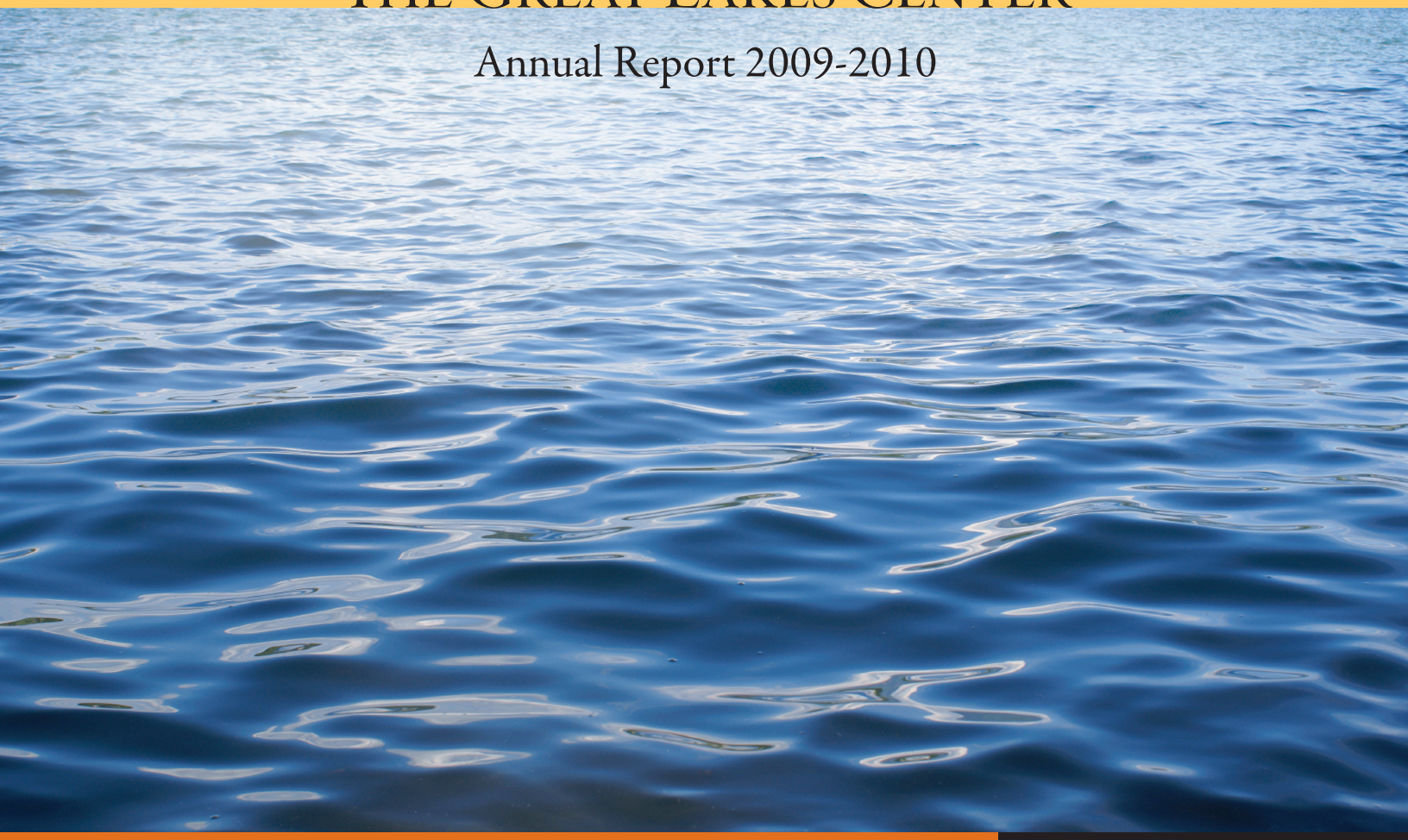
The Great Lakes Center

Annual Report 2009-2010



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Buffalo State
State University of New York

Content

2010 Annual Report
Great Lakes Center – Buffalo State College

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 all areas of our operations, including research, education and service, and was successful in obtaining grant funding. We continued our excellence in research conducted by GLC personnel and in collaboration with other faculty from Buffalo State College, as well as other institutions in North America, Europe, and South America.

- Our researchers have published **12** peer-reviewed papers, **5** papers were accepted and **5** papers were submitted for publications.
- Presented **41** talks, including: **21** at national/international/regional conferences, **10** invited talks, and **10** presentations in non-refereed venues.
- Submitted **21** grant proposals (total requested amount **$14,398,908, including $7,197,673 for Buffalo State).**
- Ten projects for research and education (including multi-year grants) are currently funded in the GLC totaling **$2,391,130 (including $1,825,180 for Buffalo State).**
- Request for additional funding for the Great Lakes Center for **$650,000** was submitted to US Congress.
- Center personnel acted as advisers to graduate students, and taught **9** graduate and undergraduate courses.
- All of the Center resources, including vessels, sampling equipment, field station labs and the conference room, the environment toxicology lab, and the aquatic ecology lab were used extensively to train undergraduate and graduate students.
- We made significant progress in updating and replacing equipment and facilities improvements at the Field Station.
- We have made substantial progress toward development of a Graduate program in the Great Lakes Ecosystem Science.

I. Staff

In October 2009 Sergey Mastitsky left GLC and moved to Heidelberg University, Germany to join his wife. He was a productive scientist and a good colleague. During the 14 months he was a member of the GLC he was actively involved in all our activities, including field work, data processing, grants writing, and updated our website. He published two papers, submitted three for publication and presented 9 talks and posters at scientific meetings.

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
	Charlotte Roehm
Secretary:	Cathleen Nasca
Field Station Personnel:	Field Station Director, Research Associate & Ships Captain Mark Clapsadl
	Research Fleet Manager & Ships Captain Caleb Basiliko
	Field Station Technician Kit Hastings
Research Assistants:	Christopher Janik (Buffalo State College)
	Marissa Hajduk (Buffalo State College)
	Jessica Martin (Buffalo City Honors School)
	Vadim Karatayev (Buffalo City Honors School)
Work Study Students:	Shauna Freidhoff
	Elizabeth Klock

GLC Affiliates (at Buffalo State College)

- Randal Snyder, Associate Professor, Biology Department
- Howard Riessen, Professor, Biology Department
- Gary Pettibone, Professor, Biology Department
- Kimberley Irvine, Professor, Geography and Planning Department
- Kelly Frothingham, Associate Professor, and Geography and Planning Department Chair
- Jill Singer, Professor, Earth Sciences and Science Education Department and Director of the Office of Undergraduate Research.

Collaborators

At 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 at Stony Brook
- Lars Rudstam, Professor and Director of the Cornell Biological Field Station, Cornell University
- Liza Holst, State Wildlife Grants Coordinator, New York Department of Environmental Conservation
- Matthew Schlesinger, Chief Zoologist, New York Natural Heritage Program
- 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
- Bill Edwards, Assistant Professor of Biology, Niagara University
- Paul Patrick, Senior Consultant, Senes Consulting, LTD
- Mike Goehle, Regional ANS Coordinator, US 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
- Robert Baier, Professor and Executive Director of the Industry/University Center for Biosurfaces, University at Buffalo
- Diana S. Aga, Associate Professor, Chemistry Department, University at Buffalo.
- Katherine Alben, Senior Scientist, Wasdworth Institute, Albany

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 D. Zanatta, Assistant Professor, Biology Department, Central Michigan University, Mount Pleasant, Michigan
- James Kitchell, Professor and Director of the Center for Limnology, University of Wisconsin, Madison
- 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
- Mara L. Alexander, Ecologist, U.S. Fish and Wildlife Service, San Marcos National Fish Hatchery and Technology Center, 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
- Dave Evers, Assistant Professor, Biology Department, University of Southern Maine
- Mark Green, Associate Professor, Biology Department, Saint Joseph's College of Maine
- Alan van Arsdale, Senior Ecologist, US EPA
- Joseph Conroy, Ohio State University, Columbus, Ohio
- 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, Dept of Geological Sciences Department Chair, 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
• Tom Bridgeman, University of Toledo, Toledo, Ohio.

International:
• Demetrio Boltovskoy, Professor, University of Buenos Aires, Argentina
• Sergei Olenin, Professor, Coastal Research and Planning Institute, Klaipeda University, Lithuania
• Sergey Mastitsky, Postdoc, Integrative Bioinformatics and Systems Biology (iBioS), German Cancer Research Center, Heidelberg University, Germany
• Charles Ramcharan, Associate Professor, Department of Biology, Laurentian University, Sudbury, Ontario, Canada
• Jan Ciborowski, Professor, Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada
• Frances Lucy, Associate Professor, Institute of Technology, Sligo, Ireland
• Jan Karlsson, Climate Impacts Research Centre (CIRC), Department of Ecology and Environmental Science, Umeå University, Sweden
• Reiner Giesler, Climate Impacts Research Centre (CIRC), Department of Ecology and Environmental Science, Umeå University, Sweden
• Richard Soare, Department of Geography and Planning, Concordia University, Montreal, Canada
• Norman Yan, Professor, York University, York, Ontario, Canada.

Awards and Achievements

• Dr. Christopher Pennuto became a Million Dollar Club member for securing sponsored program funding in excess of a million dollars. A certificate of recognition was presented at the 13th Annual Research Foundation Recognition Reception event on April 26, 2010. (http://www.rf.buffalostate.edu/latest-news/192-dr-pennuto-a-million-dollar-club-member.html)

Dr. Dennis K. Ponton, Provost, and Mr. Ted Turkle, Operations Manager and Director of Research Administration, present Dr. Christopher Pennuto with a certificate of recognition as a Million Dollar Club member for securing sponsored program funding in excess of a million dollars. 13th Annual Research Foundation Recognition Reception, April 26, 2010.

• Research paper "The invasive bivalves *Dreissena polymorpha* and *Limnoperna fortunei*: parallels, contrasts, potential spread and invasion impacts" by A. 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 one of the top articles in the journal accessed by users during 2009 (2009 BioOne Publisher Report, March 31, 2010).

II. Research Activities

Aquatic Ecology and Ecosystems Research

Most of the aquatic ecology/ecosystems research is carried out at the GLC Field Laboratory, and focuses on the Great Lakes and their tributaries, however, Center personnel are also involved in numerous projects in other states (e.g. 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 nearshore and offshore Lake Erie nutrient study (NOLENS).

Although the nutrient abatement strategies implemented in the Lake Erie watershed have reduced nutrient inputs to target levels, not all of the anticipated responses have been realized. The central basin hypoxia event (the 'dead-zone'), extensive Cladophora growth in the eastern basin, and repeated outbreaks of nuisance algae in the western basin have all occurred since the reduction in nutrient inputs. This project documented the quantity of nutrients present in all biotic and abiotic compartments of the nearshore and offshore pelagic and benthic habitats and pathways for trophic transfer. We measured directly flux rates in the most rapidly cycling pools and use published, scientifically peer-reviewed nutrient flux rates for the remaining biota in the system, coupled with published hydrodynamic models of particle transport, to assess whether the pools of nutrients in the nearshore and offshore regions follow the predicted patterns of early lake mixing models. This project is in collaboration with National Center for Water Quality Research in Heidelberg University, Kent State University, Ohio State University, and Case Western Reserve University.

Chris Janik collecting water samples.

Chris Pennuto is getting ready for collecting benthic samples in Lake Erie.

Picking benthos at the shore of Lake Erie. Marissa Hajduk, Lyubov Burlakova, and Sergey Mastitsky.

Goby larval drift and recruitment.

This project will determine the density, seasonal timing, and diel patterns in the drift of larval round gobies in a tributary stream to Lake Erie. These samples will be coupled with lake plankton trawls to estimate the relative contribution of tributary streams/ rivers to lake round goby recruitment.

Shana Chapman and Chris Janik electrofishing for gobies in Ellicott Creek.

Round goby effects on stream processes.

This project will examine the effect of invasive round gobies on stream primary production and leaf litter decomposition by combining field measurements of periphyton standing stock and leaf litter breakdown rates at locations with and without round gobies present. It will also use replicate experimental streams to test the impact of fish communities (either round gobies only, darters only, both, or none) on the same stream processes as the field study (i.e., periphyton production and leaf litter decomposition).

Do lake and stream round gobies (*Neogobius melanostomus*, Pallas 1814) occupy the same trophic position?

This project examines the different trophic niches that the round goby occupies in Lake Erie and in the tributaries that it has invaded. Through examination of the diet of different size/age gobies and their trophic status (determined by stable isotope analyses) we seek to determine differences among the goby populations that inhabit these very different environments and their impact in invaded streams.

Role of exotic invertebrates in Lake Erie.

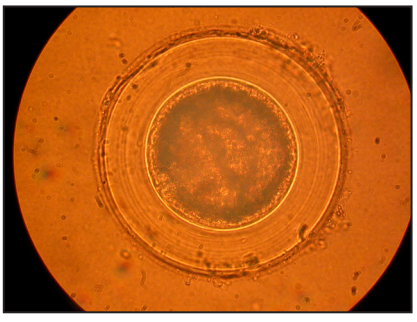
This project examines the role of exotic invertebrates in Lake Erie benthos that increased dramatically during last decades. Our 2009 benthic survey of Lake Erie has shown that benthic invaders currently constitute 40% of total benthic density, and over 95% of the total wet biomass. Benthic community 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.

Quagga mussels *Dreissena r. bugensis* from 62 meter depth in Eastern Lake Erie.

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* 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. Although in many waterbodies *D. r. bugensis* have been reported to outcompete *D. polymorpha*, local competition may be much more dependent upon local environmental conditions and will determine which dreissenid species will become dominant in a given waterbody, and thus likely to attach to boats and spread. To assess which biological traits allowed different dreissenid species to dominate under different environment conditions, we studied survival and growth rate of zebra and quagga mussels in Lake Erie.

Alexander Karatayev installs the flow-through system to study survival and growth rate of zebra and quagga mussels.



Trematoda *Cyathocotyle bushiensis* found in exotic snail Bithynia tentaculata collected in Golden Hill Creek, NY.

Parasites of aquatic exotic species: an underestimated threat to invaded ecosystems.

Exotic species may serve as vectors of introduction for their specific parasites, including highly pathogenic ones, and may also become hosts for aboriginal disease agents. This can result in catastrophic outbreaks of the parasitic diseases that would otherwise not have existed in the introduced areas. A clear understanding of the mechanisms and patterns of the spread of exotic species and their associated parasites is therefore required to predict and prevent such outbreaks. We are assembling a database of parasites of aquatic invaders and conducting field study to determine the prevalence and intensity of infection of aquatic exotic invertebrates by parasites in their native and invaded ranges.

Diversity, distribution and long-term changes in freshwater Unionidae in Texas.

Freshwater Unionidae is the most rapidly declining faunal group in the US, including Texas. Among the 52 species known in Texas, there are at least 26 species that require special attention, including six endemic and one federally listed endangered species. Currently we are funded by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department (State Wildlife Grants, 2004 - 2010) to conduct statewide surveys of the rare and the most valuable Unionidae populations in Texas. As a result of our surveys, of the 46 Unionidae species currently present in Texas, 65% were classified as rare and very rare, including all state and regional endemics. All collected data will be a part of the Texas Natural Diversity Database, making the data readily available for conservation, monitoring and decision making. We are currently working with TPWD personnel to prioritize sites for conservation based on species endemism and diversity.

Vadim Karatayev and Alexander Karatayev measure freshwater molluscs Unionidae collected in Neches River, East Texas.

A very rare Texas endemic mollusc ***Lampsilis bracteata*** found in Llano River, Central Texas.

Endocrine-disrupting effects of persistent organic pollutants in fish populations from eastern Lake Erie.

We are studying the effects of the endocrine disrupting pollutants PCB and PBDE on steelhead trout, common carp, and largemouth bass from eastern Lake Erie. To assess the impacts to reproduction of these chemicals we are measuring the levels of a unique female protein synthesized for egg production in male fish. The effects of these pollutants on fish include the alteration of their sexual characteristics and reproductive fitness.

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

We are sampling 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.

Alicia Pérez-Fuentetaja and graduate students Beryl Ankrah and Jessica Wuerstle dissecting a steelhead trout for contaminant studies

Botulism type E in the Great Lakes.

We have eight 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 (EPA) and state agencies (DEC, NY-F&WS) 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.

The role of the zooplankton *Bosmina freyi* in acidifying lake ecosystems.

This organism plays a vital role in the future of lakes that are exposed to acid rain and deforestation and, therefore, have declining calcium levels. ***Bosmina*** is a small zooplankton species that has low Ca requirements and, therefore, can potentially replace the common grazer ***Daphnia*** in many of the thousands of lakes that are part of the Canadian Granitic Shield, altering permanently the structure of the food webs. We are working with researchers at York University, Ontario, to compare in a highly replicated experiment the competitive and environmental advantages of ***Bosmina*** in lakes suffering from decalcification and Climate Change.

Effects of transgenerational Calcium decrease in freshwater cladocerans.

We are studying how Ca requirements through several generations of ***Daphnia pulex*** can impact populations in low Ca aquatic environments. Effects of low Ca include decreased survivorship and reproduction and possibly a vulnerability to impacts of additional stressors.

Feeding ecology of the new Great Lakes invader *Hemimysis anomala.*

A new invasive species in Lake Erie and other Great Lakes that is also making its way into the Finger Lakes region, *H. anomala* is the first Mysid to become established in Lake Erie. *H. anomala's* feeding selectivity carries the potential for trophic cascade effects as their predation may limit the number of important grazer species. However, their adaptive omnivorous diet may allow them to shift their diet to include a larger portion of algae, occupying an intermediate feeding niche. We are examining diet selectivity of this species in laboratory and field experiments.

Long Term Monitoring on Lake Erie.

Long Term Monitoring - Mark Clapsadl and Kit Hastings prepare the YSI sonde for profile readings.

This multiagency effort aimed at building a database of biotic and abiotic information from multiple sites on Lake Erie was picked up from the USFWS in 2008. Samples are collected bi-weekly from two sites in Eastern Lake Erie from May through October. An additional monitoring site was added in 2009 for the GLC database, and more extensive benthic sampling has been initiated.

Kit deploying the YSI to sample a profile.

Water Quality/Watershed Studies

Current Projects:

Point Peterbrooke and Cattaraugus Creek Watershed dynamics.

The Great Lakes Center has made a substantial commitment to the study of the impact of the contributing watersheds on the Great Lakes. We have continued the development of our model watershed in Point Peter Brook watershed in Cattaraugus County, where we have installed weirs with water level gauges and automated samplers along the trunk stream and several tributaries, piezometers, rain gauges, and a meteorological station. The initial goal for this project was to identify Variable Source Area (VSA) controls on the exports of nitrogen (N) and dissolved organic carbon (DOC) during storm events. We have expanded our watershed monitoring program, with funding from the USACE, USEPA, and NYS DEC as part of an effort to identify critical sources of sediment and nutrients to the Cattaraugus Creek, a major contributing watershed to Lake Erie. Part of the goal of the Cattaraugus Creek project is to assess how land use and climate change will affect sediment and nutrient loading, via model predictions. The model can then be used 1) as input to a lake-wide model and 2) for managers and stakeholders to make informed decisions about nutrient management such as developing remediation plans to reduce future excessive loading. The model is currently in finalization stages. The monitoring of the Point Peterbrooke watershed is continuing and this summer will incorporate additional measurement parameters to include the contribution of carbon loads.

Hydrological characterization of Woodlawn Beach State Park: Implications for *E. coli.*

Woodlawn Beach State Park protects a 12 acre wetland that is listed on the Park's master plan for preservation and enhancement. This project focuses on defining the hydrological flowpaths implicated in the transport and fate of E. Coli and other contaminants within the Woodlawn Beach State Park. The project is combined with the Pre-Restoration Wetland Characterization and Chemical Mass Balance Study. We are undertaking an effort to assess both the physical and chemical characteristics of the wetland, followed by the development of an effective management plan. This proposed effort is a collaboration between Buffalo State College and Woodlawn Beach State Park. Proposal priorities address a critical aquatic habit where the current treatment effectiveness of this wetland is to be evaluated and compared with alternative approaches for treatment. The results will be used as a benchmark for defining the Strategic Master Plan of the New York State Parks, Recreation and Historic Preservation.

Sampling water quality parameters in high alpine Arctic Lakes.

Impacts of climate change on Subarctic Lakes.

TAs part of a collaborative effort with Umeå University, Sweden, an ongoing project is looking at carbon and energy redistribution within watersheds affected by permafrost degradation and ultimately the impact on and fate in aquatic ecosystems. This is an ongoing three year collaborative project.

Algal blooms in coastal wetlands of the Great Lakes.

This project aims to identify physical and biological parameters that cause the initiation of algal blooms within coastal wetlands.

Wetlands are often considered traps for excess nutrients and contaminants. However, should the threshold of accumulation be exceeded, these ecosystems may contribute to the formation of blooms, which can be hydrologically transported into the Great Lakes during periods of high flow. This study aims to understand the complex dynamics of algal bloom formation and contribution within coastal wetlands through a combination of field observations and laboratory bioassays.

Wetland remapping project.

In collaboration with NYSDEC, an initiative is taking place this summer focusing on remapping wetland distribution and boundaries within the Oswego/Oneida watershed. This project involves the digitization of current NWI maps into the GIS databases and field verification of wetland boundaries in order to improve current wetland distribution maps.

Environmental Toxicology

The Environmental Toxicology Laboratory of the Great Lakes Center maintains state of the art facilities on the campus of Buffalo State College. 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:

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 animal.

Development of mechanism-based MMP inhibitors:

This study was undertaken to develop a project in the area of chemoprevention. We are currently interested in developing strategy to prevent tumor metastasis which is the most common cause forcancer death. It is now growing evidence that the environmental pollutants including those found in Great Lakes are involved in this process of carcinogenesis. Our initial effort is to develop small organic molecules as potential inhibitors of matrix metalloproteinase-9 (MMP-9) which appears to be specifically involved in the metastasis of prostate cancer. Our continuing effort is directed to develop synthesis of the potential inhibitors of MMP-9.

Subodh Kumar purifying a synthetic intermediate by column chromatography in the organic chemistry laboratory (SCI-401) of Environmental Toxicology and Chemistry Lab of GLC while preparing a series of selenium-containing compounds as potential chemopreventive agents.

Mechanism-based CYP2A6 inhibitors as smoking cessation agents:

Nicotine addiction is the primary cause for cigarette smoking which leads to high incidence of lung cancer and other diseases. CYP2A6 has been identified a principal cytochrome P-450 which is predominantly involved in the metabolism of nicotine to inactive products, thereby, removing active nicotine from body circulation. The

smokers with high CYP2A6 in liver are prone to higher level of smoking to maintain the desired level of nicotine in the body. Thus CYP2A6 appears to be an excellent target for developing therapeutic agents for preventing cigarette smoking. Thus, our objective is to identify small organic molecules that can effectively inhibit CYP2A6 and, consequently, maintain clinical level of nicotine for a longer period in an effort to reduce frequency of cigarette smoking, especially, for chain smokers.

Effect of cigarette smoke components on nicotine addiction:

This research is directed to identify chemical constituents in cigarette smoke that may be involved in promoting nicotine addiction by reversibly inhibiting the liver enzyme CYP2A6, a major enzyme involved in the metabolism nicotine to inactive metabolites, during smoking.

Effect of heavy metals on PAH-induced genotoxicity:

Studies directed to understand the mechanism(s) underlying the potentiating effect of cadmium, nickel and other heavy metals designated as environmental pollutants on the genotoxicity of PAHs, and thereby presents the carcinogenic risk to humans. We studied the effect of above metal pollutants on the protective signaling events (p53- dependent or independent cell cycle arrest and apoptosis) induced in response to genotoxic stress by PAHs with a view to determine the biomarker(s) involved in metal toxicity.

Jagat Mukherjee and Ronald Gocinski (student) are analyzing the activation of signaling events induced in response to environmental pollutants PAHs.

Identification of phenolic component(s) present in the environment as well as in tobacco smoke condensate (TSC) as tumor promoter:

We observed that the weakly acidic TSC phenolic fraction is a tumor promoter and increased the number of colonies of cells on soft agar (anchorage-independent cell growth). It possesses hundreds of phenolic components as determined by high pressure liquid chromatography (HPLC). The HPLC separated fractions as well as the crude TSC phenolic fraction is tested individually to examine their effect on anchorage-independent cell growth. We are in the process of determining the particular phenolic fraction(s) responsible for tumor promoting activity.

Mechanism of tumor promotion by TSC phenolic fraction:

Attempts are pursued to understand the mechanism of synergistic interactions of active TSC phenolic component(s) with polynuclear aromatic hydrocarbons (PAHs) (present in the environment) toward potentiation of carcinogenicity. We determined the interference of TSC phenolic fraction with PAH-induced p53 response which is known to trigger the cellular protective machinery thereby justifying the possibility of p53's role in this regard. We are in a process to examine the role of p53 downstream signaling events e.g. NFkappaB and MAP kinases with a view to understand the underlying mechanism of tumor promotion by TSC phenolic fraction.

Gene expression in benzopyrene treated cells:

We determined in vitro effect of the PAH benzo[a]pyrene on the cellular expression of several thousands of genes by cutting age Microarray technique. We observed up-regulation and down-regulation of many genes by benzo[a]pyrene. We are analyzing these thousands of gene expression data to sort out the role of particular gene product(s) in benzo[a]pyrene-induced celluar responses (both protective and tumorigenic) with a view to the development of biomarkers.

Tumor promoting effect of alcohol in polynuclear aromatic hydrocarbon (PAH)-induced carcinogenesis:

Attempts are pursued to understand the mechanism of tumor promotion by ethanol in benzo[a]pyrene-induced tumorigenesis. Research is in progress to examine the effect of alcohol on cell cycle arrest and apoptosis induction in benzo[a]pyrene treated cell lines with a view to identify the signaling intermediates involved in alcohol-mediated tumor promotion in PAH-induced carcinogenesis.

Grants and Funding

Proposals Funded (Total $2,391,130, including $1,825,180 for Buffalo State)

1. Burlakova, L., A. Karatayev, M. Goehle. Preliminary Risk Assessment of the Parasites of Aquatic Exotic Invertebrates in the Great Lakes Region. Great Lakes Research Consortium, NYGLPF Small Grants Program. $9,473. 2010-2011.
2. Karlsson, J., C. Roehm, T. Christensen, N.T. Roulet. Greenhouse Gas Emissions from Lakes in Northern Permafrost Areas: Quantitative Importance and Climate Impacts. Swedish Research Council. $490,950 (not to BSC). 2009-2012.
3. Lange, C., B. Martinez-Hackert, J. Carbonara, J.S. Sabato, C.L. Roehm, K. Huffner, J. Zawicki, T. Tang, K. Williams, B. Tomaselli, D. Henry, D. MacIsaac. NASA-NSPIRES, STUDIES (Students and Teachers Using Data from Investigations in Earth Systems). $654,250. 2010-2013.
4. Pennuto, C. URM: The watershed as a model for training minority undergraduate Biology majors for graduate careers. National Science Foundation, Division of Biological Infrastructure. $721,000. 2007-2011.
5. Pennuto, C.M., A.Y. Karatayev, A. Pérez-Fuentetaja, L.E. Burlakova, G. Matisoff, J. Kramer, J. Conroy. The Nearshore and Offshore Lake Erie Nutrient Study (NOLENS). U.S. EPA Great Lakes National Program Office, Lake Erie Central and Eastern Basin Studies of Nearshore/Offshore Nutrient Fluxes and Interactions. $150,000 ($75,000 for BSC). 2009.
6. Pérez-Fuentetaja, A., M. Clapsadl, D. Aga, Mehran Alaee. Food web–mediated transport and bioaccumulation of flame retardants (PBDE) in sport fish from eastern Lake Erie. New York Great Lakes Protection Fund. Large Grants Program. $100,000. 2009-2011.
7. Roehm, C.L. Arctic: The Unexpected frontier. Geography and Planning Department lecture series. Buffalo State Faculty Student Award (FSA). $1,000. 2009.
8. Roehm, C.L., S. Vermette, M. Janis. Hydrological characterization of Woodlawn Beach State Park: Implications for E. Coli, NYS Water Resource Institute, USGS National Institutes for Water Resources (NIWR). $55,517. 2010-2011.
9. Roehm, C.L. Freshwater Wetland Remapping, EPA/NYSDEC, $100,000. 2009-2011.
10. Vermette, S., K. Irvine, C.L. Roehm. Pre-Restoration Wetland Characterization and Chemical Mass Balance Study: Woodlawn Beach State Park, New York, New York Great Lakes Research Consortium (GLRC), $9,940. 2010-2011.

Submitted Proposals (Total $14,398,908, including $7,197,673 for Buffalo State):

11. Boyer, G.L., S.W. Wilhelm, J.F. Atkinson, J.C. Makarewicz, L.E. Burlakova, A.Y. Karatayev, J.D. Conroy, D.A. Culver, R.H. Becker, T.B. Bridgeman, G.S. Bullerjahn, R.M.L. McKay, R.A. Bourbonniere, S.B. Watson, R.Yerubandi, R.E.H. Smith, ECOHAB: Role of population diversity, growth and transport in the formation of toxic Microcystis blooms in the Lower Great Lakes. Department of Commerce; Center for Sponsored Coastal Ocean Research Coastal Ocean Program (FY 2010 ECOHAB) $4,998,670 ($299,983 for BSC). 2010- 2015. (Not funded).
12. Burlakova, L.E., A.Y. Karatayev, M.E. May. Survey of rare and endemic freshwater mussels in Texas. Texas Parks and Wildlife Department Traditional Section 6. $176,355. 2010- 2013. (Not funded).
13. Burlakova, L.E., A.Y. Karatayev, D.K. Padilla. Alternative States in Lake Benthic Communities. NSF. $828,570. ($583,514 for BSC). 2010-2012. (Not funded).
14. Karatayev, A.Y., L.E. Burlakova, D.K. Padilla. Reduce ecological and economic damage posed by parasites of exotic species introduced to the Great Lakes and their tributaries. NY Sea Grant. $149,000 ($94,776 for BSC). 2011- 2013. (Pending).
15. Krieger, K.A., J. Ciborowski, L. Burlakova, A. Karatayev, D. Barton, V. Richardson, M. Thomas. Lake Erie zoobenthic biomass, distribution and composition. U.S. EPA Great Lakes Restoration Initiative. $251,397. ($82,221 for BSC). 2010-2012. (Not funded).
16. Kumar, S., J.J. Mukherjee. Role of depurinating adducts in thia-PAH-induced

mutagenesis/carcinogenesis (Resubmission). National Institutes of Health. $822,250. 2010-2013. (Not funded).

17. Kumar, S., J.J. Mukherjee. P450 isozyme-specific metabolism of tobacco carcinogen dibenz[a,h]acridine in human lung. National Institutes of Health. $367,500. 2010-2013. (Not funded).
18. Kumar, S., J.J. Mukherjee. Potentiation of PAH-induced carcinogenicity by tobacco smoke metal constituent. National Institutes of Health. $367,500. 2010-2013. (Not funded).
19. Kumar, S., J.J. Mukherjee. Effect-directed screening of sediment for emerging toxics. Environmental Protection Agency-GLNPO. $199,911. 2010-2012. (Not funded).
20. Kumar, S., J.J. Mukherjee. Effect-directed screening of Great Lakes fish for potential toxics. Environmental Protection Agency-GLNPO. $314,361. 2010-2012. (Not funded).
21. Kumar, S., J.J. Mukherjee. Effect of cigarette smoke components on nicotine addiction. National Institutes of Health. $404,250. 2010-2012. (Pending).
22. Makaraweicz, J., J. Atkinson, B. Edwards, T. Vordecek, C. Pennuto. Predicting changes in the coastal zone of Lake Ontario. U.S. EPA Great Lakes Restoration Initiative. $799,989 ($41,998 for BSC) 2010-2012. (Not funded).
23. Molloy, D.P., D. Mayer, A. Pérez-Fuentetaja, K. Nishikawa, M. Gaylo, H. Shi, L. Burlakova, A. Karatayev, M. Clapsadl, R. Getchell, H. Bootsma, D. Einhouse, B. Moraska Lafrancois. Breakthrough Assay to Track Botulism E in Aquatic Food Webs. U.S. EPA Great Lakes Restoration Initiative. $799,995. ($199,970 BSC). 2010-2013. (Not funded).
24. Mukherjee, J.J., S. Kumar. Potentiation of PAH-induced carcinogenicity by alcohol (Resubmission). National Institutes of Health. $147,000. 2010-2012. (Not funded).
25. Pennuto, C.M., A.Y. Karatayev, A. Pérez-Fuentetaja, L.E. Burlakova, D. Bade, G. Matisoff, J. Kramer, C. Mayer. The Lake Erie Nearshore and Offshore Nutrient Study (LENONS). U.S. EPA Great Lakes Restoration Initiative 2010. $615,813. (365,101 for BS). 2010-2013. (Selected for funding).
26. Pennuto, C.M., A. McMillan, Collaborators: C.L. Roehm, R. Snyder, A. Pérez-Fuentetaja, L. Burlakova, A. Karatayev, S. Vermette, T.Tang, S. Kumar, D.L. Potts. REU Site: Research in the Great Lakes ecosystem: from genes to landscapes. National Science Foundation, DBI. $566,401. (Not funded).
27. Roehm, C., M. Clapsadl, D. Potts, Improving Core Equipment in Applied Ecological Research at the Great Lakes Center Field Station. National Science Foundation FSML. $328,465. 2010. (Pending).
28. Roehm, C., M. Clapsadl, A. Karatayev, C. Pennuto, D. Burns. Renovation of Climate Change Related Research Facilities at the Great Lakes Center Research Station, National Science Foundation, Academic Research Infrastructure Program: Recovery and Reinvestment (ARI-R²). $860,271. 2010-2012. (Not funded).
29. Roehm, C.L., S. Vermette, D. Beletsky, E. Anderson. Observing Systems and Monitoring in Nearshore Lake Erie, EPA Great Lakes Restoration Initiative grant. $962,583 ($793,528 for BSC). 2010-2012. (Selected for funding).
30. Snyder, R.J., L.E. Burlakova, D.B. MacNeill, A.Y. Karatayev. Taking the Battle Overseas: Using Russian Literature in the War Against Invasive Fishes. U.S. EPA Great Lakes Restoration Initiative. $111,264. 2010-2011. (Selected for funding).
31. Zanatta, D., L. Burlakova, A. Karatayev, R. Krebs, M. Hoggarth, F. de Szalay, J. Bossenbroek, E. Meyer, M. Walsh, Collaborators: M. Schlesinger, R. Haas, T. Crail, P. Badra, N. Welte, 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 BSC). 2010-2013. (Pending).

Other funding sources

1. Karatayev, A.Y. Request for additional funding for the Great Lakes Center submitted to US Senate. $650,000. 2010. (Pending).

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 5 were accepted for publication, and 5 were submitted to peer-reviewed journals. A total of 40 presentations were made by the GLC researches, including: 21 presentations at national/international/regional conferences, 10 invited talks, and 10 presentations were made in non-refereed venues.

Refereed Journal Publications (Published):

1. Burlakova, L.E., D.K. Padilla, A.Y. Karatayev, D.N. Hollas, L.D. Cartwright, and K.D. Nichol. 2010. Differences in population dynamics and potential impacts of a freshwater invader driven by temporal habitat stability. Biological Invasions 12: 927-942.
2. Boltovskoy, D., A. Karatayev, L. Burlakova, D. Cataldo, V. Karatayev, F. Sylvester, and A. Mariñelarena. 2009. Significant ecosystem-wide effects of the swiftly spreading invasive freshwater bivalve *Limnoperna fortunei*. Hydrobiologia 636: 271-284.
3. Karatayev, A.Y., L.E. Burlakova, D.K. Padilla, S.E. Mastitsky, and S. Olenin. 2009. Invaders are not a random selection of species. Biological Invasions 11: 2009-2019.
4. Karlsson, J., T.R. Christensen, T. Fribog, J. Förster, D. Hammerlund, M. Jackowicz-Koeczynski, U. Kokfelt, C.L. Roehm, and P. Rosen. 2010. Carbon emissions from a sub-arctic lake: quantitative importance and response to permafrost thawing. J. Geophys. Res –Biogeosciences doi:10.1029/2010JG001305.
5. Kumar, S. and S. Saravanan. 2009. A facile synthesis of 11,12-dimethoxydibenzo[def,p]-chrysene, a preferred precursor for the synthesis of the proximate and ultimate carcinogens of dibenzo[def,p]chrysene (DBC). Polycyclic Aromatic Compounds 29: 282-288.
6. Mastitsky, S.E., A.Y. Karatayev, L.E. Burlakova, B.V. Adamovich. 2010. Non-native fishes of Belarus: diversity, distribution, and risk classification using the Fish Invasiveness Screening Kit (FISK). Aquatic Invasions 5: 103-114.
7. Mastitsky, S.E. 2009. On the role of alien mollusc *Dreissena polymorpha* (Bivalvia, Dreissenidae) in the spread of trematode infections among fishes in Belarus. Voprosy Rybnogo Khozyaystva Belarusi 26: 183-189.
8. Mastitsky, S.E. and J.K. Veres. 2010. Field evidence for a parasite spillback caused by exotic mollusc *Dreissena polymorpha* in an invaded lake. Parasitology Research 106: 667-675.
9. Mukherjee, J.J. and S. Kumar. 2010. Phenolic fraction of tobacco smoke condensate potentiates benzo[a]pyrene diol epoxide-induced cell transformation: Role of protein kinase C. Mutation Res. 696: 89-94.
10. Pennuto, C.M., P.J. Krakowiak and C.E. Janik. 2010. Diet, energy consumption, and seasonal abundance of round gobies (*Neogobius melanostomus*) in Lake Erie, USA tributary streams. Ecology of Freshwater Fish 19: 206-215.
11. Roehm, C.L., R. Giesler and J. Karlsson, 2009, Bioavailability of terrestrial organic carbon to lake bacteria: the case of a degrading sub-arctic permafrost mire complex. J. Geophys. Res.- Atmospheres, 114, G03006, doi:10.1029/2008JG000863.
12. Sobiechowska, M., M. Bridoux, A-H. F. Ferreira, A. Pérez-Fuentetaja, K., T. Alben. 2010. Biomarkers of algal populations in phytoplankton, filamentous algae, and sediments from the eastern basin of Lake Erie 2003-2005. Journal of the Great Lakes Research 36: 298-311.

Refereed Journal Publications (Accepted):

1. Bridoux, M., M. Sobiechowska, A. Pérez-Fuentetaja, K.T. Alben. 2010. Algal pigments in Lake Erie dressenids, pseudofeces and sediments, as tracers of diet, selective feeding and bioaccumulation. Journal of the Great Lakes Research.
2. Karatayev, A.Y., L.E. Burlakova, and D.K. Padilla. 2009. *Dreissena polymorpha* in Belarus: history of spread, population biology, and ecosystem impacts. In: The Zebra Mussels in Europe (G. Van der Velde, S. Rajagopal and A. bij de Vaate, eds.).
3. Mastitsky, S.E., A. Y. Karatayev, L.E. Burlakova and D.P. Molloy. Parasites of exotic species in invaded areas: does lower diversity mean lower epizootic impact? Diversity and Distributions.
4. Molloy, D.P., L. Giamberini, L.E. Burlakova, A.Y. Karatayev, J.R. Cryan, S.L. Trajanovski, and S.P. Trajanovska. 2009. Investigation of the endosymbionts of *Dreissena stankovici* with morphological and molecular confirmation of host species. In: The Zebra Mussels in Europe (G. van der Velde, S. Rajagopal and A. bij de Vaate, eds.).
5. Pérez-Fuentetaja, A., S. Lupton, M. Clapsadl, F. Samara, L. Gatto, R. Biniakewitz and D. S. Aga. 2010. Current PCB and PBDE Levels in Wild Common Carp (Cyprinus carpio) from Eastern Lake Erie. Chemosphere.

Refereed Journal Publications Submitted (in Review):

1. Burlakova, L.E., A.Y. Karatayev, V.A. Karatayev, D. L. Bennett, M.J. Cook and M.E. May. Endemic species: contribution to community uniqueness, effect of habitat alteration, and conservation priorities. Submitted to Biological Conservation.
2. Karatayev, A.Y., L. E. Burlakova, V.A. Karatayev and D. Boltovskoy. *Limnoperna fortunei* vs. *Dreissena polymorpha*: Population densities and benthic community impacts of two invasive freshwater bivalves. Submitted to Journal of Shellfish Research.
3. Karatayev, A.Y., L.E. Burlakova, D.K. Padilla, S.E. Mastitsky and M. Hajduk. Differences in growth and survivorship of zebra and quagga mussels: size matters. Submitted to Hydrobiologia.
4. Karatayev, A.Y., L.E., Burlakova, S.E. Mastitsky, D.K. Padilla and E.L. Mills. Invasion and secondary spread at different spatial scales: are they related?? Submitted to Global Ecology and Biogeography.
5. Pérez-Fuentetaja, A., M. Clapsadl, R.G. Getchell, P.R. Bowser and W.T Lee. Clostridium botulinum Type E in Lake Erie: Inter-Annual Differences and Role of Benthic invertebrates. Submitted to Journal of the Great Lakes Research.

International/National/Regional Conference Presentations:

1. Burlakova, L.E., A.Y. Karatayev, C. Pennuto, S.E. Mastitsky M.M. Hajduk, C.P. Basiliko and J. Conroy. Dominance of exotic invertebrates changes the structure of the Lake Erie benthic community. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.

Social event during the 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON. D. Mayer (NYSM), L. Burlakova, T. Newton (USGS), V. Karatayev, M. Hajduk, C. Pennuto, and A. Pérez-Fuentetaja.

2. Burlakova, L.E., A.Y., Karatayev, V.A. Karatayev and M.E. May. Patterns of diversity, rarity and endemism: conservation priorities for freshwater bivalves (Fam. Unionidae) in Texas. 2010 American Society of Limnology and Oceanography ASLO/NABS Summer Meeting, June 6-10, 2010, Santa Fe, NM.
3. Chapman, S. and C.M. Pennuto. 2010. Assessing drift densities of larval and juvenile round gobies (*Neogobius melanostomus*) in a Great Lakes tributary. Great Lakes Research Consortium Student/Faculty Conference. March 19-20, Syracuse, NY.

4. Cudney, K., C.M. Pennuto and C.E. Janik. 2010. The effect of the invasive round goby (*Neogobius melanostomus*, Pallas 1814) on leaf breakdown in a Lake Erie tributary stream. Great Lakes Research Consortium Student/ Faculty Conference. March 19-20, Syracuse, NY.

20th Annual Great Lakes Research Consortium Conference in SUNY-ESF. March 19-20, 2010, Syracuse, NY. C. Pennuto, K. Cudney, M. Hajduk, T. Duval, K. Waldron, S. Chapman, C. Janik, L. Burlakova, and V. Karatayev.

5. Hajduk, M.M., S.E. Mastitsky, L.E. Burlakova and A.Y. Karatayev. Assessing Potential Threats: Parasitological Surveys of Great Lakes Non-Native Species. 20th Annual Great Lakes Research Consortium Conference in SUNY-ESF. March 19-20, 2010, Syracuse, NY. Received Outstanding Student Award in Limnology Session, and a Sea Grant prize in memory of Dr. Donald Rennie (http://www.esf.edu/glrc/).

Undergraduate URM student M. Hajduk and high school student V. Karatayev receive Outstanding Student Awards in Limnology Session, and Sea Grant prize in memory of Dr. Donald Rennie at the 20th Annual Great Lakes Research Consortium Conference in SUNY-ESF. March 19-20, 2010, Syracuse, NY.

6. Hajduk, M.M., S.E. Mastitsky, L.E. Burlakova and A.Y. Karatayev. Hidden Invaders in the Great Lakes: Endosymbionts of Non-Native Species. Poster. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON
7. Janik, C.E., C.M. Pennuto and K. Cudney. 2010. Indirect effects of the invasive round goby on primary production in Ellicott Creek, a tributary stream of Lake Eire. Great Lakes Research Consortium Student/Faculty Conference. March 19-20, Syracuse, NY.
8. Karatayev, A.Y., L.E. Burlakova, C. Pennuto and C.P. Basiliko, Dominance of exotic invertebrates changes the Lake Erie benthic community. 6th Biennial Conference of the Lake Erie Millennium Network. April 27-29, 2010, Windsor, ON.
9. Karatayev, A.Y., L.E. Burlakova, S.E. Mastitsky, D.K. Padilla and M. Hajduk. Contrasting survival and growth of zebra mussels and quagga mussels under different temperature regimes. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.
10. Karatayev, V.A., A.Y. Karatayev, L.E. Burlakova and D.K. Padilla. Dominance within the lake does not represent invasion potential for dreissenids. Poster. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON
11. Karatayev, A.Y., L.E. Burlakova, S.E. Mastitsky, D.K. Padilla, E.L. Mills and V.A. Karatayev. Competitive ability versus invasion rate: which is a better invader, *Dreissena polymorpha* or *Dreissena rostriformis bugensis*? 2010 American Society of Limnology and Oceanography ASLO/ NABS Summer Meeting, June 6-10, 2010, Santa Fe, NM.

At the 2010 Summer Joint Meeting with ASLO & NABS, June 2010, Santa Fe, NM. W. G. Sprules (University of Toronto at Mississauga, Canada), J. Havel (Missouri State University), C. Ramcharan (Laurentian University, Canada), L. Burlakova, V. Dodson, and H. Riessen.

12. Karatayev, V.A., A.Y. Karatayev, L.E. Burlakova and D.K. Padilla. In spite of *Dreissena r. bugensis* dominance, *D. polymorpha* retains a strong potential to invade from the Great Lakes. 20th Annual Great Lakes Research Consortium Conference in SUNY-ESF. March 19-20, 2010, Syracuse, NY. Received Outstanding Student Award in Limnology Session, and a Sea Grant prize in memory of Dr. Donald Rennie (http://www.esf.edu/glrc/).
13. Mayer, D., A. Pérez-Fuentetaja, K. Nishikawa, H. Shi, M. Gaikowski, D. Aloisi, T. Hubert, M. Gaylo, L. Burlakova, A. Karatayev, M. Clapsadl, T. Brady, J. Luoma and D. Molloy.

Potential to Manage the Impacts of Invasive Species on Endangered Wildlife in the Great Lakes. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.

14. Mukherjee, J.J. and S. Kumar. Cadmium interferes with benzo[a]pyrene-diol epoxide (BPDE)-induced apoptotic signaling pathway: Role of extracellular signal-regulated kinases (ERKs). 3rd International Symposium of Translational Cancer-2009, December 18-21, 2009, Bhubaneswar, India.
15. Pennuto, C.M. and S.A. Chapman. Preliminary estimates of round goby drift from a Great Lake tributary. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.
16. Pérez -Fuentetaja, A., C. Pennuto, A. Karatayev, L. Burlakova, J. Conroy, J. Kramer, D. Bade and G. Matisoff. Biological Production and Nutrient Fate in Nearshore and Offshore Lake Erie. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.
17. Pérez-Fuentetaja, A., C. Pennuto, A. Karatayev, L. Burlakova, J. Conroy, J. Kramer, D. Bade, G. Matisoff. 2010. Poster Presentation. Biological influence on the Nearshore and offshore nutrient dynamics of Lake Erie. 2010 American Society of Limnology and Oceanography ASLO/NABS Summer Meeting, June 6-11, 2010, Santa Fe, NM.
18. Pérez-Fuentetaja, A. 2010. Type E Botulism in the Great Lakes: a Widespread Concern. Lake Erie Millenium Network (LEMN). Sixth Biennial Conference. University of Windsor, April 28, 2010, Windsor, ON.
19. Roehm, C.L., R. Giesler and J. Karlsson. 2010. Carbon Cycling in Alpine and Arctic watersheds affected by permafrost degradation: An insight from Sweden, (Oral) 2010, Aquatic Sciences: Global Changes from the Center to the Edge, American Society of Limnology and Oceanography (ASLO) and North American Benthological Society (NABS) Joint Meeting, June 6-11, 2010, Santa Fe, NM.
20. Roehm, C.L. and M. Wilson. 2010. Nutrient dynamics in Great Lakes Coastal Wetlands. 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17-21, 2010, Toronto, ON.
21. Roehm, C.L., and M. Wilson, 2010, Hydrological and nutrient dynamics in coastal wetlands. New York State Wetlands Forum (NYSWF), Buffalo, April 28th and 29th, 2010.

Invited Talks

1. Burlakova, L.E. and A.Y. Karatayev, Unionidae diversity and rarity in Texas. The Texas Parks and Wildlife Department Freshwater Mussel Meeting. January 7, 2010.
2. Hastings K. Long-term lower trophic level monitoring of Eastern Basin, Lake Erie, 2008-2009, Great Lakes Center Seminar Series: April 15, 2010.
3. Karatayev, A.Y., L.E. Burlakova and D.K. Padilla. Spread and ecological impacts of *Dreissena rostriformis bugensis* and *Dreissena polymorpha*. University at Buffalo. Aquatic Invasive Species in New York: an Environmental Forum. September 25, 2009.
4. Mukherjee, J.J. 2009. Interference of tumor potentiating environmental pollutants with p53 signaling. 2nd International Symposium on Recent Advances in Basic, Clinical and Social Medicine (jointly organized by The University of Manitoba, Canada and Shantou University, China) held in Shantou University, China.
5. Pennuto, C.M. 2009. Status and impacts of the round goby in the Great Lakes and contributing waters. University at Buffalo. Aquatic Invasive Species in New York: an Environmental Forum. September 25, 2009.
6. Pennuto, C.M., A. Pérez-Fuentetaja, A. Karatayev, L. Burlakova, G. Matisoff, D. Bade, J. Conroy, E.A. Marschall, and J. Kramer. The nearshore and offshore Lake Erie nutrient study (NOLENS): an update. Lake Erie Phosphorous Task Force, Toledo, February 2010.
7. Pérez-Fuentetaja, A. 2010. Sources and Pathways of Type E Botulism in the Lake Erie. Dept. of Environmental Engineering, University at Buffalo, Buffalo, NY, March 5, 2010.

8. Roehm, C. L. Invited science speaker for the 68th Annual WNY Science Congress and awarded the Outstanding Scientists of the year 2010 award. April 30th, 2010, Buffalo N.Y.

Charlotte Roehm presenting an invited lecture at the 68th Annual Western New York Science Congress.

9. Roehm, C.L. When to Where: Coastal Wetlands of the Great Lakes, UB Department of Geography, Erie IGERT Seminar Series, University of Buffalo, Nov. 20th, 2009.

10. Roehm, C.L. Testimony before the Senate Standing Committee on Environmental Conservation – Public Hearing on: "The Protection of the Wetlands", Buffalo Science Museum, Buffalo, N.Y., October 20, 2009.

Conference Presentations (Non-Refereed)

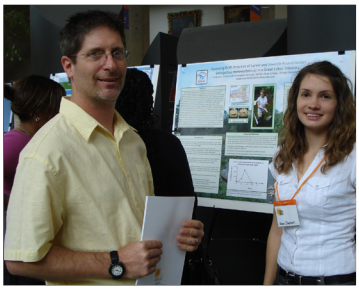
1. Burlakova, L.E., A.Y. Karatayev, V.A. Karatayev and M. May. Survey of freshwater molluscs in Texas: new discoveries. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

2. Burlakova, L.E., A.Y. Karatayev, D.N. Hollas, R. Ngoen-klan, M. Perrelli and K. Irvine. Spread of aquatic invasive species: survey of applesnail *Pomacea insularum* in southeastern Texas. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

Presenting posters at the 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. L. Burlakova, S. Mastitsky, A. Karatayev, and C. Roehm.

3. Hajduk, M.M., S.E. Mastitsky, L.E. Burlakova and A.Y. Karatayev. Assessing potential threats: parasitological surveys of Great Lakes and Finger Lakes non-native species. Buffalo State College 2010 Student Research and Creativity Celebration. April 30 - May 1, 2010. Poster.

4. Chapman, S.A. and Pennuto, C.M. Assessing drift densities of larval and juvenile round gobies (*Neogobius melanostomus*) in a Great Lake Tributary. Buffalo State College 2010 Student Research and Creativity Celebration. April 30 - May 1, 2010. Poster.



Chris Pennuto and undergraduate URM student Shana Chapman at the 2010 Buffalo State College Student Research and Creativity Celebration. April 30 - May 1, 2010.

5. Kumar, S. A concise and convenient synthesis of 6-fluoro-9-(2-deoxy-3,5-bis(tert-butyldimethylsilyl)-ß-D-erythropentfuranosyl) purine. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

6. Mastitsky, S.E., M. Hajduk, A.Y. Karatayev and L.E. Burlakova. Parasites of exotic molluscs in the Lake Erie and Lake Ontario watersheds. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

7. Mastitsky, S.E., E. Snyder, L.E. Burlakova and A.Y. Karatayev. Case study on the population biology of the New Zealand mud snail in Western New York. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

8. Mastitsky, S.E., L.E. Burlakova and A.Y. Karatayev. Quagga mussel demonstrates higher growth and survival rates than zebra mussel under experimental conditions. 10th Annual 2009 Faculty and Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

9. Mukherjee, J.J. and R. Gocinski. Tumor promoting activity of phenolic fraction of tobacco smoke condensate: Role of PKC down-regulation. 10th Annual Faculty/Staff Research and Creativity Fall Forum, Buffalo State College, October 29, 2009. Poster.

10. Roehm, C.L. and M. Wilson. 2010. Hydrological and nutrient dynamics in coastal wetlands. New York State Wetlands Forum (NYSWF), Buffalo, April 28-29, 2010

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.

Classes Taught (2009-2010):

- BIO 104 – Environmental Biology – A. Pérez-Fuentetaja.
- BIO 213 – Introduction to Evolution, Ecology, & Behavior – C. Pennuto.
- BIO 361/362 – Biology/URM Seminar – C. Pennuto.
- BIO 389/612 – Aquatic Entomology – C. Pennuto.
- BIO 617 – Research Seminar – A. Pérez-Fuentetaja.
- BIO 635 – Great Lakes Ecology – A. Pérez-Fuentetaja.
- HON 202 – Social Science perspectives – C. Roehm.
- GEG 307 – Conservation and Resource Management – C. Roehm.
- GEG 610 - HydroBiogeochemistry – C. Roehm.

Graduate Program

Multi-Disciplinary Masters Degree Program Administered by the GLC:

Student:	Advisor:
• Vileno, Codie	Roehm, C. L.
• Reeverts, T.	Roehm, C. L.
• Childs, Heidi	Potts, D
• Reth, Kimly	Irvine, K.
• Winkler, Katherine	Frothingham, K.
• Karcz, John	Kumar, S.
• Drake, Robbyn	Burlakova, L.

Degree(s) Granted:

Student:	Advisor:	Graduated:
• Sowyrda, Alexander	Irvine, K.	May 2010

Advising Undergraduate and Graduate Students

- Chris Pennuto was the advisor of five graduate students from the Biology Department (Bryan Young, Nini Dong, Shannon Rupprecht, Christopher Janik and Kevin Cudney), and one undergraduate URM student (Shana Chapman). He also was MA thesis committee member for six students (Noelle Raymon, Jackie Walters, Andrew Harrison, Beryl Ankrah, Jessica Wuerstle, and Nicole Woods).
- Charlotte Roehm supervised two graduate students (C. Vileno and T. Reeverts) and an URM student and McNair Scholar (Monique Wilson). In addition, she was co-advisor/ committee member for Masters student JoAnn McNeill (Dept. Earth Sciences).
- Lyuba Burlakova was the major professor for one graduate student (Robbyn Drake), one URM student (Marissa Hajduk), and was a member of Graduate Committee for Biology graduate student Jessica Wuerstle. She also supervised Undergraduate Research Project (BIO 495, Spring 2010) of Lindsay Morris, "Distribution of zebra mussel (*D. polymorpha*) and quagga mussel (*D. bugensis*) in Lake Erie" and two students from Buffalo City Honors School (Jessica Martin and Vadim Karatayev). In addition, she was an External Dissertation Examiner for master thesis defense by Elaine Keenan "Changes in Littoral Invertebrate Communities in Lough Corrib in Response to an Invasion by *Lagarosiphon major*" (College of Life Sciences, School of Biology and Environmental Science, University College Dublin, Dublin, Ireland), June 2010.
- Alicia Pérez-Fuentetaja was the major professor for two graduate students (Jessica Wuerstle and Beryl Ankrah) and supervised research in her lab by Honors students Jennifer Kishbaugh (Fall 2009) and Fawn Goodberry (Spring 2010). She also was MA thesis committee member for six students (Bryan Young, Shannon Rupprecht, Nini Dong, Chris Janik, Kevin Cudney, June Louie).
- Subodh Kumar was the major professor for two graduate students (John Carz and M. Williams).

Other Educational Activities

- Subodh Kumar continues 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 3 supervision and Grade 4 Management. The number of trainees attended these courses were 8, 10, 5, 3, and 3, respectively, in the fall semester of 2009 and 13, 12, 11, 13, and 4, respectively, in spring semester of 2010.

IV. Service Activities

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

Caleb Basiliko:

- Black Rock Canal Park Steering Committee Member
- Grant-Amherst Business Assn Member
- Great Lakes Assn of Science Ships Steering Committee Member,
- Great Lakes Captains Assn Member,
- International Ship Masters Association Member,
- CERT Member and a Buffalo Niagara Riverkeepers Site Captain.
- Organized and ran the Scajaquada Creek Clean-up and the 12th Annual Rediscover Amherst Street Festival.

Lyubov Burlakova:

- Coordinator of the Great Lakes Center and Biology Department Seminar Series.
- Co-chair of Aquatic Invasive Species Session, 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17 – 21, 2010, Toronto, ON.
- Advised Texas Parks and Wildlife Department, Lower Colorado River Authority & other organizations in Texas on distribution and abundance of rare Unionid mussels in Texas. Based on the results of our research, TPWD added 15 species of freshwater mussels to the state's list of threatened species in January 2010.
- Provided information required for conservation of Unionidae in Texas: data needed for WildEarth Guardians Petition submitted to US FWS to list six rare Texas mussels under the Endangered Species Act, for US FWS response to the petition. Provided data for US FWS finding for twelve Texas threatened unionid species.
- Reviewed grant proposal for "Graduate Women in Science" Fellowships..
- Reviewed doctoral dissertation by N. V. Barulin, "The fish-biology substantiation of application of laser radiation in technology of sturgeon aquaculture (Acipenser)". Belarusian State Agricultural Academy, Gorky, Belarus.
- Reviewed manuscripts submitted to: *Environmental Conservation, Ecosystems, Biological Invasions, The Texas Journal of Science*, and *Water Research*.
- Judge, 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17 – 21, 2010, Toronto, ON.
- Member of the Great Lakes Research Consortium.
- Member of the American Society of Limnology and Oceanography.
- Member of the Freshwater Mollusc Conservation Society.
- Member of United States Conference On Teaching Statistics (USCOTS) NSF Post-Intro Statistics Cluster.

Mark Clapsadl:

- Organized interagency meeting with NYS DEC, USFWS, SUNY ESF and BSC to provide opportunity to start collaborative projects and explore funding opportunities.
- Served on McKinley High School Science Curriculum Advisory Committee.
- Television interview Channel 4 News regarding the Asian Carp invasion.
- Served as Dive Control Board member and assisted new Dive Safety Officer.
- Assisted the NYS DEC with Lake Erie trawl surveys.
- Presentation of Field Station Activities at GLC annual Open House.
- Met with Fredonia High School student Alyssa Patterson for Job Shadowing.
- Met with Fredonia High School student Margaret McDonald for Job Shadowing.

Kit Hastings:

- Participated in field collection and laboratory studies in multiple projects conducted at the Field Station.
- Contributed to SafeZone Campus Survey creation process.

Alexander Karatayev:

- Organized Great Lakes Center Open House (April 2010).
- Published Great Lakes Center 2008 – 2009 report (April 2010).
- Co-chair of Aquatic Invasive Species Session, 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17 – 21, 2010, Toronto, ON.
- Oral Testimony before the Senate Standing Committee on Environmental Conservation – Public Hearing on: *"The improvement of water quality throughout New York State",* Buffalo, N.Y., September 29th, 2009
- Multiple interviews for various mass media.
- Campus representative for the Great Lakes Research Consortium.
- Member of the Biology Department Personnel Committee.
- New Science Building Renovation Committee member.
- Member of the Facilities Master Plan – Buffalo State College Advisory Committee.
- Member of the American Society of Limnology and Oceanography
- Member of the North American Benthological Society
- Member of the International Association of the Great Lakes Research
- Reviewed manuscripts for *Biological Invasions*, and *Journal of Great Lakes Research.*

Subodh Kumar:

- Adjunct Research Professor in Chemistry
- Radiation Safety Committee member.
- New Science Building Renovation Committee member.
- Chemical Hygiene Committee member.
- 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 *Journal of Medicinal Chemistry, Chemical Research in Toxicology, ARKIVOC* (also serves in Editorial Board), *Bioorganic and Medicinal Chemistry Letters, Bioorganic and Medicinal Chemistry, and Chemistry Letters.*
- Member of the American Chemical Society
- Member of the American Association for Cancer Research
- Member of Sigma Xi
- Member of the American Association for the Advancement of Sciences
- Member of the Environmental Mutagen Society
- Member of the Great Lakes Research Consortium

Jagat Mukherjee:

- Invited reviewer of the grant proposals submitted to the Bankhead-Coley Cancer Research Program managed by the Florida Department of Health.

Cathy Nasca:

- Assisted in preparation of the Great Lakes Center Annual Report and booklets about GLC for publication.
- Organized Great Lakes Center Open House.

Christopher Pennuto:

- Faculty advisor, NASO (Native American Student Organization).
- Faculty co-advisor, Biology Club.
- Chair of the Great Lakes Center Graduate Program Committee. Serving on the Committee for the Graduate Masters Program to establish a new multidisciplinary Masters program. (2008-current).
- Member of the Great Lakes Research Consortium.
- Co-chair of Aquatic Invasive Species Session, 53rd Annual Conference on Great Lakes Research. The International Association for Great Lakes Research, May 17 – 21, 2010, Toronto, ON.
- Hosting 3 undergraduate research 'volunteers' in summer 2010.

- Workshop Co-presenter with D. Derrick and P Furhman: Stream Ecology, Biomonitoring, and Restoration. (Workshop for the UB Civil and Environmental Engineering Dept. as part of involvement with the ERIE, IGERT). July 2009.
- Member: North American Benthological Society, International Association of Great Lakes Research, Ecological Society of America, American Indian Science and Engineering Society.
- Reviewer: *Ecology of Freshwater Fish, Aquatic Ecology, Hydrobiologia, Journal of Great Lakes Research.*

Alicia Pérez-Fuentetaja:

- Chair of the Biology Department Graduate Committee.
- Member of the Biology Department Communications Committee.
- Member of the Great Lakes Research Consortium.
- Reviewed manuscripts submitted to: *Journal of Great Lakes Research, Canadian Journal of Fisheries and Aquatic Sciences*
- Member Board of Directors for Rhizogen LLC (2009).

Charlotte Roehm:

- Founder and leader of the Geography and Planning Departments seminar series: Arctic: The Unexpected frontier, funded by the Faculty Student Association of Buffalo State College (Spring 2010).
- Invited to participate in the American Geophysical Union Climate Science Experts online live question and answer session, organized by the AGU to field questions from the media concerning scientific issues pertaining to the Copenhagen Climate Summit held in Denmark in December 2009.
- Member of the Great Lakes Center Graduate Program Committee. Serving on the Committee for the Graduate Masters Program to establish a new multidisciplinary Masters program. (2008-current).
- Invited to talk to new and interested faculty about writing group experience (Fall 2009)
- Member of the Great Lakes Research Consortium.
- Participated in Combined Sewer Overflow project (Dr. Irvine) (Spring-Fall 2009)
- Involved in the ERIE IGERT program with UB (2009-current).
- Involved in the REU program at UB (2008-current).
- Served on the Mildred Campbell Leadership Award Committee (Fall 2009).
- Served on the Who's who amongst students in American University and Colleges (Fall 2009).
- Responsible for the maintenance and running of the Point Peter Brook Watershed.
- Involved in a discussion group led by Susan McMillan regarding writing group success at Buffalo State College (Oct 2009).
- Volunteered in the H1N1 vaccine clinic as a CERT member (November 2009).
- Member of the Buffalo State Community Emergency Response Team (CERT) course. (Sept.-Nov. 2008)
- Reviewed manuscripts submitted to: *Global Biogeochemical Cycles, Journal of Geophysical Research - Biogeosciences, Limnology and Oceanography, Limnology and Oceanography: Methods, Book Review for upcoming publication.*

V. Professional Development Activities

Caleb Basiliko:

- Attended the United States Coast Guard Sector Buffalo Industry Day to update on current and proposed rules and regulations.
- Upgraded his captain's license to 100 Ton Master.
- Attended training for vessel operators in Traverse City Michigan.

Lyubov Burlakova:

- Attended a Seminar: "PCA and Factor Analysis Using SPSS", March 20, 2010.

Mark Clapsadl:

- Took SCUBA refresher course including night and limited visibility diving.

Alexander Karatayev:

- Took SCUBA refresher course including night and limited visibility diving

Kit Hastings:

- Attended a workshop "Preventing Sexual Harassment in the Workspace" sponsored by the Equity and Campus Diversity Office, Buffalo State College, June 18, 2009.
- Attended a webinar "How to Store your YSI products for the Season" presented by YSI Inc., October 22, 2009, to review procedures for maintenance and long-term storage for our sonde.
- Attended a webinar "Cost-Effective Continuous Monitoring Tools for Improved Aquatic Ecosystems Restoration" presented by YSI Inc., January 28, 2010, to learn problems and consideration for long term and continuous monitoring projects.
- Enrolled as part-time student, Geography major (GIS minor), to take GIS courses for use in current and future projects; Spring 2010, took GEG 425 Fundamentals of GIS and began applying techniques learned to the LTM dataset.
- Attended a training workshop "Basic SKYWARN Spotter Training," presented by the National Weather Service, Buffalo NY Forecast Office, March 6, 2010. Became a Weather Spotter, certification good through December 2012

Subodh Kumar:

- Participated in the online webinar training program entitled "EPA Quality System Overview" organized for Great Lakes National Program Office of Water. April 14th, 2010.
- Participated in the online webinar training program entitled "Data Quality Act/ Information Quality Guidelines," organized for Great Lakes National Program Office of Water. April 14th, 2010.
- Participated in the online webinar training program entitled "Systematic Planning and Quality Documentation for Projects using Existing Data," organized for Great Lakes National Program Office of Water. April 15th, 2010.
- Participated in the online webinar training program entitled "Quality Assistance Training for Project Officers," organized for Great Lakes National Program Office and Office of Water. April 15th, 2010.

Charlotte Roehm:

- Participated in the online webinar-conference entitled "28th Annual International Submerged Lands Management Conference: Wetlands Restoration." November 5th, 2009.
- Participated in the online webinar-conference entitled "28th Annual International Submerged Lands Management Conference: Water Dependency." October 23rd, 2009.

VI. Field Laboratory Activities

The bulk of the ecosystems/fisheries research is carried out at the GLC Field Laboratory. The Field Laboratory was designed as a state-of-the-art facility at the head of the Niagara River on Lake Erie that is capable of supporting high-level research in a variety of disciplines. The Field Laboratory houses a fully-automated aquaculture system, a variety of data loggers and automated sampling equipment, and both macro and micro-visualization equipment. Over the past two years we have been working to repair, replace or upgrade equipment and systems in the field station and have made significant progress towards this goal as well as efforts to better utilize space to maximize opportunity for research.

Improvements to the Infrastructure

- The purchase and installation of three windows in the visiting scientist office allowed us to move the permanent Field Station staff into this space, while still allowing for work space for visiting researchers. The old office space has been converted into a microscopy laboratory thus enabling us to move sensitive expensive microscope equipment out of a chemical/wet lab and into a clean dry lab. This move provides a much better working space for microscope users and will help to prevent damage to these microscopes from moisture or chemicals as well as to create more space in the chemical laboratory.
- Another facility upgrade was installation of semi-transparent shades in the Outdoor Classroom Building. Prior to the installation of shades it was almost impossible to use this space for projected presentations because the building receives so much natural light. We have received a lot of positive feedback about the shades.
- We have added a new spectrophotometer to our laboratory equipment here at the Field Station. This instrument will be useful for sample analysis from samples collected from the Long Term Monitoring project and is compatible with the spectrophotometers that are used by other GLC staff.
- We have added two new vehicles to our fleet: one is a 7 person minivan that can be used either for researchers to access field sites or to attend conferences and meetings; the other is an F-350 pickup truck that can be used to tow the RV John J. Freidhoff to sites away from eastern Lake Erie. These are significant purchases because we have several funded projects that will require moving people, gear, and vessels to sites away from the FS.
- Our efforts to clean and organize the field station have continued. Truckloads of obsolete or useless materials such as old computers, non-functioning printers, outdated computer manuals, scrap metal, have been either recycled or discarded. The garage /workshop space has been rearranged to provide an open bay for working on our small boats or other projects. To protect tools and other valuable supplies, we have installed a tool cage in the garage.

Research Vessels

- After consulting with researchers from GLC and the interested researchers on rest of the campus we made the decision to remove the RV Seneca from our inventory. This decision was based on the fairly limited projected need of the vessel balanced against the high cost of repair, maintenance, and labor.
- We have purchased a 20' Polar-Kraft that can be used in both rivers and the lakes and will also be converted to an electro-fishing boat to replace our old electro-fisher.
- We have purchased replacement trailers for two of our Boston Whalers. These trailers will be key to safely getting our vessels to work sites during the next few years of work at the western end of Lake Erie.
- Additionally we have purchased new engines for some of our small vessels to replace old and less reliable engines.

Instructional Support

- Dr. Standora's class was given limnology equipment demonstration and lecture
- Elisa Bergslein class was taken on R/V John J. Freidhoff to show sampling methods on Lake Erie
- Facilities were provided for Lisa Anselmi's Anthropology class experiments

The Field Laboratory offered advice, facilities, and assistance for the following research activities:

- Provided research support and assistance with the PBDE project
- Provided research vessel and logistical assistance for the Nearshore Offshore Lake Erie Nutrient Study (NOLENS) project
- Provided facilities and support for Randy Snyder's Fatty Acid/alewife experiments
- Provided Channel 4 news with interview regarding Asian carp
- Continued long-term sampling of the eastern basin of Lake Erie.
- Assisted Alicia Pérez-Fuentetaja graduate students with Hemimysis experiments
- Assisted Jill Singer with logistics and instrument installation design for her Buffalo River current sonar modeling project.
- Provided support and facilities for Kim Irving's CSO monitoring project
- Worked with DEC constructing and emplacing protective structures to shield tern nesting sites from predators along the breakwalls of the Buffalo Harbor and Black Rock Canal
- Provided support to DEC with muskellunge spawning research

William Hughes checking acoustic instruments aboard the RV Seiche.

VII. New Initiatives

Great Lakes Center MS Program in Great Lakes Environmental Science

The Great Lake Center has developed a Letter of Intent, in conjunction with the Departments of Geography & Planning, Earth Sciences, Biology, and the Dean's Office of Natural and Social Sciences, for a new M.S. degree program in Great Lakes Environmental Science. The degree builds upon an effort begun nearly a decade ago to create a Great Lakes-focused, graduate research degree. Multiple meetings were held throughout 2009, resulting in a selection of new and existing coursework and degree expectations. The Letter of Intent will be submitted to SUNY for approval in Fall 2010 with an anticipated start date of Fall 2011. This program will be able to accommodate a range of students and faculty outside GLC, but it would still lean toward our core interests. The locale and facilities of Buffalo State College provide a unique opportunity to study the effects of interactions of physical and biological processes with the social, economic and civil activities of humans living on one of the world's most precious resources - fresh water. The Great Lakes Region holds approximately 20% of the world's store of fresh water. The entire Great Lakes Basin drains through Lake Erie and the Niagara River and thus directly past BSC's Great Lakes Center on the Niagara River. This is a prime site for students who wish to study how humans both create and resolve environmental problems, especially those related to the aquatic environment. Students will become professionals who will provide critical insight and interventions for future planning and management of the world's water supplies.

Publication of GLC Annual Reports

In order to increase the visibility of the GLC, more effectively disseminate information about our activities, and to receive feedback from the college, scientists, and community, in the spring of 2010, we published GLC 2008-2009 annual report. The report was presented at our traditional Spring Open House and is available both as a hard copy and electronically at the GLC website. We will continue to publish and disseminate our annual reports.

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 2009 – 2010 we invited five speakers to present talks on our seminar, including:

- Greg Boyer, SUNY ESF. "Toxic cyanobacteria in the Great Lakes: problems, issues and solutions". December 7, 2009
- Thomas Hahn, Division of Applied Marine Physics, Rosenstiel School of Marine and Atmo spheric Science, University of Miami. "Acoustics of pelagic fish schools". November 19, 2009.
- Kenneth A. Krieger, Water Quality Lab, Heidelberg University. "Benthic invertebrates as indicators of lake quality in Lake Erie". March 25, 2010.
- Kit Hastings, Great Lakes Center Buffalo State College. "Long-term lower trophic level monitoring of eastern basin, Lake Erie, 2008-2009," April 15, 2010.
- Dima Beletsky, CILER - School of Natural Resources and the Environment, University of Michigan, Ann Arbor. "Modeling thermal structure and circulation in the Great Lakes". May 13, 2010.