

EcoLink

February 2016 (Volume 1, Issue 1)



Ecological Research
& Education Center  *The Field Station of the Bluegrass*

Letter from the Director

With our first, semi-annual newsletter, we are passing on the word about EREC - what it is, what's going on, and what we intend to accomplish. After 20 years as an ecological research site, EREC has been funded by the National Science Foundation to plan its emergence as a field station. Our plan is to combine research with education and community engagement. EREC is a unique field station located in the Bluegrass ecoregion. Nested within a suburban landscape, it is a field site for researchers studying organisms and organic processes in the context of natural and human-influenced environments. Examples of the many research projects include the restoration of native trees, pollination of native goldenrod, seasonal patterns of bird behavior, and the ecology of invasive plants.

Our goal is to attract top-tier experimental researchers looking to work in semi-natural systems. In addition, we hope to become a beacon for the outdoor education of students and citizens, and for broad engagement of the community in science and science-related activities. Dr. Lou Hirsch is the Program Coordinator and leads SPARK program (School-Powered Academic Research in Kentucky), which connects research projects with K-12 students as collaborators. Our Community Engagement Coordinator, Dr. Megan Seifert, heads the BIOTIC community engagement program (BIOlogy Teams In the Community). This spring BIOTIC will launch its first biologically-themed art exhibit and a community garden. To find out more about EREC activities, visit our website at <http://darwin.uky.edu/~erec/>.

We welcome new research projects, ideas for bringing science effectively to schools, and queries about EREC for those interested in volunteering or other forms of participation.

We look forward to hearing from you!

Philip H. Crowley,
Director of EREC



Events

Workshops and Symposia

Strengthening the Connection
Between Research and K-12
(April 2)

UK Center for Ecology,
Evolution and Behavior
Symposium
(May 12)

For Credit & Professional Development Courses

PCR Ecology
(June 6 - July 1)

Informal Classes

Beginning Beekeeping
(February 27,
March 19)

Beyond Beginning
Beekeeping
(May 14, June 25)

Beginning Birding
(March-April)

Community Events

Community Garden:
Information Meeting (March 3),
Garden Opening (April 2),
AgExt Growing Community
Garden Fair (April 23)

Biology + Art
Exhibit Opening Reception
(March TBA)

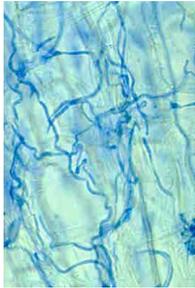
Stay up to date on EREC news and events or contribute to the Newsletter.

Contact [Megan Seifert](mailto:megan.seifert@uky.edu) at megan.seifert@uky.edu

Research Recap

Chemicals as Mediators of Fungi and Grass Populations

Tall fescue is a commonly planted forage grass, and it is often naturally infected with fungal endophytes. These fungi help tall fescue tolerate drought, and also produce toxic chemicals called alkaloids that prevent insects and mammals from feeding on the



Fungal hyphae in fescue grass cells
Photo by Lou Hirsch

grass. Different fungal isolates produce different alkaloid compounds, which can have far-ranging impacts on insects and the health of grazing livestock. Scientists at UK, ECU, and EREC are teaming up with the Fayette and Garrard County schools to investigate how the production of these chemicals affects the populations of endophytic fungi and their grass hosts. The plan is to work with regional partners in order to extend the ecological and geographic context of this research. Currently, researchers and students are establishing field plots in

Garrard and Fayette Counties (including a site at EREC). Aside from introducing young scholars to the process of science, this research will yield publication-quality data that will help reinforce EREC's mission of scientific engagement with the community and fostering the development of future scientists in our Commonwealth. [Contact: robert.hirsch@uky.edu](mailto:robert.hirsch@uky.edu)

Social Networks & the Dynamics of Invasive Western Mosquitofish in Kentucky

The western mosquitofish (*Gambusia affinis*) has been introduced worldwide as an agent for mosquito control, and these introductions have had negative impacts on aquatic communities. These fish naturally occur in the Mississippi River Drainage, up the Ohio River to western Kentucky, and have expanded their range eastward throughout Kentucky over the last 100 years. Dr. Craig Sargent's lab explores natural range expansion to gain insights into this species' invasiveness, and does so by examining dispersal in artificial streams at EREC. Research has focused on how a fish's personality (social/asocial; shy/bold) and body size affects dispersal. Current research focuses on how much dispersal is done by individuals versus groups, how individual personality affects how fish assemble into groups and the collective behavior of groups. This work is funded by KSEF. [Contact: csargent@uky.edu](mailto:csargent@uky.edu)

Crayfish-Engineered Increases in Water Turbidity as a Mechanism of Predator Escape

Ecosystem engineers are organisms that modify, maintain or create habitat for other species. As such, they can have strong positive effects on local biodiversity and ecosystem health. Luc Dunoyer (PhD Student, UK Biology) is conducting research on how crayfish affect turbidity, a metric of water clarity or particulate density. He uses a combination of field manipulations in natural (Green River) and artificial stream systems (EREC). This research has revealed new insights. He found that crayfish increase turbidity allowing them a chance to escape predators. The ability of crayfish to physically alter the environment is negatively affected by cheliped (front most claw and leg) loss. Crayfish with regenerating chelipids had a smaller effect on water turbidity. This work was funded through the Karri Casner Fellowship.

[Contact: luc.dunoyer@uky.edu](mailto:luc.dunoyer@uky.edu)

Tree Restoration in Kentucky Bluegrass Woodland

Land-use change has left the unique plant community of the Central Kentucky Inner Bluegrass savanna woodland imperiled. Savanna systems are maintained through a combination of disturbance (e.g., drought, fire, herbivory) and competition. Through experimental manipulations Jim Shaffer (PhD Student, UK Biology) and Dr. Scott Gleason (UK Biology) are examining how these biotic and abiotic factors limit or promote seedling recruitment. Research conducted at Griffith Woods Wildlife Management Area (GW-WMA) and



Bur Oak Sapling. Photo by Jim Shaffer.

EREC has shown that browsing by white-tailed deer (*Odocoileus virginianus*) and eastern cottontail (*Sylvilagus floridanus*) and grass competition have strong negative effects on the establishment of several key species. Upcoming experiments on seedling fire sensitivity at GW-WMA will elucidate how this ecological filter may contribute to savanna-woodland formation and maintenance. [Contact: jim.shaffer@uky.edu](mailto:jim.shaffer@uky.edu)

Invasive Wintercreeper and Honeysuckle Negatively Affect Native Plant Communities

Wintercreeper (*Euonymus fortunei*) and Amur honeysuckle (*Lonicera maackii*) are invasive plants in Kentucky and pose a significant threat to native biodiversity. Dr. Sarah Bray and students from Transylvania University (TU) are exploring the ecological impact of these plants at EREC. In fall 2015, they set up a factorial experiment: honeysuckle removed, wintercreeper removed, both honeysuckle and wintercreeper removed and a control plot. NSF REU participants and TU Ecology students developed independent projects on the individual and combined effects of wintercreeper and honeysuckle. Several interesting findings emerged: wintercreeper and honeysuckle extracts slowed germination of grass seeds but not Fast Plants (*Brassica rapa*), and the removal of wintercreeper and honeysuckle increased plant and fungal diversity. Another project examining the decomposition rate of oak leaves in removal plots, under live and dead wintercreeper, and under simulated wintercreeper, found no difference in decomposition rate among environments but did find a difference in the number of worms and moisture levels among environments. These findings have led to an independent research project led by Rachel Ferrill, a senior at Transylvania University. She will assess decomposition rates between native hackberry and ground and climbing wintercreeper to separate the effect of chemical composition from the physical effect of wintercreeper on decomposition rate in the environment. [Contact: sbray@transy.edu](mailto:sbray@transy.edu)



Wintercreeper removal. Photo by Sarah Bray

Parental Care in Bess Beetles: Good for one or good for all?

Most beetles do not care for their young, but the bess beetle or horned passalus (*Odontotaenius disjunctus*) is an intriguing exception. These 1-inch long beetles live in decaying logs and form monogamous pair bonds, caring for their offspring as a couple. The family group stays together for several months after the offspring mature

(i.e., delayed dispersal). This prolonged residence may directly benefit young adults, giving them the opportunity to acquire resources before dispersing. Alternatively, offspring may stay at home to help their parents care for siblings (i.e., cooperative breeding). Jacqueline Dillard (PhD candidate, UK Biology) research aims to determine the extent to which juveniles benefit directly (e.g.,



Mature Bess beetle. Photo by Leslie Potts

delayed dispersal) or indirectly (e.g., cooperative breeding) from prolonged family formation. To test this, she set up 40 experimental logs at EREC in summer 2015. This work will contribute to our understanding of family evolution across taxa, from beetles to birds to humans.

Contact: jacqueline.dillard@uky.edu

K-12 Interaction

Workshop: Strengthening the Connection Between Ecological Research & K-12

EREC is hosting a workshop on Saturday, April 2nd to explore effective strategies in forming productive research collaborations and education engagement activities between researchers and K-12 STEM classrooms. Attendees we will hear from Dr. Pat Marsteller, the Associate Dean for Undergraduate Research and Scholarship at Emory University, Dr. Ginny Shepherd, the Director of the Center for Science Outreach at Vanderbilt University, and Dr. Robin Cooper, Associate Professor of Biology at the University of Kentucky. All faculty members at UK, local universities and colleges, and the K-12 school system are invited to attend. Email [Dr. Hirsch at robert.hirsch@uky.edu](mailto:Dr.Hirsch@robert.hirsch@uky.edu) for more information.

SPARK Gains STEAM:

High Schoolers Research Grass Fungal Endophytes

The SPARK Program (Student-Powered Academic Research in Kentucky) is an initiative that provides opportunities for researchers to collaborate with teachers and K-12 students. Two high school students from STEAM Academy in Lexington, KY have joined the Fescue Endophyte Project. This spring, they will gain conceptual knowledge and hand-ons training in molecular techniques to examine the population-level outcomes of fescue grass-endophyte association. You can find more information about SPARK on our website (<http://darwin.uky.edu/~erec/ERECGITeachers.html>). For school teachers and administrators or for researchers that would like to discuss ideas for SPARK initiatives, contact the [SPARK Coordinator at robert.hirsch@uky.edu](mailto:SPARK Coordinator@robert.hirsch@uky.edu).

New! UK & Professional Development Course

We are pleased to announce a new summer course “BIO 580: PCR Ecology”, offered at EREC from July 6 to July 1, 2016. Polymerase Chain Reaction (PCR) is a technique in molecular biology that allows scientists to analyze DNA and investigate important biological phenomena. This class combines laboratory-based molecular techniques with ecological sampling in the field, providing a comprehensive educational experience. Students will learn how to sample bacteria, fungi, insects, and spiders and will become familiar with DNA extraction, PCR, gel electrophoresis, and data analysis and interpretation. For educators, datasets generated during the class can be developed into teaching modules. UK students can enroll for credit and K-12 STEM teachers enroll at a reduced cost. Contact [Dr. Hirsch at robert.hirsch@uky.edu](mailto:Dr.Hirsch@robert.hirsch@uky.edu) for more information.



Sustainability and Garden Science Curriculum Aligns to Next Generation Science Standards

In collaboration with local partners at UK and Fayette County Public Schools, EREC is spearheading a program that introduces elementary school students to sustainability through garden science. Plant growth and vegetable production are powerful and approachable analogies for understanding the concepts of sustainability. The Sustainability and Garden Science (SGS) curriculum connects tightly with the Next Generation Science Standards (NGSS) now being implemented in Kentucky Public Schools.



In 2015, Drs. Phil Crowley (EREC), Kim Zeidler (PIMSER) and Patti Works (Regional Teacher Partner/Consultant with PIMSER) the SGS curriculum in collaboration with elementary school teachers (Mr. Josh Radner, Yates Elementary; Ms. Cindy Townsend, Mary Todd Elementary) and UK graduate and undergraduate students. Each school formed a team consisting of the teacher, a UK graduate student (Rose Marks, Jim Shaffer), and 2-3 UK undergraduates (Ryan McDuffie, Annie Griggs, Olivia Windhurst, Hejab Malik, and Connor English) that worked with the students through hands-on activities. Pre- and post-tests indicated good retention of biological concepts. UK students presented a poster at UK conference, eliciting considerable interest and positive feedback. We thank the UK Office of Community Engagement and Assistant Vice President Lisa Higgins-Hord for funding. This project will serve as proof of concept for future extramural funding. Contact [Megan Seifert at megan.seifert@uky.edu](mailto:Megan Seifert@megan.seifert@uky.edu) for more information.

Community Connection

Become a Citizen Scientist and Help Restore the Environment for Monarch Butterflies

As plants emerge and flowers open, you will see butterflies fluttering between plants in search of energy-rich nectar. These visits are



Monarch on Swamp Milkweed
Photo by Tom Koerner/USFWS

very important for plant pollination, spreading pollen between plants and aiding in the production of healthy plant seeds. UK researchers in Biology and Agricultural Economics are collaborating on a project entitled "Supporting Monarchs and Pollinators through Citizen Science and Public Engage-

ment", funded by the UK Student Sustainability Council. As part of the project, they are recruiting citizens to help study whether monarchs pollinate and increase milkweed seed production. Each citizen scientist will collect information on two milkweed plants: one caged

(excludes pollinators) and one uncaged (open to all pollinators). This allows them to determine what happens to plant seed production when monarchs are not able to pollinate milkweed. Anyone can be a citizen scientist! If you are interested or would like more information, [contact Megan Seifert at megan.seifert@uky.edu](mailto:megan.seifert@uky.edu).

New! Birding Course

Spring is around the corner! Learn about the birds singing in your backyard and beyond.

Transylvania University biology professor Becky Fox studies bird behavior and is leading classes every Saturday morning from mid-March through May. Classes will cover a range of topics including basic bird biology and ecology and will incorporate many activities, like bird identification and experiments you can do at your backyard bird feeders. Most classes will be based at EREC with some satellite field trips to nearby sites. There will be a modest fee. Check our website for updates on the course dates and times.

New! EREC Community Garden

We welcome you to come grow your own fresh produce at the new Community Garden EREC. Plowed plots, water, and some basic equipment will be provided. First plant and work day is Saturday, April 2nd at 9 AM. There will be an information and organization meeting at EREC on Thursday, March 3rd at 6 PM: all are welcome to attend. Sign-up for a garden plot, to attend the information meeting or for any if you have any questions, [contact Megan Seifert at megan.seifert@uky.edu](mailto:megan.seifert@uky.edu).



Jacqueline Dillard painting a house sparrow
Photo by Carlos Gutierrez

art students as part of a master art class. We invite you to come enjoy this one of a kind mural. [Contact Megan Seifert at megan.seifert@uky.edu](mailto:megan.seifert@uky.edu) more information.

Beekeeping Courses

Honey is one of nature's tastiest sweeteners. Did you know that you could manage a bee colony to produce your own honey? Phil Craft is bringing his beekeeping expertise and more than 15 years of experience to EREC. Craft, a retired Kentucky State Apiarist, is a nationally known beekeeping instructor and lecturer, and author of the monthly question/answer column, "Ask Phil," in Bee Culture Magazine. He teaches two levels of beekeeping courses at EREC. The beginners course is perfect for anyone wanting an introduction to beekeeping - how do you know if it's right for you and how do you get started? For those



New bee emerging. Photo by Mary Parnell Carney.

people with some background knowledge or experience in beekeeping but are in need of some direction, the "Beyond Beginning Beekeeping" course is for you. This spring, there will be two sessions of each class. Courses will be held from 9 AM - 4:30 PM at EREC and cost \$40 each. Check our events calendar and website for course dates. [Contact Phil Craft at philcraftbeekeeping@windstream.net](mailto:philcraftbeekeeping@windstream.net) to register.

Larger than Life Bird Mural

People connect to nature in different ways. The recently installed mural at EREC is a visual aviary, celebrating the beauty and diversity of birds through an artistic lens. The artwork is part of an Italian muralist's (Hitnes) journey across the US exploring the life work of John James Audubon, a reknown illustrator of American birdlife. Hitnes painted the mural in collaboration with

Help EREC Grow

The success of EREC depends on the active involvement of scientists, teachers, students, and citizens. This can come in many forms: join the community garden, attend events, participate in research or citizen science projects, share ideas about teaching and learn scientific principles. Once you've learned a bit about EREC from this newsletter and the website, please feel free to contact us about ways for you to become involved. We look forward to hearing from you.

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The ongoing research and education activities at EREC hinge on the availability of funds.

Please consider making a donation of any amount by writing a check to the UK Department of Biology, indicating "To support activities at EREC" on this check.

This can be mailed or delivered to: Department of Biology, 101 Morgan Building, University of Kentucky, Lexington KY