

GREAT LAKES RESEARCH CONSORTIUM



Biennial Report 2008 - 2009 2009 - 2010

<http://www.esf.edu/glrc/>

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STAFF



GREAT LAKES RESEARCH CONSORTIUM



Working Together for Great Lakes Research, Outreach and Education



Greg Boyer
Executive Director
of the Great Lakes
Research Consortium
and Professor of
Biochemistry

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Department of Chemistry
Phone: (315) 470-6825
Fax: (315) 470-6970

Greg Boyer assumed the directorship of the GLRC in 2007. His research interest include monitoring systems for cyanobacteria and harmful algal blooms in the lower Great Lakes and other inland waters.



Heather Carrington
Assistant to the Director
Great Lakes Research
Consortium

Office: 253 Baker Lab,
Phone: (315) 470-6720
Fax: (315) 470-6970
Email: glrc@esf.edu

Heather joined the GLRC in September of 2009. Her experience as a landscape architect has sparked her interest in watershed management issues. She earned her MLA degree at SUNY-ESF and is right at home at the GLRC offices.



George Westby
Research Scientist
Great Lakes Research
Consortium

Office: 252 Baker Lab,
Phone: (315) 470-6720
Fax: (315) 470-6970
Email: grwestby@gmail.com

George joined the GLRC in 2009 to facilitate our emerging activities in the Great Lakes Observing System. He has served as a field coordinator for ESF's Antarctica project, and brings to the task a background in electrical engineering and systems control.

Work Study Assistants 2008-2009: Sara Oliver and Cassandra Pinkoski
Work Study Assistants 2009-2010: Daren Card and Cassandra Pinkoski

Special thanks to:

Jessica Eckerlin,
Graduate Assistant
2007-2010

and to

Khris Dodson,
Staff Assistant
2007-2009

MESSAGE FROM THE DIRECTOR



Message from the Director: GREG BOYER

I am pleased to report that the GLRC member institutions have been very active these last two years. The organization has continued our traditional activities such as our annual meeting (page 14-16) and seminars series (page 6-8) and implemented a number of new student-related programs including our student travel awards (page 19), student presentations as part of Great Lakes Day at the Capital (page 18), and our matching internship series (page 17). We hope to continue and grow these activities in the future. Most importantly, the GLRC has continued to do its part to foster a vibrant Great Lakes Research Community within New York State. The Great Lakes Center at Buffalo State College has recently updated its research vessel fleet with the addition of the 27 foot research vessel *John J. Federoff*, a modern deep-water vessel named after their station manager who tragically died in a diving accident in 2007. Working with the NY DEC – the GLRC has funded 24 small grants (<\$10,000 each) over the last five years (page 9-12). These small grants have provided critical information needed in the early stages of many of our successful larger projects. We have also initiated a Research Tasks Groups program to support team-building activities that build capacity for future proposals. These team-building efforts are showing positive results in that GLRC member schools have been submitting proposals and receiving significant research funding in support of their Great Lakes-related research (page 23-24). In response to this last year's Great Lakes Restoration Initiative through the US EPA, New York State submitted more than 110 projects totaling nearly \$71M dollars and received \$19.5M in support for a 27% success rate. GLRC-member schools accounted for more than \$9.4M or nearly 50% of that successful funding. We are submitting more proposals, for larger dollar amounts and involving a greater number of collaborators, all in recognition of the increasing prominence of New York Research Institutions in the greater Great Lakes basin. The GLRC also continues to play an important role in the greater basin-wide activities, with our participation on International Joint Commission's Council of Great Lakes Research Managers, our co-chairing the Great Lakes Science Advisory Committee for New York's Oceans and Great Lakes Ecosystem Conservation Council, and our participation in the NY Great Lakes Basin Advisory Council. As part of this later group, we have successfully completed a report consisting of recommendations for legislation, regulations or rules that are necessary to implement and effectuate the requirements and purposes of the Great Lakes-St. Lawrence River Basin Water Resources Compact. The report; *Our Great Lakes Resources: Conserving and Protecting Our Water Today for Use Tomorrow*, is the culmination of a multi-year effort to provide guidance to New York State on how we should respond to the Great Lakes-St. Lawrence River Basin Water Resources Compact .

This is an exciting time for Great Lakes researchers, and I look forward to working with all of our member institutions over the coming year.

ORGANIZATION

The Great Lakes Research Consortium is an organization of eighteen colleges and universities in New York, with nine affiliate campuses in Ontario, dedicated to collaborative research and education on the Great lakes. We have nearly 400 member faculty, who are conducting research in every facet of Great Lakes science. The organization is run by an Executive Director with input from Campus Representatives from each member institution. Final decision-making authority rests with the Board of Governors. The Board consists of one representative from the Research Foundation of the State University of New York and one representative from each of the member colleges and universities. Each board member is appointed by the President of his/her Institution and is given the authority to commit the institution to implementing decisions of the Board of Governors.

Our mission is to improve the understanding of the Great Lakes ecosystem, including the physical , biological, and chemical processes that shape it, as well as the social and political forces that affect human impact on the lakes and their associated economic resources. We accomplish this through research, instruction, and public service.

MEMBER INSTITUTIONS

University at Albany	Cornell University	SUNY Oswego
Binghamton University	SUNY Cortland	SUNY Plattsburgh
SUNY Brockport	SUNY ESF	SUNY Potsdam
Buffalo State College	Hobart and William Smith	Rochester Institute of Technology
University at Buffalo	SUNY Fredonia	Syracuse University
Clarkson University	SUNY Geneseo	St. Lawrence University

CANADIAN AFFILIATES

Brock University	University of Guelph	McMaster University
University of Ottawa	Queens University	Ryerson University
University of Toronto	University of Waterloo	University of Windsor

ORGANIZATION

CAMPUS REPRESENTATIVES

Joseph Atkinson
University at Buffalo

Ellen Braun-Howland
University at Albany

Lisa Cleckner
Syracuse University

John Halfman
Hobart and William Smith (2009/10)

John Hassett
SUNY-ESF

Carolyn Johns
St. Lawrence University

Alexander Karatayev
Buffalo State College

John Lombardo
SUNY Cortland

Joseph Makarewicz
SUNY Brockport

Timothy Mihuc
SUNY Plattsburgh

Michael Milligan
SUNY Fredonia

James Pagano
SUNY Oswego

Jason Schreer
SUNY Potsdam

Robert Simon
SUNY Geneseo

Michael Twiss
Clarkson University

Anthony Vodacek
Rochester Institute of Technology

David White
New York Sea Grant

Stephen Kresovich
Cornell University
(2008/09)

Bin Zhu
Hobart and William Smith (2008/09)

GLRC GOVERNING BOARD

Stuart Appelle
SUNY Brockport

Mark Severson
Buffalo State College

Valerie Lehr
St. Lawrence University

James Ammerman
New York Sea Grant

Jack Gelfand
SUNY Oswego

Timothy Murphy
SUNY Research Foundation

Anne Baldwin
SUNY Geneseo

Stephen Gilje
Binghamton University

Galen Pletcher
SUNY Potsdam

Marion Balyszak (2008-2010)
Hobart and William Smith

Amy Henderson-Harr
SUNY Cortland

Neil Ringler
SUNY ESF

Stefi Baum
Rochester Institute
of Technology

Jorge Jose
University at Buffalo

Harold Silverman
State University
of New York

Bruce Bongarten
SUNY ESF

Robert Buhrman
Cornell University (2009/10)

Lynn Videka
SUNY Albany

David Ewing
SUNY Fredonia (2008/10)

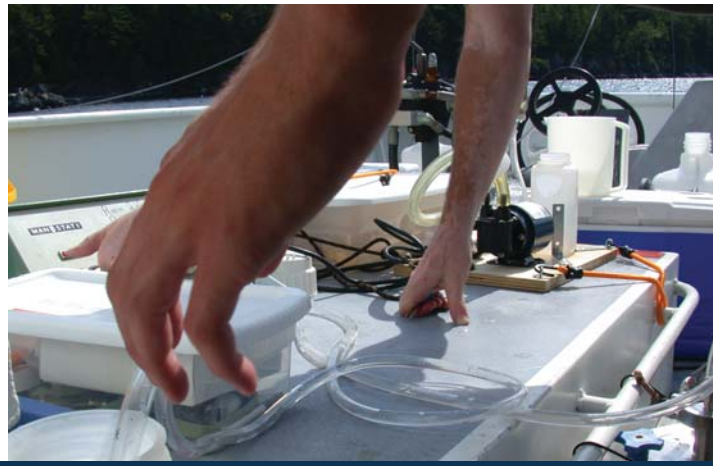
Kathleen Lavoie
SUNY Plattsburgh

Thomas Young
Clarkson University

Edward Mills
Cornell University (2008/09)

Gina Lee-Glauser
Syracuse University (2008/09)

Mark Lichtenstein
Syracuse University
(2009/10)



RESEARCH ACTIVITIES



SEMINAR SERIES

The GLRC is pleased to support a seminar series on a variety of topics presented by its member scientists. This is one mechanism by which we promote interactions between member schools and help foster research collaborations between scientists.

2008-2009 Offerings

- Aga, Diana; University at Buffalo. *Biodegradation of pharmaceuticals in biological treatment systems.*
- Atkinson, Joe; University at Buffalo. *Resource Sheds in the Great Lakes.*
- Baier, Robert; University at Buffalo. *Preventing Biofouling without Poisons: Lessons from Bioengineering.*
- Bhavsar, Satyendra; University of Toronto. *Risk assessment of PCB in fish: How to overcome deficiency of congener-specific PCB measurements?*
- Boyer, Greg; SUNY-ESF. *Toxic Cyanobacteria in the Great Lakes: Problems, Issues and Solutions.*
- Campbell, Linda; Queen's University. *Global trends in mercury and metal biomagnification in the large lakes of the world.*
- Campbell, Linda; Queen's University. *Role of invasive and introduced species in foodwebs of large lakes and Great Lakes (Lakes Champlain, Simcoe, Nipigon, Ontario, Erie).*
- Cleckner, Lisa; Center of Excellence, Syracuse University. *Water Resources Research at the Syracuse Center of Excellence and Its Importance for Economic Development in Central Upstate NY.*
- Gardella, Joseph; University at Buffalo. *Geospatial statistics and public service learning in community based environmental and urban brownfield science and policy.*
- Grima, A.P. Lino; University of Toronto. *Climate Change and Great Lakes Levels Management in the Context of Climate change. Will the Well Run Dry? Valuing Water before we Run Out*
- Guildford, Stephanie; University of Minnesota, Duluth. *Microcystin research in southern Ontario: some recent results.*
- Hall, Charles; SUNY-ESF. *Peak oil, energy return on investment and our economic future.*
- Hall, Roland; University of Waterloo. *Paleolimnological Studies of the Peace-Athabasca Delta: An Effective Approach to Assess Natural & Human-Induced Changes at a Landscape Scale*
- Haynes, Jim; SUNY Brockport. *Population monitoring, trophic relationships, and levels of bioaccumulative chemicals of concern in mink, a sentinel species.*
- Holsen, Thomas; Clarkson University. *Mercury in the Environment: Cycling and Sources.*
- Johnson, Glenn; SUNY Potsdam. *Conservation biology of Blanding's turtles in northern New York.*
- Johnson, Glenn; SUNY Potsdam. *Conservation strategies for spruce grouse at the edge of the range.*
- Johnston, John; University of Waterloo. *Five millennial-long paleo-hydrographs for the Upper Great Lakes constructed from ancient shorelines.*
- Kostyniak, Paul; University at Buffalo. *PCB and PBDE Exposure and Effects.*
- Krantzberg, Gail; McMaster University. *Revitalization of Great Lakes Governance.*
- Langen, Tom; Clarkson University. *Locating and mitigating hotspots of road mortality of turtles and other herpetofauna along rural highway networks.*
- Lodge, Jeffrey; Rochester Institute of Technology. *Isolation and Characterization of hydrocarbon degrading bacteria from soils from Western New York.*
- O'Neill, Charles; New York Sea Grant. *Aquatic Invasive Species of the Great Lakes Basin: Introductions, Impacts, and Management.*
- Pennuto, Chris; Buffalo State College. *Round gobies in tributary streams: seasonal abundance, community effects, and energy consumption.*
- Perez-Fuentetaja, Alicia; Buffalo State College. *Persistent Organic Pollutants in Male Common Carp and Steelhead Trout in Eastern Lake Erie.*
- Perez-Fuentetaja, Alicia; Buffalo State College. *Type E Botulism in Lake Erie: Inter-Annual Differences and Trophic Transfer.*
- Powers, Susan, Clarkson University. *Environmental and Energy Benefits of Biofuels - A Lifecycle Perspective.*
- Rabideau, Alan, University at Buffalo. *Ecosystem restoration in Western New York.*
- Rabideau, Alan, University at Buffalo. *Is the dual-mode absorption concept useful for environmental modeling?*
- Regenstein, Joe; Cornell University. *Fish Gelatin : A use for skin, scales and bones?*
- Regenstein, Joe; Cornell University. *Slaughtering Aquacultured Fish -- the Animal Welfare Issues.*
- Riessen, Howard; Buffalo State College. *Turning Inducible Defenses On and Off: Adaptive Responses of Zooplankton Prey to a Gape-Limited Predator.*
- Rinchar, Jacques; SUNY Brockport. *Polyunsaturated fatty acids in the Lake Michigan food web and their effect on yellow perch reproductive success.*
- Romeu, Jorge Luis; Syracuse University. *Design of Experiments in Ecological Systems: some methods and issues.*

SEMINAR SERIES

2008-2009 Offerings (cont.)

- Rudstam, Lars; Cornell University. *Interactions at the edge of distributions - on the importance of understanding distributions in Great Lakes pelagia.*
- Schulz, Kimberly; SUNY-ESF. *Ecosystem effects of invasive filter feeders and nutrient reduction -- insights from mesocosm experiments.*
- Schulz, Kimberly; SUNY-ESF. *Fatty acids and food webs: diet determination, food quality, and phylogenetic constraints.*
- Schulz, Kimberly; SUNY-ESF. *When "all you can eat" may not be enough: the importance of quality at the aquatic food web buffet.*
- Smardon, Richard; SUNY-ESF. *Sustaining the World's Wetlands; Story of GL Wetlands Policy Consortium.*
- Smardon, Richard; SUNY-ESF. *Facilitation of Revitalization of Onondaga Creek; An Urban Creek with multiple stakeholders.*
- Snyder, Randal; Buffalo State College. *Fatty Acids and Thermal Tolerance in Freshwater Alewives*
- Tully, William; SUNY-ESF. *Water and the Ecocity.*
- Twiss, Michael; Clarkson University. *Winter Assessment of Microbial Biomass and Metabolism in Lake Erie.*
- Walcek, Chris; University at Albany. *Air Pollution Dispersion, the effects of Shear on plumes from point sources An overview of the skeptical scientific evidence surrounding the role of humans in climate change.*
- Whittingham, Stanely; Binghamton University. *A cleaner and energy independent America through chemistry, materials and public participation.*

2009-2010 Offerings

- Aga, Diana; University at Buffalo. *Biodegradation of pharmaceuticals in biological treatment systems.*
- Alben, Katherine; University at Albany. *Algal pigments as biomarkers to assess diet, nutrition, and health of organisms from Lake Erie and Lake Ontario.*
- Arhonditsis, George; University of Toronto. *Eutrophication Risk Assessment and Adaptive Management Implementation in Hamilton Harbour: A Bayesian Approach*
- Atkinson, Joe; University at Buffalo. *Resource Sheds in the Great Lakes.*
- Baier, Robert; University at Buffalo. *Preventing Biofouling without Poisons: Lessons from Bioengineering.*
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- Boyer, Greg; SUNY-ESF. *Toxic Cyanobacteria in the Great Lakes: Problems, Issues and Solutions.*

- Boyer, Greg; SUNY-ESF. *Algal bio-diesel: Is it a solution to our current energy needs?*
- Campbell, Linda; Queen's University. *Global trends in mercury and metal biomagnification in the large lakes of the world.*
- Campbell, Linda; Queen's University. *Role of invasive and introduced species in foodwebs of large lakes and Great Lakes (Lakes Champlain, Simcoe, Nipigon, Ontario, Erie).*
- Cleckner, Lisa; Center of Excellence, Syracuse University. *Water Resources Research at the Syracuse Center of Excellence and Its Importance for Economic Development in Central Upstate NY.*
- Dupont, Diane; Brock University. *Differences in Water Consumption Choices in Canada: the Role of Socio-demographics, Experiences, and Perceptions of Health Risks.*
- Gardella, Joseph; University at Buffalo. *Geospatial statistics and public service learning in community based environmental and urban brownfield science and policy.*
- Grima, A.P. Lino; University of Toronto. *Climate Change and Great Lakes Levels Management in the Context of Climate change. Will the Well Run Dry? Valuing Water before we Run Out*
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- Holsen, Thomas; Clarkson University. *Mercury in the Environment: Cycling and Sources.*
- Jankovic, Igor; University at Buffalo. *Physics-Based Stochastic Modeling of Groundwater Flow and Contaminant Transport.*
- Johnson, Glenn; SUNY Potsdam. *Conservation biology of Blanding's turtles in northern New York.*
- Johnson, Glenn; SUNY Potsdam. *Conservation strategies for spruce grouse at the edge of the range.*
- Johnson, Glenn; SUNY Potsdam. *Edge of the Range: Conservation of Blanding's turtles in northern New York.*
- Johnston, John; University of Waterloo. *Five millennial-long paleo-hydrographs for the Upper Great Lakes constructed from ancient shorelines.*

SEMINAR SERIES

2009-2010 Offerings (cont.)

- Kostyniak, Paul; University at Buffalo. *Mercury Exposure: Different Chemical Forms Result in Different Toxicological Effects*
- Kraft, Clifford; Cornell University. *Long-term population and ecosystem response to the large-scale removal of a dominant non-native piscivore— smallmouth bass—in north temperate lake ecosystems*
- Krantzberg, Gail; McMaster University. *Revitalization of Great Lakes Governance.*
- Langen, Tom; Clarkson University. *Locating and mitigating hotspots of road mortality of turtles and other herpetofauna along rural highway networks.*
- Lodge, Jeffrey; Rochester Institute of Technology. *Isolation and Characterization of hydrocarbon degrading bacteria from soils from Western New York.*
- Makarewicz, Joseph; SUNY Brockport. *Lake and Watershed Interactions: Responses of Aquatic Plants, Algae, and Bacteria to Changes in Nutrient Inputs from Agricultural Watersheds.*
- Malmsheimer, Bob; SUNY-ESF. *Climate Change Mitigation benefits of Managed Forests.*
- McMillan, Amy; University at Buffalo. *The Uncommon Loon: Population Genetics and Type E Botulism in Gavia immer.*
- McMillan, Amy; University at Buffalo. *The Decline of Eastern Hellbenders in the New York Allegheny Drainage.*
- O'Neill, Charles; New York Sea Grant. *Aquatic Invasive Species of the Great Lakes Basin: Introductions, Impacts, and Management.*
- Pennuto, Chris; Buffalo State College. *Round gobies in tributary streams: seasonal abundance, community effects, and energy consumption.*
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- Whittingham, Stanely; Binghamton University. *A cleaner and energy independent America through chemistry, materials and public participation.*

NY GREAT LAKES PROTECTION FUND SMALL GRANTS

The **Great Lakes Protection Fund Small Grants Program** is administered by the Great Lakes Research Consortium, in cooperation with the New York Department of Environmental Conservation and the New York Great Lakes Basin Advisory Council, with earnings that accrue from New York State's investment in the regional Great Lakes Protection Fund. The protection fund (NYGLPF) small grants program was developed to provide "seed" money for new, cooperative approaches to researching and protecting the environmental quality of the Great Lakes.

NYGLPF Awarded Projects 2008 Funding Cycle

Tracing the invasion pathway of *Hemimysis anomala* into Lake Ontario and beyond

Principal Investigator: Amy B. Welsh
Department of Biological Sciences, State University of
New York at Oswego

Hemimysis anomala (Crustacea: Mysidacea) is a recent invader to the Great Lakes and little is known about its invasion pathway throughout the Great Lakes. A recent study used genetics to track the spread of *H. anomala* throughout the Ponto-Caspian region, as well as a population in Lake Michigan. Conclusions from that study showed that the Lake Michigan population derived from the Danube. However, preliminary studies conducted at SUNY-Oswego indicate that the Lake Ontario population does not originate from the Danube. Professor Welsh continued this work to confirm the origin of *H. anomala* in Lake Ontario and determine whether multiple introductions have occurred throughout the Great Lakes. She collaborated with the U.S. Geological Survey and the Department of Fisheries and Oceans Canada to obtain samples from areas throughout the Great Lakes. Results from this project will help further the goal of the NYGLPF to assess the impacts of likely changes in the Great Lakes environment, specifically future impacts of invasive species.



Characterization of subsistence fishing in Monroe County

Principal Investigator: Katrina Smith Korfmacher,
University of Rochester Medical Center

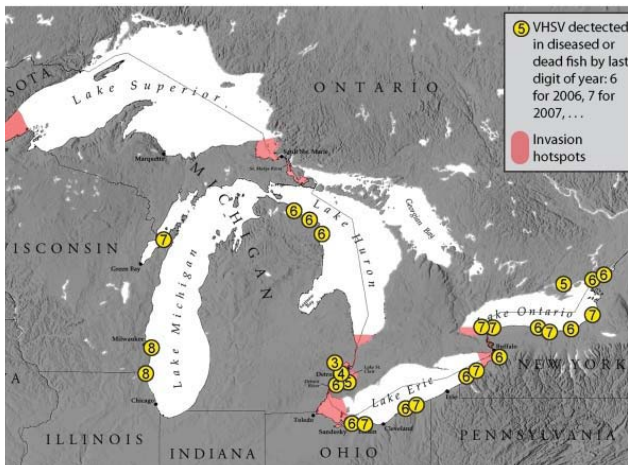
This collaborative pilot project conducted an initial characterization of the consumption of fish taken from Lake Ontario within Monroe County (primarily within the Rochester Embayment). University of Rochester (UR) faculty and staff conducted a literature review of similar efforts in other communities, developed an Advisory Council to inform the research including representatives of government, community, and academic institutions, and developed, pilot tested, and reviewed survey protocols. UR hired and supervised two interns - one graduate student and one community member - to participate in field work (angler surveys) during the summer months. Results have been analyzed to determine the demographic, cultural, and geographic patterns of subsistence fishing in Monroe County. Based on the findings, the researchers recommended directions for further research and/or educational efforts.

NY GREAT LAKES PROTECTION FUND SMALL GRANTS

Aquatic Invasions in the Great Lakes: Responding to Pathogens

Principal Investigator: Mark Bain
Assoc. Prof. Aquatic Systems Ecology, Natural
Resources, Cornell University

The Great Lakes have been changed forever by species invasions, and many started with commercial ships. Introduced pathogens capable of infecting aquatic species and humans have recently grabbed public attention from the more familiar invaders like fish and mussels. Viral Hemorrhagic Septicemia (VHS) has been killing fish in several Great Lakes locations, is thought to have been introduced by ballast water in transport ships, and is now being spread by recreational boaters and fisherman (live fish bait). Pathogen invaders are poorly understood, alarming to the public, and provoking a disorganized and ineffective government policy response. This study collected fish and water samples in New York's Great Lakes to detecting VHS, analyze associations of VHS with different shore and harbor settings, and demonstrate practical surveillance methods for pathogens. These study tasks are critical contributions to an emerging regional collaboration to solve the problem of ship-mediated invasive species in the Great Lakes with natural resource agencies, the maritime industry, and the expected regulatory authorities.



Riverwatch Water Quality Monitoring and Outreach Internship

Principal Investigator: Robbyn Drake
Buffalo Niagara Riverkeeper

The Buffalo Niagara RIVERKEEPER provided a graduate internship to support two key programs. In partnership with SUNY and the Rochester Institute of Technology, the internship advanced the Riverwatch program by assisting in the collection of water quality monitoring data and in the development of new communication tools for expressing research results to key stakeholders about the condition of the rivers. Secondly, the internship addressed an important environmental justice issue facing the Buffalo and Niagara watersheds in the Citizen Action program. The intern developed and executed a survey to gather baseline data about the consumption of sick and contaminated fish by recreational anglers in minority and underrepresented communities in western and southern neighborhoods of the City of Buffalo. Survey results will be used to develop written guidance to inform RIVERKEEPER and partners as to knowledge gaps and misinformation held by anglers and to improve messaging to this user group. Both projects directly align with the data collection and public communication objectives of the Great Lakes Protection Fund and implementation of the Buffalo River Remedial Action Plan.

NY GREAT LAKES PROTECTION FUND SMALL GRANTS

NYGLPF Awarded Projects 2009 Funding Cycle

Preliminary Risk Assessment of the Parasites of Aquatic Exotic Invertebrates in the Great Lakes Region

Principal Investigator: Lyubov Burlakova, Research Scientist, Ph.D.
Great Lakes Center, Buffalo State College

Exotic species may serve as vectors of introduction for their specific parasites and may also become hosts for aboriginal disease agents. Although spreading invaders typically lose most of their coevolved parasites, the few introduced exotic parasites may have devastating impacts on their novel hosts, including large-scale mortalities. The aim of this cooperative research is to conduct a preliminary parasitological risk analysis for exotic invertebrates introduced into the Great Lakes region. The objectives of the study reflect common components of the risk analysis process and include: literature search to identify the species of exotic invertebrates and their parasites that pose the highest risk of epizootics in the region ("hazard identification"); field sampling at selected sites to reveal the current composition of parasites associated with risky exotic invertebrates ("risk estimation"); compiling a database on the parasites of exotic invertebrates of the Great Lakes to promote information access to decision-makers ("risk management"). The results of this project can become a baseline for a long-term basin-wide program to monitor the parasitological consequences of introduction of exotic species, and will also be used in preparation of a larger grant proposal to a federal agency.



Pre-Restoration Wetland Characterization and Chemical Mass Balance Study: Woodlawn Beach State Park, New York

Principal Investigator: Stephen Vermette, PhD
Buffalo State College

Woodlawn Beach State Park protects a twelve acre wetland that is listed on the Park's master plan for preservation and enhancement. Proposed is 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, Woodlawn Beach State Park, and the Student Conservation Association. Proposal priorities address a critical aquatic habitat where the current treatment effectiveness of this wetland is to be evaluated and compared with alternative approaches for treatment.

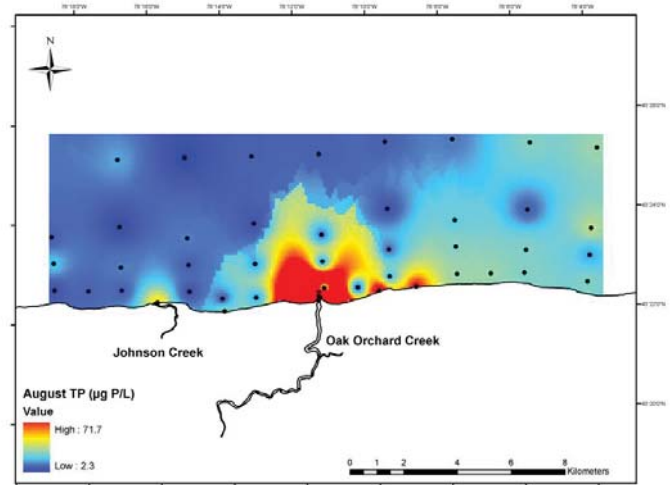


NY GREAT LAKES PROTECTION FUND SMALL GRANTS

Riverwatch Low-Cost Water Monitoring Buoy Pilot Project

Principal Investigator: Kerry Bentkowski & Robbyn Drake
Buffalo Niagara Riverkeeper

Buffalo Niagara Riverkeeper is directing a pilot project to develop a low-cost water monitoring buoy and communication system. The buoy will be designed to function as a tool for gathering important water quality data from major tributaries to the Great Lakes at a cost affordable to public school systems and small community organizations. The real time data produced will be made available for use in the classroom as a teaching tool as well as to community organizations and the general public for use in understanding water quality issues and advocating for improvement. This collaborative project will utilize the exceptional technical skills of the Rochester Institute of Technology's Laboratory for Imaging Algorithms and Systems team; Buffalo Niagara Riverkeeper's local expertise as Buffalo River RAP Coordinator and water quality advocate; and the Buffalo Public School System's infrastructure and engaged teacher and student body. The project will advance the Riverwatch program by assisting in the collection of water quality monitoring data and in the development of new communication tools for expressing research results to key stakeholders about the condition of the rivers.



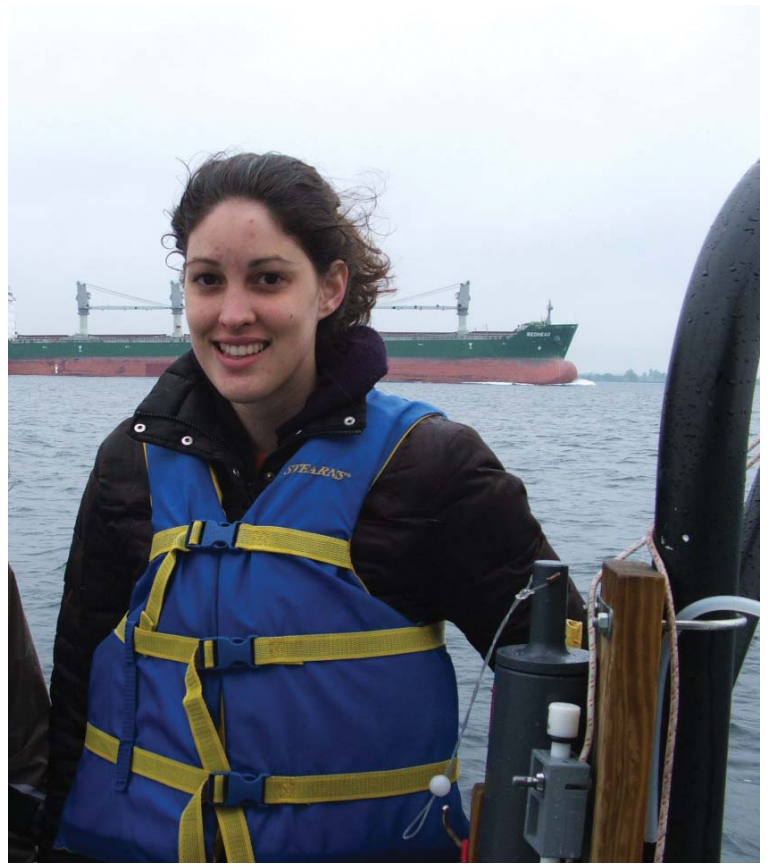
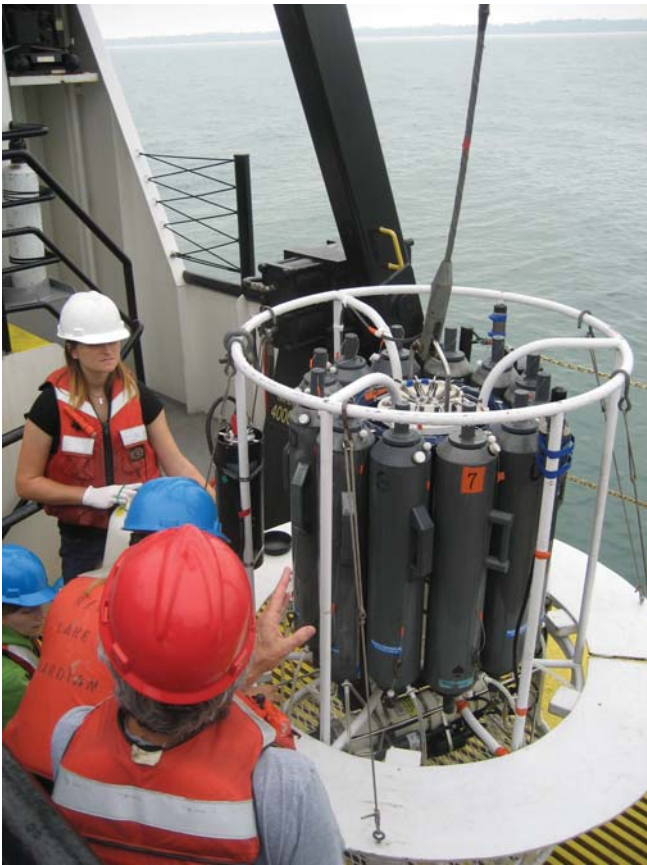
Lake Ontario Nearshore Nutrient Transport Study (LONNS) Analysis of caffeine as a tracer point of source nutrient loading

Principal Investigator: William J. Edwards, PhD
Associate Professor of Biology, Niagara University and Director, Environmental Leadership Institute

This research proposes to analyze water samples collected during the intensive survey in 2008 of the Lake Ontario Nearshore Nutrient Study for caffeine as a conserved tracer of point source nutrient loading. The LONNS project is assessing the hypothesis that nutrients are being trapped in the nearshore region, limiting offshore productivity and impacting the nearshore through benthic algae blooms and beach closures. In samples taken offshore of Rochester, NY, there was evidence of upwelling, non-point source loading and point sewage effluent in the nearshore region. Analysis of caffeine will allow separation of the nearshore sources of nutrients and better modeling for the LONNS project, providing more accurate assessment of remediation actions for lake managers. This project will analyze the samples collected during the June and August Rochester LONNS sampling and will integrate these samples into the GIS, database and modeling efforts.



STUDENT ACTIVITIES



ANNUAL CONFERENCES

The Great Lakes Research Consortium's annual conference provides New York and Ontario's Great Lakes researchers, students, agencies and advocates with a forum to discuss current research, academic programs, science, and policy. The conference includes student oral and poster research presentations, a poster session, a plenary session on a topic of current interest for the New York Great Lakes research community, a banquet dinner and a luncheon celebrating best student presentations.

19th Annual Student/Faculty Conference, Spring 2009

With many federal and state lawmakers looking toward wind energy to help solve our energy crisis, the Great Lakes region is quickly becoming the focus for potentially harnessing up to a third of the country's energy needs. The Great Lakes Research Consortium's 2009 Annual Conference addressed questions such as: is wind energy a great thing for the Great Lakes? What are the implications on the ecosystem, tourism and overall lake health? What will it take to harness the wind?

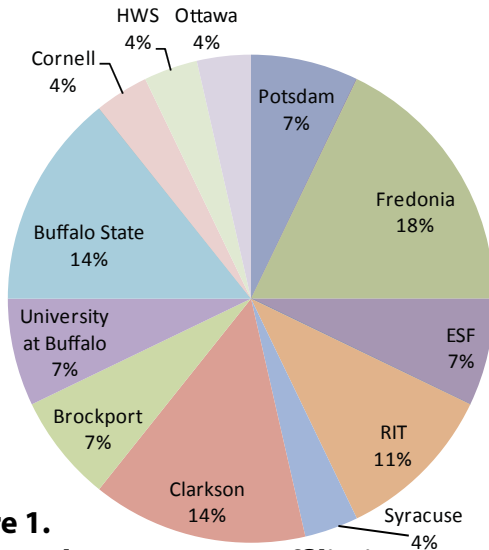


Figure 1.
2009 Student Presenter Affiliations

Plenary speakers included Bruce Bailey, President and CEO of AWS Truewind, Keith Lott of Ohio Department of Natural Resources, and Dereth Glance of Citizens Campaign for the Environment. In addition to the plenary session, there were 29 student presentations in the areas of chemistry, limnology, engineering and Great Lake policy.

One outstanding presentation from each of the five categories and the poster session received the Don Rennie Award. This award, named after the former Vice President at the University of Buffalo and one of the founders of the GLRC, is sponsored by New York Sea Grant.



Don Rennie Memorial Award *Outstanding Student Presentations* Spring 2009



- Nick Sard** (SUNY Fredonia): *Genetic Divergence and Longitudinal Variation of Smallmouth Bass (*Micropterus dolomieu*) Populations in Lake Erie and its Tributaries*
- Margaret Pavlac** (SUNY ESF): *Application of Continuous Monitoring in the Lake Ontario Nearshore Nutrient Survey*
- Cassidy Hahn** (SUNY Fredonia): *Influence of Biotic and Abiotic Factors on Walleye (*Sander vitreus*) Year Class Strength in Lake Erie*
- Shannon Rupprecht** (Buffalo State College): *Assessing the swimming performance of the round goby (*Neogobius melanostomus* Pallas 1814) and its implications for upstream migration in tributary streams and rivers*
- Nini Dong** (Buffalo State College): *Effects of Experience on Predator Avoidance Behavior of Crayfish*
- Aaron Gerace** (Rochester Institute of Technology): *An Increased Potential for the Landsat Data Continuity Mission (Ldcm) To Contribute To Water Resource Assessment*

ANNUAL CONFERENCES

20th Annual Student/Faculty Conference, Spring 2010



The 2010 Great Lakes Research Consortium Annual Conference plenary session addressed the topic of “Environmental Economics and the Great Lakes”. Great lakes ecosystem protection and restoration has been the focus of growing regional and national attention. While the environmental benefits of the restoration of the the Great lakes are very clear, less attention has been focused on the economic benefits. Yet, the Great lakes provide an important economic foundation for the surrounding region. Panelists Sharon Brooks, Associate Economist, Office of General Counsel, NYS DEC, Andrew Gugliemi, Senior Attorney, Office of General Counsel, NYS DEC, and Sean Mahar of the New York State Audubon Society each addressed the following question: As we move toward greater investment in ecosystem restoration, what will be the return on our investment?

Don Rennie Memorial Awards

This year’s conference featured 34 student presentations, representing 11 universities in the areas of limnology, engineering, policy and environmental science. Increased emphasis was placed on the poster session, with award winners invited to present their posters at Great Lakes Day in Albany (page 18). New York Sea Grant again sponsored the Don Rennie Memorial Awards for best presenter in each of 5 categories. The 2010 award winners are listed below.

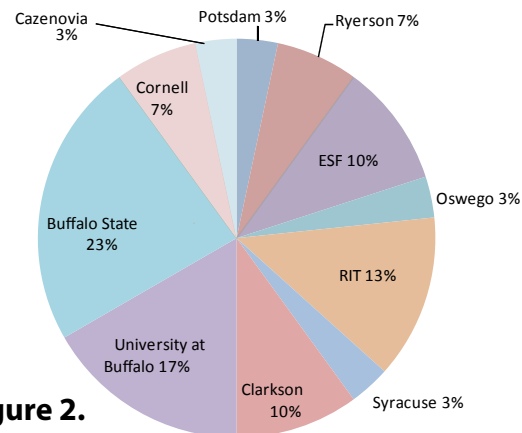


Figure 2.
2010 Student Presenter Affiliations



Don Rennie Memorial Award *Outstanding Student Presentations* Spring 2010



Adrienne Lee (Ryerson University): *Utilization of Immunoassays for Dioxin Detection as an Alternative Site Remediation Tool*

Marissa Hadjuk (Buffalo State College): *Assessing Potential Threats: Parasitological Surveys of Non-Native Species*

Vadim Karatayev (City Honors School, Buffalo): *In Spite of Dreissena r. bugensis dominance, D. polymorpha retains a strong potential to invade from the Great Lakes*

Yanping Feng (University at Buffalo): *A Nested Princeton Ocean Model for Lake Ontario Nearshore Waters*

Joshua Valentino and Alex O’Hara (SUNY Oswego): *Bedrock joint control on surface and subsurface hydro geology in the Tug Hill plateau and environmental implications*

Shana Chapman (Buffalo State College): *Assessing drift densities of larval and juvenile round gobies (Neogobius melanostomus) in a Great Lakes tributary*

ANNUAL CONFERENCES

Our annual conferences focus on student presentations. We have averaged about 34 student presentations over the last four years (Figure 3), with representation from more than 70% of our member schools (Figure 4).

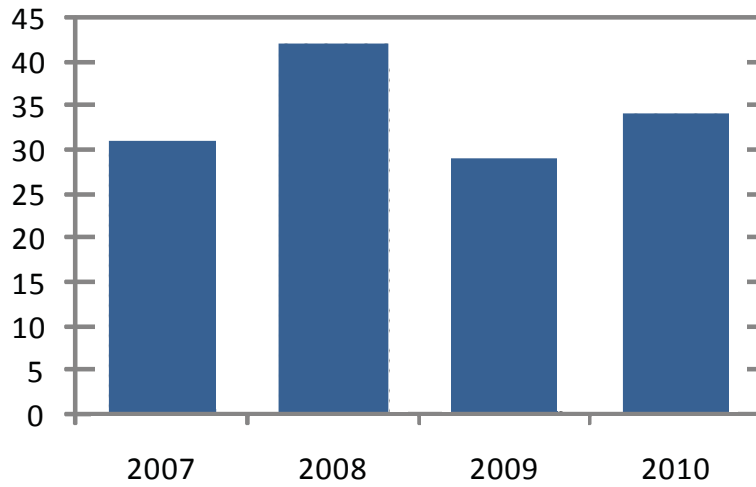


Figure 3.
Number of Student Presentations 2007-2010

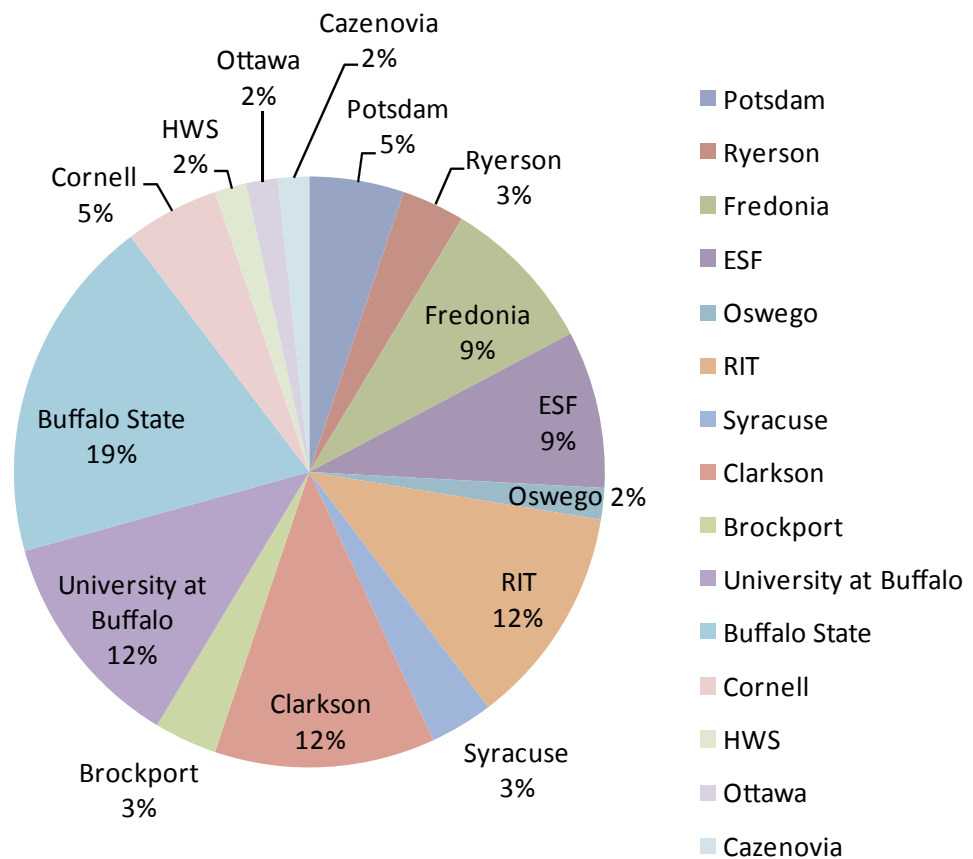


Figure 4.
2009 & 2010 Conferences Student Presenter Affiliations

INTERNSHIPS

Development of student scientists remains one of the core missions of the Great Lakes Research Consortium. To facilitate this process, the Great Lakes Research Consortium instituted an internship program in 2007. Initial funding came from the USGS to support fisheries research done in conjunction with scientists working at the USGS Lake Ontario Biological Station or at the Tunnison labs. In 2008, this program was expanded using funds generously provided by New York State Senator John D. Francisco to provide matching support for students working in any area of Great Lakes science. These matching internship positions must be filled by a student from a GLRC member school other than that of the faculty mentor's home campus and provide one more mechanism to focus collaborations across campuses. More information on our internship program is available on the GLRC website at www.esf.edu/glrc/interns.



USGS and Matching GLRC Internships (2008 – 2010)

Monica Minson (2008; Cornell University) Biology of the New Invader in the Great Lakes, the Small Mysid Shrimp, *Hemimysis anomala*. Mentor: Prof. Lars Rudstrum, (Cornell University) and Maureen Walsh (USGS).

Mallory Santoro (2008; Cornell University) Water Quality and Biological Response to Water Quality of Embayments to Lake Ontario. Mentor: Prof. Charlie Driscoll (Syracuse University).

Francis More (2009; Clarkson University) Harmful Algal blooms in the Lower Great Lakes. Mentor: Prof. Gregory Boyer (SUNY-ESF).

Christopher Nack (2009; SUNY-ESF) A study on fallfish diets in the Salmon River. Mentor: Prof. Karin Linburg (SUNY-ESF) and Jim Johnsons (USGS).

Errol Scheid (2009; Cornell University and SUNY-ESF) Relationship between overwinter temperature and recruitment of alewives on the survival of age-1 to age-2 age classes. Mentors: Maureen Walsh (USGS) and Brian Lantry (USGS).

Andy Miller (2010; SUNY-ESF) Diet analyses will be conducted on predatory fishes in the lower Salmon River ("estuary") immediately above the confluence with Lake Ontario. Mentors: Prof. Neil Ringler (SUNY-ESF) and Jim Johnsons (USGS).

Christopher Nack (2010; SUNY-ESF) Habitat data, sediment cores and fisheries research on Labrador Creek, Tioughnioga Creek and Snye Marsh. Mentors: Dawn Dittman (USGS), James McKenna (USGS), George Ketola (USGS), and Jim Johnsons (USGS).

Yinting Hou (2010, SUNY-Buffalo) Nested Hydrodynamic Model Development for Oswego Harbor. Mentors: Joseph Atkinson (SUNY-Buffalo) and Jamie Kettle (SUNY-Oswego).

GREAT LAKES DAY IN ALBANY

Great Lakes Day in Albany

Helping students to understand the importance of their research in the greater New York State Arena has always been a focal point for the GLRC. This is done through our travel awards and annual conference. Starting in 2009, the GLRC has expanded those efforts and now participates in Great Lakes Day in Albany. GLRC, with help from New York Sea Grant and the generous sponsorship of Senators DeFrancisco and Maziarz, has sponsored a poster session in Albany on Great Lakes Day where students have an opportunity to present the results of their research to our state legislatures, providing them with an opportunity to better understand the legislative process as it applies to our Great Lakes.

Students attending the event have the opportunity to meet other Great Lakes researchers, policy makers and environmental advocates. Posters submitted from GLRC member campuses across the state and are selected on the basis of their relevance to Great Lakes research and/or policy.

In the last two years, the GLRC has supported 17 students' participation in the Great Lakes Day in Albany poster session through travel support, providing information on the legislative process, and by arranging meetings with their respective legislative representatives. Posters selected for Great Lakes Day 2010 were also displayed at the Great Lakes Research Consortium Annual Conference in March at SUNY-ESF.



ANNUAL BEACH CLEAN-UP

Annual Beach Clean-up

To facilitate students meeting other students with Great Lakes interests, GLRC has helped sponsor the clean-up of one of Lake Ontario's beaches each year as part of National Beach Days. These activities play an important role in introducing students to the Great Lakes Community, while providing them with an opportunity to give something back to our Great Lakes.



GLRC Student Travel Awards

Starting in 2008, the GLRC instituted student travel awards. Since that time, 11 students have received support to attend and present their research at national and international conferences and meetings. This Student Travel Award promotes student attendance at the local, national and international conferences by subsidizing a portion of the costs of travel to and from the meeting. Student participation at such conferences is integral to the students' education and the student is expected to attend the entire conference to take advantage of the many educational opportunities afforded by attending these meetings. The application consists of a one page form available on the GLRC website. To be eligible, the student must be enrolled in one of the GLRC member colleges, and must be an author on a presentation (oral or poster). The GLRC has sponsored the following students to attend the following meetings:

2008-2009

Geoffrey Eckerlin	American Fisheries Meeting
Sarah Darkwa	Conservation Society of Chattanooga
Amy Risen	Society of Environmental Toxicology and Chemistry Conference
Margaret Pavlac	International Association of Great Lakes Research

2009-2010

Geoffrey Eckerlin	NY Fisheries Society Annual Meeting
Kevin Kapuscinski	NY Fisheries Society Annual Meeting
Margaret Pavlac	International Association for Great Lakes Research
Jeremy Sullivan	International Association for Great Lakes Research
Sean Thomas	International Association for Great Lakes Research
Vadim Karatayev	International Association for Great Lakes Research
Derek Smith	International Association for Great Lakes Research

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FINANCIAL OVERVIEW



BUDGET OVERVIEW

FY 2008 Financial Summary: Total Budget \$125,000

As a consortium of private and public Universities, the GLRC receives its funding from a variety of sources. This ranges from direct support from individual campuses through its member dues and contributions, to state and federally sponsored research projects that support the GLRC activities. These funds are used to support the wide variety of GLRC activities.

The pie charts shown below detail only the expenditures of the GLRC main office in Syracuse NY. Additional funds that flow directly to the GLRC member are shown in the following section on Grants and Funding to the GLRC member institutions.

FINANCIAL OVERVIEW

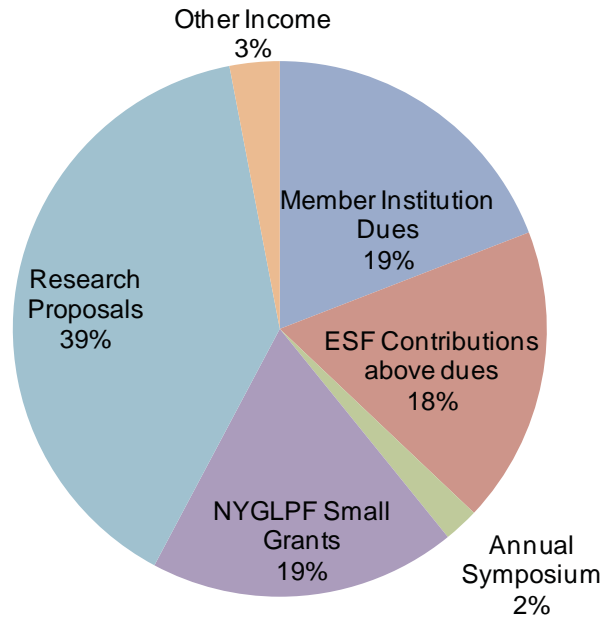


Figure 6.
FY 2008 - 2009 GLRC Income (%)

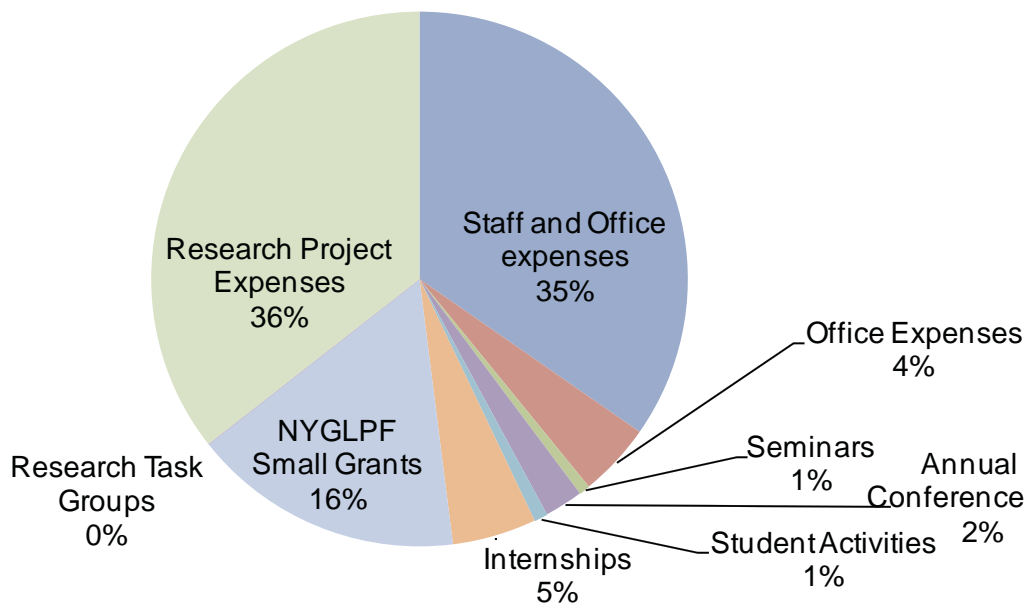


Figure 7.
FY 2008 - 2009 GLRC Expenses (%)

BUDGET OVERVIEW

FY 2009 Financial Summary: Total Budget \$152,000

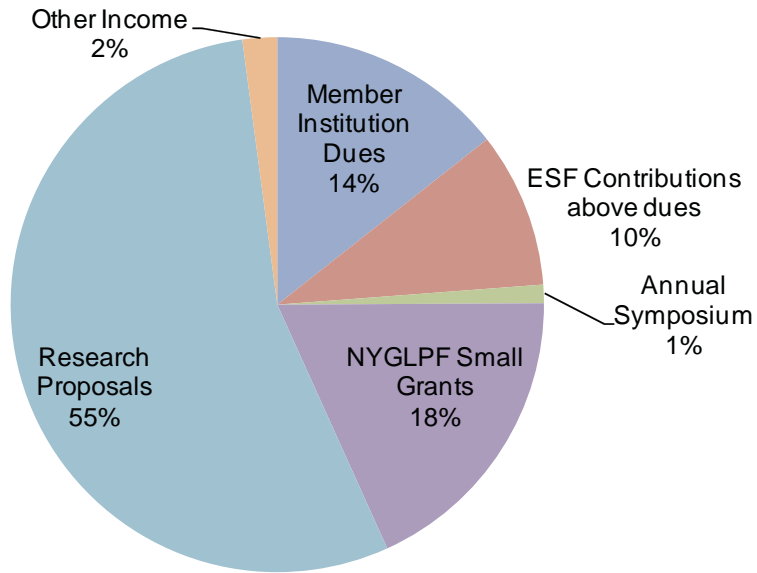


Figure 8.
FY 2009 - 2010 GLRC Income (%)

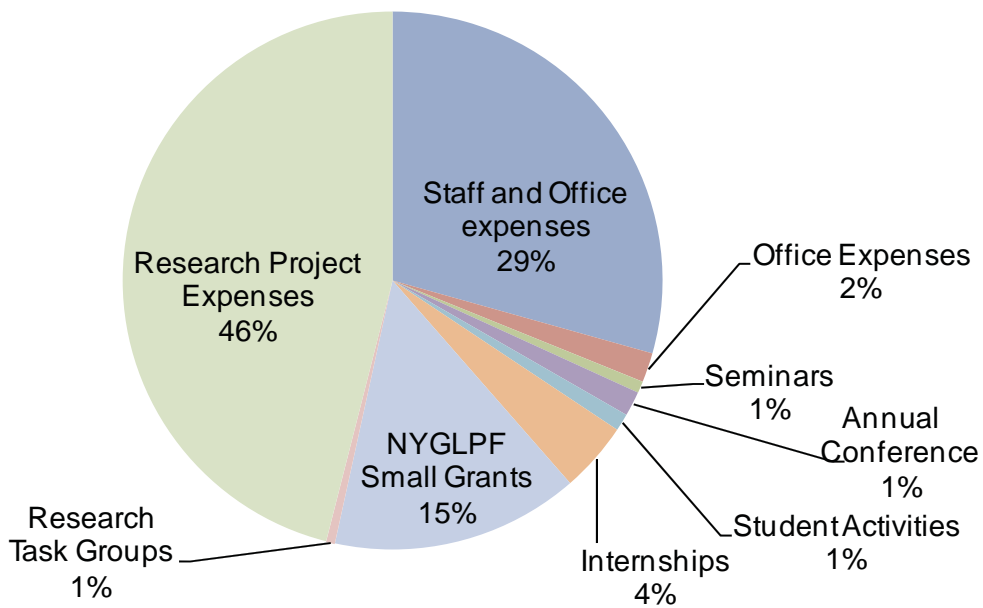


Figure 9.
FY 2009 - 2010 GLRC Expenses (%)

GRANTS AND FUNDING

Grants and Funding for the GLRC

The Great Lakes Research Consortium is a diverse and active group of institutions. Below is a selection of funded and or submitted proposals from our GLRC member schools. We have also included a few proposals for acquisition of instrumentation that may impact the research capabilities of more than one GLRC institution. This list is by no means meant to be inclusive of all the research activities currently underway by the participating institutions.

Proposals Funded: \$16,156,379 (2008-2010)

Braun-Howland, E. (UAlbany), with Co-PI M. Cambridge (NYDOH), Implementation of Rapid Detection Methods on Lake Erie, Environmental Protection Agency. **\$222,867**

Braun-Howland, E. (UAlbany), with Co-PI M. Cambridge (CEH), Implementation of Rapid Detection Methods on Lake Ontario, Environmental Protection Agency. **\$222,867**

Cambridge, M (CEH) with co-PI E. Braun-Howland (UAlbany) Beach Sanitary Surveys at 13 Lake Erie Beaches, Environmental Protection Agency. **\$250,000**

Cambridge, M (CEH) with co-PI E. Braun-Howland (UAlbany) Beach Sanitary Surveys at 9 Lake Ontario Beaches, Environmental Protection Agency. **\$250,000**

Cambridge, M (NYDOH) with co-PI E. Braun-Howland (UAlbany) Beach Sanitary Surveys at 16 St. Lawrence Beaches, Environmental Protection Agency. **\$250,000**

Atkinson, J. (U-Buffalo) Acquisition of Fiber-Optic Distributed Temperature Sensing for Ecohydrology Education and Research. National Science Foundation **\$130,599**

Boyer, G. L. (ESF) Outreach efforts in support of Monitoring and Event Response for Harmful Algal Blooms. National Oceanographic and Atmospheric Administration (NOAA – MERHAB), **\$11,827**

Boyer, G. L. (ESF) Preparation of a Monitoring Manual for Harmful Algal Blooms in the Great Lakes. National Oceanographic and Atmospheric Administration (NOAA – MERHAB), **\$31,500**

Boyer G. L. (ESF), with Co-PIs A. Karatayev (BSC), C. Implementation of the Great Lakes Observing System (GLOS), 2008-2011, NOAA-Integrated Oceans Observing System –Great Lakes Observing System **(\$433,438)**

Boyer, G.L. (ESF) with Co-PIs S. Effler, Source Tracking the Oswego River Phosphorus (Lake Ontario), Environmental Protection Agency. **\$289,552**

Boyer, G.L. (ESF) with Y-Y Luk (Syracuse Univ), R.P. Doyle (Syracuse Univ), S.N Loh (UMU), and S Wilkens (UMU) Acquisition of a Multiuser Benchtop MALDI TOF Mass Spectrometer. US Department of Defense. **\$150,000**

Boyer, G. L. (GLRC) Development of an Ecosystem-Based Management Research and Monitoring Agenda. New York Department of State, **\$95,000.**

Boyer, G. L. (GLRC) Internships for Research and Restoration of Great lake Fish Communities US Geological Survey **\$50,000**

Boyer, G. L. (ESF) and M.T. Twiss (Clarkson University) Development and Deployment of a Remote Observing System for Determination of Taxon-Specific Phytoplankton Abundance. Syracuse Center of Excellence in Energy and Environmental Systems. **\$299,931**

Holson, R. (Clarkson Univ.) and Co-PIs The Great Lakes Fish Monitoring and Surveillance Program: Pushing the Science. Environmental Protection Agency **\$6,500,000**

GRANTS AND FUNDING

Grants and Funding for the GLRC (cont.)

Luzedis, V (ESF) with Co-PIs G.L. Boyer (GLRC) and K. Limberg (ESF) Quantitation and Valuations of Ecosystem Services, SUNY Conversations in the Disciplines **\$5,000**

Makarewicz J. (Brockport) with Co-PI's J. Atkinson (UB), G.L. Boyer (ESF), L. Burkova (BSC), C. Pennuto (BSC), W. Edwards (Niagara Univ) and others. Lake Ontario Nearshore Nutrient Survey (LONNS). New York State Department of Environmental Conservation, **\$450,000**.

Pennuto C. (BSC) and Co-PIs. The Lake Erie Nearshore and Offshore Nutrient Study (LENONS) Environmental Protection Agency **\$615,813**

Read J (Great Lakes Observing System) with Co-PIs G.L. Boyer, (GLRC) and many others. GLOS Enhanced tributary Monitoring to Support AOCs and LaMPs. Environmental Protection Agency (via the University of Michigan), **\$2,670,634**

Rinchar J. (Brockport) and J. Makarewicz (Brockport). Acquisition of a Gas Chromatograph-Mass Spectrometer (GC/MS) and a High Performance Liquid Chromatography (HPLC) System for Education and Research. National Science Foundation. **\$175,000**

Ringler, N.H (ESF), with Co-PIs J.L. Brunner (ESF), J.L. Farrell (ESF), D.J. Leopold (ESF) and K.L. Schulz (ESF) Renovation of Wet Las and CyberInfrastructure to enhance Integrated research and teaching in Aquatic Science at SUNY-ESF, National Science Foundation **\$1,757,801**

Roehm, C. L (BSC), with J. Singer (BSC), M Perelli (BSC), and others. Observing Systems and Monitoring in Nearshore Lake Erie. Environmental Protection Agency **\$962,583**

Rudstam, L. (Cornell) and co-PIs P. Sullivan, G. Steinhart, K. Holeck, J. Watkins (Cornell); D. McNeill (New York Sea Grant); B. Lantry and M. Walsh (USGS); T. Copeland (USFWS); S. LaPan, M. Connerton, and J. Lantry (NYDEC), J. Makarawicz (SUNY Brockport); and eight Canadian researchers including: M. Munawar, R. Dermott, K. Bowen, V. Richardson, A. Dove, T. Stewart, T. Johnson, and T. Schaner. Evaluation of the current status of Lake Ontario. Environmental Protection Agency **\$331,967**

Other Submitted Proposals (\$38,935,106)

Research funding is a competitive business and not all proposal submissions are successful. Below is a partial listing of other proposals submitted by GLRC member institutions that are either in the review process or have been declined for funding. They are included here to give one a greater understanding of the breath and diversity of the GLRC in research activities.

Alben, K (U-Albany) with co-PIs C. Kelly-Cirino (UAlbany) and E. Egan (U Albany). Mechanisms for initiation of type E botulism, Environmental Protection Agency

Atkinson J. (UBuffalo) with G.L. Boyer (GLRC), P Adriens (Michigan) and S.G. Schladow (UC-Davis); Center for Sustainable Freshwater Lake Ecosystem Management. Science and Technology Center, Integrative Partnerships. National Science Foundation, **\$18,894,329**. (declined)

Boyer G.L. (ESF) and J. Atkinson (U-Buffer) Phosphorus Dynamics and Noxious Algal Blooms in the Oswego River Outflow, USDI Geological Survey. **\$243,541** (declined)

Boyer G.L. (ESF) and J. Atkinson (U-Buffer) Role of the Oswego River as a Driver of Noxious Algal Blooms in Lake Ontario US Department of Commerce –NOAA. **\$219,019** (under review)

Boyer G.L. (GLRC) Development of an Integrated Science Plan for the St. Lawrence River, Environmental Protection Agency. **\$98,940** (declined)

Boyer G.L. (GLRC) plus many other Co-PIs (14)s. Dimensions: Collaborative Research: Linking Phylogenetic and Functional Diversity with Process: The Nitrogen Cycle of a Hypereutrophic Large Lake System, National Science Foundation **\$62,500** (GLRC only)

GRANTS AND FUNDING

Other Submitted Proposals (\$38,935,106)

Boyer G.L. (ESF) and J. Atkinson (U-Buffalo), J. Makarewicz (Brockport), A. Karatayev (BSC), L Burlakova (BSC), and 12 others. ECOHAB: The Role of Population Diversity, Growth and Transport in the Formation of Toxic Microcystis blooms in the Lower Great Lakes. US Department of Commerce. **\$4,998,670** (declined)

Boyer, G.L. (ESF) with A Karatayev (BSC), A Perez Puentetaja (BSC) and L Burlakova (BSC) Phosphorus, Dreissenids and Harmful Algal Blooms in Western Lake Erie. U.S. EPA Great lakes Program Office **\$100,000** (declined)

Boyer, G.L. (GLRC) Implementation of the Great Lakes Observing System (GLOS) 2011-2016. IOOS - National Oceanographic and Atmospheric Administration. **\$1,401,611** (pending)

Braun-Howland, E. (UAlbany), with Co-PI M. Cambridge (CEH), Implementation of Rapid Detection Methods on Lake Ontario, Environmental Protection Agency. **\$222,867** (declined)

Litton S. (NYDEC) with G.L.Boyer (GLRC), J. Makarewicz (Brockport) and others. GLECOS - Great Lakes Environmental Conditions Observing System Environmental Protection Agency **\$790,451** (declined)

Makarewicz J. (Brockport) with J. Atkinson (U-Buffalo), G.L. Boyer (ESF), T Vodacek (RIT) C. Pennuto (BSC) and W. Edwards (Niagara U.) Monitoring, Assessing and Predicting the Status and changes in the Coastal Zone of Lake Ontario (LONNS 4), Environmental Protection Agency **\$799,989** (declined)

Makarewicz J. (Brockport) Enhancement of Great Lakes Research Capabilities: Renovation and Laboratory Construction at the Lake Ontario Research Center at the Port of Rochester, New York. National Institute of Standards and Technology, **\$10,000,000** (pending)

Siegel D.I. (Syracuse Univ) with Co-PIs G.L. Boyer (GLRC), K Acharya (DRI), J.W. Tillotson (UNLV), Z. Yu (UNLV) and 15 others. PIRE- A US-China partnership in research and education on natural and human-induced causes of eutrophication, National Science Foundation. **\$2,512,800** (declined)





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