

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

Andrew H. Baldwin, University of Maryland, Dept. of Environmental Science & Technology  
Michael S. Kearney, University of Maryland, Dept. of Geography  
Jeffrey C. Cornwell, University of Maryland Center for Environmental Science

***Project objectives:*** Primary objectives are to: measure rates of elevation change in tidal freshwater marshes to determine if they are accreting sufficiently to keep pace with rising sea level; relate indicators of vegetation stress to environmental variables; experimentally examine the effect of saltwater intrusion on marsh elevation change; and quantify the biogeochemical and elevation responses of tidal freshwater marsh soils to simulated saltwater intrusion.

***Hypotheses tested and questions addressed:*** Are tidal freshwater marshes currently accreting sufficiently to keep pace with sea level rise, and which underlying mechanisms control elevation change? We hypothesize that saltwater intrusion will result in increased subsidence of marsh soils due to higher decomposition rates associated with a shift to sulfate reduction metabolism. Vegetation stress indicators are hypothesized to relate strongly to salinity and soil waterlogging.

***Location of research activities:*** This field portion of 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. Soil cores for greenhouse mesocosm studies will be collected from tidal freshwater marshes at Jug Bay on the Patuxent River in Maryland. This is also the location of a field salinity addition experiment.

***Research approach:*** Sediment accretion and elevation changes are measured at 15 sites on the Nanticoke River using Surface Elevation Table (SET) and marker horizon measurements and geochronological analyses of sediment cores. Physiological and morphological indicators are used to examine stress to vegetation relative to environmental variables. Seawater solutions are applied to field plots and greenhouse soil microcosms to examine effects of salinity on elevation and biogeochemical processes, including methanogenesis, sulfate reduction, iron reduction, and organic matter decomposition.

***Expected accomplishments and deliverables:*** This research is among the first to systematically examine responses (and underlying mechanisms) of tidal freshwater marshes of the U.S. Atlantic coast to sea level rise. This research has been featured in scientific presentations and is expected to result in several refereed publications. Additionally, the project is focus of graduate research for two Ph.D. and one M.S. students.