

## **Changes In Freshwater Inflows to Galveston Bay and the Trinity-San Jacinto Estuary, Texas**

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Galveston Bay and the Trinity-San Jacinto Estuary lie in the warm temperate climatic zone of the upper Texas coast and cover an area of about 600 square miles--the largest of all seven major bay and estuary (tidal) systems in the state. Although transected by a deep (>40ft) ship channel, the average depth of the estuary is only 8.5 ft. Indeed, some view it as a shallow mixing bowl above the continental shelf of the Gulf of Mexico.

Galveston Bay receives an average 10.1 million acre-feet per year of the freshwater inflows from the Trinity River Basin (54%), the San Jacinto River Basin (28%), the San Jacinto-Brazos Coastal Basin (10%), and Neches-Trinity Coastal Basin (6%), and the Trinity-San Jacinto Basin (2%). The seasonal distribution of these freshwater inflows is typified by peak springtime inflows in May, followed by minimum summer inflows in August. Seasonal inflow distribution is generally controlled by the discharges of the Trinity River. The ecological importance of freshwater inflow is revealed through its functional roles in the following aspects:

- transporting and distributing sediments and nutrients throughout the estuarine environment;
- creating and maintaining a proper salinity gradient between the inflowing rivers and the Gulf of Mexico so as to produce estuarine conditions for adequate growth, survival and reproduction of estuarine-dependent species;
- maintaining wetland habitats, primary (plant) and secondary (animal) productivity of the estuary; and
- maintaining economically important fish and shellfish populations with an estimated statewide economic impact of ~\$1.64 billion (1994 dollars) in commercial fishing, sport fishing, and other recreational activities annually (= \$2,312/acre of bay or \$1,333/acre of total estuary including marshes and mudflats).

Nevertheless, this does not mean that estuarine needs for freshwater are in some way constant or uniform, since dynamic fluctuations within the biologically productive range, both seasonally and annually, are realistic and desirable for maintaining a sound ecological environment. However, extended or semi-permanent inflow conditions which consistently fall below the maintenance levels can lead to degraded estuarine environments, loss of important nursery habitats for the young or many economically valuable fish and shellfish (seafood) resources, and a reduction in the potential for natural assimilation of organic and nutritive wastes produced by human activities.

As the human population in the contributing and surrounding drainage basins of Galveston Bay increases, so do competitive demands for freshwater supplies for domestic, municipal, industrial,

agricultural, and other beneficial uses. Although these uses would be expected to decrease inflows to the estuary, several factors may act together to offset the consumptive losses, including improved conservation practices, increased rainfall-runoff due to increased impervious cover in urbanized areas, increased use of groundwater with wastewater discharge to the surface drainages, and interbasin transfer (importation) of freshwater. This may help explain the finding that total inflows to the estuary did not exhibit a statistically significant increasing or decreasing trend overall during the 1968-1987 period, even though seven (7) local watersheds did show statistically significant increases over time. These are given with their estimated change (percent increase per year) as follows:

- East Fork, San Jacinto River near Cleveland (1.06%);
- Caney Creek near Splendora (2.17%);
- Whiteoak Bayou at Houston (3.06%);
- Brays Bayou at Houston (3.08%);
- Sims Bayou at Houston (1.92%);
- Greens Bayou near Houston (3.02%);
- Spring Creek near Westfield (1.45%)

Potential future development and use of freshwater in the region are also capable of changing the historical hydrological regime. Some changes are likely to result from the beneficial use of eastern freshwater with subsequent return inflows mainly to the western side of the bay, however, the percent of total freshwater inflows to the estuary that are involved is modest (<10%) but not insignificant, either statistically or ecologically.