

US Army Corps of Engineers

# 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

HOTE TANTER GA







US Army Corps of Engineers • Engineer Research and Development Center

# SUSTAINABILITY

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



US Army Corps of Engineers • Engineer Research and Development Center

# 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

US Army Corps of Engineers • Engineer Research and Development Center

UNCLASSIFIED

# 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.



US Army Corps of Engineers • Engineer Research and Development Center

### **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."

US Army Corps of Engineers • Engineer Research and Development Center

# **Engineering With Nature**<sub>®</sub>

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

UNCLASSIFIED



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



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



**Engineering With Nature** 



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

US Army Corps of Engineers • Engineer Research and Development Center

# **Engineering With Nature**<sub>®</sub> 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

### **EWN Elements**

US Army Corps of Engineers • Engineer Research and Development Center

### **COLLABORATION AND COMMUNICATION**



www.engineeringwithnature.org

US Army Corps of Engineers • Engineer Research and Development Center

### 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

UNCLASSIFIED

### Project Awards:

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

US Army Corps of Engineers • Engineer Research and Development Center

UNCLASSIFIED



Integrated Environmental Assessment and Management





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\* |

# 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





US Army Corps of Engineers • Engineer Research and Development Center

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

July 2014

CO -EH

> Center for Occupational & Enviromental Health UCLA



US Army Corps of Engineers • Engineer Research and Development Center

# 森林浴 Shinrin-yoku: "Forest Bathing"

