

Great Lakes Center Newsletter

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Erik Hartnett pouring a benthic sample into the elutriator aboard the *R/V Lake Guardian* to remove excess sediment. Credit: Sebastian Paczuski

That's a wrap: Intensive survey of Lake Superior completed

by Susan Daniel

Last September, two GLC personnel (Allison Hrycik and Erik Hartnett) traveled to Lake Superior to sample aboard the EPA's *R/V Lake Guardian* with several EPA researchers, crew members, and collaborators as part of the [Cooperative Science and Monitoring Initiative](#) (CSMI). Each year, the CSMI focuses on one of the Great Lakes, but since there was no sampling in 2020 due to the COVID-19 pandemic, we needed to sample two lakes this year to catch up. In addition to the [Long-Term Biological Monitoring](#) (LTM) that samples set stations in every lake each year, Lake Huron was intensively sampled in July and Lake Superior was sampled in September. After this year, we should be back on schedule for the other CSMI lakes, but for our laboratory that meant that we had 1.5x the samples that we normally collect.

The survey of Lake Superior took place September 21 through October 5, 2022. The crew had originally planned to sample 73 stations but had several snags along the way. Particularly stormy weather and hard substrate caused the EPA to cancel some of the stations. Then the *Lake Guardian's* bow thruster began to leak. The bow thruster is an auxiliary propulsion device at the bow, or forward part of the ship, that aids in maneuvering the vessel. Anyone who has ever stayed on the *Lake Guardian* knows the sound of the bow thruster very well, as it's a sure sign that we are approaching station or nearing our port. Without full use, it would be dangerous to attempt sampling because maneuverability is significantly more challenging. Due to the bow

thruster leak and weather delays, the EPA made the difficult decision to cancel the remaining survey. In the end, 55 stations were successfully sampled.

Once the 164 successfully collected samples were returned to our laboratories, we started our work processing samples and enumerating species. These data can be used to understand the water quality of Lake Superior and the ecology of this pristine lake. We hired several new employees to make sure we had enough time to process samples collected during the LTM and CSMI Huron. Because of this big effort and amazing teamwork, we were able to process Lake Superior samples in under four months! Remarkably, we counted 11,880 individual organisms and identified 60 different taxa. Our researchers are now currently preparing our final report for CSMI Superior that will be available in 2-3 months. •

GLES graduate programs at 10 years old

by Christopher Pennuto

The Great Lakes Center [graduate programs](#) are now 10 years old. It hardly seems that much time has passed since the degrees in Great Lakes Environmental Science (GLS) were first announced. The degrees began their existence as Great Lakes Ecosystem Science, to emphasize our belief in a holistic, large-scale understanding of the forces at play in making the Great Lakes what they are today. “Ecosystems” allowed us to consider human dimensions, watershed land use, and historical use (and abuse) in understanding current conditions. The moniker served us well, but students worried it wasn’t as recognizable as a degree title or didn’t convey a broader scope. Thus, we elected for a name change to our current one: Great Lakes Environmental Science.

There have been 30 program graduates in the last 10 years (including those finishing degrees now). Students entering the GLS program had the option of entering as thesis students (M.A.), or internship students (M.S.). The M.S. degree has been affiliated with the national [professional science master’s program](#) (PSM) since inception. To have that designation requires degree programs to recognize the co-dependency of science and technology with management and communications. We structured the degree to encourage and prepare natural scientists for careers in both corporate and agency management positions, and linked student requirements with equivalent coursework in the [Data Science and Analytics](#) PSM offered through the Math Department. Thus, both degree programs benefited from the shared coursework, and the interactions with young professionals from diverse areas of study.

Throughout this 10-year life, we have explored ways to streamline the degree, yet retain its flexibility to meet student interests and admissions. For example, in keeping with national trends and the growing body of evidence indicating standardized tests often disadvantage large numbers of prospective students, we omitted our GRE (graduate record exam) requirement for admissions. We are currently exploring a merger of the two existing degrees into a single M.S. degree with a thesis or internship option, recognizing the two options serve different student career paths, and reduce some costs. We also now offer a number of competitive tuition [scholarships](#) for students thanks to a generous external gift two years ago, made to the GLC. These are called the Huppoch Tuition Scholarship, and all entering students should consult with the GLC Coordinator to determine their eligibility for an award.

Graduates from the GLS programs have done very well in their adventures after completing their area of study. Every student that has completed the program has found employment in their field or is currently pursuing a Ph.D. elsewhere. That is a great track record. GLS graduates are found in nearly all of the agencies making up our advisory board, as well as the Hamburg school district, NY Parks, and Montana Game & Fish Department. Some thesis topics covered by GLS students include [invasive starry stonewort](#) impacts on native macrophyte and macroinvertebrate communities, seasonal diets and body condition in threespine sticklebacks, water chestnut invasion dynamics in the Erie Canal system, and invasive knotweed distribution patterns along local waterways. •

Time scales of ecosystem impacts and recovery under individual and serial invasions

by Alexander Karatayev and Lyubov Burlakova

Introductions of keystone or ecosystem engineering species can profoundly transform ecosystem functions, but what will happen if multiple invasions occur? The zebra mussel is one of the most aggressive and impactful freshwater invaders that colonized hundreds of lakes and reservoirs across Europe and North America. Currently, another related species, the quagga mussel, is spreading into lakes already colonized with zebra mussels.

To investigate whether serial invasions of a closely related competing species magnify the impacts of the initial invader, we assembled an international team of scientists from the United States, Hungary, and Belarus, including Vadim Karatayev, Lars Rudstam, Alexander Karatayev, Lyubov Burlakova, Boris Adamovich, Hanna Zhukava, Kristen Holeck, Amy Hetherington, James Jackson, Csilla Balogh, Zoltan Serfozo, Christopher Hotelling, Tatyana Zhukova, Tamara Mikheyeva, Raisa Kovalevskaya, Oleg Makarevich, and Darya Kruk.

We were interested how ecological changes induced by invasion are recapitulated in ecosystems that span a range of conditions, are located in different regions, and were invaded in different decades. To answer the question, we synthesized a many-decade time series across the seven best studied ecosystems in the Northern Hemisphere to resolve shared changes in several key ecosystem features following invasion by zebra mussels and subsequent invasion by quagga mussels.

It took us over six years to analyze and present the data, and our paper "[Time scales of ecosystem impacts and recovery under individual and serial invasions](#)" was recently published in *Ecosystems*. Our seven polymictic shallow lakes revealed remarkably similar trends, with the strongest ecosystem impacts occurring within 5-10 years of zebra mussel invasion. Surprisingly, plankton communities then exhibited a significant partial 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. Thus, we show that the ecosystem impacts of invasive species can subside over time, but amplify with serial introductions of competing, even closely similar, taxa. •



2017 workshop to analyze long-term data hosted at Cornell Biological Field Station, left to right: Hanna Zhukava, Alexander Karatayev, Boris Adamovich, Lars Rudstam, and Lyubov Burlakova.



Hanna Zhukava, Lyuba Burlakova, Lars Rudstam, and Boris Adamovich checking a plankton sample from Lake Oneida.

Accessibility for conference presentations

by Kit Hastings

Conference season is here with the [25th Annual Student Research and Creativity Conference](#) on May 5, 2023 at Buffalo State University, and the International Association of Great Lakes Research's [66th Annual Conference on Great Lakes Research](#) happening May 8-12, 2023 in Toronto, Canada. Before you start designing your presentation or poster, let's talk about accessibility.

Accessibility is the degree to which something can be accessed by people with disabilities, either directly or with assistive technology. In the United States, [up to 1 in 4 adults have a disability](#). We all have the possibility of becoming disabled at any time, whether permanently or temporarily, especially as we age. Everyone can benefit from accessible design. For example, having captions available is helpful when you can't hear the TV because your dog won't stop barking. So, we can't assume that there aren't any people who will benefit from accessibility in our audience. As a public institution, we are required to comply with [federal laws regarding individuals with disabilities](#), but as individuals, it is our personal responsibility to include as many people as possible when sharing our research.

For presentation accessibility, I have a pair of easy suggestions and a harder one. First, when you're giving an oral presentation, use a microphone if it's available and repeat the questions in your Q&A so everyone knows what was asked. Even if you have a loud voice or you're in a small room, the provided sound system can make the difference for someone who's hard of hearing, aging, or sitting next to a loud vent. Repeating the questions in a Q&A is so important, too. Because of the arrangement of the room, people might have trouble hearing the questions asked by other audience members. Without the repetition, you're just answering the question for that one person, not the whole room. Combined, these are a great first step toward making your oral presentation more accessible. It doesn't take any special training, and anyone can do it.

A more advanced suggestion is to have an accessible version of your presentation available. This could be a Word, PowerPoint, or PDF document, or a webpage that you can share as a link or a QR code at the beginning of your presentation, or by email request afterwards, so your audience can follow along to meet their access needs. Since the COVID-19 pandemic, virtual and hybrid conferences and webinars have become more prevalent. Virtual attendance can make events accessible for people who wouldn't normally be able to attend in person, but it can also introduce new accessibility challenges, including a greater need for sharing an accessible version of your slides or poster. This suggestion is a loftier, but achievable goal. Learning how to create accessible documents takes time and practice, but many programs have accessibility checkers built in that can help you get started.

If you're interested in accessibility, want to do better, and don't know where to start, Buffalo State has [resources](#) to learn about creating [accessible websites](#), [PDFs](#), and [PowerPoints](#). Buffalo State employees can also [request online certification courses](#) from Deque University, which is how I got started with creating accessible documents. [SUNY Center for Professional Development](#) often has webinars on accessibility and [Universal Design for Learning](#). There are conferences about accessibility like the [14th Annual CUNY Accessibility Conference](#) and [axe-con](#). And a book I'm enjoying on the topic of presentations is [The Inclusive Speaker](#) by Denis Boudreau, which addresses how to connect with your audience without leaving people behind due to disabilities or different learning styles.

There are many things to learn about accessibility and it can be quite daunting, but don't let perfection get in the way of progress! There will always be more to learn, so don't wait to implement any changes until you've found all the answers. Accessibility is a practice, and any step you take in the direction of greater accessibility will allow more people to access your research. Good luck with your presentations! •

[Reference list](#)

Karatayev ranked #1 scientist at Buffalo State University

by Lyubov Burlakova

The Alper-Doger Scientific Index in 2023 ranked [Alexander \(Sasha\) Karatayev](#) as the [best scientist at Buffalo State University](#) based on the total H index (41), total i10 index (98), and the total number of citations (6,585). Karatayev is also ranked as #64 scientist in Fisheries, Aquatic Ecology, Conservation Biology, Invasive Species and Freshwater Ecology in the United States. The [Alper-Doger Scientific Index](#) analyzes academic studies from 217 countries, 20,006 universities/institutions, and 1,334,957 scientists by using numerous criteria to produce an index for the evaluation of productivity and efficiency of individuals and institutions. The



Sasha Karatayev doing field work aboard the EPA's R/V Lake Guardian.

most cited articles he co-authored include Karatayev et al. 2007 "The effects of *Dreissena polymorpha* (Pallas) invasion on aquatic communities in eastern Europe," Lopes-Lima et al. 2017 "Conservation status of freshwater mussels in Europe: state of the art and future challenges," and Karatayev et al. 2007 "Changes in global economies and trade: the potential spread of exotic freshwater bivalves."

In 2022, Sasha published 13 peer-review research papers with co-authors, including three large reviews on biology, ecology, ecosystem services, and impacts of invasive mollusc *Dreissena*. Freshwater molluscs in genera *Dreissena* (zebra and quagga mussels) are considered among the most aggressive freshwater invaders due to the economic and ecological disruptions that have accompanied their spread across Europe and North America. One of these reviews (Karatayev and Burlakova 2022: "What we know and don't know about the invasive zebra (*Dreissena polymorpha*) and quagga (*Dreissena rostriformis bugensis*) mussels") spanned over 74 printed pages and summarized over 2,800 publications on zebra and quagga mussels, including data on their taxonomy, systematics, evolution, life cycle, reproduction, feeding, growth and longevity, population dynamics, interspecific competition, habitat requirements, and distribution within and among waterbodies. In addition, Sasha has just submitted another review, the largest to date at 240 pages with 607 literature references, to *Reviews in Fisheries Science & Aquaculture* (Karatayev et al. "Natural enemies of zebra and quagga mussels: predators, parasites, and ecological competitors").

Additionally, [Lyubov \(Lyuba\) Burlakova](#) is the next highest ranked scientist at Buffalo State, technically at #3 since Sasha accidentally has two Google Scholar accounts. Burlakova has a total H index of 40, total i10 index of 94, 6,436 citations, and is ranked #78 in Fisheries, Aquatic Ecology, Conservation Biology, Invasive Species and Freshwater Ecology in the United States. Lyuba's top cited articles are the same as Sasha's since they co-author many papers. Congratulations, Sasha and Lyuba! •

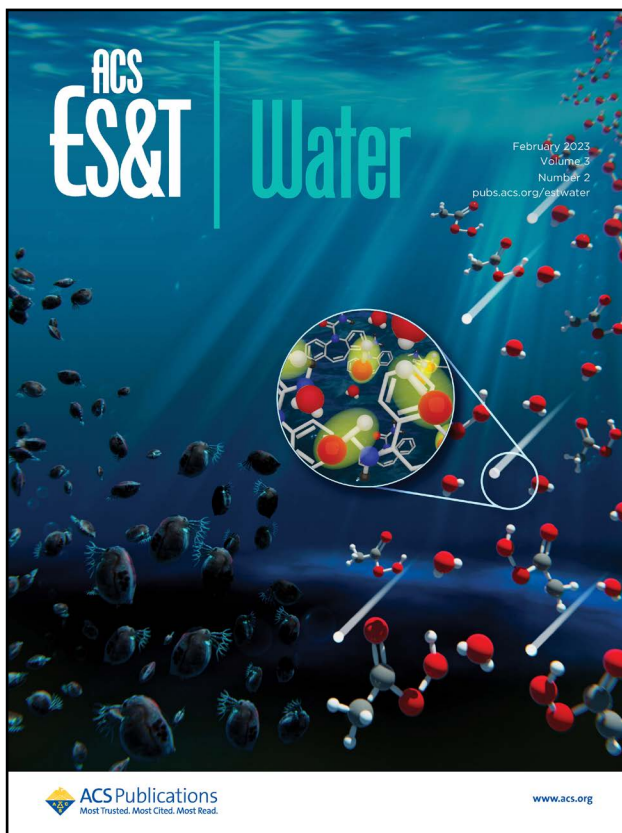
Thesis makes cover page of prestigious journal

by Alicia Pérez-Fuentetaja

A recent research paper published in [Environmental Science and Technology Water](#) portrays Biology graduate student Benjamin Szczygiel's thesis work on *Daphnia magna*. The paper focuses on various approaches to remove pharmaceuticals and personal care products from the pre-treated wastewater that is released into our lakes, rivers, and ocean. "Effects of advanced oxidation on wastewater effluent ecotoxicity: A novel assessment through the life history and lipidomics analysis

of *Daphnia magna*" uses life history analysis of *Daphnia* raised under wastewater effluents subjected to different clean-up methods. An original approach for this research was to also analyze the lipid profiles of the *Daphnia* exposed to the treatments, which showed how the animals responded to the stress caused by the different combinations of water chemistry. Overall, the best clean-up method for pre-treated wastewater effluent was a combination of UV light and hydrogen peroxide, which caused minimal stress on *Daphnia* and did not impact reproduction. The artwork depicting this project (created by one of the co-authors) was chosen for the journal's cover.

Ben Szczygiel was advised by Dr. Pérez-Fuentetaja and his thesis work appeared in our [Spring 2019 newsletter](#) "Treating the treatment: Examining cost effective methods to further clean sewage effluent." After completing his thesis, Benjamin Szczygiel joined Purdue University and works for the Illinois-Indiana Sea Grant as a buoy specialist, operating buoys that collect data from Lake Michigan. As we move towards more unpredictability in the Great Lakes due to climate change, his focus includes data collection, interpretation, outreach to boaters and anglers, and teaching. •



The cover illustration shows *Daphnia* swimming and pharmaceutical molecules being broken down by UV light. Credit: ACS ES&T Water

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