



2022 North Carolina Congress of Herpetology

May 11-14, virtual via Zoom through Moodle

Wednesday, May 11th

- 12:00 Welcome and opening remarks; ice-breaker questions
- 12:10 Networking via break-out rooms (2-3 sessions, 2-3 minutes each)
- 12:20 **International Wildlife Trafficking Syndicates**
Jason Keith, Special Agent, United States Fish and Wildlife Service
- 12:45 **Herp Conservation & Community: The Duke Forest Herp Community Science Project**
Nicolette Cagle, Duke University
- 1:10 **Developing Conservation Strategies for Salamanders in North Carolina**
Dustin Smith, North Carolina Zoo
- 1:25 Wrap up and additional Q&A
- 7:00 Mentoring/networking opportunities

Thursday, May 12th

- 12:00 Welcome, opening remarks, and networking
- 12:10 **Using Camera Traps and eDNA to Evaluate Bog Turtle Occupancy and Population Status in North Carolina**
Michael Knoerr, Tangled Bank Conservation and Virginia Tech
- 12:35 **Plethodon Populations in Northwestern NC: Historical Site Revisits and Estimates of Population Parameters**
Jon Davenport, Appalachian State University
- 1:00 **Unwanted Herps: Invasive Amphibians and Reptiles in North Carolina**
Jeff Beane, North Carolina State Museum of Natural Sciences

1:25 Wrap up and additional Q&A

7:00 Workshops:

1. **Strike a Pose! Using Trail Cameras to Learn About Cryptic Herps** with Kabryn Mattison, North Carolina Wildlife Resources Commission
2. **Genetic Applications for Species Conservation and Management** with Heather Evans, North Carolina Wildlife Resources Commission
3. **The Value of Occupancy Modeling to Conservation** with Andrew Durso, Florida Gulf Coast University
4. **Using Avenza PDF Mapping App** with John Maerz, University of Georgia

Friday, May 13th

12:00 Welcome, opening remarks, and networking

12:10 **An Exploration of Survey Methodology for the Endemic and Declining Neuse River Waterdog (*Necturus lewisi*)**
Eric Teitsworth, North Carolina State University

12:35 **Tallying Terrapins Along the North Carolina Coast: Using Citizen Scientists to Inform Management**
Sarah Finn, North Carolina Wildlife Resources Commission

1:00 **Hellbender Conservation in North Carolina: Are We Doing Enough?**
Lori Williams, North Carolina Wildlife Resources Commission

1:25 Wrap up and additional Q&A

7:00 Trivia fun night! We will use Kahoot! so be sure to download this app onto your phone; there will be prizes!

Saturday, May 14th

10:00 Welcome, opening remarks, and networking

10:10 **Gray Area: Where to Draw the Line Between Species of Gray Cheeked Salamanders?**
Louisa Collins, Tangled Bank Conservation

10:35 **Assessing Factors That Increase Dusky Gopher Frog (*Rana sevosa*) Larval Performance in Open-canopy Wetlands**
Myles Lance, Western Carolina University

11:00 **StumpCams for Buzztails: Observing Rattlesnake Behavior Using Trail Cameras**
Jeff Hall, North Carolina Wildlife Resources Commission

11:25 **The Auspicious Start Of A Salamander Biologist: An Overview Of E.R. Dunn's Salamander Fieldwork In The Southern Appalachians**
David Beamer, Nash Community College

11:50 Wrap up and additional Q&A

12:00 NC Herp Society Executive Council meeting

Speaker Abstracts

The Auspicious Start Of A Salamander Biologist: An Overview Of E.R. Dunn's Salamander Fieldwork In The Southern Appalachians. David Beamer, Nash Community College

E.R. Dunn's salamander work, particularly his *The Salamanders of the Family Plethodontidae* book transformed the field of salamander biology. Some of Dunn's fieldwork and his reasons for pursuing salamander biology are highlighted in the famous forward from his Plethodontid book. Additional details about his fieldwork, his adventures and the specimens he collected are contained in his correspondences with other herpetologists. I have kindly been provided access to Joe Mitchell's Dunn archive by Susan Walls and I will present some of my findings as they relate to the history of Dunn's specimens. I have reconstructed his field work itineraries, revisited his collection localities and have sequenced specimens representing most of his collections which allow his historical work to be placed in phylogenetic context.

Unwanted Herps: Invasive Amphibians and Reptiles in North Carolina. Jeff Beane, North Carolina State Museum of Natural Sciences

North Carolina has become home to an increasing number of exotic amphibian and reptile species representing varying degrees of invasiveness. Non-native species known to be established and breeding in the state include the red-eared slider (*Trachemys scripta elegans*), Mississippi map turtle (*Graptemys pseudogeographica kohnii*), Mediterranean gecko (*Hemidactylus turcicus*), brown anole (*Anolis sagrei*), and Texas horned lizard (*Phrynosoma cornutum*). Potential invasives that have turned up in the state but that are not (yet) known to have established breeding populations include the greenhouse frog (*Eleutherodactylus planirostris*), Cuban treefrog (*Osteopilus septentrionalis*), Argentine black and white tegu (*Salvator merianae*), Brahminy blindsnake (*Indotyphlops braminus*), and others. I will profile these species and outline partnering efforts between the Museum of Natural Sciences, North Carolina Wildlife Resources Commission, and other entities to document their occurrence and temporal spread, as well as prevent and curtail further arrivals of these and other invasives.

Herp Conservation & Community: The Duke Forest Herp Community Science Project.

Nicolette Cagle, Duke University.

Prior to the 1960s, researchers recorded dozens of herpetofauna species in the Duke Forest, but in recent years, many of those species haven't been found. In 2018, the Duke Forest launched a herp community science program to determine which species still exist in the Duke Forest and to support the Duke Forest's wildlife management goal of maintaining a diverse population of animals native to the Piedmont. This program engages community volunteers to monitor the amphibians and reptiles of the forest, resulting in community-building and data on forest herpetofauna. Learn more about the program and what it has discovered during this presentation by Dr. Nicolette Cagle, the Duke Forest Herp Community Science project's science advisor.

Gray Area: Where to Draw the Line Between Species of Gray Cheeked Salamanders?

Louisa Collins, Tangled Bank Conservation

The Southern Appalachian Mountains harbor the highest known salamander biodiversity including many endemic species. These endemic montane salamanders have limited ranges and are vulnerable to anthropogenically induced habitat shifts. *Plethodon amplus* (the Blue Ridge Gray-Cheeked Salamander) is a North Carolina endemic salamander whose current published range is likely inaccurate due to data deficiencies. *Plethodon amplus* are visually indistinguishable from other Gray-Cheeked Salamanders which occupy adjacent mountain ranges, making it difficult to locate exact boundary lines between species. To re-delineate the range of *P. amplus*, we collected tissue samples from Gray-Cheeked Salamanders from sites surrounding and within *P. amplus*'s known range. We extracted DNA from each tissue sample then amplified and sequenced mtDNA using primers for three protein-coding regions. The results did not indicate clear species boundaries and suggested that there was likely genetic exchange between species in their recent evolutionary history. This study also found evidence to support that current published boundary lines for two of the Gray-Cheeked Salamander species (*P. amplus* and *P. meridianus*) are inaccurate. Future studies using additional mtDNA genes and nuclear DNA genes or next-generation sequencing techniques will be necessary to draw accurate boundary lines between species of Gray-Cheeked Salamanders.

Plethodon Populations in Northwestern NC: Historical Site Revisits and Estimates of Population Parameters.

Jon Davenport, Appalachian State University

With amphibian declines reported globally, it is important to understand how natural populations of amphibians are persisting in diverse regions. For example, the southern Appalachians harbor high diversity of Plethodontid salamanders with many endemic species. However, population estimates are missing for many of these species especially in the northwestern region of North Carolina. To remedy this, my research lab has revisited some historical sites in the region to understand how salamander populations may have changed. We also provide some of the first population estimates of endemic species to the region and present this data in the context of ecosystem dynamics.

Tallying Terrapins Along the North Carolina Coast: Using Citizen Scientists to Inform Management.

Sarah Finn, North Carolina Wildlife Resources Commission; Hope Sutton and Elizabeth Pinnix, North Carolina Coastal Reserve and National Estuarine Research Reserve

The Terrapin Tally, a citizen science project led by the NC Coastal Reserve and NC Wildlife Resources Commission, has collected head-count data around Masonboro Island Reserve since 2014. After a brief hiatus in 2020, the Terrapin Tally was expanded in 2021 to 10 new sites in addition to Masonboro Island, extending the project to 6 counties and a total of 39 mapped kayak routes. Several new partners were added to the project for coordinating terrapin head-count surveys and over 200 volunteers were trained in 2021. The goal of the project is to identify terrapin hot spots that may be important for further study and management. Using head-count surveys has proven to be an effective method of rapid-assessment of terrapin relative abundance. A recent amendment to the Blue Crab Fishery Management Plan allows the NC Division of Marine Fisheries to designate areas of high terrapin abundance as Diamondback Terrapin Management Areas (DTMAs), requiring bycatch reduction devices (BRDs) to be used on blue crab pots within these designated areas. Data from the Terrapin Tally was used to inform one of the first two pilot DTMAs, Masonboro Island DTMA. With continued annual surveys and expanded geographic coverage of the Terrapin Tally, we hope the data will be used to designate future DTMAs in North Carolina.

StumpCams for Buzztails: Observing Rattlesnake Behavior Using Trail Cameras. Jeff Hall, North Carolina Wildlife Resources Commission

Trail cameras, or camera traps, are being used more and more for reptile and amphibian work. Deployed at several different sites across North Carolina, I have used trail cameras to “capture” several different snake species, including species of conservation concern such as Eastern Coachwhip, Timber Rattlesnake, and Eastern Diamondback Rattlesnake. There are challenges to using trail cameras with snakes, and I will explore these during the presentation. However, the rewards can be high, and I will present several interesting behaviors observed using cameras. As methods are further improved, this survey tool continues to offer significant added value to the toolbox for herp conservation.

International Wildlife Trafficking Syndicates. Jason Keith, Special Agent, United States Fish and Wildlife Service

A case study examining the successful identification, targeting, dismantling and federal prosecution of transnational criminal syndicates actively engaged in the high level domestic and international trafficking of wildlife. This will include a brief examination of syndicate structures, wildlife values, sentencings etc.

Using Camera Traps and eDNA to Evaluate Bog Turtle Occupancy and Population Status in North Carolina. Michael Knoerr, Tangled Bank Conservation and Virginia Tech; Kyle Barrett, Clemson University; William Sutton, Tennessee State University; Gabrielle Graeter, North Carolina Wildlife Resources Commission; Susan Cameron, United States Fish and Wildlife Service; and JJ Apodaca, Tangled Bank Conservation

Applying effective conservation strategies for endangered species depends on a reasonable understanding of their distribution on the landscape. Significant data gaps exist in the known distribution of bog turtles (*Glyptemys muhlenbergii*) in the southern portion of the species range (VA, NC, TN, GA, and SC). Many potential and historically occupied sites have either never been surveyed or not surveyed adequately by trained biologists. This is in part because conventional means for detecting bog turtles (visual surveys, probing, and trapping) are logistically, temporally, and financially intensive and require a high level of expertise. In 2021 we ran an experiment that evaluated two novel methods (eDNA and camera traps) for detecting bog turtles. This work took place in 11 occupied NC sites of variable turtle abundance and density. Occupancy was validated at each of the 11 sites using both techniques. Camera traps also provided insight into relative abundance, recruitment, activity periods, and high-use areas within the wetlands. It appears that these techniques greatly expand our capacity to understand bog turtle distribution and status. We anticipate that one or both methods will be used to evaluate dozens of bog turtle sites annually in the years to come. These techniques also hold promise for other cryptic species that live shallowly inundated wetlands such as spotted turtles (*Clemmys guttata*), gopher frogs (*Lithobates capito*) and southern bog lemmings (*Synaptomys cooperi*).

Assessing Factors That Increase Dusky Gopher Frog (*Rana sevosa*) Larval Performance in Open-canopy Wetlands. Myles Lance, Western Carolina University

The federally endangered dusky gopher frog, *Rana sevosa*, is one of the most imperiled amphibians in the United States. Dusky gopher frogs have higher larval survival and growth in open-canopy wetlands as opposed to closed-canopy wetlands. However, the exact mechanisms of performance increase are poorly understood. I conducted a complete factorial experiment with dusky gopher frog larvae in outdoor mesocosms to compare the relative strengths of several factors expected to differ between open-canopy and closed-canopy wetlands. This work contributes to basic

knowledge of tadpole ecology and also informs critical management decisions regarding the recovery of the dusky gopher frog.

Developing Conservation Strategies for Salamanders in North Carolina. Dustin Smith, North Carolina Zoo

Having the most salamanders in the Solar System, comes with a lot of responsibility. Although many of the 60+ species of salamander in North Carolina are not listed under a threat status, over a dozen species are listed as endangered, threatened, or species of special concern, in North Carolina. In an effort to conserve rare species, and to keep common species common for future generations, the North Carolina Zoo is working with a variety of native salamander species to determine the best reproductive strategies to help guide future potential conservation efforts. Working with partners from Mississippi State University, using ART (assisted reproduction technologies), we are developing a variety of strategies for future success.

An Exploration of Survey Methodology for the Endemic and Declining Neuse River Waterdog (*Necturus lewisi*). Eric Teitsworth, North Carolina State University; Andrew Glen, North Carolina Wildlife Resources Commission; Michael Walter, North Carolina Wildlife Resources Commission; Jennifer Archambault, United States Fish and Wildlife Service; Jeff Humphries, North Carolina Wildlife Resources Commission; Krishna Pacifici, North Carolina State University

Whether as a mascot or a legal hurdle, the Neuse River Waterdog (*Necturus lewisi*) has received considerable attention since its addition to the Endangered Species Act in June 2021. Managers and private interests alike require accurate and up-to-date assessment of its distribution to adhere to new regulations and guide conservation efforts. Yet, monitoring waterdog distribution is challenging because they are patchily distributed amongst instream microhabitats and their activity patterns vary temporally. Because of its federally-listed status as threatened, managers must request surveys more often to help evaluate whether development projects will affect the species. The survey method recommended and traditionally considered most effective in determining presence is baited minnow trapping during winter months when waterdogs are most active. Our objective was to evaluate the effectiveness of alternative survey methods that may accommodate project time constraints. During 2021, we tested the efficacy of minnow trapping in months with lower waterdog activity, targeted snorkel surveys, and leaf-litter trapping surveys at a subset of locations, which were compared to our primary winter minnow trapping surveys. Minnow trapping during low activity months (Apr.-Oct.) yielded no detections at a location with known presence and recruitment. Snorkeling surveys during the summer months resulted in lower presumed presence and fewer total detections than did winter minnow trapping at the same locations. Leaf-litter trapping year-round was effective at detecting juveniles, but with much higher effort than minnow trapping. Surveys performed in winter with minnow traps still appear to be the most effective at documenting Neuse River Waterdog presence, however additional research may highlight situational uses for the alternative methods explored.

Hellbender Conservation in North Carolina: Are We Doing Enough? Lori Williams, North Carolina Wildlife Resources Commission.

Whether philosophical or practical, the question of "are we doing enough?" to conserve Eastern Hellbenders in North Carolina warrants discussion. For over 15 years, the North Carolina Wildlife Resources Commission, partners, collaborators, and volunteers have amassed a wealth of data and tackled a growing number of research needs, yet so much remains unanswered and unaddressed. I will present a brief look back at the history of hellbender conservation work in the state, such as inventory and monitoring surveys (including eDNA), disease surveillance, public outreach efforts, captive breeding, habitat restoration and augmentation, and numerous research

projects. Finally, I will outline the most pressing needs going forward to help ensure the long-term survival of our North Carolina populations.