Spatial and Temporal Patterns of Eastern Oyster (Crassostrea virginica) Populations and Their Relationships to Dermo (Perkinsus marinus) Infection and Freshwater Inflows in West Matagorda Bay, Texas

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Objective
An integrated Matagorda Bay oyster model was developed in Stella to simulate oyster population responses to stochastic environmental changes over a 50-year period.

Study Area
Three reefs in Matagorda Bay: Shell Island (154-acres), Mad Island (112-acres) and Sammy’s Reef (9-acres) receive freshwater inflows from Colorado River.

Methods
Matagorda Bay oyster model utilizes 2001-2005 historical trends:
• Average daily flow from Colorado River and tides from Gulf pass.
• Monthly oyster abundance collected by Texas Parks and Wildlife Department (TPWD) at Shell Island, Mad Island and Sammy’s Reefs.
• Average daily salinity and temperature data from Lower Colorado River Authority (LCRA) stations on Shell Island Reef and Gulf Intracoastal Waterway (GIWW) outlet into Matagorda Bay.

Results
Spawning/Larvae Distribution Responses to Freshwater Inflows
Peaks indicate when each reef spawned following freshwater inflows (0.1 SD Simulation Run). Results are comparable with three oyster populations’ historic trends or responses to floods and droughts. Blue-Shell Isl. Red-Mad Isl. Green-Sammy’s Black-Colorado Delta

Growth Response to Freshwater Inflows

Dermo Responses to Freshwater Inflows
Longer time between peaks to reach lethal levels following sustained freshwater inflows in Mad Island Reef oyster populations over 50-yr period (2.0 SD Simulation)

Conclusions
• Model showed growth, spawning and spat set were positively related to duration and timing of freshwater inflows; and also distance from freshwater sources.
• Up-estuary reefs relied on the distribution of larvae from down-estuary reefs following freshwater related mortalities, and meteorological and tidal forces.
• Matagorda Bay oyster populations are integral members of a dynamic bay ecosystem that function as one unit and not separate reef populations.