

Action Plan. This is a series of three action plans that address issues common to all five Gulf states. The first plan was implemented in 2006 through a cooperative consensus-based approach. The Governors' Action Plan is updated every 5 years. In 2016, marine debris was identified as a concern that needed to be addressed in Action Plan III, and the Marine Debris Cross-Team was established.

The Galveston Bay Plan, 2nd Edition was also consulted as a guidance document for the AD Action Plan. The Galveston Bay Plan is the comprehensive conservation and management plan for the Bay. This plan is based on a scientific characterization of the estuary and is developed and approved by a broad coalition of stakeholders.

Following a second Trash Summit and a series of conference calls in 2018, stakeholders developed an

A **stakeholder** can be an elected official, government employee, nonprofit organization employee, local business owner, landowner, volunteer, recreational bay user, or industry representative. A **partner** is any person, group, or entity actively working in the Galveston Bay Watershed to implement the Galveston Bay Watershed Aquatic Debris Action Plan.

outline for the proposed regional plan. Participants reviewed their common goals and practices and examined existing litter abatement efforts in the Galveston Bay watershed, including projects in Fort Worth and Dallas. Stakeholders also identified potential strategies and evaluated possible solutions that would prevent and reduce land-based litter and marine debris in the Houston-Galveston region.

Stakeholders tied this evaluation to three major goals for the initial draft plan. Each goal includes several litter abatement strategies and associated tasks,

including examples of current litter-related efforts in the Galveston Bay watershed. The structure of the AD Action Plan is designed to be open-ended and inclusive so that it can be adapted to future successes and new challenges.

The purpose of the AD Action Plan is to serve as a guidance document and a central point of reference for improved collaboration and coordination among the multitude of stakeholders across the Greater Houston-Galveston region, and to avoid duplication of work while enhancing the strength and efficiency of their efforts. The AD Action Plan is not intended to be a regulatory document or specifically binding.

Goal 1: Conduct High Quality Research and Needs Assessment

It is imperative to know the sources, types, and amounts of litter and trash and the hotspots in the region for litter and trash accumulation. This litter generation and deposition data is instrumental in the implementation of proposed prevention, outreach, education, removal, and research efforts. While several entities are documenting cleanup efforts throughout the area, the Houston-Galveston region does not currently have an ongoing effort to document trash and litter in a single database. The most recent regional study that conducted field work to assess the scope of litter and trash problem was conducted in over 25 years ago (Morgan and Lee, 1993). In 2018, the Galveston Bay Report Card (www.galvbaygrade.org, 2017) determined that litter and trash are a major concern of the Houston-Galveston region's residents and visitors, but little has been done to define and understand the growing trash and litter problem in bayous throughout the Houston-Galveston region. New and accurate data are essential to address the underlying causes of this serious problem. Research data will be critical in developing and executing a cost-effective and efficient regional action plan. It is necessary to determine

best methods to assess the type, quantity, and source of trash and litter found on land, and area waterways. Stakeholders identified six strategies, outlined below, to aid in achieving Goal 1.

Strategy 1.1 Identify Resources, Current Efforts and Costs of Current Efforts

Task 1.1.1 Create a digital resource that identifies regional efforts (e.g. cleanups, education events and campaigns, etc.) and assets of each organization involved to prevent and remove litter and marine debris. Listed are examples of efforts that could be included:

- Review Municipal Separate Storm Sewer System (MS4) permits and Stormwater Management Plans of regional permittees for their floatables outreach and management plans;
- Cleanup spot sponsors and support programs;
- Cleanup activities documentation, either qualitative or quantitative;
- Resources for policies and best practices of debris management;
- Texans for Clean Water’s report “The Cost of Litter & Illegal Dumping in Texas” that includes costs spent by 9 cities across Texas;
- Endeavor to capture public and private sector costs, as well as costs for different types of efforts, such as clean-up, outreach, etc.;

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Task 1.1.2 Convene Research Subcommittee annually to foster partnerships, collaboration, and expand knowledge base.

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Strategy 1.2 Data Gap Assessment to Prioritize Needs

Task 1.2.1 Perform data characterization to frame and understand current data sets, including metadata availability (quantity and quality of data, dates available, geographic regions available).

Task 1.2.2 Create a forum for governments, nonprofits, and researchers to analyze data gaps, improve collaboration, and share data.

Task 1.2.3 Establish baseline datasets that will comprise the following for litter and marine debris for the region:

- estimated quantity of regional litter and aquatic debris;
- composition of regional litter and aquatic debris;
- hotspots of aquatic debris;
- costs of removing litter and aquatic debris;
- cost-based recycling and re-use options;
- costs associated with impacts of litter and aquatic debris;
- costs of educating the public on litter and aquatic debris prevention;
- estimated volumes/types of litter and aquatic debris removed annually;
- education/communications resources; and
- locations/quantity of abandoned and derelict vessels.

Strategy 1.3 Develop understanding of life cycle, transport, quantity and accumulation rate of litter and marine debris

Task 1.3.1 Identify research priorities for life cycle assessments of litter and marine debris. Establish priorities for research to improve knowledge about ecological and economic impacts.

- Perform gap assessments and evaluate lessons learned from research priorities. *Examples include:*
 - Identify and develop database for information on entanglement/ingestion, and habitat;
 - How to increase access to and share data;
 - Identify hotspots;
 - Identify/develop a regional model and/or trend analysis to inform decision making;
 - Review research on wildlife interactions with, and impacts of, litter and aquatic debris that include plastic pollution, microplastics cycling and uptake by wildlife, hotspots of interactions, health and risk assessment, long-term and cumulative effects.

Task 1.3.2 Evaluate effectiveness of Best Management Practices for removal and prevention of litter and aquatic debris. Search for existing BMPs to evaluate from water and from land.

Task 1.3.3 Identify emergency response protocols and identify/develop regional strategies to reduce impacts on wildlife habitats.

Strategy 1.4 Monitoring

Task 1.4.1 Identify organizations that use aquatic debris containment systems and determine whether they quantify and characterize types of debris that are collected. Analyze existing data and emphasize ongoing quantification and develop a protocol for data uniformity.

Task 1.4.2 Compile data from selected cleanup organizations. Determine whether monitoring is part of the initial clean-up activities and is ongoing.

- Compare cleanup sites to litter and debris accumulation sites to evaluate and monitor impact of cleanup sites.

Task 1.4.3 Using data gaps assessment (conducted in Strategy 1.3) and results from Tasks 1.4.1 – 1.4.2, develop monitoring priorities.

- Short-term and long-term.
- Identify possible funding sources.

- Use forum from Task 1.2.2 to communicate priorities and get updates on status of priorities.

Strategy 1.5 Establish Standardization (Metrics and Metadata)

Task 1.5.1 Review programs that implement data collection methodologies to select or create an effective and proven methodology for region.

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Task 1.5.2 Develop a new data management collection system, or adapt a successful one, using relevant facts and details from Houston-Galveston region, and then establish a communication strategy that promotes information inputs from other regional organizations.

Task 1.5.3 Identify metadata on land-based and water-based debris that are aligned to the following elements: a) Open and Nearshore Water b) Shoreline c) Deep and Nearshore Sediments d) Fisheries e) Water Infrastructure (wastewater systems, stormwater).

Task 1.5.4 Using same established methodologies for review from Task 1.5.1, develop monitoring protocol and metadata criteria. Include all parameters: optimal (must have) to minimal (would be nice to have) requirements.

Strategy 1.6 Research Effectiveness of Communications Campaigns

Task 1.6.1 Develop and monitor communications metrics to assess effectiveness.

Task 1.6.2 Develop strategies to determine effectiveness of outreach campaigns.

Goal 2: Reduce Land-Based and Water-Based Debris through Prevention

The lower Galveston Bay watershed is home to a diverse population of more than 10 million people (as of 2019). The watershed’s residents produce about 11.3 million pounds of plastic litter² waste² per day, totaling nearly 3 billion pounds per year, according to ?.

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According to a 2009 study on littering, about 85% of littering is the result of individual attitudes (KAB, 2009). Changing individual behavior is key to preventing litter. Most littering behavior (81%) occurred with notable intent. This included dropping (54%), flick/flip of the item (20%), and other littering with notable intent (7%). According to the Don’t Mess With Texas (DMWT) litter survey conducted in 2019, visible litter along Texas highways (maintained by Texas Department of Transportation) decreased 17% between since the last survey was conducted in 2013. “The decrease in visible litter occurred despite estimated rises in both adult population in Texas (10.3%) and traffic levels statewide (12.7%) (Texas Litter Survey, 2019). Micro litter, defined as items smaller than two square inches in which cigarette butts are the largest contributor, increased by 90% according to the DMWT 2019 survey. A 2017 DMWT attitudes and behavior study indicated half of the respondents admitted to littering. The self-reported

items most littered were food and organic materials and small pieces of paper, and 69% of smokers admitted to littering cigarette butts.

However, ongoing population growth will continue to put pressure on litter abatement efforts. Even if litter is reduced on a per capita basis, greater population will still tend to result in more litter. As urbanization and population increase, local stakeholders and communities must develop novel and collaborative strategies to reduce litter. Galveston Bay watershed stakeholders must ensure that messaging is as unique and diverse as the communities themselves. Identifying the sources of trash is complex. Strategies that can be deployed in a multi-level approach will create unique partnerships to help disseminate the litter abatement message. Tapping into the resources, talents, and stewardship of diverse groups, from education and the arts, to merchants and businesses, will empower area residents and visitors to take pride in a clean Galveston Bay watershed for generations to come.

Strategy 2.1 Increase Awareness and Change Behavior

Task 2.1.1 Identify education/communications resources that are currently available and identify gaps on content and style/type.

Task 2.1.2 Create new or adapt existing educational/communications resources that target specific segments in the region focused on specific behaviors to foster sustainable behavior changes.

Task 2.1.3 Work with regional partners to conduct “train the trainer” webinars and workshops to implement sustainable behavior changes throughout the watershed.

Task 2.1.4 Engage tourism industry, marketing organizations, and agencies to help develop creative marketing/communications strategies for businesses to encourage behaviors that support sound sustainability practices.

Task 2.1.5 Partner and collaborate with visual and performing arts organizations to communicate the impacts of trash, plastic pollution, litter and marine debris and to highlight projects and exhibits focused on reusing, reducing and recycling and eliminating trash and plastic pollution.

Task 2.1.6 Engage schools and school districts to incorporate trash and plastic pollution lesson plans into classrooms.

Task 2.1.7 Increase capacity for education and infrastructure for regional boater litter disposal.

Task 2.1.8 Disseminate information to boaters through outreach events (e.g. boat shows, fishing tournaments and local events).

Task 2.1.9 Increase partnerships with marina managers, encouraging them to develop programs and outreach efforts within their own facilities. Conduct workshops and webinars for marina managers and marina staff on best management practices for litter abatement.

Task 2.1.10 Work with local governments to identify communication gaps and developing resources and materials.

Task 2.1.11 Promote existing vessel turn-in programs and identify needs/gaps and causes of abandoning vessels.

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Strategy 2.2 Promote and Encourage Producer and Merchant Responsibility

Task 2.2.1 Develop a plan and encourage regional food service leadership organizations to increase use of sustainability and conservation practices, suppliers and products.

Task 2.2.2 Create programs/opportunities addressing the reduction of single-use plastic items.

Task 2.2.3 Work with regional partners to conduct “train the trainer” webinars and workshops to implement sustainable behavior changes throughout the watershed.

Task 2.2.4 Engage advocacy groups and decision makers in trash and plastic pollution public policy education.

Task 2.2.5 Foster creative problem solving for reducing trash and plastic pollution sources and/or removing existing litter by identifying cost-based recycling, re-use, and removal options.

Task 2.2.6 Target policies/strategies to address source issues.

- Engage local industries, manufacturers and merchants to increase corporate responsibility for the end of life of products.
- Work with manufacturers to reduce volume of plastic packaging.

Strategy 2.3 Enhance Efforts to Support Waste Reduction

Task 2.3.1 Compile and disseminate information to local governments and organizations to foster use of best practices at special events.

- Collect and disseminate information on best practices for event planning/managing for outdoor public events to improve debris disposal, recycling, and reduce single-use plastics.
- Collect and disseminate information (plans, documents, articles) on best practices for bin management, signage, and communication.
- Identify ways to reduce deposition of balloons, balloon strings, confetti, beads, and other celebratory items.
- Identify ways to reduce litter escape during transit from commercial and residential vehicles as well as waste management vehicles.

Task 2.3.2 Organize expert workgroups to collect information, review and prioritize needs/opportunities that reduce water-based debris for beaches, rivers, waterfront parks, bridges and piers.

Task 2.3.3 Maintain online resources including a website (donttrashagoodthing.org), and promote/create other online tools that share existing resources. Develop new documents including tip sheets, lesson plans for educators, PowerPoint presentations, guidance plans etc., and make them available online.

Task 2.3.4 Support knowledge sharing between local, regional, and state organizations.

- Develop a plan to facilitate/encourage region and state-wide collaboration and knowledge-sharing activities which connect civic organizations, municipal organizations, and nonprofits/environmental organizations.
- Disseminate available resources for outreach and volunteer training, adoption programs, tools for cleanup efforts, and education materials.
- Disseminate effective communication strategies and research data to neighborhood associations, local businesses, and advocacy groups.

Task 2.3.5 Increase incentives for reusable bags and enable the reduction of single-use plastics and plastic bags,

Task 2.3.6 Increase water refill stations and promote reusable water bottles/ drink containers.

Goal 3: Support and Sustain Removal of Aquatic Litter and Marine Debris

It is essential to develop strategies to support and sustain removal of litter and marine debris. Litter cleanup, either through single-day events or long-term efforts, helps by cleaning specific areas, especially those with ongoing issues. The action plan is developed to address strategies to support regional removal efforts to reduce the impact on natural resources, navigational safety, and the economy. There are three categories for the removal strategy. The first category includes litter and illegal dumping, identifying hot spots, promoting and supporting cleanups, and utilizing appropriate physical mechanisms to prevent litter and marine debris accumulation.

Emergency response to litter and marine debris is the second category. Unexpected catastrophes result in potentially large and hazardous amounts of litter and marine debris. Preplanning for removal strategies is crucial and requires a high level of structure and organization. In 2019, NOAA worked with state and federal agencies, nonprofits, and citizens and developed the Texas Marine Debris Emergency Response Guide. The guide provides organization roles and responsibilities and captures the most likely response structure and actions for effective response.

The final category is large debris. In the Houston-Galveston region this commonly refers to abandoned and derelict vessels and submerged automobiles. This type of debris requires specialized procedures and resources.

Regardless of the type of litter and marine debris to be removed and the location of the removal, having a plan and building partnerships will go a long way to achieving removal goals

Strategy 3.1 Removal of Traditional Debris

Task 3.1.1. Promote and Support Cleanups

- Advertise, endorse and volunteer for cleanup efforts

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Task 3.1.2. Identify Debris Hot Spots

- Work with local governments and other groups to identify debris hot spots.
- Identify, develop, or adapt best management practices to target specific environments or debris types and share with stakeholders.
- Promote the use of online tools and smartphone apps for reporting pollution.
- Engage residents, businesses and industries, in service-learning projects to prevent and remove litter and marine debris.

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Task 3.1.3. Enhance Efforts to Utilize Physical Mechanisms to Prevent Litter from Becoming Marine Debris

- Support the use and maintenance of appropriate trash capture technologies that can be deployed at different locations, when and where practicable, including:
 - Storm drain inlets, the entry points to the stormwater system,
 - In-line, within the pipes or at outlet of stormwater systems, and
 - Open-water, such as a floating boom or trash vacuum boat, in the receiving water body.
- Identify funding sources for the placement and regular maintenance of trash/recycling containers in public and private spaces; including parks, recreational facilities, boat ramps, marinas, public beaches, retail/commercial shopping centers, etc.
- Support installation of target trash receptacles (eg. cigarette butt canisters, fishing line receptacles, trash cans with messaging).

Strategy 3.2 Removal of Disaster Debris

Task 3.2.1 Review the Texas Marine Debris Emergency Response Guide for existing disaster debris reporting, response, clean-up deployment, and reporting systems to ensure this region is prepared-

Task 3.2.2 Provide year-round stakeholder education about separation of disaster debris to facilitate removal and proper disposal by type of item: household trash, vegetative debris, construction and demolition debris, appliances, electronics, hazardous household waste, etc.

Task 3.2.3 Develop local government debris management workshops that will facilitate advanced planning for debris removal.

Task 3.2.4 Provide resources to coordinate with government/industry agencies for rapid response to debris from a catastrophic manmade or natural event, focusing on the impact of the debris on humans, wildlife, and habitat and aiding with removal that protects those interests.

Strategy 3.3 Increase Capacity for Large Debris Removal

Task 3.3.1 Support efforts to remove abandoned vehicles from the region's rivers, lakes, bayous, and bays.

Task 3.3.2 Identify organizations willing to take responsibility for leading specialized cleanups for large marine debris items.

Task 3.3.3 Work with local groups addressing abandoned and derelict vessels (ADV) to identify successful strategies and potential improvements.

Task 3.3.4 Identify how ADVs are reported, potentially developing a regional reporting and tracking strategy of ADV locations, dates, and responses. (Also included in Goal 1: Research)

Task 3.3.5 Identify additional funding sources for ADV removal.

***List of Stakeholders participating in Partners in Litter Prevention**

American Bird Conservancy, Artist Boat, Audubon Texas, Bayou Preservation Association, Black Cat GIS, Brazoria County Parks Department, Buffalo Bayou Partnership, City of Galveston Island Park Board of Trustees, City of Houston, City of Nassau Bay, City of Pearland, Galveston Bay Estuary Program, Galveston Bay Foundation, Environmental Protection Agency, Flower Garden Banks National Marine Sanctuary, Harris County, Harris County Flood Control District, Houston Advanced Research Center, Houston Audubon, Houston-Galveston Area Council, Houston Parks Board, Houston Wilderness, Houston Zoo, Lee College, Moody Gardens, National Oceanic and Atmospheric Administration, Plastic Pollution Prevention (P3) Partnership, Port Houston, Texans for Clean Water, Texas Conservation Fund, Texas General Land Office, Texas Parks and Wildlife Department, Turtle Island Restoration Network

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