RESTORE Council Proposal Document

General Information

Proposal Sponsor: Texas Commission on Environmental Quality (TCEQ)

Title:
Chenier Plain Ecosystem Restoration Program

Project Abstract:
Texas, through the Texas Commission on Environmental Quality, is requesting $39.6M in Council-Selected Restoration Component funding for the proposed Chenier Plain Ecosystem Restoration Program. This would include $3,366,000 in planning and project management funds as FPL Category 1, as well as a separate $36,234,000 implementation component as an FPL Category 2 priority for potential funding. The program will support the primary RESTORE Comprehensive Plan goal to restore and conserve habitat through activities to restore and conserve coastal habitats within the Chenier Plain complex of Texas through a variety of methods including beneficial use of dredge material, construction of breakwaters to protect shoreline, and restoration of hydrology and wetlands. Targeted habitats will include freshwater to estuarine marsh, coastal prairie grasslands, tidal flats, creeks and basins, all of which creates a productive complex for diverse fish and wildlife resources and protects inland areas from storm surge. Potential partners for the program may include the U.S. Army Corps of Engineers, Texas Parks and Wildlife Department, Ducks Unlimited, U.S. Fish and Wildlife Service, and local and regional governments. The program will utilize specified criteria for selecting projects that were identified earlier through public meetings and as part of a stakeholder process.

Implementation of the program has the potential to restore degraded wetlands, reduce erosion, improve water quality, create habitat, provide land reclamation, and increase coastal resiliency in an effective and efficient manner. Program duration is 4 years.

FPL Category: Cat1: Planning/ Cat2: Implementation

Activity Type: Program

Program: Chenier Plain Ecosystem Restoration Program

Co-sponsoring Agency(ies): N/A

Is this a construction project?:
Yes

RESTORE Act Priority Criteria:
(I) Projects that are projected to make the greatest contribution to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region, without regard to geographic location within the Gulf Coast region.
(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 program will meet three of the RESTORE Act Priority Criteria:

1. Projected to make the greatest contribution to restoring and protecting natural resources. This program aims to restore and protect the natural resources within the Chenier Plain. The Chenier Plain is a highly diverse and productive area, containing the largest contiguous estuarine marsh complex in Texas. The natural resources provided by this region are being diminished due to wetland degradation, erosion, and decreasing water quality. The benefits of this program are projected to restore, protect, and increase habitats, water quality, and coastal resiliency in the most effective and efficient manner.

2. Large-scale projects and programs. This program includes individual, large-scale ecosystem restoration projects which have the potential to provide a significant amount of habitat restoration. The benefits of these combined projects will restore hydrology in this large area, support natural diversity and productivity, and increase coastal resiliency.

3. Contained in existing Gulf Coast State Comprehensive Plans. Many of the components of prospective projects in this program were evaluated in the 2019 Texas Coastal Resiliency Master Plan (TCRMP), the state comprehensive coastal plan for Texas. Chenier Plain projects scored in the top tier of TCRMP projects (TGLO, 2019).

Project Duration (in years): 4

Goals

Primary Comprehensive Plan Goal:
Restore and Conserve Habitat

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

Secondary Comprehensive Plan Objectives:
N/A

Secondary Comprehensive Plan Goals:
N/A

PF Restoration Technique(s):
Create, restore, and enhance coastal wetlands, islands, shorelines and headlands: Protect natural shorelines
Create, restore, and enhance coastal wetlands, islands, shorelines and headlands: Sediment placement
Restore hydrology and natural processes: Restore natural salinity regimes

Location

Location:
Chenier Plain of southeast Texas including locations in four upper coastal counties: Galveston, Orange, Jefferson, and Chambers.

HUC8 Watershed(s):
Texas-Gulf Region(Neches) - Neches(Lower Neches)
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(Sabine Lake)

State(s):
Texas

County/Parish(es):
TX - Chambers
TX - Galveston
TX - Jefferson
TX - Orange

Congressional District(s):
TX - 14
TX - 36

Narratives

Introduction and Overview:

The Chenier Plain environment includes freshwater to estuarine marsh, coastal prairie grasslands, tidal flats, and creeks and basins, all of which creates an extremely productive complex with a diverse array of vegetation, fish, and wildlife resources (Johnson, Cairns, and Houser, 2013). This environment provides many benefits for surrounding communities. The gradual transition of freshwater marshes to estuarine marshes, punctuated by upland ridges, across the Chenier Plain creates a unique landscape of habitats which supports a wide variety of plants and animals. The vast resources provided by the Chenier Plain have been in decline due to both anthropogenic and natural processes, particularly in locations along the Gulf Intracoastal Waterway. Continued degradation in this area may result in a decrease in the effectiveness of storm surge suppression, significant increase in the risks of storm damage, economic losses, and habitat destruction. The Texas portion of the Chenier Plain holds areas of environmental significance including, but not limited to, Salt Bayou Watershed, Sea Rim State Park, Texas Point National Wildlife Refuge, McFaddin National Wildlife Refuge, and J.D. Murphree Wildlife Management Area. These and similar locations will likely be the focus of specific project activities (see map).

The lower reach of the Salt Bayou Watershed within the Chenier Plain is the largest contiguous estuarine marsh complex in Texas and is a highly productive fishery and critical storm surge protection barrier for inland marshes and communities, including Sabine Pass, Port Arthur and Beaumont, with their critical petrochemical and military infrastructure (Texas Parks and Wildlife Department, 2013). Salt Bayou and the adjacent Chenier Plain watersheds support a mosaic of 139,000 acres of coastal wetlands. Natural diversity and productivity are dependent on sediment deposition and freshwater sheet flows to support these essential functions. This program would implement several components to restore hydrology and marsh elevations to enhance wetlands and stabilize shorelines within the Salt Bayou Watershed Ecosystem along the Upper Texas Coast.

Excavation of the Gulf Intracoastal Waterway (GIWW, see map) in the early 20th century severed Gulfward sheet flow and freshwater inflows via bayous and tributaries, and initiated saltwater intrusion into the heart of this low-lying landscape, killing emergent brackish marsh vegetation, resulting in erosion and scouring. Relative sea level rise and human-induced subsidence and faulting has also caused fragmentation and loss of marsh and flats to open water (White and Tremblay, 1995). Vegetation coverage has been reduced in places from near 100% to 50% or less (Texas Parks and Wildlife Department, 2013; White et al., 2007). This program will work with local partners to increase the transport of freshwater from north of the GIWW into marshes south of the GIWW potentially through construction of additional siphons underneath the GIWW. It may also include construction of shore protection structures to slow or stop erosion of existing marshes, replacing water control structures to reduce saltwater intrusion, and modification and repair of existing levees to improve environmental land management.

The sponsor of this program is the Texas Commission on Environmental Quality (TCEQ). The TCEQ administers RESTORE Act activities in Texas and has experience in implementing FPL1 projects. Furthermore, TCEQ is a Natural Resource Trustee agency involved in the state's Natural Resource Damage Assessment (NRDA) program. Importantly, our NGO, state, and federal agency collaborators have significant experience in overseeing environmental restoration projects and addressing Chenier Plain problems. In fact, the effort to restore the Texas Chenier Plain has been ongoing since at least 1990. In 2013, the Salt Bayou Marsh Workgroup (Workgroup) published a restoration plan describing the status of the Texas Chenier Plain, a review of past and ongoing projects, and recommendations for future work. The Workgroup members include: (1) Ducks Unlimited, (2) Jefferson County Engineering Department and Drainage District #6, (3) NOAA NMFS Habitat Conservation Division and the Restoration Center, (4) Texas General Land Office Coastal Erosion Planning and Response Act

and the Natural Resource Damage Assessment Programs, (5) Texas Parks and Wildlife Department Wildlife and Coastal Fisheries Divisions and the Environmental Assessment, Response, and Restoration Program, (6) Texas Water Development Board Coastal Water Resources Group, (7) U.S. Army Corps of Engineers Galveston District, and (8) U.S. Fish and Wildlife Service McFaddin National Wildlife Refuge and the Coastal Program. The proposed program will involve this Workgroup and other stakeholders to a great extent.

This program conforms to the RESTORE Council's FPL3 Planning Framework by adhering to the priority to restore and conserve habitat, and to restore, enhance, and protect habitats and shorelines. This program will also advance the commitments set forth in the 2016 Comprehensive Plan Update by using the best available science for ecological restoration, developing a monitoring and data management framework, and defining metrics of success for the potential Chenier Plain projects. The total cost of this program and the amount of Council Selected Restoration Component funding being requested is $39.6 million over 4 years. The actual cost of individual projects may vary based on the funding granted, and because of this the program is scalable and will allow for a reduction or increase in projects and size. The timeline is also subject to change based on the scalability. Potential partners for the program include, but are not limited to, USACE, TPWD, DU, USFW, and local and regional governments.

Proposed Methods:

This program aims to use a variety of methods, including beneficial use of dredge material, the construction of breakwaters to protect shoreline, levee regrading, and the restoration of hydrology and wetlands to enhance and restore the Chenier Plain complex. This program will develop a process for selecting activities that builds on Texas' stakeholder-driven process for developing the Planning Framework and selecting preliminary projects for FPL3 consideration. Texas' process started with learning the public's concerns regarding coastal environmental problems, their causes, and the types of things we should do to address them. We initially held three public meetings in Brownsville, Corpus Christi, and Galveston. Following these meetings, 127 people filled out an online survey where they scored their levels of environmental concern and identified the types of activities needed to address them. The same survey was provided to our NGO and state-federal working group partners, which provided 32 more responses. With the information from this survey, county governments, NGOs, and a workgroup made up of Texas NRDA/NFWF and Texas Coastal Resiliency Master Plan (TCRMP) representatives submitted 38 projects for FPL3 consideration. Coastal experts, Harte Research Institute staff, and Texas Commission on Environmental Quality (TCEQ) staff reviewed the projects and selected 23 for public comment. Once preliminary projects were selected, public meetings in Corpus Christi and Galveston were held to gather feedback. Among these 23 projects, there are 5 multicomponent projects that address the Chenier Plain and have many elements that scored in the top tier in the TCRMP (Texas General Land Office, 2019). These projects or project components plus additional activities as they arise will be considered in this program for implementation. This program will develop criteria for project funding that considers project efficacy in meeting objectives and improving the environment, resiliency, and its synergy with other projects on the Chenier Plain.

General steps to completing the potential project components will include:

1. Coordinating with local partners
2. Completing engineering and design
3. Applying for permits
4. Soliciting bids for construction
5. Overseeing construction
6. Conducting monitoring and adaptive management.

Restoration methods for consideration

Beneficial Use of Dredge Material (BUDM):
An activity of this program will include BUDM to restore wetlands and elevate marshes. This is a known and documented method of habitat creation when combined with restoration and conservation efforts, with well over 13,000 acres of wetlands benefitting from the practice of BUDM (Cluff, 1989; Parson, 2012). The degradation of coastal wetlands can be largely attributed to the breakup and lowering of marshes, transforming them to shallow-water habitat. Thus, reintroduction of sediment to restore substrate elevations is a fundamental step of marsh restoration (Ford, 1999). Dredge material can also be used to nourish beaches, specifically berms which provide a level of protection of landward environments from storm over wash and relative sea level rise.

This program will implement BUDM for habitat restoration to restore marshes at several potential priority sites with input from NRDA trustees and the Ducks Unlimited Beneficial Use (BU) team. In 2018, 41 potential BU sites were selected for evaluation by Ducks Unlimited, the U.S. Army Corps of Engineers (USACE), state and federal resource agencies, and NGO groups. The geographic scope of those BU sites includes a large portion of the Texas coast and will consider sediments from the GIWW and other federal ship channels, private channels, berths, as well as the mining of dredge material placement areas currently used by the USACE and the Texas Department of Transportation (TxDOT). The potential BU project sites in the Chenier Plain complement the Salt Bayou Marsh Restoration Plan, an ongoing multi-agency effort to restore the Salt Bayou Marsh Complex in Jefferson County, that identifies BUDM as a major component of the long-term marsh restoration strategy (Texas Parks and Wildlife Department, 2013). Site investigations, geotechnical sampling and bathymetric surveys will be performed at potential sites to provide the necessary information for project selection and design.

Fresh Water Siphons:
This program will consider additional siphons to route freshwater underneath the GIWW and bring it south of the GIWW to the lower Chenier Plain. These siphons are designed to reconnect the natural flow of freshwater and flush saltwater from the coastal wetlands thereby improving wetland health (Pothina and Guthrie, 2009; Texas Parks and Wildlife Department, 2013). A similar siphon project is currently active as part of the Salt Bayou Restoration Plan and funded through the Gulf Environmental Benefit Fund administered by the National Fish and Wildlife Foundation.

Other successful siphon and freshwater diversion projects have been completed in similar locations in Louisiana. The West Pointe a la Hache Freshwater Diversion project was designed to restore the natural hydrology and offset the sinking of the marsh in the Barataria Estuary. The project consists of eight 1.8-meter diameter siphons that divert freshwater from the Mississippi River into the wetlands of the estuary at a rate of 59 cubic meters of water per second (Good, 1993). When constructed, these siphons were expected to restore about 9,200 acres of marshland. As a result of the siphons the land loss rate is estimated to be reduced by 38 acres per year, from a rate of 1.29% to 0.89% post-construction (Boustany, 2010).The Caernarvon freshwater diversion, Naomi siphon, White's Ditch siphon, and Bohemia structure are other examples of siphon projects that have been completed, all with the goal of restoring hydrology and offsetting relative sea level rise in wetland areas of Breton Sound, Louisiana (Lane, 1999).

Breakwaters:
Installation of breakwaters will be considered to reduce shoreline erosion and protect coastal wetlands. Breakwaters have been used widely and in a variety of environmental settings to reduce wave energy. This program will seek gain additional benefit through their potential to promote oyster habitat when designed effectively and efficiently (Douglass, 2012).

Levee modification:
Levees may be regraded in several potential project sites, such as within the McFaddin and JD Murphee Wildlife Refuge Complexes. Natural or human induced damage to levees can cause significant damage to water quality, ecosystem productivity, and flood protection. Taking steps to repair these levees will support the mitigation of flood risk and help to restore coastal ecosystems in these areas, while increasing the productivity of the surrounding habitats (Olson 2015).

Environmental Benefits:
The Chenier Plain Ecosystem Restoration program will provide habitat restoration and provide for the health and stability of the environment, enhancing the existing habitats and creating new ones. Proposed project methods will include marsh restoration through the beneficial use of dredge material, construction of breakwaters along eroding shorelines, placement and distribution of rock materials, reparation and regrading of levees, and the use of best management practices to restore hydrological connections and marsh elevations. These practices have the potential to restore degraded wetlands, reduce erosion, improve water quality, create habitat (including oysters), provide land reclamation, and increase coastal resiliency in a large-scale, effective, and efficient manner.

Numerous factors such as channelization, subsidence, and erosion of critical shorelines in the Chenier Plain Ecosystem have degraded habitats (White et al., 2007; Paine, Mathew, and Caudle, 2012). This degradation increases the risk of storm surge impacts to economically important industries and nationally significant ports along the Upper Texas Coast. Restoration and protection of this marsh system would not only directly ensure long-term ecological benefits from the habitats, it would also reduce vulnerability of critical infrastructure to hurricanes and storm surges. In addition, this program would enhance coastal resiliency by restoring and protecting economically important fisheries and valuable recreation areas. This project combines several Tier 1 projects which are identified in the Texas Coastal Resiliency Master Plan (Project IDs R1-1, R1-2, R1-19, R1-25, R1-41 R1-42, R1-43) (Texas General Land Office, 2019) and would add to the previously funded work completed with Deepwater Horizon NRDA Texas Trustee funds and Gulf Environmental Benefit Fund grants.

The ecosystem services provided by the Chenier Plain system include storm surge buffering, water quality maintenance, sediment retention, nutrient regulation, recreation, and a wide variety of critical habitat. These services contribute to human wellbeing on the upper Texas coast and have both market and non-market value making them unreplaceable (Barbier et al., 2011). Implementation of this program will help preserve ecosystem services for the future.

Metrics:

Metric Title: HR013 : Wetland restoration - Acres restored
Target: TBD
Narrative: This program aims to restore wetland habitats within the Chenier Plain. Wetlands are a significant habitat in this geographic area, and activities including marsh elevation and hydrology restoration will be performed. Success will be measured by maximizing the wetland habitats that are restored through the program, which would have been otherwise lost or negatively impacted. This can be quantified through land surveys and comparing rates of degradation or erosion. A reasonable estimate for acres being restored in this program will be made once specific projects are selected.

Metric Title: HR014 : Habitat restoration - Acres of coastal habitat prevented from eroding
Target: TBD

Narrative: The goal of this program is to restore and conserve habitat within the Chenier Plain geographic area. This includes reducing or preventing the degradation and erosion of coastal environments. A measure of this program's long-term success will be the quantity of critical environments that would have been lost or negatively impacted if no restoration activities were performed. This will be quantified through land surveys and comparisons to past or future predicted rates of degradation. Project selection will inform a reasonable target for this metric.

Metric Title: HR009 : Restoring hydrology - Acres with restored hydrology
Target: TBD
Narrative: This program will restore hydrology especially south of the GIWW to positively impact coastal wetlands that have been affected by saltwater intrusion and other altered hydrology. Success for this aspect of the program can be measured by improved hydrology in the proposed project locations. Project selection and design will inform a reasonable target for this metric.

Metric Title: HR002 : Shoreline restoration - Miles of shoreline stabilized and restored
Target: TBD
Narrative: This program aims to restore shorelines within the Chenier Plain geographic area through various methods including the construction of breakwaters. The target is to provide the greatest benefit to reducing shoreline erosion and preserve a significant amount of critical environments given the funding provided. Success of the program can be measured by maximizing the length of shorelines that receive restoration activities. Texas will provide annual updates to the Council on the length of shoreline being restored and the features constructed.

Risk and Uncertainties:

Potential risks include the continuing increase of costs for construction and environmental permitting requirements. Additional long-term maintenance costs are also an uncertainty. Effective planning and design, including careful cost estimates and line item budgets for selected projects, can help to minimize these risks. In addition, adjacent landowners may object to the construction of hard structures that could potentially impact shoreline positions. Large-scale projects require planning for maintenance costs and coordination with program partners to identify a party to hold permits and be responsible for permit conditions. In addition, the uncertainty with dredging costs may impact the budgets for each component of the program. However, projects can be phased or scaled to accommodate the available funding and sediments. In addition, there could be several dredge cycles during a project period which may provide some cost savings through opportunities to cost share with program partners such as USACE.

The process of habitat restoration through the utilization of sediments from maintenance dredging is a widely used restoration technique and has proven to be very cost effective and successful in application. Other techniques used in this program also have successful track records. However, there are risks to the implementation of this program. The predominate risk to this program is the rate of relative sea level rise. Due to risks from relative sea level rise and hurricane impacts, dredged materials will likely need to be replenished periodically, and the frequency will depend on changes in relative sea level rise and storm impacts. The upper Texas coast has the highest rate of subsidence in Texas, driven by groundwater withdrawal, oil and gas extraction, and compaction of Holocene sediments (Morton, 2003; Penland and Ramsey, 1990; White and Morton, 1997). The average rate of relative sea level rise in nearby Galveston from 1909 to 2003 was 6.5 mm/year as measured from the tide gauge at Pier 21 on Galveston Island, which provides the longest continuous record of sea-level variations along the Texas coast (Zervas, 2009). The impacts of relative sea level rise in this region are predicted to change rates and patterns of sedimentation, distribution of intertidal

habitats, and exacerbate the effects of storm surge (TGLO, 2019). To alleviate this risk, projected future rates of relative sea level rise will be incorporated into the design to ensure that project elevations remain sufficient to support marsh vegetation or to protect shorelines.

The return period of storms of all magnitudes are also higher on the upper Texas coast – tropical storms strike the region on average every 3 years, hurricanes every 8 years, and major hurricanes every 26 years (Keim et al., 2007). The effects of relative sea level rise will enhance storm surges, driving inundation farther inland (TGLO, 2019). Storms also have the potential to move large quantities of offshore sediments inland thus majorly impacting the regional distribution of sediment, as evidenced by Hurricane Ike in 2008 moving an estimated sediment volume of 13.7 million m^3 (Williams, 2012). Frequent monitoring of shorelines through bathymetric surveys, ground surveys, and aerial lidar surveys plus offshore sediment sampling will assist in developing a regional sediment budget and help inform where additional sediment is needed (Campbell, 2005).

Monitoring and Adaptive Management:

Project monitoring for this program will involve observations for ensuring (1) proper construction, (2) performance, and (3) to support adaptive management (NAS, 2017). Type of monitoring data will include biophysical observations (elevation, morphology, vegetation, hydrologic) of the project and of adjacent areas to serve as reference sites and to detect off site impacts (DWH-NRDA, 2017). Monitoring will occur on semiannual or annual bases for a minimum of two years following project completion. Project monitoring will be conducted on a project by project basis. Once specific projects are selected, a more detailed monitoring strategy will be put in place.

The Chenier Plain Ecosystem Restoration program will require long term monitoring to ensure the goals and objectives are being fulfilled. Monitoring the area over the program duration and in the future will help determine if the areas are providing the expected benefits. Project monitoring for this program will involve observations to ensure proper construction, performance, and to support adaptive management (DWH-NRDA, 2017). Different biophysical observations will be performed within the geographic area of the Chenier Plain to guarantee the success of the program. Continuous non-destructive elevation, morphology, and hydrologic sampling of the project sites will verify the health of the wetland ecosystems being restored. These measurements can be compared to similar habitat types in the surrounding areas as reference sites to determine quantitative beneficial changes (Thayer et al., 2003). Water quality samples such as water temperature, dissolved oxygen, and salinity will be monitored as indicators of improvement. The frequency of monitoring may change over time as the projects develop and depending on the types of restoration activities.

Data Management:

Data management for this program is designed to make data publicly available thereby enhancing outcomes and future restoration efforts.

Planning data: During program planning, a variety of existing data and newly acquired data will be gathered. Data in this category includes mostly existing geospatial data on shoreline change rates, land cover, elevation, and ecological data describing past and current environmental conditions. Geotechnical and engineering data with construction specifications are also included.

Project implementation data: these data are needed for determining as-built conditions. Detailed engineering survey data and photography are included.

Post-project implementation data: these data are needed for monitoring performance, informing adaptive management actions, and for improving future projects. They include time series of biophysical and engineering data plus hydrological data for understanding trends.

Program activities will identify data used. TCEQ and GRIIDC (Gibeaut, 2016) will work with data users to ensure data are shared when key activities end. GRIIDC is a well-known data repository designed to receive data from a variety of sources and from various scientific and engineering disciplines. GRIIDC will track, curate, and archive data in the GRIIDC repository and make it publicly discoverable and available. Metadata will follow the ISO 19115-2 standard and datasets will be reviewed for completeness and organization to enable reuse. This well-documented, accessible repository with metadata that enables interoperability with other datasets will facilitate data mining for performance monitoring and adaptive management.

Collaboration:

Two Texas workgroups were established to provide input on coastal priorities: State & Federal Representatives and Non-Governmental Organizations. On-line and in-person meetings were held to discuss plans to develop Texas coastal priorities and to ensure the public's involvement. A survey was developed that asked for individual's coastal priorities. These surveys were available to the public and were also completed by members of the two work groups. Public meetings were conducted in three coastal cities for the public to present their issues and concerns. Information received from workgroup meetings, discussions with elected officials, public meetings and the surveys was used to develop a list of priorities to be included in the RESTORE Council's Planning Framework document. These efforts of collaboration will continue throughout the process to develop programs and projects. Work will continue with Texas representatives for NRDA/NFWF to consider leveraging opportunities.

Public Engagement, Outreach, and Education:

The decision to submit this program was based on many months of discussions with work groups and participation by the public. It began with discussions with the Texas representatives for NRDA & NFWF to identify programs/projects for FPL 3b. This identified list was shared with the two workgroups (State & Federal and NGOs) established for Bucket 2 planning purposes, for their review and comment. County judges in the coastal area also were given the opportunity to identify potential programs/projects for their areas. Using the information compiled as part of this process, a list of 23 projects were posted for public comment on the Texas RESTORE website. In addition, two public hearings were held in coastal cities. In reviewing the comments received, the timing to move forward with proposals, and in discussions with the Texas Governor's staff, it was determined that program rather than project specific proposals would be submitted. The development of the program proposals was done to ensure that projects posted for public comment could be considered in at least one of the program submissions. Much of the work has already been done to identify projects that could be funded within this program submission. The process to select FPL 3b grant recipients will include the requirement that projects will have to already been vetted by this process or through other public processes such as the GLO's Coastal Resiliency Master Plan, or NRDA & NFWF related activities. The criteria to select the specific projects would include, but not limited to, the following: addresses issues presented in the program proposal; amounts of funds available for the program; readiness; leveraging opportunities; scalability; risk/benefit ratio; and distribution of funds across the Texas coastline. Notification of the projects selected to receive grant funds will be posted on the Texas RESTORE website. This overall process, parts already completed and others to be completed after the program has been approved for FPL 3b funds, will ensure that the ultimate selection of projects for this program are not only consistent with the RESTORE Planning Framework document, but also reflect the ideas that were discussed by the work groups, the elected officials, the public and the Office of the Governor.

Leveraging:

Funds: TBD
Type:

Status:
Source Type:
Description: As part of the process to initially identify programs for FPL 3b, Texas held discussions with county judges, NGOs, NRDA and NFWF. Projects that are selected for funding in Texas could likely include partnerships leveraging various funds, including RESTORE, NRDA and NFWF monies. All parties have emphasized the need to leverage DWH Oil spill associated funds, as well as other funds, and it is Texas' intent to consider leveraging as a criteria in selecting projects, including the recognition of previous projects and the potential for a new project to add to the cumulative impact to the area. Over the years NRDA and NFWF have invested in the Chenier Plains and we look forward to partnering with them in that geographic area.

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 is currently proposed for Category 2. Texas intends to work with other members of the Council in an effort to move some or all of the implementation component to Category 1 prior to a Council vote on the final FPL.

Bibliography:

Barbier, E.B., Hacker, S.D., Kennedy, C., Koch, E.W., Stier, A.C. and Silliman, B.R., 2011. The value of estuarine and coastal ecosystem services. Ecological Monographs, 81: 169-193. doi:10.1890/10-1510.1

Boustany, Ronald G., 2010. Estimating the Benefits of Freshwater Introduction into Coastal Wetland Ecosystems in Louisiana: Nutrient and Sediment Analyses. Ecological Restoration, 28(2) 160-174. https://www.jstor.org/stable/pdf/43443227.pdf?refreqid=excelsior%3Af064f348b341d348d6faa150c82e7526

Campbell, T., Benedet, L., and Finkle, C.W., 2005. Regional Strategies for Coastal Restoration along the Louisiana Chenier Plain. Journal of Coastal Research 44, 268-283.

Cluff, Donald B., 1989. "Wildland Hydrology/Watershed Management Working Group – Technote :U.S. Army Corps of Engineers Wetland Programs and Activities." Hydata News and Views, vol. 8, no. 6, pp.10-12. www.jstor.org/stable/43650497.

Douglass, S.L., Ferraro, C., Dixon, C.R., Oliver, L., Pitts, L., 2012. A Gulf of Mexico Marsh Restoration and Protection Project. Coastal Engineering. https://pdfs.semanticscholar.org/948d/8cd768d164d76571c09ac2974c5797ce643f.pdf

DWH-NRDA, 2017. Deepwater Horizon (DWH) Natural Resource Damage Assessment Trustees. 2017. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December. Available: http://www.gulfspillrestoration.noaa.gov/.

Esslinger, C.G., and B.C. Wilson. 2001. North American Waterfowl Management Plan, Gulf Coast Joint Venture: Chenier Plain Initiative. North American Waterfowl Management Plan, Albuquerque, NM. 28 pp. + appendix. (Revised 2003.) http://www.gcjv.org/docs/ChenierPlainpub.pdf

Ford, M.A., Cahoon, D.R., Lynch, J.C., 1999. Restoring marsh elevation in a rapidly subsiding salt marsh by thin-layer, 12(3-4):189-205. February 1999. https://www.sciencedirect.com/science/article/pii/S0925857498000615.

Gibeaut, J., 2016. Enabling data sharing through the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC). Oceanography 29(3):33–37, https://doi.org/10.5670/oceanog.2016.59.

Good, Bill. (1993). Louisiana's Wetlands: Combatting Erosion and Revitalizing Native Ecosystems. Restoration & Management Notes, (11)2, 125-133. https://www.jstor.org/stable/pdf/43440123.pdf

Johnson, J.S., Cairns, D.M., and Houser, C., 2013. Coastal marsh vegetation assemblages of Galveston Bay: insights for the east Texas chenier plain. Wetlands, v. 33, issue 5, p. 861 – 870.

Keim, B D., Muller, R A., and Stone, G.W., 2007. Spatiotemporal Patterns and Return Periods of Tropical Storm and Hurricane Strikes from Texas to Maine. J. Climate, 20, 3498–3509, https://doi.org/10.1175/JCLI4187.1.

Lane, R.R., Day Jr., J.W. and Thibodeaux, B., 1999. Water Quality Analysis of a Freshwater Diversion at Caernarvon, Louisiana. Estuaries, 22(2) 327-336. https://link.springer.com/article/10.2307/1352988

Morton, R.A., 2003. An overview of coastal land loss: with emphasis on the southeastern United States (Open-file Report). U.S. Geological Survey.

NAS, 2017. The National Academies of Sciences, Engineering, and Medicine (NAS). 2017. Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico. Washington, DC: The National Academies Press. doi: 10.17226/23476.

Olson, K., Matthews, J., Morton, L.W., Sloan, J., 2015. Impact of levee breaches, flooding, and land scouring on soil productivity. Journal of Soil and Water Conservation. Jan 2015. 70 (1) 5A-11A. DOI: 10.2489/jswc.70.1.5A.

Paine, J.G., Mathew, S. and Caudle, T., 2012. Historical shoreline change through 2007, Texas Gulf coast: rates, contributing causes, and Holocene context. Gulf Coast Association of Geological Sciences Journal, v. 1, p. 13-26.

Parson, L.E. and R. Swafford. 2012. "Beneficial use of sediments from dredging activities in the Gulf of Mexico." Technical Framework for the Gulf Regional Sediment Management Master Plan, Journal of Coastal Research, Special Issue No. 60, 45-50. https://www.jstor.org/stable/41508591.

Penland, S., Ramsey, K.E., 1990. Relative sea-level rise in Louisiana and the Gulf of Mexico: 1908-1988. J. Coast. Res. 6, 323–342.

Pothina, D. and C. Guthrie, 2009. Evaluating inverted siphons as a means of mitigating salinity intrusion in the Keith Lake/Salt Bayou System, Jefferson County, Texas: prepared by the Texas Water Development Board. Grant No. MX-96401704. U.S. Environmental Protection Agency, Gulf of Mexico Program.
http://www.twdb.texas.gov/surfacewater/bays/major_estuaries/sabine_neches/doc/TWDB_KeithLake2009_FinalReport.pdf

TGLO, 2019. Texas General Land Office , 2019. "Texas Coastal Resiliency Master Plan." Austin, Texas, March 2019. https://coastalstudy.texas.gov/resources/files/2019-coastal-master-plan.pdf.

Texas Parks and Wildlife Department. "Salt Bayou Watershed Restoration Plan." May 2013. https://tpwd.texas.gov/publications/pwdpubs/media/salt_bayou_plan.pdf.

Thayer, G.W., McTigue, T.A., Bellmer, R.J., Burrows, F.M., Merkey, D.H., Nickens, A.D., Lozano, S.J., Gayaldo, P.F., Polmateer, P.J., Pinit, P.T. 2003. "Science-Based Restoration Monitoring of Coastal Habitats." NOAA Coastal Ocean Program Devision Analysis Series. No. 23, Vol 1. 2003. https://repository.library.noaa.gov/view/noaa/439.

White, W.A., Morton, R.A., 1997. Wetland losses related to fault movement and hydrocarbon production, southeastern Texas coast. J. Coast. Res. 13, 1305–1320.

White, W.A. and Tremblay, T.A., 1995. Submergence of wetlands as a result of human-induced subsidence and faulting along the upper Texas Gulf coast. Journal of Coastal Research, v. 11, No. 3, p. 788 – 807.

White, W.A., Tremblay, T.A., Waldinger, R.L., and Calnan, T.R., 2007. Status and Trends of Wetland and Aquatic Habitats on Texas Barriers: Upper Coast Strandplain-Chenier System and Southern Coast Padre Island National Seashore. Final Report prepared for Texas General Land Office and NOAA under GLO Contract No. 06-044 and NOAA Award No. NA05NOS4191064, 88 pp.

Williams, H.F., 2012. Magnitude of Hurricane Ike storm surge sedimentation: implications for coastal marsh aggradation. Earth Surf. Process. Landforms, 37: 901-906. doi:10.1002/esp.3252

Zervas, C., 2009. Sea level variations of the United States 1854-2006 (Tech. Report No. NOS CO-OPS 053). National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

Budget

Project Budget Narrative:
The total requested for this program is $39.6 million. Of that amount, approximately $37.45 million will be provided to sub-recipients to implement projects selected for this program. TCEQ estimates that it will require approximately $2.15 million to support the following: administrative expenses (salary, indirect, travel, fringe, supplies, etc…); hosting & maintenance costs for the Texas RESTORE web site; and for a contract to provide technical assistance to TCEQ staff.

Category 1: $3,366,000

Planning Activities (3%) = $1,188,000
Project Management (5.5%) = $2,178,000

Category 2: $36,234,000

Implementation (81.5%) = $32,274,000
Contingency (10%) - $3,960,000

Data management and monitoring & adaptive managements costs are included in the implementation costs.

Since some costs are uncertain depending on the type of individual project ultimately selected, contingency costs are included at this point and could be considered in a project specific budget as appropriate.

Total FPL 3 Project/Program Budget Request:
$ 39,600,000.00

Estimated Percent Monitoring and Adaptive Management: 0 %
Estimated Percent Planning: 3 %
Estimated Percent Implementation: 81.5 %
Estimated Percent Project Management: 5.5 %
Estimated Percent Data Management: 0 %
Estimated Percent Contingency: 10 %

Is the Project Scalable?:
Yes

If yes, provide a short description regarding scalability.:
This program will include several independent projects, which may be scaled down or reduced in number depending on the amount of funding received.

Environmental Compliance[1]

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	Yes	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Endangered Species Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Historic Preservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical

[11] Environmental Compliance documents available by request (restorecouncil@restorethegulf.gov).

		Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Magnuson-Stevens Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Fish and Wildlife Conservation Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council

		vote on the final FPL.
Coastal Zone Management Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Barrier Resources Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Farmland Protection Policy Act	No	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 is currently

		proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Water Act (Section 404)	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
River and Harbors Act (Section 10)	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Protection, Research and Sanctuaries Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Mammal Protection Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Marine Sanctuaries Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Migratory Bird Treaty Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Bald and Golden Eagle Protection Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Air Act	No	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 is currently proposed for Category 2. If

		applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Other Applicable Environmental Compliance Laws or Regulations	No	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 is currently proposed for Category 2. If any other environmental compliance laws of regulations are applicable, those requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Maps, Charts, Figures

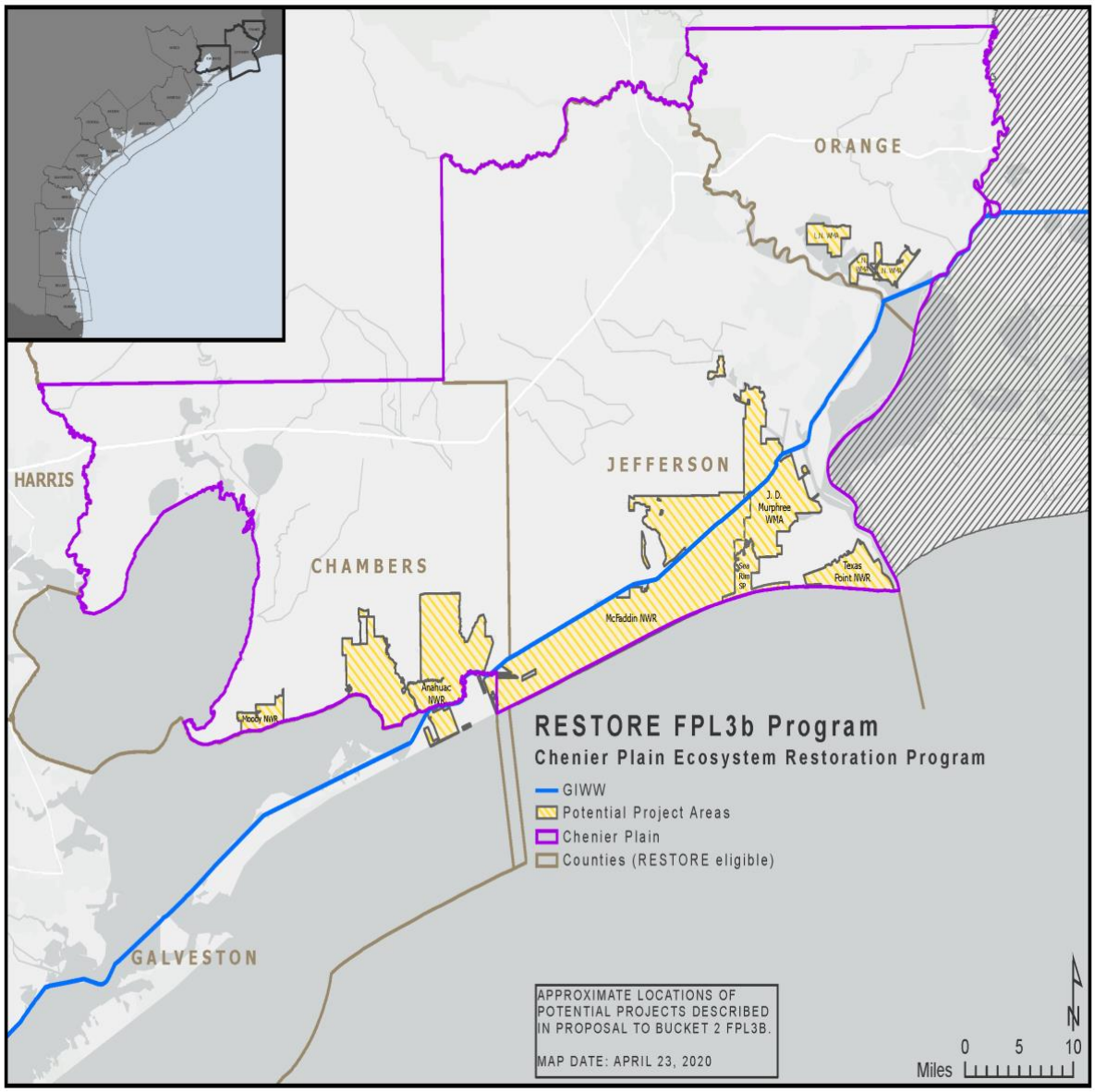

Figure 1: Approximate locations of Chenier Plain Ecosystem Restoration program activities.

RESTORE Council FPL 3 Proposal Document

General Information

Proposal Sponsor:
Texas Commission on Environmental Quality

Title:
Chenier Plain Ecosystem Restoration Program

Project Abstract:
This program aims to restore and conserve high-quality coastal habitats within the Chenier Plain complex of Texas through a variety of methods including beneficial use of dredge material, the construction of breakwaters to protect shoreline, and the restoration of hydrology and wetlands. Targeted habitats will include freshwater to estuarine marsh, coastal prairie grasslands, tidal flats, creeks and basins, all of which creates an extremely productive complex for a diverse array of fish and wildlife resources and protects inland areas from storm surge. The cost of the program and the amount of funding being requested is $39.6 million for planning and implementation phases. The current timeline for the program is 4 years, but that may be adjusted as the project scales up or down based on funds granted. Potential partners for the program may include USACE, TPWD, DU, USFW, and local and regional governments. Implementation of the project has the potential to restore degraded wetlands, reduce erosion, improve water quality, create habitat, provide land reclamation, and increase coastal resiliency in an effective and efficient manner.

FPL Category: Cat1: Planning/ Cat2: Implementation

Activity Type: Program

Program: Chenier Plain Ecosystem Restoration Program

Co-sponsoring Agency(ies): N/A

Is this a construction project?
Yes

RESTORE Act Priority Criteria:
(I) Projects that are projected to make the greatest contribution to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region, without regard to geographic location within the Gulf Coast region.

(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 program will meet three of the RESTORE Act Priority Criteria:

1. Projected to make the greatest contribution to restoring and protecting natural resources. This program aims to restore and protect the natural resources within the Chenier Plain. The Chenier Plain is a highly diverse and productive area, containing the largest contiguous estuarine marsh complex in Texas. The natural resources provided by this region are being diminished due to wetland degradation, erosion, and decreasing water quality. The benefits of this program are projected to restore, protect, and increase habitats, water quality, and coastal resiliency in the most effective and efficient manner.

2. Large-scale projects and programs. This program includes individual, large-scale ecosystem restoration projects which have the potential to provide a significant amount of habitat restoration. The benefits of these combined projects will restore hydrology in this large area, support natural diversity and productivity, and increase coastal resiliency.

3. Contained in existing Gulf Coast State Comprehensive Plans. Many of the components of prospective projects in this program were evaluated in the 2019 Texas Coastal Resiliency Master Plan (TCRMP), the state comprehensive coastal plan for Texas. Chenier Plain projects scored in the top tier of TCRMP projects (Texas General Land Office, 2019).

Project Duration (in years): 4

Goals

Primary Comprehensive Plan Goal:
Restore and Conserve Habitat

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

Secondary Comprehensive Plan Objectives:
N/A

Secondary Comprehensive Plan Goals:
N/A

PF Restoration Technique(s):
Create, restore, and enhance coastal wetlands, islands, shorelines and headlands: Protect natural shorelines
Create, restore, and enhance coastal wetlands, islands, shorelines and headlands: Sediment placement
Restore hydrology and natural processes: Restore natural salinity regimes

Location

Location:
Chenier Plain of southeast Texas including locations in four upper coastal counties: Galveston, Orange, Jefferson, and Chambers.

HUC8 Watershed(s):
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(Sabine Lake)

State(s):
Texas

County/Parish(es):
TX - Chambers
TX - Galveston
TX - Jefferson
TX - Orange

Congressional District(s):
TX - 14
TX - 36

Narratives

Introduction and Overview:

The Chenier Plain environment includes freshwater to estuarine marsh, coastal prairie grasslands, tidal flats, and creeks and basins, all of which creates an extremely productive complex with a diverse array of vegetation, fish and wildlife resources (Johnson, Cairns, and Houser, 2013). This environment provides a wide variety of benefits for surrounding communities. The gradual transition of freshwater marshes to estuarine marshes, punctuated by upland ridges, across the Chenier Plain creates a unique landscape of habitats which supports a wide variety of plants and animals. The vast resources provided by the Chenier Plain have been in decline due to both anthropogenic and natural processes, particularly in locations along the Gulf Intracoastal Waterway. Continued degradation in this area may result in a decrease in the effectiveness of storm surge suppression, significant increase in the risks of storm damage, economic losses, and habitat destruction. The Texas portion of the Chenier Plain holds areas of environmental significance including, but not limited to, Salt Bayou Watershed, Texas Point National Wildlife Refuge, McFaddin National Wildlife Refuge, and J.D. Murphree Wildlife Management Area. These and similar locations will likely be the focus of specific project activities (see map).

The lower reach of the Salt Bayou Watershed within the Chenier Plain is the largest contiguous estuarine marsh complex in Texas and is a highly productive fishery and critical storm surge protection barrier for inland marshes and communities, including Sabine Pass, Port Arthur and Beaumont, with their critical petrochemical and military infrastructure (Texas Parks and Wildlife Department, 2013). Salt Bayou and the adjacent Chenier Plain watersheds support a mosaic of some 130,000 acres of coastal wetlands. Natural diversity and productivity are dependent on sediment deposition and freshwater sheet flows to support these essential functions. This program would implement several components to restore hydrology and marsh elevations to enhance wetlands and stabilize shorelines within the Salt Bayou Watershed Ecosystem along the Upper Texas Coast.

Excavation of the Gulf Intracoastal Waterway (GIWW, see map) in the early 20th century severed Gulfward sheet flow and freshwater inflows via bayous and tributaries, and initiated saltwater intrusion into the heart of this low-lying landscape, killing emergent brackish marsh vegetation, resulting in erosion and scouring. Relative sea level rise and human-induced subsidence and faulting has also caused fragmentation and loss of marsh and flats to open water (White and Tremblay, 1995). Vegetation coverage has been reduced in places from near 100% to 50% or less (Texas Parks and Wildlife Department, 2013; White et al., 2007). This program will work with local partners to increase the transport of freshwater from north of the GIWW into marshes south of the GIWW potentially through construction of additional siphons underneath the GIWW, construction of shore protection structures to slow or stop erosion of existing marshes, and replacing water control structures to reduce saltwater intrusion.

This program will protect and conserve up to 7,000 acres of coastal lands in the Chenier Plain region of southeast Texas, expanding an extensive conservation landscape of extremely high-value habitats and enhancing the viability and mission of the Texas Chenier Plain Refuge Complex. Sprawl from the metropolitan and industrial complexes of Houston, Beaumont, Port Arthur and Orange is putting increasing pressure on the Chenier Plain region, resulting in fragmentation and conversion of natural environments to agriculture and developed areas, which reduces biological diversity and productivity. A variety of methods will be used to fulfill the goal of restoring and conserving habitats with specific projects and activities to be determined during the planning stages of the program.

- Installation of siphons beneath the GIWW to re-introduce freshwater to the chenier plain Gulfward of the GIWW.

- Installation of breakwaters will be installed to reduce shoreline erosion and protect coastal wetlands. Breakwaters have been used previously to reduce wave energy and also have the potential to promote oyster habitat when designed effectively and efficiently (Douglass, 2012).
- Another activity of the program will include beneficial use of dredge material (BUDM) to enhance wetlands and elevate marshes. This is a known and documented method of habitat creation when combined with restoration and conservation efforts, with well over 13,000 acres of wetlands benefitting from the practice of BUDM (Cluff, 1989; Parson, 2012). This program will implement BUDM for habitat restoration, restoring marshes at several potential priority sites with input from NRDA trustees and the Ducks Unlimited BU team. The degradation of coastal wetlands can be largely attributed to the breakup of vegetated marshes, transforming them to a shallow open water habitat. Thus, reintroduction of sediment to restore soil elevations is a fundamental step of habitat restoration (Ford, 1999). Dredge material can also be used to nourish beaches, specifically berms which provide a level of protection of landward environments from storm over wash and relative sea level rise.
- Levees will be regraded in several potential project sites, such as within the McFaddin and JD Murphee Wildlife Refuge Complexes. Natural or human induced damage to levees can cause significant damage to water quality, ecosystem productivity, and flood protection. Taking steps to repair these levees will support the mitigation of flood risk and help to restore coastal ecosystems in these areas, while increasing the productivity of the surrounding habitats (Olson 2015).

This program conforms to the RESTORE Council's FPL3 Planning Framework by adhering to the priority to restore and conserve habitat, and to restore, enhance, and protect habitats and shorelines. This program will also advance the commitments set forth in the 2016 Comprehensive Plan Update by using the best available science for ecological restoration, developing a monitoring and data management framework, and defining metrics of success for the potential Chenier Plain projects. The total coast of this program and the amount of Council Selected Restoration Component funding being requested is $39.6 million over 4 years. The actual cost of individual projects may vary based on the funding granted, and because of this the program is scalable and will allow for a reduction or increase in projects and size. The timeline is also subject to change based on the scalability. Potential partners for the program include, but are not limited to, USACE, TPWD, DU, USFW, and local and regional governments.

Proposed Methods:

This program aims to use a variety of methods, including beneficial use of dredge material, the construction of breakwaters to protect shoreline, levee regrading, and the restoration of hydrology and wetlands to enhance and restore the Chenier Plain complex. This program will develop a process for selecting activities that builds on Texas' stakeholder-driven process for developing the Planning Framework and selecting preliminary projects for FPL3 consideration. During this earlier work, county governments, NGOs, and a workgroup made up of Texas NRDA/NFWF and Texas Coastal Resiliency Master Plan (TCRMP) representatives submitted 38 projects for FPL3 consideration. Coastal experts, HRI staff, and TCEQ staff reviewed the projects and selected 23 for public comment. Among these 23 projects, there are 5 multicomponent projects that address the Chenier Plain and have many elements that scored in the top tier in the TCRMP (Texas General Land Office, 2019). These projects or project components plus additional activities as they arise will be considered in this program for implementation. This program will develop criteria for project funding that considers project efficacy in meeting objectives and improving the environment, resiliency, and its synergy with other projects on the Chenier Plain.

General steps to completing the potential project components will include:

1. Coordinating with local partners
2. Completing engineering and design
3. Applying for permits
4. Soliciting bids for construction
5. Overseeing construction
6. Conducting monitoring and adaptive management.

This program will implement beneficial use (BU) of dredge material for habitat restoration (BUDM), restoring marshes at several potential priority sites with input from NRDA trustees and the Ducks Unlimited BU team. In 2018, 41 potential beneficial dredge use sites were selected for evaluation by Ducks Unlimited, the U.S. Army Corps of Engineers, state and federal resource agencies, and NGO groups. The geographic scope of this program includes a large portion of the Texas coast and will consider sediments from the GIWW and other federal ship channels, private channels, and berths, as well as the mining of dredge material placement areas currently used by the USACE and the Texas Department of Transportation (TxDOT). The potential BU project sites in the Chenier Plain complement the Salt Bayou Marsh Restoration Plan, a multi-agency effort to restore the 55,000-acre Salt Bayou Marsh Complex in Jefferson County, that identifies BUDM as a major component of the long-term marsh restoration strategy (Texas Parks and Wildlife Department, 2013). This program would build upon these existing activities. Site investigations, geotechnical sampling and bathymetric surveys will be performed at potential sites to provide the necessary information. In addition, installation of siphons to bring freshwater flow from north of the GIWW Gulfward to the lower chenier plain will also be considered to counter the effects of salt water intrusion (Pothina and Guthrie, 2009; Texas Parks and Wildlife Department, 2013)

Given the documented success of similar activities within the Chenier Plain ecosystem, the proposed program has a high likelihood of success. Potential project partners include USACE, TPWD, DU, USFW, and local and regional governments.

Environmental Benefits:

The Chenier Plain Ecosystem Restoration program will provide habitat restoration and provide for the health and stability of the environment, enhancing the existing habitats and creating new ones. Proposed project methods will include marsh restoration through the beneficial use of dredge material, construction of breakwaters along eroding shorelines, placement and distribution of rock materials, reparation and regrading of levees, and the use of best management practices to restore hydrological connections and marsh elevations. These practices have the potential to restore degraded wetlands, reduce erosion, improve water quality, create habitat (including oysters), provide land reclamation, and increase coastal resiliency in a large-scale, effective, and efficient manner.

Numerous factors such as channelization, subsidence, and erosion of critical shorelines in the Chenier Plain Ecosystem have degraded habitats (White et al., 2007; Paine, Mathew, and Caudle, 2012). This degradation increases the risk of storm surge impacts to economically important industries and nationally significant ports along the Upper Texas Coast. Restoration and protection of this marsh system would not only directly ensure long-term ecological benefits from the habitats, it would also reduce vulnerability of critical infrastructure to hurricanes and storm surges. In addition, this program would enhance coastal resiliency by restoring and protecting economically important fisheries and valuable recreation areas. This project combines several Tier 1 projects which are identified in the Texas Coastal Resiliency Master Plan (Project IDs R1-1, R1-2, R1-19, R1-25, R1-41 R1-42, R1-43) (Texas General Land Office, 2019) and would add to the previously funded work completed with Deepwater Horizon NRDA Texas Trustee funds and Gulf Environmental Benefit Fund grants.

The ecosystem services provided by the Chenier Plain system include storm surge buffering, water quality maintenance, sediment retention, nutrient regulation, recreation, and a wide variety of critical habitat. These services contribute to human wellbeing on the upper Texas coast and have both market and non-market value making them unreplaceable (Barbier et al., 2011). Implementation of this program will help preserve ecosystem services for the future.

Metrics:

Metric Title: HR013: Wetland restoration - Acres restored: Habitat Restoration
Target: TBD
Narrative: This program aims to restore wetland habitats within the Chenier Plain. Wetlands are a significant habitat in this geographic area, and activities including marsh elevation and hydrology restoration will be performed. Success will be measured by maximizing the wetland habitats that are restored through the program, which would have been otherwise lost or negatively impacted. This can be quantified through land surveys and comparing rates of degradation or erosion. A reasonable estimate for acres being restored in this program will be made once specific projects are selected.

Metric Title: HR014: Habitat restoration - Acres of coastal habitat prevented from eroding: Habitat Restoration
Target: TBD
Narrative: The goal of this program is to restore and conserve habitat within the Chenier Plain geographic area. This includes reducing or preventing the degradation and erosion of coastal environments. A measure of this program's long-term success will be the quantity of critical environments that would have been lost or negatively impacted if no restoration activities were performed. This will be quantified through land surveys and comparisons to past or future predicted rates of degradation. Project selection will inform a reasonable target for this metric.

Metric Title: HR009: Restoring hydrology - Acres with restored hydrology: Habitat Restoration
Target: TBD
Narrative: This program will restore hydrology especially south of the GIWW to positively impact coastal wetlands that have been affected by saltwater intrusion and other altered hydrology. Success for this aspect of the program can be measured by improved hydrology in the proposed project locations. Project selection and design will inform a reasonable target for this metric.

Metric Title: HR002: Shoreline restoration - Miles of shoreline stabilized and restored: Habitat Restoration
Target: TBD
Narrative: This program aims to restore shorelines within the Chenier Plain geographic area through various methods including the construction of breakwaters. The target is to provide the greatest benefit to reducing shoreline erosion and preserve a significant amount of critical environments given the funding provided. Success of the program can be measured by maximizing the length of shorelines that receive restoration activities. Texas will provide annual updates to the Council on the length of shoreline being restored and the features constructed.

Risk and Uncertainties:

Potential risks include the continuing increase of costs for construction and environmental permitting requirements. Additional long-term maintenance costs are also an uncertainty. Effective planning and design, including careful cost estimates and line item budgets for selected projects, can help to minimize these risks. In addition, adjacent landowners may object to the construction of hard structures that could potentially impact shoreline positions. Large-scale projects require planning for maintenance costs and coordination with program partners to identify a party to hold

permits and be responsible for permit conditions. In addition, the uncertainty with dredging costs may impact the budgets for each component of the program. However, projects can be phased or scaled to accommodate the available funding. In addition, there could be several dredge cycles during a project period which may provide some cost savings through opportunities to cost share with program partners such as USACE.

The process of habitat restoration through the utilization of sediments from maintenance dredging is a widely used restoration technique and has proven to be very cost effective and successful in application. Other techniques used in this program also have successful track records. However, there are risks to the implementation of this program. The predominate risk to this program is the rate of relative sea level rise. To alleviate this risk, projected future rates of relative sea level rise will be incorporated into the design to ensure that intertidal elevations remain sufficient to support marsh vegetation.

Monitoring and Adaptive Management:

Project monitoring for this program will involve observations for ensuring (1) proper construction, (2) performance, and (3) to support adaptive management (NAS, 2017). Type of monitoring data will include biophysical observations (elevation, morphology, vegetation, hydrologic) of the project and of adjacent areas to serve as reference sites and to detect off site impacts (DWH-NRDA, 2017). Monitoring will occur on semiannual or annual bases for a minimum of two years following project completion.

The Chenier Plain Ecosystem Restoration program will require long term monitoring to ensure the goals and objectives are being fulfilled. Monitoring the area over the program duration and in the future will help determine if the areas are providing the expected benefits. Project monitoring for this program will involve observations to ensure proper construction, performance, and to support adaptive management (DWH-NRDA, 2017). Different biophysical observations will be performed within the geographic area of the Chenier Plain to guarantee the success of the program. Continuous non-destructive elevation, morphology, and hydrologic sampling of the project sites will verify the health of the wetland ecosystems being restored. These measurements can be compared to similar habitat types in the surrounding areas as reference sites to determine quantitative beneficial changes (Thayer et al., 2003). Water quality samples such as water temperature, dissolved oxygen, and salinity will be monitored as indicators of improvement. The frequency of monitoring may change over time as the projects develop and depending on the types of restoration activities.

Data Management:

Data management for this program is designed to make data publicly available thereby enhancing outcomes and future restoration efforts.

Planning data: During program planning, a variety of existing data and newly acquired data will be gathered. Data in this category includes mostly existing geospatial data on shoreline change rates, land cover, elevation, and ecological data describing past and current environmental conditions. Geotechnical and engineering data with construction specifications are also included.

Project implementation data: these data are needed for determining as-built conditions. Detailed engineering survey data and photography are included.

Post-project implementation data: these data are needed for monitoring performance, informing adaptive management actions, and for improving future projects. They include time series of biophysical and engineering data plus hydrological data for understanding trends.

Program activities will identify data used. TCEQ and GRIIDC (Gibeaut, 2016) will work with data users to ensure data are shared when key activities end. GRIIDC is a well-known data repository designed to receive data from a variety of sources and from various scientific and engineering disciplines. GRIIDC will track, curate, and archive data in the GRIIDC repository and make it publicly discoverable and available. Metadata will follow the ISO 19115-2 standard and datasets will be reviewed for completeness and organization to enable reuse.

Collaboration:

Two Texas workgroups were established to provide input on coastal priorities: State & Federal Representatives and Non-Governmental Organizations. On-line and in-person meetings were held to discuss plans to develop Texas coastal priorities and to ensure the public's involvement. A survey was developed that asked for individual's coastal priorities. These surveys were available to the public and were also completed by members of the two work groups. Public meetings were conducted in three coastal cities for the public to present their issues and concerns. Information received from workgroup meetings, discussions with elected officials, public meetings and the surveys was used to develop a list of priorities to be included in the RESTORE Council's Planning Framework document. These efforts of collaboration will continue throughout the process to develop programs and projects. Work will continue with Texas representatives for NRDA/NFWF to consider leveraging opportunities.

Public Engagement, Outreach, and Education:

The decision to submit this program was based on many months of discussions with work groups and participation by the public. It began with discussions with the Texas representatives for NRDA & NFWF to identify programs/projects for FPL 3b. This identified list was shared with the two workgroups (State & Federal and NGOs) established for Bucket 2 planning purposes, for their review and comment. County judges in the coastal area also were given the opportunity to identify potential programs/projects for their areas. Using the information compiled as part of this process, a list of 23 projects were posted for public comment on the Texas RESTORE website. In addition, two public hearings were held in coastal cities. In reviewing the comments received, the timing to move forward with proposals, and in discussions with the Texas Governor's staff, it was determined that program rather than project specific proposals would be submitted. The development of the program proposals was done to ensure that projects posted for public comment could be considered in at least one of the program submissions. Much of the work has already been done to identify projects that could be funded within this program submission. The process to select FPL 3b grant recipients will include the requirement that projects will have to already been vetted by this process or through other public processes such as the GLO's Coastal Resiliency Master Plan, or NRDA & NFWF related activities. The criteria to select the specific projects would include, but not limited to, the following: addresses issues presented in the program proposal; amounts of funds available for the program; readiness; leveraging opportunities; scalability; risk/benefit ratio; and distribution of funds across the Texas coastline. Notification of the projects selected to receive grant funds will be posted on the Texas RESTORE website. This overall process, parts already completed and others to be completed after the program has been approved for FPL 3b funds, will ensure that the ultimate selection of projects for this program are not only consistent with the RESTORE Planning Framework document, but also reflect the ideas that were discussed by the work groups, the elected officials, the public and the Office of the Governor.

Leveraging:

Funds: TBD
Type: TBD
Status: TBD
Source Type: TBD

Description: The expectation is that programs and/or projects that are ultimately selected for funding in Texas could likely include partnerships leveraging various funds, including RESTORE, NRDA and NFWF monies. In continuing discussions with NRDA, NFWF, county judges and NGOs, all parties have emphasized the need to leverage all DWH Oil spill associated funds, as well as other funds, and it is Texas' intent to consider leveraging as a criteria in selecting projects. This selection process would be similar to the decision-making associated with the proposed programmatic areas included in the Texas pre-proposals. Over the years NRDA and NFWF have invested in the Chenier Plains and we look forward to partnering with them in that geographic area.

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 is currently proposed for Category 2. Texas intends to work with other members of the Council in an effort to move some or all of the implementation component to Category 1 prior to a Council vote on the final FPL.

Bibliography:

Barbier, E.B., Hacker, S.D., Kennedy, C., Koch, E.W., Stier, A.C. and Silliman, B.R., 2011. The value of estuarine and coastal ecosystem services. Ecological Monographs, 81: 169-193. doi:10.1890/10-1510.1

Cluff, Donald B. 1989. "Wildland Hydrology/Watershed Management Working Group – Technote :U.S. Army Corps of Engineers Wetland Programs and Activities." Hydata News and Views, vol. 8, no. 6, pp.10-12. www.jstor.org/stable/43650497.

Douglass, S.L., Ferraro, C., Dixon, C.R., Oliver, L., Pitts, L. "A Gulf of Mexico Marsh Restoration and Protection Project." Coastal Engineering 2012. https://pdfs.semanticscholar.org/948d/8cd768d164d76571c09ac2974c5797ce643f.pdf

DWH-NRDA, 2017, Deepwater Horizon (DWH) Natural Resource Damage Assessment Trustees. 2017. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December. Available: http://www.gulfspillrestoration.noaa.gov/.

Esslinger, C.G., and B.C. Wilson. 2001. North American Waterfowl Management Plan, Gulf Coast Joint Venture: Chenier Plain Initiative. North American Waterfowl Management Plan, Albuquerque, NM. 28 pp. + appendix. (Revised 2003.) http://www.gcjv.org/docs/ChenierPlainpub.pdf

Ford, M.A., Cahoon, D.R., Lynch, J.C. "Restoring marsh elevation in a rapidly subsiding salt marsh by thin-layer." 12(3-4):189-205. February 1999. https://www.sciencedirect.com/science/article/pii/S0925857498000615.

Gibeaut, J., 2016, Enabling data sharing through the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC). Oceanography 29(3):33–37, https://doi.org/10.5670/oceanog.2016.59.

Johnson, J.S., Cairns, D.M., and Houser, C., 2013. Coastal marsh vegetation assemblages of Galveston Bay: insights for the east Texas chenier plain. Wetlands, v. 33, issue 5, p. 861 – 870.

NAS, 2017, The National Academies of Sciences, Engineering, and Medicine (NAS). 2017. Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico. Washington, DC: The National Academies Press. doi: 10.17226/23476.

Olson, K., Matthews, J., Morton, L.W., Sloan, J. "Impact of levee breaches, flooding, and land scouring on soil productivity." Journal of Soil and Water Conservation. Jan 2015. 70 (1) 5A-11A. DOI: 10.2489/jswc.70.1.5A.

Parson, L.E. and R. Swafford. 2012. "Beneficial use of sediments from dredging activities in the Gulf of Mexico." Technical Framework for the Gulf Regional Sediment Management Master Plan, Journal of Coastal Research, Special Issue No. 60, 45-50. https://www.jstor.org/stable/41508591.

Pothina, D. and C. Guthrie, 2009. Evaluating inverted siphons as a means of mitigating salinity intrusion in the Keith Lake/Salt Bayou System, Jefferson County, Texas: prepared by the Texas Water Development Board. Grant No. MX-96401704. U.S. Environmental Protection Agency, Gulf of Mexico Program. http://www.twdb.texas.gov/surfacewater/bays/major_estuaries/sabine_neches/doc/TWDB_KeithLake2009_FinalReport.pdf

Paine, J.G., Mathew, S. and Caudle, T., 2012. Historical shoreline change through 2007, Texas Gulf coast: rates, contributing causes, and Holocene context. Gulf Coast Association of Geological Sciences Journal, v. 1, p. 13-26.

Texas General Land Office, 2019. "Texas Coastal Resiliency Master Plan." Austin, Texas, March 2019. https://coastalstudy.texas.gov/resources/files/2019-coastal-master-plan.pdf.

Texas Parks and Wildlife Department. "Salt Bayou Watershed Restoration Plan." May 2013. https://tpwd.texas.gov/publications/pwdpubs/media/salt_bayou_plan.pdf.

Thayer, G.W., McTigue, T.A., Bellmer, R.J., Burrows, F.M., Merkey, D.H., Nickens, A.D., Lozano, S.J., Gayaldo, P.F., Polmateer, P.J., Pinit, P.T. 2003. "Science-Based Restoration Monitoring of Coastal Habitats." NOAA Coastal Ocean Program Devision Analysis Series. No. 23, Vol 1. 2003. https://repository.library.noaa.gov/view/noaa/439.

White, W.A. and Tremblay, T.A., 1985. Submergence of wetlands as a result of human-induced subsidence and faulting along the upper Texas Gulf coast. Journal of Coastal Research, v. 11, No. 3, p. 788 – 807.

White, W.A., Tremblay, T.A., Waldinger, R.L., and Calnan, T.R., 2007. Status and Trends of Wetland and Aquatic Habitats on Texas Barriers: Upper Coast Strandplain-Chenier System and Southern Coast Padre Island National Seashore. Final Report prepared for Texas General Land Office and NOAA under GLO Contract No. 06-044 and NOAA Award No. NA05NOS4191064, 88 pp.

Budget

Project Budget Narrative:
The total requested for this program is $39.6 million. Of that amount, approximately $37.45 million will be provided to sub-recipients to implement projects selected for this program. TCEQ estimates that it will require approximately $2.15 million to support the following: administrative expenses (salary, indirect, travel, fringe, supplies, etc…); hosting & maintenance costs for the Texas RESTORE web site; and for a contract to provide technical assistance to TCEQ staff.

Total FPL 3 Project/Program Budget Request:
$ 39,600,000.00

Estimated Percent Monitoring and Adaptive Management: 0 %
Estimated Percent Planning: 3 %
Estimated Percent Implementation: 81.5 %
Estimated Percent Project Management: 5.5 %
Estimated Percent Data Management: 0 %
Estimated Percent Contingency: 10 %

Is the Project Scalable?:
Yes

If yes, provide a short description regarding scalability.:
This program will include several independent projects, which may be scaled down or reduced in number depending on the amount of funding received.

Environmental Compliance[1]

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Endangered Species Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Historic Preservation Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Magnuson-Stevens Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Fish and Wildlife Conservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical

[1] Environmental Compliance document uploads available by request (restorecouncil@restorethegulf.gov).

		Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Zone Management Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Barrier Resources Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Farmland Protection Policy Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Water Act (Section 404)	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
River and Harbors Act (Section 10)	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Protection, Research and Sanctuaries Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Mammal Protection Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Marine Sanctuaries Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Migratory Bird Treaty Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Bald and Golden Eagle Protection Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Air Act	No	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 is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Other Applicable Environmental Compliance Laws or Regulations	No	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 is currently proposed for Category 2. If any other environmental compliance laws of regulations are applicable, those requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Maps, Charts, Figures

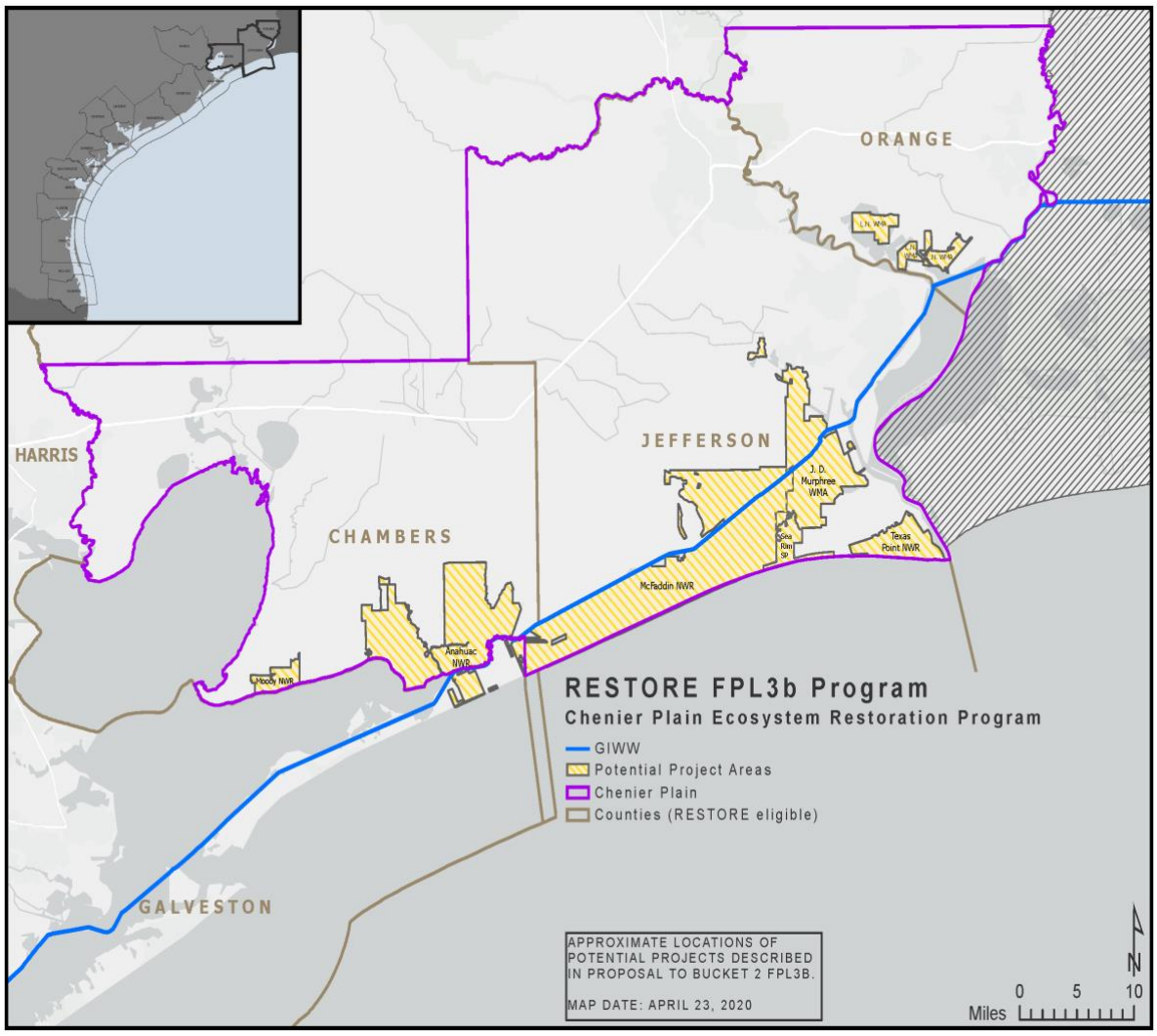

Figure 1: Approximate locations of Chenier Plain Ecosystem Restoration program activities.

FPL 3b Internal Staff Review of Proposal Submitted 4/24/2020

Project/Program	Chenier Plain Ecosystem Restoration Program		
Primary Reviewer	Heather Young	Sponsor	Texas
EC Reviewer	Heather Young	Co-Sponsor	

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?	No
Notes	Council staff recommend that the sponsor edit the budget narrative to specifically identify the amount of funding being requested in FPL Category 1 and FPL Category 2. The proposed budget indicates that approximately 3% of the overall program cost will be dedicated to Planning, and an additional 5.5% ($2.15 million) for Program Management. Program Management activities described in the narrative can be grouped with Planning under Cat 1. The discussion of risks references several costs that are uncertain in the types of projects to be considered, supporting the inclusion of contingency costs in the budget request. Council staff recommend including a statement in the budget narrative that the need for contingency costs

	will be considered as appropriate as individual project-specific budgets are prepared.

7. Are there any recommended revisions to the selected leveraged funding categories?			Yes
Notes	The sponsor indicates leveraging is TBD and has not identified the type or source. The proposal states it is Texas' intent to consider leveraging as a criteria in selecting projects. However, based on text included in the "Proposed Methods" and "Environmental Benefits" sections it appears the sponsor should identify leveraging of restoration and restoration planning in this geographic area previously completed associated with the Salt Bayou Marsh Restoration Plan, RESTORE Bucket 1, RESTORE Bucket 2, NRDA, DWH, and GEBF. Categories could include "Build on Other Work" and "Adjoining". Later, as projects are identified, the leveraging information can be further updated if appropriate.		

8. Have three external BAS reviews been completed?	More information needed
Notes	Please see the external BAS review comments, and external reviews summary attached with these review comments.

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

10. 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	Council staff recommends revising the environmental compliance checklist to indicate "Yes" for NEPA and "N/A" for all other environmental requirements since no implementation is proposed as Category 1 at this time. The additional compliance notes provided are appreciated and can be left as is. If this activity is included in FPL 3b, the subsequent award document would require compliance with all applicable laws in the event that field sampling is required in association with the approved planning, engineering and design.

11. Geospatial Compliance: Have the appropriate geospatial files and associated metadata been submitted along with a map of the proposed project/program area?	More information needed

Notes	The submitted GIS project boundary also intersects the Lower Neches watershed. Council staff recommends the sponsor add the Lower Neches watershed to the selection.

FPL 3b BAS Review Summary – Chenier Plain Ecosystem Restoration Program

May 2020

Overall, the external Best Available Science reviews from Reviewers 1 and 3 for the *Chenier Plain Ecosystem Restoration Program* are positive. Reviewer 2 provides recommendations and suggestions to strengthen the proposal. The information supporting the proposal is directly pertinent to the Gulf Coast region (all reviewers). Reviewer 1 notes further that the "proposal methods are adaptable to other regions and vice versa." Reviewers 1 and 3 agree that the proposal is based on science that uses peer-reviewed and publicly available information and that literature sources are accurately cited and represented in an unbiased manner. However, Reviewer 2 felt that, overall, the proposal could be strengthened by the inclusion of more references to justify the proposed restoration efforts, methodological considerations, and measures of success.

Reviewers generally agree that the proposal has clearly defined goals and objectives as well as measures of success that clearly align with these goals/objectives (all reviewers). To bolster discussion of the proposed methods, Reviewers 1 and 2 suggest providing additional scientific references and data. To this end, Reviewer 1 points to data from the U.S. Army Corps of Engineers, Maryland Department of Natural Resources, Virginia Institute of Marine Science, and other publications. Reviewer 1 further recommends clarifying the discussion of the site selection process by including a table that outlines final sites, existing conditions, and proposed activities. Reviewer 2 points out that the siphon installation listed in the proposed methods should also be fully described. Reviewer 3 recommends that additional information be provided to describe the response rate of public surveys to demonstrate the extent of public input.

Generally, reviewers suggest including additional details to expand on the TCEQ's experience in implementing a similar program to that being proposed (all reviewers). Reviewer 2 also suggests clarifying information about project partners in the proposal.

Reviewers 1 and 3 agree that the proposal has identified the likely environmental benefits of the program, while Reviewer 2 recommends that this discussion be developed to further describe methods of evaluating that a shoreline has attained "improved quality". Reviewer 1 felt that the proposal has "thoroughly" outlined a monitoring and data management strategy to support measures of success. However, Reviewer 3 recommends clarifying conflicting statements regarding monitoring in the proposal: "Monitoring is planned to be conducted for 2 years after project completion, but the program "will require long term monitoring" (p. 8)." Reviewer 3 feels that while the repository aspect of data management was well-described, a discussion of data mining should be included.

Reviewers 1 and 3 agreed that the proposal has fully evaluated risks and uncertainties in achieving objectives over time and is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such programs. Reviewer 3 suggests strengthening the discussion of long-term risk with information about the longevity of and/or need for periodic replenishment of dredged materials. Reviewer 2 did not agree that the

proposal has fully evaluated risks, and specifically recommends that the proposal authors consider the use of “sandflat algal restoration- as these do survive hurricanes.”

While several short-term implementation risks and uncertainties are described in the proposal along with potential mitigation strategies (Reviewers 2 and 3), more information is requested to fully evaluate these risks (Reviewers 1 and 3). Reviewer 3 notes that while potential conflicts with adjacent landowners was discussed as a risk, a mitigation strategy should be provided. Reviewer 3 also suggests expanding the discussion of short-term risks to include risks associated with impacts from the program itself. All reviewers agree that additional information about the past successes and failures of similar efforts would strengthen the proposal’s discussion of risks and uncertainties.

In final comments, while Reviewer 2 has concerns about proposed activities, Reviewer 1 states, “This is an ambitious program and it appears to have been very well vetted through public input with various partners [...].”

Texas Chenier Plain Ecosystem Restoration Program

RESTORE Act Bucket 2 FPL3b Proposal

Response to Best Available Science External Review

15 June 2020

From summary of BAS reviews provided by RESTORE Council Staff:

"Overall, the external Best Available Science reviews from Reviewers 1 and 3 for the Chenier Plain Ecosystem Restoration Program are positive. Reviewer 2 provides recommendations and suggestions to strengthen the proposal. The information supporting the proposal is directly pertinent to the Gulf Coast region (all reviewers)."

Following are replies to specific comments.

> (1) Reviewer 2: Feels the proposal could be strengthened by the inclusion of more references to justify the proposed restoration efforts, methodological considerations, and measures of success.

Reply: Additional scientific literature will be added to the references section, specifically regarding the restoration efforts, methodology, and metrics of success.

> (2) Reviewers 1 and 2: Suggest providing additional scientific references and data. (Reviewer 1 points to data from the U.S. Army Corps of Engineers, Maryland Department of Natural Resources, Virginia Institute of Marine Science, and other publications.)

Reply: As stated above, we will add more scientific references and data to further support the proposed activities.

VIMS: Hardaway Jr., C.S., and Gunn, J.R. A brief history of headland breakwaters for shore protection in Chesapeake Bay, USA. (2011). *Shore & Beach, 78(4)/79(1).* https://pdfs.semanticscholar.org/79f0/aba4ca89c3f0d4f2123374ea5e506a776284.pdf

> (3) Reviewer 1: Recommends clarifying the discussion of the site selection process by including a table that outlines final sites, existing conditions, and proposed activities.

Reply: The proposal discusses the types of activities and general locations within the program area that would take place. The final sites and specific activities, however, would be determined during the planning of the program. It is premature to provide a definitive list of projects at this stage.

> (4) Reviewer 2: Points out that the siphon installation listed in the proposed methods should also be fully described.

Reply: We will expand discussion regarding siphon installation, including references to similar project methods.

Good, Bill. (1993). Louisiana's Wetlands: Combatting Erosion and Revitalizing Native Ecosystems. R*estoration & Management Notes, (11)2*, 125-133. https://www.jstor.org/stable/43440123.

Boustany, Ronald G. Estimating the Benefits of Freshwater Introduction into Coastal Wetland Ecosystems in Louisiana: Nutrient and Sediment Analyses. (2002). *Ecological Restoration, 28(2) 160-174.* http://www.jstor.com/stable/43443227

Lane, R.R., Day Jr., J.W. and Thibodeaux, B. (1999). Water Quality Analysis of a Freshwater Diversion at Caernarvon, Louisiana. *Estuaries, 22(2) 327-336.* http://www.jstor.com/stable/1352988

Boshart, W. M., B. Richard 2005. 2005 Operations, Maintenance, and Monitoring Report for Naomi Outfall Management (BA-03c), Louisiana Department of Natural Resources, Coastal Restoration Division and Coastal Engineering Division, New Orleans, Louisiana.

(5) Reviewer 3: Recommends that additional information be provided to describe the response rate of public surveys to demonstrate the extent of public input.

Reply: We will add the following information to the proposal: To learn the public's concerns regarding coastal environmental problems, their causes, and the types of things we should do to address them, we initially held three public meetings in Brownsville, Corpus Christi, and Galveston. Following these meetings, 127 people filled out an online survey where they scored their levels of concern and identified the types of activities needed to address them. The same survey was provided to our NGO and state-federal working group partners, which provided 32 more responses. Once preliminary projects were selected, public meetings in Corpus Christi and Galveston were held to gather feedback.

(6) Reviewers 1, 2, and 3: Suggest including additional details to expand on the TCEQ's experience in implementing a similar program to that being proposed

Reply: The following will be added to the proposal: The TCEQ administers RESTORE Act activities in Texas and has experience in implementing FPL1 projects. Furthermore, TCEQ is a Natural Resource Trustee agency involved in the state's NRDA program. Importantly, our NGO, state, and federal agency collaborators have significant experience in overseeing environmental restoration projects.

(7) Reviewer 2: Suggests clarifying information about project partners in the proposal.

Reply: The following information will be added to the proposal: The effort to restore the Texas Chenier Plain has been ongoing since at least 1990. In 2013, the Salt Bayou Marsh Workgroup (Workgroup) published a restoration plan describing the status of the Texas Chenier Plain, a review of past and ongoing projects, and recommendations for future work. The Workgroup members include: (1) Ducks Unlimited, (2) Jefferson County Engineering Department and Drainage District #6, (3) NOAA NMFS Habitat Conservation Division and the Restoration Center, (4) Texas General Land Office Coastal Erosion Planning and Response Act and the Natural Resource Damage Assessment Programs, (5) Texas Parks and Wildlife Department Wildlife and Coastal Fisheries Divisions and the Environmental Assessment, Response, and Restoration Program, (6) Texas Water Development Board Coastal Water Resources Group, (7) U.S. Army Corps of Engineers Galveston District, and (8) U.S. Fish and Wildlife Service McFaddin National Wildlife Refuge and the Coastal Program. The proposed program will involve this Workgroup and other stakeholders to a great extent.

(8) Reviewer 2: Recommends that the environmental benefits discussion be developed to further describe methods of evaluating that a shoreline has attained "improved quality".

Reply: A detailed monitoring plan with specified methods aimed at including "quality" in the miles of shorelines restored is appropriate for a later stage of program development but not at this stage.

> (9) Reviewer 3: Recommends clarifying conflicting statements regarding monitoring in the proposal: "Monitoring is planned to be conducted for 2 years after project completion, but the program "will require long term monitoring" (p. 8)."

Reply: We will add the following to the proposal: Project monitoring will be conducted on a project by project basis. Once specific projects are selected, a more detailed monitoring strategy will be put in place. However, we will clarify conflicting statements in this section.

> (10) Reviewer 3: Feels that while the repository aspect of data management was well-described, a discussion of data mining should be included.

Reply: It is not clear exactly what is meant by "data mining" in this context but we propose to add the following: A well-documented, accessible repository with metadata that enables interoperability with other datasets will facilitate data mining for performance monitoring and adaptive management.

> (11) Reviewer 3: Suggests strengthening the discussion of long-term risk with information about the longevity of and/or need for periodic replenishment of dredged materials.

Reply: We will add more information regarding relative sea level rise and hurricane impacts on project plans, which are the principle long-term risks to the restoration actions in this area.

> (12) Reviewer 2: Did not agree that the proposal has fully evaluated risks, and specifically recommends that the proposal authors consider the use of "sandflat algal restoration- as these do survive hurricanes."

Reply: Creating sandflat algal environments as the primary restoration target in this area is not feasible in this naturally intertidal marsh dominated area undergoing sea level rise. However, it is likely that flats will develop as adjacent to marsh restoration areas. Furthermore, marshes survive hurricanes too.

> (13) Reviewers 1 and 3: Request more information to fully evaluate short-term implementation risks.

Reply: Implementation risks will vary depending on the specific projects selected.

> (14) Reviewer 3: Notes that while potential conflicts with adjacent landowners was discussed as a risk, a mitigation strategy should be provided.

Reply: At this FPL proposal stage, detailed mitigation plans are not required as individual projects have not been selected. In the project selection phase, we will include additional information on potential mitigation plans, specifically regarding potential conflicts with adjacent landowners.

> (15) Reviewer 3: Suggests expanding the discussion of short-term risks to include risks associated with impacts from the program itself.

Reply: This is an interesting comment, and this type of information will be developed when meeting environmental compliance requirements for this program.

(16) Reviewers 1, 2, and 3: Additional information about the past successes and failures of similar efforts would strengthen the proposal's discussion of risks and uncertainties.

Reply: More information on these types of projects that have already occurred in the Texas and Louisiana Chenier Plains and similar settings on the upper Texas coast will be added.

Campbell, T., Benedet, L., and Finkle, C.W. (2005). Regional Strategies for Coastal Restoration along the Louisiana Chenier Plain. *Journal of Coastal Research 44, 268-283.* https://www.jstor.org/stable/25737061

Campbell, T., Benedet, L, and Thomson, G. (2005). Design Considerations for Barrier Island Nourishments and Coastal Structures for Coastal Restoration in Louisiana. *Journal of Coastal Research 44,186-202.* http://www.jstor.com/stable/25737057

Gulf Coast Ecosystem Restoration Council

FPL 3b Internal Best Available Science Review Panel Summary

July 2020

Introduction

On Tuesday, June 30, and Wednesday July 1, 2020 the RESTORE Council convened the Funded Priorities List (FPL) 3b Internal Best Available Science (BAS) Review Panel. The purpose of this internal panel was to use Council member-agency expertise to address external BAS review comments provided for FPL 3b submitted project/program proposals, and potentially identify project/program synergies not identified prior to proposal submission. The ultimate goal of the panel was to provide Council members with substantive best available science content to inform their decision-making.

The internal panel was convened via webinar with representatives from each of the Council's eleven member agencies present. Each BAS Panel member was provided the following:

1) Full FPL 3b proposals
2) 3 external BAS reviews for each proposal
3) Summary of external BAS reviews for each proposal
4) Proposal Sponsor's response to the BAS reviews summary
5) Any proposed revisions to the proposal

Proposal sponsors provided a brief synopsis of their proposal to the panel, a summary of comments made in external reviews, and discussed their proposed response to the external reviews. Council staff then solicited feedback from the panel on the proposal sponsor's presentation of comments and responses to those comments, and any additional BAS concerns. Council staff also solicited feedback on any existing or future synergies with other Gulf restoration activities. The proceedings of the meeting for this proposal are summarized below.

Texas

Chenier Plain Ecosystem Restoration Program

Feedback from the panel on the proposal sponsor's presentation of comments and responses to those comments, and any additional BAS concerns:

References: Providing additional scientific references and data is suggested.

- A panelist notes that when Texas provides additional references, that corresponding in-text citations should also be included.

- Texas response: Texas concurs, and will ensure all new references are cited both in-text and in the bibliography.
- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Site selection process: It is recommended that the discussion of the site selection process be clarified by including a table that outlines final sites, existing conditions, and proposed activities

- The BAS panel agrees that Texas has appropriately addressed this comment.

Methodological details: Fully describing the siphon installation listed in the proposed methods is recommended.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Justification: Additional information is requested describing the response rate of public surveys to demonstrate the extent of public input.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Past experience: It is suggested that additional details be included to expand on the TCEQ's experience in implementing a similar program to that being proposed.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Collaboration: Clarifying information about project partners in the proposal is suggested.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Evaluation of success: It is recommended that the environmental benefits discussion be developed to further describe methods of evaluating that a shoreline has attained "improved quality".

- The BAS panel agrees that Texas has appropriately addressed this comment.

Monitoring duration: It is recommended that conflicting statements regarding monitoring be clarified in the proposal: "Monitoring is planned to be conducted for 2 years after project completion, but the program "will require long term monitoring" (p. 8)."

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Data-mining: It is suggested that while the repository aspect of data management was well-described, a discussion of data mining should be included.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Long-term risks: Strengthening the discussion of long-term risk is suggested, with information about the longevity of and/or need for periodic replenishment of dredged materials.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Additional risks: It was suggested that the proposal does not fully evaluate risks, and that the proposal authors should consider the use of "sandflat algal restoration- as these do survive hurricanes."

- The BAS panel agrees that Texas has appropriately addressed this comment.

Short-term risks: More information is requested to fully evaluate short-term implementation risks.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Risk mitigation: While potential conflicts with adjacent landowners was discussed as a risk, a mitigation strategy should be provided.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Unintended consequences: It is suggested that the discussion of short-term risks be expanded to include risks associated with impacts from the program itself.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Lessons learned: Additional information about the past successes and failures of similar efforts would strengthen the proposal's discussion of risks and uncertainties.

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Panel comments on existing or future synergies with proposed activity:
Chenier Plain is a focal point, with potential convergence of many different techniques appropriate for meeting restoration needs. For this reason, there could be synergies between, for example, three different projects under three different Texas proposed programs occurring in the Chenier Plain.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Chenier Plain Ecosystem Restoration Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 1
Date of Review: May 8, 2020

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:	
I see 3 methods to restore and conserve high quality coastal habitats with in the Chenier Plain complex of Texas: 1) benefical use of dredge material 2) breakwaters for shore protection and 3) restoration of hydrology and wetlands. The references a bit light. 1) there is considerable data on this subject via USACE 2) See Maryland DNR and Virginia Institute of Marine Science 3) Plenty more on this.	

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 methods are adaptable to other regions and visa versa.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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)?	Need more information
Comments:	
The reference list is bit light. There is extensive data on breakwater performance as well as thin layering research particularly by the Corps. Reference Monica Chasten.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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)	Need more information
Comments:	
Click here to enter text.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
However, more referenced projects,even in other regions of the country, would assist partners in having confidence as the program moves forward.	

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)	No
Comments:	
Only in passing. Aditional references would strengthen the program proposal	

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:	
Thoroughly	

Please summarize any additional information needed below:
This is an ambitous program and it appears to have been very well vetted through public input with various partners. The site selection process would benefit with a table of final sites, existing conditions and proposed activities. Through Google searches I have been able to find much of the data but this should be in a summary document that may well exist. Having that will make assessing this and other programs easier for those of us asked to review it. Some of the online resourses are a bit cumbersome to view. At least this program has specific projects identified. The problem I have is trying to assess and tie this massive effort into a reviewable format. It's difficult to assess the program by simply looking at the proposal and limited references. For this program the use of breakwaters for shore protection is not detailed enough for one to provide critical review. This effort is far enough along where comments on detailed projects would seem to be the next step.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Chenier Plain Ecosystem Restoration Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 2
Date of Review: 12 May 2020

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?	No
Comments:	
The proposal is not well vetted in terms of supporting papers. Methods are not thoroughly described. Siphon installation listed but not described.	

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:	
Methods are adapted, yet are poorly described. The options for rating this question don't really apply.	

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?	No
Comments:	
This is a poorly supported proposal in terms of demonstrating awareness of restoration efforts, methodological considerations, and how to measure success. Adding dredged spoils to an area being eroded only perpetuates a losing proposition.	

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?)	No
Comments:	
The risk management section is extremely weak. Stating that x method has risk is not a solution. This section lacks information	

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?	No
Comments:	
The use of limited numbers of references is not sufficient justification	

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)?	Need more information
Comments:	
The proposal is logical to this reviewer, it lacks the needed review of the science of restoration	

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?	No
Comments:	
Click here to enter text.	

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?	No
Comments:	
No partners are specifically identified. Clearly USCE for dredged material are one agency. Env Impact assessments? This section is weak	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
These are generic goals (e.g. miles of resotred habitat) versus enhanced oyster reef development to enhance shoreline or use of electrified substrates to build hard bottoms. This is weak because of the lack of detail	

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)?	No
Comments:	
This is a huge weakness -this is completely undeveloped/missing	

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?	No
Comments:	
This is not developed. Generic "improvements" are listed – miles fo shoreline, not the method of deciding there is an improved quality!	

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:	
The before/after change in habitat is the only statistical approach that I found. This is weak	

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)	Need more information
Comments:	
While there is some concerns about preventing unwanted effects, overall there is limited appreciation of this issue	

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:	
Several issues were listed, but this is a weak successful response.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	No
Comments:	
Click here to enter text.	

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)	No
Comments:	
Click here to enter text.	

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)	No
Comments:	
The repository aspect of data management is thoroughly described. No data mining is discussed	

Please summarize any additional information needed below:
The restoration of NWP only seems like a poor use of Texas funding Consider use of sandflat algal restoration as these do survive hurricanes (Laguna Madre is an excellent example, also evidence in Mike Sullivan's work in MS marsh systems.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Chenier Plain Ecosystem Restoration Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 3
Date of Review: 5/14/20

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
"Documented success" was noted (p. 6), but no elaboration on sponsor involvement in this success was provided.	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Click here to enter text.	

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:	
Only sea leve rise was noted as an environmental risk (p. 8). No information on the longevity or need for periodic replenishment of dredge material deposit areas were discussed.	

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)	Need more information
Comments:	
Implementation risks of construction cost, permitting considerations, and future sea level rise scenarios were raised as uncertainties along with strategies to mitigate these variables. Potential conflicts with adjacent land owners was raised but no mitigation strategy was provided. No risks associated with impacts from the project (e.g. dredging) were presented.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
Click here to enter text.	

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:	
Past success was noted but not evaluated. The beneficial use of dredge material has been “successful in application”, and other proposed techniques “have successful track records” (p. 8). No failures were noted.	

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	Yes

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)	

Comments:

There are somewhat contradictory statements involving monitoring. Monitoring is planned to be conducted for 2 years after project completion, but the program "will require long term monitoring" (p. 8). This should be resolved.

The measurements from the project will be compared to similar habitat types in surrounding areas.

Please summarize any additional information needed below:

No information on the response rate of the surveys completed by the public and the two work groups or level of attendance at the three public meetings (p. 9) was provided. Therefore, it is not clear the extent of public input.