ENGINEERING WITH NATURE: TOWARD SUSTAINABLE SYSTEMS

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ASBPA
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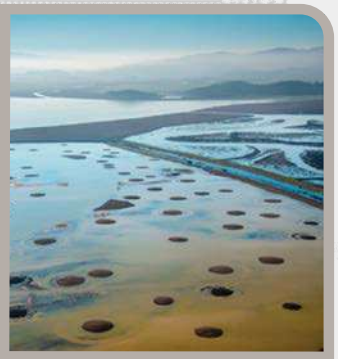

US Army Corps of Engineers

ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER

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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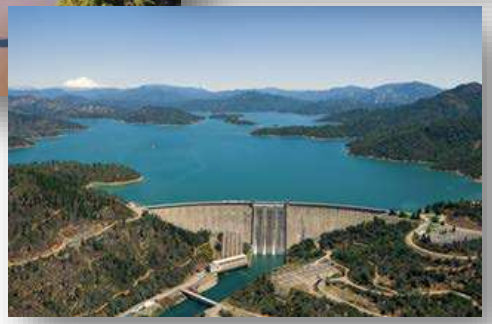
EWN® ACROSS USACE MISSION SPACE

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

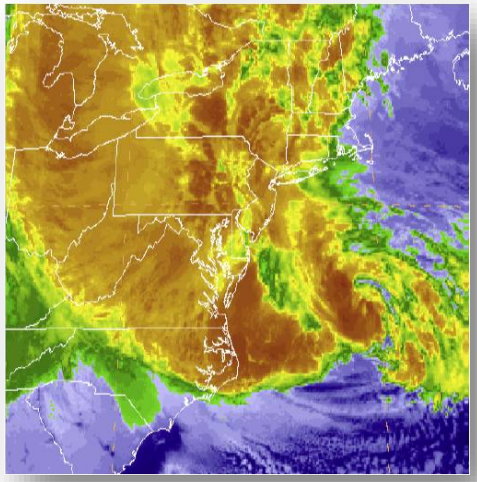
Water Operations
- Shoreline stabilization using native plants
- Environmental flows and connectivity



LEVERAGING NATURE TO CREATE 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

NATURAL AND NATURE-BASED FEATURES

NNBF are landscape features that are developed to provide engineering functions relevant to flood risk management while producing additional economic, environmental and social benefits.

ONEHUNGA BAY FORESHORE RESTORATION AUCKLAND, NEW ZEALAND

FORT PIERCE CITY MARINA, FLORIDA

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

Middle Harbour Port of Oakland, USA

2018 PIANC *Working with Nature* Award Winner

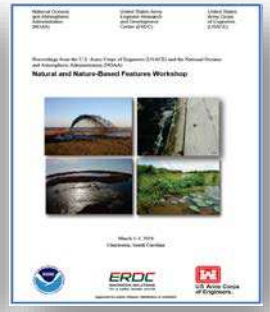
US Army Corps of Engineers • Engineer Research and Development Center

HORSESHOE BEND ISLAND, ATCHAFALAYA RIVER

- Options for managing DM via shore-based wetland creation were exhausted
- Strategic placement of sediment (0.5-1.8 mcy/1-3 yrs) was used to create a ~35 ha island
- Producing significant environmental and engineering benefits
- Project Awards:
  - 2015 WEDA Award for Environmental Excellence
  - 2017 WEDA Award for CC Adaption
  - 2017 DPC Award for Working, Building, and Engineering with Nature

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)

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 engineering and construction techniques for 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 (IRIS)
  - CRADA and Educational Partnering Agreement
  - Multiple levels of collaboration on EWN and NNBF
  - EWN curriculum development

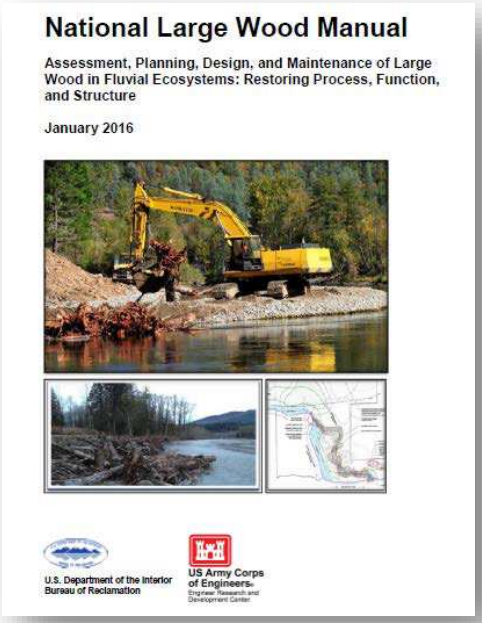
Institute for Resilient Infrastructure Systems
UNIVERSITY OF GEORGIA

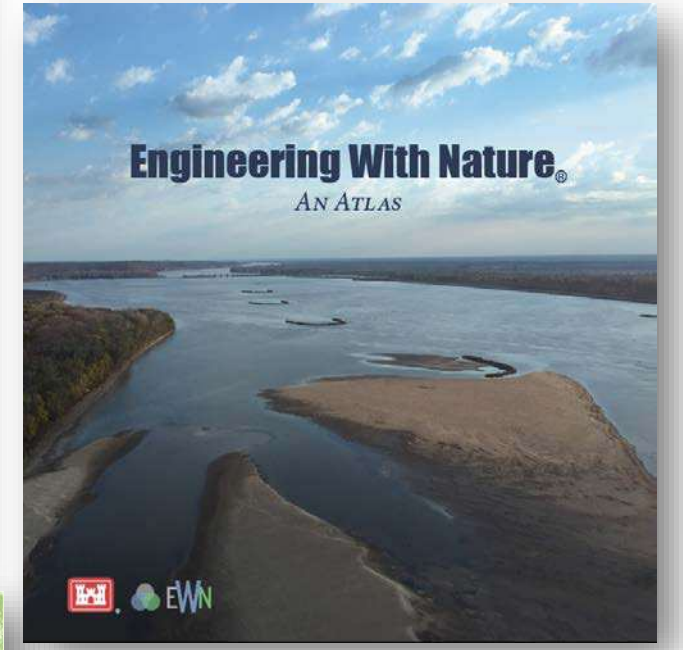
INTERNATIONAL GUIDELINES ON THE USE OF NATURAL AND NATURE-BASED FEATURES FOR SUSTAINABLE COASTAL AND FLUVIAL SYSTEMS

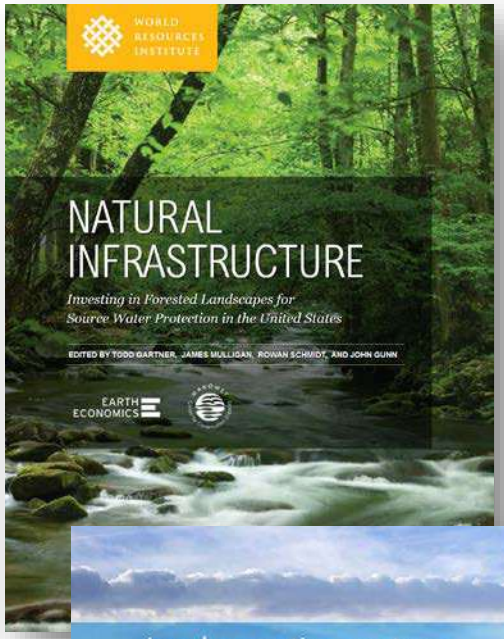
Purpose: Develop guidelines for using NNBF to provide engineering functions relevant to flood risk management while producing additional economic, environmental and social benefits.

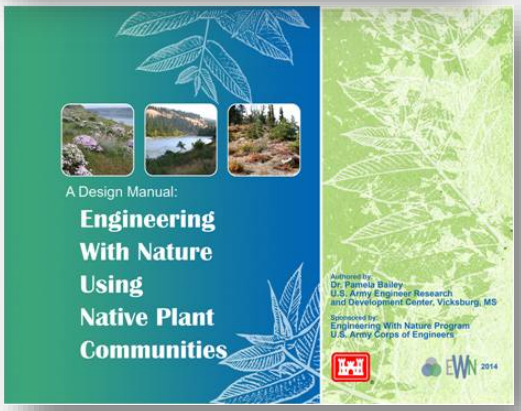
- Publish NNBF technical guidelines by 2020:
  - Multi-author: government, academia, NGOs, engineering firms, construction companies, etc.
  - Addressing the full project life cycle
  - Guidelines in 4 Parts
    - Overarching
    - Coastal Applications
    - Fluvial Applications
    - Conclusions

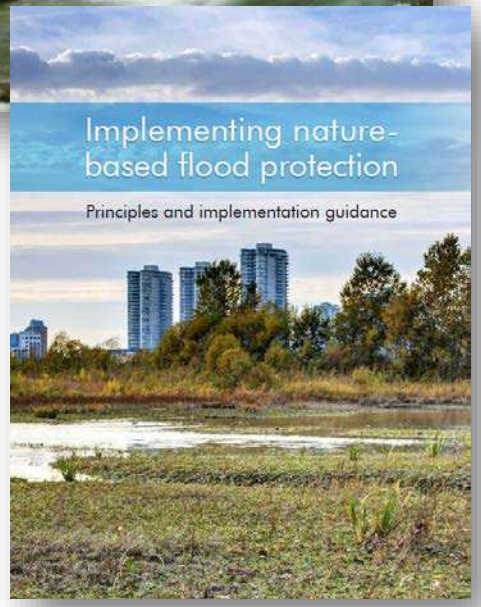
COMMUNICATING BEST PRACTICE











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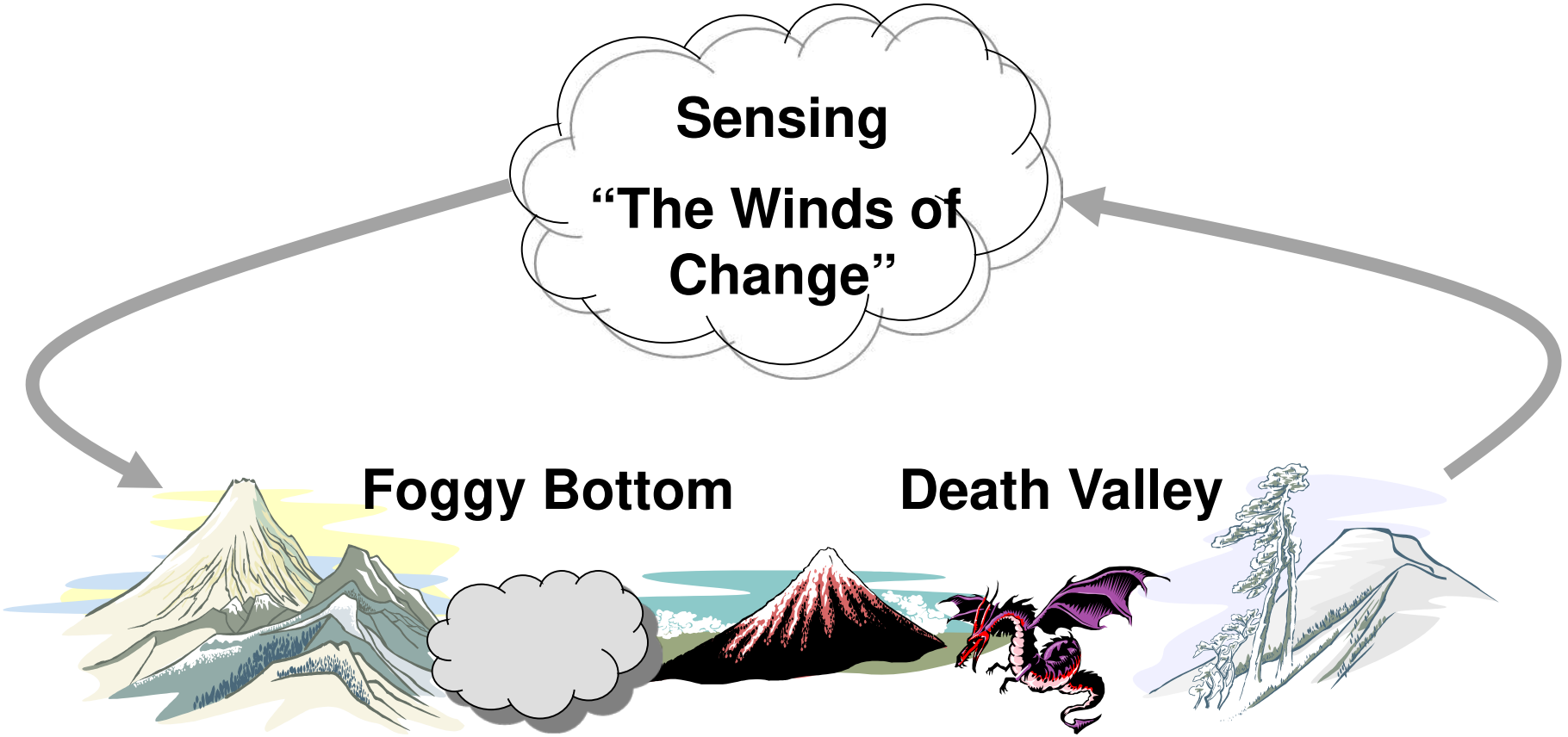
"The Land of Technology Development and Application"



INCENTIVES

- Public agency goals
  - E.g., USACE establishing national goals and metrics for: 1) dredged material beneficial use, 2) Natural and Nature-Based Features
- Private company goals
  - E.g., Dow Chemical commits to produce $1B in value by 2025 through nature's services and functions
- Ports
  - E.g., Port of Huelva 20% discount in concession fees in exchange for a commitment to environmental improvement
- Regulatory programs
  - E.g., USACE national / regional permits for living shorelines / nature-based solutions
  - Reduced mitigation requirements
- Cost-sharing
  - E.g., public-public and public-private partnerships, e.g., USACE-NOAA, USACE-USFWS; USACE-EPA; USACE-TNC

MEANS

Engineering With Nature

- Innovate
- Diversify projects to meet the need:
  - Wetlands
  - Islands
  - Tidal flats
  - Subtidal features: reefs, ridges, relief
- Scale up the size of projects to fully address the needs and opportunities
- Keep the projects “real”
  - Beware of over-design, -constraint, -requirement
  - Affordability is key
- Document the produced benefits and values created
- Coordinate communication across partnering organizations for maximum impact