

UVA has a long tradition of leadership in coastal research, with the oldest Environmental Sciences department in the country and a focus on coastal systems for a half century. The university leads the multi-institution **Virginia Coast Reserve Long Term Ecological Research (VCR LTER) Program** based on the Eastern Shore – one of the National Science Foundation's (NSF) longest running flagship programs. The Virginia LTER was the first coastal site in the national LTER network, and has been funded continuously for over 35 years. The **Coastal Research Center (CRC)** was dedicated in August 2006 with the opening of 2 of 5 planned buildings to host the VCR LTER program. Other university programs also use the facility.

Virginia's Eastern Shore is the longest expanse of coastal wilderness on the U.S. eastern seaboard. VCR LTER researchers study the marshes, coastal bays and barrier islands of the Virginia coast to understand how these ecosystems function, to track how they change over time, and to predict how they will be affected by future climate and human activities. Our research informs strategies for using nature-based solutions for coastal resilience in Virginia and globally.

- The VCR LTER program involves 20 scientists from 8 partner institutions, including all the major research universities in Virginia; UVA is the lead institution.
- Since 1987, the program has received over \$30 million in direct funding from NSF. The current \$7 million grant has leveraged an additional \$10 million in research support, primarily from federal agencies.
- Each year, 20-25 graduate students and 5-10 undergraduate students are trained in coastal research.



Key Research Findings

- The coastal barrier system is inherently resilient. Coastal ecosystems are dynamic and can shift locations, yet the landscape as a whole retains its integrity.
- Healthy ecosystems (marshes, barrier islands, seagrass meadows) protect coastal communities, but they can reach tipping points in response to coastal flooding, storms, or other disturbances, with potential impacts on fisheries and storm protection.
- Habitat restoration of oyster reefs and seagrass meadows increases coastal resilience and provides other benefits such as carbon sequestration, fisheries support, nutrient removal, and increased biodiversity. The Virginia coastal bays host the world's largest seagrass restoration. UVA researchers wrote the international protocol for trading offset carbon credits for seagrass restoration.

Research Impacts on Regional Coastal Communities

- Guidance for coastal resilience strategies, focusing on nature-based solutions including oyster and seagrass restoration, marsh migration, and barrier island resilience.
- Carbon market participation for restoration of submerged aquatic vegetation. VCR LTER research is the basis for Virginia Senate Bill SB 763.
- Collaboration on the Coastal Resilience on-line decision-support tool to help Eastern Shore communities visualize risk and enhance resilience, with The Nature Conservancy.



K-12 Education - The "Schoolyard" LTER program provides high-impact classroom and outdoor experiences for regional K-12 students, statewide teacher-training programs, and on-line educational tools that are open access and available globally. Core programs include:

- Art and science collaborations to foster public engagement and understanding of coastal ecosystems.
- Outdoor learning from home resources for elementary students.
- Professional development for K-12 teachers, especially elementary science teachers, who receive the least science training nationally.
- Scholarships that support equitable student involvement in Nature Camp on the Eastern Shore.
- Partnership on field opportunities for 3rd-12th grade students to fulfill VA Department of Education requirement for a Meaningful Watershed Experience (MWEE).
- Summer research internships through Research Experience for High School Students program.

Outreach and Key Partners

- Key research partners include The Nature Conservancy and Smithsonian Environmental Research Center, in addition to VCR LTER participating institutions. International partners in the Netherlands, Belgium, Denmark, Italy, Mexico, and Australia.
- Technical advising on regional issues with the Eastern Shore Coastal Adaptation Working Group, Accomack and Northampton County Planning Commissions, NOAA Coastal Zone Management Program, and Resource Conservation & Development Council.
- Outreach to local and regional communities. Science open house events, Master Naturalists Program, Art/Science exhibits, Climate Adaptation Working Group (CAWG), Resilience Adaptation Feasibility Tool (RAFT).

Useful Links

- Virginia Coast Reserve LTER Program: <http://www.vcrlter.virginia.edu>
- VCR LTER Education Programs: <http://www.coastaleducation.virginia.edu/>
- UVA Coastal Research Center: <http://www.abrc.virginia.edu>
- Videos of research highlights: https://www.vcrlter.virginia.edu/home2/?page_id=272
- Nature Conservancy - UVA Resilience Decision Support Tool: http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/virginia/Pages/vaeas_ternshore.aspx
- Worthy Waters: The importance of marine ecosystems. <http://wise.berkeley.edu/previewproject.html?projectId=14487> ("to preview the project without constraints")
- Farming oysters...to fight pollution? https://www.youtube.com/watch?v=aSMq29mnY_k



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