Coastal wetland deterioration, climate change and nutrient inputs in California and southern New England salt marsh

Elizabeth Burke Watson[1]
Cathleen Wigand[1]
Joanna Nelson[2,3]
Kerstin Wasson[3,4]

[1] U.S. Environmental Protection Agency, ORD-NHEERL, Narragansett, RI
[2] Department of Environmental Studies, University of California, Santa Cruz, CA
[3] Elkhorn Slough National Estuarine Research Reserve, Watsonville, CA
[4] Ecology and Evolutionary Biology Department, University of California, Santa Cruz, CA

Coastal salt marshes provide a wide variety of ecosystem services, including habitat for protected vertebrates and ecologically valuable invertebrate fauna, flood protection, and improvements in water quality for adjacent marine and estuarine environments. Here, we consider the impacts of future sea level rise combined with other anthropogenic stressors to salt marsh sustainability through the implementation of field and laboratory mesocosms, manipulative experiments, correlative studies, and predictive modeling conducted in central California and southern New England salt marshes. We report on measurements of soil respiration, decomposition, sediment accumulation, and marsh elevation, which considered jointly suggest in some cases an association between nitrate input and marsh elevation loss resulting from mineralization of soil organic matter. Furthermore, use of imaging techniques (CT scans) has shown differences in belowground root and rhizome structure associated with fertilization, resulting in a loss of sediment cohesion promoted by root structure. Additionally, field and greenhouse mesocosm experiments have provided insight into the specific biogeochemical processes responsible for plant mortality at high immersion or salinity levels. Our results indicate that a better understanding of the relative impacts of the various stressors leading to salt marsh loss is needed to ensure the continuation of the ecosystem services provided by tidal wetlands and to develop sustainable management strategies that provide favorable outcomes under a variety of future sea level rise and land use scenarios.