

## **Impacts of multiple stressors on southern New England salt marshes**

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In the Northeastern U.S., salt marsh area is in decline. Low sediment supply combined with regionally high rates of sea level rise mean that future salt marsh survival depends primarily on biomass production and organic matter accumulation, which are impacted by high nutrient loading to tidal marshes. Coastal marsh responses to nutrient enrichment apparently depend upon soil matrix and whether the system is primarily biogenic or minerogenic. Deteriorating organic rich marshes in Jamaica Bay, NY receiving wastewater effluent had lower belowground biomass, organic matter, and soil strength, larger rhizomes, and greater carbon dioxide emission rates than stable marshes. The deteriorating marshes maintained soil volume through production of larger diameter rhizomes and swelling of waterlogged peat, and were able to keep up with sea level rise. Using a combination of field and laboratory mesocosm inundation experiments, 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 determined that 89% of Northeastern salt marshes are located at elevations where growth is sub-optimal relative to productivity maxima, suggesting that productivity declines will accompany increases in tidal flooding with sea level rise. By manipulating water column nutrients and precipitation, we found that altered precipitation patterns predicted by climate change were associated with significant reductions in above and belowground biomass, and that elevated nutrient levels may adversely impact organic matter accumulation. These results provide evidence that Northeastern U.S. marshes are vulnerable to the effects of accelerated sea level rise, and precipitation changes and that cultural eutrophication may exacerbate the adverse effects of sea level rise.