ENGINEERING WITH NATURE FOR SUSTAINABLE ESTUARIES

Dr. Todd S. Bridges, Ph.D.

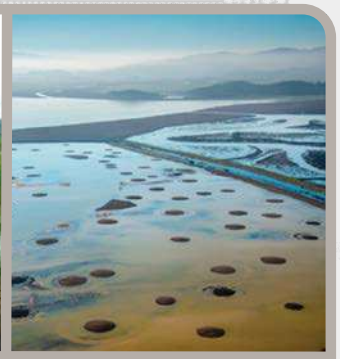
Senior Research Scientist (ST), Environmental Science

US Army Corps of Engineers

US Army Engineer Research and Development Center

Todd.S.Bridges@usace.army.mil

Restore America's Estuaries
13 December 2018



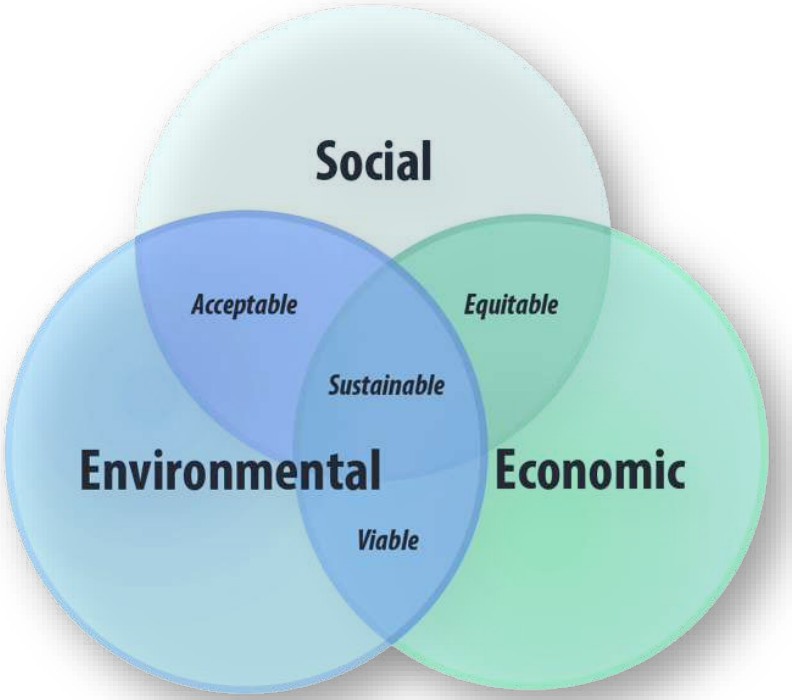
US Army Corps of Engineers

ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

SUSTAINABILITY

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



A "SUSTAINABILITY LEDGER" FOR SEDIMENT MANAGEMENT

Efficiency

- Reducing sedimentation in channels & reservoirs
- Reducing transport distances for dredged material
- Reducing dredging time
- Expanding operational flexibility
- Linking multiple projects
- Optimizing regulatory processes to streamline the project schedule

Value Creation

- Restoring natural sediment processes to sustain landscapes
- New nature-based features that reduce flood risks
- Budget space for additional infrastructure work
- New habitat for fish and wildlife
- New features that provide recreational and other social value

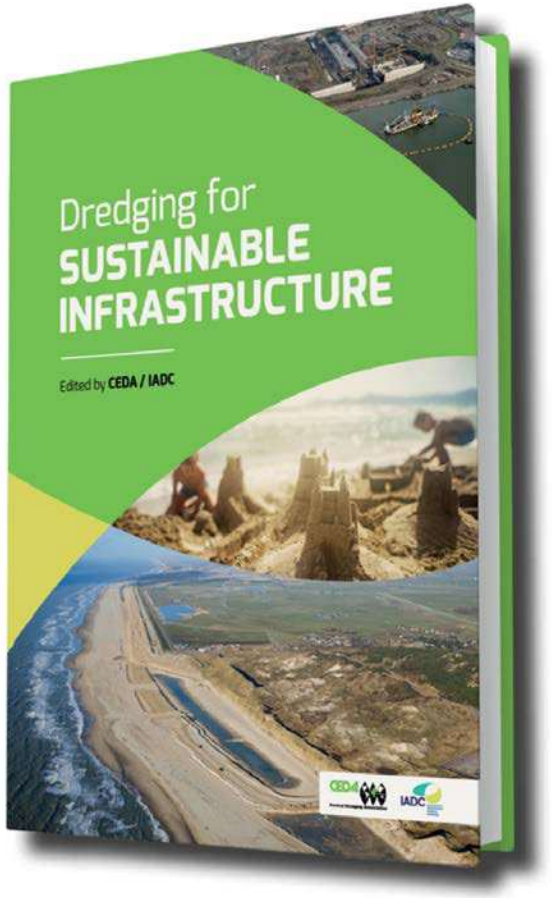
Dredging for Sustainable Infrastructure

Integrating Dredging with Sustainable Development

By Todd Bridges and Tiedo Velinga

Guiding Principles

1. *Comprehensive consideration and analysis of the social, environmental and economic costs and benefits of a project is used to guide the development of sustainable infrastructure.*
2. *Commitments to process improvement and innovation are used to conserve resources, maximize efficiency, increase productivity, and extend the useful lifespan of assets and infrastructure.*
3. *Comprehensive stakeholder engagement and partnering are used to enhance project value.*



CREATING VALUE THROUGH ALIGNMENT…

- What opportunities are there to achieve better alignment of natural and engineered systems?
  - Can improved alignment reduce risks to life, property and ecosystems?
  - What range of services can be produced through such alignment?
  - What are the science and engineering needs in order to achieve better alignment?

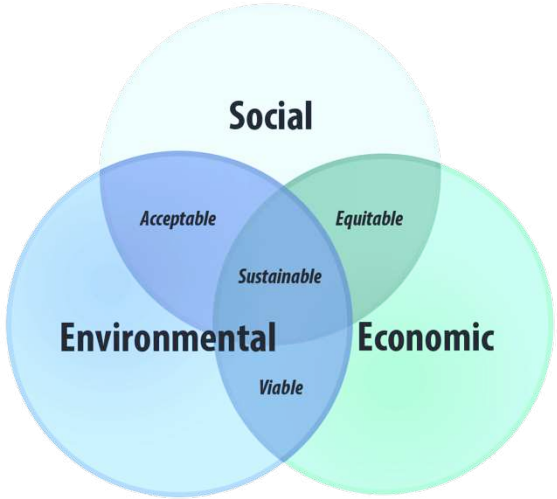
Sustainable Solutions Vision: "Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges."

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
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



www.engineeringwithnature.org

US Army Corps of Engineers • Engineer Research and Development Center

EWN ELEMENTS

Four major elements are key to applying EWN to develop projects:

Producing Efficiencies

Using science and engineering to produce operational efficiencies

Using Natural Processes

Using natural processes to maximize benefit

Broadening Benefits

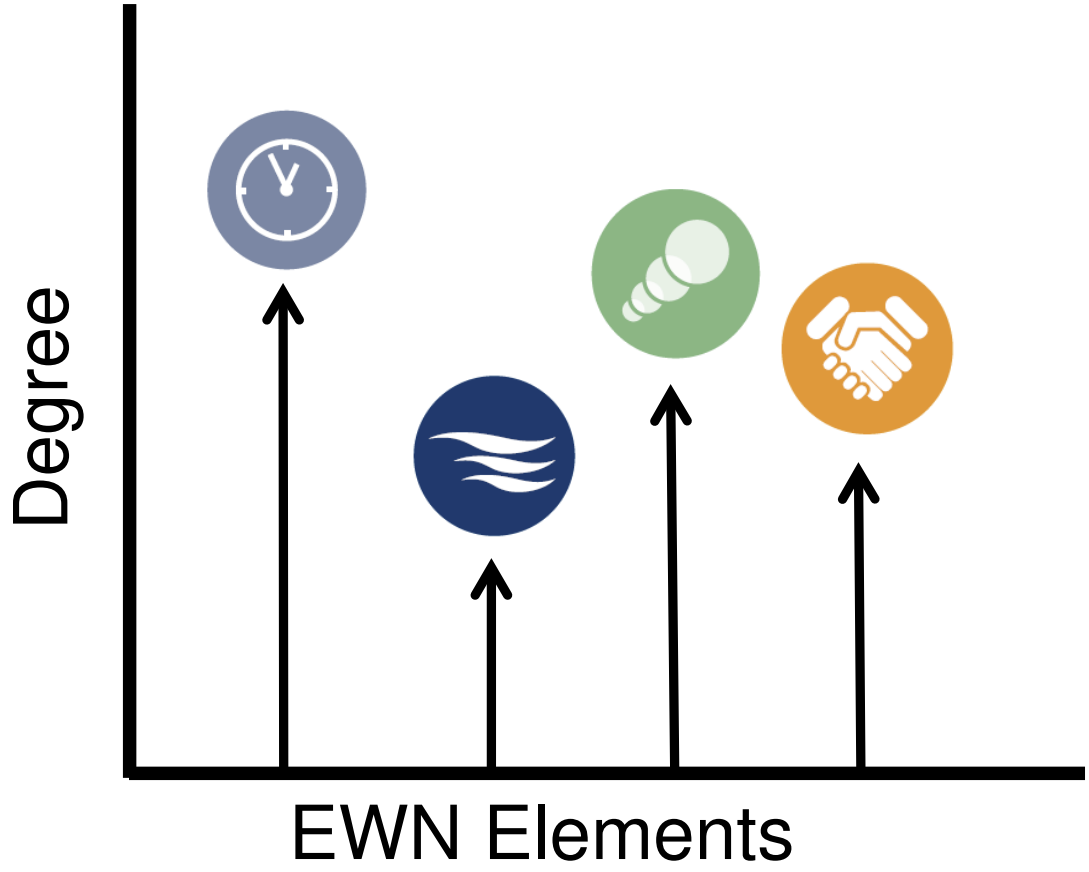
Increasing the value provided by projects to include social, environmental, and economic benefits

Promoting Collaboration

Using collaborative processes to organize, engage, and focus interests, stakeholders, and partners

Engineering With Nature®

Elements



EWN Elements

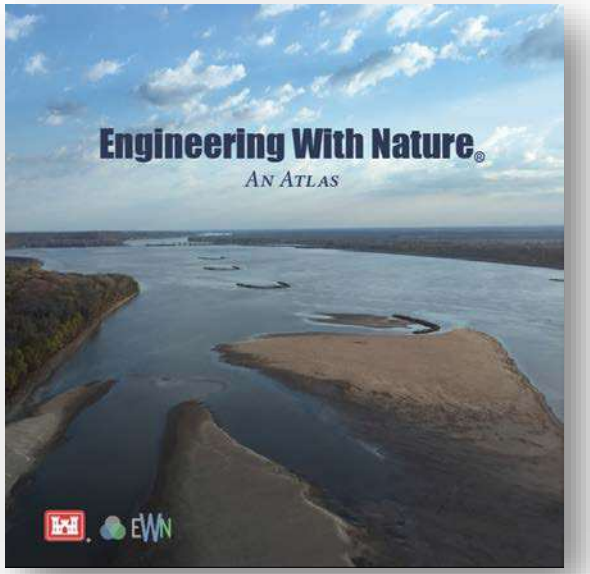
Four major elements are involved in applying EWN to develop infrastructure projects:

- Using science and engineering to produce operational efficiencies
- Using natural processes to maximize benefit
- Increasing the value provided by projects to include social, environmental, and economic benefits
- Using collaborative processes to organize, engage, and focus interests, stakeholders, and partners

COLLABORATION AND COMMUNICATION

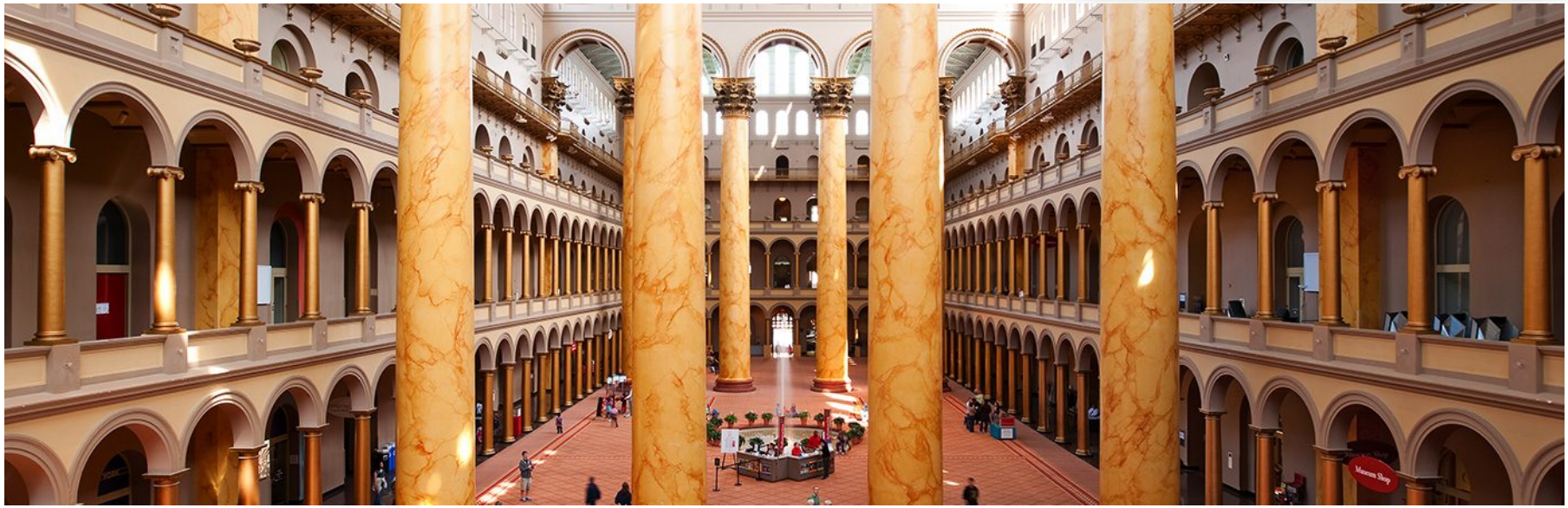
www.engineeringwithnature.org

EWN ATLAS "LAUNCH EVENT"



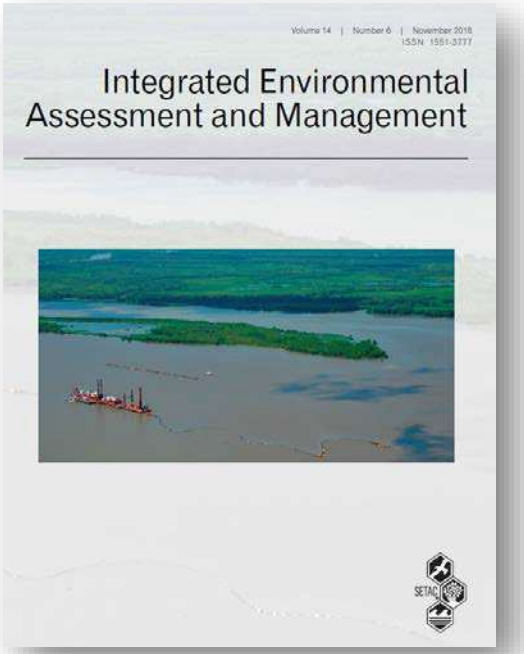
10:30-12:00
January 16, 2019
National Building Museum
Washington, D.C.

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



US Army Corps of Engineers • Engineer Research and Development Center

HORSESHOE BEND ISLAND, ATCHAFALAYA RIVER



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*†

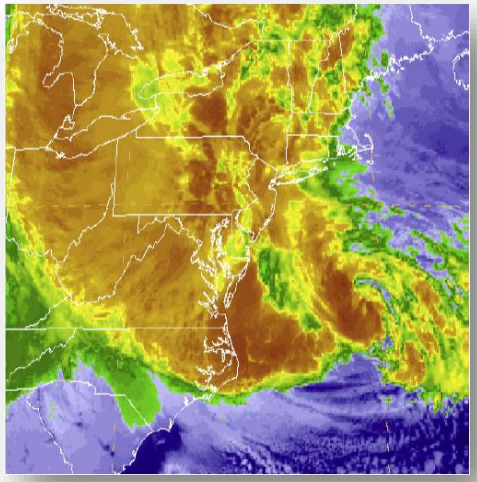
Project Awards:

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

LEVERAGING NATURE FOR ENGINEERING VALUE

Following Hurricane Sandy:

- Risk industry-based tools used to quantify the economic benefits of coastal wetlands
  - Temperate coastal wetlands saved more than $625 million in flood damages.
  - In Ocean County, New Jersey, salt marsh conservation can significantly reduce average annual flood losses by more than 20%.



COASTAL WETLANDS AND FLOOD DAMAGE REDUCTION

Using Risk Industry-based Models
to Assess Natural Defenses in the Northeastern USA

October 2016

UNIVERSITY OF CALIFORNIA SANTA CRUZ · The Nature Conservancy · Wildlife Conservation Society · LLOYD'S TERCENTENARY RESEARCH FOUNDATION

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

Center for Occupational & Enviromental Health UCLA

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

森林浴 *Shinrin-yoku*: “Forest Bathing”