Texas Sea Grant

2016 ANNUAL REPORT

From the Director



This year Sea Grant celebrated its 50th anniversary! Congress created the National Sea Grant College Program in 1966, modeled on the successful Land Grant concept, and Texas was one of the first four state programs established. Today there are 33 programs, and collectively the network has served the nation in diverse, meaningful and measurable ways and has changed the way we value, use and enjoy our coastal and marine resources.

The Texas program celebrated our own 45th anniversary this year, and we can look back on some notable successes right here at home. Since its earliest days, Texas Sea Grant, a successful partnership between Texas A&M University and NOAA, has supported the Texas shrimp fishery, the most important commercial fishery in our state, by providing technology transfer and training to fishermen to reduce their operating costs, increase the value of their catch, and reduce penalties and fines for non-compliance with federal regulations. We also helped establish the Galveston Marine Laboratory, a center for marine research and education in Texas that became Texas A&M University at Galveston in 1979. Texas Sea Grant accelerated the tempo and preeminence of coastal and marine research and innovation, funding more than \$60 million in cutting-edge research at Texas' universities that led to the discovery of the first marine viruses, helped restore depleted commercially important wild fish stocks in the Gulf of Mexico, gave rise to the designation of the Flower Garden Banks National Marine Sanctuary, and generated significant developments in offshore technology that accelerated industrial use and commercialization of our ocean resources. Texas Sea Grant has also mobilized and trained Texans who, through their voluntary efforts, have restored tens of thousands of acres of degraded Texas coastal habitat; saved thousands of stranded sea turtles, marine mammals and birds; developed nature trails; and monitored Texas coastal waters for harmful algal blooms like red tides.

As we look ahead to our own 50th anniversary and beyond, we will continue to build on our solid foundation and stay true to our legacy. Texas Sea Grant will continue to play a central role in building resilient coastal communities and economies.

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- Pamela Plotkin, Ph.D.





TEXAS SEA GRANT

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TAMU-SG-17-301 1500 February 2017 COVER PHOTO © SETH PATTERSON/TEXAS SEA GRANT

Texas Sea Grant 2016 Impacts



Provided training and tools to

25 communities

to protect them from storms and other coastal hazards



in fuel savings for the shrimp fishing industry



16 to 1

Every state dollar invested in Texas Sea Grant returns more than \$16 to the Texas economy.



20,186 K-12 students

reached through informal education programs



about rip currents distributed to coastal communities and deployed on beaches



Mobilized **56,686 hours** of volunteer time valued at \$1.4 million



of stormwater diverted through rain gardens, improving water quality



404 acres of coastal wetlands, dunes and prairie restored



supported through grants and fellowships

Supporting Coastal Economies

Seafood harvesting and production are among the most important industries on the Texas coast. Commercial fishing is a \$1.5 billion business in Texas employing 26,496 people. Shrimp is by far the largest segment of the catch, and Texas Sea Grant works with shrimp fishermen to help them overcome market factors like high fuel prices and low-priced imports, meet regulatory requirements, and maximize their profits. We also work with them and with retailers to help facilitate their access to specialty markets. Aquaculture contributes another \$349 million to the state's economy, and we support research that helps these businesses increase their productivity sustainably and economically.

FUEL SAVINGS FOR THE TEXAS SHRIMP FISHING FLEET

For the Gulf of Mexico shrimp trawl fishery, fuel costs are a major expense. We worked with shrimpers to test fuel-saving trawl gear, conducted economic analyses of the benefits of improved net material and advanced trawl door designs, and transferred the technology to the Texas shrimp fleet. In 2016, 431 vessels in Texas saved 2.05 million gallons of fuel valued at \$3.08 million. Since 2008, when the project began, the state's shrimp fishermen have saved an estimated 21.8 million gallons of fuel, worth \$57.6 million, with additional savings through the reduced need for oil and filter changes and major engine overhauls.

HELPING FISHERMEN ACCESS NEW MARKETS AND COMPLY WITH REGULATIONS

Bycatch is the incidental capture of non-target species by a commercial fishery. Federally mandated turtle excluder devices (TEDs), when used correctly, are 97 percent effective in allowing endangered sea turtles to escape from shrimp nets while reducing shrimp losses. With funding from the National Fish and Wildlife Foundation, we trained 507 shrimp vessel crew members and owners to install and use TEDs and, at the request of fishermen, boarded 189 vessels to inspect their TEDs, helping the fishermen avoid costly fines for non-compliance. Shrimp vessels in compliance were issued an inspection form that can be used to market shrimp as turtle safe, giving fishermen access to markets and consumers who actively seek sustainably harvested products, and 303 of the fishermen have said that the properly adjusted TEDs increased shrimp retention in their nets. We also tripled the number of our staff who could conduct these voluntary inspections through a National Marine Fisheries Service training program, and began technology transfer of a new design of TED that increases shrimp retention by 3 to 5 percent. In spite of having a higher initial cost,

12 vessels so far have adopted the new gear on the advice of Texas Sea Grant and have increased their catch by \$180,000 collectively.

FACILITATING REGULATORY REVIEW FOR INSHORE SHRIMP FISHERMEN

Bay shrimp fishermen were able to extend their fishing time and increase their harvests in 2016 thanks to our efforts to bring together representatives of the industry and the state agency that regulates the inshore fishery. We facilitated discussions between the fishermen and the Texas Parks and Wildlife Department (TPWD) and among fishery stakeholders, and then submitted a list of recommended regulatory changes that resulted from those meetings to TPWD. After thorough review by state biologists and economists, the agency last year approved longer fishing times and loosened catch restrictions. The rules changes are directly benefiting the profitability of more than 360 bay shrimp license holders, 360 bait license holders and more than 180 bait dealers; improving access to bait for recreational fishermen; and providing more consistent supplies of table shrimp for seafood buyers, restaurants and consumers.

REVOLUTIONIZING SHRIMP AQUACULTURE

We funded refinement of a technique for super-intensive indoor farming of Pacific white shrimp and the creation of an operations manual that explains the equipment and procedures needed for aquaculture businesses to implement it. When managed properly, the new technique, which is based on existing technology, can increase production to four crops per tank per year and reduce the costs of shrimp mariculture from \$5 per pound to only \$2 per pound. A Texas aquaculture producer in Palacios that field-tested the new technique reported that it has doubled his business' production capacity. The new system also practically eliminates effluent pollution and protects the shrimp from viral infections.

FINDING NEW SPECIES FOR AQUACULTURE PRODUCTION

A Texas Sea Grant-funded research project is making progress toward the commercial production of a potential new farmed species: pigfish, a popular live baitfish used by recreational fishermen. Pigfish are harvested from the wild but are only available for a few months a year, limiting their availability for the growing angling community. Though pigfish spawn during the winter months in the wild, the researchers successfully manipulated water temperatures and day length in the laboratory to get the fish to spawn in the summer, and also developed procedures that maximize their growth, leading to successful production of market-size fish in commercial aquaculture ponds. An economic analysis now under way will assess the feasibility of commercial-scale production and identify needed process improvements.

FINDING ECONOMIC BENEFITS TO COASTAL INDUSTRIES FROM RESTORED OYSTER REEF

We partnered with The Nature Conservancy to help them determine the social and economic benefits of their restoration of Half Moon Reef, a 54-acre oyster habitat in Matagorda Bay and one of the largest such restoration projects in the country. The restored habitat has increased the biodiversity, including more fish like flounder and redfish, in and around the reef and has increased recreational fishing in Matagorda Bay. We surveyed anglers and fishing guides and found that the increased recreational fishing at the reef added \$691,000 to Texas' gross domestic product per year, generated an additional \$1.2 million in annual economic activity, and created a dozen new jobs and \$465,000 in annual labor income. Fishing guides and fishermen agreed that the reef was an above-average to excellent fishing spot in Matagorda Bay to which they will return multiple times.



Resilient Coastal Communities

The Texas coast faces rapidly increasing population and development now and in the coming decades. We are helping coastal cities and towns plan and prepare for a future of unprecedented growth and increase their resilience to hurricanes, flooding and other coastal hazards, allowing them to better protect their economies, natural resources and people. Our research and programs provide coastal communities with real data to support informed decisionmaking, increase capacity to communities that lack resources, and improve the quality of life of coastal stakeholders.

REDUCING LONG-TERM RISK FROM NATURAL DISASTERS

In partnership with the Texas A&M AgriLife Extension Service and the Federal Emergency Management Administration (FEMA), we held Community Engagement and Risk Communication (CERC) workshops in six counties for hundreds of officials from 25 communities to help them reduce long-term risks and mitigate hazards. The day-long resiliency workshops used the CHARM platform, a GIS-based scenario mapping application, which was the first introduction for many participants to FEMA's Risk MAP datasets for their communities. Additionally, the partnership has helped us identify communities that are willing and able to improve their resiliency through FEMA's National Flood Insurance Program Community Rating System, a voluntary incentive program that encourages community floodplain management activities and results in discounted flood insurance premiums. Three communities have taken steps to improve local policies or update plans inspired in part by the workshops and resources we made available to them.

HELPING COMMUNITIES REDUCE CURRENT AND FUTURE FLOODING RISK

With funding from the Texas General Land Office, we supported the City of Rockport's efforts to participate in the Community Rating System. We produced a *State of the Community Report* that summarizes Rockport's existing demographics, housing, economy, environment, hazard vulnerability, transportation and community facilities, then conducted and analyzed a community survey designed to find out about the experiences and perceptions of the city's residents regarding flood hazards in the city. We also developed an *Alternative Scenarios Report* that summarizes four hypothetical scenarios of future development in the city and details potential outcomes with respect to flooding, natural areas, water usage and impervious surface coverage associated with each alternative. Our efforts to assist the City of Rockport have led to a larger collaboration within the Mission-Aransas National Estuarine Research Reserve with Aransas County, the City of Aransas Pass, the Town of Fulton and the City of Rockport to develop a county-wide, multi-jurisdictional Floodplain Management Plan. We are working proactively with the communities to develop a plan that will reduce the negative effects of future flooding events and thus increase resilience.

INCLUDING SOCIAL VULNERABILITY IN RESILIENCE PLANNING

The City of Aransas Pass is nearing completion of a comprehensive coastal resiliency plan that incorporates data and information from a tool developed by Texas Sea Grant and our partners to help communities pinpoint locations that are most vulnerable to impacts from coastal hazards. The Social Vulnerability Index uses 36 socioeconomic, demographic and infrastructure variables to provide information about both social and environmental impacts at the census block level, thus mapping the areas where residents might have fewer resources to be able to prepare for or respond to flooding or storms and facilitating targeted outreach to people in those locations.

HELPING TEXANS BE WEATHER READY



As part of the National Weather Service's Weather-Ready Nation, we launched Weather Ready Texas, an outreach campaign on the two most popular social media platforms to provide weather-

related information and alerts to coastal Texas. The goal of the national and state programs is to engage local communities to reduce the risk of being adversely impacted by extreme weather and water events, and increase community resilience for future extreme events.

Healthy Coastal Ecosystems

Healthy ecosystems are the foundation of the communities and economies of the Texas coast. They are essential for commercial and recreational fishing and the tourism industry, but their value is also priceless to those who live, work and play along our coast. A rapidly increasing population, greater demands on fisheries resources and other human activities are placing greater stresses on these fragile systems. We are funding research and giving resource managers the information they need to make science-based decisions to respond to water quality degradation, wetlands loss and other threats to these ecosystems.

RESTORING COASTAL WETLANDS USING INNOVATIVE TECHNIQUES

Agriculture and reservoir construction erased almost all of the original coastal prairie wetlands that were located in the area that is now Sheldon Lake State Park. Our Texas Coastal Watershed Program (TCWP) partnered with the Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service beginning in 2003; with support from other partners and with much of the replanting done by trained volunteers, to date we have restored more than 300 acres at the park. The first wetland restoration project in Texas designed to reclaim filled wetlands by re-excavating the original basins, the project employs a technique that uses historical topographical maps and precision equipment to expose original wetland prairie soil and re-create historic contours. Restoration of these wetlands not only provides visitors with a glimpse of the historical landscape, it also stores and detains rainfall runoff and removes pollutants from surface waters, thus reducing downstream flooding and improving the water quality of Carpenters Bayou and eventually Galveston Bay.

PLANTING WETLANDS TO CONTROL FLOODING AND IMPROVE WATER QUALITY IN HOUSTON

Stormwater wetlands are planted wetlands installed in stormwater detention basins to improve water quality and flood control, and increase recreational opportunities for local residents and habitat for wildlife. To promote the use of stormwater wetlands as a preferred best management practice for the Texas coast, TCWP initiated pilot projects in multiple locations in the Houston area, working with project partners to select sites and providing hydrological analyses, consultation, design, plants and planting. Exploration Green is a signature multi-use stormwater detention facility being developed by the Clear Lake City Water Authority in southeast Houston; the first planting of a pilot stormwater wetland began there in June as the first of five phases of more than 40 acres of such wetlands that drain into the impaired Horsepen and Armand bayous. Two other projects in the preliminary stages are a pilot project at Brazosport College in Lake Jackson in the Oyster Creek watershed that will be used as a teaching center and water quality improvement asset, and a stormwater wetland that will be added to a basin receiving runoff from a new parking lot expansion at MD Anderson Cancer Center in Houston in the watershed of the impaired Brays Bayou.

LANDSCAPING TO CONSERVE WATER AND DECREASE POLLUTANTS

Our TCWP WaterSmart Program focuses on providing tools to help people landscape in a way that is low maintenance and low cost, and has a low impact on the environment. Residential and commercial landscapes are a major sink for freshwater, diverting the inflows necessary to maintain the health of Galveston Bay and substantially increasing the nutrients and pesticides entering the bay. WaterSmart yards use plants and practices that require less water and little or no fertilizers or pesticides. We conducted multiple workshops and demonstrations to inform local officials, landscaping professionals and homeowners on best landscaping practices, including the use of native plants. One demonstration project, at the Ghirardi Family WaterSmart Park in League City, annually diverts 637,500 gallons of stormwater through its rain gardens, improving water quality. We installed two new demonstration gardens in 2016, both butterfly gardens, at the Armand Bayou Nature Center and at the Environmental Institute of Houston at the University of Houston-Clear Lake, and released a series of short videos to educate homeowners about WaterSmart techniques, Texas native plants, composting and irrigation.

REMOVING DANGEROUS DEBRIS FROM TEXAS WATERWAYS

Monofilament fishing line is another name for the single-strand, high-density nylon fishing line that is used on fishing reels. Used fishing line can be harmful to coastal and marine wildlife that become entangled in it when it is not disposed of properly. Our Texas Monofilament Recovery and Recycling Program is a statewide, volunteer-led effort to reduce monofilament fishing line in the environment by educating the public about the problems it can cause and coordinating the collection and recycling of line through a network of volunteer-maintained bins around the state. In 2016, volunteers collected 648 pounds of used monofilament, the equivalent of 879 miles of line, keeping it out of our waterways.

MONITORING FOR HARMFUL ALGAL BLOOMS

A red tide in Texas is a rapid and widespread bloom of a toxic algae that can cause difficulty breathing in humans and negative impacts on commercially important finfish and shellfish. We provide organizational support and training to the Red Tide Rangers, a volunteer group of citizen scientists who monitor coastal waters in South Texas for red tide. During the 2016 red tide off South Padre Island, the Rangers collected and analyzed samples from Gulf waters, monitored harmful aerosols produced by the algae, and followed up on news of fish kills. The group ground-truthed NOAA harmful algal bloom satellite forecasts and reached out to communities and businesses in the affected area to make them aware of the presence of red tide and steps they can take to reduce the impact on human health, pets and business.



Preparing Texas' Students for Tomorrow's Challenges

Educating students at all levels, from K-12 through graduate study at institutions of higher education, is crucial to continuing progress and meeting the challenges ahead. Texas Sea Grant's goals include building tomorrow's workforce to support coastal and marine industries and ensuring a scientifically literate public that is able to use our natural resources in ways that capture the economic, environmental and cultural benefits they offer while preserving their quality and abundance for future generations.

TRANSFORMATIONAL LEARNING THROUGH RESEARCH

Our support to university researchers includes funding undergraduate and graduate students working in laboratories alongside faculty mentors to prepare them for their own future careers as scientists. Over the lifetime of our program, several hundred students have been able to participate in research projects thanks to Texas Sea Grant funding. Today, some are faculty conducting their own studies; others just starting out are the next generation of researchers whose work will one day answer guestions critical to Texas' future. We also provide direct support to student researchers through grants and fellowships. In 2016, our Grants-In-Aid of Graduate Research Program awarded \$22,000 to 12 graduate students at three Texas universities to support their research. The Texas Sea Grant Scholars Program, a partnership with the LAUNCH: Undergraduate Research Scholars program at Texas A&M University, provided stipends of up to \$1,000 to 12 students whose research projects were related to the marine environment.

BRINGING THE GULF OF MEXICO INLAND

As part of Texas Sea Grant's mission to advance marine literacy, we sponsor the adoption of 29-gallon saltwater aquariums in K-12 classrooms in the Brazos Valley. The Aglantis Jr. program, named after our Aglantis aquarium on the Texas A&M University campus, is designed to help inland students learn about and gain appreciation for the Gulf of Mexico and the world's oceans. To date the program has distributed aquariums to 40 public and private schools at all grade levels.

DEVELOPING TEXAS' FUTURE WORKFORCE

With the Port of Port Arthur, we co-direct Camp SeaPort, a weeklong summer day camp designed to introduce high school students in Port Arthur to maritime career opportunities. Jefferson County is home to three major ports that handle a guarter of the nation's petroleum products and millions of tons of cargo. As a consequence, there are many jobs at maritime industries, but most local young people are unaware of the opportunities and often seek employment outside the area. Camp participants meet with local industry contacts, find out career requirements and the benefits available in these types of jobs, and receive information from college advisers at area schools offering maritime-related training.

UNDERGRADUATE STUDENTS SUPPORTED BY TEXAS SEA GRANT, 2001-2016



GRADUATE STUDENTS SUPPORTED BY TEXAS SEA GRANT, 2001-2016



Making Science Work for Texans

Texas Sea Grant supports integrated research and extension projects that improve the understanding, wise use and stewardship of Texas' coastal and marine resources. The overarching goals of Texas Sea Grant's research program are to support outcome-oriented research that spans broad areas of natural, physical, social, behavioral and economic sciences and engineering, and to make research investments that will generate substantial social, economic and environmental impacts in Texas.



NEW RESEARCH PROJECTS FUNDED BY TEXAS SEA GRANT, 2016-2018

A new early warning tool to mitigate harmful algal blooms	Dr. Lisa Campbell, Department of Oceanography, Texas A&M University
Study of wetland erosion due to storms through combined field, labo- ratory, and numerical investigations	Dr. Kuang-An Chang, Zachry Department of Civil Engineering, Texas A&M University
Determining the suit- ability of soil microbial amendments to enhance ecological restoration of coastal Texas sand dunes	Dr. Kerri Crawford, Department of Biology and Biochemistry, University of Houston
The South Texas Banks ecosystem: Oceanography, biodiver- sity and genetics	Dr. Diego Figueroa, Department of Biological Sciences, University of Texas Rio Grande Valley
Testing macroclimate models of coastal wet- land plant communities	Dr. Christopher Gabler, Department of Biology and Biochemistry, University of Houston
Perceptions of commu- nity resilience in Texas shoreline counties	Dr. Kirby Goidel, Public Policy Research Institute, Texas A&M University
Conservation genomics of the critically endangered Kemp's ridley sea turtle (Lepidochelys kempii)	Dr. Luis Hurtado, Department of Wildlife and Fisheries Sciences, Texas A&M University
Bioavailability and chem- ical characterization of dissolved organic nitro- gen in South Texas rivers	Dr. Zhanfei Liu, Department of Marine Science, University of Texas Marine Science Institute

Program Funding

Texas Sea Grant's primary source of funding is through NOAA's National Sea Grant College Program. These core funds are supplemented by special NOAA competitions available only to state Sea Grant programs. Support from the State of Texas to Texas Sea Grant, through Special Item funding, is critical to meeting NOAA's requirement of a 50 percent match from state sources. Texas A&M University contributes additional matching funds to Texas Sea Grant, and we also win competitive grants and contracts from federal, state, corporate and notfor-profit sponsors.

TEXAS SEA GRANT FUNDING SOURCES, 2016



EXTERNAL FUNDING AWARDED TO TEXAS SEA GRANT, 2006-2016



Texas Sea Grant Staff

Texas Sea Grant's greatest resource is our people. Their efforts are the key to building bridges with the public and collaborating with industry, non-profit organizations, natural resource agencies and others. Only a fraction of the staff are located at headquarters in College Station; the majority of our personnel are located on the Texas coast, where they are trusted voices within their communities but also contribute on the wider stage by representing Texas' interests on boards and commissions in their areas of expertise at state, regional, national and international levels.



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Texas Sea Grant Awards

Gary Graham, Marine Fisheries Specialist, received a Lifetime Achievement Award from the Southern Shrimp Alliance in "recognition of outstanding dedication, vision and amazing lifetime accomplishments in and for the United States domestic shrimp industry."

Julie Massey, Coastal and Marine Resources Agent for Galveston County, received a Distinguished Service Award from both the National Association of County Agricultural Agents and the Texas Association of County Agricultural Agents.

Dr. Pamela Plotkin, Director, received a Texas A&M University College of Geosciences Dean's Distinguished Achievement Award for Faculty Excellence.

Cindie Powell, Assistant Director, received a Texas A&M University College of Geosciences Dean's Achievement Award for Exemplary Staff Services.

Rhonda Cummins, Coastal and Marine Resources Agent for Calhoun County, was named Woman of the Year by the Port Lavaca Chamber of Commerce for her professional and personal dedication to the community, especially in her activities that focus on education and marine issues. A marsh restoration project in Calhoun County that **Cummins** first identified in our Gulf Sea Grant inventory of potential hydrological restoration projects received the Texas Environmental Excellence Award from the Texas Commission on Environmental Quality.

Wetland Program Specialist **Marissa Sipocz'**s Sheldon Lake State Park restoration and outreach efforts received a Mayor's Proud Partner Award from Keep Houston Beautiful as a distinctive project that contributes to the overall value of the city.

Mary Carol Edwards, Stormwater Wetland Program Specialist, and other partners in the Exploration Green stormwater detention park project were recognized with a Connection Award by the Our Great Region Awards of the Houston-Galveston Area Council. The award honors projects that advance Our Great Region's long-range sustainability plan through innovative partnerships.

A data collection effort Associate Director **Heather Wade** led with the Harte Research Institute to inventory public beach access points under a grant from the Texas General Land Office (TGLO) was converted into a web application (txcoast.org) by TGLO; the app received a third-place award at a prestigious international GIS conference.

