Characterizing the Barrier Island Geomorphic State Monitoring and Adaptive Management Activity Implementation Plan

Introduction

The Deepwater Horizon (DWH) oil spill settlement in 2016 provides the Natural Resource Damage Assessment (NRDA) Trustees (Trustees) up to $8.8 billion, distributed over 15 years, to restore natural resources and services injured by the spill. As described in the DWH oil spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP/PEIS) (DWH NRDA Trustees, 2016), the Trustees selected a comprehensive, integrated ecosystem approach to restoration. The Final PDARP/PEIS considers programmatic alternatives, composed of Restoration Types, to restore natural resources, ecological services, and recreational use services injured or lost as a result of the DWH oil spill incident. As shown in the PDARP/PEIS, the injuries caused by the DWH oil spill affected such a wide array of linked resources over such an enormous area that the effects must be described as constituting an ecosystem-level injury. The PDARP/PEIS and information on the settlement with British Petroleum Exploration and Production Inc. (called the Consent Decree) are available at the Gulf Spill Restoration website.

Given the unprecedented temporal, spatial, and funding scales associated with the DWH oil spill restoration effort, the Trustees recognized the need for robust Monitoring and Adaptive Management (MAM) to support restoration planning and implementation. As such, one of the programmatic goals established in the PDARP/PEIS is to "Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation" to ensure that the portfolio of restoration projects provides long-term benefits to natural resources and services injured by the spill (Appendix 5.E of the PDARP/PEIS). This framework allows the Trustees to evaluate restoration effectiveness, address potential uncertainties related to restoration planning and implementation, and provide feedback to inform future restoration decisions.

The Louisiana Trustee Implementation Group (LA TIG) MAM Strategy (LA TIG, 2021) has identified a need for barrier island creation, restoration, and maintenance (resilient/maintained over time) with the goal of reducing land and habitat loss as a high-level objective under the Wetland, Coastal, and Nearshore Habitats (WCNH) Restoration Type. Under this high-level objective is the fundamental objective to support natural processes of barrier island evolution (e.g., erosion, overwash that builds back-barrier platform, and longshore sediment transport within the littoral zone; barrier island rollover rate) through barrier island restoration projects (WCNH #5*)*. To develop a Specific, Measurable, Achievable, Relevant, appropriate Timeline (SMART) objective, the LA TIG has identified that a MAM effort is needed to develop and document an approach for assessing and characterizing restored barrier island response to natural processes (e.g., changes to dune morphology and island resistance or resilience to overwash and sea-level rise) (WCNH #5.a). The MAM activity described here will fill this information gap while working closely with other ongoing barrier island activities to support integration into planning and restoration, such as the Louisiana Coastal Protection and Restoration Authority's (CPRA) Barrier Island Comprehensive Monitoring Program (BICM) and Barrier Island System Management Program (BISM).

Purpose of this document

This MAM Activities Implementation Plan (MAIP) describes the MAM activity, "*Characterizing the barrier island geomorphic state*" to address MAM priorities identified within the Louisiana Trustee Implementation Group (LA TIG) MAM Strategy for WCNH Fundamental Objective #5 (LA TIG, 2021). Specifically, this document outlines a MAM activity for assessing and characterizing restored barrier island response to natural processes (e.g., changes to dune morphology and island resistance or resilience to overwash and sea-level rise), directly addressing the need identified by the LA TIG (WCNH #5.a) in order to develop and document a SMART Objective. This document provides information about the activities to be implemented and the data gaps and uncertainties they will address.

This MAM activity is consistent with the LA TIG MAM Strategy and the DWH Final PDARP/PEIS. In addition to filling an information gap for a key SMART objective related to characterizing a barrier islands resistance or resilience to overwash and sea-level rise as described above, this activity will also provide information needed to advance WCNH Fundamental Objective #6 ("*Maintain habitat heterogeneity to support resilient nearshore and coastal ecosystems"*). Maintaining barrier island habitat diversity requires a dynamic balance of natural processes. In the short-term, overwash is necessary to produce low-lying habitat in the back barrier and intertidal habitat that supports, for example, foraging by shorebirds. In the long-term, however, sea-level rise and submergence may increase the frequency of overwash and eventual loss of subaerial habitat. By characterizing overwash and the resilience of barrier islands in the short- and long-term, this activity also will help advance approaches to quantifying spatial heterogeneity of habitats associated with these features (WCNH #6).

Monitoring and Adaptive Management: Characterizing the barrier island geomorphic state

This MAM MAIP describes a MAM activity for the WCNH Restoration Type to address key knowledge gaps identified by the LA TIG. The information below outlines the alignment with this activity with the PDARP/PEIS.

- Wetlands, Coastal, and Nearshore Restoration Type (Section 5.5.2 in PDARP/PEIS)
    - Goals addressed:
        - Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.
        - Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

    - Rationale:

        - The objective of this activity is to create metrics that can be used to understand topography and related habitat information across sites through time. We envision the approach having separate stand-alone metrics (e.g., island width, median elevation), which will then be integrated for holistic evaluation of barrier island response to natural processes. Collectively, this information can be integrated with information from the BICM program and integrated into the BISM program to identify barrier islands that would benefit from restoration projects.
        - This activity is focused on barrier islands along coastal Louisiana, where the most extensive damage from DWH occurred.
- Habitat Projects on Federally Managed Lands Restoration Type (Section 5.5.3 in PDARP/PEIS)
    - Goals addressed:
        - Restore federally managed habitats that were affected by the oil spill and response actions through an integrated portfolio of restoration approaches across a variety of habitats.
        - Restore for injuries to federally managed lands by targeting restoration on federal lands where the injuries occurred, while considering approaches that provide resiliency and sustainability.
    - Rationale:
        - The framework used for this activity will be developed in close coordination with federal stakeholders (e.g., U.S. Fish and Wildlife Service [USFWS]) and the geographic scope of the activity will include the Breton National Wildlife Refuge (NWR) (i.e., Breton and Chandeleur Island).
        - In addition to providing a framework that is needed to address the previously mentioned SMART objectives, metrics developed through this activity can help gauge the impact of NRDA restoration efforts on barrier islands.
- Monitoring and Adaptive Management (Section 5.5.15 in PDARP/PEIS)
    - Goals addressed:
        - Increase the likelihood of successful restoration
        - Provide feedback for management decisions
    - Rationale:
        - The objective of this activity is to create metrics that could be used to understand topography and related habitat information across sites through time. We envision the approach having separate stand-alone metrics (e.g., island width, median elevation), but we also plan to develop an approach to integrate various metrics. Collectively, this information can be integrated with information from the BICM program and integrated into processes developed by BISM to identify barrier islands that would benefit from restoration projects.
        - In addition to providing a framework that is needed to address the previously mentioned SMART objective, metrics developed through this activity can be used for monitoring and evaluation of NRDA restoration efforts on barrier islands.
        - The framework used for this activity will be developed in close coordination with state (e.g., CPRA) and federal stakeholders (e.g., USFWS, NOAA).

Regarding the LA TIG MAM Strategy, the activity will align with several fundamental objectives for the WCNH Restoration Type and the Cross Restoration Type, including:

- WCNH fundamental objective #5: "Support natural processes of barrier island evolution (e.g., erosion, overwash that builds back-barrier platform, and longshore sediment transport within the littoral zone; barrier island rollover rate) through barrier island restoration projects"
    - Collectively, the outputs and of this activity will assist with the finalization of the SMART objective titled "Develop and document approach for assessing and characterizing restored barrier island response to natural processes (e.g., changes to dune morphology and island resistance or resilience to overwash and sea-level rise)."
- WCNH fundamental objective #6: *"*Maintain habitat heterogeneity to support resilient nearshore and coastal ecosystems*"*
    - Spatial heterogeneity of habitats is related to a barrier island's overall resistance and resilience to overwash and sea-level rise. Consequently, this activity will also explore habitat distribution and spatial heterogeneity on barrier islands. Thus, this activity will help advance approaches to quantifying spatial heterogeneity of habitats, which is an information gap that has been identified by the LA TIG.
- Cross Restoration Type fundamental objective #1: "Maximize the combined benefits of the various Restoration Types and approaches cross the overall restoration portfolio (PDARP Section 5.5.1)"
    - This effort will help provide metrics that can be used for evaluating the efficacy of various strategies in land creation/restoration, particularly barrier island restoration, which is identified as a need for SMART Objective 1.a.

MAM Activity Description

Background

Barrier islands are highly dynamic features with strong coupling between the geomorphic state and response to natural processes. Research has shown that geomorphic state, which can be characterized using elevation data and habitat coverage, is linked to a barrier island's resistance and resilience. Here, resistance refers to the island's short-term response to storms, whereas resilience is the long-term ability of the barrier island to adapt to sea-level rise. The ability to characterize, distinguish, and predict the short-term response of barrier islands to storms and the long-term trajectory of these features is paramount to supporting successful restoration. Doing so enables restoration efforts to be sited and timed to support islands that are approaching tipping points of submergence in response to sea level rise, prioritizing them over islands that are incurring storm damage but have the capacity to recover. In addition, this understanding can support the design of barrier island restoration projects that can support a diversity of habitat in the short- and long-term.

The relationship between resistance and resilience is complex: although an island may erode and overwash during a storm, sediment transported onshore by overwash may build elevation along the back-barrier and enhance resilience. Understanding the resistance and resilience of Louisiana's barrier islands to storms is critical to maintaining ecosystem services in the short- and long-term, including: (1) intertidal and supratidal habitat for birds, sea turtles, and other species; (2) attenuation of wave energy

and storm surge; and (3) preservation of estuarine water quality. The objective of this activity will be to characterize the resistance/resilience of Louisiana barriers based on a synthesis of geomorphic state literature, an assessment of available data, and, when feasible and necessary, development of derivative datasets from readily available data. In addition to the most recent elevation datasets, this activity will utilize information from existing monitoring programs such as habitat maps, elevation, and sediment grain size from CPRA's BICM Program, and other CPRA project-specific datasets.

During the development of this activity, the project team discussed synergy between this MAM activity and two other barrier island activities, namely BICM and BISM. The discussion highlighted several important factors related to linkages to the MAM and other programs, including: (1) the proposed activity is valuable to monitoring and adaptive management efforts; (2) the activity is unique and not duplicative of efforts planned for BICM; and (3) there is a willingness and interest from the BICM program to collaborate on this activity and integrate metrics produced from this study into future barrier island-related monitoring and adaptive management efforts. For example, this activity will help inform future, planned BICM activities, such as overwash analysis. Additionally, the outputs and outcomes of this work can support more robust MAM planning and management of the barrier islands, including the DWH restoration portfolio; characterizing key metrics for evaluating the trajectory of the coastal system in support of CPRA's BISM Program; current engineering and design activities for Chandeleur Islands; and informing the long-term management of the Breton Island NWR. To build on the successful foundation of this activity and maximize future success, this activity will be closely coordinated with CPRA, USFWS, and other decision-makers and stakeholders with interests tied to the Louisiana barrier islands.

Objectives and Tasks

The objective of this activity will be to characterize the resistance/resilience of Louisiana barriers based on a synthesis of geomorphic state literature and an assessment of available data. In addition to the most recent elevation datasets, this activity will utilize information from existing monitoring programs such as habitat maps, elevation, and sediment grain size from CPRA's BICM Program. When feasible and necessary, new derivative datasets may be developed from readily available data sources. This activity will fill knowledge gaps necessary to finalize metrics for a SMART objective related to maintenance of natural processes of barrier island evolution based on the identified MAM need #5a, "Develop and document approach for assessing and characterizing restored barrier island response to natural processes (e.g., changes to dune morphology and island resistance or resilience to overwash and sea-level rise)." The study area for this effort will be the Louisiana barrier islands (Fig. 1).

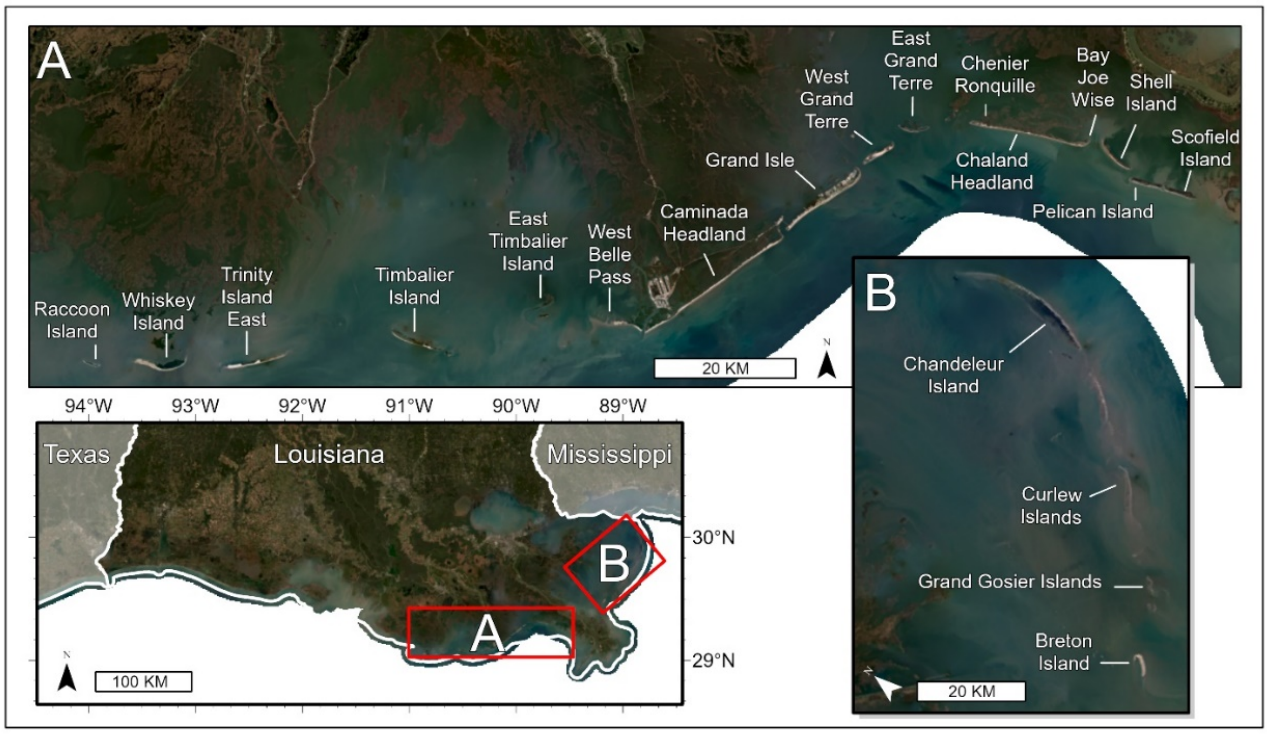

Fig. 1. Study area for the barrier island geomorphic state monitoring and adaptive management activity, which includes Louisiana's barrier islands. The project will focus pilot efforts to develop metrics on a subset of these sites that will be informed through the stakeholder engagement and data availability assessment tasks included in this activity, then applied more broadly.

This activity will include several key steps, including:

1. Stakeholder engagement and coordination throughout project life cycle
2. Literature review on barrier island geomorphic state metrics
3. Develop a pilot assessment(s)
4. Refine the process, as necessary, and deploy to other barrier islands (Fig. 1)
5. Publication of datasets and final report

Task 1: Develop/Engage Technical Advisory Group (TAG) — Stakeholder Engagement, Coordination, and Expert Elicitation

We will develop a TAG that will allow for stakeholder engagement, coordination, and expert elicitation throughout the entire project life cycle. The TAG for this activity will follow the model used by the Mississippi Coastal Improvements Program (MsCIP) (USACE, 2016). The primary goals of the stakeholder engagement and coordination will be to ensure synergy between this activity and other barrier island-related activity in Louisiana, namely BICM, BISM, and ongoing monitoring, Engineering and Design, and LA TIG restoration and adaptive management activities under NRDA (e.g., Breton Island, Chandeleur Islands, and Outer Coast), National Fish and Wildlife Foundation, and other programs. This task will ensure that stakeholder concerns and feedback are addressed and integrated whenever possible, and to support input into refinement of methodology to support barrier island restoration in practice. Additionally, this activity will also coordinate with planned and ongoing activities with U.S. Geological Survey's (USGS) Coastal Marine Hazards Resource Program (e.g., planned lidar acquisitions and lidar-derived beach/dune morphology). Information related to planned lidar acquisitions will be

provided to TAG members for potential utilization for other activities and to avoid any duplication of effort. Collectively, interactions with the TAG will ensure that the activity leads to a framework that will be fully integrated in future barrier island MAM efforts by both state and federal stakeholders. TAG membership will be finalized in coordination with the other LA TIG Trustees. The TAG will provide feedback across the various other tasks of this activity including (Fig. 2): (1) the literature synthesis; (2) the pilot assessment plan and metric methodologies; (3) the pilot assessment results; (4) key findings for the other Louisiana barrier islands; and (5) review of the final report. On an annual basis, we envision the TAG time commitment to require about 15–20 hours per person and include: (1) two 90-minute webinars; (2) 4–8 hours of document review; and (3) two half-day meetings.

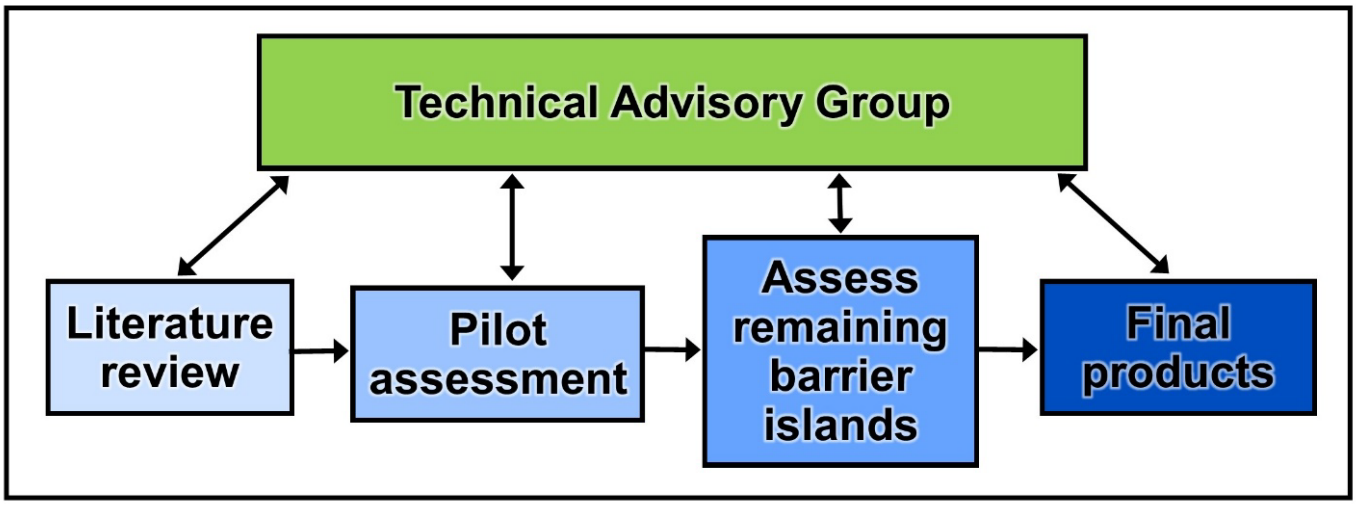

Fig. 2. Overview of the tasks and feedback points between the technical advisory group (TAG) and the project team for the barrier island geomorphic state monitoring and adaptive management activity.

Task 2: Literature review

This task will encompass conducting a literature review of prior work characterizing dune geomorphic state, barrier island resistance/resilience, habitat state changes resulting from overwash and sea-level rise, and the evolution of the Louisiana barrier islands. This review will include peer-reviewed literature and technical reports that have been compiled for Louisiana by CPRA under BICM, the Louisiana Sediment Management Plan (LASMP) and associated activities, the Breach Management Program, project-scale planning and monitoring, and other programs; the rest of the northern Gulf of Mexico; and elsewhere as relevant to this task. This synthesis will also include past efforts by other stakeholders and Trustees, such as engineering and design of the Breton Island restoration project supported by USFWS. This synthesis will help fill an existing information gap to inform the development of a SMART objective related to WCNH Fundamental Objective #5 “Support natural processes of barrier island evolution (e.g., erosion, overwash that builds back-barrier platform, and longshore sediment transport within the littoral zone; barrier island rollover rate) through barrier island restoration projects.” During this phase, the team will work with the TAG to identify additional data and information sources that may support the task.

Task 3: Develop and apply resilience/resistance assessment methodology

The team will identify metrics that support the SMART objective for characterizing the response of restored and unrestored barrier islands to natural processes. These metrics will be part of an assessment methodology that can also be applied to characterize the resilience and resistance of barrier

islands. While the literature review will drive the development of the metrics, the team envisions parameters and analyses could include the following: (1) overwash frequency; (2) overwash area; (3) island width; (4) island elevation (mean, median, and other statistics characterizing the dune, berm, and other geomorphic features); (5) shoreline fractal index; (6) habitat coverage and change; (7) habitat heterogeneity; (8) estimate of sediment volume within the active littoral zone; and (9) other parameters as suggested by literature or stakeholders. Analysis of existing data will be used to evaluate methods for extracting these metrics and determining their skill and value in assessing the trajectory of barrier islands, the influence of natural processes, and determination of their short- and long-term resistance and resiliency.

The metrics and methodology will be based primarily on application at one or more pilot locations, with the number and location determined in part based on data availability. For example, the team may select a data-rich site for initial development and assess the portability (or opportunities for refinement for application) to a site with less available data. In addition, the team will consider coastal variability so that the location(s) is representative of the Louisiana coast. The location of the pilot site(s) will be finalized in coordination with the TAG.

Using data from the pilot site(s), an assessment plan will be developed which will include a detailed methodology and identification of draft metrics. Upon completion of the pilot assessment(s), the team will present the findings to the TAG for review and feedback.

After the pilot assessment is completed and TAG feedback is incorporated, where possible, the team will then focus on expanding the methodology and metric application more broadly across the Louisiana coast (Fig. 1). The primary focus will be on barrier islands that have not been substantially modified with hard structures that disrupt natural processes. Some sites (e.g., East Timbalier Island) may be excluded from the analysis for this reason, and/or if there are insufficient existing data to robustly characterize them with the developed methodology. The team will present key findings from the analysis for the broader study area to the TAG upon completion (Fig. 1). Ultimately, this synthesis and analyses will be used to build and refine the potential of a suite of metrics for assessing and characterizing restored barrier island response to natural processes (e.g., changes to dune morphology and island resistance or resilience to overwash and sea-level rise). In the future, these metrics can be used by monitoring programs to evaluate project success as part of an adaptive management approach to restoration, while prediction of their outcomes in can be incorporated into engineering and design to maximize the benefits of projects.

Task 4: Reporting

A multi-chaptered report will be developed to cover all the tasks of this activity, including the literature review, Trustee and stakeholder engagement/feedback, development of metrics for barrier island geomorphic state, results of the application of this analysis to the Louisiana coast, and a "lessons learned" section that highlights one or more case studies. The development of this report will be led by the USGS with support from a contractor or cooperator. In addition to being reviewed by the TAG, the report will be peer-reviewed by subject matter experts within the USGS or other external experts. It will be published as a USGS Open-File Report. This report will be hosted and publicly available via the USGS' Publications Warehouse (https://pubs.er.usgs.gov/) and include a digital object identifier.

Outputs of all tasks from this activity:

- Identification of metrics and analysis mechanism for analyzing the resilience and resistance of Louisiana barrier islands
- Identification of metrics that can be used as part of SMART objectives for monitoring and adaptive management, develop draft SMART Objectives WCNH #5a and Cross Restoration Type #1a, and support TIG revision and finalization of WCNH #5a and Cross Restoration Type #1a
- Annual progress reports, including progress on deliverables within each fiscal year
- Derived data products published as a USGS data release that will be publicly available on ScienceBase (https://doi.sciencebase.gov/) and uploaded to Data Integration, Visualization, Exploration, and Reporting (DIVER) Restoration Portal. Note, this project does not include collection of field data, but products may include derived or interpreted data products.
- USGS Open-File Report that will cover literature review, stakeholder engagement and coordination, methodology, and results of the analysis.

Budget

The total budget requested for this MAM activity is $713,676. The breakdown of this request by organization is outlined in Tables 1 and 2.

Table 1. U.S. Geological Survey budget for the barrier island geomorphic state monitoring and adaptive management activity by general cost category by fiscal year (FY).

Category	FY22	FY23	FY24	FY25
Contracts	$7,290.76	$38,792.72	$40,007.36	$28,653.80
Project equipment	$4,000.00	$2,752.29	$2,752.29	$2,752.29
Publishing				$20,000.00
Federal labor		$38,179.80	$39,403.80	$40,703.60
Federal travel	$733.00	$1,698.00	$1,698.00	$733.00
Indirect costs	$2,547.24	$25,496.19	$26,409.55	$29,037.31
Total	**$14,571.00**	**$106,919.00**	**$110,271.00**	**$121,880.00**
Grand total				**$353,641.00**

The total budget request for the USGS is $353,641.00. The funding request under the “contracts” category includes labor hours and travel to project meetings for a B.S.-level Student Service Contractor. The “project equipment” category includes Google Earth Engine user costs through the Department of Interior contract in FY23 to FY25. Estimated cost is based on the cost for FY22. The “publishing” cost is for a multi-chaptered USGS Open-File report. Collectively, travel expenses were estimated for several project meetings in southeastern Louisiana. This will generally include two meetings per year for (except for FY22, which will just have a single meeting). The USGS will provide in-kind salary support for this MAM activity for each year for the Principal Investigator for a total of $56,728.00 ($9,774.40 in FY22; $15,146.40 in FY23; $15,645.60 in FY24; $16,161.60 in FY25). The indirect rate (21.171% for FY22) was increased by 0.5% to account for minor potential increases in indirect rates. Similarly, labor rates were increased by 3.3% per year to account for inflation.

Table 2. Contractor or cooperator budget for the barrier island geomorphic state monitoring and adaptive management activity by general cost category by fiscal year (FY).

Category	FY22	FY23	FY24	FY25
Labor	$15,191.37	$81,782.30	$81,271.18	$82,019.15
Travel	$1,649.79	$3,196.71	$3,196.71	$1,646.79
Total	**$16,838.16**	**$84,979.01**	**$84,467.89**	**$83,665.94**
Grand total				**$269,951.00**

The total budget estimate for the contractor or cooperator support is $269,951 for labor and travel. Estimated cost is based on the cost for FY22. Travel costs assume the same frequency of meetings as for the USGS and account for the Principal Investigator and a Research Assistant to attend.

Table 3 includes cost estimates from Trustees for engaging in the TAG throughout the activity. As previously mentioned, on an annual basis, we envision the TAG time commitment to require about 15–20 hours per person and include: (1) two 90-minute webinars; (2) 4–8 hours of document review; and (3) two half-day meetings.

Table 3. Trustee engagement costs for the barrier island geomorphic state monitoring and adaptive management activity by fiscal year (FY).

Trustee	FY22	FY23	FY24	FY25	Total
CPRA	$15,000	$25,000	$25,000	$15,000	$80,000
NOAA	$1,500	$3,300	$3,465	$1,819	$10,084
Total by year	**$16,500**	**$28,300**	**$28,465**	**$16,819**	
Grand total					**$90,084**

Activity implementation

Timeline

This activity will occur over a period of three years starting at the development of an active agreement and receipt of funding. We anticipate this activity will begin in July 2022 and continue through the end of June 2025. The breakdown of task timing for the activity are outlined in Table 4.

Table 4. General timeline by task for the three-year barrier island geomorphic state monitoring and adaptive management activity.

Task	FY22	FY23	FY24	FY25
Develop/engage TAG				
Literature review				
Pilot assessment(s)				
Assessment for other islands				
Publishing final report and data				

Data management and reporting

This activity will include a collation of existing data and potential development of new derivative datasets. This activity does not include the collection of new field data. Datasets produced for this activity will be in a common, readable formats (e.g., shapefiles, GeoTIFF files, comma-separated value files). Data storage and accessibility will be consistent with the guidelines in Section 3.1.3 of the MAM Manual, which will include DIVER updates. Data developed by the USGS will be stored on a secure network with regularly scheduled back-ups. The same protocol will be followed by the contractor or cooperator using both collocated and offsite back-ups. Final data products developed through this effort will be published as a USGS data release. These products will have a digital object identifier and be publicly available on USGS' ScienceBase (https://www.sciencebase.gov/). Where identified as appropriate through coordination with CPRA, data products will also be archived on the Louisiana Coastal Information Management System (CIMS) following the protocols for that system.

A multi-chaptered report will be developed to cover all the tasks of this activity, including the literature review, stakeholder engagement/feedback, development of various metrics for barrier island geomorphic state, and the results of the analysis. The development of this report will be led by the USGS and the Water Institute of the Gulf. It will be published as a USGS Open-File Report. This report will be hosted and publicly available via the USGS' Publications Warehouse (https://pubs.er.usgs.gov/) and include a digital object identifier.

The DWH Trustees, as stewards of public resources under the Oil Pollution Act (OPA), will inform the public on the MAM activity's progress and performance. Therefore, DOI will report the status of the proposed activity via the Data Integration, Visualization, Exploration, and Reporting (DIVER) Restoration Portal annually, as outlined in Chapter 7 of the PDARP/PEIS (DWH NRDA Trustees 2016). Annual reports, final report, and finalized datasets created or compiled as part of this activity will also be stored on the DIVER Restoration Portal, and datasets will utilize DIVER data templates. In the event of a public records request related to data and information that are not already publicly available, the Trustee to whom the request is addressed would provide notice to the other LA TIG members prior to releasing any data that are the subject of the request.

Consistency of MAM Activity with the PDARP/PEIS

This MAM activity is consistent with and supports multiple programmatic goals (section 5.3) in the PDARP/PEIS, including a variety of restoration types (section 5.5) and restoration approaches (Appendix 5.D). This MAM activity supports the following programmatic goals: (1) Restore and Conserve Habitat; (2) Replenish and Protect Living Coastal and Marine Resources; (3) Provide and Enhance recreational Activities; and (4) Provide for Monitoring, Adaptive management, and Administrative Oversight to Support Restoration Implementation.

The activity will support a variety of restoration types described in the PDARP/PEIS, including *Wetlands, Coastal, and Nearshore Habitats* (section 5.5.2). This activity is focused on barrier islands which include all three of these habitats that are mentioned explicitly in the PDARP/PEIS. In addition, the development of SMART objective metrics related to barrier island resistance or resilience will assist with *Planning and Implementation Considerations (*Section 5.5.2.3*)* and enhance *Monitoring and Adaptive Management* (Appendix 5.E) of these important resources. By developing this critical SMART objective, the activity will

have indirect linkages to many other Restoration Types identified in the PDARP/PDEIS, including: (1) *Habitat Projects on Federally Managed Lands* (section 5.5.3); (2) *Enhance Recreational Opportunities* (section 5.5.14); (3) *Birds* (section 5.5.12); (4) *Sea Turtles* (section 5.5.10); and (5) *Submerged Aquatic Vegetation* (section 5.5.8).

Linkages between this MAIP activity and the restoration approaches as identified in the PDARP/PEIS as appropriate under the Oil Pollution Act (OPA) are provided below.

- Create, Restore, and Enhance Barrier and Coastal Islands and Headlands (D.1.4) and Protect and Conserve Marine, Coastal, Estuarine, and Riparian Habitats (D.1.7)
    - This activity will create metrics that can be used to evaluate the geomorphic trajectory of barrier island sites — the targeted habitat of this portion of the PDARP — through time. We envision the approach having separate stand-alone metrics (e.g., island width, median elevation, sediment volume within the active littoral system), as well as an approach to integrate various metrics into an overall assessment.
    - The developed metrics provide information to protect barrier island habitats by focusing and enhancing monitoring efforts, in addition to supporting effective and resilient restoration project design.

- Restore and Enhance Dunes and Beaches (D.1.5)
    - Dunes and beaches are among the habitat types supported by barrier islands. The geomorphic state metrics will help inform the restoration and enhancement of barrier islands, including associated dunes and beaches.
    - The developed metrics provide information to protect barrier island habitats by focusing and enhancing monitoring efforts, in addition to supporting effective and resilient restoration project design.
- Restore and Enhance Submerged Aquatic Vegetation (D.1.6)
    - The metrics of geomorphic state can be linked with submerged aquatic vegetation maps and monitoring to help inform submerged aquatic vegetation impacts from overwash.
    - This information can assist with restoration benefits and design for enhancing submerged aquatic vegetation resources.

- Sea Turtle Restoration Approaches (D.4)
    - Enhance Sea Turtle Hatchling Productivity and Restore and Conserve Nesting Beach Habitat (D.4.3)
        - Although sea turtle utilization of coastal barrier islands is relatively low compared to other states, the information from this activity could be linked with sea turtle monitoring data to help provide information for understanding species condition, nest success, and population levels.
        - The developed metrics provide information to protect barrier island habitats, including beaches that can be utilized by nesting sea turtles, by focusing and enhancing monitoring efforts, in addition to supporting effective and resilient restoration project design.

- Bird Restoration Approaches (D.6)
    - Restore and Conserve Bird Nesting and Foraging Habitat (D.6.1)
        - The metrics and outputs from this activity could be linked with avian monitoring and help understand how geomorphic state may impact species condition, nest success, and population levels.
        - The developed metrics provide information to protect barrier island habitats, including those utilized by avian species, by focusing and enhancing monitoring efforts, in addition to supporting effective and resilient restoration project design.
- Recreational Use Restoration Approaches (D.8)
    - Enhance Public Access to Natural Resources for Recreational Use (D.8.1)
        - The metrics on geomorphic state will help inform the restoration and enhancement of dunes, beaches, and coastal wetlands on barrier islands. For publicly assessable barrier islands, this should enhance recreational opportunities by providing information on where and when to protect, restore, or conserve natural resources.
- Monitoring and Adaptive Management (5.E)
    - This activity will provide information on beaches, dunes, and wetlands along the back-barrier of barrier islands and a set uniform and quantifiable metrics for evaluating barrier islands. As such, they provide a framework to support project-specific monitoring and a mechanism for evaluating project evolution that can be used in adaptive management of projects. This action supports and advances multiple components of Monitoring and Adaptive Management (5.E), including:
        - "*…inform restoration planning, supports the evaluation of project performance and ensures project compliance.*"
        - "*Cross-resource-level monitoring and scientific support to fulfill data and information needs common among multiple injured resources, thereby promoting efficiency and consistency in data collection and restoration evaluation."*
        - *"Can fulfill data and information needs for multiple projects benefitting a common injured resource, thereby promoting efficiency and consistency in data collection and restoration evaluation."*

Evaluation of NEPA Requirements

The Trustees' approach to compliance with NEPA summarized in this section is consistent with, and tiers where applicable from the PDARP/PEIS Section 6.3.2. Resources considered and impact definitions (minor, moderate, major) align with the PDARP/PEIS. Relevant analyses from the PDARP/PEIS are incorporated by reference. Such incorporation by reference of information from existing plans, studies or other material is used in this analysis to streamline the NEPA process and to present a concise document that briefly provides sufficient evidence and analysis to address the Louisiana TIG's compliance with NEPA (40 CFR 1506.3, 40 CFR § 1508.9). All source documents relied upon are available to the public and links are provided in the discussion where applicable.

As discussed in Chapter 6 of the PDARP/PEIS, a TIG may propose funding a planning phase (e.g., initial engineering, design, and compliance) in one plan for a conceptual project, or for studies needed to maximize restoration planning efforts. This would allow the TIG to develop information needed leading to sufficient project information to develop a more detailed analysis in a subsequent restoration plan, or for use in the restoration planning process. Where these conditions apply and activities are consistent with those described in the PDARP/PEIS, NEPA evaluation is complete and no additional evaluation of individual activities is necessary at this time.

NEPA Review of MAM Activity

The activities and tasks described here consist exclusively of desktop analysis of existing literature, existing data resources, developing new geospatial datasets, as needed, development of a report, and engagement of stakeholders. This activity would include data collation and data analysis with no field data collection. Consequently, there will be no impact to resources as defined with the PDARP/PEIS.

NEPA Conclusion

After review of the proposed activities against those actions previously evaluated in the PDARP/PEIS, the Louisiana TIG determined that the environmental consequences resulting from this MAM activity falls within the range of impacts described in Section 6.4.14 of the PDARP/PEIS, thus no additional NEPA evaluation is necessary at this time.

Compliance with Environmental Laws and Regulations

The Louisiana TIG has completed technical assistance with the appropriate regulatory agencies for this project. Due to the nature of the project, which consists of data analysis and purchase of equipment with no proposed field activities, permits and consultations are not required. Other projects proposed under Louisiana MAM may directly fund field work, thus existing permits and consultations will be reviewed to determine if they are sufficient to complete the work or if additional compliance work is needed.

Federal environmental compliance responsibilities and procedures follow the Trustee Council Standard Operating Procedures (SOP), which are laid out in Section 9.4.6 of that document. Following the SOP, the Implementing Trustees for each activity will ensure that the status of environmental compliance (e.g., completed vs. in progress) is tracked through the Restoration Portal.
Documentation of regulatory compliance will be available in the Administrative Record that can be found at the DOI's Online Administrative Record repository for the DWH NRDA (https://www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: http://www.gulfspillrestoration.noaa.gov/environmental-compliance/.

Activity Close Out

In accordance with Section 9.5.1.6 of the TC SOPs, the Implementing Trustee (USGS) shall provide the LA TIG with a closeout report after all activities and expenditures have been accomplished. The Final Report

shall include a description and any documentation of the completed activity, estimated benefits to natural resources, the final funding balances and any transfers described in Section 7 of the TC SOPs, a summary of the results of monitoring, and any recommendations on adaptive management for the activity. Upon request, the Implementing Trustee shall provide the LA TIG with additional information and supporting documents to complete the closeout report.

Literature Cited

Deepwater Horizon Louisiana Trustee Implementation Group (LA TIG), 2021, Louisiana Trustee Implementation Group Monitoring and Adaptive Management Strategy (LA TIG MAM Strategy): Baton Rouge, La., 43 p. Available: https://www.fws.gov/doiddata/dwh-ar-documents/3443/DWH-ARZ009746.pdf.

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016, Deepwater Horizon oil spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. Assessed February 2022 at http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

U.S. Army Corps of Engineers (USACE), 2018, Mississippi Coastal Improvements Program: Comprehensive Barrier Island Restoration Monitoring and Adaptive Management Plan: Mobile, Ala., U.S. Army Corps of Engineers, Mobile District., 44 p. [Also available at https://www.sam.usace.army.mil/Portals/46/docs/program_management/mscip/docs/MAMPlan-Appendices-07-31-2018.pdf?ver=2018-11-02-115742-747.]