

Briefing Paper on Lower Galveston Bay and Bayou Watersheds
Lower Bay I: Armand Bayou to Moses Lake and Adjacent Bay Waters

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Description of the Watershed

This subwatershed encompasses 431 square miles. It begins in the north at the upper reaches of Armand Bayou in the southern portion of Pasadena. It extends to the I-45 Causeway to Galveston in the south. On the east it is bordered by Galveston Bay and extends westward to the headwaters of Clear Creek. This triangle of land contains the Clear Creek/Clear Lake watershed, the Dickinson Bayou/Dickinson Bay watershed, Moses Lake and the adjoining waters of Lower Galveston Bay. It contains the municipalities of Seabrook, Kemah, League City, Dickinson, La Marque and Texas City, as well as portions of Houston and Pasadena. There is a large industrial complex on the south side of Texas City, which has a ship channel and port facility associated with it.

Land Use and Habitat in the Watershed

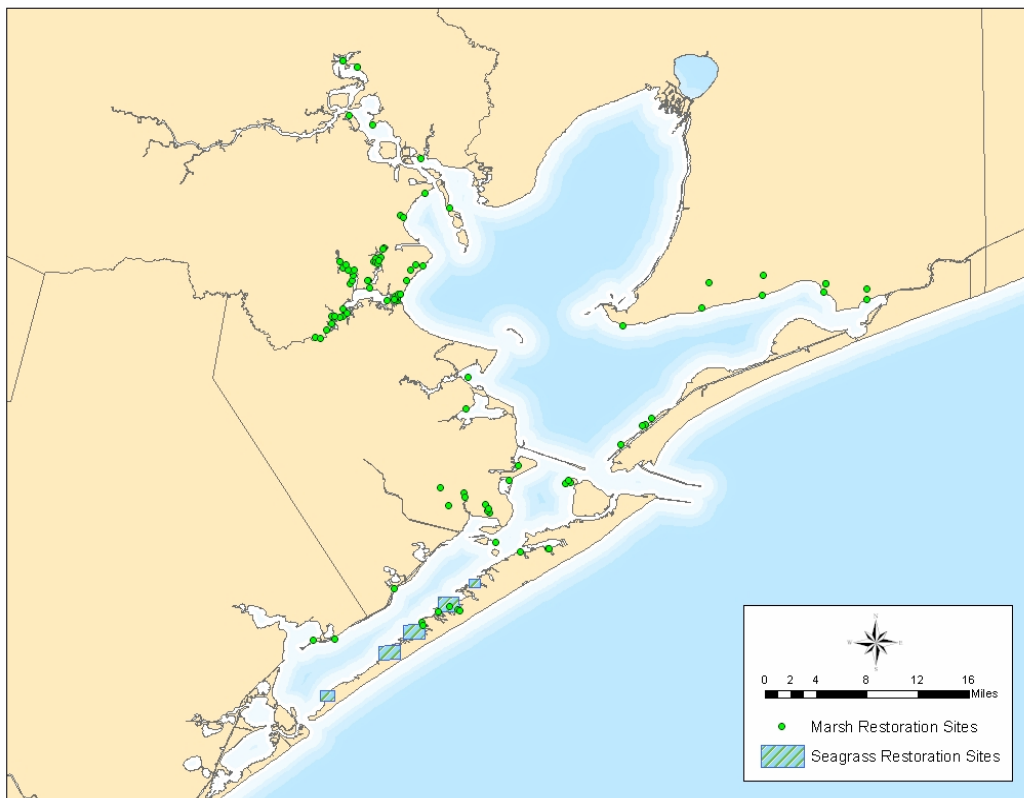
This region consists of highly developed land areas classified as industrial, commercial and residential. Industrial facilities are clustered primarily on the southern side of Texas City. There are commercial clusters in the Clear Lake area around NASA Johnson Space Center, in various areas centered on shopping malls and in downtown areas of the municipalities. Residential land use is most intense around the centers of Clear Lake, Dickinson and Texas City/La Marque. There is limited agricultural land use in this region. Undeveloped land is likely held for future development or conservation purposes.

Several large parcels of land in this area are held for conservation purposes. Armand Bayou Nature Center covers more than 2,500 acres and works to restore the historical aquatic and terrestrial habitats of the area. Texas Nature Conservancy has a 3,000 acre preserve on Moses Lake dedicated to restoring a population of the endangered Atwater's prairie chicken and its habitat. Scenic Galveston holds more than 2,000 acres around I-45 south of Texas City and is protecting and restoring the marsh and prairie habitat. Various other organizations also protect and restore habitat in this subwatershed.

The largest natural ecosystems found in this area are coastal prairie, which was historically dominated by tall grasses; salt marsh, in which *Spartina* grass dominates; and riparian forest along the bayous, which are based on a variety of hardwood trees. The Bay waters adjoining this land area were noted for oyster reefs, which played a prominent role in the history of the region. From Eagle Point in San Leon to Smith Point on the other side of the Bay, a nearly continuous oyster reef existed when settlers arrived. This structure and many smaller reefs were decimated by the shell dredging industry prior to 1969. Some efforts are being made to increase the amount of oyster reef in this area.

Many of the wetland restoration projects in the Galveston Bay system have been undertaken in this area. The figure below shows how intensive the efforts have been to restore marsh habitat along the shores of Clear Lake, Clear Creek, Armand Bayou and Taylor Bayou. This geographic focus is likely related to the location of Armand Bayou Nature Center, the Galveston Bay Foundation and the Galveston Bay Estuary Program in the area around Clear Lake along with a concentration of well educated potential volunteers from the NASA and aerospace industry workforce.

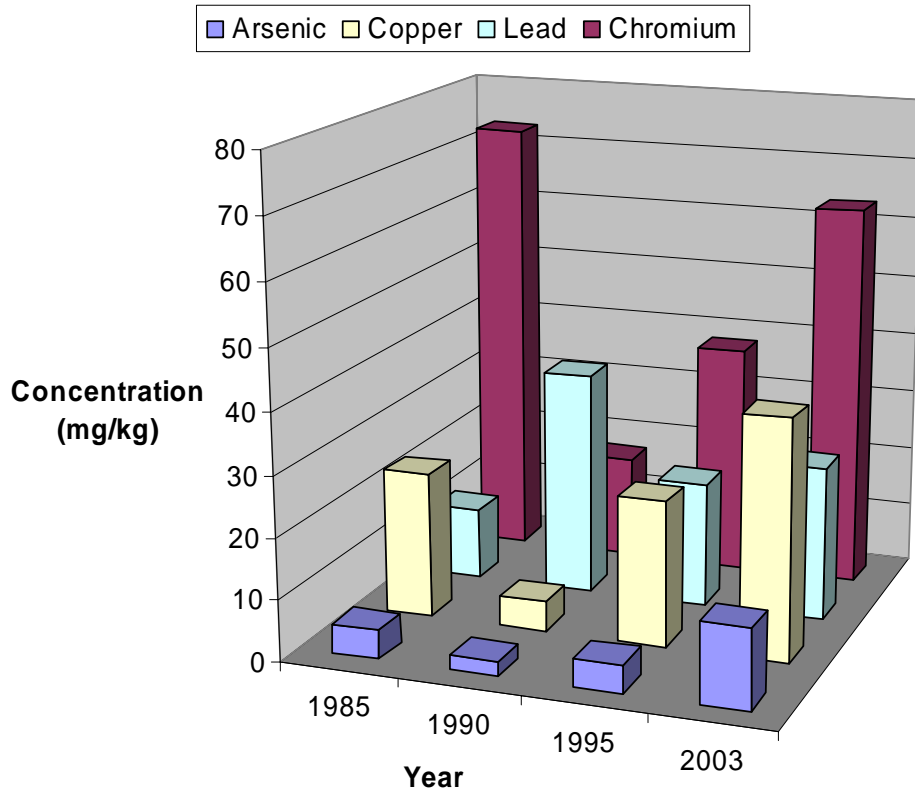
Figure 1. Locations of 103 fringing marsh and SAV restoration sites planted in the Lower Galveston Bay watershed since 1973. Fifty-eight of the marsh restoration projects are found in this subwatershed. Map created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data sources: Dr. Geoffrey Matthews, National Marine Fisheries Service Galveston Laboratory; US Fish and Wildlife Service Texas Coastal Program; Texas Parks and Wildlife Department.



Water Quality Issues

The most serious water quality issues in this area, as in most parts of the Lower Galveston Bay watershed, are associated with the center of industrial activity. In this area, that is the Texas City Ship Channel. Discharges over many years from industrial facilities have contributed to the accumulation of persistent metal pollutants in the sediment. The graph below shows representative concentrations of four metals commonly measured by TCEQ in sediment samples taken over the last 20 years from sample sites in the Texas City Ship Channel.

Figure 2. Concentrations of four metals (arsenic, copper, lead, and chromium) over the last 20 years collected from sample sites in the Texas City Ship Channel. Map created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data source: Texas Commission on Environmental Quality.



The most common water quality problem in this area is an excess of coliform bacteria in the bayous, especially Clear Creek and Dickinson Bayou. These two bodies of water and Armand Bayou are listed by Texas Commission on Environmental Quality (TCEQ) as impaired for historical use due to levels of fecal coliform bacteria that exceed the screening level. This parameter is discussed below as a public health concern.

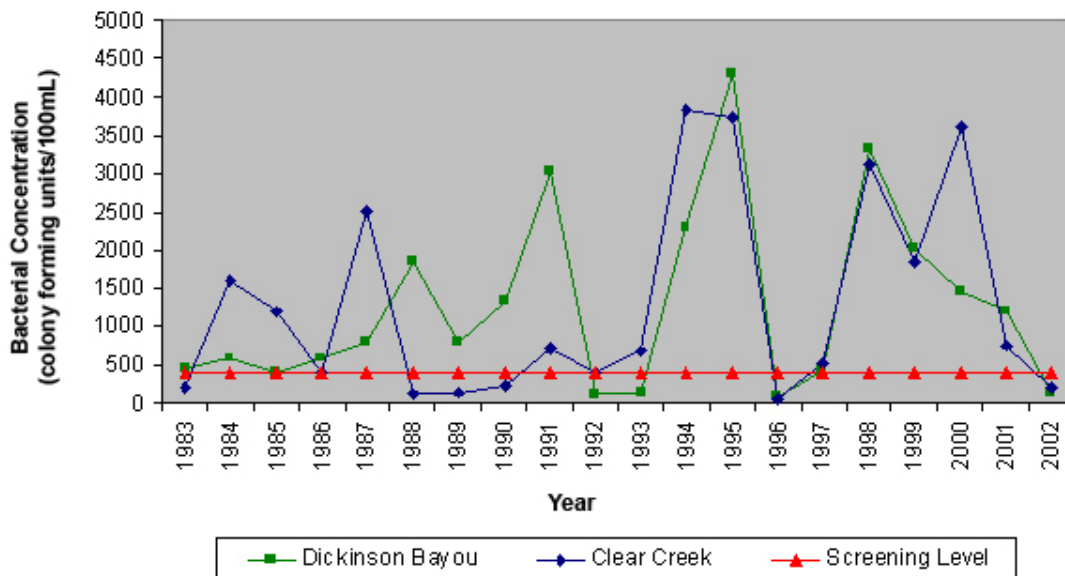
Armand Bayou has relatively high nutrients and can exhibit low dissolved oxygen. This is to be expected for a water body that lies in a heavily developed area and has very low flows. Low dissolved oxygen is a common warm weather problem caused by high levels of nutrients, phytoplankton, and microbial activity.

Legacy water quality problems arising from the Brio Superfund Site have been addressed in Clear Creek. In the past, leaching contamination from this location reached Clear Creek and resulted in fish contamination. A seafood consumption advisory was issued in 1993 because fish and crabs contained concentrations of a pesticide and several organic compounds that represented significant health risks. This was rescinded in 2001 because subsequent sampling showed that the level of contamination had fallen and the risk from consumption was no longer significant.

Public Health Issues

Clear Creek and Dickinson Bayou have levels of fecal coliform bacteria that exceed the screening levels used by TCEQ to determine which water bodies need to be listed as impaired for historical use. Both water bodies would be considered a health risk for contact recreation. The annual average concentrations of fecal coliforms in water samples from both water bodies are shown for 20 years from 1983 to 2002 in the figure below. The level of pollution clearly varies considerably over time. Swimming and other forms of contact recreation should be avoided when the bacterial concentrations in Dickinson Bayou or Clear Creek exceed 400 colony forming units per 100 ml of water. Other locations for contact recreation, such as the Texas City Dike, have no known pollution that would justify avoidance for public health reasons.

Figure 3. Annual average concentrations of fecal coliforms in water samples from Clear Creek and Clear Lake and Dickinson Bayou and Dickinson Bay from 1983 to 2002. Map created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data source: Texas Commission on Environmental Quality.



The other public health issue is seafood safety. Clear Creek had a seafood consumption advisory in the past, which has been rescinded. Recent sampling has found no contamination that would cause any increase in risk of cancer or non-cancer health effects from consumption.

Harvesting shellfish from Dickinson Bay, Clear Lake and Moses Lake is prohibited for public health reasons due to the historically high levels of coliform bacteria in the water. Consumption of oyster from these waters would not be advisable due to health risks, but most of the waters of Lower Galveston Bay are approved for shellfish harvest.

Other Issues

The residential areas surrounding Clear Creek and Dickinson Bayou have experienced flooding in the past. There is an active planning process funded by the Corps of Engineers to design a flood mitigation project for Clear Creek that will meet with public approval. An earlier plan for dredging and straightening the creek met with opposition. Flooding is likely to remain a major issue for this subwatershed as more land is converted from prairie wetland complex to housing and commercial development.

Conclusion

There are parts of this area where the tension between habitat loss and habitat restoration is strong. Around Clear Lake and Armand Bayou there are many efforts to restore wetland and prairie habitats despite the continued rapid conversion of vegetated land to development. There is also a focus on conservation around Texas City embodied in the Prairie Chicken reserve and the restoration projects around the Causeway and Virginia Point. Water quality is impaired by industrial activity and residential development, but the problem is localized in tributaries and the Texas City Ship Channel. Much of the water quality degradation is due to bacterial contamination, which makes the problem one of public health as well. The seafood of this area appears to be safe to consume as long as shellfish are not harvested from embayments or nearshore water. The environmental quality of this area is a smaller and less degraded version of the picture in Houston to the north.