

H-6: MONITORING AND ADAPTIVE MANAGEMENT PLAN FOR DEEPWATER HORIZON NRDA PROJECT

Stewardship of Coastal Alabama Beach Nesting Bird Habitat

1. PROJECT OVERVIEW

The Gulf Coast region supports a diversity of coastal bird species throughout the year, as nesting grounds during the summer, as a stopover for migrating species in the spring and fall, and as winter foraging and sheltering habitat for numerous species that breed elsewhere.

This project would expand on existing work in coastal Alabama by reducing human disturbance to and predation of nests and chicks of coastal nesting bird species injured by the DWH oil spill, thereby potentially increasing productivity of those species. These techniques have been identified by the DWH Trustees in the Strategic Framework for Bird Restoration Activities (DWH NRDA Trustees, 2017a). This proposed three-year project would complement the work of similar initiatives in the Gulf of Mexico in Florida, Mississippi, Louisiana, and Texas. ADCNR would be the implementing Trustee; USDOJ would be a collaborating agency.

The program would consist of five components that would work together to reduce stressors that affect coastal bird populations and provide information to support future restoration decision-making. Specific activities and target locations may vary from year to year based on a number of factors including, but not limited to: where nesting occurs, where evidence of stressors is detected, what management activities are most successful at each area, and where project implementers are able to gain access (some nesting areas may be located on private property and will require authorization from landowners to access). Proposed initial target project areas and restoration actions are listed in Table 3.

a. Conduct stewardship activities to reduce human disturbances that contribute to nest failure.

Human disturbance is of particular concern for beach nesting birds in coastal Alabama because of the popularity of Alabama's beaches for recreational activities. This disturbance often leads to seasonal nest or colony abandonment in local areas, resulting in egg loss and chick mortality. Reducing anthropogenic disturbance at important nesting areas can support success (Burger et al., 2004; DWH Trustees 2016a; Larson et al., 2016; McGowan and Simons, 2006; Molina and Erwin, 2006; Pruner et al., 2011). A primary element of the proposed program would involve reducing human disturbance in target nesting areas to improve local productivity. Species that would benefit from this project include the least tern (*Sternula antillarum*), black skimmer (*Rynchops niger*), snowy plover (*Charadrius nivosus*), and Wilson's plover (*Charadrius wilsonia*). Project implementers would install symbolic (temporary post and rope) and/or exclusionary fencing around nesting areas prior to the start of the nesting season to reduce human ingress and disturbance. While on site, implementers may also work to educate and guide beachgoers away from sensitive nesting areas. Implementers could also engage the public by providing opportunities to observe birds from a safe distance using viewing scopes into nesting areas for the public to observe adults incubating eggs and/or feeding small, flightless chicks from a safe distance. These activities would serve to encourage protective behavior by the public, further reducing disturbance.

b. Conduct targeted, coordinated predator management activities. Site-specific predator management strategies can help increase bird productivity where predators are among the primary causes of nest or fledgling mortality (Greer et al., 1988; Saalfield et al., 2011). The City of Orange Beach, for example, is currently implementing a predator management strategy on islands in Perdido Bay focused on the management of red fox and coyote, and BSNWR is planning coyote

removal from targeted units at strategic times to facilitate beach nesting bird production. This project would coordinate with these activities to help refine beach nesting bird predator management activities. Funding would support continued predator management efforts at BSNWR and in the City of Orange Beach and begin predator management activities on Dauphin Island and/or other sites where needed.

- c. **Conduct monitoring in support of adaptive management at project sites to determine nesting and fledging success.** Monitoring critical nesting sites, assessing nest success, and determining breeding densities provides insight into the status of Alabama breeding populations for the above-referenced species, all of which are listed as Alabama Species of Conservation Concern (ADCNR 2015). Nesting activity and evidence of predator activity would be monitored following Pruner et al. (2011) or another appropriate method that facilitates consistent data collection across similar projects in the Gulf region. In addition to bird numbers and breeding productivity, monitoring would also quantify and assess the number of acres treated with fencing, education, predator reduction; quantify and assess habitat quality, degree of predator activity, extent of human disturbance, and number of people reached with outreach and education activities. These data would help inform Trustees' understanding of coastal ecosystem health and the extent of human-induced threats. Project implementers would coordinate routinely to discuss adaptive management of posted areas (e.g., shifting or expanding a posted area).
- d. **Deploy decoys.** Species-specific decoys would be deployed to attract target bird species to suitable nesting areas (e.g., lower risk of human disturbance or predation and that contain natural cover and forage access for adults and chicks). In some cases, species are nesting in areas of high human traffic or predation, which increases the likelihood of nest failure. Deploying decoys to areas that are not currently used for nesting, but are deemed suitable habitat, would potentially encourage target species to use habitat that experiences reduced stressors associated with nest or fledgling mortality. Decisions regarding specific deployment locations would be made in coordination with ADCNR and USDO I experts prior to implementation.
- e. **Conduct habitat and nesting area enhancements.** The City of Orange Beach actively manages a number of islands in the Perdido area for bird species, including least tern, black skimmer, and great blue heron. The project would increase the size of a current least tern nesting area by removing vegetation and installing/distributing shell hash. Vegetation plantings are also proposed and would include a variety of native trees and shrubs and coastal dune grasses on Robinson and Walker Islands. The project would also repair/replace signage and perch posts as needed in Submerged Aquatic Vegetation (SAV) beds to deter boat traffic in areas that serve as foraging habitat for birds.

1.1 Restoration Type Goals and Project Restoration Objectives

- **Programmatic Goal:** Replenish and protect living coastal and marine resources.
- **Restoration Type:** Birds
- **Restoration Type Goal:** Restore lost birds by facilitating additional production and/or reduced mortality of injured bird species.
- **Restoration Approaches:** Establish or re-establish breeding colonies. Protect and conserve marine, coastal, estuarine and riparian habitats.
- **Restoration Technique(s):** Use decoys to attract breeding adults to potential breeding sites. Develop and implement management actions in conservation areas and/or restoration projects. Conduct stewardship activities to address anthropogenic stress.

Objective 1: Reduce anthropogenic disturbances to colonial beach nesting birds and solitary beach nesting birds.

Objective 2. Reduce threats to birds from mammalian predators.

Objective 3. Conduct habitat enhancements in nesting areas.

Objective 4. Monitor nesting and fledging success at select sites.

1.2 Conceptual Setting and Anticipated Outcomes

A conceptual model forms the basis of this monitoring plan, and includes a summary of the project activities, the expected product or output of those activities and the desired project outcome. The purpose of the conceptual setting within a Monitoring and Adaptive Management (MAM) Plan is to identify, document and communicate interactions and linkages among system components at the project site and to understand how these system components may be affected by associated restoration actions.

Table 1: Conceptual Model

Activity	Output	Short-term outcome	Long-term outcomes
Install symbolic fencing and conduct outreach at select nesting areas	Deter human disturbance and educate visitors	Reduce anthropogenic disturbance	<ul style="list-style-type: none"> Enhanced bird reproductive success Enhanced habitat quality and availability for target bird species Enhanced bird forage base Enhanced bird diversity Improved resiliency and sustainability of coastal habitat
Conduct predator management activities at select nesting sites	Remove predators	Reduce stress/mortality to nests/young/adults	
Monitor nesting and fledging success at select sites.	New information to understand potential benefits of restoration actions and inform future restoration decision-making	Increase knowledge of the most effective restoration techniques for beach nesting birds	
Apply alternative site attraction	Deploy decoys deployed to selected suitable habitats	Attract birds to nest in more suitable habitats	
Prepare sites with suitable vegetation/shell hash, install signage, and deploy decoys.	Habitat enhancements are completed	Enhanced habitat quality/quantity	

1.3 Sources of Uncertainty

Drivers are outside forces, natural or anthropogenic, that have the potential to influence the outcomes of a restoration project (DWH Trustees 2017: Section E.6.3). 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).

When evaluating the proposed project, the following outside drivers and stressors were considered:

- Sea level rise
- Catastrophic weather
- Human disturbance
- Predators

This list should not be considered exhaustive; additional drivers may be identified as the project is implemented and/or monitored. These drivers may affect the achievement of the restoration goals and objectives of the project. For example, if the intensity and frequency of hurricanes increase in the region, or if there is an increase in the rate of sea level rise, nesting areas could be impacted. The target species for this project are highly vulnerable to disturbance because they commonly forage and nest in areas that are also highly utilized by humans, and are located in areas that are susceptible to weather disturbance events such as hurricanes (Enwright et al., 2017). If any drivers and/or stressors are negatively impacting the project, adaptive management may be necessary to ensure the project's goals and objectives are being achieved. The adaptive management strategy for the project is outlined below.

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. The following are example uncertainties that may be applicable to this project. This list should not be considered exhaustive; additional uncertainties may be identified as many uncertainties exist around bird responses to various restoration techniques (NAS 2017).

- Land use changes
- Whether people respond positively to stewardship efforts to reduce disturbance
- Frequency of high intensity overwash or nest site flooding
- Short-and long-term fate of natural and/or placed material
- Natural variability in ecological and physical processes, such as wave-driven transport or vegetation growth, and in the associated habitat responses
- Effect of predator management on nesting success

2. PROJECT MONITORING, PERFORMANCE CRITERIA, POTENTIAL CORRECTIVE ACTIONS AND MONITORING SCHEDULE

The proposed monitoring plan for this restoration project was developed to evaluate project performance, key uncertainties, and identify potential corrective actions, if needed. For each of the monitoring parameters identified below, information is provided on the intended purpose of each monitoring parameter (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. This section also describes applicable

performance criteria and potential corrective actions for project parameters associated with project objectives. The decision-making process requires a structured approach for incorporating new information gained from monitoring and evaluation. As specified in the NRDA regulations, performance criteria are used to determine restoration success or the need for corrective action (15 CFR 990.55(b)(1)(vii)). However, unanticipated consequences, previously unknown conditions or unanticipated environmental drivers uncovered during the evaluation step may also determine the need for corrective actions. The decision to implement a corrective action will holistically consider the overall outcomes of the restoration project by assessing the results of all monitoring parameters compiled in the evaluation step.

The monitoring parameters below are directly related to assessing the performance of the proposed project activities, which include predator management, active stewardship, decoy deployment and habitat enhancements.

The ALTIG is taking an adaptive approach to this project in order to maximize benefits over time. The ALTIG has preliminarily identified a number of potential target locations based on previous nesting data compiled under the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund- funded Alabama Coastal Bird Stewardship Program (ALCBSP) (Table 3). These sites as well as the potential activities may change in Year 1 and in subsequent years depending on where target species are nesting and what management activities are determined to be most effective at a particular location. ADCNR, DOI and the selected contractor implementing the project will meet annually prior to nesting season to determine target locations and actions. In the event birds are not present in a previously identified location, new locations will be identified. In addition to site locations varying from year to year, monitoring frequency for parameters will also vary based on priority locations. For example, monitoring nests on an island may be conducted less frequently than a site that is more easily accessed. Additional parameters will be collected on standardized data sheets as part of the project; these data sheets will be appended to the MAM Plan when available. This MAM Plan will be updated on a yearly basis to reflect additional information as it is available prior to the start of nesting season. Standardized data sheets will be developed to conduct monitoring for parameters identified below.

2.1 Monitoring Parameters

Objectives	Parameter	Purpose	Method	Timing, Frequency, Duration	Performance Criteria	Potential Corrective Action(s)
1: Reduce anthropogenic disturbances to colonial beach nesting birds and solitary beach nesting birds.	Symbolic fencing and outreach	Monitor progress toward meeting the restoration objective.	Record # acres fenced; Record # hours/people contacted and type of outreach	Monthly for the duration of the project	No human encroachment into fenced areas	Reevaluate efficacy of treatment methods to advise future efforts (e.g. add additional fencing/outreach).
2: Address threats to birds from mammalian predators.	Prevalence of predators	Monitor progress toward meeting the restoration objective.	Visual observation of predators (photos, tracks, scat) and depredation (eggs, nests, birds)	Areas checked mornings approx. biweekly during nesting season for duration of project	Annual decreases in prevalence of predators over course of project	Reevaluate methods and results to advise future efforts.

Objectives	Parameter	Purpose	Method	Timing, Frequency, Duration	Performance Criteria	Potential Corrective Action(s)
3: Conduct habitat enhancements in nesting areas.	Vegetation % survival; Area	Monitor progress toward meeting the restoration objective.	Calculate percent survival or any planted vegetation; Calculate area of enhanced habitat through vegetation enhancements, shell hash placed and/or decoys	Baseline, then yearly for three years	Increase in habitat area and/or quality	Reevaluate methods and results to advise future efforts.
4: Conduct monitoring at select nest sites	Bird densities	Monitor progress toward meeting the restoration objective.	Visual count methods by age class as outline in FSA breeding bird protocol	Once/week throughout nesting season	Annual use of sites by breeding shorebirds	Reevaluate methods and results to advise future efforts.

Table 2: Monitoring Schedule

Monitoring Parameter	Objective(s)	Pre-Execution Monitoring	As-Built (year 0)	Project Monitoring (Years 1-3)
MONITORING PARAMETERS APPLICABLE TO ALL SITES				
Parameter 1: Symbolic fencing and outreach	1,4			X
Parameter 2: Prevalence of predators	2			X
Parameter 3: Vegetation % survival	3	X	X	X
Parameter 4: Area	3		X	X
Parameter 5: Bird densities	1,2,3,4			X

3. ADAPTIVE MANAGEMENT

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed

outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer & Llewellyn 2000). Although adaptive management is a critical component of the restoration plan as a whole, the need for adaptive management may vary on a project-by-project basis. Some projects may be well understood and not have uncertainties which warrant adaptive management. The monitoring and adaptive management framework may be more robust for elements of the restoration plan with high degrees of uncertainty or where numerous restoration projects are planned within a given geographic area and/or for the benefit of a particular resource (DWH NRDA Trustees 2016a, Appendix 5.E.1). Under OPA NRDA regulations, restoration projects clearly identify performance criteria that would be used to determine project success or the need for corrective action. Adaptive management should not be used for projects where learning is unlikely, where decisions are irreversible, or where no opportunity exists to revise or reevaluate decisions based on new information (Doremus et al. 2011).

This alternative has a high likelihood of improving the protection of coastal habitats that are critically important to the nesting success and reproduction of four bird species injured by the DWH oil spill. The proposed stewardship, habitat, and nesting area enhancement approaches have already been demonstrated to be effective along the Gulf Coast and around the country (Burger et al., 2004; Johnson, 2016). Predator control and management programs are a widely used tool for increasing nest success for beach nesting birds and have been implemented by federal Trustee agencies along the Gulf coast (DWH Trustees, 2013; Florida Trustee Implementation Group [FL TIG], 2019). Decoy programs of the type proposed as part of this alternative have been demonstrated effective for establishing new nesting sites for beach nesting birds (Kotliar and Burger, 1984). The Trustees anticipate the alternative's overall likelihood of success would be further improved by implementing the monitoring and adaptive management component to provide essential data for further targeting the stewardship and predator management activities over the 3-year life of the initiative.

The ALTIG is taking an adaptive approach to this project in order to maximize benefits over time. See Section 2 above for more information on this approach. The ALTIG has preliminarily identified a number of potential target locations based on previous nesting data compiled under the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund- funded Alabama Coastal Bird Stewardship Program (ALCBSP) (Table 3). These sites as well as the potential activities may change in Year 1 and in subsequent years depending on where target species are nesting and what management activities are determined to be most effective at a particular location. See Section 2 above for more information related to how the ALTIG will adaptively manage the project.

Table 3: Potential Project Areas, Activities, and Species

Potential Areas	Potential Activities	Potential Species
Tern Island Pelican Island <ul style="list-style-type: none"> • Marsh Island • Coffee Island • Cat Island^a • Alabama Point • BSNWR • Gulf State Park • Dauphin Island West End^a • Lower Perdido Islands • Additional/other sites to be determined 	<ul style="list-style-type: none"> • Erect signage • Install symbolic and/or exclusionary fencing; • Provide active stewardship to reduce human and predator disturbance; • Conduct predator management; and Install shell hash and/or plantings to encourage nesting; • Other activities as appropriate. 	<ul style="list-style-type: none"> • Black skimmer • American oystercatcher • Least tern • Reddish egret • Brown pelican • Least tern • Snowy plover • Wilson’s plover • Great blue heron • Other species as appropriate

^a This property is currently under private ownership and would require consent and cooperation from the landowner for access. In the event that appropriate access cannot be obtained for this property, these activities would be redirected to another appropriate location if possible.

4. EVALUATION

Evaluation of monitoring data is needed to assess the performance of the project in meeting its restoration objectives, resolving uncertainties to increase understanding, and determine whether corrective actions are needed. As part of the larger decision-making context beyond the project scale, the evaluation of monitoring data from the individual projects would be compiled and assessed at the Restoration Type and TIG level, and the results would be used to update the knowledge base to inform decisions such as future TIG project prioritization and selection, implementation techniques, and the identification of critical uncertainties. The results of the analysis would be used to answer the following questions:

- Were the project objectives achieved? If not, is there a reason why they were not met?
- Did project activities undertaken produce unanticipated effects?
- Were there unanticipated events unrelated to the project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified?
- In areas where predator management activities were implemented, did nesting success increase, if nest fate was ascertained?

- Did the number of disturbance events change over time as stewardship actions were implemented?

These questions will be answered and compiled in annual monitoring reports for the project and revision to the MAM plan will be made if needed.

5. DATA MANAGEMENT

5.1 Data Description

All data collected will follow the data standards as per the MAM Manual 1.0 (DWH NRDA Trustees 2017). To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hardcopy datasheets and notebooks and photographs will be retained by the Implementing Trustee. Relevant project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Electronic data files will be named with the date on which the file was created and will include a ReadMe file that describes when the file was created and by whom, and any explanatory notes on the file contents. If a data file is revised, a new copy will be made and the original preserved.

5.2 Data Review and Clearance

After transcription of the data, a second person not associated with data transcription will perform a verification of the data in the electronic data sheets against the original hardcopy datasheets and/or notebooks and would make any corrections to transcription errors as appropriate before data are used for any analyses or distributed outside the agency. Implementing Trustees will verify and validate monitoring data and information and ensure that all data are entered or converted into agreed upon/commonly used digital format labeled with metadata. All data will undergo proper QA/QC protocols, be reviewed and verified following the process outlined in Section 3 of the MAM Manual Version 1.0. Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred.

5.3 Data Storage and Accessibility

Once all data have been verified by quality assurance/quality control procedures, they will be submitted to the DIVER Restoration Portal. Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than one year from when data are collected.

5.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred. Some data collected may be protected from public disclosure under federal and state law (e.g., personally identifiable information under the Privacy Act or observer information collected under Magnuson–Stevens Fishery Conservation and Management Act (MSFCMA), etc.) and

therefore will not be publicly distributed. Data will be formatted in accordance with machine-readable acceptable formats, per the Evidence Based Policy Making Act (Public Law 115-435).

6. REPORTING

Annual MAM reports describing results of project monitoring and evaluation will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface. A final MAM report for the project will be developed prior to project closeout and submitted to the DIVER Restoration Portal.

7. ROLES AND RESPONSIBILITIES

ADCNR is the Implementing Trustee agency for this project and will ensure that the project is completed and implemented. ADCNR will be responsible for monitoring progress of towards each parameter and will provide regular reports documenting the progress and results of each parameter. Reports provided by Third Party Contractor and the City of Orange Beach will be qualitative and quantitative and will be in a format which is easily interpreted and transcribed into DIVER at least annually and in accordance with Section 5, above.

DOI will consult.

ADCNR, the Third-Party Contractor and DOI will collaboratively develop priority locations and activities for work to be conducted on an annual basis, prior to nesting season.

The Trustee Council facilitates consistency in monitoring and data management procedures to evaluate and report on progress towards meeting restoration goals articulated in the PDARP/PEIS.

8. REFERENCES

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9. MAM PLAN REVISION HISTORY

Old File Name	Revision Date	Changes Made	Reason for Change	New File Name