NERRS Science Collaborative Project:
Assessing how climate change will affect coastal habitats in the Northeast
Available: September 2017

RESEARCH NEEDS
Salt Marsh Habitat

Introduction

The [Climate Change Vulnerability Assessment Tool for Coastal Habitats](#) (CCVATCH) was applied to multiple habitats in the northeastern United States as part of a National Estuarine Research Reserve (NERR) Science Collaborative Science Transfer project entitled: '[Assessing how climate change will affect coastal habitats in the northeast](#)'. Identified project outputs included: a regionally relevant resource document capturing the state of knowledge on the impact of climate change; identified research needs; site-specific vulnerability scores to support local management decisions; and, project planning and outreach documents to serve as a model for applying CCVATCH to other areas (e.g. case studies, process agendas).

CCVATCH is designed to require the collaborative input of local knowledge experts and habitat managers to assess the likely sources of vulnerability to climate change impacts for habitats of ecological, economic, and management concern. Habitat vulnerability assessment is achieved through score assignment associated with habitat exposure and sensitivity as well as adaptive capacity (i.e. inherent traits and site characteristics that mitigate exposure and/or sensitivity). Climate change stressors that are included during the vulnerability assessment process include an increase in carbon dioxide (CO_2), temperature, and extreme climate events as well as a change in precipitation and sea level. Score assignment is based on the perceived ability of these climate stressors to both directly affect the habitat being assessed and interact with existing or anticipated non-climate stressors (e.g. invasive/nuisance species, nutrients, sedimentation supply, erosion and environmental contaminants) following the process of data/knowledge collection derived from models/tools, expert elicitation, site assessments and literature review. It is presumed that an expanded understanding of which specific climate/non-climate stressor interactions are most likely to contribute to the loss (or gain) of a particular habitat will help habitat managers and local decision-makers to select the most appropriate strategies to either eliminate or reduce the stressor, or alternatively, to improve the processes and conditions that support the resiliency of the habitat.

CCVATCH also requires tool users to assign certainty scores for each exposure-sensitivity and adaptive capacity score assigned. Certainty scores are designed to reflect the specific source of information considered and range from zero to four (Table 1). In general, overall certainty scores tend to be moderately higher where local data is available or active management is being planned or applied. The assignment of certainty scores (and the retention of scoring session notes) not only allows future users to evaluate whether additional knowledge has later been assembled that further validates or challenges original score assignment but also helps to fill a gap between science and management by identifying specific research needs.

The assessment team assembled in the State of Rhode Island performed a thorough data collection, expert elicitation, and literature review process in preparation for applying CCVATCH to numerous salt marshes throughout the state. As a consequence of that effort, numerous data gaps and

research needs have been identified. The identified research needs, if addressed, would lead to a broader understanding of relative vulnerability of salt marsh to climate change across the northeastern United States.

Score	Scoring level description
0	No direct or anecdotal evidence is available to support the score, topic needs further investigation
1	Low: Inconclusive evidence (limited sources, extrapolations, inconsistent findings, poor documentation and/or methods not tested, etc.), disagreement or lack of opinions among experts, score base on anecdotal observations
2	Medium: Suggestive evidence (a few sources, limited consistency, models incomplete, methods emerging, etc.), competing schools of thought, score based mostly on expert opinion
3	High: Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus, general information can be applied to local habitats
4	Very High: Strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus, information for local habitats

Research Needs

Certainty score assignment associated with specific stressors (or stressor interactions) that were assigned an average score of less than two across assessed sites in RI indicate a general lack of evidence or consensus regarding habitat response. In Table 2, closed circles indicate direct stressor effects or stressor interactions that fall within that category.

TABLE 2: DIRECT STRESSOR OR STRESSOR INTERACTIONS WITH IDENTIFIED RESEARCH NEEDS

	Current Condition	CO$_2$	Temp.	Precip.	Sea Level	Extreme Climate
Direct Effects						●
Invasive /Nuisance Sp.			●	●		
Nutrients		●	●	●	●	●
Sedimentation						
Erosion						
Env. Contaminants	●	●	●	●	●	●

There is a clear need for more research on nutrient and environmental contaminant availability and uptake associated with changing climate conditions. For nutrient supply, species specific

response will likely alter vegetation community composition but relative change in aboveground versus belowground biomass which influences marsh geomorphic stability as well as altered accretion and/or decomposition rates is needed to inform management. The effect of legacy and emerging contaminants as well as change in contaminant mobility as the result of climate change is also not well understood and should be a targeted focus for study.

In some cases, certainty scores were more directly linked to the availability or absence of site specific data (as opposed to more general knowledge about habitat condition and response to identified stressors) which would be reflected in a variation in score assignment that was quite different from the average score indicated here. However, the identification of site specific data needs were not the intention of this resource document. Rather it is hoped that, as researchers and funding agencies recognize the need for additional information on which to base restoration and coastal resiliency planning efforts, they would focus resources to fill these identified knowledge gaps which would, even in the absence of site specific information, lead to a broader understanding of the challenges salt marshes face in the context of a changing climate.