Investigating Lake Sturgeon habitat use, feeding ecology and benthic resource availability in the lower Niagara River

Funded through the Ecological Greenway Fund

Progress Report for 2015

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Objectives

1. Use bathymetric and habitat data obtained from USFWS’s side-scan sonar project on the lower Niagara River to create benthic habitat maps. Using the habitat maps, assess diversity and community structure of benthic invertebrates in the lower Niagara River.

2. Document habitat use, movements, and diet of lake sturgeon in the lower Niagara River.
1. Use bathymetric and habitat data obtained from USFWS’s side-scan sonar project on the lower Niagara River to **create benthic habitat maps**.
Bathymetric and Flow Velocity layers were generated as both are important abiotic variables affecting benthic communities and bottom-feeding fish.
1. Using the habitat maps, **assess diversity and community structure of benthic invertebrates in the lower Niagara River.**

Benthic sampling has been done and the majority of species has been identified.

Statistical analyses and habitat modelling to relate biological data to physical habitat.
Clusters benthic community with similar biomass in a certain habitat
Maps locate areas of high, moderate or low biomass in the river

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
<th>Cluster 5</th>
<th>Cluster 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>Medium</td>
<td>Deep</td>
<td>Medium</td>
<td>Medium</td>
<td>Shallow</td>
<td>Shallow</td>
</tr>
<tr>
<td>Major Substrate</td>
<td>Gravel</td>
<td>Gravel</td>
<td>Gravel/Cobble-Gravel</td>
<td>Sand/Gravel</td>
<td>Sand</td>
<td>Gravel</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>% sites with macrophytes</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>% site with invasive species</td>
<td>90</td>
<td>85</td>
<td>50</td>
<td>100</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Total Species</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td>15</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Total Biomass (g/m²)</td>
<td>342</td>
<td>0.47</td>
<td>0.26</td>
<td>10.6</td>
<td>5.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Dominant Taxa (per biomass)</td>
<td>Dreissena bugensis Pleurocera acuta Leptoxis carinata (Bythotrephes longimanus) Echinogammarus ischnus Tanytarsus Cryptochironomus Bithynia tentaculata Carinata leptoix Chironomus Immature Tubificinae Limnodrilus hoffmeisteri Phaenopsectra Chironomus Helicopsyche</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Benthic Habitat Maps

Link benthic communities with physical habitat information to provide information on spatial distribution, abundance and biomass.

Information from statistical analyses important basis to map spatial distribution of benthic communities (incl. abundance and biomass) at the ecosystem scale.
Results: Dreissena habitat suitability map

Results: Sturgeon Spawning Habitat map
Spatiotemporal changes in forage resources for lake sturgeon

62 samples collected from April 2014 until March 2015

Samples are currently being processed and will be finished in summer 2016.

Benthic maps showing temporal changes in forage resources will be done in summer 2016.
Resampling Historic Sites 2015

Compare the current benthic community composition with the historic community

15 benthic samples from historic sites (surveyed in 1983)

Data analysis in progress
2. Objective

Document movements and diet of lake sturgeon in the lower Niagara River
Document **movements** and **diet** of lake sturgeon in the lower Niagara River.
Deployed 39 acoustic receivers

Retrieved and downloaded data from 35 receivers

Started adding acoustic releases to the array

Telemetry data collection is complete.
Acoustic Tagging

181 lake sturgeon captured this season

Surgically implanted the all remaining acoustic tags (30)
Document movements and **diet** of lake sturgeon in the lower Niagara River
Frequency of occurrence of major prey groups

% Occurrence

Prey Group

Amphipoda, Round Goby, Chironomidae, Crayfish, Trichoptera, Dreissena, Isopod, Diptera, Shiner, Ephemeroptera, Sunfish
Major Prey Groups by % Weight

- Amphipoda
- Round Goby
- Chironomidae
- Crayfish
- Trichoptera
- Dreissena
- Isopod
- Diptera
- Shiner
- Ephemeroptera
- Sunfish

% Weight

- < 1%
The graph illustrates the prey-specific abundance and percent occurrence of various species. Species are plotted on a scatter plot with axes labeled "Percent Occurrence" and "Prey-Specific Abundance." The species represented include:

- Goby
- Shiner
- Crayfish
- Dreissena
- Chironomid
- Amphipod

The graph uses a diagonal line to categorize species into:
- More Specialist
- Dominant Prey
- Frequent, small amounts
- Rare Prey
- Infrequent, large amounts

Species are color-coded for visual distinction.
Isospace plot of lake sturgeon tissues

- Fin
- Red Blood Cells
- Plasma
- Goby
- Crayfish
- Amphipods
- Dreissena
- Snails

δ¹⁵N (%o)

δ¹³C (%o)
Dietary Proportions of Prey Groups in Plasma

Source
- Snail
- Goby
- Dreissena
- Crayfish
- Chironomids
- Amphipods

Proportion
Map Sturgeon Feeding Grounds

Combine objectives 1 and 2 to derive feeding ground maps for higher trophic levels (i.e. lake sturgeon)

Siaulys et al. 2012
Future Tasks: 1. Objective

Analysis is in progress from seasonal sampling sites and historic sites.

Set Goby and crayfish traps to estimate biomass and abundance as both are important prey items for sturgeon even though not in proposal.
Future Tasks: 2. Objective

**Telemetry**

- Continue to analyze detection data and generate home range estimates

**Diet Analysis**

- Continue analyzing and interpreting stable isotope data
Publications in submitted and in progress


Proposal submitted for upper Niagara River
International Conferences


Public Outreach


6. Gorsky, D. 2015. What was lost, now is found: The story of lake sturgeon recovery in the lower Niagara River. Cornell Biological Field Station at Shackleton Point, NY.
