# Incorporating EWN into Breakwaters and Other Hard Infrastructure

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#### **EWN Meeting**

30 Sept. – 2 Oct 2014 Galveston, TX



US Army Corps of Engineers
BUILDING STRONG®



#### **Presentation Overview**

- Cleveland & Ashtabula, OH Breakwater Invertebrate/Fish Habitat
- Ashtabula, OH Tern Nesting Habitat
- Milwaukee, WI Fish Spawning Habitat





### 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





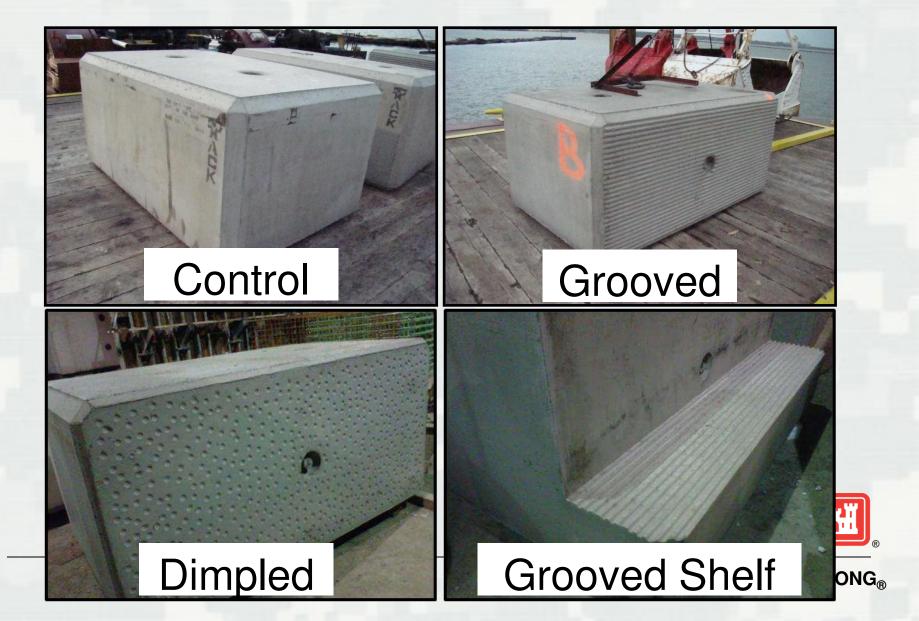
#### **Cleveland East Arrowhead Breakwater**

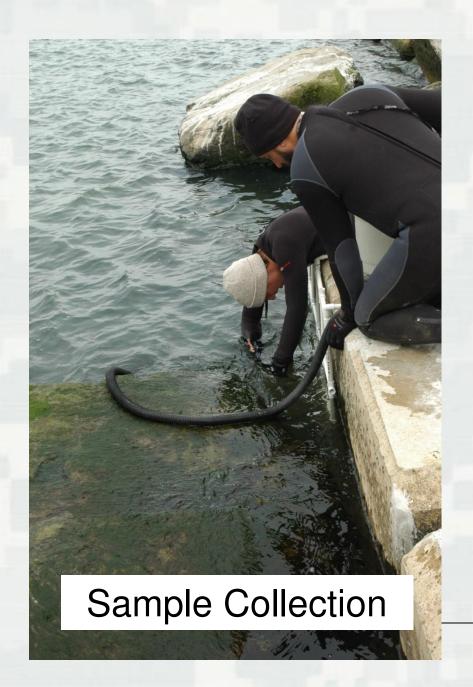
- Beyond indirect and unplanned habitat creation
- Modify design of featureless concrete toe blocks used for breakwater maintenance
- Provide features creating habitat opportunities for GL fish and other aquatic life
- Examines creation of habitat surfaces on toe blocks
  - > Protected indented shelf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





## Cleveland & Ashtabula, OH







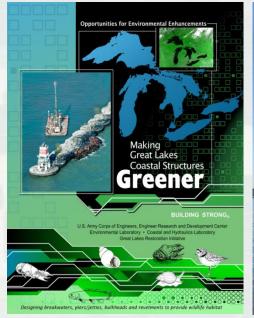
## Preliminary Implications

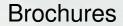
(Cleveland)

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



# Cleveland Harbor Products and Awards







**Trade Publications** 



PIANC WwN Certification



# 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





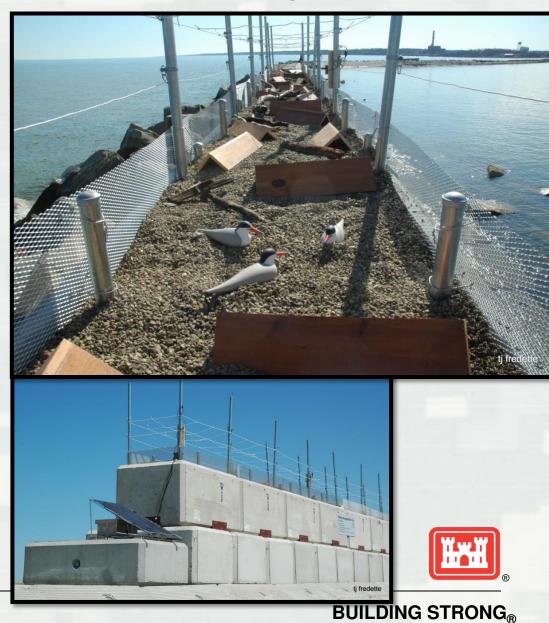


### Ashtabula Harbor Tern Habitat Construction



### 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

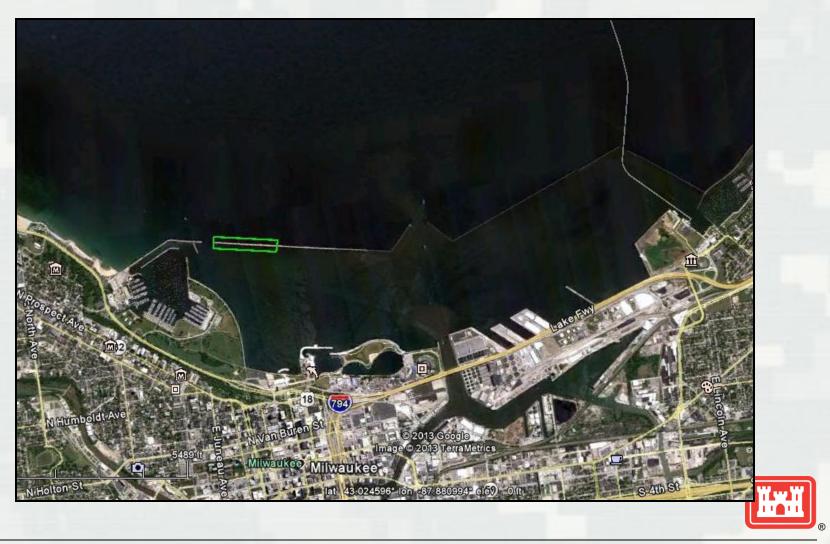


### Milwaukee Harbor Project Approach

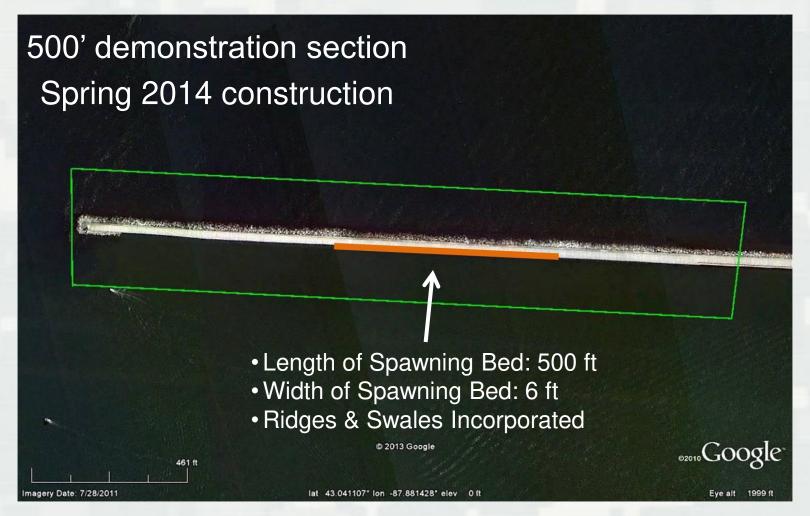
- Modify design of rubble mound breakwater during maintenance
- Create spawning bed for fish such as walleye and smallmouth bass
- Habitat for forage species
- Modifications
  - Smaller stone size (lee/harbor side)
  - Gentler sloping shelf



### Milwaukee Harbor, WI Lake Michigan

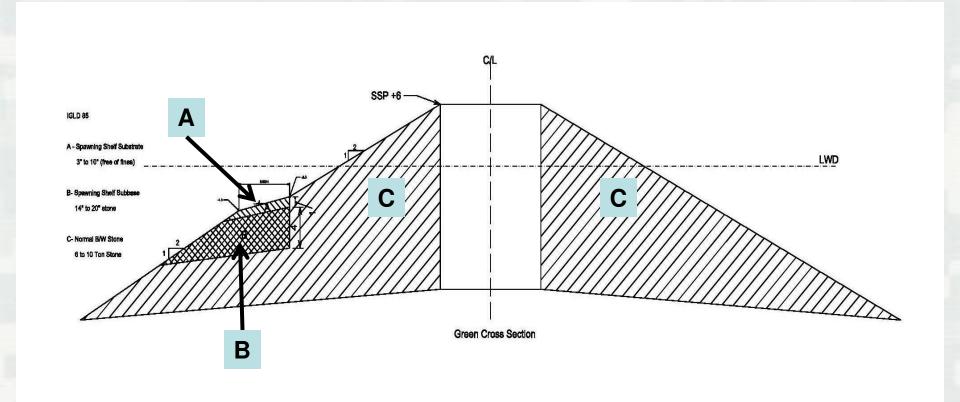


### **Fish Spawning Bed Location**





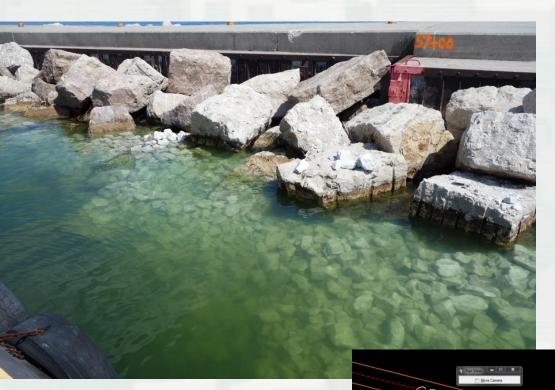
# Modified Rubble Mound Breakwater Fish Spawning Shelf



- 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**



Visual Confirmation

CS 60+00

Side-scan Sonar

## 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



