Monitoring Plan for Deepwater Horizon NRDA Phase 1 Early Restoration Project

Mississippi Oyster Cultch Restoration Project

Prepared by Mississippi Department of Environmental Quality

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

Introduction and Project Overview

For over a hundred years shell/cultch plants in Mississippi have proven to be successful in growing new and harvestable oysters in the Mississippi Sound. The Mississippi Oyster Cultch Restoration project restored and enhanced oyster cultch within the existing footprint of the oyster harvest areas of the Mississippi Sound that cover approximately 12,000 acres. Oyster cultch plant areas are routinely surveyed to identify potential enhancement and restoration opportunities.

This project restored and enhanced approximately 1,430 acres of the oyster cultch areas of the Mississippi Sound (Figure 1). Cultch material (oyster shell and limestone) were deployed at a rate of 100 cubic yards per acre with adjustments for site conditions as needed. More than 140,000 cubic yards of material were deployed for this project.

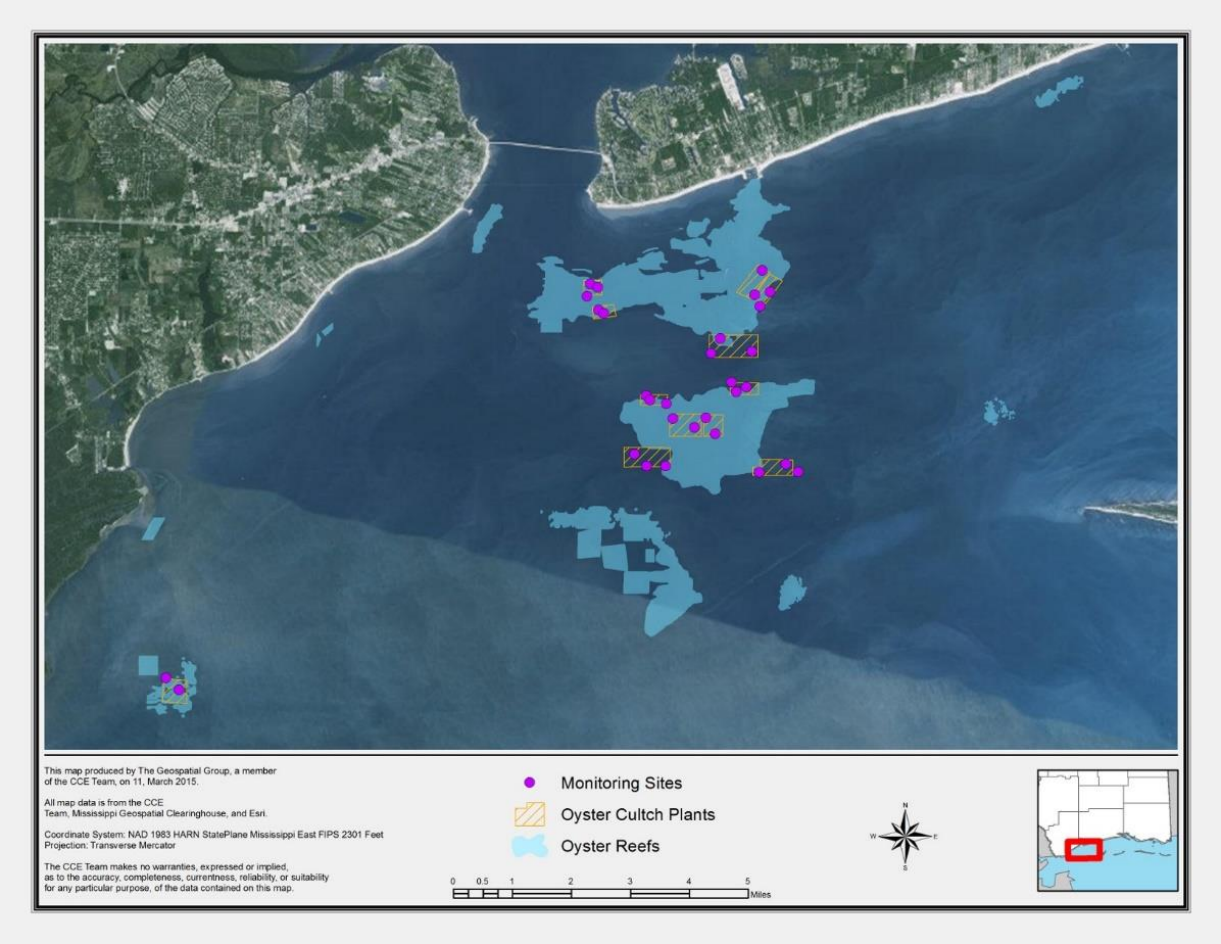

Figure 1. Mississippi's oyster reef areas, cultch plants area, and oyster monitoring sites.

Restoration Objectives and Performance Criteria

The overall goal for this project was to restore 1,430 acres of oyster cultch areas to produce oysters suitable for commercial or recreational use. The specific restoration objectives and performance criteria for this goal are the following:

1) Enhance 1,430 acres of oyster cultch areas that are sustained for the project lifespan
    a. Performance Criterion: At post-deployment, year 3, and year 7, acreage of spatial extent of cultch plants equivalent to 1430 acres
2) Promote oyster settlement and growth
    a. Performance Criterion: At year 3, 5, and 7 the density of oysters is equal to or greater than 4 adult oysters per square meter
3) Promote habitat utilization of reefs by invertebrate epifauna and infauna (supplemental)
    a. Performance Criterion (supplemental): Over 7 years, the average non-bivalve invertebrate infauna and epifauna biomass is at least 84g ww/m^2

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: • Oyster cultch area	Parameters for Objective 1: • Oyster cultch area	Parameters for Objective 1: • Oyster cultch area Parameters for Objective 2: • Oyster density (oysters/m^2), size distribution, and settlement Parameter for Objective 3: • Biomass (supplemental)
	Timing/Frequency: Once before construction begins	Timing/Frequency: Within 90 days following construction	Timing/Frequency: • Oyster cultch area: Years 3 and 7 • Oyster Density: 2 times a year for Years 1,3,5,7 (Dredge tows); once a year for Years 1,3,5,7 (quadrat sampling) • Biomass – 7 monitoring events within 7 years
	Location: Proposed restoration site	Location: Restoration site	Location: Restoration site
Additional Monitoring (optional, project-specific):			Example parameters: • Water temperature and salinity
			Timing/Frequency: During biological sampling
			Location: Restoration site

Conceptual Model and Monitoring Questions

Conceptual Model

Activity	Output	Short- and Mid-term outcomes
• Place cultch material on oyster seed grounds	• 1430 acres of oyster cultch areas are enhanced	• Oyster cultch area maintains the projected spatial extent for the lifespan of the project • Oysters settle and grow to a size suitable for commercial or recreational use

Monitoring questions

- Was the oyster cultch area built as designed?
- Is the oyster cultch area maintaining the projected spatial extent for the expected project lifespan?
- Are oysters settling and growing to a size suitable for commercial or recreational use?

Project Monitoring

Objective #1: Enhance 1,430 acres of oyster cultch areas that are sustained for the project lifespan

<u>Parameter #1: Spatial extent of oyster cultch areas</u>

a) Method: Conduct side-scan sonar surveys of the cultch areas with transects covering the entire project site.
b) Timing and Frequency: Pre-deployment (once); Post-deployment (Year 0, 3, and 7).
c) Sample Size: entire deployment area
d) Sites: Restoration site designated at selected MDMR Cultch Plant Sites (Figure 1).
e) Performance Criteria: At post-deployment, year 3, and year 7, acreage of spatial extent of cultch plants equivalent to approximately 1430 acres
f) Corrective Action: Add suitable cultch material to cultch areas

Objective #2: Promote oyster settlement and growth

Parameter #1: Oyster density (oysters/m^2), size distribution, and spat settlement

a) Method 1: Identify and count oysters (live spat/juveniles <25mm, live adults 26-74mm, live harvestable-sized adults >75mm, and total dead oysters (recent dead and past dead) using the MDMR Oyster Sampling Standard Operating Procedures (e.g., quadrat sampling). Analyze for size frequency distribution (shell height; mm) of live oysters.
   Method 2: Dredge surveys of Cultch area, as per MDMR Standards.
b) Timing and Frequency:
   a. Method 1 - SCUBA surveys of square-meter areas once per year within 12 to 24 months after each deployment event in the respective cultched area, as well as in Years 3, 5 and 7 for all cultched areas after the last deployment event. The survey should be done concurrently with one of the biannual 1-minute dredge tow surveys.
   b. Method 2- 1-minute dredge tows bi-annually (i.e., within 12 to 24 months after each deployment event in the respective cultched area), as well as in Years 3, 5 and 7 for all cultched areas after the last deployment event.
c) Sample Size: According to MDMR Standards as identified in Scope of Work.
   a. Method 1- During each SCUBA survey, at least 30 sites will be monitored throughout deployment locations.
   b. Method 2 - During each survey, at least 30 tows will be conducted in deployment areas.
d) Sites: Randomly chosen within cultch sites; station locations during the surveys over 7 years shall ideally remain the same to be able to evaluate changes from year to year.
e) Performance Criteria: At year 3, 5, and 7 the density of oysters is equal to or greater than 4 adult oysters per square meter
f) Corrective action: add suitable cultch material to existing cultch areas

Objective #3: Promote habitat utilization of reefs by invertebrate infauna and epifauna (supplemental)

Parameter #1: Non-bivalve invertebrate epifauna and infauna 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-deployment (7 monitoring events)

c) Sample Size: One "site" would include up to six (6) replicate substrate baskets and up to four (4) replicate settlement trays.
d) Sites: Nine sites would be sampled in restored oyster harvest areas. In addition, three sites will be monitored as a control (non-restored).
e) Performance Criteria (Supplemental): Over 7 years, the average non-bivalve invertebrate infauna and epifauna biomass is at least 84g ww/m^2
f) Corrective action: add suitable cultch material to existing cultch areas

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

Monitoring Event	2012	2013	2014	2015	2016	2017	2018	2020
Deployment	X	X	X					
Spatial Extent Survey – Side-scan	X Pre	X Post			X Post			X Post
Biological Monitoring-Quadrats (4 events)			May & June		May & June		May & June	May & June
Biological Monitoring – Dredge Tows – (8 events)			May &Oct		May &Oct		May &Oct	May &Oct
Biological Monitoring – Non-bivalve invertebrate infauna and epifauna (7 total events)			May/ June & August/ Oct	May/ June & August/ Oct		May/ June & August /Oct	May/ June	

Note: Number of monitoring events will remain the same but the timing of the events is subject to change if field conditions require a modification.

Reporting and Data Requirements

Contractor Reporting

Side Scan

Contractor will prepare a brief report after each side scan sonar survey. Each report shall include a summary of side scan sonar planning and execution including (but not limited to) electronic copies of post processed mosaics and hard copies of mosaics. Data shall be interpreted, describing the state of the clutched areas. Each report shall relate the newly acquired findings to findings obtained in previous surveys. The Year 7 report shall be prepared as a final report.

Biological Monitoring – quadrats and dredge tows

- *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 activities in the respective year in one document. This report may also relate the biological assessment findings to the findings of the side scan sonar survey if conducted during that year.
- *Final Report:* Final report in Year 7 that will provide an analysis of the project. The report shall contain all data of oyster metrics including planning and execution including but not limited to field data sheets, photographs, electronic files, GIS/GPS data, analysis, monitoring reports for each episode, annual reports and the final annual report. The interpretation of the data in this report shall also incorporate the key findings of the side scan sonar surveys conducted throughout the monitoring period.

Biological Monitoring – biomass

- *Event report:* Within thirty (30) days of completion of each monitoring activity, contractor shall submit a brief report that includes a summary of the data collected in the field, copies of the data sheets, and all relevant photographs.
- *Annual Report:* If at least one monitoring activity occurs during a calendar year, then on or before January 31st of the following year, contractor shall submit a report to MDEQ combining all monitoring and sample processing activities in the respective year in one document.
- *Final Report:* Within sixty (60) days of completion of all monitoring activities the contractor will submit a final report to MDEQ that will provide an overall analysis of the Project. The final 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 comprehendible 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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