



Bays and Estuaries Program

Why is freshwater inflow important to Texas bays and estuaries?

Texas has seven major and five minor estuaries covering 1.5 million acres along the Texas Gulf Coast. These estuaries, characterized by a mixture of freshwater and salt water, are significant sources of seafood production and an important part of the state's tourism industry. However, as the state's population grows, increased demands for water may limit the volume of freshwater reaching the bays. As mandated by Senate Bill 137 (1975), House Bill 2 (1985), Senate Bill 683 (1987), and other legislative directives, the Texas Water Development Board (TWDB) works with the Texas Parks and Wildlife Department to maintain a data collection and analytical study program focused on understanding how freshwater inflows affect economically and ecologically important fish and shellfish species and the estuarine life upon which they depend. The Texas Commission on Environmental Quality assesses these studies when considering applications for permits to store, take, or divert water. Recent legislative directives, Senate Bill 1 (1997) and Senate Bill 3 (2007), also require the TWDB to provide technical assistance for regional water planning and for the development and adaptive management of environmental flow regime recommendations.

What is the mission of the Bays and Estuaries Program?

The program's mission is to maintain a continuous data collection, modeling, and analytical study program focused on determining the freshwater inflow requirements necessary to maintain the health of Texas bays and estuaries.

What tools are used to analyze freshwater inflow to bays?

Significant progress has been made in developing tools to investigate resource management questions related to coastal waters. Bays and Estuaries staff continues to develop and modify computer models to produce reliable estimates of streamflow for ungauged coastal watersheds in order to estimate total freshwater inflows to the Texas coast. Staff also works to improve hydrodynamic and salinity transport models to simulate the effects of freshwater inflows and tides on bay salinity and circulation.

Recently, staff began investigating the use of three-dimensional models with the goal of having such models for future bay studies.

Previous studies of freshwater inflow needs of Texas' major bay systems used an optimization program to objectively integrate various management decisions (for example, minimum acceptable fisheries harvest levels) and ecological needs (for example, salinity or nutrient needs of fisheries species) in order to compute the minimum amount of freshwater inflow needed to best satisfy a set of specified constraints. However, as a result of the Senate Bill 3 process for environmental flows, recent studies of the estuaries now focus on determining a range of inflows necessary to maintain bay health. This approach frequently includes a focus on habitat-based methods, such as determining the inflow requirements to support wetland habitats or oyster reefs.

Because all such analytical tools require data, the TWDB collects or funds the collection of hydrologic and water quality data to improve our understanding and modeling capabilities of these complex systems. Many of the analytical tools and data developed by the program have been provided to other agencies, river authorities, and engineering firms concerned with similar resource management questions.

What do freshwater inflow needs studies involve?

Enlisting support and contributions from the U.S. Geological Survey, river authorities, universities, and sister agencies, the TWDB has conducted intensive hydrographical surveys of all major bays of the Texas coast. These studies feature synoptic measurements of water velocity and level and water quality data in navigation channels and other representative locations over several tidal cycles. Long-term data also are important for understanding how bays respond to too much or too little freshwater; therefore, the TWDB funds monitoring of water quality at selected sites along the coast. Short-term studies also are conducted to investigate the influence of freshwater inflows, such as contributions of nutrients and sediments from major rivers into coastal waters. In fact, an ongoing cooperative investigation with the U.S. Geological Survey to monitor nutrient and sediment loads entering Texas bays over a range of hydrologic conditions has resulted in the development of a real-time, continuous record of suspended sediment using surrogate methods at selected sites.

How does bay modeling support other Texas programs?

Modeling capabilities developed for the Bays and Estuaries Program have been applied to questions beyond those associated with freshwater inflow issues. One important application is to the Texas General Land Office Oil Spill Prevention and Response effort, whereby model simulations of water currents in the major bays are maintained in near real-time and forecast modes. For bays with heavy ship traffic, these models quickly provide information on the potential path of an oil spill. Models also have been applied to study the effects of man-made structures and practices on bay circulation and salinity.

Where can I get more information?

Bays and Estuaries Program studies and data are available upon request to: coastal-data@twdb.texas.gov.

A further description of the program can be found at: www.twdb.texas.gov/surfacewater/bays

Coastal water quality monitoring data are available on the TWDB's Water Data for Texas website: waterdatafortexas.org/coastal

More information also may be obtained by email or phone:

Caimee Schoenbaechler
Manager, Bays and Estuaries Program
Caimee.Schoenbaechler@twdb.texas.gov, (512) 463-3128

Dr. Carla G. Guthrie
Director, Surface Water Division
Carla.Guthrie@twdb.texas.gov, (512) 463-4179