Emerald Shiner
Habitat Conservation and Restoration Study in the Upper Niagara River
Year 3

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Research team

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The Emerald Shiner Connects the Niagara Ecosystem

Emerald shiner (Notropis atherinoides)
Emerald Shiner Nutritional Status

Graduate student Colleen Kolb (BSC) using a Gas Chromatograph to determine fatty acids in emerald shiners and their predators.
What is a fatty acid?

A fatty acid is a carboxylic acid with a long carbon atom chain and they are the building blocks of lipids.

Fatty acids give a picture of the meals consumed by organisms and provide an idea of the food resources in the environment and predator-prey relationships.

They can help answer the question:

*What are the critical prey of key consumers in relation to prey abundance, availability, and nutritional quality?*
Emerald Shiners (small vs large)

[Bar chart showing the comparison of fatty acids between small and large Emerald Shiners. The x-axis represents different fatty acids, and the y-axis represents the percentage.]
Morphological Differences

Graduate student John Lang (BSC) measuring emerald shiners to use for morphometric analyses.
Canonical Variate Analysis of Morphology
Shiner Swimming Experiments (UB and USACE)

Velocity testing swim tunnel design

![Diagram of swim tunnel design with labeled parts: Cap, Screen, Plexiglass Pipe, ID: 4 in, Length: 24 in]
Swimming Performance of Emerald Shiners from the White River, AR,

Hoover and Adams, 1996
Shiners swimming in tunnel.
Water velocity measured using an acoustic Doppler velocimeter (ADV)
### Summary statistics of the 60-minute swimming endurance tests

<table>
<thead>
<tr>
<th>Velocity (cm/s)</th>
<th>Average Time to Fatigue (minutes)</th>
<th>Standard Deviation</th>
<th>n</th>
<th>Standard Error</th>
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Redesign of swim tunnels into a triangular formation of box swim tunnels
Summary statistics for the 200-minute swimming endurance tests

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<th>Velocity (cm/s)</th>
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</table>
Combined data for the probability of successfully swimming against a given water velocity for a sustained period of time.
School or emerald shiners fighting flow fields in the Niagara
Effects of Water Pollution on Shiners
Health Assessment Index (HAI) used to determine condition of emerald shiners
Healthier
Escherichia coli most probable number (MPN) in 100 ml of sample water

Upper Niagara River sites

Eastern Lake Erie (reference)
Shinners in better condition when livers did not have bacteria.

Shinners in better condition when they had low numbers of parasites.

Juveniles in better condition than adults as they have had less time of exposure to river water.
Geographic Information System

Data and graphs at each site for:

- Water physico-chemistry
- Shiner catch data
- Total Phosphorus
- Total Zooplankton Biomass
- Habitat data
Lessons Learned: Recommendations to GESC

✓ The emerald shiner is **THE MOST IMPORTANT** fish species in the upper Niagara River.

✓ The emerald shiner is the perfect “bioindicator” species to determine the health of the aquatic ecosystem.

✓ Maintain native food webs by conserving and restoring habitat for resident and migrating avian, fish, reptile and mammalian species that utilize the Niagara River.

✓ RemEDIATE the excess of waste material that enters the river and affects aquatic life beyond what they can tolerate.

✓ Soften shorelines and eliminate bulkheads when possible.

✓ Fix seawalls to provide fish passage.

✓ Enhance existing wetlands to provide nursing habitat for fish during the larval stages through habitat protection, plantings and sheltering from current and boating waves/ice scouring.

✓ Create wetlands where they have been extirpated.

✓ Control invasive herbivorous fish, such as the common rudd, that degrade macrophyte beds and nursery habitats.