Proceedings

62nd Southern Forest Insect Work Conference

Cover Graphic by Ashleigh Hillen, Virginia Tech

July 25 – 27, 2023
Sheraton Raleigh Hotel
Raleigh, North Carolina

PROCEEDINGS

62nd Annual

SOUTHERN FOREST INSECT WORK CONFERENCE

Sheraton Raleigh Hotel

Raleigh, North Carolina

25–27 July 2023

Jessica Harthorn and Scott Salom, Program Chairs

Robert Jetton and Kelly Oten, Local Arrangements

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Registration List, 62nd SFIWC, Raleigh, North Carolina

* = student, † = retired, # = remote

Olivia Andrews*#
Carissa Aoki
Marcelo Ardón
Chris Asaro
Matthew P Ayres
Jordan Bailey
Brittany Barnes
Mohammad Bataineh
David Bechtel
Crystal Bishop
Alexandra Blevins
Andrew J Boone†
Zachary Bragg*
Emma Briggs*
Lori Chamberlin
Predeesh Chandran
Stephen R Clarke†
Natalie Clay
Robert N Coulson
David R Coyle
Katy Crout
Katlin DeWitt
Neil (Royce) Dingley*
Miriam Edelkind-Vealey*
Jeffrey M Eickwort
Rhys Eshleman*
Christine Favorito
Michael Ferro
Christine Fortuin
Kamal J K Gandhi
Ben Gochnour*
Demian Gomez
Lauren Gonzalez*
Mitchell Green*
Denita Hadziabdic-Guerry
Jessica Hartshorn
Christopher Hayes
Brian Heath
Hanusia Higgins*
Kristin Hilborn*
Ashleigh Hillen*
Hannah Hollowell
Jaesoon Hwang
David Jenkins
Robert Jetton
Crawford "Wood" Johnson
Todd Johnson
Michelle Kirchner*
Emily Klein*
Kier D Klepzig
Morgan Knutsen*
Frank Koch
Jonathan Kressuk*
David L Kulhavy
Vasiliy Lakoba
F Wayne Langston
Simone Lim-Hing*
Matthew Longmire*
Marina Lupu*
Julia Luyk*
Matt Marsh
Bud Mayfield
Kristy McAndrew*
Elise McDonald*
James R Meeker
Colton Meinecke*
Paul Merten
Robert Meyer
Dan Miller
Jim Moeller
Isabel Munck#
Holly Munro
Ryan Nadel
Ourania Nikolaidis*
John Nowak
Rabiu Olatinwo
Kelly Oten
James Forest Palmer
Kevin Potter
Carrie Preston*
Robert Progar
Abigail Ratcliff
James "Rusty" Rhea
Lynne K Rieske-Kinney
Dieter Rudolph
Scott M Salom
Ashley Schulz
Delaney Serpan*
Robert Setter
Prabina Sharma*
Thomas Sheehan
William P Shepherd
Timothy Shively*
Laura Sims
James Slye
Kenna Smith
Lawrence Allen Smith
Courtney Smith Johnson*
Clyde Sorenson
Serenity Stueve*
Brian T Sullivan
Andrew Tait
Damilola Taiwo*
Gabriel Tigreros*
Robert Trickel†
Caterina Villari
Kendra Wagner
Mary Wallace*
Margot Wallston
Greg Wiggins
Casey Wofford*

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34 students, 3 retirees, and 74 professional members = 111 registered participants

SFIWC 2023 Group Pictures

Figure 1
Front Row (left to right): Christine Favorito, Emma Briggs, Nia Nikolaidis, Greg Wiggins, Demian Gomez, Katlin DeWitt
Back Row (left to right): Allen Smith, Dan Miller, Royce Dingley, Andy Boone, Jim Meeker, Todd Johnson

Figure 2
Front Row (left to right): Scott Salom, Jess Hartshorn, Caterina Villari, Hanusia Higgins, Holly Munro, Kamal Gandhi
Back Row (left to right): Prabina Sharma, Forest Palmer, Morgan Knutsen, Jeffrey Eickwort, Zachary Bragg, Mary Wallace, Robert Trickel

Figure 3
Front Row (left to right): Hannah Hollowell, Lori Chamberlin, Lynne Rieske-Kinney, Natalie Clay, Kendra Wagner, Ben Gochnour
Back Row (left to right): Ryan Nadel, Robert Coulson,Chris Asaro, Dave Coyle, Kier Klepzig, John Nowak

Figure 4
Front Row (left to right): Frank Koch, Elise McDonald, Mitchell Green, Kenna Smith, Alexandra Blevins, David Kulhavy
Back Row (left to right): Robert Setter, Rusty Rhea, Jim Slye, Kelly Oten, David Jenkins, Dan Miller, Brian Sullivan, Ashley Schulz

Figure 5
Front Row (left to right): Casey Wofford, Serenity Stueve, [Robert Jetton], Kristin Hilborn, Delaney Serpan, Abby Ratcliff, Lauren Gonzalez
Back Row (left to right): Paul Merten, Courtney Johnson, Jon Kressuk, Emily Klein, Will Shepherd, Robert Meyer, Tom Sheehan

Figure 6
Front Row (left to right): Brittany Barnes, David Bechtel, Simone Lim-Hing, Carrie Preston, Rhys Eshleman, Julia Luyk
Back Row (left to right): Bud Mayfield, Demian Gomez, Ashleigh Hillen, Tim Shively, Margot Wallston

Figure 7
Front Row (left to right): Gabriel Tigreros, Kristy McAndrew, Damilola Taiwo, Katy Crout, Jordan Bailey, Crystal Bishop
Back Row (left to right): Matthew Longmire, Rabiu Olatinwo, Wood Johnson, Jim Moeller, Wayne Langston, Brian Heath

Attendees not pictured: Olivia Andrews, Carissa Aoki, Marcelo Ardón, Matt Ayres, Mohammad Bataineh, Predeesh Chandran, Steve Clarke, Miriam Edelkind-Vealey, Mike Ferro, Christine Fortuin, Denita Hadziabdic Guerry, Chris Hayes, Jaesoon Hwang, Michelle Kirchner, Vasiliy Lakoba, Marina Lupu, Matt Marsh, Colton Meinecke, Isabel Munck, Kevin Potter, Robert Progar, Dieter Rudolph, Laura Sims, Clyde Sorenson, Andy Tait

62nd Annual Southern Forest Insect Work Conference
July 25 – 27, 2023
Raleigh, NC
Program

Tuesday, July 25th — **Location**

8:00 – 10:00 Meeting Registration — **Esplanade**
Organizer: *Will Shepherd, USDA-FS-SRS*

8:00 – 9:30 Southern Pine Beetle Working Group — **Oak Forest A**
Organizer: *John Nowak, USDA-FS-FHP*

- **Introduction** - John Nowak, USFS, Asheville, NC
- **Current Status of SPB Pineville Field Office Zone/Asheville Field Office Zone -** Jim Meeker/ Paul Merten, USFS
- **Current Research Topics on SPB -** Brian Sullivan, USFS
- **SPB Prediction Model Updates** - Matt Ayres and Carissa Aoki, Dartmouth College
- **SPB Prevention Program in Florida** - Jeff Eickwort, FLDACS
- **When does prescribed burn reduce Southern pine beetle (*Dendroctonus frontalis* Zimmermann) spot incidence? A case study from the Bienville and Homochitto National Forests in Mississippi.** Chris Kuetsinya, Manoj Pandey, Jess McKenny, Jim Meeker, Chris Steiner, Tim Scholwalter, T.D. Johnson (Presenting).

9:00 – 10:00 Roger F. Anderson Award Committee
Governor's I
Organizer: *Lynne Rieske-Kinney, University of Kentucky*

10:00 – 11:00 A.D. Hopkins Award Committee — **Governor's I**
Organizer: *Stephen Clarke, USFS (Retired)*

10:45 – 12:00 Southeast Needle Blight Working Group — **Oak Forest A**
Organizer: *John Riggins, Mississippi State University*

11:00 – 12:00 Executive Committee Meeting — **Governor's I**
Organizer: *Lynne Rieske-Kinney, University of Kentucky*

12:00 – 1:00 LUNCH

1:00 – 1:15 **Welcome Address** **Oak Forest A**
Presenter: *NC Senator Sydney Batch*

1:15 – 2:00 **Opening Business Meeting** **Oak Forest A**
Organizer: *Lynne K. Rieske-Kinney, University of Kentucky*

2:00 – 2:30 **Keynote Address** **Oak Forest A**
Ghost forests as symbols of climate change and resilience, Marcelo Ardón, *North Carolina State University*

2:30 – 3:00 **Plenary Session I** **Oak Forest A**
What is Forest Health? *Andrew Tait*, *Co-Executive/Forestry Director, EcoForesters*

3:00 – 3:30 **Plenary Session II** **Oak Forest A**
Forest Health: It takes a village. *Lori Chamberlin, Forest Health Program Manager, VA Dept of Forestry*

3:30 – 4:15 **BREAK / GROUP PHOTOS** **Esplanade**

4:15 – 5:00 **AD Hopkins Presentation** **Oak Forest A**
A privileged first observer of marvelous things. *Brian Sullivan, US Forest Service*

5:30 – 6:00 **Poster Set-up** **Oak Forest B**
Organizer: *Forest Palmer, Clemson University*

6:00 – 7:00 **Mixer and Reception** **Esplanade**

8:00 – 11:00 **Insect Light Sheeting** **Lake Raleigh**
Organizers: *Tom Sheehan, Jones Center at Ichauway; Michelle Kirchner, NCSU*
Please contact Tom at 630-430-8645 if you are interested in attending

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8:00 – 8:30 Meeting Registration **Esplanade**

Organizer: *Will Shepherd, USDA-FS-SRS*

8:30 – 10:00 Graduate Student Session **Oak Forest A**

Organizers: *Ashley Schulz, Mississippi State University; Kristin Hilborn, North Carolina State University; Damilola Taiwo, Mississippi State University; Prabina Sharma, Clemson University*

- **Preserving the spice: Determining the insect diversity and community composition of northern spicebush.** Matthew Longmire (Ph.D.),[1,4] Jerome Grant,[1] Mark Windham,[1] Alan Windham,[2] Albert Mayfield,[3] and Qiusheng Wu[1]. [1]University of Tennessee, Knoxville, TN; [2]University of Tennessee, Nashville, TN; [3]USDA - Forest Service, Asheville, NC.

  [**Abstract:** A native shrub with ecological and cultural significance, *Lindera benzoin* (L.) Blume (northern spicebush), is currently in danger due to laurel wilt (LW), a fungal disease caused by an invasive pathogen, *Harringtonia lauricola* sp. nov. This pathogen has spread across the southeastern U.S. for two decades on several species of Lauraceae. Recently, spicebush was confirmed to be susceptible to LW in a natural setting in several states, including Tennessee. Two dozen counties across Tennessee have been confirmed to have LW, including several in East Tennessee. While these infections have been primarily found on sassafras, there is concern that LW will begin infecting spicebush in areas where these two laurel species overlap as LW continues to spread throughout the state. It is unclear what impact the loss of spicebush may have, especially as it relates to insect communities. Few studies have focused on how LW will influence Tennessee forests, and there is no comprehensive study of insects associated with spicebush. Some species, such as larvae of *Papilio troilus* L. (spicebush swallowtails), feed almost exclusively on spicebush or sassafras. Other insects may also exhibit a specialized dependence on spicebush. Because no treatment for LW currently exists, it has the potential to spread throughout the native range of spicebush. If spicebush is lost due to LW, it is critical to have basic knowledge of associated insects to gauge which species may become threatened, endangered, or even locally or regionally extinct. A multi-year study was initiated in East Tennessee designed to determine insect diversity and community composition on spicebush. So far, several observed native insect species, such as spicebush swallowtail and *Neolasioptera linderae* (a gall midge), were determined to rely on spicebush. While some species did not directly feed on spicebush, they were found to be dependent on spicebush for shelter. The spread of LW could result in the loss of these native species. Spicebush is important to the overall health and diversity of East Tennessee forests, especially to insect and bird communities. This research seeks to inform conservation efforts of native insects associated with spicebush.]

- **Developing a comprehensive restoration plan for sites invaded by tree-of-heaven and treated with the biocontrol agent *Verticillium nonalfalfae.*** Timothy J. Shively (Ph.D.)[1], Jacob N. Barney[1], J. Leighton Reid[1], Anton B. Baudoin[1], Scott M. Salom[2], [1]Virginia Tech, School of Plant and Environmental Sciences, Blacksburg, VA, [2]Virginia Tech, Department of Entomology, Blacksburg, VA.

  [**Abstract:** *Ailanthus altissima* (tree-of-heaven, or TOH) is a widespread invasive tree that displaces native vegetation, decreases biodiversity, and provides habitat to the invasive insect *Lycorma delicatula* (spotted lanternfly). TOH is susceptible to the vascular wilt fungus *Verticillium nonalfalfae*,

which has been petitioned for federal approval as a commercially available biological control agent. TOH is problematic in forests, disturbed areas, and edge habitats that are frequently occupied by several nonnative species, so using the bioherbicide to treat and remove only TOH may lead to proliferation of other invasive plants. Six TOH stands located around Virginia were treated with *V. nonalfalfae* in 2017, and six more sites were established in 2022 for continued study of the bioherbicide. TOH mortality was extensive over the five interim years following the 2017 treatment. Vegetative surveys were then conducted in both the treatment and control plots from 2017 in addition to the 2022 controls. In the understory, overall species richness decreased after treatment. More specifically, the richness of native herbaceous species was reduced by 29%, and their diversity declined by 34%. Meanwhile, nonnative woody species saw a moderate decline in richness, while observations of nonnative trees in the understory were limited to TOH and a single instance of *Pyrus calleryana* (callery pear). Site-specific context will be important for treating and restoring sites invaded by TOH, and individual surveys that assess the number and prevalence of co-occurring species will be vital to successful implementation. Planting of aggressive or fast-growing native species along with mitigation of invasive herbaceous species may be necessary to achieve a holistic approach. Future work will focus on comparing natural regeneration to an active restoration treatment that was installed in 2023 to develop practical guidelines for managing TOH with the bioherbicide and returning sites to a native plant community.]

- **Exploring RNAi-mediated disruption of olfaction for suppressing *Ips calligraphus* populations.** Mary Wallace (Ph.D.) and Lynne K. Rieske. Department of Entomology, University of Kentucky.

[**Abstract:** Like other bark beetles, *Ips calligraphus* exploits disturbance conditions like droughts and storms to rapidly expand its population. This relies in part on their ability to use pheromones and host volatiles to initiate mass attacks on individual trees, overwhelming host defenses and leading to increasingly significant pine mortality. To mitigate the growing severity of these outbreaks, novel technologies like RNA interference (RNAi) are being explored to augment traditional IPM strategies. Our previous work successfully triggered the RNAi pathway in *I. calligraphus*, resulting in significant mortality. However, the versatility of RNAi technology enables the targeting of other genes, potentially allowing for the disruption of those involved in the chemical communication underlying mass attacks. In this study, we sequenced and assembled a *de novo* head transcriptome for pooled male and female *I. calligraphus* adults, then annotated chemosensory genes based on homology to insect entries in the NCBI GenBank database. The transcriptome analysis annotated previously unidentified chemosensory genes in *I. calligraphus*, including 53 olfactory receptors, 21 gustatory receptors, 50 ionotropic receptors, 31 odorant-binding proteins, 5 chemosensory proteins, and 9 sensory neuron membrane proteins. Through additional analyses we were able to classify certain proteins into subclasses and characterize features such as the completeness of the open reading frame and sequence similarity to other scolytines. Furthermore, we identified homologs of olfactory receptors that have previously demonstrated responsiveness to *Ips*-specific odorants (ipsdienol and ipsenol) in the congeneric species *I. typographus*. Ongoing work is focused on using exogenous dsRNA to knockdown the odorant receptor co-receptor (Orco), one of the most conserved chemosensory genes integral to insect olfaction. Adult beetles will ingest dsRNA specifically designed to target Orco mRNA, and will then be assessed for changes in gene expression using quantitative PCR. Using RNAi to target genes involved in the olfactory response of *I. calligraphus* is a promising approach for incorporating gene silencing technology in future management tools. This work is critical to understanding the molecular basis of key sensory processes in *I. calligraphus*, and to assessing the feasibility of targeting these genes as RNAi-based pest management technologies continue to advance.]

- **Optimizing trap type and deployment timing for monitoring baldcypress leafroller. Kristy** M. McAndrew (Ph.D.)[1], Brian T. Sullivan[2], and Samuel F. Ward[1]. [1]Mississippi State University Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology; [2]U.S. Forest Service, USDA, Southern Research Station, Pineville LA.

  [**Abstract:** Forested wetlands are ecologically and economically important ecosystems that support diverse biota and provide a wide range of ecosystem services. Baldcypress leafroller (*Archips goyerana* Kruse) is a native pest that defoliates baldcypress (*Taxodium distichum* (L.) Rich.), a keystone species throughout forested wetlands of the southeastern United States. Outbreaks of baldcypress leafroller (BCLR) have been isolated to Louisiana, where they have caused reduced growth, crown dieback, and tree death. However, spatiotemporal analyses suggest outbreaks are expanding eastward towards Mississippi. Given the possibility of expanding outbreaks, it is important to understand the timing of insect activity, such as the duration of dispersal, and efficacy of different trap types to guide survey efforts. With the help of collaborators, we deployed paired traps, one UNI-trap and one delta trap, baited with synthetic BCLR sex pheromone at ten sites across Mississippi, Florida, Georgia, and North Carolina. We checked traps weekly and quantified (i) differences in number of insects caught per trap type and (ii) the growing degree-days accumulated at the onset, peak, and cessation of the flight period. We hope that optimizing trapping practices for BCLR will improve detection of endemic populations and help identify areas potentially at risk of experiencing outbreaks.]

- **Assessing occurrence of *Harringtonia lauricola*, the causal agent of laurel wilt disease, in sassafras-associated insects.** Morgan Knutsen (Ph.D.) and Lynne K. Rieske. University of Kentucky, Department of Entomology.

  [**Abstract:** Rapid globalization has led to an increase in trade and introduction of non-native species to novel areas. Introduced species can become invasive, causing significant tree mortality, and altering ecosystem function. When the invader in question consists of an endophagous insect-fungal pathogen complex, management difficulties are exacerbated. Laurel wilt disease (LWD) is a lethal vascular disease impacting species within the Lauraceae family, causing tree mortality throughout the southeastern United States. LWD is caused by *Harringtonia lauricola*, the fungal symbiont of the exotic redbay ambrosia beetle (*Xyleborus glabratus* Eichoff) (RAB), which carries fungal propagules phoretically on the exoskeleton or internally in mycangia. LWD continues to spread into new northern and western regions utilizing additional hosts including sassafras (*Sassafras albidum*) and spicebush (*Lindera benzoin*). Previous studies in avocado (*Persea americana*) have shown phoretic transport of *H. lauricola* by ambrosia beetle species other than RAB. My objective was to evaluate the presence of *H. lauricola* in insect associates. Working in sassafras forests at the leading edge of the LWD range expansion, I collected insects and evaluated them for internal and phoretic presence of *H. lauricola*. Infected bolts were placed into emergence bins and monitored daily for insect emergence for 2 months. All insects that emerged from laurel-wilt infected sassafras were collected and identified to order. Insects that emerged with ≥ 5 individuals were evaluated for phoretic and internal presence of *H. lauricola* propagules, including hidden snout weevils (*Apteromechus ferrartus*) (n=24), Eastern subterranean termites (*Reticulitermes flavipes*) (n=10), granulate ambrosia beetles (*Xylosandrus crassiusculus*) (n=8), and thread-waisted ants (*Aphaenogaster rudis*) (n=6). Once growth of *H. lauricola* was observed on agar plates, I verified fungal identity by extracting DNA and performing gel electrophoresis using taxon-specific microsatellite primers. Out of all individuals evaluated (N=24), I found internal presence of *H. lauricola* in one weevil and two granulate ambrosia

beetles showing that insects other than RAB can potentially serve as vectors of LWD. My results are important because they provide a greater understanding of the interactions that are occurring within laurel wilt infected sassafras, which will ultimately help us develop management methods to reduce the spread of this invasive complex.]

- **How does prescribed fire and salvage logging impact bark and woodboring beetles one-year after a catastrophic hurricane?** Benjamin M. Gochnour (Ph.D.)[1], Kamal J.K. Gandhi[1], Kier D. Klepzig[2], Thomas N. Sheehan[2], Chelsea N. Miller[3]. [1]D.B. Warnell School of Forestry and Natural Resources, University of Georgia, 180 E Green Street, Athens, GA 30602, USA; [2]The Jones Center at Ichauway, 3988 Jones Center Drive, Newton, GA 39870, USA; [3]Holden Forest and Gardens, Kirtland, OH, USA.

[**Abstract:** Climate change is increasing the intensity and hence, the severity of Atlantic hurricanes in forested ecosystems. These storms act as forest disturbance agents, with implications for the population dynamics of bark beetles and other wood colonizing insects. Windstorms have been shown to play a role in bark beetle outbreak events, where populations levels allow beetles to begin killing healthy trees. Longleaf pine (*Pinus palustris* Miller) trees are generally more resistant to bark beetle outbreaks than other southeastern pine species. This may be due in part to the defensive characteristics of individual trees and, at the stand level, the open canopy structure of frequent fire longleaf pine woodlands may lead to lower impacts from high winds, and lower attack rates by bark beetles. Our objective was to evaluate the effect of management practices including prescribed fire and salvage logging on bark and woodboring beetles in longleaf pine stands during the first year after catastrophic Hurricane Michael in southwestern Georgia. We used funnel traps and cross-vane traps baited with a combination of (+/-) ipsenol, *cis*-verbenol, and (+/-) ipsdienol, or ultra-high release ethyl alcohol and Sirex blend (70% alpha-pinene and 30% beta-pinene) respectively, to compare catches of three native *Ips* species (*Ips calligraphus*, *I. grandicollis*, and *I. avulsus*) as well as the associated woodboring beetle (Coleoptera: Cerambycidae) community. Treatments included prescribed fire and salvage logging, prescribed fire and no salvage logging, and no prescribed fire and no salvage logging. Both *Ips* and woodboring beetle species showed no statistically significant differences between treatments. The lack of treatment effects from management practices post wind disturbance may be attributed to the resilience of longleaf pine ecosystems under prior vigilant management via prescribed fire. Further, as of Summer 2023, there have been no reported beetle outbreaks on the Ichauway property. Longleaf pine's natural resistance to both wind disturbance and bark beetle outbreak may obviate the need for specific management techniques to suppress bark beetle outbreaks after windstorms.]

- **The Life of *Leucotaraxis argenticollis* in the eastern US.** Carrie E Preston (Ph.D.)[1], Nicholas J. Dietschler[2], Mark C Whitmore[3], and Scott M Salom[1], [1]Department of Entomology, College of Agriculture and Life Sciences, Virginia Tech, 170 Drillfield Dr. Blacksburg, VA 24061, USA, [2] Department of Ecology and Evolutionary Biology, College of Arts and Sciences, Cornell University, E145 Corson Hall, Ithaca, NY 14853, USA, [3] Department of Natural Resources and the Environment, College of Arts and Sciences, Cornell University, 106 Fernow Hall, Ithaca, NY 14853, USA.

[**Abstract:** *Leucotaraxis argenticollis* (Diptera: Chamaemyiidae) is one of two *Leucotaraxis* species being released for biological control of hemlock woolly adelgid (HWA) in the eastern US. To understand how better to time its release, we studied the phenology of the western strain of *L.*

argenticollis in relation to HWA phenology at field sites in Ithaca, New York and Bland, Virginia in 2021 and Virginia only in 2022. In 2021, 30 mesh cages were placed over HWA-infested eastern hemlock branches at both sites. When HWA sistens started egg production, ten (5M:5F) *L. argenticollis* adults were released into the cages. Biweekly sampling occurred from March – July and monthly sampling occurred from August – September to document the life stages of *L. argenticollis* and HWA. Branch dissections revealed that *L. argenticollis* eggs were present when HWA sistens eggs and progrediens eggs were present at both field sites. *Leucotaraxis argenticollis* eggs were also found in August when aestivating sistens were present in NY, whereas eggs were not found at this time in VA. Larvae were first observed on March 12th in VA and on April 27th in NY. Once puparia were observed on April 9th in VA and on May 25th in NY, they were consistently found throughout the remaining sampling dates for both sites. In 2022, 19 cages were employed at the Bland, VA site only, due to high HWA winter mortality at the Ithaca site in NY. Seven (3M:4F) *L. argenticollis* adults were released into the cages when HWA sistens started egg production. Biweekly sampling occurred from March – July and monthly sampling occurred from August – March. *Leucotaraxis argenticollis* eggs were present when HWA sistens eggs and progrediens eggs were present, similar to what was observed in 2021. Larvae were first observed on April 4th, which was three weeks later compared to 2021. Also as in the previous year, once puparia were first observed (May 2nd), they were consistently found throughout the remaining sampling dates. This study presents evidence that the phenology of the western strain of *L. argenticollis* synchronizes well with HWA phenology, improving the prospects of it being able to establish in the East.]

10:00 – 10:30 BREAK

10:30 – 12:00 Graduate Student Session cont'd **Oak Forest A**

Organizers: *Ashley Schulz, Mississippi State University; Kristin Hilborn, North Carolina State University; Damilola Taiwo, Mississippi State University; Prabina Sharma, Clemson University*

- **Assessing emerald ash borer phenology to optimize parasitoid releases in North Carolina.** Courtney Smith Johnson (Ph.D.)[1], G. Ryan Bohannon[2], Dr. Robert Jetton[1], and Dr. Kelly Oten[1], [1]NC State University, Raleigh, NC, [2]Clemson University, Clemson, SC.

[**Abstract:** The emerald ash borer (EAB), *Agrilus planipennis*, is a major threat to ash trees in North America. First discovered in North Carolina in 2013, the pest has now spread to over 60 counties in the state. Parasitoid wasps are a major component of the management efforts of this forest pest, but their establishment in the South has been limited. To optimize releases of these biological control agents, we assessed the phenology of EAB in central North Carolina from 2019 to 2021. Results indicated that EAB is univoltine in central North Carolina, making *Spathius agrili* the most suitable parasitoid for the region with optimal releases likely to occur from mid-to-late June to late August. However, while EAB is univoltine in central NC, models suggest that the climate of western NC may yield semivoltine EAB, changing parasitoid release recommendations. *Testrastichus planipennisi* and *Spathius galinae* are more suitable for regions with semivoltine EAB where mature EAB larvae are available when *T. planipennisi* and *S. galinae* emerge in spring. As such, we confirmed these models by sampling EAB in western NC and eastern TN to assess overwintering life stages. At four research sites, overwintering EAB specimens were collected which aligned with models' suggestions. As a result, releases of *Tetrastichus planipennisi* and *Spathius galinae* have begun at sites in western NC and will be monitored for establishment.]

- **Emerging technologies for conifer tree protection against southern pine beetle.** Zachary Bragg (Ph.D.) and Lynne K. Rieske. Department of Entomology, University of Kentucky.

[**Abstract:** RNA-interference (RNAi) is a natural process that defends against viral attack, however, when manipulated with engineered double-stranded RNA (dsRNA) this pathway can induce potent gene-specific silencing in insects. Coleopterans, including the mountain and southern pine beetles (*Dendroctonus ponderosae*, Hopkins and *D. frontalis*, Zimmerman), are especially susceptible to orally ingested dsRNA. As concerns persist over pesticide safety and environmental contamination, protecting high value trees or plantations from insect pest attack will likely include hostplant delivered biopesticides, therefore a better understanding of the within-plant behavior of dsRNAs is necessary. Previous work in loblolly pine (*Pinus taeda*, L.) demonstrated that dsRNAs applied as a hydroponic root soak move rapidly and systemically throughout the plant, but plant response to insect-specific dsRNA on a molecular level remains unknown. To investigate, loblolly pine seedlings were treated with southern pine beetle-specific dsRNA, and mRNA was sequenced (N = 4), transcriptomes were assembled, and key genes were annotated and analyzed for differences in gene expression. Fourteen RNAi-related proteins were annotated from the loblolly transcriptome, however, expression analysis showed that none of these transcripts were differentially expressed in treated seedlings. However, there were thousands of differentially expressed transcripts between treated and untreated seedlings, with the greatest abundance of orthologs categorized under 'replication and repair of nucleic acids.' Pathway enrichment revealed differential expression of multiple metabolic and information processing pathways including those related to defense and stress response. The lack of observed RNAi response could be explained by limitations of sampling technique, a localized or ephemeral RNAi response, or a separation of dsRNA from RNAi machinery in-planta. Therefore, future work investigating the various interactions dsRNAs experience within plant tissue will be necessary for developing formulations and products to enhance delivery. With future work increasing the stability and uptake, RNAi based products could represent a powerful pest management tool for single tree protection. My work is important because it lays the groundwork for understanding the cross-kingdom effects of RNAi and moves us closer to integrating this technology into existing management plans, bolstering our trees for a healthier tomorrow.]

- **Impacts of habitat fragmentation on southern pine beetle infestation in the Homochitto National Forest, Mississippi, USA.** Damilola M. Taiwo (M.S.)[1], Adam D. Polinko[1], John J. Riggins[2], and Ashley N. Schulz[1]. [1]Mississippi State University, Department of Forestry; [2]Mississippi State University, Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology.

[**Abstract:** Southern pine beetle (*Dendroctonus frontalis*) is a native forest insect pest with a long history of destruction in the southeastern United States. However, in the last couple of decades, outbreak activity has significantly declined. Reasons for this decrease are unknown, though it has been hypothesized that fragmentation of suitable habitat (i.e., overstocked and unimproved pine stands) may be a contributing factor. Here, we tested this hypothesis and estimated how habitat fragmentation affects southern pine beetle infestation. We focused on the Homochitto National Forest in southwestern Mississippi because it has experienced southern pine beetle infestation in the last ten years. We conducted a GIS analysis where each southern pine beetle spot was assigned a 100 m buffer radius to determine the fragmentation within the spots. The land use land cover classifications of the 2012, 2015, 2017, and 2019 southern pine beetle spots were derived from the National Land Cover Database and processed through fragmentation analysis (FRAGSTAT) at the class and landscape levels. To select the best class level landscape metric that described the southern pine beetle infestation, an ordinary least square forward selection was employed at an $\alpha = 0.05$

significance level. Our preliminary results demonstrate that years 2017 and 2012 had the most abundant southern pine beetle infestations, and evergreen forest had the highest percentage of land cover within each spot across the four consecutive years, ranging from 53.3% to 75.9%. Based on the landscape level metrics, the Shannon Diversity Index demonstrated more species diversity within the spots in 2012 than the remaining years, while the year 2017 had the lowest species diversity. We found that total patch area (ha), year of infestation, and Euclidean nearest neighbor mean (m) were found to be weak but significant drivers impacting southern pine beetle infestation in the Homochitto National Forest. Though further analyses will be necessary, these results demonstrate that southern pine beetle infestation may be lessened in fragmented versus highly connected pine forest.]

- **Assessing release and recovery methods for *Leucotaraxis* spp., predators of hemlock woolly adelgid.** Olivia Andrews (Ph.D.)[1], Scotty Yang[1], Albert Mayfield[2], Mark Whitmore[3], and Scott Salom[1]. [1]Virginia Tech Entomology Department; [2]USDA-FS, and [3]Cornell University.

  [**Abstract:** In the last decade, rearing and release of predators for hemlock woolly adelgid, *Adelges tsugae* Annand (Hemiptera: Adelgidae) has focused on two *Laricobius* spp. (Coleoptera: Derodontidae). More recently, two species of *Leucotaraxis* flies (Diptera: Chamaemyiidae) have also been studied and released. They are present during the second generation of HWA (in the spring) when *Laricobius* spp. drop to the soil to complete development, and thus, have the potential to help regulate HWA populations in combination with the *Laricobius* beetles. Releases of *Leucotaraxis* spp. since 2015 have resulted in only one confirmed recovery past the F1 generation. With continued release of these predators into the environment we are monitoring populations for establishment. Caged releases of *Leucotaraxis* spp. were performed in the spring of 2022 at eight sites in both Virginia and Maryland. Three treatments with different release timings and fly species (*Leucotaraxis argenticollis* and *Leucotaraxis pinperda*) were randomly assigned to these eight sites. Monthly samples were taken after the spring releases in 2022 until October to confirm *Leucotaraxis* spp. were able to reproduce successfully. Sites were then sampled bi-annually in the spring of 2023. The recovery of *Leucotaraxis* spp. at different life stages through one year post release will be utilized to determine the best release timing. Six additional sites in Virginia and Maryland were added and utilized for releases in the spring of 2023. Caged vs. open releases are currently being investigated to determine which method of release results in the best recovery.]

- **Bugs hanging out in the canopy: A preliminary study of longleaf pine canopy arthropods.** N. Royce Dingley (M.S.)[1], Thomas N. Sheehan[2], Kier D. Klepzig[2], and Elizabeth McCarty[1]. [1]University of Georgia, [2]The Jones Center at Ichauway.

  [**Abstract:** Longleaf pine communities once covered most of the Southeastern Coastal Plains. Now only approximately two percent of the original longleaf pine habitat remains. Gaining a greater understanding of an ecosystem home to many threatened species can provide important information to forest and land stewards. Canopy arthropods constitute an unknown network of ecological connections that, once studied, will expand current longleaf pine ecosystem knowledge. This pilot project was conducted at the Jones Center at Ichauway in Southwest Georgia, where we established plots in three longleaf pine-dominated ecological communities: flatwoods, upland forest, and fluvial terrace. In addition to documenting arthropods in this habitat, research questions include: (1) does total canopy arthropod trap catch vary among longleaf pine ecological community types? (2) does order-level arthropod trap catch vary among ecological communities? (3) does arthropod family-level richness vary among ecological communities? A flight intercept trap was placed in a longleaf pine tree

at mid-canopy level at three sites in each ecological community (9 traps total). Traps were set for one week each month from May – August 2022. The ecological communities were the study treatments, while 'site' is the experimental unit. Total, order-level, and family-level abundance were analyzed using an ANOVA to determine if there was a difference among ecological communities ($P \leq 0.05$). During the 2022 collecting season 4004 arthropods from 13 orders were collected from the longleaf canopies. Diptera was the most prevalent taxon, comprising 34.3% of specimens. However, 21.8% of collected specimens were from the order Collembola. As a small-bodied and non-flying group of insects, it is intriguing that Collembola inhabit longleaf canopies in large numbers. Overall, hemipteran, coleopteran, dipteran, collembolan, and lepidopteran trap catch was similar among the ecological communities. Among the three orders identified to family-level (Coleoptera, Collembola, and Hemiptera), only Hemiptera differed in family-level richness. This study sets the stage for further canopy research in longleaf pine trees.]

- **Examining park user's risk perceptions of emerald ash borer management tactics.** Mitchell Green (M.S.), Brittany F. Barnes, Kamal JK Gandhi, Elizabeth F. Pienaar. University of Georgia, Athens, GA.

  [**Abstract:** Invasive insect pests such as the emerald ash borer (EAB) (*Agrilus planipennis*) cause widespread host tree mortality, and significant management efforts are required to reduce ecological impacts. However, stakeholders' risk perceptions of invasive species management tactics (i.e., biological control or chemical control) may be different than those of the managers leading to an aversion towards using them. Awareness and knowledge of EAB or attitudes towards ash (*Fraxinus* spp.) trees may influence stakeholder support for management. This study examined park user's risk perceptions and support for EAB management through an intercept survey across four county parks in northeastern Georgia. We received 174 surveys and completed ordinal logistic regression with support for either biological or chemical control as our dependent variables and measured constructs (i.e., awareness, knowledge, and risk perceptions) and demographic information as our independent variables. After stepwise backwards regression to identify the best fit models, we found that risk perceptions negatively influenced support for chemical and biological control as management tactics. Individuals who were more concerned about EAB were more likely to support biological control but not chemical control. We also found that individuals who indicated that they use the parks to sit and enjoy nature were more likely to support biological control, while birdwatchers were less likely to support either of the control measures. Finally, individuals who expressed positive attitudes towards ash trees were more likely to support chemical control. These results suggest that stakeholder risk perceptions, recreation preferences, and attitude towards impacted trees may influence their levels of support for EAB management. Agencies or organizations that are managing EAB may thus choose to alter their messaging around invasive species management to better communicate and connect with their stakeholders.]

- **The impact of soil applied imidacloprid on the subterranean survivorship of *Laricobius* spp. (Coleoptera: Derodontidae), a specialist predator of *Adelges tsugae* (Hemiptera: Adelgidae).** Ashleigh P. Hillen (M.S.)[1], Aaron D. Gross[1], Albert E. Mayfield III [2], Jeremiah R. Foley IV [3], Jacob Williams [4], Kang Xia [5], Scott M. Salom[1]. [1] Department of Entomology, Virginia Tech University, Blacksburg, VA; [2] USDA Forest Service, Southern Research Station, Asheville, NC; [3] USDA-ARS Invasive Plant Research Laboratory (IPRL), Ft. Lauderdale, FL; [4] Department of Statistics, Virginia Tech University, Blacksburg, VA; [5] Department of Plant and Environmental Sciences, Virginia Tech University, Blacksburg, VA.

[**Abstract:** The invasive hemlock woolly adelgid (HWA) *Adelges tsugae* (Annand) (Hemiptera: Adelgidae) has spread throughout most of the range of eastern hemlocks, *Tsuga canandensis* (L.) and the entire range of Carolina hemlocks, *Tsuga caroliniana* (Engelman). Integrated pest management (IPM) tactics for HWA combine chemical applications with the simultaneous release of biological control agents on untreated trees within the same stand. *Laricobius* spp. (Coleoptera: Derodontidae) have been used as biological control agents of HWA since 2003, occupying a subterranean and arboreal life phase synchronous with HWA. Within forests managed by IPM tactics, there is the potential for released *Laricobius* spp. to land on insecticide-treated trees and settle below the tree's drip line for the subterranean phase of its lifecycle. Imidacloprid is the most widely used insecticide for HWA management. It has been shown persist in the soil for up to five years post-application, and along with metabolites, has been found to negatively impact soil microarthropods. During the subterranean portion of their lifecycle (May-October), *Laricobius* adults undergo aestival diapause. There is limited knowledge of this portion of their life cycle and how imidacloprid and its metabolites impact their aestivation. Field investigations took place to assess the impact of historical and active imidacloprid soil treatments on the subterranean life phase of *Laricobius* spp. by quantifying imidacloprid and metabolite soil concentrations and percent adult emergence from the soil in the fall. This is the first study to document the effect of imidacloprid soil treatments on the subterranean survivorship of *Laricobius* spp. Based on this study, there is a significant treatment effect from soil drench imidacloprid applications on percent emergence and on the concentration of chemical residues at the topsoil and 1-5 cm depths ($P < 0.05$). From 2021 to 2022, there were above average field emergence rates from soil treated with imidacloprid soil injections that took place in 2020 (20.4 ± 4.7%) and 2017 (22.8 ± 2.5%). This study shows no significant negative impact of soil injection applications of imidacloprid on *Laricobius* spp. percent emergence, whether applied one or five years before aestivation takes place.]

12:00 – 1:00 LUNCH

1:00 – 3:00 Field Trip

Organizers: Kelly Oten and Abby Ratcliff, NC State University
Nature Research Center, North Carolina Museum of Natural Sciences
11 West Jones Street, Raleigh, NC 27601
https://naturalsciences.org/exhibits/permanent-exhibits/nature-research-center

1:30 – 3:00 Frustrana Cup

Organizers: Kelly Oten and Abby Ratcliff, NC State University
Raleigh Beer Garden
614 Glenwood Ave, Raleigh, NC 27603
https://theraleighbeergarden.com/

6:00 – 8:00 Poster Session **Oak Forest B**

Organizer: Forest Palmer, Clemson University

8:30 – 10:00 Concurrent Session 1

Invasive forest pests, forest health, and forest genetics **Governor's I**
Moderators: *Robert Jetton and Fred Hain (retired), NC State University*

- **Genetic diversity, gene conservation, and risk management.** Robert Jetton, N.C. State University.

- **On the hunt for 'suspiciously healthy' trees: establishing a range-wide protocol to identify lingering hemlocks.** Margot Walston, NC Hemlock Restoration Initiative

- **Traditional breeding and genetic engineering for American chestnut restoration.** Vasiliy Lakoba, The American Chestnut Foundation.

- **Using genomic tools to better understand emerging needle diseases of loblolly pine.** Colton Meinecke, University of Georgia.

It takes two – updates on diseases associated with insects in the Southeast **Oak Forest A**
Moderators: *Kaitlin DeWitt, Virginia Department of Forestry and Caterina Villari, University of Georgia*

- **Secondary insects and facultative pathogens in disturbed pine forests.** Kier Klepzig[1], Crystal Bishop[1], Colton Meinecke[2], Tom Sheehan[1], and Caterina Villari[2], [1]Jones Center at Ichauway, [2]University of Georgia.

  [**Abstract:** Fungi in the genera *Leptographium* and *Grossmania* are diverse and widely distributed in pine forests. Most of these species are saprophytic, colonizing only dead or severely stressed host tissue. A few are associated with secondary insects and seem to play some role in hastening the death of trees with compromised defenses. Fewer still are a small group of primarily pathogenic, virulent fungi which can kill healthy trees. Some of these fungi have been implicated as causal factors in tree decline and death. In a study of longleaf pine forests impacted by Hurricane Michael, we trapped root and lower stem infesting beetles and isolated fungi from the insects and from tree roots. While beetle numbers increased post storm (and post salvage logging and prescribed burning), they evened out by the following year. The fungus most abundantly isolated was *G. profanum*, previously known to occur only in the roots of hardwoods. This surprising finding has implications for our understanding of which fungi are prevalent in pines in the southeastern US.]

- **Host-pathogen-vector interactions in walnut, sassafras, and oak systems.** Hadziabdic-Guerry, Denita, University of Tennessee.

- **Management of eastern white pine diseases and insect pests in the northeast.** Munck, Isabel[1], Kara Costanza[2], Cameron McIntire[1], Stephen Wyka[3], [1]USDA Forest Service, Durham NH, [2]USDA Forest Service, St. Paul, MN, [3]Colorado State University, Fort Collins, CO.

[**Abstract:** Until the 2000s, white pine blister rust (*Cronartium ribicola*) and white pine weevil (*Pissodes strobus*) were considered the major pests of Eastern white pine (*Pinus strobus*). More recently, Caliciopsis canker (*Caliciopsis pinea*), and foliar diseases such as needle casts (*Bifusella linearis* and *Lophophacidium dooksii*) and brown spot needle blight (*Lecanosticta acicola*) have caused unprecedented damage. These diseases are native and present in most white pines stands surveyed. Recent damage is correlated with drought for Caliciopsis canker and an increase in temperature and early summer rainfall for foliar diseases. Foliar diseases cause defoliation that reduced the basal area increment of affected white pines by 25-73%, whereas Caliciopsis canker damage degraded lumber quality. In a study replicated at 2 sites, the effects of thinning at two different residual stocking densities (60 and 100 sq feet per acre or 14 and 25m^2 ha^{-1}) on mitigating the negative impacts of WPND within infected stands was evaluated. Severity of WPND was reduced by 35% in low-density residual thinnings in the second year of the study. We also visually inspected crown condition and incidence of white pine weevil and diseases in stands under different silvicultural regimes: shelterwood (residual basal area of 80 sq ft per acre or 18 m^2 ha^{-1}), patches (3 acre or 1.2 ha openings), low density thinnings (residual basal area of 30 and 60 ft sq per acre or 7 and 14 m^2 ha^{-1}, respectively), and no treatment control (>2 ha). Each treatment was replicated at least twice. Silvicultural treatments improved pest and disease conditions of white pine (*Pinus strobus*) residual trees and regeneration by improving growing conditions and increasing the distance for inoculum spread.]

- **Flash talk: Advancing diagnosis and surveillance for the oak wilt pathogen, *Bretziella fagacearum*, using LAMP.** Meinecke, Colton D.[1], Rhys A. Eshleman[1], Karandeep Chahal[2], Demian F. Gomez[3], Monique L. Sakalidis[2], Andrew Loyd[4], Caterina Villari[1], [1]University of Georgia, [2]Michigan State University, [3]Texas Forest Service, [4]Bartlett Tree Experts.

- **Flash talk: Gene Silencing provides a potential tool for managing redbay ambrosia beetle**. Morgan Knutsen and Lynne Rieske. University of Kentucky.

10:00 – 10:30 BREAK **Esplanade**

10:30 – 12:00 Concurrent Session 2

State Cooperators Session **Governor's I**
Moderators: *David Coyle, Clemson University and Kelly Oten, NC State University*

- **We should have zigged, but we zagged…elm zigzag sawfly's appearance in North Carolina.** Heath, Brian, North Carolina Forest Service.

- **The great South Carolina forest tent caterpillar outbreak of 2023: Remote-sensing reveals interesting distribution patterns.** David Jenkins, South Carolina Forestry Commission.

- **Relámpago blight: A new and unusual tree pathogen discovered in Florida.** Jeff Eickwort[1], Claudia Paez[2], Hector Urbina[3] and Jason Smith[2], [1]Florida Forest Service, [2]University of Florida, [3]Florida Dept. of Agriculture and Consumer Service.

- **Legions of *Lymantria* – spongy moth in the Shenandoah Valley of Virginia.** Katlin Dewitt, Virginia Department of Forestry.

Use of remote sensing in forest health and invasive species **Oak Forest A**
Moderators: *Jess Hartshorn, Clemson University*

- **Introduction to remote sensing in forest health.** Jess Hartshorn, Clemson University.
- **Interactive survey: Developing a decision-making tool for land managers to control invasive plants.** Jess Hartshorn, Clemson University
- **Multi- and hyper-spectral imagery in forest health monitoring and invasive plant detection.** Marina Lupu, Clemson University.
- **Use of drones in urban pest management detection.** David L. Kulhavy, Daniel R. Unger, I-Kuai-Hung, Yanli Zhang and Victoria Williams. Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, Texas.
- **Case study: use of remote sensing to detect and monitor invasive plants.** Jess Hartshorn, Clemson University
- **Group discussion.**

12:00 – 1:30 LUNCH

1:30 – 3:00 Concurrent Session 3

The good, the bug, and the not-so-ugly: beneficial insects in forests I **Governor's I**
Moderators: *Tom Sheehan and Christine Favorito, The Jones Center at Ichauway*

[**Abstract:** Much of forest entomology focuses on pest insects that threaten to kill trees. While studying these organisms is important, many other forest insects perform valuable functions. The goal of this session was to highlight important beneficial insects in forests and how they contribute to forest health. As many groups of insects decline, continuing to learn more about their roles in forests is critical to their conservation. Some topics explored in this session included insect roles in deadwood decomposition, insect biodiversity and potential use as umbrella species, forest pollination, and forest insect conservation through cooperative agencies. We hope that this session highlighted some of the many beneficial insects in forests and facilitated a continuing discussion about this topic.]

- **The good, the bug, and the not-so-ugly: Beneficial insects in forests: An overview.** Christine Favorito and Tom Sheehan, The Jones Center at Ichauway.
- **It's the end of the wood as we know it. Live!** Mike Ferro, Clemson University.
- **Fire, forests, and friends: Beneficial insects of longleaf pine.** Sheehan, Thomas N.[1], Christine M. Favorito[1], Kamal J.K. Gandhi[2], and Kier D. Klepzig[1], [1]The Jones Center at Ichauway, [2]D.B. Warnell School of Forestry and Natural Resources, University of Georgia

[**Abstract:** The longleaf pine ecosystem contains over 3,000 documented arthropod species, the vast majority of which play beneficial roles as decomposers, pollinators, and bioindicators. Decades of research demonstrate the important—but complicated—relationships between insects and prescribed fire. The subterranean layer of this system contains commensals of important vertebrate species that create burrows (e.g., the gopher tortoise and pocket gopher), root feeders, underground nesters, and underground pupators. The forest floor contains ants which have been relatively well researched, but also other epigaeic predators (e.g., carabids and spiders) and decomposers of wood, dung, and carrion that require more attention. The herbaceous layer—incredibly diverse in this system—has a particularly strong relationship with prescribed fire. This layer has benefitted from research on pollinators, but also contains complex plant-herbivore-parasitoid and plant-pollinator networks that have received little attention. The arboreal fauna is primarily known in the context of red-cockaded woodpecker prey, which is limited to the boles of trees; the foliage of this layer remains largely unexplored. Although a multitude of scientists have conducted excellent research in this system over the past several decades, numerous and important gaps deserve critical attention in this imperiled ecosystem.]

- **Condo or cuisine? The function of fine woody debris in driving decomposition, detritivores, and their predators.** Natalie Clay, [1], Nicholas Benedetto[1], and Craig McClain[2], [1]School of Biological Sciences, Louisiana Tech University, [2]Department of Biology, University of Louisiana-Lafayette.

- **Friends in high places: Arboreal ants of the southeastern Piedmont.** Michelle Kirchner, Clyde Sorenson, Elsa Youngsteadt, Department of Entomology and Plant Pathology and Department of Applied Ecology, North Carolina State University.

- **The frosted elfin butterfly: An umbrella species for southern Sandhills.** Robert T. Meyer, Tall Timbers Research Station, Tallahassee, FL

Forest Health Metrics and Indicators **Oak Forest A**
Moderators: *Chris Asaro, US Forest Service*

- **What do we mean by "forest health"?** Chris Asaro, USFS-FHP, Atlanta, GA.

[**Abstract:** Forest health is a concept for which an operational definition can be elusive. When attempting to define forest health, one must first grapple with value-based criteria centered around ecological or utilitarian metrics. There is also the problem of scale – forest health indicators are more difficult to assess as you scale up from tree to stand to forest to landscape to biome. Taking into consideration all of these factors, any comprehensive definition of forest health is necessary lengthy and contains lots of caveats. Nonetheless, we can approach forest health 'metrics' by starting with quantifiable parameters that are objective and universally understood. Distinguishing between baseline or density-dependent mortality of trees as part of natural stand development from density-independent mortality due to extrinsic factors can be one potential starting point. Resistance, resilience, and stability are useful concepts applied to forest health because they can only be assessed in the context of disturbance events. Yet, depending on forest type, scale, and many other factors, these concepts are also difficult to define and quantify in a consistent way. Specific factors impacting forest health include biotic and abiotic disturbance events, with altered disturbance regimes being particularly problematic, site and stand conditions, the rate and amount of tree mortality, and forest management practices or lack thereof. Metrics are, by definition, measurable

and quantifiable, while indicators are simply metrics that are useful or indicative of something related to forest health. A forest health 'index' may be most useful since it applies some combination of multiple indicators into some scale-based system that can be understood by non-experts. Despite the challenges in clearly defining forest health, there are many tools available to improve forest health, such as density management, prescribed burning, reforestation techniques, and climate adaptation strategies.]

- **Forest health indicators from other than the usual sources.** Frank Koch, USFS-SRS, RTP-Raleigh, NC.

  [**Abstract:** What is a 'useful' forest health indicator? Utility depends on the scale and purpose - Is it for broad-level reporting and assessment? Does it have tactical or operational implications? Historical versus current versus potential future conditions? Direct or indirect measure? Biotic or abiotic agent/process? Both? Data sources also shape indicators. Within the US Forest Service, FIA is a go-to source for 'official numbers', but other data sources also see a lot of use and may fill in gaps left by FIA. Density metrics such as total basal area (TBA) can be related to insect and disease activity across the United States. Drought and extreme heat are key metrics that have broad, landscape-level impacts to forests, particularly under future climate-change scenarios. Mortality trajectories for species groups can also be revealing. These examples are just the start of the conversation. The main take-home message is that there are lots of useful data already, we just need a little creativity with applying them. Ultimately, we want indicators that predict when/where forests will depart significantly from baseline conditions, which could mean historical or desired conditions. We also need to have a better understanding of what factors most threaten long-term forest sustainability.]

- **National multi-scale assessments of forest regeneration: contrasting indicators for native and non-native trees.** Kevin Potter, Kurt Riitters, and Quinfeng Guo, USFS-SRS, RTP-Raleigh, NC.

  [**Abstract:** Metrics for regeneration are important indicators of forest health. National inventory data allow us to quantify species-level regeneration patterns across broad scales. For native species, *regeneration deficit* is a problem. For non-native species, *successful regeneration* is a problem. Forests and individual tree species need seedlings and saplings to sustain themselves. The FIA database can be useful for identifying what species have high or low regeneration potential by ecoregion and offer insights into which species and areas of the country are at risk of losing genetic variation because of regeneration deficit. Provisional seed zones are areas within which plant materials can be transferred with little risk of being poorly adapted to their new location and may be an important restoration tool for tree species with low regeneration potential; they are determined based on environmental information independent of genetics. Some caveats with provisional seed zones are that there is an assumption that tree species are always well-adapted to their current environmental conditions and that adapted variation is partitioned similarly across species. Nonetheless, provisional seed zones combined with national inventory (FIA) data are useful for sustainability assessment and conservation decision-making. Invasive tree species are relatively uncommon on the US mainland compared to native species, although non-native understory plants are highly problematic in some regions. A handful of tree species are highly invasive across broad areas of the US mainland, while Hawaii and Puerto Rico have uniquely higher invasive tree species richness despite their much smaller size. Islands, in general, have 3x more invasive plant species as mainland areas.]

- **Invasive plants as indicators of forest health.** Kelly Oten, NCSU, Raleigh, NC.

  [**Abstract:** Disturbances are natural and necessary to maintain forest health, but they can also facilitate establishment of invasive species. Invasive plants increase in presence and abundance when

a forest no longer resistant, resilient, or stable. Negative impacts of invasive plants include biodiversity reduction, altered ecosystem structure and nutrient cycling, impacts to wildlife, increased risk and intensity of wildfire, and can worsen problems associated with insect pests and tree disease. In addition, climate change will likely increase plant invasion and its consequences by: 1) increasing the frequency and intensity of disturbances such as fire and hurricanes; 2) changing plant population dynamics and species distributions due to warming and altered precipitation regimes; 3) increasing competitiveness of some invasive plants due to elevated CO_2 and 4), increasing stress to natives species and ecosystems. Monitoring the abundance of invasive plants in understory communities can be a good way to assess the health of forest ecosystems.]

3:00 – 3:30 BREAK

3:30 – 5:00 Concurrent Session IV

The good, the bug, and the not-so-ugly: beneficial insects in forests II **Governor's I**
Moderators: *Tom Sheehan and Christine Favorito, The Jones Center at Ichauway*

[**Abstract:** Much of forest entomology focuses on pest insects that threaten to kill trees. While studying these organisms is important, many other forest insects perform valuable functions. The goal of this session was to highlight important beneficial insects in forests and how they contribute to forest health. As many groups of insects decline, continuing to learn more about their roles in forests is critical to their conservation. Some topics explored in this session included insect roles in deadwood decomposition, insect biodiversity and potential use as umbrella species, forest pollination, and forest insect conservation through cooperative agencies. We hope that this session highlighted some of the many beneficial insects in forests and facilitated a continuing discussion about this topic.]

- **It's good to know your friends – Venus flytraps avoid eating their pollinators.** Clyde Sorenson[1], Elsa Youngstadt[2], Laurie Hamon[3], Rebecca Irwin[2], Michael Kunz[4], Dale Suiter[5], Matt Bertone[1], [1]Department of Entomology and Plant Pathology, North Carolina State University, [2]Department of Applied Ecology, North Carolina State University, [3]Xerces Society, [4]N.C. Botanical Garden, [5]U.S. Fish and Wildlife Service.

  [**Abstract:** While the Venus flytrap (*Dionaea muscipula*) is one of the most famous plants in the world and has been the subject of a large volume of research (primarily addressing the trapping mechanism found in the leaves), little was known about its reproductive ecology. We conducted research to determine the pollinators of this imperiled plant and to assess the overlap between its pollinators and its prey. The Venus flytrap appears to exploit a number of generalist pollinators, primarily bees (including sweat bees, bumble bees, and, where they are near, non-native honey bees), and clerid and long-horned flower beetles, which access the flowers through flight. The bulk of its prey, primarily ants and spiders, walk or hop into the leaf traps. The little overlap between flower visitors and prey consisted of taxa that were poor pollinators. The tall (ca. 20 cm) scape which separates the flowers from the basal rosette of trapping leaves may be a mechanism that partitions the pollinator community from the prey community. In subsequent work, we determined that the flytrap is self-fertile within the plant but not within the flower, is somewhat pollen-limited, and that prey supplementation can increase the number of flowers produced by a plant.]

- **Wild bee community responses to forest harvesting: Implications of the patchwork landscape.** Christine Fortuin[1], Madalyn Stoecker[1], Kristine Evans[1], Kamal J.K. Gandhi[2], [1]College of Forest Resources, [1]Mississippi State University, [2]D.B. Warnell School of Forestry and Natural Resources, University of Georgia.

[**Abstract:** Managed forests in the Southeastern United States often form a patchwork landscape of planted pine interspersed with corridors of hardwood, recently cleared early successional areas, and traversed heavily by forest roads. Wild bees (Hymenoptera : Apoidea) are critically important to the sustainability of forest systems and neighboring agricultural areas in the Southeast, and may be in decline in this region and worldwide. Most wild bee species rely on a range of resources to successfully complete their life cycles, including nesting and foraging resources, which often come from different habitat types. A heterogeneous landscape therefore could benefit wild bee communities by way of creating complementary habitat for nesting and foraging resources. Conversely, significant disturbance of forest ecosystems could shift communities toward disturbance-adapted species and have consequences for pollinator biodiversity and functional diversity. Critical research gaps in our understanding of how wild bee communities respond to human-managed forest landscapes limit our capability to address pollinator health these systems. Here we present two investigations of the wild bee community responses to the managed forest landscape in Alabama, Georgia and Mississippi.

Wild bees were collected in and around unpaved forest roads in 2017 and 2018 in Clarke County and Jackson County, Georgia. Sites included four replicates each of mature upland hardwood, managed Loblolly pine, and early successional regenerating clearcut (cut within 1-2 years). Within each stand, nesting habitat indicators were sampled along 100 m transects including snags (standing dead trees), duff layer depth (the depth of the top layer of organic soil), the volume of downed woody debris (lying dead wood), and the decay class of downed wood. Wild bees were sampled in and around unpaved forest roads in 2022 and 2023 at 18 sites in Kemper County Mississippi and Pickens County Alabama. Sites included early successional (0-3 years), closed canopy (>15 years) and post-thinned (15-21 years) Loblolly pine stands. Vegetation cover data were recorded at four $1m^2$ plots at each site, and understory plant diversity was recorded along a 10 m transect.

In the Georgia study, early successional areas were highest in bee abundance and alpha diversity, while hardwood forests were highest in beta diversity. Early successional areas were shown to favor specific functional traits in the bee community such as soil nesting, litter nesting and sociality. Hardwoods and closed canopy pine forests supported more diverse nesting strategies including cavity nesting and softwood nesting, and supported early season and solitary bees. Nesting habitat was determined to be a strong driver of bee community response in managed forest environments. Preliminary results from Alabama and Mississippi likewise suggest that bee communities differ between early successional and closed canopy forests. Both studies suggest that forest roads are not instrumental in shaping bee communities, but bumble bees showed significant association with forest road edges in both studies. Overall, evidence is growing that the patchwork landscape of managed forests in the southeast support and benefit a diversity of wild bee communities, and that maintaining a diversity of habitat types within the forest matrix, including early successional habitat, is beneficial for bee community and functional diversity.]

- **Understanding wild bee community composition at the urban-forest interface.** Miriam Edelkind-Vealey[1], Michael D. Ulyshen[2], and S. Kristine Braman[1], [1]Department of Entomology, College of Agricultural and Environmental Sciences, University of Georgia, Athens, GA, USA, [2]United States Department of Agriculture (USDA) Forest Service, Southern Research Station, Athens, GA, USA.

- **Wild bee and understory plant responses to forest herbicides in working loblolly pine stands.** Emma L. Briggs[1], Daniel U. Greene[2], Christine C. Fortuin[3], Brittany F. Barnes[1], Kamal J.K. Gandhi[1], [1]D.B. Warnell School of Forestry and Natural Resources, University of Georgia, [2]Weyerhaeuser Company, Environmental Research South, Columbus, MS, [3]Forestry Department, Mississippi State University.

  [**Abstract:** Working loblolly pine (*Pinus taeda* L.) forests rely on herbicides to remove understory plant cover and promote forest productivity, but there has been limited research on the effects of herbicide applications on wild bee communities in forest ecosystems. To conserve wild bees in working pine forests, we initiated a two-year study to evaluate how different herbicide application treatments impact wild bee communities. Our objectives are to: 1) evaluate the indirect effects of herbicide use on wild bee populations and communities over a two-year period; 2) simultaneously assess changes in understory plant communities; and 3) determine linkages between changes in understory plant communities and wild bee responses. We conducted the study during 2022-2023 in loblolly pine stands in the Piedmont region of Georgia, where the herbicide imazapyr is commonly used to control competing vegetation. Stands of two stages (early establishing or thinned mid-rotation) underwent imazapyr application through either: 1) aerial or skidder broadcast spray; 2) backpack spray with banded application; or 3) control with no herbicide. We selected these stages since our previous research indicated that bee diversity and richness is often greatest in early establishing and thinned mid-rotation forests. We sampled wild bees with blue, yellow, and white pan traps and blue vane traps, and recorded stand characteristics including tree diameter, height, and density, understory floral resources, and canopy openness. Preliminary results indicated that in 2022 there were no significant differences in wild bee abundance between the herbicide treatments for both the stand age classes; bee species identifications are underway for 2022 and 2023. However, we hypothesize that treated stands may possess greater habitat heterogeneity beneficial for soil, deadwood, and cavity nesting bees. While plant cover and species richness initially declined with increased herbicide intensity in early establishing sites, the plant community showed recovery in the second sampling year. In mid-rotation stands, understory plant cover and species richness were higher in untreated sites during both the sampling years. Future work includes creating a final bee species list from these working pine forests and using multivariate analyses to link stand structure and composition (overstory and understory plants) with bee population and community attributes. Overall, this study will provide critical information on how herbicides can be used to increase site productivity in working loblolly pine forests, while also conserving wild bees and their vital pollination services.]

- **Georgia Insect Conservation Alliance: Making connections, sharing resources, supporting conservation initiatives.** Meghan W. Hedeen, US Fish and Wildlife Service, Athens, GA.

- **Group discussion** (15 mins)

Open Session **Oak Forest A**

Moderators: *Greg Wiggins, North Carolina Department of Agriculture and Consumer Services, Todd Johnson, Louisiana State University, and Katy Crout, Clemson University*

- **CANCELED. Global analyses suggest that bridgeheads play critical roles in invasions by bark and ambrosia beetles.** Samuel F. Ward[1*], Eckehard G. Brockerhoff[2], Robert J. Rabaglia[3], Jiří Trombik[4], and Andrew M. Liebhold[4,5], [1]Department of Entomology, The Ohio State University, Columbus, OH, [2]Swiss Federal Research Institute WSL, Birmensdorf, Switzerland, [3]USDA Forest Service Forest Health Protection (Retired), Washington, DC, [4]Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Czech Republic, [5]USDA Forest Service Northern Research Station, Morgantown, WV.

- **Progress in improving the selection and deployment of fusiform rust resistance in loblolly pine stands.** Simone Lim-Hing, Department of Plant Biology, University of Georgia.

- **Current forest health studies at Louisiana Tech University.** L. Sims, Adams, J., Adams, H., Holley, G., Crosby, M., Huckaby, A., and Freeman, A. Louisiana Tech University, Forestry Program.

- **Optimization of a high-throughput screening protocol to assess resistance in loblolly pine families against brown spot needle blight.** Rhys Eshleman[1], Colton Meinecke[2], Katie McKeever[3], Caterina Villari[2], [1]Department of Plant Biology, University of Georgia, [2]Warnell School of Forestry and Natural Resources, University of Georgia, [3]Resistance Screening Center, USDA Forest Service.

  [**Abstract:** *Lecanosticta acicola,* causal agent of brown spot needle blight (BSNB), is a serious pathogen of pine that causes premature defoliation of needles, often resulting in growth reduction. Historically, this disease has primarily impacted longleaf pine (*Pinus palustris*) ecosystems and plantations in the southeast U.S. In the past few decades, however, the host and geographic range of *L. acicola* has been rapidly expanding, creating concerns about new hosts in the Southeast. Especially alarming is the significant increase in incidence and severity on loblolly pine (*P. taeda*) reported by industry partners and government agencies across the region. Considering loblolly pine is a crucial timber species, managing BSNB on plantations is a primary concern of the forestry community. Initial observations of outbreaks in several states have suggested that different loblolly pine families possess various levels of resistance to BSNB, but this has not been validated through controlled screening. Through a collaboration with the US Forest Service Resistance Screening Center (RSC), we aim to develop and optimize a high-throughput seedling screening protocol for the selection of loblolly pine families resistant to BSNB. The RSC already has operating protocols for screening pine for resistance against fusiform rust (*Cronartium quercuum f. sp. fusiforme*) and pitch canker (*Fusarium circinatum*), and currently serves as a resource for the southern forestry industry. Therefore, the facility is an optimal resource for developing an equivalent protocol for BSNB that can be utilized by foresters across the region. Inoculation trials, which began in summer 2023, consist of testing how inoculum concentration, incubation period, and seedling age impact disease progression. Additionally, we are conducting experiments to determine the best conditions for sporulation in culture, including optimal media type and incubation temperature and humidity. Four isolates from multiple outbreaks are being tested in these experiments to capture geographic variability in the pathogen. After a suitable protocol is developed and optimized, we aim to perform an initial screening of numerous loblolly pine families, which will also consist of examining host-defense mechanisms. Through this project, we aim to establish a foundation for a BSNB-resistant loblolly breeding program.]

- **Insect pollinators in the Piney Woods of east Texas.** Robert Coulson and James Tracy, Knowledge Engineering Laboratory, Department of Entomology, Texas A&M University.

- **It's a bird! It's a plane! Wait no, it is a Joro spider!** Brittany Barnes[1], Matt Elliott[2], Rhys Eshleman[1], Erin Grabarczyk[3], Colton Meinecke[1], Jason Schmidt [4], Caterina Villari[1], Rebekah Wallace[4] and Kamal Gandhi[1], [1]D.B. Warnell School of Forestry and Natural Resources, University of Georgia, [2]Georgia Department of Natural Resources, [3]Department of Biology, Valdosta State University, [4]Department of Entomology, University of Georgia.

5:00 – 6:00 **Closing Business Meeting** **Oak Forest A**

7:00 – 9:00 **Banquet – Hannover I & II**

Insect Photo Salon

Organizer: *Brittany Barnes, University of Georgia*

Graduate Student Presentation Awards

Roger F. Anderson Award

A.D. Hopkins Award

2023 SFIWC Posters - Oak Forest B

Organizer: Forest Palmer, Clemson University

1. **Coleopteran predators and fungivores associated with bark and woodboring beetles attracted to traps baited with ethanol and α-pinene in southern USA.** Daniel Miller, USDA-FS-SRS.

2. **Predators attracted to cerambycid pheromones in hardwood forests of southern USA.** Daniel Miller[1] and Jon Sweeney[2], USDA-FS-SRS[1] and Canadian Forest Service[2].

3. **Predators attracted to combination of bark beetle pheromones and host volatiles in pine forests of southeastern United States.** Daniel Miller[1], Chris Crowe[1] and Chris Asaro[2], USDA-FS-SRS[1] and USDA-FS-FHP[2].

4. **Trends in bark beetle impacts in North America during a period (2000–2020) of rapid environmental change.** Christopher J. Fettig[1], Christopher Asaro[2], John T. Nowak[2], Kevin J. Dodds[2], Kamal J.K. Gandhi[3], Jason E. Moan[4], and Jeanne Robert[5]. Pacific Southwest Research Station, USDA Forest Service[1], Forest Health Protection, USDA Forest Service[2], D.B. Warnell School of Forestry and Natural Resources, University of Georgia[3], Alaska Division of Forestry[4], and British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development[5].

5. **Biological control of hemlock woolly adelgid in North America: history, status, and outlook.** Albert E. Mayfield III[1], Tonya D. Bittner[2], Nicholas J. Dietschler[2], Joseph S. Elkinton[3], Nathan P. Havill[4], Melody A. Keena[4], David L. Mausel[5], James R. Rhea[6], Scott M. Salom[7], and Mark C. Whitmore[2]. [1]USDA Forest Service, Southern Research Station, Asheville, NC 28804, [2]Department of Natural Resources and Environment, New York State Hemlock Initiative, Cornell University, Ithaca, NY 14853, [3]Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003, [4]USDA Forest Service, Northern Research Station, Hamden, CT 06514, [5]USDA Forest Service, State and Private Forestry, Forest Health and Forest Markets, Eastern Region, Milwaukee, WI 53202, [6]USDA Forest Service, State and Private Forestry, Forest Health and Forest Markets, Southern Region, Asheville, NC 28804, [7]Department of Entomology, Virginia Tech, Blacksburg, VA 24061.

[**Abstract:** The hemlock woolly adelgid (HWA, *Adelges tsugae*, Hemiptera: Adelgidae) is an invasive insect that threatens the ability to maintain eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga caroliniana*) as ecologically functional components of eastern North American forests. Since the early 1990s, a classical biological control program for HWA has been pursued using insect predators from regions of Asia and western North America where the adelgid is native. Early efforts to establish ladybird beetles (Coleoptera: Coccinellidae) resulted in the establishment of *Sasajiscymnus tsugae* from Japan, but consistently poor field recovery of this species suggests it has not been an effective biocontrol agent in the introduced range. Two additional ladybird beetles, *Scymnus ningshanensis* Yu & Yao, and *S. camptodromus* Yu & Liu, were released but did not establish. Subsequent introduction, widespread establishment and spread of *Laricobius nigrinus* and *La.*

osakensis (Coleoptera: Derodontidae) has provided substantial predation on winter stages of HWA, but has not provided overall regulation of adelgid populations below levels that cause hemlock shoot growth loss and mortality. Recently, efforts have focused on prey-specific genetic lineages of *Leucotaraxis argenticollis* and *Le. piniperda* (Diptera: Chamaemyiidae), which co-occur with *La. nigrinus* in their native range of the Pacific Northwest and show promise for eventual establishment in eastern North America. Continued release, monitoring and research associated with the *Laricobius* and *Leucotaraxis* species will be needed to determine if their combined effect can regulate HWA below host-damaging levels. Specimen preservation and molecular identification of field-recovered insects is key to this effort, as it enables immature insects to be differentiated by species, and *Leucotaraxis* species to be further differentiated by their original geographic, prey-associated lineages. Field insectaries are natural or planted hemlock stands where production and maintenance of both prey and predator populations are encouraged, and from which predators can be periodically harvested and redistributed. An operational shift toward more field-insectary production of *Laricobius* will make laboratory resources available for rearing the newer *Leucotaraxis* agents. Program success is likely to be enhanced through integration with other management tactics, consideration of environmental conditions across regions, and recognition of an ever-changing climate.]

6. **Predators attracted to *Ips* pheromones ipsenol, ipsdienol and lanierone in the South.** Dan Miller[1], Chris Asaro[2], and Wayne Berisford[3], USDA-FS-SRS[1], USDA-FS-FHP[2] and University of Georgia[3].

7. **Eight years and counting: the impacts of a regional forest health education program.** Katy Crout[1], Molly Darr[2], and David Coyle[1], Clemson University[1] and Washington State University[2].

8. **The beetle racer wrecking the acer: The race against ALB in SC.** Crystal Bishop[1], Katy Crout[1], Meredith Bean[1], Marina Lupu[1], Abby Ratcliff[2], Lena Schmitt[1], Kelly Oten[2], and David Coyle[1], [1]Department of Forestry & Environmental Conservation, Clemson University, [2]Department of Forestry and Environmental Resource, University of North Carolina.

9. **Asian citrus psyllid and huanglongbing (HLB): Current status in the United States and in the state of South Carolina.** Predeesh Chandran and Xiao Yang, Clemson University.

10. **Exploring patterns of relatedness and genetic evidence of virulence in endemic populations of the pine pitch canker pathogen, *Fusarium circinatum*.** Colton D. Meinecke[1], Owen Hudson[2], Caterina Villari[1], Jeremy T. Brawner[2], [1]Warnell School of Forestry and Natural Resources, University of Georgia, [2]Department of Plant Pathology, University of Florida.

11. **Bumpy beech: Identifying a novel forest pathogen.** Julia Luyk[1], Colton Meinecke[1], Caterina Villari[1], [1]D.B. Warnell School of Forestry & Natural Resources, University of Georgia. Athens, GA.

12. **Deadwood dwellers: Insects and fungi utilizing downed oaks and pines.** Gabriel Tigreros[1,2], Kier Klepzig[1], and Joseph McHugh[2], The Jones Center at Ichauway[1] and University of Georgia[2].

13. **Legacies of disturbance and management: How do management practices affect ant communities in a longleaf pine ecosystem?** Ourania M. Nikolaidis[1], James T. Vogt[2], Kier D. Klepzig[3], and Kamal J.K. Gandhi[1], University of Georgia[1], USDA-FS-SRS[2], and Jones Center at Ichauway[3].

14. **Forecasting future forest invaders with i-Tree Pest Predictor.** Ashley Schulz[1], Angela Hoover[2], Angela Mech[3], Matthew Ayres[4], Andrew Liebhold[5], Travis Marsico[6], and Kathryn Thomas[2], [1]Mississippi State University, [2]United States Geological Survey Southwest Biological Science Center, [3]University of Maine, [4]Dartmouth College, [5]USDA Forest Service, [6]Arkansas State University.

15. **Use of drones to assess pest impact on urban forests as part of Tree Campus USA.** Kulhavy, D. L., D. Unger, V. Williams, I. Hung and Y. Zhang, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX.

16. **Identifying climatic factors associated with brown spot needle blight of loblolly pine in the Southeastern United States.** Olatinwo, R.O., Jaesoon Hwang, and C. Wood Johnson, USDA Forest Service, Southern Research Station, Pineville, LA, 71360.

[**Abstract:** Incidence of brown spot needle blight (BSNB) associated with loblolly pine (*Pinus taeda* L.) in commercial plantations have increased significantly across the southeastern United States in recent years. Brown spot needle blight, caused by the fungal pathogen *Lecanosticta acicola*, which typically affects longleaf pine (*Pinus palustris* Mill.) at the early grass stage of development, started causing significant damage on loblolly pine in the past few years. Positive confirmations of the causal pathogen on loblolly pine needles, using species-specific molecular markers, have been reported in AL, AR, FL, GA, LA, MS, SC, and TX since 2016. Concerns about this new emerging threat to loblolly pine stands have increased, especially in parts of the region where, the viable pathogen is available all year. The study objective was to identify climatic factors or environmental triggers associated with recent reports of BSNB across the southeast since 2016, using the geographic distribution of positive confirmations and the historical climate data. Climatic factors evaluated in this study were the Soil Moisture Anomaly (SMA), Standard Precipitation Index (SPI), a drought index that captures how observed precipitation deviates from the climatological average over a given period, Last Spring Freeze Day, and minimum temperature from February to April. Historical data indicate a consistently higher soil moisture content in parts of the southeastern United States during the early spring period in February from 2019 to 2021, particularly in AL, AR, MS, and LA where BSNB has been widely reported in recent years. Results showed that most recent years (2016-2023) with above normal spring total precipitation also had early Last Spring Freeze Days. Overall, the extended period of flooding or water saturation in poorly drained sites across the region could affect soil nutrient movement, transpiration rate, stomatal functions, and other host physiological activities. Inadequate tree response to precipitation and temperature anomalies may predispose stressed trees to subsequent infections by pathogens such as *L. acicola*. A better understanding of interactions between abiotic and biotic factors associated with the recent surge in BSNB will be critically

important in mitigating further loss of loblolly pine to BSNB in commercial plantations in the southeastern US.]

17. **Impact of competition and site quality on green ash resilience in the North Carolina Piedmont.** Jonathan Kressuk[1], Kelly Oten[1], Robert Jetton[1], and Zakiya Leggett[1], North Carolina State University[1].

18. **Assessing egg releases in establishing *Laricobius* populations on eastern hemlock.** Greg Wiggins[1], Charles Dial[1], Nancy Oderkirk[1], Jackie Fredieu[1], Martha Flanagan[1], and Rusty Rhea[2], [1]Beneficial Insects Laboratory, Plant Industry Division, North Carolina Department of Agriculture and Consumer Services, Raleigh, NC 27699 and [2]Forest Health Protection, Southern Region, USDA Forest Service, Asheville, NC 28804.

19. ***Anoplophora glabripennis* WATCH: Preliminary results of potential ecological impacts in North Carolina.** Kristin Hilborn[1], Kelly Oten[1], and David Coyle[2], North Carolina State University[1], Clemson University[2].

20. **How do climate factors affect Ips beetle dynamics in planted pine forests?** Hanusia Higgins[1], Elizabeth P. McCarty[1], Cristian Montes[1], Kier D. Klepzig[2], Caterina Villari1, and Kamal J. K. Gandhi[1], University of Georgia[1] and The Jones Center at Ichauway[2].

21. **Ash trees: The next generation?** David Bechtel[1] and Jerome Grant[1], University of Tennessee[1].

[**Abstract:** In 2010, emerald ash borer (EAB) was documented in two counties in Tennessee, representing the first confirmation of this invasive insect pest in the southern U.S. It has since been found in 65+ of 95 counties in Tennessee, and EAB is present throughout eastern and middle Tennessee, where it has killed millions of ash trees. A biological control program against EAB was initiated in eastern Tennessee in 2012. From 2012 to 2016, more than 264,000 parasitoids (*Spathius agrili* Yang and *Tetrastichus planipennisi* Yang) were released at 8 locations in 6 counties. In 2021, a multi-year study was begun to assess establishment of these introduced parasitoids of EAB in Tennessee, since no releases had been made since 2016. Both introduced parasitoid species were found to be established in Tennessee. Another exotic parasitoid species, *Spathius galinae* (source of introduction unknown), has been recovered in yellow pan traps and sentinel bolts and is considered to be established in Tennessee. Of our 8 release locations, the Ramsey Site has by far the most substantial ash regeneration. Thus, this site has been designated as an "aftermath site" to assess regeneration of ash and infestation by EAB. All three introduced parasitoid species also have been recovered at this site. Fifty green ash saplings (mean DBH = 4.9 cm and height = 5.4 m) sampled at Ramsey had a mean canopy condition of 1.0 (on a 1-5 scale, with 1 being healthy and 5 completely dead) despite means of 0.3 (sd = 0.7) D-holes and 3.9 (sd = 5.0) blisters/bark splits per tree. Blisters/bark splits result from the formation of callus tissue around larval galleries and subsequent growth of new, healthy tissue over the galleries. The number of D-holes observed was substantially lower than the number of blisters/bark splits on trees, suggesting that the parasitoids may be enhancing ash survival by reducing the number of EAB reaching adulthood. These preliminary results provide an overview of the condition of the ash tree recovery at our aftermath site (Ramsey Site) following the introduction and establishment of parasitoids of EAB and provide a baseline to compare future conditions.]

22. **Implications of insects & arthropods in invasive callery pear (*Pyrus calleryana* Decne.).** Jordan B. Bailey, J. Forest Palmer, David R. Coyle, Jess Hartshorn, Michael L. Ferro, Clemson University.

23. **Trees just wanna have sun: a silvicultural approach to hemlock restoration and management of hemlock woolly adelgid.** Lauren Gonzalez[1], Robert Jetton[1], Bud Mayfield[2], Andy Whittier[2], and Bryan Mudder[2], North Carolina State University1 and USDA-FS-SRS2.

24. **Proposing a joined network of forestry professionals to combat forest health and productivity issues within the west gulf region and extended through the South.** Laura Sims[1], Joshua Adams[1], Nan Nan[1], Shaoyang Yang[1], Gordon Holley[1], Jeremy Stovall[2], and John Lock[3], Louisiana Tech University[1], Stephen F. Austin University[2], Caddo Sustainable Timberlands[3].

25. **Phenology of elm zigzag sawfly in North Carolina.** Delaney Serpan[1], Abby Ratcliff[1], and Kelly Oten[1], North Carolina State University[1].

26. **Effects of fire regimes on wild pollinators in managed pine forests.** E. McDonald[1], Briggs, E[1]., Fortuin C.[2], Gandhi K.[1], University of Georgia[1], Mississippi State University[2].

Minutes of the SFIWC Opening Business Meeting
Tuesday, July 25, 2023

Sheraton Raleigh Hotel
Raleigh, North Carolina

Chair Lynne Rieske-Kinney called the 62nd meeting of the Southern Forest Insect Work Conference to order at 1:18 PM, following a welcome to Raleigh by North Carolina State Senator Sydney Batch. Chair Rieske-Kinney welcomed everyone and thanked all of the meeting organizers. She asked first-time attendees to stand and introduce themselves. The group then paused for a moment of silence in remembrance of SFIWC members, Fred Hain (NC State University) and Pat Shea (USDA Forest Service), and noted forest entomologist, Don Bright (Canadian Department of Agriculture), who passed away since the 2022 SFIWC meeting. Members were invited to share announcements of professional transitions or retirements (none).

Reports

Secretary-Treasurer Will Shepherd reported that the minutes of the 2022 meeting in Lexington, Kentucky are available in the Proceedings on the SFIWC website. Financially, SFIWC had a checking account balance of $4,585.66 on 12/31/22. Expenses for the Lexington meeting exceeded income by $34.67. SFIWC 2023 has been approved for a total of 13.5 Continuing Forestry Education (CFE) credits by the Society of American Foresters (SAF). Will announced that SFIWC will donate $100.00 to the Hemlock Restoration Initiative in memory of Fred Hain.

Paul Merten read the Historian's Report (see attached) with highlights of the one NAFIWC and six SFIWC meetings previously held in North Carolina, including the 8th SFIWC also in Raleigh in 1963.

A.D. Hopkins Award – Scott Salom, speaking for Chair Steve Clarke, reported that the Hopkins Award committee has agreed on a recipient, to be announced at the Thursday banquet. He also reminded everyone that Brian Sullivan would give his A.D. Hopkins Presentation later in the afternoon.

Roger F. Anderson Award – Lynne Rieske-Kinney, Chair, said that the award's recipient would be announced at the Thursday banquet.

Resolutions – Kamal Gandhi reported that there are no resolutions pending at this time.

Website – Elizabeth McCarty not present.

Social Media – Courtney Smith Johnson asked everyone to follow the SFIWC Twitter page and that she would be taking pictures for SFIWC social media throughout the week.

Theses and Dissertations – David Kulhavy had nothing to report.

Local Arrangements – Chair Rieske-Kinney thanked Local Arrangements Chairs, Robert Jetton and Kelly Oten, for helping to organize this year's meeting. She also thanked the NC State

University graduate students for compiling a list of suggested restaurants near the hotel in Raleigh, which can be found at the registration table.

Chair Rieske-Kinney asked everyone to visit the registration table to donate non-perishable food items or money for SFIWC's annual food drive. All donations will be sent to the Food Bank of Central and Eastern North Carolina.

Kelly Oten announced that everyone who signed up for the Field Trip to the Nature Research Center should have received a confirmation email. Anyone wanting more information on the tour can see her for details.

Kelly Oten invited everyone to the Frustrana Cup, organized by Abby Ratcliff. It will be a cornhole tournament to be held on Wednesday afternoon at the Raleigh Beer Garden.

Bob Coulson announced that there would be no Frontalis Cup golf tournament this year, due to lack of participation.

Old Business

Chair Rieske-Kinney shared the results of a poll sent out shortly before the 2023 meeting, seeking input on the members' positions on the proposed scope and/or name change for SFIWC. The poll was open for 30 days and had 104 respondents, most of whom generally supported a change in both scope and name. A smaller majority favored a change in the names of the awards currently named for forest entomologists. Also, most respondents agreed with formalizing a Program Committee and the Executive Committee to include non-entomologists. Chair Rieske-Kinney reminded everyone that "the devil is in the details," and the membership should carefully consider how to move forward following a scope/name change. She welcomed any suggestions for proposed changes be made to the Executive Committee.

New Business

Nominations – SFIWC needs one new Counselor for a full three-year term to replace Jess Hartshorn, and another Counselor for a one-year term to replace Chandler Barton. Voting on nominees will be held during the closing business meeting. Contact Lynne Rieske-Kinney (Chair) or Jess (Counselor) if you wish to submit a nomination.

SFIWC 2024 – Jess Hartshorn, 2024 Local Arrangements Chair, invited everyone to next year's meeting, July 16-18 in Greenville, South Carolina. Volunteers for Program Chairs are needed.

SFIWC 2025 – Chair Rieske-Kinney asked everyone to consider potential locations for the 2025 meeting.

Chair Rieske-Kinney thanked this year's Local Arrangements Chairs, Robert Jetton and Kelly Oten, and Program Chairs, Jess Hartshorn and Scott Salom, for their diligent work in putting together a great meeting and agenda.

Brittany Barnes asked everyone to meet for group photos during the afternoon break.

Poster Session – Lynne Rieske-Kinney asked everyone to attend the Wednesday night poster reception, organized by Forest Palmer, in Oak Forest B.

Graduate Student Session – Ashley Schulz, Graduate Student Session Coordinator, invited everyone to the session on Wednesday morning.

There being no further business, the meeting adjourned at 1:53 PM.

Minutes of the SFIWC Closing Business Meeting
Thursday, July 27, 2023

Sheraton Raleigh Hotel
Raleigh, North Carolina

Chair Lynne Rieske-Kinney called the meeting to order at 5:08 PM.

She thanked all of the organizers, presenters, and students.

Old Business

Frustrana Cup – Abby Ratcliff reported that the team of Mitchell Green and Jim Meeker won the cornhole tournament on Wednesday afternoon.

SFIWC Food Drive – Lynne Rieske-Kinney thanked everyone for their donations of food and cash, totaling $600 (thus far), for the Food Bank of Central and Eastern North Carolina.

Election of Counselors – Demian Gomez, Holly Munro, Kelly Oten, Allen Smith, and Kendra Wagner were nominated as candidates for SFIWC Counselors, 2023-2027 and 2023-2024. Two votes were conducted. The winner of the first vote was Kelly Oten, who will serve as Counselor, 2023-2027. The winner of the second vote (among the remaining nominees) was Holly Munro, who will serve as Counselor, 2023-2024.

SFIWC 2024 – Lynne Rieske-Kinney told everyone that next year's meeting in Greenville, South Carolina will be held July 16-18 at the SpringHill Suites Greenville Downtown and asked for volunteers for Program Chairs. Mohammad Bataineh and Todd Johnson agreed to be the Program Co-Chairs.

New Business

SFIWC 2025 – Dieter Rudolph agreed to be the Local Arrangements Chair for the 2025 meeting, tentatively scheduled to be held in Tulsa, Oklahoma. The Executive Committee will begin looking at hotels in the area.

NAFIWC 2026 – Chair Rieske-Kinney stated that planning should commence for the 2026 meeting, with SFIWC possibly needing to lead these efforts.

Scott Salom moved to change the name of the Southern Forest Insect Work Conference to the Southern Forest Health Work Conference, citing the benefit of formalizing the expanded scope of SFIWC previously discussed and generally agreed on by the membership during the past two meetings. The new SFHWC would amend its guidelines (bylaws) to include a focus on all aspects of forest health, and not just entomology. Several points for and against the name change were brought up by the membership. Those supporting the original name stated that the Western Forest Insect Work Conference (WFIWC) was able to expand its scope beyond entomology, yet keep its historical name. Some argued that the term "forest health" is a poorly defined "umbrella term" and can mean different things in research, industry, etc., making it a less-than-ideal candidate for the new name. Others said that SFIWC already welcomes all forest health

professionals and includes a diverse range of session topics, so a name change is the next logical step. Pathologists and other non-entomologists working in forest health may feel excluded under the original name.

With a 2/3 vote needed to change the name of SFIWC, due to it being a change in the guidelines (bylaws), the motion passed.

Chair Rieske-Kinney reintroduced the survey results, highlighting the membership's views on award names, the establishment of a Program Committee, and the makeup of the Executive Committee to reflect the new name and scope changes. There was a general consensus by the attendees that any changes to award names should be tabled until a future meeting. A suggestion was made to add new awards (with new names) for non-entomology groups within SFHWC. Discussion of the Executive Committee creating a Program Committee and designating non-entomologists to serve on it led to a general consensus by the attendees to let such a committee evolve naturally. There also was a general consensus by the attendees to add Caterina Villari, a pathologist, as an additional Program Co-Chair for 2024 (she agreed). Next, the composition of the Executive Committee was discussed, with the specific question of whether to add a pathologist and/or an invasive plant specialist. There was a general consensus by the attendees that this should happen organically. Lynne Rieske-Kinney moved that SFHWC should be mindful of our Executive Committee inclusivity. The motion passed unanimously.

Chair-Elect Kamal Gandhi led the membership in thanking Lynne Rieske-Kinney, our longest-serving SFIWC Chair, for everything she did during her years of leadership for our organization.

There being no further business, Chair Rieske-Kinney adjourned the meeting at 6:07 PM.

Minutes of the Awards Banquet
Thursday, July 27, 2023

Sheraton Raleigh Hotel
Raleigh, North Carolina

Chair Lynne Rieske-Kinney called the awards ceremony to order at 8:06 PM.

Robert Trickel led the SFIWC attendees in a state toast for North Carolina.

Photo Salon – Brittany Barnes thanked Tom Sheehan for taking over hosting duties at the 2022 SFIWC. She introduced a new category for next year's meeting: Forest Pathogens and Fungi. Brittany stated that 52 photos and 4 videos were submitted this year from 14 members, whom she thanked along with judges: Paul Merten, Abby Ratcliff, and Caterina Villari. She announced the 1st Place winners in each category, as well as the Best in Show winner, **Katlin DeWitt** (see attached). Katlin received $50, and her picture will be featured on the cover of the SFHWC 2024 program. Pictures will be forwarded to the Bugwood website.

Chair Rieske-Kinney reminded everyone to donate to this year's Food Drive. [The final donation amount was $700 and multiple food items.]

Graduate Student Presentation Awards – Ashley Schulz, Graduate Student Session Coordinator, thanked the students and four judges: Christine Fortuin, Todd Johnson, Holly Munro, and Kendra Wagner. She presented the Fred Stephen Award for Outstanding M.S. Presentation and $200 to **Morgan Knutsen**, a student of Lynne Rieske-Kinney at University of Kentucky; and the Fred Stephen Award for Outstanding Ph.D. Presentation and $300 to **Timothy Shively**, a student of Jacob Barney at Virginia Tech.

Roger F. Anderson Award – Lynne Rieske-Kinney, Chair, thanked committee members, Bob Coulson, Kier Klepzig, and Brian Sullivan. She announced that **Carrie Preston**, a Ph.D. student of Scott Salom at Virginia Tech, received the 2023 award. Carrie was presented a certificate; $500 and her personalized award plaque will be mailed to her in a few weeks.

A.D. Hopkins Award – Scott Salom, standing in for Chair Steve Clarke, presented 2022 recipient, Brian Sullivan, with a personalized award plaque. He thanked committee members, Natalie Clay, Jeffrey Eickwort, Anna Grossman, Hannah Hollowell, Jim Meeker, and Allen Smith. Scott reported that this year's winner is **Bud Mayfield**, USDA Forest Service. Bud was given an A.D. Hopkins framed picture and letter. A personalized award plaque will be presented to Bud at the 2024 SFHWC.

Chair Rieske-Kinney thanked everyone who helped organize the 2023 SFIWC and adjourned the awards ceremony at 8:27 PM.

Respectfully submitted,

William P. Shepherd, Secretary-Treasurer

SFIWC Financial Report, CY 2023

SFIWC Income & Expenditures

January 1, 2023 – December 31, 2023

Balance on hand, 1/1/23	$4,579.16
Income	
Registrations, Donations, and Banquet fees	$35,380.60
Available Funds	$39,959.76
Expenses	
2023 Meeting	$33,163.00
Awards & Administration	$1,441.82
Total Expenses	$34,604.82
Balance on hand, 12/31/23	$5,354.94

Historians Report
62nd SFIWC
Raleigh, North Carolina

This report is for the 62nd Southern Forest Insect Work Conference held in Raleigh, North Carolina. The great state of North Carolina has hosted SFIWC six times since the inception of our organization in 1956. North Carolina also hosted NAFIWC one time back in 2006. The town of Raleigh was the first hosting of the 8th annual SFIWC meeting in the state of North Carolina back in August 27-28, 1963, sixty years ago!

The 1963 meeting was led by chairman Lloyd Warren and the program chair was Eben Osgood. Officers that year were Secretary/treasurer Edward Merkel, and counselors Caleb Morris, Lacy Hyche, and Robert Thatcher. Seventy-two men were registered for the 8th SFIWC. The 1963 meeting didn't have a keynote speaker which was common in the early days of SFIWC, as welcome or keynote addresses didn't become a custom until 1968. The main working group discussions in the 1963 meeting were as follows:

- The opening topic with the first Raleigh meeting comprised of "What Changes in Entomological Training are Needed to Meet Future Demands of Forest Insect Control and Research". In this workshop, members of the USFS, state agencies and industry spoke about the importance of the fundamentals of entomology. Items such as the need for basic entomology, taxonomic studies, detection, prevention, insect life histories, mass rearing techniques, biocontrol, chemical control, tree physiology, resistance screening, silviculture and many more elements of entomology were discussed.
- The second workshop addressed Southern Pine Beetle, namely the ecology of bark beetles, impacts of rainfall, outbreak population dynamics, sampling, flight behavior, and stimuli responses.
- The third workshop addressed pine tip moths with discussion about ecology, life histories, parasitism, and control.
- The fourth workshop entailed a wide variety of discussions about chemosterilants and attractants but most of the insects studied were fruit and houseflies. Pros and cons of sterilizing male insects with gamma rays were discussed. Interestingly there was discussion about sex attractants, but the term "pheromone" was absent in the text.
- The final workshop entailed discussion about the use of insecticides. Most of the discussion was about analysis including quantification of effectiveness of insecticides. Most of the forestry insecticides used at the time were Benzene Hexachloride (BHC) and Dichloro-diphenyl-trichloroethane (DDT) which were both considered to be in danger following President Kennedys advisory committee recommendations for an orderly reduction in persistent insecticides. Recall that Rachel Carson's book titled "Silent Spring" was published on September 27, 1962…

For temporal context, below are some of the pop culture and issues occurring in the year of 1963:

- Average cost of a new home was $19,300, average annual income was $4,400 and the average cost of a new car was $3,000
- Dr. Martin Luther King delivered his “I have a dream” speech on the steps of the Lincoln Memorial
- The Sabin oral polio vaccine which was taken with a lump of sugar was given nationwide
- Soviet cosmonaut Valentina Tereshkova became the first woman in space
- US car manufacturer Studebaker went out of business
- US Postal Service launches Zone Improvement Plan (ZIP) code system
- Beatlemania erupted in the UK, newspaper headlines included "Beatle Bug Bites Britain”
- Number one hit on the billboard year end hot 100 singles was “Surfin’ USA” by the Beachboys
- Edward Craven Walker invented the lava lamp
- Top rated TV show was the “Beverly Hillbillies”
- Tragically president Kennedy was assassinated in Dallas Texas (November 22)

Like most SFIWC’s in the 1950’s-1970’s the 1963 meeting made little mention of exotic insects, Balsam Wooley Adelgid being the exception. In contrast, this year’s SFIWC is once again dominated with exotic insect research, along with a fair number of topics on pathogens and invasive plants. Terminology in today’s research topics include words not mentioned 60 years ago such as: insect diversity, habitat restoration, RNAi mediated disruption, habitat fragmentation, stakeholder perception survey, genetic engineering, host-pathogen-vector interactions, or drones…Unmanned Aircraft Systems, not male bees.

Lastly, I wanted to address the impact of the proposed changes to our SFIWC organization. The idea of formally changing our work conference name and scope to join the field of entomology with pathology and weed sciences is significant for our long SFIWC tradition. The thought changing our name conjured up the phrase of “What’s in a name?” What’s in a name comes from the 16th century William Shakespeare play “Romeo and Juliet”, in which Juliet is not allowed to associate with Romeo because he is from a feuding family. If he had any other last name, it would be fine. Juliet attempts to make a case that words (i.e., his last name of Montague) are meaningless and stated, “That which we call a rose by any other name would smell just as sweet”. With the discussion of this conference merging with forest pathology and invasive plants to possibly become more oriented with Forest Health, we are at a pivotal time for this 67-year-old organization. Changing SFIWC will be significant, but keep in mind that forest pathogens directly connected to insects have always been a part of the SFIWC discussion. After all, how can one discuss the dynamics of southern pine beetle killing trees without including *ophiostoma* fungi? What success would long range spread of oak wilt have without nitadulid beetles? Without the aid of *Entomophaga maimaiga*, spongy moth infestations would be much more severe. The pathogens mentioned are just a few of the many insect/pathogen interactions that have long been a part of the conversation at SFIWC. Likewise, invasive plants have been part of the discussion at SFIWC for many years as well, mostly in relation to insects that provide biological herbivory control or fungal vector relief from the weeds unrelenting spread. Names

do have meaning, but I trust that the high quality of content, comradery, information sharing and long held traditions of SFIWC will remain regardless of the name that we may choose.

Prepared by Paul Merten SFIWC Historian; July 20, 2023

Photo Salon Awards
2023 SFIWC – Raleigh, North Carolina
Brittany Barnes, Organizer

Forest Insect
1st Place Joe Pase – Robber fly, Diptera: Asilidae: *Diogmites* spp.

Forest Insect Damage
1st Place Bud Mayfield – Wool sower gall caused by *Callirhytis seminator* on a white oak seedling

Series
1st Place Joe Pase – Rambur's forktail (female and male), Odonata: Ceonagrionidae: *Ischnura ramburii*

Other
1st Place Bud Mayfield – A man fly fishes on the French Broad River near Hot Springs, North Carolina

Entomologists or Forest Health Specialists at Work
1st Place Katlin DeWitt – Find the beetles

Video
1st Place Brittany Barnes – Joro enjoying a snack

Humor
1st Place Christine Favorito – Caught him!

Best in Show Katlin DeWitt – Find the beetles

Judges: Paul Merten, Abby Ratcliff, and Caterina Villari

Officers and Committees – 2022-2023

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GRADUATE STUDENT SESSION

Ashley Schulz, Mississippi State University, Dept. of Forestry, 327 Thompson Hall, Box 9681, Mississippi State MS 39762. 662-325-5809. Email ash.schulz@msstate.edu

62nd Conference, July 25-27, 2023
Raleigh, North Carolina

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63rd Conference, July 16-18, 2024
Greenville, South Carolina

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