by the project activities because of the short-term localized nature of the activities and the ability of Gulf sturgeon to avoid the immediate area. Dredging operations for the creation of temporary flotation channels would use a mechanical method, such as a clamshell or crane combo in which the dredged material would be scooped up and sidecast. Gulf sturgeon takes are not anticipated using this method.

Gulf Sturgeon Critical Habitat

Gulf sturgeon critical habitat exists in the project area and is represented on the habitat resources map (Figure 1). However, no effects to PCEs from the proposed project are expected in the riverine ecosystems as no work will occur in these habitats. PCEs include abundance of prey items, water quality, sediment quality, and safe and unobstructed migratory pathways. All restoration activities will take place in shallow estuarine waters near the shoreline allowing sufficient area for passage of individuals if present during implementation. Additionally, the benthic habitat in the project area is not preferred foraging habitat for Gulf sturgeon. Well oxygenated, clear water with sandy substrates are primarily used for feeding by the species (Fox et al., 2002; Ross et al., 2009). Benthic habitat in the project footprint is largely composed of soft, silty substrates with turbid waters. Potential water quality impacts as a result of dredging and disposal have also been considered. Dredging and disposal is expected to produce turbidity levels in excess of natural conditions, however sediment disturbance during these operations are expected to be temporary and minimal. If floatation channels are created for work barges, dredging will likely impact benthic invertebrates. These impacts are primarily short-term in nature, consisting of a temporary loss of populations in the footprint of the channel. These impacts will not result in permanent habitat alteration due to the fact that the areas will re-colonize with similar benthic species upon completion of the project, remaining functionally identical to the existing habitat. The shallow areas and substrate type that the channels may be constructed in are not considered suitable foraging habitat for sturgeon, therefore we do not expect any effect to abundance of prey items for the Gulf sturgeon.

Sediment Quality

The non-motile benthic community within the project area would be temporarily, adversely impacted as a result of the dredging and placement operations, but would recover within several months to 1 year following the dredging event. The majority of the motile species present within the project area will abandon the area during dredging and placement activities. They will return once the activities have been completed.

During construction of the breakwater, marsh, and oyster cultch deployment, the fine-grained soft bottom habitat would be altered by the placement of breakwater materials. The footprint of the combined project is approximately, 212.9 acres (Table 4). Approximately 111.9 acres would be filled for construction of project elements including breakwater construction (19.9 acres), marsh creation (46 acres) and oyster reef creation (46 acres), resulting in a long-term, moderate impact to a relatively small project footprint. In addition, the flotation channels would be constructed to transport the barges carrying the fill material (approximately 101 acres). The sidecast material from the construction of the flotation channels would temporarily alter the seafloor morphology until waves and currents naturally push the sidecast material or other sediment back into excavated channels after construction. To the extent possible, materials from the flotation channel may be used beneficially to create marsh. Adverse impacts to the submerged habitat during construction are expected to be short-term and minor.

There will be long-term, moderate adverse impacts to the bottom habitats (approximately 111.9 acres) over the life of the project because fine-grained sediment will be covered with hard structure and sediment for the creation of breakwaters, marsh and oyster reefs. However, the project area constitutes a small fraction of the total available habitat for the listed species in the area. There will be short-term

minor impacts to approximately 101 acres of fine-grained sediment for the creation of temporary flotation channels. The net benefits of the habitat protection and restoration would include increased benthic habitat diversity, structural complexity, greater diversity and abundance of marine aquatic species. In addition, the entire Hancock County marsh would experience reduced shoreline erosion.

Water Quality

Placement of the breakwater, created marsh, and deployment of oyster cultch would result in short-term, minor adverse impacts to water quality as a result of re-suspension of sediment by vessels (barges, tugs, skiffs, etc.) moving in and out of the project area, excavation of the flotation channels, and filling of the marsh. The suspended sediment may be transported into surrounding wetlands, waterways, and the Mississippi Sound. However, the area is currently exposed to elevated turbidity levels as a result of re-suspension of sediment during frequent storms, tides and other typical events. It is expected during dredging and placement that suspended particles will settle out within a short time frame, with no measurable effects on water quality.

Prey Abundance

As Gulf sturgeon feed principally on benthic invertebrates, potential impacts to the foraging constituent element would be confined to possible impacts to the benthic community. However, past observances have recorded subpopulations found within the Pearl and Pascagoula Rivers utilize sandy substrates around the Mississippi barrier islands in depths from 5-20 feet as foraging grounds during the fall migration and winter months (Fox et al., 2002; Ross et al., 2009). Additionally, construction would occur in depths shallower than those typically utilized by Gulf sturgeon. Benthic habitat in the project footprint is largely composed of soft, silty substrates with turbid waters, therefore there would be no adverse impact on prey abundance.

Safe and Unobstructed Migratory Pathways

Within Unit 8, subadult and adult Gulf sturgeon move from the rivers through estuarine and marine areas to feeding areas (Figure 3). Unit 8 is known to support migratory pathways for Gulf sturgeon sub-populations (Pascagoula and Pearl Rivers). It is believed that Gulf sturgeon that are neo-natal to the Pearl River system swim through the action area during intermittent inter-riverine movements (November to March) . Construction would occur in water depths of around 3.5 feet and less except for the excavation of the temporary flotation channels, which will be constructed out to the 8 ft. contour. To avoid migration disturbance, the project aims to construct restoration features from May-October while the species occupies riverine habitat. This provides ample opportunity for Gulf sturgeon to migrate through the immediate area. Given this information, no adverse impacts to migratory pathways are anticipated.

<u>Sea Turtles</u>

The five sea turtles species on the list are rarely observed in Mississippi waters (MDWFP 2001). Most of these species nest in locations far from Mississippi although it is possible that both Kemp's ridley and loggerhead sea turtles could use the offshore barrier islands for nesting (NOAA Fisheries 2012; NOAA Fisheries 2013b; NOAA Fisheries 2013c). Both the Kemp's ridley and loggerhead have been caught close to the shoreline by land-based fishermen indicating use of the Mississippi nearshore areas for foraging

and/or movement (MDWFP 2001). The shoreline habitat in the action area is unsuitable for sea turtle nesting (i.e., no sandy beach above high tide) and we do not expect nesting in the action area.

The green sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle do not have more than a transient occurrence within the project area. Dredging operations for the creation of temporary flotation channels would use a mechanical method, such as a clamshell or crane combo in which the dredged material would be scooped up and sidecast. This method is not known to take sea turtles; sea turtles are highly mobile and will likely avoid the area due to project activity and noise. Additionally, project components would be constructed very close to the shoreline and are therefore not expected to impede sea turtle migratory routes. In summary, impacts to these species, if any, would be short-term and minor. If any sea turtles are found to be present in the immediate project area during restoration activities, construction would be halted until species moves away from project area. Best management practices as outlined by NOAA (NOAA 2006) will be utilized to prevent and minimize impacts to sea turtles. These practices include construction personnel education, use of "no wake/idle" speeds in proper locations, adhering to protection guidelines when a sea turtle is within 100 yards or activities, and reporting turtle injuries (NOAA 2006).

Direct Effects

Direct impacts will be limited to the area directly around the construction site where sediments will be disturbed by placement of hardened reef and breakwater material, dredging flotation channels, marsh material, and installing pilings. These adverse direct impacts would be short term to the listed species and it is expected that ambient conditions will be restored following cessation of work each day. Once the structures are stabilized, a long-term benefit is expected due to the newly created habitat that will attract infauna (aquatic animals that live in the sediment), shellfish, crustaceans, and transient fish.

Indirect Effects

Indirect adverse impacts are not expected in the short or long term. Long-term indirect benefits are expected due to anticipated increased habitat use of restoration features.

Cumulative Effects

Within the action area, major future changes are not anticipated at the project site and recreational use of the area is expected to continue at present levels in the near future. Listed species of sea turtle and Gulf sturgeon are not expected to be affected during their life cycles from project activities. The Hancock County Marsh Living Shoreline project will have a beneficial effect on the estuarine habitats in the area very shortly after construction. Fish and invertebrates would colonize the breakwaters relatively quickly, while marsh growth and oyster development may take longer; 3 to 5 years. The cumulative impact of these structures and the anticipated calm water conditions landward of the breakwaters are expected to create conditions favorable to SAV and oyster reef colonization and to generally improve water quality. Increases in SAV coverage, structural habitat, and shoreline erosion reduction will improve many habitats in the area.

6.0 Conservation Measures

General BMPs

1. Watch for and avoid collisions with wildlife while traveling on foot, equipment, vehicles or vessel.
    a. Activities shall occur during daylight (dawn to dusk) hours only.
    b. Vehicles and equipment shall be operated at speeds slow enough to avoid wildlife while still safely operating the vehicle.
    c. Avoid marked wildlife or other conservation areas.

2. Minimize the risk of attracting invasive species and predators to the action area.
    a. Prior to bringing any equipment (including personal gear, machinery, vehicles or vessels) to the work site, inspect each item for mud or soil, seeds, and vegetation. If present, the equipment, vehicles, or personal gear shall be cleaned until they are free from mud, soil, seeds, and vegetation. This inspection will occur each time equipment, vehicles, and personal gear are being prepared to go to a site or prior to transferring between sites to avoid spreading exotic, nuisance species.
    b. Inspect sites periodically to identify and control new colonies/individuals of an invasive species not previously observed prior to construction.
    c. Remove trash or anything that would attract nuisance wildlife to work areas daily.
    d. Project related trash or debris shall not be allowed to blow into open water or onto beaches.

3. Minimize unnecessary habitat disturbance.
    a. The nearest, existing staging, access and egress areas, travel corridors, pathways, and roadways shall be used (including those provided by the State, local governments, land managers, trustee, or private property owner, with proper permissions).
    b. Do not modify existing access.
    c. Minimize vegetation removal.
    d. Avoid driving over the wrack line or areas of dense seaweed, as these habitats may contain baby birds or other organisms that are difficult to see.

4. Minimize lighting impacts to wildlife
5. Prevent spills. Conduct daily inspections of all construction and related equipment to assure there are no leaks of antifreeze, hydraulic fluid, or other substances.
6. Prohibit use of hazardous materials, such as: lead paint, creosote, pentachlorophenol, and other wood preservatives during construction in, over, or adjacent to, sensitive sites during construction and routine maintenance.

Gulf Sturgeon

1. Project components will be constructed in the months of May-October to avoid inter-riverine migration movements.
2. Project construction activities will be subject to a stop work order if the species is observed in the project footprint. Work will continue once the species leaves the area.

The five sea turtles species on the endangered species list are rarely observed in Mississippi waters (MDWFP 2001). There is no sawtooth critical habitat in or near the project action area. The Trustee would adhere to the Sea turtle and Smalltooth Sawfish Construction Guidelines as a cooperative and voluntary measure, working cooperatively with NOAA and in order to avoid any possible adverse effect.

Sea turtle and Smalltooth Sawfish Construction Guidelines 2006

The permittee shall comply with the following protected species construction conditions:

1. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

2. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

3. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

4. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

5. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft. radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

6. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

7. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Measures for Reducing Entrapment Risk to Protected Species

Bottlenose dolphins, sea turtles, and Gulf sturgeon (protected species) are known to inhabit coastal waters of the northern Gulf of Mexico. Bottlenose dolphins are protected under the Marine Mammal Protection Act (MMPA) and sea turtles and Gulf sturgeon are protected under the Endangered Species Act (ESA). Because of the potential for these protected species to become entrapped within coastal waters of construction sites along the northern Gulf coast, projects that enclose shallow open water areas for wetland creation or nourishment will use the following measures to minimize the potential for entrapment:

1. *Pre-construction planning.* During project design, the Federal Action Agency or project proponents must incorporate at least one escape route into the proposed retention structure(s) to allow any protected species to exit the area(s) to be enclosed. Escape routes must lead directly to open water outside the construction site and must have a minimum width of 100 feet. Escape routes should also have a depth as deep as the deepest natural entrance into the enclosure site and must remain open until a thorough survey of the area, conducted immediately prior to complete enclosure, determines no Protected Species are present within the confines of the structure (see item 5 below for details).

2. *Pre-construction compliance meeting.* Prior to construction, the Federal Action Agency, project proponents, the contracting officer representative, and construction personnel should conduct a site visit and meeting to develop a project-specific approach to implementing these preventative measures.

3. *Responsible parties.* The Federal Action Agency will instruct all personnel associated with the project of the potential presence of protected species in the area and the need to prevent entrapment of these animals. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing protected species. Construction personnel will be held responsible for any protected species harassed or killed as a result of construction activities. All costs associated with monitoring and final clearance surveys are the responsibility of project proponents and must be incorporated in the construction plan.

4. *Monitoring during retention structure construction.* It is the responsibility of construction personnel to monitor the area for protected species during dike or levee construction. If protected species are regularly sighted over a 2 or 3 day period within the enclosure area during retention structure assembly, construction personnel must notify the Federal Action Agency. It is the responsibility of the Federal Action Agency to then coordinate with the National Marine Fisheries Service (NMFS) Marine Mammal Health and Stranding Response team (1-877-WHALE HELP [1-877-942-5343]) or the appropriate State Coordinator for the Sea Turtle Stranding and Salvage Network (see http://www.sefsc.noaa.gov/species/turtles/stranding_coordinators.htm) to determine what further actions may be required. Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area.

5. *Pre-closure final clearance.* Prior to completing any retention structure by closing the escape route, the Federal Action Agency will insure that the area to be enclosed is observed for protected species. Surveys must be conducted by experienced marine observers during daylight hours beginning the day prior to closure and continuing during closure. This is best accomplished by small vessel or aerial surveys with 2-3 experienced marine observers per vehicle (vessel/helicopter) scanning for protected species. Large areas (e.g. >300 acres) will likely require the use of more than one vessel or aerial survey to insure full coverage of the area.

These surveys will occur in a Beaufort sea state (BSS) of 3 feet or less, as protected species are difficult to sight in choppy water. Escape routes may not be closed until the final clearance determines the absence of protected species within the enclosure sight.

6. *Post closure sightings.* If protected species become entrapped in an enclosed area, the Federal Action Agency and NMFS must be immediately notified. If observers note entrapped animals are visually disturbed, stressed, or their health is compromised then the Action Agency may require any pumping activity to cease and the breaching of retention structures so that the animals can either leave on their own or be moved under the direction of NMFS.

    a. In coordination with the local stranding networks and other experts, NMFS will conduct an initial assessment to determine the number of animals, their size, age (in the case of dolphins), body condition, behavior, habitat, environmental parameters, prey availability and overall risk.

b. If the animal(s) is/are not in imminent danger they will need to be monitored by the Stranding Network for any significant changes in the above variables.

c. Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area. Coordination by the Federal Action Agency with the NMFS SER Stranding Coordinator may result in authorization for these actions.

d. NMFS may intervene (catch and release and/or rehabilitate) if the protected species are in a situation that is life threatening and evidence suggests the animal is unlikely to survive in its immediate surroundings.

e. Surveys will be conducted throughout the area at least twice or more in calm surface conditions (BSS 3 feet or less), with experienced marine observers, to determine whether protected species are no longer present in the area.

While NMFS recommends these best management practices to prevent the future takes of marine mammals by entrapment, use of these measures cannot guarantee a take will not occur. Following these measures does not constitute compliance with the MMPA's Incidental Take requirements and take is not authorized.

7.0 Conclusion

Based upon the findings of this BA, the proposed action "may affect, but is not likely to adversely affect" the following species under the purview of the NOAA Fisheries:

- Loggerhead Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.

- Green Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.

- Leatherback Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.

- Hawksbill Sea Turtle- Due to the lack of appropriate food sources and the absence of direct observation of hawksbill sea turtles in coastal Mississippi, their occurrence within the action area is highly unlikely. The proposed action is not likely to adversely impact hawksbill sea turtle individuals or populations. There is no critical habitat located in the project area.

- Gulf Sturgeon - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.

- Gulf Sturgeon Critical Habitat – The project footprint does fall within Gulf sturgeon critical habitat (Unit 8); however, it has been determined that the construction activities associated with this project will not adversely modify designated Gulf sturgeon critical habitat.

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9.0 Figures

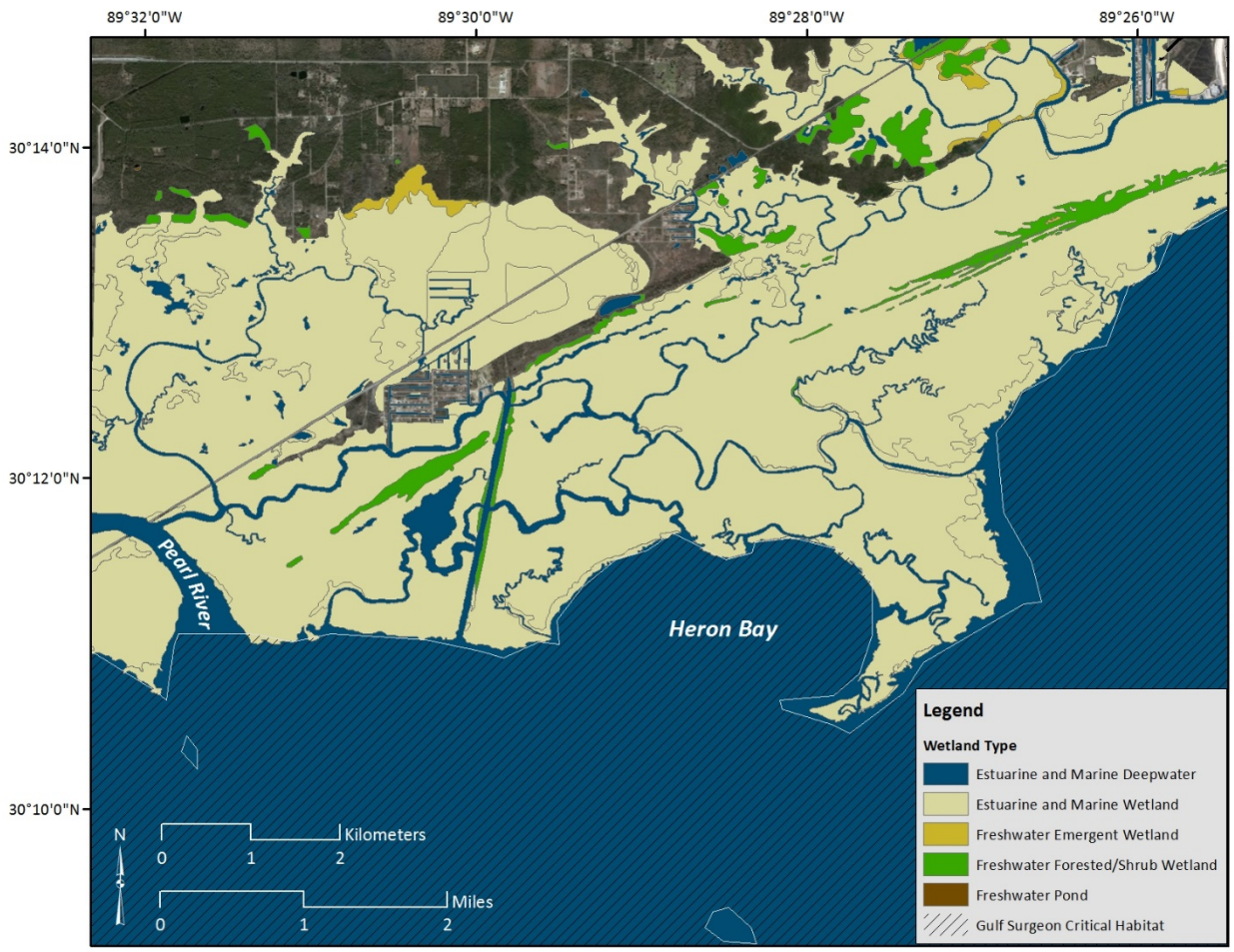

Figure 1. Project site area depicting wetland habitat and Gulf sturgeon critical habitat.

Figure 2. Conceptual project design with construction features.

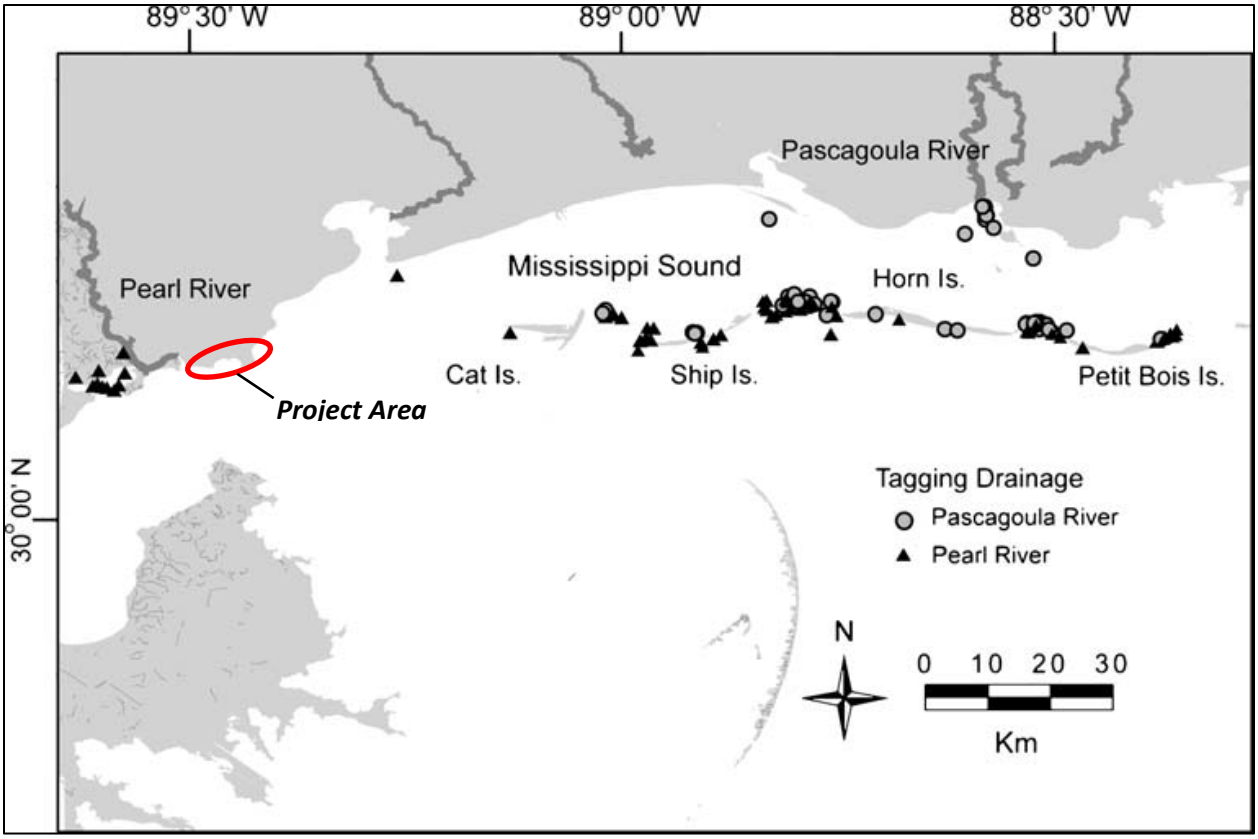

Figure 3. Telemetry locations of Gulf sturgeon in the estuarine and marine environment. Note that no telemetry locations in this study were found in the project area. Modified from Ross et al., 2009.