



**W.K. KELLOGG BIOLOGICAL STATION
ANNUAL REPORT 2014-2015**





A LETTER FROM OUR DIRECTOR

“EMPOWER THE EXTRAORDINARY!”

With our exceptional faculty and staff, outstanding research facilities and access to a variety of habitats and environments, KBS embodies this theme of the MSU Capital Campaign.

In this report we focus on people and programs that highlight the strength of our faculty, how we work together with others at MSU and in the community to empower individuals, and how our research and outreach programs affect our community. I hope you find those we have included in this report interesting and noteworthy. Our success is dependent on the extent to which we serve and welcome the community in and around KBS, from our local neighbors to our global guests.

Our partnership with local schools is growing to include more elementary teachers and urban communities. With this, the grounds of the Manor House Estate have become a way to showcase how the schoolyard can be used to teach science outdoors. The Bird Sanctuary continues to be a focal point for visitors and many are taking advantage of the expanded trails there.

We are committed to providing opportunities for students and community members to learn about the world around them through educational and research experiences. Our summer academic programs are growing, and we are working to develop Citizen Science programs in collaboration with Michigan Natural Feature Inventory that will involve community members in locally and globally relevant research. We want to share our enthusiasm for science with learners of all ages!

We are committed to fulfilling the “legacy of conservation and commitment to sustainability” that defines KBS and makes us a truly unique and important asset to MSU and this community. Partnerships and support from donors helps us to continue to play an important role in the community. With your support, we look forward to another active and exciting year at W.K. Kellogg Biological Station.

ON BEHALF OF ALL OF US AT KBS - THANK YOU!

Katherine L. Gross
DR. KATHERINE L. GROSS
KBS Director

THE MISSION OF THE W.K. KELLOGG BIOLOGICAL STATION IS TO INCREASE OUR UNDERSTANDING OF NATURAL AND MANAGED ECOSYSTEMS AND THEIR LINKAGES TO SOCIETY.

2014-2015 HIGHLIGHTS

KBS'S COMMITTED AND TALENTED STAFF, FACULTY AND STUDENTS HAVE ACCOMPLISHED THE EXTRAORDINARY AND GIVEN THE COMMUNITY AND MSU MUCH TO BE PROUD OF THIS YEAR.

- Dr. Steve Hamilton received two prestigious awards. In November 2014 he received the Service and Civic Engagement Award from Michigan State, and in March 2015 he was the recipient of the Society for Freshwater Science's Environmental Stewardship Award.
- The W.K. Kellogg Farm hosted the Extending the Grazing Season Workshop, attended by 27 farmers from throughout the Midwest, educating them on different approaches to pasture management.
- Levi Storks, KBS undergraduate alumnus (MSU Zoology major), received the prestigious MSU Board of Trustees Award for his academic achievement.
- Four KBS graduate students (Jakob Nalley, Tomomi Suwa, Bonnie McGill and Dustin Kincaid) attended the National Conference and Global Forum on Science, Policy and the Environment in Washington, D.C. Support for the students to attend this meeting was provided by discretionary funds from private donors for the Director.
- KBS Event Coordinator Nicole Kokx was named MSU's College of Agriculture & Natural Resources (CANR) 2014-2015 Outstanding Staff Member.
- KBS received funding from the National Science Foundation for the Research Experience for Undergraduates program for three years, which offers full-time KBS research opportunities to undergraduates.
- Bill and Jeannette Maxey generously established the Kellogg Biological Station Graduate Student Research Fellowship Fund to support graduate students' research, with a preference for aquatic or bird research.



The W.K. Kellogg Farm received Cropping System certification and Livestock and Farmstead Systems certifications from the Michigan Agriculture Environmental Assurance Program (MAEAP), which verifies that the Farm is working to protect natural resources by using environmentally sound practices.



KBS staff collaborated with Gull Lake Community Schools to renovate and re-open the middle school's greenhouse, giving students the opportunity to conduct experiments and grow plants for the community farmers' market. The project was also supported by the GLCS Foundation, Gull Lake United Way and Boven's Greenhouse.



The W.K. Kellogg Bird Sanctuary received an Interpretive Project Grant from the National Association for Interpretation (Region 4) to improve the Pollinator Garden at the Sanctuary. The funds allowed for planting more native plants in the garden, and the addition of a bee condominium and signs developed by interns and volunteers.



In 2015, over 100 undergraduate students from all over the country came to KBS for summer courses, internships and research experiences.



WHY ENDOWMENTS?

Gifts to KBS endowments are particularly meaningful because they offer a dependable, perpetual source of funding. Endowments provide support that makes a sustainable difference in the work and lives of our students, faculty, and staff — by enhancing their education, research, daily work, and present and future excellence. Endowed gifts enable KBS to offer a truly world-class experience to all who come here. To learn more about supporting KBS, contact Sarah Carroll (269-671-2444) and givingtokbs@kbs.msu.edu.



over **\$1.17** million

has been invested in KBS endowed scholarships

\$58,636

of which was donated this year



KBS Sources of Support

- 36% MSU GENERAL FUND
- 26% BUSINESS ACCOUNTS
- 26% GRANTS & ALLOCATIONS
- 6% MSU AGBIO & EXTENSION
- 6% DONOR GIFTS & TRUST



KBS Donors

- 380 DONORS
- 160 REPEAT DONORS
- 35 LONG-TERM DONORS (5+ YEARS)



FROM THE MICROSCOPE TO THE WORLD

DR. ELENA LITCHMAN'S GLOBALLY SIGNIFICANT RESEARCH & IMPACT

Dr. Elena Litchman's work is intellectually fascinating, but it reaches beyond an academic audience. Litchman, a KBS professor in MSU's Department of Integrative Biology (formerly Zoology), is driven by her curiosity about the natural world and passion for globally applicable research.

Litchman's enthusiasm for science is evident when she talks about her research. Her focus is on phytoplankton (algae) that live in freshwater and marine ecosystems. These small organisms collectively contribute about 50% of photosynthetic oxygen production on earth.

"You can answer not only big ecological questions but also evolutionary questions, which is really exciting. They're not just pretty under the microscope - they're really globally important," said Litchman. "Without phytoplankton, life wouldn't be possible."

Much of Litchman's research has explored how phytoplankton affect and are affected by the environment. Phytoplankton form the base of many food webs in most aquatic systems. Factors that affect them ripple through the whole ecosystem.

Litchman's research includes studying Gull Lake and other local lakes to study the relationship between climate change and harmful algal blooms. One of her projects is a collaboration with faculty in MSU's College of Engineering,

working on a robotic fish that can gather data on water quality. The robots have been deployed in several local lakes, including Gull Lake.

The data collected by the robotic fish will supplement those gathered by more time-consuming traditional methods. Together these data can be used to test models about conditions that precede harmful algal blooms in lakes, and help to predict when and where these blooms may occur.

One of Litchman's most globally reaching research projects is on Lake Baikal in Siberia, Russia. Lake Baikal is the world's oldest and deepest lake and is home to unique endemic species. Litchman and others are studying Lake Baikal's ecosystems' response to warming.

"These species seem to be very sensitive to rising temperatures, and Lake Baikal is warming pretty fast," said Litchman. "What we're trying to do is assess whether these endemic species have the capacity to adapt to this changing climate evolutionarily. It's novel information."

For Lake Baikal, as well as the rest of the world, the role of phytoplankton in climate change cannot be overstated. Litchman conducts scientifically riveting research that has real consequences. Her inspiring and impactful research mirrors her character as a scientist.

Litchman said, "It's excitement for

science, on a fundamental level, because you are learning something about the universe, from a purely intellectual point of view. At the same time, you see that it is relevant to society."

Kirill Shchapov, a co-researcher on Litchman's Lake Baikal project, came to KBS to work with Litchman as a visiting scholar from Russia. Litchman has shown him what it takes to be a great scientist.

Shchapov said, "Elena is a scientist with a passion and talent to reach out and collaborate with others. Thanks to her scientific ambition, vision and persistence, I gained international contacts and scientific experience."

Shchapov and the other graduate students in Litchman's lab are inspired by her energy and work ethic. Jake Nalley, who is conducting research on algal biofuels grown on brewery wastewater, cites Litchman's excitement for learning as a motivator.

"I think her inquisitive nature has been the most transferable skill she has passed on," said Nalley. "Emulating this sense of eagerness to explore

and understand has been inspirational and driven me to be a better scientist."

In addition to cultivating a strong culture of curiosity in her lab, Litchman values collaboration in her students' work. She enjoys seeing the results of their combined strengths and interests.

"I think my grad students are brilliant. They can learn more and accomplish more if they collaborate than if they just did their own thing," said Litchman.

Litchman leads by example. She excels as part of a team and celebrates the successes of others. Her love of learning leads her toward innovative research, and she investigates on a microscopic level to find answers to some of the world's biggest questions.



DR. ELENA LITCHMAN & CO-RESEARCHERS AT LAKE BAIKAL

HAMILTON LEADS THE WAY TO GREATER ENVIRONMENTAL STEWARDSHIP

As a KBS faculty member for the past 20 years, Dr. Steve Hamilton has been known to be careful, unassuming, and wise.

His graduate students in particular think he's an award-worthy scientist and mentor - so much so that they nominated him for an award from the Society of Freshwater Science (SFS).



Hamilton was selected for SFS's 2015 Environmental Stewardship Award in recognition of his leadership in helping to restore the Kalamazoo River after the disastrous oil spill of 2010. Hamilton is considered a leader both locally and nationally.

"The spill into the Kalamazoo River here was by far the biggest inland oil spill that's ever occurred in North America," Hamilton said. "It happened locally, but it involved city, county, state and federal officials in the cleanup. I'm in touch a lot with the EPA and Michigan Department of Environmental Quality."

Hamilton is the director of the Kalamazoo River Watershed Council, which he lightheartedly refers to as a side activity. This role launched his involvement in the oil spill cleanup. The Watershed Council gives him the opportunity to collaborate with the community to improve and protect the health of the Kalamazoo River.

He is committed to empowering others toward environmental action. In his work with the Watershed Council, he raises public understanding of ecological issues through talks and individual conversations.

"The Kalamazoo River Watershed Council and the Kalamazoo River ecosystem have benefited greatly from Dr. Hamilton's tireless volunteer efforts," said Jamie McCarthy, watershed coordinator for the Watershed Council. "His ability to take the skills and knowledge from his academic and research experiences and use them for real world problem solving has been invaluable to the Council and the community."

Hamilton has also worked with the Gull Lake Quality Organization (GLQO), coordinating research done on the lake by MSU graduate student Jeff White and GLQO members. Hamilton's willingness to share his knowledge and experience is appreciated by Mike Gallagher, a board member for GLQO.

Gallagher said, "Steve has helped us tremendously by being on our water quality committee and never hesitating to share his knowledge with us. He has a great way of communicating with riparians, students and scientists. KBS is lucky to have Steve and so are the people in the Gull Lake watershed."

Hamilton is known for his ecological expertise locally and globally. His research is primarily on the ecology of rivers and streams, which has led to studying agricultural landscapes through the LTER (Long-Term Ecological Research) and GLBRC (Great Lakes Bioenergy Research Center) programs at KBS.

Beyond KBS, his research has taken him around the world, including South America and Australia, to study a variety of river ecosystems. He especially enjoys opportunities to study tropical ecosystems. He currently collaborates with researchers studying dams on the Amazon River.

"The environmental effects of those dams are concerning because they're building so many of those and so fast, and when they're on smaller rivers that allows them to bypass environmental review entirely," said Hamilton. "Each one, by itself, doesn't seem like such a big deal, but the cumulative effects of building so many are concerning."

In addition to being a world-class researcher, Hamilton is also a dedicated mentor to graduate students and visiting scholars. Bonnie McGill and Dustin Kincaid, graduate students in Hamilton's lab, highlighted this in their reasons for nominating him for the SFS award.

"Steve's work on the Kalamazoo River oil spill cleanup effort alone warrants this recognition; however, his perpetual dedication to conserving our natural resources and engaging local community members to do so make him an exceptional recipient of this award," said Kincaid.

"We were inspired by how much time he invests in outreach through the Kalamazoo River Watershed Council on top of all the time he puts into being a professor."

BONNIE MCGILL

"Being in Steve's lab means you become one of the family.

Despite being one of the busiest people I know, he always makes time for his students, no matter if it's in the office, lab, or field."

DUSTIN KINCAID

Hamilton credits his own graduate advisors as important influences for him as a scientist. "In my case, they were and are people who were adept at thinking and moving across disciplines and fields, so that made me unafraid to try to do that," he said. He passes on this interest in interdisciplinary work to his students.

McGill said, "I appreciate his creativity and willingness to take risks in the name of science. He empowers me by allowing me to think outside of the box, supporting me when I set lofty goals for myself, and encouraging me when I question myself."

Hamilton is an example of KBS's commitment to excellent research, education and outreach. It is because of people like him that KBS is an internationally recognized research center and a valuable part of the community around us.



DUSTIN KINCAID & DR. STEVE HAMILTON
WORKING TOGETHER IN THE FIELD

KBS TEAMS UP WITH TEACHERS FOR ONGOING EXTRAORDINARY IMPACT

KELLOGG BIOLOGICAL STATION HAS LONG BEEN KNOWN AS A CENTER OF WORLD-CHANGING RESEARCH, BUT TO MANY TEACHERS IN THE AREA, IT'S ALSO A SOURCE OF EMPOWERMENT AND EDUCATION.

“The relationship between KBS and the K-12 teachers has grown really strong, and we all gain from it. We learn from each other,” said Kara Haas, recently appointed KBS Science Education and Outreach Coordinator.

The K-12 Partnership has been part of KBS since 1999 and serves teachers who come from more than 15 school districts to KBS throughout the year for professional development, education and research opportunities.

“We work with about 150 active teachers right now, but there have been over 350 teachers active over the last 15 years, so they’ve reached thousands of students,” Haas said. “This is one of those programs where I think some of the impacts are immeasurable because they’re rippling down to students.”

The K-12 Partnership is comprised of multiple programs that serve teachers and students. In this annual report, we highlight some of these.

Haas said, “What’s most extraordinary to me about the impact of this program is how excited the teachers are to come to KBS. Their passion about coming here and learning about science and sharing with us what they’ve done in their classrooms is really inspiring.”

Tom Getty, Director of an NSF grant that helps fund the Partnership noted, “An extraordinary aspect of this Partnership is that it is a true partnership. Teachers come to KBS to learn from national leaders. KBS faculty and grad students learn from the teachers’ efforts.”

RESEARCH EXPERIENCES FOR TEACHERS (RET)

The RET program funds teachers to work with KBS faculty researchers in their labs on summer research projects. Funding for RET comes from supplements to faculty grants from the National Science Foundation.

Teachers involved in the RET program not only conduct their own research, but also partner with others in the lab to better understand how research develops. Shaun Davis, a teacher at Thornapple Kellogg Middle School who has worked in Dr. Jen Lau’s lab for the past two summers, appreciates this about RET.

“Never having done true scientific research in the past, I could only talk about what I’d read. Now, I can talk about research as a true participant. Being able to share the true nature of scientific research is rewarding for me and it definitely makes science more fun for the kids,” said Davis.

KBS faculty are fortunate to be able to recruit teachers from the K-12 Partnership as RETs in their labs. Having

passionate and experienced teachers in their labs makes RET a beneficial experience for all involved.

“Often science teachers don’t see themselves as scientists. So that’s been a really great thing to offer to teachers – that opportunity to be a scientist,” Haas said. “That’s what I think is extraordinary, that we’re able to have a relationship with local teachers, that we’re able to share cutting-edge science with them.”

TEACHING SCIENCE OUTDOORS

New to the KBS K-12 Partnership is a program designed to help local



ABOVE: 4TH GRADERS LEARN ABOUT A PLOT AT GALESBURG-AUGUSTA PRIMARY SCHOOL
BELOW: TEACHERS EXPLORE THE KBS GREAT LAKES BIOENERGY RESEARCH PLOTS

elementary teachers understand and teach science. The program, Teaching Science Outdoors (TSO) was recently awarded funding from the Environmental Protection Agency for the next two years. TSO is building on having been successfully piloted for the previous two years.

TSO brings 12-15 elementary school teachers to KBS for a week in the summer. Teachers experience in-depth habitat investigations and schoolyard habitat activities they can apply with their students. As part of the program, teachers also learn strategies and tools for teaching science that align with emerging national standards.

DATA NUGGETS

The Data Nuggets project came from K-12 partner teachers’ interest in having real data for their classroom activities, exchanging standard story problems for authentic local research. The project was started in 2011 by KBS graduate students Elizabeth Schultheis and Melissa Kjellvik.

Schultheis and Kjellvik collaborated with students and faculty in the K-12 partnership to develop this project with funding from the LTER and the BEACON center at MSU. The project was recently awarded a \$1.1M grant from the National Science Foundation.

Data Nuggets are worksheets that include a description of a research project and data from the project, which students analyze and interpret. They are based on KBS research so students can learn about local research on topics like climate change and invasive species.

The worksheets include a picture and bio of the scientist whose data the students are asked to analyze. These elements can help students feel more connected to the scientist.

“We think it’s important to put a face on the scientists, who are young women, young men, people of color, international students,” said Haas. “We hope that the human element helps kids identify with the scientists too, that it helps them to see that they could be a scientist someday.”



GK-12 FELLOW DI LIANG WITH PLAINWELL MIDDLE SCHOOL STUDENTS

GK-12 FELLOWSHIPS

For the past 10 years, support from a NSF grant provided funding for KBS graduate students to participate in the K-12 Partnership. GK-12 Fellows worked with partner teachers in their classrooms and also planned and organized workshops for teachers.

Bonnie McGill was a GK-12 Fellow for two years. She remembers the special influence she had in the life of a Plainwell High School student in Sandy Breitenbach’s AP biology class.

“One day she came to class early and I struck up a conversation with her. I asked her what she’s thinking about doing after graduation,” recalled McGill. “Ever since I took that small step to show an interest in her, she opened up a lot, taking down her grumpy teenage facade, and showing her unmistakable enthusiasm for science.”

McGill made it her goal to help students see science as a career path that they could follow, even if they didn’t think they fit the stereotypical image of a scientist. At the end of the school year, she received a heartwarming letter from the AP biology student (quote below).

McGill said, “When I wonder, ‘Did I really make an impact in Sandy’s classroom? Was all that time and effort worth it to anyone?’ I couldn’t ask for better evidence than this letter that it was totally worth it.”

The K-12 Partnership encourages teachers and students to see themselves as scientists and to be curious about the world around them. The Partnership’s many programs provide extraordinary experiences for all involved, making a lasting impact on the next generation.

“BEFORE THIS CLASS AND BEFORE YOU, I HAD NO IDEA WHAT ECOLOGY WAS, BUT THANKS TO YOU, I KNOW AND REALLY LIKE IT. I LIKE IT SO MUCH SO THAT I AM NOW PLANNING ON GOING TO COLLEGE TO MAJOR IN ECOLOGY AND EVOLUTIONARY BIOLOGY. THANK YOU SO MUCH FOR COMING TO MY CLASS BONNIE. YOU’VE INSPIRED ME SO MUCH AND NOW I CAN’T WAIT TO BECOME AN ECOLOGIST.”

- Letter to GK-12 Fellow Bonnie McGill from a Plainwell High School student

We thank you for your support.

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183 active KBS volunteers invested 5,360 hours of their time & invaluable service, which translates to a contribution of \$76,189 to KBS. Without our volunteers, many programs at KBS would not be possible.

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KBS Communications Coordinator

Photos courtesy of Bethany
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