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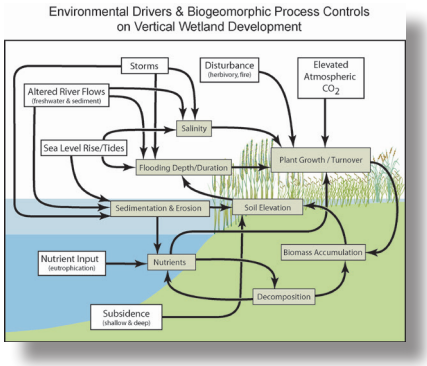
Patuxent Wildlife Research Center

Predicting the Vulnerability of Coastal Wetlands to Sea-Level Rise & Global Climate Change

The Challenge: Accelerations in sea-level rise and global climate change have important implications for the integrity of coastal wetlands and for efforts to restore and protect the ecosystem services they provide. Their persistence and adaptation to these stressors depends on the net effects of changes in physical processes and biotic responses. Future planning by decision makers will require scientifically sound forecasts of potential impacts, knowledge of sea-level rise thresholds, and indications of the potential effectiveness of various adaptation strategies.



The Science: The response of coastal wetland elevation, stability, and ecosystem function to multiple interacting factors is varied and complex. Because it is difficult to predict the response of these ecosystems to the effects of global climate change, it is critical that we understand the susceptibility of the Nation's coastal wetlands to projected changes in relative sea level as well as the biological and physical processes driving coastal wetland surface elevation change. In this project, we attempt to explore these issues through the following research questions:

- What are the linkages and feedback effects that control habitat stability of coastal wetlands, specifically how do wetlands maintain surface elevations relative to sea level?
- How do external forcing functions, such as sea-level rise, elevated CO_2, and nutrients, interact with these internal processes to affect ecosystem stability?
- Can we develop a predictive capacity to forecast future responses of coastal wetlands to changes in external forcing functions?

The Future: The work conducted in this research program is designed to both test hypotheses and predict the response of coastal wetlands to climate change. To accomplish both of these objectives, data collected from the field research component of this study will be used to develop a modeling framework that incorporates both multivariate hypothesis testing and forecast modeling. This modeling effort will enable us to forecast ecosystem responses to a wide variety of scenarios and provide critical feedback to managers, which will enable them to modify strategies for the sustainable management of coastal wetlands.

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