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Civil Engineering Ph.D. Student Puts Virginia Sea Grant Graduate Fellowship to Work on Living Shorelines

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By Keith Pierce (kpierce@odu.edu)

Maura Boswell, a civil and environmental engineering Ph.D. student at Old Dominion University, said, in a 2014 Hampton Roads Business Journal profile that, "if there is something you don't like or agree with, do something to impact a positive change."

Maura Boswell

As sea level rise continues to pose a threat, Boswell is making good on those words, thanks to a graduate research fellowship from Virginia Sea Grant (VASG), a division of the National Oceanic and Atmospheric Administration (NOAA).

Boswell, a native of Olney, MD, is the first Old Dominion University engineering student to win the highly competitive fellowship. Her proposal, "Nature-based features for Coastal Resilience: Quantifying Wave Dissipation," examines the effect of a combination of hard coastal structures and soft natural components, commonly referred to as "living shorelines," in damping waves and reducing erosion.

"As a practicing engineer, when I was tasked with designing a marsh sill living shoreline system a few years ago, I became frustrated with the lack of design guidance available for engineers," Boswell explained. "This grant makes it possible for me to conduct research to meet my goal of providing sound science upon which living shoreline designers can optimize their designs."

According to NOAA, hardened structures, such as revetment, bulkheads or concrete seawalls, can increase the rate of coastal erosion. In contrast, living shorelines limit the use of concrete and instead rely on natural or green infrastructure - such as plants, sand and marsh - to provide shoreline protection and maintain valuable habitat. Boswell's research aims to provide guidance for designers and property owners on the level of erosion protection provided by a living shoreline design.

Property owners have a choice with how to protect the upland from an eroding shoreline, yet the most common method is with a continuous hardened structure, such as a revetment or seawall.

"This type of design puts a physical barrier between the water and land to ideally stop further erosion of the upland," Boswell said, "However, by putting a hardened structure on the shoreline, the interaction between water and land is completely cutoff and habitat is lost."

Utilizing field measurements and numerical modeling, Boswell seeks to better understand the way the structures and vegetation interact with waves and water to optimize the land-water interaction, and quantify the level of protection afforded by the entire living shoreline system.

"The idea behind a living shoreline is to couple a smaller structure with vegetation to help dissipate waves approaching the shoreline to provide erosion protection, but still allow for interaction between water and land to maintain existing habitat," she said. "Quantifying the level of protection of a living shoreline design will allow a property owner to directly compare a continuous hardened structure shoreline erosion protection system with a living shoreline erosion protection system."

Experts indicate that seas surrounding Norfolk are rising at twice the national average, making Hampton Roads a global hot spot for sea level rise, and the second most vulnerable region in the country, behind New Orleans. That rise recently prompted the U.S. Army Corps of Engineers to propose $1.8 billion in coastal upgrades for the City of Norfolk.

"Maura has tremendous experience and an incredible passion for this type of research," said Navid Tahvildari, an assistant professor in civil and environmental engineering. "The Virginia Institute of Marine Science (VIMS), which has a long track record of conducting applied research on ecological aspects of living shorelines, was looking for engineers who could conduct research to inform science-based design guidelines. Our research on coastal hazards and their impacts on the natural and built infrastructure, coupled with ODU's leadership in the area of coastal resiliency, contributed to Maura's success in obtaining this competitive fellowship."

As Virginia Sea Grant aims to find ways to help guard American coastlines from the threats that sea level rise presents, Old Dominion University remains actively engaged in aggressive research, education and outreach on critical issues pertaining to resilience at the community, regional, national and international levels. Supporting research such as Boswell's is just one small part.

"With the help of this grant, I hope to provide significant, science-based research for policymakers or anyone considering shoreline stabilization projects for sustainable and resilient coastal communities," Boswell said. "I'm thrilled to be a part of such important work."

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