Essential Fish Habitat Assessment for the Proposed North Breton Island Restoration, Chandeleur Islands Barrier System, Louisiana

Introduction

This document presents the findings of the Essential Fish Habitat (EFH) assessment for the North Breton Island Component of the Louisiana Outer Coast Restoration project (North Breton Island component), proposed as part of the early restoration efforts during the Deepwater Horizon Natural Resource Damage Assessment and Restoration process. This EFH assessment is being conducted as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1996 (Magnuson-Stevens Act). The objectives of this EFH Assessment are to describe how the actions proposed by the North Breton Island component may affect EFH designated by the National Marine Fisheries Service (NMFS) and Gulf of Mexico Fisheries Management Council, for the area of influence of the project. The area of influence of the project would be the island construction area and a target borrow area within the shoals to the east southeast of the island. This assessment includes a description of the proposed action; a summary of EFH within the vicinity of the North Breton Island component; an analysis of the direct and indirect effects on EFH for the managed fish species and their major food sources; and proposed mitigation of potential impacts to EFH from project implementation.

Project Description

North Breton Island is part of the Chandeleur Islands, a chain of barrier islands off the Louisiana coast, southeast of New Orleans. Due to man-made and natural processes, these islands have been undergoing steady sediment losses for the last 100 years or more. Hurricane Katrina (2005) caused severe losses throughout the barrier island chain. Following the Deepwater Horizon oil spill, the State of Louisiana constructed sand berms (2010 to 2011) along the beaches of these islands to help capture oil and to restore the severely degraded islands. However, a tropical storm in 2010 impacted the berm during construction. Slow-moving Hurricane Isaac (August 28, 2012) removed much of the remaining sand, leaving intertidal sand flats in its place.

A 2010 USGS habitat analysis of North Breton Island reflects benefits associated with berm construction conducted earlier that year. That analysis, based on 2010 aerial imagery (Figure 1), shows that North Breton Island was 109 acres of intertidal zone, 88 acres of mud flat, 7 acres of salt scrub, 4 acres of salt march, 2 acres of *Spartina* salt marsh and 1 acre of bare sand (above the tidal zone). Erosion from tides and storms constitutes a major and ongoing threat to the island. Without actions to restore sand into the North Breton Island system, the island and its habitats are expected to be completely submerged sometime between 2014 and 2037 depending on the frequency and magnitude of future storms (Lavoie, 2009).

The North Breton Island Restoration includes a conceptual design for placement of sand and back barrier marsh sediment mimicking the North Breton Island pre-Hurricane Katrina island coverage and expected island evolution pattern (Figure 2). Restoration design includes approximately 16,000 linear feet (76.2 acres) of beach, 138.7 acres of dune, and 137.3 acres of back barrier marsh habitat for a total of 352 additional acres of barrier island created through project implementation. Other design features include:

- a total island width of 1,100 feet, bounded by sloped foreshore and back barrier marsh platforms (optimum slope to be determined);
- an elevated dune platform of + 8-10 feet above sea level (optimum elevation to be determined) by 400 feet-wide at the base and 100 feet-wide at the top;
- Gulf-side beach 3 feet above sea level by 200 feet-wide;
- a landward back barrier marsh platform approximately 3 feet above sea level[1] and 500 feet wide;
- sand fencing to trap and retain deposited sediments and build dune habitats; and
- vegetative plantings of dune and back barrier marsh.

To achieve the above project specifications, approximately 3.7 million cubic yards of sand, silt and clay material will be dredged from one or more sites within offshore borrow areas occurring approximately 6 to 20 feet below the water surface (Figures 3-5) and placed on the existing submerged island platform to create the desired island configuration. Dredging will be accomplished using a 30-inch diameter hydraulic dredge with a cutterhead. Dredged material will be transported via temporary pipeline from the borrow area to North Breton Island and pumped directly to placement locations at the restoration site (i.e., single handling) through submerged piping. Final depth, location and design of borrow sites will be developed following sampling and analyses of potential borrow materials. Dredged material retention dikes will be constructed on the island platform in shallow water using in situ material (i.e., using material from within the marsh creation area prior to back filling from the offshore borrow site) to contain the dredged material for marsh restoration, then leveled to match appropriate topography after construction. Dredging and transport of material from borrow sites are an integral part of this project and needs to be authorized by the appropriate regulatory jurisdiction through review and permitting to consider the effects from dredging. Dozers will shape the sand for the dune and beach portions of the project.

The total area of construction footprint includes all access routes and staging areas. Project engineering and design has not yet proceeded to the point of producing a detailed construction schedule. However, construction could take from 6 months to a year or more given potential logistics of the conceptual design. Construction windows will take into consideration potential effects to fish and wildlife resources and will be adjusted to the maximum extent practicable through consultation with both the U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS). To this end, monitoring of habitat types and wildlife resources will be incorporated into the plan to include baseline (prior to construction), construction (to direct activities around resources), and post-construction monitoring (for a sufficient period after construction to document restoration project response and wildlife benefits).

Essential Fish Habitat

Essential Fish Habitat (EFH) has statutory significance because of the Magnuson-Stevens Act, which is intended to promote the protection, conservation, and enhancement of EFH. Essential fish habitat includes waters and substrate necessary to Federally-managed fish species for spawning, breeding, feeding or growth to maturity. The 1996 amendments to the Magnuson-Stevens Act set forth

[1] Three feet above sea level is a post-construction approximate initial elevation prior to settlement. Compaction rates of substrate from the placement area will be estimated using geotechnical data collected during the engineering and design process, and used to guide appropriate placement of fill resulting in the target elevation. The tidal range in this area approximates -0.4 to 1.5 ft, which helps guide the target design height for this portion of the proposal.

a mandate for NMFS, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. EFH in the project's area of effect is identified and described for various life stages of managed fish and shellfish that may use project area EFH. A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by a Fishery Management Plan (FMP) (16 U.S.C. 1853(a)(7)). There are FMP's in the Gulf region for shrimp, red drum, reef fishes, coastal migratory pelagics, and highly migratory species (e.g., sharks). Table 1 lists the types of EFH found within the vicinity of the North Breton Island Restoration Project.

Table 1. Representative categories of Essential Fish Habitat known to occur within the Gulf of Mexico Region (Louisiana and Mississippi Territorial waters).

Estuarine Areas	Marine Areas
Estuarine emergent wetlands	Water column
Mangrove wetlands	Vegetated bottoms
Submerged aquatic vegetation (SAV)	Non-vegetated bottoms
Algal flats	Live bottoms
Mud, sand, shell, and rock substrates	Coral reefs
Estuarine water column	Geologic features
	Continental shelf features

EFH is separated into estuarine and marine components. The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." The project includes effects in both an estuarine system and a marine near-shore system. Estuarine fishes include species that inhabit the estuary for part of their life cycle and are commonly associated with seagrass beds, submerged aquatic vegetation (SAV), oyster reefs, and unvegetated soft bottom habitats.

Table 2. Life stages and EFH for managed highly migratory species present in the vicinity of the North Breton Island Restoration Project.

Species	Life Stage	EFH Ddescription
Atlantic sharpnose shark	juvenile	<25m; Mississippi & Atchafalaya Deltas
Bonnethead shark	juvenile	Inlets, estuaries, coastal waters < 25m, Louisiana & Texas
Blacktip shark	late juvenile	< 25m; Cape San Blas to Mississippi Delta

Table 3. Life stages and EFH for managed species present in the vicinity of the North Breton Island.

Species	Life Stage	System	EFH Description
Brown shrimp	larvae	M	planktonic, sand/shell/soft bottom, SAV, emergent marsh
	juvenile	E	sand/shell/soft bottom, SAV, emergent marsh, oyster reefs
	adults	M	Sand/shell/soft substrate
White shrimp	larvae	M	Planktonic
	juveniles	E	SAV, soft bottom, emergent marsh
Pink shrimp	eggs	M	Sand/shell bottom
	larvae	M	Planktonic; sand/shell bottom, SAV
	juveniles	E	Sand/shell substrate
Red drum	eggs	M	Gulf of Mexico, < 46m west from Mobile Bay
	larvae	E	SAV, sand/shell/soft bottom, emergent marsh
	juveniles	E/M	SAV, sand/shell/soft bottom, emergent marsh
	adults	M/E	SAV, sand/shell/soft bottom, emergent marsh
Vermilion snapper	eggs	M	Planktonic
	larvae	M	Planktonic
	juveniles	M	Reefs, hard bottoms
	adults	M	Reefs, hard bottoms
Lane snapper	eggs	M	4-132 m; planktonic
	larvae	E/M	4-132 m; reefs. SAV
	juveniles	E/M	<20 m; SAV, mangrove, reefs, sand/shell/soft bottoms
Dog snapper	eggs	M	Planktonic
	larvae	M	Planktonic
	juveniles	E/M	SAV, mangrove, emergent marsh
Wenchman	eggs	M	Planktonic
	larvae	M	Planktonic
Gray snapper	adults	M	Hard bottom, reefs
Greater amberjack	eggs	M	Planktonic
	larvae	M	Planktonic
	juveniles	M	Drift algae (Sargassum)
Lesser amberjack	eggs	M	Planktonic
	larvae	M	Planktonic
	juveniles	M	Drift algae (Sargassum)
Gray triggerfish	larvae	M	Drift algae (Sargassum)
	juveniles	M	Drift algae (Sargassum), mangroves, reefs
King mackerel	juveniles	M	<9 m; Pelagic
Spanish mackerel	juveniles	M/E	<50 m; pelagic
	adults	E/M	<75 m; pelagic
Cobia	eggs	M	Planktonic

The above-listed managed species and their associated EFH are described below:

Altantic Sharpnose Shark (*Rhizoprionodon terraenovae)*
Atlantic sharpnose sharks are abundant from the intertidal to deeper waters at depths of 33 to 918 feet and often occur close to the surf zone off sandy beaches, and also enclosed bays, sounds, and harbors, in estuaries and river mouths, mostly over sandy or muddy bottoms. During summer months, juveniles, subadults, and adults inhabit shallow inshore waters (Benson, 1982). An offshore migration occurs in the fall, as they often tend to concentrate in even deeper offshore waters during the winter (Benson, 1982). They feed on small bony fishes such as menhaden and parrotfish (Benson, 1982), shrimp, crabs, segmented worms and mollusks. Females migrate inshore during summer months to give birth. Juveniles are known to occur in shallow waters in the vicinity of the Mississippi River and Atchafalaya River Deltas. Given the proximity of North Breton Island to the Mississippi River delta, juveniles could use project area waters.

Bonnethead Shark (*Sphyrna tiburo*)
Bonnethead sharks are found on the continental and insular shelves, on inshore and coastal areas, over mud and sand bottoms, and on coral reefs and occur in shallow water including estuaries, shallow bays and over coral reefs. They feed primarily on crustaceans, consisting mostly of blue crabs, but also shrimp, mollusks and small fish. They are subtropical, brackish/marine fish with depths ranging from 33 to 262 feet. Juveniles are typically found in inlets of estuaries and coastal waters less than 82 feet, and typically warmer than 70ºF.

Blacktip Shark (*Carcharhinus limbatus)*
This fish-eating shark inhabits shallow coastal waters and estuaries and offshore surface waters. Blacktip sharks use shallow inshore waters from South Carolina to Texas as nursery areas for their pups in spring and summer. They can be found in groups as young or adults feeding in shallow water. Juveniles may occur in nearshore and/or bay waters of the project area.

Brown Shrimp (*Farfantepenaeus aztecus*)
Post-larval brown shrimp feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults prey primarily on amphipods, polychaetes, and chironomid larvae as well as algae and detritus (Patillo et al., 1997; Lassuy, 1983). Post-larval brown shrimp have been captured in salinity from essentially fresh water (Swingle, 1971) to 69 ppt (Simmons, 1957) with 19 ppt being optimal within this given range (Lassuy, 1983). Post larval and juvenile brown shrimp are likely to occur in marshes and shallow protected habitats on North Breton Island. Adult brown shrimp typically inhabit offshore waters (Patillo et al., 1997), such as those off the coast of Louisiana. Subadults are likely to occur in nearshore or inland waters, and around barrier island marshes.

White Shrimp (*Litopenaeus setiferus*)
Juvenile white shrimp are common to abundant within the project vicinity from July through October. Post-larval white shrimp seek shallow, estuarine water with muddy sand bottoms high in organic detritus or vegetative cover; while juvenile white shrimp inhabit turbid estuaries, marsh edges, and SAV (Patillo et al., 1997). Post-larval white shrimp use soft muddy or peat-like bottoms for burrowing (Muncy, 1984). White shrimp can be replaced by brown shrimp in muddy areas due to competition for habitat (Muncy, 1984). Like brown shrimp, post-larval white shrimp feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults prey on amphipods, polychaetes, and chironomid larvae and also consume algae and detritus (Patillo et al., 1997). Post-larval white shrimp prefer a mesohaline salinity regime; juveniles prefer lower salinity habitats (6 to 8 ppt); and larger late juvenile stage

individuals prefer brackish habitats (10 to 18 ppt). Adult white shrimp spend most of their life offshore, where they spawn in waters that have salinity of approximately 23-27 ppt.

Pink Shrimp (*Farfantepenaeus duorarum*)
Post-larval pink shrimp feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults consume algae and detritus and prey on amphipods, polychaetes, and chironomid larvae (Patillo et al., 1997). Juvenile pink shrimp prefer SAV and shell-sand substrate over more muddy substrates. Marsh edge habitats also provide cover and foraging habitat for juvenile shrimp. Although densities of pink shrimp are considered highest in SAV habitat by (Patillo et al., 1997) juveniles prefer high salinity SAV over low salinity SAV. Project area beaches and sand bottom substrates are likely utilized by pink shrimp.

Red Drum (*Sciaenops ocellatus*)
Adult and juvenile red drum occur in a variety of habitats within the project vicinity. Both adults and juveniles can be found in the project vicinity's shallow open water and emergent marsh habitats year round; however, adults are more common April through October, and juvenile red drum are common to abundant year-round. Spawning typically occurs outside the project vicinity in deeper water near the mouths of bays and inlets (Pearson, 1928) near the Gulf of Mexico. Planktonic red drum larvae are carried by currents into bays and estuaries, where they settle into the tidally influenced emergent wetlands (Stunz et al., 2002a). Juvenile red drum prefer specific habitat types, occurring at higher densities in SAV (Stunz et al., 2002a). They grow faster in SAV as well as in brackish emergent marsh and oyster reefs (Stunz et al., 2002b). Additionally, juvenile red drum prefers a mesohaline (5 to 16 ppt) to euryhaline salinity regime (16 to 36 ppt), and growth rates are highest between 65ºF and 88ºF.

Red drum is considered a predator in estuaries, and they are abundant throughout Louisiana's coastal marshes and nearshore waters. They are considered intermediate feeders due to their use of the bottom for foraging (eating oysters, clams, and blue crabs), as well as the pelagic habitat to hunt for prey fish species. Red drum are also known for their preference for crabs. Juvenile red drum show preferences for fish, crabs, and shrimp, particularly mysid shrimp (Reagan, 1985). Adult red drum feed primarily on fish, shrimp, and crabs. Fish, primarily menhaden (*Brevoortia*) and anchovies (*Anchoa* spp.), are an important source of food in the winter and spring, while crabs and shrimp are important in the summer and fall (Reagan, 1985).

Vermilion Snapper (*Rhomboplites aurorubens*)
The Vermilion snapper occurs Gulf-wide in waters 80 to 350 feet deep. They may form large schools suspended off the bottom over reefs, around oil rigs, and over rocky bottom protrusions called "lumps" in the northern Gulf of Mexico. Although they do eat small fish, they prefer to feed on invertebrates such as tunicates, amphipods, squillids, crabs, mysids, and polychaetes.

Lane Snapper (*Lutjanus synagris*)
Within the project vicinity, EFH occurs for the larvae and juvenile lane snapper. Lane snapper occupy a wide variety of habitats, from coral reefs in clear water to turbid, brackish water over soft substrates (Bortone et al., 1986). Croker (1962) indicates most snappers (including the lane snapper) spawn in groups in an offshore marine environment. Larval lane snapper prefer an estuarine/marine environment with depths ranging from 13 to 433 feet. While adult lane snappers prefer marine areas with hard bottoms and reefs, juvenile lane snapper prefer mangrove areas with sand, shell, or soft bottoms at depths less than 66 feet. As such, lane snappers feed on a wide variety of organisms (Bortone et al., 1986), such as crabs, shrimp, worms, gastropods, and cephalopods. Lane snapper are typically found in waters with

temperatures ranging from 61ºF to 84ºF, and salinity of 19.1 to 35.0 ppt (Bortone et al., 1986). While adults typically live offshore with salinity near the higher end of the range, juveniles use estuaries as nursery areas.

Dog Snapper (*Lutjanus jocu*)
Juvenile dog snapper are typically found in estuaries, mangroves, emergent marsh, and submersed aquatic vegetation. They have been collected at depths ranging from 6 to 131 feet, although they typically inhabit the water column between 16 to 98 feet. Dog snappers feed nocturnally on a wide variety of organisms such as, crabs, shrimp, worms, gastropods, and cephalopods. Dog snapper are typically found in waters with temperatures ranging from 61ºF to 84ºF, and salinity of approximately 19 to 35 ppt. While adults typically live offshore with salinity near the higher end of the range, juveniles use estuaries as nursery areas.

Wenchman (*Pristopomoides aquilonaris*)
This small snapper is widespread throughout the Gulf of Mexico in waters 80 to 1,200 feet deep. It is most common over hard, low-relief bottoms, but occurs on most substrate types except soft mud. Wenchman feed primarily on fish and average about one pound in weight.

Gray Snapper (*Lutjanus griseus*)
The gray or mangrove snapper occurs in the western Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Juveniles may utilize mangroves, canals, tidal creeks, grass flats, and open water habitats. Adults occur mostly in open water environments, where most gray snapper are found near the bottom or around reefs. They can be found at depths ranging from 5 to 180 meter, but are most common at less than 50 meter (Froese et al. 2013). Gray snapper feed primarily on small fish and crustaceans.

Greater Amberjack (*Seriola dumerili*)
Greater amberjack are found offshore in waters 60 to 240 feet deep around reefs, oil platforms, and wrecks. Juveniles may occasionally be found hanging below floating objects in water less than 30 feet deep. Amberjacks exhibit schooling behavior when young, but older fish are more solitary. Adults feed on fish, squid, and crabs. Juvenile amberjack feed on plankton such as decapod larvae and other small invertebrates.

Lesser Amberjack (*Seriola fasciata*)
The lesser amberjack occurs Gulf-wide. It is smaller than the greater amberjack and may use deeper waters the greater amberjack. The lesser amberjack may also be found near floating objects and around weed lines.

Gray triggerfish (*Balistes capriscus*)
The gray triggerfish occurs in Gulf waters 40 to 200 feet deep around wrecks, reefs, oil platforms, and rock outcroppings. With the triggerfish's strong jaws and teeth, it eats benthic invertebrates and shellfish as barnacles, crabs, mussels, sand dollars, snapping shrimp, and sea urchins. It will also eat planktonic larvae of fish and crustaceans. Juvenile triggerfish may associate with sargassum.

King Mackerel (*Scomberomorus cavalla*) and Spanish Mackerel (*Scomberomorus maculatus*)
Water temperature and salinity levels are the most important factors governing distribution of both king and Spanish mackerel (Godcharles and Murphy, 1986). Both species prefer water temperature ranging from 70ºF to 81ºF, rarely being collected in temperature below 64ºF. All life stages (eggs, larvae,

juvenile, adult) inhabit waters with salinity ranging from 32 to 35 ppt (Godcharles and Murphy, 1986). Both of these species are primarily pelagic carnivores in the juvenile and adult stages. Juveniles of both species are piscivorous (primarily feeding on schooling fish), but king mackerel have a preference for invertebrates.

Both species in the larvae stage are planktonic in marine environments from depths of 30 to 590 feet. Juvenile king mackerel prefer a marine pelagic environment at depths less than 30 feet, while juvenile Spanish mackerel use more estuarine/marine environment at depths less than 164 feet. Adult phases of both species are pelagic, while king mackerel prefer marine environments and Spanish mackerel use estuarine/marine environments at depths of 115 to 591 feet and less than 246 feet, respectively.

Cobia (*Rachycentron canadum*)
Cobia are found nearly worldwide in tropical, sub-tropical, and warm temperature waters ranging from approximately 61ºF to 90ºF with salinity ranging from 22.5 to 44.5 ppt (NMFS, 2010). Eggs and larvae are typically found offshore in water depths from 36 to 174 feet, while early juvenile stages tend to move toward more inshore areas, inhabiting coastal areas, bays and river mouths. Occasionally entering estuaries, adults are more prevalent on the continental shelf and in coastal waters. They can be found within varying depths of the water column; however, they are more of a pelagic species (NMFS, 2010). Habitats vary from mud, rock, sand and gravel bottoms, over coral reefs, and in mangrove sloughs. Along coastal inshore areas they can be found around pilings and buoys, as well as drifting and stationary objects. Cobia migrate to areas with high food abundance, typically eating crabs and other crustaceans, benthic invertebrates, and fish.

Assessment of EFH Impacts

Specific categories of EFH that have been designated in the proposed project's borrow area include: marine water column and marine non-vegetated bottoms. EFH in the fill area includes estuarine water column; estuarine mud, sand, and shell substrate; and estuarine emergent wetlands. The project area includes about 597 acres (2.4 km^2) of existing intertidal and sub-tidal habitats including vegetated marsh, tidal flats and beaches, and shallow open water bottoms, all of which provide EFH for managed species.

Temporary adverse impacts to non-vegetated water bottoms, consisting of sandy and/or soft substrates, at the proposed borrow site, will occur during project construction via excavation of existing substrate. Construction-induced turbidity increases will also temporarily impact the water column at the borrow site. Turbidity related smothering of benthos in areas adjacent to the borrow site might also occur. Those impacts will be temporary as construction-related turbidity will decrease to background levels soon after construction is complete. Modeling exercises will be conducted as part of this project to assess possible changes in the wave climate due to changes in substrate contours resulting from source dredging. Models will provide information on how any changes in wave patterns may affect future island dynamics given conceptual restoration designs. Model results will inform the selection of a final design, which will maximize longevity of the restored island.

After construction work has been completed, benthos will likely be become re-established at the borrow site. Palmer et al. (2008) found that a pit in the Gulf off of Holly Beach, Louisiana, exhibited reduced diversity and abundance of benthic macrofauna 38 months after dredging, suggesting a post-construction recovery time. However, benthic communities of old dredged pits in Tampa Bay, Florida were found to be similar to adjacent non-dredged waterbottoms (US Environmental Protection Agency 2005), demonstrating the potential for full natural recovery.

Storms and tidal action will likely fill and/or reduce the borrow pit depth over time as has been documented in East Cote Blanche Bay where a 13 to 15 foot-deep borrow pit (cut to -20 ft NAVD88) was half filled in the first year after dredging (CPRA unpublished report 2012). A borrow pit in the Gulf 4.3 miles off of Holly Beach, Louisiana, was 71% filled (naturally) over a 38-month period (Palmer et al. 2008) from April 2003 to June 2006. Such borrow pit filling will reduce the potential for anoxic conditions to develop in the waters at the bottom of the borrow pit. Monitoring of that East Cote Blanche Bay borrow pit revealed that low dissolved oxygen conditions (2 to 3 mg/L) occurred for short periods of time during the late summer of the first year post-construction (CPRA unpublished report 2012). Because warm water cannot hold as much dissolved oxygen as cooler water, anoxia is most likely to occur during the summer months when water temperatures are highest. Conversely, during winter months, deeper and warmer dredge holes may be more heavily utilized by nekton than the adjacent shallower waters (US Environmental Protection Agency 2005). Dredge hole impacts will occur most frequently during the first few years post construction, until the pit is substantially filled. However, the offshore open water environment of the proposed borrow site, and anticipated high rate of tidal flushing, may minimize stagnation and associated development of anoxic conditions more so than at the previously mentioned East Cote Blanche Bay site.

Some managed fisheries species could be expected to use the pre-construction borrow site during one or more phases of their life cycle. Given the mobility of juveniles and adults, it is assumed that they will avoid the disturbances associated with borrow site dredging. However, due to limited mobility, eggs and planktonic life stages may not be able to avoid the site during construction. Because many of the potentially affected species are rather ubiquitous throughout the northern Gulf of Mexico, we anticipate that any adverse impacts to eggs and/or planktonic life stages would be temporary and minimal given the extent of undisturbed open water habitat throughout the northern Gulf.

The discharge of hydraulically dredged material to restore North Breton Island will replace existing water bottoms and intertidal/subtidal flats at the fill site with beach, dune, and marsh. The dunes and higher elevation portions of the beach will replace EFH with approximately 215 acres of higher elevation non-EFH. The dunes and beach supra-tidal habitats are thought to constitute a historic and more stable island configuration that better resists destructive storm-related washover scours and island cutting. Over time, most of the higher elevation non-EFH areas will likely be reduced in elevation to mostly intertidal elevations (and will become EFH) as has occurred with the sand berm created immediately seaward of the Chandeleur Island chain in 2010. Therefore, the construction-related loss of EFH will be temporary, and overall, the proposed reconstruction of North Breton Island will in the near term, result in a much larger island having much more high quality marsh EFH, and much more high-quality shallow water EFH around the reconstructed island’s perimeter. The island and its high quality EFH would be more resilient to storm damage than the existing island, which is rapidly disappearing and converting to lower quality open-water EFH.

Louisiana’s extensive intertidal marshes are believed to be largely responsible for the high production of estuarine-dependent species in the north-central Gulf of Mexico. In addition to being designated as EFH for a number of species, aquatic and wetlands habitats in the project area provide nursery, foraging, and predator refugia habitat that support other managed marine fishery species as well as numerous other species. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fisheries Management Council. The project design will utilize retention dikes to avoid adverse direct impacts to emergent wetlands. Those designs may allow some nourishment of existing wetlands but placement of fill will be strictly managed to protect existing wetland/marsh habitat and augment it by placing back-barrier marsh substrate and/or plantings (Figure 2). Project implementation would result in a substantial project-related increase in highly valuable marsh and back-marsh shallow water EFH habitats and additional subtidal flats and tidal flats will be created around the edges of the reconstructed island.

Loss of benthos in and adjacent to the restoration footprint will likely occur when the fill material is deposited. Additionally, runoff from the construction site associated with rainfall and the dewatering of hydraulically pumped sediments will likely result in a turbidity plume that may smoother benthos in the immediate outfall area. Those impacts are expected to be temporary. For example, after 1.5 years, benthic communities had returned to near background levels in diversity and abundance on created intertidal flats in Crouch Estuary of England (Bolam, S.G, and P. Whomersley 2003); Novak (2011) found the benthos on created saltmarshes were similar to control marshes within 3 years of construction; and Sheridan (2004) found that in Laguna Madre, benthos become re-established on the newly formed subaqueous flats after 4 to 8 years. Turbidities should drop to background levels within months after construction as placed sand/sediment gets worked into the natural littoral system of the island. Despite the temporary construction related impacts to EFH, the restoration of North Breton Island will increase the acreage of North Breton Island's rapidly disappearing barrier island beaches and marshes, flats and subtidal EFH habitats, compared to the expected no-action condition.

Barrier island wetlands, flats, and subtidal habitat provide unique nursery, foraging, and spawning habitat for numerous marine and estuarine species of commercial and recreational importance. The project area barrier island is utilized by distinct groups of fish and crustaceans that exhibit a preference for barrier island habitats over mainland habitats or are dependent on these habitats as transients during portions of their life history for foraging and predator refugia. Common surf zone species include gulf menhaden (*Brevoortia patronus*), spot (*Leiostomus xanthurus*), striped mullet (*Mugil cephalus*), southern kingfish (*Menticirrhus americanus*), anchovies (*Anchoa* spp.), scaled sardine (*Harengula jaguana*), Florida pompano (*Trachinotus carolinus*), Atlantic bumper (*Chloroscombrus chrysurus*), spotfin mojarra (*Eucinostomus argenteus*), and rough silverside (*Membras martinica*). The surf zone temporarily is used by larval and juvenile life stages of some of these species awaiting transport to back-barrier, bay, or mainland habitats. Barrier island flats typically are used by white mullet (*Mugil curema*), longnose killifish (*Fundulus similis*), darter goby (*Ctenogobius boleosoma*), and inland silversides (*Menidia beryllina*). Marsh edge and interior creeks are used by brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopeneaus setiferus*), Atlantic croaker (*Micropogonias undulatus*), spotted seatrout (*Cynoscion nebulosus*), sheepshead minnow (*Cyprinodon variegatus*), killifish, and sand seatrout (*Cynoscion arenarius*), some of which are constituents of assemblages that use the other island aquatic habitats. Additionally, shallow, back bay areas are inhabitated by american oysters (*Crassostrea virginica*). Economically important fish species such as spotted seatrout, red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), and southern flounder (*Paralichthys lethostigma*) use barrier island habitats (e.g., shorelines and passes) for foraging areas, nursery habitat, and staging areas during spawning or associated migratory aggregations (Saucier and Baltz 1993). Additionally, young of the year red drum and gray snapper (*Lutjanus griseus*) have a high affinity for quiescent intra-island creeks and ponds in the post larval early juvenile stages.

Mitigation of Impacts to EFH

The Service, in consultation with the interested natural resource agencies, will take all practicable precautions during the detailed project design phase to avoid and/or minimize negative impacts to EFH, including borrow pit designs (e.g., sloping sides), to avoid and/or reduce the potential for hypoxia at the bottom of the borrow pit. The project is not expected to result in adverse, direct impacts to emergent wetlands, existing oyster reefs, or SAV. Project construction may result in minor, short term adverse impacts to the water column and benthic organisms. Those impacts may temporarily affect habitat utilization by individuals considered under EFH fishery management plans. Most motile fauna such as crab, shrimp, and finfish will likely avoid the area of potential effect during the construction process. Following construction, there is expected to be increased habitat utilization of North Breton Island by these species and a beneficial, long-term impact is anticipated. More specifics regarding the project-related footprint and associated benefits and impacts to EFH will be available upon completion of detailed engineering and design. This information will be provided to NMFS when it becomes available.

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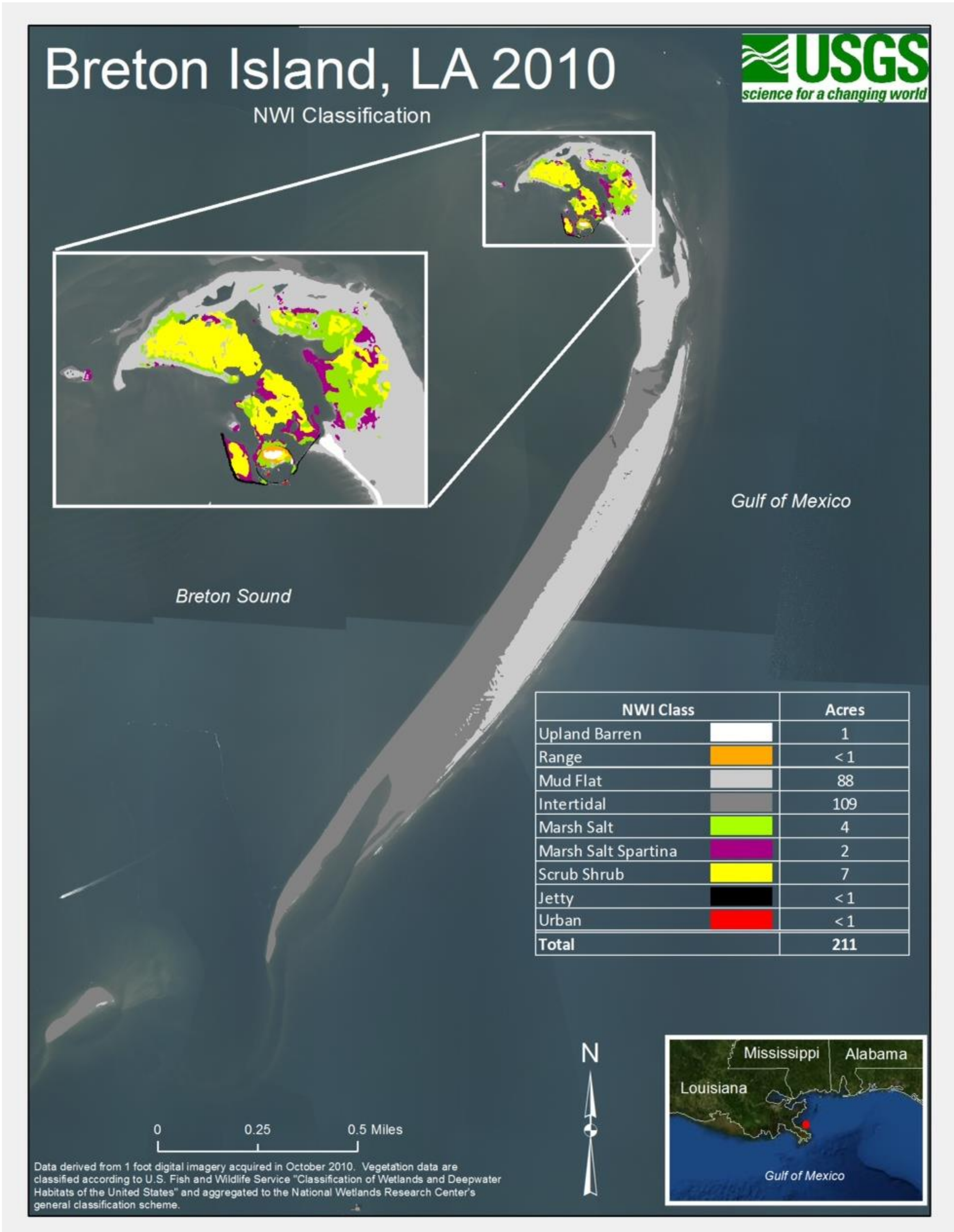

Figure 1. Map of North Breton Island in 2010 with National Wetlands Inventory classifications.

Figure 2. North Breton Island conceptual construction design.

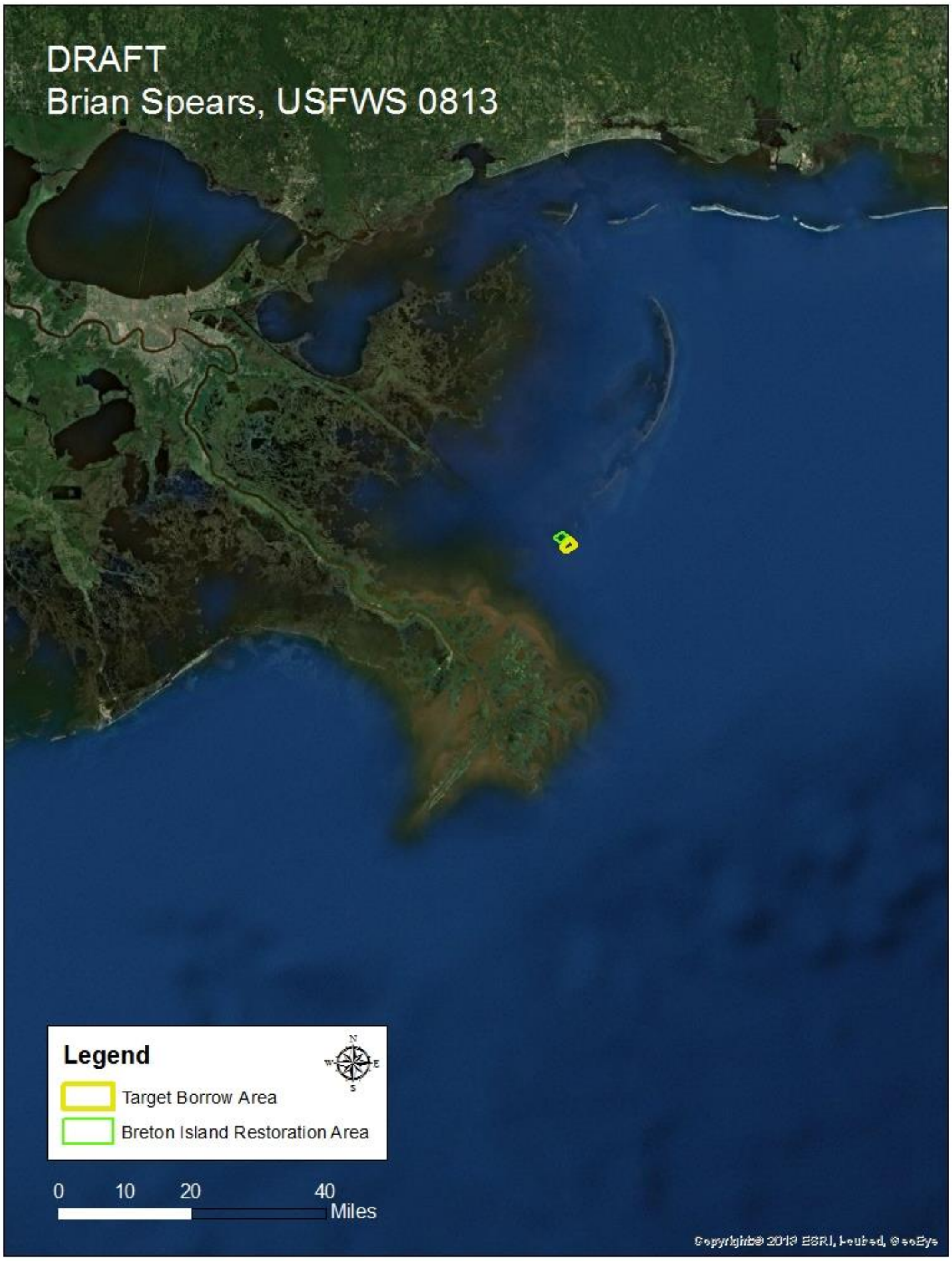

Figure 3. Map of North Breton Island restoration proposal and borrow source areas.

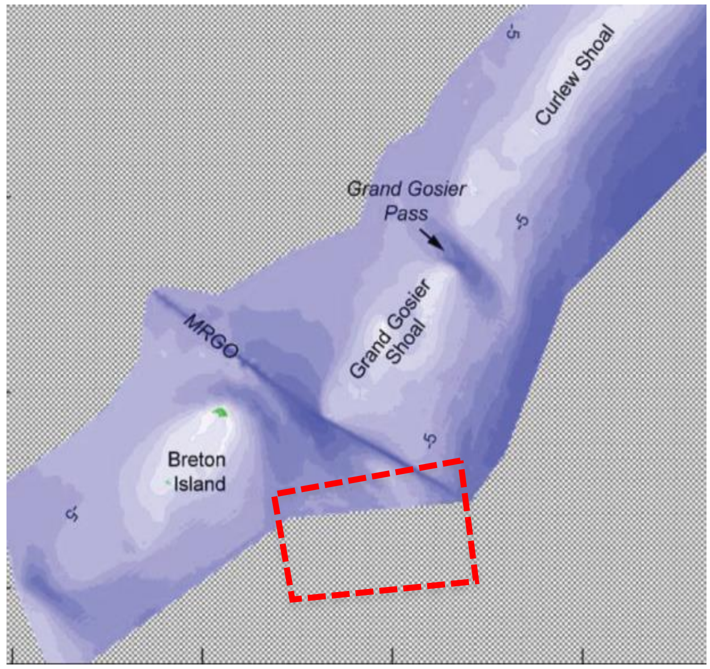

Figure 4. Approximate location of the North Breton Island restoration offshore shoals target borrow area.

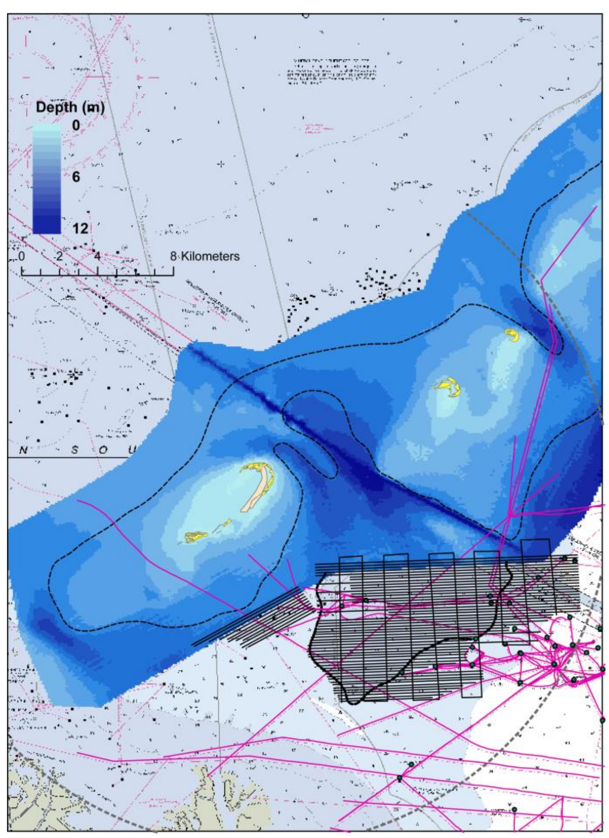

Figure 5. Offshore shoals target borrow area with proposed geophysical survey lines (black). (Pipeline infrastructure designated with pink lines.)