

Restoration of Spawning Habitat for Native Fish in the Central Great Lakes



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Huron – Erie Corridor
(HEC)

Spawning Habitat Restoration



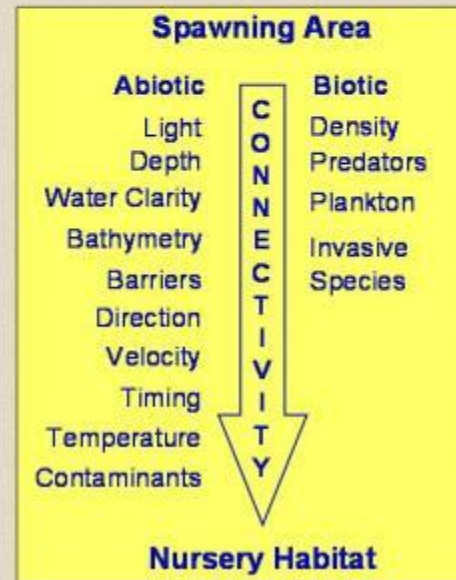
Restore habitat connectivity and function to promote native fish production and ecological resilience

FACT: Habitat function is critical to fish production

HYPOTHESIS: Habitat quantity and dysfunction limit fish production in the Huron - Erie Corridor



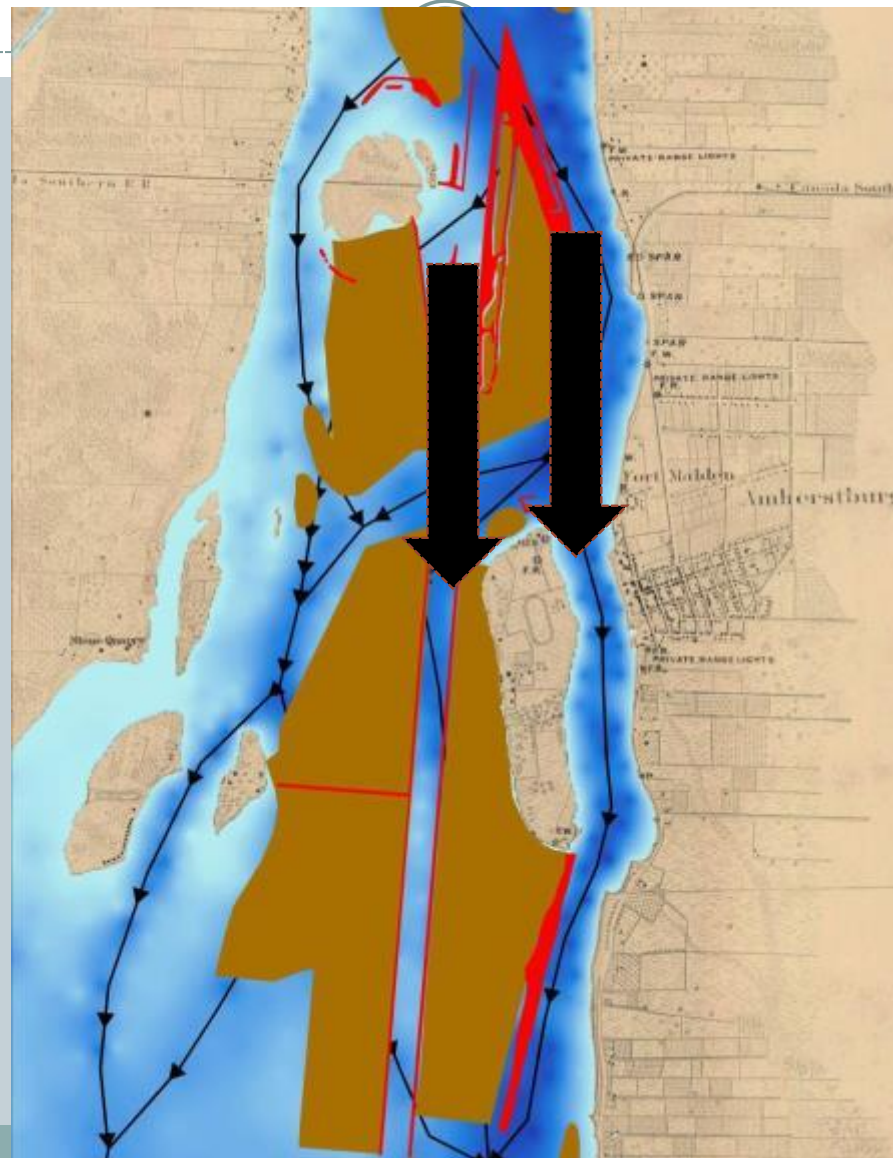
The GLSC and its partners have initiated research projects to identify and quantify ecological relationships defining fish habitat in the Huron-Erie Corridor. New field studies examining fish spawning and nursery habitat began in 2005 and will continue through 2008.



Habitat Alterations



Changes In Flow



Huron-Erie Corridor (HEC)

Industry



Urban development



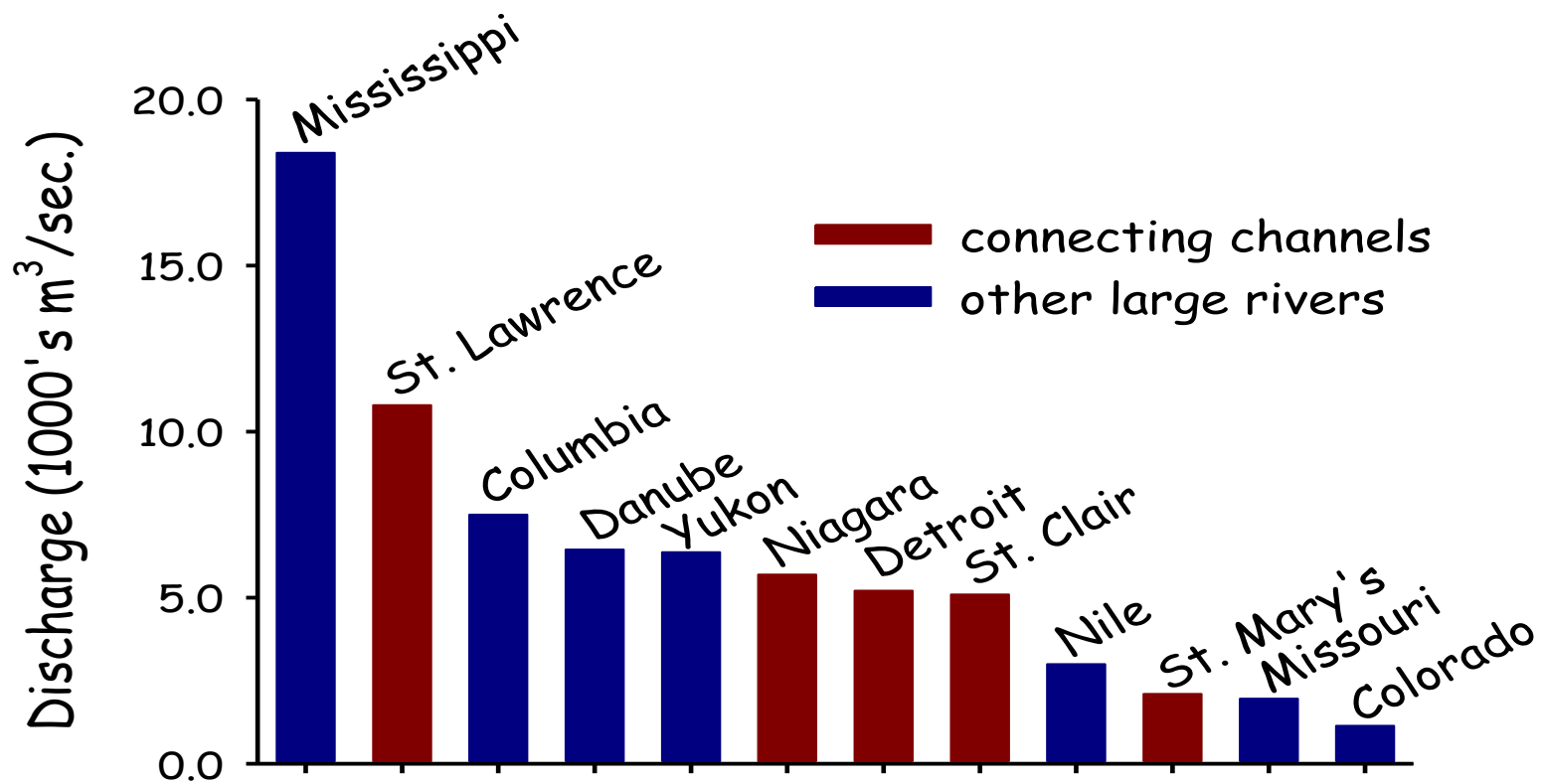
Shoreline modification



Traffic



The connecting channels are huge



What's special about the HEC?



- Only free-flowing connecting channel in the Great Lakes
- Connects cooler upper GL to warmer lower GL
- Fishery worth 2 billion annually
- Six AOCs in the HEC (GL Water Quality Agreement)
- Contains the only International Wildlife Refuge in N. America
- Historic high fish productivity, but massively degraded
- Huge runs of fish spawned in the channel (lake whitefish, walleye, lake trout, lake herring, and lake sturgeon)
- More than 65 species of fish inhabit the HEC
- 16 species of fish are threatened or endangered
- Largest self sustaining population of lake sturgeon in the Great Lakes

Fish Habitat Remediation in the HEC

Belle Isle Reef (2004)

3 Reefs total, 1 of each material

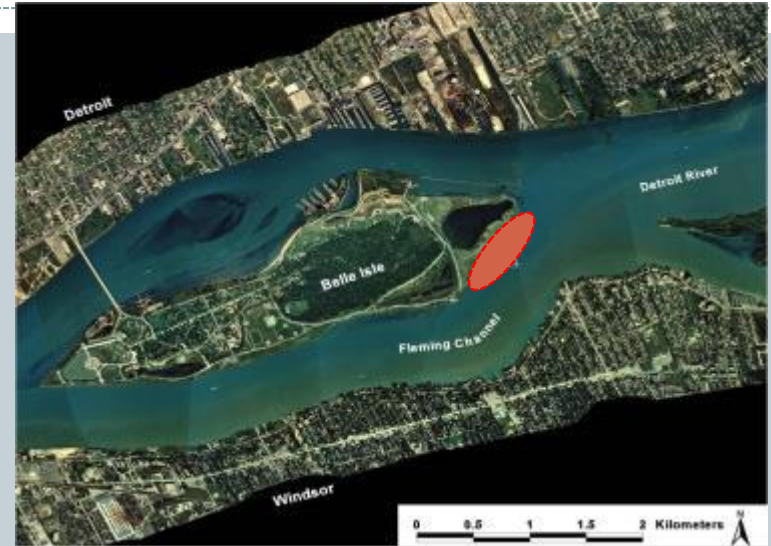
- Limestone, Fieldstone, Coal cinders
- **1100m² total reef area** –Each reef 375 m²

Originally built to target lake sturgeon spawning

Pre Construction: Evidence of adult lake sturgeon in the area.

Post Construction: Lake whitefish and walleye along with many other native species use the reefs to spawn but no lake sturgeon eggs have been found (Read and Manny, 2006).

Lesson Learned: Construct a larger reef to span the channel creating a “no miss design”. **Importance of assessment.**



Fish Habitat Remediation in the HEC

Fighting Island Reef (2008)

12 Reefs (275 m² total) = **3300 m² total reef area** (3 times the size of Belle Isle)

Pre Construction: No evidence of lake sturgeon spawning (Roseman et al., 2011).

Post Construction:

- Egg sampling using egg mats showed fish prefer the four island side reefs (Roseman et al., 2011). The combination of the influence from the island on flow and the water being less turbid cause the fish to prefer specific reef.
- Night drift samples targeting larval lake sturgeon in 2012, showed the majority larval lake sturgeon were found downstream of the reefs .

Lessons Learned: Location (within known sturgeon movement) plays a key role in determining use.



Fish Habitat Remediation in the HEC

Middle Channel Reef (2012)

9 Reefs total, 3 of each material (picture on right: JJR, LLC)

- 10 – 20 cm (round rock SR, sorted limestone SL, and a mixture MX)
- **4005 m² total reef area** –Each reef 445 m²

Pre Construction: No evidence of lake sturgeon spawning in the channel.

Post Construction: Lake Sturgeon started spawning on the reef during construction (two pictures above; adult lake sturgeon on the reef (right) lake sturgeon eggs on the rounded rock reef (left)).

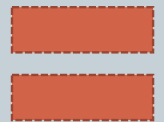
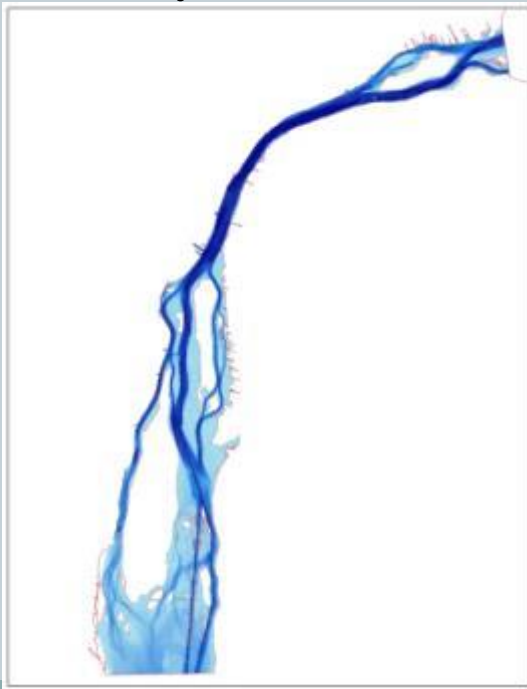
Lesson Learned: Type of substrate is not as important as greater water depth and velocity. Build future reefs using one substrate type.



Spatial Modeling

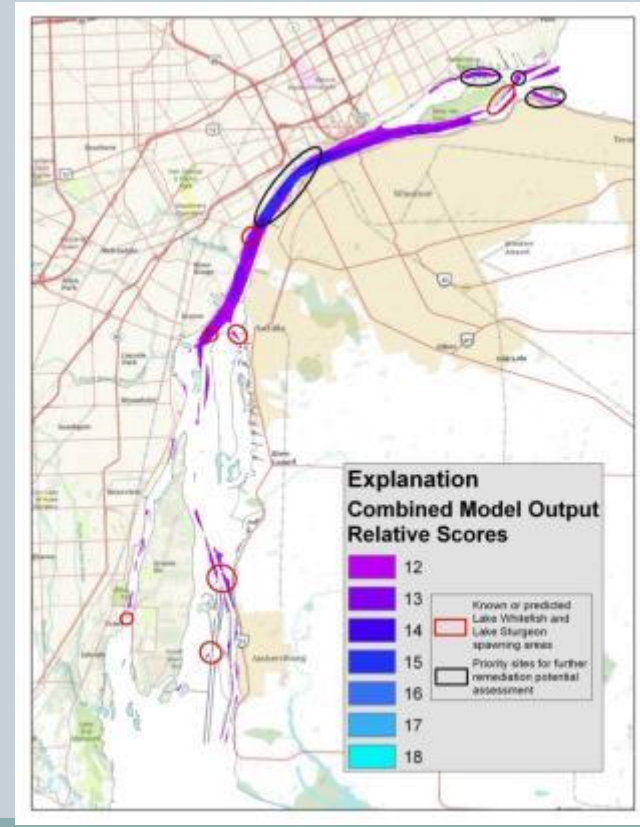
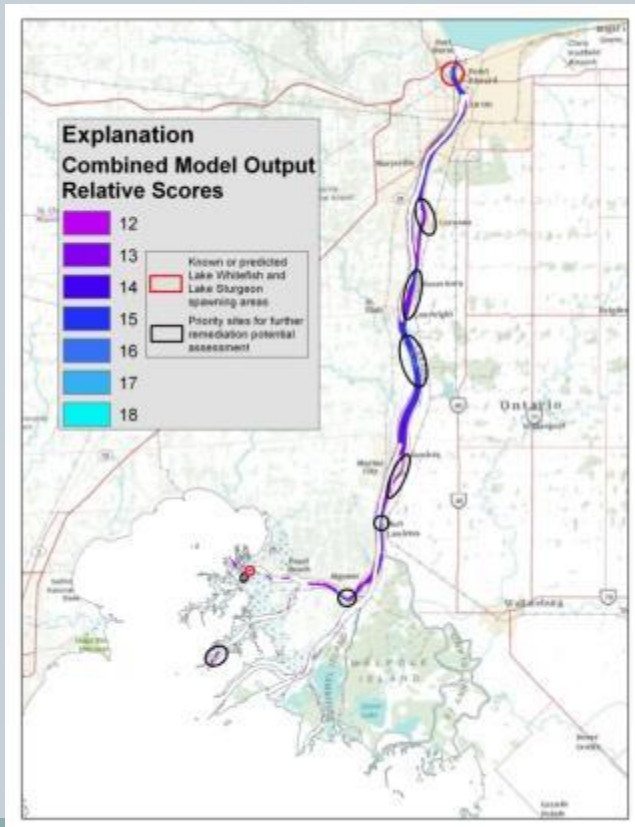


- Four main physical habitat parameters, consisting of **water depth**, **flow velocity**, substrate and water temperature, were identified as important to spawning lake sturgeon, walleye and lake whitefish
- From these, water depth and flow velocity were singled out to form the basis of our analysis



Spatial Modeling

- Produced system-wide habitat rankings for our target species
- 2.7% of total HEC area is indicated as potentially suitable for fish spawning habitat remediation



Spawning Habitat Site Pre-assessment



- Science-based justification
- Are fish using the area
- Water velocity across study area
- Bottom substrates: composition, extent, & arrangement
- Water depths – bank slope, contours
- Don't want to bury actively used spawning substrates

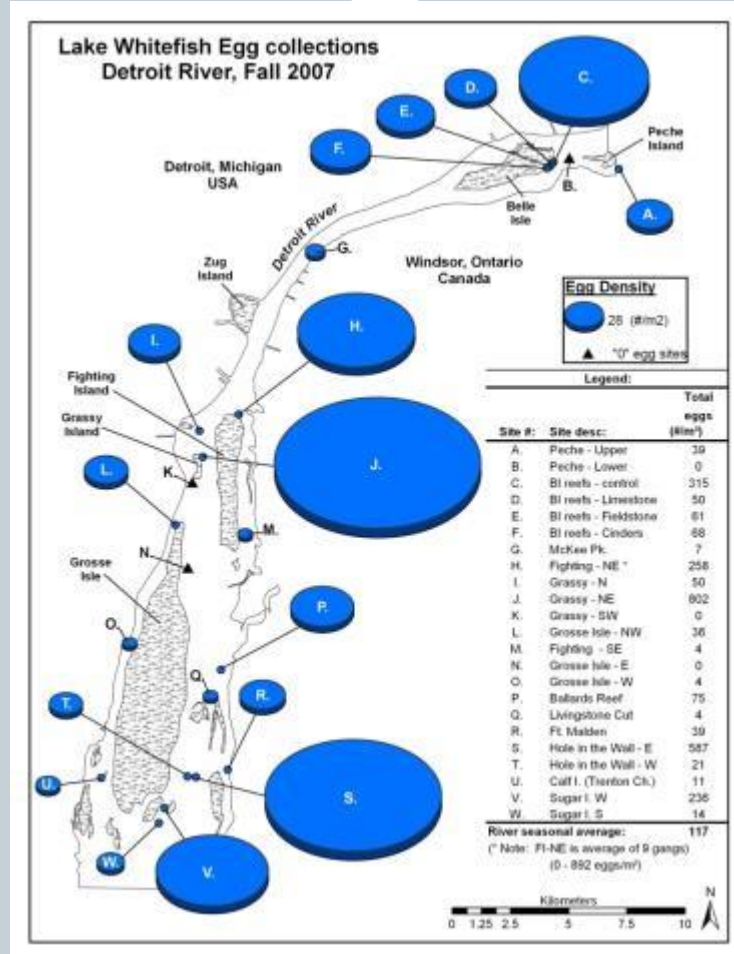
Spawning Assessment



- Pre-construction: upstream, reef site, and downstream
- Post-construction: 1 gang per reef, with 1 control upstream
- Pulled weekly
- Eggs reared in lab for identification



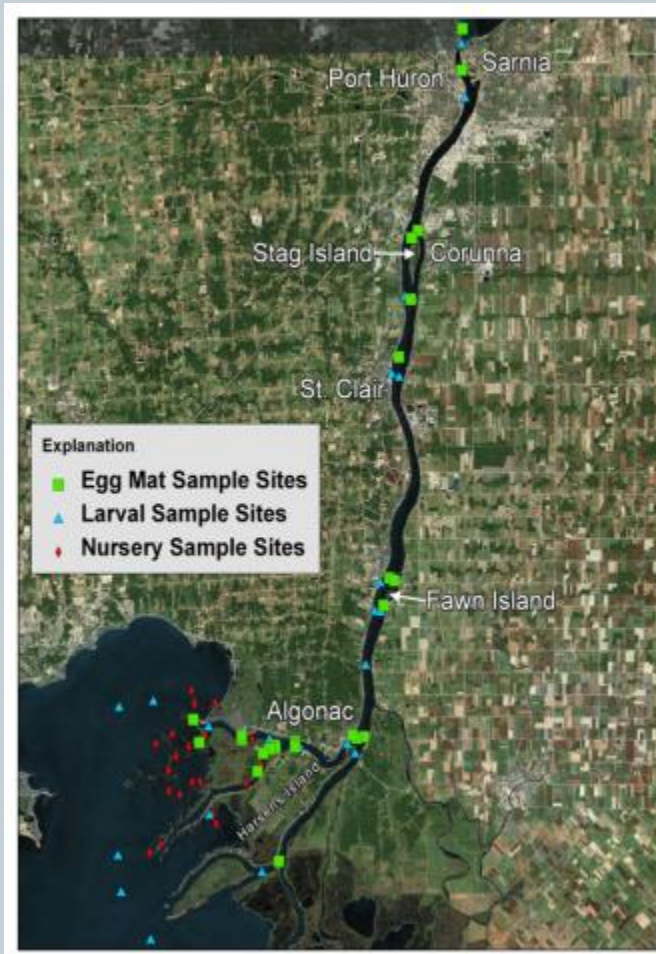
Spawning Assessment



Larval Assessment



Egg and Larval Sample Sites



Adult Assessment



- USFWS monitored adult fish use
- Set lines and gill nets
- 2 year prior and 2 years post-construction

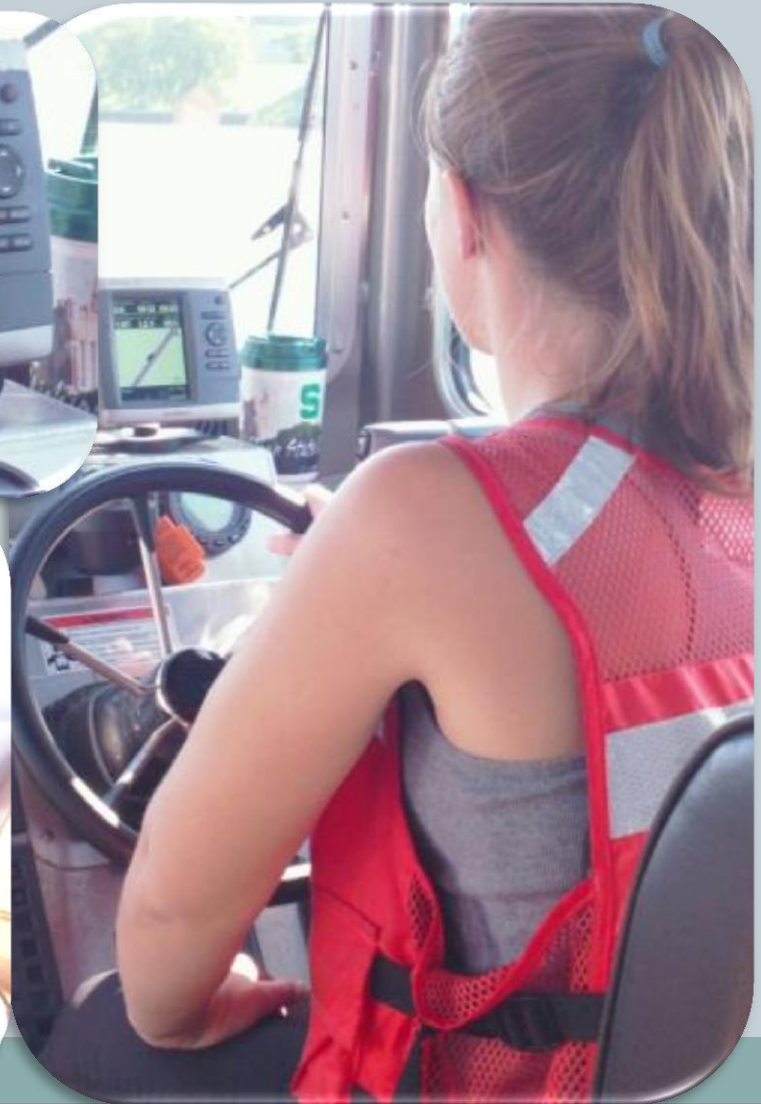


Assessment Effort



- Sampling efforts 2010-11:
 - > 1,200 fish spawning samples (egg mats)
 - > 3,900 larval fish samples (various gear)
 - 1007 hours of standardized gillnetting
 - 107,936 hook-hours standardized setlining
 - 444 minutes of bottom trawling
 - 6,904 hours of minnow trap sampling for small benthic fishes
 - Implanted 8 lake sturgeon with telemetry transmitters
 - Tagged and released 80 lake sturgeon with PIT and visual tags

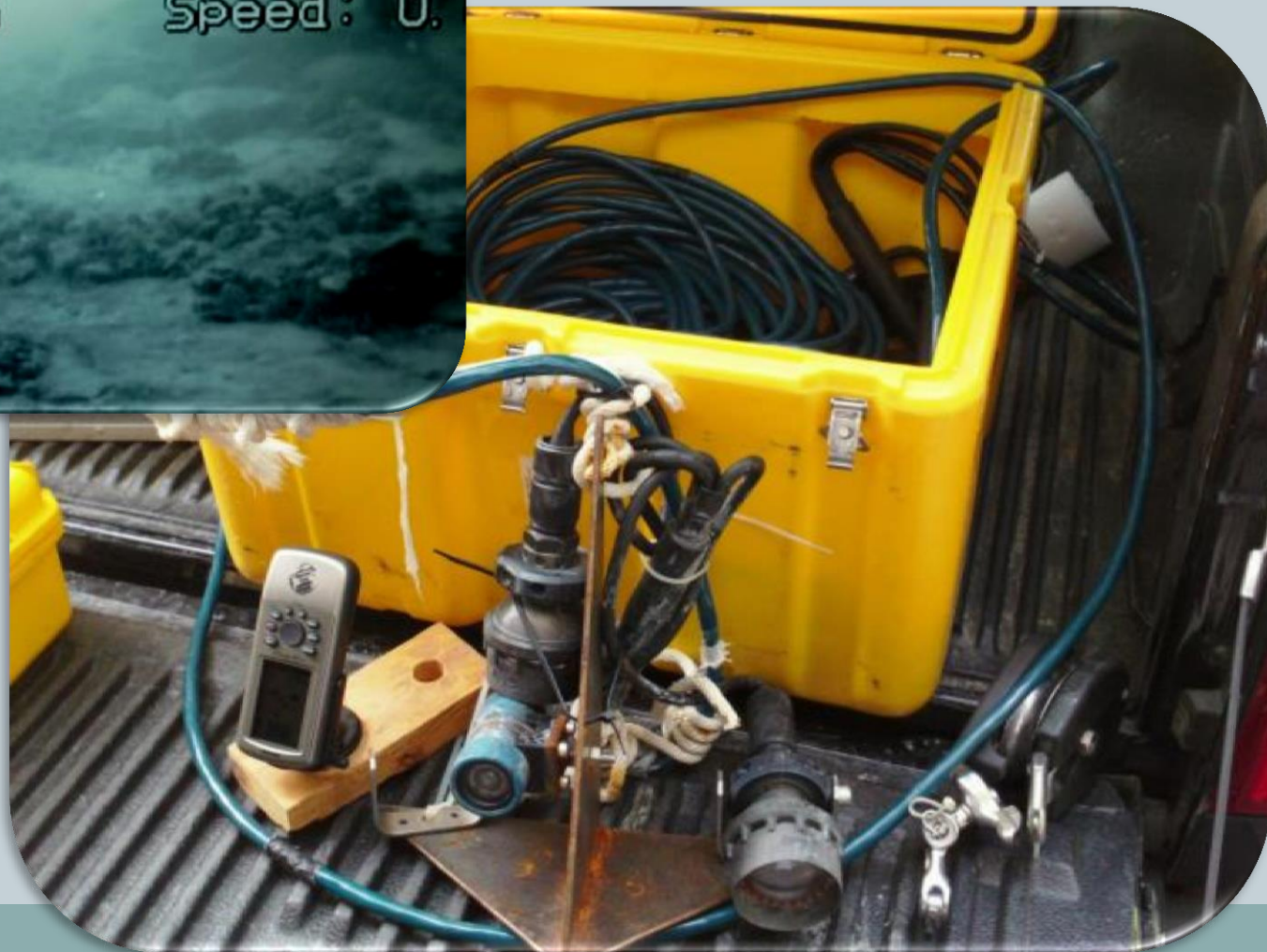
Substrate mapping using Side-Scan SONAR



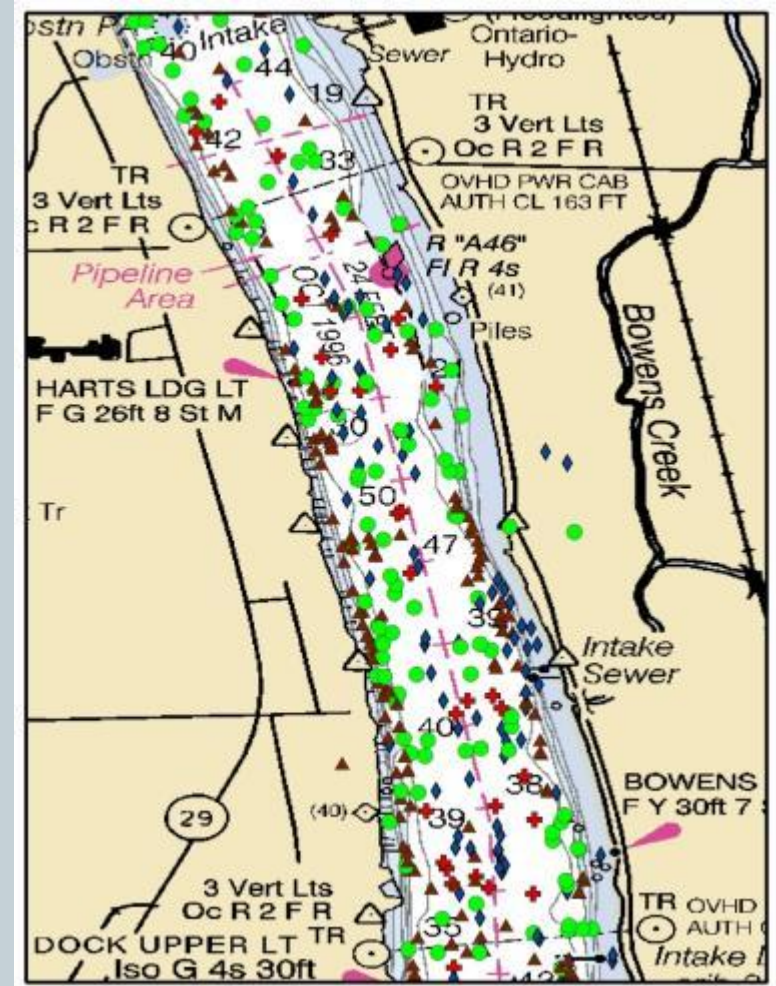
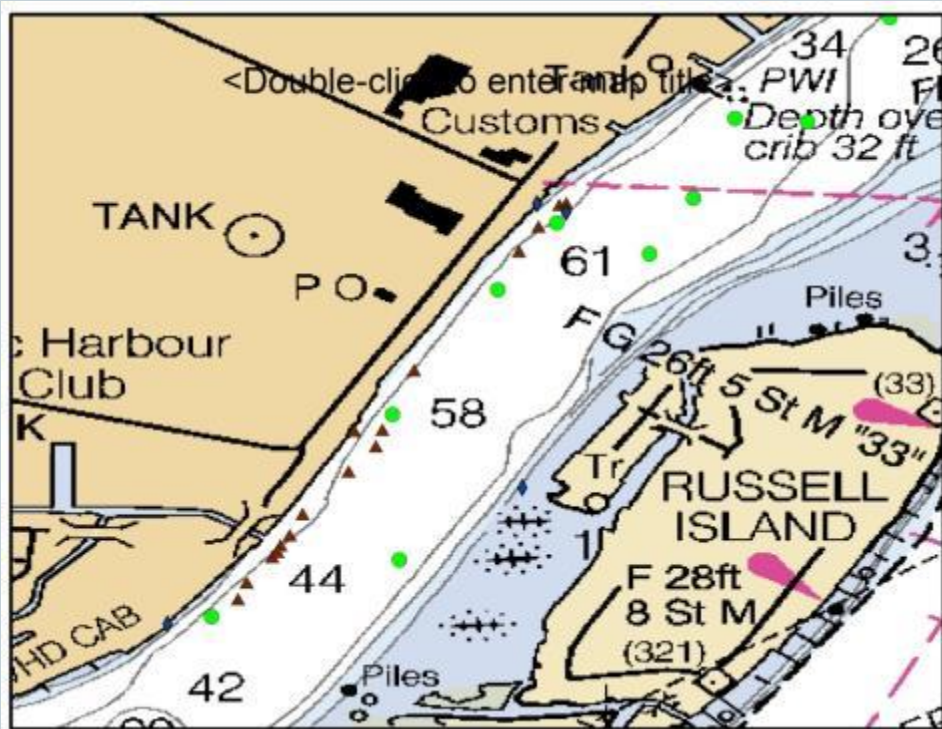
Underwater Video ground-truth

N 42 36.951
W082 35.495

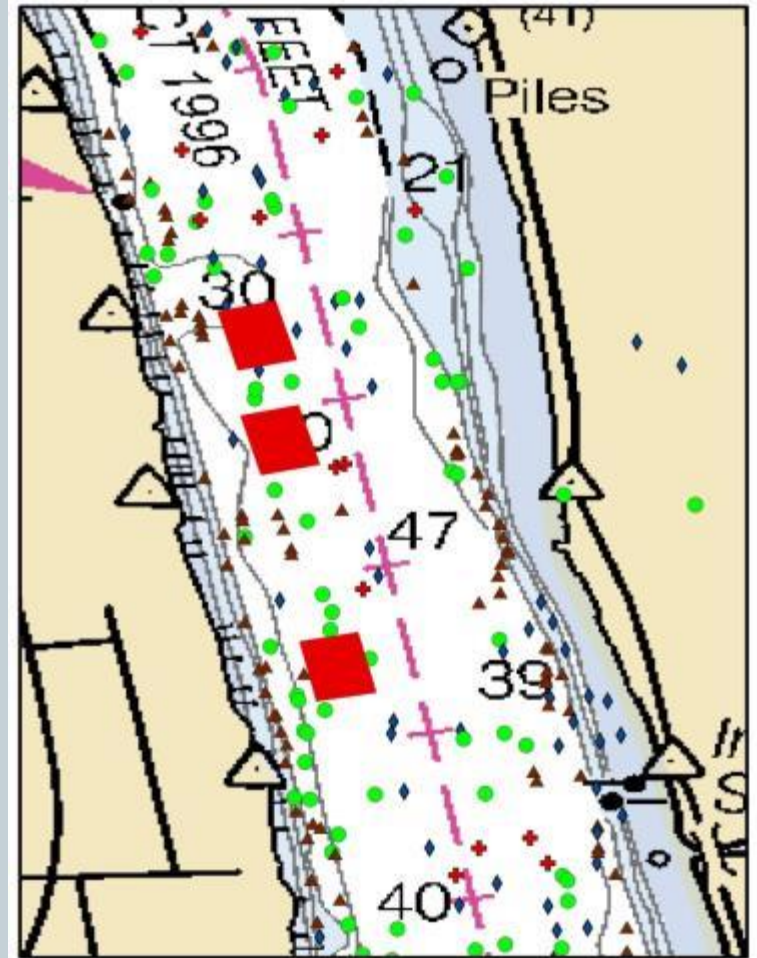
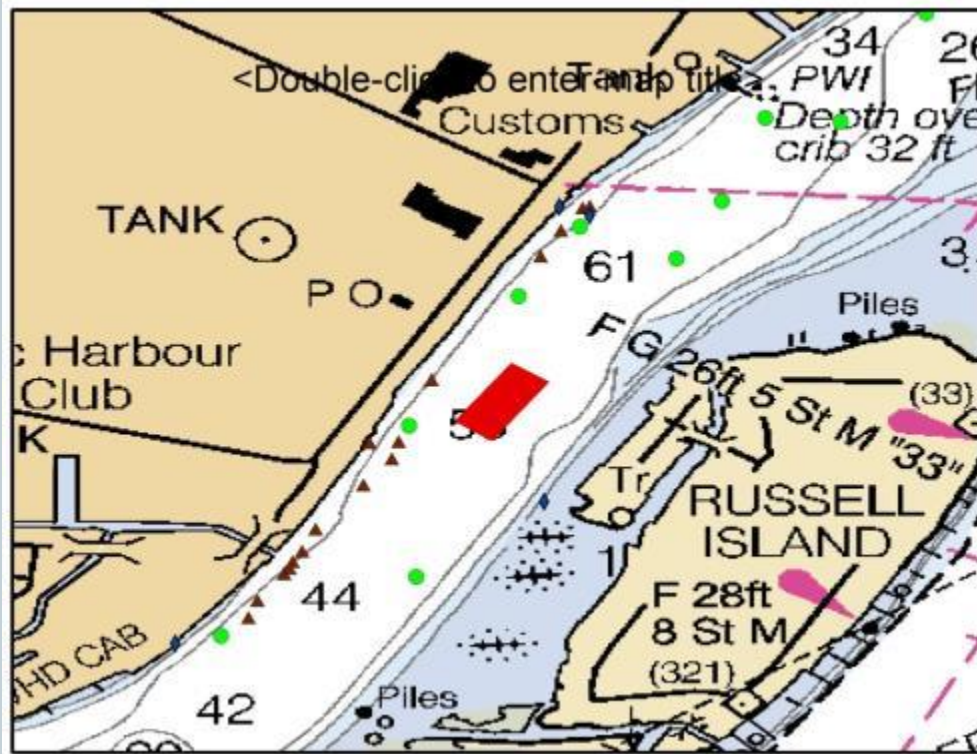
Hdg: 25
Speed: 0.



Results of initial target analysis – development of restoration site locations



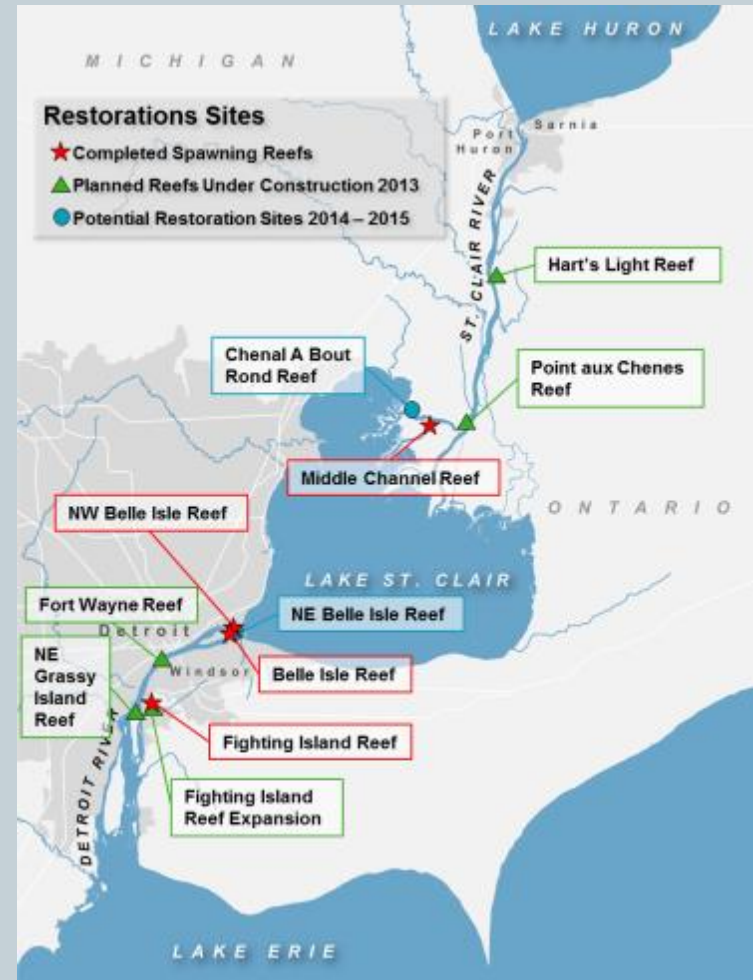
Results of initial target analysis – development of restoration site locations



Future Projects Based on the Model



- Fort Wayne
- Fighting Island Expansion
- Point Aux Chenes
- Harts
- NE Belle Isle
- NE Grassy Island



Achievements



- Scientific achievements:
 - Documented spawning of several native fishes
 - Use of constructed spawning habitats by native fishes in the St. Clair and Detroit rivers
 - Threatened / Endangered species habitat use (river darter, northern madtom, river redhorse, lake sturgeon)
 - Transport of L. Huron fishes through corridor (lake herring)
 - Siting and configuration of future restored habitats in the HEC to promote restoration of native fishes (spatial model)

Achievements



- Habitat can be restored
 - Quantity, quality, function
 - Response by numerous native fishes
 - Documented improvements in habitat quality
- Approach applicable to other systems, AOCs
 - Defensible scientific approach
 - Effective collaborative partnerships
 - Knowledge for informed decision making
- “Locally applicable, regionally significant”

Questions?

