Buffalo State
Great Lakes Center
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Annual Report 2016-2017

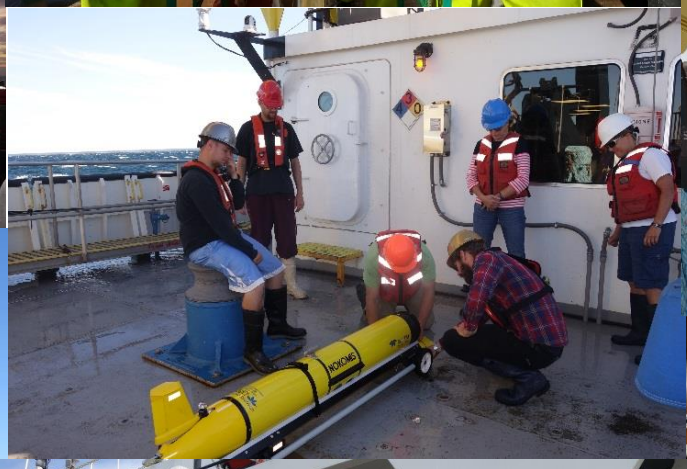
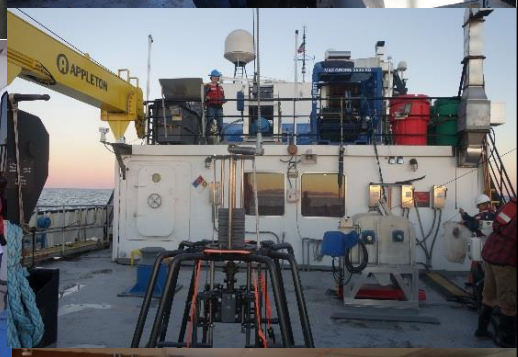
http://greatlakescenter.buffalostate.edu

Cooperative Science and Monitoring Initiative
Lake Superior Benthic Survey

September 2016

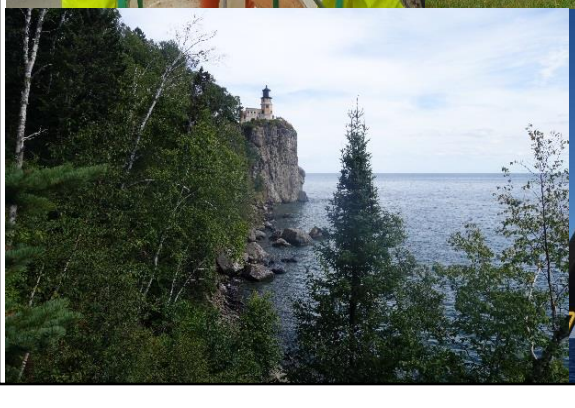
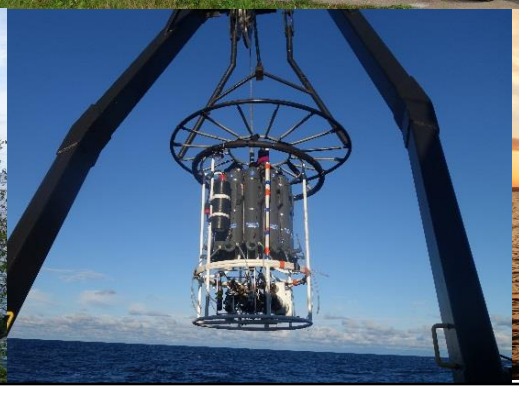
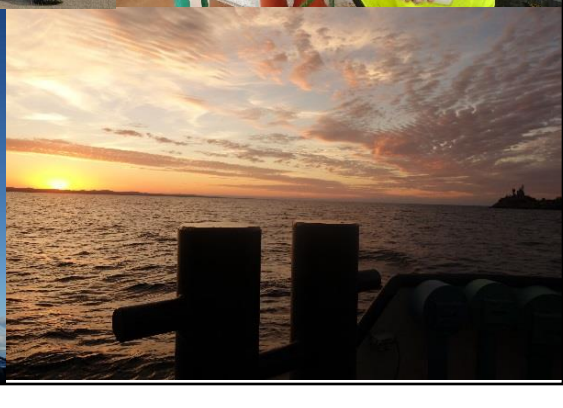








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MISSION

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; **11** papers were submitted for publication.
- We presented **44** talks, including **24** at national/international/regional conferences, **17** invited talks, and **3** presentations in non-refereed venues.
- We submitted **11** grant proposals with a total requested amount **$7,507,170**, including **$4,081,538** for Buffalo State.
- **Nine** projects for research and education (including multi-year grants) are currently funded in the GLC totaling **$8,666,321**, including **$4,562,275** for Buffalo State.
- **Seventeen** students were enrolled in Great Lakes Ecosystem Science M.A. and M.S. programs.
- **Two** issues of GLC newsletters were produced over the last year.

I. Staff

Our field and lab research technician, Joshua Fisher, took a new position with the NYS DEC. Research technician Brianne Tulumello left GLC to become a farmer. In May 2017, we hired Brian Haas as field and lab research technician.

GLC Personnel

Director: Alexander Karatayev

Research Scientists: Lyubov Burlakova
Mark Clapsadl (Field Station manager)
Knut Mehler
Christopher Pennuto
Alicia Pérez-Fuentetaja

Research Technicians: Susan Daniel
Brian Haas
Kit Hastings
Erik Hartnett (part-time)

Secretary: Susan Dickinson

WNY PRISM Coordinator: Andrea Locke

WNY PRISM seasonal employees:
Tyler Christensen (SUNY Fredonia)
Emily Dyett (University at Buffalo)
Nick Ransbury (SUNY Oswego)
Kevin Sanders (University at Buffalo)
Ian Sansone (University at Buffalo)
Heather Zimba (Jamestown Community College)

Student Research Assistants:

Sonya Bayba	Luke Klein
Eric Bruestle	Colleen Kolb
Jacob Cochran	Rhudwan Nihlawi
Marisa Dyckman	Keith Pawlowski
Liz Gorski	Lysander Pope
Adam Haines	Aereiana Rounds
Culture Hall	Benjamin Szczygiel
Josephine Johnson	Anthony Urena
Chris Kalinowski	Morgan Zyzik

GLC Adjunct Professors

- Zy Biesinger, Fish Biologist, U.S. Fish and Wildlife Service
- Dimitry Gorsky, Fish Biologist, U.S. Fish and Wildlife Service
- Daniel Molloy, Scientist Emeritus, New York State Museum Molloy & Associates, LLC
- Martin A. Stapanian, Research Ecologist, U.S. Geological Survey

GLC Affiliates (at SUNY Buffalo State)

- Kelly Frothingham, Chair of the Geography and Planning Department
- Richard Johnson, Sponsored Programs
- Catherine Lange, Associate Professor, Earth Sciences and Science Education Department
- Susan McCartney, Director, Small Business Development Center
- Mary Perrelli, GIS Lab Supervisor, Geography and Planning Department
- Gary Pettibone, Professor, Biology Department
- Daniel L. Potts, Associate Professor, Biology Department
- Howard Riessen, Professor, Biology Department
- Jill Singer, Professor, Earth Sciences and Science Education Department and Director of the Office of Undergraduate Research
- Randal Snyder, Professor, Biology Department
- Stephen Vermette, Professor, Geography and Planning Department
- Robert J. Warren, Assistant Professor, Biology Department

Collaborators

In New York State

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

Collaborators at other U.S. Institutions

- Darren Bade, Kent State University, Kent, Ohio
- Ashley Baldridge, NOAA Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan
- Richard Barbiero, CSRA, Chicago, Illinois
- Dima Beletsky, Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, Michigan
- David Berg, Department of Zoology, Miami University, Ohio
- Serghei Bocaniov, Graham Sustainability Institute, University of Michigan, Ann Arbor, Michigan
- Jakob Boehler, Research Assistant, Heidelberg University, Tiffin, Ohio
- Jonathan Bossenbroek, Department of Environmental Sciences, University of Toledo, Toledo, Ohio
- Tom Bridgeman, University of Toledo, Toledo, Ohio
- David Campbell, Department of Natural Sciences, Gardner-Webb University, Boiling Springs, North Carolina
- Paris Collingsworth, Illinois–Indiana Sea Grant and Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana
- Joe Conroy, Ohio Department of Natural Resources
- David De Marini, Environmental Carcinogenesis Division, U.S. EPA, Triangle Park, North Carolina
- Elizabeth Hinchey Malloy, U.S. EPA Great Lakes National Program Office, Chicago, Illinois
- Joel Hoffman, U.S. EPA, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division, Duluth, Minnesota
- Donald Jerina, Laboratory of Bioorganic Chemistry NIDDK, National Institutes of Health, Bethesda, Maryland
- Vadim Karatayev, Department of Environmental Science & Policy, University of California, Davis, California
- Jack Kramer, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Richard Kraus, Lake Erie Biological Station, Great Lakes Science Center, U.S. Geological Survey, Sandusky, Ohio
- Bob Krebs, Department of Biology, Geology, Environmental Science, Cleveland State University, Cleveland, Ohio
- Kenneth Krieger, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Barry Lesht, Department of Earth and Environmental Sciences, University of Illinois at Chicago; CSRA, Chicago, Illinois
- Christine Mayer, Department of Environmental Sciences and Lake Erie Center, University of Toledo, Ohio
- Elizabeth Meyer, Pennsylvania Natural Heritage Program
- Pawel Michalak, Bioinformatics Institute, Virginia Tech, Blacksburg, Virginia
- Thomas Miller, Lamar Bruni Vergara Environmental Science Center, Laredo Community College, Texas
- Thomas Nalepa, The Graham Sustainability Institute, University of Michigan, Ann Arbor, Michigan
- Euan Reavie, Natural Resources Research Institute, University of Minnesota Duluth, Minnesota
- Mark Rowe, Great Lakes Environmental Research Laboratory University of Michigan CILER, NOAA, Ann Arbor, Michigan
- Jill Scharold, U.S. EPA, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division, Duluth, Minnesota
- Don Schloesser, USGS, Great Lakes Science Center, Ann Arbor, Michigan
- Kurt L. Schmude, Department of Natural Sciences, Lake Superior Research Institute,

University of Wisconsin-Superior, Superior, Wisconsin
- Astrid Schwalb, Department of Biology/ Aquatic Station, Texas State University, San Marcos, Texas
- Michael Sierszen, National Health and Environmental Effects Research Laboratory, U.S. EPA Mid-Continent Ecology Division, Duluth, Minnesota
- Jake Vander Zanden, Center for Limnology, University of Wisconsin, Madison, Wisconsin
- Mary Walsh, Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Pittsburgh, Pennsylvania
- Glenn Warren, U.S. EPA, Great Lakes National Program Office, Chicago, Illinois
- Daelyn Woolnough, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- David Zanatta, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan

International Collaborators

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

New research technician Brian Haas did his Biology Masters ('15) at Buffalo State, studying map turtles (*Graptemys geographica*) in the Niagara River.

Tamara Makarevich, from Belarus, visited in April to give a presentation and discuss collaboration.

II. Research Activities

Current Projects

Monitoring of benthic invertebrates in Great Lakes

The GLC, 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 through 2017, analyze this data, and make it available to environmental and fisheries managers. Additional research projects include evaluation of an early detection system for aquatic invasive species, and development of biotic indices of ecosystem health based on benthic invertebrates. We have already identified benthic samples collected onboard the EPA R/V *Lake Guardian* in 2012-2015 from all Great Lakes. Based on these data, we have made 19 presentations at various meetings and conferences and submitted 3 manuscripts for publication in the *Journal of the Great Lakes Research*.

Susan Daniel collecting sediment cores aboard the R/V *Lake Guardian*.

Changes in Lake Erie benthos over the last decades: 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 increases every decade, and their impact has had enormous consequences for the whole ecosystem. In the summer of 2014, within the project "Lake Erie & Lake Michigan Benthos: Cooperative Science & Monitoring Initiative," we conducted a lake-wide survey of the benthic community using traditional (PONAR grabs, SCUBA) and modern (underwater video) methods, and we are currently working on data analysis. Data from this wide-lake survey will be compared to historical data to assess changes in the benthic community and trends in dreissenid populations that have important management implications.

Lake Michigan Benthos Cooperative Science and Monitoring Initiative

In 2015, in collaboration with the U.S. EPA, University of Michigan, and NOAA, we conducted the first lake-wide survey of the benthic community of Lake Michigan after the *Dreissena* spp. invasion. We collected and analyzed 421 PONAR samples from 143 sites located in all basins of the lake, and depths ranged from 10 to 196 m. Over 110 different macroinvertebrate taxa were found in the lake, with Chironomidae and Oligochaeta being the most diverse taxonomic groups.

Lake Superior Benthos Cooperative Science and Monitoring Initiative

With the assistance of EPA GLNPO and in collaboration with EPA Mid-Continent Ecology Division (Duluth), in September 2016 we collected 180 benthic samples at 60 nearshore sites in Lake Superior. 27 of these sites were previously sampled by EPA Duluth in 1994, 2000 and 2003, and the rest were chosen randomly in the nearshore zone. This effort was funded by EPA through USGS (PIs Karatayev and Burlakova). All benthic samples are sorted and identification of the samples will be finished in summer. Analysis of this data will provide a better understanding of the state of nearshore Lake Superior benthic communities, and reveal trends

in benthos abundance and diversity. Together with the offshore data collected by EPA Duluth, this survey will help to estimate the population status and trends in deepwater amphipod *Diporeia*, a major food source for commercially important species of fish in Lake Superior (Photo page.).

Knut Mehler, Elizabeth Hinchey Malloy (EPA), Brianne Tulumello, and Lyuba Burlakova collect water from Lake Superior with a rosette.

Mapping *Dreissena* distribution in Lake Michigan using underwater video

Almost every study of *Dreissena* in the Great Lakes has relied on bottom grabs to characterize mussel presence and biomass, but until now, the scale at which mussel cover varies has largely been unknown. In 2015, in collaboration with the U.S. EPA, University of Michigan, and NOAA, we collected 421 PONAR grab samples from 143 sites, and 429 underwater video images to estimate the spatial distribution of quagga mussels in Lake Michigan. We developed a novel method, which analyses video footage recorded from a GoPro camera on a towed benthic sled, to estimate dreissenid cover and biomass. We compared quagga mussel cover and biomass estimates based on 3 replicate PONARs vs. 500 m-long video transects. Overall, replicate PONAR samples yielded very high errors in estimates of quagga mussel presence, especially at sites with low to moderate mussel cover, because mussel cover heterogeneity typically occurs at spatial scales much larger than the sample size collected by replicate bottom grabs (0.052 m^2). We hypothesize that, in the shallow littoral zone, quagga mussels have an abundant food supply but are limited by wave activity and therefore will form large aggregations on hard substrates, but almost no mussels will be found on soft and unconsolidated sediments, resulting in high heterogeneity in their distribution. In contrast, in the deep stable profundal zone with no wave action, mussels are food limited and will form small loose aggregations, which maximizes food consumption and results in low heterogeneity in distribution. The largest *Dreissena* density will therefore be observed in the intermediate depth zone, where sediment deposition is highest and wave activity does not reach the bottom. Based on these data we have made 8 presentations at various meetings and conferences and submitted a manuscript for publication in the *Journal of the Great Lakes Research*.

Biomonitoring of hypoxic zones using invasive *Dreissena* species in Lake Erie

In the Laurentian Great Lakes, the most severe hypoxia routinely develops in the central basin of Lake Erie, causing strong negative ecological impacts. In collaboration with scientists from University of Michigan, Purdue University, U.S. EPA, and USGS, we measured bottom dissolved oxygen using 19 high frequency data loggers distributed throughout the central basin to validate a three-dimensional hydrodynamic-ecological model simulating dissolved oxygen distribution, and compared predicted values with the distribution of *Dreissena*. We found that a deep, offshore hypoxic zone was formed by early August, and expanded into nearshore waters by late September, restricting *Dreissena* population to shallow areas of the central basin. Deeper than 20 m, where bottom hypoxia routinely develops, only young of the year mussels were found in small numbers, indicating restricted recruitment and survival of young *Dreissena*. Monitoring Dreissena occurrence and length-frequency distribution can be an effective tool for mapping the extent and frequency of hypoxia in freshwater. In addition, our results suggest that an anticipated decrease in the spatial extent of hypoxia resulting from nutrient management has the potential to increase the spatial extent of profundal habitat in the central basin available for *Dreissena* expansion. Based on these data we have made 4 presentations at various meetings and conferences and submitted a manuscript for publication in the *Journal of the Great Lakes Research*.

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 2014-2018. 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, but essential information about sturgeon ecology 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 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 collected over 250 benthic samples and produced a habitat map which will be the basis for future habitat restoration projects in the river. Our study produced 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. The results of this work were presented at the 59th and 60th IAGLR meetings in 2016 and 2017.

Knut Mehler holds up the GoPro camera and frame used to film gobies in the lower Niagara River. It was briefly lost and had to be retrieved. Knut is relieved to have it back!

Regional invasive species management

The Western New York Partnership for Regional Invasive Species Management (WNY PRISM) continues to identify, map, and develop management plans to control aquatic and terrestrial invasive species in the eight western-most counties of New York. The office hires three seasonal crew members each summer to aide in its management and restoration efforts, in addition to employing a full-time Coordinator and Project Manager. The office coordinates management activities and public outreach efforts among a wide diversity of partners in the region, including NGO's, state and federal agencies, and academic institutions. More information about WNY PRISM and its activities can be found in Section VII or on its website.

Behavior across invasion fronts

This project is investigating whether time since colonization or hydraulic conditions correlate with differences in behavioral responses of the invasive round goby (*Neogobius melanostomus*). Fish from newly-colonized Lakes Oneida and Cayuga are being compared to fish from Lakes Ontario and Erie, as well as upstream and downstream locations on Ellicott and 18-Mile Creeks to determine if differences exist in risk-taking, aggressive, and exploratory behaviors. Determination of behavioral syndromes associated with expanding invasion fronts holds promise as a tool to exploit behavior in slowing the advance of invasive gobies into new habitats.

Nearshore-offshore migration in an invasive fish

Researchers at the GLC are documenting the seasonal population density, size distribution, and nutrient content of round gobies in the nearshore of western Lake Ontario, as well as the lower Niagara River, to understand cues related to their offshore and inshore annual migration. The benthic invader departs the nearshore in later fall, moving off to deeper waters in excess of 100 m over a period of a few weeks, and returns in the spring over a longer period. The project is addressing the contribution of this offshore migration to the offshore nutrient budget by comparing the population density, size distribution, and nutrient mass in the migrating and returning goby population.

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




Top left: Graduate student Jo Johnson and technician Joshua Fisher going to sample emerald shiners in the upper Niagara River, summer 2016. Top right: Graduate student Jo Johnson preparing to seine emerald shiners. Bottom left: Graduate student Steve Fleck sampling fish larvae from a marina in the upper Niagara River. Bottom right: Graduate student Morgan Zyzik preserving a water sample to measure coliform bacteria in the Niagara River.

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.

Bioaccumulation of flame retardants and emerging contaminants on fish and wildlife in the Niagara River

We are collecting and analyzing samples at different trophic levels to determine the prevalence of contaminants in the Niagara River's fish and wildlife, in particular those that contain halogenated compounds with a tendency to bioaccumulate. These contaminants are analyzed in water collected near wastewater treatment plants' outflow into the river and in predatory fish and avian and mammal wildlife. In particular, we are focusing on pharmaceuticals that enter the river routinely and may affect animal behavior. Our focus will include one of the most commonly prescribed antidepressants, selective serotonin reuptake inhibitors (SSRIs), which may cause impairments in fish and wildlife.

Long-term monitoring on Lake Erie

The GLC 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 the spring of 2012, the GLC has been 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 GLOS has been made by operating an observation buoy five miles offshore of Dunkirk, New York. This buoy records and transmits real time measurements of water temperature, wind speed, wave height, dissolved oxygen, and 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.

Grants and Funding

Ongoing grants, including two newly received in 2016-2017 (Total $8,666,321, including $4,562,275 for Buffalo State)

1. 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**. 2014-2018.
2. Karatayev, A. Y., and L. E. Burlakova. Lake Superior Benthos: Cooperative Science and Monitoring Initiative. U.S. EPA, U.S. Geological Survey. **$150,000**. 2016-2018.
3. Karatayev, A. Y., and M. Clapsadl. National Atmospheric and Oceanographic Administration. Implementation of a regionally distributed observing network to support critical stakeholder needs for the 2016-2020 GLOS-RA. Cooperative Agreement, SUNY ESF. **$100,000**. 2016-2020.
4. Karatayev, A. Y. and L. E. Burlakova. Lake Erie and Lake Michigan Benthos: Cooperative Science and Monitoring Initiative. U.S. EPA. **$500,000**. 2014-2017.
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. U.S. 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. Tang, T. and C. Pennuto. 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 2016-2017 (Total $7,507,170, including $4,081,538 for Buffalo State)

1. Aga, D. S. and A. Pérez-Fuentetaja. Assessing bioaccumulation of halogenated antidepressants (SSRIs) and flame retardants (PBDEs) in aquatic birds from the Niagara Migration Flyway. New York Great Lakes Protection Fund Small Grants Program. **$15,000**. (rejected).
2. Burlakova, L. E., and A. Y. Karatayev. DNA Barcode Reference Library: Mollusca, Annelida, and minor phyla. GLRI, U.S. EPA. **$400,000**. 2017-2019 (pending).
3. Mayer, C., E. Roseman, D. Schloesser, L. Burlakova, T. Wills, and K. Keeler. Revaluation of the benthic invertebrate community in the St. Clair-Detroit River System after restoration. Great Lakes Fish and Wildlife Restoration Act FY 2017. **$133,729** (**$8,000** for Buffalo State). 2017-2018 (rejected).
4. Molloy, D., and L. E. Burlakova. The natural enemies of dreissenid mussels: An update of the seminal monograph published in 1997. Hudson River Foundation. **$65,200**. 2017-2019 (funded).
5. Pennuto, C. REU: Ahead of the invasion: Understanding the impacts of non-native species on ecosystems. NSF, Directorate for Biological Sciences. **$322,976**. 2017-2020 (rejected).
6. Pennuto, C., and A. Locke. Eastern Slender False Brome Working Group. GLRI, U.S. EPA. **$299,906**. 2017-2019 (pending).
7. Pennuto, C., and A. Locke. Buffalo River Watershed Environmental Stewardship Worker Training and Partnership Development. Office of Environmental Justice, U.S. EPA. Subaward from PUSH Buffalo. **$6,000**. 2016-2018 (funded).
8. Pennuto, C., and A. Locke. Vernal pool enhancement project at Tifft Nature Preserve. Buffalo/Niagara River Greenway Ecological Committee. Subaward from Tifft Nature Preserve, Buffalo Museum of Science. **$11,910**. 2017-2018 (funded).
9. Pérez-Fuentetaja, A. and D. S. Aga. Bioaccumulation of flame retardants (PBDEs) and pharmaceuticals (SSRIs) in upper-food web wildlife from the urban/industrial Niagara River: Focus on NYS threatened common tern (*Sterna hirundo*) and mink (*Neovison vison*). Great Lakes Research Consortium Small Grants Program. **$21,090**. 2017 (rejected).
10. Pérez-Fuentetaja, A., M. Clapsadl, and R. Snyder. Ecology and vulnerability of the early life history stages of the common rudd (Scardinius erythrophthalmus) to predict population responses to increasing temperatures and determine mitigation measures to reduce herbivory on wetlands. New York Sea Grant. Pre-Proposal. **$231,456**. 2017 (rejected).
11. Rudstam, L., L. E. Burlakova, A. Y. Karatayev, and J. Watkins. Great Lakes Long-term Biological Monitoring Program. GLRI, U.S. EPA. **$5,999,903** (**$2,700,000** for BSC). 2017-2022 (pending).

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 11 were submitted to peer-reviewed journals. A total of 44 presentations were made by the GLC researches, including 24 presentations at national/international/regional conferences, 17 invited talks, and 3 presentations made in non-refereed venues.

Refereed Journal Publications (published):

1. Allen, I. W., S. K. Delavan, A. R. Hannes, and A. Pérez-Fuentetaja. 2017. Potential barriers to upstream fish passage caused by anthropogenic river modifications: A computer modeling study of emerald shiners (*Notropis atherinoides*) in the upper Niagara River. *Ecological Engineering*, 103: 76-85.
2. Collas, F. P. L., A. Y. Karatayev, L. E. Burlakova, and R. S. E. W. Leuven. 2016. Detachment rates of dreissenid mussels after boat hull-mediated overland dispersal. *Hydrobiologia*, DOI: 10.1007/s10750-016-3072-4.

3. Dascher, E. D., L. E. Burlakova, A. Y. Karatayev, D. F. Ford, and A. N. Schwalb. Distribution of unionid freshwater mussels and host fishes in Texas. A study of broad-scale spatial patterns across basins and a strong climate gradient. *Hydrobiologia*, DOI: 10.1007/s10750-017-3168-5.
4. Delavan, S. K., S. Sood, A. Pérez-Fuentetaja, and A. R. Hannes. 2017. Anthropogenic turbulence and velocity barriers for upstream swimming fish: A field study on emerald shiners (*Notropis atherinoides*) in the upper Niagara River. *Ecological Engineering*, 101: 91-106.
5. Forzono, E. M., D. Crane, K. Kapuscinski, and M. Clapsadl. 2017. Dry-weight energy density of prey fishes from nearshore waters of the upper Niagara River and Buffalo Harbor, New York. *Journal of Great Lakes Research*, 43: 215-220.
6. Karatayev, A. Y., L. E. Burlakova, and D. K. Padilla. 2016. Can introduced species replace lost biodiversity? A test with freshwater molluscs. *Hydrobiologia*, DOI: 10.1007/s10750-017-3135-1.
7. Mehler, K., L. E. Burlakova, A. Y. Karatayev, Z. Biesinger, A. Valle-Lewinson, C. Castiglione, and D. Gorsky. 2016. Sonar technology and underwater video analysis can enhance invasive *Dreissena* distribution assessment in large rivers. *Hydrobiologia*, DOI 10.1007/s10750-016-3040-z.
8. Mehler, K., L. E. Burlakova, A. Y. Karatayev, Z. Biesinger, E. Bruestle, A. Valle Levinson, C. Castiglione, and D. Gorsky. 2017. Integrating remote sensing and species distribution modeling to predict benthic communities in a Great Lakes connecting channel. *River Research and Applications*, DOI: 10.1002/rra.3169.
9. Pérez-Fuentetaja, A., and F. Goodberry. 2016. *Daphnia*'s challenge: Survival and reproduction when calcium and food are limiting. *Journal of Plankton Research*, 38: 1379-1388.

Refereed Journal Publications Submitted (in review):

1. Arnnok, P., R. S. Singh, R. Burakham, A. Pérez-Fuentetaja, and D. S. Aga. Selective uptake and bioaccumulation of antidepressants in fish from effluent-impacted Niagara River. Submitted to: *Environmental Science and Technology*.
2. Bossenbroek, J. M., L. E. Burlakova, T. C. Crail, A. Y. Karatayev, R. A. Krebs, and D. T. Zanatta. Modelling habitat of freshwater mussels (Bivalvia: Unionidae) in the lower Great Lakes 25 years after the *Dreissena* invasion. Submitted to: *Freshwater Science*.
3. Bridoux, M. C., M. Sobiechowska, A. Pérez-Fuentetaja, and K. T. Alben. In Review. LC-PDA/APCIitMS identifications of algal carotenoid and oxysterol precursors to fatty acid esters in hydrolyzed extracts of the freshwater mussel *Dreissena bugensis*. Submitted to: *Analytical and Bioanalytical Chemistry*.
4. Bridoux, M. C., M. Sobiechowska, R. G. Briggs, A. Pérez-Fuentetaja, and K. T. Alben. Separation and identification of intact fatty acid esters of algal carotenoid metabolites in the freshwater mussel *Dreissena bugensis*, by liquid chromatography with visible-wavelength and mass spectrometric detectors in series. Submitted to: *Journal of Chromatography A*.
5. Burlakova, L. E., K. E. Kovalenko, K. L. Schmude, R. P. Barbiero, A. Y. Karatayev, B. M. Lesht. Developing indices of water quality based on the profundal benthic communities of the Great Lakes: Traditional and modeling approaches. Submitted to: *Journal of the Great Lakes Research*.
6. Burlakova, L. E., R. P. Barbiero, A. Y. Karatayev, S. E. Daniel, E. K. Hinchey, and G. Warren. The benthic community of the Laurentian Great Lakes: Analysis of spatial gradients and temporal trends from 1998-2014. Submitted to: *Journal of the Great Lakes Research*.
7. Cava, Z., A. McMillan, C. Pennuto, and R. Warren. Predator-avoidance behavior of native and exotic prey affects predation outcomes by a native predator. Submitted to: *Journal of Herpotology*.
8. Karatayev, A. Y., L. E. Burlakova, K. Mehler, S. A. Bocaniov, P. D. Collingsworth, G. Warren, Kraus, R. T., and E. K. Hinchey. Biomonitoring using invasive species in a large lake: *Dreissena* distribution maps hypoxic zones. Submitted to: *Journal of the Great Lakes Research*.
9. Karatayev, A. Y., K. Mehler, L. E. Burlakova, E. K. Hinchey, and G. Warren. You can count them, if you can see them: Underwater video image analysis can greatly improve monitoring of *Dreissena* populations. Submitted to: *Journal of the Great Lakes Research*.

10. Karatayev, V., L. E. Burlakova, A. Y. Karatayev, T. Miller, and L. Yang. Habitat loss and flow magnitude interactively regulate population persistence in rivers. Submitted to: *Ecological Applications*.
11. Pennuto, C. M., K. A. Cudney, and C. E. Janik. Fish invasion alters ecosystem function in a small heterotrophic stream. Submitted to: *Biological Invasions*.

International/National/Regional Conference Presentations

1. Barbiero R. P., B. M. Lesht, G. J. Warren, L. G. Rudstam, J. M. Watkins., L. E. Burlakova, A. Y. Karatayev, and E. D. Reavie. A comparative survey of the lower food web across the Laurentian Great Lakes. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
2. Burlakova, L. E., R. P. Barbiero, A. Y. Karatayev, and S. E. Daniel. Factors affecting spatial and temporal patterns in benthic communities across the Laurentian Great Lakes. ASLO Aquatic Sciences Meeting. February 26 - March 3, 2017, Honolulu, Hawaii.
3. Burlakova, L. E., and A. Y. Karatayev. Interactions between unionids and dreissenids: Lessons learned. 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
4. Burlakova, L. E., K. E. Kovalenko, K. L. Schmude, R. Barbiero, A. Y. Karatayev, B. M. Lesht. Developing water quality indices based on Great Lakes benthos: Traditional and modeling approaches. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
5. Clapsadl, M., A. Pérez-Fuentetaja, R. Snyder, J. Lang, J. Cochran, C. Osborne, and J. Fisher. Seasonal comparison of energy content of Emerald Shiners (*Notropis atherinoides*) from four different systems in the Great Lakes. American Association of Limnology and Oceanography (ASLO). American Fisheries Society, New York Chapter, February 1-3, 2017, Buffalo, New York.
6. Daniel, S.E., L.E. Burlakova, A.Y. Karatayev, K. Meyer, and E. Hinchey. The effect of *Dreissena* on sediment organic matter and oligochaeta in the Great Lakes. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
7. Elgin, A., L. Burlakova, A. Karatayev, K. Mehler, and T. Nalepa. Quagga mussel body condition and size distribution inform recent Lake Michigan population trends. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
8. Johnson, R. J., A. Pérez-Fuentetaja, G. Pettibone, R. Snyder, and M. Clapsadl. Evaluating immune responses of emerald shiners (*Notropis atherinoides*) in the Niagara River. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
9. Johnson, R. J., A. Pérez-Fuentetaja, G. Pettibone, R. Snyder, M. Clapsadl. Evaluating immune responses of emerald shiners (*Notropis atherinoides*) in the Niagara River. American Fisheries Society, New York Chapter, February 1-3, 2017, Buffalo, New York.
10. Karatayev, A. Y., L. E. Burlakova, K. Mehler, S. A. Bocaniov, P. D. Collingsworth, G. Warren, R. T. Kraus, and E. K. Hinchey. Bottom hypoxia is a major driver of *Dreissena* spp. distribution in Lake Erie. A.Y. XXXIII Congress of International Society of Limnology. July 31 - August 5, 2016, Torino, Italy.
11. Karatayev, A. Y., L. E. Burlakova, K. Mehler, S. A. Bocaniov, P. D. Collingsworth, G. Warren, R.T. Kraus, and E. K. Hinchey. Biomonitoring using invasive species in a large lake: *Dreissena* distribution maps hypoxia zones. Status of Lake Erie: Understanding the Nearshore and its Connections. The 8th Binational Meeting of the Lake Erie Millennium Network. February 21-23, 2017, Windsor, Ontario, Canada.
12. Karatayev, A. Y., L. E. Burlakova, K. Mehler, V. A. Karatayev, T. F. Nalepa, A. K. Elgin, and E. K. Hinchey. Underwater video is an effective tool to reveal *Dreissena* spatial distribution. ASLO Aquatic Sciences Meeting. February 26 - March 3, 2017, Honolulu, Hawaii.
13. Karatayev, A. Y., L. E. Burlakova, K. Mehler, V. A. Karatayev, T. F. Nalepa, A. K. Elgin, and E. K. Hinchey. Underwater video is an effective tool to reveal *Dreissena* spatial distribution. 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
14. Karatayev, V. A., Nalepa, T. F., Karatayev, A. Y., Weidel, B., Rudstam, L. G., and L. E. Burlakova. Living fast or slow: Habitat-specific demography of invasives regulates their large-scale food web impacts. ASLO

GLC reserachers at the 60th Annual Conference on Great Lakes Research in Detroit, Michigan, May 15-19, 2017.

The poster session at IAGLR.

Aquatic Sciences Meeting. February 26 - March 3, 2017, Honolulu, Hawaii.

15. Karatayev, V., L. E. Burlakova, A. Y. Karatayev, T. Miller, and L. Yang. Going with the flow: Evidence for advective dispersal of adult unionids from case study on the Rio Grande and insights for investigation. 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
16. Karatayev, A. Y., V. A. Karatayev, L. E. Burlakova, K. Mehler, M. Clapsadl, M. Rowe. *Dreissena* growth variation in time and space: Lessons from Lake Erie. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
17. Kovalenko, K. E., E. D. Reavie, L. E. Burlakova, A. Y. Karatayev, L. G. Rudstam, and R. P. Barbiero Cross-lake comparisons of multi-assemblage breakpoints: The GLNPO story. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
18. Mehler, K., L. E. Burlakova, and A. Y. Karatayev. Spatial distribution of *Dreissena* spp. and their effect on benthos in the lower Niagara River. 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
19. Mehler, K., L. E. Burlakova, and A. Y. Karatayev. Niagara River from a benthic perspective: What has been done and what needs to be done. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
20. Pennuto, C. M., and K. Mehler. Round goby nearshore-offshore migrations and implications for Lake Ontario nutrient budgets. American Fisheries Society, New York Chapter. February 1-3, 2017, Buffalo, New York.
21. Pennuto, C. M. and K. Mehler. Nutrient translocation by migrating round gobies: Is it significant for Lake Ontario? 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
22. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, and J. Cochran. Importance of migratory forage fish in the workings of the Niagara ecosystem: The emerald shiner. 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
23. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, J. Cochran, and P. Michalak. The emerald shiner (*Notropis atherinoides*) as a key food web link in the upper Niagara River. American Fisheries Society, New York Chapter. February 1-3, 2017, Buffalo, New York.
24. Snyder, R., A. Pérez-Fuentetaja, M. Clapsadl, C. Osborne, J. Lang, and J. Cochran. Growth and mortality of emerald shiners in the upper Niagara River, NY. Association of Limnology and Oceanography (ASLO). American Fisheries Society, New York Chapter. February 1-3, 2017, Buffalo, New York.

Invited Talks

1. Burlakova, L. E., K. Kovalenko, A. Y. Karatayev, K., Schmude, and R. Barbiero. Modified Oligochaete Trophic Indices. Invited presentation at the National Coastal Condition Assessment Great Lakes Benthic Indicator Development Workshop. Chicago, Illinois. October 18, 2016.
2. Burlakova, L. E., A. Y. Karatayev, and S. E. Daniel. Status, quality assurance, and long-term trends in benthos data. 2017 Great Lakes Biology Monitoring Program Assessment. Chicago, Illinois. May 30, 2017.
3. Karatayev, A. Y., L. E. Burlakova, K. Mehler, V. A. Karatayev, T. F. Nalepa, A. K. Elgine, and E. K. Hinchey. Underwater video is an effective tool to reveal *Dreissena* spatial distribution and densities. Cooperative Science and Monitoring Initiative - Lake Michigan. Invited talk presented at EPA Great Lakes National Program Office. Chicago, Illinois. January 26, 2017.
4. Mehler, K., A. Y. Karatayev, L. E. Burlakova, V. Karatayev, T. Nalepa, A. Baldridge, and E. Hinchey-Malloy. Integrating remote sensing and underwater imagery to enhance invasive *Dreissena* distribution assessment in the Great Lakes. Desert Research Science Hour. Las Vegas, Nevada. April 5, 2017.
5. Mehler, K., and C. M. Pennuto. Using underwater video imagery for Round Goby assessment in the Niagara River. USGS-MDNR round goby assessment workshop. Geological Survey Great Lakes Sciences Center. Ann Arbor, Michigan. November 10, 2016.
6. Locke, A. Invasive pests for Christmas tree farms. Invited talk at the Christmas Tree Farmers Association of New York Annual Summer Meeting. Holland, New York. July 16, 2016.
7. Locke, A. Invasive species priorities of Western New York. Invited talk at the Reinstein Woods Teacher Training. Depew, New York. August 3, 2016.
8. Locke, A. Invasive species and native landscaping alternatives. Invited talk at Lancaster Women's Civic Club Meeting. Lancaster, New York. November 9, 2016.
9. Locke, A. Invasive species seminar for Intro to Environmental Studies. Invited talk at Niagara University. Lewiston, New York. December 1, 2016.
10. Locke, A. Invasive species management for master forest owners. Invited talk for Cornell Cooperative Extensions Master Forest Owners Program. East Concord, New York. December 13, 2016.
11. Locke, A. Birds and invasives. Invited talk at Roger Tory Peterson Institute as part of National Invasive Species Awareness Week. Jamestown, New York. February 27, 2017.
12. Locke, A. Invasive species ecology. Invited talk for Cornell Cooperative Extension of Erie County Master Gardeners Program. East Aurora, New York. March 17, 2017.
13. Locke, A. Fragile Forests: Globalization, our changing planet, and the future of our wooded spaces. Program panelist at St. Bonaventure University. St. Bonaventure, New York. April 19, 2017.
14. Locke, A. Silver Lake: Planning, funding & executing public projects, a discussion with government agencies and community groups. Program moderator and panelist for Silver Lake Association. Perry, New York. May 13, 2017.
15. Pennuto, C. M. Fish invasions: A story of round goby woes and stream ecosystem resiliency. SUNY Geneseo Seminar Series. Geneseo, New York. February, 2017.
16. Pérez-Fuentetaja. Wetland habitat restoration needs for larval fish nursery in the Niagara River. International Joint Commission (US-Canada) meeting. Buffalo, New York. March 28, 2017.
17. Pérez-Fuentetaja. Daphnia's challenge: Strategies to survive and reproduce under limiting environmental conditions. University at Buffalo. Evolution, Ecology and Behavior Seminar Series. Buffalo, New York. April 5, 2017.

Conference Presentations (non-refereed)

1. Burlakova, L. E., A. Y. Karatayev, and S. Daniel. Great Lakes Center participates in EPA's Long-Term Biological Monitoring of Great Lakes. 17th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State College, October 27, 2016 (poster).
2. Daniel, S., L. E. Burlakova, and A. Y. Karatayev. The effect of *Dreissena* on the vertical distribution and abundance of Oligochaeta in Lake Erie. 17th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State College, October 27, 2016 (poster).
3. Mehler, K., A. Y. Karatayev, and L. E. Burlakova. Integrating remote sensing techniques and spatial modelling to better understand benthos distribution in the Niagara River. 17th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State College, October 27, 2016 (poster).

Celebrating the 2017 Lifetime Achievement Award to Thomas Nalepa at the 60th Annual Conference on Great Lakes Research (Alexander Karatayev, Lyuba Burlakova, and Thomas Nalepa).

Discussion of the joint phytoplankton, zooplankton, and benthos paper (Jim Watkins, Lars Rudstam, Lyuba Burlakova, Katya Kovalenko, Euan Reavie, and Rick Barbiero) at the same conference.

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

The GLC administers two interdisciplinary applied environmental science programs in Great Lakes Ecosystem Science (GLES). The GLES programs provide an opportunity for students to pursue graduate studies through a thesis-based Master of Arts (M.A.) and an internship-based Master of Science (M.S.). Both programs provide students with the opportunity to attain a broad understanding of the physical, chemical, biological, and social factors that comprise the Great Lakes ecosystems. GLES graduates are prepared to provide a leadership role as they address a broad 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 in 2016-2017:

Master of Art:	**Master of Science:**
Eric Bruestle	Julie Berlinski
Jacob Cochran	Susan Daniel
Lee Evans	Jason Paeplow
Jo Johnson	Mary Pokorski
Colleen Kolb	Michael Radomski
YingYu Zhang	Sean Ryan
	Leah Santasiero
	Chad Schuster
	Yusheng Ye

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 the Integrative Graduate Education and Research Traineeship Ph.D. Program (Isabel Porto Hannes) and a committee member for Brandon Sansom (2015-present), Ph.D., State University of New York at Buffalo. She was also a faculty Mentor/Advisor for Susan Daniel and Keith Pawlowski, and a member of the graduate committee for Erik Bruestle in the Great Lakes Ecosystem Science Graduate Program at Buffalo State.
- Alexander Karatayev was a member of the Graduate Committee for a Ph.D. student at State University of New York at Buffalo (Isabel Porto Hannes).
- Mark Clapsadl was a committee member for five graduate students.
- Knut Mehler was a member of the Graduate Committee for Eric Bruestle in the M.A. Great Lakes Ecosystem Science Graduate Program. He was also the instructor of GLC 600 Seminar for Spring Semester 2017.
- Chris Pennuto was the advisor of three graduate students and a committee member for seven graduate students.

- Alicia Pérez-Fuentetaja was the advisor for four graduate students and a committee member for three graduate students.

Mary Pokorski (left) and Chad Schuster (right) conducting Stream Visual Assessment Protocol (SVAP) studies in Tonawanda Creek during their internships with Buffalo Niagara Riverkeeper, summer 2016.

Seminars

In order to facilitate collaboration between the GLC personnel and leading experts in aquatic ecology and related sciences, and to increase visibility of the Center in 2016-2017, we invited 11 speakers to present talks at our seminar series, including:

1. William Dennison, University of Maryland Center for Environmental Science. "How is your ecosystem doing? Developing scientifically based report cards." September 30, 2016.
2. Steve Young, NYS Department of Environmental Conservation. "New York's rare and endangered plant program." October 3, 2017.
3. Christine Mayer, University of Toledo. "The Maumee River, a fish-eye view." October 17, 2016.
4. Chris Pennuto, SUNY Buffalo State. "Lessons from invasions and the role of fish in stream ecosystem function." October 31, 2017.
5. Howard Lasker, University of Buffalo. "Dynamics of Caribbean Gogonian communities." November 14, 2016.
6. Martin Stapanian, U.S. Geological Survey. "Population dynamics of mayfly nymphs in Lake Erie." November 28, 2016.
7. Kurt Karboski, Lower Great Lakes Fish and Wildlife Conservation Office. "The battle for Lake Ontario: Native and invasive species interactions in the Great Lakes." January 30, 2017.
8. Chris Castiglione, Lower Great Lakes Fish and Wildlife Conservation Office. "Using GIS to uncover the secrets of your data." February 27, 2017.
9. Jonathan Bossenbroek, Department of Environmental Sciences, University of Toledo. "Bringing landscape ecology into the Great Lakes." March 13, 2017.
10. Jason Robinson, Department of Environmental Conservation. "Walleye movement and management in Lake Erie." April 10, 2017.
11. Mike Fox, Environmental & Resource Studies Program and Department of Biology, Trent University. "Fish life history evolution." May 1, 2017.

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.
- Helped to organize the Great Lakes Center Open House (May 2017).
- Assisted in publishing Great Lakes Center 2015-2016 Annual Report (November 2016).
- Member of Search Committee for Field Station Technician.
- Wrote multiple articles for GLC Newsletter series.
- Attended meeting with GLNPO in Chicago to present current progress on the ongoing projects and discuss future research and grant opportunities.
- Attended National Coastal Condition Assessment Great Lakes Benthic Indicator Development Workshop, assisted with assigning species tolerance values. October 18-20, 2016, Chicago, Illinois.
- Participated in 2017 Great Lakes Biology Monitoring Program Assessment, U.S. EPA GLNPO, Chicago, Illinois, May 30, 2017.
- Participated in multiple phone conferences with EPA, NOAA, USGS, 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-editor of the Special Issue of *Hydrobiologia* on Ecology and Conservation of Freshwater Bivalves.
- Guest editor of the Special Issue of the *Journal of Great Lakes Research* "U.S. EPA Great Lakes National Program Office Long-Term Monitoring of the Laurentian Great Lakes: Approaches, achievements and lessons learned."
- Co-chair of the session, "Changes in large freshwater ecosystems: Drivers, responses, and restoration," at the ASLO Aquatic Sciences Meeting in Honolulu, Hawaii, February 26 - March 3, 2017.
- Co-chair of a Special Session: "Keeping it flowing: Science and research in connecting channels of the Great Lakes" (with Gorsky, D., K. Mehler, E. F. Roseman). 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
- Co-chair of a Special Session: "Insights into mechanisms of ecological change from cross-lake comparisons" (with Rudstam, L., J. Watkins, T. Nettesheim). 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
- Co-chair of a Special Session: "Understanding drivers of benthic community condition in the Laurentian Great Lakes" (with Hinchey, E., G. Warren, J. Lietz). 60th Annual Conference on Great Lakes Research. May 15-19, 2017, Detroit, Michigan.
- Member of Freshwater Molluscs Conservation Society *ad hoc* International Committee.
- Panel member for the discussion on mollusks as ecosystem engineers during 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
- Member of the Association for the Sciences of Limnology and Oceanography.
- Member of the International Association for Great Lakes Research.
- Member of the Freshwater Mollusk Conservation Society.
- Member of the Ecological Society of America.

- Reviewed manuscripts for *Global Change Ecology*, *Northeastern Naturalist*, and *Hydrobiologia*.
- Participated in planning Cooperative Science and Monitoring Initiative for Lake Ontario 2018. Cornell University Biological Field Station, Bridgeport, New York. November 15-16, 2016.
- Member of the Buffalo State's "The Friends of the Maud Gordon Holmes Arboretum."

Workshop for planning 2018 Lake Ontario study within the Cooperative Science and Monitoring Initiative, held at Cornell University Biological Field Station.

Mark Clapsadl:

- Participated in and supervised the Lake Erie Long-Term Lower Trophic Level Monitoring Project.
- Played a key role in the GLC Dock and Shoreline Improvement Project, working with Facilities Planning staff as well as engineers, consultants, and contractors.
- Chair of Search Committee for Field Station Technician.
- Served on the Project Advisory Committee for the Regional Niagara River Lake Erie Watershed Management Plan-Phase 2.
- Provided significant support to numerous research projects, as well as support to outside agencies and organizations.

Susan Daniel:

- U.S. Student Board Member, International Association of Great Lakes Research.
- 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 of the Great Lakes Research.
- Communications & Outreach Committee Member, International Association of Great Lakes Research.
- Nominations Committee Member, International Association of Great Lakes Research.
- Co-Chair of Awards Committee, International Association of Great Lakes Research.
- U.S. Student Board Member, International Association of Great Lakes Research (2016-2018).

Susan Dickinson:

- Assisted in preparation of the Great Lakes Center Annual Report for publication.
- Organized Great Lakes Center Open House (May 2017).
- Assisted in preparation of the Great Lakes Center, Biology Department and Great Lakes Ecosystem Science Program Seminar Series.
- Organized and participated in a passenger van safe driving course.
- Treasurer, CSEA Local 640, Buffalo State College.
- Volunteer, SPCA of Niagara.

Kit Hastings:

- Participated in field collection and laboratory studies in multiple projects conducted at the Field Station.

- Implemented the Lake Erie Lower Trophic Level (LTLA) Monitoring Project.
- Member of the Institutional Animal Care and Use Committee.
- Sustainability Council member.
- Member of WNY GIS User Group.
- Member of NYS GIS Association.
- Played a key role in producing two issues of GLC Newsletters (editor).
- Wrote multiple articles for GLC Newsletter series.
- Assisted in preparation of the GLC Annual Report publication.
- Updated the GLC website.
- Assisted in lab work associated with the Great Lakes Long-term Biological Monitoring Program and Lakes Michigan and Superior CSMI projects (mounted oligochates and chironomids slides and identified oligochaetes).
- Identified oligochates for Lake Superior CSMI project.
- Provided instructional support on field sampling procedures for multiple Buffalo State classes.
- Gave a tour of the field station and field sampling demonstration for Groundwork Buffalo and WNY PRISM, August 4, 2016.
- Volunteered with Buffalo Niagara Riverkeeper to plant shrubs along Gill Creek in Niagara Falls in April 2017, and for the Shoreline Sweep clean-up in April 2017.
- Trained volunteer for the CommuniTree Steward Project, a collaboration between Cornell Cooperative Extension of Erie County and the City of Buffalo to care for and replace street trees.

Alexander Karatayev:

- 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 (2011 – present).
- Personnel Committee member, Biology Department.
- Member of Search Committee for Field Station Technician.
- Organized Great Lakes Center Open House (May 2017).
- Published Great Lakes Center 2015-2016 Annual Report (November 2016).
- Wrote multiple articles for GLC Newsletter series.
- 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, etc., about current research and potential future projects.
- Participated in 2017 Great Lakes Biology Monitoring Program Assessment, U.S. EPA GLNPO, Chicago, Illinois, May 30, 2017.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-term Biological Monitoring Program.
- Participated in planning Cooperative Science and Monitoring Initiative for Lake Ontario 2018. Cornell University Biological Field Station, Bridgeport, New York. November 15-16, 2016.
- Co-editor of the Special Issue of *Hydrobiologia* on Ecology and Conservation of Freshwater Bivalves.
- Co-editor of the Special Issue of *Journal of Great Lakes Research,* "U.S. EPA Great Lakes National Program Office Long-Term Monitoring of the Laurentian Great Lakes: Approaches, achievements and lessons

learned."

- Co-chair of the session, "Changes in large freshwater ecosystems: Drivers, responses, and restoration," at the ASLO Aquatic Sciences Meeting in Honolulu, Hawaii, February 26 - March 3, 2017.
- Campus Representative for the Great Lakes Research Consortium.
- Advisory Board Member, *International Journal of Aquatic Invasions*.
- Multiple interviews for various mass media.
- Member of Freshwater Mollusk Conservation Society ad hoc International Committee.
- Panel member for the discussion on mollusks as ecosystem engineers during 10th Biennial Symposium of the Freshwater Mollusk Conservation Society**,** March 26-30, 2017, Cleveland, Ohio.
- Member of the Association for the Sciences of Limnology and Oceanography.
- Member of the International Association for Great Lakes Research.
- Member of the Freshwater Mollusk Conservation Society.
- Member of the Ecological Society of America.
- Member of the Buffalo State's "The Friends of the Maud Gordon Holmes Arboretum."
- Reviewed manuscripts for *Freshwater Science* and *Journal of the Great Lakes Research*.

Knut Mehler:

- Instructor of GLC 600 Seminar for Spring Semester 2017.
- Co-editor of the Special Issue of *Hydrobiologia* on Ecology and Conservation of Freshwater Bivalves.
- Participated in planning Cooperative Science and Monitoring Initiative for Lake Ontario 2018. Cornell University Biological Field Station, Bridgeport, New York. November 15-16, 2016.
- Wrote articles for GLC Newsletter series.

Christopher Pennuto:

- Graduate Committee member, Biology Department.
- Curriculum Committee Chair, Biology Department.
- Admissions Committee Chair for GLES Master Programs.
- Graduate Open house weekend, September 17, 2016 (representing GLES and Biology).
- Reviewed manuscripts for *Journal of Great Lakes Research*, *Environmental Toxicology and Chemistry*, *Environmental Biology of Fishes*, *Journal of Environmental Pollution*, *Journal of Insect Science*, and *Biological Invasions*.

Alicia Pérez-Fuentetaja:

- Biology Department Graduate Committee.
- Member of Search Committee for Field Station Technician.
- Represented Buffalo State for the International Joint Commission (USA/Canada).
- Membership Committee member for International Association of Great Lakes Research (IAGLR).
- Student presentation Judge at International Association of Great Lakes Research Conference (IAGLR) May 15-19, 2017.
- Participant at the Public Panel Discussion at the International Joint Commission meeting in Buffalo (March 28, 2017) following the oral presentations by experts.
- Interviewed by Radio WBFO about the state of the Niagara River and the more immediate needs to improve the ecosystem.

- Member of the Board for the denomination of the Niagara Corridor as a RAMSAR site. Proposal currently in review.
- Research Advisor to the Lake Erie Forage Task Group. This international multi-agency group reviews fisheries data on the lower food web organisms in Lake Erie and reports to the Great Lakes Fishery Commission.
- Run an intensive outreach program to inform and involve the public on the research we are doing in the Niagara River and promote rehabilitation and conservation of the ecosystem. I have a graduate student that is our outreach specialist (Jo Johnson) and with my direction and supervision maintains a webpage, and informs the public about our research progress through public presentations, Twitter and Instagram.
- Reviewed article for *Journal of Great Lakes Research* and *Journal of Hazardous Materials*.

Susan Daniel graduated in the spring with an M.S. in Great Lakes Ecosystem Science.

Kit Hastings (lower left) and the other participants of the chironomid taxonomy workshop.

V. Professional Development Activities

Lyubov Burlakova:

- Completed 2 days of courses in Level 1 - 3 Microsoft Access training, June 15-16, 2017.

Susan Daniel:

- Graduated with Great Lakes Ecosystem Science Master of Science in Spring 2017.
- Completed Freshwater Gastropod identification workshop, Cleveland, Ohio.
- Completed 2 days of courses in Level 1 - 3 Microsoft Access training, June 15-16, 2017.

Kit Hastings:

- Completed training in "Taxonomy of Freshwater Chironomid Midges" workshop at the National Center for Water Quality Research, Heidelberg University. March 9-10, 2017.
- Attended GeoCove Lunch and Learn "ArcMap Editing Tips and Tricks." December 21, 2016.
- Attended training course: "ArcGIS Pro: An Introduction." February 15, 2017.
- Attended training course: Workplace Violence Prevention Refresher course. June 1, 2017.
- Attended training course: American Heart Association Heartsaver First Aid/CPR/AED recertification. June 2, 2017.
- Completed 2 days of courses in Level 1 - 3 Microsoft Access training, June 15-16, 2017.

Knut Mehler:

- Completed Freshwater Gastropod identification workshop, Cleveland, Ohio.
- Completed "Managing Student Workers Workshop: Creating student employment learning experiences that increase department productivity." March 7, 2017. Buffalo State College.
- Completed 2 days of courses in Level 1 - 3 Microsoft Access training, June 15-16, 2017.

Andrea Locke:

- Certified Pesticide Applicator Continued Education.
- Completed SUNY Buffalo State Course GEG/PLN Maps and Map Making Using GIS.
- Attended Cornell Cooperative Extension In-Service.
- Attended Healing Our Waters 12th Annual Great Lakes Restoration Conference.

VI. Field Station Activities

This year we were able to fill the vacant Field Station Technician position and are happy to welcome Brian Haas to the GLC. Brian completed a M.S. at Buffalo State in 2015; his graduate work focused on map turtles in the upper Niagara River. This work experience, along with his familiarity with the Niagara River and a strong academic background, help to make a Brian a great addition to the team.

We continue to update and maintain our research support systems. This year we completed the engineering, planning and contractual phases of the largest station improvement project to take place here in over 20 years. This project will see the renovation of our existing boat ramp so that it is functional in all water level conditions, improvements to our existing barge including the addition of a floating dock system and the installation of rip-rap along the shoreline south of the boat ramp. Construction is to begin July 5, 2017. This project, when completed, will greatly improve the functionality of our launch and dock, as well as radically improve the aesthetics of the waterfront portion of the Field Station. Funding for this project has been provided by the NYS Department of Environmental Conservation, the Oishei Foundation, and the SUNY construction fund. We are very grateful for all of the campus staff that have helped secure funding for this work and for shepherding the project through the complex process of design and contract awards.

Research Vessels

We have a rigorous regular maintenance program in place for our research boats. This program, coupled with the ability to store the boats in the "boat shed" out of sun, rain and snow, has enabled us to keep the boats in good working order.

Instructional Support

- Dr. Perez-Fuentetaja's Fisheries class participated in an electrofishing and trap-netting field trip.
- Dr. Standora's Ecology class was given a limnology equipment demonstration and lecture in the fall.
- Dr. Bergslien's GES 460 was given a limnology equipment demonstration and lecture in the spring.
- Facilities were provided for Dr. Anselmi's Anthropology class experiments.
- Provided laboratory support for six graduate student projects.

Brian Haas, Dr. Pérez-Fuentetaja, and four students get ready to collect fish from a trap net in the Black Rock Canal during the Fisheries class lab on a stormy May day.

Research Activities

- Extensive involvement with "Emerald Shiners in the Upper Niagara River."
- Published preservation methods study in peer reviewed journal.
- Provided vessel and technician support for "Lake Erie CSMI."

- 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, New York.
- 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 Support to USFWS fish tracking project.
- Facilitated access to the boat launch for NYS Department of Environmental Conservation and U.S. Fish and Wildlife Service.

Mark Clapsadl and Knut Mehler haul in lines covered in dreissenid mussels. Attached to the lines were growth chambers to measure how mussels grew at different locations and depths in eastern Lake Erie. A side effect was that we provided substrate for wild mussels to colonize.

Outreach

- Hosted multiple Buffalo Niagara Riverkeeper kayaking touring events for public education.
- Hosted Helen Domske with Sea Grant outreach event.
- Provided access and support to the NYS Department of Environmental Conservation 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.

U.S. Fish and Wildlife Service used our facilities to stage a lake sturgeon telemetry study. Here they are measuring and weighing a lake sturgeon caught in Buffalo Harbor, before tagging and releasing it.

VII. Western New York PRISM Activities

WNY PRISM provides a significant service to the greater Buffalo community and western New York. An organization focused on invasive species management, WNY PRISM's mission is to address invasive species priorities using a coordinated partnership network, for which we provide leadership, information management, and collaboration opportunities. Our goal is to improve, restore, and protect local aquatic and terrestrial resources by improving the effectiveness of invasive species management efforts and increasing awareness of invasive species issues throughout our 8 county region. WNY PRISM is one of eight regional partnerships created to address threats posed by invasive species across New York State. PRISMs, comprised of diverse stakeholder groups including federal and state agencies, universities, non-profit organizations, industry, interested citizens and citizen scientists, are key to New York's integrated approach to invasive species management.

Invasive species pose a significant threat to our environment, economy, and human health. By fostering regional collaboration, the impact of invasive species are minimized and the natural resources and beauty of western New York will be preserved. We have increased Buffalo State's profile within both the professional and public communities through state and regional meeting, workshops, and extensive education and outreach. We have also presented at and attended various Buffalo State Events.

This past year has seen WNY PRISM make great strides towards achieving our goals. We developed a regional early detection reporting protocol, established a Slender False Brome (*Brachypodium sylvaticum*) Working Group, and began implementation of a Boot Brush Station research project designed to test the effectiveness of Boot Brush Stations as means to limit the spread and establishment of invasive species along trails.

The WNY PRISM Strategic Plan identifies six goals including:

1. Partner/Network Coordination
2. Information Management
3. Education and Outreach
4. Prevention, Early Detection
5. Management
6. Habitat Restoration

The following is a brief description of WNY PRISM accomplishments within the past year, provided by WNY PRISM coordinator, Andrea Locke, on all six major goals.

Partner/Network Coordination

- Held 2 Full Partner Meetings.
- Held quarterly Steering Committee Meetings.
- Accepted Chautauqua Watershed Conservancy as new Steering Committee Member; obtained Letter of Support as per Operational Guidelines.
- Participated in PRISM Leader's Quarterly Meetings.
- Participated in Monthly PRISM webinar series.
- Met with Hilary Mosher, FL-PRISM Coordinator, to improve coordination between FL-PRISM and WNY PRISM.

- Participated in Great Lakes Action Agenda Meetings.
- Participated in Erie County Parks Stakeholder Meeting.
- Participated in Great Lakes Action Agenda Meetings.
- Participated in Working Group for development of WNY Native Plant Nursery.
- Participated in NYS Invasive Species (IS) Priorities Setting Meeting.
- Participated in Town of Amherst IS Taskforce Meeting, appointed member.
- Release Call for 2017 Partner Crew Project Requests, accepted and reviewed requests with Steering Committee.
- Participated in *Hydrilla* Collaborative (WNY Hydrilla) calls.
- Participated in WNY EAB/Forest Pest Taskforce meetings.
- Posted, interviewed and hired 2017 Summer Seasonal Positions (1 E&O, 2 ISMA).
- Assisted region with applications for DEC AIS Spread Prevention Program.
- Provided Letters of Support to multiple Partners seeking grant funds.

Information Management

- Mapped invasive species at 6 sites including surveys of the Chautauqua Lake outlet and tributaries, expanding upon previous project area.
- Provided survey summaries and management recommendations to Partners.
- Provided iMapInvasives training for Groundworks Buffalo Green Team, held training at Roger Tory Peterson Institute and Grand Island Memorial Library.
- Provided management recommendations for multiple Partners to begin project planning.
- Sent Call-out through listserve requesting information from Partners on invasive species activities implemented in 2016.
- Held Conservation Targets Working Group Meetings.
- Provided information to partnership on grant opportunities and new research through listserve.
- Reached out to Partners to help identify research needs.
- Requested suggestions from Partners on previous/completed invasive species removal/habitat restoration projects for Crew to conduct post-project IS survey.

WNY PRISM crew (Ian Sansone, Emily Dyett, and Tyler Christensen) and Coordinator Andrea Locke, surveyed Franklin's Gulf County Park for invasive species. Photo Credit: Wayne Schacher, Eden Conservation Board.

Education and Outreach

- Multiple presentations on invasive species, including *Hydrilla* Hunters, Christmas Tree Farmers Association meeting, Reinstein Woods Teacher Institute, Majestic Hemlock workshop, Lancaster Civic Club, Niagara University seminar, Forest Owners workshop, Master Gardeners of Erie County.
- Staffed PRISM display at outreach events, including Tifft Insectival, Canal Fest of the Tonawandas, Erie County Fair, Franklinville, Lockport, Dunkirk, and Clarence Hollows Farmers' Markets, Plant WNY Conference, and Reinstein Woods Fall Festival.
- Assisted Partners with education and outreach efforts and provided materials to Partners for events totaling 10,000 individual items.
- Buffalo Audubon Zoar Valley Hike, discussed IS with attendees.

Summer 2016 WNY PRISM Invasive Species Management crew. Tyler Christensen, Emily Dyett, and Ian Sansone staffing the WNY PRISM display at the Clarence Hollow Farmers' Market Annual Monarch Release. Photo Credit: Flora Leamer.

- Coordinated Invasive Species Awareness Week Planning for WNY PRISM Region.
- Participated in ISAW planning and follow-up calls.
- Received proclamation from the Town of Amherst recognizing ISAW.
- Coordinated and planned events for WNY: *Hydrilla* Hunters/AIS Workshop, Honeysuckle Harvest at Kenneglenn Nature Preserve, and Hemlock Woolly Adelgid Film & Panel Discussion.
- Submitted surveys and data from WNY ISAW events to ISCS.

Invasive Species Awareness Week logo.

- Held Education and Outreach Working Group Meetings.
- Developed WNY PRISM Invasive Species Coloring Book.
- Released 2017 Fall/Winter eNewsletter.
- Submitted article to Great Lakes Center Fall Newsletter.
- Updated website with blog posts and new invasive species information.
- Developed poster displays for libraries and schools.

WNY PRISM and Partners hosted a WNY Hydrilla Hunters and AIS Workshop during Invasive Species Awareness Week, held at West Canal Marina in North Tonawanda.

- WNY PRISM held and attended events that had >250,000 attendees and 2350 direct contacts.

Prevention

- Provided materials for Lake Associations and Boat Stewardship Programs.
- Continued Boot Brush Station Pilot Project and Research – collected seed from 5 project locations, to be grown out in Buffalo State's greenhouse.
- Included prevention messaging in all education and outreach efforts.

Early Detection and Rapid Response

- Conducted Early Detection site monitoring.
- Finalized and released Early Detection Reporting Protocol for WNY.
- Held first two *Brachypodium sylvaticum* Working Group Meetings.
- Accepted a Buffalo State graduate student intern for the development of a GIS-based habitat suitability project for *Brachypodium sylvaticum*.
- Interviewed and selected Terrestrial Invasive Plant (*Brachypodium sylvaticum*) Survey and Monitoring Intern.

Management and Habitat Restoration

- Removed invasive shrubs from Bergen Swamp, Conewango Valley Preserve, Stella Niagara, and Fredonia College Lodge.
- Removed invasives including both woody and herbaceous species from Seneca Bluffs, Niagara Escarpment Preserve, and Kenneglenn Nature Preserve.
- Assisted Jamestown Audubon with efforts to remove water chestnut (*Trapa natans*) from ponds.
- Assisted DEC with *Galerucella* beetle collection for purple loosestrife bio-control.

WNY PRISM Crew assisted Tifft Nature Preserve with planting of 30,000 native plant plugs in areas with previous invasive species management.

- Assisted Tifft Nature Preserve with planting 30,000 native plant plugs in areas previously treated for invasive species.
- Worked with USACE, DEC and USFWS on pre-treatment *Hydrilla* surveys in Tonawanda Creek/Erie Canal as part of Demonstration Project.
- Hosted 2016 DEC Giant Hogweed Crew.
- Worked with Buffalo Audubon and DEC to acquire permit for invasive species removal at Klydel Wetlands.
- Provided summaries of Summer Crew Projects to Partners.

- Worked with Partners on management planning, reviewed multiple site management plans.
- Conducted site visit at SUNY Fredonia College Lodge for target species: *Phragmites australis* and *Rhamnus cathartica*.
- Attended project planning meetings for PUSH Buffalo - Silo City/Buffalo River Restoration Site.

Additional Program Elements

- Completed and released 2016 Annual Report.
- Developed and released 2017 Annual Work Plan.
- Submitted grant application to GLRI-EPA Foundation for Invasive Species Collaborations for Eastern Slender False Brome Working Group.
- Submitted NCTE/Budget to DEC for approval.

WNY PRISM removed invasive shrubs from Bergen Swamp alongside our Partners with the Bergen Swamp Preservation Society.

WNY PRISM is a sponsored program through the Research Foundation at Buffalo State, and is hosted by the Great Lakes Center. Funding is provided by the Environmental Protection Fund, through a contract with NYS Department of Environmental Conservation. More information on WNY PRISM and the invasive species impacting western New York.