Version date: 3/11/2022

FISCAL YEAR 2022 WORK PLAN
SECTION 320
GALVESTON BAY ESTUARY PROGRAM

Revision 3.1

EPA #CE-00655007

TCEQ Grant #332020

A PROGRAM OF TCEQ

Texas Commission on Environmental Quality
P.O. Box 13087, Austin, Texas 78711-3087

May 2021

TABLE OF CONTENTS

LIST OF ABBREVIATIONS iii
SECTION 1: PROGRAM OVERVIEW 5
SECTION 2: INTRODUCTION 7
SECTION 2.1: ORGANIZATIONAL STRUCTURE 8
SECTION 2.2: GOALS AND ACCOMPLISHMENTS SINCE FY 2021 WORK PLAN SUBMISSION 13
SECTION 2.3: STRATEGIC ACTION PLAN GOALS TO FOCUS ON IN FY 2022 17
SECTION 3: FY 2022 PROJECTS 20
SECTION 3.1: FY 2022 FEDERAL PROJECTS - SUMMARY 20
SECTION 3.2: FY 2022 FEDERAL PROJECTS - DETAIL 21
SECTION 3.3: FY 2022 GRANT BUDGET SPREADSHEETS 31
SECTION 4: ONGOING PROJECTS 34
SECTION 4.1: ONGOING FEDERAL PROJECTS - SUMMARY 34
SECTION 4.2: ONGOING FEDERAL PROJECTS - DETAIL 35
SECTION 5: COMPLETED PROJECTS 42
SECTION 5.1: PROJECTS COMPLETED SINCE FY 2021 WORK PLAN SUBMISSION - SUMMARY 42
SECTION 5.2: PROJECTS COMPLETED SINCE FY 2021 WORK PLAN SUBMISSION – DETAIL 43

LIST OF ABBREVIATIONS

Table 1. Abbreviations List

Name	Abbreviation
Assessment Unit	AU
Bacteria Implementation Group	BIG
Bacteria Source Tracking	BST
Best Management Practice	BMP
Comprehensive Conservation and Management Plan	CCMP
Dissolved Oxygen	DO
Enterobacterial Repetitive Intergenic Consensus-Polymerase Chain Reaction	ERIC-PCR
Environmental Institute of Houston	EIH
Fiscal Year	FY
Galveston Bay Council	GBC
Galveston Bay Estuary Program	GBEP
Galveston Bay Foundation	GBF
Galveston Bay Plan	*GBP*
Galveston Bay Plan, 2nd Edition	*GBP, 2nd Edition*
Galveston Bay Public Awareness and Education Campaign	Back the Bay
Geographic Information System	GIS
GeoTechnology Research Institute	GTRI
Gulf of Mexico Alliance	GOMA
Houston Advanced Research Center	HARC
Houston-Galveston Area Council	H-GAC
City of Houston Parks and Recreation Department	HPARD
Harris County Department of Education	HCDE
Implementation Plan	I-Plan
Lead	Pb
Monitoring and Research	M&R
National Estuary Program	NEP
Natural Resource Uses	NRU
Nonpoint Source	NPS
Park Board of Trustees of the City of Galveston	PBTG
Pharmaceutical and Personal Care Products	PPCPs
Plastic Pollution Prevention Partnership	P3P
Point Source	PS
Polychlorinated Biphenyls	PCBs
Per- and Polyfluorinated Alkyl Substances	PFAS

Name	Abbreviation
Public Participation and Education	PPE
Quality Assurance Project Plan	QAPP
Regional Monitoring Database	RMD
River, Lakes, Bays N' Bayous Trash Bash	Trash Bash
Soil and Aquatic Microbiology Laboratory	SAML
Texas A&M AgriLife Extension Service	Texas AgriLife
Texas A&M University	TAMU
Texas A&M University at Galveston	TAMUG
Texas Commission on Environmental Quality	TCEQ
Texas Estuarine Restoration Network	TERN
Texas General Land Office	GLO
Texas Institute for Applied Environment Research	TIAER
Texas Parks and Wildlife Department	TPWD
Texas Water Resources Institute	TWRI
Total Maximum Daily Load	TMDL
U.S. Army Corps of Engineers	USACE
U.S. Environmental Protection Agency	EPA
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS
University of Houston	UH
University of Houston – Clear Lake	UHCL
Water and Sediment Quality	WSQ
Watershed Protection Plan	WPP

SECTION 1: PROGRAM OVERVIEW

The initial application of grant #CE-00655007 was for three years of time and one year of funding with the intent to request another year of time and funding each year for the next two years and extend the grant term to five years total through 8/31/2024. The fiscal year (FY) 2022 Work Plan is the third request for funding for this grant. The Texas Commission on Environmental Quality (TCEQ) has found this method is most effective for successful operation and coordination of the Galveston Bay Estuary Program (GBEP).

Galveston Bay is the largest and one of the most productive estuaries in Texas. It sits adjacent to one of the most heavily industrialized areas in the nation. The GBEP service area encompasses 5,000 square miles and 232 miles of estuarine shoreline along the upper Texas Coast and incorporates the five-county area bordering Galveston Bay: Liberty, Chambers, Harris, Galveston, and Brazoria counties.

GBEP was established in 1989 to provide comprehensive management of this vital resource. In 1990, GBEP began working with a diverse group of stakeholders to develop a comprehensive plan that would receive broad-based support from, and involvement by, federal and state agencies with jurisdiction in Galveston Bay, industries and businesses, local government officials, commercial and recreational fisherman, conservation organizations, and citizens. In 1994, the *Galveston Bay Plan* (*GBP*), the comprehensive conservation and management plan (CCMP), was completed, and in 1995 it was approved by the governor of Texas and the U.S. Environmental Protection Agency (EPA) administrator. The initial effort was jointly funded by EPA, the Texas General Land Office (GLO), and TCEQ. The *Galveston Bay Plan*, 2nd *edition* (*GBP, 2nd Edition*) was approved by TCEQ in March 2019.

The *GBP* identified 82 action items to protect and restore the health and productivity of the estuary while supporting continued economic growth and public use of Galveston Bay. GBEP received a grant from the EPA to begin implementing the *GBP* in 1995. This grant ran from FY 1995–1999 and is now closed. Subsequent grants have run from FY 2000–2003, FY 2004–2007, FY 2008–2010, FY 2011–2013, and FY 2014–2016. Grant #CE-00655006 (FY 2017–2019) is open but is no longer receiving funding allocations. Over 200 implementation projects have been initiated under these grants.

GBEP and its partners have received 17 national awards for their partnerships and progress in implementing the *GBP* and preserving Galveston Bay.

Pre-2008 AWARDS

- Four awards from Coastal America: one in 1999, Clear Creek Habitat Restoration project, for the beneficial use of dredge material, one in 2002 for Galveston Island State Park habitat restoration, one in 2003 for habitat restoration at Jumbile Cove, and one in 2005 for San Jacinto State Park for beneficial use of dredge material.
- Recognition award from the National Aeronautics and Space Administration for Galveston Bay estuary restoration and five years of implementation of the *GBP*.
- National Wetland Conservation Award for the Delehide Cove Protection and Restoration project from the U.S. Fish and Wildlife Service (USFWS) in 2006.
- EPA Gulf of Mexico Program Gulf Guardian Partnership Award for the Brays Bayou Urban Wetlands project.
- The Fisheries and Habitat Conservation Partnership award for the cumulative habitat conservation work on the part of the Natural Resource Uses (NRU) subcommittee.
- Two EPA Gulf of Mexico Program Gulf Guardian Awards to GBEP partners, including an award in the non-profit category to SCENIC GALVESTON for the Virginia Point Coastal Preserve in which GBEP played an instrumental role, and an award in the individual category to Dick Benoit, a highly active local citizen.

2008-PRESENT AWARDS

- EPA Gulf of Mexico Program awarded the First Place Gulf Guardian Award in the Partnership category for the East Bay Shoreline Protection project.
- Department of Interior's Collaborative Conservation award for the East Bay Shoreline Protection project.
- EPA's Gulf of Mexico Program Gulf Guardian Partnership Award for the North Deer Island Protection project.
- Coastal America Partnership Award for the North Deer Island Protection project.
- Coastal America Partnership Award for the Savannah Oaks Conservation project.
- TCEQ Texas Environmental Excellence Awards 2014 Finalist: Civic/Community for the Sheldon Lake Restoration project in 2014.
- Keep Houston Beautiful Mayors Proud Partner Award for the Sheldon Lake Restoration project in 2015.

- Houston-Galveston Area Council's (H-GAC) Our Great Region Diligence Award for Double Bayou Watershed Protection Plan (WPP) in 2016.
- USFWS Southwest Region Annual "Partnership of the Year" Award for 2016 for Oyster Lake Shoreline Protection and Marsh Restoration Project.
- H-GAC Our Great Region Award for the Double Bayou WPP in 2017.
- EPA's Gulf of Mexico Program Gulf Guardian Partnership Award for the Plastic Pollution Prevention Partnership in 2017.
- EPA's Gulf of Mexico Program Gulf Guardian Partnership Award for River, Lakes, Bays N' Bayous Trash Bash (Trash Bash) in 2017.
- TCEQ Texas Environmental Excellence Awards 2018 Winner: Civic/Community for Trash Bash.
- EPA 2018 Award for Green Infrastructure & Excellence in Communications/Important Message (Green Infrastructure for Texas – Exploration Green).
- TCEQ Texas Environmental Excellence Award for Trash Bash in 2019.
- EPA Gulf Guardian Award in for Trash Bash 2019.
- City of Houston/Keep Houston Beautiful Mayor's Proud Partner Award in Honor of project excellence and longevity for Trash Bash in 2019.

SECTION 2: INTRODUCTION

GBEP, a non-regulatory program of TCEQ, is a partnership of local governments, business and industry, conservation organizations, bay user groups, and resource agencies. GBEP is charged with implementing the *GBP*, the CCMP for Galveston Bay. GBEP is part of TCEQ's Office of Water, Water Quality Planning Division. A program manager and staff of seven located in the Houston-Galveston area directly oversee the implementation of the *GBP*. Program staff responsibilities are as follows:

- Acquire, manage, and disperse funds to implement specific actions in the *GBP*;
- Provide for coordination and communication among state and federal resource agencies for many cross-jurisdictional issues;
- Coordinate, monitor, and track implementation activities of Galveston Bay Council (GBC) partners;
- Identify and communicate bay improvements to agencies, stakeholders, and the public;
- Conduct public outreach and education to increase awareness of Galveston Bay;
- Advocate conservation of the estuary (see Figure 1); and
- Maintain stakeholder involvement in the decision-making process through the GBC and its subcommittees.

Figure 1. Great egret on a breakwater installed to decrease shoreline erosion near Galveston Island State Park (photo credit: Cassidy Kempf).

SECTION 2.1: ORGANIZATIONAL STRUCTURE

GBEP has the primary responsibility for coordinating and administering the work plan. Program staff and job descriptions are provided below.

Lisa Marshall, **M.S., GBEP Program Manager:** Responsible for the overall implementation of the *GBP*, including: securing and managing funds to support operations, staff, and projects; fostering stakeholder involvement to facilitate *GBP* implementation; managing program staff and operations to ensure efficient use of resources; and representing GBEP on national, state, and local boards and committees and at national and state conferences/events to garner federal and state support. Ms. Marshall also coordinates the GBC and the Budget and Priorities subcommittee.

Cynthia Clevenger, Public Participation and Education (PPE) Coordinator and Community Relations Specialist: responsible for coordinating the implementation of PPE actions in the *GBP;* building relationships and developing communication channels and dialogue with local government officials, private sector, and other outside organizations key to implementing the *GBP;* facilitating the PPE subcommittee of the GBC; providing information to stakeholders, the public and media; overseeing the Galveston Bay Public Awareness and Education Campaign (Back the Bay); promoting special events and projects; and overseeing the websites of GBEP. Ms. Clevenger facilitates cross-sectoral learning of public relations and marketing activities for the Galveston Bay watershed; organizes and manages community relations events and the State of the Bay symposium; and tracks emerging stakeholder community concerns/issues.

Lindsey Lippert, NRU Coordinator: responsible for coordinating the implementation of habitat protection, species population protection, freshwater inflows, shoreline management, and spills and dumping actions in the *GBP*; coordinating invasive species work group and the NRU subcommittee of the GBC; implementing specific projects to protect, restore, and enhance coastal habitat and native species populations, and manage and control invasive species; maintaining Legislative Budget Board and EPA Government Performance and Results Act performance measures; and serving as a back-up budget liaison and bill analyst for the GBEP office.

Kristen McGovern, Ph.D., Monitoring and Research (M&R) Coordinator: responsible for coordinating research actions in the *GBP*; coordinating the regional monitoring program, including data management/reporting, and development and application of environmental indicators; facilitating the M&R subcommittee of the GBC; coordinating CCMP implementation tracking, and researching, evaluating, and reporting findings concerning scientific and technical issues impacting *GBP* implementation.

Christian Rines, M.S., Water and Sediment Quality (WSQ) Coordinator: responsible for coordinating the implementation of public health protection, WSQ, nonpoint source (NPS), and point source (PS) pollution actions in the *GBP*; implementing specific stormwater, wastewater, septic systems, and seafood safety projects; facilitating the WSQ subcommittee of the GBC; and researching, evaluating and reporting findings concerning scientific and technical issues impacting *GBP* implementation.

Patricia Thompson, M.S., Technical and Quality Program Coordinator: responsible for serving as the quality assurance officer, assists with oversight of contract management, tracking, and execution, budget liaison, and grants coordinator for GBEP. Ms. Thompson also coordinates the development and submission of federal reports, identifies, and tracks the evolution of issues affecting bay management, and researches policy, technical, and management results that pertain to Galveston Bay in collaboration with the NRU and WSQ coordinators.

Doretta Thomas, Administrative Assistant: responsible for travel coordination, vehicle and equipment maintenance and repairs, mail, correspondence, office safety, and general administrative support for GBEP.

Vacant, Education and Outreach Coordinator: responsible for handling GBEP outreach events, conducting educational presentations in schools and at events, assisting with the informational needs of the program, managing contracts, and assisting subcommittee coordinators in implementing habitat, water quality, species protection, and monitoring projects.

PROGRAM COMPETENCY DEMONSTRATION

The following statements demonstrate GBEP's competency as a Continuing Environmental Program:

- Competency is demonstrated by TCEQ Quality Systems Audits conducted biennially by the TCEQ Quality Assurance Manager.
- Competency is demonstrated through EPA Quality Project and Program Management training taken by TCEQ GBEP staff. GBEP staff that review Quality Assurance Project Plans (QAPPs) or manage projects with QAPPs have taken this training and any new staff with QAPP-related responsibilities will be required to take this training. Certificates are available upon request.
- Competency is demonstrated through the EPA approved TCEQ Quality Management Plan (Revision 26 approved January 2021) that GBEP operates under, which provides descriptions of the quality assurance policies, including all the requirements described in the EPA document QA/R-2.
- The GBEP Program Manager and staff take many professional development training classes annually which are also available upon request.

FY 2021 LEVERAGING, TRAVEL, AND TECH TRANSFER AMOUNTS

Figures reported in Table 2 provide a mid-year estimate of leveraged funding reported by partners and grantees from September 2020–August 2021 (fiscal year 2021). The number is subject to change as additional funding may be reported for the period.

Table 2. FY 2021 Leveraging

EPA Funds to Program (Section 320)	Other Federal Funds	State Funds	Local Government Funds and In-Kind	Private funds & In-kind
$662,500	$5,830,000	$1,102,112	$0	$15,500,000

Figures reported in Table 3 depict the travel expenses and tech transfer descriptions from fiscal year 2021.

Table 3. FY 2021 Travel and Tech Transfer

EVENT, LOCATION, & PURPOSE	STAFF PERSON	EPA SECTION 320 FUNDS	TCEQ 100% STATE FUNDS
Galveston Bay Foundation (GBF) Conservation Committee Meetings Houston, Texas (Virtual) – Bimonthly The GBF and partners meet to discuss conservation projects, management needs, and funding strategies for lands held by GBF. The committee also reviews bylaws and requirements needed to maintain GBF's Land Trust Alliance accreditation.	Lindsey Lippert	$0	$0
Interagency Public Meeting for the U.S. Army Corps of Engineers (USACE) Coastal Texas Protection and Restoration Feasibility Study Galveston, Texas (and via teleconference) – Monthly USACE Galveston District meets with state and federal agency partners to consult on the progress of the study which will identify critical data needs and recommend a comprehensive strategy for reducing coastal storm flood risk through structural and nonstructural measures that take advantage of natural features like barrier islands.	Lindsey Lippert	$0	$0
The H-GAC Natural Resources Advisory Committee Houston, Texas (Virtual) – Quarterly These meetings provide information on issues related to natural resource management of the region. The GBEP Program Manager is a non-voting member.	Lisa Marshall	$0	$0

EVENT, LOCATION, & PURPOSE	STAFF PERSON	EPA SECTION 320 FUNDS	TCEQ 100% STATE FUNDS
University of Houston-Clear Lake (UHCL)/ Environmental Institute of Houston (EIH), Science Advisory Board Houston, Texas (Virtual) – Biannual The meetings provide updates from EIH staff and faculty on their research and educational initiatives. The GBEP Program Manager is a non-voting member.	Lisa Marshall	$0	$0
H-GAC Bacteria Implementation Group (BIG) Houston, Texas (Virtual) – Semiannual These meetings provide an update of implementation activities of the BIG Implementation Plan (I-Plan) and present topics that are related to water quality.	Lisa Marshall Christian Rines	$0	$0
Trash Summit Meetings Houston, Texas (and teleconference) – Monthly Watershed-wide coordinating initiative to research, track, and quantify litter. This stakeholder-led effort aims to identify prevention and removal strategies. Other efforts include identifying funding strategies, partnership opportunities, and communication approaches. Initial steps were taken to develop a regional action plan—like other water-based plans—focused on litter and marine debris prevention.	Cynthia Clevenger Lisa Marshall Christian Rines	$0	$0
P3P Meetings Houston, Texas (Virtual) – Quarterly Region-wide collaborative of several organizations and agencies to address plastic debris affecting wildlife and water quality. The group organizes cleanups, wildlife entanglement rescues, and outreach and education efforts. This group is an outcome of regional efforts to address EPA's Trash Free Waters initiative.	Cynthia Clevenger	$0	$0
Fishing Line Recycling Work group Houston, Texas (Virtual) – Quarterly An outcome of P3P addressing concerns about the large amount of monofilament fishing line causing wildlife entanglements and water quality issues on the Texas City Dike and Seawolf Park in Galveston, Texas. The work group is a partnership with organizations and agencies working with the Texas City Waste Management Department and the City of Galveston Park Board of Trustees to develop a campaign to help anglers and visitors keep fishing line off the ground.	Cynthia Clevenger	$0	$0
Trash Bash Event Coordination Meetings Houston, Texas (Virtual) – Quarterly These meetings provide regional coordination, site selection, training, outreach materials development and training, and organizational support for the regional Trash Bash events.	Patricia Thompson	$0	$0
American Shore and Beach Preservation Association Texas Chapter Meeting (Virtual) – Quarterly The meeting brings together academics, local government officials, state and federal agencies, and the public to discuss a broad range of topics, including coastal ecology, science, and resiliency.	Lisa Marshall Kristen McGovern	$0	$0

EVENT, LOCATION, & PURPOSE	STAFF PERSON	EPA SECTION 320 FUNDS	TCEQ 100% STATE FUNDS
Texas Watershed Coordinator Roundtable Meetings Different locations across the state (Virtual) – Semiannual These meetings provide a forum for water professionals to establish and maintain dialogue between watershed coordinators, facilitate interactive solutions to common watershed issues faced throughout the state, and add to the fundamental knowledge conveyed at the short courses.	Christian Rines Lisa Marshall	$0	$0
2020 National Coastal and Estuarine Virtual Summit – Restoring America's Estuaries Virtual Conference – September 2020 The conference provided the opportunity to learn, coordinate, and exchange information with other National Estuary Programs (NEPs) and federal program staff and allows GBEP to implement the succession plan.	Lindsey Lippert Lisa Marshall Kristen McGovern Christian Rines Patricia Thompson	$400	$1,000
Fall EPA NEP Tech Transfer Meeting Virtual – October 2020 The meeting provided NEP program managers a chance to exchange information and network.	Lisa Marshall	$0	$0
Bayou Preservation Association 2020 Symposium Virtual Conference – October 2020 The conference provided information on the expanding importance of diversity in all its forms — physical, geomorphological, biological, socioeconomic, and conceptual.	Cynthia Clevenger Lisa Marshall	$0	$40
North American Association for Environmental Education 49th Annual Conference Virtual Conference – October 2020 The conference provided information on accelerating environmental literacy and civic engagement along with networking opportunities and knowledge needed to fulfill the role of the PPE Subcommittee Coordinator.	Cynthia Clevenger	$0	$325
9th Annual Gulf Coast Water Conservation Symposium Virtual Conference – October 2020 The symposium provided important information about water conservation and management, a listed priority in the *GBP*.	Lisa Marshall	$0	$25
Gulf of Mexico Alliance (GOMA) Marine Debris Cross Team Initiative Virtual Meeting – October 2020 The meeting reviewed cross-team updates, plan to implement Action Plan IV, and discuss grant applications.	Cynthia Clevenger Lisa Marshall	$0	$0
SharePoint 2016 Training (two classes per person) Virtual Training – October & November 2020 The user training relayed software basics such as working with lists and libraries, page customization, forms and managing site permissions and users. Staff learned to create, edit, and manage web page content in the site owner training.	Christian Rines Kristen McGovern	$0	$938

EVENT, LOCATION, & PURPOSE	STAFF PERSON	EPA SECTION 320 FUNDS	TCEQ 100% STATE FUNDS
GOMA Fully Serving the Underserved Virtual Workshop – January 2021 The workshop informed professional development and peer-to-peer learning to engage and support underserved and underrepresented populations.	Cynthia Clevenger Lisa Marshall	$0	$0
2020 Parks and Natural Areas Awards Virtual Ceremony – February 2021 The award ceremony highlighted best management practices (BMPs) and innovative approaches to parks planning and implementation in the greater Houston-Galveston area. A GBEP staff served as a panel judge for the competition in October 2020.	Christian Rines	$0	$0
Urban Riparian Symposium Virtual Conference – February 2021 The conference provided information on restoration, monitoring, and invasive plant and pest techniques needed for project development in the implementation of the *GBP*.	Christian Rines Lisa Marshall Patricia Thompson	$0	$225
Gulf Coast Joint Venture Mid-Coast Meeting Virtual Meeting – February 2021 The meeting provided the NRU Subcommittee Coordinator the opportunity to discuss conservation priorities for bird habitat along the coast in 16 counties from Galveston to Corpus Christi, TX.	Lindsey Lippert	$0	$0
2021 Texas Plastic Pollution Symposium Virtual Conference – March 2021 The symposium focused on research, solutions, and public policy regarding plastic pollution around the state of Texas.	Cynthia Clevenger Lisa Marshall Christian Rines	$0	$0
Texas Land Trust Council Virtual Meeting – April 2021 This conference connected public and private organizations completing land acquisition in Texas for tech transfer, lessons learned, and collaboration.	Lindsey Lippert	$0	$210
National Monitoring Conference – North American Lake Management Society Virtual Conference – April 2021 This conference provided information on aquatic contaminants, monitoring, new technologies, data tools, and harmful algal blooms, among other relevant topics in aquatic M&R.	Kristen McGovern	$0	$155
Gulf of Mexico Conference "GoMCon" 2021 Virtual Conference – April 2021 This meeting combined the annual GOMA All Hands Meeting, the annual Gulf of Mexico Oil Spill and Ecosystems Science Conference, and the triannual State of the Gulf Summit. The conference emphasized the intersection of scientific research and the management of Gulf Coast human and natural systems.	Lindsey Lippert Lisa Marshall Kristen McGovern Christian Rines	$0	$0
Total		$400	$2,918

*Travel is dependent on TCEQ management review and approval. Rates for fiscal year 2021 are subject to change.

SECTION 2.2: GOALS AND ACCOMPLISHMENTS SINCE FY 2021 WORK PLAN SUBMISSION

GBEP partners made notable achievements in improving water quality, restoring wetlands, protecting unique habitats, and educating the public in fiscal year 2021. These achievements are highlighted in the following sections.

HABITAT AND LANDSCAPE-LEVEL CONSERVATION: CREATE, RESTORE, AND PROTECT IMPORTANT COASTAL HABITATS

The Texas coast features a wealth of coastal habitats that support a tremendous abundance and diversity of fish and wildlife. Although the habitat conservation efforts of GBEP and its partners are bay wide, distinctive consideration has been given to the West Bay watershed. Preserving wetlands and natural areas is critical to maintaining water quality and protecting valuable fish and wildlife habitat in this region.

Since 2000, GBEP and its partners created, protected, and enhanced 33,892.99 acres of important coastal habitats, leveraging $143,438,434 in local, industry, state, and federal contributions. During fiscal year 2020, GBEP protected and enhanced 610.24 acres of wetlands and coastal habitats, and leveraged $22,432,112 in local, industry, state, and federal contributions. In addition, 900 linear feet of bay shoreline were enhanced through the installation of living shoreline and nearshore breakwater projects.

As of February 2021, an additional 100 acres of coastal habitat have been conserved via land acquisition. Through acquisition and restoration initiatives currently in progress, GBEP and partners are positioned to conserve and/or enhance an additional 5,000 acres of coastal habitat by August 2021.

KEMAH LIVING SHORELINE PROJECT

Figure 2. Aerial view of completed breakwater in Kemah, Texas (photo credit: GBF).

The Kemah Living Shoreline project aimed to protect the shoreline of GBF's headquarters property from erosion and restore the intertidal wetland complex. Owned by GBF, the Kemah tract is a 30-acre conservation and education property located on the west shoreline of Galveston Bay in Galveston County, Texas. Galveston Bay is a high wave energy environment, particularly in the immediate area of the project. The project is located along approximately 900 feet of eroding shoreline. Wind-driven waves result in severe shoreline erosion at the project site.

GBF and project partners developed the Kemah Living Shoreline project to reduce wave energy impacting the shoreline, halt the erosion of the shoreline, and promote deposition of suspended sediments landward of the structure. After acquiring the necessary permits and competitively bidding the project, GBF oversaw the construction of the 905-foot rip-rap breakwater which protects the adjacent shoreline from erosion. The breakwater layout provides for the restoration of 2.8 acres of intertidal wetland complex restoration. The planting of smooth cordgrass by community volunteers has been delayed due to COVID-19 social distancing guidelines. GBF is hoping planting efforts can begin with small groups in 2021.

IMPROVING & PROTECTING WATER QUALITY: SUPPORTING CORE CLEAN WATER ACT PROGRAMS

In support of EPA's core Clean Water Act goals GBEP has worked to build capacity of local stakeholders through watershed protection planning and implementation of water quality improvement projects. Through this effort in coordination with other water programs of TCEQ and local stakeholders, most of the impaired waters in the five-county region surrounding Galveston Bay have some level of watershed protection or improvement underway.

WPPs

Highland Bayou WPP

Highland and Marchand bayous experienced periods of low dissolved oxygen (DO) and elevated bacteria levels, which can impact aquatic life and can be harmful to human health, respectively. All the state's assessments (Texas 303(d) List) since 2002 have listed multiple assessment units (AUs) within Highland Bayou (segment 2424A) and Marchand Bayou (segment 2424C) as impaired for these constituents of concern.

Texas AgriLife Extension Service (Texas AgriLife) coordinated the creation of a characterization report and a stakeholder-driven draft WPP for Highland Bayou. However, the draft WPP only addressed the bacteria impairment. Guidance from the EPA in 2018 indicated that the DO impairment and flow need to be included for a WPP to meet all requirements for approval as a watershed-based plan. DO impairments and flow have now been addressed as well as three new AUs added to the WPP – Highland Bayou Diversion Canal (segment 2424G_01), Moses Bayou (segment 2431A_01), and Unnamed Tributary of Moses Lake (segment 2431C_01).

This project resulted in the completion of the final WPP revisions which include finalizing load reductions, obtaining stakeholder approval and submitting the WPP to EPA for consistency review.

Coordinating Implementation of a WPP for Double Bayou

The Double Bayou WPP was approved in July 2016 in response to the West Fork being listed (Texas 303(d) List) for elevated bacteria levels and low DO and the East Fork being identified as a concern for near-nonattainment of water quality standards for elevated bacteria levels and as a water quality concern for low DO. The plan was developed through a stakeholder-driven process that provided a foundation to restore and maintain water quality in the Double Bayou Watershed.

Since development, the plan has served as a living document to include new data and be modified as conditions in the watershed change over time. The current project, *Coordinating Implementation of a WPP for Double Bayou*, serves to fund water quality data analysis and maintain stakeholder efforts in the watershed, to support the implementation of the WPP. This project will monitor current water quality of DO and bacteria in the bayous and communicate water quality conditions to stakeholders to support adaptive management and expand public knowledge and participation in the Double Bayou watershed.

Water quality monitoring in coordination with the U.S. Geological Survey (USGS) continues at four sampling sites once every other month and at the local wastewater treatment facility. Stakeholder involvement has evolved from in-person meetings to virtual workshops, digital stakeholder resources, and maintenance of the Double Bayou Watershed Partnership website and stakeholder list.

Water Quality Improvement Projects

WSQ Accomplishments

Since the submission of the fiscal year 2021 Work Plan, one WSQ project has reached completion and provided new insights into leading contributors of bacteria in select tributaries of Trinity and Galveston Bays:

Bacterial Source Tracking on Tributaries of Trinity and Galveston Bays

To better characterize sources of bacteria entering Trinity and Galveston Bays, a *Bacterial Source Tracking on Tributaries of Trinity and Galveston Bays* study was employed to help decision-makers determine the most appropriate management measures needed to reduce bacteria in the waterbodies. Each of the selected waterbodies were listed as impaired in the *2020 Texas Integrated Report*. Much of the land serviced by the watersheds examined were classified as undeveloped, agricultural, or developed land. The Texas Water Resources Institute (TWRI) conducted monthly sampling at five waterbodies (Buffalo, Double, Cedar, and Dickinson bayous and Clear Creek) for one year (60 total water samples). A total of 91 known source samples were collected and delivered to the Texas A&M University (TAMU) Soil and Aquatic Microbiology Laboratory (SAML). SAML used these samples to supplement the Texas *E. coli* Bacteria Source Tracking (BST) Library with isolates DNA fingerprinted using the enterobacterial repetitive intergenic consensus-polymerase chain reaction (ERIC-PCR) and RiboPrinting combination method. SAML also conducted library-dependent BST and analyzed 241 *E. coli* isolates from the 60 water samples (four isolates per sample). The Texas *E. coli* BST Library was expanded and refined, with the current version containing 1,886 isolates from 1,645 known source fecal samples retrieved from 4,301 individual known source samples in over 20 watersheds. Of the 77 known

source isolates fingerprinted from the Trinity Bayand Galveston Bay watersheds, an additional 33 isolates from 31 fecal samples were added to the BST Library. The BST analysis in the Trinity Bay and Galveston Bay indicates that wildlife (non-avian and avian) were the leading contributors of *E. coli* in the five sample sites with variable levels of human contributions across the sites.

Targeted Bacteria Monitoring

The *Targeted Bacteria Monitoring* project with H-GAC aims to reduce bacteria concentrations in impaired streams in the BIG project area. The objectives of the project are to 1) investigate bacteria sources in the most bacteria-impaired waterways in the BIG project area, and 2) work with local jurisdictions to reduce or eliminate those sources.

This project will follow a similar approach to the previous GBEP fiscal year 2015 Top Five/Least Five project completed in May of 2017 but will only focus on the most impaired AUs from the Top 10 "Most Wanted" Streams in the BIG project area. The previous project identified significant bacteria sources in four bacteria impaired AUs in the BIG project area and reported those findings to local jurisdictions, which resulted in corrective actions, such as the identification of collection system leaks and overflows, infrastructure repairs, increased wastewater treatment facility sampling, and resident education. Outreach for the *Targeted Bacteria Monitoring* project will convey the results to local jurisdictions and the public to help promote the successes and importance of bacteria reduction efforts.

Occurrence of Microplastics in Tributaries to Galveston Bay

Litter and trash, such as plastics, is an issue of concern in Galveston Bay and its tributaries and has been identified by the WSQ and the PPE subcommittees of the GBC as a priority topic for research. Microplastics, which are plastic particles <5 mm in diameter, are of increasing concern. The long-term effects of microplastics in the environment are currently not well known but concerns over potential effects have resulted in an increasing interest in understanding the extent and magnitude of their presence and their potential for bioaccumulation and disruption to ecosystem function and services. To date, no studies that assess the occurrence and abundance of microplastics in tributaries of Galveston Bay have been published. Collecting microplastic samples in this region can provide information about the spatial distribution and concentrations of microplastics in the Galveston Bay watershed.

Results from the *Occurrence of Microplastics in Tributaries to Galveston Bay* study will provide preliminary information on the occurrence of microplastics in the Galveston Bay watershed and will include quantification and categorization of microplastic particles and provide the foundation for future study and abatement.

CONTINUE BUILDING REGIONAL SUPPORT FOR PPE

Figure 3. GBEP staff member teaching children about the Galveston Bay watershed at Trash Bash 2019 (photo credit: Kristen McGovern).

GBEP continued engaging communities with outreach and education through GBEP funded projects and partnering with stakeholders on various initiatives. Due to the COVID-19 pandemic, face-to-face community

engagement was moved to virtual and online outreach and education.

Examples of these activities include:

- Continued to partner with P3P to highlight messages about awareness on water pollution and marine debris risks to native wildlife at various education and outreach events.
- Continued participating in the Fishing Line Recycling campaign with the Fishing Line Recycling Work group, a work group of the P3P, on a monofilament fishing line abatement project for the Texas City Dike and Seawolf Park in Galveston. Due to COVID-19, partners were not able to do one-on-one engagement with anglers. However, fishing line cleanups continued, and partners worked to create messaging to place on display boards to demonstrate how to recycle fishing line and why it's important to the health of Galveston Bay and wildlife.
- Continued to share coordination with partner organizations on marine debris for a fifth Trash Summit workshop held virtually in April 2020. This was a continuation of efforts to coordinate regional planning and implementation as well as fill in missing gaps for projects, research, and communication on local trash, marine debris, and plastic pollution issues. This is in coordination with EPA's Trash Free Waters initiative. The goal of the meeting was to update partners on regional efforts on litter and marine debris mitigation and to establish working groups for removal, research, and communication. More information on this effort can be found on the website www.donttrashagoodthing.org.
- Helped coordinate and participated in the virtual 2021 Trash Bash.
- Coordinated and hosted 24 quarterly meetings of the GBC and its subcommittees.

Trash Bash

Trash Bash 2021 was held virtually March 27–29, 2021. In 2021, the 27th annual Trash Bash event had 765 volunteers from all over the Houston-Galveston area collect approximately 5.5 tons of trash—including 51 tires—and recycled 300 pounds of trash.

The event promotes environmental stewardship and encourages volunteers to do their part at home by properly disposing of trash, household chemicals, and pet waste. Trash Bash supports two EPA fiscal year 2018–2022 Strategic Plan Goals: Goal 1: A Cleaner, Healthier Environment, Objective 1.2) provide for clean and safe water and Goal 2: More Effective Partnerships, Objective 2.2) increase transparency and public participation. Trash Bash has received 30 awards in its lifetime, including nine in the last five years.

IMPROVING RESOURCE MANAGEMENT THROUGH TARGETED RESEARCH THAT INCREASES ECOSYSTEM UNDERSTANDING

M&R Accomplishments

Since the submission of the fiscal year 2021 Work Plan, one M&R project has reached completion and provided new insights into components of the Galveston Bay ecosystem:

The *Galveston Bay Intertidal Oyster Reef Mapping and Analysis* project created a geographic information system (GIS) database of intertidal oyster reef habitat in West Galveston Bay. Texas Orthoimagery Program aerial photographs were analyzed with mapping software and classified into categories based on pixel value; these categories were then examined to assign habitat type values, including potential intertidal oyster reef habitat. A sub-sample of identified potential intertidal reefs were ground-truthed to validate the GIS analysis. 59,931 m^2 (14.8 acres) of intertidal reef were confirmed by ground-truthing; there is an additional 758,197 m^2 (187.35 acres) of presumed intertidal reef. Oyster abundance, size demography, reef structure (overall percent cover of shell, percentage of live oysters, and rugosity), oyster condition (relative index of oyster health), benthic associated macrofaunal community composition, and avian use of reefs were additionally assessed on representative reefs. Reefs that were ground-truthed generally fell into two categories: shell rakes, which were mainly piles of shell with little or no oysters or three-dimensional reef characteristics; and true intertidal oyster reefs, with relatively high oyster abundance and three-dimensional reef characteristics. Intertidal reef habitat was mainly concentrated in three areas: North and South Deer Islands on the far northern extreme of West Bay, in Bastrop Bay, and in southern Christmas Bay into Drum Bay. The associated benthic macrofaunal community was sparse in terms of richness and diversity, indicating a lack of structural complexity on most of the reefs within this system. Avian utilization of this habitat type appeared to be mainly for self-maintenance, with limited foraging observed.

M&R Goals

The M&R subcommittee has identified several focus priorities to guide the project selection process. These priorities include research on the effects of erosion control structures on shoreline marsh species populations, which is being targeted through the *Effects of Erosion Control Structure on Shoreline Marsh Species Populations* project; research on microplastics in Galveston Bay, which are being addressed by the *Galveston Bay Oyster Microplastics: Baselines and Impacts* and *The Effect of Microplastics on the Base of Marine Food Webs* projects;

and research on contaminants in Galveston Bay, which are being investigated through the *Lead Isotopes and Heavy Metal Concentrations in Galveston Bay Waters, Sediments, and Oysters*, *Characterizing PCBs and Dioxins in the Houston Ship Channel and Galveston Bay Post Hurricane Harvey*, *The Distribution, Fate, and Transport of Emerging Contaminants in Galveston Bay,* and *The Fate of Emerging PFAS Pollutants in Shellfish and Fish of Galveston Bay* projects.

SECTION 2.3: STRATEGIC ACTION PLAN GOALS TO FOCUS ON IN FY 2022

- Conserve, restore, and enhance important coastal habitats.
- Reduce NPS and PS pollutant loads.
- Implementation of watershed-based plans to address bacteria impaired contact recreation waters.
- Ensure adequate levels of freshwater inflows necessary to maintain the balance of salinity, nutrients, and sediments required to support a productive estuary.
- Create a sense of personal ownership and shared responsibility among all cultural components of the community, including the public, industry, and government.
- Ensure that stakeholders receive the knowledge necessary to act on GBEP's priorities in ways that benefit Galveston Bay and the entire community.
- Increase the number of partners actively involved in GBEP initiatives.
- Increase understanding of the Galveston Bay ecosystem.
- Make information available needed by the public, GBC members, and GBEP subcommittee members to support the implementation of the *GBP*.

FY 2022 EXPECTED OUTCOMES

- Conserve, restore, and enhance important coastal habitats.
- Improve knowledge of the contributing sources of elevated bacteria and lowered DO levels in the lower Galveston Bay watershed.
- Increase coordination of marine debris and plastic pollution reduction efforts throughout the region.
- Increase the public's awareness of their connection to and effect on the Galveston Bay ecosystem.
- Increase coordination of environmental education efforts in the region.
- Engage students and teachers in citizen science research and conservation work in the Galveston Bay watershed.
- Improve knowledge of Polychlorinated Biphenyls (PCBs) and dioxin levels in Galveston Bay post-Hurricane Harvey.
- Improve knowledge of lead isotope composition and heavy metal concentrations in Galveston Bay waters, sediments, and oysters.
- Improve knowledge of the types, quantities, and spatial distribution of microplastics in Galveston Bay and its tributaries.
- Improve knowledge of types and quantities of microplastics in Galveston Bay oysters relative to surface waters.
- Improve knowledge of spatial variation in oyster health relative to microplastic loads.
- Improve knowledge of microplastic accumulation in Galveston Bay fishes since 1952.
- Improve knowledge of the effect of microplastics on Galveston Bay fishes' swimming performance and physiology.
- Improve knowledge of spatial and temporal variation in per-and polyfluorinated alkyl substances (PFAS) and pharmaceutical and personal care products (PPCPs) concentrations in Galveston Bay and the Houston Ship Channel.
- Improve knowledge of the effects of erosion control structures on shoreline marsh species populations.
- Improve knowledge of the fate of PFAS pollutants in Galveston Bay biota.
- Improve knowledge of the health effects of PFAS exposure on Galveston Bay biota.
- Improve the dissemination of local and regional green infrastructure BMPs.
- Improve knowledge of underserved and underrepresented communities that are in need of environmental education opportunities.

FY 2022 EXPECTED OUTPUTS

- Conserve and protect 5,500 acres of habitat.
- Restore and enhance 300 acres of habitat.

- Build upon three years of outreach on reducing NPS pollution by providing implementation resources for existing watershed-based plans.
- Complete two bird and wildlife habitat restoration projects that incorporate educational workshops, interpretive signage, and volunteer opportunities.
- Complete an estuary resilience assessment of the goals, objectives, and actions in the *GBP, 2nd Edition*.
- Continue to participate in the coordination of Trash Bash.
- Continue implementing Back the Bay.
- Continue one project that monitors freshwater wetland restoration.
- Continue maintaining GBEP and Back the Bay websites.
- Continue the assessment of the public's attitudes and perceptions of the Galveston Bay watershed and use the information gathered to create community-specific targeted education and outreach campaigns.
- Continue construction of the Regional Monitoring Database (RMD), containing datasets related to Galveston Bay conservation and management.
- Continue a targeted bacteria monitoring project to investigate sources of bacteria in impaired waterbodies and work with local jurisdictions to reduce or eliminate those sources.
- Continue an assessment of types and quantities of microplastics in tributaries draining to Galveston Bay.
- Continue monitoring of PFAS and PPCPs concentrations in Galveston Bay and the Houston Ship Channel.
- Continue monitoring microplastic types and abundances in Galveston Bay oysters, fish, and surface water.
- Continue the analysis of historical microplastics accumulation in Galveston Bay fishes.
- Initiate an assessment of the fate of PFAS pollutants in Galveston Bay biota.
- Initiate an assessment of the health effects of PFAS exposure on Galveston Bay biota.
- Initiate an assessment of the effects of erosion control structures on shoreline marsh species populations.
- Initiate a baseline assessment of types and quantities of microplastics in Galveston Bay.
- Initiate a project to consolidate local and regional green infrastructure BMPs.
- Initiate a project to create at least two green stormwater infrastructure demonstration features in the Houston area.
- Initiate an assessment mapping project to identify schools in need of environmental education.
- Initiate a project to host partner workshops and provide environmental education opportunities focused on native prairies.

FY 2018–2022 EPA STRATEGIC PLAN MEASURES IMPLEMENTED

The projects proposed for fiscal year 2022 implement objectives of all three goals identified in the fiscal year 2018–2022 EPA Strategic Plan, including:

Goal 1: A Cleaner, Healthier Environment - Deliver a cleaner, safer, and healthier environment for all Americans and future generations by caring out the Agency's core mission.

- Objective 1.2: Provide for Clean and Safe Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsistence activities.

As Objective 1.2 is the main goal of all NEPs, GBEP's projects focus on safeguarding human health and maintaining, restoring, and/or improving water quality through a variety of methods including land conservation, water quality implementation outreach, green infrastructure projects, and microplastics and emerging contaminants research.

Goal 2: More Effective Partnerships - Provide certainty to states, localities, tribal nations, and the regulated community in carrying out shared responsibilities and communicating results to all Americans.

- Objective 2.1: Enhance Shared Accountability: Improve environmental protection through shared governance and enhanced collaboration with state, tribal, and federal partners using the full range of compliance assurance tools.

GBEP itself is an exercise in cooperative federalism between TCEQ, EPA, and the GBC. Projects are developed and implemented by a diverse partnership of federal and state agencies, local government, industry, and nonprofits.

- Objective 2.2: Increase Transparency and Public Participation: Listen to and collaborate with impacted stakeholders and provide effective platforms for public participation and meaningful engagement.

GBEP is a non-regulatory program that maintains stakeholder involvement associated with the GBC and its subcommittees. In addition, many of GBEP's projects have significant education and public outreach components that emphasize public participation to better partner with stakeholders and local communities to create tangible environmental results.

Goal 3: Greater Certainty, Compliance, and Effectiveness - Increase certainty, compliance, and effectiveness by applying the rule of law to achieve more efficient and effective agency operations, service delivery, and regulatory relief.

- Objective 3.3: Prioritize Robust Science: Refocus the EPA's robust research and scientific analysis to inform policy making.

GBEP's proposed M&R projects were developed and selected by the GBC and its subcommittees, composed of federal and state agencies, research and academia, and local industry, to address current and future environmental concerns and/or emerging environmental issues, develop new approaches, and improve the scientific foundation for environmental protection.

TCEQ GOAL, OBJECTIVE, AND STRATEGY

TCEQ Goal 1: Assessment, Planning, and Permitting

To protect public health and the environment by accurately assessing environmental conditions, by preventing or minimizing the level of contaminants released to the environment through regulation and permitting of facilities, individuals, or activities with potential to contribute to pollution levels.

- Objective 1.1: Reduce Toxic Releases

  Decrease the amount of toxic chemicals released into the environment via air, water, and waste pollutants in Texas by at least two percent as comparing the current Toxic Release Inventory (TRI) values to the previous reported TRI reporting year values and reduce air, water, and waste pollutants through assessing the environment.

  - Outcome Measure 1.1 oc 10: Number of acres of habitat created, restored, and protected (through implementation of Estuary Action Plans).
  - Strategy 1.1.2: Water Resource Assessment and Planning

    Develop plans to ensure an adequate, affordable supply of clean water by monitoring and assessing water quality and availability.

    Output Measures 1.1.2 op 1: Number of surface water assessments.

FY 2022 FEDERAL AND STATE FUNDING

This request is for funding in the amount of $700,000 (federal) and $700,000 (state) for a total equaling $1,400,000. The match ratio for this grant is 50/50. Full-time (FTE) equivalent for the grant are seven. Tables 5 and 6 provide funding and budget details.

Table 5. FY 2022 Funding and FTE Summary

Program Element		Division	Federal	State Match	Total	FTEs
TCEQ Strategy 1.1.2						
1	GBEP Program Implementation	Water Quality Planning	$700,00	$700,000	$1,400,000	7
Total			**$700,000**	**$700,000**	**$1,400,000**	**7**

Table 6. FY 2022 Budget Detail

Budget Detail- see also FY 2021 Federal Projects	Amount ($)
Salaries (includes Fringe and Indirect)	$628,516
Travel	$5,115
Capital	$0
Supplies	$445
Contracts	$31,000
Other	$734,923
Total	**$1,400,000***

*Rounded from $1,399,999

PROJECT SCHEDULE

The execution of the tasks associated with this work plan will occur over a 36-month period, which is anticipated to begin September 1, 2021, and end August 31, 2024. The exact start date of the work plan and all due dates for deliverables are contingent upon the actual date the grant funds are awarded and contracts are executed.

The projects outlined in this work plan were developed by the NRU, WSQ, PPE, and M&R subcommittees, balanced by the Budget and Priorities subcommittee, and submitted to the GBC for approval in October 2020. The GBC approved the projects listed in this work plan at the October 21, 2020, quarterly meeting.

The project scopes of work will be submitted to the TCEQ Quality Assurance Officer to determine which projects in the work plan will require a QAPP. Under the authority granted by EPA to TCEQ to approve QAPPs for GBEP, GBEP staff and their project partners will develop QAPPs for projects determined by TCEQ and EPA to require QAPPs. QAPPs will be developed in accordance with EPA QAPP requirements, EPA document QA/R-5.

SECTION 3: FY 2022 PROJECTS

SECTION 3.1: FY 2022 FEDERAL PROJECTS - SUMMARY

PROJECT NAME	FISCAL YEAR	FEDERAL	STATE MATCH	TOTAL 2021 GBEP BUDGET	STATUS
Program Administration (Includes supplies, travel, salary, fringe and indirect)	2022	$317,113.00	$317,113.00	$634,226.00	Annual
1. GBEP Website Hosting and Maintenance	2022	$3,000.00	$3,000.00	$6,000.00	Annual
2. Back the Bay Website Redesign	2022	$12,500.00	$12,500.00	$25,000.00	New
3. Mickey Leland Environmental Internship	2022	$0	$0	$0	Annual
4. Regional Monitoring Database	2022	$52,009.00	$52,009.00	$104,018.00	Ongoing
5. Estuary Resilience Assessment	2022	$21,338.50	$21,338.50	$42,677.00	Ongoing
Administration Total		$405,960.50	$405,960.50	$811,921.00	
6. Conservation Assistance Program	2022	$42,500.00	$42,500.00	$85,000.00	Ongoing
7. Sylvan Rodriguez Habitat Restoration Project Phase III	2022	$37,650.00	$37,650.00	$75,300	New
NRU Total		$80,150.00	$80,150.00	$160,300.00	

8. Baseline Assessment of Microplastics in Galveston Bay	2022	$5,328.50	$5,328.50	$10,657.00	Ongoing
9. Supporting the Use of Green Infrastructure in the Lower Galveston Bay Watershed	2022	$22,500.00	$22,500.00	$45,000.00	New
10. Townwood Park Green Stormwater Infrastructure	2022	$40,000.00	$40,000.00	$80,000.00	New
WSQ Total		$67,828.50	$67,828.50	$135,657.00	
11. Audubon TERN Citizen Science in Schools: Students as Field Researchers	2022	$20,000.00	$20,000.00	$40,000.00	Ongoing
12. Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution	2022	$25,000.00	$25,000.00	$50,000.00	Ongoing
13. Mobilizing the Environmental Education Community through Prairie Education	2022	$40,000.00	$40,000.00	$80,000.00	New
PPE Total		$85,000.00	$85,000.00	$170,000.00	
14. The Distribution, Fate, and Transport of Emerging Contaminants in Galveston Bay	2022	$7,750.00	$7,750.00	$15,500.00	Ongoing
15. Effects of Erosion Control Structure on Shoreline Marsh Species Populations	2022	$19,082.50	$19,082.50	$38,165.00	New
16. The Fate of Emerging PFAS Pollutants in Shellfish and Fish of Galveston Bay	2022	$34,228.00	$34,228.00	$68,456.00	New
M&R Total		$61,060.50	$61,060.50	$122,121.00	
FUNDING REQUEST GRANT TOTAL		$700,000.00*	$700,000.00*	$1,400,000.00**	

*Rounded from $699,999.50
**Rounded from $1,399,999

SECTION 3.2: FY 2022 FEDERAL PROJECT - DETAIL

3.2A - ADMINISTRATIVE PROJECTS FOR FY 2022

1. GBEP Website Hosting and Maintenance

CCMP Actions Implemented: SPO-1, SPO-2, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: Wilkins Group

FY 2022 Budget: $6,000 ($3,000 Federal, $3,000 State)

Total Project Budget: $6,000 ($6,000 from Award #CE-00655007)

Milestones: N/A

Project period: September 2021–August 2022

Status: Annual project.

Objective(s): Support or maintain two websites for public participation, education, and outreach.

Project Description: This project provides support for two websites maintained by GBEP:

- www.gbep.texas.gov: Tasks for the GBEP website include hosting, maintenance, and updates as needed throughout the year.
- www.backthebay.org: Tasks for the Back the Bay website include hosting, maintenance, updates as needed throughout the year, and domain name registration.

2. Back the Bay Website Redesign

CCMP Actions Implemented: SPO-1, SPO-2, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: Wilkins Group

FY 2022 Budget: $25,000 ($12,500 Federal, $12,500 State)

Total Project Budget: $25,000 ($25,000 from Award #CE-00655007)

Milestones: N/A

Project period: September 2021–August 2022

Status: New project.

Objective(s): To work with the PPE subcommittee and partners to create a website that is more of an outreach and education resource tool and less of an awareness campaign.

Project Description: Redesign the www.backthebay.org website as a resource to support education and outreach efforts in the region with Back the Bay messaging.

3. Mickey Leland Environmental Intern

GBEP has decided to forego the intern for fiscal year 2022 due to staffing vacancies and a lack of a stimulating project to enhance a current undergraduate or graduate student's education and experience for a summer-long internship.

4. Regional Monitoring Database

CCMP Actions Implemented: ACS-1, ACS-2

EPA's Strategic Plan Measures Implemented: Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: Houston Advanced Research Center/GeoTechnology Research Institute (HARC/GTRI)

FY 2022 Budget: $104,018 ($52,009 Federal, $52,009 State)

Total Project Budget: $350,228 ($234,019 from Award #CE-00655007: FY 2021 $130,001, FY 2022 $104,018)

Milestones: Coordination/orientation and QAPP meeting conducted in January 2021.

Project period: January 2021–August 2024 (total project period to August 2025)

Status: Ongoing project.

Objective(s): This project will establish the Galveston Bay RMD, an interactive, web-based data portal through which users can view and download Galveston Bay watershed environmental data.

Project Description: This project will develop, launch, and maintain the RMD, an interactive web-based portal providing quality-assured data related to the conservation and management of Galveston Bay. The RMD will allow users to view, explore, and download data. The Performing Party will gather environmental datasets related to the lower Galveston Bay watershed in cooperation with federal, state, and local governments; universities; and research organizations in support of the Regional Monitoring Plan detailed in *GBP, 2nd Edition*. Datasets included in the RMD will be informed by the ecosystem indicators identified in *GBP, 2nd Edition*. The RMD will: assist in evaluating whether the goals and objectives of the *GBP, 2nd Edition* are being met; inform future State of the Bay Reports by GBEP; and provide the public and stakeholders access to data related to management and research within the lower Galveston Bay watershed.

Partners and Their Role(s): HARC/GTRI will perform the tasks necessary to develop and launch the RMD. HARC/GTRI will consult with local stakeholders for input and feedback throughout the process.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due March 2021;
- RMD to be released in three phases;
- Galveston Bay datasets and metadata; and
- Final report due July 2025.

Long-term Outcomes: Dissemination of data related to the conservation and management of Galveston Bay.

5. Estuary Resilience Assessment

CCMP Actions Implemented: Galveston Bay Regional Monitoring Program.

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: HARC/GTRI

FY22 Budget: $42,677 ($21,338.50 Federal, $21,338.50 State)

Total Project Budget: $136,108 ($30,000 from Award #CE-00655006: FY 2019 $30,000; $62,677 from Award #CE-00655007: FY 2020 $20,000, FY 2022 $42,677)

Milestones: Draft Consequence/Probability Matrix due February 2020, Final Work group meeting in May 2020, and Final Consequence/Probability Matrix by July 2020.

Project period: September 2018–June 2023

Status: Ongoing project. The project and development of the report were significantly delayed due to a contract amendment executed in December 2019. All stakeholder meetings have been held, and the work group contributed immensely to the assessment. HARC/GTRI developed a draft Consequence/Probability Matrix and the initial draft Estuary Resilience Assessment is due February 2021. Amendment No. 2 was executed on February 25, 2022, to allow for stakeholder coordination and development of the Estuary Resiliency Action Plan by adding $42,677 in FY22 funds and $43,431 in FY23 funds, and extending the project to June 30, 2023.

Objective(s): This project will assess the goals, objectives, and actions in the *GBP, 2nd Edition* against a series of coastal resilience criteria, meeting the requirements identified in the EPA NEP Funding Guidance.

Project Description: The final output of the project will be a companion document to the *GBP, 2nd Edition* and will provide resiliency adaptation considerations for implementers of the *GBP, 2nd Edition*. The document will be developed in coordination with subject matter experts and/or members of GBC and its subcommittees through workshops or via existing meeting structures. The project will follow the requirements identified in the EPA NEP Funding Guidance.

Partners and Their Role(s): While the lead contractor is HARC/GTRI, the Estuary Resilience Assessment will draw on the expertise of GBC members and subcommittee members including a diverse group of research institutions and federal, state, local, and non-governmental organizations that collect data in the watershed.

Outputs/Deliverables:

- Three stakeholder meetings or workshops;
- Quarterly progress reports until contract expiration; and
- Final Estuary Resilience Assessment document and report due January 2022.

Long-term Outcomes: Galveston Bay estuary is managed by all GBEP partners based on best-known data and implementation efforts to consider resiliency during project selection.

3.2B - NRU PROJECTS FOR FY 2022

6. Conservation Assistance Program

CCMP Actions Implemented: HC-1, HC-2, HC-3, SC-1, SC-2

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: GBF

FY 2022 Budget: $85,000 ($42,500 Federal, $42,500 State)

Total Project Budget: $600,000 ($200,000 from Award #CE-00655006: FY 2018 $100,000, FY 2019 $100,000; $300,000 from Award #CE-00655007: FY 2020 $100,000, FY 2021 $115,000 FY 2022 $85,000)

Milestones: Not applicable. Milestone dates for individual tasks are not applicable as project identification is a continuous task, and specific project support is applied for as needed.

Project period: September 2017–August 2023

Status: Ongoing project. GBF was selected as the project contractor and the contract was executed in July 2018. Conservation Assistance Program work group meetings were held November 2018, March 2018, June 2019, November 2019, May 2020, and November 2020. Several acquisition projects are being developed, and two projects (Angleton Prairie and Dollar Bay) have been completed. Several projects are projected to close in the next calendar year, including the 4,600-acre Chocolate Bay project.

Objective(s): The goal of this project is to place 2,500 acres of coastal habitat in the Galveston Bay area in permanent conservation.

Project Description: The overall goal of the Conservation Assistance Program is to support GBEP and its partners' efforts to preserve wetlands and other important coastal habitats to protect the long-term health and productivity of Galveston Bay. The Conservation Assistance Program will continue to accomplish these goals by:

- Identifying priority conservation properties with the help and consensus of conservation partners;
- Building funding strategies through grant identification, grant writing, and fundraising;
- Working with willing sellers to negotiate fee simple or conservation easement transactions;
- Carrying out legal, title, and other due diligence transaction support; and
- Finalizing the sale and transfer of title to a third-party organization or government entity.

Partners and Their Role(s): The Conservation Assistance Program work group is comprised of a diverse group of federal, state, local, and non-governmental organization resource managers.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Annual report due August 31 until contract expiration; and
- Final report due August 2023.

Long-term Outcomes: The permanent conservation of coastal habitat and preservation of important hydrologic and water quality functions in lower Galveston Bay.

7. Sylvan Rodriguez Habitat Restoration Project Phase III

CCMP Actions Implemented: HC-2, HC-3, SC-1, SC-2

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: City of Houston Parks and Recreation Department (HPARD)

FY 2022 Budget: $75,300 ($37,650 Federal, $37,650 State)

Total Project Budget: $75,300 ($75,300 from Award #CE-00655007: FY 2022 $75,300)

Milestones: Project work plan anticipated by November 2021.

Project period: September 2021–May 2024

Status: New project.

Objective(s): To complete the restoration of the final 19 acres of the Sylvan Rodriguez Habitat Restoration Project. This project supports HPARD's overall goal of restoring natural ecosystem function to mitigate flooding, improve water quality, and enhance wildlife habitat.

Project Description: Sylvan Rodriguez Park is a 113.5-acre park acquired by the City of Houston on December 30, 1991. According to historical aerial imagery, the park consisted of coastal prairie habitat at the time of acquisition. Numerous prairie potholes and drainage features can be seen throughout the site in the historical photos dating back to 1944. In the absence of natural processes such as fire and intermittent grazing, the park became inundated by Chinese tallow and other woody vegetation. By the mid-2000s, HPARD had developed the southwestern portion of the park, which included 2 lacrosse fields, parking areas, restrooms, a retention pond, and trails.

HPARD is currently working on a multi-phased project that will result in 72 acres of coastal prairie and riparian habitat. This phase (Phase III) of the project will complete the restoration of the final 19 acres of prairie. A hydro-ax contractor will chip invasive tree species, leaving a mulch layer that will improve soil

quality and provide the basis for a new prairie habitat. An herbicide contractor will treat the cut stumps and remove any invasive species that appear at the site after chipping occurs. The site will be seeded with native prairie plant species and will be planted with grasses and forbs. HPARD will host two community planting events to educate the community on the importance of prairie habitat and promote stewardship and appreciation of nature parks in local communities.

Partners and Their Role(s): HPARD will provide project management and oversight of management activities at Sylvan Park. They will also provide native herbaceous plants for the project.

Outputs/Deliverables:

- Project work plan within 30 days of contract execution;
- Quarterly progress reports until contract expiration; and
- Final Report due May 2024.

Long-term Outcomes: Provide benefits for native vegetation and wildlife by restoring 12.5 acres of open grassland habitat that was degraded by invasive woody vegetation and enhancing 6.5 acres of existing grassland to increase the overall function as habitat for grassland-dependent species. The project will also provide opportunities to educate residents on the importance of prairie habitat and promote stewardship and appreciation of nature parks in local communities.

3.2C - WSQ PROJECTS FOR FY 2022

8. Baseline Assessment of Microplastics in Galveston Bay

CCMP Actions Implemented: NPS-1, PS-1, RES-2, RES-3, SPO-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: USGS

FY 2022 Budget: $10,657.00 ($5,328.50 Federal, $5,328.50 State)

Total Project Budget: $90,000 ($90,000 from Award #CE-00655007: FY 2021 $79,343, FY 2022 $10,657)

Milestones: Coordination/orientation and QAPP meeting conducted in December 2020.

Project Period: September 2020–May 2023

Status: Ongoing project.

Objective(s): The objectives of this study are to 1) investigate the occurrence of microplastics in the open waters of Galveston Bay, and 2) categorize the type(s) of microplastics present.

Project Description: Litter and trash, such as plastics, are an issue of concern in Galveston Bay and its tributaries and have been identified by GBEP as a priority topic for research. Microplastics, which are plastic particles less than 5 mm in diameter, are of increasing concern. These small particles are derived from the degradation or mechanical breakdown of larger plastic objects or particles and are introduced to waterways through urban runoff and wastewater effluent. Microplastics ingested by living organisms, such as birds, oysters, fish, and turtles can have effects on their health, including obstructions in the digestive system, impaired reproduction, malnourishment, and death. Microplastics also have high sorption capacities, enabling the accumulation of organic pollutants, pathogens, and metals that could potentially affect living organisms.

This study will contribute data to the current GBEP funded *Occurrence of Microplastics in Tributaries to Galveston Bay* project and other partner projects. These baseline studies can provide information about the spatial distribution and concentrations of microplastics in the Galveston Bay watershed.

Partners and Their Role(s): USGS will perform the tasks necessary for the collection and analysis of microplastics samples. Collected samples will be submitted to OptoKhemia Analytical for analysis.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due March 2021;
- Data release due August 2023; and
- Final project summary due August 2023.

Long-term Outcomes: Provide preliminary information on the occurrence of microplastics in Galveston Bay, including quantification and categorization of microplastic particles; as well as a preliminary assessment of the spatial distribution of microplastics in Galveston Bay to provide the foundation for future study and

abatement.

9. Supporting the Use of Green Infrastructure in the Lower Galveston Bay Watershed

CCMP Actions Implemented: PS-1, NPS-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: H-GAC

FY 2022 Budget: $45,000 ($22,500 Federal, $22,500 State)

Total Project Budget: $45,000 ($45,000 from Award #CE-00655007: FY 2022 $45,000)

Milestones: Coordination/orientation meeting anticipated in November 2021.

Project Period: September 2021–August 2022

Status: New project.

Objective(s): Make a recommended green infrastructure practice list that is based on local and regional data available to local decision-makers.

Project Description: H-GAC through this project will:

- Convene and organize a project committee (e.g. EIH, HARC/GTRI, Texas AgriLife, Harris County Flood Control District, Harris County, City of Houston);
- Compile available local BMP data, catalogued by practice(s);
- Complete analysis of BMP data and/or utilize existing analysis;
- Compare analysis with state and national examples from areas of common soils and precipitation;
- Recommend BMPs based on performance;
- Host at minimum one NPS workshop targeted to municipal separate storm sewer system operators and local governments; and
- Write a final report that includes a distribution and outreach plan.

Partners and Their Role(s): H-GAC will work with local water professionals to form a project committee that will catalog green infrastructure practices, identify and assist in acquiring local green infrastructure data, and develop weighted performance guidance (e.g., water quality, cost, maintenance, etc.). H-GAC will also work with partners, including GBEP, TX AgriLife, HARC, GBF, and others to support BMP implementation through the partner's watershed-based plans.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due December 2021;
- Green Infrastructure priority list due August 2022; and
- Final Report due August 2022.

Long-term Outcomes: Provide a resource to local municipalities and decision-makers detailing regionally appropriate BMPs for green infrastructure projects to support improved water quality and flood prevention in the region.

10. Townwood Park Green Stormwater Infrastructure

CCMP Actions Implemented: NPS-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: HPARD

FY 2022 Budget: $80,000 ($40,000 Federal, $40,000 State)

Total Project Budget: $80,000 ($80,000 from Award #CE-00655007: FY 2022 $80,000)

Milestones: Coordination/orientation meeting anticipated in November 2021.

Project Period: September 2021–May 2024

Status: New project.

Objective(s): The project will create at least two green stormwater infrastructure demonstration features to support future implementation of similar projects in parks and private development in Houston.

Project Description: HPARD will create two bioretention demonstration projects in Townwood Park to slow stormwater runoff and support infiltration and water retention. Native grasses and forbs, collected locally and propagated by HPARD, will be installed to provide beatification, infiltration, and water quality improvements in the systems. HPARD will work with staff and volunteers to amend the soil and install a mix of native shrubs, grasses, and wildflowers. Interpretive signage will be installed adjacent to each feature to identify them as City approved green stormwater infrastructure examples for the incentive program. The signs will provide information on the functions of green stormwater infrastructure, the connections of Houston's watersheds to Galveston Bay, and the role that community members play in protecting our waterways. The project will tackle water quality, habitat creation, and community education.

Partners and Their Role(s): HPARD will provide project management and maintenance of the green stormwater infrastructure features. They will also provide native herbaceous plants for the project.

Outputs/Deliverables:

- Project work plan within 30 days of contact execution;
- Quarterly progress reports until contract expiration; and
- Final Report due May 2024.

Long-term Outcomes: The establishment of these features will provide a needed nature-based approach to water quality and quantity concerns for the City of Houston and will be a key step in addressing Houston's resiliency challenges.

3.2D - PPE PROJECTS FOR FY 2022

11. Audubon TERN Citizen Science in Schools: Students as Field Researchers

CCMP Actions Implemented: SPO-2, SPO-3, PEA-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: Harris County Department of Education (HCDE)

FY 2022 Budget: $40,000 ($20,000 Federal, $20,000 State)

Total Project Budget: $89,323 ($89,323 from Award #CE-00655007: FY 2021 $49,323, FY 2022 $40,000)

Milestones: Coordination/orientation meeting conducted in December 2020, teacher recruitment in December 2020.

Project Period: November 2020–August 2022

Status: Ongoing project.

Objective(s): This project will engage and train students and teachers in citizen science conservation work alongside biologists and Audubon staff in the Galveston Bay watershed through the Texas Estuarine Restoration Network (TERN) program created by Audubon Texas.

Project Description: The project targets schools identified in the Harris County School District that are at least 70% underserved and located near a waterbody. The TERN program will deliver trainings; classroom lessons and activities; and field trips to local sub-watersheds for bird monitoring and data collection. Teachers and students will be provided lessons that focus on bird identification, how to use the equipment, and how to analyze data. A field trip will be included for each school so students can apply what they learned in the classroom in a field setting. Each of these activities are Texas Essential Knowledge Skills aligned with the appropriate grade level.

Partners and Their Role(s): HCDE will help recruit schools and provide access to classrooms for Audubon Texas to deliver the TERN program.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Teacher and student training materials;
- End-of-school year projects created by students highlighting data and information collected due June 2021; and
- Final Report due July 2022.

Long-term Outcomes: Engage students and teachers in citizen science conservation work alongside biologists

and wardens in the Galveston Bay watershed to demonstrate how citizen science and the data collected can help the community.

12. Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution

CCMP Actions Implemented: NPS-2, SPO-3, PEA-1, PEA-2, PEA-3, RES-2, RES-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: UHCL EIH

FY 2022 Budget: $50,000 ($25,000 Federal, $25,000 State)

Total Project Budget: $114,458 ($114,458 from Award #CE-00655007: FY 2021 $64,458, FY 2022 $50,000)

Milestones: QAPP meeting was conducted in December 2020 and the Coordination/orientation was conducted in February 2021.

Project Period: January 2021–May 2023

Status: Ongoing Project.

Objective(s): This project aims to build general scientific literacy and environmental stewardship among Galveston Bay residents regarding microplastics and increase public utilization and knowledge of the research capacity and conservation programs throughout the Galveston Bay area.

Project Description: This project targets fourth grade and high school grade levels in the Galveston Independent School District, a historically underserved district, by providing curriculum that focuses on watershed science, food web interactions, microplastics, marine debris, and conservation. Students will be guided in selecting sites within the Galveston Bay watershed to collect water and sediment samples for microplastics. The sites will be monitored monthly to compare data to water and sediment sample data collected by other area citizen science groups and utilized in the biostatistical analysis. In addition, UHCL EIH will collect water and sediment samples along shorelines in the Galveston Bay watershed for research and geospatial statistical data analysis.

Partners and Their Role(s): Turtle Island Restoration Network will provide teacher and student training and oversee student data collection. UHCL EIH will collect data, conduct research, and geospatial statistical analysis of that data for microplastics along designated shorelines in Galveston Bay. UHCL EIH seeks to characterize the spatial distribution of plastic debris along Galveston Bay shorelines.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due April 2021;
- Teacher and student training materials;
- Student Citizen Science Sampling in Galveston Bay Task Report due May 2023;
- Graduate student sampling report due May 2023; and
- Final Report due July 2023.

Long-term Outcomes: Incorporate citizen science methodologies for monitoring and research of microplastics into classrooms to foster scientific literacy among students and create sustainable behavior change to reduce microplastics in addition to increasing knowledge of the spatial relationship and accumulation of microplastics along shorelines and the open waters of Galveston Bay.

13. Mobilizing the Environmental Education Community through Prairie Education in the Galveston Bay

CCMP Actions Implemented: SPO-1, SPO-2, SPO-3, SPO-4, PEA-1, PEA-2, PEA-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: UHCL EIH

FY 2022 Budget: $80,000 ($40,000 Federal, $40,000 State)

Total Project Budget: $80,000 ($80,000 from Award #CE-00655007: FY 2022 $80,000)

Milestones: Coordination/orientation and QAPP meeting anticipated in September 2021.

Project Period: September 2021–May 2024

Status: New Project.

Objective(s): This project will facilitate prairie education programs for K-12 students and educators in underserved and underrepresented populations in the lower Galveston Bay watershed. Agencies will also collect data as part of a vigorous mapping project to identify underserved school districts (and students) that do not receive (and could greatly benefit from) quality environmental education programming.

Project Description: Citizens Environmental Coalition and EcoRise will conduct a needs assessment for underserved and underrepresented communities and host a partner workshop to create a plan of action to deliver environmental education programs to those identified communities. UHCL EIH and Native Prairies Association of Texas will facilitate prairie education programs to increase knowledge and awareness of ecological services provided by native coastal prairies and wetlands for K-12 students, educators, and the community at large. The prairie programs will serve as the demonstration project/case study for how a program can adapt to meet the identified needs of the community. This project seeks to address the low science and math test scores and workforce development of students in Texas Region Four communities by providing science, technology, engineering, and mathematics (STEM) activities on the Deer Park Prairie and at UHCL EIH through field trips, summer camps, and teacher/administrator workshops. Activities can be adapted to virtual formats if needed.

Partners and Their Role(s): Citizens Environmental Coalition and EcoRise will conduct a needs assessment mapping project and host a partner workshop and the Native Prairies Association of Texas will assist UHCL EIH with prairie education programs.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due December 2021;
- Prairie education workshops and field trips due April 2024;
- Map of underserved communities in need of environmental education due May 2024;
- Environmental education program delivery plan of action due May 2024; and
- Final Report due May 2024.

Long-term Outcomes: Disseminate mapping project results to help partners engage communities in need of environmental education opportunities and provide field trips, tools, and resources to students and educators from underserved and underrepresented communities. STEM activities related to environmental education will connect those communities to environmental issues in the Galveston Bay watershed.

3.2E - M&R PROJECTS FOR FY 2022

14. The Distribution, Fate, and Transport of Emerging Contaminants in Galveston Bay

CCMP Actions Implemented: RES-2

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: TAMU

FY 2022 Budget: $15,500 ($7,750 Federal, $7,750 State)

Total Project Budget: $108,438 ($108,438 from Award #CE-00655007: FY 2021 $92,938, FY 2022 $15,500)

Milestones: Coordination/orientation and QAPP meeting was conducted in February 2021. The QAPP was executed in February 2021.

Project Period: January 2021–December 2022

Status: Ongoing project.

Objective(s): This project will measure concentrations of PFAS and PPCPs in water and sediment in Galveston Bay and the Houston Ship Channel over a two-year period.

Project Description: This project will examine spatial and temporal variation in a group of emerging contaminants, including PFAS and PPCPs in Galveston Bay water and sediment. TAMU will conduct quarterly field observations at 13 sites in Galveston Bay and the Houston Ship Channel over a two-year period, extending a current dataset dating from June 2017 to present. Unlike legacy contaminants such as PCBs and dioxins, PFAS and PPCPs are soluble in water, which poses a threat to water quality. Baseline data on the distributions, fate, and transport of PFAS and PPCPs in Galveston Bay is scarce, making it difficult to understand whether and to what extent extreme events such as hurricanes and chemical releases contribute additional contamination to Galveston Bay. This project aims to answer: 1) What are the distributions of PFAS and PPCPs in Galveston Bay concerning river discharge rates and extreme events? 2) Do hurricanes and chemical releases contribute to elevated levels of PFAS and/or PPCPs in the bay, and if so, how long does it take to recover to background levels? and 3) What are the water/sediment partitioning patterns of these

emerging contaminants in Galveston Bay?

Partners and Their Role(s): TAMU will conduct sampling and complete analyses for PFAS and PPCPs in Galveston Bay and the Houston Ship Channel.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due March 2021;
- PFAS concentration data for water and sediment samples;
- PPCPs concentration data for water and sediment samples; and
- Final report due December 2022.

Long-term Outcomes: Insight into spatial and temporal variation in PFAS and PPCPs concentrations in Galveston Bay and the Houston Ship Channel.

15. Effects of Erosion Control Structures on Shoreline Marsh Species Populations

CCMP Actions Implemented: RES-3, RES-8, ACS-2

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: Texas A&M University at Galveston (TAMUG)

FY 2022 Budget: $38,165 ($19,082.50 Federal, $19,082.50 State)

Total Project Budget: $69,305 ($38,165 from Award #CE-00655007: FY 2022 $38,165)

Milestones: Coordination/orientation and QAPP meeting anticipated in September 2021.

Project Period: September 2021–October 2023

Status: New project.

Objective(s): Determine if the presence or absence of erosion control structures (breakwaters) influence species populations in shoreline marsh areas.

Project Description: This project will examine whether the presence or absence of erosion control structures (breakwaters) influence species populations in shoreline marsh areas of Galveston Bay. This will be accomplished by surveying nekton and zooplankton in Galveston Bay shoreline marsh areas with and without breakwater or sill structures and examining productivity patterns.

Partners and Their Role(s): This project leverages existing shoreline projects around Galveston Bay to study the effects of erosion control measures on species populations. The project also leverages existing research equipment, laboratory space, vessels and vessel maintenance, and high-resolution microscopes for species identification and zooplankton counts at TAMUG.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due November 2021;
- Biological sampling data;
- Biological Sampling and Field Surveys Task Report;
- Statistical Analysis Task Report; and
- Final report due October 2023.

Long-term Outcomes: Insight into the influence of erosion control structure presence in shoreline marsh areas on species populations and productivity.

16. The Fate of Emerging PFAS Pollutants in Shellfish and Fish of Galveston Bay

CCMP Actions Implemented: RES-2, RES-5

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: TAMUG

FY 2022 Budget: $68,456 ($34,228 Federal, $34,228 State)

Total Project Budget: $105,549 ($68,456 from Award #CE-00655007: FY 2022 $68,456)

Milestones: Coordination/orientation and QAPP meeting anticipated in September 2021.

Project Period: September 2021–October 2023

Status: New project.

Objective(s): Measure emerging (PFAS) pollutant body-burdens in shellfish and fish from Galveston Bay and assess biomarkers of health in the exposed shellfish and fish.

Project Description: This project aims to increase the current understanding of the fate of emerging pollutants in Galveston Bay biota. This project will generate data on the body-burdens of PFAS in fish and shellfish collected from Galveston Bay. Biomarkers of stress will also be measured in these organisms to determine the effect(s) of PFAS exposure on Galveston Bay fish and shellfish health.

Partners and Their Role(s): Leverages in-kind services from Texas Parks and Wildlife Department [(TPWD); collects fish and shellfish samples], in-kind supplies from TAMUG (research equipment, laboratory space), and in-kind services from TAMUG co-principle investigators.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due November 2021;
- PFAS body-burden data for Galveston Bay biota;
- Stress biomarker enzyme activity level data for Galveston Bay biota;
- PFAS Levels in Galveston Bay Biota Task Report;
- Stress Biomarker Enzyme Activity Levels in Galveston Bay Biota Task Report; and
- Final report due October 2023.

Long-term Outcomes: Insight into the fate of PFAS pollutants in Galveston Bay biota and associated health effects.

SECTION 3.3: FY 2022 GRANT BUDGET SPREADSHEETS

3.3A - FY 2022 Grant Budget by Category - Summary

FY 2022 Grant Budget Totals	Administration	NRU	WSQ	PPE	M&R	Total Costs
Project #	95748	95748	95748	95748	95748	95748
Salaries	$362,633	$0	$0	$0	$0	$362,633
Contracts	$31,000	$0	$0	$0	$0	$31,000
Travel	$5,115	$0	$0	$0	$0	$5,115
Other	$146,845	$160,300	$135,657	$170,000	$122,121	$734,923
Supplies	$445	$0	$0	$0	$0	$445
Equipment	$0	$0	$0	$0	$0	$0
Construction	$0	$0	$0	$0	$0	$0
Sub-Total	**$546,038**	$160,300	$135,657	$170,000	$122,121	**$1,134,116**
Fringe 38.84%	$140,846	$0	$0	$0	$0	$140,846
Indirect 34.48%	$125,037	$0	$0	$0	$0	$125,037
GRANT TOTAL	**$811,921**	$160,300	$135,657	$170,000	$122,121	**$1,400,000***

*Rounded from $1,399,999

3.3B - FY 2022 Grant Budget by Category - Detail

FY 2022 GBEP Budget Summary by Grant Budget Category	Amount
Salaries	**$362,633**
Salaries for GBEP Staff Members	$362,633
Contracts	**$31,000**
Website Hosting Costs	$6,000
Website Redesign	$25,000
Travel	**$5,115**
Travel for GBEP Program Manager to attend the Fall NEP Tech Transfer Meeting - CANCELLED	$0
Travel for GBEP Program Manager to attend Spring EPA NEP Workshop	$2,460
Travel for GBEP Program Manager to attend GOMA conference	$0
To be allocated in a future Work Plan	$2,655
Other	**$734,923**
Mickey Leland Intern	$0
Reginal Monitoring Database	$104,018
Estuary Resilience Assessment	$42,677
Conservation Assistance Program	$85,000
Sylvan Rodriguez Habitat Restoration Project Phase III	$75,300
Baseline Assessment of Microplastics in Galveston Bay	$10,657
Supporting the Use of Green Infrastructure in the Lower Galveston Bay Watershed	$45,000
Townwood Park Green Stormwater Infrastructure	$80,000
Audubon TERN Citizens Science in Schools: Students as Field Researchers	$40,000
Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution	$50,000
Mobilizing the Environmental Education Community through Prairie Education	$80,000
The Distribution, Fate, and Transport if Emerging Contaminants in Galveston Bay	$15,500
Effects of Erosion Control Structure on Shoreline Marsh Species Populations	$38,165
The Fate of Emerging PFAS Pollutants in Shellfish and Fish of Galveston Bay	$68,456
Other Operating Expenses (website domain registration)	$150
Supplies	**$445**
Outreach and education supplies	$445
Fringe and Indirect	**$265,883**
FY 2022 GRANT TOTAL	**$1,400,000***

*Rounded from $1,399,999

3.3C - FY 2022 Travel Summary by Trip

FY 2022 Travel Summary by Trip	Amount
Spring NEP Tech Transfer Meeting in Tampa Bay, Florida (1-person travel, 4-5 days)	$2,460
Airfare	$1,035
Airport Parking	$150
Lodging ($157/night)	$620
Hotel Tax (12.0%)	$75
Taxi/transport	$150
Per diem ($61/day)	$305
Conference registration	$125
Fall EPA-NEP Workshop in Washington, D.C. (1-person travel, 4 days). - CANCELLED	$0
Airfare	$0
Airport Parking	$0
Lodging ($189/night)	$0
Hotel Tax (14.5%)	$0
Taxi/transport	$0
Per diem ($76/day)	$0
Conference registration	$0
Travel for the GBEP Program Manager to attend the GOMA conference (1-person travel, 5 days). Travel costs for the GBEP Program Manager will be covered by GOMA.	$0
To be allocated in a future Work Plan	$2,655
FY 2022 Travel Estimate Total*	$5,115

*All out of state travel is dependent on TCEQ management review and approval. Rates for fiscal year 2022 are subject to change and estimates are based on actual cost or estimates of previous trips from fiscal year 2021 as well as the current fiscal year 2021 federal and state per diem rates.

SECTION 4: ONGOING PROJECTS

SECTION 4.1: ONGOING FEDERAL PROJECTS - SUMMARY

Ongoing Projects		Award #CE-00655007				Award #CE-00655006
PROJECT NAME	Contract Number	Funding Years	2022 Budget	2021 Budget	2020 Budget	2017-2019 Budget
1. GBEP Website Hosting and Maintenance	N/A	2017–2022	$6,000	$6,000	$6,000	$38,802
3. Mickey Leland Environmental Internship	N/A	2017–2021	$0	$7,500	$7,500	$23,798
4. Regional Monitoring Database	21-10088	2021–2024	$104,018	$130,001	$0	$0
5. Estuary Resilience Assessment	19-90217	2019–2020, 2022	$42,677	$0	$20,000	$30,000
Administration Total			$152,695	$143,501	$33,500	$92,600
6. Conservation Assistance Program	18-80344	2018–2023	$85,000	$115,000	$100,000	$200,000
NRU Total			$85,000	$115,000	$100,000	$200,000
8. Baseline Assessment of Microplastics in Galveston Bay	21-10078	2021-2022	$10,657	$79,343	$0	$0
17. Targeted Bacteria Monitoring	20-10367	2020–2021	$0	$40,000	$40,000	$0
18. Outreach Implementation for Galveston Bay Watershed Water Quality Projects	21-10087	2021	$0	$40,000	$0	$0
19. Occurrence of Microplastics in Tributaries to Galveston Bay	20-10173	2020	$0	$0	$40,000	$0
WSQ Total			$10,657	$159,343	$80,000	$0
11. Audubon TERN Citizen Science in Schools: Students as Field Researchers	21-10097	2021–2022	$40,000	$49,323	$0	$0
12. Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution	21-10096	2021–2022	$50,000	$64,458	$0	$0
20. Trash Bash 2022	19-90216	2019–2021	$0	$10,000	$10,000	$15,000
21. Public Perception Assessment and Community-Based Social Marketing Campaigns to Enhance Conservation and Educational Outreach Programs	20-10175	2020	$0	$0	$86,000	$0
PPE Total			$90,000	$123,781	$96,000	$15,000
14. The Distribution, Fate, and Transport of Emerging Contaminants in Galveston Bay	21-10104	2021–2022	$15,500	$92,938	$0	$0
22. Lead Isotopes and Heavy Metal Concentrations in Galveston Bay Waters, Sediments, and Oysters	20-10170	2020	$0	$0	$133,668	$0
23. Characterizing PCBs and Dioxins in the Houston Ship Channel and Galveston Bay Post Harvey	20-10179	2020	$0	$0	$60,000	$0
24. Galveston Bay Oyster Microplastics: Baselines and Impacts	21-10080	2021	$0	$90,427	$0	$0
25. The Effect of Microplastics on the Base of Marine Food Webs	21-10079	2021	$0	$36,939	$0	$0
M&R Total			$15,500	$220,304	$193,668	$0
GRAND TOTAL-ONGOING PROJECT FUNDING			$353,852	$761,929	$503,168	$307,600

SECTION 4.2: ONGOING FEDERAL PROJECTS - DETAIL

4.2A - ONGOING ADMINISTRATIVE PROJECTS

None

4.2B - ONGOING NRU PROJECTS

None

4.2C - ONGOING WSQ PROJECTS

17. Targeted Bacteria Monitoring

CCMP Actions Implemented: NPS-1, NPS-2, NPS-3, PEA-1, PHA-3, PS-2, PS-3, RES-4, SPO-1, SPO-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: H-GAC

Total Project Budget: $80,000 ($80,000 from Award #CE-00655007: FY 2020 $40,000, FY 2021 $40,000)

Milestones: The QAPP was executed in March 2020.

Project period: September 2019–August 2022

Status: Ongoing project.

Objective(s): The goal of the Targeted Bacteria Monitoring project is to reduce bacteria concentrations in impaired streams in the BIG project area, toward meeting contact recreation standards. The objectives of the project are to 1) investigate bacteria sources in the most bacteria-impaired waterways in the BIG project area, and 2) work with local jurisdictions to reduce or eliminate those sources.

Project Description: In its annual reports, the BIG identifies the Top 10 "Most Wanted" Streams – those designated AUs with the highest geomeans of *E. coli* concentrations in the BIG project area. For the past eight years, the Bayou Preservation Association and/or H-GAC have conducted intensive bacteria monitoring within the most impaired AUs, to help move these streams back to attaining the applicable recreational water quality standards.

This project will focus on the most impaired AUs to identify relative differences in bacteria levels to narrow down the GIS location of potential sources. When potential sources are identified, the information will be passed on to local authorities in a targeted monitoring report. H-GAC will encourage local jurisdictions to investigate any identified sources and will report back on any action taken to address the identified source(s).

Partners and Their Role(s): H-GAC will partner with the Bayou Preservation Association on implementation of the project, with H-GAC in a primary technical advisory role and Student Conservation Association interns will conduct sampling.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Findings and preliminary action report;
- Outreach and education summary due June 2022;
- Targeted monitoring report August 2022; and
- Final report due August 2022.

Long-term Outcomes: Significantly reduce bacteria levels in impaired streams of the BIG project area and help move these streams back to attaining the applicable recreational water quality standards. Promote the importance of bacteria reduction efforts to other jurisdictions and the general public.

18. Outreach Implementation for Galveston Bay Watershed Water Quality Projects

CCMP Actions Implemented: NPS-1, NPS-2, PS-1, PS-2, SPO-2, SPO-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: H-GAC

Total Project Budget: $40,000 ($40,000 from Award #CE-00655007: FY 2021 $40,000)

Milestones: Coordination/orientation meeting in March 2021.

Project Period: February 2021–August 2022

Status: Ongoing project.

Objective(s): This project will provide implementation resources for existing watershed-based plans in the Galveston Bay watershed that are adaptable to each community.

Project Description: All H-GAC watershed-based plans focus outreach efforts on reducing NPS by changing resident behavior. This project will build upon three years of outreach conducted under the Coastal Communities project, a Section 319 NPS Program grant-funded project. The Coastal Communities project provides implementation resources for watershed-based plans in the coastal portion of H-GAC's service region.

The Coastal Communities project currently works with small communities to determine their needs and identify ways to help reduce bacteria in local waterways with a regional approach tailored to each community. The Coastal Communities Roadmap was developed as an outreach implementation tool for this program. This project will specifically focus on conducting additional needs assessments and will further develop outreach materials and resources for 24 small, non-municipal separate storm sewer system coastal communities. Targeted outreach will help reduce four common types of NPS through proper disposal of pet waste; proper disposal of fats, oils, grease, and wipes; maintenance of on-site sewage facilities; and reducing litter and illegal dumping. The Performing Party will design a Community-Based Social Marketing pilot project that will focus on one of these four pollution types.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Public outreach materials;
- Community-based needs assessment report due January 2022;
- Project Outreach and Education Plan report due July 2022;
- Final report due August 2022.

Long-term Outcomes: This project will provide resources that directly and indirectly improve water quality across the lower Galveston Bay watershed by reducing NPS pollution.

19. Occurrence of Microplastics in Tributaries to Galveston Bay

CCMP Actions Implemented: NPS-1, PS-1, RES-2, RES-3, SPO-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 - Increase Transparency and Public Participation; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: USGS

Total Project Budget: $40,000 ($40,000 from Award #CE-00655007: FY 2020 $40,000)

Milestones: The QAPP was executed in March 2020.

Project period: September 2019–February 2022

Status: Ongoing project.

Objective(s): The objectives of this study are to 1) investigate the occurrence of microplastics in selected watersheds draining to Galveston Bay; and 2) categorize the type(s) of microplastics present in these watersheds.

Project Description: Litter and trash, such as plastics, are an issue of concern in Galveston Bay and its tributaries and have been identified by the WSQ subcommittee as a priority topic for research. Microplastics, which are plastic particles less than 5 mm in diameter, are of increasing concern. These small particles are derived from the degradation or mechanical breakdown of larger plastic objects or particles and are introduced to waterways through urban runoff and wastewater effluent. Microplastics ingested by living organisms, such as birds, oysters, fish, and turtles can have effects on their health, including obstructions in the digestive system, impaired reproduction, malnourishment, and death. Microplastics also have high sorption capacities, enabling the accumulation of organic pollutants, pathogens, and metals that could potentially affect living organisms.

To date, no studies that assess the occurrence and abundance of microplastics in the tributaries of Galveston Bay have been published. Collecting microplastics samples in this region will provide baseline information about the spatial distribution and concentrations in the Galveston Bay watershed.

Partners and Their Role(s): USGS will perform the tasks necessary for sample collection. Collected samples

will be submitted to OpthoKhemia Analytical laboratory for analysis.

Outputs/Deliverables:

- Annual project work plan due at the beginning of each fiscal year of the project;
- Quarterly progress reports until contract expiration;
- Data release due July 2021; and
- Project summary due February 2022.

Long-term Outcomes: Results will provide information on the occurrence of microplastics in the Galveston Bay watershed and will include quantification and categorization of microplastic particles. The results of this reconnaissance study will provide a preliminary assessment of where microplastics are found in the Galveston Bay watershed and provide the foundation for future study and abatement.

4.2D - ONGOING PPE PROJECTS

20. Trash Bash 2022

CCMP Actions Implemented: PEA-2, PEA-3, SPO-1, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: H-GAC

Total Project Budget: $35,000 (FY 2019 $15,000 from Award #CE-00655006; $20,000 from Award #CE-00655007: FY 2020 $10,000, FY 2021 $10,000)

Milestones: Trash Bash event will occur between March and April of each year of the project.

Project Period: September 2018–August 2022

Status: Ongoing project.

Objective(s): The goal of Trash Bash is to promote environmental stewardship of the watershed through public education and to provide a means to clean-up waterways in the Houston-Galveston area.

Project Description: Trash Bash is a successful volunteer-based litter cleanup event that has been held at multiple sites in the Houston-Galveston area on an annual basis since 1994. In fiscal year 2022, funding will go towards salary and fringe benefits for a portion of the H-GAC Trash Bash coordinator position and other planning expenses.

Partners and Their Role(s): Partners for this project include H-GAC which organizes and coordinates the event, Gulf Coast Authority which provides equipment and t-shirts for the event, the Texas Conservation Fund which manages the funding, and private and corporate sponsorships.

Outputs/Deliverables:

- Trash Bash Steering Committee meeting agendas and meeting minutes due July 31 annually; and
- Final report due August 2022.

Long-term Outcomes: Reduce the amount of trash in our waterways by promoting environmental stewardship using hands-on-education and public outreach.

21. Public Perception Assessment and Community-Based Social Marketing Campaigns to Enhance Conservation and Educational Outreach Programs

CCMP Actions Implemented: NPS-2, PEA-1, PEA-2, PEA-3, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: HARC/GTRI

Total Project Budget: $86,000 ($86,000 from Award #CE-00655007: FY 2020 $86,000)

Milestones: Public awareness and perception evaluation executed and evaluated in May 2020.

Project period: September 2019–May 2022

Status: Ongoing project. Advisory work group established in October 2019. Development of the public awareness and perception evaluation completed in September 2020.

Objective(s): This project seeks to conduct public assessment and awareness and implement three small education and outreach campaigns using a community-based engagement approach.

Project Description: The goal of the project is to conduct a community-centered approach to implementing public outreach and education campaigns. A public perception and awareness assessment will be conducted to identify communities and behaviors to target for the three small outreach and education campaigns. Once the targeted behaviors and communities have been identified, the campaigns will be created and implemented. Metrics will be developed to evaluate the success of each of the campaigns. The outcome of the campaigns and the public assessment and awareness information will be shared with stakeholders to demonstrate another approach to communicating with the public the importance of changing behaviors to conserve and protect Galveston Bay.

Partners and Their Role(s): HARC/GTRI will partner with GBF to conduct the public awareness and perception assessment, and GBF will implement the three outreach and education campaigns.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Final public assessment report due March 2021;
- Three small outreach and education campaigns; and
- Final report due May 2022.

Long-term Outcomes: Disseminating the project results to help partners and stakeholders have additional tools and resources to engage the public at the community-level on outreach and education campaigns that lead to sustainable behavior changes to preserve Galveston Bay.

4.2E - ONGOING M&R PROJECTS

22. Lead Isotopes and Heavy Metal Concentrations in Galveston Bay Waters, Sediments, and Oysters

CCMP Actions Implemented: RES-2, RES-5

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: University of Houston (UH)

Total Project Budget: $133,668 ($133,668 from Award #CE-006550067: FY 2020 $133,668)

Milestones: The QAPP was executed in November 2019.

Project period: September 2019–August 2021

Status: Ongoing project. Sample collection and analyses are complete. UH is in the process of completing data analyses and writing up the final report.

Objective(s): This study proposes lead (Pb) isotope compositions and heavy metal concentrations be determined for Galveston Bay waters, sediments, and oysters to evaluate the toxicity of the bay and identify types of industrial pollution sources.

Project Description: Galveston Bay is an estuary where industrial runoff, wastewater, and other pollutants enter the bay within incoming freshwaters. These flows can contain heavy metals, either dissolved in the waters or absorbed onto inflowing sediments, which can be toxic for humans and pelagic/benthic communities in the bay. This study proposes heavy metal concentrations be determined for Galveston Bay waters, sediments, and oysters, and Pb isotopes be determined for Galveston Bay sediments and oysters to evaluate the toxicity of the bay and identify types of pollution sources. Oyster samples will be collected from eight sites in Galveston Bay along with water and sediment samples collected with external funding at eight sites in Galveston Bay as well as up to 15 inflowing freshwater sites. Together Pb isotope and heavy metal concentration data will highlight areas with elevated pollutant levels, provide insight into pollutant mobility, and constrain pollutant sources and fluxes. The Texas Surface Water Quality Standards and Texas Risk Reduction Program will be used as references for analyzing surface water and sediment samples. The information obtained from additional water, sediment, and oyster analyses will enhance understanding of pollution in Galveston Bay, and inform pollution reduction, remediation, and mitigation efforts in the region.

Partners and Their Role(s): UH will be performing the laboratory preparation of samples (leaching, extracting, etc.) as well as the Pb isotope analysis. TAMU will be subcontracted to perform the heavy metal concentration analyses.

Outputs/Deliverables:

- Annual project work plan due at the beginning of each fiscal year of the project;
- Quarterly progress reports until contract expiration;
- Heavy metal and Pb isotope data due August 2021; and
- Final report due August 2021.

Long-term Outcomes: Insights into Pb isotope composition, heavy metal concentrations, and potential types of industrial pollution sources in Galveston Bay and associated freshwater inflows.

23. Characterizing PCBs and Dioxins in the Houston Ship Channel and Galveston Bay Post Hurricane Harvey

CCMP Actions Implemented: RES-2, RES-5

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: UH

Total Project Budget: $60,000 ($60,000 from Award #CE-006550067: FY 2020 $60,000)

Milestones: The QAPP was executed in March 2020.

Project period: September 2019–April 2022

Status: Ongoing project. Sample collection and analyses were delayed due to COVID-19 and are expected to occur in the summer and fall of 2021.

Objective(s): This project seeks to collect fish and crab tissue and sediment samples to measure PCB and dioxin levels in the Houston Ship Channel and Galveston Bay post-Hurricane Harvey for comparison to historical datasets from total maximum daily load (TMDL) studies conducted by UH with TCEQ funding.

Project Description: Two observations after Hurricane Harvey motivate this study: 1) some parts of the Houston Ship Channel and Galveston Bay exhibited higher concentrations of dioxin and PCBs in sediment after the hurricane relative to historic levels; and 2) it has been reported that the protective cap on the San Jacinto River Waste Pits site incurred failures during the hurricane, potentially exposing waste material in the pits to the San Jacinto River waters. An existing study funded by GBF examining fish and crab dioxin and PCB levels in the San Jacinto River and the Houston Ship Channel is limited to a five-mile radius around the San Jacinto River Waste Pits Superfund site. The main goal for this study is to expand the sampling scope beyond the five-mile limit of the GBF study to encompass the remainder of the Houston Ship Channel and Galveston Bay system as applicable and appropriate.

Partners and Their Role(s): UH will perform the tasks necessary for the collection and analysis of sediment and tissue samples and for comparing the measurements to historical data collected within the system to determine change, if any, post-Hurricane Harvey.

Outputs/Deliverables:

- Annual project work plan due at the beginning of each fiscal year of the project;
- Quarterly progress reports until contract expiration;
- PCB and dioxin data due April 2022; and
- Final report due April 2022.

Long-term Outcomes: Insight into potential changes in PCB and dioxin levels in the Houston Ship Channel and Galveston Bay following Hurricane Harvey.

24. Galveston Bay Oyster Microplastics: Baselines and Impacts

CCMP Actions Implemented: NPS-2, PEA-1, PEA-3, RES-2, RES-3

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: TAMUG

Total Project Budget: $90,427 ($90,427 from Award #CE-00655007: FY 2021 $90,427)

Milestones: Coordination/orientation and QAPP meeting was conducted in February 2021. The QAPP was executed in February 2021.

Project Period: January 2021–October 2022

Status: Ongoing project.

Objective(s): This project will examine spatial variation in the presence, type, and relative amount of microplastics in Galveston Bay oysters.

Project Description: This project will examine spatial variation in the presence, type, and relative amount (density per gram of tissue) of microplastic (pieces of plastic less than 5 mm in diameter) particles and fibers in Galveston Bay oysters; identify and compare the composition of microplastics retained by oysters relative to the microplastics present in surface waters to ascertain whether oysters selectively retain certain types of microplastics; and examine the potential for microplastic loads in oysters to influence oyster health. The

researchers will sample surface water and oysters at three sites in each of five major bay regions: Trinity Bay, East Bay, West Bay, Dickinson/Central Bay, and the Kemah/Seabrook area (15 sampling locations with up to 28 oysters per location for a total of 420 oyster samples and nine one-liter water samples per location for a total of 135 water samples). Up to 12 oyster samples per region will be used to determine the microplastic type(s) and abundance. Oyster tissue will be extracted in a clean fume hood in the laboratory before undergoing acid digestion and vacuum filtration to extract microplastics. Microplastic type(s) for oyster and water samples will be identified using Fourier Transform Infrared Spectroscopy, which identifies the chemical composition of polymers. Up to 16 oysters per region will be used to determine a representative oyster condition index for each sampling location. The condition index is calculated by determining the amount of tissue within an oyster in relation to the available volume inside the shell and provides a relative indication of oyster health. This project will provide information on the links between spatial variations in surface water microplastic loads, oyster microplastic loads, and oyster health.

Partners and Their Role(s): TAMUG will complete measurements of microplastic loads and analysis of plastic types in oysters and sediments and facilitate completion of the final report. UH will complete measurements of the oyster condition index. GBF will facilitate the creation and dissemination of outreach and education materials.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due March 2021;
- Oyster condition index data;
- Oyster and surface water microplastic load data;
- Oyster and surface water microplastic composition data;
- Public outreach materials;
- Classroom curriculum materials; and
- Final report due October 2022.

Long-term Outcomes: Insight into types and amounts of microplastics in Galveston Bay oysters relative to that present in surface water, as well as spatial variation in oyster health relative to microplastic abundance.

25. The Effect of Microplastics on the Base of Marine Food Webs

CCMP Actions Implemented: RES-2, RES-3

EPA's Strategic Plan Measures Implemented: Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: TAMUG

Total Project Budget: $36,939 ($36,939 from Award #CE-00655007: FY 2021 $36,939)

Milestones: Coordination/orientation and QAPP meeting were conducted in February 2021.

Project Period: January 2021–May 2022

Status: Ongoing project.

Objective(s): This project will investigate how microplastic exposure affects physiological and swimming performance in filter-feeding fishes and investigate the trend of plastic accumulation in filter-feeding fishes in Galveston Bay over the last 78 years.

Project Description: This project will use gulf menhaden and bay anchovies as model organisms to investigate if and how microplastics impact the survival needs of filter-feeding fishes, which comprise an important prey base for many marine food webs. Microplastic abundances in the respiratory tissue (gills) and gastrointestinal tract of specimens from the Texas A&M Biodiversity Research and Teaching Collection (1952–present) will be quantified using fluorescence microscopy. These data will be used to statistically model the trend of presumed microplastic accumulation over the past 78 years as well as predict future abundances in Galveston Bay and the western Gulf of Mexico. This project will also investigate the physiological impacts of exposure to microplastics on these species. Gulf menhaden and bay anchovies will be collected from the Galveston Bay estuary system. In the lab, fish will be placed into an intermittent-flow respirometer, exposed to varying concentrations of polyethylene terephthalate microplastic fibers, and subjected to increasing velocities of flow. Oxygen consumption and flow rate will be recorded and used to calculate several respiratory and swimming performance parameters. Video recordings of the swimming trials will be taken and analyzed to measure kinematic changes. These data will be used to compare environmental microplastic abundance to changes in respiratory, kinematic, and/or swimming performance. Microplastic abundance in the respiratory tissue and gastrointestinal tract will also be determined for a subset of these fish following the swimming trials.

Partners and Their Role(s): TAMUG will obtain historical fish specimens from TAMU. TAMUG will complete analyses of microplastic accumulation in Galveston Bay fishes and conduct swimming trials of fishes under exposure to varying concentrations of microplastics.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- QAPP due March 2021;
- Model of historical microplastic accumulation in Galveston Bay fishes;
- Respiratory and swimming performance data; and
- Final report due May 2022.

Long-term Outcomes: Insight into microplastics accumulation in Galveston Bay fishes since 1952 and information on effects of microplastics on fish physiology and swimming performance.

SECTION 5: COMPLETED PROJECTS

SECTION 5.1: PROJECTS COMPLETED SINCE FY 2021 WORK PLAN SUBMISSION - SUMMARY

	Completed Projects Under		Award #CE-00655007	Award #CE-00655006			
PROJECT NAME	TCEQ Contract Number	Funding Years	2020 Budget	2019 Budget	2018 Budget	2017 Budget	Final Report Submitted
26. The State of the Bay, Fourth Edition	18-80343	2018, 2020	$25,000	$0	$85,000	$0	December 2020
27. Bacteria Source Tracking on Tributaries of Trinity and Galveston Bays	18-80240	2018–2020	$21,421	$138,579	$80,000	$0	August 2020
28. Highland and Marchand Bayou Watershed Protection Plan	19-90214	2019	$0	$68,362	$0	$0	March 2021
29. Texas Estuarine Resource Network Citizen Science Program in Galveston Bay	17-73627	2017–2018	$0	$0	$27,393	$25,000	August 2020
30. Know Your Watershed Educators Summer Institute	19-90211	2019	$0	$38,341	$0	$0	August 2020
31. Blackhawk Park Coastal Prairie Restoration and Education Project	19-90212	2019	$0	$53,600	$0	$0	August 2020
32. Galveston Seawall Recycling	19-90210	2019	$0	$18,420	$0	$0	August 2020
33. Galveston Bay Intertidal Oyster Reef Mapping and Analysis	19-90213	2019	$0	$64,883	$0	$0	March 2021
GRANT TOTAL-PROJECT FUNDING			$46,421	$382,185	$192,393	$25,000	

SECTION 5.2: PROJECTS COMPLETED SINCE FY 2021 WORK PLAN SUBMISSION – DETAIL

26. The State of the Bay, Fourth Edition

CCMP Actions Implemented: All

EPA's Strategic Plan Measures Implemented: Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: HARC/GTRI

Total Project Budget: $110,000 ($85,000 from Award #CE-00655006: FY 2018 $85,000; $25,000 from Award #CE-00655007: FY 2020 $25,000)

Milestones: The website was launched in October 2020.

Project period: September 2017–December 2020

Status: Completed project.

Objective(s): To create a web-based State of the Bay Report, 4th Edition based on the *GBP, 2nd Edition*. The report summarized *GBP* implementation, research findings, monitoring data, indicators, and metrics for the Galveston Bay watershed. Information was aggregated by sub-bay, watershed, or station as appropriate, based on stakeholder input, and acquired and quality-assured monitoring data collected through 2017.

Project Description: The State of the Bay Report is a summary of current *GBP* implementation. This includes research, analysis, and presentation of the indicators and metrics available for Galveston Bay based on acquired and quality-assured monitoring data from the Galveston Bay Status and Trends project. Information is related to the goals of the *GBP, 2nd Edition,* and issues of concern for managers and stakeholders. The State of the Bay Report was developed in a web-based format that enabled content, graphics, narrative GIS storyboard, analysis, and linked data to be presented in a format that is easily updated, sharable, and accessible to managers, scientists, and other stakeholders. In this format, the State of the Bay Report can become a continuing electronic record of the progress of the *GBP, 2nd Edition,* and the accomplishments of GBEP, GBC, and partner organizations.

Partners and Their Role(s): HARC/GTRI updated the chapters and data in the State of the Bay Report and converted the report to a web-based format.

Outputs/Deliverables:

- Crosswalk document between old State of the Bay Report and new;
- 11 updated sections in a web format, storyboard, and success stories;
- Quarterly progress reports until contract expiration; and
- Final State of the Bay Report website due October 2020.

Long-term Outcomes: State of the Bay Report updated with the most current data and in a sharable and accessible format.

27. Bacteria Source Tracking on Tributaries of Trinity and Galveston Bays

CCMP Actions Implemented: NPS-1, PHA-3, PS-2, PS-3, RES-4

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: Texas AgriLife/TWRI

Total Project Budget: $240,000 ($218,579 from Award #CE-00655006: FY 2018 $80,000, FY 2019 $138,579; $21,421 from Award #CE-00655007: FY 2020 $21,421)

Milestones: Final report completed August 2020.

Project Period: September 2017–August 2020

Status: Completed project.

Objective(s): To gather information needed to address bacteria concerns in five watersheds of Trinity and Galveston Bays.

Project Description: A water quality monitoring regime was employed to help decision-makers make recommendations for addressing bacteria impairments in Buffalo, Double, Cedar, and Dickinson bayous and Clear Creek. Monthly sampling was conducted by TWRI at one site on each waterbody for 12 months. Field

parameters collected included pH, temperature, conductivity, and DO. Water samples were collected and delivered to SAML where *E. coli* was prepared for BST analysis. The SAML also conducted library-dependent BST and analyzed *E. coli* isolates (four isolates per sample) using the ERIC-PCR and RiboPrinting combination method. TWRI collected 91 known source samples from local watersheds that helped improve the accuracy of BST results. Known source sample isolates were archived in the Texas *E. coli* BST Library. Results of both the known source sampling and BST analysis were reported in the project final report.

Partners and Their Role(s): TAMU performed all water quality monitoring and collected all fecal samples. All water and fecal samples were delivered to the SAML for analysis. The SAML added source fecal samples to the BST Library using the ERIC-PCR and RiboPrinting combination method.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Data results and interpretation due July 2020;
- Analysis of BST results for presentation and inclusion in the final report due July 2020;
- Final white paper due July 2020; and
- Final report due July 2020.

Long-term Outcomes: This project provided a better understanding of the sources contributing to bacteria pollution in the lower Galveston Bay watershed. BST further characterized the watershed and supports the implementation of local watershed-based plans. The information will help decision-makers determine the most appropriate management measures needed to reduce bacteria.

28. Highland Bayou Watershed Protection Plan

CCMP Actions Implemented: NPS-1, NPS-2, NPS-3, NPS-4, PHA-3, SPO-2

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: Texas AgriLife

Total Project Budget: $68,362 ($68,362 from Award #CE-00655006: FY 2019 $68,362)

Milestones: The Highland Bayou WPP completed in March 2021.

Project Period: September 2018–March 2021

Status: Completed project.

Objective(s): The goal of this project was to update the Highland Bayou WPP to include load reduction estimates which incorporated flow data to address both bacteria and DO impairments, and to shepherd the WPP through TCEQ and EPA Region 6 approval process.

Project Description: Highland and Marchand bayous experienced periods of low DO and elevated bacteria levels, which can impact aquatic life and can be harmful to human health, respectively. All the state's assessments (Texas 303(d) List) since 2002 have listed multiple AUs within Highland Bayou (segment 2424A) and Marchand Bayou (segment 2424C) as impaired for these constituents of concern.

Texas AgriLife coordinated the creation of a characterization report and a stakeholder-driven draft WPP for Highland Bayou. However, the draft WPP only addressed the bacteria impairment. Guidance from the EPA in 2018 indicated that the DO impairment and flow need to be included for a WPP to meet all requirements for approval as a watershed-based plan.

During fiscal year 2018, the Texas Institute for Applied Environment Research (TIAER) at Tarleton State University, with funding from TCEQ's TMDL program explored options for modeling flow with existing data from surrogate watersheds using various methods. TIAER's goal was to find an acceptable protocol for addressing flow without collecting new data. Once an acceptable protocol was determined, the TCEQ TMDL program began funding a second year (fiscal year 2019) of work to complete the modeling and associated load reduction calculations for both bacteria and DO. In addition to Highland and Marchand Bayous, three new AUs were added to the WPP and the load reduction calculations – Highland Bayou Diversion Canal (segment 2424G_01), Moses Bayou (segment 2431A_01), and Unnamed Tributary of Moses Lake (segment 2431C_01). The load reduction calculations were then used to re-prioritize management measures and complete the WPP.

Partners and Their Role(s): TIAER researched the method for determining flow, and TCEQ's TMDL program performed modeling to calculate load reductions for bacteria and DO, and Texas AgriLife revised the WPP with the new information.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Education and outreach plan due November 2018;
- Updated Highland Bayou WPP website due November 2018; and
- Final WPP due March 2021.

Long-term Outcomes: Improved water quality in Highland bayou watershed.

29. Texas Estuarine Resource Network Citizen Science Program in Galveston Bay

CCMP Actions Implemented: PEA-1, PEA-2, SPO-1, SPO-2, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: TPWD

Total Project Budget: $52,393 ($52,393 from Award #CE-00655006: FY 2017 $25,000, FY 2018 $27,393)

Milestones: The final report completed in May 2020.

Project period: August 2017–August 2020

Status: Completed project.

Objective(s): The goal of this project was to conduct outreach and education on plastic pollution and wildlife entanglement. Project partners developed a working guidance plan much like a Standard Operating Procedure for volunteers who collected information to identify and report injured and sick birds and wildlife in need of aid.

Project Description: This project developed a Seabird Scout Project and a plastic pollution education program to provide educational opportunities for new and existing citizen scientists. These volunteers assisted with documenting and coordinating a response to birds that have been injured by anthropogenic sources and educated the public on the impacts of plastic pollution. Project partners worked with volunteers to coordinate the collection of recycled monofilament fishing line materials and gathered data from, at a minimum of three stations in Galveston County. This helped fill data gaps for area partners installing and maintaining fishing line recycling stations. Because there are limited resources and individuals who are permitted to handle and transport injured birds, an information guidance document pertaining to the TPWD and USFWS permitting process was developed for citizen scientists so they can assist with capture and transport of injured birds and wildlife in the Galveston Bay watershed. The document provides volunteers with information regarding the necessary steps, timeline, and fees required for the permitting process.

Partners and Their Role(s): TPWD provided a memorandum of agreement with Audubon Texas and guidance for developing the permitting process document that was produced by Audubon Texas. Additionally, Audubon Texas conducted public outreach and education and coordinated the citizen scientist activities.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Education and outreach materials;
- Permitting process information document; and
- Installing and maintaining monofilament fishing line recycling containers.
- Final report due May 2020.

Long-term Outcomes: Supporting citizen science training and development and increasing the monitoring knowledge of injured birds and wildlife in the Galveston Bay watershed. Educating the public on the impacts of plastic pollution.

30. Know Your Watershed Educators Summer Institute

CCMP Actions Implemented: FWI-3, NPS-2, NPS-4, PEA-1, PEA-2, PEA-3, PS-1, SPO-1, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: UHCL

Total Project Budget: $38,341 ($38,341 from Award #CE-00655006: FY 2019 $38,341)

Milestones: The final report completed in July 2020.

Project period: September 2017–August 2020

Status: Completed project.

Objective(s): To support formal K-12 education efforts to incorporate Galveston Bay watershed environmental education into classrooms in the region.

Description: The goal of the project was to hold an eight-day summer institute to provide educators with resources and field experiences on environmental education. The focus was on the importance of watersheds, wetland creation and restoration, marshes, storm drain water quality, and benefits of BMPs for citizens that improve water quality. Educators had the opportunity to tour wastewater treatment plants and constructed outfall wetlands for stormwater treatments. Teachers learned how they can use this information in their classrooms, schools, and/or community. Additionally, the project held a one-day symposium for school administrators that addressed questions on what environmental education entails and how they can support classroom teachers to incorporate environmental education into curricula and lesson plans.

Partners and Their Role(s): UHCL partnered with GBF to provide support to create and implement the summer institute and the symposium. Additionally, in-field support was provided by area municipalities and the Armand Bayou Nature Center.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Summer institute and symposium; and
- Final report due July 2020.

Long-term Outcomes: Increase the awareness level of the connection between the natural environment and the impacts that environmental education can have on the public's understanding of water quality and habitat preservation.

31. Blackhawk Park Coastal Prairie Restoration and Education Project

CCMP Actions Implemented: FWI-1, HC-2, HC-3, NPS-2, PEA-1, PEA-2, PEA-3, SC-1, SC-2, SPO-1, SPO-2, SPO-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: HPARD

Total Project Budget: $53,600 ($53,600 from Award #CE-00655006: FY 2019 $53,600)

Milestones: The final report completed in July 2020.

Project period: September 2017–August 2020

Status: Completed project.

Objective(s): Engage the community in restoring a city park to its historic coastal prairie pothole habitat. The project aimed to involve the community in habitat restoration to learn the historic significance of coastal prairie, its benefit to wildlife, and the positive impacts that a prairie site can have on the community.

Description: The City of Houston Natural Resources Management Program targeted 47-acres of undeveloped land within Blackhawk Park for prairie restoration. This area was identified as a historic coastal prairie through satellite imagery and still contains valuable prairie plants. These plants were being crowded out by non-native woody vegetation. Once restored, this park has the potential to provide significant ecosystem functions, habitat value for wildlife, and educational importance for surrounding urban and coastal communities. GBEP funded a 10-acre portion of the park through this project.

Partners and Their Role(s): The City of Houston partnered with the Student Conservation Association to perform habitat management activities focusing on the removal of invasive species. The Student Conservation Association also led community volunteers in planting native grasses and forbs that were grown in the City of Houston's greenhouse by Master Naturalist volunteers.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Quarterly public education and volunteer events; and
- Final report due July 2020.

Long-term Outcomes: Increase the awareness level of the connection between the natural environment and the impacts the public can have on water quality and habitat preservation.

32. Galveston Seawall Recycling

CCMP Actions Implemented: NPS-2, PEA-1, PEA-2, PEA-3, PS-1, SPO-1

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.2 – Increase Transparency and Public Participation

Grantee/Contractor: The Park Board of Trustees of the City of Galveston (PBTG)

Total Project Budget: $18,420 ($18,420 from Award #CE-00655006: FY 2019 $18,420)

Milestones: The final report completed in August 2020.

Project period: September 2017–August 2020

Status: Completed project.

Objective(s): The goal of the project was to provide recycling opportunities along approximately six miles of Galveston's seawall to reduce litter that could become marine debris affecting the stormwater system and Galveston Bay.

Description: This project was an outcome of the Marine Debris Task Force, a collection of various groups including Artist Boat, GLO, Turtle Island Restoration Network, GBF, and National Oceanic Atmospheric Administration Flower Garden Banks National Marine Sanctuary. The Task Force was formed after a workshop meeting in Galveston in 2015 for EPA's Trash Free Waters Initiative. The group identified the need to purchase 20 recycling cans to place at seawall bus stops as well as a six-compartment recycle stations that can be moved based on areas of highest need, particularly during special events. The project leveraged $58,500 of in-kind contributions from PBTG. The Back the Bay message and logo was incorporated on the recycling cans.

Partners and Their Role(s): PBTG partnered with Artist Boat to coordinate efforts to deploy the recycling receptacles.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration:
- Recycling receptacles;
- Map of where recycling containers are located; and
- Final report due August 2020.

Long-term Outcomes: Increase the awareness level of the connection between the natural environment and the impacts that the public can have on water quality.

33. Galveston Bay Intertidal Oyster Reef Mapping and Analysis

CCMP Actions Implemented: SC-1, ACS-2, RES-1, RES-3

EPA's Strategic Plan Measures Implemented: Goal 1 – A Cleaner, Healthier Environment, Objective 1.2 – Provide for Clean and Safe Water; Goal 2 – More Effective Partnerships, Objective 2.1 – Enhance Shared Accountability; Goal 3 – Greater Certainty, Compliance, and Effectiveness, Objective 3.3 – Prioritize Robust Science

Grantee/Contractor: UH

Total Project Budget: $64,883 ($64,883 from Award #CE-00655006: FY 2019 $64,883)

Milestones: The final report was completed in March 2021.

Project period: September 2018–January 2021

Status: Completed project.

Objective(s): This project created a complete GIS database of oyster reef habitat in Galveston Bay while simultaneously assessing intertidal oyster population dynamics and community structure on selected reefs.

Project Description: Intertidal oyster shell reef locations in Galveston Bay have not been extensively mapped on a large scale in the last 20 years. Small scale exploratory projects have been conducted in Bastrop Bay and the Carancahua reef area in West Bay by UHCL EIH. Obtaining information on past intertidal reef locations provides baseline data that can be used as a benchmark for analyzing restoration techniques in the bay and monitoring future growth/loss of habitat.

The project used 2015 Texas Orthoimagery Program aerial photography to build historic intertidal reef datasets. The Texas Orthoimagery Program data was recorded in a 0.5 m resolution, providing a higher quality image for habitat reclassification than other publicly available images.

After obtaining GIS created shapefiles of possible intertidal reef locations, ground-truthing was conducted on a sub-sample of locations to validate the analysis and collect current elevation data with a sub-meter accuracy Global Positioning System unit. On a sub-sample of the mapped intertidal reefs, oyster population characteristics were assessed. These metrics included oyster abundance, size demography, reef structure (overall percent cover of shell, percentage of live oysters, and rugosity), and oyster condition (provides a relative index of oyster health). Additionally, the benthic associated macrofauna was excavated and community composition determined. This community analysis not only indicates the value of Galveston Bay intertidal reefs as habitat but also provides a relative indication of the value of this habitat type for mobile nekton and birds.

Partners and Their Role(s): Black Cat GIS and Biological Services created the GIS shapefiles and developed the online Story Map and Gulf Coast Bird Observatory helped to assess the community structure on selected oyster reefs.

Outputs/Deliverables:

- Quarterly progress reports until contract expiration;
- Final shapefiles showing intertidal oyster reef habitat due January 2021;
- Final white paper due January 2021; and
- Final report due January 2021.

Long-term Outcomes: A complete GIS database of oyster reef habitat in Galveston Bay while simultaneously assessing intertidal oyster population dynamics and community structure on selected reefs**.**