Post-Channel Widening Water Quality Monitoring at Bahia Grande, Cameron County, Texas

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Passive restoration of the Bahia Grande estuary was initiated in 2005 through construction of a narrow pilot channel, 4.5 m wide, 685.5 m long, connecting it to the Brownsville Ship Channel and filling the >25 sq km basin for the first time in over 70 years. A monitoring program (2005 – present) identified the occurrence of extreme hypersalinity events (>70 psu) over large portions of the basin that interrupted and redirected benthic and nekton community succession. These extreme hypersalinity events resulted in shifts away from the desired outcomes of restoring associated ecosystem services for ecologically and economically important fauna and wildlife. In July 2022, the pilot channel was widened to 45.7 m. The anticipated result was an estimated 4-fold increase in tidal exchange from ~7% to ~30% of the total water volume exchanged per tidal cycle and a more moderate basin-wide salinity regime. Post-channel water quality monitoring employed continued use of three permanent water quality monitoring stations established in 2005 for comparison with historic data. In addition, a 71 point-station grid was sampled in 2019 (pre-widening) and in 2023 (post-widening). Data collections included measurements of dissolved oxygen, pH, salinity, conductivity, water depth, and water temperature. Post-widening water quality monitoring indicates extreme hypersalinity and hypoxic conditions continue to persist in the largely hydrologically isolated northern compartment (~2/3rds the total basin area) and relieved temporarily by episodic rainfall. An abandoned railroad causeway (~4.5 km) bisecting the basin is a known barrier to tidal exchange. A system-wide hydraulic circulation model is recommended to inform natural resource management decisions for modifying the railroad causeway to improve tidal circulation to the northern compartment and passive restoration of an additional ~770 hectares of habitat.

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