

A National Synthesis of Tidal Marsh Response to Sea Level Rise

Project Description - Overview for end users

Project Summary

Building upon two NSC catalyst projects that established a prototype methodology for standardizing, visualizing, and analyzing tidal marsh monitoring data, we are conducting a detailed, national-scale synthesis of tidal marsh responses to climate change, specifically changes in marsh vegetation community responses to sea-level-rise (SLR).

The National Estuarine Research Reserves (NERR) are uniquely situated to address this topic given our decade-long ‘Sentinel Site’ monitoring focused on understanding effects of changing sea levels and inundation regimes on coastal habitats. A recent paper documents marsh resilience to SLR across 16 NERRS sites and found many marshes to be vulnerable (Raposa et al. 2016). Accelerated rates of SLR and shifts in marsh vegetation communities have occurred nationwide, however a dedicated nationwide synthesis of site-specific data has yet to be conducted.

Using a variety of NERR datasets, we will quantify climate-induced shifts in marsh integrity and resilience at local, regional and national scales to document ecological responses and inform best management practices to support marsh resilience. Additionally, we will investigate forcing factors, shifts in species ranges and patterns of diversity across latitudes and biogeographic regions. Our proposed work will provide:

1. Immediate insight on how climate change is affecting marshes nationwide
2. NERRs-specific templates and user-friendly tools for data analysis and visualization
3. Transferable utility to other organizations with similar monitoring datasets
4. Transferable utility to other coastal habitats (e.g., seagrass, mangroves)
5. Framework for facilitating other national-level research
6. Education and science translation products and dissemination approaches to support adaptive marsh management and resilience

Research Questions

We propose a set of research questions utilizing this data to examine marsh response over time in the context of climate change, especially SLR, and to identify ways that findings can be used to guide adaptive marsh management to build resilience:

1. Are there plant community changes over time and do they differ across regions?
2. Are plant community changes more rapid where local SLR is proportionately greater relative to tidal range?
3. Are marshes that are failing to keep up with SLR (shown by surface elevation table data) also showing the largest changes in vegetation?
4. Are there predictable geographic changes in plant abundance and diversity?

Collaborative research question

5. How can results of the national tidal marsh synthesis be used in education, adaptive marsh management and policy development to build marsh resilience.

Research Team and Stakeholder Engagement

To reach these goals and objectives, we plan to use a collaborative approach that engages our primary end-users throughout the project through utilization of multiple distinct project teams led by project leaders. These project teams and responsibilities include:

Principal working group (PWG): project management and end-user engagement

Technical working group (TWG): design and implement data analysis tools responsive to end user needs

Technical advisory group (TAG): advise and guide Technical Working Group products to facilitate use by end users

Cross-sector working group (CWG): guide and prioritize communication products and processes to inform education programs and adaptive marsh management that builds resilience.

Outcomes Anticipated from our work together

Science generated and products produced will improve coastal wetland management and public outreach on this critical, timely topic by:

- Highlighting impacts of climate change on tidal marshes. We expect our findings to have implications in marsh resilience, conservation, and restoration.
- Identifying potential drivers/indicators of change at local, regional, and national scales.

The community of practice around tidal marsh research, management, and restoration practitioners will be strengthened by providing data and analysis tools and a synthesis for regional and national trends both within the NERRS and end user community.

NERRS communication on tidal marsh data and trends will increase knowledge about how tidal marshes respond to climate change and build capacity to help shape management plans for marsh resilience. We expect to work across sectors to provide NERRs, other end users, and the public with intuitive visualizations (graphs and maps) that describe vegetation changes observed in tidal marshes responding to climate change at multiple scales. Our work will add to the growing NERR work on evaluating marsh condition and vulnerability as well as increase capacity at individual participating Reserves to help shape management plans and produce scientific publications and outreach materials for Sentinel Site data.

Education and experience in collaborative science will be provided for students and young professionals through funding a masters-level graduate student at the University of New Hampshire and intern support at Great Bay, Jacques Cousteau, North Carolina and South Slough Reserves.

Project Leads

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