

Project Title: Ecological Effects of Sea Level Rise (EESLR) in North Carolina

Summary

The North Carolina Sea Level Rise (NC SLR) Project is a cooperative network of five multi-investigative projects funded by NOAA's Center for Sponsored Coastal Ocean Research (CSCOR) through its Ecological Effects of Sea Level Rise (EESLR) Program. The threat of sea level rise and increased storminess poses many resource management challenges in North Carolina due to low elevation, extensive barrier islands and vulnerability to coastal storms. NC coastal decision makers need locally tailored information to successfully plan for the future effect of sea level rise and storminess on vital coastal ecosystems. Since its beginning in 2005, the NC SLR Project has engaged NC state and local managers to disseminate findings and adopt their recommendations in subsequent plans. The goal of this project is development of mapping and modeling tools to deliver to the North Carolina coastal management community the most up to date research on the effect of sea level rise and storminess on coastal habitats.

Description:

Why Care

The effects of sea level rise on NC coastal habitats are currently occurring and are expected to accelerate due to climate change. Eight NOAA tide gauges in North Carolina show SLR rate currently about 4 mm/yr, and accelerating. The state possesses the largest estuarine system on the U.S. Atlantic coast, with an extensive barrier island chain, and over 2,300 square miles of coastal land vulnerable to a one meter rise in sea level. Environmental managers need to plan for the future viability of low-lying lands, wetlands, beaches, and benthic habitats such as submerged aquatic vegetation and oyster reefs due to future inundation. Given the range of possible sea level rise scenarios and their associated levels of plausibility, NC Coastal Resources Commission's Science Panel on Coastal Hazards recommends that a rise of one meter be adopted as the amount of anticipated rise by 2100, for policy development and planning purposes.

Planning for research

A Technical Advisory Committee formulated a research program for predicting the ecological effects of sea level rise and to help design and lead a needs assessment scoping workshop composed of over 60 scientists and managers who identified relevant research questions that would advance knowledge and predictions of interactions among sea level, shoreline, bathymetry, coastal habitats, and ecosystem effects, and their application to coastal management. The outcome of the [*Research and Management Needs Assessment Workshop*](#) was a White Paper outlining the management requirements for scientific information and predictions, and the research strategy for addressing these requirements.

What CSCOR did

Competitive Funding was awarded in FY 2005. Our approach involves integration of models of physical attributes such as circulation, tidal elevations, and storm surge with ecological models of wetlands, oyster reefs, submerged aquatic vegetation (SAV) and other near shore ecosystems. On the physical modeling side, our NOAA partners adjusted land elevations and water depths to a common vertical datum, integrated bathymetry for the underwater study area with the LIDAR based land elevations, developed a Storm Surge Model to simulate wind-driven tides, and

hurricane-driven surges, synoptic wind events, as well as changing shoreline and inundation patterns.

On the ecological modeling side, our academic partners developed techniques to forecast the impacts of sea level rise on various coastal habitats and physical locations. On the Neuse River and Pamlico Sound, East Carolina University researchers created a predictive method to incorporate the critical parameters controlling shore-zone dynamics as determined by the isolated shore zone studies. On the wetlands of Pamlico & Core Sounds, a team lead by University of South Carolina researchers used an existing model for *Spartina* that integrates vegetation responses to changes in mean sea level with sediment accretion and supply and adapted that model to the *Juncus* marsh communities and conditions and on Back & Bogue Sounds. The research team from the University of North Carolina created a habitat simulation module to forecast the effects of variable water levels and shoreline stabilization on the structure and ecological function of sub-tidal, SAV, inter-tidal flat, oyster, and marsh habitats. Last, an East Carolina University researcher developed a landscape scale model to integrate physical and ecological parameters to examine the effect and extent of ecological change due to sea level rise and storm surge on coastal habitats.

Management Connections to the research A second workshop, *Planning for the Impacts of Sea Level Rise and Climate Change*, was held in 2007 with the goal of soliciting guidance from the coastal management community for designing scientifically informed modeling and mapping tools that will assist governing agencies and businesses located in North Carolina's coastal zone. Over 50 coastal zone managers and stakeholders from North Carolina learned about the NC SLR scientific research, and then identified four priority applications for scientifically informed decisions. A [Workshop Summary](#) is available.

A third scoping workshop, *North Carolina Sea Level Rise Project: Application to Management*, in 2009, informed managers of the NC SLR Project's advances toward understanding the impacts of SLR on NC coastal ecosystems and toward development of maps and modeling tools to aid coastal managers and decision makers. Through presentations and discussions, a list of the management questions potentially answered by the NC SLR Project was developed. The workshop [White Paper](#) is available.

What is happening now?

CSCOR has collaborated with decision makers in North Carolina since the project's inception. We are aware of the need to improve the current format of the scientific results for the NC SLR project. We have recently funded a research geographer, through the North Carolina State Cooperative Institute for Climate and Satellites (CICS), to lead a team to present the scientific results in an integrated format, particularly using maps and geospatial data. The members of the project team include scientists from the Nature Conservancy, NC Department of the Environment and Natural Resources (NCDENR) and the Albemarle- Pamlico National Estuary Program. Also involved are scientists from NC Sea Grant. The team will plan and develop high profile climate adaptation workshops. Outcomes of this follow-on work will include web-accessible maps, a hosted website with interactive web-mapping interface, downloadable geospatial data for State and local GIS users, and a set of use case scenarios and success stories documenting model, tool, and information implementation examples for coastal managers, planners, and restoration projects

Location of research

The North Carolina study area included the Pamlico, Back, Bogue and Core Sounds as well as the Neuse River including all coastal habitats.

Project Period: 2005- continuing