

# Analysis and Overview of Existing Navigation and Coastal *Engineering With Nature* Projects

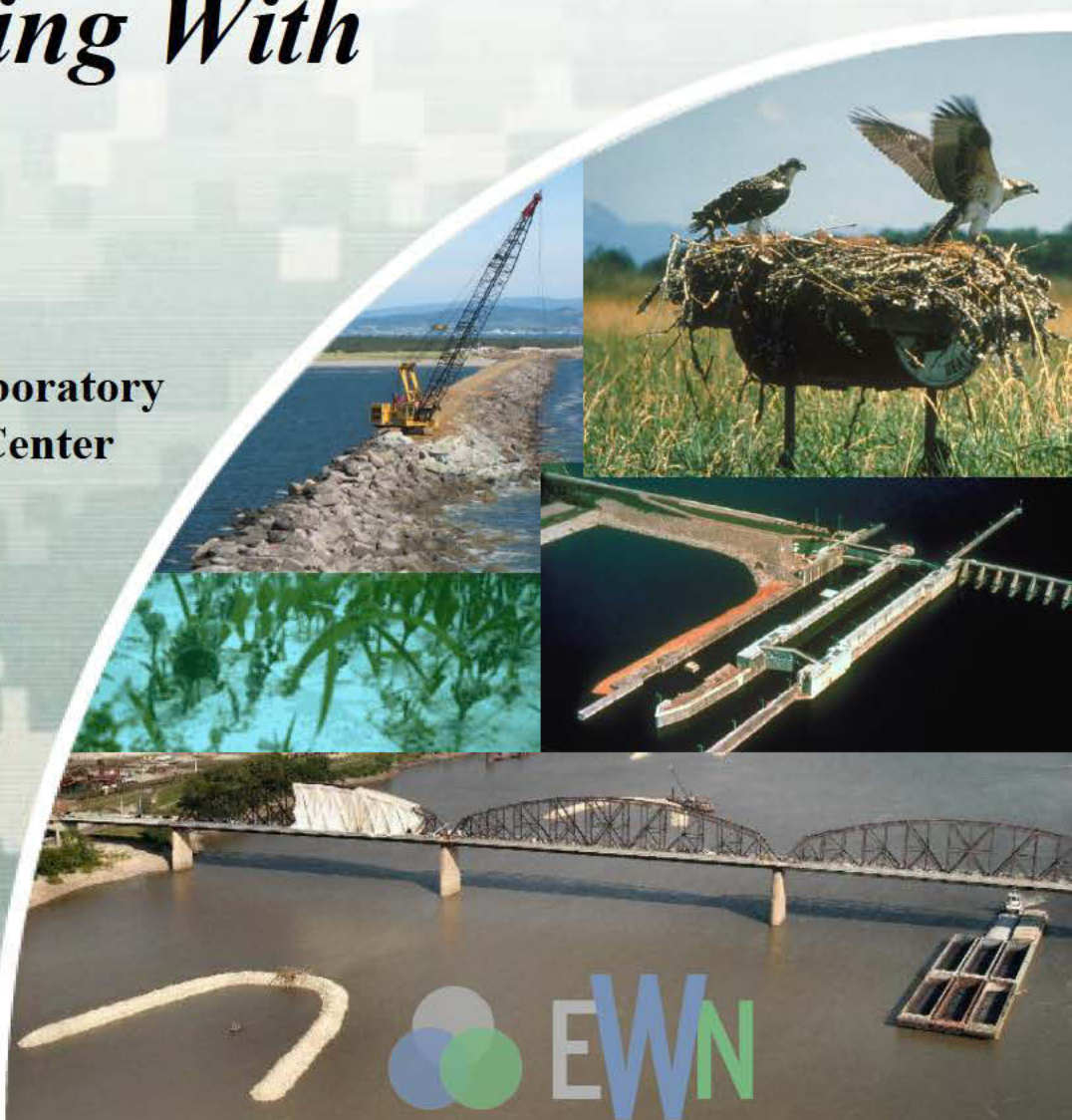
**ERDC**  
Engineer Research and  
Development Center

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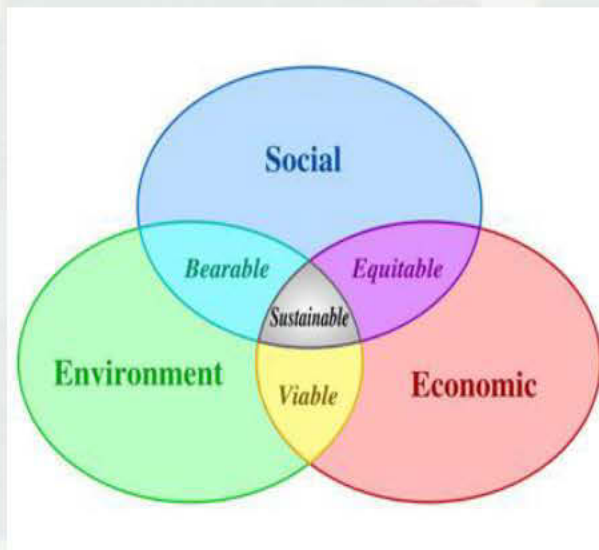


US Army Corps of Engineers  
**BUILDING STRONG**



# Definition

*Engineering With Nature* is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits associated with water resources projects.



# EWN Poster Child The Chevron



# Historical River Training Methodology



# Chevrons as Alternative to Dike Extensions



# Notched Chevron River Flow and Sediment Bed Behavior

Center section of  
chevron at lower  
elevation (e.g., notched)

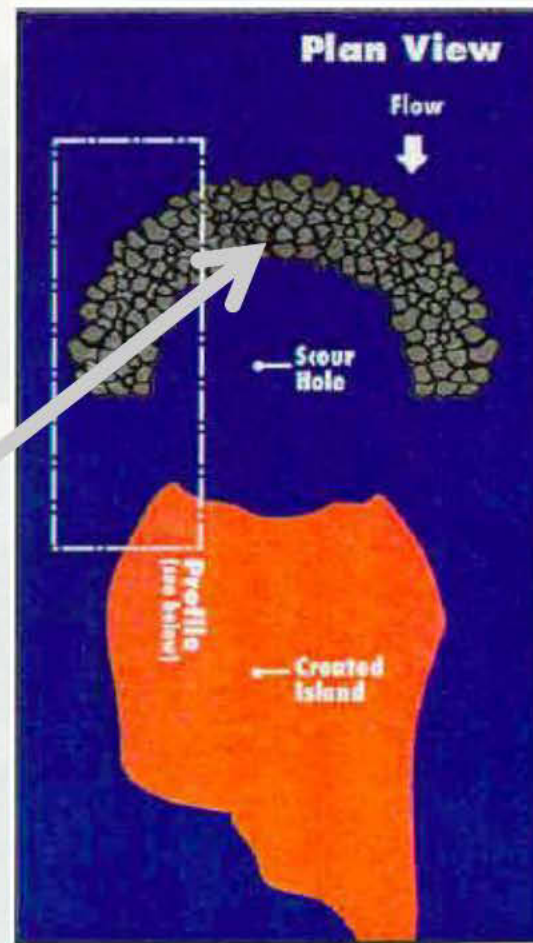


Figure 5.10. Blunt Nosed Chevron

# Comparison of Environmental Project Types

Criteria	EWN	Mitigation	Restoration
Extent to which natural processes are used to produce benefits and outcomes	★	★	★
Extent to which the project and its configuration broaden the base of benefits provided (economic, social, and environmental)	★		★
Extent to which the project makes use of collaborative processes to organize and focus interests, stakeholders, and partners	★		★
Extent to which the project produces and makes use of efficiencies to contribute to sustainable delivery of project benefits, including consideration of how the project function is sustainable in the broader systematic context (e.g., regional watershed or sediment systems)	★	★	★
Extent to which the added benefits are incorporated in association with (but not as mitigation for) construction or maintenance of civil works infrastructure	★		

# EWN Opportunities/Existing Examples?





# Identify Examples

## Collect Documentation

### Evaluate Against Criteria



# Reef Habitat Breakwaters, Pensacola, FL



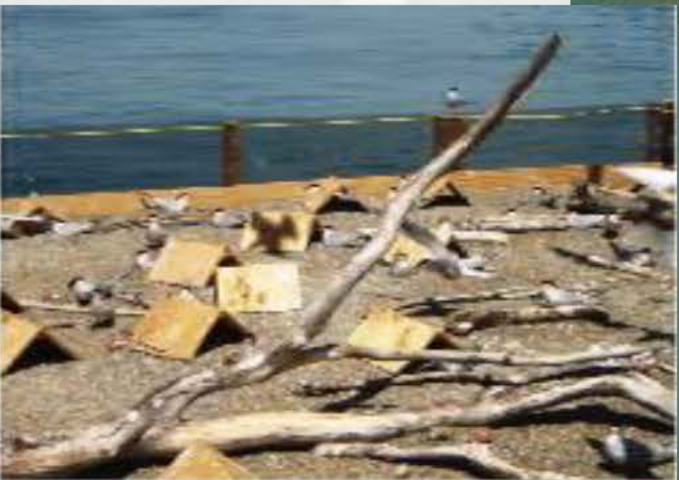
# South Bay Marina



- Spur jetties to create marsh and protected shallows.
- Fish spawning stones incorporated into design.

# Tern Nesting Habitat

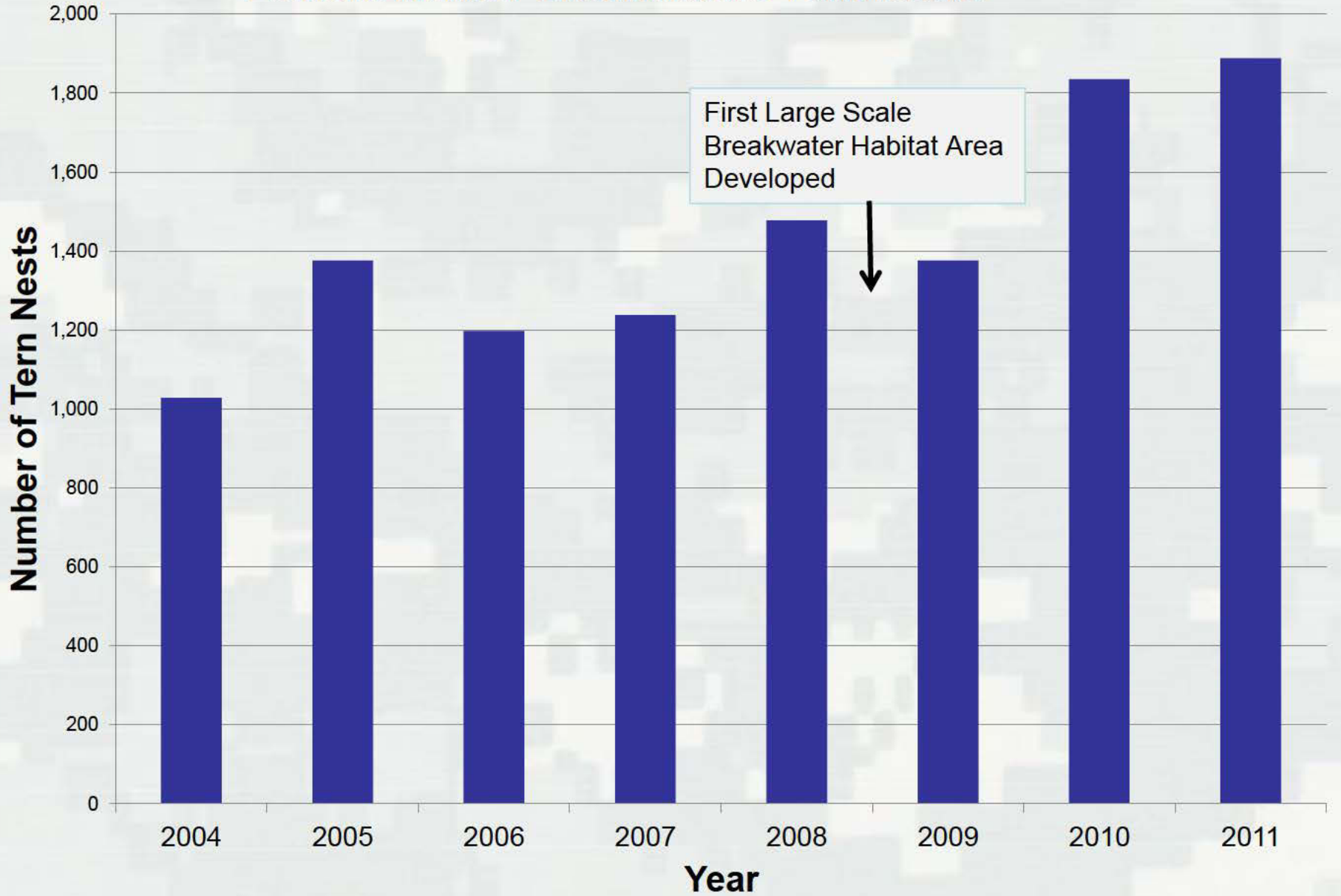
## New York Power Authority – Buffalo, NY



**NYPA  
Tern  
Nesting  
Habitat**

See <http://niagara.nypa.gov/EcologicalStandingCommittee/EcoStanddefault.htm>

# Buffalo Harbor Breakwaters Tern Nests



# East River Osprey Nest Platform, Buffalo, NY



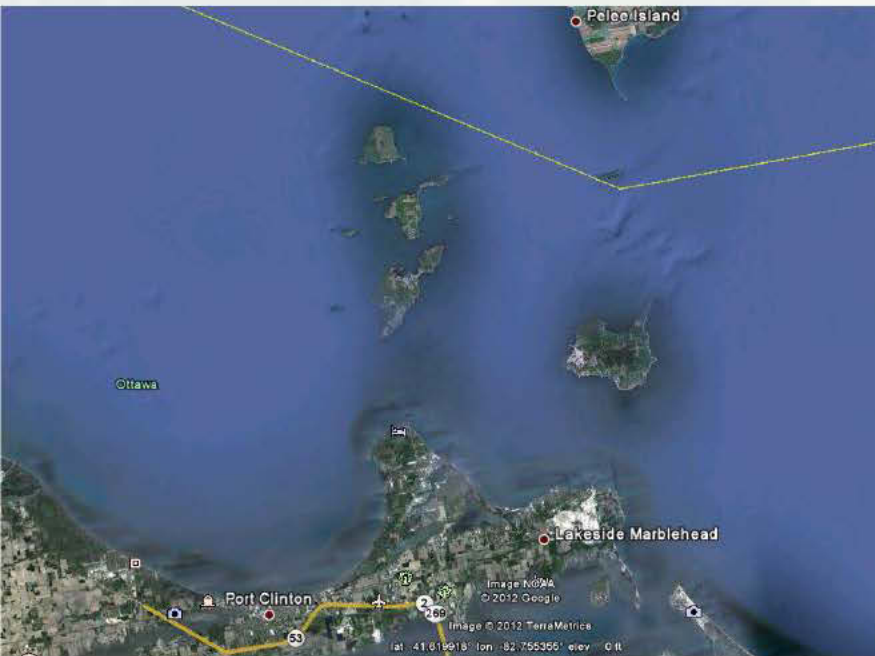
**New York Power  
Authority**



<http://niagara.nypa.gov/EcologicalStandingCommittee/EcoStanddefault.htm>

# Lake Erie Watersnake Recovery Plan

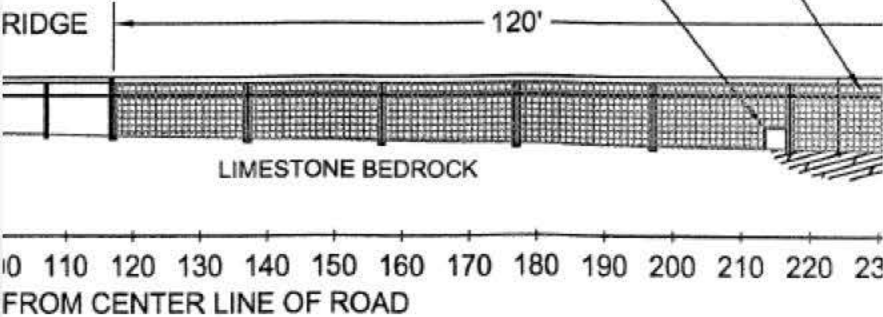
(*Nerodia sipedon insularum*)



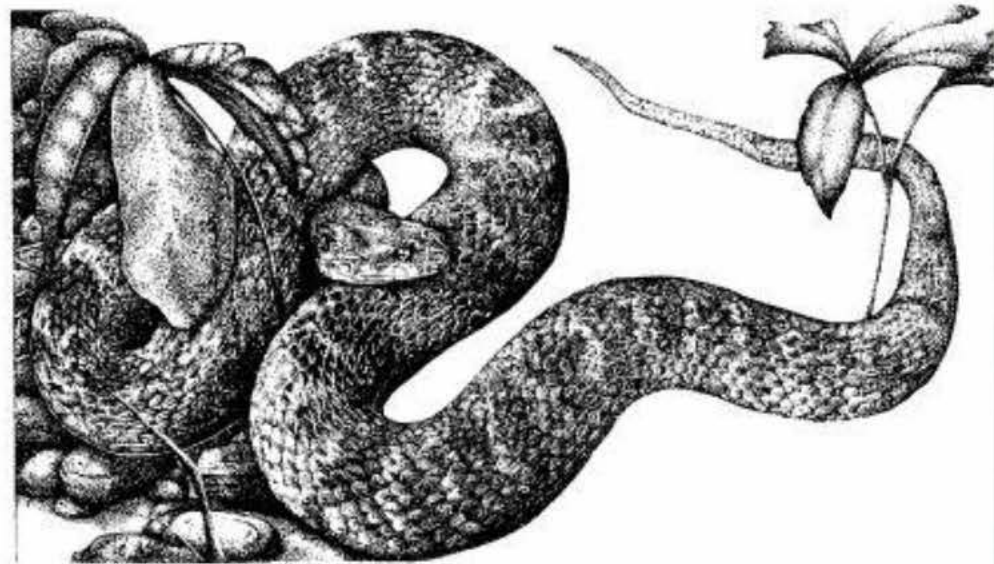
JUST A TRACE  
S WITH  
ES AND  
LIMESTONE

20' X 13' ROCK FILLED  
STEEL CRIB MODULES  
CONNECTED TOGETHER

3' X 3' FRAMED OPENING  
THROUGH DOCK TO ALLOW  
FLOW THROUGH



**PROFILE A-A**



September 2003

# Seattle, WA Seawall Study

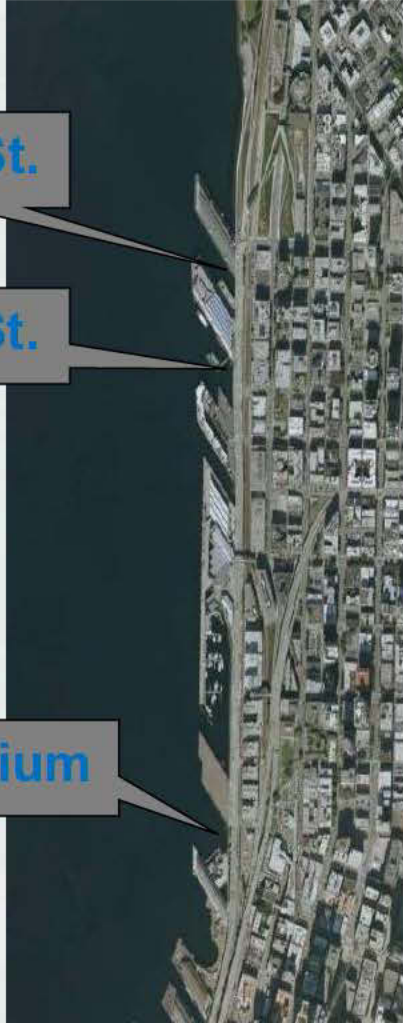
<https://sites.google.com/a/uw.edu/seattle-seawall-project/home>

## 3 Sites

Clay St.

Vine St.

Aquarium



3 panel designs, each with 2 surface treatments;  
plus Reference and Control





# EWN Data Viewer





# USACE Engineering With Nature A Look At Global Engineering With Nature Sites



Map Widget

Edit Widget

Help Page

## Map Widget

Clear

Search for EWN site name



Dike



Breakwater

PPO



Groin

PPT



Beach



Chevron

PEG



Reef

SEG



Island

TEG



Wetland



Revetment



Jetty



Default



Pier/Wharf





# USACE Engineering With Nature A Look At Global Engineering With Nature Sites



Map Widget

Edit Widget

Help Page

**Map Widget**

Clear

Fish Habitat

Invertebrate Habitat

**PPO**  **Bird Habitat**

**PPT**  Beach Nourishment

Plant Habitat

**PEG**  Default

**SEG**  Reptile Habitat

**TEG**





# USACE Engineering With Nature A Look At Global Engineering With Nature Sites



[Map Widget](#) [Edit Widget](#) [Help Page](#)

**Site Name:** Dauphin Island Wave Attenuation Devices

**Site Manager:** University of Alabama Dauphin Island

**PPO Type:** Shore Defense

**PPT Type:** Breakwater

**PEG Type:** Fish Habitat

**SEG Type:** Invertebrate Habitat

**TEG Type:** Default

Site: Dauphin Island Wave Attenuation Devices

bing. **Bienville Blvd**

50 m

200 ft

Bienville Blvd

2

Mobile Bay Ferry Dauphin Island

Mobile Bay

POWERED BY  
**esri**

# EWN 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



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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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## 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 (EEN) 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 benefits 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 51 questions. The survey captured a wide range of perspectives on the EEN concept including ideas, concerns, research needs, and relevant laws and policies. Study recommendations included further promotion of the concept of EEN 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

The US Army Corps of Engineers (USACE) has responsibility for an extensive coastal, intracoastal, and inland navigation system with over 19,000 km of navigation channel, 193 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, regulation, 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 (EEN) concept, (2) identify potential impediments to implementation and solutions to such impediments, (3) identify existing navigation projects designed with the express

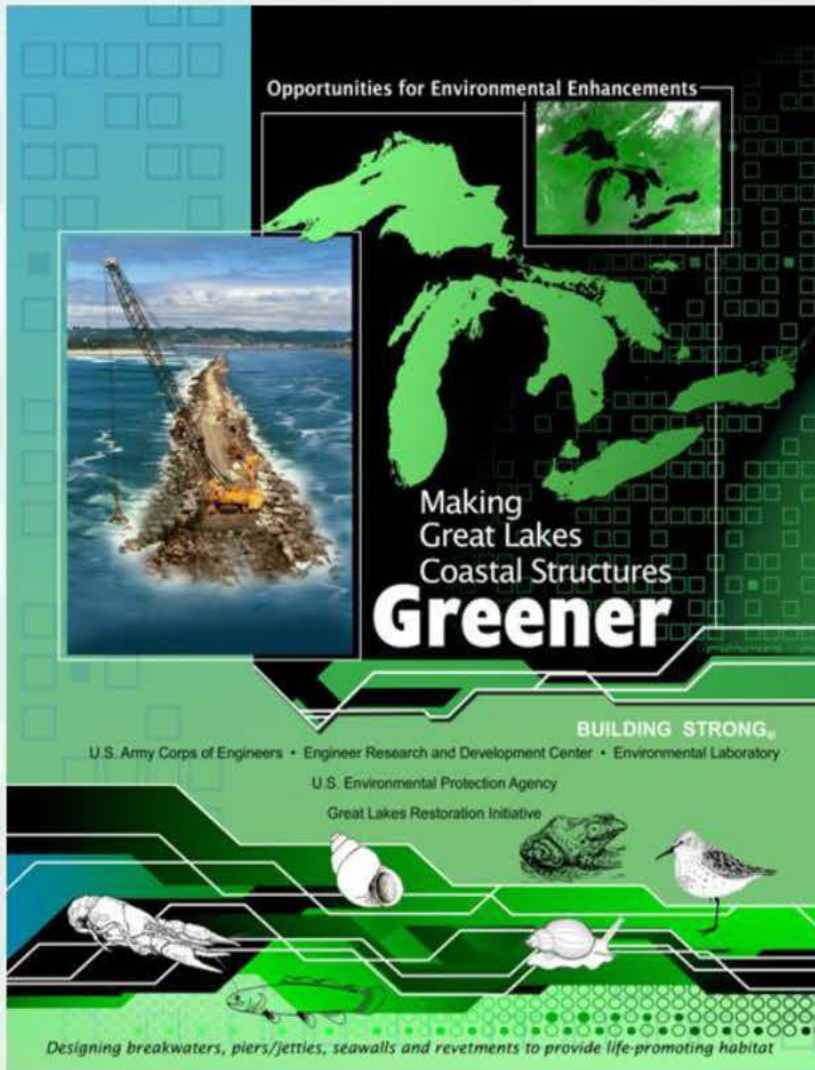
Integr

Environmental Policy & Regulation

<http://el.erdcl.usace.army.mil/elpubs/pdf/trel11-07.pdf>

<http://el.erdcl.usace.army.mil/elpubs/pdf/doerr16.pdf>

# EWN-Related GLRI Products



<http://el.ercdc.usace.army.mil/dots/doer/pdf/GLGB-Booklet.pdf>

<http://el.ercdc.usace.army.mil/dots/doer/pdf/InlandPort-USACEEnvSustainability.pdf>

# Path Forward

<b>EWN Issues</b>	<b>Potential Solutions</b>
Complication of Future Maintenance	Interagency Agreements
Cost Sharing	Section 1135, 206, 107
Compromising Primary Function	Pilot Studies, Modeling
Agency Priority	Agency Goals & Visible Support from Top
Technical Support Basis	<b><i>Pilot Studies</i></b> <b><i>Success Documentation</i></b>

