

## PROJECT DESCRIPTION

Sea level rise and its potential impacts to habitats and species are a concern for the National Wildlife Refuges within the South Atlantic Landscape Conservation Cooperative (SALCC). Climate change models are predicting sea level rise on the eastern seaboard, and existing National Oceanic and Atmospheric Administration (NOAA) and US Geological Survey (USGS) stations and buoys in the Atlantic Ocean have measured appreciable sea level rise over the past decade. The mean elevation of wetland surfaces must increase to keep pace with the annual rise in sea level and subsidence of organic substrates. Understanding rates of wetland elevation change and relative sea level rise will help managers at these refuges answer critical questions (i.e. Are marshes going to keep pace with relative sea level rise?) and adjust management techniques towards future and changing conditions.

The Southeast Region Inventory and Monitoring Network has funded this project to monitor the effects of sea level rise across coastal refuges within the SALCC and to determine local levels of sea level rise within Pamlico Sound. Funding for this project was used to purchase and install at least one Sea Level Monitoring Station at Swanquarter National Wildlife Refuge (NWR) in the Pamlico Sound and an array of rod surface elevation table (RSET) benchmarks on 18 coastal refuges within the SALCC that will measure rates of sediment accretion and subsidence.

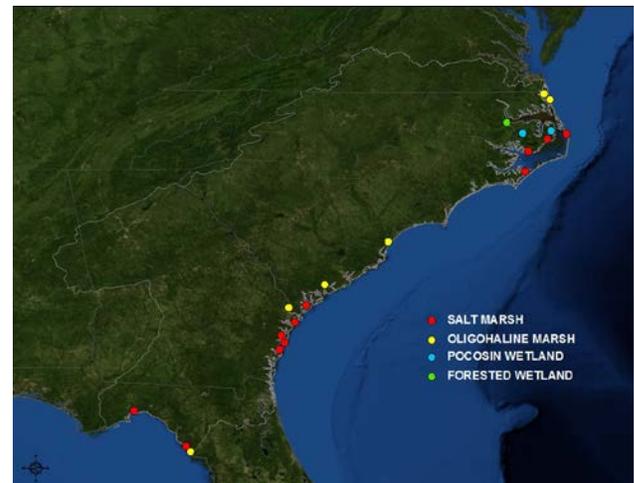
## OBJECTIVES AND ALTERNATIVES

The project objective is to observe impacts of sea level rise and change in priority habitats, rates of wetland elevation change and relative sea level rise, and forecast longevity of these habitats in coastal NWRs within the SALCC.

## METHODS AND PROTOCOLS

Our monitoring approach was derived and modified from the Louisiana Department of Natural Resources protocol (Folse and West 2004), USGS (Cahoon and Lynch 2003) and National Park Service Southeast Coast Network (NPS) protocols.

This project focuses wetland elevation monitoring within three priority habitats: salt marsh, oligohaline (0.5-5ppt) marsh, and pocosin wetlands. Sites were established on 18 refuges and selected based on pre-established site criteria (i.e., accessibility, dominant vegetation type, degree of disturbance, and distance from water body). A minimum of three RSET benchmarks were installed within a priority habitat through a spatially-balanced sampling design. Each RSET benchmark will also be surveyed using National Geodetic Survey guidelines so wetland surface elevation can be linked to local sea level.



Wetland surface elevation is being measured from each RSET benchmark by attaching the RSET arm, which is used to make highly accurate and precise measurements of sediment elevation over long periods of time (Cahoon et al. 2002B; Folse and West 2004). Height measurements (in millimeters) are being taken by attaching the RSET arm to the permanent benchmark and lowering pins to the marsh surface. Measurements will be collected quarterly during the first year; biannually the second and third years; and annually thereafter.

Vertical accretion is being measured from established 50 cm X 50 cm marker horizon plots within each site. The marker horizon is white feldspar clay that is evenly sprinkled on the surface of the wetland, and the plots are established on the same day as the initial RSET readings are recorded. Sediment cores will be taken using a mini Macaulay corer or cryogenic coring method, and sediment accretion above the feldspar will be measured using calipers. Sampling will occur six and twelve months following establishment, then annually thereafter.

Porewater salinity is being measured from established 50 X 50 cm plots within each site. Sipper tubes are used to extract three samples of soil porewater from 10 and 30 cm depths, and temperature, salinity and specific conductance are measured from the porewater using a handheld salinity meter. Measurements will be collected quarterly during the first year; biannually the second and third years; and annually thereafter.

Vegetation sampling in conjunction with RSET sites will be started in the summer 2013. Protocols are currently being reviewed for this project.

Cahoon D. R., and J. C. Lynch. 2003. Surface Elevation Table Website, Patuxent Wildlife Research Center, Laurel, MD. U.S.A. <http://www.pwrc.usgs.gov/set/>

Folse, T. M. and J. L. West. 2004. A Standard Operating Procedures Manual for the Louisiana Department of Natural Resource's Coastal Restoration Division: Methods for Data Collection, Quality Assurance / Quality Control, Storage, and Products. Louisiana Department of Natural Resources, Baton Rouge, LA.

## DATA MANAGEMENT

Refuge staff will record data on project datasheets and upload datasheets to the project sharepoint site (currently under development). Data will be entered into the NPS Southeast Coast Network Data Management System, Salt Marsh Elevation and Community Monitoring Database Module. This module consists of a SQL Server 2008 database, InfoPath 2007 forms, and a SharePoint site. The I&M Coastal Ecologist and Data Manager will perform entry and QA/QC of project data.

## DATA ANALYSIS / MODELS

Data analysis will be performed using the application component of the Salt Marsh Elevation and Community Monitoring Database Module following the third sample year. Project data will be used in conjunction with similar data collected from RSET benchmarks maintained by the NPS, USGS, and the National Estuarine Research Reserve System (NERRS) to better examine landscape scale changes brought on by sea level rise. SALCC staff will also use the project data to run and validate landscape-scale models.

## ACCOMPLISHMENTS AND MANAGEMENT IMPLICATIONS

- 60 RSET benchmarks were installed on 18 coastal refuges within the SALCC
- Refuge staff are being trained to collect wetland elevation, vertical accretion, and porewater data from RSET sites; to be completed in Jan 2013
- Data will be linked with NPS, USGS, and NERRS data and used to forecast habitat longevity in relation to relative sea level rise
- This information will help refuge managers identify critical areas where rates of loss are exceeding the ability of the habitat to respond
- This project highlights the importance of within agency and interagency cooperation and data sharing. Multiple partners came together to ensure consistent protocols, implementation, and data management in order to address landscape scale questions

## PARTNERS

The Southeast I&M Network has partnered with 18 refuges, the U.S. Geological Survey, the Nature Conservancy, the National Park Service, the South Atlantic Landscape Conservation Cooperative, the National Estuarine Research Reserve System, the National Geodetic Survey, and Atkins Global to accomplish many aspects of this project.

## SOURCES OF SUPPORT

- Personnel, lodging, and boat support from the 18 refuges
- Personnel support from the Nature Conservancy
- Planning and sample design support from USGS, Patuxent Wildlife Research Center and National Wetlands Center
- RSET install and measurement training support from the USGS National Wetlands Center
- Funding support from Southeast I&M Network

## MORE INFORMATION

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