

- A new **Historical Walking Tour brochure** tells the story of the Kellogg family’s life on their Gull Lake Estate and maps stops at each of the estate’s historical buildings.
- KBS marked **ten years of partnership with Michigan Career and Technical Institute**, a vocational training center for adults with disabilities. MCTI students work with the KBS Grounds staff to receive landscape management training and help keep KBS beautiful for visitors.
- The KBS Volunteer Program’s new **Adopt-a-Trail** opportunity allows individuals and families help us to maintain walking trails at KBS for the enjoyment of all.
- An updated website - **shoreline.msu.edu** ~ provides information about different ‘green’ lakescaping techniques that can be seen at the KBS Shoreline Demonstration Area.
- MSU student interns Ernest Schenk and Brock Downs worked with the KBS Grounds Department and the Gull Lake Landscape Company to design and plant **elegant, new landscaping** at the Caretaker’s Cottage. The interns were supported by funds from the W.K. Kellogg Manor House & Estate and Conservation Legacy Endowments.
- Contributions from local individuals, organizations and foundations made possible the installation of **interpretive signs at the Kellogg Bird Sanctuary** to enhance visitor experiences with added learning opportunities.
- The KBS Long-term Ecological Research (LTER) program, the Kellogg Bird Sanctuary and KBS volunteers worked together to develop a valuable teaching tool for elementary students. The new **Agriculture & Ecology Student Activity Trail** demonstrates ways that plants, animals, soil and people are all important to sustainable agriculture.



WE INVITE YOU TO VISIT OUR CAMPUS,
LEARN MORE ABOUT THE NATURAL WORLD
AND CELEBRATE W.K. KELLOGG’S LEGACY.





Purple Martin eggs at Kellogg Bird Sanctuary

A Letter from our Director

Dear Friends and Neighbors,

KBS’s location and unique facilities allow us to accomplish things in our community that others cannot. Our world-class research facilities are surrounded by diverse and ecologically interesting landscapes. In partnership with colleagues at MSU and the local community, we continue to develop innovations in education and research that extend our reputation worldwide. Our work with local schools in science and math education connects us to students and teachers throughout the region. This year, we expanded our portfolio to include students enrolled in the Gull Lake Community Schools Gateway Academy. (Read more about the project inside this report!)

We have a historical legacy at KBS, being located on property developed by W.K. Kellogg when he lived on Gull Lake. Through an endowment in his name, we now have a greater capacity to preserve the many historic structures and grounds of the Kellogg Estate, and to provide opportunities for students to help us share Mr. Kellogg’s story and enrich the experiences of all who visit our lakeside campus. Many of you have generously helped us grow this endowment and as a result we are close to meeting a matching goal from the W.K. Kellogg Foundation.

It is important to our mission that learners of all ages and experiences feel welcome at KBS. This year, we established several new trails at the Bird Sanctuary and a new Adopt-a-Trail volunteer position, and hope these will further community interest in KBS, encourage people to enjoy our landscapes and to join us quite literally along a path to environmental stewardship. Undergraduate student interns from MSU and local colleges helped us develop teaching tools that go along with these trails; paid internships are another important way we provide educational experiences for students.

We hope this report will make you proud of your commitment to KBS. Our faculty, students and staff continue to develop partnerships across MSU, globally and in the local community that enhance the work we do here. Your support for KBS—through memberships, gifts and contributions, participation in programs and by hosting your private or professional events here—shows that we are valued by the community. Stop by for a visit and let us know how we can serve you.

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On the Cover

The BEACON High School Residential Program brought 31 high school students from districts across Michigan for a weeklong summer workshop exploring quantitative and evolutionary approaches to engineering. Led by MSU faculty in biology, engineering and computer science and funded by MSU’s BEACON Center for the Study of Evolution in Action, the experience introduced promising future scientists and engineers to contemporary research and career opportunities. The students visited ongoing research projects at KBS and engaged in field research on natural selection and sexual selection. They then learned to apply the evolutionary perspectives they had studied to engineering problems that can be approached using biomimicry, where manmade designs are modeled on living things and processes. The students also enjoyed some of the perks of a KBS summer experience – canoeing at sunset on Gull Lake will be lasting memory.

Cover and inset photos courtesy of MSU Engineering Recruitment & K-12 Outreach

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director@kbs.msu.edu

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Kellogg Farm & Pasture Dairy Center

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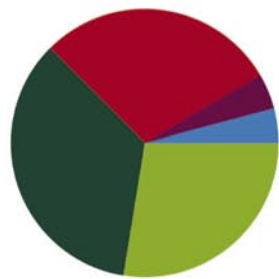
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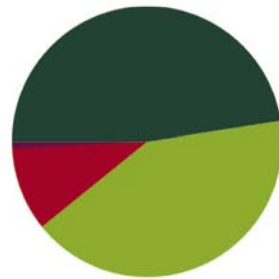
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Grants, trusts, endowments and direct gifts play an important role in advancing our mission. Generous support from donors allows us to develop new programs and to grow those already making positive impacts on our community.

We Thank You for Your Support.
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MY KBS:

Cristy Portales

What takes a student from learner to scientist?

For Cristy, it was the freedom she found at KBS to ask – and to answer – her own big questions.

“I first heard about KBS from one of my professors at the University of Texas – Austin, who recommended the URA (Undergraduate Research Apprenticeship) program as a great way to gain experience,” says KBS student Cristy Portales.

“Working as a summer research assistant gave me a real look at what it’s like to go into research, incorporating theory I’d learned in classrooms with actual, hands-on experience.”

Cristy spent Summer 2012 working as a URA in Dr. Jen Lau’s (Plant Biology) lab. She studied how garlic mustard, an invasive plant species found throughout southern Michigan, affected native plants in the forest understory.

At Dr. Lau’s urging, Cristy returned to KBS this year through the Research Experiences for Undergraduates (REU) program. She developed her own project that explored how different strains of *Rhizobium* – a soil bacteria that live in the roots of legumes – impact plant growth and survival. Finding a strain that better tolerates herbicide might benefit Michigan farmers.

“As an REU, my research project was the priority. I used what I had learned as a URA to develop better methods and expanded my study.”

Cristy entered college as a Biochemistry major but has since added Ecology and is now considering going to graduate school.

“Being at KBS has definitely changed my career goals,” she said. 🌱

Funding for 2013 REU projects was provided by the BEACON Center for the Study of Evolution in Action, the Great Lakes Biodiversity Research Consortium, and the National Science Foundation.



Kalamazoo Gazette/MLive Media Group

“I think we as Michiganders should be proud of the work being done here. From the time I grew up, I looked up to the work being done at the biological station.”

-Michigan Governor Rick Snyder, delivering an environmental policy address at KBS on November 28, 2012

OUR KBS...



MSU Today

Helping Farmers GO GREEN

Nitrogen is essential for plant growth and a key ingredient in most fertilizers. But plants often absorb only some of the nitrogen provided by fertilizers: the rest moves out of the soil and into groundwater, or is converted to nitrous oxide, a greenhouse gas.

Helping farmers find ways to reduce nitrogen fertilizer use is the goal of a

new project led by KBS researchers and funded by a \$1.46 million, four-year grant from the National Science Foundation. The multidisciplinary research team, led by KBS faculty member Dr. Diana Stuart (Sociology), will work with 75 Midwestern farms to determine how fertilizer use and climate affect soil fertility and crop production. They will focus on determining what underlies farmers' decisions regarding fertilizer use.

The team also includes KBS faculty Dr. G. Philip Robertson (Plant, Soil & Microbial Sciences) and Dr. Bruno Basso (Geological Sciences) and several MSU social science faculty.

“Results from this project will be useful to inform approaches on how best to reduce water pollution and greenhouse gas emissions from Midwestern corn farming,” Stuart told MSU Today in June. “It will provide new information and models to aid policymakers working to curb pollution and climate change.”

When Dr. Nalini Nadkarni (University of Utah) came to KBS in October as a Visiting Scholar, she brought her dual passions for forest ecology and education to students at Gateway Academy, an alternative high school within the Gull Lake Community Schools (GLCS). After sharing a slide show of her research on forest canopies, she took the students outside, strapped herself into a harness and climbed a tree to demonstrate the power of experience.

Inspired by Dr. Nadkarni's visit, a team of educators from KBS and GLCS worked together to obtain funding to develop hands-on learning activities to enhance Gateway's online science curriculum. To inform their work, the team spent time in the field with KBS scientists and attended a science education workshop at the University of Wisconsin-Madison's Great Lakes Bioenergy Research Center. The real-life science experiences helped the team create engaging supplemental activities that use microscopes and science kits to investigate heredity, natural selection, plant growth and ecology.

“By pairing activities with the online courses, Gateway students will get a more authentic science experience than is offered at other alternative academies,” said Gateway instructor Matt Hawkins. “We hope it will inspire them to continue their education and think about science careers.”

Support for this project was provided by the Great Lakes Bioenergy Research Center, Perrigo Foundation, Gull Lake Community Schools Foundation and contributions to KBS.



Matt Hawkins



Kateryna Rybachuk

Mapping the Napo

Winding for 550 miles through Ecuador and Peru, the Napo River supports a diverse rainforest ecosystem and indigenous villages sustained by farming and fishing. Flooding is a natural part of the river's dynamics and its floodplains fill with run-off during heavy, seasonal rains.

Little is known about how water moves between the Napo and its floodplains - a growing concern as development of the region's oil reserves, commercial dredging and other facets of modernization generate pollution that spreads when the river floods. When a pipeline burst last May, spilling thousands of gallons of crude oil into the Napo, research done only months earlier by Jorge Celi, a KBS Zoology doctoral student, became very important.

Working in collaboration with NASA's Jet Propulsion Laboratory, Jorge's team used an experimental radar system called UAVSAR to map water movement into the Napo floodplains with unprecedented detail. Jorge and others explored the area by boat and on foot, recording observations of flooding, plant communities and elevation to help interpret the radar maps.

Although the May oil spill is now contained, there could be others. A better understanding of the Napo floodplains, resulting from Jorge's research, will help to minimize damage to the rainforest ecosystem and its inhabitants.

Jorge's project was supported through a JPL project funded by NASA's MEaSUREs program.



MSU Today / Angela DePalma-Dow

For teachers, having the chance to engage in hands-on research can bring life to a classroom in more ways than one.

“Students are a lot more interested when you did it, when you have photos and samples that you yourself collected,” says Jodie McManus, a Parchment High School biology and environmental science instructor. McManus spent last summer studying invasive plant species in Gull Lake through the KBS Research Experiences for Teachers (RET) program. In 2012-13, the program provided science teachers from six Southwest Michigan districts with field and lab research experiences.

ReinterPREting Teacher Development

Working with KBS faculty member Dr. Stephen Hamilton (Ecosystem Ecology, Biogeochemistry), volunteers from the Gull Lake Quality Organization (GLQO) and Michigan Department of Environmental Quality staff, McManus and GLQO member Mike Gallagher surveyed plants along 160 transects in Gull Lake, sampling at three depths for evidence of invasive aquatic species like Eurasian Water Milfoil and Curly Pondweed. With help from Hamilton and MSU outreach specialist Jo Latimore, McManus learned to identify plants she collected, occasionally sending back photos with her cell phone to consult with the experts to identify a sample.

She now brings her own samples into her classroom, and is contributing to monitoring efforts at a lake where she lives.

“I've participated in a lot of science programs, but this summer was something for me. The hands-on experience was invaluable.”

Funding for the KBS RET program comes from the National Science Foundation and Great Lakes Bioenergy Research Center.