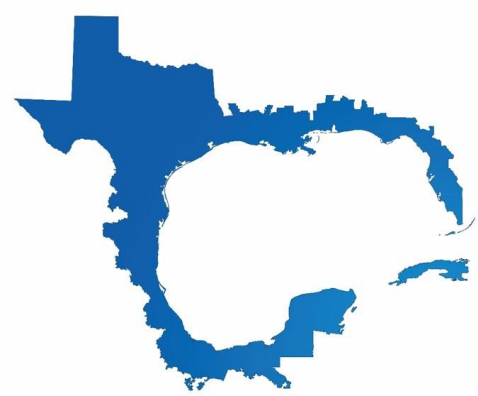

T • E • X • A • S

ONEGULF

Center Of Excellence

Strategic Research and Action Plan

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Executive Summary:

Texas OneGulf Center of Excellence is a nine member consortium of research institutions throughout the state of Texas with both broad and profound expertise in marine sciences, human health, sociology, economics, law, and policy. It is our **mission** to improve our understanding the Gulf of Mexico large marine ecosystem and its' effects on human health for the betterment of both. Our **vision** for Texas OneGulf is to become a trusted network of Gulf experts that provides science-driven information to decision makers and resource managers working to ensure the environmental, economic, and human health sustainability of the Texas Gulf coast and beyond. This Strategic Research and Action Plan is a document that lays out our strategic research focus and the capacity that we have built to move toward reaching our strategic goals and vision.

Texas OneGulf consortium member institutions:

- Harte Research Institute for Gulf of Mexico Studies at Texas A&M University – Corpus Christi
- The Center for Translational Environmental Health Research at Texas A&M Health Science Center
- The Sealy Center for Environmental Health and Medicine at the University of Texas, Medical Branch
- The Center for U.S. and Mexican Law at the University of Houston Law Center
- The School of Earth, Environmental and Marine Sciences at University of Texas – Rio Grande Valley
- Geochemical and Environmental Research Group and Department of Oceanography at Texas A&M University
- Gulf of Mexico Coastal Ocean Observing System – Regional Association
- The Meadows Center for Water and the Environment at Texas State University
- The Departments of Marine Biology and Science and Engineering at Texas A&M University – Galveston

Strategic Goal 1: Improve understanding of the Gulf of Mexico as a large marine ecosystem. Texas OneGulf will focus on habitats, living marine resources, environmental flows, estuarine and coastal systems, offshore and deep gulf systems, socio-ecological connections, and the pressures and stressors that affect the current and future health of the Gulf of Mexico large marine ecosystem. Improved understanding in each of these areas is required to better understand the Gulf as a holistic, connected system. Our focus, therefore, will be to connect each of these research areas in a manner that is actionable and relevant to the improved understanding, management, and restoration of the Gulf of Mexico.

Strategic Goal 2: Improve understanding of the connections between environmental and human health to benefit both. Texas OneGulf recognizes that humans and the environment are intrinsically linked and that the health of the Gulf and the health of people around it are dependent upon one another. Therefore we will focus on making explicit connections between environmental health and human health. This includes the impacts that environmental quality have on human health – including mental health – at individual and community levels. Each of these connections affects community resilience and the overall ability of the Gulf coast to thrive well into the future. Better understanding of these connections will support a more holistic view of the Gulf and its importance to Gulf communities.

The capacity to reach these goals is found within the Texas OneGulf Network of Experts (TONE), a body of 160+ experts (*Appendix A*) capable of undertaking the research and actions necessary to achieve the goals and vision in this plan. Texas OneGulf is working to improve the ability of decision-makers to implement **science-driven solutions** by fostering **collaboration**, encouraging **communication/engagement** across our entire stakeholder group, building strong **data management** capabilities, and supporting the development of a **baseline and long-term monitoring** strategy. Ultimately, Texas OneGulf strives to support improved environmental and human health of the Gulf of Mexico region with relevant and timely scientific information and research for many generations to come.

Texas OneGulf Center of Excellence:

Texas OneGulf Center of Excellence (Texas OneGulf) was designated in January 2015. It was made possible by the federal Resources and Ecosystem Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE) Act, which is funded by the Deepwater Horizon administrative and civil penalties, as well as funds from the Governor of Texas that were provided by British Petroleum to the State of Texas. The mission of Texas OneGulf is to gather and improve knowledge about the Gulf of Mexico to inform decision-making around the challenges to environmental and economic sustainability of the Gulf of Mexico and its impact on the health and well-being of Texans and the nation.

Texas OneGulf is a consortium of nine institutions led by the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi and includes: the Center for Translational Environmental Health Research at Texas A&M Health Sciences Center; the Texas A&M University Department of Oceanography – Geochemical and Environmental Research Group; Texas A&M University – Galveston – Marine Biology, Science and Engineering Departments; The University of Texas Rio Grande Valley – Marine & Coastal Sciences and Environment & Earth Science, School of Multidisciplinary Studies; The University of Texas Medical Branch – Sealy Center for Environmental Health and Medicine; Texas State University – The Meadows Center for Water and the Environment; University of Houston – Law Center for U.S. and Mexican Law; and the Gulf of Mexico Coastal Ocean Observing System-Regional Association.

Texas OneGulf consortium is unique because it combines diverse institutions with exceptional expertise in understanding the ocean environment, socio-economics and human health with the ability to develop science based solutions to Gulf of Mexico problems that affect the health, wealth and safety of Texas and its citizens. Texas OneGulf recognizes that humans are part of the environment and that a healthy environment, a healthy economy, and healthy citizenry define a Gulf of Mexico that Texas wants now and for the future. Texas and the Gulf of Mexico is where environmental health and economic viability both coexist and contend with one another. Sustainability of both depend on science based management, policy and regulations.

Texas OneGulf is designed with the capacity and flexibility to address all five disciplines denoted in Section 1605 of RESTORE. Texas OneGulf will bring to bear the best available science to: 1) *Foster coastal sustainability, restoration and protection;* 2) *Enhance coastal fisheries and wildlife ecosystem research and monitoring;* 3) *Secure the safe sustainable development of the offshore energy resources of the Gulf of Mexico;* 4) *Support sustainable and resilient growth, economic and commercial development; and,* 5) *Provide comprehensive observation, monitoring and mapping of the Gulf of Mexico.*

Each of these five disciplines is broad in scope and complexity and defines objectives that may only be effectively addressed by an interdisciplinary approach. Doing so successfully, recognizes that the process is a continuum extending through three broadly defined steps: assessment, synthesis and solution. Assessment includes research and data/information acquisition; synthesis includes analytics, modeling and integration; and, solutions focused on decision support and related activities assisting policy and decision-makers to make use of the best available science. A key element in this process is access to an extensive and open ended source of knowledge about the Gulf at both macro and micro levels. To provide access to this knowledge, Texas OneGulf will integrate the two largest such entities in the Gulf – the Gulf of Mexico Research Initiative's Information & Data Cooperative (GRIIDC – managed by Harte Research Institute), the largest network of Gulf researchers ever assembled and the Gulf of Mexico Coastal Ocean Observing System database with the capacity to access near real time data, to accomplish this goal.

Texas OneGulf Strategic Research and Action Plan:

Texas OneGulf Strategic Research and Action Plan (SRAP) is the foundational document that will guide the focus of Texas OneGulf. This plan lays out our mission and our vision for the future. Developed with the input of our stakeholders and leadership, it outlines the research areas in which we will focus coupled with the capacity contained within the consortium to make progress in these areas. The SRAP is a living document capable of adapting "in-step" as our knowledge of the Gulf and its communities evolves. The SRAP is a guide to Texas OneGulf and our stakeholders that provides guidance to the research and actions that Texas OneGulf will both undertake and support.

The initial phase of SRAP development used a framework to solicit input from our stakeholders. The development of the framework was based on an analysis of 12 existing strategic plans that were chosen based on their relevance to the Texas coast as well as being current enough to include insight into the Deep Water Horizon disaster. Within these plans, 211 individual priorities were identified and categorized into a group of 10 broad themes (*see Appendix B*). The goal of this analysis was to provide insight into existing priority areas and needs within the Gulf of Mexico region. The resulting framework was used to gather input from our stakeholders, Texas OneGulf Consortium Leadership, and Texas OneGulf Science Advisory Committee. Between March of 2016 and January of 2017, a series of five in-person input workshops with the Texas OneGulf Network of Experts, representatives from several environmental and public-health related NGO's, Texas state environmental and human-health agencies, non-consortium academic institutions, Gulf-related businesses, and other stakeholder groups were held. During these in-person workshops framework was presented as a starting point to and gather input from these stakeholders who identified priority research areas as well as a better understanding of the capacity contained within Texas OneGulf to further each of the identified priority research areas.

The second phase in SRAP development was to use the input gathered from the stakeholder groups to develop an initial draft of the SRAP. The initial draft was used as a platform for further and more refined input from our stakeholders. The framework allowed for a systematic method for collecting input from our core stakeholder groups mentioned above. The framework was first presented along with our strategic goals to provide a common point of departure for stakeholders to provide input. That input was compiled and coded according to our strategic goals and used to develop a cohesive vision of the priority research areas needed to support those goals. Ultimately, expert and stakeholder input were the basis for the initial draft of the SRAP. The initial draft was reviewed by the Texas OneGulf Consortium Leadership as well as a committee of independent advisors, the Texas OneGulf Science Advisory Committee. The initial draft was then sent to the Texas Commission on Environmental Quality for an administrative review, which resulted in the release of the initial draft of the SRAP to the broader public.

In the final phase of development, the SRAP was vetted and approved by the Texas OneGulf Science Advisory Committee and the Texas OneGulf Consortium Leadership. The first step in this phase was a series of public meetings and electronic distribution of the initial draft of the SRAP to the public and other stakeholder groups. The SRAP was also released at the State of the Gulf of Mexico Summit in Houston for stakeholders across the Gulf to view the plan and provide input. Therefore, the vetted SRAP includes input from the public as well as the larger stakeholder group before being reviewed by the Texas OneGulf Science Advisory Committee and accepted by the Texas OneGulf Consortium Leadership. This iterative process of input and revision is designed to ensure that the SRAP evolves "in-step" with our understanding of the Gulf of Mexico as well as the emerging needs identified by our stakeholders. In keeping with the living nature of the SRAP, the most up-to-date version is available on the TexasOneGulf.org website for review and input. On an annual basis, stakeholder input will be compiled for the Texas OneGulf Consortium Leadership and Texas OneGulf Science Advisory Committee and considered for incorporation into the annual update of the SRAP.

The SRAP is to be used by the Texas OneGulf Consortium Leadership as well as the Texas OneGulf Science Advisory Committee in the development of an annual work plan. The annual work plan will layout the short-term, annual steps needed to move toward furthering our strategic goals and delineate funding priorities for Texas OneGulf. These short-

term goals will be used to develop Requests for Proposals (RFPs) that will solicit projects that fit into the annual work plan and support the priority research areas laid out in this document. Specific criteria for securing future Texas OneGulf funding will be laid out in each RFP that will also describe specific selection and grading criteria for individual projects.

In addition to the initial RESTORE funding for Texas OneGulf, the Governor's office provided approximately $2 million as a result of early payments from BP. Without a formalized SRAP, the aforementioned framework was used as a guide for choosing projects funded by the Governor's Office (*see Appendix D*). These projects provided Texas OneGulf the ability to begin working in several of the areas that have previously been identified as important and to reinforce collaboration among interdisciplinary teams within the consortium. These projects also provide a chance to begin working on the types of solutions-based research Texas OneGulf seeks to undertake in the coming years. In subsequent years, the SRAP and annual work plans will be the guiding documents that will help direct future funding allocations and RFPs.

***Mission**: The mission of Texas OneGulf is to improve understanding of the Gulf of Mexico large marine ecosystem and clearly delineate its' role in human health and well-being in an effort to support a healthy environment and communities in Texas, the Gulf region, and beyond.*

***Vision**: Become a trusted network of Gulf experts that provides science-driven information to decision makers and resource managers working to ensure the environmental, economic, and human health sustainability of the Texas Gulf coast and beyond.*

Introduction:

The Gulf of Mexico is a vital asset to our Nation and our economy. It is home to abundant commercial fisheries, valuable energy resources, diverse international shipping infrastructure, abundant recreational opportunities, and deep cultural roots for those that live along its' shores. This makes the Gulf of Mexico strategically important in terms of both environmental and economic sustainability. Yet the region faces challenges, both past and present, which will only be amplified by a projected 40% increase in population from current levels by the year 2025. Increased population will inevitably increase the use and demand on the resources of the Gulf of Mexico. To meet these challenges we must deepen our understanding of the Gulf and the role it plays in the health and prosperity of those that depend on it.

The Gulf of Mexico has endured a long history of environmental degradation, much of it a result of human activity. Over the last several decades, major changes in hydrology have affected water quality and quantity of many of the major rivers that flow into the Gulf. This has led to decreased water quality, hypoxic zones, and physical changes along bays, barrier islands, and other coastal habitats. Increased fishing pressure has affected populations of commercially important species. Industrial activities have also impacted our coastal habitats and living marine resources. Development along the coast has altered habitats and decreased the ability of these habitats to respond to stressors such as climate change and hurricanes. Loss of habitats and their essential functions has diminished the ability of the ecosystem to respond and rebound from the inevitable pressures and stressors, which result in a diminished capacity for the provision of ecosystem services and fewer opportunities for coastal residents to benefit from these natural assets. To address these challenges we must deepen our understanding of the Gulf and the role it plays in the health and prosperity of those that depend on it, and infuse decision-making processes with improved science and tools to sustain the benefits provided by the Gulf well into the future.

We cannot view the Gulf of Mexico as a collection of discrete, compartmentalized functions. It is a large marine ecosystem composed of a dynamic biophysical system to which an equally dynamic human society is inextricably linked. The overall health of the system has broad-reaching implications for the prosperity and well-being of the citizens of Texas and beyond. The cumulative impacts of these alterations on the Gulf ecosystem endanger both the natural systems and the social and economic ability of the region to remain prosperous. With the advent of the RESTORE Act, an unprecedented opportunity to positively address these challenges and build a stronger, more resilient Gulf is before us.

Texas OneGulf Center of Excellence:

As outlined in the RESTORE Act, each of the five Gulf States will designate Centers of Excellence that will undertake research to address one or more of the five RESTORE disciplines: 1) Foster coastal sustainability, restoration and protection; 2) Enhance coastal fisheries and wildlife ecosystem research and monitoring; 3) Secure the safe and sustainable development of the offshore energy resources of the Gulf of Mexico; 4) Support sustainable and resilient

growth, economic and commercial development; 5) Provide comprehensive observation, monitoring and mapping of the Gulf of Mexico.

Texas OneGulf is founded on the concept of OneHealth, the collaborative effort of multiple disciplines to attain optimal health for people, wildlife and the environment. Texas OneGulf explicitly recognizes that people and the environment cannot be treated as separate. Both humans and the environment are dependent upon one another for optimal health and prosperity. Furthermore, effective policy, regulation and management of the Gulf of Mexico must integrate this understanding into the decision-making process if we are to successfully sustain the health of our natural and human resources.

Texas OneGulf has built the capacity to support our mission, vision and goals through the formation of the Texas OneGulf Network of Experts (TONE). These are the individuals with the necessary expertise in marine science, human health, social sciences, economics, law and policy, that are committed to the interdisciplinary work to further our mission and vision. The TONE consists of 160+ scientists, policy experts and researchers that represent the body of expertise and capacity to address long-term issues affecting the health and productivity of the Gulf, as well as the opportunity to develop a group of rapid responders to emergencies that threaten the health and safety of Texans. Ultimately, the TONE is the interdisciplinary unit that will perform the assessment, research, and synthesis activities that enable Texas OneGulf to meet its' mission, vision and goals.

Strategic Research Goals:

Strategic Goal 1: Improve understanding of the Gulf of Mexico as a large marine ecosystem:

The Gulf of Mexico large marine ecosystem is geographically bound by the coasts of the United States in the north, Mexico in the southwest, and Cuba in the southeast. Yet, simple geographic boundaries do little to capture the connectivity of habitats, living marine resources, and the dynamic interplay among the biophysical and human activities along its shores and beyond. The Gulf of Mexico large marine ecosystem is driven by the unique hydrography and bathymetry that define the movement of water into and out of the system. The Gulf itself is nourished, in part, by the freshwater inputs that nourish the system. It is also influenced by large scale water movements, such as the Loop Current, that move water throughout the Gulf as far as the Caribbean Sea through the Yucatan Straits and out to the Gulf Stream through the Straits of Florida. This dynamic movement of water and the life it contains creates a unique tapestry that defines the productive ability of the Gulf and requires that we begin to synthesize our knowledge to adopt a more holistic view of the system that explicitly includes this complexity and connectivity.

Both human activities and natural processes continue to drive changes within the Gulf of Mexico large marine ecosystem. These changes have the potential to diminish the ability of the both the human and natural communities to thrive. Stressors such as continued energy exploration, the procession of climate change, coastal developments, alterations in hydrology, and many others continue to impact the system and can hinder its ability adapt and function at healthy levels. Therefore, it is of paramount importance that we develop a baseline that describes the system in a meaningful and actionable manner then continuously monitor the system in a manner that allows us to detect and respond to these changes over time.

Priority Research Areas:

- Habitats: Understand quantity, quality, function, and connectivity among coastal habitats and their importance in environmental health and ecosystem service provisioning.

- Living Marine Resources: Understand the condition and interdependence of populations of living marine resources (i.e. fisheries, marine mammals, sea turtles, and many others) and identify and measure threats (i.e. marine debris, vessel strikes, invasive species, climate change, ocean acidification, etc.) to healthy populations, communities and biodiversity.

- Environmental Flows: Understand the relationships among quality, quantity and timing necessary to manage freshwater inflows and the movement of nutrients and sediments to alleviate conflicts among users and mitigate negative impacts on environmental and human health.

- Estuarine and Coastal Environments: Improve understanding of the biological, physical and chemical processes that comprise the ecosystem starting at the input of rivers continuing out to the continental margins and beyond.

- Offshore and Deep Gulf: Improve understanding of the large-scale biological, physical, and chemical processes that define the offshore and Deep Gulf environments beyond the continental shelf and the implications for environmental and human health.

- Socio-Ecological Systems: Develop a comprehensive understanding of the interactions among a coupled socio-ecological system to improve community resilience, understand vulnerabilities/risks to environmental stressor/disturbances, and further understand the provisioning of ecosystem services.

- Pressures and Stressors: Understand the human activities and natural processes that act as stressors such as climate change, relative sea level rise, habitat loss, hydrographic/hydrologic changes, effects of land use, coastal

development, and others that impact the ability of the Gulf of Mexico large marine ecosystem to support thriving human and ecological communities.

Possible Outcomes:

1. A holistic, systems view of the Gulf of Mexico large marine ecosystem and an understanding of the human benefits it provides is used to inform planning and resource management of habitats, living marine resources, and resilient coastal communities.
2. Biodiversity is maintained in a manner that supports both environmental and human health.
3. Environmental flows and their ecological and economic benefits are considered in planning and resource management throughout Texas and the Gulf of Mexico region.
4. Improved understanding of the biophysical connections and feedbacks between estuarine and coastal environments and the offshore and deep Gulf environments.
5. Pressures and stressors that impact the Gulf of Mexico are addressed to inform planning and resource management that supports greater socio-ecological resilience.
6. Define a "baseline" condition that is capable of measuring and communicating changes within the Gulf of Mexico large marine ecosystem that is capable of informing planning and resource management decisions.

Strategic Goal 2: Improve understanding of the connections between environmental and human health to benefit both.

Human health is fundamentally linked to our environment through the air we breathe, the water we drink, the food we eat, and the places we live. Along the Gulf coast, many residents are able to enjoy the benefits of abundant seafood resources, protection from storms by barrier islands, and access to a multitude of recreational opportunities in nature. Yet at the same time, others along the Gulf are subjected to respiratory irritation from harmful algal blooms or increased flooding risk due to habitat loss/degradation, while others lack access to safe seafood due to high levels of toxic metals. These realities coexist all along the Gulf coast and can have major implications for both individual and public health.

In order to address these issues, it is important that we explicitly make these connections between environmental and human health to understand the underlying processes that drive them. We must also begin to understand the effects of a healthy ecosystem on mental health and the connections between our natural environments and the well-being of our communities. By working toward a deeper understanding of these connections between environmental and human health, we will be supporting the ability to build strong, resilient communities that are able to respond and adapt to the dynamic Gulf coast environment while still preserving our natural and cultural resources.

Priority Research Areas:

- Human and Environmental Health: Understand and make explicit the connections between human health and water/air quality, seafood safety/sustainability, human nutrition, natural/man-made disturbances/disasters, and waterborne, disease-causing pathogens to benefit human health and well-being.

- Environmental Stressors and Individual Health: Understand the human body, its' functions, pathways and systems that are vulnerable to the effects of environmental stressors.

- Environmental Stressors and Public Health: Understand the complex interactions that drive and contribute to environmental health disparities by understanding the effects of environmental stressors at the community level.

- Mental Health: Understand that environmental health supports healthy social systems and can have profound impact upon mental health for those people affected by environmental disasters/disturbances/stressors.

- Community Resilience: Understand the links between healthy social systems and a healthy environment including the drivers of community resilience, vulnerability, and human well-being.

Possible Outcomes:

1. The perspective of coupled ecological and human health, the OneHealth concept, is more widely used to inform planning and resource management, and public health decisions.
2. Explicit connections are made between the health of the Gulf of Mexico Large Marine Ecosystem and individual, public and mental health.
3. An improved understanding of community resilience is used to inform more planning and resource decisions in Texas and the Gulf of Mexico region.

Strategic Actions and Principles:

Collaboration: The heart of the Texas OneGulf consortium is built on the ideals of interdisciplinary research and collaboration. Texas OneGulf consortium members bring expertise in a multitude of both biological and physical marine sciences, public health, toxicology, pharmacology, epidemiology, sociology, economics, law, policy and many more. To achieve our goals, Texas OneGulf has committed itself to working across disciplines to provide the actionable scientific insight to tackle the multifaceted challenges the Gulf faces. Texas OneGulf also seeks to broaden the reach of our collaborative approach by supporting teams of experts in seeking and securing funding outside of the Center of Excellence in a manner that is consistent with our strategic goals and mission. Gulfbase.org will be the platform that helps to facilitate collaboration and connection of Texas OneGulf Network of Experts members by housing profiles of individual work and expertise, location, assets, and much more. In addition, each of the four remaining Gulf States (Louisiana, Mississippi, Alabama, and Florida) has at least one Center of Excellence, funded through RESTORE Act and undertaking research in at least one of the five RESTORE disciplines. This provides a platform of analogous entities with which Texas OneGulf both consult and collaborate when possible. The goal of collaboration is furthered through these connections to not only positively impact the State of Texas and its citizenry, but the broader Gulf as well.

Communication and Engagement: Texas OneGulf seeks to fulfill its vision by building a network of experts that will act as a trusted science resource for Texas decision-makers that are working to address challenges here in Texas and the broader Gulf. This means that we support data collection, integration and synthesis tools that paint a clear, unbiased picture of the state of the Gulf of Mexico. By focusing on solutions driven research, we seek to add value to the decision-making process by providing insight into the complex issues associated with human activities, resource management and public health in Texas and the region. Texas OneGulf will use the State of the Gulf of Mexico Summit, hosted in conjunction with the Harte Research Institute for Gulf of Mexico Studies, as a primary outlet for broad scale outreach, while maintaining the capability to identify teams of experts and respond to emerging issues as they arise.

Data Management: To reach our strategic goals, it will be necessary to develop tools that can accurately describe the Gulf of Mexico as a large marine ecosystem and the interplay among its multitude of functional components and their impacts upon each other. This will require that data, both historical and current, become accessible to the broader stakeholder group and experts alike. Texas OneGulf has begun to develop the Texas Knowledge Base which leverages the infrastructure and data management capabilities of two programs within the consortium: the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC) and the Gulf of Mexico Coastal Ocean Observing System – Regional Association (GCOOS-RA). Combined, both programs have the data management expertise to store and make accessible data that is generated from Texas OneGulf research as well as existing or future data that may be available. Ultimately, Texas Knowledge Base will enhance access to and use of the two largest and most powerful data management and information systems ever assembled for the Gulf of Mexico.

Baseline and Long-Term Monitoring: Texas OneGulf believes that long-term monitoring of the Gulf of Mexico is of paramount importance. Simply working to describe the system in a disconcerted, one-time fashion will leave an incomplete picture of the large marine ecosystem at best. Therefore, Texas OneGulf supports the idea of a Gulf-wide, coordinated effort of monitoring biophysical parameters, human health indicators as well as appropriate socioeconomic indicators to support improved understanding of the Gulf of Mexico and inform its' management. Historically, this type of monitoring was not possible due to funding. Texas OneGulf seeks to work to change that paradigm by leveraging partnerships within the consortium and across the Gulf to support this goal as much as possible. In order to begin this process, Texas OneGulf is developing framework for the first Gulf of Mexico Eco Health Metrics Report which will be first applied as a pilot project in the Mission-Aransas National Estuarine Research Reserve and will act as a baseline and communication tool to understand the current state of the study-site with the goal to expand out to the entire Gulf of Mexico in the future.

Capacity:

Texas OneGulf has developed several capacities to achieve the strategic goals set out before us. The first is the development of the consortium of nine member institutions with broad expertise and capabilities. The second is the designation of experts within the consortium member institutions that will act as the principal investigators and collaborators in research and activities supported by Texas OneGulf. Mechanisms have also been developed to ensure that our capacity to grow and adapt to changing needs within the Gulf can be met. Beyond the strategic research and action plan being a living document, new member institutions are able to be added to the consortium by way of vote from the Texas OneGulf Consortium Leadership. A similar approach is taken with the TONE membership in that its' membership list must be reviewed and approved by vote each year to ensure that the membership remains appropriate and up-to-date.

Texas OneGulf Consortium Member Institutions:

Texas OneGulf is a consortium of research institutions from across the state of Texas. Each institution brings unique experience to the consortium (*See Appendix C for a summary of each institutions' capacities*). By creating an interdisciplinary consortium of member institutions Texas OneGulf is equipped to undertake research that both address the Strategic Goals set out in this document as well as provide valuable insight into some of the most pressing environmental challenges facing the Gulf coast. Texas OneGulf is equipped with expertise in biological, ecological, geological, physical, biomedical, economic, sociological, and public health expertise necessary to address the complexity of many of these multi-faceted challenges. Ultimately, Texas OneGulf seeks to make these insights available to decision and policy-makers that are working to tackle these environmental challenges.

Texas OneGulf Network of Experts (TONE):

The TONE is a group of 160+ experts (*See Appendix A for complete membership list*), designated by their Texas OneGulf consortium institution, that represent a trusted group of experts that have distinguished themselves in their respective fields and are willing to provide their expertise to Texas OneGulf. Their expertise is defined in one or more of five categories: Ecosystem Health, Physical and Chemical Systems, Organismal and Population Health, and Human Health and Well-Being. These five categories correspond to expertise needed to address any one of the five RESTORE disciplines. Further refinement of expertise will be housed in GulfBase.org by the consortium member, Harte Research Institute for Gulf of Mexico Studies. GulfBase.org will allow experts, not only in TONE, but throughout the Gulf, to maintain pages that describe their projects, the places they work, and the unique capabilities that they possess. This will be a tool to help support collaboration among TONE members and the broader Gulf scientific community.

Overall, Texas OneGulf will use the SRAP as a guiding document as we undertake the research necessary to support sustainable environments, economies and communities throughout Texas and the broader Gulf coast. The mission, vision, strategic goals, strategic actions and principles, as well as the profound expertise found within the consortium members provide the path and the tools to tackle these challenges with both a depth and breadth that few can rival. The coming years will be pivotal in the future health and wealth of both the Texas Gulf coast and the broader region. This is why the OneGulf concept is intentionally holistic, interdisciplinary, and inclusive. Our research has the ability to impact environmental challenges not only in the United States, but also Mexico and Cuba. Therefore, it is important that Texas OneGulf research moves beyond basic scientific questions to provide solutions-driven science that seeks to help inform decision and policy-makers with the best available scientific insights as we work in concert to ensure the health and prosperity of the Gulf well into the future.

Appendix A: TONE Membership List and Expertise Matrix FY 2018:

				Expertise Matrix				
Affiliation	**Title**	**First**	**Last**	Ecosystem Health	Physical and Chemical Systems	Organismal and Population Health	Socio-Economics and Resilience	Human Health and Well-Being
TAMUCC	Assistant Professor	Hussain	Abdulla		X			
CTEHR	Associate Professor	Clinton	Allred					X
TAMUG	Associate Professor	Jaime	Alvarado-Bremer			X	X	
TAMUG	Associate Professor	Rainer	Amon		X			
TAMUG	Associate Professor	Ayal	Anis		X			
SCEHM	Professor	G. A. Shakeel	Ansari					X
TAMUG	Associate Professor	Anna	Armitage	X		X	X	
UTRGV	Assistant Professor	Karl	Berg	X		X		
TAMUCC	Associate Research Scientist	Mark	Besonen		X			
TAMUCC	Assistant Professor	Chris	Bird			X	X	
TAMUCC	Assistant Professor	Darek	Bogucki	X				
SCEHM	Professor	Allan R.	Brasier					X
UTRGV	Professor	Chip	Breier	X	X			
GCOOS-RA	Assoc. Director of Marine Science	Jorge	Brenner	X		X	X	X
TAMUG	Professor	Sam	Brody				X	
GERG/OCNG	Professor	Piers	Chapman	X	X		X	
TAMUCC	Endowed Chair and Professor	Ruizhi	Chen					
CTEHR	Professor	Weihsueh	Chiu		X			

TAMUCC	Assistant Professor	Patrick	Christopher			X		
UTRGV	Associate Professor	Carlos	Cintra Buenrostro	X	X			
TAMUG	Department Head and Professor	Edward	Clancy					
TAMUCC	PENS Chair and Professor	Richard	Coffin	X	X	X		
TAMUCC	Assistant Professor	Jeremy	Conkle			X		
SCEHM	Associate Professor	Sharon	Croisant					X
TAMUG	Professor	Randall	Davis			X		
TAMUG	Assistant Professor	Meri	Davlasheridze				X	
TAMUG	Associate Professor	Tim	Dellapenna		X			
UTRGV	Professor	Hudson	DeYoe	X		X		
GERG/OCNG	Professor	Stephen	Dimarco	X	X	X		
GCOOS-RA	Executive Director of TIAER	Quenton	Dokken	X		X	X	
SCEHM	Professor	Cornelis	Elferink					X
TAMUG	Assistant Professor	Ron	Eytan			X		
TAMUCC	Assistant Professor	Joseph David	Felix	X	X			
UTRGV	Assistant Professor	Alejandro	Fierro Cabo	X		X		
TAMUG	Assistant Professor	Jens	Figlus		X			
UTRGV	Assistant Professor	Diego	Figueroa		X	X		
GERG/OCNG	Assistant Professor	Jennifer	Fiztsimmons					
SCEHM	Professor	Yuriy	Fofanov			X		
TAMUCC	Professor	Joe	Fox			X		
UTRGV	Assistant Professor	Christopher	Gabler	X		X	X	
UHLC	Co-Director, US Mexico Bi-National GoM Research	Guillermo	Garcia Sanchez				X	
GCOOS-RA	System Architect, Harte Research Institute and GCOOS-RA	Felimon	Gayanilo		X			
TAMUCC	Assistant Professor	Simon	Geist		X			
TAMUCC	Endowed Chair and Professor	James	Gibeaut	X	X		X	
GERG/OCNG	Professor	Gerardo	Gold Bouchot	X	X	X		
GERG/Geography	Assistant Professor	Dan	Goldberg		X		X	
GERG/OCNG	Research Professor	Norman	Guinasso		X			
TAMUG	Assistant Professor	David	Hala	X		X		X
TX ST	Endowed Professor	Thom	Hardy	X	X	X		
UHLC	Lecturer	Tracy	Hester				X	

GERG/OCNG	Professor	Robert	Hetland		X		X	
UTRGV	Director and Professor; School of Multidisciplinary Sciences	David	Hicks	X		X		
TAMUG	Assistant Professor	Wes	Highfield				X	
TAMUCC	Assistant Professor	Derek	Hogan	X		X		
CTEHR	Associate Professor	Jennifer	Horney				X	X
GCOOS-RA	GCOOS-RA Data Manager, TAMU Research Scientist	Matthew K.	Howard		X			
TAMUCC	Assistant Professor	Xinping	Hu	X	X			
TAMUG	Professor	Tom	Iliffe			X		
TAMUCC	CBI Director, Professor of Geographic Information Science	Gary	Jeffress		X			
TAMUCC	Assistant Professor	Jinha	Jung		X			
GERG/ENG	Professor	James	Kaihatsu		X			
TAMUG	Assistant Professor	Karl	Kaiser		X			
TAMUG	Associate Professor	Matthew K.	Kane					
SCEHM	Associate Professor	Bhupendra S.	Kaphalia					X
SCEHM	Associate Professor	M. Firoze	Khan					X
GCOOS-RA	GCOOS-RA Executive Director, TAMU Research Scientist	Barbara	Kirkpatrick	X		X		X
UTRGV	Assistant Professor	Richard	Kline	X		X		
GERG/OCNG	Professor/Director	Anthony	Knap	X	X	X		X
CTEHR	Professor	Koichi	Kobayashi					X
TAMUG	Assistant Professor	Jessica	LaBonte	X	X			X
TAMUCC	Assistant Professor	Byung Cheol	Lee				X	X
TAMUCC	Assistant Professor	Chuntao	Liu		X			
TAMUG	Assistant Professor	Hui	Liu			X		
UHLC	Director, Center for US and Mexican Law	Alfonso Lopez	de la Osa Escribano				X	X
TAMUG	Professor	Patrick	Louchouarn		X			
GERG	Research Scientist	Stacey	Lyle		x			
CTEHR	Dean	Jay	Maddock				X	X
CTEHR	Associate Professor	Kristen	Maitland					X
TAMUG	Associate Professor	Chris	Marshall			X		
CTEHR	Professor	Tommy	McDonald				X	X
TAMUCC	Executive Director	Larry	McKinney	X		X	X	
TAMUCC	Endowed Chair and Professor	Richard	McLaughlin				X	

TAMUCC	Professor	Pamela	Meyer					X
TAMUG	Assistant Professor	Maria Pia	Miglietta			X		
TX ST	Research Associate	Meredith	Miller	X			X	X
TAMUCC	Endowed Chair and Professor	Paul	Montagna	X		X		
TAMUCC	Director for Water Supply Studies and Assistant Professor	Dorina	Murgulet	X	X			
GCOOS-RA	GCOOS-RA Senior Advisor, TAMU Distinguished Professor Emeritus	Worth D.	Nowlin Jr.		X			
TAMUG	Assistant Professor	Luke	Nyakiti					
CTEHR	Regents Professor	Marcia	Ory				X	X
TAMUG	Professor	Kyeong	Park		X			
TAMUG	Assistant Professor	Lene	Petersen	X		X		X
CTEHR	Professor	Timothy	Phillips					X
GCOOS-RA	Director	Pamela	Plotkin			X		
TAMUCC	Assistant Professor of Marine Biology	Jennifer	Pollack	X		X		
GERG/OCNG	Professor	Kent	Portney	X				
TAMUCC	Assistant Professor	David	Portnoy			X		
GERG/OCNG	Visiting Scientist	Henry	Potter		X			
SCEHM	Assistant Professor	John	Prochaska				X	X
UTRGV	Professor	Daniele	Provenzano	X		X		X
TX ST	Research Professor	Warren	Pulich	X	X	X		
TAMUG	Professor	Antonietta	Quigg	X	X	X	X	X
UTRGV	Professor	Abdullah F.	Rahman	X				
TAMUCC	Assistant Professor	Maryam	Rahnemoonfar		X			
TAMUCC	Assistant Research Scientist	Victoria	Ramenzoni				X	X
TAMUCC	Assistant Professor	Brandi	Reese	X		X		
TAMUG	Professor	Jay	Rooker	X		X		
TX ST	Research Professor	Rudolph	Rosen	X		X		X
TAMUG	Professor	Gilbert	Rowe	X	X	X		X
GERG/VET	Professor	Ivan	Rusyn			X		X
TAMUCC	Professor	Alexey	Sadovski	X		X		
CTEHR	Distinguished Professor	Stephen	Safe					X
TX ST	Research Professor	Andrew	Sansom	X				
TAMUG	Professor	Peter	Santschi	X	X			

TAMUCC	Associate Professor	John	Scarpa			X		
TAMUG	Associate Professor	Anja	Schulze			X		
TAMUG	Professor	John	Schwarz	X		X		
GERG/OCNG	Asst. Professor	Katie	Shamberger	X		X		
TAMUCC	Associate Professor	Jian	Sheng		X			
TAMUCC	Assistant Professor	Toshiaki	Shinoda		X			
GCOOS-RA	GCOOS Outreach and Education Coord., TAMU Research Scientist	Chris	Simoniello	X		X		
TAMUCC	Associate Research Scientist	James	Simons			X		
TAMUCC	Associate Professor	Lee	Smee			X		
GERG/OCNG	Professor	Scott	Socolofsky		X			
SCEHM	Professor	Lawrence C.	Sowers					X
TAMUCC	Assistant Professor	Michael	Starek		X		X	
TAMUCC	Professor	Blair	Sterba-Boatwright					
TAMUCC	Endowed Chair and Professor	Greg	Stunz	X		X	X	
TAMUCC	Deputy Director	Gail	Sutton					
TAMUG	Associate Professor	John	Sweetman		X			
UTRGV	Assistant Professor	Owen	Temby				X	X
GCOOS-RA	Dept. Head, Oceanography	Debbie	Thomas		X			
CTEHR	Professor	David	Threadgill					X
TAMUCC	Associate Director/Associate Research Professor	Philippe	Tissot		X			
TAMUCC	Endowed Chair and Professor	Wes	Tunnell	X				
TAMUCC	Assistant Professor	Jeffrey	Turner			X		
TAMUG	Professor	Pete	van Hengstum		X			
GCOOS-RA	GCOOS-RA Board Treasurer, BMT Group	Jan	van Smirren		X			
CTEHR	Professor	Arnold	Vedlitz				X	X
GERG/OCNG	Research Professor	Terry	Wade	X	X	x		
GERG/OCNG	Technical Lead	John	Walpert		X			
TAMUCC	Assistant Professor	Benjamin	Walther			X		
GERG	Assistant Research Scientist	BinBin	Wang		x			
UHLC	Associate Professor	Gina	Warren				X	
TAMUG	Assistant Professor	David	Wells	X		X		
TAMUCC	Associate Professor	Michael	Wetz	X	X			

UHLC	Research Director of the Health Policy and Law Institute	Allison	Winnike				X	X
TAMUCC	Assistant Professor	Kim	Withers			X		
TAMUCC	Senior Associate for Strategic Planning & Policy	Katya	Wowk				X	X
TAMUCC	Assistant Professor	Feiqin	Xie		X			
TAMUCC	Endowed Chair and Professor	David	Yoskowitz				X	
TAMUCC	Assistant Professor	Hua	Zhang	X	X			
TAMUCC	Assistant Professor	Lin	Zhang		X			
TAMUCC	Director Center for Coastal Studies	Paul	Zimba	X	X	X		X

Appendix B: Texas OneGulf Consortium Member Institutions:

- **Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi:**

The Harte Research Institute (HRI) is built around the unique Harte Model, which employs an interdisciplinary holistic approach that creates synergy for addressing ecosystem scale problems threatening the Gulf of Mexico and raises awareness that people and the environment are inexorably linked in their solution. The Harte Model is organized into seven areas headed by Endowed Chairs who are among the world's leading experts in their areas of research: Coastal and Marine Geospatial Sciences; Ecosystems Studies and Modeling; Biodiversity and Conservation Science; Fisheries and Ocean Health; Marine Policy and Law; Socio-Economics; and Marine Genomics.

The Harte Research Institute is the only marine research institute dedicated solely to advancing the long-term sustainable use and conservation of the world's ninth-largest body of water. HRI integrates outstanding scientific research with public policy to provide international leadership in generating and disseminating knowledge about the Gulf of Mexico ecosystem and its critical role in the economies of the North American region.

HRI's objective is to think beyond basic science and build on its foundation to address the pressing conservation issues facing the Gulf today. Our research advances sustainability and conservation efforts on a Gulf-wide scale and supports governance frameworks that apply and build upon sound science in decision-making. The distinction between HRI and other marine institutions is the focus on integrating science with economic, legal and policy expertise to solve societal problems related to the environment and specifically the Gulf of Mexico.

Since 2002, HRI researchers have published over 110 peer reviewed papers; 62 books or significant book chapters; 105 technical reports and proceedings; and made over 450 presentations at scientific meetings. HRI has organized and hosted some 23 major scientific meetings with 60 to 400 participants each on topics as varied as sea level rise, freshwater inflows to estuaries, fisheries management and ecosystem services. HRI's international relations include eight Memorandums of Understanding (MOU's) with major Mexican academic institutions bordering the Gulf of Mexico.

- **Center for Translational and Environmental Health Research at Texas A&M Health Sciences Center:**

The Center for Translational Environmental Health Research (CTEHR) is a National Institute of Environmental Health Sciences (NIEHS) National Center of Excellence in Environmental Health Science located at Texas A&M University. CTEHR is comprised of several facility cores and programs which serve to establish a "Discovery Pipeline," providing resources to support hypothesis generation, testing, and translation. The research base of CTEHR is organized around five interrelated thematic focus areas: early life exposures, microbiome, chronic disease, metabolism, and enabling technologies. Research within each of these themes focuses on environmental stressors, modifiers of individual response, and human health outcomes.

The mission of CTEHR is to improve understanding of environmental influences on human health by integrating basic, biomedical and engineering research across translational boundaries from the laboratory, clinic, community and back. The Center's membership is comprised of leading experts from various fields, ranging from microbiology to public policy— with the commonality of conducting leading-edge research related to human environmental health and well-being.

CTEHR has linkages within the Texas A&M University System through the College of Medicine, College of Science, AgriLife, College of Veterinary Medicine and Biomedical Sciences, College of Engineering, College of Education and Human Development, College of Medicine, School of Public Health, and the Institute of Biosciences and Technology.

- **Sealy Center for Environmental Health and Medicine at the University of Texas Medical Branch:**

The Sealy Center for Environmental Health and Medicine (SCEHM) is an interdisciplinary environmental health sciences center concerned with the human health consequences of environmental exposures. The SCEHM supports excellence in basic and translational (clinical) research, education, and community outreach relevant to human health and safety. The long-term objectives are to improve the health of people in general, and those on the Gulf coast in particular by mitigating the negative effects of environmental insults.

The 37 SCEHM members represent a cohort of investigators from the basic and translational sciences arena with broad and extensive biomedical research experience centered on human health and safety while *Environmental Health Sciences* examines 'gene x environment' interactions—the observable effect of interactions between genes and the environment—to understand how environmental exposures impact human health. The experimental strategies used include computational biology, cell-free systems, tissue culture, animal models, "omics", and population studies. SCEHM scientists use mass spectrometry, genome-wide sequencing, bioinformatics, biostatistics, and computer modeling. *Community Outreach and Education* fulfills the mission of translating environmental health science and medicine for the communities it serves through partnerships with local, state, and regional stakeholders using programs designed to disseminate environmental health knowledge to health care and public health practitioners, those engaged in policy-making related to environmental health, and the lay public.

- **Texas A&M University - Galveston, Departments of Marine Biology, Oceanography, and Engineering:**

Texas A&M University – Galveston (TAMUG) provides enriching educational, research and service programs on the Gulf coast. TAMUG has 50 active research faculty in marine biology, marine sciences, marine engineering and maritime affairs that specialize in organismal biology, environmental chemistry, oceanography, geomorphology, and coastal planning and resiliency. TAMUG has targeted programs on sustainable and resilient coastal communities driving a deeper understanding of how stressed systems in the Gulf of Mexico and worldwide respond to extreme environmental perturbations and climate change (e.g., sea level rise). Through its statutorily authorized Center for Texas Beaches and Shores TAMUG conducts cutting-edge research on reducing hurricane-induced storm surges and inundation from rainfall events. TAMUG possesses extensive scientific and technical facilities, equipment, and instrumentation for field and laboratory research and robust capabilities for information and data acquisition. Community Outreach and Education translates science to the community thru K-12 (e.g., Sea Campus) and works with Texas Sea Grant Extension Outreach Specialists (two housed on site).

In future years, TAMUG will seek to make significant and national impacts on ocean and coastal studies through catalyzing scholarship and innovation in maritime transportation and administration, engineering solutions in coastal zones (storm surge protection), littoral urban planning and coastal community development (megacity sustainable development, coastal tourism, and health industry), environmental sustainability, global communication, maritime public policy, marine and subsea engineering, maritime cultural studies, and in marine safety and cyber security. We have the only Food and Drug Administration (FDA) approved seafood safety lab on the Gulf coast. Through a relationship with Texas Engineering Extension Service (TEEX), we train oil field workers and others on oil spill response and fast rescue crafts.

- **Geochemical and Environmental Research Group (GERG) at Texas A&M University:**

GERG deals with coastal zone contamination issues specifically relating to uptake of contaminants and environmental responses to environmental insults. Researchers have extensive experience with ocean and human health and safety issues. Reflecting the diverse disciplines in the College of Geosciences, GERG/Department of Oceanography's core competencies include Ocean Science, Environmental Sciences and Resource Geosciences. Staff and partners include geologists; geochemists; analytical and contaminant chemists; biological, chemical, geological and physical oceanographers; biologists, ecologists and toxicologists. GERG is renowned for its coastal observing systems.

GERG integrates science with new technologies to provide real-time and near real-time data to understand oceanographic and atmospheric processes. Technological advances provide tools to allow decision makers to more effectively allocate limited resources through strategic planning and in rapid tactical response to natural disasters. Among the technologies in use are buoys, remote autonomous vehicles and Ferrybox systems, supplemented with a Coastal Ocean Dynamics Applications Radar (CODAR) High Frequency radar network which measures currents and waves 120 miles over the horizon. *Environmental Science* maintains a state-of the-art laboratory of specialized instrumentation and disseminates information and the expertise to interpret the results to government and industry stakeholders. *Resource Geosciences* manages a geochemical data-base from over 10,000 piston core samples. This data-base is expanding through colleagues who investigate environmental effects and technological advances of "unconventional" oil and gas extraction.

- **University of Texas Rio Grande Valley (UTGRV), Department of Environmental Sciences:**

UTRGV Department of Environmental Sciences is a growing, interdisciplinary group with expertise blending human environmental disciplines covering: microbiology, immunology, neuroscience, environmental biology, coastal fisheries, oceanography, remote sensing and marine ecology. These disciplines intersect through molecular biology, biotechnology, stable isotopes, nutrient cycling, environmental physiology, hydro-acoustics, telemetry, remote sensing, and multivariate analyses. UTRGV synergistically applies research expertise to issues related to sustainability, restoration, coastal fisheries, human health, human-driven environmental changes and coastal resilience in the Rio Grande Delta region. Existing research capabilities include evaluating restoration status of coastal estuaries (e.g., Bahia Grande); examining disturbance on ecosystem function and resilience in coastal environments; analyzing connectivity and biodiversity; characterizing natural and artificial reefs; and investigating bird migrations. UTRGV is positioned to collect and process marine and coastal samples from a wide-range of ecosystems; rapidly analyze physical/chemical, biochemical and molecular, and genetic sequencing; and evaluate the impact of anthropogenic activities on microbial consortia, species interactions, and animal behavior and how changes in these areas affect human and environmental health.

- **Meadows Center for Water and the Environment at Texas State University:**

The Meadows Center faculty have served on coastal water quality boards and fish consumption panels, including mercury and selenium panels. Center directed citizen scientists monitor water quality along coastal and inland waters for evidence of public health hazards. Staff members have worked on coastal community resilience, emergency response planning, and sea level rise response and modeling. The Meadows Center works to develop and promote programs and techniques for ensuring sustainable water resources for human needs, ecosystem health, and economic development. Interdisciplinary water system ecology research and planning at the Center brings together social scientists, geographers, biologists, ecologists, agricultural specialists, hydrologists, GIS specialists, natural resources managers, organization managers, and policy experts. The Meadows Center is home to the Institute for International Watershed Studies, Headwaters to Oceans water education project, Texas Stream Team, Initiative for Conservation Leadership, Underwater Archaeology and Exploration Initiative, and Initiative for Watershed Excellence.

The Meadows Center work includes ecological characterizations and modeling of coastal systems, rivers, riparian areas, wetlands, water flows, and mapping of biological, biogeographical, ecological, geological, hydrogeological, topographical, weather/climate, land use, water use, and human demographic information. This includes multi-dimensional hydrodynamic water quality and comprehensive environmental impact modeling. Ecological monitoring and modeling of submerged seagrass beds, riverbeds, lakes and other water bodies is conducted using the latest high-resolution remote sensing using aerial drones. Ecological Disaster Vulnerability Assessments focus on water quality, habitat, species management, drought, and floods. Additional capabilities include the following: underwater archaeology investigations in the Gulf of Mexico, Caribbean, and Latin America.

- **University of Houston Law Center (UHLC), Center for US and Mexican Law (USMexLaw):**

U.S. and Mexican Law. USMexLaw studies the development of oil and gas resources in the Gulf of Mexico, with a focus on differences in regulation and development under U.S. and Mexican laws and regulations. The goal is to identify potential areas of regulatory conflict that could endanger the environment of the Gulf of Mexico. USMexLaw also initiated a binational study to examine whether legal services have kept up with dramatic increases in cross-border interactions.

Health Law. UHLC also houses the leading health law program in the United States, centered in the Health Law and Policy Institute (HLPI). USMexLaw is partnering with HLPI to provide research and educational programs to U.S. and Mexican agencies engaged in health care and cross-border health issues, including research initiatives that focus on communities and regions in the Gulf of Mexico coastal and border areas.

Energy Law. USMexLaw is working with UHLC's Environment, Energy and Natural Resources Center (EENR) to develop proposals for research and educational programs for Mexican energy agencies, including PEMEX, the Mexican Secretaría de Energia, the Mexican Federal Competition Commission, and other agencies in the United States and Mexico.

Environmental Law. Houston's leading role as the center for energy, chemical and petrochemical industries in the United States also creates a need for researching and crafting strong and creative environmental policies and laws. UHLC's EENR Center also promotes and pursues research on environmental issues created by energy and natural resource development, and it works to provide a neutral forum to assess positive solutions and approaches to resolve them.

- **Gulf of Mexico Coastal Ocean Observing System – Regional Association (GCOOS-RA):**

GCOOS-RA freely serves information important to human health and safety, including present conditions and forecasts useful for: search and rescue, oil spill response and mitigation, safe boating and fishing, and safe and efficient marine operations. The GCOOS website reports near real-time harmful red tide organisms and historical observations of fecal coliforms with benefits to preserving human health. GCOOS-RA has an 11-year history of aggregating, integrating, packaging and disseminating myriad data sets from diverse distributed providers for diverse distributed stakeholders (e.g., near real-time observations from over 1800 data streams). We have a 17 member Board of Directors, a staff of ten, and seven councils, committees and task teams to guide our activities. The members represent governmental, non-governmental, private, and academic organizations and have wide-ranging expertise. In addition to human health and safety, our expertise includes general oceanography, computer systems architecture, database programming, GIS, remote sensing, public health, modeling, information technology, environmental policy, outreach, education, and project management.

GCOOS-RA's expertise in environmental science ranges from academic specialists to advanced informatics to support restoration, policy and management decisions related to species, habitats and ecosystems. We specialize in near real-time and historical collections of physical oceanographic, marine meteorological, biogeochemical and biological data. We offer products such as a lionfish mapping tool to track this invasive species in the Gulf as well as many other data based products to help develop an efficient and effective information infrastructure for sets of physical and biological observations. Our Outreach and Education Council conceives of unique products such as the EPA Gulf Guardian award winning Eco Hero kiosk in nine informal learning centers including Mexico and the United Kingdom, web pages for recreational boaters, and Citizen Scientist story maps to facilitate sharing data collected by educators and public.

Appendix C: Summary of Existing Strategic Plans:

The Texas OneGulf Center of Excellence is a consortium of nine research institutions across the state of Texas with expertise in the ocean environment, socio-economics, and human health. With such wide breadth of expertise, Texas OneGulf sets itself apart by developing science-based solutions to Gulf of Mexico problems that affect the health, wealth and safety of Texas and its' citizens. This breadth of expertise also requires the development of a focused set of priorities which will ultimately become the Texas OneGulf Strategic Research and Action Plan (SRAP). As part of the process of developing the SRAP, a subset of existing strategic plans, relevant to the Gulf of Mexico and to the post-Deepwater Horizon research landscape, were analyzed to provide insight into existing priorities and needs within the Gulf of Mexico region. An analysis of these plans led to the development of a framework of priorities that were presented to our stakeholders as a starting point for gathering their input on Gulf research priorities and issues.

A total of 211 priorities were identified among the 12 existing plans that were analyzed. Each of the priorities were categorized into a group of 10 broad themes to help understand the similarity in trends (Table 1) among the plans and identify areas that Texas OneGulf has a unique ability to contribute. Each plan was broken into its' respective priorities (Table 2) and then categorized by theme and RESTORE Discipline: 1) Coastal and deltaic sustainability, restoration, and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner; 2) Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf coast region; 3) Offshore energy development including research and technology to improve the sustainable and safe development of energy resources; 4) Sustainable and resilient growth, economic and commercial development in the Gulf coast region, and; 5) Comprehensive observation, monitoring and mapping of the Gulf of Mexico. This analysis was used as a first step in the development of the SRAP framework. This framework was then used to collect input from Texas OneGulf stakeholder groups and experts.

Table 1: Summary of priority themes, their definition, and percentages of priorities addressed across all research and action plans analyzed (n=211).

SUMMARY of PRIORITY THEMES:		
THEME:	DEFINITION	% / theme
HAB: Habitat Conservation/Restoration	Focused on habitat integrity, conservation and/or restoration	10.0%
LMR: Living Marine Resources	Focused on living resources such as fisheries	10.4%
ENV FLOW: Environmental Flows	Focused on access, transport, and placement of freshwater, nutrients, sediments etc.	14.2%
RES ECOL: Ecological Resilience	Focused on creating strong ecosystems that withstand stressors	4.2%
RES SOC: Socioeconomic Resilience	Focused on creating strong socioeconomic systems that withstand stressors	18.5%
O&G: Oil and Gas/Energy	Focused on energy production and activities	3.8%
MMM: Monitoring, Modelling, Mapping	Focused on data collection via monitoring, mapping and creating models	18.0%
ED: Education/Outreach	Focused on the dissemination of information	9.0%
*LME: Large Marine Ecosystem	Focused on synthesis activities for broader understand of systems as a whole	1.4%
*HH: Human Health	Focused on connecting human health to natural and man-made conditions	10.5%
These themes represent the two strategic goals of Texas OneGulf to 1) understand the Gulf of Mexico as a Large Marine Ecosystem and 2) to link human and environmental health.		

Table 2: Existing plans, priorities for each, how each priority relates to the five RESTORE disciplines, and the overarching theme of each priority.

Texas Sea Grant Strategic Plan: 2014-2017
(http://seagrant.noaa.gov/Portals/0/Documents/network_resources/planning/strategic_plans/final_plans_2014-2017/TX_2014-2017plan_fancy.pdf)

- Main Points:
  - HCE: Healthy Coastal Ecosystems
  - RCE: Resilient Communities and Economies
  - SFA: Sustainable Fisheries and Aquaculture
  - ELWD: Environmental Literacy and Workforce Development

			RESTORE DISCIPLINES: (see above)					
	PLAN	**PRIORITIES for SRAP (n=211)**	**1**	**2**	**3**	**4**	**5**	**THEME**
1	TXSG	HCE: Develop and calibrate new standards, measures and indicators of ecosystem sustainability	1	2				LMR
2	TXSG	HCE: Identify critical uncertainties that impede progress toward achieving sustainable ecosystems and the goods and services they provide.	1	2				LMR
3	TXSG	HCE: Provide stakeholder access to data, models, policy information and training that support Ecosystem Based Management (EBM), planning and decision-making.	1	2				MMM
4	TXSG	HCE: Collect baseline data, standards, methodologies, and indicators developed to assess the health of ecosystems and watersheds.	1	2				MMM
5	TXSG	HCE: Education/outreach for residents, resource managers, business and industries to help them understand the effects of human activities and environmental changes on coastal resources.	1					RES SOC
6	TXSG	HCE: Education/outreach for resource managers to help understand the policies that apply to coastal protected species.	1					EDU
7	TXSG	HCE: Education/outreach to help residents, resource managers, and businesses understand the importance of the benefits provided by preserving non-degraded ecosystems.	1					HAB

8	TXSG	HCE: Education/outreach to help residents, resource managers, and businesses understand the threats to ecosystems and the consequences of degraded ecosystems.	1					HAB
9	TXSG	HCE: Develop technologies and approaches to restore degraded habitats.	1					HAB
10	TXSG	SFA: Education/outreach to help fishery managers and fishermen to understand the dynamics of wild fish populations.		2				LMR
11	TXSG	SFA: Education/outreach to inform the seafood industry about innovative technologies, approaches and policies.		2				EDU
12	TXSG	SFA: Education/outreach to inform commercial and recreational fishermen about efficient and responsible fishing techniques.		2				LMR
13	TXSG	SFA: Education/outreach to inform the commercial fishing industry about innovative marketing strategies to add value to its products.		2				LMR
14	TXSG	SFA: Education/outreach to inform the seafood processing industry about economically viable techniques and processes to ensure the production and delivery of safe and healthy seafood.		2				LMR
15	TXSG	SFA: Education/outreach to inform the seafood industry of the standards for safe seafood.		2				LMR
16	TXSG	SFA: Education/outreach help seafood industry become knowledgeable about consumer trends regarding seafood sustainability and safety and how to adjust operations to meet emerging demands.		2				RES SOC
17	TXSG	SFA: Education/outreach to seafood consumers with the knowledge to evaluate sustainable seafood choices.		2				LMR
18	TXSG	SFA: Education/outreach to seafood consumers with increased knowledge of the nutritional benefits of seafood products and how to judge seafood safety and quality.		2				RES SOC

19	TXSG	RCE: Education/outreach to make communities aware of the interdependence between health of the economy and the health of the natural and cultural systems.	1			4		RES SOC
20	TXSG	RCE: Provide access to information needed to understand the value of waterfront and tourism-related economic activities.				4		RES SOC
21	TXSG	RCE: Education/outreach to help communities understand the strengths and weaknesses of alternative development scenarios on resource consumption and local economies.				4		RES SOC
22	TXSG	RCE: Education/outreach to make communities aware of regulatory regimes affecting economic sustainability.				4		RES SOC
23	TXSG	RCE: Education/outreach to make communities knowledgeable about economic savings from energy planning and conservation.				4		RES SOC
24	TXSG	RCE: Education/outreach to help communities understand the connection between planning and natural resource management issues make management decisions that minimize conflicts, improve resource conservation efforts and identify potential opportunities.				4		RES SOC
25	TXSG	RCE: Education/outreach to make communities aware of the impact of human activities on water quality and supply.				4		ENV FLOW
26	TXSG	RCE: Education/outreach to make communities aware of the value of clean water, adequate supplies and healthy watersheds.				4		ENV FLOW
27	TXSG	RCE: Communities understand water laws and policies affecting the use and allocation of water resources.				4		ENV FLOW
28	TXSG	RCE: Residents and decision-makers are aware of and understand the processes that produce hazards and climate change and the implications of those processes for them and their communities.				4		RES SOC

29	TXSG	RCE: Decision-makers are aware of existing and available hazard- and climate-change related data and resources and have access to information and skills to assess local risk vulnerability.				4		RES SOC
30	TXSG	RCE: Communities have access to data and innovative and adaptive tools and techniques to minimize the potential negative impacts from hazards.				4		RES SOC
31	TXSG	RCE: Decision-makers understand the legal and regulatory regimes affecting adaptation to climate change, including coastal and riparian property rights, disaster relief and insurance issues.				4		RES SOC
32	TXSG	ELWD: Formal and informal educators are knowledgeable of the best available science on the effectiveness of environmental science education.	1					EDU
33	TXSG	ELWD: Formal and informal educators understand environmental literacy principles.	1					EDU
34	TXSG	ELWD: Lifelong learners are able to engage in informal science education opportunities focused on coastal topics.	1					EDU
35	TXSG	ELWD: Students and teachers are aware of opportunities to participate in science, technology, engineering, mathematics and active stewardship programs.	1					EDU

Sea Grant Gulf of Mexico Research Plan: 2009 (http://seagrant.noaa.gov/Portals/0/Documents/what_we_do/regional_innitiatives/plans/Gulf%20of%20Mexico.pdf) **and Sea Grant Gulf of Mexico Research Plan: 2013 Update** (http://masgc.org/assets/uploads/publications/642/masgp-13-025.pdf)

- Main Points:
  - EHI: Ecosystem Health Indicators
  - FWIH: Freshwater Input and Hydrology
  - HLR: Habitats and Living Resources
  - SLCSSS: Sea Level Change, Subsidence, and Storm Surge
  - WQN: Water Quality and Nutrients

36	SG	EHI: Determine the correct variables to use as indicators of ecosystem health, identify the optimal methods to measure the indicators, and design better-defined indices with more indicators to evaluate the status of ecosystems.	1	2				MMM
37	SG	FWIH: Examine how river diversions and the placement of sediment impact water quality, sediment processes, shoaling, coastal processes, fisheries, habitat utilization by organisms, and marshes and other habitats.	1	2				ENV FLOW
38	SG	FWIH: Analyze the role of freshwater input on coastal wetlands and habitat change over time to determine the hydrologic requirements of healthy marsh systems and quantify effects of sediment discharge reduction on erosion rates and habitat loss.	1	2				ENV FLOW
39	SG	FWIH: Examine the impacts of reduced freshwater input and temperature change on water stratification, biodiversity, species composition and production, benthic communities, trophic interactions, fisheries, the range of native and nonnative species, emergent coastal habitats, sediment transport, and shoreline erosion.	1	2				ENV FLOW
40	SG	FWIH: Predict the impacts of current building and permitting practices on freshwater inflow and examine the effects of human manipulation (e.g. upstream impoundments, causeways, and placing processed water into confined areas) on the amount, timing, and type of freshwater inflows and their impacts on natural resources and the environment.	1	2		4		ENV FLOW
41	SG	FWIH: Determine the changes in freshwater, nutrient, pollution, groundwater and sediment input due to changes in pattern and quantity of precipitation and predict the subsequent impact of these inputs on geochemical and physical coastal processes and biological (including benthic and epibenthic) communities.	1	2				ENV FLOW

42	SG	HLR: Model resource stability and sustainability and include interactions between fisheries, habitat, threatened and endangered species, ecosystem processes, and stressors to assist with making ecosystem-based management decisions.	1	2				MMM
43	SG	HLR: Examine changes in habitat quality and quantity over time and identify the effects of changes on marine organisms including the threshold level of habitat quality and quantity required to support sustainable populations of living resources.	1	2				HAB
44	SG	HLR: Identify connections among habitats and connections between habitats and living marine resources.	1	2				HAB
45	SG	SLCSSS: Determine and predict the physical impacts of climate change on coastal and upland areas in terms in terms of sea level change, rate of elevation change, shoreline change, loss of barrier islands, role of coastal development in preventing migration of marshes and other habitats, and change inland, coastal, and ocean hydrology and apply this knowledge in habitat restoration efforts.	1			4		RES ECOL
46	SG	SLCSSS: Examine the public's perception of sea level change, evaluate hazard-related communications and people's change in behavior in relation to hazard mitigation; and identify approaches that local governments are employing to adapt to sea level change.	1			4		RES SOC
47	SG	SLCSSS: Determine how storm surge, subsidence and sea level change affects ecosystems, native coastal habitat, wetland composition, saltwater intrusion, coastal flooding, cultures, agriculture, and human health.	1			4		RES SOC
48	SG	SLCSSS: Identify the optimal use and allocation of sediment and evaluate the rates of shoreline change from anthropogenic and natural impacts including sediment mobilization, transport, and deposition from major storm events.	1			4		ENV FLOW

49	SG	SLCSSS: Predict socioeconomic impacts of climate and sea level change on population dynamics, community infrastructure, short- and long-term community demographic shifts, social capital, and commerce and shipping centers.	1			4		RES SOC
50	SG	WQN: Identify the relationships between nutrient loading, eutrophication, hypoxia, and harmful algal blooms; examine their impacts on ecosystem health, seagrasses, and higher trophic organisms and determine the effects of freshwater diversion on hypoxia.	1	2				ENV FLOW
51	SG	WQN: Evaluate the impacts of coastal development, land use, land cover, storm water management, and wastewater management on eutrophication, nutrient loading, water quality, and the environment.	1			4		ENV FLOW
52	SG	WQN: Model the impacts of non-point source pollution on coastal resources.	1			4		ENV FLOW
National Academies of Science: Gulf of Mexico Research Program: A Strategic Vision (http://www.nas.edu/gulf/vision/index.htm) • Main Points: ○ OS: Enhance Oil System Safety ○ HH: Human Health-Environmental Connections ○ DS: Gulf of Mexico as a Dynamic System								
53	NAS	OS: Partner with industry, government, and academia to explore key factors to prevent future blowouts, oil spills, and accidents and enhance safety culture.			3			O&G
54	NAS	OS: Explore models of decision support systems for safe and environmentally stable offshore oil and gas development, disaster response, and remediation options.			3			O&G
55	NAS	OS: Provide research opportunities that improve understanding of how social, economic, and environmental factors influence community vulnerability, recovery, and resilience.			3	4		O&G

56	NAS	OS: Support research, long-term observations and monitoring, and information development to advance understanding of environmental conditions, ecosystem services, and community health and well-being in the Gulf of Mexico.	1		3	4		O&G
57	NAS	OS: Support the development of future professionals and leaders in – science, industry, health, policy, and education – who apply cross-boundary approaches to critical issues that span oil system safety, human health, and environmental resources.			3	4		O&G
58	NAS	OS: Identify opportunities for knowledge transfer between the Gulf of Mexico and other US outer shelf regions.			3			O&G
59	NAS	OS: Support activities to improve understanding and the use of scientific information by the public and policy makers in decisions related to environmental stewardship, human health improvement, and responsible oil and gas production.			3	4		O&G
60	NAS	HH: Connection between well-being and closure of fishing grounds and the effects on those associated with the seafood industry.	1	2				HH
61	NAS	HH: Understanding baselines and endpoints associated with both short- and long-term exposure, especially to spill-related products, and the effects on human health.	1		3			HH
62	NAS	HH: Long-term mental and behavioral well-being of those affected by oil spills.	1		3			HH
63	NAS	HH: Begin to understand the effects of future man-made and natural disasters, climate change impacts, and other environmental stressors may have on human health.	1			4		HH
64	NAS	HH: Understand the linkages between human communities and their natural environment to define the drivers of resiliency, vulnerability, and recovery of both human and natural systems to help respond to disasters and other environmental stressors.	1			4		HH

65	NAS	HH: Understand the linkage between human health and water and air quality, seafood safety, natural disturbances/disasters and	1	2		4		HH
66	NAS	DS: Define and gather information necessary to understand systems, functions and processes, and interconnection to inform both response and recovery from disasters.				4		RES SOC
67	NAS	DS: Define and gather the information necessary to understand the key variables and to track and anticipate change, and to use the information to inform decision making in the face of multiple natural and man-made stressors.				4		RES SOC
GCOOS Build-Out Plan: 2011 (http://gcoos.tamu.edu/BuildOut/GCOOS_BuildoutPlan_V1.pdf)								
68	GCOOS	Obtain accurate bathymetry and topography with consistent vertical control between data sets in the coastal zone, including locations of shorelines.					5	MMM
69	GCOOS	Improve coverage of real-time currents in the coastal zone and navigable estuaries using HF radars as primary technique.					5	MMM
70	GCOOS	Improve real-time, offshore meteorology measurements (V, P, T, H).					5	MMM
71	GCOOS	Improve forecasts and nowcast models of sea level, winds, and waves; this requires added real-time measurements.					5	MMM
72	GCOOS	Improve hurricane severity forecasts.				4	5	MMM
73	GCOOS	Improve forecasts and nowcasts of surface currents offshore.					5	MMM
74	GCOOS	Improve severe weather monitoring, forecasting, and dissemination.				4	5	MMM
75	GCOOS	Enhance measurements of water quality parameters.	1				5	MMM
76	GCOOS	Implement a modern, real-time current and water level observing system in all major ports.					5	MMM

77	GCOOS	Establish coastal storm surge/inundation maps for mitigation planning (not real time).				4	5	MMM
78	GCOOS	Improve information on and forecasts of visibility.					5	MMM
79	GCOOS	Produce upper ocean profiles of temperature, salinity, and currents.	1	2			5	MMM
80	GCOOS	Produce reliable forecast maps of three-dimensional currents offshore.					5	MMM
81	GCOOS	Improve real-time forecasts of coastal inundation.					5	MMM
82	GCOOS	Increase number of stations monitoring HABs.	1	2			5	MMM
83	GCOOS	Improve data and product dissemination techniques taking into account the sophistication of the user.				4	5	MMM
National Institutes of Environmental Health Sciences 2012-2017 Strategic Plan: Advancing Science, Improving Health: A Plan for Environmental Health Research (http://www.niehs.nih.gov/about/strategicplan/strategicplan2012_508.pdf) • Main Points: ○ FR: Fundamental Research ○ ER: Exposure Research ○ TS: Translational Science ○ HDGEH: Health Disparities and Global Environmental Health								
84	NIEHS	FR: Investigate basic biological processes of how the body functions and pathways and systems that are susceptible to the effects of environmental stressors.	1					HH
85	NIEHS	FR: Build on the knowledge from new tools and techniques that allow for more in-depth questions about the effects of the environment on biological systems.	1					HH
86	NIEHS	FR: Investigate systems and computational approaches, and recognition of the importance of changes in sensitivity to environmental stressors at different life stages.	1					HH

87	NIEHS	FR: Understand the mechanisms of disease and the interaction of these mechanisms and environmental stressors.	1					HH
88	NIEHS	ER: Study of environmental exposures, both internal and external, as well as exposure rising from a variety of sources such as the microbiome, infectious agents, nutritional sources, stress as well as chemical environmental pollutants.	1					HH
89	NIEHS	ER: Key research includes technology development for exposure measurement, better biological markers, new sensor and detector tools, remote detection of exposures, more sensitive analytical models, high-throughput predictive pharmacokinetic models, and informatics tools to improve quantitation of information on exposure from large datasets.	1					HH
90	NIEHS	TS: Connect basic research with practical application in public health, medical, regulatory, and individual practice focusing on the broader prevention of adverse health consequences from environmental exposure and translational pathways such as behaviors and choices, and to wider public policy changes and public health practice.	1					HH
91	NIEHS	TS: Predictive toxicology that allows for specific information that supports decision making about risk.	1					HH
92	NIEHS	TS: Incorporate translational science into state-of-the-art medical practice with a new-level of information about gene-environment interactions affecting drugs, biologics, infections, and other environmental factors in health and disease.	1					HH
93	NIEHS	TS: Enhance the use of metrics of comparative effectiveness in environmental health to inform health economics by evaluating the impact of environmental health research, including contributions to prevention of disease that is systematic and transparent.	1					HH

94	NIEHS	HDGEH: Research environmental justice by defining the environmental factors and complex interactions that contribute to environmental health disparities, and by studying chemical and nonchemical stressors at the community level.	1					HH
95	NIEHS	HDGEH: Improve capacity building among entities that can positively affect the public health of disadvantaged communities and who often bear a larger share of environmental burdens.	1					HH
Gulf Of Mexico Alliance: Governors' Action Plan II 2009-2014 (http://www.gulfofmexicoalliance.org/pdfs/ap2_final2.pdf) • WQ: Water Quality • HCR: Habitat Conservation and Restoration • EIA: Ecosystem Integration and Assessment • NNI: Nutrients and Nutrient Impacts • CCR: Coastal Community Resilience • EE: Environmental Education								
96	GOMA	WQ: Improve the understanding of waterborne, disease-causing microorganisms (pathogens), including their sources and survival so that coastal managers can make informed decisions that benefit public health and coastal economies.	1			4		RES SOC
97	GOMA	WQ: Reduce the effects of HABs by improving our ability to detect, track, forecast, and mitigate HAB movement and their effects along the Gulf coast.	1			4		MMM
98	GOMA	WQ: Identify sources of mercury in Gulf fishery resources, understand its presence in the Gulf food web, and develop the ability to reduce the human health risk of exposure.	1			4		HH
99	GOMA	WQ: Obtain and provide vital information about the conditions of Gulf waters to support better management decisions regarding coastal fisheries, recreation, tourism, public health, and infrastructure planning.	1	2		4		RES ECOL
100	GOMA	HCR: Identify and engage in non-participating relevant US stakeholders with interests in the health and sustainability of the	1			4		RES SOC

		Gulf, and coordinate specific issues with representatives from the Gulf Mexican States.						
101	GOMA	HCR: Address specific public policy issues impeding habitat conservation and restoration.	1			4		HAB
102	GOMA	HCR: Identify and resolve specific scientific and technical issues so that conservation and restoration of Gulf habitats are more successful.	1	2		4		HAB
103	GOMA	HCR: Develop and implement the Gulf Regional Sediment Management Master Plan (GRSMMP) to move effectively use dredged material and other sediment resources for restoration projects.	1					ENV FLOW
104	GOMA	HCR: Monitor a Gulf-wide inventory of distribution, gain, and loss of coastal habitats and measure the ecosystem services they provide.	1				5	HAB
105	GOMA	EIA: Produce the Gulf of Mexico Master Mapping Plan (GMMMP), a comprehensive plan to collaboratively acquire data on the physical characteristics of the Gulf region, particularly elevation, shoreline, and surface data.	1				5	MMM
106	GOMA	EIA: Provide resource managers and Alliance partner's access to a Gulf-Wide data and ecosystem support services system.	1				5	MMM
107	GOMA	EIA: Provide collaboration opportunities for the various living marine resources organizations to support the management of the Gulf as a Large Marine Ecosystem.	1	2			5	LME
108	GOMA	EIA: Develop an Emergent Wetlands Status and Trends Report to provide scientists and decision makers with regional information to guide management decisions.	1				5	HAB
109	GOMA	EIA: Determine the socioeconomic values of critical coastal ecosystem services in the Gulf region.	1			4		RES SOC

110	GOMA	NNI: Implement regional nutrient characterization studies to evaluate ecosystem responses and to develop the tools for better characterization of nutrients in coastal waters.	1				5	ENV FLOW
111	GOMA	NNI: Identify common state needs and priorities for the development of nutrient criteria and provide support and technical assistance to facilitate a regional approach to nutrient criteria development and management.	1				5	ENV FLOW
112	GOMA	NNI: Develop management tools and implement nutrient reduction activities in cooperation with local communities to reduce excess nutrient inputs to estuaries and coastal waters.	1			4		ENV FLOW
113	GOMA	CCR: Provide tools to coastal communities to better understand the risks and impacts associated with coastal hazard, including climate changes. In addition, the Alliance will assess the risks of coastal hazards to the natural, built, and social environments of the Gulf Coast and increase infrastructure to better quantify these risks in the future.	1			4	5	RES SOC
114	GOMA	CCR: Prepare and inventory of existing capabilities and tools to address coastal hazards in the Gulf region, identify important gaps, and, where needed, develop new methods to enhance regional and local resilience.	1				5	RES SOC
115	GOMA	CCR: Inform communities about the risks associated with coastal hazards and provide access to the tools necessary to increase their resilience.	1				5	RES SOC
116	GOMA	EEO: Increase awareness and promote action among Gulf citizens by engaging in educational and outreach activities.	1			4		EDU
117	GOMA	EEO: Expand public awareness efforts to connect the Gulf and its relevance to the lives of citizens.	1			4		EDU

118	GOMA	EEO: Increase environmental literacy within the K through 20 audience by developing, implementing, expanding, and enhancing specific environmental education programs.	1			4		EDU
119	GOMA	EEO: Include the economic value of Gulf ecosystems in environmental education.	1			4		EDU
Texas Parks and Wildlife Department: Texas Conservation Action Plan 2012 (https://tpwd.texas.gov/landwater/land/tcap/documents/tcap_statewide_multiregion_handbook.pdf)								
120	TPWD	Habitat fragmentation and habitat loss, including open-space land conversion.	1	2				HAB
121	TPWD	Water development, management and distribution (quantity and quality) to include environmental flows; planning and policies; water quality control and improvement, impoundment and damn operations; and basin transfers.	1				5	ENV FLOW
122	TPWD	Invasive species both native and non-native to include data collection/monitoring as well as the effects of climate change.	1			4	5	LMR
123	TPWD	Changing demographics and the resulting pressures/stressors on natural resources.	1			4	5	HAB
124	TPWD	Energy production as it relates to the conservation of natural resources including water resources and wildlife.			3	4		O&G
125	TPWD	Identify and increase coordination with Mexico with respect to protecting shared/impacted natural resources.	1			4		RES SOC
Texas General Land Office: Texas Coastal Management Program 2016-2020 (Not found online) • WPR: Wetland Protection and Restoration • CH: Coastal Hazards • PA: Public Access • MD: Marine Debris								

126	GLO	WPR: Continued and enhanced monitoring of wetlands including status, ecological function, and ecosystem services.	1					HAB
127	GLO	WPR: Enhance management processes to provide for wetland resilience through policies, restoration, and outreach.	1	2				HAB
128	GLO	WPR: Develop vulnerability assessments of wetland habitat, incorporating projected environmental and anthropogenic changes.	1	2		4		HAB
129	GLO	CH: Continue to promote outreach to coastal communities on coastal resiliency and preparedness and provide hazard planning assistance and tools.	1			4	5	EDU
130	GLO	CH: Expand mapping and modeling efforts of hazards on the environment.	1			4	5	MMM
131	GLO	CH: Identify high-risk populations, evaluate exposure and vulnerabilities, and develop targeted programs to address hazard preparedness and post-disaster recovery.	1			4		RES SOC
132	GLO	PA: Improving public access through information and data management.	1			4		MMM
133	GLO	PA: Comprehensive public access planning.	1			4		RES SOC
134	GLO	PA: Public engagement, communication and outreach.	1			4		EDU
135	GLO	MD: Marine Debris, develop strategies to reduce the effects of marine debris on the coastal resources of Texas	1			4		LMR
136	GLO	WPR: Increase living shorelines in an effort to conserve wetland habitats.	1			4		HAB

Gulf Coast Ecosystem Restoration Task Force: Gulf of Mexico Ecosystem Science Assessment Needs 2012 (http://gcoos.tamu.edu/documents/GCERTF-Book-Final-042712.pdf)

- CHHR: Coastal Habitats are Health and Resilient
- LCMR: Living Coastal and Marine Resources are Healthy, Diverse and Sustainable
- CC: Coastal Communities are Adaptive and Resilient
- SB: Storm Buffers are Sustainable
- IHW: Inland Habitats and Watersheds are Managed to Help Support Healthy and Sustainable Gulf of Mexico Ecosystems
- OE: Offshore Environments are Healthy and Well Managed

137	GCERTF	CHHR: Improve resilience and ensure the long-term viability of Gulf ecosystems and the habitats that the Gulf supports, including coastal wetlands, seagrass meadows, and barrier shorelines.	1					RES ECOL
138	GCERTF	CHHR: Ensure long-term vitality of Gulf Coast estuaries.	1					RES ECOL
139	GCERTF	CHHR: Restore the functionality and sustainability of coastal wetlands.	1					HAB
140	GCERTF	CHHR: Ensure sustainability of barrier islands, mainland beaches, and other shoreline habitats.	1					HAB
141	GCERTF	LCMR: Protect and restore important habitats for living marine resources. These habitats include estuaries, wetlands, coral reefs, sargassum mats, and deep-water habitats.	1	2				HAB
142	GCERTF	LCMR: Develop a strategic coastal and marine spatial plan that is consistent with and supportive of essential habitats for all life history stages of living marine resources.	1	2				HAB
143	GCERTF	LCMR: Enhance and improve existing long-term monitoring programs and develop additional programs as necessary to facilitate adaptive management of living marine resources in the Gulf of Mexico.	1			4		RES SOC
144	GCERTF	CC: Establish and enhance capacity-building programs for local governments.	1			4		EDU

145	GCERTF	CC: Enhance, expand, and enable locally driven solutions.	1			4		EDU
146	GCERTF	CC: Enhance communication of risk information to promote resilience to coastal hazards.	1			4		RES SOC
147	GCERTF	CC: Identify and support critical research initiatives supporting community resilience.	1			4		RES SOC
148	GCERTF	SB: Provide uniform storm surge and wave evaluations for the entirety of the Gulf Coast and use evaluations to identify high-risk areas and features that may diminish the storm buffering character of the coastline.	1			4		MMM
149	GCERTF	SB: Develop/update Gulf-wide sediment budget (for example, sources, sediment transport pathways, and final deposition sites) to document sediment movement around the Gulf.	1			4		ENV FLOW
150	GCERTF	SB: Focusing on high-risk populations, identify general actions that could/should be taken that would help to prove sustainable reductions in storm surge risk. Convey that information to States and local communities.	1			4		RES SOC
151	GCERTF	IHW: Reduce nutrient/pollutant inputs in upper watersheds to prevent their delivery to coastal wetlands and Gulf of Mexico.	1	2				ENV FLOW
152	GCERTF	IHW: Evaluate inland land-use practices, and modify them as necessary.	1					RES ECOL
153	GCERTF	IHW: Develop a comprehensive long-term monitoring program that measures system parameters from watershed to Gulf.	1					MMM
154	GCERTF	IHW: Reduce water quantity conflicts among humans and habitats.	1			4		ENV FLOW
155	GCERTF	OE: Enhance and expand an observing system focused on key indicators related to a resilient offshore water column and benthic habitats.	1					MMM

156	GCERTF	OE: Reduce effects of hypoxia by improving detection, tracking, and forecasting ability.	1			4	5	MMM
157	GCERTF	OE: Analyze offshore indicators to support coastal and marine spatial planning and habitat conservation.	1				5	MMM
158	GCERTF	OE: Assess current operational and research modeling efforts within the Gulf and support offshore ecosystem protection and preservation efforts.	1				5	MMM
NOAA Restore Act Science Program Science Plan: 2015 (http://restoreactscienceprogram.noaa.gov/wp-content/uploads/2015/05/Science-Plan-FINAL-for-website.pdf)								
159	NOAA-RESTORE	Comprehensive understanding of ecosystem services, resilience, and vulnerabilities of couple social and ecological systems.	1			4		RES ECOL
160	NOAA-RESTORE	Construct management-ready and accessible ecosystem models.	1			4	5	MMM
161	NOAA-RESTORE	Improve monitoring, modeling, and forecasting of climate change and weather effects on the sustainability and resiliency of the ecosystem.	1				5	MMM
162	NOAA-RESTORE	Comprehensive understanding of freshwater, sediment, and nutrient flows and impacts on coastal ecology and habitats.	1	2				ENV FLOW
163	NOAA-RESTORE	Comprehensive understanding of living coastal and marine resources, food web dynamics, habitat utilization, protected areas, and carbon flow.	1	2				LME
164	NOAA-RESTORE	Develop, identify, and validate system-wide indicators of environmental and socioeconomic conditions.	1			4		RES ECOL
165	NOAA-RESTORE	Develop decision-support tools to assist resource managers with management decisions planned to sustain habitats, living coastal and marine resources, and wildlife.	1	2		4		RES ECOL

166	NOAA-RESTORE	Network and integrate existing and planned data and information from monitoring programs.					5	MMM
167	NOAA-RESTORE	Develop and implement advanced technologies to improve monitoring.					5	MMM
Ocean Conservancy: Restoring the Gulf of Mexico: 2011 (http://www.oceanconservancy.org/places/gulf-of-mexico/restoring-the-gulf-of-mexico.pdf**)** • RCW: Restore, protect and maintain the Gulf coast with emphasis on wetlands • RCMH: Restore, protect and maintain coastal and marine habitats of significance • MON: Gulf of Mexico ecosystem research and Monitoring (GEM) program for adaptive management • DZ: Reduce the northern Gulf "Dead Zone" • WP: Restore, protect and maintain wildlife populations • GF: Sustain globally competitive Gulf fisheries • CRR: Promote community recovery and resilience								
168	OC	RCW: Reconnect rivers with estuaries and wetlands by restoring influxes of fresh water and sediment.	1					ENV FLOW
169	OC	RCW: Reestablish wetland vegetation and fish and waterfowl habitats in obsolete canals by backfilling with dredge material from spoil banks or using other sources of material compatible with site characteristics.	1					HAB
170	OC	RCW: Protect wetlands from incompatible development, and restore or enhance ecologically beneficial freshwater inflows that promote natural recovery.	1			4		ENV FLOW
171	OC	RCMH: Promote natural sediment recruitment and exchanges.	1					ENV FLOW
172	OC	RCMH: Maintain or enhance natural vegetation, reduce foot and vehicular traffic and create adequate buffers from development.	1			4		RES SOC
173	OC	RCMH: Protect and enhance bird and sea turtle nesting sites and associated habitats.	1					LMR

174	OC	RCMH: Reestablish or maintain existing oyster reefs and sea grasses for fisheries and other ecosystem services.	1	2				LMR
175	OC	RCMH: Protect corals from incompatible human activity.	1			4		LMR
176	OC	MON: Create a permanently funded Gulf of Mexico Ecosystem Research and Monitoring (GEM) Program for Adaptive Management.	1	2			5	MMM
177	OC	DZ: Shrink the “dead zone” area by reducing nutrient loads into the Gulf of Mexico.	1			4		ENV FLOW
178	OC	WP: Gather basic information on the status, biology, and ecology of marine mammals, sea turtles and coastal marine birds in the Gulf.	1					LMR
179	OC	WP: Implement existing recovery and management plans for threatened and endangered species and species of special conservation or management concern.	1	2				LMR
180	OC	WP: Evaluate threats to wildlife, such as marine debris, vessel strikes and artificial lighting on offshore platforms, and work to reduce threats, especially if deemed to be significant at the population level.	1	2				LMR
181	OC	GF: Improve fishing opportunities and increase economic benefits through investments in fisheries science and monitoring.		2		4		LMR
182	OC	GF: Invest in gear technology and fleet performance initiatives that increase environmental and economic benefits.		2		4		RES SOC
183	OC	CRR: Restore, expand or enhance public-use areas and amenities.				4		RES SOC
184	OC	CRR: Enable the fishing industry to modernize and become more competitive through gear conversions, investments in product quality and improved marketing.		2		4		RES SOC

185	OC	CRR: Promote recovery and long-term health of subsistence and minority fishing communities.		2		4		RES SOC
186	OC	CRR: Engage local businesses and train and employ a local Gulf workforce in the implementation of restoration projects.	1			4		RES SOC
Galveston Bay Estuary Program: Charting the Course to 2015 (https://www.tceq.texas.gov/publications/gi/gi-385.html/at_download/file) • HC: Habitat and Landscape Level Conservation • FWI: Freshwater Inflow • SP: Sustaining Species Populations • WSQ: Water and Sediment Quality • PH: Public Health Protection • PS: Public Stewardship • PA: Public Awareness • ES: Educate Stakeholders • EP: Expand Partnerships • MR: Monitoring and Research								
187	GBEP	HC: Protect existing coastal habitats in the Lower Galveston Bay Watershed.	1					HAB
188	GBEP	HC: Restore and enhance coastal habitats in the lower Galveston Bay Watershed.	1					HAB
189	GBEP	HC: Increase sustainable recreational opportunities and access to the bay and its tributaries.	1			4		RES SOC
190	GBEP	FWI: Ensure freshwater inflows necessary to maintain the balance of salinity, nutrients and sediments required to support a productive estuary.	1	2				ENV FLOW
191	GBEP	FWI: Ensure that alterations de not negatively affect productivity and ecosystem health.				4		RES ECOL
192	GBEP	SP: Eradicate or reduce population of exotic invasive species, and prevent new invasions.	1	2				LMR

193	GBEP	SP: Sustain and restore native species populations.	1			4		LMR
194	GBEP	WSQ: Reduce Non-point source (NPS) pollutant loads.	1			4		ENV FLOW
195	GBEP	WSQ: Maintain the capacity and integrity of municipal sanitary sewer collection systems to eliminate sewage bypasses the unauthorized overflows.	1			4		ENV FLOW
196	GBEP	WSQ: Eliminate pollution problems from poorly operated sewage treatment plants and promote regionalization of small wastewater treatment plants, including publicly owned treatment works.	1			4		ENV FLOW
197	GBEP	WSQ: Eliminate harm from produced brine discharges.	1			4		ENV FLOW
198	GBEP	PH: Minimize the risk of waterborne illnesses resulting from contact recreation.	1			4		HH
199	GBEP	PH: Maximize safe access for contact recreation.	1			4		HH
200	GBEP	PH: Reduce oyster-reef closures.		2				LMR
201	GBEP	PH: Reduce the concentration of toxins in key species of concern.	1	2				LMR
202	GBEP	PH: Reduce human-health risk resulting from consumption of seafood contaminated with toxic substances.	1					HH
203	GBEP	PS: Create a sense of public ownership and shared responsibility for all cultural components of the community including the public, industry and the government.	1			4		RES SOC
204	GBEP	PA: Obtain information to develop and evaluate Estuary Program communication efforts.	1					EDU
205	GBEP	PA: Facilitate broad public involvement in Estuary policy, management, and implementation.	1	2				EDU

206	GBEP	ES: Ensure that stakeholders receive the knowledge necessary to act on estuary priorities in ways that benefit the bay and the entire community.	1			4		EDU
207	GBEP	EP: Increase participation of local government in Estuary Program initiatives.	1			4		EDU
208	GBEP	EP: Increase the number or partners actively involved in the Estuary Program initiatives.	1			4		EDU
209	GBEP	MR: Supply the council and its members with the information and assessments they need to protect and manage the resources of the Galveston Bay ecosystem.	1				5	MMM
210	GBEP	MR: Provide the Water and Sediment Quality Committee with the information they need to achieve the goals of the Plan for which they are responsible.	1				5	MMM
211	GBEP	MR: Achieve a complete understanding of the Galveston Bay ecosystem.	1	2	3	4	5	LME

Appendix D: Texas OneGulf Projects Funded by the Governor's Office (FY2016-FY2017):

Project Title: Texas OneGulf Network of Experts Communications
Amount: $81,390
Project Lead: Texas A&M University-Corpus Christi
Collaborating Institution(s): Amazee Labs LLC
SRAP Goals: Strategic Goals 1 and 2/Collaboration/Communication and Engagement

To develop and implement a communication strategy that includes GulfBase.org that will advance the ability of the Texas OneGulf Network of Experts (TONE) to inform all Texas stakeholders about the TONE's capabilities and expertise. The goal of this tool is to facilitate communications amongst researchers, policy makers, and the general public.

Project Title: Gulf of Mexico Report Card Prototype for Texas
Amount: $550,000
Project Lead: Texas A&M University-Corpus Christi
Collaborating Institution(s): Harwell Gentile & Associates and University of Delaware
SRAP Goals: Strategic Goal 1/Communication and Engagement/Baseline and Long-Term Monitoring
Priority Research Area(s): Habitats/Living Marine Resources/Estuarine and Coastal Environments/Offshore and Deep Gulf/Pressures and Stressors

Coastal Texas and its watersheds provide an excellent model of the entire Gulf of Mexico for developing an EcoHealth Metrics Report Card because of the diversity and complexity of its ecosystems, human communities, and associated environmental pressures and stressors. Consequently, the Texas Pilot Project will serve as a proof-of-concept evaluation or "prototype" of the framework and its implementation of the Gulf of Mexico Report Card. Workshops will convene to partition coastal Texas into its constituent ecological habitats and to identify the full suite of pressures and stressors that impinge on coastal Texas ecosystems. The workshops will consist of scientists, stakeholders, and Texas environmental managers to ensure appropriate existing or prospective data and metrics are considered, and that the management issues and long-term sustainability goals for coastal Texas are adequately defined. Following the workshops, an interim report will be prepared to overview the Texas Pilot Project and to be set up as a prototype for developing similar regional-scale EcoHealth Metrics for other regions of the Gulf of Mexico.

Project Title: Red Tide Data Integration Project
Amount: $103,650
Project Lead: Texas A&M University-Corpus Christi
Collaborating Institution(s): N/A
SRAP Goals: Strategic Goal 2
Priority Research Area(s): Socio-Ecological Systems/Human Health and Environmental Health/Environmental Stressors and Individual Health/Environmental Stressors and Public Health

Harmful algal blooms (HABs) are composed of phytoplankton known to naturally produce biotoxins. Along the Texas coast, HABs, like red tide, occur when certain types of microscopic algae grow quickly in coastal or oceanic water, forming visible patches that may harm the health of the environment, plants, or animals. When the red tide algae disintegrate, their neurotoxins may become an aerosol causing adverse effects that can significantly increase emergency room traffic and visits to doctors. Emergency responders and the medical community may not be aware of the proximate cause and not equipped to handle significant increases in patients and demands on facilities increasing the risk of severe illness, even

death, to the afflicted population. HABs affect not only the health of people and marine ecosystems, but also the "health" of our economy — especially coastal communities dependent on the income of jobs generated through fishing and tourism. The Texas HAB Data Integration Project will employ Texas researchers with expertise in HABs and coastal processes and medical researchers familiar with data about the effects of HABs on humans to work together to better prepare first responders, emergency rooms and the medical system in responding to red tide events, minimizing human health risks. Considerable temporal and spatial data exist on red tides occurring in coastal water adjacent to the mid-coast of Texas. To our knowledge, no one has analyzed these environmental and medical datasets with the objective of developing a predictive model. With climate change and increasing nutrient pollution increasing HAB occurrences, we must provide better coordination with emergency responders, the medical community, and other Gulf States in predicting and monitoring HAB events.

Project Title: Socio-Economic Indicators for Coastal Community Disaster Response and Resilience
Amount: $125,060
Project Lead: Texas A&M University-Corpus Christi
Collaborating Institution(s): N/A
SRAP Goals: Strategic Goal 1 and 2/Baseline and Long-Term Monitoring
Priority Research Area(s): Socio-Ecological Systems/Community Resilience

A critical element to effective disaster response is an understanding of the underlying socio-economic conditions of the impacted community. Disasters range from very local, such as a harmful algal bloom, to potential widespread damage that might be associated with an oil spill or hurricane. Identifying socio-economic indicators that can be used in disaster response assessments as well as day-to-day decision making is important for resource deployment as well as resiliency and adaptation strategies. In order to support an infrastructure that can respond to disasters we propose to: 1) Inventory the state-of-art socio-economic indicators for community and human well-being by bringing together leading expertise in this area to populate a searchable database; 2) Examine operationalizing the indicators in a local context by working with Gulf of Mexico National Estuarine Research Reserves, and; 3) Publish online and in print a guide to socio-economic indicators for disaster response and community resilience.

Project Title: Species Identification Training for Effective Monitoring and Management of Harmful Algal Blooms
Amount: $60,000
Project Lead: Texas A&M University-Galveston
Collaborating Institution(s): Gulf of Mexico Coastal Ocean Observing System
SRAP Goals: Strategic Goal 1/Collaboration/Communication and Engagement/Baseline and Long-Term Monitoring
Priority Research Area(s): Living Marine Resources/Pressures and Stressors

Effective monitoring and management of harmful algal blooms (HABs) relies on accurate and timely identification of the species involved. The classic method of detection is microscopic examination for algae species is based on morphological characteristics. Other tools for species identification are molecular methods and flow cytometry; these still require the classic method to ground truth the findings. There is however a paucity of trained ‘classical’ taxonomists, and those that are excellent are either retired or close to retiring. For a variety of reasons, there has been for many decades a lack of dedicated U.S. algal taxonomic and identification training programs (this also applies to other arenas). At this time, there is a critical need to provide a comprehensive training in identification and taxonomic for scientists, technicians and managers. This is critical now more than ever not only for harmful algal bloom research but also for biofuels and other algal based research.

Project Title: Texas OneGulf Center of Excellence Disaster Response Pilot Project Program
Amount: $150,000
Lead: Texas A&M University Health Science Center
Collaborating Institution(s): The University of Texas Medical Branch
SRAP Goals: Strategic Goal 2/Collaboration/Communication and Engagement
Priority Research Area(s): Human and Environmental Health/Environmental Stressors and Individual Health/Community Resilience

The Environmental Human Health and Safety Program funded by the US Treasury RESTORE COE funds has its main focus as creating the infrastructure to support disaster response. In doing so, the main objectives of the program are to 1) create a disaster response and mitigation system, 2) participate in the Disaster Research Response (DR2) Program, and 3) Organize the Texas OneGulf Network of Experts (TONE) to provide rapid response to environmental health disasters and to address long-term issues (such as hypoxia in the Gulf of Mexico). The monumental task of creating the infrastructure for assessing the impact of both man-made and natural disasters has been recently been launched and several workshops and activities are underway for gathering information from Texas experts and stakeholders. As the program progresses, input from the TONE and from the DR2 workshops will catalyze the need for the Texas OneGulf Center of Excellence (TOCOE) to provide seed funding from the Texas Governor's office to launch additional DR2 activities via the TOCOE Pilot Project program.

Project Title: Developing a Predictive Ecosystem Model for the Lower Laguna Madre
Amount: $213,956
Project Lead: The University of Texas-Rio Grande Valley
Collaborating Institution(s): Texas State University
SRAP Goals: Strategic Goal 1/Collaboration
Priority Research Area(s): Habitats/ Environmental Flows/Estuarine and Coastal Environments

This proposal concerns the coastal sustainability of the Lower Laguna Madre (LLM) research into ecological functions, developing predictive tools for sustainable management of the LLM, and developing a system-level approach to observing and monitoring the LLM that can be used into the future. This project is specifically responsive to the mission of Texas OneGulf as it seeks to improve knowledge about one of the more "data-poor" yet ecologically important regions in the northwestern Gulf of Mexico, the LLM. We will develop and validate a process-based ecological model of primary production, which in the future, can be coupled with a hydrodynamic hydrologic model to further resolve the complex physical flows within the system. In this study we will:

- develop a process-based ecological modeling system,
- estimate water and nutrient flux boundary conditions for the Lower Laguna,
- obtain representative field datasets at strategic sites to validate the model, and
- predict trends in primary production over the next decade

Project Title: Isotope Geochemistry of Texas Coastal Waters
Amount: $220,365
Project Lead: Texas A&M University–Corpus Christi
Collaborating Institution(s): Texas A&M University
SRAP Goals: Strategic Goal 1/Collaboration/Baseline and Long-Term Monitoring
Priority Research Area(s): Environmental Flows/Estuarine and Coastal Environments/Pressures and Stressors

Texas has 400 miles of coastline with growing evidence that extensive areas of hypoxia (critically low oxygen) as well as a buildup of nutrients within this complex coastal ocean of bays, estuaries and barrier islands may pose the same socioeconomic threats and challenges as the 'Dead Zone' off the Mississippi delta. These observations may have direct management implications as efforts to reduce nutrient loading within the Mississippi watershed will have little effect on coastal hypoxia off the Texas coast, as the freshwater and nutrient inputs driving Texas hypoxia are from several different sources. Light elemental isotope analyses have been shown to provide significant understanding of aquatic system biogeochemical cycles. Stable carbon and nitrogen isotope analyses on water column samples will be taken to identify the seasonal and spatial variation in biogeochemical cycles that control water column oxygen concentrations. Sampling under this project will focus on multiple sites off the coast of Texas, e.g., near the Brazos River mouth, offshore of the entrance to Corpus Christi, Galveston, and Matagorda Bays, and at offshore deep system coastal end members. This study will complement physical and oxygen water column data gathered during GERG Hypoxia Glider Project operations scheduled for summer 2016 under a separate RESTORE grant. The purpose of this project is to provide an early and late summer overview of coastal Texas water column carbon and nitrogen source variations with a focus on the contribution to water column hypoxia. The purpose of the GERG Hypoxia Glider Project is to provide a means to quickly provide real-time data and projecting conditions into the future that can be employed rapidly to assess the impact of disasters along the Texas Gulf coast in real-time. While each project will produce stand-alone results, through synergistic effort, these complementary projects will provide a holistic view of the state of Texas water quality and an opportunity to model changes for the future.

Project Title: The Marine Microbiome as a Sentinel for Ecological Health and Resiliency
Amount: $186,224
Project Lead: The University of Texas Medical Branch
Collaborating Institution(s): Texas A&M University-Galveston
SRAP Goals: Strategic Goal 1/ Collaboration/Baseline and Long-Term Monitoring
Priority Research Area(s): Living Marine Resources/Estuarine and Coastal Environments/Pressures and Stressors

The goal of the proposed study is to establish the base line of diversity and species composition in microbial communities resident in near-shore Gulf of Mexico environs, and to monitor changes in the microbiomes associated with petrogenic pollutants. The proposed project will aim to collect over 1,000 water and sand/soil samples throughout the Houston – Galveston coastal community, including the Port of Texas City, Port of Houston, Port of Galveston, Houston Ship Channel, Intercostal Waterway, as well as several dozen locations encompassing shores/beaches and open water in the Galveston Bay, Trinity Bay and Gulf of Mexico including Bolivar Peninsula, Galveston Island, and Pelican Island. The proposed project will also take advantage of an already established water sample collection strategy. The characterization of these samples will form the basis of an invaluable baseline data set that will be needed to monitor changes in the microbial ecosystem associated with ecological disasters, bioremediation efforts and long-term environmental changes in the Gulf attributed to climate change and rise of the sea level.

Project Title: Restoring and Enhancing Structurally Complex Nursery Habitat to Enhance Reef Fish Populations
Amount: $223,752
Project Lead: Texas A&M University-Galveston
Collaborating Institution(s): Texas A&M University-Corpus Christi and the University of Texas-Rio Grande Valley
SRAP Goals: Strategic Goal 1/Collaboration
Priority Research Area(s): Habitats/Living Marine Resources/Estuarine and Coastal Environments/Pressures and Stressors

The science behind this study will provide critical data on the function and efficacy of low-relief nurseries, which will allow us to more "objectively assess the health and productivity" as well as sustainably manage ("making sound management decisions") reef fish stocks in the Gulf of Mexico. The proposed research will provide baseline biological information on the fishery benefits of creating and enhancing low-relief nursery habitat on the inner continental shelf in the NW Gulf of Mexico. Specifically, we will develop structurally complex nursery habitat using both natural and man-made materials to improve the early life survival and recruitment success of reef-dependent fishes. Here, we propose to create and enhance low-relief nursery habitat in areas known to naturally contain this type of low-relief substrate (e.g., relic barrier islands or sand shoals/ridges). New recruits (settlers) or early juvenile fishes will be collected and quantified from areas within and away from low-relief nurseries at two inner shelf locations in the NW Gulf of Mexico that contain suitable substrate (e.g., Freeport and Rio Grande banks). In addition to characterizing the assemblage structure and monitoring low-relief habitats over time, several life history, dietary, and genetic parameters will be measured for key species utilizing these nurseries including growth, natural mortality, genetic diversity, and recruitment potential (growth-mortality index). In addition, data on the movement of potential predators associated with our study sites will be evaluated at one site using acoustic telemetry to assess the home range and foraging strategies of potential predators (sub-adults and adults) in the general vicinity of natural and created low-relief nurseries.

Project Title: Impact of Environmental Criminal Enforcement on Disaster Response
Amount: $80,251
Project Lead: University of Houston Law Center
Collaborating Institution(s): Texas A&M University-Corpus Christi
SRAP Goals: Strategic Goal 1/Collaboration
Priority Research Area(s): Socio-Ecological Systems

To date, no one has fully investigated whether industrial disasters actually trigger environmental criminal investigation or enforcement to the degree that critics and the regulated community have suggested. If an industrial explosion occurs or a spill takes place without underlying intentional criminal conduct, it's simply unknown whether the federal or state governments will seek criminal enforcement in five - or ten - or eighty percent of those cases. In addition, no one has studied the degree to which these fears and concerns about criminal liability have hampered or constrained first responses to disasters. This study will aid future responses to environmental incidents and releases in the Texas Gulf region by shedding light on the true risks of environmental enforcement after disasters, and offer suggestions on how best to promote effective and speedy disclosure and cleanup in light of those risks. This research will assemble a database of all major industrial disasters in the United States since 2000. While it will focus on incidents that have occurred in the Texas Gulf Region, it will include information from other areas of the United States to provide a baseline for comparison and assessment. With the database in hand, the study will then review EPA, DOJ and state records to assess whether these incidents led to any civil and criminal responses by federal and state authorities under relevant environmental laws.