U.S. Coastal Research Program

Quarterly Bulletin

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September USCRP Quarterly Bulletin

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For more information on the motivation and goal of the USCRP as well as current initiatives, please see the USCRP website, https://uscoastalresearch.org/.

Understanding the USCRP's Organization – a general overview

Originating from a need for a coordinated, national science plan to address the coastal communities' needs, researchers from federal agencies, academia, industry, and non-governmental organizations banded together to establish the U.S. Coastal Research Program (USCRP). The USCRP identifies coastal research needs, enhances coordination of interagency activities, improves funding source identification, and strengthens academic programs. To support these efforts, the USCRP is composed of multiple organization's representatives operating together through a temporary governance structure that spans the coastal community from academic researchers to key federal leadership to community outreach practitioners. To support greater transparency, this article provides a general overview of the different mechanisms that create the USCRP.

Central to its operation is the USCRP's **Leadership Council** (LC) which serves as the policy and coordination oversight body for the program. While the LC does not provide advice on research directions or needs, it offers guidance and the high-level commitments necessary to sustain the program. With the assistance of the Virtual Program Office (VPO), the LC is responsible for drafting the Annual Research & Development, and Science & Technology Plan and updating the existing 5-Year Strategic Plan. The membership of the LC includes federal representatives and the upper levels of leadership from each of the engaged agencies, a representative from academia, and two representatives from the Stakeholder Team, currently represented by members of the American Shore and Beach Preservation Association (ASBPA).

Under its authority the LC established three operating teams – the Federal Team, Stakeholder Team, and an Academia Team – to support specific aspects of the USCRP. The **Federal Team** consists of leadership from federal agencies engaged in the program and federal members of the LC. The Federal Team establishes federal funding investments by implementing recommended and prioritized proposals provided by the LC. The **Stakeholder Team** collects and communicates coastal community users' needs by presenting recommendations to the LC annually. The membership of the Stakeholder Team currently comprises representatives from ASBPA and seeks to

include future participation from entities such as the Coastal States Organization, state and local governments, and industry. The **Academia Team**, composed of representatives from universities and research institutes with nationally recognized ocean or coastal-based science or engineering programs, categorizes research infrastructure investment needs and communicates those needs annually to the LC. While the Academia Team does not fund research projects, the team utilizes the priority research recommendations recognized by the LC when writing grant proposals. Providing support and adequate representation from all interested parties in the USCRP, the LC oversees these different levels of engagement to address the research needs of the nation's coastal community.

Lastly, the **Virtual Program Office** makes up the final piece of the USCRP governance structure and runs the program's day to day operations by developing, coordinating, and tracking technical collaboration; enabling infrastructure; and organizing products and logistics to facilitate the achievement of important milestones and deliverables. Such milestones and deliverables include planning teambuilding workshops, drafting proposals for the program's final governance mechanism, conducting in-progress reviews of collaborative research projects, establishing workings groups and tracking their progress, producing the Quarterly Bulletin, and organizing bi-annual meetings. Presently, VPO membership includes representatives from the U.S. Army Corps of Engineers, Bureau of Ocean Energy Management, U.S. Geological Survey, National Oceanic and Atmospheric Administration, and the American Shore and Beach Preservation Association.

ASBPA White Paper Summary

The American Shore and Beach Preservation Association (ASBPA) has finalized a white paper on the State of U.S. Coastal Science and Engineering: 2018. A full version is available online (http://asbpa.org/publications/white-papers-fact-sheets/) and published in ASBPA's *Shore and Beach* journal. Here's an advance peek at the findings:

In 2018, ASBPA conducted a survey of 51 coastal academic researchers from Geology, Engineering, Oceanography, Planning, Marine and Wetland, and Environmental Science programs. Most coastal academics (62% of respondents) stated that funding has generally decreased over the last five years. Only 14% of survey participants stated that funding has increased.

Despite the reduction in funding, the number of coastal science/engineering university courses has either increased or stayed the same in 84% of the programs; only 16% of programs saw a decrease in the number of coastal courses. Courses that teach fundamentals are offered annually or every semester by 80% of the programs.

Survey respondents indicated that the federal agencies that fund coastal academic research are (in order of most often cited to least): NOAA, NSF, USACE, BOEM, USGS, ONR, EPA, and the National Park Service. The typical grant size ranges from $100,000 to $500,000. Funding was categorized as difficult to obtain by 47 out of 50 respondents. Overall, the coastal academics surveyed are conducting an even mix of applied vs. basic research.

Recommendations

Despite some advances for coastal research in recent years, including formation of the USCRP and increased coastal research investment by National Science Foundation (NSF), funding for coastal academics remains difficult to obtain and has declined over the last five years. As such, ASBPA endorses the implementation of an updated version of recommendations from NRC (1999) and additional sub-recommendations (3a and 3b) informed by the community outreach conducted during this white paper effort:

1. The coastal engineering and science academic community continue working toward a robust consortium to improve research and education through cooperative arrangements for interdisciplinary approaches by leveraging major research resources, facilities, and educational capabilities.
2. The NSF should continue to fund fundamental research on coastal engineering and science (in its Engineering and Geoscience Directorates and/or elsewhere).
3. Federal agencies, academics, and stakeholders continue to support the U.S. Coastal Research Program, which is making significant progress toward the previously stated goal that "the USACE and other federal agencies should establish a substantial program to fund applied research in academic coastal engineering and science programs and promote partnerships between academia, federal agencies, & private interests." A portion of the USCRP's academic funding should be specifically dedicated to:
    a. Traditional coastal engineering topics (e.g., design/maintenance of gray infrastructure, beach nourishment), and
    b. New, interdisciplinary research projects to support Recommendation #1.

Reference

National Research Council 1999. *Meeting Research and Education Needs in Coastal Engineering*. Washington, DC: The National Academies Press. http://www.nap.edu/catalog/9613.html

Invited Contribution by Nicole Elko, ASBPA Science Director.

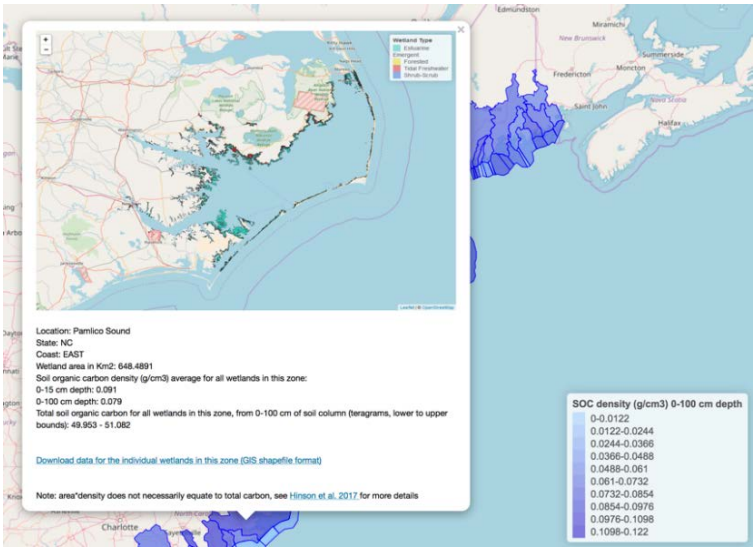
Project Spotlight: Blue Carbon Database

The spatial distribution of tidal wetland carbon affects the implementation of the Paris Climate Agreement, the United States (U.S.) National Greenhouse Gas Inventory, and project-level evaluation of CO_2 sequestration credits. Tidal wetlands currently comprise a large portion of the global marine and terrestrial soil carbon-stock reservoir (Duarte *et al.*, 2005; Mcleod *et al.*, 2011), and they are important in global climate regulation, with sequestration in these systems estimated to be as much as 50 times greater than that of similar sized rainforests (Bridgham *et al.*, 2006). The annual mitigation potential of 'blue carbon' ecosystems, not accounting for the current pace

of land loss, is estimated to be 0.9% to 2.6% of total anthropogenic CO_2 emissions (Murray *et al.*, 2011).

To address a growing need for high resolution maps of this resource, researchers developed a spatial database of soil organic carbon (SOC) distribution across the continental U.S. (Hinson *et al.*, 2017). The data and maps are publically available at the U.S. National Blue Carbon Database (bluecarbon.tamu.edu).

Researchers designed the interface for bluecarbon.tamu.edu to be user-friendly and allow for easy exploration of the database. The data is laid out in an online GIS. When a user clicks on a polygon, the data for a given estuary is displayed. This includes the location, state, wetland area in km^2, soil organic carbon density (g/cm^3), and total soil organic carbon. A small pop-up map image also displays the shapefiles for four land cover classes (Estuarine Emergent, Estuarine Forested, Estuarine Shrub-Scrub, and Tidal Freshwater). The pop-up also gives the user the ability to download high resolution shapefiles of the individual wetlands across the US, wherein the user can access the data at 5-cm increments from 0 to 300 cm of depth.



Example of user interface with popup selected for Pamlico Sound.

This database stresses the value of coastal ecosystems to sequestering carbon. The database is designed to assist both researchers and coastal managers in making informed decisions about the tidal wetland carbon located in their areas of operation.

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Duarte CM, Middelburg JJ, Caraco N (2005) Major role of marine vegetation on the oceanic carbon cycle. *Biogeosciences,* 2, 1-8.

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Mcleod E, Chmura GL, Bouillon S *et al.* (2011) A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. *Frontiers in Ecology and the Environment,* 9, 552-560.

Murray BC, Pendleton L, Jenkins WA, Sifleet S (2011) Green payments for blue carbon: Economic incentives for protecting threatened coastal habitats. *Nicholas Institute for Environmental Policy Solutions, Report NI,* 11, 04.

Invited Contribution by Dr. Thomas Huff, Dr. Rusty Feagin, and Dr. Audra Hinson of Texas A&M University, Coastal Ecology and Management Lab.

Project Spotlight: Unmanned Aerial Systems for Coastal Flood Risk & Emergency Management Operations

The Unmanned Aircraft Systems (UAS) for Coastal Flood Risk and Emergency Management Operations work unit is led by the U.S. Army Engineer Research and Development Center's (ERDC) Coastal and Hydraulics Laboratory (CHL), Geospatial Research Laboratory (GRL), and Environmental Laboratory (EL)), and is intended to identify (and develop when needed), defendable and consistent UAS-based methodologies and data products that seamlessly integrate with numerical models. These tools will be used to monitor coastal topography and bathymetry, storm- damage management infrastructure, and ecosystem health, providing the U.S. Army Corps of Engineers (USACE) with up-to-date quantitative data that can inform risk assessment and emergency management decisions.

Context

Static infrastructure combined with dynamic coastal landscapes creates navigation, flooding, and environmental management challenges that are exacerbated during natural (and human-related) disasters. Without accurate, quantitative, and efficient assessment technologies, USACE district engineers are left with inadequate funds, tools, and data to properly plan for and assess damages from these hazards, including coastal flood risks. Improving our physics-based understanding of many interdisciplinary processes affecting flood risk management actions, as well as ensuring the integrity of our coastal infrastructure, requires frequent monitoring which is expensive and time-intensive using current methodology and approaches.

Recent advancements in UAS-based technologies provide cost-efficient tools that allow for accurate, detailed, and timely two-dimensional (2D) and three-dimensional (3D) monitoring of coastal terrain, environmental features, and infrastructure. As a result, UAS remote sensing methods have the potential to substantially alter how the USACE collects, processes, and exploits geospatial products for a variety of coastal

management applications. These applications include improved assessment of flood risks and storm impacts from timely surveying capabilities, as well as emergency management operations during and after natural disasters. However, the rapid growth of this market (platforms, sensors, software) has created a wide-range of potential solutions with variable data quality, methodologies, and cost. UAS are not an all-in-one fix for all types of geospatial data acquisition, but are an important additional tool that USACE can add to its current geospatial surveying methodologies. Careful examination and assessment of UAS technology is needed alongside appropriate implementation guidance to ensure that USACE utilizes the most appropriate UAS-based solutions in its coastal emergency management practices.

Progress/Moving Forward

After input from the across USACE District offices, as well as federal and academic partners within the coastal community, the team began the work in 2017 by identifying available UAS technologies and application to USACE flood risk and coastal management practices. To accomplish this, the team planned and executed a multi-partner (11 teams total) field experiment to evaluate performance of different UAS platforms in a coastal environment. Partners included: the US Geological Survey, National Oceanic and Atmospheric Administration, Naval Research Laboratory (NRL), Oregon State University, Virginia Commonwealth University, and private industry. A number of these partners are also members of the Coastal Imaging Research Network (CIRN), a network of U.S. government agency, and international academic and private industry researchers committed to the future development and use of video imaging in coastal science and engineering. CIRN, led by Drs. Katherine Brodie (ERDC-CHL) and Margaret Palmsten (NRL), is focused on developing open-source code repositories and fostering communication and growth between researchers and users of coastal video imagery data.

Since the coordinated experiment, teams have been processing and analyzing the data and partnering with USACE Districts to conduct applied UAS pilot projects. Initial results from experimental data have illustrated the capability for different UAS platforms and software processing approaches to quantify coastal terrain, structures, and environments. Field deployments have included surveys in USACE District offices in Charleston, Jacksonville, Wilmington, Detroit, and Norfolk. These practices have allowed researchers to evaluate USACE deployment and processing approaches for real world concepts of operations (CONOPs).

Moving forward, work will focus on refining products and CONOPs from USACE District pilot projects, as well as the associated model-data framework tools and beginning polishing for technology transfer. Technology will be deployed with USACE Districts and partner organizations through presentations, training, and technology demonstrations.

Invited Contribution by Alexander Renaud, USACE-ERD, CHL, FRF

Announcements and Upcoming Events

Announcements:

DUNEX Announcement – DUNEX is a multi-agency, academic, and NGO collaborative of the USCRP to study nearshore coastal processes during one or more coastal storms. It is planned in several phases in the vicinity of the Outer Banks, NC beginning with a pilot study in the fall of 2019, followed by focused storm measurements extending from fall 2020 into winter 2021. For more information, please see the USCRP website and download the USCRP DUNEX Factsheet.

Upcoming Events and Conferences:
Oceans: Conference & Exposition, October 22-25, 2018.
Charleston, SC.
https://charleston18.oceansconference.org/

ASBPA, Resilient Shorelines for Rising Tides Conference, October 30-November 2, 2018.
Galveston Island Convention Center and San Luis Resort
Galveston, TX.
http://asbpa.org/conferences/

AGU 2018 Fall Meeting, December 10-14, 2018.
Washington, D.C.
https://fallmeeting.agu.org/2018/

Coastal Sediments 2019 (CS19), "Advancing Science & Engineering for Resilient Coastal Systems," May 27-31, 2019.
Tampa/St. Petersburg, FL.
http://coastalsediments.cas.usf.edu/

For More Information

If you are interested in contributing to the next Quarterly Bulletin, please contact Kathryn McIntosh (Kathryn.H.McIntosh@usace.army.mil) by November 9, 2018 to be considered for inclusion in the December Bulletin.

USCRP website: https://uscoastalresearch.org/
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