

Sea level rise effects on coastal ecosystem distributions and biodiversity status in the U.S. Middle Atlantic Region

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This research will integrate three disparate fields of modeling and spatial analysis to achieve a novel synthesis regarding climate change effects on coastal ecosystems. We will (1) use new protocols to obtain accurate forecasts of marine intrusion under several scenarios of climate change and sea level rise, (2) develop and implement approaches for forecasting ecosystem shifts, and (3) integrate the first two outputs with biodiversity data to forecast biodiversity impacts. This research will cover the Middle Atlantic coastal region of the eastern United States, a region where high-quality digital topographic data, long-term observations of tide and storm surge data, and historic ecosystem distribution data are available for modeling and validation. As a proof-of-concept, the research will focus on development and testing of forecasts of ecosystem distribution shifts using ecological niche modeling approaches.

We will use three modeling and spatial analysis approaches, each of which has been developed or implemented by one or the other of the PIs.

1. Marine intrusion resulting from sea level rise will be estimated via improved GIS approaches.
2. Ecosystem shifts resulting from sea level rise and changing climates will be forecasted via ecological niche modeling approaches applied to each coastal ecosystem.
3. Biodiversity distributions for a selected set of species of interest for biodiversity conservation will be reconstructed via detailed occurrence data sets and via ecological niche modeling approaches.

We anticipate that this project will produce:

- (1) A series of scientific publications documenting protocols for each modeling step, as well as our results in terms of marine intrusion, ecosystem shifts, and biodiversity consequences. Our work will be submitted to international scientific journals for peer review and publication.
- (2) Software code and protocols for free and open use by the scientific community, so that others may use or build on our approaches.