

Estuary Use Support Assessment



Shrimp boat in the Intracoastal Waterway

Estuary Use Support Assessment

For the 2002 report, 57 estuaries (48 classified; 9 unclassified) encompassing 2003.9 square miles (mi²) were surveyed and at least one designated beneficial use was assessed in each water body. The surveyed mi² represent 83.7 percent of the area covered by estuarine waters along the Texas Gulf Coast (Figure 10.1). Eight more estuaries covering 10.5 mi² were surveyed in 2002 than in 2000, the year of the last full statewide assessment by the TCEQ. The increase in surveyed mi² is due to additional monitoring of small side bays and harbor areas.



Figure 10-1. Estuary Square Miles Surveyed

Of the 2,003.9 mi² surveyed, sufficient monitoring data were available to provide assessment of 1,726.5 mi² (86.2%). About 79 percent of the assessed 1,726.48 mi² fully support all their designated uses (Figure 10-2). Some form of pollution impairs the remaining 21 percent of assessed estuary mi². The framework, indicators, and criteria used to assess designated uses in estuaries are described in the “Surface Water Assessment Methodology” section and are shown in Tables 18-28.

Figure 10-3 indicates the causes and sources of pollutants that impair (i.e., prevent from fully supporting designated uses) estuary mi². Causes that contribute most to overall use impairment of designated uses in estuaries include elevated fecal coliform and enterococci densities (contact recreation use), dioxins in water (aquatic life use), and metals in water (aquatic life uses). The sources of pollution for most estuaries are presently unknown, contributing to about eighty percent of impaired assessed mi². Industrial point sources (10%), account for the largest category of known pollution sources.



Aquatic Life Use Support

Individual use support information provides additional detail about water quality problems in estuaries. Approximately 2,003.9 mi² were surveyed

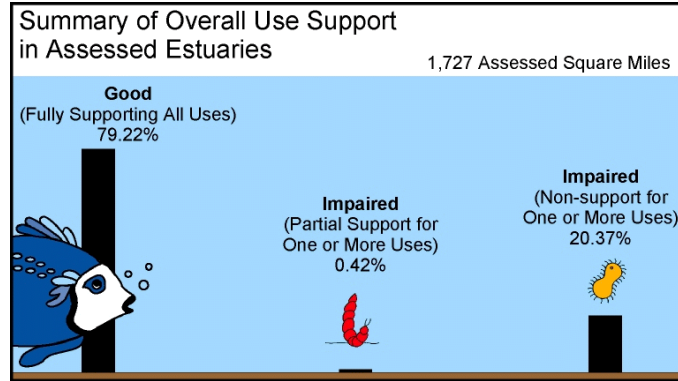
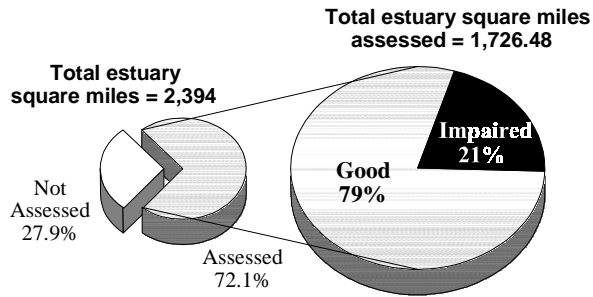


Figure 10-2. Summary of Use Support in Assessed Estuaries

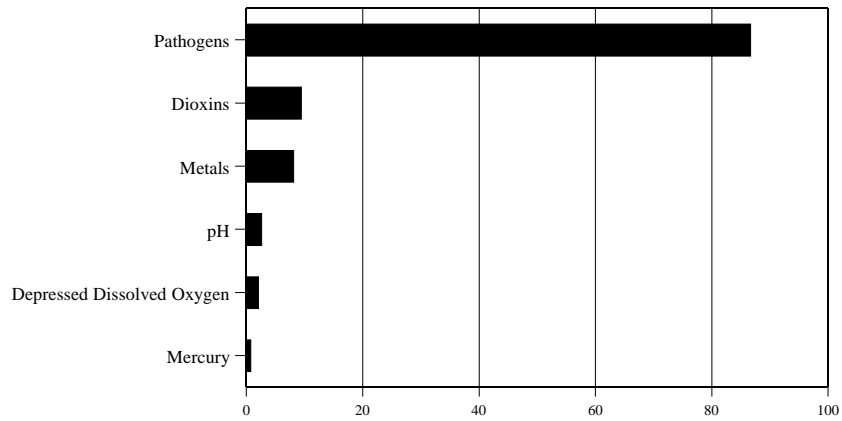
to determine support of the aquatic use. Sufficient data were available to provide assessment of 970 mi² (48% of surveyed mi²) (Table 10-1). Of these assessed 969.5 mi², about 99 percent fully supported the aquatic life use, one percent partially supported the use, and none failed to support the use. Depressed instantaneous (grab sample) dissolved oxygen concentrations, compared to the absolute minimum criteria, was the most common indicator used to assess support of the aquatic life use (Table 10-2). Of the 971.28 mi² assessed (48.5% of surveyed mi²) by dissolved oxygen, approximately 99 percent supported aquatic life uses and one percent partially supported the use. The aquatic life use in estuaries was also evaluated in 33.6 mi² (1.6% of surveyed mi²) by metals in water data (acute and chronic exposure to aquatic life) and 100 percent supported the use. For the remaining six indicators (24-hour dissolved oxygen, organic substances in water, sediment and water toxicity tests, and macrobenthos, fish, and habitat evaluations) data were insufficient to assess estuaries by each indicator.

Most of the bay systems fully supported the aquatic life use based on dissolved oxygen concentrations alone. Depressed dissolved oxygen concentrations was the fifth most common cause of impaired aquatic life use in estuaries and bays (Figure 10-3). Low dissolved oxygen concentrations caused Oso Bay (Segment 2485) to be the only estuary identified with a partially supported aquatic life use. None of the estuarine waters were evaluated by 24-hour dissolved oxygen measurements (Table 10-2). Tier 1 concerns, based on comparison of instantaneous dissolved oxygen measurements to the minimum criteria, were identified for the Victoria Barge Canal (Segment 1701) and the Brownsville Ship Channel (Segment 2494).

The cause of low dissolved oxygen concentrations in the estuarine waters is probably due to natural factors. The dissolved oxygen criteria are set relatively close to saturation. As the coastal waters warm to elevated



Causes Found in Impaired Estuaries



Sources Found in Impaired Estuaries

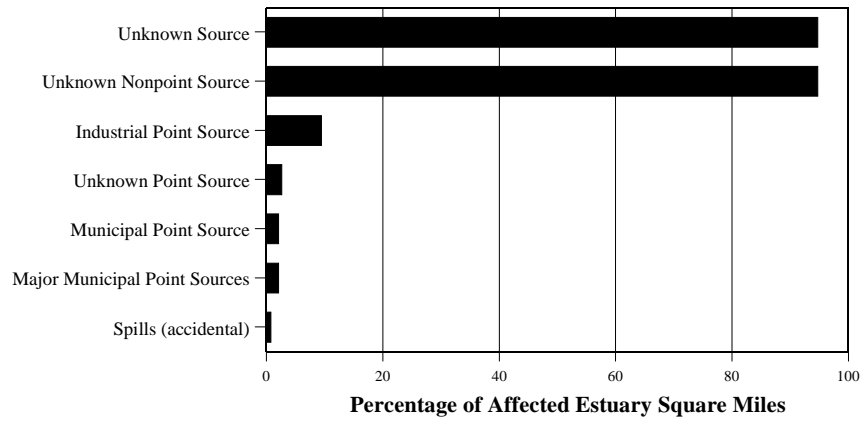








Figure 10-3. Causes and Sources of Impaired Estuary Square Miles

Table 10-1. Individual Overall Use Support in Estuaries - 2002

Designated Use	Sq. Miles Surveyed	Sq. Miles Assessed	Percent of Sq. Miles Assessed	Percent of Assessed Square Miles		
				Good (Fully supporting)	Fair (Partially Supporting)	Poor (Not Supporting)
 Aquatic Life Support	2,003.98	969.50	48.07	99	1	0
 Fish Consumption	2,003.98	281.90	14.07	87	0	13
 Oyster Waters	1,880.50	1,534.40	63.53	78	0	22
 Contact Recreation	1,998.76	1,518.78	75.99	100	X*	0
 Noncontact Recreation	5.22	2.40	45.98	100	X*	0
 General Uses	2,001.62	969.50	48.44	99	1	0

X* - Category not applicable

* Category not applicable

Table 10-2. Individual Indicators for Assessment of Aquatic Life, Fish Consumption, and General Use Support in Estuaries - 2002




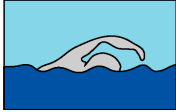
Designated Use	Sq. Miles Surveyed	Sq. Miles Assessed	Percent of Sq. Miles Assessed	Percent of Assessed Sq. Miles		
				Good (Fully supporting)	Fair (Partially Supporting)	Poor (Not Supporting)
 Aquatic Life Support						
Instantaneous Dissolved Oxygen- min	2,003.98	971.28	48.47	99	1	0
24-hour Dissolved Oxygen	2,003.98	0.00	0.00	0	0	0
Metals in Water	2,003.98	33.60	1.68	100	0	0
Organics Substances in Water	2,003.98	0.00	0.00	0	0	0
Water Toxicity	2,003.98	0.00	0.00	0	0	0
Sediment Toxicity	2,003.98	0.00	0.00	0	0	0
Macrobenthos Community	2,003.98	0.00	0.00	0	0	0
Fish Community	2,003.98	0.00	0.00	0	0	0

Table 10-2. Individual Indicators for Assessment of Aquatic Life, Fish Consumption, and General Use Support in Estuaries-2002 (Continued)

Designated Use	Sq. Miles Surveyed	Sq. Miles Assessed	Percent of Sq. Miles Assessed	Percent of Assessed Sq. Miles		
				Good (Fully supporting)	Fair (Partially Supporting)	Poor (Not Supporting)
 Fish Consumption						
Advisories / Closures	2,003.98	205.10	10.24	82	0	18
Human Health Criteria	2,003.98	95.60	4.77	100	0	0
 General Uses						
Water Temperature	2,001.62	969.50	48.44	100	0	0
pH	2,001.62	969.50	48.44	99	1	0

* Category not applicable
 X* - Category not applicable

temperature and become more saline due to reduced freshwater inflows in the summer months, they lose their ability to retain dissolved oxygen. Assimilation of even minor point and nonpoint source pollutant loads can result in depression of dissolved oxygen below the criteria.



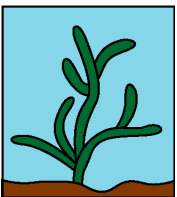
Contact Recreation Use Support

Contact recreation use is assigned to most estuaries, except those used for heavy ship and barge commerce. Fecal coliform and enterococci data were sufficient to provide assessment of the contact recreation use in 1,518.8 mi² (75.9% of surveyed mi²). Of the 1,518.8 mi² assessed, 100 percent fully supported the contact recreation use (Table 10-1). San Antonio Bay (Segment 2462), St. Charles Bay (Segment 2473), and Oso Bay (Segment 2485) were identified with Tier 1 concerns.



Noncontact Recreation Use Support

The Texas City Ship Channel (Segment 2437), Bayport Channel (Segment 2438), Corpus Christi Inner Harbor (Segment 2484), Brownsville Ship Channel (Segment 2494), and Victoria Barge Canal (Segment 1701) are the only estuaries designated for noncontact recreation use. The use is assigned to these estuaries due to heavy ship and barge traffic and not an indicator of poor water quality. Although these ship channels are assigned noncontact recreation use, they must meet more stringent contact recreation criteria. Fecal coliform and enterococci data were sufficient to provide assessment of the noncontact recreation use in 2.4 mi² (45.9% of surveyed mi²)(Table 10-1). Of the 2.4 mi² assessed, all fully supported the noncontact recreation use.



General Use Support

Field measurements of pH and water temperature are assigned to classified estuaries and used to determine support of general water quality uses. The framework used to assess the general use category for estuaries is shown in Table 18. Together, water temperature and pH data were sufficient to provide assessment in 969.5 mi² (48.4% of surveyed mi²)(Table 10-1). All of the assessed mi² fully supported general uses based on water temperature measurements and 99 percent supported general uses based on pH measurements (Table 10-2). General uses in Carancahua Bay (Segment 2456) were partially supported due to high pH values.



Fish Consumption Use

Approximately 2,003.9 mi² of estuarine waters were surveyed to determine support of the fish consumption use. Sufficient data were available to provide assessment of 281.9 mi² (14.1% of surveyed mi²)(Table 10-1). Of the assessed mi², 87 percent fully supported the fish consumption use and five percent failed to support the use. Issuance of consumption advisories and aquatic life closures by the TDH and evaluation of human health criteria for water were two indicators used to assess the fish consumption use (Table 10-2). Of the 205.1 mi² assessed (10.2% of surveyed mi²) by issuance of advisories and closures, approximately 82 percent fully supported the fish consumption use, while 18 percent failed to support the use. Of the 95.6 mi² assessed by human health criteria, all fully supported the use.

The TDH issued in September 1990 a restricted consumption advisory for the general population and a no-consumption advisory for restricted sensitive subpopulations (children and women of child bearing age) for the Upper Galveston Bay system. The advisories were issued due to elevated dioxin concentrations in catfish and blue crabs. The fish consumption use is not supported due to issuance of the no-consumption advisory and encompasses Upper Galveston Bay (Segment 2421), Tabbs Bay (Segment 2426), San Jacinto Bay (Segment 2427), Black Duck Bay (Segment 2428), Scott Bay (Segment 2429), Burnett Bay (Segment 2430), Barbours Cut (Segment 2436), and the Bayport Channel (Segment 2438).

The fish consumption use is not supported in Lavaca Bay (Segment 2453) due issuance in April 1988 by the TDH of an aquatic life closure. The closure was issued due to elevated mercury concentrations in fish and crabs. The source of the mercury was from an industrial point source. The closure prohibits the taking of all fish species and crabs from the affected area.



Oyster Waters Use Support

Contaminated shellfish pose a public health risk particularly to consumers of raw shellfish. Shellfish such as oysters, clams, and scallops extract their food (plankton) by filtering water over their gills. In contaminated water shellfish accumulate bacteria and viruses in their gills, fleshy mantle, and digestive tracts. If shellfish grown in contaminated water are not cooked properly, consumers may ingest bacteria and viruses.

To protect public health, the TDH administers the National Shellfish Sanitation Program (NSSP) in Texas. The TDH routinely monitors

Table 10-3. Summary of Oyster Water Assessments for Bays

Segment Number	Segment Name/ Area (sq mi)	Use Supported % (sq mi)	Use Not Supported % (sq mi)	Use A Primary Concern % (sq mi)	Use Not Assessed % (sq mi)
2411	Sabine Pass (2.1)				100 (2.1)
2412	Sabine Lake (68.7)				100 (68.7)
2421	Upper Galveston Bay (108.2)	26.0 (28.1)	55.0 (59.5)	19.0 (20.6)	
2422	Trinity Bay (130.1)	0.9 (1.1)	46.4 (60.4)	52.7 (68.6)	
2423	East Bay (52.1)	77.9 (40.6)	22.1 (11.5)		
2424	West Bay (69.3)	64.8 (44.9)	35.2 (24.4)		
2432	Chocolate Bay (7.6)		100 (7.6)		
2433	Bastrop Bay (4.9)	100 (4.9)			
2434	Christmas Bay (8.9)	100 (8.9)			
2335	Drum Bay (1.7)	100 (1.7)			
2439	Lower Galveston Bay (139.6)	46.6 (65.1)	43.5 (60.7)	9.9 (13.8)	
2441	East Matagorda Bay (59.1)	72.7 (43.0)	2.6 (1.5)	24.7 (14.6)	
2442	Cedar Lakes (6.9)		100 (6.9)		
2451	Matagorda Bay (261.7)	91.7 (240.0)	8.3 (21.7)		
2452	Tres Palacios Bay (14.7)		49.0 (7.2)	51.0 (7.5)	
2453	Lavaca Bay (54.8)	69.5 (38.1)	30.5 (16.7)		
2454	Cox Bay (2.9)	73.8 (2.1)		26.2 (0.8)	
2455	Keller Bay (7.5)	86.6 (6.5)			13.4 (1.0)
2456	Carancahua Bay (19.0)		48.4 (9.2)	51.6 (9.8)	
2461	Espiritu Santo Bay (60.8)	99.0 (60.2)			1.0 (0.6)
2462	San Antonio Bay (119.5)	40.6 (48.5)	8.5 (10.2)	50.9 (60.8)	
2463	Mesquite Bay (12.6)	95.0 (12.0)			5.0 (0.6)
2471	Aransas Bay (87.8)	92.2 (81.0)		7.8 (6.8)	
2472	Copano Bay (65.2)	79.4 (51.8)	20.6 (13.4)		
2473	St. Charles Bay (13.1)	100.0 (13.1)			

Table 10-3. Summary of Oyster Water Assessments for Bays (Continued)

Segment Number	Segment Name/ Area (sq mi)	Use Supported % (sq mi)	Use Not Supported % (sq mi)	Use A Primary Concern % (sq mi)	Use Not Assessed % (sq mi)
2481	Corpus Christi Bay (123.1)	87.0 (107.1)		13.0 (16.0)	
2482	Nueces Bay (28.9)		100 (28.9)		
2483	Redfish Bay (28.8)				100 (28.8)
2485	Oso Bay (7.2)			100 (7.2)	
2491	Laguna Madre (347.4)	38.8 (134.8)		5.2 (18.1)	56.0 (194.5)
2492	Baffin Bay (49.8)				100 (49.8)
2493	South Bay (7.8)	100 (7.8)			
Totals	Area = 1971.8	54.9(1084.1)	17.2(339.8)	12.4(201.8)	17.6(346.1)



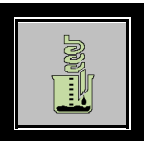
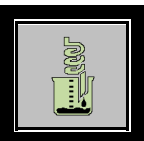
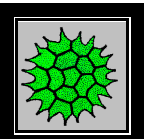
shellfish growing areas, called oyster waters in the TSWQS, for bacterial contamination (fecal coliform densities) and restricts shellfish harvesting in contaminated waters. Not all estuaries are assigned the oyster water use due to water quality conditions, lack of oyster reefs, or no active monitoring of the area. Approximately 1,880.5 mi² were surveyed to determine support of the oyster waters use (Table 10-1). Sufficient data were available to provide assessment of 1,534.4 mi² (63.5% of surveyed mi²). Of these assessed mi², 78 percent fully support the oyster waters use and 22 percent failed to support the use.

Assessed areas in Bastrop Bay, Christmas Bay, Drum Bay, St. Charles Bay, Keller Bay, , and South Bay fully support the oyster water use (Table 10-3). Portions of 15 bays fail to support the use. Portions of twelve bays were identified with concerns. The entire area of Sabine Lake, Sabine Pass, Baffin Bay and Redfish Bay and portions of Keller Bay, Espiritu Santo Bay, Mesquite Bay, and the Laguna Madre were not assessed due to insufficient data.

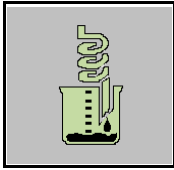
Estuary Secondary Concerns Assessment

The TCEQ and CRP have developed screening levels to identify estuaries with elevated nutrient and chlorophyll *a* concentrations in water, elevated toxic substances in sediment, and elevated fish tissue contaminants. Water quality criteria have not been developed by the TCEQ in the TSWQS for these indicators. Water quality concerns are identified when greater than 25

Table 10-4. Individual Nutrient and Chlorophyll *a* Concerns in Estuaries - 2002

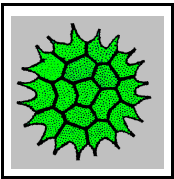
Concern parameter	Sq. Miles Surveyed	Sq. Miles Assessed	Percent of Sq. Miles Assessed	Percent of Assessed Square Miles	
				No Concern	Concern
 Ammonia	2,003.98	986.77	49.24	99	1
 Nitrate + Nitrite	2,003.98	986.77	49.24	84	16
 Orthophosphorus	2,003.98	965.90	48.20	98	2
 Total Phosphorus	2,003.98	982.80	49.04	85	14
 Chlorophyll <i>a</i>	2,003.98	912.80	45.55	97	3

percent of samples exceed the screening levels. The framework, indicators, and criteria for evaluation of water quality concerns in estuaries are discussed in the “Surface Water Assessment Methodology” section and are shown in Tables 29-33. Estuaries with identified concerns are targeted by the TCEQ and CRP for increased fixed station monitoring or special studies to identify possible causes and sources.



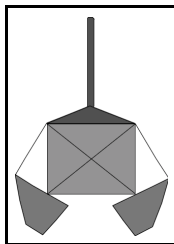
Nutrient Concerns

Approximately 2,003.9 mi² were surveyed to identify areas of concern caused by elevated concentrations of ammonia nitrogen, nitrite plus nitrate nitrogen, orthophosphorus, and total phosphorus (Table 10-4). Sufficient data were available to provide assessment of about 980 mi² (about 48% of surveyed mi²) for each nutrient indicator. Of the mi² assessed, water quality concerns were identified in one percent for ammonia nitrogen, two percent for orthophosphorus, and 14 percent for total phosphorus. Nitrite plus nitrate nitrogen was the nutrient indicator with the highest percentage of assessed mi² (16%) with concerns. Nine estuaries were identified with concerns for ammonia nitrogen, five for nitrite plus nitrate nitrogen, four for orthophosphorus, and seven for total phosphorus (Table 10-5).



Chlorophyll *a* Concerns

Approximately 2,003.9 mi² of estuaries were surveyed to identify areas of concern caused by elevated chlorophyll *a* concentrations. Sufficient data were available to provide assessment of 912.8 mi² (45.5% of surveyed mi²) (Table 10-4). Of the assessed mi², 3 percent were identified with elevated chlorophyll *a* concentrations. Four estuaries were identified with concerns for elevated chlorophyll *a* concentrations (Table 10-5). Clear Lake (Segment 2425) and the Laguna Madre (Segment 2491) were also identified with concerns for at least one of the nutrient indicators, suggesting that nutrient loading may be responsible for stimulation of algal growth in these estuaries.

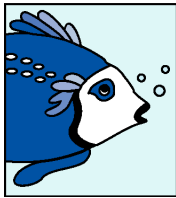


Sediment Concerns

Like in streams and rivers and reservoirs and lakes, sediment sampling data are very limited in estuaries due to excessive laboratory costs. Most of the limited sampling is targeted to estuaries where industries are sited nearby or ship and barge traffic is heavy. Of the 2,003.9 mi² surveyed for elevated sediment contaminant concentrations, sufficient data were available to provide assessment in only 381.3 mi² (19% of surveyed mi²) (Table 10-6). Of the assessed mi², only one percent were identified with sediment concerns. Elevated metals in sediment were identified as cause for concern in the Old Brazos River Channel (Segment 1111, barium, copper, and nickel) and Lavaca/Chocolate Bay (Segment 2453, chromium, manganese, and nickel).

Table 10-5. Esutuaries with Secondary Concerns for Nutrients and Chlorophyll *a*


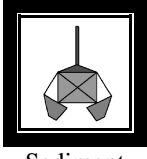
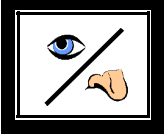
Segment Number	Water Body	Nutrient				Chl <i>a</i>
		NH ₃ -N	NO ₂ +N O ₃ -N	OPhos	TPhos	
2421	Upper Galveston Bay				X	
2422	Trinity Bay		X			
2424B	Lake Madeline (unclassified water body)	X				
2424E	English Bayou (unclassified water body)	X				
2424F	Crash Basin (unclassified water body)	X				
2425	Clear Lake	X		X	X	X
2437	Texas City Ship Channel	X		X	X	
2439A	Seawall Lagoon (unclassified water body)	X				
2452	Tres Palacios Bay/Turtle Bay	X				
2456	Carancahua Bay		X		X	
2462	San Antonio Bay/Hynes Bay/Guadalupe Bay		X	X	X	
2472	Copano Bay/Port Bay/Mission Bay				X	
2484	Corpus Christi Inner Harbor	X	X			
2485	Oso Bay					X
2491	Laguna Madre	X	X	X	X	X
2492	Baffin Bay/Alazan Bay/Cayo del Grullo/Laguna Salada					X

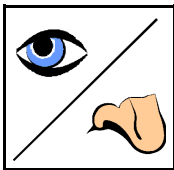


Fish Tissue Concerns

Of the 2,003.9 mi² surveyed, only 252.4 mi² (12.6% of surveyed mi²) were assessed for contaminants in fish tissue. The high cost associated with laboratory preparation and analytical determination of toxicants in tissue limits the statewide coverage of fish tissue sampling. No fish concerns were identified in areas where data were sufficient to provide assessment (Table 10-6).

Table 10-6. Overall Concerns for Fish Tissue Contaminants, Sediment Contaminants, and Narrative Criteria in Estuaries-2002

Concern parameter	Sq. Miles Surveyed	Sq. Miles Assessed	Percent of Sq. Miles Assessed	Percent of Assessed Square Miles	
				No Concern	Concern
 Fish Tissue Contaminant	2,003.98	252.40	12.60	100	0
 Sediment Contaminant	2,003.98	381.30	19.03	99	1
 Narrative Criteria	2,003.98	2,003.98	100.00	100	0



Narrative Concerns

Examples of narrative concerns include such categories as floating debris and surface oil sheens, suspended solids and excessive foam, odor producing substances, dramatic changes in color or turbidity, and excessive algal blooms. No narrative concerns were identified for any of the estuaries (Table 10-6).

The Galveston Bay Estuary Program

The Galveston Bay Estuary Program (GBEP) is a program of the Texas Commission on Environmental Quality (TCEQ), charged with implementing The Galveston Bay Plan (The Plan). In 1999, the Texas Legislature passed the Texas Estuaries Act, which not only recognized the Estuary Programs as programs of the State, but also designated TCEQ as the lead entity responsible for implementing Combined Coastal Management Plans (CCMPs) in Texas. Although this designation does not require that the TCEQ administer the Program, the Galveston Bay stakeholders identified the TCEQ, as the State Agency responsible for implementing water quality programs in Texas, as the most appropriate entity to administer the GBEP.

The GBEP has eight staff, who are managed by the Policy and Regulations Division of the TCEQ. The GBEP office is centrally located within the study area. The staff is advised by a 41-member group called the Galveston Bay Council (GBC) and its six subcommittees. The organization of the subcommittees parallels the structure of *The Plan* and program office to facilitate implementation activities. The subcommittees include: Natural Resource Uses (NRU), Water and Sediment Quality (WSQ), Public Participation and Education (PPE), Monitoring, Research, and Consistency Review. The efforts of the volunteers that serve on the Council and/or its subcommittees are key to the success of the GBEP. The Council's diversity (Figure 10-4) and membership participation sustains momentum in plan implementation. Federal and state agencies, regional and local governments, Environmental and Citizen groups, and business and industry participate equally, attending quarterly meetings 75% of the time.

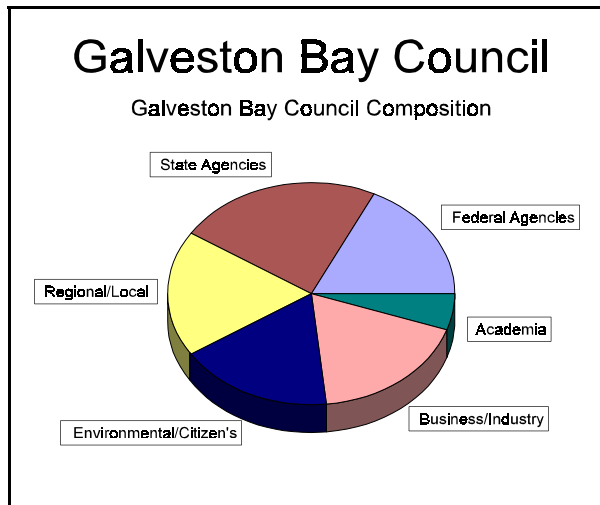


Figure 10-4. Composition of the Galveston Bay Council

Consistent attendance and participation is important to a body serving to provide a forum for coordination and information sharing; setting annual priorities by consensus; providing input on project selection; and serving as an avenue for collection of data and information relevant to Galveston Bay activities and conditions.

The NRU Subcommittee covers Habitat Protection, Shoreline Management, Freshwater Inflow and Circulation, Species Protection, and Spills/Dumping. The WSQ Subcommittee covers the NPS, Point Sources of Pollution, Water and Sediment Quality, and Public Health Action Plans. To support ongoing implementation efforts, the Public Participation and Education Subcommittee focuses on increasing awareness and knowledge of bay issues and increasing participation in its preservation. The Monitoring Subcommittee integrates and coordinates existing monitoring activities to get a comprehensive depiction of the state of the bay. The Research Coordination Board identifies and coordinates research needs and projects conducted in the Galveston Bay area.

The Plan outlines nine main action plans, encompassing 70 individual actions in the areas of natural resource uses and water and sediment quality. These actions are to address specific Bay problems, which were identified during characterization. There are also two support action plans, consisting of 12 specific actions in the areas of public participation/education and research. These actions are designed to support the main action plans. Each action is also given a priority level. This priority level is used to guide general implementation efforts. The individual actions, which are further divided into steps, identifies a schedule and lead implementing entity. *The Plan* currently outlines steps to be implemented between the years 1995 and 2000, with all steps having varying initiation periods.

Tracking Progress

GBEP tracks progress in plan implementation in three ways: 1) surveying *Plan* partners to assess the activities they are conducting to implement *The Plan*; 2) evaluating the progress towards accomplishing the objectives outlined in *The Plan* during subcommittee meetings; and 3) developing and tracking specific quantifiable performance measures.

An annual survey is conducted by interview and in writing. Data is gathered on a project information form. The form includes the name of the organization conducting the activity, name of the project or program; the location or area where the activity is being conducted; the corresponding plan action the activity is implementing; funding amount and source;

deliverables; environmental data gathered; and lessons learned. The forms are inserted into a database, which allows the activities to be organized by Plan action. The database provides a tool to quantifiably assess contributions towards specific actions in *The Plan*.

The GBEP conducted a five-year review of progress in implementing *The Plan*. In an effort to build on the 5-year review, the GBEP routinely compiles similar information during subcommittees meetings. The Subcommittees meet at least quarterly to coordinate future and ongoing projects. During these meetings information pertinent to achieving the objectives in *the Plan* are extracted. Efforts are made on other actions as opportunities present themselves or as changes in public opinion changes. Public perspectives may change due meteorological conditions (i.e extensive flooding), economics, or health outbreaks (Illness outbreak from contaminated oysters). Medium or Low actions that were given additional attention include seafood safety, invasive species.

The methods used to compile information for tracking is working. However, the GBEP is assessing the use of Memorandums of Understanding between the state agencies outlined in the Texas Estuaries Act to establish a more consistent, routine, and effective mechanism for compiling the information.

Progress in Plan Implementation

The ranking outlined in *The Plan* possesses the greatest weight in guiding implementation efforts. More than half of the actions are ranked as high. Given limited resources, the GBC and it's subcommittees are used to augment how annual priorities are set.

In 2000, the GBEP initiated a process to review, assess, and document progress over the first 5- years of implementation. Documenting progress in implementation and forming the basis for establishing priorities for the coming years were objectives of the Plan Review. Noteworthy changes in priorities include development of a seafood consumption safety program was elevated from a medium to high priority and eliminating the introduction of exotic species was elevated from a low to medium/high priority.

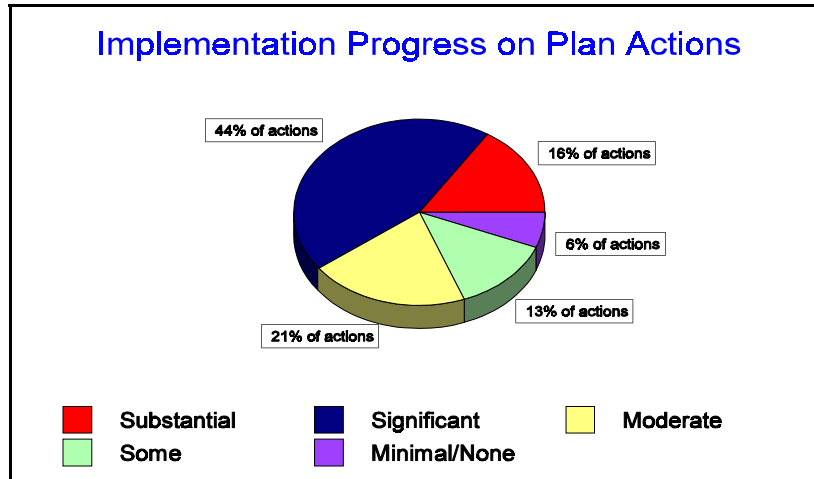


Figure 10-5. Implementation of Galveston Bay Plan Actions

Great progress has been made in the first five years of implementing Galveston Bay Plan. Although work has not been initiated on all steps, implementation activities have begun in various forms on 94% of the actions: 16% of the actions had substantial progress, 44% of the actions had significant progress, 21% of the actions had moderate progress, and 13% of the actions had some progress (Figure 10-5).

The amount of progress is due in large part to the collaboration and action taken by plan partners. The role of the GBEP has been to identify gaps and facilitate filling the gaps. GBEP's time and resources have been focused on the higher priority actions. Attention given to public participation and involvement, as evidenced in the GBEP activities noted in later parts of this report, signifies the public's importance in successful implementation. GBEP efforts are carried out through direct funding of projects, coordination/ facilitation of meetings, and provision of technical assistance.

Program Areas and Individual Action Plans

The Natural Resources and Balanced Human Uses include Habitat Protection Action Plan, Species Protection Action Plan, Freshwater Inflows and Bay Circulation Action Plan, Shoreline Management Action Plan, and Spills and Dumping Action Plan. Most of the Habitat Protection and Species Protection plans actions demonstrated significant progress with some actions showing substantial or some progress. Great focus has been given to a select group of habitat and species protection actions. Shoreline Management and Freshwater Inflows and Bay Circulation actions varied

from significant to moderate with substantial progress being made on a few actions. There were a few actions in habitat and species showing minimal progress. See Figure 10-6 for the percent of actions by Action Plan in each status category. The specific progress made on these Actions Plans are outlined below.

Habitat Protection

Successes: Habitat is being restored under *The Plan's* number one priority Action Plan of Habitat Protection. Over 4,500 acres of marsh habitat have been restored, protected, or created in the last five years. Some 1000 acres of wetlands have been subject to rehabilitation and several thousand have been protected through new acquisitions by private organizations and local governments. GBEP has been directly responsible for some 738 acres.

GBEP Projects: Protecting, creating, and restoring habitat is expensive. GBEP focuses heavily on developing partnerships and leveraging additional funds to achieve the goals under this action as demonstrated in the list of projects below.

Freshwater Inflows

Successes: The Freshwater Inflow and Bay Circulation Action Plan has been advanced through a regional collaborative effort. The TPWD and the TWDB were already at work on estimates of the freshwater needs of Texas' estuaries when legislation was passed to initiate regional watershed planning. Their study of the needs of this estuary provided critical information to the Galveston Bay Freshwater Inflow Group (GBFIG) supported in part by GBEP for consideration of this issue. GBFIG discussed the study results and made recommendations to the Region H watershed planning group on essential flow levels. Region H incorporated the needs of the bay into our regional water plan. This is the only region in Texas to specifically address the needs of an estuary during its planning process. Water conservation education has also made large strides to reduce our vulnerability to future drought conditions. A vision of sustainable water supplies for people and nature is growing.

GBEP Projects: GBEP identified facilitation of discussions as the greatest need from the Program to move the issue forward.

Species Protection

Successes: Species protection efforts for birds have been enhanced. Resources are being leveraged to build additional islands for bird habitat.

Although work continues, updated data indicate apparent increases in several bird species, including the brown pelican.

GBEP Projects: GBEP conducted one project to reduce bycatch; however, successes identified in habitat restoration has also contributed to success in species protection.

Shoreline Management

Successes: Shoreline management remains a challenge. Actions have been initiated to preserve the integrity of our shorelines, but much work is needed. Under the Coastal Erosion Planning and Response Act, some \$15 million in Texas fiscal year 2000 and 2001 were provided for erosion response efforts, which focused largely on the Gulf side. Some cities are considering the importance of key wetland habitat along the shoreline, as wetland plans are being developed. However, integrated planning and management will be needed to reconcile the activities of improving public access and expanding recreational opportunities with maintaining shoreline integrity.

GBEP Projects: The GBEP conducted shoreline management projects under the previous implementation review. Due to higher priority actions, the GBEP did not focus on this Action Plan during this review period.

Spills and Dumping

Successes: The Natural Resources Damage Assessment Program (NRDA) has made very important contributions to progress on the Spills/Dumping Action Plan. NRDA partners have greatly facilitated the process of turning environmental damage into habitat conservation opportunities. Seagrant has developed a Clean Marina Program for Texas and is working cooperatively with the GBEP to address boater waste issues. The implementation of Phase I of the NPDES Stormwater program under the Clean Water Act will have major positive impacts on spills and solid waste associated with runoff. Public attention has been focused on this source of pollution through the successful Trash Bash activity coordinated by Gulf Coast Waste Disposal Authority. Public recognition of the pollution problems associated with runoff could change our vision of what it means to be environmentally responsible. This new focus could lead to increased partnerships with local governments, thus increasing our effectiveness.

GBEP Projects: The GBEP did not focus on this action plan during this review period due to higher priority actions needing attention.

The Water and Sediment Quality Action Plans

The Water and Sediment Quality Action Plans include Nonpoint Sources, Point Sources, Water and Sediment Quality, and Public Health. Overall, substantial progress was made under public health and significant progress made in some of the water and sediment quality actions, point sources actions, and a few of the NPS actions. Although NPS is the number one water quality problem in Galveston Bay, significant attention is given to just a few actions at a time. Many of the actions are temporally dependant on activities occurring under other actions and would take some time before demonstrating significant or substantial progress. The progress under WSQ is a result of the progress being made on TMDL's. Progress under Point Sources is due in large to GBEP's technical assistance efforts for small wastewater treatment plants. The specific progress made on these Actions Plans are outlined below.

Nonpoint Sources of Pollution

Successes: Non-point sources of pollution, the number one water quality problem in Galveston Bay, is being addressed. Local governments are

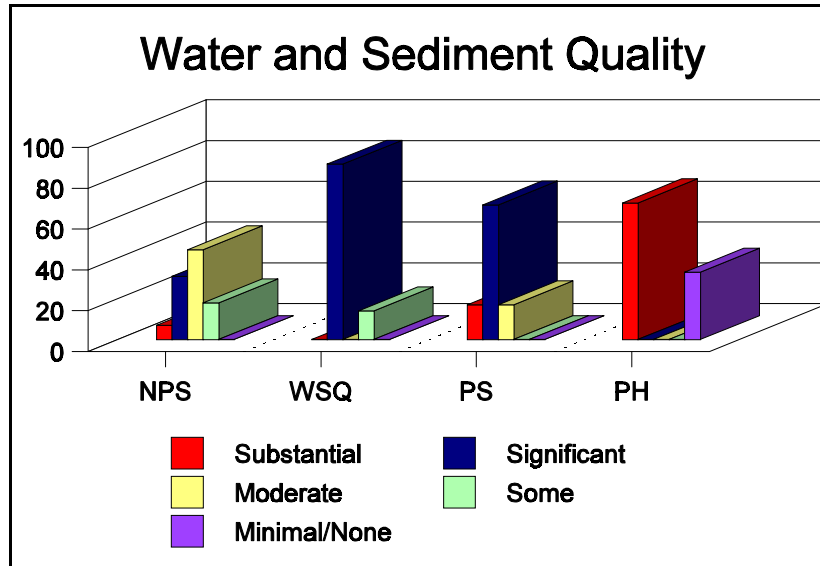


Figure 10-6. Water and Sediment Quality of Galveston Bay

developing storm water management programs; small businesses are implementing voluntary pollution prevention actions; flood control districts are restoring streambanks through re-vegetation; homeowners are being educated on proper maintenance of septic systems; and more citizens are using bay friendly landscaping techniques.

GBEP Projects: GBEP focused over the past 3 years on assisting local governments with developing stormwater management plans and developing the tools needed to aid in implementation of those plans.

Point Sources of Pollution

Successes: Municipal point source discharges are improving. Small utility districts, who may not have the resources or expertise to operate certain wastewater treatment plants in the most efficient and effective way, are improving due to technical assistance efforts.

GBEP Projects: GBEP focused on supporting technical assistance efforts.

Public Health

Successes: Some of the action plans have shown very significant progress thanks to new programs developed by partners of GBEP. For example, on the Public Health Action Plan, GBEP has worked closely with Texas Department of Health (TDH) on increased monitoring of seafood for fecal coliforms, *Vibrio* bacteria and toxic contaminants. GBEP provided funding for a comprehensive risk assessment of Galveston Bay seafood regarding chemical contaminants. TDH has performed fecal coliform testing in excess of monitoring requirements to reclassify oyster harvest areas, an objective of *The Plan*. There has also been progress by the Texas General Land Office (GLO) under the Coastal Management Program on monitoring beach water for contaminants that could impact contact recreation. The health of Galveston Bay's users is better protected than it was before GBEP encouraged collaboration among management agencies

GBEP Projects: GBEP focused on evaluating Seafood Safety Consumption risks. This element of the Public Health Action Plan was elevated to a high priority during the Plan Review due to increased public interest. A bay-wide seafood consumption risk assessment was completed.

Water and Sediment Quality

Successes: Actions addressing water and sediment quality have progressed through the implementation of TMDL and other projects on the bay and its tributaries. A total of 8 TMDLs have been initiated by TCEQ in the lower Galveston Bay watershed. Voluntary programs for municipalities (Clean Cities) and businesses (Clean Industries) demonstrate the value of non-regulatory initiatives to improvement of water quality. These participatory programs address the problems of every impaired water body in the region, build partnerships, and contribute to a shared vision of the environmental future of the Galveston Bay watershed.

GBEP Projects: The GBEP conducted water and sediment quality projects under the previous implementation review. Due to higher priority actions, the GBEP did not focus on this Action Plan during this review period. However, we were involved in the TMDL stakeholder process.

Public Participation and Education

Successes: The Public Participation and Education Action Plan recognizes the value of an educated citizenry for the protection and monitoring of Galveston Bay. The public's attitude toward the environment and the bay are monitored by the *Texas Environmental Survey*. Results of this research provide the GBEP subcommittees with useful information on the public's views of environmental issues and through trend analysis provides a picture of how effective outreach efforts have been in the past. Planning for the biennial State of the Bay Symposium is another stakeholder driven activity which provides a form for sharing results of *Plan* implementation demonstration projects, results of monitoring and protection programs, and current updates on the state of the bay.

GBEP Projects: GBEP devotes staff and funding to many worthwhile volunteer efforts, including: Bay Day, Marsh Mania, Trash Bash, Citizen Water Quality Monitoring, and the Galveston Bay Yards and Neighbors Program. Actions in this arena make important contributions to a widely held vision of the bay based on *The Plan*.

GBEP Programs And Initiatives

The GBEP has undertaken additional initiatives to support implementation activities including encouraging involvement of organizations and entities not engaged in implementation activities through the GBEP Grant Program and Local Government Initiative; increasing awareness of *The Plan* and its partners through the Stewardship Award Program; and providing a forum for information sharing, coordination, collaboration through the Biennial State of the Bay Symposiums. For more information on these initiatives or more detail on GBEP projects visit the Web site at www.gbep.tamug.tamu.

Galveston Bay Grant Program

As part of an effort to increase local government and user group partnerships, the GBEP initiated a new grant program in 2000. The Galveston Bay Grant Program is one of the newest tools available for protecting and improving Galveston Bay's water quality and natural resources. Grant

dollars help communities, non-profits, local governments, school districts, and state agencies to implement *The Plan* by supporting programs to create solutions to local water pollution problems, protect, preserve and restore habitat, and encourage people of all ages to be environmental stewards. The Galveston Bay Grant Program fosters community and local government involvement in implementation of *The Galveston Bay Plan*. To date GBEP has funded 15 community-based projects totaling \$350,000.

Watershed Stewardship for Ed White Elementary School

The students of Ed White III Elementary School, teachers and PTA volunteer parents created and installed a freshwater wetland habitat, received watershed education, and conducted community outreach. Plans included implementing a watershed curriculum library and offering teacher workshops. On Jan 7, 2001, over 75 volunteers assisted with digging the wetland pond on the school property. Students spent the next five months using emergent native plants to create a natural habitat for observation and study. Science classes studied water quality, insects, and flora that grew in the pond. The older students also studied the problems with urban runoff and non-point source pollution. Local Master Gardeners also had classes at the wetland for volunteer docents that wanted to assist school faculty with the outdoor classrooms.



*Elementary Students Installing a Freshwater Wetland Habitat
Water-Borne Educators*

The Upper Texas Coast Water-Borne Education Center of Liberty and Chambers County in Anahuac, Texas is the recipient of the “Education and Public Awareness Award” from the Texas General Land Office. The award was presented at the Texas Coastal Treasures 2002 Conference. The award was given for developing a unique and innovative nonprofit educational organization that offers hands-on, real-life learning experience focusing on the ecology of the Trinity River and Galveston Bay.



San Jacinto Point Marsh Restoration Phase II

The City of Baytown, Department of Parks and Recreation worked with students from regional schools to restore over 1½ acres of salt marsh wetlands at San Jacinto Point. Students were



given classes on the “Science of Galveston Bay”, including water quality monitoring, indigenous wetland plants, native birds, and environmental impact of this vital ecosystem to Galveston Bay. All data collected from their observations at the marsh gave thorough understanding of how wetlands impact the coastal environment.

Texas Environmental Survey

Dr. Stephen Klineberg, Sociologist, Rice University, conducts biennial public surveys in a five county region surrounding Galveston Bay. The Texas Environmental Survey was initiated in 1990, to determine the public’s attitude toward local and statewide environmental problems. The survey focuses on such issues as bay quality, public health, pollution, non-point source pollution, recreational use, government involvement, environment vs economy, and personal ‘pro-environmental’ behaviors. The analysis of trends, changes of opinions, and regional concerns is published with results for multiple years compared.

Coastal Bend Bays and Estuaries Program

In its 1987 reauthorization of the CWA, the U.S. Congress established the National Estuary Program (NEP) to promote long-term planning and management of nationally significant estuaries threatened by pollution, development, or overuse. The Administrator of the EPA was given authority to convene Management Conferences and to award Federal financial assistance grants to approved state programs for the purpose of developing and implementing a CCMP. The CWA defines criteria by which Management Conferences are charged with balancing the conflicting uses in target estuaries, while restoring or maintaining their natural character.

The Coastal Bend Bays & Estuaries Program (CBBEP)(formerly the Corpus Christi Bay National Estuary Program) was formally established in October 1992 with committee meetings beginning in late 1993. The CBBEP was one of the first NEPs to use a streamlined approach to the development of a CCMP. The goal of the CBBEP to complete a Preliminary CCMP within 12 to 18 months (from 09/01/94) and a Final CCMP in approximately four years (by September 1998) was achieved.

A State-EPA Management Conference Agreement detailing this and other specific outputs of the four-year program was signed in May 1994 by the Regional Administrator of the EPA and the Chairman of the State lead-agency for the Program, the TCEQ. The Program Office has been established since December 1993, as a program of the TCEQ, with a non-profit organization established in 1999 to lead implementation.

The project area encompasses the estuarine environment of 75 miles of the south-central Texas coastline, and includes the 12 counties of the region known as the Coastal Bend. This 514 square mile area of water includes all bays, estuaries, and bayous in the Copano, Aransas, Corpus Christi, Nueces, Baffin, and upper Laguna Madre bay systems, which together represent three of the seven major Texas estuaries.

The Priority Issues for the CBBEP are:

- ! Alteration of Freshwater Inflow into Bays and Estuaries
- ! Condition of Living Resources
- ! Loss of Wetlands and Estuarine Habitats
- ! Degradation of Water Quality
- ! Altered Estuarine Circulation
- ! Bay Debris
- ! Selected Public Health Issues

The *Coastal Bend Bays Plan* has been developed to address each of these priority issues under the following categories of action plans: Human Uses; Maritime Commerce and Dredging; Habitat and Living Resources; Water and Sediment Quality; Freshwater Resources; and Public Education and Outreach. The projects selected for implementation under this Cooperative Agreement reflect a combination of priority and readiness or feasibility for implementation. Implementing Partners for other actions of the *Bays Plan* will likewise be called upon to begin and continue to implement their own portions of the *Bays Plan*. The role of Program staff is multi-faceted, but will include at a minimum the following tasks: (1) acquire, manage, and disperse funds to implement the *Bays Plan*; (2) develop and implement partnership projects with local governments, state and federal agencies, and private organizations; (3) monitor, track, and report on implementation performance by implementing partners, and work to maintain implementation commitments; and (4) coordinate the environmental monitoring and assessment of the *Bays Plan* implementation effectiveness.