

POWER OF

R&D

NEWSLETTER

CONNECTING THE DOTS.
TO INNOVATION

WHAT LIES BENEATH

Crowdsourcing would boost USACE's
inland waterway surveying efforts



U.S. ARMY



US Army Corps
of Engineers

FIELD NOTES

BRIGADIER GENERAL GEOFF VAN EPPS

COMMANDING GENERAL, NORTHWESTERN DIVISION



Since our great nation's founding, the U.S. Army Corps of Engineers (USACE) has delivered vital engineering solutions to some of America's toughest challenges. Today, our mission demands technological innovation like never before as our country faces new challenges, risks and threats.

In the Northwestern Division (NWD), our dedicated team manages civil works across nearly one million square miles drained by two of our country's largest watersheds – the Columbia and Missouri rivers – while overseeing a portfolio of engineering, construction and environmental work that supports a wide range of military, international and interagency partners. Research and development supports our mission by generating fresh options and reducing risk as we devise solutions to new or novel engineering challenges.

As an example, we're using R&D to buy down design risk at Howard A. Hanson Dam (HAHD), around 40 miles southeast of Seattle, where an exciting biological study is underway to evaluate the hydraulic effects on the survival rates of juvenile salmon during passage through the dam. The results will inform the design of a first-of-its-kind facility that promises to reopen more than 220 miles of habitat to endangered species by the end of this decade.

Another innovative project we're proud to be a part of is the use of water injection dredging to address increased sedimentation at Tuttle Creek Reservoir, located along the Big Blue River about five miles north of Manhattan, Kansas. This new technique could be much less expensive than traditional dredging, given the large volume of sediment in the lake. If it proves successful at Tuttle Creek, we see the potential for its use at other lakes and reservoirs across the nation.

On the military programs side, support from the U.S. Army Engineer Research and Development Center (ERDC) has been critical to two pilot projects that will use sustainable building materials to construct new barracks at Joint Base Lewis-McChord in Washington. Although neither the materials nor the construction methods are new, the application of low-carbon concrete, increased electrification and mass timber represents a military construction innovation that will allow the Army to evaluate the effects of this approach on cost, schedule, resilience and sustainability over the facilities' life-cycles.

I am grateful to the USACE R&D community and the profound impact its efforts have had in NWD. Including innovation in all our efforts, from taking care of people to supporting partners and delivering programs, will be key to our future success throughout NWD and across the USACE enterprise.

Essayons!

BG Geoff Van Epps
Commanding General
Northwestern Division



“INCLUDING INNOVATION IN ALL OUR EFFORTS, FROM TAKING CARE OF PEOPLE TO SUPPORTING PARTNERS AND DELIVERING PROGRAMS, WILL BE KEY TO OUR FUTURE SUCCESS THROUGHOUT NWD AND ACROSS THE USACE ENTERPRISE.”



NAVIGATE

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● Carl Nim, a biologist with the water quality team for the U.S. Army Corps of Engineers Pittsburgh District, crosses beneath a bridge to perform water sampling in a tributary flowing into Crooked Creek in Pennsylvania.

● Cover illustration uses photo from NASA.



**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.

RUNNING LOW ON TIME & SPACE

Dwindling capacity at Tuttle Creek Reservoir calls for an urgent and innovative solution

A unique sedimentation challenge occurs when a river enters a reservoir and most of its sediment becomes trapped along the bottom. As this sediment builds up over the years, the reservoir's water capacity decreases. One place this has occurred is at Tuttle Creek Lake, located on the Big Blue River in Kansas. An important reservoir for flood control, navigation and recreation, Tuttle Creek has lost an estimated 46 percent of its original storage capacity due to sedimentation. In response, USACE researchers studied and recommended a pilot project using a technique never before used to flush sediment in a lake. A full-scale water injection dredge was designed to fluidize the sediment and flush it through the dam structure and downstream. The team will also study the environmental effects that releasing the sediment has on the downstream environment. Water injection dredging has the potential to be far less expensive than traditional dredging for moving large quantities of sediment in a reservoir. By collecting lots of data, the group hopes to apply the lessons it learns to other USACE lakes and reservoirs.

To read the full story, visit:

<https://www.erdc.usace.army.mil/Media/News-Stories/Article/3564583/dwindling-capacity-at-tuttle-creek-reservoir-calls-for-an-urgent-and-innovative/>

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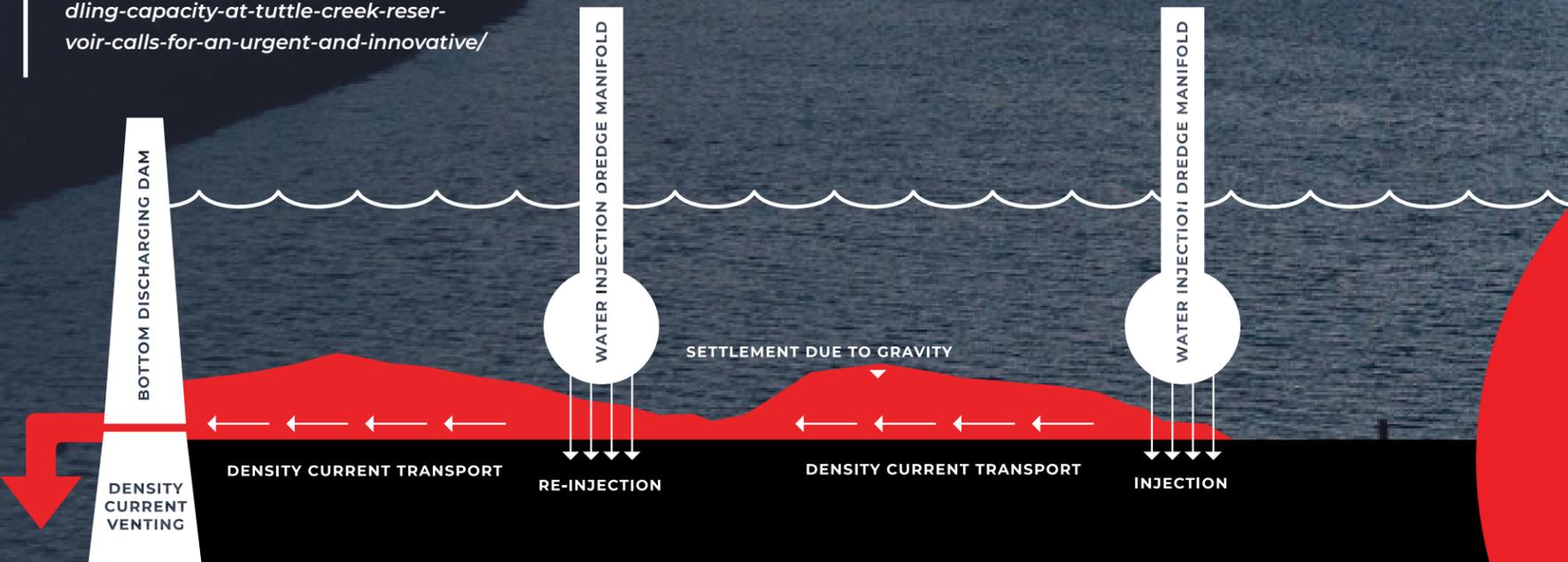
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Photo by USACE Ranger Keith Morlewski



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Water injection dredging offers a **MUCH LESS EXPENSIVE** method for removing large quantities of sediment in a reservoir

Arkabutla Lake • Due to concerns about the condition of the Arkabutla Lake dam, the Vicksburg District (MVK) drew down the lake in May to levels not seen since the dam's 1943 construction. The lower levels gave ERDC researchers an opportunity to observe sediment conditions of the reservoir's bed and shoreline. Wave action had eroded the reservoir's banks, and sediment had caused issues for boaters at several boat ramps. During the visit, the ERDC team and MVK officials discussed potential ways that natural and nature-based features (NNBF) could be implemented during the lower water levels to reduce sedimentation issues.



WRAP • Led by ERDC scientists, the USACE Wetlands Regulatory Assistance Program hosted training at the St. Paul District to learn more about the physical, chemical and biological processes in streams. The Stream Restoration for Regulators course included technical approaches for stream assessment, compensatory mitigation and monitoring. It will aid USACE regulatory decision making and enable the transition of technical guidance and technologies. The course also served as an outreach opportunity, providing technical training to partners involved in protecting the nation's aquatic resources.

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

BRIDGES • ERDC engineers developed the Bridge Resource Inventory Database for Gap Emplacement Selection (BRIDGES) to support military engineers and planners working on wet gap crossings. BRIDGES provides vital information for improved decision making and seamless data sharing across operational units. BRIDGES pinpoints strategic gaps using geospatial data, tracks major bridge components to ensure critical allocation and management, allows bridging resources to be monitored in real-time, and more.



3D Printing • An ERDC team successfully used dredged material to 3D-print nature-inspired infrastructure components for the first time, as part of a project to generate novel methods to restore habitats, reduce storm impacts and improve coastal resilience. The printed object, which was inspired by mangrove roots, was created using dredged material pulled from the river and harbor near Mobile, Alabama. It will now be used in hydraulic modeling research. Funded by the USACE Engineering With Nature® program, the project supports USACE's goal to beneficially use 70 percent of all dredged material by 2030.



GUIDING RESILIENCE

Playbook will expand NNBFs along Great Lakes



David Bucaro
 Chief, Planning Branch
 U.S. Army Corps of Engineers
 Chicago District

“INFORMATION AND NNBF DESIGNS OFFERED IN THE PLAYBOOK WILL **HELP COMMUNITIES & STAKEHOLDERS** ...”

DR. JEFF KING, NATIONAL LEAD, ENGINEERING WITH NATURE®

Communities along the Great Lakes coastline are experiencing increased frequency in coastal flooding and erosion, causing property damage, putting lives at risk and disrupting local economies. And while Natural and Nature-Based Features (NNBF) can provide innovative ways of improving coastal resilience, current understanding of these measures is mostly limited to the ocean coast, resulting in a lack of confidence in applying them along the Great Lakes.

In response, USACE researchers, with the support of the Engineering With Nature®(EWN) initiative, are developing a Great Lakes-specific playbook to NNBF and Multiple Lines of Defense (MLD) to improve future coastal resiliency.

The effort will assess and quantify the performance of existing NNBF and MLD projects along the Great Lakes, use EWN principles to develop new conceptual designs specific to the region that achieve greater resiliency, and estimate cost-benefit performance of innovative NNBF and MLD designs under a range of current conditions and future climate scenarios.

By informing the recently initiated Great Lakes Coastal Resiliency Study, this effort has the opportunity to directly apply this guidance in planning for coastal resiliency at a watershed scale.

To read the full story, visit:
<https://www.erdc.usace.army.mil/Media/News-Stories/Article/3564577/natural-features-to-play-crucial-role-in-building-a-more-resilient-great-lakes/>

CONNECTING THE DOTS

The EWN playbook will **provide needed confidence** to implement sustainable, adaptable and cost-effective NNBF measures along the Great Lakes

UNDERSTANDING GLOBAL HYDROLOGY

Global Hydro Intelligence analysis ensures secure water resources across the global environment

Scientists with the U.S. Army Engineer Research and Development Center's (ERDC) Coastal and Hydraulics Laboratory (CHL) are exploring potential opportunities by utilizing a collaboration between ERDC, NASA, U.S. Air Force, and other DOD agencies in the development of Global Hydro Intelligence (GHI).

GHI integrates remote sensing, atmospheric, land surface, and hydrological models that provide on-demand hydrological data at the global scale.

GHI provides a comprehensive modeling framework that will serve as an authoritative source for hydrology data.

GHI REPRESENTS A CRITICAL STEP TO UNDERSTANDING THE PRESENT & FUTURE WAYS WE WILL BE AFFECTED BY EARTH'S MOST PRECIOUS RESOURCE.

SARAH LYTLE

To read the full story, visit:

<https://www.erdc.usace.army.mil/Media/News-Stories/Article/3588678/understanding-global-hydrology/>



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GHI will serve as an authoritative source for hydrology data

MORE THAN MERRIER

Crowdsourcing bathymetry could provide near-time picture of nation's inland waterways

Dr. Brandon Scully
Research Civil Engineer
U.S. Army Engineer Research
and Development Center

While USACE performs routine surveys on the 25,000 miles of inland waterways it manages, these snapshots in time don't capture rapidly evolving changes. However, expanding this traditional survey capability isn't cost sustainable.

To improve waterway safety, USACE researchers are working on a system that would use the depth finders and GPS of any volunteer vessel to create a near real-time picture of a channel and any obstructions that may exist. Data would be transmitted from existing waterway users and then be analyzed and aggregated with data from with other vessels, making it easy to find emerging navigation hazards.

This crowdsourced bathymetry effort will help prioritize the actions of the USACE survey fleet and provide the ability to watch the waterways between scheduled surveys. It will also provide more immediate data after a hurricane or other natural disaster.

Lt. Gen. Scott Spellmon, 55th Chief of Engineers and Commanding General of USACE, said he envisions the use of this crowdsourced bathymetry as a sort of digital, near-time traffic map for inland waterways.

To read the full story, visit:
<https://www.erdc.usace.army.mil/Media/News-Stories/Article/3564555/crowdsourcing-bathymetry-could-provide-near-time-picture-of-nations-inland-wate/>

CONNECTING THE DOTS

Crowdsourced bathymetry can prioritize actions of USACE survey fleet and provide updated data between surveys

CONNECT WITH

Dr. Zachary Tyler

Zachary Tyler is a research physical scientist with ERDC's Coastal & Hydraulics Laboratory.

How is R&D important in your projects?

R&D plays a crucial role in shaping our research projects by providing valuable insights and perspectives. While past R&D efforts may not always align perfectly with our current objectives, they serve as a stepping stone, offering a foundational understanding. In some cases, they act as a guide, helping us navigate what to avoid, which paths to take, and whose approaches to innovate upon. It's a valuable learning experience that helps us refine our strategies and move forward in a more informed and effective manner.

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

I believe our focus should be on action and practical solutions to the challenges we encounter daily. It's about demonstrating resilience and determination to build a nation that truly aligns with the aspirations of the American public. R&D is valuable, and the urgency lies in implementing tangible steps and strategies to bring about the positive changes we envision.

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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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

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