

E.5. Create, Restore, and Enhance Barrier and Coastal Islands and Headlands: Monitoring Guidance



This guidance is intended to promote consistency in data collection among similar types of projects and allow for future analysis across TIGs and Restoration Types, (Section 10.6.2 of SOP; DWH NRDA Trustees, 2016). This guidance may also assist the TIGs by providing recommended methodologies for monitoring restoration projects, saving time and money spent developing suitable monitoring protocols for individual restoration projects. If adjustments from this monitoring guidance are needed for a particular project, these adjustments should be described in the project-specific MAM Plan and agreed to by the TIG (Section 10.6.3 of SOP; DWH NRDA Trustees, 2016). Project teams within each TIG will identify parameters applicable to the objectives for each individual restoration project when developing the project MAM Plan. In addition to the project monitoring guidance identified in this Manual, specific monitoring may be required to comply with permits granted by regulatory agencies. The TIGs are not restricted from adding additional parameters, and other project monitoring that may be needed for specific projects should be determined by the TIGs.

The Cross-TIG MAM developed this monitoring guidance by following the process described in the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0 (MAM Manual Version 1.0; DWH NRDA Trustees, 2017).

This guidance is intended to assist the TIGs in developing MAM Plans for restoration projects, as appropriate. Specifically, it provides:

- Examples of Restoration Techniques
- Guidance on example restoration objectives, example drivers, and example uncertainties
- Guidance on core performance monitoring parameters for projects within the Restoration Approach
- Guidance on supplemental performance monitoring parameters for specific restoration objectives.

The monitoring parameters identified within a project MAM Plan should be consistent with the recommended monitoring defined within this guidance document, wherever appropriate. Depending on the nature of the restoration project, TIGs may choose not to include some of the elements described in this guidance document (e.g., drivers, uncertainties). If adjustments from the monitoring guidance are needed, these adjustments should be described in the project-specific MAM Plan and agreed to by the TIG (Section 10.6.3 of SOP; DWH NRDA Trustees, 2016b). The guidance provided should not be considered exhaustive. Therefore, TIGs may develop project-level objectives, drivers, uncertainties, and monitoring parameters that have not been previously identified. The TIGs will develop MAM objectives and monitoring parameters that pertain to their restoration activities; and will determine the frequency and duration of

monitoring, and the associated budget they deem appropriate. Finally, this section is subject to change as new monitoring parameters, methods, and technologies are identified and/or developed.

The monitoring parameters recommended in this guidance document are further detailed in Attachment E Section E.3, which includes a complete list of core- and objective-specific monitoring parameters identified by the Cross-TIG MAM work group and guidance on measurement unit(s) and monitoring methods. Guidance on monitoring locations, frequencies, durations of sampling and potential analyses is also provided where appropriate.

E.5.1. Restoration Techniques

Restoration Techniques are specific restoration actions the Trustees identified for each of the Restoration Approaches. Restoration Techniques may be used individually or in combination. See Appendix 5.D of the PDARP/PEIS (DWH NRDA Trustees, 2016a). The following are example Restoration Techniques included in the PDARP/PEIS for this Restoration Approach. This list should not be considered exhaustive; additional Restoration Techniques may be developed and/or identified.

1. Restore or construct barrier and coastal islands and headlands via placement of dredged sediments
2. Plant vegetation on dunes and back-barrier marsh.

E.5.2. Example Project-Level Restoration Objectives

Project-level restoration objectives should be specific to the resource injuries and clearly specify the desired outcome(s) of the restoration project (15 CFR § 990.55(b)(2)). See Section 2.4.1 of the MAM Manual Version 1.0 for guidance on establishing restoration objectives. The following are example project-level restoration objectives that may apply to one or more of the above-mentioned Restoration Techniques. This list should not be considered exhaustive; additional objectives may be developed and/or identified.

- Restore a barrier island that is sustained for the expected project lifespan to provide coastal habitat(s) important for the restoration of ecosystem functions and stability.
- Restore a barrier island structure to reduce potential storm damage impacts on coastal habitats.
- Promote establishment of beach dune and back-barrier marsh vegetation to:
 - Stabilize marsh and beach sediments
 - Stabilize the shoreline
 - Promote longevity of the subaerial island
 - Reduce erosion
 - Encourage sediment deposition
- Contribute to the ecosystem function (habitat for birds and native species) of dunes and back-barrier marshes.
- Increase availability of high-quality beach and/or dune habitat in support of species utilization, foraging, and/or nesting activity.
- Promote recovery of Threatened and Endangered (T&E) Species.
- Improve the long-term littoral drift/sediment transport system to naturally sustain barrier systems.
- Enhance recreational use.
- Maintain a sand beach and dune system to improve the resilience and sustainability of coastal habitat by the capture or retention of sand. Reduce the rate of sediment loss and/or reduce erosion.

- Maintain beach, dune, back-barrier marsh elevation profile and area, as well as adjacent subtidal areas.
- Minimize habitat loss and fragmentation; reduce adverse human impacts (e.g., development, vehicular and pedestrian traffic) to protect the barrier or coastal island system.

E.5.3. Example Drivers

Drivers are outside forces, natural or anthropogenic, that have the potential to influence the outcome(s) of a restoration project. Drivers tend to be large-scale, long-term forces that are not easily controlled at the scale of a single restoration project (Harwell et al., 2016). See Section 2.4.2 of the MAM Manual Version 1.0 for guidance on establishing the conceptual setting for a MAM Plan, including identifying drivers. The following are example drivers that may be applicable to this Restoration Approach. This list should not be considered exhaustive; additional drivers may be identified.

- Adjacent development/land use
- Sediment availability
- Wave dynamics
- Storm events
- Sea level rise.

E.5.4. Example Uncertainties

Uncertainties or information gaps have the potential to affect adaptive management decisions for individual or multiple restoration projects. These decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as intended. See Section 2.4.3 of the MAM Manual Version 1.0 for guidance on identifying potential sources of uncertainty for a MAM Plan. The following are example uncertainties that may be applicable to this Restoration Approach. This list should not be considered exhaustive; additional uncertainties may be identified.

- Natural variability in ecological and physical processes, such as wave-driven transport or vegetation growth, and in the associated barrier island response (e.g., geomorphic variability and barrier island evolution)
- Short- and long-term fate of natural and/or placed material
- Climate variability, such as tropical cyclone frequency, intensity, and timing; and the impact on redistributing natural or placed sand on vegetation types, growth, and distribution
- Future rate of local relative sea level rise (e.g., subsidence plus eustatic variability), including if the rate of rise will be relatively constant or will accelerate the ecological and geomorphic response of the island to sea level rise
- Adequate availability of appropriate borrow sources
- Availability of property
- Timeframe for recolonization of native fauna species (e.g., year-round residential species, nesting species, T&E Species, migratory species, vegetation, invertebrates)
- Sustainability of long-term project management (e.g., continued funding)
- Permitting.

E.5.5. Guidance on Developing Parameters for Project-Level Performance

This section includes two types of monitoring parameters for consideration under the Create, Restore, and Enhance Barrier and Coastal Islands and Headlands Restoration Approach:

1. Core performance monitoring parameters applicable to projects within a Restoration Approach (core performance monitoring parameters are those used consistently across projects in order to facilitate the aggregation of project monitoring results and the evaluation of restoration progress for each Restoration Type; Appendix 5.E.4 of PDARP/PEIS; DWH NRDA Trustees, 2016a)
2. Objective-specific performance monitoring parameters that are only applicable to projects with a particular restoration objective.

Additional adaptive management and/or validation monitoring parameters for consideration have also been identified. These additional parameters may be helpful for resolving uncertainties, explaining outside drivers, optimizing project implementation, supporting decisions about corrective actions and other adaptive management of the project, and informing the planning of future DWH NRDA restoration projects. Tables E.5.1 and E.5.2 should not be considered exhaustive, and other parameters may be considered, as appropriate. See the complete list of core- and objective-specific monitoring parameters, Section E.3 above, for details on the core performance monitoring parameters including definitions, units, and other guidance.

Table E.5.1. Core performance monitoring parameters and additional parameters for consideration under the Create, Restore, and Enhance Barrier and Coastal Islands and Headlands Restoration Approach

Core performance monitoring parameters	Parameters for consideration (as appropriate)
<ul style="list-style-type: none"> • Area • Shoreline position • Elevation 	<ul style="list-style-type: none"> • Width (beach, dune, island) • Classification of hardbottom and submerged habitats • Position of hardbottom and submerged habitats • Substratum type • Relief • Sediment distribution within hardbottom habitats • Persistence or exposure of hardbottom habitats • Habitat connectivity • Wave height/energy/attenuation • Velocity and patterns • Sediment budget and transport patterns • Frequency and extent of overtopping and overwash

Table E.5.2. Performance monitoring parameters and additional parameters for consideration for projects with specific restoration objectives. These would be collected in addition to the parameters listed in Table E.5.1.

Project-specific objective	Objective-specific performance monitoring parameters	Parameters for consideration (as appropriate)
Stabilize marsh and/or shoreline by promoting establishment of beach, dune, and back-barrier marsh vegetation	<ul style="list-style-type: none"> • Vegetation density or vegetation percent cover • Vegetation species composition 	<ul style="list-style-type: none"> • Survival/mortality • Height

Project-specific objective	Objective-specific performance monitoring parameters	Parameters for consideration (as appropriate)
Reduce sediment loss and erosion and/or reduce adverse human impacts	<ul style="list-style-type: none"> Structural integrity and function of constructed features 	<ul style="list-style-type: none"> Extent of shoreline armoring Sediment depth data, texture, type, and consolidation rate Number of protected habitat sites Sediment budget and transport patterns Visitor use and access Vegetation density Vegetation percent cover Vegetation species composition Species density/abundance Species utilization
Living coastal marine resource or T&E Species habitat, utilization, foraging, nesting, or recovery	<ul style="list-style-type: none"> Bird (or targeted injured species) abundance/density Bird (or targeted injured) species composition 	<ul style="list-style-type: none"> Bird nest density Bird habitat utilization Bird nest success Nekton diversity and/or abundance Benthic abundance, biomass, diversity Targeted injured species abundance/density Targeted injured species utilization Hardbottom mapping Dissolved oxygen Turbidity Salinity (surface water) Sediment depth data, texture, type, and consolidation rate
Enhance recreational use	<ul style="list-style-type: none"> See Enhance Public Access to Natural Resources for Recreational Use Monitoring Guidance (Section E.11 of Attachment E of this manual) for core and objective-specific performance monitoring parameters 	<ul style="list-style-type: none"> See Enhance Public Access to Natural Resources for Recreational Use Monitoring Guidance (Section E.11 of Attachment E of this manual) for core and objective-specific performance monitoring parameters

References

DWH NRDA Trustees. 2016a. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS). Available: <http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan>.

DWH NRDA Trustees. 2016b. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill. Originally approved May 4, 2016; revised November 15, 2016.

Harwell, M.A., J.H. Gentile, L.D. McKinney, J.W. Tunnell Jr., W.C. Dennison, and R.H. Kelsey. 2016. A New Framework for the Gulf of Mexico EcoHealth Metrics. Available: <http://www.harterresearchinstitute.org/sites/default/files/resources/Framework%20for%20the%20Gulf%20EcoHealth%20Metric.pdf>.