

Engineering With Nature

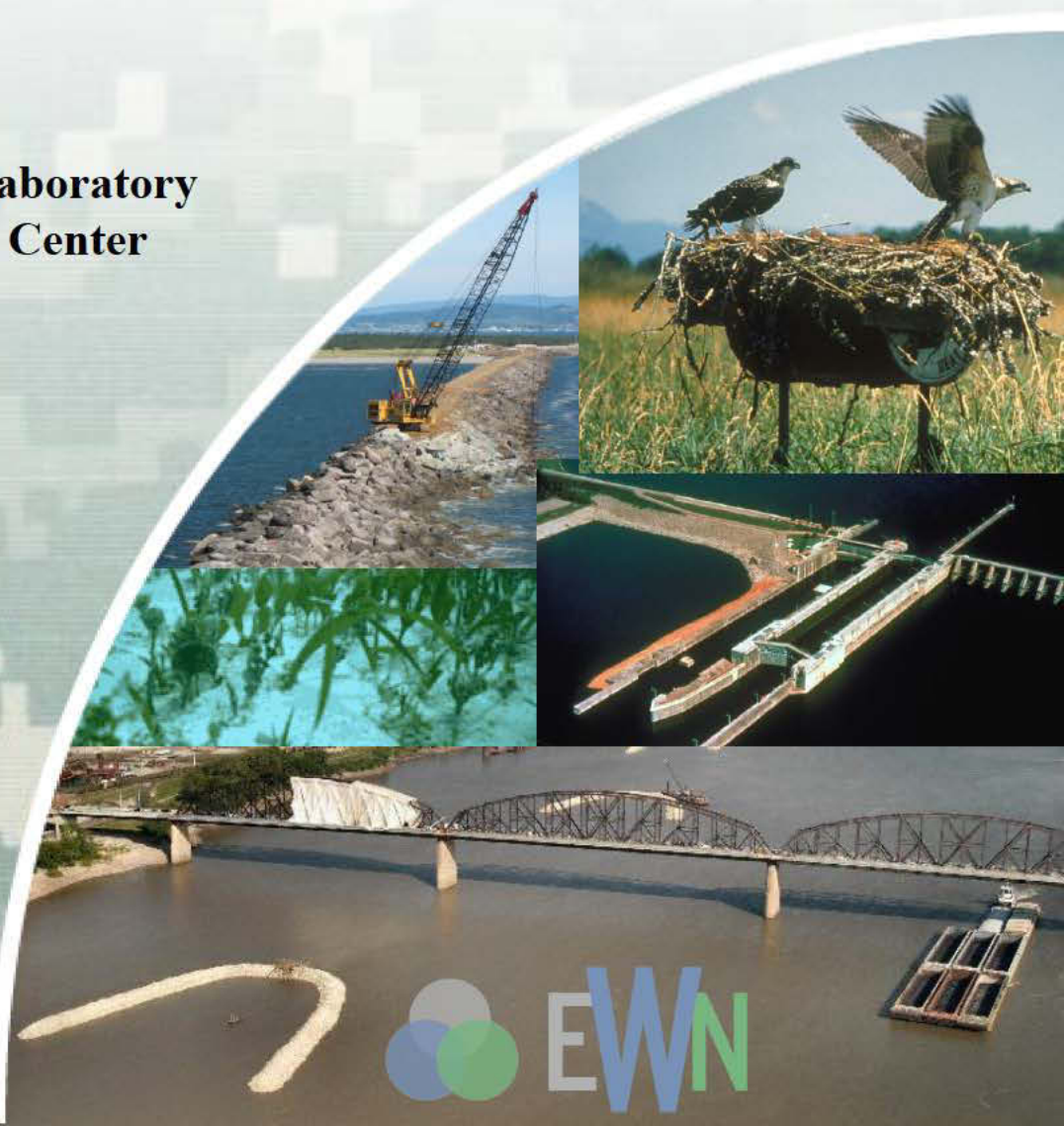
Summary of Prior Work & Results

Dr. Thomas J. Fredette

**Research Biologist, Environmental Laboratory
Engineer Research and Development Center**



US Army Corps of Engineers
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Opportunities?





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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2010 Study

[http://el.erdcl.usace.army.mil/elpubs/pdf/
trel11-07.pdf](http://el.erdcl.usace.army.mil/elpubs/pdf/trel11-07.pdf)

Project Approach

- **Webinars**
- **On-line Survey**
- **Telephone Follow-up**
- **Meeting/Conference Presentations**
- **Data Summary**
- **Report**

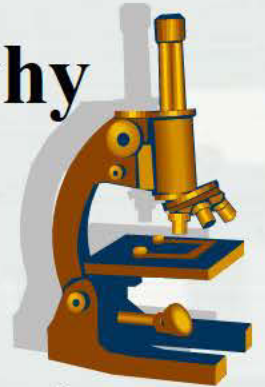


Survey Sections

- **Environmental Enhancements: Present and Potential (13 Qs)**
- **Laws, Policies, and Regulations (6 Qs)**
- **Impediments to Use (12 Qs)**
- **Research Needs (8 Qs)**
- **Is There Anything We Missed? (3 Qs)**
- **Invite Others (2 Qs)**
- **Information About You (9 Qs)**

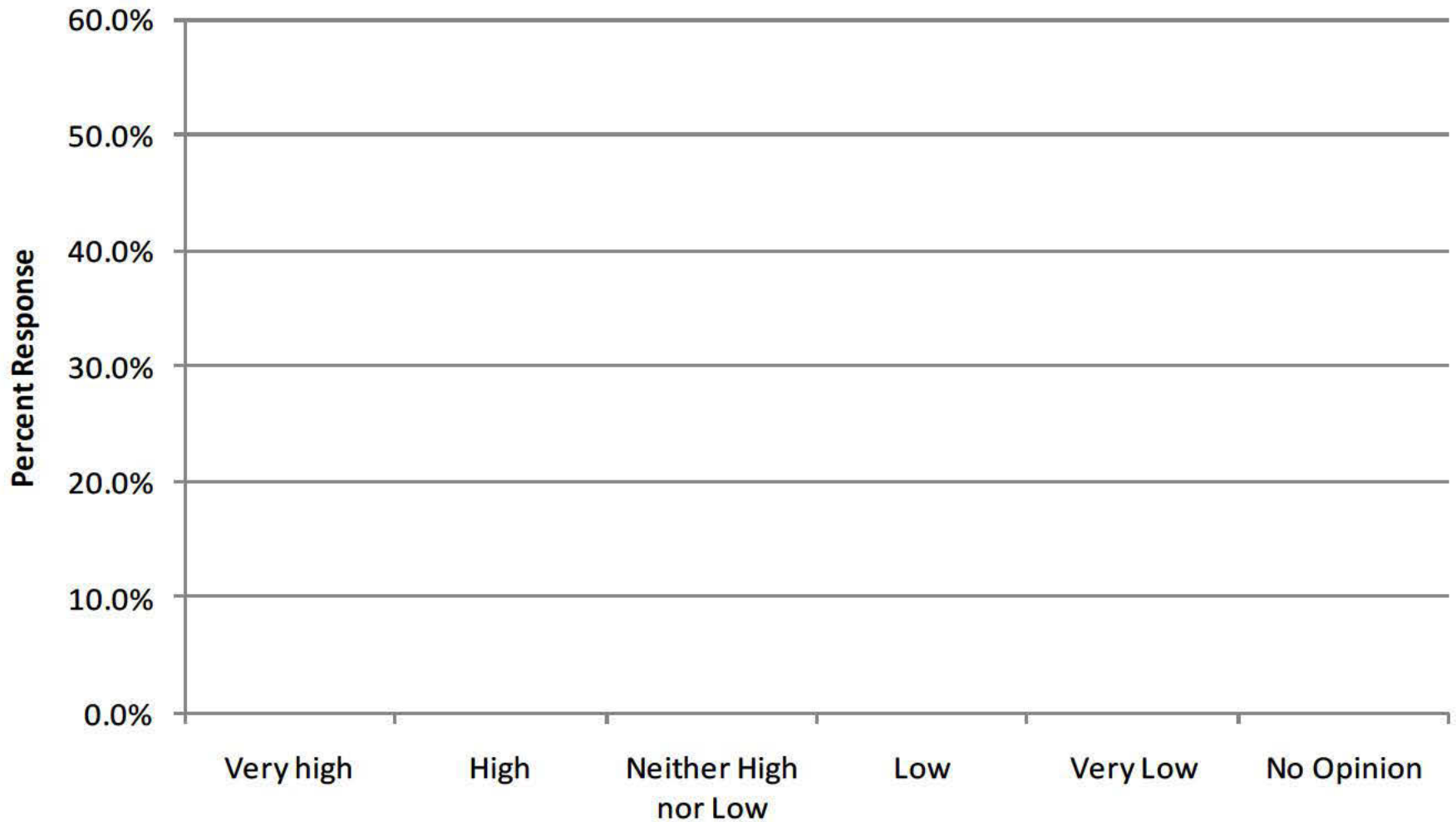
Information Needs

- Key policies, regulations, & laws
- Things we already do
- Ideas for new possibilities
- Things tried that haven't worked and why
- Impediments to improvement
- Potential solutions to impediments
- Items needing further *research* to support use
- Case studies and relevant reports



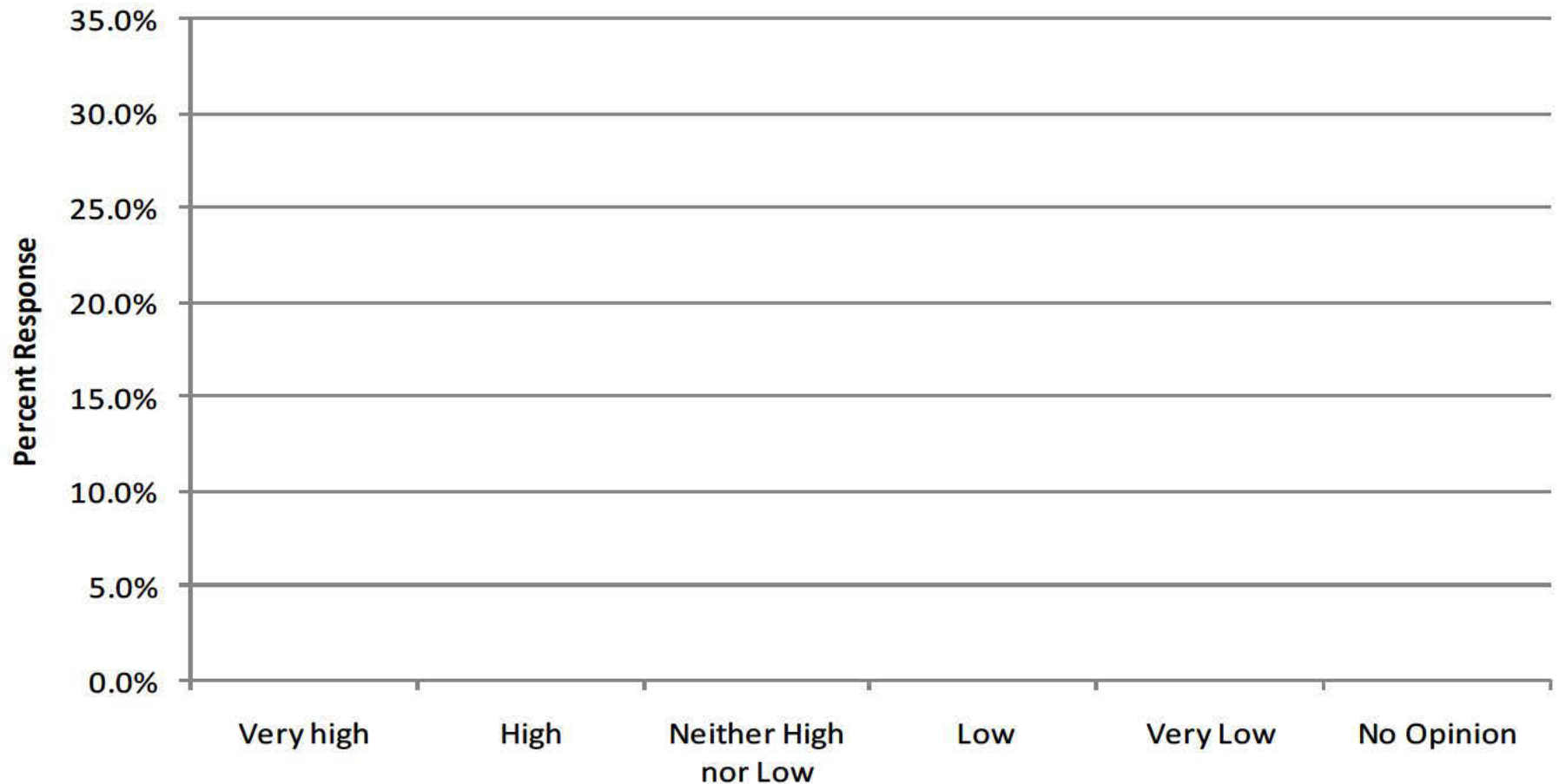
Views on Impediments

How high of an impediment do you believe cost sharing is to EENI?



Views on Impediments

Inclusion of environmental enhancements may be believed to constrain/complicate future maintenance operations of navigational infrastructure. How important of an impediment do you think this belief may be to consideration of EENI?



Suggestions to Reduce Impediments

- **Greater stakeholder interaction**
- **Interagency agreements**
- **Special program funding**
- **Promote the EENI concept**
- **Document case studies**
- **Develop agency goals/metrics**

Some Examples



Tern Nesting Habitat

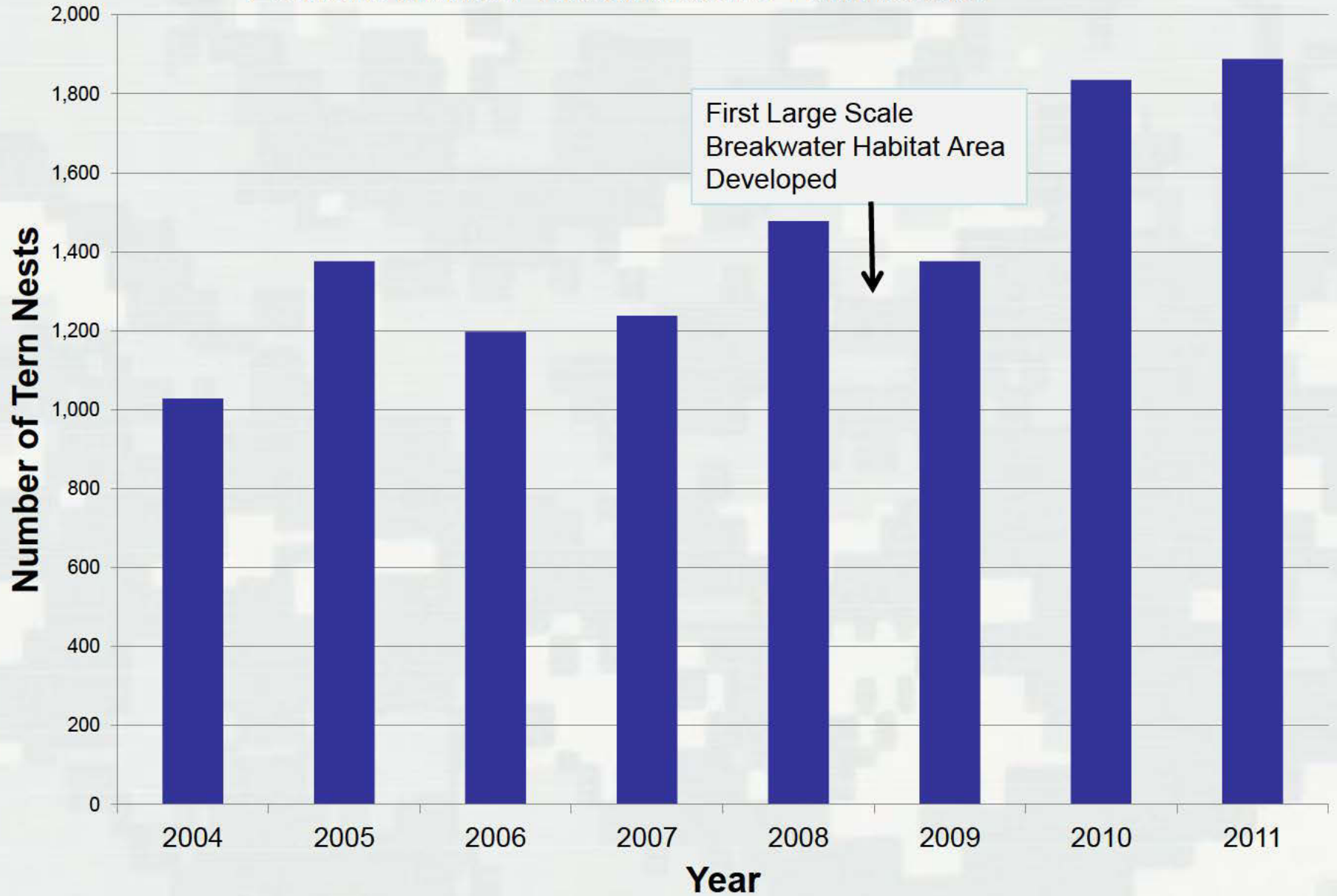
New York Power Authority – Buffalo, NY



**NYPA
Tern
Nesting
Habitat**

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

Buffalo Harbor Breakwaters Tern Nests



South Bay Marina

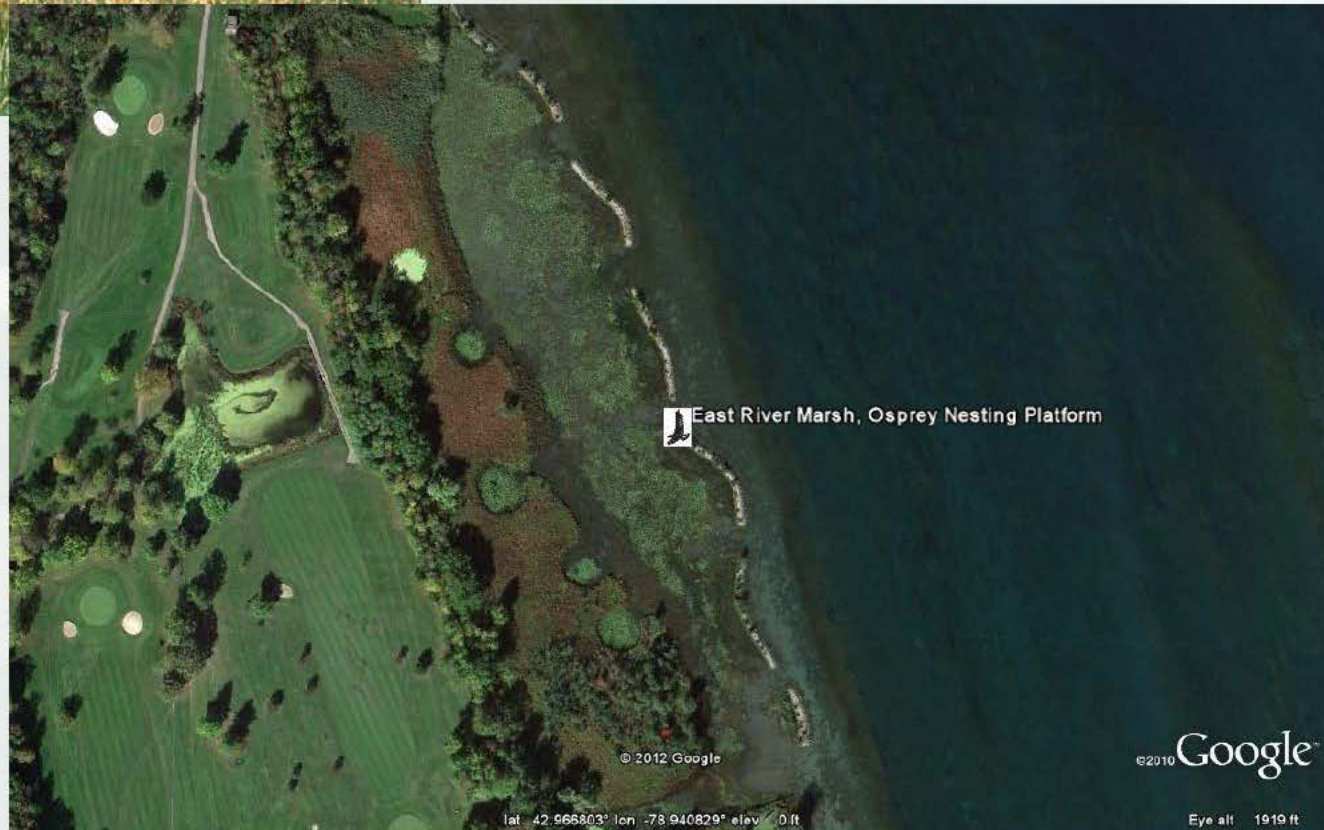


- Spur jetties to create marsh and protected shallows.
- Fish spawning stones incorporated into design.

East River Osprey Nest Platform, Buffalo, NY

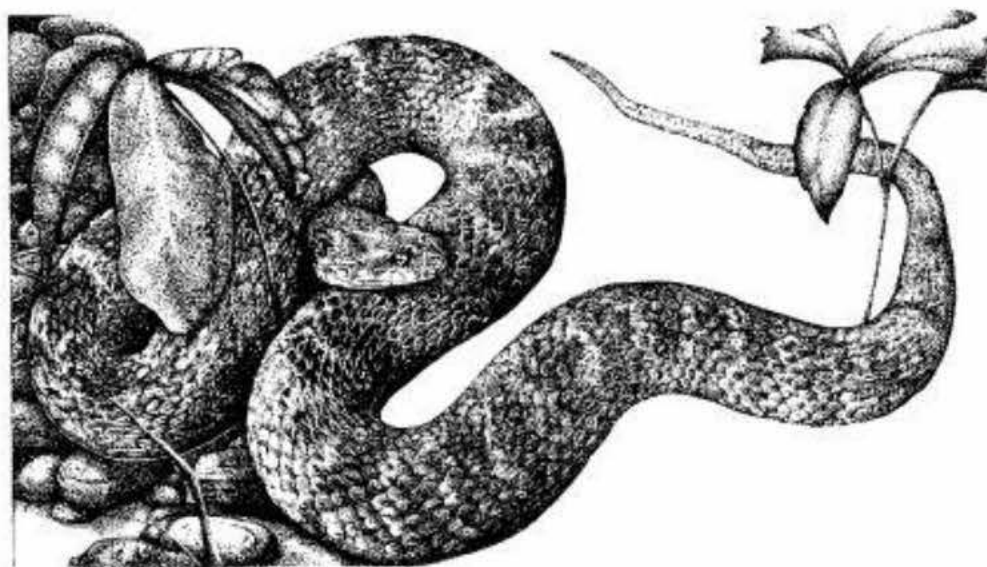


**New York Power
Authority**



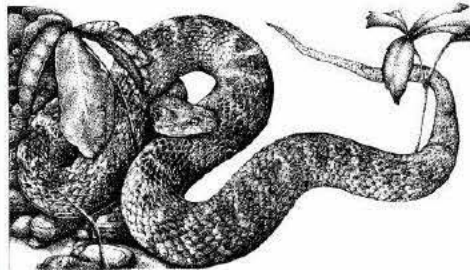
Lake Erie Watersnake Recovery Plan

(Nerodia sipedon insularum)



September 2003

Lake Erie Watersnake
Recovery Plan
(*Nerodia sipedon insularum*)



September 2003

The ODNR, in consultation with the Ohio Environmental Protection Agency (OEPA) and USFWS, published Coastal Guidance Sheet No.9, entitled, "Shore Structures and the Lake Erie Watersnake" (Appendix C). This document briefly describes the life history and habitat of the snake, and types of shoreline projects that can be designed to benefit the Lake Erie Watersnake. Since the snake was listed under the ESA, the most common type of projects that the USFWS reviews on the islands are private docks. The conservation of Lake Erie Watersnakes can be aided by incorporating rock-oriented designs into shoreline developments and associated erosion control structures. Research indicates that Lake Erie Watersnakes will use rock-filled timber or steel crib docks for summer basking and resting habitat, while sheet steel docks provide no habitat for the snake. In addition, erosion protection such as riprap provides some summer habitat for the snake, while sheet steel or poured concrete erosion protection does not provide habitat for the snake. The guidance sheet provides recommendations to use "snake-friendly" designs to benefit both the landowner and the snake. Such measures have already been adopted by many construction projects on the U.S. islands. By designing these projects in snake-friendly



Public Notice

Applicant:
Predevelopment, Ltd.

Date:
Published: December 8, 2005
Expires: January 6, 2006

U.S. Army Corps
of Engineers

In Reply Refer To:

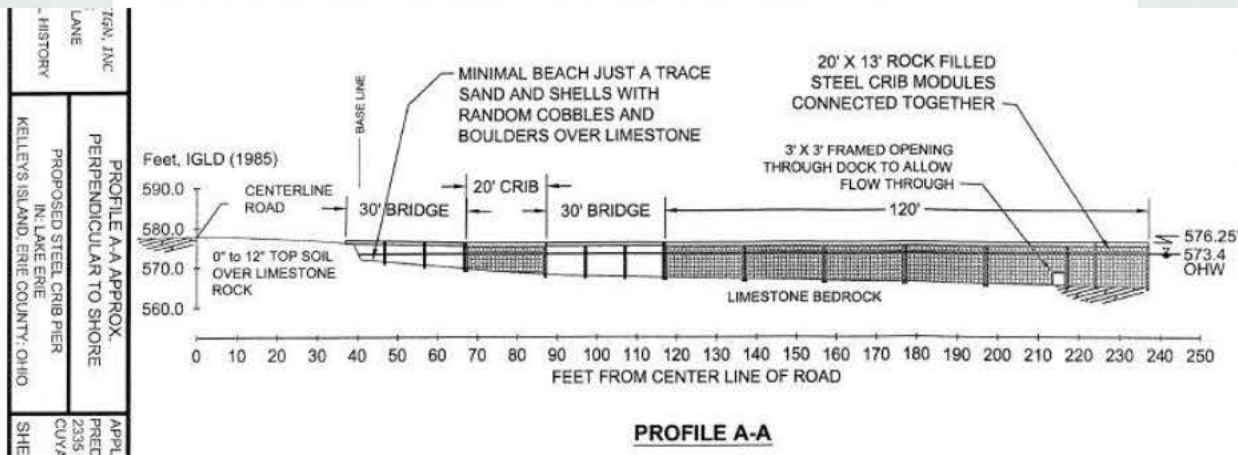
Buffalo District CELRB-TD-R RE: 2003-01621(1) Section: OH 10 and 404

Application for Permit under Authority of
Section 10 of the Rivers and Harbors Act of 1899 and
Section 404 of the Clean Water Act (33 U.S.C. 1344).

Predevelopment, Ltd., 2235 Second Street, Suite A, Cuyahoga Falls, Ohio, 44221, has requested a Department of the Army permit to construct a private rock-filled steel crib dock/pier and one stone jetty and install three floating docks in Lake Erie, located on the northwest side of Monagan Road, Kelleys Island, Erie County, Ohio.

The project consists of the following:

1. The construction of a "J" shaped rock filled steel crib dock/pier, with a 10-foot wide by 200 foot long leg containing two 30-foot long bridges, one at the shore attachment and one waterward of a 20-foot crib dock/pier section. Perpendicular to and west of the north end of this dock will be a 10-foot wide by 186-foot long steel crib dock/pier section. Perpendicular to the west end of this dock and running south will be a 10-foot wide by 40-foot long steel crib dock/pier section. This project was designed to provide habitat for the Lake Erie watersnake (*Nerodia sipedon insularum*) and to maintain water flow along the shoreline.
2. The installation of three 6-foot wide by 24-foot long floating docks on the south side of the 186-foot long dock/pier.



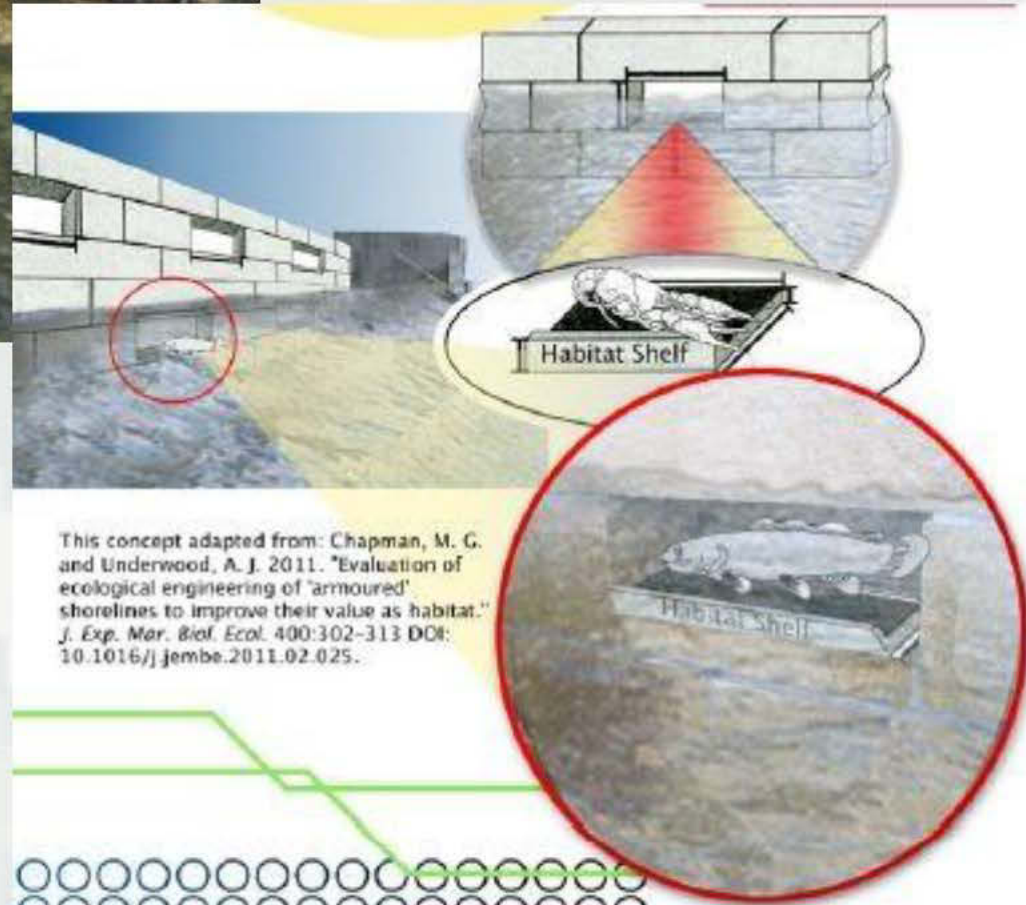


Seawall ½ Flower Pots

Seawall Habitat Shelves

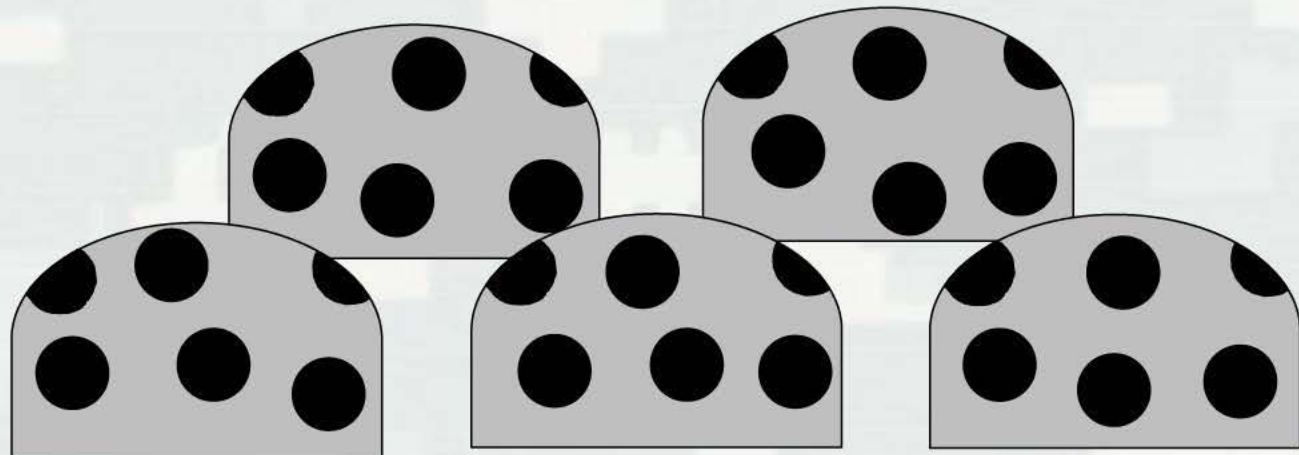
Dr. Mark Browne

<http://youtu.be/iuDmTVHKi40>





Reef Habitat Breakwaters, Pensacola, FL



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 Products

ERDC/EL TR-11-7

Environmental Laboratory



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ERDC TN-DOER-R16
June 2011

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

Thomas J. Fredette,¹ Christy M. Foran,¹ Sandra M. Brasfield,¹ and Burton C. Suedel²
¹Environmental Laboratory, US Army Corps of Engineers, Engineer Research and Development Center, 406 Virginia Rd., Concord, Massachusetts 01742, USA
²Environmental Laboratory, US Army Corps of Engineers, Engineer Research and Development Center, Woburn, Massachusetts, USA

(Submitted 2 March 2011; Revised for Review 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 (ENI) 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 ENI concept including ideas, concerns, research needs, and relevant laws and policies. Study recommendations included further promotion of the concept of ENI 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.*

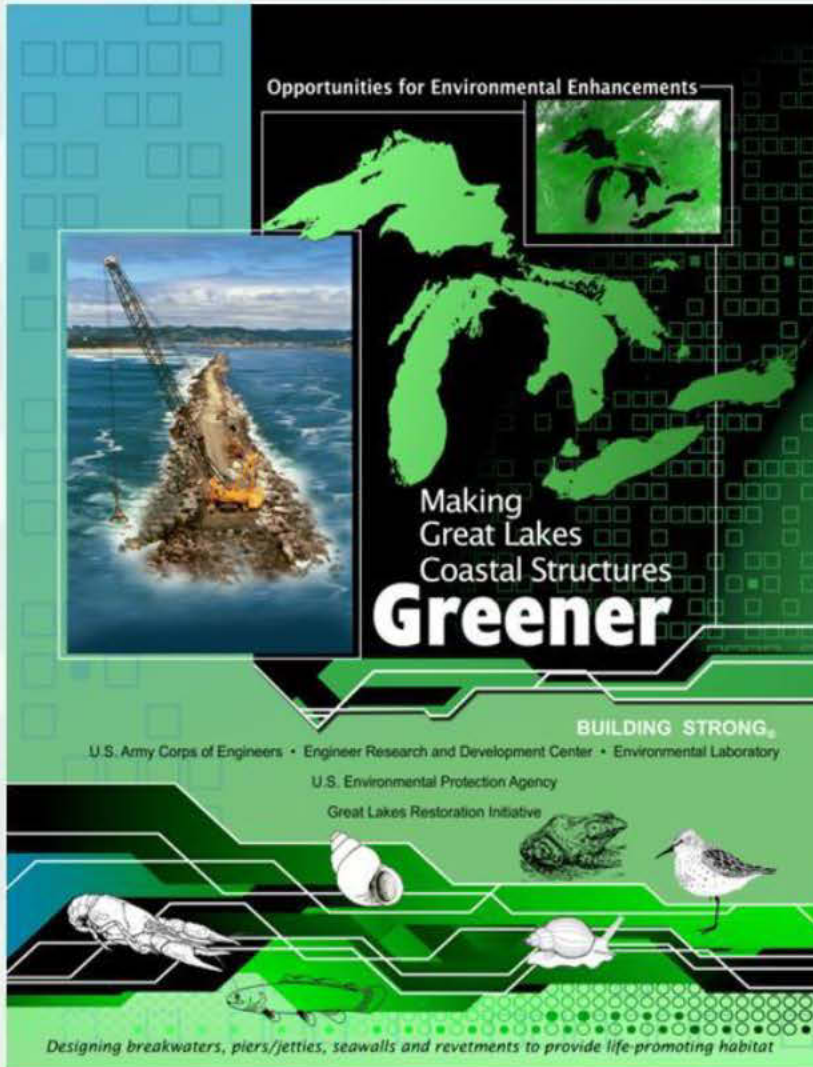
Jetties Breakwaters Sustainability Lock and dam

channels, anchorages, locks, and dams. As part of a safe and efficient water transportation system, navigation infrastructure has over 150,000 km of navigation channels, 193 navigation locks, and hundreds of jetties, breakwaters, and anchorages. For example, the New England District alone has over 150 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 (ENI) concept, (2) identify potential impediments to implementation and solutions to such impediments, (3) identify existing navigation projects designed with the express

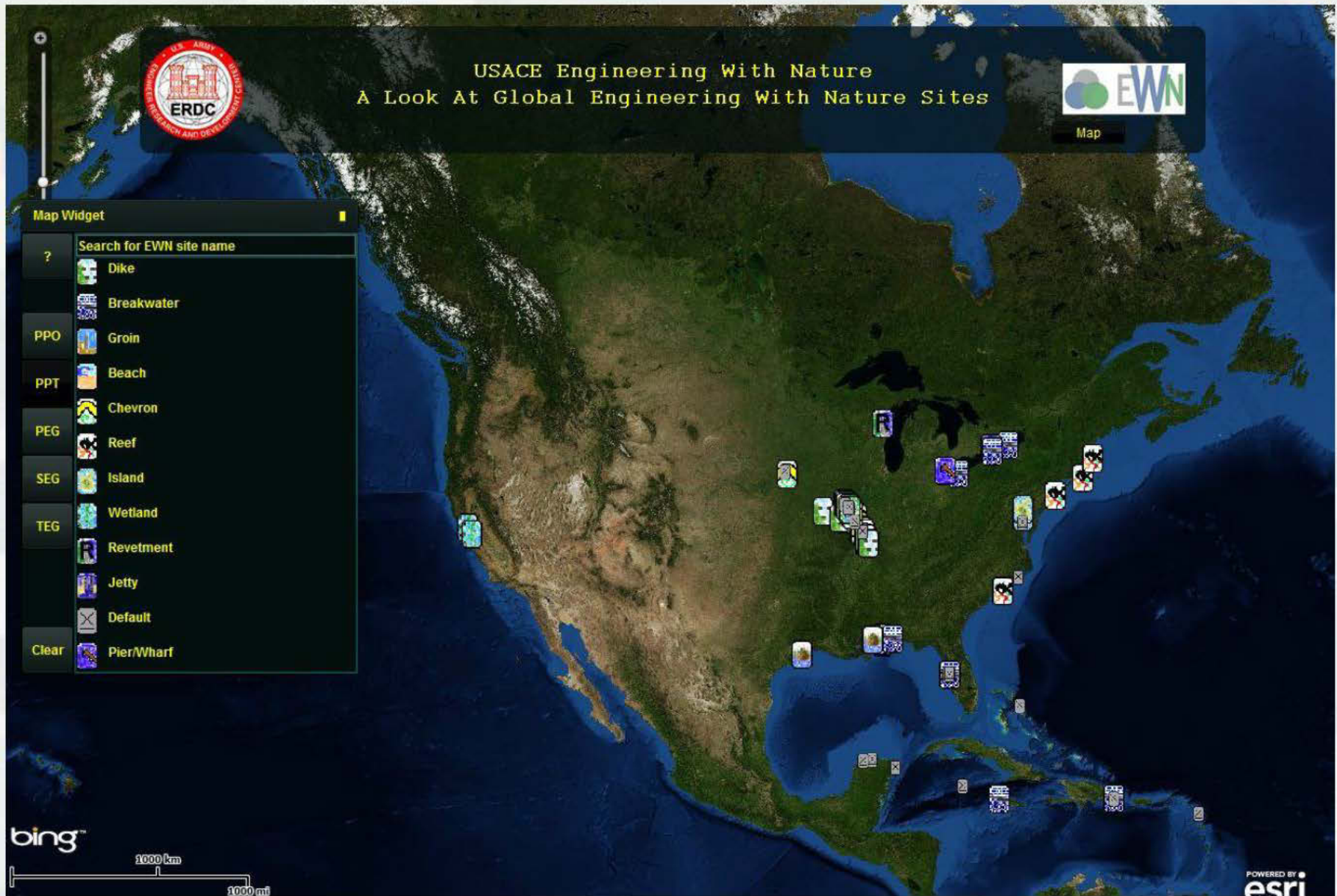
Integr.

Environmental Policy & Regulation

EWN-Related GLRI Products



EWN Mapping Project



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 | <i>Pilot Studies</i> <i>Success Documentation</i> |

