

COMMUNITY



GULF COAST COMMUNITIES: TAKING ACTION FOR A BETTER TOMORROW

IMPACTS

Gulf Coast Communities: Taking Action for a Better Tomorrow

Recognizing that coastal communities are at risk to natural, economic, and technological disasters, the Gulf of Mexico Alliance (GOMA) and its partners have provided small grants for communities through a series of different funding opportunities.

First, GOMA's Habitat and Resilience Teams, along with the Mississippi-Alabama Sea Grant Consortium, received a Regional Coastal Resilience Grant (RCRG) award from NOAA's Office for Coastal Management. One of the goals of this funding was to conduct a small grant program to help communities address their vulnerabilities to future storms. While significant funding may be available to communities *after* a disaster, there are not many existing funding opportunities for communities that want to take proactive measures to become more resilient *before* the next storm. This small grant program filled a real need for eight communities, as well as provided a series of "demonstration projects" at the local level that GOMA and partners can learn from and share with communities around the Gulf.

Second, in response to Hurricanes Harvey, Irma, and Maria (2017), GOMA solicited for small grants to applicants affected by the hurricanes in Texas and Florida. Supported by private and public funds, these eight grants went to non-traditional audiences who did not qualify for the larger federal assistance. Recipients included non-governmental organizations and small community groups who were not eligible to receive funds from a larger

parent organization. These groups included neighborhood associations, school organizations, churches, museums, zoos, and wildlife centers.

Third, GOMA partnered with the Climate and Resilience Community of Practice (CoP) to build capacity in local communities to prepare for and adapt to changing climate conditions, to lessen the impacts of localized flooding and effects of saltwater intrusion, and to communicate a clear and science-informed message to aid in future decision making. This capacity building grant was awarded through the National Academy of Sciences Gulf Research Program and expanded the reach of the CoP and its individual members to facilitate closing the gap between current science and application. It broadened the scope of membership to include additional Gulf communities, local businesses, and members from the Gulf of Mexico Alliance Resilience and Habitat Teams. Specifically, each of the implementation projects with local communities resulted in best management practices that can be shared across the region.

Finally, two community grants have been awarded through Gulf Star, GOMA's public-private partnership. Gulf Star partners are agencies, businesses, private organizations, and citizens that provide funding for projects that are tied directly to Gulf economies, such as sustainable seafood, loss of critical habitats, coastal resilience, water resources, living marine resources, and monitoring.

This report summarizes the community work that has been supported by GOMA and its partners across the Gulf of Mexico. It highlights the impacts these small grants have made in improving resilience, supporting business continuity, increasing capacity, enhancing habitat, and expanding best practices.

Living Shoreline Stabilization to Increase Resiliency

Project Lead: Coastal Conservation Association, De Soto National Memorial Park

Project Location: De Soto National Memorial Park, Manatee County, Bradenton, FL

Demographics:

- Population (53,654)
- Median age (42.9)
- Median household income (\$42,902)
- Poverty rate (17.2%)



De Soto National Memorial Park

LESSONS LEARNED:

A goal of shoreline stabilization was to reduce the rate of sediment erosion while increasing sediment accretion. Measuring success at the NW shoreline site was not possible due to the repeated loss of erosion stakes along the shoreline. The missing erosion stakes may have eroded away themselves or, more likely, park visitors removed them.

BRADENTON, FL

Issue of Concern:

De Soto National Memorial (Bradenton, FL) is an important location where both Native Americans and De Soto's army of soldiers once lived. The University of Central Florida (UCF) Department of Biology has worked closely with the National Park Service to understand how to best stabilize this shoreline through the use of living shoreline techniques combined with long-term natural recruitment. Stabilizing De Soto's shoreline is essential to decrease erosion and shoreline loss to protect the park's cultural and natural resources, especially numerous historically significant shell middens. Through pre-restoration monitoring, it was determined that high-energy boat wakes were limiting natural mangrove recruitment. Lack of retention of propagules (young mangrove plants) led to destabilized, highly eroding, bare shorelines.

To begin the recovery process, partners planted native vegetation and installed oyster shell bags seaward of the 4-year old mangroves to reduce wave energy, trap sediment and new propagules, and provide habitat for native species. One month after restoration, Hurricane Irma hit the park. The park suffered extensive damage throughout with all shorelines covered with wood and dock debris. Many plants and shell bags (now with attached live oysters) were damaged.

Taking Action:

Project partners were able to repair the damaged living shoreline materials, continue their monitoring, and deploy an additional 200 feet of living shoreline between December and August of 2018. Funding from GOMA enabled them to continue the successful restoration efforts to stabilize the shoreline damaged by Hurricane Irma and increase its resilience

for future disturbances. In addition to increasing resiliency, this project also increased the availability of critical shoreline habitat for fishes and other wildlife species and improved water quality by reducing erosion and re-establishing oysters and plants for water filtration. University of Central Florida and the National Park Service collaborated on the stabilization and monitoring as they have considerable success implementing the use of living shoreline techniques adjacent to Native American shell middens.

Key Accomplishments and Deliverables:

Restoration included ongoing replacement planting of mangroves, repair/replacement of damaged shell bags, and stabilization of an additional 207 feet on the northeast shoreline. New (not replacement) deployments included 78 mangroves, 200 smooth cordgrass plugs (*Spartina alterniflora*) and placement of 400 oyster shell bags along the shoreline. Thirty-five volunteers participated, donating 281 hours of their time. A total of 145 mangroves have survived from the 290 planted during Phase 1, a 50% survival rate. The SE site showed an overall 2.5 cm of accretion along restored sites after 1 year.

Monitoring of natural mangrove propagule recruitment was also performed at these sites. The ability of mangrove plants to self-sustain is an important component of shoreline resiliency. Monitoring results found that mangrove propagule retention along the living shoreline sites was comparable to natural sites; both were near zero. Additional structural topography (larger plants and associated root structures) is needed for natural recruitment to be successful.

GALVESTON, TEXAS

Issue of Concern:

In 2017, Hurricane Harvey severely impacted the entire Galveston Bay system, primarily by causing drastic changes in freshwater inflows, and consequently affected many of Galveston Bay Foundation's initiatives. One program in need of assistance was the Galveston Bay Dolphin Research and Conservation Program (GDRCP). The GDRCP has been studying the Galveston Bay bottlenose dolphin (*Tursiops truncatus*) population since 2013 by conducting boat-based surveys. The influx of freshwater not only changed the salinity of Galveston Bay, but likely contaminated Galveston Bay with waterborne pathogens and chemicals from toxic run off. Galveston Bay dolphins are vulnerable to these changes. After large rain events prior to Harvey, researchers observed severe skin lesions on some dolphins. Therefore, the most pressing issues surrounding the dolphins' health and ecology is their ability to tolerate low salinity, exposure to contaminants, and changes in prey availability.

Taking Action:

During the year following Hurricane Harvey, the GDRCP was able to closely track the dolphin population in Upper Galveston Bay (UGB). The grant funds from GOMA were utilized to complete boat-based field work and related analyses. Prior to Harvey, the GDRCP's normal protocol included 2 days of field work (boat-based surveying) per month, and the grant funding allowed them to increase these efforts to better monitor the population and individuals.

Between September 2017 and September 2018, the GDRCP conducted 44 photo-identification surveys in Galveston Bay. The surveys totaled over 276 hours and 3326 km of survey effort and resulted in the observation of 243 sightings/groups with over 2,400 dolphins. Data from these

surveys was entered into the Finbase Photo-ID Database. Data analyses consisted of 1) estimating dolphin encounter rates (including mother/calf pairs) to determine if and when dolphins returned to Upper Galveston Bay after Harvey, 2) calculating the prevalence and extent of skin lesions in the same population, and 3) evaluating the progression of skin lesions on individual dolphins.

Key Accomplishments and Deliverables:

Results evaluating the short-term effects of Harvey were prepared into a manuscript and submitted for publication in the journal *Estuaries and Coasts*.

- **Peer-reviewed Publication**
Fazioli, K; Mintzer, VJ; Guillen, G. Short-term effects of Hurricane Harvey on bottlenose dolphins (*Tursiops truncatus*) in upper Galveston Bay, TX.
- **Conference Presentation**
Mintzer, V; Fazioli, K; Guillen, G. The short-term effects of Hurricane Harvey on dolphins in upper Galveston Bay, TX. 9th National Summit on Coastal and Estuarine Restoration and Management. Long Beach, CA.

Evaluating the Impacts of Hurricane Harvey on Dolphins

Project Lead: Dr. Vanessa Mintzer, Galveston Bay Foundation, Galveston Bay, Texas

Project Location: Galveston Bay, Galveston, Texas

Demographics:

- Population (49,706)
- Median age (38.5)
- Median household income (\$42,486)
- Poverty rate (22.6%)



LESSONS LEARNED:

"The long-term monitoring of the bottlenose dolphins inhabiting Upper Galveston Bay allowed the comparison of encounter rates, skin lesions prevalence, and skin lesion extent before, during, and after Hurricane Harvey. These three parameters changed considerably during the three time-periods, suggesting that Harvey had important population-wide effects. Encounter rates showed that most dolphins were displaced from their Upper Bay habitat for weeks following the storm, and the individuals that stayed developed skin lesions that may be indicative of underlying health issues. Information gained from this rare event could inform management and conservation efforts of coastal populations of dolphins around the world. With a predicted increase in the intensity of storms causing heavy precipitation and flood events associated with global climate change (Easterling et al. 2000; Knutson et al. 2010), research on the effects of hurricanes and flooding is imperative to manage and maintain healthy coastal dolphin populations."

Concluding paragraph from Fazioli et al.

Rebuilding Critical Infrastructure for Supporting Shorebird Monitoring

Project Lead: Martin Hagne, Executive Director Gulf Coast Bird Observatory

Project Location: Brazoria County Lake Jackson, Texas

Demographics:

- Population (27,317)
- Median age (36)
- Median household income (\$77,739)
- Poverty rate (8.49%)



LAKE JACKSON, TEXAS

Issue of Concern:

Hurricane Harvey hit the Gulf Coast Bird Observatory (GCBO) in Lake Jackson, Texas hard in 2017. Their grounds were submerged underwater for a week.

The main building sustained rather light damage, but their field house was submerged under 10 inches of water and had to be totally gutted in order to rebuild it. The cost of repairing flood damages was estimated at \$12,000 in materials, such as sheetrock, insulation, paint, cabinetry, carpet, tile, furniture, and appliances. All the clean-up, tear down, and rebuilding work was done by staff and a group of loyal volunteers, saving an estimated \$10,000.

Gulf Coast Bird Observatory's field work, especially their shorebird conservation work, relies on staff and contracted field biologists living near the work sites, as the Upper Texas Coast is a big area. The field house on their headquarter property in Lake Jackson, Texas, can house several biologists, stores equipment, and includes a garage and workshop for maintenance and repair work on the property. Without the field house, the GCBO would incur ongoing hotel or rental costs, and their

staff and contract biologists would spend countless hours on the road, prolonging the time needed to complete work and increasing costs in salaries, fees, and mileage.

Taking Action:

The field house building was gutted down to the interior studs and completely rebuilt. With help from a core group of dedicated volunteers, GCBO was able to rebuild in just six months, saving thousands of dollars in labor costs. GOMA funds were used for material goods (sheet rock, flooring, paint, insulation, cabinets, and other supplies). A year after Harvey, the fully refurbished field house is functioning and providing shelter for interns and staff. Additionally, GCBO was able to resurrect their RV volunteer program, offering RV hook-ups, fully functioning kitchen, and bathrooms to accommodate hard-working volunteers who assume so many of the day-to-day chores necessary in maintaining the 34-acre headquarters.

Key Accomplishments and Deliverables:

Fully functioning volunteer program and rebuilt field house.



KEY LARGO, FLORIDA

Issue of Concern:

Largo Sound Park Club is on the northern border of John Pennekamp Coral Reef Park in Key Largo, Florida. When Hurricane Irma blew in, the fragile ecosystem surrounding the park was devastated. Manmade debris (e.g. destroyed boats, plastics, glass, tiles, pieces of hotels, electronics) crashed onto the beach and park. The seagrass they had been working to maintain, suffered greatly as a result of the storm. The amount of “small litter” (e.g. smashed ceramic tiles, bottles, fishing line, pieces of surrounding houses) was forced onto the beach in bulk during the storm. The park received significant damage to the beach, the concrete dock/boat launch, community grounds/playground for children, public bathrooms, fencing, and native plants that help with beach erosion. The impact of the ecosystem damage done in part by the storm—and part by man—created a significant risk to the ocean life and bird life.

Taking Action:

Largo Sound Park and the surrounding area received major damage and a lot of debris along their water line and beach area from Hurricane Irma. Their volunteers not only donated hours of time but their own money to repair and get the damage and litter cleaned from the park and surrounding area. GOMA funding helped them to hire a company to remove the major portion of the debris, remove and replace a concrete apron that was damaged due to water erosion, and repair fencing. Additional expenses included painting, plumbing repair, and tree trimming.

Key Accomplishments and Deliverables:

The Largo Sound Park Club was able to complete clean-up and repairs. They formed a kayak club that removes debris from the surrounding mangroves three times a month.

Clean-up of Largo Sound Park and John Pennekamp Waters

Project Lead:

Lisa Dykes
Largo Sound Park Club

Project Location:

Monroe County
Key Largo, Florida

Demographics:

- Population (10,071)
- Median age (51.9)
- Median household income (\$61,650)
- Poverty rate (17.3%)



Largo Sound Park and
John Pennekamp Waters



Matagorda Bay Oyster Reef Enhancement

Project Lead: William Balboa, Matagorda Bay Foundation

Project Location: Matagorda and Calhoun Counties, Palacios, Texas

Demographics:

- Population (4,647)
- Median age (37.5)
- Median household income (\$40,690)
- Poverty rate (19%)



LESSONS LEARNED:

Hurricane Harvey had direct impacts on many acres of wetlands and oyster reefs in the Matagorda Bay area. These impacts generated a new local public awareness of the importance of healthy ecosystems to protect against storm effects and for fisheries resilience and sustainability. These projects allowed citizens to participate in hurricane recovery efforts, capitalized upon the situation and educated citizens and community leaders in rural coastal Texas about the connection between conservation and coastal protection practices (living shorelines) to protect vital infrastructure, improve resilience, and benefit coastal ecology.

PALACIOS, TEXAS

Issue of Concern:

Storm surge and flooding from Hurricane Harvey caused significant damage to waterfront infrastructure, shorelines, wetlands, and oyster habitats in the Matagorda Bay Ecosystem. Matagorda Bay is a productive ecosystem and home to a significant population of Eastern oysters, which provide habitat and ecosystem services and sustain a commercial oyster fishery. Rainfall from Harvey caused catastrophic flooding in local watersheds that resulted in drastic reductions in bay salinity and extensive oyster mortality. The Matagorda Bay Foundation (MBF), Palacios Pavilion Committee, Port Alto Home Owners Association, and Matagorda 4-H identified two projects with direct ties to Harvey-induced damages to important habitats in the Matagorda Bay ecosystem. The projects introduced residents and local leadership to the concepts and value of living shorelines and the use of oyster shell as an alternative to sheet pile, rip-rap, and bulkheads for shoreline protection.

Taking Action:

The first project used oyster shell in cultch sacks to plug a storm breached area of shoreline that separates Salt Lake, a semi-enclosed, highly productive tertiary bay, from Matagorda Bay. Storm surge and wind driven waves from Harvey eroded a small wash-over into a deep channel and connected Salt Lake to high-energy waves generated across the 15 mile fetch of Matagorda Bay. The Salt Lake ecosystem is being impacted by increased tidal flow through the cut, rapid loss of shoreline, and loss of shallow water oyster reef habitat. The emergent oyster reef communities in Salt Lake are frequently used by wading birds, Black Skimmers and American Oystercatchers. The project protected nearly 675 acres of oyster reef, sea grass, wetland marsh and shallow bay habitat and employed the use of volunteers from the Port Alto Home Owners Association,

Matagorda and Calhoun 4-H, Texas Master Naturalists, and local fishing clubs.

The second project is located a few miles to the west adjacent to the new Palacios Coastal Education Pavilion on Matagorda Bay. This project also used cultch in sacks to enhance existing oyster habitat and supplement oyster recovery in the area and protect an adjacent sandy shoreline and wetland. Enhanced and restored reef habitat will be a focal point of future education activities and demonstrate living shorelines concepts. The adjacent wetland, protected by the living shoreline project, was also enhanced and planted with native wetland species sourced from a nearby state of Texas hatchery.

Key Accomplishments and Deliverables:

- **Palacios Pavilion Oyster Garden/ Living Shoreline**
Matagorda Bay Foundation staff and volunteers filled approximately 350 sacks of oyster shell (cultch sacks). A community effort to kick-start spat set and colonization of cultch was initiated and employed high school students and 4-H youth volunteers. The students also participated in wetlands enhancement plantings of *Spartina alterniflora* along a bulkhead wetland at the project site.

A diverse group of adult and youth volunteers formed a “living conveyor” and transported ~200 cultch sacks to the surveyed site during an extreme low tide event. About 75 *Spartina alterniflora* plugs were sourced from a nearby hatchery and planted along a 100 foot stretch of bulkhead and in an adjacent wetland pond.
- **Redfish and Salt Lake Living Shoreline**
Matagorda Bay Foundation staff distributed 175 sacks of cultch to volunteers and waterfront property owners in and near the Port Alto, Texas area. This effort had a two-fold purpose 1) to educate and engage the public in coastal issues and restoration techniques, and, 2) to allow spat and encrusting organism propagation on the cutch. The sacks were distributed with the understanding that staff will retrieve the sacks for placement at the project site in the future.

SARASOTA COUNTY, FLORIDA

Issue of Concern

Mira Lago is a community of 183 homes located on Palmer Ranch in Sarasota County. The four lakes in this community connect to Eligraw Bayou, which empties into Sarasota Bay, and the bay is directly connected to the Gulf of Mexico. The community is only about 2 miles east of Sarasota Bay.

The Mira Lago Community Association has recently increased the lake plants and also allowed the grass along the perimeter to grow to a height of 12 inches to 18 inches to create a buffer zone. However, during Hurricane Irma (2017), tree branches fell into the lake due to the high winds, and a great deal of run-off entered the lakes due to the abundant rain. The additional organic matter plus the chemicals in the run-off started an algae bloom. This occurred even though they did not fertilize any lawns in the community from June through October.

Taking Action

Funds from GOMA allowed the Mira Lago Community Association to place

four floating islands of aquatic plants in the lakes, which are very efficient in removing chemical toxins and enhancing water purity. They placed two of the smaller floating islands (160 sq. ft. each) in the largest lake, which is shaped like a horseshoe; another (160 sq. ft.) in a smaller lake; and another larger one (224 sq. ft.) in a slightly larger lake that is uniform in shape. The lakes in the Mira Lago community empty into Eligraw Bayou, which empties directly into Sarasota Bay about 2 miles away. The goal for installing the floating islands was to improve the water quality in the lakes. This is important because during a hurricane with copious rainfall, large amounts of runoff from the lakes enter Sarasota Bay. That runoff could contain contaminants from the lakes.

Key Accomplishments and Deliverables:

The Mira Lago Community Association anticipates better water quality and being able to reduce the need to apply chemicals in the lakes, thereby reducing contaminants passed on into Sarasota Bay.



Improving Water Quality by Utilizing Floating Wetlands

Project Lead: Carol Auricchio, Mira Lago Community Association

Project Location: Sarasota County, Sarasota, Florida

Demographics:

- Population (426,718)
- Median age (56.5)
- Median household income (\$61,683)
- Poverty rate (10.5%)



LESSONS LEARNED:

The community was challenged in implementing the installation of aquatic plants (floating islands). This heightened their awareness of the operating environmental issues. One of their partners cautioned against the installation of the islands during the winter months because the cold temperatures would likely kill the young plants. Once things warmed up in March, they were ready to go.

Replacing Animal Care Equipment

Project Lead: Beverly Osborne, Curator, Theater of the Sea Marine Animal Park

Project Location: Monroe County, Islamorada, Florida

Demographics:

- Population (6,488)
- Median age (56.1)
- Median household income (\$63,882)
- Poverty rate (10.5%)



ISLAMORADA, FLORIDA

Issue of Concern

Theater of the Sea sustained much damage in the wake of Hurricane Irma. The park sits at ocean level and the storm surge flooded almost every area of the 17-acre property, some areas as high as 5 feet. Debris from fallen trees also impacted some of the structures. The structures sit at ground level with open air systems so there was not much protection from the storm, and most of the equipment used for animal care operations was ruined.

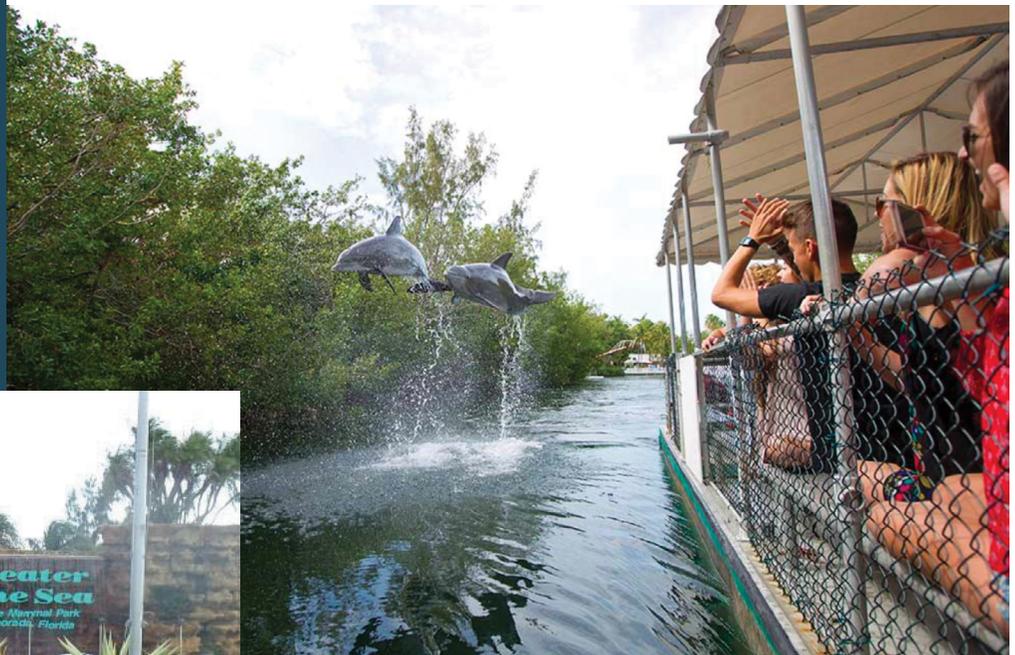
Taking Action

The goal of this project was to replace the animal care equipment that was lost during Hurricane Irma. These items are essential with animals that are geriatric or have special needs, such as several rescued turtles that have buoyancy disorders and

other injuries. For example, the animal park makes weights by hand for one of its turtles with this disorder and custom orders a special life jacket for another. Other staples in the animal care routine include refrigerators and an ice machine for keeping fish and produce fresh for all the animals. Some of the more advanced medical equipment, such as the endoscopy machine, medical refrigerators, and freezers, was also lost.

Key accomplishments and deliverables:

The Theatre of the Sea purchased equipment that was destroyed as a result of Hurricane Irma including: a condensing unit for walk-in fish food freezer, replacement aerators and aerator parts for fish tanks, and a new variable speed sea water pump.



CORPUS CHRISTI, TEXAS

Issue of Concern

The Texas Sealife Center provides medical and surgical care for wildlife and nearby wildlife facilities in Corpus Christi and the Coastal Bend region including the Amos Rehabilitation Keep (ARK). Hurricane Harvey resulted in catastrophic damage in Port Aransas including the ARK at University of Texas Marine Science Institute (UTMSI) where over 60 sea turtles were being housed. After the hurricane, 30 sea turtles were released, but 30 needed medical treatment and surgery. They were transported to the Texas Sealife Center where they continue to receive medical care and surgery. In addition, this also included sea turtles that are permanent residents of the ARK.

Taking Action

Because of the increase in sea turtles that were housed at the Texas Sealife Center, the focus of this project was on increasing and improving the center's holding capacity, filtration, and water quality for those animals under their care and those continuing to come in after the hurricane.

Acquisition of a 6-foot diameter hospital pool with associated filtration aided in increasing hospital space. The filtration capabilities improved with the addition of UV sterilizers, ozone generators, and a protein fractionator. Heaters for the hospital pools assisted in preparation for winter temperatures and future cold stunning events. These cold stunned turtles present during freezing weather annually and are admitted to both the Texas Sealife Center and the ARK. Because of the damage in Port Aransas there was a need to prepare to house more sea turtles at the Sealife Center.

Key Accomplishments and Deliverables:

The overall project aided in the rescue, rehabilitation, and ultimate release of wildlife, specifically sea turtles that were stranded in the Coastal Bend and surrounding regions. The small grant helped by improving water quality for the increased number of turtles being housed at the Texas Sealife Center and by increasing their capacity to house more animals in the event of a cold stunning event.



Hurricane Harvey Sea Turtle Hospital Pool Project

Project Lead: Tim Tristan, Texas Sealife Center

Project Location: Corpus Christi, Texas

Demographics:

- Population (326,566)
- Median age (35.3)
- Median household income (\$56,602)
- Poverty rate (16.2%)



LESSONS LEARNED:

Hurricane damage can be extensive and result in the need to relocate resources, in this case to other wildlife centers. When hurricane damage is widespread, it can be difficult to find holding capacity for injured wildlife.

Assessing Whole Community Resilience

Project Lead: Niki Pace,
Louisiana Sea Grant

Project Location: St. Mary's
Parish, Louisiana (Morgan City, LA)

Demographics:

- Population (52,578)
- Median age (38)
- Median household income (\$41,345)
- Poverty rate (19.5%)



Morgan City,
Louisiana

MORGAN CITY, LOUISIANA

Issue of Concern:

Morgan City and St. Mary's Parish saw the need to understand community resilience more holistically and identify potential areas of common concern that could maximize resilience across their inter-connected ports, tourism, and fisheries sectors.

Taking Action:

This project used multiple Resilience Indices (Ports Resilience Index, Tourism Resilience Index, and Fisheries Resilience Index) within the St. Mary's Parish, Louisiana, community to develop a cross-sector evaluation of overall community resilience.

Key Accomplishments and Deliverables:

Project partners facilitated the completion of the Ports Resilience Index with the Port of Morgan City, the Tourism Resilience Index with the St. Mary's Chamber of Commerce and Cajun Coast Visitors and Convention Center, and the Fisheries Resilience Index with Vermillion Bay Seafood. This was the first time multiple Resilience Indices had been strategically completed for one community and the first time the Tourism Resilience Index and Fisheries Resilience Index were used in Louisiana.

LESSONS LEARNED:

Communities and small businesses have limited capacity and flexibility to schedule and participate in assessment activities. Unforeseen events that put an extra burden on local government or businesses can create circumstances where capacity is no longer available for planning and assessment projects. Even under normal operations, it can be especially difficult for small businesses to fit time into their schedule for an assessment; some businesses have a hard time seeing the direct benefit of future planning compared to other immediate items in their busy schedules. The project team suggests a certificate of completion or other incentives for participation in the future.



POINTE-AU-CHIEN, LOUISIANA

Issue of Concern:

The way of life for Pointe-au-Chien community residents is tied closely to the land and Tribe members have historically made a living as farmers, fishermen, and hunters. However, this way of life and the long-term survival of the community have been compromised by sea-level rise and storms; these hazards cause significant coastal land loss and saltwater intrusion. Culturally significant habitats and community infrastructure have been threatened in recent years.

Taking Action:

This project assisted in performing a community self-assessment to identify vulnerabilities and prioritized projects focused on habitat and economic resilience. A greenhouse for native and culturally important plant species was constructed to support the sustainability of cultural heritage for the Pointe-Au-Chien and other neighboring Tribes. The greenhouse was constructed adjacent to the Tribe's community center and incorporates a wind turbine and other "green" features into the overall design. The features will increase the resilience of this vital community infrastructure.

The second project provided enhancements to a boat launch/dock area used regularly by the Tribe to access the water for fishing and education/outreach activities with members of the community and outside groups. The Tribe considers access to the water an essential component of their economic resilience. An eroding shoreline has been stabilized, invasive plants removed, and the boat launch has been expanded to improve access and safety.

Key Accomplishments and Deliverables:

- Completion of the Coastal Community Resilience Index self-assessment, construction of a greenhouse for native and culturally important plants, stabilization of eroding shoreline, and improved access to the water.
- Development of a Tribal version of the Coastal Community Resilience Index is a leveraged accomplishment from this project. As a result of the partnership and process of working with the community the need for a Tribe-specific resilience index was identified.
- The Tribe received the 2019 *Spirit of Community Award* for their efforts to improve resilience and plan for future conditions in their community.

Saving Culturally Important Plant Species and Building Economic Resilience

Project Lead: Theresa Dardar, Pointe-Au-Chien Tribe/First People's Conservation Council; Matt Bethel and Melissa Daigle, Louisiana Sea Grant; Kristina Peterson, Lowlander Center

Project Location: Pointe-Au-Chien, Louisiana

Demographics:

- Population (1,992)
- Median age (29.7)
- Median household income (\$28,413)
- Poverty rate (35.1%)



Pointe-Au-Chien, Louisiana



LESSONS LEARNED:

Working with Tribal communities requires building trust, respecting their availability to participate in activities, and allowing a longer timeline for project implementation. In our experience, Tribe members are deeply involved in their community and are often directly involved in the execution of projects; allowing additional time for project work supports the Tribe's direct involvement and fosters true collaborative relationships.

At the beginning of this project, the Pointe-Au-Chien Tribe shared a "Declaration of Principles" that included best practices for working with the Tribe. It included openness and honesty, clear communication, commitment against harm to the community, valuing of local knowledge and input, inclusion of the entire community, flexibility by project partners to conduct work on their schedule, and sharing of collaborative work. This declaration set the tone and collaborative framework for work among all partners throughout the project.

Community Flood Preparation and Planning

Project Lead: The City of Covington, Chris Brown, Building Official and Floodplain Administrator

Partners: St. Tammany Parish Emergency Operations Center, Louisiana Sea Grant, Flood Loss Outreach and Awareness Taskforce (FLOAT), Gulf of Mexico Alliance Resilience Team, The Water Institute of the Gulf

Project Location: City of Covington, located on the north shore of Lake Pontchartrain in St. Tammany Parish, Louisiana

Demographics:

- Population (9,925)
- Median age (36.5)
- Median household income (\$57,438)
- Poverty rate (13%)



COVINGTON, LOUISIANA

Issue of Concern:

The community has experienced several storm-related disasters in the past. For example, during Hurricane Katrina (2005) wind gusts in the area were over 130 mph. While the community is prepared for tropical storm events, on March 11, 2016, a rainfall event to the north of the town triggered unprecedented flash flooding throughout the area. Covington only received 6 inches of rain; however, Washington Parish, to the north, and northwestern St. Tammany Parish received over 20 inches. The following day, as the water moved downstream, areas in Covington that had never experienced this type of flooding were inundated. The flood waters remained in the community for about 8 hours, with over 300 buildings, 57 streets, and 7 sewer lift stations impacted. Multiple subdivisions to the east of Collins Boulevard had to be evacuated by the police and fire departments, with 103 individuals and 7 pets needing evacuation assistance. The flooding caught the community off guard. In some areas, the sun was shining while the waters were rising. Therefore, the city identified the need to more accurately and efficiently notify impacted residents of the impending flash flood. In addition, they determined it was imperative to educate residents about

appropriate flash flood response so they could be prepared in the future.

Taking Action:

The city compiled all data from the March 2016 flood event into an appropriate GIS database that is accessible by various city departments. They drafted a Flood Preparation and Response Plan so that the city is prepared to respond to flash flood events in the future. The city led and completed an emergency response exercise using the plan to test and practice the response techniques decided upon. They also provided education materials to residents and business owners, which the community tied into its Community Rating System program. Finally, the city shared the process and lessons learned with neighboring communities through a free workshop for surrounding local governments and other interested individuals. They also made all deliverables and publications available online and gave presentations at the Louisiana Chapter of the Association of State Floodplain Managers.

Key Accomplishments and Deliverables:

City of Covington Flood Response Plan, Flood Response Newsletter, City of Covington Situation Overview, Video Case Study



LESSONS LEARNED:

Hurricanes and storm surge are not the only flooding threat to coastal communities. The unexpected flooding from flash flood events can place people, property, and the environment at risk. Preparing city staff and residents for these events will increase a community's resilience.

OCEAN SPRINGS, MISSISSIPPI

Issue of Concern:

Ocean Springs is a forward-thinking community whose citizens can point to over 300 years of successful adaptation to their coastal environment. Today, the city's leaders are investing in planning, research, and infrastructure to adapt to a number of climate challenges, including predicted sea level rise. The city completed the Coastal Community Resilience Index (CRI), a vulnerability assessment aimed at identifying potential risk, high priority needs, and possible mitigation solutions to future storms. One of the main needs identified by the city was local business continuity planning. This was also a high priority for the city's Comprehensive Plan and Hazard Mitigation Plan. The purpose of business continuity planning is to ensure critical services can resume as soon as possible after a natural or man-made disaster.

Taking Action:

The city worked with the local Chamber of Commerce to identify standards for business continuity plans and offered competitive grants to local businesses to share the cost of preparing the plans.

The city then held a lunch-n-learn to gain interest from local businesses and share the importance of continuity planning. A template was created that included: (1) Assessing the threats, risk, and vulnerabilities to the business, (2) Analyzing impacts to people, property, finances, and reputation, (3) Developing a strategy for preparedness and response and how to implement the plan, (4) Test and maintain the continuity plan including preparing updates and training employees. The city then held a workshop and invited interested businesses to come and begin the process of filling out the template with the goal of each business leaving with a draft Business Continuity Plan. The project strengthened the city's economic and social resilience by working with business leaders to identify overall needs, as well as by offering to help local businesses prepare their own Business Continuity Plans.

Key Accomplishments and Deliverables:

Fillable pdf template for local businesses in Ocean Springs and workshops to assist businesses in the development of a Business Continuity Plan.

Planning for Business Continuity

Project Lead: The City of Ocean Springs, Carolyn Martin, Planning and Grant Manager

Partners: Mississippi-Alabama Sea Grant Consortium, Ocean Springs Chamber of Commerce, Northern Gulf of Mexico Sentinel Site Cooperative, Jackson County Economic Development Corporation, Ocean Springs Ministerial Alliance

Project Location: Small businesses in the city of Ocean Springs, Mississippi

Demographics:

- Population (17,514)
- Median age (39)
- Median household income (\$55,935)
- Poverty rate (9.37%)



LESSONS LEARNED:

A survey conducted by the city found that the majority of businesses in Ocean Springs had no Business Continuity Plan or even a written business plan. Although many businesses were interested in completing their own Business Continuity Plan (BCP), finding a time when they could meet to work with the city was a challenge. Small businesses cannot always afford to close for an afternoon or even early on any given day. Sharing BCPs between local businesses and city government is a valuable step in preparing for future storm events. This project found the process of working together to develop BCPs can assist with identifying resources that may be needed immediately following a storm, help to stage resources and/or services (e.g. medical services, equipment such as generators), and build relationships necessary to communicate effectively after a disaster.

Stormwater Plan for Tatumville Gully Watershed

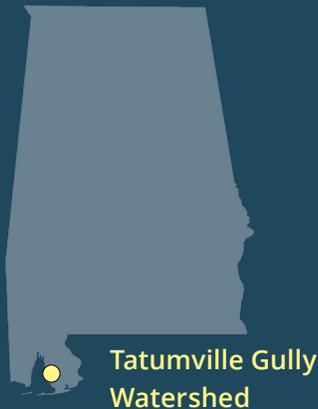
Project Lead: The City of Fairhope, Jessica Walker, Economic & Community Development Director

Partners: Mobile Bay National Estuary Program, Mott MacDonald Engineers

Project Location: Fairhope, Alabama

Demographics:

- Population (19,561)
- Median age (45)
- Median household income (\$66,074)
- Poverty rate (8.9%)



LESSONS LEARNED:

While stormwater management continues to be one of the most pressing issues in the Tatumville Gully Watershed area, the vulnerable population that live within this area have additional unmet needs that were unknown to the city.

FAIRHOPE, ALABAMA

Issue of Concern:

The City of Fairhope is situated on the eastern shore of Mobile Bay in Baldwin County, in southwest Alabama. Fairhope's rainfall averages more than 69 inches per year. Sustainable development continues to be a priority in preserving Fairhope's natural resources. Fairhope is frequently affected by severe storms, flooding, hurricanes, and tornadoes. All have a high probability of occurring, and the city has been significantly impacted by numerous federally declared disasters.

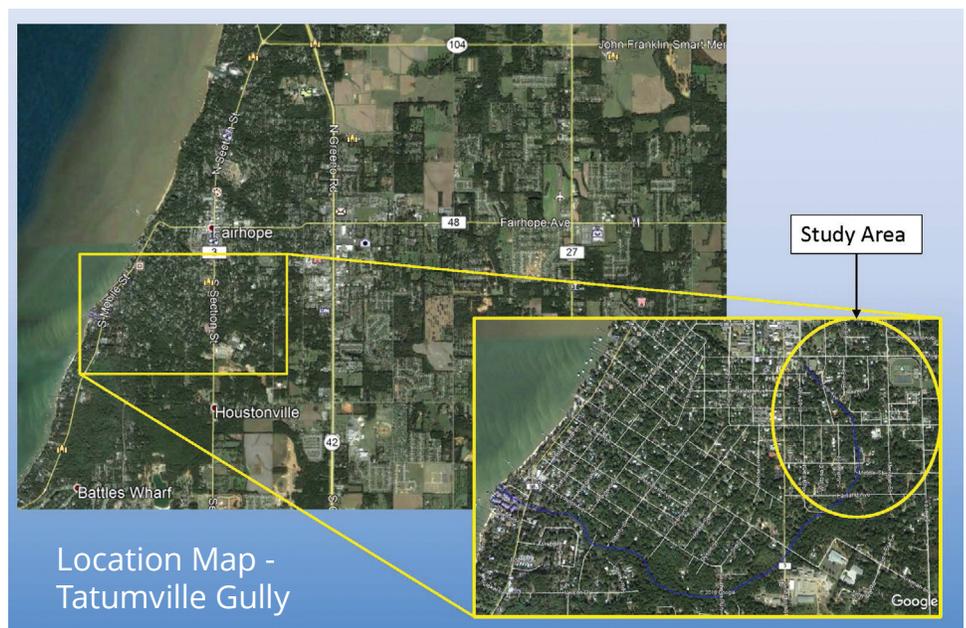
The 2012 Stormwater Study, Annual MS4 Storm Sewer Inventory, and the city's Community Resilience Index assessments each identified the Tatumville Gully watershed as a particularly vulnerable area. The Gully is experiencing many threats including erosion, flooding/fast moving water, invasive species, and many older homes on low-lying parcels. In addition, it is located in a historic black community located along the Bay which has the highest concentration of low-income and vulnerable residents in the city.

Taking Action:

The project improved stormwater management infrastructure using low-impact engineering that protects, enhances, and improves the natural coastal resources, as well as increases the sustainability, resiliency and preparedness of the city. Fairhope secured the engineering services of Mott MacDonald Engineers to locate and place the stormwater infrastructure for the watershed into the city's GIS system with elevation and size data, and generate hydrologic/hydraulic models necessary to evaluate and predict stormwater flows/levels, using current conditions as a baseline. The Stormwater Study made recommendations for offsetting stormwater discharges by increasing pipe size, installing new ponds to provide greater storage volume, and modeled low areas as possible detention for upstream ponds.

Key Accomplishments and Deliverables:

Concurrent with the Stormwater Study, the city conducted the South Fairhope Community Action Plan. The city has begun work to improve the Young Street Community Park as well as meet the needs of elderly citizens in the area as identified in the plan.



ARANSAS COUNTY TEXAS

Issue of Concern:

Aransas County experiences frequent flash flooding (5 events in 2015 alone). In addition, the county's vulnerable location along the Gulf Coast puts it at risk for hurricanes and associated storm surges. Storm surge has caused flooding in the county seven times since 1919. If the frequency and severity of hurricanes increases, the area could be impacted more frequently in the future. Flooding has been an ongoing hazard to the county with recent changes in precipitation regime moving from drought conditions, and these events could become more frequent and severe.

Taking Action:

Aransas County's effort to develop a Floodplain Management Plan highlighted the value in participating in the Federal Emergency Management Agency's National Flood Insurance Program (NFIP) Community Rating System (CRS). The county has a track record of exceptional dedication to exceeding the minimum NFIP standards, and the county wanted citizens to be able to benefit from the discount in flood insurance rates due to their participation in the CRS. After completing the Coastal Community Resilience Index (CRI)

self-assessment, the county decided to apply for funding to (1) join the CRS and (2) strengthen the communication protocols for alerts and action notices for the county. The project was temporarily delayed due to Hurricane Harvey, which landed on August 25, 2017. After recovery, the county submitted their CRS Application and CRS Quick Check Form to FEMA and their state NFIP Coordinator.

Key Accomplishments and Deliverables:

The county developed a comprehensive website with a library of resources, including elevation certificates, Letter of Map Amendment (LOMA), Flood Insurance Rate Maps (FIRMs), ArcGIS maps, and resources for floodplain protection and the permitting process for development within the county. The county is now prepared for its Community Assistance Visit (CAV) and the CRS verification process required by FEMA. The county also developed a Hurricane Harvey/Flood Response Recovery Plan that includes a communications protocol. These efforts have resulted in greater preparedness to storm events and increased capacity to respond and adapt to changes in weather patterns, climate, and storm events.

Using the Coastal Resilience Index to Inform and Guide Community Rating System Initiatives

Project Lead: Aransas County, David Reid and Diana Espinosa

Partners: City of Rockport, LIA Engineering, Inc.

Project Location: Aransas County, Texas

Demographics:

- Population (24,832)
- Median age (46.6)
- Median household income (\$44,601)
- Poverty rate (17.8%)



LESSONS LEARNED:

Aransas County saw the need to help their residents become more aware of how important it is to have regulations in place for building. If individuals undertaking new construction are aware of the county's regulations and reasons for their existence, the county can avoid having to issue penalties, or in difficult cases, having to take cases to court. In addition, participation in the Community Rating System has economic benefits to county residents in addition to helping them become more resilient as a community.

Oyster Bed Coastal Protection and Restoration

Project Lead: Deb Abibou, Restoration Programs Director, Coalition to Restore Coastal Louisiana (CRCL)

Partners: Terrebonne Parish Consolidated Government, Lafourche Parish, Pointe-au-Chien Tribe, ConocoPhillips, Shell

Project Location: Terrebonne and Lafourche Parishes, Louisiana



Terrebonne and Lafourche Parishes, LA

TERREBONNE AND LAFOURCHE PARISHES, LA.

Issue of Concern:

Coastal Louisiana parishes are on the front lines of coastal erosion and relative sea level rise. The area has experienced a presidentially declared disaster from a hurricane or tropical storm an average of every three years. These natural forces are exacerbated by canals dug for oil and land exploration, timber, and fur industries. Tribes have continued to be negatively effected by the massive amount of land loss. The project site is on the corner of a natural bayou and a manmade canal. The tribe identified a sacred mound at risk of washing away incrementally with the tides or en masse during the next storm event.

Taking Action:

The Coalition to Restore Coastal Louisiana (CRCL) worked with the Terrebonne and Lafourche Parish governments, as well as the Point-au-Chien Tribe, to restore eroding wetland with an oyster shell living shoreline to prevent culturally important artifacts from being lost to rising seas. They coordinated with

the Environmental Assessment Team to finalize the Environmental Assessment (EA) and secure permits for coastal use from Louisiana's Department of Natural Resources and a Programmatic General Permit from the U.S. Army Corps of Engineers. CRCL worked closely with the Pointe-au-Chien Indian Tribe to coordinate dates that worked for the tribal community and to recruit boat captains and local volunteers. They coordinated with Louisiana Department of Wildlife & Fisheries to secure a no-cost staging area at a nearby Wildlife Management Area to hold the shell and host the volunteers. CRCL recruited volunteers to work at their shell storage site in Buras, Louisiana, to wrap pallets of oyster shell so that they could be transported by the truckload to Pointe-au-Chien. The recycled shell was transported and deployed on separate dates.

Key Accomplishments and Deliverables:

Approximately 612 volunteers contributed to creating over 8,800 shell bags, wrapping 250 pallets, and deploying 200 tons of shell into the water to create the living shoreline.



LESSONS LEARNED:

The Oyster Bed Surge Protection System benefits both the built environment and the existing shoreline. The installations protect the shoreline and provide wave attenuation to significantly reduce erosion. Due to the location, the retention of the existing marsh continues to provide wave and storm surge protection and delays the erosion of the mound and channels. Habitat benefits include oyster cultch development, as well as observations of fishery support and bird populations. Water quality is also expected to benefit from the filtering capacity of the oysters potentially increasing water clarity and nitrogen cycling.



NEW PORT RICHEY, FLORIDA

Issue of Concern:

City staff recognized the need to replace aging stormwater management equipment after heavy storms in 2016, including Hurricane Hermine, flooded the city and damaged roads. New Port Richey had never experienced such severe flooding and people had to use boats or kayaks to move around. As Hurricane Irma approached in September 2017, residents were again worried about flooding.

Taking Action:

The city was able to reduce water levels in flood-prone areas by purchasing and

utilizing a new stormwater pump, reassuring residents and business owners. The new pump was able to free up the existing small pumps to quickly answer the call of residents with smaller flooding issues while at the same time making sure the larger retention areas remained functional in order to protect the neighborhoods and community.

Key Accomplishments and Deliverables:

Residents, business owners, and city staff in New Port Richey, Florida, now have peace of mind that heavy rains and storms will not cause damage or cut off local roadways, thanks to new stormwater equipment.



Stormwater Division Portable Pump Addition

Project Lead: Barret Doe, Public Works Department, City of New Port Richey

Partner: Thompson Pump and Manufacturing Company, Inc.

Project Location: New Port Richey, Florida

Demographics:

- Population (15,674)
- Median age (47.3)
- Median household income (\$33,995)
- Poverty rate (20.3%)



LESSONS LEARNED:

The city identified a strong need to protect the city from future flood events. The small grant helped the city to purchase equipment that diverts water to and from large retention areas, helping residents and businesses with flooding issues.

Mapping Coastal High Hazard Area

Project Lead: South Florida Regional Planning Council

Partners: Islamorada Village of Islands, Monroe County Southeast Florida Regional Climate Compact, Florida Department of Environmental Protection

Project Location: Islamorada Village of Islands, Florida

Demographics:

- Population (6,488)
- Median age (56.1)
- Median household income (\$63,882)
- Poverty rate (10.5%)

ISLAMORADA VILLAGE OF ISLANDS

Issue of Concern:

Hurricanes pose a substantial threat to Florida’s coastal communities. Sea-level rise will increase storm surge height (likelihood of risk), and development increases in high-risk areas will intensify storm surge exposure (consequences of risk). Mitigating and adapting to these growing coastal hazards requires incorporation of resilience into all aspects of local government, from land use planning to infrastructure improvements. Sea-level rise in South Florida manifests itself prominently via extreme tides, elevated storm surge, and the water tables exceeding ground elevations in low-lying areas. These impacts cause transportation delays, compromised drainage, property damage, erosion, complications to regional water supplies, habitat degradation, and an array of other costs and inconveniences.

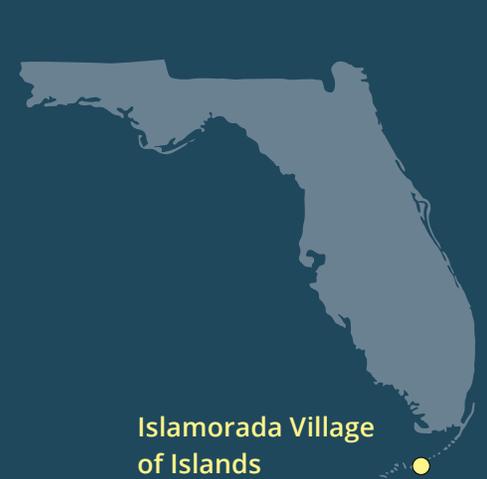
Adequately addressing these issues is vital to the longevity and prosperity of South Florida’s communities. By building on existing vulnerability assessments, continuing to draw from academic research, and utilizing the best available datasets and models, progress can be made to advance resilience with local actions aligning at the regional level.

Taking Action:

This project focused on Islamorada in the Florida Keys, a community that identified a need for high-resolution data to evaluate potential storm surge and sea-level rise impacts. The Principal Investigators used LIDAR and storm surge data to redefine the Coastal High Hazard Area (CHHA) for a Category 1 storm at current sea levels and two future sea-level scenarios. This information was used to identify assets under current and future risk within the CHHA. The South Florida Regional



Bud N’ Mary’s Marina is an iconic marina utilized by countless tourists as a central location to hire and board charter boats for watersport activities. Following Hurricane Irma, the roughly 45 fishing guides and offshore captains who operate out of Bud N’ Mary’s were out of work until the marina docks and moorings had been rebuilt and debris removed.



Islamorada Village of Islands

Planning Council completed the data aggregation, GIS modeling, and drafting of GIS maps displaying storm surge under various sea-level rise scenarios for Monroe County. Analysis results were presented in the form of an interactive map using ESRI's Story Map platform. The maps allow viewers to easily assess how the CHHA will likely change spatially in coming decades. Additionally, important differences between the Atlantic and Gulf coasts (e.g. bathymetry and storm surge) are noted. A comprehensive set of recommendations to address local sea-level rise impacts was provided with the maps.

Key Accomplishments and Deliverables:

The goal of this project was not only to provide a valuable resource to Monroe County and Islamorada, but to anyone else interested in conducting a similar analysis

for their own region. The online story mapping platform lends itself to being hosted on partners' websites and shared via social media. Viewing the data and resultant analysis does not require special software or licenses of any kind, which significantly increases access to audiences.

This project also interviewed a large cross section of the community and found the most frequently mentioned adaptation option was mandating that building codes require building elevations greater than 1 foot above base flood elevation, followed by actions taken by private homeowners. Both hardening infrastructure (e.g. retrofitting critical infrastructure) and green infrastructure options (e.g. living shorelines, beach renourishment) were discussed as valuable adaptation opportunities. By and large, participants were unwilling to consider eventual retreat from the Florida Keys as a viable option.

LESSONS LEARNED:

Hurricane Irma's impact provided insight into the validity and applicability of SFRPC's analysis. Adjacent residential complexes received damage during the storm, from catastrophic to minor. A 10-unit condo complex, located within the coastal high hazard area (CHHA), was mostly leveled. Its neighbors received minimal damage—based on the SFRPC analysis, these parcels are largely or entirely outside of the current CHHA. Using the time-lapse feature of the mapping tool, planners and local officials can visualize the changing CHHA and increasing vulnerability.

Creating a Shoreline Master Plan

Project Lead: City of South Padre Island, Texas

Partners: Chamber of Commerce and Economic Development, Corporation of South Padre Island, Cameron County Commissioners Court, Texas Parks and Wildlife, Boys and Girls Club of Laguna Madre, South Padre Island Birding and Nature Center, South Texas Chapter of the Surfrider Foundation, South Padre Island's Property Owners Who Care, Ocean Trust Foundation

Project Location: South Padre Island, Texas

Demographics:

- Population (2,856)
- Median age (59)
- Median household income (\$45,060)
- Poverty rate (10.8%)



SOUTH PADRE ISLAND

Issue of Concern:

The community of South Padre Island has a long history of confronting strong storms and responding to their impacts. Over the last 50 years, four major hurricanes have impacted the small, low-lying barrier island community, exacting moderate to severe damage from the Gulf shoreline to the Laguna Madre. Hurricane Beulah (1967) generated a 20-foot storm surge that completely inundated South Padre Island and cut 31 Gulf-to-bay blowouts. Subsequent storms, notably Hurricanes Ike (2008) and Dolly (2008), also greatly impacted South Padre Island, causing structural and environmental damage and weakening the seasonal beach-tourism economy upon which the community relies.

Taking Action:

The City of South Padre Island revised its Comprehensive Plan to include a Shoreline Master Plan, providing a list of broad, interrelated goals that enhance or support existing education, tourism, conservation, and public access projects. Each goal is accompanied by recommendations that build upon commitments from the city's previous planning documents and the knowledge gained from the results of a public planning meeting. Feedback on the plan was also obtained using a Master Plan Survey, direct conversations with citizens in one-on-one interviews, and at a Comprehensive Plan Open House.

The Shoreline Master Plan promotes the resiliency of South Padre Island by preserving adjacent aquatic habitats, such as wetlands, algal and mud flats, mangroves, and other features that serve to attenuate water level rise and storm surge. Maintaining this vital storm buffer minimizes damage to hard structures and lessens the flood risks to the upland areas of the island. Storm buffering helps ecosystems withstand natural and anthropogenic disturbances. Additionally, the conservation of ecologically important lands will ensure that future development will take place in more resilient locations.

Key Accomplishments and Deliverables:

The Shoreline Master Plan sets a path toward improving the community and visitor experience as it relates to the shoreline, creating a more resilient coastline and preserving the Island's natural resources. Plan development used the best available information to identify key action items and made engagement of current stakeholders and the community a priority in the planning process, as they will have the most direct impact on the success of each goal. Actions that directly enhance environmental education, shoreline tourism, conversation, and public access within the city are identified in the plan. It is important to note that the amount of effort required per strategy will vary; some are being accomplished while others will require innovation and greater resources.

LESSONS LEARNED:

South Padre Island anticipates 4.3 million visitors annually, concentrated from March to September each year. Securing and expanding new public access and recreational opportunities on the island will encourage tourism during the off-peak season and promote the more stable, year-round economy that the community needs. Identifying key projects that allow visitors the opportunity to access the unique ecotourism features of the island will only help grow this expanded tourism season. Public education is a central and evolving aspect to the overall goal of The Shoreline

Master Plan. Informing the public of their role in creating a resilient community encourages the public to personally connect with the environment, giving them an intrinsic reason and motivation to protect and preserve it for future generations. Preservation of seagrass, mangroves, wetlands, marshes, and intertidal flats will enhance ecological resilience, providing essential habitat to the residential birds, fish, and terrestrial wildlife that depend on them. In addition, the preservation of habitats preserves biodiversity with ecological significance, enhancing their ecotourism value.

Drainage System Maintenance

COVINGTON, LOUISIANA

Issue of Concern:

Covington is a relatively small city on the north shore of Lake Pontchartrain in St. Tammany Parish, Louisiana. With a population of approximately 9,925, the community covers 6.1 square miles and is home to several schools, hospitals, and other critical facilities. The city has experienced extreme flooding events and needed to update their Flood Damage Reduction Activities (Activity 540) under the Community Rating System (CRS), an incentive program the Federal Emergency Management Agency (FEMA) offers to lower flood insurance premiums. The goal of this project was to improve drainage system maintenance efforts to reduce flood losses to existing development and improve related CRS scores for the City of Covington.

Taking Action:

The City of Covington, Louisiana, increased its drainage system maintenance to existing development to reduce flood losses. The work is intended to improve their Community Rating System (CRS) score, which will decrease the flood insurance premiums for their residents. The project team consisted of representatives from the City of Covington, University of New Orleans, and Louisiana Sea Grant. The Team developed two videos to increase the public's understanding of the community's drainage system: one for public education and outreach and the second for internal training purposes.

The first video provides an overview of the drainage system (e.g., how ditches, streams, and channels are connected), and emphasizes the importance of keeping all components of the system clear of debris. The video conveys the importance of protecting the drainage system so it will reduce potential flood damage and protect natural resources throughout the city.

The second video is being used to train the City of Covington Public Works staff. It provides details on policies and procedures of the city's inspection and maintenance program. The video gives staff directions on how to correctly complete a work order when removing debris from a waterway so that the information can be used to keep track of debris clearing.

Key Accomplishments and Deliverables:

The project team provided draft language to add to the city's annual outreach project (flyer) and use in other public information efforts. Recommended standard operating procedures, drainage system map and related inventory, and outreach and ordinance language were approved by the Community Rating Specialist who oversees the CRS scoring. The project team provided guidance for all elements of Activity 540 focusing on the city's Standard Operating Procedures for Drainage Maintenance (including problem sites and natural and scenic rivers), the city's drainage system map and inventory, an annual outreach flyer, and a stream dumping regulation ordinance.

Project Leads: Chris Brown, Building Official and CRS Coordinator, City of Covington and Monica Farris, Director, University of New Orleans, Center for Coastal Hazards Assessment Response and Technology (UNO-CHART)

Partners: Gulf of Mexico Climate and Resilience Community of Practice

Project Location: Covington, Louisiana

Demographics:

- Population (9,925)
- Median age (36.5)
- Median household income (\$57,438)
- Poverty rate (13%)



LESSONS LEARNED:

Chris Brown, Covington's Building Official and CRS Coordinator, said the work completed as part of the project will help the city gain CRS points in three areas: channel debris removal, problem site maintenance, and stream dumping regulations. The city was also able to add language to the litter ordinance to address the dumping of trash, landscape debris, and other materials in rivers, creeks, canals, ditches, or storage basins. The language was approved and adopted by the city council.

Community Resilience Working Group

Project Leads: Mississippi-Alabama Sea Grant Legal Program, University of Mississippi

Partners: City of Orange Beach, Alabama, Gulf of Mexico Climate and Resilience Community of Practice, Louisiana Sea Grant, Smart Home America, Northern Gulf of Mexico Sentinel Site Cooperative

Project Location: Orange Beach, Alabama

Demographics:

- Population (5,826)
- Median age (53.9)
- Median household income (\$69,388)
- Poverty rate (7.55%)

CITY OF ORANGE BEACH

Issue of Concern:

Due to its proximity to the coast and high annual rainfall, the City of Orange Beach can regularly experience flooding. The low terrain within the city (the highest elevations within the city are around 30 feet), is another factor that contributes to flooding hazards. These flood hazards include seasonal rainfall, coastal storms, and storm surge. Continual flooding is associated with erosion which destroys the shoreline and can lead to damage of built infrastructure (e.g. roads, pipes, buildings) as well as green infrastructure (e.g. marshes, wetlands). The erosion of beaches and wetlands can result in a number of consequences, including economic loss from decreased tourism, property damage, lost revenue to the city, and risk to coastal residents.

Communicating clearly about the risks of coastal flooding and notifying residents of approaching disasters is an essential responsibility of local government. Proper flood communication is not merely about reaching as many people as possible, good flood communication should build upon other plans and procedures the city has to guard against flood hazards. The city developed a Program for Public Information (PPI) to accomplish these goals by providing for continual evaluation and monitoring of the communication process.

Taking Action:

The City of Orange Beach developed a Community Resilience Working Group (CRWG) to initiate the development of a Program for Public Information (PPI) to enhance education and outreach efforts and increase the city's Community Rating





System (CRS) score under the National Flood Insurance Program. The Mississippi-Alabama Sea Grant Legal Program provided group facilitation and project management services to support the work of the CRWG.

During the PPI process, the City of Orange Beach selected seven topics to serve as the core of its PPI outreach activities. Six of the seven are designated as priority topics under the CRS program:

- (1) Know your flood hazard, (2) Insure your property against flood hazard, (3) Protect people from the flood hazard, (4) Protect your property from flood hazard, (5) Build responsibly, and (6) Protect natural floodplain functions.

After subsequent discussion with city staff and the PPI committee, it was decided to include one additional topic in the Orange Beach PPI program: (7) Be prepared for hurricanes.

Key Accomplishments and Deliverables:

The creation of the Program for Public Information will enhance education and outreach efforts and increase the city's

Community Rating System (CRS) score under the National Flood Insurance Program (an incentive program that will lower flood insurance rates for their residents).

The PPI Committee and Orange Beach staff will disseminate flood messaging and outreach through two primary methods of information conveyance: online web resources and the permitting process. It is the opinion of the PPI Committee and city staff that online resources have the greatest capacity to reach the largest number of people in a short period of time. With that in mind, the city has taken a number of steps to improve its online communication capacity. One example of this is the city's Facebook Live account. By using Facebook Live, the city can convey critical flood information and stream drone footage, which will be used to indicate the level of damage in Orange Beach neighborhoods. The city also uses its website to share valuable online resources for public information. Visitors can download the city's Emergency Operation Plan and review debris removal procedures in the event of a disaster.



Orange Beach, AL

LESSONS LEARNED:

Half of the housing units within the city of Orange Beach are classified as properties for seasonal use. Given the high fluctuations in seasonal use the city experiences, especially in the summer months, the city's ability to devise a robust flood response will depend on whether flooding occurs during a peak visitation period or not.

Enhanced Stormwater and Floodplain Management

Project Lead:

Louisiana State University
Coastal Sustainability Studio

Partners:

Tangipahoa Parish
Louisiana Sea Grant

Project Location: Tangipahoa Parish, Louisiana

Demographics:

- Population (128,850)
- Median age (34.9)
- Median household income (\$45,901)
- Poverty rate (21.9%)



LESSONS LEARNED:

Development of staff education materials, training workshops, and ordinance updates is still in progress. This is in large part because the parish wants to present a comprehensive list of changes to their stormwater management strategies. To date, they have made piecemeal changes that are generally not serving the parish well, as there are contradictions and additional confusion at times rather than resolution.

TANGIPAHOA PARISH

Issue of Concern:

Tangipahoa Parish is located in southeastern Louisiana, with its southern border on Lake Pontchartrain and its northern border on the Mississippi state line. The Tangipahoa River and its tributaries are the parish's primary surface water bodies. There are no major flood control structures in the parish, which means it is prone to both storm surge flooding from tropical storms and riverine flooding from extreme rain events. There have been seven major disaster declarations in the parish since 2005, including two in 2016 that impacted nearly 16,000 structures. Flooding in March and August of 2016 was due to the swelling of the Tangipahoa River and its tributaries backing up and overflowing during and after substantial rains. Water quality and impaired waterways are also a consideration, with rapid development in the southern portions of the parish and hydrologic alterations and agricultural runoff concerns in the northern reaches.

There is currently a lack of funding and capacity to address the parish's needs related to updating and coordinating existing development management regulations, identifying implementation mechanisms for new flood and stormwater management approaches, and updating implementation and enforcement protocols.

Taking Action:

The goal of this project was to support enhanced floodplain and stormwater management in Tangipahoa Parish, LA, through policy gap analysis, updated enforcement and best practice protocols, and coordination between partners to further the recovery process and reduce vulnerability as outlined in the Tangipahoa Parish Community Recovery Plan.

First, project partners conducted a Stormwater Management Policy Gap Analysis,

assessing relevant codes, ordinances, rules, and regulations to coordinate legal and policy implementation mechanisms. Then, they updated the Stormwater Management Plan enforcement protocols and documentation to meet state requirements, and created staff education materials for Tangipahoa Parish Government, as well as trained them on the new procedures. Next, they developed model ordinance language to implement best practices for flood reduction and water quality in relevant codes, ordinances, rules, and regulations. Finally, they provided planning and best practice guidance and recommendations to support the hydraulics and hydrology study conducted by the parish.

Key Accomplishments and Deliverables:

Completed a review of relevant land and floodplain management ordinances for Tangipahoa Parish. Completed a Stormwater Management Policy Gap Analysis, assessing relevant codes, ordinances, rules, and regulations and identified implementation challenges from the parish perspective. Translated best practices to community-specific recommendations. Identified best practices, model language, and opportunities for future updates of key ordinances. Identified planning and best practice guidance and recommendations in support of preliminary hydrology and hydraulics studies and priorities for watershed management in the parish.





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The National Academies of SCIENCES
ENGINEERING
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Climate and Resilience
COMMUNITY OF PRACTICE

This publication was supported by the NOAA Regional Coastal Resilience Grant (Award NAS16NOS4730008) awarded to the Gulf of Mexico Alliance. The views expressed herein do not necessarily reflect the views of GOMA, NOAA, Mississippi-Alabama Sea Grant Consortium, or any of its subagencies.

Suggested Citation: Gulf of Mexico Alliance and Mississippi-Alabama Sea Grant Consortium. Community Impacts: Gulf Coast Communities Taking Action for a Better Tomorrow. (2020). Publication number # MASGP-20-015.