# Nightwing News

The Newsletter of the Southeastern Bat Diversity Network

Volume 107, Number 1 Spring 2017


## PRESIDENT'S ADDRESS

Katrina Morris

Letter from President

I began my term as SBDN President during the annual meeting this year in Asheville, North Carolina. If you missed this year's very successful meeting, you'll find information about it in this issue. It is certainly hard to imagine that I am capable of leading a group of such talented individuals representing so many agencies and organizations across the southeast. I take this task very seriously and hope that I can in some way contribute something new and valuable to this incredible organization. If you have suggestions for how we can more forward and improve, I welcome them. I invite you to give me a call if you have something you would like to discuss or something that concerns you. I can't promise I'll be in the office waiting for the phone to ring, but I'll do my best to get back to you as soon as I can.

During the meeting we took some time to recognize the exceptional service to two individuals who were leaving the SBDN Executive Committee. Dr. Tim Carter and Dr. Joy O'Keefe both dedicated a significant amount of time to this organization over many years. Their contributions helped move this organization forward and set an example for other working groups across the country. Piper Roby also finished her term as Secretary this year and I would like to sincerely thank her for her service to the organization. It has been a pleasure working with so many incredible people and I look forward to continuing this important work for the next four years.

It's hard to believe that two years of my six year term with the board has already passed. Where does the time go? We didn't have much of a winter in Georgia again this year and spring temperatures are quickly rising toward summer heat. I'm starting to get more phone calls about bats taking up residence in interesting places including expected ones like attics and barns and more unexpected ones like picnic umbrellas and light fixtures. It's sometimes hard to make time to address these nuisance issues while also providing some education about bats to the general public. But we have to make time for education. This is probably our most critical mission, especially in the face of white-nose syndrome.

White-nose syndrome continued to spread across the country this winter and into Texas, arguably the state most known for its bats. If there is one positive thing that has come out of this devastating disease it is an increased awareness about bats. When I first began working with bats the majority of calls started with a frightened individual desperate to kill the pests that were plaguing them. I rarely get calls like this anymore. More often I hear from concerned citizens that are trying to safely remove bats from their home and want to provide an alternative roost structure for the colony. I'm not naïve enough to think that many bats aren't still being harmed by unknowing or uncaring individuals, but this is still a big change. And it's partly because of our efforts to educate the public about the importance of bats.

For most of us, education is not our main mission. But it should be part of every biologist's job. It doesn't have to involve a big festival such as the upcoming **Missouri Bat Festival**, the **Great Lakes Bat Festival**, the **Indiana Bat Festival** or the **Austin Bat Fest.** These incredible events are helping to increase awareness and concern for bats across the country but not all of us have the resources or the time to organize one. Education does take time and it takes time to see the results. But we are making progress. Back in 1996 when SBDN was founded, bats mostly resided in myth and mystery for the average person. Today when you search for articles about bats, you'll find information about **WNS**, impacts of **wind energy** on bats and how bat's might help fight **Zika** ahead of information about how to get rid of bats and bats as reservoirs for disease.

These changes are partly due to the work that SBDN members do every day. It might be giving presentations to local schools, clubs and service groups or taking a few extra minutes to provide information to someone who is calling with concerns about bats on their property. Whatever it is we have to continue and improve these efforts even though it takes time, something none of us have much of to spare. If you have ideas for how we can work on improving bat education efforts as an organization, please let us know. And keep up the good work you're already doing.

Here's hoping you all have a great spring and productive summer with lots of time outdoors. Thank you for being part of this great organization.

Trina

706-557-3220

### In This Issue

# Executive Committee Meeting

**Southeastern Bat Diversity Network**
**Executive Committee**
**Minutes of the Mid-Year Board Meeting**
**February 16, 2017**

**Attendees**
**Executive Committee**
Brian Carver, President/Incoming Past President
Tim Carter, Treasurer
Piper Roby, Secretary
Katherine Caldwell, Incoming Secretary
Luke Dodd, Member at Large/Incoming Treasurer
Pete Pattavina, Incoming Member at Large
Trina Morris, President Elect/Incoming President
Joy O'Keefe, Past President
Steve Samoray, Incoming President Elect

**Action Items**

AI1: Carter write up proposal outlining use of SBDN funds to help with 2017 Bat Blitz and send to Executive Committee for a vote.
AI2: Carter work with Carver to update the meeting host package, e.g., include participant and host questionnaire, appendix of non-bat mammal contacts, need poster boards for poster session, extension cords, etc.
AI3: Carver provide Samoray with meeting and bat blitz host packages to put on website.
AI4: Carter create a guide for students on how to get reimbursed for travel expenses if they win the travel award.
AI5: Carver send emails to state agency biologists to solicit summaries from their states for the Nightwing Newsletter.
AI6: Pattavina give updated list of state contacts to Carver.
AI7: Carver create ad hoc bat poster committee.

Call to Order: 8:08AM EST, President Carver

**General Discussion**

**Discussion about next year's joint meeting, led by Rick Reynolds – VA Fish and Game**
Next year's annual meeting will include SBDN, NEBWG, and MWBWG, taking place in Roanoke, VA from 26 – 30 March 2018 (Tuesday – Thursday). The location is near downtown, has an airport shuttle, and is close to food and other options. There is a local pub within walking distance where the social may happen. There is one big room with dividers for the meetings. Lots of people are involved in helping to plan the meeting – Pete Pattavina, Trina Morris, Rob Meis, Tim Carter, Emily Davis, Mark Ford, Paul Moosman, Jeff Gruver, Karen Powers. The hotel has an association with Virginia Tech and tried to get free parking, but couldn't work it out. However, the hotel put in for a grant to help cover some expenses and was awarded $2500. NEBWG has offered up $2000, and the host committee would like to ask for $2000 from SBDN. MWBWG is too new to have surplus funds to contribute. Trying to keep registration costs down. There will be committees set up in order to get everything done. There isn't a program topic at the moment but the format will be similar with the Colloquium on the last day. The registration doesn't have to go through the venue so the registration cost will be similar to previous joint meetings. Registration is going through Organization for Bat Conservation (Rob Meis).

**November 2016 Executive Committee meeting action items:**

- Action Items 1 – 3 from last meeting are complete.
- Not done. AI1: Carter write up proposal outlining use of SBDN funds to help with 2017 Bat Blitz and send to EC for a vote.
- Not done. AI2: Carter work with Carver to update the meeting host package, e.g., include participant and host questionnaire, appendix of non-bat mammal contacts, need poster boards for poster session, extension cords, etc.
- Not done. Need to wait until AI2 is complete. AI3: Carver provide Samoray with meeting and bat blitz host packages to put on website.
- Action Items 7 – 8 done.
- Not done but will happen in April. AI4: Carter create a guide for students on how to get reimbursed for travel expenses if they win the travel award.
- Not done. Since it is a Past President duty, change to Carver's responsibility. AI5: Carver send emails to state agency biologists to solicit summaries from their states for the Nightwing Newsletter. AI6: Pattavina give updated list of state contacts to Carver.

- Action Items 11 – 12 done.
- Done. O'Keefe looked into pricing for a Bats of the Eastern US poster. Still have work to do: fundraising, get range maps, photos. Carver contacted wildlife photographer Michael Durham who was very interested in providing photos and said he would give them for free, but Carver wants to pay him something. O'Keefe suggested funding Durham to attend a bat blitz so he can get additional photos. A committee needs to be formed and include members from NEBWG and MWBWG. AI7: Carver create ad hoc bat poster committee.

**New Business:**

Treasurer's Report
The accounting is caught up through January 1, 2017. We spent $600 on the website in the last month to get it where it needs to be. Four state bat working groups use SBDN as a bank. Carter zeroed out all the floating accounts in preparation for the transition to Dodd becoming Treasurer. We have >$30,000 in the surplus account, so we should be able to contribute $2000 to the joint meeting for next year. We don't intend to make money on the meetings, just want to break even and spend the extra on attendees (i.e., food and drinks).

Carter and Dodd won't make the transition until mid-March after this meeting is wrapped up and get the banks sorted out. Carter will remove O'Keefe as the second signature on the account and add Samoray as the second to Dodd.

Carver mentioned that we don't need to keep building surplus funds but need to come up with a minimum to cover catastrophic events, like the cancellation of a meeting. Carter suggested we keep a minimum of $20,000 since we would have to cover 80% of meeting costs, even if the meeting was cancelled.

Caver called for a motion to donate $2000 to the joint meeting for next year. Carter calls for a motion. Morris seconds.
All – aye. None opposed. The motion passes.

COMMITTEES

Awards committee – Dennis Krusac is receiving the Lifetime Achievement Award. David Saugey (previous winner) will present the award.

Bat blitz committee – Morris will discuss at the Business Meeting since Michael Whitby (chair) is not at the meeting

Membership committee – We will hear from Scott Bergeson at the Business Meeting.

Website committee – Samoray: We will use Stripe for online payments through the website and PayPal to conduct transactions at the meeting. We could get a Square for swiping credit cards. We have skated by on free website stuff until now, but now we are paying for it and need to plan for upkeep and changes. Discussion about where money will come from. Dodd will create a designated account for website costs. Agreed that $200/event/year should be enough. Carver called for a motion to designate $200 of Colloquium funds and $200 of Bat Blitz funds each year to this new account. Carter moved this motion. Morris seconded. All – aye. None opposed. The motion passes. A line will be added to the host package for meetings and blitzes so the hosts are award of this charge.

Discussion about the website and the social media responsibilities being combined into the same committee with Samoray passing off website responsibilities eventually since he will be on the board for the next 6 years (President elect, President, Past President). He will continue to be on the website committee for now but will consider resigning those duties in the future. Caldwell indicated that she could assist.

Meeting adjourned at 9:15AM EST.

***BUSINESS MEETING, 3:30PM EST***

There is a changing of the guard this year. At the end of the business meeting, O'Keefe, Carter, and Roby will no longer serve on the Executive Committee. The new EC will be:

Past President – Brian Carver
President – Trina Morris
President Elect – Steve Samoray
Treasurer – Luke Dodd
Secretary – Katherine Caldwell
Member at Large – Pete Pattavina

Treasurer's Report
One of the major services that SBDN offers to the bat community is holding and dispersing money for various functions and groups. Annually our two largest events are the Bat Blitz, and the Annual Meeting and Colloquium.

Currently we have $4,678.46 is in our general operations account. Membership dues remain our primary source of operating income. The largest general expense of this year is having our taxes prepared ($600) and maintaining our website ($258.05).

In 2016 we received $63,822.71 and spent $46,631.64. Most of that is from the 2016 SBDN/Colloquium Meeting and 2016 Bat Blitz. We now serve as a bank for 4 different state bat working groups. As you can see from the amount of money moving through our bank account on behalf of various functions and groups we perform a valuable service to the bat community.

On a final note, I have served as treasurer for SBDN since 2003. It has been an honor and privilege to help our organization grow and become the impressive entity that it is. Thank you to everyone for entrusting me as your treasurer.

Respectfully submitted: 2/12/2017 – By Tim Carter – SBDN Treasurer

Awards Committee – Nikki Castleberry: The student travel award to go to NASBR went to Patrick Moore last year. There will be a call for applications in the spring for this year's travel award. Thanks to everyone who helps judge. Lifetime Achievement Award is going to Dennis Krusac – David Saugey presented. Previous winners:

1996 – Wayne Davis
2003 – Mick Harvey
2009 – Bob Currie
2010 – Troy Best
2011 – David Saugey
2014 – Susan Loeb
2017 – Dennis Krusac

Bat Blitz Committee – Trina Morris: Mike Whitby is the chair of this committee but couldn't be here today. At the blitz last summer at the Talladega National Forest in northern Alabama, there were 100 people and 192 bats of 9 species caught, including Indiana bats, northern long-eared bats, and gray bats. This year's blitz will be at Mammoth Cave National Park from 23-27 July 2017, but the number of participants will be limited. In 2018, Tennessee Wildlife Resources Agency (TWRA) will host the blitz and it will be open to participants like in normal years.

Membership Committee – Scott Bergeson: co-chair with Chris Comer who couldn't be here. There were 155 members in 2015 (joint meeting with Midwest and west) and 92 in 2016 (remote location). There were 241 registrants for this meeting (2017) but will wait for the membership list to be updated when the meeting is wrapped up. There are 734 people on the listserv. Ways to pay dues include 1) during registration, 2) at the meeting, 3) on the website (www.sbdn.org), and 4) mail a check. Ideas for rewarding membership: hats? hugs? In order to increase membership, a survey will be sent to members to ask things like, why do you like being a member, what do you want to see more of, how are we doing as an organization, etc. We have a website (www.sbdn.org), a Facebook page (The Southeastern Bat Diversity Network), and an Instagram account (sbdnbats). If you have any ideas for increasing membership, email Scott at smbergeson@gmail.com.

NABCA Update – Brian Carver: We had breakout sessions last year to determine threats to bats. The committee has been sorting through the data. A publication is planned. The next steps are to decide where to go from here.

Website Committee – Steve Samoray: We cleaned up the website, revamped the look, and integrated meeting and blitz registrations. The new website was working well at first, but then there was a miscommunication between GoDadddy and WordPress and users started getting error messages. Everything has been fixed and we are in a good place now. We hosted the AL bat blitz on our website and it worked out well, so we can continue to do this for other state's blitzes. I did a Google analysis of our website traffic and found that we have had 3,213 users, 12,757 page views over 4,912 visits to the website. The website committee is going to incorporate social media updates. I will stay on through the transition, but looking for someone to chair this committee.

WNS Committee – Pete Pattavina, new chair: We are re-organizing what this committee does. Working on getting local volunteers to monitor sites like culverts for bats. Want to try to increase the money that comes into WNS research. We are asking members on guidance on how to do that. Email Pete if you have suggestions: pete_pattavina@fws.gov

Future meetings – Rick Reynolds is the past president of NEBWG and is hosting the 2018 joint meeting with NEBWG and MWBWG. Details of the meeting outlined in the EC meeting notes.

In 2019, the annual meeting may be in Georgia or Florida. It's best to plan ahead, so never too early to come forward with a bid to host the meeting!

**New Business** – none from the floor.

Brian Carver: we sent out a questionnaire last year about how the meeting went and we'll do again this year.

Trina Morris – SBDN is recognizing Joy O'Keefe and Tim Carter for their years of dedicated service to this organization. Joy has been a board member since 2007 and Tim has been Treasurer since 2003. We are losing a lot by losing them as board members.

Each were presented with a unique, handmade clock created by biologist and artist, Aaron McAlexander.

# Executive Committee Contact Information

**President:**
Trina Morris
Wildlife Biologist
Georgia Department of Natural Resources
Nongame Conservation Section
2065 U.S. Hwy. 278 S.E.
Social Circle, GA 30025-4743
Office: 706-557-3220
Cell: 678-836-5769
Fax: 706-557-3580
katrina.morris@dnr.ga.gov

**President Elect:**
Steve Samoray
Biologist/Project Manager
Copperhead Enviromental Consulting
Paint Lick, KY 40461
(615) 542-1000
Ssamoray@copperheadconsulting.com

**Past President:**
Brian Carver
Assistant Professor of Biology
Tennessee Technological University
Cookeville, TN 38505
(931) 372-3127
bcarver@tntech.edu

**Treasurer:**
Luke Dodd
Assistant Professor
Department of Biological Sciences
Eastern Kentucky University
Memorial #183
Richmond, KY 40475
859-622-2523
luke.dodd@eku.edu

**Secretary:**
Katherine Caldwell
Wildlife Diversity Biologist
Associate Wildlife Biologist®
NC Wildlife Resources Commission
24 Looking Glass Lane
Asheville, NC 28805
828-545-8328
Katherine.caldwell@ncwildlife.org

**Board Member at Large:**
Pete Pattavina
Bat Biologist/Southeast White-nose Syndrome Coordinator
U.S. Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, GA 30606
706-613-9493, ext. 236
pete_pattavina@fws.gov

# Committee Contact Information

**BAT BLITZ COMMITTEE**

| Member | Affiliation | E-Mail |
|---|---|---|
| Michael Whitby (Chair) | University of Nebraska-Lincoln | michael.whitby@gmail.com |
| Leanne Burns | Clemson University | lkburns@clemson.edu |
| Tim Carter | Ball State University | tccarter@bsu.edu |
| Nikki Castleberry | University of Georgia | neotoma@uga.edu |
| Dennis Krusac | US Forest Service | dkrusac@fs.fed.us |
| Bree McMurray | MO DOT | mobatgirl1@yahoo.com |
| Katrina Morris | Georgia DNR | Katrina.morris@dnr.state.ga.us |
| Joy O'Keefe | Indiana State University | joyokeefe@gmail.com |
| Gary Libby | Skybax Ecological Services, LLC | garylibby@windstream.net |
| Jason Robinson | Biological Systems Consultants, Inc | jason@biologicalsystemsconsultants.com |

**AWARDS COMMITTEE**

| | | |
|---|---|---|
| Steven Burnett (Chair) | Clayton College & State University | StephenBurnett@mail.clayton.edu |
| Nikki Castleberry | Georgia Museum of Natural History | neotoma@uga.edu |
| Chris Comer | Stephen F. Austin State University | comerce@sfasu.edu |
| Lisa Gatens | NC Museum of Natural Sciences | lisa.gatens@naturalsciences.org |

**MEMBERSHIP COMMITTEE**

| | | |
|---|---|---|
| Chris Comer (co-chair) | Stephen F. Austin State University | comerce@sfasu.edu |
| Scott Bergeson (co-chair) | Indiana State University | sbergeson@gmail.com |
| Steve Thomas | Mammoth Cave National Park | steve_thomas@nps.gov |
| Blake Sasse | Arkansas Game and Fish Commission | dbsasse@agfc.state.ar.us |

**WHITE-NOSE SYNDROME COMMITTEE**

| | | |
|---|---|---|
| Pete Pattavina (Chair) | U.S. Fish and Wildlife Service | pete_pattavina@fws.gov |
| Katie Gillies | Bat Conservation International | kgillies@batcon.org |
| Katherine Caldwell | NC Wildlife Resources Commission | katherine.caldwell@ncwildlife.org |
| Dottie Brown | Ecological Solutions, Inc. | dottiebrown@ecologicalsolutions.net |
| Caroline Byrne | Biodiversity Research Institute | caroline.bryne@briloon.org |
| Emma Willcox | University of Tennessee | ewillcox@utk.edu |

**BYLAWS COMMITTEE**

| | | |
|---|---|---|
| Nikki Castleberry (Chair) | Georgia Museum of Natural History | neotoma@uga.edu |
| Tim Carter | Ball State University | tccarter@bsu.edu |
| Brian Carver | Tennessee Technological University | bcarver@tntech.edu |

**WEBSITE COMMITTEE**

| | | |
|---|---|---|
| Steve Samoray (Chair) | Copperhead Consulting | ssamoray@copperheadconsulting.com |
| Kristina Hammond | WEST, Inc. | khammond68@yahoo.com |
| Sara Samoray | BDY Environmental | sara.samoray@gmail.com |

# Committee Reports

**WEBSITE COMMITTEE:**

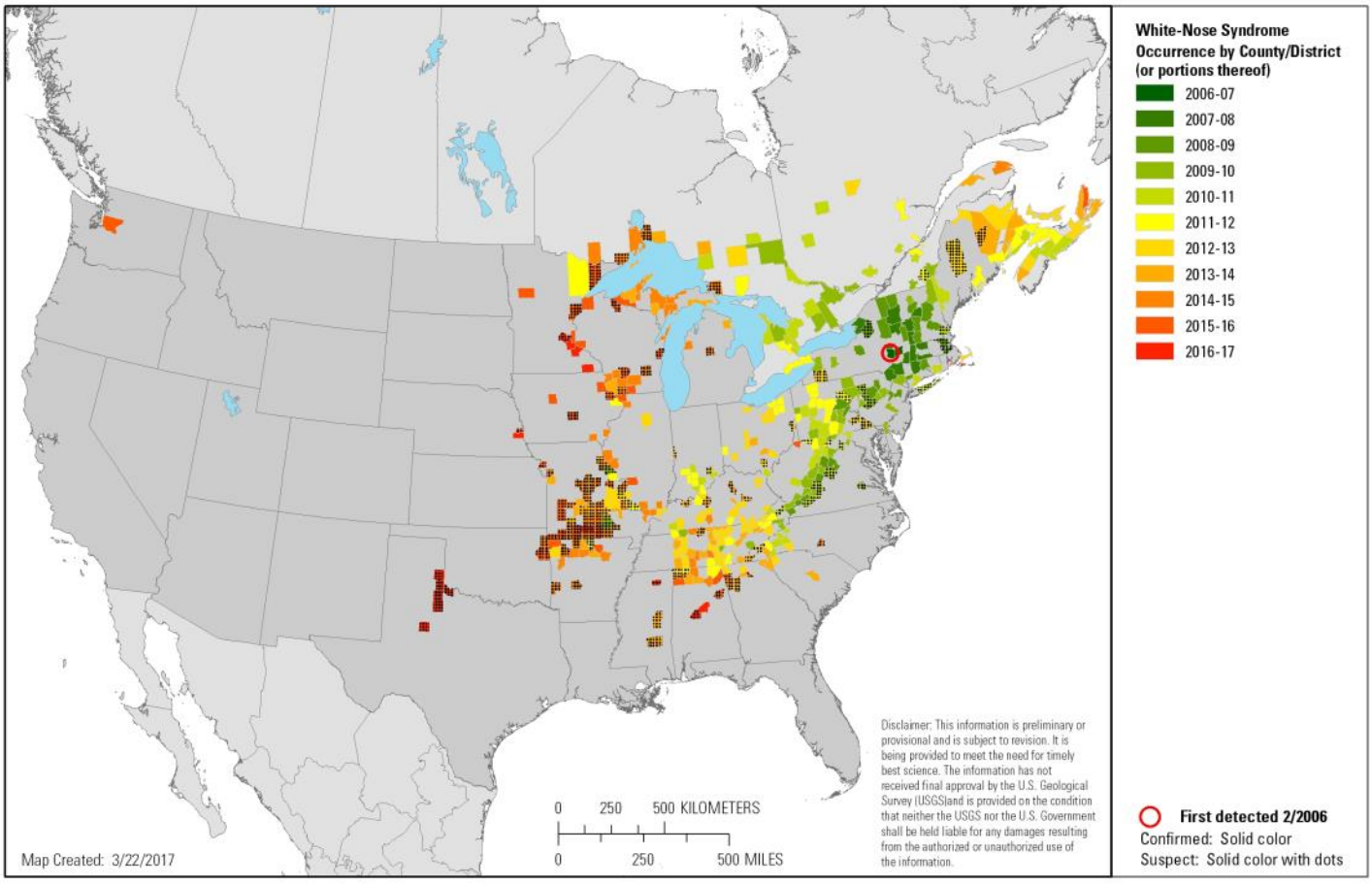
Several updates and changes have been made to the SBDN website since the fall of 2016. Our main improvement is the addition of Swipe to our online payment options. This allows for direct credit card payments on our webpage and should make it easier for state and federal employees to register for events and purchase yearly memberships.

The website committee is seeking new members and a new chair. If you are interested in helping maintain our site please contact Steve Samoray at ssamoray@copperheadconsulting.com

# White-Nose Syndrome Update

**South Carolina:** The fungus that causes white-nose syndrome (Pseudogymnoascus destructans) is now present in three new counties in South Carolina: Greenville, Union and Lancaster. The South Carolina Department of Natural Resources (SCDNR) recently received confirmation from the National Wildlife Health Center that the fungus was present on bats in each of these counties. This doubles the previous number of counties known to have the fungus in South Carolina. Previously known counties Oconee, Pickens and Richland not only harbor the fungus, but signs of WNS have also been seen in bats there.

**Texas:** The fungus that causes white-nose syndrome has been found for the first time in Texas. The fungus has been detected in samples taken from three bat species in six West Texas counties — Childress, Collingsworth, Cottle, Hardeman, King and Scurry. A research team from Texas A&M University and Bat Conservation International report the samples showed fungus present on tri-colored, cave myotis and Townsend's big-eared bats. No cases of the disease were found in those counties. Texas is home to more than 30 bat species which control insect populations and help with crop pollination.




Map depicts the first time WNS is reported suspect or confirmed in a county or district (or portions thereof); each time period in the legend spans a winter bat hibernation period.
Citation: White-nose syndrome occurrence map - by year (2017). Data Last Updated: 3/22/2017. Available at: https://www.whitenosesyndrome.org/resources/map.

# Annual Meeting Summary

**22nd Annual Meeting of the Southeastern Bat Diversity Network**
**&**
**27th Annual Colloquium on the Conservation of Mammals in the Southeastern U.S.**

**February 16-17, 2017**
**Renaissance Asheville Hotel-Marriott**
**Asheville, NC**

# Annual Meeting Summary

**2017–2019**
**Executive Committee**

L to R: Pete Pattavina, Member At-Large; Steve Samoray, President-Elect; Katherine Caldwell, Secretary; Brian Carver, Past President; Trina Morris, President; Luke Dodd, Treasurer

**2015–2017**
**Executive Committee**

L to R: Piper Roby, Secretary; Brian Carver, President; Joy O'Keefe, Past President; Luke Dodd, Member At-Large; Trina Morris, President-Elect; Tim Carter, Treasurer

A great location for the meeting, and we all enjoyed having the tables to hold our coffee mugs and for note taking.

# Annual Meeting Summary

**Meeting Hosts**

L to R: Kristi Alexis, Katerine Caldwell, Tim Carter, and Keifer Titus. Not pictured: MaryKay Clark. Thanks to our hosts and all the volunteers for all of their hard work and organizing; it was a great meeting!


**Thanks for the cool new swag!**

Members from BCI's Bat Squad, Logan and Alexis, started our meeting with an inspiring talk on their important roles in bat research and education.

# Awards and Recognition


## Lifetime Achievement Award

### Dennis Krusac

Congratulations to Dennis Krusac on receiving SBDN's Lifetime Achievement Award for his many years of significant contributions toward bat research.

# Awards and Recognition

**Best Student Poster**

**Summer Higdon**

Proactive Anti-Predator Behavior of White-Tailed Deer (*Odocoileus virginianus*) During Fawning Season

**Best Overall Student Presentation**

**Corrinne Diggins**

Activity Patterns of Squirrels Using Camera Traps

**Best Student Bat Presentation**

**S. Piper Kimpel**

Roost Network of Southeastern *Myotis* in an Old-Growth Bottom-land and Hardwood Forest

# Awards and Recognition

## SBDN SERVICE AWARD

**Purpose:** To recognize outstanding service and contributions to the Southeastern Bat Diversity Network.

**Nomination Procedure**: The SBDN awards committee will call for nominations in September or October of each year through the SBDN mailing list. Nominations will be submitted to the committee by December 1. Nominations can be submitted by any SBDN member, including members of the Executive Committee and the Awards Committee. Nominations will consist of a letter that describes the nominee's service to SBDN. The committee will review the nominations and evaluate them based on significance of the contributions to SBDN. One name will be forwarded to the SBDN Executive Committee for final approval by January 1. If no worthy nominees have been submitted for consideration, no name will be forwarded to the Executive Committee.

**Award Process:** The awardee will be announced at the SBDN annual meeting, usually held in February. A plaque will be presented to the awardee by the previous recipient or the SBDN president. The Awards committee will be responsible for obtaining the plaque and funds will be provided by SBDN. A copy of the nomination letter and pictures of the award presentation will be deposited in the SBDN archive.

## SBDN LIFETIME ACHIEVEMENT AWARD

**Purpose:** To recognize individuals who have made significant contributions to the conservation of southeastern bats through research, education, or management efforts. The intent of this award is to recognize more senior individuals who have amassed a variety of accomplishments throughout their careers. The award is SBDN's highest honor. The award may not be given every year.

**Nomination Procedure:** The SBDN awards committee will call for nominations in September or October of each year through the SBDN mailing list. Nominations can be submitted by any SBDN member, including members of the Executive Committee and the Awards Committee. Nominations will be submitted to the committee by December 1. Nominations will consist of: 1) a letter that describes the nominee's accomplishments and how they have impacted bat conservation in the southeast, and 2) the nominee's Curriculum Vitae. The committee will review the nominations and evaluate them based on the totality of the accomplishments and their impact on bat conservation and/or our understanding of bat ecology. The committee will forward one name to the SBDN Executive Committee for final approval by January 1. If no worthy nominees have been submitted for consideration, no name will be forwarded to the Executive Committee.

**Award Process:** The awardee will be announced at the SBDN annual meeting, usually held in February. A plaque will be presented to the awardee by the previous recipient or the SBDN president. The Awards committee will be responsible for obtaining the plaque and funds will be provided by SBDN. A copy of the nomination letter, the awardees' CV, and pictures of the award presentation will be deposited in the SBDN archive.

## STUDENT TRAVEL AWARD

The Southeastern Bat Diversity Network (SBDN) established an annual Student Travel Award in 2006 to financially assist one student attending the North American Symposium on Bat Research (NASBR). If you are a student enrolled in a university in the Southeastern US and are planning to give an oral or poster presentation at NASBR in 2017 (www.nasbr.org), you are qualified to apply for a student travel award from SBDN. Information on the award and the application process are available at: http://www.sbdn.org/files/SBDN_Student_Award.pdf. **DEADLINE for 2017 applications will be June 1, 2017**. Send applications to Stephen Burnett via email (sburnett@clayton.edu) or snail mail (Stephen Burnett, Department of Natural Sciences, Clayton State University, 2000 Clayton State Blvd, Morrow GA 30260). E-mail submissions are preferred. Contact Stephen Burnett (sburnett@clayton.edu) if you have questions.

# History of Meetings

| Colloquium | SBDN | Year | Location | Host |
|---|---|---|---|---|
| 27th | 22nd | 2017 | Asheville, NC | Tim Carter, MaryKay Clark, Katherine Caldwell |
| 26th | 21st | 2016 | Guntersville, AL | Tennessee Valley Authority |
| 25th | 20th | 2015 | St. Louis, MO | |
| 24th | 19th | 2014 | Nacogdoches, TX | Chris Comer |
| 23rd | 18th | 2013 | Fall Creek Falls, TN | Brian Carver |
| 22nd | 17th | 2012 | Louisville, MS | Darren Miller |
| 21st | 16th | 2011 | Louisville, KY | Tim Carter & Brooke Hines |
| 20th | 15th | 2010 | Asheville, NC | Mary Kay Clark |
| 19th | 14th | 2009 | Jonesboro, AR | Tom Risch & Blake Sasse |
| 18th | 13th | 2008 | Blacksburg, VA | Michael St. Germain |
| 17th | 12th | 2007 | Destin, FL | Jeff Gore |
| 16th | 11th | 2006 | Chattanooga, TN | Tim Carter & Troy Best |
| 15th | 10th | 2005 | Paris Landing, TN | John Nelson |
| 14th | 9th | 2004 | Helen, GA | Steven Castleberry |
| 13th | 8th | 2003 | Mississippi State, MS | Darren Miller |
| 12th | 7th | 2002 | Clemson, SC | Susan Loeb |
| 11th | 6th | 2001 | Memphis, TN | Michael Kennedy |
| 10th | 5th | 2000 | Guntersville, AL | Troy Best |
| 9th | 4th | 1999 | Wytheville, VA | Rick Reynolds |
| 8th | 3rd | 1998 | Hot Springs, AR | David Saugey |
| 7th | 2nd | 1997 | Black Mountain, NC | Mary Kay Clark |
| 6th | 1st | 1996 | Somerset, KY | Mike Lacki |
| 5th | | 1995 | Cookeville, TN | Michael Harvey |
| 4th | | 1994 | Athens, GA | Joshua Laerm |
| 3rd | | 1993 | Mountain View, AR | Gary Heidt & Rick McDaniel |
| 2nd | | 1992 | Guntersville, AL | Troy Best |
| 1st | | 1991 | Memphis, TN | Mike Kennedy |

# Upcoming Events

**SAVE THE DATE:**

## Joint Bat Working Group Meeting

**SBDN, MWBWG, NEBWG**

March 26–30, 2018

Roanoke, Virginia

---

**97th Annual Meeting of the American Society of Mammalogists**

June 20–24, 2017

Hotel UMass - Amherst, MA

---

**24th Annual Conference of the Wildlife Society**

September 23–27, 2017

Albuquerque, NM

---

**47th North American Symposium on Bat Research**

October 18–21, 2017

Knoxville, TN

---

# Closing Comments

**FROM THE EDITOR:**

The Spring Newsletter focuses on the Annual meeting and let me say it was great again this year.
"Thanks: to all the many people that made sure we had another great meeting.

A "Very Special Thank You" to all the out going Executive Committee members,
some who have devoted many years to SBDN to ensure that we have a rock solid group.
"Thank You!!!!"


**See something interesting, take a picture and tell us about it!**

**Be Safe and Try To Have Some Fun Along the Way!**

# 2017 Meeting Abstracts

**CONTRIBUTED ORAL PRESENTATION ABSTRACTS**

*Listed in order of presenter's last name.*

**THERMOREGULATORY FLEXIBILITY OF THE INDIANA BAT IN RESPONSE TO WEATHER VARIATION**

S.M. Bergeson, J.M. O'Keefe, and R.M. Brigham. *Center for Bat Research, Outreach, and Conservation, Indiana State University, Terre Haute, USA* (SMB and JMO)*; Department of Biology, University of Regina, Regina, CAN* (RMB)

Due to increasing temperatures, the Midwestern U.S. is predicted to become climatically unsuitable for the federally endangered Indiana bat (*Myotis sodalis)* by 2030–2050. However, bats may be able to buffer the impacts of climate change via thermoregulation. Our objective was to investigate how flexible Midwestern Indiana bats are in their roost and torpor use in response to varying weather patterns. We tagged 13 adult female and 4 juvenile bats, captured in Central Indiana from 2013–2015, with temperature sensitive transmitters and tracked them back to their roosts. We compared models testing the effects of weather and roost characteristics (38 individual roosts) on daily torpor patterns (104 full temperature days), with reproductive period as a random effect. Based on $AIC_c$ results, weather and roost canopy closure models best explained variation in torpor duration and depth. Torpor duration decreased with increasing air temperature and increased with roost canopy closure; bats used torpor for less time (often remaining normothermic) on hot days and while using solar-exposed roosts. Torpor depth was positively related to air temperature, precipitation, and humidity; bats used deeper torpor on colder, more humid, and stormier days. Additionally, bats greatly reduced the time they spent torpid during an extended period of abnormally high temperatures (> 29.9 C). However, bats also continued to use solar-exposed roosts during this time period, suggesting that they were resilient to high ambient temperatures. These results suggest that Indiana bats are flexible in their response to weather variation. Due to their flexibility, temperate bat species may be more resilient to the negative impacts of climate change and may be able to persist in landscapes that are climatically unsuitable for other endotherms, especially if efforts are made to provide roosts with an array of thermal characteristics.

**BIRTH AND BEHAVIOR IN A COLONY OF BIG BROWN BATS IN WESTERN NORTH CAROLINA**

M.J. Braine* and C.W. Nicolay. *Department of Biology, University of North Carolina Asheville, Asheville NC 28804.*

Owing to the inherent difficulties in observing the behavior of bats, the actual act and process of giving birth has rarely been observed and has received almost no systematic study. This study documents the birthing process and related behaviors in a maternity colony of 50-60 big brown bats (*Eptesicus fuscus*) at a residence in rural western North Carolina. The colony roosted between the outer slats and inner screen of an attic ventilation window, which effectively constrained bats to roosting on a 2-dimensional surface. This enabled non-invasive video recording and facilitated observation of behavior. All births observed (n=34) occurred within the first week of June. The majority of births occurred in the morning, with fewer occurring in the afternoon, and none at night. Females entering labor typically moved apart from the main aggregate of the colony and rotated to hang inverted (by the thumbs) so the pup would be caught in the uropatagium. Strong obvious contractions then preceded expulsion of the pups. Characteristic of vespertillionids, presentation of pups was breech (feet-first), although one head-first delivery was observed. Females regularly licked themselves and occasionally pulled at the pup to facilitate delivery. The duration of the process was variable, but complete parturition typically took between 30-60 minutes. Delivery of the placenta was delayed from the delivery of the pups. Twins occurred in 90% of females, but single births and one instance of triplets were observed. The majority of females in labor showed aggression towards other females. Neutral interactions were also observed, including a few cases where the non-parturient female engaged in possible mid-wife behaviors.

**WINTER ACTIVITY PATTERNS OF BATS ON THE CUMBERLAND PLATEAU IN RELATION TO HABITAT AND ENVIRONMENTAL CONDITIONS**

L.K. Burns, S.C. Loeb, W.C. Bridges Jr., and P.G. Jodice. *Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634 (LKB); USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SCL); College of Engineering and Science, Department of Mathematical Sciences, Clemson University, Clemson, SC 29634 (WCB); US Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit, Clemson University, Clemson, SC 29634 (PGJ)*

As winter is an energetically expensive time for temperate bats, a better understanding of their winter activity can inform conservation strategies in the face of white-nose syndrome and other threats, such as wind energy development. We investigated winter bat activity in Big South Fork National River and Recreation Area in Tennessee and Kentucky by continuously monitoring bat activity with acoustic detectors from December through February 2014-2015 and 2015-2016. We sampled nine sites: three in recently burned (< 2 years) forests, three in unburned forests, and three in fields containing a pond. We obtained nightly meteorological data from a weather station in the park and recorded temperatures at each sampling site every 30 mins with an iButton data logger. Vegetation surveys were conducted to quantify site-specific structural characteristics. We recorded 2,235 bat passes and identified four species/species groups active on the landscape throughout winter. Winter activity was strongly correlated with temperature, as both the number of nights on which bats were active and the level of nightly activity increased with temperature. Little activity was observed when nightly temperatures were ≤ 0°C, but all species/species groups were detected at temperatures < 10°C. While bats were active at all sites, activity was greatest at sites close to ponds, with significantly less activity recorded in forested sites. Greater activity near water may suggest that bats were arousing to drink during the winter months, as gleaning insects—an important cold-temperature foraging strategy—is likely easier in forested areas. Our findings suggest dehydration may influence winter activity in our study area.

**SPATIAL PATTERNS OF URBAN AND RURAL WHITE-TAILED DEER IN SOUTHERN INDIANA**

Timothy C. Carter, Jonathan K. Trudeau, and Garrett B. Clevinger. *Department of Biology, Ball State University, Muncie, IN 47306*

White-tailed deer (*Odocoileus virginianus*) have been extensively researched throughout their distribution and in varying habitat types. Interest in urban populations has been growing due to increasing densities of white-tailed deer in these areas. Though much is known about each population separately, little is known about how these two populations interact with one another. Understanding the differences between urban and rural white-tailed deer space use and movements in adjacent areas is essential to effectively manage the two populations. This study was conducted in Morgan, Monroe, and Brown counties of southern Indiana, with our urban study area being the city of Bloomington, Indiana. Using a drop net, dart projectors, suspended net-gun, and clover traps we captured 41 rural and 45 urban adult white-tailed deer between January and July of 2015/2016. Of the 85 deer collared, 51 had Global Positioning System (GPS) collars and 34 had VHF radio transmitter collars. Locations were collected every 3-6 hours on GPS collars and 2-4 times a week on radio transmitter collars depending on season. We predicted that the urban population would have smaller home ranges than the rural population, but found urban class to have little effect on home range size ($p=0.339$). Males had larger home ranges than females ($p<0.001$), suggesting sex has a larger influence on home range size than urban class. We used occupancy modeling to determine the probability of observing seasonal excursion events given an excursion was made at some point during our sampling period. Results suggest that rural deer were more likely to be observed while on a seasonal excursion than their urban counterparts, however the influence of sex did not seem to affect excursion probability. Comparisons of annual movement characteristics and home range variations will continue as data is collected on these animals until July 2017.

**IMPLICATIONS OF MOBILE TRANSECT INTERPRETATIONS TO BAT MANAGEMENT CONSIDERATIONS**

John D. Chenger and Janet D. Tyburec. *Bat Conservation and Management, Inc., Carlisle, USA; Bat Survey Solutions, LLC, Tucson, USA*

It is widely assumed that mobile acoustic transect surveys offer an efficient snapshot of bat occupancy along a spatiotemporal continuum in a study area. Like any acoustic project, mobile surveys can be compromised by assumptions which fail to address the very real biases caused by (1) the variability of recording hardware used, (2) biases introduced by either the surveyor or the selected route, (3) inappropriate recording settings or deployment considerations, (4) temporal variation in bat activity, (5) effects of weather conditions on recording quality, (6) post-processing protocols, and (7) analysis software limitations. The influence these factors have on mobile datasets and their results range from major to minor, but will be exaggerated due the relatively tiny amount of data that is collected over a very short time, i.e. 20 mile-per-hour surveys lasting only an hour. In practice it has proven to be exceedingly difficult to consistently set up one “perfect” detector with the “perfect” settings relative to the ambient conditions appropriate for a transect survey. Therefore the result of a single detector ends up being considered just one opinion of the bat activity, a snapshot, for the night that was sampled, yet this is rarely acknowledged. The variability of results during a single night, on a single route is richly illustrated when a second recording device, perhaps from a different manufacturer, is added to a planned transect. When simultaneous efforts are combined, these biases become clearer. Moreover, redundant deployments on transects protect against unavoidable (and common) complete failure. Moreover, when two devices more-or-less sort-of agree insofar as species occupancy is concerned, researchers and wildlife managers will have far more confidence in transect results. This presentation illustrates the very real variability in data collected, analyses performed, and conclusions drawn during mobile transects conducted simultaneously with different equipment, settings, and protocols.

**ROOSTING HABITS OF THE EASTERN SMALL-FOOTED BAT IN THE SHAWNEE NATIONAL FOREST, ILLINOIS**

Kristi A. Confortin* and Timothy C. Carter. *Ball State University, Muncie, IN 47306*

The Eastern small-footed bat (*Myotis leibii*) primarily uses upland habitats. Within this habitat the bats use rocky outcrops with loose rocks as roosts. The spread of the bat disease White-Nose Syndrome has made it more crucial to understand the species distribution across the landscape. In 2005 a population of this species was discovered in in Illinois on the Shawnee National Forest. Over the last few years limited research has been done to document the presence and basic roosting habits for this population. Because of its limited distribution and perceived low numbers, the Eastern small-footed bat was added to the Illinois Threatened Species List in spring 2015. To guide future management decisions, the US Forest Service needs a better understanding of the summer roosting ecology and how it might be impacted by those decisions. During the summer of 2015 and 2016 we examined the roosting habits, 21 females and 21 males were fitted with radio transmitters and tracked to their day roosts. Seventy of the 96 roosts were located under loose rocks. Characteristics were recorded for all of these roost rocks. Our research shows bat occupancy will increase with the width of rock, a larger area of dryness under the rock and higher percentage of vegetation around the roost rock. Bat occupancy will decrease when percent area under the rock is covered with debris. Results also show that Eastern small-footed bats use a diversity of roosts beyond loose rocks. This species also made use of rock cervices, cliff bluffs, and man-made structures as their day roosts. The proportion of time each roost was used differed by roost type. We were also able to document the differences in daily travel distances between roost types and genders.

**ACOUSTIC SAMPLING FOR BAT PRESENCE IN URBAN ENVIRONMENTS: APPLICABILITY OF NABAT AND USFWS METHODS**

S. M. Deeley*, A. Silvis, and W.M. Ford. *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (SMD and AS.); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit (WMF)*

The U.S. Fish and Wildlife Service (USFWS) Ecological Services Offices and North American Bat (NABAT) program both have outlined acoustic sampling guidance for presence/absence detection of bat species. However, White-nose Syndrome has drastically reduced the abundance of many bat species throughout eastern North America – a factor that may render current guidelines for sampling intensity and duration inadequate. Our objective was to explore sampling effort requirements to detect presence of extant species on detectability. To understand better these relationships, we sampled 52 urban, suburban and semi-natural areas on National Park Service and Department of Defense lands of the District of Columbia and Maryland over multiple nights in the summer of 2016. We used two acoustic software programs (Kaleidoscope and EchoClass) to identify species presence on each site-night. For each species detected, we used nightly results from each software package as well as the agreement nights (both software packages congruent on presence) to determine average latency to detection in number of days, as well as probability that random sampling at various levels of effort within USFWS and NABAT methods would have detected presence of each species. We found that neither protocol requires an adequate number of sample nights to determine presence of the endangered Indiana (*Myotis sodalis*) and threatened northern long-eared (*Myotis septentrionalis*) bat at each site. Our results strongly suggest need for continued review and assessment of sampling requirements for bat species with rapidly decreasing populations.

**ACTIVITY PATTERNS OF SQUIRRELS USING CAMERA TRAPS**

Corinne A. Diggins*, K. Aylett Lipford, Summer D. Higdon, and W. Mark Ford. *Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University (CAD and KAL); School of Natural Resources, University of Missouri (SDH); Virginia Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey (CAD, WMF)*

Squirrels (Sciuridae) are typically surveyed using traditional techniques, such as live-trapping or nest boxes. Non-traditional techniques, such as camera traps, can be used to determine biological information that may be more difficult to obtain with traditional survey techniques, such as daily activity patterns. We utilized camera trapping to determine activity patterns of one nocturnal (southern flying squirrels, G*laucomys volans*) and two diurnal squirrel species (American red squirrels, *Tamiasciurus hudsonicus*; Eastern chipmunks, *Tamias striatus*). We surveyed for red squirrels in a red spruce (*Picea rubens*) – Fraser fir (*Abies faseri*) at Roan High Bluff, Roan Mountain Highlands, Mitchell County, NC for 8 days during late May-early June 2015. We surveyed for southern flying squirrels and Eastern chipmunks in an upland oak (*Quercus* spp.) and northern hardwood forest for 14 days during July 2015. We used Bushnell 6MP Trophy Trail Camera set 1.5 m up on the bole of a tree. All cameras were baited with a peanut butter suet cake placed in a metal suet basket. We used observations separated by ≥30 min intervals for each species and analyzed data in package 'overlap' in Program R. Chipmunks are strongly crepuscular with activity greater during the afternoon. Red squirrels were active throughout the day, with increased activity during the morning and the hour right before sunset. Southern flying squirrels where most active directly after sunset, with activity decreasing around midnight. Our results demonstrate the potential usefulness of camera traps as a survey technique for squirrels. Furthermore, better understanding activity patterns may inform other survey techniques, such as radio-telemetry survey periods.

**SIZE METRICS AS PREDICTORS OF THE ENERGETIC VALUE OF LEPIDOPTERAN PREY**

S. A. Fulton*, L. E. Dodd, and L. K. Rieske-Kinney. *Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 (SAF and LED); Department of Entomology, University of Kentucky, Lexington, KY 40506 (LKRK)*

Lepidopterans are a core component of the diets of North America's imperiled insectivorous bats. However, the comparative quality of prey items within Lepidoptera is poorly understood. To estimate energetic differences among Lepidoptera of various sizes, the metrics wingspan and total length will be assessed as predictors for nutritive quality given caloric density values for known Lepidoptera. Mean wingspan values from authoritative literature were used, and accuracy was verified by manually measuring subsets of field-collected Lepidoptera. Published total length values were used when possible, and linear regression was used to estimate values for species with no readily available total length data. A species list of Lepidoptera occurring at Mammoth Cave National Park, Kentucky was generated following extensive sampling efforts undertaken from 2011 – 2015. Species were clustered by wingspan and assigned size classes; mean wingspan differs significantly across size classes at all taxonomic levels ($P < 0.05$). Wingspan and total length appear to have a strong positive correlation ($r_s = 0.976$), and total length was selected as the primary explanatory variable to be used in a linear regression predicting the caloric density of the 685 species known to occur at Mammoth Cave National Park. Estimated caloric density values will be applied to spatially- and temporally-tagged lepidopteran abundance data, and paired with bat acoustic data, allowing the relationship between expected nutritive quality and bat activity to be explored. Resulting patterns at the size-class level, as well as at all taxonomic levels, will be assessed in the context of numerous environmental and biological variables, including season, burn frequency, and the arrival of white-nose syndrome at Mammoth Cave National Park.

**REJECTION OF PIT TAGS FROM FLORIDA BONNETED BATS**

J. A. Gore and M. W. Gurley. *Florida Fish and Wildlife Conservation Commission, 3911 Highway 2321, Panama City, FL 32409* (JAG); *Florida Fish and Wildlife Conservation Commission, 298 Sabal Palm Road, Naples, FL 34114* (WMG)

Passive Integrated Transponders, or PIT tags, are frequently used to mark animals for study, but the rate at which PIT tags are rejected by animals has seldom been reported, especially in bats. During a study of roosting behavior, we PIT-tagged Florida bonneted bats (*Eumops floridanus*) in Charlotte County during 9 capture sessions in 2014-2016 using 12 mm, 134.2 kHz tags inserted subcutaneously on the dorsum. We also took wing tissue to collect DNA for genotyping individuals. All bats were captured at bat houses, most of which had automatic PIT tag readers. After unexpectedly finding lost tags, we decided to further assess tag loss in this species. We used a handheld reader to find rejected tags on the ground below bat houses. We also concluded a tag was lost if genotype matching determined a captured bat without a tag was the same individual captured and tagged previously. Over 2 years, we inserted 258 tags into 235 individuals. We retagged 20 animals, including 1 animal that had a total of 3 tags and 1 that received 4 tags. Counting those retagged animals, we detected 32 lost tags or 12.4% of tags inserted. Tag loss did not differ significantly between sexes or age classes ($X^2$, $P>0.05$). We have not yet assessed the effect of exposure time on tag loss, but the automatic reader data and found tags show the range of retention times for lost tags was 1 – 596 days and median retention time was 44 days. Only 1 bat captured without its tag showed evidence that it had been tagged previously. We suspect some tags are lost quickly due to poor insertion and others are more slowly rejected. Our data suggest that researchers using PIT tags should assess tag loss and how it may affect results, particularly estimates of survival or roost fidelity.

**SURVIVAL AND MOVEMENTS OF REHABILITATED BLACK BEAR CUBS RELEASED IN NORTH CAROLINA**

C. A. Gray, G. Albers, and C. Olfenbuttel. *North Carolina Wildlife Resources Commission, NCSU Centennial Campus, 1751 Varsity Drive, Raleigh, NC 27606, USA*

Throughout North America, orphaned black bear cubs are rehabilitated and released back into the wild. Initially released to supplement recovering black bear populations, now cubs are often rehabilitated to fulfill the public's expectation on how this public trust resource should be managed. Historically, rehabilitated cubs were not monitored post-release due to limitations of technology. Consequently, little is known about survivorship rates, mortality factors, movements and whether these bears are more prone to cause nuisance issues. Since 1976, the North Carolina Wildlife Resources Commission (NCWRC) has rehabilitated and released 114 black bear cubs back into the wild. Starting in July 2015, the NCWRC fitted all rehabilitated bears with Vectronics GPS collars (n=12) and released these bears on state managed lands in both the mountain and coastal plain regions of North Carolina. The mean survival rate of rehabilitated cubs in the first 7 months after release was .400 ± 0.2 (SE). Five of eight mortalities were caused by legal hunter harvest. Average daily movements of released bears in 2015 was 2.32 km/day ($n$=4, SE=0.22, range: 1.88–2.93) within the first 4 weeks. During this time period, all 4 bears left the state managed lands where they were released and only one bear returned. The maximum straight-line distance from release site during these 4 weeks was 17.1 km. While results are preliminary, we have no reports of conflict issues with people or property. The geospatial data collected will be used to further

evaluate post-release movements, mortality factors, survivorship, and the influence of environmental factors (e.g., release site) on results. Through collaboration with other researchers, combined with our data, we hope to gain better insight on the fate of rehabilitated bears that will aide in making management decisions based on sound science.

**MODELING THE DISTRIBUTION OF MYOTIS SEPTENTRIONALIS IN NORTH GEORGIA**

John F. Grider, Steven B. Castleberry, and Jeffrey Hepinstall-Cymerman. *Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602-2152*

Mortality from White-nose Syndrome has led to several formerly common species of bats becoming a management priority. Developing conservation strategies for these species is difficult due to limited knowledge regarding their distribution and habitat associations. To address this paucity of knowledge, we are examining the ecology of cave roosting bats during summer. Our objective is to determine the summer distribution and habitat use of *Myotis septentrionalis*, a declining species in northern Georgia, so that land use decisions, such as highway development, can be made that minimize impacts to this species and other bats in the region. We used mist-netting records across north Georgia, from the summer of 2007 through the summer of 2016, to determine species distribution in a pre and post White-nose syndrome environment. Distribution models were constructed using a multi-season site occupancy model, which allows for fluctuations in the area occupied between years. Variables included in model building were land cover, number of forest patches, largest forest patch, perimeter to area ratio of forest patches, total core area of forest, Julian date, and sampling effort. Variables were assessed on two scales, home range scale (65 ha) to potential movement scale (491 ha). Preliminary results for Northern long-eared bat (*Myotis septentrionalis*) suggest deciduous forest and large forest patches, at the home range scale, are the best predictors of occupancy. Refinement and future direction of current distribution models will be discussed.

**INTERACTING EFFECTS OF PRESCRIBED FIRE AND WHITE-NOSE SYNDROME ON BAT ACTIVITY ACROSS THE FOREST LANDSCAPE OF MAMMOTH CAVE NATIONAL PARK**

R. E. Griffitts, L. E. Dodd, M. J. Lacki, N. S. Skowronski, L. K. Rieske, and M. B. Dickinson. *Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 (REG and LED); Department of Forestry, University of Kentucky, Lexington, KY 40546 (MJL); USDA Forest Service, Northern Research Station, Morgantown, WV 26505 (NSS); Department of Entomology, University of Kentucky, Lexington, KY 40546 (LKR); USDA Forest Service, Northeastern Research Station, Delaware, OH 43015 (MBD)*

Bat community composition may be altered due to population level impacts of White-nose Syndrome (WNS). Few studies have researched the combined impacts of prescribed burns and WNS. Bat prey communities are also likely impacted by these variables. Our objective was to determine the effects of WNS and prescribed fire on bat activity and insect abundance across the landscape of Mammoth Cave National Park (MACA). Transects of acoustic detectors (Anabat II) were deployed in burned and unburned areas prior to (2010-2012) and following the detection of WNS (2013-2016) at MACA. Recordings were classified (Bat Call ID v.2.7c) into phonic groups (low, mid, or *Myotis*). Analyses were conducted using recordings consisting of ≥ 5 pulses and a 70% confidence interval for phonic group. Blacklight traps were deployed concurrent with acoustic transects and captured insects were identified to order. Activity of low phonic group increased, mid phonic group decreased, and *Myotis* phonic group decreased following the detection of WNS ($P \leq 0.05$). Low phonic activity was greater in burned areas, mid phonic activity had no response to burns, and the greatest *Myotis* phonic activity shifted from unburned areas before WNS to burned areas after WNS ($P \leq 0.05$). Lepidopteran, Coleopteran, and total insect abundance increased after WNS ($P \leq 0.05$), with no difference in Dipteran abundance. These data indicate substantial changes in both predator and prey community composition at MACA. Forest managers should take prescribed fire and landscape features into consideration when managing for bat population impacted by WNS.

**WHY ARE ROCKET BOXES FAVORED BY AN INDIANA BAT MATERNITY COLONY IN THE CORE OF ITS' RANGE?**

J. P. S. Hoeh* and J. M. O'Keefe. *Center for Bat Research, Outreach, and Conservation, Indiana State University, Terre Haute, IN 47807*

For temperate bats that roost in tree cavities/crevices, natural daytime refuges may be a limiting resource in a developed landscape, even if ample foraging resources are available. Installing artificial roosts or bat boxes may aid endangered species, but we need more data to find the optimal bat box design for particular bats, e.g. the Indiana bat (*Myotis sodalis*). To characterize differences inherent in three artificial roost styles (birdhouse, rocket box, and modified BrandenBark™), we evaluated roosting surface area, entrance area, volume, temperature (at 15 points/roost), and relative humidity (at 3 points/roost) while bats were excluded from one cluster containing one of each roost style. We compared emergence counts across 1–2 years at five additional clusters. Rocket boxes provided >2X the entrance and surface area and >5X the volume vs. other roost types. Relative humidity measurements were less variable in the rocket box across the season (comparing mean ±SD: for rocketbox = 67.3±15.3%RH, birdhouse =

70.8±17.3%RH, and modified BrandenBark™ = 65.8±19.5%RH) and the rocket box provided a wider range of available temperatures at a given time (comparing mean top-to-bottom roost temperature range: rocket box = 3.86°C, modified BrandenBark™ = 2.24°C, and birdhouse = 1.96°C). Across the season, consistently more Indiana bats emerged from the rocket box (2–210 bats/night) than the other roost styles, and 4 of 5 available rocket boxes had >30 Indiana bats. The max emergence count in birdhouse and modified BrandenBark™ (in clusters) was 22 and 2 bats, respectively. In this area, Indiana bats selected rocket box roosts over birdhouse and modified BrandenBark™. Possible explanations for this preference include Indiana bats choosing larger roosts, moderate humidity, or more available temperatures during extreme temperature events.

**RELATIONSHIP OF *PEROMYSCUS* MICE TO HEMLOCK AND NON-HEMLOCK FOREST COMMUNITIES OF THE CUMBERLAND PLATEAU, TENNESSEE**

K.S. Howser*. *Tennessee Technological University, Graduate Student, M.S., Cookeville, TN 38505*

The invasive hemlock woolly adelgid (*Adelges tsugae*) causes widespread mortality to eastern hemlock (*Tsuga canadensis*) trees in the United States and was first documented on the Cumberland Plateau, Tennessee in 2008. Many studies have examined the impact of lost hemlock habitat on birds, salamanders, aquatic invertebrates, and ants, but few on small mammals, especially in the southern extent of the eastern hemlock range. In 2013 and 2014, hemlock and associated non-hemlock stands in Putnam, White, and Van Buren counties on the Cumberland Plateau in Tennessee were sampled to look for relationships between forest composition and the rodent community composition in hemlock forests prior to tree loss expected from HWA infestation. *Peromyscus* captures were greater in hemlock stands (Putnam County $p = 0.0146$, White County $p = 0.0005$, Van Buren County $p = 0.0495$) than control stands. A model was developed using logistic regression where five vegetative variables were predictive of mice captures; three (hemlock stem count, canopy density, and horizontal ground cover) included odds ratios higher than one. Changes to Cumberland Plateau forest structure resulting from hemlock mortality via HWA may impact *Peromyscus* species composition locally with increased *Peromyscus leucopus* populations and decreased *Peromyscus maniculatus* populations.

**PROFILING BAT SPECIES PRESENCE IN MANAGED WILDLIFE LANDSCAPES**

Maggie Aduddell Hunt* and Thomas McElroy. *Department of Ecology, Evolution, and Organismal Biology, Kennesaw State University, 370 Paulding Ave NW, MD #1202, Kennesaw, GA 30144*

Restoration of endemic flora or reintroduction of at-risk fauna may include methods such as controlled forest burns or artificial habitats to encourage presence and breeding for target organisms. These methods may also affect the activity of other wildlife. Bats inhabit key ecological niches in several ecosystems and are often considered indicators of ecosystem health. We investigated the effect of forest management history and current forest management practices on bat species presence and activity. We deployed bat detectors to passively monitor species presence and activity from July 2016 to October 2016. Monitoring was done concurrently for two wildlife management areas in the Raccoon Creek Watershed of northwest Georgia, USA, that differ in landscape management histories and current long leaf pine restoration practices. Our preliminary results indicate a difference in species presence and activity between regions that differ in landscape management histories, but no significant differences among contemporary restoration practices.

**AERIAL RADIO TRACKING OF FLORIDA BONNETED BATS (*EUMOPS FLORIDANUS*)**

G. A. Janos, S. T. Samoray, and E. C. Braun de Torrez. *Copperhead Environmental Consulting, Inc., Paint Lick, KY 40461 (STS and GAJ); Department of Wildlife Ecology and Conservation, 110 Newins-Ziegler Hall, University of Florida, Gainesville, FL 32611 (ECB)*

Little is known about the foraging and roosting strategies of the Florida bonneted bat. For most bat species, this information is gathered by attaching radio transmitters to individuals and tracking them during foraging bouts at night and to roost trees during the day. However, until recent advances in netting techniques, this large, high-flying species was rarely captured and the success of radio telemetry studies was limited. Here we describe a pilot study in which bonneted bats were fitted with radio transmitters and tracked using a Cessna 172 aircraft to determine foraging habits and to locate day roosts. Two adult male bats were radio tracked in April 2016 and five bats were radio tracked in August 2016 (3 adult males, 2 adult females). Duration of tracking per bat varied. Two of the 7 individuals were tracked during their entire nightly bout and another two tracked for partial bouts (e.g. from tree to presumed foraging area or vice versa). Bats traveled an average distance of 9.6 miles (range 4.2-12.8 mi) from roosts to presumed foraging area where they spent approximately 1 hour before appearing to night roost or returning to their day roost. Travel time to the presumed foraging area was greater than travel time back to day roosts, averaging 1 hour 12 minutes and 44 minutes respectively. Although two individuals appeared to night roost during foraging bouts, no night roost was located. Our data represent important preliminary results and indicate that valuable information about the Florida bonneted bat can be obtained using aerial telemetry techniques.

**TEMPORAL FORAGING ACTIVITY OF SYNTOPIC BAT SPECIES FOLLOWING WHITE-NOSE OCCURRENCE IN LAND BETWEEN THE LAKES NATIONAL RECREATION AREA**

M. J. Kailing*, T.L. Derting, and C. N. Walker. *Biological Sciences, Murray State University, Murray, KY 42071*

Bat community dynamics can be altered by the introduction of white-nose syndrome (WNS) through the decline of susceptible species. Bats are known to partition the use of resources in multiple ways including roosting behavior, diet selection, and spatio-temporal foraging patterns. Resource partitioning enables species coexistence which leads to diverse communities. Our objective was to identify how temporal foraging patterns within the bat community in Land Between the Lakes National Recreation Area (LBL) has changed since the first documentation of WNS in Kentucky in 2011. We used Anabat SD2 acoustic recorders to monitor bat foraging pre-WNS (2010) and post-WNS (2015-2016) from May to September. We monitored bat activity for 35 and 57 detectors nights at eight recurring sites pre- and post-WNS, respectively. Call files were analyzed using Kaleidoscope Pro. The total number of identified calls were 95 per detector night pre-WNS and 131 post-WNS. Red bats (*Lasiurus borealis*), tri-colored bats (*Perimyotis subflavus*), and northern long-eared bats (*Myotis septentrionalis*) constituted a smaller proportion of the total calls post-WNS. A correlation matrix of the hourly foraging activity of species indicated that 14 out of 36 species-species interactions increased in foraging overlap by at least 50% post-WNS. The most substantial shifts were in interactions between big brown bats (*Eptesicus fuscus*) and hoary bats (*Lasiurus cinereus*) with other species. Furthermore, most species shifted their foraging from consistent activity throughout the night pre-WNS to more concentrated activity in the early evening post-WNS, potentially indicating competitive release. A release from competition may provide an opportunity for species to forage optimally around sunset at the time of prey emergence. We will further investigate the temporal foraging activity reported here in relation to prey availability and diet selection at LBL.

**SEARCHING FOR SURVIVORS: POST-WHITE-NOSE SYNDROME DAY-ROOSTING OF NORTHERN LONG EARED BATS IN THE MID-ATLANTIC**

N.J. Kalen*, M. S. Muthersbaugh, S.M. Deeley, A. Silvis, and W.M. Ford. *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (NJK, MSM, SMD and AS.); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit (WMF)*

Because of post-White-nose Syndrome (WNS) population declines resulting in reduced capture rates, examination of the northern long-eared bat (*Myotis septentrionalis*) day-roost ecology in the mid-Atlantic (Fall Line to the Allegheny Front) has become challenge for biologists. Nonetheless, with listed status, land managers have an urgent need to assess the extent and quality of potential day-roost habitat for this once common species. Specifically targeting northern long-eared bats in 2015 and 2016, we netted over 4,000 net-hours at multiple sites in District of Columbia, Maryland, New Jersey, Virginia and West Virginia and tracked radio-tagged females to day-roosts. We found active, but reproductively unsuccessful maternity colonies the Allegheny Highlands of Bath County, Virginia and Shenandoah National Park in Madison County, Virginia in both years. In 2016 along Fall Line, we observed a successful maternity colony in Rock Creek Park in the District of Columbia and evidence of reproductive success based on juvenile capture at Marine Corps Base-Quantico and Prince William Forest Park in Stafford County, Virginia. Collectively these efforts accounted for a miniscule 32 day-roosts. Except for Shenandoah National Park, most day-roosts were small, midstory deciduous trees or snags with cavities. Day-roosts in the Allegheny Highlands occurred mostly in stand modified by prescribed burning or recent harvesting. Despite near-old growth characteristics with large trees and snags throughout, northern long-eared bats at Rock Creek Park roosted in some of the smallest diameter stems (< 8 cm) recorded for the species. Conversely, bats at Shenandoah National Park primarily chose adelgid-killed eastern hemlock (*Tsuga canadensis*) snags that were substantially larger and taller than elsewhere we worked. Northern long-eared bat day-roost choice post-WNS was consistent with conditions used pre-WNS, particularly with regard to evidence of past stand disturbance processes.

**DOES HUNTING OR HIKING AFFECT MAMMAL COMMUNITIES IN PROTECTED AREAS?**

Roland Kays, Arielle W. Parsons, Megan C. Baker, Elizabeth L. Kalies, Tavis Forrester, Robert Costello, Christopher T. Rota, Joshua J. Millspaugh, and William J. McShea. *North Carolina Museum of Natural Sciences, 11 West Jones St, Raleigh, NC 27601 (RK, AWP); Department of Forestry & Environmental Resources, North Carolina State University, Raleigh, NC 27695 (RK); Smithsonian's National Museum of Natural History, 10th & Constitution Av NW, Washington, DC 20560 (RC); Smithsonian Conservation Biology Institute, 1500 Remount Rd., Front Royal, VA 22630, (MCB, TF, WJM); The Nature Conservancy, Durham, NC 27701 (ELK); Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO 65203 (JJM); Division of Forestry and Natural Resources, Wildlife and Fisheries Resources Program, West Virginia University, Morgantown, WV 26506, (CTR)*

Managed public wild areas have dual mandates to protect biodiversity and provide recreational opportunities for people. These goals could be at odds if recreation, ranging from hiking to legal hunting, disrupts wildlife enough to alter their space use or community structure. We evaluated the effect of managed hunting and recreation on 12 terrestrial wildlife species by employing

a large citizen science camera trapping survey at 1947 sites stratified across different levels of human activities in 32 protected forests in the eastern USA. Habitat covariates, especially the amount of large continuous forest and local housing density, were more important than recreation for affecting the distribution of most species. The four most hunted species (white-tailed deer, raccoons, eastern grey and fox squirrels) were commonly detected throughout the region, but relatively less so at hunted sites. Recreation was most important for affecting the distribution of coyotes, which used hunted areas more compared with unhunted control areas, and did not avoid areas used by hikers. Most species did not avoid human-made trails, and many predators positively selected them. Bears and bobcats were more likely to avoid people in hunted areas than unhunted preserves, suggesting that they perceive the risk of humans differently depending on local hunting regulations. However, this effect was not found for the most heavily hunted species, suggesting that human hunters are not broadly creating 'fear' effects to the wildlife community as would be expected for apex predators. Although we found that hiking and managed hunting have measureable effects on the distribution of some species, these were relatively minor in comparison with the importance of habitat covariates associated with land use and habitat fragmentation. These patterns of wildlife distribution suggest that the present practices for regulating recreation in the region are sustainable and in balance with the goal of protecting wildlife populations and may be facilitated by decades of animal habituation to humans. The citizen science monitoring approach we developed could offer a long-term monitoring protocol for protected areas, which would help managers to detect where and when the balance between recreation and wildlife has tipped.

**ROOST NETWORK OF SOUTHEASTERN MYOTIS IN AN OLD-GROWTH BOTTOMLAND HARDWOOD FOREST**

S. P. Kimpel* and S. C. Loeb. *College of Agriculture, Forestry, and Life Sciences, Clemson University, Clemson, SC 29634 (SPK), USFS, Southern Research Station, Clemson, SC 29634 (SCL)*

Little is known about the roosting habits of southeastern myotis, *Myotis austroriparius*, in Coastal Plain forests. Our objective was to quantify roost habits of southeastern myotis in Congaree National Park, an old-growth bottomland hardwood forest in the Upper Coastal Plain of South Carolina during winter (November-March) 2015-16 and summer (May-August) 2015 and 2016. We located roosts through opportunistic cavity searches and by tracking radio-tagged bats, and counted bats in roosts using a light and mirror or during roost emergence counts. To examine roost network structure, we calculated the number of primary connections between roosts which we defined as the number of bat-trips between two roosts. Roost occupancy ranged from 1 to 310 individuals. We radio-tagged 47 bats and located 32 bats ≥ 1 times. Of the 36 roosts used by radio-tagged bats, 2.7% were located in upper bole cavities, 36.1% were located in the branches of trees (canopy roosts), and 63.8% were located in basal cavity roosts. All but one of the canopy roosts were located during winter. Of roosts used by transmittered bats, 77.8% were used only during one season, 19.4% were used during two seasons, and 2.7% were used during all three seasons. Single-season roosts had an average of 2.4 ± 0.3 primary connections to other roosts, two-season roosts had an average of 5 ± 2.0 connections to other roosts, and the three-season roost had 9 primary connections to other roost trees. Multi-season use of roost trees and the interconnectivity of roosts used in Congaree National Park suggest that one large colony occupies the western section of the park, rather than several smaller colonies, and that certain trees may be more important to the colony.

**SEPARATING THE EFFECTS OF WATER QUALITY AND URBANIZATION ON BATS AT LANDSCAPE SCALE**

H. Li and M. Kalcounis-Rueppell. *Department of Biology, the University of North Carolina at Greensboro, Greensboro, NC 27412 (HL and MKR)*

Insectivorous bats are top predators of insects and play a critical role in top down control of food webs in both urban and non-urban environments and environments with high water quality and low water quality. What changes, however, is the particular bat species that dominates the community depending on how species respond to the urbanization gradient, the water quality gradient, or both. Few studies have been able to tease apart the effects of urbanization vs water quality on bat communities especially in single city studies. Across the state of North Carolina, we used the standardized North American Bat Monitoring Program (NABat) mobile protocol to survey bats in 2015 and 2016. We used the National Land Cover Database 2011 to generate urban land cover predictors and data from the North Carolina Environmental Quality, Division of Water Resources to generate water quality predictors. We found that statewide, water quality was not significantly associated with urban land cover ($p > 0.05$) and species specific bat activity responded to urban land cover and water quality independently. The big brown bat and hoary bat negatively responded to water quality degradation ($p \leq 0.01$). In contrast, the red bat and tri-colored bat were more active in areas with low quality water ($p < 0.05$). The silver-haired bat did not respond to water quality ($p > 0.05$) but had higher activity in more urbanized areas ($p = 0.01$). The Mexican free-tailed bat had higher activity in more urbanized areas ($p = 0.04$) and avoided low water quality areas ($p < 0.05$). The evening bat did not respond to either variable. Our findings demonstrated that both urban land cover and water quality affected bat distributions at the broad scale and showed consistent patterns found at finer scales.

**FALL AND SPRING ACTIVITY PATTERNS OF CAVE DWELLING BAT SPECIES IN THE CENTRAL APPALACHIANS AROUND HIBERNACULA.**

Michael S. Muthersbaugh*, Alexander Silvis, Sara E. Sweeten, and W. Mark Ford. *Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University (MM, SES, AS); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit (WMF)*

Bat conservation and research efforts largely have focused on summer maternity colonies and winter hibernacula, leaving fall habitat associations for most species poorly understood. This is critical data for understanding potential additive impacts to White-nose Syndrome (WNS) affected bats, especially in regards to bat activity in habitats surrounding hibernacula. To examine bat activity patterns in the fall in the Appalachian Mountains of Virginia and West Virginia, we acoustically monitored bat activity around three hibernacula from early September through November 2015, and from early March through April 2016. We assessed the effects of distance to hibernacula and ambient conditions on hourly bat activity using generalized additive mixed effects models. Consistent with region-wide declines in bat populations, overall bat activity was negligible at all sample sites except sites proximal to hibernacula entrances through both the fall and spring sample periods. Best-supported models describing bat activity differed for individual bat species in the fall sampling period, but in the spring there was a strong response to date, shared amongst species. In the spring, the threatened northern long-eared bat (*Myotis septentrionalis*), the endangered Indiana bat (*Myotis sodalis)*, and the little brown bat (*Myotis lucifugus)* spiked in activity around April 19th. Date appeared to have a lesser effect on the activity of these three *Myotis* during the fall sampling period. Hour after sunset was negatively related to bat activity, but did not appear in any of the best-supported models. Overall bat activity in the fall around hibernacula was variable through the sampling period, but total activity had largely ceased by mid-November.

**PREDICTING THE RESPONSE OF BATS TO INTENSIFIED BIOENERGY PRODUCTION ACROSS THE SOUTHEASTERN U.S.**

H. K. Ober, R. J. Fletcher, S. A. Johnson, and I. G. W. Gottlieb. *Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611*

A desire to increase domestic production of fuels in the U.S. has generated great interest in identifying sustainable options for creating bioenergy from renewable resources. One option receiving strong consideration is intensified production of biomass to be converted to biofuels. Due to the favorable growing conditions in the Southeast, this region is expected to contribute heavily to such biomass production. Thus, it is important to understand how changes in land use resulting from market pressures to produce biomass for biofuels may impact wildlife in the Southeast. Two commodities well suited to serve as feedstocks for biofuels are already produced across the region: corn and pine. To compare likely impacts of alternative bioenergy production pathways to wildlife, we conducted repeated acoustic surveys for bats over 336 nights at 84 sites in AL, GA, and FL during 2013-2015 as part of a multi-taxa study involving bats, birds, bees, and reptiles. We compared the impacts to bat communities of (1) production of corn, and intensified production of pine biomass via (2) short rotation pine plantations, (3) removal of residual debris from clearcuts following pine logging operations, and (4) mid-rotation thinning of pine stands. We found that shortening the length of pine stand rotations was most detrimental to bats, resulting in decreased occupancy rates. Removal of logging residues from pine clearcuts had equivocal effects on occupancy rates, as did production of corn. In contrast, thinning of pine stands led to increased occupancy rates. Species-specific patterns generally followed predictions expected due to foraging adaptations resulting from differential wingloading and aspect ratios. If pressures to produce biomass for biofuels increase as expected, we recommend use of mid-rotation thinning of pine stands as a source of materials, and caution against the adoption of short rotations, particularly when combined with removal of logging residuals after clear-cut harvesting.

**PREDICTING THE RESPONSE OF BATS TO INTENSIFIED BIOENERGY PRODUCTION ACROSS THE SOUTHEASTERN U.S.**

H. K. Ober, R. J. Fletcher, S. A. Johnson, and I. G. W. Gottlieb. *Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611*

A desire to increase domestic production of fuels in the U.S. has generated great interest in identifying sustainable options for creating bioenergy from renewable resources. One option receiving strong consideration is intensified production of biomass to be converted to biofuels. Due to the favorable growing conditions in the Southeast, this region is expected to contribute heavily to such biomass production. Thus, it is important to understand how changes in land use resulting from market pressures to produce biomass for biofuels may impact wildlife in the Southeast. Two commodities well suited to serve as feedstocks for biofuels are already produced across the region: corn and pine. To compare likely impacts of alternative bioenergy production pathways to wildlife, we conducted repeated acoustic surveys for bats over 336 nights at 84 sites in AL, GA, and FL during 2013-2015 as part of a multi-taxa study involving bats, birds, bees, and reptiles. We compared the impacts to bat communities of (1) production of corn, and intensified production of pine biomass via (2) short rotation pine plantations, (3) removal of residual debris from clearcuts following pine logging operations, and (4) mid-rotation thinning of pine stands. We found that shortening the

length of pine stand rotations was most detrimental to bats, resulting in decreased occupancy rates. Removal of logging residues from pine clearcuts had equivocal effects on occupancy rates, as did production of corn. In contrast, thinning of pine stands led to increased occupancy rates. Species-specific patterns generally followed predictions expected due to foraging adaptations resulting from differential wingloading and aspect ratios. If pressures to produce biomass for biofuels increase as expected, we recommend use of mid-rotation thinning of pine stands as a source of materials, and caution against the adoption of short rotations, particularly when combined with removal of logging residuals after clear-cut harvesting.

**PREVALENCE OF *TOXOPLASMA GONDII, LEPTOSPIRA SPP., AND PARVOVIRUS SPP.* IN NORTH AMERICAN RIVER OTTER THROUGHOUT NORTH CAROLINA.**

Charles W. Sanders II*, Christopher S. DePerno, and Colleen Olfenbuttel. *Fisheries, Wildlife, & Conservation Biology, College of Natural Resources, NC State University. 2616 Brookwood Dr., Raleigh, NC 27603, Fisheries, Wildlife, & Conservation Biology, College of Natural Resources, NC State University. Turner House, Box 7646, Raleigh, NC 27695-7646, Surveys and Research, Wildlife Division, NC Wildlife Resources Commission. 1293 Laurel Bluffs, Pittsboro, NC 27312*

The river otter is an economically and financially important furbearer in North Carolina. *Toxoplasma gondii* is a parasite spread largely by cat feces and ingesting infected meat, which causes the disease Toxoplasmosis. Toxoplasmosis is the leading cause of human death attributed to foodborne illness in the United States. *Leptospira* spp. is a bacterial disease commonly carried by rodents, which causes the disease Leptospirosis. Leptospirosis is highly infectious in most mammal species. Leptospirosis is spread by contact with cuts, abrasions, or ingestion which often results in flu-like symptoms. *Parvovirus* spp. is a virus that infects individuals in the cat, dog, raccoon, and weasel families. *Parvovirus* spp. is spread generally through feces, and is acquired either orally or nasally and results in diarrhea, vomiting, and other similar symptoms. All 3 diseases can be fatal to animals and people if untreated. From November 2014 through February 2016, we collected 220 otters from 9 river basins throughout North Carolina and tested them for exposure to *T. gondii, Leptospira* spp., and *Parvovirus* spp. We determined that 25% of otters tested positive for *T. gondii* antibodies, 1% tested positive for *Leptospira* spp. antibodies, and 19% tested positive for *Parvovirus* spp. antibodies. While our results for *Parvovirus* spp. seem to be higher than other studies, results for *T. gondii* and *Leptospira* were similar or lower than other studies. Knowing the prevalence of these viruses in the natural population provides a baseline to monitor in the future and a glimpse at the health of our waterways now.

**RELATIONSHIP OF ENVIRONMENTAL STRUCTURE TO ECHOLOCATION PULSE QUALITY**

M.J. Shirazi*, D. Hakkenberg, N.Abaid, W.M. Ford, and A. Silvis. *Department of Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, VA 24061 (MJS and NA); Patrick Henry High School, Roanoke, VA (DH); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blackburg, VA 24061 (WMF); Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (AS)*

Acoustic sampling of bats requires recording adequate numbers of high-quality calls suitable for species identification. Recorded bat call quality and abundance can be influenced by factors such as microphone orientation and height, detector deployment, and environmental conditions (humidity, temperature, environmental structure, i.e. density of tree stems and foliage). However, no studies have assessed the impact of these factors on recorded call quality under controlled experimental conditions. Accordingly, we assessed the relationship of bat call quality to two environmental structural characteristics, basal area and clutter. In an anechoic chamber, we conducted an acoustic playback experiment wherein we recorded synthetic bat calls generated with a custom sonar emitter and passed through a gradient of basal area and clutter conditions at five azimuthal angles. This allowed us to compare known call quality to subsequently recorded call quality. We analyzed raw spectrograms as well as zero-crossing calls. For spectrograms, we measured root means square error with respect to the control condition and multi-dimensional spread based on PCA. For zero-crossing calls, we measured a suite of commonly used call parameters with Kaleidoscope software. We assessed the relationship between measured variables and structural conditions with a series of regression models. We found trends with reduction in call quality due to increasing amounts of basal area and clutter, but these were confounded by interactions of the two variables. Microphone angle also contributed to variation in call quality. Moreover, quality reduction differed among full spectrum and zero-crossing calls which could have implications for field sampling.

**THOUGHTS ON UNCERTAINTY IN BAT ACOUSTICS**

Alexander Silvis, W.M. Ford, and E.R. Britzke, *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (AS); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blackburg, VA 24061 (WMF), U.S. Army Engineer Research and Development Center, Environmental Lab, Vicksburg, MS 39180 (ERB)*

Although advantages and drawbacks of acoustic surveys for bats have been debated since their introduction as a sampling

methodology, this debate arguably has reached a zenith. This coincides with the U.S. Fish and Wildlife Service accepting results of acoustic surveys with software identification of species for *Myotis sodalis* and *M. septentrionalis*, finalization of the North American Bat Monitoring Program (NABat), and increased competition in acoustic recording and analysis software markets. In contrast to the early days of bat acoustic studies, where concern with uncertainty primarily centered on detector deployment, recording media, assigning bat calls to phonic groups, and understanding assumptions, commonly voiced concerns today largely relate to absolute species identification accuracy by software, performance of full spectrum and zero-crossing formats, disagreement in call identification across software, and relative accuracy of automated and hand-identification. While critical, equally germane topics like conservation costs of false-positive and negative identifications, effects of misidentification on inference, and nature and structure of bias in acoustic identification have been largely under-discussed. Furthermore, discussion of uncertainty has become relatively simplistic, poorly articulating modern assumptions of acoustic studies, and, realistically, few advances in dealing with uncertainty have been made. In this talk, we explore different bias structures in identification accuracy, what bias in acoustic identification means for surveys, and consequences of misidentification both in threatened and endangered species surveys and greater ecological understanding. Additionally, we highlight where existing statistical methods are useful in dealing with and understanding acoustic uncertainty, where "we're going to need a bigger boat," and how programs such as NABat will struggle in addressing acoustic uncertainty.

**SEASONAL TORPOR PATTERNS OF TRICOLORED BATS IN RELATION TO HIBERNACULA CONDITIONS IN SOUTH CAROLINA**

P. Sirajuddin*, S. C. Loeb, E. R. Britzke, and D. Jachowski. *Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634 (PS and DJ); USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SCL); US Army Engineer Research and Development Center, Vicksburg, MS 39180 (ERB)*

Recent data from the southeastern U.S. suggest tricolored bat (*Perimyotis subflavus*) populations have experienced > 80% declines due to white-nose syndrome (WNS) despite milder and shorter winters in the south. However, data are lacking on *P. subflavus* responses to WNS and hibernacula temperatures. Therefore, we initiated a study to determine whether torpor patterns of *P. subflavus* and hibernacula conditions in a WNS positive site in northwestern South Carolina differed between early winter (November - December 2016) and late winter (January – March 2016). We used temperature sensitive radio transmitters and Lotek data loggers to record *P. subflavus* skin temperatures ($T_{sk}$) and iButtons to record hibernacula temperatures and relative humidity. We collected data on 16 *P. subflavus* (9 in early winter and 7 in late winter). Mean hibernacula temperatures were significantly ($P < 0.001$) warmer in early winter (10.1°C) than late winter (9.3°C). Minimum torpor $T_{sk}$ was 3.6°C and average torpor $T_{sk}$ in early winter (15.3°C) did not differ significantly from average torpor $T_{sk}$ in late winter (15.6°C). Torpor bout length ranged from 1 to 15 days and torpor bouts were not significantly different between the two seasons ($P = 0.15$). Mean arousal frequency was 4.5 times during the tracking period (mean tracking period = 21.6 $\pm$ 2.9 days) and arousal length ranged from 30 to 593 minutes. Arousal frequencies and arousal length of *P. subflavus* were not statistically significant between seasons. Our preliminary results suggest that although hibernaculum temperatures differed between seasons, *P. subflavus* torpor patterns did not change in response to environmental conditions.

**DYNAMIC LANDSCAPES: CHANGE DETECTION OF EPHEMERAL HABITATS FOR THE ENDANGERED INDIANA BAT IN THE MID-ATLANTIC**

Michael St. Germain, Andrew Kniowski, Alex Silvis, and W. Mark Ford. *Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061 (MSG, AK, AS and WMF), US Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, VA, 24061 (WMF)*

In 2015, an active Indiana bat (*Myotis sodalis*) maternity colony was discovered on Fort A.P. Hill, a U.S. Army installation along the Piedmont/Coastal Plain boundary near Fredericksburg, Caroline County, Virginia. This finding represents the first confirmed Indiana bat maternity colony in Virginia and for the Coastal Plain physiographic province in the mid-Atlantic. The core roosting area is comprised of a dead-standing loblolly pine (*Pinus taeda*) patch adjacent to an emergent shrub wetland, within a larger matrix of mature, mid-Atlantic hardwood forests. Snags appeared to be pine beetle (*Dendroctonus frontalis*) and/or prescribed fire killed individuals. Using a 1-2-3 band combination with a histogram equalize (ArcGIS 10.3) from 2012, 2014 NAIP imagery, the signature revealed a specific reflectance for recently killed trees. These spatial signatures and ground verification provided support for an additional supervised imagery classification of the installation using ERDAS Imagine. Measuring change detection of recent pine tree mortality from 2012-2014 suggest an average potential roost recruitment of 1.2% annually. Modelling mortality areas with various spatial and topographic attributes has yielded several locations of suitable habitat on site and may indicate the presence of additional colonies. This geospatial model may prove to be a very useful tool in identifying these ephemeral habitats for this endangered species in the region.

**BAT TO THE FUTURE: THE SEQUEL**

Michael St. Germain and W. Mark Ford. *Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061 (MSG and WMF), US Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, VA, 24061 (WMF)*

Bat populations have declined throughout the eastern United States since the onset of White-nosed Syndrome (WNS). Signs of WNS started to appear in Virginia in 2009-2010. We replicated a comprehensive pre-WNS acoustic survey (2007) at Fort Pickett Maneuver Training Center, Blackstone, Virginia, in 2016, to quantify potential changes across the landscape. We hypothesized that WNS-susceptible species would show a decline in acoustic activity levels whereas WNS-resistant species would remain constant or increase. We surveyed the same 87 locations over 530+ nights each year using the same acoustic detectors (Anabat II – CFZcaim). Data analysis for both years was performed using Kaleidoscope Pro v4.0.0. We observed that overall bat activity and NWS-susceptible species declined, and most NWS-resistant species remained the same. One surprising result was a significant reduction in the amount of eastern red bat (*Lasiurus borealis*) calls. It is unclear if this is a region wide trend or a study site specific occurrence. Comparisons to other 2016 study sites within Virginia show similar levels of activity as Fort Pickett, however, no pre-WNS acoustic data exists for those sites. These data will be part of a larger region wide cooperative WNS niche impact study with Fort Drum, NY; Quabbin Reservoir, MA; Fernow Experimental Forest, WV; Savannah River DOE, SC; Sumter NF, SC, Chickamagua NBP, GA; and Wisconsin DNR data.

**A CHANGING COMMUNITY?: THE EFFECTS OF WHITE-NOSE SYNDROME ON BAT COMMUNITY STRUCTURE IN THE SOUTHEASTERN UNITED STATES**

K. D. Teets*, S. Loeb, J. Kilgo, D. Jachowski, and W. M. Ford. *Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634 (KDT and DJ); USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SL); USDA Forest Service, Southern Research Station, New Ellenton, SC 29809 (JK); USGS Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, VA 24061 (WMF)*

Recent research in New York suggests that post-WNS, non-affected bat species have expanded their foraging niches to include those formerly occupied by the little brown bat (*Myotis lucifugus*). Whether this pattern occurs where WNS impacts have been more recently documented and the bat community has higher species richness is unknown. Accordingly, as part of a larger study of WNS and niche impacts in the eastern U.S., we sought to determine if there was an effect of WNS on niche partitioning among sympatric bat species in South Carolina. We hypothesized that, with the decline of WNS-susceptible species, WNS-resistant species will exploit the niche space formerly occupied by WNS-susceptible species. To evaluate this hypothesis, we selected the Andrew Pickens District (APD) of the Sumter National Forest, South Carolina, a WNS positive site, as our study area; APD had pre-WNS data. In summer 2016 (post-WNS) we used Anabat Express bat detectors to record bat calls and identified calls to species using Kaleidoscope Pro v.3.8.1. Overall, we observed a decline in WNS-susceptible species detections post-WNS, whereas WNS-resistant species detections remained the same or slightly increased. We observed this same pattern of detections over all habitat types except mixed pine-hardwood forests where WNS-resistant species detections slightly declined. The percent of detections over a night of both species groups remained similar. Patterns of activity throughout the night for both species groups' post-WNS also remained similar to pre-WNS patterns, with the exception of a sharp increase of activity at the end of the night for WNS-susceptible species. Our preliminary data indicate that WNS has not affected temporal niche partitioning. Spatial niches of WNS-resistant species may have experienced a change post-WNS while those of WNS-susceptible species have remained similar. Further analyses will consider if this alteration in spatial activity patterns is due to changes in community dynamics.

**ADDRESSING VARIATION IN TIMBER HARVEST TECHNIQUES AND THE EFFECTS ON BAT OCCUPANCY AND DETECTION**

Keifer L. Titus*, and Timothy C. Carter. *Ball State University, Muncie, IN 47306*

Timber harvest in southern Indiana is an essential tool in habitat management for the Indiana DNR-Division of Forestry. The primary method of timber harvesting conducted on Indiana state forest land is selection harvesting, yet there are a variety of other timber harvesting techniques taking place on the landscape. However, the long term effects of these harvesting techniques on the ecological community, especially with regard to the bat community, is poorly understood. Since the onset of White-Nose Syndrome (WNS) in Indiana in 2011 bat conservation efforts continue to be a priority. Identifying the effects of each harvest is of great interest to all parties. In order to understand how each timber harvesting techniques effect the bat community we are examining how relative bat occupancy changes across a continuum of timber harvest intensity. This continuum includes unharvested "control" forest, selection harvests, shelter-wood harvests, and clear cut harvests. This work is being conducted as part of the Hardwood Ecosystem Experiment (HEE) in south-central Indiana. This is a long-term (100 year) ecological study that provides a unique opportunity to research how bats are responding to the different harvesting techniques. In the summer of 2016 from May to August, we sampled 144 sites using SM2+ acoustic echolocation detectors; each detector recorded simultaneously for

three nights. Over 33,500 call files were recorded during our first field season and analyzed using Bat Call ID (BCID) an automated call identification software. Even with in our first field season we determined difference is species detection in relation to intensity of timber harvest. We plan to collect an additional field season of data to examine inter-year differences and to strengthen our current findings.

**INFLUENCE OF PRESCRIBED FIRE ON ENDANGERED BATS IN THE SOUTHERN APPALACHIANS**

Kaitlyn Rountree-Torrey*, Andrew Edelman, Joseph Johnson, and Jonathan Stober.

*Department of Biology, University of West Georgia, Carrollton, USA; Department of Biological Sciences, Ohio University, Athens, USA; Shoal Creek Ranger District, Talladega National Forest, U.S. Forest Service, Heflin, USA*

Longleaf pines (*Pinus palustris*) ecosystems of the southeastern U.S. require low-intensity fire to maintain their open-canopy forest structure. Efforts to restore this once widespread ecosystem are being implemented by use of prescribed fire and forest thinning. These restoration efforts may, however, have negative impacts on the threatened northern myotis (*Myotis septentrionalis*) and the endangered Indiana myotis (*Myotis sodalist*), which are declining due to white-nose syndrome. Our objective is to examine roost site selection and foraging patterns of northern myotis and Indiana myotis across prescribed fire regimes. The study area is located in the Shoal Creek Ranger District of the Talladega National Forest in northeastern Alabama. We mist netted for and radio tagged northern myotis and Indiana myotis during the summer of 2016. We tracked each tagged individuals daily to find day roosts, and we obtained foraging points nightly. We obtained roost characteristics for each day roost found. Our preliminary results suggest that northern myotis and Indiana myotis had a higher proportional home range use in high fire frequency areas. Indiana myotis used pine snags with high DBH for roosts, whereas northern myotis used a variety of living and dead pine and hardwood trees with a lower DBH for roosting. These early results suggest that extensive prescribed fire management associated with longleaf pine ecosystem restoration is compatible with the habitat needs of the northern myotis and Indiana myotis. This research will be continued in the summer of 2017 to obtain more data on roost selection and foraging behavior of Indiana myotis and Northern myotis on the Shoal Creek Ranger District.

**ACOUSTIC LURE ALLOWS FOR CAPTURE OF A HIGH-FLYING, ENDANGERED BAT: THE FLORIDA BONNETED BAT (*EUMOPS FLORIDANUS*)**

E. C. Braun de Torrez, S. T. Samoray, M. W. Gumbert, H. K. Ober, and R. A. McCleery. *Department of Wildlife Ecology and Conservation, University of Florida*, *314 Newins-Ziegler Hall, Gainesville, FL 32611, USA (ECB, HKO, RAM); Copperhead Environmental Consulting, Inc., Paint Lick, KY 40461 (STS, MWG)*

Mist nets are a valuable tool for capturing free-flying bats, but they are not equally useful for all species. High-flying, open-space foragers are especially difficult to capture in mist nets. Few studies have investigated the effectiveness of acoustic lures (playbacks of conspecific vocalizations) to increase capture success of bats in mist nets. We tested the efficacy of an acoustic lure to capture a high-flying rare molossid, the endangered Florida bonneted bat (*Eumops floridanus*), which had only once been captured away from a known roost prior to our research. We used a cross-over experimental design with two lure treatments (nets with lures playing social call recordings from two different roosts) and two control nets (no lures) in six sites for two nights each. We captured 15 Florida bonneted bats in treatment nets and zero in control nets. One lure had higher capture success (n = 13) than the other (n = 2) and there was a trend for higher captures of males (n = 11) than females (n = 4). We suggest that these differences are due to the social context in which the calls used in the lures were recorded from this harem-forming species. Our study clearly demonstrates the utility of acoustic lures to capture Florida bonneted bats and opens up novel research opportunities with the species, such as the ability to track these evasive bats with radio-telemetry to identify roosting and foraging areas, which is critical to the conservation of the species. Our research also lays the foundation for future research into social call playbacks as a technique to lure other high-flying and elusive bat species into mist nets.

**RANGE-WIDE POPULATION GENETIC STRUCTURE OF RAFINESQUE'S BIG-EARED BATS, *CORYNORHINUS RAFINESQUII*, AND SOUTHEASTERN MYOTIS, *MYOTIS AUSTRORIPARIUS***

J.M. West* and B.D. Carver. *Tennessee Technological University, Cookeville, TN 38505*

Population genetic structure can provide pertinent and essential information for the conservation and management of rare species. *Corynorhinus rafinesquii*, or Rafinesque's Big-eared Bat, and *Myotis austroriparius,* or Southeastern Myotis, are two rare bat species with overlapping ranges across much of the southeastern United States. At the state level, both species are regarded as threatened, endangered, or of greatest conservation need (GCN) across nearly all of their range. The overall objective of this study is to understand the population genetic structure of *C. rafinesquii* and *M. austroriparius* to determine population connectivity and determine if there is sufficient gene flow to maintain a high level of genetic diversity among populations. I collected

tissue samples from both species across their range in order to extract and sequence DNA through genotyping by sequencing (GBS). Thanks to the collaborative efforts of many researchers, in 2016, I collected more than 380 tissue samples from 10 different states and will be collecting samples again in 2017. Understanding the population genetic structure of these two rare species will provide much-needed information, such as gene flow and population connectivity, genetic diversity among populations, and needs for management of both species based on these population characteristics. Some populations may be disjunct and may need to be considered as separate evolutionarily significant units (ESUs) or management units (MUs). It may be beneficial to create wildlife corridors to reconnect these populations for proper mixing of the gene pool, while lessening the impacts of genetic drift and the risk of a population bottleneck. Each state will be able to use the gathered information to infer management protocols and conservation actions specific to their state. In addition, personnel at specific parks, sanctuaries, refuges, and similar preserves will be able to use this information to determine how to best support populations of these two species.

**POSTER PRESENTATION ABSTRACTS**

*Listed in order of presenter's last name.*

**IMPACTS OF PRESCRIBED FIRE AND RIPARIAN AREAS ON BAT ACTIVITY IN WARM SPRING MOUNTAIN, VIRGINIA**

L.V. Austin*, A. Silvis, and W.M. Ford. *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (LVA and AS.); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, VA 24061 (WMF)*

Prior to the mid-20th century, fire occurrence was widespread in the central Appalachians. During this time, low to mixed severity fires supported a suite of fire-adapted ecological communities. Fire suppression efforts beginning in the mid-20th century decreased fire frequency and intensity regionally, resulting in profound shifts in forest composition. Land managers are now prioritizing prescribed fire as a restoration tool in current and transitioning fire-dependent communities. However, it is unclear how the re-introduction of fire will affect bat community assemblages, particularly after severe White-nose Syndrome related population declines of many cave-hibernating bat species. To address these concerns, we used paired sampling to monitor bat activity in burned, unburned, riparian, and non-riparian areas to test the hypothesis that burned stands and corresponding riparian areas have significantly greater bat species richness and relative activity than unburned stands and corresponding riparian areas. We sampled 40 sites continuously from mid-May to August 2016. We conducted automated identification of calls using Kaleidoscope and then hand verified a subset of calls. We used an information theoretic approach to rank zero-inflated negative binomial mixed models that incorporated burn and riparian variables. This poster will discuss the relationship of burn condition and riparian status on bat activity patterns for the northern long-eared bat (*Myotis septentrionalis*), Indiana bat (*Myotis sodalis*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), tri-colored bat (*Perimyotis subflavus*), and hoary bat (*Lasiurus cinereus*).

**SPATIAL VARIATION IN BAT ACTIVITY IN GREAT SMOKY MOUNTAINS NATIONAL PARK**

Elizabeth A. Beilke* and Joy M. O'Keefe. *Center for Bat Research, Outreach, and Conservation, Indiana State University, Terre Haute, USA*

Many studies have shown that bat echolocation call structure is related to both maneuverability and habitat use. In general, bats with lower frequency, flatter calls tend to utilize more open areas, while bats with higher frequency, steeper calls occupy more cluttered environments. Great Smoky Mountains National Park is known for its high botanical diversity and is composed of several types of forests with varying levels of clutter. Given this diversity, we would expect spatial partitioning by the local bat community based on call structure. We conducted a large-scale acoustic survey with Pettersson D500X detectors from May to late August 2016 to test the hypothesis that bat phonic group activity varies by land cover class. We surveyed 42 random points (2-8 nights each), stratified by 4 major vegetative groups (early successional, conifer & mixed hardwoods, northern hardwoods, and spruce-fir forests) and proximity to water (near, ≤ 50 m away or far, ≥ 200 m) for a total of 204 detector-nights. We analyzed calls to phonic group (Low, Mid, and *Myotis*) in Bat Call ID v2.7c and assessed the degree of spatial variation in bat activity. The *Myotis* group was more active in the cluttered northern hardwood and spruce-fir forests, while the low and mid phonic groups were more active in the comparably open conifer & mixed hardwood and early successional habitats. Although this matched our predictions, we note that bat population declines are likely a significant factor in this area where white-nose syndrome has devastated populations of 4 bat species (3 *Myotis* and *Perimyotis*).

**ACTIVITY PATTERNS OF EASTERN SPOTTED SKUNKS IN ALABAMA**

Isik Benson*, William Cornelison, and Andrew Edelman. *Department of Biology, University of West Georgia, Carrollton, GA 30118*.

The eastern spotted skunk is a small, nocturnal skunk that was once abundant throughout the eastern and central United States. However, over the last 75 years this species has experienced a widespread decline. Until recently, spotted skunks have remained largely unstudied due to their small size, nocturnal behavior, and overall elusiveness. The primary objective of this study is to record the general activity patterns of the eastern spotted skunk in Alabama via game camera observation of den sites. Skunks were captured, fixed with radio collars, and released. These skunks were then tracked to their dens and a game camera was placed near the entrance. The cameras recorded exit and re-entry times, providing patterns of active or inactive time periods. We found that, on average, spotted skunks typically first exited the den about 90 minutes after sunset and re-entered for the last time about 160 minutes before sunrise. Additionally, the greatest proportion of skunks are active in the earlier evening hours (which we defined as sunset to 9:00 pm), with overall activity gradually dropping off as night progresses to morning. We also observed that many skunks exit and re-enter a den multiple times in one night. These data can be used to map likely hours of activity for radio-tracking and surveying spotted skunk populations. Additional data to be considered is to include the influence of den type and location, weather, and season on skunk activity.

**MICROCLIMATES OF WINTER ROOSTING SITES IN TRICOLOR BATS**

H. E. Blackwell*, P. Sirajuddin, and S.C. Loeb. *Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634 (HEB and PS); USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SCL)*

Studies show that bats utilize a range of temperatures and humidity, particularly during torpor. While research has been conducted on microclimates used by other bat species, little is known about the microclimates of tricolored bats (*Perimyotis subflavus*) at hibernation sites. Our objective was to determine microclimates of *P. subflavus* roost sites within their hibernacula. Our study was conducted in Stumphouse Tunnel, Walhalla, South Carolina. We measured the relative humidity and wall temperature of roost sites within the hibernacula every 200 meters beginning November 2016. We also measured the relative humidity and wall temperature where bats roosted during four annual counts. Further, we captured 19 bats (14 males, 5 females), and measured the wall temperature of their roost sites. We used correlation analysis to test the relationship between body weight and wall temperature, number of bats and wall temperature, and number of bats and relative humidity. We used a t-test to examine differences in wall temperature of male and female roost sites. There was no correlation between the number of bats and wall temperature (r = 0.17). However, there was a positive correlation between weight and wall temperature (r = 0.34) and between relative humidity and number of bats (r = 0.35) although these relationships were not statistically significant. Males roosted at sites with higher temperatures (12.5 ℃) than females (11.8 ℃) but this difference was not statistically significant. Females may use lower temperatures to save energy for pregnancy in the spring. The reason behind the correlation between weight and wall temperature is unclear. However, the high wall temperatures and relative humidity used by *P. subflavus* during this study likely facilitate the growth of *Pseudogymnoascus destructans,* the fungus that causes white nose syndrome.

**CONTINUED MONITORING OF GRAY BATS (*MYOTIS GRISESCENS*) IN VIRGINIA: JUVENILE RECRUITMENT, AGE IDENTIFICATION ACCURACY, AND MITE LOADS IN 2016**

Cameron M. Comer*, K. E. Powers, R. J. Reynolds, and W. Orndorff**.** *Biology Department, Radford University, Radford, VA 24142 (CMC and KEP); Virginia Department of Game and Inland Fisheries, Verona, VA 24482 (RJR); Virginia Department of Conservation and Recreation, Natural Heritage Program, Christiansburg, VA 24073 (WO)*

Gray bats (*Myotis grisescens)* are federally-endangered species whose summer breeding range includes far southwest Virginia. Since the onset of White-nose Syndrome, we conducted almost yearly surveys in the late summer to monitor the status of known populations. Analyses of data from 2009-2014 suggested a decline in reproductive success and recruitment. Based on these findings, the goals of Summer 2016 were to (1) compare the proportion of juveniles captured in June 2016, July 2016, and August (previous surveys); and to (2) compare the accuracy of age identification in June and July 2016 to August (previous surveys) via backlit wing photographs. Based on other findings from past work, we also sought to (3) compare mite loads between age classes in June, July, and August. In summer 2016, we captured and processed 500 individuals: 155 adult females, 124 juvenile females, 57 adult males, and 164 juvenile males. Our high number of juvenile captures (49% of captures in June and 85% of captures in July) suggests recruitment may not yet be a serious threat to this Virginia population. Because in-the-field age accuracy was highest in June (95.4%) and July (94.8%), and lowest in August (80.6%), analyses of wings post field-work is strongly suggested for late summer surveys. The average number of mites per wing varied significantly across months and age class, and trends will be discussed in light of recent analyses. Summer surveys will continue in 2017 and will expand to include exit counts and investigations of recapture rates and individual health.

**LANDSCAPE-LEVEL HABITAT SELECTION OF EASTERN SPOTTED SKUNKS IN ALABAMA**

William Cornelison* and Andrew Edelman, *Department of Biology, University of West Georgia, Carrollton, GA 30118*

Due to a lack of ecological knowledge and an observed decline in abundance, Alabama has classified eastern spotted skunks (*Spilogale putorius*) as a state protected species of high conservation concern. Our objective was to conduct a telemetry-based study of eastern spotted skunks in the Talladega National Forest, Alabama to determine habitat use at the landscape scale. From December 2014 to December 2016 we collected 343 locations for 13 individual skunks within the Talladega National Forest. These point data were compared to an equal number of random available points throughout the study area using LIDAR and GIS derived landscape variables. Preliminary results indicate that eastern spotted skunks selected sites at higher elevations and on steeper slopes than expected by availability. In addition, used sites had denser canopy cover at 2-6ft, 6-20ft, and 20-45ft above the forest floor compared to available sites. These results indicate that dense woody cover at the mid- to understory level is a critical habitat component for eastern spotted skunks in the southern Appalachians. Dense woody cover likely provides critical protection from predators, particularly owls. These results will facilitate the development of a management plan for eastern spotted skunks in Alabama, and will assist in the creation of conservation strategies that may reverse the decline of this rare species.

**ASSESSING SUMMER BAT ACTIVITY USING ACOUSTIC SURVEYS AT RADFORD ARMY AMMUNITION PLANT, VIRGINIA, IN 2016**

H. N. Custer*, K. E. Powers, and L. L. Diioia. Jr. *Radford University, Radford, VA, Box 6931, 24142 (HNC and KEP); Radford Army Ammunition Plant, Constitution Rd, Radford, VA 24141 (LLD)*

White-nose Syndrome (WNS) has caused significant declines in summer cave bat populations in western Virginia, and recent research in the Commonwealth has suggested that acoustic surveys are the most efficient method to detect rare species. At the Radford Army Ammunition Plant (RFAAP, Virginia), pre-WNS netting documented two bat species: Brown Bats and Red Bats, and brief surveys in 2013 additionally detected Tri-colored Bats via capture and 5 more species via acoustic signatures. To fill in our knowledge gaps about uncommon species, in summer 2016, we launched a large-scale acoustic survey of the RFAAP. We deployed 12 Songmeter SMZC units at 14 sites from April-August. We recorded >109,000 valid echolocation call sequences that we analyzed using Kaleidoscope (v. 4.0) and EchoClass (v. 3.1). Of those that were identified to species in Kaleidoscope, Silver-haired Bats (30.7%), Big Brown Bats (29.9%), Red Bats (29.4%), myotids (5.3%), Tri-colored Bats (2.5%), and Hoary Bats (2.2%) were detected. In EchoClass, identifiable calls included Red Bats (50.6%), Big Brown Bats (39.0%), Silver-haired Bats (4.8%), Hoary Bats (4.5%), Tri-colored Bats (0.7%), and myotids (0.5%). To date, >90% of 3,500 myotid calls may have been incorrectly assigned by Kaleidoscope and typically are the calls of Red Bats. The misidentification by Kaleidoscope emphasizes the continued need for visual (manual) confirmation of any suspected Myotis calls. At this time, we find little evidence of Myotis species at RFAAP. Our study provides further evidence for the anticipated state listings of all cave-hibernating myotids in the Commonwealth.

**DETERMINANTS OF BAT ACTIVITY ACROSS AN URBAN UNIVERSITY CAMPUS**

J. K. Adkins and L. E. Dodd. *Division of Natural Sciences and Mathematics, Transylvania University (JKA); Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 (LED)*

The prevalence and dispersion of resident bats across urban environments is relatively undocumented across much of eastern North America. Given the overlapping of ecoregions in central Kentucky, it is likely that a variety of bat species may make use of the ever-expanding urban landscape in the Bluegrass Region. Thus, we seek to document the seasonal occurrence and nightly temporal activity patterns of bats on an urban university campus in Lexington, Kentucky (Transylvania University). In our first year's sampling effort (July-Sept 2016) we conducted full-spectrum acoustic surveys (Echometer Touch) for bats via point counts along transects that began 30 min after sunset. These random survey locations were georeferenced, and light levels were recorded alongside a suite of other environmental variables. Results to date suggest that *Eptesicus fuscus*, *Lasiurus borealis*, *Lasiurus cinereus*, and *Lasionycteris noctivagans* are most common in this landscape, whereas *Myotis* species and *Perimyotis subflavus* were generally absent. Furthermore, we found a weak positive correlation between bat activity and ambient light levels. With additional survey efforts in 2017, we will continue to investigate the influence of streetlamps (i.e., light pollution) and other environmental factors on the spatial distribution of bat activity.

**ESTABLISHING PRE-WNS NUMBERS OF CAVE-ROOSTING BATS AND THE POTENTIAL FOR CAVES TO SUPPORT *PSEUDOGYMNOASCUS DESTRUCTANS* (Pd) IN FLORIDA.**

Lisa Smith, Terry J. Doonan, and Jeffery A. Gore. *Florida Fish and Wildlife Conservation Commission, Lake City, FL 32055 (TJD); Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, FL 32601 (JAG, LS)*

White-nose syndrome (WNS), the fungal disease caused by *Pseudogymnoascus destructans* (*Pd*), has killed millions of hibernating bats across eastern North America. *Pd* has spread into Alabama and Georgia, thereby increasing the threat to Florida's two winter cave roosting species: the tricolored bat (*Perimyotis subflavus*) and southeastern myotis (*Myotis austroriparious*). During three winters (January-March) from 2014-2016, we surveyed 144 caves 1-3 times in Florida's two primary karst regions in the panhandle (northwest; n = 74) and the peninsula (north central; n = 70). We detected a total of 2,147 tricolored bats in 112 caves (77.8%), with numbers ranging from 1-220 per cave (mean = 8.3, *SE* = 1.61). Tricolored bat numbers remained fairly constant between years. Most tricolored bats were found in colder panhandle caves and only two caves sheltered over 100 tricolored bats. Southeastern myotis were detected in 26 caves (18.1%), and their numbers fluctuated dramatically from year to year, with 1,117 bats in 2015 and 49,551 bats in 2016. We placed HOBO© temperature loggers near roosts in 50 caves to evaluate susceptibility of Florida's caves to *Pd.* In winter 2015 and 2016, 37.0% and 42.4% of caves, respectively, had average temperatures within the optimum *Pd* growth range (12.5-15.8 ºC). In summer 2015, 63.9% of caves had average temperatures higher than the maximum critical temperature for growth of *Pd* (19.0-19.8 ºC). Peninsular caves had warmer average annual temperatures (20.1 ºC) than panhandle caves (17.6 ºC) and are likely to experience slower growth of *Pd.* Although *Pd* has not been detected in Florida, tricolored bats remain potentially vulnerable to WNS since more than 50% of these bats hibernate in only 5 caves, 4 of which are in the panhandle where ambient cave temperatures are cooler and in winter are suitable to growth of *Pd.*

**NOTOEDRIC MANGE IN FOX SQUIRRELS**

Heather M. A. Fenton*, Devinn Sinnott, Elizabeth Elsmo, Sarah K. Peltier, and Michael J. Yabsley *Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA 30602 (HF, SP, MJY), D. B. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602 (MJY), University of California Davis College of Veterinary Medicine, Davis, CA, 95616 (DS), Marshfield Labs, Marshfield, WI, 54449 (EE).*

*Notoedres* is a genus of sarcoptiform mites that have been documented in numerous mammalian hosts worldwide, most commonly rodents and bats. Most of what is known about this genus is related to *Notoedres cati*, the causative agent of mange in domestic cats. However, other mammalian hosts, including humans, have been diagnosed with *Notoedres* sp. infections. This case report describes the lesions in two adult, male fox squirrels (*Sciurus niger*) from Kansas that were observed with bilateral areas of hair loss (alopecia) along the dorsal midline. The squirrels were submitted to the Southeastern Cooperative Wildlife Disease Study in Athens, Georgia for diagnostic evaluation. Deep skin scrapings of the alopecic skin revealed numerous adult mites with two pairs of anterior and posterior legs, long unbranched pedicels, and a dorsal anus, consistent with the genus *Notoedres*. Amplification and sequencing of the ITS-2 region of mite DNA as described showed 99.4% similarity to a *N. centrifera* sequence (KF278482). *Notoedres centrifera* seems to be endemic in some wild squirrel populations in the United States, but periodic outbreaks of notoedric mange associated with significant mortality have been reported in Western gray squirrels in California and Washington, Eastern gray squirrels in Massachusetts, and fox squirrels in Indiana and Illinois. Most recently, *N. centrifera* has been associated with a large die-off in Western gray squirrels in the San Bernandino Mountains in California. Risk factors that have been proposed to predispose free-ranging squirrels to outbreaks include: poor nutritional condition (e.g. crop failure), habitat loss, mild winter conditions, and stress. The objective of sharing these cases is for biologists to be able to recognize signs of mange in the field and to consider that equipment used to trap, handle, and ear tag free-ranging mammals could also potentially act as fomites and potentially transmit mites to other hosts.

**A HISTORY OF NORTHERN LONG-EARED BATS IN THE NORTH CAROLINA COASTAL PLAIN**

M.E. Frazer. *Three Oaks Engineering, Durham, NC 27701*

Recent survey work has indicated that northern long-eared bats (*Myotis septentrionalis*, MYSE) are present in North Carolina's coastal plain both in the summer and the winter, although caves and subsurface mines are lacking. Previously, only a handful of records occurred outside the mountains of NC, all of which were historic or provided limited detail. Three county records existed from bats submitted to rabies labs in the early 2000's, while a fourth county had four records from 1901-1981. The first mist-netting capture of MYSE in the coastal plain (in Washington County) did not occur until 2007, despite previous mist-netting in the region (Morris et al 2009). Since then, more intensive surveys have been conducted. In 2012, MYSE were captured in Washington and Camden counties (including juveniles), and positive MYSE echolocation calls were recorded in Bladen County (Grider et al 2016). In 2013 and 2014, MYSE were captured in Currituck County near the Great Dismal Swamp. In the winter of 2015-2016, MYSE were tracked to roost trees in Currituck and Gates County. During the spring and summer of 2016, captures occurred in Dare, Bertie, and Martin counties, including a juvenile. Captures in Bladen County in the summer and early winter of 2016 confirmed MYSE echolocation calls recorded in 2012 reported in Grider et al (2016). MYSE captures in the last decade have resulted in eight new county records from the NC coastal plain. In addition to NC, recent MYSE captures have also occurred in the coastal plain of Virginia and South Carolina. The occurrence of MYSE in an area where their presence had been considered questionable may be a lesson for other coastal plain locations, as well as other regions where there has not been intensive survey work. Population estimates of MYSE and the extent of the species' range in the coastal plain remain to be seen.

**WILL THEY FLEE? RESPONSE OF ANIMALS TO CAMERA TRAPS.**

Lisa Gatens, Kristen Lewey, Arielle Parsons, and Roland Kays. *North Carolina Museum of Natural Sciences, Raleigh, [2]NC North Carolina State University, Raleigh, NC*

Motion sensitive camera traps are a popular method for monitoring mammals and are considered noninvasive because they do not physically capture animals. Many analytical methods applied to camera trap data presume the devices have no effect on animals, presuming a constant rate of detection throughout the sample period. However, even cameras with IR flashes that appear silent to humans emit frequencies of light and sound that animals can detect. Anecdotal observations suggest that some animals notice the equipment, but there has been no evaluation of the effect of camera traps on animal behavior in the wild. We quantified the response of animals to camera traps by reviewing the reactions of 6050 individuals from 169 species photographed in short video sequences by Reconyx brand camera traps at nearly 1000 sites around the world. We found that 86% of the individuals did not notice the camera traps, 8% noticed but ignored the equipment, 5% were attracted to the camera, and 1% ran away in alarm. Reactions were seen in few species, but were more likely in predators and domestic animals. We conclude that animals do sometimes notice camera traps but are not typically alarmed by them. Camera traps with IR flashes and no bait

have a minimal impact on the behavior of most mammal species making their data appropriate for use in analyses that presume unbiased detections over time.

**ECOLOGY OF URBAN/SUBURBAN BLACK BEARS IN WESTERN NORTH CAROLINA**

J. Strules, N. P. Gould*, C. Olfenbuttel, and C. S. DePerno. *Fisheries, Wildlife, and Conservation Biology Program, North Carolina State University, Raleigh, NC 27695-7646, USA (JS, NPG, and CSD); Division of Wildlife Management, North Carolina Wildlife Resources Commission, Pittsboro, NC 27312, USA (CO)*

In North Carolina, American black bear (*Ursus americanus*) populations occupy 60% of the state and their range continues to expand. Additionally, the human population in North Carolina has increased and growth continues unabated. Humans and black bears are now living in greater proximity to each other, resulting in increased human-bear interactions and some areas of the state may have reached or exceeded the social carrying capacity. In several of these areas, population management options appear limited, as hunting is often restricted in residential and urban developments. We used Global Positioning System technology with fine-scale locational data on black bears in Asheville, North Carolina to address questions about whether urban areas function as a source or sink for bear populations; to what extent do bears use urban areas; and if bears in urban areas are vulnerable to harvest. A total of 91% (87/96) of GPS-collared bears had $\geq$ 5% (range: 5 – 92%) of their locations inside the Asheville city limits. Forty-one percent (11/27) of juvenile bears dispersed from the city limits, and survival of dispersing juvenile bears was low ($\phi$ = 0.23, SE = 0.14). Overall, 28% (40/141) of study animals died with primary causes of mortality coming from collision with vehicles and legal harvest. Lastly, 82% (14/17) and 46% (6/13) of adult females produced 38 cubs ( $\bar{x}$ = 2.2) and 11 cubs ( $\bar{x}$ = 0.8) in 2015 and 2016, respectively. Surprisingly, we documented consistent juvenile female reproduction with 80% (4/5) and 75% (3/4) of females producing 7 cubs ( $\bar{x}$ = 1.4) and 5 cubs ( $\bar{x}$ = 1.3) in 2015 and 2016, respectively. In both years, approximately 30% (15/46) of den sites were located inside the city limits. Ultimately, the results from this project will be used to develop science-based management strategies for bear populations in North Carolina.

**ORGANOCHLORIDE PESTICIDES PRESENT IN ANIMAL FUR, SOIL, AND STREAMBED IN AN AGRICULTURAL REGION OF SOUTHEASTERN ARKANSAS**

Matthew E. Grilliot, John L. Hunt, and Christopher G. *Sims. Auburn University—Montgomery, Biology Department, College of Arts and Sciences, P.O. Box 244023, Montgomery, AL 36124 (MEG); University of Arkansas at Monticello, School of Mathematical and Natural Sciences, 397 University Drive, Monticello, AR 71656 (JLH and CGS)*

Animals in agricultural settings may be subject to bioaccumulation of toxins. For the last several years, we have been collecting hair samples from bats and rodents in an agricultural area near Bayou Bartholomew in Drew County, Arkansas. Several of these samples have contained measurable amounts of organochloride pesticides or their metabolites, including some that have been banned for decades, such as dichlorodiphenyltrichloroethane (DDT) and chlordane. During the last year, we collected more hair samples from mammals for testing. In addition, we collected several samples of soil from within an agricultural field, in adjacent edge habitat, along the bank of the Bayou, and from the bed of the Bayou itself. Although none of the samples from this year tested positive for DDT or chlordane, all of the samples except one contained measurable amounts of metabolites from these pesticides. This study raises questions about environmental persistence of DDT/DDE and other organochlorides. There may be risk to wildlife populations, warranting further investigation into effects of long-term exposure to these toxins.

**PECULIAR ROOSTS OF NORTHERN LONG-EARED BATS**

Kristina R Hammond and Timothy Sichmeller. *Western EcoSystems Technology Inc. (WEST, Inc.), Cheyenne, WY 82001 (KRH and TS)*

With the spread of white-nose syndrome (WNS) populations of some bat species have declined, including the northern long-eared bat (NLEB; *Myotis septentrionalis*), which led to the species being listed as federally Threatened in 2015. Prior to the spread of WNS, our understanding of the roosting ecology of the NLEB was relatively limited. Available studies indicated that, unlike the Indiana bat, the northern long-eared bat appeared to be a generalist in roost selection, using a greater variety of roost types and sizes. Since the federal listing in 2015 and the spread of WNS, the understanding of NLEB roosting ecology has expanded as additional research studies and presence/absence studies have been conducted. To supplement the general knowledge of roost types and characteristics that NLEB may utilize, we present examples of peculiar NLEB roosts that that we have observed NLEB to use.

**EXPERIMENTAL TESTING OF THE IMPACT OF ENVIRONMENTAL CLUTTER ON THE ACOUSTIC DETECTION OF BATS**

D. Hakkenberg*, M.J. Shirazi, N.Abaid, W.M. Ford, and A. Silvis. *Patrick Henry High School, Roanoke, VA (DH); Department of Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, VA 24061 (MJS and NA); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blackburg, VA 24061 (WMF); Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061 (AS)*

Acoustic detection of bats is a relatively easy and inexpensive method of determining the presence of bats on a landscape, and now an essential monitoring tool since White-nose Syndrome in the East has decimated populations of many species and rendered mist-net capture difficult. Although past research has identified the relationship of proximity to water on occupancy estimates, little is known about the impact of environmental clutter on the detection. Knowing more about how clutter changes detection probabilities is necessary as acoustic sampling protocols are increasingly used for monitoring. In this study, we conducted an experiment to test the impact of environmental clutter on the acoustic detection of bat calls using sounds generated by a custom ultrasonic emitter and recorded using ultrasonic microphones in an anechoic chamber. The generated sounds were both frequency-modulated chirps and idealized calls from several species of bats whereas the clutter consisted of various ensembles of wooden cylinders designed to mimic tree trunks. We varied the density and basal area of clutter in a modular experimental apparatus and recorded echoes in microphones positioned throughout the chamber. Herein, we describe the laboratory design and preliminary results.

**POTENTIAL BENEFITS OF REFORESTED AGRICULTURAL RIPARIAN ZONES FOR BAT COMMUNITIES**

M. T. Harris*, H. P. Griscom, and P. M. Ludwig. *Department of Biology, MSC 7801, James Madison University, Harrisonburg, VA 22807*

Bat conservation must occur in multiple habitats beyond national parks and protected forests if the ecosystem services bats provide are to be protected. This project seeks to contribute to our understanding of the efficacy of current conservation practices in mitigating bat habitat loss within agricultural settings. Current research suggests that restored riparian forests within an agricultural matrix provide bat species with improved feeding opportunities and act as covered corridors between habitats. Our findings will help inform stakeholders and government agencies as to the value of riparian forests established through the Conservation Reserve Enhancement Program (CREP) for promoting bats. Pettersson acoustic detectors will be used to determine if CREP sites (compared to control sites with denuded riparian areas) promote bat diversity and foraging activity within the Shenandoah Valley of Virginia. The species richness and diversity of recorded bats and number of feeding buzzes recorded will be analyzed across treatments. Populations of bat prey, *Coleoptera* and *Lepidoptera*, will be surveyed bimonthly using black-lights to identify if CREP sites promote bat prey in greater quantities than do denuded riparian zones. Transects, 100m- x 20m, will be established at each site and will be surveyed for canopy cover, number of snags, and DBH. It is expected that these characteristics promote bat populations within these riparian zones and will be correlated with increased bat activity, supporting the hypothesis that bat populations are using CREP sites for feeding sources as well as covered corridors. By analyzing multiple aspects of these riparian forests, we will be able to define what specific characteristics of CREP sites are most correlated with increased bat activity and help to inform land managers and government agencies involved with CREP and other riparian projects.

**PROACTIVE ANTI-PREDATOR BEHAVIOR OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) DURING FAWNING SEASON**

S. D. Higdon*, C. A. Diggins, M. J. Cherry, and W. Mark Ford. *School of Natural Resources, University of Missouri - Columbia, 302 Anheuser-Busch Natural Resources Building, Columbia, MO 65211 (SDH); Department of Fish and Wildlife Conservation, Virginia Tech, 310 West Campus Drive, Blacksburg, VA 24061 (CAD and MJC); Virginia Cooperative Fish and Wildlife Unit, 310 West Campus Drive, Blacksburg, VA 24061 (WMF)*

Coyotes (*Canis latrans*) are a novel predator in the southeastern United States and white-tailed deer (*Odocoileus virginianus*) fawns serve as an important food source in the summer months. To understand how deer have adjusted their behavior in response to this threat, we developed a study to evaluate activity patterns of adult female deer with and without fawns in the presence of coyotes. We conducted our study in the Roan Highlands of western North Carolina during June - August 2015. We randomly placed camera traps at 40 grassy bald and forested sites for approximately 78 days. We determined sex and age for all photos of deer. We plotted coyote activity patterns with activity patterns for does with fawns and does without fawns using the date and time stamp available on all camera trap images. Coyotes were strongly crepuscular and does without fawns overlapped with them the majority of the time (dhat = 0.717). Does with fawns were primarily active during the day, effectively avoiding the times during which coyotes were most active (dhat = 0.385). The presence of fawns created a significant difference in doe activity overlap with coyotes. Few studies demonstrate that coyotes induce behavioral modifications in their prey. We offer evidence that female deer with fawns adjust their activity budgets to avoid interactions with coyotes.

**SEXUAL SIZE DIMORPHISM IN THE THIRTEEN-LINED GROUND SQUIRREL (*ICTIDOMYS TRIDECEMLINEATUS*)**

John L. Hunt, E. Gus Cothran, and Troy L. Best. *University of Arkansas at Monticello, School of Mathematical and Natural Sciences, 397 University Drive, Monticello, AR 71656 (JLH); Department of Veterinary Integrative Biosciences, College of Veterinary and Biomedical Sciences, Texas A&M University, College Station, TX (EGC); Department of Biological Sciences, College of Science and Mathematics, Auburn University, Auburn, AL (TLB)*

We evaluated *Ictidomys tridecemlineatus* for sexual dimorphism by taking 40 skeletal measurements from 267 specimens from Texas, New Mexico, and Oklahoma. Measurements from males and females were compared using discriminant-function analysis with included ANOVAs. Males and females were significantly different overall. Of the nine characters that were significantly different, eight were larger in males, while females had a greater sacrum width. We postulate that sexual selection may be the most likely driver of the slight differences in size between males and females.

**EXTRA LIMIT MATERNITY COLONY OF SOUTHEASTERN MYOTIS IN NORTHEASTERN ALABAMA**

Mattea Lewis* Kaitlyn Rountree, Andrew Edelman, Joe Johnson, and Jonathan Stober

*Department of Biology, University of West Georgia, Carrollton, Georgia (ML, KR, AE), Department of Biological Sciences, Ohio University, Athens, Ohio (JJ), Talladega National Forest, U.S Forest Service, Heflin, Alabama (JS)*

Southeastern myotis (*Myotis austroriparius*) is an insectivorous bat that occurs in bottomland hardwood forest along the coastal plain and Mississippi River from southern Illinois to Florida. Female southeastern myotis form large maternity roosts containing several hundred to 90,000 individuals during the spring and summer months. These maternity roosts are primarily located in caves, but have also been found in tree cavities. In Alabama, only two known maternity roosts for southeastern myotis exist and both are located in caves along the coastal plain. Southeastern myotis are considered a species of highest conservation concern in Alabama and little is known about their distribution and natural history in the state. We discovered a maternity colony of southeastern myotis in the southern Appalachians of northeastern Alabama over a hundred miles outside the known range of this species. The maternity roost was located in a basal cavity of a large tulip popular (*Liriodendron tulipifera*) in upland riparian forest habitat. Over two years, we misted netted for bats at the maternity roost and in the surrounding riparian habitat. A total of 37 adult and juvenile southeastern myotis were captured over two years at the study site. Emergence observations at the maternity roost revealed that several hundred bats were using the roost during the breeding season. In 2016, we radio tagged two pregnant females and an adult male southeastern myotis and tracked their day roost usage. The two females exclusively used the basal hollow maternity roost, whereas the male used small, cavity roost sites. Due to the lack of ecological knowledge of this species, we cannot conclude if the range of southeastern myotis has extended or has previously been undetected in the area. Further research will provide a more conclusive outcome.

**MULTI-SEASON HABITAT OCCUPANCY OF SCIURID POPULATIONS USING CAMERA TRAPS**

K.A. Lipford*, C.A. Diggins, and W.M. Ford. *Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 24061 (KAL); U.S. Geological Survey Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, Virginia, 24061 (CAD, WMF)*

Sciurid species (i.e., squirrels) are typically monitored using traditional methods, such as live trapping or nest boxes. Camera trapping is considered an effective, non-invasive technique for determining occupancy of mammals, however it is typically used on large mammals or carnivores. We used camera traps to determine habitat and landscape variables that influence occupancy of two common Sciurid species in an Appalachian forest: southern flying squirrel (*Glaucomys volans*) and Eastern chipmunk (*Tamias striatus*). We conducted out study in dry upland oak (*Quercus* spp.) and hemlock (*Tsuga canadensis*)-northern hardwood stands on Salt Pond Mountain, Giles County, Virginia. We set-up two 3 x 4 camera trap grids (13.5 ha each). Camera were baited with peanut butter suet and deployed simultaneously in each grid for 14 days in July 2015. Using detection/non-detection data obtained from camera traps, we assessed species occupancy using a two-step approach multi-season model in Program R using package 'unmarked'. We determined which covariates influenced detection (temperature, precipitation, bait, bear [*Ursus americanus*] presence, raccoon [*Procyon lotor*] presence) against the null. We then used ranked relative importance values to assess the predictive strength of occupancy covariates (habitat type, landform index, canopy cover, trees/ha, oaks/ha, snags/ha, ericaceous shrub cover) and modelled all possible combinations (N = 128 models per species). Southern flying squirrels occupancy was not strongly associated with any of the habitat covariates, demonstrating that they are habitat generalists. Eastern chipmunk occupancy was positively associated with ericaceous shrub cover. Our research demonstrates the applicability of camera traps to assess habitat associations of Sciurid species.

**USE OF EARLY SUCCESSIONAL HABITAT BY BATS IN THE SOUTHERN APPALACHIANS: EFFECTS OF PATCH DISPERSION**

Susan C. Loeb and Jonathan D. Brooks. *USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SCL) and Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634 (JDB).*

Early successional habitats (ESH) in the eastern U.S. have been declining over the past several decades and consequently, restoration of ESH in the southern Appalachians is a priority management goal. However, several questions regarding restoration of ESH remain. The objective of this study was to test whether bat activity in ESH patches and the forest matrix between them varied with patch aggregation. Five 0.40 ha patches that were approximately 30 m apart (aggregated) and five 0.40 ha patches that were approximately 60 m apart (dispersed) were cut during spring 2016 on the Nantahala National Forest in northwestern North Carolina. We used Anabat SD2 bat detectors to measure bat activity for 4-5 nights each month from late May through early August 2016 in plot centers, edges, and the forest matrix between plots. All files that contained $\geq$1 bat call were retained as a measure of overall bat activity and files that contained $\geq$ 5 search phase calls were identified using Kaleidoscope Pro v.3.1.8. Overall bat activity and activity of big brown bats (*Eptesicus fuscus*)/silver-haired bats (*Lasionycteris noctivagans*) was significantly greater at dispersed patch edges than aggregated patch edges, but did not differ between dispersed and aggregated patch centers and forest matrix. Red bat (*Lasiurus borealis*)/evening bat (*Nycticeius humeralis*) activity was also significantly greater at dispersed patch edges than aggregated patch edges, but was significantly lower in the forest matrix between dispersed patches. Tricolored bat (*Perimyotis subflavus*) activity was significantly greater in centers of dispersed plots than aggregated plots whereas activity of *Myotis* spp. did not differ between dispersions for any location. Although bats tended to use dispersed patches more than aggregated patches, it is unclear whether this was due to a preference for dispersed plots or an inability to easily move through the forest matrix between dispersed plots.

**MESOPREDATOR USE OF FENCES IN THE INNER BLUEGRASS OF KENTUCKY**

M. M. McKenna*, L. E. Dodd. *Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475*

Mesopredator release and edge effects are both known to contribute to the abundance of mammals across fragmented landscapes. Amidst a fragmented landscape, Kentucky has a variety of fences that mammals may use as pathways, hunting grounds, and cover. We conducted a study at Lower Howard's Creek Nature Preserve in the Inner Bluegrass region of Kentucky to examine mesopredator use of dry stone fences and woven wire fences. Camera traps were deployed across two hay fields from June-August 2016. Cameras were placed 0.5 m above the ground randomly at various distances from the fences, as well as selectively placed adjacent to fences. A total of 71 nights were surveyed over the summer, resulting in 476 trap-nights that yielded 94 images of mammalian activity. We hypothesized that mesopredator activity would be greatest adjacent to fences, as these habitat features would likely be used for foraging and as corridors. We found that mesopredator abundance was greater adjacent to fences (64.1 captures / 100 trap nights) than at randomly sampled sites (4.0 captures / 100 trap nights). Mesopredator activity was greater in June (78.1 captures / 100 trap nights) than July (27.6 captures / 100 trap nights) or August (1.4 captures / 100 trap nights). Woven wire fences had more activity (103.8 capture / 100 trap nights) than dry stone fences (17.2 / 100 trap nights). Mesopredators use the fences at Lower Howard's Creek Nature Preserve; future research will consist of a systematic sampling effort placing cameras both near and away from fences for comparison.

**ACTIVITY OF SENSITIVE *MYOTIS* SPECIES ACROSS A FRAGMENTED LANDSCAPE MANAGED BY THE KENTUCKY ARMY NATIONAL GUARD**

C. E. McNamara* and L. E. Dodd. *Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475*

Bat populations across North America are in decline due to habitat loss and, more recently, the impacts of White-Nose Syndrome. Understanding bat activity across landscapes dominated by non-native vegetation contributes to the success of conservation and management plans, which may increase the amount of suitable habitat for federally-listed species such as *Myotis sodalis* and *Myotis septentrionalis*. Our first-year objective was to develop a list of bat species present at the Wendell H. Ford Regional Training Center in Muhlenburg County, Kentucky. This area was historically mined for coal and is now mainly composed of non-native or invasive vegetation. Wildlife Acoustics SM2BAT+ detectors were deployed at 102 randomly selected sites across the landscape from June to August 2016. Full spectrum analysis was used to automatically assign identifications to the recorded calls. In total, 11,453 passes were recorded. Less than 1% of the passes were identified as either *M. sodalis* or *M. septentrionalis*. Even so, *M. sodalis* and *M. septentrionalis* passes were detected, suggesting that imperiled *Myotis* are likely present on the landscape, but not abundant. Future survey efforts in 2017 will identify habitat characteristics that may influence the distribution of these bats.

**SPATIAL ECOLOGY OF SOUTHERN FLYING SQUIRREL WITHIN RED-COCKADED WOODPECKER CLUSTERS IN EAST-CENTRAL MISSISSIPPI**

Robert T. Meyer*, Scott A. Rush, and Steve Reagan. *Wildlife, Fisheries, and Aquaculture. Mississippi State University, Mississippi State, MS 39762 (RTM and SAR); DOI U.S. Fish and Wildlife Service, Sam D. Hamilton Noxubee National Wildlife Refuge, Brooksville, MS 39739 (SR)*

Southern flying squirrels (*Glaucomys volans*; flying squirrels) are known kleptoparasites on the cavity trees of the endangered red-cockaded woodpecker (*Picoides borealis*; RCW) and can negatively affect the RCW's nest success. The spatial ecology of flying squirrels is largely unknown in the loblolly pine ecosystems they inhabit with RCWs. Understanding how flying squirrels use these pine systems may provide useful incite in conserving RCWs. To understand flying squirrel spatial ecology relative to RCW management, we equipped (n = 13: 8 male; 5 female) flying squirrels with radio-transmitters within and outside of eight randomly selected RCW clusters within mixed hardwood x loblolly pine (*Pinus taeda*) of the Sam D. Hamilton Noxubee National Wildlife Refuge, east-central Mississippi. We tracked flying squirrels throughout the year to determine seasonal variation in home range size and behaviors. Kernel density estimates of home range size differed between sexes ($p = 0.04$) with females occupying smaller home ranges (3.88 ha ± 1.46) than males (8.71 ha ± 3.84). Home range size did not differ between within or outside of RCW cluster areas ($p = 0.86$). Independent of location (within or outside of RCW clusters), total tree density did not affect home range size ($p = 0.24$). Flying squirrel home range size was not related to the ratio of hardwood to pine ($p = 0.42$). These results indicate that flying squirrel home range size depends on sex of the squirrel but is not directly influenced by other environmental factors measured in this study.

**FLYING BETWEEN THE TREES: HOW HABITAT STRUCTURE IN LONGLEAF PINE FORESTS AFFECTS USE BY BATS**

L. H. Moore* and S. M. Hermann. *Department of Biological Sciences, Auburn University, Auburn, AL 36849.*

Overharvesting and fire exclusion resulted in a 97% reduction in acreage of longleaf pine (*Pinus palustris*), affecting many of today's species of conservation concern that once inhabited these expansive communities – including bats. Due to morphological and acoustic requirements of bats to maneuver within habitats, structure of vegetation within a forest influences whether bats use the forest. These requirements vary among species, with some adapted to occupying habitats with relatively thick vegetation and others adapted to occupying habitats with sparse vegetation. Longleaf pine forests experiencing frequent fire develop an open midstory, which may provide ample flight paths for bats. However, use of longleaf pine forests by bats is poorly understood. The goal of this preliminary study was to determine whether structural features of longleaf pine forests affect use by bats. Bats were acoustically recorded in Conecuh National Forest July-August 2016 using Anabat SD1 detectors. Recordings occurred in three categories of habitat based on classifications of the midstory: no midstory, longleaf pine regeneration, and hardwood. Habitat characteristics of the canopy, midstory, and understory were quantified to assess variation in structure. Preliminary results indicate bats select habitats primarily on features of the canopy instead of characteristics of the midstory or understory. There was significantly more activity of bats at sites with taller heights of each tree's lowest limb, indicating increased vertical flight space is important to bats. The results of this preliminary study will help inform subsequent research at Conecuh that aims to evaluate how prescribed burning affects activity of bats due to the influence of burning on forest structure. This subsequent study will provide information to forest managers on how to restore longleaf in a way that simultaneously benefits longleaf and provides optimal habitat for bats.

**HIGH-ELEVATION OBSERVATIONS OF LONG-TAILED WEASEL AND EASTERN CHIPMUNK IN THE SOUTHERN APPALACHAINS**

A. M. Moser*, C. A. Diggins, and W. M. Ford. *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24060 (AMM and CAD); Virginia Cooperative Fish and Wildlife Research Unit, USGS, Blacksburg, VA 24060 (WMF).*

Observations of Long-tailed Weasel (*Mustela frenata*) are rare within the southern Appalachians, while observations of Eastern Chipmunk (*Tamias striatus*) in high-elevation spruce-fir forests are uncommon. We conducted camera trap surveys at Roan Mountain Highlands in Red Spruce (*Picea rubens*) – Fraser Fir (*Abies fraseri*) forest during summer 2016. During the survey, we observed a Long-tailed Weasel at 1893 m in elevation and an Eastern Chipmunk at 1703 m in elevation. These are the highest elevation records for both species in the eastern United States outside of Great Smoky Mountains National Park, and the highest elevation record for Long-tailed Weasel in North Carolina.

**USING AN ECOSYSTEM ENGINEER TO RESTORE FUNCTIONALITY OF NATURAL PINELANDS IN THE SOUTHEASTERN UNITED STATES**

JT Pynne*, S. B. Castleberry, L. M. Conner, E. I. Parsons, J. D. Austen, R. A. Gitzen, S. I. Duncan, and R. A. McCleery. *Warnell School of Forestry and Wildlife Sciences, University of Georgia, 180 E Green St, Athens, GA 30602 (JTP and SBC); Joseph (JTP and LMC); Auburn University, School of Forestry and Wildlife Sciences, 602 Duncan Drive, Auburn, AL 36849 (EIP, JDA, RAG); University of Florida, Gainesville, FL 32611 (SID and RAM).*

The southeastern pocket gopher (*Geomys pinetis*) is a native species to the Natural Pinelands in the southeastern United States. This ecosystem has been targeted for restoration over the past 30 years through prescribed fire and mechanical hardwood removal methods; however, ecosystem engineers, like the pocket gopher, can help restore vital functions to the system such as nutrient cycling, soil aeration, and understory maintenance. Southeastern pocket gophers have been declining throughout their historic range with the primary threats to populations being habitat loss, degradation, and fragmentation. However, little is known about the species' ecology, natural history, current distribution, or population dynamics. Therefore, a multi-state collaborative project is being conducted to develop decision support tools for managing the species, genomic analyses to assess taxonomic designation and genetic connectivity, while also identifying areas for possible translocation. We are currently surveying areas from the pocket gopher range to assess occupancy and habitat suitability. Additionally, we are live trapping the gophers to take tissue samples to assess genetic connectivity and collect morphological data. Range wide surveys are still being conducted. To date, gophers have been present on 30.9% of public lands surveyed with the highest percentages located in the southern portion of the range in Florida.

**APPLYING MOBILE ACOUSTIC SURVEYS TO DISCERN BAT DISTRIBUTION BY LAND USE TYPES**

V. G. Rojas, J. M. O'Keefe, and S. C. Loeb. *Center for Bat Research, Outreach, and Conservation, Indiana State University, Terre Haute, IN 47809 (VGR and JMO); USDA Forest Service, Southern Research Station, Clemson University, Clemson, SC 29634 (SCL)*

Mobile acoustic surveys allow estimates of overall indices of bat activity, relative abundance, and richness across large areas. Stationary acoustic surveys are often efficient and produce long-term data, however mobile acoustic surveys cover larger areas, and provide an index for population size and distribution details across large areas. Our main objectives were to expand our understanding of bat distributions in northeast Tennessee, a mountainous area (457–1487 m) with multiple land uses, and to assess the relative effects of land use on relative abundance of three phonic groups (Low, Mid, *Myotis*). Mobile surveys are more suited to flat terrain but can be adapted to difficult terrain. We established 12 mobile transects (48 km long) in an area spanning 7 counties in northeast Tennessee, surveying each twice per year from June to July 2014–2015. Surveys began 30 minutes after sunset on evenings with optimal weather and were driven at an average speed of 32 kph. To record calls, we used an Anabat SD2 ultrasonic recording device synced to a GPS device with roof-mounted microphone. We used Bat Call Identification (v2.7d) to identify calls to phonic group, followed by visual verification. Detections were mapped using x,y coordinates associated with each call file. We tested for the effects of weather, elevation, and land cover types on bat species richness and density. Preliminary analyses indicate higher relative abundance for the Low frequency bats (43%), followed by Mid (27%), and *Myotis* (5%); 25% of the files were unknown. The majority of call files were in forest, however, dominant land use types in our study regions were Forest (57%), Pasture/Hay (28%), and Developed (12%). Activity levels were as expected with fewer *Myotis* calls on roads, however, higher Low frequency activity in forests may suggest an effect of land use on bat distribution and activity levels.

**REPRODUCTION OF THE NORTH AMERICAN RIVER OTTER IN NORTH CAROLINA**

Charles W. Sanders II*, Christopher S. DePerno, Colleen Olfenbuttel. *Fisheries, Wildlife, & Conservation Biology, College of Natural Resources, NC State University. 2616 Brookwood Dr., Raleigh, NC 27603 (CS), Fisheries, Wildlife, & Conservation Biology, College of Natural Resources, NC State University. Turner House, Box 7646, Raleigh, NC 27695-7646 (CD), Surveys and Research, Wildlife Division, NC Wildlife Resources Commission. 1293 Laurel Bluffs, Pittsboro, NC 27312 (CO)*

The North American River Otter (*Lontra canadensis*) is native to all regions (Coastal, Piedmont, and Mountains) of North Carolina, but was extirpated from the Piedmont and Mountain regions by the end of the 19$^{th}$ century. While otters in the Piedmont recovered naturally, efforts were taken to reintroduce otters to the Mountains in the early to mid-1990s. By 2010, trapping seasons were open to all regions with no special restrictions. Between November 2009 and February 2016, we collected carcasses of harvested river otters from licensed trappers across all regions of North Carolina. We necropsied the collected otters and preserved samples for multiple tests. We used cementum annuli analysis to determine age from the lower canine tooth. We analyzed female reproductive tracts, specifically presence/absence and counts of corpora lutea for an estimation of reproductive rates. Between November 2009 and February 2016, we collected 823 otters including 447 from the Coastal Plain, 54 from the Mountains, and 322 from the Piedmont regions. Harvested otters ranged between ¾ and 12 ¾ years of age. Males comprised 63% of the specimens. Approximately 82% of females displayed active corpora lutea. Our sampled parameters suggest that North Carolina has a healthy and robust otter population throughout the state.

**POST- WHITE-NOSE SYNDROME SUMMER ROOSTING HABITAT USE BY THE TRI-COLORED BAT (*PERIMYOTIS SUBFLAVUS*) IN LAND BETWEEN THE LAKES NATIONAL RECREATION AREA IN KENTUCKY AND TENNESSEE**

K. E. Schaefer* and T. L. Derting. *Biological Science, Murray State University, Murray, KY 42071*

The tri-colored bat (*Perimyotis subflavus*) is undergoing severe declines across its range due to white nose syndrome (WNS). Our objective was to determine distinguishing characteristics of roost trees and habitat used by tri-colored bats so that the species' needs can be considered in management plans. We captured bats at Land Between the Lakes National Recreation Area during the summer of 2015 and 2016. We attached radio transmitters to captured adult bats. We tracked each of 15 bats to its day roost for 1-12 days. Habitat data were collected at 38 roost areas and randomly-selected trees around each roost tree for comparison. Our data showed that tri-colored bats used roost trees within relatively small geographic areas. The greatest distance moved between successive roosts by a bat was 482 m, with average distance between roosts of 86 m. Bats remained within 2.5 km of their original capture site. Tri-colored bats' roost tree selection was nonrandom. Bats were observed roosting in nine different species of tree, with the most commonly-selected species being *Carya tomentosa* and *Quercus alba* (46% and 23% of roost trees, respectively). The most abundant species among the randomly-selected trees were *Q. alba*, which was selected roughly in proportion to its abundance, and *Acer saccharum*, which was never selected as a roost. In contrast with some declining bat species, all roosting tri-colored bats were located in the foliage of live trees. A generalized linear model on all variables measured showed that increasing tree crown depth, increasing distance from roads, and increasing basal area of trees were correlated with roost tree use. A model of occupancy using these variables (p-values less than 0.041) has an $R^2$ of 0.3. Our data indicated that management plans for declining bat species need to take into account specific roosting needs and preferences of tri-colored bats.

**SOUTHEASTERN MYOTIS AND RAFINESQUE'S BIG-EARED BATS MAKE SEASONAL SWITCHES IN THEIR ROOSTING HABITS IN ARKANSAS BOTTOMLANDS**

S. J. Scherman*, T. S. Risch, and V. Rolland. *Department of Biological Sciences, Arkansas State University, Jonesboro, AR 72467 (SJS, TSR, and VR).*

Rafinesque's Big-Eared (*Corynorhinus rafinesquii*; CORA) and Southeastern (*Myotis austroriparius*; MYAU) bats are considered rare across their range. Both species use tree roosts in bottomland forests, but little is known about their roost requirements as seasons change from fall to winter. The objective was to characterize roost trees in both seasons in the Cache River National Wildlife Refuge, Arkansas, one of few remaining tracts of bottomland hardwoods that have not been altered significantly by drainage or channelization. In October-December 2016, we radio-tracked 15 bats (9 CORAs and 6 MYAUs) to their roosting trees daily for up to 14 days. Tree species and cavity type (e.g., volcano vs. chimney tree) were recorded for each confirmed roost tree and its associated random tree. We identified 36 trees, 92% of which were water tupelos, with no seasonal difference. MYAUs did not exhibit specific preferences in either season for tree species or cavity type. However, CORAs were roosting in various tree cavity types in early fall before switching to trees with upper window and volcano openings. This suggests that CORAs anticipate seasonal flooding that could potentially trap them inside the cavity, as the water level frequently reaches above the top of basal cavities. Additionally, the distance between consecutive roosts of each tracked individual became shorter as the season progressed, which may coincide with changing priorities from foraging to mating or simply maintaining homeostatic balance (drink, urinate, relocate, etc.). Future analyses will focus on the microclimate of seasonal roosting cavities, emergence patterns, and colony composition.

**MORE REFERENCE RECORDINGS DECREASES, RATHER THAN INCREASES, ACOUSTIC CLASSIFICATION PERFORMANCE OF *MYOTIS SODALIS* AND *M. LUCIFUGUS***

Joseph M. Szewczak, John D. Chenger, and Janet D. Tyburec

*Humboldt State University, Arcata, USA (JS); Bat Conservation and Management, Inc., Carlisle, USA (JC); Bat Survey Solutions, LLC, Tucson, USA (JT)*

Initial attempts to use recordings from species-known tracked bats to identify *Myotis sodalis* and distinguish it from the acoustically similar congener *M. lucifugus* indicated some acoustically distinct parts of their respective call repertoires. This encouraged continued tracking and recording of these species in hope that a larger data set would strengthen the statistical difference between their echolocation calls and provide more robust classification. Instead, additional data filled in parts of the data space previously reserved to the other species and vice versa. This implied that apparent classification success between these species might result from the stochasticity of the data used to base a classifier. To investigate this, we used a set of 10,955 species-known call samples recorded from tracked individuals in twelve states across its range. We randomly selected sets from 614 to 10,005 call samples to build and test classification performance using both the full SonoBat version 4 time-frequency and

time-amplitude parameters and Analook-equivalent time-frequency parameters. Classification performance ranged from 95.0–69.9% correct using the full SonoBat parameter sets and from 88.6–56.9% correct for the Analook-equivalent parameter sets. Both approaches revealed greater range of performance for smaller data sets, a downward trend in classification performance with larger data sets, and both extrapolated to a meaningless 50% correct performance near 21,000 calls. This indicates that these species may make similar flight and foraging maneuvers requiring calls having similar solutions to the task at hand, and that any single call or sequence cannot identify these species definitively.

**TEMPORAL AVOIDANCE AND ACTIVTY SHIFTS OF SYMPATRIC MESOCARNIVORES IN THE CENTRAL APPALACHIANS**

Emily D. Thorne* and W. Mark Ford. *Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA (EDT); U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Unit, Blacksburg, VA (WMF*)

Identification of factors that influence species distributions and regulation of community assemblages is important for conservation and management. In mesocarnivore communities, interspecific interactions may be explained by separation in resource use and variation in behavioral responses when the same resources are utilized by similar species. We investigated ecological and environmental factors that impact spatial and temporal overlap among six sympatric mesocarnivore species: coyotes (*Canas latrans*), bobcats (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), and eastern spotted skunks *(Spilogale putorius*) in the Appalachian region of western Virginia. We utilized a detection/non-detection sampling method using baited camera trap data from January to May 2014 and 2015 to 1) assess probability of site use by each species based on landscape characteristics extracted from geographic information systems to 1) investigate the potential for temporal separation among each species and 2) assess shifts in activity periods influenced by carnivore co-occurrence using kernel density estimates on circular data. Results from this study provide insight into the factors that facilitate coexistence of species within the mesocarnivore guild and improve the effectiveness of conservation and management of target species.

**IMPROVING BAT SURVEY EFFICIENCY AND OCCUPANCY RESULTS BY USING SIMULTANEOUS CAPTURE AND ACOUSTIC METHODS**

Janet D. Tyburec, John D. Chenger, and Joseph M. Szewczak. *Bat Survey Solutions, LLC, Tucson, USA (JT); Bat Conservation and Management, Inc., Carlisle, USA (JC); Humboldt State University, Arcata, USA (JS)*

All survey methods for bats are biased. Physical capture surveys, using mist nets will over-represent species that: (1) fly close to the ground, (2) have fast, un-maneuverable flight styles, and (3) are common. Passive acoustic surveys, using high-frequency microphones on bat detectors, will over-represent species that have echolocation calls that are: (1) high-amplitude, (2) low-frequency, and (3) unique (i.e., include repertoires that have little overlap with other species in the area). We illustrate the occupancy results of single-survey method efforts using either mist-nets or bat detectors and then compare occupancy results when acoustic and capture efforts are combined simultaneously. Surveys were conducted during the summer of 2016 at survey sites in three distinct geographic locations of the United States: the Southwest (southeastern Arizona), Northwest (extreme northern California), and Midwest (western Kentucky). Total bat species diversity known from each area is based upon decades of work by the authors at these three locations and ranged from 13-21 species. At each location, the completeness of bat surveys using single vs. combined methods was documented using species accumulation models. By combining both acoustic and capture survey methods, simultaneously, time spent in the field to determine the most accurate estimate of species occupancy was reduced by up to 60%. Researchers performing bat surveys will be more efficient and produce more reliable results when capture and acoustic methods are deployed simultaneously.

**THE DISCOVERY OF GRAY BATS (*MYOTIS GRISESCENS*) IN BRIDGES IN WESTERN NORTH CAROLINA**

J. A. Weber, K. L. Caldwell. *North Carolina Wildlife Resources Commission. 1751 Varsity Drive, Raleigh, NC 27606*

In North Carolina, 14 gray bat (*Myotis grisescens*) individuals have been caught in mist nets in three western counties since 2003; however, records of roosting or hibernating gray bats in the state are nonexistent. These infrequent mist net captures have been attributed to the nearby Tennessee population because the species has a large foraging range and because NC is not known to have suitable caves for gray bats. We acoustically detected gray bats during an emergence count at a Buncombe County bridge, which led to the first roosting records of this species in NC. On 19 July, 2016 we extracted one female juvenile gray bat from the bridge to confirm the acoustic detection. On 30 August, 2016 we captured 13 gray bats in mist nets at the bridge and applied radio transmitters to two females. We tracked the tagged bats for 12 days, during which time they foraged over streams 5.2 km to 6.8 km from the bridge and roosted in the bridge every day. We conducted visual surveys at 70 additional bridges and documented six bridges with roosting gray bats in Madison and Yancey Counties. Future work will determine the nature of each roost (e.g., maternity colony, bachelor colony, or transient roost), the approximate size of gray bat colonies in each roost, the period of the year the roost remains occupied, and other roosts and potentially hibernacula in western NC.

**NON-TRADITIONAL PARTNERS TO PRESERVE SPECIES AND PROMOTE SCIENCE LITERACY IN THE NORTH CAROLINA PIEDMONT**

L.A. Zarecky and M.C. Kalcounis-Rueppell. *Greensboro Science Center, Greensboro, NC 27455 (LZ); University of North Carolina at Greensboro, Greensboro, NC (MCKR).*

Accredited zoos and aquariums often partner with academic institutions, government agencies and not-for-profits to broaden the impact of scientific research, conservation outreach and community awareness to preserve various species and habitats. The Greensboro Science Center (GSC), in Greensboro, provides the Piedmont, North Carolina, region with a science education resource, a family attraction, and a conservation and research partner. At the University of North Carolina at Greensboro (UNCG), science outreach is conducted on multiple levels not only benefiting students' abilities to communicate science to the public, but also broadens science participation and enriches the community's knowledge and awareness of science. UNCG and GSC are neighbors and natural partners with similar goals of science discovery and literacy through like-minded goals and cooperative efforts. Our UNCG – GSC collaborative includes an acoustic study that analyzes bat species foraging behaviors below, within, and above the GSC SKYWILD, a 3 acre treetop adventure park within the zoo. SKYWILD contains 60 challenges that range from 12 to 45 feet above the ground. A large central tower platform is central to each challenge, providing access for acoustic equipment to record nightly bat activity. The study will bring awareness of environmental influences on bat conservation and an understanding of how Piedmont bats in an urban setting use the forest canopy to visitors of the GSC. At the same time, the study will contribute to ongoing research on year-round activity of Piedmont bats as part of graduate research projects at UNCG and may contribute as a stationary data collection site for the North Carolina NABat monitoring program.