

**DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS**

COMPLETE STATEMENT OF

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SENIOR RESEARCH SCIENTIST**

**BEFORE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENVIRONMENT
UNITED STATES HOUSE OF REPRESENTATIVES**

ON

MARCH 2, 2022

Chairwoman Sherrill, Ranking Member Bice, Chairwoman Johnson, Ranking Member Lucas, and Members of the Committee, I am honored to testify before you today. I am the U.S. Army's Senior Research Scientist for Environmental Science and my duties include leading research, innovation, and environmental initiatives at the U.S. Army Engineer Research and Development Center for both the U.S. Army and the U.S. Army Corps of Engineers (USACE). Among other responsibilities, I serve as the National Lead for the USACE Engineering With Nature® (EWN®) initiative, which supports sustainable, resilient infrastructure systems, where appropriate and consistent with authorized missions, for U.S. Army and USACE applications.

In the United States, we are blessed with an abundance of natural capital: 100 million acres of wetlands (in the lower 48 states alone), 3,000 miles of barrier islands along our coastlines (more than any other country) and thousands of miles of mainland beaches and dunes. Studies have estimated that the wetlands along the northeast Atlantic Coast helped to avert \$625 million of flood damage during Hurricane Sandy and that the 500,000 acres of mangroves around Florida helped to avert more than \$1.5 billion in flood damages during Hurricane Irma in 2017. In the context of USACE's civil works mission, nature-based solutions, and similar terms, refer to the intentional and substantial use of natural systems in providing water resources solutions. USACE has made significant use of such approaches, going back many decades, to integrate human engineering with natural systems where possible. The USACE Engineering With Nature initiative was established in 2010 to advance opportunities to implement nature-based solutions for civil works projects in partnership with cost-sharing sponsors and the public, and began expanding application to military programs in the Department of Defense in 2018.

In 2018 and in 2021 we published Volumes 1 and 2 of *Engineering With Nature®: an Atlas*. These books showcase 118 examples of constructed projects around the world that illustrate what engineering with nature practice and projects can look like. Fifty of these projects were built by USACE through the civil works program at sites across the country. These projects include coastal and riverine restoration, beneficial use of dredged material, island construction projects, among others, that produce economic and environmental benefits. Example projects include:

- Horseshoe Bend Island, Louisiana, is a mid-river island that was constructed through beneficial use of material dredged from the Atchafalaya River and Bayous Chene, Boeuf, and Black, Louisiana Federal navigation channel. The island provides more than 80 acres of habitat; and
- Hamilton Airfield Wetlands Restoration Aquatic Ecosystem Restoration Project and Sears Point Tidal Restoration Project, a portion of which USACE funded under the Estuary Habitat Restoration Program, in California involved the restoration of 1,500 acres of wetlands while providing coastal resilience with respect to sea level rise.

Our work on EWN over the last decade, including documenting nature-based solutions like those in the EWN Atlases, has allowed us to identify many of the key enablers for advancing engineering with nature, including:

- Developing new science, engineering practices, and methods of working;
- Fostering creative problem-solving, planning, project formulation, and design;
- Documenting the diverse benefits and performance of nature-based solutions;

- Communicating openly, widely, and strategically to share and facilitate progress;
- Preparing practitioners to support future needs and practice through education and training; and
- Leveraging the power of collaboration and partnerships across organizational boundaries and sectors in order to innovate.

Likewise, we have recognized that challenges exist to advancing engineering with nature at the project level in the civil works program. Key challenges include:

- While the potential set of solutions to a large scale or complex water resources problem may encompass both traditional and nature-based project features, some of those features may not align with the community's vision;
- All solutions, whether nature-based or conventional, require land to build solutions at the scale the problem requires, which directly affects project costs; and
- Hesitancy regarding new engineering practice and how to account for uncertainty in planning and design.

USACE established the Network for Engineering With Nature with the University of Georgia in 2020 to foster multi-sector collaboration, and we are actively engaged with universities across the country, including: the University of Florida; University of Oklahoma; Arizona State University; and the University of Delaware, among many others.

We are partnering with other government agencies at the Federal and state level. USACE completed restoration projects at Cat Island and Ship Island using supplemental appropriations under the Mississippi Coastal Improvements Program in partnership with the state of Mississippi and the National Park Service to provide habitat, recreation, and coastal resilience functions.

USACE has established four EWN Practice Leads for coastal and riverine applications at Baltimore, Mobile, St. Louis, and Omaha Districts to complement the leadership being provided by the six Engineering With Nature Proving Ground Districts in the Corps. The two riverine EWN Practice Leads, the St. Louis District EWN Proving Ground, and our university collaborators will help facilitate development of inland nature-based solutions as opportunities arise.

Dialogue and collaboration with the private sector and industry leaders, non-profits, and financial institutions are advancing our understanding of where and how nature-based solutions work within their business models and how those lessons may apply to the USACE and Army programs.

Collaborating across the Department of Defense is helping expand the application of nature-based solutions to support its mission. Specifically, we are working with the Defense Advanced Research Projects Agency (DARPA) to develop reef-mimicking systems to mitigate coastal flooding, erosion, and related storm damage to DoD and neighboring civilian infrastructure. Similarly, we are working with the Air Force as part of its \$5 billion rebuild of Tyndall Air Force Base following the destruction from Hurricane Michael by applying Engineering With Nature to demonstrate, on the ground and in the water, the resilience function that can be generated through natural-based solutions.

Nature-based solutions have and are being built around the world by the public and private sectors as stand-alone projects and in combination with conventional engineering solutions, where land and

conditions allow, to reduce short and long-term project costs, extend the functional life of projects, and provide multi-purpose functions.

Finally, in closing, I would like to thank you again for the invitation to testify before the Committee. I look forward to answering your questions.



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Dr. Bridges is the US Army and US Army Corps of Engineers' Senior Research Scientist for Environmental Science. He became a Senior Professional (ST) within the US Army in 2006, where his responsibilities include leading innovation, research and development, and environmental initiatives. Dr. Bridges' responsibilities support goals related to resilience, sustainability, and environmental management. His primary areas of activity concern: 1) the science and engineering of sustainable infrastructure development; 2) risk and decision analysis methods applied to infrastructure and environmental systems; 3) management of sediment and environmental contaminants; and 4) natural systems engineering.

Dr. Bridges is the National Lead for the USACE Engineering with Nature® (EWN®) initiative, which includes a network of research, field-scale applications, and communication activities to promote sustainable, resilient infrastructure systems. He led a large international collaboration over five years that developed and published (in 2021) technical guidelines on the use of Natural and Nature-Based Features (NNBF) for coastal and fluvial flood risk management. Dr. Bridges is the technical lead and Program Manager for the Dredging Operations Environmental Research (DOER) program, one of the Corps' largest and longest-running R&D programs. In 2020, Dr. Bridges led a large multi-disciplinary team across ERDC to develop and apply analysis and modeling tools to support national responses to COVID-19. His work has been supported by programs within the USACE; the U.S. Army, Navy, and Department of Defense; other federal agencies; and the private sector. He has chaired international working groups and guidance development for the United Nations' International Maritime Organization and the World Association for Waterborne Transport Infrastructure (PIANC), where he currently serves as Chairman of PIANC's Environmental Commission.

Dr. Bridges and his work have been recognized through receipt of several national, Army, and USACE awards. In 2021, Dr. Bridges was recognized by President Biden in receiving the Distinguished Presidential Rank Award as a Senior Professional within the US government. Engineering News-Record selected Dr. Bridges as one of its 25 Newsmakers across the engineering and construction industry in 2021. The Secretary of the Army, Ryan McCarthy, awarded Dr. Bridges with the Army's Distinguished Civilian Service Medal in 2020. Other awards include the Army Engineer Association's Bronze Order of the de Fleury Medal in 2014, the Outstanding Practitioner Award from the Society for Risk Analysis in 2012, the Government Service Award from the Society of Environmental Toxicology and Chemistry in 2009, the Army's Meritorious Civilian Service Medals in 2008 and 2021, among other awards. The EWN® Initiative was awarded the 2013 USACE Environmental Award in Natural Resource Conservation, the 2014 USACE Sustainability Award for Green Innovation, and the 2019 Outstanding Achievement Award from the Renewal Natural Resources Foundation.

Dr. Bridges has served on the editorial boards for the journals of *Integrated Environmental Assessment and Management*, *Environmental Toxicology and Chemistry*, and *Dredging Engineering*. He is a member of the Society for Risk Analysis, the Society of Environmental Toxicology and Chemistry, PIANC, and is a member of the Board of Directors for the Western Dredging Association. Dr. Bridges also serves as an Adjunct Assistant Professor with the College of Engineering at the University of Georgia.

Over the last 30 years, Dr. Bridges has published more than 60 journal articles and several books, book chapters, and numerous technical reports. He received his B.A. (1985) and M.A. (1988) in Biology/Zoology from California State University, Fresno and his Ph.D. (1992) in Biological Oceanography at North Carolina State University.