

THE GREAT LAKES CENTER  
**Strategic Plan**  
2009-2014

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**Buffalo State**  
*State University of New York*

# Great Lakes Center Strategic Plan 2009-2014

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## **I. Center Mission and Goals**

### **Overview**

The Great Lakes Center is a multidisciplinary research, education, and service institute with a primary focus on the Great Lakes. The Center is committed to providing the best possible science for understanding the physical, chemical, biological, and social dimensions of the Great Lakes and their watersheds. Personnel of the Center acknowledge that proper stewardship of the Great Lakes requires transdisciplinary research approaches to fully understand their complex dynamics, community outreach to promote understanding of the system, and education of future generations.

On campus, the Center serves as both a catalyst and facilitator to link high-quality research with graduate and undergraduate education, increasing the College's role and visibility in the community. The Center also serves as a regional resource to promote activities which enrich the cultural, social, and intellectual lives of the people of western New York. The Great Lakes Center brings together faculty from academic departments with particular emphasis on the specialties of aquatic ecology, fisheries, watershed hydrology, water quality, environmental toxicology and chemistry, urban ecology, and environmental education. In addition, the Center actively promotes collaborative research with other academic and research institutions in the United States, Canada, Europe, and South America, and is a member of the Great Lakes Research Consortium.

### **Conceptual Basis and Mission of the Center**

The Great Lakes Center and its staff are engaged in three broad areas: research, education, and outreach. Although research activities provide the major extramural funding revenue generated by the Center and comprise the majority of staff time, they support and enhance both education and outreach.

**RESEARCH:** The central research theme and major strength of the Great Lakes Center is the study of the environment, its conditions and constituents, and interactions with a focus on the Great Lakes and their watershed. Research emphases within the Center can be split into several disciplines and sub-disciplines reflecting personnel expertise. These research areas are complimentary and have broad overlap. Research expertise within the Center includes:

- Fisheries, plankton, and benthic ecology,
- Understanding the effects of invasive species in aquatic systems,
- Understanding land-use impacts on surface water quality,
- The transformation, movement, and health effects of environmental contaminants,
- Lake and watershed carbon and nitrogen dynamics, and
- The effects of global climate change on aquatic systems.

Great Lakes fisheries, plankton and benthic ecology research at the Center focuses on species dynamics, food web connections and energy flow. In this regard, research projects include fish population dynamics, fish predation in the Great Lakes (including basin wide studies on diet, metabolism of fatty acids and bioenergetics) and fish exposure to persistent organic pollutants and bioaccumulation. Other activities focus on the role of zooplankton and benthic species in food web structure and their impacts on energy flows and contaminant transport.

Invasive species research conducted by Center staff focuses on the mechanisms of spread, population dynamics, growth, reproduction, and impacts of non-native species on the structure and function of aquatic ecosystems. Some activities relate to the biology and ecology of specific non-native taxa (*e.g.*, round gobies, zebra and quagga mussels, spiny amphipod, apple snail, golden mussel), whereas other activities relate to how non-native species affect ecosystem processes (*e.g.*, decomposition rates, nutrient cycling, host/parasite dynamics, development of community species diversity and richness).

The land-use/water quality research within the Center focuses on the transport of suspended sediment and associated biological and chemical contaminants and their impact on stream and river ecology. Much of the activity in this research line has been performed in the Buffalo River/Upper Niagara River AOC and surrounding tributary streams. Center staff have expertise in rapid bioassessment of macroinvertebrate, fish, and periphyton communities as well as microbial and sediment characterization.

Research investigating environmental contaminants addresses both legacy and emerging pollutants. Understanding the mechanisms of cancer development as a result of exposure to water and air-borne chemicals has been a long-standing area of expertise within the Center. Legacy pollutants under investigation include mercury, PCB's, PBDE's, and PAH's, whereas estrogen mimics and biological pathogens (*e.g.*, Type E botulism) represent some emerging contaminants investigated by the Center.

Evaluation of nitrogen and carbon dynamics in lakes and watersheds is a multidisciplinary effort in areas of biogeochemistry, hydrology and soil science. Main research interests are in examining linkages between soil nutrient cycling, nutrient transport through the landscape, and surface water solute export and how these processes are affected by global climate change. Recent projects include an evaluation of the source and fate of nitrogen and dissolved organic carbon during hydrologic events and an understanding of the effect of snowpack depth, and therefore soil freezing, on soil nitrogen cycling and export.

The anticipated impacts in Great Lakes region resulting from global climate change are diverse and interrelated, and affect both human and environmental dimensions. Center staff examine how plankton, benthic communities, and whole food webs will likely respond to different scenarios of future environmental change, both in terms of climate and the consequences of increased human population growth and density. In addition, Center staff will analyze how the list of likely invaders, patterns and sources of invasion, and impacts of invaders will be changed under these scenarios. This information then will be used to allow managers to target the most vulnerable aquatic communities and regions

of the Great Lakes, as well as identify the non-native species most likely to invade and have major impacts. Ultimately, this information can inform legislation to reduce non-native species arrival to the Great Lakes region.

**EDUCATION:** Graduate and undergraduate education is the second core function of the Center and its staff and is enhanced by faculty research activity. The Center administers a graduate degree, an M.S. in Multidisciplinary Studies in Great Lakes Ecology. This graduate degree provides intellectual and skill training to prepare students for careers in environmental consulting, government agencies, non-profit research organizations, or the pursuit of doctoral education. The graduate degree emphasizes publication of research findings. At the undergraduate level, Center faculty teach a broad range of courses in their home departments, plus offer a range of summer courses and continuing education workshops.

**OUTREACH:** Public and campus outreach is the third main activity area of the Center. Center staff provide tours and short boat excursions to local schools at all levels, and to civic and community organizations. Staff regularly participate in city and regional conferences, fairs, and expos. The Center has a long-standing relationship with McKinley High School and its Aquatic Biology Program, providing assistance in student training for net deployment, organism identification, and boating safety and use. Facilities at the Great Lakes Field Station are available for internal faculty and staff at no charge, and to external community groups for a fee. Outside researchers also are able to use Station facilities for a fee.

The Center also serves the Western New York/Southern Ontario region as a technical and intellectual resource for resolving environmental issues, as well as for continuing education and specialized training. It provides information and guidance to local and state lawmakers, public school students, industry, environmental groups, and others with interests in the Great Lakes to improve decision-making and governance, sustain the natural resources of the basin, and promote the economy of the Great Lakes.

**MISSION:** As a whole, the Great Lakes Center 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. In addition, 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.

## **II. Center Facilities**

Great Lakes Center facilities include on-campus and off-campus space to support high-quality research in a variety of disciplines, promote rigorous graduate and undergraduate education, and facilitate research dissemination to the public. They include state-of-the-

art laboratories at its Field Station on Lake Erie, a fleet of research vessels capable of operating in the open Great Lakes and their contributing waters, a demonstration watershed for research and teaching, an Environmental Toxicology Laboratory on the Buffalo State College campus, and a variety of sampling and analytical equipment to support the research and educational missions.

- **Lake Erie Field Station and Vessels:** Situated on the Black Rock Canal near the head of the Niagara River, the Great Lakes Center's Field Station consists of facilities for work in aquatic ecosystems, water chemistry, and fish aquaculture as well as offices, a conference room, and a teaching pavilion. Support facilities include an electronics shop, maintenance and fabrication garage, and water pumping facility. Dock, boat launch ramp, and vessel storage are available on site to serve the Center's fleet of research vessels.

The Station fleet is capable of supporting a variety of research operations. The 46-foot R/V Seneca, along with the 40-foot R/V Aquarius and the 26-foot R/V Pisces, are deep-water vessels that can deploy a variety of water and biological sampling devices, electronic monitoring equipment, and lake bottom imaging devices. Smaller boats, including one equipped for electro-shocking, are used on inland lakes, rivers, and wetlands for a wide range of sampling and monitoring missions.

- **Environmental Toxicology and Chemistry Laboratory (ETCL):** Housed on the Buffalo State College main campus in the Science Building, ETCL has maintained a cutting edge research facility which includes *in vitro* cell culture, a fish laboratory, high tech separation instruments, digitized imaging systems and analytical laboratory. The analytical lab contains state of the art instrumentation for organic syntheses and analyses of environmental pollutants and their biotransformed products. ETCL offices house a Lab Manager and a research scientist. The researchers of this facility are actively involved in determining the biological effects of environmental pollutants in cell culture systems and other *in vitro* and *in vivo* models relevant to human and aquatic species found in Great Lakes. An overarching objective is to characterize a biomarker(s) for a particular chemical contaminant and to understand the mechanism by which these chemical contaminants mediate their toxic effects (such as carcinogenicity and endocrine disruption).

- **Point Peter Brook Experimental Watershed:** The Point Peter Brook watershed, located in the Town of Gowanda, Cattaraugus County, was originally developed to understand how variable source areas (VSAs) control the export of nitrogen and dissolved organic matter during storm events. It is equipped with soil water samplers, weirs, Parshall flumes, piezometers, a rain gauge, and a meteorological station. Research in the watershed has expanded to include the effects of snow cover on soil nitrogen processes and export during winter.

- **Richard Smith Teaching Pavilion:** Often referred to as the Dick Smith Outdoor Classroom, the teaching pavilion is located on the grounds of the Field Station, near the shore of the Black Rock Canal and overlooking Lake Erie and the Niagara River. It is a glass-walled structure with a seating capacity of 50 people used for classroom instruction, workshop delivery, and campus and community events.

- **Main Administrative Office:** The main office of the Great Lakes Center is the home of the Center's Director and secretary, and is located in a two room suite in the Science Building on the campus of Buffalo State College. Center research assistants occupy a four-room suite in the second floor in the Classroom Building.
- **Watershed Research Laboratory:** Although most of the research at the GLC in watershed dynamics is field-based, a laboratory in the Science Building on the campus is available for sample preparation and holding, equipment maintenance and storage, and some analytical procedures.
- **Aquatic Ecology Lab** is located in the Science Building and is used for processing and storage of benthic samples. It houses a large collection of native and invasive freshwater molluscs, with over 50 species of unionid bivalves from Texas and Wisconsin.

### **III. Center Personnel and Administrative Structure**

Personnel with direct ties to the Great Lakes Center include a Director (A. Karatayev), an office assistant (C. Nasca), four full-time research scientists (S. Kumar, J. Mukherjee, L. Burlakova, and Sergei Mastitsky), three half-time research scientists holding half-time faculty appointments in campus departments (C. Pennuto, A. Pérez-Fuentetaja, and C. Rhoem), an interim field station manager/research scientist (M. Clapsadl), a boat captain/research fleet manager (C. Basiliko), and work-study students. Additionally, multiple faculty from various departments are Center affiliate, associate, or adjunct members.

The Center director oversees all operations of the Great Lakes Center. The director represents the Center to the outside community, engages in fund-raising for the Center, maintains an active research program supported by extramural funding sources, participates in graduate student education, facilitates access by the campus community to GLC resources, promotes cross-disciplinary research interactions, evaluates staff, participates in campus government, and provides leadership for the research mission within the Center. The director is a tenured position with an appointment in a campus department. The director is reviewed by the Dean of Natural and Social Sciences and appointment to the director position is the result of a national search. The administrative assistant assists the director in all activities essential to the normal functioning of the Center.

Full-time research scientists affiliated with the Center are engaged in scholarly research and extramural grant-writing. These personnel have no instructional obligations and their continuing appointment is based on Center and Research Foundation review. Half-time research scientists hold joint appointments in an academic department. These personnel have tenure-track appointments and teach half the contact hours of faculty with full-time appointments, generally three courses per academic year. Decisions concerning continuing appointment for half-time research scientists are made by their respective departments and the Center. The boat captain/research fleet manager is responsible for managing, maintaining, and coordinating the research fleet. The captain is directly

responsible for the safety of the vessel and crew while underway. When not underway, the fleet manager assists with operations of the field station and shore-based research. The field station manager is responsible for daily operations and maintenance of field station infrastructure and equipment critical to aquatic research and education. Additionally, the station manager seeks extramural funds to support research and education, conducts research, and prepares results for dissemination. The manager also operates and maintains the research fleet and assists researchers in the use field station equipment and materials. Both the fleet and station managers perform outreach activities. The work study students are generally assigned to the field station manager and the administrative assistant.

#### IV. Past Performance of the Center

Center personnel are engaged in scholarly research activities promoting greater understanding of the biological, chemical, and physical dynamics of the environment, but especially concerning processes, contaminants, and structure of the Great Lakes and their watersheds. Although the number of personnel within the Center has fluctuated over the years, research productivity has remained high. Over the last five years, the Center has published, on average, more than 15 papers per year, presented 16 conference talks per year, submitted over 18 grants per year with an average request value of \$7,227,597. Center personnel have received a total of \$3,797,712 in funding over the last five years for research and education related to understanding the Great Lakes (Table 1). Funding sources include federal and state agencies (*e.g.*, National Science Foundation, National Institute of Health, U.S. Dept of Agriculture, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, N.Y. Dept of Environmental Conservation), private foundations (Philip Morris External Research Program, Hahn Family Foundation, Rivers United), industry contracts (Beak and Associates), and internal campus opportunities (Provost Incentive grants).

	2003-04	2004-05	2005-06	2006-07	2007-08	Total
Refereed publications	21	8	10	17	22	78
Conference presentations	7	12	21	15	25	80
# of grants submitted	18	15	19	24	16	92
# of grants funded	5	3	3	6	9	26
Total request amount, \$	8,387,118	5,700,714	7,484,974	8,783,089	5,782,090	36,137,985
Total amount funded, \$	2,272,134	10,070	104,000	942,528	468,980	3,797,712

Graduate and undergraduate student training represent an important function of the Great Lakes Center. In the last five years, Center personnel acted as the major advisor for 30 graduate students and served on 12 graduate student committees. Additionally, 29 undergraduate student researchers participated with Center personnel on projects over the last five years. All of the Center resources, including vessels, sampling equipment, field station labs and conference room, and ETL facilities, were used extensively to train undergraduate and graduate students either as part of a course or, in some cases, the

entire course was completed at GLC facilities. Twenty-seven classes, representing offerings in three departments used Center resources (including space, equipment, or boats) in the last five years. A total of 663 students participated in these offerings (Table 2). Faculty from all departments on campus are able to use Center resources to fulfill their teaching missions. In this capacity, the Center is an important tool in the campus education mission and it represents the only such facility capable of meeting this educational need.

Public outreach and education represent the third critical function of the Great Lakes Center. The Center promotes boating safety and training to youth primarily through its participation with the Sea Scouts. Additionally, nearly 100 students, on average, tour the field station facility and research vessels. The GLC has a long-standing relationship with McKinley High School's Aquatic Biology program, providing lake and river access essential for the training and exposure of inner city youth to Great Lakes research. Multiple campus departments and offices hold banquets, workshops, or meetings in either the FS conference room or the Richard Smith Teaching Pavilion. Since its construction this site has hosted, on average, almost 30 events per year.

Table 2. Courses training undergraduate and graduate students in the last five years which have used Center facilities, equipment, or boats.

<b>Courses</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>
BIO 104 Environmental Biology	0	153	0	71	85
BIO 213 Intro Ecology, Evolution, & Behavior	0	0	44	0	83
BIO 389 Advanced Environmental Biology	17	0	0	0	0
BIO 429 Fisheries Biology	0	0	0	18	0
BIO 430 Stream Ecology	14	0	18	18	0
BIO 612 Topics in Ecology	6	10	0	5	13
BIO 627 Topics in Zoology	0	14	0	5	0
BIO635- Great Lakes Ecology	0	0	0	0	9
BIO 690 Master's Project	0	5	5	5	5
GEG 365 Soil Science and Management	0	15	10	0	0
GEG 516 Watershed Pollution	0	0	4	0	0
GEG 610 Geography Seminar	10	0	6	0	0
GEG 617 Hydrologic Modeling	0	2	0	0	0
GEG 618 Fluid Dynamics & Sediment Transport	0	1	0	2	0
GEG 619 Wetland Hydrology & Ecology	0	0	10	0	0
<b>TOTAL</b>	<b>47</b>	<b>200</b>	<b>97</b>	<b>124</b>	<b>195</b>

## **V. Strategic Directions, Initiatives, and Actions for Research, Education, and Outreach**

### **STRATEGIC DIRECTION #1: Excellence in Research**

The success of the GLC depends on its ability to assemble a balance of researchers whose combined expertise, insights, and cooperation fosters investigation of significant issues related to environmental conditions and problems with a main focus on the Great Lakes

and their watersheds. Examples of fundamental issues to be addressed in the next quarter century include: What impacts to aquatic ecosystems result from non-native species? What are the biotic and abiotic constraints which limit the abundance and distribution of organisms? How do spatial patterns of the distribution and abundance of organisms shift over time? To what extent are communities of organisms linked by common history as opposed to random dispersal patterns? What are the ecological and evolutionary consequences of human-mediated release of environmental contaminants? Can we predict synergistic or antagonistic effects of multiple contaminants? What are the ecological and evolutionary consequences of environmental change at both short and long time scales? Can we predict the impacts of environmental change on the functioning, diversity, or structure of the Great Lakes? How will climate change affect nutrient and carbon dynamics in the Great Lakes and other aquatic habitats? The Center believes that the researchers who investigate these issues will be those on the forefront of advances in Great Lakes study and its goal is to provide an environment that fosters creative and rigorous research approaches and facilitates collaboration among researchers.

The fundamental knowledge provided through the efforts of GLC personnel make contributions to our understanding of societal concerns, especially as they relate to the Great Lakes. Concerns such as non-native species, biodiversity loss, and environmental degradation remain important societal issues. Recent federal and international mandates, such as the Global Change Initiative, Environmental Monitoring and Assessment Program (EMAP), and the Millennium Project, seek to address these concerns. Center personnel will continue to contribute to our understanding of these issues and to train future researchers in the methodologies and applications needed to tackle problems ahead.

## **Goal**

The Great Lakes Center will be recognized as a regional, national, and international center for research excellence in aquatic and watershed studies.

### **Strategic Initiative 1.1**

#### **Increase the research reputation of the GLC**

##### **Action 1.1.1**

Establish a monitoring program for abiotic parameters, benthos, and plankton in eastern Lake Erie. This program is supported by multiple external stakeholders and will bring greater visibility to GLC activities. Long-term data will allow us to evaluate trends in water quality, provide early detection of non-native species, and establish a base for comparisons in the future.

##### **Action 1.1.2**

Create a fund for attracting visiting researchers. This fund will allow preeminent scientists to collaborate with GLC personnel for extended periods, sharing and collecting

new information, preparing external grant applications, and writing publications. Visiting scientists will advertise the GLC to other scientists and funding agencies.

#### Action 1.1.3

Increase recognition of GLC personnel through submission of external grant applications and peer-reviewed publications. The GLC has a target goal of increasing external grant funding by 50% over 2007-2008 year and peer-reviewed publications by 20% over five years.

#### Action 1.1.4

Develop infrastructure to support research excellence. Discussions with field station directors across the nation reveal that short-term housing is a major consideration for attracting visiting scientists. Housing options in the vicinity of the field station should be investigated. Possible solutions include code-approved mobile units, nearby neighborhood rentals, or developing an agreement for adjacent Officer Club housing.

#### Action 1.1.5

Develop and sustain an invited speaker seminar series for preeminent scientists. The seminar series will expose GLC researchers to cutting-edge science in and around the Great Lakes while also introducing our invitees to the research expertise and facilities of the GLC.

#### Action 1.1.6

Increase the visibility of GLC personnel and activities in the region through increased press releases, creation and dissemination of a GLC annual activity report, a biannual newsletter, and a brochure. These activities will increase regional knowledge of GLC expertise and capabilities.

#### Action 1.1.7

Host professional workshops and conferences to increase the visibility of Great Lakes Center research activities.

### **STRATEGIC DIRECTION #2: Excellence in Teaching and Student Training**

Center personnel make significant contributions to the training and education of graduate and undergraduate students. A major objective for graduate education is to recruit and provide substantial support for excellent graduate students, linking the research and education missions. The GLC is committed to maintaining the excellence of its education and student training.

#### **Goal**

The Great Lakes Center will be recognized as a regional, national, and international center for the education and training of students in aquatic and watershed studies, with particular emphasis on graduate students.

## **Strategic Initiative 2.1**

### **Increase the teaching and student training reputation of the GLC**

#### Action 2.1.1

Increase the size of the Stevenson endowment to provide greater recognition to high quality graduate student research.

#### Action 2.1.2

Create a new Freidhoff Award recognizing a graduate student whom exemplifies research innovation, creativity, and resourcefulness.

#### Action 2.1.3

Increase the number of graduate students by 10% over next five years through advertising, recruitment, and grant applications.

#### Action 2.1.4

Continue to offer workshops and courses when demand dictates, and continue to develop new workshops for students and professionals, especially those possible only with GLC facilities.

## **STRATEGIC DIRECTION #3: Excellence in Outreach and Service to the Community**

Center personnel make significant contributions to public outreach and service to the community. Disseminating research findings of the Center and its collaborators is a fundamental step in promoting decision-making by an informed community. The GLC will continue to play an essential role in educating the greater Buffalo community in matters related to the Great Lakes and its watersheds.

### **Goal**

The Great Lakes Center will be recognized as a regional center for excellence in public outreach and service to the community.

## **Strategic Initiative 3.1**

### **Increase the outreach and community service reputation of the GLC**

#### Action 3.1.1

Provide and constantly update the information obtained from the monitoring program on water quality, fish food base and invasive species on the GLC web site. This data will be a valuable source for the local community and all stakeholders, including lake managers and policy makers.

#### Action 3.1.2

Continue to participate in community service activities highlighting Great Lakes resources and initiatives. Activities may include, but are not limited to: biannual Great Lakes student summit, Envirothon, and round goby round-up.

#### Action 3.1.3

Develop cooperative agreements with outside organizations and school districts for access to GLC facilities and staff expertise. Such agreements might include designation of the GL Field Station as a field trip destination for area schools, designation of the GLC as the coordination center for western New York PRISM, or formalizing the GLC relationship with McKinley high school and its aquatic biology program.

#### Action 3.1.4

Upgrade the Dick Smith outdoor classroom to a year-round teaching and small conference facility.

#### Action 3.1.5

Develop a summer study program for middle school and high school students, possibly in partnership with the US Fish & Wildlife Service and Sea Grant extension. This summer program will lead to the creation of new environmental teaching materials relevant to Great Lakes education. An environmental education specialist would be required.

### **STRATEGIC DIRECTION #4: Expansion of Financial Support**

#### **Goal**

The Great Lakes Center will be recognized by donors (e.g., public, philanthropic, private, agency or foundation) as a destination for charitable or directed funding.

#### **Strategic Initiative 4.1**

**Expand our portfolio of funding partners and agencies to remain competitive in seeking further extramural awards.**

##### Action 4.1.1

Increase our communication and relationship with government relations. The work of the GLC has direct implications for the quality of life in the western NY region, and establishing a close relationship with government relations will bring our mission directly to local and regional elected officials.

##### Action 4.1.2

Increase our communication and relationship with institutional advancement office. The GLC mission needs to be communicated to institutional advancement and a strategy developed to engage Alumni and College Relations as well as the College Foundation for assistance in meeting financial demands.

### Action 4.1.3

Continue dialog and interaction with the Research Foundation to ensure the GLC is positioned to take advantage of available extramural support opportunities.

## **VI. Resources Required for GLC to Fulfill Initiatives**

Although Center personnel will be actively involved in seeking external funds to improve facilities and support research activities, College support is essential in several areas including:

1. Laboratory technician position is critical for a monitoring program. Although Center personnel will seek external funds to support monitoring, external sources cannot provide stable, long-term funding for personnel for this new program.
2. Upgrade fleet of research vessels is extremely important as current boats are over 40 years old, and require constant money and time investment.
3. A \$25,000 revolving fund is needed to bring research scientists to the GLC for one-month interactions. This fund will support two awards for preeminent scientists (\$7,500 each) and two post-docs (\$5,000 each) to collaborate with GLC personnel for a one-month period, conducting pilot studies, preparing external grant applications, and writing publications.
4. Housing in the vicinity of the field station to accommodate 5 – 6 visiting scientists/graduate students/post-docs will greatly enhance collaboration with other institutions and agencies.
5. A \$20,000 revolving travel fund will allow Center personnel to attend more professional meetings and conferences and will increase opportunities for collaborations with other institutions, including international, and will increase the visibility of the GLC.
6. Installation of blinds, AV capabilities, and heating to upgrade the Dick Smith outdoor classroom to a year-round facility.
7. Hire a dedicated staff position as an Environmental Education specialist.

## **VII. Update**

1. Laboratory technician position for a monitoring program was established through Research Foundation. The monitoring program will allow us to evaluate trends in water quality, provide early detection of non-native species, and establish a base for comparisons in the future
2. A new open water boat was constructed and will be delivered to the GLC within a month. This boat will greatly increase our ability to sample both nearshore and offshore water of the Great Lakes.