

Oyster Restoration Through Community Participation

GLO Contract # 11-020-000-4318

FINAL REPORT

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Prepared for:



A REPORT OF THE COASTAL COORDINATION
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PROJECT SUMMARY

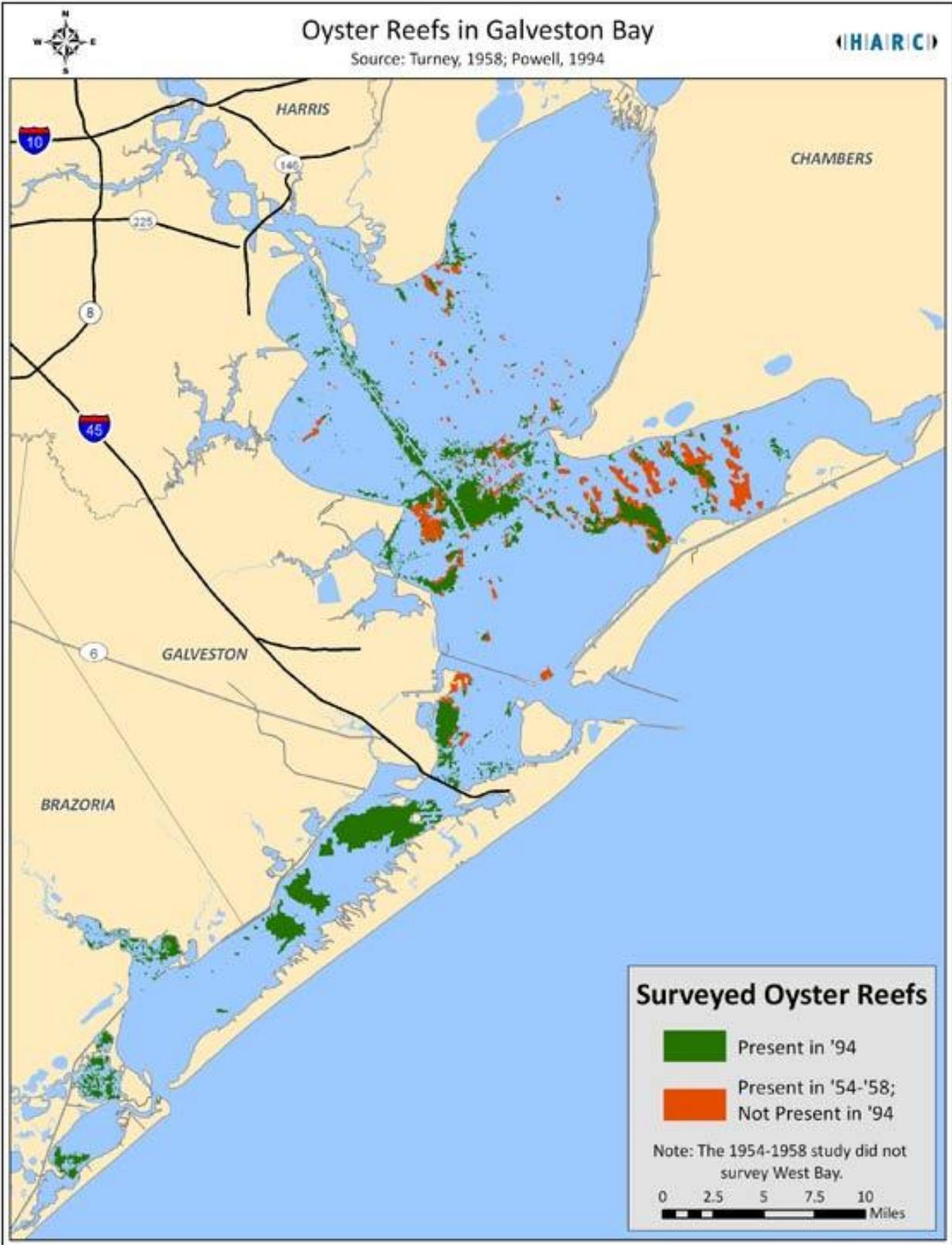
The Galveston Bay Foundation (GBF) recognizes the critical need for oyster restoration to maintain a healthy and sustainable estuarine system. Due to 2008's Hurricane Ike, it is believed that over 50% of Galveston Bay's oyster reef habitat (80% in East Bay) was destroyed from sedimentation (Texas Parks and Wildlife Department estimate). Productive oyster reefs provide many beneficial functions throughout Galveston Bay. As natural bio filters, oyster help to improve the quality and clarity of the surrounding water. They provide shelter and feeding grounds for many types of wildlife including various invertebrates, fish, and birds. Oyster reefs can also act as breakwaters, helping to reduce wave and wake impacts along shorelines and they are also beneficial to both commercial and recreational fisheries.

The goals of this project include educating the public about the importance of oysters to the Galveston Bay ecosystem, and recruiting volunteers and interested stakeholders to assist with oyster restoration, education and oyster gardening efforts in Galveston Bay. This will assist GBF with reinstating its oyster restoration program and help address the issues that have arisen since Hurricane Ike.

This project focus' on enhancing and restoring oyster reefs, which are a Coastal Natural Resource Area, and it aligns with specific CMP goals including protecting, preserving, and enhancing CNRA's and also educating the public about coastal issues and protecting and improving CNRA's.

The mission of the Galveston Bay Foundation is to preserve, protect and enhance the natural resources of the Galveston Bay estuarine system and its tributaries for present users and for posterity. GBF achieves this through four goals: advocacy, conservation, education, and research. This project allows us to focus on these goals, specifically through conservation and community education.

Figure 1: Galveston Bay Oyster Reefs (1994)

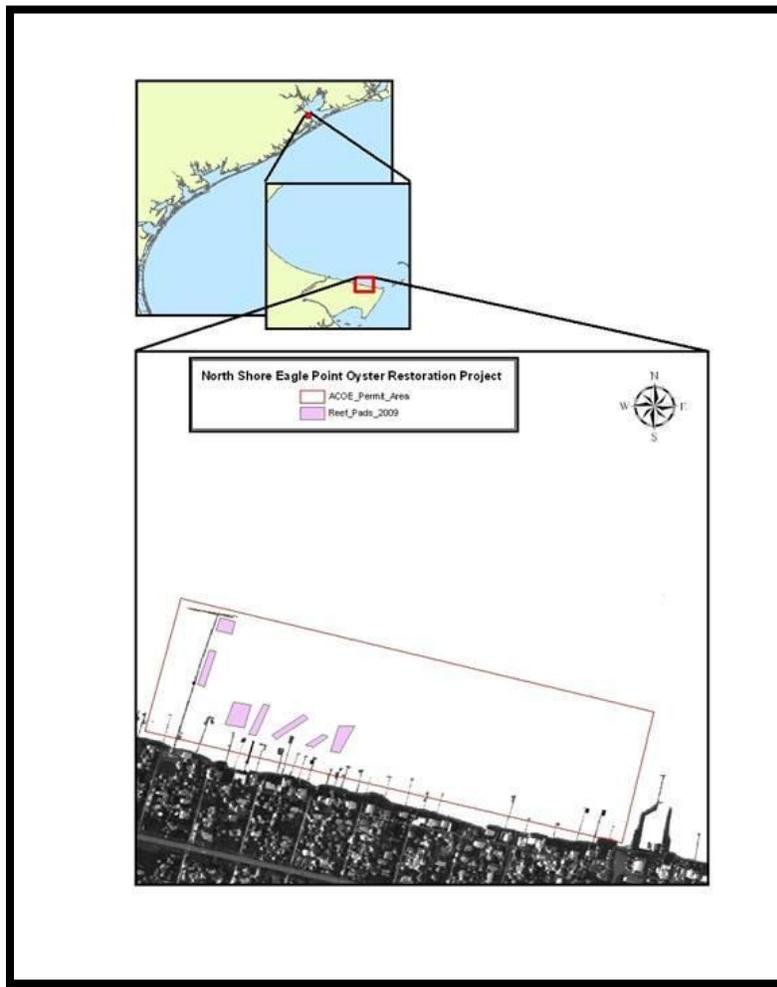


INTRODUCTION

The restoration of existing oyster reefs and the construction of new reefs have many benefits including improved water quality, enhanced fish habitat, and increased commercial and recreational value. Another benefit to the construction of near shore reefs is that reefs within 200 feet of privately owned piers cannot be commercially harvested. This means that these reefs can continue to develop and grow without being harvested, and their spawn will help increase reef populations throughout the bay.

Since 2009, the Texas Parks and Wildlife Department (TPWD) has been working to restore nearshore oyster reefs along the north shore of San Leon, on Galveston Bay (see Figure 2). The Galveston Bay Foundation sought to help enhance this project through community education, oyster gardening, and community involvement. Although the main site location for this project is located along the north shore of San Leon, community education efforts were directed around the entire Galveston Bay region in an effort to increase the public's knowledge and interest in the importance of oyster reefs in Galveston Bay.

Figure 2: Map of Primary Project Area



This project involved the development of educational materials (handouts, presentations) and distributing this material to the public through community events and presentations. These presentations and events help to not only educate the public about the importance of oyster reef habitat and oyster reef restoration in Galveston Bay, but also provided them with information about how they can become involved by volunteering to assist with these projects.

Three tasks were proposed for this project: The production and distribution of outreach materials; the recruitment of volunteers and interested stakeholders; and oyster gardening.

PROJECT IMPLEMENTATION

The first and longest running task was the development and distribution of educational materials for outreach. Immediately after the execution of the grant, development of an oyster restoration informational brochure was begun. This brochure highlights oyster gardening, the habitat benefits oysters provide, and the importance of oysters to Galveston Bay (see Outreach Deliverables). It was edited and approved, and the first round of printing was done in December 2010. These brochures were used throughout the project to provide information to interested parties, as well as given out at presentations and events to provide more information to the public about oyster reef restoration efforts.

Also in December 2010, GBF began efforts to recruit volunteers and interested stakeholders that could assist GBF with its oyster restoration efforts. This began with a call for volunteers posted both on the Galveston Bay Foundation website, and also in our quarterly newsletter, The Gazette (see Recruitment Deliverables).

In early 2011 development of an oyster restoration PowerPoint presentation began, along with research to find outreach opportunities throughout the Galveston Bay region (included in electronic submission only). Time was also spent in January and February meeting with interested residents in San Leon to discuss the gardening portion of the project and recruiting volunteers to assist with oyster gardening efforts. In preparation for oyster gardening, supplies were purchased and mesh bag samples were ordered to determine the best material to use for the oyster bags. GBF continued coordination with TPWD Oyster Biologists in preparation for the oyster gardening aspect of the project.

By April 2011, the oyster restoration brochure was being mailed to interested parties and distributed at community events. Along with community events, there was also a presentation to a local Sea Scout Troop. The details of the summer gardening project were finalized, and a volunteer list was compiled. Nine piers in the community of San Leon committed to the gardening project, while presentations were given to the nearby community of Baycliff in an effort to recruit more volunteers. A cured shell donation was secured for the project and shell was bagged by volunteers to prepare for the oyster gardening work session in June. Education and outreach continues at Galveston Bay Foundation's Bay Day event on May 21. An estimated 7000 visitors attended the event. GBF had an oyster restoration booth at the Bay Day event where patrons were taught about oyster reef habitats, oyster reef restoration efforts, and shown examples of live oysters and oyster reef inhabitants with a live reef exhibit.

June 2011 kicked off the oyster gardening project, with volunteer work days on June 18th and 30th. In San Leon, 20 volunteers assisted GBF staff with hanging approximately 100 bags from nine volunteer piers. Additionally, approximately 30 bags were hung from five piers in the nearby community of Baycliff. Throughout the summer, routine maintenance of the oyster bags was conducted by volunteers. The maintenance includes pulling the bags out of the water and rinsing them to remove predators and algae, checking and repairing bags and ropes as needed, and monitoring oyster spat settlement and growth. Throughout the summer, these volunteers contributed over 160 hours maintaining the gardening bags. Along with the regular maintenance, outreach continued with the development of a community-based oyster reef restoration display for events (See Outreach Deliverables). Planning began to determine a date for the placement of the successfully gardened oysters onto the restoration reefs at the end of the summer.

The oyster gardening project wrapped up in September with a workdays on the 16th and 17th. GBF met with TPWD staff on the 16th to collect data on the number of oyster spat contained within a percentage of the gardened bags. The next day GBF and TPWD directed volunteers in the removal of oyster bags from the piers, loading them onto a boat and dispersing the gardened oyster shells on the restoration reefs adjacent to the gardening piers in San Leon. A press release was issued about the event, and a couple of local media outlets ran brief stories about the community-based oyster reef restoration project in San Leon. Volunteer data sheets were collected and volunteer numbers were compiled. Throughout the project, a total of 95 people volunteered a total of 444.5 hours, worth \$3222.63.

Progress with the project was delayed with the original project manager resigning her position with GBF in November. The Galveston Bay Foundation proceeded with advertising the position and hiring a new project manager, and filed for an extension to the program grant. The new project manager began in March 2012. At that time the focus was placed on enhancing the education and outreach materials regarding oyster restoration and to continue to conduct outreach programs. Development began on an oyster gardening booklet that describes the process, elaborates on the importance of oyster reefs, and highlights how the Galveston Bay Foundation can assist with this process. A one-page handout was also created, with the purpose of providing basic oyster facts for the public. The one-page handout is included in the section for outreach materials deliverables, but due to the format of the gardening outreach booklet, it is included in electronic format only. Along with these projects, several outreach programs were given. Over two days, biology students from College of the Mainland (Texas City, TX) met with the project manager to learn about Galveston Bay oysters, their importance to the ecosystem, and the various aspects of oyster reef restoration that GBF is involved in.

On June 2nd, two meetings were conducted on Galveston Island. The first was partnered with TPWD and included an oyster restoration and gardening presentation to approximately 30 residents of Jamaica Beach. Information regarding community-based restoration programs was provided to the homeowners, and GBF staff assisted TPWD with beginning gardening in Jamaica Beach which will benefit a nearby restoration site adjacent to West Bay. Afterwards, the project manager met with the owners of Pelican Rest Marina in

Galveston to discuss several Galveston Bay Foundation conservation efforts planned at the marina, including oyster reef restoration. The marina is already permitted for restoration, and advice was provided in methods to determine if adjacent reefs are producing spat (through gardening bags and the placement of reef balls). The marina also agreed to provide us with a location to place outreach materials for the public and oyster restoration brochures were left with the owners.

The final outreach event of the project was Galveston Bay Foundation's 2012 Bay Day at the Kemah Boardwalk on Saturday, June 9, 2012. Over a five hour period, GBF staff and volunteers discussed the importance of reefs to Galveston Bay, the issues that have arisen over the past few years affecting Galveston Bay oyster reefs, and how local residents can become more involved in local restoration and education efforts. Oyster restoration handouts were distributed, and the oyster restoration banner was used as well. Additionally, two display containers showed the visitors various organisms that live in and around oyster reefs.

PROJECT RESULTS

The efforts to contact and recruit local volunteers was a huge success. Even after the culmination of the gardening project, many of the volunteers have continued monitoring the reef that was restored in front of their homes, and have been back in touch with the project manager inquiring about future efforts in the area.

The oyster gardening project was also very successful. The means and materials used for the project were very effective in establishing oyster spat settlement and growth. This is evident in the photographs of the oyster growth approximately 2 ½ months after gardening began (see Figure 3). We are hopeful that these gardened oysters were of great benefit to the created reef near San Leon, and that the reef will continue to grow and thrive.

Figure 3 – Oyster spat grown at the San Leon project site



Education and outreach, along with the development of new materials have continued throughout the duration of the grant. Over the final three months, new materials have been developed and internally reviewed. These products are attached for your perusal and will be used to continue to educate volunteers, interested stakeholders, and the general public about the ongoing oyster restoration efforts that involve the Galveston Bay Foundation. In addition, information and ideas that were observed during this project will be used to enhance the future development of education and outreach programs.

LESSONS LEARNED

There were several lessons that were learned from this project, all of which are beneficial to future restoration project efforts. It appears that there is a long term benefit to focusing outreach to communities and engaging them in restoration efforts. Continued contact with the residents of San Leon who volunteered with this project has shown that many of these people are interested in continuing projects into the future. Another contributing factor to this is that active participation with this project provided a sense of ownership with the reef restoration site, and provided an additional sense of accomplishment. Both the gardening process and the restoration were very successful, because of the efforts of these volunteers.

Another lesson taken from this project is that there is a definite correlation between the frequency of maintenance and monitoring of the gardening bags and the potential for successful gardening. Piers with more frequent monitoring showed a higher spat attachment. This can be attributed to several factors including that the increased monitoring helped to minimize the time that predators were exposed to the spat, and also that more frequent monitoring meant that damaged bags were noticed, and repaired more quickly. This meant there was less of a chance of the bags breaking free, or ripping completely open causing a total loss of the shell in the bag.

TASK 1 DELIVERABLES

Community-based Oyster Reef Restoration Tri-fold Brochure
Community-based Oyster Reef Restoration Program Display
Galveston Bay Oyster Fact Sheet

*Oyster Gardening informational booklet is not included in this report due to the length of the file. It is included with the digital report.

Community-based Oyster Reef Restoration Tri-fold Brochure



Oyster reefs are critical to Galveston Bay

Oyster reefs are vital in maintaining the Galveston Bay ecosystem. Reefs provide habitat for bottom-dwelling fish and invertebrates which attract larger game fish. Reefs stabilize the bay bottom and break wave energy, preventing shoreline erosion. The oyster acts as a natural filtration system, removing silt and contaminants from the water. A single oyster can filter up to 50 gallons of water per day! A large, healthy oyster population filters large volumes of water and thereby improves local water quality and clarity.

Galveston Bay's oyster reefs were hit particularly hard during Hurricane Ike in 2008. The storm deposited a layer of sediments and debris atop the bay bottom, smothering live oysters. More than 50 percent of the oyster reef habitat in Galveston Bay, and 80 percent of East Bay's oyster population was destroyed. The oyster reefs have still not recovered. Since then, a number of efforts have been launched to restore Galveston Bay's oyster reefs--including projects led by the Galveston Bay Foundation.

Project partners

A publication of the Coastal Coordination Council pursuant to National Oceanic and Atmospheric Administration Award No. NA16R0243R0007.



Community-based Oyster Reef Restoration



If you are interested in oyster restoration, please contact GBF's Oyster Restoration Project Manager:
Tiffany Andrey
281.332.3381x203
tandrey@galvbay.org

www.galvbay.org

Oyster gardening for oyster reef restoration

Galveston Bay Foundation (GBF) applies a community-based approach to its oyster reef restoration projects. Local volunteer citizens and groups are invited to "oyster garden" with us! Volunteers compile bags of reclaimed oyster shell for local pier owners to hang off their piers for the oyster gardening process. Volunteers and pier owners monitor the growth of young oysters, called spat, which attach to the shells inside the oyster gardening bags. After a couple months of development, the oysters are removed from the piers and bags and then distributed across artificially-constructed reef pads nearby where they will flourish as part of a restored oyster reef. Note: Oysters produced in GBF's oyster gardening programs are not for consumption; they are only to provide ecosystem services such as water quality improvements, habitat creation, and shoreline protection.



Photos: Galveston Bay Foundation, Texas Parks and Wildlife, and volunteers are working on community-based oyster restoration projects in the San Leon and Kemah areas of Galveston Bay. Volunteers are creating bags of reused shell and hanging them from piers during the oyster gardening process before placed to create restored reefs.



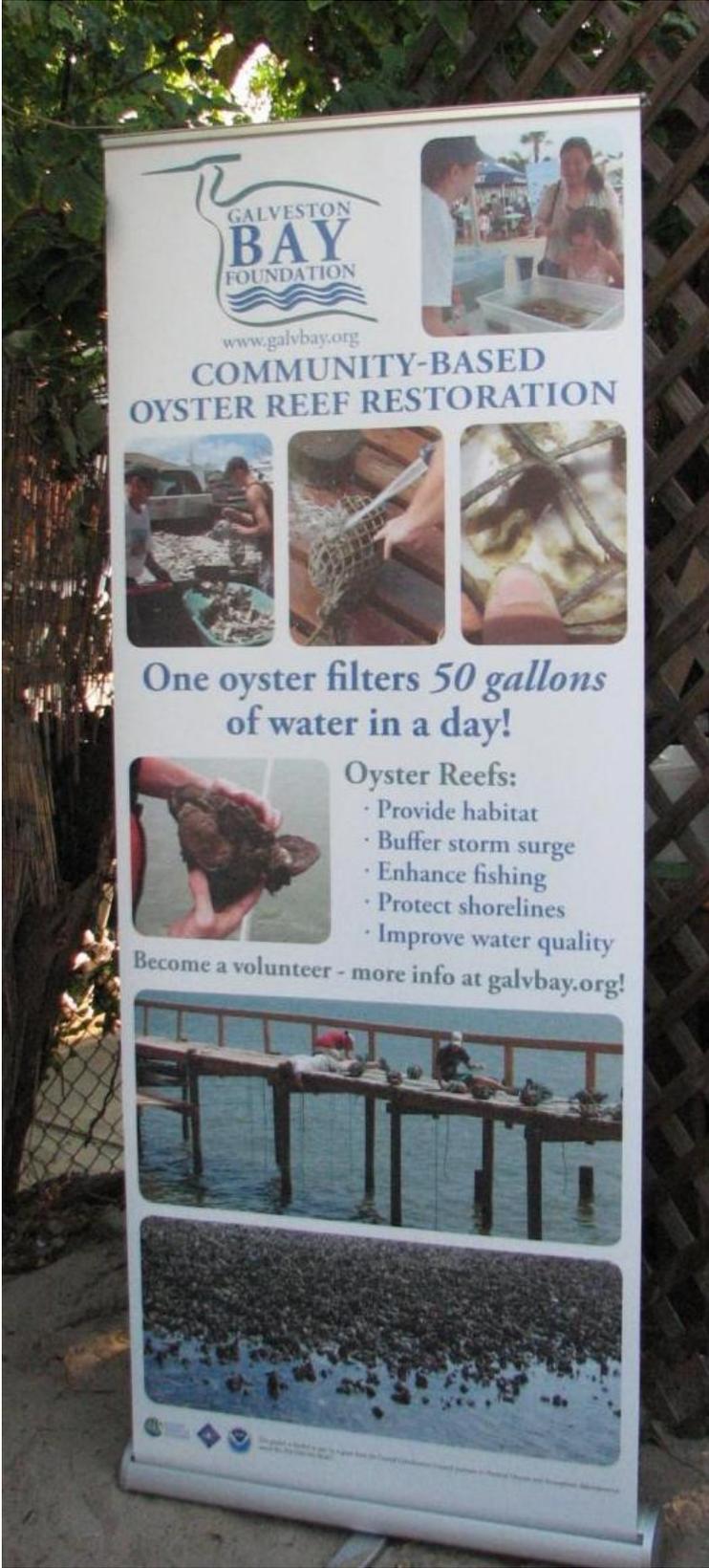
Oyster reefs

- Improve water quality
- Provide habitat for fishery species
- Protect shorelines
- Buffer storms
- Stabilize the bay bottom
- Improve fishing
- Provide a source of food for birds & other wildlife

preserving, protecting, and enhancing the natural resources of the Galveston Bay estuarine system



Community-based Oyster Reef Restoration Program Display



Galveston Bay Oyster Fact Sheet

GALVESTON BAY OYSTERS

WHERE AND IN WHAT CONDITIONS DO OYSTERS LIVE?

- The Eastern oyster (*Crassostrea virginica*) is native to Galveston Bay.
- Adult oysters are sessile (cannot move).
- Free floating larvae (spat) require hard substrate on which to attach in order to develop.
- Ideal conditions include good water circulation, temperate water (68-86 ° F is ideal), and moderate salinity (10-30 ppt).
- Oyster reefs can be intertidal or subtidal (to depths up to 25 ft).

WHY ARE OYSTERS IMPORTANT?

- Oyster reefs provide shelter and foraging opportunities for many different species of fish, shrimp, and crab.
- Oyster reefs stabilize the bay bottom and break wave energy, protecting shorelines from erosion.
- Oysters act as a natural filtration system by filtering silt and contaminants from the water, making it cleaner and clearer.
- A single oyster can filter up to 50 gallons of water a day!

WHAT IS THE STATUS OF OYSTERS, BOTH GLOBALLY AND LOCALLY?

- Recent studies show that oyster reef is the most threatened marine habitat worldwide, with 85% loss on a global scale (Source: Beck, et al. Shellfish Reefs at Risk, 2009. PG.2)
- Prior to 2008, Galveston Bay accounted for 80% of all oysters harvested in Texas.
- In 2008, Hurricane Ike severely impacted nearly 60% of Galveston Bay's oyster reefs as sediments from the storm deposited on reefs and physically smothered oysters. East Bay lost 80% of its reefs. (Source: TPWD—Galveston Bay Oyster Reefs Expanding. Aug. 15, 2011)

HOW CAN I GET INVOLVED IN OYSTER REEF RESTORATION?

- Contact the Galveston Bay Foundation (GBF). By working with GBF, you can get involved in ongoing efforts including:
 - Oyster gardening
 - Oyster reef restoration
 - Oyster shell recycling

For more information on Galveston Bay Foundation's oyster restoration projects, please contact Matthew Abernathy, Conservation Programs Outreach Specialist, at 281.332.3381 x203 or mabernathy@galvbay.org. You can also visit galvbay.org/conservation_oyster.html or simply scan the QR Code below with your smart-phone!



TASK 2 DELIVERABLES

GBF Gazette 'Call for Volunteers'

GBF Website 'Call for Volunteers'

Press Release - *Galveston Bay Foundation Works With Local Bay Residents to Restore Near-shore Oyster Reefs* (published in the Texas Newcomer Press September 15, 2011)

GBF Gazette ‘ Call for Volunteers’

Galveston Bay Foundation

GBF

GAZETTE

Volume 20, Issue 3
 Fall 2010 Gazette

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Protecting A National Wildlife Refuge

In 2006, the Galveston Bay Foundation joined with the U.S. Fish and Wildlife Service and a long list of partners and supporters to undertake a fairly ambitious task—protecting the Anahuac National Wildlife Refuge's (NWR) bay shorelines from continued erosion. Shoreline erosion of up to 10 feet per year in some places had resulted in extreme losses of valuable land and habitat. Gently sloping shorelines with consistent fringes of valuable intertidal marsh habitat had been replaced by steep bluffs and very patchy remnants of marsh. Had this erosion trend been allowed to continue, saltwater would have eventually intruded upon the more landward brackish and freshwater wetlands and coastal prairies, significantly changing the hydrological regime and altering the ecological diversity of the area.

Thanks to the efforts of many who recognized the need to protect this valuable resource, this trend of erosion and habitat loss has been stopped along Anahuac NWR's East Bay shoreline. The first phase of work in 2006-2007 consisted of construction of 16,802 feet of rock breakwaters and 200 feet of reef dome breakwaters. The second phase of work in 2009-2010 built upon previous successes and resulted in the construction of another 17,771 feet of rock breakwaters plus 1,380 feet of ReefBLK™ breakwaters. Combined, these two efforts from 2006 to 2010 have in effect **protected 36,153 feet of Refuge shoreline—equivalent to 6.85 miles!**

Besides the extensive length of protected shoreline, what made this project so impressive was the level of creativity and innovation that project partners used in deploying personnel and equipment, which significantly contributed to its cost efficiency. The East Bay project site is extremely shallow and remote. Conventional techniques for this type of project require transporting construction materials by barge and dredging access channels to the shoreline, dramatically increasing project costs. However, during the first phase, Anahuac NWR staff worked closely with contractors and suppliers to develop land-based techniques to stage and place breakwater materials without permanently damaging existing marsh areas. Consequently, partners far exceeded our original project goals while staying within the project budget. (cont'd on page 8)

Oyster Restoration

GBF currently has two efforts for community-based oyster restoration, one in San Leon and the other in Kemah. Volunteers are needed in 2011 to assist with these projects. Volunteers will help with "behind the scenes" prep work and, most importantly, will be our oyster gardeners off local San Leon and Kemah piers. If you would like to get involved in our oyster restoration projects, as a pier owner or volunteer, please contact GBF's Conservation Technician, Tiffany Anders, at tand@galvbay.org.

GBF Website 'Call for Volunteers'



Conservation

Oyster Restoration

Oyster reefs are vital in maintaining the Galveston Bay ecosystem. Reefs provide habitat for bottom-dwelling fish and invertebrates which attract larger game fish. Reefs also stabilize the bay bottom and break wave energy, preventing shoreline erosion. Oysters act as a natural filtration system; they filter silt and contaminants from the water. A single oyster can filter up to 50 gallons of water per day! A large, healthy oyster population filters large volumes of water and thereby improves local water quality and clarity. Galveston Bay's oyster reefs were hit particularly hard during Hurricane Ike in 2008—the storm deposited a layer of sediments and debris atop the bay bottom, smothering live oysters. More than 50 percent of the oyster reef habitat in Galveston Bay, and 80 percent of East Bay's oyster population was destroyed. The oyster reefs have still not recovered. Since then, a number of efforts have been launched to restore Galveston Bay's oyster reefs—including projects lead by Texas Parks and Wildlife (TPWD) and the Galveston Bay Foundation. Watch [TPWD's video](#) on Galveston Bay oyster restoration efforts.

GBF's Community-Based Oyster Restoration is Back!

Galveston Bay Foundation (GBF) is building upon our past oyster reef restoration efforts in light of the devastation from Hurricane Ike. Since 2009, GBF has been working with TPWD and the U.S. Fish and Wildlife Service to restore reefs. And in 2010, GBF secured funding for two community-based oyster restoration efforts, a grant from the Texas Coastal Management Program and a grant from Restore America's Estuaries. Our focus is community-based efforts to restore oyster reefs on the western shoreline of Galveston Bay. To do so, GBF will be calling on local citizens to participate in oyster restoration with oyster gardening as a main component. Interested in volunteering? [Sign-up.](#)

[BECOME A MEMBER/
DONATE ONLINE](#)

[SIGN UP FOR GBF E-NEWS](#)

What is Oyster Gardening?

Volunteers compile bags of reclaimed oyster shell for local pier owners hang off their piers for the oyster gardening process. Volunteers and pier owners monitor the growth of young oysters, called spat, which attach to the shells inside the oyster gardening bags. After a couple months of development, the oysters are removed from the piers and their bags, and they are distributed across artificially-constructed reef pads nearby where they will flourish as part of a restored oyster reef. **Note:** Oysters produced in GBF's oyster gardening programs are not for consumption; they are only for ecosystem services such as water quality, habitat creation, and shoreline protection.



Reused shell



Bagging shell



Hanging bags



Monitoring oyster spat

Current Projects: San Leon and Kemah

GBF currently has two efforts for community-based oyster restoration, one in the San Leon community and one in the Kemah area. Volunteers are needed in 2011 for both projects. Interested volunteers will help with "behind the scenes" prepwork for the projects and, most importantly, will be our oyster gardeners off local San Leon and Kemah piers. If you would like to help us in our oyster restoration projects, as a pier owner or volunteer, please contact Tiffany Anders, GBF's Conservation Technician, at tanders@galvbay.org.

Resources

[Oyster Information \(TPWD\)](#)

[Practitioner's Guide to Shellfish Restoration \(.pdf\) \(Nature Conservancy\)](#)

Funded in part by...



Press Release - Galveston Bay Foundation Works With Local Bay Residents to Restore
Near-shore Oyster Reefs



CONTACT: Emily Demmeck
281-332-3381, x213
edemmeck@galvbay.org

FOR IMMEDIATE RELEASE

**Galveston Bay Foundation Works With
Local Bay Residents to Restore Near-shore Oyster Reefs**

Webster, TX – September 14, 2011 – The Galveston Bay Foundation (“GBF”) worked with residents from several communities along Galveston Bay this summer as part of GBF’s community-based oyster reef restoration program. The program was reinstated as a result of the devastation to native oyster populations from Hurricane Ike in 2008, when sediments were deposited across reefs, suffocating 50% of Galveston Bay’s oysters. Volunteers in San Leon, Bayview, and Kemah, Texas, joined together to restore Galveston Bay’s oysters and became “oyster gardeners”, raising oysters that will be used to seed nearby reef restoration sites.

On Saturday, September 17, 2011, community members in San Leon will remove the oyster gardening bags from their piers and place the live, gardened oysters on several adjacent constructed reef pads in an effort to expedite colonization by oysters. This particular reef restoration site is five acres and extends along the north shore of Eagle Point. The Texas Parks and Wildlife Department constructed the reef pads, and GBF is aiding with community involvement. On the reef pads, the oysters become mature within their first year and will quickly begin spawning to further the reefs’ development. For the past three summers, volunteers in the community of San Leon have been gardening oysters to help restore reefs and have witnessed the results firsthand—better fishing and cleaner water. This summer, Kemah and Bayview residents have joined the oyster gardening effort.

Residents who participate in oyster gardening first hang bags of reclaimed oyster shell from their piers over the summer months. They then monitor the growth of baby oysters, called *spat*, which naturally attach to the shells inside the oyster gardening bags. As part of their monitoring and maintenance of the bags, volunteers also remove algae and predators from the bags. After months of growth and development, the oysters are removed from the piers and their bags, and are distributed across artificially-constructed reef pads nearby where they will flourish as part of a restored oyster reef. Because these restored oyster reefs are located within 200 feet of the shoreline, they are not for

consumption, but only for ecosystem services such as water quality, habitat creation, and shoreline protection.

A recent study of the state of oyster reefs found that about 85% of the world's oyster reefs have been destroyed, making them the most endangered of all marine habitat types. We are fortunate to have some of the world's remaining healthy oyster reefs in Galveston Bay, but it is imperative that we tend and nurture these reefs to ensure their survival across Galveston Bay. Oyster reefs are critical for Galveston Bay's health—they filter the water, provide habitat for numerous bottom dwelling fish and invertebrates which in turn are food for larger game fish, they protect our shores, and provide economical benefits to the region.

Galveston Bay Foundation's Community-Based Oyster Reef Restoration program is made possible through various grantors and supporters, including the National Oceanic and Atmospheric Administration, Texas Coastal Management Program, Restore America's Estuaries, Texas Parks and Wildlife Department, ConocoPhillips, ERM Foundation, Hillcrest Foundation, KBR, Samson Lone Star LLC, and The Dow Chemical Company.

About Galveston Bay Foundation

The mission of the Galveston Bay Foundation is to preserve, protect, and enhance the natural resources of the Galveston Bay estuarine system and its tributaries for present users and for posterity. The Foundation was incorporated in 1987, and is a non-profit organization under Section 501 (c)(3) of the Internal Revenue Code. GBF is located at 17330 Highway 3 in Webster, Texas. For further information, contact GBF at 281-332-3381, or visit the website at www.galvbay.org.

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TASK 3 DELIVERABLES

Oyster Gardening Photos

Preparing gardening bags to hang on a volunteer's pier in San Leon



Volunteers hanging a bag in San Leon



Shell bags prepared for oyster gardening in San Leon



TPWD Oyster Biologist placing gardened oysters on a reef pad



Oyster gardening wrap-up in San Leon—Sept. 17, 2011



MEDIA COVERAGE - Texas Fish & Game – 10/2011

TRUE GREEN

Restoring Near-Shore Oyster Reefs

THE GALVESTON BAY FOUNDATION ("GBF") WORKED WITH RESIDENTS FROM SEVERAL COMMUNITIES ALONG GALVESTON BAY THIS SUMMER AS PART OF GBF'S COMMUNITY-BASED OYSTER REEF RESTORATION PROGRAM. THE PROGRAM WAS REINSTITATED AS A RESULT OF THE DEVASTATION TO NATIVE OYSTER POPULATIONS FROM HURRICANE IKE IN 2008, WHEN SEDIMENTS WERE DEPOSITED ACROSS REEFS, SUFFOCATING 50% OF GALVESTON BAY'S OYSTERS.

Volunteers in San Leon, Bayview, and Kemah, Texas, joined together to restore Galveston Bay's oysters and became "oyster gardeners," raising oysters that will be used to seed nearby reef restoration sites.

In September, community members in San Leon removed the oyster gardening bags from their piers and placed the live, garden-raised oysters on several adjacent constructed reef pads in an effort to expedite colonization by oysters. This particular reef restoration site is five acres and extends along the north shore of Eagle Point. The Texas Parks and Wildlife Department constructed the reef pads, and GBF is aiding with community involvement. On the reef pads, the oysters become mature within their first year and will quickly begin spawning to further the reefs' development. For the past three summers, volunteers in the community of San Leon have been gardening oysters to help restore reefs and have witnessed the results firsthand—better fishing and clearer water. This summer, Kemah and Bayview residents have joined the oyster gardening effort.

Residents who participate in oyster gardening first hang bags of reclaimed oyster shell from their piers over the summer months. They then monitor the growth of baby oysters, called spat, which naturally attach to the shells inside the oyster gardening bags. As part of their monitoring and maintenance of the bags, volunteers also remove algae and predators from the bags. After months of growth and development, the oysters are removed from the piers and their bags, and are distributed across arti-

ficially-constructed reef pads nearby where they will flourish as part of a restored oyster reef. Because these restored oyster reefs are located within 200 feet of the shoreline, they are not for consumption, but only for

habitat for numerous bottom-dwelling fish and invertebrates which in turn are food for larger game fish; they protect our shores, and provide economical benefits to the region.

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The mission of the Galveston Bay Foundation is to preserve, protect, and enhance the natural resources of the Galveston Bay estuarine system and its



Volunteer "oyster gardeners" will move these live oysters from their garden pier to nearby reef pads.

ecosystem services such as water quality, habitat creation, and shoreline protection.

A recent study of the state of oyster reefs found that almost 85% of the world's oyster reefs have been destroyed, making them the most endangered of all marine habitat types. We are fortunate to have some of the world's remaining healthy oyster reefs in Galveston Bay, but it is imperative that we tend and nurture these reefs to ensure their survival across Galveston Bay. Oyster reefs are critical for Galveston Bay's health—they filter the water, provide

tributaries for present users and for posterity. The Foundation was incorporated in 1987, and is a non-profit organization under Section 501 (c)(3) of the Internal Revenue Code. GBF is located at 17330 Highway 3 in Webster, Texas. For further information, contact GBF at 281-332-3381, or visit the website at www.galvbay.org.

—Staff Report **★TG**



PIN LIM: FOR THE CHRONICLE

Eco project restores near-shore oyster reefs

On Sept. 17, volunteer “oyster gardeners” in Santa Fe, working with the Galveston Bay Foundation, removed oyster gardening bags from their piers and placed the live baby oysters within them on reef pads constructed by the Texas Parks and Wildlife Department in an effort to expedite colonization by oysters.

The restoration program was reinstated as a result of the devastation to native oyster populations from Hurricane Ike. Residents who participate in the project first hang bags of reclaimed oyster shells — a safe haven for oyster larva that is free-flowing in the bay during the summer. Baby oysters, called spat, naturally attach to the shells inside the oyster gardening bags.

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Oyster reef restoration project one of many

■ Galveston Bay Foundation protects natural resources

By FLORI MEEKS
CHRONICLE CORRESPONDENT

As the new director of development for the Galveston Bay Foundation, Sharon Roark spends a lot of time telling others what the nonprofit organization does to protect the natural resources of Galveston Bay.

So it was especially exciting for her last Saturday when she got to see one of the foundation's key efforts — oyster reef restoration — as it took place.

Roark joined community volunteers in San Leon Sept. 17 as they removed oyster gardening bags from their piers and placed the baby oysters within them on reef pads constructed by the Texas Parks and Wildlife Department.

"Riding in the boat, observing the captain locate the reef, and watching our volunteers and Galveston Bay Foundation and Texas Parks and Wildlife staff throw the oysters overboard onto the reef was a real thrill for me," said Roark, who commutes to the foundation's offices in Webster from Spring Branch.

Community effort

The oyster reef restoration project site is five acres and extends along the north shore of Eagle Point. The project was the culmination of a summer's worth of efforts in several bay-area communities, foundation conservation specialist Tiffany Anders said.

The bags volunteers hang from their piers con-



PIN LIM PHOTOS: FOR THE CHRONICLE

LABOR OF LOVE: Residents in San Leon removed oyster gardening bags from their piers and placed the live, gardened oysters on several adjacent constructed reef pads in an effort to expedite colonization by oysters.

tained reclaimed oyster shells — a safe haven for oyster larva that is free-flowing in the bay during the summer.

"All of this larva is looking for a hard surface to land on, and the shells provide that," Anders said.

Volunteers monitor the growth of the baby oysters, called spat, and remove predators — algae and crabs — from the bags.

On Sept. 17, they opened the bays for the last time and sprinkled the baby oysters on five acres of reef pads.

Because these reefs are within 200 feet of the shoreline, these oysters are not for consumption, Anders said, but they will contribute to water quality, habitat creation and shoreline protection.

Anders estimates that volunteers placed a total of 5,000 oysters on reefs in San Leon, Bayview and Kemah this year.

The San Leon volunteers were joined on the 17th by representatives from Dow Chemical, a founda-



NEW HOME: Once the oysters were moved from their gardening bags, volunteers like Jennie Rohrer, above, distributed the oysters across artificially-constructed reef pads.

tion partner, and Deer Park High School students creating a video of the day's events.

"Everyone has been so enthusiastic about this project," Roark said. "I topped the day off with stopping by Hillman's Seafood Market for some fresh shrimp from the bay, which was a real treat."

Oyster Shell Recycling and Reef Restoration

Oyster Shell Recycling: Reclaiming the Resource

GBF has been staying busy with the newly established oyster shell recycling pilot program. Since March of 2011, GBF has been collecting discarded oyster shells from Tommy's Restaurant & Oyster Bar in Clear Lake. Tom Tollett, the owner of Tommy's, is a progressive thinker and has a true passion for a sustainable industry and has also been a strong advocate for freshwater inflows. Oyster shell recycling is a time and labor intensive process. How does it all work?

First, the owner and wait staff of the participating restaurant internally decide what process works best to keep discarded oyster shells separate from other table waste. Throughout the day, recyclable shell gets transferred outdoors and placed in GBF's collection bins behind the restaurant. GBF staff and volunteers collect the bins of recycled shells twice a week and transport them to our remote property in Texas City where the shells are piled. The shell pile for this phase must be away from urban areas because of the associated smell and interested critters. Shells are cured and bleached from the sun for a minimum of six months as recommended by the Texas Parks and Wildlife Department coastal biologists. The curing phase kills off any parasitic or non-native organisms which is important to the health and survivability of our native oyster population. After the six month curing period, the oyster shells are ready to be reused in Galveston Bay for oyster restoration. Oyster larvae in our bay are free flowing and in search of a hard substrate to settle on and begin growth. Recycled oyster shells are a perfect solution to the lack of suitable substrate in our bay which was caused by shell mining up until the mid-1930s, and most recently by Hurricane Ike.

GBF is also working with Sea Scout Ship 1659 of North Houston, who is designing and building a GBF shell recycling facility. It will consist of a concrete slab, breakaway walls, and different chambers to track shells curing status. We are very excited to work with the kids on this project and are grateful for their efforts.

All About Oysters!

GBF reinstated its community-based oyster gardening and reef restoration program in response to the devastation of oyster reefs from Hurricane Ike in 2008 where sediments deposited and smothered nearly 60% of Galveston Bay's oyster reef. Staggering statistics have also recently been published on oysters—more than 85% of the world's oysters have been completely lost, making oyster reef the most threatened marine habitat in the world (a TNC report, Beck et al.). Oysters are critical for an ecologically stable and healthy bay system. Each oyster filters up to 50 gallons of water in a day, improving water quality and clarity. Oyster reefs provide habitat to fishery species, thereby increasing the quality of fishing and diversity of fish species. Reefs also act as a coastal buffer to slow wave action and prevent shoreline erosion.

Community-Based Oyster Reef Restoration: Program Updates

GBF has seen very strong interest and support of our community-based oyster restoration program. Starting back in March 2011, a group of college students from the University of North Texas came down for an alternative spring break, and helped us prep bags and rope for this summer's oyster gardening program. In May, a group of high school volunteers from a Michigan environmental program came down to stuff recycled oyster shells into the gardening bags. GBF was kept busy during June with its community based oyster gardening hanging shell bags from private residence's piers. As of now, there are over 150 shell bags actively gardening oysters at 17 different piers from Kemah to San Leon. These bags hang for the summer months when oyster spawning peaks and more oyster larvae are present in our bay. The baby oysters (aka "spat") attach to our recycled shells and begin development. The volunteers with shell bags hanging from their piers, will be monitoring the bags, removing predators, and cleaning algae from the bags. In September, GBF will use the gardened oysters as live seed "topdress" our reef pad sites, speeding up the reef restoration progress. Note: oysters produced in GBF's oyster gardening programs are never for consumption; they are only for ecosystem services.

GBF's Community-Based Oyster Reef Restoration program partners include: National Oceanic and Atmospheric Administration, Texas General Land Office Coastal Management Program, Restore America's Estuaries, Texas Parks and Wildlife, ConocoPhillips, Dow, ERM Foundation, Hillcrest Foundation, KBR, and Samson. Thanks to all of these supporters and our hardworking volunteers!



Since April, 4.8 tons of oyster shell have been recycled from Tommy's Restaurant & Oyster Bar. Special thanks to NRG for providing staff support with our shell recycling program.



GALVESTON BAY FOUNDATION

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The mission of the Galveston Bay Foundation is to preserve, protect and enhance the natural resources of the Galveston Bay estuarine system for present users and for posterity.



GBF Gazette underwriting provided by our valued partner, the Port of Houston Authority.

Photos in this month's issue of the GBF Gazette contributed by:
Anna Armitage
Gene Fissler
Don Kirchoff
Allan Trieman
GBF Staff

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GBF is a 501(c)(3) organization affiliated with EarthShare of Texas and with Restore America's Estuaries.

You're Invited to Galveston Bay Foundation's

2nd Annual Oyster Reef Restoration Benefit

Saturday, August 20
Doors open at 6:00 pm
Live music from 7:00 pm-2:00 am

The Last Concert Café
1403 Nance Street
Houston, TX 77002

\$20 donation includes Mexican dinner (food served until 10 pm)
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And Melissa Savčić

Please visit www.galvbay.org for details

All proceeds benefit Galveston Bay Foundation's oyster reef restoration efforts.



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Galveston Bay Foundation protects natural resources

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PIN LIM PHOTOS: FOR THE CHRONICLE LABOR OF LOVE: Residents in San Leon removed oyster gardening bags from their piers and placed the live, gardened oysters on several adjacent constructed reef pads in an effort to expedite colonization by oysters. Photo: Pin Lim / Copyright Pin Lim.



Galveston Bay Foundation protects natural resources

By FLORI MEEKS, CHRONICLE CORRESPONDENT

Published 02:25 p.m., Tuesday, September 20, 2011

As the new director of development for the [Galveston Bay Foundation](#), **Sharon Roark** spends a lot of time telling others what the nonprofit organization does to protect the natural resources of Galveston Bay.

So it was especially exciting for her last Saturday when she got to see one of the foundation's key efforts - oyster reef restoration - as it took place.

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"Riding in the boat, observing the captain locate the reef, and watching our volunteers and Galveston Bay Foundation and Texas Parks and Wildlife staff throw the oysters overboard onto the reef was a real thrill for me," said Roark, who commutes to the foundation's offices in Webster from Spring Branch.

Community effort

The oyster reef restoration project site is five acres and extends along the north shore of Eagle Point. The project was the culmination of a summer's worth of efforts in several bay-area communities, foundation conservation specialist **Tiffany Anders** said.

The bags volunteers hang from their piers contained reclaimed oyster shells - a safe haven for oyster larva that is free-flowing in the bay during the summer.

"All of this larva is looking for a hard surface to land on, and the shells provide that," Anders said

Volunteers monitor the growth of the baby oysters, called spat, and remove predators - algae and crabs - from the bags.

On Sept. 17, they opened the bays for the last time and sprinkled the baby oysters on five acres of reef pads.

Because these reefs are within 200 feet of the shoreline, these oysters are not for consumption, Anders said, but they will contribute to water quality, habitat creation and shoreline protection.

Anders estimates that volunteers placed a total of 5,000 oysters on reefs in San Leon, Bayview and Kemah this year.

The San Leon volunteers were joined on the 17th by representatives from Dow Chemical, a foundation partner, and [Deer Park High School](#) students creating a video of the day's events.

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Galveston Bay Foundation Works With Local Bay Residents to Restore Near-shore Oyster Reefs

Thursday, 15 September 2011 14:38

The Galveston Bay Foundation ("GBF") worked with residents from several communities along Galveston Bay this summer as part of GBF's community-based oyster reef restoration program. The program was reinstated as a result of the devastation to native oyster populations from Hurricane Ike in 2008, when sediments were deposited across reefs, suffocating 50% of Galveston Bay's oysters. Volunteers in San Leon, Bayview, and Kemah, Texas, joined together to restore Galveston Bay's oysters and became "oyster gardeners", raising oysters that will be used to seed nearby reef restoration sites.

On Saturday, September 17, 2011, community members in San Leon will remove the oyster gardening bags from their piers and place the live, gardened oysters on several adjacent constructed reef pads in an effort to expedite colonization by oysters. This particular reef restoration site is five acres and extends along the north shore of Eagle Point. The Texas Parks and Wildlife Department constructed the reef pads, and GBF is aiding with community involvement. On the reef pads, the oysters become mature within their first year and will quickly begin spawning to further the reefs' development. For the past three summers, volunteers in the community of San Leon have been gardening oysters to help restore reefs and have witnessed the results firsthand—better fishing and cleaner water. This summer, Kemah and Bayview residents have joined the oyster gardening effort.

Residents who participate in oyster gardening first hang bags of reclaimed oyster shell from their piers over the summer months. They then monitor the growth of baby oysters, called *spat*, which naturally attach to the shells inside the oyster gardening bags. As part of their monitoring and maintenance of the bags, volunteers also remove algae and predators from the bags. After months of growth and development, the oysters are removed from the piers and their bags, and are distributed across artificially-constructed reef pads nearby where they will flourish as part of a restored oyster reef. Because these restored oyster reefs are located within 200 feet of the shoreline, they are not for consumption, but only for ecosystem services such as water quality, habitat creation, and shoreline protection.

A recent study of the state of oyster reefs found that about 85% of the world's oyster reefs have been destroyed, making them the most endangered of all marine habitat types. We are fortunate to have some of the world's remaining healthy oyster reefs in Galveston Bay, but it is imperative that we tend and nurture these reefs to ensure their survival across Galveston Bay. Oyster reefs are critical for Galveston Bay's health—they filter the water, provide habitat for numerous bottom dwelling fish and invertebrates which in turn are food for larger game fish, they protect our shores, and provide economical benefits to the region.

Galveston Bay Foundation's Community-Based Oyster Reef Restoration program is made possible through various grantors and supporters, including the National Oceanic and Atmospheric Administration, Texas Coastal Management Program, Restore America's Estuaries, Texas Parks and Wildlife Department, ConocoPhillips, ERM Foundation, Hillcrest Foundation, KBR, Samson Lone Star LLC, and The Dow Chemical Company.

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Man-made Oyster Reefs Growing In Galveston Bay

September 15, 2011

A community effort to restore damaged oyster reefs continues this weekend along Galveston Bay. Man-made reefs will soon have young oysters taking up residence.

listen now:

Hurricane Ike wiped-out or damaged many of the oyster reefs in Galveston Bay, but local residents have been nursing them back to health since then. Bob Stokes is with the [Galveston Bay Foundation](#) and says the reefs are coming back thanks to a little help.

"We work to create a new reef structure. We do that by laying down a thin layer of crushed concrete, or crushed limestone down on the bay bottom, and we come in afterwards and we bring oyster shell, and we put the oyster shell on top of that and the oyster reef really starts growing almost immediately."

The reefs near Bacliff and San Leon are about 200 feet offshore and the oysters there aren't for consumption and are only to help the ecosystem.

This Saturday, residents who have been growing young oysters will lay them on top of the man-made oyster bed.

"Each oyster can filter up to 50-gallons of water per day. And so as the reefs are growing and solidifying, they're actually cleaning the water in the local area. But then really, frankly the reason a lot of these people are interested and a lot of people are involved is that reef structure really improves the fishing in the area."

Texas and Louisiana have some of the last healthy oyster reefs in the world. A recent study found that 85-percent of the world's oyster reefs have been destroyed.

Written by Jack Williams and voiced by Carrie Feibel.

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