

POWER OF **R&D** NEWSLETTER

— **CONNECTING THE DOTS.**
TO INNOVATION

HIDE & SEEK

USACE deploys DNA
technology to protect
threatened species



US Army Corps
of Engineers

FIELD NOTES

BRIGADIER GENERAL KIRK E. GIBBS

COMMANDING GENERAL, PACIFIC OCEAN DIVISION



In issuing a charge to better leverage the powerful tool of research and development that resides within the U.S. Army Corps of Engineers (USACE), our Chief, Lt. Gen. Scott Spellmon said, “while the challenges of the 21st Century are the greatest we have ever faced, I contend that our world-class people are some of the best and brightest we have ever seen.”

I could not agree more.

This is a moment USACE was created for, a moment to apply our innovative and dynamic science and engineering to generational challenges. To be successful, we must bring to bear the full weight of our ingenuity and creativity.

From the Arctic Circle to the Indo-Pacific Region, the Pacific Ocean Division oversees nearly 9 million square miles of our planet, a scope and scale that brings about a unique combination of geography, culture and climate. It also brings about a range of emerging engineering challenges.

Thanks to the support and innovation of those within the USACE R&D community, we continue to Engineer for a Free and Open Indo-Pacific and Arctic, in support of the theater Army and our allies and partners, applying new techniques and technologies to confront many of the challenges referenced by the Chief.

Advanced modeling of snow melt in Alaska has allowed us to develop a more comprehensive coastal erosion protection plan in Utqiagvik (Barrow), Alaska.

Experts in structural and geotechnical engineering have supported our Far East District (South Korea) with concrete assessments, leading to a more comprehensive understanding of the overall health of our buildings and more resilient installations.

Scientists have ventured into the tropics of Hawaii to study the habits and migration patterns of non-native birds to see how they are impacting the seed dispersal of native plants. Their work is leading to restoration efforts of native plants impacted by this change to the ecosystem.

From supporting our investment in critical and over-extended infrastructure, to researching ways to mitigate the impact of climate change, to developing a more resilient and sustainable environment across our area of responsibility, research and development is playing a critical role, and more investment is necessary.

While the challenges may be among the most complex we have ever faced, it is among my greatest privileges to be on the front lines addressing these challenges head on. We have the knowledge, and most importantly, we have a world-class workforce that evolves to meet tomorrow’s toughest challenges.

Essayons! Building Strong!

BG Kirk Gibbs
Commanding General
Pacific Ocean Division



Red-whiskered bulbul on a branch.



Rene Tam, a University of Illinois graduate student at the U.S. Army Engineer Research and Development Center’s Construction Engineering Research Laboratory, uses radiotelemetry to follow fruit-eating birds in O’ahu, Hawaii.

“I’M A
FIRM BELIEVER
THAT R&D, WITH THE RIGHT FOCUS,
IN THE RIGHT ENVIRONMENT,
CAN REALLY HELP
US GET AFTER SOME OF THESE
STICKY CHALLENGES
THAT WE ARE EXPERIENCING, WHETHER IT’S
CLIMATE CHANGE, WHETHER IT’S ENERGY RESILIENCE,
WHETHER IT’S ENVIRONMENTAL SUSTAINABILITY.”

LTG SCOTT A. SPELLMON
55TH CHIEF OF ENGINEERS
COMMANDING GENERAL, USACE

NAVIGATE

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Cover illustration by Jared Eastman, U.S. Army Engineer Research and Development Center



**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.

A DIFFERENT PERSPECTIVE

Dr. Todd Swannack
Research Biologist
U.S. Army Engineer Research
and Development Center



CONNECTING THE DOTS

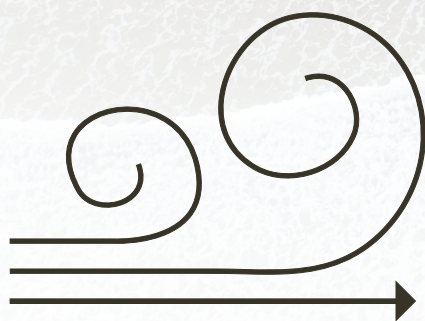
Integrated Ecological Modeling provides user-friendly rapid modeling capabilities that can result in time **SAVINGS OF 6 TO 8 MONTHS**

“... A MORE ACCURATE APPROACH FOR PREDICTING THE DYNAMICS OF ENVIRONMENTAL SYSTEMS.”

DR. TODD SWANNACK

One of the priorities laid out in the USACE R&D Strategy – “Ensure Environmental Sustainability and Resilience” – directs researchers to innovate holistic approaches to aligning civil works projects with ecosystem benefits. Leaning into this priority, a team at U.S. Army Engineer Research and Development Center (ERDC) Environmental Laboratory (EL) is taking a new approach to predicting environmental response by focusing on ecological modeling, and EL researchers have now taken that a step further by integrating ecological models with engineering models. According to Dr. Todd Swannack, research biologist at ERDC, “Having refined forecasting tools not only reduces the cost associated with long-term data collection and model development, but also provides a more accurate approach for predicting the dynamics of environmental systems.”

To read the full story, visit:
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3188552/usace-developing-multifaceted-approach-to-environmental-forecasting/>



ONSHORE WIND
+/- SEDIMENT



OCEAN

+/- VEG BIOMASS & MORPHOMETRICS

BEACH

FOREDUNE

SECONDARY DUNE



OFFSHORE WIND
+/- SEDIMENT

• To learn more about these projects and programs, email: cerd.info@usace.army.mil •

Better Mobility in Arctic Environments •

Researchers at ERDC's Cold Regions Research and Engineering Laboratory in New Hampshire are using a heavily-modified Polaris MRZR to better understand how it, and other military vehicles, operate in Arctic environments and conditions. The work, conducted by the lab's Winter Mobility Laboratory, collects data and then develops mobility models to support military planners.



Innovator of the Year •

Kelsey Ciarrocca, a cartographer with the USACE Galveston District, was named USACE's Innovator of the Year for her work with real-time data and Smartsheet – a cloud-based program. Her work developed web-accessible, detailed maps that could provide her Real Estate team useful information about properties to make their jobs more efficient and safer. Ciarrocca is now working to make the application available to all of USACE using Smartsheet.



Small Scale, Big Results • ERDC partnered with the Pittsburgh District for a study focused on replacing auxiliary locks at three sites along the Upper Ohio River — Montgomery Lock, Emsworth Lock and Dashields Lock. By developing a 1:100 scale navigation approach model of the planned design for Montgomery Lock, millions were ultimately saved on the project's construction compared to earlier project plans. "It is far more cost-effective for us to analyze the performance of something in a scaled model and tweak the model than it is to tweak the facility after it is constructed," said Steve Fritz, mega projects program manager for the USACE Pittsburgh District.



Doors Developed to Upgrade Personnel Bunkers •

A team of ERDC engineers and scientists, working in collaboration with the USACE Transatlantic Division and the USACE Protective Design Center, was recently recognized with the 2022 USACE Innovation of the Year Award. The team quickly developed simple and effective bunker enclosure door designs for the U.S. Central Command to help reduce risk for traumatic brain injury to bunker occupants.

WASTE NOT, WANT NOT

ONGOING R&D IS DISCOVERING NEW WAYS
TO PUT DREDGED SEDIMENT TO USE

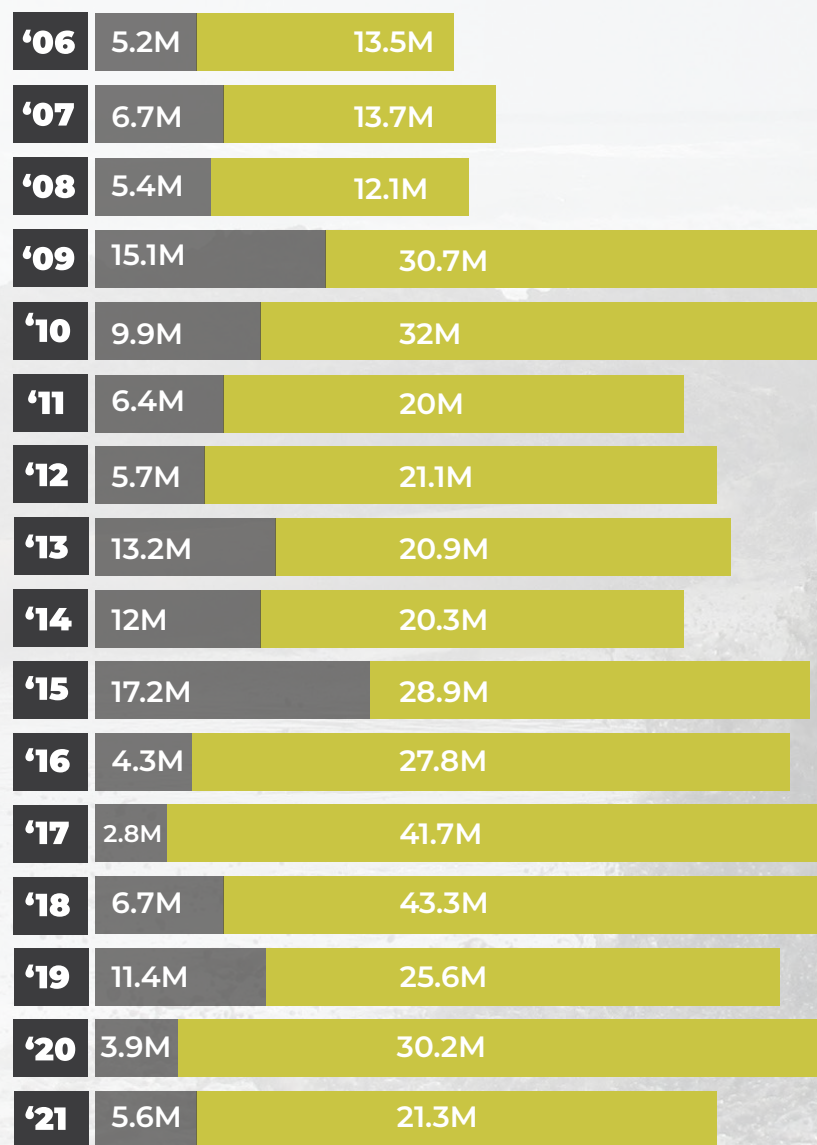
Dr. Katie Brutsché
Science & Technology
Program Manager
South Atlantic Division

Using dredged sediment beneficially is an important aspect of the USACE's dredged material management strategy, and USACE is striving to increase beneficial use to 70 percent by 2030. More than 400 ports and 25,000 miles of navigation channels are dredged throughout the U.S. annually to keep traffic operating efficiently. Currently, 30 to 40 percent of all dredged material from federal navigation channels is used beneficially, and there are enterprise-level efforts under way to increase that number. USACE has advanced the use of sediment through a commitment to innovation for more than 40 years across multiple research programs, and plans to continue that trend.

To read the full story, visit:
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3188616/ongoing-rd-is-discovering-new-ways-to-put-dredged-sediment-to-use/>

NAVIGATION SEDIMENT PLACEMENT

Below is a graph comparing beneficial use to regular disposal of dredged sediment by the **USACE South Atlantic Division** over the last 15 years. USACE is continuing to research and develop techniques and technologies to increase its beneficial use to 70 percent by 2030.



■ BENEFICIAL USE ■ DISPOSAL

“We’ve realized that
**SEDIMENT IS
A RESOURCE.**
It has a value to it.”

DR. KATIE BRUTSCHÉ

CONNECTING THE DOTS

USACE's goal is to recycle
70 PERCENT
of its dredged sediment by 2030

UNCONVENTIONAL APPROACH UNBELIEVABLE RESULTS

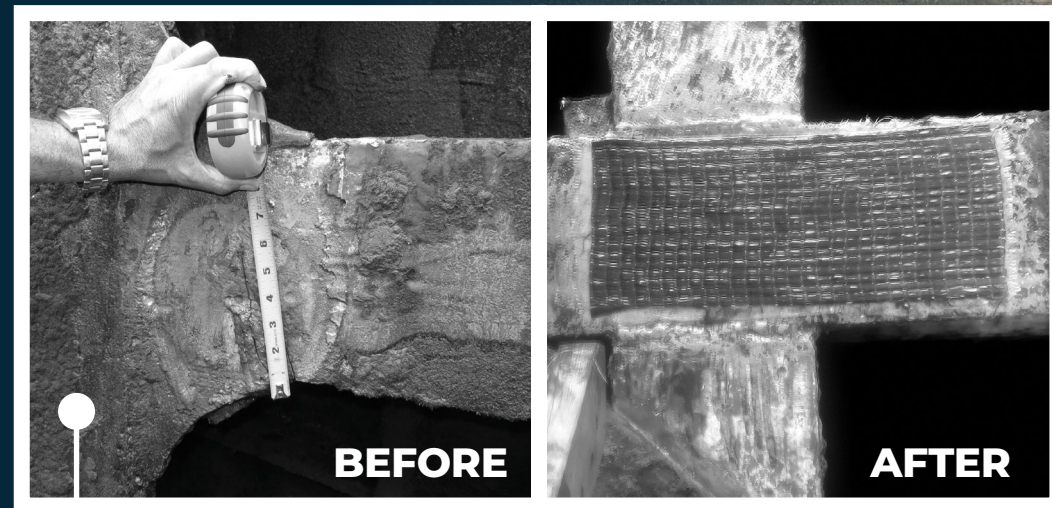


Dr. Guillermo Riveros
Research Civil Engineer
U.S. Army Engineer Research
and Development Center

Advanced materials and methods are infusing
new life into crucial infrastructure components

An innovative approach in using advanced materials and techniques, developed by researchers at ERDC, is helping USACE Districts extend the life of their critical infrastructure components. To address the repetitive problem of cracks caused by fatigue found in lock miter gates, Dr. Guillermo Riveros discovered fiber-reinforced polymers (FRP), such as cloth-like materials fortified with carbon fiber or basalt, are not only easier to use than current repair methods but are also more effective and less expensive. The method, in combination with other current repair methods, can extend the life of hydraulic steel structures by an estimated 20 years. With seven USACE projects already benefitting from the use of the new materials and techniques, more Districts have expressed interest in using FRP to address cracks on their gates.

To read the full story, visit:
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3188525/advanced-materials-methods-driving-new-life-in-critical-infrastructure/>



Above left is an image of a fatigue-induced crack on a miter gate at Old Hickory Lock. The area had been cleaned before repairs. On the right is an area where fiber reinforced polymer was placed to repair the crack and strengthen the gate's cross section.

“These materials are so lightweight. Their **strength-to-weight ratio** is very high and adds relatively no weight to the structure at all, while giving tremendous stiffness to the cross section.”

DR. GUILLERMO RIVEROS

CONNECTING THE DOTS

Extends the life of hydraulic
steel structures by an estimated

20 YEARS



NO DETAIL TOO SMALL

Using life's basic building blocks to search for threatened species

One of the biggest challenges USACE faces in overseeing more than 12 million acres of public lands and water is managing threatened and endangered species. A new technology is making the search for these species easier and faster. By sampling for environmental DNA (eDNA) – or the DNA creatures slough off in the environment – scientists can better understand what species live in an area, or travel through it. “We have found that eDNA can be between two to 70 times more cost efficient than traditional sampling,” said Dr. Jinelle Sperry, a wildlife biologist with ERDC. Thanks to ERDC research, eDNA has been used extensively by the Department of Defense to track threatened and invasive species on its installations and training lands, and its use is growing within the USACE civil works program. For example, the Chicago District has used this innovative process to better track the spread of invasive carp.

To read the full story, visit:
<https://www.usace.army.mil/Media/News/NewsSearch/Article/3188533/lifes-basic-building-blocks-used-in-search-for-threatened-species/>



Dr. Jinelle Sperry
Wildlife Biologist
U.S. Army Engineer Research
and Development Center

“IT’S EXTREMELY DIFFICULT USING TRADITIONAL METHODS TO BE ABLE TO QUANTIFY ENTIRE COMMUNITIES, BUT I CAN **COLLECT WATER** AND TELL YOU ABOUT AN **ENTIRE COMMUNITY** IN A COUPLE OF WEEKS.”
DR. JINELLE SPERRY

CONNECTING THE DOTS

Using eDNA, scientists can sample sections of **TRAINING GROUNDS** to determine what species live in the area

CONNECT WITH

Dr. Jinelle Sperry

Dr. Jinelle Sperry, a native of Montana, is a wildlife biologist for ERDC's Construction Engineering and Research Laboratory (CERL) in Champaign, Illinois. In addition to being an adjunct professor at the University of Illinois in the Natural Resources and Environmental Sciences Department, she leads CERL's Threatened and Endangered Species Program.



How is R&D important in your research projects?

R&D is at the core of all of our projects. The overarching goal of our work is conducting research and developing a solution for our sponsors. Successfully reaching that objective requires defensible research as the backbone for endangered species management. Our most satisfying projects start with basic, fundamental biological questions that transition into actionable knowledge that, ultimately, increases the effectiveness of species conservation and management.

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

There are numerous research areas in my field that need investigating, but I feel that the most significant need is the communication of completed research. There is often a disconnect between the research community and those who are actively managing wildlife species, resulting in valuable research not fully transitioning into practice. Developing a more effective platform that would facilitate the distribution of research results and guidelines into the hands of wildlife and land managers could enable earlier adoption of effective research into wildlife management.

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.

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Win Future Wars



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Enable Smart & Resilient Installations



Ensure Environmental Sustainability and Resilience



Secure Reliable Installation Energy



Revolutionize and Accelerate Decision Making



Improve Cyber and Physical Security



Protect and Defend the Arctic



SCAN FOR
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