Engineering With Nature

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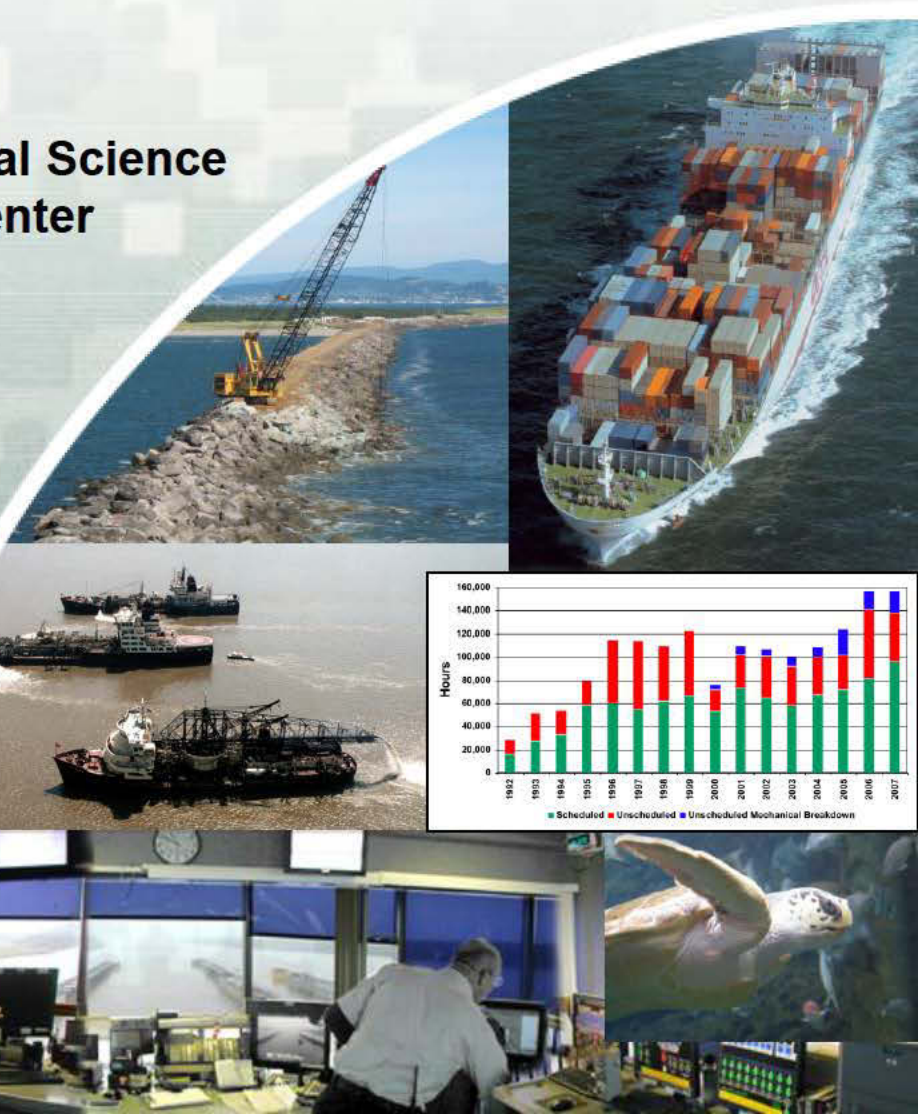
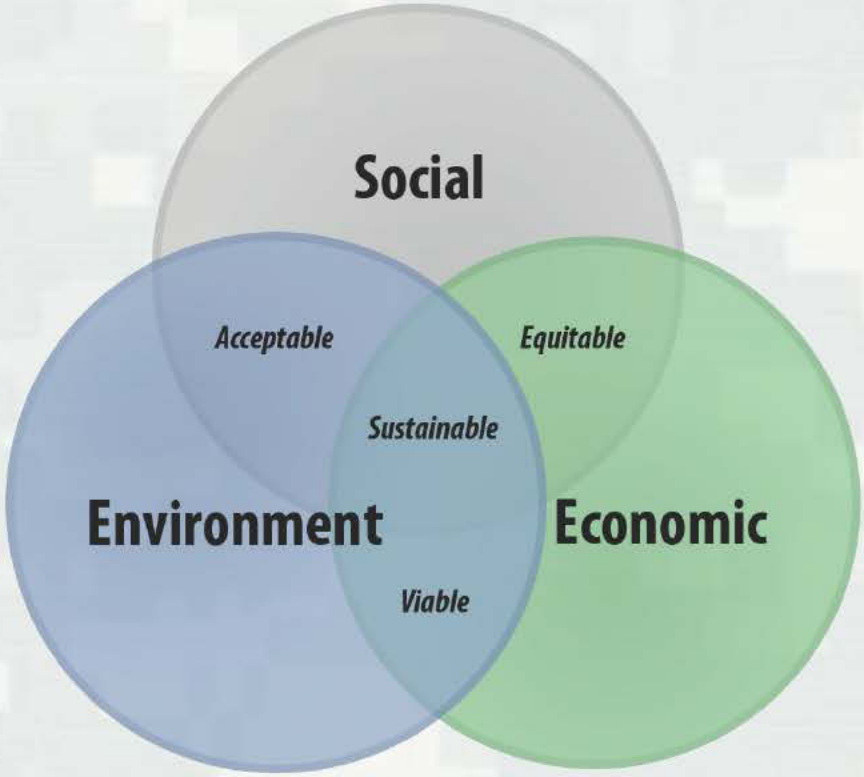


US Army Corps of Engineers
BUILDING STRONG®

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.

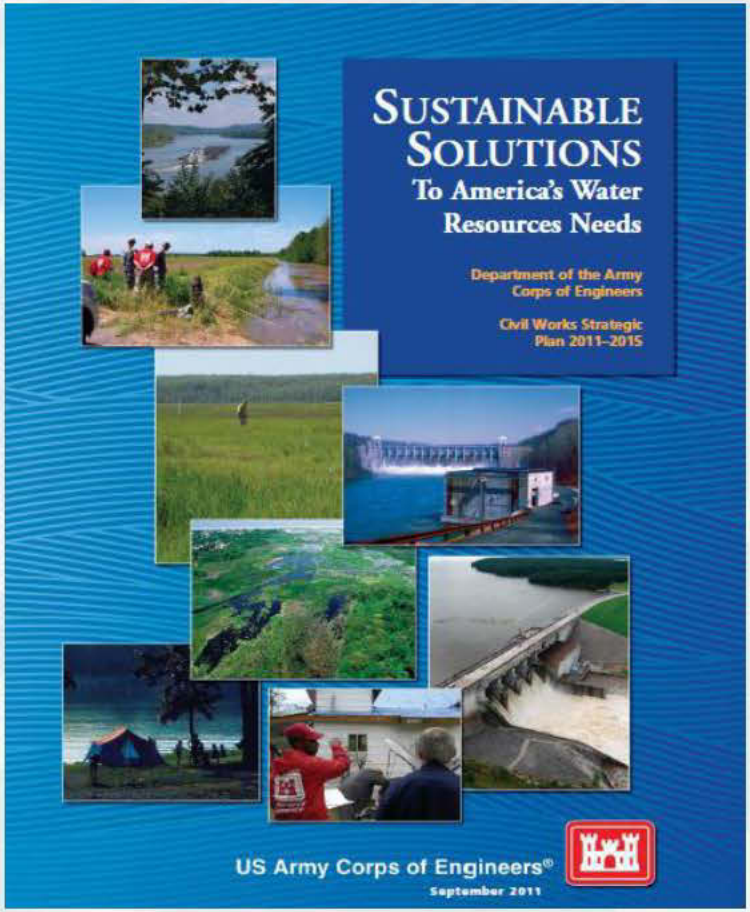


The USACE Civil Works Strategic Plan

Sustainable Solutions to America's Water Resources Needs

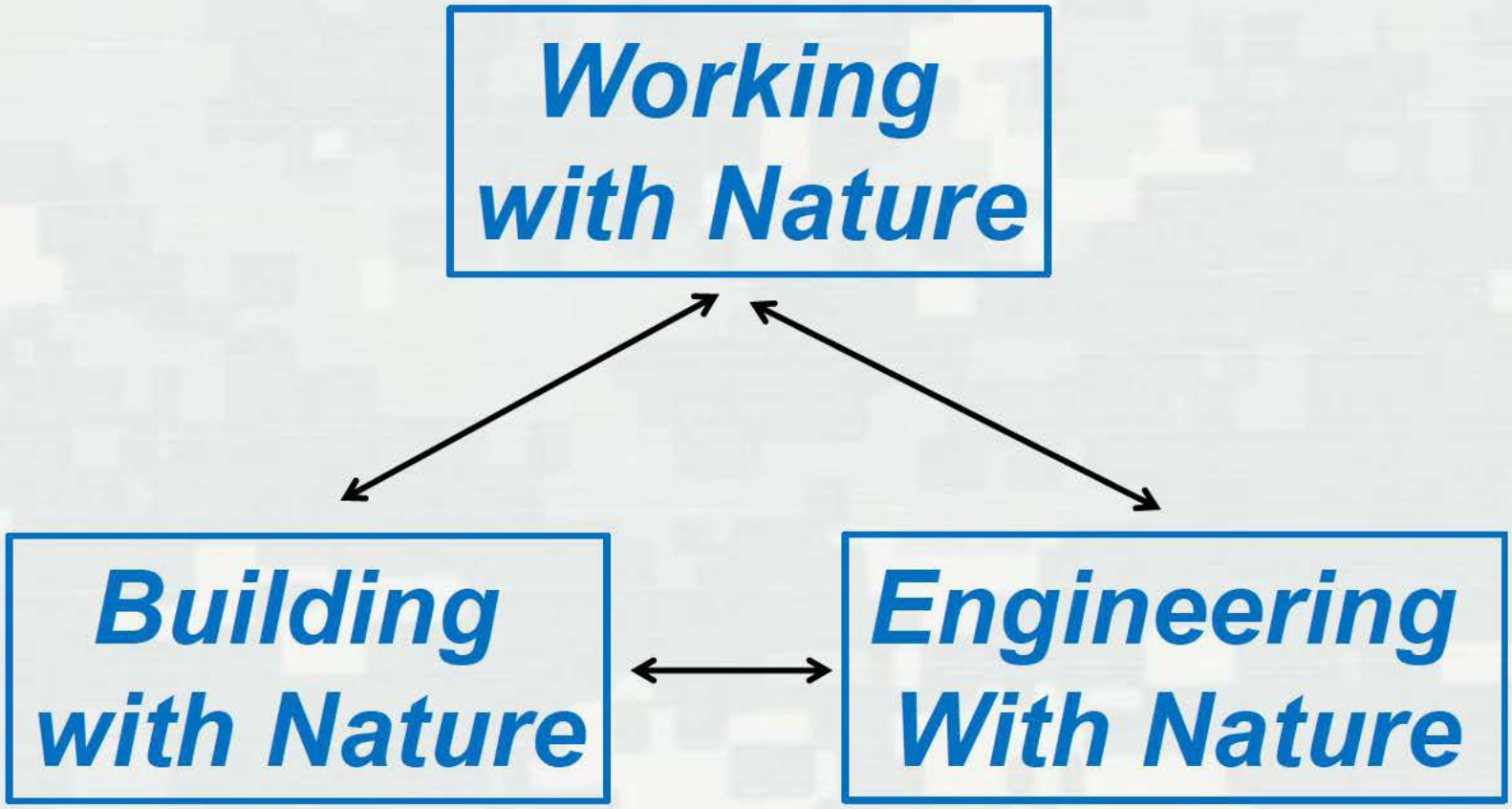
- Vision: "Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges."

- 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.


Working with Nature
Building with Nature
Engineering With Nature

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

Guiding Principles

Engineering With Nature is:

- **Holistic** – an ecosystem approach for planning, designing, constructing and operating projects where social, economic and environmental factors are equitably weighed in the decision- making process.
- **A Systems Approach** – reflecting the reality that USACE projects exist in complex physical and social/cultural systems, and that a single action influences many other parts of the system.
- **Sustainable** – focused on the long-term sustainability and resilience of project solutions and the benefits streams provided by the system over time.
- **Science-based** – built on first understanding, then working deliberately with natural forces and processes to accomplish engineering goals.

Guiding Principles *cont'd*

- **Collaborative** – based on effective partner and stakeholder communication, engagement and collaboration through the entire life cycle of a project, beginning at the earliest conceptual stages.
- **Efficient and cost effective** – reducing time and rework, while minimizing social friction.
- **Socially responsive** – aligned with the values, objectives, interests and priorities of USACE, partners, stakeholders and society at large.
- **Innovative** – embracing new and emerging technologies and incorporating continuous learning, technology transfer and adoption of new and leading practices.
- **Adaptive** – demonstrating adaptive attitudes, structures and processes that enable a living, evolving and sustainable practice.

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.

Engineering With Nature:
The Progression

Inputs and Outputs
'Degree of'

Outcomes

- System Resilience
- Efficiency
- Benefits Related to the Project

Inputs

- Communications and Technology Transfer
- Technical Understanding
- Innovation and Creativity
- Diversity of Skills and Expertise
- Stakeholder Engagement

STAGES

1. Business as Usual
2. Understanding Natural Processes
3. Aligning Processes
4. Expanding Benefits
5. Enabling Self-Sustaining Benefits

EWN

Example EWN Solutions

Upper Mississippi River Training Structures: Chevrons

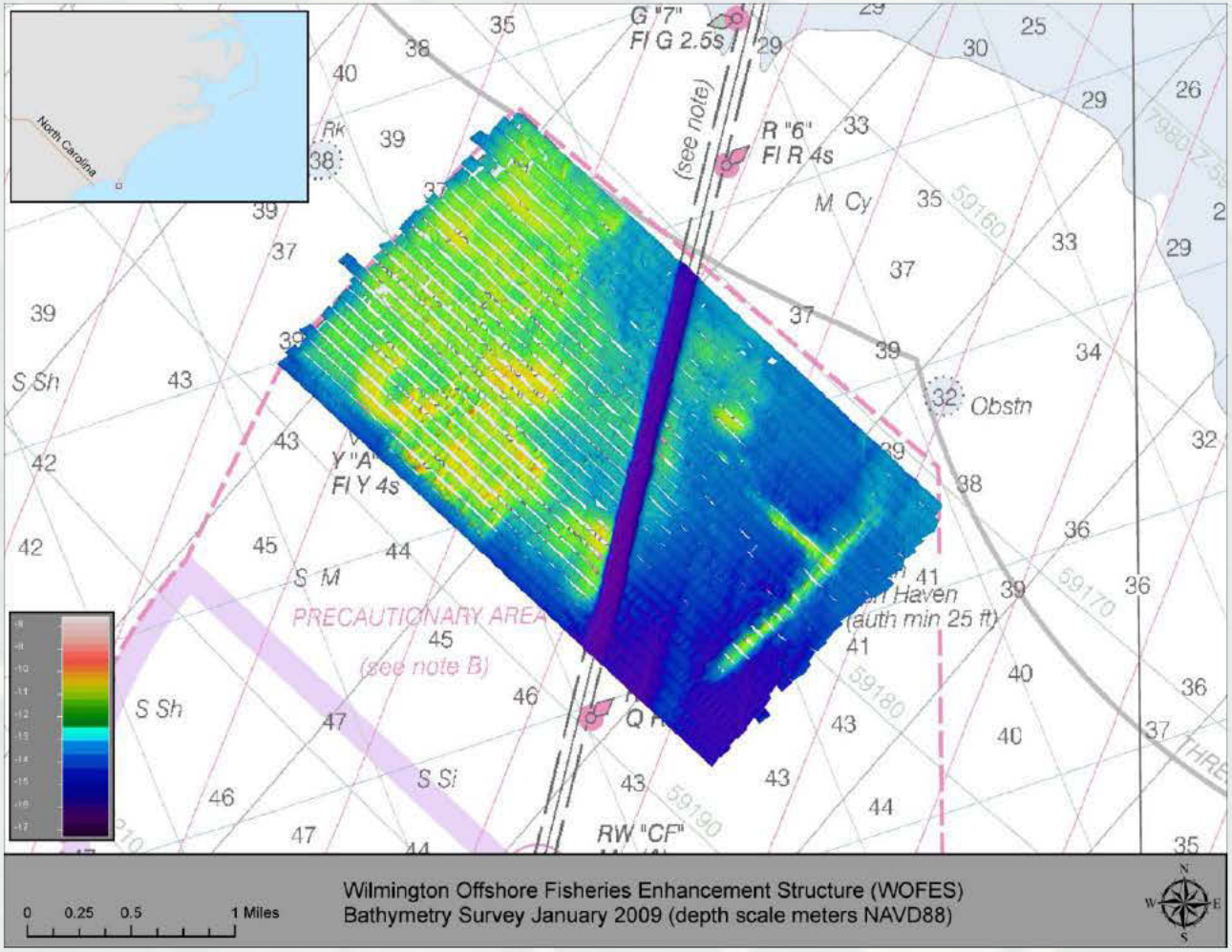
Example EWN Solutions

River Bendway Weirs

Example EWN Solutions

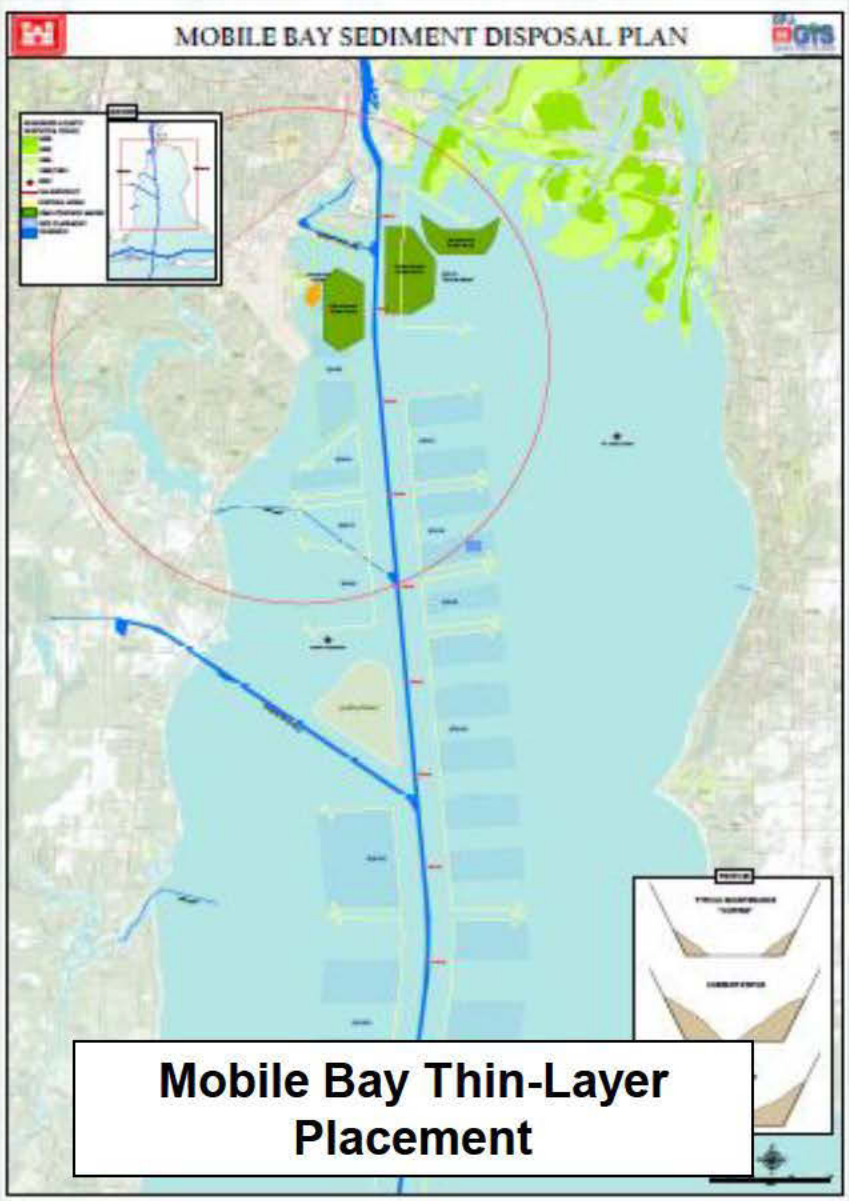
Poplar Island, Chesapeake Bay

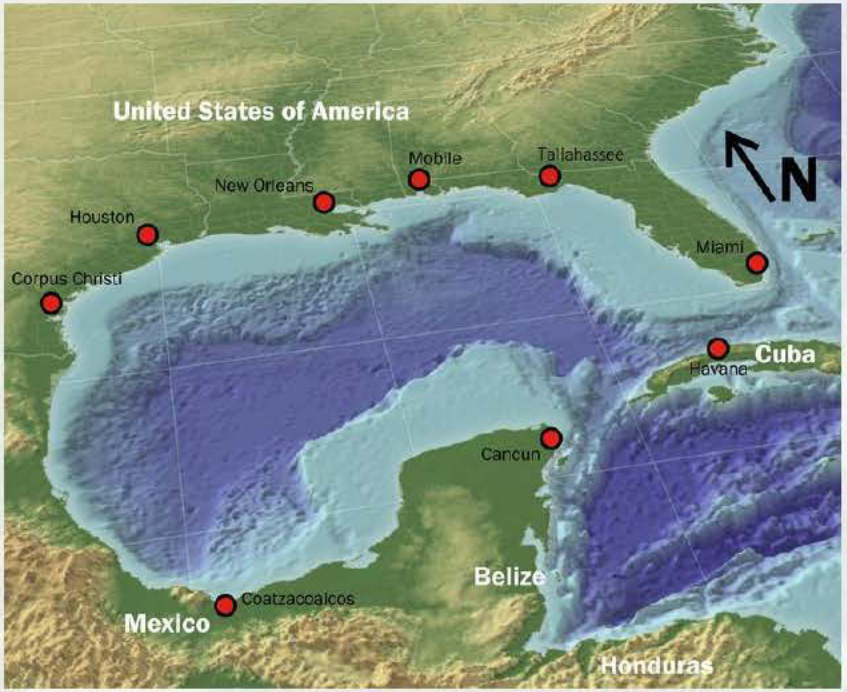
Example EWN Solutions



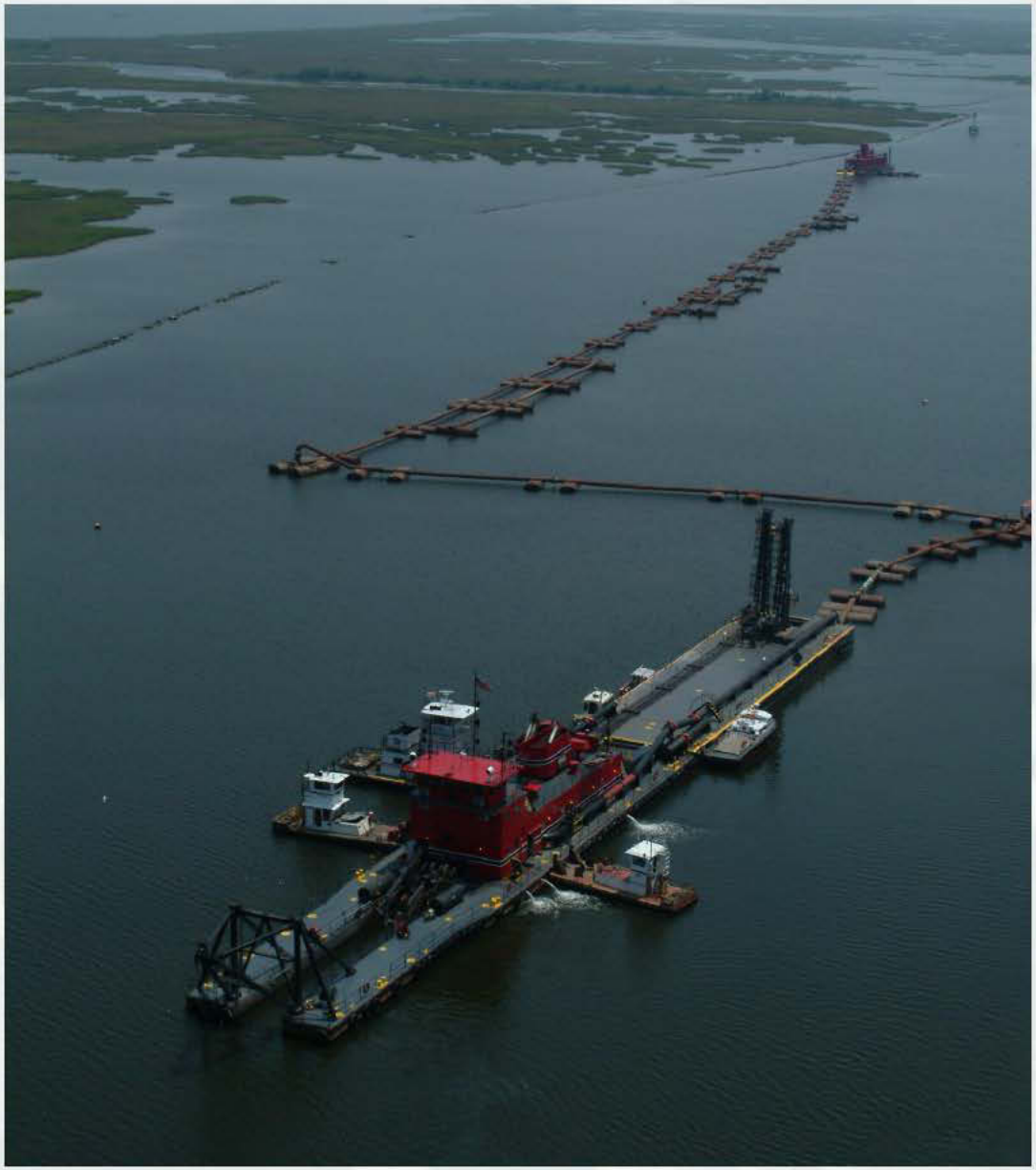
Wilmington Offshore Fisheries Enhancement Structure

Example EWN Solutions





Example EWN Solutions



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

Engineering With Nature

- Smart, efficient engineering practice
- Expand the range of benefits provided through water-based infrastructure
  - Particularly, environmental benefits
- Promote productive, collaborative project dynamics