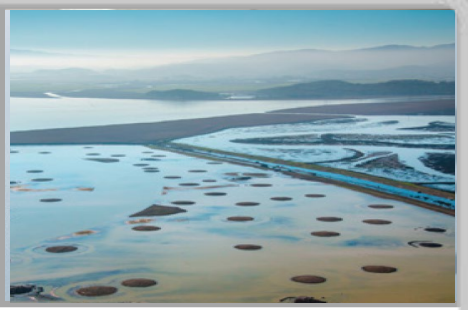


Engineering With Nature®: Pursuing a New Relationship With Nature

Dr. Todd S. Bridges
Senior Research Scientist (ST), Environmental Science
National Lead, USACE Engineering With Nature®
Todd.S.Bridges@usace.army.mil

NAE Workshop: Natural Infrastructure
10-11 May 2022

US Army Corps of Engineers®

ERDC

Nature-Based Solutions: A White House Priority

2022 Earth Day EO

BRIEFING ROOM

Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies

APRIL 22, 2022 • PRESIDENTIAL ACTIONS

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

WHITE HOUSE ROUNDTABLE – "KNOWLEDGE IN NATURE: HOW NATURE CAN HELP GROW A BETTER FUTURE"

BRIEFING ROOM

Executive Order on Tackling the Climate Crisis at Home and Abroad

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS

America the Beautiful 30x30

Justice40 Initiative

Sec. 4. Deploying Nature-Based Solutions to Tackle Climate Change and Enhance Resilience:
"To further amplify the power of nature, including its ability to absorb climate pollution and increase resilience in all communities, today's Executive Order calls for the following:"

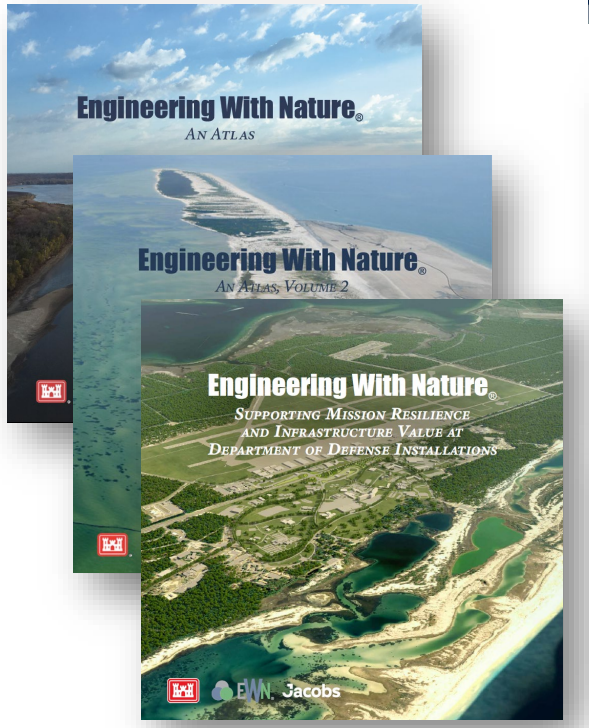
1) ***Report on Nature-Based Solutions***
2) ***Guidance on Valuing Nature***
3) ***First U.S. National Nature Assessment***

Engineering With Nature®

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

Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Increase and diversify infrastructure value
- Science-based collaboration to organize and focus interests, stakeholders, and partners



"We absolutely want to do more engineering with nature everywhere we work across the Corps, you have my commitment."

— LTG Scott A. Spellmon, 55th Chief of Engineers to the House Committee on Transportation & Infrastructure, Water Resources & Environment Subcommittee (24 June 2021)

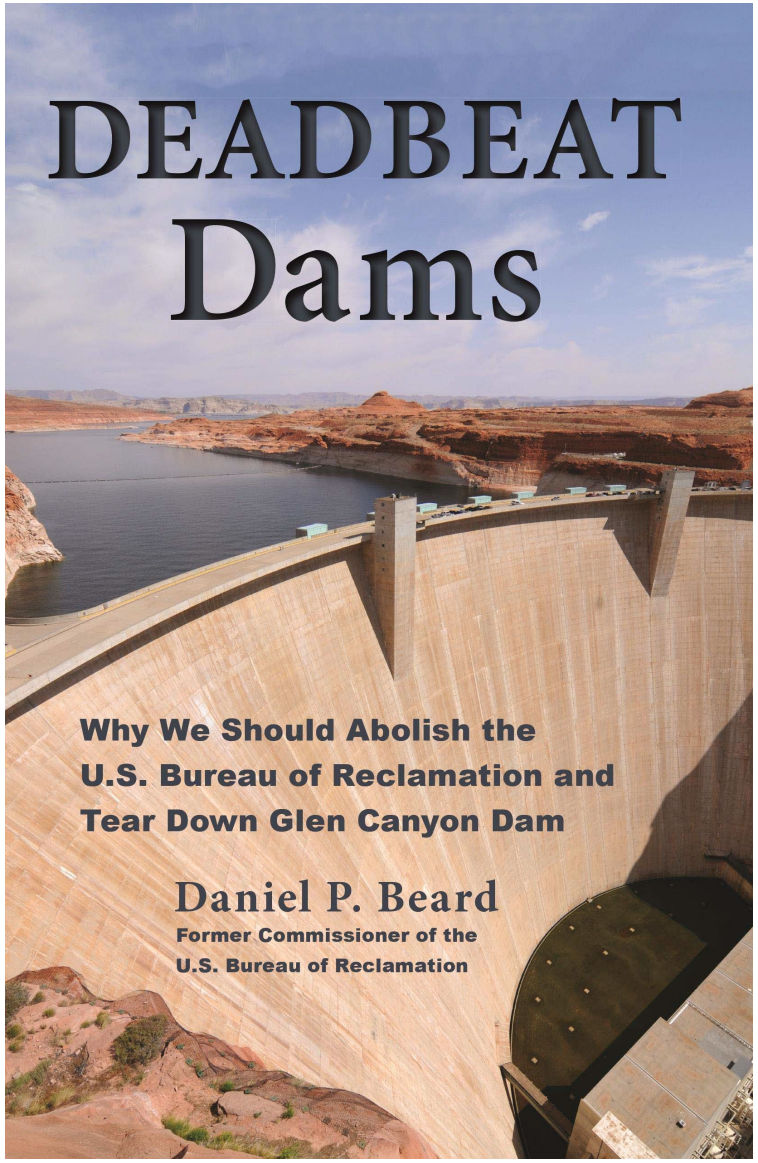
The Need for Innovation

"The unwillingness to change and be innovative has been a sad characteristic of water professionals for decades… We are innovative and creative people, except when it comes to water."

"We have little history of innovation, little history of experimentation. We run out the same old solutions year after year, decade after decade. We don't experiment; we don't test the limits."

"If there's a flood, how do our experts propose to handle the problem? Their first response is to build a levee to protect the populated areas"

"If we want more water to supply future needs, what's the approach suggested by our experts and politicians? Build a dam and reservoir."

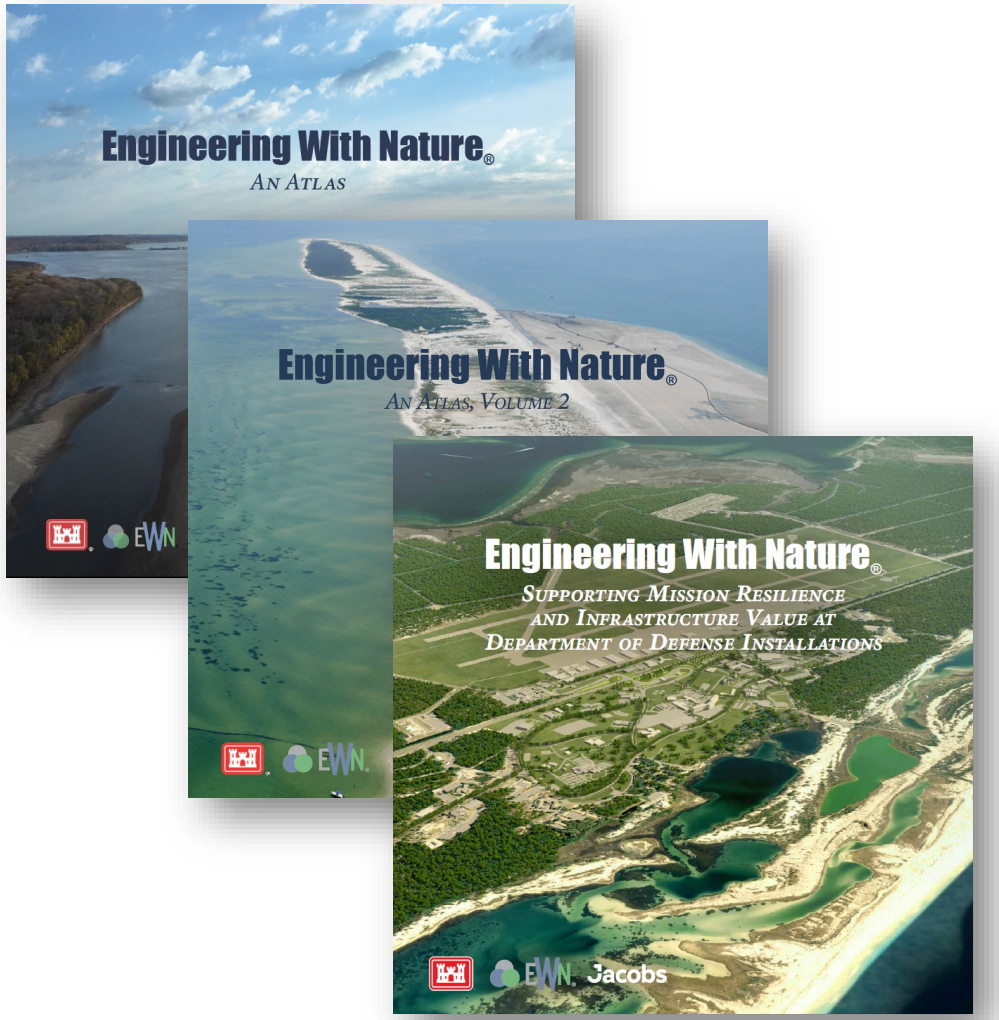


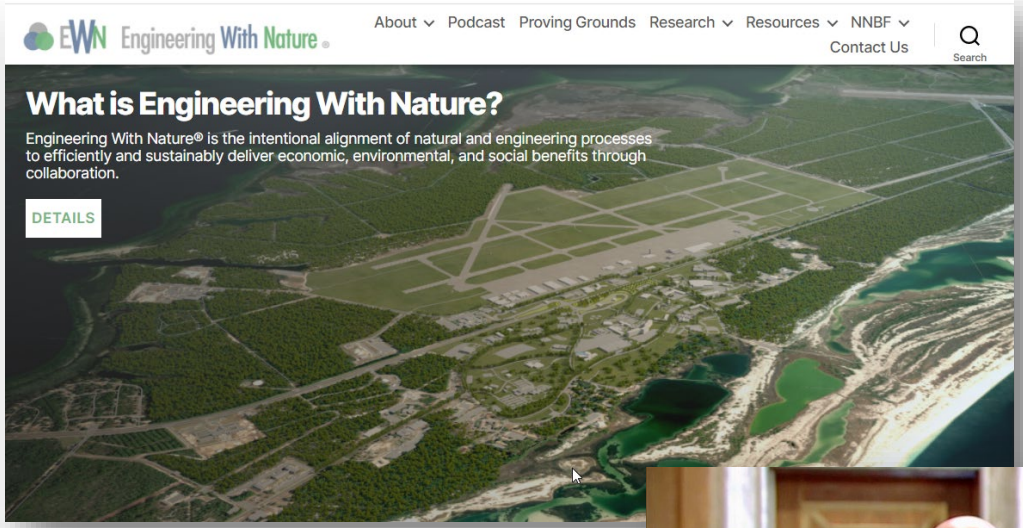
The Role of Technical Standards and Guidance

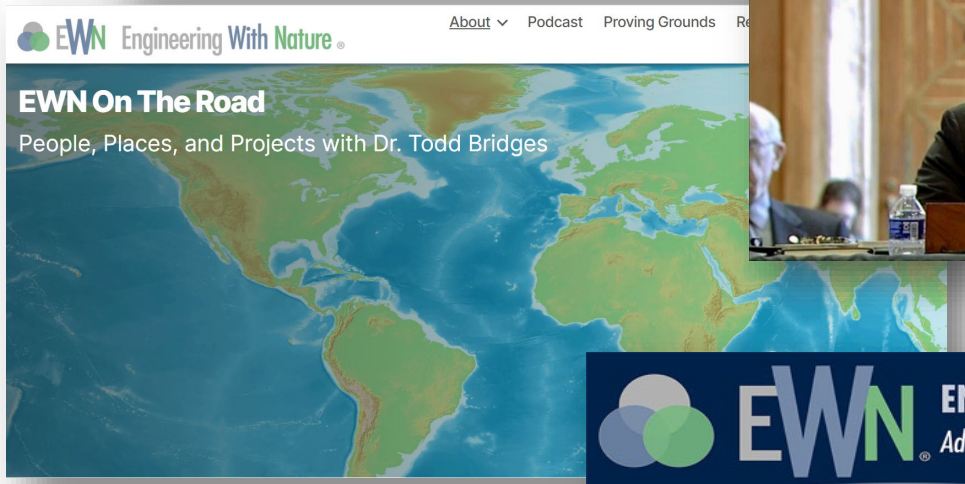
“We need more than pretty pictures.”
USACE engineer

“I also think that one of the hallmarks of engineering is the concept around engineering judgment. I think our profession has gotten to a place where we rely on standards and guidelines maybe almost to a fault.”
Kristina Swallow, P.E., Past President of the American Society of Civil Engineers.

Sparking Conversation, Thinking, and New Ideas







https://ewn.erdc.dren.mil/?p=3586

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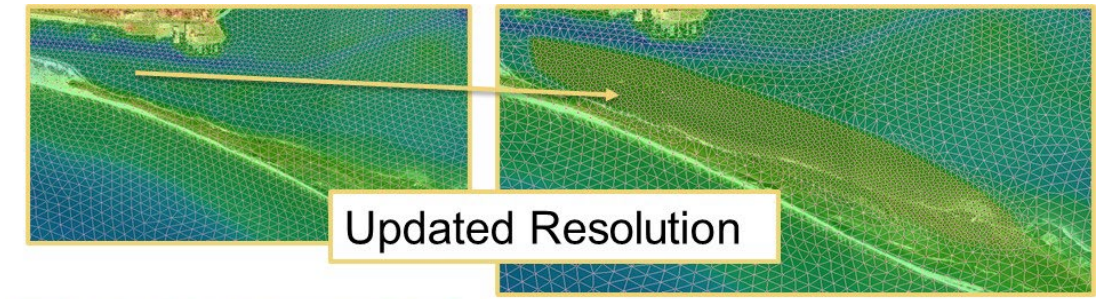
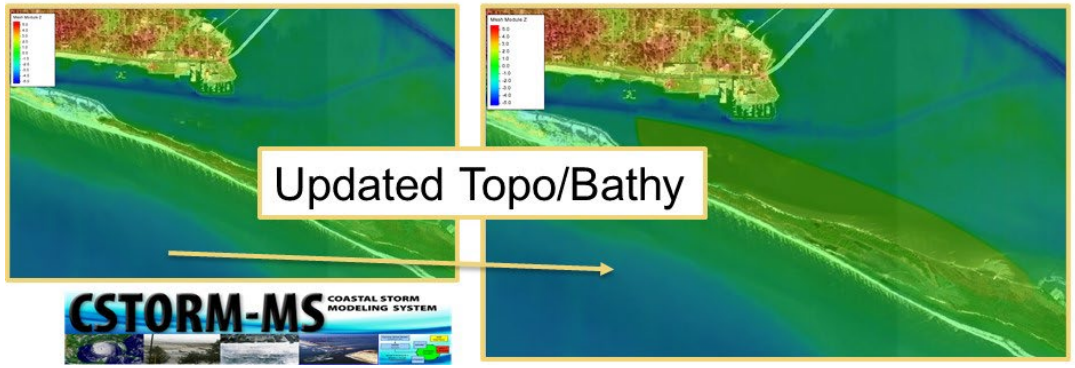
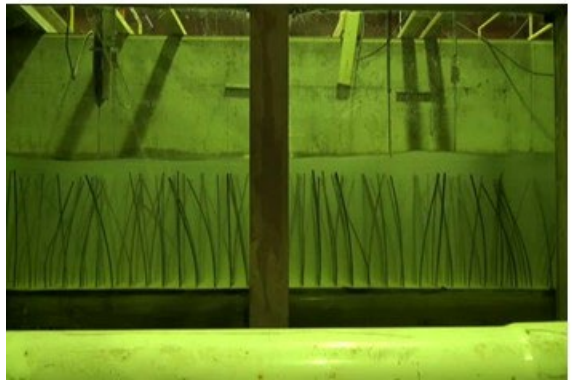
Advancing Technical Tools

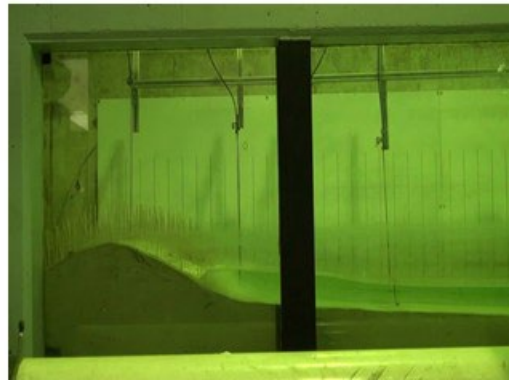
Numerical and Physical Modeling

EWN Toolkit for CSTORM

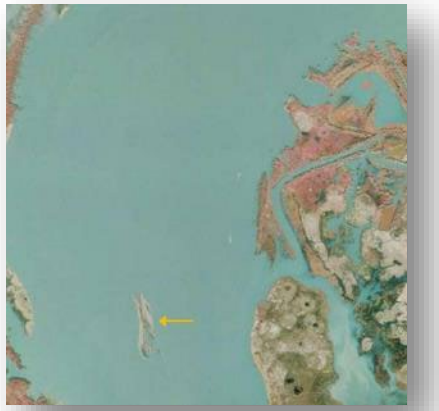


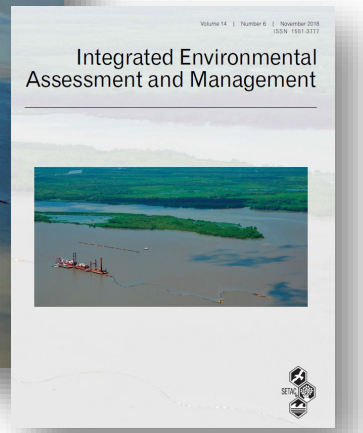






Documenting NBS Benefits: Horseshoe Bend Island, Atchafalaya River, Louisiana, USA





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‡*

Project Awards:

- 2015 Western Dredging Association Award for Environmental Excellence
- 2017 Western Dredging Association Award for Climate Change Adaption
- 2017 Dredging and Port Construction Award for Engineering with Nature
- 2020 USACE Green Innovation Award

Evaluating Benefits: BCA Policy Research

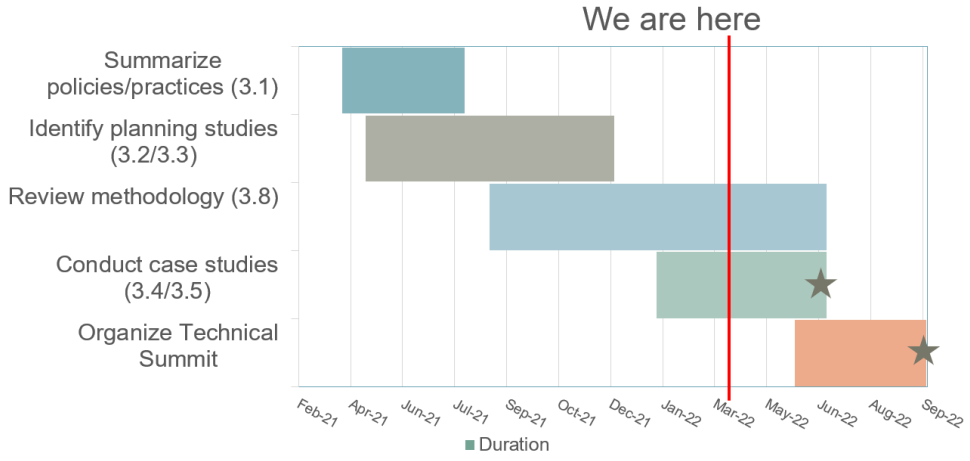
Current federal alternative evaluation process does not comprehensively value economic, environmental, and social benefits. These constraints screen out or exclude Nature-Based Solutions (NBS) and could lead to outcomes inconsistent with the Administration's priorities around community resilience and equity.

THE WATER INSTITUTE OF THE GULF

Approach:

- **Summarize** historical and current alternative evaluation policies and practices
- **Identify** 6 historical planning studies that considered NBS alternatives suitable for case study analysis
    1. *Jacksonville Harbor (NAV, South East)*
    2. *Jamaica Bay Reformulation (CSRM, North East)*
    3. *Southwest Coastal (CSRM, Gulf Coast)*
    4. *South Platte River and Tributaries (FRM, North West)*
    5. *West Sacramento (FRM, Pacific)*
    6. *South San Francisco Bay Shoreline (FRM, Pacific)*
- **Review** updated valuation methods and planning frameworks that incorporate environmental and social benefits
- **Analyze** case studies using updated methods and exploratory analysis to look beyond current policy constraints

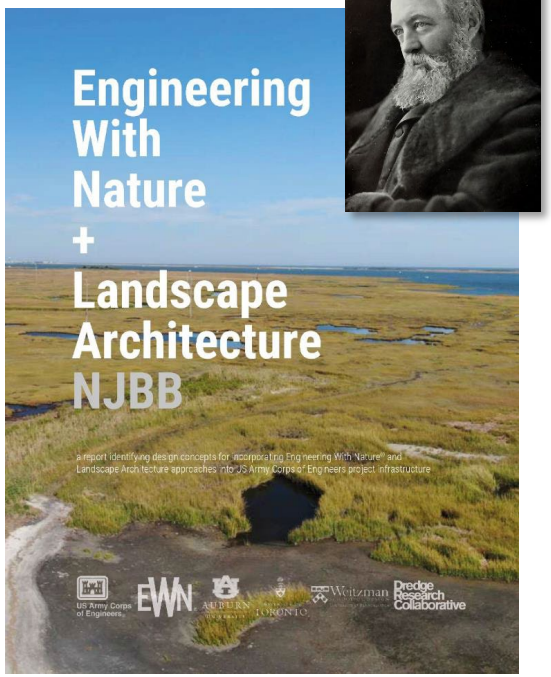
SCHEDULE AND PROGRESS



Supporting Field Application: SMIIL

Seven Mile Island Innovation Laboratory

- Collaboration and partnership that is building first-of-their-kind NBS projects in coastal New Jersey
  - Began in conversation
  - Accelerated by a storm (Sandy)
  - Progressed through piloting
  - Now in full-scale implementation



US Army Corps of Engineers

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOAA

The Nature Conservancy
Protecting nature. Preserving life.

NEW JERSEY DIVISION OF Fish and Wildlife

Wetlands INSTITUTE

Developing Guidance: *International Guidelines on Natural and Nature-Based Features for Flood Risk Management*

NNBF Guidelines Table of Contents

https://ewn.erdc.dren.mil/?page_id=4351

www.engineeringwithnature.org

NNBF Guidelines
- >1,000 pages, 5-year effort
- >70 multi-sector organizations
- >170 authors and contributors

"The guidelines do not contain or represent the policy commitments or policy positions of the organizations that participated in their development. Policy development is the sole purview of each organization and the laws and procedures that govern their activities." Pages xi-xii.

Supporting Education and Progress: The Network for Engineering With Nature (N-EWN)

- Multi-sector network supporting innovation
  - Types of partners: public and private sector
  - Research – gov't, academic, private
  - Industry practitioners
  - Project owners
- Aligning research with the needs of practice
- Grounding approach in real projects
- EWN education: curricula and training
- Experiential learning for students – systems thinking, cross-disciplinary training
- Freely flowing communication and knowledge sharing
- Accelerate implementation

N-EWN

US Army Corps of Engineers.

Institute for Resilient Infrastructure Systems
UNIVERSITY OF GEORGIA

NYC Mayor's Office of Climate Resiliency

TRIBAL NATIONS TECHNICAL CENTER OF EXPERTISE

THE WATER INSTITUTE OF THE GULF

The UNIVERSITY of OKLAHOMA

Arizona State University

GEORGIA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

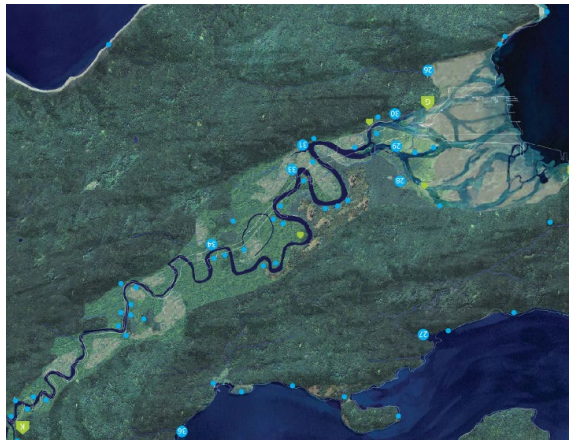
NCCOS
NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

UF UNIVERSITY of FLORIDA
CENTER FOR COASTAL SOLUTIONS

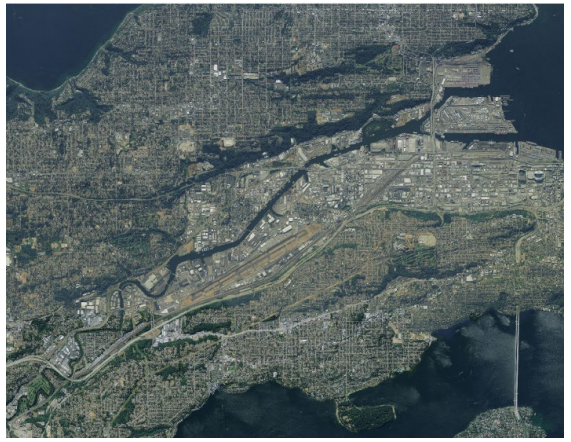
www.engineeringwithnature.org; https://n-ewn.org/

The Spectrum

"Wild and Free-Flowing Nature" — *"Tamed and Conquered Nature"*



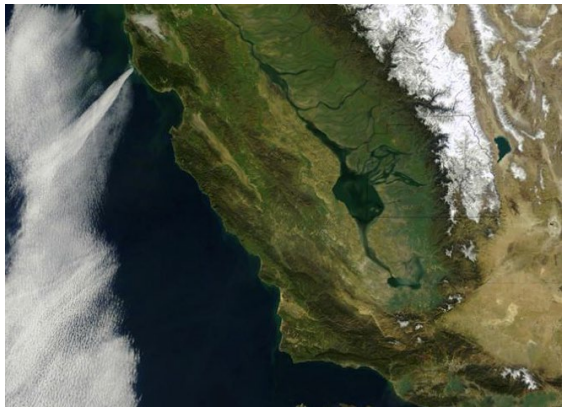
Duwamish River, WA 1800s



Duwamish River, WA today

"Not either / or, but <u>and</u>"

(Structural vs. Natural)



San Joaquin Valley, CA 1800s

Conserved Nature

Engineered Nature-Based Solutions

\+ Engineered Structures

Lasting, Sustainable, Resilient Systems

San Joaquin Valley, CA today

Some Questions and Thoughts About "Guidance"

- **Guidance for what applications?**
  - Flooding, heat, drought, wildfire, etc.
- **What are the requirements (elements) of the guidance?**
  - Design, construction, monitoring, adaptation, O&M, etc.
- **What level of prescription?**
  - "Cookbook engineering guidance leads to cookie-cutter engineering solutions"
- **How to sync technical guidance with existing and evolving policies?**
  - There is a wide interface between policy and technical guidance
  - Across programs and organizations
- **How to make timely step-wise progress?**
  - Assemble, organize, and share technical resources
  - Partner for progress
  - Learn by doing and communicating