

Research Learning Center (RLC) Report to Congress
FY 2006-07

Great Lakes Research and Education Center

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EXECUTIVE SUMMARY

The Great Lakes Research and Education Center (GLREC) was established in 2002 as part of the Natural Resource Challenge mandate. Its goals are 1) to facilitate research in 10 Great Lakes National Parks; 2) to provide park science research and education opportunities to the public; and 3) to convey applied natural and cultural resources research to the network parks through education and outreach.

During Fiscal Year 2006-07 the Great Lakes Research and Education Center made considerable progress in development of research, the research station, and education programs. Activities included completion of the Field Research Station, provision of laboratory equipment to resource managers, development of the educational resource center, and increasing partnerships to enhance research and engage the public in park science. Both multi-park and individual park research projects were enhanced directly through GLREC staff support, such as grant writing, funding procurement, and technical support. The number of research permits currently active and recently expired is 57. Research results were communicated to managers and the public through education workshops, local and national publications, and presentations at local and national meetings. The GLREC staff facilitated production of research publications and educational projects. Ten internal and external research publications resulted from 2007 research projects. Staff also produced several newspaper articles, brochures, local publications, and electronic communications to scientists, managers, and the public on Great Lakes national parks research and management, and current research from other related programs.

Program implementation proceeded primarily with Research Learning Center base funding. Future planning will include expanding research at the GLREC Field Research Station, developing partnerships for funding support, developing scientific consortia with universities and other government agencies to enhance research opportunities and information sharing, developing a research grant program, continuing support for citizen science training programs, and expanding data and information transfer among the network parks and other Natural Resource Challenge programs.

GLREC Summary

The Great Lakes Research and Education Center (GLREC) was established in 2002 to facilitate research in 10 national park units in the Midwest Great Lakes Region with Natural Resource Challenge (NRC) funding of \$225,000 (Appendix 1, Table 1).

Center staff consists of a Research Coordinator and an Education Coordinator.

The Research Coordinator assists researchers in grant writing for internal and external funding sources, reviews technical reports, provides technical support, develops internship programs, manages park research permits, oversees single and multi-park research projects, and manages the housing and the Field Research Station for researchers to use. The Education Coordinator provides research focused educational workshops, provides current natural resource research information to network parks, develops educational materials, manages the educational loan materials, and facilitates several educational and interpretive programs.

The facilities include a renovated 1908 Sears catalog house that serves as a Field Research Station (FRS) for laboratory and office use by visiting researchers. The FRS wet laboratory facilities includes a drying oven, incubator, laminar flow hood, growth chamber, microscopes, pH meters, centrifuge, microassay equipment, other materials used for research and training purposes, and high speed internet access. Educational materials, such as science kits, are also housed in the FRS and made available to teachers. In addition, dormitory housing is available to visiting researchers.

Budget Summary

Budget information is shown in Appendix 1, Table 2. Approximately \$163,080 (72%) of the FY2006-07 budget was allocated to coordinators' salaries and support. A student internship program for seven parks was developed and supported with \$21,500 (9.5%) from the GLREC budget. FRS laboratory development, provision of high-speed internet in the FRS, and research and education supplies for other parks accounted for the majority of the supplies and equipment costs, and contracts (\$27,203 -12%). On-line science library search capacity through Current Contents Connect was continued for 12 resource managers for a total cost of \$3,000. Radio telemetry equipment and education curriculum guides were purchased to support research and education at Pictured Rocks National Lakeshore (PRNL) (\$1,961) and Voyageurs National Park (VOYA) (\$2,582). GLREC provided kayaks, floatation devices, boating supplies, and a science education membership to Sleeping Bear Dunes National Lakeshore (SLBE) (\$4,182). APIS and ISRO received educational table displays (\$503). The total amount provided to GLKN partners for equipment and supplies was \$9, 228. The rest of the funding was allocated to travel (2%), building maintenance (1%), and other administrative costs (3%). No other external partners provided operational funding support in 2005-06. Purdue University North Central provided \$7,000 through an Indiana Lake Michigan Coastal Grant to implement a GLREC-USGS-sponsored WETMAAP workshop in July 2007. The Centers for Ocean Sciences Education Excellence (COSEE-Great Lakes) provided \$800 to support GLREC educational activities.

Summary of Accomplishments

Facilitated Use of Parks for Scientific Research

- *No. nights used in park housing*

Lodging was provided to 12 researchers at INDU for a total of 122 nights and for one researcher at SLBE for 78 nights (Appendix 1, Table 3). **The total cost savings to researchers for lodging was \$17,062, which is about three times the savings from FY2005-06.**

- *RPRS Permits at INDU*

The Research Coordinator processed 44 active permits and 13 recently expired permits, for a total of **57 permits** related to inventorying, monitoring, and research. RPRS permits are described in Appendix 1, Tables 4a and 4b.

- *Multipark projects*

The Research Coordinator continued facilitating a research project on cattail hybridization and pitcher plant population genetics. Plant materials were collected from INDU and the Indiana Dunes State Park during summer 2007. The information gained from both research projects will have implications to wetland restoration in the Great Lakes Network (GLKN) parks. Peer-reviewed journal articles are currently being developed to convey this information to scientists.

- *Laboratory facilities used*

The Nature Conservancy (TNC) continued for a second year the controlled rearing of Karner Blue Butterfly, a federally endangered species found in INDU, at the FRS during June and July 2007. Brood-chamber rearing is part of a re-introduction program coordinated by TNC in state and federal lands in the Midwest. The lab was also fully used by the University of Illinois researchers to conduct methyl mercury research.

High-speed internet access was provided to researchers, Ph.D. students, and interns using the FRS Station. University of Illinois Urbana-Champaign researchers (2) used the research station for conducting methyl mercury research during May, July, and November 2007. Two USGS scientists from the Lake Michigan Field Station made arrangements to use the facility to conduct plant cytogenetics research.

Biologists from the Midwest Region Inventory and Monitoring (MWRO I&M) Program also used the facility for a long-term water quality monitoring project.

The FRS conference facilities were used to host a research seminar and meetings with 7 researchers.

- *Non-NPS funds leveraged for park research and education*

A Purdue University researcher obtained \$7,000 from an Indiana Coastal Grant to host the Wetland Education and Training for Mapping and Aerial Photography (WETMAAP) at INDU, part of an overall \$59,000 non-NPS funded project. The participants (17) included teachers, government resource managers, nonprofit resource managers, informal educators, and private citizens.

COSEE – Great Lakes O’Lakers Program supported connecting underserved high school students with Great Lakes research. COSEE provided \$800 to the GLREC for educational development. The overall program used \$59,000 of non-NPS funding.

Value-added Products and Research Information Provided to Staff and Management

- Continued research internship program for seven GLKN parks
- Continued license for electronic scientific search capability of Current Contents Connect for GLKN park managers
- Conducted WETMAAP Workshop to train educators and managers in aerial photography interpretation and mapping, and provided a web-based learning tool
- Provided articles and reports to GLKN parks (see literature below)
- Provided assistance to MWRO Inventory and Monitoring Program Coordinator in development of protocols for bioaccumulative substances
- Provided weekly email of Science Magazine research reports and abstracts to RLC coordinators and GLKN resource managers on Climate Change, biological and geological topics
- Provided assistance to MWRO managers in development of Climate Change bulletins for GLKN, Heartland, and Great Plains for distribution to interpretive staff
- Provided information on controlling spread of invasive species by reducing seed transport, resulting in a GLKN park applying boot-brush control methods
- Provided assistance to the Midwest Invasive Plant Network (MIPN) to develop a full-color flier featuring photographs and invasive species information.

Relevance of Park Research to the Public, Educators, and Researchers

Appendix 1, Table 5 presents the communication of scientific information conveyed by the GLREC coordinators. Highlights of these include:

- Oral (Powerpoint™) and Poster Presentations at meetings and conferences:
Byappanahalli, M., W. Smith, and R. Whitman, 2007. *E.coli*...What Does It Really Mean?, Indiana Rivers Rally, June 7-9, West Lafayette, IN.

Marburger, Joy. 2007. The Trouble with *Typha*. Presentation to Prairie Streams Initiative- Creating Backyard Habitats, 17 March 2007, Franklin, Illinois.

Marburger, Joy. 2007. Wetland Acres in Great Lakes National Parks. Data provided to Wetlands Subcommittee for Data Call to the Great Lakes Regional Collaboration., Region 5 Environmental Protection Agency, Chicago, Illinois.

Marburger, Joy, Steven Travis, and Steve Windels. 2007. The Role of Hybridization in Cattail Invasions of Freshwater Wetlands in Great Lakes National Parks. Botany and Plant Biology Joint Congress, July 7-11, 2007, Hilton Chicago, Chicago, Illinois.

Marburger, J. and B.A. Middleton. 2007. Local Volunteer, Global Citizen: An Example of an International Citizen Science Research Effort. Citizen Science Toolkit Conference, 20-23 June, 2007, Cornell Laboratory of Ornithology, Ithaca, New York (invited participant)

Marburger, Joy E. and Wendy W. Smith. 2007. The Great Lakes Research and Education Center – Linking Research and Education. Indiana Dunes Research Forum, 25 April, 2007, Hammond, Indiana

Marburger, J. and W. Smith. 2007. The Trouble with *Typha*, or “It’s Not the Ordinary Cattail You Used to See”, Indiana Rivers Rally, June 7-9, West Lafayette, Indiana

Myers, L. and W. W. Smith. 2007. The Great Lakes National Parks: Science Out of the Box, Michigan Science Teachers Association Annual Conference, 15-17 March, 2007, Grand Rapids, Michigan

Smith, Wendy W. 2006. The Great Lakes Research and Education Center – Linking Research and Education in the Great Lakes National Parks. Great Lakes Dunes Conference, 3 October, 2006, Traverse City, Michigan

Smith, Wendy W. 2006. Invasive Species and Engaging Audiences around Native Landscaping, Chicago Wilderness Congress, 15 November, 2006, Chicago, Illinois

Smith, Wendy W. 2007. Invasive Species and Engaging Audiences around Native Landscaping, Wild Things Conference, 3 March, 2007, Chicago, Illinois

Smith, Wendy W. 2007. Invasive Species: Get Your Students Involved, National Science Teachers Association Annual Conference, March 29 – 31, 2007, ST. Louis, Missouri

- Workshops

Two Great Lakes Educator Workshops linking research at Great Lakes National Parks with educational activities conducted at INDU (30 July-1 Aug 07) and PRNL (13 Oct 06), in partnership with Alliance for the Great Lakes and the Dunes Learning Center (DLC).

One NAB the Aquatic Invader Educator Workshop conducted with the Illinois-Indiana Sea Grant College Program and East Chicago Central High School (8 Nov 06)

A Great Lakes Institute Follow-up Workshop, highlighting Apostle Islands Fisheries Research, conducted for teachers; partners included GLREC and USGS staff (13 Jan 07)

A Flying Wild workshop (2 March 07) was held at Indiana University, Northwest. The workshop featured an ongoing bird banding project and was held in cooperation with the Indiana Department of Natural Resources

Inquiry-based Learning Educator Institute Workshop on white-tailed deer management and research, partnered with DLC and Brookfield Zoo (9-10 March 07)

Oak Savanna Restoration Workshop in partnership with INDU and Purdue University Calumet (14 June 07)

- RLC contributions to the George Wright Society Meeting and INDU-sponsored Indiana Dunes Research Forum; both coordinators assisted in development and coordination of these conferences.
- Two and a half day WETMAAP workshop to train resource managers, formal and informal educators, nonprofit resource managers, and private citizens in use of aerial photography in mapping and associated educational tools.
- Booths, Displays, Posters: GLREC staff displayed information on research and educational projects related to the GLREC program and invasive species at several meetings, festivals, and plant sales

- Other GLREC-assisted school programs sponsored by COSEE and USGS Lake Michigan Ecological Field Station: field/trip and discussion for biology students to emphasize importance of Great Lakes research to resource management.

Promoting Resource Stewardship through Partnerships

Appendix 1, Table 6 presents GLREC partners during FY 2006-07 including:

- NGOs such as Chicago Wilderness, Midwest Invasive Plant Network, Northwest Indiana Invasive Plant Network, Save the Dunes Conservation Fund, the Nature Conservancy
- GLREC-USGS Purple Loosestrife Volunteers (citizen science program)
- Wetlands education workshops sponsored by GLREC, DLC, USGS
- Great Lakes Educator Workshops co-sponsored by multiple organizations including Alliance for the Great Lakes, Illinois-Indiana Sea Grant, USGS

Vignettes

- *Facilitating use of parks for scientific inquiry*

The GLREC facilitated several multi-park projects, including continuing research on cattail hybridization and pitcher plant population dynamics. The Research Coordinator and research intern collected cattail morphological data at several locations within INDU during June-August 2007, to add additional data to the study.

The Research Coordinator managed a total of 57 permits (current and recently expired). Tables 4a and 4b provide details on permit research topics and their relevance to INDU information needs. The number of students involved with research projects through the RPRS permits was 18, as shown in Appendix 1, Table 7.

The Research Coordinator facilitated housing for all research projects at INDU. Housing was provided to 12 researchers in INDU. Of these 10 were university researchers and one was a resource manager from the Midwest Inventory and Monitoring Program. SLBE also provided housing to one researcher conducting work on Pitcher's Thistle, a federally endangered species.

- *Supporting science-informed decision making*

The GLREC coordinators provided information on ongoing research and research needs and associated educational needs in GLKN parks through several oral and poster presentations at scientific meetings, at universities, and at the April 25, 2007 Indiana Dunes Research Forum.

Information on GLKN park research needs was conveyed to the Great Lakes Northern Forest CESU coordinator in development of a Midwest Region Science Strategy, which includes streamlining the SCC proposal submission process. The Research Coordinator provided technical support for 2007 PMIS pre-proposal reviews for SCC 2010 by reviewing 60 and ranking 50 pre-proposals.

The Education and Research Coordinators provided information on recent and ongoing research involving invasive plants through several oral presentations and exhibits at regional conferences. Both coordinators provided information on invasive plants to resource managers through publications and GLREC participation in the Northwest Indiana Invasive Plants Network (NIIPN) and the Midwest Invasive Plants Network (MIPN). The Research

Coordinator completed a one-year term on the MIPN board and continued work on the research committee. The Education Coordinator continued work on the education committees for both organizations.

The Research Coordinator serves on the Wetlands Subcommittee for the Great Lakes Regional Collaboration and provided information on wetland acres restored, protected, and enhanced in Great Lakes National Parks.

Both the GLREC Coordinators assisted in organizing the 2007 RLC annual meeting at the George Wright Society annual conference and presented a poster highlighting significant research and education projects.

The Research Coordinator co-hosted a Citizen Science symposium and gave two presentations at the George Wright Society Conference:

- Global Citizen, Local Volunteer (monitoring purple loosestrife)
- GLREC Research Internship Program
- *Communicating relevance and providing access to research knowledge*

The GLREC provided electronic scientific literature access to resource managers in the GLKN parks for access to Current Contents abstracts. At this time 12 resource managers have received the license.

The Education Coordinator provided invasive species and other topical research information at national, state, and regional science teacher association meetings and conferences.

GLREC staff provided research reports through a series of e-mails to researchers, educators, resource managers, and interpreters around the Midwest Region. The Education Coordinator provided tours at three Great Lakes National Parks to three staff members from Kaminos National Park during June 2007.

- *Promoting resource stewardship and research communication through partnerships*
The Research Coordinator developed a power point presentation for a USGS researcher who uses citizen scientists to conduct purple loosestrife research both nationally and internationally:
Middleton, B.A. and J.E. Marburger. 2007. Global citizen, local volunteer. Presentation at George Wright Society Conference, April 2007.
- *Grants, Proposals, and Contracts*
 - The Research Coordinator managed a \$2,490 contract with a Michigan Technological University Ph.D. student to conduct pitcher plant genetics research at INDU
 - The Research Coordinator managed a \$2,205 contract with University of Illinois researcher to conduct methylmercury research at INDU, resulting in a report

- The Research Coordinator co-wrote NOAA Sea Grant Preproposal with Purdue University and University of New England researchers: Development Guidelines for Detecting Hybrid Cattail (*Typha x glauca*) Invasions in Coastal Wetlands of Lake Michigan
- The Research Coordinator co-wrote Fish and Wildlife Coastal Programs Grant with IN DNR resource manager, private company botanist, and University of New England researcher: Survey Coastal Areas within the Lake Michigan Watershed to Identify Native, Exotic, and Hybrid Cattails
- The Research Coordinator co-wrote Great Lakes Protection Fund Grant Pre-proposal with IN DNR resource manager, private company botanist, and University of New England researcher: Forensic and Morphological Protocols to Identify Invasive Cattails in the Great Lakes Region
- The Research Coordinator edited research proposals associated with INDU research permits in 2007:
 - Development of a Diagnostic Indicators for Assessing “Health” of Black-Oak (*Quercus velutina*) Savannas in the Chicago Region, Dr. Young Choi, Purdue University Calumet
 - Methylmercury in the Wetlands of the Indiana Dunes National Lakeshore and Grand Calumet Watershed: Tests of Diffusive Gradients in Thin Films as a Means of Monitoring Bioavailable MeHg, Dr. Robert Hudson, University of Illinois Urbana Champagne

Collaboration across the Challenge

The following example(s) relate how the GLREC is improving efficiency and effectiveness in working with other NRC programs.

- The Research Coordinator continued collaboration with the Great Lakes Northern Forest CESU in development of a Regional Science Strategy and promoting CESU member university research in the GLKN parks.
- The Research Coordinator reviewed and editing of GLKN I&M monitoring protocols: Route, Bill, William Bowerman, and Karin Kozie. 2006 (draft). Protocol for monitoring bioaccumulative contaminants. Great Lakes Inventory and Monitoring Network, National Park Service, Technical Report Number GLKN/2006/Version1.0
- The Research Coordinator supported use of the FRS laboratory and equipment to GLKN I&M water quality monitoring staff.
- The Research Coordinator provided FRS laboratory and equipment to researchers: a CESU university researcher (University of Illinois) and Loyola University researcher; Research Coordinator and INDU staff member assisted in testing the efficacy of a new probe to evaluate methyl mercury in water to determine if nondestructive methods could supplement the use of organisms for testing bioaccumulation of this contaminant.

- The Research Coordinator developed and implemented a safety plan for the GLREC Research Field Station.
- The Education Coordinator collaborated with the GLKN EPMT Coordinator to provide educational tools, facilitate workshops and information related to invasive species. Invasive species Powerpoint™ presentations were also distributed to land managers to share with their staffs. Two such presentations were placed on-line. A booth on invasive species was displayed at the National Science Teacher Association Annual Convention.
- GLREC provided funding to support Wildlife Society Conference with major contributions by MWRO staff: Belant, Jerrold L. 2007. Temporal patterns in elevational distribution of wildlife in United States national parks. Ecological responses to rapid climate change within species, communities, and ecoregions. The Wildlife Society 14th Annual Conference, 22-26 September, 2007, Tucson, Arizona.
- GLREC continued the research internship program in 2007 (Figs. 3 a, b, c) to assist resource managers in seven GLREC network parks in research and monitoring projects (Appendix 1, Table 8, Appendix 2 Summary). Both resource managers and student interns reported a very positive experience with this program. This program was funded by \$21,500 from the GLREC budget.

Government Performance and Results Act (GPRA) Goals

The achieved GPRA goals include:

Goal Ia1A- Disturbed Lands
 Goal Ia1B- Invasive (non-native) Plants
 Goal Ia1C- Land Health: Wetland Areas
 Goal Ia1E- Land Health: Upland Areas
 Goal IIa1A- Visitor Satisfaction
 Goal IVb1a- Park Partnerships

There is overlap in some of the goals, such as GLREC development and implementation of public workshops on topics such as plant taxonomy, wetland restoration and protection, and invasive species control (Goals Ia1B, Ia1C, Ia1E, IIa1A, IVb1a).

Value to Partners: Quotes

Research Coordination:

- Dr. Pamela Geddes, Postdoctorate, Department of Biological Sciences, Loyola University, Chicago, College of Arts and Sciences, Department of Biology, 6525 N. Sheridan Rd., Chicago, IL 60626
 Email pgeddes@luc.edu

As a researcher at Indiana Dunes National Lakeshore, I have had the privilege to work with Dr. Joy Marburger, Research Coordinator at GLREC. My project studies an invasive plant (*Typha*) and its effects on microbially-mediated biogeochemical cycling, particularly regarding soil nitrogen transformations. Dr. Marburger has been extremely helpful in aiding me throughout my project. Specifically, she aided in selection of some invaded sites, she facilitated information about the park, she shared information regarding results from previous projects on the same invasive plant, and she has facilitated my research by providing me access to gear and the GLREC's wet lab. She has also been a very important mediator for communication between me and other scientists at the park. Joy helped recruit Research Interns for the summers of 2006 and 2007. The Research Interns participated in several park projects, including mine, where they were exposed to different techniques and methodologies in a varied spectrum of scientific research topics. This provided an excellent opportunity to expose interns to research experience as well as providing help for us researchers conducting these studies at the park. The availability of Research Interns provides very tangible advantages, as well as providing useful opportunities for undergraduate students locally or regionally. I believe this program is an asset for GLERC that complements the other resources available for researchers at the park. I thank Dr. Marburger for allowing me to participate in this program.

- Mr. Lawrence Handley, Remote Sensing and Mapping Co-Director, USGS National Wetlands Research Center, 700 Cajundome Boulevard, Lafayette, LA 70506
Phone 337-266-8691; Email larry_handley@usgs.gov

For the past three years Joy Marburger has been working to have a WETMAAP site developed at Indiana Dunes National Lakeshore to provide maps, aerial photos, and satellite imagery as resource materials to K-12 formal and informal educators through workshops and the web. Joy has networked with local educators, Purdue University, Indiana Lake Michigan Coastal Grants Program, among others in order to promote the education concept and secure funding for the project. After submitting several proposals to the National Park Service, Joy's persistence succeeded in securing the funding through a consortium of entities including the National Park Service, the USGS, Indiana Lake Michigan Coastal Grants Program, Purdue University, the University of Louisiana at Lafayette, and Chadron State College in Nebraska. Both coordinators assured that The WETMAAP workshop was highly successful, with 17 participants attending. Information about land-use changes at Indiana Dunes will be available on the WETMAAP webpage (WETMAAP.org).

- Dr. Robert J.M. Hudson, Associate Professor, Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign, Urbana, IL 61801
Phone 217-333-7641 ; Email rjhudson@uiuc.edu; rjmhudson@gmail.com

During the summer of 2006 and 2007, my research group (3 graduate students plus myself) conducted a field study of methylmercury in wetlands of the Grand Calumet watershed and Indiana Dunes National Lakeshore (INDU). For this project, we used the field research station at INDU as our base of operations. We also conducted sample processing and experimental incubations in the lab. Joy Marburger, the Research Coordinator at INDU, assisted us greatly in planning the logistics for the field effort, in the permitting process, and in learning details of the INDU wetlands that were important for our sampling design. In addition to our field effort last

summer, Joy and I have been collaborating on a pilot-scale field study to test a novel method for sampling methylmercury in water from wetland pools that should provide a more accurate and economical means of assessing wildlife exposure to this toxicant. This project has the potential to allow broad-scale studies of MeHg to be conducted by NPS field workers without a great deal of training and at a very modest cost compared to having specially-trained field researchers collect water for MeHg analysis. Myself and my Ph.D. student has been very happy with the laboratory facilities provided by the GLREC.

Education Coordination:

- Stephanie Smith, Education Program Manager, Alliance for the Great Lakes
17 N. State Street, Chicago, IL, 60602
Phone 312-939-0838 ext. 226; E-mail ssmith@greatlakes.org

Again this year, the Great Lakes Research and Education Center (GLREC) proved an essential partner in working with the Alliance for the Great Lakes. Together we crafted a workshop for formal and non-formal educators to teach them about the Great Lakes, provide key educational resources and scientific research, demonstrate ways to integrate the information into classroom learning and offer an opportunity to bring stewardship and service learning to their students. The GLREC's role was of particular importance in bridging the gap between educators and scientists and finding ways to bring research to students in the region. The partnership was significant to the Alliance for the Great Lakes, as it enabled us to conduct outreach and forge new relationships we would otherwise have been unable to reach with our Great Lakes in My World curriculum and Adopt-a-Beach program.

- Robin G. Goettel, Associate Director for Education, Illinois-Indiana Sea Grant College Program, University of Illinois, 368 NSRC, MC-635, 1101 W. Peabody Drive, Urbana, IL 61801 Phone 217 333-9448; E-mail goettel@uiuc.edu

Illinois-Indiana Sea Grant has appreciated working with the GLREC on many levels. Education Coordinator Wendy Smith has been invaluable to our education program. We partnered with Wendy and the GLREC to present the 2007 Great Lakes Institute. This allowed us to share numerous program resources and new research findings on issues such as fish contaminants and aquatic invasive species, and also to offer new opportunities for teacher professional development by sharing information on the COSEE (Center for Ocean Science Excellence in Education) Great Lakes project. Wendy Smith coordinated a COSEE O'Lakers education program for students, has assisted with publicity for a wide variety of research-based professional development workshops we offer for teachers, and is serving on our planning committee for COSEE's 2008 Lake Michigan Exploration Workshop. We also appreciated the GLREC participation on our COSEE Advisory board and look forward to continuing this fruitful relationship.

Literature Resulting from GLREC Efforts/Funding

Belant, Jerrold L. 2007. Temporal patterns in elevational distribution of wildlife in United States national parks. Ecological responses to rapid climate change within species, communities, and

ecoregions. The Wildlife Society 14th Annual Conference, 22-26 September, 2007, Tucson, Arizona.

Baker, S.D. and M.S. Sepúlveda. 2007. An Evaluation of the Effects of Persistent Environmental Contaminants on the Reproductive Success of Great Blue Herons (*Ardea herodias*) in Indiana. *Journal of Wildlife Diseases* (submitted).

Maker, S.D., H.G. Ocoa-Acuña, and M.S. Sepúlveda. 2007. Utilizing Stable Isotopes to Determine Potential Feeding Grounds of Great Blue Herons in Indiana with a Review of Stable Isotopes in Albumin of Bird Eggs. *Condor* (submitted).

Hudson, R. and J. Marburger. 2007. Methylmercury in the Wetlands of the Indiana Dunes National Lakeshore: A Pilot Test of Diffusive Gradients in Thin Films for Monitoring Bioavailable MeHg. Report Submitted August 2007.

Karberg, J.M. 2006. Development and Screening of Inter Simple Sequence Repeats (ISSRs) Primers for Analysis of *Sarracenia purpurea* in Pinhook Bog, Indiana Dunes National Lakeshore. Unpublished Report. 4 pp.

Karberg, J.M. and M.R. Gale. 2006. Genetic Diversity and Distribution of *Sarracenia purpurea* (Sarraceniaceae) in the Western Great Lake Superior Basin. *Canadian Journal of Botany* 84:235-242.

Marburger, Joy, Steven Travis, and Steve Windels. 2007. The Role of Hybridization in Cattail Invasions of Freshwater Wetlands in Great Lakes National Parks. Abstract. Botany and Plant Biology Joint Congress, July 7-11, 2007, Hilton Chicago, Chicago, Illinois.

Marburger, Joy. 2006. Silent Stalkers of the Bog. *Singing Sands Almanac*, Fall 2006, Indiana Dunes National Lakeshore, National Park Service.

Maragi, F. 2007. Interpolation of Browse Intensity by White-tailed Deer on Forested Communities of Apostle Islands National Lakeshore. Apostle Islands National Lakeshore, Wisconsin (A report submitted in fulfillment of the 2007 GLREC internship at Apostle Islands National Lakeshore).

Middleton, B.A. 2007. Invasive Species. Book Chapter in: *Encyclopedia of Ecology*. C. Jorgensen, ed. Springer (in press).

Impacts to Accomplishments

In 2006-07 there were no major changes in the program that affected the accomplishments. Travel limitations had some impact on networking with researchers through professional meetings. GLKN parks expressed a strong interest in continuing the research internship program (Appendix 2).

Future Plans for FY 2007-08

Future priorities for the program include:

- establish a GLREC strategic plan in line with the RLC mission and goals; increase communication among the GLREC staff and regional program staff to achieve the RLC mission and goals of the plan
- seek external funding sources and partnerships to continue and expand research and education opportunities
- facilitate rigorous scientific approaches to park science to improve resource management
- enhance closer relationship with university researchers; develop educational/outreach component associated with research objectives
- provide technical support via student internships to researchers in GLKN parks
- develop scientific consortia with universities and other government entities to enhance information sharing among researchers and managers
- continue development of GLREC research facilities and support to encourage more research in Great Lakes network national parks
- promote high quality citizen science training to the public and university students alike to assist researchers in data collection
- improve data and information technology accessibility among the network parks and Natural Resource Challenge programs
- develop avenues to communicate research to wider and more diverse audiences.

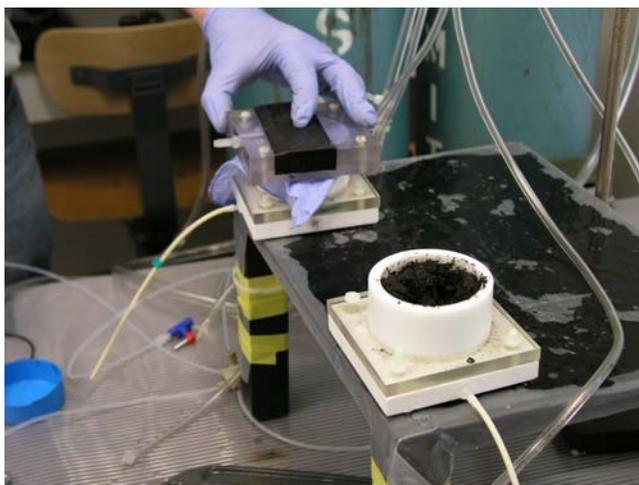
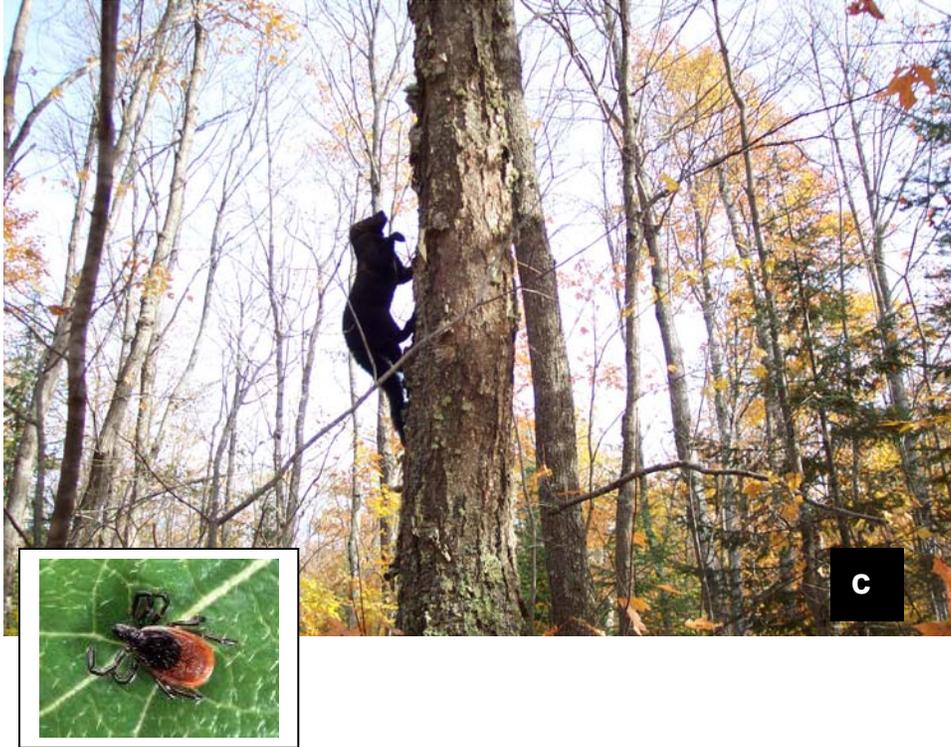


Figure 1: A University of Illinois Ph.D. student is conducting methyl mercury research, year 2, in the GLREC Field Research Station. Photo shows removal of water from a sediment sample under vacuum.



Figure 2: A Loyola University (Chicago) postdoctoral student is investigating the impacts of hybrid cattails in Cowles Bog on microbial populations in the field and in mesocosms.





Figures 3 a, b, c: GLREC research interns investigating: a) deer browse impacts at APIS; b) cattail ecology and earthworm populations at INDU c) deer tick parasites on fishers in PRNL.



Figure 4. Participants in WETMAAP workshop learn to interpret aerial photographs for mapping wetlands in INDU and surrounding landscape.



Figure 5. Teachers get a close-up view of macroinvertebrates during the Great Lakes Institute Workshop.

Appendix I: Tables

Table 1. Great Lakes Research and Education Center and Network Parks

RLC Name	Parks Served	Acronym	Initial/main Funding Source
<p>Great Lakes Research and Education Center- 2002</p>	<p>Indiana Dunes National Lakeshore, IN (host park) Other parks in network include: Apostle Islands National Lakeshore (WI) Grand Portage Nat'l. Historic Monument (MN) Indiana Dunes National Lakeshore (IN) Isle Royale National Park (MI) Keweenaw National Historic Park (MI) Pictured Rocks National Lakeshore (MI) St. Croix National Scenic Riverway (WI) Sleeping Bear Dunes National Lakeshore (MI) Voyageurs National Park (MN)</p>	<p>APIS GRPO INDU ISRO KEWE PRNL SACN SLBE VOYA</p>	<p>Natural Resource Challenge (\$225,000)</p>

Table 2. GLREC FY2007 Budget Summary

SALARIES								
	Name	Title	Grade	Step	RLC \$	% of RLC \$	Other NPS \$	Non-NPS \$
	Dr. Joy Marburger	RLC Research Coordinator	11	5	\$77,896.70	34.6%		
	Wendy Smith	RLC Education Coordinator	11	4	\$85,183.48	37.8%		
	VIP	Research Intern (INDU)	-	-	\$499.28	<1% (0%)		
	Maintenance OT				\$742.71	<1% (0%)		
	Internship Accts	Research Intern (7 parks)			\$21,000.00	9%		
	SUBTOTAL SALARIES				\$185,322.17	82%		
	TRAVEL				\$5,188.35	2%		
	Dr. Joy Marburger				\$1,484.74			
	Wendy Smith				\$3,703.61			
	EQUIPMENT PURCHASES AND MAINTENANCE				\$1,909.74	1%		
	SUPPLIES				\$20,598.08	9%		
	SERVICES (2 research contracts and Wildlife Society Symposium support)				\$4,731.56	2%		\$7,000.00
								Purdue U.
	PRINTING				\$323.00	<1% (0%)		\$800.00
								COSEE
	BUILDING REHAB AND MAINTENANCE				\$0.00	0%		
	OTHER ADMIN COSTS (e.g. GSA vehicle, etc.)				\$6,927.10	3%		
	ASSESSMENTS (Regional and park based)				\$0.00	0%		
	RESEARCHERS ASSISTANCE STIPEND PROGRAM				\$0.00	0%		
	PAC PROGRAMS AND TEACHER TRAINING				\$0.00	0%		
	PUBLICATIONS				\$0.00	0%		
	TOTAL				\$225,000.00	100%		\$7,800.00

Table 3. GLREC FY2007 Housing

Type of Housing	No. Researchers	\$ / Night @ # Nights	Total Cost	Equivalent Private Lodging	\$ / Night @ # Nights	Total Private Value	Savings to Researchers
House 1 (GLREC pays)	1 1	2@\$10.10/night 2@\$10.69/night	\$20.20 \$21.38	Hotel	4@\$75/night	\$300.00	\$558.42
House 1 (GLREC pays)	1 (research intern)	64@\$10.69/night	\$684.16	Hotel	64@\$75/night	\$4,800.00	\$4,115.84
House 2 (Researcher pays)	2	29@\$8.66/night	\$251.14	Hotel	29@75.00/night	\$2,175.00	\$1,923.86
House 2 (Researcher pays)	4	8@\$8.66/night	\$69.28	Hotel	8@75.00/night	\$600.00	\$530.72
House 2 (Researcher pays)	2	16@\$8.66/night	\$138.56	Hotel	16@75.00/night	\$1,200.00	\$1,061.44
House 2 (Researcher pays)	1	1@\$8.66/night	\$8.66	Hotel	1@75.00/night	\$75.00	\$66.34
Sleeping Bear Dunes NL (GLREC funded construction)	1	78@\$7.11/night	\$554.58	Hotel	1@\$120.00/night	\$9,360.00	\$8,805.42
Total	13		\$1,747.96			\$18,510.00	\$17,062.04

Other Savings to Researchers

Researchers and their support staff had access to kitchen and laundry facilities at INDU and to kitchen facilities at SLBE. Researchers from University of Illinois Urbana Champagne utilized the FRS laboratory for 11 days during the second spring- summer season to conduct their research. Besides using the equipment provided by GLREC, they had access to ultra-pure water to conduct their water and sediment analyses. The GLREC Research Coordinator provided support to University of Illinois researchers in developing a new analytical method for methyl mercury analysis. The FRS also provided researchers and students with office space and high-speed internet access. The GLREC Research Coordinator conducted oversight of the project permits, housing, lab use, and intern staff involved with the projects. The Research Coordinator assisted three researchers in grant proposal writing (described in text).

Tables 4a and 4b. FY2007 Facilitated Research Permits

LEVEL OF RLC INVOLVEMENT is ranked as follows:

0=no involvement

1=little or superficial involvement (e.g. communicate with researchers about projects via phone or email or at professional or in-park meetings)

2=moderate involvement (e.g. provide short term housing, participate in scientific meetings/workshops on research topic, facilitate communication of research results to managers or public)

3=significant involvement (e.g. provide long term housing – several weeks to months, provide computer access, actively solicit projects, co-write research proposals, focused effort to communicate research results to managers or the public)

*identifies research that helped to reduce park back-logged needs for resource management information.

Table 4a. GLREC FY2007 Approved/Active Permits at Indiana Dunes National Lakeshore

	Permit Number- Active	title/description	Level of RLC Involvement
1	INDU-2007-SCI-0012	a molecular, morphological and experimental assessment of the conservation status of American sea-rocket (Brassicaceae)	1*
2	INDU-2006-SCI-0018	a spatio-temporal study of methylmercury biogeochemistry in wetlands of the southern Lake Michigan watershed	3*
3	INDU-2007-SCI-0005	amphibian, reptile, fish and crayfish surveys in the miller woods subunit of the Indiana Dunes National Lakeshore	1*
4	INDU-2005-SCI-0016	assessing the potential homogenization of the vegetation of the western Great Lakes coastal dunes	1*
5	INDU-2006-SCI-0015	<i>Botrychium matricariifolium</i> occurrence in northwest Indiana	2*
6	INDU-2004-SCI-0008	determine occurrence and population distribution of rare plant species in INDU and collect voucher specimens of such species	0*
7	INDU-2007-SCI-0017	determining the effects of long-term nitrogen deposition on plant- mycorrhiza interactions at the Indiana Dunes National Lakeshore	2*

8	INDU-2007-SCI-0020	dispersal distribution curve of pollen and seeds of invasive plant species, <i>Typha</i> spp. (cattail) and <i>Phragmites australis</i> (common reed) using mathematical modeling , and molecular methods of parentage analysis	2*
9	INDU-2006-SCI-0002	do interacting microbial mutualists alter the invasibility of dune plant communities?	2*
10	INDU-2007-SCI-0007	dunes creek watershed management plan	0
11	INDU-2005-SCI-0004	ecological impacts of remediation at the Grand Calumet River superfund site: assessment of Great Blue Heron reproductive success	2*
12	INDU-2007-SCI-0013	ecology of invading blacklegged ticks in the Midwest	2*
13	INDU-2007-SCI-0019	effect of plant mating systems on the genetic architecture of quantitative traits for <i>Arabis lyrata</i>	2*
14	INDU-2007-SCI-0009	evolutionary genetics of self-incompatibility in natural populations of <i>Arabis lyrata</i> (family Brassicaceae)	1*
15	INDU-2006-SCI-0013	examining an invasive vine (oriental bittersweet) and its native congener: morphology, genetics, hybridization and fire effects	2*
16	INDU-2006-SCI-0020	examination of population characteristics of two state-listed (Indiana) <i>Carex</i> species within the pannes of the west beach unit of the Indiana Dunes National Lakeshore	0*
17	INDU-2003-SCI-0012	experimental restoration of oak-savanna in the Indiana Dunes National Lakeshore	3*
18	INDU-2006-SCI-0010	exploring mechanisms behind biological invasions: do microbes mediate plant invasion success by altering nutrient dynamics?	3*
19	INDU-2007-SCI-0010	feasibility of wood frog (<i>Rana sylvatica</i>) reintroduction in a restored flatwoods wetland in northern Illinois	1*
20	INDU-2006-SCI-0005	field methods for college biology students	3
21	INDU-2007-SCI-0008	Great Lakes inventory & monitoring network long-term vegetation monitoring	1*

22	INDU-2004-SCI-0005	gypsy moth survey	1
23	INDU-2007-SCI-0011	how far is too far? genetic consequences of seed provenance decisions in sedges (<i>Carex</i> : Cyperaceae)	2*
24	INDU-1994-SCI-0003	impact of air pollution on the fungi of Indiana Dunes National Lakeshore	2*
25	INDU-2005-SCI-0013	Indiana Dunes National Lakeshore herbarium	1*
26	INDU-2007-SCI-0015	Indiana dunes NL vegetation mapping project	3*
27	INDU-2007-SCI-0024	Indiana Emerald Ash Borer survey	0*
28	INDU-2003-SCI-0009	Kankakee Sands Efrogmson Restoration Project (KSER)	0
29	INDU-2007-SCI-0006	Karner Blue Butterfly controlled propagation, augmentation and reintroduction plan	3*
30	INDU-2007-SCI-0014	monitoring avian productivity and survivorship in Miller Woods	2*
31	INDU-2007-SCI-0003	Northern Indiana public service company (NIPSCO), Bailly Generating Station, RCRA facility investigation	3
32	INDU-2004-SCI-0017	persistance and dispersal patterns of <i>Galerucella</i> sp. at Long Lake, Indiana Dunes National Lakeshore	0*
33	INDU-2006-SCI-0019	Pines site remedial investigation	0*
34	INDU-2006-SCI-0017	probabilistic assessment of the Grand Calumet River and Indiana Harbor Canal area of concern with emphasis on development of delisting criteria	3*
35	INDU-2007-SCI-0023	re-monitoring of various rare plant species at Indiana Dunes National Lakeshore summer 2007 through summer 2008.	2*
36	INDU-2007-SCI-0018	sand dune succession rates	3*

37	INDU-2007-SCI-0008	shrubs and woody vines of Indiana	2*
38	INDU-2007-SCI-0001	sediment movement and deposition along south shore of Lake Michigan	3*
39	INDU-2005-SCI-0020	spatial and temporal effects of climate change on Great Lakes wetlands	1*
40	INDU-2007-SCI-0022	the impacts of inbreeding depression on species interactions	1*
41	INDU-2006-SCI-0021	the role of soil-borne pathogens in forest dynamics and disease	1*
42	INDU-2004-SCI-0016	part i) integrating long-term demographic data and repeated genetic sampling for viability analysis of natural and restored <i>Cirsium pitcheri</i> populations. (new) part ii) recovery plan and seed banking of <i>Cirsium pitcheri</i>	1*
43	INDU-2005-SCI-0017	long-term comparison of the demography and genetics of natural and restored populations of <i>Cirsium pitcheri</i> : can we create and maintain viable plant populations?	1*
44	INDU-2007-SCI-0004	water quality monitoring of inland lakes and streams (NPS I&M Program)	3*

Table 4b. FY2007 Recently Expired Permits at Indiana Dunes National Lakeshore

	Permit Number	Title/Description	Level of RLC
	Recent Expired FY2006		Involvement
1	INDU-2006-SCI-0012	Isolation of arbuscular mycorrhizae fungi from successional dune soil along the Indiana Dunes National Lakeshore	1*
2	INDU-2005-SCI-0006	Survey of submerged aquatic plants and associated invertebrates at Indiana Dunes NL	1*
3	INDU-2006-SCI-0022	Avian Influenza Surveillance Program	2*
4	INDU-2006-SCI-0015	<i>Botrychium matricariifolium</i> (G5 S2 SR, Indiana)occurrence in NW Indiana	3*
5	INDU-2004-SCI-0002	Collection of endangered butternut germplasm	1*
6	INDU-2006-SCI-0008	Dancing in the dark? Is there succession of arbuscular mycorrhizal fungal communities?	2*
7	INDU-2006-SCI-0016	Do symbioses determine plant species abundances? How endophytic fungi may control rarity, dominance, and invasiveness of grasses	2*
8	INDU-2006-SCI-0007	Effects of persistent pollutants on Great Blue Heron reproductive success	1*
9	INDU-2005-SCI-0007	Genetic diversity of <i>Sarracenia purpurea</i> : Restoration within Indiana Dunes National Lakeshore	3*
10	INDU-2006-SCI-0009	Karner Blue Butterfly controlled propagation, augmentation and reintroduction plan	3*
11	INDU-2005-SCI-0010	Mapping the vegetation and fuels of the Indiana Dunes National Lakeshore	1*
12	INDU-2005-SCI-0003	Mesocosm and field studies to determine the levels of heavy metals and nitrogen in pannes	1*
13	INDU-2005-SCI-0021	Mycorrhizal regulation of ecosystem response to chronic nitrogen deposition	1*

Table 5. GLREC FY2007 Communications

Type of Product or Event	Audience	Title of Product/Event	Program Objective	Number of Scientists Involved or Contributing	Type of Recipients, Benefactors, or Participants	Number of	Length of Event
	P=public					Recipients, Benefactors, or Participants	(hours)
	T=Teachers or students					(% signed as volunteers)	
	M= Mgmt or Staff					Note estimates w/ an *	
	S=scientists or professionals						
Conference Presentation	M,S	Research and Education: Making the Connection	Communicate GLREC mission and projects	4	Resource managers and scientists, formal and informal educators	100	0.5
Conference Presentation Poster	M,S	Hybrid cattail-threat to wetlands in National Parks	Provide current research results	4	Scientists, resource managers, formal educators	N/A	8
Conference Presentation Poster	M,P,S	The GLREC - linking research and outreach in Great Lakes National Parks	Communicate GLREC projects	1	Resource managers, scientists, formal and informal educators	N/A	16
Conference Presentation at Symposium	M,P,S	Research internships as a means to train future scientists	Training undergraduate and graduate students	4	Resource managers, scientists, undergraduate and graduate students	30	3
Conference Presentation (Symposium co-lead)	M,P,S	Citizen science supporting research objectives	Promoting public involvement with research and monitoring	5	Informal educators, resource managers, scientists	30	3
Conference: Indiana Dunes Research Forum	M,P,S, T	Provide current research information and facilitate research	Facilitate research in INDU and GLKN parks with partner organizations and universities	7	Researchers, resource managers, university educators, nonprofit organization staff	68	8

Workshop	T	Great Lakes Education Workshop Follow-up	Provide current information on Great Lakes Issues	1	Formal and informal educators	12	5
Tour	S	GLREC Field Research Station informal tour	Tour of GLREC Field Research Station	5	Scientists	5	2
Workshop	T	NAB the Aquatic Invaders	Use of website to involve educators and students in AIS projects	6	Primary and secondary school teachers	22	7.5
Workshop	T	Flying Wild	Provide educators with activities and information on bird banding and other educational activities	1	Formal and informal educators	16	3
Conference Presentation	M, P,S	Invasive Species	Provide research information on invasive species	3	General public, resource managers, scientists, educators	N/A	0.5
Booth	P	Great Lakes Research and Education Center display	Provide information about GLREC mission and USGS research	0	General public	300	32
Booth	P	Invasive Species	Provide information and educational tools	0	General public, teachers	600	5

Staff Training	M	GLREC update	Provide GLREC information to INDU interpretive staff	5	INDU interpretive staff	10	7
Workshop	M, T	Great Lakes Educator Workshop	Share research from Pictured Rocks Nat'l Lakeshore and provide topical educational activities	2	Formal and non-formal educators, interpretive staff	27	6
Conference Presentation	M,P,T	Invasive Species and Going Native	Share research on invasive species and provide topical educational materials	0	General public, managers, scientists	30	0.5
Workshop	T	Inquiry-based learning	Share research on deer populations and related activities	0	Formal and informal educators	12	16
Conference Workshop	T	Great Lakes Educator Workshop: Science Out of the Box	Share research from GLKN parks and present topical educational activities	5	formal and informal educators	45	1.75
Workshop	M, T	Great Lakes Educator Workshop	Share research from Indiana Dunes and present topical educational activities	2	Formal and informal educators, interpretive staff	18	25

Science Magazine on-line and other cutting-edge research abstracts	M,P,S,T	Current scientific research related to natural resources	Provide current research information via email	1	Network RM, RLC research coordinators, researchers	100	weekly
Current Contents Connect	M	Literature search capacity via website	increase availability of scientific literature to resource managers	N/A	License to 12 resource managers in the GLKN network	12 resource managers	N/A
University Seminar	S, T (university)	Research Opportunities in Great Lakes National Parks	Provide opportunities for research in the GLKN parks	2	Researchers, undergraduate, and graduate students	30	1.5
Conference Presentation/ Booth	T	National Science Teachers Assoc.	Provide information on invasive species	1	Educators, interpreters	45	1.5
Climate Change Bulletins	M,P	GLKN and Heartland parks	Share research and predictions of climate change effects on parks	0	Park staff, public	N/A	N/A

School program	T	Great Lakes Research- Then and Now	Provide information to public schools on research needs for national park management	5	High school students	15	5
Public Environmental Festival	M,P,T	Hybrid Cattails and <i>E. coli</i> : what do they really mean?	Provide research information; impacts to restoration and recreational water quality	3	Resource managers, public, teachers, students	55	1.5
Workshop	M,P,S,T	WETMAAP Workshop	Provide training in aerial photography interpretation and mapping, and use of associated websites	4	Informal educators, scientists, public, resource managers	17	20
Workshop	M,T	Application of oak savanna restoration in educational activities	Provide educational Information/activities	1	Educators, interpreters, resource managers, students	11	2

Table 6. GLREC FY2007 Partnerships

Partner Name	Level	Focus (education, research, restoration of historic structures)
	(national, regional, state, local)	
Alliance for the Great Lakes	regional	education
Brookfield Zoo	regional	education/research
Center for Ocean Science Excellence in Education	regional	education/research
Chicago Botanic Garden	regional	education/research
Chicago State University	regional	education/research
Chicago Wilderness (multi-partnership within)	regional	education/research
East Chicago Central High School	local	education
Field Museum of Chicago	regional	research
Friends of Indiana Dunes	local	education
Illinois-Indiana Sea Grant College Program	regional	education/research
Indiana Department of Natural Resources	state	education
Indiana Dunes Environmental Learning Center	regional	education
Indiana University NW, Bloomington	regional	education
Midwest Invasive Plants Network	regional	education/research
Northern Michigan University	regional	education/research
Northwest Indiana Invasive Plants Network	local	education
NW Indiana Teacher Training Hub	regional	education
Openlands Project	regional	education/research
Porter County Convention, Recreation, and Visitor Commission	local	education
Purdue University, Calumet, Lafayette, North Central	state	education/research
Region 5 Environmental Protection Agency	national	education/research
Save the Dunes Conservation Fund and Council	local	education
Shedd Aquarium	regional	education/research
Sierra Club	national	education
TalTree Arboretum	local	research
Texas A&M University	regional	education/research
University of Illinois Urbana Champagne	regional	research
US Environmental Protection Agency Region 5	regional	education/research
US Fish and Wildlife Service	national	education/research
USGS Lake Michigan Ecological Research Station	regional	research
USGS National Wetlands Research Center	national	research

Table 7. GLREC FY2007 Student Research Facilitated or Supported Through Permits*

Degree Being Sought	No. of students	Fields of Research	Research Topics	Types of Products
Post-doctoral Appointment	2	Plant Ecology, Microbial Ecology Mathematical Ecology	Microbial communities in wetlands; relationship to cattail invasions	Research publications
	1		Effects of microbial mutualists in exotic plant invasions of dunes Dispersal distribution modeling of two invasive plant species	Research publications
PhD	1	Microbiology Molecular Plant Genetics	Soil fungi regulation of ecosystem response to atmospheric nitrogen	Research publications
	1		Genetic diversity of pitcher plants	Research publications, Year in Review article (2006); Workshop presentations; restoration techniques
	1	Parasitology Restoration Ecology	Role of vertebrate hosts in spread of Lyme disease in IN and MI	Research publications
	1		Restoration of oak-savanna at Indiana Dunes NL	Demonstration site, presentations, publications
1	Biogeochemistry	Methyl mercury processing and bioaccumulation in wetlands in Indiana Dunes NL and the Grand Calumet region	Research publications, meeting presentations	
Post Master's	1	Plant Taxonomy	Population characteristics of two state-listed <i>Carex</i> (sedge) species in the pannes of Indiana Dunes NL	Research publications; restoration techniques
Master's	1	Molecular Ecology Biogeochemistry Plant Ecology	Microbial soil communities and relationship to sand dune succession	Research publications
	2		Mycorrhizal regulation of ecosystem response to chronic nitrogen deposit	Research publications
	1		Restoration of beach pea on shores of Indiana Dunes National Lakeshore	Report
Bachelor's: capstone	1	Geomorphology	Sediment and sand movement and deposition along the southern shore of Lake Michigan	Undergraduate student project; publications
Bachelor's	1	Biogeochemistry	Development of methyl mercury probes for water sampling in wetlands	Probes for M.S. student to deploy in Indiana Dunes NL wetlands
	3	Biogeochemistry	Mycorrhizal regulation of ecosystem response to chronic nitrogen deposit	Undergraduate student training

***Total number of students working on research projects through RPRS at INDU: 18**

Table 8. GLREC FY2007 Student Internship Program*

Degree Sought	Park	No. students	Fields of Research	Research Topics	Types of Products
Master's	APIS	1	Ecology	White-tailed Deer Browse Impacts to Forested Communities	Report and Park Presentation
	VOYA	1	Mammalogy	Beaver Population Dynamics	Beaver Suitability Model
	PRNL	1	Mammalogy	Tick Parasites of Fishers (<i>Martes pennanti</i>)	Data, Park Presentation
Bachelor's	INDU	1	Biology	Cattail Ecology, Earthworm Distribution	Report on Earthworms, Cattail
	ISRO	1	Mammalogy	Mustelid Survey (Scat Collection)	Data
	SLBE	1	Plant Ecology	Mapping Pitcher's Thistle Populations (endangered species)	Data, Refine Mapping Methods
Non degree (post B.S.)	SACN	1	Invertebrate Ecology	Inventory of Terrestrial Invertebrates (first one in park)	Presentation at Riverway Research Rendevous

***GLREC provided full or partial funding for internship program.**

Total number of students receiving training through the GLREC internship: 7

Appendix 2: Internship Summary

Introduction

The National Park Service initiated the Natural Resources Challenge in 1999. The Challenge resulted in the development of Research Learning Centers (RLCs) throughout the country. The RLCs increase the effectiveness and communication of scientific research in national parks by 1) facilitating use of parks for scientific inquiry; 2) supporting science-based decision making; 3) communicating current research information; and 4) promoting resource stewardship through partnerships. RLCs initiate, support, and implement a wide variety of research projects and provide opportunities for university students to work with researchers and park managers. The Great Lakes Research and Education Center (GLREC) initiated a university student internship program in 2005 to provide support for researchers and managers in the Great Lakes Network parks (GLKN). Among the 10 GLKN parks, seven participated in the program in FY2006-07.

Internship Funding

The GLREC allocated \$21,500 of FY 2006-07 budget for development of the internship program at seven parks. INDU conveyed funds to the MWRO for distribution to each of the other six GLKN parks. In February 2007 the Research Coordinator sent an announcement to each park for research proposals that related to the research needs of the park. The schedule for the interns' duty time varied by park needs. The announcement was advertised through the Great Lakes Northern Forest Cooperative Ecosystem Study Unit (CESU), RLC and national NPS websites, and the Society of Wetland Scientists. The resource management staff at each park selected the most qualified applicant for their park.

Products

Interns produced a report on the research and monitoring projects that they were assigned. Intern products included development of research equipment, reports, and oral presentations using Powerpoint™ to park staff and at conferences. Reports and Powerpoint™ presentations will be entered into NPS websites for managers and the public to view. Table 8 summarizes student background, projects, and products obtained through the internship. A survey questionnaire was emailed to both the resource managers and the interns to evaluate the success of the program. Resource managers were very pleased with the interns' qualifications and results and expressed strong interest in having the program continue.

Future Planning for GLKN Internships

The Great Lakes Research and Education Center played an important role in promoting student research opportunities in the GLKN parks. This effort benefited resource managers in providing needed field assistance, and provided students with a hands-on research and monitoring experience in the eight GLKN parks.

A RLC research internship program can provide a strategic link for conducting park science and meeting public education needs. The program can provide hands-on training of undergraduate

and graduate students for future natural resource manager positions in a real-world situation. Parks are “living laboratories” in which concepts can be tested in the field for improving park management. For example, a student could conduct experimental seed germination and propagation studies of various native plant species in order to develop better restoration techniques. Interns who are paid by the NPS can be trained by scientists and managers to help conduct research projects in the parks. Several of the projects were focused on monitoring activities rather than actual research. Resource managers in the participating parks recommended continuation of the program; however, future efforts should be more focused on actual research projects by teaming the student intern with a university or USGS researcher. The CESU network could be a point of contact to promote the research elements of the program.