

Final Report
on
The Oyster Lake Shoreline Protection and Marsh Restoration Project

TCEQ Contract # 582-15-53288

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Prepared for:



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Executive Summary

The Oyster Lake Shoreline Protection and Marsh Restoration project aimed to protect sensitive estuarine marsh habitat on the Brazoria National Wildlife Refuge (NWR) from continued erosion and habitat conversion. The project is located along approximately 5,200 feet of severely eroding shoreline between Oyster Lake and West Bay. Wind driven waves have impacted the shoreline with severe erosion and resulted in vegetation and soil losses. It is estimated that since 1944, up to 650 feet of shoreline has been lost on the West Bay side and up to 150 feet of shoreline has been lost from the Oyster Lake side. Furthermore, the rate of erosion appears to be more extreme in recent years, as just since 1995, up to 175 feet of shoreline has been lost on West Bay side and 55 feet from Oyster Lake side (see Figure 2).

GBF and project partners developed the Oyster Lake Shoreline Protection and Marsh Restoration project to reduce wave energy impacting the shoreline, halt erosion of the shoreline, and promote deposition of suspended sediments landward of the structure. After acquiring the necessary permits and competitively bidding the project, GBF oversaw the construction of 4,786-foot rip-rap breakwater which protects 5,150' of shoreline. The placement of the breakwater created an approximate fourteen (14)-acre calm water habitat area between the structure and shoreline that has the potential to restore intertidal wetlands as elevations allow. At the time of this report, approximately 1.5 acres of this area has been planted with smooth cordgrass by GBF volunteer groups and partners. The breakwater also protects upwards of 60 acres of coastal habitat that are part of the Brazoria NWR.

Project Description

The Oyster Lake Shoreline Protection and Marsh Restoration project aimed to protect estuarine marsh habitat on Brazoria National Wildlife Refuge (NWR) property from continued erosion and habitat conversion. The project is located along approximately 5,200 feet of eroding shoreline between Oyster Lake and West Bay. Wind-driven waves have impacted the shoreline with severe erosion and resulted in vegetation and soil losses.

West Bay is a high wave energy environment, particularly in the immediate area of the project shoreline. Just south of the project area, San Luis Pass allows for tidal exchange with the Gulf of Mexico. This pass also serves for ingress and egress of ecologically and economically important species that migrate between the Gulf and the bay. The project shoreline, located in this highly dynamic area, is the only separation between the calm, shallow waters of Oyster Lake and the high wave energy, deeper waters of West Bay. Historically, the calm, shallow waters of Oyster Lake have supported submerged aquatic vegetation and oysters. There is a concern that a breach in the project shoreline would open Oyster Lake up to the higher wave action of West Bay and likely result in conversion of the system to a deeper-water, higher-wave energy extension of West Bay. The resulting conditions within Oyster Lake would no longer be conducive to supporting sea grasses or oysters.

This project intended to reduce wave energies affecting the shoreline between Oyster Lake and West Bay, impede the pending breach between the two systems, and restore fringing marsh habitat along the shoreline through the installation of hard structure breakwaters and the transplanting of marsh vegetation behind the structures. It is anticipated that these breakwaters will not only reduce wave action and halt erosion, but they will also result in sediment accretion behind the structures, building up intertidal elevations for the expansion of fringing marsh habitat. The hard structures will also provide substrate on which oyster spat can attach and grow into matured oysters, increasing oyster bed habitat and reinforcing shoreline protection features. These practices have been demonstrated at numerous other high wave energy project sites around Galveston Bay with successful results in reducing erosion, accreting sediments, reestablishing fringing marsh, and providing hard substrate suitable for oyster development.

Work conducted under this agreement builds upon shoreline protection measures implemented in Phase I of this project. Phase I provided erosion protection for ~500 feet of West Bay shoreline and ~500 feet of protection on the Oyster Lake shoreline.

This project proposed the construction of near shore breakwaters along the shoreline to reduce wave energy impacting the shoreline primarily from West Bay, halt erosion of the shoreline, and promote deposition of suspended sediments landward of the structure. The goals and objectives of the project are to:

- construct up to 4,700 feet of breakwater along the eroding shoreline;
- restore estuarine intertidal salt marsh between breakwater and shoreline; and
- protect the valuable coastal habitat of a federal refuge property.



Approximate locations of Oyster Lake shorelines in 1944 (blue), 1995 (green), and 2010 (red), indicating severity of shoreline loss in this area

Project Methodology

Project activities began in 2014 with GBF securing consulting and survey agreements. In June of 2014, A LSLS and bathymetric survey was completed. A contract between GBF and HDR was executed. HDR visited the site to view phase 1 and the layout of the phase 2 site. The agreement delivered an engineer's recommendation on type, size and placement locations for the breakwater structures. This information was used to submit permit applications to USACE and lease application to Texas GLO. By the end of July 2015, permits were issued for the project; USACE SWG-2012-00679 and GLO SL20120046. GBF developed bidding and contract documents for the project.

A notice to Bidders was advertised in the Bay Area Citizen newspaper on June 18th and 25th. GBF also distributed the documents to project partners and directly to contractors that have expressed an interest in these type projects in the past. A pre-bid meeting was held at GBF office on June 30, 2015. Bids were received July 16, 2015

Bids were initially advertised to be due July 8, 2015. Potential bidders requested the date be delayed due to the close proximity of the original date to the July 4th holiday, which was causing

potential issues with bidders receiving bid bonds. An addendum was issued July 2, 2015, which clarified bidder questions and delayed the bid due date to July 16, 2015.

On July 16, 2015, five bids were received. GBF compiled the bids into a bid tabulation form. A bid tabulation sheet in which did not identify individual bidders by name was sent to local project funding partners for review. A conference call was held between the local partners on July 23, 2015. During the call the different bid options were discussed and it was decided that option 3 (rip rap breakwater to +2.5 elevation) would be the preferred option to award. Two contractors were very close in bid amounts for this option. GBF determined that the low bidder on the option was well qualified to complete the project and a Notice of Award was issued to Apollo Environmental Strategies on July 28, 2015.

A construction contract was executed between GBF and Apollo on August 11, 2015.

A pre-construction meeting was held at GBF offices on September 1, 2015.

A notice to proceed was issued to Apollo on September 18, 2015. The NTP set the start date of the project for September 21, 2015.

During the last week of September, Apollo received delivery of project materials and mobilized construction equipment. Breakwater construction began October 5, 2015.

After construction the first 850' of structure (BW8, 9, 10), Apollo estimated the quantity of material secure for construction would not be enough to construct the desired structure length of 4,700'. GBF discussed this issue with engineers at DU, and weighed different options to reduce material being used. Different options discussed included; widening the gaps, reducing the crest width of structure, increasing side slopes. GBF and DU contacted the design engineer at HDR for their recommendation. HDR expressed that the crest width should remain at the current 3' width and recommended increasing the slope from 2:1 to 1.5:1. This would decrease the bottom width of the structure from 17' wide to 14' wide. On paper, this would save 0.25 ton/ft and allow the quantity of material to construct longer segments of the breakwater. Aaron agreed with HDR's recommendation and Apollo began constructing the new footprint with BW11.

In mid-December the contractor reported that with the current quantity of material on hand the estimated length of breakwater that could be constructed was ~4,200'. GBF was able to locate a local source for a comparably spec'd concrete rip rap and purchased an additional 1,091 tons of rip rap to complete project construction. With the additional purchase of materials two contract change orders went into effect during the reporting period. At the beginning of the project the initial shipment of limestone rip rap was short by 203 tons. Change order #1, reduced the contract price by \$15,022.00, the contract cost for these 203 tons of material. Change order #2 added a total of \$47,331.20 to the original contract cost. As part of the change order GBF requested an additional two sign posts be procured and installed. This increased the contract by \$800. The remaining increase was for the additional labor to place 888 tons of the concrete rip rap at a cost of \$52.40 per ton. Please note that the contract labor cost only increased by 888 tons, as the labor to install the shorted 203 tons was included in the initial contract. GBF procured and paid for the additional concrete material directly at a rate of \$25 per ton.

GBF and DU visited the site on January 4, 2016 to perform a final walkthrough. Work was approved pending final site cleanup. Apollo demobilized from the site on January 5th and GBF verified site cleanup during a site visit on January 8th

Project Results

At the conclusion of this grant agreement, August 31, 2016, all required tasks have been completed.

The project resulted in the construction of an approximately 4,786-foot breakwater to protect approximately 5,150 foot of the Oyster Lake shoreline from continued erosion. Reflective warning signs and project partnership signs were placed just bayward of the breakwater to warn and inform boaters in the area. The breakwater ends were left open, not tying into the existing shoreline and gaps were integrated into the breakwater structure to enable ingress/egress for water and wildlife. The breakwater protects upwards of 60 acres of coastal wetland habitat and created a fourteen (14)-acre calm water habitat area between the breakwater and shoreline. This fourteen (14)-acre area has the potential to restore intertidal wetlands as elevations allow. At the time of this report 1.5 acres of this area has been transplanted with smooth cordgrass by community volunteers and project partners.

Moving Forward

Upon completion of this grant agreement GBF will continue to pursue volunteer or contractual opportunities to plant the area behind the breakwater with smooth cordgrass.

GBF will monitor the project site for five (5) years with funding from NFWF. Monitoring will include vegetation data and elevation surveys.

Project Funding

Partner	Contribution	Contribution Type
GBEP (TCEQ)	\$80,000.00	State
USFWS	\$28,778.00	Federal
DU-NOAA	\$100,000.00	Federal
NFWF GEBF	\$967,080.00	Private
GLO CEPRA	\$270,000.00	State
CCA Texas	\$114,000.00	Private
TCEQ SEP	\$25,000.00	Private administered by state
NRG	\$6,900.00	Private in-kind
Total	\$1,591,758.00	

Project Conclusions and Lessons Learned

In planning for the project it was determined that the expected cost to place a breakwater at the preferred elevation of +2.5 NAVD the available budget would be very tight. With this in mind, project construction bidding was broken down into several options and payment would be based on quantity of material placed instead of linear foot placed. In a project of this nature the norm is to bid as linear foot placed. With the anticipated cost GBF did not think a bidding structure based on linear foot placed would not have afforded the opportunity to construct to elevation +2.5. In bidding quantity based GBF did receive bids that allowed construction to +2.5 within budget. However, even though precautions were made throughout construction to track tons of material per foot in order to track progress and anticipate final breakwater length, the project ran short of material as originally contracted. The material shorted would have left the breakwater well short of the desired length of breakwater constructed. Thankfully, GBF was able to locate alternative materials locally at a reduced cost and was able to complete the breakwater at the desired elevation and length. Future projects should be looked at very closely to determine which way to bid the project either quantity based or length based.

Late 2015 and early into 2016, the Galveston Bay area was subjected to extremely high tides and winds for an extended amount of time. During these high tides, erosion and sediment washout occurred behind Phase 1 of the project. In hind sight it may have been prudent to construct a larger structure, similar to Phase 2 in front of phase 1, which is constructed at a lower elevation. However, up until that time Phase 1 showed promising results of reducing erosion and marsh establishing behind the breakwater. GBF has a balance of project funds that were tabbed to be used to contract vegetation plantings behind the Phase 2 breakwater. With the recent erosion issue behind Phase 1, those funds may go towards extending the Phase 2 breakwater in front of Phase 1.

Project Photographs



Beginning Construction, October 6, 2015



October 14, 2016



November 3, 2015



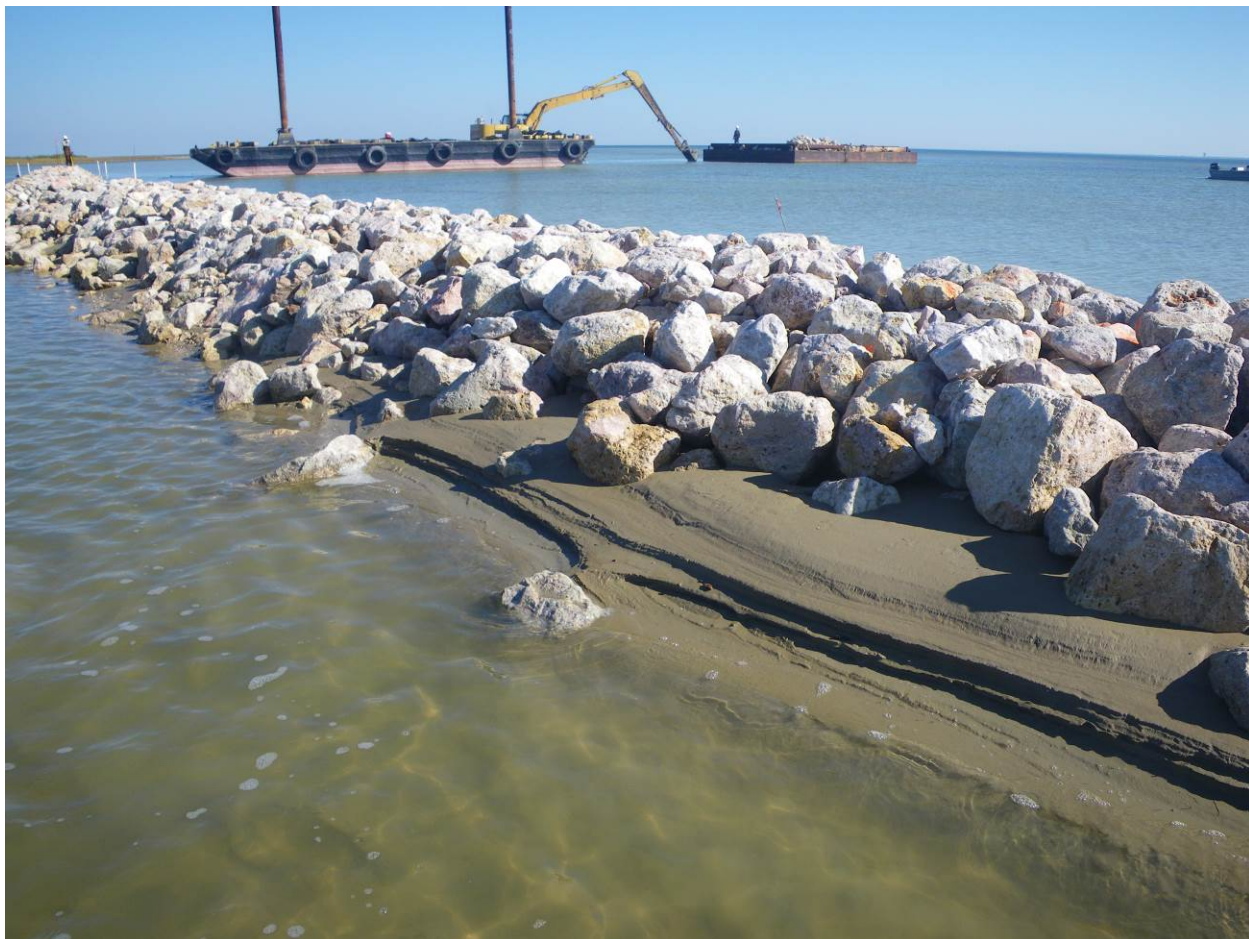
November 12, 2015



November 23, 2015



December 9, 2015



Project already showing signs of accretion; December 9, 2015



Accretion, 1/4/2016



Planting event, 6/21/2016



After planting event 6/25/16

Oyster Lake Shoreline Protection and Wetlands Restoration Project Phase 2



Performed in part with penalty monies from a Texas Commission on Environmental Quality enforcement action

For more information about this exciting project,
please contact the Galveston Bay Foundation at 281.332.3381.
www.galvbay.org

Partnership signage placed at multiple locations at project site