

CREAM OF THE CRO



Kellogg Biological Station combines research, education and outreach into outstanding land-grant facility

BY HOLLY WHETSTONE

Editor

Like most students at the Michigan State University (MSU) W. K. Kellogg Biological Station (KBS), which is renowned for advancements in ecological science and evolutionary biology, Christine Sprunger arrived eager to roll up her sleeves and get her hands dirty — literally.

“When I took my first soils class as a sophomore at the University of Washington, I just kind of fell in love with the topic,” said Sprunger, now pursuing a dual doctoral degree in crop and soil sciences and ecology, evolutionary biology and behavior from MSU. “One of the main reasons I’m interested in environmental science is that I was born in Haiti. I know the environmental degradation they’ve had to face, and I want to do work that will help that situation.”

Having spent the past three field seasons at KBS, Sprunger has been able to better define the career interest that was sparked by a desire to help the country she moved from shortly after birth.

“When I came to grad school, I was thinking I wanted to be a faculty member my whole life,” she said. “But I’ve transitioned to thinking that I’d like to work for the government or a smaller NGO [non-governmental organization]. My

passion is sustainable agriculture and soil conservation, so any job where I could focus on those aspects would be great.”

Fellow doctoral student Bonnie McGill was also drawn to KBS because of the hands-on experience and the opportunity to work with some of the country’s leading scientists and brightest students. Pursuing a specialization in environmental science and policy from MSU, McGill spent the past summer as a teaching assistant for a field ecology and evolution course at KBS. In her free time, she explored

possible topics for her thesis and hiked the nearby trails with her Labrador retriever.

“Out here you can become much more isolated from all of the outside distractions you might find on campus and really hunker down, brainstorm and focus on a specific topic,” said McGill, who is interested in agriculture, climate change and water issues, and is considering a career advising policymakers on scientific issues.

Located 65 miles from campus between Kalamazoo and Battle Creek, KBS has more than 3,200 acres of land — managed and unmanaged forests, agricultural fields, lakes and ponds, and restored prairies — and a state-of-the-art research building, modern greenhouses, computing facilities and laboratories equipped to conduct molecular analyses.

The largest of MSU’s off-campus education complexes, the KBS academic campus also includes a half-dozen field laboratories, a conference center and housing for up to 140. Such amenities attract students, visiting scientists and educators interested in science and ecology education, conservation of natural resources, and sustainable agriculture research and demonstration.

KBS Director **Kay Gross**, an MSU university distinguished professor of plant biology, who has been at the helm of the research center for nearly a decade, said the facility is primarily geared toward graduate students throughout the academic year. In the summer, however, it becomes a haven for undergraduates seeking a learning experience that will guide career decisions.

“We see time and time again how a summer at a field station can be a transformative experience in a student’s life,” she said.

“Touching and feeling a plant and seeing and hearing birds are very different from looking at stuffed specimens or dried plant material because you can put them in the context of the habitat they’re in.

OPPOSITE PAGE: Stephen Hamilton, MSU ecosystem ecology and biogeochemistry professor, stands in front of an 80-acre field cropping experiment at Kellogg Biological Station in Hickory Corners.

LEFT: Christine Sprunger is pursuing a dual doctoral degree in crop and soil sciences, and ecology, evolutionary biology and behavior from MSU. Sprunger has had the opportunity to conduct field work with many well-respected scientists in the areas of ecological science and evolutionary biology.





LEFT: Sieglinde Snapp, MSU AgBioResearch crop and soil ecologist, has been examining various field crop rotations in an effort to find ways to reduce fertilizer use and improve soil carbon and water quality. Many of her projects are through the National Science Foundation Long-Term Ecological Research (LTER).

BOTTOM LEFT: MSU doctoral student Bonnie McGill is pursuing a specialization in environmental science and policy. Primarily interested in the interaction between agriculture and water, McGill was thrilled to spend her first summer at Kellogg Biological Station earlier this year. McGill explored possible projects for her thesis and worked as a teaching assistant.

RIGHT: Grassland ecologist Kay Gross has been director of Kellogg Biological Station for nearly a decade. In addition to her administrative role, she is also involved in two ongoing research endeavors: the Long Term Ecological Research and the Great Lakes Bioenergy Research Center.



“Having a student appreciate the effect of global climate change is very different when they’re looking at rainfall data and a parched and wilted plant community. Getting some idea of what that might mean long term is very, very different when you see it firsthand.”

In addition to education, community outreach is also a priority. The facility offers training for agricultural and natural resource professionals — including scientists, educators and journalists — and opportunities for the general public to learn about and participate in environmental research at the complex.

“Though there is some public access, we have very little problem with vandalism or disruption of our research, in part because the community has become increasingly aware of what we do and values it,” Gross said. “We’ve done a lot in outreach on bioenergy, global climate change, and lake water and stream water quality that engages them in what we do, so they appreciate it.”

Strong educational and outreach components combined with leading-edge research have resulted in KBS being recognized as one of the premier inland field stations in the nation’s network of land-grant universities.

Rich in research diversity

KBS has 14 full-time MSU faculty members (a 15th will be added in 2014)



“We’ve done a lot in outreach on bioenergy, global climate change, and lake water and stream water quality that engages them in what we do, so they appreciate it.”

— Kay Gross

based there year-round. It is also home to two high-profile research endeavors: a National Science Foundation Long-Term Ecological Research (LTER) site and the sustainability division of the U.S. Department of Energy’s Great Lakes Bioenergy Research Center (GLBRC).

Research topics range from how gene transfer affects traits of individual species and populations to ecosystem processes that affect the global climate. People, plants, animals and microorganisms are among the subjects studied. And a primary focus is on how evolutionary and ecological processes interact to determine the kinds of species, communities and processes that occur in different types of landscapes.

For MSU ecosystem ecology and biogeochemistry professor **Stephen Hamilton**, KBS has been an ideal place to pursue his interests in aquatic environments and controls on movement of water through landscapes. He is co-leading the

RIGHT: Santiago Utsumi, Michigan State University assistant professor of animal science, oversees the operations of the W.K. Kellogg Pasture Dairy Center. The center was one of the early adopters of automated milking systems in Michigan and has led research on how this system works with pasture-based dairy production. His research focuses on reducing the carbon footprint of the dairy industry by mitigating greenhouse gas emissions.



biogeochemical and hydrological aspects of the GLBRC research program, investigating the environmental sustainability of proposed biofuel crops ranging from conventional corn to grass monocultures, prairie polycultures and tree plantations.

“Establishing GLBRC sites at KBS in 2008 was a good investment by the Department of Energy because we already had field research on agricultural systems and could hit the ground running,” said the MSU scientist. “First and foremost, KBS had the land base, so we could set up the experiments. We have the people, the equipment and the experience to conduct farming activities, and the labs to do all of the measurements.”

Another project contributing to the breadth and depth of KBS research is LTER, a project focusing on agricultural ecology. (A book synthesizing 25 years of KBS LTER research will be published in 2014 by the Oxford University Press.) MSU AgBioResearch crop and soil ecologist **Sieglinde Snapp** has been examining various field crop rotations in an effort to find ways to reduce fertilizer use and improve soil and water quality. The LTER research she conducts has led to methods that can be adopted by growers throughout the world to meet increasing food production needs.

“KBS is embedded in the landscape of southwest Michigan, so it is a real-world example where we can study long-term

processes,” she said. “We’re able to test how farming practices affect processes such as soil organic matter storage that take decades to change. There are years when we have different weather, and we need to see how field crops respond to a change in growing conditions.”

Dairy production is another area where KBS is breaking new ground. The W. K. Kellogg Pasture Dairy Center was one of the early adopters of automated milking systems in Michigan and has conducted research on how this system works with pasture-based dairy production. Research under the direction of **Santiago Utsumi**, assistant professor of animal science, focuses on reducing the carbon footprint of the dairy industry by mitigating greenhouse gas emissions.

“Overall, we strive to come up with successful solutions to the many challenges farmers are going to face in the next 15 to 20 years,” said the MSU AgBioResearch scientist. “Particular emphasis is on cost-effective practices that will allow the development of more resilient production systems in response to variations in production costs and/or market prices.”

Discovering ways to make agriculture more sustainable in economically viable ways has been a priority since 1928, when Kellogg first provided the land and funds for the Kellogg Farm to Michigan State College. And this has remained a focus since KBS became a year-round research station in the 1960s.

Celebrating a historical milestone

This fall marked an official milestone for KBS 50 years of research in aquatic ecology. A commemorative book that traces the history and development of KBS back to the 1920s is nearing completion. A portion of the book will focus on the uniqueness of the research and educational facility.

“The first year-round research director (**George Lauff**) was hired at KBS in the early 1960s, and he was committed to having a year-round faculty based here,” Gross said. “The fact that we continue to have that today, not just in the summer or seasonally, is one thing that distinguishes us from other field stations.”

MSU College of Agriculture and Natural Resources Dean **Fred Poston** said that KBS has many attributes that help set it apart.

“Not only does it have an excellent reputation and a strong director, but it’s an unusual place in the state with all of the surrounding lakes that are all connected underground,” he said. “The hydrology of the place is just extraordinary. Interfaced with the agriculture and some urban development around the water, it equates to a real unique setting with virtually unlimited possibilities for research, education and outreach.”

Perched atop the highest point on Gull Lake, the sprawling summer estate of the late cereal magnate W. K. Kellogg welcomes



LEFT: Phil Robertson, professor of ecosystem science at KBS, is the lead scientist for the KBS Long Term Ecological Research (LTER) and the Great Lakes Bioenergy Research Center leader of the sustainability division.

visitors when they arrive. The Tudor manor was built in 1925 by Kellogg, who founded the Toasted Corn Flake Company of Battle Creek in 1906. The estate also included a windmill, a greenhouse, a boathouse, a combined guesthouse, garage and chauffeur's residence, and a caretaker's house, all of which are preserved today.

In 1927, Kellogg acquired nearby Wintergreen Lake and its surrounding farmland. In an effort to demonstrate the most modern farming practices, he established the Kellogg Farm and deeded it to Michigan State College to serve as an "object lesson to the people of the region." At the same time, he also established the W. K. Kellogg Bird Sanctuary, which continues operation today.

After years of enjoyment with his family, Kellogg let the military use the manor in 1942, first as a training center for the Coast Guard, and from 1944 to 1950, as a rehabilitation center for the Percy Jones Army Hospital in Battle Creek. In 1952, the W. K. Kellogg Foundation donated the property to Michigan State College (now MSU), which developed it as a research and education center. Since then, researchers at the facility have established research programs that attract both scientists and students.

"We have long-term datasets that can support incoming Michigan State faculty members who want to develop a question and ask something about dynamics (how a physical system might develop or alter over time and the causes of those changes)," said Gross, a grassland ecologist. "In addition to the LTER project, which is a relatively

'young' long-term project, we have datasets on lakes and streams in the area that go back 40 to 50 years."

Today, there is no doubt that Kellogg would be proud of the facility. In addition to being a savvy businessman, Kellogg dabbled a bit in science. It was actually a failed experiment that helped him to get his start in the cereal business. In 1898, Kellogg and his brother accidentally flaked wheat berry. Kellogg continued experimenting until he was able to flake corn and created the recipe for Kellogg's Corn Flakes.

A half-century after his passing, Kellogg's interest in science blended with a passion for nature and environmental preservation has managed to transcend time. KBS students Sprunger and McGill are two fine examples of his legacy.

"Through KBS, we're trained as good research scientists, but we will be able to apply the skills that we gain here in several aspects of our lives," Sprunger said.

Sprunger is already well on her way. Earlier this year, she gave her first major presentation at the Ecological Society of America's annual meeting in Minneapolis. Sprunger, who spoke on the four-year perennial ecosystems services trial she worked on with Snapp at KBS, said her talk went off without a hitch, even though she spoke just after a highly respected name in the scientific community.

"I admit I was a little nervous because I was following Randy Jackson, a famous agroecologist at Wisconsin," she said. "But I spent a lot of time preparing the talk and everything went well. The response was very positive."

For students at KBS, working alongside highly-respected scientists is part of the daily routine.

"When the article on nitrogen came out in *National Geographic* (ngm.nationalgeographic.com/2013/05/fertilized-world/charles-text) earlier this year and they quoted KBS researcher **Phil Robertson** [MSU university distinguished professor of crop and soil sciences], I told my friends and family, 'Yeah, I drink coffee with him and sometimes get to have lunch with him,'" McGill said. "Now that's pretty cool." 🌱

More information on the web:

Kellogg Biological Station:

kbs.msu.edu/

Great Lakes Bioenergy Center:

glbrc.msu.edu/

Long-Term Ecological Research network:

lter.kbs.msu.edu

lternet.edu

Two blogs of KBS undergrad researchers:

lter.kbs.msu.edu/?p=2763

lter.kbs.msu.edu/?p=2730





▶ *For students at KBS, working alongside highly-respected scientists is part of the daily routine.*

