

## Nutrient enrichment and precipitation changes do not enhance resiliency of salt marshes to sea level rise in the Northeastern U.S.

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**Abstract** In the Northeastern U.S., salt marsh area is in decline. Habitat change analysis has revealed fragmentation, displacement of high marsh by low marsh species, and marsh drowning, while development of adjacent uplands limits upslope migration. Measures of marsh vegetation loss for eight sites in Rhode Island and New York between ca.1970 and 2011 indicate that substantial loss has occurred over past decades, with higher loss rates found for lower elevation salt marshes. Using inundation experiments, field surveys, and LiDAR datasets, we developed an elevation-productivity relationship for *Spartina alterniflora* specific to the U.S. Northeast, and located current salt marsh orthometric heights on this curve. We estimate that 87 % of Northeastern salt marshes are located at elevations where growth is limited by inundation. By manipulating water column nutrients, precipitation, and elevation, we further found that altered precipitation regime was associated with significant reductions in biomass, and that nutrient enrichment adversely impacts organic matter accumulation and peat formation. These results provide evidence that Northeastern U.S. marshes are vulnerable to the effects of accelerated sea level rise, and that neither precipitation changes, nor cultural eutrophication, will contribute positively to long-term salt marsh survival.

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