M & R FOCUS AREA

Issue Area: Collaborate with Research Institutions to Support Focus Area Applied Research and Monitoring

PRIORITY ISSUE	ISSUE AREA DESCRIPTION	SPECIFIC OBJECTIVES	ACTION	MEASURE	TARGETED OUTPUTS (Short, Medium, Long-term)	GALVESTON BAY PLAN AREA	SAP AREA	LEAD IMPLEMENTERS	STATUS (Projects & Accomplishments)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
A Lack of Available Applied Research and Monitoring Data Can Prevent Understanding Galveston Bay Ecosystem Components, Addressing Limits to Human Uses, and Implementing Estuary Preservation Initiatives.	Better Understand Galveston Bay Ecosystem Components	Conduct Biological Stressor Monitoring and Research	Evaluate the influence of biological stressors (e.g. harmful algal blooms, *Toxoplasma gondii, Perkinsus marinus* (Dermo), invasive species and commercial and recreational harvest) on aquatic, semi-aquatic, and terrestrial species populations found in the Galveston Bay watershed.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	RSC-2	*Ecosystem and Human Health - Sustain and Restore Native Species Populations* - Goal 1 - Objective A - Identify declining or threatened native species, Objective D Support research identifying habitat and environmental needs of declining species. Goal 2 - Eradicate or reduce populations of exotic invasive species and prevent new invasions - Objective B - Support research on invasive species. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective D.	GBEP and Research Institutions, Agencies, and NGOs	● TAMU has taken the lead in studying HABs and Dermo in the past. ● TPWD investigates fish kills. ● TPWD, USFWS, NRU and others have led efforts to study effective ways to limit or locally eradicate invasive species populations. ● Other institutions have studied individual populations (e.g. UHCL and Houston Zoo's Diamondback Terrapin work).
		Conduct Geochemical Stressor Monitoring and Research	Investigate the affect of geochemical stressors (e.g. eutrophication, biomagnification of legacy toxins and endocrine disrupters) on aquatic, semi-aquatic and terrestrial species populations found in the Galveston Bay watershed. Evaluate fate and transport through the environment and develop baselines for future comparison.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	RSC-2	*Ecosystem and Human Health - Sustain and Restore Native Species Populations* - Goal 1 - Objective A - Identify declining or threatened native species, Objective D Support research identifying habitat and environmental needs of declining species. WSQ Goal 1 Reduce NPS Pollutant Loads Objective D. *Public-Health Protection* Goal 3: Reduce human health risk resulting from consumption of seafood contaminated with toxic substances, Objective A. Goal 2: Reduce the concentrations of toxins in key species of concern, Objective B. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective D.	GBEP and Research Institutions, Agencies, and NGOs	●Watershed based plans identify current water quality baselines to determine load reductions needed to meet water quality standards. ● TCEQ has begun to develop nutrient numerical standards beginning with Lakes and Rivers. Sediment and Litter might be emerging areas where baselines could be developed. ● Baylor University, TAMU Galveston , USGS and others have identified endocrine disrupters and personal care products in this region. ● TAMUG and UHCL-EIH have studied Dolphin populations and conducted tissue bioassays. There has been some interest in biomagnification studies in avian populations.
	Better Understand Galveston Bay Ecosystem Components (continued)	Conduct Physical Stressor Monitoring and Research	Study the influence of physical changes to the estuary (e.g. litter and illegal dumping, modified freshwater inflows, bay circulation, coastal erosion, shoreline hardening, land use changes and loss or fragmentation of habitats) on aquatic, semi-aquatic, and terrestrial species populations found in the Galveston Bay watershed.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	FW-5, FW-7, SM-4, RSC-2	*Ecosystem and Human Health - Sustain and Restore Native Species Populations* - Goal 1 - Objective A - Identify declining or threatened native species, Objective D Support research identifying habitat and environmental needs of declining species. *Ensure Freshwater Inflows Necessary to Maintain the Balance of Salinity, Nutrients, and Sediments Required to Support a Productive Estuary* - Goal 1 Objective B - Support further research to understand the annual and seasonal freshwater inflow needs for Galveston Bay. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective C.	GBEP and Research Institutions, Agencies, and NGOs	● Bay circulation and infrastructure studies were completed in 1999 by the TWDB for GBEP. ● Research covering sea level rise, wetland habitat loss and freshwater inflows have been completed during the first twenty years. ● Estuarine wetland habitat restoration projects have resulted in seagrass bed returns to West Bay. ● UHCL and Houston Zoo have conducted studies on Diamond backed Terrapin.

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
A Lack of Available Applied Research and Monitoring Data Can Prevent Understanding Galveston Bay Ecosystem Components, Addressing Limits to Human Uses, and Implementing Estuary Preservation Initiatives. (continued)	Better Understand Factors that Limit Human Use of Bay Resources	Conduct Monitoring and Research to Address Limits to Contact Recreation	Initiate and complete studies that characterize the public's contact recreation risks from waterborne pathogens in bay and bay tributaries; conduct bacteria source tracking to characterize sources of pathogens and evaluate the emergence of new pathogen indicators.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	PH-3, RSC-2	*Ecosystem and Human Health - Public-Health Protection* Goal 1: Minimize risk of waterborne illness resulting from contact recreation, Objective C. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective C.	GBEP, Local Governments and Research Institutions, Agencies, and NGOs	● City of Houston, Harris County, TAMUG and others have been looking at alternative bacteria indicators, analysis methods, resuspension and other research. ● FY 2018 planned funding by GBEP for watersheds within the GBEP region.
		Conduct Monitoring and Research to Address Limits to Seafood Consumption	Identify sources and evaluate remedial actions to address legacy pollutants, surface run-off, illegal dumping and air deposition that can affect the size of recreational shellfish harvest areas or number of seafood advisories. Known pollutants of concern include PCB, Dioxin, and mercury.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	PH-1, WSQ-2, RSC-2	*Ecosystem and Human Health - Public-Health Protection* Goal 3: Reduce human health risk resulting from consumption of seafood contaminated with toxic substances, Objective A. Goal 2: Reduce the concentrations of toxins in key species of concern, Objective B. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective C.	GBEP, TDSHS, TCEQ, TPWD, GLO, Research Institutions, Agencies, and NGOs	● ADV-55 was issued in December 2015 and rescinded ADV 49 and the pesticide advisory (HSC) due to lower concentrations but maintains consumption advisory for Dioxin and PCBs in fish and shellfish (all fish and blue crabs) for HSC above Fred Hartman Bridge and an advisory for catfish, spotted seatrout and blue crab between Fred Hartman Bridge south to a line from Red Bluff Point to Five-Mile Cut Marker to Houston Point. ●ADV 50 issued in June 2013 advisory for all species of catfish for Galveston Bay and all contiguous waters, including Chocolate, East, Trinity, and West Bays. GB Symposium highlighted air deposition studies and GBEP funded a project with the University of Houston.
	Better Assist Bay Sustainability Initiatives	Evaluate Best Management Practice (BMP) Demonstration Projects	Evaluate the effectiveness of BMPs to address NPS and PS pollutants and improve water quality. Evaluation of data from either built BMPs with available data or from future planned demonstration BMPs would be studied. New projects would be instrumented or monitored to collect stormwater run-off in watersheds containing impaired waters.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	NPS-2, NPS-5, NPS-11, RSC-2	*Ecosystem and Human Health - WSQ* Goal 1 Reduce NPS Pollutant Loads Objective C. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective C.	GBEP, Research Institutions, Agencies, and NGOs and Local Governments	Demonstration Projects Include: ● Brays Bayou Wetland, ● Ghirardi Family Watersmart Park, ● HCFCD Detention with Water Quality Improvement Features, ● Birnamwood Dr., ● Almeda Rd.
A Lack of Available Applied Research and Monitoring Data Can Prevent Understanding Galveston Bay Ecosystem Components, Addressing Limits to Human Uses, and Implementing Estuary Preservation Initiatives. (continued)	Better Assist Bay Sustainability Initiatives (continued)	Conduct Research on Ecosystem Service and Economic Valuation of Bay Resources	Detail the Ecosystem Services provided by Galveston Bay and Upland Habitats and Determine an Economic Value for Each.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	New - Topic not Identified in Plan	*Ecosystem and Human Health Habitat and Landscape Level Conservation* Goal 1 Protect Existing Coastal Habitats in the Lower Galveston Bay Watershed. *Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective D.	GBEP and Research Institutions, Agencies, and NGOs	● Initial White Paper completed by HARC (2005?). ● Research being carried out by Harte Research Institute and Gulf of Mexico Alliance - study completed for Galveston Bay in 2012 ● Paper by the SSPEED Center on Mid Coast completed in 2014 ● Ecosystem services viewer by Dr. David Yoskowitz TAMU Corpus Christi ● Houston Wilderness and The Nature Conservancy have each addressed Galveston Bay ecosystem services
		Complete Coastal Resiliency and Acclimation Studies	Characterize the risks to coastal habitats from rising sea-levels, altered precipitation patterns, and changes to the frequency and size of tropical systems. Determine the impacts and ecosystem adaptations to changing patterns.	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Measures]***	***[See M&R Issue Area: Increase Access to Galveston Bay Ecosystem Information - Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research Information Targeted Outputs]***	New - Identified as an Emerging Threat.	*Monitoring and Research* - Goal 1 - Increase Understanding of Galveston Bay Ecosystem Objective A and Goal 2 - Make Available Information Needed by the public, GBC, and Subcommittee to Support Implementation of the Galveston Bay Plan Objective D.	GBEP and Research Institutions, Agencies, and NGOs	● The Bureau of Economic Geology completed a sea level change analysis in (2005?). ● SSPEED center has worked in recent years to evaluate coastal resiliency and change due to storms and sea level rise.

*Measurable Action	Short-Term	Actions Conceived Completion within 2-5 Years
	Medium-Term	Actions Conceived Completion within 5-10 Years
	Long-Term	Actions Conceived Completion within 10+ Years

Global M&R Element
Global PPE Element
Background Information / Resources Driving Plan Content

M & R FOCUS AREA
Issue Area: Increase Access to Galveston Bay Ecosystem Information

PRIORITY ISSUE	ISSUE AREA DESCRIPTION	SPECIFIC OBJECTIVES	ACTION	MEASURE	TARGETED OUTPUTS (Short, Medium, Long-term)	GALVESTON BAY PLAN AREA	SAP AREA	LEAD IMPLEMENTERS	STATUS (Projects & Accomplishments)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
A Lack of Information and Data Gaps Can Impair the Ability of Resource Managers, Decision Makers and Public to Asses Bay Health and Make Appropriate Decisions	Characterize and Disseminate Monitoring and Research that Creates Greater Understanding and Opportunities to Access Information	Support Tracking the Status and Trends of Environmental and Stressor Indicators of Galveston Bay Ecosystem Health	Obtain, analyze, and synthesize routine monitoring data sources needed to determine the status and trends of bay indicators, parameters and stressors directly related to the health and sustainability of the bay in formats that increase access and understanding.	**Status and Trends Report/Status and Trends Website**	**S: Create Status and Trends Report, Post Status and Trends to the Website.**	RSC-3, Regional Monitoring Program	*Monitoring and Research* Goal 2: Make Available information needed by the public, Galveston Bay Council members, and GBEP subcommittee members to support implementation of the Galveston Bay Plan Objectives A and B.	M&R and Budget and Priorities	● GBEP has produced the Status and Trends on an annual basis to meet Legislative Budget Board measure. Status and Trends has been used to gather and maintain data related to the Bay to prevent loss of data and prevent the need for costly restarts and maintain continuity and knowledge. ● The Galveston Bay Foundation and Houston Advance Research Center have begun to produce an annual report card based on Status and Trends work and previous GBEP indicator development. ● The State of the Bay report builds on the Status and Trends information, reports on changes to environmental and social indicators, summarizes resource management efforts to preserve and protect Galveston Bay, and summarizes the latest Galveston Bay research.
				****Galveston Bay Report Card**	**S: Support Development of the Galveston Bay Report Card.**				
				State of the Bay Characterization Report	**M: Create the State of the Bay Characterization Report.**				
				Plan Update	**M: Conduct The Galveston Bay Plan Update.**				
				Plan Revision	**L: Conduct The Galveston Bay Plan Revision.**				
		Expand the Dissemination of Easy to Access Galveston Bay Monitoring and Research	Disseminate monitoring and research results through a variety of active and passive outreach vehicles for consumption by different audiences, including GBEP partners, decision makers, bay user groups and the public.	**State of the Bay Symposium and Proceedings**	**S: Support the Regular State of the Bay Symposium and Proceedings.**	RSC-3, Regional Monitoring Program	*Monitoring and Research* Goal 1: Increase Understanding of the Galveston Bay Ecosystem Objective B - Support the dissemination of monitoring and research results to GBEP partners and the public.	M&R, GBEP, TAMU, GBF, HARC, and other Research Institutions, Agencies, and NGOs	● In addition to passive outreach in the form of reports GBEP, project contractors, and technical stakeholders (e.g. Master Naturalist) present at the Biennial State of the Bay Symposiums, technical presentations at the behest of local organizations, and at workshops. ● The GBEP website and Galveston Bay Information Center have also been used to house monitoring and research reports, National Green Book series, and project location/information.
				Data and Mapping Research Hub	**S: Collect Data and Create Data and Mapping Research Hub (Database).**				
				White Papers, Journal Publications, Technical Presentations and Workshops	**S: Support the Development of White Papers, Journal Publications, Technical Presentations, and Workshops.**				
				State of the Bay Characterization Report	**M: Create the State of the Bay Characterization Report.**				
				Plan Update	**M: Conduct The Galveston Bay Plan Update.**				
				Research Synthesis Report	**L: Create the Research Synthesis Report.**				
				Plan Revision	**L: Conduct The Galveston Bay Plan Revision.**				

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