

(2) ABSTRACT/PROJECT SUMMARY

NOAA/NOS/NCCOS/CSCOR: 2015 Ecological Effects of Sea Level Rise Program

(EESLR 2015) The Coastal Recovery from Storms Tool (CReST): A Model for Assessing the Impact of Sea Level Rise on Natural and Managed Beaches and Dunes

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The barrier islands within the North Carolina Sentinel Site Cooperative (NCSSC) sustain rich ecosystems, host valuable infrastructure, and protect the mainland coast from sea level rise (SLR) and storms. A transdisciplinary team of coastal geomorphologists, ecologists, and managers proposes to transform the way in which vulnerability, resiliency, and the ecological effects of SLR are assessed in the NCSSC through the development of a new management instrument called the Coastal Recovery from Storms Tool (CReST). This innovative modeling system will couple an emerging understanding of the feedbacks between dune vegetation and sand transport with a recently developed coastal dune model to assess beach and dune evolution in both natural and managed systems in response to SLR and extreme storms.

Specific objectives of the proposed research include:

1. **Develop the Coastal Recovery from Storms Tool (CReST)**, in consultation with NCSSC personnel, which will integrate an emerging understanding of biophysical processes by explicitly coupling SLR, sediment transport processes, and the dynamics of dune-building beach grasses to assess the time and space scales of beach and dune evolution in both natural and managed systems.
2. **Apply CReST to Cape Lookout National Seashore (CReST-CALO)**, to estimate recovery and vulnerability to future storm events under a variety of SLR, storm change, and management scenarios.
3. **Apply CReST to Bogue Banks (CReST-BB)**, in particular examining the impact of extensive beach nourishment programs on dune recovery following storms as well as under various SLR, storm change, and management scenarios.

To optimize management decisions within the relatively natural (CALO) and more managed (Bogue Banks) portions of the NCSSC coastline, it is necessary to make assessments of storm impacts to beaches, dunes, and backshore ecosystems under both today's conditions as well as under a range of possible future SLR and storm change scenarios. CReST-CALO and CReST-BB will be user-inspired predictive tools—developed in collaboration with NCSSC, NPS, and Carteret County, North Carolina participants and staff—which will provide output to enable coastal managers to assess and compare a range of future management strategies. Ideally, the tools will be used to inform restoration of degraded ecosystems and protection of healthy ones. By developing the capability to incorporate dune recovery processes into storm impact assessments and to forecast the vulnerability of dune-backed beaches under different climate change scenarios, the proposed project will fill an important gap in the understanding of how dune recovery processes affect, and often drive, overall coastal vulnerability and resilience.