Deepwater Horizon Open Ocean Trustee Implementation Group

MONITORING AND ADAPTIVE MANAGEMENT ACTIVITIES IMPLEMENTATION PLAN: INFORMING GULF STURGEON POPULATION STATUS AND TRENDS AS A BASELINE TO EVALUATE RESTORATION

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1 Introduction

The Deepwater Horizon (DWH) oil spill settlement in 2016 provides the Natural Resource Damage Assessment (NRDA) Trustees (Trustees) $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. 2016a), 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. 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 NRDA 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 Trustees also established a governance structure that assigned a Trustee Implementation Group (TIG) to each of the eight designated Restoration Areas, including the Open Ocean Restoration Area. Each TIG makes restoration decisions for the funding allocated to its Restoration Area and is also responsible for identifying MAM priorities for its respective TIG. The Open Ocean TIG includes the four federal Trustee agencies: the National Oceanic and Atmospheric Administration (NOAA); U.S. Department of the Interior (DOI); U.S. Department of Agriculture (USDA); and U.S. Environmental Protection Agency (EPA). It is responsible for restoring the natural resources and services within the Open Ocean Restoration Area that were injured by the DWH oil spill and associated spill response efforts.

The DWH Trustees opened a publicly available Administrative Record for the DWH NRDA , including restoration planning activities, concurrently with publication of the 2010 Notice of Intent (pursuant to 15 CFR § 990.45). DOI is the lead federal Trustee for maintaining the Administrative Record, which can be found at http://www.doi.gov/deepwaterhorizon/adminrecord. This administrative record is used by the Open Ocean TIG to provide the public with information about DWH restoration planning, including MAM activities. Additional information is also provided at http://www.gulfspillrestoration.noaa.gov. Information about restoration projects and MAM activities, including data and/or analyses produced and annual reports, are made publicly available via the Data Integration Visualization Exploration and Reporting portal (DIVER), available at https://www.diver.orr.noaa.gov/web/guest/home.

2 Document Purpose

The Open Ocean TIG MAM Strategy (see http://www.gulfspillrestoration.noaa.gov), released in May 2019, describes the TIG's approach to MAM, responsibilities, and goals for the use of the Open Ocean Restoration Area MAM allocation. It also describes the TIG's process to develop and release MAM Activities. MAM activities are projects or other MAM efforts (e.g., monitoring, modeling, data collection, research) developed to address identified MAM priorities. MAM priorities are the knowledge gaps or information needs that, if addressed, would help the Trustees successfully implement Gulf restoration.

This MAM Activities Implementation Plan (MAIP) describes the MAM activity, "*Informing Gulf sturgeon population status and trends as a baseline to evaluate restoration*" to address MAM priorities preliminarily identified by the Open Ocean TIG for the Sturgeon Restoration Type. This MAM activity is intended to support evaluation of regional restoration outcomes within the Open Ocean Restoration Area; perform data aggregation and data management; resolve critical information gaps and uncertainties for restoration planning and informing restoration decision-making; and perform monitoring to inform the design and implementation of future restoration projects. This document provides information about the activities to be implemented and the data gaps and uncertainties they will address. It also describes its applicability to the Open Ocean MAM Strategy and consistency with the programmatic alternative selected by the Trustees in the PDARP/PEIS.

3 MAM Activity Overview: Informing Gulf Sturgeon Population Status and Trends as a Baseline to Evaluate Restoration

The Open Ocean TIG initiated the process of identifying potential MAM needs while developing its first and second restoration plans (see Gulf Spill Restoration Open Ocean Restoration Area) and while developing the Open Ocean MAM Strategy. Public input was solicited during the 2017 call for restoration project ideas. In addition, the Trustees solicited input from stakeholders and experts from the Trustee agencies, academia, conservation groups, and related industries. Based on this input, the Open Ocean TIG developed this MAIP to address MAM priorities for the Sturgeon Restoration Type to inform restoration planning, evaluation, and adaptive management.

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a fish that inhabits coastal and estuarine waters in the northern Gulf of Mexico and rivers from the Pearl River in Louisiana to the Suwannee River in Florida. After spending the first 2 to 3 years in the river in which it hatched, Gulf sturgeon becomes anadromous, spending fall and winter in the Gulf of Mexico and spring and summer in the rivers where it spawns. The Gulf sturgeon is listed as threatened under the federal Endangered Species Act (56 Federal Register [FR] 49653), and critical habitat has been designated (68 FR 13370). The focused assessment of potential injuries to Gulf sturgeon conducted by the DWH Trustees found that between 1,100 and 3,600 Gulf sturgeon were potentially exposed to DWH oil in the nearshore areas of the northern Gulf of Mexico. Since large numbers of Gulf sturgeon from most river populations were potentially exposed to DWH oil, an important number of these federally protected species was affected. Although a direct kill of Gulf sturgeon from the oil was not observed, the Trustees found evidence of

physiological injury, including exposure biomarkers for DNA damage and immunosuppression, to exposed Gulf sturgeon compared with Gulf sturgeon that were not exposed to the oil. Considering the protected status of Gulf sturgeon, the DWH Trustees decided to focus restoration on approaches that are consistent with those identified in the federal Gulf Sturgeon Recovery Plan (USFWS & GSMFC 1995). Therefore, the restoration approaches identified in the PDARP/PEIS emphasize spawning habitat and reproductive success.

3.1 Activity Description

3.1.1 Background

The Gulf Sturgeon Recovery Plan suggests the use of population models to assess restoration and management options for Gulf sturgeon, identify future research needs, and forecast time to population recovery (Section 1.3.2; USFWS and GSMFC 1995). Progress has been made on this task in a variety of ways. Capture-recapture models have been used to assess population status for Gulf sturgeon in several individual rivers (USFWS and NMFS 2009) and one stock assessment has been conducted to estimate trends in abundance, mortality, and recruitment (Pine and Martell 2009). Other efforts have estimated carrying capacity using stock-reduction methods (Ahrens and Pine 2014), and large-scale telemetry efforts continue to estimate natural mortality (Rudd et al. 2014). These models have partially leveraged efforts by the Gulf Sturgeon Partnership, an informal team of Federal, State, Local Agencies, Universities, NGOs, volunteers, interns, students, researchers, regulators, managers, biologists, and citizen scientists actively participating in collecting data to support Gulf sturgeon recovery.

Pine and Martell (2009) developed a stock assessment report using a similar process to the NOAA Southeast Data Assessment and Review (SEDAR) process, using available data up to 2005. The key outcome from this assessment was the determination that long-term demographic data sufficient for completing assessment efforts were only available for the Apalachicola and Suwannee rivers. Analyses of these data (mostly from passive tagging programs) revealed divergent trends in future Gulf sturgeon stock status depending on model structure used because of confounding parameter estimates between capture probability and survival in the tagging data. This led to a joint NOAA-USFWS effort to estimate mortality using telemetry tags over a 5-year period (2010-2015). Using data from 2010-2011, Rudd et al. (2014) presented estimates of adult mortality for, and transition probabilities between, each of the key Gulf sturgeon river systems. However, following the DWH oil spill, data from other years were no longer available for use as tag detections of telemetered fish were sequestered during litigation. These data, along with data collected as part of the NRDA response across the Gulf of Mexico, are now available for analyses. Substantial work remains to assimilate the decades of information collected by the Gulf Sturgeon Research Partnership into a common currency for assessment. At the same time, limited work has been done to integrate this information to develop models to forecast Gulf sturgeon populations to inform decision making related to restoration actions. These pieces of information are critical needs for planning, implementing, and evaluating restoration.

3.1.2 Objectives

Section 5.5.7.1 of the PDARP/PEIS states that to address impacts to sturgeon, restoration goals will focus on improving access to spawning areas and increasing reproductive success of Gulf sturgeon. Consistent with these goals, the objectives of this MAM activity are to assess Gulf sturgeon stock status and population viability to inform restoration priorities and develop a standardized data collection and storage program to evaluate Gulf sturgeon population responses to restoration actions.

3.1.3 Task 1: Assess Gulf sturgeon stock status and population viability

Task 1a. Review and compile available Gulf sturgeon capture-recapture information since the 2009 assessment and develop a unified database of Gulf sturgeon data to establish a baseline for river, region, and Gulfwide populations to evaluate restoration. This task builds upon earlier funded efforts from NOAA, USFWS, and volunteer efforts to compile these data. The 2009 stock assessment included data for the Suwannee and Apalachicola river systems through 2007, and since that time substantial field sampling efforts have occurred related to the NOAA-USFWS funded telemetry project, the NRDA injury assessment, and annual tagging efforts by members of the Gulf Sturgeon Partnership. In addition, episodic natural and anthropogenic events that could affect Gulf sturgeon recovery have occurred during this period (i.e., hurricanes, drought, and oil spill).

Task 1b. Use available tagging and life-history data to build a series of age-structured mark-recapture (ASMR) models to estimate Gulf sturgeon abundance for each river system and potential management unit in the Gulf of Mexico. These models will initially build on the ASMR (Coggins et al. 2006) structure used in Pine and Martell (2009) to estimate age and/or life-stage specific trends in survival. These, or similar models will also be used to evaluate the overall rate of population change (λ) for different rivers or management units of interest (see Pine et al. 2013 for Gulf sturgeon example from Suwannee River).

Task 1c. Develop an individual-based population viability analysis (PVA) model (females only) to evaluate "what-if" scenarios related to the viability of Gulf sturgeon populations. The model structure for the PVA model has already been developed and used to evaluate management options for humpback chub *Gila cypha*, a long-lived highly migratory species from the Colorado River (Pine et al. 2013), and a preliminary Gulf sturgeon model has also been developed and presented at a 2017 Gulf Sturgeon Workshop. The PVA will address various restoration scenarios. This information will provide a better understanding of extinction risk for each of the seven Gulf sturgeon populations and address concerns that the potentially increasing frequency of episodic mortality events may be a limiting factor for Gulf sturgeon recovery.

Task 1 will provide key information for prioritizing river systems in which to direct restoration efforts to reduce risk of population declines (e.g., negative lambda values from ASMR and/or high extinction probabilities from the PVA), and meet requirements for assessing species status and trends as detailed in the Gulf Sturgeon Recovery Plan (USFWS and GSMFC 1995).

3.1.4 Task 2: Develop a standardized data collection and storage program for Gulf sturgeon

Assessing Gulf sturgeon recovery and responses to management and restoration actions as well as future perturbations requires data collection, sharing, archiving, and analyses activities across each of the Gulf of Mexico basin states from multiple state, federal, and academic cooperators. In this data-based activity, an electronic data entry (electronic logbook) and improved data management system will be implemented, utilizing the Gulf Sturgeon Encounter History Database. These efforts will facilitate data collection, improve data accuracy and archiving, and increase data sharing opportunities among members of the Gulf sturgeon working group. These tools will improve ongoing assessment efforts and increase efficiencies between field efforts and decision-making. For example, Gulf sturgeon demonstrate high site fidelity to natal rivers, and many proposed management actions for this species are directed at enhancing access to spawning habitat through increasing fish passage past migratory barriers or creating new spawning habitat. To assess the effectiveness of restoration actions, a "Before-After-Control-Impact" (BACI) statistical design is recommended (Green 1979). This requires monitoring the targeted river basin before and after restoration action along with comparisons to river basins in which no actions are taken. In absence of this framework, it is difficult to statistically demonstrate that the restoration action had the desired effect or determine if any observed response was due to other factors. Task 2 will be comprised of the following actions:

Task 2a. Work with academic and private industry partners to cooperatively develop a standardized data collection and storage program for Gulf sturgeon. Because of limited funding for Gulf sturgeon research, field collection efforts have not been widely updated since the 1990's, leaving a patchwork of strategies and equipment for conducting research to assess species status and trends across the Gulf of Mexico. Under this task, methods and equipment used by agency and academic cooperators of the Gulf sturgeon partnership will be standardized, enabling the use of a common platform for tagging Gulf sturgeon to continue 20+ years of mark-recapture efforts to inform population status and trends. This includes tags, tag readers, and electronic logbooks to capture information from ongoing capture-recapture programs. Data collected will be used to assess population responses to restoration actions. Standardization of equipment and methods will increase efficiency and accuracy in data collection by modernizing equipment and data collection practices by reducing transcription errors and missing data fields, and will facilitate evaluations of stock status and population viability at the regional and Gulf-wide scale.

Task 2b. Working with partners and following data management policies (DOI: https://www.fws.gov/southeast/data-management/; NOAA: https://nosc.noaa.gov/EDMC/nao_212-15.php), training will be provided to Gulf sturgeon cooperators in using electronic logbook systems and integrating these data with the Gulf sturgeon database.

Task 2c. Logbook information will be linked to the database developed in Task 1 via a standardized set of tabular and graphical summaries that capture ongoing field efforts and population status (i.e., size structure, marking rate, ratios of marked:unmarked fish captured). These data summaries will allow simple comparisons across each river where field efforts are ongoing. By design, these efforts will be available in near real-time to resource managers as data are collected, allowing much easier comparisons and assessments by resource managers of ongoing field efforts.

3.2 Activity implementation description

This MAM activity is designed to leverage the operational resources that exist within the Gulf Sturgeon Partnership including office space and technology support. These resources were recently marshalled in support of the multi-year, NRDA Gulf Sturgeon Injury Assessment, a study that was completed only through the contributions of multiple (6+) partner agencies and institutions. This partnership remains strong and convenes annually to exchange ideas and plan recovery activities. This activity is also intended to enhance and expand the Gulf sturgeon data management system funded in 2017 and 2018 to compile existing data from field data collection efforts from the mid-1990's to 2013.

Acquiring and outfitting equipment to update Gulf sturgeon data collection efforts, developing the electronic logbook program and the database will be the first part of implementation. Equipment includes passive integrated transponder (PIT) tags, tag readers, implanting devices, field rugged tablets, communications equipment, storage boxes, and shipping costs for moving equipment between labs. This activity will support three positions for four years to conduct data analyses, assist with implementing new data collection methods into existing field programs by providing training on new tablets and data loggers (already permitted for this work), and assist in developing common metrics for monitoring Gulf sturgeon populations across each river system. This activity will also assist with training Gulf sturgeon researchers on the use of the electronic logbook system and update the research partnership at the annual Gulf Sturgeon Workshop.

This activity will provide electronic log-book software and database development as well as an updated stock-assessment model (within a year following data compilation). Previously developed log-book programs will be used, then these systems will be adapted for use with Gulf sturgeon. This approach is more cost efficient than developing a novel log-book program for Gulf sturgeon.

In summary, Task 1 will provide information for prioritizing direct restoration efforts that will reduce risk of population declines and also meet requirements for assessing species status and trends as detailed in the 1995 Gulf Sturgeon Recovery Plan. Task 2 will implement a standardized Gulf-wide data capture, storage, archiving, and analyses framework that will enhance feedback loops for evaluating Gulf Sturgeon population responses to restoration actions under the PDARP/PEIS.

This project is not funding fieldwork directly, but is providing data tools and equipment to enhance current data collection efforts, therefore no regulatory permits or consultations are needed.

3.2.1 Budget

The total estimated budget for this activity is $910,000.

3.2.2 Timeline

This MAM activity is anticipated to take four years to complete (October 2019 – September 2023) with Task 1 and Task 2 implemented concurrently.

3.2.3 Roles of Implementation Partners

The following trustee partners will implement specific tasks associated with each of the major activity components.

Activity Components	Description	Trustee/Agency Lead	Expected Timeline
Assess Gulf sturgeon stock status and population viability	Existing data review, model development, and population viability analyses.	NOAA & DOI / USGS	Years 1-4
Develop standardized data collection and storage program	Develop standardized data collection methods, obtain PIT tags and readers, and acquire data storage.	NOAA & DOI / USGS	Years 1-3
Activity Management, Administration, and Oversight	Activity planning, tracking, oversight, and reporting.	NOAA	Years 1-4

3.2.4 Data management and reporting

A data management plan will be developed in conjunction with development of the database, including data documentation standards, quality assurance and quality control procedures, and long-term maintenance and data archiving policies, that are consistent with the guidance provided in the Monitoring and Adaptive Management Procedures and Guidelines Manual (DWH NRDA Trustees 2017) and the Trustee Standard Operating Procedures (DWH NRDA Trustees 2016b).

Annual reports will be submitted to DWH DIVER Portal. Annual reports will also be presented at Gulf Sturgeon workshops. A summary report that synthesizes the findings will be prepared by the project principal investigators/coordinators, in addition to peer-reviewed manuscripts, a completed database that could be used as a model for other protected species, and graduate theses and/or dissertations. Inferences and recommendations regarding priorities for Gulf sturgeon restoration and recovery will be the focus of the final summary report.

4 Open Ocean MAM Strategy Goals Addressed

This MAM activity addresses the Open Ocean MAM strategy goals to evaluate the outcomes of the Open Ocean restoration efforts across the portfolio of Open Ocean projects, including evaluating benefits to Restoration Types, such as Gulf sturgeon; and to identify the benefits and outcomes from Open Ocean restoration activities to Gulf sturgeon. The analyses and models produced by this activity will provide key information for prioritizing river systems in which to direct restoration efforts to increase Gulf

sturgeon reproductive success and to test the theoretical effectiveness of potential restoration actions. The data that will continue to be gathered and managed by this program will also be instrumental to estimating the benefits of the restoration actions undertaken to Gulf sturgeon.

5 Consistency of MAM Activity with the PDARP/PEIS

The PDARP/PEIS establishes goals to restore and protect Gulf sturgeon by improving access to spawning areas and by increasing their reproductive success. This activity is designed to address information gaps and critical uncertainties regarding the abundance and rates of population change of Gulf sturgeon by developing age-structured population models, an individual-based population viability model, and a database of comprehensive data needed to parameterize the models. It will also improve collection efficiency and accuracy for fishery data used in the models. The models are intended, in part, to be used to plan and evaluate the collective performance of projects implemented under all of the restoration approaches described in the PDARP/PEIS (Section 5.5.7.2 and Appendix 5.D) by estimating changes in Gulf sturgeon reproductive success, as reflected in estimated survival rates of early life stages. This is also consistent with PDARP/PEIS Section 5.5.7.4, which identifies the estimation of trends in juvenile Gulf sturgeon abundance as a critical information gap. Evaluating the performance of Gulf sturgeon restoration projects collectively is anticipated to assist in determining the need for adaptive management to fully meet Gulf Sturgeon restoration goals as described in PDARP/PEIS § 5.5.7.4. Therefore, this MAM activity is consistent with the PDARP/PEIS, including the Monitoring and Adaptive Management Framework, as described in Section 5.5.15.2.

6 National Environmental Policy Act (NEPA) Review

The Trustees' approach to compliance with NEPA summarized in this section is consistent with, and follows where applicable from the PDARP/PEIS Section 6.14.4. Resources considered and impacts 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 Open Ocean TIG's compliance with NEPA (40 CFR s 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.

6.1 NEPA Review of MAM Activity: Informing Gulf sturgeon population status and trends as a baseline to evaluate restoration

Available Gulf sturgeon capture-recapture information collected since 2009 will be compiled in a unified database. The data will be used to build a series of age-structured mark-recapture models to estimate Gulf sturgeon abundance and rate of population change for each river system and potential management unit of interest in the Gulf of Mexico. An individual-based population viability model will also be developed to assess the 5-year and 50-year probabilities of extinction for a range of population sizes drawn from the 5-year status review, and to examine the resilience of Gulf sturgeon populations to episodic mortality events. In addition, a standardized collection and management program for Gulf sturgeon data will be developed, including implementation of an electronic logbook system that would also be linked to the unified database, providing near real-time availability of the data to decision-makers.

Consistent with the impacts considered in the PDARP/PEIS Section 6.4.14, all components of this activity are data-based, including review and compilation of data into a unified database, development of models and standardization of methods, training in use of electronic logbook systems. None of the activities will result in impacts to the environment. The data gathered will lead to beneficial impacts to biological resources through increased understanding of juvenile distribution and usage of physical areas monitored in this study.

6.2 NEPA Conclusion

After review of the proposed activities against those actions previously evaluated in the PDARP/PEIS, the Open Ocean 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.

7 Compliance with Other Environmental Laws and Regulations

The Open Ocean TIG has completed technical assistance with the appropriate regulatory agencies for this activity. Due to the nature of the activity, which consists of data analysis and purchase of equipment with no proposed field activities, permits and consultations are not required. Other activities proposed under Open Ocean 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 this 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. The Implementing Trustees will keep a record of compliance documents (e.g., Endangered Species Act biological opinions, U.S. Army Corps of Engineers permits) and ensure that they are submitted for inclusion in the Administrative Record. The current status of environmental compliance by project can be viewed at any time on the Trustee Council's website: http://www.gulfspillrestoration.noaa.gov/environmental-compliance/

8 References

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