

## FY22 ANNUAL WORK PLAN

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## **HUMAN USES**

Port Aransas Nature Preserve Automated Gates \*

Aransas Woods Site Access and Signage \*

Nueces County Coastal Parks Education Outreach Materials \*

Dimmitt Pier Interpretive Signage \*

Trail Extension and Invasive Species Removal at Sunset Lake Park

\* Indicates project proposed by the Human Uses Implementation Team

## **PROJECT #2212 Port Aransas Nature Preserve Automated Gates**

**Performing Organization: City of Port Aransas**

**Total Project Cost: \$25,000**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: TR 2.1, TR 3.1**

### **Background:**

The City of Port Aransas has developed several nature parks all stemming from a developed master plan. The City has several access points to the Nature Parks that require the opening and closing of gates by the local police department. The current preserves have operating hours of daylight to dusk. When the local police department is responding to calls, they are not able to open or close the park gates at the posted times for access.

The City of Port Aransas is requesting funds to install three (3) automatic solar powered gates at the Nature Preserves of Port Aransas. These gates would be installed at the North and South entrances to Charlie's Pasture and to a newly acquired 33-acre nature area off of HWY 361 that will soon be dedicated to a Nature Preserve site. The addition of the automated gates will help the City of Port Aransas monitor access during the set hours of operation.

### **Project Objectives:**

Install solar powered gates at the following Port Aransas Nature Preserve sites:

1. North entrance of City of Port Aransas Nature Preserve at Charlie's Pasture located off Port Street, Port Aransas, Texas.
2. South entrance to City of Port Aransas Nature Preserve at Charlie's Pasture located off HWY 361, Port Aransas, Texas
3. East side of HWY 361 approximately 5 miles south of Port Aransas at a newly acquired 33-acre site dedicated as a new City of Port Aransas Nature Preserve location.

## **PROJECT #2213 Aransas Woods Site Access and Signage**

**Performing Organization: Aransas First**

**Total Project Cost: \$26,000**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: TR 2.1, HLR 1.2, PEO 1.1**

### **Background:**

Aransas First is seeking funds for the continued development of the Aransas Woods property. This project will support the continued site development of Aransas Woods as a public access and education area. Aransas Woods is a preservation site located in Aransas County along state highway 35 between Rockport and Aransas Pass, Tx., This site includes site #47 of the Coastal Birding Trail. Encompassing over 100 acres of upland oak woodlands, palustrine wetlands, and a series of walking trails and observation areas this is a prime location to allow and encourage increased and enhanced public access. Aransas First, a non-profit land trust organization, is the site manager of Aransas Woods. The mission of Aransas First is to acquire and protect sensitive Coastal Bend habitat essential to wildlife and to increase public awareness of ecosystems unique to the area through education, access, and participation.

Over the past several years multiple projects have been completed to enhance this site for public access. Trail systems have been expanded, trail identification signs have been installed, GPS location markers have been posted, and a series of trail benches have been installed. These have greatly increased the access and safety for site visitors. Environmental Science students from Port Aransas High School have also used this site as an outdoor laboratory by conducting wildlife tracking through the use of trail cameras, monitoring invasive species, and investigating the water quality of the sites wetlands.

### **Project Objectives:**

1. Remove invasive species and vegetation growth that occurred post Hurricane Harvey along wetland edges.
2. Enhance additional trail pathways along the southern edge of the property to tie into the existing trail system and provide visitors access to key observation points.
3. Install educational signage along the trail system and at observation points - the signs will highlight the geological and ecological features of the area and tie these features to the overall health of the ecosystem.
4. Install a 100 linear foot pier over a portion of a 20-acre freshwater wetland allowing visitors an enhanced observation experience of the ecological system.

## **PROJECT #2217 Nueces County Coastal Parks – Education & Outreach Materials**

**Performing Organization: Nueces County Coastal Parks**

**Total Project Cost: \$7,500**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: TR 2.1, PEO 1.1**

### **Background:**

Nueces County Coastal Parks is working to provide education materials at the nature preserves and parks to create interest in these natural areas and local ecosystems, provide education opportunities, support citizen science, and generate regional tourism. Over 200,000 visitors come to the five coastal parks including long term stay campers, school groups and local outdoor recreation not including beach goers.

Padre Balli and IB Magee provide access to beaches on Mustang and Padre Islands which supports shorebirds and important dune habitats. The outreach materials will link the newly acquired Kleberg tract to the existing parks to create interest and for future visitation of the new area. New educational signs will be placed at IB Magee and Packery Channel that incorporate some of the area's history as well as the importance of the ecosystems supported at these sites. Paper pamphlets with common wildlife and habitats occurring at the parks, helpful websites, bird check lists and the county Facebook pages will be printed and available at each park. These materials will aid in bird identification, increase the preserves visibility and the region as a hot spot for neo-tropical migratory birding, encourage logging birds seen in these areas on eBird through the Audubon Society, and encourage visitors to utilize resources at other natural areas and parks. The Parks Facebook pages create a virtual platform for education and outreach that can be used to relay events and information and promote interaction among followers. The display case at the Packery Channel Nature Preserve will be used to house educational materials. These materials will be updated each month with relevant information for the time of the year.

These efforts are expected to increase education for both general public and visiting school groups, promote higher foot traffic in the county's parks while linking the parks to increase visitation in other areas. Additionally, this program will allow visitors to contribute to the collection of scientific data that can be used to promote preservation and education opportunities in the future and increase tourism by creating a national destination for birdwatching.

### **Project Objectives:**

1. Install new educational signs at I.B. Magee Beach Park and Packery Channel Nature Park.
2. Paper pamphlets with common wildlife and habitats occurring at the parks, helpful websites, bird checklists and the county Facebook pages will be printed and available at each park.
3. Facebook pages of several coastal parks will be used to relay events and information to its followers and allows for the public to ask questions and promotes interaction between the coastal parks and visitors to the areas.
4. Each month, update the display case at the Packery Channel Nature Park with relevant information for the time of year and include seasonal themes.

## **PROJECT #2219 Dimmitt Pier Interpretive Signage**

**Performing Organization: City of Corpus Christi – Parks and Recreation Department**

**Total Project Cost: \$10,000**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: TR 2.1, PEO 1.1**

### **Background:**

The Phillip Dimmitt Memorial Pier was recently updated by the City of Corpus Christi. This project proposes to add a series of four interpretive panels about the wildlife of the Laguna Madre and to educate visitors of the fauna present nearby. After sustaining damage from Hurricane Harvey in 2017, Dimmitt Pier was placed on the 2018 City bond to have \$480,000 of restoration work completed including new floorboards, new guardrails, addition of lights, a fish cleaning station, and benches. Additional work is still planned for the site which includes improvements to the parking lot. The pier has recently been reopened to the public and is being actively used by anglers.

Inclusion of interpretive signs would educate visitors about bird life, common non-game fish, water flow in the Laguna Madre, and other organisms that make up the food web.

### **Project Objectives:**

1. Design 4 interpretive panels to be used on the pier.
2. Provide sign review to funding organization.
3. Produce the approved interpretive panels from a long-life high-pressure laminate material.
4. Install the interpretive sign panels.

## **PROJECT #2238 Trail Extension and Invasive Species Removal at Sunset Lake Park**

**Performing Organization: City of Portland**

**Total Project Cost: \$31,500**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: TR 1.2, HLR 1.2**

### **Background:**

Sunset Lake Park is located adjacent to Highway 181 between Portland and Corpus Christi. The park is located within the City of Portland, only a 1/2 mile from the city's urban area. It is located on the shores of Nueces and Corpus Christi bays between Portland and Corpus Christi. The Park is an ecologically rich wetland and saltwater lake habitat designed and operated to provide a broad range of outdoor recreational opportunities. As envisioned by the City of Portland, Sunset Lake combines habitat protection and public use in a cooperatively planned outdoor experience that maintains our pristine coastal resources.

Sunset Lake Park currently features a two-mile hike and bike trail constructed on an old roadway that transects one of the most diverse coastal marsh and wetland habitats anywhere along the Texas Coast. Nature interpretation boardwalks provide visitors with view of a diversity of birds and bird activity, including roosting, nesting, and feeding in a diverse coastal marsh. Outdoor enthusiasts can fish, swim, canoe, kayak, sail, hike, bike, or enjoy birdwatching. The site is located along the Texas Coastal Birding Trail.

CBBEP will work with the City of Portland to install an extended hike and bike trail along the Sunset Lake Park bayfront, north of Indian Point pier. Invasive species removal will be included as part of the project. The City has received a report from a qualified engineering firm with an opinion of probable construction costs for the project.

### **Project Objectives:**

Enhance visitors' experiences at Sunset Lake Park by collaborating with the City of Portland to expand existing hike and bike trails and remove invasive species.



## **MARITIME COMMERCE AND DREDGING**

Blue-water/Brown-water Symposium

\* Indicates project proposed by the Maritime Commerce & Dredging Implementation Team

## **PROJECT #2204 Blue-water/Brown-water Symposium**

**Performing Organization: TBD**

**Total Project Cost: \$4,000**

**Bays Plan, 2<sup>nd</sup> Ed. Actions: MC 1.4**

### **Background:**

Corpus Christi and the surrounding communities are experiencing dramatic economic growth due to the oil and gas industry. The Port of Corpus Christi has been dubbed “the energy Port of the Americas” because the Port is the leader in U.S. crude oil exports. Strategically located on the western Gulf of Mexico, the Port is a major gateway to both international and domestic maritime commerce. To meet the future demands of the export industry, the Corpus Christi Ship Channel (CCSC) is undergoing a widening and deepening (47 to 54 feet) project to permit larger ships to access the Port. Other proposed infrastructure projects like the additional deepening (54 to 81 feet) of the CCSC from the Port Aransas jetties to Harbor Island, Harbor Island Terminal and Bluewater Deepwater Port as well as existing facilities like Moda Midstream, South Texas Gateway, Lydia Ann Channel Moorings, City of Port Aransas Marina, and the Port Aransas Ferry will increase the transit volume of ships utilizing the CCSC.

Since the CCSC is used by ships entering from the Gulf of Mexico (Blue-water) as well as ships/barges using the Gulf Intracoastal Waterway (GIWW)(Brown-water) it is essential for coordination between the groups to ensure safe navigation of all vessels. A symposium between the blue-water and brown-water groups typically occurs once a year. However, due to Covid-19 restrictions in 2020, a symposium between the Blue-water and Brown-water personnel has not occurred since 2019.

With the proposed CCSC changes and the local industrial expansion, a meeting between groups is in the best interests of the shipping industry and the local communities. The symposium offers new Deputy Pilots with under two-years of training the opportunity to gain information and experience from more experienced staff. Past symposiums have provided discussion and real-life examples of recent ship/barge contact, CCSC hot spots or chokepoints, communication standards, infrastructure development (barge shelves & wider channel), and open discussion on concerns or suggestions.

### **Project Objectives:**

The objective of this project is to help facilitate a dialogue and build relationships between the professionals who work on the waters of Corpus Christi and to address waterways issues with the aim of improving communications, trust, safety, and general knowledge among blue- and brown-water operators. The project will accomplish this objective by (1) providing a site to host the free, one-day Blue-water/Brown-water Symposium, (2) provide for facilitator fees and (3) provide lunch for all attendees.

## **HABITAT AND LIVING RESOURCES**

Shoreline Protection and Wetland Enhancement at the Cohn Preserve (Mustang Island) \*

Newcomb Marsh Shoreline Protection - Phase I \*

Supporting Conservation of Mesquite Bay Reefs \*

Evaluating Habitat Best Management Practices for SABP's Water for Wildlife Program \*

Brazilian Peppertree Removal and Treatment Experimental Plots \*

Mapping Wetland and Aquatic Habitat Change on Mustang and San Jose Islands, TX \*

Influence of an extreme cold air outbreak on food web dynamics in Baffin Bay

Texas Gulf Region Cooperative Weed Management Area: Dune Management and Restoration on Mustang Island, Phase II

Protection and Restoration of Rookery Islands in Aransas Bay and the Laguna Madre, Phase I

Post-freeze Food Web Sampling in Baffin Bay

Triangle Tree Rookery Island Protection and Restoration

Protection and Restoration of Matagorda Island West Marsh, Aransas National Wildlife Refuge

Protection and Restoration of the Blackjack Peninsula, Aransas National Wildlife Refuge

\* Indicates project proposed by the Habitat & Living Resources Implementation Team

## **PROJECT #2220 Shoreline Protection and Wetland Enhancement at Cohn Preserve (Mustang Island)**

**Performing Organization:** The Nature Conservancy

**Total Project Cost:** \$55,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2

### **Background:**

The primary purpose of the project is to enhance and stabilize degraded wetlands and shorelines at the Cohn Preserve and Mustang Island State Park while making Mustang Island more resilient to wetland habitat loss. The 480-acre Cohn Preserve and 3,950-acre Mustang Island State Park (MISP) on Mustang Island shelter Croaker Hole from Corpus Christi Bay and are undergoing significant degradation of their shorelines and coastal wetlands (conversion of wetlands to tidal flats and conversion of tidal flats to open water) due to sediment deficits, relative sea level rise, recent coastal storms and subsequent, near constant, high tides. It is estimated that sections of the Cohn Preserve have lost roughly 30 feet of shore front since 2014, and approximately 10 to 12 feet in 2020 alone, resulting in an emergency scenario for the area. Due to the nature of the bayside shoreline, this erosion has significant residual impacts beyond the immediate erosion itself, as the ecosystems within the preserve lose their protection and become vulnerable to increasing climatic volatility. There are particular areas of concern at Croaker Hole where both at the Francine Cohn Preserve and at Mustang Island State Park, there has been two breach sites of the shoreline separating it from Corpus Christi Bay.

Owned by The Nature Conservancy, the Cohn Preserve is a significant, 480-acre marine conservation area on Mustang Island, one of Texas's Gulf barrier islands. The preserve is adjacent to Mustang Island State Park, which collectively play a significant role in protecting the barrier island system from habitat fragmentation, point- and non-point source pollution, and wetland loss. The protected area's wetlands on the bayside of Mustang Island support habitats for several species of fish, including red drum, blue crabs, brown shrimp, southern flounder, and speckled trout; black mangroves; and birds, such as piping plovers, peregrine falcons, aplomado falcons and reddish egrets. The purpose of the project is to protect this conservation area while ensuring its continued productivity. Given the proximity to major coastal communities on the island, the preserve provides a unique role in maintaining natural systems in a rapidly developing region of the coast.

### **Project Objectives:**

The project objective is to conduct surveys, alternative analysis, engineering, design and permitting for structural and alternative methods to abate the erosion and assist in the restoration of the wetlands at the Cohn Preserve.

## **PROJECT #2221 Newcomb Marsh Shoreline Protection**

**Performing Organization:** Texas Parks & Wildlife Department

**Total Project Cost:** \$50,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2

### **Background:**

TPWD and several conservation partners, including CBBEP, own and manage properties on the eastern shore of Copano Bay in an area known as Newcomb Point. Estuarine emergent marsh and adjacent uplands in this area are known wintering habitat for the federally-endangered Whooping Crane, which has led to this area being prioritized for conservation by numerous partners. Estuarine emergent marsh at Newcomb Point also provides high quality nursery and foraging habitat for fish and other wildlife, many of which are commercially and recreationally important.

Erosion and marsh habitat loss in the Newcomb Point area have increased lately. Since 1995, an estimated 50 to 120 feet of shoreline have eroded and an unquantified, but significant number of acres of marsh, have been converted to open water. This is likely due to a combination of factors, including dredging and removal of oysters immediately offshore, reduced sediment availability in the Copano Bay system, subsidence from drought and mineral extraction, sea level rise, and most recently Hurricane Harvey which passed directly over this site.

A comparison of aerial imagery from 1995 to 2020 indicates that in some areas, in particular the south shore of Newcomb Point, as much as 50-75% of the emergent marsh has been converted to open water. Analysis of aerial imagery before and after Hurricane Harvey indicates that an estimated 20-30 feet of shoreline erosion occurred from January 2017 to January 2020, and shoreline breaches into the marsh increased from four to twelve. Numerous breaches into the marsh allow greater wave energy and currents into the area accelerating marsh loss. At the current rate, it is conceivable that the shoreline on the south shore will completely break down within the next five years resulting in complete loss of the point and numerous acres of marsh habitat.

TPWD is proposing to install a living shoreline or structure that would protect the eroding shoreline and approximately 280 acres of marsh habitat at Newcomb Point. The project will be conducted in multiple phases. The current phase includes alternatives analysis, engineering, design, and permitting for structural and non-structural methods for conservation and restoration of the shoreline and marsh habitat. A later phase will involve final design and construction of the living shoreline or structure.

### **Project Objectives:**

The objective of this project is to conserve and restore the shoreline, emergent marsh, and associated nearshore and upland habitat, and wildlife dependent upon this habitat, at Newcomb Marsh in Copano Bay.

## **PROJECT #2225 Supporting Conservation of Mesquite Bay Reefs**

**Performing Organization:** Harte Research Institute at Texas A&M University – Corpus Christi

**Total Project Cost:** \$60,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, TR 3.1, PEO 1.1

### **Background:**

Coastal habitats are recognized for providing ecological benefits and supporting coastal resiliency. However, the Texas coast is vulnerable to pressures from natural disasters and human activities. *Crassostrea virginica* oyster reefs rank highest among degraded marine systems, with an estimated 50-85% loss throughout the Gulf of Mexico. Loss of reef habitat translates into loss of biodiversity and associated ecosystem services, including viable fisheries, habitat provision, and water filtration. Conservation and restoration of oyster reefs can help communities become more resilient by providing natural buffers against storms, improving water quality, supplying critical habitat, and supporting coastal recreation and tourism.

In the Texas Coastal Bend, Second Chain of Islands, Ayres Reef, Third Chain of Islands, Cedar Reef, and Carlos Reef (hereafter referred to collectively as ‘Mesquite Bay Reefs’) are historically productive oyster reefs that support colonial waterbird populations and attenuate waves from passing vessels passing between the Mission-Aransas and Guadalupe Estuaries. However, in recent years, reduced oyster densities and overall degradation of reef habitat have been observed, likely due to the effects of Hurricane Harvey and ongoing commercial harvest activities (i.e., dredging). Second Chain of Islands, Third Chain of Islands, and Carlos Reef appear to have experienced the greatest declines, thus there is strong interest in protecting, conserving, and restoring the remaining Mesquite Bay Reef habitat.

The purpose of this study is to assess historical data and collect new data to support future conservation and restoration of Mesquite Bay Reefs, which may include: (1) obtaining Texas General Land Office surface leases to conduct oyster reef restoration activities, 2) working with Texas Parks & Wildlife Department (TPWD) to target oyster cultch placement efforts to these reefs, and (3) bringing a request to the TPWD Commission for closure of these reefs to limit commercial harvest and allow oyster population recovery. This project supports actions and strategies identified in the 2019 Texas Coastal Resiliency Master Plan, including ‘Oyster reef enhancement’, ‘Oyster reef planning, restoration, and monitoring’, and ‘Rookery Island Enhancement’. The project implements high-priority Tier 1 projects in Region 3, specifically R3-10, and will produce community benefits of interest to the GLO, chiefly ‘Increasing public awareness, education and support for coastal resilience’.

### **Project Objectives:**

The objective of this project is to (1) assess historical data, (2) evaluate historical aerial imagery, (3) and collect field data to support future conservation efforts on Ayers Reef and Cedar Reef in Mesquite Bay.

## **PROJECT #2216 Evaluating Habitat Best Management Practices for SABP's Water for Wildlife Water Well Program**

**Performing Organization:** San Antonio Bay Partnership

**Total Project Cost:** \$18,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, HLR 2.1

### **Background:**

San Antonio Bay Partnership (SABP) and the International Crane Foundation (ICF) have partnered on a "Water for Wildlife" program since 2014. This program is aimed at providing Whooping Cranes (and other wildlife) access to water sources of the quality which will meet their "drinking water" needs during the all-too-frequent drought periods along the Mid-Texas Coast, when salinities in tidal ponds located within or near their territories, and normally utilized for consumption by Whooping Cranes, become too high. Working with land managers and landowners within the wintering grounds of the Aransas/Wood Buffalo flock of Whooping Cranes, SABP and its partners (USFWS; TPWD; TNC; USDA-NRCS; NFWF and private landowners) have installed/replaced/maintained over 30 water wells -- and associated freshwater "ponds" -- to provide "safe and easily accessible" freshwater sources for Whooping Cranes and other wildlife.

During the all-too-frequent droughts affecting the Mid-Texas coast and upstream watersheds, salinity in the tidal ponds utilized by Whooping Cranes around their territories becomes too high for their dietary water needs. The Water for Wildlife program's installation of water wells near Whooping Crane territories has provided water sources of more suitable quality in order to reduce the need for additional, energy-consuming flight effort on the part of Whooping Cranes seeking suitable water sources. While the selection of sites for these water wells has taken into account the type and amount of vegetative cover around the wells and ponds, this vegetative cover changes over time -- while it initially may be conducive to Whooping Cranes using the water source, it now appears that without active vegetative management, vegetative cover in the area around some wells/ponds has reached a state where Whooping Cranes no longer "feel safe" and therefore no longer utilize the water source. This project would involve: (1) working with owners/managers of the properties where existing wells are located to re-establish suitable vegetative coverage at some of the well sites, (2) monitoring Whooping Crane use of these sites, via game cam surveys, and (3) comparing Whooping Crane use at these sites with use at sites where vegetative cover has not been restored to suitable conditions. Analysis of Whooping Cranes' use of "restored" sites vs. "un-restored" sites will be used to assess the potential benefits, if any, of incorporating requirements for vegetative Best Management Practices into future agreements with landowners for the installation of new "Water for Wildlife" wells.

### **Project Objectives:**

The objective of the project is to evaluate Best Management Practices for maintaining safe, appropriate vegetation coverages around existing water wells so as to encourage access by Whooping Cranes.

## **PROJECT #2222 Brazilian Peppertree Removal and Treatment in the City of Port Aransas**

**Performing Organization:** City of Port Aransas

**Total Project Cost:** \$35,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, HLR 2.1

### **Background:**

The Port Aransas Nature Preserve is 1,280 acres and encompasses four natural areas within the City of Port Aransas, located in Nueces County, Texas. The Nature Preserve at Charlie's Pasture is 1,217 acres and represents one of the few contiguous tracts of undeveloped land in any coastal plain that has been preserved for environmental, ecological and historical purposes. Located within the city limits, the Preserve is a safe haven for wildlife that face continuous pressures of habitat destruction and development. The Preserve includes grassland prairie uplands, sand flats, marshes, wooded mottes, estuaries and shoreline habitats that support diverse plant and animal life. Migrating and resident shorebirds, waterfowl and songbirds are a large driving force behind the valuable ecotourism of the Preserve. Threatened and endangered species that can be seen here include piping plover, reddish egret, Aplomado falcon and whooping crane. The most common breeding birds include willet, snowy and Wilson's plovers, least tern, least bittern, black-necked stilts, mottled duck, black-bellied whistling duck, many herons and egrets, and seaside sparrow.

The mission of the Port Aransas Nature Preserve is to preserve history, protect habitat, and promote harmony with nature. Management of the Nature Preserve areas strives to find a balance between all activities and users while protecting the coastal habitats and maintaining their natural states. Invasive species management is ongoing for mainly Brazilian peppertree, white lead tree, Guinea grass and other invasive grasses. The Texas Gulf Region Cooperative Weed Management Area (CWMA) is a partnership formed in 2014 with the goal of managing Brazilian peppertree. Since it was formed in 2014, the Nature Preserve has treated approximately 200 acres of Brazilian peppertree.

Brazilian peppertrees (*Schinus terebinthifolia*) are an invasive species and a serious threat to natural habitats throughout the warmer temperate areas of the United States including the Nature Preserve. In Port Aransas, the Brazilian peppertree is threatening the grassland prairie. The Port Aransas Nature Preserve Brazilian Pepper Control Plan includes recommendations for both chemical treatment and prescribed fire as methods to control the spread of the Brazilian peppertree. Complete removal is highly unlikely as there are adequate seed sources located outside the boundary of the Preserve. The most notable of these locations is the 67-acre property owned by the City of Port Aransas and directly adjacent to the North of Charlie's Pasture. In 2018 with a contract funded through the Texas Gulf Region CWMA, 19 acres of Brazilian peppertree was removed and chemically treated. Unfortunately, following the removal efforts Guinea grass grew in the bare disturbed soil. Guinea grass is an invasive grass that will grow in disturbed areas. Either way, it is important that the Brazilian peppertrees be controlled as soon as possible, as the fruit is readily consumed by birds and deposited in the Preserve and elsewhere. The Brazilian peppertree is very dense on portions of this property and the problem will not get any better. This project will use this property to experiment with a few different methods to determine the effectiveness of removal and re-growth but also to look at a cost-benefit analysis to determine what the best method may be.

### **Project Objectives:**

The objective of this project is to remove and treat Brazilian peppertree from a large tract of City owned property directly adjacent to the Port Aransas Nature Preserve.



## **PROJECT #2227 Mapping Wetland and Aquatic Habitat Change on Mustang and San Jose Island, TX**

**Performing Organization:** University of Texas Marine Science Institute

**Total Project Cost:** \$51,657

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 2.1, SM 1.1

### **Background:**

This project will update existing maps of wetland and aquatic habitats on Mustang and San Jose Islands, TX, including fresh, brackish and salt marshes, as well as tidal flats, seagrasses, and mangroves, in order to evaluate habitat change over time and inform decision making. The most recent change analysis of these habitats in the Texas Coastal Bend was conducted in 2004 and concluded that wetland area had considerably increased since the 1950s, though tidal flats provided an exception. However, since 2004, sea level rise accelerated, likely causing coast-wide salt marsh losses of 24% between 1990 and 2010. Warming temperatures likely also contributed to a 74% increase in mangrove area during the same period, sometimes displacing estuarine marsh. These habitats are also vulnerable to habitat transition and loss from a variety of other causes. Thus, a reevaluation of wetland and aquatic areas is overdue, and would facilitate both regional planning and broad-scale research on ecosystem trajectories.

This project will use remote sensing and geo-informatics to reevaluate change in fresh, brackish and salt marshes, as well as tidal flats, seagrasses, and mangroves. As part of this, we will also test whether rookery islands and oyster reefs can be mapped. Ultimately, the goal is to provide a framework for expansion of this mapping project to the entire Texas Coastal Bend, and the broader Texas coast in the future. These goals will be accomplished through an assessment of multi-platform satellite imagery, including PlanetScope, RapidEye, and Sentinel 2 (spatial resolution ranges from 3.7 to 60 m). These satellite data will be combined with 70-cm Digital Elevation Model (DEM) and 60-cm National Agriculture Imagery Program (NAIP) data, both acquired by the United States Geologic Survey in the Texas Coastal Bend during 2018 ([data.tnris.org](http://data.tnris.org)). Drone imagery will also be collected, as needed. Together, these imagery will serve as predictors in a machine-learning approach, where ground-truth data will be provided by field assessments. The DEM data will likely need correction, which will be accomplished through measurements from a high accuracy real time kinematic (RTK) GPS receiver. Project outputs will be presented to end-users at local meetings, through publication of journal articles, and advertised on the PI website. The data will be publicly archived to enable use and access by the science and management communities.

### **Project Objectives:**

This project will update existing maps of wetland and aquatic habitats on Mustang and San Jose Islands, TX, including fresh, brackish and salt marshes, as well as tidal flats, seagrasses, and mangroves, in order to evaluate habitat change over time and inform decision making.

## **PROJECT #2228 Influence of an Extreme Cold Air Outbreak on Food Web Dynamics in Baffin Bay**

**Performing Organization:** Harte Research Institute at Texas A&M University – Corpus Christi

**Total Project Cost:** \$60,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 2.3, HLR 2.5,

### **Background:**

The purpose of this project is to conduct rapid response sampling to assess the impacts of the recent cold snap on benthic macrofaunal prey and food web dynamics in the Baffin Bay ecosystem. The estuary has been well-characterized over the past eight years due to the presence of continuous, ongoing sampling efforts, providing a valuable baseline against which to compare post-disturbance patterns.

In late February 2021, a surge of extreme cold air poured into Texas, leading to a sharp decline in coastal water temperatures to near and below freezing for several days, and resulting in the mortality of a minimum estimate of 3.8 million fish (TPWD estimate) ranging from small forage fish to larger consumers and economically important species. Past evidence indicates that this acute mortality event will likely influence water quality and food web dynamics in Baffin Bay. The recent events provide a rare opportunity to quantify the effects of a cold air outbreak that is predicted to become more common, and to contrast the impacts with those caused by warm season disturbances (e.g., hypersalinity).

### **Project Objectives:**

1. Quantify differences in benthic macrofaunal communities before and after the cold season disturbance and compare to previously-sampled baseline and hypersaline periods.
2. Determine the influence of varying hydrological conditions on benthic macrofaunal communities during a cold season disturbance and compare to previously-sampled baseline and hypersaline periods.
3. Investigate changes in the Baffin Bay food web as a result of the cold air outbreak using stable isotopes ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ), with a focus on commercially and recreationally important fish species.

## **PROJECT #2237 Texas Gulf Region Cooperative Weed Management Area: dune Management and Restoration on Mustang Island, Phase II**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$50,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.2, HLR 2.6

### **Background:**

Barrier island dunes are a dynamic habitat due to the interactions of geology, climate, and vegetation. Dunes provide critical habitat for wildlife and serve as defense for inland areas against storm surge and beach erosion by absorbing the impact of waves and the intrusion of water. Brazilian peppertree is an invasive, noxious, and prohibited species in Texas that negatively impacts dune habitats, as well as many other coastal environments. Through rapid and aggressive growth, as well as allopathic chemicals, the species quickly modifies and degrades the quality of dune habitats.

In 2014, the Texas Gulf Region Cooperative Weed Management Area (CWMA) received a grant through the National Fish and Wildlife Foundation to establish the organization and develop a Brazilian peppertree management plan. Since that time, the CWMA has expanded to include 9 partners and over 30 participating members, including representatives from the City of Port Aransas, Nueces County, Texas Parks & Wildlife Department, Texas Forest Service, US Fish & Wildlife Service, Coastal Bend Bays & Estuaries Program (CBBEP), Mission-Aransas Reserve/University of Texas Marine Science Institute (UTMSI), Texas Invasive Species Institute at Sam Houston State University, and members of the community. The CWMA has completed 16 volunteer work days; hosted 19 outreach events; removed Brazilian peppertree from over 240 acres; and improved management on over 9,370 acres of public and managed lands.

The CWMA has currently chosen to focus their removal and restoration efforts on four zones of dune habitat located in Port Aransas on Mustang Island. These areas have high concentrations of peppertrees and are owned by CWMA partners (i.e., Nueces County, UTMSI). This project will not only advance the local Brazilian peppertree management efforts of the CWMA, but to go a step further, and focus on the restoration of dune habitats that are currently highly impacted by the invasion of Brazilian peppertree. This project builds on the “Texas Gulf Region Cooperative Weed Management Area: Dune Management and Restoration on Mustang Island, Phase I” project that was part of CBBEP’s FY21 Annual Work Plan. CBBEP is an active member of the CWMA and is committed to working with other members to prevent the spread and movement of invasive species and restore native habitats.

### **Project Objectives:**

For this project, CBBEP and the CWMA will remove Brazilian peppertree from impacted dune habitat on Mustang Island and also undertake the dune restoration process by replanting and/or reseeding treated areas. This restoration will provide habitat and dune stabilization, while also preventing the reintroduction of peppertrees by limiting the germination of seeds that are otherwise easily dispersed. Another goal of the CWMA effort is to educate the community on the importance of Brazilian peppertree removal and treatment. Therefore, funding for the project will also support the purchase of supplies needed for community workdays and educational events.

## **PROJECT #2215 Protection and Restoration of Rookery Islands in Aransas Bay and Laguna Madre, Phase I**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$830,219

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, CB 1.1

### **Background:**

Texas colonial waterbirds typically nest in spring/summer months in dense groups on small islands in the bays. Today, threats such as development, habitat loss, and human disturbance are taking their toll. Long-term data shows that the majority of colonial waterbirds in Texas are declining, some as much as 60-70%. The 2019 Texas Coastal Resiliency Master Plan (TCRMP) identifies "Rookery Island Enhancement" as a priority issue in every region of the Texas Coast. CBBEP is actively working with other members of the Texas Colonial Waterbird Society (TCWS) to conserve colonial waterbirds and their nesting habitats.

On the Texas coast, there are many opportunities to protect and restore nesting habitat for colonial waterbirds, many of which are identified as Tier 1 projects in the TCRMP. CBBEP will conduct alternatives analyses, preliminary engineering, 70% construction design, and develop permit applications for the protection and restoration of three rookery islands in the Coastal Bend. Two of the islands are listed as Tier-1 projects in the TCRMP, Benny Shack Island in the Lower Laguna Madre (R4-6) and Long Reef and Deadman Islands in Aransas Bay (R3-10). CBBEP will also explore restoration options in three areas in the Upper Laguna Madre. The rapid erosion of islands in all of these bay systems is greatly reducing the amount of nesting habitat available for colonial waterbirds and identifying the most appropriate restoration options is a priority.

### **Project Objectives:**

Conduct alternatives analyses, preliminary engineering, 70% construction design, and develop permit applications for the protection and restoration of three rookery islands in the Coastal Bend.

## **PROJECT #2218 Post-freeze Food Web Sampling in Baffin Bay**

**Performing Organization:** Harte Research Institute at Texas A&M University – Corpus Christi

**Total Project Cost:** \$24,060

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.3, HLR 2.1, HLR 2.3, HLR 2.4, CR 1.1

### **Background:**

Extreme climatic events are occurring more frequently across the globe, yet much of the scientific focus has been on understanding the ecological impacts of warm season disturbances such as tropical storms, droughts, and hypersalinity. Emerging data indicate that cold season disturbances, or “cold air outbreaks”, may be occurring more frequently with a changing climate, yet almost nothing is known about the impacts of cold air outbreaks in subtropical estuarine ecosystems.

In late February 2021, a surge of extreme cold air poured into Texas, leading to a sharp decline in coastal water temperatures to near and below freezing for several days, and resulting in the mortality of a minimum estimate of 3.8 million fish (TPWD estimate) ranging from small forage fish to larger consumers and economically important species. Past evidence indicates that this acute mortality event will likely influence water quality and food web dynamics in Baffin Bay. The recent events provide a rare opportunity to quantify the effects of a cold air outbreak that is predicted to become more common, and to contrast the impacts with those caused by warm season disturbances (e.g. hypersalinity).

The project will collect soft sediment benthic macrofauna and Serpulid reef macrofauna throughout the Baffin Bay ecosystem three times (Summer 2021). During each sampling event, water temperature, salinity, dissolved oxygen (DO) concentration, and pH will be measured at each station using a YSI Pro DSS multiparameter instrument.

### **Project Objectives:**

The objective of this project is to conduct a rapid response sampling (three sampling events during Summer 2021) to assess the impacts of the recent cold snap (February 2021) on benthic macrofaunal prey and food web dynamics in the Baffin Bay ecosystem. The estuary has been well-characterized over the past eight years due to the presence of continuous, ongoing sampling efforts, providing a valuable baseline against which to compare post-disturbance patterns.

## **PROJECT #2117 Triangle Tree Rookery Island Protection and Restoration**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$13,395

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, CB 1.1

### **Background:**

Triangle Tree, an island in the upper Laguna Madre immediately south of Corpus Christi, Texas, is approximately two acres in size. Currently, the northern edge of the Triangle Tree Island is experiencing severe erosion, primarily from wave damage produced during heavy cold fronts. Erosion at a rate of approximately 2.5 ft/yr is occurring where mature native shrubs have been established and some of these shrubs are beginning to fall into the water. Erosion of Triangle Tree is causing the on-going loss of critical rookery island habitat.

CBBEP received previous funding from the Texas General Land Office, Coastal Erosion Planning and Response Act (CEPRA) Program for preliminary engineering, alternatives analysis, 70% construction design, and submittal of a USACE permit application for shoreline protection at Triangle Tree. Due to the close proximity to the Gulf Intercoastal Waterway, the engineering and design includes an offshore structure designed to protect the north/west side of the island and take into consideration potential placement of dredge material. CBBEP is in the process of working with the engineering firm to submit a permit application. Once the permit is received, CBBEP will begin working immediately on acquiring a lease from TGLO and will use a competitive bidding process to identify a construction contractor. Following construction, CBBEP will conduct monitoring to gauge success of the project in terms of bird usage (e.g., yearly bird surveys to document total number of breeding pairs and number of active nests). CBBEP will also inspect the integrity of the breakwater structures through site visits and a final grade survey.

CBBEP has received additional funding from the CEPRA Program to complete the final engineering/design and construction of the shoreline protection structure at Triangle Tree. However, increased costs for engineering/design and permitting have resulted in CBBEP needing to allocate additional funds to the project in order to fully complete construction.

### **Project Objectives:**

The primary objective of this project is to complete the final engineering/design and construction of a shoreline protection structure at Triangle Tree Rookery Island. This will ultimately protect, enhance, and expand the amount of nesting habitat available for numerous species of colonial waterbirds.

## **PROJECT #1932 Protection and Restoration of Matagorda Island West Marsh, Aransas National Wildlife Refuge**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$498,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2

### **Background:**

Erosion is an ongoing threat to the shorelines and infrastructure of the Aransas National Wildlife Refuge, and the strong waves and storm surge that accompany hurricanes further exacerbates the erosion of beaches and shorelines, resulting in significant loss of coastal habitats and infrastructure. In August 2017, Hurricane Harvey passed directly over the Matagorda Island Unit of the Aransas National Wildlife Refuge and caused significant damage to the facilities on the Island, as well as the levees and water control infrastructure within an area known as the West Marsh. These levees and water control structures protect and preserve important coastal wetlands within the Refuge that provide critical habitat for numerous types of wildlife, including significant numbers of wintering waterfowl and shorebirds, as well as the endangered Whooping Crane.

In 2019, CBBEP entered into a cooperative agreement with USFWS to repair and replace the levees and water control structures on the Matagorda Island Unit that were damaged by Hurricane Harvey. CBBEP received \$1.95 million from the USFWS to implement this project (\$1.645 million specifically for construction), but early assessments by contracted engineers revealed that damages were more severe than initially estimated and extensive repairs were needed to the levees and culverts. As a result, CBBEP has been seeking additional funds to add to the construction budget of this scalable project. In 2020, CBBEP secured an additional \$2 million (\$1.9 million specifically for construction) from the Texas General Land Office, Coastal Erosion Planning and Response Act Program to help support engineering and construction costs. In 2021, CBBEP received an additional \$498,000 from the Matagorda Bay Mitigation Trust which will be added to the construction budget of this project.

### **Project Objectives:**

By repairing and replacing the levees and water control structures in the West Marsh area of the Matagorda Island Unit, the project will enhance thousands of acres of coastal wetlands that provide critical habitat for numerous types of wildlife, including significant numbers of wintering waterfowl and shorebirds, as well as the endangered Whooping Crane.

## **PROJECT #1931 Protection and Restoration of the Blackjack Peninsula, Aransas National Wildlife Refuge**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$500,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2

### **Background:**

Years and years of erosion along the Blackjack Peninsula shoreline at the Aransas National Wildlife Refuge, in an area known as Dagger Point, have resulted in the loss of both wetland and upland habitats that were previously protected by the fringing marsh. Significant erosion in this area has created a bluff that is now 15 feet to 30 feet in elevation. The eroding bluff currently supports a mature stand of Texas Live Oak-Redbay Forest, a plant community that is listed as imperiled. Erosion along the Dagger Point shoreline also threatens nearby public infrastructure at the Refuge and increases the vulnerability of this infrastructure to extreme weather, climate hazards, and sea level rise. This infrastructure plays an important role in the local nature tourism economy, necessitating protection from these potential threats. In 2017, Hurricane Harvey made landfall near the Refuge, further exacerbating the erosion along this San Antonio Bay shoreline and causing significant loss of both habitats and infrastructure.

In 2019, CBBEP entered into a cooperative agreement with U.S. Fish and Wildlife Service (USFWS) to address damages suffered at the Aransas National Wildlife Refuge from Hurricane Harvey and install a shoreline protection structure in San Antonio Bay that will protect the Blackjack Peninsula shoreline from ongoing erosion and storm events, and over time, restore upland and aquatic habitats that have been lost due to erosion. Once completed, the shoreline protection structure will stretch along close to five miles of the Blackjack Peninsula shoreline. The structure itself will provide habitat for fish and other wildlife, and it will also be designed to allow for colonization of aquatic plants between the barriers and the shoreline, which will create additional habitat for fisheries and wildlife and further diminish shoreline erosion. Funds will also be used to address the stabilization of the eroding bluffs along this shoreline. CBBEP has also received support from the Texas General Land Office, Coastal Erosion Planning and Response Act (CEPRA) Program to implement this project.

Using funds received from USFWS and CEPRA, CBBEP contracted with a qualified engineering firm to complete the engineering and design for the shoreline protection structure and bluff stabilization, apply for a permit, and develop a bid package for construction. Based on the draft basis of design report, the project will include alignment of the rock breakwater along the -1.5 to 2.0 foot contour to avoid impacts to seagrass and oyster reefs, while maintaining enough water depth for constructability and remaining near enough to the shoreline to protect from wave action. For the high bluffs around Dagger Point, an armored toe will be constructed at approximately the toe of slope. For the low bluffs, the existing eroding bluff face will be regraded to create a stable slope. Once the stable slope is created, the slope may be planted or allowed to vegetate naturally to further stabilize and prevent erosion of the newly graded slope.

Based on cost estimates provided as part of the draft basis of design report, CBBEP and ANWR have chosen to focus on the construction of three miles of breakwater and the bluff stabilization. CBBEP has \$18,912,200 in funding available from USFWS and recently received \$500,000 in additional funds from the Matagorda Bay Mitigation Trust to support construction of the breakwater and bluff stabilization.

### **Project Objectives:**

By installing a shoreline protection structure in San Antonio Bay, the Blackjack Peninsula shoreline will be protected from ongoing erosion and storm events, and over time, upland and aquatic habitats that have been lost due to erosion will be restored. Once completed, the shoreline protection structure will stretch along close to three miles of the Blackjack Peninsula shoreline. The project will also address the stabilization of the eroding bluffs along this shoreline.



## **COASTAL BIRDS**

CBBEP Coastal Bird Program

CBBEP Coastal Bird Program – CMP Project of Special Merit

CBBEP Coastal Bird Program – Laguna Madre Initiative

CBBEP Coastal Bird Program – Gulf Connections Phase V

Black Skimmer Conservation Along the Texas Gulf Coast

## **PROJECT #2201 CBBEP Coastal Bird Program**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$78,996

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** CB 1.1, CB 2.1, HLR 1.1, HLR 1.2

### **Background:**

Coastal birds are important components of estuarine ecosystems and serve as indicators of ecosystem health. In addition, recreational bird viewing is a significant and growing component of ecotourism, a major facet of the local economy. The 2010 Environmental Indicators Report prepared by CBBEP documented the declining populations of many colonial waterbird species in Texas, with some species experiencing a 90% reduction in breeding pairs since the 1960's. CBBEP recently released the 2020 Environmental Indicators Report, which pointed out that a few species of colonial waterbirds have shown nesting pair recovery levels but many are still declining. An ever-increasing body of research continually provides evidence of the importance of the Texas coast to many non-breeding coastal bird species, several of which are also experiencing population declines.

This project will build on the efforts of the CBBEP Colonial Waterbird projects from previous years through the continued implementation and improvement of specific management actions from the CBBEP Colonial Waterbird Rookery Island Management Plan. This plan outlines habitat management actions such as planting and establishing native shrubs, removing exotic/invasive vegetation, building artificial nest platforms, and removing nest predators as needed throughout the year. All habitat management actions such as planting native vegetation and removing exotic/invasive vegetation will be completed by February 1, as this is the beginning of the waterbird nesting season. Predator management will be conducted on an as-needed basis for the entirety of the year.

Additionally, these efforts will extend to activities that support the conservation of non-breeding coastal bird species and their habitat. This project will provide assistance to other partners, where appropriate, in efforts to assess changes in populations, current wintering and migratory movements, and important areas of habitat for non-breeding coastal species. The timeline for these efforts will depend on the seasonality of the non-breeding species, but will begin September 1, and be completed by June 15.

Years of experience working with coastal bird species in the Coastal Bend makes the CBBEP uniquely qualified to provide expertise and assistance to partners and stakeholders working to conserve coastal birds. The CBBEP will assist resource agencies, universities, and other stakeholders in joint efforts to monitor changes in coastal bird populations at a large scale. These monitoring efforts will take place primarily in December and May and provide information that helps direct waterbird management priorities for CBBEP for the coming years. In addition, the CBBEP will meet with partners and stakeholders throughout the year to provide updated information on coastal bird species ecology and management in the Coastal Bend area.

Public outreach is also a key component of this project, with the objectives of minimizing anthropogenic impacts to rookeries, educating the public, and promoting stewardship of waterbird resources. This will be accomplished through on-site signage at rookery islands, public presentations and events, and other forms of public communications, such as the distribution of flyers, updates on social media, interviews with local news outlets, and regular engagement of volunteers. Public outreach efforts will take place throughout the year.

### **Project Objectives:**

The objectives of this project include: (1) continue restoring waterbird populations through management of nesting sites, including habitat enhancement, protection, predator control, and reduction of anthropogenic impacts; (2) develop and implement public education and outreach programs that promote awareness and stewardship of coastal birds and their habitats, (3) assist partners in efforts to observe and monitor changes in coastal bird populations; and (4) provide resource agencies, researchers, and other stakeholders with expertise on coastal bird ecology, habitats, and conservation needs including assistance in tagging migratory birds for tracking.

## **PROJECT #2203 CBBEP Coastal Bird Program – CMP Project of Special Merit**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$136,390

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** CB 1.1, HLR 1.1, HLR 1.2

### **Background:**

Texas colonial waterbirds typically nest in spring/summer months in dense groups on small islands in the bays. Today, threats such as development, habitat loss, and human disturbance are taking their toll. Long-term data shows that the majority of colonial waterbirds in Texas are declining, some as much as 60-70%. The 2019 Texas Coastal Resiliency Master Plan (TCRMP) identifies "Rookery Island Enhancement" as a priority issue in every region of the Texas Coast. The Coastal Bend Bays & Estuaries Program (CBBEP) is actively working with other members of the Texas Colonial Waterbird Society (TCWS) to conserve colonial waterbirds and their nesting habitats. Using Texas General Land Office, Coastal Management Program - Cycle 26 GOMESA funds, CBBEP will work on rookery island enhancement through management and monitoring.

**MANAGEMENT:** CBBEP will continue its management efforts on colonial waterbird nesting sites from San Antonio Bay to the Lower Laguna Madre. Management actions will be targeted to optimize available nesting habitat (e.g., improve vegetation available for nesting) and reduce factors associated with nest failure or abandonment (e.g., human disturbance). CBBEP will implement management actions during the non-breeding season (Sept-Feb) at a minimum of 38 locations annually over a two-year period.

**MONITORING:** CBBEP will monitor islands during nesting season (Mar-Aug) to ensure nesting activities are proceeding as expected, and to assess and resolve problems that may be re-mediated to allow nesting to resume. CBBEP will assess site conditions and bird usage throughout the nesting season to allow for refinement of habitat management methods. CBBEP will also monitor bird islands to support data collection efforts for the annual TCWS survey. CBBEP, in coordination with TCWS, will host a meeting to share research, review status and trends from survey results, coordinate survey implementation, and discuss ways to advance waterbird conservation.

### **Project Objectives:**

The objectives of this project include: (1) continue restoring waterbird populations through management of nesting sites, including habitat enhancement, protection, predator control, and reduction of anthropogenic impacts; (2) develop and implement public education and outreach programs that promote awareness and stewardship of coastal birds and their habitats, (3) assist partners in efforts to observe and monitor changes in coastal bird populations; and (4) provide resource agencies, researchers, and other stakeholders with expertise on coastal bird ecology, habitats, and conservation needs.

## **PROJECT #2224 CBBEP Coastal Bird Program – Laguna Madre Initiative**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$100,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** CB 1.1, CB 2.1, HLR 1.1, HLR 1.2

### **Background:**

The Laguna Madre is one of the most important coastal wetland complexes for birds in the Western Hemisphere. Much of the value of this system for birds is based on the diversity of tidal flats and seagrass beds spread over a very large geography, extending from the Corpus Christi area down to Tamaulipas, Mexico.

Historically, the Coastal Bird Program has focused our management and monitoring efforts primarily on the mid-coast of Texas. However, bird populations span across program boundaries, and we recognized that expansion to the Lower Laguna Madre was needed to properly manage local waterbird populations. The Laguna Madre is used by the avian community as a contiguous ecological system and should be managed as such.

Thanks to the continued generosity of the Kleberg Foundation, the Coastal Bird Program has employed a full-time biologist in the Lower Laguna Madre who has, with the help of volunteers, implemented management actions at waterbird rookeries - installing protective signs, removing exotic vegetation, planting native shrubs, and eliminating nest predators. Staff has also focused on community engagement and coordinating volunteers. Consistent, annual efforts are vital in properly managing rookery islands. It takes several seasons of intense management to improve island habitat. Therefore, on-going investment in the Laguna Madre Initiative is needed to continue the habitat improvement and protection that is already underway.

In addition to rookery islands, other habitats found in the Laguna Madre support astounding numbers of migrating and wintering shorebirds. Millions of birds, many that migrate over 10,000 miles a year, make use of the beaches and tidal flats of the Laguna Madre. Advances in avian tracking systems are allowing us to learn more about these species and how important the Texas coast is to the migratory flyway. We have expanded our conservation and research efforts to include migratory shorebirds which depend on the Texas coast for portions of their life cycles.

Funding from the Kleberg Foundation and others has allowed us to effectively operate on the lower Texas coast and cultivate a network of local volunteers and partners. Continued investment in this program will allow us to build upon these partnerships, create new collaborative opportunities, and boost our volunteer and support base in the lower Laguna Madre, drawing us closer to our goal of a continuous, integrated, collaborative coastal bird conservation effort throughout the bi-national Laguna Madre system.

### **Project Objectives:**

The objectives of this project include: (1) improving colonial nesting waterbird populations in the Lower Laguna Madre by addressing proximate causes of nest failure such as predation, lack of suitable nesting substrate, and human disturbance; (2) implementing monitoring efforts on shorebird populations to identify potential conservation actions; and (3) engaging volunteers and communities in coastal bird conservation efforts through the coastal portion of the Rio Grande Valley.

## **PROJECT #2239 CBBEP Coastal Bird Program: Gulf Connections Phase V - Revealing Critical Nodes and Pathways for the Conservation Coastal Birds**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$40,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** CB 2.1

### **Background:**

The Gulf of Mexico supports a huge diversity of birds that depend on healthy coastal environments and that are connected to distant and often unknown locations through migration. Marbled Godwits nest in three geographically separate populations in North America, and winter along the Pacific, Atlantic and Gulf of Mexico coastlines. While the species regularly spends winters on the Gulf of Mexico, no tracking study to date has successfully established the link between these birds and their breeding grounds. These linkages are of primary importance in understanding the implications of habitat change and how these may be affecting population trajectories.

Gull-billed Terns nest on small islands in bays along the Texas coast. They primarily feed on estuarine invertebrates or in nearby agricultural fields, but they have also been observed stealing prey (fish) from Black Skimmers. Gull-billed Tern populations have declined somewhat since the 1970's, while Black Skimmers have experienced a sharp decline over that same period. Recent tracking projects with skimmers have provided important information on their foraging ranges and migration/wintering range, but similar data is lacking for the Gull-billed Terns. Tracking this species will help us determine whether terns are subsidized with "easy prey" through kleptoparasitism on skimmers or if they have more typical prey preferences. Data will also provide insight on the use of agricultural lands and migratory and wintering habits of a poorly understood species in the Gulf of Mexico.

We propose to deploy GPS tags to better understand wintering habitat use, migration timing and connectivity, and breeding habitat associations of Marbled Godwits and Gull-billed Terns. The proposed project will build on previous studies on similar species (Red Knots and Black Skimmers), and the results will expand our ability to better manage and conserve a broader suite of coastal birds. For Marbled Godwits, data from these tags will provide a more precise range of departure dates, stopover duration, breeding locations and habitat, and fall migration/wintering sites. For Gull-billed Terns, data will be analyzed to determine patterns of habitat use during different life history stages (breeding, migration, wintering) and to inform a delineation of optimal foraging habitat.

### **Project Objectives:**

Tracking northbound Marbled Godwits from the Gulf of Mexico wintering population with GPS/Argos tags will provide the most accurate migration data possible for this species. Tracking Gull-billed Terns using GPS/VHF devices will allow us to accurately delineate foraging and nesting habitats. This knowledge will help us build a GIS database to describe and map those habitats most important for the species success. Identification of these important sites is critical to facilitating full life-cycle conservation and for understanding interactions with Black Skimmers.

## **PROJECT #2231 Black Skimmer Conservation Along the Texas Gulf Coast**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$300,659

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** CB 1.1

### **Background:**

Populations of colonial waterbirds on the Texas coast have been censused annually by the Texas Colonial Waterbird Society since the 1970s. The data document the remarkable recovery of the Brown Pelican since that population neared extirpation in the Gulf following years of reproductive failure due to DDT. However, trends for many species, most notably the Black Skimmer, appear to continue in the opposite direction, showing continued declines. In the 1970s, there were approximately 8,000 pairs of Black Skimmers regularly nesting across the Texas coast. Forty years later the population hovers just over 2,000 pairs – a decline of approximately 70% (Texas Colonial Waterbird Society, unpubl. data). Notably, similar population decreases have been documented in other parts of the species' range in the Gulf and Atlantic states.

Currently there is no clear “smoking gun” pointing to a single cause of the skimmer decline in Texas. It is more likely that several factors are responsible and may be interacting. It is critically important to understand the causes of these declines if effective solutions are to be developed. Mitigations as diverse as habitat/predator management, engineering and construction to restore or create nesting sites, or a targeted outreach campaign are all potential solutions but understanding the causative effects is essential for limited resources to be directed for the best chance of success. Whichever strategies are deemed most appropriate it will be up to the community to implement, so it is important that they be well-supported by science and supported by the variety of public user groups and the broader conservation community.

This project will provide a field-based approach to assess the factors most commonly attributed to reproductive success or failure of Black Skimmers, and a better understanding of the range of human attitudes and behaviors that could be negatively affecting their conservation. Data from high-accuracy tracking devices and camera studies will generate important new metrics on breeding ecology in Texas bays, and measures of reproductive output will be compared to those reported in studies in the same areas in the 1970s and 1980s. Additionally, a study on human dimensions will investigate the cognitive underpinnings of coastal user group behavior, as well as inform the design of effective communication strategies to increase engagement in pro-conservation behavior along the Gulf Coast of Texas.

### **Project Objectives:**

1. Determine threats and causes of nest failure during the nesting season at various colony sites across the Texas coast, using a combination of regular surveys, precise tracking devices, game cameras, field measurements, and current and archived data on water level and other environmental variables.
2. Use data on prey selection and feeding areas obtained by tracking and monitoring components of the project to analyze trends in abundance and distribution, and temporal availability of prey items from TPWD Coastal Fisheries bag seine data and other sources to determine whether spatiotemporal mismatches in prey availability and abundance may be affecting reproductive success of Black Skimmers.
3. Using specifically designed human dimensions survey methodologies, identify the relevant knowledge, beliefs, attitudes, behaviors, motivations and policy preferences among the range of coastal user groups; identify typologies of user groups to inform content framing, communication delivery methods, and optimal behavior change outreach strategies to match preferences of each typology.

**LAND CONSERVATION AND STEWARDSHIP**

CBBEP Property Management

Gulf Coast Conservation Initiative

Aransas Swale Project

Texas Mid-Coast Initiative – Wetland Reserve Enhancement Partnership

## **PROJECT #2209    CBBEP Property Management**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$192,085

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** LCS 1.1, LCS 1.2

### **Background:**

CBBEP is owner and steward of Program-owned conservation properties across South Texas primarily located in Aransas, Nueces, San Patricio, Refugio, and Cameron Counties.

Included in the list of conserved properties is the CBBEP Nueces Delta Preserve which is located just outside of Odem, Texas and is the focal point of the CBBEP Land Conservation Program. The CBBEP Nueces Delta Preserve encompasses over 11,500 acres of the Nueces River Delta and is in both San Patricio and Nueces Counties. The Nueces Delta Preserve was purchased with the intent of preserving natural habitat, species, and function of the Nueces River Delta. This property is also home to the CBBEP Environmental Education Program “Delta Discovery” program.

CBBEP has taken the successful model of the Nueces Delta Preserve and has focused on preserving contiguous acres of habitat in the Refugio County’s Mission River Delta, Aransas County’s Lamar Peninsula, and on Mustang Island.

The project funds are dedicated to help support land ownership obligations and some routine maintenance associated with land ownership. Maintenance activities include but are not limited to habitat management activities, road and culvert repairs, equipment repairs purchases and maintenance, development and enhancement of public access sites, and the payment of property taxes.

Past project accomplishments have included, perimeter fencing, herbicide applications for brush control, development and implementation of prescribed burn program, road reconstruction, installation of solar water wells, and wetland enhancement and creation.

### **Project Objectives:**

1. Provide the required ongoing maintenance and management of properties owned by CBBEP.
2. Implement prescribed burn plan on a minimum of 700 acres of grasslands.
3. Mechanical brush removal to enhance at least 100 acres.
4. Replace sections of perimeter fence.
5. Make repairs to and weather seal wooden structures.
6. Repair culvert systems.
7. Design equipment storage and workshop facility.
8. Install solar water well to provide freshwater for wildlife.



## **PROJECT #2223 Gulf Coast Conservation Initiative**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** TBD

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** LCS 1.1, LCS 1.2

### **Background:**

The Gulf Coast Conservation Initiative (GCCCI)'s purpose is to protect, enhance, and/or restore habitat for Whooping Cranes, northern Aplomado falcons, Attwater's prairie chickens, Sprague's pipit and associated migratory bird species.

The Aplomado Falcon, Attwater's Prairie Chicken, and Whooping Crane are endangered species that occur in coastal Texas, and whose ranges overlap to varying degrees with one another, as well as with many migratory birds which have experienced long-term, broad-scale declines across much of their ranges. These species can neither recover nor be sustained unless habitat sufficient to support viable populations is conserved. Habitat for these species has been degraded by the production of food and fiber, and is being lost to development and rising sea-levels. Protecting, enhancing, and restoring habitat for these species from development will in this area reduce or avoid impacts from recreational uses, protect and preserve functional sensitive natural habitat types, preserve open space, and restore degraded habitats in the GCCCI priority area.

Since 2002, CBBEP has worked to acquire either fee simple title or conservation easements for more than 12,000 acres of freshwater marsh, forested wetlands, mudflats, riparian corridors, and native upland habitat for conservation management. CBBEP has coordinated with U.S. Fish & Wildlife Service, Natural Resources Conservation Services, and The Nature Conservancy to develop and implement management plans and restoration actions throughout this protected habitat. CBBEP has also coordinated and worked with other property owners (such as Aransas National Wildlife Refuge, Texas Parks and Wildlife Department, City of Corpus Christi, South Texas Botanical Gardens and Nature Center, and private property owners) to develop and implement restoration actions on their property.

CBBEP will coordinate with USFWS, Grazing Lands Coalition, TNC, USDA-NRCS, and other conservation organizations to identify and implement restoration actions that benefit a minimum of 500 acres of habitat for Aplomado Falcons, Attwater's Prairie Chickens, and/or Whooping Cranes, as well as associated focal migratory birds' habitats. For projects on private lands CBBEP or a designated project partner will develop written 10-year long agreements with landowners.

### **Project Objectives:**

Identify and implement restoration actions that benefit habitat for Aplomado Falcons, Attwater's Prairie Chickens, and Whooping Cranes.

## **PROJECT #2234 Aransas Swale Project**

**Performing Organization:** CBBEP Land Conservation Program

**Total Project Cost:** \$110,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1, HLR 1.2, LCS

### **Background:**

CBBEP has an established history of partnering with the United States Fish and Wildlife Service to enhance habitats on both private and public lands. In this project CBBEP will enter into contractual agreements for the restoration and enhancements of Whooping Crane palustrine wetland swale habitat on Aransas National Wildlife Refuge (ANWR).

During the winter, Whooping Cranes spend most of their time in the coastal wetlands of Texas, which includes shallow bays, open ponds, salt marsh, and sand flats. Although wintering whooping cranes spend much of their time in these wetland habitats, they also visit nearby upland habitat throughout the winter. These coastal prairies and oak savannahs adjacent to the salt marshes are important secondary feeding areas and sources of freshwater. These critical habitat areas have permanent and semi-permanent flooding regimes that makes them too wet to be effectively managed by fire. This has resulted in woody encroachment by Chinese tallow, button bush, and other woody species into these swale wetlands. Woody plant encroachment into these areas has degraded Whooping Crane habitat and potentially decreases adult and subadult overwinter survival, in part due to a lessened ability to detect predators.

By removing the woody and invasive species from these swale wetlands, we would be reclaiming historically used whooping crane habitat and making these habitats more desirable for use by other grassland/wetland dependent species such as mottled ducks. Mottled ducks, fulvous and black-bellied whistling ducks rely on these wetland habitats for breeding and brood rearing. Different species of rails, including the yellow and black rails, also use the freshwater at times in the different swale habitats on ANWR.

Habitat management prescriptions may vary from swale to swale depending on level of woody plant and invasive species infestation. Management will consist of a mix of the following actions: initial chemical application (aerial spraying from a rotary-wing aircraft or individual plant treatments), mulching woody plants using heavy equipment, and on-the-ground follow-up treatments conducting spot-spraying by licensed contractors to remove the woody and invasive components. The project goal is to restore swale habitat areas to high quality wetlands that will benefit many grassland- and wetland-dependent species, including mottled ducks, Whooping Cranes and black rails.

### **Project Objectives:**

1. Restore palustrine wetland swale habitats adjacent to estuarine marsh for the benefit of grassland-dependent species with a focus on Whooping Cranes and mottled ducks.
2. Restoration project that directly benefits ANWR's top two biological priorities and two of the five Regional Conservation Priorities (Whooping Cranes and mottled ducks)
3. Contribute to the Gulf Coast Joint Venture duck energy days (DEDs) goal of 16,053,891 DEDs for overwintering waterfowl and mottled ducks at ANWR by restoring natural swale wetlands to their full potential.

## **PROJECT #2226 Texas Mid-Coast Initiative – Wetland Reserve Enhancement Partnership**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$30,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** LCS 1.1, LCS 1.2, HLR 1.1

### **Background:**

The purpose of this project is for CBBEP to work collaboratively with Natural Resources Conservation Service, other conservation partners, and private landowners to develop a Wetland Reserve Enhancement Partnership (WREP) for the Texas mid-coast area encompassing Aransas, Calhoun, Goliad, Jackson, Matagorda, Refugio, San Patricio and Victoria counties. Land protection through wetland conservation easements and subsequent restoration activities will ensure habitat needs are met for critical wildlife species and that these systems will function as intended and improve water quality and quantity over the landscape and eventually into the coastal bays and estuaries.

Project partners will prioritize easement acquisitions that are adjacent to or in the immediate vicinity of existing conservation easements, or otherwise protected lands. Within “Priority Watershed Zones,” partners will identify specific properties of interest that include all desired characteristics, particularly key targeted wetland habitats and connectivity to existing conservation lands. These acquisitions will increase the size and connectivity of protected wetlands, creating larger habitat blocks and migration corridors.

Conservation and restoration of these “Priority Watershed Zones will improve water quality, water quantity and wildlife habitat, including habitat for migratory waterfowl, shorebirds, wetland dependent wildlife, and state and federal listed species, including Whooping Cranes, Piping Plover, Northern Aplomado Falcon, black-spotted newt, Peregrine Falcon, Wood Stork, Brown Pelican, White-tailed Hawk, Sooty Tern, and White-faced Ibis. Restoration will include, but is not limited to, maintaining a buffer around the stream and wetland flows including best management practices for agriculture (sediment flows, erosion control, grazing rates and rotation to encourage early succession plant communities), exotic and invasive species control, brush and vegetative control, establishment and promotion of native plant communities.

As a partner to the WREP, CBBEP will serve as a conduit to speak with landowners interested in conserving habitat on private lands. More specifically CBBEP will administer site visits on subject tracts and provide an initial site report to document habitat types and conditions on tracts within the focus area. CBBEP will coordinate with landowners and project partners to initiate due diligence documents, including but not limited to survey, Phase 1 Environmental Site Assessment, and Appraisals that meet the Uniform Appraisal Standards for Federal Land Acquisition commonly known as “Yellow Book” appraisals. CBBEP will coordinate with the NRCS and other entities throughout the process of acquiring conservation easements on private lands.

### **Project Objectives:**

The objectives of this five-year project are to: (1) conserve priority wetland habitats for migratory birds and other state and federally listed species within targeted areas and (2) through restoration and enhancement efforts, improve habitat conditions for fish and wildlife and improve overall health and freshwater inflows of streams and riparian areas into the coastal bays and estuaries.

## **WATER AND SEDIMENT QUALITY**

Construction of Platform for Continuous Water Quality & Weather Monitoring in Baffin Bay \*

Long-term Seagrass Monitoring in Corpus Christi Bay and Upper Laguna Madre \*

Nutrient Sampling in Petronila Creek \*

Nueces Delta Environmental Monitoring \*

Outreach to WWTP in Baffin Basin Phase II \*

Per- and polyfluoroalkyl substances (PFAS) in the Nueces, Corpus Christi and Oso Bays \*

Assessment of Water Quality in a Model Coastal Bend Canal Community \*

Landowner Engagement to Support Watershed Restoration & Planning Efforts in Baffin Bay \*

Baffin Bay Water Quality Monitoring

Post-freeze Water Quality Monitoring in Baffin Bay

Oso Bay/Oso Creek Watershed Model & Outreach and Education

\* Indicates project proposed by the Water & Sediment Quality Implementation Team

## **PROJECT #2229 Construction of a Platform for Continuous Water Quality & Weather Monitoring in Baffin Bay**

**Performing Organization:** Texas Water Development Board

**Total Project Cost:** \$42,994

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 1.1, WSQ 2.1, FW 1.1, FW 1.2, HLR 2.5

### **Background:**

The purpose of this project is to deploy a continuous, real-time water quality and weather monitoring system in Baffin Bay. At present, water quality data in Baffin Bay is provided by quarterly TCEQ sampling as well as an HRI-led monitoring program that collects samples on a monthly basis. This project will be highly complementary to these efforts, as it will provide high frequency data that will fill in gaps associated with both programs' lower frequency data collections. The higher frequency continuous monitoring data is necessary for capturing and quantifying the effects of infrequent, but high intensity rainfall events that are likely to be important in terms of nutrient and organic matter loadings, as well as overall water quality, in Baffin Bay. This data will also be critical for understanding the conditions that lead to phytoplankton blooms, hypoxia and fish kills in Baffin Bay. Finally, over the longer-term, the high frequency data will support adaptive management efforts associated with watershed restoration activities that are soon to commence in the Baffin Bay watershed.

Approach - The Texas Water Development Board's (TWDB) Coastal Science Department is seeking funding from CBBEP to construct a 4-post monitoring platform in Baffin Bay near the channel marker at N 27.27725 W - 97.62487. The TWDB will assume ownership of the platform and be responsible for all required permits as well as active maintenance of sensors for the life of the proposed platform. For the immediate future, TWDB plans to install two YSI EXO3 water quality sondes, one at the surface and the other near bottom. Both sondes will measure conductivity, water temperature, pH, and dissolved oxygen, while the surface sonde will also have a YSI chlorophyll-a / Phycoerythrin sensor installed. As TWDB is a member of the Texas Coastal Ocean Observation Network (TCOON), the platform will be available for researchers and partners to install additional instrumentation through our data platform. Currently, HRI is seeking funds to install an automated harmful algal bloom sensor. All data collected on this platform will be made available online through <http://waterdatafortexas.org/coastal> and warehoused in perpetuity.

### **Project Objectives:**

Construct a four-post monitoring platform in Baffin Bay for continuous water quality and weather monitoring.

## **PROJECT #2230 Long-Term Seagrass Monitoring in Corpus Christi Bay and Upper Laguna Madre**

**Performing Organization:** University of Texas Marine Science Institute

**Total Project Cost:** \$17,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** HLR 1.1

### **Background:**

The overarching goal of this work is to continue our landscape approach to long-term seagrass monitoring to evaluate status and trends in Texas coastal seagrass populations with particular focus on the Upper Laguna Madre (ULM) and Corpus Christi Bay (CCB). We will adopt the hierarchical strategy for seagrass monitoring outlined by Neckles et al. (2011) to establish the quantitative relationships between physical and biotic parameters that ultimately control seagrass condition, distribution, persistence, and overall health. The approach proposed here follows a broad template adopted by several federal and state agencies across the country, but which is uniquely designed for Texas (Dunton et al., 2011). The program is focused on “Tier-2” (Neckles et al., 2011) monitoring that includes a regional rapid assessment program using fixed stations sampled annually from a shallow-draft vessel and nutrient constituent analysis of leaf tissues.

For FY2022, this research will monitor long-term health of Texas seagrass in the ULM and CCB in combination with leveraged funds from two other agency partners. The last census was conducted in 2018. This long-term program contributes to a broader Tier-2 state-wide effort to assess seagrass condition and distribution that began in summer 2011 (see <http://www.texasseagrass.org/>). The program strongly complements a long-term commitment by both the Mission-Aransas National Estuarine Research Reserve (Mission-Aransas NERR) for sampling in Redfish and Aransas Bays and the National Park Service for Tier-2 sampling in the ULM (Padre Island National Seashore only). The data collected since 2011 is posted on the dedicated web serves as an invaluable database of existing seagrass resources available for various local, state, and national groups. This project contributes to our understanding of the quantitative relationships between physical and biotic parameters that ultimately control seagrass condition, distribution, and persistence.

### **Project Objectives:**

Monitor seagrass/water quality in Corpus Christi Bay and the Upper Laguna Madre to support the Texas Seagrass Monitoring Program and possible creation of water quality criteria for seagrass beds.

## **PROJECT #2233 Nutrient Sampling in Petronila Creek**

**Performing Organization:** Nueces River Authority

**Total Project Cost:** \$52,119

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 2.1

### **Background:**

Petronila Creek is a tributary to Baffin Bay. The health of Baffin Bay has been of great concern to scientists and concerned citizens due to fish kills, water quality problems, and food web changes in the bay. The Baffin Bay Stakeholder Group, formed in 2012, is composed of scientists from Harte Research Institute (HRI) at Texas A&M University-Corpus Christi, Coastal Bend Bays and Estuaries Program (CBBEP), USDA-NRCS, Texas State Soil & Water Conservation Board, Texas Water Resources Institute, Texas Commission on Environmental Quality (TCEQ), Texas Sea Grant, Texas General Land Office, Nueces River Authority (NRA), and a host of concerned citizens, including commercial and recreational fishermen, ranchers, and business owners. The scientists at HRI have determined that the primary causes of the water quality concerns are due to excessive nutrients in the bay. The 2019 Texas Coastal Waters: Nutrient Reduction Strategies Report recommended the Petronila watershed as a priority for the implementation of nutrient reduction strategies. The Stakeholder Group has begun an effort to develop a watershed protection plan (WPP) for Baffin Bay.

The purpose of the project is to continue conducting monthly water quality monitoring for nutrients in Petronila Creek and its tributaries. NRA currently collects chloride, sulfate, and total dissolved solids (TDS) samples monthly at one main stem site and 10 tributary sites. Two additional main stem sites, Stations 13094 and 13096, are monitored quarterly for NRA's Clean Rivers Program (CRP), so monthly data is collected in the non-CRP sampling months. NRA will add the nutrient samples (nitrate, nitrite, total Kjeldahl nitrogen, total dissolved Kjeldahl nitrogen, ammonia, total phosphorus, chlorophyll-a, and pheophytin) to this monitoring. The nutrient data will be used to help fill the data gaps with respect to identifying all possible sources of the nutrient loading to Baffin Bay. This data collection project will also address two of the nine elements of a WPP: 1) Identify causes and sources of pollution, and 2) Estimate pollution loading into the watershed and expected load reductions.

### **Project Objectives:**

The objective of this project is to conduct monthly water quality monitoring of nutrients in Petronila Creek and its tributaries to identify sources of excess nutrient concentrations in Baffin Bay. The nutrient data from Petronila Creek and its tributaries will be utilized by the Baffin Bay Working Group to help guide them in their watershed planning and restoration.

## **PROJECT #2211 Nueces Delta Environmental Monitoring**

**Performing Organization:** Conrad Blucher Institute at Texas A&M University – Corpus Christi

**Total Project Cost:** \$30,485

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** FW 1.1, FW 1.2, FW 1.3, FW 1.4

### **Background:**

Normally, a river flows through a delta area prior to making its confluence with its receiving water body. The Nueces River is different in that it flows into Nueces Bay at a point along the south shore of the bay, 2 ½ to 3 miles from the delta-bay interface, completely bypassing the delta. Only during times of severe flooding, causing over-banking of the river, or locally heavy rain, does much freshwater make it into the delta proper. To provide more freshwater diversions during normal flow conditions, the City of Corpus Christi built the Rincon Bayou Pipeline and pump station to divert up to the first 3,000 acre-feet of passthroughs per month from above the saltwater barrier dam directly into the upper Rincon Bayou.

The purpose of this project is to continue maintaining monitoring equipment in and around the Nueces Delta to observe freshwater inflows downstream of Rincon Bayou diversion pipeline so that spatial and temporal environmental effects can be calculated as well as the amount of freshwater needed to manage a healthier estuary. This project will be conducted by the Conrad Blucher Institute (CBI) at Texas A&M University – Corpus Christi. CBI will monitor and maintain one (1) a real-time meteorological station, one (1) tide gauge station with meteorological sensors, and one (1) permanent real-time salinity station within the Nueces River Delta.

### **Project Objectives:**

Maintain real-time water quality, tide gauge, and meteorological monitoring stations in the Nueces Delta and Bay to measure effects of Rincon Pipeline freshwater inflows.



## **PROJECT #2235 Outreach to Wastewater Treatment Plants in Baffin Basin – Phase II**

**Performing Organization:** Nueces River Authority

**Total Project Cost:** \$35,652

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 1.1, NPS 1.1, NPS 1.3

### **Background:**

In FY2021, the Nueces River Authority (NRA) conducted outreach and offered assistance to approximately 13 domestic wastewater treatment plants that discharge into the tributaries of Baffin Bay to help identify and address possible equipment, personnel, and capacity needs. Many of these plants receive very limited funding, are located in rural communities and districts, and were constructed in the late 1970's and early 1980's. As a result of this effort, areas were identified where further assistance in operations, new or additional equipment are needed to produce better effluent, and in many cases achieve compliance with discharge permits. NRA found the entities to be very accommodating and welcomed the non-regulatory assistance.

After having met with most of the active wastewater treatment plant operators and identified needs at each facility, it is clear that further assistance is needed to address facility and operational deficiencies. In Phase II of the Wastewater Treatment Outreach program, the NRA proposes to assist five entities in applying for funding via grants and loans to address the infrastructure issues in the wastewater collection and treatment systems. The Nueces River Authority proposes to provide leadership and assistance in identifying funding sources and completing funding applications for these purveyors. NRA will develop the detailed scopes of work necessary to address the issues, develop cost estimates, and complete the funding application for the participating wastewater operations.

### **Project Objectives:**

The purpose of this project is to identify five willing entities that participated in Phase I of this outreach program, prioritized based on need, and provide leadership and assistance in identifying and applying for funding via grants and loans to address infrastructure issues in the wastewater collection and treatment systems.

## **PROJECT #2206 Per- and Polyfluoroalkyl Substances (PFAS) in the Nueces, Corpus Christi, and Oso Bays**

**Performing Organization:** Texas A&M University – Corpus Christi

**Total Project Cost:** \$36,300

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 2.1, WSQ 2.2, PH 1.1, HLR 2.4

### **Background:**

The purpose of this project is to provide the public with an understanding of current levels of per- and polyfluoroalkyl substances (PFAS) in Nueces, Corpus Christi, and Oso Bays and affiliated groundwater. PFAS were historically and are currently used in a number of commercial (e.g., firefighting foams, plastic manufacturing) and household (e.g., cookware, food packaging) products leading to a ubiquitous accumulation of these compounds in nature. Due to their known links to reproductive, developmental, and immunological effects in humans, these compounds have received increased national attention. Despite this, little data is available about the current status of PFAS concentrations in the estuaries and groundwater of the Texas Coastal Bend. Due to direct ingestion by humans, drinking PFAS contaminated water has been the primary focus of the EPA and state governments, thus they often ignore coastal water contamination that leads to accumulation in marine food webs. In turn, seafood consumption is a primary pathway of PFAS exposure for adults.

Due to historical and current PFAS production and household/commercial uses, present loading and legacy effects could be leading to accumulation in the Coastal Bend's water resources. For instance, the Corpus Christi Naval Air Station located on Oso and Corpus Christi Bays is known to have used PFAS firefighting products and groundwater testing at this station revealed PFOS+PFOA (perfluorooctane sulfonate + perfluorooctanoic acid) concentrations of 510 ppt. For reference, this is ~7 times the EPA health advisory guidelines of 70 ppt. This type of environmental concentration data is scarce, so the regional health risk is unclear. With continued focus on industrial growth in the Coastal Bend (i.e., facility located on Corpus Christi Bay is the world's largest producer of the PFAS refrigerant, HFO-1234yf), local PFAS production and use will increase making it essential to understand the current state of PFAS contamination and locate potential hotspots of PFAS accumulation.

Monthly sampling of surface water and groundwater from Nueces Bay, Corpus Christi Bay, and Oso Bay is proposed in order to provide the public with an understanding of current levels of PFAS. Short and long chain PFAS will be measured using recently developed liquid chromatography mass spec/mass spec. A targeted approach will be used to quantify well known legacy PFAS (e.g., PFOS, PFOA, HFPO-DA, PFDA) and an untargeted approach will be used to qualify other potential PFAS present.

### **Project Objectives:**

The proposed project will provide a current assessment of the potential human and ecosystem risk of PFAS exposure in a highly-populated portion of the Coastal Bend.

## **PROJECT #2236 Assessment of Water Quality in a Model Coastal Bend Canal Community**

**Performing Organization:** Texas A&M University – Corpus Christi

**Total Project Cost:** \$49,508

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** PH 1.1, PH 2.1, WSQ 1.1, WSQ 2.1, NPS 1.1

### **Background:**

The purpose of the project is to assess the sources and physiochemical drivers of bacterial pollution in a model canal community: City by The Sea. This community and similar canal communities across the Coastal Bend are acutely vulnerable to bacterial pollution owing to decreased flushing. The City by The Sea has conducted bacterial testing for the past 25 years (\$16,290 past contribution) and they have observed a recent and alarming increase in bacteria levels. The proposed project will investigate and seek to determine the general types of bacteria and infer potential causes of this increase, and it is anticipated to advance understanding of canal water quality throughout the Coastal Bend.

The proposed bacterial source-tracking study will be conducted in accordance with previously published methods used by The Laboratory for Microbial and Environmental Genomics (<http://turnerlab.tamucc.edu/>). Water samples will be collected in duplicate monthly for a period of 1-year at 9 sampling stations (N = 216 samples). Samples will be tested for enterococci using the EPA-approved Enterolert test, and sampling stations will include the canals and Estes Flat. Water samples will be analyzed by qPCR for the abundance of host-specific molecular markers representing humans, canines, and gulls. Water temperature, salinity, dissolved oxygen, pH, nitrogen nutrients (i.e., nitrite, nitrate, ammonium and dissolved organic nitrogen), wind speed, tide, turbidity, antecedent rainfall, and seagrass presence/absence will be recorded to help identify physiochemical parameters that are potential bacterial pollution drivers. Data will be shared with City by the Sea, Coastal Bend Bays and Estuaries Program (CBBEP), and the General Land Office (GLO) to inform remediation strategies and management policies. We will also coordinate with the GLO Coastal Management Program and Clean Coast Texas to explore the expansion of water quality testing to other Coastal Bend canal communities.

### **Project Objectives:**

The project will be completed by accomplishing the following objectives:

1. Assess the spatial-temporal variation of bacterial pollution.
2. Quantify potential sources of bacterial pollution.
3. Identify physiochemical parameters that are potential bacterial pollution drivers.
4. Inform remediation strategies and management policies.

## **PROJECT #2232 Landowner Engagement to Support Watershed Restoration & Planning Efforts in Baffin Bay**

**Performing Organization:** Nueces River Authority

**Total Project Cost:** \$38,499

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 1.1, NPS 1.1

### **Background:**

The Baffin Bay watershed is 2,177,965 acres and contains three tributaries: Petronila, San Fernando, & Los Olmos creeks. There currently are impairments on two tributaries (Petronila Creek, San Fernando Creek), and ongoing water quality degradation has been documented in Baffin Bay (e.g., prolonged brown tide events). The watershed is primarily rural and privately owned.

In November 2019, the Texas Trustee Implementation Group identified the Baffin Bay watershed, and specifically the Petronila and San Fernando watersheds, as the watersheds where implementation of best management practices and restoration efforts have the most potential to reduce nonpoint source pollution from cropland, pastureland, and privately-held off-field areas. In FY2019, an evaluation of the health of the riparian areas along these tributaries was conducted to ultimately help determine priority areas for restoration and conservation easements. Because the lands adjacent to these tributaries are predominantly privately owned, a dedicated effort to engage landowners and identify those willing to participate in restoration and conservation initiatives is needed.

This project seeks to identify and communicate with riparian landowners along Baffin Bay tributaries to further generated stakeholder involvement in the watershed planning process and to identify landowners interested in and willing to participate in future riparian enhancement opportunities. The 2019 evaluation conducted by the Nueces River Authority (NRA) identified tributary streams in the Baffin Bay basin where riparian function could be enhanced. This project will identify and communicate with about approximately 150 landowners and/or operators, offer a riparian training to highlight how riparian areas can be enhanced to benefit water quality. The NRA has outreach materials developed to assist with this project, namely the Remarkable Riparian field guide and owner's manual, which will be used to help cultivate stakeholder interest in the watershed protection planning project.

### **Project Objectives:**

The objective of this project is to identify approximately 150 individual and fiduciary landowners and agricultural operators of riparian lands along Petronila, San Fernando, & Los Olmos creeks and their drainages. The NRA will engage them via in-person meetings, digitally, and by mailers to cultivate stakeholder interest and provide information about the economic and environmental benefits of healthy riparian lands, encourage engagement in the watershed planning process, and promote participation in future restoration efforts.

## **PROJECT #2205 Baffin Bay Water Quality Monitoring**

**Performing Organization:** Texas A&M University – Corpus Christi

**Total Project Cost:** \$50,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 2.1, WSQ 2.2

### **Background:**

The purpose of this project is to help continue a water quality monitoring program in Baffin Bay that will gather water samples and identify potential sources of water quality degradation in the system. Baffin Bay is undergoing significant eutrophication, as exemplified by a long-term increase in nitrogen and phosphorus loads and chlorophyll-a concentrations that have exceeded state criteria for nearly the past decade (Montagna and Palmer, 2012). Additional symptoms include blooms of potential HAB species (*A. lagunensis*, *Pyrodinium bahamense*), episodic hypoxia, and fish kills.

In response to concerns over water quality changes in Baffin Bay, Texas A&M University-Corpus Christi (TAMUCC) initiated a spatially-temporally intensive water quality monitoring program to: (1) generate data for construction of nutrient budgets and to identify potential sources of nutrient/organic matter loadings that are contributing to water quality degradation in the system, and (2) characterize the ecosystem response to loading events, including from episodic storm events.

As part of the ongoing water quality monitoring program, as well as a TAMUCC Ph.D. student project, samples will be collected at six sites from Baffin Bay on a monthly basis, as well as at higher frequencies in response to episodic storm events or fish kills. Two of the sites overlap with TCEQ quarterly monitoring stations, allowing for comparison with longer-term trends within Baffin Bay. At each site, vertical profiles will be performed, and discrete surface samples collected. Additionally, a YSI Ecomapper Autonomous Underwater Vehicle (AUV), equipped with water quality sensors (temperature, salinity, D.O., pH, chlorophyll fluorescence) may be deployed to identify water quality “hot spots” and to characterize environmental conditions pre- and post-storm.

### **Project Objectives:**

The objective of this project is to support a water quality monitoring program through TAMUCC and collect monthly data, and rain event data, to identify nutrient concentrations and loading throughout the bay system.

## **PROJECT #2210 Post-Freeze Water Quality Monitoring in Baffin Bay**

**Performing Organization:** Harte Research Institute at Texas A&M University – Corpus Christi

**Total Project Cost:** \$23,265

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 2.1, WSQ 2.2

### **Background:**

In February 2021, the state of Texas experienced a prolonged freeze event. Texas Parks and Wildlife Department (TPWD) estimates a minimum of 3.8 million fish were killed throughout the Texas coast as a result. The last freeze of similar magnitude, also resulting in an extensive fish kill, occurred in 1989 and was followed by a prolonged, multi-year brown tide event in Baffin Bay, possibly caused by excess nutrient inputs from decomposing organisms killed by the freeze, among other factors.

To monitor the impacts of the February 2021 freeze on water quality and to better understand the response and recovery of the Baffin Bay estuary to such an event, this project will collect and analyze water quality samples for the period of May – August 2021. Parameters to be analyzed include salinity, water temperature, dissolved oxygen, pH, inorganic nutrients (nitrate, nitrite, ammonium, phosphate, silicate), organic matter (TOC/TN, DOC/TDN) and chlorophyll-a. Samples will be collected at six sites in Baffin Bay where eight years of historical data is available.

### **Project Objectives:**

The objective of this project is to collect water samples from six sites in Baffin Bay monthly from May 2021 – August 2021 in an effort to better understand the response and recovery of the Baffin Bay estuary to the February 2021 freeze event.

## **PROJECT #2110 Oso Bay/Oso Creek Watershed Model and Outreach and Education**

**Performing Organization:** Nueces River Authority, Center for Coastal Studies at Texas A&M University – Corpus Christi

**Total Project Cost:** \$42,053

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** WSQ 1.1, PEO 1.1, PEO 1.2, PEO 1.3, PEO 1.4

### **Background:**

The Oso Bay/Oso Creek watershed drains an area of approximately 255 square miles and is located in the northern-most portion of the Nueces-Rio Grande Coastal Basin. Oso Bay is an enclosed, shallow body of water situated along the southern shore of Corpus Christi Bay, with a surface area of approximately seven square miles. Oso Bay receives much of the storm water runoff from the City of Corpus Christi as well as the cooling water from the Barney Davis Power Plant. The housing developments around the bay range from large, multi-acre tracts, to neighborhoods with many houses per acre, to apartment complexes.

Stakeholders identified a number of human activities as potential contributors to water quality problems in the Oso Bay/Oso Creek watershed. A lack of natural resource awareness, a depreciated value for clean streams coupled with a deficit in the understanding of human activities that contribute to nonpoint pollution underlie the existing water quality impairments. Refrigerators, tires, dead animals, and household garbage dumped at public road crossings testify to this awareness problem. The proposed public education and outreach project results from recommendations made by stakeholders during the I-Plan development process and is included as a measure within the Implementation Plan.

The goal of this four-year project is to create an education and outreach program that cultivates personal responsibility for water quality and polluting behaviors in the Oso Bay/Oso Creek Watershed. This program will connect urban and rural communities of the Oso Bay/Oso Creek Watershed by educating the public about urban waters, the effects of polluting behavior, and the impacts land use transitions have on water quality. Community awareness of the existing water quality bacteria issues in Oso Creek and Oso Bay will promote community engagement to protect and improve water quality that will in turn improve public health and revitalize watershed communities. The education and outreach will connect communities with their watershed by using a plastic, custom relief model of the Oso Bay/Oso Creek Watershed. The model will promote personal responsibility in revitalizing and restoring Oso Bay and Oso Creek by helping stakeholders visualize their “place” within the watershed and better understand pollutant pathways and the role they can play in reducing pollutant loads. These models have been used in other watersheds and have proven to be a powerful tool for educating communities about the ways runoff pollutants affect public health and the environment. The plastic watershed model will be used at every elementary school located within the Oso Bay/Oso Creek Watershed to reinforce 5th grade Texas Essential Knowledge and Skills and cultivate their understanding of the watershed in which they live. Bilingual outreach materials (e.g., PSA, news stories, posters, fact sheets, etc.) will also be developed to support the education and outreach efforts described above and provide the public with information regarding trash and flooding, septic issues, and keeping our creek and drainage areas clean.

### **Project Objectives:**

This four-year project will implement measures outlined in the draft Oso Bay/Oso Creek TMDL Implementation Plan. Funds will be used to construct a custom, plastic relief model of the Oso Bay/Oso Creek watershed and use that model for education and outreach efforts in local schools and underserved communities located within the watershed. Bilingual outreach materials will also be developed to support education activities taking place in the watershed.

## **PUBLIC EDUCATION AND OUTREACH**

A Comprehensive Stakeholder-Led Ecosystem Health Assessment for the Texas Coast to Prioritize  
Restoration Efforts

CBBEP Community Outreach Partnerships  
CBBEP Public Outreach Events and Activities



## **PROJECT #2207 A Comprehensive Stakeholder-Led Ecosystem Health Assessment for the Texas Coast to Prioritize Restoration Efforts**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$40,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** PEO 1.1, HLR 1.1, WSQ 1.1

### **Background:**

The Harte Research Institute has developed a framework for assessing coastal ecosystem health utilizing a stakeholder engagement process coupled with rigorous analysis of long-term datasets to identify and quantify trends in key indicators of ecosystem health. One important output from this process is the Texas Coast Ecosystem Health Report Card, which takes findings and makes them widely accessible to stakeholders, including policymakers and the public.

Since publication of the first Texas Coast Report Card in 2019, the Harte Research Institute has received requests to include additional ecosystem health indicators and to develop economic health indicators in future assessments. There is also a desire by regional stakeholders to develop a series of complementary bay-specific Report Cards. As a result of these requests, the Harte Research Institute is proposing work with stakeholders to produce an updated and expanded Texas Coast Report Card and to develop bay-specific Report Cards.

The Coastal Bend Bays & Estuaries Program is committed to working with HRI on this project, as it provides a much-needed ecosystem and economic health assessment for the Texas coast, and thus will serve as an important prioritization tool for restoration projects. We are particularly interested in the training opportunities it will provide that would allow for “scaling down” of ecosystem health assessments to the local bay level. By facilitating development of bay-specific Report Cards, this project will support local management plans in addition to providing a framework to prioritize proposed restoration and conservation projects.

### **Project Objectives:**

The Coastal Bend Bays & Estuaries Program will be responsible for the following:

1. Attend two stakeholder engagement/training workshops that are designed to identify relevant datasets for the various ecological/economic indicators, review the overall process for Report Card development, produce assessments and syntheses of indicators at the bay-specific and coastwide levels, and develop the Report Cards.
2. Ensure that Coastal Bend stakeholder priority issues and concerns are addressed in the bay specific Report Cards.
3. Support efforts by the Harte Research Institute research team to gather regionally relevant data sources and conduct trend analysis.
4. Oversee the printing of Coastal Bend bay-specific Report Cards.

## **PROJECT #2208    CBBEP Community Outreach Partnerships**

**Performing Organization:** Coastal Bend Bays Foundation

**Total Project Cost:** \$30,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** PEO 1.1, PEO 1.2, PEO 1.4, PEO 1.5

### **Background:**

As stated in the Coastal Bend Bays Plan, 2<sup>nd</sup> Ed., CBBEP is constantly working to promote public and private partnerships to help achieve its educational goals. The CBBEP partnership with the Coastal Bend Bays Foundation (CBBF) addresses our educational goals set forth in the Bays Plan, 2<sup>nd</sup> Ed. One of the benefits of the partnership between the CBBEP and CBBF is addressing the need for continued dialogue between competing user groups and the need for an engaging public forum to allow for individual input in the public policy debate. The Bays Plan, 2<sup>nd</sup> Ed. calls for continued involvement from CBBF, as the region prepares itself for ever-increasing number of people wanting to make use of the bays and estuaries. Minimizing conflict through informed discussion will help achieve the overall objective of ensuring the public's safety, health and enjoyment of our bays and estuaries. This project will result in increase in the community's awareness of local environmental issues through Earth Day, forums and an awards banquet. An estimated 12,000 people are expected to attend these events.

### **Project Objectives:**

1. Organize, coordinate, and host turnkey operation of Earth Day festival.
2. Organize, coordinate, and host CBBF Conservation and Environmental Stewardship Annual Awards Banquet.
3. Host Coastal Issues Forums to increase communications between resource managers, users, and the general public.
4. Organize and coordinate bay-resource/related workshops with CBBEP's approval.
5. Continue to seek matching and/or leveraging funds.

## **PROJECT #2214    CBBEP Public Outreach Events and Activities**

**Performing Organization:** CBBEP

**Total Project Cost:** \$41,000

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** PEO 1.1, PEO 1.2, PEO 1.3, PEO 1.4, PEO 1.5, TR 1.1

### **Background:**

One of the most important goals of the Coastal Bend Bays Plan is to educate citizens about the ecology of the bay system, its many environmental and economic values, and how an individual can make a positive difference to ensure its long-term health. To accomplish this, the Public Education and Outreach Action Plan is designed to raise the public's environmental awareness, foster community stewardship of bay resources; and increase individual involvement in bay resource management issues. Helping residents and visitors understand the complex issues concerning bay resource management is a priority. CBBEP utilizes a public opinion survey to gauge the effectiveness of our education and outreach efforts. In addition to understanding how the bay system functions, it is important that citizens develop a sound appreciation for the significant value and economic impact derived from the renewable resources of the bays. CBBEP is constantly working to promote public/private partnerships as stated in the Coastal Bend Bays Plan to help achieve its educational goals.

### **Project Objectives:**

CBBEP will raise awareness of environmental issues by connecting with the Coastal Bend public through our websites and at community events and festivals. We will spread the CBBEP brand through promotional and educational materials, such as posters, reusable bags and other items. We expect to reach thousands of people at various community events.

In addition, CBBEP may participate in:

1. Community events and festivals
2. CBBEP may produce or purchase educational and promotional materials
3. CBBEP will maintain a web site(s)
4. CBBEP develop and provide electronic updates
5. Other outreach opportunities

## **DELTA DISCOVERY**

Delta Discovery

## **PROJECT #2202 Delta Discovery**

**Performing Organization:** Coastal Bend Bays & Estuaries Program

**Total Project Cost:** \$151,054

**Bays Plan, 2<sup>nd</sup> Ed. Actions:** DD 1.1, DD 1.2, DD 1.3, DD 2.1

### **Background:**

Delta Discovery's mission is to connect Coastal Bend communities with opportunities and resources that plant the seeds of conservation for protecting our bays & estuaries. The educational program cost consists of the following: (1) field trips for students, (2) teacher workshops, and (3) community programs, such as Delta Discovery Days, Nature Story Times, and Home School Days.

**Field trips:** Many of the students that are being exposed to scientific concepts for the first time have never spent much time outdoors. CBBEP Environmental Educators provide field trip opportunities for teachers and students to visit the Nueces Delta Preserve. The cross-curricular trip may be organized by the teacher, with assistance from the Environmental Educator, to create an educational TEKS-aligned agenda for outdoor education. This program sees thousands of students per school-year. The goal is to plant seeds of appreciation and passion for a new generation of naturalists, biologists, and nature lovers to protect and preserve the Coastal Bend through educating school children about preserving our environment and protecting our animal and plant life.

**Teacher Workshops:** CBBEP Environmental Educators will facilitate a minimum of four workshops throughout the school year. These free workshops will address local environmental science topics and will align to the TEKS objectives, and participating teachers will receive SBEC credits. The workshops focus on equipping teachers with the skills, curriculum, support and materials to strengthen science teaching as it relates to the environment resources of the Coastal Bend. Hands-on learning in the field will be correlated to classroom instruction. The funding provides all fees for partnering, curriculum, and substitute teachers in order for these workshops to occur on weekdays.

**Delta Discovery Days:** The CBBEP will host a minimum of five Delta Discovery Days. These hands-on "family picnic days" provide multi-generational audiences time and guidance to discover, connect, and learn about the estuary in their back yard. Families bring a sack lunch and the CBBEP Education Staff facilitate interactive learning activities that model nature-play strategies throughout half-day program. Delta Discovery Days serve two purposes: (1) encourage students attending Nueces Delta Preserve field trips to return with their families to demonstrate what they have learned and (2) welcome new audiences -- families and members of the community -- to the Nueces Delta Preserve for a day of nature-based learning.

**Nature Story Time:** CBBEP will host a minimum of ten Nature Story Times. These early learner programs introduce children, ages 2-5, to nature and the joys of reading through stories, crafts, and outdoor play. Children and their "grown-ups" will build a sense of place and connection as they explore the estuary and its inhabitants

**Home School Days:** The CBBEP will host a minimum of three Home School Days to meet the needs and interest of home school families seeking field experiences. Home School Day programming will provide home school families and their students an opportunity to connect their classroom science/environmental curriculum to the natural world of the Coastal Bend using both place-based and discovery education. CBBEP Education Staff and partners will facilitate a series of hands-on activities that support select program themes and the engagement of mixed age student audiences.

**Nueces Delta Preserve Upkeep:** Upkeep of the Nueces Delta Preserve consists of electricity, trash and water costs, phone and internet costs, temporary assistance for field trip days and staff mileage.

### **Project Objectives:**

The objective of this project is to provide educational field trip opportunities for K-12 students and also to aid teachers in increasing their knowledge, skills, and resources available to effectively teach science to students in local schools.