Incorporating EWN into Breakwaters and Other Hard Infrastructure

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EWN Meeting
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Galveston, TX
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
Study Site

Cleveland East Arrowhead Breakwater – Lake Erie
Sample Collection

Post-sampled Area
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

Brochures

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 - Lake Erie

Study Site
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

500’ demonstration section
Spring 2014 construction

- Length of Spawning Bed: 500 ft
- Width of Spawning Bed: 6 ft
- Ridges & Swales Incorporated
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

Side-scan Sonar

Visual Confirmation
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