Buffalo State
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Annual Report 2023–2024

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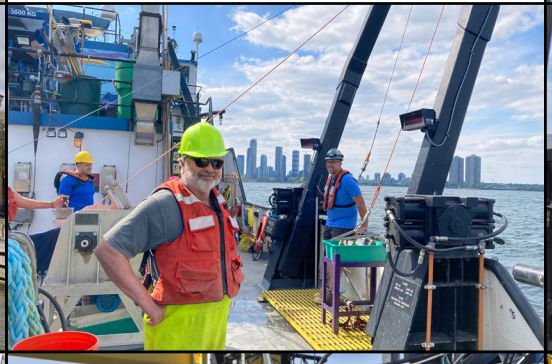
Lake Ontario CSMI

September 2023










CONTENTS

MISSION

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

HIGHLIGHTS

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

- Over the last year our researchers have published **10 peer-reviewed papers**, and **5 papers** were submitted for publication.
- We presented **33 talks**, including: 27 at national/international/regional conferences and 6 invited talks.
- Nine projects for research and education are currently funded in the GLC totaling **$12,049,393**, including **$8,011,798** for Buffalo State.
- **Seven 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.

GLC staff and guests at the GLC Open House at the Field Station on September 7, 2023.

Dr. Alexander Karatayev received the President's Award for Excellence in Research, Scholarship, and Creativity from Interim President Bonita Durand at the Faculty and Staff Recognition Ceremony on October 12, 2023.

I. Staff

GLC Personnel

Director:	Alexander Karatayev
Research Scientists:	Nikolai Barulin (hired April 2024) Lyubov Burlakova Mark Clapsadl (Field Station Manager) Susan Daniel Olesia Kormilets (left GLC in February 2024) Christopher Pennuto Alicia Pérez-Fuentetaja (retired August 2023)
Research Technicians:	Lillian Denecke Shawn Geary (left GLC in February 2024) Brian Haas Kit Hastings Nataliia Mikulska (left GLC in January 2024) Angela Tulumello Brianne Tulumello
Administrative Assistant:	Susan Dickinson
WNY PRISM Coordinator:	Andrea Locke
Program Managers:	Nicholas Farese, Aquatic Program Manager Brittany Hernon, Terrestrial Program Manager Hannah Rola, Field Crew Leader Rachel Taylor, Community Science and Engagement Program Manager
Student Research Assistants:	Kifaya Albayed, Undergraduate Student, SUNY Buffalo State University Nick Hahn, Undergraduate Student, SUNY Buffalo State University Emily Klimczak, Graduate Student, SUNY Buffalo State University Kayla Kudlowitz, Undergraduate Student, SUNY Buffalo State University Yevheniia Mikulska, Undergraduate Student, University at Buffalo

WNY PRISM Seasonal Employees

Invasive Species Management Assistants:

Alicia Addams, Canisius College (2023)
Jessica Catellan, SUNY Environmental Science and Forestry (2024)
Rebecca Kolsch, University at Buffalo (2024)
Tina Ni, University at Buffalo (2023)
Hannah Phillips, Penn State Erie, The Behrend College (2024)
Brianna Saylor, SUNY Buffalo State University (2022–2023)

Education and Outreach Assistants:

Tyler Burgess, University at Buffalo (2023)
Nikolai Harper, University at Buffalo (2024)

Survey and Monitoring Technicians:

Jason Kappan, SUNY Buffalo State University (2019–2023)
Lindsay Piotrowski, SUNY Buffalo State University (2023)

Lead Boat Stewards:

Jessica Castellan, SUNY Environmental Science and Forestry (2023)
Owen Hebeler, SUNY Brockport (2024)
Rebekah Meyers, Humboldt University of Berlin (2023)
Jimi Wiggins, University at Buffalo (2024)

Boat Steward/Environmental Educators:

- Michael Bayba, University at Buffalo (2024)
- Audra Blue, SUNY Brockport (2024)
- William Brown, SUNY Morrisville State College (2023)
- Alec Cimini, Clarkson University (2023)
- Bryan Cirbus, SUNY Erie (2023)
- Emma Clay, Paul Smith's College (2023)
- Jennifer Crane, SUNY Buffalo State University (2023)
- Daniel Conklin, University at Buffalo (2024)
- Zachary Day, University at Buffalo (2023)
- William DesJardin, University at Buffalo (2023)
- Nathan Emery, St. Bonaventure University (2023)
- Mailey Geiger, SUNY Geneseo (2024)
- Dainaira Goldthwait, University at Buffalo (2024)
- Robert Kelly, Niagara University (2024)
- David Kramp, SUNY Buffalo State University (2023)
- Andrew LaDuca, St. Bonaventure University (2023)
- Bethany Mangioni, Niagara University (2023)
- Henry Meeder, SUNY Cobleskill (2023)
- Samuel Palmieri, Jamestown Community College (2023)
- Rehn Pielechowski, SUNY Buffalo State University (2024)
- Kara Sparling, Niagara University (2024)
- Emily Townsend, University at Buffalo (2023)
- Chloe Van Nelson, University at Buffalo (2024)
- Charles Weaver III, University at Buffalo (2023–2024)
- Logan Wray, SUNY Brockport (2023)

GLC Affiliates (at SUNY Buffalo State University)

- Kelly Frothingham, Interim Dean, School of Arts and Sciences
- Susan McCartney, Director, Small Business Development Center
- Olga Novikova, Assistant Professor, Biology Department
- Mary Perrelli, GIS Lab Supervisor, Geosciences
- Daniel L. Potts, Professor, Biology Department
- Randal Snyder, Professor, Biology Department
- Tao Tang, Professor, Geosciences
- Stephen Vermette, Professor, Geosciences
- Robert J. Warren II, Professor, Biology Department

Adjunct Research Scientists

- Richard Barbiero, Chicago, Illinois
- Thomas Hahn, Buffalo, NY
- Vadim Karatayev, Assistant Professor, University of Maryland College Park
- 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
- Gregory Boyer, SUNY Environmental Science and Forestry, Syracuse
- Mike Goehle, U.S. Fish and Wildlife Service
- Dmitry Gorsky, U.S. Fish and Wildlife Service
- Andrew Hannes, U.S. Army Corps of Engineers
- Kristen Holeck, Cornell Biological Field Station, Cornell University
- Dianna Padilla, Department of Ecology and Evolution, Stony Brook University
- Isabel Porto Hannes, University at Buffalo
- Erin Redding, NYS Department of Environmental Conservation
- Lars Rudstam, College of Agriculture and Life Sciences, Department of Natural Resources, Cornell Biological Field Station, Cornell University
- James Watkins, Cornell Biological Field Station, Cornell University
- Brian Weidel, U.S. Geological Survey, Lake Ontario Biological Station, Oswego

Collaborators at other U.S. Institutions

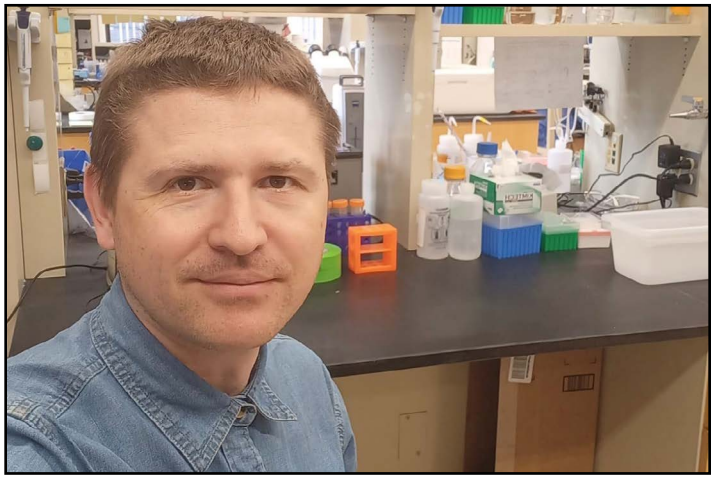
- Theodore Angradi, U.S. EPA Mid-Continent Ecological Division, Duluth, Minnesota
- Jakob Boehler, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- David Bunnell, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan
- Paris Collingsworth, Illinois-Indiana Sea Grant and Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana
- Peter Esselman, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan
- Elizabeth Hinchey Malloy, U.S. EPA Great Lakes National Program Office, Chicago, Illinois
- Joel Hoffman, U.S. EPA, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division, Duluth, Minnesota
- Leon Katona, U.S. Geological Survey, Upper Midwest Water Science Center, Madison, Wisconsin
- Richard Kraus, U.S. Geological Survey, Lake Erie Biological Station, Huron, Ohio
- 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
- Julie Lietz, General Dynamics Information Technology, Falls Church, Virginia
- Charles Madenjian, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan
- Janet Nestlerode, U.S. EPA, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, Florida
- Jessica Plavicki, Department of Pathology and Laboratory Medicine, Brown University, Providence, Rhode Island
- Euan Reavie, Natural Resources Research Institute, University of Minnesota Duluth, Duluth, Minnesota
- Mark Rowe, Great Lakes Environmental Research Laboratory, NOAA, Ann Arbor, Michigan
- Ed Rutherford, Great Lakes Environmental Research Laboratory, NOAA, Ann Arbor, Michigan
- Mike Sayers, Michigan Technological Research Institute, MTU, Ann Arbor, Michigan
- Anne Scofield, U.S. EPA Great Lakes National Program Office, Chicago, Illinois
- Robert Shuchman, Michigan Technological Research Institute, MTU, Ann Arbor, Michigan
- Yola M. Stockton, University of Hawai'i at Mānoa, Honolulu, Hawai'i
- Anett Trebitz, U.S. EPA Office of Research & Development, Mid-Continent Ecology Division, Duluth, Minnesota
- Yvonne Vadeboncoeur, Department of Biological Sciences, Wright State University, Dayton, Ohio
- Jake Vander Zanden, Center for Limnology, University of Wisconsin-Madison, Madison, Wisconsin
- Daelyn Woolnough, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- David Zanatta, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan

International Collaborators

- Boris Adamovich, Research Laboratory of Aquatic Ecology, Belarusian State University, Minsk, Belarus
- Csilla Balogh, Balaton Limnological Research Institute, Hungary
- Yulia Bespalaja, Federal Center for Integrated

Arctic Research, Russian Academy of Sciences, Arkhangelsk, Russia
- Ivan Bolotov, Federal Center for Integrated Arctic Research, Russian Academy of Sciences, Arkhangelsk, Russia
- Demetrio Boltovskoy, University of Buenos Aires, Argentina
- Frank Collas, Radboud University, Nijmegen, The Netherlands
- Nancy Correra, Sede Educativa Universitaria, UNDEF, Buenos Aires, Argentina
- Ronald Dermott, Alumnus, Fisheries and Oceans Canada, Burlington, Canada
- Maria Dittrich, University of Toronto Scarborough, Toronto, Ontario, Canada
- Elsa Froufe, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, and University of Porto, Porto, Portugal
- Jürgen Geist, TU München, Munich, Germany
- Ron Griffiths, Aquatic Ecostudies Limited, Canada
- Linda Haltiner, Kanton Luzern, Switzerland
- Jörg Huwyler, Department of Pharmaceutical Sciences, University of Basel, Switzerland
- Benjamin Kraemer, University of Konstanz, Konstanz, Germany
- Manuel Lopes-Lima, ICBAS - Abel Salazar Biomedical Sciences Institute, CIIMAR, University of Porto, Porto, Portugal
- Frances Lucy, Institute of Technology Sligo, Sligo, Ireland
- Oleg Makarevich, Belarusian State University, Minsk, Belarus
- Tamara Makarevich, Belarusian State University, Minsk, Belarus
- Zoltán Serfőző, Balaton Limnological Research Institute, Hungary
- Konstantin Shumskii, Department of Ichthyology and Aquaculture, Belarusian State Agricultural Academy, Belarus
- Ronaldo Sousa, CIIMAR and Minho University, Braga, Portugal
- Piet Spaak, EAWAG, Dübendorf, Switzerland
- Ilya Vikhrev, Federal Center for Integrated Arctic Research, Northern (Arctic) Federal University, Arkhangelsk, Russia
- Alexandra Weber, EAWAG, Dübendorf, Switzerland
- Alexandra Zieritz, University of Nottingham Malaysia Campus, Semenyih, Malaysia

Research scientist and Biology professor Dr. Alicia Pérez-Fuentetaja retired in September 2023.



Research scientist Dr. Nikolai Barulin joined the GLC in April 2024.

II. Research Activities

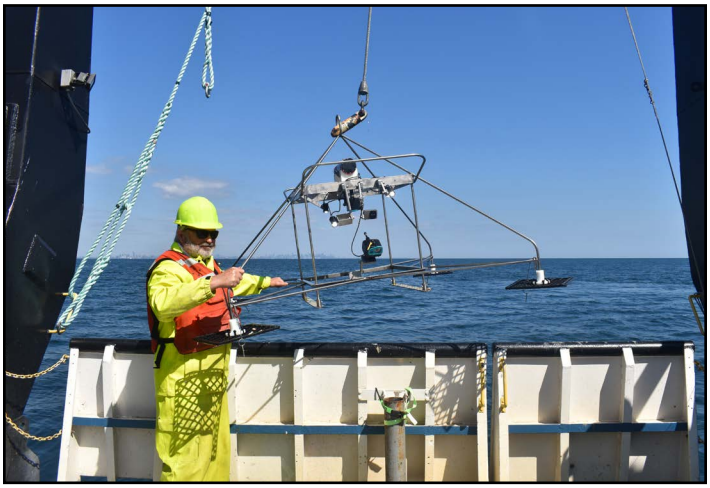
Current Projects

Monitoring of benthic invertebrates in the Great Lakes

PIs Lyubov Burlakova and Alexander Karatayev. The GLC, in collaboration with Cornell University, was awarded U.S. EPA Great Lakes Long-term Biological Monitoring grants for 2012–2017, 2017–2022, and 2022–2028. The Great Lakes Monitoring Program by the EPA Great Lakes National Program Office includes both the annual collection of benthos (Buffalo State) and zooplankton samples (Cornell University) from 57 long-term stations and a much more detailed survey conducted on each lake every 5 years within the Coordinated Science and Monitoring Initiative (CSMI). We participated in CSMI surveys in 2014 (Lake Erie), 2015 (Lake Michigan), 2016 (Lake Superior), 2017 (Lake Huron), 2018 (Lake Ontario), 2019 (Lake Erie), 2021 (Lake Michigan), 2022 (Lake Huron and Lake Superior), and 2023 (Lake Ontario). The EPA Monitoring Program is designed to provide managers access to biological data on zooplankton and benthos to support decision-making. Additional research projects include impact of dreissenids on the lower food web and benthic nepheloid layer, and development of remote sensing methods. We identified benthic samples collected onboard the EPA R/V *Lake Guardian* from all the Great Lakes in 2012–2023 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. Thus far, the results of the study have been published in over 30 papers, 13 reports, and were presented at regional and international meetings. (CSMI photo page)

New method for rapid assessment of dreissenid mussel populations

PIs Alexander Karatayev and Lyubov Burlakova.



Alexander Karatayev deploying the BIS during the CSMI 2023 on Lake Ontario in September, 2023.

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 during a typical 2-week summer cruise of the EPA research vessel *Lake Guardian*. 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 one of the major drivers of the ecosystem processes in the lower four Great Lakes. This method for *Dreissena* rapid assessment was applied in Lake Erie in 2019, Lake Michigan in 2021, Lake Huron in 2022, and Lake Ontario in 2023, and will be applied in future surveys as a valuable addition to conventional bottom grab monitoring. Results of these studies were already published in two papers and presented at multiple international meetings. This method is now used for quagga mussel monitoring in deep Swiss lakes Constance and Biel (Haltiner et al., 2022).

Benthoscapes

PIs Lyubov Burlakova and Alexander Karatayev. Images from side-looking BIS cameras used for rapid assessment of dreissenid populations during CSMI surveys are also used to assess spatial distribution of benthos and *Mysis*. Communities of benthic macroinvertebrates are among the most useful indicators for biological assessment of environmental and anthropogenic stressors, but both sample processing and species identification

are time-intensive, often requiring several years to identify all samples from a large-scale survey. Mapping benthic landscape or "benthoscape" structure and dynamics using underwater video can provide valuable and cost-effective assessment of bottom habitats on large spatial scales with minimal habitat disturbance. In 2019, during the CSMI benthic survey in Lake Erie, we used this approach to characterize benthic habitats, and then tested whether visual classification could serve as an indicator of hypoxia (Burlakova et al., 2023). We identified four habitat types that differed significantly in near-bottom dissolved oxygen concentration and confirmed that video analysis can provide a quick and reliable method to detect habitats affected by periodic hypoxia. Video identification of benthoscapes may be important for regional monitoring of over 20 hypoxic zones documented in the Great Lakes where the extent and magnitude of hypoxia currently represent a major knowledge gap. We used this method to detect hypoxic habitats in 2022 on Saginaw Bay of Lake Huron, and in 2023 on Hamilton Bay of Lake Ontario. The results of this study are being prepared for a peer-review publication.

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

PIs Alexander Karatayev and Lyubov Burlakova. 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 four years, the Great Lakes Center has been conducting an inventory of benthic surveys for all the 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, this data set could be useful to explore the effects of different environmental factors and exotic species on community organization and for monitoring 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 published as a data paper in *Ecology* (Burlakova et al., 2022). Our second paper summarizing 90 years of benthic research in Lake Erie has been recently published in the *Journal of Great Lakes Research* and the database in *Ecology* as a data paper. Currently we are summarizing benthic research conducted in lakes Superior and Huron.

Interactions of benthic invertebrates with the benthic nepheloid layer

PIs Lyubov Burlakova and Alexander Karatayev. Benthic nepheloid layers (BNLs) are areas of high turbidity and suspended solids that form near the benthos during summer stratification. We analyzed GLNPO long-term data to examine relationships between BNL intensity/thickness and benthic invertebrate production, and to compare current BNL intensity and thickness to historical data from studies prior to *Dreissena* invasion. We found that prior to the appearance of *Dreissena*, pronounced benthic nepheloid layers were a consistent and extensive feature of the offshore, stratified waters of all the Laurentian Great Lakes, except Lake Superior. In recent (2010–2019) years, the BNL has disappeared from all areas except for central Lake Erie, where only a small decrease in bottom turbidity has occurred. All stratified regions which exhibited a pre-*Dreissena* BNL, including central Lake Erie, experienced substantial post-*Dreissena* reductions in near-bottom total phosphorous. These post-invasion reductions in bottom phosphorus during the stratified season could be contributing to the offshore oligotrophication of Great Lakes and to changes in benthic populations, most notably the dramatic decline in deepwater amphipod *Diporeia*.

Eutrophication and multiple invasions decimate the most imperiled freshwater invertebrates

PIs Alexander Karatayev and Lyubov Burlakova. This is a collaborative project with scientists from Cornell University, and Maryland University College Park. We analyzed species composition and density of molluscs in Oneida Lake (New York, USA) for over a century. At the beginning of the 20th century, the lake was in a clear water phase and hosted a very diverse molluscan community. Eutrophication that peaked in 1970s resulted in 25% decline in species richness and 95% decline of the density of native gastropods. Introduction of zebra and quagga mussels was associated with an increase in water clarity and the expansion of macrophyte and bottom algae resulting in the sharp increase in species richness and the density of native gastropods by 2012 but caused a complete extirpation of unionids by 1995. Introduction of round gobies in 2013 was associated with

the significant decline across all gastropod families, but the strongest impact was recorded for the soft-shelled snails. Gobies impact was also depth- and time-dependent. Deep areas were less affected, and most molluscs experienced at least partial recovery.


Lyubov Burlakova and Alexander Karatayev collecting samples at Oneida Lake in July, 2023.

The impact of serial invasion of dreissenids on lake ecosystems

PIs Alexander Karatayev and Lyubov Burlakova. This is a large collaborative project involving over 15 scientists from multiple institutions in North America and Europe. Within this project, we synthesized decadal time series across seven lake ecosystems to resolve shared changes in seven key ecosystem features following the invasion by zebra mussels and the subsequent invasion by quagga mussels. These two congeners are among the most widespread invasive species that re-engineer and increasingly co-invade freshwater ecosystems. Seven polymictic shallow lakes with long-term data sets revealed remarkably similar trends, with the strongest ecosystem impacts occurring within 5–10 years of zebra mussel invasion. Surprisingly, plankton communities then exhibited a partial, significant recovery. This recovery was absent, and impacts of initial invasion amplified, in four lakes where quagga mussels outcompeted zebra mussels and more completely depleted phytoplankton. Recently, we added data on deep stratified lakes to address the following hypotheses: (1) In stratified lakes, quagga mussels form higher lake-wide density than zebra mussels and therefore their ecosystem impact will be stronger. Alternatively, as the bulk of quagga mussel population in stratified lakes is located below the thermocline and is isolated from the surface waters for most of the growing season, their impact on planktonic communities may be lower than zebra mussels, while profundal benthic community may be more strongly affected by quagga mussels. (2) In contrast to polymictic lakes, in stratified lakes it takes much longer for quagga mussels to reach a population maximum and therefore the maximum ecosystem impacts will be delayed. We are in the process of obtaining more data from additional stratified lakes in USA, Germany, Switzerland, and France.

Natural enemies of zebra and quagga mussels

PIs Alexander Karatayev and Lyubov Burlakova. During the past year, we summarized our long-term research on the natural enemies of dreissenids. This research resulted in an 80-page review paper published in *Reviews in Fisheries Science & Aquaculture*. The article summarized the biology and ecology of organisms known to be involved in the predation (143 species), parasitism and commensalism (86 species and higher taxa), and competitive exclusion (14 species) of species in the genus *Dreissena*. We found that predators can at times have major impacts on dreissenid populations, but these reductions are typically only temporal and occur in restricted (e.g., shallow) areas within large waterbodies. A cumulative effect of a growing suite of enemies may have a constant, but overall limited, role in suppressing *Dreissena* densities – one far from any likelihood of population eradication. A diverse and abundant community of natural enemies, however, is beneficial because of its positive impact on energy flow. The introduction of dreissenids has redirected energy from the planktonic to the benthic community and predators, in particular molluscivorous fish and waterfowl, have served to redistribute this energy flow back into the pelagic environment.

Western New York Partnership for Regional Invasive Species Management (WNY PRISM)

PI Christopher Pennuto. The Western New York Partnership for Regional Invasive Species Management works to address invasive species priorities using a coordinated partnership network for which the program provides leadership, technical assistance, and opportunities for collaboration. The goal of this program is to improve, restore and protect local aquatic and terrestrial resources by improving the effectiveness of invasive species management efforts, engaging the public in management actions, and increasing awareness of invasive species issues throughout the eight-county, Western New York region. To achieve established goals, WNY PRISM coordinates several high profile and priority programs. WNY PRISM runs a robust Early Detection and Response Program, several Community Science Programs, a Crew Assistance Program that sees WNY PRISM work with dozens of partners across the region each year, and a Watercraft Inspection Stewardship Program with up to 20 Boat Stewards. This is in addition to expansive education and outreach, data collection, and information management efforts. For more information WNY PRISM activities and results, see section VI.

The response of red-swamp crayfish to intensive trapping

PI Christopher Pennuto. Recently, a small pond in the region was invaded by red-swamp crayfish (*Procambarus clarkii*). This invasive crayfish has had significant food web impacts in other locations it has invaded, leading to loss of littoral macrophyte beds and changes in fish communities. We are attempting an intensive trapping campaign to assess changes in population size structure and reproductive phenology.

A sign informing visitors of the presence of red swamp crayfish at the Park School.

Behavior weaponized: can the winner-loser effect influence crayfish invasion resistance?

PI Christopher Pennuto. Dominance hierarchies are common in multi-species assemblages where interactions for shared, limited resources occur. In these hierarchies, the dominant species tend to be the largest, though this is not always the case. Within species, the winner-loser effect results when 'winners' of a competition have a higher likelihood of winning future contests than expected, whereas 'losers' have a higher likelihood of losing future contests. Rarely has intraspecific status ('winner') been assessed for its influence on interspecific interactions. This project is examining whether native crayfish resistance to an invasive crayfish can be enhanced by training against intraspecific competitors.

Implementation of the Great Lakes Observing System

PIs Brian Haas and Mark Clapsadl. We received another year of funding to operate the eastern Lake Erie Buffalo State/Great Lakes Observing System (GLOS) buoy, including $3,399 for salary recovery and associated fringe costs. This funding comes despite decreased funding opportunities on the heels of a successful 2023 season. Continued success in funding is a result of the fact that we have reliably operated buoys for the GLOS network since 2012. 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. The GLOS buoy is gaining in popularity and, once again, we expect over 20,000 visits to the GLOS website by users looking to see lake conditions and our buoy data are regularly included on Channel 4 Television News weather reports.


A common tern on the GLOS buoy in October, 2023.

Grants and Funding

Ongoing grants, including two newly received in 2023–2024 (total $12,049,393, including $8,011,798 for Buffalo State)

1. Haas, B., and M. Clapsadl. Buffalo State University Eastern Lake Erie Buoy. National Atmospheric and Oceanographic Administration. **$14,688**. 2023–2024.
2. Goodrich, Z. East Canal Ecological Renovation at Tifft Nature Preserve, Buffalo Museum of Science. Niagara River Greenway Commission Greenway Ecological Standing Committee. $344,754.00 (**$18,378 for Buffalo State**). 2024–2026.
3. Clapsadl, M., B. Haas, and K. Hastings. Osprey Nesting Platform and Migrator Habitat Enhancement. Niagara River Greenway Commission. **$94,014**. 2018–2024. (no-cost extension)
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. **$35,193**. 2021–2024.
5. 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**. 2017–2023.
6. Pennuto, C. Administration of the Western NY PRISM: Partnership for Regional Invasive Species Management. NY DEC. **$4,667,125**. 2024–2028.
7. Pennuto, C. Efficacy of predatory fish to control invasive crayfish in small ponds. USFWS, Lower Great Lakes Fisheries Unit. **$78,420**. 2023–2025.
8. Watkins, J., L. Rudstam, L. E. Burlakova, A. Y. Karatayev, and A. Hrycik. Great Lakes Biology Monitoring Program: Zooplankton, Mysis, and Benthic Components. GLRI, U.S. EPA. $6,750,000 (**$3,038,781 for Buffalo State**). 2022–2028.
9. Great Lakes Center is an associated partner institution for the joint SeeWandel-Climate project. Spaak, P., H. Hetzenauer, A. Brinker, D. Straile, M. Möst, U. Lang, K. Schmieder, H. Stibor, M. Speckle, R. Ebersbach, R. Schick, O. Köster, and A. Karatayev (associated partner). BODENSEE in STRESS - Modelling the consequences of climate change and invasive species for the Lake Constance ecosystem as a basis for integral management: BOiSMo" Interreg VI (Switzerland) €4,910,438 (not for Buffalo State). 2024–2027.

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. Ten manuscripts were published, another 5 were submitted to peer-reviewed journals. A total of 33 presentations were made by the GLC researchers, including: 27 presentations at national, international, and regional conferences; and 6 invited talks.

Refereed Journal Publications (published/accepted)

1. Adamovich, B. V., O. A. Makarevich, A. Y. Karatayev, L. G. Rudstam, R. Z. Kavalevskaya, M. A. Baturina, and T. V. Zhukova. 2024. Temporal and spatial distribution of macrozoobenthos in three polymictic lakes of different trophic state: a case study of the Narochianskie Lakes (Belarus). *Hydrobiologia*. 851: 1335-1351.
2. Burlakova, L. E., A. Y. Karatayev, A. R. Hrycik, S. Daniel, K. Mehler, E. K. Hinchey, R. Dermott, R. Griffiths, and L. E. Denecke. 2024. Density data for Lake Erie benthic invertebrate assemblages from 1930 to 2019. *Ecology*. e4301.
3. Daniel, S. E., L. E. Burlakova, A. Y. Karatayev, and L. E. Denecke. 2024. Invasion dynamics of New Zealand mud snail (Potamopyrgus antipodarum) in the Laurentian Great Lakes. *Hydrobiologia*.

4. Karatayev, A. Y., D. P. Molloy, and L. E. Burlakova. 2024. Natural enemies of zebra and quagga mussels: Predators, parasites, and ecological competitors. *Reviews in Fisheries Science & Aquaculture*. 32: 1-80.
5. Karatayev, A. Y., and L. E. Burlakova. *Dreissena* in large lakes: Long-term population dynamics and population assessment using conventional methods and videography. *Hydrobiologia*.
6. Kraemer, B. M., S. Boudet, L. E. Burlakova, L. Haltiner, B. W. Ibelings, A. Y. Karatayev, V. Karatayev, S. Rossbacher, R. Stöckli, D. Straile, and P. Spaak. 2023. An abundant future for quagga mussels in deep European lakes. *Environmental Research Letters*. 18 124008.

New Zealand mud snails (*Potamopyrgus antipodarum*).

7. Paolucci, E. M., L. E. Burlakova, N. Yarza, N. Correa, D. Boltovskoy, and A. Y. Karatayev. 2024. Planktonic larvae of the invasive bivalves *Dreissena* spp. and *Limnoperna fortunei:* review of their effects on freshwater communities. *Hydrobiologia*.
8. Glenn, K. R., and C. M. Pennuto. 2023. Winter residency and foraging of non-native round goby populations in Great Lakes tributary streams. *Journal of Fish Biology*. 103:1401-1408.
9. Qiao, J., S. J. Bennett, J. F. Atkinson, P. A. Cocca, S. K. Delavan, A. R. Hannes, B. A. Hinterberger, T. J. Pede, A. Pérez-Fuentetaja, and R. J. Ruby. 2024. Unconfined fishway design, implementation, and assessment for the emerald Shiner (*Notropis atherinoides*) in the Upper Niagara River, New York. *Ecological Engineering*. 199.
10. Basista, M. P., L. E. Burlakova, A. Y. Karatayev, and S. E. Daniel. Demographic patterns of quagga mussel invasion into Lake Michigan profundal zone. *Hydrobiologia*.

Refereed Journal Publications Submitted (in review)

1. Barbiero R. P., L. E. Burlakova, J. M. Watkins, and A. Y. Karatayev. The benthic nepheloid layer in the offshore waters of the Great Lakes and its post-dreissenid disappearance. *Journal of Great Lakes Research*.
2. Katona, L. R., L. E. Burlakova, A. Y. Karatayev, and Y. Vadeboncoeur. Progressive enrichment of benthic primary producer and dreissenid δ15N with depth in Lakes Erie and Ontario. *Hydrobiologia*.
3. Hrycik, A. R., L. E. Burlakova, A. Y. Karatayev, S. E. Daniel, R. Dermott, M. Tarbell, and E. K. Hinchey. A dataset of individual wet weights of benthic macroinvertebrates. *Limnology & Oceanography Letters*.
4. Glenn, K., and C. M. Pennuto. Stream energy dynamics are disrupted by a non-native fish: Effects on drift and emergence subsidies to riparian spiders. *Freshwater Biology*.
5. Wagner, J. A., and C. M. Pennuto. Dynamics of *Cladophora* tissue breakdown: The role of waves and crayfish consumption. *Aquatic Ecosystem Health & Management*.

Published Reports

1. Burlakova, L. E., A. Y. Karatayev, S. E. Daniel. 2023. Lake Superior Benthos Survey Cooperative Science and Monitoring Initiative 2022. Technical Report. USEPA-GLRI GL00E02259. Great Lakes Center, SUNY Buffalo State University, Buffalo, NY.

International/National/Regional Conference Presentations

1. Karatayev, A. Y., L. E. Burlakova, K. Mehler, O. N. Kormilets (Makhutova), and L. E. Denecke. Rapid assessment of *Dreissena* population in the Great Lakes using underwater videography. 22nd Buffalo State Faculty/Staff Research and Creativity Fall Forum. Buffalo State University, Buffalo, NY. November 2, 2023

(Poster).

2. Burlakova, L., A. Karatayev, S. Daniel, O. Kormilets (Makhutova), K. Hastings, B. Tulumello, and L. Denecke. Great Lakes Center conducts the largest monitoring of benthic invertebrates in the Great Lakes. 22nd Buffalo State Faculty/Staff Research and Creativity Fall Forum. Buffalo State University, Buffalo, NY. November 2, 2023 (Poster).
3. Hastings, K. L. Great Lakes Benthic Oligochaete Guide. 22nd Buffalo State Faculty/Staff Research and Creativity Fall Forum. Buffalo State University, Buffalo, NY. November 2, 2023 (Poster).
4. Karatayev, A. Y., V. A. Karatayev, L. G. Rudstam, L. E. Burlakova, B. V. Adamovich, H. A. Zhukava, K. T. Holeck, A. L. Hetherington, J. R. Jackson, C. Balogh, Z. Serfőző, C. W. Hotaling, T. V. Zhukova, T. M. Mikheyeva, R. Z. Kovalevskaya, O. A. Makarevich, and D. V. Kruk. 2024. Serial invasions can disrupt the time course of ecosystem recovery. 37th Congress of International Society of Limnology. May 5–9, 2024. Iguazu, Brazil.
5. Burlakova, L. E., and A. Y. Karatayev. Role of dreissenids in benthos and effect on North American Great Lakes ecosystems after three decades of invasion. 37th Congress of International Society of Limnology. May 5–9, 2024. Iguazu, Brazil.
6. Karatayev, A. Y., and L. E. Burlakova. *Dreissena* in Great Lakes: Population dynamics and population assessment using conventional method and videography. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
7. Daniel, S., L. Burlakova, A. Karatayev, and L. Denecke. Invasion dynamics of New Zealand mud snail (*Potamopyrgus antipodarum*) in the Laurentian Great Lakes. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
8. Denecke, L. E., L. E. Burlakova, A. Y. Karatayev, and S. E. Daniel. Distribution of Round Goby across depth zones in the Laurentian Great Lakes. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
9. Dittrich, M., Z. Diloreto, K. Avetisyan, S. Zaferani, L. Burlakova, and A. Karatayev. Geochemical heterogeneity at the sediment-water interface is linked to a presence of freshwater mussels in Lake Ontario. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
10. Elgin, A., S. Pothoven, A. Karatayev, L. Burlakova, and T. Nalepa. Catching history in a Ponar: Documenting decades of dreissenid mussel invasion in Lake Michigan. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
11. Harrow-Lyle, T., A. Elgin, M. Rowe, P. Aslip, L. Burlakova, A. Karatayev, R. Valipour, and D. Depew. Comparing interpolation techniques for dreissenid distributions across Lake Erie. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
12. Herne, T., L. Rudstam, J. Watkins, S. Lawhun, P. Boynton, A. Karatayev, and L. Burlakova. Shrimp on film: Utilization of benthic habitat by *Mysis diluviana* in Lake Michigan. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.

Lyubov Burlakova presenting at the International Society of Limnology conference in Brazil in May, 2024.


An image taken from a video clip from Lake Ontario with round gobies circled in yellow.

13. Lawhun, S. D., J. W. Watkins, L. G. Rudstam, L. E. Burlakova, A. Y. Karatayev, and L. E. Denecke. As different as night and day: Using ponar counts to assess *Mysis* benthic habitat use. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
14. Makhutova (Kormilets), O., K. Mehler, A. Hrycik, L. Burlakova, and A. Karatayev. *Dreissena* spp. coverage: a tool for rapid assessment of mussel distribution and condition in the Great Lakes. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
15. Hinchey, E., A. Scofield, E. Yang, L. Burlakova, A. Karatayev, S. Daniel, and J. Lietz. Long-Term Monitoring of Muddy Macrofauna - EPA GLNPO's Great Lakes Benthic Monitoring Program. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
16. Burlakova, L., A. Karatayev, J. Scharold, O. Makhutova, S. Daniel, and K. Mehler. Decadal changes in Lake Superior benthic community. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
17. Hastings, K. L., S. E. Daniel, and L. E. Burlakova. Oligochaete community of Lake Huron. 67th Annual Conference on Great Lakes Research. May 20–24, 2024 (poster). Windsor, Ontario, Canada.
18. Karatayev, A. Y., and L. E. Burlakova. *Dreissena* in Great Lakes: Population dynamics and population assessment using conventional method and videography. Association for the Sciences of Limnology and Oceanography. June 2–7, 2024. Madison, Wisconsin.
19. Burlakova, L. E., R. P. Barbiero, J. M. Watkins, and A. Y. Karatayev. The disappearance of benthic nepheloid layer in the Laurentian Great Lakes invaded by dreissenids. Association for the Sciences of Limnology and Oceanography. June 2–7, 2024. Madison, Wisconsin.
20. Vadeboncoeur, Y., L. Katona, L. E. Burlakova, and A. Y. Karatayev. Basal resource hot zones: Disturbance, morphometry, and nutrients maximize benthic plus planktonic chlorophyll at intermediate depths in the lower Great Lakes. Association for the Sciences of Limnology and Oceanography. June 2–7, 2024. Madison, Wisconsin.
21. Pennuto, C. M., and E. Klimczak. Behavior weaponized: can the winner-loser effect influence interspecific interactions during a crayfish invasion? Invasive Crayfish Collaborative, Great Lakes Aquatic Nuisance Species meeting, Sault St. Marie, Ontario, Canada (virtual).
22. Pennuto, C. M., and K. Yerofeev. Snails behaving badly: An example of maladaptive behavioral response to non-native predators. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
23. Klimczak, E., and C. M. Pennuto. Intensive trapping as a management action against red swamp crayfish. 67th Annual Conference on Great Lakes Research. May 20–24, 2024. Windsor, Ontario, Canada.
24. Yerofeev, K., and C. M. Pennuto. Snails behaving badly: An example of maladaptive behavioral response to non-native predators. NY Chapter AFS. Cooperstown, New York.
25. Klimczak, E., and C. M. Pennuto. Intensive trapping as a management action against red swamp crayfish. NY Chapter AFS. Cooperstown, New York.
26. Feagley, R., B. Roth, T. Berenson, C. Pennuto, P. Siwula, L. Tanner, R. Stroess, C. Blanke, C. Dindorf, and W. Budnick. 2023. Evaluating the prevalence of crayfish species and owner knowledge in the pet retail trade throughout the Great Lake Basin. Ecological Society of America (ESA).
27. Feagley, R., B. Roth, W. Budnick, T. Berenson, C. M. Pennuto, T. Fitzgerald, and P. Siwula. 2023. Buying your new (potentially invasive) best friend: Evaluating the prevalence of crayfish species available for purchase in the pet retail trade throughout the Great Lake States. Midwest Fish & Wildlife Conference.

Invited Talks

1. Burlakova, L. E., A. Y. Karatayev, and S. E. Daniel. Status and temporal trends in Lake Superior benthic community. Lake Superior CSMI Workshop. October 24–25, 2023. Duluth, Minnesota.
2. Karatayev, A. Y., and L. E. Burlakova. *Dreissena* and other benthos. Virtual Lake Erie CSMI Lower Food Web/Harmful Algal Bloom/Hypoxia Working Group Lightning Talk Workshop. October 30, 2023.

3. Denecke, L. E., A. Karatayev, L. E. Burlakova, and S. E. Daniel. Estimating Round Goby (*Neogobius melanostomus*) densities in Great Lakes across depth zones using videography. Invited talk presented at EPA Great Lakes National Program Office. February 27, 2024. Chicago, Illinois (presented virtually).
4. Karatayev, A. Y., and L. E. Burlakova. Population dynamics and population assessment of dreissenids in lakes Michigan and Huron using conventional methods and videography. Invited talk presented at EPA Great Lakes National Program Office. February 27, 2024. Chicago, Illinois.
5. Karatayev, A. Y., and L. E. Burlakova. Quagga mussels in North America - What do we still not know? Invited talk at the 1st meeting SeeWandel-Climate Thematic Working Group "Importance of the quagga mussel," EAWAG. March 19, 2024. Eawag, Dübendorf, Switzerland.
6. Karatayev, A. Y., and L. E. Burlakova. Quagga mussels in the Great Lakes: What have we learn in 35 years of invasion. Invited talk at the PEAK course on quagga mussels, EAWAG. March 20, 2024. Zurich, Switzerland.
7. Karatayev, A. Y., and L. E. Burlakova. Quagga mussels in the Great Lakes: What have we learn in 35 years of invasion. Invited talk at Lake Constance Water Supply Bodensee-Wasserversorgung, Germany. March 22, 2024. Zurich, Switzerland.


Sampling Hamilton Harbor, Ontario, Canada as part of the CSMI 2023 Ontario, with help from Fisheries and Oceans Canada and the R/V *Cisco*. Left: Captain Robert Linley, Brian Haas, Alexander Karatayev, and Kelly Bowen after a successful survey. Right: Lyubov Burlakova in Hamilton Harbor, in July, 2023.


Sampling the western basin of Lake Erie in May for CSMI Erie 2024. Left: Brian Haas deploys a small BIS for benthic videography. Right: Mark Clapsadl collects benthic samples using a ponar dredge.

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 M.S. and M.A. Graduate Programs

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

Students enrolled in GLES Administered by the GLC in 2023–2024:

Master of Art:
Danielle Dolan
Emily Klimczak

Master of Science:
Zachary Colling
Michael Kalinka (graduated in 2024)
Lindsay Piotrowski
Robert Salefske
Lisa Yaeger

Advising Undergraduate and Graduate Students

- Lyubov Burlakova was the thesis co-advisor for one GLES M.A. student and a graduate committee member for M.S. student Sarah Lawhun (Cornell University, 2024).
- Chris Pennuto was the advisor of one graduate student, a committee member for three graduate students, the advisor for four GLES non-thesis PSM students, and Internship Coordinator for two GLES graduate students.

Michael Kalinka (left) interned at the NYS DEC Region 9 Office. Lindsay Piotrowski (right) worked with WNY PRISM and interned with Erie County Parks. Together, they worked on a service-learning project for Erie County Parks Department to create a map to identify Eastern hemlock stands in two parks to assist hemlock wooly adelgid survey efforts.

IV. Outreach, Service, and Professional Development

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

Lyubov Burlakova:

- Associate Editor for the *Journal of Great Lakes Research*.
- Associate Editor for the *Hydrobiological Journal* (Ukraine).
- Guest Editor, Special Issue "Biology and impacts of invasive freshwater molluscs" in *Hydrobiologia*.
- Member of Scientific Committee for 2024 Annual ASLO Meeting.
- Graduate Committee Member, Sarah Lawhun, Cornell University (2024 – present).
- Member of Buffalo State Sustainability Committee.
- Ruth Huppuch Research and Education Award Fund Committee member.
- Committee member for Great Lakes Center Goals 2030.
- Presented at 2023 Fall Forum on November 2, 2023.
- Helped to organize Great Lakes Center Open House, September 7, 2023.
- Assisted in preparation of Great Lakes Center 2022–2023 Annual Report.
- Wrote articles for GLC Newsletter series.
- Participated in Big Dig V on November 4, 2023, to plant trees on campus.
- Completed online training for Preventing Harassment & Discrimination (November 6, 2023).
- Participated in multiple Lake Erie CSMI 2024 survey planning workshops.
- Participated in collaboration between Great Lakes Center and the Swiss Federal Institute of Aquatic Science and Technology (Dr. Piet Spaak).
- Participated in GLNPO workshop (February 2024) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Chaired section at the IAGLR 67th Annual Conference on Great Lakes Research. May 2024, Windsor, Ontario, Canada.
- Chaired section at the meeting of the Association for the Sciences of Limnology and Oceanography. June 2–7, 2024.
- Hosted delegation of German engineers and scientists of Lake Constance Water Supply to share our knowledge about the development of quagga mussels in the Great Lakes, to estimate and predict what might happen in the Lake of Constance in the near future. February 2024.
- Invited and hosted Turkmen Water Management meeting with Great Lakes Center for Environmental Research and Education to discuss freshwater resources, conservation, and management. November 15, 2023.
- Participated in virtual Lake Erie CSMI Lower Food Web/Harmful Algal Bloom/Hypoxia Working Group Lightning Talk Workshop, October 30, 2023.
- 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.

- Interview by David Todd for research and educational work on behalf of a non-profit group, the Conservation History Association of Texas, and for a book and a website for Texas A&M University Press, and finally for an archive at the Briscoe Center for American History, which is at the University of Texas at Austin. February 2024.
- Member of Aquatic Life Use Metrics - Benthic Invertebrate subgroup led by Ohio Sea Grant and Ohio EPA to develop aquatic indicators for Lake Erie.
- Member of Freshwater Mollusk Conservation Society.
- Member of the Association for the Sciences of Limnology and Oceanography.
- Member of the International Association for Great Lakes Research.
- Member of Ecological Society of America.
- Member of Society of International Limnology.
- Reviewed 2 manuscripts for *Hydrobiologia* and 6 papers for the *Journal of Great Lakes Research*.
- Reviewed one research proposal for SUNY ESF 2023-24 McIntire-Stennis Research Program.
- Reviewed one proposal for the French National Research Agency.
- Member of the Buffalo State "The Friends of the Maud Gordon Holmes Arboretum."

Mark Clapsadl:

- Oversaw general Field Station operations, improvements and worked on plans for design upgrades.
- Supported outside agencies such as the NYSDEC and USFWS through general assistance and the use of the field station grounds and boat launch.
- Collected benthic samples for spring CSMI in the Western Basin of Lake Erie.

Susan Daniel:

- Completed online training for Preventing Harassment & Discrimination (October 5, 2023).
- Wrote articles for GLC Newsletter series.
- Assisted in preparation of GLC Annual Report.
- Attended the annual Great Lakes Open House on September 7, 2023.
- Attended award ceremony for President's Award for Excellence Research, Scholarship, and Creativity on October 12, 2023.
- Attended 2023 Fall Forum on November 2, 2023.
- Participated in Big Dig V on November 4, 2023, to plant trees on campus.
- Attended the annual Arboretum Christmas Party on December 4, 2023.
- Supervisor of student research assistants Kifaya Albayed and Kayla Kudlowitz (undergraduate SUNY Buffalo State), as well as Yevheniia Mikulska (undergraduate SUNY University of Buffalo).
- Women in Fisheries Mentorship Participant with the New York Chapter American Fisheries Society participant. As a part of this program participants are asked to meet monthly to discuss various topics including management, professional development, etc. I am both a mentor and a mentee as a part of

Susan Daniel (pictured) and Angela Tulumello helped give a tour of their science mission aboard the R/V *Lake Guardian* to politicians and attendees of the Brownfields 2023 conference in Detroit, Michigan, in August, 2023.

this program.

- Participated in multiple phone conferences with EPA about current research and potential future projects, as well as the status of various data submissions.
- Participated in meetings with our partners from Cornell University on the Great Lakes Long-term Biological Monitoring Program.
- Attended GLNPO collaborators meeting at Cornell Field Station in Bridgeport, NY.
- Member of the New York Chapter American Fisheries Society.
- Member of the World Wildlife Fund.
- Member of the Buffalo State "The Friends of the Maud Gordon Holmes Arboretum."
- Member and Regular U.S. Board Member of the International Association for Great Lakes Research.
- Member of the Awards Committee for the International Association for Great Lakes Research.
- Member of the Justice, Equality, Diversity, and Inclusion Committee for the International Association for Great Lakes Research.
- Chair of the Membership Committee for the International Association for Great Lakes Research.
- Member of the International Association for Great Lakes Research Sustainers Circle.
- Organized the participation in the annual Buffalo City School's Career Fair, spring 2024.
- Assisted with planning for and presentation given by GLC staff for Take Your Child to Work Day, April 25, 2024.
- Coordinated travel for visiting scientist Ronald Griffiths on July 11–13, 2023.
- Participated by providing laboratory space and giving a tour for students involved in the Future Innovators in Tech and Engineering summer camp on July 17, 2023.
- Attended lecture "Strategies for Unstoppable Success" by Arel Moodie hosted by SUNY RF on July 19, 2023.
- Hosted and gave a tour to Carrianne Pershyn, Biodiversity Research Manager for the Ausable River Association, on October 6, 2023.
- Participated and presented at U.S. EPA 2023 Lake Superior CSMI Workshop, October 24–25, 2023.
- Hosted and coordinated travel for visiting scientist Sarah Lawhun on January 15–16, 2024.

Lillian Denecke:

- Trained undergraduate work study students.
- Analyzed video data collected from CSMI years 2019–2023 for round goby presence.
- Assisted in the archival, salvage, and documentation of historic samples.
- Completed online training for Preventing Harassment & Discrimination (December 22, 2023).
- Attended GLNPO collaborators meeting virtually (February 27–28, 2024).
- Attended International Association for Great Lakes Research conference in Windsor, ON May 20–24, 2024.
- Wrote an article for the GLC Newsletter series.
- Participated in phone conferences with EPA GLNPO regarding ongoing research projects.
- Participated organizing and running activities with GLC staff for Take Your Child to Work Day, April 25, 2024.
- Member of International Association for Great Lakes Research.

Susan Dickinson:

- Execute daily operations of the GLC including purchases of supplies and equipment, travel paperwork, and

maintaining multiple budgets (all with State, Research Foundation and College Foundation monies); update departmental bulletin boards and website.

- Proof-read multiple research papers, reports, and flyers/brochures for GLC and WNY PRISM.
- Scheduled and organized annual Open House and staff meetings.
- Maintained or disposed of departmental files in accordance with NYS and SUNY schedules for records management.
- Assist with GLES program functions: scheduling of thesis proposal/defense meetings, Banner course input, distribution and collection of annual Performance and Evaluation forms.
- Assisted with planning for and presentation given by GLC staff for Take Your Child to Work Day, April 25, 2024.
- Assisted with planning/logistics to host the Great Lakes St. Lawrence Governors & Premiers annual meeting on campus and catered their daily meetings.
- CSEA Local 640 Treasurer beginning July 2021 (4-year term).
- Chair of Local 640's Budget Committee and Audit Committee; member of Veterans Committee, Health and Safety Committee, Grievance Committee, and Planning Committee.
- Presented about CSEA at New Member Orientation.
- Professional development: Completed Sexual Harassment Prevention Training (11/3/23), Workplace Violence Prevention Training (11/3/2023), Mandatory Ethics Training (5/9/24); joined the campus Administration Staff Working Group.

Brian Haas:

- Aided in the setup, launching, and retrieval of the GLOS buoy in Lake Erie.
- Collected benthic samples for spring CSMI in the western basin of Lake Erie.
- Provided vessel field trips and tours for classes and school groups.
- Helped graduate students from Buffalo State University with research projects that were conducted in the field station labs.
- Provided general assistance to WNY PRISM at the Field Station.
- Installed additional plantings in the Field Station's migratory bird garden.
- Worked with campus facilities to remove heaters, chillers, and old electronics from the Field Station's main fish lab. This was done to prepare for the installation of a new efficient heating and cooling system with modern electronics.
- Worked with campus grounds to clear the Field Station boat launch of stone and debris which had made the launch unusable.
- Worked with campus grounds to build up the stone access road that connects the Field Station and the boat storage building.
- Supported local agencies including the NYSDEC and USFWS through general assistance and the use of the Field Station grounds and boat launch.
- Made strategic purchases and installations that enhanced the Field Station's operational and research capacity.
- 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.
- Helped various departments on campus when our resources were requested.

- Worked with Field Station neighbors, including the West Side Rowing Club and the Navy Operational Support Center, and provided assistance when possible.

Kit Hastings:

- Assisted with the Great Lakes Long-term Biological Monitoring Program's Summer 2023 project, and Lakes Huron and Ontario CSMI projects (oligochaete taxonomy).
- Compiled a species addition proposal for *Ripistes parasita* to the GLNPO database.
- Continued to work on the Great Lakes Benthic Invertebrate Guide.
- Produced two issues of GLC Newsletter (editor).
- Wrote articles for the GLC Newsletter series.
- Prepared the GLC Annual Report for publication.
- Managed the current GLC website.
- Began redesigning the GLC website, to be completely replaced by the end of 2024.
- Improved the accessibility of the GLC website, Annual Report, and Newsletters, in compliance with Buffalo State Guidelines for Accessibility.
- Made a slideshow of GLC activities for the 2023 GLC Open House.
- Participated in webinars that pertain to my field of study, including Great Lakes research and website and document accessibility.
- Attended axe-con 2024, a virtual accessibility conference.
- Attended IAGLR's 67th Annual Conference on Great Lakes Research.
- Invited panelist for "Gender and STEM: Inspiring the Next Generation" on March 12, 2024, at Buffalo State University.
- Member of the Buffalo State Institutional Animal Care and Use Committee.
- Member of the International Association for Great Lakes Research.
- Member of WNY GIS User Group and NYS GIS Association.
- Member of oSTEM.
- Member of Buffalo State Bengal Allies and LGBTQ+ Resource Center.

Brittany Hernon:

- Hosted 3 invasive species volunteer removal workdays to help community members to learn about and participate in invasive species management.
- Led 2 Walk and Talks to education community members on invasive species identification and iMapInvasives reporting methods.
- Facilitated a Mile-a-Minute Working Group Meeting to bring together organizations from the region to focus removal efforts on this priority early detection species.
- Attended the NYS Invasive Species Expo at Saratoga Spa State Park, Saratoga Springs, NY. September 2023.

Alexander Karatayev:

- Organized Great Lakes Center Open House, September 7, 2023.
- Published Great Lakes Center 2022–2023 Annual Report.
- Wrote articles for GLC Newsletter series.
- Campus Representative for the Great Lakes Research Consortium.
- Associate Editor of *Hydrobiological Journal* (Ukraine).

- Participated in multiple Lake Erie CSMI 2024 survey planning workshops.
- Participated in GLNPO workshop (February 2024) to present on current progress of the ongoing projects and discuss future research and grant opportunities.
- Chaired section at the IAGLR 67th Annual Conference on Great Lakes Research. May 2024. Windsor, Ontario, Canada.
- Chaired section at the meeting of the Association for the Sciences of Limnology and Oceanography. June 2–7, 2024.
- Hosted delegation of German engineers and scientists of Lake Constance Water Supply to share our knowledge about the development of quagga mussels in the Great Lakes, to estimate and predict what might happen in the Lake of Constance in the near future. February 2024.

A meeting at the GLC between Alexander Karatayev (standing, second from left) and Lyubov Burlakova (seated, left), Dr. Piet Spaak (seated, center), and the six members of the Lake Constance Water Supply in February 2024.

- Invited and hosted Turkmen Water Management meeting with Great Lakes Center for Environmental Research and Education to discuss freshwater resources, conservation, and management. November 15, 2023.
- Participated in virtual Lake Erie CSMI Lower Food Web/Harmful Algal Bloom/Hypoxia Working Group Lightning Talk Workshop, October 30, 2023.
- Invited by Dr. Piet Spaak to present our research and take part in workshop in Switzerland, and to discuss collaboration between Great Lakes Center and the Swiss Federal Institute of Aquatic Science and Technology, including writing publications and grant proposals. March 2024.
- 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.
- Participated in the Meeting of the State and Provincial Designees and Science Team Meeting and presented a talk on the Great Lakes Center mission and accomplishments.
- Interview by David Todd for research and educational work on behalf of a non-profit group, the Conservation History Association of Texas, and for a book and a website for Texas A&M University Press, and finally for an archive at the Briscoe Center for American History, which is at the University of Texas at Austin. February 2024.
- Member of Aquatic Life Use Metrics - Benthic Invertebrate subgroup led by Ohio Sea Grant and Ohio EPA to develop aquatic indicators for Lake Erie.
- Member of Freshwater Mollusk Conservation Society.
- Member of the Association for the Sciences of Limnology and Oceanography.
- Member of the International Association for Great Lakes Research.
- Member of Ecological Society of America.
- Member of Society of International Limnology.
- Reviewed manuscripts for the *Journal of Great Lakes Research*.
- Reviewed proposal by Aaron Ninokawa, "Sensitivity of Dreissenid mussels to natural and anthropogenic

shifts in water chemistry."

- Member of the Buffalo State "The Friends of the Maud Gordon Holmes Arboretum."

Andrea Locke:

- Held multiple, open WNY PRISM Partnership and Working Group Meetings to allow for public involvement in regional invasive species issues.
- 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.
- Coordinated with the Department of Agriculture and Markets to direct WNY response to Spotted Lanternfly.
- Coordinated with Cornell Cooperative Extension and NY Invasive Species Research Institute to release swallow-wort biocontrol agent at multiple sites and coordinated with volunteers to assist with monitoring.
- Participated in Great Lakes Action Agenda Working Group Meetings and sub-committee on Cattaraugus Creek.
- Held position on Great Lakes Phragmites Collaborative Advisory Committee and Funding Sub-Committee.
- Member of the GLES PSM Advisory Board.
- Reviewed and updated priority species lists for Western New York: Approaching Region Species, Early Detection Species, and Data Gap Species.
- Assisted Western New York AmeriCorps Program with forming local connections to support service members.
- Participated in Niagara River Greenway Plant Guidelines Working Group.
- Held Resume Building Workshop for WNY PRISM Boat Stewards, August 2023.
- Attended NAISMA Biocontrol Summit, December 2023.
- Attended Leading People Responsibly Workshop, January 2024.
- Attended Allyship in Action Workshop, March 2024.

Christopher Pennuto:

- Coordinator, GLES masters programs.
- Chair, Biology Department.
- Member, BSU Sustainability Committee.
- Student awards judge, AFS conference, Cooperstown, NY, February 2024.
- Reviewer for *Journal of Great Lakes Research*, *Biological Invasions*, *Aquatic Ecology*, *Journal of Freshwater Ecology*, and *Herpatolgica*.

Rachel Taylor:

- Served as regional representative for DEC-led Invasive Species Education and Outreach Committee, Metrics Sub-Committee, and Social Media Sub-Committee.
- Coordinated with community scientists for Tonawanda Rails to Trails Surveys, including data collection and review, and provided summary of results and recommendations to the Town of Tonawanda.
- Coordinated Boot Brush Station Program to support partners in invasive species spread prevention efforts.
- Coordinated with community scientists for Hemlock Woolly Adelgid Surveys, including survey locations and data collection.
- Coordinated with Department of Agriculture and Markets, partners, and community scientists to facilitate and implement spotted lanternfly survey and trapping efforts.

- Hosted an invasive species removal volunteer workday in partnership with the Friends of Letchworth State Park to help community members learn about and participate in invasive species management.
- Attended the Monitoring and Managing Ash Workshop, Castile, NY. August 2023.
- Attended the NYS Invasive Species Expo at Saratoga Spa State Park, Saratoga Springs, NY. September 2023.

Angela Tulumello:

- Attended the annual Great Lakes Open House on September 7, 2023.
- Was actively involved in LTM and CSMI research projects with Dreissena taxonomy, picking, and assisted in preparing oligochaete slides.
- Archival and documentation of historic *Dreissena* samples.
- Assisted with setting up for the presentation given by GLC staff for Take Your Child to Work Day, April 25, 2024.
- Assisted in training student research assistants.
- Completed online training for Preventing Harassment & Discrimination (December 6, 2023).

Brianne Tulumello:

- Assisted with the Great Lakes Long-term Biological Monitoring Program's Summer 2023 project, and Lakes Huron and Ontario CSMI projects (chironomid taxonomy, prepared chironomid and oligochaete slides).
- Photographed many Chironomidae genera and other taxa for online benthic taxa list.
- Assisted in the archival, salvage, and documentation of historic samples.
- Trained Research Scientist Olesia Kormilets in benthic sample processing and picking.
- Compiled a species addition proposal for *Paratendipes albimanus*, *Potthastia longimanus* group and *Monodiamesa* sp. to the GLNPO database.
- Attended the annual Great Lakes Open House on September 7, 2023.
- Completed RF learning and development online training, Culture of Civility: Sexual Harassment (NY) (RF), December 31, 2023.

V. Field Station Activities

Educational Support and Outreach

We have continued to provide support to Buffalo State classes through field trips and station tours. In addition, we have helped graduate students working on projects at the field station and within the wet labs. We are in talks with a teacher from North Tonawanda High School about providing some course content input and Field Station visit opportunities for a new Great Lakes course she is starting next fall.

Boat Launch debris clearing

The lower underwater portion of the Field Station boat launch accumulated literal tons of stone and debris from the intense storms over the past few years. This debris made launching boats impossible by the Spring

Clearing debris from the end of the boat launch.

of 2024, but with the help of the BSU grounds crew and their heavy equipment, we were able to get the debris cleared out and launch boats again.

Boat Storage access road

The gravel access road that connected the Field Station and the boat storage building needed to be built up due to compaction and erosion. The stone ramp that connects the lower and upper lots had steepened over the years and made bringing our largest boats up to the Field Station difficult. We had almost 200 tons of crusher run limestone trucked in to rebuild our access road and lower lot. The BSU grounds crew was able to spread the stone and fix the grade of our stone ramp.

Delivering stone for the boat storage access road.

Osprey Nesting Platform and Habitat Enhancement Project

In 2023–2024, we assessed the progress and the most successful components of the Osprey Nesting Platform and Habitat Enhancement Project funded through the Niagara River Greenway Commission (no-cost extension 2024) ($94,104, PI's Clapsadl, Haas, and Hastings). During this time frame we requested and were granted a no-cost extension to finish up the project and complete the final installments planned for the Fall of 2024 and the Spring of 2025.

Other projects

We provided field and laboratory support for multiple funded projects, including the deployment/retrieval of the GLOS (Great Lakes Observing System) buoy in Eastern Lake Erie and we collected benthic samples in the Western Basin of Lake Erie for the spring CSMI. We have continued to maintain a regular maintenance program for our research boats. This program, coupled with the ability to store the boats in the boat storage building out of the sun, rain, and snow, has enabled us to keep the boats in good working order.

VI. Western New York PRISM Activities

Western New York Partnership for Regional Invasive Species Management (WNY PRISM) is a sponsored program of the Research Foundation for SUNY Buffalo State University and is hosted by the Great Lakes Center. Funding for WNY PRISM is provided by the Environmental Protection Fund through a contract with the NYS Department of Environmental Conservation. Funding for WNY PRISM, through a new contract that began January 1, 2024, supports continued operations through December 31, 2028.

WNY PRISM works to address invasive species priorities using a coordinated partnership network, 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 efforts, engaging the public in management actions, 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.

WNY PRISM addresses invasive species issues as identified in the WNY PRISM Strategic Plan (2019–2024), which was developed through a year-long collaborative process involving regional partners in 2019, and updated in 2022. The original plan put forth an ambitious program designed to provide the framework by which the invasive species management needs of western New York may be met. The 2022 updates served to strengthen and expand upon the established framework by addressing shifted priorities, expanded programs, and new

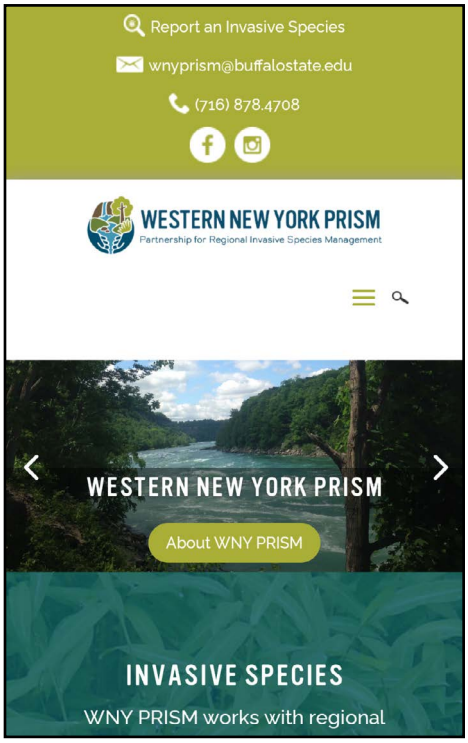
opportunities.

The strategic plan identifies six goals associated with WNY PRISM's established core functions (Partnership Coordination, Information Management, Education and Outreach, Prevention, Early Detection/Rapid Response, and Habitat Management and Restoration), which are further broken down into objectives and strategies for implementation. The strategic plan is supported by annual work plans that identify specific tasks WNY PRISM staff will focus on in any given year. WNY PRISM operates on the calendar year, and the WNY PRISM 2023 and 2024 Annual Work Plans provided the framework for FY24.

Program Highlights and Accomplishments

Western New York Partnership for Regional Invasive Species Management (WNY PRISM) continues to address invasive species priorities through our many programs and essential partnerships with regional stakeholders. Since being established in 2014, WNY PRISM has recorded over 21,000 invasive species presence/absence data points, held and/or participated in 450 educational events, conducted 75,500 boat inspections, completed 103 Crew Assistance Program Projects, surveyed, monitored, and managed 40 early detection sites with 5 sites reaching "presumed eradicated" after 7 years of no plants found, hired 168 seasonal employees, and worked with 218 partner organizations and agencies.

After nearly a full year in development, the new WNY PRISM website went live on July 28, 2023. The new website improves visitor experience by offering increased functionality and by making it faster and easier to locate information. Streamlined menus clearly identify where information is located, and the new homepage highlights the most important, and oft requested, items including the events calendar and a contact tab. New functionality includes a fully-integrated events calendar, use of Web Map Services for boot brush station and boat launch locations, and our invasive species profiles, and community members are now able to pledge online for the Pledge to Protect Program.



Screenshot of the mobile version of the new WNY PRISM homepage.

WNY PRISM conducted a comprehensive review of invasive species in 2023 using the NYS Tier Ranking System, which identifies five tiers based on species abundance (presence and distribution), impact (including potential future impact), cost of control, and difficulty of control. WNY PRISM first adopted the tier system in 2019, using it to identify species priorities, inform management decisions, and assist in project selection. This review involves looking at the suggested Tier Ranking for each species, based on the model used by iMap that includes presence data from multiple databases, and comparing that result to potential data gaps and local knowledge, and assessing the feasibility of management. Terrestrial and Aquatic Working Group Meetings were held as part of WNY PRISM's Fall Partner Meeting, leading to several changes being made to individual species designations. In addition, nine new species were added to WNY PRISM's list of ranked species. The updated WNY PRISM Invasive Species Tier Rankings, including 156 ranked species, is available for reference.

WNY PRISM maintains an Approaching Region Priority List and Early Detection Priority Species List, along with a Data Gap Species Priorities, which provide guidance beyond the Tier Rankings for species prioritization. Updates for 2024 included the removal of waterwheel (*Aldrovanda vesiculosa*) and kudzu (*Pueraria montana*) from the Approaching Region Priority List, replacement of goatsrue (*Galega officinalis*) with amur corktree (*Phellodendron amurense*) on the Early Detection Priority List, and fully replacing the Data Gap Species List, adding wild chervil (*Anthriscus sylvetris*), elm zigzag sawfly (*Aproceros leucopoda*), yellow floating heart

(*Nyphoides peltata*), and black jetbead (*Rhodotypos scandens*).

Community science volunteers learning to identify HWA at a training at Knox Farm State Park on January 20, 2024.

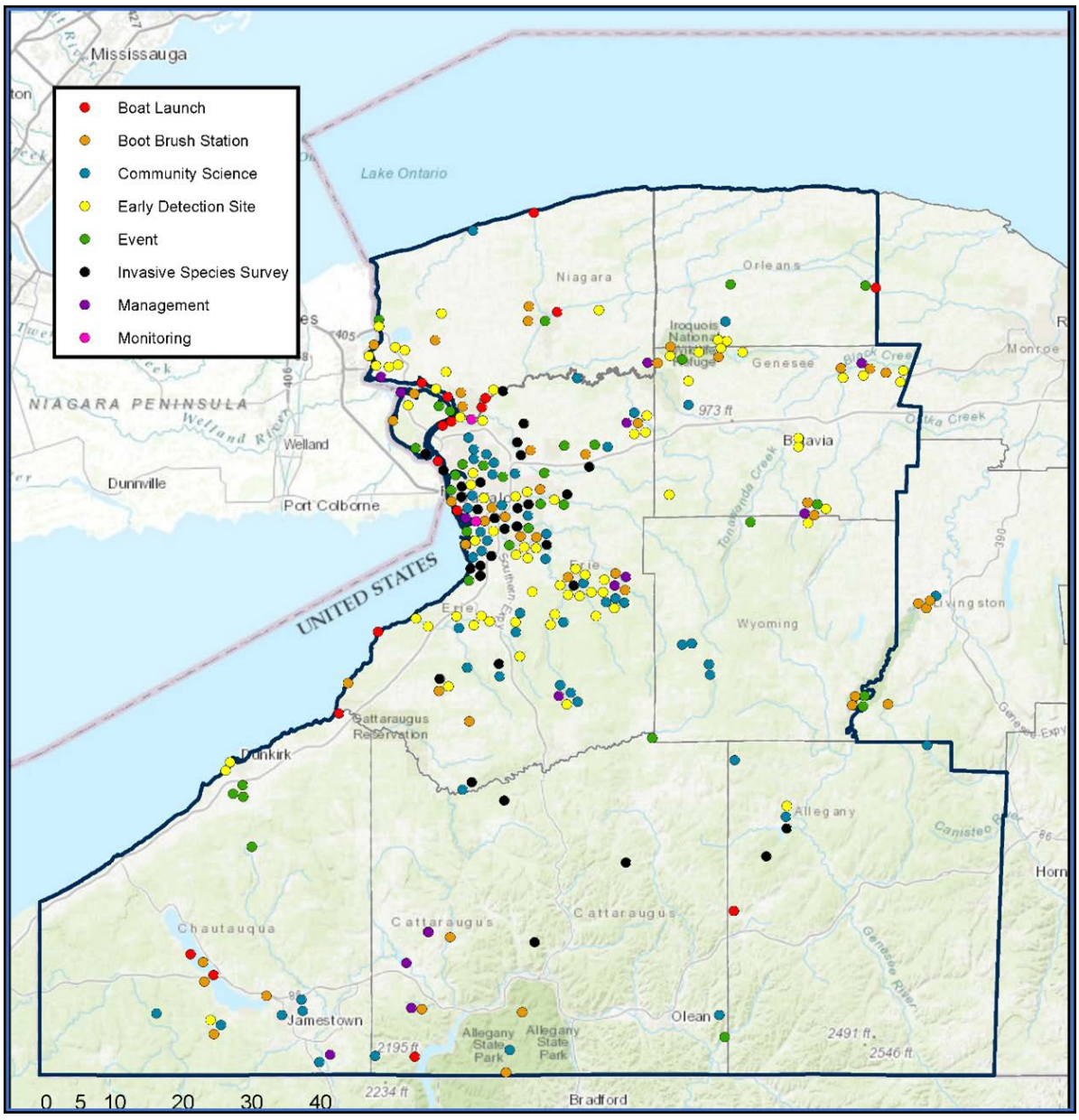
Several community science initiatives were implemented this year, including the Trail Survey, Spotted Lanternfly Monitoring, and Hemlock Woolly Adelgid Hunters Programs. Seven community scientists completed eight of the ten identified trail sections as part of the Trail Survey Program, contributing twenty-five volunteer hours and submitting 130 presence records. Fifteen unique species were recorded with the most frequently reported species being common buckthorn (54), cutleaf teasel (*Dipsacus laciniatus*, 22), knapweed spp. (*Centaurea* spp., 10), and honeysuckle spp. (8). Twenty-two spotted lanternfly (SLF) traps were set up and monitored in Allegany (2), Chautauqua (1), Erie (16), Genesee (1), Orleans (1), and Livingston (1) Counties, and no SLF were detected. Seventeen community scientists contributed 50.25 volunteer hours (self-reported) to hemlock woolly adelgid surveys. Twenty-seven locations were surveyed in Allegany (1), Cattaraugus (6), Chautauqua (4), Erie (14), Genesee (1), and Wyoming (1) Counties. A total of 274 observations were submitted to iMapInvasives; 246 not detected observations and 28 confirmed detections.

During the 2023 summer season, WNY PRISM's Watercraft Inspection Stewards surveyed 17,147 watercraft, inspected 15,215 watercraft, submitted 14,655 WISPA (Watercraft Inspection Survey Program Application) surveys, and achieved an 88.73% acceptance rate, which represents an increase of over 4% from 2022. During an inspection, Stewards remove all organic matter from watercraft, including native and invasive species. Stewards identified and removed 610 individual, invasive organisms (interceptions) from inspected boats. The most intercepted invasive species was curly-leaf pondweed (*Potamogeton crispus*, 319), followed closely by Eurasian watermilfoil (*Myriophyllum spicatum*, 257). Additional species intercepted include zebra mussel (*Dreissena polymorpha*, 24), brittle naiad (*Najas minor*, 4), starry stonewort (2), European frog-bit (*Hydrocharis morsus-ranae*, 2), *Hydrilla* (*Hydrilla verticillata*, 1), and quagga mussel (*Dreissena bugensis*, 1). The total number of inspected watercraft with interceptions was 1,679, representing 11% of total watercraft. Of the 11%, 81.24% were retrieving boats and 18.75% were launching boats, demonstrating the importance of cleaning boats when they leave the water.

Terrestrial early detection survey efforts focused on porcelain berry, slender false brome, goatsrue, and Japanese stiltgrass from the early detection priority list, and amur cork tree, another Tier 2 species in the region. Surveys were carried out at thirty-six sites throughout the region, encompassing over 4,000 acres, and Survey Technicians surveyed 53.31 miles. One new porcelain berry, two new goatsrue and three new Japanese stiltgrass sites were found as a result of early detection survey efforts and other program efforts. Aquatic early detection survey efforts focused on water hyacinth and water lettuce. Three water lettuce and two water hyacinth sites were each surveyed twice during the field season, and no plants were found. A new water hyacinth site was discovered by a partner at Dunkirk Harbor, and all plants were removed at this site.

Slender false brome manual removal was carried out at four sites and led to the removal of thirteen bags of plants, while herbicide treatment was carried out at two sites that encompassed 222.35 acres. Japanese stiltgrass hand-pulling was implemented at twenty-two sites resulting in the removal of 23 bags of plants. Herbicide treatment was carried out at five total Japanese stiltgrass sites, including two sites where hand-pulling was also implemented, resulting in 25.34 acres treated. Goatsrue manual removal was carried out at one site and included the removal of six bags of plants from 0.09 acres.

The 2023 Crew Assistance Program resulted in 745.5 acres surveyed and 45.88 acres managed. Reports for each of the sixteen completed projects were provided to partners and included a summary of the completed work, results and recommendations for future management actions. The 2024 Crew Assistance Program request for proposals was released in December 2023 and proposals were due on January 26. WNY PRISM received sixteen proposals from thirteen unique partners, and selected eight projects for implementation (5 removal, 3 survey), which will be completed in summer 2024.



Where WNY PRISM worked. Most of WNY PRISM's activities take place within the eight county Western New York region of Erie, Allegany, Cattaraugus, Chautauqua, Genesee, Niagara, Orleans, and Wyoming counties.

2023 Program Highlights

- WNY PRISM has worked with 218 partners including 7 new partners in 2023.
- Hired 24 seasonal staff members: Invasive Species Management Assistants (3), Education and Outreach Assistant (1), Watercraft Inspection Steward/Environmental Educators (18), and Survey & Monitoring Technicians (2).
- Completed update of WNY PRISM website, including new functionality.
- Attended NYS Invasive Species Expo, staffing an informational table and presenting on invasive species messaging.
- Conducted a comprehensive review and update of Tier Rankings and updated WNY PRISM priority species lists.
- The Crew Assistance Program received 18 proposals from 16 partners and resulted in 16 completed projects including 745.5 acres surveyed and 45.88 acres treated.
- Terrestrial early detection surveys were carried out at 36 sites encompassing 4,000 acres and 53.31 miles.
- Aquatic early detection surveys were carried out at 5 sites, encompassing 281 acres.
- Early detection priority species removal efforts resulted in 34 sites managed with a combination of herbicide and manual removal and efforts totaled 412.4 acres treated.
- 6,809 records were uploaded to iMapInvasives for the region, including 88 unique species.
- The top five recorded invasive species for WNY PRISM were Eurasian watermilfoil (936), curly-leaf pondweed (687), giant hogweed (402), bush honeysuckle (320) and Japanese stiltgrass (307).
- Giant hogweed was the top not-detected species.
- Tabled at 18 events, delivered 14 presentations, and held 4 Walk and Talks and 10 workshops.
- Events resulted in 2,745 direct contacts and had 45,561 attendees.
- Obtained 388 signatures for WNY PRISM's Pledge to Protect program.
- WNY PRISM Listserv added 37 subscribers, maintaining 377 members.
- WNY PRISM staff responded to 131 public inquiries.
- Facebook posts reached 33,570 individuals and WNY PRISM added 114 page likes.
- Instagram posts reached 17,391 individuals and increased followers by 17%.
- Developed 8 Boot Brush Stations for partners; 48 Boot Brush Stations have been installed across the WNY PRISM region since 2016.
- Completed survey of boot brush stations looking at condition of the station and invasive species presence.

Boot brush station at Lytle Nature Preserve on May 25, 2024.

- The Watercraft Inspection Stewardship Program achieved an 88.7% acceptance rate with 610 interceptions; the most encountered species were curly leaf pondweed (319) and Eurasian watermilfoil (257).
- Boat Stewards had 51,567 total interactions and conducted 14,565 boat inspections working at 17 launches.
- Stewards conducted 445 Walk-Up Surveys and 120 Angler Surveys; no invasive species were observed.

Additional Projects

East Canal Ecological Renovation at Tifft Nature Preserve

Twenty-four acres of riparian and shoreline habitat along the East Canal will be renovated through intensive management of invasive plants, and thoughtful, comprehensive revegetation efforts. This project is an extension of previously completed work and will leverage and protect the ecological outcomes of earlier projects by improving plant community structure and species diversity, and by aiding in the replacement of the existing riparian tree canopy with a new and more diverse cohort of trees. Through a collaboration with Tifft Nature Preserve, WNY PRISM works to enhance and restore the 24 acres that make up the East Canal area of Tifft Nature Preserve. Efforts included invasive species removal and native plant restoration.

Collaboration

WNY PRISM staff participate in and/or facilitate several local, statewide, and regional collaboratives to better provide support for the region we serve. WNY PRISM facilitates and/or participates in the following local, regional, and statewide collaboratives:

- AIS Lakes/Ponds Prioritization
- Buffalo State Arbor Day Committee
- Great Lakes Action Agenda
- Great Lakes Environmental Sciences PSM Advisory Board
- Great Lakes Hydrilla Collaborative
- Great Lakes Phragmites Collaborative
- Great Lakes Slender False Brome Working Group
- iMapInvasives Post-Treatment Working Group
- iMapInvasives Tools Planning - various
- Invasives Crayfish Collaborative
- Lake Erie Watershed Protection Alliance Watershed Advisory Committee
- NYS Aquatic Coordinators Working Group
- NYS Hydrilla Task Force
- NYS PRISM Education and Outreach Committee
- NYS Terrestrial Coordinators Working Group
- Phragmites Adaptive Management Framework
- Spotted Lanternfly Monitoring Group - AGM
- Swallow-wort Research Group
- Watercraft Inspection Stewardship Program App (WISPA)
- Watercraft Inspection Stewardship Program Manual Update
- WNY Forest Pest Task Force
- WNY Mile-A-Minute Working Group
- WNY PRISM Aquatic Working Group
- WNY PRISM Education and Outreach Working Group
- WNY PRISM Terrestrial Working Group
- WNY Spotted Lanternfly Working Group
- WNY Water Chestnut Working Group

WNY PRISM Steering Committee Members

- Sharon Bachman, Cornell Cooperative Extension of Erie County
- Kathleen Buckler, U.S. Army Corps of Engineers, Buffalo District
- 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
- Megan Kocher, New York Sea Grant
- Jenny Landry, New York State Department of Environmental Conservation
- Leslie Moma, New York State Department of Transportation
- Christopher Pennuto, SUNY Buffalo State University

- Mike Shaw, U.S. Department of Agriculture, Natural Resources Conservation Service
- Jonathan Townsend, Royal Fern Nursery

Presentations, Workshops, and Trainings

Particpants at the Walk and Talk at Genesee County Park and Forest on July 26, 2023, signed the Pledge to protect trees by not moving firewood.

1. Hernon, B., and R. Taylor. Walk and Talk at Genesee County Park and Forest. WNY PRISM, East Bethany, NY, July 26, 2023.
2. Taylor, R., and T. Leenders. Walk and Talk: Cassadaga Lakes Nature Park. WNY PRISM, Cassadaga, NY, August 5, 2023.
3. Hernon, B. Volunteer Removal Workday: West Seneca Soccer Complex. WNY PRISM, West Seneca, NY, August 19, 2023.
4. Hernon, B. Volunteer Removal Workday: Mill Road Park. WNY PRISM, West Seneca, NY, September 9, 2023.
5. Locke, A. Walk and Talk at Holley Canal Falls. WNY PRISM, Holley, NY, September 9, 2023.
6. Taylor, R., K. Sabins, M. Pistolese-Shaw, and K. Robinson. Storytelling and the Language of Invasive Species Outreach. NYS Invasive Species Expo, Saratoga Springs, NY, September 25, 2023.
7. Locke, A. WNY PRISM Fall Partner Meeting. WNY PRISM, Buffalo, NY, October 17, 2023.
8. Locke, A. Invasive Species Management. Erie County Environmental Management Council, Virtual, October 17, 2023.
9. Hernon, B. Terrestrial Invasive Species Tier Ranking Session. WNY PRISM Fall Partner Meeting, Buffalo, NY, October 17, 2023.
10. Taylor, R. Protect Your Forests from Invasive Species. Wyoming County Maple School and Trade Show, Attica, NY, December 19, 2023.
11. Taylor, R., and B. Hernon. Hemlock Woolly Adelgid Volunteer Survey Training. WNY PRISM, East Aurora, NY, January 20, 2024.
12. Locke, A. Woody Invasive Species Management. Plant WNY, Buffalo, NY, February 1, 2024.
13. Locke, A. Invasive Species in the Landscape. Hamburg Garden Club, Hamburg, NY, February 14, 2024.
14. Taylor, R. Mapping Invasive Species in Your Backyard and Beyond. Communities in Bloom Gardening Classes, CCE Erie County, Buffalo, NY, February 24, 2024.
15. Taylor, R. Mapping Invasive Species in Your Backyard and Beyond. Rural Landowners Workshop, CCE Allegany County, Yorkshire, NY, March 2, 2024.
16. Hernon, B. Backyard Least Wanted Plants: Management of Knotweed, *Phragmites* and Other Invasive Grasses. Rural Landowners Workshop, CCE Allegany County, Yorkshire, NY, March 2, 2024.
17. Locke, A. Management for Lawncare and Landscape Professionals. WNY PRISM, Depew, NY, March 13, 2024.
18. Locke, A. WNY PRISM Spring Partner Meeting. WNY PRISM, Blasdell, NY, April 18, 20204.
19. Locke, A. WNY PRISM Programs and Impact. Research Foundation for SUNY Buffalo State University, Buffalo, NY, April 23, 2024.
20. Hernon, B. Backyard Least Wanted Plants: Identification and Management of Common and Priority Invasive Species. Orleans County Master Gardeners, Albion, NY, April 25, 2024.
21. Taylor, R., and B. DesJardin. Walk and Talk at Bergen Swamp. WNY PRISM and Bergen Swamp Preservation Society, Bergen, NY, June 1, 2024.

22. Taylor, R., K. Sabins, M. Pistolese-Shaw, and K. Robinson. Storytelling and the Language of Invasive Species Outreach. NY Invasive Species Awareness Week Webinar Series, June 3, 2024.
23. Hernon, B., and R. Taylor. Invasive Plant Species ID and iMapInvasives Training. WNY PRISM, Depew, NY, June 3, 2024.
24. Taylor, R., N. Harper, and A. Blue. Exploring the Impacts of Invasive Species and What You Can Do About It. Environmental Field Days, Gasport, NY, June 5, 2024.
25. Taylor, R. Volunteer Survey Training Program. WNY PRISM, Buffalo, NY, June 22, 2024.
26. Hernon, B. Volunteer Workday: Slender False Brome. WNY PRISM, East Bethany, NY, June 29, 2024.

Visit our website for more information about WNY PRISM.
WNY PRISM's Annual Reports are available online.



Release of *Hypena opulenta*, a biocontrol agent for swallow-wort on June 27, 2024. Left: Cups with *H. opulenta* for release. Middle: An *H. opulenta* caterpillar. Right: Adult *H. opulenta* moth.

The Watercraft Inspection Stewards participated in a water chestnut removal at Elm Creek Dam Site 16 on July 14, 2023.

The Crew applied a foliar treatment to mugwort at Cassadaga Lakes on May 20, 2024.