

Evaluation of Nearshore Fish Assemblages, Habitat, and the Effects of Herbivorous Rudd (*Scardinius erythrophthalmus*): Facilitating Successful Fish Habitat Restoration Efforts in the Buffalo Harbor and Niagara River

2012 PROGRESS REPORT

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We made substantial progress toward meeting our core research objectives during 2012. A brief summary of the work completed under each objective are provided below, as is a general research plan for 2013. We are still in the process of summarizing data collected during 2012 for each objective. Please contact Kevin Kapuscinski with any comments or questions.

Objective 1: Survey nearshore fish assemblages to monitor reproduction, identify priority areas for protection and habitat improvement, and determine if fish assemblages change in response to habitat restoration efforts

- We sampled fish assemblages and habitat at 11 sites during 30 July-7 Aug (10 index sites and Frog Island)
- Four seine hauls were conducted at each site (44 total hauls), and two mini-fyke nets and 12 minnow traps were fished overnight at each site
- Habitat was surveyed at six points along each seine haul (24 points / site, 264 total points); water depth, water velocity, substrate type, and several measurements regarding aquatic vegetation were recorded at each point
- Two additional sites were sampled by seine only (eight total hauls)
- Catch rates of young-of-the-year muskellunge in the upper Niagara River averaged 0.22 / haul at index sites, the lowest catch rate on record during since our index seining began in 2007; no young-of-the-year muskellunge were captured at two Buffalo Harbor sites (Figure 1)

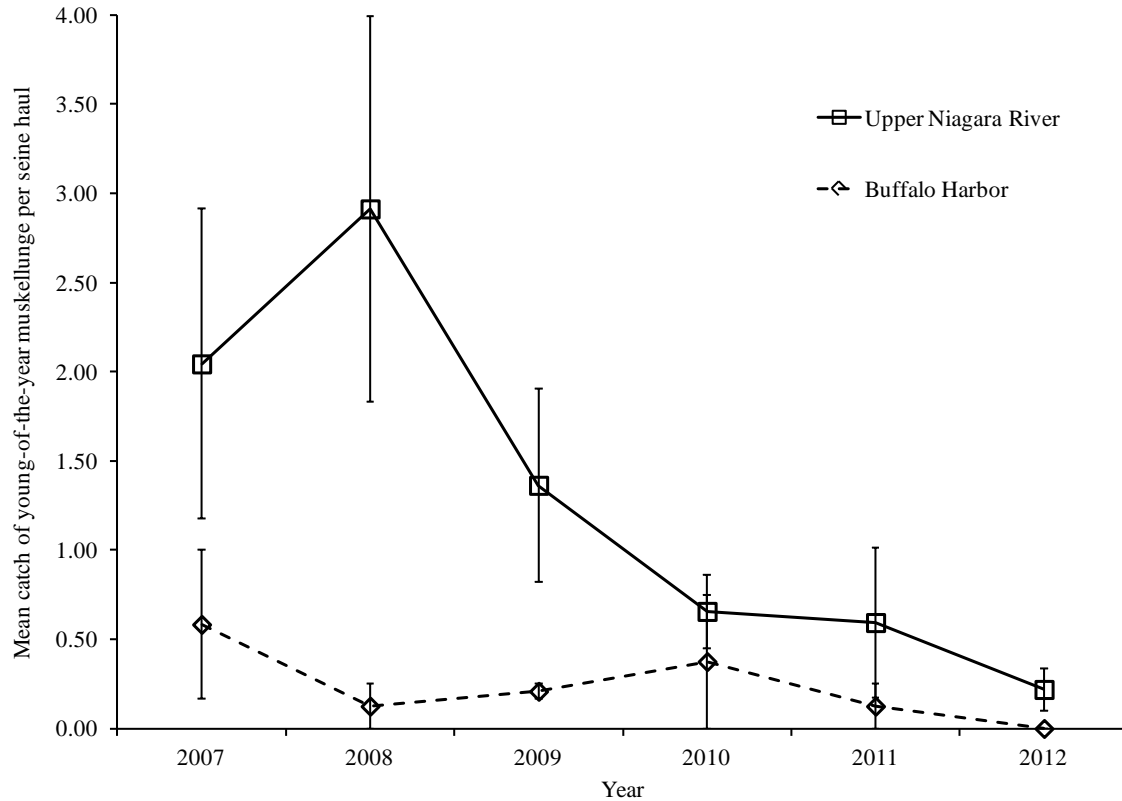


Figure 1. Mean number of young-of-the-year muskellunge caught per seine haul at index survey sites during 2007-2012.

Objective 2: Quantify seasonal changes in the structure and species composition of submerged aquatic vegetation at nearshore sites of the Niagara River

- Matthew Gunderson (MS candidate) was hired in May to address this objective as part of his graduate research
- 116 total quadrats along 20 randomly selected transects were sampled in late June-early July in the upper Niagara River to assess aquatic vegetation and associated habitat
- At each quadrat the following were recorded: distance from shore, water depth, water velocity, substrate type, and vegetation species present
- 85 quadrats along 15 transects were sampled in August, and data were recorded as described for June-July with additional measurements of the maximum height of each species, relative coverage of each species, and total quadrat coverage being recorded
- The shoreline at each transect was assessed using an index of shoreline quality (Minnesota Department of Natural Resources “score your shore”)
- 33 randomly selected quadrats within the Beaver Island wetland were surveyed for water depth, water velocity, substrate type, and vegetation species present; other species observed outside of the quadrat were noted

- 46 randomly selected quadrats within the wetland on the SE shore of Grand Island were surveyed for water depth, water velocity, substrate type, and vegetation species present

Objective 3: Determine the effects of fish herbivory on aquatic vegetation and water quality

- Trap-nets were fished at 12 sites in Buffalo Harbor and the upper Niagara River during 31 May-15 June
- All rudd, common carp, and goldfish were marked (fin clip) and released
- The first 30 rudd, common carp, and goldfish from each site were measured and sex was determined
- All other species were identified and counted
- > 5,000 rudd were marked; recapture surveys will be conducted this fall
- A field experiment to quantify excretion rates (soluble reactive P, ammonia, total P, total N) of rudd were conducted in June and July; water samples were analyzed at external labs and data should be available soon

Objective 4: Identify and quantify vegetation and physical habitat characteristics at muskellunge spawning sites in the Buffalo Harbor and upper Niagara River

- Spotlighting for spawning muskellunge was conducted on 21 nights (approximately 9:00 pm – 1:00 am) from 2 May-5 June; multiple crews were used to increase effort when available
- Spotlighting was focused on water < 2 m deep, adjacent to northwest Grand Island, Grass Island, southeast Grand Island and downstream from Strawberry Island
- Three spawning pairs were observed downstream of Strawberry Island from 17-22 May (Figure 2); the spawning pair observed on 22 May consisted of a muskellunge and a northern pike
- A fourth spawning pair was observed off the SE point of Grand Island on 26 May (Figure 2)
- Habitat data were collected at all spawning sites the following day
- 91 single muskellunge were observed; most single fish sightings were in close proximity to locations where spawning fish were observed
- 55% of single fish spotlighted during this year's effort were observed in a relatively small area downstream of Strawberry Island
- 254 randomly selected points within spawning areas were sampled in order to compare habitat use to habitat availability
- Egg sweeps were conducted at each spawning and random point, a substrate sample was collected, and the following data were recorded: aquatic vegetation taxa, vegetation height, vegetation coverage by taxa, total vegetation coverage, water depth, and water velocity
- Water temperature and water level loggers were deployed throughout the sampling period

- 30 eggs were collected from eight points downstream of Strawberry Island (Figure 2)
- 14 eggs hatched and were positively identified as muskellunge; 12 of 14 eggs that hatched were from one point where a pair of spawning muskellunge was observed
- One northern pike larvae and egg were collected downstream of Strawberry Island

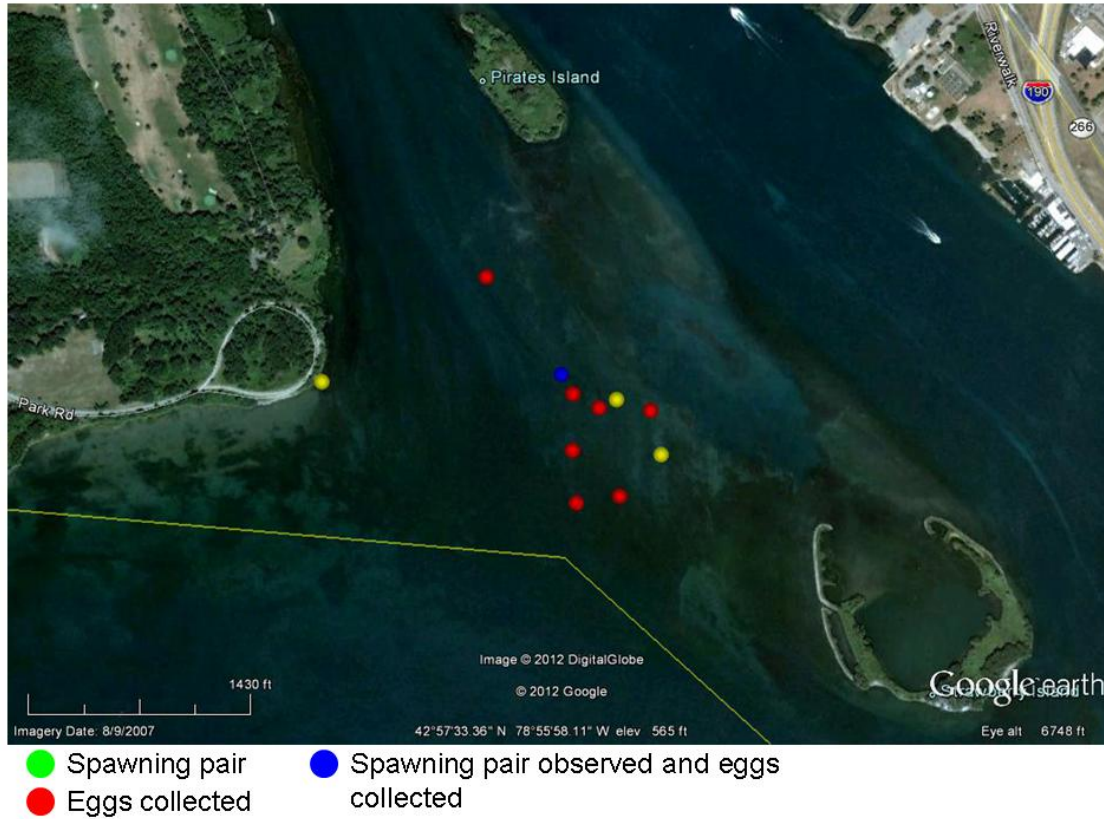


Figure 2. Location of observed muskellunge spawning pairs and points where eggs were collected.

2013 Planned Activities

- Objective 1: continue fish assemblage and habitat sampling at index sites
- Objective 2: continue transect sampling to quantify vegetation-habitat relations, initiate fixed-location sampling to quantify seasonal changes in vegetation assemblages
- Objective 3: complete mark-recapture survey, complete rudd excretion experiment, conduct experiment to quantify consumption rates of vegetation by rudd
- Objective 4: complete field survey of muskellunge spawning, develop a model that quantitatively describes muskellunge spawning habitat