

HABITAT RESTORATION

Modeling Hydrologic Alternatives for Wetland Restoration on Brazoria National Wildlife Refuge



A weir on the Refuge Diverting Rainfall Runoff Towards Chocolate Bay

INTRODUCTION

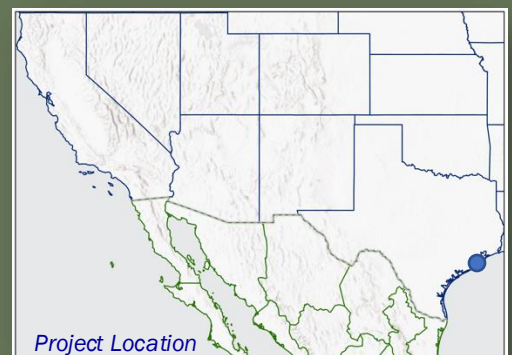
Brazoria National Wildlife Refuge (NWR) is located on the east coast of Texas, north of Houston. Since 1966, it has protected various migratory birds, herpetological species, and wetland ecosystems. Prior to becoming a refuge, a network of drainage ditches had been constructed through the area to reduce flood risks and support agricultural operations in the watershed. These ditches altered the hydrology causing the wetlands to become drier and less nutrient-rich, resulting in degraded habitats for fish and wildlife resources. To restore the refuge's native wetlands, the project team used various tools, mapping technology, and hydrology models to evaluate existing conditions and compare different alternative solutions.

KEY ISSUES ADDRESSED

Ditches streamline drainage, decreasing the time water resides on the landscape. As a result, the hydroperiod, or number of days water remains on the landscape, decreases, making the wetland areas drier. Additionally, the water quality is reduced as it drains directly from the ditches into Chocolate Bay without passing through the vegetated wetlands. However, completely filling in the ditches without water management infrastructure would flood upstream communities and threaten businesses that rely on agricultural production. According to studies, Brazoria County is at a "severe" risk of flood damage while its commercial areas face an "extreme" risk—the two highest classifications. Increasing hydrologic connectivity is a nature-based solution to both support ecological restoration as well as protect human communities.

PROJECT GOALS

- Restore a portion of historic wetland flow by increasing the hydroperiod on Brazoria NWR wetlands
- Maintain flood safeguards to protect Brazoria County communities
- Develop a restoration plan that is beneficial and manageable for Brazoria NWR and the Drainage District.



PROJECT HIGHLIGHTS

Applying Surface Water Flow Modeling to Wetland Conservation: Light Detection and Ranging (LiDAR) mapping, combined with Real Time Kinematic surveys, helped identify how surface water was currently flowing through the refuge. These instruments were also used to model the restorative effects of several alternative actions like the removal or installation of berms and weirs, placed at different locations.

Redirecting Drainage: After considering the environmental impacts demonstrated by the modeling results, ease of maintenance, and cost efficiency, partners decided to fill in parts of the ditch network while installing and altering the placement of several berms and weirs. These changes will help divert water into the landscape while also providing vehicular access to manage the 9,200-acre tract and maintain or repair ditch structures. Brazoria NWR and their partners completed construction in October 2024.

Establishing Trust with Partners: USFWS staff promoted collaboration and trust by ensuring that Drainage District engineers participated in reviewing the modeling results and planning meetings. Through the partnership of the USFWS, Drainage District, Ducks Unlimited, Freese & Nichols, and other stakeholders, the group was able to ensure that the needs of the community and wildlife resources were met.



Weir Installed on a Levee to Capture Rainfall Runoff on the Refuge

LESSONS LEARNED

Brazoria NWR's flat topography made it difficult to identify how surface water was moving on the land. By combining LiDAR and a flood assessment model, the team was able to understand existing conditions, evaluate alternative design features, and optimize a suite of actions that will accommodate future environmental changes such as sea level rise and periods of drought or extreme precipitation.

Balancing both human and environmental concerns can pose challenges. The Drainage District was established to support agriculture and protect the community from flooding. Meanwhile, Brazoria NWR was established to conserve habitats for fish and wildlife. Because of these different missions, each organization prioritized different objectives. Incorporating the needs of partners into a strategy to develop a nature-based solution helped focus evaluation criteria and develop a final design for the project. The resulting plan will not only support wildlife and prevent increased flooding, but may reduce flood risk to upstream communities.

NEXT STEPS

- Now that construction is completed, the project team will implement the post-construction monitoring plan to assess project performance.
- Evaluate the monitoring results and reconvene project partners to determine if any adaptive management actions are needed.
- Explore ways to communicate this project's importance and benefits to a general audience.

PARTNERS

- See online for full list of partners
- For more information, contact Kevin Hartke: khartke@ducks.org

