

ANNUAL REPORT 2013

LACAWAC SANCTUARY



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About Lacawac

OUR MISSION

The mission of Lacawac Sanctuary is to preserve Lake Lacawac, its watershed, the surrounding forest and historic structures; provide a venue for ecological research, scholarly interaction and the training of scientists; provide public education on environmental and conservation issues; and conserve open space in Pennsylvania.

OUR PLACE

Lacawac Sanctuary, a nature preserve, ecological field research station and public environmental education facility located in the Pocono Mountains of northeastern Pennsylvania was founded in 1966. The most notable feature of Lacawac Sanctuary is Lake Lacawac - a 52 acre glacial lake preserved in almost pristine condition (totally free from development or encroachment). The Lake was declared a National Natural Landmark by the U.S. Department of the Interior in 1968. Lacawac features a natural boreal bog, the Wallenpaupack Ledges Natural Area, Partner Ridge, a native plants garden, demonstration forest/deer enclosure plots, and eight public hiking trails. At the heart of the Sanctuary is the National Historic Registered "Adirondack Great Camp" complex constructed in 1903 as summer residence and hunting lodge.

OUR VISITORS

Our vision is for every Field Station visitor to connect with our landscapes, biological diversity, and cultural history. Through their investigation, we hope visitors will develop a "sense of place" that fosters lasting stewardship of the region and of the environment in general. To accomplish this, we provide opportunities for visitors to immerse themselves in the area through experiential learning, research, and the practice of conservation.



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Research

RESEARCH PROPOSALS

- **Jennie Brentrup, PhD** student at Miami University. 1) *Linking high-frequency sensor data with a climate change index and 2) Combining automated sensors on buoys with in-situ experiments: Deciphering the response of aquatic food webs to increases in dissolved organic matter.*
- **David Byman**, Professor at Penn State Worthington-Scranton. *The effects of deer exclosures and forest management on cover dependent small mammals.*
- **Anita M. Collins**, former USDA scientist. *Survey of Native Bees of Lacawac Sanctuary.*
- **Sarah DeVaul**, PhD student at Temple University. *Temperature-driven Changes in the Community of Bacterivorous Protists in a Freshwater Lake..*
- **Kate Hackett**, undergraduate at Miami University. *Testing the climate forcing optical index.*
- **Bruce Hargreaves**, Professor at Lehigh University. *Hydrologic response of Lake Lacawac to climate change.*
- **Taylor Leach**, PhD student at Miami University. 1) *The role of ultraviolet radiation in the diel vertical migration of Daphnia and Copepoda across transparency and seasonal gradients: an experimental assessment of the Transparency-Regulator hypothesis, 2). Seasonal variation in diel vertical migration of zooplankton: How does changing driver strength impact DVM?*
- **Matthew Meeks**, undergraduate at Miami University. *Lake surface avoidance exhibited by Daphnia.*
- **Maria Moulton**, undergraduate at Miami University. *Horizontal Migration of Zooplankton and Possible Drivers of Movement.*
- **Joan Ramage**, Professor at Lehigh University. *A novel approach to snow wetness monitoring: validation of water content reflectometers in a snowpack and determining snowmelt runoff input into Lake Lacawac's water budget.*
- **Elizabeth Simpson** undergraduate at Cornell University. *Interactions between whitetail deer and earthworms in Northeastern forests.*

PUBLICATIONS AND THESES

- Jeffrey R Babb. 2013. Bridging the Gap between Public Visitors at Lacawac Sanctuary and Lake Researchers: Developing Outreach Materials on Advanced Environmental Sensors. Electronic Thesis or Dissertation. Miami University, 2013. <https://etd.ohiolink.edu/>
- Dave Byman*, Shannon D. Harding, and Francis W. Spear. 2013. Demographic effects of white-tailed deer (*Odocoileus virginianus*) exclosures on white-footed mice (*Peromyscus leucopus*). *The American Midland Naturalist* 170: 171-183. *Penn State Worthington Scranton
- Scott A. Fay*, Rebecca J. Gast, and Robert W. Sanders. 2013. Linking bacterivory and phyletic diversity of protists with a marker gene survey and experimental feeding with BrdU-labeled bacteria. *Aquatic Microbial Ecology* 71: 141-153. *Temple University
- Adam W. Heinze*, Corrine L. Truesdale, Sarah B. DeVaul, Jonathan Swinden, and Robert W. Sanders. 2013. Role of temperature in growth, feeding, and vertical distribution of the mixotrophic chrysophyte *Dinobryon*. *Aquatic Microbial Ecology* 71: 155-163. *Temple University
- Laura G. Leff*, Darren L. Bade, Jonathan Scaffidi, Craig E. Williamson, and Chris Woolverton. 2013. Environmental aquatic resource sensing: basic sciences, business education, and outreach. *Journal of Contemporary Water Research and Education* 150: 63-71. *Kent State University

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Engaged Learning

CLASS AND GROUP USAGE

Lacawac Field Station provides a center for ecological research on aquatic ecosystems and ecological observatory networks, and strives to provide an exciting, inviting, and collegial working and learning environment. During the year 2013, the following colleges and universities used Lacawac for teaching and learning:

- Miami University (Ohio)
- Drexel University
- Franklin and Marshall College
- Lehigh University
- East Stroudsburg University
- University of the Sciences in Philadelphia



- University of Pennsylvania
- University of Scranton
- Lackawanna College
- University of Oregon
- Wayne Highlands School District

ENVIRONMENTAL AND NATURE PROGRAMS

Lacawac Sanctuary hosted over 25 educational and nature programs during the months of June, July, August and September on the following environmental and biological topics:

- Birds of Prey
- Bald Eagles of the Upper Delaware
- Aquatic Research
- Lake Microorganisms
- Habitats
- Owls of Pennsylvania
- Imperiled Reptiles and Amphibians
- Bees
- Bears
- Birding
- Wild Mushrooms
- Nature Photography

CONFERENCES

Lacawac Ecological Observatory Workshop (LEOW)

The Lacawac Ecological Observatory Workshop brings together experts on buoy technologies, advanced ecological sensors, continental scale ecology approaches, and management/analyses of large ecological datasets to train students and early career faculty on these cutting-edge approaches in ecology. First held in 2012, LEOW has welcomed a diverse group of participants from many countries and states across the US. Many leaders in the EONs (ecological observatory networks) have presented at LEOW representing many different EONs including NEON (National Ecological Observatory Network) and GLEON (Global Lake Ecological Observatory Network).

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LEOW 2013 took place June 26 – 29, 2013. Thirty three (33) participants attended the conference from 3 countries and 15 institutions: Bard College, Bloomsburg University, CONICET – Argentina, East Stroudsburg University, Fairfield University, Kent State University, Lehigh University, LimnoTech, Miami University, NEON Inc, Precision Measurement Engineering, Uppsala University – Sweden,

University of Nebraska-Lincoln, University of New Mexico, and University of Wisconsin

Lacawac Ecology Conference (LEC)

The Lacawac Ecology Conference began in 2012 and is held annually at the end of September. The conference is designed to bring together regional scientists. LEC gives scientists at all levels from undergraduate to PhD-level an opportunity to discuss research ideas in an informal setting and to build new collaborations in the Northeast region.

LEC 2013 took place September 27-28, 2013. The conference had 18 participants from 11 institutions: Cornell University, East Stroudsburg University, Franklin and Marshall College, Lehigh University, Lycoming College, Miami University, Misericordia University, Penn State Worthington Scranton, Vassar College, Wilkes University.



The Keynote Speaker was Dr. Lynn Christenson from Vassar College who presented on Cascading effects of climate change on forest ecosystems: Biogeochemical links between moose and trees.

INTERNSHIPS

- Devyn Riley, undergraduate at Miami University
- Kristine Wasco, undergraduate at Bloomsburg University

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Highlights and Developments

ENVIRONMENTAL RESEARCH AND EDUCATION CONSORTIUM

Lacawac Sanctuary Foundation, Miami University (Oxford Ohio), the Academy of Natural Sciences of Drexel University and Drexel University announced in the Fall 2013 an agreement to form an environmental research and education consortium at Lacawac Sanctuary, a popular National Natural Landmark and ecological field research station in the Pocono Mountains. The consortium will build on existing partnerships with leading universities and will focus on cutting-edge global climate-change and water-quality research. The agreement coincides with plans to construct a new research laboratory at Lake Lacawac, a 13,000-year-old pristine lake that forms the heart of Lacawac Sanctuary in northeastern Pennsylvania.

Miami University in Oxford, Ohio, and Drexel University in Philadelphia have been key partners in developing the consortium concept, which will specifically focus on global climate-change issues and water-quality research. The consortium builds on the partnership between Miami University and Lacawac that has existed for the past several years. The Consortium will also be an opportunity to partner with local school districts seeking educational and career pathways for their students interested in environmental sciences.

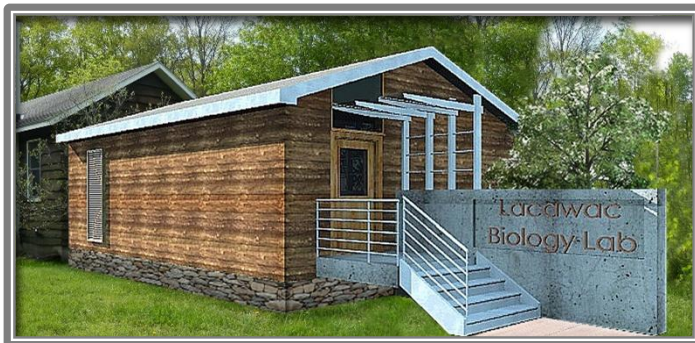


THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY

It is Lacawac's intent to focus on generating accurate and un-biased scientific data and analyses and informing the public of the results. As these studies relate to public policy, Lacawac is committed to a neutral and un-biased perspective regarding water quality and land-use issues and will expect its member organizations to remain balanced and objective as well, Lawrence said.

NEW BIOLOGY LABORATORY

A recent grant in the amount of \$329,000 from the National Science Foundation (NSF) to create a year-round aquatic optical analysis laboratory at Lacawac Sanctuary will enhance Lacawac's role as a resource for research and training for national and global ecological observatory networks.



The lab will help researchers carry out independent research on natural glacial lakes at Lacawac- a 'hub for EONs – ecological observatory networks. Analytical laboratory space and optical instruments provided by grant funds will allow scientists to train students and faculty on emerging sensors, sensor deployment platforms such as buoys and other EON approaches.

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Financial Statements

REVENUE AND SUPPORT

Contributions and Memberships	\$48,111
Grant Income	\$21,000
Fund-Raising Events	\$7,944
Lodging and Facility Usage Fees	\$29,052
Program Income	\$5,771
Gift Shop Sales	\$222
Interest and Dividend Income	\$16,345
Net Realized & Unrealized Gain (Loss) on Investments	(\$16,946)
Other	\$82
Items Released from Restriction	\$0
Total Unrestricted Income	\$111,581

EXPENSES

Program Services	\$111,813
Management and General	\$22,499
Fundraising	\$10,543
Total Operating Expenses	\$144,855

Net Increase (Decrease) in Net Assets	(\$33,274)
Net Assets – Beginning Year	\$4,211,968
Net Assets – End of Year	\$4,178,594

Where Lacawac is headed

RESEARCH AND INCREASED AWARENESS

Lacawac Sanctuary strives to enhance its national reputation as a field station that facilitates meaningful discovery in the natural sciences and serves as a training ground for field research. Monitoring and conservation-focused research will contribute to a more fuller understanding of our ecosystems and environmental change through published works, conferences and other means. Our goals for the upcoming years including attracting new and established scientists and foster a stronger field station culture; increase resources for the research program; enhance Lacawac's reputation as an institution that helps to launch the careers of new scientists; integrate field station research with educational programs; and organize more scientific workshops.

Lacawac Sanctuary Biological Research Station is recognized as a "**Hub for EON's**" (ecological observatory networks) that promotes and facilitates high quality training, research, and scholarly interaction in the development and application of advanced ecological sensors to understand ecological processes ranging from the local to the regional and global scales. The field station provides a physical facility for EON-related work, and runs workshops and conferences to bring faculty and student researchers together around key EON issues. Novel advanced sensor arrays, networks of people and instruments, and advanced cyber infrastructure are used to address key grand challenges in macrosystems ecology. At the core of our philosophy is to provide hands-on research and educational opportunities for students ranging from undergraduates to postdoctoral fellows as well as faculty and staff.

EDUCATION

Lacawac's educational programs are designed to increase general and scientific knowledge and love of nature through field-based activities and presentations for students, teachers, members, and the community. We strive to provide the public with an appreciation and understanding of how the natural world works. Our goals are to increase our year round programs for children and adults; become a valued environmental educational resource for schools and teachers; make the educational program fiscally self-sustaining; and help the local economy by hiring local individuals to serve as educators.

ENVIRONMENTAL RESEARCH AND EDUCATION CONSORTIUM

The Consortium informs of research opportunities, encourages collaborative research among members, strengthens collective capacity, offers research awards for projects, and communicates relevant research findings in order to highlight Consortium member activity. The Consortium develops interdisciplinary collaborative research projects; enhances undergraduate and graduate research opportunities; collaborates on joint funding applications; and organizes scientific workshops and conferences.

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The Consortium will work to unite members to develop programs that bring participants together to engage not only in traditional teaching practices, but also devise and execute innovative, cutting-edge, field experiences in the ecologically and economically important upper Delaware watershed.

RECREATION AND PUBLIC OUTREACH

Lacawac's recreational and outreach programs are designed to increase general knowledge and love of nature; promote healthy outdoor activities and continue the close relationship between the Sanctuary and the local community by providing access to our land and allowing enjoyment of the natural beauty of Lacawac. Our goals are to encourage a more meaningful use of Lacawac through scheduling guided and interpretive walks and other activities throughout the year; increase the capacity of staff and volunteers to maintain trails; and make the recreational programs fiscally self-sustaining.

ADVANCEMENT




Lacawac Sanctuary Foundation is a 501(c)3 charitable organization. Sources of funding include membership donations, public and private grants, and income from programs fees and facilities rentals. Our goals are to create the capacity to meet operational challenges, diversity revenue streams; maintain and strengthen financial stability; cultivate partnerships; and engage members, supporters and others through outreach.



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