A Model-Data Synthesis of the Status and Trends of New Jersey's Coastal Wetlands for Sea Level Rise Planning

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Elizabeth Watson, Principal Investigator, measuring spatial patterns of wetland sediment deposition in Delaware Bay tidal marsh.

Across the Mid-Atlantic region, coastal marshes are in decline. Analyses conducted for a 'State of the Estuary' report indicate that Delaware Bay lost an acre per day of tidal wetlands between 1996 and 2006, and a recent analysis of Long Island tidal wetlands shows a loss rate of native marsh vegetation in excess of 10% between the early 1970s and early 2000s. Similar rates and patterns of losses have also been estimated for Chesapeake Bay and southern New England suggesting that these patterns and trends are regionally widespread. These losses of coastal wetland habitat are symptomatic of marsh drowning, and include marsh retreat, edge erosion, marsh island loss, and the development and enlargement of interior dieback areas. While some of these wetland losses will be offset by marsh migration into uplands with sea level rise, intensive development of adjacent areas in the high population density mid-Atlantic region acts as a barrier for upslope transgression of intertidal habitats, exacerbating threats of climate change to coastal marsh survival.

An eroding marsh shoreline.

The deterioration and fragmentation of fringing coastal marshes leaves housing and infrastructure vulnerable to the impacts of coastal storms, which are expected to increase in frequency and intensity over the coming decades. Although living shoreline installations, hydrologic remediation, and sediment additions are being used to help lengthen the lifespan of coastal wetlands, it is unlikely that funding will be available to apply such techniques to all of the estimated 80,000 hectares of tidal wetlands in New Jersey.

The objectives of this project are to develop a better understanding of the processes responsible for coastal marsh drowning and to refine the predictive capabilities of decision support tools to help prioritize investments in coastal protection. The researchers will analyze historical trends in marsh extent and loss at representative sites around New Jersey, and use data from a regional sentinel site monitoring program to parameterize common ecological models used to predict changes in marsh location and extent. The investigators will collaborate with management and conservation organizations to develop modeling and analysis scenarios so that research activities are impactful with resource managers.

Measurement of coastal marsh elevation change using a surface elevation table, or SET. Project scientists are monitoring marsh elevation change and sediment deposition at more than three dozen locations in regional estuaries. This photo also shows how marshes are migrating into coastal forests with sea level rise, resulting in a 'ghost forest' with a marsh understory.

This project is a collaboration between the Academy of Natural Sciences (ANS) Wetlands and Biogeoinformatics Research Groups, the Partnership for the Delaware Estuary, and former ANS researcher Dr. Elsey-Quirk, now an assistant professor at Louisiana State University. This project also includes involvement by two Drexel University Ph.D. students (Computer Science & Informatics, and Environmental Science), and undergraduate research interns from Drexel's co-operative education program.