



ENGINEERING WITH NATURE

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U.S. Army Engineer Research and Development Center

OU Visit to ERDC

15 April 2019



**US Army Corps
of Engineers.**



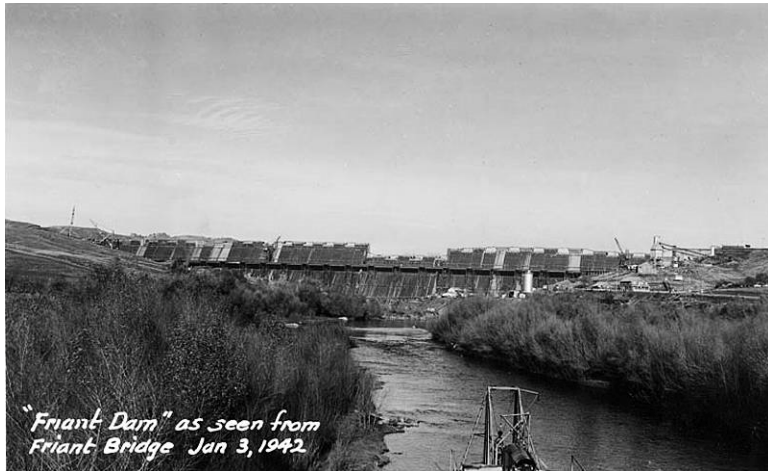
ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER

1900-2000: THE CENTURY OF INFRASTRUCTURE (US)

- 4,071,000 miles of roadway
 - 47,182 miles in the Interstate system
- 149,136 miles of mainline rail
- 640,000 miles of high-voltage transmission lines
- 614,387 bridges
- 90,580 dams
- 155,000 public drinking water systems
- 4,500 military installations
- 926 ports

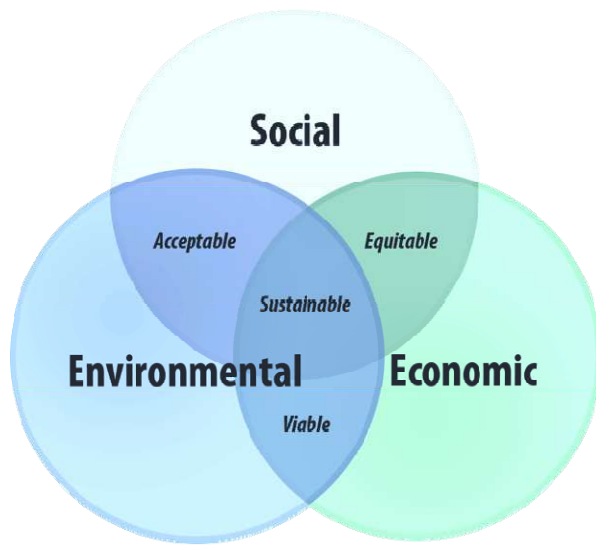


FRIANT DAM ON THE SAN JOAQUIN RIVER, CA



SUSTAINABILITY

Sustainability is achieved by efficiently investing resources to create present and future value



SUSTAINABLE DEVELOPMENT GOALS



Engineering With Nature®

...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



And Many More!



www.engineeringwithnature.org

EWN[®] OVERVIEW

Engineering With Nature[®] began in 2010

- Engaging across USACE, other agencies, NGOs, academia, private sector, international collaborators
- Guided by a strategic plan
- Established through Proving Grounds
 - Galveston, Buffalo, Philadelphia
- Informed by focused R&D
- Demonstrated with field projects
- Advanced through partnering
- Shared by strategic communications
- Marking progress
 - 2013 Chief of Engineers Environmental Award in Natural Resources Conservation
 - 2014 USACE National Award-Green Innovation
 - 2015, 2017 WEDA Awards; 2017 DPC Award



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EWN[®] ACROSS USACE MISSION SPACE

Navigation

- Strategic placement of dredged material supporting habitat development
- Habitat integrated into structures
- Enhanced Natural Recovery

Flood Risk Management

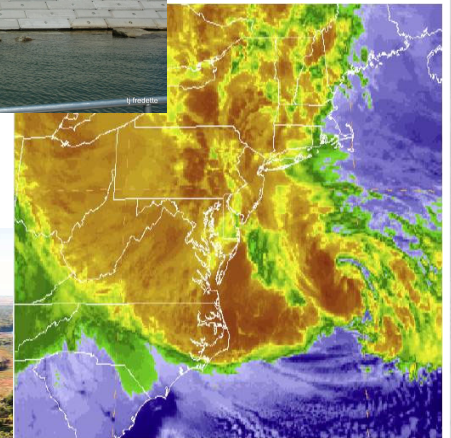
- Natural and Nature-Based Features to support FRM
- Levee setbacks

Ecosystem Restoration

- Ecosystem services supporting engineering function
- “Natural” development of designed features

Water Operations

- Shoreline stabilization using native plants
- Environmental flows and connectivity



EWN[®] STRATEGY

Wave I: Broaden and Deepen Partnerships

- Build the organization and internal capacity to support, grow, and sustain EWN
- Expand by engaging districts and early adopters throughout USACE
- Expand by engaging agency partners and key external stakeholders
- Establish/expand collaboration through agreements with key international partners
- Advance EWN through effective governance

Wave II: Expand Capabilities

- Continue to develop science and technical alliances
- Leverage social science to better engage agency partners and stakeholders, and build capacity
- Expand and focus the EWN research agenda to strengthen capabilities

Wave III: Expand Applications and Communication

- Support and document multi-scale demonstrations of EWN practices
- Support and reinforce EWN progress through ongoing engagement and communication
- Enable EWN application through development of policies and guidance

EWN PROVING GROUNDS

- Galveston District (2014)
- Buffalo District (2014)
- Philadelphia District (2016)
- Method
 - Identify opportunities to implement EWN across current and future programs and projects
 - Pursue opportunities through solution co-development



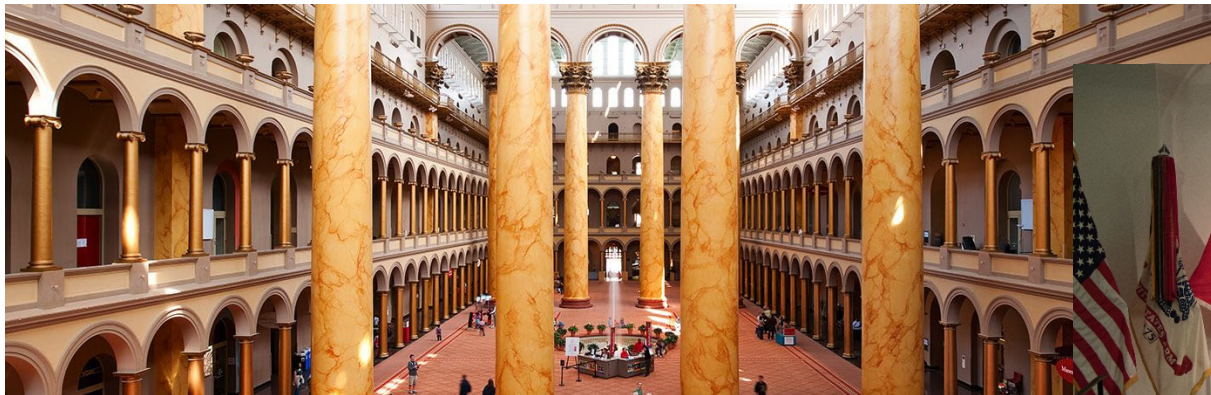
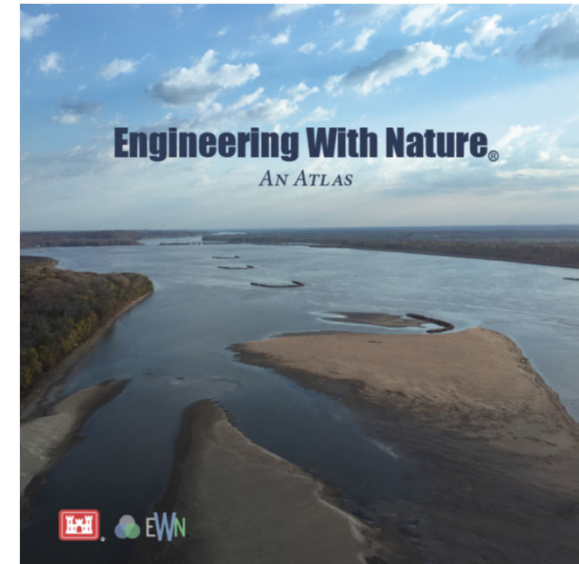
EWN ATLAS LAUNCH EVENT

10:30-12:00

January 16, 2019

National Building Museum
Washington, D.C.

“Engineering With Nature is an important initiative for the U.S. Army Corps of Engineers.” James Dalton, USACE Director Civil Works



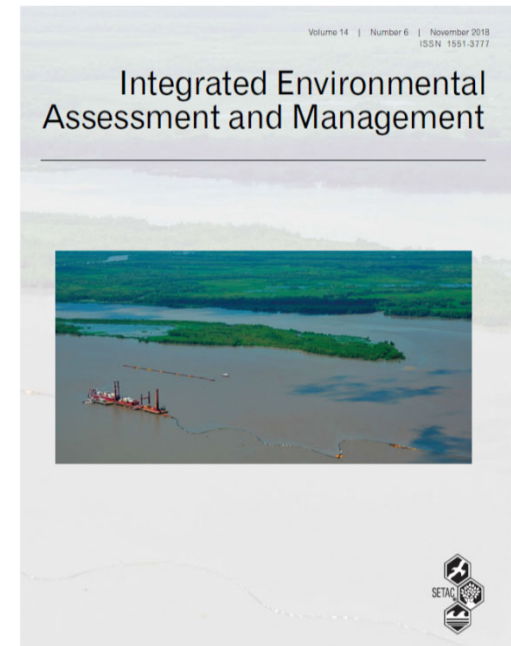
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HORSESHOE BEND ISLAND, ATCHAFALAYA RIVER



Project Awards:

- 2015 WEDA Award for Environmental Excellence
- 2017 WEDA Award for CC Adaption
- 2017 DPC Award for Working, Building, and Engineering with Nature



Quantifying Wildlife and Navigation Benefits of a Dredging Beneficial-Use Project in the Lower Atchafalaya River: A Demonstration of Engineering with Nature®

Christy M Foran,[†] Kelly A Burks-Copes,[‡] Jacob Berkowitz,[‡] Jeffrey Corbino,[§] and Burton C Suedel^{*,‡}



USACE PHILADELPHIA DISTRICT: EWN IN BACK BAY NEW JERSEY



Mordecai Island

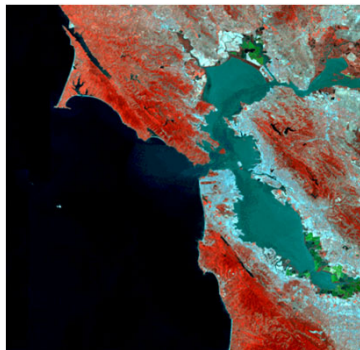


Stone Harbor



Avalon

HAMILTON AND SEARS POINT WETLANDS SAN PABLO BAY, CA



HUMBER ESTUARY; ALKBOROUGH, UK (INCREASED FLOOD STORAGE CAPACITY)

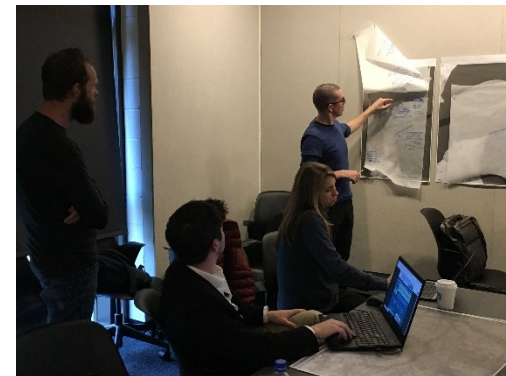


KRUIBEKE, SCHELDT RIVER BELGIUM



INCORPORATING EWN INTO INFRASTRUCTURE THROUGH LANDSCAPE ARCHITECTURE

- Team of EWN and academic and private LAs
- USACE Projects include:
 - Moses Lake Tide Gate Area (SWG);
 - Comite Canal Project (MVN);
 - Franklin Lock/Dam Recreation Area (SAJ);
 - Morehaven West Campground Site (SAJ);
 - Back Creek and Fishing Creek Jetties (NAB);
 - Proctor Creek (SAM); and
 - Sabine to Galveston (S2G) Project (SWG)
- Team has visited project sites and collected data
- Continue working with respective District POCs
- EWN/LA Team met JAN 19 at Auburn to work on initial renderings
- Meetings w/ USACE Districts to discuss rendering will begin in MAR 19
- Final report/renderings delivered to Districts JUL 19



EWN: SCIENCE, ENGINEERING, TECHNOLOGY TARGETS

Fundamental processes

- Sediment transport through and around NNBF
- Long-term engineering and environmental performance of features
- Benefits / Ecosystem Services provided by engineered features and structures
- Processes contributing to system-scale resilience

Modeling systems that support broad-scale application

- Planners, stakeholders and decision-makers
- Engineering design
- Operations and maintenance

Reliable, cost-efficient monitoring technologies

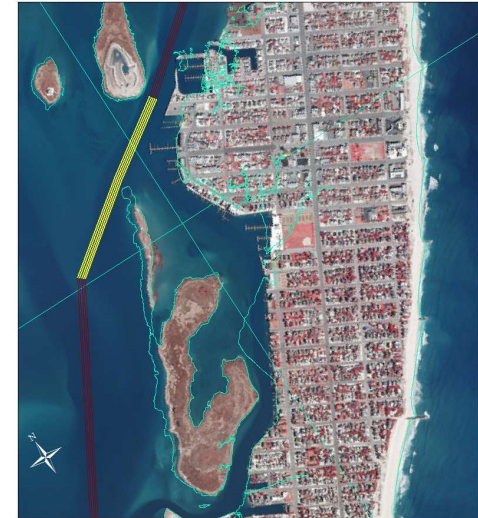
- Measuring system evolution
- Infrastructure/feature performance

Guidance development and tools

- For planning, design, construction, O&M

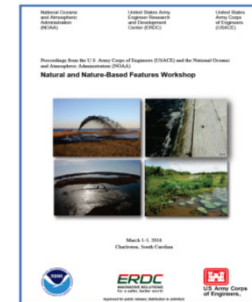
Demonstration/pilot projects to innovate and learn

- Facilitate necessary collaboration
- Evolve organizational culture and practice
- Produce credible evidence of success at field scale
- Fuel the “power of the story”



COLLABORATION ACROSS GOVERNMENT

USACE/NOAA Collaboration Workshop: Natural and Nature-based Features, Charleston, SC; 1-3 March 2016



USACE/NOAA-NMFS Collaboration Workshop Engineering With Nature, Gloucester, MA; October 5-6, 2016

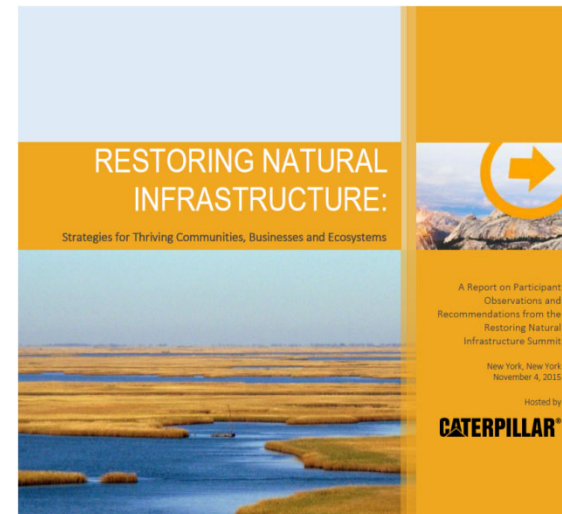


www.engineeringwithnature.org (NNBF)

US Army Corps of Engineers • Engineer Research and Development Center

COLLABORATION WITH THE PRIVATE SECTOR

- Caterpillar Inc.
 - ▶ Restoring Natural Infrastructure Summit; November 4th, 2015; New York City
 - ▶ Natural Infrastructure Initiative – USACE Collaboration Work Streams
 1. NI Opportunity Evaluation Tool.
Capitalizing on enterprise-level capability: CE Dredge DST
 2. Evaluation and Decision Making
 3. Field Application and Demonstration
- Western Dredging Association (WEDA)
 - ▶ Collaborative technical workshop on “Construction Methods Supporting Engineering With Nature”



<http://www.caterpillar.com/en/company/sustainability/natural-infrastructure.html>

COLLABORATION WITH ACADEMIA

- Texas A&M University



- Partnering through the Coastal Science and Engineering Collaborative (CSEC)
- Joint research on NNBF
- EWN Seminar spring 2018
- Developing graduate curriculum to support EWN

- University of Georgia



*Institute for Resilient
Infrastructure Systems*
UNIVERSITY OF GEORGIA

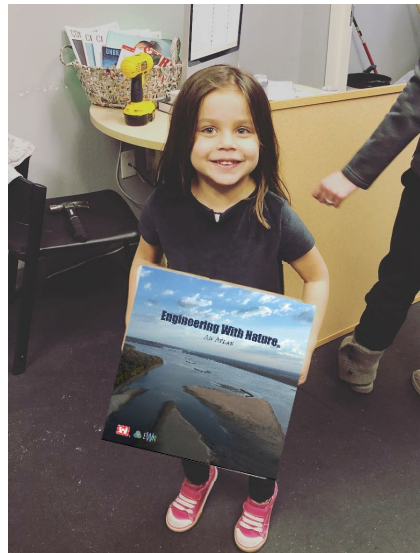
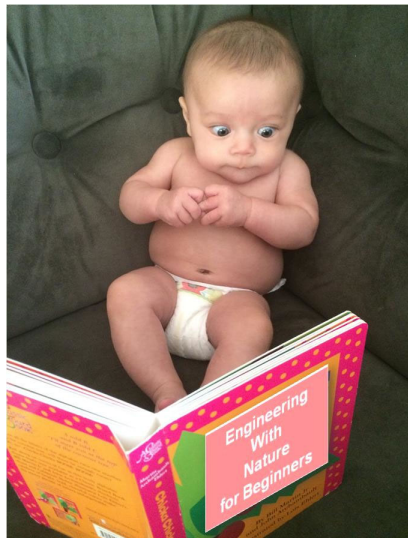
- Institute for Resilient Infrastructure Systems (IRIS)
- Multiple levels of collaboration on EWN and NNBF
- EWN curriculum development

- University of Oklahoma

- Water Security
- Focus on mid-western and western landscapes and water resources
- Streams, rivers, reservoirs and related infrastructure and purposes



COMMUNICATION ACROSS ALL LEVELS



**NATURAL INFRASTRUCTURE:
A SMART INVESTMENT**

Come hear representatives from Great Lakes Dredge and Dock, Caterpillar, AECOM, The Army Corps of Engineers and The Nature Conservancy discuss why and how their organizations are making investments in natural infrastructure.

**Thursday, March 21, 2019
10:30 am – 11:30 am
2253 Rayburn House Office Building**

Featured Speakers

Bill Hanson, Great Lakes Dredge and Dock (*moderator*)
Vice President, Government Relations

Don M. McNeill, Caterpillar
Strategic Growth Manager
Director, Natural Infrastructure Initiative

Michael J. Donahue, PhD, AECOM
Vice President, Water Resources and Environmental Services and
Director, National Coastal and Ecosystem Restoration Practice

Todd Bridges, PhD, U.S. Army Corps of Engineers
Senior Research Scientist (ST), Environmental Science, U.S. Army Engineer
Research and Development Center

Sarah Murdock, The Nature Conservancy
Director, U.S. Climate Resilience and Water Policy

[Click Here to Register](#)

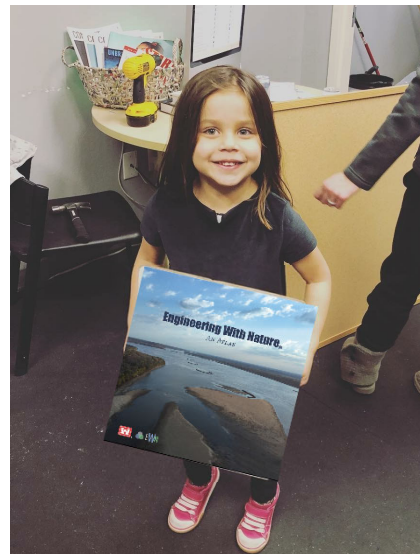
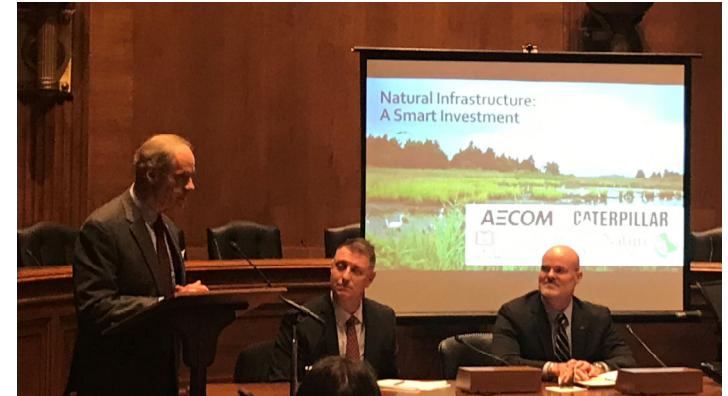
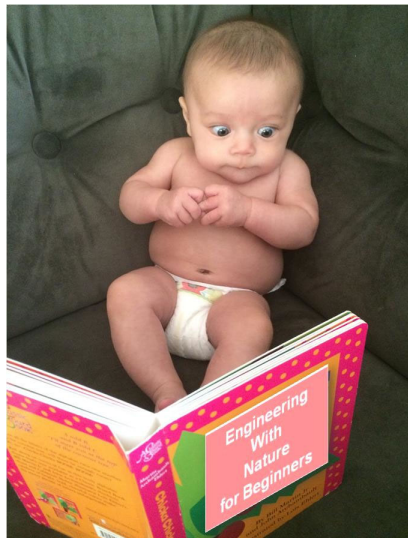
CATERPILLAR® AECOM

US Army Corps of Engineers

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COMMUNICATION ACROSS ALL LEVELS



Urban River Parkways

An Essential Tool for Public Health

Richard J. Jackson, MD, MPH - UCLA Fielding School of Public Health

Tyler D. Watson, MPH - UCLA Fielding School of Public Health

Andrew Tsiu, MPH - UCLA Fielding School of Public Health

Bianca Shulaker, MURP - USC Department of Urban Planning

Stephanie Hopp, MPH - Johns Hopkins School of Public Health

Mladen Popovic - UC Santa Barbara

July 2014



Every \$1 spent on rec trails results in \$3 to >\$10 of direct medical benefit

