Buffalo State
Great Lakes Center
Since 1966

Annual Report 2019-2020

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 Buffalo State College, as well as other institutions in North America, Europe, and South America.

- Over the last year our researchers have published **5 peer-reviewed papers**, and **10 papers** were submitted for publication.
- We presented **23 talks**, including: 9 at national/international/regional conferences, 8 invited talks, and 6 presentations in non-refereed venues.
- Fifteen projects for research and education, including three newly received in 2019-2020, are currently funded in the GLC totaling **$11,169,966, including $7,533,009 for Buffalo State**.
- **Fourteen students** were enrolled in Great Lakes Environmental Science M.A. and M.S. programs.
- Two issues of the GLC newsletter were produced over the last year.

Editor's Note: All pictures where there are no masks or social distancing were taken before the COVID-19 pandemic.

GIFTS

The Great Lakes Center received a very generous gift of about $500,000 from Ruth E. Huppuch, who died March 2, 2020, at the age of 97. She completed a master's degree at Cornell University and taught Social Studies in the Orchard Park School System for over 47 years. Ruth was a life member of the Buffalo State Alumni Association and a committee member for the 50th reunion of the class of 1942 and helped establish the Class of 1942 Scholarship, which was dedicated to class members who enlisted in the military during WWII and returned after the war to complete their education. The Ruth Huppuch Research and Education Award Fund will provide support to Great Lakes Center scientists and students involved in research and education activities that promote understanding of freshwater ecological systems.

I. Staff

GLC Personnel

Director:	Alexander Karatayev
Research Scientists:	Lyubov Burlakova Mark Clapsadl (Field Station Manager) Susan Daniel Allison Hrycik Knut Mehler Christopher Pennuto Alicia Pérez-Fuentetaja
Research Technicians:	Sonya Bayba Brian Haas Erik Hartnett Kit Hastings Brianne Tulumello
Administrative Assistant:	Susan Dickinson
WNY PRISM Coordinator:	Andrea Locke
Program Managers:	Brittany Hernon, Early Detection and Response Kristin King, Aquatic Invasive Species Lucy Nuessle, Terrestrial Invasive Species Marcus Rosten, Aquatic Invasive Species Emily Thiel, Education and Outreach
Students Research Assistants:	Joshua Allan, Graduate Student, GLES, Buffalo State Sonya Bayba, Graduate Student, GLES, Buffalo State Emily Burch, Graduate Student, Buffalo State Saniyya Dennis, Undergraduate Student, Buffalo State Leah Domiano, Graduate Student, GLES, Buffalo State Martens Dorcely, Undergraduate Student, Buffalo State Kyle Glenn, Undergraduate Student, Buffalo State Shania Jean-Pierre, Undergraduate Student, Buffalo State Megan Kocher, Graduate Student, Biology, Buffalo State Lauren Martinek, Graduate Student, GLES, Buffalo State Christina Perry, Undergraduate Student, Buffalo State Akshay Sharma, Undergraduate Student, Buffalo State Tasnim Tajin, Undergraduate Student, Buffalo State Shahedatul Trisa, Undergraduate Student, Buffalo State

WNY PRISM Seasonal Employees:

- Grace Bichler, Cornell University (2019)
- Julia Biondi, SUNY Potsdam (2020)
- Hunter Bogdan, Buffalo State (2019)
- Melissa Boglioli, Cornell University, UMass Auburn (2018–2020)
- Michele Carmelia, Erie Community College (2019–2020)
- Ashley Carmichael, Michigan State University (2019)
- Danielle Casler, Canisius College (2019)
- Skylar Claud, SUNY Oneonta (2019)
- Derek Claus, University at Buffalo (2019)
- Bryan Colby, Susquehanna University (2020)
- Kelly 'Layla' Crabtree, SUNY Fredonia (2019–2020)
- Riley Delpriore, SUNY Cobleskill (2020)
- Alexandra DePonceau, Penn State (2019–2020)
- Danielle Dolan, University at Buffalo (2020)
- Ryan Elliott, SUNY Oneonta (2019)
- Lily Engebrecht, Canisius College (2020)
- Candace Engel, University at Buffalo (2019)
- Fabio Espinal, University at Buffalo (2019)
- Amanda Gabryszak, SUNY Environmental Science & Forestry (2019–2020)
- Julia Gerard, SUNY Environmental Science & Forestry (2019)
- Devyn Goldberg, University at Buffalo (2020)
- Bianca Gonzales, Buffalo State (2019–2020)
- Matthew Hahn, Buffalo State (2019–2020)
- Payton Hanssen, College of Brockport (2019)
- Emily Harrower, SUNY Fredonia (2019–2020)
- Kegan Hoopes, Penn State (2019)
- Jason Kappan, University at Buffalo (2019–2020)
- Matthew Kongesor, Canisius College (2019)
- Daniel Korff, University at Buffalo (2020)
- Samuel Krebs, SUNY Environmental Science & Forestry (2020)
- Alexander Krest, Buffalo State (2020)
- Anna Lee, SUNY Environmental Science & Forestry (2020)
- Vincent Manuela, University at Buffalo (2020)
- Brandon Metzinger, SUNY Cobleskill (2020)
- Elizabeth Morrison, University at Buffalo (2020)
- Jarred O'Connor, Buffalo State (2019–2020)
- Jason Porter, Canisius College (2019)
- Katelin Quarles,University at Buffalo (2019)
- Brianna Saylor, Buffalo State (2020)
- Kyle Serena, University at Buffalo (2020)
- Katrina Smith, University at Buffalo (2020)
- Jesse Stevens, Buffalo State (2020)
- Tristan Williams, Alfred University (2019)

GLC Affiliates (at Buffalo State)

- Kelly Frothingham, Associate Dean, School of Natural and Social Sciences
- Susan McCartney, Director, Small Business Development Center
- Amy McMillan, Director, Honors Program
- Mary Perrelli, GIS Lab Supervisor, Geography and Planning Department
- Gary Pettibone, Professor, Biology Department
- Daniel L. Potts, Chair and Associate Professor, Biology Department
- Jill Singer, Distinguished Teaching Professor, Earth Sciences and Science Education Department
- Randal Snyder, Professor, Biology Department
- Yola M. Stockton, Assistant Professor, Art and Design Department
- Tao Tang, Professor, Geography and Planning Department
- Stephen Vermette, Professor, Geography and Planning Department
- Robert J. Warren II, Associate Professor, Biology Department

GLC Adjunct Professors

- Zy Biesinger, Fish Biologist, U.S. Fish and Wildlife Service
- Dimitry Gorsky, Fish Biologist, U.S. Fish and Wildlife Service
- Knut Mehler, Research Scientist at the Lower Saxony State Office for Water Economy, Coastal and Environmental Protection, Department of Water Management and River Basin Management, Germany
- Daniel Molloy, Scientist Emeritus, NY State Museum, Molloy & Associates, LLC

Collaborators

Collaborators in New York State

- Connie Adams, NYS Department of Environmental Conservation
- Diana Aga, Chemistry Department, University at Buffalo
- Katherine Alben, Wadsworth Institute, Albany
- Joe Atkinson, Environmental Engineering, University at Buffalo
- Gregory Boyer, SUNY Environmental Science & Forestry, Syracuse
- Mary Alice Coffroth, Department of Geology, University at Buffalo
- Tim DePriest, NYS Department of Environmental Conservation
- Donald Einhouse, NYS Department of Environmental Conservation
- Mike Goehle, U.S. Fish and Wildlife Service
- Andrew Hannes, U.S. Army Corps of Engineers
- Clifford Kraft, Department of Natural Resources, Cornell University
- Jenny Landry, Region 8 Bureau of Wildlife, NYS Department of Environmental Conservation, Avon
- Brian Lantry, U.S. Geological Survey, Oswego
- Howard Lasker, Department of Geology, University at Buffalo
- David Lodge, Atkinson Center for a Sustainable Future, Cornell University
- Dianna Padilla, Department of Ecology and Evolution, Stony Brook University
- Lars Rudstam, College of Agriculture and Life Sciences, Department of Natural Resources, Cornell Biological Field Station, Cornell University
- Brandon Sansom, Environmental Engineering, University at Buffalo
- James Watkins, Cornell Biological Field Station, Cornell University
- Brian Weidel, U.S. Geological Survey, Oswego
- Michael Wilkinson, NYS Department of Environmental Conservation

Collaborators at other U.S. Institutions

- Theodore Angradi, U.S. EPA Mid-Continent Ecological Division, Duluth, Minnesota
- Darren Bade, Kent State University, Kent, Ohio
- Richard Barbiero, CSRA, Chicago, Illinois
- Dima Beletsky, Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, Michigan
- Jacob Boehler, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Jonathan Bossenbroek, Department of Environmental Sciences, University of Toledo, Toledo, Ohio
- Valerie Brady, Natural Resources Research Institute, University of Minnesota Duluth, Minnesota
- Tom Bridgeman, University of Toledo, Toledo, Ohio
- David Bunnell, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan
- David Campbell, Department of Natural Sciences, Gardner-Webb University, Boiling Springs, North Carolina
- Zachary Cava, Florida Game and Fish Department
- 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, Columbus, Ohio
- Peter Esselman, U.S. Geological Survey, Ann Arbor, Michigan
- Mary Ann Evans, U.S. Geological Survey, Ann Arbor, Michigan
- 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
- Leon Katona, Wright State University, Dayton, Ohio
- Sergei Katsev, Large Lakes Observatory, University of Minnesota Duluth, Duluth, Minnesota
- 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
- Katya Kovalenko, Natural Resources Research Institute, University of Minnesota, Duluth, Minnesota
- Donald Jerina, Laboratory of Bioorganic Chemistry NIDDK, National Institutes of Health, Bethesda, Maryland
- Barry Lesht, Department of Earth and Environmental Sciences, University of Illinois at Chicago; CSRA, Chicago, Illinois

- Charles Madenjian, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan
- Christine Mayer, Department of Environmental Sciences and Lake Erie Center, University of Toledo, Toledo, Ohio
- Pawel Michalak, Bioinformatics Institute, Virginia Tech, Blacksburg, Virginia
- Thomas Miller, Lamar Bruni Vergara Environmental Science Center, Laredo Community College, Laredo, Texas
- Thomas Nalepa, The Graham Sustainability Institute, University of Michigan, Ann Arbor, Michigan
- Janet Nestlerode, U.S. EPA, National Health and Environmental Effects Research Laboratory Gulf Ecology Division, Florida
- Meredith Nevers, U.S. Geological Survey, Great Lakes Science Center, Chesterton, Indiana
- Michel Pfrender, Notre Dame Genomics and Bioinformatics Core Facility, University of Notre Dame, Notre Dame, Indiana
- Euan Reavie, Natural Resources Research Institute, University of Minnesota, Duluth, Minnesota
- Catherine Riseng, University of Michigan, Ann Arbor, Michigan
- Mark Rowe, University of Michigan CILER, NOAA, Ann Arbor, Michigan
- Ed Rutherford, Great Lakes Environmental Research Laboratory, NOAA, Ann Arbor, Michigan
- Mike Sayers, Michigan Tech Research Institute, Michigan Technological University, Ann Arbor, Michigan
- Jill Scharold, U.S. EPA, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division, Duluth, Minnesota
- Kurt L. Schmude, Department of Natural Sciences, Lake Superior Research Institute, University of Wisconsin-Superior, Superior, Wisconsin
- Anne Scofield, U.S. EPA Great Lakes National Program Office, Chicago, Illinois
- Robert Shuchman, Michigan Tech Research Institute, Michigan Technological University, Ann Arbor, Michigan
- Michael Sierszen, National Health and Environmental Effects Research Laboratory, U.S. EPA Mid-Continent Ecology Division, Duluth, Minnesota
- David Strayer, Graham Sustainability Institute, University of Michigan, Ann Arbor, Michigan
- Anett Trebitz, U.S. EPA Office of Research & Development, Mid Continent Ecology Division, Duluth, Minnesota
- Yvonne Vadeboncoeur, Department of Biological Sciences, Wright State University, Dayton, Ohio
- Jake Vander Zanden, Center for Limnology, University of Wisconsin, Madison, Wisconsin
- Molly Wick, U.S. EPA Mid-Continent Ecological Division, Duluth, Minnesota
- 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
- Yulia Bespalaja, Federal Center for Integrated Arctic Research, Russian Academy of Science, Arkhangelsk, Russia
- Ivan Bolotov, Laboratory of Evolutionary Ecology and Phylogenetics, Federal Center for Integrated Arctic Research, Russian Academy of Science, Arkhangelsk, Russia
- 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
- Maria Dittrich, Department of Physical and Environmental Sciences, University of Toronto Scarborough, Toronto, Ontario, Canada
- Elsa Froufe, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Portugal
- Jürgen Geist, Fish Biology, TU München, Germany
- Michail Gladyshev, Department of Aquatic and Terrestrial Ecosystems, Siberian Federal University, Krasnoyarsk, Russia
- Ron Griffiths, Aquatic Ecostudies Limited, Canada
- Paul Hebert, Centre for Biodiversity Genomics, Guelph University, Guelph, Ontario, Canada
- Ladd Johnson, Department of Biology, Laval University, Quebec City, Quebec, Canada

- Vadim Karatayev, School of Environmental Sciences, University of Guelph, Guelph, Ontario, 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
- Olesya Makhutova, Institute of Biophysics, Siberian Branch, Russian Academy of Sciences, Krasnoyarsk, Russia
- Sergey Mastitsky, RNT Consulting Inc., Ontario, Canada
- Krystian Obolewski, Department of Hydrobiology, Kazimierz Wielki University, Bydgoszcz, Poland
- Isabel Porto-Hannes, Fisheries and Oceans Canada, Burlington, Ontario, Canada
- Richard Soare, Department of Geography and Planning, Concordia University, Montreal, Canada
- Ronaldo Sousa, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, and Minho University, Portugal
- Ilya Vikhrev, Laboratory of Molecular Ecology and Biogeography, Federal Center for Integrated Arctic Research, Russian Academy of Science, and Northern (Arctic) Federal University, Arkhangelsk, Russia
- Hanna Zhukava, Department of General Ecology and Methods of Biology Teaching, Belarusian State University, Minsk, Belarus
- Alexandra Zieritz, University of Nottingham Malaysia Campus, Malaysia

GLC staff, students, and collaborators at the Great Lakes Center Open House, hosted at the Field Station in September, 2019.

Participants of the Lake Michigan Planning Workshop in March, 2020. From left to right: Ashley Elgin (NOAA), Susan Daniel, Allison Hrycik, and Lyuba Burlakova (GLC).

Goodbye party for Research Scientist Knut Mehler in Summer 2019. Knut is still an adjunct and collaborator.

Research Scientist Allison Hrycik, who was hired in Spring 2020.

II. Research Activities

Current Projects

Monitoring of benthic invertebrates in Great Lakes

The GLC, in collaboration with Cornell University, was awarded U.S. EPA Great Lakes Long-term Biological Monitoring grants for 2012–2017 and for 2017–2022. The EPA Monitoring Program is designed to provide managers access to biological data on zooplankton and benthos to support decision-making. Within this project we collect benthos (Buffalo State), zooplankton, and chlorophyll data (Cornell University) across the five Great Lakes, analyze this data, and make it available to environmental and fisheries managers. Additional research projects include impact of dreissenids on the lower food web, and development of remote sensing methods. We identified benthic samples collected onboard the EPA R/V *Lake Guardian* from all Great Lakes in 2012–2018 and submitted the data to the Great Lakes National Program Office (GLNPO). These data are the basis for individual lake reports as well as reports for the State of the Great Lakes. The results of the study were published in over 40 papers and presented at multiple talks at regional and international meetings.

Cooperative Science and Monitoring Initiative

The Great Lakes Monitoring Program by the Great Lakes National Program Office includes both the collection of samples from a few (9–16) long-term stations sampled every year and a much more detailed survey conducted on each lake every 5 years within the Cooperative Science and Monitoring Initiative (CSMI). We participated in these surveys in 2014 (Lake Erie), 2015 (Lake Michigan), 2016 (Lake Superior), 2017 (Lake Huron), 2018 (Lake Ontario), and 2019 (Lake Erie).

Lake Ontario Benthos

In 2018, we conducted one of the largest benthic-oriented surveys in the last decade. During September, we visited 52 stations lake-wide and collected 138 Ponar benthic samples and Ponar video, 52 samples for benthic algae and primary productivity (Leon Katona, Wright State University), and 17 samples for little-studied benthic copepods Harpacticoida (Joseph Connolly, Cornell University). Janet Nestlerode (U.S. EPA, NHEERL Gulf Ecology Division) applied the Sediment Profile Imaging system (SPI) at 51 stations to explore sedimentary and biogenic features and possible relationships between these measures across known stress gradients (e.g., organic enrichment, eutrophication) for development of a SPI-based Freshwater Index of Benthic Habitat Quality. Finally, for *Dreissena* monitoring, we collected video data from 56 500 m-long transects and from an additional 34 nearshore stations using a drop-down camera (collaboration with Molly Wick, U.S. EPA Mid-Continent Ecological Division). This extensive survey was documented by Yola Monakhov Stockton (Art and Design Department, Buffalo State) and displayed as a photo exhibition and a poster at the 2019 IAGLR meeting. Based on the results of this survey we are preparing a report and several manuscripts for a Special Issue of the *Journal of Great Lakes Research*.

Lake Erie Benthos

In 2019, we collected benthic samples from 85 stations located in all three basins of Lake Erie. In addition, our collaborators collected samples to study benthic algae and primary productivity (Leon Katona, Wright State University), diversity of Harpacticoida (Joseph Connolly, Cornell University), and sediment profile images (Janet Nestlerode, U.S. EPA, NHEERL Gulf Ecology Division) to explore the effect of hypoxia on sedimentary and biogenic features. For *Dreissena* monitoring, we collected video data using a drop-down camera at 95 stations and video transects at 43 stations. Video data from the drop-down camera were

Research scientists aboard the R/V *Lake Guardian*. Paul Glyshaw (CILER), Elizabeth Hinchey Malloy (EPA), Lyuba Burlakova (GLC), and Natalia Mrozinska (GLC).

used to test a new method of rapid assessment of *Dreissena* populations we are developing since all previous population assessment methods were based on bottom grab sampling that require several years to process. At the end of the survey, we produced a map of lake-wide *Dreissena* distribution in real time. Preliminary analysis revealed a strong decline in *Dreissena* populations in Lake Erie, especially in western basin, compared to the previous survey in 2014. This method for *Dreissena* rapid assessment will be applied for the other Great Lakes in the future as a valuable addition to conventional bottom grab monitoring. (Research pictures on page 32.)

Early Detection of Mollusks and Annelids in the Great Lakes

Alexander Karatayev collecting specimens in Lake Michigan for barcoding. August 1, 2019.

In 2017, we received U.S. EPA GLRI funding to create a DNA Barcode Reference Library for Mollusca, Annelida, and minor phyla. This project is one of three funded by the EPA Great Lake Program Office geared toward genetic barcoding of invertebrate specimens from the Great Lakes. Two additional projects target zooplankton and rotifers (PI M. Pfrender, Notre Dame University, and Cornell University) and benthic arthropods (PI D. Lodge, Cornell University). Barcode sequences for collected specimens are generated by the Centre for Biodiversity Genomics, Guelph University, Canada. The overall goal of the three collaborative projects is to advance the current state of the genetic barcode library for invertebrates in the Great Lakes, which will improve our knowledge of Great Lakes diversity and help in early detection of non-native and potentially invasive species to this important resource. To date, we have submitted 13 plates with specimens of all the taxa. In total, 947 sequences were generated by Barcode of Life Data System (BOLD) based on 942 specimens submitted. Preliminary estimates show that approximately 44% of Annelida, 87% Mollusca, 63% of Platyhelminthes, 100% of Cnidarian, Nematomorpha and Nemertea, and 29% of Bryozoan species on the targeted list have been barcoded to date. Currently we are analyzing genetic results, verifying taxonomy, resolving taxonomic issues, and working with BOLD on creating a Barcode reference library that will include all records created during the funded projects and will also include all previously generated data for species in the Great Lakes watershed existing in BOLD. A value-added product of this project will be a Great Lakes basin-wide species list for the taxonomic groups targeted in this project that we are preparing during the final year of the project. The results were presented by Susan Daniel at IAGLR and other regional meetings.

Partnership for Regional Invasive Species Management (PRISM)

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. This award was funded for 5 more years. More information on WNY PRISM activities is in Section VII.

Understanding round goby migration behavior

This project is investigating the cues and pre-migratory behavior of round gobies in Lake Ontario and its connecting waters. The activity budgets of fish from Lake Ontario (migratory population) and Ellicott Creek (non-migratory population) are being assessed for movement behavior, distances moved, and seasonal activity patterns to discern the influence of habitat context.

Nearshore-offshore migration in an invasive fish

Researchers in 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 late 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.

Lake Erie lake sturgeon: understanding historical and current spawning habitat extent and characteristics

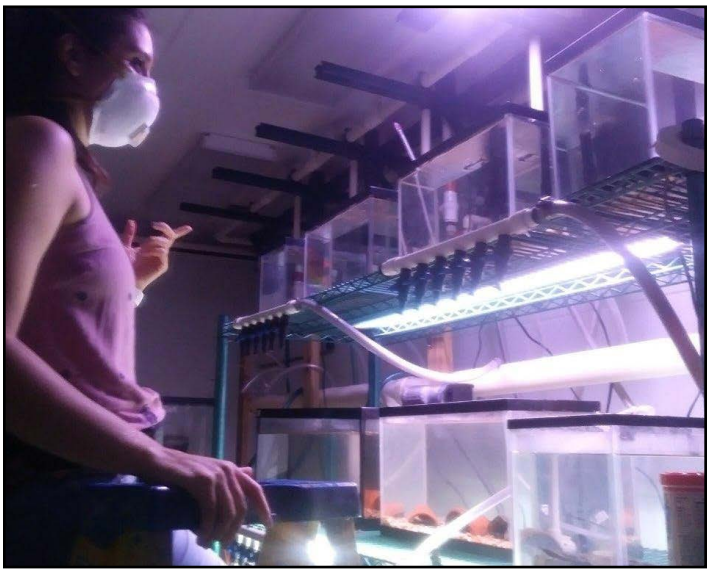
This project is a new collaboration with the U.S. Fish and Wildlife Service which began Fall 2019. It will assess all historical records of sturgeon spawning habitat in tributaries to Lake Erie through investigations of NYS Department of Environmental Conservation and library archives. It will revisit those same locations and document any changes in land use condition or in-stream spawning habitats. Ultimately, these activities should allow an update of tributary habitat suitability values for lake sturgeon in the Lake Erie watershed.

Bioaccumulation of flame retardants and emerging contaminants in wild birds and their eggs in the Niagara Region

We are collecting and analyzing samples of aquatic birds and their eggs to determine the prevalence of contaminants in the Niagara River's wildlife, particularly those that contain halogenated compounds with a tendency to bioaccumulate. We are analyzing for flame retardants (PBDEs), PCBs and the legacy pesticide DDT, which cause impairments in fish and wildlife.

Biological and metabolic responses of aquatic organisms to mixtures of municipal treated effluent

In this project, we are testing different approaches to improving the removal of pharmaceuticals and antibiotics from treated wastewater, using toxicological testing of the organisms exposed to the alternative water treatments. The testing includes LC50 and life history experiments in crustaceans (*Daphnia*) and behavioral and developmental responses of larval fish (fathead minnow, *Pimephales promelas*). The changes in biological endpoints and metabolic products (metabolomics) in these organisms will determine if additional treatment of effluents would be beneficial for wildlife.



M.A. Biology student Amy Cavanaugh works on a fish larva culture at the Field Station.

Effects of calcium decline and climate change on gastropods

In this project, we are looking into the effect of climate change (increased CO_2 levels) and human activities in watersheds (logging, acid rain) on calcium levels in soft water. Many lakes in Canada and around the world are soft water lakes, i.e., they have low buffering capacity. One of the problems with declining calcium levels in these lakes is that aquatic organisms that need calcium for their exoskeletons or shells are not able to obtain it from the water and this deficiency may carry up the food web. We are testing, in an experimental setting, calcification in snails that are raised in a soft water medium resembling natural calcium concentrations and exposed to different levels of atmospheric CO_2 and calcium.

Implementation of the Great Lakes Observing System

We completed another year participating in the Great Lakes Observing System (GLOS) and have reinstalled the buoy for the 2020 season. Since spring of 2012, the GLC has been a participating member of the 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, 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. In 2019, our GLOS buoy received 19,000 views. Early this season, researchers received many emails asking when our buoy would be deployed. The data are also used by researchers who oftentimes want to download the historical data. Recently, this included a researcher from the U.S. Geological Survey and another from Purdue University.

Grants and Funding

Ongoing grants, including three newly received in 2019-2020 (total $11,169,966, including $7,533,009 for Buffalo State)

1. Aga, D. S., N. Dai, A. Pérez-Fuentetaja, J. L. Fiegl, and H. M. Domske. Assessing Innovative Advanced Wastewater Treatments in Removing Antidepressant Drugs Based on Chemical Analysis and Fish Physiological Responses. Great Lakes Research Consortium. **$25,000 ($7,000 for Buffalo State)**. 2018–2021.
2. Boyer, G., A. Y. Karatayev, 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.
3. Burlakova, L. E., and A. Y. Karatayev. DNA Barcode Reference Library: Mollusca, Annelida, and minor phyla. GLRI, U.S. EPA. **$400,000**. 2017–2020.
4. Clapsadl, M., B. Haas, and K. Hastings. Osprey Nesting Platform and Migrator Habitat Enhancement. Niagara River Greenway Commission. **$94,014**. 2018–2019.
5. Goodrich, Z. Mosquito Junction Swamp Restoration at Tifft Nature Preserve, Buffalo Museum of Science. Niagara River Greenway Commission Greenway Ecological Standing Committee. **$344,754.00 ($25,700 for Buffalo State)**. 2019–2022.
6. Karatayev, A. Y., and K. Mehler. CSMI Lake Ontario Workshop. International Joint Commission. **$20,000**. 2019.
7. Locke, A., and C. M. Pennuto. Slender false brome working group. GLRI, U.S. EPA. **$299,900**. 2017–2019.
8. Locke, A. Priority Lands Invasive Species Removal and Volunteer Monitoring Program, The Research Foundation for Buffalo State College, WNY PRISM. U.S. Forest Service Great Lakes Restoration Initiative Cooperative Weed Management Areas. **$39,999**. 2018–2020.
9. Locke, A. Restoration for Enhanced Resiliency Against Invasive Species Re-establishment in Managed Sites, The Research Foundation for Buffalo State College. Lake Erie Watershed Protection Alliance – Water Quality Implementation Grant Program. **$7,995**. 2020–2021.
10. Molloy, D., and L. Burlakova. The Natural Enemies of Dreissenid mussels: An update of the seminal monograph published in 1997. Hudson River Foundation. **$65,200**. 2017–2020.
11. Pennuto, C. Administration of the Western NY PRISM: Partnership for Regional Invasive Species Management. NY DEC. **$3,499,212**. 2019–2023.
12. Pennuto, C. Northern Forest/Great Lakes CESU. Support for a Cladophora growth model: Frequent biomass and coverage assessments married to Sentinel 3 satellite imagery in Lake Ontario. USGS. **$103,576**. 2018–2019.
13. Pennuto, C., and B. Hernon. Rapid Response and Early Detection of Slender False Brome and Japanese Stiltgrass in Western New York. NYS Department of Environmental Conservation Terrestrial and Aquatic Invasive Species Rapid Response. **$99,858**. 2019–2021.
14. Pennuto, C. Historic and contemporary sturgeon habitats in the Lake Erie basin. U.S. FWS. **$70,555**. 2020–2022.
15. 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 Buffalo State)**. 2017–2022.

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. Five manuscripts were published, another 10 were submitted to peer-reviewed journals. A total of 23 presentations were made by the GLC researches, including: 9 presentations at national, international, and regional conferences; 8 invited talks; and 6 presentations made in non-refereed venues.

Refereed Journal Publications (published)

1. Bunnell, D. B., S. A. Pothoven, P. M. Armenio, L. Eaton, D. M. Warner, A. K. Elgin, L. E. Burlakova, and A. Y. Karatayev. 2019. Spatiotemporal variability in energetic condition of alewife and round goby in Lake Michigan. *Canadian Journal of Fisheries and Aquatic Sciences*. 76(11): 1982–1992.
2. Krebs, R. A., L. E. Burlakova, and D. T. Zanatta. 2019. Post-glacial dispersal patterns of *Pyganodon grandis* (Bivalvia: Unionidae) into the lower Great Lakes Watershed. *The Nautilus*. 133(3–4): 74–84.
3. Mehler, K., L. E. Burlakova, A. Y. Karatayev, A. K. Elgin, T. F. Nalepa, C. P. Madenjian, and E. Hinchey. 2020. Long-term trends of Lake Michigan benthos with emphasis on the southern basin. *Journal of Great Lakes Research*. 46: 528–537.
4. Mitchell, Z. A., L. E. Burlakova, A. Y. Karatayev, and A. N. Schwalb. 2019. Changes in community composition of riverine mussels after a severe drought depend on local conditions: a comparative study in four tributaries of a subtropical river. *Hydrobiologia*.
5. Porto-Hannes, I., L. E. Burlakova, A. Y. Karatayev, and H. R. Lasker. 2019. Molecular phylogeny, biogeography, and conservation of the freshwater endemic mollusk *Lampsilis bracteata* in Texas. *Zootaxa*. 4652(3): 442–456.

Refereed Journal Publications Submitted (in review/accepted)

1. Boltovskoy, D., N. Correa, L. Burlakova, A. Karatayev, E. Thuesen, F. Sylvester, and E. Paolucci. Traits and impacts of introduced species: A quantitative review of meta-analyses. Submitted to *Hydrobiologia*.
2. Evans, T., Z. Feiner, D. Mason, E. Reavie, A. Scofield, L. Burlakova, A. Karatayev, and W. Sprules. Size spectra analysis in the Laurentian Great Lakes: Analysis of lake and season effects across a decade. Submitted to *Canadian Journal of Fisheries and Aquatic Sciences*.
3. Hannes, I. P., H. R. Lasker, and L. E. Burlakova. Boundaries and hybridization in a secondary contact zone between freshwater mussel species (Family: Unionidae). Submitted to *Heredity*.
4. Hannes, I. P., H. R. Lasker, and L. E. Burlakova. Genetic isolation and homogenization: Potential effects of landscape features on the population genetic structure of freshwater mussels. Submitted to *Aquatic Conservation: Marine and Freshwater Ecosystems*.
5. Karatayev, A. Y., L. E. Burlakova, K. Mehler, A. K. Elgin, L. G. Rudstam, J. M. Watkins, and M. Wick. *Dreissena* in Lake Ontario 30 years post-invasion. Submitted to *Journal of Great Lakes Research*.
6. Karatayev, V. A., L. E. Burlakova, A. Y. Karatayev, L. Yang, and T. Miller. Advection and habitat loss interactively reduce persistence: maintaining threatened riverine populations while restoring natural flow regimes. Submitted to *Oecologia*. (Accepted).
7. Pennuto, C. M., K. Mehler, B. Weidel, B. F. Lantry, and E. Bruestle. Dynamics of the seasonal migration of Round Goby (*Neogobius melanostomus*, Pallas 1814) and implications for the Lake Ontario food web. Submitted to *Ecology of Freshwater Fish*.
8. Qiao, J., J. Atkinson, S. Bennet, B. Hinterberger, A. Hannes, A. Pérez-Fuentetaja, and S. Delavan. Unconfined Fishway Design and Hydraulic Condition Assessment for the Emerald Shiner (*Notropis atherinoides*) in the Upper Niagara River. Submitted to *River Research and Applications*.
9. Teixeira, J. E., E. Froufe, A. Gomes-dos-Santos, A. E. Bogan, A. Karatayev, L. Burlakova, D. C. Aldridge, I. N. Bolotov, I. V. Vikhrev, A. Teixeira, S. Varandas, D. T. Zanattah, and M. Lopes-Lima. Complete mitochondrial genomes of the freshwater mussels *Amblema plicata* (Say, 1817), *Pleurobema oviforme*

(Conrad, 1834) and *Popenaias popeii* (Lea, 1857) (Bivalvia: Unionidae: Ambleminae). Submitted to *Mitochondrial DNA Part B: Resources* (Accepted).

10. Travis, S. C., A. Pérez-Fuentetaja, and D. S. Aga. Legacy Persistent Organic Pollutants in Threatened Migratory Common Terns Nesting in the Great Lakes. Submitted to *Environment International*.

Published Reports

1. Karatayev, A. Y., L. E. Burlakova, K. Mehler, S. E. Daniel, A. K. Elgin, and T. F. Nalepa. 2020. Lake Huron Benthos Survey Cooperative Science and Monitoring Initiative 2017. Technical Report. USEPA-GLRI GL00E02254. Great Lakes Center, Buffalo State, Buffalo, NY.

International/National/Regional Conference Presentations

1. Bayba, S., L. Burlakova, A. Karatayev, S. E. Daniel, K. Mehler, E. Hinchey Malloy, and K. A. Bockwoldt. Effects of *Dreissena* on benthos of Lake Huron. State of Lake Huron Conference, Saginaw, Michigan, October 8–11, 2019.
2. Burlakova L., A. Karatayev, K. Mehler, and J. Scharold. Trends in Lake Superior nearshore benthos and *Diporeia*. Lake Superior Cooperative Science and Monitoring Workshop, Duluth, Minnesota, July 10–11, 2019 (online presentation).
3. Burlakova L., and A. Karatayev. Long-Term Invasion Impacts: coexistence or extirpation for native mussels in the Dreissena Era? 21st International Conference on Aquatic Invasive Species, Montreal, Canada, October 27–31, 2019.
4. Daniel, S. E., L. E. Burlakova, A. Y. Karatayev, K. Mehler, P. D. N. Hebert, M. E. Pfrender, D. Lodge, and A. Trebitz. Great Lakes DNA Barcode Reference Library: Mollusca, Annelida, and Minor Phyla. IAGLR 2020 Virtual, June 9–11, 2020 (online presentation).
5. Daniel, S., L. Burlakova, A. Karatayev, K. Mehler, P. Hebert, M. Pfrender, D. Lodge, A. Trebitz, and J. Watkins. Great Lakes DNA barcode reference library: Mollusca, Annelida, and minor phyla. State of Lake Huron Conference, Saginaw, Michigan, October 8–11, 2019.
6. Karatayev, A. Y., L. E. Burlakova, K. Mehler, S. Daniel, A. Elgin, T. Nalepa, and J. Watkins. Current state and long-term dynamics of Lake Huron benthos. State of Lake Huron Conference, Saginaw, Michigan, October 8–11, 2019.
7. Karatayev, A., L. Burlakova, L., K. Mehler, V. Karatayev, M. Rowe, M., A, Elgin, and T. Nalepa. Lake morphometry determines *Dreissena* invasion dynamics. 21st International Conference on Aquatic Invasive Species, Montreal, Canada, October 27–31, 2019.
8. Pennuto, C. M. The good, the bad, and the tasty: perspectives on invasive crayfish. Science in the Virtual Pub, Buffalo, New York, June 2020.
9. Pennuto, C. M., K. Mehler, and E. Bruestle. Seasonally migrating round goby in Lake Ontario: a case of missing adults? 21st International Conference on Aquatic Invasive Species, Montreal, Canada, October 27–31, 2019.

Invited Talks

1. Burlakova, L. E. Experimental Design and Statistics in Ecology. Invited lectures presented at Siberian Federal University, Krasnoyarsk. Russia, October 2019.
2. Burlakova, L. E. Effects of *Dreissena* on Great Lakes benthic communities. Invited talk presented at Seminar Series, Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada, October 17, 2019.
3. Burlakova, L., A. Karatayev, and K. Mehler. Updates on Benthos Monitoring Program and Lake Erie Benthoscapes. Talk presented at EPA Great Lakes National Program Office, Chicago, February 25, 2020.
4. Burlakova, L., A. Karatayev, and K. Mehler. Lake Erie Benthoscapes. Talk presented at Lake Michigan CSMI 2020 Planning Meeting, Buffalo, March 12, 2020.

5. Karatayev, A. Y. Environmental problems of American Great Lakes. Invited talk presented at Siberian Federal University, Krasnoyarsk, Russia, October 2019.
6. Karatayev, A. Y. Invasive species. Invited talk presented at Siberian Federal University, Krasnoyarsk, Russia, October 2019.
7. Karatayev, A., L. Burlakova, and K. Mehler A. Recent status of *Dreissena* spp. populations in lakes Ontario and Erie. Invited talk presented at EPA Great Lakes National Program Office, Chicago, February 25, 2020.
8. Karatayev, A., L. Burlakova, and K. Mehler A. Recent status of *Dreissena* spp. populations in lakes Ontario and Erie. Talk presented at Lake Michigan CSMI 2020 Planning Meeting, Buffalo, March 12, 2020.

Presentations at local Conferences and workshops (non-refereed)

1. Bayba, S., L. Burlakova, A. Karatayev. *Dreissena* and benthos: Exploring mechanisms of facilitation and competition. 20th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State, November 14, 2019.
2. Bayba, S., L. Burlakova, A. Karatayev, R. Warren, S. Daniel, and E. K. Hinchey. Invasive Mussels in the Great Lakes: Impacts and Interactions. Buffalo State Student Research Creativity Conference, May 12, 2020.
3. Daniel, S., L. Burlakova, A. Karatayev. Great Lakes DNA Barcode Reference Library: Mollusca, Annelida, and Minor Phyla. 20th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State, November 14, 2019.
4. Hastings, K., M. Clapsadl, and B. Haas. Habitat Enhancement Plantings at the Great Lakes Center Field Station. 20th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State, November 14, 2019.
5. King, K. WNY PRISM's Watercraft Inspection Program. 20th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State, November 14, 2019.
6. Monakhov Stockton, Y., L. Burlakova, and A. Karatayev. Lake Ontario benthic survey through a photographer's lens. 20th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State, November 14, 2019.

U.S. EPA Administrator Andrew Wheeler and Region 5 Administrator Cathy Stepp with a group of scientists during 2019 CSMI Lake Erie benthic survey. Credit: Eric Vance, EPA

One of our largest recorded quagga mussels from Lake Erie was 47.05mm. Quagga mussels (*Dreissena r. bugensis*) rarely measure above 40mm in the Great Lakes.

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 Environmental 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 M.S. and M.A. Graduate Programs

The GLC administers two interdisciplinary applied environmental science programs in Great Lakes Environmental 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 2019-2020:

Master of Art:	**Master of Science:**
Sonya Bayba	Zachary Adams
Corinna Solomon	Joshua Allan
	Joseph Bodnarchuk
	Leah Domiano
	Hutong Fan
	Stephanie Hanson
	Xuejing Hu
	Lauren Martinek
	Zachary Neudeck
	Cecilia Pershyn
	Helen Toledo
	Benjamin Wrazen

Advising Undergraduate and Graduate Students

- Lyubov Burlakova was a faculty mentor/advisor for Sonya Bayba, M.A. student, Great Lakes Environmental Science (2018–2020). She also supervised an internship of two international visiting scholars, Ph.D. students Martyna M. Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland, at the Great Lakes Center (June 15–September 15, 2019). Lyubov supervised an undergraduate math project relevant to the Great Lakes together with Emily Fagerstrom, a lecturer in the Math Department at Buffalo State.

- Alexander Karatayev was a committee member for two graduate students and supervised an internship of two international visiting scholars, Ph.D. students Martyna M. Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland, at the Great Lakes Center (June 15–September 15, 2019).

- Chris Pennuto was the advisor of two graduate students, a committee member for three graduate students, the advisor for 7 GLES non-thesis PSM students, and one summer undergraduate research fellow.

- Alicia Pérez-Fuentetaja was the thesis advisor for three Biology graduate students and was a committee member for another Biology graduate student. She served as a Ph.D. committee member for two

students in the Chemistry Department at the University at Buffalo, and a scientific advisor to a Ph.D. student at Wayne University in a collaborative project with NOAA Great Lakes Environmental Research Laboratory.

International students exchange

- In the summer of 2019, we hosted two international visiting scholars, Ph.D. students Martyna Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland (June 15–September 15, 2019). These students worked under the supervision of Lyubov Burlakova and Alexander Karatayev on different aspects of Great Lake benthic ecology, including learning EPA Long-term Monitoring protocol, collecting (onboard EPA R/V *Lake Guardian*) benthic samples and video images, sample processing, data analysis, and report and publication writing.
- We established a formal collaboration for joint research and student exchange (Agreement of Cooperation) between Buffalo State and Kazimierz Wielki University in Bydgoszcz, Poland.
- Lyubov Burlakova and Alexander Karatayev presented lectures on Experimental Design and Statistics in Ecology, Environmental Problems of the Great Lakes, and Invasive Species for students, faculty and staff at Siberian Federal University, Krasnoyarsk, Russia in October 2019.

Natalia Mrozinska and Martyna Bakowska (center) receive certificates at the GLC Open House.


Martyna Bakowska preserves benthic samples aboard the R/V *Lake Guardian* during the CSMI Lake Erie survey.

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 fall/winter 2019-2020, we invited 3 speakers to present talks at our seminar series, including:

1. Josef Ackerman, Department of Integrative Biology, University of Guelph. "Using physical ecology to understand the complexity of freshwater mussels: Mass transfer relationships." November 18, 2019.
2. Peter Esselman, USGS Great Lakes Science Center. "Development and application of a robot-assisted computer vision system to support ecological monitoring in the Great Lakes." December 2, 2019.
3. Allison Hrycik, University of Vermont. "Winter Limnology from Carboys to Continents." January 23, 2020.

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

- Helped to organize Great Lakes Center Open House (September 13, 2019).
- Helped to publish the Great Lakes Center 2018–2019 Annual Report (August 2019).
- Supervised an undergraduate math project relevant to the Great Lakes together with Emily Fagerstrom, a lecturer in the Math Department at Buffalo State. The students learned to work in R with physical and chemical data obtained by SeaBird CTD sensor during benthic data collection aboard of US EPA R/V *Lake Guardian*.
- Chaired Job Search Committee for Research Scientist Position (Fall 2019).
- Supervised an internship of two international visiting scholars, Ph.D. students Martyna M. Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland, at the Great Lakes Center (June 15–September 15, 2019).
- Helped to establish a formal collaboration for joint research and student exchange (Agreement of Cooperation) between Buffalo State and Kazimierz Wielki University in Bydgoszcz, Poland.
- Wrote articles for GLC Newsletter series.
- Organized Lake Michigan CSMI 2020 Planning Meeting, March 12–13, 2020, Buffalo.
- Session Chair of F3: Ecophysiology and Adaptive Evolution of Invaders at the 21st International Conference on Aquatic Invasive Species. Montreal, Canada, October 2019.
- Participated in preparation of the State of the Great Lakes 2019 Workshops and Report.
- Coordinator of the Great Lakes Center and Biology Department Seminar Series; invited 3 speakers in the fall/winter 2019–2020.
- Attended meeting with GLNPO in Chicago (February 2020) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Participated in GLRI DNA barcode workshop in Bridgeport, New York, February 19–21, 2020.
- 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.
- Member of the International Planning Committee for the joint meeting of European Large Lakes Society and International Association for Great Lakes Research in Petrozavodsk in 2021.
- Member of Freshwater Mollusk Conservation Society ad hoc International Committee.
- 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 Buffalo State "The Friends of the Maud Gordon Holmes Arboretum."
- Reviewed 2 proposals for Pennsylvania Sea Grant College Program.
- Reviewed 6 manuscripts for *Hydrobiologia*, *Journal of the Great Lakes Research*, *Biological Conservation*, *Biological Invasions*, *Frontiers in Ecology and Evolution*, and *Freshwater Mollusk Biology and Conservation*.

Mark Clapsadl

- I have continued to improve the Field Station grounds via the "Osprey nesting platform and migrator gardens" grant by adding to and maintaining plantings that were specified in the project.
- I have worked with the West Side Rowing Club to provide access to the grounds facilitating multiple regattas and other events. We were unable to host several planned Buffalo State field trips on Lake Erie and K-12 events this spring due to COVID-19.
- I am currently working on a large multi-year research grant proposal in collaboration with SUNY Environmental Science and Forestry, the New York State Department of Environmental Conservation and the Niagara Musky Association. If successfully funded, we expect to begin field work in 2021.
- The Great Lakes Observing System buoy that I operate in eastern Lake Erie has become a valuable tool for numerous individuals and agencies. Recreational and commercial charter operators use the real-time lake condition data to make decisions about safety (wave height), agencies such as NYS DEC use lake temperature profile data to guide research activities, and climate scientists are using these data in climate models.

Susan Daniel

- Wrote multiple articles for GLC Newsletter series.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-term Biological Monitoring Program.
- Acting Safety Officer for the Great Lakes Center on the Chemical and Biological Hygiene Committee, Buffalo State (2014–present).
- Awards Committee Co-Chair, International Association for Great Lakes Research.
- Participated in search committee for Research Scientist position at GLC, Fall 2019.
- Participated in GLRI DNA barcode workshop in Bridgeport, New York, February 19–21, 2020.
- Participated in "Ask-A-Scientist Event" with Ellis Middle School, April 7–10, 2020.
- Provided tour to Science and Technology Entry Program (STEP) students on January 28, 2020.
- Session chair for "Exploring Great Lakes diversity: Using traditional and genetic approaches," Virtual 63rd Annual Conference on Great Lakes Research (oral presentation), June 9–11, 2020.
- Participated in Web seminar: "What are freshwater mussels worth?" Freshwater Mussel Conservation Webinar Series, June 16, 2020.
- Participated in Web seminar: "A survey-design framework based on the motivating question(s) to guide the choice of methods and techniques," Freshwater Mussel Conservation Webinar Series, June 30, 2020.

Susan Dickinson

- Assisted in preparation of the Great Lakes Center Annual Report for publication.
- Organized Great Lakes Center Open House, September 2019.
- Assisted in preparation of the Great Lakes Center, Biology Department and Great Lakes Ecosystem Science Program Seminar Series.
- Help to organized Lake Michigan CSMI 2020 Planning Meeting, March 12–13, 2020, Buffalo.
- Help to prepare documents to invite two international visiting scholars, Ph.D. students Martyna M. Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland, at the Great Lakes Center (June 15–September 15, 2019).

Brian Haas

- Accompanied Buffalo Riverside Academy on the River Queen field trip and gave a talk about the Great Lakes and water quality sampling techniques.

- Led field trips onto Lake Erie for select Buffalo State classes.
- Received requests from Field Station neighbors including the West Side Rowing Club and the Navy Operational Support Center and provided assistance when possible.
- Installed additional plantings and maintained the migratory bird garden as part of the Osprey Nesting Platform and Migrator Habitat Enhancement Project.
- Aided in the launching and retrieval of the GLOS buoy in Lake Erie.
- Traveled to the central basin of Lake Erie and conducted benthic video sampling of near shore sites.
- Provided general assistance to the Lake Ontario *Cladophora* Project.
- Provided general assistance to WNY PRISM at the Field Station.
- Helped graduate and undergraduate students from Buffalo State with research projects that were conducted in the Field Station labs.
- Supported local agencies including the NYSDEC and USFWS through general assistance and the use of the Field Station grounds and boat launch.
- Provided maintenance and managed the equipment and assets located at the Great Lakes Center Field Station.
- Made numerous strategic purchases and installations that enhanced the Field Station's operational and research capacity.
- Worked on Field Station conference room updates, through the addition of educational Great Lakes bathymetric maps and historic photographs.
- Worked with Buffalo State Property Control and the SUNY Research Foundation to manage both state-owned and grant-awarded assets.
- Ensured boats, vehicles, and equipment were properly stored and maintained.
- Continued to surplus obsolete equipment and create space for upgrades.
- Completed the installation of a gravel access road between the Field Station and the lower lot, which makes the Field Station more secure and functional regarding vessel transport and parking.
- Cleared debris and secured Field Station grounds after the destructive Halloween storm of 2019.
- Worked with Environmental Health and Safety to clean and remove chemicals from our storage shed to create a safer storage space for WNY PRISM.
- Helped ensure the Field Station has proper safety measures in place to help keep everyone using the facility safe during the COVID-19 pandemic.

Kit Hastings

- Participated in field collection and laboratory studies on multiple projects conducted at the Field Station.
- Wrapped up the Lake Erie Lower Trophic Level Monitoring Project: finished processing samples, submitted data, wrote a report, and archived samples.
- 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.
- Managed the GLC website.
- Assisted in lab work associated with the Great Lakes Long-term Biological Monitoring Program and Lake Ontario CSMI projects (mounted oligochaetes and chironomids slides and identified oligochaetes).
- QAQC manager for the Great Lakes Benthos Barcoding grant.

- Accompanied Buffalo Riverside Academy on the River Queen field trip and gave a talk about the Great Lakes and water quality sampling techniques.
- Member of the Buffalo State Institutional Animal Care and Use Committee.
- Member of Buffalo State Bengal Allies.
- Member of WNY GIS Users Group.
- Member of NYS GIS Association.
- Member of the International Association for Great Lakes Research.
- Member of oSTEM.

Alexander Karatayev

- Organized Great Lakes Center Open House (September 13, 2019).
- Published Great Lakes Center 2018–2019 Annual Report (August 2019).
- Personnel Committee member, Biology Department.
- Supervised an internship of two international visiting scholars, Ph.D. students Martyna M. Bakowska and Natalia Mrozinska, from Kazimierz Wielki University in Bydgoszcz, Poland, at the Great Lakes Center (June 15–September 15, 2019).
- Established a formal collaboration for joint research and student exchange (Agreement of Cooperation) between Buffalo State and Kazimierz Wielki University in Bydgoszcz, Poland.
- Organized Lake Michigan CSMI 2020 Planning Meeting, March 12–13, 2020, Buffalo.
- Search committee member for the Research Scientist position at GLC, Fall 2019.
- Participated in writing report from CSMI 2018 Lake Ontario: Data Synthesis and Reporting for Management and Policy Making Workshop at the Great Lakes Center at Buffalo State.
- Session Chair of E1: Emerging Vectors, Pathways and Invasion Threats at 21st International Conference on Aquatic Invasive Species, Montreal, Canada, October 2019.
- Editor of the Special Issue of the Journal of Great Lakes Research dedicated to Lake Ontario.
- Participated in preparation of the State of the Great Lakes 2019 Report.
- Attended meeting with GLNPO in Chicago (February 2020) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Participated in GLRI DNA barcode workshop, February 19–21, 2020, Bridgeport, New York.
- 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.
- External examiner of the doctoral dissertation of O. N.by Olesya Kormilets, "Fatty acids in the food webs of freshwater ecosystems." Siberian Federal University, Krasnoyarsk, Russia, October, 2019.
- Member of the International Planning Committee for the joint meeting of European Large Lakes Society and International Association for Great Lakes Research in Petrozavodsk in 2021.
- Campus Representative for the Great Lakes Research Consortium.
- Member of Freshwater Mollusk Conservation Society ad hoc International Committee.
- 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.

- Reviewed manuscripts for *Hydrobiologia*, *Journal of the Great Lakes Research*, and *Diversity and Distribution*.

Christopher Pennuto

- Graduate Committee member, Biology Department.
- Admissions Committee Chair for GLES Master Programs.
- Coordinator, GLES master's programs.
- College Personnel Committee member.
- Chair, Personnel Committee, Biology Department.
- Reviewed manuscripts for *Oikos*, *Biological Invasions*, *Aquatic Invasions*, and *Ecology of Freshwater Fish*.

Alicia Pérez-Fuentetaja:

- Chair and editor of final document for Great Lakes Center Goals for 2030.
- Chair of Personnel Committee, Biology Department.
- Major Advisor/Supervisor for three M.A. Biology graduate students: Benjamin Szczygiel, Amy Cavanaugh, and Shawn Witte.
- Chair and Major Advisor for M.A. in Biology Comprehensive Exam students.
- Committee member for one Biology M.A. graduate student.
- Academic Advisor for 13 undergraduate students in Biology.
- Served as a Ph.D. Committee Member for two students at (Environmental) Chemistry Department at University at Buffalo.
- Member of Steering Committee for the Ramsar denomination of the Niagara River (USA side), which was federally approved in October 2019.
- Member Association of Great Lakes Research.
- Member Association for the Sciences of Limnology and Oceanography.
- Reviewed articles for *Journal of Great Lakes Research* and *Journal of Hazardous Materials*, and reviewed grant proposals for the Great Lakes Research Consortium.

V. Professional Development Activities

Brian Haas

- Participated in NYDEC webinars that pertain to my field of study.
- Attended local meetings outside of work to gain more knowledge on a variety of topics concerning the Great Lakes.
- Learned the formal process for equipment loans to other colleges.

Kit Hastings

- Attended training courses: webinar "Web Accessibility Standards" on 2/11/2020; SUNY Accessibility Week: "Introduction to PowerPoint Accessibility," "Creating Accessible Word Documents," and "Improving PDF Accessibility" on 5/20/2020, and "Introduction to Audio/Visual Accessibility" and "The Importance of Captioning and How it's Done" on 5/21/2020; QPR Suicide Prevention Gatekeeper Training on 6/15/2020.
- Deque University Accessibility certification: "Accessibility Fundamentals - Disabilities, Guidelines, and Laws," "Designing an Accessible User Experience," "Basic Web and Document Accessibility for Content Contributors," "MS Word Accessibility," "MS PowerPoint Accessibility," "Basic PDF Accessibility," "Advanced PDF Accessibility," "InDesign Accessibility," "Excel Accessibility," "EPUB Accessibility."

VI. Field Station Activities

In 2019–2020, we continued to work on the Osprey Nesting Platform and Habitat Enhancement Project, funded through the Niagara River Greenway Commission in 2018 ($94,104, PI's Clapsadl, Haas, and Hastings). The work during this time has focused on placing additional perennials and woody plants in the plantings that were created as part of this project. All plants used are native plants selected for their potential to provide food, cover, and nesting sites for migrating and local birds. Photos on page 33.

We experienced record water levels along the Black Rock Channel this past year and on Halloween of 2019, a powerful windstorm created a very large seiche. An estimated 8 foot-plus rise in water levels damaged significant portions of the shoreline. Large rocks and other debris were scattered across the shoreline and a deep layer of large rock and gravel was deposited in the boat ramp, rendering the ramp unusable. We have been working with campus Facilities Management to secure federal disaster funding to pay for remediation of the site, but those repairs are likely months in the future. In the interim, Field Station staff are attempting to remove enough material by hand to regain the ability to launch at least some of the smaller vessels.

We have also continued to upgrade and maintain the GLC laboratory facilities with the addition of outside water access and improved use of pre-existing capacity for safe herbicide storage for the WNY PRISM team.

We have continued to maintain a rigorous regular maintenance program 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.

We provided field and laboratory support for multiple faculty and student research projects, including, but not limited to operating the GLOS (Great Lakes Observing System) buoy in Lake Erie off Dunkirk, New York, and sampling round goby in the eastern and central basins of Lake Erie.

Like everyone else, we have felt the impacts of COVID-19 restrictions on our day to day activities. It has sometimes been challenging, but we have been successfully providing support to researchers, students and others. We will continue to try and find ways to safely support the needs of those who rely on the GLC Field Station.

Brian Haas inspecting a section of shoreline with major erosion showing the loss of lawn from the high waters.

Stone deposited in the boat launch from the storm, filling most of the ramp with gravel of various sizes.

VII. Western New York PRISM Activities

WNY PRISM works to address invasive species priorities using a coordinated partnership network, for which we provide leadership, information management, and opportunities for collaboration. 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 eight-county region. By fostering regional collaboration, the impact of invasive species will be minimized, and the natural resources and beauty of Western New York will be preserved.

The WNY PRISM office was established in 2014. Over the past six and a half years, it has collected over 7,500 invasive species presence/absence data points, held 272 educational events, conducted 23,129 boat inspections, hired 76 seasonal employees and worked with 159 partner organizations and agencies. WNY PRISM received a second 5-year contract that began January 1, 2019, which will provide funding through December 31, 2023. Combined with additional project funding, the contract supports five full-time staff members.

Program Highlights and Accomplishments

The WNY PRISM office focused on program assessment and development this year. The most significant effort involved the development of a 5-year strategic plan to coincide with the new contract. This effort took place alongside: the implementation of a new regional Watercraft Inspection Stewardship Program, which moved from a two-launch pilot project in summer 2018 to a 22-launch program in summer 2019; the development of an expanded early detection and response program; improved Crew Assistance Program; and a new strategic approach to social media. New regional early detection species data collection protocols and general survey protocols were developed to encourage greater consistency in data collection among partners and to ensure necessary data is being collected. WNY PRISM also received a 2020 Environmental Excellence Award, presented by the Erie County Environmental Management Council.

WNY PRISM addresses invasive species issues as identified within the Strategic Plan and in accordance with established Core Functions: Partnership Coordination, Information Management, Education and Outreach, Prevention, Early Detection/Rapid Response, and Habitat Management and Restoration.

Partner/Network Coordination

- Held 2 Full Partner Meetings and Quarterly Steering Committee Meetings.
- Participated in PRISM Leader's Quarterly Meetings and Monthly webinar series.
- Completed new WNY PRISM five-year Strategic Plan.
- Released 2020 Annual Work Plan.
- Posted, interviewed and hired 2020 Seasonal Positions (1 E&O, 3 ISMA, 16 Boat Stewards, 2 Lead Stewards, 1 GIS Technician, 2 Survey and Monitoring Technicians).
- Served on the Great Lakes *Phragmites* Collaborative Advisory Committee.
- Participated in Great Lakes Action Agenda Meetings.
- Participated in *Hydrilla* Collaborative and NYS *Hydrilla* Meetings.

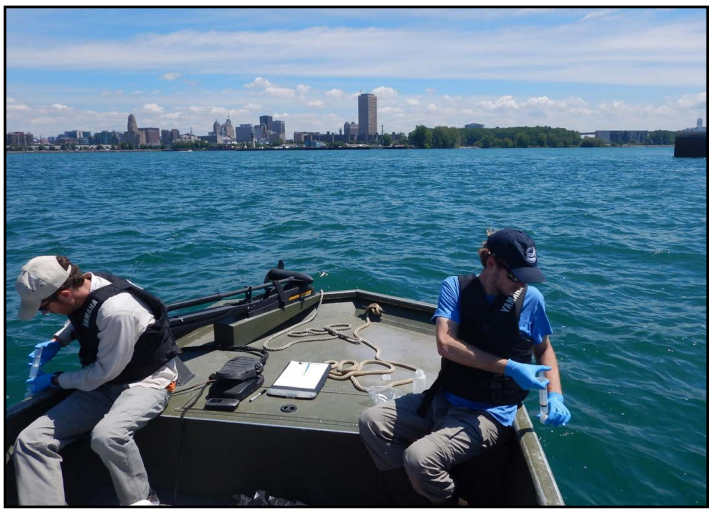
WNY PRISM held their Fall Partner Meeting at the Cornell Cooperative Extension Office, part of the Roycroft Campus in East Aurora. Credit: WNY PRISM

- Established formal Western New York Water Chestnut Working Group and facilitated meetings and communication.
- Participated in NYS Invasive Species (IS) Priorities Setting Meetings.
- Participated in WNY and Chautauqua County Forest Pest Taskforces.
- Served as regional representative for NYS Department of Environmental Conservation's Pesticide Regulations Stakeholder Meetings.
- Provided grant proposal and invasive species management plan review for partners.
- Provided Letters of Support to partners seeking grant funds.

Information Management

- Finalized early detection site assessment form and data collection protocols.
- Developed multiple Survey123 and iMapInvasives (iMap) Advanced mobile surveys for field data collection.
- Fully adopted NYS Invasive Species Tier Ranking System and reclassified species.
- Identified data gaps within iMap for project planning.
- Implemented 6 invasive species mapping projects and submitted 600 observations, including 42 species, from efforts in 9 counties.
- Provided survey summaries and management recommendations to partners.
- Accepted NYS Tree of Heaven Mapping Trophy for uploading more Tree of Heaven observations to iMap than any other PRISM region.
- Worked with partners to identify invasive species research needs and coordinated with New York Invasive Species Research Institute.
- Maintained WNY PRISM Listserv serving 309 members (as of March 2020).
- Released bi-monthly eNews featuring News, Funding Opportunities, and Events in WNY.
- Assisted with sample collection for NYS eDNA Harbors Project.
- Maintained online resources including documents identifying contractors, private lands programs, grants and native plant suppliers.

WNY PRISM 2020 Field Crew conducting invasive species surveys. Credit: WNY PRISM



WNY PRISM assisted Dr. Paul Simonin with the collection of eDNA samples in support of the NYS eDNA Harbors Project. Credit: WNY PRISM

Education and Outreach

- Released Spring and Fall Newsletters.
- Finalized WNY PRISM Trifold informational brochure.
- Developed WNY PRISM informational banners and flags.
- Published Best Management Practices for Mile-A-Minute.
- Coordinated NY Invasive Species Awareness Week events for the WNY PRISM region, for 2019 (July 7–13, 2019) and 2020 (June 7–13, 2020), including a total of 34 events.
- Conducted outreach at 17 events, held 4 workshops, 4 volunteer workdays, and gave 25 presentations.
- WNY PRISM made 2,324 direct contacts, and the combined number of attendees at all outreach related events reached 72,181 (not including the estimated 1.24 million Erie County Fair attendees).
- Provided 2,770 pieces of outreach materials to partners for project use and further distribution.
- Social Media:
    - Facebook: 489 page likes, 150 published posts, reached 42,283 users, generated 4,558 clicks, and led to 3,052 engagement actions.
    - Instagram: 324 followers, 122 published posts, generated 2,613 likes, and drove 123 people to the WNY PRISM website.

Prevention

- Watercraft Inspection Steward Program (WISP):
    - Received 2020 Environmental Excellence Award.
    - Created WISP Project Page
    - Conducted a two day online training for 18 Boat Stewards in 2020.
    - Boat Stewards staffed 22 public boat launches in summer 2019 and 19 public boat launches in 2020.
    - Data showed a 95% acceptance rate, with 2,156 Aquatic Invasive Species interceptions.
    - Conducted 17,850 inspections and 41,290 interactions.
    - 72% of Boaters have had previous contact with a Boat Steward, up 12% from the same time last year.
    - Produced weekly and monthly reports on Boat Steward data collection and interactions.

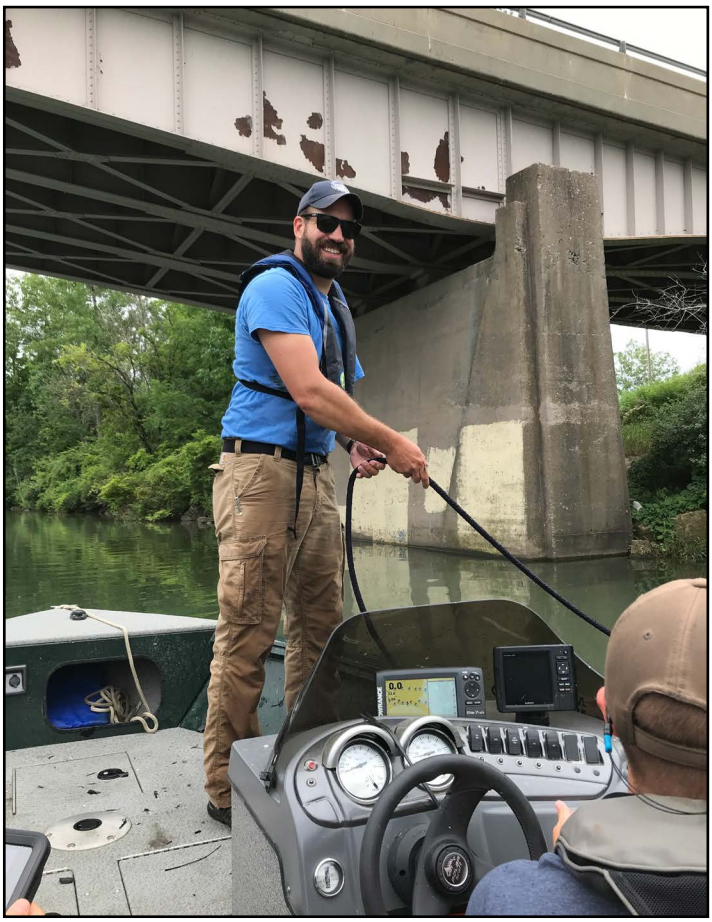
WNY PRISM Boat Steward inspecting a boat in 2019, at Prendergast Point on Chautauqua Lake. Credit: WNY PRISM

- Developed and placed seven Boot Brush Stations in 2019.
- Received eight Boot Brush Station requests in 2020, selected and developed seven stations.
- Developed protocol for the selection of new species to the Approaching Region priority species list.

Early Detection and Rapid Response

- Conducted 40 Japanese stiltgrass surveys including new and previously identified sites. Eight new infestations were discovered.
- WNY PRISM implemented removal at ten Japanese stiltgrass sites and 23 previously managed had no observed plants in 2019.
- Facilitated WNY Mile-a-Minute Working Group meetings and communication, and assisted partners with removal and outreach efforts.
- For the first time since 2014, no new water hyacinth populations were reported in WNY, and all known sites had no plants observed.
- Worked with Tonawanda Creek/Erie Canal *Hydrilla* Demonstration Project Partners to continue surveys, management, and outreach.
- Assisted with Orchard Park *Hydrilla* effort with surveys and outreach.
- Held quarterly (four) Great Lakes Slender False Brome Working Group meetings.
- Conducted 34 site surveys for slender false brome, identifying fourteen new infestations. Of these, nine were removed by hand, three were treated with herbicide, and the remaining two will need to be addressed in the future.
- Results from slender false brome management research aided in the development of Best Management Practices and a Management Technical Guide.
- Distributed spotted lanternfly and Asian giant hornet information to partners.

WNY PRISM treated Japanese stiltgrass (*Microsteginum vimineum*), an early detection priority species, at Hunters Creek County Park, near Wales. Credit: WNY PRISM



WNY PRISM Boat Stewards assisted NYS DEC and USACE-Buffalo District with pre-treatment *Hydrilla* surveys in Tonawanda Creek. Credit: WNY PRISM

Management and Habitat Restoration

- Implemented invasive species removal projects at Seneca Bluffs Natural Habitat Park, Kenneglenn Scenic and Nature Preserve, Niagara Escarpment Preserve, SUNY Fredonia's

College Lodge, North Tonawanda Audubon Preserve, Rosche Preserve (formerly Conewango Wetland Preserve), Audubon Community Nature Center, Woodlawn Beach State Park, and Bergen Swamp, among others.

- Crew Assistance Program:
  - Completed identified 2019 projects that included three survey projects and 14 invasive species removal projects. Projects resulted in 302 acres surveyed and 63.9 acres of invasive species removal.
  - Released 2020 Crew Assistance Program Request for Projects. Received 21 requests for assistance from 13 partners across six counties. Selected ten new projects for 2020.
- Assisted with Niagara County Soil and Water Conservation District's Japanese Knotweed Eradication Program, implementing knotweed removal activities on eight sites totaling five acres.
- Implemented 112.7 acres of invasive species removal as part of the Priority Lands Invasive Species Removal and Volunteer Monitoring Program.
- Held Seneca Bluffs Natural Habitat Park Restoration Project Stakeholders Meeting.
- Assisted partners in development of invasive species and restoration management plans.

WNY PRISM 2020 Field Crew took an early season look at an upcoming invasive species removal project at Tifft Nature Preserve. Credit: WNY PRISM

- Met with partners to discuss new and ongoing management projects.

Projects

Great Lakes Slender False Brome Working Group

Slender false brome (*Brachypodium sylvaticum*) is an invasive species of grass that threatens a wide range of habitats including forests, wetlands and grasslands, and is capable of dominating areas to the near complete exclusion of native species. A large infestation was discovered in New York in 2009, far from all other known occurrences in the Pacific Northwest. The Great Lakes Slender False Brome Working Group provides information and coordination for this species within the Great Lakes Basin, with a focus on New York. Work includes species surveys, development of Best Management Practices, implementation of removal projects and regional outreach.

WNY PRISM successfully completed the project as identified by Great Lakes Restoration Initiative funding, which ended December 31, 2019. However, WNY PRISM continues to address slender false brome. WNY PRISM continues to facilitate the Working Group, conduct research, and implement management.

WNY PRISM's 2019 Field Crew manually removed slender false brome from Genesee County Park and Forest. Credit: WNY PRISM

Priority Lands Invasive Species Removal and Volunteer Monitoring Program

The goal of this project is invasive species removal and monitoring efforts on high conservation value lands located within Erie and Niagara Counties, owned by the WNY Land Conservancy and Buffalo Audubon Society. WNY PRISM is continuing work to remove invasive shrubs from identified sites: Owens Falls Sanctuary, Niagara Escarpment Preserve, and Stella Niagara Preserve. Target species include Japanese barberry, common buckthorn, bush honeysuckle, multi-flora rose and knotweed species. This project will result in a sustainable level of ongoing management needs and will allow for the natural regeneration of native plant communities present within the project sites. WNY PRISM has received a one-year no-cost time extension due to COVID-19 limiting our ability to complete deliverables.

Rapid Response and Early Detection of Slender False Brome and Japanese Stiltgrass in Western New York

Early detection of priority invasive species require rapid response to control current infestations and move toward the end goal of eradication in a region. Two early detection species of concern are slender false brome (*Brachypodium sylvaticum*) and Japanese stiltgrass (*Microstegium vimineum*). Both grasses can displace native species and form dense monocultures. In order to achieve the goal of eradication, this project will perform a slender false brome removal in conjunction with surveys for these two early detection species in areas near known infestations to document the extent of their presence and distribution.

WNY PRISM worked at Tifft Nature Preserve to remove common buckthorn from upland areas connecting, and adjacent to, vernal pool restoration sites. Left: Before/during removal. Right: After removal. Credit: WNY PRISM

Restoration for Enhanced Resiliency Against Invasive Species Re-establishment in Managed Sites.

Invasive species pose a serious threat to the environment including significant negative impacts to the native plant communities necessary for providing ecosystem services such as nutrient filtration, air and water quality, pollinator habitat, runoff capture, and erosion control. WNY PRISM developed native seed mixes of species with demonstrated characteristics that will allow for increased competitiveness against invasive species. This project provides for the purchase of native seed mix for the restoration of ten acres within the Lake Erie Watershed.

Mosquito Junction Swamp Restoration at Tifft Nature Preserve.

Extensive invasive species removal and habitat restoration has taken place at the Buffalo Museum of Science Tifft Nature Preserve, mostly focused on the remnant marsh areas. This project will focus on the important transitional areas between the marsh and additional wetlands and upland areas that continue to be threatened by invasive species. Through a collaboration with Tifft Nature Preserve and the Lyceum at Silo City, WNY PRISM will work to enhance and restore the 14 acres that make up the Mosquito Junction area of Tifft Nature Preserve. Efforts will include invasive species removal and native plant restoration.

Collaborators

WNY PRISM Steering Committee Members

- Sharon Bachman, Cornell Cooperative Extension of Erie County
- Jennifer Dunn, New York State Department of Environmental Conservation
- Paul Fuhrmann, Ecology & Environment, Inc.
- Lynn Greer, U.S. Army Corps of Engineers – Buffalo District
- Aaron Heminway, New York State Office of Parks, Recreation and Historic Preservation
- Colleen Kolb, U.S. Fish and Wildlife Service – Lower Great Lakes Fish and Wildlife Conservation Office
- Monica Miles, New York Sea Grant
- Marcus Rosten, Buffalo Niagara Waterkeeper
- Mike Shaw, U.S. Department of Agriculture – Natural Resources Conservation Service
- Bob Smith, New York State Certified Nursery and Landscape Association
- Jonathan Townsend, Roger Tory Peterson Institute
- Alisia Vilonen, New York State Department of Transportation

Invited Talks

Presentations, Workshops and Trainings

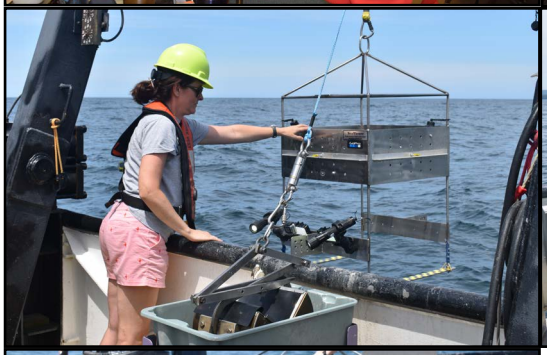
1. Locke, A. Seneca Bluffs Walk and Talk. Erie County Environment and Planning, Seneca Bluffs Natural Habitat Park, Buffalo, New York, July 9, 2019.
2. Locke, A. Speaker Series: Buffalo River Invasive Species ID and Removal. Buffalo Niagara Waterkeeper, Buffalo, New York, July 11, 2019.
3. Hernon, B. Common Backyard Invasive Species. Friends of Letchworth State Park, 2nd Annual Stewardship Day, Castile, New York, July 22, 2019.
4. Locke, A. Niagara Gorge Restoration Project. Western New York Land Conservancy, Niagara Gorge, Niagara Falls, New York, August 1, 2019.
5. Hernon, B. Slender False Brome Management Workshop. Genesee County Park and Forest, East Bethany, New York, August 8, 2019.
6. Thiel, E. iMapInvasives Introduction. Alfred University, Virtual, September 12, 2019.
7. Hernon, B. Assessing Best Management Practices for Slender False Brome. NAISMA (North American Invasive Species Management Association) Annual Conference, Saratoga Springs, New York, October 1, 2019.
8. Thiel, E. Water Quality and Environmental Impact Day with the Riverside Community High School. Canalside, Buffalo, New York, October 7, 2019.
9. Locke, A., and B. Hernon. WNY PRISM Fall Partner Meeting. East Aurora, New York, October 24, 2020.
10. Thiel, E. An Introduction to WNY PRISM and Western New York's Forest Pests. Forum on Chautauqua County's Invasive Forest Pests. Roger Tory Peterson Institute, Jamestown, New York, November 7, 2019.

WNY PRISM held a Management Workshop for slender false brome and participants toured the management research plots at Genesee County Park and Forest. Credit: WNY PRISM

11. Locke, A., and E. Thiel. Town of Tonawanda Board Meeting – Rails to Trails Program. Tonawanda, New York, November 18, 2019.
12. Locke, A. Orleans County Master Gardener Class, Invasive Species and Pollinators. Orleans County CCE, Albion, New York, December 4, 2019.
13. Thiel, E. Invasive Species Resources for Educators. Educator Development Day in Agriculture Based Education, Hamburg Fairgrounds, Hamburg, New York, January 24, 2020.
14. Thiel, E. Hemlock Woolly Adelgid Survey and Volunteer Training. Chestnut Ridge Park, Orchard Park, New York, February 8, 2020.
15. Locke, A., and E. Thiel Town of Tonawanda Rails to Trails Volunteer Training. Town of Tonawanda, Tonawanda, New York, February 13, 2020.
16. Locke, A. Update on Early Detection Priorities. 28th Annual Rural Landowners Workshop, Yorkshire, New York, March 7, 2020.
17. Thiel, E. Mapping Invasive Species on Your Private Property. 28th Annual Rural Landowners Workshop, Pioneer Central School, Yorkshire, New York, March 7, 2020.
18. King, K. Aquatic Invaders and How They Impact Your Property. 28th Annual Rural Landowners Workshop, Pioneer Central School, Yorkshire, New York, March 7, 2020.
19. Locke, A. Invasive Species in the Landscape. South Towns Garden Club, West Seneca, New York, March 13, 2020.
20. Thiel, E. Hemlock Woolly Adelgid Survey and Volunteer Training. Emery Park, South Wales, New York, March 14, 2020.
21. Hernon, B. Survey, Assessment, and Management Resources. WNY PRISM Spring Partner Meeting, Webinar, April 16, 2020.
22. Thiel, E. Invasive Species in Your Garden. Erie County Master Gardeners, Erie County Cornell Cooperative Extension, Virtual, April 30, 2020.
23. Hernon, B. Early Detection Webinar. WNY PRISM Webinar Series 2020, Buffalo, New York, April 30, 2020.
24. Locke, A. WNY PRISM Spring Partner Meeting, Webex, Buffalo, New York.
25. Locke, A. Birds and Invasives. WNY PRISM Spring Webinar Series 2020, Buffalo, New York, May 7, 2020.
26. Nuessle, L. Boot Brush Program and Installation. WNY PRISM Spring Webinar Series 2020, Buffalo, New York, May 14, 2020.
27. Hernon, B., A. Locke, L. Nuessle, M. Rosten, and E. Thiel. Ask an Expert. WNY PRISM Spring Webinar Series 2020, Buffalo, New York, May 28, 2020.
28. Hernon, B. Invasive Species Identification and Management. Friends of Letchworth State Park, 3rd Annual Stewardship Day, Webinar, May 30, 2020.
29. Nuessle, L. Invasive Species: Identification, Management and Native Alternatives. Remote webinar for the Chautauqua County Master Gardeners Training Program, Buffalo, New York, June 17, 2020.
30. Thiel, E. Frequently Asked Invasive Species Topics for Gardeners. Remote webinar for WNY Master Gardener Volunteers, Buffalo, New York, June 6, 2020.
31. Dolan, D., and E. Thiel. iMapInvasives Training and Mapping Challenge. Remote webinar for New York's Invasive Species Awareness Week, Buffalo, New York, June 12, 2020.

For more information: WNY PRISM
Annual Reports and the 5-year Strategic Plan



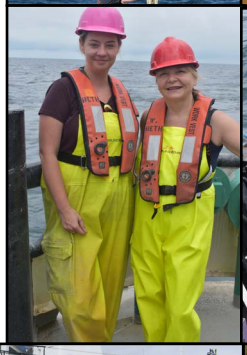
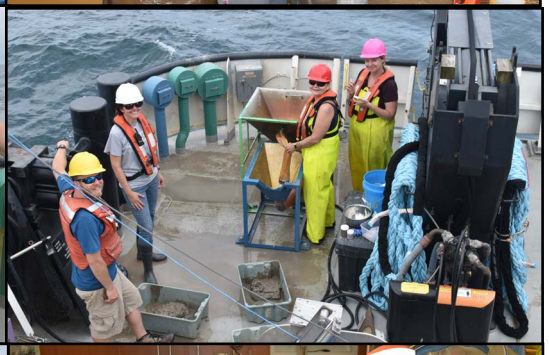



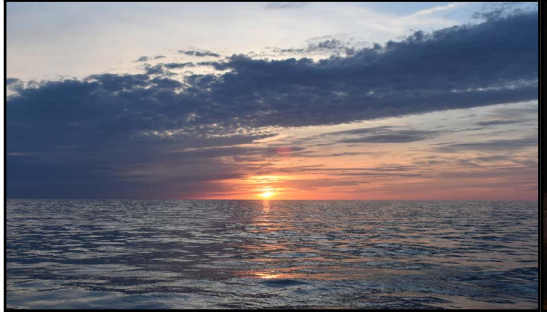

Lake Erie Benthic Survey

July 2019

Great Lakes Long-Term Biological Monitoring Program Cooperative Science and Monitoring Initiative




Field Station Habitat Gardens

2019