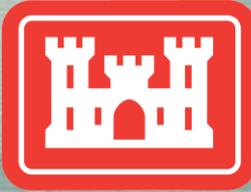


Engineering With Nature

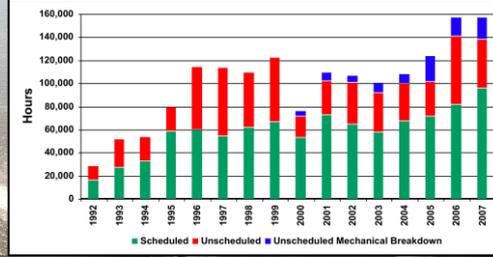


Cynthia J. Banks
Research Biologist
Engineer Research and Development Center

Planning Associates Brief
6 February 2013



US Army Corps of Engineers
BUILDING STRONG



Outline

- USACE Policy
- What is Engineering With Nature (EWN)?
- EWN examples
- Current EWN projects
- Next steps

The USACE Navigation Mission

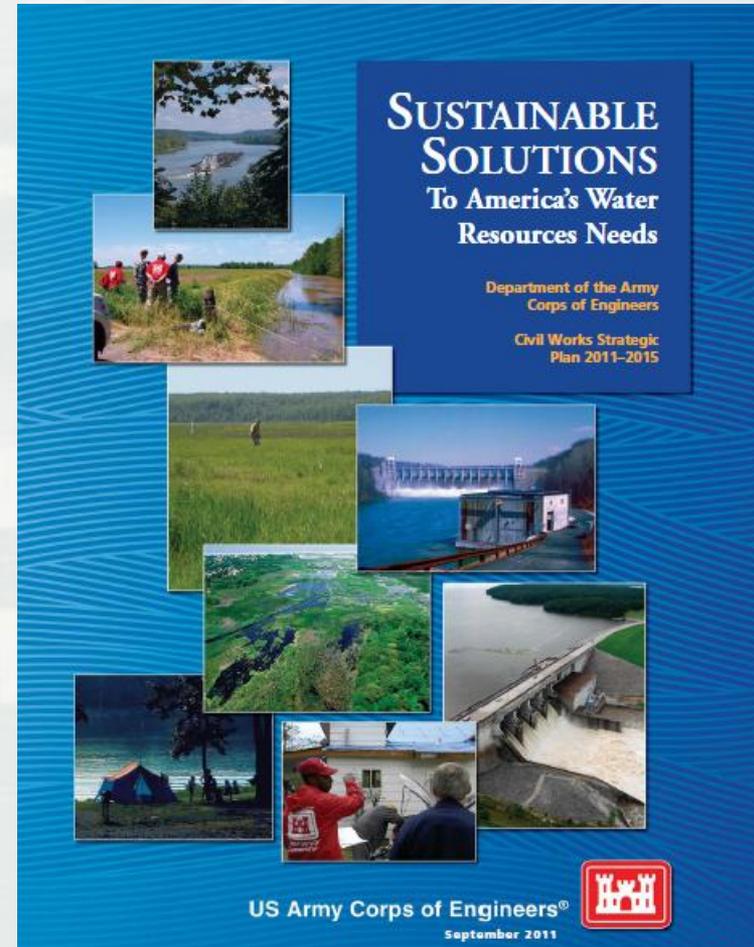
To provide safe, reliable, efficient, effective and **environmentally sustainable** waterborne transportation systems for movement of commerce, national security needs, and recreation



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.



The USACE Campaign Plan

Goal 1. Deliver USACE support to combat, stability, and disaster operations through forward deployed and reach back capabilities

Goal 2. Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders

Goal 3. Deliver innovative, resilient, sustainable solutions to the armed forces and the Nation

Goal 4. Build and cultivate a competent, disciplined, and resilient team, equipped to deliver high quality solutions

Goal 2: Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders.

Objective 2a: Deliver integrated, sustainable, water resources solutions. 

Objective 2b: Implement collaborative approaches to effectively solve water resource problems.

Objective 2c: Implement Streamlined and Transparent Regulatory Processes to Sustain Aquatic Resources.

The USACE Environmental Operating Principles



US Army Corps
of Engineers®

ENVIRONMENTAL OPERATING PRINCIPLES

One Corps Serving The Army and the Nation

Further information is available at: <http://www.usace.army.mil>



Environmental Sustainable Housing Fort Lee, VA

1 Strive to achieve Environmental Sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.



Wetlands at Melvin Price Lock and Dam

2 Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of Corps programs and act accordingly in all appropriate circumstances.



Endangered Whooping Crane Aransas National Wildlife Refuge, Texas

3 Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.



Planting a tree within Mississippi Delta

4 Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.



Listening to the public at Lake Hartwell drought meeting

5 Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work.



Alligator as found in Everglades

6 Build and share an integrated scientific, economic and social knowledge base that supports a greater understanding of the environment and impacts of our work.



Corps labs support research and development in Far East District

7 Respect the views of individuals and groups interested in Corps activities; listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.

Engineer Update
announces
USACE 'reinvigorates'
Environmental
Operating Principles
8/29/2012



The Challenge

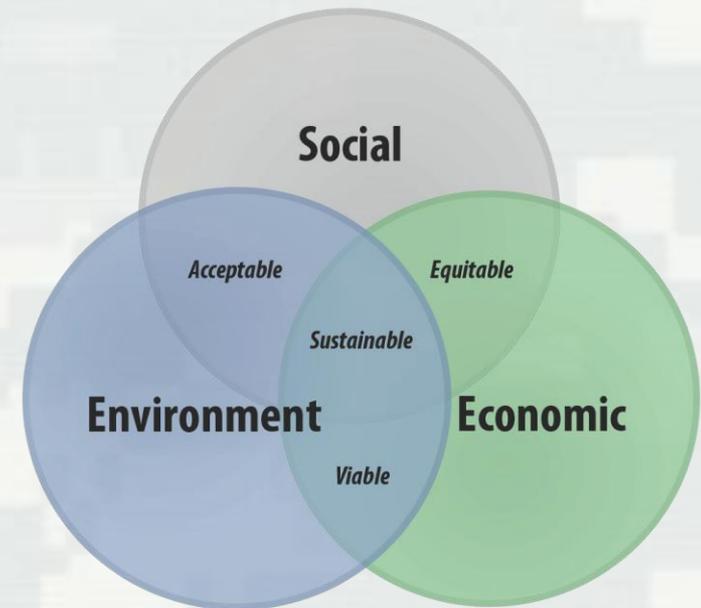
- An efficient, cost effective engineering and operational practices.
- More collaboration and cooperation with our partners and stakeholders.
 - ▶ Ports, commercial interests, regulators, NGOs, and others
- Triple-win outcomes integrating social, environmental and economic objectives = sustainable projects.

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.

Key Ingredients:

- 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



Environmental Enhancement and Navigation Infrastructure (EENI)

- To increase application of environmental sustainability to the design and maintenance activities associated with navigation infrastructure
 - ▶ Webinars
 - ▶ On-line Survey
 - ▶ Telephone Follow-up
 - ▶ Meeting/Conference Presentations
 - ▶ Data Summary
 - ▶ Report



*Dredging Operations and
Environmental Research*

EWN Examples



Upper Mississippi River Training Structures: Chevrons



River Bendway Weirs

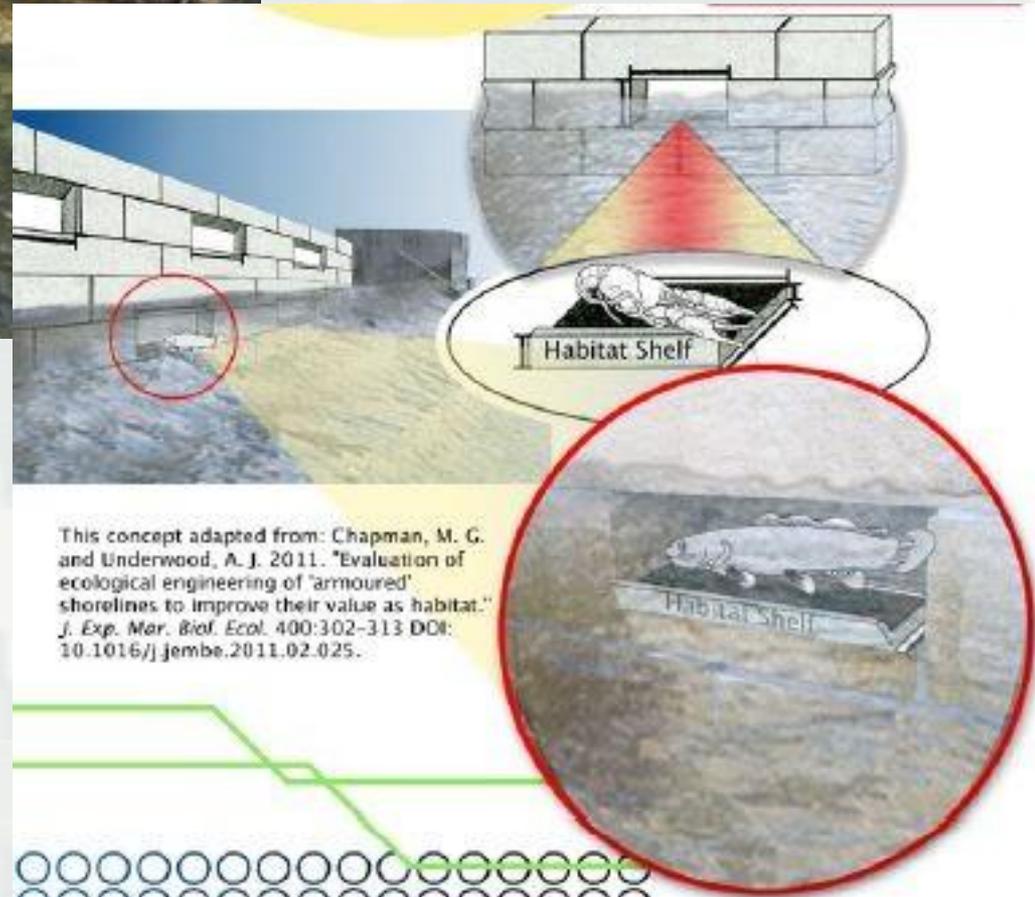


Seawall ½ Flower Pots

Seawall Habitat Shelves

Dr. Mark Browne

<http://youtu.be/iuDmTVHKi40>



EENI Products

ERDC/EL TR-11-7

Environmental Laboratory



US Army Corps
of Engineers®
Engineer Research and
Development Center

Environmental Enhancements and Navigation Infrastructure: A Study of Existing Practices, Innovative Ideas, Impediments, and Research Needs

Thomas J. Fredette, Christy M. Foran, Sandra M. Brasfield,
and Burton C. Suedel

July 2011



Approved for public release; distribution is unlimited.

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Environmental Engineering of Navigation Infrastructure: A Survey of Existing Practices, Challenges, and Potential Opportunities

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ABSTRACT

Navigation infrastructure such as channels, jetties, river training structures, and lock-and-dam facilities are primary components of a safe and efficient water transportation system. Planning for such infrastructure has until recently involved efforts to minimize impacts on the environment through a standardized environmental assessment process. More recently, consistent with environmental sustainability concepts, planners have begun to consider how such projects can also be constructed with environmental enhancements. This study examined the existing institutional conditions within the US Army Corps of Engineers and cooperating federal agencies relative to incorporating environmental enhancements into navigation infrastructure projects. The study sought to (1) investigate institutional attitudes towards the environmental enhancement of navigation infrastructure (EENI) concept, (2) identify potential impediments to implementation and solutions to such impediments, (3) identify existing navigation projects designed with the express intent of enhancing environmental benefit in addition to the primary project purpose, (4) identify innovative ideas for increasing environmental benefits for navigation projects, (5) identify needs for additional technical information or research, and (6) identify laws, regulations, and policies that both support and hinder such design features. The principal investigation tool was an Internet-based survey with 53 questions. The survey captured a wide range of perspectives on the EENI concept including ideas, concerns, research needs, and relevant laws and policies. Study recommendations included further promotion of the concept of EENI to planners and designers, initiation of pilot studies on some of the innovative ideas provided through the survey, and interagency agreements to facilitate implementation. Integr Environ Assess Manag

Jetties Breakwaters Sustainability Lock and dam

Environmental Policy & Regulation



ERDC TN-DOER-R16
June 2011

Environmental Enhancements and Navigation Infrastructure: Existing Practices, Innovative Ideas, and Research Needs

by Thomas J. Fredette, Christy M. Foran, Sandra M. Brasfield,
and Burton C. Suedel

PURPOSE: The concept that navigation infrastructure can serve as valuable habitat is not novel. However, the concept of designing navigation infrastructure with the specific intent of accomplishing both the engineering goal and specific environmental goals is, in most instances, a new idea for many planners and designers. The inclusion of environmental enhancements in navigation infrastructure represents both opportunities and challenges for project managers. The purpose of this document is to present an overview of the advantages, while addressing some of the implementation challenges, as seen by the current planning and engineering contingents. This study sought to (1) identify existing and potential navigation project features that were designed with the express intent of enhancing environmental benefit, (2) identify laws, regulations, and policies (formulation boundaries) that both support and hinder such design features; (3) identify opportunities for increasing environmental benefits for navigation projects within existing formulation boundaries; (4) propose potential changes to formulation boundaries that would further increase opportunities for environmental benefits; and (5) identify potential areas where research may increase the opportunity to integrate environmental features into future projects.



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The US Army Corps of Engineers (USACE) has responsibility for an extensive coastal, intra-coastal, and inland navigation system with over 19,000 km of navigation channel, 195 navigation locks, and hundreds of jetties, breakwaters, and anchorages. For example, the New England District alone has over 130 breakwaters and jetties with a total length of over 60 km, over 800 hectares of anchorage, and over 750 km of channel. In addition to maintenance and replacement of existing structures, the USACE is also tasked with building new infrastructure on an ongoing basis. As a consequence, applying an environmental sustainability paradigm during the planning for new infrastructure or maintenance of existing infrastructure could result in substantial benefits for ecosystem services where the concept is applied. It is also important to recognize, however, that the USACE is a very large organization and that its activities are governed by a complex set of environmental and fiscal laws, regulations, and policies. Paradigm shifts must contend with such realities. Accordingly, this study was designed to examine the existing institutional conditions within the USACE and cooperating federal agencies relative to incorporating environmental enhancements into navigation infrastructure projects. The study sought to (1) investigate institutional attitudes towards the environmental enhancement of navigation infrastructure (EENI) concept, (2) identify potential impediments to implementation and solutions to such impediments, (3) identify existing navigation projects designed with the express

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EWN Mapping Project

The screenshot displays the EWN Mapping Project web application. At the top, a dark banner features the ERDC logo on the left, the text "USACE Engineering With Nature A Look At Global Engineering With Nature Sites" in the center, and the EWN logo on the right. Below the banner is a satellite map of the United States with numerous small icons representing different engineering sites. A "Map Widget" is open on the left side, showing a search bar and a list of site types with corresponding icons: Dike, Breakwater, Groin, Beach, Chevron, Reef, Island, Wetland, Revetment, Jetty, and Pier/Wharf. A "Clear" button is at the bottom of the list. The map includes a scale bar at the bottom left (1000 km and 1000 mi) and the "bing" logo. The bottom right corner features the "POWERED BY esri" logo.

USEPA Great Lakes Restoration Initiative (GLRI) Breakwater Ecosystem Improvement Study

- To evaluate opportunities for enhancing aquatic ecosystem benefits at existing breakwaters and navigation structures
- During routine repairs and maintenance, as part of modifications, or during comprehensive structural repairs and replacements
- Concept extends to shore protection structures, non-USACE structures

Cleveland Harbor Pilot Project

- Cleveland Harbor East Arrowhead Breakwater was identified as a coastal structure with critical repair needs located in an Area Of Concern
- The project will involve:
 - ▶ Breakwater habitat creation by providing submerged habitat boxes/shelves
 - ▶ Surface texture modifications
 - Protected indented shelf
 - Dimpled block surface
 - Grooved block surface



Environmentally
Enhanced
Breakwater
Toe Blocks

Monitoring Photos



April 2012



June 2012



**Toe block with
horizontal groove
(August 2012)**



Sampler Design

GLRI Products

Opportunities for Environmental Enhancements

Making Great Lakes Coastal Structures **Greener**

BUILDING STRONG.
U.S. Army Corps of Engineers • Engineer Research and Development Center • Environmental Laboratory
U.S. Environmental Protection Agency
Great Lakes Restoration Initiative

Designing breakwaters, piers/jetties, seawalls and revetments to provide life-promoting habitat

The cover features a green and black color scheme with a grid pattern. It includes a map of the Great Lakes, a photograph of a construction site with a crane, and illustrations of various aquatic and coastal organisms like a crab, a snail, a frog, a bird, and a fish.

Inland Port
2011 Issue VI

USACE Promotes Environmental Sustainability

**Panama Canal Impact Projections
Inland Ports Must Promote Trade with Mexico
PIANC and IRPT Conference Wraps**

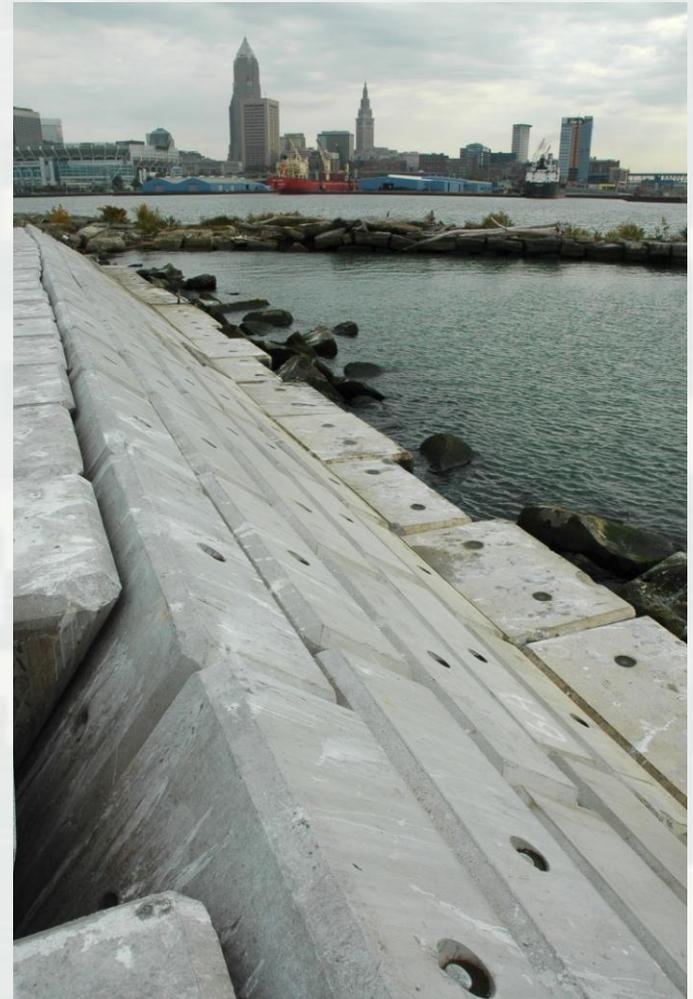
The cover features a photograph of a large yellow and black ship named 'MCFARLAND' on a body of water. The text is overlaid on the image in white and orange.

Current Status

- *Engineering With Nature* initiative was started by USACE Navigation program in 2010. Over that period we have:
 - ▶ Engaged USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
 - Workshops (9), dialogue sessions, project development teams, etc.
 - ▶ Developed a strategic plan for the initiative
 - ▶ Initiated research to support the intent of EWN
 - ▶ Implementing our communication plan

Engineering With Nature Path Forward

- Expands the range of benefits provided through water-based infrastructure
 - ▶ “Doing more with less”
- Balancing consideration of environmental risks with **benefits**
- Leads to more sustainable projects



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