

# Great Lakes Center Newsletter

## Fall 2015



*Jo Johnson and Josh Fisher electrofishing for emerald shiners in Cattaraugus Creek.*

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## Emerald Shiner Project: Year Two

by Steve Fleck, Colleen Kolb, and Jo Johnson, graduate students

The second field season of the Emerald Shiner Project has come to a close and three graduate students have joined the team: Colleen Kolb and Jo Johnson are new to the project, and Steve Fleck was previously a technician during the 2014 field season. Steve has spent the season sampling marinas for larval fish and mapping aquatic vegetation on the Niagara River. Jo worked this summer as a laboratory technician completing stomach content and stable isotope analysis. Colleen began her position in early September, and will be conducting fatty acid analysis and larval fish identification.

This season, a large effort was focused on mapping vegetation and substrate within shallow areas on the upper Niagara River; Steve coordinated this effort in collaboration with the Army Corps of Engineers and was joined by the University at Buffalo PhD student, Brandon Sansom, who measured water velocity. The crew collected and identified plant species and used a sonar technique to map the vegetation beds. Additionally, a ponar grab was used to collect and categorize substrate.

One of the primary objectives of this project is to determine the emerald shiners' role in the upper Niagara River ecosystem. Jo has finished up identifying the stomach contents of last year's emerald shiners and is working

now on determining the stable isotopes of carbon and nitrogen of shiners and their predators. Colleen will be working on fatty acid analysis of both the emerald shiner and its diet. With this data we will be able to get a better understanding of how fatty acids are transferred up the food web.

Jake, Chris, John, and Steve continued their biweekly rotation of electroshocking and larval seining throughout the upper Niagara for the entirety of the summer. In addition to their field duties, they have been collecting data for their respective theses. Jo fills in for them when needed, and Jake has been teaching both her and Steve how to drive the boats and operate equipment for next year's field season.

This project is a unique experience because we are learning how to be independent scientists both in the field and the laboratory. As graduate students, we are expected to conduct research on our own, while also collaborating with our peers. This summer has been a great opportunity for us all to pool our knowledge, as well as encourage each other to discover new skill sets. •

Please follow the Emerald Shiner project on their [website](#) or on [Facebook](#) and other social media platforms.

# Outreach experience for Emerald Shiner Project

by Jo Johnson, GLES M.A. student

I have been working as the outreach specialist for the Emerald Shiner Project since June this year. It is an exciting opportunity for a graduate student, because it allows me to build the necessary skills for both non-profit industry work and scientific research simultaneously. As a young scientist, gaining experience in both fields at once will help me choose which career path to pursue in the future. Additionally, engaging the public about the truth behind conservation is extremely valuable in this day and age, when scientific skepticism is widespread.

For my position, I have designed a [webpage](#) which is hosted through Buffalo State. It has pictures from our field and lab work, and outlines the major objectives and purpose of this research project. In addition to the web page, we have social media accounts on

[Twitter](#), [Facebook](#) and [Instagram](#). This has allowed us to network with other scientists, environmental organizations, and students throughout the country. Images from our field work reach other ecologists in real time, and allow us to network with other researchers instantaneously. On a local scale, this position has allowed me to network with organizations such as Buffalo Niagara Riverkeeper, NYSDEC, New York Sea Grant, Reinstein Woods Nature Preserve and several others. I have tabled numerous environmental events over the summer, and engaged with dozens of students, local fishermen and water enthusiasts in the region.

This has been an extremely worthwhile experience for me in only three months' time.

My work as an outreach specialist has greatly improved my professional skillset, and will benefit me in my future endeavors. •



Jo Johnson with Ba Zan Lin from Buffalo Niagara RIVERKEEPER sharing a table at Great Lakes Awareness Day. This event was hosted by NOAA New York Sea Grant at the Aquarium of Niagara.



Jo Johnson with a local fisherman at Small Boat Harbor. The boaters at this launch site were very interested in the Emerald Shiner Project, and the status of emerald shiner populations.

Jo Johnson giving a presentation about emerald shiners to a group of high school students both on land and water. Buffalo Niagara RIVERKEEPER, in collaboration with Buffalo Public Schools has a group of students interested in environmental science that have a different guest speaker experience each week. Top photo credit: Adam Hovey

GRADUATE STUDENT BIOS



My name is Steve Fleck and I'm a 2011 graduate from the University at Buffalo. I graduated with a degree in Philosophy, but my true passion aligned more closely with my minor, environmental studies. After graduation I took many temporary, mainly plant-centered, positions and internships with Parks & Recreation, The Department of Environmental Conservation, the Buffalo Botanical Gardens, Ecology and Environment, and in early 2013 moved to Escalante, Utah, to do botanical work under the Bureau of Land Management. In 2014, I decided that I wanted to move back to Buffalo, NY, to pursue a master's degree in biology at SUNY Buffalo State. After a semester of undergraduate refresher courses, I met Dr. Pérez-Fuentetaja and began working for her soon afterwards, first as a technician and more recently as a graduate student. I am applying my background in botany to explore

the relationship between young-of-the-year fish and aquatic vegetation beds. I'm unsure of what the future holds, but I plan on continuing plant-related research and potentially pursuing a PhD.



My name is Jo Johnson and I am in my first semester as a Great Lakes Ecosystems Science (GLES) M.A. student. I was raised in the Hudson Valley, and settled in Buffalo six years ago. I graduated in May 2015 with a Bachelor of Arts in Biology at Buffalo State. I would like to research the immune response of emerald shiners that are living in sewage environments, and gather E. coli data for each site. I am an advocate of environmental conservation, and aspire to help bridge the gap between scientists and citizen activists.

I hope to obtain a Ph.D in aquatic ecology, while continuing my involvement in social outreach and engagement.



My name is Colleen Kolb and I am in my first year in the Great Lakes Ecosystem Science M.A. program. I am originally from Rochester, NY, and I obtained my bachelor's degree in environmental science with a concentration in aquatic ecology and biology from the State University of New York at Brockport. While I was at Brockport I was an aquaculture assistant and conducted research on fatty acids in different species of fish. It was through these projects that my interest in aquatic organisms and their chemical make-up grew. My thesis work will focus on the fatty acid analysis of the emerald shiner.



Chris and Jake seining for juvenile fish at Burnt Ship Creek, a tributary of the Niagara River off of Grand Island.



Steve sampling the marina for larval emerald shiners.



Jake with a juvenile muskellunge that was captured during seining for the Emerald Shiner Project.



REPLY TO  
ATTENTION OF

## DEPARTMENT OF THE ARMY

BUFFALO DISTRICT, CORPS OF ENGINEERS  
1776 NIAGARA STREET  
BUFFALO, NEW YORK 14207-3199

November 18, 2015

Environmental Analysis Section

Subject: Niagara River Emerald Shiner Study, November 2014 – October 2015

Alicia Pérez-Fuentetaja, PhD  
254 Science Bldg.  
SUNY Buffalo State  
1300 Elmwood Ave., Buffalo, NY 14222

Dear Dr. Pérez-Fuentetaja:

This memorandum summarizes the Niagara River Emerald Shiner Study activities completed by the U.S. Army Corps of Engineers, Buffalo District (USACE) from November 2014 to October 2015.

### **Emerald Shiner use of the Black Rock Lock and Black Rock Canal**

The Black Rock Canal, a 3.8 mile long waterway running alongside the uppermost reach of the Niagara River (U.S. side), provides an opportunity for shiners moving upstream to bypass the high velocity reach of the upper Niagara River. To investigate the Black Rock Canal and Lock as an obstacle or opportunity for shiner passage between the Niagara River and Lake Erie, seining was performed monthly from July - Oct 2014 and continued from May – June 2015 to detect the presence of shiners throughout the Black Rock Canal and Lock. During each monthly sampling event a total of 20 stations were seined (Figure 1). These stations include shoreline and openwater areas downstream of the lock, within the lock, and throughout the canal. Water quality monitoring is being conducted in concert with all sampling events. Each monthly sampling event take 2-3 days and requires two boats and a crew of 3-4 people. Data processing, analysis and report preparation is scheduled for winter/spring of 2016.

### **Broderick Park Investigations - Dive Team**

On July 8<sup>th</sup>, 2015 the USACE dive team made underwater visual observations of emerald shiners in the recessed area to determine if their movement is restricted upstream of this area. Video documentation was collected at the upstream end of the recess where the high velocities hit the recess. Shiners appeared to be swimming hard to hold position and the turbulence is effecting their collective ability to maintain a tight school formation affecting the overall performance of the school. Shiner schools were observed to periodically dive and attempt to swim along the wall, however once near the bottom, small mouth bass would strike in and further disorganize the school causing individuals to retreat or get blown back into the recess. Video documentation and observations were shared with the project team.

Subject: Niagara River Emerald Shiner Study, November 2014 – October 2015

### **Shoreline Flow Velocity Assessment Report**

On April 15<sup>th</sup>, 2015 the USACE finalized a report that investigated the velocities along the U.S. and Canadian shorelines between the Peace Bridge and International Railroad Bridge and how it relates to emerald shiner movement. Velocity measurements and observations suggest that shiner movement along the studied stretch of the Canadian shoreline is not restricted by flow velocities along the shoreline and that the Broderick Park timber crib wall on the U.S. side likely presents the greatest obstacle along this stretch of the Upper Niagara River for shiner movement into Lake Erie (Figure 2). This report and observations were shared with the project team. Data collected through this effort and modeling completed by State University of New York (SUNY) at Buffalo is currently being synthesized into a manuscript entitled “Assessing Potential Restrictions on Habitat Connectivity of the Emerald Shiner (*Notropis atherinoides*) Population in the Upper Niagara River”.

### **Emerald Shiner Habitat Characterization**

In August and September 2015 the USACE coordinated and conducted a field activities to characterize the aquatic habitat at 16 sites along the upper Niagara River. The locations of the sites were determined by Dr. Perez-Fuentetaja’s research group and correspond with sites that her group has been assessing emerald shiners at different life stages over the last two years. This was a coordinated effort between USACE, SUNY Buffalo State and SUNY at Buffalo. Data collection took five days and required one boat and a crew of 3-4 people. Data processing, analysis and report preparation is scheduled for winter/spring of 2016. The following information was collected at each site:

- Using a Lowrance HDS Sonar and BioBase ([www.cibiobase.com](http://www.cibiobase.com)) the depth, substrate hardness and macrophyte biovolume was mapped at each site (Figure 3).
- A point intercept sampling plan was developed for each site and the following data was collected at each point:
  - macrophyte species presence and abundance data was collected via rake tosses
  - flow velocity and direction using an Acoustic Doppler Velocimeter (ADV)
  - substrate characterization using a Peterson Surface Grab Sampler
  - data collected at each point intercept will be overlaid upon the site maps to provide a more detailed habitat characterization of each site
- At select locations plants were collected for periphyton characterization; water quality measurements were collected at these sites as well

If you have any questions or would like to discuss any information in this memo please call (716-879-4437) or email ([Andrew.Hannes@usace.army.mil](mailto:Andrew.Hannes@usace.army.mil)).

Sincerely,

Andrew Hannes, Ecologist  
Environmental Analysis Section  
US Army Corps of Engineers - Buffalo District

Subject: Niagara River Emerald Shiner Study, November 2014 – October 2015



Figure 1: Seining was performed monthly from July – Oct 2014 and May – June 2015 at twenty locations throughout the Black Rock Canal and Lock

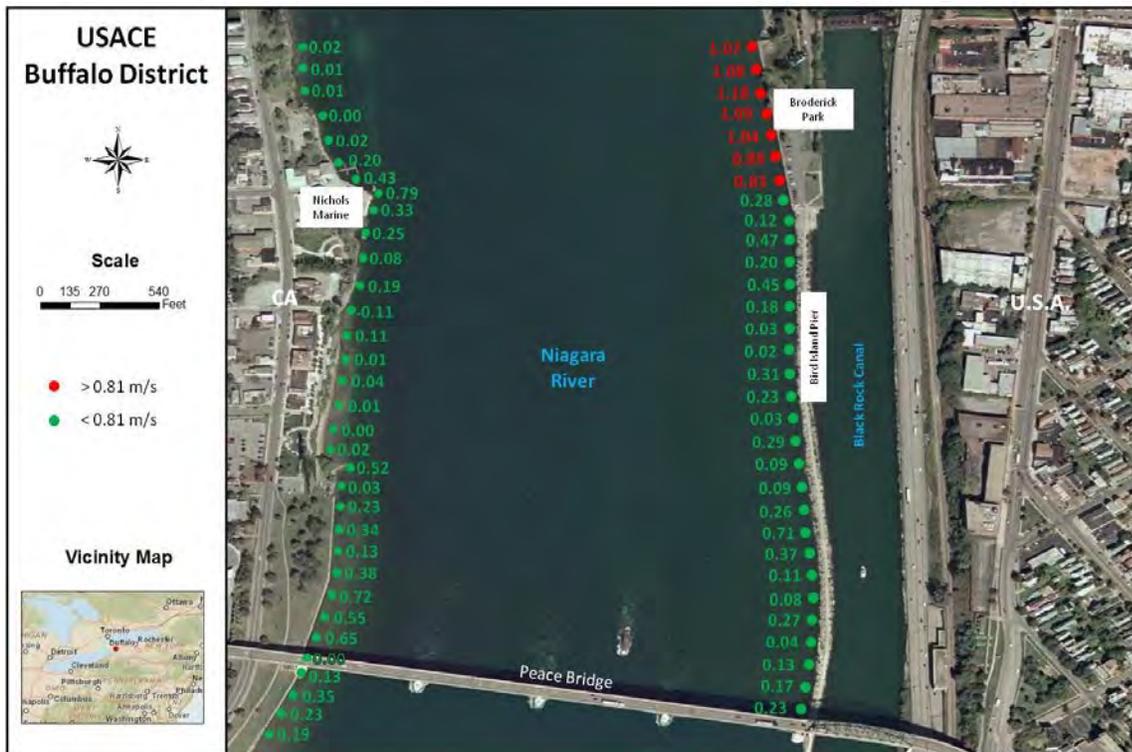


Figure 2: Map showing location of measurement stations and average velocities for each station. Velocities highlighted in red are in excess of 0.81 m/s.

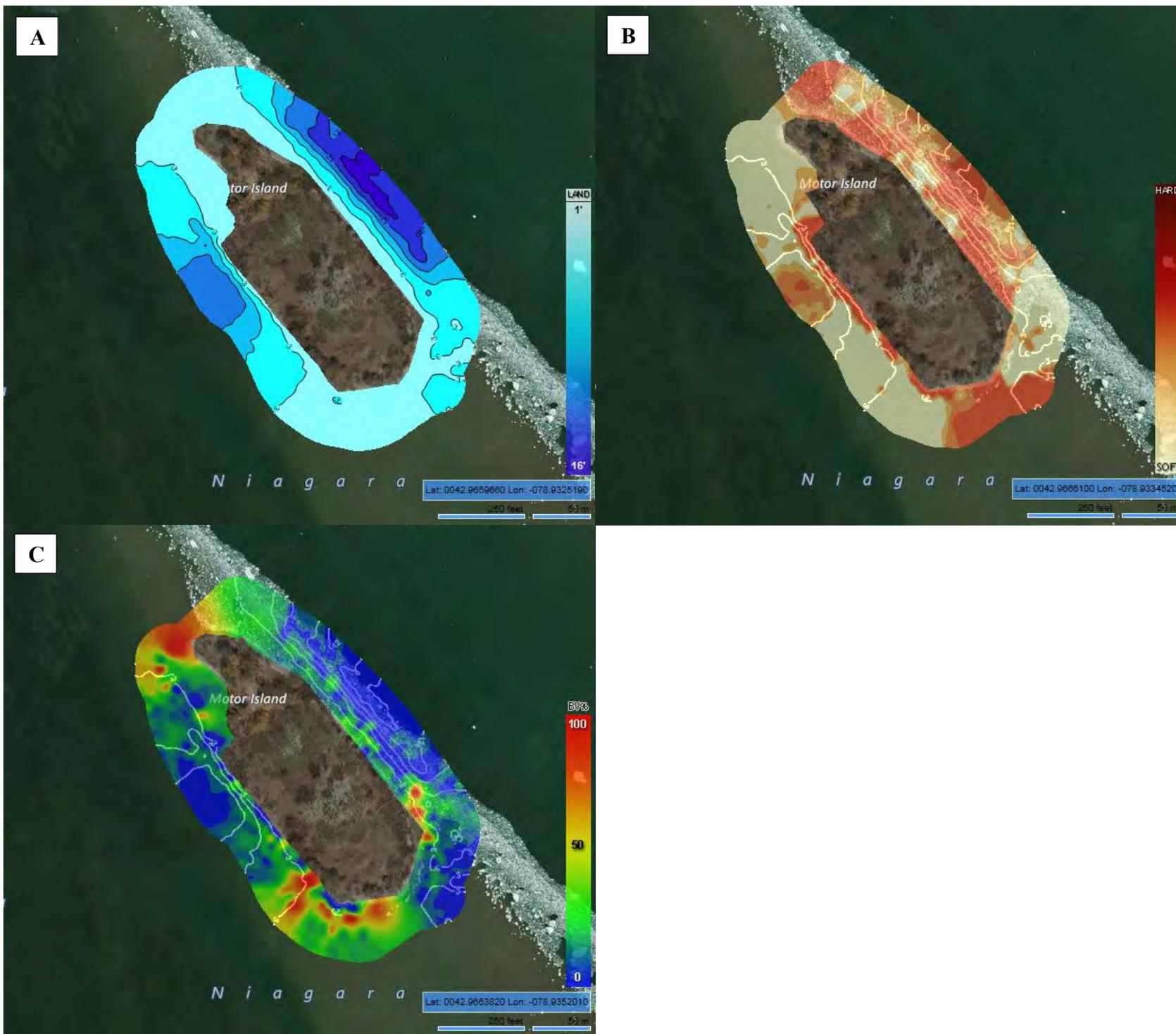


Figure 3: Using a Lowrance HDS Sonar and BioBase ([www.cibiobase.com](http://www.cibiobase.com)) the (A) depth, (B) substrate hardness, and (C) macrophyte biovolume was mapped at Motor Island in the upper Niagara River

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**Emerald Shiner Habitat  
Conservation and  
Restoration Study in the  
Upper Niagara River:  
Importance for Sport Fish,  
Common Terns and Public  
Education**

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Buffalo Niagara RIVERKEEPER®  
Sub-Contract -

Study Team Collaboration:  
Habitat Group +  
Education and Outreach Team

**Progress Report  
February 23, 2015-November  
15 2015**

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November 15, 2015



**TASK 2**

**Participate in regular Study Team meetings held to achieve project objectives**

**TASK 3**

**Develop, share and implement materials and activities for education, interpretation and outreach in collaboration with the Study Team Education Specialist**

- A. Describe what progress you have made toward each of your grant objectives. Did you meet your goals for this period? Please be specific.**

*Task 2:*

RIVERKEEPER has attended and participated in required Study Team and sub-committee meetings in order to achieve the project objectives. Meetings were held on 3/4/17, 4/17/15 and 5/13/15.

*Task 3:***Direct Public Outreach:**

This year, Riverkeeper welcomed a new team member Jo Johnson onto the outreach team. Jo and Riverkeeper worked in concert to complete multiple outreach events promoting the Emerald Shiner Project. Below is a list of events where Emerald Shiner Project Outreach has taken place:

3/14/15 12-4PM River Academy Fish Forum, Bulger Communications Center, Buffalo State College:

Attendance: Staff-Ba Zan Lin, Chris Murawski, Jill Jedlicka, Joseph Gould, Kerrie Gallo, Robbyn Drake, and Susan Kornacki from Riverkeeper, and Helen Domske from Cornell Cooperative Extension. Public Attendance- 30 individuals.

This event was a session of Riverkeeper's River Academy College Class in partnership with ECC that was also open to the public. Riverkeeper Executive Director Jill Jedlicka presented on the degradation of the Buffalo and Niagara Rivers and its effect on native fish and Ecological Programs Manager Kerrie Gallo presented on the Emerald Shiner Project and Riverkeeper's work with native brook trout in the watershed. Helen Domske of Cornell Cooperative Extension presented on invasive fish species and their impacts on natives including the emerald shiner.

6/11/15 Young Environmental Leaders Program (YELP) Emerald Shiner Classroom lesson and kayak paddle, Buffalo State College Great Lakes Center:

Attendance: Staff- Robbyn Drake, Chris Murawski and Emily Burch (intern) from Riverkeeper, Jo Johnson from Buffalo State College, Adam Hovey from South Park High School and John Bihr from Riverside High School. Students-8 from South Park HS and 8 from Riverside HS.

Jo Johnson developed an emerald shiner presentation and accompanying fact sheet (see appendix B). Jo worked closely with Riverkeeper staff on planning how to present to the students. Jo gave a 30 minute presentation to the students about the ecology of the Niagara River and the emerald shiner. Staff and students then kayaked in the Black Rock canal and explored some of the manmade modifications that affect the shiner. They also observed common terns and gull species feeding on the shiner while on the water. This provided a very immersive learning experience for the students.

6/27/15 Family Fishing Day Outreach

Jo Johnson and Riverkeeper staff conducted outreach at Family Fishing Day held at Black Rock Canal Park on the Niagara River. Attendance was light due to steady rain; however 50 fact sheets were handed out to attendees. Day 2 of Family fishing day was canceled due to continued rain.

7/23/15 Outreach to boaters at Small Boat Harbor on Buffalo's Outer Harbor

Jo Johnson accompanied Riverkeeper staff during aquatic nuisance species outreach to boaters. 50 boaters were informed about the project and given fact sheets. Boaters were mostly fisherman and were excited to hear about the project.

7/29/15 Outreach at the Central Branch of Buffalo And Erie County Public Library:

Jo set up a display and spoke engaged with patrons of the library during the lunch hours.

7/30/15 Outreach at the Crane Branch of Buffalo And Erie County Public Library:

Jo set up a display and spoke engaged with patrons of the library during the afternoon hours.

8/20/15 Outreach to boaters at Small Boat Harbor on Buffalo's Outer Harbor

Jo Johnson accompanied Riverkeeper staff during aquatic nuisance species outreach to boaters. The harbor was slow that day due to weather. 8 Boaters were engaged and 20 fact sheets were left in the fish cleaning room.

8/27/15 Great Lakes Awareness Day at the Niagara Aquarium

Jo Johnson and Riverkeeper staff conducted Emerald Shiner Outreach at the Aquarium. 150 people were engaged and 40 flyers handed out.

**Materials Created this year for outreach:**

- a. Emerald Shiner Trifold Presentation Board (See Appendix A)  
The board is 24x36 inches and free standing.
- b. Emerald Shiner Fact Sheet (See Appendix B)
- c. Emerald Shiner Project Website <http://emeraldshiner.buffalostate.edu/>
- d. Emerald Shiner Facebook Page <https://www.facebook.com/emeraldshiners>  
Weekly posts were created documenting the research and outreach efforts of the flyer.

**B. What challenges have you encountered? How are you addressing these challenges?**

Due to steady rain most of two days, there was limited attendance on Day 1 of Family Fishing Day and outreach was canceled on Day 2. This was planned as a large opportunity to educate local anglers on the project. Plans are in place to schedule additional outreach opportunities at angler centered events in 2016.

**C. Are you on schedule to complete your project in the proposed timeline? If not, please explain why you are ahead or behind schedule.**

Yes

**D. Please describe the level of your efforts within the budget expended to date. Was there in-kind support from other resources?**

RIVERKEEPER expended their subcontract amount allocated for 2015 in the efforts described above and documented within the Appendices. In addition, RIVERKEEPER successfully integrated and leveraged this project into multiple programs and projects throughout our organization. A compiled summary of our collaboration efforts and products to date is found in the Appendices.

**E. What progress toward your objectives do you expect to make before your next status report? Please be specific.**

Emerald Shiner curriculum will be included in the Young Environmental Leaders Program and River Academy 2016.

The project information, fact sheets and trifold board presentation will be integrated into Riverkeeper's efforts at all general outreach events going forward during the project period. In addition, outreach will be conducted at targeted events which have an emphasis on angling such as Family Fishing Day, USFWS Festival, The Greater Niagara Fishing and Outdoor Expo in Niagara Falls, and Great Lakes Day at the Niagara Aquarium.

Riverkeeper plans on posting social media updates on the project in the fall of 2015 and spring of 2016.

**Appendices:**

**Appendix A Emerald Shiner Trifold Presentation Board:**




**The study**  
**Life history and habitat utilization**

- How do Emerald Shiners use the habitats in the Upper Niagara River for spawning, growth and maturation?
- In this study, we are identifying the habitats, riparian vegetation and features that are key for the success of the Emerald Shiner during different life stages.

**Population and genetics**

- Are Emerald Shiners in the upper Niagara River genetically distinct populations, or are they part of a broader population that can also be found in Lakes Erie and Ontario?
- This study investigates whether the population found in the Niagara River is genetically and morphologically unique or different from other Emerald Shiner populations.



Sampling Sites for Emerald Shiners in the Upper Niagara River



**Contribution to the food web**

- What role do Emerald Shiners play in the diets of sport fish and the Common Tern?
- By using various laboratory techniques and looking at stomach contents of predators, we can determine if the Emerald Shiner is a key species in the diets of important species in the system.

**Effects of man-made structures and alterations to the Niagara River on Shiner passage**

- In this project, we will investigate how bathymetry or native position of the river affect the movement of the Emerald Shiner by increasing water velocities.

# THE EMERALD SHINER

## KEYSTONE OF THE NIAGARA

Habitat Conservation and Restoration Study in the Upper Niagara River



**What is an Emerald Shiner?**

- Native minnow species in the Niagara River, Eastern Lake Erie, and Western Lake Ontario.



**Why Study The Emerald Shiner?**

- The Emerald Shiner fuels the food web in the Niagara River as prey for sport fish and migratory birds.
- This Emerald Shiner is the most important bait fish harvested locally.
- Our knowledge about this important resource in the Niagara River ecosystem is limited.
- The Study connects other projects in the Niagara River Corridor.

**It's bigger than just a little fish...  
The Emerald Shiner plays a critical role in the diets of sport fish and the Common Tern**



**Studying the Emerald Shiner allows us to:**

- Understand how the Shiner supports the Niagara River ecosystem and connects it to its inhabitants.
- Recognize the fragile interdependence of all the aspects of this ecosystem.
- See that conserving and restoring habitat for the Shiners benefits the whole ecosystem.
- Make more informed decisions about future projects that will help to bring about change in the Niagara River.




**Historical challenges to the Emerald Shiner**

- Modifications to the natural shoreline impact habitat and spawning areas.
- Competition from non-native species.
- Changing water diversions and changes in water velocity.
- Large quantities are caught to support the bait fishery.
- Numerous sporadic mass mortality events.






**Complementary projects and ongoing efforts**

- Develop a plan for habitat and shoreline restoration at key areas.
- Creation of detailed engineering plans for restoration projects by iSPACE.
- Develop a GIS Map.
- Creation of a map of habitat use by Emerald Shiners in the Niagara River.
- Will inform decisions about future management and restoration projects.
- Empower the community with new information.




**Other work is currently underway with ongoing habitat restoration projects by:**

INVESTIGATE • iSPACE • iSPACE • iSPACE

- Conservation of the effects of man-made structures on Shiner migration.
- Analyzing the impact of fish ladders.
- Designing more fish-friendly alternatives to those barriers.
- Evaluating the success of mitigation measures on Emerald Shiner passage.

**RESEARCH TEAM**

**Principal Investigators**

- A. Perna-Kunze
- M. Olszka
- R. Snyder

**Collaborators**

- C. Adams
- S. Delpiran
- T. Duffner
- D. Enhouse
- C. Leggett
- A. Mariani
- K. Hastings
- R. Smith
- C. Galo
- A. Yagi



## Appendix B Emerald Shiner Fact Sheet



# THE EMERALD SHINER KEYSTONE SPECIES OF THE NIAGARA RIVER

### The Study

#### Life History and Habitat Utilization

How do emerald shiners use the habitats in the upper Niagara River for spawning, growth and maturation?

In this study, we are identifying the habitats, along with nearshore vegetation and substrates, that are key for the success of the emerald shiner during different life stages.

#### Population and Genetics

Are emerald shiners in the upper Niagara River a genetically distinct population, or are they part of a broader population that can be found in lakes Erie and Ontario?

This study investigates if the population found in the Niagara River is genetically and morphologically similar or different from adjacent emerald shiner populations.



### Meet the Emerald Shiner

The emerald shiner (*Notropis atherinoides*) is a native minnow species in the Niagara River. As prey, it fuels the food web in the upper river, sustaining predatory fish (walleye, smallmouth bass, steelhead, yellow perch, muskie) and piscivorous migrating bird populations (common tern, common loon, mergansers) in the Niagara Flyway. In addition, the emerald shiner is the most important baitfish harvested locally, contributing to economic prosperity in the region. The health of the emerald shiner population, and the ability of these fish to successfully reproduce and migrate, has direct and significant regional, ecological and economic impacts.



### Contribution to the Food Web

What role do emerald shiners play in the diets of sport fish and the common tern?

By using various laboratory techniques and looking at stomach contents of predators, we can determine if the emerald shiner is a key species in the diets of important species in the system.

### Effects of Man-Made Structures and Alterations to the Niagara River on Shiner Passage

In this project, we will investigate how bottlenecks in the river affect the movement of the emerald shiner by increasing water velocities.

### Education and Outreach

We are committed to engaging and connecting with community members, policymakers, and educators. Our outreach and education specialist is working on getting the message out to the community about the importance to our region of this unique fish that supports many of the species that people love.

[emeraldshiner.buffalostate.edu](http://emeraldshiner.buffalostate.edu)

## It is bigger than just a little fish...

### The Project

This is the first comprehensive study of the emerald shiner in the Niagara River, eastern Lake Erie, and western Lake Ontario. It includes investigations into the life history, genetics, habitat utilization, migration, and the role in the food web of this valuable species. Funding has been provided by the Niagara Greenway Ecological Standing Committee and by the US Army Corps of Engineers.

The focus of the project is on the important role of the emerald shiner in the Niagara River as it supports and connects the ecosystem through food web interactions, creating an interdependence among all organisms in the river. Therefore, any improvements made in the Niagara River for shiner habitat and passage radiate outward, benefiting the whole ecosystem.

This project is unique and multi-disciplinary, and it coordinates with other projects running concurrently. Examples include: NYSDEC work at Strawberry Island and Frog Island, Motor Island shoreline habitat restoration, Cherry Farm restoration site, USACE seawall repair project, Buffalo-Niagara Riverkeeper shoreline restoration projects, and emerald shiner population assessments conducted by the Ontario Ministry of Natural Resources.