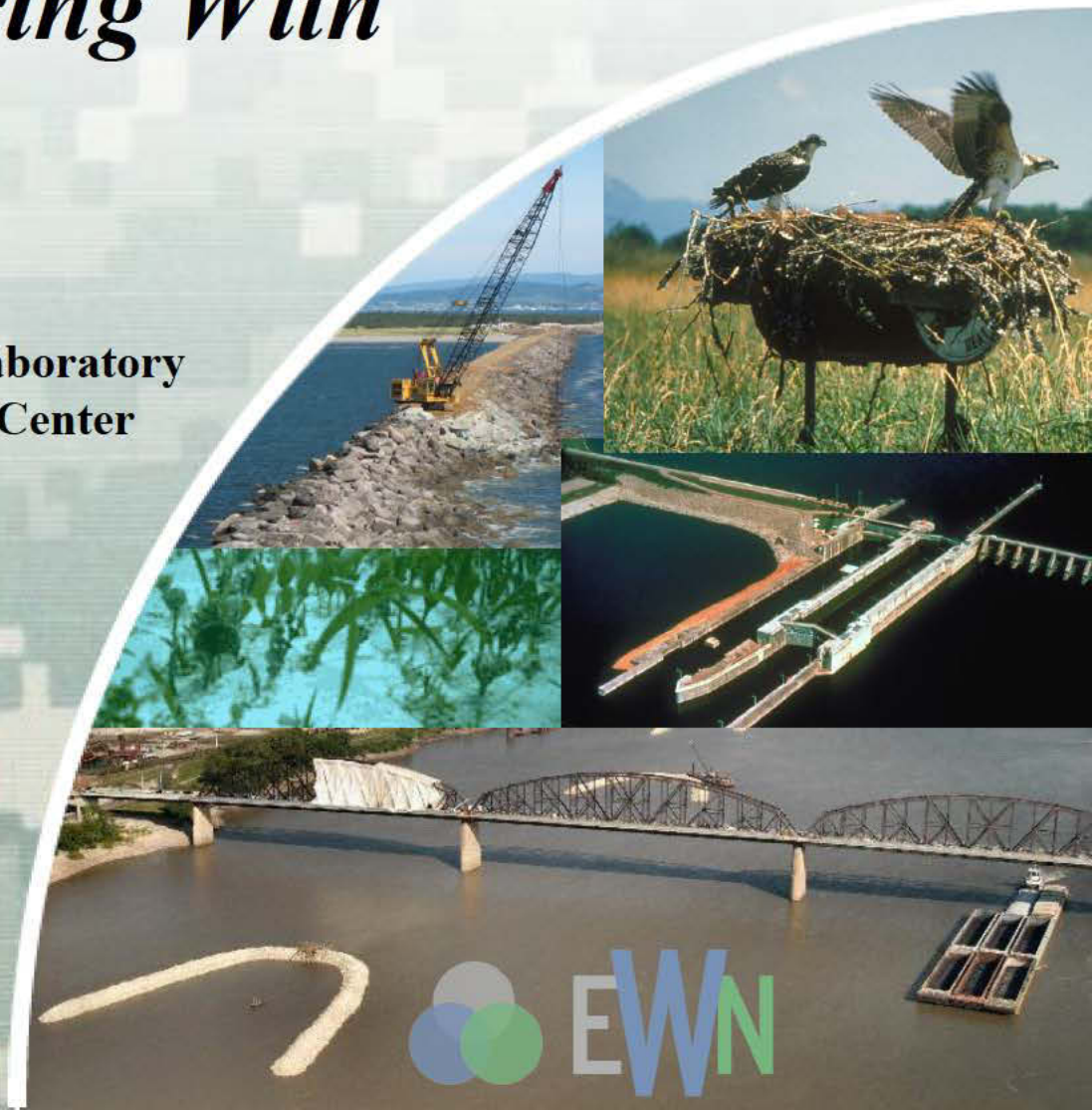
Analysis and Overview of Existing Navigation and Coastal *Engineering With Nature* Projects

ERDC
Engineer Research and Development Center

Thomas J. Fredette, PhD
Research Biologist, Environmental Laboratory
Engineer Research and Development Center

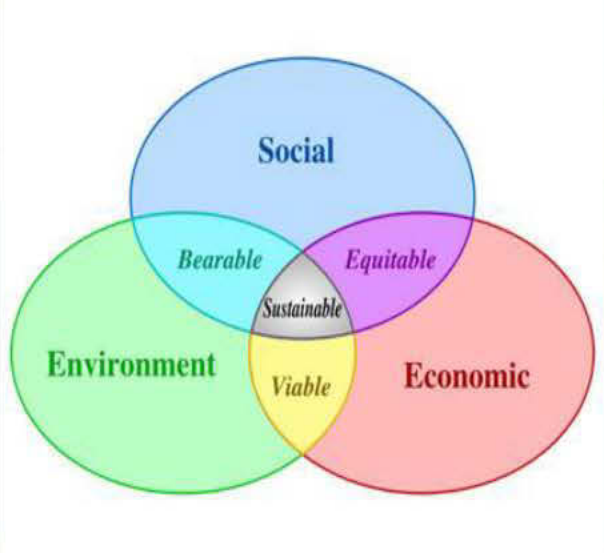
and
Burton C. Suedel, PhD
Cynthia J. Banks
Austin V. Davis



US Army Corps of Engineers
BUILDING STRONG®

Definition

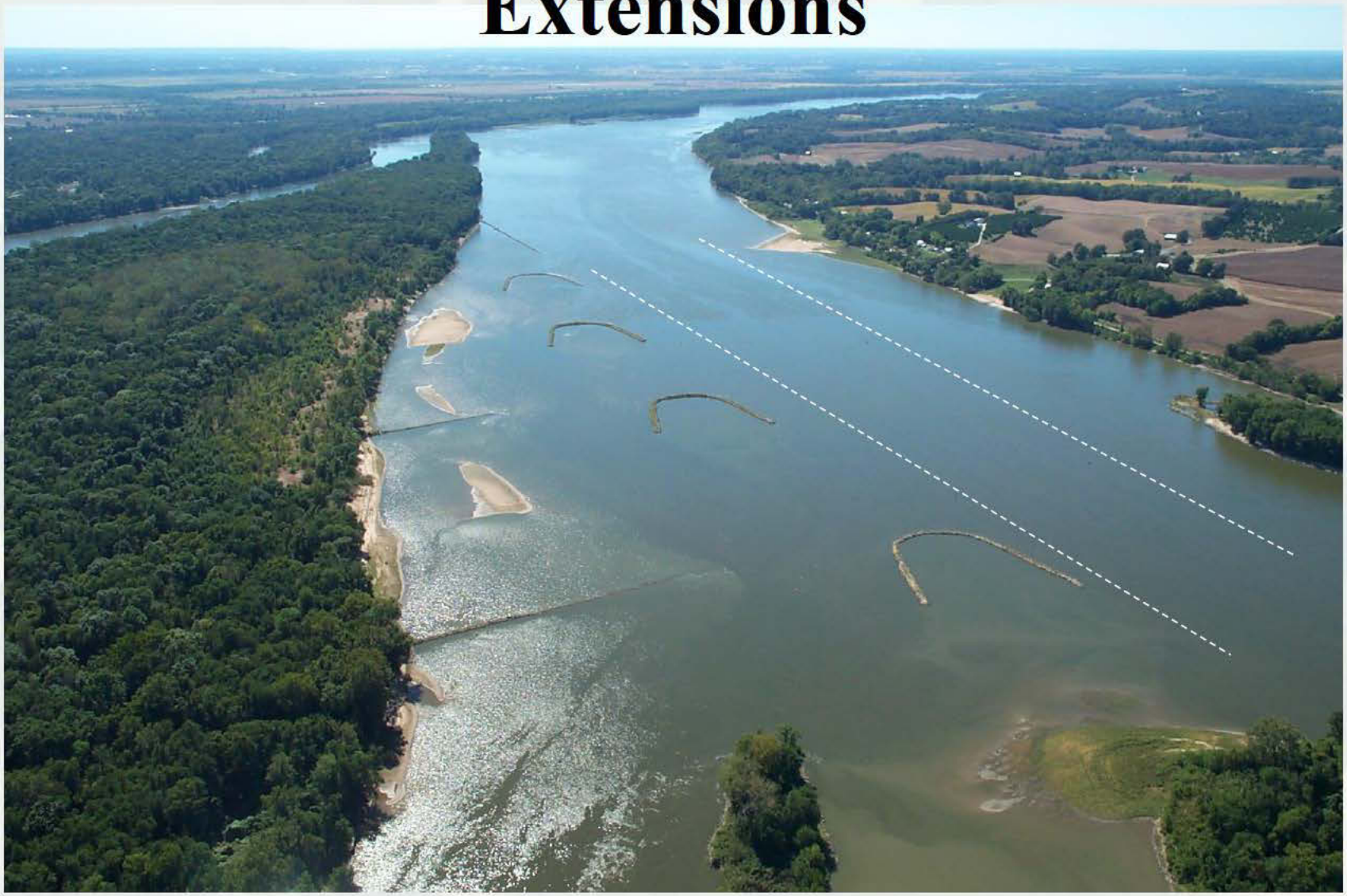
Engineering With Nature is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits associated with water resources projects.



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)

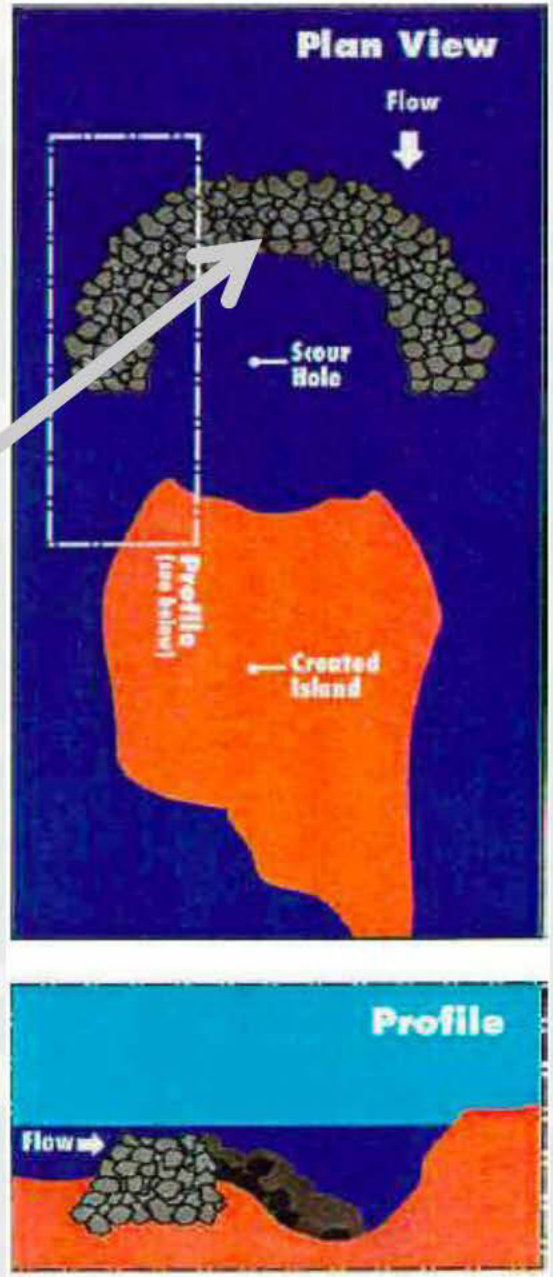
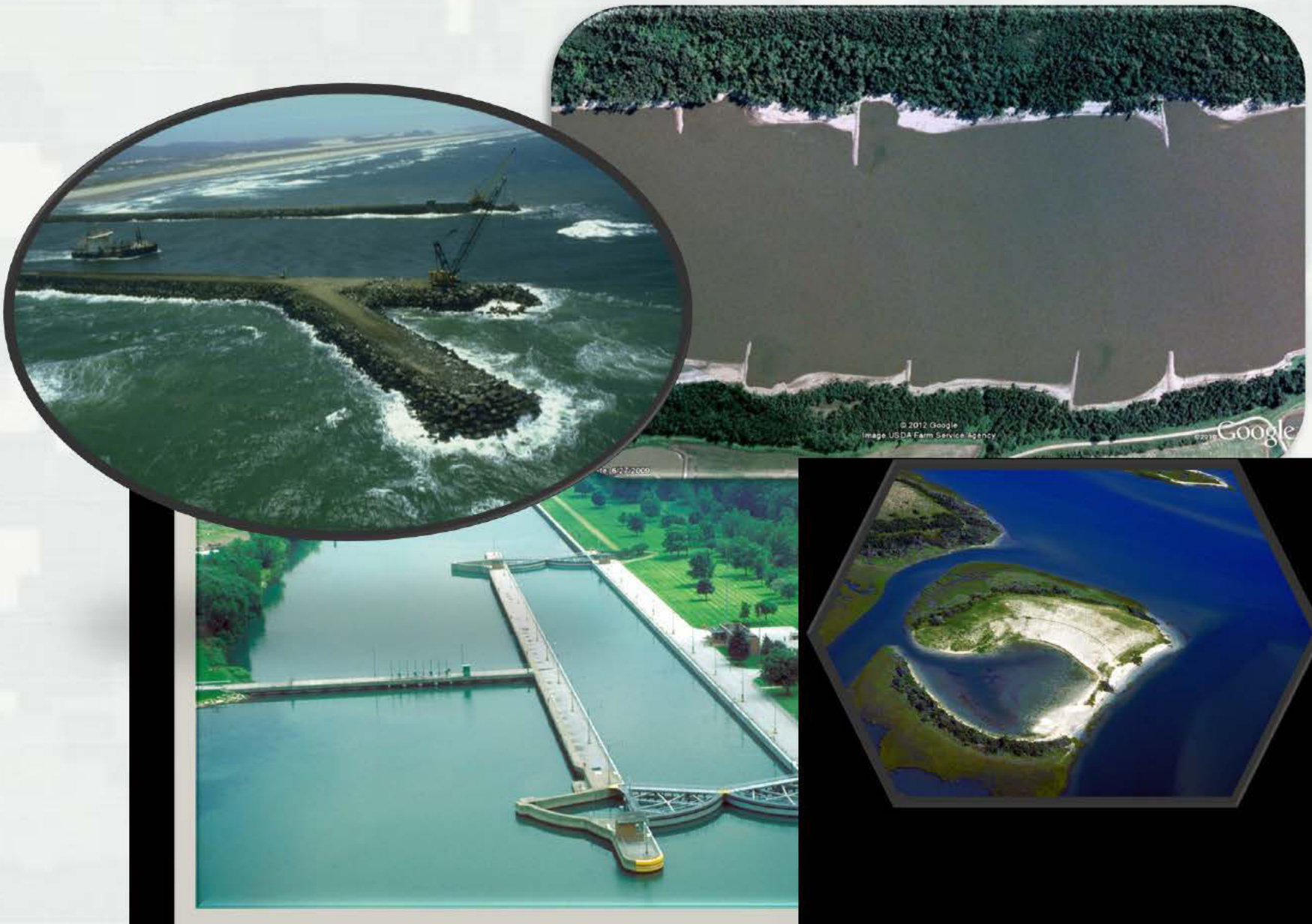


Figure 5.10. Blunt Nosed Chevron

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	★		

Opportunities/Existing Examples?



Identify Examples
Collect Documentation
Evaluate Against Criteria

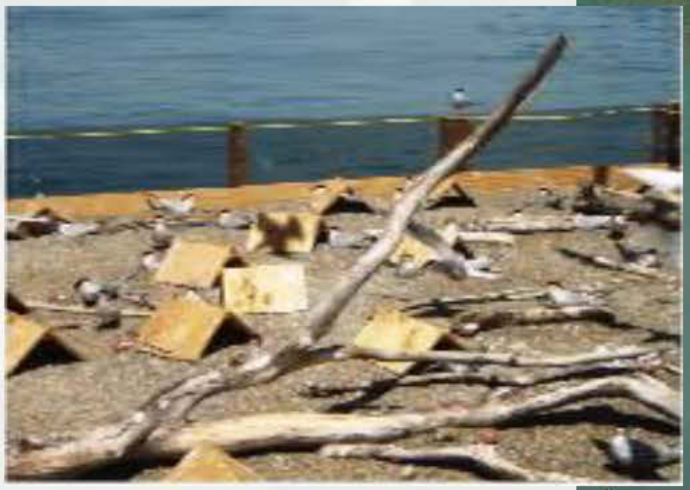
Reef Habitat Breakwaters, Pensacola, FL

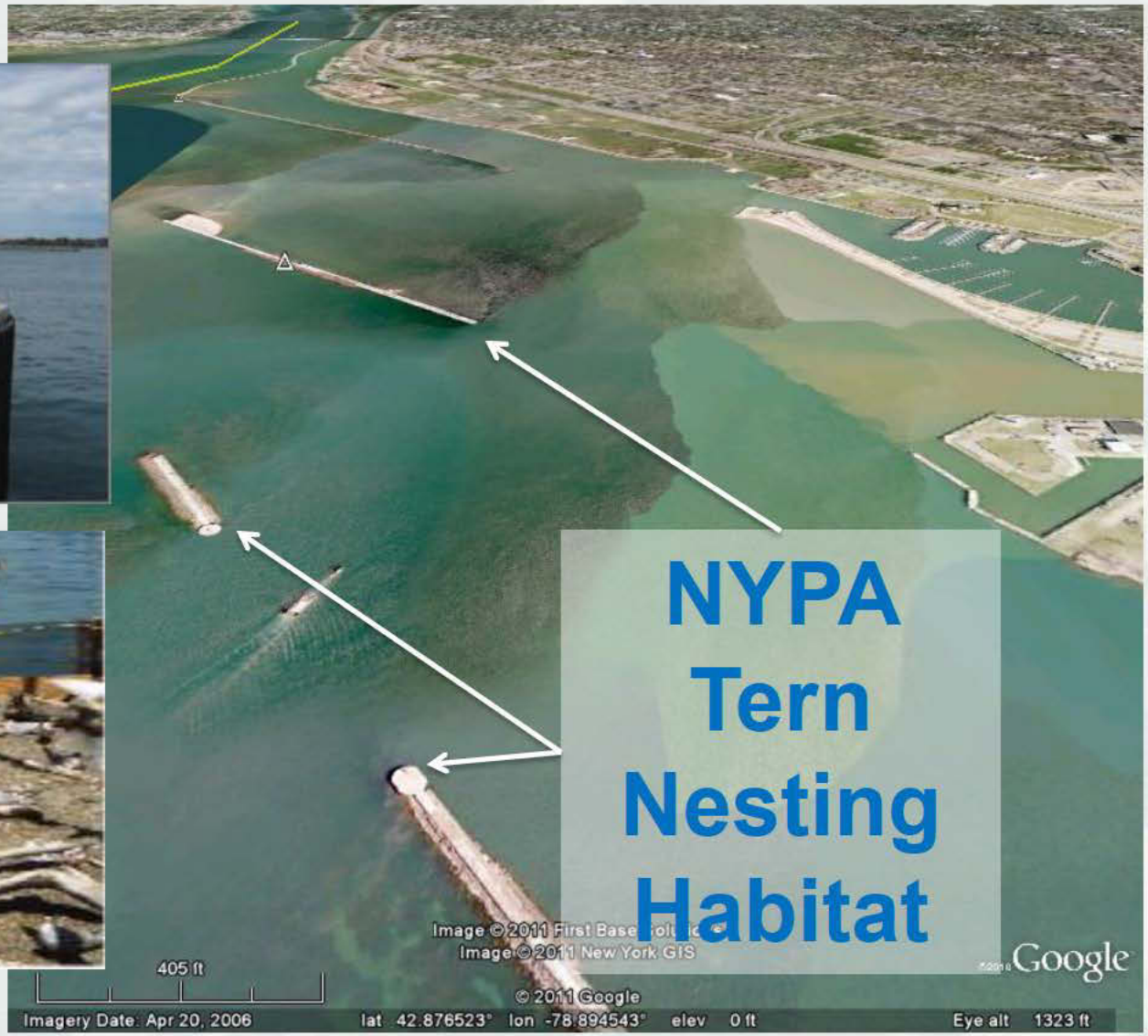
South Bay Marina

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

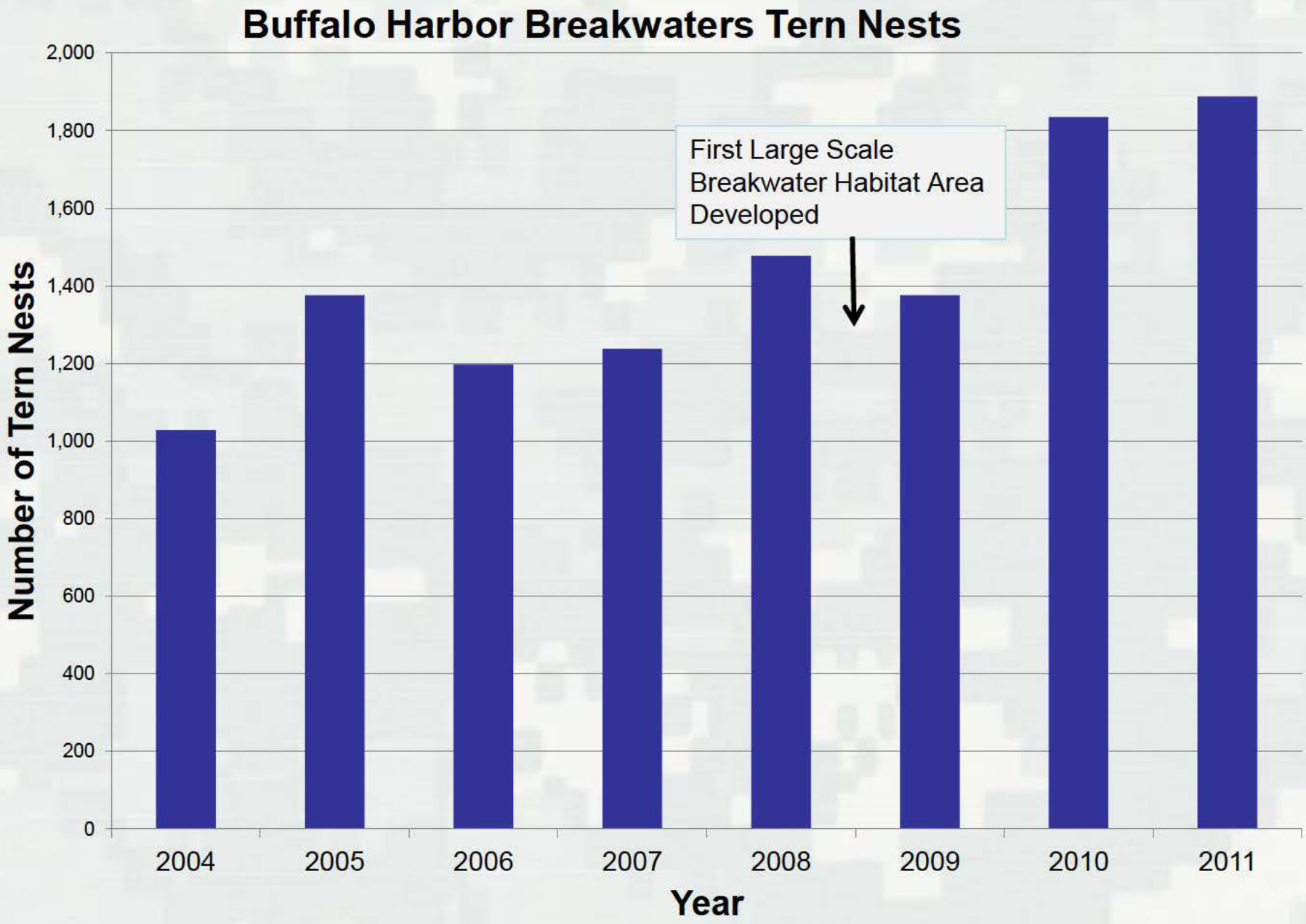
http://www.seagrant.wisc.edu/Home/Topics/HabitatsandEcosystems/Details.aspx?PostID=552

Tern Nesting Habitat
New York Power Authority – Buffalo, NY





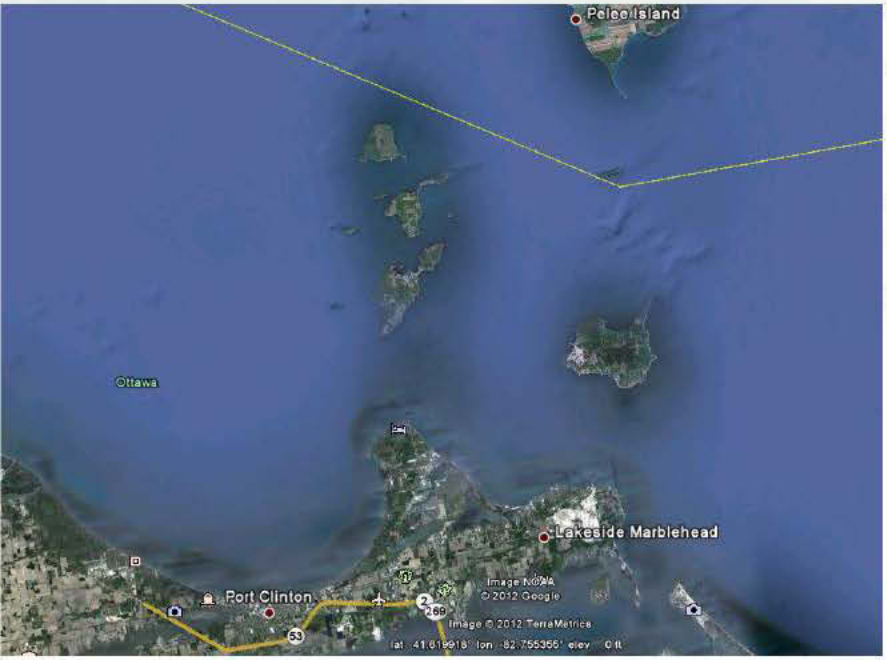
See
http://niagara.nypa.gov/EcologicalStandingCommittee/EcoStanddefault.htm


Buffalo Harbor Breakwaters Tern Nests
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Number of Tern Nests
First Large Scale Breakwater Habitat Area Developed
2004
2005
2006
2007
2008
2009
2010
2011
Year

East River Osprey Nest Platform, Buffalo, NY

New York Power Authority

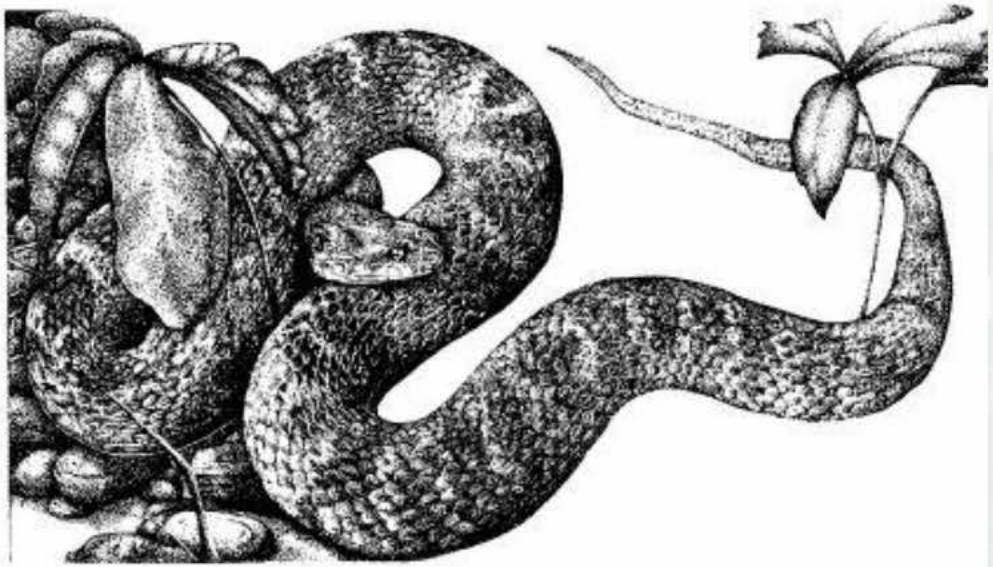
http://niagara.nypa.gov/EcologicalStandingCommittee/EcoStanddefault.htm

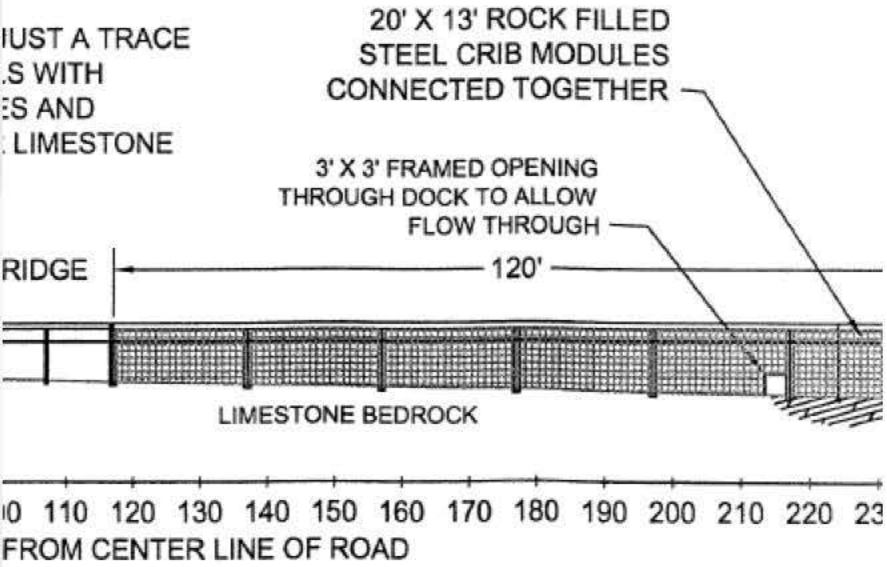


U.S. Fish & Wildlife Service

Lake Erie Watersnake Recovery Plan

(Nerodia sipedon insularum)





PROFILE A-A

September 2003

Seattle, WA Seawall Study

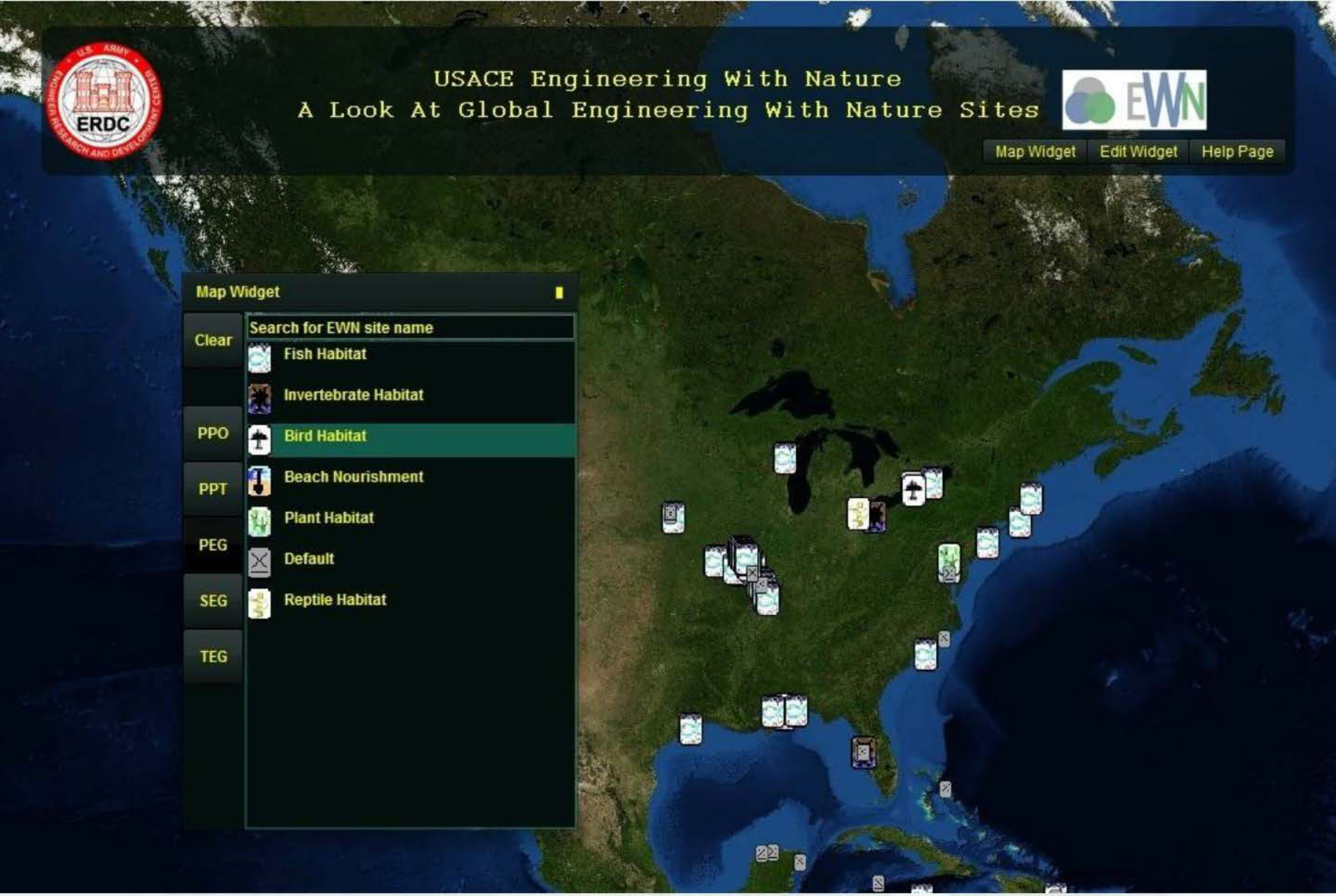
https://sites.google.com/a/uw.edu/seattle-seawall-project/home

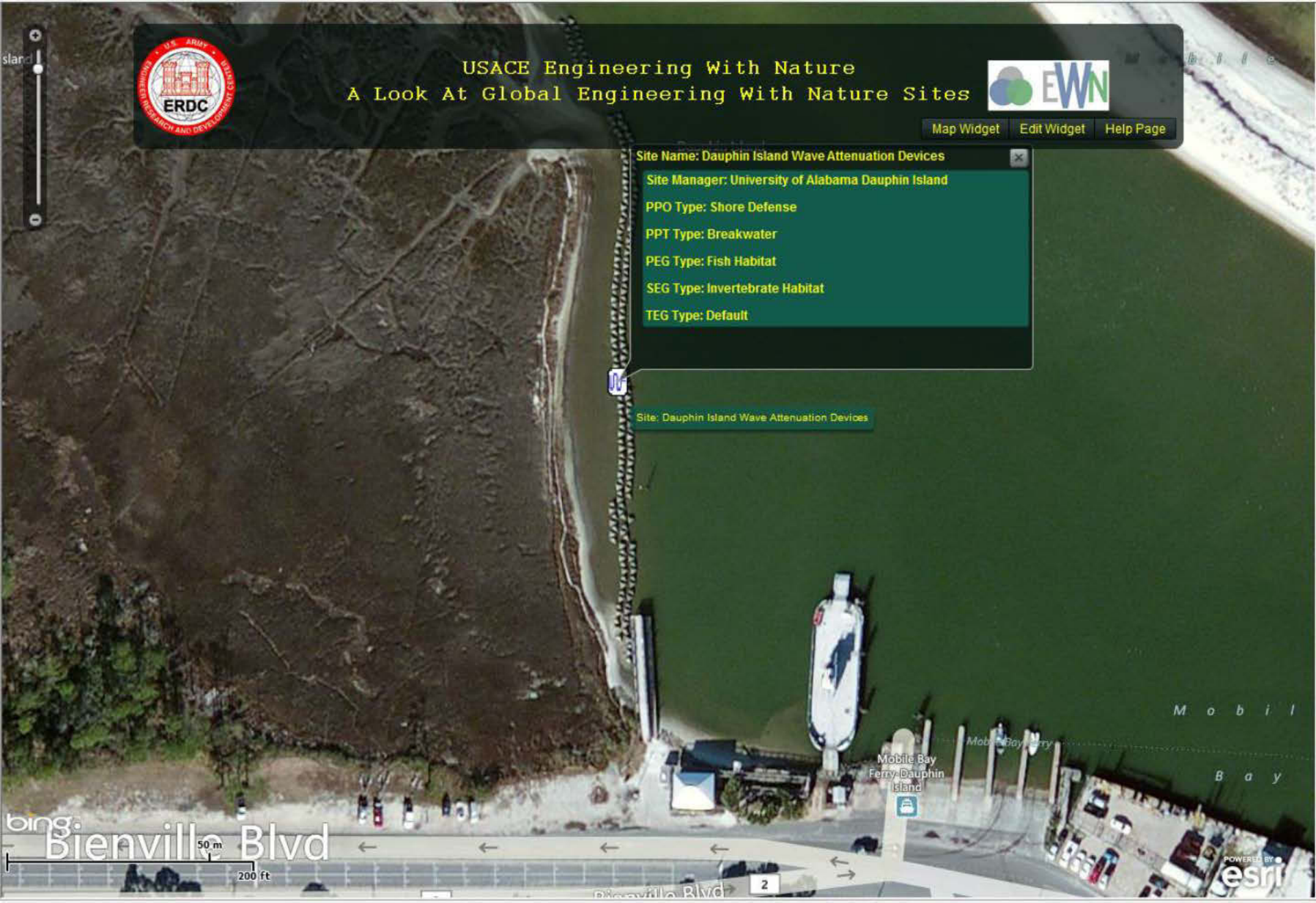
3 Sites

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
ERDC
EWN
Map Widget
Edit Widget
Help Page
Map Widget
Clear
Search for EWN site name
PPO
PPT
PEG
SEG
TEG
Dike
Breakwater
Groin
Beach
Chevron
Reef
Island
Wetland
Revetment
Jetty
Default
Pier/Wharf


USACE Engineering With Nature
A Look At Global Engineering With Nature Sites
ERDC
EWN
Map Widget
Edit Widget
Help Page
Map Widget
Clear
Search for EWN site name
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
ERDC
EWN
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
Mobile Bay Ferry-Dauphin Island
Bienville Blvd
50 m
200 ft
2
bing
esri

EWN Products

ERDC/EL TR-11-7

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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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http://el.erdc.usace.army.mil/elpubs/pdf/trel11-07.pdf

Integrated Environmental Assessment and Management — Volume 8, Number 1—pp. 175–182
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Environmental Engineering of Navigation Infrastructure: A Survey of Existing Practices, Challenges, and Potential Opportunities

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

†Environmental Laboratory, US Army Corps of Engineers, Engineer Research and Development Center, 696 Virginia Rd, Concord, Massachusetts 01742, USA

‡Environmental Laboratory, US Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, Mississippi, USA

(Submitted 2 March 2011; Returned for Revision 3 May 2011; Accepted 15 July 2011)

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, [illegible] tation 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

channels, anchorages, [illegible] ctures, and lock-and-[illegible] ms part of a safe and [illegible]. For more than 4 [illegible] tructure has involved [illegible] icable, impacts on the [illegible] ronmental assessment [illegible] cy Act 1969). More [illegible] pt of environmental [illegible] to ask whether such some form of environ- [illegible] that goes beyond the [illegible] onmentally damaging [illegible] 200 2010). While the [illegible] odland 1995) and has [illegible] dredged sediments for [illegible] applying an environ- [illegible] ructure itself has been [illegible]

[illegible] ters

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, 135 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

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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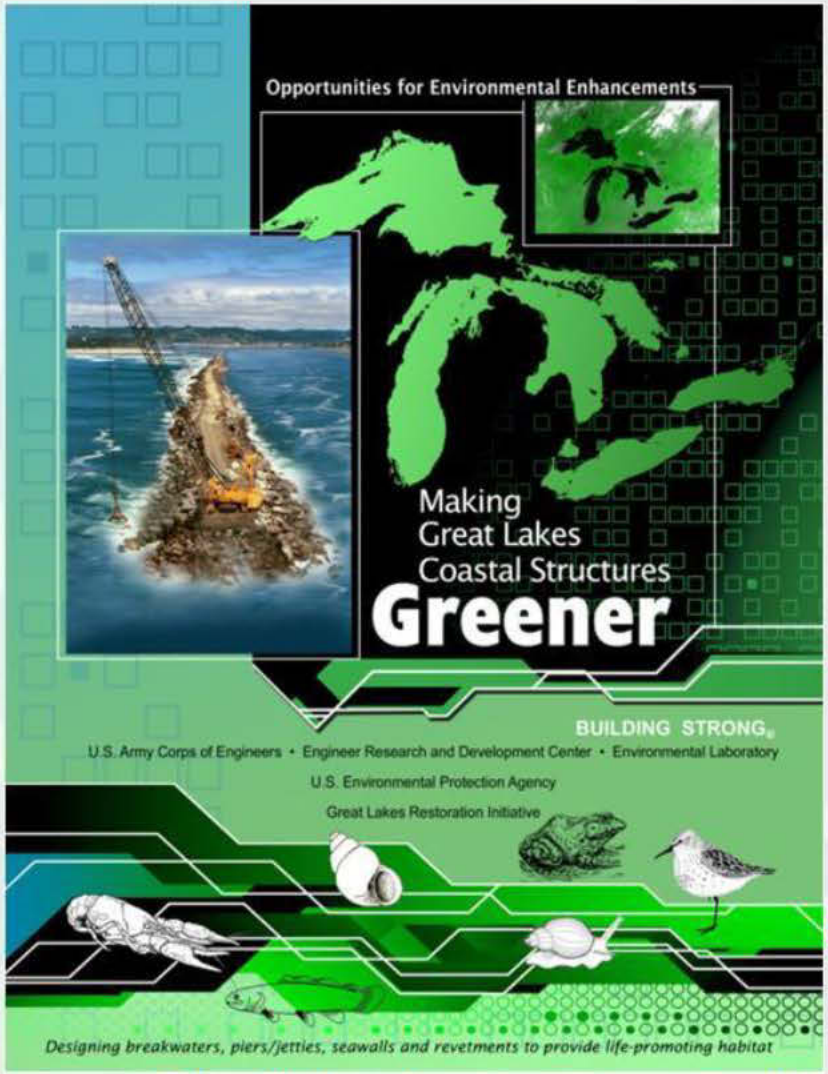

http://el.erdc.usace.army.mil/dots/doer/pdf/GLGB-Booklet.pdf

http://el.erdc.usace.army.mil/dots/doer/pdf/InlandPort-USACEEnvSustainability.pdf

Path Forward

EWN Issues	Potential Solutions
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	***Pilot Studies*** ***Success Documentation***