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Serafino's  
Stovall Products  
U.S. Department of Agriculture  
U.S. Environmental Protection Agency

### KBS Volunteers

Volunteers continue to be an integral part of KBS. We are thankful for the talents and many hours they share with us.



Share the Harvest



Manor House Tour

**MICHIGAN STATE**  
**UNIVERSITY**

**W.K. Kellogg Biological Station**

A Legacy of Conservation; A Commitment to Sustainability

*2010—2011 Annual Report*



RESEARCH



EDUCATION



OUTREACH



## MICHIGAN STATE UNIVERSITY

Dear Friends and Neighbors,

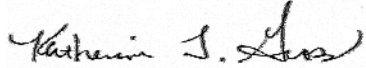
I am excited to share with you highlights of the past year at the Kellogg Biological Station (KBS). We have several new research projects funded this year and expanded programs to provide undergraduate students with research-focused educational experiences. Important improvements made in our facilities increased functionality for research and education and enhanced public access and the enjoyment of KBS.

All of this is possible because of grants awarded to our faculty and the support we receive from you! We have a growing list of partnerships with businesses, community groups and foundations. Individual donations are also important and play a key role in our capacity to better connect what we do at KBS with issues of local concern.

Highlighted in this report are a few of the growing partnerships between KBS researchers and community groups. These community partnerships are an exciting way for us to involve the public in research and increase awareness and understanding of local environmental issues. Projects developed this year include research on water quality in Gull Lake and the surrounding watershed, restoration of native grasslands, and improving access to the Manor House.

We hope you find in this report many reasons to support KBS and will show that support by making a financial contribution to one (or more!) of our programs. Contributions from all of you are important in allowing us to provide unique experiences for everyone who comes to KBS and continue our *Legacy of Conservation and Commitment to Sustainability!*

Thank you for your support,



Your neighbor and KBS Director



**W.K. Kellogg  
Biological Station**  
www.kbs.msu.edu

### Director's Advisory Board

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Dr. David Dvorak  
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Mary Jo Hawk  
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Dr. Russell Mawby  
Carole Mendez  
Dr. William Uggen

### KBS Mission

To develop programs in research, education and outreach directed toward a comprehensive understanding of terrestrial and aquatic ecosystems and the conservation of natural systems. 🌱

### Cover Photo

Trumpeter Swans in flight over Winter Green Lake at **Kellogg Bird Sanctuary**. Great Lakes explorers noted the abundance of Trumpeter Swans, the world's largest waterfowl, in this area as early as 1701. However, by 1885 the birds were eliminated from Michigan. These large, slow moving birds were hunted in large numbers for their eggs and feathers which were prized in Europe for home and ladies' fashion. The destruction of wetlands and marshes required for nesting and feeding and competition with the Mute Swan, introduced from Europe, contributed to the decline of the Trumpeter Swan in North America.

Efforts led by the Kellogg Bird Sanctuary staff working with state and federal agencies, Consumers Energy, two Native American tribes, several zoos and private citizens resulted in a successful restoration of these birds to the Great Lakes region. The Great Lakes population is now estimated to be nearly 10,000 birds. 🌱



### KBS Administration Office

3700 East Gull Lake Drive  
Hickory Corners, MI 49060  
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director@kbs.msu.edu  
www.facebook/pages/Kellogg-Biological-Station

### KBS Conference Center

3700 East Gull Lake Drive  
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conference@kbs.msu.edu

### Kellogg Bird Sanctuary

12685 East C Avenue  
Augusta, MI 49012  
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birdsantuary@kbs.msu.edu  
www.facebook/MSUKelloggBirdSanctuary

### Kellogg Farm and Dairy Center

10461 North 40th Street  
Hickory Corners, MI 49060  
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www.facebook.com/pages/Kellogg-Farm-and-Dairy

### W.K. Kellogg Manor House

3700 East Gull Lake Drive  
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www.facebook.com/wkkelloggmanorhouse

### MSUE Land & Water Unit

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landandwater@kbs.msu.edu

[www.kbs.msu.edu](http://www.kbs.msu.edu)

## Continuing the Legacy

### New Scholarship Honors Patricia A. Werner's Passion for Field Ecology Studies



Dr. Patricia A. Werner, an internationally recognized plant population ecologist, educator, and science administrator, has established a new scholarship to support undergraduates at KBS. Pat earned her doctorate from MSU in 1972, and was on the KBS faculty from 1973-1987, before leaving for a career in science administration that took her to Washington, DC, Florida and Australia, where she now lives.

She credits the experiences and lessons learned in field studies at KBS as the shaping force for her life's work, and that of her students. Throughout her career she inspired many students with her passion for testing ecological theory on the processes structuring plant communities and how this can guide better management.

This scholarship honors her passion for sharing knowledge by helping KBS provide hands-on field experiences to undergraduates as a vital complement to their classroom and lab studies.

To make an on line donation, visit  
<http://bit.ly/p45QR3>. 🌱

### Thank you for your gift to KBS... (through June 30, 2011)

#### \$30,000 and Up

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Dr. George Lauff  
Dr. Patricia A. Werner

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Joseph C. and Karen S. Seelig

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Lauren M. and Skyler B. Tripp

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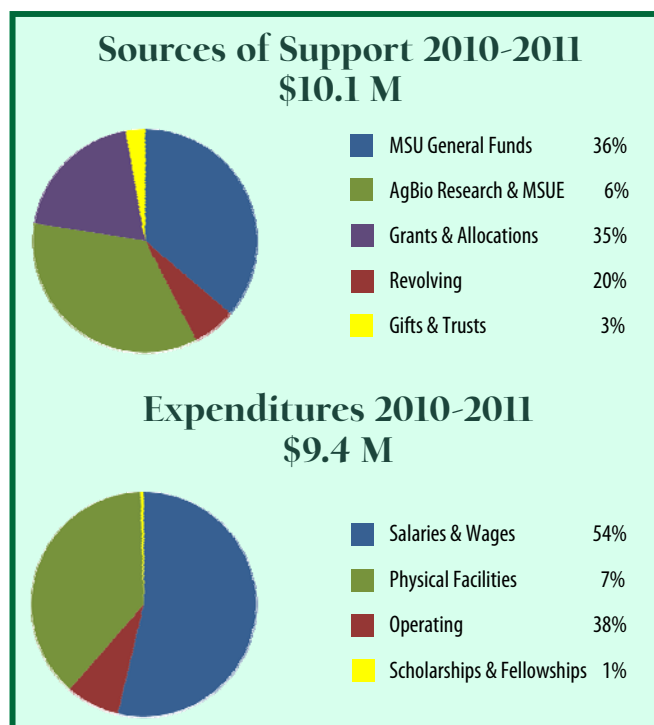
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## Academic Grants Received

Over **\$7.9 million** in new grants were awarded to faculty, staff and students this year. 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 both federal, state and non-governmental agencies, including:

- Electric Power Research Institute (EPRI)
- MI Department of Energy, Labor and Economic Growth (DELEG)
- National Science Foundation (NSF)
- U.S. Department of Agriculture (USDA)
- U.S. Environmental Protection Agency (EPA)



## Facility Upgrades


Support from federal grants, donors and MSU programs to enhance technology enabled KBS to update and improve facilities. These improvements increased energy efficiency and reduced costs, strengthening our commitment to sustainability:

- Built a second greenhouse to accommodate expanding research.
- Installed new KBS directional and information signs.
- Upgraded climate control system in Academic Building.
- Installed back-up generators at Experimental Pond and Plant Ecology Labs.
- Furnished Carriage House apartment to provide visiting scholar and guest housing.
- Improved entry and access to the Kellogg Manor House.


## Investing in the Next Generation

### Student Research and Internships

Thirty-six undergraduate students from MSU and 17 other institutions gained hands-on research and professional experience at KBS in 2011. These students worked on projects ranging from scientific research in ecology and mathematics to public outreach and marketing.

Fourteen students were funded on Research Experiences for Undergraduate (REU) programs to work with KBS faculty supported by grants from NSF, the KBS LTER, Great Lakes Bioenergy Research Center (GLBRC) and Bio/computational Evolution in Action CONsortium (BEACON). An additional ten students worked as Undergraduate Research Apprentices, a program that combines coursework and research experience for students early in their careers. 

### Scholarships

Over \$90,000 in scholarships was awarded this year to graduate and undergraduate students to support their participation in research and education opportunities at KBS. Funding came from endowed scholarships the College of Natural Science (CNS), College of Agriculture and Natural Resources (CANR) and the Graduate School of MSU. 



## Academic Center

- More than 200 students from 11 countries came to KBS this year to take courses or workshops. A new course, *Adaptive Dynamics in Ecology and Evolution*, attracted advanced ecology and biomathematics graduate students, postdoctoral researchers and faculty to KBS to learn new computational techniques and tools.
- Funding from a National Science Foundation (NSF) grant supports collaboration between KBS faculty, graduate students and K-12 teachers to study the ecology and environmental impacts of cellulosic biofuel crops. The grant continues the successful K-12 partnership KBS established over the past decade with 12 local rural school districts.
- SpartaNature brought more than 140 incoming MSU freshman to KBS for three 3-day seminars this summer. Students took short courses to explore research methods and tools used in ecology and evolution, math, physics and physiology.



## Bird Sanctuary

- Through online surveys and public meetings, the Sanctuary staff worked together with community members to develop a strategic plan that will guide Sanctuary programs and activities for the next five years. Plans include expanding hiking trails and the development of family-focused educational programs to enhance the understanding of science.
- The Sanctuary completed a successful fundraising campaign to replace a bridge that was an important part of the walking trail. Installation is slated for fall 2011. The new bridge enhances enjoyment for all visitors, especially those using wheelchairs and strollers.



## Kellogg Farm

- A walking tour of the KBS Long-term Ecological Research (LTER) site opened this summer. The tour introduces the public to KBS research on sustainable agriculture and how this relates to changing needs for food and fuel.
- New research on farming practices at the Pasture Dairy Center integrates ecology, animal science and social science. Research focusing on how automatic milking and pasture-based systems impact the environment and cattle will benefit farmers and consumers. Social scientists are studying how incentive structures and markets influence adoption of these practices. Results from this research will contribute to the sustainability of small and mid-sized dairy farms in Michigan and worldwide.
- Pasture Dairy Center public tours continue to attract visitors from the region and around the world.



## W.K. Kellogg Manor House

- Thanks to generous donations, the Manor House improved access with a newly installed walkway and restored another tapestry original to the House. Both projects honored former Manor House Director, Ann Spezia.
- Rose and Thistle Garden Club members continue to support the Manor House through gifts of time and funds to help maintain the beautiful gardens. The Club sponsored a successful Garden Education Day in May, offering a variety of workshops to help home owners enhance their gardens.
- Thanks to the KBS Conservation Legacy Fund an intern was hired this year to help with the Manor House grounds. The intern designed a shade garden and with the help of Michigan Career and Technical Institute (MCTI) students, planted a beautiful garden near the Manor House entrance.



## MSU Extension Land & Water Unit

- A grant from the MI Department of Energy, Labor and Economic Growth to the KBS Land & Water Unit is supporting work to show how underutilized land can be used for growing bioenergy crops. Bioenergy plots were established along highways right of way, airports, a vacant urban lot and farm sites throughout Michigan.
- Farmers throughout the Midwest can find up-to-date information on cover crops and their regional usages through a web-based tool developed by the Midwest Cover Crop Council. The program allows farmers to select the appropriate cover crop based on farm location, crops grown and desired benefits.
- The KBS Michigan Natural Shoreline Partnership established a *Certified Natural Shoreline Professional* program this year. A training program held at KBS this summer included hands-on experience in replacing one of the shoreline demonstration areas along Gull Lake.





Making a Difference at Home and Around the World

Sustainable Agriculture Research Continues—KBS LTER Grant Renewed

The KBS Long-term Ecological Research (LTER) program continues to address the important agricultural challenge of providing the food and biofuel society needs, while minimizing negative environmental consequences. The program recently received a six-year renewal grant of \$5.6 million from the National Science Foundation to continue its work.

The new grant focuses on enhancing environmental benefits from agricultural working lands. Recognizing the crucial role of humans in agricultural ecosystems, the grant includes social science research focusing on alternative cropping systems economics and perceptions. The project attracts researchers



from around the world and leverages millions of dollars in additional grants for research, education and outreach on sustainable agriculture. KBS LTER research provides crucial data to determine how to meet the increasing demand for food and fuel production from agriculture in the face of changing markets and climate. To learn more, visit <http://www.kbs.msu.edu/research/lter>.

Mentoring Research of the Future

A new KBS program provides students with the opportunity to participate in research early in their careers. The Undergraduate Research Apprenticeship (URA) program targets MSU students with little or no prior research experience. URA students gain a real understanding of what it is like to be a scientist.

Students take one or more KBS courses and assist a graduate student mentor with their research. The coursework component of the apprenticeship serves as a bridge between the type of learning students are familiar with and the new experience of conducting research.

Apprentices receive a tuition and housing scholarship to reside at KBS, as well as a stipend.

Funding for the URA program comes from the Lauff scholarship fund, faculty grants and MSU.



Bridging the “Research vs. Reality” Gap in Africa



Researchers often argue that successful solutions require long-term research, while farmers want and need more immediate results. KBS Soil Ecologist Dr. Sieg Snapp found a way to meet these conflicting demands that also resolves the need for increased crop yields in Africa.

Fertilizers are widely promoted as a means to grow high yield crops, yet are expensive and beyond the reach of poor farmers in developing countries. Climate change and extreme weather events are additional challenges facing farmers everywhere and pose particular hardships to farmers in Africa.

Snapp has worked with local famers in Malawi to develop ways to improve soil fertility by planting a mixture of shrubby or ground crops that provide nutrients to the soil and decrease the need for fertilizer. These crops also reduce soil erosion.

Snapp found that solutions are location specific. Farmers were more likely to plant a diversified cover if it had a bonus value such as something to sell, or to feed their children. What worked depended on the local economy and culture.

With grant support from the McKnight Foundation, Snapp continues her research in Africa on the basic ecology of different crop rotations in collaboration with local farmers. She also conducts research at KBS on how cover crops and perennial grains can improve Midwest agricultural systems sustainability.

For additional information, visit <http://bit.ly/pYxzJh>.

Growing Community Partnerships

Graduate Students “Plot” with the Next Generation for Sustainability

Local teachers have worked with KBS faculty and graduate students to design and establish experimental plots in their school yards to address the question: *Can we grow our fuel and flowers and butterflies too?* The goal is to provide students and teachers with the opportunity to conduct research to determine the ecological and economic impacts of different cellulosic biofuel crops. Cellulosic biofuel crops have the potential to produce an alternative to fossil fuels that does not reduce food production.

Together students, teachers and KBS graduate students have established the BEST (BioEnergy SusTainability) Schoolyard Research Network at their schools. Schoolyard plots are designed to mimic those at the KBS Long-term Ecological Research (LTER) site and Great Lakes Bioenergy Research Center (GLBRC).

Over the next four years, teachers and students will develop research on the BEST plots to address questions about the sustainability and ecology of different biofuel crops. The data contributes to the students understanding of research and options for developing sustainable biofuel crops. Learn more at <http://bit.ly/rtTqkQ>.



Prairie Diversity: Restoring with a Purpose

This fall, KBS graduate student Tyler Bassett (Department of Plant Biology) will establish an experiment to answer the question: “How many plant species are necessary to successfully restore native grasslands?” Native prairies are among the most imperiled ecosystems in North America. Restoring them recreates a native plant community that potentially provides habitats for rare and desirable insect and bird species.

Re-establishing a native prairie is challenging. The seed is expensive, and invasive species can outcompete the natives. Research shows that more diverse communities resist invasion by non-native species. The trick is finding a cost-effective way to establish a diverse, native plant community that inhibits the spread of the invasive species. Tyler’s research is designed to find what traits of native species make them good at inhibiting invasive species and promote a diverse native community.

The Southwest Michigan Land Conservancy’s Woodlawn Preserve near KBS is the site for Tyler’s research. Tyler also collaborates with Native Connections, a local restoration company. An area resident donated The Woodlawn Preserve for research and to promote a greater understanding of our natural heritage.

Watching Out for Water Quality in Gull Lake

Over the past decade, scientists and community members noted an increase in the abundance of *Microcystis*, an undesirable blue-green algae (Cyanobacterium) in Gull Lake in late summer. The ‘blooms’ of these algae correlate with increases in zebra mussels that invaded many Michigan Lakes. What causes this cycle and how it relates to changes in nutrient inputs to lakes from the surrounding lands concerns lake residents and scientists.

A partnership between KBS researchers and the Gull Lake Quality Organization (GLQO) established a monitoring program on Gull Lake, its inlet streams and Little Long Lake. The GLQO provided funds for a fellowship to support an MSU graduate student to conduct this research. The project provides a more complete and consistent monitoring program that ideally serves as a baseline for evaluating future changes in water quality. It also integrates research on Gull Lake with research conducted on other Michigan lakes by MSU and KBS researchers.

