



Coastal Erosion Planning & Response Act

A REPORT TO THE 86TH LEGISLATURE



Texas General Land Office
George P. Bush, Commissioner

Cover Imagery, clockwise from top:

Breakwaters at Virginia Point; lifeguard stand on Galveston Island beach; newly constructed dune ridge along County Road 257, Brazoria County; newly forming foredunes at McFaddin Beach; Marsh Mania Event 2017 at Dickinson Bayou (Imagery courtesy of Galveston Bay Foundation); freshly planted marsh mounds at Galveston Island State Park.



George P. Bush, Commissioner, Texas General Land Office

A MESSAGE FROM THE COMMISSIONER

Honorable Members of the 86th Texas Legislature, I am pleased to submit the FY18-19 Biennial Report on the Coastal Erosion Planning and Response Act (CEPRA) Program. This report covers current CEPRA Cycle 10 projects and projects that have been completed since the preceding legislative session. The projects showcased in this report underscore the important work the CEPRA Program does in maintaining Texas' barrier island and bay systems. These features are critical components for ensuring a strong and resilient Texas coastal ecosystem and economy. Whether it is a natural hazard or economic fluctuation that alters how a coastal system operates, CEPRA projects help local communities and industry be more resilient to and recover from continuous coastal change. These projects act as the first line of defense from hurricanes, tropical storms, and high tides, while enhancing recreational, fishing, and hunting opportunities. CEPRA projects also ensure protection of billions of dollars in coastal infrastructure and the energy, chemical, and tourism industries.

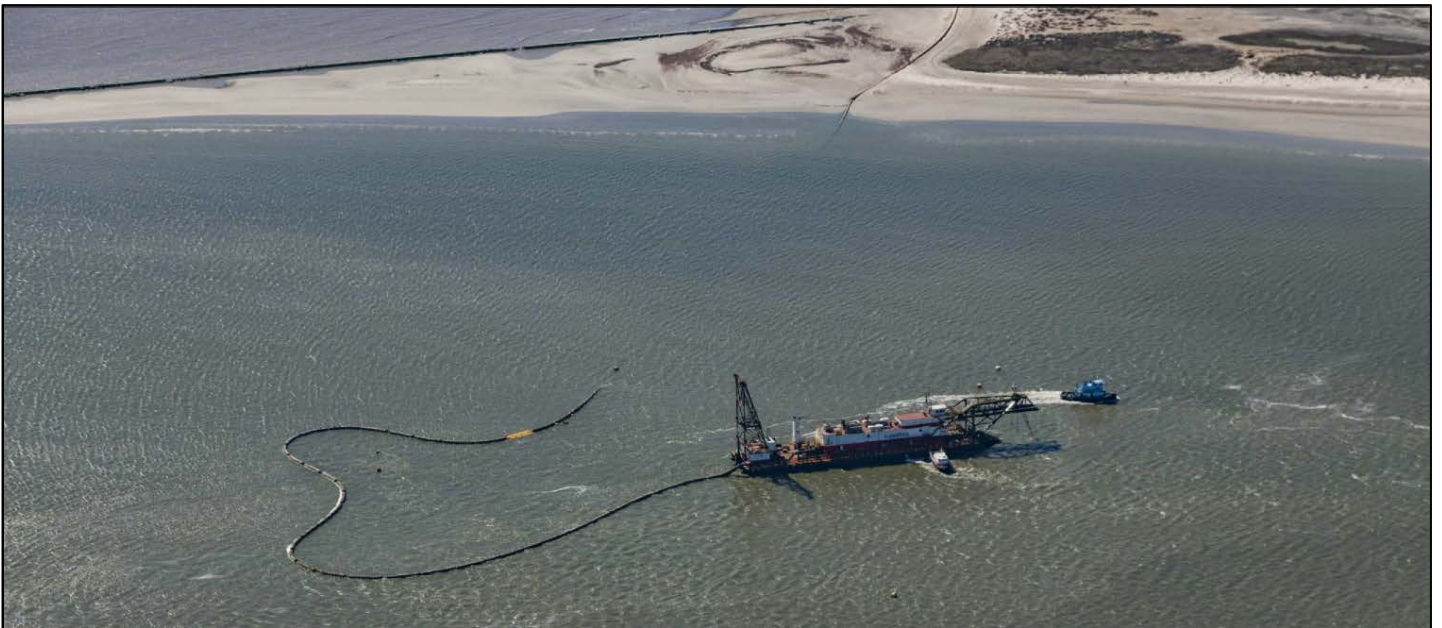
The 85th Legislature appropriated \$14,271,940 million to the Texas General Land Office (GLO) to administer the CEPRA Program for Cycle 10 projects. CEPRA funds were leveraged against \$133 million in matching funds from federal and local sources. To further CEPRA's positive impacts, additional funds are critically

needed and the CEPRA Program is establishing new opportunities to coordinate and leverage funding sources to implement larger, more impacting projects. The GLO's Coastal Resources (CR) Division recently released the Texas Coastal Resiliency Master Plan (Master Plan). The GLO is amending the CEPRA rules to allow Gulf of Mexico Energy Security Act (GOMESA) funds to be used in coordination with CEPRA funds to construct Tier 1 projects outlined in the Master Plan. CEPRA is also teaming up with CR' Resource Management team to leverage a historic amount of civil and criminal penalty funds from the Deepwater Horizon spill with Natural Resource Damage Assessment (NRDA), National Fish and Wildlife Foundation (NFWF), and Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE) funding sources.

However, these funds will not always be available and are not enough to sufficiently protect the Texas coast. Despite these efforts and new funding opportunities, Texas continues to lack millions of dollars needed to meet project needs of our coastal communities. It is imperative to establish a permanent source for CEPRA Program funding. The 86th legislature has the opportunity to enact the Hotel Occupancy Tax Bill which would allow 2% of coastal counties state occupancy tax revenue to be contributed directly to the CEPRA Program account. It is critical that we take this opportunity to secure these funds to sustain the increasingly important positive impacts the CEPRA Program has on Texas' coast as CEPRA remains a true steward of Texas' precious coastal resources.

I am constantly amazed at what was accomplished this last biennium, and I feel certain you will be, too. I look forward to our continued partnership in protecting the security and economy of the Texas coast. The CEPRA Legislative report may be downloaded at <http://www.glo.texas.gov/coast/coastal-management/forms/files/cepra-report-2019.pdf>.

For additional information or to request hard copies of this report, please contact Kevin Frenzel at 512-463-2482.



Weeks Marine Dredge Vessel at Galveston Seawall

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Marsh Mania 2017 at Dickinson Bayou; photo courtesy of Galveston Bay Foundation

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LIST OF ACRONYMS

BEG

The University of Texas Bureau of Economic Geology

BMMP

Beach Monitoring and Maintenance Plan

BUDM

Beneficial Use of Dredged Materials

CBBEP

Coastal Bend Bays and Estuaries Program

CEPRA

Coastal Erosion and Planning Response Act

CCAC

Coastal Coordination and Advisory Committee

CMP

Coastal Management Program

ERP

Erosion Response Plan

FEMA

Federal Emergency Management Agency

GBF

Galveston Bay Foundation

GPB

Galveston Park Board

GOMESA

Gulf of Mexico Energy Security Act

GIWW

Gulf Intracoastal Waterway

GLO

General Land Office

NFWF

National Fish and Wildlife Foundation

NRDA

Natural Resources Damage Assessment

NWR

National Wildlife Refuge

OBA

Texas Open Beaches Act

PCCA

Port of Corpus Christi Authority

RESTORE

Resources and Ecosystems Sustainability, Tourism Opportunities, and Revived Economies of the Gulf States Act of 2012

SPI

South Padre Island

TPWD

Texas Parks and Wildlife Department

TNC

The Nature Conservancy

USACE

United States Army Corps of Engineers

USFWS

United States Fish and Wildlife Service



Galveston Seawall Beach Nourishment; active construction photo

INTRODUCTION

Texas has 367 miles of gulf-facing shoreline and approximately 3,300 miles of bay shoreline. The Texas coast has some of the highest coastal erosion rates in the country with some locations losing more than 55 feet per year. On average, the Texas coast is eroding at four feet per year.

Coastal erosion results in the loss of property, which negatively affects property values and reduces tourism opportunities in local communities. Coastal erosion also results in the loss of beaches, dunes, and wetlands. These environments play critical roles in the reduction of impacts to coastal communities from tropical storms and hurricanes. Other coastal resources impacted by coastal erosion include the Gulf Intracoastal Waterway (GIWW), ports and ship channels, petrochemical facilities, road infrastructure, and other types of commercial businesses.

Miles of Eroding Shoreline on the Texas Coast*

Region	Total Coastal Miles	Total Eroding Miles	Percent Eroding Shoreline
1-Sabine Pass to Bolivar Roads (Galveston County)	59.0	47.6	80.6%
2-Bolivar Roads to San Luis Pass	29.0	13.9	48.1%
3-San Luis Pass to Old Colorado River	63.1	45.6	72.3%
4-Old Colorado River to Aransas Pass	83.7	45.3	54.1%
5-Aransas Pass to Padre Island National Seashore	27.3	11.3	41.4%
6-Padre Island National Seashore to Mansfield Cut	64.1	29.2	45.5%
7-Mansfield Cut to Rio Grande River/U.S. Border	40.8	32.1	78.6%
Total	367.0	224.9	61.3%

** As determined from average gulf shoreline erosion rates greater than 2ft/yr measured over the past 70 years by the University of Texas Bureau of Economic Geology.*

Table 1. Eroding Areas Along the Texas Coast

The 367 miles of the Texas gulf-facing shoreline is predominantly composed of low-elevation sandy beaches that are part of numerous long, narrow barrier island complexes, barrier peninsulas, and delta headlands. Behind these gulf-facing shores, an additional 3,300 miles of shorelines surround the many bays and estuaries that formed near the mouths of river systems. Most of these gulf and bay shorelines are retreating due to coastal erosion.

AREAS OF CRITICAL EROSION

Texas Natural Resources Code §33.601 defines coastal erosion as:

"The loss of land, marshes, wetlands, beaches, or other coastal features within the coastal zone because of the actions of wind, waves, tides, storm surges, subsidence, or other forces."

The General Land Office (GLO) Rules for Management of the Beach/Dune System (31 TAC §15.2 [32]) define an eroding area as a portion of the shoreline that is experiencing a historical erosion rate of greater than two feet per year based on data published by the University of Texas Bureau of Economic Geology (BEG). Section 33.601(4) of the Natural Resources Code defines a coastal erosion area as:

"A coastal area that is experiencing an historical erosion rate, according to the most recently published data of the BEG."

The Commissioner finds coastal erosion to be a threat to:

- *Public health, safety or welfare;*
- *Public beach use or access;*
- *General recreation;*
- *Traffic safety;*
- *Public property or infrastructure;*
- *Private, commercial, and residential property;*
- *Fish or wildlife habitat; and*
- *Any area of regional or national importance."*

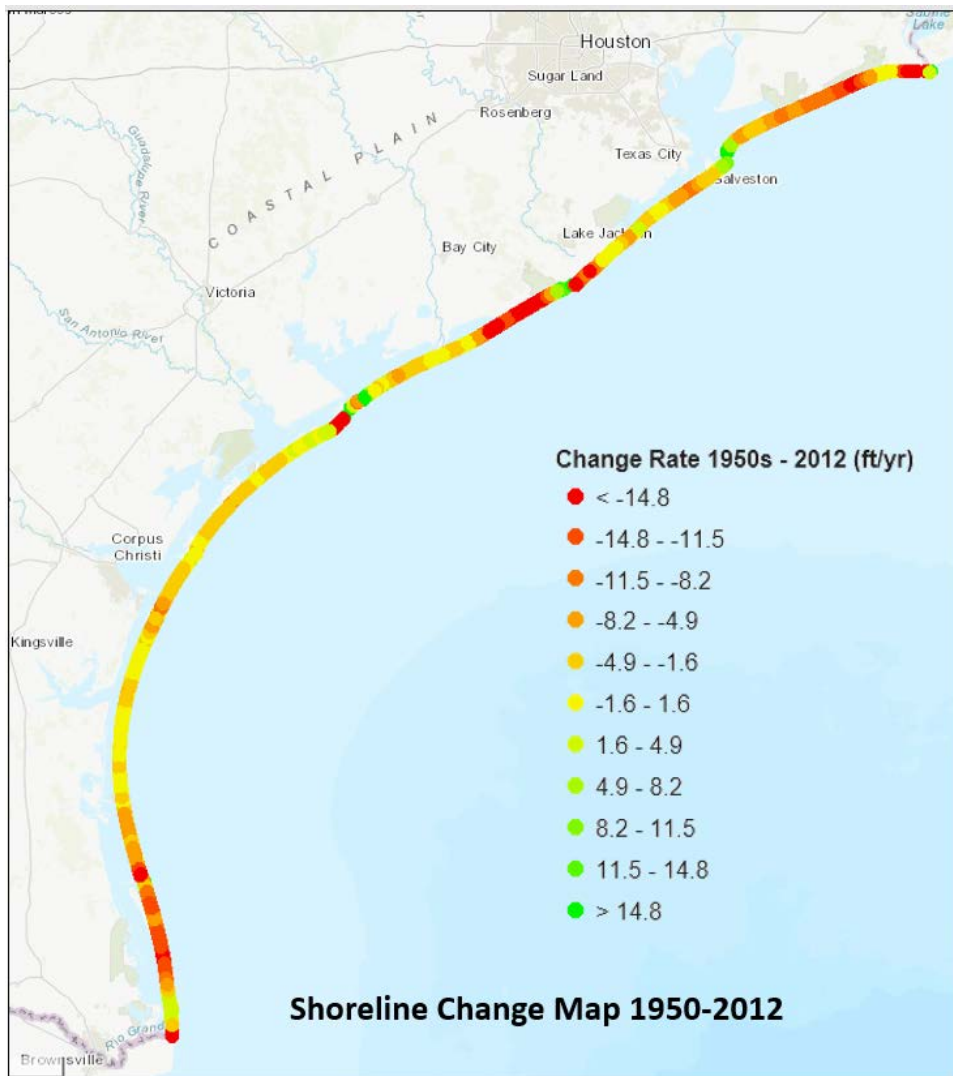


Figure 1. Texas Gulf Shoreline Change

Rates greater than two feet per year are shown in orange and red, and stable or accreting (gaining land) areas are shown in green. Data were compiled from historical erosion rates determined by the University of Texas Bureau of Economic Geology.

[Figure 1](#) and [Table 1](#) illustrate the distribution and extent of eroding areas of the Texas coast. Sixty-one percent of the Texas gulf shoreline is classified as eroding where the rate of shoreline retreat is greater than two feet per year. The areas experiencing the highest erosion rates in Texas are located along the upper Texas coast from Matagorda County northward, and on the lower Texas coast along South Padre Island in Willacy and Cameron counties. On average, 235 acres of land along the Texas Gulf Coast and the state's bays, estuaries, and navigation channels are lost each year to erosion.

ENACTING THE CEPRA PROGRAM

To combat coastal erosion and secure the future of natural resources and the economies of Texas' coastal communities, the Coastal Erosion Planning and Response Act (CEPRA) was enacted on September 1, 1999, during the 76th Legislative Session. The GLO's Coastal Resources Division administers the CEPRA program with a goal to reduce impacts to valuable coastal resources caused by coastal erosion.

Since the inception of the CEPRA program in 1999, ten cycles have been administered. Each cycle consists of a two-year period and coincides with the Legislative biennium. Funding appropriated within the biennium must be encumbered and spent on projects within the biennium unless funding for a particular project is given "carryover" authority by the Legislature. Historically, "carryover" authority has been given to projects leading to or involving construction that are not anticipated to be completed within that biennium.

The CEPRA program partners with other state, federal, and local governments, as well as non-profit organizations to develop and fund coastal erosion projects. According to Texas Natural Resources Code, §33.603(e), beach nourishment projects require at least 25 percent match funding while other coastal erosion response studies or projects require at least 40 percent match funding.

The CEPRA program administers a wide variety of coastal projects to reduce impacts from coastal erosion. These projects include alternative analyses studies to evaluate different erosion response methods, engineering design of preferred methods, beach and dune restoration ([Figure 2](#)); habitat restoration of coastal wetlands ([Figure 3](#)); shoreline protection using hard and soft techniques ([Figure 4](#)); scientific studies to collect data in support of the program; structure removal assistance and debris removal ([Figure 5](#)); and other projects that continue to promote sound coastal stewardship. The program also maintains a robust Beach Monitoring and Maintenance Program (BMMP) for engineered beaches ([Figure 6](#)). Highlights within this report include recently completed projects, current Cycle 10 projects, eroding areas of concern, funding measures, a calculated economic and natural resource benefit analysis that the CEPRA program provides for the state's economy. These reporting requirements are in accordance with Texas Natural Resources Code §33.608.



Figure 2. CEPRA Project 1530 McFaddin Beach and Dune Restoration

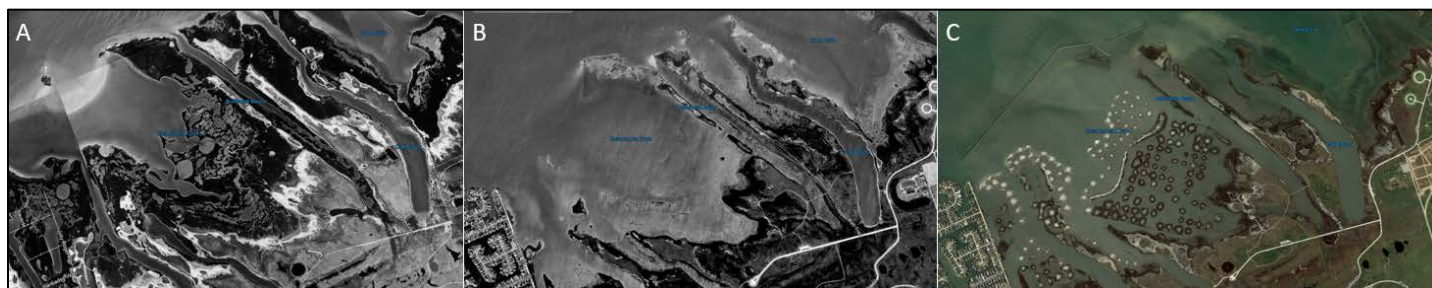


Figure 3. CEPRA Project 1601 West Galveston Island Marsh Restoration

A) Carancahua Cove, Butterowe Bayou, Oak Bayou, and Dana Cove in 1954; B) Massive loss of marsh by 1995; C) Post-construction imagery of marsh restoration efforts in 2018.



Figure 4. CEPR Project Number 1572 Dickinson Marsh Restoration



Figure 5. CEPR Project 1657 Structure Relocation 214 Jettyview Road Surfside, Texas

A) Structure on public beach; B) Post-movement of structure to new location; C) Structure in new location.



Figure 6. CEPR Project 1604 Indianola Beach BMMP Beach Nourishment

Indianola Beach is one of 13 beaches monitored under the Beach Monitoring and Maintenance Plan (BMMP) program in CEPR. Monitoring these beaches provides the CEPR program with analysis and guidance for management of these beach resources.

FINANCIAL STATUS OF THE CEPRA ACCOUNT

For the 85th Legislature, \$14,271,940 will be utilized to implement CEPRA Cycle 10 projects and studies. Cycle 10 covers the period from September 1, 2017 to August 31, 2019. Thirty-two Cycle 10 biennium projects will be described in detail in upcoming report sections. The CEPRA appropriated funds were also leveraged against \$133,115,582 dollars in funding which includes [Tables 2 & 3](#):

- \$5,402,438 in local partner match funds;
- \$11,250,000 in GOMESA funds;
- \$9,806,003 in FEMA funds;
- \$31,892,000 in NFWF funds;
- \$15,000,000 in USFWS Direct Harvey Funds;
- \$17,354,141 in RESTORE funds;
- \$17,811,000 in NRDA funds;
- \$24,600,000 in USACE in-kind.

Funding Cycle	Projects Funded	Appropriated CEPRA Funding	CEPRA Match Funding	Total Budget for Cycle
5 (FY10-11)	28	\$15,907,639	\$68,914,538	\$84,822,177
6 (FY12-13)	26	\$17,394,456	\$41,972,295	\$59,366,751
7 (FY14-15)	21	\$17,038,734	\$27,349,977	\$44,388,711
9 (FY16-17)	18	\$14,920,538	\$11,462,267	\$26,382,805
10 (FY18-19)	32	\$14,271,940	\$133,115,582	\$147,387,522

¹ FY 2010-2015 - GLO received funding via Interagency Contract with the Texas Parks and Wildlife Department

² FY 2016-2019 - GLO received a direct General Revenue appropriation

Table 2. Summary of CEPRA Funding Allocations by Cycle

Note: Cycle 10 CEPRA Match funds include funds from partnerships between the GLO and various entities representing restoration funding sources.

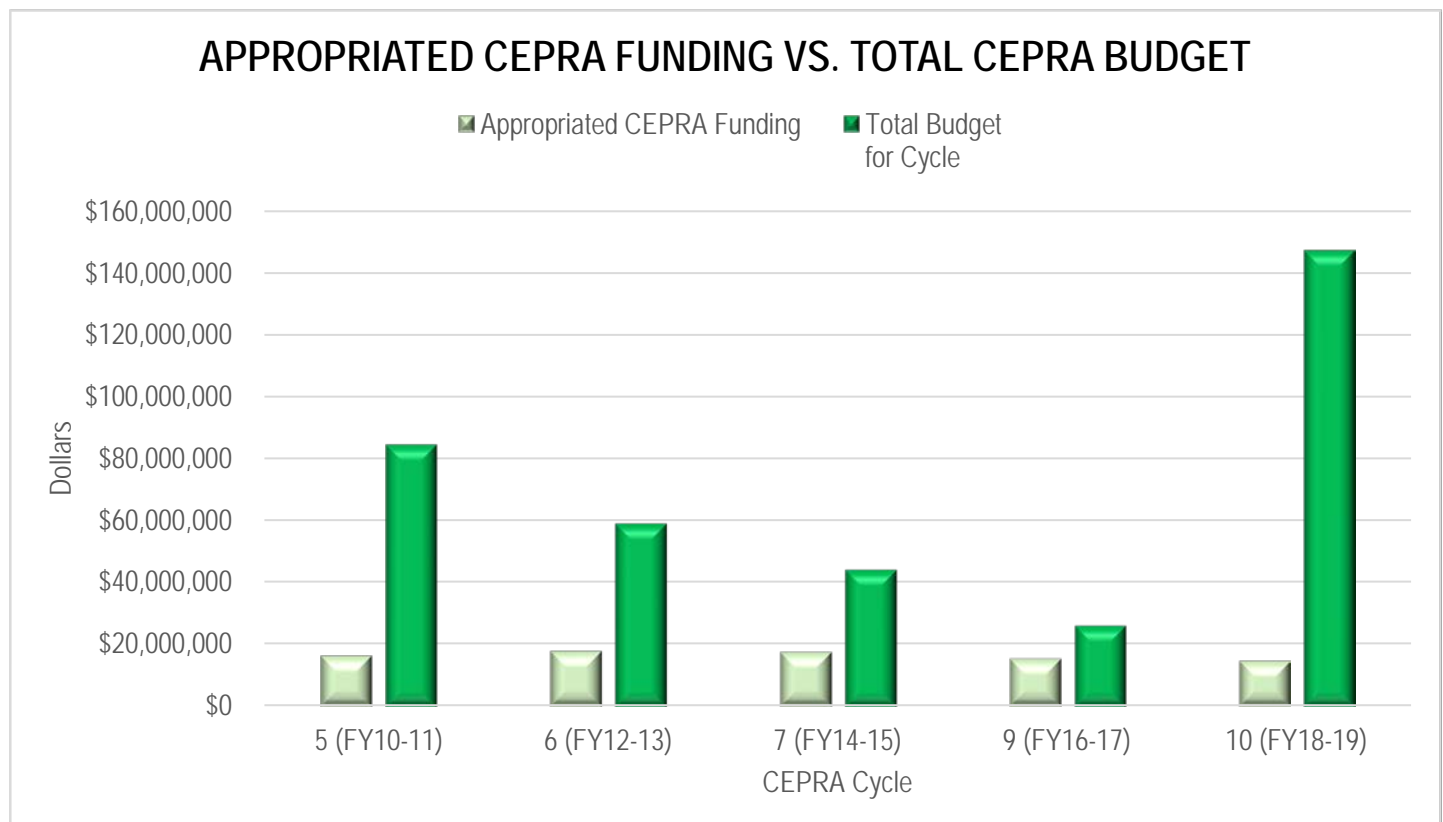


Table 3. CEPRA Funding vs. Total Budget by Cycle

FINANCIAL ASSESSMENT OF NEEDS

Each biennium, the CEPRA Program receives new applications to fund projects along the Texas coast. However, funding limitations result in many projects not receiving funding during the biennium. These projects are categorized as “alternates” and may receive funding if an approved project is canceled. The entire need that was unmet for the Cycle 10 biennium totaled \$221,675.

While the amount of designated alternate projects may seem underwhelming for Cycle 10, in most cycles this amount ranges in the millions and will certainly increase exponentially as coastal communities begin to undertake projects identified in the Texas Coastal Master Resiliency Plan (Master Plan). This plan identified an enormous need to restore marshes, wetlands, beaches, and barrier islands back to historic levels and expand historic footprints to increase the resiliency of the shoreline from subsidence and rising sea levels. The GLO has also partnered with United States Army Corps of Engineers (USACE) to begin the Coastal Texas Study which centers on ensuring “strategic military ports”, intracoastal waterways, recreational activities, and tourism in the state are kept safe from coastal erosion, relative sea level rise, coastal storm surge, habitat loss and water quality degradation (CTS, 2019). This study lays out massive resiliency footprints to combat the threats to our coastal communities and will require state, federal, and community funds and cooperation for success. The following sections will give a brief outline in avenues the CEPRA Program is evaluating to help the need for funding these restoration projects.

FINANCIAL PROGRAM SHORTFALLS

Sales Tax on Sporting Goods (MOU with Parks and Wildlife)

On June 8th, 2015 Governor Abbott signed into law the passage of House Bill 158 which included a Memorandum of Understanding with Texas Parks and Wildlife Department and dedicated 94% of the Sporting Goods Sales Tax for use by state and local parks. Previously, 13% was allotted to the CEPRA Program from 2008 to 2014.

CEPRA is seeking alternative funds that can be established as a permanent source for the success of the program. A current bill has been introduced to the Texas Senate and House to dedicate a permanent amount of hotel taxes towards the program. The 86th legislature has the opportunity to enact the Hotel Occupancy Tax Bill which would allow 2% of coastal counties state occupancy tax revenue to be contributed directly to the CEPRA Program account.

Post-Hurricane Relief

The month CEPRA Cycle 10 projects were to be awarded, Hurricane Harvey hit the Texas coast in 2017. Hurricane Harvey proved to be one of the most devastating and costliest tropical cyclones to hit the states since Hurricane Katrina (US NHC, 2018). CEPRA Cycle 10 appropriated funds were utilized for hurricane debris cleanup which made the program subject to reimbursement by FEMA and the long timeline associated with the process. As a result, CEPRA Cycle 10 projects are slated to begin in May of 2019, almost at the end of Cycle 10's biennium. Without a dedicated funding source, a reliable program is next to impossible to facilitate in a timely manner. This discourages local, state, and federal partnerships.

Project Match Requirements

Additional funds are imperative to the continued success of the CEPRA Program. Despite CEPRA's efforts to leverage additional funding sources, the program remains critically underfunded to be an effective steward for the Texas coast. CEPRA lacks millions of dollars needed to meet coastal community's project needs. In addition to uncertain funding mechanisms in the program, CEPRA guidance requires potential qualified project partners to have a minimum match requirement of 25-40% depending on project type. This requirement often creates a deficiency of projects in coastal communities that lack funds to meet this match requirement. To combat this bias in funding allocation and ensure these underrepresented communities get adequate representation for CEPRA projects the GLO is revising CEPRA guidance on match requirements by allowing Gulf of Mexico Energy Security Act (GOMESA) funds to be utilized as partner match.

GOMESA FUNDS

The CEPRA Program recognizes the importance of community involvement and the need to ensure all coastal communities can take part in restoration efforts that enhance resiliency in their local communities. To facilitate these efforts, the CEPRA rules are being amended to allow GOMESA funds to be utilized for CEPRA projects as the partner match during construction. GOMESA funds come from leasing revenues shared between the Gulf-producing states depending on the sum of the state's inverse distances from all applicable leased tracts. GOMESA Phase II will cap fund sharing between all Gulf-producing states at \$500 million per fiscal year through year 2055, with 50% going directly towards all states and their political subdivisions and a dedicated 10% of the total for that fiscal year as a minimum will be received by every state. This creates a great opportunity for the states and their political subdivisions to implement much needed restoration.

GOMESA funds are currently approved for activities associated with:

- (1) Projects and activities for coastal protection, including conservation, coastal restoration, hurricane protection, and infrastructure directly affected by coastal wetland losses;
- (2) Mitigation of damage to fish, wildlife, or natural resources;
- (3) Implementation of a federally approved marine, coastal, or comprehensive conservation management plan;
- (4) Mitigation of the impact of OCS activities through the funding of onshore infrastructure projects; and
- (5) Planning assistance and administrative costs not-to-exceed 3 percent of the amounts received.

Although the GOMESA cap is set at \$500 million per fiscal year for all Gulf-producing states, this does not mean this cap will be met each fiscal year, so seeking a permanent funding source for the CEPRA Program remains a necessity.

IMPLEMENTING TIER 1 PROJECTS OF THE TEXAS COASTAL RESILIENCY MASTER PLAN

Using GOMESA funds, the CEPRA Program will begin work on Tier 1 Master Plan projects ([Figure 7](#)). To implement Tier 1 Master Plan projects that are CEPRA-eligible, the CEPRA Program will engage in increased community outreach to encourage collaboration and will give priority to these collaborative projects. The CEPRA Program will use GOMESA funds to sponsor qualified project partner match for construction phase projects. Due to the size of restoration needs identified coast-wide in the Master Plan, the CEPRA Program's needs for a dedicated funding source is crucial as well as the program establishing relationships with restoration partners to leverage state dollars.



Figure 7. Texas Coastal Master Plan Regions and Projects

RESTORATION PARTNERSHIPS MAKING A BIG CHANGE

Due to deficits in the CEPRA Program's budget, the CEPRA program is consistently seeking funds to leverage additional support. Criminal and civil penalties from the Deepwater Horizon Oil Spill have created various restoration partnerships and funding opportunities with Natural Resource Damage Assessment Trustees (NRDA), National Fish and Wildlife Foundation (NFWF), and Resources and Ecosystems Sustainability, Tourism Opportunities, and Revived Economies of the Gulf States Act of 2012 (RESTORE) funds. These monumental partnerships funded \$4.5 million since the last report and are dedicating upwards of \$60 million in funds for current Cycle 10 projects. During the Cycle 10 biennium, \$2,518,669 of CEPRA funding will be leveraged against \$67,057,141 in NRDA, NFWF, and RESTORE funds.

These restoration partnerships are important driving forces in nationwide conservation of habitat that focus on funding the most effective projects that utilize the best science and best project management. The CEPRA program is a proud ally to these restoration partners and is currently trusted to implement many large-scale restoration projects for the various funding sources because of the GLO's robust system of procurement and project management experience. These restoration projects will be presented in the upcoming sections of current CEPRA Cycle 10 projects and recently completed CEPRA construction projects.

THE NEED FOR THE CEPRA PROGRAM

The need for the CEPRA Program is evident in every successful project implemented. The Texas coast is the nation's top state for waterborne commerce with Texas ports representing over 82.8 billion in economic value to the state (TCS, 2019). The CEPRA Program works with local state governments, navigation districts, and federal authorities to construct protective structures to ensure continued commerce through our vast waterway systems. The GLO is the dedicated steward of our natural resources along the coast, so ensuring the CEPRA Program can sustain and grow the program is crucially important for the viability of Texas' economy for both coastal and inland workers. CEPRA Program projects easily illustrate that restoration does work. [Figure 8](#) illustrates long-term versus short-term shoreline changes rates produced by the BEG along one of Texas' most busy barrier islands, Galveston Island. The Shoreline Change Maps show a dramatic change in long-term rates versus rates of shoreline change since the program began implementing projects in 2000. Areas once devastated by erosion now benefit from beach nourishment with partnerships between local entities and the USACE. On the bayside of Galveston Island, the CEPRA Program has restored a multitude of wetlands and marsh habitat which is crucial for the island's fisheries and tourism. Tourism is a vital part of this island's economy, so the CEPRA Program partners with local entities to conduct various studies to increase resiliency of the beaches and dunes and wetlands to safeguard the economy for future generations to come.

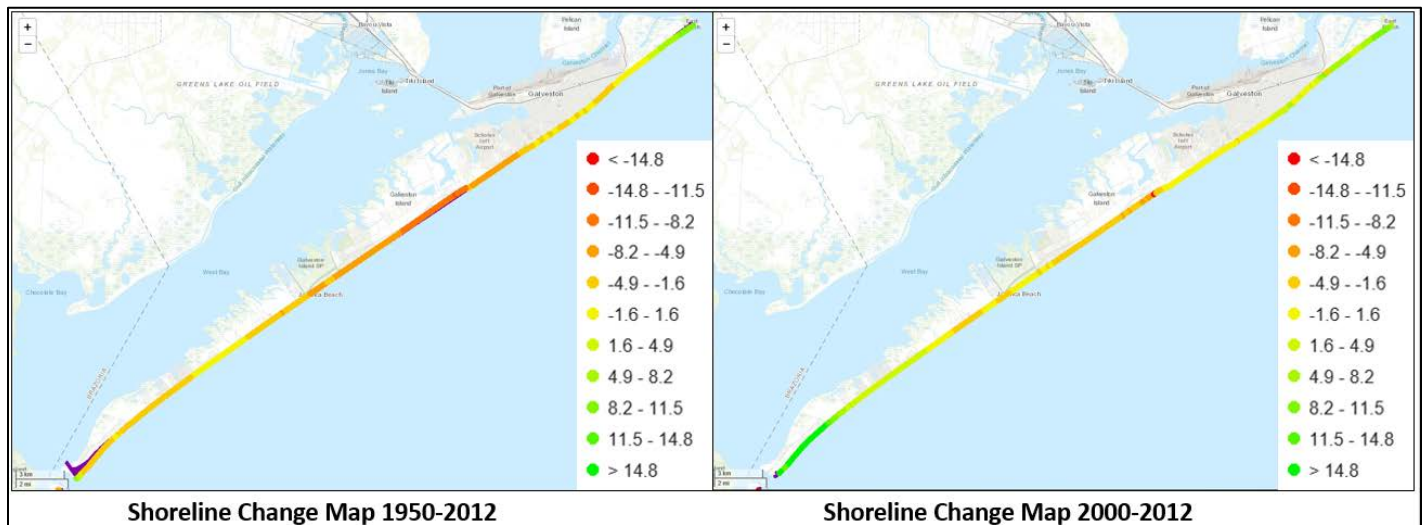


Figure 8. Galveston Island Shoreline Change Rates

CEPRA projects aid in protection against hurricane storm surge. [Figure 9](#) illustrates a digital elevation model (DEM) extracted from post-Harvey lidar along a section of the highly eroded shoreline of McFaddin National Wildlife Refuge. This shoreline was nourished, and the dune ridge was restored to a historic height after many storms ravaged the natural sand recovery system and left the beach devoid of sand with clay outcrops. The DEM shows the success of the restored portion of dune ridge versus the unrestored portion.

One of the highest returns for CEPRA funds is the ecological restoration provided by restoring habitat. [Figure 10](#) illustrates least tern data taken during the CEPRA Cycle 9 McFaddin Pilot Project. Immediately following emplacement of sand and restoration of the dune ridge, upwards of 500 least terns quickly built nests due to the newly available habitat. This activity had not been documented in the area since the shoreline was stripped of all healthy beach and dune habitats. The least terns made the newly restored dune ridge their own accommodations so quickly that planting of the dune ridge could not be completed until after bird nesting season.

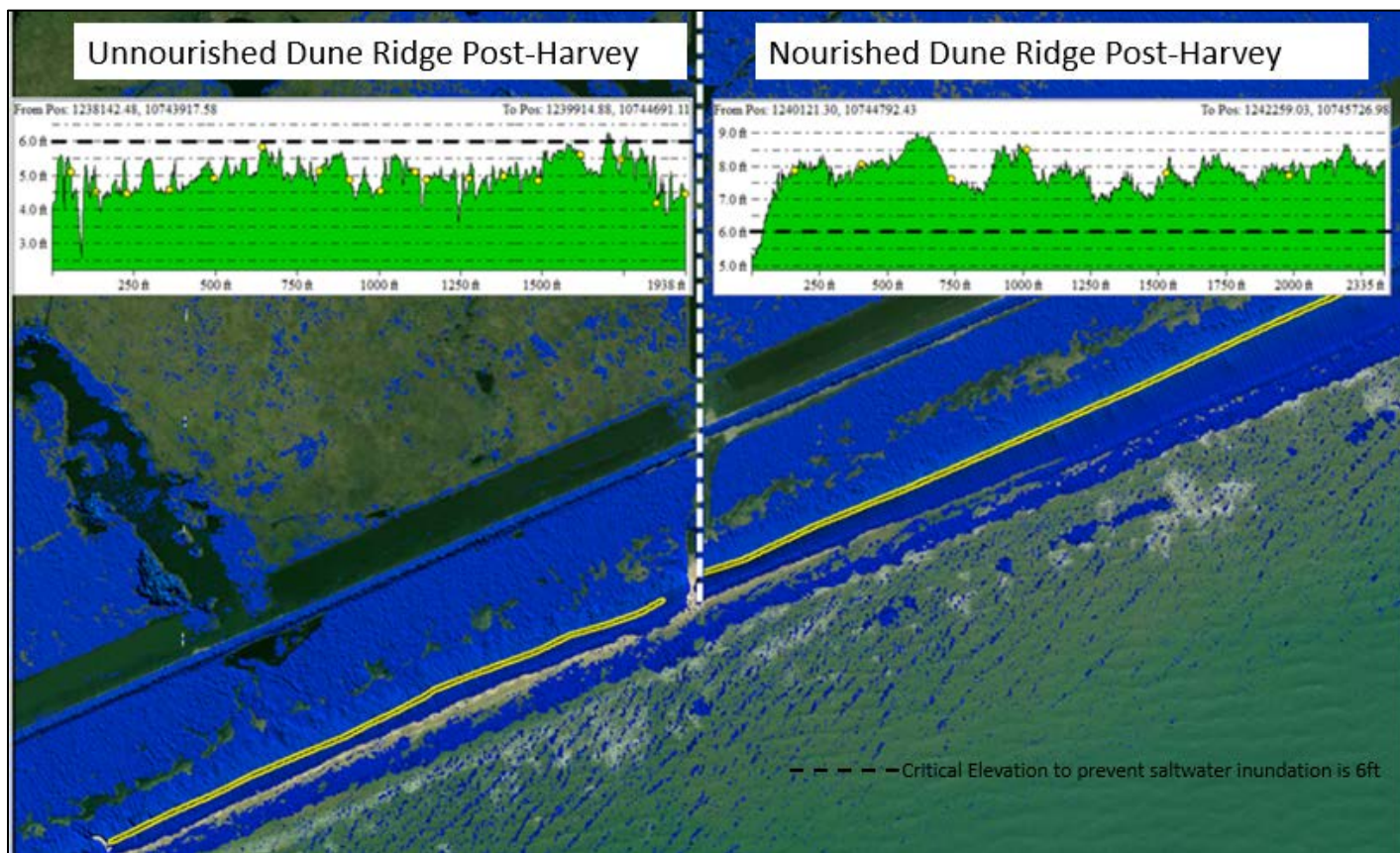


Figure 9. Extracted Lidar Post-Harvey

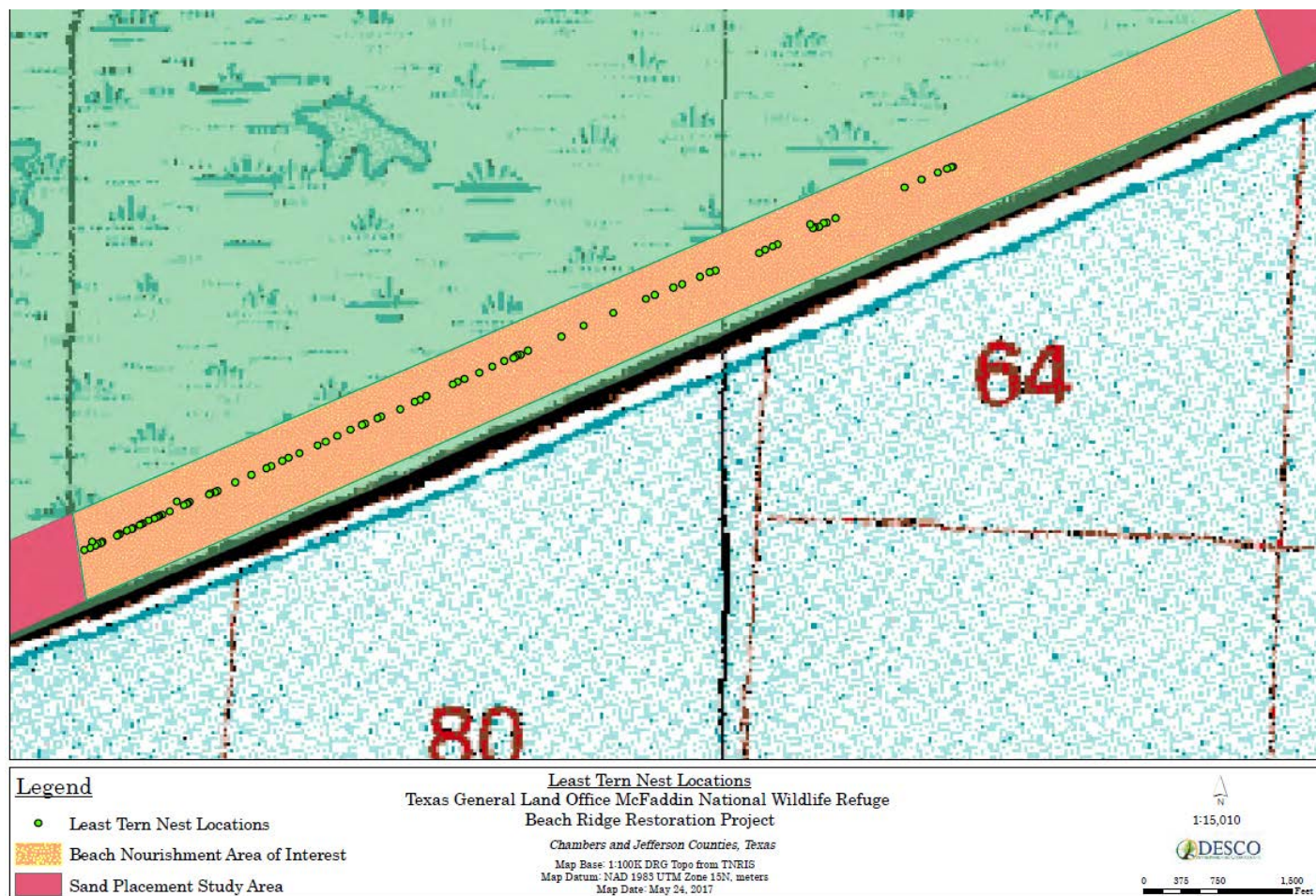


Figure 10. Least Tern Nest Locations McFaddin Pilot Project

ECONOMIC AND NATURAL RESOURCE BENEFITS OF THE CEPRA PROGRAM

Texas' coastal assets, including infrastructure, industry, public and private property, beaches, dunes, wetlands, marshes, and parks, provide significant economic value to Texas. Erosion caused by natural and man-made activities such as storms or cuts in barrier islands damage these assets. The Texas Legislature requires the GLO to report the economic and natural resource benefits derived from CEPRA construction projects every biennium. The GLO contracted Taylor Engineering, Inc. to perform the benefit-cost (B/C) analyses for thirteen Cycle 7,8, and 9 construction projects. The study reported that the state of Texas received \$11 in economic and financial benefits for every dollar the state invested in these projects. This result is based on analysis of the following thirteen CEPRA Cycle 7, 8, and 9 construction projects, which are a representative sampling of the CEPRA program:

- #1529 Follet's Island Habitat Restoration (unofficially County Road 257 Dune Restoration)
- #1530 McFaddin National Wildlife Refuge Beach Ridge Restoration (shoreline protection)
- #1566 Galveston Seawall Beach Renourishment (beach nourishment immediately seaward of the Galveston seawall between 12th and 61st streets)
- #1572 Dickinson Bayou Wetland Restoration
- #1574 South Padre Island Beach Nourishment with Beneficial Use of Dredge Material State FY2016 event (BUDM arising from USACE maintenance dredging of the Brazos Island Harbor entrance and jetty channel segments)
- #1596 Virginia Point Wetland Protection & Restoration (besides marsh restoration also involved shoreline protection)
- #1601 West Galveston Island Bayside Marsh Restoration
- #1604 Indianola Beach renourishment (maintenance renourishment of one cell at Indianola Beach)
- #1610 Bolivar Beach Restoration Leveraging CIAP (beach nourishment & dune restoration at Caplen Beach on Bolivar peninsula west of Rollover Pass)
- #1612 Mad Island Wildlife Management Area Shoreline Protection Phase 2 (marsh restoration & shoreline protection)
- #1614 Shamrock Island Protection & Habitat Enhancement Phase 2 (marsh restoration & shoreline protection)
- #1619 GIWW Rollover Bay Reach Beach Nourishment with BUDM State FY2017 & 2018 Events (BUDM arising from annual USACE maintenance dredging of the GIWW segment through Rollover Bay, pumping dredge material onto Caplen Beach west of Rollover Pass)
- #1627 Moses Lake Shoreline Protection Phase 3 (living shoreline protection)

The project benefits analyses classified and estimated economic and financial benefits associated with commercial and recreational fishing, tourism and ecotourism (wildlife viewing), improved water quality, carbon sequestration, beach recreation, out-of-state visitor spending, non-Texas project funding, and storm protection. The stream of economic benefits over time varied from project to project depending on a project's durability. The period of analysis for the various projects varied from 1 to 25 years.

This study adopts a Texas accounting perspective. Funding from outside Texas and spending by visitors from outside the state represent financial benefits to the state. This perspective views project contributions normally considered a cost when viewed from a national or world perspective as a financial benefit. Costs funded by non-Texas dollars represent a financial benefit because money flows into the Texas economy. As appropriate, the findings reported here show this adjustment to reflect the Texas accounting perspective for the estimates of benefits and costs. This report serves to estimate the cost-effectiveness of the 13 projects listed above via benefit-cost ratios and net benefits on an individual project basis, and as a group, or "portfolio."

[Table 4](#) presents a summary of the assessed projects. The direct and positive net benefits (benefit-to-cost ratios greater than one) from the 13 evaluated projects combined indicate that these coastal erosion control projects yield high returns on investment for the state of Texas. Preserving Texas' coastal assets proves a worthy public investment strategy for Texas taxpayers and citizens.

CEPRA Project Number / Name	County	Project Year ¹	Beginning of Project Year		Beginning of 2018 ³		Benefit-to-Cost (B/C) Ratio
			Discounted Cost ² (\$)	Discounted Benefits (\$)	Discounted Cost ³ (\$)	Discounted Benefits (\$)	
#1529 Follet's Island Habitat Restoration	Brazoria	2017	1,907,520	4,179,129	1,982,486	4,343,369	2.2
#1530 McFaddin NWR Beach Restoration	Jefferson	2017	2,590,695	12,828,494	2,692,509	13,332,654	5.0
#1566 Galveston Seawall Beach Nourishment	Galveston	2017	5,102,452	163,905,874	5,302,978	170,347,375	32.1
#1572 Dickinson Bayou Wetland Restoration	Galveston	2016	767,156	1,112,968	828,639	1,202,166	1.5
#1574 South Padre Island Beach Nourishment with BUDM	Cameron	2016	1,379,964	11,872,191	1,490,561	12,823,682	8.6
#1596 Virginia Point Wetland Protection & Restoration	Galveston	2016	450,579	5,626,754	486,690	6,077,707	12.5
#1601 West Galveston Island Bayside Marsh Restoration	Galveston	2016	785,570	12,156,643	848,529	13,130,931	15.5
#1604 Indianola Beach Renourishment	Calhoun	2017	207,038	81,329	215,175	84,525	0.4
#1610 Bolivar Beach Restoration	Galveston	2017	2,375,200	4,865,396	2,468,545	5,056,606	2.0
#1612 Mad Island WMA Shoreline Protection Phase 2	Matagorda	2017	880,100	95,331	914,688	99,078	0.1
#1614 Shamrock Island Shoreline Protection Phase 2	Nueces	2016	1,140,357	1,103,821	1,231,750	1,192,286	1.0
#1619 GIWW Rollover Bay Reach Beach Nourishment with BUDM	Galveston	2017	171,659	59,987	178,405	62,344	0.3
#1627 Moses Lake Shoreline Protection Phase 3	Galveston	2018	1,983,400	65,595	1,983,400	65,595	0.03
Total ⁴					\$20,624,356	\$227,818,318	11.0

Table 4. CEPRA Cycles 7-9 Projects, Costs, and Benefits

Notes: ¹Project Year represents the year benefits begin to accrue and may not represent the actual construction year.

²Texas portion only; dollar values reflect present worth equivalents at the beginning of Project Year.

³Dollar values reflect present worth equivalents at the beginning of 2018 with a 3.93% discount rate

⁴Total B/C Ratio represents the Total Discounted Benefits divided by the Total Discounted Cost of all thirteen projects combined (i.e., 227,818,318/20,624,356 = 11).

The leveraging of federal participation plays a substantial role for several projects. For example, the low Texas cost of the Virginia Point Wetland Protection & Restoration reflects contributions from the National Fish and Wildlife Foundation (NFWF) and Coastal Impact Assistance Program (CIAP), which covered 98.4% of the total project costs. As another example, the low Texas cost of the beach nourishment near Rollover Pass reflects the substantial cost savings from partnership with the U.S. Army Corps of Engineers (USACE) for the beneficial use of dredged material. This project placed beach fill at an effective unit cost of \$1.26 per cubic yard (cy) of beach fill, far below typical industry costs. However, even with this low beach fill unit cost, the benefit-to-cost ratio is still low, mainly because of the project area's relatively low property values and low visitation rates compared to more popular tourist destinations (e.g., Galveston Island and South Padre Island beaches). Furthermore, the benefit-to-cost ratio of this beach nourishment project does not include federal spending as a benefit, because federal spending

would be the same with or without the project (because the federal dredging project would occur with or without the beach nourishment).

Federal spending on CEPRA projects is also important from a Texas point of view because it reflects financial inflows to the state economy and lowers project costs to Texas. Several of the evaluated projects realized these benefits, as described by the following examples. The Virginia Point Wetland Protection & Restoration experienced federal spending benefits (\$4,863,030 discounted present worth) from NFWF and CIAP funding as mentioned above. Similarly, Follet's Island Habitat Restoration experienced federal spending benefits (\$2,698,128 discounted present worth) from funding by U.S. Fish and Wildlife Service (USFWS) and CIAP. Funding provided by the Federal Emergency Management Agency (FEMA) led to significant federal spending benefits for the Galveston Seawall Beach Nourishment (\$19,577,409 discounted present worth).

A discount rate of 3.93% was used in the benefit cost calculations to convert benefits and costs occurring at different points in time to comparable equivalent values ("discounted present worth") for comparison at the beginning of each project's period of analysis. In Table E.1, the discounted present worth of benefits and costs is also converted to equivalent values at a common point in time, 2018. This makes the benefits and costs of the different projects comparable and additive, allowing them to be viewed as a portfolio. The discount rate chosen for this study represents a mid-range average of 20-year AAA corporate bond rates existing at the time of study initiation.

CEPRA PROJECTS EVALUATED IN THE ECONOMIC STUDIES REPORT

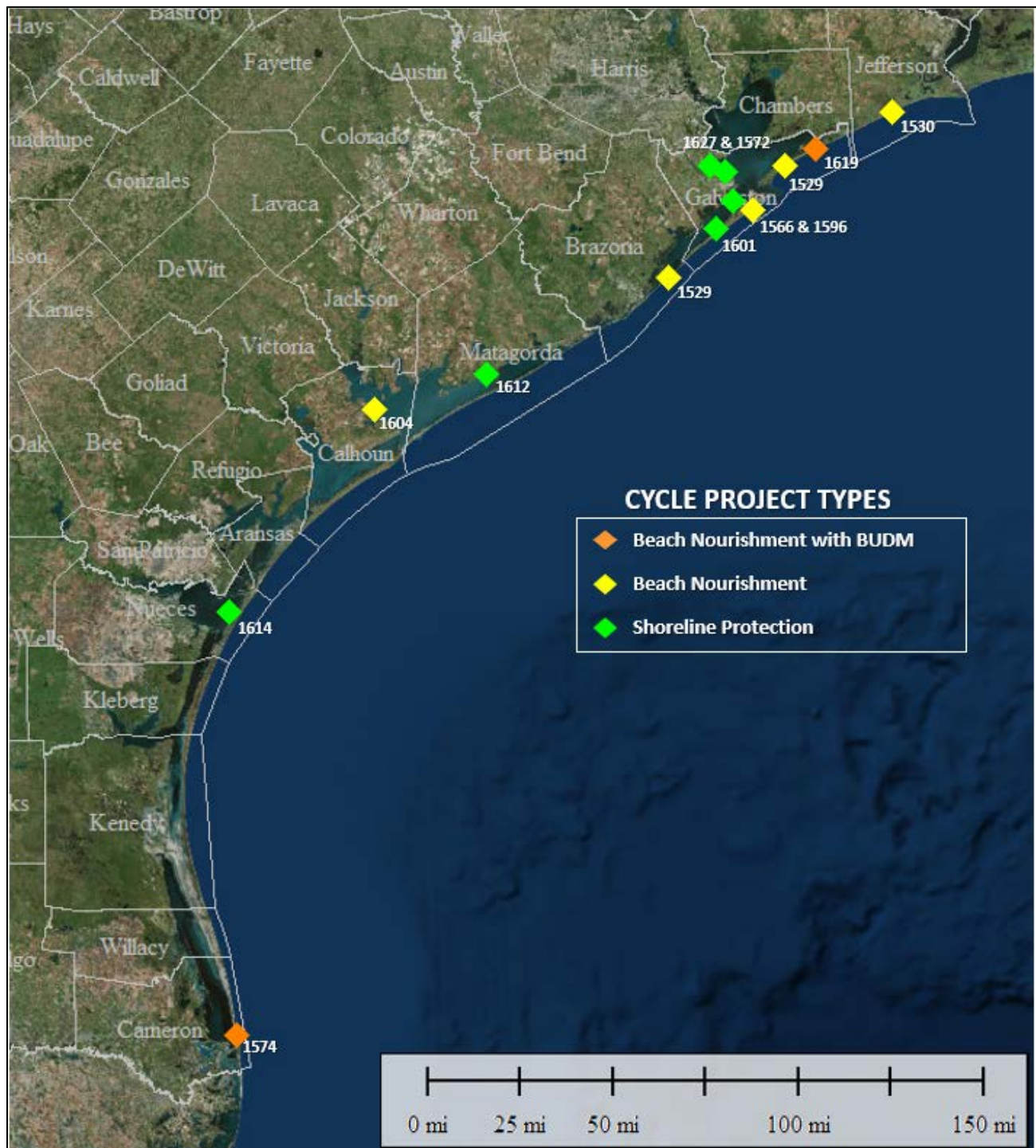


Figure 11. Economic Study Report Project Locations

This section covers all recently completed construction projects that were completed during the Cycle 10 biennium. These projects are referenced in an earlier section where recently completed CEPRA construction projects are used to assess the economic and natural resource benefits the program provides to the state of Texas ([Economic and Natural Resource Benefits of the CEPRA Program](#)).

1529 Follet's Island Habitat Restoration

Partner(s): Brazoria County)

Phase: Completed

Budget: \$3,817,793

Location: Brazoria County

CEPRA Share: \$1,717,793

Project Description

Engineer: Mott MacDonald (Formerly Coast & Harbor Engineering, Inc.)

Contractor: Sorrell Construction Equipment & Materials, LLC. & Apollo Environmental Strategies, Inc.

The project restored the beach and dune system along County Road 257 while providing an extra buffer for the road infrastructure. The dune was planted with native plants in the adjacent region. Following construction, at least one turtle nesting location was identified. After Hurricane Harvey, large piles of wood were placed into the restored dune to increase resiliency of the dune structure and encourage sand to stay in place.



Figure 12. CR 257 Dune Restoration

A) Section of the restored dune and beach. B) Post-Hurricane Harvey the dune and beach system maintains a healthy sand system.

1530 McFaddin Beach and Dune Ridge Restoration Phase I

Partner(s): Jefferson County and USFWS

Phase: Completed

Budget: \$11,400,532

Location: Jefferson County

CEPRA Share: \$1,500,454

Project Description

Engineer: Gahagan and Bryant Associates, Inc.

LJA Engineering, Inc.

Contractor: Weeks Marine Inc.

The pilot project restored three miles of much needed beach and dune habitat along the McFaddin National Wildlife Refuge shoreline. Immediately following dune restoration, least terns created 300-500 nests. Following construction, the dune was planted with bitter panicum and sea oats and which facilitates dune stability and prevents erosion while encouraging volunteer plant species to thrive. The beach nourishment survived Hurricane Harvey's devastating flooding in the region and helped illustrate the importance of a healthy beach and dune system which enables beach habitats to recover naturally post-storm. Utilizing lessons learned from the pilot project, the next 17-miles of degraded shoreline will be restored in [CEPRA Cycle 10](#) under Project Number 1658 McFaddin Dune Restoration and Beach Nourishment Phase II.

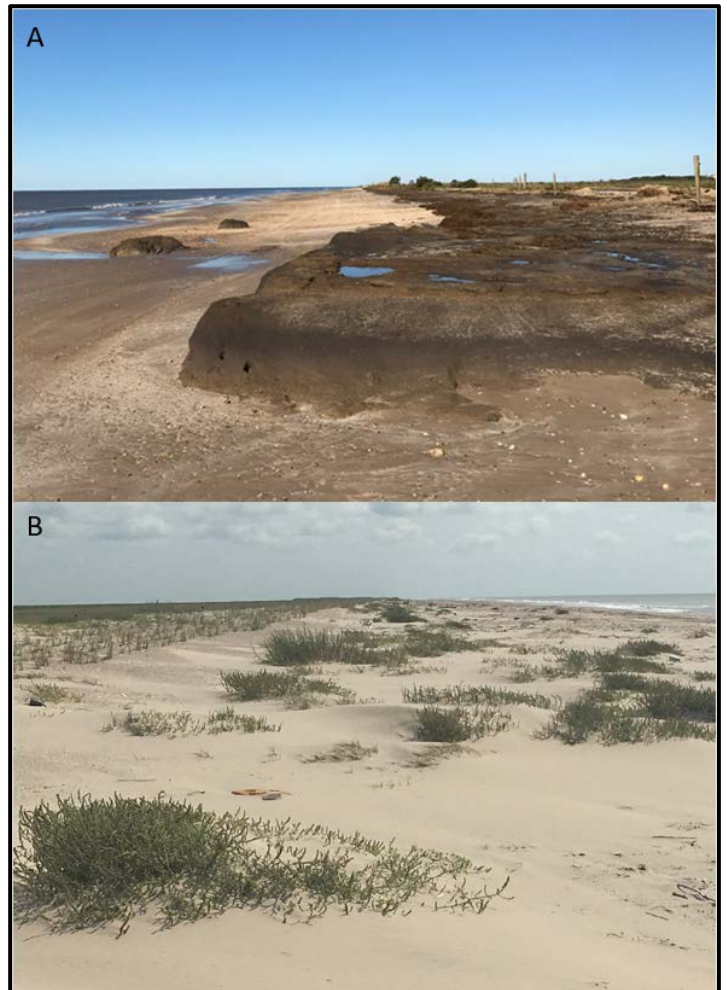


Figure 13. McFaddin Shoreline

A) McFaddin's shoreline with clay outcrops before nourishment. B) A restored beach with planted dune and volunteer plants seaward of dune encouraging embryonic dune formation.

1566 Galveston Seawall Beach Nourishment (12th-61st St.) *BMMP Beach

Partner(s): City of Galveston & Galveston Park Board;
USACE

Phase: Completed

Budget: \$19,086,315

Location: Galveston County

CEPRA Share: \$2,756,497

Project Description

Engineer: HDR Engineering, Inc.

Contractor: Weeks Marine Inc.

The project facilitated nourishment of the shoreline between 12th and 61st streets, and area of approximately 3.78 miles. This stretch of beach is monitored with CEPRA's BMMP and qualifies for FEMA assistance post-storm. Following Hurricane Harvey, a Project Worksheet for FEMA assistance has been created and will be carried out in [CEPRA Cycle 10](#) under Project Number 1670 Galveston Seawall Beach Harvey Repair.



Figure 14. Galveston Seawall Beach

A) During construction pedestrians traverse the beach. B) March 2019; despite damage from the storm, the post-Harvey shoreline remains robust and a peak attraction for tourists.

1572 Dickinson Bayou Wetland Shoreline Protection

Partner(s): TPWD; USFWS, CCA, GBF

Phase: Completed

Budget: \$1,479,522

Location: Galveston County

CEPRA Share: \$700,000

Project Description

Engineer: HDR Engineering, Inc.

Contractor: Apollo Environmental Strategies, Inc.

The project created two marsh cells adjacent to highly eroding shorelines in Dickinson Bayou. The marsh cells were constructed with a berm and living shoreline structure by beneficially using approximately 130,000 cubic yards of existing materials borrowed from within the bayou to construct 3,000 linear feet of earthen clay berms and pump softer materials into two wetland containment areas until it consolidated and settled to appropriate elevations to support the healthy growth of emergent wetland plants. An additional 3,000 cubic yards of concrete rock material was used to protect the outer side slopes of the earthen berms and create a living shoreline breakwater to protect existing wetlands on the south side of the project area.



Figure 15. Dickinson Bayou Marsh Cells A & B

1574 South Padre Island Beach Nourishment with BUDM

Partner(s): City of South Padre Island; USACE

Phase: Completed 2018 Emergency Event

Budget: \$9,682,497

Location: Cameron County

CEPRA Share: \$2,250,000

Project Description

Engineer: USACE-led project

Contractor: USACE-led project

The project included surveys and beneficial use of dredge material for a beach nourishment project in which the City of SPI and the GLO leveraged funds against the USACE's dredging activities of navigation channels to reduce the cost of beach nourishment by half.



Figure 16. SPI Beach

A) During beach nourishment. B) Post-construction; small scarps are present as the beach equilibrates to the engineered template.

1596 Virginia Point Shoreline Protection

Partner(s): Scenic Galveston

Phase: Completed

Budget: \$4,054,665

Location: Galveston County

CEPRA Share: \$65,000

Project Description

Engineer: AECOM

Contractor: Apollo Environmental Strategies, Inc.

The project constructed 1.65 miles of breakwaters along the shoreline of Virginia Point. Subsequent phases include continuous planting events along the shoreline with spartina alterniflora donated by RESTORE and GBF's Marsh Mania events.

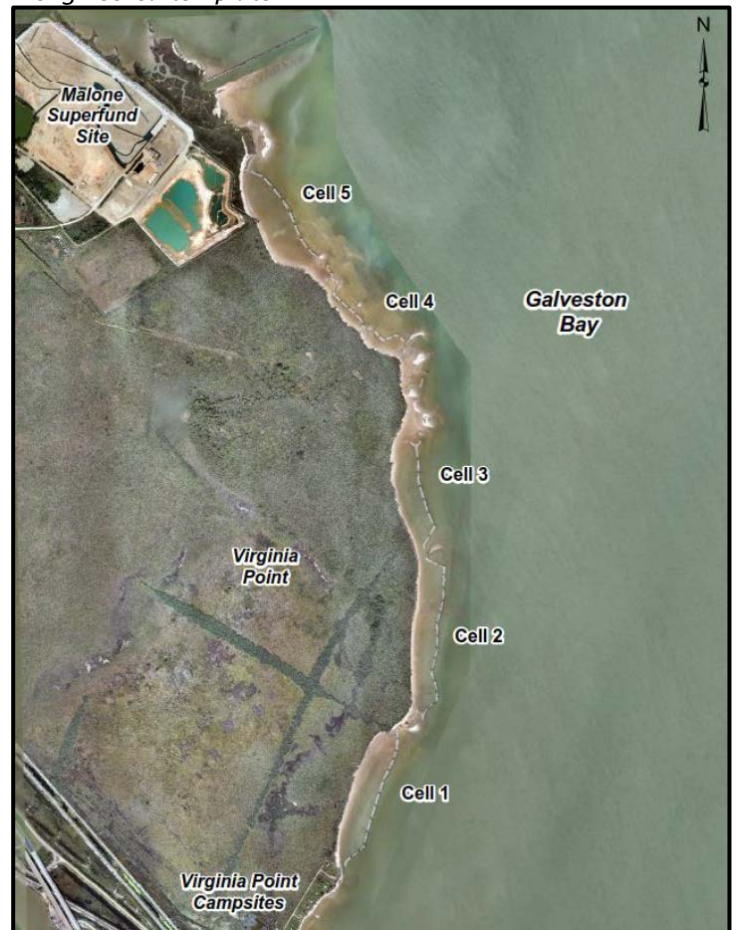


Figure 17. Breakwater Marsh Cells

1601 West Galveston Island State Park (GISP) Bayside Marsh Restoration Phase II

Partner(s): Texas Parks & Wildlife Department; NFWF

Phase: Completed

Budget: \$7,796,806

Location: Galveston County

CEPRA Share: \$50,778

Project Description

Engineer: HDR Engineering, Inc.

Contractor: Apollo Environmental Strategies, Inc.

The project restored approximately 75 acres of intertidal marsh complex within Carancahua Cove at GISP through construction of 81 marsh mounds and 5,415 linear feet of rock breakwater. The marsh mounds consist of sandy dredged material placed to create broad, gently-sloping mounds. The breakwater provide protection from wave action for new and existing marsh features. This project was mainly funded via NFWF restoration funds. Five years of post-construction monitoring is on-going. [CEPRA Cycle 10](#) Project Number 1637 GISP Phase III is compounding on this project by extending breakwaters into adjacent coves.

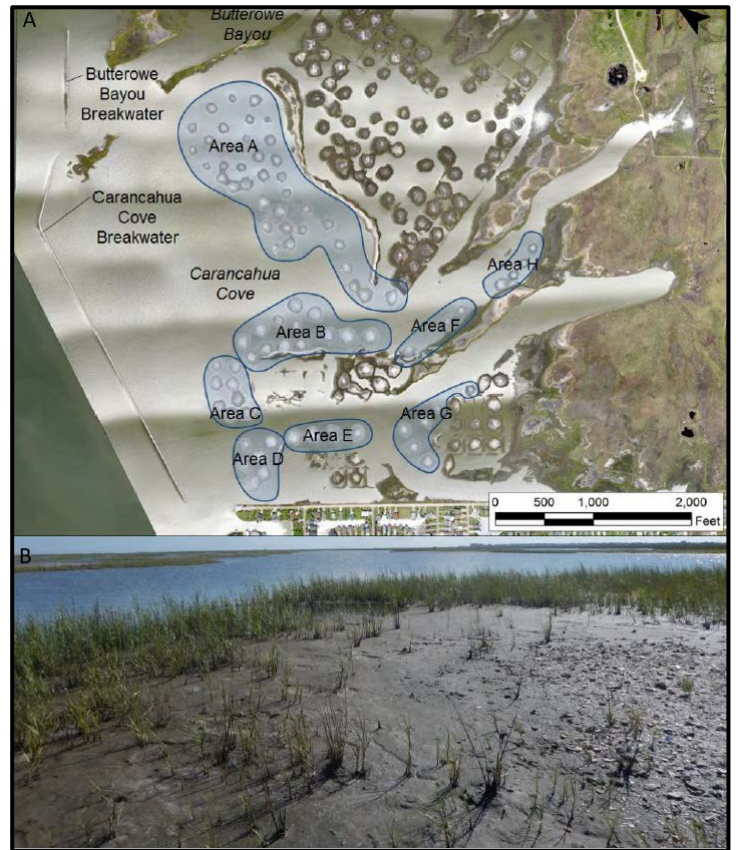


Figure 18. GISP Phase II

A) GISP Project footprint. B) Marsh mound imagery taken during Year 1 post-construction monitoring.

1604 Indianola Beach Nourishment *BMMP Beach

Partner(s): Calhoun Port Authority

Phase: Completed

Budget: \$237,600

Location: Calhoun County

CEPRA Share: \$178,200

Project Description

Engineer: Arcadis U.S., Inc.

Contractor: Apollo Environmental Strategies, Inc.

The project nourished the currently monitored BMMP beach. Monitoring of the beach revealed the southeast end of the beach cell either approached or is less than the Action Width (nourishment trigger threshold) defined as 35 feet.



Figure 19. Indianola Beach Project Location

1610 Bolivar Beach Restoration

Partner(s): Galveston County

Phase: Completed; on-going

Budget: \$5,016,735

Location: Galveston County

CEPRA Share: \$2,000,000

Project Description

Engineer: Galveston-led project

Contractor: Galveston-led project

The proposed project area has been the subject of previous investigations through the original Corps of Engineers, "Sabine Pass to Galveston Bay Shoreline Erosion Feasibility Study" and the investigations conducted by the Land Office in their study of Rollover Pass and its effects on adjacent beaches. The project restored the dune system along 2.6 miles of shoreline with CIAP funds. This project provided improved habitat for nesting shorebirds and sea turtles, widened recreational beaches for citizens and visitors, and a stronger first line of defense for storm damage reduction benefits. Hurricane Sandy proved that wider beaches and taller healthier dunes provided greatly increased storm damage reduction benefits. The proposed project is the culmination of Galveston County's CIAP program. Each of the County's CIAP projects has been intended to establish and enhance a nourished beach in this area. The CEPRA Program will be completing restoration in this area with an upcoming beach nourishment phase.



Figure 20. Bolivar Restoration Project Location

1612 Mad Island Wildlife Management Area (WMA) Shoreline Protection

Partner(s): TPWD

Phase: Completed

Budget: \$1,000,000

Location: Matagorda County

CEPRA Share: \$500,000

Project Description

Engineer: HDR Engineering, Inc.

Contractor: Bertucci Contracting Company, LLC.

The project emplaced 2,974 linear feet of breakwater riprap along the Gulf Intracoastal Waterway (GIWW). The GIWW in this portion was created by cutting into marsh habitat-rich uplands creating an on-going erosion problem from boat and commerce activity along the channel.



Figure 21. Mad Island WMA Project
A) Pre-construction. B) Post-construction.

1614 Shamrock Island Shoreline Protection Phase I

Partner(s): The Nature Conservancy (TNC)

Phase: Completed

Budget: \$1,782,228

Location: Nueces County

CEPRA Share: \$69,336

Surface Damage Funds Share: \$1,000,000

Project Description

Engineer: Mott MacDonald

Contractor: Luhr Brothers, LLC.

The project placed three offshore breakwaters totaling 915 linear feet of shoreline protection along the southeast portion of the bird rookery island. Construction also entailed 715 cubic yards of beach fill on the northern portion of the island, and 850 cubic yards of beach fill on the southern portion of the island in beach areas that had breached into the interior lagoon.



Figure 22. Shamrock Project Before and After Construction

1619 GIWW Rollover Bay Reach Beach Nourishment with BUDM FY 17-18

Partner(s): Galveston County

Phase: Completed

Budget: \$15,026,750

Location: Galveston County

CEPRA Share: \$558,000

Project Description

Engineer: USACE-led project

Contractor: USACE-led project

This project beneficially utilized sand from the USACE's annual maintenance dredging of the Gulf Intracoastal Waterway Rollover Bay reach segments and returned the dredged sediment to the littoral system west of Rollover Pass.



Figure 23. Caplen Beach Project Location

1627 Moses Lake Shoreline Protection Phase III

Partner(s): Galveston Bay Foundation

Phase: Completed

Budget: \$2,000,000

Location: Galveston County

CEPRA Share: \$750,000

Project Description

Engineer: AECOM

Contractor: Shoreline Foundation, Inc.

The project complemented existing erosion response measures in place on Moses Lake, including a 1,600-foot section of rock breakwater structures constructed in 2002 and a 2,400-foot section constructed in 2012. This phase represented the third "project" along this shoreline and built upon the successes of the previous work done along the Moses Lake shoreline to extend shoreline protection northward up to an estimated 5,000 feet.



Figure 24. Moses Lake Breakwaters

CEPRA CYCLE 10 PROJECTS

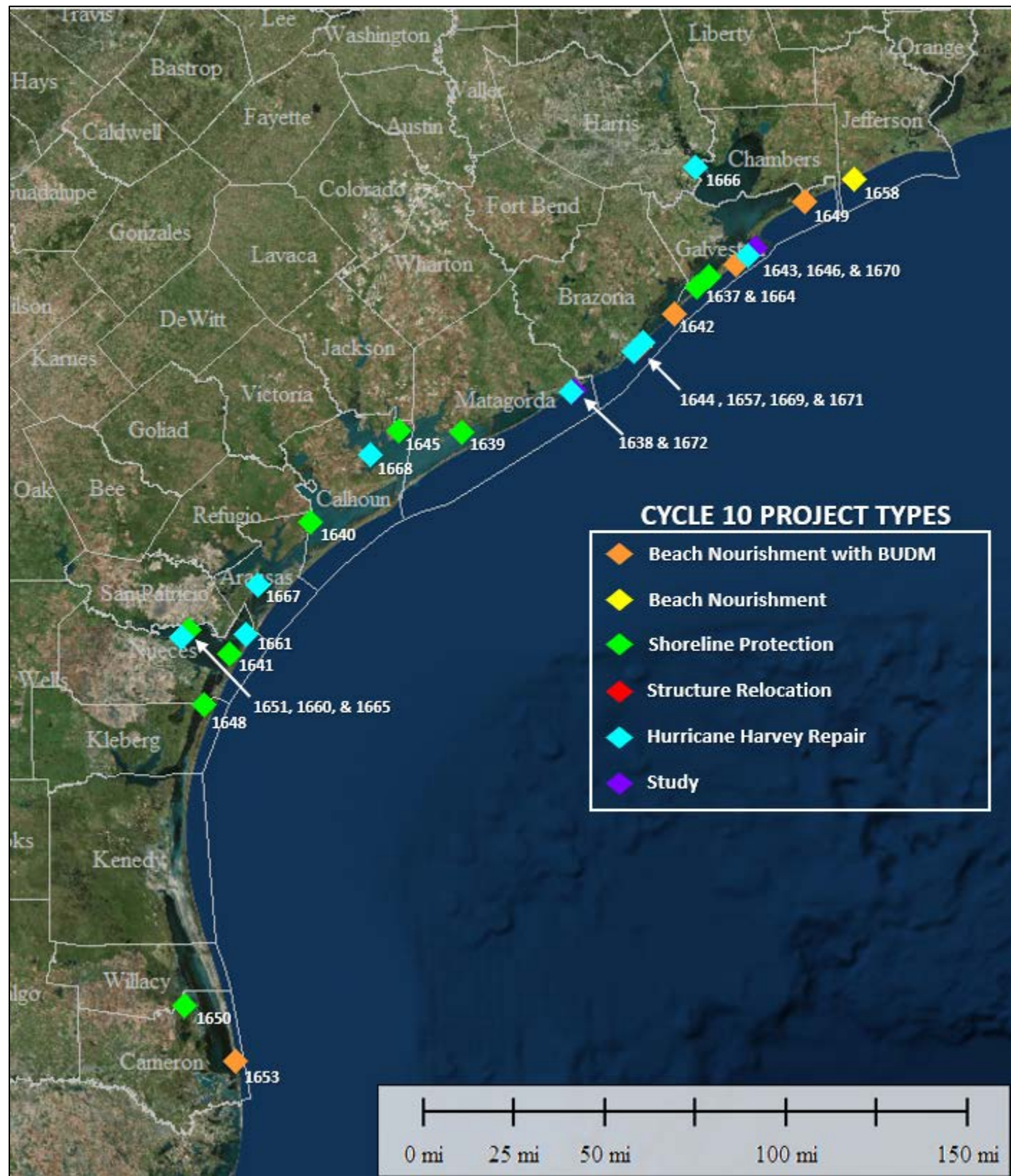


Figure 25. CEPRA CYCLE 10 Project Locations

This section contains CEPRA Cycle 10 projects ([Figure 25](#) and [Table 5](#)). Cycle 10 of the CEPRA Program approved thirty-two GLO- or Qualified Project Partner-led projects focused on beach nourishment; beach nourishment with Beneficial Use of Dredged Material (BUDM); Marsh and Wetland Restoration; Shoreline Protection; Alternatives Analysis, Permitting, Engineering and Design; Structure Relocation; and Studies. Cycle 10 funds total \$14,271,940 with \$133,115,582 of outside funds leveraged for a Cycle 10 projected total budget of \$147,387,522.

CYCLE 10 PROJECT NAMES AND TYPES

<p>◆ Beach Nourishment with BUDM</p> <ul style="list-style-type: none"> ◆ 1642 Treasure Island MUD BUDM ◆ 1643 Babes Beach BUDM ◆ 1649 Caplen-GIWW Rollover Bay BUDM *CEPRA BMMP Beach ◆ 1653 South Padre Island BUDM *CEPRA BMMP Beach <p>◆ Beach Nourishment</p> <ul style="list-style-type: none"> ◆ 1644 Village of Surfside Beach Nourishment *CEPRA BMMP Beach ◆ 1658 McFaddin Dune Restoration and Beach Nourishment Phase II <p>◆ Shoreline Protection</p> <ul style="list-style-type: none"> ◆ 1637 Galveston Island State Park Shoreline Protection Phase III ◆ 1639 Mad Island Marsh Preserve Shoreline Protection ◆ 1640 Aransas National Wildlife Refuge Dagger Point Shoreline Protection ◆ 1641 Shamrock Island Shoreline Protection Phase III ◆ 1645 Carancahua Bay Shoreline Protection ◆ 1648 Triangle Tree Rookery Island Shoreline Protection ◆ 1650 Adolph Thomae Park Shoreline Protection ◆ 1651 Indian Point Causeway Shoreline Protection ◆ 1660 Indian Point Shoreline Protection Phase II ◆ 1664 Bird Island Cove Shoreline Protection 	<p>◆ Structure Relocation</p> <ul style="list-style-type: none"> ◆ 1657 214 Jettyview Road, Surfside Structure Relocation <p>◆ Hurricane Harvey Repair; BMMP and 406 Hazard Mitigation</p> <ul style="list-style-type: none"> ◆ 1661 Port Aransas Nature Preserve Hurricane Harvey Repair ◆ 1665 Corpus Christi North Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1666 Sylvan Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1667 Rockport Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1668 Indianola Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1669 Quintana/Bryan Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1670 Galveston Seawall (12-61st) Beach Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1671 Surfside Pedestrian Hurricane Harvey Repair *CEPRA BMMP Beach ◆ 1672 Sargent Beach East Hurricane Harvey Repair *CEPRA BMMP Beach <p>◆ Study</p> <ul style="list-style-type: none"> ◆ 1638 Sargent Beach Segmented Breakwater Study ◆ 1646 Galveston Park Board Back-Passing Nourishment Practices Study ◆ 1659 Texas Coastwide Erosion Response Plan Update ◆ 1602 Beach Monitoring and maintenance Plan (BMMP) Surveys ◆ 1662 Bureau of Economic Geology (BEG) Shoreline Change Update Study ◆ 1663 Economic and Natural Resource Benefits of the CEPRA Program; A Study of Cycles 7-9
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Table 5. CEPRA Cycle 10 Project Types

Beach Nourishment with Beneficial Use of Dredged Material (BUDM)

Through partnerships with local communities and the USACE, the GLO continuously seeks opportunities to utilize material dredged from USACE-managed navigation channels to beneficially use in beach and dune nourishment or marsh restoration.

Beach Nourishment

Through USACE-permitted borrow sources, the GLO oversees small- and large-scale beach nourishment projects that facilitate beach and dune habitat restoration on Gulf and Bay beaches. GLO-engineered beaches are maintained through a Beach Monitoring and Maintenance Program (BMMP) which actively ensures beaches maintain their engineered fill template above the 50% threshold to ensure reimbursement by FEMA in the event damage by tropical storm.

Shoreline Protection and Marsh Restoration

Methods of shoreline protection range from hard structures like revetments, rip-rap, breakwaters, and bulkheads to green softer structures like living shorelines and shoreline planting. Many projects involve some form of marsh restoration behind the protective structure.

Structure Relocation and Debris Removal

Natural Resources Code states the GLO shall undertake studies and projects that shall address storm damage mitigation, post-storm damage assessments, debris removal, and removal and relocation of structures from public beaches (emergency or regular).

Hurricane Harvey Repair

BMMP maintained beaches or GLO-partnered structures qualify for repair when damaged during a tropical storm. FEMA reimburses repair costs up to 90% leaving the GLO and project partners to cover the remaining 10% of non-federal cost-share.

Studies or Demonstration Projects

The GLO funds various studies which evaluate the status of erosion on the coast and ways to mitigate erosion and/or increase coastal resiliency.

BUDM PROJECTS



Figure 26. Cycle 10 BUDM Projects

1642 Treasure Island MUD BUDM

Partner(s): Brazoria County

Phase: Regulatory

Budget: \$15,000.00

Location: Brazoria County

CEPRA Share: \$11,250.00

Project Description

This phase of the project will modify the current USACE Permit to allow maintenance dredging of the SLPCP access channel. The material will then be hydraulically placed for beach nourishment along the Treasure Island MUD shoreline.



Figure 27. Proposed nourishment area on Treasure Island

1643 Babes Beach BUDM

Partner(s): Galveston Park Board of Trustees

Phase: Construction

Budget: \$10,500,000

Location: Galveston County

CEPRA Share: \$5,000,000

GOMESA Share: \$2,750,000

Project Description

The project will leverage current USACE channel maintenance to allow placement of dredged material onto Babe's Beach. The project is generally managed by the USACE with project partners (GLO and GPB) covering the incremental cost to place the material onshore instead of in a USACE Dredged Material Placement Area (DMPA).

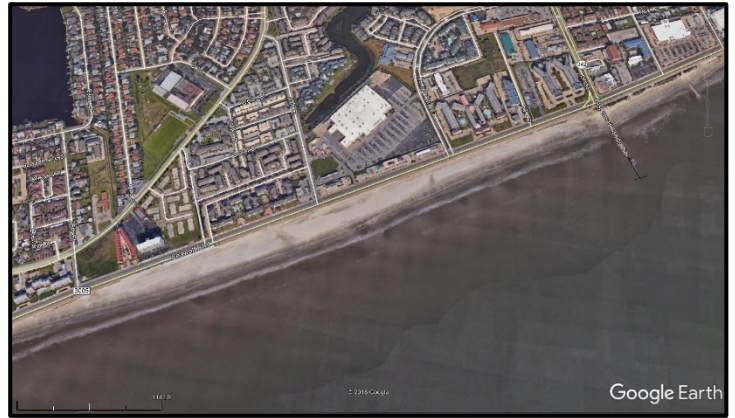


Figure 28. Babe's Beach location

1649 Caplen GIWW Rollover Bay BUDM *CEPRA BMMP Beach

Partner(s): Galveston County

Phase: Construction

Budget: \$300,000

Location: Galveston County

CEPRA Share: \$225,000

Project Description

The project will utilize material dredged as part of the maintenance effort for the GIWW, and provide material for beach nourishment in the vicinity west of Rollover Pass. The beach portion of the project is expected to widen the beach and provide increased storm damage protection and increased recreational beach near Rollover Pass, including the restoration of lost sea turtle nesting habitat, while removing hazards to navigation in the GIWW.



Figure 29. Caplen Beach location

1653 South Padre Island BUDM *CEPRA BMMP Beach

Partner(s): City of South Padre Island

Phase: Construction

Budget: \$2,870,000

Location: Cameron County

CEPRA Share: 2,152,500

Project Description

The project proposes to conduct annual closure-depth maintenance surveys of the City's beach to determine the impact of beach nourishment on the Island and the sand system, complete engineering and design of beach nourishment projects per FEMA requirements, and coordinate BUDM placement with USACE during dredging of the Brazos Santiago Pass. This BUDM location has benefited from this symbiotic relationship with the USACE since 1997.

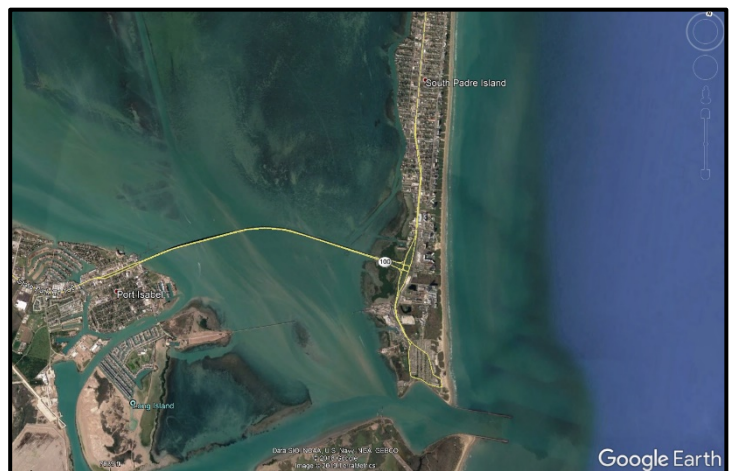


Figure 30. SPI Location

BEACH NOURISHMENT PROJECTS

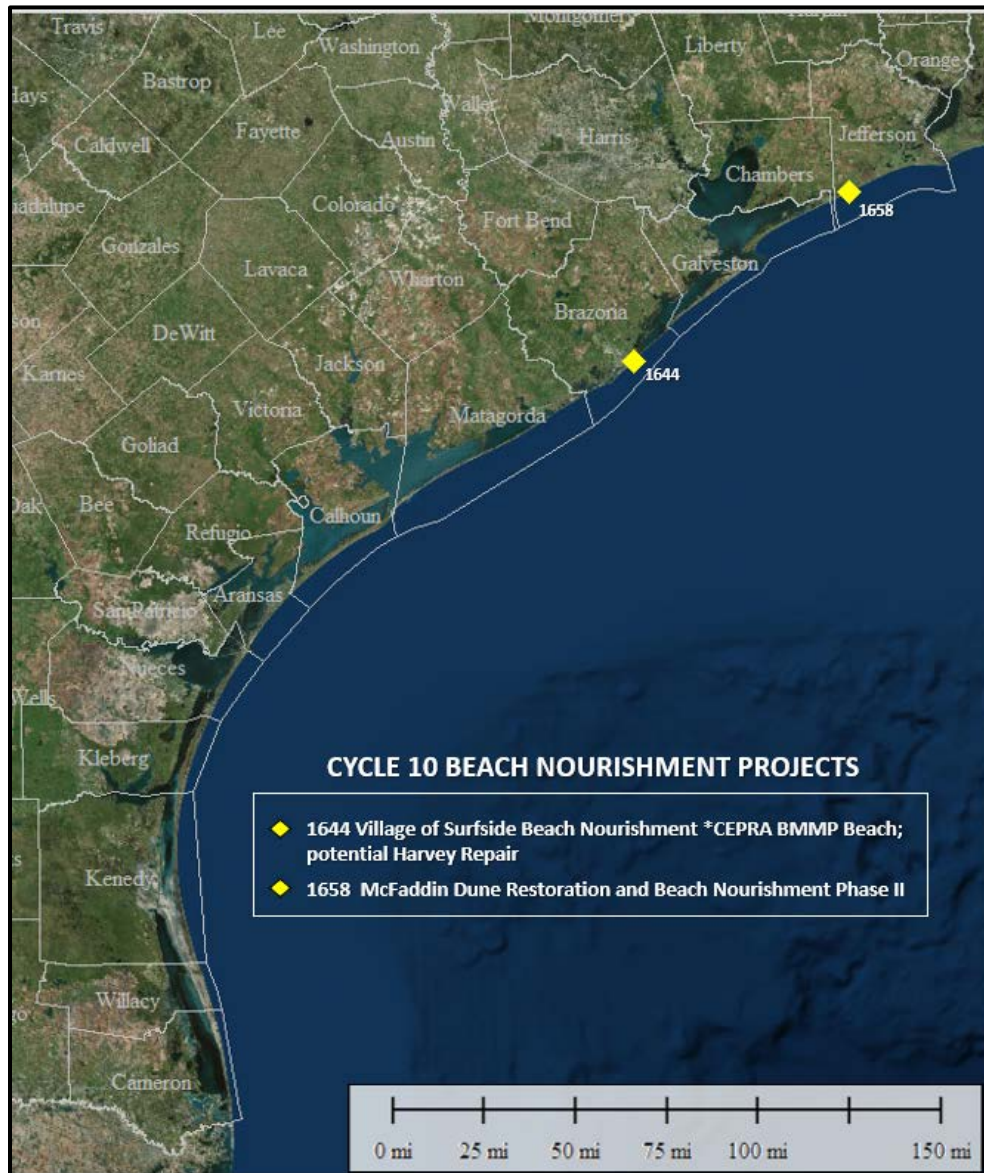


Figure 31. Cycle 10 Beach Nourishment Projects

1644 Village of Surfside Beach Nourishment

Partner(s): Village of Surfside

Phase: E&D, Permitting, and Construction

Budget: \$8,268,441

Location: Brazoria County

CEPRA Share: \$2,000,000

Project Description

The project builds on previous studies that investigated the efficacy of erosion control structures combined with beach nourishment. The project would combine groins and beach nourishment along the Surfside shoreline to provide protection for public utilities and infrastructure. RESTORE funds are currently being secured to construct the groins.



Figure 32. Surfside Project Location

1658 McFaddin Dune Restoration and Beach Nourishment Phase II

Partner(s): Jefferson County, McFaddin National Wildlife Refuge, NRDA Trustees, NFWF, RESTORE, USFWS
Phase: E&D, Permitting, Construction, Post-Construction Monitoring

Budget: \$67,360,000

Location: Jefferson County

CEPRA Share: *5,000 in CEPRA Cycle 9 Funds

Project Description

The project will nourish and restore 17 miles of beach and dune ridge along the shoreline of the McFaddin National Wildlife Refuge shoreline from High Island to Sea Rim State park. This massive restoration project will utilize many types of restoration funds to implement one of the largest beach nourishment projects in the Gulf of Mexico. Approximately 3.4 million cubic yards of material will be hydraulically pumped from an offshore borrow area to complete beach nourishment. Five years of post-construction monitoring are required. Due to Hurricane Harvey delaying CEPRA Cycle 10 funds, this

project was initiated with CEPRA 9 funds. This next phase compliments a 3-mile pilot project completed in 2017 that will be presented in the next section.



Figure 33. McFaddin Project Location

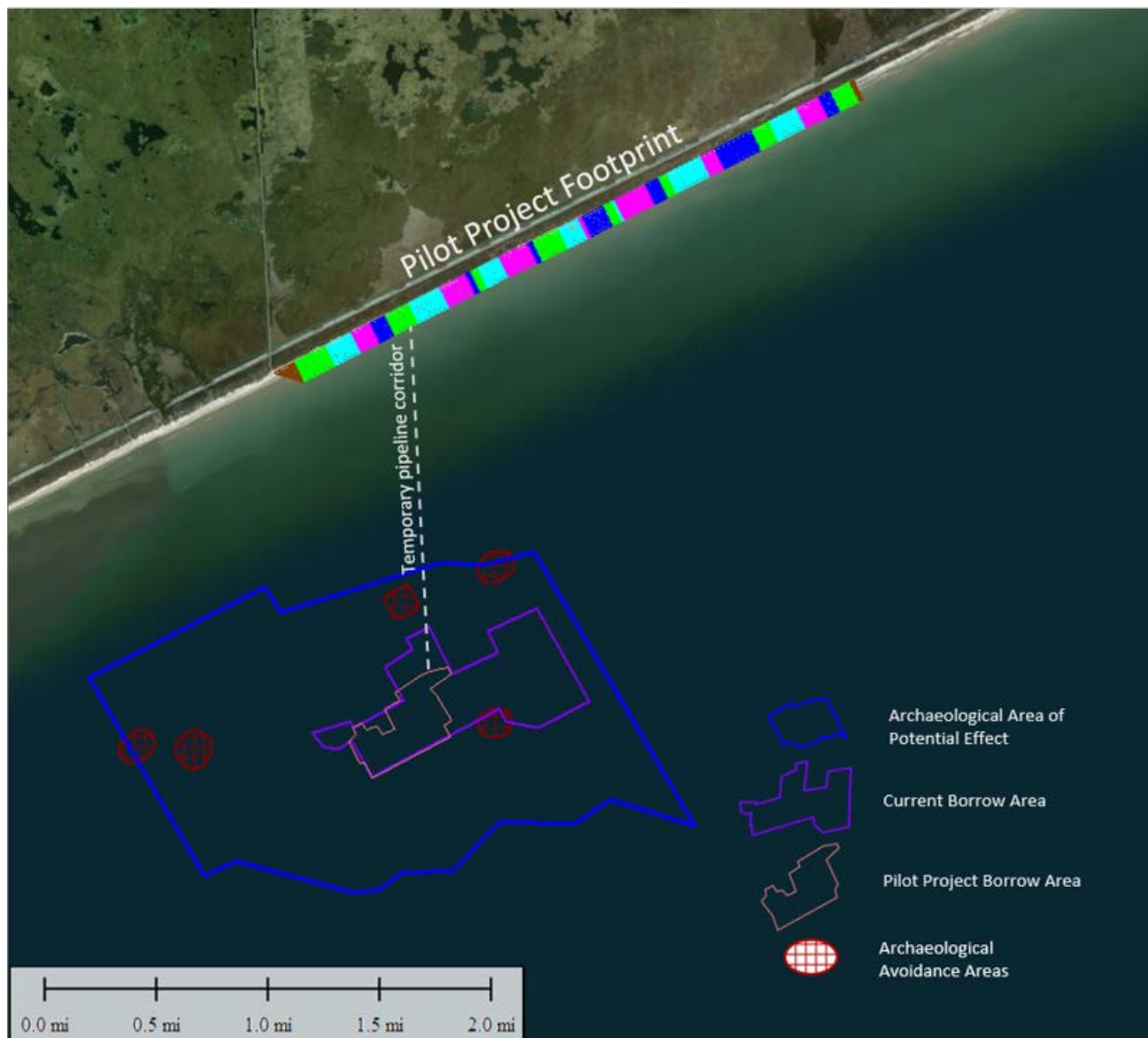


Figure 34. CEPRA Cycle 9 McFaddin 2017 Pilot Project Location
Coastal Erosion Planning & Response Act

SHORELINE PROTECTION PROJECTS



Figure 35. Cycle 10 Shoreline Protection Projects

1637 Galveston Island State Park SP Phase III

Partner(s): Texas Parks and Wildlife Division (TPWD)

Phase: E&D, Permitting, and Construction

Budget: \$5,050,000

Location: Galveston County

CEPRA Share: \$50,000

Project Description

The project will build on previously emplaced breakwaters by expanding the footprint into Dana Cove, Oak Bayou and Butterowe Bayou. The additional 7,550 linear feet of breakwaters will help protect marsh habitat and sea grasses. A place of refuge for Galveston Island, this state park area allows visitors to enjoy kayaking, birding, swimming, fishing, camping, hiking, birding, mountain biking, geocaching, or just plain relaxing.



Figure 36. GISP Phase III Location

1639 Mad Island Marsh Preserve SP

Partner(s): The Nature Conservancy

Phase: E&D

Budget: \$127,500

Location: Matagorda County

CEPRA Share: \$127,500

Project Description

The project will create a final engineering design template for a shoreline protection structure along the Preserve that is heavily impacted by the Gulf Intracoastal Waterway (GIWW). Three miles of channel lie adjacent to the Preserve's bay frontage. The GIWW has eroded through a section of the Preserve referred to as "The Oxbow" quickly increasing salinities across this marsh system.



Figure 37. Mad Island Marsh Preserve Location

1640 Aransas National Wildlife Refuge Dagger Point SP

Partner(s): Coastal Bend Bays and Estuaries Program (CBBEP)

Phase: E&D; Permitting

Budget: \$162,500

Location: Aransas County

CEPRA Share: \$97,500

Project Description

The project will create a final engineering design template for a shoreline protection structure along the Dagger Point portion of bay shoreline at the Aransas NWR. The Refuge was devastated by Hurricane Harvey in 2017 and subsequently was awarded USFWS Harvey Relief Funds that will be used for construction in Phase II.

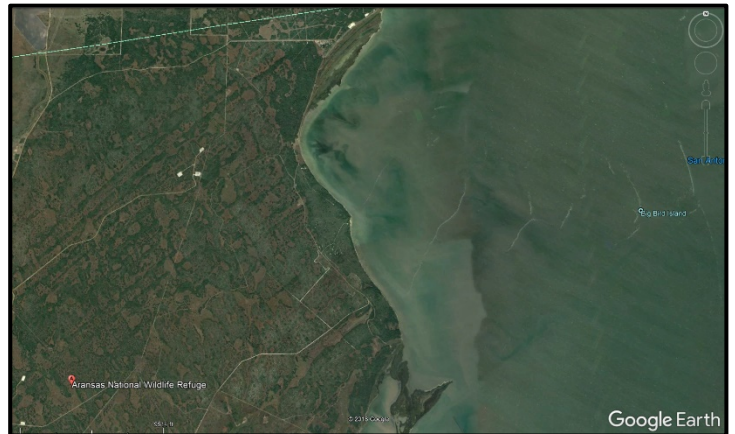


Figure 38. Aransas NWR Dagger Point Location

1641 Shamrock Island SP Phase III

Partner(s): The Nature Conservancy

Phase: E&D

Budget: \$1,285,700

Location: Nueces County

CEPRA Share: \$200,000

Project Description

The project will create a final engineering design template for the previous Cycle 9 project's North Breach area which was damaged during Hurricane Harvey. Alternatives will be investigated to create a more resilient structure. RESTORE funding is also being secured to implement construction of a feeder beach, which was not included in Cycle 9 construction due to funding restrictions.



Figure 39. Shamrock Island North Breach Location

1645 Carancahua Bay SP

Partner(s): Texas A&M AgriLife

Phase: E&D; Permitting

Budget: \$140,133.00

Location: Galveston County

CEPRA Share: \$125,000.00

Project Description

The project will create a final engineering design template to protect and restore wetland and aquatic resources at the mouth of Carancahua Bay. The strategy will be to design a living shoreline that will successfully reduce wave energy to return hydrodynamic conditions to a suitable living condition for wetland plants and seagrasses.

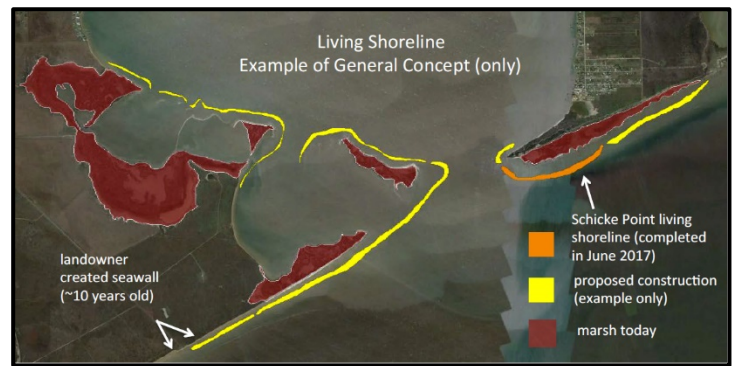


Figure 40. Carancahua Bay Project Location

1648 Triangle Tree Rookery Island SP

Partner(s): CBBEP

Phase: E&D; Permitting

Budget: \$125,000

Location: Kleberg County

CEPRA Share: \$75,000

Project Description

The project will complete engineering, design, and permitting for the construction of a shoreline protection structure around the northern portion of Triangle Tree Rookery Island. This structure will aid the rookery from wind and wave erosion while also securing sediment during future dredging placement events.

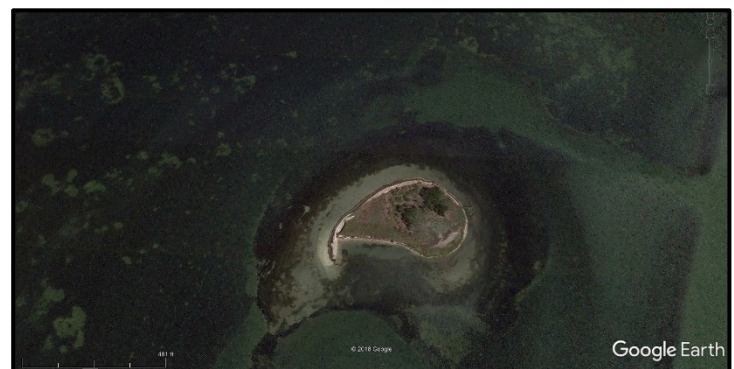


Figure 41. Triangle Tree Rookery Island Location

1650 Adolph Thomae Park SP

Partner(s): Cameron County Texas

Phase: Construction

Budget: \$700,000

Location: Cameron County

CEPRA Share: \$420,000

Project Description

Phase III of the project will construct 620 feet of shoreline protection. Final engineering and design have been completed to facilitate the construction of an articulated concrete block mat and a gravity wall. Without these structures, park facilities will remain in critical danger of being lost from vessel traffic, flooding, and storm surges through the Arroyo Colorado.

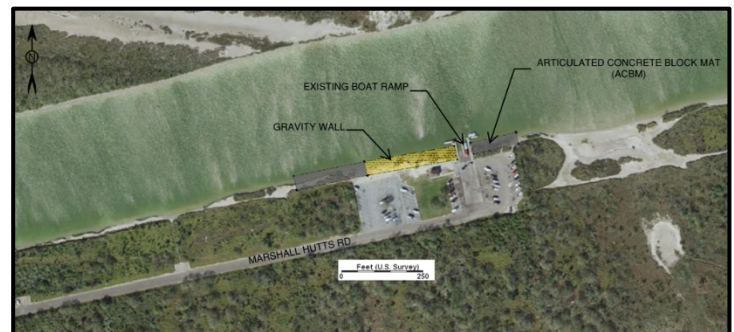


Figure 42. Adolph Thomae Park Project Location

1651 Indian Point Causeway SP Phase I

Partner(s): Port of Corpus Christi

Phase: E&D; Permitting

Budget: \$170,000

Location: Nueces County

CEPRA Share: \$170,000

Project Description

The project will continue restoration efforts around the Indian Point Marsh Area (IPMA). The IPMA area closest to the causeway is experiencing high levels of erosion. Alternatives will be explored to design an erosion control structure with marsh restoration to combat the rapid land loss.



Figure 43. Indian Point Causeway Location

1660 Indian Point SP Phase II

Partner(s): NRDA; The City of Portland; CBBEP; PCCA

Phase: Construction

Budget: \$2,002,727

Location: Nueces County

CEPRA Share: *\$5,000 in Cycle 9 Funds

Project Description

The project will continue restoration efforts around the Indian Point Marsh Area (IPMA). Previous erosion control breakwaters were emplaced in 2015 but due to funding deficits 6 breakwaters were not constructed. This phase will construct 1,800 linear feet of remaining breakwater. Due to Hurricane Harvey delaying CEPRA Cycle 10 funds, this project was initiated with CEPRA 9 funds.



Figure 44. Indian Point Project Location

1664 Bird Island Cove SP

Partner(s): NRDA; TPWD

Type: E&D; Permitting

Budget: \$191,000

Location: Galveston County

CEPRA Share: \$5,000

Project Description

The project will compliment previous shoreline protection structures constructed in the area. Final design and permitting will be completed if 8,550 linear feet of breakwaters. This project will enhance and protect approximately 135 acres of existing estuarine marsh and approximately 35 acres of restored marsh complex.

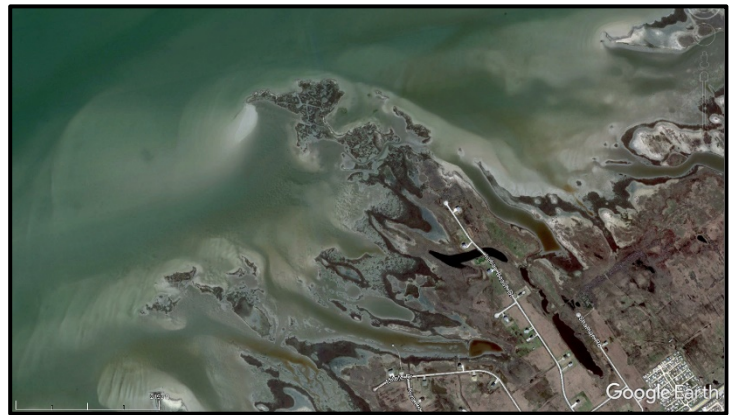


Figure 45. Bird Island Cove Project Location

STRUCTURE RELOCATION PROJECT



Figure 46. Cycle 10 Structure Relocation Project

1657 214 Jettyview Road, Surfside Structure Relocation

Partner(s): William S. Griffin III

Phase: Relocation

Budget: \$125,000

Location: Brazoria County

CEPRA Share: \$125,000 (Cycle 9 Funds)

Relocation Description

This project relocated a structure located at 214 Jettyview Rd., Village of Surfside Beach, Texas that was on the public beach.

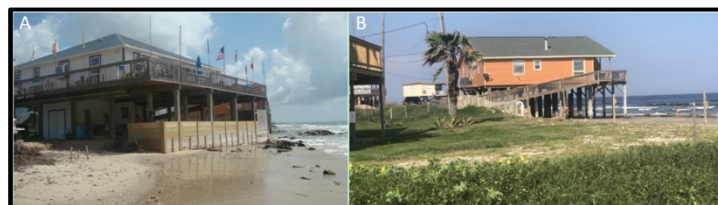


Figure 47. Structure Relocation before and after

HARVEY REPAIR PROJECTS



Figure 48. Cycle 10 BMMP & Hurricane Harvey Repair Projects

Hurricane Harvey devastated Texas coastwide in 2017 and inflicted damage along the entire coastline including many CEPRA Projects and BMMP Beaches. This section covers GLO projects that qualify for FEMA reimbursement by Section 406 Hazard Mitigation or the GLO's BMMP Program. FEMA obligates reimbursement to projects through Project Worksheets. FEMA will reimburse total project costs up to 90% leaving the GLO and qualified project partner to cost share the remaining 10% non-federal amount.

1661 Port Aransas Nature Preserve Hurricane Harvey Repair

Partner(s): The City of Port Aransas

Phase: Damage Assessment

Budget: \$310,000

Location: Nueces County

CEPRA Share: \$310,000

Project Description

The project's present scope encompasses a pre-FEMA Project Worksheet damage assessment of the shoreline revetment and bulkhead damaged during Hurricane Harvey. Upon FEMA Project Worksheet obligation, construction funds will be prioritized.

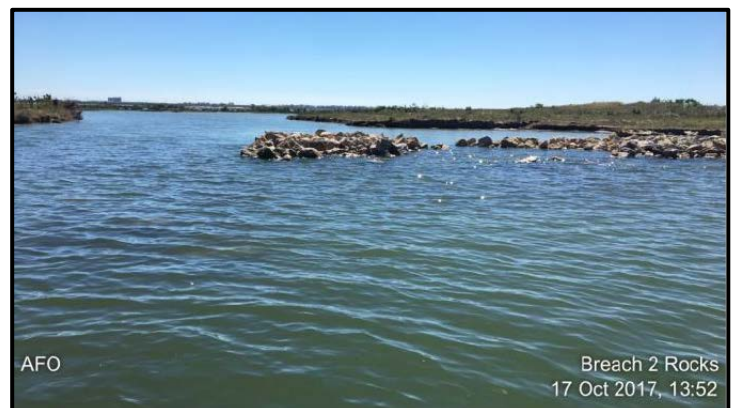


Figure 49. Port A Nature Preserve Harvey Repair

1665 Corpus Christi North Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): City of Corpus Christi
Phase: Project Worksheet Obligation
Budget: \$449,171
Location: Nueces County
CEPRA Share: \$33,688
Project Description

FEMA Project Worksheet Number 1665 has been obligated to renourish BMMP beach for the amount of sand lost during Hurricane Harvey. GLO and City of Corpus Christi will cover the 10% non-federal portion of total project cost.

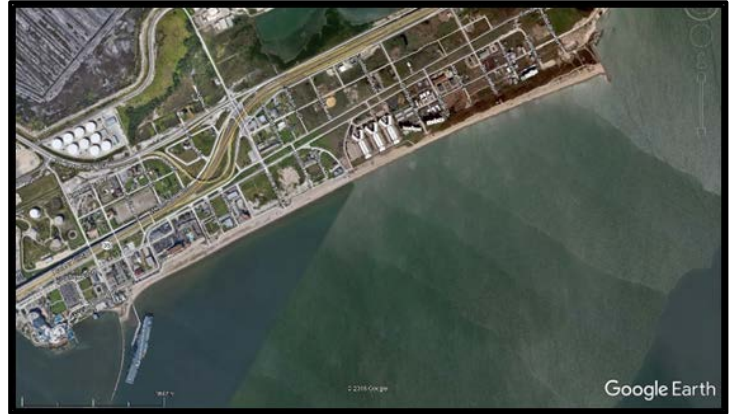


Figure 50. CC North Beach Project Location

1666 Sylvan Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): City of La Porte; Harris County
Phase: Project Worksheet Obligation
Budget: \$394,715
Location: Harris County
CEPRA Share: \$29,604
Project Description

FEMA Project Worksheet Number 2583 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and project partners, Harris County and City of La Porte will cover the 10% non-federal portion of total project cost.



Figure 51. Sylvan Beach Project Location

1667 Rockport Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Aransas Navigation District
Phase: Project Worksheet Obligation
Budget: \$639,255
Location: Aransas County
CEPRA Share: \$47,944
Project Description

FEMA Project Worksheet Number 1638 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and project partner, Aransas Navigation District will cover the 10% non-federal portion of total project cost.

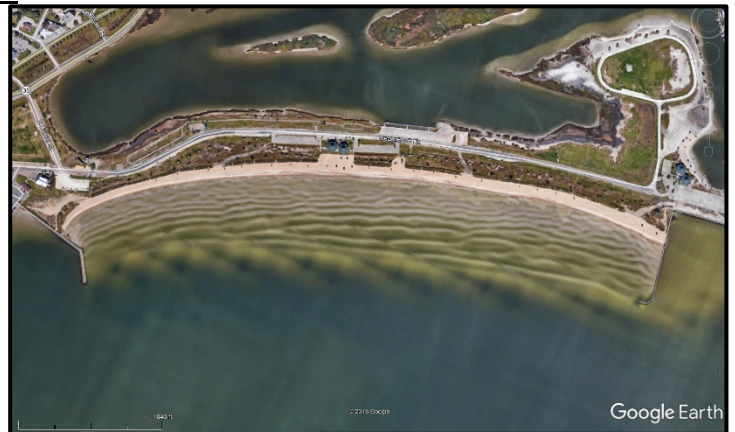


Figure 52. Rockport Beach Project Location

1668 Indianola Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Calhoun County

Phase: Project Worksheet Obligation

Budget: \$299,117

Location: Calhoun County

CEPRA Share: \$22,434

Project Description

FEMA Project Worksheet Number 2538 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and Calhoun County will cover the 10% non-federal portion of total project cost.



Figure 53. Indianola Beach Project Location

1669 Quintana/Bryan Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Town of Quintana

Phase: Project Worksheet Obligation

Budget: \$697,783

Location: Brazoria County

CEPRA Share: \$52,334

Project Description

FEMA Project Worksheet Number 2501 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and project partner, the Town of Quintana will cover the 10% non-federal portion of total project cost.



Figure 54. Quintana Beach Project Location

1670 Galveston Seawall (12th-61st St.) Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Galveston Park Board

Phase: Project Worksheet Obligation

Budget: \$7,168,099

Location: Galveston County

CEPRA Share: \$537,607

Project Description

FEMA Project Worksheet Number 3706 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and project partner, Galveston Park Board will cover the 10% non-federal portion of total project cost.

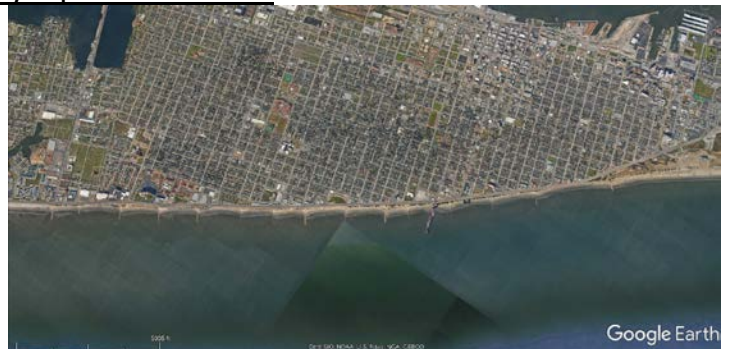


Figure 55. Galveston Seawall Beach Project Location

1671 Surfside Pedestrian Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Village of Surfside Beach

Phase: Project Worksheet Obligation

Budget: \$476,611

Location: Brazoria County

CEPRA Share: \$35,746

Project Description

FEMA Project Worksheet Number 2898 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and the Village of Surfside will cover the 10% non-federal portion of total project cost.



Figure 56. Surfside Beach Project Location

1672 Sargent Beach Hurricane Harvey Repair *BMMP Beach

Partner(s): Matagorda County

Phase: Project Worksheet Obligation

Budget: \$770,808

Location: Matagorda County

CEPRA Share: \$57,811

Project Description

FEMA Project Worksheet Number 2591 has been obligated to nourish BMMP beach from amount of sand lost during Hurricane Harvey. GLO and project partners, Matagorda County will cover the 10% non-federal portion of total project cost.



Figure 57. Sargent Beach Project Location

STUDIES

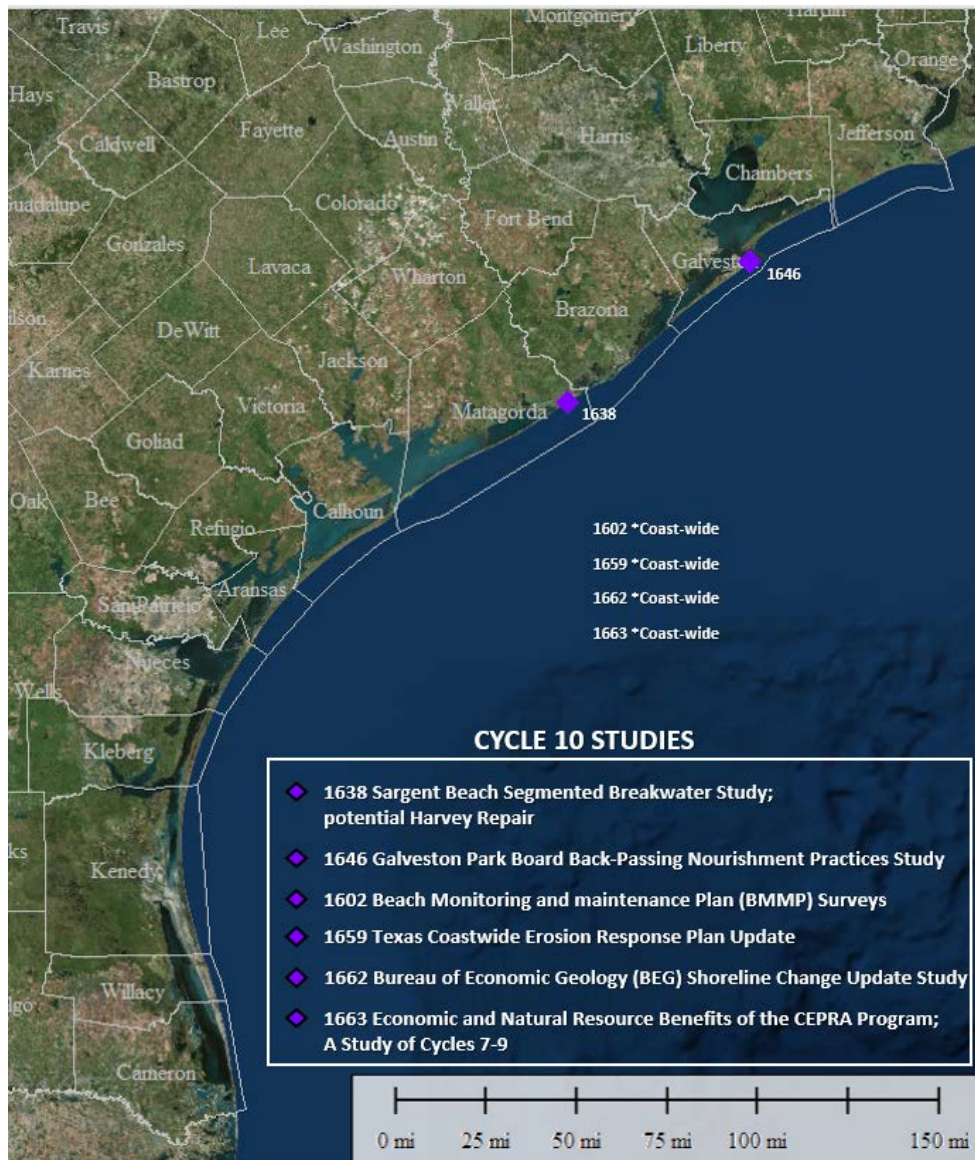


Figure 58. Cycle 10 Study Locations

1602 BMMP Surveys

Internal Study

Location: Coast-wide

CEPRA Share: \$992,710

Project Description

BMMP surveys are conducted yearly and triggered post-storm to monitor engineered templates of CEPRA-funded beaches. A BMMP report is provided to the GLO by Texas A&M Corpus Christi's Conrad Blucher Institute (CBI). CBI provides a website which archives survey data and offers a visual tool for the monitored beaches coastal restoration data called the Coastal Habitat Restoration GIS (CHRGIS). The CHRGIS website can be found here:

<https://cbi.tamucc.edu/CHRGIS/>.

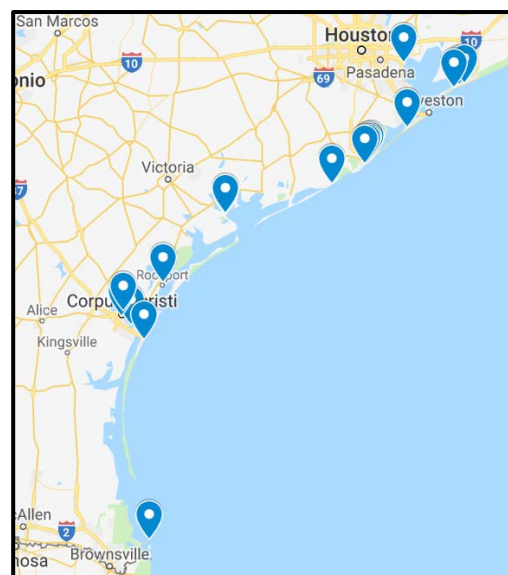


Figure 59. BMMP Beach Locations on CHRGIS Site

1638 Sargent Beach Segmented Breakwater and Beach Nourishment Study

Partner(s): Matagorda County

Phase: Study

Budget: \$197,000

Location: Matagorda County

CEPRA Share: \$118,200

Project Description

The objective of the Sargent Beach Study is to develop an integrated plan of erosion control structures and beach nourishment that maintains resiliency, mitigates risk, and strengthens efforts to protect and enhance the coastal ecosystem and infrastructure along Sargent Beach.



Figure 60. Sargent Beach Project Location

1646 GPB Back-passing Nourishment Practices

Partner(s): Galveston Park Board

Phase: Study

Budget: \$300,000

Location: Galveston County

CEPRA Share: \$150,000

Project Description

Study to evaluate the efficacy of a sediment by-passing system which will be deployed on the seafloor and pass sediment to the beach. Sediment will be dewatered and the used in maintenance events. Pilot project will study efficacy of state-wide use and may alleviate the amount of material the USACE needs to dredge to maintain navigation channels.



Figure 61. Galveston Beach Project Location

1659 Coastal Erosion Plan Update

Internal Study

Location: Coast-wide

CEPRA Share: \$35,000

Project Description

Utilizing the BEG's Shoreline Change data and report, the Texas coast-wide erosion plan is updated. The Plan encompasses highlighting the most critically eroding areas of the Texas coast while querying local communities about their continued needs to deal with erosion.

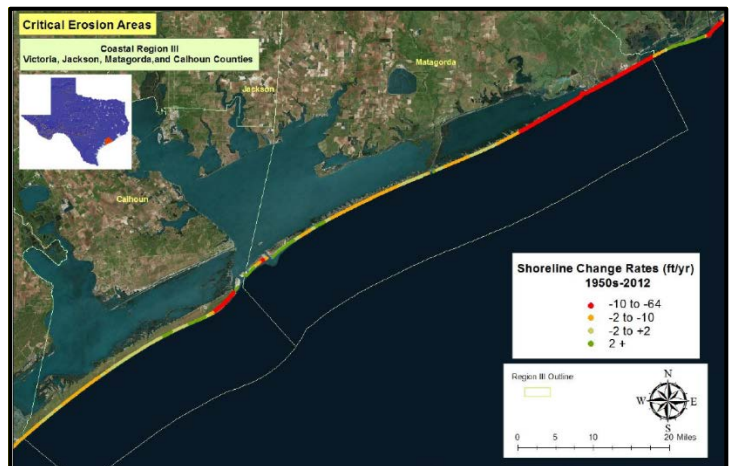


Figure 62. Assessment of a Critically Eroding Area

1662 BEG Shoreline Change Update

Internal Study

Location: Coast-wide

CEPRA Share: \$427,731

Project Description

Natural Resources code dictates the CEPRA Program must survey the Texas coast to assess historical rates of shoreline change. Shoreline change rates are used to identify areas that qualify for CEPRA funding, are used to develop development setback guidelines, and can monitor the programs successes in areas of implemented restoration. The BEG's Shoreline Change Project can be found here:

<http://www.beg.utexas.edu/research/programs/coastal/the-texas-shoreline-change-project>.

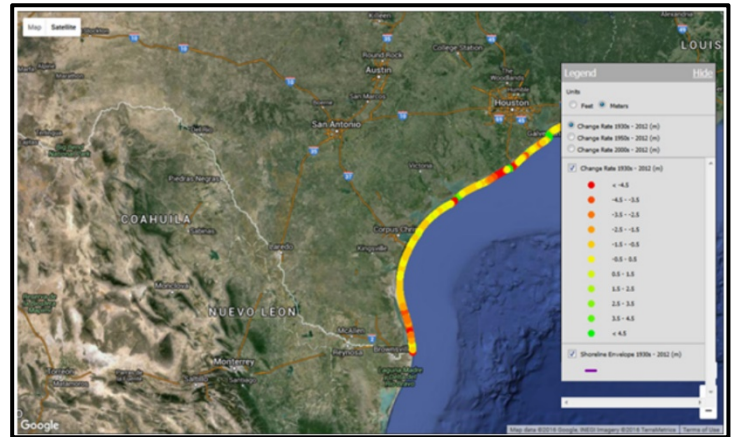


Figure 63. BEG Shoreline Change Project

1663 Economic-Natural Resource Benefits of CEPRA Projects

Internal Study

Location: Coast-wide

CEPRA Share: \$243,219

Project Description

Natural Resources code dictates the CEPRA Program must supply the Texas Legislature with an assessment of the efficacy of the CEPRA program. Recently completed CEPRA projects are assessed to determine what amount of return is made on every dollar spent on CEPRA projects. More on the report and the CEPRA projects evaluated can be found in the Economic and [Natural Resource Benefits of the CEPRA Program](#) section and the projects evaluated are highlighted in more detail in [CEPRA Projects Completed During the Cycle 10 Biennium](#) section.

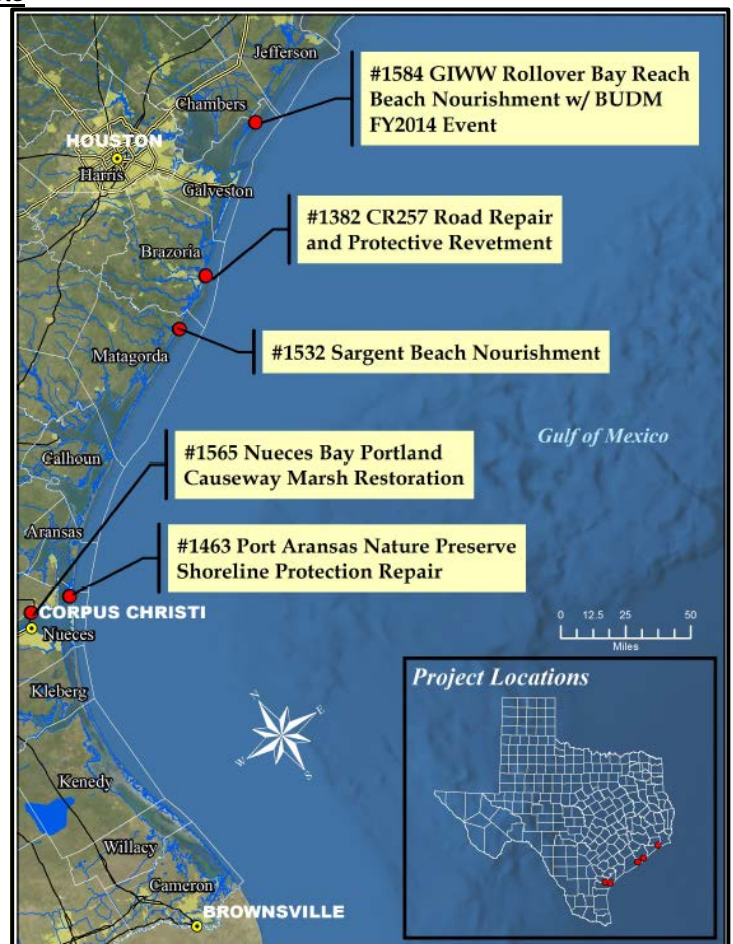


Figure 64. Assessment of Completed CEPRA Construction Projects

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