2 Introduction

The Galveston Bay estuary is a unique and productive biological system that is located in Southeast Texas and includes much of the Houston-Galveston metropolitan area. The shores of the bay are flanked by urban, industrial, and agricultural land uses. Bay waters support productive commercial and recreational fishing industries, industrial and municipal water uses, shipping, and recreational activities. With so many activities depending upon a healthy ecosystem, it is important that the parameters pertaining to the system's health be monitored and analyzed on a regular basis. It is also important for the information describing the health of the bay to be available in a form usable by resource managers and the public.

The History and Nature of the Bay

Galveston Bay has a history of human use going back thousands of years, providing food and implements to indigenous peoples long before Europeans visited the bay's shores. Since 1845 a pattern of resource use has developed that is common to other estuaries in the United States. Thus the bay has been a source of materials for industrial, agricultural, and urban development, as well as a recipient of waste from those developments.

Galveston Bay is a 600 square mile sub-tropical estuary fed by two major rivers and numerous bayous and is bordered by low-lying wetlands, a barrier island, and a peninsula. Bay waters are generally quite shallow and in some places made shallower by extensive oyster reefs. The Bay has increased in volume over the last 50 years due to subsidence, sea level rise and dredging. The bottom sediment is mostly fine-grained material, mud, silt and sand, mixed in some places with shell. On average the tidal amplitude is small compared to estuaries on the Atlantic and Pacific coasts, averaging about 0.3 meters. Circulation is primarily driven by wind and the minimal tides.

Bay productivity is high. Galveston Bay has supported large fisheries for oysters, shrimp, blue crab, and finfish for more than 50 years. The energy and nutrients for animal production come from two sources: 1) the algae and seagrasses that grow in the open bay and are eaten as living tissue by herbivores, and 2) the detritus coming primarily from dead plants in the salt marshes and riverine wetlands around the bay. In addition to aquatic animals, large numbers of water birds depend on the productivity of Galveston Bay, both as residents and as over-wintering populations.

The physical and biological nature of Galveston Bay is described in detail in State of the Bay 2nd edition (Lester 2002). The 2004-2006 Status and Trends report, will provide updated analyses of monitoring data to add detail to the picture of Galveston Bay that has already emerged from the work of many experts.

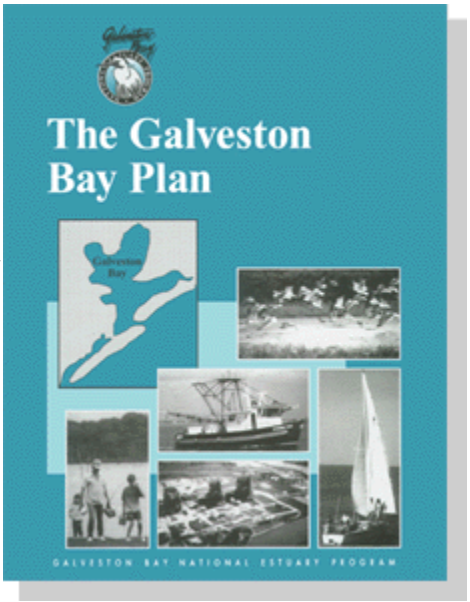
User Impacts

The Bay has many user groups and each group impacts the physical and biological systems of the bay in its unique way. Fishermen use the bay for commercial and recreational fishing, thus impacting the flow of energy through the ecosystem, the mortality rates of many species, the topography of the bottom, and the turbidity of the water. Industry uses the water of the bay and its tributaries for cooling purposes, impacting water temperature and mortality rates of species through entrainment and impingement. Industry also uses bay and tributary waters as an end location for wastewater effluent discharges, which are regulated sources of both organic load and other contaminants. Barge and vessel transportation impact the bay through channel dredging, dock construction, water turbulence, fuel and pollutant spills, and non-indigenous species dispersal. Recreational boaters have similar, but lesser impacts. Residents use the bay for discharge of treated sewage and non-point source run-off from their property and nearby roadways, impacting the concentration of pollutants.

With so many uses and subsequent impacts on such a vital ecosystem, it is important to monitor the bay's physiological and biological condition. Data supplied by long-term monitoring and assessment programs provide an historical context within which to compare present day water quality and biodiversity information. This "big picture" view over time can give resource managers, resource users and scientists an indication of whether conditions in the system are improving as a result of management, conservation, and restoration efforts or whether conditions are deteriorating, thus necessitating a response from managers and the regulatory community. It is the authors' hope that the Status and Trends report provides such an historical context.

Relationship to *The Galveston Bay Plan*

The stakeholder-led Galveston Bay Estuary Program (GBEP), formerly the Galveston Bay National Estuary Program, is a program of the Texas Commission on Environmental Quality (TCEQ). The GBEP was established in 1989 to develop a Comprehensive Conservation Management Plan (CCMP) for the Galveston Bay system. The CCMP for the Galveston Bay area is called *The Galveston Bay Plan* (*The Plan*), a consensus-based program to manage Bay resources with fewer negative impacts and to restore components of the bay system impacted by poor management decisions made in the past. *The Plan* has many goals that relate to the well-being of the bay. The ability to assess progress toward those goals is constrained by the information that can be extracted through the monitoring of selected parameters.



The Status and Trends Project is primarily focused on data collected by agencies under quality assurance project plans (QAPPs) that are or could be approved by the U.S. EPA. Trends in parameters or groups of parameters, as well as status of indicator parameters, will permit assessment of the health of the bay and its associated resources.

The data used in this report as supportive evidence are the result of various public monitoring programs run by federal, state, and local government agencies. For the most part, these monitoring programs were initiated following the passage of environmental protection laws in the 1960s and early 1970s. Water and sediment quality monitoring programs are the direct result of federal and state clean water legislation (i.e. the 1965 Federal Water Quality Act, the 1967 Texas Water Quality Act, and the 1972 Federal Clean Water Act). Monitoring of living resources is tied to the concern for wildlife embedded in environmental and fish and game legislation.

Most of the monitoring programs upon which Status and Trends analyses depend have been consistently maintained for more than 20 years. Some monitoring programs have been intermittent and contain spatial and temporal gaps, which often make the calculation of trends difficult and at times impossible. While the intent of this report is to inform the reader regarding changes in the bay, the report cannot elucidate changes that have occurred over a longer temporal period than covered by the data, nor in areas not adequately sampled.

Management of Bay resources and implementation of *The Plan* will be aided by the elimination of potential gaps in data collection and by implementation of some recent monitoring programs, e.g. wetlands permit and mitigation tracking and Texas Department of Health (TDH) health consultations.

Description of the Project

The GBEP originally collected all the known relevant data related to the environmental management of Galveston Bay in the early 1990s when *The Plan* was developed. These data sets were interpreted and the results were disseminated, but the data sets were not maintained for future management decisions. A decision was made in 2000 to repeat the process and to maintain the data in a consistent, updateable format. Since the 2000 Status and Trends Project, the GBEP, and its advisory Galveston Bay Council (GBC), have recognized the value of maintaining the Status and Trends databases. This project is a continuation of the 2000-2002 and 2003 efforts. As in the past, these data will be analyzed to make judgments on the status and trends of resources and processes forming the Galveston Bay ecosystem.

The Status and Trends Project compiles, manages and analyzes much of the monitoring and environmental impact data collected by state, federal and local agencies with quality assurance procedures and long-term records of or commitment to monitoring and managing Galveston Bay. The data is processed into a consistent format, stored in secure databases and the analytical results are made available to users over the Internet (see Section 3.6.2). In 2004 the Galveston Bay Indicators Project developed a suite of indicators describing the state of ecological resources and human uses of those resources. The Status and Trends Project updates those indicators annually for inclusion on the Status and Trends website (www.galvbaydata.org) and in the Status and Trends Final Report.