Oyster Reef Restoration Program

RESTORE Council Proposal Document

General Information

Title:
Oyster Reef Restoration Program

Project Abstract:
The Oyster Reef Restoration Program for Texas seeks to restore and conserve habitat and replenish and protect living coastal and marine resources by restoring non-commercial oyster reef habitats in Texas estuarine waters. Oyster reefs, found in both intertidal and subtidal zones across Texas bays and estuaries, have suffered significant declines. However, oysters play a critical role in ecological and economic systems, providing essential habitat, supporting secondary and tertiary production, and contributing to ecosystem services such as nutrient regulation, shoreline protection, wave attenuation, potential oyster harvest, and recreational fishing opportunities. With a proposed budget of $12.8 million, the Oyster Reef Restoration Program will employ restoration techniques including substrate placement, construction of living shorelines, and enhancement of spawning reserves. Additional program activities will include planning, implementation, and monitoring to ensure success. Priority will be given to projects that have undergone prior vetting and align with key criteria, such as project readiness, scalability, and potential effectiveness. The overall goal of this program is to enhance the habitat and productivity of Texas's oyster resources.

FPL Category: Cat1: Planning/ Cat2: Implementation

Activity Type: Program

Program: N/A

Co-sponsoring Agency(ies):
TX

Is this a construction project?:
No

RESTORE Act Priority Criteria:
(II) Large-scale projects and programs that are projected to substantially contribute to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast ecosystem.
(III) Projects contained in existing Gulf Coast State comprehensive plans for the restoration and

protection of natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region.

Priority Criteria Justification:
This is a large-scale program aiming to restore coastal resources and habitats with the goal of achieving and enhancing the habitat and productivity of Texas oyster resources. Oyster reef restoration is identified as an important issue of Gulf-wide importance. In Texas, nearly $15.1 million have been invested to enhance the understanding and implementation of oyster reef restoration projects (DWH project tracker), yet additional work is needed to continue to address this large-scale concern.

Oyster reefs are a key resource addressed in various regional, state, and Gulf-wide Plans including:

- The Texas Coastal Resiliency Master Plan (GLO, 2023)
- Deepwater Horizon Oil Spill Natural Resource Damage Assessment Texas Trustee Implementation Group Draft Restoration Plan/Environmental Assessment #2: Restoration of Wetlands, Coastal, and Nearshore Habitats; Nutrient Reduction; Oysters; Sea Turtles; and Birds (2022).
- Oyster Restoration in the Gulf of America: Proposals from the Nature Conservation (2018)

Project Duration (in years): 7

Goals

Primary Comprehensive Plan Goal:
Restore and Conserve Habitat

Primary Comprehensive Plan Objective:
Restore , Enhance, and Protect Habitats

Secondary Comprehensive Plan Objectives:
Restore , Enhance, and Protect Habitats
Protect and Restore Living Coastal and Marine Resources

Secondary Comprehensive Plan Goals:
Restore and Conserve Habitat
Replenish and Protect Living Coastal and Marine Resources

PF Restoration Technique(s):
Restore oyster habitat: Substrate placement
Restore oyster habitat: Living shorelines
Restore oyster habitat: Enhance spawning and reserves

Location

Location:
Texas Coastal Zone, particularly in areas with current and historical oyster reefs; including areas within the following Texas RESTORE eligible counties: Cameron, Willacy, Kenedy, Kleberg, Nueces, San Patricio, Aransas, Refugio, Victoria, Jackson, Calhoun, Matagorda, Brazoria, Harris, Galveston, Chambers, Jefferson, Orange Counties (Figure 1).

HUC8 Watershed(s):
Texas-Gulf Region(Neches) - Neches(Lower Neches)
Texas-Gulf Region(Neches) - Neches(Pine Island Bayou)
Texas-Gulf Region(Trinity) - Lower Trinity(Lower Trinity)
Texas-Gulf Region(Galveston Bay-San Jacinto) - San Jacinto(West Fork San Jacinto)
Texas-Gulf Region(Galveston Bay-San Jacinto) - San Jacinto(Spring)
Texas-Gulf Region(Galveston Bay-San Jacinto) - San Jacinto(East Fork San Jacinto)
Texas-Gulf Region(Galveston Bay-San Jacinto) - San Jacinto(Buffalo-San Jacinto)
Texas-Gulf Region(Galveston Bay-San Jacinto) - Galveston Bay-Sabine Lake(East Galveston Bay)
Texas-Gulf Region(Galveston Bay-San Jacinto) - Galveston Bay-Sabine Lake(North Galveston Bay)
Texas-Gulf Region(Galveston Bay-San Jacinto) - Galveston Bay-Sabine Lake(West Galveston Bay)
Texas-Gulf Region(Galveston Bay-San Jacinto) - Galveston Bay-Sabine Lake(Austin-Oyster)
Texas-Gulf Region(Lower Brazos) - Lower Brazos(Lower Brazos)
Texas-Gulf Region(Lower Colorado-San Bernard Coastal) - Lower Colorado(Lower Colorado)
Texas-Gulf Region(Lower Colorado-San Bernard Coastal) - San Bernard Coastal(San Bernard)
Texas-Gulf Region(Lower Colorado-San Bernard Coastal) - San Bernard Coastal(East Matagorda Bay)
Texas-Gulf Region(Central Texas Coastal) - Lavaca(Navidad)
Texas-Gulf Region(Central Texas Coastal) - Guadalupe(Lower Guadalupe)
Texas-Gulf Region(Central Texas Coastal) - San Antonio(Lower San Antonio)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(East Matagorda Bay)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(West Matagorda Bay)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(East San Antonio Bay)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(West San Antonio Bay)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(Aransas Bay)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(Mission)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(Aransas)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Nueces(Lower Nueces)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(North Corpus Christi Bay)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(South Corpus Christi Bay)

Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(Palo Blanco)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(South Laguna Madre)
Texas-Gulf Region(Galveston Bay-San Jacinto) - Galveston Bay-Sabine Lake(Sabine Lake)
Texas-Gulf Region(Central Texas Coastal) - Lavaca(Lavaca)
Texas-Gulf Region(Sabine) - Sabine(Lower Sabine)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(North Laguna Madre)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(San Fernando)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(Baffin Bay)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(Central Laguna Madre)

State(s):
Texas

County/Parish(es):
TX - Aransas
TX - Brazoria
TX - Calhoun
TX - Cameron
TX - Chambers
TX - Childress
TX - Galveston
TX - Harris
TX - Jackson
TX - Jefferson
TX - Kenedy
TX - Kleberg
TX - Matagorda
TX - Nueces
TX - Orange
TX - Refugio
TX - San Patricio
TX - Victoria
TX - Willacy

Congressional District(s):
TX - 2

TX - 18
TX - 22
TX - 27
TX - 14
TX - 29
TX - 36
TX - 34
TX - 7
TX - 9
TX - 8
TX - 38

Narratives

Introduction and Overview:

The Oyster Reef Restoration Program focuses on the restoration of non-commercial oyster reef habitats and aligns with the Council's goal to restore and conserve habitat and replenish and protect living coastal and marine resources. This initiative aligns with the priority approach of restoring oyster habitats through techniques such as substrate placement, the construction of living shorelines, and the enhancement of spawning reserves.

Oyster reefs, found in both intertidal and subtidal zones across Texas bays and estuaries, have suffered significant declines. It is estimated that 50 to 80 percent of native oyster populations in the Gulf of America have been lost relative to historic levels (Beck et al., 2011). Oysters play a critical role in ecological and economic systems, providing essential habitat, supporting secondary and tertiary production, and contributing to ecosystem services such as nutrient regulation, shoreline protection, wave attenuation, potential oyster harvest, and recreational fishing opportunities (Coen et al., 2007; Stunz, Minello, and Rozas, 2010; Olander et al., 2020; Smith, Cheng, and Castorani, 2023). This program aims to restore and create non-commercial oyster reef habitats to enhance the ecosystem of Texas bays and shorelines.

Oyster reefs in Texas and across the Gulf of America face numerous threats from both natural and anthropogenic sources, including saltwater intrusion, reduced freshwater inflow, disease, man-made disasters, habitat destruction (e.g., dredging and mechanical harvesting), coastal development, nutrient runoff, pollution, and a lack of shell replacement (La Peyre et al., 2014; Pollack et al., 2012). In response, the Texas Parks and Wildlife Department (TPWD) has restored over 500 acres of oyster habitat in Texas estuaries since 2009. Other entities, such as the Galveston Bay Foundation, Texas A&M University System, and The Nature Conservancy, have restored an additional 100+ acres along the Texas coast (TPWD, 2022). To date, Deepwater Horizon (DWH) funds have invested $15.1 million in enhancing oyster restoration research and implementation (DWH project tracker). Despite these efforts, the decline in oyster populations continues, highlighting the need for sustained restoration efforts to support fisheries and ecosystem services (The Nature Conservancy, 2023).

A content analysis of 119 planning and restoration documents, including those from local, state, and federal entities as well as NGOs, identified oyster reefs as a habitat of concern within estuarine environments. These documents included various area management plans, state environmental program plans, conservation plans for different species, and restoration project documents either funded or in need of funding. In July 2023, the proposed programs were presented for discussion to two Texas working groups, comprising government agencies and NGOs, that advise the Texas RESTORE process. Following the presentation, a survey was administered to the working group. The survey results showed strong support for the program, with respondents emphasizing that oyster reefs are a foundational species in need of increased restoration, protection, and enhanced management in Texas. The survey also acknowledged the multiple ecosystem services provided by oyster reefs, including shoreline protection, thus supporting oyster restoration as a living shoreline and shoreline protection approach.

Public comments also expressed support for this program, noting that "Oyster reefs are important to Texas coastal economies and provide a suite of ecosystem services to coastal communities." Commenters advocated for collaboration across program areas and partners and emphasized the use of models and available tools for predicting restoration and aquaculture potential. However, two comments expressed concern, with one suggesting that water quality issues are a challenge in oyster restoration.

This program aims to address the loss of natural resources and associated ecosystem services through a prioritized approach of oyster reef restoration. Techniques for restoring oyster habitats include substrate placement, living shorelines, and the enhancement of spawning reserves. To implement this, the program will develop a framework for selecting priority projects. Example projects for consideration are outlined in current state planning documents such as the Texas Coastal Resiliency Master Plan (TCRMP) (Texas General Land Office, 2022). The TCRMP proposes an estimated $1.87 billion in 121 proposed Tier 1 coastal resilience projects, spanning 10 priority statewide actions. These projects reflect careful consideration of the complex characteristics of the Texas coastal zone by the Texas General Land Office (TGLO) and the Plan’s Technical Advisory Committee (TAC), which includes coastal planners, community leaders, scientists, engineers, and other stakeholders. The potential project scales and budgets for oyster projects vary from $130K-31M. Considerations will be taken to leverage ongoing work and opportunities to make the most impact on oyster reef restoration. While these examples provide evidence of funding needs in Texas, funding for this program will be open to additional proposals and is not limited to those listed.

Potential budgets for oyster projects listed in the TCRMP vary from $130K-31M (Table 1). Considerations will be taken to leverage ongoing work and opportunities to make the greatest impact on oyster reef restoration. While the TCRMP projects provide evidence of funding needs in Texas, funding for this program will be open to additional proposals and is not limited to those listed in Table 1. Fundable projects must demonstrate rigorous planning, feasibility and support by the public and conservation community, as well as the applicant's experience and demonstrated ability to conduct and manage these types of projects. These projects will incorporate activities as those expressed in the methods section.

Proposed Methods :

This program will implement a project selection process that evaluates the need for the project, its potential to benefit oyster reefs and oyster habitat, the feasibility of the design and location, and the applicant's (and team's) demonstrated ability to implement and successfully construct the project. In addition, project applicants will be required to submit project success metrics, examples of which are presented in the section titled “Metrics and Measures of Success.”

To address the loss of oyster habitat, this program will support initiatives such as substrate placement, living shoreline construction, and the enhancement of spawning reserves. It is recommended that the proposed project utilize a habitat suitability assessment to assess the potential for long-term success or failure for the proposed project (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2017). In Texas, habitat suitability models are available and studies for freshwater requirements are also helpful in determining appropriate locations for restoration (Buzan et al., 2009; Jennifer Beseres Pollack et al., 2012; Powell, Matsumoto, and Brock, 2002) as well as the online mapping tool Oyster restoration siting on the Texas Coast (Pollack et al., 2019).

A critical component of oyster reef restoration is the construction of a substrate that effectively attracts and supports oyster larvae, forming a high-relief structure that mimics a natural oyster reef. These three-dimensional formations can be established in either intertidal or subtidal zones. The engineering design for these structures can range from simple, using basic cultch materials, to more complex designs that involve the installation of large rocks or prefabricated materials (Texas General Land Office n.d.). Common materials used as cultch includes oyster shells, crushed limestone, or crushed concrete, and rock material (Baggett et al., 2014; Goelz, Vogt, and Hartley, 2020). When planning the engineering design and selecting substrate placement types and materials, it is essential to consider the hydrodynamics of the project site.

The supply and successful settlement of larvae are crucial for the development and persistence of oyster populations. Local stocks can be enhanced through the use of sanctuary reefs, which can lead to increased oyster settlement, recruitment, and overall densities (Puckett and Eggleston, 2012; Schulte and Burke, 2014). A study comparing natural, restored, and protected reefs found that restored and protected reefs have a larval output potential that is approximately 4 to 700 times greater per square meter than restored and harvested or natural and harvested reefs, respectively (Peters et al., 2017). Projects adopting this approach must consider hydrodynamic processes as these processes are essential for larvae transport, enabling them to disperse over significant distances (Knights and Walters, 2010). Additionally, marine reserves, which create no-take zones, can potentially support harvested populations at nearby reef locations through larval spillover (Peters et al., 2017).

Living shorelines that incorporate oysters can be highly effective in reducing erosion and protecting coastlines. For example, a study by Manis et al. (2015) demonstrated that one-year-old treatments of marsh grasses (Spartina alterniflora) combined with live eastern oysters (Crassostrea virginica) attenuated 67% of the wave energy generated by a single recreational boat wake, compared to

bare sediment. Besides protecting coastlines from erosion, living shorelines also enhance invertebrate and fish diversity and abundance compared to armored shorelines (Bilkovic et al., 2016). The effectiveness of an oyster reef, however, depends on multiple factors, including size, orientation, and location. Depth also plays a crucial role, as reefs that are fully subtidal are likely to have a reduced ability to diminish wave energy (USACE, 2022). To optimize the creation of self-sustaining reefs, it is essential to understand the appropriate benthic topography that fosters optimal recruitment conditions —such as hydrodynamics, settlement surfaces, protection from predators, and sedimentation —and how these factors may need to adapt under changing climate conditions (Morris et al., 2019). When evaluating living shorelines, it is crucial to consider the inundation regime. Morris et al. (2021) found that living shorelines submerged less than 50% of the time were not ideal habitats for oysters but were effective in reducing wave height by 68%. Conversely, reefs with more than 50% inundation were suitable for oysters, but their wave attenuation was comparable to control sites (no reef).

Environmental Benefits:

Given their importance as habitat, their economic significance, and the ecosystem services they provide, oyster reef restoration has been recognized as a critical priority in the Gulf of America. Restoring oyster habitats supports recreational and economic benefits, improves water quality, enhances shoreline protection, and bolsters overall ecosystem health (Stunz, Minello, and Rozas, 2010; La Peyre et al., 2014; Blomberg et al., 2018; Olander et al., 2020; Smith, Cheng, and Castorani, 2023).

Monitoring and metrics of success will be tailored to the specific type of project being implemented. For example, a living shoreline design may prioritize outcomes such as erosion control and habitat stabilization, while a submerged reef project may focus on metrics like increases in oyster population densities. Metrics will be selected on a project-by-project basis to ensure they align with the unique objectives and desired outcomes of each initiative, providing a customized framework for evaluating success.

Metrics:

Metric Title: HR006 : Marine habitat restoration - Acres of oyster reef restored

Target: 0.99

Narrative: Number of acres of oyster reef restored. Target to be determined.

Metric Title: SP001 : Population - Density (# individuals/acre) - Oysters

Target: 0.99

Narrative: Number of individuals/acre. Target to be determined

Metric Title: HR012 : Shoreline protection - Miles of living shoreline installed

Target: 0.99

Narrative: Miles of living shoreline installed. Target to be determined.

Metric Title: PRM013 : Restoration planning/design/permitting - # environmental compliance documents completed

Target: 0.99

Narrative: Number of environmental compliance documents completed.

Metric Title: PRM011 : Restoration planning/design/permitting - # E&D plans developed

Target: 0.99

Narrative: Number of E&D plans developed.

Risk and Uncertainties:

In Texas, coastal habitats and communities are increasingly vulnerable to storm surge damage, especially when combined with heavy precipitation. Periodic and long-term inundation of estuarine habitats can profoundly alter the hydrology of these systems, (Hayhoe et al., 2018; Sweet et al., 2022) undermining their resilience and ability to support diverse wildlife and ecosystem functions. Trends in sea level rise along Texas bays, as reported by NOAA's Tides and Currents website, exhibit variation along the coast. In Cameron County, Port Isabel shows a rate of 4.32 mm/year, and Port Mansfield records 3.69 mm/year. Along the central coast, Rockport experiences a higher rate of 5.66 mm/year. The upper coast, particularly Eagle Point, shows the most significant trend at 12.93 mm/year (NOAA Center for Operational Oceanographic Products and Services, 2025). These trends contribute to submergence and erosion, saltwater intrusion, and a decline/change in coastal wetlands (Gornitz, 1991; Nicholls and Cazenave 2010; Mitchell, Herman, and Hershner, 2020). These hydrologic changes are expected to significantly impact the abundance, growth, and survival of intertidal and shallow subtidal species such as oysters. Studies suggest while some reefs may experience negative impacts others will be more resilient (Solomon, Donnelly, and Walterst, 2014; Rodriguez et al., 2014). Intertidal oyster growth is influenced primarily by two factors: salinity and aerial exposure, the latter being the amount of time intertidal oysters are exposed during a tidal cycle. Aerial exposure creates strong vertical zonation patterns, with distinct growth boundaries shaped by physiological and external stressors. Rapid changes in hydrologic conditions can shift these critical boundaries, potentially leading to scenarios where oyster reef accretion cannot keep pace with rising sea levels (Ridge et al., 2015). Uncertainty remains, as bay bathymetry and

shoreline dynamics may also be altered in the future (Passeri et al. 2015). Considerations for relative sea level and hydrologic trends along the Texas coast and local hydrodynamics should be integral in evaluating the potential success and longevity of restoration projects. In cases where data is lacking, expert opinions could be valuable in bridging these gaps (Cooke et al. 2021).

Climatic events, including hurricanes, extreme storms, and prolonged droughts, pose substantial risks to restoration activities. These events can cause increased erosion, sediment displacement, and habitat destruction, directly affecting the construction, effectiveness, and longevity of restoration projects (Zabin et al., 2022). Hurricanes and extreme storms can degrade estuarine water quality, and sediment deposition can temporarily reduce oyster abundance, spat settlement, and increase disease levels (Wetz and Yoskowitz, 2013; Pollack et al., 2010; Martinez et al., 2022). Additionally, oyster populations may suffer significant declines during extended periods of high freshwater inflow or heavy rain events, and can be decimated during prolonged droughts, when conditions favor oyster predators, parasites, and diseases that thrive in higher salinity conditions (Buzan et al., 2009). Considering Texas estuarine water budgets is crucial when planning for successful oyster restoration. Also, hydrodynamic-oyster population models can be useful for simulating potential oyster health scenarios (Powell, Matsumoto, and Brock, 2002).

Risk mitigation, particularly for unforeseen events such as weather-related impacts mentioned above, will be addressed by requiring applicants to provide detailed mitigation plans as part of their proposals. Additionally, risks will be managed through robust monitoring and adaptive management strategies, as outlined in the following section. These measures will ensure a proactive approach to minimize potential disruptions and enhance resilience against unexpected challenges.

Monitoring and Adaptive Management:

Given the uncertainties in restoration, the principles of adaptive management are useful in both planning and managing projects to increase the probability of success. Adaptive management is a method to systematically assess and improve the performance of restored systems and contribute to restoration technology (Thom, 2000). In essence, adaptive management involves synthesizing existing knowledge, exploring alternative actions, making explicit predictions of their outcomes, implementing actions, monitoring to determine whether outcomes match those predicted, and using these results to adjust future plans (Murray and Marmorek, 2003).

In implementing adaptive management, this program will use a goal-oriented approach focused on improving estuarine health through expanding oyster reefs. The program will engage established working groups in the development of criteria to select priority projects and utilize monitoring to assess needs and performance. Adaptive management is important considering the risks and uncertainties mentioned above, in particular those that may lessen the effectiveness, delay, or prevent project implementation (e.g., storms, drought, permitting issues). Due to these and other potential challenges, the program allocates 10% of the total budget for contingencies, providing a buffer for adaptive management.

Restoration project monitoring contributes to adaptive management and involves the systematic collection of data for three primary purposes: (1) to determine whether a project was completed as

specified in the restoration plan (construction monitoring); (2) to evaluate the performance of a restoration project relative to its objectives (performance monitoring); and (3) to learn from the restoration effort in a structured manner, enhancing the long-term effectiveness of future restoration efforts (La Peyre et al. 2014; National Academies of Sciences, Engineering, and Medicine, 2017). A wide range of monitoring metrics are available for oyster reef restoration, covering various categories such as habitat metrics (e.g., reef height, reef rugosity), geomorphology (e.g., shoreline gain/loss), hydrology (e.g., dissolved oxygen, salinity), sediment (e.g., sedimentation rate, reef subsidence rate), adjacent habitat (e.g., density and percent cover of aquatic vegetation, species composition), and oyster population attributes (e.g., oyster density, size frequency distribution, disease prevalence) (Baggett et al., 2014; National Academies of Sciences, Engineering, and Medicine, 2017). It is highly recommended that monitoring includes evaluation of the long-term impact including those socio-economic outcomes to the communities surrounding the resource (Olander et al., 2020). In addition to the metrics reported above, metrics for adaptive management will be selected based on the reef type, location, and overall project goals and objectives.

Data Management:

Data management for this program is designed to promote transparency in the project selection process. Information used in decision-making, such as supporting plans, program budgets, and past project performance reports, will also be accessible to guide potential project decisions. Once projects are selected, geotechnical and engineering data, along with construction specifications, will be made available. Furthermore, data related to post-project implementation will be collected and shared publicly. This includes information on project performance, such as potential metrics previously mentioned.

The Texas Commission on Environmental Quality (TCEQ) and the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC) will collaborate with data producers to ensure data is shared after key activities conclude. GRIIDC, a multidisciplinary repository, tracks, curates, and archives diverse datasets, making them publicly discoverable through digital object identifiers and detailed ISO 19115-2 metadata. This publicly accessible repository will facilitate data access for performance monitoring and adaptive management and ensure data interoperability and reuse.

Collaboration:

This program is positioned to foster collaboration, partnership, and leveraging opportunities. It will build on existing state and federal efforts, including the Department of Interior' Oyster Reef Restoration Program (proposed under FPL4). Continued engagement in the 2026 FPL process will integrate with ongoing coastal restoration planning processes such as TGLO's Coastal Resiliency Master Plan. Furthermore, leveraging will be a key consideration during the project selection process, ensuring that selected projects yield the greatest environmental benefits while aligning with the program's goals.

Public Engagement, Outreach, and Education:

The engagement process for 2026 FPL is ongoing and involves multiple steps to ensure comprehensive input and alignment with restoration priorities. A content analysis of 119 planning and restoration documents, including those from entities participating in our federal/state and NGO

working groups, was conducted to identify key concerns, past restoration projects and programs, and current restoration needs. This analysis, combined with other environmental data, guided the development of potential 2026 FPL programs. These programs were presented to the working groups in the summer of 2023 and followed by a survey to gather feedback on the level of support and to request suggestions for changes.

The working groups were also given the opportunity to submit additional programs for consideration. After edits and budget adjustments, the proposed programs were opened for public comment in March of 2024. Based on the feedback received and the availability of funding, the programs were then refined, combined, and revised to better meet the needs and priorities identified throughout the process.

Moving forward, the selection process for 2026 FPL grant subrecipients will require that projects are vetted through the Texas 2026 FPL process or other public process, such as the TGLO's Coastal Resiliency Master Plan, NRDA, or NFWF. Criteria for selecting projects will include but are not limited to, the following factors: alignment with issues outlined in the program activity description, availability of funds for the program, project readiness, leveraging opportunities, scalability, risk/benefit ratio, and distribution of funds across the Texas coast. This comprehensive process, which includes both completed and forthcoming steps during program planning and implementation, will ensure that the final project selections align with the RESTORE Planning Framework document and reflect the input of workgroups, elected officials, the public, and the Office of the Governor.

Leveraging:

N/A

Environmental Compliance:

The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component has been identified as an FPL Category 2 priority for future funding consideration.

The implementation of oyster reef construction or restoration projects necessitates obtaining a USACE Nationwide Permit 27 for Aquatic Habitat Restoration, Enhancement, and Establishment Activities, as well as a submerged lands lease from the Texas General Land Office. Additionally, projects that aim to enhance spawning or involve the placement of spat or live organisms will require a permit from the Texas Parks and Wildlife Department for the introduction of shellfish or aquatic plants into public waters.

If living shoreline projects are chosen for implementation under this program, they will also require Section 10 and 404 permits from the U.S. Army Corps of Engineers (USACE) and a submerged lands lease from the Texas General Land Office. The USACE permitting process ensures adherence to all relevant federal laws, particularly environmental regulations such as the Clean Water Act. Coordination is planned with the USACE and other reviewing agencies, including the Texas General Land Office, United States Fish and Wildlife Service, NOAA, Texas Historical

Commission, and the Texas Commission on Environmental Quality to ensure compliance with applicable environmental laws.

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Budget

Project Budget Narrative:
A total budget of $12,800,000 is proposed for 2026 FPL activities associated with this program. These funds are intended for planning, implementation, and monitoring of activity related to oyster reef restoration. An estimated 3% will be used for project planning, which includes activities such as project selection and development. An additional estimated 5% will be allocated for monitoring and data management activities which include project activity monitoring and collection of data to support metrics for evaluation of success.

Total FPL Project/Program Budget Request:
$ 12,800,000.00

Estimated Percent Monitoring and Adaptive Management: 5 %

Estimated Percent Planning: 3 %

Estimated Percent Implementation: 82 %

Estimated Percent Project Management: N/A

Estimated Percent Data Management: N/A

Estimated Percent Contingency: 10 %

Is the Project Scalable?:
Yes
If yes, provide a short description regarding scalability.:
Given the program's budget of $12.8 million and Texas's estimated need of over $82.5 million (Table 1. TCRMP Tier 1 projects: Oyster Restoration*), this program will prioritize and scale projects to maximize impact. The program will consist of several independent projects, which can be scaled down or reduced in number based on available funding.

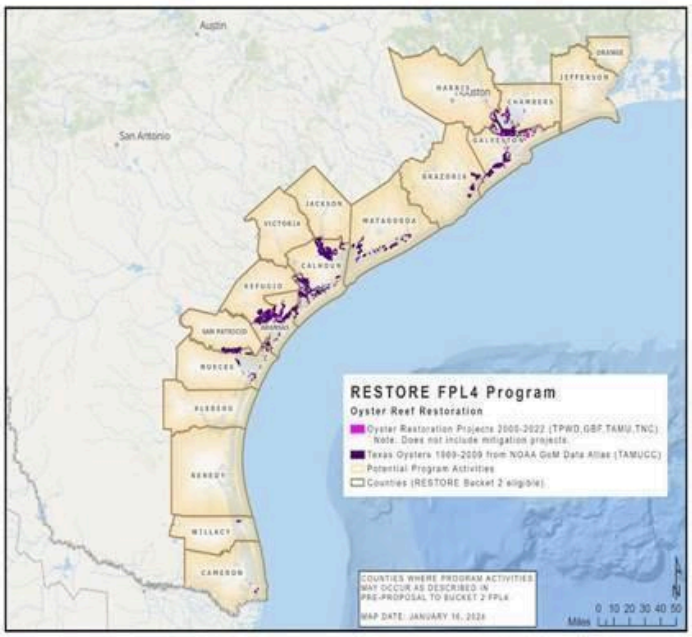
Environmental

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	N/A	Note not provided.
Endangered Species Act	N/A	Note not provided.
National Historic Preservation Act	N/A	Note not provided.
Magnuson-Stevens Act	N/A	Note not provided.
Fish and Wildlife Conservation Act	N/A	Note not provided.
Coastal Zone Management Act	N/A	Note not provided.
Coastal Barrier Resources Act	N/A	Note not provided.
Farmland Protection Policy Act	N/A	Note not provided.
Clean Water Act (Section 404)	N/A	Note not provided.
River and Harbors Act (Section 10)	N/A	Note not provided.
Marine Protection, Research and Sanctuaries Act	N/A	Note not provided.
Marine Mammal Protection Act	N/A	Note not provided.
National Marine Sanctuaries Act	N/A	Note not provided.

Migratory Bird Treaty Act	N/A	Note not provided.
Bald and Golden Eagle Protection Act	N/A	Note not provided.
Clean Air Act	N/A	Note not provided.
Other Applicable Environmental Compliance Laws or Regulations	N/A	Note not provided.

Maps, Charts, Figures

Additional Information



Caption : Figure 1. Map showing location of potential program activity, oyster habitat and previous oyster restoration projects in Texas

Other Uploads

TX Oyster Reefs-Table1
Table 1. TCRMP Tier 1 projects: Oyster Restoration*

Project ID	Project Name	Millions
9187	Carancahua Bay Community Reefing Project	$0.13
922	Oliver Point Shoreline Protection and Reef Restoration	$1.60
600	Half Moon Oyster Reef Restoration - Phase 3	$2.80
1332	Paired Subtidal and Intertidal Oyster Reef Restoration in Texas Bays	$4.00
1359	Texas Point NWR Shoreline Protection Sabine Neches Waterway and Oyster Habitat Creation	$5.00
9226	Oyster Reef Restoration in Mesquite-Carlos-Ayres Complex	$10.00
9253	Going to Scale: Expanding Oyster Restoration in Aransas Bay	$28.00
9287	Rincon Reef Breakwater	$31.00
	Total	**$82.53**

**For more information on these projects visit the TGLO's website at https://www.glo.texas.gov/coast/coastal-management/coastal-resiliency/resources/files/2023-tcrmp-overview.pdf*

GIS Data:
TX_FPL3b_LS.zip

Council Staff Review: Oyster Reef Restoration Program

FPL Internal Staff Review

Project/Program	Oyster Reef Restoration Program		
Primary Reviewer	Heather Young	Sponsor	Texas
EC Reviewer	John Ettinger	Co-Sponsor	N/A

1. Is/Are the selected Priority Criteria supported by information in the proposal?	Yes
Notes	

2. Does the proposal meet the RESTORE Act geographic eligibility requirement?	Yes
Notes	

3. Are the Comprehensive Plan primary goal and primary objective supported by information in the proposal?	Yes
Notes	

4. Planning Framework: If the proposal is designed to align with the Planning Framework, does the proposal support the selected priority approaches, priority techniques, and/or geographic area?	Yes
Notes	

5. Does the proposal align with the applicable RESTORE Council definition of project or program?	Yes
Notes	

6. Does the budget narrative adequately describe the costs associated with the proposed activity?	More information needed
Notes	The 2026 FPL proposal provides the total funding amount requested for the activity, along with the percentage breakdown between FPL Categories 1 and 2. By applying the percentages to the total for the activity the requested amount in FPL Category 1 is $2,304,000 and Category 2 is $10,496,000. Need to verify numbers are correct. This comment has been addressed.

7. Have three external BAS reviews been completed and has the proposal sponsor provided their response?	More information needed

Notes	Please see the external BAS review comments, and external reviews summary attached with these review comments.

8. Have appropriate metrics been proposed to support all primary and secondary goals?	Yes
Notes	

9. Environmental compliance: If FPL Category 1 has been selected for the implementation component of the project or program, does the proposal include environmental compliance documentation that fully supports the selection of Category 1?	N/A
Notes	The implementation component is in FPL Category 2.

Summary of Best Available Science Review: Oyster Reef Restoration Program

The Texas Oyster Restoration proposal received strong support across all reviewer levels for its scientific basis and methodological rigor. Reviewers agreed that the proposal was well justified with peer-reviewed and publicly available sources, specifically relevant to the Texas Gulf Coast. Literature was accurately cited and represented in a fair and unbiased manner. The proposal addressed environmental risks, including climate impacts, and included a robust adaptive management approach. While all reviewers affirmed the proposal's scientific credibility, there were some concerns about the clarity of implementation roles and past project experience. Goals and objectives were generally well received, though some requested more specificity. The proposed methods were deemed scientifically sound and appropriate, and the project's potential environmental benefits were clearly outlined. Metrics for success were included, but some reviewers noted a lack of defined targets and needed more detail on monitoring timelines. Long-term and short-term risks were well addressed by most reviewers, though one noted a gap in mitigation planning. The use of recent and relevant scientific information was praised, as was the integration of stakeholder feedback. While the proposal demonstrated an understanding of factors influencing oyster restoration success, it lacked specific evaluations of past project outcomes. The monitoring and adaptive management plans were widely praised, though minor requests for more detail were made. Overall, reviewers found the proposal to be scientifically robust and recommended it for advancement.

Summary of Texas' Response to BAS Comments: Oyster Reef Restoration Program

In response to BAS comments, the state clarified that the proposal represents a program and that past projects have been implemented by likely project partners. Additional information on risk mitigation was included, along with case studies highlighting both successful and unsuccessful oyster restoration efforts in Texas. The state also provided potential scenarios related to risk and uncertainty to illustrate its monitoring and adaptive management approach.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Oyster Reef Restoration Program
Location (If Applicable): Program activity is in the Upper and Middle Texas Coast, particularly in areas with historical location of oyster reefs; including areas within the following Texas RESTORE eligible counties: Nueces, San Patricio, Aransas, Refugio, Victoria, Jackson, Calhoun, Matagorda, Brazoria,Harris, Galveston, Chambers, Jefferson, Orange Counties.
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: In State
Date of Review: November 4, 2024

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
Applicant provided multiple peer-reviewed and publicly available sources to justify the problem, objectives to meet a possible solution, and methods to reach that solution. Sources include scientific studies, management plans, and recommendation documents from federal agencies and NGOs.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
Proposal directly pertains to the Gulf Coast.	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Yes
Comments:	
Many sources were used in this proposal from a wide background and using multiple perspectives, from federal to state to NGO to academia. Additionally, these sources were accurately sited and used in an unbiased manner.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
Risks were addressed, specifically relating to climate and environmental concerns. Risks considered include hurricanes, storms, and droughts.	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	

The peer-reviewed and publicly available data cited in this proposal are from diverse sources providing the perspective of multiple entities to build their goal, objectives, and methodology. Citations are mostly from recent publications within the last 10 years, with some older publications expressing the status of oyster reefs over time. Scientific sources are from recognized oyster experts with supporting metrics that enhance the proposal.

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
The applicant provided statistics that justify the problem and the historical decline of oyster populations. The applicant cited multiple peer-reviewed publications to justify the methods for restoring oyster reefs and the additional investigations required to determine the best site selection, cultch material, etc. Data provided from citations show integrity and quality, and these data support the proposal's objectives.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
Risks are well documented using multiple citations from known researchers on the Texas Gulf Coast. The risks are communicated and uncertainties in the outcomes.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Need more information
Comments:	
The applicant does not refer to previous projects that they have personally implemented, but the methods and monitoring indicate an understanding of this process. More information would be needed to specifically understand the applicant's history with oyster reef restoration projects.	

Question B	
Does the project/program have clearly defined goals and objectives?	Need more information

Comments:	
The objectives are vague including the targeted number of oyster reefs to be restored, the area, and/or the specific systems where the reefs will be restored in. However, the goal specifies restoration of non-commercial oyster reefs along the Texas Gulf Coast and seems to be broad to allow for unique designs. It is implied that objectives and targets will be defined throughout the planning process.	

Question C	
Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes
Comments:	
The applicant lists methods that have been scientifically backed with peer-reviewed papers or publicly available documents like management plans and recommendations from NGOs. There are multiple approaches that the applicant considers depending on the environment, showing an understanding of the different factors that may influence the success of a project.	

Question D	
Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes
Comments:	
The applicant describes how non-commercial oyster reefs can provide habitat benefits, shoreline protection, fisheries support, and more by citing peer-reviewed publications. The applicant also refers to multiple management plans, including the Texas Coastal Resiliency Master Plan.	

Question E	
Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Need more information
Comments:	
Success measures are not clearly defined.	

Question F

Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Yes
Comments:	
The applicant clearly states the project's vulnerability to long-term environmental risks and indicates consideration of these risks throughout the project planning and implementation process.	

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	No
Comments:	
Implementation risks and mitigation plans to reduce risk were not mentioned in this proposal.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
Scientific peer-reviewed articles were mostly from the last decade with many more recent in the last 2-5 years. The applicant took recency of their citations into consideration to help define the problem and address the solution.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Need more information
Comments:	
It is not clear whether the applicant has evaluated past successes or failures of similar efforts, but they reference other restoration projects led by different organizations. The citations point to publications by other agencies and NGOs that have engaged in oyster reef restoration.	

Question J

Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is the appropriate best available science justification provided? If applicable, how is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	Need more information

Comments:

While the applicant states the options for monitoring and the importance of adaptive management, metrics are not clearly stated including recommended monitoring timeline. However, the applicant does state that the metrics will be selected based on the project goals and objectives.

Please summarize any additional information needed below:

This proposal considers recent, peer-review publications along with publicly available documents from state and federal agencies, NGOs, and academia. The citations build a strong backing for the problem at hand (decline in oyster populations) and the proposed solution (restore non-commercial oyster reefs). The applicant provides sufficient justification on their design preferences, methods, and risk that may impact this project. Multiple management plans and state-wide guidance documents like the Texas Coastal Resiliency Master Plan were considered and will continue to be considered throughout the project lifecycle. This applicant provided unique and highly valuable information by incorporating working group feedback with government agencies and NGOs, which allows participants to provide feedback through a survey. Survey results indicated strong support and emphasized the need for a program like this in Texas.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Oyster Reef Restoration Program
Location (If Applicable): Program activity is in the Upper and Middle Texas Coast, particularly in areas with historical location of oyster reefs; including areas within the following Texas RESTORE eligible counties: Nueces, San Patricio, Aransas, Refugio, Victoria, Jackson, Calhoun, Matagorda, Brazoria,Harris, Galveston, Chambers, Jefferson, Orange Counties.
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Out of State
Date of Review: September 10, 2024

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
The objectives and methods are justified and use well-established peer reviewed information that is particularly relevant to the Texas Gulf Coast.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
To reiterate my previous comment, the information is very relevant to the Texas Gulf Coast	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Yes
Comments:	
I am familiar with quite a few of the cited references and authors. The proposal cites excellent and relevant publications.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
The proposal does an excellent job in spelling out and evaluating specific, uncertainties (weather and climatic events, anthropogenic impacts, etc.) The proposal spells out adaptive management strategies to address these real concerns to the success of the project(s).	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	
The applicant did a thorough job in providing justification for the project using excellent and relevant peer-reviewed data.	

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
Well-established metrics for success were spelled out that support the ability to maximize quality, objectivity and integrity of information.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
Risks and uncertainties were well documented and understood.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Yes
Comments:	
The project sponsor demonstrated an excellent history and track record of implementing previous projects similar to this one.	

Question B	
Does the project/program have clearly defined goals and objectives?	Yes
Comments:	
Primary Goal: Restore and Conserve Habitat Primary Objective: Restore, Enhance and Protect Habitats Secondary Goal: Replenish and Protect Living Coastal and Marine Resources Secondary Objective: Protect and Restore Living Coastal and Marine Resources	

Question C

Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes

Comments:

In general, the proposed methods are ones that the restoration community supports. Also, the fact that they propose intertidal and subtidal reef restoration, living shorelines using oyster cultch and oyster spawning reserves is an excellent comprehensive approach. I also like their proposal to utilize a habitat suitability assessment to assess the potential for long-term success or failure for the project.

Question D

Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes

Comments:

Environmental benefits of enhancing lost oyster habitat and productivity were well defined. They also describe several underlying stressors leading to the historical loss of oyster habitat along the Texas coast and how their plans will deal with those stressors.

Question E

Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Yes

Comments:

Success measures were clearly spelled out in the proposal. These include reef area, oyster recruitment and density and length of shoreline protection.

Question F

Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Yes

Comments:

Proposers identify climatic events, including hurricanes, extreme storms, and prolonged droughts as substantial risks which can cause increased erosion, sediment displacement, and habitat destruction, directly affecting the construction, effectiveness, and longevity of restoration projects. Proposers recommend considering Texas water budgets when planning for successful oyster restoration. They also mention that hydrodynamic-oyster population models can be useful for simulating potential oyster health scenarios.

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	Yes
Comments:	
The proposers describe many, if not all, of the short-term risks and uncertainties of oyster restoration, and because of these concerns they smartly describe their intention and approach to adapt the principles of adaptive management, which are critically useful in both planning and managing restoration projects, to increase the probability of success.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
Their section on Risks and Uncertainties goes into great detail in discussing (and referencing) the many issues confronting oyster habitat restoration. The information is both recent and relevant, so they have a clear understanding of the challenges they will be facing.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Need more information
Comments:	
The project identified risks associated with oyster habitat restoration, but I did not find any information in the proposal that evaluated past successes or failures from previous projects. From my own experience, I have had both success and failure in undertaking this kind of work – there is no guarantee that any one project will be successful. But the proposers demonstrate an understanding of this, and have proposed methods to minimize failure by identifying such vulnerabilities in their site selection criteria.	

Question J	
Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is appropriate best available science justification provided? If applicable, how	Yes

is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	

Comments:

The proposers do an excellent and comprehensive job in their approach to monitoring and data management. They identify a suite of well-established metrics to measure success, including habitat metrics (e.g., reef height, reef rugosity), geomorphology (e.g., shoreline gain/loss), hydrology (e.g., dissolved oxygen, salinity), sediment (e.g., sedimentation rate, reef subsidence rate), adjacent habitat (e.g., density and percent cover of aquatic vegetation, species composition), and oyster population attributes (e.g., oyster density, size frequency distribution, disease prevalence).

They also recognize the critical importance of adaptive management in considering the risks and uncertainties, in particular those that may set back, delay, or prevent the project implementation. Recognizing this, they have allocated 10% of the total budget for contingencies, providing a buffer for adaptive management.

Please summarize any additional information needed below:

This review was requested to determine if the Best Available Science (BAS) was being utilized to accomplish the goals and objectives of this project/program. It is my expert opinion that they have very successfully demonstrated this to be true. They have shown previous success in Texas oyster habitat restoration projects, a thorough understanding of risks and uncertainties and how to address them, and the environmental benefits of this project. Their approach using adaptive management is sound, and their proposed methods are considered tried-and-true within the oyster habitat restoration community.

Therefore, I have no concerns in recommending this proposed project to move forward from a scientific perspective.

Thank you for the opportunity to review this proposal on its scientific merits.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Oyster Reef Restoration Program
Location (If Applicable): Program activity is in the Upper and Middle Texas Coast, particularly in areas with historical location of oyster reefs; including areas within the following Texas RESTORE eligible counties: Nueces, San Patricio, Aransas, Refugio, Victoria, Jackson, Calhoun, Matagorda, Brazoria,Harris, Galveston, Chambers, Jefferson, Orange Counties.
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Out of Gulf
Date of Review: October 10, 2024

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
The proposal includes many citations to relevant peer-reviewed literature, and the literature review appears to be comprehensive.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
The proposal directly pertains to the Gulf Coast region.	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Yes
Comments:	
Yes, the literature is cited accurately and fully.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
Several risks and sources of uncertainty have been identified, particularly those that affect coastal hydrology and water budgets.	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	
The proposal is well supported by peer-reviewed literature and publicly available data/reports. Cited literature include seminal works and recent publications.	

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
The proposal includes consideration of many different factors that could affect the success of oyster restoration projects, supported by peer-reviewed literature, and also includes expectations of project candidates to consider habitat suitability models when siting projects. The adaptive management section also outlines monitoring expectations across different phases of each restoration project to ensure accountability.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
Risks and uncertainties are well summarized and supported by literature, and plans to mitigate the risks are also included.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Need more information
Comments:	
There is discussion of many oyster restoration projects that have been implemented in Texas, but it is unclear whether the proposing team managed or oversaw those projects. Language throughout the proposal, such as in the discussion of permitting requirements, indicates the team has led oyster restoration projects previously, but their role in managing prior projects is not stated explicitly.	

Question B	
Does the project/program have clearly defined goals and objectives?	Yes

Comments:
The proposal includes a well defined goal and key considerations to be made of candidate projects, though there are no specifically defined objectives.

Question C	
Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes
Comments:	
The methods include several key considerations that should be made before instituting oyster reef restoration projects, and outlines an expectation that supported initiatives use habitat suitability modeling to inform project siting. The proposal does not discuss cost-effectiveness or include other specific review criteria.	

Question D	
Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes
Comments:	
The “Environmental Benefits” section outlines several benefits of oyster reef restoration. This section does not describe underlying environmental stressors, but such stressors are comprehensively discussed earlier in the proposal. Several regional plans are cited throughout the proposal in which oyster reef restoration projects are called for.	

Question E	
Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Yes
Comments:	
Five metrics are included, though the targets are listed as 0 for each, and the narratives for each metric do not elaborate on the metrics in detail.	

Question F

Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Yes
Comments:	
Yes, several risks that drive coastal hydrology (e.g. extreme weather events, sea level rise, erosion, wetland loss) are discussed along with their potential impacts to oyster reef restoration projects, and the risks and uncertainties section is well supported by peer-reviewed literature.	

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	Yes
Comments:	
The proposal has a particularly strong adaptive management section in which a monitoring plan is outlined, which will facilitate data collection at different restoration project stages to create points in time when adaptive actions can be taken to mitigate project failure. There is also discussion of monitoring metrics beyond just the biophysical (e.g., to evaluate socio-economic outcomes to nearby communities), but it is unclear whether such monitoring will actually occur.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
The proposal cites a combination of seminal works and recent publications and reports.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Yes
Comments:	
The proposal, in many places, explains factors that are known to contribute to the success or failure of oyster reef restoration projects. Specific project successes and failures are not described, but the factors that generally lead to success or failure are.	

Question J	
Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is appropriate best available science justification provided? If applicable, how is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	Yes
Comments:	
The monitoring and adaptive management plan is particularly strong, and well supported by literature. The monitoring plan will produce information needed to assess whether adaptive actions are required to mitigate project failures. The monitoring plan does not directly reference the performance metrics, but there is some overlap between the metrics and the proposed monitoring measures. The data management plan is also clearly conveyed and comprehensive.	

Please summarize any additional information needed below: