Deepwater Horizon Open Ocean Trustee Implementation Group

MONITORING AND ADAPTIVE MANAGEMENT ACTIVITIES IMPLEMENTATION PLAN: JUVENILE GULF STURGEON – GULF-WIDE POPULATION DYNAMICS AND HABITAT USE

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Document Purpose

The *Open Ocean Trustee Implementation Group Monitoring and Adaptive Management Strategy* (see Gulf Spill Restoration Open Ocean Restoration Area), released in May 2019, describes the approach to Monitoring and Adaptive Management (MAM), responsibilities, and goals for the use of the Open Ocean Restoration Area MAM allocation. It also describes the process used by the Open Ocean Trustee Implementation Group (TIG) 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, "*Juvenile Gulf Sturgeon-Gulf-wide Population Dynamics and Habitat Use*" 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. This MAM activity is consistent with the OO TIG MAM Strategy and the DWH Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP/PEIS).

MAM Activity Overview

Gulf of Mexico Sturgeon *Acipenser oxyrinchus desotoi* "Gulf Sturgeon" was federally listed under the US Endangered Species Act in 1991 by NOAA and USFWS (56FR 49653). Current management units for Gulf Sturgeon include seven river systems and adjacent estuarine and marine habitats across the northern Gulf of Mexico from the Pearl River in Louisiana to the Suwannee River in Florida. Based on PDARP/PEIS review (section 5.5.7) large numbers of Gulf Sturgeon were exposed to Deepwater Horizon oil, and these fish were affected by exposure. 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.

Effective Gulf Sturgeon restoration requires a better understanding of baseline status and conditions, an ability to identify and prioritize habitats most in need of restoration, and a framework for monitoring the results of restoration in an adaptive management context. We intend to address these needs through this activity by studying juvenile Gulf Sturgeon habitat use and preference in estuaries in the Northern Gulf of Mexico (NGOM). Estuaries serve as important foraging habitat for juvenile Gulf Sturgeon in winter, yet little is known about the patterns of habitat use within the estuary, or the preference for habitats such as oyster reefs, seagrass beds, or mud flats. This information is critical for determining effective strategies for estuarine restoration to benefit Gulf Sturgeon. Furthermore,

recruitment, growth, and survival patterns of juvenile Gulf Sturgeon are poorly understood, yet this information is necessary to identify population and system-based priorities for restoration, and to quantify the success of Gulf-wide restoration efforts.

As restoration projects (for Gulf Sturgeon or other purposes) are implemented in the future, annual assessment of juvenile Gulf Sturgeon cohorts will be important to evaluate the effectiveness of the restoration efforts. Data collected through this activity, prior to active restoration efforts (e.g., fish passage), will provide a baseline of "pre-restoration" recruitment levels that will facilitate the quantitative assessment of restoration effectiveness. Because many environmental variables (flow regime, temperature regime, etc.) likely interact to affect annual recruitment, evaluation of those effects requires several years of baseline monitoring prior to system manipulation.

This activity is crucial to developing a science-driven, adaptive management framework for Gulf Sturgeon restoration. Successful completion of this activity will fill data gaps that currently impede or preclude our ability to plan strategic habitat restoration for the species as a whole. By conducting this investigation across all seven populations and systems simultaneously, and in standardized fashion, we will quantify the patterns of coarse-scale habitat use by juvenile sturgeon in estuarine and marine environments, and establish the baseline for juvenile recruitment, growth and survival, overall population size, and effective spawning cohort size. These results will enable an unprecedented, comparative analysis that will provide insights to restoration that are system-, population-, and habitat-specific. The effects of future restoration actions will be directly assessed relative to the baseline conditions established during this activity to determine outcomes and efficacy. Ultimately, this should be the goal of any adaptive management approach to ecosystem restoration conducted to benefit the Gulf Sturgeon. Further, the knowledge of habitat use will help Federal regulatory agencies when evaluating the myriad of projects proposed within the estuarine/marine footprint of Gulf Sturgeon Critical Habitat.

- **Objectives**: This activity will (1) identify important estuarine habitats and (2) establish baseline metrics to inform restoration prioritization and evaluate restoration success for juvenile Gulf Sturgeon (GS).
- **Scope**: This activity involves a 3-year assessment of the estuarine habitat use patterns by juvenile GS, and trends in juvenile sturgeon recruitment, growth, survival, genetics and kinship across the following occupied systems: (1) Pearl, (2) Pascagoula, (3) Escambia, (4) Yellow, (5) Choctawhatchee, (6) Apalachicola, and (7) Suwannee (Figure 1).
- **Duration**: 4 Years (3 years activity, 1 year closeout)
- **Total Budget**: $2,054,000
- **Implementing Trustee and Partners:**
    - The Department of the Interior (DOI) is the lead Implementing Trustee. DOI will provide technical and administrative oversight and lead the coordination of all activities.

- NOAA is the co-Implementing Trustee and will provide technical review, assist with coordination, and will provide field assistance during implementation of the work in the Suwannee River system.
- Partner Implementation Teams, including academic institutions, will conduct the field and laboratory activities in each of the aquatic systems.

Schedule

This activity is organized into the following major elements:

- Management, Administration, Coordination and Oversight
- Juvenile Sturgeon Sampling
- Telemetry Monitoring
- Fish Aging
- Data Analyses
- Genetics Analyses

Table 1. Implementation Schedule

Major Element	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**
Management, Administration, Oversight	**X**	**X**	**X**	**X**
Juvenile Sturgeon Sampling	**X**	**X**	**X**	
Telemetry Monitoring	**X**	**X**	**X**	
Fish Aging	**X**	**X**	**X**	
Data Analyses		**X**	**X**	**X**
Genetics Analyses		**X**	**X**	

Roles of Implementation Partners

The team described above will implement specific tasks associated with each of the major elements. This section describes the activities associated with the major elements and the entities responsible for each activity.

Table 2. Activity Roles and Responsibilities

Activities by Major Element	DOI	NOAA	Implementation Teams
Management, Administration, and Oversight			
Develop & Maintain Management Plan	X	X	
Prepare Technical Proposals and Budgets	X		X
Develop and Execute Cooperative Agreements	X		X
Planning, Coordination, and Protocol Development	X	X	X
Data management and DIVER reporting	X		
Juvenile Sturgeon Sampling			
Fish capture, tagging, measuring, tissue sampling	X	X	X
Telemetry Monitoring			
Array design	X	X	X
Array deployment			X
Annual array maintenance			X
Fish Aging			
Fin ray preparation and reading	X		X
Data Analyses			
Analysis of fish capture and telemetry data sets	X	X	X
Genetics Analyses			
Analysis of tissue samples, generation of metrics			X

Management, Administration, and Oversight

Roles: DOI, NOAA, and Implementation Teams

Description: Activity planning and coordination (e.g., telemetry array design), and development of standard protocols for field work, will be conducted prior to the launch of the activity and within year 1 of the activity. This work will involve DOI, NOAA, and the Implementation Teams, and will be conducted during in-person workshops, and via teleconferences and webinars. Regular oversight of implementation will be conducted during the entire duration of the activity by DOI and NOAA using field and laboratory visits and excursions, and regular teleconferences to ensure that the deliverables are being met on schedule and in timely fashion. DOI, in coordination with NOAA, will submit information to the DWH DIVER Portal for annual reporting.

Juvenile Sturgeon Sampling and Tagging

Roles: Implementation Teams, with oversight and assistance from DOI and NOAA

Description: Annual recruitment of age-1 GS (i.e., cohort abundance) will be assessed using traditional tagging approaches and subsequent mark-recapture data modeling (see Data Analyses).

Implementation Teams, with assistance from DOI and NOAA will conduct field data collection efforts targeting juvenile Gulf Sturgeon. Juvenile sturgeon will be captured using anchored gill nets fished in riverine holding areas. All fish captured will be fitted with a passive integrated transponder (or PIT) tag that uniquely identifies each individual. All fish captured will be weighed and measured. In addition, fin ray samples will be obtained from all juvenile sturgeon for aging purposes. Standard methods for fish collection, handling, and data collection and storage will be employed by all of the Implementation Teams involved in the activity. Standard methods of data collection will be consistent with those required for the Informing Gulf Sturgeon Population Status and Trends as a Baseline to Evaluate Restoration MAM Activity to ensure maximum utility of the collected data. DOI and NOAA staff will play a major role in coordinating the activities of the Implementation Teams, and will also oversee and assist with field data collection to the extent possible.

Telemetry Monitoring

Roles: Implementation Teams, with oversight and assistance from DOI and NOAA

Description: During Juvenile Sturgeon Sampling activities, Implementation Teams will outfit juvenile sturgeon with VEMCO ® acoustic transmitters, surgically implanted into the abdominal cavity of each fish. These acoustic tags will enable the active and passive detection of fish in each study system. Implementation Teams will deploy an array of passive acoustic telemetry receivers in the estuary of each study system that will record information on the timing and movements of juvenile fish during the Fall-Winter-Spring periods. Standard methods for fish collection and surgical tagging will be employed by all of the Implementation Teams involved. DOI and NOAA staff will play a major role in training and coordinating the activities of the Implementation Teams, but will also oversee and assist with field data collection to the extent possible. The information collected by the passive telemetry arrays will be analyzed (see Data Analyses) to describe the spatiotemporal patterns of estuarine habitat use by juvenile sturgeon in each system.

Fish Aging

Roles: Implementation Teams, with oversight and guidance from DOI

Description: Select members of the Implementation Teams will process and read the fin ray samples obtained from juvenile sturgeon. Processing involves cross-sectioning the fin ray samples, mounting and polishing the thin ray section, and then reading the structure under the microscope. This work in necessary to assign fish to a corresponding age class, and this assignment is essential to subsequent analyses of fish capture data during cohort abundance estimation. Training and guidance on the process of fish aging will be provided by DOI.

Data Analyses

Roles: Implementation Teams, with oversight and guidance from DOI and NOAA

Description: Select members of the Implementation Teams with skills and experience analyzing the types of data sets generated by the activity will accomplish this task. Data analyses will fall into the

following categories: cohort abundance, age and growth, over-winter survival, and estuarine habitat use patterns. Standard methods of data collection will be consistent with those required for the Information Gulf Sturgeon Population Status and Trends as a Baseline to Evaluate Restoration MAM Activity to ensure maximum utility of the collected data. We anticipate several graduate students and their academic research advisors from the Implementation Teams, and staff from DOI and NOAA to collaborate on this task. Federal agency staff will coordinate the analytical efforts to ensure that results are comparable both within and across study systems.

Genetics Analyses

Roles: Implementation Teams, with oversight and guidance from DOI and NOAA

Description: During Juvenile Sturgeon Sampling, small fin clips will be collected for genetic analyses. One of the Implementation Teams will be involved with processing and analyzing the genetic material collected during the activity. Using established methods, the effective number of spawning adults that contributed to the next generation will be quantified. This metric- the number of "effective breeders"- measures the impact of changes in genetic frequencies in a cohort, which can be influenced by variance in reproductive success among parents and environmental impacts on recruitment. Monitoring this metric over time will help evaluate the success of restoration activities such as fish passage projects.

Data Management and Reporting

A data management plan will be developed 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).

DOI, in coordination with NOAA, will submit annual reports to the publically available DWH DIVER Portal. DOI, in coordination with NOAA and the implementation teams, will prepare a final summary report synthesizing the findings of the Activity, including inferences and recommendations regarding priorities for Gulf sturgeon restoration and recovery.

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. Effective Gulf Sturgeon restoration requires a better understanding of baseline status and conditions, an ability to identify and prioritize habitats most in need of restoration, and a framework for monitoring the results of restoration in an adaptive management context. This activity is designed to address these information gaps and critical uncertainties by studying juvenile Gulf Sturgeon habitat use and preference in estuaries in the Northern Gulf of Mexico (NGOM). Estuaries serve as important foraging habitat for juvenile Gulf Sturgeon in winter, yet little is known about the patterns of habitat use within the estuary, or the preference for

habitats such as oyster reefs, seagrass beds, or mud flats. This information is critical for determining effective strategies for estuarine restoration to benefit Gulf Sturgeon.

This is 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. 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.

Open Ocean MAM Strategy Goals Addressed

This MAM activity addresses the Open Ocean MAM strategy goal to Identify and fill data gaps that affect the Open Ocean TIG's ability to meet and/or evaluate progress toward restoration goals for Open Ocean resources. Recruitment, growth, and survival patterns of juvenile Gulf Sturgeon are poorly understood, yet this information is necessary to identify population and system-based priorities for restoration, and to quantify the success of Gulf-wide restoration efforts. This activity is crucial to developing a science-driven, adaptive management framework for Gulf Sturgeon restoration. Successful completion of this activity will fill data gaps that currently impede or preclude our ability to plan strategic habitat restoration for the species as a whole. Results of this activity will enable an unprecedented, comparative analysis that will provide insights to restoration that are system-, population-, and habitat-specific.

National Environmental Policy Act Review

Consistent with the impacts considered in the PDARP/PEIS, this activity would include minimally intrusive field activities as well as preliminary restoration planning and data-based activities. Temporary impacts to the biological and physical environment could include short-term, temporary disturbance of habitats and species; and minor disturbance to terrestrial, estuarine, and marine environments through the placement of telemetry instrumentation at field sites. Analysis of the data collected, planning meetings, and preparation of reports are data-based components of this activity. Consistent with the analysis in Section 6.4.14 of the PDARP/PEIS, environmental consequences would be direct, short-term, minor impacts through the associated field work. The data gathered would lead to beneficial effects to biological resources through increased understanding of juvenile distribution and usage of physical areas monitored in this study.

Field-based tasks will also include scientific collection (capture using small and large mesh gill nets, handling, fin ray sampling, fin clip collection, tagging with acoustic transmitters and PIT tags, and release) of live juvenile Gulf sturgeon necessary to collect biometric information and transmit telemetry data to instrumentation at established field sites. Data collection by this means requires federal and state permits for actions involving threatened and endangered species. USFWS adheres to existing state permits for sturgeon field activities. Based on 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 fall within the range of impacts described in Section 6.4.14 of the PDARP/PEIS, thus no additional NEPA evaluation is necessary.

Compliance with Other Environmental Laws and Regulations

The Open Ocean TIG will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to this MAM activity, including technical assistance from appropriate regulatory agencies. The Open Ocean TIG is currently engaged in technical assistance with regulatory agencies.

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 the 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.

Documentation of regulatory compliance will be available in the Administrative Record that can be found at the DOI's Online Administrative Record repository for the DWH NRDA (https://www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: http://www.gulfspillrestoration.noaa.gov/environmental-compliance/.