THE EXTENT OF TIDAL INFLUENCE IN THE WACCAMAW RIVER, SOUTH CAROLINA

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The Waccamaw River Basin is located in the coastal plain and meanders from North Carolina to South Carolina. This tidal black-water river flows parallel to the coast past the cities of Conway and Georgetown, terminating in Winyah Bay. The river is hydrologically connected to the Atlantic Intracoastal Waterway (AIW) and experiences semi-diurnal tides with a range classified as micro-tidal (< 6.5 feet). The semi-diurnal tidal amplitude in the Waccamaw River declines with increasing distance upstream from Winyah Bay and the AIW. Temporal variations in the longitudinal tidal gradient of Winyah Bay, AIW, and the Waccamaw River reflect varying effects of astronomical tides, weather, and streamflow.

Streamflow data collected at Reaves Ferry at river mile 63.0 showed that when water levels receded in early September 2013, a semi-diurnal tidal amplitude of 0.4 to 1.0 feet was recorded in addition to reversing stream velocity. Improved understanding of the hydrology at these tidal freshwater reaches would provide valuable information for water-resource and land-use planning and management.

In order to explain the temporal difference in variance a time series model, Auto Regressive Integrative Moving Average (ARIMA) was used in the analysis of the tidal reach based upon hourly averaged observations from 06/21/2013 to 09/12/2014. The upstream, local, and downstream data were hourly averaged and analyzed with a multiple regression and ARIMA. A multiple regression model was used to systematically show that all the predictors were significant (r^2=0.921, <0.03 at p=0.05) in describing variance of water level at Reaves Ferry. Results from the ARIMA show that all tidal reach predictors were significant (<0.00 at p=0.05) in describing water level at Reaves Ferry.

The low gradient of the coastal plain and low river flow allow for significant tidal influence along the Waccamaw River. The ARIMA time-series model was successfully able to delineate the hydrograph at Reaves Ferry of tidal and non-tidal scenarios. At the monthly-scale, there are clear patterns between downstream and upstream predictors, which are shown or are evident in the Reaves Ferry hydrograph. The frequency and duration of flooding in tidal freshwater forested wetlands is highly variable based on these predictors in the Waccamaw River. Future study plans aim to examine the distribution of TFFW and analyze water-quality events in conjunction with tidal processes. This information aims to benefit local scientists and highlight the importance of USGS long-term gaging stations.

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