



Investigating the Interconnectedness of Climate Change, Nuisance Mosquito Populations, and Long-Term Resilience of Coastal Salt Marsh Systems

Overview

The Jacques Cousteau National Estuarine Research Reserve convened a roundtable of mosquito control agencies to examine the intersection of sea level rise, salt marsh structure, habitat modification and restoration, and nuisance mosquito populations. A chief concern is how climate change and sea level rise may affect marsh habitats, subsequently increasing mosquito production. Also of concern is how past physical alterations meant to reduce mosquito habitat affect the ability of salt marshes to maintain their relative elevation, and, as a result, their long term resiliency in the face of sea level rise. Recognizing the valuable role that salt marshes play in buffering coastal communities, coastal decision-makers are increasingly advocating for the restoration of salt marshes. While the thin-layer application of dredge spoil is of increasing interest as a way to help marshes keep up with rising sea levels, it could also greatly affect mosquito production. In this project, mosquito control agencies and other land management partners are working together to design and implement a marsh research program that informs future mosquito control management actions.

Anticipated Benefits

- Better understanding of how salt marsh change, marsh platform restoration strategies, and critical mosquito habitat are connected.
- Increased understanding of the vital role of estuaries, how they are altered by anthropogenic activities, and how a community can adapt to changes in mosquito breeding habitats.
- Informed policy decisions about the management and restoration of New Jersey salt marshes to sustain the ecosystem services they provide.
- Customized products designed to meet the needs of coastal decision-makers, including the New Jersey Department of Environmental Protection State Mosquito Control Commission; potential updating of the “Open Water Marsh Management Standards” and state and county departments of health policies.

Project Location

New Jersey

Project Duration

November 2016 to October 2019

Project Lead

Richard Lathrop
Rutgers University
(848) 932-1580
lathrop@crssa.rutgers.edu

Project Type

Collaborative Research – generating science that informs decisions

Project Partners

- Rutgers University
- Jacques Cousteau National Estuarine Research Reserve
- Atlantic County Office of Mosquito Control
- Burlington County Office of Mosquito Control
- Monmouth County Mosquito Control Division
- Ocean County Mosquito Extermination Commission
- Barnegat Bay Partnership
- New Jersey Division of Fish and Wildlife

Project Approach

The project has three major components:

- **Characterizing marsh landscape.** Collect baseline data to characterize changes in temporal and spatial marsh surface structure with in situ surface elevation tables, field collection of mosquito, water, and soil samples, environmental DNA (eDNA) analyses, remote sensing, and marsh habitat analyses;
- **Identifying salt marsh mosquito population hotspots and disease risk.** Develop novel strategies to effectively predict salt marsh mosquito production hotspots—strategies that replace the current trial-and-error or reactive approaches. For example, development of an eDNA approach to pinpoint locations chosen by females to deposit eggs and eDNA tools to recover historical patterns of mosquito distribution in salt marsh soil cores; and
- **Developing a restoration case study.** Undertake a coupled field survey (detailed elevation-habitat mapping and mosquito sampling) at a site that has undergone thin-layer application to determine where and how this habitat restoration technique might affect mosquito production.

Targeted End Users and Anticipated Products

Primary end users are New Jersey mosquito control agencies, land management agencies, and watershed partners. Major project outputs include the following:

- Information on potential future coastal habitat change (to 2050) to aid place-based decision making;
- Collaborative and interactive models of sea level rise and changing salt marsh structure;
- Higher resolution habitat mapping and modeling to identify mosquito production hotspots under rising sea levels and extreme but temporary flooding events;
- Enhanced techniques for monitoring mosquito populations based on specific environmental cues and past trends; and
- A module for middle school and high school educators focused on biology, ecology, and impacts of climate change on mosquitoes and their salt marsh habitats.

About the Science Collaborative

The National Estuarine Research Reserve System's Science Collaborative supports collaborative research that addresses coastal management problems important to the reserves. The Science Collaborative is managed by the University of Michigan's Water Center through a cooperative agreement with the National Oceanic and Atmospheric Administration (NOAA). Funding for the research reserves and this program comes from NOAA. Learn more at coast.noaa.gov/nerrs or graham.umich.edu/water/nerrs.