Evaluating Habitat Restoration in the St. Clair-Detroit River System using Egg Deposition on Spawning Reefs and Larval Drift of Native Fishes

Kevin Keeler1,2, James Boase2, Justin Chiatti1, Jaqueleen Craig1, Robin DeBruyne1,2, Richard Drouin1, Rosanne Ellison1, Jason Fischer6, Stacey Ireland1, Greg Kennedy1, Bruce Mann2, Jennifer Read, Edward Roseman1, Lynn Vaccaro1

1USGS Great lakes Science Center, Ann Arbor, MI 2US Fish and Wildlife Service, Waterford, MI 3U.S. Environmental Protection Agency, Gross Ile, MI 4University of Toledo, Toledo, OH 5Ontario Ministry of Natural Resources, London, ON 6University of Michigan Water Center, Ann Arbor MI

Background
- Pollution, channelization, dredging, and development in the St. Clair and Detroit Rivers reduced water quality and removed natural spawning substrate for fishes leading to declines in fish populations including lake sturgeon Acipenser fulvescens.
- These losses resulted in designation of portions of the system as a Great Lakes Area of Concern with Beneficial Use Impairments (BUI) related to habitat and population losses.
- Improvements to water quality provided opportunities for habitat and population restoration.
- Toward this end, artificial reefs are being constructed and monitored through a collaborative multi-agency partnership to delist BUI’s within the system.
- Assessment and monitoring of egg deposition at reefs has been conducted with egg mats and larval lake sturgeon drift with D-frame nets.

Pointe aux Chenes Reef
- 1.5 acres constructed in 2014
- Sorted Limestone – 10 to 15 cm

Survey Results
- Pre-assessment began in 2013
- Low density walleye and sucker eggs
- Post-assessment began in 2015
- Lake sturgeon eggs captured on the reef averaging 897 eggs/m²
- Low density walleye and sucker species were captured on reef site

E Belle Isle Reef
- Will add 2 acres of reef area
- Sorted Limestone – 10 to 15 cm
- Eggs collected include walleye, sucker species, and lake whitefish

Survey Results
- Pre-assessment began in 2004
- Walleye density averaged 91 eggs/m² of egg mat
- Post-assessment began in 2005
- No lake sturgeon eggs have been collected to date
- Eggs collected include walleye, sucker species, trout-perch, and lake whitefish

NE Belle Isle Reef
- Constructed in 2012, part of the Blue Heron Lagoon Habitat Restoration
- Natural rock material

Fort Wayne Reef
- Test reef constructed in 2015

Survey Results
- Pre-assessment
- Egg collections include sucker species, lake whitefish and high densities of walleye (5,657 eggs/m² of egg mat in 2013)

Belle Isle Reef
- 0.027 acre area constructed in 2004
- Limestone, fieldstone, and coal cinders

Survey Results
- Pre-assessment began in 2004
- Walleye density averaged 91 eggs/m² of egg mat
- Post-assessment began in 2005
- No lake sturgeon eggs have been collected to date
- Eggs collected include walleye, sucker species, trout-perch, and lake whitefish

Grassy Island Reef
- 4 acres constructed in 2015
- Sorted Limestone – 10 to 15 cm

Survey Results
- Pre-assessment began in 2013
- Eggs collected include high densities of walleye (1,711 eggs/m² of egg mat) and lake whitefish (2241 eggs/m² of egg mat)
- Post-assessment to begin in 2016

Harts Light Reef
- 3.8 acres constructed in 2014
- Sorted Limestone – 10 to 15 cm

Survey Results
- Pre-assessment began in 2013
- Lake sturgeon eggs were captured in 2013 (21 eggs/m²) and 2014 (150 eggs/m²) upstream of the reef site
- Post-assessment began in 2015
- Lake sturgeon eggs captured on the reef averaging 3,240 eggs/m² of egg mat
- Larval drift results from 2015 suggest larval lake sturgeon are actively using the constructed reef
- Other eggs collected on reef include sucker species
- Control egg mats collected walleye, sucker species, and lake whitefish

Middle Channel Reef
- 1.0 acre total area constructed in 2012
- Mixed rock and limestone – 10 to 20 cm
- Pre-assessment began in 2010
- Walleye eggs were captured in the reef area
- Post-assessment began in 2012
- Lake sturgeon eggs were collected in 2012 and 2013
- 2014 season has been the most successful year to date for larval lake sturgeon drift though no eggs were collected on the reef

Fighting Island Expansion
- Constructed in 2013
- 1.2 acre expansion below western third of original FI Reef
- Made of sorted Limestone – 10 to 15 cm

Survey Results
- Sturgeon egg densities averaged 1,382 eggs/m² of egg mat in 2014 and 256 eggs/m² of egg mat in 2015

Fighting Island Reef
- 0.81 acre total reef area constructed in 2008
- Shot-rock, sorted limestone, and sorted round stone

Survey Results
- Pre-assessment began in 2007
- Walleye, trout-perch, sucker species, and lake whitefish were collected
- Post-assessment began in 2009
- LAS eggs have been collected in 2009-2010, 2012, & 2014-2015 on the western reefs
- Highest density year of LAS was 2012 with 329 eggs/m² of egg mat
- Other eggs captured include walleye, sucker species, trout-perch, and lake whitefish

Restoration Sites
- Completed Reefs
- Planned Reefs Under Construction 2016
- Sites Under Evaluation for Reef Placement