

Balancing Freshwater Needs in Texas' Changing Climate

Project Location

Mission-Aransas National Estuarine Research Reserve, Texas

Project Lead

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Targeted End Users and Products

- [System Dynamics and Blue Crab Population Model Description](#)
- [Video: A Collaborative Approach to Research](#)
- [Video: Balancing Freshwater Needs in a Changing Environment](#)

Project Partners

- [Mission-Aransas Reserve](#)
- [Texas A&M University](#)
- [Texas Commission on Environmental Quality](#)
- [University of Texas](#)
- [University of Texas Marine Science Institute](#)

About the Science Collaborative

The National Estuarine Research Reserve System's Science Collaborative supports collaborative research that addresses coastal management problems important to the reserves. Learn more at www.nerrs.noaa.gov.

Overview

Healthy estuaries are vital to the economy of the Texas central coast, supporting the region's multibillion-dollar fishing industry and a growing tourist trade. Adequate supplies of freshwater are key to the productivity of these estuaries. However, as the regional population grew and the recent drought deepened, estuaries were receiving less freshwater. In response to this challenge, the Mission-Aransas Reserve worked with a multidisciplinary team to develop science-based, stakeholder-informed recommendations to support freshwater inflows to maintain healthy estuaries in this region, while balancing other competing needs for freshwater.

Project Benefits

- The Texas Commission on Environmental Quality incorporated the project's recommendations in its freshwater inflow adaptive management processes.
- Data from the project's water circulation study are being used to calibrate and improve the accuracy of the Texas Water Development Board's water model.
- The San Antonio Bay Foundation expanded the project's water circulation study into San Antonio Bay.
- Two regional workshops engaged reserves in the Gulfs of Maine and Mexico.
- A Teachers on the Estuary module was developed and delivered to educators around the Gulf of Mexico.

Project Approach

The Mission-Aransas Reserve and Texas A&M University used the collaborative learning process to work with stakeholders to create a system dynamics model of the Guadalupe-San Antonio and Mission-Aransas estuaries. The project also produced recommendations on how to balance freshwater resources to meet the needs of communities and the estuaries upon which their quality of life depends.

- **Data Collection and Modeling:** The team engaged coastal managers, scientists, fishermen, and other stakeholders to develop qualitative models of the estuaries and create a shared knowledge base.

Project Approach (continued)

- Biophysical Studies and Modeling: Studies were conducted to better understand estuarine water circulation between the Mission-Aransas estuary and adjacent bays, the effects of land use and climate change scenarios on freshwater inflows, and the impacts of these inflows on blue crab populations.
- Collaboration and Integration: The ecological and biological data were integrated with the stakeholder-developed qualitative models to create a system dynamics model of the Mission-Aransas Estuary. Stakeholders tested this model under various climate, land use, and freshwater inflow scenarios to develop recommendations about how much freshwater should be allocated to flow to the estuaries.

