

# Bull Shoals Field Station

## Newsletter

Winter 2016-17

### BSFS Notes



BSFS summer class samples macroinvertebrates in Bee Creek

We, the BSFS staff, were pleased to award our first two mini-grants to graduate students this year. The ability to offer these mini-grants is provided through donations from alumni and supporters of the Bull Shoals Field Station. Read about Dylan Maag's work on pygmy rattlesnakes and Tyler Remick's work on botflies in field mice. We hope to be able to continue to offer these mini-grants to undergraduate and graduate researchers next summer.

### Inside this issue:

Grad Research Awards	2
Tyler Remick	2
Dylan Maag	2
Emily Beasley	3
GLADE 2016 Highlights	3
Collections Digitization	4
Friends of BSFS	4
Long Term Monitoring	4

### Class/Events in 2016

- Herpetology (B. Greene) Apr 15
- Plant Taxonomy (Bowe) Apr 30
- Fisheries Field Lab (S. Sickler) Apr 16
- Ozarks Natural Communities (J. Greene) May 20-22 & 27-28
- Kirbyville Middle School Field Days (Prussia) Jun 7, 14
- OTC Class (J. Greene) Jun 10
- GLADE (Kinslow, Trantham), Jun 20-26
- STEEL Teacher Training (Prussia) Jul 27
- Woody Plants ID (Bowe), Sep 17, Oct 22
- Plant Ecology (Wait), Sep 25 & 29
- Mammalogy Weekends (Maher) Sep 30-Oct 2; Oct 7-9
- Master Naturalists Retreat (Cantrell), Nov 4-6
- Christmas Bird Count (J. Greene), Jan 1, 2017

The field station staff offers Project Learning Tree, Project WET, and Flying WILD workshops throughout Missouri. Workshops provide interdisciplinary activities for educators to supplement their educational curriculum. In 2016, we offered 24 workshops and trained 437 educators.

We maintain several long-term monitoring projects at BSFS including weather data, neotropical birds, water quality of Bull Shoals Lake, phenology of seasons, and others. We are currently working on installing a buoy on the lake that will record a daily temperature profile. We have had some technical difficulties due to cellular network connectivity, but look for information on the website sometime this spring. See the article on the last page of this newsletter for more info.

It's been another great year for the Field Station. Thank you to all our supporters and friends. As usual, we are always happy to show the field station to you if you're in the area.

### Brooke Widmar—Spotlight on a GLADE Graduate

In 2013, a junior from Ozark High School came to a work party sponsored by BSFS and GLADE at the Dabbs Creek Area of the Mark Twain National Forest. Upon meeting this young woman, it was evident that she was special. Brooke went on to participate in GLADE 2013 and was admitted to MSU in the Biology program in Fall 2015. Janice Greene and Celeste Prussia nominated Brooke for the Woman Student of Distinction Award in spring 2016. She was awarded Honorable Mention which is notable for a student in her freshman year of studies. Since then, Brooke has gone on to achieve a number of other awards recognizing her community service through volunteerism and education. Most recently, Brooke was honored as a James River Basin Partnership's 20th Anniversary Awardee for Volunteerism and Studentship. Brooke is one of many GLADE graduates in the Biology program at Missouri State.

### BSFS Outreach in 2016

Thanks to a number of community cooperators including Watershed Center/Watershed Committee of the Ozarks and Equestrian Center of Water Valley Park, Botanical Center, City of Springfield Environmental Services, Missouri Department of Conservation, Springfield Plateau Master Naturalists and individual volunteers, BSFS was able to provide outreach services to help make the following events possible: Homeschool Outdoor Fairs on May 5 and Oct 6; Kirbyville Middle School Field Days on June 7 and 14; Missouri Environmental Education Association (MEEA) Missouri Green School Environmental Education (MOSGEE) Conference on November 5; and a Land Ethic Leaders Workshop held November 14-16. These events were attended by over 600 people—a number that would be difficult to achieve without off-site efforts.

## BSFS Graduate Research Awards

### **Botfly Life Cycle Impacts to Small Mammals**

Tyler Remick

Botflies, of the genus *Cuterebra*, are common parasites of rodents and lagomorphs. Eggs are commonly laid around small mammal burrows, where the larvae will hatch and attach to a host as it is entering or exiting. Each larva will then make its way into the oral or nasal passage and eventually form a small pocket under skin with a single opening for respiration, called a warble. As the larva matures, it exits the host through the pore, burrows into the ground and pupates, until an adult emerges and the cycle is repeated. Unlike most parasites, botfly larvae can be relatively large compared to the size of the host. In white-footed mice (*Peromyscus leucopus*), a mature larva is similar in size to the mouse's head. The size and location of the botfly warble, which is commonly found in the lower abdomen between the hind legs, is known to affect movement and reproductive ability in white-footed mice. If individuals are moving less and not actively searching for mates, it is likely that they are coming into contact with fewer individuals in the population. This decrease in contact rates can have cascading effects on the spread of disease, or other parasites through the population.

To study how botfly infection can affect contact rates in white footed mice populations, I established several live trapping grids in the Drury-Mincy Conservation Area. Captured mice would be given a unique ear tag number, examined for botflies and other parasites, and then released at the point of capture. Contact between individuals was inferred from capture locations, and a social network can then be

constructed showing the contacts between individuals. Since botfly infection is seasonal, most mice become infected with botflies at the end of June and throughout July with a second pulse period in September, so networks can be constructed and compared before botfly infection (May-June) and during peak botfly infection (July). Overall rates of contact can then be measured to determine if botfly infection changes the structure of the network or just changes the rates of contacts for infected individuals. If botfly-infected individuals are moving less and have fewer contacts, this could then alter the rate at which they become infected with other parasites such as fleas and ticks. It is important for wildlife managers and health officials to understand what is driving the contact rates for these small species that act as disease vectors.



Life stages of the botfly *Cuterebra fontinella*. Left to right – Second instar larva; Third instar larva ready to exit the host; Pupa that would be buried underneath the soil; Adult bot fly.

### **Pygmy Rattlesnakes**

Dylan Maag

The pygmy rattlesnake (*Sistrurus miliarius*) is an interesting and important species of Missouri's ecosystems. They help control small rodent populations and provide food for larger mammals and birds. Little is known about this species and research is essential so we can understand and appreciate the role of these animals in ecosystems.

My research was specifically focused on the spatial ecology and microhabitat selection of the pygmy rattlesnake. All the data collection was done at BSFS in the Drury Conservation Area but also included the Mincy Conservation Area and some privately-owned properties close to the station. Snakes were captured using a combination of cover board, road surveys, and walking the roadside ditches. All of the snakes captured were tagged, and body measurements (mass, snout-to-vent length, and tail length) with capture locations were recorded. Of the 33 pygmy rattlesnakes captured, 14 were implanted with radio transmitters in their body cavities. Once each snake recovered from the surgery, it was released back to the capture site. As the common name suggests, these snakes are not very long or massive. For the 33 snakes found, the average length of the snakes was only 12.5 – 13.5 inches and weighed around 2 ounces, depending on the sex.

The second phase of my research involved radio tracking the snakes in their natural environment. From June through November, the snakes were located one to four times a week using an antenna and radio receiver. Upon re-locating the snake, the time, date, body position, whether it was alive or not, and its GPS coordinates were recorded. Over the entire tracking period half of the radio-tagged

snakes died either from surgery complications, predation from large mammals and birds of prey, or from unknown causes. These snakes are ambush predators and their movements were characterized by multiple small movements with rare longer movements. This behavior has been documented before in rattlesnakes but not to this extreme. These snakes moved so little that for some snakes they stayed within an area of a 10-car parking lot.

Microhabitat selection of specimens was also researched. Microhabitat is the habitat directly around the snake. Habitat inventory included the quantity and size of rocks, snake's proximity to the rocks, the canopy cover and nearby bushes and trees. When a snake would leave the area in which it was previously found, I inventoried and measured the prior microhabitat structures plus some others. Then for each re-location of the snakes, a random point was selected and the same structures at that point were measured. This allowed me to compare sites that the snakes selected to sites in the environment, thus indicating preferences and avoidances. I am still analyzing these data. Anecdotally, these snakes seem to prefer more vegetation, such as bushes and tufts of grass, rather than rocky outcrops. However, since the females give birth to live young, pregnant females seem to select more open and rocky microhabitat than do males and non-pregnant females. This allows them to achieve higher body temperatures to aid their developing young.

Some non-pregnant and male snakes were located and can be tracked. Thus my research at BSFS will continue from late spring through early fall of 2017. With the new data, I hope to fill the gaps and answer some questions that arose during my research on this species during 2016.

## When an Island is not an Island

Emily Beasley

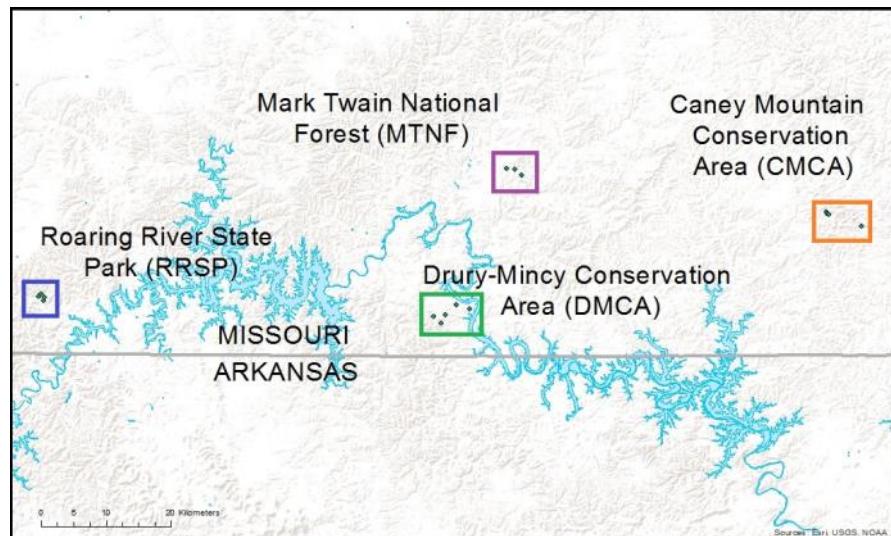
Southwest Missouri contains a diverse suite of habitat types, including hardwood forests, savannas, caves and glades. The Ozark glades in particular are unique habitats characterized by shallow soils, the absence of a developed canopy, and dolomite and/or limestone bedrock. The glades are home to a diverse assemblage of mammals, including common species such as white-footed mice (*Peromyscus leucopus*) and Eastern wood rats (*Neotoma floridana*), plus less common species such as Texas mice (*P. attwateri*) and Fulvous harvest mice (*Reithrodontomys fulvescens*). Glades are a naturally fragmented or "patchy" habitat, and can often be viewed as habitat "islands" in a forest "sea". This makes the glades a suitable system for island studies and metacommunity concepts, both of which involve local communities that live among a set of islands or habitat patches.

My thesis research, conducted at Drury-Mincy Conservation Area and three other locations in southwest Missouri (map at right), focuses on explaining patterns of small mammal distributions among glades. Several metrics are available for evaluating spatial patterns, but I am focusing on the traditional island biogeography theory (IBT) and the more modern elements of metacommunity structure (EMS) framework. IBT describes the effects of

patch area and isolation on species richness, whereas the EMS framework describes species responses to an environmental gradient, such as elevation, and matches the overall pattern of responses to an idealized meta-community structure.

Last summer I captured approximately 250 individuals representing eight different species. Of these, 70 individuals within seven species were from the glades around Bull Shoals Field Station. Additional data will be collected next

summer. The results of this study will not only further our knowledge of community dynamics, it also will be applicable to the broader fields of disease ecology, community responses to climate change, and conservation biology. Understanding spatial patterns of communities in a naturally fragmented system will aid in our understanding of artificially fragmented communities, which is in reality the landscape that is becoming increasingly fragmented by human activity.



Map of Island Biogeography Theory study sites in southwestern Missouri



Tammy Trantham  
Co-Director of GLADE



Another successful GLADE week was held at the Bull Shoals Field Station from June 19-25, 2016. Fifteen students attended the week-long camp to learn about Ozarks ecosystems. Our days included entomology, herpetology, bird banding, water quality assessments, and leadership activities. The students participated in hands-on activities to learn about the Ozark ecosystems from experts in the field. Some new topics were added this year including soil morphology and soil health. In addition, we walked through "time" on a climate change timeline to see how carbon dioxide has increased in our atmosphere over the last several decades.

The students enjoyed the week and soaked up a lot of information. Mid-week of GLADE, all of the students helped MDC transplant Giant River Cane to restore native habitat at Bee Creek on the Mincy Conservation Area. They planted over 80 plants in record time! Many of the students are working on ideas for a Community Action Project in their neighborhood. We hope to see more projects completed this Spring.

Keep in mind the 2017 GLADE application period is open and the form is available at this URL: <http://www.greenleadershipacademy.org> Applications are due on March 25, 2017.

**Bull Shoals Field Station**  
Missouri State University  
901 S. National Ave—Biology  
Springfield, MO 65897

Visit us on the web...  
[bullshoals.missouristate.edu](http://bullshoals.missouristate.edu)  
Or Like us on Facebook at MSU  
Bull Shoals Field Station

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.

Dr. Janice Greene, BSFS Director  
Dr. Beth Bowles, BSFS Research Specialist  
Erica Cox, Project WET Coordinator  
Celeste Prussia, MS, BSFS Manager

417-836-5306  
417-836-3731  
417-836-4337  
314-313-6694

[JaniceGreene@MissouriState.edu](mailto:JaniceGreene@MissouriState.edu)  
[BethBowles@MissouriState.edu](mailto:BethBowles@MissouriState.edu)  
[EricaCox@MissouriState.edu](mailto:EricaCox@MissouriState.edu)  
[CelestePrussia@MissouriState.edu](mailto:CelestePrussia@MissouriState.edu)

## BSFS Working Toward Digitization of Plant Collection

iDigBio, Integrated Digitized Biocollections, is the National Resource funded by the National Science Foundation for Advancing Digitization of Biodiversity Collections (ADBC). Through iDigBio, data and images for millions of biological specimens are being curated, connected and made available in electronic format for the biological research community, government agencies, students, educators, and the general public.

BSFS is working with iDigBio to make its electronic database of plants available online. The database of herbarium sheet label information is maintained by Dr. Michelle Bowe and the plants were mostly collected by Shanda King and Jennifer Moody-Weis during their Master's thesis research

The ultimate goal of this work is photographic digitization of the collection so the images can be searchable online through Symbiota for research and casual interests.



Sample of herbarium sheet for digitization

## 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**, and we're still looking for a few good friends..

Membership donations support projects including: Undergraduate and Graduate research, education, ongoing research and long-term monitoring  
Membership benefits include: Newsletters, invitations to special member events; Corporate sponsorship (gains your logo on BSFS publications)  
Membership levels are: \$25 (Individual), \$40 (Family), \$100 or more (Sustaining); and \$200 (Corporate)  
A donation of any amount may be made in honor of or as a memorial to someone for whom you care

You can give online today at [www.missouristate.edu/giving](http://www.missouristate.edu/giving) (enter Bull Shoals Field Station in search bar) or contact Janice Greene to learn more.

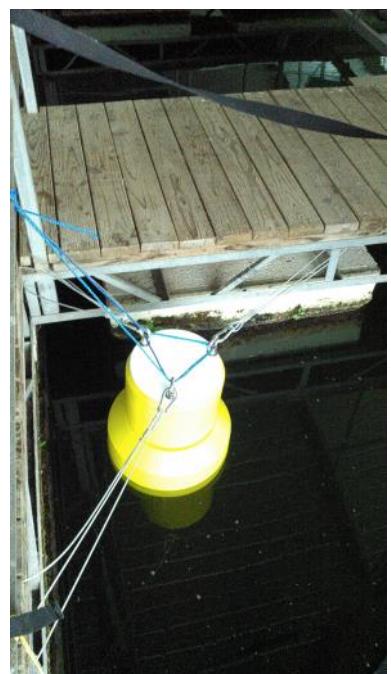
## BSFS Long Term Monitoring Equipment

BSFS maintains two long term environmental monitoring stations and is in the process of adding a third.

The Weather Station has been in operation since 2001 (equipment updated in 2015) recording meteorological data from a food plot in the Drury Conservation Area.. Data sets can be accessed at our website: <http://bullshoals.missouristate.edu/weather.htm>

On November 20, 2013 we uploaded our first images from a StarDot NetCam on a 30 foot mast in a glade within the Drury CA. Each half hour, the camera records an image of the landscape from 7 am to 7 pm CST. The latest image capture by our PhenoCam can be seen in your Internet web browser at this URL: <https://phenocam.sr.unh.edu/data/latest/bullshoals.jpg>

Beth Bowles and Celeste Prussia have been working on the challenges of cellular communications from a Verizon Wireless tower in Kirbyville to network a SDL500C datalogger that records the temperature at 12 depths in Bull Shoals Lake at K-Dock Marina. The bluff rises sharply above the marina at an elevation of 100-120 meters higher than the water level where the CB500 buoy is moored. This topography makes it impossible to establish a line-of-sight from the cellular tower to the antenna and modem inside the datalogger or any antenna that we have been able to connect to the system. We'll keep working on it, though!



CB50 Buoy that will house the SDC500C