



Bull Shoals Field Station Newsletter

Winter 2013-14

Director's Notes



Janice holds an Eastern Screech Owl that was banded in 2013

We continue to grow and expand our education and research programs at BSFS. Several projects are highlighted within the next pages, including an armadillo survey using game cameras, bird banding, collecting bat guano, joining the Phenocam Network, working with homeschool groups, and a new lichen brochure. Celeste continues to teach a field-related class every summer onsite, and many classes are taking field trips to the station throughout the year.

We increased our monitoring projects including a new phenology camera, water quality monitoring of Bull Shoals Lake, and Christmas Bird Count. We have submitted a grant proposal to do acoustic monitoring of birds, bats, and frogs at BSFS. We should hear about this grant in mid-2014.

A big goal for the year is to redo our website. Due to several web program changes and other difficulties, our website has become out of date. I look forward to sharing a new updated site later in 2014. As usual, we are always happy to show the field station to you if you're in the area.

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Class/Events in 2013

- Plant Taxonomy (Bowe), Apr 9
- GLADE (J. Greene, Prussia), Jun 16-22
- Everyday Botany for Teachers (Prussia), Jul 10-11; 17-18
- GLADE/Logan-Rogersville Mentorship Workshop (J. Greene, Prussia), Sep 27-28
- Mammalogy Weekends (Robbins) Sep 20-22 and Oct 18-20
- Plant Ecology (Wait), Oct. 20
- ID of Woody Plants (Bowe), Oct 25
- GLADE Reunion, Nov. 9
- LEP State Coordinator Meeting (Prussia), Nov.15-16
- Christmas Bird Count (J. Greene), Dec. 27-28

Keeping an eye on BSFS with a new camera

BSFS has installed a phenocamera on a glade near Shanda's Point to begin monitoring tree canopy phenology for the Phenocam Network. The camera takes an image of the canopy every 30 minutes during the day. These images can be used to determine yearly patterns of leafing out and development of fall colors, forest physiological health from drought, long-term effects of climate change, and how this Ozarks forest compares to other ecosystems in the U.S. You can see the latest image at: <http://phenocam.sr.unh.edu/webcam/sites/bullshoals/>

Phenocam atop 20 foot mast



BSFS Gains a New Team Member

Theresa Johnson has been hired as a Science Communication Specialist with the National Park Service. Her office is in the Kings Street Annex on the MSU campus. Position goals included becoming familiar with current educational programs in the Parks and developing new activities. Largely, Year-1 accomplishments were collaborative efforts with partners from Missouri State University. Relationships were established with the Bull Shoals Research Station, Missouri Department of Conservation, Springfield Interpreters Coalition, and other educators in the region. Serving as liaison between NPS scientific researchers and park interpretive staff gave opportunities to share information about the protection and preservation of the natural resources that exist in our National Parks.

Interactive displays, activities and lessons were developed using data generated by the Heartland Inventory and Monitoring Network in the context of the park's specific resources. Local educators and park staff can use these resources in classrooms or on-site in the network of parks. The presentations and interactive programs engage the public while emphasizing the role of science in managing National Parks.

Coordinators' Corner

Water Education for Teachers—Missouri Project WET



Celeste Prussia, BSFS Manager (10 years) and Erica Cox, MO Project WET coordinator (5 years) received MSU service awards for 2013

Project WET had a great year in 2013 with 21 WET workshops held state-wide and a total of 352 workshop participants, ranging from college students, agency and non-profit environmental educators and classroom teachers. Besides the normal number of WET workshop offerings, Project WET benefitted from workshops funded by grant projects.

Missouri Project WET received grant funding from the Department of Natural Resources to offer workshops all around the state over the last 2 years, targeting all educators within designated impaired waters areas. We finished out the grant-funded WET workshops in Nevada, Joplin, Farmington, Kansas City and Springfield in the spring and summer of 2013. The next phase, which has already begun, is research to determine the post-workshop use of Project WET. This grant is funded from 2011-2014 and we are grateful for the assistance and support of the Missouri DNR—they've been great partners. The state-wide workshops allowed us to work with many great facilitators throughout Missouri and meet environmental educators in each area.

Project WET's involvement with a large urban watershed monitoring and implementation grant, also from the DNR 319 Section, helped provide educational opportunities for area teachers. *Storm Water Management for Educators* was offered in June 2013 for credit through Missouri State University. Eight teachers participated and it was a successful first-time class. Plans are already in the works to repeat the course in summer 2014. Carrie Lamb, from the City of Springfield's Storm Water Services division and Kevin Barnes, Environmental Engineer

with Greene County helped provide valuable input for this course and led our field trips around Springfield. We visited several areas where storm water improvements have helped the water quality and living quality of the families in the area.

Another successful partnership formed between Project WET and the National Park Service has led to specialized workshops around area National Parks. In November 2013, I worked with Theresa Johnson, of the Heartland Division of the NPS and we traveled to Ozark National Scenic Riverways to focus on water and land management topics surrounding the park, through the use of Project WET and Project Learning Tree activities. This same workshop was replicated in January 2014 for the Buffalo River in AR and we hope to do similar workshops in the future.

We just wrapped up our annual New Facilitator training for Projects WET, Flying WILD and Project Learning Tree and have 21 new facilitators, ready to do workshops around Missouri. With these new facilitators in place, Project WET is in good hands as we continue to offer educator workshops.

For more information about Project WET or any of our special projects, please contact Erica Cox at EricaCox@missouristate.edu or 417-836-4337.

BSFS Hosts Multi-state LEP Coordinator Meeting

Missouri State University, and specifically the Bull Shoals Field Station, serves as the coordinating body for the Leopold Education Project (LEP) in Missouri. The mission of LEP is to build an ecologically literate citizenry so that each individual might develop a personal land ethic. LEP does this through an interdisciplinary approach of reading about Aldo Leopold's recorded discoveries from *A Sand County Almanac* (ASCA) and participating in meaningful activities that increase participants' understanding of the land and expands their ecological awareness.

BSFS's offer to host the national meeting of the LEP state coordinators stands testament to the willingness of this little field station to serve as a place to meet and provide housing for researchers, educators, and students. Due to budget constraints experienced by many LEP coordinators, a decision to focus the meeting on a teleconference call brought in coordinators from 20 states. The Mincy House served as the hub with 5 neighboring states in attendance.

A field trip to the Leopold Cabin at the Caney Mountain Refuge in Gainesville built a Missouri-Leopold connection. The visiting LEP coordinators, who consider themselves "Leopold scholars," have made

the pilgrimage to "The Shack", Leopold's cabin in Baraboo, WI, the site and inspiration of his essays in ASCA. The Leopold Cabin is where A. Sarker Leopold, first born son of Aldo and Estella Leopold, was a wildlife biologist in the 1940's, specifically to improve the chances of successful reintroduction and restoration of wild turkey and white-tailed deer moved from the Drury-Mincy Conservation Areas. Sarker laid much of the groundwork that lead to the recovery of deer and turkey populations throughout Missouri and beyond.

LEP state coordinators inside the Leopold Cabin



BSFS Wishlist

- ⇒ New or used mini-van to transport small groups to the field station
- ⇒ Outdoor benches for the porches and grounds
- ⇒ Two tumbling drum composters and an outdoor fireplace
- ⇒ Two more double-bunk beds for the Drury House
- ⇒ Remodel the hall bathroom at the Mincy House

GLADE at BSFS

Green
Leadership
Academy for
Diverse
Ecosystems

The Bull Shoals Field Station hosted its fifth week long residential program June 16-22, 2013 with 16 motivated southern Missouri high school students who desired to impact their communities in the areas of environmental sciences and conservation leadership. The GLADE project has developed as a collaborative effort between the Greater Ozarks Audubon (GOAS) and Missouri State University. GLADE 2013 was made possible by financial assistance from The Community Foundation of the Ozarks—Rural Schools Partnership Initiative, Delta Foundation, Audubon Society of Missouri, North Face, L.A.D. Foundation, K-Dock Marina, Ozarks Water Watch, White River Valley Electric Cooperative, Great Southern Bank, and Missouri Department of Conservation by grant awards or in-kind support and numerous private donations from people like you..



GLADE reunion at Bluff overlook

GLADE has evolved to include glade restoration and habitat improvement projects in spring and fall with the USDA-Forest Service staff at the Dabbs Creek Area of the Mark Twain National Forest. Eastern Red Cedar removal, wildlife brush pile building, native plant installation and seed distribution, and pollinator habitat structure installation were accomplished after a general trash/litter clean up of the parking area and trails.

The GLADE/Logan-Rogersville Mentorship Development Project, a teacher-mentor training and development weekend at BSFS was added in 2012 thanks to funding from the Community Foundation of the Ozarks who funded another weekend training in 2013.



Bird banding during GLADE-LR mentorship project workshop

Eleven teachers representing school systems as large as Springfield Public Schools and as small as Chadwick R-1 participated in bird banding, leadership activities, nature journaling, and networking. Andrew Kinslow highlighted the Logan-Rogersville Field Research Program as a demonstration of how field work can be incorporated into the high school biology curriculum. Each teacher became eligible for additional funding for GLADE student-led projects for their roles as mentors. During the workshop, four years of GLADE graduates joined forces to install a native wildflower demonstration plot in front of the Mincy House. The students then had a chance to chat with and share some of their GLADE experiences the teachers.

In November, most of the GLADE 2013 class reunited at BSFS to prepare for their presentation to the GOAS membership and board. This personalized pitch is made each year and has been successful in gaining further support for the program from GOAS.

Thanks to ALL our students, funders, presenters, organizers and volunteers!!!



GLADErs sport new hardhats at Dabbs Creek

MSU is Flying WILD!

Missouri State is now the official state sponsor of Flying WILD, a national environmental education program which celebrates birds. The goal of the program is to engage students in science through birds. Field Station staff, Erica Cox and Janice Greene, will conduct training workshops for classroom teachers and other educators. MSU is also the state sponsor for two other environmental education programs, Project WET (Water Education for Teachers) and the Leopold Education Project. If you are interested in learning more about any of these programs, contact Erica (Project WET), Janice (Flying WILD) or Celeste (LEP).



Bird Banding Update

We had the biggest year so far in our bird banding research project in 2013 with 164 birds captured and banded. Many of these birds have migrated to Central or South America and returned to BSFS – some several times.

Black-and-White Warbler

Our most common species this year was the Black-and-White Warbler. An exciting addition to our bird banding activities had us working after dark and our rewards included Eastern Screech Owl and Barred Owl!

New Brochure: Common Missouri Ozarks Lichens

Our new lichen brochure will debut at the Missouri Natural Resources Conference in early February 2014. The information was co-authored by the Master Naturalist Lichen Team of Darrell and Pat Blech, Hammons and Nancy Schanda, and BSFS manager Celeste Prussia who also served as editor and layout manager. Master Naturalist Art Daniels photographed the 12 specimens included in the photo spread inside the 11x17 brochure. If you would like to receive a copy, please send a self-addressed, postage-paid envelope to Celeste's attention at the address on the back page of this newsletter.



Woodland Community Research in a Prescribed Burn Area—by Dr. John Heywood



Two views of the woodland community



Most Ozarks woodlands were clear-cut at least once by European settlers. Because of active fire suppression, the young stands that have regenerated are too dense to support the rich prairie understory that characterized pre-settlement woodlands. However, small patches of old-growth woodland still exist, one of which is located within the Drury Conservation Area on a dry ridge-top bounded on the east by Bull Shoals Lake and on the west by the flooded mouth of Mincy Creek. When the Missouri Department of Conservation initiated fire management in the 1980s, the glade community on the western slope of this ridge had been invaded by Eastern Red Cedar, but the Post-Oak woodland on the ridge top was largely intact. Red Cedars have been completely removed from the ridge, and with regular prescribed burns a rich prairie community now thrives in both the glade and the woodland.

In 1999, Biology graduate student Shanda King and faculty member John Heywood identified, measured, and mapped all trees in this woodland community. Dr. Heywood and graduate student Will McClain cored a sample of these trees and were able to confirm that the Post Oaks are old growth, with ages approaching 300 years despite their small sizes. Cores also suggested a flush of Black Hickory recruitment about a century ago. In the summer of 2012, Dr. Heywood recruited undergraduate students Joey Michalski and Abby Holloway (now a graduate student at Mizzou) to help relocate all mapped trees that were still alive and obtain cores from all Post Oaks at the site. Mapping and coring were completed during the summer of 2013, and the cores are now being processed by Joey Michalski and fellow undergraduate Tessa Middleton. The updated map will indicate how each tree species has responded to prescribed burns over the past 14 years. Tree core data will be used to reconstruct the age distribution and recruitment history of the post oak population, as well as the recent climatic history of the site.

Eric Green's Armadillo Behavior Research

Nine-banded armadillos (*Dasypus novemcinctus*) are becoming more common in Missouri. Several studies over the years have predicted the northernmost range limits of armadillos, which have subsequently invalidated each of these predictions by moving yet further north. Contrary to popular belief, armadillos are not technically invasive to Missouri. Their naturalization did happen before our eyes over the last hundred years or so, but they immigrated northward naturally, which makes them a native species. They were accidentally introduced in Florida and became invasive there. Several likely factors have contributed to armadillos' recent disbursal northward, including a reduction in the historical subsistence hunting by Native Americans, lower water levels in the Rio Grande River, and increased habitat fragmentation.

Like it or not, armadillos are here to stay and they enhance the ecosystem in important ways. For instance, their primary food sources are ants, termites, and beetle larvae, the latter of which they dig up next to plant roots. While this may cause minor crop damage (armadillos forage by digging four-inch wide, cone-shaped holes), they also remove grubs that feed on the roots of crops. This may have a positive impact on plant health and crop output, and would be worth studying scientifically. Also, armadillos dig and live in underground burrows. In the city, this can damage flowerbeds; but in the wild, used burrows provide shelter for numerous wildlife species such as groundhogs, small rodents, reptiles, spiders, and insects, all of which play an important role in a complex food web and keep our wild ecosystem healthy.

As armadillos are new native residents of our state, it is important to understand their behavior, life history, and ecology. I am conducting a six-month long observation of armadillo activity using game cameras. The study is running from October 2013 through March 2014. The cameras are placed in various locations around the Drury-Mincy Conservation Area, mostly aimed at suspected or confirmed armadillo burrows. When activity is recorded, each photo includes a time and date stamp along

with the air temperature.

Previous observations have noted anecdotally that armadillos in northern latitudes seem to shift from being active at night in warmer months to being active during the day in winter. It is suspected that in cooler climates this is an adaptation that allows the animals to forage when the ground is warmer and less likely to be frozen. This is important because armadillos do not store fat, cache food, hibernate, or migrate to warmer climates for the winter. This adaptation is not likely a new one, as evolution of this magnitude tends to work on a much slower scale than a hundred years. More likely, they evolved the ability to adapt to cold climates during the last ice age or earlier. This innate genetic ability to adapt is called phenotypic plasticity.

At the end of the data collection, each observation will be compared against the times of sunrise, sunset, and astronomical twilight, which will tell whether the activity was nocturnal, diurnal, or crepuscular. The data will be pooled into weekly or bi-weekly segments, and for each segment, nocturnal, diurnal, and crepuscular activity indices will be calculated. These indices will be compared to the change in photoperiod (day length) and air temperature over the course of the study. The hypothesis is there will be a nocturnal-to-diurnal shift in activity, and that this shift will have an inverse correlation to photoperiod, but no correlation to air temperature.

So far, we've seen a definite shift in activity, but have not yet conducted statistical analyses. We've also collected observations of many other mammal species including elk, white-tailed deer, bobcats, coyotes, gray foxes, groundhogs, squirrels, mice, and rats. These observations will be part of another undergraduate research project, which will be a survey of mammal species present in the area.



Bobcat on game camera

Brenna Tinsley's Bat Research: Artificial Bat Roosts and Non-invasive Genetic Sampling

Roost habitat availability is integral to many bat species' survival and fitness, and such habitat requirements during the summer maternity period are varied among Missouri species (Timpone et al. 2010). Roost selection can affect a bat's ability to obtain and conserve energy depending upon a roost's location relative to foraging sites and the structural ability to provide shelter from the elements (Kellner 1999). The ideal roost for any species would provide the best of these characteristics, while ensuring the bat alone can have ease of access (Kellner 1999). Natural habitat is selected more often than artificial habitat when an adequate amount of the former is available, especially by those species that primarily use trees for roosting, but when those parameters aren't met, artificial habitat can successfully be used as a replacement by some species (Whitaker et al. 2006).

Artificial bat habitat can include many anthropogenic structure, including homes, outbuildings, and bridges. The endangered Indiana bat (*Myotis sodalis*) has been documented under the siding of homes and inside the plastic cover of a ground-wire from a utility pole (Whitaker et al. 2006). Structures that are designed to mitigate the loss of limited natural habitat can also be used by roosting bats, as well as by researchers who want to monitor the activities of bats within the roost (Sparks et al. 2009). They might also allow researchers to observe how behaviors might differ in natural and artificial roosts and how the temperature and humidity fluctuations throughout the day inside the roost affect the inhabitants (Sparks et al. 2009). The designs for these structures are numerous, but all generally have the goal of providing shelter with an internal temperature greater than ambient (Brittingham and Williams 2000). Internal temperature gradients are typically achieved by insulating or putting a dark outer covering over some

portions while ventilating others (Brittingham and Williams 2000).

The bat houses used in this study are intended to provide alternative roosts and a method of non-invasive genetic sampling of any individuals who might use them, allowing for species identification and, potentially, a count of individuals and the frequency with which any individuals return. Non-invasive sampling is optimal at bat roosts since direct contact or disturbance of the bats themselves may result in roost abandonment. The information gathered from this study on artificial habitat usage could be used to increase the success of relocation and mitigation efforts concerning the species examined if any are found to use one design type more than the others, as well as further the use of non-invasive genetic material collection in studying these animals without deterring them from continued use of a roost.

Six bat house designs (n=2-6) were erected in four different locations across Missouri. The first question being addressed is: Are the bat species of Missouri more likely to inhabit a specific design of artificial habitat above others? The second question, which will be used in answering the first, is: Can mitochondrial DNA from guano be used to confidently identify the species of bats in Missouri? It is hypothesized that if the number of individuals of each species inhabiting six different styles of artificial habitat (PVC rocket box, artificial tree bark wrap, metal sheeting wrap, barn top, rocket box, and nursery box) during the maternity season (April 15th – August 15th) is measured, then

more Indiana bat (*Myotis sodalis*) individuals will be found in the artificial bark and metal sheeting wraps, more Northern long-eared myotis (*Myotis septentrionalis*) individuals in the PVC rocket box, more big brown bat (*Eptesicus fuscus*) in the barn top, and more little brown bat (*Myotis lucifugus*) individuals in the single bat box and rocket box. It is also hypothesized that if guano samples are collected within one week of deposition, then mitochondrial DNA will be present in large enough quantities to show variation between species, and potentially individuals within species, to make identification of species and individuals possible.



Rocket box for roosting bats and collection basket for bat guano

Hawthorn



Crataegus spp.

Cathy Combs' Habitat Rummy Card

Everyday Botany for Educators

BSFS offered a four-day class in July to provide insight into using plants for interdisciplinary inspiration in classrooms and non-formal education settings. Four undergraduates and three graduate students surveyed the plant world under the supervision of Celeste Prussia for some of the biological, chemical, and physical phenomena that make plants and plant allies unique. The students examined plants to develop insights and consider reasons

why certain plants are useful to people for medicinal, herbal, fiber and food applications. The overall goal of the course was to increase the students' disposition to excite others about plant biology and improve their ability to guide students of all ages toward experimenting with plants for science fair projects or answering self-guided inquiry questions about plants.

Some of the activities that engaged student interest included

collecting glade plants to analyze their potential for allelopathic effects, testing fresh and expired yeast for its potency, mordanting and dyeing cloth with plant material, preparing an herbal first aid kit with essential oils, making lotion bars and lip balm using natural botanicals and beeswax, and making paper from plant fiber. Students completed the course by submitting an independent plant-related project.

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Visit us on the web...
bullshoals.missouristate.edu

Our mission is to provide a location for faculty, students, and visiting scientists to conduct research and educational programs that increase public understanding of southwest Missouri ecosystems.

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BSFS Rallied Springfield Area Educators for Homeschool Outdoor Fair

March 19th and November 7th marked the second and third semi-annual Homeschool Outdoor Fairs in 2013. The spring event was hosted by The Watershed Center and The Botanical Center hosted the fall fair. There were over 200 attendees at the fall fair where the theme was "Harvests and Habitats." Environmental and conservation educators from throughout the Springfield area presented a wide array of activities, tours, demonstrations, and exhibits to

showcase the rich diversity of outdoor educational opportunities that exist in our area.

BSFS is delighted to announce that the next Homeschool Outdoor Fair is scheduled for May 1st at The Equestrian Center and The Watershed Center. "Showers to Flowers." is the spring theme for the fair with a focus on the water cycle, plants, and sustainability.

Contact Celeste if you'd like to be part of the action!



Homeschool student holds a Luna Moth

Friends of Bull Shoals Field Station

Are you interested in the protection of southwest Missouri's unique ecosystems? Do you have a love of the outdoors? Did you do field research as a student at MSU? Have you shared your excitement about nature with others? If you answer yes to any of these, then you're a perfect fit to be a **Friend of Bull Shoals Field Station**, a new organization to support research and education about the Missouri Ozarks.

Your membership donation will help support:

Undergraduate and Graduate Research Projects

Funds for equipment purchases, supplies, and transportation to/from BSFS
Summer stipends will eventually be provided as the funding builds

Education Projects

Green Leadership Academy for Diverse Ecosystems (GLADE) – high school juniors and seniors
Teacher workshops on resource education - Outreach for K-12 programs

Ongoing Research and Monitoring Projects

Monitoring Avian Productivity and Survivorship (MAPS) – bird banding
Water Quality Monitoring and more!

Members will receive the annual newsletter and the quarterly updates. Members will also receive an invitation to a Biennial Field Station Celebration to highlight our programs and celebrate the Ozarks. Sustaining members will receive periodic additional opportunities. Corporate members will be able to have their logo on BSFS publications.

Complete this form and return it to Janice Greene, Bull Shoals Field Station, Missouri State University, 901 S. National Ave., Springfield, MO 65897. Please, make checks payable to: Missouri State University Foundation.

Or—You can give online today at www.missouristate.edu/giving (enter Bulls Shoal Field Station in search bar).

Name _____ Phone _____

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Email address: _____

Membership Categories

_____ \$25	Individual membership	_____ \$100 or more	Sustaining membership
_____ \$40	Family membership	_____ \$200	Corporate membership