



Annual Report 2020–2021



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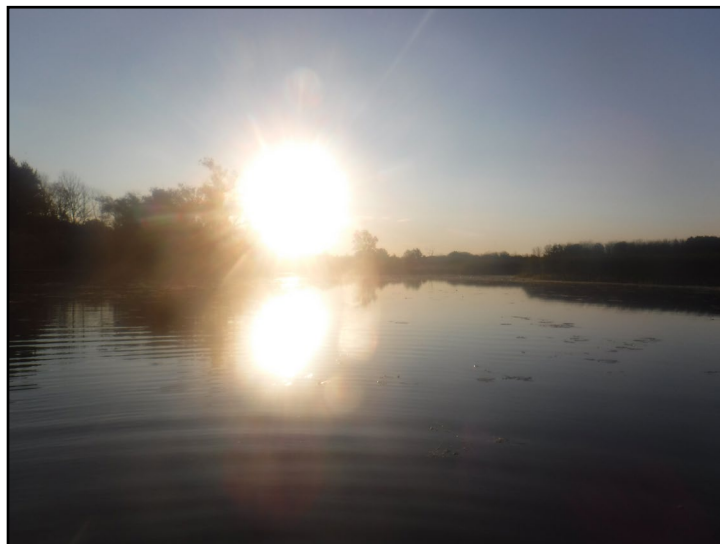
MISSION

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

- Over the last year our researchers have published **15 peer-reviewed papers**, and **8 papers** were submitted for publication.
- We presented **31 talks**, including 18 at national/international/regional conferences and 13 invited talks.
- Fifteen projects for research and education, including three newly received in 2019–2020, are currently funded in the GLC totaling **\$11,123,603**, including **\$7,467,444** for Buffalo State.
- **Ten students** were enrolled in Great Lakes Environmental Science M.A. and M.S. programs.
- **Two issues** of GLC [newsletters](#) were produced over the last year.



The sun rises over Burnt Ship Creek on Grand Island, New York.

I. Staff

GLC Personnel

Director:	Alexander Karatayev
Research Scientists:	Lyubov Burlakova Mark Clapsadl (Field Station Manager) Susan Daniel Allison Hrycik Christopher Pennuto Alicia Pérez-Fuentetaja
Research Technicians:	Brian Haas Erik Hartnett Kit Hastings Brienne Tulumello
Administrative Assistant:	Susan Dickinson
WNY PRISM Coordinator:	Andrea Locke
Program Managers:	Brittany Hernon, Terrestrial Invasive Species Nicole Smeenk, Aquatic Invasive Species
Student Research Assistants:	Kyle Glenn, Graduate Student, Buffalo State College Alexander Krest, Graduate Student, Buffalo State College Kylie Wirebach, Graduate Student, Buffalo State College Kira Yerofeev, Graduate Student, Buffalo State College

WNY PRISM Seasonal Employees:

- Greer Barclay, Niagara University (2021)
- Sonya Bayba, Buffalo State College (2021)
- Nathaniel Beard, Allegheny College (2021)
- Julia Biondi, SUNY Potsdam (2020)
- Melissa Boglioli, Cornell University, UMass Auburn (2018–2021)
- Nicholas Brown, University at Buffalo (2021)
- Michele Carmalia, Erie Community College (2019–2020)
- Bryan Colby, Susquehanna University (2020)
- Kelly ‘Layla’ Crabtree, Fredonia (2019–2020)
- Riley Delpriore, SUNY Cobleskill (2020)
- Alexandra DePonceau, Penn State (2019–2020)
- Danielle Dolan, University at Buffalo (2020)
- Lily Engebrecht, Canisius College (2020)
- Aubrey Franks, College at Brockport (2021)
- Amanda Gabryszak, SUNY Environmental Science & Forestry (2019–2021)
- Noah Gerstein, University at Buffalo (2021)
- Mia Giannini, University at Buffalo (2021)
- Devyn Goldberg, University at Buffalo (2020)
- Bianca Gonzales, Buffalo State College (2019–2020)
- Matthew Hahn, Buffalo State College (2019–2020)
- Benjamin Halleck, St. Bonaventure University (2021)
- Tyler Harrington, University at Buffalo (2021)
- Emily Harrower, Fredonia (2019–2020)
- Jennifer Kachermeyer, Southern New Hampshire University (2021)
- Jason Kappan, University at Buffalo (2020–2021)
- Colin Kingsbury, Alfred University (2021)
- Daniel Korff, University at Buffalo (2020)
- Samuel Krebs, SUNY Environmental Science & Forestry (2020)
- Alexander Krest, Buffalo State College (2020)
- Anna Lee, SUNY Environmental Science & Forestry

- (2020)
- Vincent Manuela, University at Buffalo (2020–2021)
- Brandon Metzinger, SUNY Cobleskill (2020)
- John Montgomery, Ohio University (2021)
- Elizabeth Morrison, University at Buffalo (2020)
- Nicholette Nowak, University of South Florida St. Petersburg (2021)
- Emily O’Byran, Hobart and William Smith College
- (2021)
- Jarred O’Connor, Buffalo State College (2019–2020)
- Emma Ranney, SUNY Geneseo (2021)
- Heather Reimondo, Canisius College (2021)
- Kyle Serena, University at Buffalo (2020)
- Katrina Smith, University at Buffalo (2020)
- Jesse Stevens, Buffalo State College (2020–2021)
- Lyndzie Vail, University at Buffalo (2021)

GLC Affiliates (at Buffalo State College)

- Kelly Frothingham, Associate Dean for Curriculum and Assessment, School of Arts and Sciences
- Susan McCartney, Director, Small Business Development Center
- Amy McMillan, Professor, Biology Department
- Mary Perrelli, GIS Lab Supervisor, Geography and Planning Department
- Daniel L. Potts, Chair and Associate Professor, Biology Department
- Jonathan Seinen, Assistant Professor, Theater 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

Adjunct Research Scientists

- Zy Biesinger, Fish Biologist, U.S. Fish and Wildlife Service
- Dimitry Gorsky, Fish Biologist, U.S. Fish and Wildlife Service
- Vadim Karatayev, Postdoctoral Fellow at the School of Environmental Sciences, University of Guelph, Guelph, Ontario, Canada
- 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 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 and Forestry, Syracuse
- Mary Alice Coffroth, Department of Geology, University at Buffalo
- Tim DePriest, 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, Lake Ontario Biological Station, Oswego
- Howard Lasker, Department of Geology, University at Buffalo
- David Lodge, Atkinson Center for a Sustainable Future, Cornell University
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- Brendon Sansom, Environmental Engineering, University at Buffalo
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Collaborators at other U.S. Institutions

- Theodore Angradi, U.S. EPA Mid-Continent Ecological Division, Duluth, Minnesota
- Darren Bade, Kent State University, Kent, Ohio
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- Joe Conroy, Ohio Department of Natural Resources, Columbus, Ohio
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- Sergei Katsev, Large Lakes Observatory, University of Minnesota Duluth, Duluth, Minnesota
- Richard Kraus, U.S. Geological Survey, Lake Erie Biological Station, Sandusky, Ohio
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- Katya Kovalenko, Natural Resources Research Institute, University of Minnesota Duluth, Duluth, Minnesota
- 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
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- Isabel Porto-Hannes, Fisheries and Oceans Canada, Burlington, Ontario, Canada
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- Ronaldo Sousa, CIIMAR and Minho University, Braga, Portugal
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- Hanna Zhukava, Department of General Ecology and Methods of Biology Teaching, Belarusian State University, Minsk, Belarus
- Alexandra Zieritz, University of Nottingham Malaysia Campus, Semenyih, Malaysia

International Collaborators

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- Ivan Bolotov, Laboratory of Evolutionary Ecology and Phylogenetics, Federal Center for Integrated Arctic Research, Russian Academy of Sciences, 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
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- Maria Dittrich, Department of Physical and Environmental Sciences, University of Toronto Scarborough, Toronto, Ontario, Canada

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 the Great Lakes in 2012–2019 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 45 papers and presented at multiple talks at regional and international meetings.

Cooperative Science and Monitoring Initiative

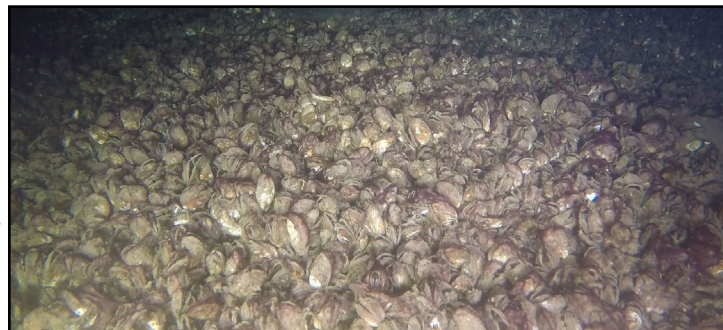
The Great Lakes Monitoring Program by the Great Lakes National Program Office includes both the collection of samples from 57 long-term stations sampled every year and a much more detailed survey conducted on each lake every 5 years within the Coordinated Science and Monitoring Initiative (CSMI). We participated in these surveys in 2014 (Lake Erie), 2015 (Lake Michigan), 2016 (Lake Superior), 2017 (Lake Huron), 2018 (Lake Ontario), and 2019 (Lake Erie). The Lake Michigan survey was cancelled in 2020 due to COVID-19 restrictions. Both Lake Michigan and Lake Superior CSMI surveys are planned for July and September 2021.

Lake Ontario Benthos

The benthos of Lake Ontario has been studied intensively in the last six decades and can provide insights into the impact of environmental changes over time. We used the long-term data and results of our intensive CSMI 2018 benthic survey to examine temporal changes in community composition over the last 54 years and to assess the major drivers of long-term changes in benthos. The paper describing this study has been recently published in the Special Issue of the *Journal of Great Lakes Research* (Burlakova et al., 2021). We found that the benthic community of Lake Ontario underwent significant transformations that correspond with three major periods. The first period, termed the pre/early *Dreissena* period (1964–1990), was characterized by high densities of *Diporeia*, Sphaeriidae, and Tubificidae. During the next period in the 1990s, defined by zebra mussel dominance, the same groups were still prevalent, but at altered densities. In the most recent period (2000s to present), characterized by the dominance of quagga mussels, the community has changed dramatically: *Diporeia* almost completely disappeared, Sphaeriidae have greatly declined, and densities of quagga mussels, Oligochaeta, and Chironomidae have increased. Therefore, introduction of invasive dreissenids has changed the Lake Ontario benthic community, historically dominated by *Diporeia*, Oligochaeta and Sphaeriidae, to a community dominated by quagga mussels and Oligochaeta. Dreissenids, especially the quagga mussel, were the major drivers of these changes over the last half century.

Lake Erie Benthos

In 2019, we collected benthic samples from 85 stations located in all three basins of Lake Erie. During this survey, we enhanced the traditional collection of Ponar bottom grabs with underwater videos using drop-down GoPro cameras and the Sediment Profile Imaging camera. We classified benthic habitats based on analysis of the images for presence and relative abundance of benthic taxa, verified images against infauna data from Ponars, and compared results with water quality data collected at each station via the Sea-Bird profiler casts. We found



A dense patch of dreissenid mussels on the lake bottom in a still image taken from video footage.

four visually distinct habitat types and communities formed by different species assemblages. Benthic taxa abundant in identified habitat types differed in their tolerance to hypoxia, indicating that near-bottom oxygen availability structures Lake Erie benthoscapes.

Early Detection of Mollusks and Annelids in the Great Lakes

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 Lakes National Program Office geared toward genetic barcoding of invertebrate specimens from the Great Lakes. Two additional projects target zooplankton and rotifers (Notre Dame University, and Cornell University) and benthic arthropods (Cornell University). Barcode sequences for collected specimens are generated by the Centre for Biodiversity Genomics, University of Guelph, 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. The results of the project were presented by Susan Daniel at IAGLR and other regional meetings and will be summarized in the 2021 final report.

New method for rapid assessment of Quagga and Zebra mussel populations

The Great Lakes Center, in collaboration with the U.S. Environmental Protection Agency's Great Lakes Biology Monitoring Program and Office of Research and Development-Great Lakes Toxicology and Ecology Division, has developed a new method for rapid assessment of dreissenid mussel populations in lakes. The method uses a Benthic Imaging System (BIS) to estimate population size of these invaders in near-real time. The BIS consists of Go-Pro cameras and lights mounted to a steel frame that is lowered to the lakebed from a ship. The resulting bottom images are analyzed via imaging software to estimate mussel density and percent coverage. The new method substantially reduces the time required to map distributions of dreissenid mussels across large spatial scales compared to traditional sediment collection methods. This increase in spatial resolution and reporting times of monitoring is especially important considering that the quagga mussel is now the primary regulator of phosphorus cycling in the lower four Great Lakes and their tissues and shells now contain nearly as much phosphorus as the entire water columns of the impacted Great Lakes (Li et. al., 2021). The resulting research paper [Rapid assessment of *Dreissena* population in Lake Erie using underwater videography](#) is published online with @SpringerNature in *Hydrobiologia*. This method for *Dreissena* rapid assessment will be applied in Lake Michigan in 2021 and other Great Lakes in the future as a valuable addition to conventional bottom grab monitoring.

Benthos of Laurentian Great Lakes: Inventory of lake-wide surveys

Over 110 lake-wide benthic surveys were conducted on the Laurentian Great Lakes since 1929. However, these studies often are not readily available, and have never been combined in one dataset to preserve historic data. According to our estimations, primary data for at least 20% of all surveys are incomplete or have already been lost. For over three years, the Great Lakes Center has been conducting inventory of benthic surveys for all Great Lakes to create a database with all the available information on species composition, distribution, density, and biomass of benthic invertebrates. Considering the rarity of long-term benthic studies in lake ecosystems, these data set could be useful to explore effects of different environmental factors and exotic species on community organization, for monitoring of water quality, biodiversity, exotic species introduction, fish food base assessment, and other ecosystem services provided by benthic community. Our first complete dataset on the Lake Ontario benthic community includes taxonomic data to the species level for 11 of the surveys and data to the group level for another two surveys covering the last 54 years, and was submitted as a data paper currently in review in *Ecology*.

Partnership for Regional Invasive Species Management (WNY PRISM)

The [Western New York Partnership for Regional Invasive Species Management](#) (WNY PRISM) works to address invasive species priorities using a coordinated partnership for which we provide leadership, technical assistance, 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. This partnership is supported by a NYS DEC Environmental Protection Award through December 2023. For more information on Western New York PRISM Activities, see [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

GLC researchers 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.

Lake Erie Lake Sturgeon: understanding historical and current spawning habitat extent and characteristics

This project is a collaboration with the U.S. Fish and Wildlife Service which began Fall 2019. It will assess all the 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.

Invasive Starry Stonewort and macroinvertebrate communities

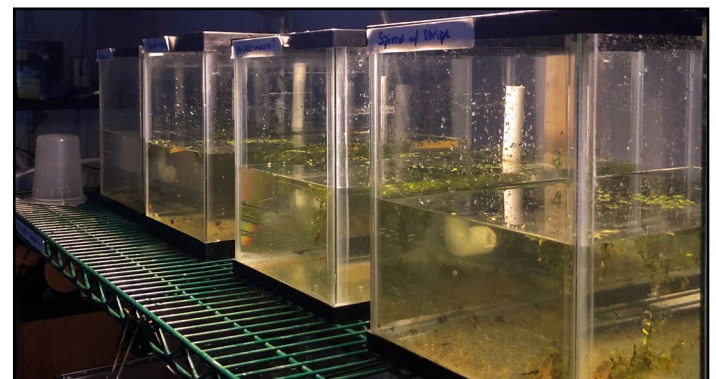
We are investigating the possible community-level impacts of a new invasive plant in the region by comparing macroinvertebrates collected from plant stands with varying abundances of stonewort ranging from no stonewort to 100% stonewort coverage. We have selected 5 locations with infestation meeting these criteria for collections. Additionally, since plant detritus is such an important energy source for a wide range of macroinvertebrate consumers, we are investigating the use of stonewort as a food resource by measuring decomposition rates in natural settings.



A six-pointed star shaped bulbil found on stems of starry stonewort. (Photo credit: Kylie Wirebach)

Does predator-avoidance behavior play a role in detrital food webs

This project will investigate the strength of direct and indirect interactions between benthic predators and their snail prey, and the resultant influence on detrital processing rates. Round gobies (an invasive benthic fish) and native crayfish are both snail predators, and snails are important in detritus breakdown in wetland habitats. We are using a mesocosm approach to investigate whether a reduction in snail foraging activity (due either to their avoidance of predators or being consumed) translates into slower leaf decomposition.



Snail mesocosms from preliminary work for this project. Future mesocosms will be outside in kiddie pool setups.

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

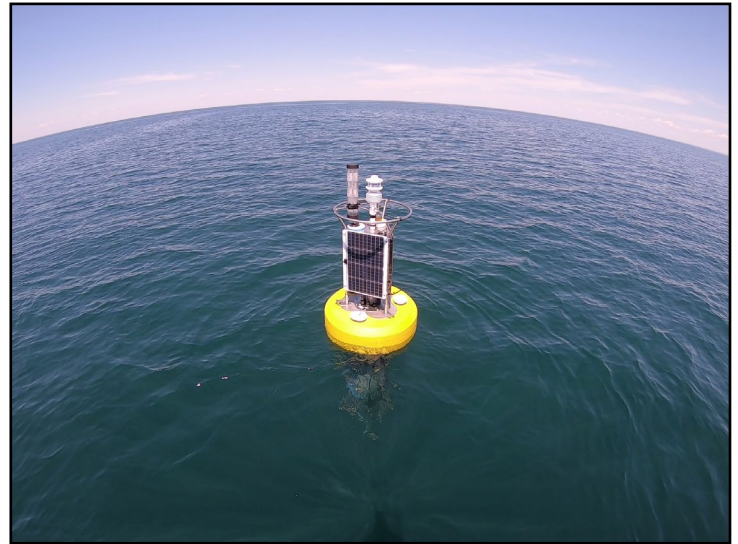
In this project, we are testing different approaches to improving the removal of pharmaceuticals and antibiotics from treated wastewater, using toxicological testing of the organisms exposed to the alternative water treatments. The testing includes LC50 and life history experiments in crustaceans (*Daphnia*) 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.

Effects of calcium decline and climate change on gastropods

In this project, we are looking into the effect of climate change (increased CO₂ 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 CO₂ 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 2021 season. Since spring of 2012, the GLC has been a participating member of the GLOS. 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. It is the only GLOS buoy operating in eastern Lake Erie, making it an important source of information for a variety of stakeholders. During 2019, we had over 19,000 visits to the buoy website, and in 2020, there were over 16,000 visits (reduction due to shortened deployment period as a result of COVID-19).



The new GLOS buoy that was deployed in 2021.

Grants and Funding

Ongoing grants, including three newly received in 2020–2021 (total \$11,123,603, including \$7,467,444 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 2016–2021 GLOS-RA. Cooperative Agreement, SUNY ESF. **\$122,925**. 2016–2021.
3. Burlakova, L. E., and A. Y. Karatayev. DNA Barcode Reference Library: Mollusca, Annelida, and minor phyla. GLRI, U.S. EPA. **\$400,000**. 2017–2021.

4. Burlakova, L. E., and A. Y. Karatayev. EPA-R5-GL2017-ZBC Great Lakes Long-Term Biology Monitoring Program: Zooplankton, Benthos, Mysis, and Chlorophyll-a Components. Request to EPA for additional 2022–2023 funding. **\$287,676**.
5. Clapsadl, M., B. Haas, and K. Hastings. Osprey Nesting Platform and Migrator Habitat Enhancement. Niagara River Greenway Commission. **\$94,014**. 2018–2021.
6. Drake, R., and A. Locke. Invasive Species Management to Protect Rare Habitats at Alexander and Houghton Preserve, Nature Sanctuary Society of Western New York, Inc., U.S. Forest Service Great Lakes Restoration Initiative Cooperative Weed Management Areas. **\$31,320.00 (\$12,118 for Buffalo State)**. 2021–2023.
7. Goodrich, Z. Mosquito Junction Swamp Restoration at Tiff Nature Preserve, Buffalo Museum of Science. Niagara River Greenway Commission Greenway Ecological Standing Committee. **\$344,754 (\$25,700 for Buffalo State)**. 2019–2022.
8. Locke, A. Priority Lands Invasive Species Removal and Volunteer Monitoring Program, The Research Foundation for SUNY Buffalo State, WNY PRISM. U.S. Forest Service Great Lakes Restoration Initiative Cooperative Weed Management Areas. **\$39,999**. 2018–2021.
9. Locke, A. Restoration for Enhanced Resiliency Against Invasive Species Re-establishment in Managed Sites, The Research Foundation for SUNY Buffalo State. Lake Erie Watershed Protection Alliance – Water Quality Implementation Grant Program. **\$7,995**. 2020–2021.
10. Locke, A. Western New York Japanese Stiltgrass (*Microstegium vimineum*) Early Detection and Rapid Response Project, The Research Foundation for SUNY Buffalo State, WNY PRISM. U.S. Forest Service Great Lakes Restoration Initiative Cooperative Weed Management Areas. **\$35,192**. 2021–2023.
11. 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**. 2017–2021.
12. Pennuto, C. Administration of the Western NY PRISM: Partnership for Regional Invasive Species Management. NY DEC. **\$3,499,212**. 2019–2023.
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.

Submitted Grant proposals

1. Burlakova, L. E., and A. Y. Karatayev. EPA-R5-GL2017-ZBC Great Lakes Long-Term Biology Monitoring Program: Zooplankton, Benthos, Mysis, and Chlorophyll-a Components. Request to EPA for additional 2022–2023 funding. **\$287,676**. (Funded).
2. Ercoll, F., L. Burlakova, M. Lopes-Lima, M. Zagars, A. Karatayev, S. Capinha, and F. Collas. Development of Pan European management strategies for the conservation and restoration of ecosystems invaded by dreissenid mussels. Submitted to European Commission, BiodivERsA and Water JPI 2020–2021. “Conservation and restoration of degraded ecosystems and their biodiversity, including a focus on aquatic systems.” **\$480,000**. (Not funded).
3. Farrell, J. M., A. Pérez-Fuentetaja, and M. Clapsadl. 2020. Assessment and Suitability of Habitat Enhancements for Muskellunge Reproduction within the Niagara River and Buffalo Harbor, Lake Erie. Pre-proposal was submitted to the Fish and Wildlife Habitat Enhancement and Restoration Fund (**\$621,422**). A full proposal was requested.
4. Locke, A., and B. HERNON. Western New York Japanese Stiltgrass (*Microstegium vimineum*) Early Detection and Rapid Response Project, The Research Foundation for SUNY Buffalo State, WNY PRISM. U.S. Forest Service Great Lakes Restoration Initiative Cooperative Weed Management Areas. 2021–2024. **\$35,193**. (Funded).

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. Fifteen manuscripts were published, another 8 were submitted to peer-reviewed journals. A total of 31 presentations were made by the GLC researchers, including: 18 presentations at national, international, and regional conferences; and 13 invited talks.

Refereed Journal Publications (published/accepted)

1. Boltovskoy, D., N. Correa, L. Burlakova, A. Karatayev, E. Thuesen, F. Sylvester, and E. Paolucci. 2021. [Traits and impacts of introduced species: A quantitative review of meta-analyses](#). *Hydrobiologia*.
2. Burlakova, L. E., A. Y. Karatayev, A. R. Hrycik, S. E. Daniel, K. Mehler, L. G. Rudstam, J. M. Watkins, R. Dermott, J. Scharold, A. K. Elgin, and T. F. Nalepa. 2021. [Six decades of Lake Ontario ecological history according to benthos](#). *Journal of Great Lakes Research*.
3. 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. *Canadian Journal of Fisheries and Aquatic Sciences*. In press.
4. Hrycik, A. R. and J. D. Stockwell. 2021. [Under-ice mesocosms reveal the primacy of light but the importance of zooplankton in winter phytoplankton dynamics](#). *Limnology and Oceanography*.
5. Jansen, J., S. MacIntyre, D. C. Barrett, Y.-P. Chin, A. Cortés, A. L. Forrest, A. R. Hrycik, R. Martin, B. C. McMeans, M. Rautio, and R. Schwefel. Winter limnology: How do hydrodynamics and biogeochemistry shape ecosystems under ice? *JGR Biogeosciences*. In Press.
6. Karatayev, A. Y., L. E. Burlakova, K. Mehler, L. G. Rudstam, J. M. Watkins, and M. Wick. 2021. [Dreissena in Lake Ontario 30 years post-invasion](#). *Journal of Great Lakes Research*.
7. Karatayev, A. Y., L. E. Burlakova, K. Mehler, E. K. Hinchey, M. Wick, M. Bakowska, and N. Mrozinska. 2021. [Rapid assessment of Dreissena population in Lake Erie using underwater videography](#). *Hydrobiologia*. 848 (9), 2421-2436.
8. Karatayev, A. Y., V. A. Karatayev, L. E. Burlakova, K. Mehler, M. D. Rowe, A. K. Elgin, and T. F. Nalepa. 2021. [Lake morphometry determines Dreissena invasion dynamics](#). *Biological Invasions*.
9. Karatayev, V. A., L. E. Burlakova, A. Y. Karatayev, L. Yang, and T. Miller. 2020. [Advection and habitat loss interactively reduce persistence: maintaining threatened riverine populations while restoring natural flow regimes](#). *Oecologia*. 193: 773-785.
10. Pennuto, C. M., K. Mehler, B. Weidel, B. F. Lantry, and E. Bruestle. 2021. Dynamics of the seasonal migration of Round Goby (*Neogobius melanostomus*, Pallas 1814) and implications for the Lake Ontario food web. *Ecology of Freshwater Fish*. 30(2): 151-161.
11. Porto-Hannes, I., L. E. Burlakova, D. T. Zanatta, and H. R. Lasker. [Boundaries and hybridization in a secondary contact zone between freshwater mussel species \(Family: Unionidae\)](#). *Heredity*.
12. Rudstam, L. G., J. M. Watkins, A. E. Scofield, R. P. Barbiero, L. E. Burlakova, A. Y. Karatayev, K. Mehler, E. D. Reavie, E. T. Howell, and E. K. Hinchey. 2020. Status of lower trophic levels in Lake Huron. Pages 14–45 in S. C. Riley and M. P. Ebener, editors. State of Lake Huron. Great Lakes Fisheries Commission Special Publications 2020-01.
13. Teixeira, J. E., E. Froufe, A. Gomes-dos-Santos, A. E. Bogan, A. Y. Karatayev, L. E. Burlakova, D. C. Aldridge, I. N. Bolotov, I. V. Vikhrev, A. Teixeira, S. Varandas, D. T. Zanatta, and M. Lopes-Lima. 2020. Complete mitochondrial genomes of the freshwater mussels *Amblyma plicata* (Say, 1817), *Pleurobema oviforme* (Conrad, 1834) and *Popenaias popeii* (Lea, 1857) (Bivalvia: Unionidae: Amblymaeinae). *Mitochondrial DNA Part B*. 5:3, 2977-2979, DOI: 10.1080/23802359.2020.1791008.
14. Travis, S. S., A. Pérez-Fuentetaja, and D. S. Aga. 2020. Evidence of continued exposure to legacy persistent organic pollutants in threatened migratory common terns nesting in the Great Lakes. *Environment International*. 144:106065. DOI: 10.1016/j.envint.2020.106065.
15. Yang, B., M. G. Wells, B. C. McMeans, H. A. Dugan, J. A. Rusak, G. A. Weyhenmeyer, J. A. Brentrup, A.

R. Hrycik, A. Laas, R. M. Pilla, J. A. Austin, P. J. Blanchfield, C. C. Carey, M. M. Guzzo, N. R. Lottig, M. D. MacKay, T. A. Middel, D. C. Pierson, J. Wang, and J. D. Young. A new thermal categorization of ice covered lakes. *Geophysical Research Letters*. 48 (3): e2020GL091374.

Refereed Journal Publications Submitted (in review)

1. Burlakova, L. E., A. Y. Karatayev, A. R. Hrycik, S. E. Daniel, K. Mehler, L. G. Rudstam, J. M. Watkins, R. Dermott, J. Scharold, A. K. Elgin, T. F. Nalepa, E. K. Hinchey, and S. J. Lozano. Density data for Lake Ontario benthic invertebrate assemblages from 1964 to 2018. Submitted to: *Ecology*.
2. Chiapella, A., H. Grigel, H. Lister, A. R. Hrycik, B. O'Malley, and J. D. Stockwell. A day in the life of winter plankton: Under-ice community dynamics during 24 hours in a hypertrophic lake. Submitted to: *Journal of Plankton Research*.
3. Haines, A. D. and C. M. Pennuto. Seasonal diet and body condition changes in the Common Mudpuppy (*Necturus maculosus* Rafinesque, 1818) in Western New York. Submitted to: *Journal of Herpetology*.
4. Hrycik, A. R., P. D. F. Isles, R. Adrian, M. Albright, L. C. Bacon, S. A. Berger, R. Bhattacharya, H.-P. Grossart, J. Hejzlar, A. L. Hetherington, L. B. Knoll, A. Laas, C. P. McDonald, K. Merrell, J. C. Nejtgaard, K. Nelson, P. N6ges, A. M. Paterson, R. M. Pilla, D. M. Robertson, L. G. Rudstam, J. A. Rusak, S. Sadro, E. A. Silow, J. D. Stockwell, H. Yao, K. Yokota, and D. C. Pierson. Earlier winter/spring runoff associated with warmer winters corresponds to lower summer chlorophyll-a in north temperate lakes. Submitted to: *Global Change Biology*.
5. Karatayev, A. Y., L. G. Rudstam, V. A. Karatayev, L. E. Burlakova, B. V. Adamovich, H. A. Zhukava, K. T. Holeck, A. L. Hetherington, J. R. Jackson, T. V. Zhukova, T. M. Mikheyeva, R. Z. Kovalevskaya, O. A. Makarevich, and D. V. Kruk. Serial invasions disrupt the time course of ecosystem recovery. Submitted to: *Ecological Applications*.
6. Pennuto, C. M. and J. D. Wagner. Seasonal changes in nearbed and *Cladophora* tissue nutrients in Lake Ontario. Submitted to: *Journal of Great Lakes Research*.
7. Porto-Hannes, I. P., H. R. Lasker, and L. E. Burlakova. Genetic isolation and homogenization: potential effects of waterfalls and man-made canals on the population genetic structure of freshwater mussels. Submitted to: *Conservation Genetics*.
8. Spear, M. J., P. A. Wakker, T. P. Shannon, R. L. Lowe, L. E. Burlakova, A. Y. Karatayev, and M. J. Vander Zanden. Early changes in the benthic community of a eutrophic lake following zebra mussel (*Dreissena polymorpha*) invasion. Submitted to: *Inland Waters*.

Published Reports

1. Hinchey Malloy E., A. Scofield, E. Osantowski, N. Singleton, M. Tuchman, L. Blume, J. Watkins, L. Rudstam, T. Holda, L. Burlakova, A. Karatayev, E. Reavie, R. Barbiero, B. Lesht, J. Lietz, and M. Middlebrook Amos. 2021. Status of the Lower Food Web in the Offshore Waters of the Laurentian Great Lakes: Trends for chemical, physical, and biological variables through 2018. EPA 905-R-20-007.
2. Karatayev, A.Y., L. E. Burlakova, K. Mehler, S. E. Daniel, and A. R. Hrycik. 2021. [Lake Ontario Benthos Survey Cooperative Science and Monitoring Initiative 2018. Technical Report](#). USEPA-GLRI GL00E02254. Great Lakes Center, SUNY Buffalo State, Buffalo, NY.

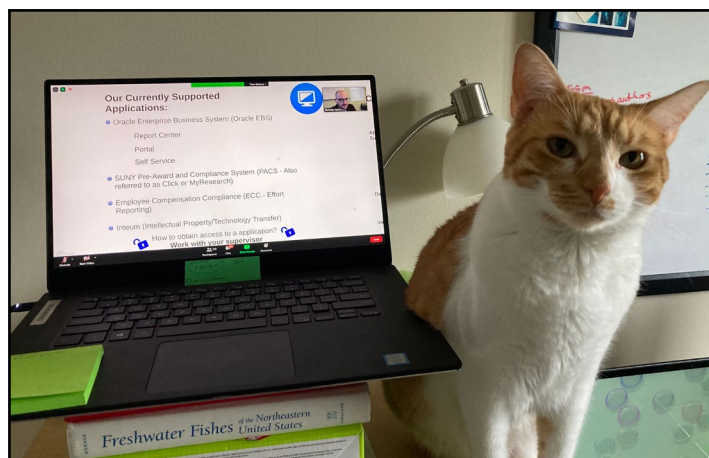
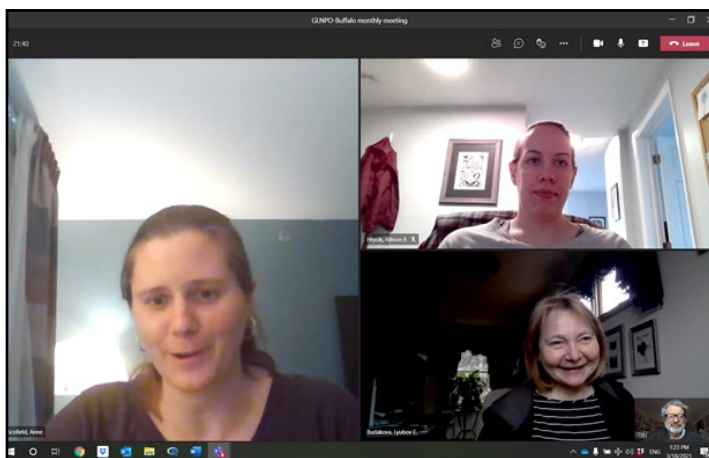
International/National/Regional Conference Presentations

1. Burlakova, L., A. Karatayev, A. Hrycik, S. Daniel, K. Mehler, L. Rudstam, J. Watkins, R. Dermott, J. Scharold, A. Elgin, and T. Nalepa. Six decades of Lake Ontario ecological history according to benthos. State of Lake Ontario. March 9–11, 2021 (Virtual).
2. Burlakova, L. E. and A.Y. Karatayev. Exploring Great Lakes Benthoscapes: Can we visually delineate freshwater benthic communities? 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).

3. 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. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
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. 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).
5. Evans, T., Z. Feiner, L. Rudstam, D. Mason, J. Watkins, E. Reavie, A. Scofield, L. Burlakova, A. Karatayev, and W. G. Sprules. Size spectra analysis in Lake Ontario detects food web changes and provides insight into energy transfer efficiency. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
6. Grimm, A., R. Shuchman, M. Sayers, and C. Pennuto. Long-term and lake-scale satellite monitoring of Lake Ontario *Cladophora*. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
7. Hrycik, A., K. Mehler, L. Burlakova, and A. Karatayev. Lake Ontario *Dreissena* dynamics as revealed by video analysis. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
8. Hrycik, A. R., L. E. Burlakova, A. Y. Karatayev. Biomass estimates for benthic invertebrates of the Great Lakes. 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).
9. Karatayev, A., L. Burlakova, K. Mehler, A. Elgin, L. Rudstam, J. Watkins, and M. Wick. *Dreissena* in Lake Ontario 30 years after the invasion. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
10. Karatayev, A. Y., L. E. Burlakova, A. R. Hrycik. Benthos of Laurentian Great Lakes: Inventory of lake-wide surveys. 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).
11. Krest, A. C. and C. M. Pennuto. 2021. A preliminary comparison of macroinvertebrate communities within invasive Starry Stonewort (*Nitellopsis obtusa*) and native plant stands. Society for Freshwater Science (Virtual).
12. MacLellan-Hurd, R., A. Karatayev, A. Scofield, E. Hinchey Malloy, and L. Burlakova. Dreissenid density effects on sediment nutrient composition and other benthic organisms. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
13. MacLellan-Hurd, R., L. Burlakova, A. Karatayev, S. E. Daniel., A. Scofield, and E. Hinchey Malloy. Invasive dreissenids effects on sediment nutrient composition and other benthic organisms. 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).
14. Neubauer A. K., S. E. Daniel, and K. M. TePas. Scientists to Students! Using Great Lakes video calls to connect with youth learners. 64th Annual Conference on Great Lakes Research. May 18–21, 2021 (Virtual).
15. Pennuto, C. M. 2021. Rapid response of the nearshore round goby population to temperature declines associated with upwelling events in Lake Ontario. NY Chapter American Fisheries Society (Virtual).
16. Pennuto, C., and J. Wagner. Fine scale spatiotemporal dynamics of nutrients in and around *Cladophora* beds. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
17. Rutherford, E., D. Mason, H. Zhang, B. Weidel, B. Lantry, M. Koops, M. Hossain, C. Chu, C. Boston, G. Arhonditsis, L. Rudstam, K. Fitzpatrick, J. Watkins, K. Holeck, T. Johnson, M. Yuille, E. Brown, J. Holden, K. Fitzpatrick, L. Burlakova, T. Stewart, E. Hinchey, R. Portiss, L. Cartwright, and M. Connerton. Modeling Nutrient and Invasive Species Tipping Points on the Lake Ontario Food Web. State of Lake Ontario Conference. March 9–11, 2021 (Virtual).
18. Wirebach, K. and C. M. Pennuto. 2020. Using historic records and habitat suitability analysis for the reintroduction of lake sturgeon (*Acipenser fulvescens*) in Lake Erie tributaries: Preliminary findings. Research & Scholarship Conference, Pennsylvania University System (Virtual).

Invited Talks

1. Burlakova, L. Zebra and Quagga Mussel Impacts on Native Mussels. Invasive Mussel Collaborative Webinar. January 13, 2021.
2. Burlakova, L., A. Karatayev, S. Daniel, K. Mehler, A. Elgin, and T. Nalepa. Lake Huron Benthos: Current State, Long-Term Trends, and Information Gaps. Lake Huron Partnership Working Group. January 28, 2021 (Virtual).
3. Burlakova, L., K. Mehler, and A. Karatayev. Trends in Lake Superior benthos with particular emphasis on the amphipod *Diporeia* spp. Lake Superior Partnership Working Group. March 3, 2021 (Virtual).
4. Burlakova, L., A. Karatayev, and K. Mehler. Updates on Benthos Monitoring Program and Lake Erie Benthoscapes. EPA Great Lakes National Program Office, Chicago. February 17, 2021 (Virtual).
5. Hrycik, A. R., L. Burlakova, A. Karatayev, and S. Daniel. Biomass Estimates for Benthic Invertebrates of the Great Lakes. EPA Great Lakes National Program Office Cooperators' Meeting. February 17–18, 2021 (Virtual).
6. Hrycik, A. R. Effects of changing winter severity on plankton ecology in temperate lakes. Seminar presented to Queen's University Limnology Group. April 14, 2021 (Virtual).
7. Hrycik, A. R., A. Karatayev, and L. Burlakova. Benthos Data. 2019 CSMI Lake Erie Data Sharing Workshop. April 22, 2021 (Virtual).
8. Karatayev, A. Y., L. E. Burlakova, V. Karatayev, M. Rowe, K. Mehler, A. Elgin, and T. Nalepa. Lake morphometry determines *Dreissena* invasion dynamics. Department of Physics and Astronomy, University of Minnesota Duluth, Duluth, Minnesota. March 3, 2021 (Virtual).
9. Karatayev, A., L. Burlakova, K. Mehler, E. Hinchey, M. Wick, M. Bakowska, and N. Mrozinska. Rapid assessment of *Dreissena* population in Lake Erie using underwater videography. EPA Great Lakes National Program Office, Chicago. February 17, 2021 (Virtual).
10. Karatayev, A., L. Burlakova, K. Mehler, and A. Hrycik. Benthos of Laurentian Great Lakes: Inventory of lake-wide surveys. EPA Great Lakes National Program Office, Chicago. February 17, 2021 (Virtual).
11. Daniel, S. E., and A. Neubauer. Invasive Species. Student Ask Scientist Illinois Sea Grant Outreach and Education Presentation. April 28, 2021 (Virtual).
12. Pérez-Fuentetaja, A. A recent invader finds its ecological niche in the Great Lakes: *Hemimysis anomala*, the bloody red shrimp. Buffalo State College. October 26, 2020 (Virtual).



The COVID-19 pandemic altered the way we interacted with our collaborators and colleagues. Instead of in-person meetings, we met over Zoom or Microsoft Teams. Left: The March monthly GLNPO meeting with our EPA colleagues. Clockwise from left, Anne Scofield (EPA), Allison Hrycik, Lyuba Burlakova, and Sasha Karatayev (inset, bottom right). Right: Sometimes, meeting from home meant having our pets attend with us. Allison's cat, Quincy, was a frequent attendee.

III. Education

The GLC fulfills its educational mission directly through the classes its researchers teach, through its Master of Arts 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 MS and MA 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](#) (MA) and an internship-based [Master of Science](#) (MS). 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 2020–2021:

Master of Art:

Lara Hargrave
Alexander Krest
Corinna Solomon

Master of Science:

Taylor Anne Donoughe
Hutong Fan
Stephanie Hanson
Xuejing Hu
Amanda Jacobs
Cecilia Pershyn
Helen Toledo

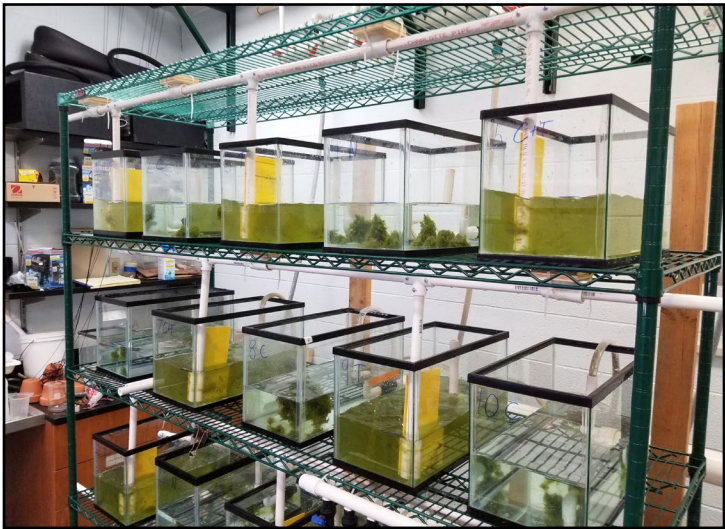
Advising Undergraduate and Graduate Students

- Lyubov Burlakova was a faculty Mentor/Advisor for Sonya Bayba (2018–2020) and a co-advisor for Lara Hargrave, GLES M.A. students. She also presented a lecture at Upper-Level Photography FAR 322, 323, and 420 class “Waste: Socially-Engaged Practice in Photography and Art” (Prof. Yola Monakhov Stockton) and made a commitment to participate in teaching of a new practical theater course (a collaboration between the Great Lakes Center and Theater Department, developed by Jonathan Seinen, Assistant Professor, Theater Department).
- Allison Hrycik was a faculty co-advisor for Lara Hargrave, GLES M.A. student.
- Alexander Karatayev was a committee member for one graduate student. He presented a lecture at Upper-Level Photography FAR 322, 323, and 420 class “Waste: Socially-Engaged Practice in Photography and Art” (Prof. Yola Monakhov Stockton) and made a commitment to participate in teaching of a new practical theater course (a collaboration between the Great Lakes Center and Theater Department, developed by Jonathan Seinen, Assistant Professor, Theater Department).
- Chris Pennuto was the advisor of 6 graduate students, a committee member for three graduate students, and the advisor for 6 GLES non-thesis PSM students.
- Alicia Pérez-Fuentetaja was the thesis advisor for four Biology graduate students and was a committee member for two Biology graduate students. She served as a PhD committee member for two students in the Chemistry Department at the University at Buffalo, and a scientific advisor to PhD students at Wayne University in a collaborative project with NOAA Great Lakes Environmental Research Laboratory.

Seminars

In order to facilitate collaboration between GLC personnel and leading experts in aquatic ecology and related sciences, and to increase visibility of the Center in 2020–2021, we invited 5 speakers to present talks at our seminar series, including:

1. Vadim Karatayev, University of Guelph. “Ecological resilience of heterogeneous and diverse ecosystems.” October 5, 2020.
2. Alicia Pérez-Fuentetaja, Buffalo State College. “A recent invader finds its ecological niche in the Great Lakes: *Hemimysis anomala*, the bloody red shrimp.” October 26, 2020.
3. Jason Stockwell, University of Vermont. “Partial diel vertical migration and Mysis: where do we go from here?” November 30, 2020.
4. Maureen Coleman, University of Chicago. “Microbial Ecology Across the Laurentian Great Lakes.” March 5, 2021.
5. John Downing, University of Minnesota. “Lake Eutrophication Projections to 2050/2100: Climate Role and Cost.” April 2, 2021.



Biology M.A. student Jay Wagner completed a project at the Field Station in July 2020 examining the biotic and abiotic factors involved in the decomposition of *Cladophora glomerata*. Using tanks set up at the Field Station, the four treatments included: aquaria with a single crayfish dispersing *Cladophora* around the tank; algae suspended and dispersed by mild turbulence induced by a fin attached to a motor to simulate waves; a combination of crayfish and mechanical turbulence; and the control with no turbulence or crayfish, leaving a single mass of algae in one location in the tank.



GLCS M.A. student Alex Krest began thesis work at an infestation of starry stonewort (*Nitellopsis obtusa*) that was discovered in Burnt Ship Creek State Park on Grand Island, NY last summer. After mapping the infestation, which is the second in Western New York and the first in Erie County, samples were collected to compare the vegetation and macroinvertebrates found in patches with starry stonewort, muskgrass (a native macroalgae), and American elodea (a native macrophyte).

IV. Outreach and Service Activities

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

Lyubov Burlakova:

- Assisted in preparation of [Great Lakes Center 2019–2020 Annual Report](#).
- Member Committee for Great Lakes Center Goals 2030.
- Associate Editor, *Journal of Great Lakes Research*.
- Editorial Board member of International Scientific Hydrobiological Journal, Ukraine.
- Organized Lake Michigan and Lake Superior CSMI 2021 Planning Meeting, March 2021, Buffalo (Virtual).
- Wrote articles for [GLC Newsletter](#) series.
- Participated in writing Report Status of the Lower Food Web in the Offshore Waters of the Laurentian Great Lakes: Trends for chemical, physical, and biological variables through 2018. EPA 905-R-20-007.
- Member of Aquatic Life Use Metrics, Benthic Invertebrate subgroup led by Ohio Sea Grant and Ohio EPA to develop aquatic indicators for Lake Erie.
- Participated in GLNPO workshop (February 2021) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Participated in multiple phone conferences with EPA, NOAA, USGS, Sea Grant 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.
- Completed “Preventing Discrimination and Harassment for Managers (New York)” course (October 2, 2020).
- 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 2022.
- Reviewed 2021 National Strategy for Mollusc Research.
- 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’s “The Friends of the Maud Gordon Holmes Arboretum.”
- Reviewed 7 manuscripts for *Aquatic Conservation, Diversity, Ecology and Evolution, Hydrobiologia, Limnologica, and Aquatic Ecology*.

Mark Clapsadl:

- Received replacement buoy the Great Lakes Observing Network for our ageing TIDAS-900 buoy. The new buoy contains the latest technological improvements and improved deployment capability and is valued at \$21,957.
- COVID-19 restrictions limited the activities possible in terms of field station activities. However, I was able to coordinate activities with other field station personnel and continue to safely provide a presence at the field station throughout the pandemic. We were able to provide the support required for the projects listed above and to address routine field station needs.
- GLC field station staff were unable to offer field trips that we normally provide to BSC classes such as Fisheries or Limnology in the Fall 2020 and Spring 2021 semesters because of COVID-19 restrictions. However, Brian Haas and I were able to create virtual field trip content that has been used for BSC laboratories. This content

included demonstrations and lectures for electrofishing and trap-netting in the Upper Niagara River. We are continuing to add content that contains demonstrations and lecture content of various limnological sampling techniques. We are working to provide video content to local underserved high schools, particularly to Riverside Academy.

- 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. During 2019, we had over 19,000 visits to the buoy website, and in 2020, there were over 16,000 visits (reduction due to shortened deployment period as a result of COVID-19).

Susan Daniel:

- Wrote multiple articles for [GLC Newsletter](#) series.
- Made a commitment to participate in the exploration of a Great Lakes Biota exhibit in collaboration with The Aquarium of Niagara led by Marissa Boyer.
- Acting Safety Officer for the Great Lakes Center on the Chemical and Biological Hygiene Committee, SUNY Buffalo State (2014 – present).
- Member of Aquatic Life Use Metrics, Benthic Invertebrate subgroup led by Ohio Sea Grant and Ohio EPA to develop aquatic indicators for Lake Erie.
- Participated in GLNPO workshop (February 2021) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Participated in multiple phone conferences with EPA, NOAA, Sea Grant 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 and newly elected Board Member of the International Association for Great Lakes Research. Co-Chair of the Awards Committee, and member of the Justice, Equity, Diversity, and Inclusion Committee (JEDI).
- Member of the Buffalo State's "The Friends of the Maud Gordon Holmes Arboretum."
- Completed "Preventing Discrimination and Harassment for Managers (New York)" course (October 4, 2020).
- Completed "Ethics Training for Special Government Employees" (May 11, 2021).
- Completed "Compliance & Ethics Training" (December 17, 2020).

Susan Dickinson:

- Assisted in preparation of the [Great Lakes Center Annual Report](#) for publication.
- Made multiple purchases of supplies and equipment.
- Proof-red multiple research papers, reports, and flyers/brochures for GLC and WNY PRISM.
- Assist with GLES program functions: scheduling of thesis proposal/defense meetings, Banner course input, distribution and collection of annual Performance and Evaluation forms.
- Began to digitize departmental historical files.
- Updated GLC Publications poster.
- Volunteered at mandatory on-campus COVID-19 testing site, February – June 2021.
- Completed "QPR Suicide Prevention Gatekeeper Program" training (May 11, 2021).
- Acted as part-time Administrative Assistant for Physics Department, June – August 2020.
- Volunteered to daily pick up building-wide mail and packages from campus Mail Room while staff/faculty were

working remotely due to pandemic, summer 2020.

- Participated in Zoom meetings with candidates for new dean position and provided feedback to search committee.

Brian Haas:

- 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.
- Provided general assistance to WNY PRISM at the field station.
- Helped graduate and undergraduate students from Buffalo State College 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 Field Station.
- 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 cared for.
- Made strategic purchases and installations that enhanced the field station's operational and research capacity.
- Created a virtual field trip video for students that were unable to participate in the normal in person field trip due to the limitations caused by COVID-19.
- Worked to clear debris and secure the grounds in the wake of numerous storms that caused shoreline damage at the Field Station due to high water levels.
- Received requests from Field Station neighbors including the West Side Rowing Club and the Navy Operational Support Center and provided assistance when possible.
- Helped ensure the Field Station had proper safety measures in place to keep everyone using the facility safe during the COVID-19 pandemic.

Kit Hastings:

- 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.
- Created two maps to support a publication on common terns in the Niagara River and a muskellunge project proposal.
- Updated the GLC Poster.
- Updated [GLC website](#).
- Assisted in lab work associated with the Great Lakes Long-term Biological Monitoring Program and Lake Erie CSMI projects (mounted oligochaetes and chironomids slides and identified oligochaetes).
- Created an Oligochaete Identification Reference Guide for the Great Lakes Benthos Monitoring Project.
- QAQC manager for the [Great Lakes Benthos Barcoding grant](#).
- Member of the Buffalo State Institutional Animal Care and Use Committee.
- Member of WNY GIS User Group and NYS GIS Association.
- Member of oSTEM.
- Bengal Allies member.

Brittany Hernon:

- Facilitated 1 remote WNY PRISM Terrestrial Working Group meeting to increase communication and collaboration among partners and interested parties and update the terrestrial invasive species tier ranking list, March 2021.
- Facilitated 1 remote Great Lakes Slender False Brome Working Group meeting to increase communication and collaboration among partners and interested parties, April 2021.

Allison Hrycik:

- Coordinator of the Great Lakes Center and Biology Department Seminar Series (together with Lyubov Burlakova). Six speakers related to Great Lakes ecology presented their research.
- Faculty Co-advisor, Lara Hargrave, GLES M.A. student (2020 – present).
- Organized and presented at Lake Superior CSMI 2021 Planning Meeting (March 25–26, 2021, Virtual Meeting).
- Participated in preparation of the State of the Great Lakes Report.
- Participated in multiple phone conferences with EPA, NOAA, USGS, etc. about current research and potential future projects.
- Completed “Preventing Discrimination and Harassment for Employees (New York)” course (May 14, 2020).
- Attended SUNY Research Foundation New Employee Orientation (September 30, 2020).
- Participated in the Benthic Invertebrate Subgroup panel of experts of the Lake Erie Aquatic Life Use Metrics project led by Ohio EPA to advise the state on the development of aquatic life use metrics for Lake Erie.
- Member of the Association for the Sciences of Limnology and Oceanography.
- Member of the International Association of the Great Lakes Research.
- Reviewed 3 manuscripts for *Limnologica* (1 manuscript), and *Limnology & Oceanography* (2 manuscripts).

Alexander Karatayev:

- Published [Great Lakes Center 2019–2020 Annual Report](#) (August 2020).
- Committee member for Great Lakes Center Goals 2030.
- Organized Lake Michigan and Lake Superior CSMI 2021 Planning Meeting, March 2021, Buffalo (Virtual).
- Completed Comprehensive Ethics Training and Sexual Harassment Training.
- Wrote articles for [GLC Newsletter](#) series.
- Participated in writing Report Status of the Lower Food Web in the Offshore Waters of the Laurentian Great Lakes: Trends for chemical, physical, and biological variables through 2018. EPA 905-R-20-007.
- External reviewer for a faculty promotion to Full Professor.
- Editor of the Special Issue of the *Journal of Great Lakes Research* dedicated to Lake Ontario.
- Editorial Board member of International Scientific Hydrobiological Journal, Ukraine.
- Interviewed by Detroit Public TV Great Lakes Now on [Dreissena research in Great Lakes](#).
- Member of Aquatic Life Use Metrics, Benthic Invertebrate subgroup led by Ohio Sea Grant and Ohio EPA to develop aquatic indicators for Lake Erie.
- Participated in GLNPO workshop (February 2021) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Participated in multiple phone conferences with EPA, NOAA, USGS, Sea Grant 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 2022.
- 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 *Aquatic Invasions*.

Andrea Locke:

- Participated in New York State Cooperative Agricultural Survey Committee (CAPS) Meeting.
- Participated in Tonawanda Creek/Erie Canal *Hydrilla* Demonstration Project Collaborative as part of Advisory Committee and as part of the New York State *Hydrilla* Task Force.
- Participated in Great Lakes Action Agenda Working Group Meetings.
- Held position on Great Lakes Phragmites Collaborative Advisory Committee.
- Member of the GLES PSM Advisory Board.
- Held Resume Building Workshop for WNY PRISM seasonal employees, including SUNY Buffalo State Students.
- Provided information, updates, and feedback to the New York Invasive Species Advisory Committee (ISAC) and Invasive Species Council (ISC).
- Coordinated Rails to Trails Volunteer Monitoring and Removal Program in partnership with the Town of Tonawanda.
- Served as regional contact and representative for NYS Department of Environmental Conservation's Pesticide Regulations Stakeholder Meeting – collected, organized, and submitted partner comments.
- Served as regional representative for New York State statewide Forest Pest Task Force and Hemlock Initiative.
- Coordinated Mile-a-Minute Working Group meetings to address emergence of the species in Genesee County.
- Coordinated Southern Tier Water Chestnut Working Group.
- Worked with Erie County to develop parks management plan to include reduced mowing, improved invasive species management and habitat restoration. Implemented demonstration site project at Ellicott Creek Park.
- Held multiple, open WNY PRISM Partnership and Working Group Meetings to allow for public involvement in regional invasive species issues.
- Assisted partners with invasive species management planning for public lands restoration efforts.

Christopher Pennuto:

- Coordinator, GLES masters programs.
- College Personnel Committee member.
- Member Committee for Great Lakes Center Goals 2030.
- Reviewed manuscripts for *Journal of Great Lakes Research*, *Biological Invasions*, and *Ecology of Freshwater Fish*.

Alicia Pérez-Fuentetaja:

- Chair and editor of final document for Great Lakes Center Goals for 2030.
- Interviewed by Silvana Bujan from ECOS 95.7 Mhz- Radio National University Mar del Plata, Argentina

(in Spanish), about persistent bioaccumulative pollutants in the environment and their effect in wildlife and humans. Aired December 12, 2020.

- Interviewed by Carrie Arnold, environmental reporter based in Virginia, on our publication on the common tern in the Great Lakes and pollution for an article for the Audubon magazine.
- Scientific advisor for the implementation of prototype of fish passage in the Niagara River in coordination with the U.S. Army Corps of Engineers.
- Member of the International Association of Great Lakes Research.
- Member of the Association for the Sciences of Limnology and Oceanography.

Nicole Smeenk:

- Participated in the New York State Aquatics Staff Meeting, December 2020.
- Participated in the Aquatic Invasive Species Lakes and Ponds Vulnerability Prioritization Advisory Group, February 2021.
- Facilitated the Aquatic Invasive Species Tier Ranking meeting, March 2021.
- Coordinated Southern Tier Water Chestnut Working Group, March 2021.
- Attended the New York State *Hydrilla* Task Force Meeting, May 2021, June 2021.
- Coordinated training for the WNY PRISM Watercraft Inspection Steward Program, May 2021.

V. Professional Development Activities

Brian Haas:

- Participated in NYSDEC webinars that pertain to my field of study.
- Researched and became proficient with GoPro cameras and accessories.
- Learned how to edit raw footage and create finished videos for remote learning.

Kit Hastings:

- Attended training courses: Sexual Harassment Prevention training 8/7/2020; CITI IACUC training 1/11/2021; Coursera American Deaf Culture course 2/2021.
- Attended webinars: “Science Storytelling in the Digital Age” and “Lake Bed 2020” 8/10/2020; “A Web Accessibility Assessment Hands-on Tutorial” on 5/11/2021; SUNY Global Accessibility Day on 5/20/2021; “ADA at 30” and “Celebrating Diversity through Disability: In Search of Common Values” 7/29/2020; “The 1619 Project: The Impact on America Today” on 2/18/2021; “Confronting Racism in America” with Ibram X. Kendi on 2/22/2021; Conversations in and out of Disciplines “#BlackBoyJoy...All Day E’ry Day” on 2/26/2021; EPA Office of Environmental Justice “The Mapping Inequality Project” on 3/4/2021, “Redlining and Climate Change” on 4/6/2021, and “California EPA’s Pollution and Prejudice Project” on 6/10/2021; Civic Engagement Week “Food Security in the Wake of COVID-19 in 14207” on 3/29/2021.

Brittany Hernon:

- Attended UMISC (Upper Midwest Invasive Species Conference), Virtual. November 2020.
- Attended the Ontario Invasive Plant Council Conference, Virtual. January 2021.

Andrea Locke:

- Attended multiple online workshops and presentations on the emerging threat of spotted lanternfly, management tools, and strategies.
- Attended Upper Midwest Invasive Species Online Conference, November 2020.

- Attended New York State Invasive Species Conference/In-Service, November 2020.
- Attended Ontario Invasive Plant Council Conference, January 2021.
- Completed the Research Foundation Elevation Sessions Leadership Development Program. Seven sessions were held in March – April 2021.

Nicole Smeenk:

- Attended “Facilitating Effective Project Planning, Implementation, and Continuous Improvement with a Committee, Department, or Working Group” workshop.
- Attended the Aquatic Nuisance Species Priorities for Prevention and Management Webinar.



Erik Hartnett and Susan Daniel archiving samples from the EPA Long-term Biological Monitoring Project.



Sampling for unionids in Tonawanda Creek. Left: Lyuba Burlakova, Allison Hrycik, Susan Daniel, and Isa Porto-Hannes (Fisheries and Oceans Canada). Right: Sasha Karatayev, Marisa Turk (Buffalo Museum of Science), Allison Hrycik, Susan Daniel, and Isa Porto-Hannes.

VI. Field Station Activities

Work was completed in Fall 2020 to address some of the storm damage that we experienced along the shoreline and boat ramp in 2019. The damage was the result of a powerful windstorm which created a very large seiche (an estimated 8 foot plus rise in water levels) which eroded a significant portion of the shoreline and left large rock and other debris scattered across the lawn and into the boat ramp, rendering the ramp unusable. We experienced another storm in 2020 of similar strength, and again experienced some damage; the added revetment greatly reduced the impact of this storm.

The staff at the Field Station usually host a Fisheries field trip every other spring, but due to COVID-19, it was not possible to take the students out onto the water this year. Instead, Brian Haas and Mark Clapsadl created a video using GoPro cameras to provide the students with a virtual field trip. The video introduced them to fish sampling techniques that are commonly used in fisheries management and showed these techniques being performed in our local waterways. The final product was streamed to the class through Blackboard and will also be used to support upcoming education and outreach objectives. [Pictures on page 34](#).

The new skills developed through this process will certainly have applications moving forward at the Field Station. Even without COVID-19, it can be difficult to get groups of students out onto the water because of weather, boat capacity, and numerous other factors. The GoPro cameras and editing software allow for the Field Station staff to create and share content with students who otherwise would not have been able to accompany the staff as they work to complete research projects. These new tools can now be used to offer even more opportunities to enrich the student education experience at Buffalo State College by providing digital content that is exciting and informative.

In 2020–2021, we continued to work on the Osprey Nesting Platform and Habitat Enhancement Project funded through the Niagara River Greenway Commission (no cost extension 2021) (\$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 that were selected for their potential to provide food, cover, and nesting sites for migrating and local birds.

We provided field and laboratory support for multiple faculty and student research projects, including, but not limited to providing support for the acquisition and deployment of a new GLOS (Great Lakes Observing System) buoy in Lake Erie off Dunkirk ([pictures on page 34](#)), as well as several Master's level research projects.

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.

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 Field Station.



Mark Clapsadl preparing to retrieve the old GLOS buoy for the last time in October 2020.



The old GLOS buoy was ten years old and quite weather-worn. It was time to be retired.

VII. Western New York PRISM Activities

[Western New York Partnership for Regional Invasive Species Management](#) (WNY PRISM) works to address invasive species priorities using a coordinated partnership network, for which we provide leadership, information and technical assistance, 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 and over the past seven and a half years has collected over 11,000 invasive species presence/absence data points, held 295 educational events, conducted 36,170 boat inspections, hired 98 seasonal employees, and worked with 171 partner organizations and agencies. WNY PRISM received a second, 5-year contract that began January 1, 2019 and that will provide funding through December 31, 2023. When combined with additional grants and project funding, WNY PRISM supports between 3–5 five full-time staff members and nearly 30 seasonal or temporary employees each year.

Program Highlights and Accomplishments

WNY PRISM faced many challenges brought by the COVID-19 pandemic. The Watercraft Inspection Stewardship Program, invasive species survey efforts, and data collection protocol development were able to move forward with relatively little impact while our educational programs and invasive species removal efforts were impacted more significantly. Despite the hurdles, WNY PRISM was able to accomplish a great deal.

WNY PRISM worked to remove invasive species from 231 acres across 39 sites and restored 14 acres with native seed and plugs. Staff submitted 4,109 records to iMapInvasives, including 62 unique species, and surveys included 77 sites (51 early detection sites) and 98 miles of trail. The Watercraft Inspection Stewardship Program achieved 23,041 inspections with an 89% acceptance rate and 1,309 aquatic invasive species interceptions. While outreach events were limited this year WNY PRISM still provided 23 opportunities for learning, primarily as online presentations, and workshops.

WNY PRISM addresses invasive species issues as identified within the [5-year Strategic Plan](#) and in accordance with established Core Functions. WNY PRISM's Core Functions include 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.
- Released 2020 Annual Report.
- Released 2021 Annual Work Plan.
- Developed and released invasive species priority tier rankings for 146 species.
- Posted, interviewed, and hired 2020 Seasonal Positions (1 E&O, 3 ISMA, 17 Boat Stewards, 2 Lead Stewards, 1 GIS Technician, 2 Survey and Monitoring Technicians).
- Hired 2 Data Analysts during Fall Semester.

- Served on the Great Lakes *Phragmites* Collaborative Advisory Committee.
- Participated in Great Lakes Action Agenda Meetings.
- Participated in *Hydrilla* Collaborative and NYS *Hydrilla* Meetings.
- Coordinated Western New York Water Chestnut Working Group and facilitated meetings and communication.
- Facilitated Mile-a-Minute Working Group meetings and communication.
- Participated in WNY and Chautauqua County Forest Pest Taskforces.
- Presented at the Chautauqua Lake Association Annual Meeting.
- 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

- Submitted 4,190 records to iMapInvasives including 62 unique species.
- Identified data gaps within iMap, developed and implemented data gap survey projects involving yellow flag iris and flowering rush.
- Surveyed 17 sites across 8 counties and recorded 992 presence reports and 31 not-detected reports.
- Surveyed 14 sites for water chestnut with no new infestations found.
- Implemented invasive species phenology project looking at 12 common and widespread species.
- Worked with partners to select and monitor research sites for newly approved biocontrol agent targeting swallow-wort species, *Hypena opulenta*.
- Worked with partners to identify invasive species research needs and coordinated with New York Invasive Species Research Institute.
- Maintained WNY PRISM Listserv serving 320 members.
- Released bi-monthly eNews featuring News, Funding Opportunities, and Events in WNY.
- Maintained online resources including documents identifying contractors, private lands programs, grants, and native plant suppliers.

Education and Outreach

- Released Spring and Fall [eNewsletters](#).
- Published Best Management Practices for Biennials, Tree of Heaven, Water Hyacinth, Water Lettuce, and Water Chestnut.
- Coordinated NYISAW Events for the WNY PRISM Region.
- Coordinated Fall Weekly Webinar Series including 5 presentations: Dormant Season ID and Prevention,

Emerging Forest Pests and Disease, Agricultural Pests and Disease, Managing Woody Invasive Species in Winter, and Emerging Aquatic Threats.

- Held 4 workshops and provided 19 educational presentations, resulting in 1,010 direct contacts.
- Established WNY PRISM YouTube Channel and posted 9 recorded presentations, receiving 306 views.
- Social Media:
 - Facebook: 690 page likes and 793 followers, 133 published posts reached 34,065 users, generated 2,109 clicks, and led to 2,443 engagement actions.
 - Instagram: 557 followers, 99 published posts generated 1,734 likes, and drove 156 people to the WNY PRISM website.

Prevention

- Watercraft Inspection Steward Program (WISP):
 - Data showed an 89% acceptance rate with 1,309 Aquatic Invasive Species interceptions.
 - Conducted 23,041 inspections.
 - 74% of Boaters have had previous contact with a Boat Steward, an increase of 2%.
 - Produced weekly and monthly reports on Boat Steward data collection and interactions.
 - Completed 2021 site prioritization and selection.
 - Conducted two-day, training for Boat Steward/Environmental Educators.
 - Boat Stewards staffed 19 public boat launches in summer 2020 and have identified 18 public boat launches for 2021.
- Finalized WNY PRISM Spread Prevention Protocol for staff and made available for partner use.
- Completed installation of 4 new Boot Brush Stations, developed signs for 2 additional stations.



Boat stewards practicing boat inspections for the Watercraft Inspection Steward Program. The training took place at the Field Station using our boats.



The 2021 Boat Stewards and Environmental Educators at the WISP training at the Field Station in May 2021.

- Updated Approaching Region Priority Species list to include Goatsrue (*Galega officinalis*) and remove porcelain berry (*Ampelopsis brevipedunculata*), which was moved to the early detection priority list after being discovered in Delaware Park.

Early Detection and Rapid Response

- Facilitated WNY Mile-a-Minute Working Group meetings and communication and assisted partners with removal and outreach efforts.
- Completed site monitoring for water hyacinth, one previously known site had 6 plants and a single new site was detected.
- Completed site monitoring for water lettuce, no plants were found at monitoring sites.
- New water lettuce infestation was discovered at Hyde Park in Niagara Falls resulting in 730 plants being removed.
- Completed second year of Japanese angelica tree treatment at Lake Erie State Park.
- Responded to report of red swamp crayfish and worked with property owners to develop a management plan including trapping and installation of a fence.
- Worked with Tonawanda Creek/Erie Canal *Hydrilla* Demonstration Project Partners to continue surveys, management, and outreach.
- Developed Japanese stilt grass GIS-based habitat suitability map.
- Held semi-annual Great Lakes Slender False Brome Working Group meetings.
- 45 sites and 92 miles of trail were surveyed for slender false brome and Japanese stilt grass.
- New populations of Japanese stilt grass were found in Erie and Allegany Counties.
- 56 acres of slender false brome and 12 acres of Japanese stilt grass were managed.
- Distributed spotted lanternfly and Asian giant hornet information to partners.



A WNY PRISM employee manually removing Mile-a-Minute vine in Oakfield, NY, in July 2020.



WNY PRISM crew at a site to remove Mile-a-Minute vine in Franklin Gulf, NY, in August 2020.



WNY PRISM crew applying targeted pesticides to Mile-a-Minute vine in Hunter's Creek, NY, in July 2020.

Management and Habitat Restoration

- Implemented invasive species removal projects across 231 acres and 39 sites including Seneca Bluffs Natural Habitat Park, Kenneglenn Scenic and Nature Preserve, Niagara Escarpment Preserve, 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.
- Completed third year of treatment as part of the Riverwalk/Greenway Trail @ Porter Ave. Project targeting knotweed, wild parsnip, *Phragmites* and mugwort.
- Crew Assistance Program:
 - Completed 11 projects identified in 2020 projects including 11.5 acres of invasive species removal and 540 acres surveyed.
 - Provided project reports to all partners.
 - Released 2021 Crew Assistance Program Request for Projects. Received 18 proposals from 12 partners, including 3 new partners.
- Assisted Niagara County Soil and Water Conservation District (NCSWCD) with the Niagara County Japanese Knotweed Eradication Program for the third year. Approximately 400 sites have been identified as part of this program. The Crew joined NCSWCD staff for 3 days, treating 0.97 acres across 3 sites in 2021.
- Assisted partners in development of invasive species and restoration management plans.
- Met with partners to discuss new and ongoing management projects.

Additional Projects

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 of NYS that are owned by the 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.

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

Early detection 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. 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.

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 Tift Nature Preserve

Extensive invasive species removal and habitat restoration has taken place at the Buffalo Museum of Science Tift 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 Tift 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 Tift Nature Preserve. Efforts will include invasive species removal and native plant restoration.

Western New York Japanese Stiltgrass (*Microstegium vimineum*) Early Detection and Rapid Response Project

WNY PRISM will implement an invasive species removal project focused on Japanese stiltgrass (*Microstegium vimineum*), an early detection priority species. WNY PRISM will lead survey and removal efforts across sites along Cazenovia Creek, Buffalo River, Hunter's Creek and Eighteen Mile Creek. Removal will involve the use of volunteers for hand removal and the WNY PRISM Crew for herbicide treatments. Boot brush stations will be placed at trailheads to reduce the spread and reintroduction of invasive species along trails.

Invasive Species Management to Protect Rare Habitats at Alexander and Houghton Preserves

The Nature Sanctuary Society of WNY has partnered with WNY PRISM to eradicate invasive shrubs from 16 acres of the NSSWNY's Houghton Preserve. Removal efforts will focus on glossy buckthorn, multi-flora rose, and bush honeysuckle, and will protect the integrity of the preserve's sphagnum bog habitat that is home to rare species such as spotted turtle and podgrass. The project will also include detection, eradication, and control of goutweed and garlic mustard on the 118-acre Alexander Preserve, where these invasives threaten old growth forest understory habitat hosting rare and listed species such as Virginia Bluebell.

WNY PRISM Steering Committee Members

- Sharon Bachman, Cornell Cooperative Extension of Erie County
- Mark Bogdan, New York State Department of Transportation
- Kathleen Buckler, U.S. Army Corps of Engineers Buffalo District
- Megan Kocher, New York Sea Grant
- Jennifer Dunn, New York State Department of Environmental Conservation
- Paul Fuhrmann, WSP
- Aaron Heminway, New York State Office of Parks, Recreation and Historic Preservation
- Colleen Keefer, U.S. Fish and Wildlife Service Lower Great Lakes Fish and Wildlife Conservation Office
- Mike Shaw, U.S. Department of Agriculture Natural Resources Conservation Service
- Bob Smith, New York State Certified Nursery and Landscape Association
- Jonathan Townsend, Chautauqua County; Royal Fern Nursery
- Ronald Zietz, Buffalo Niagara Waterkeeper

Presentations, Workshops and Trainings

1. Thiel, E., and A. Locke. Introduction to Invasive Species and Mapping Challenge. M&T Bank Think Green Resource Group, Online. July 21, 2020.
2. Thiel, E. Introduction to Invasive Species Management. Erie County Master Naturalists, Sprague Brook Park, Glenwood, NY. September 19, 2020.
3. Thiel, E. Dormant Season Identification and Prevention of Invasive Species. WNY PRISM Fall Webinar Series, Online. October 15, 2020.



Master Naturalist Training at Sprague Brook Park.

4. Locke, A., B. Hernon, L. Nuessle, and E. Thiel. WNY PRISM Fall Partner Meeting. WNY PRISM, Online. October 22, 2020.
5. Locke, A. Invasive Agricultural Pests and Diseases: European Cherry Fruit Fly and Plum Pox Virus. WNY PRISM Fall Webinar Series, Online. November 5, 2020.
6. Thiel, E. Tools, Tips & Tricks to Enhance Invasive Species Education and Outreach During a Time of Social Distancing. Cornell Cooperative Extension Invasive Species In-Service, Online. November 6, 2020.
7. Hernon, B., and L. Nuessle. Managing Woody Invasive Species in the Fall and Winter. WNY PRISM Fall Webinar Series. November 12, 2020.
8. Thiel, E. Emerging Aquatic Threats in WNY. WNY PRISM Fall Webinar Series, Online. November 19, 2020.
9. Locke, A. Invasive Species Update and Municipal Involvement. Chautauqua Lake Association Annual Meeting, Online. December 7, 2020.
10. Thiel, E. Take Action Against Invasive Species. BWELL (Buffalo Women in Environmental Learning and Leadership), Online. December 9, 2020.
11. Hernon, B. Great Lakes Slender False Brome Working Group- A Collaborative Effort to Research and Manage an Invasive Grass. Ontario Invasive Plant Council Conference, Virtual. January 12, 2021.
12. Locke, A. Invasive Species, Spread Prevention and the Role of Municipalities. Erie County Environmental Management Council, Online. January 19, 2021.
13. Thiel, E. iMapInvasives User Stories from 2020. iMapInvasives Monthly Web Series, Online. February 24, 2021.
14. Thiel, E. iMapInvasives: Web Map Services. iMapInvasives AGOL Workshop, Online. March 2, 2021.
15. Thiel, E. Hemlock Woolly Adelgid Survey and Volunteer Training. Chestnut Ridge, Orchard Park, NY. March 6, 2021.
16. Locke, A. Invasive Species Management from Theory to Practice. University at Buffalo Invasion Ecology Seminar, Online. March 26, 2021.
17. Locke, A., B. Hernon, and N. Smeenck. Multiple Presentations – WNY PRISM Programs. WNY PRISM Spring Partner Meeting, Online. April 15, 2021.
18. Montgomery, J., and A. Locke. 8th Annual NYISAW Kick-Off! New York Invasive Species Awareness Week Daily Webinar Series, Online. June 6, 2021.
19. Smeenck, N. Multiple Boat Stewards, Launch and Learn. New York Invasive Species Awareness Week, multiple locations. June 6, 2021.
20. Locke, A. Seneca Bluffs Natural Habitat Park Walk and Talk. New York Invasive Species Awareness Week, Seneca Bluffs, Buffalo, NY. June 7, 2021.
21. Locke, A. Invasive Species & Pollinators: Understanding the relationship between invasive species, pollinators and the restoration of healthy landscapes. New York Invasive Species Awareness Week, Online. June 9, 2021.
22. Locke, A. Great Baehre Swamp WMA Walk and Talk. New York Invasive Species Awareness Week, Great Baehre Swamp WMA, Buffalo, NY. June 12, 2021.
23. Hernon, B., and S. Bayba. Invasive Species Identification and Management. Friends of Letchworth State Park, 4th Annual Stewardship Day, Castile, New York. June 19, 2021.

For more information: [WNY PRISM](#)
[WNY PRISM's Annual Reports](#)

Field Station Virtual Field Trip and Buoy Deployment

Spring 2021



A still image from a video field trip demonstrating electrofishing techniques. Common rudd (*Scardinius erythrophthalmus*) being transferred to the livewell aboard the electrofishing boat.



Brian Haas preparing to electrofish in Woods Creek, a tributary of the Upper Niagara River. Note the GoPro mounted to his head strap.



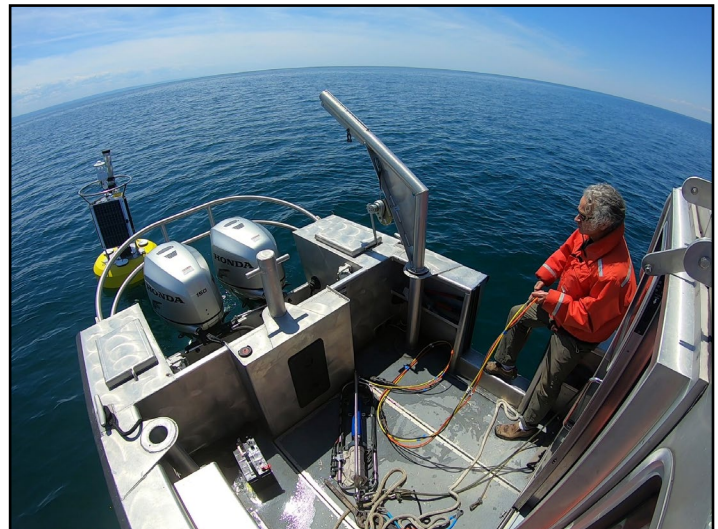
Mark Clapsadl checking a trap net on the edge of a wetland in the Upper Niagara River.



Rock bass (*Ambloplites rupestris*) being displayed during the fish identification portion of the field trip.



The new GLOS buoy being prepared for deployment. The newer buoy is smaller and lighter, and is made from hard foam instead of fiberglass.



Mark Clapsadl deploying the new GLOS buoy in May 2021.

