Sea Grant
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Research Projects
2012-2014

Evaluating Ecological and Social Impacts of New Jersey Legislation Regulating Fertilizer Nitrogen Loads to Barnegat Bay – Little Egg Harbor Estuary by Using Isotopic Signatures, Seagrass Demographics, Social Response, and Communications

R/6210-0013

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When excess nutrients like nitrogen and phosphorus enter a water body from an external source, the overabundance of nutrients stimulates biological activity that ultimately depletes the oxygen supply in the water, compromising the ecosystem and making it less hospitable to plants and animals. In the case of New Jersey's Barnegat Bay-Little Egg Harbor the source of many of these excess nutrients has been attributed to stormwater runoff from fertilized lawns within the Barnegat Bay-Little Egg Harbor Watershed. To help understand how these nutrient-rich fertilizers affect the bay, a research project led by Drs. Michael Kennish and Benjamin Fertig of Rutgers University Institute of Marine and Coastal Sciences is studying the impact of fertilizers in this important New Jersey estuary.

YSI probe measuring temperature, salinity, dissolved oxygen and pH in the seagrass bed

The study will attempt to discern how human action through fertilizer application is linked to the condition of seagrass in the estuary. Since seagrasses assimilate nutrients, chemical analysis of these seagrasses has the potential to identify the presence of nitrogen derived from synthetic fertilizers. This means that seagrass can serve as an indicator of how the ecosystem responds to human activity. The timing of this project enables an assessment of the impact of recent legislation limiting fertilizer application (New Jersey Legislative Bills S-1411 and A-2290) in improving the condition of the bay.

Since these legislative changes are recent, the project will also gauge associated public awareness, attitudes, and behavior change in Ocean County, New Jersey where Barnegat Bay-Little Egg Harbor is located.

Dr. Fertig prepares a filter for a collected water sample.

Undergraduate intern Lela Novak collects a water sample with a syringe. Sea grass is visible.

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The Influence of Estuary Geomorphology on Accretion of Coastal Wetlands: A Potential for Priority Planning for New Jersey Coastal Areas Vulnerable to Sea Level Rise R/6210-0011

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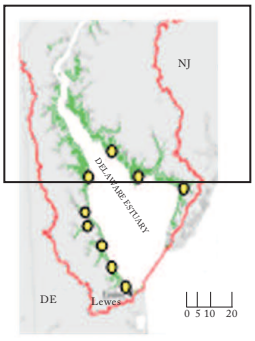
Coastal wetlands are extremely important ecosystems providing habitat for fish and wildlife, protection from storm surge and sea level rise, and nutrient and carbon removal services. In order for wetlands to be sustained with accelerating sea level rise, their elevation needs to increase through both sediment deposition and plant matter accumulation. These processes may occur at different rates in different types of estuaries. In coastal lagoons, such as Barnegat Bay, limited sediment deposition may result in a slower elevation increase than in coastal plain estuaries, such as the Delaware Bay, where sediment availability may be greater. Lower sedimentation rates can cause a negative feedback where plant growth is less vigorous and less plant material accumulates to build up the marsh surfaces. Salt marshes in some estuary types such as Barnegat Bay may be more vulnerable to sea level rise than salt marshes in estuaries where sediments are abundant.

To test this hypothesis, this project is measuring elevation change, plant biomass, historic accretion rates, and continuous water levels in New Jersey salt marshes along two estuary types: a coastal plain estuary (Delaware Bay) and a coastal lagoon estuary (Barnegat Bay). To better understand the sub-watershed level influences, the project will include a geographic information system (GIS) component to examine local wetland area change over time including quantifying the rate of shoreline edge erosion and landward transgression.

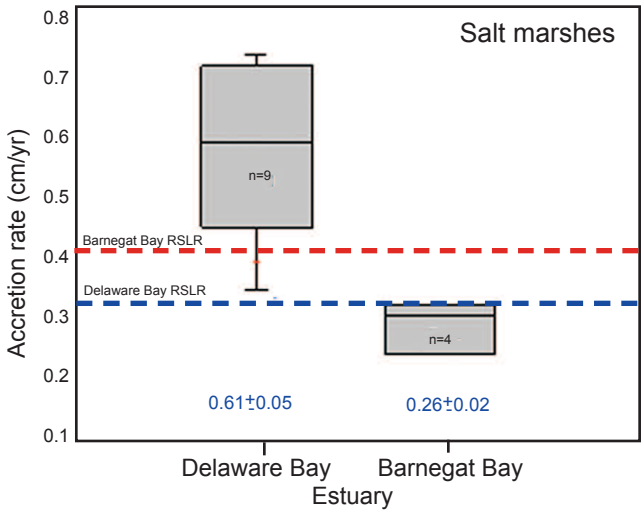
Preliminary data support the hypothesis.

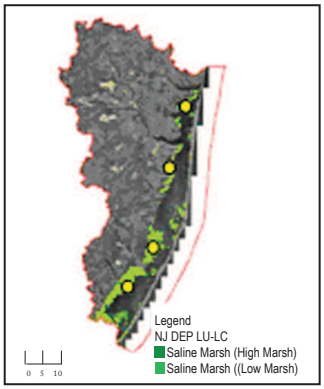
Accretion rates averaged over the last 50 to 100 years are over two times less in salt marshes of Barnegat Bay than salt marshes of the Delaware Bay. In addition, over the last 100 years, accretion rates in salt marshes of Barnegat Bay have been less than the rate of sea level rise.

This project will determine the fine scale mechanisms that are contributing to the difference in accretion and potentially the elevation change between salt marshes in Delaware Bay and Barnegat Bay, New Jersey.



Velinsky and Sommerfield in prep





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Research Projects 2012-2014

Economic Vulnerability to Climate Change on the Jersey Shore: Promoting Adaptation, Resilience and Sustainability in Coastal New Jersey R/6210-0012

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Residents of New Jersey's coastal communities have become concerned in recent years about the impacts climate change may have on their communities. Most of the climate change research in New Jersey has focused on mapping different projections for sea level rise and potential flooding impacts. In this study scientists will take a different approach to studying climate change by focusing more on its local-level social and economic impacts. It is important for coastal communities to better understand the economic value of businesses that are vulnerable to climate change and to learn about ways they can better prepare for and adapt to these changes.

Led by Dr. Robin Leichenko, director of the Rutgers Initiative on Climate and Society and associate professor of Geography at Rutgers University, this research project will investigate the economic vulnerability of coastal New Jersey to climate change, options for adaptation, and ways to help community decision-makers use this information to inform local-level planning. Co-investigators on the project include Richard Lathrop, Lisa Auermuller and Melanie McDermott. Data will be collected by conducting interviews with representatives from different economic sectors, ranging from fishing to tourism, and by analyzing numerical data relating to the economic impacts of climate change and adaptation. Geographic Information Systems (GIS) will help researchers map and identify areas of high vulnerability to climate change and cost benefit analysis will help to assess the different options for adaptation.

Dr. McDermott (left) and Dr Leichenko.

Flooded parking lot, spring 2011.

The key benefit of this project is to enhance the ability of coastal communities to prepare for and adapt to climate change. Unlike studies that analyze the science behind climate change and create predictive models, this research will allow scientists to better interact with community members to understand the human dimensions of the impacts of climate change.

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The Decline of Winter Flounder: Influences of Changes in Connectivity Between Estuaries and the Inner Continental Shelf R/6210-0014

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The goal of this research is to better understand the connection between estuarine and continental shelf habitats and address issues related to the decline of winter flounder and management of its habitats.

Numerous scientific studies report that in late fall winter flounder move into estuaries in anticipation of spawning. However, current research results indicate that winter flounder movements are variable, and spawning may take place in estuaries and on the continental shelf. Estuaries are dynamic environments that can present hostile conditions to adults and eggs in winter, and as seen in other fish species, can result in the evolutionary adoption of a wider spawning habitat to account for environmental conditions that can be detrimental to their survival. The validity of the current spawning habitat definitions remains unclear, with the implication that legal mechanisms for winter flounder protection are either too restrictive or not restrictive enough.

Past efforts utilized acoustic tags that enabled the project's researchers to track the movement of winter flounder in and near estuaries. The effort undertaken to capture winter flounder for tagging purposes in estuaries and the data from the acoustic tags has helped them to create a clearer picture of how winter flounder might use an estuary once they enter it. But the question of how the winter flounder that remain in the ocean utilize continental shelf habitats remains largely unanswered. The project will conduct a reevaluation of the seasonal movements of adults and determine the spawning sites for winter flounder (estuary and/or ocean) in New Jersey with archival tags or data storage tags, an approach unique to this species. The data storage tags will allow them to back calculate the movement of tagged fish over a greater time period and larger area. Success of the project depends on recapture and cooperation among recreational and commercial fishers to return the tags and will be encouraged by a substantial reward program.

Information on previous efforts can be found at http://njseagrant.org/jersey-shoreline/vol26_no1/regulatory_solutions.html

About the Tag

Dimensions: (diameter x length): 15mm x 46mm
0.6 x 1.8 inches

Fishermen who catch a tagged winter flounder should contact either of the researchers for return instructions.

Tag shown actual size

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