# Incorporating EWN into Breakwaters and Other Hard Infrastructure

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#### **EWN Meeting**

1-3 Dec. 2014 Buffalo, NY



US Army Corps of Engineers
BUILDING STRONG®



### **Presentation Overview**

- Cleveland & Ashtabula, OH Breakwater Invertebrate/Fish Habitat/Low Vegetation
- Ashtabula, OH Tern Nesting Habitat
- Milwaukee, WI Fish Spawning Habitat
- St. Marys River, MI
   Multiple options





### Great Lakes (GL) Green Breakwaters Study

 Evaluate alternatives 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



### **Demonstration Projects - Approach**

- Demonstrate potential improvements
- GL coastal structures during routine maintenance activities
- Simple design modifications to structural elements
- Potential to reduce environmental impairments within GL region



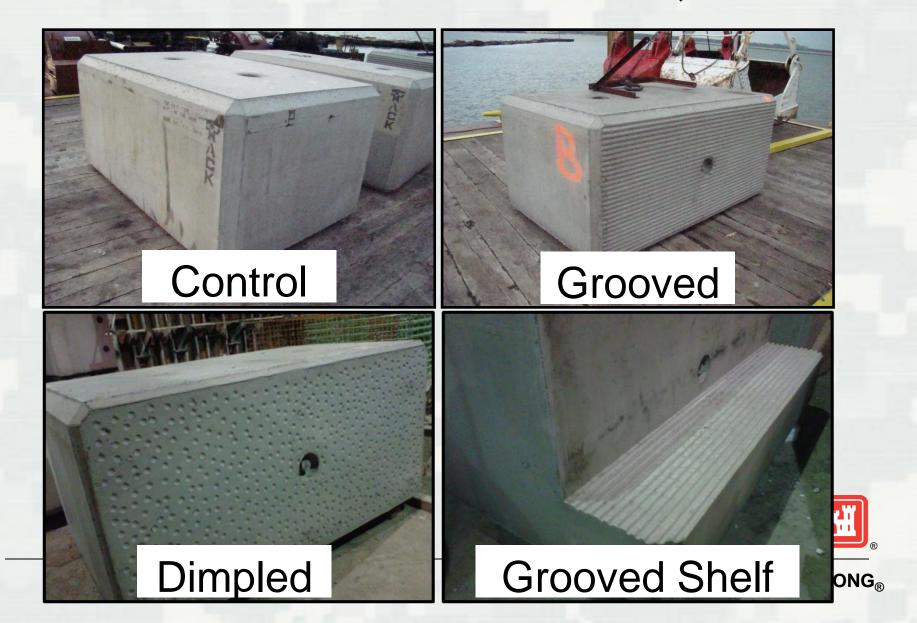
### **Cleveland East Arrowhead Breakwater**

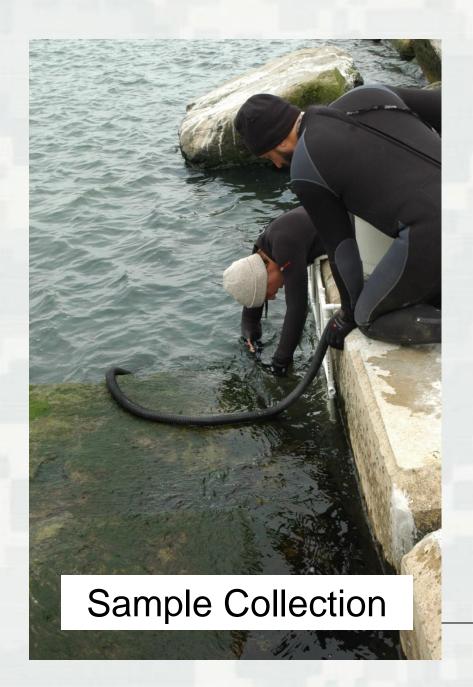
- Beyond indirect and unplanned habitat creation
- Modify design of featureless concrete toe blocks used for breakwater maintenance
- Provide features creating habitat opportunities for GL fish and other aquatic life
- Examines creation of habitat surfaces on toe blocks
  - > Protected indented shelf
  - Dimpled block surface
  - Grooved block surface





## Cleveland & Ashtabula, OH





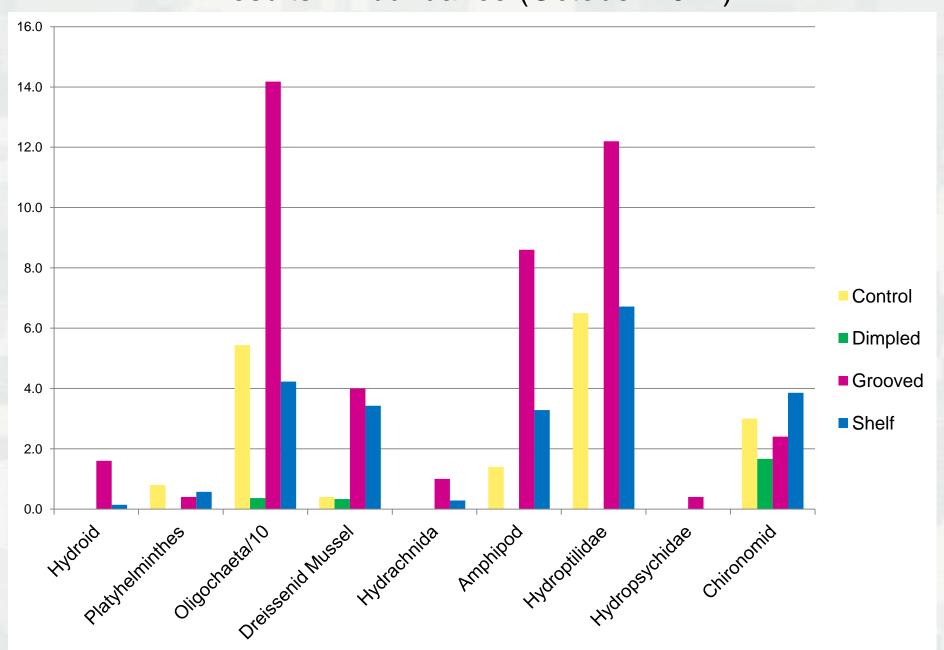


## Schedule

	Cleveland
Construction	April 2012
Monitoring 1	October 2012
Monitoring 2	June 2013
Monitoring 3	October 2013
Monitoring 4	September 2014



### Results – Abundance (October 2012)



## What Have We Learned to Date?

- Initial colonization (Oct. 2012) greater for most groups on grooved blocks
  - ► Invertebrate secondary production increase
- Potential to provide juvenile fish refuge
- Awaiting sample processing and analysis from other monitoring events
- Extended monitoring?



# Ashtabula Harbor Breakwater Project Tern Habitat

- Modify design of breakwater to create tern habitat during routine maintenance
- Habitat created using modified toe blocks
  - Nesting pea gravel
  - Predator/competitor exclusion grid
  - > Side fencing
  - Chick shelters







### Ashtabula Harbor Tern Habitat Construction

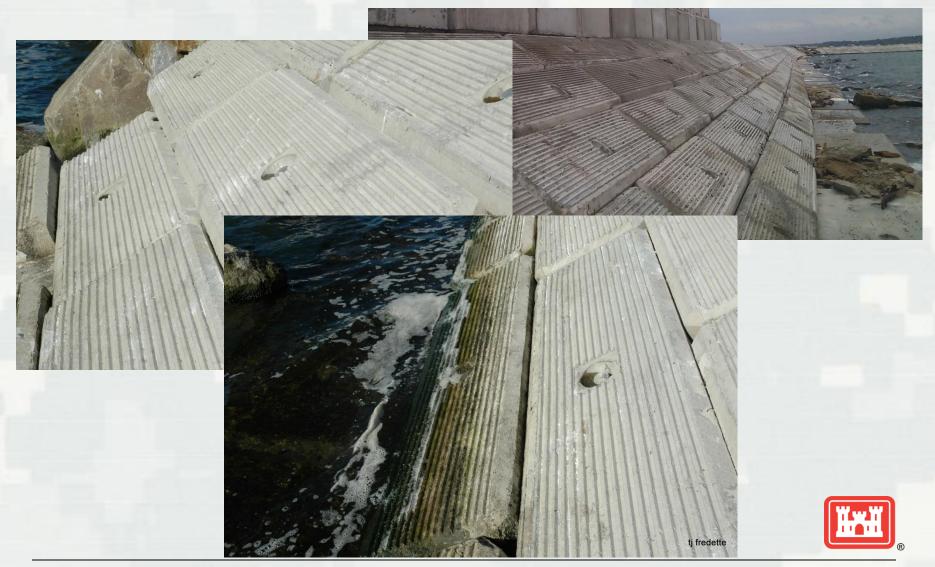


### Ashtabula Harbor Breakwater Project Status

- Winter ice conditions delayed installation of decoys, tern call box, predator cable grid, and shelters until late April
- Site discovery and colony establishment could take 2-3 years
- Tern monitoring ongoing
- Habitat size doubled during Phase 2 (Sept. 2014) to sixteen blocks further increasing the chances of success



### Ashtabula Harbor Slope Blocks Low-Growing Vegetated Plant Potential

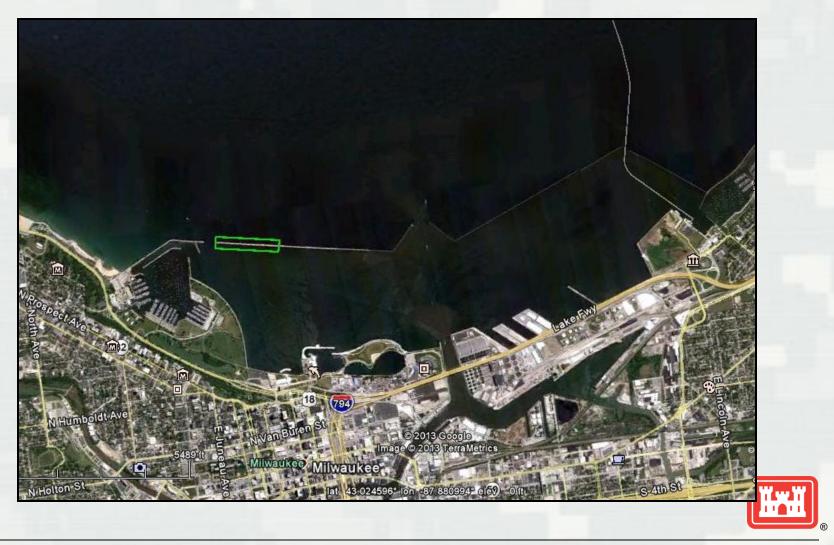


### Milwaukee Harbor Project Approach

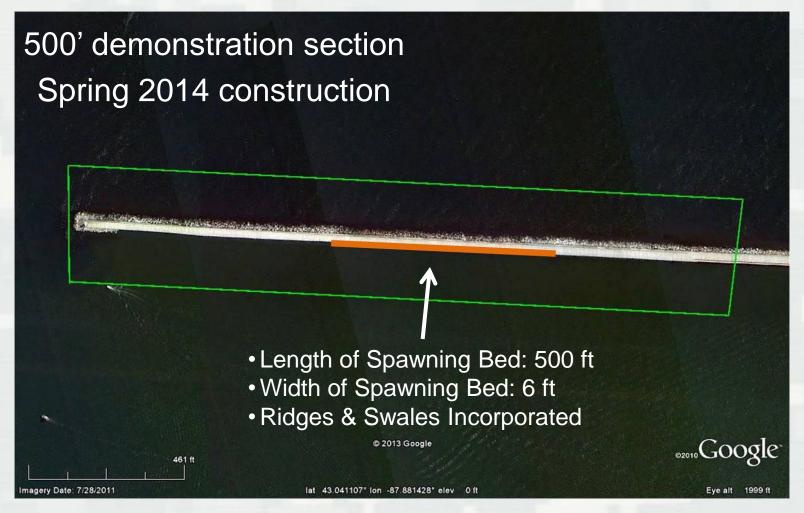
- Modify design of rubble mound breakwater during maintenance
- Create spawning bed for fish such as walleye and smallmouth bass
- Habitat for forage species
- Modifications
  - Smaller stone size (lee/harbor side)
  - > Gentler sloping shelf



## Milwaukee Harbor, WI Lake Michigan

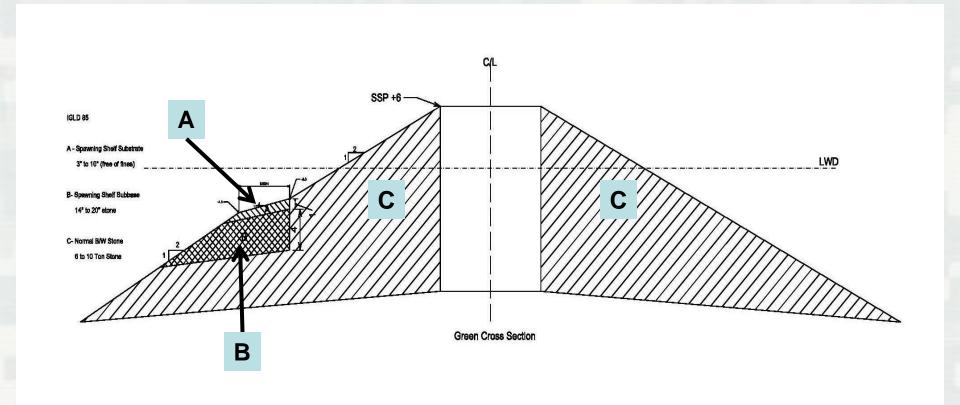


### **Fish Spawning Bed Location**





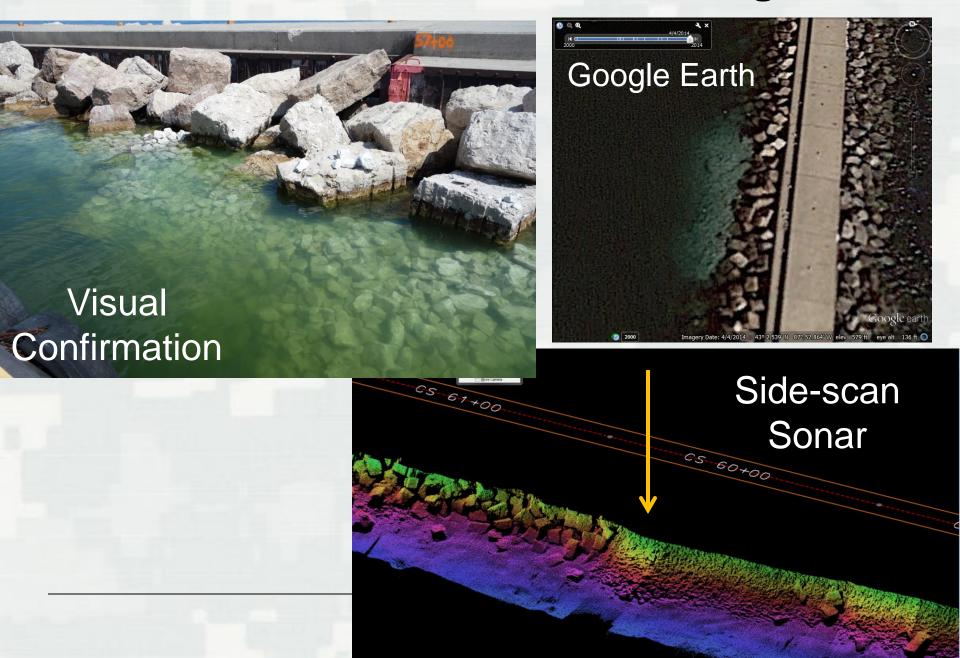
# Modified Rubble Mound Breakwater Fish Spawning Shelf



- A Spawning Shelf Substrate: 4-8" stone free of fines
- B Spawning Shelf Sub-base: 8-18" stone
- C Normal B/W Stone: 6-10 ton stone



### **Post Construction Monitoring**





## St Marys River, MI





## Path Forward

Seek opportunities to conduct demonstrations or full

scale projects with partners

- Assess and report
   on benefits and
   realized ecosystem
   goods and services
- Lessons learned adaptively manage
- Fully communicate
   with partners, academia, and public

