

Increasing Habitat Value on Coastal Structures through Engineering With Nature

**Burton Suedel, Cynthia Banks,
and Tony Friona**

USACE-ERDC-EL
Vicksburg, MS

Paul Bijhouwer and Rich Ruby

USACE Buffalo District

Hal Harrington

USACE Detroit District

Peter Esselman

USGS Ann Arbor, MI

**NAP EWN
Collaboration
Meeting**

7-8 June 2016



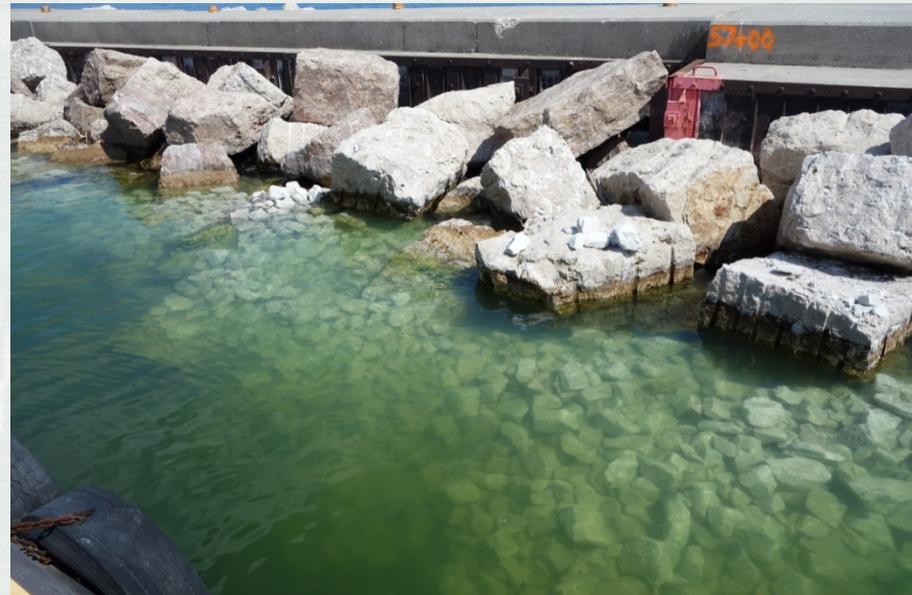
®

US Army Corps of Engineers
BUILDING STRONG®



Great Lakes Coastal Structures Studies

- 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
- Simple design modifications to structural elements
- Concept extends to shore protection structures, non-USACE structures



Cleveland East Arrowhead Breakwater Project Approach

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



Cleveland
East
Arrowhead
Breakwater –
Lake Erie

Study Site



Cleveland & Ashtabula, OH



Control



Grooved



Dimpled



Grooved Shelf



Sample Collection



Post-sampled Area

Preliminary Implications

- Initial colonization greater for most groups on grooved blocks
 - ▶ Invertebrate secondary production increase
- Potential to provide juvenile fish refuge
- Update – sample processing and analysis from monitoring events
- Monitored 24 months



Ashtabula Harbor Breakwater Project Approach

- **Beyond indirect and unplanned habitat creation**
- **Modify design of breakwater to create bird habitat during routine maintenance**
- **Provide features creating habitat opportunities for the common tern**
- **Examines creation of tern habitat using modified toe blocks**
 - **Nesting pea gravel**
 - **Predator/competitor exclusion grid**
 - **Side fencing**
 - **Chick shelters**



Ashtabula Harbor - Lake Erie

Study Site



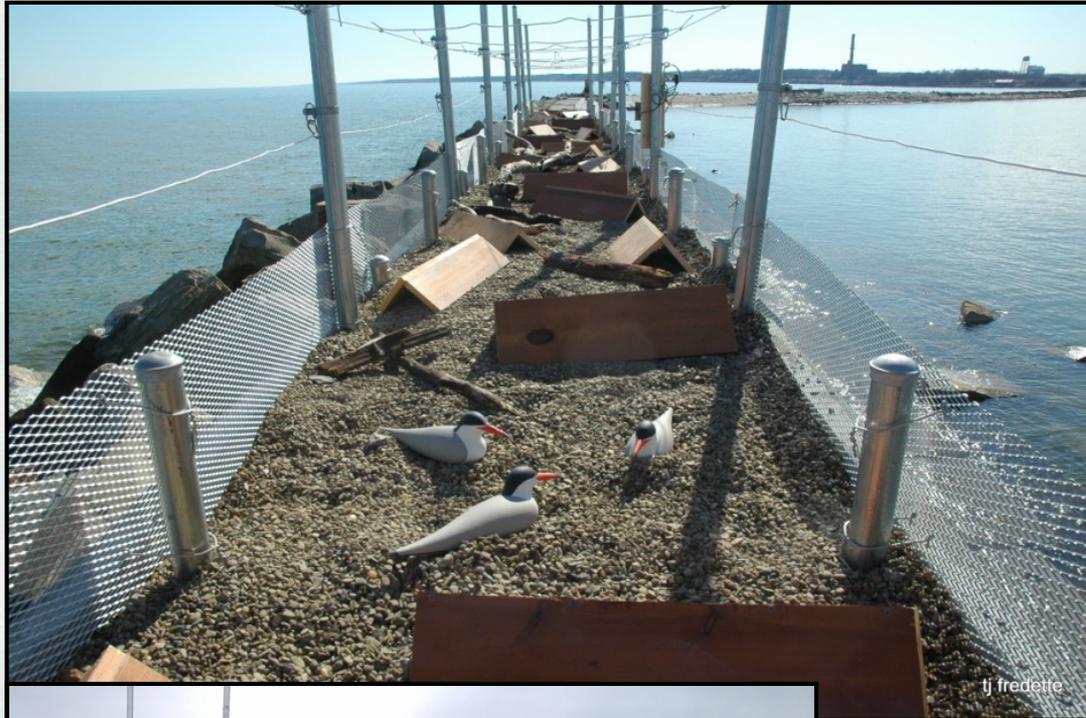
Ashtabula Harbor Tern Habitat Construction



BUILDING STRONG®

Ashtabula Harbor Breakwater Project Status

- Winter ice conditions delayed installation of decoys, tern call box, predator cable grid, and shelters (2014, 2015)
- Site discovery and colony establishment could take 3-5 years
- Tern monitoring ongoing
- Doubling habitat size in 2014 to sixteen blocks will further increase the likelihood of success
- The Nature Conservancy constructed shelters



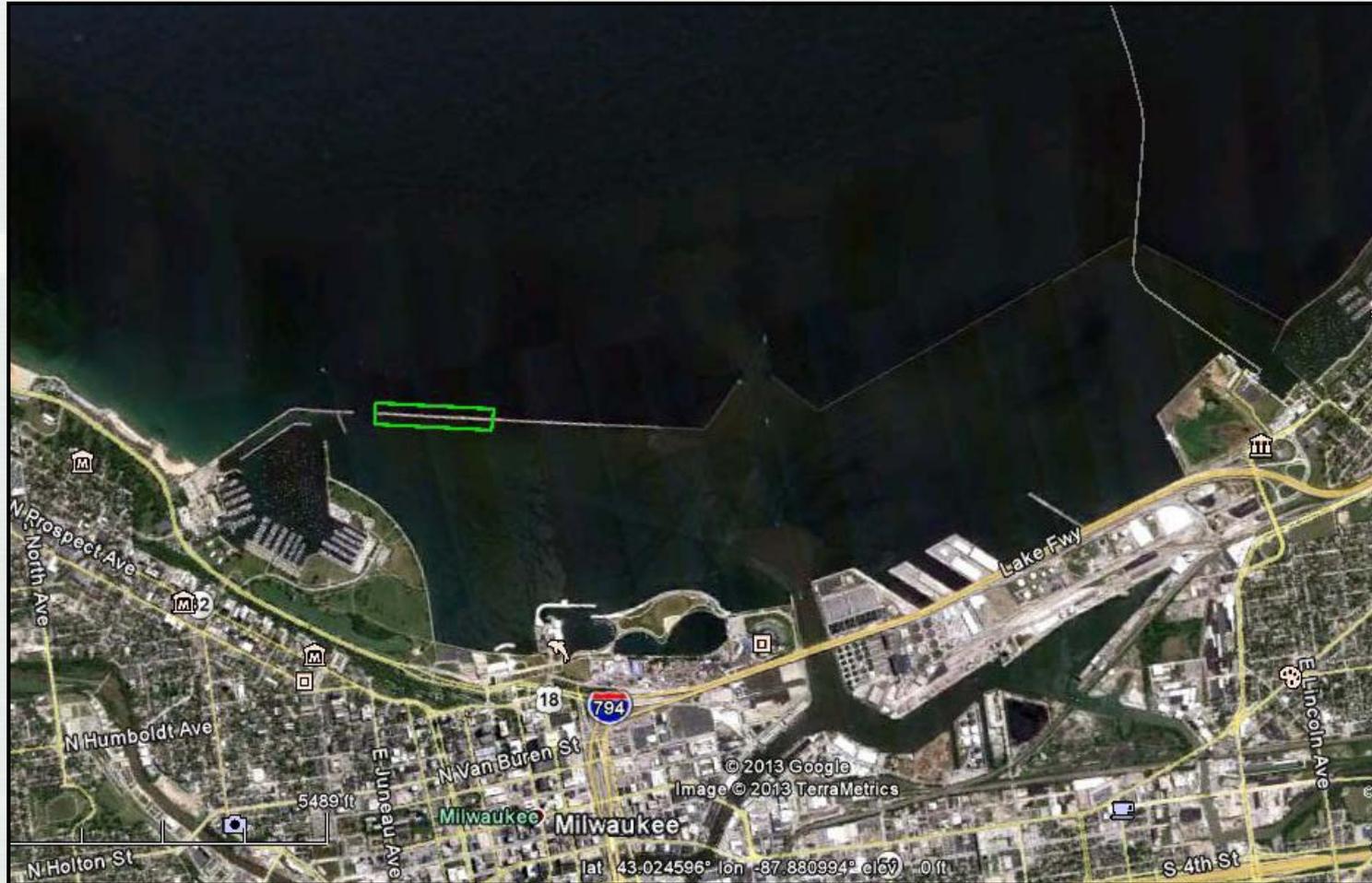
STRONG®

Milwaukee Harbor Project Approach

- **Extend beyond indirect and unplanned habitat creation**
- **Modify design of rubble mound breakwater during maintenance**
- **Provide features creating habitat opportunities for GL fish and other aquatic life**
- **Examine creation of habitat surfaces using rubble mound**
 - **Stone size**
 - **Gentler sloping shelf**
- **Create spawning bed for fish such as walleye and yellow perch**



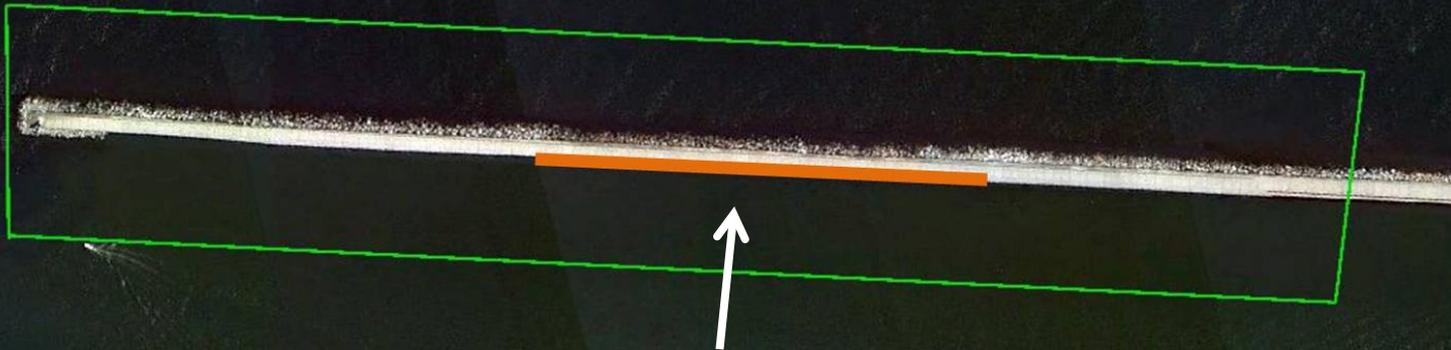
Milwaukee Harbor, WI Lake Michigan



BUILDING STRONG®

Milwaukee Harbor Fish Spawning Bed

500' demonstration section
Spring 2014 construction



- Length of Spawning Bed: 500 ft
- Width of Spawning Bed: 6 ft
- Discontinuous Bed

© 2013 Google

©2010 Google

Imagery Date: 7/28/2011
461 ft

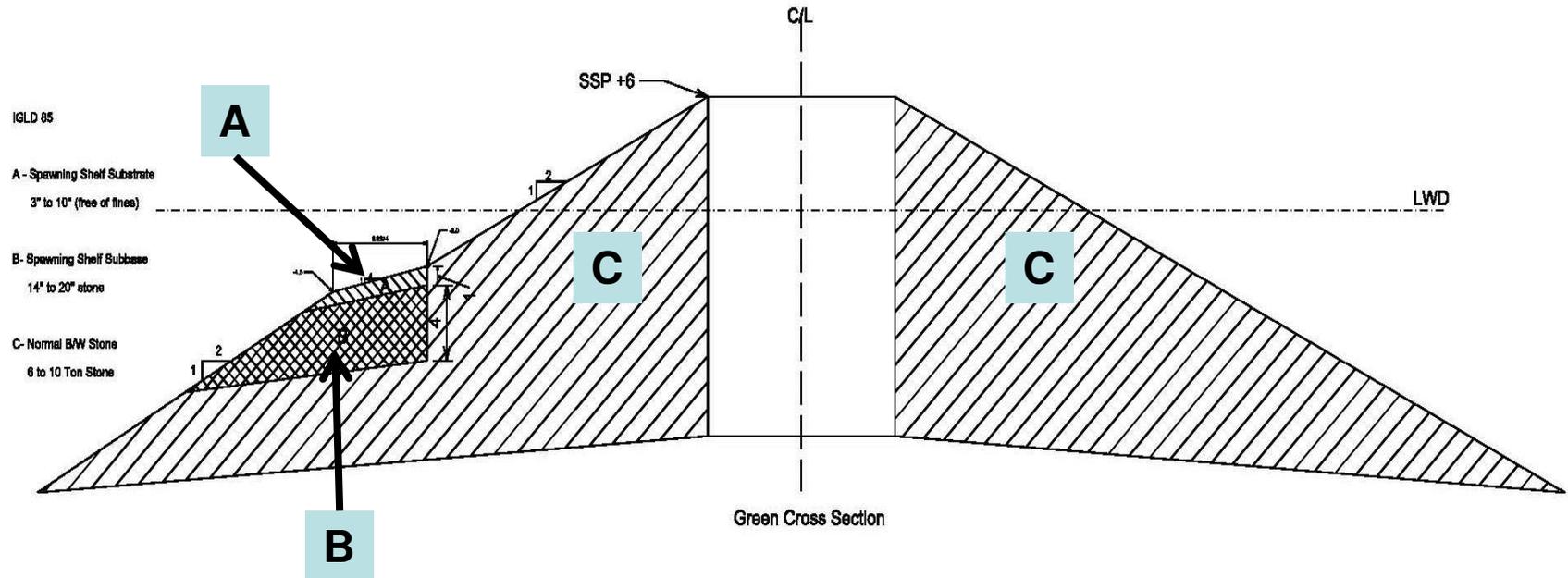
lat 43.041107° lon -87.881428° elev 0 ft

Eye alt 1999 ft



BUILDING STRONG®

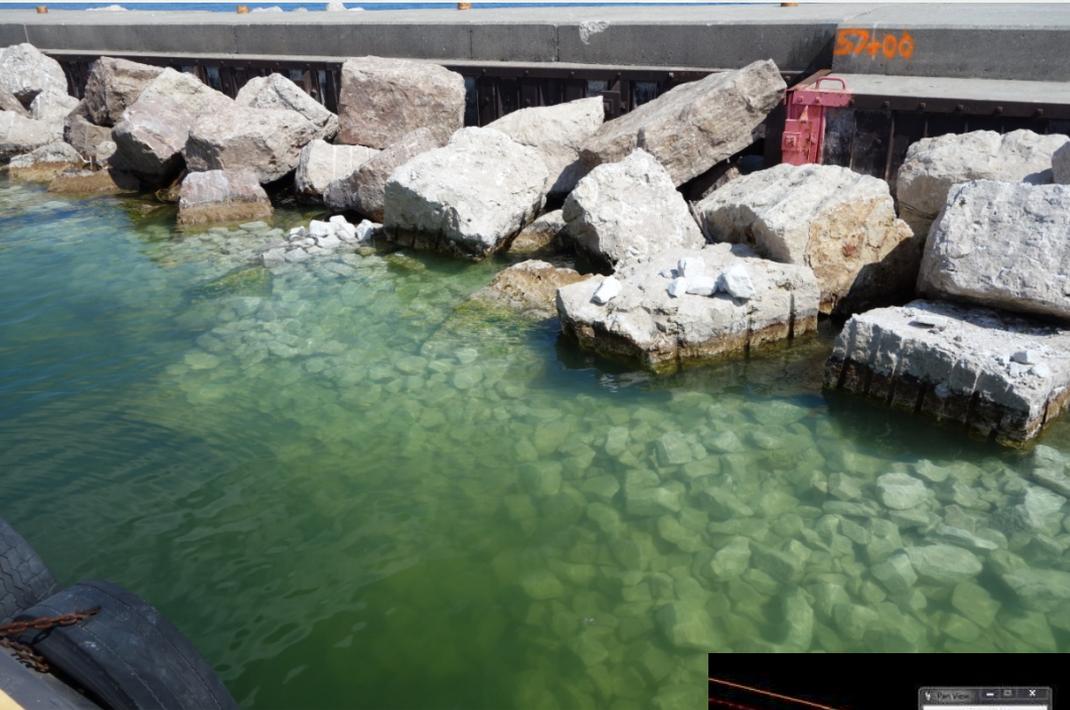
Modified Rubble Mound Breakwater Fish Spawning Shelf



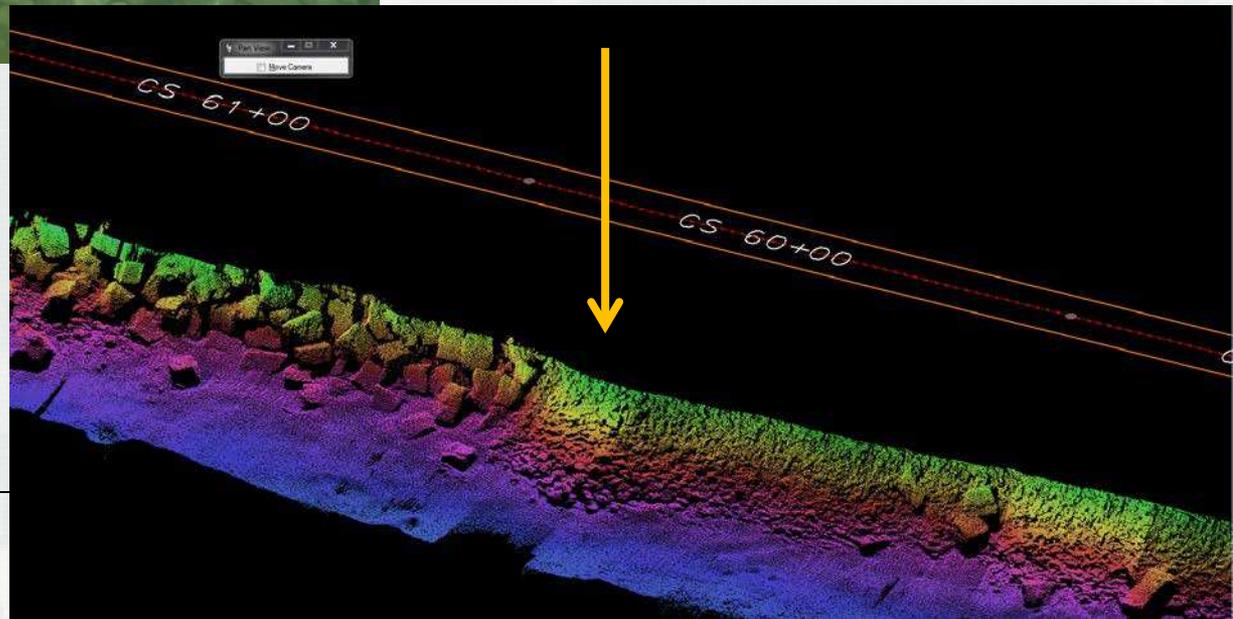
- A - Spawning Shelf Substrate: 4-8" stone free of fines**
- B - Spawning Shelf Sub-base: 8-18" stone**
- C - Normal B/W Stone: 6-10 ton stone**



Post Construction Monitoring



- Visual confirmation
- Biological monitoring
- Side-scan sonar



Path Forward

- Seek opportunities to conduct demonstrations or full scale projects with partners in NAP
- Assess and report on benefits and realized ecosystem services
- Lessons learned – adaptively manage
- Fully communicate with partners, academia, and public

