Effects of Climate Change and Sea Level Rise On the Tuckerton Peninsula Salt Marsh System

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Saltwater Intrusion:

- *Loss of coastal plants*
- *Changing animal communities*

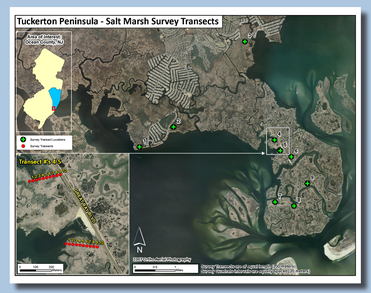
Changes in the salt marsh platform, such as marsh edge transfer and erosion are critical to quantifying effects of climate change and sea level rise. Understanding the vulnerability of Tuckerton Peninsula to these forces is necessary to plan climate change adaptation strategies.

Abstract: The Tuckerton Peninsula is projected to be among the first salt marsh systems in New Jersey to be lost by sea level rise associated with climate change and coastal subsidence. While this ~2000 ha *Spartina* salt marsh platform in southern New Jersey is heavily dissected by an expanding channel network and pond development, broad expanses of the marsh surface are susceptible to inundation and submergence. Reduction in the marsh habitat area has accelerated due to extreme weather events, storm surge, sea level rise, and perimeter shoreline erosion; for example, the rate of salt marsh habitat loss along the eastern and southern shorelines of the southern platform margin amounted to 1.6 m yr^{-1} between 1995 and 2008. Current sediment accretion rates (0.18 to 0.30 cm yr^{-1}) of salt marsh in the general area are only slightly higher than local rates of relative sea level rise (0.10 to 0.24 cm yr^{-1}), and they may be significantly lower in future years. Management plans must be formulated for coastal communities to ensure effective adaptation strategies for future loss of this extensive marsh platform.

Establishing Tier 2 assessment of JCNERR salt marsh builds capacity to monitor effects of climate change and sea level rise

Objectives:

- Establish salt marsh monitoring sites in three segments of Tuckerton Peninsula (North, Central, South)
- Characterize spatio-temporal changes in emergent vegetation composition, abundance, density, and areal cover
- Examine key drivers of salt marsh habitat change, e.g. storm activity, erosion, ditching, and sea-level rise
- Investigate impacts on biogeochemistry, hydrology, and habitat



Tier 2 vegetation monitoring is conducted along nine transects (ten equally spaced stations each) distributed among three segments of Tuckerton Peninsula. Transects 1-3 (North) cross ditched areas, transects 4-6 (Central) are reference habitats, and transects 7-9 (South) are most suceptible to currents and waves, erosion, and sea level rise.

Monitoring of emergent vegetation examines responses of wetlands and their functions to climate change. This includes shore-zone modification in response to sea level rise, disturbance, loss of coastal plant and animal communities due to saltwater inundation, and alterations of biogeochemical, hydrological, and habitat functioning.

KEYWORDS:

- Sentinel sites
- Climate change impacts
- Salt marsh vulnerability

Building capacity for NERRS by establishing JCNERR as a sentinel site for the detection and monitoring of climate change effects. The marsh-intertidal interface of Tuckerton Peninsula will be among the first in New Jersey impacted by rising sea level associated with climate change.

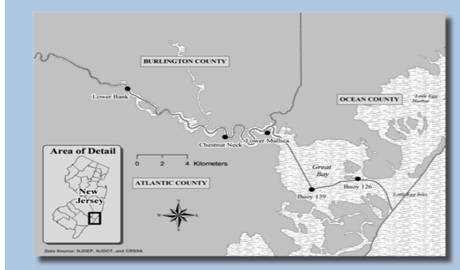
Deliverables:

- Sentinal monitoring stations
- Interdisciplinary Database
  - water quality (SWMP)
  - weather and climate
  - vegetation production
  - remote sensing
  - vertical control
- Data synthesis & models
- Interactive online mapping of salt marsh scenarios
- Strategy for informing climate adaptation

Combining multiple approaches to leverage understanding of climate change and facilitate adaptation planning

1) Synthesizing SWMP data

- Integrate SWMP data with other datasets
- Determine effects of weather and climate on Tuckerton Peninsula salt marsh habitat.



Water quality data collected at SWMP monitoring stations in the Mullica River estuary will be related to weather, climate change, and sea level.

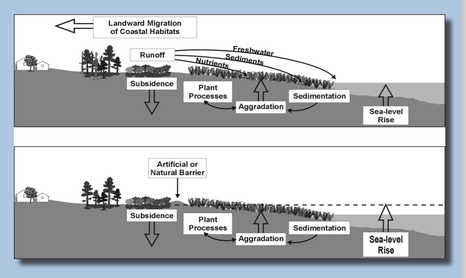
2) Modeling change

- Model emergent vegetation production at increased temperatures and inundation.
- Quantify sediment accretion rates with surface elevation tables and remote sensing.

Surface elevation tables will be constructed in each segment of Tuckerton Peninsula to quantify spatial patterns of elevation changes.

3) Predicting scenarios

- Forecast changes with the Sea Level Rise Affecting Marshes Model (SLAMM)
- Visualize Tuckerton Peninsula's vulnerability to climate change.



Salt marsh in Tuckerton Peninsula has decreased. Its vulnerability and response to sea level rise represents the mid-Atlantic region, where sea level rise is 2.74 to 4.06 mm yr^{-1} (Psuty and Ofiara, 2004).

Acknowledgement:

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Reference:

Psuty, N.P. and Ofiara, D.D. 2004. Coastal Hazard Management: Lessons and Future Directions from New Jersey. Rutgers University Press, New Brunswick, New Jersey.