Galveston Bay Status and Trends Project 2007-2008

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Year 1 Progress Report

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Texas Commission on Environmental Quality
Galveston Bay Estuary Program
17041 El Camino Real, Ste. 210
Houston, Texas 77058

Project Coordinator
Steven R. Johnston
SJohnsto@tceq.state.tx.us

Prepared By:

Geotechnology Research Institute (GTRI)
Houston Advanced Research Center (HARC)
4800 Research Forest Drive
The Woodlands, Texas 77381

Principal Investigator
Lisa A. Gonzalez
lgonzalez@harc.edu

L. James Lester
jlester@harc.edu

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www.galvbaydata.org

Table of Contents

Tables and Figures

Tables

Figures

1 Introduction

The Galveston Bay Estuary is located in Southeast Texas adjacent to the Houston-Galveston metroplex. The shores of the bay are bordered 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. The use of bay resources depends upon and reciprocally impacts the functional health of the bay ecosystem. It is, therefore, important to regularly assess indicators describing the current state of and historical trends in bay health and resource use. It is also important for the resulting information to be available in a form usable to resource managers and the public.

The stakeholder-led Galveston Bay Estuary Program (GBEP) of the Texas Commission on Environmental Quality (TCEQ), formerly the Galveston Bay National Estuary Program, was established in 1989 to develop a comprehensive conservation management plan (CCMP) for the Galveston Bay Ecosystem. The CCMP for the Galveston Bay area is called *The Galveston Bay Plan* (*The Plan*). The principle function of *The Plan* is to leverage resources--funding and expertise--for more efficient resource management. *The Plan* outlines a series of goals and links a set of specific initiatives to the identified priority issues for Galveston Bay.

For more than 40 years federal, state and local agencies and organizations have monitored the health of Galveston Bay. Databases describing the bay's water and sediment quality, living resources, fisheries landings and seafood safety are just a few of the many that exist. The intention of this project is to apply these data to the management issues raised in *the Plan* regarding the health and integrity of the bay.

The Project Goal

The goal of the Galveston Bay Status and Trends Project is to compile, manage, analyze, and disseminate monitoring and environmental impact data collected by organizations with quality assurance procedures and long-term records of or a commitment to monitoring and managing Galveston Bay resources. The goal is achieved through the following objectives:

1. Data are obtained, quality assured, and processed into standardized formats and stored in secure databases;
2. Data are analyzed to update established indicators of bay health according to priorities set by the relevant GBC subcommittees with approval of the GBC; and
3. Analytical results will be disseminated to the GBEP, GBC, GBC subcommittees, other stakeholders and the public via the project website, presentations, and GBEP outreach materials.

This progress report outlines the progress made in Year1 of the current Fiscal Year (FY) 2007-2008 project. In Year 1, many of the databases were updated and several analyses were completed. The work will be continued in Year 2 with the update of databases for which updates were not available in 2007 and the completion of all data analyses and public outreach and education products.

Project Background

With guidance from GBEP staff, the 41-member Galveston Bay Council (GBC) and the GBC Monitoring and Research Subcommittee, the Galveston Bay Status and Trends Project will utilize historical and recent data collected for Galveston Bay by a number of federal, state and local agencies and organizations. The Status and Trends Project will acquire, manage and analyze this data. Ultimately the Status and Trends Project will make results of the data analyses available to the public in summary form through a final report and issue-oriented web pages residing on the Status and Trends data website (www.galvbaydata.org).

The GBEP originally compiled the relevant data related to the environmental management of Galveston Bay in the early 1990's. These data sets were interpreted, but not maintained for future management decisions. A decision was made in 2000 to repeat the compilation process and to maintain the data in a clearinghouse. Since the 2000 Status and Trends Project, the GBEP and the GBC have recognized the value in maintaining the Status and Trends database. This project will continue that work. As in the past, data will be analyzed to make judgments on the status and trends of resources and processes forming the Galveston Bay system and Lower Galveston Bay Watershed. Data quality objectives will be established in consultation with the agencies that provide the data sets and the GBC subcommittees that provide priorities for the Status and Trends Project.

The website and final report are organized according to issue/data type (water quality, fisheries resources, seafood safety, etc.). Contributing agency programs, their quality assurance procedures, the parameters for which values are obtained, and associated metadata are described as available. Summaries of data by month, year and sampling area are maintained and recorded in Status and Trends Project documentation. All statistical programs used to produce output submitted to the GBEP project manager are documented as well as the form and content of the output.

Records produced by this project consist of databases in several stages of quality beginning with the raw data acquired from the cooperating agencies and progressing through stages of compilation and purging of data that cannot be properly qualified or validated. The raw data consist of all data contained in the data archives of the cooperating agencies and collected from the spatial domain of Galveston Bay and its watershed. Progress reports on data processing and analysis are submitted quarterly.

This project does not perform any sampling. Sampling process design is the responsibility of the agencies collecting the data. All of the data employed in this project are non-direct in that they are obtained from the agencies that conducted the direct measurements. The entire project is limited by the data collected and stored in databases maintained independently by resource agencies.

Data quality is an issue is always addressed. As stated above, quality assurance procedures employed by the agencies are described. All data are accepted from agency sources, but are subject to a validation process. The intention is to apply historical data to the management issues raised in *The Plan* regarding the health and integrity of the bay. If data are validated and agency

quality assurance procedures are noted, the only limitations on use of the data are set by the sampling requirements of the various statistical tests and procedures.

This project is built upon the use of computing and electronic communication resources for the transfer, processing and maintenance of the data. Three data servers (one for GIS data and applications, one for project data files, and one for website products and associated backend databases) with dual processors and high capacity, redundant hard drives are dedicated to this project. All of the other computing resource components are part of the HARC computing network. HARC employs security software and security protocols to protect data from virus infection and tampering by unauthorized users. The HARC network and the Status and Trends servers administer user rights using password protection to limit access to the data files. The data servers are equipped with a tape backup and an archival system to provide additional security. The servers also have emergency power supplies.

2 Project Methodology

2.2 Data Collection

2.2.1 General Data Processing Procedures

The Galveston Bay Status and Trends Project compiles, manages and analyzes monitoring and environmental impact data collected by organizations with quality assurance procedures and a long-term commitment to monitoring and managing the natural resources of Galveston Bay. To date, the Galveston Bay Status and Trends Project maintains more than 50 databases from 25 agencies and organizations (see Appendix A). The databases characterize the Lower Galveston Bay Watershed by describing water and sediment quality, living resources, habitat quantity, seafood safety, freshwater inflows, and human uses of resources such as shipping, recreational boating, and commercial and recreational fishing.

The period of record for each data set varies. Some contain recent data that date back to the late 1990s while others date back to the early 1920s. The variability in the period of record is due to multiple factors including but not limited to 1) the length of time a monitoring program has been in existence and 2) the ability of agencies to quality assure older monitoring data. The Status and Trends Project strives to maintain the most recent versions of data; updating each database annually.

Many of the data sets acquired by the Status and Trends Project have a spatial coverage that is much larger than the spatial scope of this project. For the purpose of this project, data are limited to those collected from monitoring stations located within the Lower Galveston Bay Watershed as defined by the Galveston Bay Segmentation Scheme originally developed for the Galveston Bay National Estuary Program in 1992 (Jones and Neuse 1992) and modified by the Status and Trends Project in 2003 (see Figure 1).

Subbays:

1. Christmas Bay Complex
2. East Bay
3. Trinity Bay
4. Upper and Lower Galveston Bay
5. West Bay

Tributaries:

6. Armand Bayou
7. Bastrop Bayou
8. Buffalo Bayou
9. Cedar Bayou
10. Chocolate Bayou/Bay
11. Clear Creek/Lake
12. Dickinson Bayou/Dickinson Bay
13. East Intracoastal Waterway
14. Galveston Channel
15. Houston Ship Channel
16. Oyster Bayou
17. San Jacinto River
18. Texas City Channel
19. Trinity River

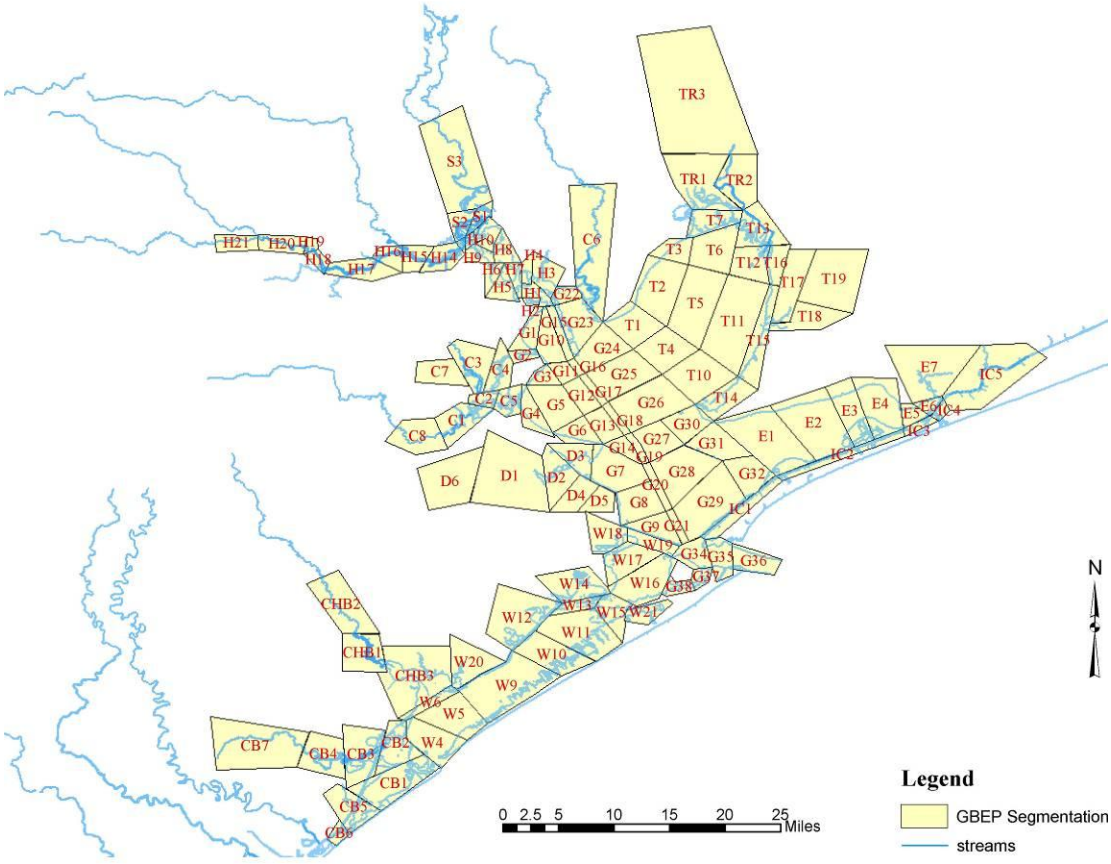

Figure 1. Tributaries and subbays of Galveston Bay per the Galveston Bay Segmentation Scheme as modified by the Status and Trends Project in 2003.

All databases managed by the Status and Trends Project are processed according to methodologies detailed in a Quality Assurance Project Plan (QAPP) (see Figure 2) approved by the Texas Commission on Environmental Quality (TCEQ).

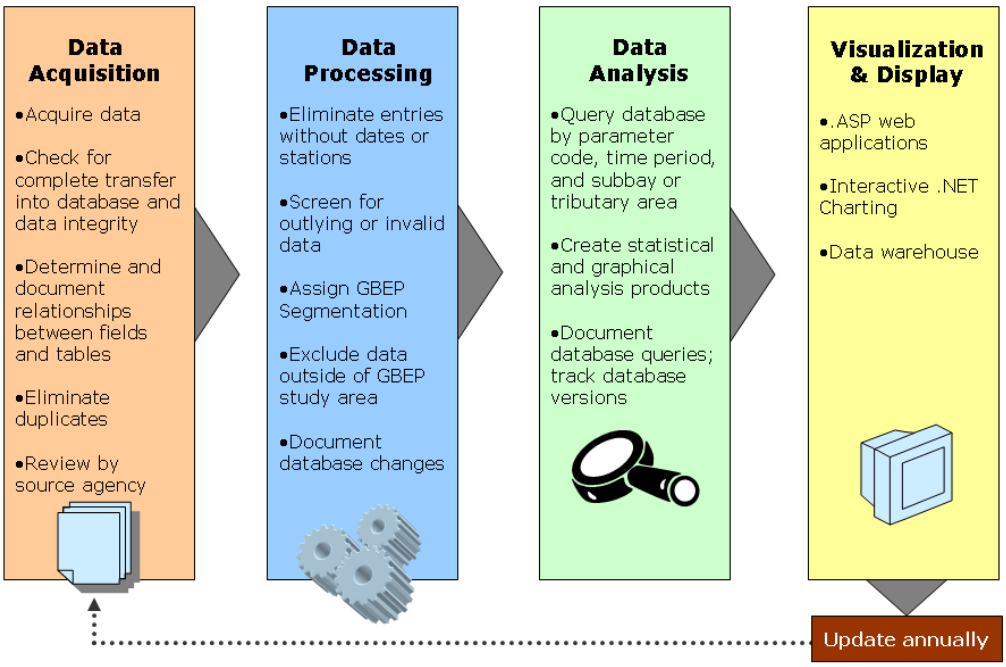

Figure 2. Data acquisition and processing methodology for data acquired by the Galveston Bay Status and Trends Project.

2.2.2 Data Sources – Major Updates in 2007

Program Element 1 of the Project Work Plan requires that databases be updated on an annual basis. This section outlines the progress made toward this task in FY 2007. In total, updates for 30 databases were attempted. In some instances data updates were not available in FY 2007. Every effort will be made to update the remaining databases in FY 2008. Please see Appendix B for a list of all databases updated in FY 2007. Descriptions of major database updates are provided below.

Water and Sediment Quality: Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) maintains a Surface Water Quality Monitoring (SWQM) database which contains data describing physical, chemical, and biological characteristics of surface waters and sediment in water bodies throughout the state of Texas. This database is one of the largest databases updated and maintained by the Status and Trends Project. The TCEQ uses these data to form the basis of the Texas 305(b) Inventory, Texas 303(d) List of Impaired Waters, Total Maximum Daily Load (TMDL) studies, and other regulatory and non-regulatory policies.

Raw SWQM data can be downloaded directly from the TCEQ website by river and coastal basin. Metadata are posted online by the TCEQ (TCEQ 2007). The Status and Trends Project downloads data for the coastal and river basins listed in Table 1.

Table 1. River and coastal basins for which Galveston Bay data are downloaded from the TCEQ Surface Water Quality Monitoring (SWQM) database.

TCEQ Basin Number	TCEQ Basin Name
7	Neches-Trinity Coastal Basin
8	Trinity River Basin
9	Trinity-San Jacinto Coastal Basin
10	San Jacinto River Basin
11	San Jacinto-Brazos Coastal Basin
12	Brazos River Basin
24	Bays and Estuaries
25	Gulf of Mexico

Water and sediment quality data are also collected by the TCEQ through the Clean Rivers Program. Locally, the Clean Rivers Program is administered by the Houston-Galveston Area Council (H-GAC). The H-GAC coordinates the local monitoring efforts of local government entities including the City of Houston Department of Water Quality Control, City of Houston Department of Health and Human Services, City of Pearland, Environmental Institute of Houston at the University of Houston-Clear Lake, Harris County Environmental Public Health Division, San Jacinto River Authority-Lake Conroe Division, the San Jacinto River Authority-Woodlands Division, and the US Geological Survey. Clean Rivers Program data are collected via web download from the H-GAC Data Clearinghouse website.

All water and sediment quality data are managed under the Status and Trend Project's Quality Assurance Project Plan (QAPP). Data are filtered by depth, time of day (for parameters such as dissolved oxygen), detection limits, minimum and maximum outliers, and minimum number of samples. Data are grouped spatially by subbay and tributary according to the Galveston Bay Segmentation Scheme shown in Figure 1.

After the initial download from the TCEQ and incorporation of the Clean Rivers Program data, the Galveston Bay TCEQ SWQM database contained data for 2,663 storet codes (i.e. parameter codes established by the US Environmental protection Agency's national *Storage and Retrieval* data system) and 748,184 records.

The Galveston Bay Status and Trends Project filtered the data spatially (according to the GBEP Segmentation Scheme as seen Figure 1), and by storet code. Storet codes were chosen for analysis if they: 1) had an adequate number of samples, 2) had a long-term monitoring record, and 3) were related to Galveston Bay management issues identified by the Galveston Bay Council. After the data were filtered, the database contained 41 storet codes (see Appendix C) with 255,283 records that ranged in date from 1969 through 2006.

This project year is the first in which TCEQ SWQM database contained data quality fields identifying minimum and maximum outliers for each of the storet codes. The Galveston Bay Status and Trends Project is working on a methodology to remove outliers from the Galveston Bay database. This is problematic in that outliers are present in the database, but the database as downloaded from TCEQ contains no information regarding whether or not the outliers were verified as a valid measurement. In light of this lack of validation information, the Status and Trends Project is developing a methodology to purge outliers from the database. This must be done carefully so as not to purge data records that contain high or low concentrations that while appearing to be outliers are actually real and valid measurements for degraded water bodies. See Section 2.4 of this report for a discussion of quality assurance.

Seafood Safety: Texas Department of State Health Services

The Texas Department of State Health Services (DSHS) Seafood and Aquatic Life Group maintains two important monitoring databases pertaining to water quality and sediment quality and public health. The databases describe concentrations of 1) coliform bacteria in surface waters and 2) organic and inorganic contaminants in fish and shellfish tissue in Galveston Bay.

The bacteriological database contains more than 37,000 samples detailing concentrations of total coliform bacteria, fecal coliform bacteria, salinity, dissolved oxygen, water temperature, and precipitation data collected from 184 stations during the years 1963-2006. Table 2 and Figure 3 below detail the spatial and temporal distribution of this dataset. The agency uses the data to establish shellfish harvest areas, a regulatory framework designed to protect the public from consuming pathogen-contaminated oysters harvested from Texas estuaries.

Table 2. Number of bacteriological samples collected in Galveston Bay from 1963-2006 by the Texas Department of State Health Services.

	Waterbody	Number of Samples	% of Total
Subbays	Christmas Bay Complex	1,519	4%
	East Bay	3,653	10%
	Trinity Bay	3,932	11%
	Upper and Lower Galveston Bay	20,962	56%
	West Bay	5,231	14%
Tributaries	Bastrop Bayou	208	1%
	Dickinson Bayou/Dickinson Bay	572	2%
	Galveston Channel	229	1%
	Houston Ship Channel	583	2%
	Texas City Channel	238	1%
	Total	**37,127**	

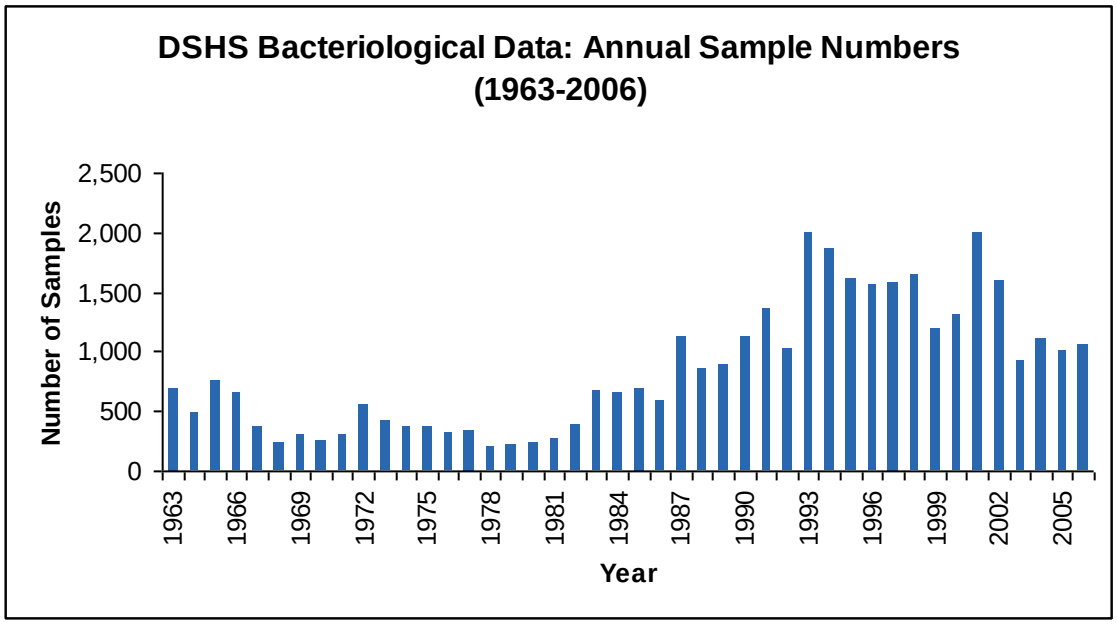

Figure 3. Number of bacteriological samples collected in Galveston Bay annually from 1963-2006 by the Texas Department of State Health Services.

The database describing organic and inorganic contaminants in fish and shellfish tissue in Galveston Bay contains data for 390 samples collected by the DSHS in 1998, 1999, 2000, and 2004. The data are collected to evaluate potential health risks associated with consumption of finfish and blue crabs in Galveston Bay. The DSHS health characterization studies are funded in part by the Texas Commission on Environmental Quality's Galveston Bay Estuary Program (GBEP).

In the initial 1998-2000 sampling effort, 345 samples were collected to evaluate concentrations of seven inorganic and 12 organic contaminants in nine areas of Galveston Bay. In the 2004, the sampling effort focused on the Houston Ship Channel and Upper Galveston Bay. The 2004 targeted sampling effort collected 45 samples to evaluate concentrations of seven inorganic and 213 organic contaminants. In all samples from 17 species of estuarine and freshwater finfish and blue crab were collected. An additional round of sampling was recently completed by the DSHS. However, the data are not yet available from the agency pending completion of the health characterization process.

Oil Spills: Texas General Land Office

The Texas General Land Office (GLO) Oil Spill Prevention and Response Program maintains a database describing spills of petroleum products reported in Texas coastal counties. The GLO reports oil spills for four of the five counties surrounding Galveston Bay (Brazoria, Chambers, Galveston, Harris, and Liberty). Spills are not reported for Liberty County, which is not defined as a coastal county by the GLO Oil Spill Prevention and Response Program.

The database compiled for the Lower Galveston Bay Watershed describes 3,056 spills occurring from 1998 to 2006. The data contain county of occurrence, date and time of the spill, volume of the spill, type of product spilled, and the general source (vessel or facility). Latitudes and longitudes of the spills are not available. The annual and county level distributions of the spills are outlined below in Table 3 and Figure 4.

Table 3. Number of oil spills in the counties surrounding Galveston Bay as reported by the GLO Oil Spill Prevention and Response Program; 1998-2006.

County	Number of Spills
Brazoria	229
Chambers	99
Galveston	1,107
Harris	1,621
Total	**3,056**

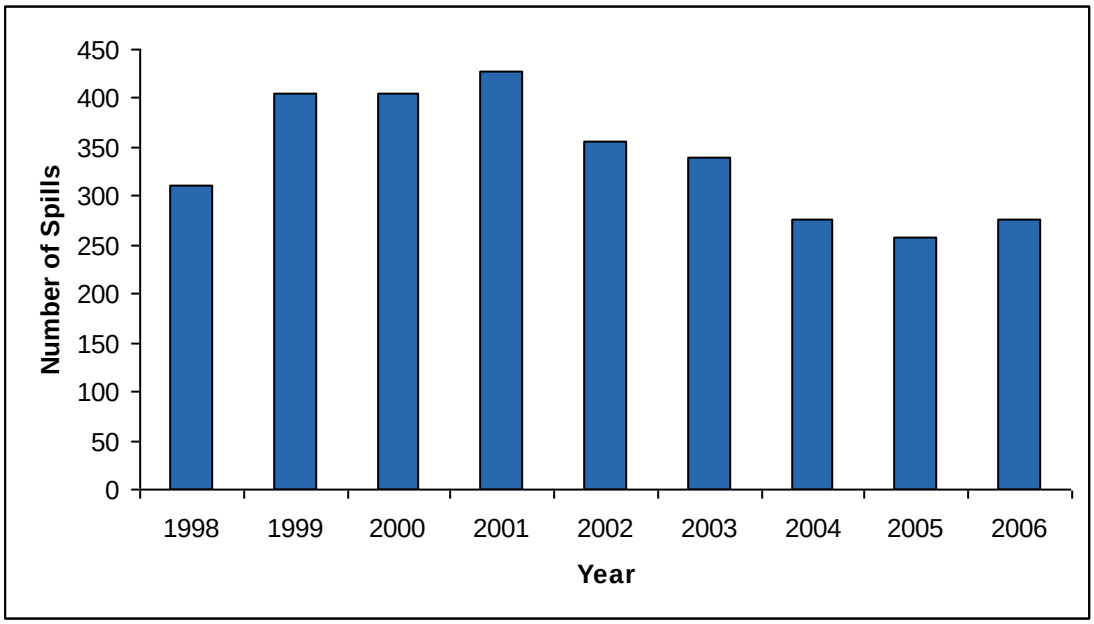

Figure 4. Number of petroleum product spills reported annually in the Lower Galveston Bay Watershed by the GLO Oil Spill Prevention and Response Program; 1998-2006.

As seen in Table 4, ten product types constituted 92 percent of the petroleum product spills in the Lower Galveston Bay Watershed during the period 1998-2006. Diesel and waste oil and oily water mixtures accounted for 29 percent and 35 percent of the spills, respectively. Eight percent of the spills were of unknown or unidentified product types.

Table 4. Number of petroleum product spills by product type occurring in the Lower Galveston Bay Watershed as reported by the Texas General Land Office (GLO) Oil Spill Prevention and Response Program; 1998-2006.

Product Type	Number of Spills	% of Total
Bunker C and other heavy fuel oils	198	6%
Condensate	41	1%
Crude oil	100	3%
Diesel	890	29%
Gasoline	75	2%
Hydraulic oil	244	8%
Jet fuel/kerosene	19	1%
Lubricating oils	125	4%
Non-petroleum oils	30	1%
Waste oil and oily water mixtures	1,071	35%
Other	190	6%
Unknown	73	2%
Total	**3,056**	

Coastal Fisheries: Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) Coastal Fisheries Division collects data describing the fisheries resources of Galveston Bay. This fisheries independent monitoring database is separate from the commercial and recreational fisheries landings database maintained by the agency. The fisheries resource database is the second largest database maintained by the Status and Trends Project (second in size to the TCEQ water and sediment quality database).

The database includes information on a host of aquatic plants and animals sampled by the TPWD using a variety of sampling techniques (e.g. bag seine, shrimp trawl, gill net, and oyster dredge). The Coastal Fisheries database is used by the Status and Trends Project for the trend analysis of species abundances in East Bay, Upper and Lower Galveston Bay, Trinity Bay, West Bay, and Christmas Bay. Some data exist for samples captured near the mouth of local bayous. However, these samples are not analyzed by the Status and Trends Project due to the fact that the TPWD Coastal Fisheries Monitoring Program focuses monitoring on the major estuarine subbays and any data for the local bayous would likely provide an incomplete characterization of those waterbodies. TPWD also collects hydrological data in association with its fisheries independent monitoring program.

The TPWD coastal fisheries monitoring program utilizes a randomized sampling station methodology and catalogues every organism captured in a sample. Collected data include spatial and temporal information describing the sample location and time, collection gear information, hydrological data (e.g. dissolved oxygen, water temperature, and salinity), weather conditions, species caught, number of each species captured, and total length (length of fish from snout to tip of caudal fin) of the first 19 individuals of a captured species.

TPWD Coastal Fisheries data are requested from the TPWD Rockport Office annually and are typically available in June of the year in which data are requested. Data are received from the

TPWD on a set of CDs in .csv format. The TPWD Coastal Fisheries Operations Manual is available in hard copy format upon request from the agency's Rockport Office. The manual provides details for all aspects of the Coastal Fisheries monitoring program.

A large amount of data processing is required to analyze the TPWD Coastal Fisheries dataset. The data are converted from .csv format into a MS Access database and spatially formatted according to the GBEP segmentation scheme (see Figure 1). The data are then aggregated according to gear type, sample (by date and location) and species. This yields a count of the number of individuals of each species captured in each TPWD sample. Next, the data are converted from number captured to standardized catch per unit effort (CPUE). CPUE for gill net, shrimp trawl and oyster dredge is calculated by dividing the total number of individuals of a species captured by the total time sampled to yield *catch per hour*. CPUE for bag seine is calculated by dividing the total number individuals of a species captured by total area sampled to yield *catch per hectare*. Annual and monthly CPUEs are calculated by Subbay for each species of interest.

Figure 5 below shows the spatial distribution of the TPWD Coastal Fisheries data collected in Galveston Bay over the period of record. Bag seine and gill net samples are greatest in West Bay and Upper and Lower Galveston Bay. Oyster dredge samples are greatest in Upper and Lower Galveston Bay and East Bay (this sampling method is highly dependent upon the location of oyster reefs). Shrimp trawl samples are greatest in Upper and Lower Galveston Bay and Trinity Bay where trawls can be towed with relative ease. Shrimp trawl samples are seldom collected in Christmas Bay where trawls are difficult to deploy due to the shallow nature of the subbay.

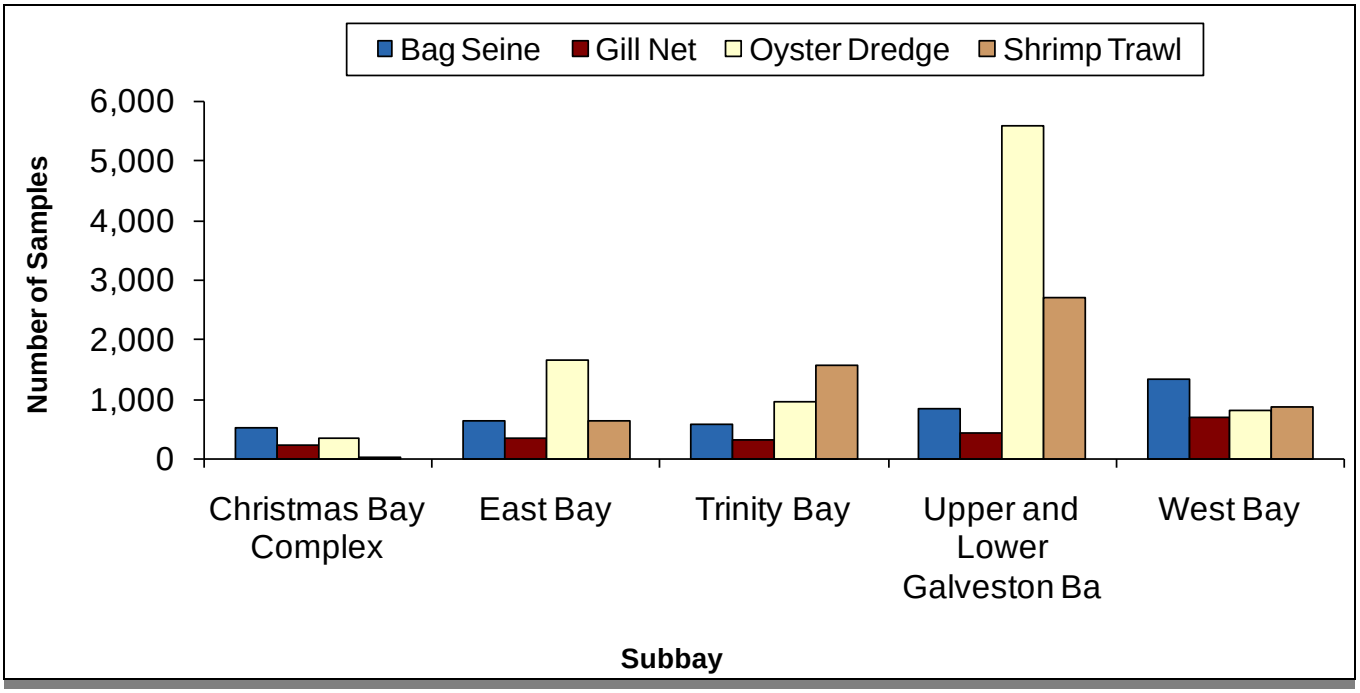

Figure 5. Number of records in the TPWD Coastal Fisheries database collected in Galveston Bay over the period of record; grouped by gear type and Subbay.

Habitat: National Oceanic and Atmospheric Administration, Coastal Change and Analysis Program

Geospatial data were obtained from the National Oceanic and Atmospheric Administration (NOAA) Coastal Change Analysis Program (C-CAP). The C-CAP land cover classification is based on Landsat Thematic Mapper satellite imagery. The data have a spatial resolution of 30 m and a target accuracy of 85%. C-CAP data are mapped at 1:100,000 scale with 22 standard classes representing major landscape types. C-CAP classification is supported by ground truthing and the use of supplementary data such as U.S. Geological Survey (USGS) maps, Topologically Integrated Geographic Encoding and Referencing system (TIGER) road data, and National Wetland Inventory (NWI) data. In an effort to be consistent with wetland classifications prepared by other agencies, the wetland data included in the C-CAP Coastal Land Cover Classification System are based on the Cowardin classification (Cowardin 1979). Detailed information describing the Gulf Coast C-CAP methodology can be found on the NOAA-CCAP Gulf Coast Land Cover website.

The newest NOAA C-CAP dataset inventories and describes the change in land cover along the Texas-Louisiana coast over a five year period, 2001 to 2005. With the addition of the 2001 to 2005 inventory, NOAA C-CAP provides a standardized habitat classification data set for the period 1996 to 2005. The Status and Trends Project analyzes wetland classification and related land use/land cover data for the Lower Galveston Bay watershed (21 subwatersheds and five counties). The five C-CAP wetland classes analyzed by the Status and Trends Project include: Estuarine Emergent Wetland, Estuarine Scrub/Shrub Wetland, Palustrine Emergent Wetland, Palustrine Forested Wetland, and Palustrine Scrub/Shrub Wetland.

Three wetland classes were not included in the wetland change analysis. Estuarine Forested Wetlands (e.g. mangroves) do not exist in the Galveston Bay Estuary. Also not analyzed were the Estuarine Aquatic Bed and Palustrine Aquatic Bed classes. The aquatic bed classes do not allow one to differentiate between submerged aquatic vegetation (seagrass) and other aquatic vascular plants such as invasive water hyacinth (*Eichhornia crassipes*) and Salvinia (*Salvinia molesta*).

Precipitation amounts present at the time satellite imagery is acquired is a major factor affecting the comparability of remotely sensed palustrine wetland data from one year to the next. Palustrine wetland acreages from wet and dry years are not directly comparable as wet years will yield relatively larger palustrine wetland acreage amounts and dry years will yield relatively smaller acreage amounts. For this reason, in addition to acquiring the NOAA C-CAP habitat data, annual precipitation data from the National Climate Data Center (NCDC) were also obtained for Houston, 1941-2006. According to the NCDC precipitation data for Houston:

- 1996 was the 8th driest year on record with 36.34 inches of rain
- 2001 was the 3rd wettest year on record with 81.84 inches of rain, and
- 2005 was the 7th driest year on record with 36.02 inches of rain

Based on the NCDC precipitation data, 1996 and 2005 are good years for comparison of palustrine wetland classification data due to their relatively equal rainfall amounts. 2001 was a much wetter year and the NOAA C-CAP habitat classification data for that year are not directly comparable to the data from 1996 and 2005 as the palustrine wetland acreages will be much larger in 2001 due to the existence of wet conditions.

Additionally, wetland acreages from previous wetland assessment studies and land cover classifications (Jacob 2005; Pulich 1996; USFWS 1992; Webb 2005; White 1993) cannot be directly compared to the results of Galveston Bay Status and Trends Project's C-CAP data analyses. The land cover classifications use different remote sensing imagery as baseline data sets (e.g. aerial photos versus satellite imagery), assess geographic areas of varying size, and use slightly differing habitat classification systems. Please see Section 3.2 for results of the analysis.

Habitat: US Army Corps of Engineers, Section 10/404 Permit Data

Over the last three years, the Status and Trends Project has made several efforts to collect and assess Clean Water Act Section 10/404 wetland permit and mitigation data from the U.S. Army Corps of Engineers (COE) Galveston District. COE permit and mitigation data are maintained in the Regulatory Analysis and Management System (RAMS) database at the district level. This relational database is used by the COE-Galveston District to store, track, and report project-level information pertaining to wetland permit review process. Nationally, the COE uses the regional RAMS databases as the source for tracking the federal commitment to "No Net Loss" of wetland habitats. The COE is in the process of converting the RAMS database into a new permit review/tracking system. The new system aims to move to a national level database ultimately accessible to the public via the internet (Personal communication with COE staff, March 27, 2007).

In the 2004-2006 Status and Trends project year the COE RAMS permit data were obtained from Dr. Samuel Brody of Texas A&M University who had obtained the data directly from the COE Galveston District. In March 2007 the Status and Trends project obtained a new version of this database directly from the COE Galveston District.

The newest version of the COE RAMS database contains data describing 3,597 wetland permit actions processed by the COE during the period, 1991-2006. The database appears to be incomplete as a number of permits for the western portion of the Lower Galveston Bay Watershed are not included in the data obtained from the COE. After several requests, the missing data are still not available.

Population: US Census Bureau

All human population data used by the Status and Trends Project are acquired from the US Census Bureau and the H-GAC. Census data updated in the 2007 project year include new human population estimates for 2006 from the US Census Bureau. Metadata describing the 2006 population estimates can be viewed online. Data acquired from the H-GAC include population projections from the 2035 Regional Forecast.

2.3 Database Maintenance and Storage

Program Element 2 of the Status and Trends Work Plan addresses database maintenance and storage of Status and Trends data. The Status and Trends Project is built upon the use of computing and electronic communications resources for the transfer, processing and maintenance of data. All project computing resources are housed at HARC and maintained by HARC staff. Project staff coordinate with the HARC Information Technology (IT) Department to ensure that server and network maintenance minimally interferes with project computing, storage, and network/website connectivity needs. As required by the QAPP, all data are backed up to other server locations, tape backup, and external hard disk on a periodic basis. Tape backups and an external hard drive are stored off-site to prevent against catastrophic loss of data. Data are also backed up prior to any server or network maintenance.

Three servers (one data server, one map server, and one web server) with dual processors and high capacity hard drives in a RAID 5 array are dedicated to this project. All of the other computing resource components are employed as part of the HARC computing network. HARC employs security systems and software to protect the data from virus infection and tampering by unauthorized users. The HARC IT Department and the Status and Trends staff work together to administer user rights by means of password protection to limit access to the project's data files. The data servers are equipped with tape backup and an archival system to provide additional security. The data server also has an emergency power supply.

The project uses Microsoft software packages for processing and maintaining the data: Microsoft (MS) SQL Server, MS Access and Excel. ESRI ArcGIS is used to produce maps and spatial analysis products. S-Plus and *Analyse-It* are used to perform statistical analyses. MS Access and SQL Server are used as the database maintenance software packages. Web products are created using .HTML, .ASP, and .NET.

All data accepted from agency sources undergo a validation process prior to data analyses and placement on Status and Trends website (see Figure 2). Raw agency data and processed data are stored in separate locations on the server.

Volunteer monitoring data are acquired, stored, and analyzed separately from agency monitoring data. The volunteer monitoring data are held on the same server, but in a database separate from agency monitoring data. The two types of data are not combined.

2.4 Quality Assurance

Program Element 4 of the Project Work Plan addresses quality assurance. All data acquired by the Status and Trends Project in FY 2007 are managed under an updated Quality Assurance Project Plan (QAPP) approved by the Texas Commission on Environmental Quality in March 2007. The QAPP designates the data processing methodologies, data storage and backup requirements, data quality objectives, and data validation and verification requirements.

Upon receipt of data from the source agency/organization, the Status and Trends Project reviews data for duplicate records, missing data and metadata, incorrect spatial coordinates, and outlier values. These data quality steps are integral in ensuring the validity of the data, the analyses and the information products that they support. All databases updated in FY 2007 have been reviewed for the data errors mentioned above.

Numerous data comparisons are made throughout the data management and analysis process. After the initial conversion to a database format used by the Status and Trends Project, the newly processed data are compared to the raw data from the source agency to ensure that no processing errors occurred. If errors are found then the initial processing step is repeated. The source agency is contacted if the error is found to be in the raw data. In those instances a new version of the data is requested from the source agency. Additional comparisons are made between the new dataset and previous versions from prior Status and Trends Project years. If large changes in sample sizes or analytical results are seen, then the data are reviewed to ensure that no errors were introduced. All databases updated in FY 2007 have been reviewed for data processing errors.

Duplicate and Missing Records
Records that are identified as duplicates are removed from analyses as are records with incomplete metadata (e.g. date and location). In some instances it may be determined that a large number of records are missing from a dataset (such as an entire geographic area). The missing data are requested from the source agency. If they are not available, then the dataset is not used for analyses.

Incorrect Geospatial Coordinates
All geospatial coordinates are reviewed. Those that are incorrect (latitude/longitude does not match the physical location description of the sampling site) are corrected when possible. If the coordinates cannot be corrected, then the data records are removed from analyses

Outliers
In some databases, such as those describing water and sediment quality, data records are identified by the source agency as being below or above an acceptable range of values. The Status and Trends Project typically identifies a value as an outlier if it is greater than two orders of magnitude above or below the maximum or minimum acceptable value. This is modified in some locales and for some parameters such as bacteria in surface waters where extremely high

concentrations are commonly observed. Identified outliers are removed from analyses and the source agency is notified.

The introduction of errors and loss of data are managed through procedures for record keeping and auditing. Documentation (using MS InfoPath) describes changes made by project personnel and the time at which the changes were made. Each time a file is changed it is saved in a new version and the old version is archived. New file names and locations are recorded in the database documentation. Files are archived when data updates are received from the source agency and the data processing cycle starts over. Periodic comparisons between recent and early versions are made to detect problems.

3 Project Results

3.2 Data Analysis

Program Element 3 of the Project Work Plan addresses data analyses of which there are three general types: 1) Analysis of monitoring gaps, 2) status and trends analyses, and 3) spatial analyses. Several of these analyses are completed and are included below or have been the subject of oral presentations (see Section 3.3 of this report). Many of the data sets acquired by the Status and Trends Project will be analyzed in Year 2 of the two-year project due to the time of year in which the source agencies release the data (e.g. TPWD Coastal Fisheries data were released in June, TCEQ Surface Water and Sediment Quality data were obtained in late spring). The analyses of those larger data sets and the update of indicators that rely upon them will be reported in Year 2 progress reports, outreach materials and oral presentations. The results of data analyzed in Year 1 of the project are reported below.

Habitat: National Oceanic and Atmospheric Administration, Coastal Change and Analysis Program

Using the NOAA Coastal Change Analysis Program (C-CAP) data set released in 2007 (See Section 2.2.2 for a description of this dataset), five land cover classes were analyzed to detect changes in wetland acreage for the period 1996 to 2005. Summary data are provided in Appendices D and E.

The area of land analyzed (a total land area of 2,742,911 acres) included the 21 subwatersheds of the Lower Galveston Bay Watershed (see map in Figure 6). Changes in wetland acreages were also analyzed at the county level (Brazoria, Chambers, Galveston, Harris, and Liberty counties).

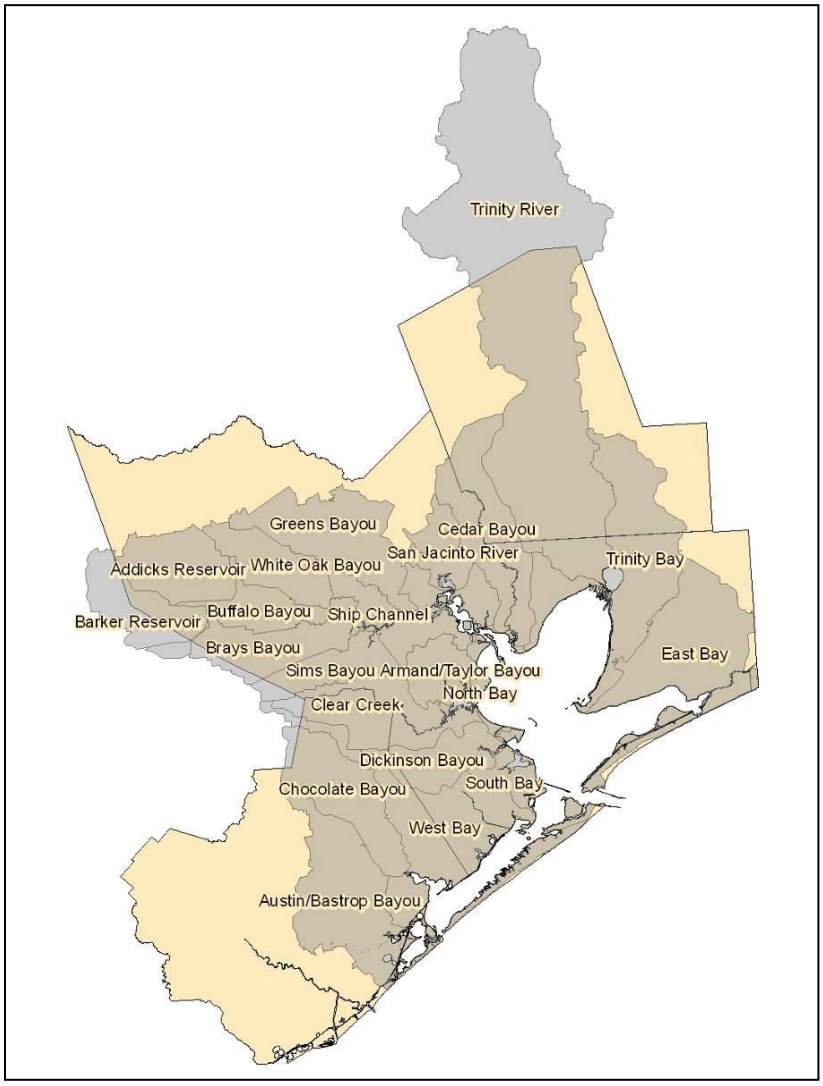

Figure 6. Counties and subwatersheds of the Lower Galveston Bay watershed. Varying aerial coverage account for the acreage difference in the wetland change analysis at the county and subwatershed scales.

Habitat classification data for five estuarine and palustrine wetland classes were analyzed for the years 1996 and 2005: 1) Estuarine Emergent Wetland, 2) Estuarine Scrub/Shrub Wetland, 3) Palustrine Emergent Wetland, 4) Palustrine Forested Wetland, and 5) Palustrine Scrub/Shrub Wetland. According to the NOAA C-CAP dataset, the total acreage of these estuarine and palustrine wetland classes in 2005 was estimated to be 717,848 acres or 26 percent of the total land area in the Lower Galveston Bay Watershed. Over the ten year period of 1996 to 2005, changes in land cover and land use are evident throughout the Lower Galveston Bay Watershed and are discussed below. Several land use classes were also analyzed in FY 2007 in an attempt to characterize the type of changes occurring (e.g. development or clearing of land).

It should be noted that the data below representing change in habitat acreage are calculated in terms of increases and decreases in acreage, the balance of which is "net change". It is unclear whether a negative change is truly a "loss" or a positive change is truly a "gain" in wetland acreage. Additional analyses and ground-truthing are required to bear this out. A decrease in wetland acreage is a true "loss" if the habitat has been converted to a human land use or to a hydrologically altered landscape (e.g. palustrine emergent wetland drained and converted to a developed land use). Jacob and Lopez (2005) attempted to quantify this type of wetland loss in the Lower Galveston Bay Watershed. Wetland habitat that is altered to another habitat type (e.g. palustrine forested wetland cleared and converted to palustrine emergent wetland) may represent a change, but not a permanent loss of wetland habitat.

As seen in Table 5, net change in palustrine and estuarine wetlands (loss of wetlands offset by gains) totaled 717,848 acres in the 21 subwatersheds surrounding Galveston Bay during the ten year period, 1996 to 2005. Negative changes largely occurred in the palustrine wetland classes of palustrine forested (-9,256 acres), palustrine scrub/shrub wetlands (-6,046) and palustrine emergent wetlands (-2,326). Overall, the acreage of estuarine wetlands showed little change in the 1996 to 2005 time period. A positive change in estuarine emergent wetlands (124 acres) was apparent.

Table 5. Change in acreage of five wetland classes in 21 subwatersheds of the Lower Galveston Bay watershed, 1996 to 2005. Original data source: NOAA Coastal Change Analysis Program, 2007.

Wetland Class	1996	2005	Change in Acres
Estuarine Emergent Wetland	124,333	124,456	124
Estuarine Scrub/Shrub Wetland	244	229	-15
Palustrine Emergent Wetland	135,448	133,123	-2,326
Palustrine Forested Wetland	418,469	409,213	-9,256
Palustrine Scrub/Shrub Wetland	56,873	50,827	-6,046
Net Total	**735,366**	**717,848**	**-17,519**

As seen in Table 6, of the 21 subwatersheds of the Lower Galveston Bay Watershed, the five with the largest estimated acreages of estuarine and palustrine wetlands in 2005 were the:

- Trinity River watershed with 306,053 acres
- East Bay watershed with 83,840 acres
- West Bay watershed with 77,364 acres
- Austin-Bastrop Bayou watershed with 70,535 acres, and
- Trinity Bay watershed with 56,721 acres

During the period 1996 to 2005, the greatest decreases in estuarine and palustrine wetland acreages occurred in the Trinity River (-6,243 acres), Trinity Bay (-1,860 acres), and Clear Creek (-1,594 acres) subwatersheds. Also of note are the Brays Bayou and White Oak Bayou subwatersheds which saw decreases in wetland acreage of 43 percent (-224 acres) and 33 percent (-181 acres) respectively from 1996 to 2005.

Table 6. Change in acreage of wetlands in 21 watersheds of the Lower Galveston Bay watershed, 1996 to 2005. Original data source: NOAA Coastal Change Analysis Program, 2007.

Watershed	1996	2005	Change in Acres
Addicks Reservoir	7,554	7,401	-153
Armand Bayou	6,702	6,470	-232
Austin-Bastrop Bayou	70,981	70,535	-446
Barker Reservoir	10,887	10,657	-230
Brays Bayou	521	298	-224
Buffalo Bayou	455	398	-57
Cedar Bayou	24,554	23,665	-889
Chocolate Bayou	14,356	13,970	-386
Clear Creek	10,131	8,537	-1,594
Dickinson Bayou	7,553	7,062	-491
East Bay	85,319	83,840	-1,480
Greens Bayou	12,353	11,250	-1,103
Houston Ship Channel	6,020	5,654	-366
North Bay	2,892	2,694	-198
San Jacinto River	9,933	9,827	-106
Sims Bayou	1,621	1,378	-243
South Bay	14,059	13,714	-345
Trinity Bay	58,582	56,721	-1,860
Trinity River	312,296	306,053	-6,243
West Bay	78,057	77,364	-693
White Oak Bayou	541	360	-181
Net Total	**735,366**	**717,848**	**-17,519**

Status of Wetland Habitat in Five Counties of the Lower Galveston Bay Watershed

The analysis of the NOAA C-CAP data was expanded to analyze the change in wetlands in the five county region in and around Galveston Bay (Brazoria, Chambers, Galveston, Harris, and Liberty counties) during the same period, 1996 to 2005. The area of land within the five counties (3,438,890 acres) differs from, but includes the 21 subwatersheds (see **Error! Reference source not found.** above). The change in overall area presents a slightly different view of changes in wetland acreage from that seen above in the section on subwatershed-level changes.

In 2005, the total acreage of wetlands in the five counties was estimated to be 946,988 acres or 28 percent of the total county land area in 2005. When compared to estuarine and palustrine acreage decreases in the 21 subwatersheds, the net decrease of estuarine and palustrine wetland classes in the five county area was larger at -25,792 acres (see Table 7).

As with the subwatersheds, wetland acreage decreases occurred in palustrine wetland classes, specifically palustrine forested wetlands (-18,2648 acres), palustrine scrub/shrub wetlands (-6,045 acres), and palustrine emergent wetlands (-1,678 acres). A small increase in the estuarine emergent class of 199 acres was seen.

Table 7. Change in acreage of five wetland classes in five counties of the Lower Galveston Bay watershed, 1996 to 2005. Original data source: NOAA Coastal Change Analysis Program, 2007.

Wetland Class	1996	2005	Change in Acres
Estuarine Emergent Wetland	163,029	163,228	199
Estuarine Scrub/Shrub Wetland	229	224	-5
Palustrine Emergent Wetland	169,746	168,068	-1,678
Palustrine Forested Wetland	564,715	546,451	-18,264
Palustrine Scrub/Shrub Wetland	75,061	69,016	-6,045
Net Total	**972,780**	**946,988**	**-25,792**

When the C-CAP wetland data were analyzed by county, it was determined that the areas with the largest estimated acreages of estuarine and palustrine wetlands in 2005 were Brazoria County (341,474 acres) and Liberty County (295,116 acres) (see Table 8). During the period 1996 to 2005, the greatest decreases in wetland acreage occurred in Liberty County (-12,253 acres) and Harris County (-6,124 acres). The changes in land cover classes for these two counties are described further below.

Table 8. Change in acreage of wetlands in 5 counties of the Lower Galveston Bay watershed, 1996 to 2005. Original data source: NOAA Coastal Change Analysis Program, 2007.

County	1996	2005	Change in Acres
Brazoria	344,188	341,474	-2,714
Chambers	137,429	134,719	-2,710
Galveston	80,872	78,881	-1,991
Harris	102,922	96,798	-6,124
Liberty	307,369	295,116	-12,253
Net Total	**972,780**	**946,988**	**-25,792**

Land Use Changes in Liberty and Harris Counties

Liberty County

As was reported last year by the Status and Trends Project, the NOAA C-CAP data describes large landscape scale changes in Liberty County. Liberty County is the Northeastern most county of the Lower Galveston Bay Watershed, is situated at the southern extent of the East Texas Piney Woods and contains the Trinity River Bottomlands. As seen in Table 9, during the period 1996 to 2005 Liberty County shows a decrease of more than 12,000 acres in the palustrine wetland classes. An analysis of the land use classification data from the NOAA C-CAP data set shows an increase of almost 20,000 acres in the agricultural land use classes of Cultivated (tilled row crops), Pasture/Hay (open to grazing), and Grassland (may be open to grazing). The data show an increase of nearly 2,500 acres of developed land use classes. Based on these data, it appears that freshwater wetlands, especially forested freshwater wetlands, are being altered for uses other than suburban development. A different story is told by the NOAA-C-CAP data for Harris County.

Table 9. Changes in acres of estuarine and palustrine wetland and land use classes in Liberty County, 1996 to *2005. Original data source: NOAA Coastal Change Analysis Program, 2007.*

County	Wetland Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005	Total Change in Acres 1996 to 2005
Liberty	Estuarine Emergent Wetland	1	0	-1	--	-1
	Estuarine Scrub/Shrub Wetland	0	0	0	--	
	Palustrine Emergent Wetland	13,023	11,701	-1,322	-10%	
	Palustrine Forested Wetland	284,272	275,213	-9,059	-3%	-12,253
	Palustrine Scrub/Shrub Wetland	10,073	8,201	-1,872	-19%	
	NET TOTAL	**307,369**	**295,115**			**-12,254**

County	Land Use Type	Land Use Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005	Total Change in Acres 1996 to 2005
Liberty	Agricultural	Cultivated	52,413	52,791	378	1%	
		Pasture/Hay	174,025	173,845	-180	-0%	**19,669**
		Grassland	25,547	45,019	19,472	76%	
	Developed	Bare Land	609	1,222	613	101%	
		Developed Open Space	3,605	4,042	437	12%	
		Low Intensity Developed	14,278	15,350	1,072	8%	**2,556**
		Medium Intensity Developed	3,561	3,702	141	4%	
		High Intensity Developed	947	1,241	294	31%	
	NET TOTAL		**274,985**	**297,210**			**22,225**

Harris County

Harris County is the urban center of the Lower Galveston Bay Watershed and is home to almost 3.9 million people as estimated in 2006 (US Census Bureau, 2007). The NOAA C-CAP data show the results of urban and suburban development in this county. As seen in Table 10, during the period 1996 to 2005, Harris County shows a decrease of more than 6,000 acres in the palustrine wetland classes, most of that in the palustrine forested wetland class. An analysis of the land use classification data from the NOAA C-CAP data set also shows a decrease of more than 24,000 acres in the agricultural land use classes of Cultivated (tilled row crops), Pasture/Hay (open to grazing), and Grassland (may be open to grazing). According to this data set, during the same time period developed land use classes increased by more than 68,000 acres with more than 52,000 acres of that increase being in the Low, Medium, and High Intensity Developed land use classes.

Table 10. Changes in acres of estuarine and palustrine wetland and land use classes in Harris County, 1996 to 2005. Original data source: NOAA Coastal Change Analysis Program, 2007.

County	Wetland Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005	Total Change in Acres 1996 to 2005
Harris	Estuarine Emergent Wetland	3,278	3,271	-7	-0%	-8
	Estuarine Scrub/Shrub Wetland	143	142	-1	-1%	
	Palustrine Emergent Wetland	9,915	10,388	473	5%	
	Palustrine Forested Wetland	74,509	69,455	-5,054	-7%	-6,116
	Palustrine Scrub/Shrub Wetland	15,077	13,542	-1,535	-10%	
	NET TOTAL	**102,922**	**96,798**			**-6,124**

County	Land Use Type	Land Use Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005	Total Change in Acres 1996 to 2005
Harris	Agricultural	Cultivated	32,898	31,864	-1,034	-3%	
		Pasture/Hay	172,830	148,503	-24,327	-14%	**-24,705**
		Grassland	41,535	42,190	655	2%	
	Developed	Bare Land	2,865	8,712	5,847	204%	
		Developed Open Space	106,814	116,916	10,102	10%	
		Low Intensity Developed	135,658	147,412	11,754	9%	**68,675**
		Medium Intensity Developed	201,117	227,857	26,740	13%	
		High Intensity Developed	89,970	104,202	14,232	16%	
	NET TOTAL		**783,687**	**827,656**			**43,969**

3.3 Outreach

Program Element 5 of the Project Work Plan outlines data interpretation and dissemination of project results. Efforts undertaken through this task deal directly with how the results of data analyses are communicated via meetings, presentations, reports, web products, and sharing of data with other organizations.

3.3.1 Meetings and Presentations

Public outreach is a large component of the Status and Trends Project. Project staff attend a number of meetings throughout the year that are:

- Organized to meet project tasks and deliverables (e.g. quality assurance site meetings and meetings of the GBC subcommittees),
- Attended to initiate or strengthen relationships with data providers and researchers/partners holding similar interests, and
- Attended to maintain knowledge regarding coastal management issues associated with the project.

While meetings directly related to the project tasks and deliverables are of course important, meetings indirectly related to the project (bullets two and three above) are equally integral to the project in that they keep project staff up to date on data sources, emerging issues, and management priorities of GBEP/GBC stakeholders. A list of the meetings attended by project staff is included in Appendix F.

Additionally, project staff give a number of presentations to coastal managers, the public, and educators regarding Status and Trends data analyses. Major presentations were given at the *State of the Bay* Symposium in Galveston, Texas in January 2007, the Science Teachers Regional Collaborative at the University of Houston-Clear Lake in March 2007, and the EPA Water Quality Monitoring and Assessment Seminar held in Bandera, Texas in April 2007. Presentations given by project staff are also included in Appendix F.

3.3.2 Data Requests

The number of data requests has decreased over the last project year, largely due to the Water and Sediment Quality and Fisheries Data Portals now operational on the www.galvbaydata.org website. These data portals allow users to download raw data from the two largest and most popular Status and Trends databases (TCEQ Surface Water and Sediment Quality and TPWD Coastal Fisheries). Still, the Status and Trends Project does process a number of data requests each year. In Fiscal Year 2007, the Status and Trends Project processed and supplied data listed in Appendix G.

3.3.3 Website: www.galvbaydata.org

Web visitation statistics for the www.galvbaydata.org website are tracked using free software from *SiteMeter*. Visitation statistics for the website can be viewed by anyone with an internet connection by clicking on the icon on the webpage.

According to the most recent data from *SiteMeter*, the number of visits over the most recent project year (September 1, 2006 through August 31, 2007) total 3,332 visits or 284 visits per month. Website visits have increased by approximately 40 percent from the beginning of the project year to the present.

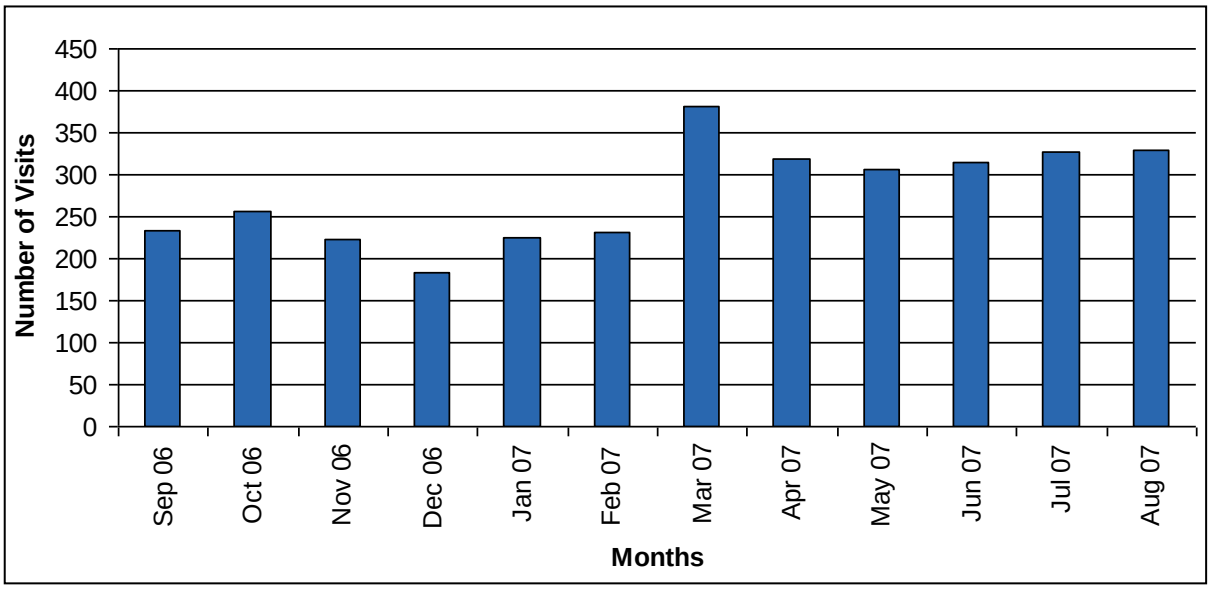

Figure 7. Monthly average of visits to the www.galvbaydata.org website in 2007 project year.

4 Project Conclusions and Lessons Learned

Much progress was made in FY 2007 under all program elements outlined in the FY 2007-2008 Project Work Plan. Under Program Element 1, efforts to update thirty of the fifty-one databases were made. Under Program Element 2, the Quality Assurance Project Plan (QAPP) was updated and approved. Quality Assurance/Quality Control documentation was updated and maintained as required by the QAPP. Project servers and firewalls were maintained without loss or corruption of project data. As outlined in Program Element 3 of the Project Work Plan, several major analyses were completed and are included in this progress report. Quality assurance tasks under Program Element 4 of the Work Plan were completed for all updated databases in FY 2007. Progress under Program Element 5 was noted, including a number of meetings attended and presentations made. The number of visits to the Status and Trends website continues to increase.

The Status and Trends process of compilation and analyses of data relevant to the Galveston Bay Plan appears to be an important and unique effort. Demand for the information on the interactive web site is growing. Requests for the Status and Trends PI to attend meetings on resource management issues are increasing. The agencies contributing data to the program have made no changes in data management or analyses that conflict with or duplicate the Status and Trends effort. When consulted about the analytical results, they are cooperative and usually confirm/support Project findings.

One lesson learned over the course of Status and Trends data management effort is the essential aspect of quality assurance. Large agency data sets received by the Status and Trends project often have incomplete or inaccurate metadata and sometimes erroneous data values. It appears that data quality is receiving more attention from TCEQ as evidenced by the addition of outlier minima and maxima to the data fields for most storet codes. However, this approach could result in omission of real extreme values. Clarification is needed on the validity of outlier values.

The Status and Trends program has learned that analyses of habitat area from remote sensing are individualistic and difficult to compare. They differ in scale/resolution, season, number of images summarized, soil moisture and other relevant variables. Trying to perform a meta-analysis of changes in wetland acreage has been very difficult and imprecise. It appears that NOAA has finally provided remote sensing data for land cover change analysis that is sufficiently comparable to make accurate statements about changes over the period of 1996 to 2006. The results of this analysis of habitat change will be discussed with local experts, but offers the best opportunity to date to present accurate wetland acreage trends for the Galveston Bay watershed.

FY 2008 of the two-year project will continue to see updates of project databases, metadata, and quality assurance documentation as the data are made available by the source agencies. Additionally, Project staff will work to update Galveston Bay indicators and present those indicators via presentations, outreach materials, and products posted on the www.galvbaydata.org website. In the near term, project staff will offer to present some the results of the FY2007 data analyses, particularly the wetland acreage analyses in Section 3.2 of this report, to technical subcommittees of the Galveston Bay Council such as the Natural Resource Uses Subcommittee. The Status and Trends PI is scheduled to give a presentation

entitled, “Ecosystem Indicators Developed for a Texas Sized Urban Estuary: The Galveston Bay Indicator Framework” at the Estuarine Research Federation Conference in Providence, Rhode Island in November 2007. A presentation to K-12 science educators in the Houston-Galveston region is also scheduled for Fall 2007.

In FY2008, the Status and Trends Project will attempt to improve the degree to which quality assurance issues (e.g. outliers and data entry errors) identified in data obtained from source agencies are addressed by the source agency. This will entail identifying the correct contact within the agency- someone that has the ability to ensure that data quality issues are addressed in the source database.

The Status and Trends Project also plans to continue to upload data analysis products to the www.galvbaydata.org website. The development of web products, particularly those with data query capabilities (such as interactive maps and ASP.NET applications similar to the Water Quality and Fisheries data portals) is a time intensive task. The Project PI will work with GBEP Project Manager to identify specific web deliverables for the FY 2008 project year.

5 Bibliography

Cowardin L.M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States.

Jacob J.J., and Lopez, R. 2005. Freshwater, Non-tidal Wetland Loss in the Lower Galveston Bay Watershed 1992-2002: A Rapid Assessment Method Using GIS and Aerial Photography. Houston, Texas. Report nr TCEQ/GBEP Contract No. 582-3-53336. 62 p.

Jones and Neuse. 1992. Segmentation Development for Galveston Bay. Webster, Texas: Galveston Bay National Estuary Program. 125 p.

Pulich W.M., Jr., and J. Hinson. 1996. Coastal studies technical report No. 1: development of geographic information system data sets on coastal wetlands and land cover. Austin, Texas: [TPWD] Texas Parks and Wildlife Department.

TCEQ. 2007. 2007 Surface Water Quality Monitoring Data Management Reference Guide. Austin, Texas: Texas Commission on Environmental Quality. 126 p.

US Census Bureau. 2007. State & County QuickFacts. Online at http://quickfacts.census.gov/qfd/states/48000.html. Accessed 7/31/2007.

USFWS. 1992. National Wetlands Inventory. US Fish and Wildlife Service

Webb J.W. 2005. Galveston Bay: Estuarine and Marine Habitat Change Analysis. Final report. Houston, Texas: [GBEP] TCEQ Galveston Bay Estuary Program. p 35.

White W.A., T.A. Tremblay, E.G. Wermund, Jr., L.R. Handley. 1993. Trends and status of wetland and aquatic habitats in the Galveston Bay system, Texas. Webster, Texas. Report GBNEP-31.

6 Appendices

Appendix A. Agencies and organizations contributing data to the Galveston Bay Status and Trends Project.

1. Dr. Stephen Klineberg, Rice University
2. Gulf Coast Waste Disposal Authority (GCWA)
3. Gulf States Marine Fisheries Commission (GSMFC)
4. Harris County
5. Houston-Galveston Area Council (H-GAC)
6. National Oceanic & Atmospheric Administration (NOAA) National Status and Trends Program
7. National Oceanic & Atmospheric Administration (NOAA) / NMFS Galveston Laboratory
8. Port of Galveston
9. Port of Houston Authority
10. Port of Texas City
11. Texas Commission on Environmental Quality (TCEQ)
12. Texas Comptroller
13. Texas Department of State Health Services (DSHS)
14. Texas Department of Transportation (TXDOT)
15. Texas General Land Office (GLO)
16. Texas Parks and Wildlife Department (TPWD)
17. Texas Sea Grant
18. Texas Water Development Board (TWDB)
19. University of Texas Bureau of Economic Geology (BEG)
20. US Army Corps of Engineers (COE)
21. US Census Bureau
22. US Coast Guard Vessel Traffic Service
23. US Environmental Protection Agency (EPA)
24. US Fish and Wildlife Service (FWS)
25. US Geological Survey (USGS)

Appendix B. List of all databases updated by the Status and Trends Project in FY 2007.

Category		Source Agency	Database
Habitat Protection	1	Houston-Galveston Area Council (HGAC)	H-GAC Classification of Regional Landscape
Habitat Protection	2	NOAA	National Benthic Inventory
Habitat Protection	3	Texas Parks and Wildlife Department (TPWD)	Coastal Wetlands Habitat / Land Cover (Pulich and Hinson, 1996)
Habitat Protection	4	University of Texas Bureau of Economic Geology (BEG)	Shoreline Environmental Sensitivity Index (ESI)
Habitat Protection	5	US Army Corps of Engineers (COE)	Regulatory Analysis and Management System (RAMS) / Section 10/404 Permits
Inflows & Bay Circulation	6	Texas Water Development Board (TWDB)	Modeled Monthly Inflows to the Trinity-San Jacinto Estuary (Galveston Bay)
Inflows & Bay Circulation	7	Texas Water Development Board (TWDB)	Texas Historical Water Use Data (Go To Region H)
Inflows & Bay Circulation	8	US Army Corps of Engineers (COE)	Galveston Bay Water Circulation Velocities
Public Health	9	National Oceanic & Atmospheric Administration (NOAA)	Mussel Watch Data
Public Health	10	Texas Department of State Health Services (DSHS)	Fish Consumption Advisory Maps
Public Health	11	Texas Department of State Health Services (DSHS)	Raw Shellfish Related Illness due to Vibrio spp.
Public Health	12	Texas Department of State Health Services (DSHS)	Seafood Safety Health Consultation Data
Social & Economic	13	Dr. Stephen Klineberg, Rice University	Galveston Bay Public Attitudes Survey
Social & Economic	14	Texas Department of State Health Services (DSHS)	Shellfish Harvest Area Maps
Species Protection	15	Gulf Sates Marine Fisheries Commission (GSMFC)	SEAMAP Data
Species Protection	16	Texas Parks and Wildlife Department (TPWD)	Coastal Fisheries Resource Data
Species Protection	17	Texas Parks and Wildlife Department (TPWD)	Commercial Fisheries Landings Data
Species Protection	18	Texas Parks and Wildlife Department (TPWD)	Recreational Fisheries Landings Data
Species Protection	19	US Census Bureau	US Census Bureau
Species Protection	20	US Fish and Wildlife Service (FWS)	US Fish and Wildlife Service (FWS)
Spills & Dumping	21	Gulf Coast Waste Disposal Authority (GCWA)	Gulf Coast Waste Disposal Authority (GCWA)
Spills & Dumping	22	Texas General Land Office (GLO)	Texas General Land Office (GLO)
Water & Sediment Quality	23	Houston-Galveston Area Council (HGAC)	Texas Clean Rivers Program Data
Water & Sediment Quality	24	Houston-Galveston Area Council (HGAC)	Texas Watch Volunteer Monitoring Data
Water & Sediment Quality	25	Texas Commission on Environmental Quality (TCEQ)	303(d) List of Impaired Waters
Water & Sediment Quality	26	Texas Commission on Environmental Quality (TCEQ)	Surface Water Quality Monitoring Data
Water & Sediment Quality	27	Texas Department of State Health Services (DSHS)	Galveston Bay Water Quality - Bacteriological Data
Water & Sediment Quality	28	Texas Parks and Wildlife Department (TPWD)	Coastal Fisheries Resource Hydrological Data
Water & Sediment Quality	29	US Environmental Protection Agency (EPA)	EMAP/REMAP Data (Prior to NCA)
Water & Sediment Quality	30	US Environmental Protection Agency (EPA) / TPWD	National Coastal Assessment (NCA) Data

Appendix C. List of TCEQ water and sediment quality Storet/parameter codes analyzed by the Galveston Bay Status and Trends Project.

Media	Storet Code	Parameter Description
Sediment	01003	ARSENIC, BOTTOM DEPOSITS (MG/KG AS AS DRY WT)
Sediment	01028	CADMIUM,TOTAL, BOTTOM DEPOSITS (MG/KG,DRY WT)
Sediment	01029	CHROMIUM,TOTAL, BOTTOM DEPOSITS (MG/KG,DRY WT
Sediment	01043	COPPER, BOTTOM DEPOSITS (MG/KG AS CU DRY WT)
Sediment	01052	LEAD, BOTTOM DEPOSITS (MG/KG AS PB DRY WT)
Sediment	01068	NICKEL, TOTAL, BOTTOM DEPOSITS (MG/KG,DRY WT)
Sediment	01093	ZINC, BOTTOM DEPOSITS (MG/KG AS ZN DRY WT)
Sediment	01148	SELENIUM, BOTTOM DEPOSITS (MG/KG AS SE DRY WT)
Sediment	34203	ACENAPHTYLENE, DRY WT, BOTTOM (UG/KG)
Sediment	34208	ACENAPHTHENE, DRY WT, BOTTOM (UG/KG)
Sediment	34223	ANTHRACENE DRY WTBOTUG/KG
Sediment	34250	BENZO-A-PYRENE DRY WTBOTUG/KG
Sediment	34323	CHRYSENE DRY WTBOTUG/KG
Sediment	34379	FLUORANTHENE DRY WTBOTUG/KG
Sediment	34384	FLUORENE DRY WTBOTUG/KG
Sediment	34445	NAPHTHALENE DRY WTBOTUG/KG
Sediment	34464	PHENANTHRENE DRY WTBOTUG/KG
Sediment	34472	PYRENE DRY WTBOTUG/KG
Sediment	34529	BENZO(A)ANTHRACENE1,2-BENZANTHRACENDRYWTBOTUG/KG
Sediment	34559	1,2,5,6-DIBENZANTHRACENE DRY WTBOTUG/KG
Sediment	39351	CHLORDANE(TECH MIX&METABS) SED,DRY WT,UG/KG
Sediment	39373	DDT IN BOTTOM DEPOS. (UG/KG DRY SOLIDS)
Sediment	39383	DIELDRIN IN BOTTOM DEPOS. (UG/KG DRY SOLIDS)
Sediment	39519	PCBS, BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
Sediment	39783	GAMMA BHC (LINDANE), SEDIMENT, DRY WT (UG/KG)
Sediment	71921	MERCURY,TOT. IN BOT. DEPOS. (MG/KG) AS HG DRY WG
Water	00010	TEMPERATURE, WATER (DEGREES CENTIGRADE)
Water	00094	SPECIFIC CONDUCTANCE,FIELD (UMHOS/CM @ 25C)
Water	00300	OXYGEN, DISSOLVED (MG/L)
Water	00310	BIOCHEMICAL OXYGEN DEMAND (MG/L, 5 DAY - 20DEG C
Water	00400	PH (STANDARD UNITS)
Water	00480	SALINITY - PARTS PER THOUSAND
Water	00530	RESIDUE, TOTAL NONFILTRABLE (MG/L)
Water	00610	NITROGEN, AMMONIA, TOTAL (MG/L AS N)
Water	00630	NITRATE-NITRITE NITROGEN, TOTAL (MG/L as N)
Water	00665	PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)
Water	00680	CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L
Water	31613	FECAL COLIFORM, MF AGAR (COLONIES/100 ML)
Water	31699	E. COLI, COLILERT, IDEXX METHOD, MPN/100ML
Water	31701	ENTEROCOCCI, ENTEROLERT, IDEXX, (MPN/100 ML)
Water	32211	PHEOPHYTIN-CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH

Appendix D. Acreage of palustrine and estuarine wetland classes in the Lower Galveston Bay Watershed, by county 1996 to 2005.

County	Wetland Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005
Brazoria	Estuarine Emergent Wetland	80,657	80,712	55	0%
Brazoria	Estuarine Forested Wetland	0	20	20	na
Brazoria	Estuarine Scrub/Shrub Wetland	3	2	-1	na
Brazoria	Palustrine Emergent Wetland	73,021	73,634	613	1%
Brazoria	Palustrine Forested Wetland	153,832	151,665	-2,167	-1%
Brazoria	Palustrine Scrub/Shrub Wetland	36,675	35,461	-1,214	-3%
Chambers	Estuarine Emergent Wetland	34,368	34,405	37	0%
Chambers	Estuarine Forested Wetland	0	2	2	na
Chambers	Estuarine Scrub/Shrub Wetland	39	38	-1	-4%
Chambers	Palustrine Emergent Wetland	55,488	54,601	-887	-2%
Chambers	Palustrine Forested Wetland	42,273	40,975	-1,298	-3%
Chambers	Palustrine Scrub/Shrub Wetland	5,261	4,701	-560	-11%
Galveston	Estuarine Emergent Wetland	44,725	44,839	114	0%
Galveston	Estuarine Forested Wetland	0	14	14	na
Galveston	Estuarine Scrub/Shrub Wetland	44	43	-1	-2%
Galveston	Palustrine Emergent Wetland	18,299	17,744	-555	-3%
Galveston	Palustrine Forested Wetland	9,829	9,143	-686	-7%
Galveston	Palustrine Scrub/Shrub Wetland	7,975	7,112	-863	-11%
Harris	Estuarine Emergent Wetland	3,278	3,271	-7	0%
Harris	Estuarine Forested Wetland	0	23	23	na
Harris	Estuarine Scrub/Shrub Wetland	143	142	-1	-1%
Harris	Palustrine Emergent Wetland	9,915	10,388	473	5%
Harris	Palustrine Forested Wetland	74,509	69,455	-5,054	-7%
Harris	Palustrine Scrub/Shrub Wetland	15,077	13,542	-1,535	-10%
Liberty	Estuarine Emergent Wetland	1	0	-1	na
Liberty	Estuarine Forested Wetland	0	1	1	na
Liberty	Estuarine Scrub/Shrub Wetland	0	0	0	na
Liberty	Palustrine Emergent Wetland	13,023	11,701	-1,322	-10%
Liberty	Palustrine Forested Wetland	284,272	275,213	-9,059	-3%
Liberty	Palustrine Scrub/Shrub Wetland	10,073	8,201	-1,872	-19%

Appendix E. Acreage of palustrine and estuarine wetland classes in the Lower Galveston Bay Watershed, by subwatershed 1996 to 2005.

Subwatershed	Wetland Class	1996	2005	Change in Acres 1996 to 2005	Percent Change 1996 to 2005
Addicks Reservoir	Estuarine Emergent Wetland	0	0	0	na
Addicks Reservoir	Estuarine Forested Wetland	0	0	0	na
Addicks Reservoir	Estuarine Scrub/Shrub Wetland	0	0	0	na
Addicks Reservoir	Palustrine Emergent Wetland	493	589	96	19%
Addicks Reservoir	Palustrine Forested Wetland	3,993	3,867	-126	-3%
Addicks Reservoir	Palustrine Scrub/Shrub Wetland	3,068	2,945	-123	-4%
Armand Bayou	Estuarine Emergent Wetland	262	261	-1	0%
Armand Bayou	Estuarine Forested Wetland	0	4	4	na
Armand Bayou	Estuarine Scrub/Shrub Wetland	9	8	0	na
Armand Bayou	Palustrine Emergent Wetland	918	967	49	5%
Armand Bayou	Palustrine Forested Wetland	4,545	4,437	-108	-2%
Armand Bayou	Palustrine Scrub/Shrub Wetland	969	797	-172	-18%
Austin-Bastrop Bayou	Estuarine Emergent Wetland	21,614	21,592	-22	0%
Austin-Bastrop Bayou	Estuarine Forested Wetland	0	2	2	na
Austin-Bastrop Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Austin-Bastrop Bayou	Palustrine Emergent Wetland	28,946	28,824	-123	0%
Austin-Bastrop Bayou	Palustrine Forested Wetland	9,461	9,371	-90	-1%
Austin-Bastrop Bayou	Palustrine Scrub/Shrub Wetland	10,959	10,747	-212	-2%
Barker Reservoir	Estuarine Emergent Wetland	0	0	0	na
Barker Reservoir	Estuarine Forested Wetland	0	0	0	na
Barker Reservoir	Estuarine Scrub/Shrub Wetland	0	0	0	na
Barker Reservoir	Palustrine Emergent Wetland	1,738	1,892	154	9%
Barker Reservoir	Palustrine Forested Wetland	4,877	4,635	-242	-5%
Barker Reservoir	Palustrine Scrub/Shrub Wetland	4,272	4,129	-143	-3%
Brays Bayou	Estuarine Emergent Wetland	0	0	0	na
Brays Bayou	Estuarine Forested Wetland	0	0	0	na
Brays Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Brays Bayou	Palustrine Emergent Wetland	52	41	-11	-22%
Brays Bayou	Palustrine Forested Wetland	299	222	-78	-26%
Brays Bayou	Palustrine Scrub/Shrub Wetland	169	35	-135	-79%
Buffalo Bayou	Estuarine Emergent Wetland	0	0	0	na
Buffalo Bayou	Estuarine Forested Wetland	0	0	0	na
Buffalo Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Buffalo Bayou	Palustrine Emergent Wetland	28	32	4	12%
Buffalo Bayou	Palustrine Forested Wetland	270	246	-24	-9%
Buffalo Bayou	Palustrine Scrub/Shrub Wetland	156	120	-36	-23%
Cedar Bayou	Estuarine Emergent Wetland	618	618	1	0%
Cedar Bayou	Estuarine Forested Wetland	0	4	4	na
Cedar Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Cedar Bayou	Palustrine Emergent Wetland	2,725	3,077	352	13%
Cedar Bayou	Palustrine Forested Wetland	19,898	18,945	-953	-5%
Cedar Bayou	Palustrine Scrub/Shrub Wetland	1,313	1,024	-289	-22%
Chocolate Bayou	Estuarine Emergent Wetland	826	822	-5	-1%
Chocolate Bayou	Estuarine Forested Wetland	0	4	4	na
Chocolate Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Chocolate Bayou	Palustrine Emergent Wetland	1,901	1,957	56	3%
Chocolate Bayou	Palustrine Forested Wetland	9,452	9,239	-213	-2%
Chocolate Bayou	Palustrine Scrub/Shrub Wetland	2,177	1,952	-225	-10%
Clear Creek	Estuarine Emergent Wetland	438	439	1	0%
Clear Creek	Estuarine Forested Wetland	0	8	8	na
Clear Creek	Estuarine Scrub/Shrub Wetland	0	0	0	na
Clear Creek	Palustrine Emergent Wetland	1,788	1,579	-209	-12%
Clear Creek	Palustrine Forested Wetland	5,386	4,661	-725	-13%
Clear Creek	Palustrine Scrub/Shrub Wetland	2,519	1,858	-661	-26%
Dickinson Bayou	Estuarine Emergent Wetland	847	838	-8	-1%
Dickinson Bayou	Estuarine Forested Wetland	0	7	7	na
Dickinson Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Dickinson Bayou	Palustrine Emergent Wetland	1,063	1,049	-14	-1%
Dickinson Bayou	Palustrine Forested Wetland	4,036	3,839	-198	-5%
Dickinson Bayou	Palustrine Scrub/Shrub Wetland	1,607	1,336	-271	-17%
East Bay	Estuarine Emergent Wetland	38,403	38,350	-53	0%
East Bay	Estuarine Forested Wetland	0	0	0	na
East Bay	Estuarine Scrub/Shrub Wetland	39	37	-2	-5%
East Bay	Palustrine Emergent Wetland	41,434	40,379	-1,055	-3%
East Bay	Palustrine Forested Wetland	3,792	3,601	-191	-5%
East Bay	Palustrine Scrub/Shrub Wetland	1,652	1,473	-179	-11%

Greens Bayou	Estuarine Emergent Wetland	0	0	0	na
Greens Bayou	Estuarine Forested Wetland	0	1	1	na
Greens Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Greens Bayou	Palustrine Emergent Wetland	177	316	139	79%
Greens Bayou	Palustrine Forested Wetland	11,800	10,649	-1,151	-10%
Greens Bayou	Palustrine Scrub/Shrub Wetland	377	285	-91	-24%
Houston Ship Channel	Estuarine Emergent Wetland	1,478	1,511	32	2%
Houston Ship Channel	Estuarine Forested Wetland	0	5	5	na
Houston Ship Channel	Estuarine Scrub/Shrub Wetland	111	103	-8	-7%
Houston Ship Channel	Palustrine Emergent Wetland	590	631	41	7%
Houston Ship Channel	Palustrine Forested Wetland	2,677	2,483	-194	-7%
Houston Ship Channel	Palustrine Scrub/Shrub Wetland	1,163	926	-237	-20%
North Bay	Estuarine Emergent Wetland	989	1,023	34	3%
North Bay	Estuarine Forested Wetland	0	0	0	na
North Bay	Estuarine Scrub/Shrub Wetland	1	1	0	0%
North Bay	Palustrine Emergent Wetland	322	294	-29	-9%
North Bay	Palustrine Forested Wetland	881	828	-53	-6%
North Bay	Palustrine Scrub/Shrub Wetland	699	548	-151	-22%
San Jacinto River	Estuarine Emergent Wetland	808	808	0	0%
San Jacinto River	Estuarine Forested Wetland	0	2	2	na
San Jacinto River	Estuarine Scrub/Shrub Wetland	34	33	-1	-3%
San Jacinto River	Palustrine Emergent Wetland	623	679	56	9%
San Jacinto River	Palustrine Forested Wetland	7,495	7,352	-142	-2%
San Jacinto River	Palustrine Scrub/Shrub Wetland	973	954	-18	-2%
Sims Bayou	Estuarine Emergent Wetland	0	0	0	na
Sims Bayou	Estuarine Forested Wetland	0	1	1	na
Sims Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
Sims Bayou	Palustrine Emergent Wetland	320	337	17	5%
Sims Bayou	Palustrine Forested Wetland	1,025	860	-165	-16%
Sims Bayou	Palustrine Scrub/Shrub Wetland	276	180	-95	-35%
South Bay	Estuarine Emergent Wetland	7,587	7,523	-65	-1%
South Bay	Estuarine Forested Wetland	0	2	2	na
South Bay	Estuarine Scrub/Shrub Wetland	5	5	0	na
South Bay	Palustrine Emergent Wetland	3,730	3,561	-169	-5%
South Bay	Palustrine Forested Wetland	1,063	1,020	-44	-4%
South Bay	Palustrine Scrub/Shrub Wetland	1,673	1,607	-67	-4%
Trinity Bay	Estuarine Emergent Wetland	10,410	10,427	17	0%
Trinity Bay	Estuarine Forested Wetland	0	0	0	na
Trinity Bay	Estuarine Scrub/Shrub Wetland	12	12	0	2%
Trinity Bay	Palustrine Emergent Wetland	3,577	3,266	-311	-9%
Trinity Bay	Palustrine Forested Wetland	41,677	40,120	-1,557	-4%
Trinity Bay	Palustrine Scrub/Shrub Wetland	2,905	2,896	-10	0%
Trinity River	Estuarine Emergent Wetland	403	375	-28	-7%
Trinity River	Estuarine Forested Wetland	0	0	0	na
Trinity River	Estuarine Scrub/Shrub Wetland	0	0	0	na
Trinity River	Palustrine Emergent Wetland	20,032	18,901	-1,131	-6%
Trinity River	Palustrine Forested Wetland	279,450	276,756	-2,694	-1%
Trinity River	Palustrine Scrub/Shrub Wetland	12,411	10,020	-2,391	-19%
West Bay	Estuarine Emergent Wetland	39,650	39,869	219	1%
West Bay	Estuarine Forested Wetland	0	9	9	na
West Bay	Estuarine Scrub/Shrub Wetland	31	27	-4	-14%
West Bay	Palustrine Emergent Wetland	24,974	24,728	-246	-1%
West Bay	Palustrine Forested Wetland	5,960	5,767	-193	-3%
West Bay	Palustrine Scrub/Shrub Wetland	7,441	6,973	-468	-6%
White Oak Bayou	Estuarine Emergent Wetland	0	0	0	na
White Oak Bayou	Estuarine Forested Wetland	0	0	0	na
White Oak Bayou	Estuarine Scrub/Shrub Wetland	0	0	0	na
White Oak Bayou	Palustrine Emergent Wetland	18	26	8	44%
White Oak Bayou	Palustrine Forested Wetland	430	313	-116	-27%
White Oak Bayou	Palustrine Scrub/Shrub Wetland	93	21	-73	-78%
	Net Total	735,366	717,898	-17,468	

Appendix F. Presentations given and meetings attended by the Status and Trends Project staff in Fiscal Year 2007.

Date	Personnel	Location & Purpose
4th Quarter		
8/14/2007	Gonzalez	Attended TCEQ White Oak/Buffalo Bayou Population Dynamics Project Advisory Group meeting at the H-GAC offices in Houston, Texas
8/1/2007	Gonzalez	Attended Region H Regional Water Planning meeting at the San Jacinto River Authority offices in Conroe, Texas
7/23/2007	Gonzalez, Alvis, Lester, Vardhan, and Nguyen	Attended TCEQ/GBEP quality assurance site visit meeting at HARC.
3rd Quarter		
5/29/2007	Lester	Attended GBEP Monitoring & Research Subcommittee Meeting
5/22/2007	Gonzalez	Attended and gave presentation on bacterial indicators at HGAC Clean Rivers Program Regional Monitoring Meeting
4/30/2007-5/2/2007	Gonzalez	Attended and gave presentation on bacterial indicators at EPA 2007 Water Quality Monitoring & Assessment Seminar held at the Mayan Ranch Conference Center in Bandera, Texas
4/9/2007	Lester, Gonzalez, Alvis	Met with Dr. Sam Brody of TAMU to discuss wetlands research
4/4/2007	Gonzalez	Gave Brown Bag seminar presentation of Galveston Bay Status and Trends Project and Indicators at HARC
3/27/2007	Lester, Gonzalez	Meeting at US Army Corps of Engineers Galveston District office to discuss acquisition of RAMS data
3/8/2007	Gonzalez	Presented Galveston Bay Indicators in outreach presentation to science teachers attending EIH/UHCL's Regional Collaborative Training
2nd Quarter		
2/20/2007	Lester	Attended GBEP Monitoring & Research Subcommittee Meeting
1/23/2007	Gonzalez, Alvis, and Lester	Presented at State of the Bay Symposium, Galveston Texas. Habitat Session- "Through a Glass Darkly: Past, Present, and Future Wetland Change"
1/23/2007	Lester and Gonzalez	Presented at State of the Bay Symposium, Galveston Texas. Plenary- "The State of the Bay: An Update on the State of the Ecosystem, Successes, and Challenges Ahead"
12/11/2007-12/13/2007	Gonzalez	Attended Restore America's Estuaries Conference in New Orleans, LA
1st Quarter		
10/11/2006-10/12/2006	Lester, Gonzalez	Attended GBEP Strategic Plan meeting in League City. Gave presentation on State of the Bay and emerging issues.
10/5/2006	Gonzalez	Attended Habitat Conservation Blueprint Meeting @ EIH-UHCL
9/19/2006	Lester, Alvis & Gonzalez	Attended Research & Monitoring Subcommittee meeting @ GBEP. Gave presentation on wetlands data and habitat fragmentation.

Appendix G. Data requested from and supplied by the Status and Trends Project staff in Fiscal Year 2007.

Date	Data Requested By	Data Requested	HARC Personnel
4th Quarter			
8/24/2007	Ms. Amy Nelson, Anchor Environmental, LLC	TPWD Coastal Fisheries Data; all gears, species and samples collected from 1996-2005	Gonzalez, Vardhan
3rd Quarter			
4/27/2007	Dr. Robert Harriss, HARC	TCEQ fecal pathogen data	Gonzalez
2nd Quarter			
2/28/2007	Dr. Ann Cheek, UT-Health Science Center	TCEQ PCB data for Patrick Bayou	Gonzalez
2/28/2007	Dr. Ann Cheek, UT-Health Science Center	DSHS Tissue Contaminant data 1999-2004 samples	Gonzalez
1/23/2007	Dr. Bob McFarlane, McFarlane & Associates	TPWD Coastal Fisheries data; shrimp trawl only for year 2004; all species captured per unique sample	Gonzalez
1/3/2007	Steven Johnston, TCEQ/GBEP	Summary of TCEQ SWQM data for Dickinson Bayou; sample counts by storet code with range of sample years	Gonzalez
1st Quarter			
n/a	n/a	n/a	n/a