

## **DLIA ATBI CONFERENCE 2014**

### **Schedule at a Glance**

#### **THURSDAY, MARCH 20, 2014**

- 8 a.m. Registration Open (Vendor and poster setup)
- 9 a.m. - 5 p.m. Field Trip A: ALL DAY – **Tuckaleechee Cave Tour: Cave Ecology and Conservation – Matt Niemiller**
- 9 a.m. - 4 p.m. Great Smoky Mountains Science Colloquium (see schedule that follows)
- 12 p.m. Lunch (on your own)
- 1 - 5 p.m. Field Trip B: HALF DAY – **Bryophytes of the Smokies – Ken McFarland**
- 1 - 5 p.m. Field Trip C: HALF DAY – **Spring Wildflowers – Dan Pittillo and Steve McGaffin**
- 5 - 7 p.m. Opening Reception “Business after Hours” with Gatlinburg Chamber of Commerce at Twin Creeks Science and Education Center, heavy hors d'oeuvres and drinks.

#### **FRIDAY, MARCH 21, 2014**

- 7 - 10 a.m. Field Trip D: **Birding and Bird Diversity in the Smokies – Charles Smith**
- 8 a.m. Registration Open
- 9 - 9:15 a.m. **DLIA and Park Welcome:** Pat Parr, DLIA Board Chair; Pedro Ramos, GSMNP
- 9:15 - 9:30 a.m. **Update: Smokies’ ATBI – Todd Witcher, Discover Life in America**
- 9:30 - 10 a.m. **Update: Park Air Resources – Jim Renfro, Great Smoky Mountains National Park**  
This presentation will provide a summary of the status and trends of air quality monitoring in and around the national park and ongoing efforts addressing these issues. The talk will include an overview of the responsibilities and requirements of the park’s federal Class I Area designation under the Clean Air Act. Also, the discussion will focus on the air pollution problems that impair scenic views from fine particle pollution and regional haze, deposition concerns from excessive nitrogen, sulfur and mercury to aquatic and terrestrial systems, ozone pollution impacts to park vegetation, and the challenges from non-attainment designations of the EPA ozone and fine particle public health standards.

**Jim Renfro** is the Air Resource Specialist for GSMNP. He started working for the Smokies in 1984, and is currently responsible for managing the park’s air quality program, one of the most comprehensive air monitoring programs in the National Park Service. He earned a Bachelor’s and Master’s degree in Forestry from Southern Illinois University at Carbondale. Jim’s duties include coordinating air resources management operations and monitoring activities at seven research stations.

10 - 10:30 a.m.

**ATBI Science Presentations (15 minute intervals):**

**Introduction – ATBI Science** – Mike Dennis, DLIA Science Committee Chair

**Crayfish of Great Smoky Mountains National Park: Natural History and Conservation** – Zach Loughman, Michael Lucero, Nicole M. Sadecky

As part of Discover Life in America's ATBI, crayfishes were sampled in GSMNP. Site selection was nonrandom and determined based on site access and availability. Crayfishes were collected by hand with seines and dipnets and while snorkeling. Survey results indicate ten crayfish species occur in GSMNP, with the genus *Cambarus* dominating GSMNP's fauna. Two undescribed species with limited distributions were discovered with this effort. *Cambarus bartonii* was the most widespread crayfish, occurring in all watersheds in GSMNP. *Cambarus tuckasegee*, a North Carolina endemic was discovered occurring in all GSMNP Tuckasegee watershed tributaries, significantly increasing the species' known range. Two burrowing species, *Cambarus acanthura* and *Cambarus carolinus* make up GSMNP burrowing crayfish fauna. The genus *Orconectes* is depauperate in GSMNP, and represented by two species, *Orconectes erichsonianus* and *Orconectes forceps*. Both species are limited to low elevation, large mainstem systems. *Cambarus asperimanus* and *Cambarus reburus* were recorded in previous GSMNP surveys, but not collected in this effort. At present GSMNP's crayfishes appear to be stable.

**Zachary Loughman** began studying crayfish while in pursuit of a master's degree in biology at Marshall University. Since his inception into astacology in 2004, Loughman has published extensively on central Appalachia's crayfish and described several three new crayfish taxa, performed field work in West Virginia, Maryland, Ohio, Virginia, Kentucky and Great Smoky Mountains National Park. Loughman recently completed a six year statewide inventory and conservation assessment of West Virginia crayfish, the data of which currently is being prepared for a book on West Virginia's crayfishes. Loughman has worked as an environmental educator for Oglebay Institute's Schrader Environmental Education Center, and currently is Assistant Professor of Zoology at West Liberty University where he is director of both the Ecology, Evolution, and Organismal Biology and Environmental Education and Stewardship majors in biology.

10:30 - 10:45 a.m.

Break

**Is Great Smoky Mountains National Park a Biodiversity Hotspot for Nematodes?** – Tom Powers

For the last three years a research group from the Universities of Nebraska and Tennessee has been sampling soil nematodes in 16 ATBI sites and several other locations of special interest in the park. The initial survey focused on recording the number of species using standard light and scanning electron microscopy. To date 461 specimens representing 78 genera have been identified. However, in order to address questions regarding the origin of diversity and the processes that influence nematode diversity, DNA-based methods are required. The molecular approach for nematode DNA analysis includes selecting individual nematodes, measuring, photographing and amplifying specific regions of the

nematode genome. These molecular studies have necessarily concentrated on Criconeematidae, a family of plant feeding nematodes. It is too early to make broad conclusions, but the initial observations are intriguing. First, there are a considerable number of cryptic "species" in the park. These are species only identifiable by DNA analysis. Second, there are nematode lineages (species?) that are quite genetically distinct from related species outside the park. Third, there is not a clear relationship between plant diversity and nematode diversity. For example, given the low level of plant diversity in the beech gap forests, there is a surprisingly large amount of nematode diversity in these plant communities.

**Dr. Thomas Powers** is a professor of Plant Pathology at the University of Nebraska-Lincoln. His research centers on nematode biodiversity, its origin and the processes that influence diversity. Currently, together with Dr. Ernest Bernard from the University of Tennessee, he is characterizing plant parasitic nematode diversity from the major ecoregions of North America.

**ATBI Mapping Program: Where Do All These Species Live?** – Tanner Jessel  
The ATBI not only focuses on scientific research and education, but also on conservation stewardship of the national park. One of the most valuable conservation questions it is answering is: Where do the thousands of species that call the Smokies "home" actually live? To date the ATBI not only has dot maps for almost all the species, but for those with enough (>30) point locations our partners at the University of Tennessee can produce "predictive models" of where they occur over the entire 800+ square mile park... an Atlas of Species!

**Tanner Jessel** is a 2002 graduate of the Sevier County School System, where he enjoyed numerous field trips to the nearby Smokies and was inspired to study ecology at the University of Tennessee in Knoxville. After four years with the U.S. Geological Survey's Biological Informatics Program, he returned to UT-Knoxville to pursue a Master of Science in Information Sciences with a minor in Computational Science, working as a graduate research assistant for the NSF-funded Data Observation Network for Earth (DataONE). He currently volunteers with Tom Colson (NPS) and Keith Langdon (NPS, retired) on the ATBI mapping project.

**Thicket of Diversity ATBI** – Mona Halvorsen

Measuring biodiversity is an important first step to acquire knowledge on the health and sustainability of planet Earth. Inventories, as assessment tools, provide the valuable data needed to describe the status of living organisms. The Big Thicket National Preserve's ATBI is called the Thicket of Diversity (ToD). It targets not only park lands but other public and private properties with an eye on management and conservation. Since the ToD's establishment in 2006, 118,891 specimens have been collected or observed and 2,901 species have been identified according to the February 2014 Taxa Tally. Of those, 12 are new to science, 378 are new to the preserve, 133 are new to the state, and 1 is new to the United States. ToD Director Mona Halvorsen will provide an overview of

the ATBI project, how interns strengthened and visualized inventory, mapping benefits, and how mitigation funds are sustaining the ATBI project.

**Mona A. Halvorsen**, Director of Thicket of Diversity, worked in the field of technology before graduating from Lamar University with a Bachelor's degree and is a certified Technical Writer. She has continued working with technology for almost 20 years, and applies this knowledge to the Thicket of Diversity All Taxa Biodiversity Inventory. While living in Montana, she was the first woman to become a member of Cascade County Search and Rescue, a group consisting entirely of volunteers. She is actively involved with the work of the researchers and scientists of the Thicket of Diversity ATBI, and became a Myxomycetes, Nematode and Macro Fungi Citizen Scientist, which enables her to collect specimens for scientists in their absence.

11:30 a.m. - 12:30 p.m. **The Ecology of Cave Life in East Tennessee** – Matt Niemiller

Caves represent one of the most challenging environments on the planet. Animals face extreme challenges to find food, potential mates and other resources in complete darkness. Yet a variety of organisms utilize caves during their lives, including some species that have successfully colonized and are completely restricted to subterranean habitats. This presentation will discuss the variety of organisms that can be found in caves of East Tennessee, including several species known as troglobionts that are obligately found underground. We will examine adaptations that have evolved to survive in a world of perpetual darkness and generally limited food resources, the ecology of cave ecosystems, and the threats facing subterranean life in the region. In addition, we will look at educational outreach opportunities and the development of teaching modules for K-12 on cave life that can be employed in the classroom.

**Dr. Matthew L. Niemiller** is currently a postdoctoral researcher in the Department of Biology at the University of Kentucky. He received his B.S. and M.S. from Middle Tennessee State University and his Ph.D. from the University of Tennessee-Knoxville. He was a Donnelley Postdoctoral Fellow at Yale University. Dr. Niemiller studies the ecology, evolution and conservation of cave life. He has published more than 25 articles and book chapters on subterranean biology, as well as a field guide to cave life in Tennessee, Alabama and Georgia. He also is the coeditor of *The Amphibians of Tennessee* and *The Reptiles of Tennessee* published by the University of Tennessee Press.

12:30 - 1:30 p.m. Lunch (on your own)

1:30 - 4:30 p.m. **Concurrent Sessions**

1:30 - 3:30 pm. **Nature Photography with your Phone: iPhonography** – Paul Hassell

The best camera is the one you have with you. Let's face it, probably your camera phone, right? Enter the two hours that will shift your thinking about photography with your phone! In this unique and very practical program, you'll learn everything you need to know to become a master of light. Then, we'll go try things out on a short adventure outside. Yes, we'll cover some of the latest gadgets and apps that make phone photography so stunning. But we'll mostly

wow you with how a few simple understandings about light can shift everything for your phone photography. The various citizen science databases will be real happy you came. Bring whatever picture-making device you have and walk away a changed person!

**Paul Hassell** found what makes him tick and organized his life around that calling. He designed a unique major at The University of Tennessee: Freelance Photography and Writing for the Natural Environment. He's a member of North American Nature Photography Association (NANPA) and Southern Appalachian Nature Photographers (SANP), but the credentials matter less to him than sharing the profound experience.

1:30 - 2:00 p.m.

**Tennessee Valley Authority's Endeavors in Monitoring, Management, and Protection of Bats** - Holly LeGrand

The Tennessee Valley Authority (TVA) is the nation's largest public power provider and a corporation of the U.S. government. TVA's multifaceted mission includes environmental stewardship across the TVA Power Service Area (PSA), which includes Tennessee and portions of the six surrounding states. The TVA PSA encompasses much of the interior southeast, which is one of the mostly biologically diverse regions in the U.S. Several species of bat, including two federally endangered bats, are known to occur in the PSA and on TVA-managed lands. TVA actively works across seasons and with sister agencies to monitor and manage protected bats species and their associated habitat.

**Holly LeGrand** is a terrestrial zoologist with the Tennessee Valley Authority in Knoxville, Tennessee. She earned her B. S. in Biology from Salem College (Winston-Salem, NC) and her M.S. in Wildlife from Louisiana State University, Baton Rouge. She began her career with TVA in 2005 in Guntersville, Alabama, where she served on the local watershed team and focused on management of natural resources on TVA-managed lands. She transitioned to her current position in 2009, when her primary responsibilities shifted to ensuring TVA's regulatory compliance with respect to rare and protected species, migratory birds, and resources important to terrestrial animals across the seven-state TVA Power Service Area.

2:00 – 2:15 p.m.

**Microsoft Enterprise and ArcGIS Technologies to Support Data Discovery and Management of GSMNP Biological Data Collections** – David White

Clemson University is working with the Great Smoky Mountains National Park to support the migration of the park's biological database to an enterprise Geographic Information System (GIS). The objectives of this project are to develop a web-based mapping tool to support data discovery, visualization and data download. In addition, the project requires the capability to support data entry and editing. These efforts have focused on the migration of the ATBI Microsoft Access data model into a relational database model. To achieve this, GSMNP staff and partners developed a relational database model that runs as a Microsoft SQL Server application, and is integrated with ESRI's ArcGIS Desktop and ArcGIS Server technologies. We will discuss the status of the project and

present our efforts to enable web-based tools and enterprise technologies for the GSMNP biological data collections.

**Dr. David White** serves as Director of Environmental Informatics at Clemson's Cyberinfrastructure Technology Integration. He has an extensive background in developing, planning, and implementing activities in support of environmental information management systems. His efforts include the development of web-based metadata authoring systems, directing the deployment of hardware and software systems for real-time data collection systems, and the design and implementation of spatially-enabled relational databases to support geospatial portals and web services. Dr. White has a Ph.D. in Marine Science from the University of South Carolina where he studied the spatial and temporal dynamics of phytoplankton community structure and water quality in estuarine coastal systems.

2:15 - 2:30 p.m.

**Myxomycete Diversity at the Big Thicket National Preserve** – Kate Winsett  
Myxomycetes, or plasmodial slime molds, are eukaryotic microorganisms associated with decaying vegetation throughout terrestrial ecosystems. These organisms are generally considered bacteriovores within soil and humus layers and form fruiting structures on the surface of dead or decaying vegetation. Between 2007 and 2011, the first intensive collecting effort for these organisms was undertaken in the Big Thicket National Preserve in Eastern Texas. The Big Thicket is an ecotonal region with ecological influences from eastern hardwood forests, the grasslands of Central North America, and the subtropical coastal plains and wetlands. Within this rich and diverse region, 948 collections representing 99 species were recovered from field surveys and laboratory cultivation from decaying plant material within 11 units of the preserve. Fifty-eight species were new records for the preserve. Several species encountered are generally associated with more tropical than temperate regions. One species recovered, *Arcyria margino-undulata*, is considered rare, but was collected more than once within the preserve.

**Dr. Katie Winsett** is an instructor of biology at the University of Southern Indiana currently teaching environmental science. Dr. Winsett studies the biodiversity and ecology of the mycetozoa (true slime molds), and she started working with the Thicket of Diversity ATBI program at the Big Thicket National Preserve in 2007. In addition to scientific research, she spends a significant amount of time writing activities and designing tools for active learning in large enrollment science classrooms.

2:30 - 2:45 p.m.

**Bat Surveys on the Oak Ridge Reservation** – Kitty McCracken  
The Department of Energy's Oak Ridge Reservation (ORR) is a 33,500-acre tract of land located in East Tennessee. Most of the ORR is forested, with large blocks of mature interior forest, extensive areas of undisturbed wetlands, streams with riparian vegetation and several hundred acres of grassy meadows, with the Clinch River forming its south and west boundaries. The ORR also contains three major developed sites. A two-year bat monitoring plan was developed and approved by DOE and the USFWS to conduct acoustic surveys at sites across the

ORR to determine bat species richness and abundance, with particular emphasis on the endangered Indiana Bat. The results presented here cover the first year of the acoustic survey plan, as well as mist net trapping data collected as part of a University of Tennessee doctoral research project. Thirty-four sites were selected for acoustic surveys, and one site for mist-netting. Analysis of acoustic data revealed the presence of twelve bat species. Seven of these species were confirmed at the mist-netting site, including the endangered Indiana bat and gray bat.

**Kitty (Mary Kathryn) McCracken** has worked in the Environmental Sciences Division at Oak Ridge National Laboratory for more than twenty years, and is a member of the Natural Resources Management Team. She heads a large survey effort to identify bat species present on the 34, 500-acre Oak Ridge Reservation for the Department of Energy, particularly the endangered Indiana Bat. Kitty received her M.A. degree in 1988 from the University of Tennessee for research on migratory pathways of Mexican Free-tailed Bats, and she worked with Dr. Gary McCracken on several aspects of Mexican Free-tailed Bat maternal behavior and population genetics.

2:45 - 3 p.m.

**Break**

3 - 3:15 p.m.

**Changes in Winter Activity of Bats in Great Smoky Mountains National Park Due to White-Nose Syndrome** – Riley Bernard

The White-Nose Syndrome (WNS) epizootic, characterized by the psychrophilic fungus *Pseudogymnoascus destructans* (Pd), has caused unprecedented mortality of hibernating bats throughout the Northeastern United States. Pd was first recorded in Great Smoky Mountains National Park during winter 2009/2010 and bats were confirmed WNS positive in winter 2011/2012. By January 2013, park rangers began receiving numerous reports regarding daytime activity of bats within the park, including contact with a park visitor. The goal of this research is to evaluate possible behavioral changes of bats during winter hibernation following progression of WNS. We hypothesize that WNS-affected caves in southern latitudes may experience delayed mortality due to warmer ambient temperatures during hibernation. Using ultrasonic detectors and temperature data, we have established that bats in GSMNP are active throughout the winter.

**Riley Bernard** is a Ph.D. student in the Department of Ecology and Evolutionary Biology at the University of Tennessee, Knoxville and works with Dr. Gary McCracken, focusing on the winter behaviors of cave roosting bats in Tennessee and how their populations and behaviors may change due to the presence of White-Nose Syndrome. She attended Linfield College and graduated with a B.S. in Environmental Studies, then worked in the Natural Resource Division of the Confederated Tribes of the Grand Ronde in Grand Ronde, Oregon on projects ranging from lamprey toxicology tests, wetland surveys, spawning salmon and steelhead surveys, to dissecting deer and elk heads for chronic wasting disease testing. In 2008, she attended the University of Hawaii at Hilo to pursue a Master's degree in Tropical Conservation Biology and Environmental Science.

Her thesis looked at the foraging and migratory behaviors of the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*).

3:15 - 4 p.m.

**Cave Ecology and White-Nose Syndrome** - Cory Holiday

This talk provides a brief introduction to cave ecology in North America including bats and how bats impact cave systems. We will explore the nature of life in a cave, the dynamics of White-Nose Syndrome and how it might affect bats and caves throughout North America. We will take a close look at the Gray Bat, a southeastern species that may be the most "at risk" bat as a result of WNS. Looking forward, the presentation will conclude with an introduction to WNS mitigation research.

**Cory Holliday** is a cave and karst program manager for The Tennessee Chapter of The Nature Conservancy. Cory is a board member of the TN Bat Working Group and is a founding member of the TN Cave and Karst Working Group. His background is in cave ecology and cave bat conservation, but he has shifted focus to White-Nose Syndrome since 2009. Cory and The Nature Conservancy constructed an artificial cave to serve as the first-of-its-kind experimental WNS mitigation project, and Cory serves in a leadership position as part of the national WNS response planning effort.

3:30 - 4:30 p.m.

**White-Nose Syndrome (WNS) and Bat Conservation in 2014** – David Pelren

This talk provides a report on the current status of our rarer bats, with a primary emphasis on cave-dwelling species of Tennessee. What does the future hold for these mammals? We will discuss WNS surveillance and response as well as population monitoring for federally endangered species in the state (Indiana and Gray Bats). Current population trends of other species being affected by WNS that have been historically considered more common will be addressed (for example, Northern Long-eared Bat, little Brown Bat, and Tricolored Bat).

**David Pelren** graduated with a B.A. in Biology from Berea College (Berea, Kentucky), has an M.S. in Biology from Tennessee Technological University (Cookeville, Tennessee), and has worked as a fisheries biologist with the Environmental Section of Kentucky Department of Fish and Wildlife Resources. He also worked as Fish and Wildlife Biologist with the Ecological Services Division of Fish and Wildlife Service. In 2011, he took over the office's role as lead biologist in addressing endangered bat species recovery, and also addresses other cave resource issues, such as the current evaluation for potential listing of six cave beetles.

6 - 9 p.m.

Keynote Address and Reception with Merlin Tuttle, heavy hors d'oeuvres and drinks.

**The Amazing World of Bats**

Bats comprise nearly a quarter of all mammals. They come in an amazing variety, as cute as any panda or as strange as any dinosaur, from tiny bamboo bats that live in beetle holes to giant flying foxes with six-foot wingspans.



They're found nearly everywhere, are primary seed dispersers in both deserts and rain forests, pollinate some of the world's most valuable crops and save American farmers billions of dollars annually in avoided pesticide use. They maintain long-term social relationships similar to those of humans, elephants and dolphins, share information and even adopt orphans.

If you'd like to learn more about these fascinating creatures, you won't want to miss Dr. Merlin Tuttle's talk, "The Amazing World of Bats." Introduced to the study of bats in Knoxville while a student at the University of Tennessee, Tuttle has traveled the world for more than 50 years studying and photographing hundreds of species of bats, from bizarre to beautiful. His stunning photography has been published and exhibited worldwide, including in five National Geographic articles; his latest is scheduled to appear in the March 2014 issue. The images show bats courting, rearing young, emerging from beetle holes, pollinating crops, fishing, catching insects and much more.

Dr. Tuttle founded Bat Conservation International and has been an invited speaker at America's most prestigious institutions, from Harvard and Princeton Universities to the National Geographic Society and Smithsonian.

#### **SATURDAY, MARCH 23, 2014**

8:30 a.m. - Noon

Field Trip E: **Schoolyard ATBI – Tiffany Beachy and Steve McGaffin**

9 - 10 a.m.

**Biodiversity in Southern Appalachia Over the Past Seven Million Years: The Gray Fossil Site and Beyond** – Blaine Schubert

Very little of the Cenozoic Era, or past 65 million years, is represented in the fossil record of Appalachia. The Mio-Pliocene Gray Fossil Site of northeastern Tennessee is an exception, dating to 4.5-7 million years ago based on the represented mammals. This sinkhole lake deposit represents the only Miocene or Pliocene fossil locality in the Appalachians, filling a significant gap in our understanding of how ecosystems in this region changed over time. The fossil site is extensive, covering approximately 5 acres, and is more than 100 feet deep in some areas. At this point less than 1% of the site has been excavated. Fossils are abundant and include plants, insects, fish, salamanders, frogs, lizards, snakes, turtles, alligators, birds, and a wide variety of mammals. Significant discoveries include a new type of red panda, early short-faced bears, a venomous beaded lizard, rhinos, large camels, saber-toothed cats, shovel-tusked elephants, and an abundance of tapirs. Because the site is so unique, many of the organisms recovered are completely new to science. In fact, a number of new species have already been described, and other descriptions are underway. The represented plants and animals indicate the site was surrounded by an oak-hickory forest with Asian affinities, and winter temperatures were warmer than present. With such an incredibly rich and extensive deposit, the Gray site will continue to produce new discoveries, adding to our knowledge of Appalachian biodiversity through time.

**Dr. Blaine W. Schubert** is the Director of the Center of Excellence in Paleontology and Natural History Museum at the Gray Fossil Site. He is also an Associate Professor in the Department of Geosciences at East Tennessee State University. Dr. Schubert is a vertebrate paleontologist and his research focuses on the evolution and paleoecology of reptiles and mammals over the past 20 million years. In particular, he is known for his research on bears, alligators, Pleistocene mammals, and Ice Age cave faunas.

10 - 10:45 a.m.

**NSTA Citizen Science Book Series** – Susan Sachs

In the fall of 2013, NSTA press published "Citizen Science: 15 Lessons that Bring Biology to Life, Grades 6-12." The goal of the book is to engage students in public research projects, also known as citizen science. Two of the 15 lessons shared in this book come from Great Smoky Mountains National Park, with one focusing on the park ATBI. This session will highlight the Smokies ATBI activity and will share extensions not in the book to bring STEM into the classroom.

**Susan Sachs** is the Education Coordinator for the Appalachian Highlands Science Learning Center in Great Smoky Mountains National Park. She has been fortunate to be involved with creating ATBI education activities and citizen science projects in the Smokies since 1999.

10:30 - 10:45 a.m.

**Summary of a Multi-Year Spring Migration Study of Indiana Bats from Four Tennessee Caves, 2009 -2013** – Piper Roby and Mark Gumber from Copperhead Consulting

Beginning in 2009, Copperhead Consulting, in conjunction with multiple state and federal agencies, began research focused on understanding migratory behavior of Indiana Bats (*Myotis sodalis*) that hibernate in Tennessee and locating maternity colonies. Relatively little is known about the migratory behavior of Indiana Bats, and movements have historically been described as straight line flights between banding and recapture sites. In addition to identifying previously unknown summer grounds, data were collected on how bats migrate with regards to direction, tortuosity, flight speed, use of stopover sites, and weather effects. Ground and aerial radio-telemetry were used to track female Indiana Bats during spring migration from four caves in eastern Tennessee over five consecutive spring migration seasons: 2009-2013.

**Piper Roby** has a BA in Biology from Hanover College and an MS in Biology from the University of Louisville. Between pursuing her degrees, Piper worked as a wildlife biotech for the Santa Monica Mountains National Recreation Area in Thousand Oaks, CA where she trapped and radio-tracked bobcats, coyotes, and mountain lions, conducted extensive herp surveys, and trapped small mammals. Piper has been a wildlife biologist with Copperhead Consulting in Paint Lick, KY since 2005 where she conducts endangered species surveys; however, her main task is surveying for Indiana bats and conducting research on their ecology. Her main interest is studying the spring migration behavior of Indiana bats and has been conducting this research since 2009.

10:45 - 11 a.m.

**Break**

11 - 11:30 a.m. **Poster Session** (Nematodes, Springtails, Slime Molds, others)

11 a.m. - 12:30 p.m. **Crayfish in Curriculum and the Classroom** – Zach Loughman

Crayfishes provide a wonderful conduit to engage children in science. These enigmatic creatures often are one of the first animals children interact with in a river, creek or wetland. This workshop will provide educators with a hands-on review of crayfish biology, behavior, and ecology that will enable them to capture their students' enthusiasm for crayfishes in a classroom environment. Focus will be placed on the major anatomical characteristics used to differentiate crayfish species and key concepts associated with their taxonomy. Utilization of crayfishes in the classroom and the field will be discussed, and activities employing crayfishes to teach scientific method, basic biological concepts, and ecology will be described. In addition, techniques used to maintain live crayfish in the classroom will be discussed. Identification keys, curricula, and crayfish literature will be provided to all attendees.

12:30 p.m. **Lunch** (on your own)

1:30 - 2:30 p.m. **Citizen Science: Electronic Naturalist** – Steve McGaffin

As technology gets smaller, more powerful and more connected, the opportunities for naturalists to explore nature and participate in science grow. We'll explore a variety of online tools that will help you identify and learn about wildlife, share your discoveries, track and organize your observations, and help you collect data for scientists.

**Steve McGaffin**, Curator of Education at Knoxville Zoo, has been interpreting natural history in a variety of settings since 1987. Addicted to citizen science, he is a coordinator for the Knoxville Zoo FrogWatch USA Chapter, state coordinator for the Tennessee Butterfly Monitoring Network and a member of the steering committee for the North American Butterfly Monitoring Network. While volunteering to help with bird banding, he likes to look for dragonflies because (don't tell the birders) they're so much cooler. At home he likes to collect data for the National Phenology Network. He has been on the DLIA Education Committee since 2011.

2:30 - 3:30 p.m. **Electronic Field Trips: The Next Big Thing!** – Emily Guss

Would you like to take your class on a field trip to Yellowstone National Park or Grand Canyon National Park, but live hundreds of miles away? Why not let park rangers bring their national parks into your classroom with curriculum-based distance learning video conferences? Schools can connect directly to the park for an interactive education program that meets national and state standards. Distance learning programs are the next big tool to help teachers find creative ways to engage their students through technology. Rangers can bring the park and subjects, like science and history, alive through interactive techniques and imagery. Geology, wildlife, Civil War, and national park careers are examples of subjects that the park can tailor for a teacher's classroom. This presentation will provide an overview of distance learning opportunities, along with a live

program from Yellowstone National Park! Join us to discover the new world of electronic field trips.

**Emily Guss** has worked in education as a park ranger for more than 13 years with the National Park Service and for another two years as an Environmental Educator for the Wetlands Institute in Stone Harbor, NJ. Emily started working in Great Smoky Mountains National Park in 2004 and is currently in charge of middle and high school education programs and initiatives for the Tennessee side of the National Park. These initiatives include pursuing distance learning programming within the national park. She recently returned from Grand Canyon National Park, where she worked in their highly innovative distance learning studio as a cross-training experience. She has also studied abroad in Costa Rica (tropical ecology and Spanish) and worked for Conservation Volunteers Australia. Emily earned a Bachelors of Science at James Madison University in Virginia and is currently working on a Masters in Resource Interpretation from Stephen F. Austin University in Texas.

5 - 7 p.m.

Knoxville Event with Merlin Tuttle at the East Tennessee History Center  
**A National Geographic Preview: Flowers That Guide Bat Echolocation, the Story Behind the Story**

Dr. Merlin Tuttle has lectured at most of America's premier institutions and his fifth National Geographic article is scheduled to appear in the March 2014 issue. The article features recent discoveries of highly sophisticated floral adaptations that acoustically guide echolocating bats to specific sites in flowers, ensuring exclusive bat pollination. Tuttle worked in Costa Rica, Cuba and Ecuador, taking more than 20,000 images for this story. He will share his spectacular, high-speed action photos as well as highlights of the challenges and techniques involved in getting these images.

Reception includes food, drinks and a signed copy of National Geographic (the first 100 paying attendees). Cost \$25.