

THE GREAT LAKES CENTER

Annual Report 2012-2013

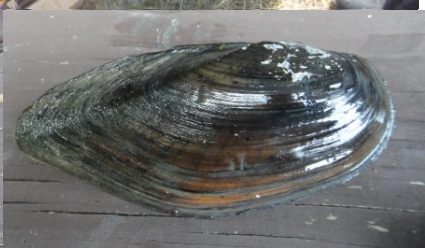


greatlakescenter.buffalostate.edu

Buffalo State
State University of New York



**Conservation of
Native
Freshwater
Mussel Refuges
in the lower
Great Lakes
Lake Ontario
Summer 2012**



CONTENTS

MISSION	3
HIGHLIGHTS.....	3
I. STAFF.....	4
GLC PERSONNEL	4
GLC AFFILIATES (AT SUNY BUFFALO STATE).....	5
COLLABORATORS	5
AWARDS AND ACHIEVEMENTS	7
II. RESEARCH ACTIVITIES	8
AQUATIC ECOLOGY AND ECOSYSTEMS RESEARCH	8
ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY LABORATORY	12
GRANTS AND FUNDING	13
PUBLICATIONS AND PRESENTATIONS	15
III. EDUCATION.....	19
GRADUATE PROGRAMS	19
ADVISING UNDERGRADUATE AND GRADUATE STUDENTS.....	19
SEMINARS.....	20
OTHER EDUCATIONAL ACTIVITIES	20
IV. SERVICE ACTIVITIES.....	21
V. PROFESSIONAL DEVELOPMENT ACTIVITIES	25
VI. FIELD STATION ACTIVITIES	26
RESEARCH VESSELS	26
INSTRUCTIONAL SUPPORT	26
RESEARCH ACTIVITIES.....	26
VII. NEW INITIATIVES	27
GREAT LAKES CENTER M.S. AND M.A. PROGRAMS.....	27
GREAT LAKES CENTER NEWSLETTER.....	27

MISSION

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

HIGHLIGHTS

Over the last year, the Great Lakes Center saw sustained activity and productivity in research, education and service. We continued our excellence in research conducted by GLC personnel and in collaboration with other faculty from SUNY Buffalo State, as well as other institutions in North America, Europe, and South America. Our graduate programs for Master of Art and Master of Science in Great Lakes Ecosystem Science were finally approved at all levels. We are recruiting students into these programs for Fall 2013.

- Over the last year our researchers have published **12** peer-reviewed papers, **6** papers were accepted and **6** papers were submitted for publications.
- We presented **32** talks, including: **19** at national/international/regional conferences, **6** invited talks, and **7** presentations in non-refereed venues.
- We submitted **16** grant proposals (total requested amount **\$7,274,000**).
- **Eleven** projects for research and education (including multi-year grants) are currently funded in the GLC totaling **\$3,298,513**.
- In collaboration with Cornell University we were awarded a US EPA Great Lakes Long-term Biological Monitoring grant for 2012-2017 (**\$3,867,525**, including **\$1,094,726** for Buffalo State). This research project will be an excellent opportunity to expand our research activity to all of the Great Lakes and to increase our visibility among the Great Lakes research community.
- The GLC will host the Western New York PRISM (Partnerships for Regional Invasive Species Management) Coordinator for 2012-2017. PRISM is funded by the New York Department of Environmental Conservation (**\$1,100,768**). This program will be an excellent instrument for outreach and will bring a lot of visibility to the Center and Buffalo State. We are in process of searching for a PRISM coordinator.
- We are also adding **three** employees to our GLC staff. In addition to the upcoming PRISM coordinator position, we have hired two technicians. Susan Daniel was selected as a new research technician with the main responsibility of collecting and analyzing benthic samples for the EPA grant. Joshua Fisher, our new Field Station technician, has worked for US Fish & Wildlife Service before taking this position and gained a great deal of experience with field and laboratory studies.

- We developed and launched the GLC Newsletter, and updated our website, including design, content, and photo galleries and videos.
- Finally, with the completion of construction last fall, the GLC office and Aquatic Ecology laboratories have moved into the new Science and Mathematics Complex. Although the moving was a bit painful, we really enjoy the new office and lab space, as well as the new equipment that came with the building.



The first phase of the Science and Mathematics Complex.
The GLC office is on the third floor.

I. Staff

In 2013, we have hired Joshua Fisher as Field Station technician and Susan Daniel as a research technician for the EPA monitoring grant for 2012-2017.

GLC Personnel

Director:	Alexander Karatayev
Research Scientists:	Subodh Kumar, Director of the Lab of Environmental Toxicology Lyubov Burlakova Mark Clapsadl Jagat Mukherjee Christopher Pennuto Alicia Pérez-Fuentetaja Thomas Hahn (part time)
Research Technician:	Susan Daniel
Secretary:	Cathleen Nasca
Field Station Personnel:	Mark Clapsadl, Manager Kit Hastings, Technician Joshua Fisher, Technician
Research Assistants:	Brianne Tulumello (SUNY Buffalo State) Paul Juette (SUNY Buffalo State) Allyse Fischer (SUNY Buffalo State) Anthony Cevaer (SUNY Buffalo State) Steve Sliwinski (SUNY Buffalo State) Vadim Karatayev (University at Buffalo)

GLC Affiliates (at SUNY Buffalo State)

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

Collaborators

In New York State

- Daniel Molloy, Associate Scientist and Director of the Field Research Laboratory New York State Museum
- Denise Mayer, Assistant Director and Research Scientist, New York State Museum Field Research Laboratory
- Dianna Padilla, Professor, Department of Ecology and Evolution, State University of New York, Stony Brook University
- Lars Rudstam, Professor and Director of the Cornell Biological Field Station, Cornell University
- Joseph Makarewicz, Distinguished Service Professor, Environmental Science and Biology, State University of New York in Brockport
- Joe Atkinson, Professor Environmental Engineering, State University of New York at Buffalo
- Howard Lasker, Professor, Director of Graduate Program in Evolution, Ecology and Behavior, Department of Geology, State University of New York at Buffalo
- Mary Alice Coffroth, Professor, Department of Geology and Graduate Program in Evolution, Ecology and Behavior, State University of New York at Buffalo
- Amy Mahar, Wildlife Diversity Biologist, New York State Department of Environmental Conservation, Avon, NY
- Jenny Landry, Wildlife Diversity Biologist, Region 8 Bureau of Wildlife, New York State Department of Environmental Conservation, Avon, NY
- Mike Goehle, Regional ANS Coordinator, U.S. Fish and Wildlife Service
- Dimitry Gorsky, Fish Biologist, U.S. Fish and Wildlife Service
- Gregory Boyer, Director, Great Lakes Research Consortium, Professor of Biochemistry, State University of New York, College of Environmental Science and Forestry, Syracuse
- David Campbell, The Paleontological Research

Institution, Ithaca, NY

- Robert Baier, Professor and Executive Director of the Industry/University Center for Biosurfaces, State University of New York at Buffalo
- Diana S. Aga, Associate Professor, Chemistry Department, State University of New York at Buffalo
- Katherine Alben, Senior Scientist, Wasdworth Institute, Albany
- James Watkins, Research Associate, Cornell Biological Field Station, Cornell University
- Clifford Kraft, Associate Professor, Department of Natural Resources, Cornell University

At Other US Institutions

- Walter Hoeh, Associate Professor, Evolutionary, Population, and Systematic Biology Group, Department of Biological Sciences, Kent State University, Kent, Ohio
- Jake Vander Zanden, Associate Professor, Center for Limnology, University of Wisconsin, Madison, Wisconsin
- David Zanatta, Assistant Professor, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- Daelyn A. Woolnough, Assistant Professor, Biology Department, Institute for Great Lakes Research, Central Michigan University, Mount Pleasant, Michigan
- Bob Krebs, Professor, Department of Biology, Geology, Environmental Science, Cleveland State University, Cleveland, Ohio
- Jonathan Bossenbroek, Assistant Professor of Ecology, Department of Environmental Sciences, University of Toledo
- Mary Walsh, Aquatic Ecologist, Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy
- Elizabeth Meyer, Aquatic Ecologist, Pennsylvania Natural Heritage Program
- Marsha May, Texas Nature Trackers, Wildlife Diversity Branch, Texas Parks and Wildlife Department, Austin, Texas
- Robert Gottfried, Administrator, Texas Natural Diversity Database, Texas Parks and Wildlife Department, Austin, Texas
- Thomas D. Miller, Director, Lamar Bruni Vergara Environmental Science Center, Laredo Community College, Texas
- David J. Berg, Professor, Department of Zoology, Miami University, Ohio
- Brian Lang, Biologist, New Mexico Department of Game and Fish, New Mexico
- Charles Randklev, Research Associate, Texas Water Resources Institute, Texas A&M Institute of Renewable Natural Resources, San Antonio, Texas
- Michael R. Kidd, Assistant Professor, College of Arts and Sciences, Texas A&M International University, Laredo, Texas
- Yixin Zhang, Assistant Professor, Department of Biology, Texas State University, San Marcos, Texas
- Donald Jerina, Head, Laboratory of Bioorganic Chemistry NIDDK, National Institutes of Health, Bethesda, Maryland
- Kenneth Laali, Professor in Chemistry, Kent State University, Kent, Ohio
- David De Marini, Environmental Carcinogenesis Division (B-143-06), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina
- Kenneth Krieger, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Jack Kramer, National Center for Water Quality Research, Heidelberg University, Tiffin, Ohio
- Gerald Matisoff, Chair, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio
- Darren Bade, Kent State University, Kent, Ohio
- Christine Mayer, Associate Professor, Department of Environmental Sciences and Lake Erie Center, University of Toledo, Ohio
- Don W. Schloesser, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, MI
- Dima Beletsky, Associate Research Scientist, Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, MI
- Tom Bridgeman, University of Toledo, Toledo, Ohio

International

- Demetrio Boltovskoy, Professor, University of Buenos Aires, Argentina
- Sergey Mastitsky, Postdoc, Integrative Bioinformatics and Systems Biology (iBioS), German Cancer Research Center, Heidelberg University, Germany
- Manuel Lopes-Lima, ICBAS - Abel Salazar Biomedical Sciences Institute, Laboratory of Ecophysiology, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Portugal
- Jan Ciborowski, Professor, Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada
- Renata Claudi, RNT Consulting Inc., Ontario, Canada
- Frances Lucy, Lecturer, Institute of Technology, Sligo, Ireland
- Richard Soare, Department of Geography and Planning, Concordia University, Montreal, Canada
- Norman Yan, Professor, York University, York, Ontario, Canada
- Tamara A. Makarevich, Associate Professor, Department of General Ecology, College of Biology, Belarusian State University, Minsk, Belarus.

Awards and Achievements

- Drs. Alexander Karatayev and Lyubov Burlakova became Million Dollar Club members for securing sponsored program funding in excess of a million dollars. A certificate of recognition was presented at the 16th Annual Research Foundation Recognition Reception event on April 29, 2013.
- Research paper “The invasive bivalves *Dreissena polymorpha* and *Limnoperna fortunei*: parallels, contrasts, potential spread and invasion impacts” by A. Y. Karatayev, D. Boltovskoy, D. K. Padilla, and L. E. Burlakova, published in the *Journal of Shellfish Research* in 2007 (volume 26, issue 1, pp. 205-213), was recognized as the most cited article in the journal over the last five years.
- Research paper “*Dreissena* population status in nearshore Lake Ontario” by C. M. Pennuto, E. T. Howell, T. W. Lewis, and J. C. Makarewicz, published in the *Journal of Great Lakes Research* in 2012 (volume 38(Suppl. 4), pp. 161-170), received an award of recognition from Elsevier Publishing for being among the 15 most-cited papers in 2012.



Mark Severson, the Dean of the School of Natural and Social Sciences (in the middle) presenting the Million Dollar Club certificate of recognition to Alexander Karatayev and Lyuba Burlakova.

II. Research Activities

Aquatic Ecology and Ecosystems Research

Most of the aquatic ecology/ecosystems research is carried out at the GLC Field Station and focuses on the Great Lakes and their tributaries. However, Center personnel are also involved in numerous projects in other states, including Ohio, Pennsylvania, Michigan, and Texas, as well as in Canada and Europe. We maintain active international collaboration with world experts in invasion biology that allow us to be aware of future invaders, and concentrate our limited resources in order to minimize the negative effects of aquatic nuisance species.

Current Projects

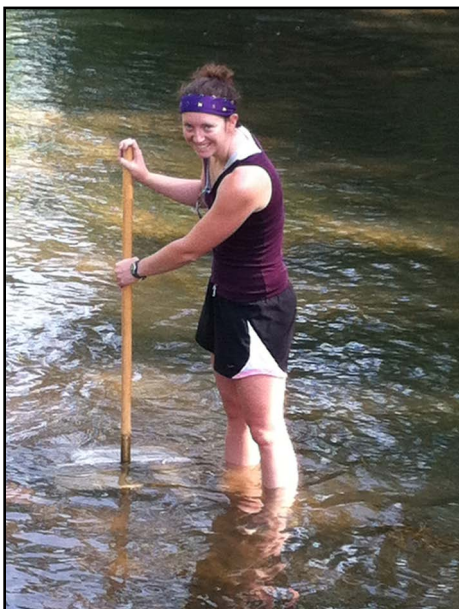
The Lake Erie nearshore and offshore nutrient study ([LENONS](#))

Even though nutrient input target levels in Lake Erie have been reached, significant issues like the central basin “dead-zone,” extensive *Cladophora* growth in the eastern basin and *Lyngbya* in the west, and repeated outbreaks of nuisance algae continue to occur. The role of nearshore and offshore dreissenid mussel populations and the flux and sequestration of nutrients within mussel beds and sediments remain a priority consideration to understanding the nearshore shunt hypothesis and to explaining the Lake Erie trophic paradox. The work quantified all the major biotic and abiotic nutrient pools, flux rates, and trophic pathways in the nearshore and offshore regions of Lake Erie.

We directly measured nutrient levels in these compartments and flux rates in the most rapidly cycling pools. Additionally, we will couple our data with hydrodynamic models of particle transport and phosphate source tracking using $^{18}\text{O}_p$ to assess whether the pools of nutrients in the nearshore and offshore regions follow the predicted patterns of lake mixing models and the nearshore shunt hypothesis.



Dr. Chris Pennuto collecting benthic samples, August 2012.



Graduate student Allyse Fischer collecting benthic invertebrates in a study stream.

Round goby impacts on tributary stream leaf litter decomposition

The round goby has been implicated in the alteration of both macroinvertebrate and fish communities in tributary streams to the Great Lakes. This project assessed whether an invasive invertivorous, benthic fish-mediated trophic cascade (fish predator to insect shredders/ grazers to microbial communities to [leaf breakdown](#)) influences microbial community structure. This was the first application of community respiration profiling to assess a possible cascade effect on microbes in a stream ecosystem.

Role of exotic invertebrates in Lake Erie benthos

This project examined the [role of exotic invertebrates in Lake Erie benthos](#) that increased dramatically during last decades. Our 2009, 2011, and 2012 benthic survey of Lake Erie has shown that benthic invaders currently constitute 40% of total benthic density, and over 95% of the total wet biomass. Benthic community structure and dominance has changed significantly since 1979, and the community is currently dominated by exotic species, resulting in dramatic changes in the food web dynamics of

the whole lake.

Invasion paradox: Who is the better invader – *Dreissena rostriformis bugensis* or *Dreissena polymorpha*?

Dreissena polymorpha (zebra mussel) and *D. r. bugensis* (quagga mussel) are both invaders, co-occur in their native habitat, and have very different histories of invasion. We compared the rates of spread of *D. polymorpha*



Lyuba Burlakova and Dan Molloy developing zebra and quagga mussel vitality test, October 2012.

and *D. r. bugensis* at different spatial scales and contrasted differences in their ecological and population characteristics to determine the relative importance of these traits on the [success and patterns of invasion for these two species](#). In recent years, *D. r. bugensis* has become the dominant species of dreissenids in the lower Great Lakes. However, we found that in glaring contrast to the ratios of the dreissenid species in the Great Lakes, *D. polymorpha* was found to obtain similar or larger sizes and density than *D. r. bugensis* on examined boats - the main vectors of spread for the two species. Therefore, lakes Erie and Ontario are still important sources for *D. polymorpha* secondary spread in North America.

Parasites of aquatic exotic invertebrates: Identification of potential risks posed to the Great Lakes

Exotic species typically lose most of their associated parasites during long-distance spread. However, the few [parasites that are co-introduced](#) may have considerable adverse impacts on their novel hosts, including mass mortalities. We conducted a comprehensive inventory of parasites known to infect 38 species of exotic invertebrates established in the Great Lakes, as well as 16 invertebrate species predicted to arrive in the near future, all of them crustaceans. Based on a literature analysis, we identified a total of 277 parasite taxa associated with the examined invertebrates in their native ranges and/or invaded areas. Of these parasites, 56 species have been documented to cause various pathologies in their intermediate or final hosts, with humans and fishes being the most frequently affected host categories. Potentially harmful parasites were identified in 61% of the invaders, with molluscs and crustaceans hosting the highest numbers of such parasites. The results of our study provide a baseline for further assessment and management of the parasitological risks posed by exotic species to the Great Lakes.

Conservation of native freshwater mussel refuges in Great Lakes coastal zones

Since the introduction of dreissenid mussels into the Laurentian Great Lakes in the late 1980s, the diverse native mussel communities of the region have declined sharply. However, there have been several locales identified as [refuges in coastal and nearshore areas](#). Although these have existed with the ongoing threat of dreissenid mussels in nearby offshore waters for over 20 years, the long-term survival of unionids in these habitats remains in question. In 2011 within this large collaborative project funded by the U.S. Fish and Wildlife Service we surveyed a total of 117 sites at 41 locations in bays, coastal wetlands, and drowned river mouths on the U.S. side of Lake Erie and Lake St. Clair and collected 1778 individuals belonging to 23 unionid species. While species assemblages in the lakes have shown major shifts, these findings are especially encouraging given that surveys shortly after the dreissenid invasion pointed toward total extirpation of the unionid fauna. We also found that the number and weight of dreissenids attached to unionid shells is tenfold fewer than in the early stages of invasion, indicating that the adverse impact of dreissenids on unionids has declined. Our continuing research will attempt to develop models based on unionid presence/absence and habitat characteristics in unionid refuges to identify additional refuge locations. In summer 2012, we surveyed the U.S. part of Lake Ontario and examined unionid genetic diversity/isolation to determine if there is gene flow between coastal refuges and nearby riverine

habitats. This information will help managers develop conservation strategies to sustain existing populations in these refuges. We will also make management recommendations to agencies responsible for conservation of coastal zones and recovery of listed (endangered and threatened) species. Finally, this expansive project also trained undergraduate and graduate students, thereby creating a cadre of future scientists and managers who will work to protect this imperiled resource. For more information please check the [Great Lakes Unionid Refuge Project](#). [Photos on page 1](#).

Survey of Texas Hornshell populations in Texas

The Texas Hornshell (*Popenaias popeii*) is listed as a species of Greatest Conservation Need in Texas and New Mexico, as Endangered in both states, and is a candidate for listing in both states under the federal Endangered Species Act (Federal Register 2008). Using an opportunity provided by U.S. Fish and Wildlife Service for bilateral species conservation effort in New Mexico and Texas, we assessed the [current distribution and habitat requirements of *P. popeii* in Texas](#), evaluating existing populations and their trends, and studying species' biology to develop the recovery plan and management options for *P. popeii* in Texas. In 2011-2013 we surveyed the Devils River and the Rio Grande River near Laredo and found the largest known population of *P. popeii* between Laredo and Eagle Pass, which is healthy and reproducing. However, probably due to pollution, the species has not been found downstream from Laredo. We analyzed all historical data and documented long-term changes in the distribution of *P. popeii* in Texas including range fragmentation and local extirpations. We are currently working on estimation of *P. popeii* population and life-history parameters (e.g., individual growth, survival, size structure, recruitment) and trends by monitoring selected population in Laredo using mark-recapture methods. [Additional photos on page 28](#).



Surveying freshwater mollusks in Pecos River, Texas, February 2013.



Visiting EPA R/V Lake Guardian in October 2012. Alexander Karatayev, James Watkins (Cornell University), Lyuba Burlakova, Glen Warren (EPA), and Lars Rudstam (Cornell University).

Monitoring of benthic invertebrates in Great Lakes

The EPA [Monitoring Program](#) is designed to provide managers access to biological data on zooplankton and benthos to support decision-making. In collaboration with Cornell University, this project will collect benthos (Buffalo State), zooplankton, and chlorophyll data (Cornell University) across the five Great Lakes from 2013 to 2017, analyze this data and make it available to environmental and fisheries managers. Additional research projects include evaluation of early detection systems for invasives, and evaluation of biotic indices of ecosystem health. The project will be conducted in association with the Cooperative Science and Monitoring Initiative years in each of the Great Lakes.

Evaluate Ponto-Caspian fishes for risk of Great Lakes invasion



Among the fish with the highest risk for invading the Great Lakes were black-striped pipefish (*Syngnathus abaster*, above), Caspian tyulka (*Clupeonella caspia*), Volga dwarf goby (*Hyrcanogobius bergi*), and Caspian bighead goby (*Ponticola gorlap*). (Photo credit: Giacomo Radi)

In our previous GLRI project (*Evaluating Ponto-Caspian Fishes for Risk of Great Lakes Invasion*), we used multivariate statistical techniques and new physiological and ecological data from European literature to identify [Ponto-Caspian fishes](#) possessing characteristics that correlate strongly with harmful invasions of the Great Lakes. In the current project, we study the geographic distributions, habitat use, and reproductive biology of high-risk Ponto-Caspian fishes identified in our earlier project and the work of others (e.g. Kolar and Lodge 2002), with a particular focus on areas in and around key European ports. The results of the project will improve our estimates of invasion risk by examining not only species characteristics, but also the likelihood of successful introductions based on current geographical distributions and seasonal variation in occurrences in Europe. As a part of the proposed project, we will also integrate species identification information and other outreach products

in development from our previous GLRI project that target fisheries managers, recreational water users and coastal educators, and make this information easily available.

Food web-mediated transport and bioaccumulation of flame retardants (PBDE) in sport fish from eastern Lake Erie

We sampled sport fish (walleye, lake trout, steelhead trout, smallmouth bass) and their forage fish (gobies, emerald shiners, yellow perch, smelt), and forage invertebrates (dreissenids, amphipods and zooplankton), water and sediment, to determine [PBDE congener load at all these trophic levels](#). Stable isotopic determination of organisms will help us determine their position in the food web and bioaccumulation coefficients for these chemicals of concern.

Botulism type E in the Great Lakes

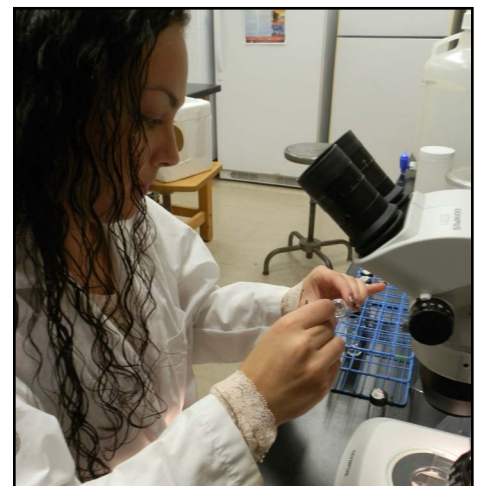
We have ten years of research experience in the new and ongoing botulism outbreaks in the Great Lakes basin. Our current role in this topic is to act as a resource for information for federal and state agencies as well as the Great Lakes Research Consortium and to the greater research community. Our expertise includes sources of [type E botulism in the Great Lakes](#) and food web transmission.

Effects of calcium decline and food levels on *Daphnia* development and reproduction

The common cladoceran zooplankter *Daphnia* takes the calcium to form their carapace from the surrounding water. They also are an important link at the base of many aquatic food webs. Declining levels of calcium in the Canadian Shield lakes threaten to disrupt trophic interactions and lead to significant changes in ecosystem functioning. We are investigating the [interaction between food availability and calcium](#) on growth, reproduction, and survivorship of *Daphnia*.

Long-term monitoring on Lake Erie

Since 2008, the Great Lakes Center has monitored two sites in eastern Lake Erie for the [Lower Trophic Level Assessment](#), a multiagency effort begun in 1999 by the Forage Task Group of the Great Lakes Fisheries Commission. This long-term project is aimed at building a database of

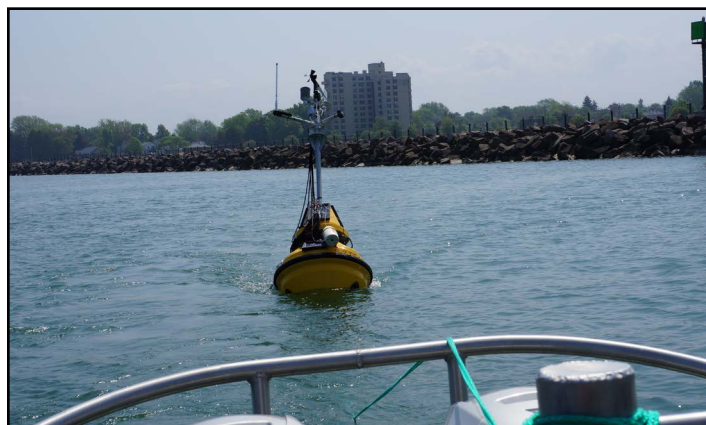


Graduate student Fawn Goodberry examines *Daphnia* under a microscope.

biotic and abiotic information from sampling stations throughout Lake Erie to describe annual trophic conditions. From May through October, we collect physical limnology data, water samples, and plankton samples biweekly, and benthos monthly.

Implementation of the Great Lakes Observing System

In the summer of 2012 and 2013 we deployed an automatic buoy provided by GLOS (Great Lakes Observation System) to SUNY Buffalo State. The [buoy](#) is maintained and run through the Great Lakes Center as a part of a regionally distributed network of 19 fixed monitoring buoys that are located throughout the five Great Lakes. The buoy is one of six new standard GLOS buoys and the only one located in the Eastern basin of Lake Erie.



Towing the GLOS buoy to its mooring site in Lake Erie.

Environmental Toxicology and Chemistry Laboratory

The Environmental Toxicology Laboratory of the Great Lakes Center maintains state of the art facilities on the campus of SUNY Buffalo State. The scientists at this laboratory study the mechanism by which various environmental pollutants present in the Great Lakes induce their adverse effects on human health and the health of other species in order to assess the risk associated with these chemicals, and also to develop preventive measures for minimizing or eradicating various adverse health effects associated with human exposure to these contaminants.

Current Projects

Alcohol and its role in PAH-induced carcinogenesis

Efforts are in progress to understand the tumor promoting mechanism of [alcohol in PAH-induced carcinogenesis](#). Interference with PAH-induced cellular protective response of cell cycle arrest/apoptosis and the role of the transcription factor p53 has been implicated in this regard.

Role of long chain saturated fatty acids in cellular protective response of apoptosis against PAH-induced carcinogenesis

Efforts are in progress to decipher a new mechanistic insight with regard to the [role of saturated fatty acids in PAH-induced apoptosis](#) in p53-independent manner. In this context we will examine the effect of modulation of lipid metabolism on PAH-induced apoptosis response.

Long chain fatty acids as chemo-preventive agents against PAH-induced carcinogenesis

Studies undertaken include examination of the effect of [long chain saturated fatty acids on PAH-induced tumorigenesis](#). In this context we will examine the regulation of fatty acid desaturase and AGPAT-9 which are involved in fatty acid metabolism.

Identification of gene products modulated by benzopyrene (an environmentally present carcinogenic PAH) by cutting age microarray technique and *in vitro* analyses of the role of the particular gene in BP-induced signaling with a view to the development of biomarkers

We already have the microarray data of [benzo\[a\]pyrene-induced gene expression](#) in mouse epidermal JB6 cell line performed in Roswell Park Cancer Research Institute. The data include expression level of 50,000 genes. We are now analyzing the data with the objective of identifying the biomarkers modulated in response to BP, an

environmental carcinogen.

Studies on polynuclear aromatic hydrocarbons, polynuclear sulfur heterocycles, and their metabolites

In our continuing effort to understand the mechanism by which environmental occurring [polynuclear aromatic hydrocarbons and their heterocyclic analogs](#) induce cancer, we are currently studying the metabolism of phenanthro[3,4-b]thiophene to its mutagenic/carcinogenic metabolites by liver and lung microsomes from various animal species as well as human in order to have a better understanding of the carcinogenic potential of this and related carcinogens in various animals.

Studies on developing selenium incorporated chalcones as potential chemopreventive and chemotherapeutic agents of next generation

Because of the ability of natural occurring chalcones and various organoselenium compounds to prevent or reverse carcinogenesis or kill cancer cells with high selectivity without showing any genotoxicity and drug resistance, we initiated a pilot study that has been directed toward [developing organoselenium compounds containing chalcone scaffold](#). We believe that such natural product-driven studies may provide important leads to develop an effective anti-cancer drug that has potential to supplement or replace current anti-cancer drugs which are known to produce adverse side effects, mutations leading to cancer and/or drug resistance.

Grants and Funding

Ongoing Grants (Total \$3,298,513)

1. Burlakova, L. E., A. Y. Karatayev, M. E. May, M. D. Warriner, and B. Gottfried. Survey of threatened freshwater mussels (Bivalvia: Unionidae) in Texas. State Wildlife Grant Program, U.S. Fish and Wildlife Service, and Texas Parks and Wildlife Department. **\$38,000**. 2011–2012.
2. Burlakova, L. E., A. Y. Karatayev, M. E. May, and B. Lang. Survey of Texas Hornshell Populations in Texas. U.S. Fish and Wildlife Service, and Texas Parks and Wildlife Department, Traditional Section 6, Bilateral species conservation effort in New Mexico and Texas. **\$143,000**. 2011–2013.
3. Burlakova, L. E., A. Y. Karatayev. Zebra/Quagga Mussel Viability Test. U.S. Fish and Wildlife Service, Pacific Region. **\$24,962**. 2012–2013.
4. Hahn, T. and A. Y. Karatayev. Effects of Multiple Acoustic Scattering from Realistic Oceanic Bubble and Fish Assemblages. **\$151,468**. 2011–2013.
5. Karatayev, A. Y. and M. Clapsadl. Implementation of the Great Lakes Observing System. U.S. Department of Commerce. **\$62,678**. 2011–2013.
6. Mukherjee, J. J., and S. Kumar. Alcohol and PAH-induced carcinogenesis. National Institutes of Health. **\$147,000**. 2012–2014.
7. Pennuto, C. M., A. Y. Karatayev, A. Pérez-Fuentetaja, L. E. Burlakova, D. Bade, G. Matisoff, J. Kramer, and C. Mayer. The Lake Erie Nearshore and Offshore Nutrient Study (LENONS). U.S. EPA Great Lakes Restoration Initiative 2010. **\$615,813**. (**\$365,101** for SUNY-BS). 2010–2013.
8. Pennuto, C. M. Administration of the Western New York PRISM (Partnership for Regional Invasive Species Management). Department of Environmental Conservation, New York State. **\$1,100,768**. 2012–2017.
9. Rudstam, L., A. Y. Karatayev, and L. E. Burlakova. Great Lakes Long-term Biological Monitoring Program. U.S. EPA. **\$3,867,525** (**\$1,094,726** for SUNY-BS). 2012–2017.
10. Snyder, R. J., L. E. Burlakova, D. B. MacNeill, and A. Y. Karatayev. Enhanced Early Detection of Invasive Ponto-Caspian Fishes in the Great Lakes. U.S. EPA Great Lakes Restoration Initiative. **\$99,756**. 2012–2013.

11. Zanatta, D., L. E. Burlakova, A. Y. Karatayev, R. Krebs, M. Hoggarth, F. de Szalay, J. Bossenbroek, E. Meyer, and M. Walsh, Collaborators: M. Schlesinger, R. Haas, T. Crail, P. Badra, N. Welte, and L. Holst. Conservation of native freshwater mussel refuges in Great Lakes coastal zones. Great Lakes Fish and Wildlife Restoration Act FY 2010. **\$327,363 (\$71,054 for SUNY-BS)**. 2010–2013.

Submitted in 2012-2013 (Total \$7,274,000)

1. Burlakova, L. E., and A. Y. Karatayev. Zebra/Quagga Mussel Viability Test. U.S. Fish and Wildlife Service, Pacific Region. **\$24,962**. 2012–2013. **Funded**.
2. Karatayev, A. Y., L. E. Burlakova, T. Hahn, and D. Gorsky. Niagara River Observatory. Greenway Ecological Standing Committee. **\$1,277,583**. 2014–2017. **Not funded**.
3. Karatayev, A. Y., L. E. Burlakova, and D. Gorsky. Investigating Lake Sturgeon habitat use, feeding ecology, and benthic resource availability in the lower Niagara River. Greenway Ecological Standing Committee. **\$835,829**. 2014–2017. **Pending**.
4. Karatayev, A. Y., L. E. Burlakova, and K. L. Hastings. Aquatic Invasive Species Volunteer Surveillance Network. Earthwatch **\$35,000**. 2013–2016. **Pending**.
5. Kumar, S., and J. J. Mukherjee. Pilot studies on developing selenium derivatives of chalcones as anticancer drugs. National Institutes of Health (R03). **\$147,000**. 2013. **Pending**.
6. Kumar, S., and J. J. Mukherjee. Development of novel organoselenium chalcones as anti-cancer compounds. National Institutes of Health (R03). **\$147,000**. 2013. **Not funded**.
7. Mukherjee, J. J., and S. Kumar. Cellular protective response of apoptosis against carcinogenic PAHs. National Institutes of Health. 2013. **\$147,000**. **Pending**.
8. Mukherjee, J. J., and S. Kumar. PAH-induced cellular protective response of apoptosis: role of fatty acids. National Institutes of Health. **\$367,000**. 2013. **Not funded**.
9. Mukherjee, J. J., and S. Kumar. Phenolic component of tobacco smoke as tumor promoter (Renewal). National Institutes of Health. **\$367,000**. 2013. **Not Funded**.
10. Pennuto, C. M. Administration of the Western New York PRISM (Partnership for Regional Invasive Species Management). Department of Environmental Conservation, New York State. **\$1,100,768**. 2012–2017. **Funded**.
11. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, T. DePriest, M. Wilkinson, D. Einhouse, A. Hannes, R. Kraft, D. Potts, S. Delavan, and K. Hastings. Emerald shiner habitat conservation and restoration study in the upper Niagara River: importance for sport fish, common terns and public education. Niagara Greenway Commission. **\$766,448**. 2013. **Pending**.
12. Pérez-Fuentetaja, A., M. Clapsadl, R. Snyder, T. DePriest, M. Wilkinson, D. Einhouse, A. Hannes, R. Kraft, D. Potts, S. Delavan, and K. Hastings. Emerald shiner habitat conservation and restoration study in the upper Niagara River: importance for sport fish, common terns and public education. Fish and Wildlife Habitat Enhancement and Restoration Fund. **\$824,501**. 2013. **Pending**.
13. Perez-Fuentetaja, A., M. Clapsadl, R. Snyder, L. Harper, M. Wilkinson, T. DePriest, K. Hastings. Emerald shiner and common tern habitat use and trophic interactions in the upper Niagara River. Great Lakes Fish and Wildlife Restoration Act. 2013 **\$174,784**. **Not Funded**.
14. Rudstam, L., A. Y. Karatayev, and L. E. Burlakova. Great Lakes long-term biological monitoring program. U.S. EPA. **\$3,867,525 (\$1,094,726 for SUNY-BS)**. 2012–2017. **Funded**.
15. Snyder, R. J., L. E. Burlakova, D. B. MacNeill, and A. Y. Karatayev. Enhanced Early Detection of Invasive Ponto-Caspian Fishes in the Great Lakes. U.S. EPA Great Lakes Restoration Initiative. **\$99,756**. 2012–2013. **Funded**.
16. Zanatta, D., D. Woolnough, L. E. Burlakova, A. Y. Karatayev, J. Bossenbroek, and J. Schloesser. Assessment of native freshwater mussel refuges in the coastal zones of lakes Michigan and Huron. Pre-proposal submitted to the Great Lakes Fish and Wildlife Restoration Act FY 2013. **\$337,135 (\$67,593 for SUNY-BS)**. 2014–2015. **Not 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. Twelve manuscripts were published, another 6 were accepted for publication and/or published online, and 6 were submitted to peer-reviewed journals. A total of 32 presentations were made by the GLC researches, including: 19 presentations at national/international/regional conferences, 6 invited talks, and 7 presentations were made in non-refereed venues.

Refereed Journal Publications (published)

1. Burlakova L. E., D. Campbell, A. Y. Karatayev, and D. Barclay. 2012. Distribution, genetic analysis and conservation priorities for rare Texas freshwater molluscs in the genera *Fusconaia* and *Pleurobema* (Bivalvia: Unionidae). *Aquatic Biosystems* 8(1):12. [Open Access article](#) (PDF).
2. Higgins, S. N., C. M. Pennuto, E. T. Howell, T. W. Lewis, and J. C. Makarewicz. 2012. Urban influences on *Cladophora* blooms in Lake Ontario. *Journal of Great Lakes Research* 38(Suppl. 4):116–123.
3. Karatayev, A. Y., S. E. Mastitsky, L. E. Burlakova, V. A. Karatayev, M. M. Hajduk, and D. B. Conn. 2012. Exotic molluscs in Great Lakes host epizootically important trematodes. *Journal of Shellfish Research* 31(3): 885–894.
4. Karatayev, A. Y., L. E. Burlakova, J. Vander Zanden, R. C. Lathrop, and D. K. Padilla. 2013. Change in a lake benthic community over a century: evidence for alternative community states. *Hydrobiologia* 700: 287–300.
5. Lucy, F. E., A. Y. Karatayev, and L. E. Burlakova. 2012. Predictions for the spread, population density, and impacts of *Corbicula fluminea* in Ireland. *Aquatic Invasions* 7(4): 465–474. Open Access article. DOI: [10.3391/ai.2012.7.4.003](https://doi.org/10.3391/ai.2012.7.4.003).
6. Mackintosh, S. A., A. Pérez-Fuentetaja, L. R. Zimmerman, G. Pacepavicius, M. Clapsadl, M. Alaei, and D. S. Aga. 2012. Analytical Performance of a Triple Quadrupole Mass Spectrometer Compared to a High Resolution Mass Spectrometer for the Analysis of Polybrominated Diphenyl Ethers in Fish. *Analytica Chimica Acta* 747: 67–75.
7. Makarewicz, J. C., T. W. Lewis, C. M. Pennuto, J. F. Atkinson, W. J. Edwards, G. L. Boyer, E. T. Howell, and G. Thomas. 2012. Physical and chemical characteristics of the nearshore zone of Lake Ontario. *Journal of Great Lakes Research* 38(Suppl. 4): 21–31.
8. Molloy, D. P., D. A. Mayer, M. J. Gaylo, L. E. Burlakova, A. Y. Karatayev, K. T. Presti, P. M. Sawyko, J. T. Morse, and E. A. Paul. 2013. Non-target trials with *Pseudomonas fluorescens* strain CL145A, a lethal control agent of dreissenid mussels (Bivalvia: Dreissenidae). *Management of Biological Invasions* 4(1): 71–79. Open Access article. DOI: [10.3391/mbi.2013.4.1.09](https://doi.org/10.3391/mbi.2013.4.1.09).
9. Molloy, D. P., D. A. Mayer, M. J. Gaylo, J. T. Morse, K. T. Presti, P. M. Sawyko, A. Y. Karatayev, L. E. Burlakova, F. Laruelle, K. C. Nishikawa, and B. H. Griffin. 2013. *Pseudomonas fluorescens* strain CL145A – A biopesticide for the control of zebra and quagga mussels (Bivalvia: Dreissenidae). *Journal of Invertebrate Pathology* 113: 104–114.
10. Pavlac, M. M., T. T. Smith, S. P. Thomas, J. C. Makarewicz, W. J. Edwards, C. M. Pennuto, and G. L. Boyer. 2012. Assessment of phytoplankton distribution in the nearshore zone using continuous in situ fluorometry. *Journal of Great Lakes Research* 38(Suppl. 4): 78–84.
11. Pennuto, C. M., E. T. Howell, and J. C. Makarewicz. 2012. Relationships among round gobies, *Dreissena* mussels, and benthic algae in the south nearshore of Lake Ontario. *Journal of Great Lakes Research* 38(Suppl. 4): 154–160.
12. Pennuto, C. M., E. T. Howell, T. W. Lewis, and J. C. Makarewicz. 2012. *Dreissena* population status in nearshore Lake Ontario. *Journal of Great Lakes Research* 38(Suppl. 4): 161–170.

Refereed Journal Publications (accepted/in press)

1. Karatayev, A. Y., L. E. Burlakova, and D. K. Padilla. Accepted. Spread, population dynamics, and ecosystem impacts of zebra mussels versus quagga mussels: what we know and what we do not. Invited book chapter in “Zebra Mussels: Biology, Impacts and Control,” T. F. Nalepa and D. W. Schloesser (eds.). Second Ed. Lewis Publishers.
2. Lucy, F. E., L. E. Burlakova, A. Y. Karatayev, S. E. Mastitsky, and D. T. Zanatta. *Dreissena* impacts on Unionidae: A comparison of trends in North America and Europe. Invited book chapter in “Zebra Mussels: Biology, Impacts and Control,” T. F. Nalepa and D. W. Schloesser (eds.). Second Ed. Lewis Publishers.
3. Mastitsky, S. E., A. Y. Karatayev, and L. E. Burlakova. Parasites of Aquatic Exotic Invertebrates: Identification of Hazards Posed to the Great Lakes. *Human and Ecological Risk Assessment*.
4. Mayer, C. M., L. E. Burlakova, P. Eklöv, D. Fitzgerald, A. Y. Karatayev, S. A. Ludsin, S. Millard, E. L. Mills, A. P. Ostapenya, L. G. Rudstam, B. Zhu, and T. V. Zhukova. The benthification of freshwater lakes: exotic mussels turning ecosystems upside down. Submitted to: “Quagga and Zebra Mussels: Biology, Impacts, and Control,” Second Edition. Eds. Nalepa, T. F., and D. Schloesser.
5. Mukherjee, J. J., and S. Kumar. 2013. DNA synthesis inhibition in response to benzopyrene diol epoxide is associated with down-regulation of p34cdc2: Role of p53. *Mutation Research - Genetic Toxicology and Environmental Mutagenesis*.
6. Pérez-Fuentetaja, A., M. D. Clapsadl, and W. T. Lee. 2013. Comparative role of dreissenids and other benthic invertebrates as links for type-E botulism transmission in the Great Lakes. Invited book chapter in “Zebra Mussels: Biology, Impacts and Control,” T. F. Nalepa and D. W. Schloesser (eds.). Second Ed. Lewis Publishers.

Refereed Journal Publications Submitted (in review)

1. Burlakova, L. E., A. Y. Karatayev, C. M. Pennuto, and C. Mayer. Changes in Lake Erie benthos over the last 50 years: historical perspectives, current status, and main drivers. Submitted to *Journal of Great Lakes Research*.
2. Karatayev, A. Y., L. E. Burlakova, C. M. Pennuto, J. Ciborowski, V. A. Karatayev, P. Juette, and M. Clapsadl. Twenty five years of changes in *Dreissena* spp. populations in Lake Erie. Submitted to *Journal of Great Lakes Research*.
3. Karatayev, V. A., A. Y. Karatayev, L. E. Burlakova, and D. K. Padilla. Lakewide dominance does not predict the potential for spread of dreissenids. Submitted to *Journal of Great Lakes Research*.
4. Pennuto, C. M., and N. Dong. Effects of prior experience and age on learned predator avoidance by the crayfish, *Orconectes propinquus*. Submitted to *Marine and Freshwater Behaviour and Physiology*.
5. Pérez-Fuentetaja, A., and J. Wuerstle. Prey size selection and feeding ecology of a recent North American invader: *Hemimysis anomala*. Submitted to *Freshwater Biology*.
6. Snyder, R. J., L. E. Burlakova, A. Y. Karatayev, and D. B. MacNeill. Updated Invasion Risk Assessment for Ponto-Caspian Fishes to the Great Lakes, Submitted to *Journal of Great Lakes Research*.

International/National/Regional Conference Presentations

1. Burlakova, L., and A. Karatayev. Biogeography and conservation of freshwater mussels (Bivalvia: Unionidae) in Texas: drivers of diversity and threats. International Meeting on Biology and Conservation of Freshwater Bivalves, Bragança, Portugal, September 2012.
2. Burlakova, L., A. Karatayev, D. Zanatta, B. Tulumello, F. Lucy, S. Mastitsky. *Dreissena* impacts on Unionidae: general trends in North America and Europe and recent findings from Lake Erie. International Meeting on Biology and Conservation of Freshwater Bivalves Bragança, Portugal, September 2012.
3. Burlakova, L. E., A. Y. Karatayev, J. Bossenbroek, D. T. Zanatta, B. Tulumello, R. A. Krebs, W. Paterson,

and T. Griffith. Unionid community of southern Lake Ontario: Locating existing refuges and assessing dreissenids impacts. 8th Biennial Symposium of the Freshwater Mollusk Conservation Society, March 10–14, 2013, Guntersville, Alabama.

4. Burlakova, L. E., A. Y. Karatayev, B. Tulumello, D. Zanatta, F. Lucy, S. E. Mastitsky. *Dreissena* impacts on Unionidae: general trends in North America and Europe and recent findings from the lower Great Lakes. 18th International Conference on Aquatic Invasive Species. April 21–25 2013, Niagara Falls Ontario, Canada.
5. Burlakova, L. E., A. Y. Karatayev, J. Bossenbroek, D. T. Zanatta, B. Tulumello, R. A. Krebs, W. Paterson, and T. Griffith. Assessing unionid refuges and dreissenid impacts in the lower Great Lakes. 56th Annual Conference on Great Lakes Research. June 3–6, West Lafayette, Indiana.
6. Fischer, A., and C. M. Pennuto. Round gobies affect leaf litter breakdown, but not microbial communities in a Lake Erie tributary stream. 56th Annual Conference on Great Lakes Research. June 3–6, 2013. West Lafayette, Indiana.
7. Goodberry, F., and A. Pérez-Fuentetaja. The effects of calcium concentrations and food levels on the growth and reproduction of *Daphnia*. 56th Annual Conference on Great Lakes Research. June 3–6, 2013. West Lafayette, Indiana.
8. Gourgue, H., and A. Pérez-Fuentetaja. Reproduction and survival: the synergy of calcium decrease and food quality on the freshwater cladoceran *Daphnia*. McNair Symposium. June 28, 2013.
9. Hannes, I., H. Lasker, and L. Burlakova. Determination of dispersal and gene flow at multiple scales in unionids: from sperm to species. 8th Biennial Symposium of the Freshwater Mollusk Conservation Society, April 10–15, 2013. Guntersville, Alabama.
10. Juette, P., A. Y. Karatayev, and L. E. Burlakova. Factors affecting dreissenid allometry. 56th Annual Conference on Great Lakes Research. June 3–6, 2013, West Lafayette, Indiana.
11. Karatayev, A. Y., T. D. Miller, and L. E. Burlakova. Long-term changes in unionid assemblages in the Rio Grande, one of the World's top 10 rivers at risk. International Meeting on Biology and Conservation of Freshwater Bivalves, Bragança, Portugal, September 2012.
12. Karatayev, A. Y., L. E. Burlakova, and T. D. Miller. Long-term changes in the distribution range and population size of Texas hornshell *Popenaias poppeii*. 8th Biennial Symposium of the Freshwater Mollusk Conservation Society, March 10–14, 2013, Guntersville, Alabama.
13. Karatayev, A. Y., L. E. Burlakova, and D. K. Padilla. Spread, population dynamics and ecosystem impacts of zebra versus quagga mussels: What do we know and what we do not? 18th International Conference on Aquatic Invasive Species. April 21–25, 2013, Niagara Falls, Ontario, Canada.
14. Karatayev, A. Y., L. E. Burlakova, S. E. Mastitsky, and D. K. Padilla. Predicting the zebra mussels spread: what can we learn from 200 years of continuous invasion? 18th International Conference on Aquatic Invasive Species. April 21–25, 2013, Niagara Falls, Ontario, Canada.
15. Karatayev, A. Y., L. E. Burlakova, C. M. Pennuto, J. Ciborowski, V. A. Karatayev, P. Juette, and M. Clapsadl. Twenty five years of changes in *Dreissena* spp. populations in Lake Erie. 56th Annual Conference on Great Lakes Research. June 3–6, 2013, West Lafayette, Indiana.
16. Karatayev, V. A., A. Y. Karatayev, L. E. Burlakova, and L. G. Rudstam. Eutrophication versus *Dreissena*: a century of change in the Lake Oneida's molluscan community. 56th Annual Conference on Great Lakes Research. June 3–6, 2013, West Lafayette, Indiana.
17. Mukherjee, J. J., and S. Kumar. Benzopyrene diol epoxide attenuates p34cdc2 and inhibits cell growth: role of p53. Presented in American Association for Cancer Research, April 6–10, 2013, Washington, D.C.
18. Snyder, R. J., L. E. Burlakova, A. Y. Karatayev, and D. B. MacNeill. Enhanced early detection of Invasive Ponto-Caspian fishes in the Great Lakes. 56th Annual Conference on Great Lakes Research. June 3–6,



56th Annual Conference on Great Lakes Research. June 2013, West Lafayette, Indiana. Allyse Fisher, Chris Pennuto, Randy Snyder, and Alexander Karatayev.

2013, West Lafayette, Indiana.

19. Zanatta, D. T., J. Bateman, J. Bossenbroek, L. E. Burlakova, T. Crail, F. de Szalay, T. Griffith, D. Kapusinski, A. Y. Karatayev, R. A. Krebs, G. Longton, E. Meyer, W. Paterson, T. Prescott, M. T. Rowe, D. W. Schloesser, M. Shackelford, and M. Walsh. Reassessment of the remnant unionid community in Lake Erie and Lake St. Clair, 25 years after the dreissenid invasion. 8th Biennial Symposium of the Freshwater Mollusk Conservation Society, March 10–14, 2013, Guntersville, Alabama.

Invited Talks

1. Burlakova, L. E. *Dreissena* impacts on Unionidae: general trends in North America and Europe and recent findings from Lake Erie and St. Clair. Cornell University Biological Field Station, Bridgeport, NY. July 20, 2012. (Invited Seminar).
2. Burlakova, L. E. Past and current research. NOAA Great Lakes Environmental Research Laboratory. Ann Arbor, MI, November 13, 2012 (Invited Seminar).
3. Burlakova, L. E. Past and current research. EPA Great Lakes National Program Office, Chicago, November 14, 2012.
4. Karatayev, A. Y., L. E. Burlakova, D. P. Molloy, S. E. Mastitsky, V. A. Karatayev, and D. B. Conn. Parasites of exotic species in invaded areas: does lower diversity mean lower epizootic impact? Cornell University Biological Field Station, Bridgeport, NY. July 20, 2012. (Invited Seminar).
5. Karatayev, A. Y. 35 years of research. NOAA Great Lakes Environmental Research Laboratory. Ann Arbor, MI, November 13, 2012 (Invited Seminar).
6. Karatayev, A. Y. 35 years of research. EPA Great Lakes National Program Office, Chicago, November 2012.

Conference Presentations (non-refereed)

1. Clapsadl, M. D., and K. Hastings. Eastern Lake Erie Great Lakes Observing System buoy: Observational evidence explaining summertime fish kill. 13th Annual Faculty and Staff Research and Creativity Fall Forum, SUNY Buffalo State, October 25, 2012. Poster.
2. Karatayev, V. A., A. Y. Karatayev, L. E. Burlakova, and L. G. Rudstam. A century of change in molluscan community in Lake Oneida: Evidence of recovery? 13th Annual Faculty and Staff Research and Creativity Fall Forum, SUNY Buffalo State, October 25, 2012. Poster.
3. Mukherjee, J. J., and S. Kumar. Benzopyrene Diol Epoxide Induced Cell Growth Inhibition is Associated with Downregulation of p34cdc2: Role of p53. Presented in 13th Annual Faculty/Staff Research and Creativity Fall Forum, October 25, 2012. Poster.
4. Pennuto, C. M. 2013. The Western NY PRISM, an angler's update. Lake Erie State of the Lake Meeting, Hamburg.
5. Pérez-Fuentetaja, A. Emerald Shiner Habitat Conservation and Restoration Study in the Upper Niagara River: Importance for Sport Fish, Common Terns and Public Education. A presentation requested by the Niagara Greenway Commission. May 21, 2013.
6. Hastings, K. Spatial analysis of contamination levels in the soil at a USACE remediation site in Luckey, Ohio. United States Army Corps of Engineers, Buffalo District. January 16, 2013.
7. Hastings, K. Spatial analysis and 3D techniques for exploring soil contamination. WNYGIS User Group's Student Geospatial Lightning Presentations. April 26, 2013. Poster.



Annual Faculty/Staff Research and Creativity Fall Forum, 2012. Mark Clapsadl, Alicia Pérez-Fuentetaja, Kit Hastings, Alexander Karatayev, Jagat Mukherjee, and Subodh Kumar.

III. Education

The GLC fulfills its educational mission directly through the classes its researchers teach, through its [graduate program](#), 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.

Graduate Programs

Multi-Disciplinary Master's Degree Program Administered by the GLC:

Student:	Advisor:
Alyssa Russell	Irvine, K.
Heather Lewis	Frothingham, K.
Jerome Krajna	Frothingham, K.
Eric Snyder	Tang, T.
Heidi Childs	Potts, D.

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

Student:	Advisor:
Isabel Porto Hannes	Burlakova, L.

Advising Undergraduate and Graduate Students

- Lyubov Burlakova was the major professor for one student in Integrative Graduate Education and Research Traineeship Ph.D. Program at SUNY Buffalo (Isabel Porto Hannes) and one undergraduate URM student (Brienne Tulumello). She was also a member of Graduate Committee for Paul Juetten, M.A. student of the Biology Department, and Wendy Paterson, M.S. student from Central Michigan University.
- Alexander Karatayev was the advisor of a graduate student from the Biology Department (Paul Juetten). He was also a member of Graduate Committee for a Ph.D. student at SUNY Buffalo (Isabel Porto Hannes).
- Subodh Kumar was the major professor of one graduate student (M. Williams) from the Forensic Science program.
- Jagat Mukherjee assisted undergraduate students in their independent research endeavors.
- Chris Pennuto was the advisor of two graduate students from the Biology Department (Allyse Fischer and Hilary McNaughton). He also was M.A. thesis committee member for five students (Jessica Wuerstle, Nicole Woods, Lynn Socha, Paul Juetten, and Julie Boerner).
- Alicia Pérez-Fuentetaja was the major professor of two graduate students from the Biology Department (Fawn Goodberry and Melissa Miller). She was also Research Advisor of a McNair student (Hulgrid Gourgue) and advised during the past five years a Ph.D. student from the University at Buffalo (Susan Mackintosh), who successfully defended her dissertation on May 15, 2013.

Seminars

In order to facilitate collaboration between the GLC personnel and leading experts in aquatic ecology and related sciences and increase visibility of the Center in 2012 – 2013 we invited five speakers to present talks on our seminar, including:

1. Gregory M. Andraso, Professor of Biology, Gannon University. “Predation by round goby (*Neogobius melanostomus*) on dreissenid mussels: some pieces of an interesting puzzle.” October 11, 2012.
2. Clifford Kraft, Cornell University. “Thiamine deficiency and reproductive failure in great lakes fishes: new insights regarding an unsolved mystery.” December 6, 2012.
3. Thomas Hahn, Great Lakes Center. “The value of neonicotinoid seed treatment in the European Union.” February 7, 2013.
4. Jorge Luis Romeu, Syracuse University. “Design of experiments in ecological systems: some methods and issues.” April 18, 2013.
5. Thomas F. Nalepa, Graham Institute, University of Michigan, and Great Lakes Environmental Research Laboratory, NOAA (emeritus). “Effects of dreissenids (zebra and quagga mussels) on the Great Lakes ecosystem: a broad overview.” May 16, 2013.

Other Educational Activities

Subodh Kumar continued organization and coordination of DEC mandated precertification courses for waste water treatment plant operators of New York State. These training courses comprised of Basic Laboratory, Basic Operation, Activated Sludge, Grade 4 Management, and Grade 3 supervision. The number of trainees attended these courses were 9, 10, 8, 8, and 3, respectively, in the fall semester of 2012, and 4, 3, 2, 5, and 3, respectively, in the spring semester of 2013.



At left, Dr. Pérez-Fuentetaja teaches her fisheries class to use a trapnet. Right, Kit Hastings leads a demonstration on using a ponar dredge for Dr. Bergslien's Applied Environmental Methods class. These two classes typically have a lab period at the Field Station to explore field methods.

IV. Service Activities

Members of the GLC have been active in service to the profession, to the College, and to the community.

Lyubov Burlakova:

- Coordinator of the Great Lakes Center and Biology Department Seminar Series.
- Member of the Great Lakes Ecosystem Science Master program committee.
- Attended National Professional Science Master's Association Workshop "Green and Growing: Environmentally-Focused Professional Science Master's Programs," September 27–28, 2012, Monterey Bay, California.
- Assisted in preparation of the Great Lakes Center 2011–2012 [Annual Report](#), November 2012.
- Designed several posters about GLC activity.
- Session Chair at the 18th International Conference on Aquatic Invasive Species. April 21–25, 2013, Niagara Falls, Ontario, Canada.
- Co-chair of Aquatic Invasive Species Session. 56th Annual Conference on Great Lakes Research. June 3–6, 2013, West Lafayette, Indiana.
- Adjunct Associate Professor, Department of Geology, and a Member of Graduate Committee, Ecosystem Restoration through Interdisciplinary Exchange (ERIE) IGERT Program, State University of New York at Buffalo.
- Graduate Faculty and Graduate Committee Member at Central Michigan University.
- Participated in "Ensuring Great Lakes Health and Benefits: A Science-based Approach to System Management" workshop (July 10, 2012) to develop Science Strategy for Improving Great Lakes Restoration.
- Attended the Great Lakes Fishery Commission's 2013 Lower Lakes Committee Meeting, March 26–28, 2013, Niagara Falls, NY.
- Participated in a public stakeholder meeting to assess the ecological health of the Niagara River Greenway contributing toward the development of the Niagara River Greenway Habitat Conservation Strategy, September 25, 2012, Niagara Falls, NY.
- Participated in a Webinar "Revision of the National Strategy for the Conservation of Freshwater Mollusks," January 22, 2013.
- Member of the International Association of the Great Lakes Research, the Great Lakes Research Consortium, and the Freshwater Mollusc Conservation Society.
- Member of United States Conference On Teaching Statistics (USCOTS) NSF Post-Intro Statistics Cluster.
- Provided Texas Freshwater Bivalves Species Assessments for the International Union for Conservation of Nature's Red List.
- Provided information required for conservation of Unionidae in Texas for U.S. Fish and Wildlife Service for rare Texas mussels under the Endangered Species Act.
- Advised Texas Parks and Wildlife Department, Texas Commission on Water Quality, and other organizations on distribution and abundance of rare Unionid mussels in Texas.
- Reviewed manuscripts for *Aquatic BioSystems*, *Aquatic Invasions*, *Biological Conservation*, *Journal of Molluscan Studies*, *Journal of Great Lakes Research*, *Hydrobiologia*, *Oceanologia*, *The Professional Geographer*, and *The Southwestern Naturalist*.

Mark Clapsadl:

- Participated in and supervised the [Lake Erie Long Term Lower Trophic Level Monitoring Project](#).
- Participated in the [Lake Erie Nearshore Offshore Nutrient Study](#), providing logistical support essential to the project as well as actually collecting a large percentage of all the field samples taken from Lake Erie.
- In September 2012, in collaboration with and as a service to the USFWS hosted a delegation of Chinese Fisheries professionals. This event included a presentation and a tour of the Buffalo area waterways.
- Provided laboratory technical support to Dr. Randal Snyder with his alewife fatty acids research.
- Gave lectures and field trips for multiple Buffalo State classes.
- Hosted the Field Station Open House.

Kit Hastings:

- Participated in field collection and laboratory studies in multiple projects conducted at the Field Station, including the Lake Erie Long Term Lower Trophic Level Monitoring Project.
- Played a key role in developing and launching a new [GLC Newsletter](#) series as designer and editor, as well as maintaining the [GLC website](#).
- Designed and assisted in preparation of the Great Lakes Center 2011–2012 Annual Report for publication.
- Designed several posters about GLC activity.
- Produced maps for GLC staff projects.
- Provided instructional support on field sampling procedures for multiple Buffalo State classes.
- Facilitated upgrade of computer systems at the Field Station.
- Member of the Buffalo State Sustainability Council.
- Participated in proposals and planning for two grants.

Alexander Karatayev:

- Organized Great Lakes Center Open House, November 2012.
- Published Great Lakes Center 2011–2012 Annual Report, November 2012.
- Initiated GLC Newsletter series.
- Organized a meeting to address University of Michigan Water Center RFP “Support and enhance restoration efforts within the Great Lakes basin,” February 12, 2013.
- Organized Field Station Open House, May 17, 2013.
- Campus representative for the Great Lakes Research Consortium.
- Member of the Biology Department Personnel Committee.
- Member of the GLC Graduate Committee.
- Member of the Ph.D. Committee for Isabel Porto Hannes in the Ecosystem Restoration through Interdisciplinary Exchange (ERIE) IGERT Program, State University of New York at Buffalo
- Supervised a graduate student from the Biology Department.
- Member of the Field Station Renovation Committee.
- New Science Building Renovation Committee member.
- Technical committee member for 18th International Conference on Aquatic Invasive Species. April 21–25 2013, Niagara Falls Ontario, Canada.
- Co-chair of Aquatic Invasive Species Session. 56th Annual Conference on Great Lakes Research. June 3–6,

2013, West Lafayette, Indiana.

- Advisory Board member of the International *Journal of Aquatic Invasions*.
- Participated in “Ensuring Great Lakes Health and Benefits: A Science-based Approach to System Management” workshop (July 10, 2012) to develop Science Strategy for Improving Great Lakes Restoration.
- Attended the Great Lakes Fishery Commission’s 2013 Lower Lakes Committee Meeting, March 26–28, 2013, Niagara Falls, NY.
- Participated in a public stakeholder meeting to assess the ecological health of the Niagara River Greenway contributing toward the development of the Niagara River Greenway Habitat Conservation Strategy, September 25, 2012, Niagara Falls, NY.
- Multiple interviews for various mass media.
- Member of the American Society of Limnology and Oceanography, the International Association of the Great Lakes Research, the Freshwater Mollusc Conservation Society.
- Reviewed manuscripts for the *Journal of Aquatic Invasions*, *Hydrobiologia*, and *Aquatic Conservation: Marine and Freshwater Ecosystems*.

Subodh Kumar:

- Radiation Safety Committee member.
- Chemical Hygiene Committee member.
- Supervised a graduate student in Forensic Science.
- Helped and advised individuals of our local communities for their concern related to contamination with potentially toxic spills.
- Organization and coordination of DEC mandated precertification courses for waste water treatment plant operators of New York State.
- Reviewed manuscripts for *Chemical Review*, *Chemical Research in Toxicology*, *ARKIVOC* (also serves in Editorial Board), *Bioorganic and Medicinal Chemistry*, *ACS Combinatorial Science*, and *Environmental Biotechnology*.

Jagat Mukherjee:

- Trained the work-study student during fall and spring semesters of 2012–2013.
- Assisted undergraduate students in their independent research endeavors.
- Encouraged undergraduate students in ongoing research activities.
- Invited reviewer of the grant proposals submitted to the Bankhead-Coley Cancer Research Program managed by the Florida Department of Health (2010 to 2013).
- Reviewed manuscripts submitted for *Chemical Research in Toxicology*, *Cell Biochemistry and Function*, and *Journal of National Cancer Institute*.

Cathy Nasca:

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

Christopher Pennuto:

- Faculty co-advisor, Biology Club.
- Graduate Advisory Council member.
- Chair of the GLC Evaluation Committee and GLC Director Evaluation Committee: review and evaluation of GLC and Director performance in the last five years.
- Major Professor of two graduate students.
- Member of Graduate Committee of five graduate students.
- Scientific Advisory Board, NY Sustainable Flows Project (NYSFLOs).
- Workshop presenter for ERIE IGERT program at UB; Stream Ecology week (June 2013).
- Guest Editor for special issue on Lake Erie nutrients, *Journal of Great Lakes Research*.
- Reviewer for *Journal of Great Lakes Research*.

Alicia Pérez-Fuentetaja:

- Member of Great Lakes Ecosystem Master program committee: creation and implementation of a new MA and a new MSc for the Great Lakes Center.
- Member of the Great Lakes Center (GLC) Evaluation Committee: review and evaluation of GLC performance in the last five years.
- Research Advisor to the Lake Erie Forage Task Group. This international multi-agency group reviews fisheries data on the lower food web organisms in Lake Erie and reports to the Great Lakes Fishery Commission. A written report is published every year.
- Member of SNSS Personnel Committee.
- Reviewer for *Environmental Monitoring and Assessment*.



Surveying the Niagara River for emerald shiner habitat for upcoming projects. On left, student Anne Popilienski, Dr. Alicia Pérez-Fuentetaja, and Mark Clapsadl look for emerald shiners. On right, Josh Fisher launches and operates the boat.

V. Professional Development Activities

Lyubov Burlakova:

- Completed training in Taxonomy of Freshwater Oligochaeta and received a Certificate of Completion from National Center for Water Quality Research Heidelberg University.

Mark Clapsadl:

- Participated in the Annual Great Lakes Observing System Meeting to increase his capacity to operate the GLOS buoy.

Kit Hastings:

- Completed training in Taxonomy of Freshwater Oligochaeta and received a Certificate of Completion from National Center for Water Quality Research Heidelberg University.
- Attended American Heart Association Heartsaver AED training and Heartsaver First Aid training.
- Completed the following classes: GEG 428 Environmental Assessment and Planning Applications in GIS, GEG 418 Remote Sensing. Completed Geographic Information Systems Minor at SUNY Buffalo State.

Alexander Karatayev:

- Completed training in Taxonomy of Freshwater Oligochaeta and received a Certificate of Completion from National Center for Water Quality Research Heidelberg University.



Lyuba Burlakova, Alexander Karatayev, Susan Daniel, and Kit Hastings learn to identify several species of oligochaete worms from the Lake Erie watershed during the Oligochaete Workshop at Heidelberg University, May 2013.

VI. Field Station Activities

The bulk of the ecosystems/fisheries research is carried out at the GLC [Field Station](#). The Field Station is located at the head of the Niagara River on Lake Erie and is capable of supporting high-level research in a variety of disciplines. It houses a fully-automated aquaculture system, a variety of data loggers and automated sampling equipment, and microscopes. We continue to update and maintain our research support systems.

Research Vessels

All the [boats](#) were either rebuilt or repaired by spring of 2012. Boat maintenance and repairs continued in 2012–2013 and all vessels are in good working order. The new Technician will continue to maintain and improve boats as needed.

Instructional Support

- Kit Hastings has refined our Field Station orientation guide. This guide provides practical information regarding safety, policies and procedures for students new to using the GLC facilities.
- GLC staff provided boat time and class assistance with the Fisheries Class with two days of trap netting and electrofishing in the Black Rock Canal.
- Dr. Standora's Ecology class was given a limnology equipment demonstration and lecture in the fall; Dr. Bergslien's class was given a limnology equipment demonstration and lecture in the spring.
- Facilities were provided for Dr. Anselmi's Anthropology class experiments.

Research Activities

- Installed and operated the [GLOS \(Great lakes Observing System\) buoy](#) in Lake Erie off Dunkirk, NY.
- Provided research vessel and logistical assistance for the [Lake Erie Nearshore Offshore Nutrient Study](#) (LENONS) project.
- Continued Long Term sampling of the eastern basin of [Lake Erie for the Lower Trophic Level Assessment](#), adding to over ten years of data.
- Continued support for Dr. Snyder's Alewife research.
- Assisted Jill Singer with logistics for her Buffalo River current sonar modeling project.
- Provided support and facilities for Geography and Planning department training for the new autonomous underwater vehicle (AUV).
- Facilitated access to the boat launch for NYS DEC and US Fish and Wildlife Service.
- Provided support to SUNY ESF with muskellunge spawning research.
- Interviewed for several campus news articles.
- Gave Channel 4 television news interview regarding spring fish kills in the region.

VII. New Initiatives

Great Lakes Center M.S. and M.A. Programs

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



The cover of the first issue of the GLC Newsletter, from Fall 2012.

Great Lakes Center Newsletter

The Great Lakes Center is pleased to announce the first two issues of our [semiannual newsletters](#). The main goal of these newsletters is to give an update on our activities for the past 6 months to our friends, colleagues, and anyone else who's interested in what we do. While our Annual Report is business-oriented, mainly intended for reporting our productivity, newsletters have a more informal format for short articles on the progress of our research projects, conferences we attend, and other achievements; to feature student research; and to provide more pictures. Having a digital newsletter allow us to post it on our website, letting visitors know just what it is that we do. Newsletters link directly to longer articles and additional content posted throughout our website. Since it is released electronically, the newsletter is paperless, although it is still designed to be printer-friendly.



Surveys of freshwater
mussels *Popenaias*
popeii
(Texas Hornshell)
in Texas
Spring 2013



Population mark-recapture



Rio Grande



