

Evaluation of nature-based solutions to boost wetland resilience to sea-level rise

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ABSTRACT:

Coastal wetlands play a critical role in maintaining the health of our planet by providing essential ecosystem services such as flood control, water purification, and critical habitat for a vast variety of species. However, their vulnerability to climate change and sea-level rise poses a significant threat to these services. Therefore, to provide long-term protection against erosion and sea-level rise, a shoreline restoration project was designed in coastal North Carolina (US) to use dredged sediments and rebuild the historic footprint of an eroded shoreline marsh adjacent to a regional airport's runway. To evaluate the potential benefits of this restoration project, the Sea Level Affecting Marsh Model (SLAMM) was employed. The developed model was run at a high spatial resolution (1m cell size) to investigate the effects of sea-level rise on the wetland communities and estimate the potential benefits of using dredged sediment to increase surface elevation. The results of the SLAMM model indicated that the restoration project offers substantial benefits in terms of shoreline marsh persistence through 2050, under all sea-level rise scenarios. This finding is significant because it shows that the restoration project can provide immediate benefits and help sustain the coastal wetlands in the face of sea-level rise. However, the benefits of the restoration project start to diminish after 2050, and differences among marsh areas in the restored and unrestored scenario decrease with increasing rates of sea-level rise. Therefore, it is essential to develop adaptive management strategies to ensure the long-term persistence of coastal wetlands and their ecosystem services. Overall, this study shows that the beneficial use of dredged sediments as a nature-based solution can effectively sustain coastal habitats threatened by sea-level rise and erosion.

KEYWORDS:

Coastal Marshes, Restoration, Sea Level Rise