

Delaware Sea Grant Project:

Assessing the equilibrium sediment flux of Delaware tidal wetland rivers (R/ETE-11)

Investigator:

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Project Abstract:

As a continuation of Sea Grant Project R/ETE-11 (Phase I), this proposal describes the second part of a two-phase study to characterize the flow and sediment-transport characteristics of tidal rivers and shallow estuaries draining the wetland coast of Delaware Estuary and Bay. The overarching objective is to elucidate mechanisms of mass transport toward a general understanding of tidal and non-tidal hydrodynamic controls on suspended-sediment movement between open estuarine waters and fringing tidal wetland rivers. For Phase II, this objective will be met using timeseries of currents and suspended-sediment concentration (SSC) from moored sensors deployed at widely spaced locations along the tidal Mispillion and Broadkill rivers, major tributaries of southern Delaware Bay. Specific objectives of this study are as follows: 1) to identify processes of advection and tidal pumping on axial sediment fluxes, documenting how these processes vary spatially and seasonally; 2) to assess the relative importance of tidal velocity and slackwater period asymmetries on the magnitude and orientation of sediment fluxes; 3) to investigate the significance of wind forcing on river tide levels and marsh inundation; and 4) to determine the predictive skill of tidal asymmetry parameters in the context of residual sediment flux. To this end, continuous observations of water level, current, salinity, and SSC will be made for 5–6 months in the Mispillion and Broadkill rivers during Years 1 and 2 of the project, respectively. Additionally, water-level data from intertidal sites on the marsh platform in these basins, in conjunction with an existing LIDAR digital elevation model, will be used to link tidal channel flow and over-marsh sheet flow using a new method described in the literature

We will use hydrodynamic and sediment observations to evaluate the response of tidal wetland rivers to tides, river discharge events and storm surge. Resulting timeseries records of flow and sediment transport will provide context for interpreting records of sea-level rise and human disturbance in the Delaware Estuary region. Datasets developed through this project will be made available to state environmental agencies involved in developing Total Maximum Daily Loads for Delaware coastal rivers. A broader impact of this research includes graduate student training and research opportunities for undergraduates.