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Ecosystem Modeling and Chandeleur Islands Restoration

1 message

Blanchard, Mary Josie <MaryJosie_Blanchard@ios.doi.gov> Tue, Jun 30, 2020 at 1:37 PM
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Through the collaboration process, DOI and the States have determined that for the outstanding proposal on Ecosystem Modeling and Chandeleur Islands Restoration E&D, alternative funding sources might be available. Therefore, DOI is withdrawing our request for funding the Chandeleur Islands E&D under the RESTORE 3b.

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RESTORE Council FPL 3 Proposal Document

General Information

Proposal Sponsor:
U.S. Department of the Interior – U.S. Fish and Wildlife Service

Title:
Ecosystem Modeling and Chandeleur Island Restoration Engineering & Design (DOI/FWS)

Project Abstract:
"Ecosystem Modeling and Chandeleur Island Restoration Engineering and Design" is a planning project to preserve the Chandeleur Islands as part of a holistic restoration strategy for the ecologically interconnected Pontchartrain Basin, Chandeleur Sound, Mississippi Sound, and Mobile Bay system. This system includes portions of three states, which has hampered the ability to pursue restoration comprehensively. To address this challenge, we are proposing two project components. First, is an integrated modeling effort to unify the diverse models that have been developed for this region. By coupling these models, we leverage their individual capacities and gain a regional perspective. The second component is engineering and design (E&D) for the Chandeleur Islands. The Chandeleurs are a barrier island chain that sustains estuaries by providing habitat for fish and wildlife, attenuating wave energy to protect shorelines, and modulating salinity (Reyes et al. 2005, Grzegorzewski et al. 2009, Park et al. 2014). Some predict complete submergence of the Chandeleur Islands within 20 years (Fearnley et al. 2009, Moore et al. 2014). Should these projections prove true, the Chandeleurs would erode into a shoal and its ecosystem services and functions would be lost. Given the importance of the Chandeleurs, restoration planning is required now. The modeling component of this project will cost one million dollars and take two years to complete; the E&D component seven million and three years.

FPL Category: Cat1: Planning Only

Activity Type: Project

Program: N/A

Co-sponsoring Agency(ies):
DOC/NOAA

Is this a construction project?
No

RESTORE Act Priority Criteria:
(I) Projects that are projected to make the greatest contribution to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region, without regard to geographic location within the Gulf Coast region.
(II) Large-scale projects and programs that are projected to substantially contribute to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast ecosystem.
(III) Projects contained in existing Gulf Coast State comprehensive plans for the restoration and protection of natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region.
(IV) Projects that restore long-term resiliency of the natural resources, ecosystems, fisheries, marine

and wildlife habitats, beaches, and coastal wetlands most impacted by the Deepwater Horizon oil spill.

Priority Criteria Justification:
This project meets all four RESTORE Act Priority Criteria, but the project is most applicable to "large-scale", due to its modeling scope and cross-border habitat and resiliency benefits. The extent of the modeling is large-scale, covering portions of three states, ensuring future restoration investments are aligned to the portfolio of projects that would collectively provide the greatest contribution to natural resources without regard to geographic location. The E&D work specific to the Chandeleurs is foundational to sustaining the estuarine character of this system. The size (>1000 acres over 50-mile length) and expected duration of this project reflect a commitment to restoration at a large scale that enhances long-term resiliency. The Chandeleurs are included in the Louisiana Department of Wildlife and Fisheries' Louisiana Wildlife Action Plan (Holcomb et al. 2015) and are consistent with Louisiana's Coastal Master Plan (Coastal Protection and Restoration Authority of Louisiana 2017).

Project Duration (in years): 3

Goals

Primary Comprehensive Plan Goal:
Restore and Conserve Habitat

Primary Comprehensive Plan Objective:
Restore , Enhance, and Protect Habitats

Secondary Comprehensive Plan Objectives:
Improve Science-Based Decision-Making Process

Secondary Comprehensive Plan Goals:
N/A

PF Restoration Technique(s):
Create, restore, and enhance coastal wetlands, islands, shorelines and headlands: Sediment placement
Improve science-based decision-making processes: Develop tools for planning and evaluation

Location

Location:
This project is focused on the hydrogeomorphologically and ecologically interconnected Pontchartrain Basin, Chandeleur Sound, Mississippi Sound, and Mobile Bay systems (Figure 1). This area represents the extent of the regional modeling component of this project. The E&D component of this project is focused on the Chandeleur Island Chain.

HUC8 Watershed(s):
South Atlantic-Gulf Region(Mobile-Tombigbee) - Mobile Bay-Tombigbee(Mobile Bay)
Lower Mississippi Region(Lower Mississippi-Lake Maurepas) - Lake Maurepas(Lake Maurepas)
Lower Mississippi Region(Lower Mississippi) - Lake Pontchartrain(Liberty Bayou-Tchefuncta)
Lower Mississippi Region(Lower Mississippi) - Lake Pontchartrain(Lake Pontchartrain)
Lower Mississippi Region(Lower Mississippi) - Lake Pontchartrain(Eastern Louisiana Coastal)
South Atlantic-Gulf Region(Pascagoula) - Pascagoula(Pascagoula)
South Atlantic-Gulf Region(Pascagoula) - Pascagoula(Escatawpa)
South Atlantic-Gulf Region(Pascagoula) - Pascagoula(Mississippi Coastal)
South Atlantic-Gulf Region(Pearl) - Pearl(Lower Pearl)

State(s):
Alabama
Mississippi
Louisiana

County/Parish(es):
AL - Baldwin
AL - Mobile
LA - Plaquemines
LA - St. Bernard
MS - Hancock
MS - Harrison
MS - Jackson

Congressional District(s):
LA - 1
AL - 1
MS - 4

Narratives

Introduction and Overview:

The goal of this project is to advance and use best available science to restore the Chandeleur Islands – a foundational component of the northern Gulf ecosystem. Restoring these islands also protects developed shorelines, providing an opportunity to implement the two-fold restoration – environmental and economic – originally envisioned by the RESTORE Act. The first component of this project is an Integrated Ecosystem Modeling effort to synthesize the large number of modeling efforts that have been conducted for different aspects of the broader Pontchartrain Basin, Chandeleur Sound, Mississippi Sound, and Mobile Bay system. This synthesis will help address limitations of individual models. Some models cover a broad region but have low spatial resolution in locations more distant from their primary focus area. Other models include only a subset of the factors influencing an area of interest. Thus, these models lack predictive power for assessing effects on ecosystems because they have poor resolution across broad areas or lack critical drivers of hydrogeomorphology in an area. For example, many models for the Mississippi Sound fail to include areas in Chandeleur Sound, precluding their ability to predict impacts to salinity, dissolved oxygen, or tidal patterns from restoration projects or other water management actions that occur there. Understanding these foundational, landscape variables helps resource managers predict secondary impacts to living marine resources (e.g., oysters, marine mammals, etc.) and other conditions (e.g., hypoxia, red tide, etc.). The intent of this integrated modeling is to build upon the significant investments already made in ecosystem modeling and to identify and implement strategies to interconnect the models. In this way, individual models will continue to serve the purpose for which they were initially designed but will also have the enhanced functionality associated with greater resolution and spatial extent. This effort will offer insight into how landscape features and localized habitats (e.g., barrier islands, shoals, passes, etc.) interact within a broader regional context and will enable us to better utilize existing models as a decision support system in the northern Gulf. In light of the scope and scale of projects planned or completed within this system (i.e., closing of the Mississippi River Gulf Outlet, large-scale restoration of barrier islands under the Mississippi Coastal Improvements Program [MSCIP], proposed river diversions, and Chandeleur Island restoration, among others), a comprehensive understanding of interactions is necessary to ensure the sustainability and efficacy of these investments.

These models will highlight key landscape features that significantly influence system-wide hydrologic and ecological conditions. This can inform design of individual projects – whether restoration or other development – by identifying specific points of synergy and highlighting potential conflicts among projects. Most of the restoration projects in this region have been designed and implemented in relative isolation. Modeling at this scale will provide insights into how projects, both past and presently planned, might influence one another, which would enhance our ability to protect the investments already made. Likewise, modeling can contribute to an integrated understanding of the factors influencing key aspects of the Pontchartrain Basin-Chandeleur Sound-Mississippi Sound-Mobile Bay system to influence future restoration planning. The cost of this component is one million dollars and will be accomplished within two years.

The second component of this project is E&D for restoration of the Chandeleur Islands, a 50-mile long island chain in the northern Gulf of Mexico that includes a large portion of Breton National Wildlife Refuge. The Chandeleurs protect coastal communities from the effects of storms; promote oyster habitat and fisheries; and provide habitat for threatened and endangered species and nesting and migratory birds. Unfortunately, the Chandeleurs have lost 87% of their area since 1855 and are projected to disappear by 2037 (Fearnley et al. 2009, Moore et al. 2014). Although the Chandeleurs have recently lost significant acreage due to large hurricanes, the islands have a natural resilience and have historically rebounded from these immediate impacts relatively quickly because sand mobilized from the islands becomes redistributed elsewhere in the chain (Kahn 1986, sensu Suir and

Sasser 2019). The larger issue facing the Chandeleurs is the natural loss of sand from the island platform – something that nearly all barrier islands experience over time (Otvos 2018) – leading them towards becoming shoals. Compared to barrier islands, submerged shoals provide limited habitat for terrestrial wildlife, offer lower resistance to wave energy, and serve as a poor boundary for high salinity oceanic waters. Once the Chandeleurs become shoals, much of the estuarine character of the system will be diminished and restoration will require significantly greater effort, given the acceleration of loss that occurs at this stage (FitzGerald et al. 2018). Thus, restoration is urgently needed now to maintain the Chandeleurs as barrier islands and to ensure the natural resource benefits they provide to this entire system are retained.

Assuming that the problem facing the Chandeleurs is the loss of sand from the islands, turning the clock back and reversing the current trajectory requires bringing sand back to the islands (Knotts et al. 2007, Rosati and Stone 2009, Khalil et al. 2013). Although all options will be assessed during E&D, we envision the restoration project on the Chandeleurs concentrating on approaches that dredge sand and strategically place it where sediment has been depleted. In the context of the Chandeleurs, this approach is called sand backpassing. What remains unknown – and is the focus of the E&D – is where to get the sand, where to place it, and what other techniques to potentially use in concert (e.g., vegetative planting, sand fencing, shoreline protection, etc.)(FitzGerald et al. 2015). These questions are particularly important given the potential influence of the Chandeleurs on the larger system in which they occur: where do we place sand to maximize benefits to the islands and the larger system (e.g., maintenance of proper salinity regimes in Mississippi Sound)? These broader questions will both inform and be informed by the integrated modeling component of this project – necessitating that the modeling and E&D components be initiated simultaneously.

The Department of the Interior (DOI), through the U.S. Fish and Wildlife Service (USFWS), will work directly with the Department of Commerce (DOC) through the National Oceanographic and Atmospheric Administration (NOAA) to engage the diversity of state and federal resource managers within this ecosystem and design a project that accommodates multiple stakeholder needs. The RESTORE Council offers a unique opportunity for developing this project as all stakeholders can collectively fund this work and have equal voice in ensuring the ultimate restoration project benefits all. The approach of strategically placing sands on, around, and offshore of the islands is one that is increasingly being used in restoration in the Gulf to produce sustainable results, including on the barrier islands of Mississippi as part of the MSCIP (Byrnes and Berlinghoff 2012). This technique harnesses natural processes (particularly overwash and along-shore currents for sediment transport) to facilitate restoration. The proposed E&D will reduce the uncertainties and validate the assumptions of this approach by assessing sediment supplies, exploring transport models, and identifying strategic sand placement scenarios that maximize ecosystem benefits. If through design we recognize issues with our planned approaches, we will adapt and adjust accordingly to ensure a durable solution. The cost of this component is seven million dollars and will be accomplished in three years.

This project furthers the commitments set forth in the 2016 Comprehensive Plan Update (Gulf Coast Ecosystem Restoration Council 2016) by taking a regional, ecosystem-based approach to restoration. This project also exemplifies the commitment to leveraging resources and partnerships, particularly coordinating, collaborating, and connecting Gulf restoration activities. The modeling component builds upon existing efforts by leveraging their individual strengths to enhance our ability to assess the ecosystem. Further, DOI anticipates leveraging funding from other sources, potentially including the Louisiana Trustee Implementation Group (LA TIG), to complete construction once the E&D is complete. Indeed, in the Programmatic Damage Assessment and Restoration Plan (PDARP; Deepwater Horizon Natural Resource Damage Assessment Trustees 2016) the Trustees target $22 million for restoration of submerged aquatic vegetation (SAV) in the Chandeleurs. Trustees are

contemplating additional funding to support work there as well. Funding E&D through the RESTORE Council enables all parties who could be affected by a Chandeleur Islands restoration project – namely, Alabama, Louisiana, Mississippi, NOAA, and the USFWS – to participate as co-equals in its design, even if construction funding is provided via other sources in which all these partners are not directly involved.

Proposed Methods :

The goal of the Integrated Ecosystem Modeling component of this project is to advance science-based screening, planning, and implementation of restoration projects in the Pontchartrain Basin, Chandeleur Sound, Mississippi Sound, and Mobile Bay system. Considerable resources have been devoted to developing predictive models, data access portals, and decision-support tools for planning in the Gulf of Mexico. Despite these investments, leveraging of existing tools in project planning is often limited. Planners often support costly development of customized tools for their specific needs or, where resources are limited, rely on best professional judgement to inform restoration projects. Opportunities to leverage existing tools and models for new projects are often missed because either the models are not put to use after their project-specific needs are met or resources are not devoted to disseminating them to broader audiences.

Given these challenges, we will approach this model integration from two different perspectives:

1. Development of an integrated model that can serve as a decision-support tool to allow restoration practitioners to use existing data and model output in the screening of restoration projects, and
2. Advancement of a science-based restoration community of practice, including development of an online integration hub for connecting available data, modeling, and researchers to restoration project planners.

The first aspect of the modeling component will be developing a conceptual framework that integrates various models by linking outputs of one to inputs for another. Differences in resolution, time intervals, and intended application are often the most significant hurdles to model integration. By mapping these opportunities, we can crosswalk and cross-validate models and potentially identify specific metrics that can be reliably passed among existing models. This will expand the functionality of individual models and outline how they fit within the broader needs of those implementing restoration. We also envision that this framework will enable decision-makers to assess alternative portfolios of potential restoration projects. The base of this framework will be a Bayesian network that uses existing data and tools to predict environmental responses to changing conditions (Zeigler et al. 2017) and management objectives (Dalyander et al. 2016). This framework will allow decision-makers to make a first estimate of the probability that a restoration project will meet its goals. They can then use that estimate to decide whether to proceed with a more costly, detailed project evaluation.

The second aspect of the modeling component of this project will foster a science-based restoration community of practice through the connection of decision-makers and modelers in facilitated workshops to address specific stakeholder objectives. This component will develop an “integration hub” that provides an online forum to facilitate the use of science-based models in restoration project planning and should increase the use of available data and models for the region through organized access to existing databases, portals, and model archives. The integration hub will be patterned after innovation hubs, which are used in the private sector as a way to enable customers to engage directly with developers of products to identify high-priority needs and opportunities for solutions (Kandampully et al. 2016, Longo et al. 2013, Romero and Molina 2011, Zhang and Kandampully 2015). This approach combines elements of social media and online message boards with a user-friendly information visualization and access platform to enable decision-makers to familiarize themselves quickly with existing tools relevant to their needs and to connect with

researchers and modelers whose expertise is relevant to their needs.

The goal of the second component of this project is to enhance the sand budget of the Chandeleurs by preserving existing sand and increasing it in areas that have been eroding. Although other options will be considered in the course of E&D, initial designs will concentrate on sand backpassing. Sand backpassing is a beach management concept where sand being lost from a coastal system is recycled by mechanically transferring it from accreting areas (the deepwater sink north of the Chandeleur Islands) to eroding areas along the shoreline. At the Chandeleurs, the central sector of the islands was the original deltaic point source for much of the sand that ultimately built the island arc. However, sand supplies in that central section have been depleted, and as a result, a zone of accelerated erosion and conversion from an island to submerged shoals is gradually occurring in both north and south directions, away from the depleted central sand source. Sand is transported away from this zone to the north and south. In the north, sand ultimately leaves the island and is deposited north of Hewes Point in a large subaqueous spit that is filling a deep (~50 foot) tidal channel (Georgiou and Schindler 2009, Miner et al. 2009, Thomson et al. 2010).

We propose a barrier island management strategy that aims to replicate the natural processes of island development by: (1) reintroducing sand that was lost to deepwater sinks at updrift feeder sites (i.e., backpassing), (2) using shoreface retreat to liberate sand from feeder sites into the littoral system for lateral distribution over the long-term, and (3) establishing salt marshes upon back barrier sand placement sites to hold the sand and slow erosion. This comprehensive plan derives from extensive studies (e.g. Suter et al. 1988, Lavoie et al. 2009) on long-term geomorphic evolution and short-term changes – driven primarily by loss of sand from the barrier system, relatively rapid sea level rise, and hurricanes – to provide the barrier system the means to be sustainable for generations.

The concept of sand backpassing is not new to coastal management; however, it is often not a feasible technique on an eroding coast because it requires a zone downdrift from the project that is accretionary with excess sand or, as is the case with the Chandeleur Islands, a zone where coastal sand is being lost downdrift to a deepwater sink. A similar, more common, technique is mechanical sand bypassing, where sand is excavated from the accretionary side of a jetty and transported as a slurry through a pipeline to the eroding section of downdrift beach (the opposite of backpassing). Backpassing and bypassing projects rely on similar principles and have been implemented worldwide. They provide significant cost savings and long-term effectiveness as a management tool when compared to more traditional beach nourishment and barrier island restoration projects (i.e. Schwartz 1967, Bruun 1990, 1993, Boswood and Murray 2001). As currently envisioned, this proposed project would develop a strategy for sand backpassing at the Chandeleur Islands that would reintroduce sand at a rate similar to or in excess of the long-term background losses along the island arc. Building from designs proposed by Bruun (1990), Visser and Bruun (1997), and others, a mobile (e.g. mounted on a lift boat or resting on seafloor) underwater hydraulic excavator could be installed at Hewes Point (or some other reliable source of sand accumulation). During design, options for creating a sand trap (a strategically located excavation where the excavator is placed to fluidize trapped sand and pump it to shore) would be explored. The sand would be pumped through a pipeline (possibly submerged in the backbarrier Chandeleur Sound) to the central portion of the island arc. However, it might be determined that a long-distance pipeline is not needed if a small, shallow draft hopper dredge is more efficient and would transport the sand to dedicated pumpout sites along shore. Because the natural processes of wind, waves, and tidal currents would be employed to transport the sand once placed downdrift, there would be no need for extensive shaping with large land-based equipment such as bulldozers. There would also be potential for pumping to fill some areas in the backbarrier to mimic washover deposits and create new marsh platforms that can be planted with native black mangrove and Spartina alternaflora. The focus of the

engineering and design would be determination of the source of sand and volumes needed in light of expected sea-level rise and storm frequency, evaluation of options for sediment transport, and identification of strategic pump out sites. The integrated modeling being pursued as part of this project will help address those questions as well as provide insight into additional design features (e.g., strategic gaps in the island) that would meet additional restoration objectives related to water quality parameters.

We anticipate initiating these two interconnected components of this project simultaneously upon funding. The engineering and design component will take longer than the modeling component, but the latter will be completed prior to the completion of the 30% design report for the Chandeleur Islands restoration component. We will then utilize the modeling component to analyze the preliminary design in the ecosystem context provided by the models and use that analysis to inform final design.

Environmental Benefits:

Restoration of the Chandeleur Islands is a model for holistic ecosystem restoration (Powell et al. 2019). As such, there are a myriad of environmental and societal benefits to be realized from this project. In recognition of the importance of the Chandeleurs to fish and wildlife resources, this island chain was designated as Breton National Wildlife Refuge by President Theodore Roosevelt in 1904. The site has also been identified as a globally Important Bird Area by the American Bird Conservancy, in association with The Nature Conservancy (Cecil et al. 2009). As such, restoration and maintenance of this site preserves our national natural history legacy. The sandy beaches, back bay marsh and mangroves, and seagrass beds of the Chandeleurs provide important habitats for many birds, including nesting brown pelicans (historically the largest colony in the Gulf), snowy plovers, Wilson's plovers, reddish egrets, American oystercatchers, black skimmers, and a variety of other terns, including the largest sandwich tern and royal tern nesting colonies in North America. The Chandeleurs are also the only known breeding location of the Chandeleur gull – a species that has emerged as a hybrid cross between herring and kelp gulls that uniquely co-occur there (U.S. Fish and Wildlife Service 2008, Remsen et al. 2019). The Chandeleurs also serve as important habitat for wintering waterfowl, notably one of the larger concentrations of redheads – a species for which >80% of the global population winters in the Gulf. Shorebirds (e.g., sandpipers, dunlin, sanderling, etc.) are also abundant on the islands and the site has been identified as a critically important wintering site by the Western Hemisphere Shorebird Reserve Network. The Chandeleurs are designated as critical habitat for the federally threatened piping plover and recent surveys suggest they may also winter the largest population of federally threatened red knots in the entire Gulf. The Chandeleurs provide habitat for many other federal threatened and endangered species as well, including loggerhead, green, and Kemp's-ridley sea turtles and the West Indian manatee.

The Chandeleur Islands attenuate wave energy from the open Gulf, which enables the existence of some of the only seagrass beds in this region outside Mississippi Sound and in the entire state of Louisiana. These seagrass beds serve as important nursery habitat for many commercially and recreationally important fishes and provide a steady source of recruitment for these populations, particularly when poor conditions prevail at more in-shore seagrass habitats (e.g., summer of 2019). These wave attenuation benefits are also realized farther afield, and the Chandeleurs provide protection to other restoration projects and communities in the region (Grzegorzewski et al. 2009). The Chandeleurs enhance the sustainability of ~$150 million of prior and planned restoration investments in living shoreline projects in Biloxi Marsh and Hancock County, oyster restoration in both Louisiana and Mississippi, and on Cat Island. This project will also interact and enhance the restoration outcomes associated with the proposed mid-Breton Sediment Diversion. The primary and secondary benefits of Chandeleur Islands restoration confers significant protection to coastal communities and precludes the need to only rely on hard infrastructure to protect the built environment further enhancing environmental benefits.

Beyond the wave attenuation benefits, the Chandeleurs also modulate salinities in the region. Without the island chain in place, the high salinity waters of the Gulf would penetrate further into Chandeleur Sound and be transported into Mississippi Sound and elsewhere (Reyes et al. 2005). These shifts in salinity would significantly alter the estuarine character of the entire system and would likely cause large-scale shifts in the abundance and distribution of many species (Park et al. 2014). Of particular note are the potentially detrimental impacts to oysters, which thrive in harvestable numbers in moderate salinities where spat can set but predators are not abundant. Loss of the Chandeleurs would increase salinity ranges permitting increased predation on adult oysters by oyster drills. Thus, maintenance of the Chandeleurs would promote sustainable oyster reefs by preventing catastrophic collapse of numbers in the region – enhancing not only the environmental benefits of healthy reefs but also promoting a robust oyster fishery in the region.

Metrics:

Metric Title: PRM010 : Research - # studies used to inform mgmt.: Planning, Research, Monitoring
Target: 1
Narrative: The final report for the Integrated Ecosystem Modeling component of this project is a technical report that will serve as a framework for synthesizing the existing modeling capacity of the region. Given that this report and this model will be used to inform the engineering and design of the Chandeleur Islands restoration component of this project as well as other restoration projects in this region, we are characterizing this report as a study for the purposes of identifying metrics for this component of this project.

Metric Title: PRM005 : Monitoring - # monitoring plans developed: Planning, Research, Monitoring
Target: 1
Narrative: A Monitoring and Adaptive Management Plan for the Chandeleur Islands component of this project will be developed. This plan will follow guidelines established by the Council Monitoring and Assessment Working Group as well as those of the Natural Resource Damage Assessment Trustee Council's Cross-Trustee Implementation Group Monitoring and Adaptive Management Work Group (Deepwater Horizon [DWH] Natural Resource Damage Assessment Trustees 2017).

Metric Title: PRM011 : Restoration planning/design/permitting - # E&D plans developed: Planning, Research, Monitoring
Target: 3
Narrative: The final deliverable will be a single Engineering and Design report that reflects a 95% design of the project. However, we will also require interim reports at 30% and 60% design thresholds. We recognize that numerous other standard engineering reports will be required in association with the design of this project (e.g., magnetometer surveys, geotechnical investigations), but we anticipate these reports will be included as appendices to the primary design documents – even when initially developed and reviewed independently.

Metric Title: PRM013 : Restoration planning/design/permitting - # environmental compliance documents completed : Planning, Research, Monitoring
Target: 14
Narrative: As part of the design process, we anticipate completing environmental compliance to the extent practicable to ensure this project can be implemented quickly. Specifically, we will be seeking consistency, concurrence, and/or permits under the following regulatory requirements:
Bald and Golden Eagle Protection Act, Clean Water Act, Coastal Barrier Resources Act, Coastal Zone Management Act, Endangered Species Act, Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, National Environmental Policy Act, National Historic Preservation Act, National Wildlife Refuge

Improvement Act, Rivers and Harbors Act, and Wilderness Act. We recognize that this might not be a complete list of applicable regulations and note that the terms and conditions of all necessary federal, state, and local permits will be complied with during the course of implementing the project.

Risk and Uncertainties:

As a planning project, risks to success are relatively low. For the modeling component, there are uncertainties related to the ability to find connections among models and make them interoperable, given limitations of spatial and temporal resolution and the specificity of input variables. Nevertheless, we anticipate data manipulations will be able to accommodate any issues that might arise. Additionally, for the modeling component, there is always a risk associated with investment in any web application – particularly with the long-term strategy for management and maintenance. We plan to manage this risk by building the application in open source code, storing it in an open source repository, and enabling wide availability and usage of the tool. We will take advantage of various forums to demonstrate the tool (e.g., webinars, tools cafes, conferences, etc.) and reach out to practitioners on both the modeling and management sides of coastal restoration.

Risk related to implementation of engineering and design is also relatively low. A seasoned project manager will be tasked to ensure successful achievement of milestones and timely completion of deliverables on budget. With that said, sea-level rise and storms are risks to the ultimate restoration project that will be considered in the engineering and design of the Chandeleur Islands project to ensure restoration achieves desired outcomes under a range of plausible future scenarios. Sea-level rise (including subsidence) will be explicitly incorporated into design alternatives, based on the scenarios in Sweet et al. (2017) and the risk tolerance demonstrated by the design team's selection of an exceedance probability. Subsidence will also be explicitly incorporated into these estimates by using data from the Grand Isle gauge. This site demonstrates some of the highest subsidence rates in the Gulf – which will incorporate a level of conservatism in the design (Byrnes et al. 2019). To assess potential impacts of storms on the project, we will use a similar approach to that applied to North Breton Island (Long et al. 2020). There, the impacts of storms were simulated under different restoration design alternatives and the potentials for erosion, overwash, and inundation of the pre- and post-restoration island were assessed. By using this information directly in design decisions, the risk of storm impacts can be directly addressed.

Monitoring and Adaptive Management:

Monitoring specific to this proposed project will be relatively straightforward. As a planning project, the primary deliverables are meetings and reports (hard copy and web-based content). To ensure adequate progress is being made on this project in a timely manner, at least biweekly calls for each component will be held among DOI and DOC (the two co-sponsors of this project) and any subcontractors. More frequent meetings are likely during times of high activity. These calls will be established and facilitated by a dedicated project manager, who will also be responsible for all performance reporting. For the engineering and design component, monthly calls of the broader Project Management Team (including AL, LA, and MS; see Collaboration section below) will be held to ensure engagement and involvement of all stakeholders. This will also allow early identification of any concerns so they may be resolved before becoming larger issues requiring significant time and attention. Standard project management practices and financial oversight will occur.

Monitoring will also be an outcome of this project, as a Monitoring and Adaptive Management Plan associated with the restoration of the Chandeleur Islands will be developed. This plan will follow guidelines established by the Council Monitoring and Assessment Working Group as well as those of the Natural Resource Damage Assessment Trustee Council's Cross-Trustee Implementation Group Monitoring and Adaptive Management Work Group (Deepwater Horizon [DWH] Natural Resource Damage Assessment Trustees 2017).

Data Management:
Data management is a critical aspect of this project's success. The Integrated Ecosystem Modeling will require identification and collation of significant metadata on each model, including information related to model name and versioning, input variables, output variables, spatial domain, spatial resolution, vertical resolution, time period, and temporal resolution. These data will be stored in standard ISO formats on ScienceBase (https://www.sciencebase.gov/catalog/), which enables web services and translation to JSON for easy machine and application interoperability. Conceptual models and final reports will similarly be stored on ScienceBase. We will also rely on open source code (e.g., R Shiny) to develop the web application interface for the innovation hub. We anticipate storing the open access R code on GitHub (https://github.com/) – an open source repository dedicated to hosting code. Data and deliverables associated with the engineering and design component of this project will be stored on NOAA's public-facing DIVER site (https://www.diver.orr.noaa.gov/) to ensure products are readily available to various Trustees and the public. In contemplation of future funding for construction, these documents will be included in a formal administrative record for this project. Specifics on all project data will be provided in the formal data management plans and observational data plans required of all Council-funded projects.

Collaboration:
Collaboration is a defining feature of this project and a primary reason why funding is being pursued through the RESTORE Council. For the modeling component, we will enhance connectivity and collaboration not only among modelers that typically operate independently but also between modelers and resource managers that do not frequently connect their decision-making processes. For the Chandeleur Islands component, we will continue conversations that have already occurred to develop this project. The range of members represented through the RESTORE Council provides a relatively unique forum in the Gulf for all the stakeholders that will be ultimately affected by a Chandeleur Islands restoration project to participate directly in funding and design. With each stakeholder invested in the project, we ensure an equitable consideration of objectives and approaches. To this end, development of a Project Management Team has already been discussed with Alabama, Mississippi, LA, DOC, and DOI.

Public Engagement, Outreach, and Education:
Initial work has begun on the integrated modeling component of this project. Funding from NOAA and DOI has supported a review of the hydrogeomorphic models of the region and facilitated two meetings of modelers and resource managers. The advancement of a community of practice and the application of an integrated model into a decision support system are a direct result of the discussions that occurred in these forums. Additional meetings and outreach to these groups will be required to successfully implement this project and generate broad support and participation in the community of practice. We also anticipate providing presentations at both science- and management-oriented conferences, as well as to existing groups and partnerships both in-person and remotely (i.e., webinar). We recognize the potential to connect this work to other communities of practice already operating in the Gulf (e.g., Monitoring Community of Practice) and will actively pursue this opportunity when funded.

The concept of a Chandeleur Islands restoration project – the second component of this proposal – has been discussed in a variety of forums over the last few years and enjoys broad support from the public. The Chandeleurs are covered by a number of existing conservation plans, including the Breton National Wildlife Refuge's Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 2008) and the Louisiana Department of Wildlife and Fisheries' Louisiana Wildlife Action Plan (Holcomb et al. 2015). The project is also consistent with Louisiana's Coastal Master Plan (Coastal Protection and Restoration Authority of Louisiana 2017). Chandeleur Islands restoration was listed as

a top priority by Audubon in their 2018 report, “Audubon’s Vision: Restoring the Gulf of Mexico for Birds and People” (Lankford et al. 2018). The Chandeleurs are also identified in the Lake Pontchartrain Basin Foundation’s “Multiple Lines of Defense Strategy to Sustain Coastal Louisiana” (Lopez 2006). Numerous other non-governmental organizations have expressed support for Chandeleur Islands restoration, and we will work closely with these groups to further educate the public about the unique role of the Council in pursuing collaborative coastal restoration work. Furthermore, as we contemplate pursuing at least a portion of the construction funding from NRDA, there will be ample opportunity for public engagement on final E&D alternatives through formal public comment related to restoration planning.

Leveraging:

Funds: $216,000.00
Type: Adjoining
Status: Received
Source Type: Other Federal
Description: Funds provided by USFWS to The Water Institute of the Gulf to initiate activities associated with modeling component of this project.

Funds: $25,000.00
Type: Adjoining
Status: Received
Source Type: Other Federal
Description: Funds provided by NOAA to The Water Institute of the Gulf to initiate activities associated with modeling component of this project.

Funds: $3,000,000.00
Type: Bldg on Others
Status: Received
Source Type: Other
Description: Conservative estimate of collective expenditures associated with previous modeling efforts in the Pontchartrain Basin-Chandeleur Sound-Mississippi Sound-Mobile Bay system.

Environmental Compliance:
Given that this project is considered a planning effort, the Council’s Categorical Exclusion for the National Environmental Policy Act applies. However, during the course of this project, field sampling might be required, which could trigger compliance documentation of one or more laws. All applicable federal, state, and local regulations will be complied with in the course of implementing this project. As E&D progresses, we will also pursue completion of all environmental compliance documents that cover the ultimate construction of the Chandeleur Islands restoration component of this project. We have not listed these here as they are not necessary to implement this phase of the project, but we have captured these activities as a metric of success for this project.

Bibliography:

Boswood, P.K., and R.J. Murray. 2001. World-wide Sand Bypassing Systems: Data Report (Compiled 1997). Conservation Technical Report No. 15 (R20). Queensland Environmental Protection Agency. State of Queensland. Brisbane, Queensland, Australia.

Bruun, P. 1990. Beach nourishment: improved economy through better profiling and backpassing from offshore sources. J. Coast. Res. 6:265-277.

Bruun, P. 1993. An update on sand bypassing procedures and prices. J. Coast. Research 18:277-284.
Byrnes, M.R., and J.L. Berlinghoff. 2012. Gulf Regional Sediment Management Master Plan: case study compilation. J. Coast. Res. 60:72-124.

Byrnes, M.R., L.D. Britsch, J.L. Berlinghoff, R. Johnson, and S. Khalil. 2019. Recent subsidence rates for Barataria Basin, Louisiana. Geo-Marine Letters 39:265-278.

Cecil, J., C. Sanchez, I. Stenhouse, and I. Hartzler. 2009. United States of America. Pages 369-382 in C. Devenish, D. F. Díaz Fernández, R. P. Clay, I. Davidson & I. Yépez Zabala, editors. Important Bird Areas Americas - Priority sites for biodiversity conservation. BirdLife International. Quito, Ecuador.

Coastal Protection and Restoration Authority of Louisiana. 2017. Louisiana's Comprehensive Master Plan for a Sustainable Coast. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA.

Deepwater Horizon Natural Resource Damage Assessment Trustees. 2016. Deepwater Horizon oil spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. Retrieved from http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

Deepwater Horizon (DWH) Natural Resource Damage Assessment Trustees. 2017. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December. Available: http://www.gulfspillrestoration.noaa.gov/

Dalyander, P.S., M. Meyers, B. Mattsson, G. Steyer, E. Godsey, J. McDonald, M. Byrnes, and M. Ford. 2016. Use of structured decision-making to explicitly incorporate environmental process understanding in management of coastal restoration projects: Case study on barrier islands in the northern Gulf of Mexico. J. Env. Manage. 83:497-509.

Fearnley, S.M., M.D. Miner, M. Kulp, C. Bohling, and S. Penland. 2009. Hurricane impact and recovery shoreline change analysis of the Chandeleur Islands, Louisiana, USA: 1855 to 2005. Geo-Marine Letters 29:455-466.

FitzGerald, D., I. Georgiou, M. Kulp, and M. Miner. 2015. Chandeleur Islands: A post-berm analysis and island renourishment plan. Report to Lake Pontchartrain Basin Foundation. Available on-line: http://www.mississippiriverdelta.org/files/2015/11/Chandeleur-Isl-Post-berm-Rpt-UNO_Apr_27_2015v3_withApendix-FINAL.pdf. Accessed April 6, 2020.

FitzGerald, D.M., C.J. Hein, Z. Hughes, M. Kulp, I. Georgiou, and M. Miner. 2018. Runaway Barrier Island Transgression Concept: Global Case Studies. Pages 3-56 in L.J. Morre, and A.B. Murray, eds. Barrier Dynamics and Response to Changing Climate. Springer International Publishing. Basel, Switzerland.

Georgiou, I.Y., and J. Schindler. 2009, Chapter H. Numerical simulation of waves and sediment transport along a transgressive barrier island, in Lavoie, D., ed., Sand resources, regional geology, and coastal processes of the Chandeleur Islands coastal system—an evaluation of the Breton National Wildlife Refuge: U.S. Geological Survey Scientific Investigations Report 2009–5252, p. 143–168.

Grzegorzewski, A.S., M. Cialone, A.J. Lansen, M. van Ledden, J. Smith, and T. Wamsley. 2009. The influence of barrier islands on hurricane-generated storm surge and waves in Louisiana and Mississippi. DOI: 10.1142/9789814277426_0087

Gulf Coast Ecosystem Restoration Council. 2016. Comprehensive Plan Update 2016: Restoring the Gulf Coast's Ecosystem and Economy. Gulf Coast Ecosystem Restoration Council. New Orleans, LA.

Holcomb, S.R., A.A. Bass, C.S. Reid, M.A. Seymour, N.F. Lorenz, B.B. Gregory, S.M. Javed, and K.F. Balkum. 2015. Louisiana Wildlife Action Plan. Louisiana Department of Wildlife and Fisheries. Baton Rouge, LA.

Kahn, J. 1986. Geomorphic recovery of the Chandeleur Islands, Louisiana, after a major hurricane. J. Coast. Res. 2:337-344.

Kandampully, J., A. Bilgihan, and T. Zhang. 2016. Developing a people-technology hybrids model to unleash innovation and creativity: The new hospitality frontier. J. of Hospitality and Tourism Technology 29:154-164.

Khalil, S.M., C.W. Finkl, and R.C. Raynie. 2013. Development of new restoration strategies for Louisiana barrier island systems, northern Gulf of Mexico, USA. J. Coast. Res. 65:1467-1472.

Knotts, C.P., G.M. Grandy, and S.M. Khalil. 2007. Restoration of Louisiana's barrier islands – evaluation and analysis. Coast. Eng. 2006:1977-1988.

Lankford, K., J. Hebert, N.L. Michel, K. Hyun, D. Meffert, D. O'Neill, V. Vasquez, E.I. Johnson, S. Pacyna, A. Darrah, K. Barnes, C. Oberholster, and M. Korosy. 2018. Audubon's Vision: Restoring the Gulf of Mexico for Birds and People. National Audubon Society. New Orleans, LA.

Lavoie, D., editor. 2009. Sand resources, regional geology, and coastal processes of the Chandeleur Islands coastal system: an evaluation of the Breton National Wildlife Refuge. U.S. Geological Survey Scientific Investigations Report 2009–5252. U.S. Geological Survey. Reston, VA.

Long, J., P.S. Dalyander, M. Poff, B. Spears, B. Borne, D. Thompson, R. Mickey, S. Dartez, and G. Grandy. 2020. Event and decadal-scale modeling of barrier island restoration designs for decision support. Shore & Beach 88:49-57.

Longo, M.C., S.C. Giaccone, and F. Garraffo. 2013. Applying the hub-and-spoke model to virtual communities: the IBM innovation approach. International Journal of Technology Marketing 8:142–158.

Lopez, J.A. 2006. The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana. Lake Pontchartrain Basin Foundation. Metarie, LA.

Miner, M.D., M.A. Kulp, D.M. Fitzgerald, J.G. Flocks, and H.D. Weathers. 2009. Delta lobe degradation and hurricane impacts governing large-scale coastal behavior, South-central Louisiana, USA. Geo-Marine Letters 29:441-453.

Moore, L.J., K. Patsch, J.H. List, and S.J. Williams. 2014. The potential for sea-level-rise-induced barrier island loss: insights from the Chandeleur Islands, Louisiana, USA. Marine Geology 355:244-259.

Otvos, E.G. 2018. Coastal barriers, northern Gulf – Last Eustatic Cycle; genetic categories and development contrasts. A review. Quat. Sci. Rev. 193:212-243.

Park, K., S.P. Powers, G.S. Bosarge, H. Jung. 2014. Plugging the leak: Barrier island restoration following Hurricane Katrina enhances larval retention and improves salinity regime for oysters in Mobile Bay, Alabama. Mar. Env. Res. 94:48-55.

Powell, E.J., M.C. Tyrrell, A. Milliken, J.M. Tirpak, and M.D. Staudinger. 2019. A review of coastal management approaches to support the integration of ecological and human community planning for climate change. J. Coast. Conserv. 23:1-18.

Remsen, J.V., Jr., B.P. Wallace, M.A. Seymour, D.A. O'Malley, and E.I. Johnson. 2019. The regional, national, and international importance of Louisiana's coastal avifauna. The Wilson J. of Ornithology 13:221-242.

Reyes E., I. Georgiou, D. Reed, and A. McCorquodale. 2005. Using models to evaluate the effects of barrier islands on estuarine hydrodynamics and habitats: a numerical experiment. J. Coast. Res. 44:176–185.

Romero, D., and A. Molina. 2011. Collaborative networked organizations and customer communities: Value co-creation and co-innovation in the networking era. Production Planning and Control 22. Special Issue on "Co-Innovation and Collaborative Networks".

Rosati, J.D., and G.W. Stone. 2009. Geomorphic evolution of barrier islands along the northern Gulf of Mexico and implications for engineering design in barrier restoration. J. Coast. Res. 25:8-22.

Schwartz, M.L. 1967. The Bruun theory of sea-level rise as a cause of shore erosion. The J. of Geology 75:76-92.

Suir, G.M., and C.E. Sasser. 2019. Redistribution and impacts of nearshore berm sediments on the Chandeleur barrier islands, Louisiana. Ocean Coast. Manage. 168:103-116.

Suter, J.R., S. Penland, S.J. Williams, and J.L. Kindinger. 1988. Transgressive Evolution of the Chandeleur Islands, Louisiana. Gulf Coast Association of Geological Societies Transactions 38:315-322.

Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas. 2017. Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. Silver Spring, MD.

Thomson, G., M. Miner, A, Wycklendt, M. Rees, and D. Swigler. 2010. MRGO Ecosystem Restoration Feasibility Study: Chandeleur and Breton Islands. Coastal Planning and Engineering, Inc. Boca Raton, FL.

U.S. Fish and Wildlife Service. 2008. Comprehensive Conservation Plan and Environmental Assessment for Delta and Breton National Wildlife Refuges, Plaquemines and St. Bernard Parishes, Louisiana. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Southeast Region.

Visser, K., and P. Bruun. 1997. The Punaise underwater dredger. J. Coast. Res. 13:1329-1333.
Zhang, T., and J. Kandampully. 2015. Motivations for customer engagement in online co-innovation communities. J. of Hospitality and Tourism Technology 6:311-328.

Zeigler, S.L., E.R. Thieler, B.T. Gutierrez, N.G. Plant, M. Hines, J.D. Fraser, D.H. Catlin, and S.M. Karpanty. Wildlife Society Bulletin 41:666-677.

Budget

Project Budget Narrative:
The total budget for this project is $8,000,000, divided between two planning components: $1,000,000 for integrated modeling and $7,000,000 for E&D. Given that neither component is a construction project, there are no funds identified for implementation or contingency. Monitoring and Adaptive Management funds identified below are specific to development of the Monitoring and Adaptive Management plan for the Chandeleur Islands restoration project. Monitoring and adaptive management for the activities identified in this proposal are captured in the planning category as oversight. Data management for this project is relatively intensive, given the large volumes of information that will be synthesized under component one (integrated modeling) and generated under component two (E&D). Each of these components is associated with half ($200,000) of the total data management budget ($400,000). For the planning activities, the modeling work accounts for $700,000 and the E&D $5,940,000. Project management accounts for 10% of total project costs and includes monies for project participation and oversight by co-sponsors and other Council members.

Total FPL 3 Project/Program Budget Request:
$ 8,000,000.00

Estimated Percent Monitoring and Adaptive Management: 2 %
Estimated Percent Planning: 83 %
Estimated Percent Implementation: 0 %
Estimated Percent Project Management: 10 %
Estimated Percent Data Management: 5 %
Estimated Percent Contingency: 0 %

Is the Project Scalable?
Yes

If yes, provide a short description regarding scalability.:
This project has two components and is, therefore, scalable by nature. However, given the foundational nature of these two components and the time sensitives they have – both in terms of urgency and sequencing – scaling this project would cause loss of valuable synergies and benefits. As we anticipate the modeling and E&D to inform one another – modeling to help assess ecosystem effects of alternative design and stakeholder values identified in design shaping model integration – we believe these components should be initiated simultaneously to most effectively leverage these components. Opportunities to align additional components within this geography could be considered (i.e., “scaling up”), but only with individual member support and approval.

Environmental Compliance[1]

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	Yes	Council NEPA Categorical Exclusion for planning will be utilized. Additional Categorical Exclusion may be required for field sampling
Endangered Species Act	N/A	Note not provided.
National Historic Preservation Act	No	May be required for field sampling
Magnuson-Stevens Act	N/A	Note not provided.
Fish and Wildlife Conservation Act	N/A	Note not provided.
Coastal Zone Management Act	N/A	Note not provided.
Coastal Barrier Resources Act	N/A	Note not provided.
Farmland Protection Policy Act	N/A	Note not provided.
Clean Water Act (Section 404)	No	May be required for field sampling
River and Harbors Act (Section 10)	No	May be required for field sampling
Marine Protection, Research and Sanctuaries Act	N/A	Note not provided.
Marine Mammal Protection Act	N/A	Note not provided.
National Marine Sanctuaries Act	N/A	Note not provided.
Migratory Bird Treaty Act	N/A	Note not provided.
Bald and Golden Eagle Protection Act	N/A	Note not provided.
Clean Air Act	N/A	Note not provided.
Other Applicable Environmental Compliance Laws or Regulations	N/A	(National Wildlife Refuge Improvement Act and Wilderness Act)

[1] Environmental Compliance document uploads available by request (restorecouncil@restorethegulf.gov).

Maps, Charts, Figures

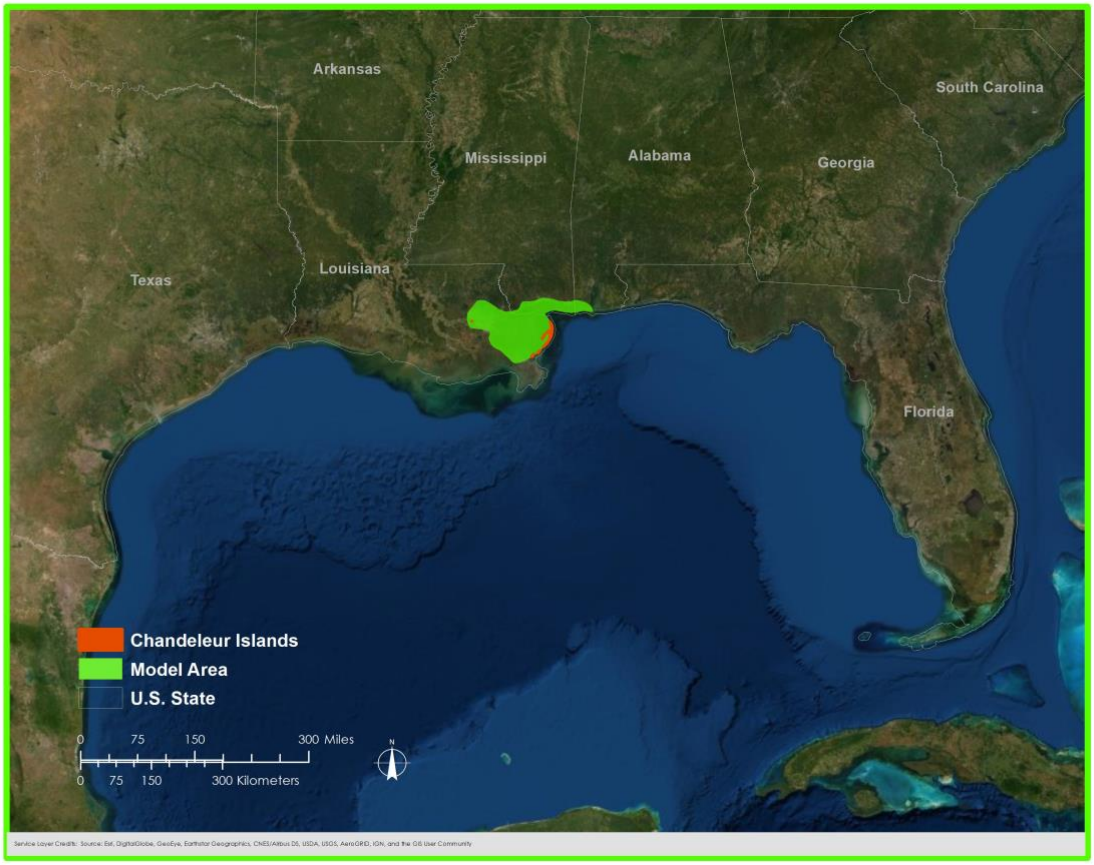

Figure 1. Chandeleur Island project location