



Sentinel Site Quarterly

*North Carolina
Sentinel Site Cooperative*

Fall 2015

The Sentinel Site Cooperatives have a new logo! A design competition was led by the Northern Gulf of Mexico SSC. After voting was complete, our new logo was chosen.

For more information about the NCSSC, or to submit ideas for inclusion in the Quarterly, contact [Jennifer Dorton](#). Previous Quarterly Newsletters can be found on the [NC DENR](#) website.

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Pivers Island Coastal Observatory (PICO)

Carbon dioxide is rising at ~3% per year in the atmosphere and oceans leading to increases in dissolved inorganic carbon and acidity. This trend is expected to continue for the foreseeable future with ocean acidity predicted to increase substantially, potentially affecting the marine ecosystem. However, coastal estuaries are highly dynamic systems that often experience dramatic changes in environmental variables over short periods of times. At the Pivers Island Coastal Observatory ([PICO](#)), we are measuring key variables of the marine carbon system along with other potential forcing variables and characteristics of the ecosystem that may be affected by ocean acidification (OA) and climate change. Initial data from time-series observations show that acidity, temperature and other stressors vary over multiple space and time

scales, and this variability is relatively higher than that observed in open ocean waters (Johnson et al. 2013).

Microbes in the oceans provide essential ecosystem services including primary production (photosynthesis) and organic matter turnover that sustain all higher marine organisms. It remains unclear how marine microorganisms will adapt to the acidification of the oceans and how much their activities will be affected. In addition to continued long-term monitoring of ocean acidity (pH), the PICO project is using microbes as sentinels to investigate whether coastal strains are better adapted to ocean acidification other stressors (e.g. temperature) compared to similar microbes from the open ocean. We also use seasonal environmental variability to explore existing microbial adaptation to specific environmental changes (Yung et al. 2015).

Advancing our understanding of these issues is essential in order to predict the consequences of OA on ocean life and fisheries, identify areas of the ocean that might be more vulnerable to OA, and propose modes of action to counteract potential adverse effects. This project combines oceanographic monitoring and advanced molecular techniques to characterize the adaptive responses of microbial communities to multiple stressors associated with OA.

By integrating multiple types of data, PICO is providing a predictive and mechanistic understanding of microbial community responses and feedbacks to OA, including essential ecosystem services. The long term goal is to understand this variability, the mechanisms that drive it and to make management recommendations for increasing ocean acidity. PICO is part of the [International Ocean Carbon-UNESCO Biogeochemical Time Series network](#). [Data](#) is freely accessible through [BCO-DMO](#).

Further Reading:

Johnson et al. (2013) Dramatic variability of the carbonate system at a temperate coastal ocean site (Beaufort, North Carolina, USA) is regulated by physical and biogeochemical processes on multiple timescales. PLoS ONE 8(12):e85117. DOI: 10.1371/journal.pone.0085117



Technician Sara Blinbry is filling BOD bottles as part of the PICO weekly sampling (photo T. Williams).

Yunget al. (2015) Thermally adaptive tradeoffs in closely-related marine bacteria. *Environmental Microbiology* **17**(7) 2421-2429. DOI:10.1111/1462-2920.12714

NCSSC "Data Corner"

NOAA's National Centers for Environmental Information (NCEI) are responsible for hosting and providing access to one of the most significant archives on earth, with comprehensive oceanic, atmospheric, and geophysical data. From the depths of the ocean to the surface of the sun and from million-year-old tree rings to near real-time satellite images, NCEI is the Nation's authority for environmental information. By preserving, stewarding, and maximizing the utility of the Federal government's billion-dollar investment in high-quality environmental data, NCEI is committed to providing products and services to private industry and businesses, local to international governments, academia, as well as the general public.

The demand for high-value environmental data and information has dramatically increased in recent years. NCEI is designed to improve NOAA's ability to meet that demand. In 2015 NOAA began the process of consolidating three existing National Data Centers, the National Climatic Data Center, the National Geophysical Data Center, and the National Oceanographic Data Center, into the NCEI.

By using consistent data stewardship tools and practices across all science disciplines and by forging an improved data management team, users will see an improvement in the overall value of NOAA's environmental data archives. The transition to NCEI will take time, with the final integration anticipated beyond 2020. An overriding principle throughout the formation of NCEI is transparency to users and a commitment to continuing to provide the geophysical, ocean, coastal, weather, and climate data on which users have come to rely. To learn more, visit: <https://www.ncei.noaa.gov/about>.

The NCSSC Quarterly will feature a "Data Corner" to highlight NCEI datasets and data products that are available for use by researchers and the public. In this edition, we are featuring the new Marine Observations Data Tool. This new tool is a beta version and the NCEI would like your help with testing. The tool provides access to expansive historical marine data archives, including the most current release of the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). ICOADS offers marine data collected over the past three centuries, making it a robust tool to learn about our changing environment. To learn more about the Marine Observations Data Tool and to participate in the beta testing, visit the following website: <http://www.ncdc.noaa.gov/news/new-marine-observations-data-tool>.



Data from buoys, satellites, and many other instruments are available on the Marine Observations Data Tool.

The Science House at NCSU's Center for Marine Science and Technology

The Science House's mission is to: 1) Motivate and prepare K-12 students, through innovative programs, to study and work in Science, Technology, Engineering, and Math (STEM) fields; and 2) Educate and empower K-12 STEM teachers to effectively integrate innovative STEM content, research, and technologies into their practices. Since The Science House was founded in 1991, the organization has remained committed to bridging the resources of NC State University, North Carolina's largest research institution, to K-12 students and educators across the state. Providing resources, programs and teaching materials, The Science House empowers scientific literacy and hands-on discovery.

What started as one office in Raleigh, N.C., has grown to include three

satellite locations in Asheville, Hickory, and Morehead City. By partnering university researchers and students with innovative programs and volunteer opportunities, The Science House helps educators produce successful grants, powerful outreach, and a platform to make a real difference in advancing STEM to every corner of the state. The Science House at NC State's Center for Marine Sciences and Technology (CMAST) in Morehead City, directed by Dr. Patrick Curley, serves school districts in southeastern North Carolina.



Middle grade students enjoy a field trip to Cape Lookout National Seashore.

Located in one of North Carolina's premiere marine research facilities, TSH@CMAST focuses on making coastal connections through an emphasis on place-based educational programs and citizen science projects.

Examples of TSH@CMAST programs and partnerships include: the Math and Science Partnership Grant "Coastal Connections", which provides teachers hands-on professional development programs and resources; a Burroughs-Wellcome Student Science Enrichment Grant for the development of middle grades coastal science inquiry clubs that provide summer and after school experiences; environmental certification workshops such as Project Learning Tree; Project WET; Project WILD; Earth Force; and, GLOBE. TSH@CMAST also hosts programs for teens such as a Sea Wolf 4H club for high school students, hosting of quarterly Teen Coastal Science Cafes' and for the first time this coming year, a pilot MATE ROV competition.

For more information visit: <http://www.thesciencehouse.org/>

Living Shorelines Workshop - Columbia, NC

The North Carolina Coastal Training Program is hosting the workshop, "Living Shorelines for Erosion Control on Estuarine Shorelines" on Wednesday, December 2, 2015. The workshop location is Pocosin Arts, 201 Main Street, Columbia, NC.

Participants will learn:

- The benefits and limitations of using living shorelines for erosion control;
- Living shorelines design standards based on site conditions;
- Living shoreline projects in North Carolina;
- Best practices for living shoreline construction and use of marsh plants; and,
- The permitting process for living shorelines.

[Registration](#) is required; however, the workshop is free. Continuing education credits are available.

NC Sea Grant/NC Coastal Reserve Research Fellowship

[North Carolina Sea Grant](#) and the [North Carolina Coastal Reserve and National Estuarine Research Reserve](#) are accepting applications for the 2016 N.C. Coastal Research Fellowship.

One successful applicant will receive a grant of up to \$10,000 for the 2016 calendar year, subject to sufficient funding and quality of the received applications. Please review the [RFP](#) for details. Applications are due by 5 p.m., Friday, November 20.

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 as well as surrounding coastal communities.