Engineering With Nature

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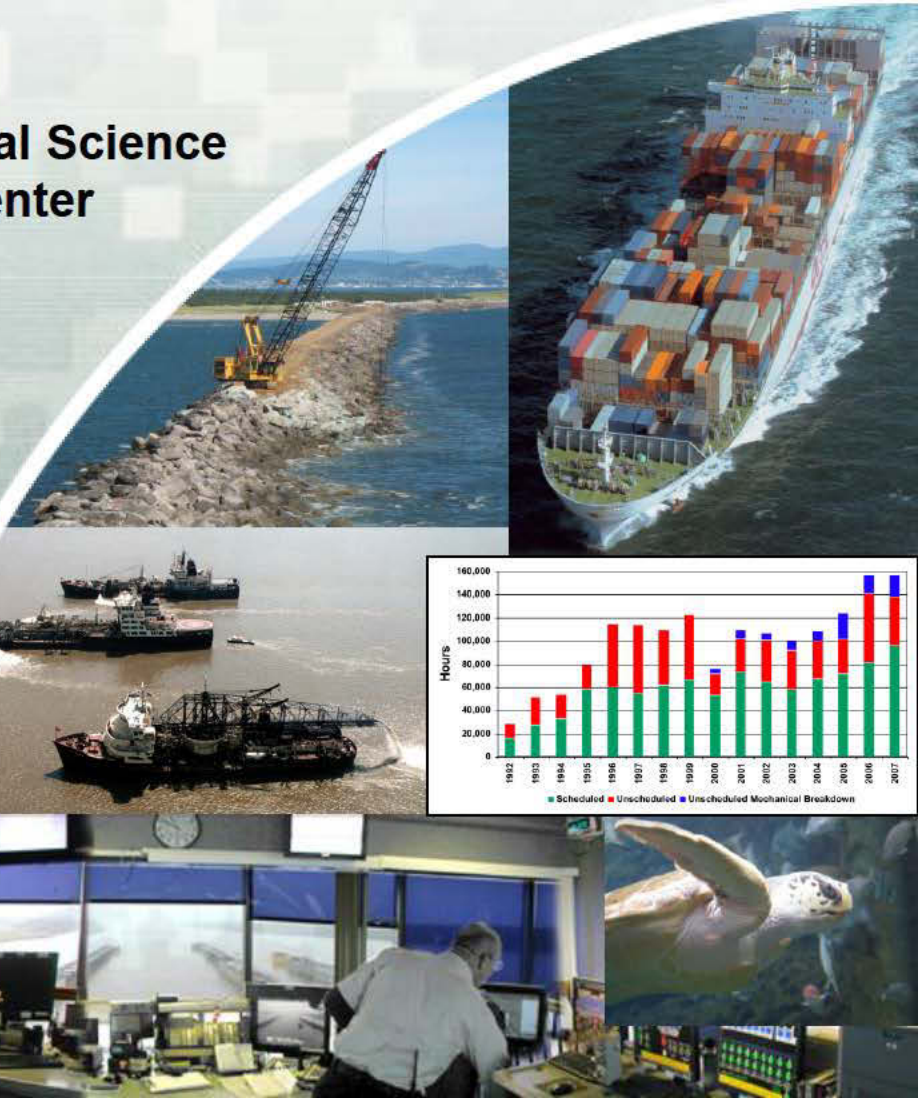
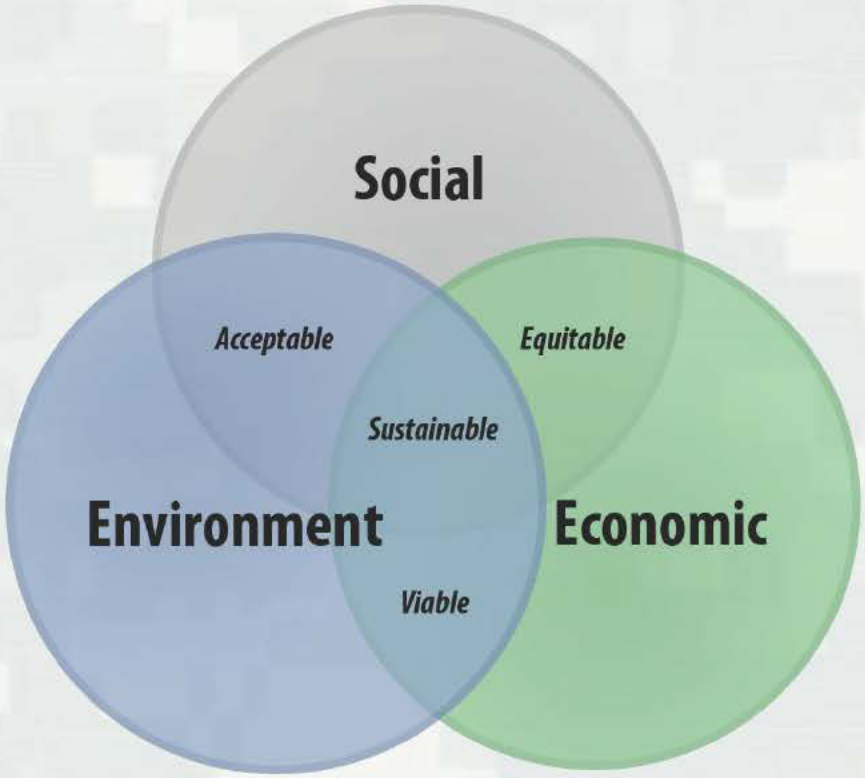


US Army Corps of Engineers
BUILDING STRONG®

The Challenge:
The *Status Quo is Not An Option*

The need:

- Efficient, cost effective ways to achieve objectives related to water-based infrastructure.
- Conduct "business" in a way that fosters collaboration and cooperation with our partners and stakeholders.
  - Ports, commercial interests, regulators, NGOs, and others
- Sustainable practices. Triple-win outcomes integrate social, environmental and economic considerations at every phase of a project.

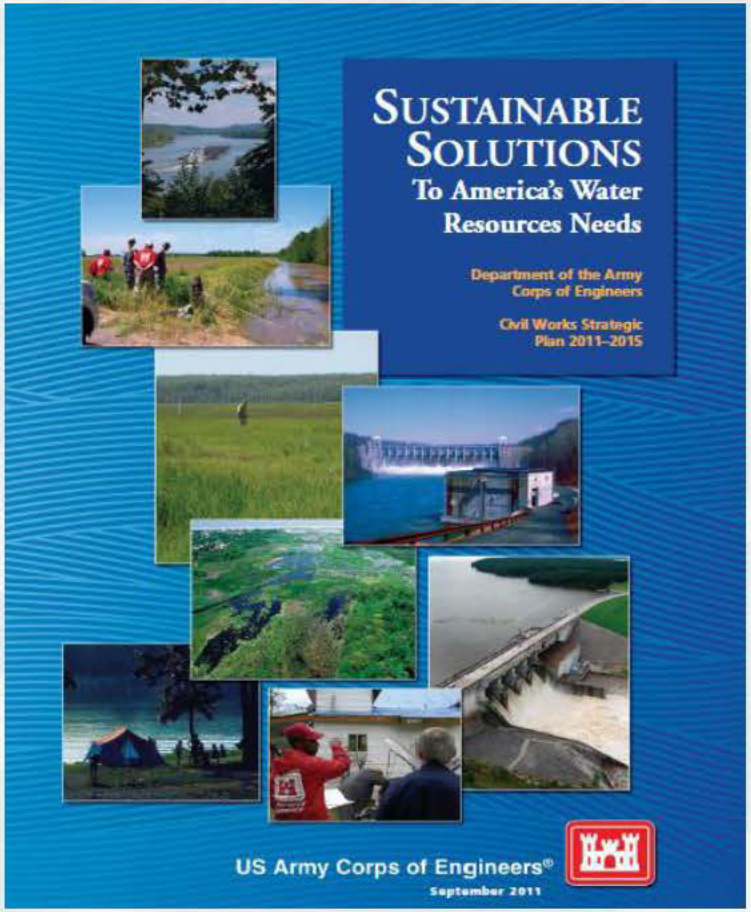


The USACE Civil Works Strategic Plan

Sustainable Solutions to America's Water Resources Needs

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

- The goals established by this strategy are to:
  - Assist in providing for safe and resilient communities and infrastructure.
  - Help facilitate commercial navigation in an environmentally and economically sustainable fashion.
  - Restore degraded aquatic ecosystems and prevent future environmental losses.
  - Implement effective, reliable, and adaptive life-cycle performance management of infrastructure.
  - Build and sustain a high quality, highly dedicated workforce.



Definition

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

Background

- *Engineering With Nature* initiative was established by the USACE Navigation program in 2010. Over that period we have:
  - Conducted 7 workshops that have defined the scope and technical approach
    - Participants have included HQ, Districts, other agencies, NGOs, academics, private sector, international collaborators
  - Developed a strategic plan for the initiative
  - Initiated research to support the intent of EWN
  - Numerous briefings and discussions in a variety of fora

The Essential Ingredients of EWN

- Use science and engineering to produce operational efficiencies
  - Support sustainable delivery of project benefits.
- Use natural process to maximum benefit
  - To reduce demands on limited resources, minimize the environmental footprint of the project, and to enhance the quality of benefits produced
- Broaden and extend the benefits provided by projects
  - To include substantiated economic, social, and environmental benefits
- Use science-based collaborative processes to organize and focus interests, stakeholders, and partners
  - To reduce social friction, resistance, and project delays while producing more broadly acceptable projects

EWN, A Natural Extension of RSM

- EWN- An *ecosystem approach* to inform development and operation of water infrastructure
  - Quantify the structure and function of the system over time
  - Account for impacts/costs <u>and</u> benefits of actions, minimizing the former and maximizing the latter
  - Integrate actions within the system to optimize the distribution of benefits

Engineering With Nature:
The Progression

Inputs and Outputs
'Degree of'

System Resilience

Efficiency

Benefits Related to the Project

Outcomes

Inputs

Communications and Technology Transfer

Technical Understanding

Innovation and Creativity

Diversity of Skills and Expertise

Stakeholder Engagement

Business as Usual | Understanding Natural Processes | Aligning Processes | Expanding Benefits | Enabling Self-Sustaining Benefits

STAGES

Example EWN Opportunities

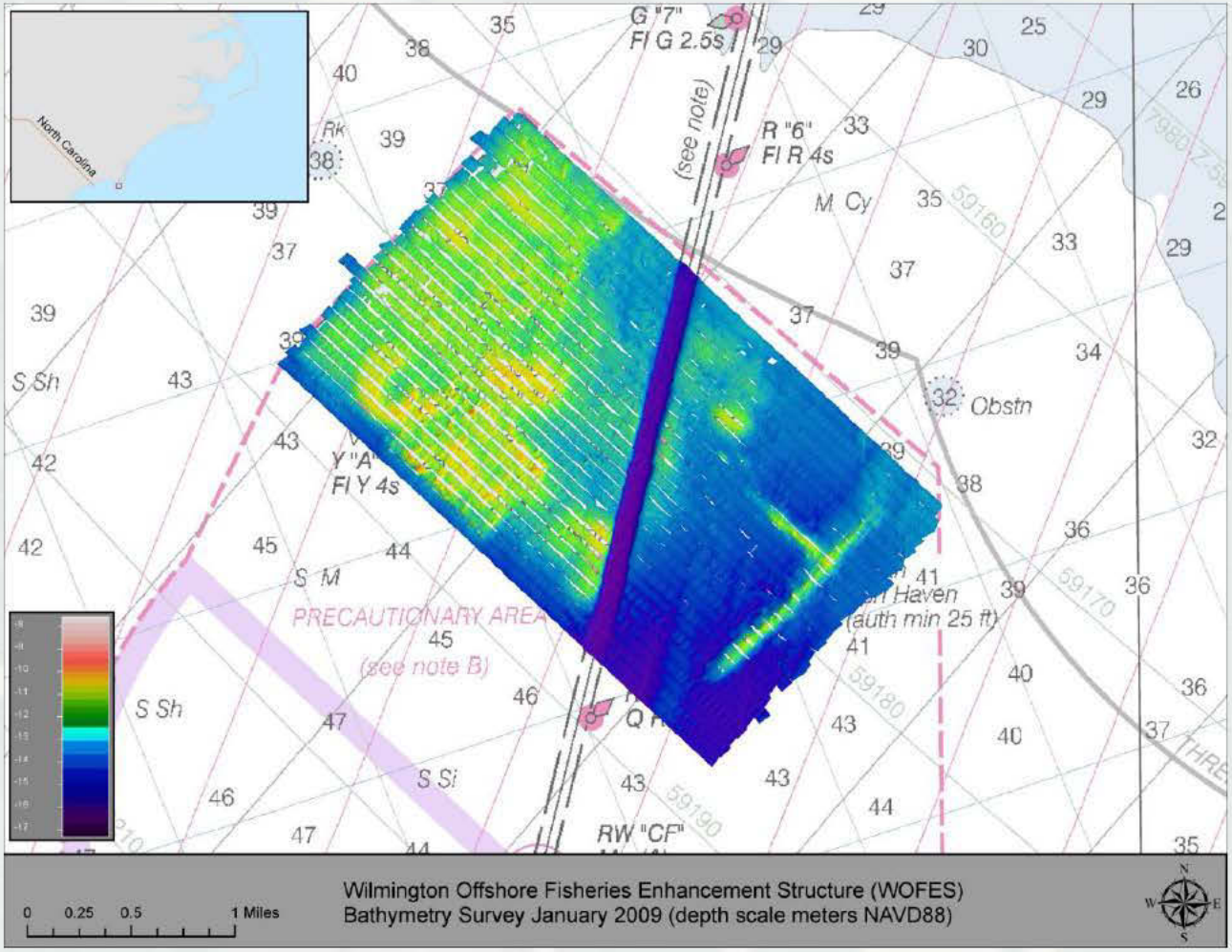
- Strategic placement of sediments for beneficial use of dredged material
  - Make use of hydrodynamics and natural transport processes to build near-shore habitats
- Use of engineering features to focus natural processes
  - To minimize navigation channel infilling and to transport and focus sediments for positive benefits
- Cost-efficient engineering practices
  - For enhancing the habitat value of infrastructure
- Optimizing the use of natural systems, such as wetlands and other features
  - To reduce the effects of storm processes and sea level rise on shorelines and coasts
- Science-based communications processes
  - To significantly improve stakeholder engagement, collaboration and communication

Example EWN Solutions

Upper Mississippi River Training Structures: Chevrons

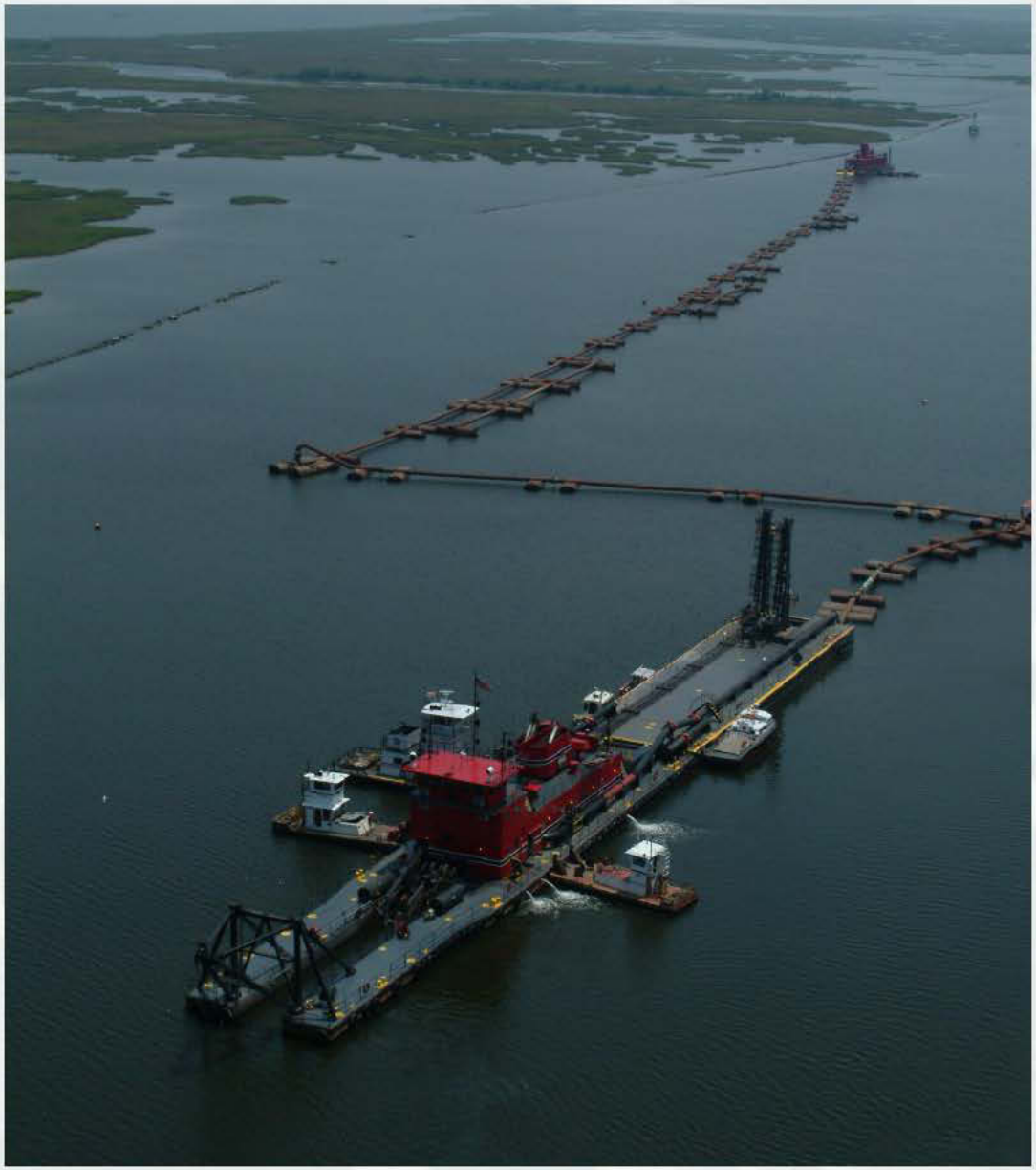
River Bendway Weirs

Example EWN Solutions



Wilmington Offshore Fisheries Enhancement Structure

Example EWN Solutions

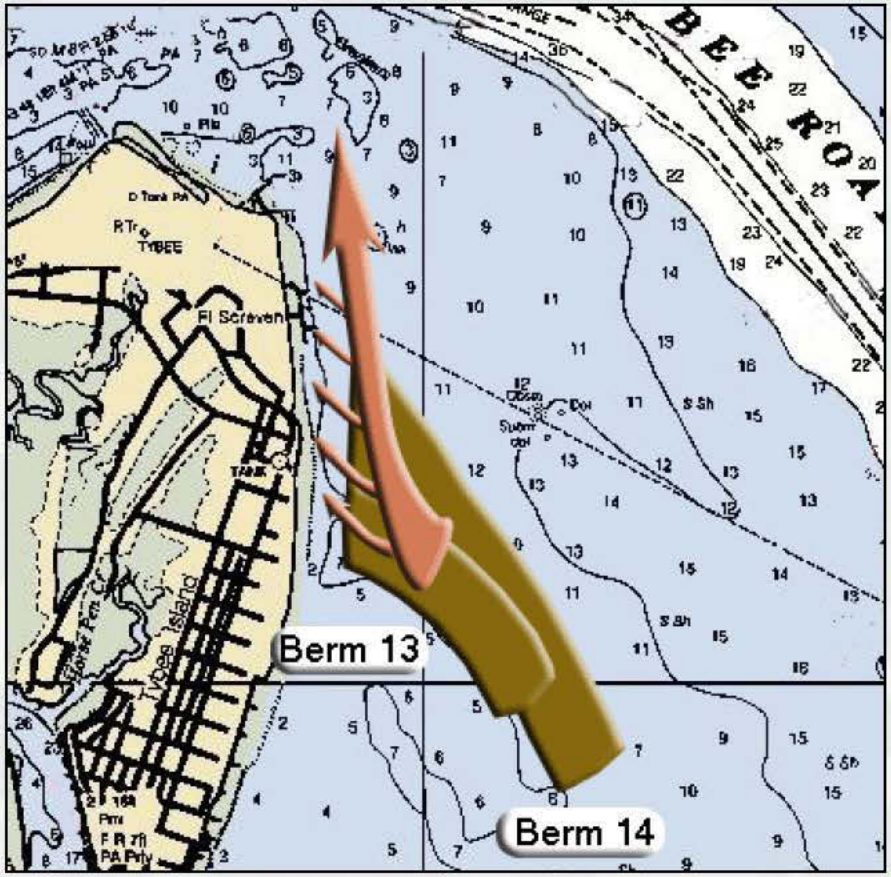


Long-distance pumping of dredged material for wetlands creation in coastal Louisiana, USA

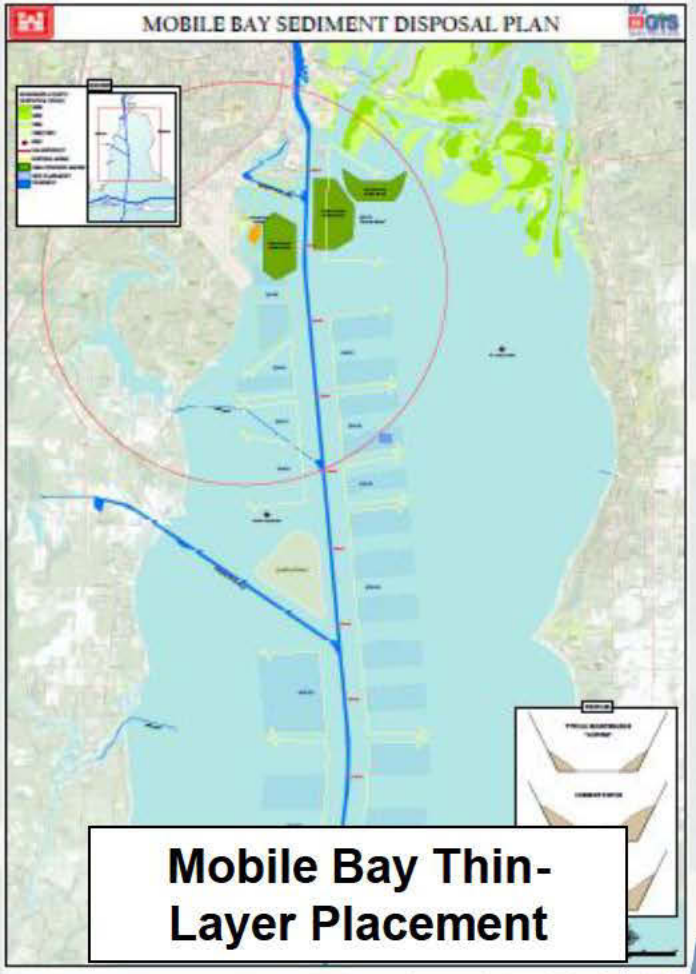
- ***How to marry LDC with natural transport processes to expand opportunities?***

Example EWN Solutions

Strategic Placement



North Tybee Island
Savannah, Georgia



Mobile Bay Thin-Layer Placement

Engineering With Nature

- Smart, efficient engineering practice
- Expand the range of benefits provided through water-based infrastructure
  - Across the range of objectives represented by USACE business lines
- Promote productive, collaborative project dynamics