

Briefing Paper on Galveston Bay Plan Action Items
Shoreline Management

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Overview

Goals of the Galveston Bay Plan

- Reduce negative environmental consequences to the bay.
- Increase environmentally compatible public access to bay resources.

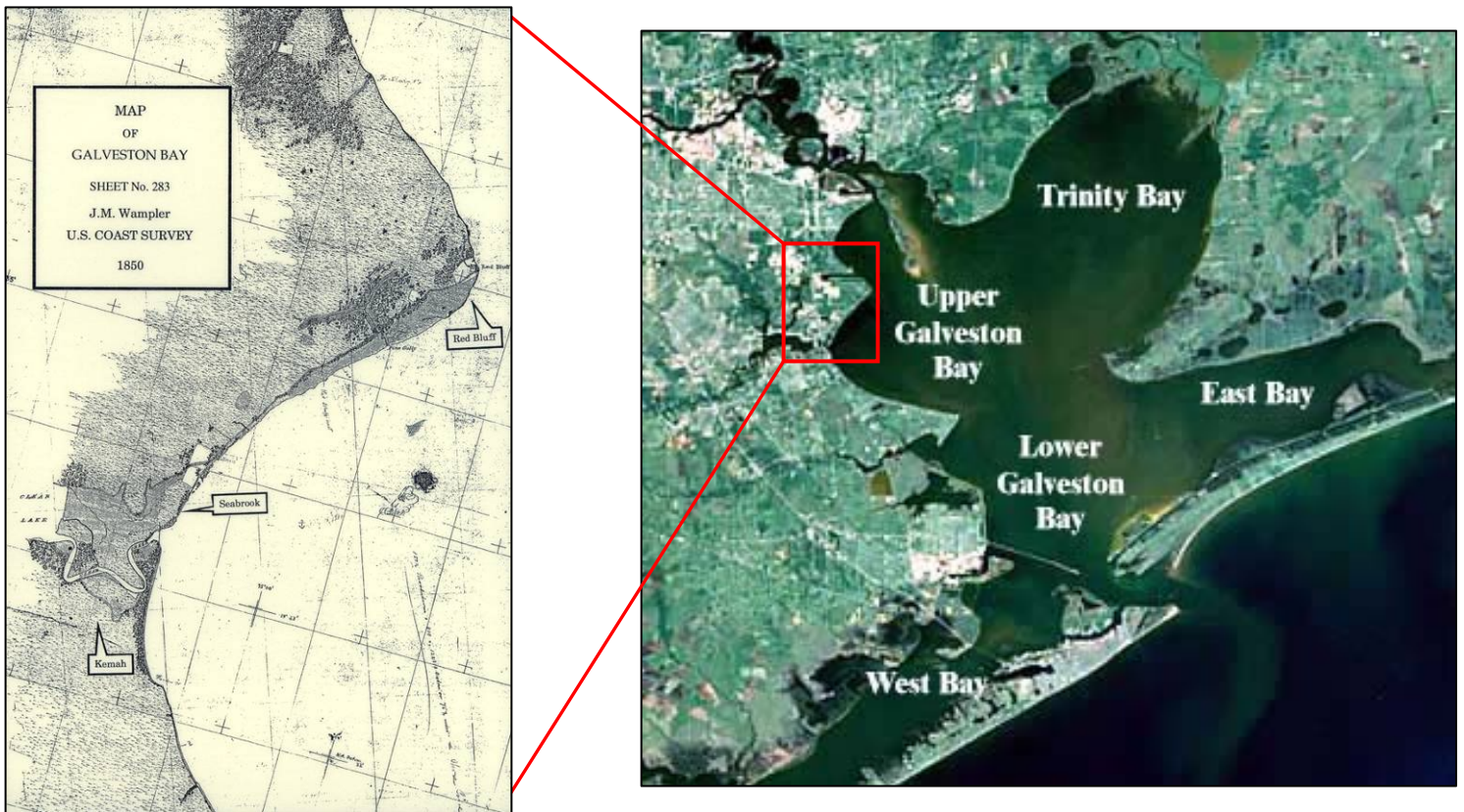
Shoreline is a term used to describe the interface between land and water. Around Galveston Bay shoreline is more often a zone rather than a definite line because of the presence of habitats such as wetlands and tidal movements. Human development includes hard structures, e.g. piers and bridges, which extend land development into the water. Alternately, human development sometimes includes construction of canals that extend water into the land.

The Galveston Bay Plan identifies issues related to shoreline development and public access to bay resources as a priority problem. Galveston Bay and its living resources should be accessed and enjoyed by all who wish to visit or live in its vicinity. However, shoreline development that promotes and enhances public access should be sensitive to the habitats and organisms that exist within and around the edges of the estuary. Very often shoreline development exacerbates environmental problems through disturbance or destruction of vital habitat, increased loadings of point source and nonpoint source pollutants, increased erosion, and introduction of solid waste and debris. Shoreline development often utilizes hard structures such as bulkheads and revetments (i.e. shoreline retaining walls). Additionally, the conversion of public shoreline to private property reduces opportunities for people living around the bay to access bay resources and appreciate the bay's unique aesthetic qualities.

Historical Trends

The shoreline surrounding Galveston Bay today looks much different from the shoreline that existed prior to European settlement, as seen in the 1850 map of Clear Creek below. Although settlement was well underway, the shoreline was rich with natural habitat and very little human development. In addition to shoreline construction, the shoreline of the bay has also been altered by dredge and fill operations and isolations of embayments previously connected to the bay system.

Figure 1. Left: Map of the 1850 shoreline near Clear Creek and Red Bluff. Source: U.S. Coast Survey Map by J.M. Wampler. Right: The same area today in the context of the entire Galveston Bay system. Source: NASA Johnson Space Center.



While bulkheads, docks, and revetments usually generate lower volumes of dredge and fill material compared to channel construction, their environmental impact may be disproportionately greater than the actual physical modifications would suggest (Ward, 1993). Most shoreline modifications involve a direct conversion of shoreline and near shore habitat from a sloping, vegetated, natural state that transitions the land-water interface to an abrupt vertical land-water barrier.

One of the greatest coastal engineering achievements in the early 20th century is attributed to Galveston's response to the devastating great storm of 1900. Vast quantities of sand were mined and transported by pipeline to raise the elevation of the entire City of Galveston by up to 11 feet above the previous land surface. Fill material was taken from several borrow areas including Offatts Bayou and East Lagoon. By the time the project was completed in 1911, over 9,900 acre-feet of material had been moved to help protect the city from future hurricanes.

In 1931, despite the protests of oil, towing, and timber interests, the entrance to Lake Anahuac (then called Turtle Bay) on the northern shore of Trinity Bay was closed to protect rice irrigation systems. The 6,000-acre embayment was isolated from the Galveston Bay system and converted to a shallow, freshwater lake. Moses Lake north of Texas City was once open to Lower Galveston Bay. In 1966, the U.S. Army Corps of Engineers (COE) constructed a tidal floodgate, isolating Moses Lake from the bay. A levee was constructed on the southern shore of Moses Lake to protect the city from floodwaters. Other isolations include the privately owned Delhomme hunting area and the impoundment utilized as part of the Reliant Energy Cedar Bayou Generating Station's cooling system.

Regional shipping terminals impact shoreline through the dredging of channels, excavation of land for berths, and through the direct conversion of shoreline habitat to shipping terminal facilities. The largest facilities in the Lower Galveston Bay watershed are the Port of Houston, which includes many private docks, Barbour's Cut Terminal built in the 1970s near Morgan's Point, and the Bayport Terminal currently under construction near Red Bluff.

The Texas City Dike is a five-mile long, mostly rippapped structure extending from Texas City into Lower Galveston Bay just north of Pelican Island. Construction of the dike was completed in 1934. The dike serves as a barrier to prevent siltation of the Texas City Ship Channel and is a popular fishing location. The dike also serves as a barrier to the flow of water and organisms into West Bay. As a result, average salinities in West Bay are some of the highest in the Galveston Bay system.

The impacts of dredging, or the removal of sediments from the bay bottom, are a topic of debate. Negative impacts to the bay ecosystem include altering the natural movement of sediments in the estuary, altering bathymetry and salinity regimes (via the intrusion of saltwater through deeper channels), facilitating the resuspension of sediments contaminated with organic and inorganic pollutants, and covering habitat with improper disposal of dredged sediment.

Shipping and navigation channels are dredged periodically to remove silt. In past dredging projects, the excavated sediment, or dredge material, was transported to upland disposal sites or deposited on the floor of the open bay smothering important bay bottom habitat. Today, dredge

material is used beneficially as substrate to restore habitat. Beneficial uses of dredge material create wetland habitat and bird nesting islands. Examples include Atkinson Island in Upper Galveston Bay and wetland reconstruction at the San Jacinto Monument.

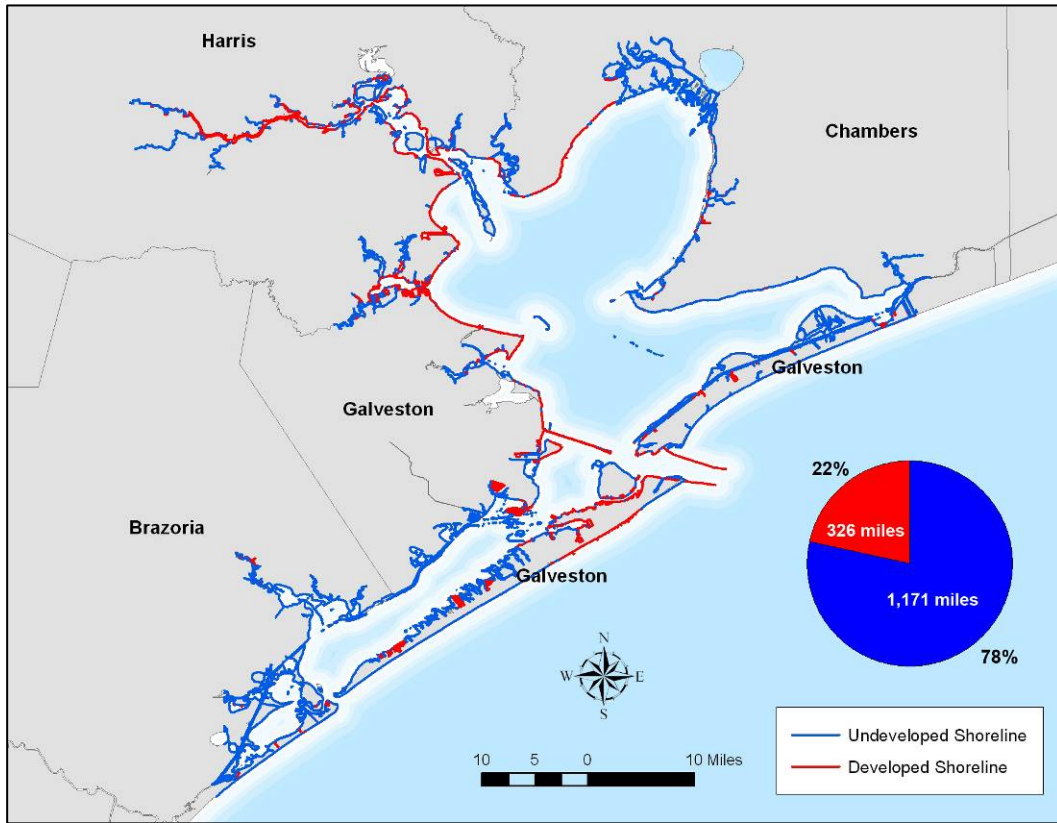
Relative sea level rise is defined as a local rise in sea level in relation to the movement of land. In the case of the Lower Galveston Bay watershed the land movement is known as subsidence, or sinking land surface caused by the extraction of groundwater. Subsidence drowns shoreline habitat and alters land use. Wetland habitat surrounding the San Jacinto Monument was converted to open water by subsidence. Subsidence caused land surface to subside by as much as ten feet in an area of Baytown known as the Brownwood Subdivision. The subdivision was abandoned after Hurricane Alicia in 1983 and is now home to the Baytown Nature Center.

A number of canal communities exist along the shore of Galveston Bay. Examples include Tiki Island, Bayou Vista, and Omega Bay just north of Galveston Island; Pirate's Beach and Cove on the backside of Galveston Island in West Bay; and Harborwalk a new master planned canal community near Bayou Vista. Most of the canal communities sit on land that was once estuarine marsh, filled to support the construction of homes. Construction of canal communities directly converts gradually sloping shoreline marsh to bulkheaded shore. Additionally, the canals in many of these communities suffer from poor circulation. Decreased dissolved oxygen levels in water during the warm summer months can result in fish kills.

Current Status in the Galveston Bay Watershed

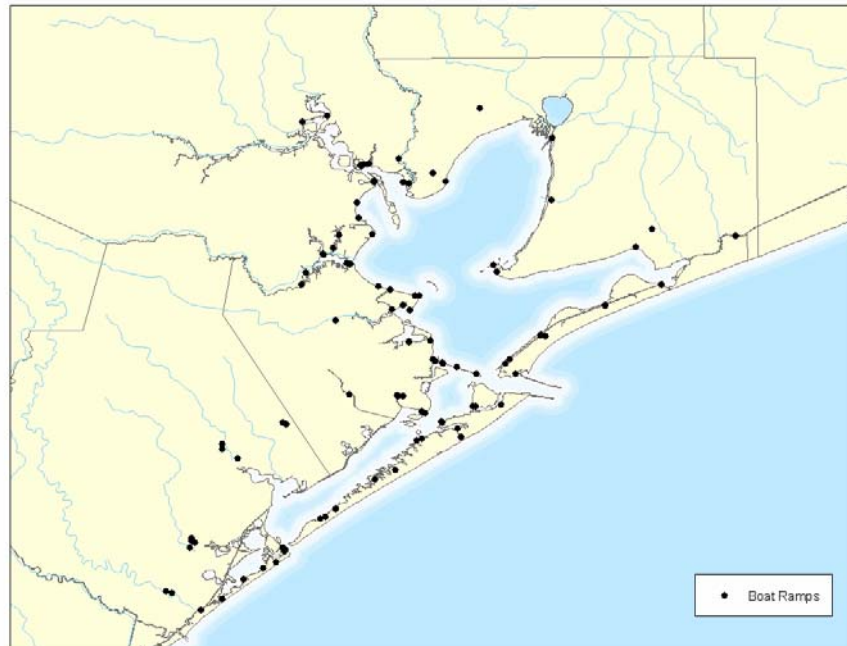
A shoreline assessment conducted by the Galveston Bay Status and Trends Project in 2005 showed that by 1995, 326 miles of the nearly 1,500-mile Galveston Bay shoreline had been developed for human use (see Figure 2). As seen below, most of the development occurs along the western shore of the bay, the Houston Ship Channel, and the East End of Galveston Island. Of great concern is increasing development on the backside of Galveston Island in West Bay, an area rich with estuarine wetland habitat. Additional shoreline assessments are needed to determine the status of developed and undeveloped shoreline around the Galveston Bay Estuary.

Figure 2. Map depicting location and extent of developed and undeveloped shoreline in Galveston Bay in 1995. Map created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data Source: University of Texas, Bureau of Economic Geology Environmental Sensitivity Index (1995).



Many types of recreational uses of the bay exist including boating, fishing, and nature viewing (e.g. bird watching). It is often difficult to quantify these recreational uses in terms of numbers of users and the number of locations by which people can access the bay and its resources. Figure 3 below shows the locations of 112 boat ramps with access to Galveston Bay waters. Other types of shoreline access areas include shoreline parks, fishing piers, bridges and roads bordering the bay.

Figure 3. Map depicting the locations of 112 boat ramps in Galveston Bay. Map created by the Galveston Bay Indicators Project. Data source: Texas Parks and Wildlife Department (TPWD) Coastal Fisheries Division.



Management

Shoreline Development

Several pieces of federal legislation regulate shoreline development. The primary tool for managing development of bay shoreline is the federal wetland permitting process. Wetland habitat that occurs on private property adjacent to navigable waterways is subject to regulation by Section 10 of the Rivers and Harbors Act (1899) and Section 404 of the Clean Water Act (1972). The U.S. Army Corps of Engineers (COE) is responsible for issuing permits under Sections 10 and 404 to destroy wetlands and for determining what mitigation will be required to offset any permitted destruction. Other federal agencies, state natural resource agencies and the public are given the opportunity to comment on permit applications. Few permits are denied if they meet procedural requirements, but permits often include mitigation requirements. There is considerable debate about the ecological equivalence of natural and created wetlands. Thus, most mitigation projects are more than twice the area of the natural wetland destroyed. In 2001, a U.S. Supreme Court ruling known as SWANCC limited the COE's jurisdiction to only those wetlands that are connected to navigable waters of the United States. This ruling was interpreted by the COE Galveston District to remove all "isolated" freshwater wetlands including pothole complexes from the protection of the COE permitting process.

Under some circumstances, shoreline development projects may also fall under the regulatory authority of the Endangered Species Act (ESA). Habitat protection under the ESA is managed by the U.S. Fish and Wildlife Service (FWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries. Large, federal shoreline development projects are also regulated by the National Environmental Policy Act (NEPA) of 1969. NEPA requires that

federal projects (i.e. projects undertaken or funded by the federal government) assess environmental, economic, and social impacts of the proposed projects and suggest reasonable alternatives. To meet this requirement, federal agencies prepare a detailed statement known as an Environmental Impact Statement (EIS).

At the state level, the Texas General Land Office (GLO) is responsible for managing the submerged lands of the state, including submerged lands just along the shoreline of the bay. Implementing the agency's mission puts on it a burden of defining the location of the shoreline of Galveston Bay or the intersection between submerged and non-submerged lands. Any party interested in building a structure such as a cabin, dock or even a pile of sediment for creating a marsh, that extends over state submerged land, must submit a permit application to the GLO. Depending on the scope and size of the project, the permitting process may require a habitat survey and habitat mitigation (i.e. an action such as habitat restoration that compensates for or minimizes habitat alteration).

Shoreline Access

Shoreline access around the bay is a concern of recreational users. Public shoreline access to the bay is generally limited to a few parks and boat ramps. As population around the bay increases, there is likely to be demand for additional public facilities in these areas. The Galveston Bay Plan proposes improving public access to the shoreline in a manner that is consistent with the protection of the bay's resources. Efforts to ensure public access to shoreline are largely non-regulatory.

There have been various efforts to acquire land for public recreational facilities along bay shorelines. However, funding constraints often prevent the implementation of plans to acquire land for public facilities. Additionally, no plan exists to encourage voluntary land dedication for use as public access points in major shoreline developments. Municipalities such as League City, Seabrook, Texas City have improved park land and public access to Bay and tributaries.

A number of projects promote non-consumptive recreational opportunities around the bay. The Texas Parks and Wildlife Department completed the Great Texas Coastal Birding Trail, which provides access and observation sites to birders along the Texas coast. The cities of Pasadena, Webster, League City, La Porte, Baytown and Seabrook are developing trails and shoreline access for low-impact recreation along the bayous in their jurisdictions. The Galveston Bay Foundation is developing the "Galveston Bay Loop Trail". The trail and associated map and booklet will direct the public to important natural resource areas around Galveston Bay. Signage at the designated sites will provide information describing issues of concern and the diverse resources of the Galveston Bay system.

The Coastal Coordination Council (CCC) is in the process of conducting a coastwide inventory of shoreline access points. The inventory will be used in developing a beach and bay access guide. The guide is part of a CCC effort to determine which coastal areas are most in need of enhanced access.

Conclusion

Public access to bay resources is a growing issue as the human population around the bay continues to increase. Intensive economic development of prime land on the water's edge will lead to less area being available for the locations of public access points such as boat ramps, shoreline parks, and fishing piers. Commercial, residential, and industrial development along the bay's edge also poses a threat to undeveloped bay habitats such as fringing wetlands, riparian forests and mud flats. As of 1995, 22% of the bay's nearly 1,500-mile shoreline was developed. Additional shoreline assessments are needed to determine the status of undeveloped shoreline. The availability of public access points in Galveston Bay is difficult to quantify because there are diverse types and no entity takes responsibility for collecting and compiling this data. Federal legislation is used to regulate the development of shoreline. However, public access to bay resources is managed using nonregulatory means.

References

Ward, G.H. 1993. Dredge and fill activities in Galveston Bay. Galveston Bay National Estuary Program Publication GBNEP-28. Webster, Texas. Galveston Bay National Estuary Program Publication GBNEP-31. Webster, Texas.