Evaluating Salinity Regimes and Material Exchange Across the Mobile-Tensaw River Delta

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Tidal freshwater forested wetlands can be extensive in large river deltas influenced by estuary and river flows. There is increasing concern about the fate of these wetlands due to sea level rise and other impacts along our coasts. The Mobile-Tensaw River Delta in southern Alabama is one of the largest deltas (~140,000 ha) in the United States. We update a study to better understand the Mobile-Tensaw River Delta and its relation to Mobile Bay. Nine continuous salinity/water level monitoring stations were installed and used to locate 47 plots (400 m^2) for tidal forest community surveys. A multivariate hierarchical clustering approach discerned five distinct communities based on canopy tree importance values. Using the water stations and other available data, a machine learning approach (i.e., deep neural network and a Hybrid Convolutional Recurrent models) was used to successfully model salinity affecting tidal freshwater forested wetlands. Based on model outputs, sites further from river channels showed significant daily salinity variability (range > 8 PSU), while those closer to the channels had less variability and lower salinity (range < 5 PSU). Across the study area, there was <10% probability that salinity will exceed 5 PSU across all the stations. Finally, to better understand connections between the Mobile-Tensaw River Delta and Mobile Bay, current and historical samples of bay sediments were analyzed. Bulk stable isotope ratios in sediments reflected terrestrial source dominance across MTRD sites (-30 to -28‰), with values increasing down Mobile Bay from north (-34 to -26‰) to south (-24 to 18‰). Preliminary analysis suggests seasonal and interannual differences were primarily driven by whether river discharge was low (<1200 m^3/s) or high (>2000m^3/s) 30 days prior to sampling. Our results depict a highly complex Mobile-Tensaw River Delta - tidal freshwater forested wetlands system and allow us to evaluate alterations expected with future sea level rise, river flows, and other changes.