“Aligning Conservation Goals”

2017 Annual Meeting
February 16 – 19
Ferncliff Camp and Conference Center
Little Rock, AR
SEPARC Meetings Code of Conduct

SEPARC is committed to providing a safe, productive and welcoming environment for all meeting participants. All participants including, but not limited to, attendees, speakers, volunteers, exhibitors, PARC staff, service providers and others are expected to abide by this SEPARC Meetings Code of Conduct. In generating this document to guide personal responsibility at our meetings we have relied heavily on the code of conduct used by the Ecological Society of America, based on Favaro et al. 2016.

Expected Behavior

▪ Treat all participants with respect and consideration, valuing a diversity of views and opinions.
▪ Be considerate, respectful, and collaborative.
▪ Communicate openly with respect for others, critiquing ideas rather than individuals.
▪ Avoid personal attacks directed toward others.
▪ Be mindful of your surroundings and of your fellow participants. Alert SEPARC Co-Chairs if you notice a dangerous situation or someone in distress.
▪ Respect the rules, policies, and property of the meeting venue.

Unacceptable Behavior

▪ Harassment, intimidation or discrimination in any form will not be tolerated.
▪ Physical or verbal abuse.
▪ Disruption of talks at oral or poster sessions.
▪ Examples of unacceptable behavior include, but are not limited to, verbal comments related to gender, sexual orientation, disability, physical appearance, body size, race, religion, national origin, inappropriate use of nudity and/or sexual images in public spaces or in presentations, threatening or stalking.

Consequences

▪ Anyone requested to stop unacceptable behavior is expected to comply immediately.
▪ SEPARC Co-chairs or security may take any action deemed necessary and appropriate, including immediate removal from the meeting without warning or refund.
▪ SEPARC reserves the right to prohibit attendance at any future meeting.

Reporting Unacceptable Behavior

▪ If you are the subject of unacceptable behavior or have witnessed any such behavior, please immediately notify a SEPARC Co-Chair.
▪ Notification should be done by contacting a SEPARC Co-chair in person or you may email your concern to separc@separc.org
▪ Anyone experiencing or witnessing behavior that constitutes an immediate or serious threat to public safety is advised to contact venue security and/or local police.

Favaro et al. 2016. Your science conference should have a code of conduct. Frontiers in Marine Science 3:103.
BEER OF ARKANSAS

FLYWAY
BREWING COMPANY
MEETING AGENDA, SEPARC 2017

THURSDAY, FEBRUARY 16

8:00am Longleaf ARC project workshop (8 hours)
4:00pm Registration and Check in for lodging at Ferncliff
6:00pm Poster Session and Social (heavy hors d’oeuvres and beverages provided).

Silent Auction Items Sign In! Photo Contest Setup! Poster Set-up!

FRIDAY, FEBRUARY 17

7:30am Continental Breakfast (provided by SEPARC)
8:15am Welcome, SEPARC Co-chairs. Andrea Drayer and Andrew Cantrell
8:30am Keynote speaker: Up Close with Alligator Snapping Turtles: My Extraordinary 21-Year Adventure with Dark Water Denizens - Stan Trauth, Ph.D., Arkansas State University

SESSION 1 – Breaking Down Barriers Conservation through Education moderator - Andrew Cantrell

9:30 am Snakecam – The Power Of Video In Snake Conservation And Changing Human Perceptions About Snakes. Cameron Young, Center for Snake Conservation
9:45 am Leaping Boundaries, Trapping Trust, And Soothing Scales. Ashley Lavere, Box Turtle Connection, The University of North Carolina at Greensboro
10:00am The Value of Citizen-Science and the Initiation of the “Herps of Arkansas Project” on iNaturalist. Luke Pearson, University of Southern Mississippi
10:15am Spread the Love - Impacts of Educational Outreach Programs, Evaluation, and using Animals in Teaching. Milton G. Newberry, III, University of Georgia
10:30am BREAK (15 min)

SESSION 2 – Habitat Restoration and Management of the Diverse Ecosystems of Arkansas moderator - Alyssa Bangs

10:45am Herps of Arkansas: Lost, Found, Rediscovered, and Undiscovered, Kory Roberts, Rogers High School, Herps of Arkansas webmaster
11:00am Effects of Non-Native Vegetation on Larval Development of a Prairie Specialist, the Crawfish Frog (Lithobates areolatus), Chelsea Kross, University of Arkansas
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:15am</td>
<td>Conservation And Glade Habitat Restoration Efforts for the Eastern Collared Lizard (<em>Crotaphytus collaris</em>) in Arkansas, <em>Casey Brewster, University of Arkansas</em></td>
</tr>
<tr>
<td>11:30am</td>
<td>Effects of Timber Harvest on the Ouachita Dusky Salamander (<em>Desmognathus brimleyorum</em>), <em>Kelly Halloran, University of Arkansas</em></td>
</tr>
<tr>
<td>11:45am</td>
<td>Prevalence of Ranavirus and Bd in Hellbender Populations in Tennessee and Arkansas, <em>R.H. Hardman, Center for Wildlife Health, University of Tennessee</em></td>
</tr>
<tr>
<td>12:00</td>
<td><strong>LUNCH (Provided by SEPARC)</strong></td>
</tr>
</tbody>
</table>

**SESSION 3 –Genetics/eDNA moderator – Brian Folt**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00pm</td>
<td>Filling Knowledge Gaps In Hellbender Distribution Through Broad-Scale Environmental DNA (eDNA) Surveys, <em>Kimberly Terrell, Memphis Zoo</em></td>
</tr>
<tr>
<td>1:15pm</td>
<td>Disentangling Eurycea Evolution With Genomic Data, <em>Todd Pierson, University of Tennessee</em></td>
</tr>
<tr>
<td>1:30pm</td>
<td>The Use Of Species Distribution Models (SDMS) And Environmental DNA To Evaluate The Distribution Of The Eastern Hellbender (<em>Cryptobranchus alleganiensis alleganiensis</em>) In Tennessee, U.S.A., <em>Jeronimo Gomes Da Silva Neto, Tennessee State University</em></td>
</tr>
<tr>
<td>1:45pm</td>
<td>Population Genetics Of The Razorback Musk Turtle (<em>Sternotherus carinatus</em>) And The Implications For Its Conservation, <em>Grover J. Brown, The University of Southern Mississippi</em></td>
</tr>
<tr>
<td>2:00pm</td>
<td>Conservation Genetics Of The Pigeon Mountain Salamander: A Georgia Endemic Species With A Narrow Distribution, <em>Kate C. Donlon, The Ohio State University</em></td>
</tr>
<tr>
<td>2:15pm</td>
<td><strong>Break (15 Min)</strong></td>
</tr>
</tbody>
</table>

**SESSION 4  General Talks moderator – Andrea Drayer**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30pm</td>
<td>Using Farm Bill Programs to Advance Reptile and Amphibian Conservation on Agricultural Lands in the Southeast, <em>Kat Diersen, Defenders of Wildlife</em></td>
</tr>
<tr>
<td>2:45pm</td>
<td>Using Law And Creative Advocacy To Protect The Southeast’s Amphibians And Reptiles, <em>Elise Bennett, Center for Biological Diversity</em></td>
</tr>
<tr>
<td>3:00pm</td>
<td>Response Of Reptile And Amphibian Communities To Prescribed Fire In Oak/Hickory Forests, <em>Steven J. Hromada, Austin Peay State University</em></td>
</tr>
<tr>
<td>3:15pm</td>
<td>Traffic Noise- The Dangers Posed To Energetic Costs Of Calling And Stress In <em>Hyla chrysoscelis</em> (Anura: Hylidae), <em>Melanie Partin, Southeastern Louisiana University</em></td>
</tr>
<tr>
<td>3:30pm</td>
<td><strong>Group Photo/Break</strong></td>
</tr>
</tbody>
</table>
SESSION 5 – Speed Talks (5 minutes) moderator – Keri Landry

3:55pm Conservation Hero Award/ Election of New Junior Co-Chair and New Steering Committee Members

4:15pm Distribution And Occupancy Of Green Salamanders In South Carolina, Jillian Newman, Clemson University

4:20pm Effects Of Short-Term Climate Variation On A Long-Lived Frog, Mike Lannoo, Indiana University School of Medicine–Terre Haute

4:25pm Understanding The Sources Of Sperm Cryo-Damage For Effective Genome Banking In The Houston Toad (Anaxyrus houstonensis), Kristin Hinkson, Memphis Zoo

4:30pm Herpetofauna Occupancy Of Tidal Swamps, Sidney T. Godfrey, Clemson University

4:35pm Development Of An eDNA Protocol to Detect And Quantify Streamside Salamanders (Ambystoma barbouri) In Low-Order Streams Of Middle Tennessee, Nicole Witzel, Tennessee State University

4:40pm Impacts Of Oak Regeneration Silviculture Treatments On Amphibian Breeding In Southern Tennessee, Lacy E. Rucker, Alabama A&M University

4:45pm Ecological Observations Of The Ouachita Streambed Salamander Eurycea subfluvicola, Kelly J. Irwin, Arkansas Game & Fish Commission

4:50pm Post-Partum Dispersal And Habitat Use Of Neonatal Copperheads (Crotalinae; Agkistrodon) In A Managed Southeastern Forest, Iwo P. Gross, Alabama A&M University

5:15pm Task Teams & Discussion Groups meet:
- Diseases/Pathogens/Parasites
- Hellbender Working Group
- Reintroduction/Translocation
- Education and Outreach
- Gopher/Crawfish Frog Complex
- Roads Task Force

6:30pm Dinner (provided by SEPARC)

SATURDAY, FEBRUARY 18

7:30 am– Continental Breakfast (provided by SEPARC)

SESSION 6 – Disease/General moderator - Todd Pierson

8:30 am Effects Of Larval Condition On Susceptibility Of Juvenile Amphibians To The Chytrid Fungus, Batrachochytrium dendrobatidis, Angela K. Burrow, University of Georgia

8:45 am Endocrine Stress Response Of Eastern Fence Lizards To Fire-Altered Landscapes, Mike Iacchetta, Austin Peay State University

9:00 am Evidence Of Genetic Recombination Resulting In Evolution Of A Highly Virulent Ranavirus Isolated
From An American Bullfrog (Lithobates catesbeianus) Farm In Georgia, Matthew J. Gray, Center for Wildlife Health, University of Tennessee Institute of Agriculture

9:15 am Leaps And Bounds: Landscape Effects On Amphibian Abundance, Community Composition, and Gene Flow, Cara L. McElroy, Jones Ecological Research Center

9:30 am Demography Of Hellbender Salamanders Along A Land Use Gradient, Cathy M. Bodinof Jachowski, Clemson University

9:45 am The Effects Of Tidal Phase On Nesting Sea Turtle Emergences Among Three Beaches, Breanna L. Ondich, Jekyll Island State Park Authority Georgia Sea Turtle Center

10:00am BREAK (15 min)

SESSION 7  General Talks moderator – Katie Parson

10:15am Generating Robust Estimates Of Salamander Vital Rates To Model Population Responses To Climate Change, Jillian Howard, University of Georgia

10:30am Demographic Trends And Nest Predation Of Declining North Carolina Bog Turtle Populations, Michael D. Knoerr, Clemson University

10:45am Searching For The “Hidden” Salamander: The Distribution And Ecology Of Desmognathus abditus, Saunders Drukker, University of the South

11:00am Why Did The Terrapin Cross The Road … And What Can You Do About It? Advances In Road Management For Diamondback Terrapin Conservation, John C. Maerz, University of Georgia

11:15am Freshwater Acidification In The Age Of A 400ppm Carbon Climate, Matthew J. Charnock, Residential Office, freelance writer

SESSION 8  Speed (5 minutes) moderator – Jeff Hall

11:30am Environmental And Intrinsic Drivers Of Road-Crossing And Nesting Behaviors By Diamondback Terrapins (Malaclemys terrapin), Carmen Candal, Georgia Sea Turtle Center, Jekyll Island State Park Authority

11:35am The Cutting Edge: An Erosion Study On Playa Tortuga (Ojochal, Costa Rica), Ashley A. LaVere, Georgia Sea Turtle Center

11:40am Rock Iguana Conservation In The Dominican Republic: Current Status And The Next Step, Christopher Pellecchia, University of Southern Mississippi

11:45am Surface Coal Mining Removes Preferred Hibernacula Habitat Of Timber Rattlesnakes In The Cumberland Plateau Of Kentucky, Thomas Maigret, University of Kentucky

11:50am Lights On, Or Lights Off? Hotel Guests’ Response To Passive Outreach Designed To Protect Nesting Sea Turtles, Katie Mascovich, University of Georgia
11:55am  Preliminary Data On Snake Fungal Disease In A Louisiana Snake Assemblage, Brad M. Glorioso, U.S. Geological Survey, Wetland and Aquatic Research Center

12:00pm  Reproductive Observations And Body Condition Assessments Of Coastal Rattlesnakes, Katie M. Parson, Jekyll Island Authority, Georgia Sea Turtle Center

12:05pm  Gopher Tortoise Translocation And Commensal Species Mitigation On A Heavy Mineral Mine Site, Lance Paden, University of Georgia

12:10pm  Blood Flukes (Digenea: Schistosomatoidea) Infecting Freshwater Turtles Of Alabama: New Species With New Host And Geographic Locality Records, Jackson Roberts, Auburn University

12:15 pm  Life In Skinny Water: Observations Of Juvenile Diamondback Terrapins (Malaclemys terrapin) Utilizing Shallow Water Habitats, Will Selman, Millsaps College

12:20 pm  Assessment of ATV Impacts on Softshell Turtle Nests, Cody D. Godwin, Southeastern Louisiana University

12:25 pm  “Land Sharing,” A New Horizon For Conservationists And It’s Effects On Biodiversity And Private Land Management, Matthew J. Charnock, Residential Office, freelance writer

12:30 pm  LUNCH (Provided by SEPARC)

WORKSHOPS:

A&R Education and Outreach
Disease – Snake Fungal Disease/BSAL

Round 1
Snake Fungal Disease
BSAL (Round 2)

1:30-3:00pm  Workshops – ROUND 1
3:00 pm  BREAK (30 min)
3:30-5:00 pm  Workshops – ROUND 2
5:00-6:00 pm  Steering Committee and Officers meeting
6:00 pm  DINNER (provided by SEPARC)
8:30 pm  Photo Contest closes
9:00 pm  Silent Auction closes

SUNDAY, FEBRUARY 19:

8:00 am  Continental Breakfast (Provided by SEPARC)

Field trips depart at 9:00AM
FRIDAY, FEBRUARY 17, 2017

KEYNOTE SPEAKER:

8:30AM UP CLOSE WITH ALLIGATOR SNAPPING TURTLES: MY EXTRAORDINARY 21-YEAR ADVENTURE WITH DARK WATER DENIZENS. Stan Trauth, Ph.D., Arkansas State University.

SESSION 1 – Breaking Down Barriers, Conservation Through Education

9:15AM A CONSERVATION STORY ABOUT MIDDLE AND HIGH SCHOOL STUDENTS AND TEACHERS TRYING TO MAKE A DIFFERENCE IN THEIR COMMUNITY. John Byrd*, The Clinch River Environmental Studies Organization (CRESO), 191 Nature Lane, Clinton, TN 37716.

After spending 12 summers transporting Junior high and high school students to remote places in the Southeastern United States to visit different ecosystems and biological field stations, we decided it was time to turn in our chauffeur hats and set-up a research facility in our own community of Anderson County, TN. In 1989 the Department of Energy partnered with Anderson County and Oak Ridge Schools to develop an education/field research program known as the Clinch River Environmental Studies Organization (CRESO). This presentation will mainly focus on CRESO conservation efforts which range from outreach education programs and schoolyard wildlife habitat construction and enhancement projects, to county amphibian and reptile identification guides. The snake ID guide has been surprisingly well received, especially by hunters. We have yet to discover a magical formula to completely avert humans from killing snakes, filling in wetlands and flood plains, stream bank vegetation removal, allowing cattle access to streams, shoddy development practices, and a heap of other wildlife and habitat insults. But we have made progress with respect to citizen attitudes and behaviors, resulting in a number of success stories. CRESO is presently working on a plan to train school system custodians and maintenance personnel in snake identification and safe removal technique from schoolyards and buildings if needed. The hope is to conduct snake education outreach programs for city and county maintenance employees as well.

John Byrd and Fred Holtzclaw are retired high school biology teachers. Prior to founding CRESO they spent their summer rejuvenation time traveling around the Southeast with a van full of students, visiting unique ecosystems. This feat was accomplished without the aid of cell phones or GPS. They and their students discovered that being a little lost can result in some extraordinary herpetological and botanical experiences, especially on the sandy back roads of Apalachicola National Forest.

9:30AM SNAKECAM – THE POWER OF VIDEO IN SNAKE CONSERVATION AND CHANGING HUMAN PERCEPTIONS ABOUT SNAKES. Cameron A. Young, Center for Snake Conservation, 1581 Ridgeview Drive, Louisville, CO, 80027.

Social video has exploded and grown exponentially in the last year. Social media experts agree that this trend will not decline in the near future. Cisco predicts that by the year 2019, video will account for nearly 80 percent of internet traffic, nearly one million minutes of video will be shared each second, and that is would take five million years for a single person to watch all the video shared each month. As example of the success of video on Facebook, Center for Snake Conservation videos reach over three times as many people as photos do. Subject (snake species), duration, quality, live versus edited, and time of share all affect the success of a video. The Center for Snake Conservation uses snake videos during its snake programs and on social media to share the true behavior of snakes helping to dispel myths perpetuated through typical media outlets. For example, defensive postures of rattlesnakes can be construed as aggressive using still photography while video shows the same snake’s retreating and shy nature. Facebook, YouTube, Vimeo, Instagram, Twitter, and SnapChat all have different applications for snake conservation. YouTube and Vimeo are outlets for longer documentary type videos while Twitter, Instagram, and SnapChat are better suited for distribution of short, single fact type videos. Video has become a powerful tool of the Center for Snake Conservation and its role will continue to grow in our Conservation Through Education efforts.
Cameron A. Young is the Executive Director of the Center for Snake Conservation and leads its efforts to change human perceptions about snakes and conserve their habitats. Prior to his role at the Center for Snake Conservation, Cameron has over 17 years’ experience as an environmental consultant for the oil and gas industry.

9:45AM LEAPING BOUNDARIES, TRAPPING TRUST, AND SOOTHING SCALES. Ashley A. LaVere*, Ann B. Somers and Catherine E. Matthews, Box Turtle Connection, The University of North Carolina at Greensboro, Greensboro, NC.

Over a five-year period, the HERP Project (Herpetology Education in Rural Places & Spaces) has developed six curricula for herpetology education in informal science education settings aimed at engaging youth from a variety of backgrounds with snakes, lizards, amphibians, box turtles, and semi-aquatic turtles. These curricula, focused on organisms and habitats, were designed to build science identities in youth by engaging them in real-world herpetology. From trapping to tracking, kids get to personally explore the world of reptiles and amphibians alongside scientists and environmental educators. They learn how to safely capture wild reptiles and amphibians as well as collect valuable morphometric and habitat data. Detailed instructions are in the curricula, available online for free.

Ashley LaVere is a graduate from the University of North Carolina at Greensboro where she first joined the HERP Project as the Assistant Director of the Box Turtle Connection, a long-term study of box turtles across North Carolina. During both her undergraduate and the years following her graduation, she has led many of the educational programs and events supported and developed by the HERP project.

10:00AM THE VALUE OF CITIZEN-SCIENCE AND THE INITIATION OF THE “HERPS OF ARKANSAS PROJECT” ON INATURALIST. Luke S. Pearson1*, Thomas J. Belford2, and Kory G. Roberts3. 1Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406; 237 White Oak Circle, Searcy, AR, USA, 72143; 3Rogers High School, 2300 S. Dixieland Road, Rogers, AR, USA, 72758.

One advantage to the ubiquity of social media nowadays is the incorporation of citizen-science. Citizen-science projects have become an important tool for amassing large amounts of distributional data for species across a large spatial scale. Although it has been a common tool within ornithology (e.g. Christmas bird counts, the Great Backyard Bird Count) for decades, citizen-science projects involving amphibian and reptile species have been lacking, possibly due to the public’s generally negative views of these species. However, there has recently been a surge in herp-related citizen-science projects, such as HerpMapper and iNaturalist to atlases from multiple states. Initiated in August 2015, the Herps of Arkansas Project (HoAP) totaled 109 registered users adding 1,393 observations of 108 amphibian and reptile species within 17 months. To ensure quality observations, HoAP requires the use of photo and/or media vouchers to confirm species identification. Species distribution data are present for 22 frogs, 24 salamanders, 15 turtles, 11 lizards, 35 snakes, and the American alligator, with snakes being the most commonly observed group at 518 observations. Additionally, 81 observations (6%) are of species of special concern in Arkansas, with 37 observations being vulnerable salamanders. The information gathered by HoAP will be used to establish baseline distributions to assess future distributional changes in both native and non-native amphibian and reptile species. Finally, as a citizen-science project, educational outreach is an important aspect to informing and attracting participants from the general public to participate and appreciate both science and herps.

Luke S. Pearson is currently a PhD student at the University of Southern Mississippi assessing the distribution, abundance, and population genetics of Alligator Snapping Turtles (Macrochelys temminckii) in Mississippi. He is also a moderator of the citizen-science project Herps of Arkansas on iNaturalist (http://www.inaturalist.org/projects/herps-of-arkansas).

10:15AM SPREAD THE LOVE - IMPACTS OF EDUCATIONAL OUTREACH PROGRAMS, EVALUATION, AND USING ANIMALS IN TEACHING. Milton G. Newberry, III, University of Georgia, 139 Four Towers, 400 River Rd, Athens, GA, USA 30602.
Over the past two decades, interest and motivation among youth to join natural resource conservation professions has waned due to phenomena such as youth not participating in outdoor activities (i.e., nature-deficit disorder). One solution to this decrease in youth connection to nature and interest in natural resource careers is implementing educational outreach programs using animals as teaching tools to facilitate outdoor experiences in nature. There is a growing population natural resource professionals who recognize the importance of educational outreach, using animals in programming, and disseminating science, but lack proficiency in communicating their science to public audiences and using animals as support. Concurrently, several natural resource professionals lack the agency in using effective strategies for outreach program development and evaluation. In this presentation, I will present effective methods of conducting educational outreach to various public audiences. Furthermore, I will discuss practical approaches to evaluating educational outreach programs. Lastly, I will discuss empirical evidence of the importance of using animals in education. I examined the effect of using raptors in a collegiate educational program on conservation perceptions towards a raptor species (Barn owl, Tyto alba) using a combination of surveys and postcards to relatives. Participants reported positive conservation attitudes towards barn owls and stating several conservation methods to use. The results indicate that animals in education can instill conservation attitudes in audiences, which are a strong predictor of conservation behavior. This finding is crucial to consider with using herpetofauna in education, which can elicit both positive and negative emotions from audiences.

Milton G. Newberry, III, Ph.D. is an assistant professor of environmental education at the University of Georgia. He examines the effect of using live animal teaching tools in educational programs, how program evaluation impacts environmental education, and the relationships between climate change perceptions, connection to nature, and extent of conservation activities.

SESSION 2 – Habitat Restoration and Management of the Diverse Ecosystems of Arkansas

10:45AM HERPS OF ARKANSAS: LOST, FOUND, REDISCOVERED, AND UNDISCOVERED. Kory G. Roberts, Rogers High School, 2300 S. Dixieland Road, Rogers, AR, USA, 72758.

Arkansas is a state of diverse natural habitats and herpetofauna. While notable past efforts, such as The Amphibians and Reptiles of Arkansas by Stanley E. Trauth, et. al. (2004), have contributed toward a contemporary baseline understanding of the state's herpetological landscape, significant changes--to the physical environments, to our conceptual frameworks, and by novel discovery--have occurred in the subsequent years. Arkansas herps have been LOST due to extirpation; habitat change/loss, including urbanization; disease; and over-harvesting. Herps have been FOUND in discovery of a species new to science (Eurycea subfluvicola), in range extensions from neighboring states and within the state, in recognition of genetically cryptic species, and in established populations of introduced/exotic species. Herps of some rarity have been REDISCOVERED at historical localities. Additionally, a number of UNDISCOVERED herp species from neighboring states hold potential for edging into the state.

Kory G. Roberts is a public school science teacher at Rogers High School, webmaster of the Herps of Arkansas website (http://HerpsOfArkansas.com), and lead author/manager of the Arkansas Herpetological Atlas.

11:00AM EFFECTS OF NON-NATIVE VEGETATION ON LARVAL DEVELOPMENT OF A PRAIRIE SPECIALIST, THE CRAWFISH FROG (LITHOBATES AREOLATUS). Chelsea S. Kross*, Logan P. Estes, and John D. Willson, Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701.

Land-use change is a primary cause of amphibian population declines. Many natural landscapes have been altered for agricultural or urban land-use, resulting in loss or degradation of habitat. Furthermore, nearby land-use change can impact intact breeding wetland vegetation composition. However, the mechanisms by which vegetation alteration impacts amphibian demography are poorly understood, particularly for prairie-associated species. We used a mesocosm approach to investigate how vegetation composition (native prairie or non-native agriculture-associated vegetation [tall fescue grass; Festuca arundinacea]), surrounding breeding wetlands and timing of oviposition affected development of the Crawfish Frog (Lithobates areolatus), a prairie specialist of conservation concern. Specifically, we measured survival, time to metamorphosis, and size and mass at metamorphosis of larvae added to tanks either 10- or 22-days post-litter addition. We found that larval survival
differed between litter types in the 10-day oviposition treatment, with nearly 100% mortality in the fescue grass treatments. Conversely, survival rates were similar across litter types in the 22-day treatment (~43%), and larvae in fescue litter metamorphosed more quickly and were larger post-metamorphosis than larvae raised in prairie vegetation. To investigate mechanisms for mortality in the fescue grass treatment, we conducted a subsequent experiment examining the effects of litter type on dissolved oxygen concentrations. We found very low DO concentrations (<2.0 mg/L) in fescue treatments persisting up to two weeks post-litter addition. These results suggest that amphibian breeding ponds in agricultural landscapes can support successful breeding, but could be ecological traps when timing of inundation and breeding occur simultaneously.

Chelsea S. Kross, M.S. is a doctoral student at the University of Arkansas. Her dissertation focuses on the effects of habitat restoration on prairie-associated herpetofauna, with particular focus on the Crawfish Frog.

11:15AM CONSERVATION AND GLADE HABITAT RESTORATION EFFORTS FOR THE EASTERN COLLARED LIZARD (CROTAPHYTUS COLLARIS) IN ARKANSAS. Casey L. Brewster*, Department of Biological Sciences, SCEN 601, University of Arkansas, Fayetteville, AR 72701.

Anthropogenic fire suppression in the past century has resulted in deterioration of Ozark glade habitats. In turn, Eastern Collared Lizard (Crotaphytus collaris) populations in Arkansas and Missouri have recently experienced substantial declines. Fortunately, restoration efforts are underway in Arkansas to improve the quality of glade habitats, and to help conserve C. collaris populations. However, many questions remain unanswered that link glade habitat degradation to population extinctions. Elucidation of the patterns and corresponding mechanisms associated with population declines are critical for effective conservation of C. collaris. Our work suggests that dense woody vegetation in glade habitats is linked to depressed age-specific body size, growth and reproduction; likely driving C. collaris population extinctions in Arkansas. Glade habitat restoration strategies of current conservation projects in Arkansas will also be discussed.

Casey L. Brewster (clbrewst@uark.edu) is a PhD candidate at the University of Arkansas in the Beaupre lab. He is the project leader or partner of three C. collaris conservation projects in Arkansas. His current research is focused on elucidating the mechanisms linked to population declines of C. collaris.

11:30AM EFFECTS OF TIMBER HARVEST ON THE OUACHITA DUSKY SALAMANDER (DESMOGNATHUS BRIMLEYORUM). Kelly M. Halloran*1, Jacquelyn C. Guzy1, Jessica A. Homyack2, and John D. Willson1.

1Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701; 2Weyerhaeuser Company, 1785 Weyerhaeuser Road, Vanceboro, NC 28586.

With anthropogenic alteration of landscapes increasing world-wide, managed forests are increasingly important as providers of ecosystem services and wildlife habitat. Therefore, it is crucial to maintain a balance between timber production and biodiversity preservation. Several studies have suggested negative effects of forestry on terrestrial plethodontid salamanders, but few studies have focused on stream-dwelling species or evaluated mechanisms driving observed shifts in abundance (e.g., mortality vs. movement). Using a Before-After-Control-Impact design, we examined the effects of clearcut timber harvesting on a stream-dwelling salamander endemic to the Ouachita Mountains, Desmognathus brimleyorum. We conducted a capture-mark-recapture study at three streams within intensely managed pine forests in west-central Arkansas from May 2014-October 2016. The pine stands surrounding two of the streams were harvested (leaving a 15-45m forested buffer, as recommended by state guidelines) in January 2015 and 2016, respectively. We estimated salamander survival and movement over the course of two years and compared rates of change between the harvested and control streams. Overall, our models show seasonal and temporal variation in salamander survival and abundance, but little evidence for strong immediate effects of timber harvesting. However, there was increased salamander movement at the sites where harvesting occurred. The results of this study will help inform management decisions aimed at conserving biodiversity and ecosystem integrity in landscapes managed for timber production.

Kelly Halloran is a master’s student at the University of Arkansas in Dr. J.D. Willson’s lab. Her research interests focus on the effects of anthropogenic changes on amphibians from an urban ecology perspective.
The Hellbender, *Cryptobranchus alleganiensis*, is a large aquatic salamander containing two subspecies (Ozark Hellbender, *C. a. bishopi* and Eastern Hellbender, *C. a. alleganiensis*) from the Ozark mountains and eastern U.S., respectively. Both subspecies have seen population declines over the past 25 years, especially in *C. a. bishopi* which is federally endangered. Habitat degradation alongside other factors may lead to secondary infections with amphibian pathogens such as Ranavirus and *Batrachochytrium dendrobatidis* (Bd). Other pathogens such as the emerging salamander chytrid (*Batrachochytrium salamandrivorans* or Bsal) are also of concern as potential primary or secondary causes of disease. Our objective was to determine prevalence of these pathogens in both subspecies to understand the role of emerging amphibian pathogens in *C. alleganiensis* declines. We collected tissue and swabs from *C. a. bishopi* and *C. a. alleganiensis* individuals from Arkansas and Tennessee respectively during the summers of 2011-2015. We used qPCR analysis to determine presence of Ranavirus and Bd from tail samples and skin swabs, respectively. In the latter two years we collected samples of microbiome and secretion analyses. Overall, for *C. a. bishopi*, we detected 32% prevalence of Bd and 8.6% ranaviral infections; for *C. a. alleganiensis*, we detected 15% prevalence of Bd and 3% prevalence of Ranavirus. We have not found any Bsal positive individuals but have discovered Bd consistently present in these populations. We are currently in our second phase of investigating morbidity and mortality in hellbenders by comparing host skin microbiomes with changes in clinical disease and host peptide production.

**Rebecca H Hardman DVM MS** is a PhD student at the University of Tennessee under the mentorship of Dr. Debra Miller. She aims to combine veterinary medicine and ecological research to solve questions in wildlife disease with a particular focus on amphibian and reptile conservation.

**SESSION 3: Genetics and eDNA**

**1:00PM FILLING KNOWLEDGE GAPS IN HELLBENDER DISTRIBUTION THROUGH BROAD-SCALE ENVIRONMENTAL DNA (eDNA) SURVEYS.** Kimberly A. Terrell*, Amy M. McMillan, Eric Chapman, Robin Foster, Joe Greathouse, John D. Kleopfer, Edward Thompson, Dan Feller, and Andrew Adams. 1. Department of Research and Conservation, Memphis Zoo, 2000 Prentiss Pl, Memphis, TN, USA; 2. Department of Biology, Buffalo State College, 1300 Elmwood Ave, Buffalo, NY, USA, 14222; 3. Western Pennsylvania Conservatory, 1067 Philadelphia Street, Indiana, PA, USA, 15701; 4. Department of Evolution, Ecology and Behavior, University at Buffalo, 12 Capen Hall, Buffalo, NY, USA, 14260; 5. Oglebay Zoo, 465 Lodge Dr, Wheeling, WV, USA, 26003; 6. Virginia Department of Game and Inland Fisheries, 3801 John Tyler Hwy, Charles City, VA, USA, 23030; 7. Maryland Department of Natural Resources, 580 Taylor Ave, Annapolis, MD, USA, 21401; 8. Susquehannock Wildlife Society, 1725 Trappe Church Rd, Darlington, MD, USA, 21034.

The eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) is currently being evaluated for federal listing by the U.S. Fish and Wildlife Service, yet there remain substantial data gaps in the species’ distribution and status. Our objective was to better document hellbender distribution through environmental DNA (eDNA) sampling. We collected eDNA samples from a total of 200 sites across New York, Pennsylvania, Maryland, West Virginia, and Virginia during 2014 and 2015 (Jul 15 – Oct 15). Hellbender eDNA was detected at eight of nine sites (89%) with recent observations and 25 of 51 sites (49%) with historic records of the species. Additionally, we detected eDNA at five anecdotal sites and 34 sites with no previous records of hellbenders. Rock-turning surveys detected hellbenders at 11 of 34 eDNA-positive sites and 1 of 43 eDNA-negative sites. Collectively, these data suggest that hellbenders have disappeared from a substantial proportion of historic sites, while many extant populations remain undocumented. Comparison with rock-turning data suggests that eDNA sampling yields increased detectability and a low incidence (2.3%) of false negatives. In addition to generating species distribution data, this project engaged >100 students and citizen scientists in native species conservation, with 2,449 hours of
volunteer effort contributed to sample collection/analysis. Our frozen eDNA samples provide ‘snapshots’ of biological communities for future monitoring of native fauna, introduced species, and aquatic pathogens. This research was supported by a Regional Conservation Needs grant from the Northeast Association of Fish and Wildlife Agencies, state wildlife agencies (VA, MD, NY, and PA), and the Colcom Foundation.

Dr. Kimberly Terrell is the Director of Research and Conservation at the Memphis Zoo. She is a 2011 David H. Smith Fellow and remains involved in the program’s efforts to promote applied conservation. Her research interests include amphibian physiology, climate change, and unconventional approaches to species detection. You can learn more about her research, conservation, and outreach efforts by following her twitter feed (@snototters).

1:15PM DISENTANGLING EURYCEA EVOLUTION WITH GENOMIC DATA. Todd W. Pierson1*, Benjamin M. Fitzpatrick1, and Kenneth H. Kozak2. 1Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN; 2Bell Museum of Natural History and Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, St. Paul, MN.

Evolution is messy. Sometimes speciation happens with continuous gene flow. Sometimes secondary contact between otherwise distinct evolutionary lineages brings about a wave of hybridization and introgression. When prevalent, these phenomena may undermine the utility of evolutionary inference based strictly on bifurcating trees. The two-lined salamander (Eurycea bistriata) species complex is a wide-ranging and abundant group distributed across the eastern United States. Previous molecular phylogenetic studies of the group have suggested greater diversity than is reflected by current taxonomy and have demonstrated paraphyly in some of the named taxa, but inferences of the underlying mechanisms generating this diversity have been limited by the relatively low number of molecular markers available. Here, we use 3RAD—a genome reduction technique similar to ddRAD—to generate and analyze tens of thousands of SNPs to reevaluate relationships in the E. bistriata species complex. We analyze this genetic variation using a combination of treelike (e.g., ML phylogenetic inference) and non-treelike (e.g., D-statistics) approaches to uncover a complex evolutionary history in the group, focusing on historic and current hybridization and introgression.

Todd W. Pierson is a PhD student at the University of Tennessee. His research focuses on using genetic and genomic data to study the ecology and evolution of Appalachian plethodontid salamanders.


The Eastern Hellbender (Cryptobranchus alleganiensis alleganiensis) is a long-lived, fully-aquatic salamander that inhabits cool, well-oxygenated streams and rivers in the eastern United States. Although once abundant, C. a. alleganiensis populations have experienced major declines across the historical range due to habitat degradation, siltation, aquatic contaminants, and infectious diseases. Tennessee provides some of the best remaining habitat for C. a. alleganiensis throughout the known geographic range. However, standardized state-wide distribution assessments have been limited to known populations, and status of other C. a. alleganiensis populations remains unknown. We used current and historical occurrence data, in combination with landscape and environmental covariates, to create a species-specific predictive habitat model using species distribution modeling (SDMs) techniques and environmental DNA samples. The overarching goals of this project are to use the resulting model to identify remaining functional populations of C. a. alleganiensis and areas of special concern, and encourage efficient use of time and resources to effectively manage and conserve the few remaining secure, yet declining, hellbender populations throughout the state of Tennessee.

Jeronimo is pursuing his Master’s degree at Tennessee State University, Nashville. Tennessee. He is using distribution modeling techniques and environmental DNA to evaluate the status of the Hellbender salamander within the state of Tennessee.
1:45PM POPULATION GENETICS OF THE RAZORBACK MUSK TURTLE (*STERNOTHERUS CARINATUS*) AND THE IMPLICATIONS FOR ITS CONSERVATION. Grover J. Brown*, Brian Kreiser, and Carl Qualls, The University of Southern Mississippi, Department of Biological Sciences, 118 College Dr., Hattiesburg, MS 39406.

The Southeastern United States is an evolutionary theater known for its rich biodiversity of aquatic species, and turtles are no exception. This is thanks in part to particularly high levels of endemism across river systems in the Gulf Coastal Plains. The razorback musk turtle (*Sternotherus carinatus*) is a small to medium-sized, inconspicuous inhabitant of a number of Gulf Coast drainages that has received a lack of attention and research, likely because it is mainly treated as by-catch. For this study, we have collected a number of tissue samples from across the species’ range from Texas to Mississippi and developed a set of microsatellite loci to determine 1) the levels of inter-drainage population structure and 2) to use this data to determine whether the species should be managed as distinct units or as a single entity. Though not currently listed as threatened or endangered by IUCN, there are disturbing levels of exploitation of this species for the Asian pet trade with hundreds of thousands of *S. carinatus* reportedly being exported in the past decade. Ultimately this study aims to use population structure in *S. carinatus* to genetically fingerprint individuals from Asian markets to help identify source populations and aid state agencies in making appropriate management decisions.

Grover Brown is currently a Ph.D. student at the University of Southern Mississippi studying the ecology and population genetics of freshwater turtles of the Southeastern United States.

2:00PM CONSERVATION GENETICS OF THE PIGEON MOUNTAIN SALAMANDER: A GEORGIA ENDEMIC SPECIES WITH A NARROW DISTRIBUTION. Kate C. Donlon1* and Thomas C. McElroy2. 1School of the Environment and Natural Resources, The Ohio State University, 210 Kottman Hall, 2021 Coffey Road, Columbus, OH 43210; 2The Department of Ecology, Evolution, and Organismal Biology, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA, 30144.

Species with limited ranges are at higher risk for extinction due to the inability to avoid and recover from disturbance. Long-term management plans are critical for the conservation of species with small ranges; however, the knowledge required to develop effective plans is often deficient. The distribution of the Pigeon Mountain Salamander, *Plethodon petraeus*, is restricted to roughly 17 kilometers along the eastern flank of Pigeon Mountain in northwest Georgia. Consequently, *P. petraeus* is highly vulnerable to the impacts associated with amphibian declines including habitat alteration, disease and climate change. Due to the species limited distribution, the salamander is protected by the state as a rare species and approximately half of its’ range is within a Wildlife Management Area (WMA). However, an understanding of genetic population structure, gene flow, and habitat use patterns is necessary for more effective and long-term management. A conservation genetic assessment of *P. petraeus* was completed using eight polymorphic microsatellite markers cross-amplified from markers identified for use within the slimy salamander complex. Population structure analysis revealed four demes across the range of *P. petraeus* and significant isolation-by-distance genetic structuring and population genetics results provided no evidence of inbreeding. The southernmost deme falls outside the habitat protection provided by the WMA. These results provide further evidence to support private land conservation partnerships to protect habitat outside of the WMA. In addition, more research is needed to better understand the species’ life history, distribution, and abundance to shape management decisions and long-term monitoring in the face of climate change.

Kate C. Donlon recently completed her MS at Kennesaw State University. She is now a PhD student in Dr. William Peterman’s lab at The Ohio State University. Her doctoral research will investigate population response of salamanders to energy related natural resource extraction processes and historic strip mining in Ohio.

SESSION 4: General Topics

2:30PM USING FARM BILL PROGRAMS TO ADVANCE REPTILE AND AMPHIBIAN CONSERVATION ON AGRICULTURAL LANDS IN THE SOUTHEAST. Kat Diersen, Defenders of Wildlife, 1 Rankin Ave., Asheville, NC, 28801.
Agricultural and forestry activities are a major driver of impacts to many species of herpetofauna in the Southeastern United States, but they can also be an important source of conservation benefits to those species. Over half of all federally imperiled species occur primarily or exclusively on private lands, so their significance for conservation efforts cannot be ignored. Approximately 75% of the land base of the Southeastern United States is devoted to farming, ranching and forestry. Privately owned working lands play a crucial role in the provision of water quality and quantity, connectivity, and habitat availability, which are essential to the survival of imperiled herpetofauna species across the region. The Farm Bill is by far the largest funding source for private lands conservation activities, with the most recent Bill dedicating $28 billion over five years to voluntary, incentive based conservation programs. Funds are available through an array of programs housed within the Natural Resource Conservation Service, and are increasingly being targeted specifically to wildlife and habitat conservation initiatives. Several case studies will demonstrate how these programs have already facilitated innovative projects on working lands that benefit both herpetofauna species and landowners. The most important common thread that emerges in this review is that collaborative partnerships between scientists, conservationists, landowners and government are essential for success. There is tremendous potential to expand the application of Farm Bill programs to benefit imperiled reptile and amphibian species in the Southeast, if these groups are sufficiently motivated to come together and drive the planning process.

Kat Diersen is the Southeast Representative for Defenders of Wildlife. Her work focuses on the development and delivery of policy tools through the Endangered Species Act and the Farm Bill that benefit imperiled species and habitats throughout the Southeast Region.

2:45PM USING LAW AND CREATIVE ADVOCACY TO PROTECT THE SOUTHEAST’S AMPHIBIANS AND REPTILES. Elise P. Bennett*, Center for Biological Diversity, St. Petersburg, FL.

The Center for Biological Diversity is dedicated to protecting all species—great and small—and the wild places they need to survive. The Center’s herpetofauna team is specially tasked with defending rare and imperiled reptiles and amphibians. Elise will discuss how the Center is using law, policy, and creative media to protect snakes, turtles, frogs, and salamanders in the Southeast. These efforts include filing state rulemaking petitions to end commercial exploitation of turtles, shepherding southeastern reptiles and amphibians through the Endangered Species Act listing process, securing recovery plans and habitat protections for listed southeastern species, and challenging government-approved projects that threaten species and their habitat. Elise will also highlight some of the Center’s innovative media spots that feature the diversity of southeastern species and raise awareness about the reptile and amphibian extinction crisis.

Elise Bennett is a Reptile and Amphibian Staff Attorney at the Center for Biological Diversity, where she works to protect rare species in the Southeast. She received her law degree and certificate in Environmental Law from Stetson University College of Law, and her Bachelor of Science in Environmental Science and Policy from the University of South Florida. Before joining the Center, Elise served as a judicial staff attorney in the Florida state Circuit Court.

3:00PM RESPONSE OF REPTILE AND AMPHIBIAN COMMUNITIES TO PRESCRIBED FIRE IN OAK/HICKORY FORESTS. Steven J. Hromada*, C.A.F. Howey, and C.M. Gienger. 1Center of Excellence in Field Biology, Austin Peay State University, Clarksville TN 37040; 2Department of Biology, Pennsylvania State University, University Park PA 16802.

Prescribed fire can have important impacts on an ecosystem, including direct effects in the form of injury and mortality to individuals, or indirect, in the form of changes to preferred resources available within the environment. Most research has focused on the direct impacts of the initial burn, and not on the long term impacts of a fire. Changes in habitat structure (such as a decrease in canopy cover or an increase in forb cover) from prescribed fire can increase availability of preferred microhabitats for some species while reducing the availability of preferred microhabitats of others. We examined the responses of herpetofaunal communities to a prescribed fire regime in an Oak/Hickory forest at Land Between the Lakes National Recreation Area, KY. Four plots were established in an area that received large scale prescribed burns, and four were established in a similar area that has not received any recent fire treatment. Herpetofaunal communities were sampled using drift fences and artificial cover object arrays, and habitat attributes were sampled via transects. Although species richness did not
differ between treatments, differences in reptile diversity and relative abundances of reptile and amphibian species between treatments reflected differences in habitat structure between treatments. These results suggest that the habitat changes caused by a prescribed fire regime can have indirect impacts on reptile and amphibian populations and community structure.

Steven J. Hromada is a graduate student in the Center of Excellence for Field Biology at Austin Peay State University. He is interested in understanding the relationship between land management and animal communities.

3:15PM TRAFFIC NOISE - THE DANGERS POSED TO ENERGETIC COSTS OF CALLING AND STRESS IN HYLIA CHRYSOSCELIS (ANURA: HYLIDAE). Melanie Partin*, Southeastern Louisiana University, Hammond, LA, USA, 70402.

Noise pollution is an increasing concern throughout the world due to potential impacts it could have on the environment and wildlife, particularly in species using acoustic communication. Changes in calling characteristics in anurans and other animals in response to noise have been well established in the literature. It has been speculated that these changes could lead to increased metabolic costs of calling. Traffic noise has been shown to cause physiological stress in different organisms. Raised concentrations of corticosterone has been found in White’s tree frogs and female wood frogs in response to traffic noise. I seek to test the hypothesis that Hyla chrysoscelis males will exhibit increased energetic costs of calling and a physiological stress response through increased corticosterone to high levels of traffic noise. Fieldwork was conducted at six sites, three of which were temporary pools in the presence of high traffic noise, while the others were in pristine sites (lacking traffic noise). 100μl blood samples were taken through cardiac puncture with heparinized hypodermic needles, and corticosterone concentrations are being measured via ELISA assays. In the next season, frogs will be placed into a respirometry chamber, and oxygen consumption will be measured after vocalization resumes to assess the energetic cost of calling. I suspect that frogs exposed to traffic noises oxygen consumption will become elevated, and corticosterone concentration will be higher relative to the pristine sites. This would indicate that excessive traffic noise could be deleterious for anurans, which could influence conservation concerns of many species.

Melanie Partin is a Master’s graduate student at Southeastern Louisiana University in her second year. She has a passion for calling frogs and for questions of physiology and endocrinology. Conservation is of great concern to her, and she hopes to pursue a career meeting goals of importance to the conservation of natural habitats, particularly of wetlands. She has grown up in Arkansas for much of her life, but she enjoys living in Louisiana currently.

SESSION 5: Speed Talks

4:15PM DISTRIBUTION AND OCCUPANCY OF GREEN SALAMANDERS IN SOUTH CAROLINA. Jillian C. Newman* and Kyle Barrett, Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634.

Green salamanders, Aneides aeneus (Plethodontidae), are experiencing a significant decline in the Blue Ridge Escarpment. The IUCN lists this salamander as “Near Threatened” globally and the state of South Carolina lists it as “Critically Imperiled.” Two likely threats to green salamanders include habitat loss and climate change. This species is also vulnerable to extinction due to its patchy distribution, which stems from the species’ dependency on rocky outcrops for at least a portion of its life cycle. Many of the historical localities in South Carolina have not been surveyed in 25 years or more. Threats from habitat loss and climate change are growing, so we sought to determine the current status of green salamanders in the state. We reassessed historically occupied locations and newly discovered potential habitat in South Carolina by conducting visual encounter surveys at rock outcrops and adjacent forests (N = 61). We collected habitat variables at each site to determine factors influencing green salamander occupancy in South Carolina. We constructed a number of models that incorporated covariates for both occupancy and detection probability and compared them using an AIC framework. The best model illustrated that detection was positively influenced by salamander activity while occupancy probability decreased with increasing elevation. Of the 51 sites that we surveyed with known historical occurrences, green salamanders were only detected at 45.1% of these sites. This suggests the possibility of local extinctions and a range contraction. However, throughout the survey period, we also discovered new occupied sites.
The amphibian response to climate change has been generally assessed through the effects of warming temperatures on breeding phenology. Using body condition indices, we consider the effects of short-term climate variation as measured by the Palmer Drought Severity Index, which incorporates temperature, precipitation, and soil moisture metrics to estimate water supply and demand, on Crawfish Frogs (Lithobates areolatus), a long-lived ranid. We demonstrate a robust correlation between drought (high temperatures, low precipitation) and body condition in both males and females, and a similar relationship between drought and fecundity. We estimate a difference of 2,647 eggs produced per female between the wettest and driest years of our study, which, based on survivorship estimates by life history stage, translates into an estimated difference of 137 breeding adults added to the population between wet and dry years. Unlike other studies, however, our data did not show a phenological relationship between drought and breeding onset, but did show a strong relationship between drought and breeding duration, which may increase the exposure of post-breeding, migrating, Crawfish Frog adults to predators.

Michael J. Lannoo Ph.D is a broad-based biologist long interested in the conservation biology of amphibians.

Genome resource banks (GRBs) are repositories of genetic material, including cryopreserved sperm samples, which can provide a safeguard against genetic collapse in captive and wild populations. Despite increasing efforts to establish GRBs for amphibians, effective sperm cryopreservation protocols have not been developed for most anurans and caudates. Sperm cells can become damaged at multiple stages of the cryopreservation process, and identifying the source of cryo-damage is the first step in optimizing these protocols. We examined the effects of cryopreservation on sperm membrane integrity in the federally-endangered Houston toad (Anaxyrus houstonensis). We tested the hypothesis that sperm membranes are damaged by exposure to cryoprotectants (prior to freezing) and further damaged by the freezing process itself. Spermic urine was collected from hormonally-induced males at the Houston Zoo and cryopreserved in 10% dimethylformamide/10% trehalose. Cell membrane integrity was assessed by eosin-nigrosin staining at three consecutive stages of sperm cryopreservation: 1) freshly-collected sperm, 2) after adding cryoprotectant, immediately before freezing, and 3) after freezing and thawing. The proportion of cells with intact membranes decreased ($P = 0.035$) after exposure to the cryoprotectant (64 ± 7% versus 27 ±10%, respectively), and further decreased ($P = 0.005$) after freezing and thawing (14 ± 5%). These data indicate that A. houstonensis sperm cells are damaged at multiple stages of the cryopreservation process. Future efforts to optimize sperm cryopreservation in this species should focus on identifying less toxic cryoprotectants and determining ideal freezing/thawing rates.

Kristin Hinkson, MS, is a research technician at the Memphis Zoo. Her work focuses on understanding amphibian reproductive physiology, with the ultimate goal of increasing the efficacy of amphibian captive breeding programs.
Tidal freshwater forested wetlands (also referred to as ‘tidal swamps’) provide habitats for a variety of herpetofauna. However, the herpetofauna community composition of most tidal swamps are currently unknown. In addition, tidal swamps are currently facing a number of natural and anthropogenic threats, such as saltwater intrusion, and the impacts of these threats to tidal swamps on herpetofauna species have not been assessed. We are examining herpetofauna diversity along a pre-existing salinity gradient (created by prior saltwater intrusion) in tidal swamps on the Savannah River near Savannah, Georgia. We sampled for herpetofauna species with visual encounter surveys, anuran vocalization surveys, automated recording devices, dip nets, cover boards, and several types of aquatic traps. Sampling was conducted at Savannah National Wildlife Refuge from March-May 2016, and sampling will be repeated from March- May 2017. We are using occupancy modeling to compare site occupancy and species richness at sites along the salinity gradient while accounting for imperfect detection probabilities. We will examine the effects of water and soil salinity, forest canopy cover, and water quality metrics on occupancy. Our goals are to: create a species inventory, determine community composition, document possible microhabitat use, and utilize occupancy modeling to infer how saltwater intrusion and other associated changes impact the herpetofauna.

Sidney T. Godfrey is a graduate student in the Department of Forestry and Environmental Conservation, which is located within the College of Agriculture, Forestry, and Life Sciences at Clemson University. He hopes to one day earn a career-level position conducting research to advance the understanding and conservation of herpetofauna in the southeastern United States.

4:35PM DEVELOPMENT OF AN eDNA PROTOCOL TO DETECT AND QUANTIFY STREAMSIDE SALAMANDERS (AMBYSTOMA BARBOURI) IN LOW-ORDER STREAMS OF MIDDLE TENNESSEE. Nicole Witzel*, Ali Taheri, and William B. Sutton, Tennessee State University, 3500 John A Merritt Blvd, Nashville, TN 37209.

The Streamside Salamander (Ambystoma barbouri) is an Ambystomatid salamander that occurs in Middle Tennessee where it is geographically isolated. This salamander species is active for a few months during winter and spring months when it emerges to breed in low-order, ephemeral streams. As these animals are cryptic and only surface-active for several months, they can be difficult to detect using traditional survey methods. Surveys that target environmental DNA (eDNA) in the form of sloughed skin, sperm, and eggs provide a potentially effective method for detecting the presence of this species. However, before this method can be used, it is essential to develop species-specific genetic primers that will correctly identify presence and absence of the target species. An initial objective of this study is to identify a primer that is specific to and will successfully amplify only the DNA of A. barbouri without amplifying DNA of congeners. Primers were selected by choosing A. barbouri cytochrome B mitochondrial DNA segments with base pairs that differed from A. texanum, a closely related species. These were used to amplify A. barbouri DNA and tested for specificity among other Ambystomatid congeners in Tennessee. Following initial tests of specificity, we will develop a quantitative PCR approach to evaluate the quantity of environmental DNA in stream water samples. The long-term goal of this study is to provide a replicable eDNA approach to identify A. barbouri populations in Tennessee. This information will provide a method which can be used to further the knowledge and conservation of the species.

Nicole Witzel is a Masters student in Environmental Science at Tennessee State University in the Wildlife Ecology Lab. Her project focuses on developing methods to detect and quantify Streamside Salamanders (Ambystoma barbouri) in ephemeral streams throughout its range in Middle Tennessee.

4:40PM IMPACTS OF OAK REGENERATION SILVICULTURE TREATMENTS ON AMPHIBIAN BREEDING IN SOUTHERN TENNESSEE. Lacy E. Rucker1*, Yong Wang1, and Callie J. Schweitzer2, Alabama A&M University, 100 Drake Drive, Huntsville, AL 35762.; 2730-D Cook Avenue, Huntsville, AL 35801.

Because of their sensitivity to habitat disturbance, amphibians’ response to silviculture practices has gained interest among researchers and conservationists. The effects of these practices on adult egg deposition have yet to be fully explored, although the importance of this is germane to sustaining these animals. The purpose of this study is to evaluate the impact of forest disturbance, distance from a forest edge, and the effect of light intensity on the breeding pool preference of amphibians in upland hardwood forests on the mid-Cumberland Plateau of southern Tennessee. One of three silviculture treatments (control, shelterwood, and oak shelterwood) were
applied to stands and replicated resulting in 14 research stands. A single pool array was placed at a distance of 10, 50, and 100 meters from the edge of treatment stands and replicated for a total of 42 pool arrays. Pool arrays contained three artificial mesocosms; each pool was assigned a screen to manipulate light intensity. Artificial pools were monitored over two peak breeding seasons from April to September. The amphibian population was estimated using opportunistic encounter surveys, visual encounter surveys, and dip-net surveys conducted every 7-10 days, and morphometric data were recorded on all collected individuals. The results of this study improved our understanding of forest disturbance on the community ecology of amphibians, and also provided forest managers and private landowners the knowledge to help reduce negative impacts of forest management techniques on amphibian populations while managing for oak regeneration on the Cumberland Plateau.

Lacy E. Rucker is a Ph.D. student at West Virginia University. She focuses on amphibian conservation, and how forest disturbance and climate change effect survival, growth, and breeding.

4:45PM ECOLOGICAL OBSERVATIONS OF THE OUACHITA STREAMBED SALAMANDER EURYCEA SUBFLUVICOLA. Kelly J. Irwin1* and Renn Tumlison2. 1Arkansas Game & Fish Commission, 915 E. Sevier St., Benton, AR 72015; 2Department of Biology, Henderson State University, Arkadelphia, AR 71999.

The recently discovered Ouachita Streambed Salamander *Eurycea subfluvicola* Steffen, Irwin, Blair, and Bonett, 2014, has one of the smallest known ranges of any vertebrate in North America. To date, this paedomorphic species has only been found in one stream valley in the Trap Mountains, a subrange of the southeastern Ouachita Mountains. It occurs in small segments of first order streams with seasonally discontinuous surface flows and relies on the interstitial spaces in the stream substrate to access subsurface water sources during low flows. Annual surface activity is bimodal, from late February – May and November – early December, with water temperature ranging from 8.7 – 16.0°C. Gravid females with well-developed eggs have been observed in late November. Adult *E. subfluvicola* and larvae of the syntopic sister species *E. multiplicata* are nocturnally active foragers. Captured animals have occasionally regurgitated food; isopods have predominated, with one instance of feeding on aquatic oligochaete worms. Field observations suggest a strong correlation between the presence of isopod concentrations near groundwater upwellings and salamander presence. Current research is underway to locate additional localities of *E. subfluvicola* using eDNA techniques.

Kelly Irwin is the herpetologist for the Arkansas Game & Fish Commission.

4:50PM POST-PARTUM DISPERSAL AND HABITAT USE OF NEONATAL COPPERHEADS (CROTALINAE; AGKISTRODON) IN A MANAGED SOUTHEASTERN FOREST. Iwo P. Gross1**, Yong Wang1, and Callie J. Schweitzer2. 1Department of Biological and Environmental Sciences, Alabama A&M University, Huntsville, AL 35811; 2Southern Research Station, USDA Forest Service, Huntsville, AL 35801.

Studies evaluating the effect of forest management on the habitat preferences of nesting snakes and their dispersing offspring are limited, despite the importance of these age cohorts to population viability and genetic diversity. Recent studies have identified the neonatal snake cohort as an important dispersal vector in several species. Unfortunately, the comprehensive examination of early-life characteristics in snakes is logistically challenging because of ineffective tracking techniques and low detection probabilities in wild populations. During the 2016-2017 activity seasons, we examined the activity patterns and microhabitat use of newborn copperheads (*Agkistrodon contortrix*) in Bankhead National Forest in northern Alabama. Gravid female copperheads were implanted with VHF radiotransmitters and tracked periodically until mid-August when they were placed in hardware cloth exclosures at their parturition sites to give birth. Neonates were implanted with harmonic direction finder tags after their initial ecdysis, and tracked daily. Case-control microhabitat surveys were conducted alongside natal tracking efforts. Microhabitat use was analyzed using conditional logistic regression within an information-theoretic framework. We used ArcMap and Geospatial Modeling Environment (GME) to visualize neonatal dispersal patterns. Our analysis revealed that neonates chose locations with less canopy closure and in closer proximity to woody undergrowth and course woody debris than what was available. Neonates exhibited a characteristic “beads-on-a-string” dispersal, punctuating step-wise movements with stops at woody shelters. Our findings indicate that recently managed areas provide neonatal copperheads with a patchy distribution of suitable thermal conditions and physical retreat sites reminiscent of naturally occurring early-successional habitat.
Iwo Gross graduated from Eastern Illinois University in May 2013 with a BS in Biological Sciences. Presently, he is pursuing an MS degree in Biology at Alabama A&M University. His interest in diminutive snake ecology arose during an undergraduate thesis project which investigated en masse midland brown snake (Storeria dekayi) seasonal migrations and the associated road mortality. His current research concerns herpetofaunal community responses to various forest management practices.

Saturday

SESSION 6 – Disease/General

8:30AM EFFECTS OF LARVAL CONDITION ON SUSCEPTIBILITY OF JUVENILE AMPHIBIANS TO THE CHYTRID FUNGUS, Batrachochytrium dendrobatidis Angela K. Burrow*, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia, Department of Biology, Miami University, Oxford, Ohio. Samantha L. Rumschlag, Department of Integrative Biology, University of South Florida, Tampa, Florida, Department of Biology, Miami University, Oxford, Ohio. Michelle D. Boone Department of Biology, Miami University, Oxford, Ohio.

Understanding factors influencing host-pathogen interactions is key to predicting outbreaks in natural systems. Many amphibian population declines have been attributed to an amphibian chytrid fungus, Batrachochytrium dendrobatidis (Bd). However, not all Bd-positive populations have been associated with declines, potentially attributable to differences in pathogen virulence or host susceptibility. In a laboratory experiment, we examined the effects of Bd isolates, two from areas with Bd associated amphibian population declines (El Cope, Panama, and California, USA) and two from areas without Bd related declines (Ohio and Maine, USA), on the terrestrial growth and survival of American toad (Anaxyrus americanus) metamorphs reared in larval environments experiencing low or high levels of intraspecific competition. We predicted that 1) Bd isolates from areas experiencing declines would have greater negative effects, and 2) across isolates, effects of Bd exposure would be greater for smaller metamorphs resulting from the high larval intraspecific competition treatment. Terrestrial survival was lower for smaller toads exposed to Bd, with variation among isolates, suggesting that smaller size increased metamorphs’ susceptibility to Bd. Toads exposed to Bd gained less mass, which varied by isolate. Bd isolates from areas with declines, however, did not have more negative effects than isolates from areas without recorded declines. Our study suggests that poor host condition increases the likelihood of negative effects of Bd exposure. Further, Bd isolates’ impact may vary in ways not predictable from origin or occurrence of disease-related population declines. Amphibian populations outside areas experiencing Bd associated declines could be impacted by this pathogen.

8:45AM ENDOCRINE STRESS RESPONSE OF EASTERN FENCE LIZARDS TO FIRE-ALTERED LANDSCAPES. Mike Iacchetta* and C.M. Gienger, Center of Excellence for Field Biology, Austin Peay State University, Clarksville, TN 37044.

Quantifying the endocrine stress response of reptiles through measurement of glucocorticoids has become an increasingly common method for determining how organisms respond physiologically to challenges imposed by the external environment. Habitat alterations, such as fire, change the landscape’s habitat structure and resource availability necessitating physiological responses to cope with the environmental change. We tested the hypothesis that Eastern Fence lizards cope with fire’s impact on the environment by modulating their endocrine stress response. We measured the baseline and stress-induced plasma corticosterone (CORT) concentration of male Eastern Fence Lizards in a chronosequence of fire-altered habitats at Land Between the Lakes National Recreation Area. Although canopy cover, leaf litter depth, and vegetation composition differed among habitat types (recently burned, recovering, and unburned), there was not a significant effect of habitat type on CORT concentration or body condition. Using a GLM, we found no cumulative effect of habitat type, type of blood draw (baseline or stress-induced), body temperature, body condition, and bleeding time on concentration of plasma CORT. Also, no single factor in the model was a good predictor of CORT concentration while controlling for all other factors within the model. Low intensity burns may not produce a challenging stressor necessary to elicit adjustments to the endocrine stress response in Eastern Fence Lizards. Instead, lizards may respond
behaviorally to avoid prolonged periods of allostatic overload by altering their basking frequency or selecting favorable microhabitats within the environment to maintain preferred body temperatures.

Mike Iacchetta is a Master’s student at Austin Peay State University within the Center of Excellence for Field Biology. His research interests include the ecology of amphibian and reptile species and the effects of habitat alteration on herpetofaunal behavior and physiology.

9:00AM EVIDENCE OF GENETIC RECOMBINATION RESULTING IN EVOLUTION OF A HIGHLY VIRULENT RANAVIRUS ISOLATED FROM AN AMERICAN BULLFROG (LITHOBATES CATESBEIANUS) FARM IN GEORGIA. Matthew J. Gray*, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN. Sieara C. Claytor, Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL. Kuttichantran Subramaniam, Department of Infectious Diseases and Pathology, College of Veterinary Medicine, University of Florida, Gainesville, FL. V. Gregory Chinchar, Department of Microbiology, University of Mississippi, Jackson, MS. Debra L. Miller, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN. Marco Salemi, Department of Pathology, Immunology, and Laboratory Medicine, College of Medicine, University of Florida, Gainesville, FL. Samantha M. Wisely, Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL. Thomas B. Waltzek, Department of Infectious Diseases and Pathology, College of Veterinary Medicine, University of Florida, Gainesville, FL.

Global trade of wildlife is believed to be contributing to the translocation and emergence of various pathogens. Further, wildlife production facilities may increase this threat, as animals are often held in high densities where pathogen transmission is guaranteed. These facilities also provide ideal conditions for genetic recombination of unique pathogen strains, because captive animals may have subclinical infections and originate from disparate locations. Our goal was to determine if multiple unique strains of an emerging pathogen (ranavirus) were present in an American bullfrog (Lithobates catesbeianus) production facility, and if there was evidence of genetic recombination between strains. We sequenced the genomes of two ranaviruses isolated from the same American bullfrog farm with ongoing outbreaks located in Georgia, USA, during different years (1998 and 2006), then compared their phylogenies with 15 other ranavirus isolates based on 52 core genes. We found that a strain of ranavirus only known previously to occur in Europe (common midwife toad virus, CMTV) and China (Chinese giant salamander virus, CGSV) was responsible for the outbreak in 1998. The 2006 isolate was shown to be a chimeric Frog virus 3 (FV3)-like strain, with regions of its genome showing recombination with the previously isolated CMTV/CGSV strain. Moreover, other studies we performed show that this chimeric FV3-like ranavirus has greater virulence over FV3 wild types. Our results provide evidence that multiple strains of ranavirus could be circulating in the global trade of American bullfrogs, and that recombination between strains is possible. Although ranaviruses that infect amphibians are listed as notifiable by the World Organization for Animal Health (OIE), most nations do not require animal health certificates for amphibians that are traded internationally, which could be contributing to the evolution and emergence of highly virulent strains of ranavirus.

Matthew Gray is a professor of wildlife ecology in the University of Tennessee Center for Wildlife Health, the director of the Global Ranavirus Consortium, and co-chair of the PARC National Disease Task Team. Dr. Gray, his students, and colleagues investigate mechanisms of pathogen emergence in amphibian communities.

9:15AM LEAPS AND BOUNDS: LANDSCAPE EFFECTS ON AMPHIBIAN ABUNDANCE, COMMUNITY COMPOSITION, AND GENE FLOW. Cara L. McElroy* and Lora L. Smith, Jones Ecological Research Center, 3988 Jones Center Dr, Newton, GA 39870, Jeffrey Hepinstall-Cymerman and Travis C. Glenn, University of Georgia, Athens, GA, 30602

Quantifying landscape effects is vital to the development of scientifically supported best management practices that support conservation and mitigate potentially negative effects of land development. To wit, the species distribution and gene flow of amphibians is largely informed by the configuration and connectivity of the surrounding landscape. To ascertain these effects, we investigated the effects of landscape features on amphibian community composition, abundance, and gene flow in geographically isolated wetlands (GIWs) on a portion of the Dougherty Plain of southwestern Georgia, 2015-2016. We used dipnetting surveys and biodiversity
metrics to determine the abundance and community composition of larval amphibians within 33 GIWs embedded within a range of land-uses. Categories of land-use/land-cover and dominant wetland vegetation (i.e., marsh or swamp) have divergent effects on amphibian species. Proximate forest cover and wetlands best explained amphibian abundance and diversity. We used these results to model regional landscape resistance to amphibian movement, and then tested the models using quantified amphibian gene flow. We determined the genetic differentiation of two amphibian species (the southern leopard frog (*Lithobates sphenocephalus*) and the southern cricket frog (*Acris gryllus*)) using 3RADseq next-generation sequencing protocols within 16 GIWs. Genetic differentiation was correlated with Euclidean distance ($R^2 = 0.364$) and quantified cost distance ($R^2 = 0.399$) for populations of southern cricket frogs, especially when wetlands were considered the primary habitat (i.e., the habitat with least resistance), but not significantly predictive for the larger and more vagile southern leopard frogs ($R^2 = 0.185$).

*Cara McElroy M.S. is an ecologist whose recent thesis focused on amphibian community composition and gene flow within the geographically isolated wetlands of southwestern Georgia. Previous work has addressed turtle population dynamics and the effects of prescribed fire and habitat restoration on herpetofauna.*

**9:30AM DEMOGRAPHY OF HELLBENDER SALAMANDERS ALONG A LAND USE GRADIENT.** Cathy M. Bodinof Jachowski*, Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634. William A. Hopkins, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24060.

The hellbender (*Cryptobranchus alleganiensis*) has experienced enigmatic range-wide declines and is currently a species of great conservation concern. Habitat loss due to land use alteration is widely suspected to be a driver of hellbender declines, but quantification of land use effects is currently lacking. We evaluated support the hypothesis that land use can function as an overarching driver of hellbender declines by examining demography of six hellbender populations stratified across a land use gradient in southwest Virginia. We also investigated associations between land use and in stream habitat characteristics to identify potential mechanisms linking land use to hellbender demography. Density of sub-adult/adult (≥ 290 mm) hellbender populations decreased and demographic structure became more skewed towards larger/older adults as forest cover within the collective riparian area upstream of a reach declined. Apparent survival estimates indicated sub-adults/adults were being lost (due to mortality and/or emigration) from each reach at about the same rate. However, populations subject to low levels (53-63%) of forest cover were slowly declining ($\lambda < 1$) while most populations in more heavily forested reaches (66-83% forest) were stable or increasing ($\lambda \geq 1$). Our findings indicate that loss of forest cover, or some correlate, negatively affects hellbenders by acting specifically on recruitment. In-stream habitat characteristics suggested alterations to water quality or substrate may function as more proximate determinants of hellbender recruitment. Failure to mitigate insufficient recruitment in areas subject to < 65% forest cover will likely result in increasing fragmentation and continued decline of extant hellbender populations.

*Cathy Bodinof Jachowski, Ph.D. is an Assistant Professor of Freshwater Ecology in the Department of Forestry and Environmental Conservation at Clemson University. Her research is focused on understanding individual and population-level responses of freshwater species to environmental change in order to develop effective conservation strategies.*

**9:45 AM THE EFFECTS OF TIDAL PHASE ON NESTING SEA TURTLE EMERGENCES AMONG THREE BEACHES.** Breanna L. Ondich*, Jekyll Island State Park Authority Georgia Sea Turtle Center, Jekyll Island, GA 31527. Oscar Brenes, Reserva Playa Tortuga, Ojochal, Costa Rica. Jaymie L. Reneker*, University of North Carolina Wilmington, Department of Biology & Marine Biology, Wilmington, NC 28403. Kimberly M. Andrews, Jekyll Island State Park Authority Georgia Sea Turtle Center, Jekyll Island, GA 31527, University of Georgia, Savannah River Ecology Laboratory, Aiken, SC 29802, University of Georgia, Odum School of Ecology, Athens, GA 30602.

The long-running research on sea turtles worldwide has afforded the ability to conduct demographical analyses which contribute essentially to our understanding of how these biological characteristics vary among populations.
The effect of tidal phase on nesting sea turtle emergence times is often discussed but less frequently citable. On beaches with a gradual slope and extreme tidal amplitude, it may be energetically beneficial for sea turtles to emerge closest to high tide. Data from Little Cumberland Island, Georgia, USA have shown that loggerhead sea turtles (*Caretta caretta*) emerge more frequently closer to high tide (Frazier 1983). This trend is also present in diamondback terrapins (*Malaclemys terrapin*; Crawford et al. 2014) nesting on nearby Jekyll Island, Georgia.

The number of successful sea turtle nesting events in each of twelve tidal phases was compared to the expectation of equal cell frequencies using a chi-squared test of probabilities with a null hypothesis that turtles emerge with no preference to tidal phase for three different beaches: Jekyll Island (JI), Georgia, USA (loggerhead sea turtles, high tidal amplitude, gradual beach slope), Bald Head Island (BHI), North Carolina, USA (loggerhead sea turtles, low tidal amplitude, medium beach slope), and Playa Tortuga (PT), Ojochal, Costa Rica (olive ridley sea turtles, high tidal amplitude, gradual beach slope). Results showed a significant preference for nesting near high tide for both JI ($\chi^2=147.5036$, df=11, $P <0.0001$) and PT ($\chi^2=55.5901$, df=11, $P <0.0001$), but not for BHI ($\chi^2=11.3872$, df=11, $P=0.4114$). These results suggest that tidal amplitude and beach slope, rather than species or population, may be significant drivers of nesting sea turtle emergence times.

As the world’s coastlines continue to become developed, fully understanding the fine temporal behaviors of marine turtles is critical for the successful management of conservation efforts, ecotourism, and other stakeholder behaviors. Understanding how tides may drive nesting behavior could potentially be applied to other coastal reptiles around the world.

Breanna Ondich received her B.S. in Marine Science-Biology from the University of Tampa. She has worked in the Research Department of the Georgia Sea Turtle Center on Jekyll Island for six years, specializing in sea turtle field research, training, and database management. In 2015, she accepted a full-time position as Park Ranger with the Jekyll Island Authority. In the future, she hopes to continue focusing on wildlife ecology, conservation and public education in human-dominated ecosystems.

**SESSION 7 – General Talks**

**10:15AM GENERATING ROBUST ESTIMATES OF SALAMANDER VITAL RATES TO MODEL POPULATION RESPONSES TO CLIMATE CHANGE.** Jillian S. Howard*, Integrative Conservation Program, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, Kira D. McEntire and John C. Maerz, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.

Population models are important for understanding how animals respond to environmental change. Informative models must contain robust estimates of vital rates, which often requires long-term data. Consequently, for many amphibians and reptiles, adequate demographic models are lacking. For example, salamanders within the *Plethodon* genus are abundant and influential in eastern deciduous forests, yet few estimates of vital rates exist. From 2010 ongoing, we conducted a robust, capture-recapture study of *Plethodon* at the Coweeta Hydrologic Lab in western North Carolina to (1) estimate size-class-specific survival and fecundity, (2) determine how survival varies with weather, and (3) create a population projection model for *Plethodon*. We found size class and average minimum daily temperature best predict 28-day survival, such that survival increases both with body size and temperature and varies throughout the year. Average annual survival estimates were: adults: 0.997, subadults: 0.983, juveniles: 0.893, hatchlings: 0.507. Annual adult female fecundity was estimated at 3 offspring based on: annual female reproduction probability: 0.387, average clutch size: 15 eggs, literature estimates of egg survival: 0.412 to 0.676. Our study provides the first robust estimates of *Plethodon* stage-specific survival. The temperature relationship likely captured the seasonality of *Plethodon* activity, suggesting that overwintering mortality, particularly among hatchlings, is key in *Plethodon* demography. Estimates of adult and subadult survival may be inflated by low capture probability, but nonetheless suggest *Plethodon* populations are characterized by high adult survival, low hatchling winter survival, and low fecundity. Surprisingly, rainfall was not associated with variation in survival, and we discuss potential reasons.

Jillian S. Howard, is a Ph. D Candidate at the University of Georgia in the innovative Integrative Conservation Program. She is studying the intersection of human land use values and high quality habitat identification to create a guide for conservation oriented land acquisition in western North Carolina.
10:30AM DEMOGRAPHIC TRENDS AND NEST PREDATION OF DECLINING NORTH CAROLINA BOG TURTLE POPULATIONS. Michael D. Knoerr* and Kyle Barrett, School of Agriculture, Forest, and Environmental Sciences, Clemson University, Clemson, SC 29634, Gabrielle Graeter, North Carolina Wildlife Resources Commission 1751 Varsity Drive, Raleigh, NC 27606.

Declines in bog turtle populations have prompted efforts by the North Carolina Wildlife Resources Commission and Project Bog Turtle to conduct annual surveys within the state. These data suggest that many of the surviving populations are small in size, declining and possibly at risk of extirpation. Previous reports indicate that some sites have much higher annual survivorship and abundance than others. Several of the smaller populations appear to have little to no recruitment. It has been suggested that low reproductive rates, nest success and/or juvenile survival may be limiting factors for these populations. These factors are likely linked to the site and landscape scale characteristics of each wetland. Additionally, It has been documented that human-commensal predators can have increased influence on herpetofauna recruitment in fragmented landscapes. To investigate the influence of meso-carnivores on bog turtle recruitment, we began a nest predation study in 2016. Thus far, we have documented and characterized 27 bog turtle nests, documented predation events that appear to coincide with demographic trends and photographed the meso-carnivore responsible for near complete nest failure within one wetland. We intend to expand this research in 2017 to see if these patterns continue at other sites. With this dataset, managers will likely have a better understanding of what is contributing to reduced recruitment in these bog turtle populations. This knowledge will play a key role in identifying and prioritizing management initiatives in the near future.

Michael Knoerr is a MS student at Clemson University. He has an extensive background in herpetofauna surveying and sampling across the US and is broadly interested in taking regional approaches to conserving imperiled non-game wildlife.


The Cumberland Plateau in Tennessee is largely understudied in respect to stream salamander ecology and distribution. One species, the Cumberland Dusky Salamander Desmognathus abditus is the only endemic surface-dwelling salamander to the region. Described in 2003 by Anderson and Tilley the salamander is still relatively understudied, though their ecology is often assumed to be similar to related species such as D. ochrophaeus and D. ocoee. To accurately describe the distribution and ecology of D. abditus, we conducted occupancy and capture-mark-recapture studies throughout their range. The distribution of D. abditus across the plateau is characterized by small populations found exclusively in perennial streams off the plateau in the sandstone layer. These sites are often characterized by bedrock cascades and waterfalls, though differences in habitat preferences may occur between northern and southern populations. Furthermore, an apparent gap in occupancy exists between Grassy Cove and Tracy City, Tennessee. Capture-mark-recapture analyses revealed that though survival was fairly similar between northern and southern populations (Southern $\psi = 0.52$, Northern $\psi = 0.52$), southern populations had much smaller temporary emigration rates (Southern $\gamma' = 0.14$ relative to $\gamma' = 0.85$). Most populations were small with 0-65 individuals, but one locality had up to 285 individuals. Ecological and morphological differences between northern and southern populations require more extensive study to understand genetic and environmental drivers of these differences. A distribution derived from small, isolated populations coupled with specific habitat preferences suggest that attention is needed to ensure that environmental changes have minimal impacts on population persistence.

Saunders Drukker is an undergrad researcher for the Sewanee Herpetology Lab at Sewanee: The University of the South. He currently works with stream salamanders across the Southern Cumberland Plateau, particularly Desmognathus abditus, analyzing population dynamics, and the influences of habitat variation on these populations.
11:00AM Why Did the Terrapin Cross the Road ... and What Can You Do About It? Advances in Road Management for Diamondback Terrapin Conservation. John C. Maerz, Brian A. Crawford, Carmen Candal, and Kayla J. Smith, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602.

Roads are a pervasive threat known to Diamondback terrapin populations. Roads directly increase female terrapin mortality and indirectly reduce nest success. Building off of our advances in identifying hot spots and moments of road mortality, we present data on additional patterns of terrapin road crossing behavior, and the success of three intervention strategies: focal hybrid barrier systems, flashing road signage, and roadside vegetation management. Using seven years of capture-recapture data along the causeway to Jekyll Island, we show that roadside hedges increased road-crossing behavior at 25 m and 50 m scales, and inter-capture distance and road crossing behavior decreased with female age [or head width]. The latter results suggests that a portion of road crossing behavior is the result of less precise nest site selection among younger females. Hybrid barriers placed at nesting hotspots reduced road mortality by 57%, and the installation of flashing signage increased survival of females crossing the road by 150%. Finally, we confirmed that the predation on terrapin nests was lower in areas without preexisting shrub rows compared to areas with shrubs, but areas where shrubs were removed had only nominal reductions in nest predation. Our ongoing studies demonstrate the benefits of long-term monitoring to identify finer-scale patterns of road and nest mortality and to measure the effectiveness of management efforts.

11:15AM Freshwater Acidification In The Age of a 400 ppm Carbon Climate. Matthew J. Charnock*, Residential Office, 1200 Montgomery Way, Lantana, TX, 76226

Since the post-industrial West began universally adopting carbon-heavy practices to hurdle over infrastructural growing-pains, we’ve collectively begun to see the cost of a carbon bloated atmosphere. (Now that we’ve consistently measured 400 ppm of carbon dioxide since the latter parts of 2012, it’s safe to say we’re at an environmental threshold; carbon-counts exceeding 300 ppm have been observed on a steady, predictable trajectory since the 1950’s.) In the wake documented “carbon sinks,” leading to oceanic dead zones, our freshwater reserves have been grossly overlooked. Increased deposits of carbonates (HCO₃⁻) and carbon dioxides (CO₂), in conjunction with metal and phosphorus bleed-offs, have lead to measurable pH fluctuations in affected freshwater environments; both wet and dry synthetically derived nitrate (commercial fertilizers) and eroded sulfur deposits only add fuel to the proverbial fire at hand. (It’s also worth noting where agricultural lands have seen more aggressive means of soil aggregation, such as hand- and commercial tiling, are far more susceptible to topsoil bleed-offs and experiencing an overall loss of microbial diversity than acreage treated with no-till practices.) Ultimately, when these airborne and grounded pollutants are introduced into otherwise unaffected freshwater bodies, algae balloons, as well as mass macrophytic die-offs, both starve and significantly alter prey populations and spawning grounds of endemic amphibian populations. But, with the re-culturation of rooting aquaflora, carbon-negative and carbon-neutral farming practices, yearly-soil gauging and systemic analysis, and forgoing liming practices commonly prescribed to acidic freshwater bodies, we can both mitigate and thwart the acidification of our riparian and freshwater wetlands.

Matthew J. Charnock is member to both Amphibian Specialist Group, Amphibian Specialist Association, and the Global Wildlife Conservation, contributing pieces for Froglog and other academic and commercial outlets. Matt’s career is steeped in freelance writing and journalistic endeavours, focusing in on areas of herpetological conservation, ecology, and ethology.

SESSION 8 – Speed Talks

11:30 ENVIRONMENTAL AND INTRINSIC DRIVERS OF ROAD-CROSSING AND NESTING BEHAVIORS BY DIAMONDBACK TERRAPINS (MALACLEMYS TERRAPIN). Carmen Candal*, Georgia Sea Turtle Center, Jekyll
Island State Park Authority, Jekyll Island, GA 31527, John C. Maerz and Brian A. Crawford, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602.

Roads are a pervasive, growing feature across most landscapes that negatively impact many herpetofauna species by fragmenting wildlife habitat and altering behaviors that increase road mortality frequency. Although spatial patterns of road mortality have been well-studied, there is a need to understand behavioral mechanisms associated with roads to predict and mitigate their impacts as ecological traps. Diamondback terrapins (Malaclemys terrapin) are semi-aquatic turtles frequently killed on coastal roads during nesting forays. We used seven years of mark-recapture data from intensive road surveys to estimate the effects of habitat and individual-specific predictors on terrapin nest site fidelity and road-crossing behavior along the Jekyll Island Causeway, Georgia. Our results confirmed nest fidelity within 100 m across years and showed evidence of fidelity to crossing between captures. The probability of road crossing increased with the percentage of roadside vegetation within 50 m of a potential nest site. We also found head width (a proxy for age) was negatively correlated with intercapture distances and road crossing, suggesting some terrapin crossings result from less precise nest site selection among younger females and barriers therefore are necessary to reduce road crossing. The management implications of our study support the need for vegetation removal along roadsides in concentrated areas of road mortality to create ideal nesting habitat and reduce crossing, which may be a viable tool used in broader strategies to reduce overall negative impacts of roads to at-risk populations of terrapins.

Carmen Candal graduated from the Warnell School of Forestry and Natural Resources at the University of Georgia with a Fisheries and Wildlife degree. Her research has included a study of diamondback terrapin nesting and road-crossing behaviors and gopher tortoise relocation and mitigation of human impacts. She joined the Andrews Applied Wildlife Conservation Lab as a field technician in 2016 and will serve an AmeriCorps term with the Georgia Sea Turtle Center as a sea turtle patrol member.

11:35 The Cutting Edge: An Erosion Study on Playa Tortuga (Ojochal, Costa Rica)
Ashley A. LaVere*, Georgia Sea Turtle Center, Jekyll Island, GA and University of Georgia, Athens, GA., Oscar Brenes, Reserva Playa Tortuga (RPT), Ojochal, Costa Rica, Kimberly M. Andrews, Georgia Sea Turtle Center, Jekyll Island, GA and University of Georgia, Athens.

Costa Rica hosts nearly 6% of the world's biodiversity despite being only the size of West Virginia. As a country lined with beaches on both coasts, much of this biodiversity relies on coastal habitats. This is no different with Playa Tortuga on the Pacific Coast in Ojochal, Osa Region, Costa Rica. Playa Tortuga holds a unique position tucked up against the mountains and at the mouth of the Térraba River, the largest in Costa Rica. Over the past few years, Playa Tortuga has had noticeable loss in beach, threatening not only shoreline vegetation, but also reducing eligible nesting habitat for Olive Ridley sea turtles (Lepidochelys olivacea) that come to nest every year. Resident research organization, Reserva Playa Tortuga, in collaboration with the Jekyll Island Georgia Sea Turtle Center, used low-cost repeatable techniques to quantify erosion on Playa Tortuga from August 2016 to December 2016, the peak of sea turtle nesting season for the West Coast. After only two months, the beach experienced a loss of over 13,000 square meters and by the end of the four months over 15,000 square meters had been lost, along with multiple trees and other vegetation. This rapid beach dynamic threatens the stability of the coastal habitat and the wildlife that relies upon it. Using real-time data over a four-month interval allowed for mapping of trends, hotspots, and rates of loss providing insight into possible causes and future management plans that can be extended to U.S. coastlines experiencing rapid erosion.

Ashley LaVere works with the Research Department of the Georgia Sea Turtle on Jekyll Island, Georgia as part of the Andrews Applied Wildlife Conservation Lab. Through support from the Disney Conservation Fund and the Jekyll Island Foundation, she travelled down to Costa Rica to work with Reserva Playa Tortuga in fall of 2016. There she worked as a research assistant with sea turtle patrolling and crocodilian monitoring and led the erosion study presented here.
11:40AM ROCK IGUIANA CONSERVATION IN THE DOMINICAN REPUBLIC: CURRENT STATUS AND THE NEXT STEP. Christopher Pellecchia*, University of Southern Mississippi, 118 College Drive, Box #5018, Hattiesburg, Mississippi, 39406, International Reptile Conservation Foundation, Inc, Tucson, Arizona, 85745.

The dry forests of Hispaniola (Dominican Republic and Haiti) feature a unique ecological phenomenon within the Caribbean Iguanas, the existence and sympatry of two species of Rock Iguana: Ricord’s Rock Iguana (Cyclura ricordii) and the Rhinoceros Iguana (Cyclura cornuta). C. ricordii is currently listed by the IUCN as Critically Endangered. C. cornuta is currently listed by the IUCN as Vulnerable. Previous conservation efforts have focused on the critically endangered C. ricordii, however recent reports and field work have shown that C. cornuta is rapidly declining throughout the island. Both species face similar existential threats including poaching, the illegal charcoal industry, habitat loss, habitat degradation, invasive species, and Iguanarios or breeding facilities.

In the Dominican Republic, major strides in Cyclura conservation have been made in the Pedernales province and on the southern shore of Lago Enriqullo. In April of 2016, a research team continued survey work along Lago Enriqullo, focusing on the illegal charcoal industry and relevant iguana activity. The 2016 expedition outlined the conservation threats to both species and laid the foundation for the use of new strategies within the niche of iguana conservation. In the summer of 2017, proposed field work will synthesize methods and technology commonly utilized in Gopher Tortoise (Gopherus polyphemus) conservation efforts across the Southeast.

Christopher Pellecchia M.S. is a Ph.D. student at the University of Southern Mississippi and a Special Projects Staff member of the International Reptile Conservation Foundation. His research is focused on the conservation, ecology, and interspecific interactions of Rhinoceros Iguanas (Cyclura cornuta) and Ricord’s Rock Iguanas (C. ricordii) in the Dominican Republic.

11:45AM SURFACE COAL MINING REMOVES PREFERRED HIBERNACULA HABITAT OF TIMBER RATTLESNAKES IN THE CUMBERLAND PLATEAU OF KENTUCKY. Thomas A. Maigret*, University of Kentucky, Department of Biology, 209 TP Cooper Bldg, Lexington, KY 40546, John J. Cox, University of Kentucky, Department of Forestry, 209 TP Cooper Bldg, Lexington, KY 40546.

Habitat loss continues to be the most common threat imperiling wildlife populations. In central Appalachia, widespread surface coal mining (“mountaintop removal”) has resulted in sudden and extensive loss of vegetation, soil and subsoil. Here, we quantified overwintering habitat loss in a species of concern, the timber rattlesnake (C. horridus), across the Cumberland Plateau of southeastern Kentucky. Based on in-situ hibernacula locations obtained through radiotelemetry and remotely sensed landscape data, we used a Mahalanobis distance ($D^2$) statistic to create a raster surface of habitat suitability values for timber rattlesnake hibernacula, and compared this to datasets of surface mining activity. Furthermore, we compared digital elevation models (DEMs) from before mining occurred to recent LIDAR data to determine which topographic positions were most frequently mined, and we used mining permit information to predict future amounts of habitat loss. Our results indicated that upwards of 8.4% of preferred hibernacula habitat across the Cumberland Plateau has been removed by mining, and a further 5.9% of habitat is currently under active mining permits. We also found that the most frequently mined topographic positions were more similar to those of hibernacula than the landscape as a whole. Our findings underscore the potential for habitat loss concentrated in a specific habitat to have cascading landscape-level effects. While further research is necessary to assess the potential for reclaimed minelands to serve as hibernacula, the direct killing of snakes due to mining in the inactive season is a concern.

Tom Maigret is a Ph.D. student in the Department of Biology at the University of Kentucky. He is interested in the impacts of habitat loss and fragmentation on wildlife populations, especially herpetofauna.

11:50AM HUMAN DIMENSIONS OF THE JEKYLL ISLAND SEA TURTLE PROJECT. Katie A. Mascovich*, University of Georgia, 140 E Green St., Athens, GA, 30602, Kimberly M. Andrews, University of Georgia & Jekyll Island Authority Georgia Sea Turtle Center, 214 Stable Rd., Jekyll Island, GA, 31527, Lincoln R. Larson, North Carolina State University, 2820 Faucette Dr., Biltmore Hall, NC State, Raleigh, NC 27695-8004
On Jekyll Island, Georgia, sea turtles nest annually along the public beach, where light pollution from beachfront hotel rooms may pose a threat to nesting and hatching sea turtles from May through October. In an effort to reduce this threat, we studied the effectiveness of sea turtle-friendly lighting education cards. In the 2015 sea turtle nesting season, the Jekyll Island Westin Hotel placed a two-sided lighting education card in each guest room. In 2016, the hotel did not provide guests with these cards. We hypothesized that if the education materials worked, then we would see a lower proportion of guest rooms with lights on and blinds open. Count surveys were performed at night in 2015 and 2016 to record the number of guest rooms with lights on and open blinds. In 2015, count surveys were conducted on randomly-selected nights and in 2016 we produced matched-pair survey nights based upon 2015 data. A Wilcoxon signed rank test found a statistically significant difference between years (p = 0.0214, z = -88.00, n = 28). Contrary to our hypothesis, 2016 – the year without education materials – had a lower mean proportion of guest room lights visible from the beachfront. While there may be some confounding variables, this result suggests that the type of passive education material used in our study does not work to change public behavior. We believe that limited resources designated for environmental education may be better directed toward an alternative method of information dissemination (e.g., targeted in-person education).

Katie A. Mascovich graduated from the University of California, Berkeley in 2011 with a Bachelor's of Science in Conservation and Resource Studies. She began working in the Southeast in 2012 as an AmeriCorps member at the Georgia Sea Turtle Center on Jekyll Island. In 2015, Katie began her master's degree with the University of Georgia's Odum School of Ecology. Her research focuses on the nesting ecology and conservation of sea turtles in developed habitats.

11:55AM PRELIMINARY DATA ON SNAKE FUNGAL DISEASE IN A LOUISIANA SNAKE ASSEMBLAGE.

Snake fungal disease (SFD) is an emerging infection in snakes caused by the fungus *Ophidiomyces ophiodiicola* (*Oo*). The disease gained prominence after being linked to high mortality rates in two protected species of pit viper. SFD has been documented in wild snakes throughout much of eastern North America. However, there are little data for most species concerning baseline prevalence rates and disease effects on populations. Therefore, we initiated a capture-mark-recapture study of the nonvenomous snake assemblage in southwest Louisiana to determine prevalence rates and compare survival probabilities of infected and uninfected snakes. We swabbed all captured snakes regardless of gross signs of the disease and used real-time PCR to detect *Oo* on the swabs. Eight species of nonvenomous snakes were captured, with Western Ribbonsnakes (*Thamnophis proximus*) and Southern Watersnakes (*Nerodia fasciata*) accounting for most captures. Return rates were near 25% and 50% for Western Ribbonsnakes and Southern Watersnakes, respectively, with some individuals captured many times allowing for possible changes in disease state. We found clear differences by season in disease prevalence in these two species. Snakes can be captured year round at this location, which may have implications for disease progression and ultimately survival compared to snakes in northern populations. The mechanisms that have allowed *Oo*, which is thought to be native, to emerge are unknown, but weather and long-term climatic factors are hypothesized as potential causes. Our future research direction is to examine some of these weather and climatic factors that may have facilitated the emergence of *Oo*.

Brad “Bones” Glorioso has worked with the Amphibian Research Monitoring Initiative (ARMI) at the USGS Wetland and Aquatic Research Center since 2008. He earned his B.S. from Southeastern Louisiana University in 2003, and his M.S. from Middle Tennessee State University in 2006, where his thesis focused on freshwater turtles. He founded the Louisiana Amphibian and Reptile Enthusiasts (LARE) Facebook group in 2012, which conducts statewide quarterly field trips and outreach, education, and citizen science efforts.
12:00PM Reproductive Observations and Body Condition Assessments of Coastal Rattlesnakes. Katie M. Parson*, Jekyll Island Authority, Georgia Sea Turtle Center, Jekyll Island, GA 31527, Kimberly M. Andrews, Jekyll Island Authority, Georgia Sea Turtle Center, Jekyll Island, GA 31527, University of Georgia, Odum School of Ecology, University of Georgia, Athens, GA 30602, Joseph E. Colbert Jekyll Island Authority, Georgia Sea Turtle Center, Jekyll Island, GA 31527, and Darren J. Fraser, University of Georgia, Odum School of Ecology, University of Georgia, Athens, GA 30602

Rattlesnakes appear to be declining throughout their range resulting in recent species petitioning. Declines have been attributed to direct impacts from human persecution and habitat loss. Less understood are the chronic impacts rattlesnakes encounter from habitat degradation and increasingly unpredictable conditions, both of which are emergent impacts from climate change. Coastal rattlesnakes experience climate change impacts at an accelerated rate due to proximity to shorelines and exposure to highly dynamic abiotic and biotic conditions. These dynamic conditions immediately influence their activity patterns which in turn determine energy budgets and available resources for maintenance and reproduction. Female rattlesnakes are ovoviviparous, ectothermic predators and have to be opportunistic and strategic with both their foraging and basking. Gravid female rattlesnakes elevate their body temperature to assist with the development of their young. We report on observational data on the reproductive behaviors of eastern diamondback rattlesnakes (Crotalus adamanteus) from Jekyll Island, Georgia, USA. In addition, monthly weights were collected throughout the active season to monitor fluctuations in weight in response to rapid changes in environmental temperatures. We introduce the frequency and phenological trends of reproductive events, as well as the growth and behaviors that pertain to these events. Over a period of five years, there have been 21 observed mating events and five successful birthing events. These observations and patterns can be foundational for understanding the local natural history of this predator on subtropical barrier islands and serve as indicators for better management plans for the species in its coastal range.

Katie Parson graduated from the University of Tampa in 2014 with a Bachelor’s of Science in Marine Science – Biology and a minor in Environmental Science. She has worked as an intern or AmeriCorps member in the Georgia Sea Turtle Center’s research department since 2013. Her research has focused on loggerhead sea turtles and Eastern diamondback rattlesnakes. Katie is in her last term as an AmeriCorps member and applying to graduate school.

12:05PM GOPHER TORTOISE TRANSLOCATION AND COMMENSAL SPECIES MITIGATION ON A HEAVY MINERAL MINE SITE. Lance Paden*, Odum School of Ecology, University of Georgia, Athens, GA 30602, Kimberly M. Andrews, Odum School of Ecology, University of Georgia, Athens, GA 30602, Georgia Sea Turtle Center, Jekyll Island State Park Authority, Jekyll Island, GA 31527, and Jim Renner, Southern Ionics Minerals LLC, 116 Hamilton St., Saint Simons Island, GA 31522.

A multi-year gopher tortoise (Gopherus polyphemus) and commensal species research and translocation mitigation project is underway in southeast Georgia on a heavy mineral sand mining site, Mission Mine, operated by Southern Ionics Minerals, LLC. This is the impetus for my Masters’ research and highlights the value of longleaf pine restoration and land management at GA DNR’s Penholoway Wildlife Management Area and similar WMAs. We have used a number of methods to vacate vertebrate wildlife prior to mining activity. Transect surveys, burrow-scoping, and manual and mechanical excavations have been employed. Prescribed fire was also extremely effective at improving efficiency of burrow surveys and increasing detection of burrows, particularly juvenile tortoise burrows. Exclusionary fencing was effective for temporarily segregating subpopulations of tortoises to reduce impacts of mining activities. To date, no tortoise mortality has been observed despite being immediately adjacent to active haul roads. Additionally, I will provide an overview of our health assessment and disease screening protocols we use to establish awareness of disease prevalence in tortoise populations, and to further our understanding of how we can reduce health consequences of translocation. My research involves intensive monitoring of tortoises at the recipient site and involves a pre- and post-penning study design intended to maximize translocated tortoise site fidelity. Preliminary data from radio-telemetry, GPS loggers, iButtons®, and game cameras suggest tortoises are not adversely affected by translocation at Penholoway. Translocated
individuals and subpopulations appear to be successfully integrating into existing populations, however longer term monitoring is needed to better understand integration dynamics.

Lance Paden is a Master’s student at the University of Georgia Odum School of Ecology under the advisement of Dr. Kimberly Andrews. While he is involved in a number research projects within Dr. Andrews’ Applied Wildlife Conservation Lab, his thesis research focuses on gopher tortoises and their response to translocated population integration.

12:10PM BLOOD FLUKES (DIGENEA: SCHISTOSOMATOIDEA) INFECTING FRESHWATER TURTLES OF ALABAMA: NEW SPECIES WITH NEW HOST AND GEOGRAPHIC LOCALITY RECORDS. Jackson R. Roberts* and Stephen A. Bullard, Aquatic Parasitology Laboratory, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, Auburn AL 36849.

Turtle blood flukes (TBFs) infect the vascular system of turtles and are most closely related to the avian and mammalian schistosomes, which cause human schistosomiasis. Before our sampling, no TBF was known from Alabama, despite the state having the highest freshwater turtle (definitive host) and snail (intermediate host) diversity in the United States. As part of an ongoing study of TBF diversity in Alabama rivers, we sampled 11 of the 29 (38%) Alabama freshwater turtle species, all of which but one are infected. Twenty-one TBF species of 3 genera infected 10 freshwater turtle species: Apalone spinifera aspera [3 TBFs], Chelydra serpentina [2 TBFs], Deirochelys reticularia [2 TBFs], Graptemys ernsti [1 TBF], Graptemys nigrinoda [2 TBFs], Graptemys pulchra [3 TBFs], Sternoterus minor [2 TBFs], Sternoterus peltifer [1 TBF], Sternoterus odoratus [2 TBFs], and Trachemys scripta [3 TBFs]. Seven of these turtles had not previously been reported as TBF hosts elsewhere (A. s. aspera, D. reticularia, G. ernsti, G. nigrinoda, G. pulchra, S. minor, S. peltifer). A new species of Spirorchis infected D. reticularia, and a new species of Vasotrema infected A. s. aspera.

Jackson Roberts began his MSc at Auburn University in August 2014. His advisor is Dr. Stephen (Ash) Bullard, a parasitologist in the School of Fisheries, Aquaculture, and Aquatic Sciences. Jackson’s thesis work focuses on the taxonomy and systematics of the blood flukes infecting freshwater turtles of Alabama. Jackson plans to graduate in August 2017.

12:15PM LIFE IN SKINNY WATER: OBSERVATIONS OF JUVENILE DIAMONDBACK TERRAPINS (MALACLEMYS TERRAPIN) UTILIZING SHALLOW WATER HABITATS. Will Selman*, Biology Department, Millsaps College, 1701 North State St., Jackson, MS, USA, 39210, Brett Baccigalopi, and William Strong, Rockefeller Wildlife Refuge, Louisiana Department of Wildlife and Fisheries, 5476 Grand Chenier Hwy, Grand Chenier, Louisiana, USA, 70643

For many turtle species, relatively little is known about the juvenile years, particularly the habitats they use. Prior ecological studies of turtles have found that juveniles use vastly different habitat than adults. Diamondback Terrapins (Malaclemys terrapin) inhabit salt marshes and mangrove habitats along the Atlantic and Gulf Coasts of the USA. While sampling for terrapins in southwestern Louisiana from 2011 – 2016, we captured 18 and 19 juveniles (<9.5 cm PL) by fyke net and manual searching via airboat, respectively. Juveniles made up only 2.8% of fyke net captures and 8.1% of manual searching captures. The commonality of all observations is that juveniles were exclusively captured in shallow water habitats (<1 m), with many captured in <10 cm of water. Fyke net bycatch of alligator gar (Atractosteus spatula), a top predator in the system, increased with depths >1 m. The presence of juveniles in shallow water marshes likely promotes better survival by having fewer predators and more cryptic habitats. These habitats likely also promote growth via better thermoregulatory opportunities (i.e., shallow, warm water), less osmotic challenges, and competitive avoidance with adult terrapins. Presumably the lack of juveniles in prior studies is due to a combination of sampling methodology, the location of habitats that are sampled, and crypsis of juveniles. Our observations further support previous observations that indicate “high
marsh“ as an important habitat for juvenile terrapins, and these habitats should be included into terrapin and/or coastal conservation planning.

Will Selman, Ph.D. is an assistant professor of biology at Millsaps College. His teaching includes Zoology and field biology courses, while his research focuses on life history ecology and applied wildlife ecology with avian and herpetofaunal species, particularly chelonians. He is the Turtles Co-Section Editor for the journal Herpetological Conservation and Biology and a member of the IUCN Tortoise and Freshwater Turtle Specialist group.

12:20PM Assessment of ATV Impacts on Softshell Turtle Nests. Cody D. Godwin*, Department of Biology, Southeastern Louisiana University, Hammond LA 70402.

Recreational vehicle use (e.g., all terrain vehicles or ATV’s) has become increasingly popular in recent years, and is particularly prevalent in the southeastern U.S.. Numerous studies have indicated negative effects of ATV’s on the environment, especially in and around wetlands, including wetland degradation, soil erosion, destruction of vegetative communities, and direct animal mortality via impact. However, the impact of ATV’s on nest success of fresh water turtles has not been documented. The beaches of the Comite River in southeastern Louisiana bring into close contact ATVs and the nesting sites for two species of softshell turtles (Apalone mutica and Apalone spinifera). The present study aims to understand the impacts of the ATVs on softshell turtle nests and thus the turtle populations. A study performed in 1993-1994, when ATVs were absent, provides a baseline for assessing the current impacts. Analyses from the 2015 and 2016 field season show that ATV’s impacted 35% and 31% of nests respectively, and is the highest source of nest mortality on the Comite River.

Cody Godwin received his Bachelors in Wildlife, Ecology, and Conservation from The University of Florida in 2013. As an undergrad he worked as a research assistant studying turtle populations in the Santa Fe River in northern Florida and worked as a research technician in South Africa, Swaziland and Gabon. After graduating he worked as a biologist with FWC studying upland snake species. Currently, he is working on his masters at Southeastern Louisiana University studying the impacts of ATVs and ORVs on softshell turtle nests.


The financial security of private land ownership and management is vital for not only the individuals, families, etc. residing on that same land—but, also, for the endemic flora and fauna found on it. Including our amphibious ilk. (The corporate overhauls and buyouts of privately owned land is a malignancy facing any-and-all means of land conservation. And, in economic recessions, are some of the first privately owned assets to be sold to commercial housing projects.) But, with the rise of the sharing economy, technology companies, such as Hipcamp, have opened-up revenue streams, onced dammed by high-overheads and improbable renting situations, for those same individuals and families who were once struggling to hold their heads above water. “Land Sharing,” as it’s now coined, allows for the future holding of hundred, if not thousands, of privately owned land through newly adopted revenue streams, thwarting-off purchasing requests from commercial and residential developers and their firms. With the continuation of companies such as Hipcamp, we can assure the continued privatization of lands vital to keeping amphibian populations intact and, thus, aiding in biodiversity intactness.

Matthew J. Charnock is member to both Amphibian Specialist Group, Amphibian Specialist Association, and the Global Wildlife Conservation, contributing pieces for Froglog and other academic and commercial outlets. Matt’s career is steeped in freelance writing and journalistic endeavours, focusing in on areas of herpetological conservation, ecology, and ethology.
POSTER ABSTRACTS

SEA LEVEL RISE MONITORING TO ADAPT COASTAL LANDSCAPES AND INFRASTRUCTURES. Alison M. Ballard*, Georgia Sea Turtle Center, 214 Stable Rd. Jekyll Island, GA 31527, Kimberly M. Andrews, University of Georgia and Jekyll Island Authority Georgia Sea Turtle Center, 214 Stable Rd. Jekyll Island, GA 31527, Fraser M. Shilling, University of California Davis, One Shields Ave, Davis, CA 95616

We describe a method to monitor shoreline and infrastructure changes in response to sea level rise (SLR) using a network of time-lapse cameras. We found that the method was sensitive to vertical changes in sea level of <1 cm, roughly equivalent to 1-2 years of sea level rise under the A1 scenario. Sea level rise of as much as 20 cm has occurred in US coastal areas and is likely to rise by another 30-45 cm by mid-century, which will imperil many coastal ecosystems, highways, and economies. This rapid degree of rise means that it is imperative to include planning for infrastructural modifications in current regional and corridor plans. Many US highways are adjacent to shoreline ecosystems, which both protect infrastructure from wave and tide energy and are home to regulated species and habitats. Accurate and timely information about the actual extent of SLR impacts to shorelines will be critical during coastal system adaptation. The method described is feasible for near-term (1 to 10 years) to long-term application and can be used for measuring fine-resolution shoreline changes in response to SLR and associated wave action inundation of marshes and infrastructure. We field-tested the method with networks of cameras in 2 coastal states (CA and GA), using web-infomatics and services to organize photographs that could be combined with related external data (e.g., gauged water levels) to create an information blend. We further describe how this information could be used to test SLR models, track habitat change, and inform SLR-adaptation planning.

Alison M. Ballard graduated from Washington State University with a degree in Environmental Science In May of 2015. She moved to Georgia in March of 2016 to serve as an AmeriCorps member at the Georgia Sea Turtle Center in the Research Department working primarily on projects with sea turtles, kingsnakes, box turtles, and influences of habitat dynamics on their behaviors.

COMPARATIVE ENERGETICS AND RESPONSES TO FEEDING OF COPPERHEAD AND COTTONMOUTH SNAKES (AGKISTRODON). McKayla M. Spencer* and C.M. Gienger, Department of Biology and Center of Excellence for Field Biology, Austin Peay State University, Clarksville, TN 37044.

Digestion is energetically demanding in some organisms especially in those that eat large meals, such as snakes. We chose to compare responses to feeding between copperheads (Agkistrodon contortrix; a terrestrial species) and cottonmouths (Agkistrodon piscivorus; a semi-aquatic species) because habitat ecology may be a significant source of energy use variation. We compared the metabolic response to feeding and postprandial thermal behavior between species by measuring body temperature (Tb). We used an open-system respirometer to measure metabolism at three temperatures (20, 25, and 30°C) and a laboratory thermal gradient to measure postprandial Tb selection by digesting snakes. Standard metabolic rate (SMR) and pre-feeding Tb measurements did not differ between species (P>0.13). Following the consumption of rodent meals, the total energetic cost of digestion (specific dynamic action) was significantly different between species at 25 and 30°C. The postprandial peak in oxygen consumption was approximately 5 to 8x higher than SMR in both species, indicating a significant increase in energy use during digestion. When comparing pre-feeding versus post-feeding Tb measurements between species we found that copperheads did not change their thermal behavior but cottonmouths selected temperatures 4-6°C warmer post-feeding. Results indicate cottonmouths behaviorally increase postprandial Tb as a possible mechanism to optimize digestion and that copperheads do not behaviorally increase postprandial Tb. Our results between copperheads and cottonmouths indicate that ecological factors can affect postprandial metabolism and thermal behavior.

McKayla M. Spencer is currently working on her M.S. at APSU, and is finishing her thesis. She has worked with a variety of herp species in multiple locations. She assisted with research on regeneration in axolotls (Ambystoma mexicanum) from 2010 to 2012 while finishing her B.S. in Zoology at University of Florida. She worked in Guam as a USGS research biologist with Brown Treensnakes (Boiga irregularis) from 2013 to 2014.

Tracking the life history of larval anurans has historically been problematic for a number of reasons; two key causes being phenotypic plasticity and related difficulty in identification. In large part because of this, the specialized habitats and their temporal stability of particular species of breeding anurans are weakly represented in conservation efforts. Many larval life histories are done in artificial settings, and few track the ontogenetic stage for comparison with size. In the winter and spring of 2016, we monitored a breeding pool of Southern Leopard Frogs (*Lithobates sphenocephalus*) in natural settings. From shortly after oviposition through metamorphosis, the data presented here represent the first detailed account of the ontogeny of Southern Leopard Frog tadpoles. Additionally, we demonstrate the unreliability of staging as a guide for estimating tadpole age. The tadpoles surveyed here grew at an average rate of 0.16 mm day$^{-1}$ in body size and the exhibited a pre-metamorphic period of 99–117 days, well within the range of recent estimates.

James Erdmann is a second-year master’s student at Southeastern Louisiana University, where he manages the herpetology collection of the Vertebrate Museum. James studies feeding behavior in the Gulf Coast Toad and is a passionate naturalist.

HOW WILL WARMING AFFECT INTERACTIONS BETWEEN CLOSELY-RELATED STREAM SALAMANDERS? Mary Lou Hoffacker* and Kristen K. Cecala, University of the South, Sewanee, TN, 37383, Joshua R. Ennen, Tennessee Aquarium Conservation Institute, Chattanooga, TN, 37401, Jon M. Davenport, Southeast Missouri State University, Cape Girardeau, MO, 63701.

Warmer temperatures are associated with higher frequency of smaller species and individuals. For communities that are size-structured, climate warming may mean that interaction strengths and directions may be disrupted yielding losses in biodiversity. Furthermore, large-scale modeling efforts suggest that biological interactions between closely related species may accelerate declines of some species. Our objective was to evaluate the effect of interspecies competition and temperature on growth and habitat selection behaviors of Appalachian streamside salamanders using ex-situ stream mesocosms. Interspecific competition did not impair growth of either species, but salamanders kept at warmer temperatures gained less mass than those at ambient temperatures. At warm temperatures, interspecific pairs spent 20% more time cohabitating aquatic refuge than they did at ambient temperatures or with a conspecific. These behavioral shifts suggest that size-dependent interactions that currently structure streamside salamander communities are likely to change in the future potentially contributing to declines and extirpation of closely related species.

EFFECTS OF FOREST MANAGEMENT ON PLETHODONTID SALAMANDER DENSITY. Benjamin McKenzie* and Kristen K. Cecala, University of the South, Sewanee, TN 37383.

The past several decades have seen dramatic expansion of human land use in the southeastern United States. These changes in land use may bring with them changes in habitat structure and microclimatic regimes. The highly adapted plethodontid salamanders of the southern highlands are especially at risk from shifting climatic and microclimatic regimes and documented declines have occurred in the past few decades. This study examines the links between human land use and microclimatic and habitat variables, as well as the influence that these factors may have on plethodontid salamander density. Microclimatic, habitat characteristics, and salamander density was observed at 12 sites in Sewanee, TN, representing 4 different management regimes including intact upland hardwood, exurban, burned, and thinned forests. Terrestrial plethodontid density was highest in exurban forests relative to all other forest types though one species also responded positively in burned forests. Relative stability of exurban forests linked with characteristics of the forest floor indicate that these small patches of forest in an otherwise urban matrix may provide high quality habitat for terrestrial salamanders.
DISTRIBUTIONS OF CREVICE-DWELLING SALAMANDERS ON THE SOUTHERN CUMBERLAND PLATEAU OF TENNESSEE. Benjamin Sadler*, Benjamin McKenzie, Kristen K. Cecala, University of the South, Sewanee, TN, 37383.

The Cumberland Plateau’s unique topography relative to other ecoregions in the eastern United States suggest that occupancy patterns of species that live there may be driven by climatic changes associated with the geology. The region is characterized by warm and dry plateaus bordered by steep and fractured sandstone bluffs. Fractures within the bluffs are occupied by a variety of amphibians, but it is unknown whether microclimatic or topographical variables influence salamander distributions in this habitat type. The objective of our study was to describe patterns of occupancy for crevice-using plethodontid salamanders. We found more than 10 amphibian and reptile species using these habitats, but only three plethodontids were found in sufficient numbers for analysis. Species-specific patterns emerged with *Aneides aeneus* positively associated with forest cover, *Eurycea lucifuga* best associated with specific coves, and *Plethodon glutinosus* positively associated with cooler temperatures and water presence. Overall, it appears that sandstone bluffs provide important habitat for herpetofaunal communities on the Cumberland Plateau and may represent climate refugia to allow some species to be active in the warm and dry seasons.

POOR BIOSECURITY COULD LEAD TO DISEASE OUTBREAKS IN AMPHIBIAN POPULATIONS E. Davis Carter*, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN, Matthew J. Gray, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN, Jennifer A. Spatz, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN, Debra L. Miller, Center for Wildlife Health, University of Tennessee Institute of Agriculture, Knoxville, TN, College of Veterinary Medicine, University of Tennessee.

Outbreaks of ranavirus and chytrid fungus have contributed to amphibian population declines. It has been suspected that biologists could contribute to pathogen outbreaks through poor biosecurity practices during sampling. Biologists frequently co-house captured amphibians and do not change gloves between handling different individuals. We tested whether these poor biosecurity practices could facilitate transmission of ranavirus from infected to uninfected wood frog (*Lithobates sylvaticus*) tadpoles, and increase the likelihood of mortality. Co-housing tadpoles for only 15 minutes with 10% of individuals initially infected resulted in transmission and mortality of 50% of uninfected tadpoles. Not changing gloves between individuals when 10% were initially infected resulted in transmission of ranavirus and mortality of 70% of uninfected tadpoles. More extreme mortality was observed when tadpoles were co-housed for longer durations, or when the initial infection prevalence was >10%. Our results indicate that poor biosecurity practices can cause pathogen transmission between individuals, which could lead to disease outbreaks and decrease survival in populations. Biologists should change gloves or decontaminate them between handling individuals, and not co-house animals.

E. Davis Carter is a MS candidate in Wildlife and Fisheries Science at the University of Tennessee, Knoxville. He is interested in amphibian diseases and determining the impact pathogens have on amphibian populations.


Saltwater intrusion into coastal freshwater swamps and marshes has become a topic of much concern in recent years. With rising sea-levels, powerful marine storms, and coastal erosion, animals that are intrinsically tied to fresh water may have an increased risk of die-offs and low reproductive success. The Lower Cypress Tract of the Big Thicket National Preserve is a tidally-influenced freshwater forested wetland that runs along the Neches River near Beaumont, Texas. There is a saltwater barrier in this area of the Neches River that keeps the water upstream of the barrier fresh for human use. Due to periodic spikes in salinity downstream of the barrier
compared to the always fresh upstream, this area is an ideal location to monitor the effects of salinity on anuran occupancy. Since 2012, 32 sites downstream of the saltwater barrier and 20 sites upstream of the barrier have been sampled for anurans using visual encounter and call surveys 4-6 times per year. Our results indicate that occupancy rates have been relatively stable over the past 4 years for most species. These data show that the Green Treefrog has a greater probability of occurring downstream of the saltwater barrier, whereas the Green Frog is more likely to occur upstream. Though some species seem to cope with increased salinity in the short-term, continuous long-term exposure may negatively affect anuran populations. The results of this long-term monitoring may impact management decisions in the future.

Lindy J. Muse is a contractor and a researcher with Cherokee Nation Businesses. She earned her B.S. in Biology from The University of Louisiana at Lafayette. She assists Hardin Waddle and Brad M. Glorioso with the Amphibian Research and Monitoring Initiative (ARMI) program at the U.S. Geological Survey Wetland and Aquatic Research Center in Lafayette, Louisiana.

MODELING OCCUPANCY AND ABUNDANCE OF TERRESTRIAL SALAMANDERS ACROSS NATURAL ENVIRONMENTAL GRADIENTS IN OLD GROWTH FOREST. Joseph A. Baecher*, Department of Biology, Eastern Kentucky University, Richmond, KY 40475. Stephen C. Richter, Department of Biology and Division of Natural Areas, Eastern Kentucky University, Richmond, KY 40475.

Terrestrial salamanders, particularly plethodontids, are quickly becoming model organisms for ecological investigations of forest integrity and biodiversity. However, their cryptic diversity and abundance presents a challenge to researchers. Estimations of population size and patch occupancy can be inaccurate when the probability of detecting a species, given its presence, is <1. Therefore, accounting for imperfect detection in ecological studies is tantamount to understanding the relationship of terrestrial salamanders and their environment. We investigated how natural environmental gradients in forested ecosystems, including canopy gaps, soil moisture, and microhabitat availability influence the occupancy and abundance of *Plethodon kentucki* and *P. richmondi* in the old growth forest of Lilley Cornett Woods (SE Kentucky, USA). Area-constrained visual encounter surveys (N=4) were conducted at 40 sampling plots during the fall of 2016, with each sampling event occurring no more than 5 days apart. Detection probability of *P. richmondi* and *P. kentucki* were influenced greatly by abundance of rocky cover and date of surveys. Canopy openness, elevation, and soil moisture were all important in explaining the conditional occupancy probability and estimated abundance of *P. kentucki* and *P. richmondi*. Abundance of *P. richmondi* showed a strong positive correlation with canopy density and a weaker, yet clear, positive correlation with elevation. *Plethodon kentucki* abundance was most strongly correlated with soil moisture. Results from this study indicate that in forests which receive minimal anthropogenic disturbance, the fine-scale distribution and density of terrestrial salamanders is influenced greatly by natural environmental gradients created by dynamic terrestrial ecosystem processes.

Alex Baecher graduated with a B.S. from the Univ. Arkansas and is currently a M.S. candidate in the Dept. of Biological Sciences at Eastern Kentucky University. He is broadly interested in the ecology, conservation, and natural history of reptiles and amphibians.

EFFECTS OF LITTER SUBSTRATE AND ALGAE WAFERS ON THE GROWTH AND SURVIVAL OF DUSKY GOPHER FROG (*RANA SEVOSA*) TADPOLES. Jaime E. Smith*, Gulf Coast Research Laboratory, University of Southern Mississippi and Western Carolina University, Gulfport MS, John A. Tupy, US Fish and Wildlife Service, Vero Beach, FL., Joseph H. K. Pechmann, Biology Department, Western Carolina University, Cullowhee NC.

Growth and survival of *Rana sevosa* tadpoles is higher in open canopy than in closed canopy ponds. Litter substrates, which are dominated by herbaceous plant material in open canopy ponds and by pine and hardwood leaves in closed canopy ponds, may contribute to these differences. Supplemental food such as algae wafers may ameliorate any effects of substrate. We tested the effects of different combinations of the substrates maidencane (*Panicum hemitomon*), juncus (*Juncus repens*), and leaf litter (*Pinus palustris*, *Liquidambar styraciflua*), both with and without weekly algae wafer additions, on *R. sevosa* tadpoles in outdoor tanks. Algae
addition increased survival by 19%, decreased mean larval period by 25 days, increased metamorph mean snout-vent length (SVL) by 8 mm, and more than doubled metamorph mean mass. Without algae, survival averaged 53% lower for leaves alone, but with algae, survival averaged 43% lower for juncus alone, compared to other substrates or substrate combinations. Without algae, larval period averaged 8-23 days shorter for juncus and for juncus plus maidencane than for other substrate treatments. With algae, substrate had no significant effect on larval period. Mass and SVL at metamorphosis were highest for juncus, lowest for leaves and leaves plus juncus, and intermediate for maidencane alone or combined with other substrates. Substrate diversity had no detectable effects. *Rana sevosa* tadpoles did most poorly overall with leaf substrate and without algae. Use of substrates from open canopy ponds and algae wafers can improve growth and survival of *R. sevosa* tadpoles raised for translocation and population supplementation.

Jaime E. Smith is a research technician at the Gulf Coast Research Laboratory, University of Southern Mississippi and Western Carolina University, and a graduate student at USM. She does research on the conservation biology of dusky gopher frogs, including their interactions with a protozoan parasite.

**IT’S AN ISLAND LIFE FOR THE CEDAR KEY MOLE SKINK.** Kevin M. Enge, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, Paul E. Moler, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, Travis M. Thomas, Nature Coast Biological Station, 552 1st Street, PO Box 878, Cedar Key, FL 32625, Aubrey Heupel Greene*, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601.

The Cedar Key Mole Skink (*Plestiodon egregius insularis*), which is endemic to a few islands in Levy County, Florida, was petitioned in 2012 for federal listing as Threatened. We collected 25 genetic samples from Atsena Otie, North, Scale, and Seahorse keys during four trips in 2015–2016. We also have a sample collected in 2004 from Deer Island. These samples will be used for a phylogenetic analysis of all five mole skink subspecies by Dr. Christopher Parkinson and Katie Mercier at the University of Central Florida. Preliminary results using two mitochondrial genes and one nuclear gene suggest that the Cedar Key subspecies is not distinct from the peninsula subspecies (*onocrepis*). Skinks were found by raking underneath dry tidal wrack and other debris. We were most successful at finding skinks on North Key, where we captured three adults and nine hatchlings during a June 2015 trip. All hatchlings found failed to match the description for this subspecies. A trip in December 2016, three months after Hurricane Hermine, failed to find skinks on North Key; we captured only one skink on Seahorse Key. Storm surge from this Category 1 hurricane eliminated most detritus used as cover by skinks. We assume most skinks survive such storms by sheltering in hammocks on higher ground and later recolonize shoreline habitats.

Aubrey Heupel Greene is a Biological Scientist working for the Florida Fish and Wildlife Conservation Commission in the Reptile and Amphibian Subsection of the Fish and Wildlife Research Institute. She primarily conducts surveys on listed herpetofaunal species throughout Florida.

**PARADISE LOST: SURVEY OF STATE-LISTED REPTILES IN THE FLORIDA KEYS.** Jonathan D. Mays* and Kevin M. Enge, Florida Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Rd., Gainesville, FL 32601

The striped mud turtle, Florida Keys mole skink, Keys ring-necked snake, red cornsnake, Florida brown snake, rim rock crowned snake, and ribbonsnake in the Florida Keys were state listed through 2016, and 5 of these taxa have been proposed for federal listing. Many locality records are old, and subsequent habitat alteration and hurricanes have affected populations. From July 2015 – July 2016, we conducted a 1-year study to collect updated occurrence records, determine effective survey methods, assess the status of historical localities, and collect genetic samples for future taxonomic studies. Public outreach efforts, including a website developed to solicit sightings, produced 75 reports of target taxa (10 mud turtles, 8 mole skinks, 10 ring-necked snakes, 35 red cornsnakes, 1 brown snake, and 11 ribbonsnakes). Monthly visits produced 164 records of target taxa: 73 records came from road (12 mud turtles, 23 red cornsnakes, and 7 ribbonsnake) or pedestrian (8 mud turtles, 12 cornsnakes, and 12 ribbonsnakes) surveys, whereas 192 coverboards produced only 8 mole skinks and 2 ring-
necked snakes. Targeted surveys for the mud turtle (trapping) and mole skink (raking) produced 62 and 19 individuals, respectively. We were unsuccessful at detecting the rim rock crowned snake. Florida recently delisted Lower Keys populations’ of the mud turtle, red cornsnake, and ribbonsnake (collection is still prohibited). Regardless of legal status, impacts to fresh water from increased human demand and salination from overwash continue to threaten wildlife in the Keys. Future development and sea-level rise will further decrease habitat and negatively impact the native herpetofauna.

Jonathan Mays is an Assistant Research Scientist in the Wildlife Research Section’s Reptile and Amphibian Subsection of FWC. His recent projects include a spotted turtle home range and movement study, river turtle surveys (Graptemys and Macrochelys), a status survey of rare upland snakes, inventory and monitoring of the Miami tiger beetle, and a statewide cave fauna inventory. In addition to Florida, he’s conducted research on reptiles, amphibians, and invertebrates in North Carolina, Tennessee, and Maine.

THE RELATIVE IMPORTANCE OF MICROHABITAT VARIATION AND INTRAGUILD SPECIES OCCUPANCY IN SHAPING STREAM PLETHODONTID SPACE USAGE: AN INITIAL REPORT. Sky T. Button*, Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL, USA, 32611, Kristin A. Bakkegard, Howard College of Arts and Sciences, Samford University, 800 Lakeshore Drive, Birmingham, AL 35229.

The tendency of salamanders to select habitats based on fine-scale gradients often necessitates constructing ecological studies at the microhabitat level. This fine scale focus is especially important for understanding the impacts of microhabitat-dependent behavior displayed by non-vagile species on overall guild dynamics. While plethodontid space use is known to be heterogenous at the microhabitat level, few studies have examined the influences of predatory and competitive interactions between plethodontid species on fine-scale patterns of larval space use. We investigated the influences of heterospecific plethodontid occupancy and several microhabitat components on the fine-scale spatial distributions of five plethodontids (Pseudotriton ruber, Desmognathus monticola, Desmognathus conanti, Eurycea cirrigera, and Eurycea guttolineata) in a first order ridge-and-valley stream in central Alabama. Our initial results suggest fine-scale spatial exclusivity between two plethodontid species (Pseudotriton ruber and Desmognathus monticola), which may be driven by competitive and defensive behaviors exhibited by both species. Surprisingly, we found little evidence for microhabitat variation within this stream influencing the fine-scale spatial distributions of any of our study species, which we suspect is a result of the relatively wide abiotic niches possessed by these species in comparison to many other plethodontids.

Sky T. Button is an undergraduate wildlife ecology and conservation student at the University of Florida. He is interested in community ecology, climate change ecology, landscape genomics, and reptile and amphibian conservation.

CHANGES IN BOG TURTLE MOVEMENT PATTERNS OVER TIME AND FOLLOWING HABITAT RESTORATION. Natalie T. Haydt*, Davidson College, Davidson, NC 28035, Annalee M. Tutterow, Davidson College, Davidson, NC 28035, Shannon E. Pittman, Davidson College, Davidson, NC 28035.

The bog turtle (Glytemys muhlenbergii), a small semi-aquatic turtle species found in the eastern United States, is listed under the Endangered Species Act as threatened in its northern range (New York to Maryland), but is only considered threatened due to “similarity in appearance” in its southern range (Virginia to northern Georgia). As a result, bog turtles in the southern range do not receive full habitat protection and may therefore be particularly susceptible to habitat disturbance and degradation. Our study examined behavioral changes in a small, isolated bog turtle population in North Carolina between two periods of radiotracking activity (2007-2008 and 2015-2016) and after significant habitat change (2015). Through examining our site’s bog turtle population over time, we observed a significant decrease in the number of individuals within the population since 1994 (from an estimated 34 turtles in 1994 to currently fewer than 10). In an effort to manage the declining population, a habitat restoration project was implemented to curtail habitat erosion. We observed a marked transition in habitat use between 2007 and 2015, and pre (2015) and post-habitat restoration (2016). Ultimately, our long-term radio-telemetry data have provided useful insights into movement patterns and individual responses to habitat change in this isolated population.
**PREDICTIVE SPATIAL MODELING AND ASSESSMENT FOR A RARE TENNESSEE ANURAN: BARKING TREEFROG (HYLA GRATIOSA).** Nyssa R. Hunt*, Department of Biology, Geology, and Environmental Science, University of Tennessee at Chattanooga, 615 McCallie Ave., Chattanooga, TN 37403, Interdisciplinary Geospatial Technology Lab, University of Tennessee at Chattanooga, 701 East M.L. King Blvd., Chattanooga, TN 37403, Andy Carroll, Interdisciplinary Geospatial Technology Lab, University of Tennessee at Chattanooga, 701 East M.L. King Blvd., Chattanooga, TN 37403, Thomas P. Wilson, Department of Biology, Geology, and Environmental Science, University of Tennessee at Chattanooga, 615 McCallie Ave., Chattanooga, TN 37403.

Amphibian declines worldwide continue to cause concern for conservationists, where researchers must assess at-risk and vulnerable species within their own regions to effectively monitor population statuses. Members of this taxonomic group tend to be sensitive to habitat alteration and climate change, both of which have the ability to shift distribution across a landscape and potentially contribute to local extinction. As landscapes gradually change with multiple factors, monitoring amphibian occurrence is important for conservation purposes, especially for species that may be threatened, endangered or rare. In the state of Tennessee, the Barking Treefrog (Hyla gratiosa) is a rare species that seems to have potential to disperse to new areas, although little is known about the mechanisms affecting its dispersal. To better understand distribution patterns, we utilized land cover data by HUC 12 and collectively analyzed North American Amphibian Monitoring Program (NAAMP) data and Tennessee Department of Environment and Conservation (TDEC) "rare species by watershed" data, with which it is possible to better elucidate our understanding of the habitats suitable for this species and to fill in data gaps for its selective distribution. Areas with documented presence will be compared to areas of apparent absence to assess for a difference in land cover metrics. In order to ensure the accuracy of the presence data, auditory field surveys will be utilized to monitor occurrence. Additionally, predictive models of H. gratiosa presence were generated with MaxEnt, where the produced models will be tested in the field by monitoring for the species in “new” locations.

Nyssa R. Hunt is an Environmental Science graduate student at the University of Tennessee at Chattanooga. She is currently working to develop and assess predictive spatial models for Barking Treefrog to better understand its apparently patchy distribution. Her research interests involve utilizing geospatial tools for conservation management and exploring herpetofauna species distribution.

**INVESTIGATION OF THE AMPHIBIAN CHYTRID FUNGUS IN EAST TENNESSEE** Paul-Erik M. Bakland* and Thomas P. Wilson, Department of Biology, Geology, and Environmental Science, University of Tennessee at Chattanooga, 615 McCallie Ave., Chattanooga, TN 37403.

In light of the current global biodiversity crisis facing amphibians, studies investigating the pathogenic fungus Batrachochytrium dendrobatidis (Bd) are a foremost priority as the fungus is responsible for extirpation and extinction events around the world. The data presented here are some preliminary results from an ongoing project that evaluates Bd infection prevalence and severity in American Bullfrogs (Lithobates catesbeianus) and Green Frogs (Lithobates clamitans) at natural wetlands as compared to urban retention ponds across East Tennessee. In addition to evaluating the role of factors such as habitat type, average rainfall, average air temperature, and canopy cover on infection prevalence and severity, this study also seeks to further characterize potential interspecific differences in infection rates between these two ecologically very similar species. The preliminary results presented here are derived from data collected at two natural wetlands in Southeast Tennessee.

Paul-Erik Bakland is an Environmental Science graduate student at the University of Tennessee at Chattanooga. He is studying effects of habitat and environmental variables on chytrid infection prevalence and severity in frogs of East Tennessee.

A five-year study was conducted to characterize the aquatic turtle community within an urban park in Dalton, Georgia prior to a pending habitat restoration. Hoop traps were used to collect turtles from Threadmill Lake, a ~1.01 ha subdivided lake, and an adjoining ~0.70 ha wetland. Sampling was conducted during two-week periods in June 2012, July 2013, June 2014, June 2015, and July 2016. Morphometric data were recorded, and sex was determined for adults. Each turtle was uniquely marked and released immediately after processing. A total of 892 turtles were captured representing four families and six species. Catch per unit effort ranged from 0.86 turtles/trap/day (2015) to 2.39 turtles/trap/day (2016). Population estimates for the five most abundant species were as follows: *Sternotherus odoratus* (846 ± 95), *Trachemys scripta* (413 ± 51), *Chelydra serpentina* (395 ± 64), *Pseudemys concinna* (384 ± 65), *Chrysemys picta* (140 ± 28). These “before” data will be useful in assessing effects of upcoming stabilization and revegetation of the shoreline on the turtle community.


A one year study was conducted to characterize the amphibian community within an urban park in Dalton, Georgia prior to a pending habitat restoration. Plans for restoration include enhancement of riparian vegetation and removal of invasive plant species. There were 3 drift fences with 4 pitfall traps per fence, 8 cover boards and 6 PVC tubes that were used to collect amphibians from the 1.5 acre wetland adjoining a 2.5 acre subdivided lake. The wetland is adjacent to an upland area of mixed deciduous forest. Sampling was conducted during April 2016 - May 2016 and October 2016 - December 2016. Measurements consisted of snout to vent length, snout to tail length when applicable, and mass. A total of 57 amphibians were captured representing 4 species. *Hyla cinerea*, *Rana clamitans*, and *Plethodon glutinosus* were captured during both spring and fall/winter trapping periods. *Lithobates catesbeianus* were only captured during the spring trapping period though a few were sighted during the fall/winter trapping period. Higher abundances were found in the fall/winter period (45) in comparison to the spring period (12). *Hyla cinerea* was the most abundant species collected in the fall/winter period while *Lithobates catesbeianus* was the most abundant collected in the spring.

Tegan Hendricks and Daley Harrison are Dalton State College students majoring in biology.

**THE MDMR COASTAL PRESERVES PROGRAM’S COMBINED CAMERA AND SCAT ANALYSIS TO DETERMINE IMPACTS OF FERAL HOGS IN HANCOCK COUNTY MARSHES.** Jennifer W Frey*, Coastal Resource Management Specialist, Mississippi Department of Marine Resources, Coastal Preserves Program, 1141 Bayview Ave. Biloxi MS 39530, USA. Janet Wright PhD, Department of Parasitology, Gulf Coast Research Laboratory, University of Southern Mississippi, 703 East Beach Drive, Ocean Springs, MS 39564. Nick Winstead, State Ornithologist, Mississippi Museum of Natural Science, Mississippi Department of Wildlife Fisheries and Parks, 2148 Riverside Drive, Jackson, MS 39202.

The Mississippi Department of Marine Resources Coastal Preserves Program is charged with protecting natural resources, preserving, restoring and enhancing native species and habitats. The Ladner tract is part of the Hancock County marsh system which is the second largest Coastal Preserve. Since 2015, we have been conducting herpetological surveys on three coastal preserves and the Ladner location has the highest species diversity of those preserves. It also has an unknown size but estimated to be large wild hog population. During the trapping period of December 2016 through January 2017 we found scat with bones protruding on the trail to the trapline and a corresponding decrease in trapping success. This lead us to hypothesize that hogs are potentially eating many of the species normally trapped. We proposed using trail cameras to monitor hog occurrence during and after trapping. We deployed cameras for two months during the last trapping season. Hog scat presence was recorded and six scats were sorted for bones. Trapping success and species accumulation curves were completed. We encountered two main predators on the cameras: feral hog, *Sus scrofa*, and bobcat, *Lynx rufus*, as well as humans and hunting dogs. Cameras were left for an additional month after trapping ended to see if hog occurrence increased after human presence decreased. Identification of bones recovered from hog scat showed nutria, *Myocastor coypus*, and a bird species had been consumed. This spring we will deploy cameras a month before trapping and after. Any encountered scat will be collected, sorted, and identified.

Spotted Turtles (*Clemmys guttata*) range from the southeastern Coastal Plain of Florida to the Great Lakes region. Despite this large range, Spotted Turtles are currently a candidate for listing under the ESA and are poorly-studied in the southern portion of their range. We monitored Spotted Turtle populations at two sites in southeastern Georgia from 2014–2016. We captured turtles using a combination of visual encounter surveys and specially designed turtle traps, marking all captured turtles with a unique shell notch. Over the 3-year sampling period, we captured and marked 55 Spotted Turtles at site 1 and 27 Spotted Turtles at site 2. Population size estimates for 2016 varied substantially between sites, reflecting the number of marked turtles (Site 1: 49.9 ± 3.1; Site 2: 27.4 ± 5.1). Adult turtles were sexually dimorphic; females were heavier (F: 157.6 ± 3.9 g; M: 143.0 ± 3.0 g) and had deeper shells (F: 36.9 ± 0.3 mm; M: 33.3 ± 0.5 mm) when compared to males. In 2016, we attached radio transmitters to 29 turtles and tracked turtles for approximately nine months. We calculated individual home ranges using kernel density estimation. Mean home range size across both sites was 6.3 ± 1.0 ha (range: 0.9–22.5 ha). Our results indicated that these two Georgia populations of Spotted Turtle are relatively small, with most individuals occupying a small home range. Additional research is needed to understand what habitats Spotted Turtles depend on in Georgia and to identify populations of conservation importance.

Houston C. Chandler is the species coordinator for the Orianne Society’s Longleaf Savannas Initiative, focusing on the conservation and management of imperiled reptiles and amphibians in longleaf pine ecosystems. He co-leads various research projects designed to inform management decisions for several species, including Spotted Turtles and Eastern Indigo Snakes.

SPATIAL ANALYSIS OF PREVALENCE OF CHYTRID FUNGUS IN AN AMPHIBIAN ASSEMBLAGE IN TENNESSEE. Cameron J. Brocco*, The University of Tennessee at Chattanooga, 615 McCallie Ave, Chattanooga, TN 37403, Dr. Thomas P. Wilson, The University of Tennessee at Chattanooga, 615 McCallie Ave, Chattanooga, TN 37403.

Chytridiomycosis is an infectious, fungal disease in amphibians caused by the highly virulent, zoosporic, pathogenic, single-celled fungus *Batrachochytrium dendrobatidis* (*Bd*). It is known to cause epidermal hyperplasia, hyperkeratosis, skin ulcerations, and fatalities by asystolic cardiac arrest either from shifts in electrolytes or increased acidity in the blood plasma. Previous research has demonstrated that urban water bodies have a higher prevalence of chytrid fungus than rural water bodies. Researchers have also found that chytrid is more prevalent in open canopy habitats than closed canopy habitats. Furthermore, it is implicated in global population declines and local extinctions in which one-third of extant amphibian species are currently threatened with extinction. This indicates that there is a need for further research into the prevalence of *Bd* and the environmental conditions in which it thrives. We sampled amphibians from four urban and four rural watercourses situated in Middle Tennessee. All captured amphibians were swabbed for the presence of Bd. Canopy structure readings were taken using a densitometer. We expect the data to indicate a positive relationship between canopy cover and prevalence of chytrid and a positive association between urbanization and prevalence of chytrid. DNA was extracted using Qiagen DNeasy kits, and all samples will be run in triplicate using an agarose and TBE gel electrophoresis. This project will elucidate the prevalence of *Bd* in Middle Tennessee, which will aid wildlife and land managers in making decisions that will protect and conserve amphibians in this region from the foremost threat to amphibian diversity and overall health.

Cameron Brocco is an undergraduate researcher in the Herpetology Lab run by Dr. Thomas P. Wilson at the University of Tennessee at Chattanooga. He examines the prevalence of the amphibian fungal disease Chytridiomycosis caused by the zoosporic fungus *Batrachochytrium dendrobatidis*.
USING A STAGE-STRUCTURED POPULATION MODEL TO ASSESS THE STATUS OF NORTH CAROLINA BOG TURTLES. Annalee M. Tutterow¹, Department of Biology, Davidson College, Davidson NC 28035, Gabrielle J. Graeter², North Carolina Wildlife Resources Commission, Raleigh NC 27699, Shannon E. Pittman, Department of Biology, Davidson College, Davidson NC 28035.

The bog turtle is a federally threatened wetland-associated species, and North Carolina contains the majority of the species’ geographic range in the southeastern United States. Thus, the demographic status of NC bog turtle populations is important for understanding the viability of bog turtle populations in the south. We used a stage-based population projection model to examine the effects of estimated annual survival rates on bog turtle population dynamics and evaluate the efficacy of certain management strategies (e.g., nest protection) in improving population growth. We investigated three different demographic models based on adult and juvenile survival estimates from three different populations. We conducted elasticity analyses to determine the life stage proportionally contributing most to population growth and used the program VORTEX to conduct a population viability analysis. By assessing the demographic status of NC bog turtle populations, our study will inform management plans focused on maintaining stable bog turtle populations and improving population viability.

GROWTH AND SURVIVAL OF HEAD-STARTED ALLIGATOR SNAPPPING TURTLES (MACROCHELYS TEMMINCKII) IN NORTHEASTERN LOUISIANA. Nathan P. Schwartz* and John L. Carr, University of Louisiana at Monroe, Department of Biology, 700 University Avenue, Monroe, LA 71209.

Throughout the southern United States, large adult M. temminckii have historically been hunted at levels that have led to threatened populations. One method to address population decline is a head-start program. However, some problems with head-started animals may occur such as disease, reduced growth, emigration, and death, so a crucial aspect is to examine how successful individuals are when compared to wild animals. To evaluate the M. temminckii head-start program, we examined growth measurements and survival. M. temminckii were raised at Tishomingo National Fish Hatchery until two-, three-, and four-years old then 10 two-, 5 three-, and 5 four-year olds were released at two field sites for three consecutive summers starting in 2014. Both field sites are oxbow lakes in different stages of succession located at Boeuf Wildlife Management Area in northeastern Louisiana. One site is a closed canopy swamp while the other is an open canopy lake. Growth measurements of plastron length, carapace length, weight, bridge length, and head width were collected on all 120 individuals before release and 61 individuals several months after release. Using ANOVA procedures in SAS, we found significant positive relationships between growth rate by year released (P = < 0.001, R² = 0.52) and by year hatched (P = < 0.001, R² = 0.42), but no relationship by age at release. Therefore, as the study progressed and as hatched year progressed concomitantly, the growth rate increased. Survivorship was 72% (four months), 52% (six months), and 6% (one year).

Nathan Schwartz is a M.S. student at the University of Louisiana at Monroe under Dr. John Carr. He graduated with a B.S. in Environmental Science from Berry College. He strives through research to sustain and foster imperiled herpetological species.

FACTORS AFFECTING THE DISPERSAL AND SETTLEMENT DECISIONS OF JUVENILE SPOTTED SALAMANDERS, AMBYSTOMA MACULATUM. Kathryn M. Greene*, Shannon E. Pittman, and Meagan E. Thomas, Department of Biology, Davidson College, Davidson NC 28035.

Spotted salamanders (Ambystoma maculatum) are pond-breeding amphibians that disperse into terrestrial habitat from natal wetlands after undergoing metamorphosis, relying on small-mammal burrows and coarse woody debris for refugia. Traversing through novel habitats dispose recently metamorphosed salamanders to risks that include density effects and predation. Salamanders may mitigate these risks via movement decisions, but movement strategies that reduce density effects may not be the optimal strategies for reducing predation pressure. A recent study indicated that juvenile salamanders may show conspecific attraction and/or trailing behavior during the dispersal phase. While conspecific attraction would increase the risk of predation pressure through the dilution effect. To explore
this concept, we used powder tracking and visual surveys to measure anuran movements and distribution around the edge of salamander breeding ponds in night field surveys and used those data to parameterize individual-based simulation models to explore how trailing behavior and the resulting high densities of salamanders impact predation risks. We found that trailing behavior decreased the risk of predation, but only under certain assumptions about predator dispersion and behavior. These results suggest that behavioral trade-offs may be important drivers of salamander movement patterns.

EXTERNAL PARASITES INFLUENCE LOCOMOTOR PERFORMANCE OF MALE EASTERN FENCE LIZARDS (SCELOPORUS UNDULATUS). K.H. Wild, B. Bedal, and C.M. Gienger, Center of Excellence for Field Biology, Department of Biology, Austin Peay State University, Clarksville, TN, 37044.

External parasites are common on wildlife and humans that inhabit forested areas. These ectoparasites may have a variable impact on the host species, from minimal effects to negative effects, that can alter the hosts physiology and potentially lead to influencing its overall health. Our objective is to quantify the effect of parasites (Dermacentor variabilis, American Dog tick and Amblyomma americanum, Lone Star tick) on male S. undulatus locomotor performance, a trait that is linked to health of an individual and ultimately important for survival. Sceloporus undulatus is relatively common throughout the eastern U.S., and parasite load varies considerably among populations. We compared locomotor performance of lizards with attached ticks to lizards without ticks. We measured locomotor performance in two ways: maximum sprint speed and 2-meter run speed. Lizards with ticks had significantly lower maximum sprint speed and 2-meter run speed in comparison to lizards where ticks were absent.

TERRESTRIAL SALAMANDER RESPONSE TO PRESCRIBED BURNS AND WILDFIRES IN THE CENTRAL APPALACHIANS. Carl D. Jacobsen*, Thomas M. Schulerb, Donald J. Browna a. School of Natural Resources, 322 Percival Hall, Morgantown, WV 26505. b. Northern Research Station, US Forest Service, 459 Nursery Bottom Road, Parsons, WV 26287.

Prescribed fires are used by land managers across the Appalachians to prevent succession from mixed-oak and pine dominated forests to hardwood dominated forests. Understanding wildlife community responses to fire is important for promoting greater biodiversity at a landscape scale; however, little is known about the long-term impacts of fire on terrestrial salamander populations, despite their ecological importance in this region. Prescribed fires alter the microhabitat characteristics of a forest, raising potential concerns for amphibians which require moist environments. I will use a chronosequence and paired sampling approach to examine the influence of fire history on salamander abundance and occupancy on the George Washington National Forest in western Virginia and east West Virginia. This study is a community-level analysis with a focus on Cow Knob salamanders (Plethodon punctatus), which is considered a species of special concern by the Virginia Department of Game and Inland Fisheries and the West Virginia Division of Natural Resources. Cow Knob salamander abundance will be measured using visual encounter surveys (VES) and salamander communities will be quantified using coverboard surveys and daytime cover object searches. Species-specific responses will be analyzed using Occupancy or N-mixture models, while community level salamander-habitat responses will be analyzed using Redundancy Analysis (RDA) or Canonical Correspondence Analysis (CCA). This study will provide quantitatively-based recommendations for land managers to balance maintenance of vegetation communities with salamander communities.

Carl D. Jacobsen is a M.S. student and graduate research assistant for the Wildlife and Fisheries Resources program at the School of Natural Resources at West Virginia University. He is examining the response of terrestrial salamanders to prescribed burns.
STATUS AND DISTRIBUTION OF THE GOPHER FROG IN FLORIDA. Kevin M. Enge*, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, Anna L. Farmer, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, Jonathan D. Mays, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, Thomas J. Devitt, 2833 Pearl Street, Austin, TX 78705, Stacey L. Lance, University of Georgia, Savanna River Ecology Laboratory, PO Drawer E, Aiken, SC 29802, Traci D. Castellón, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601.

The gopher frog, *Rana* (=*Lithobates*) *capito*, was delisted in Florida in 2016 following a biological status review. Surveys conducted 2006–2016 documented 363 breeding ponds in 34 counties. Dipnet surveys found tadpoles in 330 unique ponds, 75.5% of which were previously unknown. Tadpoles were found in every month but most frequently November–February. Call surveys found 38 new ponds, and incidental observations found four new ponds and the first records from Flagler and Madison counties. Populations are presumably extant on 80 conservation lands, where 388 breeding ponds have been identified. However, only one extant breeding pond was documented in the panhandle outside of Apalachicola National Forest and Eglin Air Force Base. Gopher frogs have been recorded from 55 of 67 counties historically, and we suspect populations are still extant in at least 43 counties based upon suitable upland and wetland habitats. Known breeding ponds (N = 396) have a mean size of 1.9 ± 4.1 ha (SD) (range 0.01–42.3 ha) and a median size of 0.7 ha; 60% are depression marshes. Sandhill is the predominant landcover type within a 300-m radius of breeding ponds, particularly in the panhandle. Sixteen percent of 288 breeding ponds contained at least one nonpredatory fish species. We genotyped across 10 microsatellite loci 1,191 samples from 64 ponds on 27 properties. Genetic diversity was high, with the within-population component contributing 82%. Distinct genetic clusters in the panhandle and peninsula are separated by the Aucilla River and correspond to the Coastal Plain and peninsular Florida lineages identified previously using mtDNA.

Kevin M. Enge began working for the Florida Fish and Wildlife Conservation Commission in 1989 after receiving his M.S. degree in Wildlife Ecology from the University of Florida. He is an Associate Research Scientist in the Reptile and Amphibian Subsection of the Wildlife Research Section. He has primarily conducted surveys for both native and non-native herpetofaunal species throughout Florida. He is collaborating on a book on Florida herpetofauna that will be published in 2018.

USE OF PRESCRIBED FIRE TO INCREASE DETECTABILITY OF GOPHER TORTOISE BURROWS PRIOR TO RELOCATION. Lance Paden, Odum School of Ecology, University of Georgia, Athens, GA 30602, Kimberly M. Andrews, Odum School of Ecology, University of Georgia, Athens, GA 30602, and Georgia Sea Turtle Center, Jekyll Island State Park Authority, Jekyll Island, GA 31527, Carmen Candal*, Georgia Sea Turtle Center, Jekyll Island State Park Authority, Jekyll Island, GA 31527, and James F. Renner, Southern Ionics Minerals LLC, 116 Hamilton St., Saint Simons Island, GA 31522

The relocation of gopher tortoise (*Gopherus polyphemus*) populations has become a commonly used mitigation strategy where their presence conflicts with industrial, agricultural, commercial, or residential development needs. In order to strive for a “no tortoise left behind” policy, we seek survey approaches that increase our detectability of covert, hidden burrows, especially those of juveniles in dense vegetation. Additionally, moving a more fully intact community would presumably reduce the impacts to important tortoise social networks, and hopefully, increase the likelihood of re-establishment and reduce the overall stress of relocation on individuals. In 2016, we conducted a large translocation of over 100 tortoises from approximately 16 hectares of sandhill forest habitat. Initial surveys revealed a high density of hatchling and juvenile tortoises. We conducted a prescribed burn to clear out dense herbaceous groundcover that small tortoises use to help hide their burrows and therefore increase burrow detectability. Here, we present pre- and post-burn survey results of both tortoise and armadillo burrows. Fire proved to be an excellent tool to increase survey efficiency and accuracy, resulting in a more effective extraction and translocation of animals. Approximately 22% of all gopher tortoise and armadillo burrows in the impact area were detected post-burn, indicating that many burrows would not have been detected solely using pre-burn surveys. Proper detection of burrows is also crucial to detecting priority commensal species, such as
eastern indigo snakes, Florida pine snakes, and gopher frogs, which may also rely on tortoise and armadillo burrows and are worthy of mitigation action.

_Carmen Candal graduated from the Warnell School of Forestry and Natural Resources at the University of Georgia with a Fisheries and Wildlife degree. Her research has included a study of diamondback terrapin nesting and road-crossing behaviors and gopher tortoise relocation and mitigation of human impacts. She joined the Andrews Applied Wildlife Conservation Lab as a field technician in 2016 and will serve an AmeriCorps term with the Georgia Sea Turtle Center as a sea turtle patrol member._


Snake fungal disease is an emerging disease caused by the fungal pathogen, _Ophidiomyces ophiodiicola_. Snake fungal disease appears to be widespread in the eastern U.S., yet large-scale field assessments and an evaluation of field diagnostics are lacking. Using two sampling methods (scale clipping and swabbing) we evaluated the use of clinical signs to predict the presence of _O. ophiodiicola_ across seasons and habitat affiliation (aquatic or terrestrial) of sampled snake species. We collected 639 samples from March 2015 to May 2016 across Kentucky. Of 15 snake species sampled, 14 tested positive for _O. ophidiicola_. We found no significant difference between sampling methods in assessing _O. ophidiicola_. Overall, snakes with clinical signs had a higher probability of testing positive regardless of season or habitat association. However, snakes occupying terrestrial environments had a lower overall probability of testing positive for _O. ophidiicola_ compared to snakes in aquatic environments. Snakes in spring and summer, with clinical signs, had the highest probabilities of testing positive. We also found that some snakes lacking clinical signs tested positive for _O. ophidiicola_, especially individuals captured during the spring. Our study indicates that _O. ophidiicola_ prevalence varies seasonally and that this fungal pathogen occurs on a wide range of both aquatic and terrestrial snake species.

**DISTRIBUTION AND ABUNDANCE OF INTRODUCED SEAL SALAMANDERS (_DESMOGNATHUS MONTICOLA_) IN NORTHWEST ARKANSAS, USA.** Jacquelyn Guzy.

Invasive species are one of the primary threats to global biodiversity and cause substantial economic damage worldwide. Invasive reptiles and amphibians are gaining recognition as an emerging group of harmful species [e.g. Burmese python (_Python m. bivittatus_), brown tree snake (_Boiga irregularis_), cane toad (_Rhinella marina_), and American bullfrog (_Lithobates catesbeianus_)]. In 2003 an introduced population of Seal Salamanders (_Desmognathus monticola_), was found in Northwest Arkansas, in Spavinaw Creek and genetic evidence confirmed an introduction from northern Georgia. Very little is known about the distribution and abundance of this non-native Arkansas population of _D. monticola_, thus, the primary objective of this study was to assess the current distribution and abundance of non-native _D. monticola_ along Spavinaw Creek. To map the distribution of the species, we conducted repeated low intensity visual surveys along the Arkansas extent of Spavinaw Creek to examine occupancy probability relative to river mile and habitat covariates. We also conducted a short-term capture-mark-recapture study to estimate abundance of _D. monticola_ at the original collection site on Spavinaw Creek. We found a clear geographic pattern of _D. monticola_ distribution, with individuals found throughout the upper 10 km of Spavinaw Creek headwaters, at very high densities of up to 14.5 _D. monticola_ per m². Our results reveal that this recent invader is more widely distributed than previously recognized, and this distribution, in conjunction with high densities, suggests that _D. monticola_ could have negative impacts on the ecosystems of Spavinaw Creek and surrounding watersheds in the Ozark highlands.
THE DIET OF THE CUMBERLAND PLATEAU SALAMANDER (*PLETHODON KENTUCKI*) IN AN OLD GROWTH FOREST OF SOUTHEASTERN KENTUCKY. Jacob M. Hutton*, Department of Forestry, University of Kentucky, Lexington, Kentucky 40506. Steven J. Price, Department of Forestry, University of Kentucky, Lexington, Kentucky 40506. Stephen C. Richter, Department of Biological Sciences and Division of Natural Areas, Eastern Kentucky University, Richmond, Kentucky 40475.

Examining the diet of salamanders is important for understanding their effects on invertebrate communities and the interactions among sympatric salamander species. We examined the diet of the Cumberland Plateau Salamander, *Plethodon kentucki* (Mittleman), in an old growth forest in southeastern Kentucky. A total of 763 prey items were recovered from 73 salamanders with an average of 10.75 prey items per stomach. The four most important prey orders were Hymenoptera (ants), Araneae (spiders), Coleoptera (beetles), and Collembola (springtails). Overall, we found a total of 58 different prey types in the stomach contents from 18 invertebrate orders. This study represents one of the few successful uses of non-lethal gastric lavage methods on a large plethodontid salamander and the first description of *P. kentucki* diet identified to family and genus. Future work should examine diet throughout the year, compare prey species composition to sympatric salamanders, and look at local prey abundances and diversity to explore salamander foraging behavior.

THE CONTRIBUTION OF WETLAND SUCCESSION TO DECLINES OF THREATENED AMPHIBIANS IN THE LONGLEAF PINE ECOSYSTEM. Angela K. Burrow* and John Maerz, Warnell School of Forestry and Natural Resources, University of Georgia.

The longleaf pine ecosystem (LLP) was once the dominant vegetation of the Coastal Plain, and embedded within the LLP were numerous isolated wetlands that supported a high proportion of regional biodiversity including many amphibian species. Historically, habitat conversion for agriculture and development was the primary threat to these wetlands, but today remnant isolated wetlands are often overgrown and hydrologically altered due to fire exclusion or incompatible, cool season fire regimes. In the absence of warm season fires when wetlands are dry, shrubs and trees succeed herbaceous plants, which alters wetland productivity via effects on light and detritus quality. In turn, wetland productivity determines larval amphibian performance including survival and size at metamorphosis, which are large determinants of amphibian population growth. Therefore, the objectives of our work are to quantify the effects of hardwood encroachment on the growth, development, and survival of gopher frog (*Lithobates capito*) and ornate chorus frog (*Pseudacris ornata*) tadpoles and metamorphs. Tadpoles will be reared in outdoor aquatic mesocosms containing either leaf litter of an encroaching hardwood or a grass/sedge with and without a shading treatment. Metamorphs will be released into terrestrial field pens in degraded, restored, and working long leaf pine forest uplands and their growth and survival will be tracked. The results of this research will be utilized to inform management and restoration of long leaf pine wetlands.

FIGHTING THE TURTLE EXTINCTION CRISIS WITH STATE LAWS: THE DIAMONDBACK TERRAPIN’S BRIGHT FUTURE. Elise Pautler Bennett*, Center for Biological Diversity, P.O. Box 2155, St. Petersburg, FL 33731.

Turtle populations in the United States are declining in the face of varied threats, and the diamondback terrapin (*Malaclemys terrapin*) is no exception. Terrapins face generalized threats from climate change, sea-level rise, and habitat destruction; as well as acute impacts from unrestrained harvest and crab-pot mortality. These cumulative impacts have caused abrupt, conspicuous declines in terrapin populations, indicating a pressing need for regulatory intervention.

Though state laws may not be well-suited to address certain large scale threats like climate change, they have proven to be excellent tools to curb the localized impacts of overharvest in the absence of federal protection. Virtually every state in the U.S. has adopted a “wildlife trust doctrine” into its state statutes, which endows the state with powers and duties to protect wildlife for the benefit of the people via statutes or administrative rules. Over the last decade, some states within the terrapin’s range have banned its commercial harvest using this power, resulting in a conservation benefit to the species.
Like overharvest, crab-pot mortality is a significant threat with localized effect; however, bycatch reduction devices (BRDs) can significantly reduce the level of terrapin mortalities in crab pots with minimal effect on the number of crabs captured. States can and should implement state regulations requiring BRDs to address the impacts of crab-pot mortality. This poster provides a nationwide survey of existing state laws pertaining to diamondback terrapins, the legal rationale for wildlife laws in every state, and model language for a rule requiring BRDs on crab pots.

Elise Bennett is a Reptile and Amphibian Staff Attorney at the Center for Biological Diversity, where she works to protect rare species in the Southeast. She received her law degree and certificate in Environmental Law from Stetson University College of Law, and her Bachelor of Science in Environmental Science and Policy from the University of South Florida.

MICROHABITAT USE BY THE EASTERN HELLBENDER SALAMANDER (CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS) IN EASTERN TENNESSEE. Jeronimo Gomes Da Silva Neto*, Tennessee State University, Nashville, Tennessee, William B. Sutton, Tennessee State University, Nashville, Tennessee, Michael Freake, Lee University, Cleveland, Tennessee.

The Eastern Hellbender (Cryptobranchus alleganiensis alleganiensis) is a long-lived, fully-aquatic salamander that inhabits cool, well-oxygenated streams and rivers in the eastern United States. Although once abundant, C. a. alleganiensis populations have experienced major declines across the historical range due to habitat degradation, siltation, aquatic contaminants, and infectious diseases. Studies have shown that C. a. alleganiensis are habitat specialists and prefer cool, fast-flowing, well-oxygenated streams and rivers with a substrate composed of medium-large rocks, but few studies have evaluated microhabitat requirements for this species. We evaluated microhabitat use of larvae, juvenile, and adult C. a. alleganiensis at three sites in eastern Tennessee by comparing microsites occupied by C. a. alleganiensis to random sites within the stream. We used Discriminant Function Analysis to evaluate microhabitat use differences among life stages and between occupied and random locations. The collective goal of this project is to identify microhabitat characteristics that are important for long-term C. a. alleganiensis conservation, and to better understand how sedimentation and habitat degradation can impact C. a. alleganiensis populations.

Jeronimo is pursuing his Master’s degree at Tennessee State University, Nashville, Tennessee. He is using distribution modeling techniques and environmental DNA to evaluate the status of the Hellbender salamander within the state of Tennessee.

DEVELOPMENT OF AN eDNA PROTOCOL TO DETECT AND QUANTIFY STREAMSIDE SALAMANDERS (AMBYSTOMA BARBOURI) IN LOW-ORDER STREAMS OF MIDDLE TENNESSEE. Nicole Witzel*, Ali Taheri, and William B. Sutton, Tennessee State University, 3500 John A Merritt Blvd, Nashville, TN 37209.

The Streamside Salamander (Ambystoma barbouri) is an Ambystomatid salamander that occurs in Middle Tennessee where it is geographically isolated. This salamander species is active for a few months during winter and spring months when it emerges to breed in low-order, ephemeral streams. As these animals are cryptic and only surface-active for several months, they can be difficult to detect using traditional survey methods. Surveys that target environmental DNA (eDNA) in the form of sloughed skin, sperm, and eggs provide a potentially effective method for detecting the presence of this species. However, before this method can be used, it is essential to develop species-specific genetic primers that will correctly identify presence and absence of the target species. An initial objective of this study is to identify a primer that is specific to and will successfully amplify only the DNA of A. barbouri without amplifying DNA of congeners. Primers were selected by choosing A. barbouri cytochrome B mitochondrial DNA segments with base pairs that differed from A. texanum, a closely related species. These were used to amplify A. barbouri DNA and tested for specificity among other Ambystomatid congeners in Tennessee. Following initial tests of specificity, we will develop a quantitative PCR approach to evaluate the quantity of environmental DNA in stream water samples. The long-term goal of this study is to
provide a replicable eDNA approach to identify A. barbouri populations in Tennessee. This information will provide a method which can be used to further the knowledge and conservation of the species.

LIFE HISTORY AND DEMOGRAPHY OF THE TWO-LINED SALAMANDERS (EURYCEA CF. AQUATICA) IN THE UPPER TENNESSEE RIVER. Todd W. Pierson, Alexander Miele*, and Benjamin M. Fitzpatrick, Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN, USA.

The two-lined salamander (Eurycea bislineata) species complex is one of the most widely distributed and common groups of plethodontid salamanders in North America, and it shows great variation in habitat across this distribution. Currently, five species are recognized in this group, including E. bislineata, E. junaluska, E. wilderae, E. cirrigera, and E. aquatica. The recognition of the brown-backed salamander (E. aquatica) has been a point of contention in the literature, although convincing genetic, morphological, and ecological data now exists to suggest that it is distinct from the occasionally sympatric E. cirrigera. Where they co-occur in close proximity, E. aquatica is found primarily in headwater springs and spring runs, while E. cirrigera is found along streams. E. aquatica also varies morphologically from cirrigera in head shape and body size. Because the E. bislineata species complex occupies a large geographic extent and broad ecological niche space, it is an interesting model for studying life history variation. For example, dates of egg deposition, patterns of parental care, length of larval period, and the timing of and size at metamorphosis all vary across the distribution of the species. Most studies of life history variation in this group have focused on E. bislineata in the northeastern United States or E. wilderae in the southern Appalachians. Here, we present preliminary life history data from a species of two-lined salamander closely related to Eurycea aquatica in the Upper Tennessee River.

WORKSHOP DESCRIPTIONS

Snake Fungal Disease: An Emerging Wildlife Pathogen Threatening Snake Populations in the Southeast

Ophidiomyces ophiodiicola, the causative agent of snake fungal disease (SFD), is identified as a primary pathogen in several free-ranging snake species, including pigmy rattlesnakes (Sistrurus miliarius barbouri), Eastern massasaugas (Sistrurus catenatus catenatus), timber rattlesnakes (Crotalus horridus), and several colubrids. To date, SFD has been documented in 21 states in more than 15 genera of captive and free-ranging snakes. Cottonmouths (Agkistrodon piscivorus) experimentally inoculated with O. ophiodiicola were observed with clinical signs, molecular, and histopathological evidence consistent with SFD, thus determining causation. The SFD clinical syndrome results in facial swelling and disfiguration, scale discoloration, granulomas, and dysecdysis. Lesions are typically restricted to the epidermis, dermis, hypodermis, and skeletal muscle of the head and cervical region in affected snakes. Currently, there is no reported therapy available for SFD. Wildlife conservation agencies, including the USFWS, are beginning to development prevention and management strategies for this pathogen. The goal of this workshop is to expose participants to the history of SFD; the known epidemiology, ecology, and pathology of the pathogen; possible threats to North American species; and management strategies for this disease. After the workshop, we will discuss opportunities for collaborative research in the southeastern United States.

Organizers: Drs. Jennifer Ballard (U.S. Fish and Wildlife Service) and Matthew Allender (University of Illinois)
**Bsal is not Bs — an emerging pathogen threatening global salamander diversity!**

*Batrachochytrium salamandrivorans* (*Bsal*) is a recently discovered fungal pathogen that is emerging in northern Europe. The pathogen causes ulcerative skin lesions that compromise the function of the epidermis and can lead to death in only a few weeks following exposure. Initial studies suggest that salamanders are particularly susceptible, especially those in the family Salamandridae. The goal of this workshop is to expose participants to the history of *Bsal* chytridiomycosis die-offs, the known ecology and pathology of the pathogen, and the possible threats to North American species. Past and current activities of the National *Bsal* Task Force and Southern Appalachian *Bsal* Working Group will be discussed. After the workshop, we will discuss opportunities for collaborative research in the southeastern United States.

**Organizers:** Drs. Matthew Gray (University of Tennessee), Debra Miller (University of Tennessee), Jennifer Ballard (U.S. Fish and Wildlife Service), and Caleb Hickman (Eastern Band of the Cherokee Indians)

---

**Introduction to Herp Education**

This workshop is an introduction to herpetofaunal environmental education. Some topics we will cover in this workshop include:

- What environmental education is
- Formal and non-formal herp education
- How to use animals safely while educating
- Venues for herp education
- Audience considerations
- Classroom/group management strategies
- Resources and considerations for different types of herp education (tabling, classroom, interpretation, citizen science, etc.)
- Demonstrations of group herp education activities

Participants will leave this workshop with education resources, knowledge, and confidence to perform herp education at a variety of venues.

**Organizers:** Andrea Drayer (University of Kentucky) and Kirsten Hecht (University of Florida)