Restoration Planning Activity Implementation Plan

Title: Conducting habitat suitability analyses to identify optimal oyster restoration locations along Florida's Gulf coast

Need: This restoration planning activity will address critical data gaps to oyster restoration in Florida by assessing habitat suitability for oysters (*Crassostrea virginica*) in multiple basins along the Gulf coast, therefore greatly increasing the success of future oyster restoration efforts in Florida.

Summary: The PDARP/PEIS indicates that successful oyster restoration will require careful planning of restoration site placement and that suitability and availability of larvae for recruitment will need to be considered when restoration projects are sited (PDARP/PEIS Section 5.5.9.3). The Oyster Strategic Framework notes several key considerations for oyster restoration; namely, selection of restoration sites which have suitable habitat parameters to sustain oyster growth as well as proximity to other oyster reefs and ability to serve as spawning reefs. In Florida, there is currently not enough information on suitable locations for oyster restoration projects. Therefore, this restoration planning activity will develop oyster habitat suitability indices for six basins along the Gulf coast which will provide critical information on the most suitable restoration sites and sequencing of NRDA implementation activities. Maps of suitable oyster habitat will be developed and available to the public through the FWC website. These maps and indices will also help guide future oyster restoration efforts in other areas along the Gulf coast of Florida and throughout Florida. The duration of the activity is five years and will involve 1) data compilation, 2) benthic mapping, 3) oyster reef monitoring, and 4) development of a GIS-based habitat suitability index (HSI) maps for six study sites in Florida: Pensacola Bay and St. Andrew Bay in the Panhandle region, Suwannee Sound and the Withlacoochee/ Crystal River area in the North Peninsular region, and Tampa Bay and Charlotte Harbor in the South Peninsular region (Figure 1).

Implementing Trustee: Florida Fish and Wildlife Conservation Commission (FWC)

Period of Performance: 5 years

Cost: $2,802,812, which includes implementation, indirect costs, and contingency.

Description of Work:

Task 1: Data Compilation

- **Description:** Existing water quality and oyster data from cooperating agencies (e.g., The Nature Conservancy, University of Florida, Coastal & Heartland National Estuary Partnership) will be compiled to analyze historic trends in environmental conditions and oyster population health, abundance, and distribution. Additionally, every attempt will be made to contact and collaborate with agencies or organizations that have ongoing or recent applicable monitoring efforts at any of the six study sites. Compiled data will also be used to adapt and revise the benthic mapping (Task 2) and oyster reef assessment and monitoring plan (Task 3) for each site to address specific data gaps.

- **Equipment/material needed:** Computers, office supplies
- **Deliverable:** A submitted report will serve as documentation of completion of this task and will summarize data compiled for all six study sites as well as the updated mapping and monitoring plan for each site.
- **Schedule:** The data compilation task will be completed in the first six months.

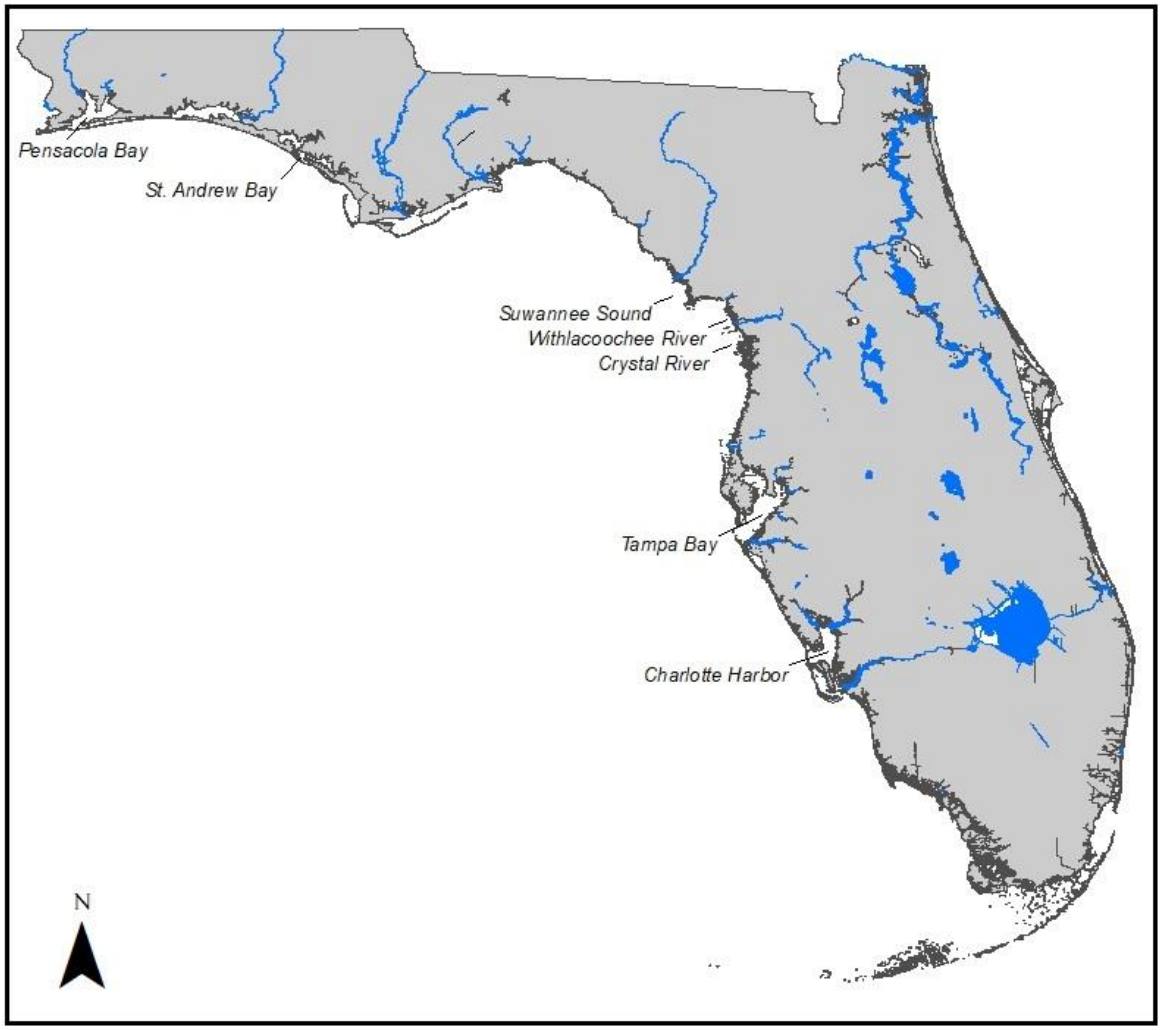

Figure 1. Locations of the six study sites in Florida.

Task 2: Benthic Mapping

- **Description:** The data compiled from Task 1, specifically the historic trends in environmental conditions, oyster population health, abundance, and distribution will be used to develop a landscape of available oyster habitat in each region (Figure 1) that we will then use to identify locations/areas for initial qualitative surveys to quickly ground truth. The initial qualitative surveys will be conducted by poling or probing from a boat to determine general benthic composition (e.g., mud, sand, shell, or rock) at subtidal and intertidal locations in all six study sites. Results from these coarse assessments will be used to provide guidance for targeted acoustic mapping at subtidal locations and for aerial/satellite imagery gathered for intertidal locations in all six study sites. Acoustic mapping using side-scan sonar

or a shallow-water interferometric multibeam system will be conducted at the targeted areas (Grizzle et al 2017). Ground-truthing of acoustically mapped subtidal reefs will be completed by visual assessment and quadrat sampling by using scuba equipment which will allow for substrate classification as well as oyster density determinations. At intertidal sites, ground-truthing will be completed by visual assessment and quadrat sampling at locations with live oysters. The final step of the mapping component will involve synthesis of all data and production of maps detailing the acreage, location, and extent of subtidal and intertidal oyster reefs as well as locations with suitable restoration substrate in all six study sites.

- **Equipment/material needed:** Truck, boat, motor, trailer, subcontract for mapping, field supplies
- **Deliverable:** Submitted final reports from the subcontracted entity(ies) will serve as documentation for completion of this task. Final reports will include methods, results, and final 3D maps (x, y, and z coordinates where practical), GIS map layers/shapefiles, and any relevant metadata.
- **Schedule:** The mapping component will be initiated in Year 1 and will continue through Year 3 or until complete.

Task 3: Field Assessment and Monitoring

- **Description:**
  - *Field assessment to establish monitoring sites:* During the first year of monitoring, a one-time stratified random survey of oysters will be conducted at all six study sites to determine oyster density and size distribution. Survey locations will be selected from the statewide oyster map layer compiled by the FWC-Fish and Wildlife Research Institute (FWRI) Oyster Integrated Mapping and Monitoring Program. Specific sampling stations will be randomly selected from numbered grid squares overlying oyster habitat (Parker 2016). The total number of stations will be determined by reef acreage, but standardized sampling efforts will be applied at all six study sites. Data collection will include classification of bottom substrate. If hard substrate or live oysters are present, up to fifteen replicate quadrats will be randomly deployed and all oysters within each quadrat will be collected for determination of the total number of live oysters and dead oysters (Parker et al 2013). In addition, shell height (SH)(maximum linear distance from the umbo to the ventral shell margin) measurements for all oysters 25 mm or larger will be recorded. A maximum of 25 SH measurements will be recorded for spat (oysters < 25 mm). This initial survey will also include field measures of salinity, water temperature, dissolved oxygen concentration, pH, depth, and turbidity. All oyster samples will be processed on site and oysters will be returned to the site they were taken from.
  - *Monitoring:* Following the field assessment, longer term monitoring will begin and continue for up to three years. In each region, a minimum of three stations per site will be established, but the total number of stations will vary among regions depending on the size of the estuary or area. Monitoring will include:
    - *Water Quality:* Temperature, salinity, dissolved oxygen, and pH will be measured monthly at each station within each site along with depth and turbidity. In addition, a continuous data logger will be deployed for the entire period of the long-term field sampling effort to measure temperature and salinity at one location in each of the six study sites.

- *Sedimentation:* Sedimentation rates and sediment depth will be assessed monthly. Sedimentation rate sampling will use replicate sediment traps at each station at all six study sites (Thomas et al 2007). Upon retrieval, contents will be rinsed into a container and filtered through pre-weighed 35 µm filters. The sediments and filters will be placed in a drying oven at 80°C for a minimum of 48 hours then dry weights recorded. Sedimentation rates will be calculated by dividing the total dry weight of the sediment sample by the number of days the sediment trap was deployed.
- *Wave Energy:* Methods for measuring wave energy or relative water motion (Wall et al. 2005) will be investigated then applied at subtidal and intertidal stations at each of the six study sites.
- *Larval Supply:* Larval supply will be assessed monthly by measuring juvenile oyster recruitment rates. Three replicate spat-monitoring arrays (spat = newly settled oyster) will be deployed at stations at all six study sites. Each of the arrays will be comprised of 12 axenic adult oyster shells (5-10 cm shell height) strung onto two separate lengths of galvanized wire (6 shells per wire). The wire is 16-gauge galvanized wire with 6 shells strung to it resulting in no more than 12 inches of exposed wire. The shells will be oriented with their inner surface facing downward when suspended off the bottom. After a month-long deployment, the shell strings will be recovered, and juvenile recruitment will be estimated by discarding the top and bottom shells of each string and counting the number of settled spat on the underside of the remaining shells. Juvenile oyster recruitment rates will be calculated by dividing the raw number of spat per shell by the number of days the shell was deployed, then standardizing to a 28-day month (Parker et al 2013).
- *Oyster Density and Size Distribution:* Oyster monitoring will be conducted quarterly at stations with live oysters or with existing hard substrate habitat. At those stations, up to fifteen replicate quadrats will be randomly deployed and all oysters within each quadrat will be collected for determination of the total number of live oysters and dead oysters (Parker et al 2013). In addition, SH (maximum linear distance from the umbo to the ventral shell margin) measurements for all oysters 25 mm or larger will be recorded. A maximum of 25 SH measurements will be recorded for spat (oysters < 25 mm). All oyster samples will be processed on site and oysters will be returned to the site they were taken from.

- **Equipment/material needed:** Computers, office supplies (from Task 1). Truck, boat, motor, trailer, field supplies (from Task 2). Lab supplies.
- **Deliverable:** Submitted semi-annual status reports will serve as documentation for progress and completion of this task. Status reports will summarize work accomplished for each field monitoring parameter during each semi-annual period.
- **Schedule:** The assessment of sites for the establishment of long-term monitoring stations will commence within the first six months and last for approximately one year or until the area has been sufficiently surveyed and long-term monitoring stations established. Once established the long-term monitoring will continue at each of the selected stations at each site for a minimum of three consecutive years.

Task 4: GIS-Based HSI Model

- **Description:** Suitability functions will be developed for environmental variables based on several sources of information. Primarily, we will use the analysis of each region's historic trends in environmental conditions and oyster population health, abundance, and distribution from Task 1. The suitability functions will also be informed by oyster habitat requirements observed in the field in each region during Tasks 3 and 4. The functions will be used to assign an HSI score ranging from 0 (unsuitable) to 1 (optimal) for each variable (Cake 1983, Barnes et al 2007, Soniat et al 2013, Theuerkauf and Lipcius 2016). HSI scores will then be used to create GIS layers for each environmental variable using historic data and data recorded during field monitoring efforts (Linhoss et al 2016). Once the model is created, data collected during mapping efforts and oyster density surveys will be used to verify the validity of the model (Theuerkauf and Lipcius 2016). Upon completion, HSI models will be made publicly available to aid future restoration efforts.
- **Equipment/material needed:** Computers, office supplies (from Task 1)
- **Deliverable:** A final report will serve as documentation for completion of this task and will summarize all work associated with Tasks 1-4 and include methods, results, and final GIS-based HSI models for all six study sites. The maps of suitable oyster habitat will be made available to the public through the FWC-FWRI GIS website.
- **Schedule:** Development of the HSI models will commence once Tasks 1 and 2 are complete for a particular study site and will continue through the end of the restoration planning activity.

Data Management and Reporting

FWRI staff will compile the appropriate data detailed above in the four tasks throughout the calendar year, synthesize the results, and send the data and a draft annual monitoring report to FWC DWH staff within two months of the calendar year ending. FWC DWH staff will QA/QC the materials and coordinate with staff should any changes be necessary. After any and all identified errors are addressed, the data and report will be considered to be QA/QC'ed. FWC will give the other Florida Trustee Implementation Group (FL TIG) members time to review materials before making such information publicly available.

The QA/QC'ed monitoring data will be stored in the DIVER Restoration Portal. FWC will submit annual reports to the publicly available DWH DIVER Portal. FWC will prepare a final summary report synthesizing the findings of this restoration planning activity, including recommendations regarding priorities for oyster restoration. The FL TIG will develop DIVER reporting metrics as the restoration planning activity progresses.

Consistency with the PDARP/PEIS:

The PDARP/PEIS (DWH NRDA Trustees 2016) establishes goals to restore and protect oysters by restoring oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs, restoring resilience to oyster populations that are supported by productive larval source reefs and sufficient substrate in larval source reefs areas to sustain reefs over time, and restoring a diversity of oyster habitats that provide ecological (PDARP/PEIS Section 5.5.12.1). This restoration planning activity is intended to address significant informational needs to facilitate future restoration planning and implementation activities for oysters. Information gained from this activity will directly benefit the Trustees' ability to effectively restore oyster populations within the broader,

future DWH Oyster Restoration Type projects. Therefore, this restoration planning activity is consistent with the PDARP/PEIS, including the Monitoring and Adaptive Management Framework, as described in Section 5.5.15.2, and the *Strategic Framework for Oyster Restoration Activities*, Module 4: Considerations for Restoration - Monitoring and Adaptive Management Considerations (DWH NRDA Trustees 2017).

National Environmental Policy Act

Introduction

Section 6.4.14 of the PDARP/PEIS considers the environmental consequences associated with activities including, but not limited to planning, feasibility studies, design, engineering, and permitting of conceptual projects. These activities can include a mixture of data collection into historical conditions, modeling of ecological response to the project, conducting surveys, and creating maps and scale drawings of potential project sites. These activities may also include minimally intrusive field activities. Upon review, the federal trustees of the FL TIG find the environmental conditions and NEPA analysis in the PDARP/PEIS current and valid. Therefore, this review relies on the analysis in Section 6.4.14 of the PDARP/PEIS, which is incorporated herein by reference and summarized below.

Summary Review

For purposes of this NEPA review, tasks described in the Description of Work section above can be categorized as "field work" and "office work". In this review, data compilation, data synthesis, development of GIS-based modeling and similar tasks are considered office work and would not cause adverse impacts to any resource area; therefore, the review focuses on field work components.

Field work includes tasks associated with benthic mapping (poling/probing from a boat to determine general benthic composition), field measures of environmental (salinity, water temperature, dissolved oxygen concentration, pH, depth, and turbidity) and oyster parameters, installation of data loggers, deployment of in-water oyster recruitment sampling arrays, and acoustic mapping using side-scan sonar or a shallow-water interferometric multibeam system. Ground-truthing includes patent tong sampling, and visual assessment and quadrat sampling at locations with live oysters. Small numbers of oysters will be collected at certain locations to determine density and size distribution.

The PDARP/PEIS determined that some planning activities would cause minor, direct, short-term impacts through associated fieldwork. Short-term adverse impacts from temporary disturbances to marine habitats and species due to the presence of boats and sampling equipment that would be used for both side-scan mapping and ground-truthing surveys would occur. Side-scan mapping would involve driving the boat along transects and ground-truthing would involve hand dredge sampling and/or cane pole sounding. Adverse impacts could include disturbance from boat noise and human presence, resulting in short-term, minor adverse impacts to wildlife. These impacts would be localized to the data collection locations.

The PDARP/PEIS states that temporary impacts to the biological and physical environment could include short-term, temporary disturbance of habitats and species, minor emissions from

equipment and vehicles, and minor disturbance to terrestrial, estuarine, and marine environments. During some field work activities, some individuals of protected species, such as West Indian manatees, Gulf sturgeon, or sea turtles could alter their behavior or flee the area. This temporary impact would not ultimately reduce the survival or reproduction of affected individuals. Additionally, the sound frequencies used in side-scan sonar usually range from 400 to 1,600 kHz, which is beyond the range of most marine mammal communication (ADCNR, 2017d). Bottlenose dolphins can hear tones with a frequency up to 160 kHz and communicate at a frequency between about 0.02 to 150 kHz. Therefore, the potential effects from side-scan sonar to marine mammals is negligible. The entanglement risk of the deploy spat collector arrays is extremely low due to rigidity (16-ga galvanized wire) and short length (<12") of exposed wire between the oyster shells and the frame. All impacts fall within the analysis provided in Section 6.4.14 of the PDARP/PEIS. All tasks will be implemented in accordance with all applicable laws and regulations concerning environmental protection, including protection of cultural and historic resources. A review of substrate-disturbing components will be conducted under Section 106 of the National Historic Preservation Act.

Conclusion

No long-term adverse impacts are expected to occur as a result of this restoration planning activity. Only short-term, negligible to minor, adverse impacts could occur related to field activities. Beneficial impacts would result from increased understanding about existing conditions and oyster restoration opportunities in Florida coastal waters. The impacts fall within the analysis provided in Section 6.4.14 of the PDARP/PEIS; therefore, no further NEPA analysis for this activity is required. Once necessary oyster restoration information is developed, the FL TIG may propose, in future restoration plans, implementation of oyster projects, at which time NEPA analysis and other environmental compliance requirements would be addressed for implementation activities. Monitoring and adaptive management plans would also be developed at that time. Although information gathered may inform future project alternatives, the outcome of the data gap studies does not commit the FL TIG to future actions.

Compliance with Other Environmental Laws and Regulations

The FL TIG has completed compliance with all applicable local, state, and, federal laws and regulations relevant to this restoration planning activity, as described below.

DOI has determined that this restoration planning activity is not likely to adversely affect any federally listed species or designated critical habitat protected by the Endangered Species Act of 1973 as amended (16 U.S.C. 1531-1544). DOI has also determined that take would be avoided under the Migratory Bird Treaty Act of 1918 as amended (16 U.S.C. 703-712), the Bald and Golden Eagle Protection Act of 1940 as amended (16 U.S.C. 668-668c), and the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1461 et seq.).

DOI has determined that the project meets the required exceptions under the Coastal Barrier Resources Act. DOI has also determined that this restoration planning activity has no potential to affect historic properties, and no further of the review of the project under Section 106 of the

National Historic Preservation Act is warranted for this restoration planning activity unless further information becomes available.

NOAA has determined that this restoration planning activity will have no effect on species or habitats protected under the Endangered Species Act under the jurisdiction of National Marine Fisheries Service (NMFS), the Magnuson-Stevens Fishery Conservation and Management Act, and the Marine Mammal Protection Act under the jurisdiction of the NFMS.

DOI, on behalf of the FL TIG, provided the Florida State Clearinghouse (Clearinghouse) with a Request for Consistency Certification with Coastal Zone Management Act (CZMA) for this restoration planning activity. However, the Clearinghouse did not select it for CZMA review and informed DOI that this restoration planning activity may proceed.

Finally, the activities being implemented as part of this restoration planning activity do not require a Section 404 or Rivers and Harbors Act permit.

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 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 (www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: www.gulfspillrestoration.noaa.gov/environmental-compliance/.

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