Monitoring Plan for Deepwater Horizon NRDA Phase 1 Early Restoration Project

Mississippi Artificial Reef Habitat Project

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NOTE: This monitoring plan was developed for the Mississippi Department of Environmental Quality's (MDEQ) *Deepwater Horizon* early restoration artificial reef enhancement project with the primary goal to offset injury to reef secondary production.

Introduction and Project Overview

The Mississippi Artificial Reef Habitat project deployed nearshore artificial reefs in the Mississippi Sound. Nearshore artificial reefs provide valuable hard bottom habitat with foraging and shelter sites for various species of larvae and sessile epifauna and infauna. There are 67 existing nearshore artificial reef areas that are each approximately 3 acres in size. Approximately half of these existing reef areas have a low profile and consist of crushed concrete or limestone. With the Mississippi Artificial Reef Habitat project, approximately 100 acres of crushed limestone was added to existing reef areas or hard substrate habitats indicated in Figure 1. The resulting artificial reefs consist of low profile reefs 4 to 6 inches above the seafloor.

Figure 1. Mississippi Nearshore Reef locations

Restoration Objectives and Performance Criteria

The goal of the project was to create artificial reefs to support secondary production. The specific objectives were to 1) Create or enhance existing nearshore artificial reefs (Figure 1) that are sustained for the expected lifespan of the project; and 2) Promote habitat utilization of reefs by mobile and sessile invertebrate infauna and epifauna.

Performance criteria will be used to determine restoration success.

- At year 1 and 2, the biomass of the non-bivalve epifauna and infauna on the reef should be at least 84g ww/m^2.
- Reefs are deployed as designed in designated areas (as-built)

Monitoring Framework

Monitoring Category	Monitoring Timeframe		
	Pre-Construction Monitoring	**Construction Monitoring**	**Post-Construction Monitoring**
Performance Monitoring: Evaluate effectiveness of the project in meeting the established restoration objectives and assist in determining the need for corrective actions.	Parameters for Objective 1:	Parameters for Objective 1: Artificial reef structural integrity	Parameters for Objective 1: • Artificial reef structural integrity Parameters for Objective 2: • Secondary Productivity
	Timing/Frequency:	Timing/Frequency: Within 90 days following construction	Timing/Frequency: • Artificial reef structural integrity – opportune • Secondary productivity – once a year for Years 1&2
	Location: Proposed restoration sites	Location: Restoration sites	Location: Restoration sites
Additional Monitoring (optional, project-specific):			Example parameters: Water temperature, salinity
			Timing/Frequency: During biological sampling
			Location: Restoration site

Conceptual Model and Monitoring Questions

Conceptual Model

Activity	Output	Short-term outcome	Long-term outcome
• Construct artificial reefs	• 100 acres of additional reef materials in permitted reef locations	• mobile and sessile invertebrate infauna and epifauna colonize	• Artificial reefs support a diverse benthic community • Artificial reefs are sustained for the expected lifespan of the project

Monitoring Questions

- Were the artificial reef structures built as designed?
- Are mobile and sessile invertebrate infauna and epifauna colonizing and being maintained on the reef structures?

Project Monitoring

Objective #1: Create or enhance artificial reefs that are sustained for the expected lifespan of the project

Parameter #1: Structural integrity of reef structure

a) Method: Conduct visual observations and poling from boat.
b) Timing and Frequency: Post-construction; Opportune observations along the reef structure during biological sampling events
c) Sample Size: N/A
d) Site: all enhanced sites for as-built and 4 monitoring sites
e) Performance Criterion: Reefs are deployed as designed in designated areas (as-built).

Objective #2: Promote habitat utilization of artificial reefs by mobile and sessile invertebrate infauna and epifauna

Parameter #1: Non-bivalve infauna and epifauna invertebrate species composition, density (individuals/m^2), biomass (ww and/or AFDW)

a) Method: Deploy substrate baskets and/or trays along the reef structure (Eggleston et al., 1998; Gregalis et al., 2009; Baggett et al., 2013). Baskets/trays shall remain in place for at least one month before collection (Baggett et al., 2013). Following collection, identify (at lowest taxonomic group possible), count, and weigh (wet weight) all species within the baskets/trays. Report density and biomass on a square meter basis.
b) Timing and Frequency: Post-construction (once a year for Years 1&2)
c) Sample Size: Four (4) sites would be sampled in western strata of the Mississippi Sound.
d) Sites: One "site" will include up to six (6) replicate substrate baskets and up to four (4) replicate settlement trays.
e) Performance Criterion: At year 1 and 2, the biomass of the non-bivalve epifauna and infauna on the reef should be at least 84g ww/m^2

Additional Monitoring

Water temperature, salinity

a) Method: Determine water temperature and salinity using appropriate instrumentation (e.g., YSI water quality sonde).
b) Timing and Frequency: During biological sampling events.

Monitoring Schedule

	Construction	2014	2015
Structural integrity	Fall 2012 and Spring 2013	x	x
Biological Monitoring		x	x
Water quality Monitoring		x	x

Reporting and Data Requirements

Contractor Reporting

- *Event report:* Brief report at the end of each monitoring event that includes a summary of the data collected in the field as well as copies of the data sheets and relevant photographs.
- *Annual Report:* Report combining all monitoring and sample processing activities in the respective year in one document. Standard operating procedures are also provided
- *Final Report:* Final report will provide an analysis of the project. The report shall contain all data for secondary production including but not limited to monitoring planning, execution, field data sheets, photographs, electronic files, GIS/GPS data, and analysis of monitoring data for each episode.

Quality Assurance

The Trustees have developed QA/QC guidance for the Early Restoration Projects which dictates the minimum requirements QA/QC clearance and release. This is described in the Trustee approved document, "**Data QA/QC, Clearance, and Release Steps".**
The Goals of the document are to:

- Ensure the quality, utility, and integrity of information disseminated by trustees
- Develop procedures that are efficient, easy to use, and result in easily accessible data

Given the large amount of monitoring data that will be generated over the next few years, following agreed upon data QA/QC, clearance, and release procedures will help the trustees:

- Ensure the quality, utility, and integrity of monitoring data
- Organize, track, locate, and access monitoring data over the long-term
- Share QA/QCed monitoring data with the public in a consistent and comprehensible format
- Meet stipulation requirements and respond to data requests by BP in a uniform and efficient manner

Furthermore, all Early Restoration Projects in Mississippi are subject to the formal Quality Management Program developed by Mississippi Department of Environmental Quality (MDEQ 2014). This program dictates that all data collection and monitoring efforts be performed under a project specific Quality Assurance Project Plan (QAPP). To meet this requirement,

Mississippi DEQ has developed a Comprehensive Quality Assurance Plan (CompQAP) for all of its early restoration projects (MDEQ 2015). Quality Assurance procedures for this monitoring plan, all field methods and associated data collection, recording and storage efforts are included in the CompQAP.

References

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