

# POWER OF **R&D** NEWSLETTER

— **CONNECTING THE DOTS •  
TO INNOVATION**

## WIRELESS WATERWAYS

Buoys may provide backbone for  
innovative navigation network



U.S. ARMY



US Army Corps  
of Engineers



# FIELD NOTES

## BRIGADIER GENERAL DANIEL HIBNER

COMMANDING GENERAL, SOUTH ATLANTIC DIVISION



The U.S. Army Corps of Engineers (USACE) is entering one of the most important periods in its 246-year history. New threats posed by changing climates, stronger storms and aging infrastructure all demand innovative solutions that will ensure the durability of our nation's civil works resources. Meanwhile, increasing global instability adds urgency to our missions to construct state-of-the-art military facilities and to manage a civil works program that promotes the nation's economic vitality.

As we face such unprecedented stresses, USACE's world-class research and development will be more important than ever.

Among the biggest threats we face in the South Atlantic Division are hurricanes – which are becoming more frequent and more ferocious. It's not a matter of if we will see tropical cyclones each year – it's a matter of how many, where will they hit, and the damage will they inflict. That's why it's so important we are continually discovering new ideas that lead to stronger and more resilient coastlines.

One way to do this is by incorporating more natural and nature-based features (NNBFs), which provide enhanced protection and greater resiliency. Adding these features into our project designs just got easier, thanks to the new Engineering With Nature® toolkit for the Coastal Storm Modeling System. This set of tools developed by USACE researchers allows project designers to understand and quantify the impact NNBFs will have on storm surge, inundation and wave attenuation for various storm events prior to implementation.

Beach dunes are one type of NNBF that have been proven to be among the most effective defenses against coastal storm damages. That's why I'm particularly excited about another research project that is studying how we can use wrack – natural material that is traditionally discarded during beach cleanup – to build stable and more durable dune systems.

USACE research is playing a critical role in solving so many of the problems we face in the South Atlantic Division – from initiatives to restore the Everglades, to strategies to better detect, manage and mitigate Harmful Algal Blooms that can harm humans and aquatic life and inflict significant economic losses.

In terms of military construction, I'm particularly proud of the work South Atlantic Division is doing to rebuild Florida's Tyndall Air Force Base after it suffered heavy damage from Hurricane Michael in 2018. Innovative R&D is central to that effort as we not only rebuild but transform that vital facility into a model for future military installations.

Our challenges are great. Solving them will require an innovative spirit that continually discovers, develops and delivers new ways to protect communities, stretch resources, manage ecosystems, house Warfighters, and execute so many other projects that are essential to our nation's security.

USACE R&D is a game-changer and a critical enabler to Districts and Divisions as we work together to solve our nation's toughest engineering challenges.

Essays! We will succeed!

BG Daniel Hibner  
Commanding General  
South Atlantic Division



**“USACE R&D IS A GAME-CHANGER  
AND A CRITICAL ENABLER TO DISTRICTS  
AND DIVISIONS AS WE WORK TOGETHER  
TO SOLVE OUR NATION'S TOUGHEST  
ENGINEERING CHALLENGES.”**





# NAVIGATE

<b>A Solution Grounded in Science:</b> Minerals can help mitigate PFAS in groundwater.....	<b>page 6</b>
<b>Innovation at Work</b> .....	<b>page 8</b>
<b>Building Naturally:</b> Wrackcycling research can lead to more resilient dune systems and coastlines.....	<b>page 10</b>
<b>Smarter &amp; Safer:</b> Innovative technology could expand inland navigation communications network.....	<b>page 12</b>
<b>Enabling Resilient Designs:</b> Toolkit allows planners to predict NNBF impacts.....	<b>page 14</b>
<b>Connect With:</b> Leigh Provost.....	<b>page 16</b>
<b>USACE R&amp;D Strategy:</b> Top 10 R&D Priorities.....	<b>page 16</b>



**US Army Corps  
of Engineers®**

Our mission is to deliver vital engineering solutions, in collaboration with our partners, to secure our nation, energize our economy, and reduce disaster risk.

● This photo of a stream near Surry Mountain Lake in Surry, New Hampshire was captured by Alicia Lacrosse, a park ranger with the U.S. Army Corps of Engineers New England District.



# A SOLUTION GROUND IN SCIENCE

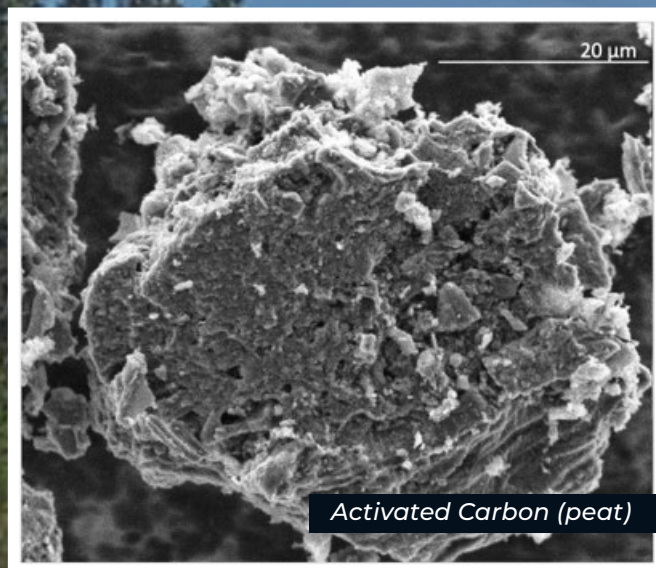
Minerals can help mitigate PFAS in groundwater

**U**SACE is working to understand detection, fate and transport, and remediation of a group of chemicals, generally known as per- and polyfluoroalkyl substances (PFAS), that present exposure risks to humans and the environment.

One project seeks to identify the best technologies to characterize, treat and manage PFAS in groundwater environments, as well as to determine how mineral-based amendments can increase the removal efficiency of natural sediments.

Using amendments as a simple and rapid tool to remove PFAS from groundwater is ideal for remote locations or those where it isn't possible to completely remove impacted soil and groundwater and destroy the PFAS. In a laboratory setting, research has shown complete removal of select PFAS using activated carbon sourced from peat mixed with iron.

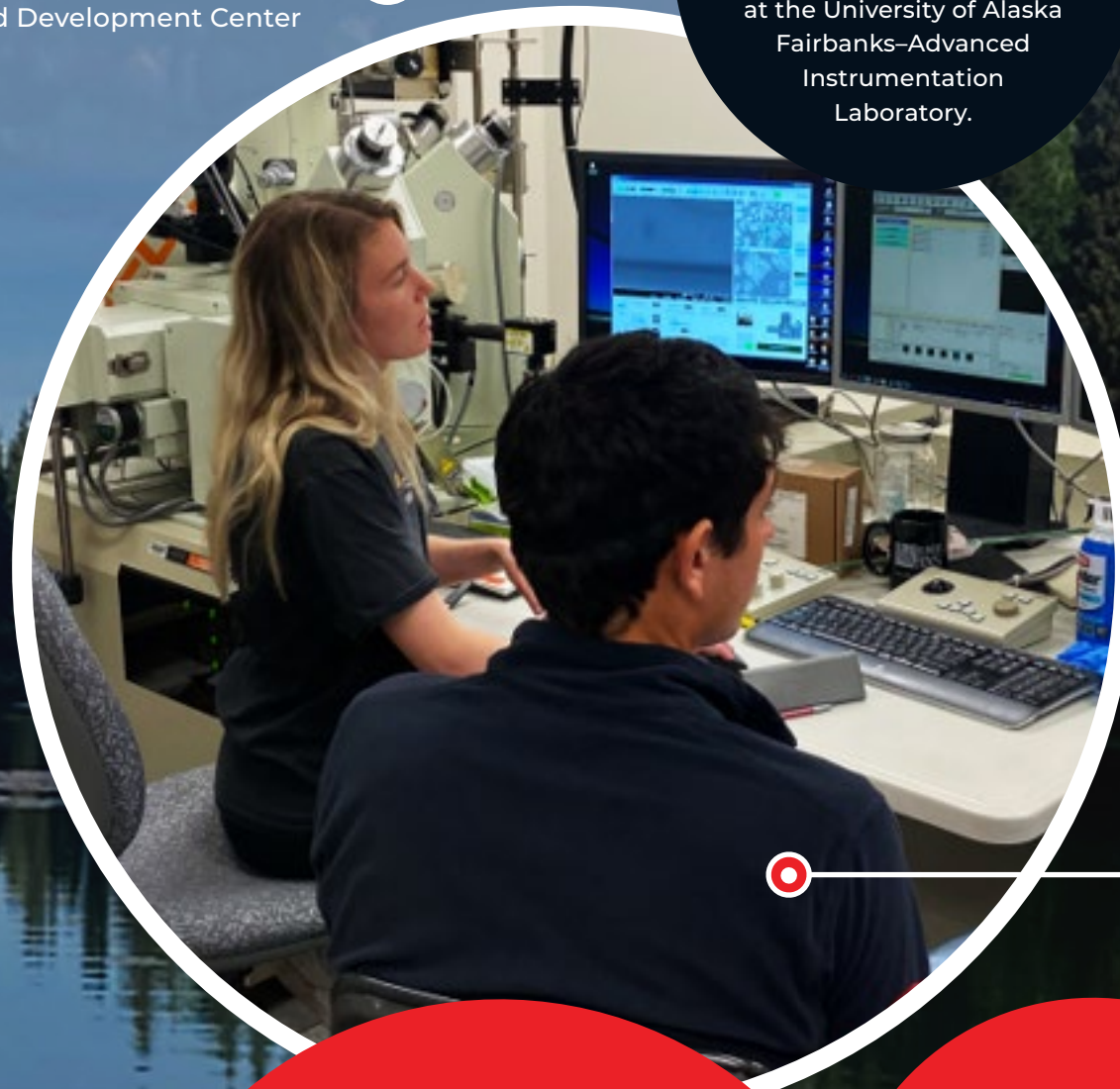
To read the full story, visit:  
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3458840/research-shows-minerals-can-help-mitigate-pfas-in-groundwater/>



**Dr. Amanda Barker**  
*Research Chemist*  
U.S. Army Engineer Research  
and Development Center



Anna Lesko and Brad Baxter, with the U.S. Army Engineer Research and Development Center, analyze amendment samples using Electron-Probe Micro-Analysis at the University of Alaska Fairbanks-Advanced Instrumentation Laboratory.



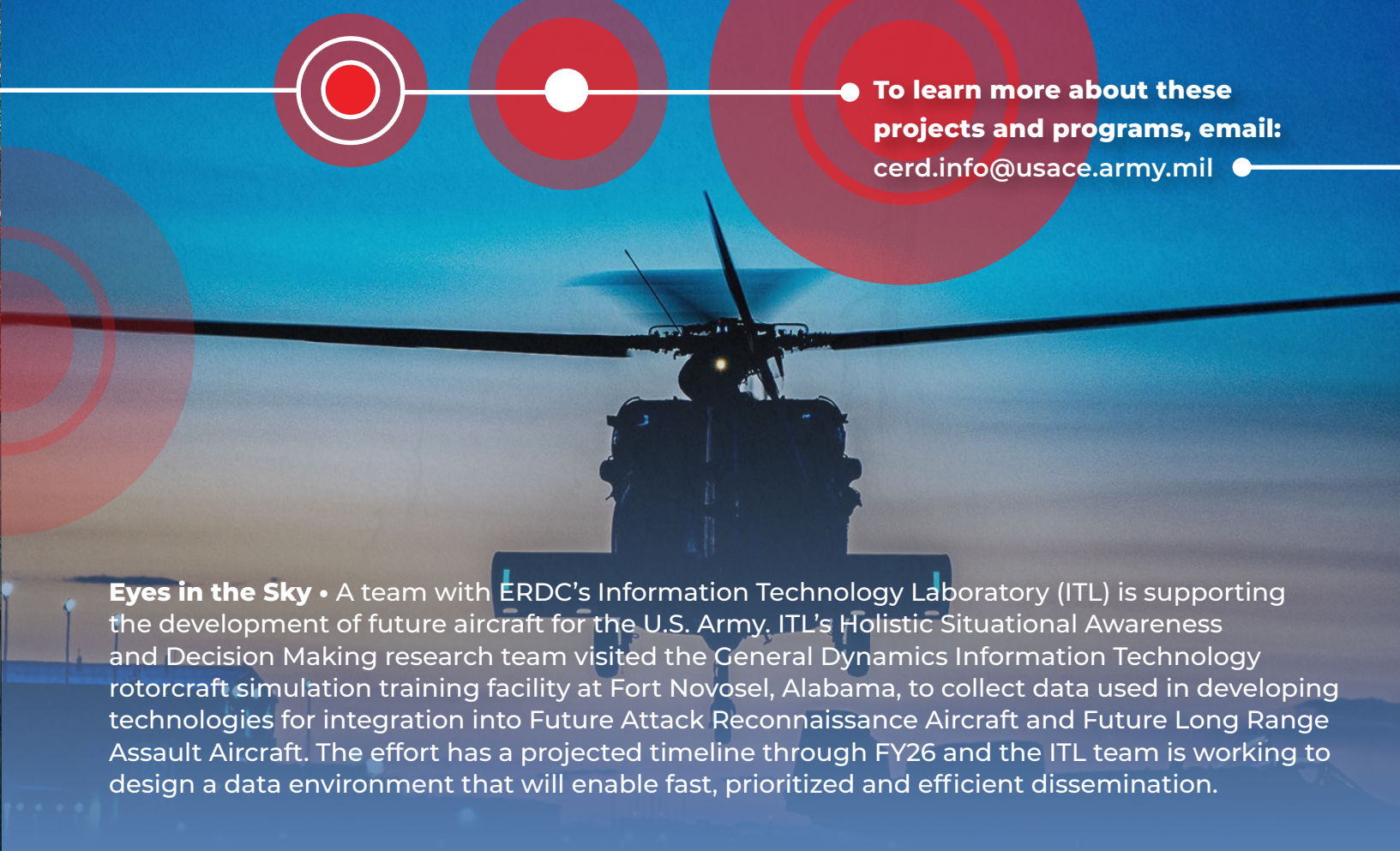
## CONNECTING THE DOTS

ERDC researchers were able to show **COMPLETE REMOVAL** of PFAS from groundwater in a laboratory setting.



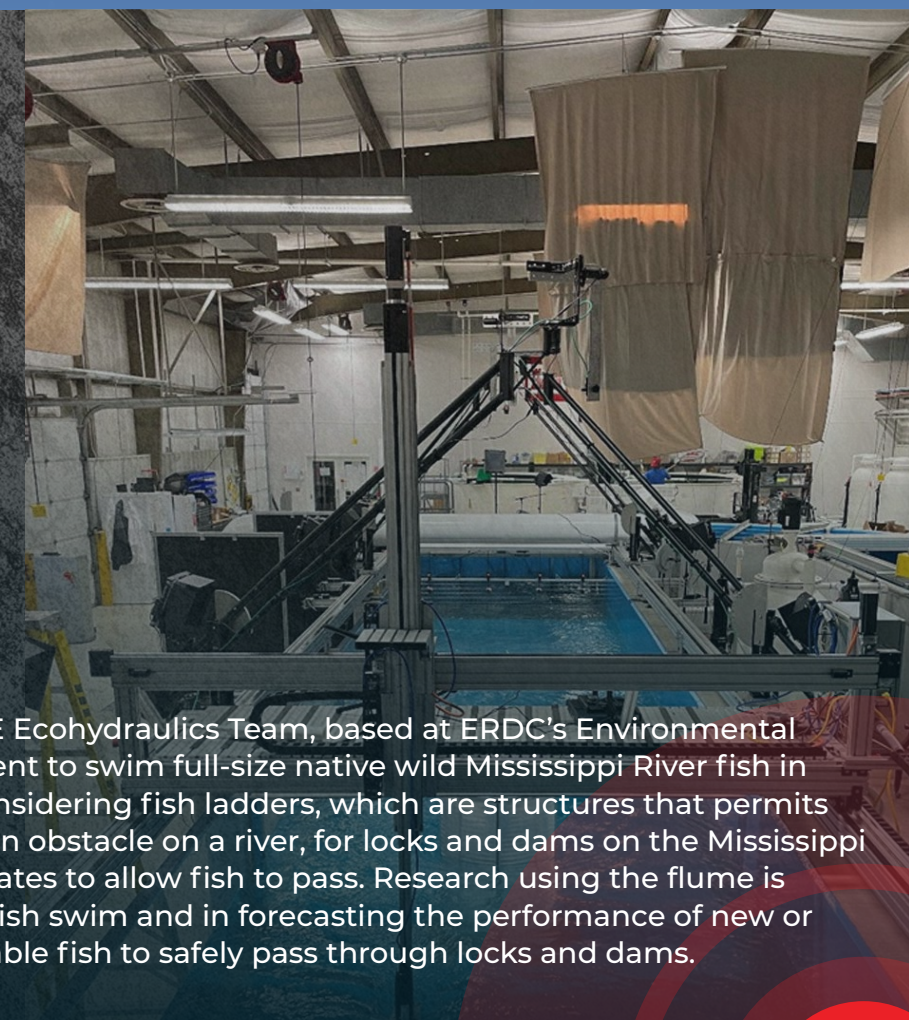


**Real-Time Monitoring** • Dr. Anna Wagner, from ERDC's Cold Regions Research and Engineering Laboratory, completed the installation and evaluation of a fiber optic-based dam seepage detection system at Moose Creek Dam, Alaska. This effort, funded by the Army's Installation Technology Transition Program, was to demonstrate how temperature changes can be monitored in real time for assessing groundwater seepage. When installed along an embankment's downstream toe, fiber optic cables can detect real-time temperature changes (~0.1°C resolution) along several kilometers of length (~20 cm resolution). The team successfully installed 500 meters of cable along a dam section that had previously experienced flooding.



**Eyes in the Sky** • A team with ERDC's Information Technology Laboratory (ITL) is supporting the development of future aircraft for the U.S. Army. ITL's Holistic Situational Awareness and Decision Making research team visited the General Dynamics Information Technology rotorcraft simulation training facility at Fort Novosel, Alabama, to collect data used in developing technologies for integration into Future Attack Reconnaissance Aircraft and Future Long Range Assault Aircraft. The effort has a projected timeline through FY26 and the ITL team is working to design a data environment that will enable fast, prioritized and efficient dissemination.

**Quick Flood Response** • ERDC responded to a request from the USACE Albuquerque District to help with the flooding within the Navajo Nation Chinle Arizona Chapter. The response was coordinated with the Albuquerque, Los Angeles and Sacramento Districts and the Navajo Nation Chinle Chapter. Uncharacteristically high snowmelt led to extreme flow events in the Chinle Wash that borders the Chinle Chapter. As a result, a large section of the Chapter's flood control levee system failed. ERDC assisted the Chinle Chapter by designing and laying out river training structures intended to redirect flow to the opposite side of the Chinle wash and away from the breached levee system and homes.



**First-Of-Its-Kind Research** • The USACE Ecohydraulics Team, based at ERDC's Environmental Laboratory, has established an experiment to swim full-size native wild Mississippi River fish in a hydraulic research flume. USACE is considering fish ladders, which are structures that permits migrating fish passage over or around an obstacle on a river, for locks and dams on the Mississippi River and in the Southeastern United States to allow fish to pass. Research using the flume is vital in better understanding how wild fish swim and in forecasting the performance of new or modified infrastructure intended to enable fish to safely pass through locks and dams.



# BUILDING NATURALLY

Wrackcycling research may lead to more resilient dune systems and coastlines

**U**SACE and its research partners at the University of Southern Mississippi and the Gulf Coast Geospatial Center are trying to understand how dunes are naturally constructed and looking for ways to use nature to build better, more resilient coastal dune networks.

Researchers are evaluating what happens when wrack, a natural material – such as seaweed – that washes up on beaches, is incrementally incorporated into man-made dunes, mimicking the natural growth cycle of dunes.

In addition to finding a beneficial use for this material, USACE hopes this method of building resilient coastlines will also reduce the need for future restoration construction projects and future beach nourishment.

To read the full story, visit:  
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3458856/wrackcycling-using-nature-to-build-stronger-dune-systems/>



**Leigh Provost**  
*Research Hydraulic Engineer*  
U.S. Army Engineer Research and Development Center

“WITH SO MANY PEOPLE LIVING ALONG THE COASTLINES, THE IMPACT OF A STORM CAN BE BILLIONS OF DOLLARS. IT IS IMPERATIVE THAT WE FIND SOLUTIONS QUICKLY TO PROTECT THESE COMMUNITIES.”

## CONNECTING THE DOTS

Placing wrack material on dunes can **TRAP SAND & ASSIST** the natural dune-building process.



# SMARTER & SAFER

**Innovative technology could expand inland navigation communications network**



Dr. Austin Davis  
Technical Director  
U.S. Army Engineer Research  
and Development Center

**W**ith more than 12,000 buoys already playing a critical role in our nation's inland navigation system, USACE is researching how to use patented technology to make those buoys even more valuable.

Leveraging digital technology developed through ERDC R&D, USACE is now exploring the idea of turning buoys, designed and positioned to mark shipping channels, into critical components of an inland waterway communications network that can push vital navigation information to mariners well beyond current capabilities.

Developed with the Inland Electronic Navigational Charts Program and the Louisville District, this technology was first targeted at providing the U.S. Coast Guard with real-time locations of its buoys. The idea has now grown beyond that.

Tests proved a mesh network was possible, but field trials are needed to answer critical questions and reach the technology's potential. Those trials will determine the best ways to augment a Coast Guard buoy and whether the system can be stretched over one river or multiple rivers, and will also address power needs, reliability, durability and costs.

To read the full story, visit:  
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3458736/digital-buoys-could-expand-inland-navigation-communications-network/>

## ©CONNECTING THE DOTS

Patented technology could provide mariners vital navigation information across a  
**COMPLETE INLAND  
WATERWAY NETWORK.**



# ENABLING **RESILIENT** DESIGNS

## Toolkit allows planners to predict NNBF impacts

**N**atural and nature-based features (NNBFs) provide important benefits that make our coasts stronger and more resilient. However, to implement these features, USACE districts must be able to predict their impact, and traditional numerical modeling methods for doing so are cumbersome and expensive.

In response, USACE developed an Engineering With Nature® toolkit for the Coastal Storm (CSTORM) Modeling System, allowing planners to easily quantify how NNBFs will change predicted values of storm surge, inundation and wave attenuation for various storm events.

The new toolkit will foster innovation, allowing engineers to quickly test multiple design ideas to determine which ones will work best. It will promote efficiency too. During recent studies with the Mobile and Philadelphia Districts, processes that would have taken two weeks to develop were completed in two hours.

To read the full story, visit:  
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3458776/ewn-toolkit-streamlines-and-standardizes-usace-coastal-storm-modeling/>



**Dr. Amanda Tritinger**  
*Research Hydraulic Engineer*  
U.S. Army Engineer Research  
and Development Center

# EWN®

“  
THE EWN TOOLKIT FOR CSTORM MODELING IS A GRAPHIC USER INTERFACE THAT ALLOWS A NUMERICAL MODELER TO REPRESENT NNBFS DIGITALLY IN EXISTING NUMERICAL MODELS AND STANDARDIZES AND STREAMLINES THE AUGMENTATION OF THOSE FEATURES INTO THE MODELING FRAMEWORK.  
”



## CONNECTING THE DOTS

During recent studies, processes that would have taken two weeks using traditional methods were completed in **TWO HOURS** using the EWN toolkit.



## CONNECT WITH

## Leigh Provost

Leigh Provost is a research hydraulic engineer with ERDC's Coastal and Hydraulics Laboratory.

### How is R&D important in your projects?

R&D allows us to measure, model and predict the performance of natural and nature-based features for the coastal zone. Our team aims to produce innovative ways to model natural systems, whether it be physically or numerically, before they ever even see a project site. Using our premier physical modeling facilities at ERDC, along with our partners across ERDC, USACE and academia, we have the unique ability to design, build, cultivate and evaluate a variety of different natural features, from live dune grass vegetation to PVC mangrove mimics, under a multitude of hydrodynamic conditions. This R&D is critical to the USACE and nation as it allows us to efficiently evaluate potential coastal solutions, in a low-cost and risk-free environment before implementing in the field, ensuring future project successes and increasing our coastal resiliency.

### Where do you see the need for more R&D?

Our coastal environment is evolving due to climate change and subsequent sea-level rise. Improving our measurement and monitoring techniques is critical to providing accurate, meaningful data of not only the natural and nature-based features we are representing, but the integrated green and gray systems that reduce our coastal flood risk and provide safe, efficient navigation. The nearshore zone is an incredibly complex environment, and there is still a lot to learn, especially regarding coastal morphodynamics and the impact of green infrastructure on coastal resiliency. Being able to accurately measure the nearshore environment, especially during extreme storm events, allows us to gain fidelity within our models representing these regions and gives way to more accurate tools and methods used to investigate solutions for both flood risk protection and navigation challenges.

# USACE R&D STRATEGY

Below are the current Top 10 USACE R&D Priorities to address the nation's toughest challenges with multi-disciplinary solutions. These strategies lay the foundation for a bold, new era of USACE R&D.

FOLLOW US



@USACEHQ



Mitigate & Adapt to Climate Change



Ensure Environmental Sustainability and Resilience



Win Future Wars



Secure Reliable Installation Energy



Modernize Our Nation's Infrastructure



Revolutionize and Accelerate Decision Making



Support Resilient Communities



Improve Cyber and Physical Security



Enable Smart & Resilient Installations



Protect and Defend the Arctic



SCAN FOR  
MORE ON  
USACE R&D  
PRIORITIES

For additional information email: [CERD.INFO@USACE.ARMY.MIL](mailto:CERD.INFO@USACE.ARMY.MIL)

Approved for public release / Distribution unlimited