Incorporating EWN into Breakwaters and Other Hard Infrastructure

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EWN Meeting

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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



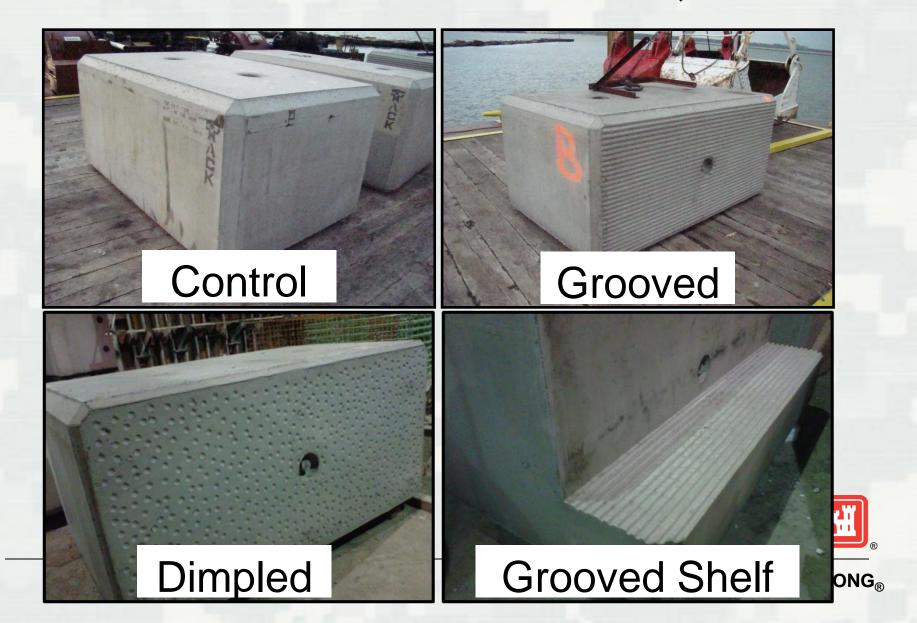
Cleveland East Arrowhead Breakwater

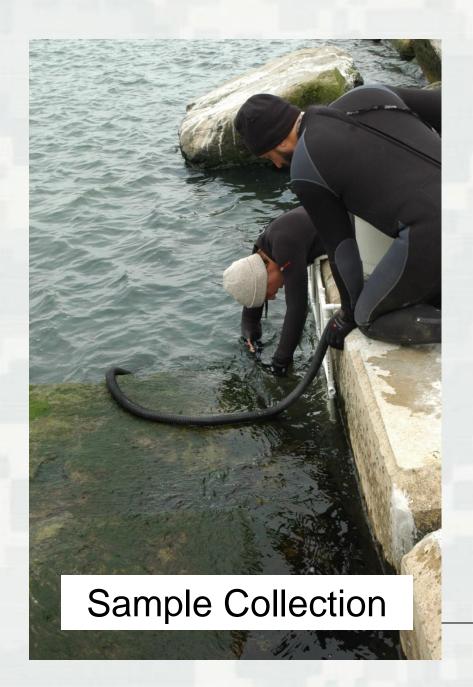
- Beyond indirect and unplanned habitat creation
- Modify design of featureless concrete toe blocks used for breakwater maintenance
- Provide features creating habitat opportunities for GL fish and other aquatic life
- Examines creation of habitat surfaces on toe blocks
 - > Protected indented shelf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





Cleveland & Ashtabula, OH





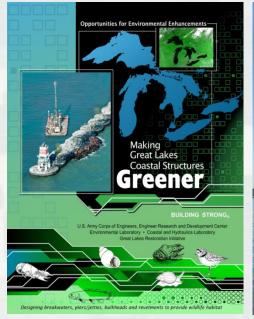


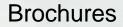
Preliminary Implications (Cleveland)

- 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

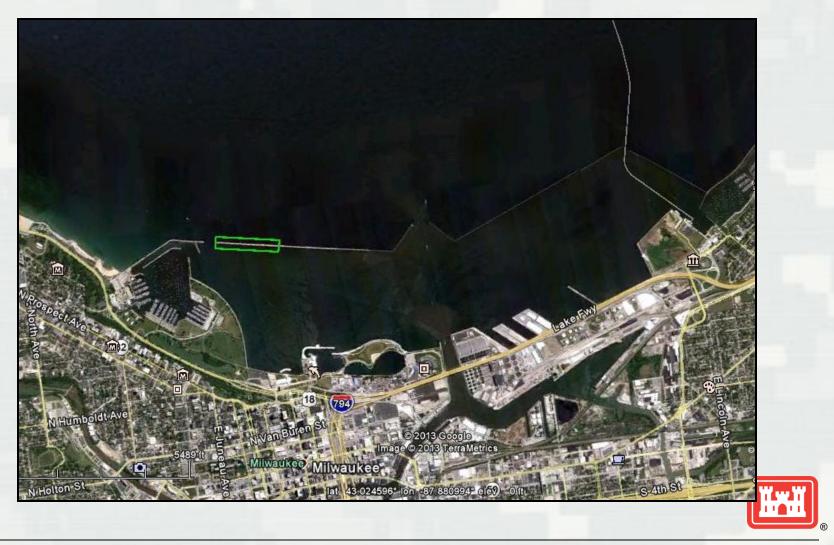


Milwaukee Harbor Project Approach

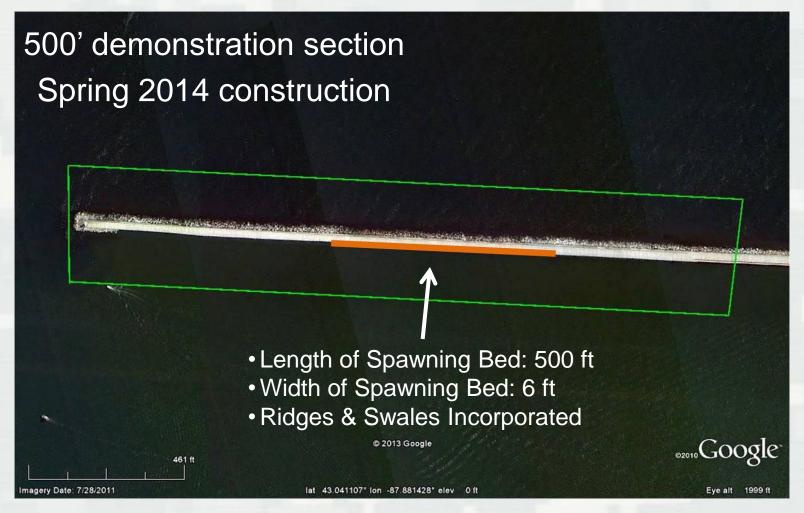
- Modify design of rubble mound breakwater during maintenance
- Create spawning bed for fish such as walleye and smallmouth bass
- Habitat for forage species
- Modifications
 - Smaller stone size (lee/harbor side)
 - > Gentler sloping shelf



Milwaukee Harbor, WI Lake Michigan

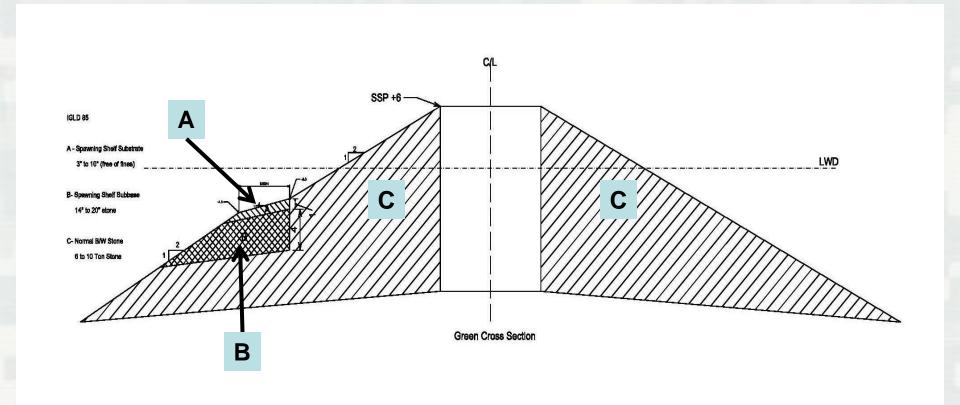


Fish Spawning Bed Location





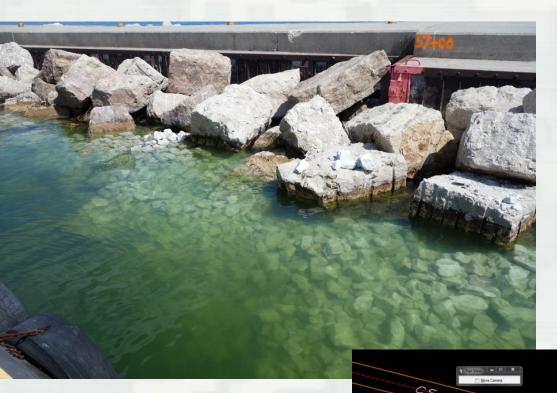
Modified Rubble Mound Breakwater Fish Spawning Shelf



- 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



