

## **Forecasting the response of tidal freshwater marshes to increasing salinity and higher tides due to sea level rise**

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*Project objectives.* The overall goal of this research is to understand responses of tidal freshwater marshes to sea level rise. We propose three specific objectives: 1. Measure rates of elevation change in tidal freshwater marshes to determine if they are accreting sufficiently to keep pace with rising sea level; 2. Measure indicators of vegetation stress and environmental variables and relate them to elevation change; and 3. Experimentally examine the effect of saltwater intrusion on marsh elevation change.

*Questions to be addressed.* We seek to answer three questions concerning tidal freshwater marshes and sea level rise. First, are tidal freshwater marshes currently accreting sufficiently to keep pace with sea level rise? Second, what biological, chemical, or physical mechanisms control elevation change? Third, can saltwater intrusion result in rapid subsidence of marsh soils? The answers to these questions will be integrated in an assessment of the current state of tidal freshwater wetlands and how they may respond to continued increases in relative sea level.

*Location of research activities.* This research will be conducted in Maryland and Delaware in tidal freshwater marshes spanning approximately 25 km of the upper estuary of the Nanticoke River, a major tributary of the Chesapeake Bay.

*Research approach and methods.* We will measure sediment accretion and elevation changes over different temporal scales using Surface Elevation Table (SET) and marker horizon measurements and geochronological analyses of sediment cores (Obj. 1). Increases in marsh surface elevation will be compared with rates of relative sea level rise reported for the Chesapeake Bay. Physiological and morphological indicators of stress to vegetation, decomposition rates, and environmental variables (such as water level, salinity, and redox potential) will be measured for Obj. 2 to determine if they are related to measured elevation change. For Obj. 3, seawater solutions will be applied to field plots and greenhouse soil microcosms to examine effects of salinity on elevation.

*Accomplishments and deliverables.* This research will be the first systematic examination of responses (and underlying mechanisms) of tidal freshwater marshes of the U.S. Atlantic coast to sea level rise. In addition to reports, publications, and presentations, we will also develop a project website and disseminate our findings to interested state and federal agencies.