

2022-23 ANNUAL REPORT



W.K. Kellogg
Biological Station
MICHIGAN STATE UNIVERSITY



DOING MORE, TOGETHER



DEAR FRIENDS AND NEIGHBORS,

As 2023 comes to a close, I hope you're enjoying time spent with loved ones and feeling gratitude for the people and experiences that enrich your life.

Relationships have been the heart and soul of the Kellogg Biological Station since its inception. From the alliances between Kellogg Bird Sanctuary staff and biologists in Alaska that heralded the re-establishment of Trumpeter Swans in Michigan to the Kellogg Manor House housing World War II soldiers while they recovered from their injuries, the story of KBS has always been that of a collective effort. This has never been truer than it is today.

Over the past year, through the three main agroecology experiments housed at the Station—the KBS Long-term Ecological Research and Long-term Agroecosystem Research programs and the Great Lakes Bioenergy Research Center site based at KBS—we're engaging with organizations like the Nature Conservancy and Environmental Defense Fund, moving toward a common goal of encouraging the adoption of regenerative agricultural practices.

Among the many remarkable research projects undertaken this year, I invite you to read about a few here—in our attempts to understand how plants and animals adapt to a changing climate, we're studying wild radish, a common agricultural weed; harlequin frogs, a family of amphibians seemingly back from the dead; turtles and the secrets they hold to longevity; and more.

Finally, we recognize staff and faculty who earned well-deserved accolades this year, as well as the retirement of a longtime KBS faculty member, Steve Hamilton.

With gratitude for all the relationships that make KBS hum, from our treasured volunteers to our K-12 students and beyond—



Fredric Janzen
KBS Director

THANK YOU

FOR YOUR GENEROSITY TO KBS IN 2022-23

Each year, contributions to KBS are made in memory or in honor of people whose lives have made lasting impacts. These gifts have been recognized in this list.

In honor of:

1. Stu Bassett
2. David G. Dvorak, M.D.
3. Lisa Dvorak
4. Katherine (Kay) Gross
5. Mary Purchase

In memory of:

6. Dorothy Carnell
7. Catherine Dennis
8. Dr. Stuart Gage
9. Judy Geary
10. Bill Hayward
11. Joe Johnson
12. Judy Maier
13. Donald McKean
14. Mary Pulford
15. Ann Rawsky

BECAUSE OF YOUR SUPPORT:

The newly created Dazil Soil Sciences Endowment Fund will provide funding for research projects and other activities that focus on the understanding of soil ecosystems and soil health.

THANK YOU:

Longtime KBS Director's Advisory Board member David G. Dvorak is stepping down from the board. We deeply appreciate all you've done for KBS.

\$10,000 and above

Douglas and Maria Bayer
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H. Wilson Cunningham and Dr. Jane A. Carstairs
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PARTNERS IN SUSTAINABILITY

KBS LTER, LTAR, GLBRC
SITES FOCUS ON LONG-
TERM OUTREACH AND
COLLABORATIONS

Agricultural research has been part of KBS from the beginning, starting with the Kellogg Farm at our founding, and expanding with the addition of the Long-term Ecological Research program site, or LTER, established in 1987. Twenty years later, the Great Lakes Bioenergy Research Center—GLBRC—Biofuel Cropping System Experiment was added to examine the performance and potential of bioenergy crops. Most recently, the Long-term Agroecology Research, or LTAR, program joined the Station in 2020, adding a focus on the co-production of knowledge with external partners.

In the coming years, agriculture will be called on to feed a growing population, while continuing to provide wildlife habitat and ecosystem services like greenhouse gas mitigation. To accomplish these goals, we need information on how to better design and manage agricultural systems, as well as the factors driving farmer adoption of regenerative practices.



THE FIRST-EVER KBS LTAR FIELD DAY, HELD IN 2023, DREW MORE THAN 90 PARTICIPANTS.

Research across KBS's three agroecology experiments—the LTER, LTAR and GLBRC programs—focuses on food crops and biofuel productivity, farmer decision-making, soil and water protection, climate regulation, economics, and biodiversity. Together, these experiments allow us to use our long record of fundamental research to inform practical questions about implementation and outcomes.

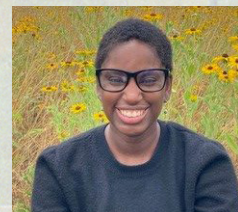
This focus has led to collaborations with external partners to

understand how research can help move the needle toward greater adoption of conservation practices in order to address important agricultural challenges.

Early in 2023, the LTAR program formed a 15-member Stakeholder Advisory Board that works to inform and elevate LTAR research, with the goal of bridging the agricultural systems of today with those needed by current and future generations.

This year's LTER All-Scientists Meeting had a similar goal to broaden its research perspectives and scope; we invited directors of agricultural programs for The Nature Conservancy, World Wildlife Fund, and Environmental Defense Fund to share their viewpoints through panel discussions and networking events.

KBS scientists are also engaging with partners at the national-level. Resident faculty member Christine Sprunger is working with the Environmental Defense Fund to study soil health in a variety of agricultural systems in order to improve our ability to measure and predict soil carbon trajectories under different management practices, thus contributing to policy on soil carbon markets.



CHRISTINE SPRUNGER

Additionally, in June 2023, the national LTAR Network signed a formal agreement with The Nature Conservancy to “accelerate the transition to climate-, ecologically, and socially beneficial and resilient agricultural systems.”

KBS LTER Director Nick Haddad said, “We quickly realized that conservation would advance more broadly if we leveraged ideas across each other's networks.”



AN EVOLVING UNDERSTANDING

STUDYING HOW SPECIES ADAPT TO CHANGING CONDITIONS CRUCIAL TO CONSERVATION EFFORTS

Understanding the ways that plants and animals adapt to changes in their environments helps us identify species in peril and determine how we might help. To do this, KBS researchers have turned to species ranging from a common agricultural weed to rare Ecuadorian amphibians.

KBS graduate student Kyle Jaynes and faculty mentor Sarah Fitzpatrick have tracked a genus of frogs, known as harlequin frogs, that are among many affected by Bd, a pathogenic fungus.



KYLE JAYNES HOLDS A FLASHLIGHT WHILE SEARCHING FOR HARLEQUIN FROGS IN ECUADOR

It's estimated that, over the past four decades, some 80% of the species in that genus have disappeared, but reports of new sightings have appeared with increasing frequency over the past 25 years.

In 2019, Jaynes won a grant from the National Geographic Society that enabled travel to Ecuador to look for the rediscovered frogs, and found that 32 of 87 once-missing species had been rediscovered.

"We want people to walk away from this with a glimmer of hope that we can still address the problems of the biodiversity crisis," said Jaynes. "But, this story isn't over for these frogs... we still have a lot to learn and a lot to do."

In the Conner Lab, Jeff Conner and graduate student Robin Waterman have researched the adaptations of wild radish, one of the world's most damaging agricultural weeds. Waterman and Conner were interested in examining how natural selection shapes flowers, using a promising new approach to studying adaptation: artificial selection.

"Adaptation can be difficult to study because natural selection has already eliminated less-fit forms," said Waterman.

The study used artificial selection to create populations with expanded variation in two traits that describe the position of the pollen-producing parts within the flower, which is important because it affects the efficiency of pollination. Their findings included some surprising results, sparking an interest in further investigation.

In one of the most comprehensive such studies to date, KBS researchers Anne Bronikowski and Fredric Janzen—along with more than 100 colleagues—analyzed data collected from more than 100 populations of 77 species of reptiles and amphibians worldwide to study variation in aging and longevity.

The findings, published in 2022 in the journal *Science*, showed that turtles, salamanders and crocodilians have particularly slow aging rates and extended lifespans for their sizes.

"One of the interesting findings was that each group has a slow or negligible aging species across all these different ectotherms," wrote Bronikowski and Janzen.

"We are committed to studying long-lived species in the wild, because nature has already done the experiment of 'how to age slowly.'"



JEFF CONNER AND ROBIN WATERMAN EXAMINE A WILD RADISH PLANT



A WATERSHED CAREER

Join us in congratulating Stephen K. Hamilton on his retirement. Hamilton, an ecosystem ecologist interested in interactions between aquatic and terrestrial systems, came to KBS in 1994. He retired at the end of 2022 as a professor of ecosystem ecology and biogeochemistry in MSU's College of Natural Science.

At KBS, the Hamilton Lab focused on aquatic environments, the movement of water through landscapes, and agricultural ecosystems. Dr. Hamilton played a key role in establishing the Great Lakes Bioenergy Research Center site at KBS, and he was a principal investigator for the KBS Long-term Ecological Research program site. He was deeply involved with the response to the 2010 oil spill in the Kalamazoo River, and served for a number of years as a senior scientist at the Cary Institute of Ecosystem Studies in New York.

WALKING THE TALK

In 2022, KBS postdoctoral researcher Cinnamon Mittan-Moreau gave a presentation that earned the honor of a W.D. Hamilton Award from the Society for the Study of Evolution.

The talk was titled, "Adaptation during range expansion: a phylogenetic, population genetic, and physiological perspective." KBS Director Fredric Janzen called the award "a tremendously competitive honor."

Dr. Mittan-Moreau joined KBS and the Fitzpatrick Lab as a postdoctoral research associate in fall 2021. Some of her research interests include genetic rescue, rapid evolution, conservation genomics and conservation policy.

Together, she and Dr. Sarah Fitzpatrick presented a 2023 Dessert with Discussion talk, which is a biannual KBS lecture series that connects the KBS and local communities.





EARLY ACCOLADES

Kadeem J. Gilbert, faculty member at KBS and in MSU's Department of Plant Biology in the College of Natural Science, was the recipient of the 2023 Eric E. Conn Young Investigator award from the American Society of Plant Biologists.

The award recognizes young scientists who have made significant contributions with their research and have demonstrated exceptional potential for continued research excellence in the field of plant biology. It's a biennial award that's awarded to a single person nationally every other year.

Dr. Gilbert is an ecologist and evolutionary biologist primarily interested in interactions between plants and other organisms, especially when those interactions are symbiotic.

EMBODYING OUR SPIRIT

Misty Klotz, KBS education and outreach coordinator, was honored with the 2023 Spirit of CANR Award from MSU's College of Agriculture and Natural Resources in May.

The award recognizes a staff member who's committed to representing Michigan State University and the college by exemplifying the CANR mission.

One award nominator wrote in support of Klotz, "I am inspired by Misty's ability to not only get volunteers in the door and manage all the requirements for volunteers, but how she makes them all feel welcome. I have watched her in volunteer gatherings, taking the time to talk to each volunteer and remembering things that might be going on in their lives. I am inspired by Misty on a regular basis."





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ART MEETS SCIENCE AT KBS



ESA SEEDS STUDENTS AND KBS STAFF POSE WITH THE NEW MURAL

In 2022, the LTER Artist-in-Residence program returned after a two-year hiatus. We welcomed muralists Anna Lee Roeder and Eric Vasilauskas, of Dream Scene Placemaking, to the Station in May.

During the residency, Roeder and Vasilauskas launched an art project called KBS SNAPS—Science Nature Art Photo Synthesis—and designed a paint-by-number mural for the Kellogg Bird Sanctuary.

In an April 2023 visit, students from the Ecological Society of America Strategies for Ecology Education, Diversity and Sustainability, or ESA SEEDS, program completed the mural, which is now on display at the Sanctuary.