

Examining Hydrological Changes, Nutrient Dynamics, and Cyanobacterial Blooms in Louisiana's Deltaic Estuaries Over a Decade

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Estuaries, including those in the northern Gulf of America, are undergoing profound alterations due to changes in climate and implementation of coastal restoration activities and these may lead to increasing frequency of harmful cyanobacteria blooms (CyanoHABs). The overall productivity of Louisiana coastal ecosystems are physically and biologically controlled by freshwater discharge from the Mississippi River, which affects the composition, diversity, and biomass of organisms at all trophic levels. Recent studies have shown that Lake Pontchartrain Estuary experiences high interannual variability in nutrients and phytoplankton community dynamics, mainly due to the effects of seasonal and episodic rainfall on hydrology, the timing, duration, and magnitude of Mississippi River water diverted into Lake Pontchartrain from operation of Bonnet Carré Spillway (BCS), as well as tributary discharges and saltwater inputs from tropical activity. Historically, the BCS has opened in 15 times since its construction in 1931 to protect New Orleans from flooding of the Mississippi River during seasons of heavy rain. Several previous BCS openings have been associated with CyanoHABs, and there is concern that more commonly occurring spillway openings due to alterations in seasonal patterns can foster more frequent blooms in the estuary that are capable of adversely affecting water resources for fisheries and human health. There are more than a decade worth of data on the estuary's water quality, CyanoHABs occurrence and toxin production. This presentation will evaluate the existing data and assess how weather/climate related drivers of Mississippi River freshwater input and transport, salinity intrusion, tropical activity, cold fronts, precipitation, drought, and shifting temperature regimes influenced the water quality of the estuarine water and drove trends in CyanoHAB formations. Lake Pontchartrain's tributaries are also critical criteria to characterize and predict the succession of dominant phytoplankton communities in the estuary. The understanding and prediction of CyanoHABs in Lake Pontchartrain Estuary will greatly attribute to the overall future health and understanding of not just Lake Pontchartrain but the connected estuaries and lakes as well.