

Up to \$100 continued

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We make every effort to ensure all KBS donors are recognized in our annual report. If you believe your name has been omitted in error, please contact our Development office at 269-671-2444.

W.K. KELLOGG BIOLOGICAL STATION

ANNUAL REPORT 2011-2012

MICHIGAN STATE
UNIVERSITY

Dear Friends and Neighbors,

This has been an exciting and challenging year at KBS. It gave us an opportunity to reflect on our priorities and to chart a course for the future that enhances our role as an academic unit of Michigan State University and strengthens our connections to the community.

We devoted considerable time this year to preparing a review of our academic program for the Deans and Provost—a process required of all MSU units every seven years. The effort allowed us to pull together data on what we do at KBS (as individuals and as an MSU unit) and to share with University leaders our accomplishments and vision for the future. The report shows that KBS scientists are world leaders in research addressing important societal challenges related to climate change, sustainable food systems, conservation of biodiversity and related environmental issues. We are also leaders in training students to help society meet these challenges.

We have modified our Academic Mission statement to better reflect who we are as a faculty and the scope of the work we do: **The mission of the W.K. Kellogg Biological Station (KBS) is to increase our understanding of natural and managed ecosystems and their linkages to society.** This will maintain our focus on basic research in ecology and evolutionary biology, and pursue, in partnership with others at MSU, research to address ecological challenges requiring multidisciplinary efforts. Too, it honors the goals and vision of W.K. Kellogg, who gave property that laid the foundation of KBS to Michigan State College in the 1920s.

We are committed to training the next generation of scientists and are expanding partnerships in science and math education. In collaboration with a newly established National Science Foundation Center at MSU (BEACON), we work with high school students and teachers to show how evolutionary biology relates to engineering (and vice versa). This summer, more than 30 Detroit-area high school students came to KBS to do field research and computer analysis. We are also developing tools to help teachers explain the importance of evolutionary biology in a changing world.

While we celebrate these new initiatives, we are renewing our longstanding commitment to maintaining the legacy of W.K. Kellogg. The W.K. Kellogg Foundation awarded MSU a \$1 million 'challenge grant' to establish an endowment. This endowment will allow us to preserve and enhance the building and grounds of the Kellogg Estate, provide funds for student internships, and expand opportunities for future generations to enjoy this gracious and beautiful property.

On a sadder note, a significant change at KBS this year was the departure of the MSU Extension Land & Water Unit and Extension staff from our campus. The move was driven by the need for Extension to strengthen its presence in counties and to establish better connections with statewide programs. While we are sorry to see our Extension colleagues leave KBS, we are developing new partnerships with Extension to expand the impact of our research programs.

You will find in this report more information about the exciting ways we are fulfilling our new mission, and investing in ways to share our work with the public. Contributions from all of you help to ensure we continue as a nationally recognized research institute and point of pride for the University and this community. ☺



Katherine L. Gross
Your neighbor and KBS Director

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On the Cover

The morning sun rises over wheat fields at the KBS Long-term Ecological Research (LTER) site in Hickory Corners, MI. For almost a quarter century, KBS LTER scientists have sought ways to make agriculture more profitable while simultaneously providing environmental benefits. Their discoveries related to crop management practices, landscape biodiversity, soil microbes, clean water and other topics are making important contributions to the global field of climate change research. One recent KBS LTER study developed a tool to help farmers reduce use of nitrogen fertilizers—a contributor to greenhouse emissions—and participate in international carbon markets.

Learn more about the KBS LTER online at lter.kbs.msu.edu/.

Cover photo by Julie Doll. Inset cover photo by NASA.

KBS Administration Office

3700 East Gull Lake Drive
Hickory Corners, MI 49060
269-671-5117
director@kbs.msu.edu

KBS Conference Center

3700 East Gull Lake Drive
Hickory Corners, MI 49060
269-671-2400
conference@kbs.msu.edu

Kellogg Bird Sanctuary

12685 East C Avenue
Augusta, MI 49012
269-671-2510
birdsantuary@kbs.msu.edu

Kellogg Farm & Pasture Dairy Center

10461 North 40th Street
Hickory Corners, MI 49060
269-671-2509
kelloggfarm@kbs.msu.edu

Kellogg Manor House

3700 East Gull Lake Drive
Hickory Corners, MI 49060
269-671-2400
manorhouse@kbs.msu.edu

www.kbs.msu.edu



Endowment Established for Manor House & Estate

Thanks to a generous, \$1 million gift to MSU from the W.K. Kellogg Foundation, an endowment established this year ensures the W.K. Kellogg Manor House and Estate on Gull Lake will be maintained in perpetuity for the education and enjoyment of future generations.

Endowment funds will be used to maintain and enhance the historic buildings and grounds of the estate built in 1925-26 as a summer residence for W.K. Kellogg and his family.

The endowment also provides support for student internships. Interns will undertake projects to expand property use and develop programs showcasing the Estate's history and the life of W.K. Kellogg, founder of the Kellogg Company and the W.K. Kellogg Foundation.

Each year, about 8,000 people visit the Manor House for tours, school outings, lectures by visiting scholars, special events, business meetings, weddings and celebrations. The endowment allows KBS to continue to keep the Manor House and Estate open for all to enjoy.



Many thanks to the nearly 200 active volunteers who make our educational outreach programs possible.



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Developing Tools to Curb Greenhouse Gas Emissions

Every farmer knows corn needs nitrogen to grow, but knowing how much fertilizer to add to realize the highest benefit without harming the environment is a challenge. When fertilizer is added in larger amounts than crops can fully absorb, the excess nitrogen can infiltrate groundwater and move into rivers and lakes, disrupting these ecosystems. Excess nitrogen in soils can move into the atmosphere as nitrous

oxide (N₂O), a greenhouse gas with 300 times the atmospheric warming potential of carbon dioxide (CO₂). Agriculture accounts for almost 70% of all nitrous oxide emissions from human activity.

A team of MSU scientists based at KBS's Long-term Ecological Research (LTER) site, working jointly with the Electric Power Research Institute (EPRI), have developed a tool that could reduce N₂O emissions from agriculture while maintaining crop yields and reducing costs for farmers. A methodology they created provides a way for farmers to calculate the climate change benefit of reducing nitrogen fertilizer inputs, and participate in existing

and emerging carbon markets, such as the American Carbon Registry and the Verified Carbon Standard.

The KBS research team was led by G. Phillip Robertson, a KBS crop and soil scientist, and Neville Millar, a KBS research associate and lead author.

Read the study.
americancarbonregistry.org/carbon-accounting/msu-epri-methodology-v1

Evolution, Climate Change and Flying Jewels



Anyone passing by a Michigan stream in summertime might see a vibrant flash of green with fluttering dark wings—the dance of the Jewelwing Damselfly. Idelle Cooper, a postdoctoral researcher working at KBS with Dr. Thomas Getty (Zoology), is studying the evolution of color variation in damselfly species found in Michigan, Canada and Hawaii. Idelle found that damselflies vary in color over their range, affecting survival and mate choice. In Hawaii, for example, bright red pigment acts as a sunscreen for the insects by protecting them from harmful ultraviolet radiation. In Michigan, wing pigmentation of Jewelwings helps in species recognition for mating.

The colors we see in damselflies today are due to past evolutionary pressure. Will these color patterns change in response to predicted changes in the North American climate? Studying these beautiful insects may provide a better understanding of how evolutionary processes shape the distribution and abundance of species in a changing world. Idelle's research is funded by BEACON, a National Science Foundation (NSF) Science and Technology Center, headquartered at Michigan State University. ☘



Cultivating Global Problem-Solvers

Investing in the future means engaging students early in research. This year, KBS expanded a novel undergraduate research program piloted in 2011: the Undergraduate Research Apprenticeship (URA) program.

Designed to sharpen scientific inquiry skills in undergraduate students with little or no previous research experience, the program partners undergraduates with graduate student mentors for project-based study. URAs work as part-time research assistants and take one or more courses at KBS over the summer. They participate in seminars where they learn about science careers, graduate school and how to communicate science to different audiences. Because URAs are in residence at KBS over the summer, they meet and exchange ideas with faculty and fellow students from around the world. In addition to a stipend, URAs receive tuition and housing scholarships covering most of their summer-study expenses. KBS graduate students, in turn, receive the benefit of part-time field assistants and gain experience in advising and mentoring students in research.

In 2012, fifteen undergraduate students participated in the URA program at KBS – most from MSU, but some from smaller schools where research opportunities for students are limited. The scope of the program may grow in the future to involve students interested in education and journalism.

Funding for the URA program comes from KBS endowed scholarship funds, education grants, faculty research grants and MSU.



Communicating about Climate Change: Is it Getting Hot in Here?

Researchers in KBS's Long-term Ecological Research (LTER) program have studied the climate impacts of various cropping systems for decades. Communicating these results to different audiences, however, can be challenging.

This year, Julie Doll, KBS LTER education and outreach coordinator, hosted two climate change communication workshops at KBS. The workshops brought together scientists, journalists and Extension educators from across the Great Lakes region. They focused on training participants how to communicate effectively, to a range of audiences, the causes and consequences of climate change in their communities.

The first workshop, organized in collaboration with MSU Extension, attracted Extension educators from every programming area. The educators attended lectures, participated in group discussions, and met with a local journalist to learn how to communicate complex scientific issues in a clear and nonthreatening way.

The second workshop was organized in collaboration with the MSU Knight Center for Environmental Journalism and the Society of Environmental Journalists. Journalists and scientists spent three days at KBS learning about ongoing research, interacting with each other and pitching story ideas. They discussed in depth the challenges and opportunities scientists and journalists face in communicating climate change science.

Both workshops highlighted the importance and value of new partnerships and collaborations. ☘



Continuing the Kalamazoo River Cleanup

Steve Hamilton, KBS professor of ecosystem ecology and biogeochemistry, remains involved as a scientific advisor in remediation efforts following the Enbridge pipeline rupture at Talmadge Creek, near Marshall, MI, in June 2010. According to the Environmental Protection Agency (EPA), oil spill response workers have to date collected over 1.1 million gallons of oil and about 200,000 cubic yards of oil-contaminated sediment and debris from the Kalamazoo River system.

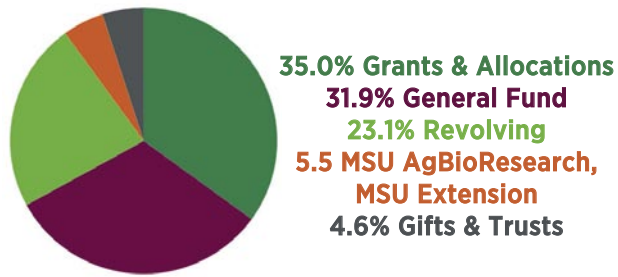
Hamilton was involved early on, providing advice to the EPA and Enbridge on the cleanup. He now serves in a scientific advisory group guiding the effort. Hamilton's work on this project has been the focus of national media interviews with NPR, the Canadian Broadcasting Corporation, and Mother Jones magazine.

Micaleila Desotelle, one of Hamilton's doctoral students, had been monitoring insect communities in the Kalamazoo River for several years before the Enbridge spill occurred. Her background data has become a key contribution to the remediation process. Micaleila is examining how stream insects responded to the spill and is monitoring their recovery. Assisted by students from Kalamazoo College and the Kalamazoo Area Math and Science Center, she investigates the ecological effects of submerged oil on insects living in the river bottom.

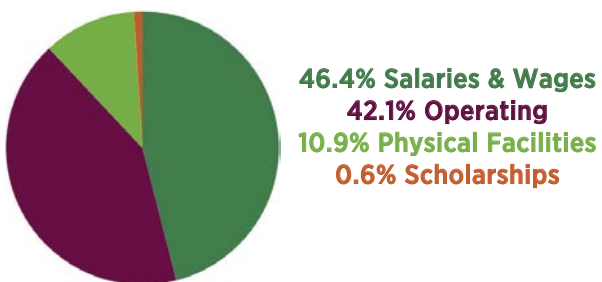
Micaleila has presented her research in national forums, including the annual meeting of the Society for Freshwater Science. At the most recent INTECOL International Wetlands Conference, she presented her work in a session that included researchers studying the effects of the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.

FY 2011-12

Sources of Support \$10.4 Million



Expenditures \$9.7 Million



Scholarships and Awards

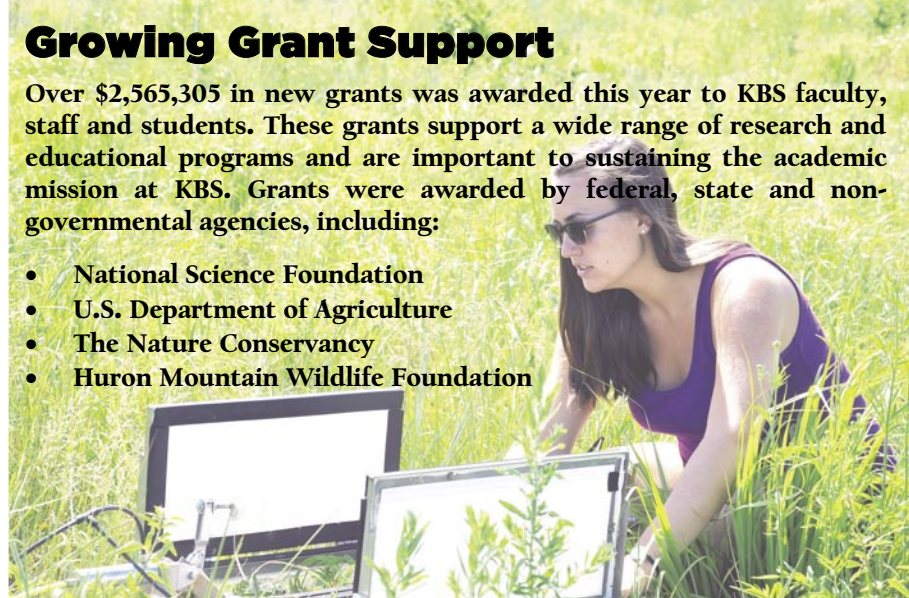
Thanks to generous support from donors and a number of MSU programs, over \$95,000 in financial assistance was provided to 65 students at KBS this year. Students came to study or participate in research experiences such as the Undergraduate Research Apprenticeship (URA) program. These funds supplemented grant-supported programs such as Research Experiences for Undergraduates (REU), which this year brought nine students from across the U.S. to work with faculty and post-doctoral researchers at KBS. Grants were also awarded to students to take specialty courses or to conduct research at KBS.

Support for these scholarships and awards came from endowed scholarships, the Colleges of Agriculture and Natural Resources, Natural Sciences, and the Graduate School of MSU.

Growing Grant Support

Over \$2,565,305 in new grants was awarded this year to KBS faculty, staff and students. These grants support a wide range of research and educational programs and are important to sustaining the academic mission at KBS. Grants were awarded by federal, state and non-governmental agencies, including:

- National Science Foundation
- U.S. Department of Agriculture
- The Nature Conservancy
- Huron Mountain Wildlife Foundation



Facility Upgrades and Enhancements

Support from grants and donors enabled KBS to update and improve facilities for researchers and guests. Many improvements made this year enhance the technological infrastructure at KBS, increasing speed and capacity in internet connections. Major projects completed this year include:

- Upgrade of the KBS wireless system, with new hardware supporting expanded wireless internet accessibility at outlying field sites and laboratories.
- Creation of a second video conference room in the Academic Building to meet growing demand for video conferencing with campus-based and other collaborators, reducing travel time and costs.
- Construction of a new field laboratory to support research at the Pasture Dairy Center.
- Installation of an energy-efficient lighting system along walkways throughout the lakeside campus to increase safety for researchers and guests.



Academic Center

- More than 100 students from eight countries participated in summer research experiences at KBS. A new course in Aquatic Entomology, taught by world leaders in the field, attracted students from across the U.S.
- Dr. Elena Litchman (Zoology) was selected for a Presidential Early Career Award for Scientists and Engineers (PECASE), one of 94 scientists recognized nationally. Dr. Jeff Conner (Plant Biology) was elected a Fellow of the American Association for the Advancement of Science (AAAS). Dr. Chris Klausmeier (Plant Biology) was awarded a Marie Curie Fellowship to support a year-long sabbatical in Denmark.
- "Evolution in Action," a research center at MSU funded by the National Science Foundation, brought 30 Detroit-area high school students to KBS to learn how engineering can be used to address questions in evolutionary biology.

Kellogg Bird Sanctuary

- The Thomas E. Dvorak Memorial Bridge was dedicated in October 2011, allowing for the reopening of a popular lakefront trail and providing better access for visitors using wheelchairs and strollers.
- A new, 1.5-mile Lake Loop trail opened in May 2012, offering Sanctuary visitors passage around Wintergreen Lake and the opportunity to explore a greater variety of forest and shoreline bird habitats.
- In partnership with MSU Extension, the Sanctuary piloted a new summer camp experience for 7th and 8th graders, "Wet and Wild Leadership Camp." Participants gained leadership skills while learning about water quality and conservation.

Kellogg Farm and Pasture Dairy

- A USDA-funded grant allows KBS researchers to study how conventional and organic farm management impact soil quality and greenhouse gas emissions. The research extends ongoing work at the KBS LTER focusing on ways farmers can manage their lands to improve the environment while maintaining high crop yields.
- A workshop on how to design and construct LEED-certified dairy and livestock facilities was held at KBS for livestock producers, architects and others interested in green farm facilities. KBS personnel shared insights gained from the construction of the Silver LEED-certified barn and milking parlor at the Pasture Dairy Center.

Kellogg Manor House

- Restoration was completed on the Manor House's collection of Baroque-era Flemish tapestries. The tapestries are each more than 400 years old and hung in the house when Mr. and Mrs. Kellogg lived there in the 1920s-40s.
- A Historical Walking Tour guide, developed by a student intern, welcomes visitors to the KBS grounds by providing information about the Estate's original buildings and gardens.
- The Rose & Thistle Garden Club sponsored Garden Education Day, at which local business owners, farmers, and Master Gardeners shared expertise on planting and maintaining different types of gardens.

You can help:
kbs.msu.edu/giving




New Colleagues



KBS welcomes **Jacqueline Bancroft** as Conference Center manager. Jackie brings over 20 years of hospitality industry experience to KBS, having most recently worked as general manager of IHG's Candlewood Suites hotel facility at Chicago's O'Hare Airport.



MSU graduate **Lisa Duke** (B.S., Zoology) joins the Kellogg Bird Sanctuary staff as the animal care technician. Lisa comes to KBS from Binder Park Zoo in Battle Creek, where as Lead Zookeeper she managed animals used in educational programming.



MSU alum **Howard Straub III** (B.S., Animal Science) joins the Kellogg Farm team as the manager of the Pasture Dairy Center. Howard came to KBS from Fredericktown, Ohio, where he owned and operated an organic farm and dairy and a custom hay harvest company.