NC Sentinel Site Cooperative

Greetings, partners and stakeholders!

The North Carolina Sentinel Site Cooperative (NCSSC) was established in 2012 as part of a National Oceanic and Atmospheric Administration (NOAA) initiative to provide coastal communities and resource managers with information on the potential impacts of sea level rise on coastal habitats and communities.

Marae Lindquist: NCSSC/NC Sea Grant Graduate Fellow

Marae Lindquist, a PhD student at University of North Carolina at Wilmington, is the new NCSSC/NCSG graduate fellow. Read more.

NCSSC hosts research session at the North Carolina Coastal Conference

The NCSSC invites our old and new partners to attend this session for research updates and to learn more about the Cooperative and opportunities for engagement. The session will be on the afternoon of Tuesday, Nov. 19. Please contact NCSSC coordinator Sarah Spiegler with questions. Conference information is here.

Archived NCSSC quarterly newsletters are available on the N.C. Department of Environmental Quality web site.

Contact NCSSC coordinator Sarah Spiegler if you have articles or events that you would like to include in the next quarterly issue.

Quick Links:

NOAA Sentinel Site Program

N.C. Sentinel Site Cooperative

Research and Updates from the NCSSC

In this issue:

Upcoming Events

Downtown Beaufort prepares for Hurricane Dorian. Photo by Sarah Spiegler.

Rebuilding at Cape Lookout National Seashore

Overwash and damage from Hurricane Florence to cabin facilities at Great Island. Photo courtesy of CALO NS.

Cape Lookout National Seashore (CALO NS) is an intact barrier island system driven by coastal geologic processes. The dynamic nature of the marine environment always has been a challenge for park managers. Increasing sea levels and climate change exacerbate the processes of accretion and erosion that are the primary environmental influences on the barrier islands and their natural resources. Intensifying storms and erosion also threaten cultural resources, including archaeological resources. In addition, infrastructure that supports visitor access and safety is susceptible to all the factors that affect natural and cultural resources.

During the recovery process after Hurricane Florence, the CALO NS management team began asking *How do we live with the environment we live in, rather than fight it?*

Several projects are under way to help National Park Service (NPS) managers understand, plan for and exist within new parameters. Several studies also are underway to better understand how

changes in habitats, waterways, fresh water lenses, and temperatures will impact ecosystems. For example, researchers from North Carolina State University recently began working with the NPS and other partners to determine how climate change might affect key cultural resources over time, as well as to understand viable options. CALO NS is being used as the study site for this research project.

After Hurricane Florence, the park management team had the opportunity to rethink park infrastructure before it is “rebuilt the way it has always been rebuilt” says CALO NS superintendent Jeff West. "First, we asked, 'Do we really have to have the facility?' If we do, 'Is it built to withstand the typical impacts we have seen throughout the history of the park?' Then, we contacted additional subject matter experts to ask if there are new materials or solutions out there."

New cross members, beefier stringers and attachment hardware, and hog-slats on the Shackleford Banks pier and dock. Photo courtesy of CALO NS.

Docks and piers are critical throughout CALO NS, not only to facilitate access for visitors, but also for routine work and maintenance activities. Rather than rebuild piers and docks with wooden treads, the NPS chose to use a concrete hog slat, or open mesh decking.

On the exposed Shackleford Banks, an island within the CALO NS, dock and pier improvements included upgrades to crossbeams and stringers, as well as attachment hardware. The pier was elevated 6” from its previous height, and hog slats, which are far heavier and allow water to pass through, were used for decking.

At the CALO NS visitor center facility on Harkers Island, which is located in a more protected harbor, NPS staff replaced dock decking with thru-flow, an open mesh composite material that also dissipates some of the force of storm waters by allowing easy water flow through the material. The height of the docks was also increased after Hurricane Florence.

NPS staff have noted that the winter storms, which historically have caused damage to docks and piers, did not do so this past year. Maintenance costs of the new techniques and materials have been reduced, and evaluation of performance and cost will continue following future storms.

After Hurricane Florence, NPS staff replaced pilings, raised docks and replaced decking with thru-flow composite material. Photo courtesy of CALO NS.

Hurricane Dorian update: CALO NS was heavily impacted by Hurricane Dorian. The 7-foot storm surge that came across Portsmouth damaged or destroyed the village's historic structures and modern maintenance structures.

"I have not seen total building impact like this to a historic district anywhere or anytime in my career," says West. "All of the infrastructure for the cabin camp was completely destroyed."

An approximate 9.3-foot storm surge washed over most of North Core Island from the sound side and left over 54 inlets that cut through the Island from sound to ocean. Currently, the larger ones are active.

"This is personally hard, professionally difficult," says West, who lives in Harkers Island. "At the same time, it is an opportunity to inject sustainable design and operations into the process of learning to live within new weather patterns, rather than fighting it!"

Please contact Jeff West, CALO NS superintendent, for more information.

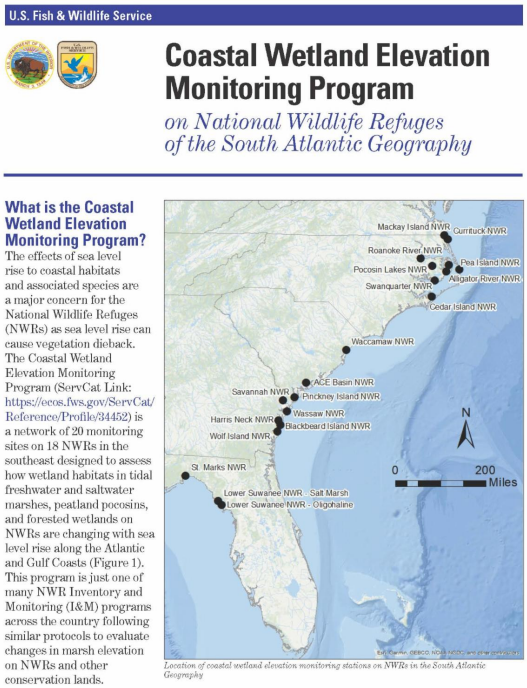
USFWS Coastal Wetland Elevation Monitoring Program

The effects of sea level rise to coastal habitats and species are a major concern for the National Wildlife Refuges (NWR), which are managed by the US Fish and Wildlife Service (USFWS).

Over the past 7 years, the USFWS Coastal Wetland Elevation Monitoring Program (CWEM) has been implemented at 20 sites on 18 NWRs throughout the southeast. This project is a collaborative effort between the NWR Inventory and Monitoring programs and participating NWRs that are monitoring changes, including sea level rise, in our Refuges' coastal wetlands.

In 2019, the program produced a regional fact sheet and 18 Refuge-specific CWEM information reports. Select CWEM completed reports are available here.

Contact Michelle Moorman, the current program manager, with questions or requests for CWEM reports.



NOAA Tools Spotlight

NOAA Sea Level Rise Viewer

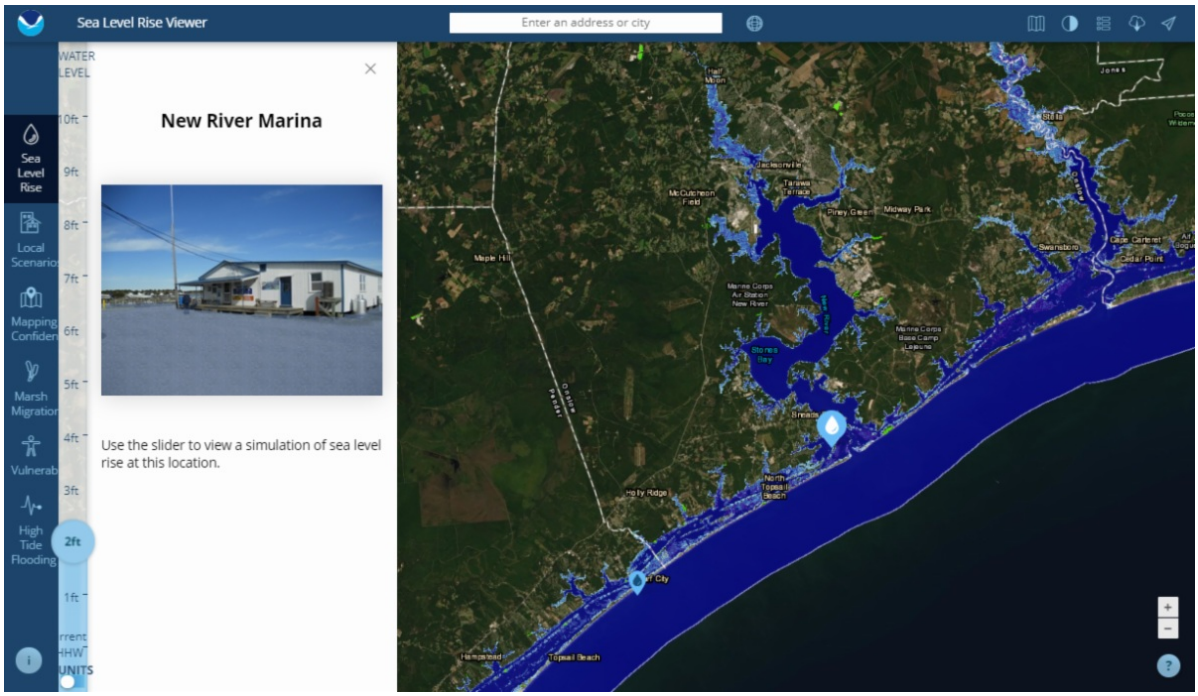
An ever-growing concern for lower-lying coastal communities is the threat of continued sea level rise. Many communities already experience concern over higher sea levels due to the increased frequency of high-tide flooding events.

Available from NOAA's Digital Coast website, the Sea Level Rise Viewer, creates map visualizations that depict sea level rise impact areas. Visitors can use the slider bar to test several sea level rise scenarios, up to 10 feet. For select locations, photo simulations show popular landmarks and how sea level rise would impact them.

The tool also shows how marshes might respond to rising seas, and the vulnerability section provides

an overlay of social and economic data to show potential impacts to vulnerable populations. In addition, the high-tide flooding tab provides insight into the areas more prone to recurrent flooding, as well as tide gauge information where available.

Access the tool here. For questions, please email NOAA.



The use of the NOAA Sea Level Rise Viewer shows the extent of two feet of sea level rise in the North Topsail Beach area. The photo is a simulation of what two feet of sea level rise might look like at the New River Marina.

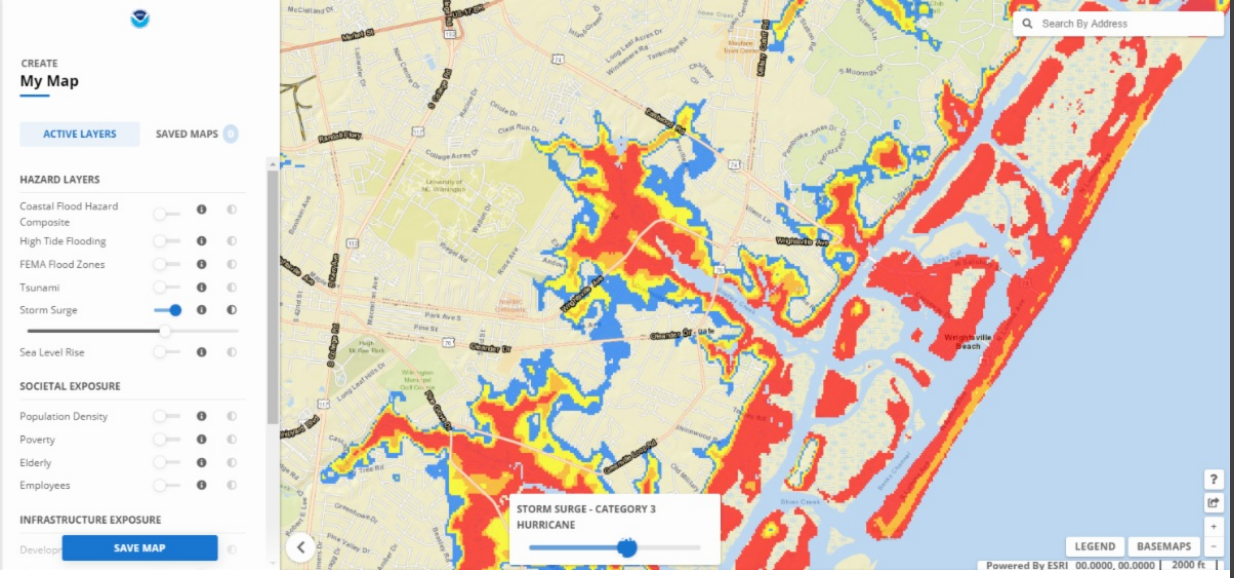
NOAA Coastal Flood Exposure Mapper

As flooding continues to be a growing problem in coastal communities, understanding the people, places, and natural resources in jeopardy is an important part of efforts to make communities more resilient.

A newly updated tool from NOAA, the Coastal Flood Exposure Mapper, helps anticipate vulnerabilities. Available from NOAA's Digital Coast website, this tool depicts areas prone to coastal flooding. Users can view flood layers that include sea level rise, storm surge risk, high tide flooding, FEMA special flood hazard areas, and tsunami run-up zones (where available). Users can save, download, or share the maps online.

The latest version allows users to enter an address of their choosing and view the flood exposure at that location. The Coastal Flood Exposure Mapper also includes tips for using the maps to engage community members and local officials. The current geography includes the East Coast, Gulf of Mexico, West Coast, and islands in the Pacific and Caribbean.

Access the tool here. For questions, please email NOAA.



The NOAA Coastal Flood Exposure Mapper shows storm surge for a category three hurricane in the areas of Wilmington and Wrightsville Beach, North Carolina.

Publications and News Features

NOAA Technical Report NOS CO-OPS 090; "2018 State of U.S. High Tide Flooding with a 2019 Outlook", June 2019

NC Sea Grant Coastwatch; "Land Versus Sea", Summer 2019 *(features the NC SET Community of Practice)*

The News & Observer; "A natural coastline is the best defense against storms", Sept. 3, 2019

Funding Opportunities

NC Sea Grant, *deadline October 7*
- NCSG Research Opportunity for Resource Management Needs

NC, SC, GA and FL Sea Grant, *deadline October 25*
- The Karl Havens Memorial South Atlantic Regional Research Competition: Effects of Coastal Flooding on Access to Infrastructure and the Resulting Effects in Coastal Communities

National Fish and Wildlife Foundation, *deadline November 12*
- 2019 Emergency Coastal Resilience Fund

NC Sea Grant and NC Coastal Reserve and National Estuarine Research Reserve, *deadline November 13*
- 2020 NC Coastal Research Fellowship

NOAA National Estuarine Research Reserve System, *deadline December 20*
- Margaret A. Davidson Fellowship

Upcoming Events

King Tide event, North Carolina
- predicted September 26 - October 2 at a shoreline near you

NOAA Office for Coastal Management, Using Flood Exposure Maps webinar
- October 1 at 1 pm; register here

2019 Living Shorelines Tech Transfer workshop, Beaufort
- October 8 - 9 at the Beaufort Hotel

SECOORA Sea Level Rise Curriculum Webinar Series
- October 15, 17, 22 and 24

Coastal and Estuarine Research Federation conference, Mobile, Alabama

- November 3 - 7 at the Mobile Convention Center

SE Climate Adaptation Science Center Regional Science Symposium, New Orleans, Louisiana

- November 13 - 15 at the New Orleans Marriott

NC Sea Grant Coastal Conference, Wilmington

- November 19 - 20 at the Hotel Ballast
- The NCSSC invites partners to attend the cooperative's session of research updates, which will take place the afternoon of Tuesday, Nov. 19.

Drones in the Coastal Zone workshop, Beaufort

- March 31 - April 2, 2020 at the Duke University Marine Lab and NOAA Beaufort Lab

The NOAA Sentinel Site Program leverages existing research and monitoring resources to ensure resilient coastal communities and ecosystems in the face of changing conditions. The program's place-based approach focuses on issues of local, regional and national significance that impact habitats and species managed by NOAA and surrounding coastal communities.