The Great Lakes Center

Annual Report 2014-2015

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Buffalo State
The State University of New York


Lake Erie Benthos:
Cooperative Science
& Monitoring
Initiative
2014
KEEP CALM AND SWIM ON
ILLINOIS

CONTENTS

MISSION

The Great Lakes Center (GLC) mission is to improve the quality of the environment by providing the best possible science to decision-makers concerned with the health and sustainability of resources, with a primary focus within the Great Lakes and their watersheds. This is accomplished through high quality research, informed and current graduate and undergraduate education, and dissemination of information to the public through outreach. The Center is committed to improving human-environment interactions in the Great Lakes ecosystem guided, in part, by an understanding of the evolutionary and ecological processes and patterns acting on the system. Although the main focus of the research in the GLC concentrates on the Great Lakes basin, nation-wide and international projects are also considered of high priority as they expose GLC scientists to the cutting edge of modern science, facilitate collaboration, and greatly increase visibility of the Center's activity in the scientific community.

HIGHLIGHTS

Over the last year, the Great Lakes Center saw sustained activity and productivity in research, education and service. We continued our excellence in research conducted by GLC personnel and in collaboration with other faculty from SUNY Buffalo State, as well as other institutions in North America, Europe, and South America.

- Over the last year our researchers have published **9** peer-reviewed papers; **8** papers were submitted for publication.
- We presented **31** talks, including: **22** at national/international/regional conferences, **9** invited talks, and **4** presentations in non-refereed venues.
- We submitted **5** grant proposals (total requested amount **$1,583,542**).
- **Two** new projects were funded over the last year totaling **$514,464**.
- **Twelve** projects for research and education (including multi-year grants) are currently funded in the GLC totaling **$9,221,118**, including **$4,860,763** for Buffalo State.
- We added **two** new employees to our staff, a research technician and a new secretary.
- WNY PRISM (Partnerships for Regional Invasive Species Management) Coordinator Andrea Locke was extremely productive during last year.
- **Fifteen** students were enrolled in Great Lakes Ecosystem Science MA and MS programs.
- **Two** issues of GLC newsletters were produced over the last year.

I. Staff

As of April 30, 2015, our secretary, Cathleen Nasca, officially retired after many years working for Buffalo State. For the last seven years she expertly coordinated multiple tasks maintaining our Center and was extremely helpful for all of us. In August 2014, we a hired new research technician, Brianne Tulumello, and in June 2015, a new secretary, Susan Dickinson.

GLC Personnel

Director:	Alexander Karatayev
Research Scientists:	Subodh Kumar
	Lyubov Burlakova
	Christopher Pennuto
	Alicia Pérez-Fuentetaja
	Knut Mehler
	Thomas Hahn (part time)
Research Technicians:	Susan Daniel
	Wendy Paterson
	Brianne Tulumello
Secretary:	Cathleen Nasca
Field Station Personnel:	Mark Clapsadl, Manager
	Kit Hastings, Technician
	Joshua Fisher, Technician
WNY PRISM coordinator:	Andrea Locke
WNY PRISM seasonals:	Jerry Krajna (SUNY Buffalo State)
	Angela Klinczar (Miami University of Ohio)
	Andrew Stadler (SUNY ESF)
	Patrick Gormley (Niagara University)
	Patricia Shulenberg (University at Buffalo)
	Alexandra Wagner (SUNY Geneseo)
	Mathew Bilz (SUNY Buffalo State)
	Lucy Nuessle (University at Buffalo)
Research Assistants:	Keith Pawlowski (SUNY Buffalo State)
	Eric Bruestle (SUNY Buffalo State)
	Jacob Bajdas (SUNY Buffalo State)
	Paul Williot (University at Buffalo)
	Anthony Cevaer (SUNY Buffalo State)
	Matt Bauer (SUNY Buffalo State)
	Jo Johnson (SUNY Buffalo State)
	Lee Evans (SUNY Buffalo State)
	Dalaikshan Rajendran (SUNY Buffalo State)
	Mike Grannis (SUNY Buffalo State)
	Mike Olejniczak (SUNY Buffalo State)
	Sonya Bayba (SUNY Buffalo State)
	Mandi Caldwell (Graduate of Central Michigan University)
	Jacob Cochran (SUNY Buffalo State)

Chris Osborne (SUNY Buffalo State)
Steven Fleck (SUNY Buffalo State)
Hulgrid Gourgue (SUNY Buffalo State)
Tenzin Lengzey (SUNY Buffalo State)

GLC staff and research asssistants with President Conway-Turner at the Field Station Open House, May 2015.

GLC Affiliates (at SUNY Buffalo State)

- Randal Snyder, Professor, Biology Department
- Howard Riessen, Professor, Biology Department
- Gary Pettibone, Professor, Biology Department
- Daniel L. Potts, Assistant Professor, Biology Department
- Robert J. Warren, Assistant Professor, Biology Department
- Kelly Frothingham, Chair of the Geography and Planning Department
- Stephen Vermette, Professor, Geography and Planning Department
- Mary Perrelli, Geography and Planning Department
- Jill Singer, Professor, Earth Sciences and Science Education Department and Director of the Office of Undergraduate Research
- Catherine Lange, Assistant Professor, Earth Sciences and Science Education Department

GLC Adjunct Professors

- Dimitry Gorsky, Fish Biologist, U.S. Fish and Wildlife Service
- Martin A. Stapanian, Research Ecologist, U.S. Geological Survey
- Zy Biesinger, Fish Biologist, U.S. Fish and Wildlife Service
- Knut Mehler, Research Scientist, Great Lakes Center, SUNY Buffalo State

Collaborators

In New York State:

- Daniel Molloy, State University of New York at Albany
- Denise Mayer, New York State Museum Field Research Laboratory
- Dianna Padilla, Department of Ecology and Evolution, State University of New York, Stony Brook University
- Lars Rudstam, College of Agriculture and Life Sciences, Department of Natural Resources, Cornell Biological Field Station, Cornell University
- Dawn Dittman, USGS, Great Lakes Science Center, Tunison Laboratory of Aquatic Science, Cortland
- Joe Atkinson, Environmental Engineering, State University of New York at Buffalo
- Howard Lasker, Department of Geology, State University of New York at Buffalo
- Mary Alice Coffroth, Department of Geology & Graduate Program in Evolution, Ecology and Behavior, State University of New York at Buffalo
- Amy Mahar, New York State Department of Environmental Conservation, Avon NY
- Jenny Landry, Region 8 Bureau of Wildlife, New York State Department of Environmental Conservation, Avon, NY
- Kofi Fynn-Aikins, US Fish and Wildlife Service
- Mike Goehle, US Fish and Wildlife Service
- Gregory Boyer, State University of New York, College of Environmental Science and Forestry, Syracuse
- Robert Baier, State University of New York at Buffalo
- Diana S. Aga, Chemistry Department, State University of New York at Buffalo
- Katherine Alben, Wasdworth Institute, Albany
- James Watkins, Cornell Biological Field Station, Cornell University
- Clifford Craft, Department of Natural Resources, Cornell University
- Jim Haynes, Biology & Environmental Science, SUNY College at Brockport, Brockport, NY
- Tim DePriest, NY Department of Environmental Conservation
- Michael Wilkinson, NY Department of Environmental Conservation
- Donald Einhouse, NY Department of Environmental Conservation
- Andrew Hannes, US Army Corps of Engineers
- Renata Kraft, Buffalo Niagara Riverkeeper
- Kerry Gallo, Buffalo Niagara Riverkeeper
- Sarah Delavan, Department of Engineering, University at Buffalo

At Other U.S. Institutions:

- Jake Vander Zanden, Center for Limnology, University of Wisconsin, Madison, Wisconsin
- David Zanatta, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- Daelyn A. Woolnough, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- Bob Krebs, Department of Biology, Geology, Environmental Science, Cleveland State University, Cleveland, Ohio
- Jonathan Bossenbroek, Department of Environmental Sciences, University of Toledo, Toledo, Ohio
- Mary Walsh, Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy
- Elizabeth Meyer, Pennsylvania Natural Heritage

Program
- David Campbell, Department of Natural Sciences, Gardner-Webb University, Boiling Springs, North Carolina
- Marsha May, Texas Nature Trackers, Wildlife Diversity Branch, Texas Parks and Wildlife Department, Austin, Texas
- Robert Gottfried, Texas Parks and Wildlife Department, Austin, Texas
- Thomas D. Miller, Lamar Bruni Vergara Environmental Science Center, Laredo Community College, Laredo, Texas
- Astrid N. Schwalb, Department of Biology/ Aquatic Station, Texas State University, San Marcos, Texas
- David J. Berg, Department of Zoology, Miami University, Ohio
- Donald Jerina, Laboratory of Bioorganic Chemistry NIDDK, National Institutes of Health, Bethesda, Maryland
- Kenneth Laali, Chemistry Department, Kent State University, Kent, Ohio
- David De Marini, Environmental Carcinogenesis Division (B-143-06), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina
- Kenneth Krieger, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Jack Kramer, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Gerald Matisoff, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio
- Darren Bade, Kent State University, Kent, Ohio
- Christine Mayer, Department of Environmental Sciences and Lake Erie Center, University of Toledo, Toledo, Ohio
- Don W. Schloesser, USGS, Great Lakes Science Center, Ann Arbor, Michigan
- Dima Beletsky, Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, Michigan
- Thomas Nalepa, The Graham Sustainability Institute, University of Michigan, Ann Arbor, Michigan
- Ashley Baldridge, NOAA Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan
- Tom Bridgeman, University of Toledo, Toledo, Ohio
- Glenn Warren, U.S. EPA, Great Lakes National Program Office, Chicago, Illinois
- Richard P. Barbiero, CSC, Chicago, Illinois
- Elizabeth Hinchey Malloy, U.S. EPA Great Lakes National Program Office, Chicago, Illinois
- Pawel Michalak, Bioinformatics Institute, Virginia Tech
- Arnoldo Valle-Levinson, Civil and Coastal Engineering Department, University of Florida, Gainesville, Florida

International:

- Demetrio Boltovskoy, University of Buenos Aires, Argentina
- Sergey Mastitsky, RNT Consulting Inc., Ontario, Canada
- Manuel Lopes-Lima, ICBAS - Abel Salazar Biomedical Sciences Institute, Laboratory of Ecophysiology, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Portugal
- Jan Ciborowski, Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada
- Renata Claudi, RNT Consulting Inc., Ontario, Canada
- Rob Leuven, Radboud University, Nijmegen, the Netherlands
- Frank P. L. Collas, Department of Environmental Science, Institute for Water and Wetland Research, Radboud University, Nijmegen, the Netherlands
- Frances Lucy, Institute of Technology, Sligo, Ireland
- Richard Soare, Department of Geography and Planning, Concordia University, Montreal, Canada
- Norman Yan, York University, York, Ontario, Canada
- Anne Yagi, Ontario Ministry of Natural Resources, Ontario, Canada
- Tamara A. Makarevich, Department of General Ecology, College of Biology, Belarusian State University, Minsk, Belarus.

II. Research Activities

Current Projects

Monitoring of benthic invertebrates in Great Lakes.

Researchers Susan Daniel (GLC) and Jim Watkins and Elliot Jackson (Cornell) aboard the Lake Guardian.

The Great Lakes Center, in collaboration with Cornell University, was awarded a U.S. EPA Great Lakes Long-term Biological Monitoring grant for 2012-2017. The EPA Monitoring Program is designed to provide managers access to biological data on zooplankton and benthos to support decision-making. During this project we collect benthos (Buffalo State), zooplankton, and chlorophyll data (Cornell University) across the five Great Lakes from 2013 to 2017, analyze this data and make it available to environmental and fisheries managers. Additional research projects include evaluation of early detection system for aquatic invasive species, and evaluation of biotic indices of ecosystem health. We have identified benthic samples collected in 2012 and 2013, and in August 2014 collected over 200 benthic samples from all Great Lakes onboard of EPA R/V Lake Guardian. Based on these data we have made six presentations at various meetings and conferences, including the 58th Annual Conference of the International Association for Great Lakes Research in Burlington Vermont, and American Society of Limnology and Oceanography Aquatic Sciences Meeting in Spain.

Changes in Lake Erie benthos over the last 50 years: historical perspectives, current status, and main drivers.

During the last 50 years the ecosystem of Lake Erie has experienced major environmental changes, from anthropogenic eutrophication in 1930-1960s, to nutrient and pollution abatement in the 1970s, and then the introduction of exotic dreissenids in the 1980s. Currently the lake-wide benthic community is dominated by dreissenids. The number of exotic species found in benthic surveys increased every decade, from one in 1963 to ten in 2009-2012, and the majority of the invaders were molluscs. Whereas the role of benthic invaders in community diversity is still low, their impact has had enormous consequences for the whole ecosystem. In summer of 2014 within a project "Lake Erie & Lake Michigan Benthos: Cooperative Science & Monitoring Initiative," we conducted a lake-wide survey of benthic community using traditional (Ponar grabs, SCUBA) and modern (underwater video) methods and are currently working on species identification. See the photo page at the front of this report for pictures.

Long-term changes in *Dreissena* spp. populations in Lake Erie.

Lake Erie has the longest history of colonization by both *Dreissena polymorpha* and *D. rostriformis bugensis* in North America, and is therefore optimal for the study of long-term dynamics of dreissenid species. Distribution of dreissenid species in Lake Erie varied depending on the time since the initial invasion, depth, and lake basin. During 2014, quagga mussels were found at various depths and in all basins, while zebra mussels were common in the western basin only, and were limited in the central and eastern basins to a very few spots in shallow depths, resulting in almost complete replacement of *D. polymorpha* with *D. r. bugensis*. In the shallowest western basin of Lake Erie, zebra mussels distributed as widely as quagga mussels, but represented <15% of the combined dreissenids density and wet biomass. In addition, to further elucidate the relationship

between hypoxia and dreissenid abundance, an exploratory dreissenid abundance/habitat mapping approach was conducted with both underwater cameras mounted on a Ponar grab and on a benthic sled towed by U.S. EPA Great Lakes National Program Office R/V Lake Guardian. Preliminary video footage analysis verified by Ponar grab samples revealed that *Dreissena* spp. avoid the central basin hypoxic zone and that monitoring dreissenid distribution and size structure can be an effective tool in mapping of the extent and frequency of hypoxia in a large waterbody.

Round goby impacts on tributary stream leaf litter decomposition.

The round goby has been implicated in the alteration of both macroinvertebrate and fish communities in tributary streams to the Great Lakes. This project assessed whether this invasive invertivorous, benthic fish impacted crayfish foraging, leading to a change in leaf litter decomposition. We used a field mesocosm manipulation to assess whether round gobies or crayfish had different impacts on the benthic macroinvertebrate community and then, indirectly, on leaf mass loss. Graduate student Stephen Tentinger is quantifying the results for his Master's thesis in Biology.

Stream restoration effects on fish and macroinvertebrate communities.

This project compared fish and macroinvertebrate communities in Elton Creek before and after an in-stream and riparian zone restoration project. The original restoration work was intended to improve trout habitat along a 1 km reach. We sampled fish and invertebrates several months prior to the project onset, and six and 12 months post-project. Sculpins did not respond to the restoration, but trout numbers in the restoration section improved slightly. Macroinvertebrate community response is still being assessed.

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

Great Lakes Center researchers have been awarded a grant by the Niagara Greenway Ecological Fund to investigate Lake Sturgeon habitat use, feeding ecology and benthic resource availability in the Lower Niagara River for 2014-2017. The lower Niagara River provides habitat to one of the few remnant populations of lake sturgeon in the lower Great Lakes. Evidence shows that this population may be in recovery (http://www.buffalonews.com/city-region/sturgeon-battles-back-to-repopulate-lake-erie-lower-niagara-river-20130907), but information about sturgeon diet and habitat use in this unique system is lacking. In this project we study the diversity, distribution and density of benthic forage resources and the biology and ecology of lake sturgeon in the lower Niagara River. We also determine lake sturgeon movement patterns, habitat use, and diet in the lower Niagara River and relate it to our benthic habitat analysis to determine substrate and habitat preferences and to predict a carrying capacity for lake sturgeon in the lower Niagara River. To date, we have collected over 250 benthic samples and produced a

Fish biologists Shana DiPalma and Dimitry Gorsky from US Fish and Wildlife transfer a lake sturgeon from the boat to collect biological data..

substrate map which is the basis for further habitat maps. The results of this work were presented at the 58th IAGLR meeting in May 2015. Our study will produce an assessment of food availability and habitat preferences of lake sturgeon in relation to restoration of the local population to aid researchers and managers in developing opportunities to protect and enhance habitat to advance lake sturgeon recovery in the lower Niagara River.

Conservation of native freshwater mussel refuges in Great Lakes coastal zones.

Since the introduction of dreissenid mussels into the Laurentian Great Lakes in the late 1980s, the diverse native mussel communities of the region have declined sharply. However, there have been several locales identified as refuges in coastal and nearshore areas. During the last three years within this large collaborative project funded by the U.S. Fish and Wildlife Service we surveyed over a total of 198 sites at 88 locations in bays, coastal wetlands, and drowned river mouths in the lower Great Lakes region and collected 4,329 individual unionids of 26 species. This information will help managers develop conservation strategies to sustain existing populations in these refuges. This expansive project also trained multiple undergraduate and graduate students, creating a cadre of future scientists and managers who will work to protect this imperiled resource, including graduate student Isabel Hannes (University at Buffalo) studying the phylogenetic relationship between *Lampsilis radiata* and *L. siliquoidea*, the levels of intermixing, and gene flow at different spatial scales. While species assemblages in the lakes have shown major shifts, these findings are especially encouraging given that surveys shortly after the dreissenid invasion pointed toward total extirpation of the unionid fauna. The number and weight of dreissenids attached to unionid shells was found to be tenfold fewer than in the early stages of invasion, indicating that the adverse impact of dreissenids on unionids has declined. We also found that the rate of infestation depends on the dominant *Dreissena* species in the lake: zebra mussels infested unionids much more often and in greater numbers. Consequently, the proportion of infested unionids, as well as the number and weight of attached dreissenids were lower in waterbodies dominated by quagga mussels. This was the first large-scale systematic study that revealed how minor differences between two taxonomically and functionally related invaders may have large consequences for native communities they invade (Burlakova et al. 2014). Results of the study were published in seven papers and presented at multiple meetings in the U.S. and abroad. For more information please check the project webpage.

Long-term changes in the distribution range and population size of endangered Rio Grande endemic mollusc *Popenaias popeii*.

The Texas Hornshell (*Popenaias popeii*) is listed as a Species of Greatest Conservation Need in Texas and New Mexico, as Endangered in both states, and is a candidate for listing in both states under the federal Endangered Species Act. Using an opportunity provided by U.S. FWS for bilateral species conservation effort in New Mexico and Texas, we studied the current distribution and population densities of the unionid *Popenaias popeii* endemic to the Rio Grande in Texas, and developed a method to reconstruct the historical range and population size of species to evaluate changes in the population's size and distribution range over the last 100 years. Sampling over 250 sites in four rivers, constituting the entire historical range of *P. popeii*, we found that the species has been extirpated from two rivers, a 76% decrease in the combined total length of the rivers populated by the mussel, and an 85% overall decline in the population size of *P. popeii*. The results of this project are published in one paper and presented at national and international scientific meetings.

Invasion Risk Assessment for Ponto-Caspian Fishes to the Great Lakes.

A majority of invasive species discovered in the Great Lakes since 1994 are native to the Ponto-Caspian region, including species that have had strong negative impacts in the Great Lakes (for example, dreissenid mussels

and the round goby). The rich biota of the Ponto-Caspian region coupled with a high volume of commercial shipping traffic strongly suggests that this region will continue to be a major source of invasive species to the Great Lakes. To assess invasion risk in Ponto-Caspian fishes that had not been included in previous studies, we reviewed English-language publications and untranslated European literature (published primarily in Russian), and used discriminant analysis to identify five additional fish species that have a high probability of becoming established, spreading, and having significant negative impacts in the Great Lakes. In a continuation of the study, within the project "Enhanced Early Detection of Invasive Ponto-Caspian Fishes in the Great Lakes" we use a variety of sources of information (primarily European literature available in English and Russian) to more accurately assess fine-scale geographic distributions and "propagule pressure" in European shipping ports associated with high-risk Ponto-Caspian fishes to identify spatial and seasonal "hot spots" in and around Great Lakes ports that should be the focus of future surveillance and early detection efforts. This project will provide surveillance and early response teams with more accurate information for their monitoring and control activities.

Emerald shiner habitat conservation and restoration study in the upper Niagara River: importance for sport fish, common terns and public education.

In this project we study the emerald shiner's use of the upper Niagara River for spawning, nursery habitat, pathways of migration and year-class formation. Results from habitat use by the shiner will be used to determine restoration needs to provide enhanced spawning and nursery areas and to diminish impediments to fish movement in the river, such as high water velocity areas from altered river shorelines (bulkheads, pilings, etc). We are also studying food availability to larval, young-of-the-year and adult shiners as well as their contribution to the diets of sport fish, adult common terns and their offspring. Our focus is to determine critical habitat for the shiners reproduction and migration and to evaluate the influence that these fish have on local sport fish and on the brood success of the common tern. Our results will answer questions about habitat conservation, restoration or possible modification to ensure the long-term success of emerald shiners, sport fish and common terns in the system. See the photo page at the back of this report for more pictures.

Graduate student Jo Johnson leads a group of students in the Young Environmental Leaders Program on a kayak tour to learn about the emerald shiner and the importance of this project. Photo credit: Adam Hoveey.

Lake Erie Lower Trophic Level Monitoring.

The Great Lakes Center has been an active member of the Forage Task Group of the Great Lakes Fishery Commission with Dr. Alicia Perez-Fuentetaja as the Buffalo State representative. As part of the Forage Task Group we have participated in a long term monitoring study in eastern Lake Erie. Since our participation began in 2008, Kit Hastings has taken a leading role in the implementation of this project by conducting most of the monitoring work at the two eastern Lake Erie sites. From May through October, we collect physical limnology data, water samples, and plankton samples biweekly, and benthos monthly. Our efforts represent a significant contribution towards building a database of biotic and abiotic information from sampling stations throughout Lake Erie that describes annual trophic conditions.

Implementation of the Great Lakes Observing System.

Since spring of 2012, the GLC has been a participating member of the Great Lakes Observation System (GLOS). GLOS consists of a varied membership of universities and government agencies that operate a system of observation stations throughout the five Great Lakes. Our contribution to the GLOS has been made by operating an observation buoy five miles offshore of Dunkirk, NY. This buoy records and transmits real time measurements of water temperature, wind speed, wave height, dissolved oxygen as well as several other parameters. This buoy is the only GLOS buoy operating in eastern Lake Erie making it an important source of information for a variety of stakeholders.

Alcohol and its role in PAH-induced carcinogenesis.

We conducted research under an NIH funded grant for understanding the tumor promoting mechanism of alcohol in PAH-induced carcinogenesis. Interference with PAH-induced cellular protective response of cell cycle arrest/apoptosis and the role of the transcription factor p53 has been implicated in this regard.

Research on microbiome.

We continued our effort in developing a new area of research in the field of microbiome. It has recently been recognized that human organs harbor commensal bacteria (microbiomes) which outnumber human cells. There is emerging evidence that these commensal bacteria may be playing an important role in maintaining healthy organs free of diseases including cancer, such as skin cancer and breast cancer. The present aim is to identify these probiotic microorganisms and the underlying mechanism by which these microorganisms protect human skin and breast from developing cancer. A proposal was developed to determine the role of microbiome in protecting breast cancer. This proposal was submitted to Department of Army as a potential source for funding.

Research on Potential Chemopreventive Agents.

We continued our effort in developing another proposal in the area of chemoprevention, and cancer treatment. The goal of this proposal was to investigate organoselenium compounds containing chalcone scaffold for developing a potential lead to a new generation of anticancer drugs with improved therapeutic index and offer potential to be unaffected by drug resistance often developed during cancer treatment. A proposal was developed and submitted to National Institutes of Health as a potential source for funding.

Dreissena growth experiment. Knut Mehler and Mark Clapsadl installing cages with quagga mussels in Lake Erie, June 2015.

Grants and Funding

Ongoing Grants including two new received in 2014-2015 (Total $9,221,118, including $4,860,763 for Buffalo State)

1. Burlakova, L. E., A. Y. Karatayev, M. E. May, and B. Lang. Survey of Texas Hornshell Populations in Texas. U.S. Fish and Wildlife Service, and Texas Parks and Wildlife Department, Traditional Section 6, Bilateral species conservation effort in New Mexico and Texas. **$143,000**. 2011-2014.
2. Karatayev, A. Y., L. E. Burlakova, and D. Gorsky. Investigating Lake Sturgeon habitat use, feeding ecology, and benthic resource availability in the lower Niagara River. Greenway Ecological Standing Committee. **$835,829**. 2014-2017.
3. Karatayev, A. Y., and M. Clapsadl. Implementation of the Great Lakes Observing System. US Department of Commerce. **$87,678**. 2011-2014.
4. Mukherjee, J. J., and S. Kumar. Alcohol and PAH-induced carcinogenesis. National Institutes of Health. **$147,000**. 2012-2015.
5. Pennuto, C. M. Administration of the Western New York PRISM (Partnership for Regional Invasive Species Management). Department of Environmental Conservation, New York State. **$1,100,768**. 2012-2017.
6. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, T. DePriest, M. Wilkinson, D. Einhouse, A. Hannes, R. Kraft, K. Hastings, and S. Delavan. Emerald shiner habitat conservation and restoration study in the upper Niagara River: importance for sport fish, common terns and public education. Niagara Greenway Ecological Fund. **$766,488**. 2014-2016.
7. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, T. DePriest, M. Wilkinson, D. Einhouse, A. Hannes, R. Kraft, K. Hastings, and S. Delavan. Emerald shiner habitat conservation and restoration study in the upper Niagara River: importance for sport fish, common terns and public education. Great Lakes Remedial Action Plan. US Army Corps of Engineers. **$1,331,247** (Funds are in-kind). 2014-2016.
8. Rudstam, L., A. Y. Karatayev, and L. E. Burlakova. Great Lakes Long-term Biological Monitoring Program. U.S. EPA. **$3,867,525** (**$1,094,726** for Buffalo State). 2012-2017.
9. Snyder, R. J., L. E. Burlakova, D. B. MacNeill, and A. Y. Karatayev. Enhanced Early Detection of Invasive Ponto-Caspian Fishes in the Great Lakes. U.S. EPA Great Lakes Restoration Initiative. **$99,756**. 2012-2014.
10. Zanatta, D., L. E. Burlakova, A. Y. Karatayev, R. Krebs, M. Hoggarth, F. de Szalay, J. Bossenbroek, E. Meyer, and M. Walsh, Collaborators: M. Schlesinger, R. Haas, T. Crail, P. Badra, N. Welte, and L. Holst. Conservation of native freshwater mussel refuges in Great Lakes coastal zones. Great Lakes Fish and Wildlife Restoration Act FY 2010. **$327,363** (**$71,054** for Buffalo State). 2010-2014.

Received in 2014-2015

11. Karatayev, A. Y. and L. E. Burlakova. Lake Erie and Lake Michigan Benthos: Cooperative Science and Monitoring Initiative. U.S. EPA. **$500,000**. 2014-2016.
12. Tang, T., C. M. Pennuto, M. Perrelli, and J. Gould. The use of low-altitude unmanned helicopter remote sensing to detect invasive plant species in the Erie Canal System: method development applied to water chestnut (*Trapa natans*). New York Great Lakes Protection Fund Small Grants Program **$14,464**. 2015-2016

Submitted in 2014-2015 (Total $1,598,006)

1. Dittman, D., and A. Y. Karatayev. Evaluating the effect of dying mussels on molluskivorous fish in the Great Lakes. USGS. **$121,250**. 2015-2016 (not awarded).
2. Gaston, M., and A. Locke. Lake Erie Watershed Invasive Species Control Program. Great Lakes Restoration Initiative: EPAR5-GL2014-2 Invasive Species Control. **$539,412**. 2014-2016 (pending).
3. Kumar, S. Selenium analogs of chalcone sulfides as new generation of potential anti-cancer drugs. National Institutes of Health. **$404,250**. 2015 (not awarded).

4. Kumar, S. Elucidating the role of breast microbiome in the etiology of breast cancer. Department of Defense: Congressional District Medical Research Program. **$505,163**. 2015 (not awarded).
5. Mehler, K., A. Y. Karatayev, and L. E. Burlakova. Preliminary assessment of benthic invertebrates and biological indicators to evaluate effectiveness of remediation and restoration efforts in the upper Niagara River. New York Great Lakes Protection Fund Small Grants Program. **$13,467**. 2015-2016 (not awarded).

Publications and Presentations

Last year the researchers of the GLC were very active in publishing papers and presenting their results at international and national meetings and conferences. Nine manuscripts were published; another eight were submitted to peer-reviewed journals. A total of 31 presentations were made by the GLC researchers, including: 22 presentations at national/international/regional conferences, nine invited talks, and four presentations were made in non-refereed venues.

Refereed Journal Publications (published):

1. Burlakova, L. E., A. Y. Karatayev, C. Pennuto, and C. Mayer. Changes in Lake Erie benthos over the last 50 years: historical perspectives, current status, and main drivers. *Journal of Great Lakes Research* 40: 560-573.
2. Burlakova, L. E., B. L. Tulumello, A. Y. Karatayev, R. A. Krebs, D. W. Schloesser, D. T. Zanatta, W. L. Paterson, T. A. Griffith, M. W. Scott, and T. Crail. 2014. Competitive replacement of invasive congeners may relax impact on native species: interactions among zebra, quagga, and native unionid mussels. *PLoS ONE* 9(7). doi:10.1371/journal.pone.0114926.
3. Karatayev, A. Y., L. E. Burlakova, C. Pennuto, J. Ciborowski, V. A. Karatayev, P. Juette, and M. Clapsadl. 2014. Twenty-five years of changes in *Dreissena* spp. populations in Lake Erie. *Journal of Great Lakes Research* 40: 550-559.
4. Karatayev, A. Y., L. E. Burlakova, S. E. Mastitsky, and D. K. Padilla. 2015. Predicting the spread of aquatic invaders: insight from 200 years of invasion by zebra mussels. *Ecological Applications* 25: 430–440.
5. Karatayev, A., D. Boltovskoy, L. Burlakova, and D. Padilla. Parallels and contrasts between *Limnoperna fortunei* and *Dreissena* species. In: D. Boltovskoy (ed.) *Limnoperna fortunei*, Invading Nature – Springer Series in Invasion Ecology, 261-297. DOI 10.1007/978-3-319-13494-9_15.
6. Karatayev, V. A., A. Y. Karatayev, L. E. Burlakova, and L. G. Rudstam. 2014. Eutrophication and *Dreissena* invasion as drivers of biodiversity: a century of change in the mollusc community of Oneida Lake. *PLoS ONE* 9(7): e101388. doi:10.1371/journal.pone.0101388.
7. Pennuto, C. M., L. E. Burlakova, A. Y. Karatayev, J. Kramer, A. Fisher, and C. Mayer. 2014. Spatiotemporal characteristics of nitrogen and phosphorus in the benthos of nearshore Lake Erie. *Journal of Great Lakes Research* 40: 541-549.
8. Pennuto, C. M., L. Dayton, D. D. Kane, and T. B. Bridgeman. 2014. Lake Erie nutrients: from watersheds to open water. *Journal of Great Lakes Research* 40: 469-472.
9. Zanatta, D. T., J. M. Bossenbroek, L. E. Burlakova, T. Crail, F. de Szalay, T. A. Griffith, D. Kapusinski, A. Y. Karatayev, R. A. Krebs, E. S. Meyer, W. L. Paterson, T. J. Prescott, M. T. Rowe, D. W. Schloesser, and M. C. Walsh. 2015. Distribution of native mussel (Unionidae) assemblages in coastal areas of Lake Erie, Lake St. Clair, and connecting channels, twenty-five years after a dreissenid invasion. *Northeastern Naturalist* 22(1): 223–235.

Refereed Journal Publications Submitted (in review):

1. Crane, D. P., C. C. Killourhy, and M. D. Clapsadl. Effects of three frozen storage methods on wet weight of fish with implications for energy content analysis. Submitted to: *Fisheries Research*.
2. Karatayev, A. K., L. E. Burlakova, T. D. Miller, and M. F. Perrelli. Long-term dynamics of the Rio Grande endangered endemic mollusc *Popenaias popeii*: An attempt to reconstruct historical range and population size. Submitted to: *Hydrobiologia*.
3. Lopes-Lima, M., R. Sousa, J. Geist, D. C. Aldridge, R. Araujo, J. Bergengren, Y. Bespalaja, E. Bodis, L. Burlakova, D. Van Damme, K. Douda, E. Froufe, D. Georgiev, C. Gumpinger, A. Karatayev, U. Kebapci, I. Killeen, J. Lajtner, B. M. Larsen, R. Lauceri, A. Legakis, S. Lois, S. Lundberg, E. Moorkens, G. Motte, K.-O. Nagel, P. Ondina, A. Outeiro, M. Paunovic, V. Prie, T. von Proschwitz, N. Riccardi, M. Rudzīte, M. Rudzītis, C. Scheder, M. Seddon, H. Sereflisan, V. Simić, S. Sokolova, K. Stoeckl, J. Taskinen, A. Teixeira, F. Thielen, T. Trichkova, S. Varandas, H. Vicentini, K. Zajac, T. Zajac, and S. Zogaris. Conservation Status of Freshwater Mussels in Europe: State of the Art and Future Challenges. Submitted to: *Biological Reviews*.
4. Mackintosh, S. A., J. S. Wallace, M. S. Gross, D. D. Navarro, A. Pérez-Fuentetaja, M. Alaee, D. Montecastro, and D. S. Aga. Review on the Occurrence and Profiles of Polybrominated Diphenyl Ethers in the Philippines, an E-Waste Receiving Country. Submitted to: *Environment International*.
5. Paterson, W. L., T. A. Griffith, L. E. Burlakova, R. W. Krebs, and D. T. Zanatta. An evaluation of the genetic structure of mapleleaf mussels (*Quadrula quadrula*) in the Lake Erie watershed. Submitted to: *Journal of Great Lakes Research*.
6. Pennuto, C. M. and M. Smith. From midges to spiders: mercury biotransport in riparian zones near the Buffalo River Area of Concern (AOC), USA. Submitted to: *Bulletin of Environmental Contamination & Toxicology*. DOI: 10.1007/s00128-015-1658-6.
7. Pennuto, C. M. and S. A. Rupprecht. Swimming behavior and fin morphology of the round goby: implications for upstream expansion in Great Lakes tributary streams. Submitted to: *Aquatic Ecology*.
8. Pérez-Fuentetaja, A., S. A. Mackintosh, L. R. Zimmerman, M. D. Clapsadl, M. Alaee, and D. S. Aga. Trophic transfer of flame retardants (PBDEs) in the food web of Lake Erie. Submitted to: *Canadian Journal of Fisheries and Aquatic Sciences*.

International/National/Regional Conference Presentations

1. Brackett, M., S. E. Daniel, and E. K. Hinchey. Engaging K-12 students in benthic ecology through self-designed, in situ critter collector. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
2. Burlakova, L. E., B. L. Tulumello, A. Y. Karatayev, R. A. Krebs, D. W. Schloesser, W. L. Paterson, T. A. Griffith, M. W. Scott, T. Crail, and D. T. Zanatta. Changed impact of *Dreissena* spp. on native Unionidae in the lower Great Lakes: dreissenid species matters. 15th World Lake Conference. September 1-5, 2014, Perugia, Italy.
3. Burlakova, L. E., A. Y. Karatayev, B. L. Tulumello, D. T. Zanatta, R. A. Krebs, D. W. Schloesser, F. E. Lucy, and S. E. Mastitsky. Impacts of dreissenid invasion on native unionid communities: a synthesis of trends in North America and Europe. ASLO Aquatic Sciences Meeting. February 2015, Granada, Spain.
4. Burlakova, L. E., A. Y. Karatayev, R. P. Barbiero, and S. E. Daniel. Integrating environmental effects of multiple stressors in the Great Lakes: dynamics of Oligochaete Trophic Index. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
5. Clapsadl, M., A. Pérez-Fuentetaja, R. Snyder, and S. Fleck. Energy content and diet of the emerald shiner from lakes Erie, Ontario and the Niagara River. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
6. Cochran, J., A. Pérez-Fuentetaja, R. Snyder, M. Clapsadl, J. Fisher, S. Fleck, C. Osborne, and J. Lang. Ecology

of the young-of-the-year emerald shiner (*Notropis atherinoides*) in the Niagara River. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.

7. Daniel, S. E., L. E. Burlakova, A. Y. Karatayev, and B. L. Tulumello. Effect of *Dreissena* on profundal Oligochaeta community. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont. Information Impact Poster Award.
8. Hannes, I. P., H. R. Lasker, and L. E. Burlakova. Blurred lines in conservation: Freshwater mussel gene flow and species boundaries. 5th annual Student Conference on Conservation Science. New York (SCCS-NY). October 14-17, 2014. Best Poster Award.
9. Karatayev, A. Y., L. E. Burlakova, and D. K. Padilla. Zebra versus quagga mussels: spread, population dynamics, and ecosystem impacts of zebra versus quagga mussels. 15th World Lake Conference. September 1-5, 2014, Perugia, Italy.
10. Karatayev, V. A., A. Y. Karatayev, L. E. Burlakova, and L. Rudstam. Eutrophication and *Dreissena* invasion as drivers of biodiversity: a century of change in a diverse mollusc community. 15th World Lake Conference. September 1-5, 2014, Perugia, Italy.
11. Karatayev, A. Y., L. E. Burlakova, and D. K. Padilla. Difference in spread, population dynamics, and ecosystem impacts of two *Dreissena* congeners. ASLO Aquatic Sciences Meeting. February 2015, Granada, Spain.

GLC researchers and graduate students attending the 58th Annual Conference on Great Lakes Research in Burlington, Vermont.

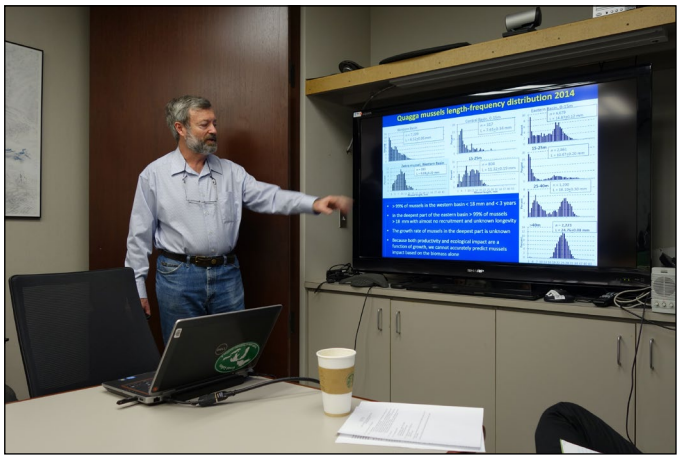
12. Lang, J., R. Snyder, A. Pérez-Fuentetaja, M. Clapsadl, J. Cochran, and C. Osborne. Morphometric differentiation of lake and river populations of the emerald shiner. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
13. Mehler, K., A. Y. Karatayev, and L. E. Burlakova. Diversity and community structure of benthic invertebrates based on GIS-derived habitat maps in the Niagara River. Society of Freshwater Science, Annual Meeting, Milwaukee, Wisconsin. May 17-21, 2015.
14. Karatayev, A. Y., L. E. Burlakova, and K. Mehler. Long-term dynamics of *Dreissena* spp. in Lake Erie: Insights for population boom and bust. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
15. Mehler, K., A. Y. Karatayev, L. E. Burlakova, and D. Gorsky. Benthic habitat mapping using remote sensing and GIS in the Niagara River. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
16. Osborne, C., R. Snyder, A. Pérez-Fuentetaja, M. Clapsadl, J. Cochran, J. Lang. Reproductive effort of the emerald shiner (*Notropis atherinoides*) in the upper Niagara River. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
17. Pandey, M. K., J. J. Mukherjee, D. Desai, S. Amin, and S. Kumar. Ethanol potentiates tobacco smoke carcinogens-induced MAPK activation. Annual Meeting of American Association of Cancer Research at Philadelphia, PA. April 18-25, 2015.
18. Paterson, W. L., L. E. Burlakova, A. Y. Karatayev, and J. M. Watkins. An international approach to improve early detection of alien species in the Great Lakes. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
19. Pennuto, C. M. and S. Rupprecht. Round goby swimming behavior and fin morphology may facilitate upstream

expansion in Great Lakes tributary streams. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.

20. Pérez-Fuentetaja, A., R. Snyder, M. Clapsadl, J. Cochran, C. Osborne, J. Lang. Population dynamics and reproduction of the emerald shiner in the upper Niagara River. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
21. Smith, S. D. P., D. B Bunnell, G. A. Burton, J. J. H. Ciborowski, A. Davidson, C. Dickinson, P. Esselman, M. A. Evans, D. R. Kashian, N. F. Manning, P. B. Mcintyre, T. F. Nalepa, A. Pérez-Fuentetaja, A. D. Steinman, D. G. Uzarski, J. D. Allan. Synthesizing and modeling interactions among environmental stressors in the Laurentian Great Lakes. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
22. Snyder, R., A. Pérez-Fuentetaja, M. Clapsadl, J. Cochran, C. Osborne, J. Lang. Growth and mortality of emerald shiners (*Notropis atherinoides*) in the Niagara River, NY. International Association of Great Lakes Research 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.

Invited Talks

1. Burlakova, L. E., A. Y. Karatayev, and R. P. Barbiero. Dynamics of the Oligochaete Trophic Index in Great Lakes, 1997-2011. February 12, 2015, EPA Great Lakes National Program Office, Chicago.
2. Burlakova, L. E., A. Y. Karatayev, S. Daniel, and R. P. Barbiero. Integrating environmental effects of multiple stressors in the Great Lakes: drivers and dynamics of Oligochaete Trophic Index. June 18, 2015, Cornell University Biological Field Station, Bridgeport, NY.
3. Karatayev, A. Y., L. E. Burlakova, and K. Mehler. Preliminary Results of *Dreissena* spp. study in Lake Erie using traditional sampling and Video Imaging Analysis. February 12, 2015, EPA Great Lakes National Program Office, Chicago.
4. Karatayev, A. Y., L. E. Burlakova, K. Mehler, and R. P. Barbiero. Environmental factors affecting distribution and population dynamics of *Dreissena* spp. in Lake Erie. June 18, 2015, Cornell University Biological Field Station, Bridgeport, NY.
5. Mehler, K., E. Bruestle, D. Gorsky, A. Y. Karatayev, L. E. Burlakova. Investigating Lake Sturgeon habitat use, feeding ecology and benthic resource availability in the lower Niagara River. January 30, 2015, Greenway Ecological Standing Committee (GESC). DEC office, Buffalo, NY.



Alexander Karatayev presenting at the EPA Great Lakes National Program Office in Chicago on February 12, 2015.

6. Paterson, W. L. Alumni speaker: my path in STEM at SUNY Oswego and beyond. Future Oswego Leaders Conference. March 7, 2015.
7. Pennuto, C. M. Ecological impacts of round gobies in tributary streams: an update. November 2014, Finger Lakes Symposium, Finger Lakes Institute, Geneva, NY.
8. Pérez-Fuentetaja, A. A new guest at the Great Lakes table: the feeding ecology of the Bloody Red Shrimp, *Hemimysis anomala*. October 30, 2014, Dept. of Civil Structural and Environmental Engineering, University at Buffalo.
9. Pérez-Fuentetaja, A. Emerald Shiner habitat conservation and restoration study in the upper Niagara River. January 30, 2015, Greenway Ecological Standing Committee (GESC), DEC office, Buffalo, NY.

Conference Presentations (non-refereed)

1. Karatayev, A. Y., L. E. Burlakova, and K. Mehler. Lake Erie benthos: first results of the Intensive 2014 Sampling Year. 15th Annual Faculty/Staff Research and Creativity Fall Forum, SUNY Buffalo State, October 30, 2014 (poster).
2. Mehler, K., L. E. Burlakova, and A. Y. Karatayev. Using remote sensing techniques to develop benthic habitat maps in the Lower Niagara River. 15th Annual Faculty/Staff Research and Creativity Fall Forum, SUNY Buffalo State, October 30, 2014 (poster).
3. Paterson, W. L., L. E. Burlakova, and A. Y. Karatayev. Finding foreigners the Baltic way. 15th Annual Faculty/Staff Research and Creativity Fall Forum, SUNY Buffalo State, October 30, 2014 (poster).
4. Bruestle, E. L., D. Gorsky, K. Mehler, A. Y. Karatayev, and L. E. Burlakova. 2014. Investigating lake sturgeon habitat use and feeding ecology in the lower Niagara River. Poster Presentation at the 15th Annual Faculty/Staff Research and Creativity Fall Forum. SUNY Buffalo State, October 29, 2014 (poster).

III. Education

The GLC fulfills its educational mission directly through the classes its researchers teach, through its Master of Art and Master of Science graduate programs in Great Lakes Ecosystem Science, through the support we offer to faculty teaching classes pertaining to environmental sciences, through the seminar speakers we sponsor, and through our educational activities in the community.

Great Lakes Center MS and MA Graduate Programs

- Two new graduate programs in Great Lakes Ecosystem Science (GLES) have been administered through the Great Lakes Center starting in the fall of 2013. In addition to GLC faculty, members the Geography and Planning, Biology, Chemistry, and Earth Sciences and Science Education Departments are involved in the GLES programs.
- The GLES programs provide an opportunity for students to pursue graduate studies through two different interdisciplinary applied environmental science programs, a thesis-based Master of Arts (M.A.) and an internship-based professional Master of Science (M.S.). Both programs provide graduates with the opportunity to attain a broad understanding of the physical, chemical, biological, and social factors that comprise the Great Lakes ecosystems, while at the same time offering graduates the depth they need in a particular discipline to prepare them for entry either into a Ph.D. program or into the workforce.
- The GLES M.S. program provides a strong foundation in environmental science and allows students to approach problems from a purely scientific perspective. Graduates will be trained to deal effectively with a broad range of problems and issues related to ecosystem structure and function within the Great Lakes and surrounding watersheds, which will prepare them for advanced research, professional employment, or study at the Ph.D. level.
- The GLES M.S. combines coursework in environmental science with business communication and project management classes and an internship experience. The M.S. program was designed to meet the needs of industry, consulting firms, non-governmental organizations (NGOs), and governmental agencies with graduates prepared to provide a leadership role as they address a wide range of problems and issues related to the management of resources within the Great Lakes and surrounding watersheds.

Students enrolled in GLES Administered by the GLC:

Fall 2014	**Spring 2015**
Master of Art:	*Master of Art:*
Jiazhen Zhang	Jiazhen Zhang
Michael Borrelli	Michael Borreli
Andrew Lenox (part time)	Andrew Lenox (part time)
Eric Bruestle	Eric Bruestle
Jacob Cochran	Jacob Cochran
Anthony Cevaer	Anthony Cevaer
Susan Daniel (part time)	Susan Daniel (part time)
YingYu Zhang	YingYu Zhang
Chenliuli Jiang	Chenliuli Jiang
Master of Science:	*Master of Science*
Keith Pawlowski	Keith Pawlowski
Zachary Adams	Zachary Adams
Heather Lewis (part time)	Heather Lewis (part time)
Ashley Perez	Ashley Perez
John Grabowski	John Grabowski
	Sean Ryan

Integrative Graduate Education and Research Traineeship Ph.D. Program at SUNY Buffalo State:

Student:	**Advisor:**
Isabel Porto Hannes	Burlakova, L.

Advising Undergraduate and Graduate Students

- Lyubov Burlakova was the major professor for one student in Integrative Graduate Education and Research Traineeship Ph.D. Program at SUNY Buffalo State (Isabel Porto Hannes). She was also a faculty Mentor/Advisor for Susan Daniel and Keith Pawlowski, a member of the graduate committee for Anthony Cevaer and Erik Bruestle in the Great Lakes Ecosystem Science Graduate Program and a member of Graduate Committee for Paul Juette, M.A. student of the Biology Department at SUNY Buffalo State.
- Alexander Karatayev was the advisor of a graduate student from the Biology Department (Paul Juette). He was also a member of Graduate Committee for a Ph.D. student at SUNY Buffalo State (Isabel Porto Hannes).
- Knut Mehler was the major advisor professor for Anthony Cevaer and a member of the graduate committee for Eric Bruestle in the M.A. Great Lakes Ecosystem Science Graduate Program.
- Christopher Pennuto was the advisor of three graduate students from the Biology Department (Allyse Fischer, Hilary McNaughton, Stephen Tentinger) and one from the Great Lakes Ecosystems Science program (Mike Borelli). He also was MA thesis committee member for five graduate students (Eric Bruestle, Jeromy Henderson, Brian Hass, Sierra Anseeuw, Zachary Cava).
- Alicia Pérez-Fuentetaja was the major advisor for one graduate student from the Great Lakes Ecosystems Science program (Jacob Cochran) and one from the Biology Department (Steve Fleck). She also was a committee member for five graduate students (Stephen Tentinger, Chris Osborne, John Lang, Isaac Allen, and Shaurya Sood).

Seminars

In order to facilitate collaboration between the GLC personnel and leading experts in aquatic ecology and related sciences and increase visibility of the Center in 2014-2015 we invited eight speakers to present talks on our seminar, including:

1. Richard Barbiero, CSC. “Recent changes in the lower food webs of the Great Lakes.” September 25, 2014.
2. Robert J. Warren II, Department of Biology, SUNY Buffalo State. “Ghosts of cultivation past - Native American dispersal legacy persists in tree distribution.” October 9, 2014.
3. Chris Barnhart, Professor of Biology at Missouri State University. “Where there’s a gill, there’s a way- Parasitism by freshwater mussels.” October 23, 2014.
4. Elizabeth Hinchey, U.S. EPA Great Lakes National Program Office. “The role of seabed dynamics in structuring an estuarine macrobenthic community.” December 4, 2014.
5. Ronald Griffiths, Oregon State University. “Effect of *Dreissena* on benthos.” January 28, 2015.
6. Katharina Dittmar de la Cruz, University at Buffalo, Department of Biological Sciences. “Evolutionary trends and ecological drivers of eye reduction in parasites." February 19, 2015.
7. Martin A. Stapanian, U.S. Geological Survey, Lake Erie Biological Station. “Polychlorinated biphenyls and mercury in Burbot: Latitudinal effects and sex differences.” April 23, 2015.
8. Thomas F. Nalepa, Graham Institute, University of Michigan, and Great Lakes Environmental Research Laboratory, NOAA. "Trends in benthic macroinvertebrates throughout the Lake Huron system." April 30, 2015.

Other Educational Activities

Subodh Kumar continued organization and coordination of DEC mandated precertification courses for waste water treatment plant operators of New York State. These training courses comprised of Basic Laboratory, Basic Operation, Activated Sludge, Grade 3 supervision and Grade 4 Management. The number of trainees attended these courses were 5, 6, 6, 5, and 1, respectively, in the fall semester of 2014, and 7, 8, 8, 12, and 7, respectively, in the spring semester of 2015.

Invertebrate identification workshop presented by Dr. Ron Griffiths, held May 1-2, 2015. 20 participants attended including students, faculty and staff, as well as USFWS biologists.

IV. Outreach and Service Activities

All members of the GLC have been actively involved in the outreach and service to the profession, to the College, and to the community.

Lyubov Burlakova:

- Coordinator of the Great Lakes Center and Biology Department Seminar Series.
- Coordinator of the Great Lakes Seminar course GLC 600.
- Member of the Scientific and Organizing committees for the 2nd International Freshwater Bivalves Conference that will be held in Buffalo in October of 2015.
- Assisted in preparation of the Great Lakes Center 2013-2014 Annual Report.
- Assisted in preparation of the Great Lakes Center Open House and the Field Station Open House.
- Helped in organizing Invertebrates Identification Workshop presented by Dr. Ron Griffiths and funded by the U.S. EPA (Great Lakes Long-Term Biological Monitoring project) with 20 participants enrolled, including Buffalo State students, faculty and staff, and USFWS biologists.
- Adjunct Associate Professor, Department of Geology, and a Member of Graduate Committee, Ecosystem Restoration through Interdisciplinary Exchange (ERIE) IGERT Program, State University of New York at Buffalo.
- Wrote articles for GLC Newsletter series.
- Member of the search committee for the GLC secretary replacement.
- Attended meeting with GLNPO in Chicago to present current progress on the ongoing projects and discuss future research and grant opportunities.
- Participated in multiple phone conferences with EPA, NOAA, USGS, TNC, etc. about current research and potential future projects.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-Term Biological Monitoring Program.
- Co-chair of two sessions at the 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
- Reviewed the 2015 National Strategy for the Conservation of Native Freshwater Mollusks, April 2015.
- Advisor for International Exchange Student F. P. L. Collas (May-June 2014), Radboud University, Nijmegen, The Netherlands.
- External Dissertation Examiner, Ph.D. Thesis by Sara Meehan, "Assessment and Utilisation of Zequanox for Zebra Mussel (Dreissena polymorpha) Control in Irish Waters." Institute of Technology, Sligo, Ireland, September 2014.
- Reviewed Ph.D. thesis by Aleksej Šaškov, "Application of underwater remote imagery and acoustic data for quantitative benthic biotopes identification, predictive mapping and building of explanatory models." Klaipeda University, Lithuania, November 2014.
- Reviewed Ph.D. thesis of Elena Letitskaya, "Benthic macroinvertebrate communities of mountain river systems (Tisa River basin)," Institute of Hydrobilogy, Ukraine, January 2015.
- Member of the American Society of Limnology and Oceanography, the International Association for Great Lakes Research, the Freshwater Mollusc Conservation Society, the Ecological Society of America.

- Reviewed manuscripts for *Limnology and Oceanography*, *Freshwater Science*, *Tropical Conservation Science*, and *Peer J*.
- Reviewed a grant proposal for Minnesota Sea Grant.

Mark Clapsadl:

- Participated in and supervised the Lake Erie Lower Trophic Level Monitoring Project.
- Served as Science Advisor on the Environmental Committee of the Niagara Musky Association.
- Provided significant support to numerous GLC research projects, as well as support to outside agencies and organizations.
- Hosted the Field Station Open House.

Susan Daniel:

- Helped in organizing Invertebrates Identification Workshop presented by Dr. Ron Griffiths and funded by the U.S. EPA (Great Lakes Long-Term Biological Monitoring project) with 20 participants enrolled, including Buffalo State students, faculty and staff, and USFWS biologists.
- Wrote articles for GLC Newsletter series.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-Term Biological Monitoring Program.
- Assisted in taxonomic training of new employees.
- Member of the International Association for Great Lakes Research.

Joshua Fisher:

- Participated in the Lake Erie Lower Trophic Level Monitoring Project.
- Planned and implemented field studies with Buffalo State faculty, researchers, and staff for the Niagara River Emerald Shiner Project.
- Planned and built upgrades on research vessels to provide increased electrofishing, seining, water sampling, and benthos collection capability of the Great Lakes Center fleet.
- Processed larval fish by phylogenetically identifying, organizing, and documenting samples collected for the Emerald Shiner Project.
- Participated in benthic sampling on the lower Niagara River as part of a study on Lake Sturgeon habitat use, feeding ecology, and benthic resource availability.
- Assisted in coordination of Field Station boats, vehicles, and buildings between the GLC and collaborating agencies, organizations, and universities.
- Provided field and laboratory procedures instructional support for several Buffalo State classes.
- Led electrofishing field trip for McKinley High School students.
- Captained vessel and assisted in the field sampling for Early Detection of Alien Species in Harbors project.
- Captained research vessel for researchers from The National Institute of Education Singapore.
- Volunteer at Buffalo Niagara Riverkeeper.

Kit Hastings:

- Participated in field collection and laboratory studies in multiple projects conducted at the Field Station.
- Implemented the Lake Erie Lower Trophic Level Monitoring Project (LTLA).
- Analyzed chlorophyll a samples for the DEC's portion of the LTLA.
- Played a key role in producing two issues of GLC Newsletters (editor) and revamping the GLC website.
- Made a slideshow representing Field Station Activities for the Field Station Open House, May 2015.
- Created a Youtube channel for the Great Lakes Center and edited video footage to post there.
- Member of the organizing committee for the 2nd International Freshwater Bivalves Conference that will be held in Buffalo in October of 2015, as well as designing and maintaining the website.
- Designed and assisted in preparation of the Great Lakes Center 2013-2014 Annual Report for publication.
- Assisted in lab work associated with the Great Lakes Long-Term Biological Monitoring Program and Lake Erie CSMI project (mounted oligochates and chironomids slides).
- Participated in collecting samples within the Great Lakes Long-Term Biological Monitoring Program project aboard the Lake Guardian.
- Provided instructional support on field sampling procedures for multiple Buffalo State classes.
- Participated in the Emerald Shiner Habitat Restoration and Conservation Study.
- Interviewed by Channel 4 WIVB about algae blooms in Toledo.
- Member of NYS GIS Association and WNY GIS User Group.

Alexander Karatayev:

- Participated in writing proposal to NYSUNY 2020 to build International Center for Great Lakes Research, Education, and Entrepreneurship. Received eight letters of support from different organizations from U.S. and Europe.
- Chair of the Organizing and Scientific Committees for the 2nd International Freshwater Bivalves Conference that will be held in Buffalo in October of 2015.
- Organized invertebrates identification workshop presented by Dr. Ron Griffiths and funded by the U.S. EPA (Great Lakes Long-Term Biological Monitoring project) with 20 participants enrolled, including Buffalo State students, faculty and staff, and USFWS biologists.
- Gave a tour to prospective students interested in Great Lakes Ecosystem Science program (August 2014).
- Organized Great Lakes Center Open House (November 2014) and Field Station Open House (May 2015).
- Published Great Lakes Center 2013-2014 Annual Report (November 2014).
- Wrote multiple articles for GLC Newsletter series.
- Member of the search committee for the GLC secretary replacement.
- Participated in Graduate School meetings.
- Attended meeting with GLNPO in Chicago to present current progress on the ongoing projects and discuss future research and grant opportunities.
- Participated in multiple phone conferences with EPA, NOAA, TNC, etc. about current research and potential future projects.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-Term Biological Monitoring Program.

- Served as Campus Representative for the Great Lakes Research Consortium.
- Member of the Ph.D. Committee for Isabel Porto Hannes in the Ecosystem Restoration through Interdisciplinary Exchange (ERIE) IGERT Program, State University of New York at Buffalo.
- Co-chair of two sessions at the 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
- Advisory Board Member, *International Journal of Aquatic Invasions*.
- Reviewed Ph.D. Thesis of Elena Letitskaya, "Benthic macroinvertebrate communities of mountain river systems (Tisa River basin)," January 2015, Institute of Hydrobilogy, Ukraine.
- Multiple interviews for various mass media.
- Member of the American Society of Limnology and Oceanography, the International Association for Great Lakes Research, and the Freshwater Mollusc Conservation Society.
- Reviewed manuscripts for *Aquatic Invasions* and *Freshwater Biology*.

Subodh Kumar:

- Member of Radiation Safety Committee and Chemical Hygiene Committee.
- Organization and coordination of DEC mandated precertification courses for waste water treatment plant operators of New York State.
- Reviewed manuscripts for *Biomed Research International*, *Chemical Research in Toxicology*, *ARKIVOC* (also serves in Editorial Board), and *ACS Combinatorial Science*.

Knut Mehler:

- Member of organizing committee for the 2nd International Meeting on Biology and Conservation of Freshwater Bivalves to be held in Buffalo in October of 2015.
- Received Adjunct Professor Position on 9/29/2014.
- Co-Coordinator of GLC 600 Seminar Fall Semester 2014.
- Reviewed a grant proposal for Minnesota Sea Grant.
- Attended Areas of Concern Conference, Toledo, OH, March 11-12, 2015.

Cathy Nasca:

- Assisted in preparation of the Great Lakes Center Annual Report for publication.
- Assisted in publication of Great Lakes Center posters.
- Organized Great Lakes Center Open House and Field Station Open House.
- Assisted in preparation of the Great Lakes Center and Biology Department Seminar Series.

Wendy Paterson:

- Wrote an article for GLC Fall Newsletter.
- Participated in planning meetings with EPA, NOAA, DEC, etc. about current research.
- Attended a biology club meeting to recruit students and encourage their attendance at the seminars.
- Assisted in the interviewing and training of all hired and student laboratory technicians.
- Supervised student laboratory technicians and advised them in their next step of their career pursuits.
- Organized formaldehyde gas testing to ensure the laboratories met OSHA standards of exposure limits.

- Recruited SUNY Oswego volunteers to encourage experience in the Great Lakes benthos field.
- Restarted a scientific diving program in collaboration with master diver, Dallas Edmiston, at Discover Diving and the University of Buffalo.
- Recruited help for sampling aquatic invasive species in Great Lakes ports from USGS, Cornell, SUNY Oswego, USGS Oswego Office, University of Toledo, Buffalo Crushed Stone, Toledo Port Authority, Toledo Skyway Marina, Ashtabula Port Authority, and Ohio DNR Ashtabula Division of Watercraft.
- Reached out to species expert, Nadine C. Folino-Rorem, about *Cordylophora caspia*. *C. caspia* had not been documented in Oswego Harbor before.
- Member of the International Association for Great Lakes Research, the Buffalo Zoo, and the National Museum of the Great Lakes.
- Participated in the fall and spring Shoreline Sweep hosted by the Buffalo/Niagara River Keepers.

Christopher Pennuto:

- Presenter, Master Teacher's Research Initiative, April 2015.
- Graduate Advisory Council member and Chair.
- Assessment Committee member and Curriculum Committee chair, Biology Department.
- Admissions Committee Chair for GLES Master Programs.
- Graduation Ceremony seating Marshal.
- Member of Graduate Committee of six graduate students.
- Student judge: Annual Conference International Association for Great Lakes Research, Burlington, VT.
- Reviewed manuscripts for *Journal of Great Lakes Research*, *Journal of Sea Research*, *Fundamental and Applied Limnology*, *Current Zoology*.

Alicia Pérez-Fuentetaja:

- Member of Personnel Committee and Graduate Committee, Biology Department.
- Advisor Graduate Comprehensive Exam students in Biology.
- Member Search Committee for Research Assistant Professor of Biology.
- Member of the Committee for the President's Awards for Excellence in Academic Advisement, Research, Scholarship and Creativity, Teaching and Undergraduate Research Mentor.
- Member of the Conference Program Committee for the International Association of Great Lakes Research Conference at the University of Vermont, May 25-29, 2015.
- Co-chair of the session: "Where the Lake Meets the River: Ecology of Connecting Rivers in the Great Lakes," at the 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.
- Member Great Lakes Environmental Assessment and Mapping Project (GLEAM).
- Outreach about the Niagara River and the importance of the fish community through the Buffalo Niagara Riverkeeper community efforts. Hired an outreach specialist to undertake this task during 2014-15 with grant funds.
- Reviewed articles for *Aquatic Biology* and *Canadian Journal of Fisheries and Aquatic Sciences*.

V. Professional Development Activities

Lyubov Burlakova:

- Completed training in taxonomic identification of benthic macroinvertebrates in the Great Lakes (Society for Aquatic Experts in Taxonomic Analyses Workshop by Dr. R. Griffiths, May 1-2, 2015).

Susan Daniel:

- Completed training in taxonomic identification of benthic macroinvertebrates in the Great Lakes (Society for Aquatic Experts in Taxonomic Analyses Workshop by Dr. R. Griffiths, May 1-2, 2015).
- Received "Information Impact Poster Award" at 58th Annual Conference on Great Lakes Research. May 25-29, 2015, Burlington, Vermont.

Joshua Fisher:

- Completed Electrofishing Safety Course (5/22/2015), First Aid/CPR certification (6/10/2015), and BIO 612 – Great Lakes Fish Ecology at Buffalo State.

Kit Hastings:

- Attended training courses: Workplace Violence Prevention Refresher course 9/29/14; American Heart Association Heartsaver First Aid/CPR/AED recertification 6/10/15.
- Completed Electrofishing Safety Course (5/22/2015).
- Attended workshop training in taxonomic identification of benthic macroinvertebrates in the Great Lakes (Society for Aquatic Experts in Taxonomic Analyses Workshop by Dr. R. Griffiths, May 2, 2015).

Alexander Karatayev:

- Completed training in taxonomic identification of benthic macroinvertebrates in the Great Lakes (Society for Aquatic Experts in Taxonomic Analyses Workshop by Dr. R. Griffiths, May 1-2, 2015).

Alicia Pérez-Fuentetaja:

- Received the Outstanding McNair Mentor of the Year Award, 2015.

Susan Daniel received the "Information Impact Poster Award" at IAGLR.

VI. Field Station Activities

The bulk of the ecosystems/fisheries research is carried out at the GLC Field Station. The Field Station is located at the head of the Niagara River on Lake Erie and is capable of supporting high-level research in a variety of disciplines. It houses a fully-automated aquaculture system, a variety of data loggers and automated sampling equipment, and microscopes. We continue to update and maintain our research support systems. Additionally, the GLC Field Station houses the Partnership in Regional Invasive Species Management (PRISM) office headed by Andrea Locke.

Research Vessels

The addition of a boat storage facility has greatly improved our ability to protect the boats from the elements while not in use and to provide a space for maintenance and repairs. The vessels are all in good working order and are being used regularly. Several safety features and a steering console were added to our electrofishing boat this year, allowing for safer operation and easier maneuverability in the shallow shoreline areas where electrofishing is often performed. Our 20' Polarkraft received an upgraded motor which was necessary to navigate the strong currents found in the Niagara River. The upgrades on both the Polarkraft and electro-fisher have greatly increased our ability to safely and effectively sample the diverse aquatic habitats found in Lake Erie, Lake Ontario, and the Niagara River. Maintenance of our research fleet has shifted from being performed by a mechanic who would travel to the field station to being performed largely by field station staff and local shops, saving thousands of dollars in maintenance expenses each year.

Instructional Support

- Dr. Standora's ecology class was given a limnology equipment demonstration and lecture in the fall.
- Dr. Bergslien's class was given a limnology equipment demonstration and lecture in the spring.
- Dr. Pérez-Fuentetaja's fisheries class was given demonstrations in trap netting and electrofishing by boat in the spring.
- Facilities were provided for Dr. Anselmi's Anthropology class experiments.

Research Activities

- Extensive involvement with "Emerald Shiners in the Upper Niagara River."
- Conducted preservation methods study and submitted manuscript.
- Provided vessel and technician support for "Lake Erie CSMI."
- Provided vessel and technician support for Early Detection of Alien Species in Harbors project.
- Provided vessel and technician support for "Investigating Lake Sturgeon habitat use, feeding ecology, and benthic resource availability in the lower Niagara River."
- Installed and operated the GLOS (Great lakes Observing System) buoy in Lake Erie off Dunkirk, NY.
- Continued long-term sampling of the eastern basin of Lake Erie for the Lower Trophic Level Assessment, adding to fifteen years of data.
- Assisted Jill Singer with logistics for her Buffalo River current sonar modeling project.
- Provided two days boat time and assistance to Kim Irvine with Singapore student final projects.

- Assisted Chris Pennuto with Elton Creek Seining project.
- Facilitated access to the boat launch for NYS DEC and U.S. Fish and Wildlife Service.

Outreach

- Students from McKinley High School were given a demonstration of electrofishing by boat and a tour of the Field Station grounds.
- Hosted multiple Buffalo Niagara Riverkeeper kayaking touring events for public education.
- Hosted Helen Domske with Sea Grant outreach event.
- Provided access and assistance to the U.S. EPA with Buffalo River sediment analysis projects.
- Provided access and support to the NYS DEC with multiple fisheries and Common Tern projects.
- Provided field station access and support to the U.S. Army Corps of Engineers.
- Provided access and support to the U.S. Navy Supply Center.

Left: Josh and Kit demonstrate field sampling techniques for the ecology class. Right: Dr. Pérez's fisheries class learns about using trap nets.

VII. Western New York PRISM Activities

Western New York State Partnership for Regional Invasive Species Management (WNY PRISM) was formed to combat the spread of invasive species and mitigate associated threats by providing region-wide coordination for invasive species monitoring and management. PRISM mission is to proactively identify, evaluate, and address invasive species priorities in western New York using a coordinated partnership of local professional, organizations, and private citizens to improve, restore, and protect aquatic and terrestrial resources. WNY PRISM is a sponsored program through the Research Foundation at Buffalo State and is hosted by the Great Lakes Center.

The WNY PRISM Strategic Plan identifies six goals including: Partner/Network Coordination, Information Management, Education and Outreach, Prevention, Early Detection, Management, and Habitat Restoration.

Partner/Network Coordination

- Met with Partners and Stakeholders across the Region, including local partners such as WNY Land Conservancy, Jamestown and Buffalo Audubon Societies, Bergen Swamp Preservation Society, Conewango Creek Watershed Association, Niagara Frontier Botanical Society, Cat. Co. SWCD, TNC, Multiple Lake/ Landowners Associations, Erie Co. Water Quality Committee, and Erie Co. Environment and Planning.
- WNY PRISM received Letters of Support from NY Sea Grant, NYS Parks, Recreation, and Historic Preservation, Buffalo Niagara Riverkeeper, NYS DOT, SUNY Fredonia, and USFWS.
- Provided Letters of Support and additional support for Grant Applications, including USFWS, Erie Co. SWCD, and Erie Co. CCE.
- Participated in NYS PRISM leader's meetings and monthly public webinars.
- Held four Steering Committee meetings.
- Held two Full Partnership meetings – held at Iroquois NWR and CCE of Erie Co.
- Participated in WNY EAB and Forest Pest Task Force and meetings.
- Participated in NYS Forest Pest and Hydrilla Taskforces and conference calls.
- Worked with Water Chestnut Working Group to develop Prevention, EDRR, and management protocols.
- Attended DEC led Great Lakes Action Agenda meetings.
- Supported Tonawanda Creek/Erie Canal Hydrilla Demonstration Project – attended meetings and assisted with education and outreach.
- Provided comments for WNY for GP-0-15-005, Management of Invasive Species.
- Submitted GLRI-EPA Grant with Erie County SWCD, to fund invasive species removal projects in the Lake Erie Watershed ($540,000 total/$97,000 WNY PRISM).

Information Management

- Utilized listserve to distribute information on invasive species issues, management, grant opportunities, WNY PRISM events, and Partner events.
- Distributed information to the partnership through listserve including press releases, regional events, PRISM updates, and Draft Permit and Management Plans.
- Held Working Group meetings (Terrestrial, Aquatic, Conservation Targets) and began process of identifying regional priorities.
- Entered over 4000 observations into iMapInvasives from 22 unique sites.
- Developed reports for property managers of

Angela Driscoll presents the WNY PRISM education and outreach display to guests at the 2014 Great Lakes Festival held in Dunkirk.

preserves where mapping took place.

- Attended CCE ISP Priority Setting Workshop at Cornell University.
- Established Facebook Page to assist with distribution of information – posts have reached over 3000 people.

Education and Outreach

- Presented at over 40 meetings, workshops and events including Western Region Annual Meeting of NYSFOLA, GLC Open House, Region 9 DEC All-Staff Meeting, 2 the Outdoors Env. Forum, Erie Co. Council of Governments, and Master Gardeners.
- Events, trainings, and meetings were attended by over 5000 individuals.
- WNY PRISM Website: hired Independent Contractor, approved design and coding completed; currently developing Content.
- Developed quarterly E-Newsletter.
- Created Education and Outreach Working Group.
- Featured Speaker at the Emerald Ash Borer Informational Meeting.
- Keynote Speaker at Rural Landowners Workshop.
- Developed educational material for WNY PRISM Table Top Display.
- Staffed WNY PRISM Display at outreach events including Great Lakes Awareness Day, Reinstein Woods Fall Festival, 10th Annual WNY Environmental Summit, Erie Co. Fair, Canal Fest of the Tonawandas, and numerous Farmer's Markets.

2014 Invasive Species Awareness Week Volunteer Training, mapping invasive species at Niagara Escarpment Preserve.

- Assisted with Watercraft Inspection Wksp. planning led by Parks and NY Sea Grant.
- Interviewed for WGRZ segment "2 the Outdoors", aired during ISAW.
- Participated in and Coordinated WNY involvement with ISAW.
- Coordinated events across WNY Region for National ISAW.

Prevention

- Assisted with development and finalization of NYS Plantwise Brochure.
- Participated in a conference call with FL-PRISM and Energetics, Inc. to discuss possible invasive species spread prevention measures within the scope of a project proposal to open up the NYS Canal System to increased barge traffic.
- Provided information on Prevention programs to our Partners and Public, and encouraged their use.

- Provided outreach to the region on new Prevention regulations from NYS including Part 575 Prohibited and Regulated Species and Water Access Sites.

Early Detection and Rapid Response

- Assisted with coordination of Hemlock Woolly Adelgid Volunteer Survey in Zoar Valley, leading to treatment of 594 trees.
- Assisted with development of water chestnut EDRR protocol for Southern Tier.
- Organized invasive species ID and iMapInvasives trainings at Bond Lake Park, Buffalo Audubon's Beaver Meadow Preserve, and Niagara Escarpment Preserves.

Jerry Krajna, Angela Driscoll, and Andrew Stadler remove water chestnut at Jamestown Audubon.

Management and Habitat Restoration

- Assisted Jamestown Audubon Society with water chestnut removal efforts.
- Assisted Tifft Nature Preserve and WNY Land Conservancy with IS removal.
- Held Invasive Species Management Workshop.
- Obtained Pesticide Applicator License, Category 3A.
- Working with Erie Co. Environment and Planning on Erie Co. Parks on IS removal and development of long-term maintenance and restoration plans for the sites.
- Assisted MARSB with development of Ash Seed Collection Wksp. and tree scouting.

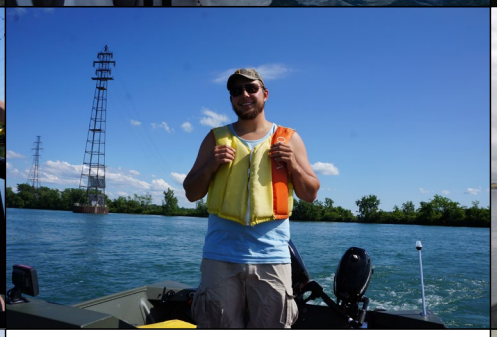
Additional Program Elements

- Developed framework for Volunteer Program and began Volunteer recruitment.
- Finalized Strategic Plan Goals, Objectives, Strategies, Outputs and Outcomes.
- Provided NYS Invasive Species Research Institute with WNY priorities for research.
- Completed 2014 Annual Report.
- Developed 2015 Annual Work Plan.

Japanese Knotweed removal at Tifft Nature Preserve.







Emerald Shiners in the Upper Niagara River

2014-2015