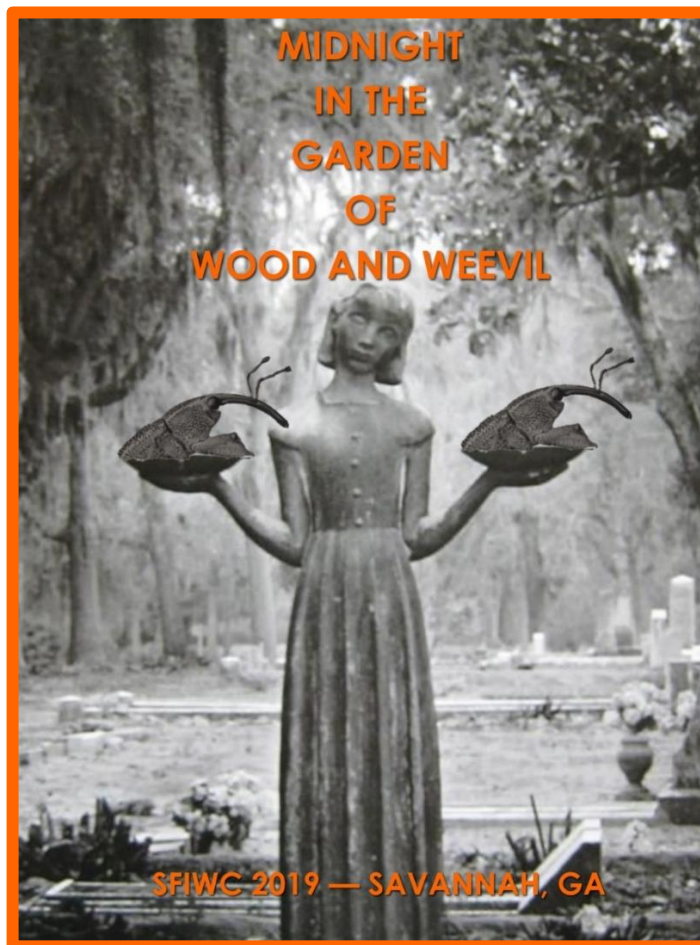


Proceedings

60th Southern Forest Insect Work Conference



July 23 – 26, 2019
Savannah Marriott Riverfront
Savannah, Georgia

PROCEEDINGS
60th Annual
SOUTHERN FOREST INSECT WORK CONFERENCE

Savannah Marriott Riverfront
Savannah, Georgia
23–26 July 2019

David Coyle and Kelly Oten, Program Chairs

Chip Bates, Local Arrangements

Officers: 2018–2019

Chairman..... Robert Jetton (2017–2019)
Secretary-Treasurer..... Will Shepherd
Counselors..... Kamal Gandhi (2015–2019)
.....JT Vogt (2017–2020)
.....Jessica Hartshorn (2018–2022)

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Registration List, 60th SFIWC, Savannah, Georgia

* = student, † = retired

Carissa Aoki	Donald M Grosman	Flávia Pampolini*
Chris Asaro	Fred P Hain†	Zack Parker*
Matthew P Ayres	Jeffrey Hamilton*	Thomas L Payne†
John Banask	Shane Harrington	Sarah Pellecchia*
Chuck Bargeron	Jessica Hartshorn	Emilee Poole*
Brittany Barnes	Hannah Hollowell*	Robert Rabaglia
John C “Chris” Barnes	Jiri Hulcr	KaDonna Randolph
Chandler Barton	David Jenkins	Lynne K Rieske-Kinney
Chip Bates	Robert Jetton	John J Riggins
Erin Berryman	Crawford “Wood” Johnson	Dieter Rudolph
Crystal Bishop*	Carrie Jubb*	Daniel Russel
Ryan A Blaedow	Kier D Klepzig	Jarmila Ruzicka
Alexandra Blevins	Brian Kopper	Scott M Salom
Jamie Bookwalter*	Bethany Kyre*	Thomas Sheehan
Andrew J Boone†	F Wayne Langston	William P Shepherd
R Scott Cameron†	Samantha Larsen	James Slye
Victoria Cassidy*	Alex Mangini	Lawrence Allen Smith
Haley Chamberlain- Nelson	Todd Matthews	Fred Stephen
Lori Chamberlin	Bud Mayfield	Dana Stone
Kevin Chase	Kristy McAndrew*	Brian Strom
Lea Clark*	Elizabeth McCarty	Bill Sweeney
Stephen R Clarke	Scott McMahan	Austin Thomas*
Natalie Clay	James R Meeker	Michael Torbett
Robert N Coulson	Julian Mendel	Robert Trickel
David R Coyle	Paul Merten	Stephen Turner
Michelle Cram	Dan Miller	Luca Valentini*
Molly Darr	DeEtta Mills	James T “JT” Vogt
John de Soto*	Katlin Mooneyham	Kendra Wagner*
Don Duerr	Holly Munro*	Théo Walden*
Tom Eager	Wesley A Nettleton†	Margot Wallston
Jeffrey M Eickwort	Abraham Nielsen	Geoff Wang
Jeremiah Foley*	Afaq Niyas	Chuck Williams
Kamal J K Gandhi	John Nowak	Alan Wilson
Demian Gomez*	Emily Ogburn	Lynne Womack
Jerome F Grant	Kelly Oten	Darian Yawn
	James Forest Palmer	Kelsea Young*

22 students, 5 retirees, and 80 professional members = 107 registered participants

SFIWC 2019 Group Pictures



Figure 1

Front Row (left to right): Lynne Womack, Chris Barnes, Paul Merten, Molly Darr, Katlin Mooneyham, Emilee Poole, Michelle Cram, Lori Chamberlin

Back Row (left to right): Brittany Barnes, Luca Valentini, John de Soto, Afaq Niyas, Bill Sweeney, Kevin Chase, Tom Eager



Figure 2

Front Row (left to right): Holly Munro, Kamal Gandhi, Flávia Pampolini, Hannah Hollowell, Théo Walden, Beth Kyre, Kelly Oten, Scott Salom

Back Row (left to right): Jarmila Ruzicka, Fred Hain, Crystal Bishop, Wayne Langston, Ryan Blaedow, Dave Coyle, Will Shepherd, Kier Klepzig, Robert Jetton, Chuck Williams



Figure 3

Front Row (left to right): Emily Ogburn, John Banask, Daniel Russell, Shane Harrington, Chip Bates, Bud Mayfield, Erin Berryman, Bob Rabaglia

Back Row (left to right): Carissa Aoki, David Jenkins, Allen Smith, Demian Gomez, Jeffrey Eickwort



Figure 4

Front Row (left to right): Alex Mangini, Abe Nielsen, Don Grosman, Kristy McAndrew, Sarah Pellecchia, Lynne Rieske-Kinney, Fred Stephen, Robert Coulson

Back Row (left to right): Jerome Grant, Margot Wallston, John Nowak, Jim Meeker, Kendra Wagner, John Riggins, Carrie Jubb, Andy Boone



Figure 5

Front Row (left to right): Samantha Larsen, Alexandra Blevins, KaDonna Randolph, Kelsea Young, Steve Turner, Chris Asaro, Michael Torbett, Jeremiah Foley

Back Row (left to right): Jeff Hamilton, Tom Sheehan, Scott Cameron, Jim Slye, Robert Trickel, Forest Palmer, Brian Kopper



Figure 6

Front Row (left to right): JT Vogt, Brian Strom, Wes Nettleton, Natalie Clay

Back Row (left to right): Elizabeth McCarty, Jiri Huler

Attendees not pictured: Matt Ayres, Chuck Barger, Chandler Barton, Jamie Bookwalter, Victoria Cassidy, Haley Chamberlain-Nelson, Lea Clark, Steve Clarke, Don Duerr, Jess Hartshorn, Wood Johnson, Todd Matthews, Scott McMahon, Julian Mendel, Dan Miller, DeEtta Mills, Zack Parker, Tom Payne, Dieter Rudolph, Dana Stone, Austin Thomas, Geoff Wang, Alan Wilson, Darian Yawn

60th Annual Southern Forest Insect Work Conference
July 23 – 26, 2019
Savannah, GA
Program

Tuesday, July 23rd

- 1:00 – 6:00 Meeting Registration – Ballroom Foyer**
Organizer: Will Shepherd, USDA-FS-SRS
- 1:00 – 2:45 Southern Pine Beetle Working Group – General McIntosh**
Organizer: John Nowak, USDA-FS-FHP
- Ongoing SPB outbreak on National Forests in Mississippi
Jim Meeker, USDA-FS-FHP
 - Efforts to expedite SPB suppression on National Forests
John Nowak, Jim Meeker, Steve Clarke; USDA-FS-FHP
 - Survey 123 process for SPB spring survey: What worked well, what did not, and ideas for next year
Michael Torbett, Chip Bates; Georgia Forestry Commission
 - SPB prediction for 2019 based on spring trapping survey: Model, maps and process
Carissa Aoki¹, Matt Ayres²; ¹Bates College, ²Dartmouth College
 - SPB hazard maps
Erin Berryman, USDA-FS-FHP
 - SPB predictions for 2019 based on weather patterns, past outbreaks, and stand conditions
Steve McNulty¹, John Nowak²; ¹USDA-FS-SRS, ²USDA-FS-FHP
 - Trap tree study, trap comparison, etc.
Steve Clarke, USDA-FS-FHP
- 3:15 – 4:30 Forest Health Committee (closed meeting) – General McIntosh**
Organizer: Chip Bates, Georgia Forestry Commission
- 4:30 – 5:00 Executive Team Meeting – Reynolds**
Organizer: Robert Jetton, NC State University
- 5:00 – 5:30 A.D. Hopkins Award Committee – Reynolds**
Organizer: Lynne Rieske-Kinney, University of Kentucky
- 5:30 – 6:00 Roger F. Anderson Award Committee – Reynolds**
Organizer: Kamal Gandhi, University of Georgia

6:00 – 8:00 Poster Set-up – Atrium

Organizers: Kendra Wagner¹, Jess Hartshorn²; ¹Mississippi State University, ²Clemson University

6:00 – 8:00 Mixer and Reception – Riverwalk

Wednesday, July 24th

Breakfast on your own

- 8:00 – Meeting Registration – Ballroom Foyer**
Organizer: Will Shepherd, USDA-FS-SRS
- 8:00 – 8:15 Welcome Address – Savannah Ballroom C**
Chuck Williams, Director, Georgia Forestry Commission
- 8:15 – 8:45 Opening Business Meeting – Savannah Ballroom C**
Robert Jetton, NC State University
- 8:45 – 9:30 Keynote Address – Savannah Ballroom C**
Five years of pre-invasion assessment of overseas wood borers: What have we learned?
Jiri Hulcr, Associate Professor, School of Forest Resource Sciences, University of Florida
Introduction: Dave Coyle, Clemson University
- 9:30 – 10:00 Plenary Session – Partnerships & Pathways: The Journey from a Non-Native Species to an Invasive Pest – Savannah Ballroom C**
Organizers: Dave Coyle¹, Kelly Oten², Chip Bates³
¹Clemson University, ²N.C. Forest Service, ³Georgia Forestry Commission
- Presenter:
Brian Kopper
Assistant Director – Q56 Risk Assessments
USDA, APHIS, PPQ, Science & Technology, Plant Epidemiology and Risk Analysis Laboratory
- 10:00 – 10:30 Break and Group Photos – Ballroom Prefunction**
- 10:30 – 12:00 Plenary Session (continued) – Savannah Ballroom C**
- Presenters:
Rebecca Rhinehart
Supervisory CBPAS
Port of Savannah, Georgia
- Albert (Bud) Mayfield, III**
Research Entomologist
USDA Forest Service – Southern Research Station

[Abstract:

It's Here...Now What? Responses of Forest Health Specialists and Researchers to a New Introduction

New introductions of invasive exotic organisms can be difficult to detect, characterize, delineate, and assess for potential impacts. The introduction of the laurel wilt vector (redbay ambrosia beetle, *Xyleborus glabratus*) and pathogen (*Raffaelea lauricola*) into the southeastern United States presented all of these challenges, prompting forest health professionals and researchers from local, state, federal, and academic institutions to work collaboratively in response. From 2002-2009, these partners effectively:

- Investigated and confirmed the cause of unusual redbay tree mortality
- Detected, named and described the causal agents, and named the disease (laurel wilt)
- Surveyed and mapped the geographic extent and spread of the disease
- Determined the susceptibility of various native and non-native tree species to the pathogen
- Described the basic biology of vector and the epidemiology of disease
- Explored and tested the efficacy of monitoring and management tools
- Educated stakeholders and the general public through multiple outlets, and
- Identified and documented needs in research, management, and education

This early cross-agency collaboration, through both informal and formal structures, laid a solid foundation of expertise, information, and tools, upon which the community of those working on laurel wilt has continued to build.]

Chip Bates

Forest Health Coordinator
Georgia Forestry Commission

12:00 – 1:30 Lunch on your own

1:30 – 3:00 Graduate Student Session – Savannah Ballroom C

Organizers: Elizabeth McCarty¹, Kristy McAndrew², Kendra Wagner²;
¹University of Georgia, ²Mississippi State University

- New records of wood borers in Cuba and its implications for regulatory agencies in United States
Demian Gomez, Damian Adams, Jiri Hulcr; University of Florida

[Abstract: Invasive species are one of the major biotic disturbances to native forests. The Caribbean is an import pathway for potentially harmful exotic pests to the US, since it is one of the most biologically diverse regions, and because of its geographic proximity and ecological similarities to the US. Cuba is the closest large land mass to Florida, but little is known about pests of concern in Cuba. As part of a USDA-APHIS Farm Bill project, we reviewed the Cuban State plant protection system and built an up-to-date database of wood borers in the country to define high-risk potential pests, with focus on bark and ambrosia beetles. Despite the lack of reference material in entomological collections and general

lack of resources, the Cuban border protection system has a solid organizational structure. Our collaborative US-Cuban team have discovered many unknown bark beetle species for the island, including undescribed species. None of these species appear to pose a threat to the US. However, the lack of access to information about interceptions in ports of entry in Cuba arriving from elsewhere and potentially being passed on to the US, is identified as one of the blind spots in the US safeguarding systems.]

- Establishment assessment for the hemlock woolly adelgid predator, *Laricobius nigrinus* in Virginia
Carrie Jubb, Thomas McAvoy, Kari Stanley, Scott Salom; Virginia Tech University

[**Abstract:** In classical biological control programs, post-release evaluation of predator establishment is critical for guiding future management decisions. Since 2003, controlled release of a predatory beetle, *Laricobius nigrinus* (Coleoptera: Derodontidae), has been utilized for management of the invasive pest, hemlock woolly adelgid (HWA; *Adelges tsugae* (Hemiptera: Adelgidae) in the eastern United States. To date, over 400,000 *L. nigrinus* beetles have been released at over 1000 unique locations. Twenty-two of those releases were made within the state of Virginia between 2003 and 2014. In order to evaluate the establishment of *L. nigrinus* in Virginia, a two-year study was initiated in 2017. Release sites were sampled each year in March or April during peak *L. nigrinus* oviposition to determine presence or absence. Two sampling methods were evaluated for effectiveness in recovering *L. nigrinus*; beat sheet sampling for adult recoveries, and branch clip sampling for larval recoveries. A native species, *Laricobius rubidus* (Coleoptera: Derodontidae), whose primary host is pine bark adelgid (PBA; *Pineus strobi* (Hemiptera: Adelgidae)), is often found in low levels feeding and completing development on HWA. Because *L. nigrinus* and *L. rubidus* were found to produce viable hybrid offspring, microsatellite analysis was used to determine the identity of *Laricobius* spp. recoveries, and to estimate the ratio of populations within release sites. *L. nigrinus* established at 82% of Virginia release sites. Eighty percent of recoveries were identified as *L. nigrinus*, 18% *L. rubidus*, and 2% were hybrids. Branch clip sampling for larvae was determined to be the most effective method of sampling for *Laricobius* spp. Further details of these establishment assessments will be presented.]

- Hemlock Bluffs Nature Preserve: A unique and imperiled population of eastern hemlock
Austin Thomas¹, W. Andrew Whittier^{1,2}, Mark Johns³, Robert Jetton¹;
¹North Carolina State University, ²USDA-FS-SRS, ³The Town of Cary, NC

[**Abstract:** Hemlock Bluffs Nature Preserve is a 140 acre preserve co-owned by the North Carolina State Park System and the Town of Cary. An eastern hemlock (*Tsuga canadensis*) population exists entirely within the preserve boundary, which is approximately 110 mi from the contiguous range of the tree. This population, occurring primarily on a north facing bluff along Swift Creek, currently faces a number of threats to its survival, notably attack by the introduced hemlock woolly adelgid (*Adelges tsugae*, HWA), bluff erosion, increased canopy competition, and climate change. A 1956 paper published in Ecology included an inventory of the hemlock population, detailed records of the forest community composition, and climate data for the area. The goal of our work was to replicate the 1956 inventory and survey, while implementing

additional modern scientific methods to analyze changes in the climate, forest community, and hemlock population over the past 66 years. Our 2018 eastern hemlock inventory found several mature trees have been lost and there is little recent seedling recruitment. Our floristic survey noted changes in understory species composition suggesting canopy cover has significantly increased since 1956, however, canopy cover was not quantitatively measured in that study. Nestedness analysis of preserve flora revealed distinct forest communities stratified by bluff and upland elevations, with bluff communities of a similar species composition to that found at middle elevations in the Southern Appalachians. Climate data is still being collected but indicates similar temperatures in spite of canopy closure, with notably increased soil moisture and humidity. Using our survey data, we have modeled both past and future hemlock population and forest community dynamics within the preserve, predicting a steady decline in the hemlock population over the next several hundred years if there is no disturbance. Based on these models we have developed a management plan proposal to ensure the preservation of this unique population of eastern hemlock trees.]

- The distribution and establishment of HWA predators *Laricobius nigrinus* (Coleoptera: Derodontidae) within the urban environment in two localities in southwest Virginia
Jeremiah Foley, Kyle Bekelja, Thomas McAvoy, Scott Salom; Virginia Tech University

[**Abstract:** Hemlock woolly adelgid (HWA), *Adelges tsugae* Annand, is a highly destructive non-native pest lethal to eastern hemlock, *Tsuga canadensis* (L.) Carrière, and Carolina hemlock, *T. caroliniana* Engelman. Fifty years following the first observation of HWA in eastern North America, a predatory beetle, *Laricobius nigrinus* Fender, was evaluated, approved, and released as a biological control agent. Efforts were made to mass rear *L. nigrinus* with the goal of redistributing the beetles on public lands, typically in forest ecosystems, as a secondary option to silvicultural and chemical controls. The majority of *L. nigrinus* releases has occurred on public lands. Herein, we report the observation of *L. nigrinus* within the urban environment outside of known release locations. Two towns, Blacksburg and Radford, were divided into 0.40 km² grids. A total of 27 and 19 grids were randomly selected from each town, respectively. Hemlocks were present in 44 and 42% of the grids surveyed in Blacksburg and Radford, respectively. In Blacksburg and Radford, 86 and 100% of the grids with hemlocks were infested with HWA, and of those infested hemlocks, *Laricobius* spp. was present in 100 and 75% of grids, respectively. A total of 154 *Laricobius* spp. (98% *L. nigrinus* and 2% *L. rubidus*) adults were collected between each town. While it is unclear the level of control *L. nigrinus* has on reducing HWA's impact, the establishment of this biological control agent in the urban environment is an additional level of predation that would otherwise not be present for homeowners with HWA infested trees.]

- Kairomonal activity of 4-allylanisole as a synergist for southern pine beetle
Holly Munro¹, Brian Sullivan², Brittany Barnes¹, John Nowak³, William Shepherd², and Kamal Gandhi¹; ¹University of Georgia, ²USDA-FS-SRS, ³USDA-FS-FHP

[**Abstract:** Southern pine beetle (*Dendroctonus frontalis* Zimmermann) (SPB) is an economically important forest pest that colonizes and kills southern pines. SPB populations must be high with several beetles attacking the tree at once to overcome the tree defenses and successfully gain entrance for feeding and reproduction. This mass aggregation is accomplished through a multitrophic chemical communication system comprised of aggregation pheromones and synergistic tree volatiles. We performed a trapping study in early Spring 2018 that showed 4-allylanisole (a monoterpene) is a strong attractive synergist of frontalin (a SPB pheromone component) for increasing attraction of SPB to traps. These results conflict with prior literature that indicates 4-allylanisole inhibits bark beetle attacks and can be used as a deterrent on trees. Hence, we aimed to characterize the behavioral activity (i.e. synergism or inhibition) of SPB to 4-allylanisole. We used a trapping study to assess the effects of three different release rates (4.8, 48, and 500 mg/day) of 4-allylanisole on the responses of SPB adults when the known attractive lure combination, frontalin and *alpha*-pinene, was present. All three release rates of 4-allylanisole significantly increased SPB attraction and there was a ten-fold increase in trap catches between the control ($M = 33.1$, $SD = 39.7$) and the highest release rate of 4-allylanisole ($M = 358$, $SD = 305$). Future research is warranted to determine if 4-allylanisole is a suitable synergist for SPB, as this may improve the current lures used for SPB monitoring and management in southeastern pine stands.]

3:00 – 3:30 Break – Ballroom Prefunction

3:30 – 5:00 Graduate Student Session (continued) – Savannah Ballroom C

- Southern pine beetle specific dsRNA affects gene expression in mountain pine beetle
Bethany Kyre, Lynne Rieske-Kinney; University of Kentucky

[**Abstract:** The southern pine beetle (SPB), *Dendroctonus frontalis*, is a highly destructive forest pest endemic to the south eastern United States. In recent years, increasingly mild winter temperatures and changing precipitation patterns have led to an unprecedented range expansion; SPB is moving northward into New England, warranting exploration of innovative management approaches. The congeneric mountain pine beetle (MPB), *D. ponderosae*, is also undergoing a range expansion eastward across the Rocky Mountains and Great Plains, and demands similarly innovative management approaches. Gene silencing using RNA interference (RNAi) is emerging as a next generation pest management strategy. RNAi is a naturally occurring anti-viral response present in most living organisms that prohibits the translation of RNA into protein. It can be artificially triggered in insects with the introduction of exogenous double stranded RNA (dsRNA). Silencing genes necessary for basic life functions results in insect mortality, and for this reason, RNAi is increasingly used as a species specific pest management approach in agricultural settings. Effective induction of the RNAi pathway depends on the exact match of at least nineteen nucleotides, making the approach incredibly specific, and non-target effects are rare. I have demonstrated that gene silencing via RNAi is highly effective in SPB following ingestion of specific dsRNAs. I evaluated the ability of dsRNAs targeting SPB to affect gene expression in MPB. I found that dsRNAs designed for gene silencing in SPB can silence genes in MPB, offering additional hope for its use as a management tool against rapidly expanding bark beetle populations.]

- Latitudinal variation in emerald ash borer development may influence parasitoid efficacy

Sarah Pellecchia, Lynne Rieske-Kinney; University of Kentucky

[**Abstract:** Emerald ash borer, *Agrilus planipennis* (Coleoptera: Buprestidae), is an invasive wood boring beetle native to Asia. It specializes in ash (*Fraxinus* spp.), feeding on the phloem and damaging the cambium as it creates serpentine galleries under the bark and girdles the tree. Classical biological control is fundamental to emerald ash borer management in North America. Four Asian parasitoid wasps of emerald ash borer have been approved and are being released in the United States, including *Tetrastichus planipennis*, *Spathius agrili*, *S. galinae*, and *Oobius agrili*. There has been little recovery of the parasitoids, notably *T. planipennis*, where they have been released in southern states compared to the north. While the exact reasons are unclear, one factor that may be influencing this is asynchrony in the life cycle relative to their host. Emerald ash borer has both 1- and 2-year life cycles, with the 2-year appearing more prominent in the north (approximately >40°N) and the 1-year more prominent in the south (<40°N). The factors contributing to the difference in life cycle are not entirely known. I am evaluating whether the length of the life cycle is dependent upon latitude, and what other factors may be playing a role. I am assessing whether the parasitoids are able to synchronize with the abbreviated life cycle and performing life table analyses of emerald ash borer at field sites at 40°, 38°, 36°, and 34°N latitude. At each latitude I am evaluating parasitoid presence, rates of parasitism, and emerald ash borer development, to determine whether the parasitoids are synchronizing with the life cycle of emerald ash borer at each latitude. My research is important because it will help determine whether the currently approved parasitoids being released for emerald ash borer control are appropriate at each latitude. These data could have profound implications for regulating emerald ash borer as it continues to spread throughout North America.]

- Visual evidence of the efficacy of gene silencing for emerald ash borer suppression

Flávia Pampolini, Thais Rodrigues, Tomokazu Kawashima, Lynne Rieske-Kinney; University of Kentucky

[**Abstract:** Emerald ash borer (EAB), *Agrilus planipennis*, is an invasive phloem-feeding beetle native to northeastern Asia. Since its accidental introduction into North America it has killed millions of ash trees (*Fraxinus* spp.), and traditional approaches to management are proving inadequate. We are investigating the use of RNA interference (RNAi) as a tool for managing EAB, and have confirmed larval and adult mortality after oral ingestion of double-stranded RNA (dsRNA) targeting the genes heat shock protein (*hsp*) and shibire (*shi*), which triggers the RNAi pathway. To evaluate our findings in vivo, we assessed dsRNA uptake through plant material and through the egg chorion. Twigs of greenhouse-grown tropical ash, *F. uhdei*, were artificially infested with EAB eggs and treated with dsRNA labeled with fluorescent Cy3 dye. In addition, EAB eggs were soaked in labeled dsRNA. Confocal microscopy was then used to detect fluorescence in plant material, EAB eggs, and neonate larvae treated with dsRNA. qPCR was then used to confirm dsRNA uptake and corroborate imaging results. After 8 days of exposure, we detected fluorescence in ash bark and cambial tissue, and larvae fed on these plants showed strong fluorescence in the alimentary canal. When EAB eggs were soaked with labeled dsRNA, fluorescence was detected in eggs and in hatched larvae. Our findings demonstrate dsRNA uptake, the efficacy of gene silencing, and the potential for topical applications of dsRNAs for deployment of

RNAi technology. The twig assay demonstrates translocation of dsRNA through plant material, suggesting that trunk injection or soil drench have potential to be used as a delivery method. Additionally, the absorption of dsRNA by EAB eggs demonstrates that spray-able dsRNA may also be an option for delivery of this technology. The emerald ash borer invasion of North America continues, but my research shows that developing innovative management strategies such as RNAi to mitigate its effects is feasible and worthy of pursuit.]

- **Diagnosis 2.0: Utilizing loop-mediated isothermal amplification (LAMP) to confirm a laurel wilt diagnosis directly in-field**
Jeffrey L. Hamilton¹, Stephen Fraedrich², Campbell J. Nairn¹, Caterina Villari¹; ¹University of Georgia, ²USDA-FS-SRS

[**Abstract:** Laurel Wilt (LW) is a devastating, invasive fungal vascular disease afflicting lauraceous species in the southeastern United States. The causal agent, *Raffaelea lauricola* (RL), is a nutritional symbiont of the redbay ambrosia beetle, *Xyleborus glabratus*. During colonization, the beetle introduces RL into the xylem of plants where it blocks water flow in host trees, including redbay, sassafras, and avocado. The pathogen induces the disease symptoms that include wilted leaves, sapwood discoloration, and eventually host death. Current management strategies that hope to slow disease spread rely on external laboratories that perform time-consuming cultural and molecular techniques to diagnose the disease. A quicker, field test is needed to reduce the time to confirm diagnoses, and thus expedite the implementation of management strategies. LAMP is an innovative molecular technique and alternative to traditional laboratory methods for disease confirmation. Our goal is to develop and validate a LAMP assay for the quick and accurate molecular identification of the LW pathogen directly in-field, using a small, portable device. A LAMP primer set that targets the beta-tubulin region of RL was designed, and the assay's specificity was verified using pure DNA extracts of RL and closely related species. We then performed laboratory inoculations of redbay saplings and sampled the plants every two days to determine when after infection the LAMP assay was capable of detecting RL in plant tissues. To enable successful field implementation, a crude DNA extraction protocol using minimal equipment and processing was developed for this phase of testing. Assaying crude DNA extracts, we confirmed the presence of RL as soon as 12 days after inoculation, which is before leaves have wilted. Finally, naturally infected plant samples from across the Southeast were tested under laboratory conditions and our results confirm that the assay can detect RL in symptomatic plant tissues and in beetles. Further validation will include testing samples directly in-field with the assay using a small portable LAMP device. The development and validation of a LAMP assay for RL will reduce the time to confirm a LW diagnosis from ~1 week to less than 1 hour.]

- **Loblolly pine defensive response to the inoculation with blue-stain fungi: a focus on terpenoids**
Luca Valentini^{1,2}, Ken Keefover-Ring³, Andrea Battisti¹, Caterina Villari²; ¹Dipartimento Territorio e Sistemi Agro-Forestali, Università degli Studi di Padova, Legnaro (PD), Italy, ²University of Georgia, ³University of Wisconsin-Madison

[**Abstract:** Loblolly pine (*Pinus taeda* L.) plantations are a crucial resource in the economy of southeastern US. Root-feeding beetles and their symbiotic blue-stain fungi, which are commonly found in these ecosystems, target stressed or diseased

trees, further reducing their vigor and thus paving the way to the arrival of other pests or pathogens that can eventually kill the hosts. Conifer species respond to the attack of parasites with a variety of different strategies, including a more abundant production of terpenoids and phenolics at the lesion site. Even though these compounds are the main players in the defensive strategy of conifers, little is known about their induction in response to blue-stain fungi. Objective of this study was to analyze the diterpene resin acids response of loblolly pine to inoculation with root-feeding beetle associated blue-stain fungi. The experiment occurred in a mature loblolly pine plantation in the Whitehall Forest (Athens, GA), where we imposed to the trees the five following treatments: wounded and inoculated with the fungi i) *Grosmannia alacris*; ii) *Leptographium profanum*; or iii) *Grosmannia huntii*; iv) wounded only; or a v) non-wounded control. Each treatment was replicated on nine trees for a total of forty-five trees. All fungal isolates used in the experiment had been previously isolated at the same location from the exoskeleton of root-feeding beetles. Plugs of phloem were removed from trees using a cork borer and replaced with infected ones. No replacements were made in the wounded only treatment. Collected plugs were analyzed to define the constitutive level of diterpene resin acids in the samples. Four weeks after the inoculation, resulting lesion length was measured, and new phloem plugs were collected at the site of infection, to determine the induced levels of diterpene resin acids. At this time, samples were collected from the non-wounded controls as well. For each sample, we analyzed diterpene resin acids composition using gas-chromatography (GC) coupled with mass-spectrometry (MS). Preliminary results show that at least six out of the eight most common diterpene acids in conifers resin are present in the phloem tissues after induction, including abietic acid, dehydroabietic acid, isopimaric acid, neoabietic acid, pimaric acid and sandaracopimaric acid. Blue-stain fungi seem to induce higher concentrations than sterile wounds and, among them, *G. huntii* is apparently the most aggressive. Results of this study provide a starting point to the understanding of the impact of root-feeding beetles and their symbiotic blue-stain fungi on the health of loblolly pine trees.]

- Induced defensive responses of loblolly pines (*Pinus taeda*) to root-infecting blue-stain fungi

Zackary Parker, Scott Harding, Kamal Gandhi, Caterina Villari;
University of Georgia

[Abstract: Various stands of loblolly pine (*Pinus taeda* L.), an economically and ecologically important timber species in the southeastern U.S., are exhibiting mortality in some counties along the fall line in Alabama and Georgia. Although no causal factor has been determined, some hypotheses suggest root pathogens may be contributing factors. Investigations at the chemical level among loblolly pine and its associated pests and pathogens may assist with better understanding the phenomenon. One component of these interactions is the defense mechanisms of the tree, including secondary metabolites, such as terpenoids and phenolics. However, little is known about phenolics in loblolly pines, which are involved in tree defense against fungal infections. Hence, our objectives are to: 1) characterize the constitutive phenolic profile of loblolly pine phloem; 2) investigate how the profile may change after inoculations with root-infecting fungal pathogens; and 3) test the effects of the phenolic compounds most responsive to fungal inoculation on the survival and growth of those fungal species. Forty mature loblolly pines were selected from a planted stand in the University of Georgia's Whitehall Forest (Athens, Georgia) and were assigned to five different treatments: (i) inoculation with *Leptographium profanum*, (ii) *Grosmannia alacris*, (iii) *G. huntii*, (iv) sterile wounding, or (v) non-wounded

control. Preliminary results show that inoculation with these fungi induces responses in loblolly pine that are variable as based on fungal species. Phenolics were extracted in methanol and are currently being analyzed using a combination of ultra-high-performance liquid chromatography—diode array detector (UHPLC-DAD) and high-performance liquid chromatography—mass spectrometry (HPLC-MS) approaches. After phenolic compounds are identified and quantified, bioassays will be designed and used to address objective three. Overall, results from this study may contribute to a broader understanding of the defense response of loblolly pine to fungal infections by further exploring an understudied interaction.]

6:00 – 8:00 Poster Session – Atrium

Organizers: Kendra Wagner¹, Jess Hartshorn²¹Mississippi State University, ²Clemson University
(Posters listed at the end of the program)

Breakfast on your own

8:30 – 10:00 Concurrent Session 1

Are you NOT disturbed? Post-disturbance forest health conditions across the South – Oglethorpe A

Organizer: Chris Asaro, USDA-FS-FHP

- Disturbance ecology and forest health
Geoff Wang, Clemson University
- Drought and oak decline in the Southern Appalachians
Ryan Blaedow, USDA-FS-FHP
- Hurricane Michael: Wind damage and forest health in a complex longleaf pine ecosystem
Kier Klepzig¹, Tom Sheehan¹, Ben Gochnour¹, Crystal Bishop¹, Catarina Villari², and Kamal Gandhi²; ¹The Jones Center at Ichauway, ²University of Georgia

[**Abstract:** On October 10, 2018 Hurricane Michael made landfall in the southeastern U.S. as the third most intense hurricane recorded to have struck the continental United States. Large acreages of some of the most important open pine and bottomland hardwood forests in the Southeast were severely damaged. Michael was the 8th most destructive hurricane to hit the U.S., causing ~\$25 billion in damages. On At the Jones Center at Ichauway (a 29,000 acre longleaf pine ecosystem and research institute) research staff worked to quantify the damage. In one extensive set of research plots, up to 40% of the mapped trees were damaged or destroyed. In the most-damaged plot, the basal area decreased from 82 to 51 square feet per acre. In addition, 233 long-term forest monitoring plots were revisited, and a total of 3,731 trees were sampled. Of all trees sampled, 20.5% sustained some type of damage from the hurricane. Longleaf pine trees were the least likely to sustain damage followed by loblolly pine, other hardwoods (i.e., hardwoods other than oak), slash pine, oaks, and shortleaf pine. Following intensive salvage operations (over 100,000 tons of wood removed by 11 logging crews) and an active prescribed fire season, the property is in the early stages of recovery. Research efforts include monitoring bark beetles, root beetles and root pathogens in salvaged, unsalvaged, burned and unburned plots.]

- Hurricane Florence: Flooding and wind impacts in North Carolina
Jim Slye, N.C. Forest Service

Bark Beetles and Fire – Oglethorpe B

Organizer: John Nowak, USDA-FS-FHP

- Fire and the physiology of southern pines
Doug Aubrey¹, David Coyle², Joseph O'Brien³, Benjamin Hornsby³, David Moorhead¹, John Nowak⁴; ¹University of Georgia, ²Clemson University, ³USDA-FS-SRS, ⁴USDA-FS-FHP

- Interactions between southern *Ips* bark beetle outbreaks, prescribed fire, and loblolly pine (*Pinus taeda* L.) mortality
Kamal Gandhi¹, Bailey McNichol¹, Brittany Barnes¹, John Nowak², Caterina Villari¹, Cristian Montes¹; ¹University of Georgia, ²USDA-FS-FHP
- Post-fire evaluation guidelines for forecasting potential insect & disease problems and associated tree mortality
Jim Meeker, Wood Johnson, Billy Bruce; USDA-FS-FHP
- Southern pine beetle and prescribed fire: Observations from National Forest in Mississippi
John Nowak¹, Jim Meeker¹, Chris Steiner¹, David Coyle²; ¹USDA-FS-FHP, ²Clemson University

Open Session I – Johnson

Moderator: Tom Sheehan, The Jones Center at Ichauway

- Ant foraging activity in long-term experimental privet plots
J.T. Vogt¹, Joe MacGown², Francis Roesch³, Chris Crowe¹, Scott Horn¹, Michael Ulyshen¹; ¹USDA-FS-SRS-Insects, Diseases, and Invasive Plants, ²Mississippi State University, ³USDA-FS-SRS-FIA
- Elongate hemlock scale and Fraser fir: A nightmare before Christmas for North Carolina
Robert Jetton, Jill Sidebottom, Jeff Owen; N.C. State University
- Pine tip moth: Systemic insecticide suppression in South Georgia
Elizabeth McCarty¹, David Dickens¹, Victoria Cassidy¹, Chris Asaro², Kamal Gandhi¹; ¹University of Georgia, ²USDA-FS-FHP

[**Abstract:** Nantucket pine tip moth (NPTM) [*Rhyacionia frustrana* (Lepidoptera: Tortricidae)] is an insect pest of young pine trees. There are three to five generations of NPTM in Georgia each year, which means that there are numerous opportunities for NPTM to damage the growing tips of pines. Management of NPTM has been problematic. Older NPTM instars bore into the pine shoot, where they are protected from contact insecticides. Later in the growing season, NPTM generations can overlap, making contact insecticide timing difficult. Systemic insecticides can provide a solution for NPTM control. Four different systemic insecticides were assessed to determine: 1) efficacy in reducing NPTM infestation rates in the first growing season and 2) how pine growth and form are affected by insecticide treatments. The study was implemented on three sites, each of which had three blocks where four insecticides (imidacloprid, dinotefuran, fipronil, chlorantraniliprole) and a control were applied to plots of 24 trees. The systemic insecticide soil drench treatments were applied within two weeks of planting seedlings. NPTM infestation rates were assessed in April and June, with more assessments planned for August, September, and October. Differences among treatments were assessed with SAS using a mixed model ANOVA. Site and block were random effects, and treatment, time, and time x treatment were fixed effects. Preliminary data analyses shows that the systemic insecticides are reducing NPTM populations. However, additional fieldwork is needed to gain a perspective on efficacy during the first growing year.]

- Bugwood Center for Invasive Species and Ecosystem Health Update: New images and reporting tools
Chuck Bargeron, Joe LaForest, Michael Toews; University of Georgia
- The monarch butterfly listing decision: A critique from a landscape perspective
Robert Coulson, James Tracy; Texas A&M University

10:00 – 10:30 Break – Second Floor Prefunction

10:30 – 12:00 Concurrent Session 2

Drones and Bones: UAVs and Dogs as Unique and Effective Surveying Tools (Live Demos) – Oglethorpe B

Organizer: Kelly Oten, N.C. Forest Service

- “Agri-Dogs”: Scent discriminating canines for the detection of plant diseases and pests
Julian Mendel; Florida International University
- Drones in forestry: Regulations, applications, and considerations
Darian Yawn; Landmark Spatial Solutions, LLC

Panel Discussion: The Expanded Southern Pine Beetle Research & Applications Program: A Tribute to the Leadership and Legacy of Bob Thatcher – Johnson

Organizer: Steve Clarke, USDA-FS-FHP

Panelists: Jack Coster¹, Robert Coulson², Fred Hain^{3,4}, Tom Payne⁵, Fred Stephen⁶; ¹West Virginia University (retired), ²Texas A&M University, ³NC State University (retired), ⁴Forest Restoration Alliance, ⁵University of Missouri (retired), ⁶University of Arkansas

12:00 – 1:30 Lunch on your own

1:30 – 5:00 Field Trip: Savannah Port, East Coast Terminal

Organizer: Chip Bates, Georgia Forestry Commission

1:30 – 5:00 Frontalis Cup – The Club at Savannah Harbor Golf Course

Organizer: Robert Coulson, Texas A&M University

2:00 – 5:00 Frustrana Cup – Moon River Brewing Company

Organizer: Steve Clark, USDA-FS-FHP

7:00 – 9:00 Banquet – Savannah Ballroom DE

Insect Photo Salon; Organizer: Brittany Barnes, University of Georgia

**Graduate Student Presentation Awards, A.D. Hopkins Award, and
Roger F. Anderson Award**

Breakfast on your own

8:00 – 9:30 **Concurrent Session 3**

State Cooperators: Making Things Happen– Oglethorpe AB

Organizer: Dave Coyle, Clemson University

- The spotted lanternfly in Virginia – it's lit!
Lori Chamberlin, Katlin Mooneyham; Virginia Department of Forestry
- Forest health in the Ozarks and the emerging challenge of jumping oak gall
Chandler Barton¹, Fred Stephen²; ¹Arkansas Forestry Commission, ²University of Arkansas

[**Abstract:** The Ozark Highlands and Boston Mountain ecoregions have a long history of curious and interesting forest health disturbances. The destructive outbreak of red oak borer (*Enaphalodes rufulus*) in the late 1990s and early 2000s captured the attention of many land owners and forest entomology researchers. Oak decline events are an observable and even expected chronic condition in this mountainous region, but other cases of landscape scale disturbances to oaks are also notable. One such event is the recent outbreak of jumping oak gall (*Neuroterus* sp. Hymenoptera: Cynipidae), which has been observed on white oaks (*Quercus alba*) at varying levels of severity since 2016 in Arkansas. Crown discoloration and defoliation caused by this wasp are easily recognized by the public. However, understanding of its population dynamics and the lasting impacts on white oaks remain uncertain.]

- Striking out the emerald ash borer: Partnering with baseball teams in outreach
Kelly Oten; N.C. Forest Service
- Utilizing GIS for forest health at the Georgia Forestry Commission
Michael Torbett, Chip Bates; Georgia Forestry Commission

Novel Methods in Natural Resource Communication – Johnson

Organizer: Molly Darr, Clemson University

- Outlets for communicating forest health issues in a changing media environment
Holly Munro; University of Georgia
- Trees for Bees and pine tip moth: knowledge transfer with county agents
Elizabeth McCarty; University of Georgia

[**Abstract:** Extension specialists can use flexibility and creativity within the university extension system to accomplish extension goals while implementing knowledge transfer on many levels. The Forest Health Laboratory at the

University of Georgia (UGA) is collaborating with UGA county agents on two projects that result in wider distribution of scientific information: Trees for Bees and Pine Tip Moth (PTM) Research.

The Trees for Bees project was a collaboration of five faculty members and seven county agents that resulted in a multi-faceted outreach project to promote pollinator habitats in urban forests. Outreach products included three extension papers, two newsletter articles, a YouTube video, an online tutorial, four infographics, a peer-reviewed annotated PowerPoint presentation, coloring sheets, and a hands-on nesting box project. County agents were trained on the materials and provided with resources to do their own Trees for Bees education events. This project resulted in 1,155 contact hours, 5,312 contacts through workshops and classes, and 212,436 total contacts. Trees for Bees was funded with an \$8,000 UGA Innovation Grant, and the cost per contact was \$0.038. Trees for Bees activities continue in Georgia beyond the initial project timeline.

The PTM Research involves two research projects: a 2018 Systemic Insecticide Study and a 2019 PTM Trapping Study. In 2018 five county agents ran systemic insecticide research plots. The plots were established with the specialist and each county agent, and the county agents assessed PTM infestation rates throughout the growing season after receiving PTM training. The agents benefitted by having research credit for their promotion, learning to install research plots, being co-authors on two posters, and one conference presentation, in addition to the forest health knowledge transfer. In 2019, thirty UGA county agents became involved in a statewide PTM trapping project. Each agent checks a pheromone trap in their county every other week and enters the data in a shared spreadsheet. With only 6 months of activity, this project has already shown numerous public benefits, including: PTM specimens for 4-H forestry programs, increased forest health knowledge, agent-written newspaper articles, and intern training. In addition, the PTM project has been used as materials for 4-H clubs, high school classes, and a Farm to Food summer camp. The Trees for Bees and PTM Research Projects have resulted in building relationships within Extension and positive rippling effects beyond the initial project.]

- Meet them where they are: Facebook as an effective digital diagnostics tool for the natural resources
Molly Darr; Clemson University
- Social Media Content vs. Campaign
Haley Chamberlain-Nelson; Smithsonian Channel, Science Channel Ltd., Untamed Science, and JASON Learning

9:30 – 10:00 Break – Second Floor Prefunction

10:00 – 11:30 Concurrent Session 4

Sugarberry Decline Symposium – Oglethorpe AB

Moderator: JT Vogt, USDA-FS-SRS

- An assessment of insects associated with sugarberry mortality
Emilee Poole¹, Michael Ulyshen², Scott Horn², Michelle Cram³, Rabi Olatinwo³, Stephen Fraedrich²; ¹University of Georgia, ²USDA-FS-SRS, ³USDA-FS-FHP

- Investigation of potential pathogens associated with sugarberry (*Celtis laevigata* L.) mortality in Georgia and South Carolina
Michelle Cram¹, Stephen Fraedrich², Rabi Olatinwo², Michael Ulyshen², Emilee Poole³, Afaq Niyas³, Caterina Villari³; ¹USDA-FS-FHP, ²USDA-FS-SRS, ³University of Georgia

[Abstract: In 2015, a high level of sugarberry (*Celtis laevigata*) mortality was noted in Augusta and the surrounding areas of Georgia and South Carolina. Sugarberry trees were declining and dying in both urban and natural areas on a wide range of site types. Symptoms included chlorosis and premature foliage loss, branch and crown dieback, phloem necrosis (tan-brown discoloration) in the stem and roots, followed by tree death. Common pests and diseases found on symptomatic trees included *Agrilus macer*, Biscogniauxia (Hypoxylon) canker, and *Armillaria gallica* root disease. Fungi isolated from discolored areas associated with the *A. macer* attacks were tested for pathogenicity; however, none were found to have a significant effect on tree health and lesions callused over within a year (Poole et al. 2019). Subsequent pathogenicity testing of fungi from discolored xylem and phloem also resulted in lesions that callused over with no impact on tree health after one year.

In May 2018, a survey of 10 paired trees was conducted to assess associations between sugarberry crown condition, discolored phloem, and presence of root disease. A total of 10 paired trees (within 50 meters) were established for destructive sampling. Trees were given a crown condition rating based on crown loss. Crown ratings were (1) 0%, (2) <10%, (3) 10-33%, (4) 33-66%, or (5) >66% crown loss. Each pairing consisted of a symptomatic tree with a crown rating of 3 - 5, and an apparently healthy tree with a crown rating of 1-2. Phloem samples were taken both at breast height and 30 cm above ground, using a cordless drill with a 12.7mm plug cutter. At each height, one plug was collected every 2 inches of diameter, and discoloration of the tissue was assessed visually. To assess the presence of root disease, two main roots were uncovered up to 4 meters from the main stem and fine roots (25 - 2 mm in diameter) were collected. Sample roots from each tree were then processed for identification of fungi and bacteria.

All symptomatic trees had discolored phloem at the base of the stem, ranging from 25 -100% of plug samples. No discoloration was found on apparently healthy trees. *Armillaria gallica* was found to cause root disease in only 2 symptomatic trees, while *Phytophthora* was not isolated from any root sample. The metabarcoding data (see Niyas et al. Abstract) found *Candidatus* Phytoplasma ulmi in the roots of only one tree, but timing and location of sampling were not optimal for finding Phytoplasma species and further investigations are underway.

Reference: Poole, E.M. et al. 2019. Ann. For. Science. 76:7.]

- Searching for the potential causal agent of the sugarberry dieback and mortality (SBDM) in southeastern US using molecular approaches
Afaq Niyas¹, Michelle Cram², Steve Fraedrich³, Caterina Villari¹;
¹University of Georgia, ²USDA-FS-FHP, ³USDA-FS-SRS

[Abstract: Sugarberry (*Celtis laevigata*) is an ecologically important tree species that occurs both in natural forests and as a landscape tree in residential areas. Widespread mortality of sugarberry trees has been recently observed in southeastern US, where both forest and urban trees are affected, and the phenomenon is being referred to as sugarberry dieback and mortality (SBDM). Symptoms associated with SBDM include leaf chlorosis, early leaf drop, and a

progressive crown dieback. In the early phases of disease development, a brownish discoloration can be observed in the phloem of roots and stems of affected trees. A number of potential pests and pathogens have been associated with the mortality, however, most of these appear to be secondary, opportunistic organisms, while the primary causal agent remains unknown. Symptoms similar to those associated with SBDM have been previously reported for acute oak decline and hackberry (*Celtis australis*) decline that occur in Europe, and these diseases are caused by pathogenic bacteria and phytoplasmas, respectively. Hence, we suspect that prokaryote pathogens might be the primary causal agent of SBDM as well. These microorganisms, however, are notoriously difficult to isolate and identify with standard culturing techniques. Our hypothesis is that if the causal agent of SBDM is of prokaryotic nature, it can be accurately characterized and identified by comparing the bacterial communities in symptomatic and asymptomatic trees using 16S metabarcoding.

As a preliminary study, 10 symptomatic and 10 apparently healthy trees were sampled from North Augusta, SC, where SBDM is widespread. In addition, a naïve tree was sampled from Athens, GA, where SBDM is not known to occur. Both phloem and root tissues were collected from each tree, DNA was extracted, and samples were sequenced using 16S metabarcoding.

Results of the preliminary study did not identify any bacterial species to be commonly associated with diseased trees, although we found phytoplasmas in one root sample, which has prompted us to focus additional screenings on phytoplasmas. Working with this taxonomic group, however, is extremely challenging, in part because of the fluctuating nature of phytoplasmas present in different plant tissues throughout the year, and in part because of the non-specificity of the currently available molecular tools normally used to identify prokaryotes.

To confirm our preliminary results, we are planning to repeat the experiment and increase the number of samples, the sampling sites and the seasons of sampling. Multiple marker regions in the metabarcoding experimental design will also be included in order to potentially target a broader range of microorganisms. At the same time, we are working to optimize a molecular method to detect phytoplasmas in different sugarberry tissue samples, as well as potential insect vectors.]

Open Session II – Johnson

Moderator: Holly Munro, University of Georgia

- Effects of systemic insecticides on spotted lanternfly and associated sooty mold
Don Grosman¹, Brian Walsh²; ¹Arborjet Inc., ²Salix Springs Landscaping
- Observations on redbay (*Persea borbonia*) regeneration following infestation by the redbay ambrosia beetle (*Xyleborus glabratus*)
KaDonna Randolph; USDA -FS-SRS

[**Abstract:** Mortality of redbay (*Persea borbonia*) trees occurs rapidly following infestation by the exotic redbay ambrosia beetle (*Xyleborus glabratus*) and associated fungus (*Raffaelea lauricola*), the causal agent of laurel wilt disease (LWD). Though much has been learned since the beetle's introduction from Asia in 2002, questions regarding the fate of small-sized stems (d.b.h. < 5 inches) which survive the initial infestation remain: Will such stems continue to grow and survive? Will they be outcompeted by other species? Or will they succumb to

LWD? A cursory look at data collected by the USDA Forest Service, Forest Inventory and Analysis (FIA) Program in Florida, Georgia, North Carolina, and South Carolina indicated potential evidence of (a) redbay seedlings growing into the 2-inch diameter class following the initial phase of infestation and (b) mortality of small-sized redbay stems tapering off 10 years after the discovery of LWD. Follow-on examination of the FIA data collected throughout the southern United States will shed additional light on stand dynamics before and after infestation by the redbay ambrosia beetle.]

- Factors affecting catches of hardwood borers
Dan Miller¹, Kevin Dodds², Jon Sweeney³; ¹USDA-FS-SRS, ²USDA-FS-FHP, ³Canadian Forest Service
- Advocacy, science, and policy of invasive species: Results of a visit to D.C. by a graduate student class
Scott Salom, Jacob Barney, David Haak, Todd Schenk; Virginia Tech University
- Impacts of bark-beetle attacked wood on detrital processes after one year
Natalie Clay¹, Corey Samples¹, Juliet Tang², Courtney Siegert³, John Riggins³; ¹Louisiana Tech University, ²USDA-FS-FPL, ³Mississippi State University

11:30 – 12:15 Closing Business Meeting – Oglethorpe AB
Robert Jetton, NC State University

2019 SFIWC Posters

**Organizers: Kendra Wagner, Mississippi State University;
Jess Hartshorn, Clemson University**

1. Seasonal effects of systemic insecticides on spotted lanternfly life stages and associated sooty mold production
Don Grosman¹, Brian Walsh²; ¹Arborjet Inc., ²Salix Springs Landscaping
2. Evaluation of systemic insecticide and fungicide for protection of sycamore from polyphagous shot hole borer / fusarium dieback
Don Grosman¹, Akif Askalen², Cavell Brownie³; ¹Arborjet Inc., ²University of California – Davis, ³North Carolina State University (Retired)
3. Analyzing global drought information and forest management practices to minimize economic impact of *Sirex noctilio*
Kendra Wagner¹, John Riggins¹, Robert Jetton², Jess Hartshorn³, Dimitrios Avtzis⁴; ¹Mississippi State University, ²North Carolina State University, ³Clemson University, ⁴Forest Research Institute, Hellenic Agricultural Organization Demeter
4. Trap height affects catches of bark and wood boring beetles in Georgia.
Dan Miller¹, Chris Crowe¹, and Jon Sweeney²; ¹USDA-FS-SRS, ²Canadian Forest Service - Atlantic Forestry Center
5. Effects of ethanol and conophthorin dose on attraction of ambrosia beetles
Dan Miller¹, Matt Ginzel², Therese Poland³, Chris Ranger⁴, Pete Schultz⁵, Beth Willhite⁶; ¹USDA-FS-SRS, ²Purdue University, ³USDA-FS-NRS, ⁴USDA-ARS, ⁵Virginia Tech University, ⁶USDA-FS-FHP
6. Beyond the beetle: analyzing saproxylic invertebrate biodiversity following simulated bark beetle attack
Kristy McAndrew¹, John Riggins¹, Natalie Clay², Courtney Siegert¹, Juliet Tang³; ¹Mississippi State University, ²Louisiana Tech University, ³USDA-FS-FPL
7. Towards adelgid tolerant Christmas trees
Austin Thomas¹, Ben Smith¹, W. Andy Whittier², John Frampton¹, David Tilotta¹, Robert M. Jetton¹; ¹North Carolina State University, ²USDA-FS-SRS

[Abstract: Fraser fir (*Abies fraseri*) Christmas trees are one of North Carolina's most important specialty crops. Furthermore, Fraser fir is a major component of spruce-fir forest in the Southern Appalachians. This tree is threatened by the non-native balsam woolly adelgid (*Adelges piceae*). Our project's aim is to evaluate and select Fraser fir clones from existing seed orchards and clone banks that have significant tolerance to the negative effects of adelgid infestation. The results of this project will inform decisions on seed usage from existing seed orchards and breeding designs for developing additional sources of adelgid tolerance.]

8. Host response of loblolly pine (*Pinus taeda*) to fungal associates of the southern pine beetle (*Dendroctonus frontalis*)

John de Soto¹, Kamal Gandhi¹, Kier Klepzig², Caterina Villari¹; ¹University of Georgia, ²The Jones Center at Ichauway

[**Abstract:** Loblolly pine (*Pinus taeda*) plantations of southern states account for a large percent of timber production in the United States, in addition to providing significant ecological benefits to the region. The southern pine beetle (*Dendroctonus frontalis*) (SPB) is loblolly pine's most important insect pest, causing widespread mortality in some years. Within the SPB associated mycobiome, two mutualistic fungi, *Ceratocystiopsis ranaculosus* and *Entomocorticium* Sp. A, and one antagonistic fungus, *Ophiostoma minus*, are the primary symbionts, and appear to have a complex interrelationship with each other and the tree host. The developing SPB larvae use *C. ranaculosus* and *E. Sp. A* as a nutritional source. *Ophiostoma minus*, on the other hand, competes with SPB larvae for food and space, and has an antagonistic relationship with both of the mutualistic fungi. One question of interest is whether competition for space is the primary manner in which *O. minus* competes with *C. ranaculosus* and *E. Sp. A*. We hypothesize that the defense response of loblolly pine to *O. minus* is less detrimental to this fungal species than to the two mutualistic ones because the mutualistic fungi are not pathogenic to plants, and hence they did not coevolve to tolerate tree defense responses. Our objectives are as follows: (i) to determine which tree defense compounds are induced after inoculation of each of the three fungal species, and (ii) after identifying the compounds, to test the toxicity of each compound against each fungal species *in vitro*. Results of this study will assist in identifying specific defensive traits of loblolly pine that have a significant antifungal action, and provide a more thorough understanding of chemical interactions within this complex system, which may cast light on other systems as well.]

9. Biological control of the invasive *Ailanthus altissima*

Rachel Brooks, Scott Salom, Anton Baudoin; Virginia Tech University

10. Attraction of pine sawyers (*Monochamus* spp.) and associates to traps baited with ipsenol and monochamol in Canada and the USA

Dan Miller¹, Jeremy Allison², Chris Crowe¹, James Dickinson³, Andy Eglitis³, Richard Hofstetter⁴, Steve Munson³, Therese Poland⁵, Laurie Reid⁶, Brytten Steed³, Jon Sweeney⁷; ¹USDA-FS-SRS, ²CFS-Great Lakes Forestry Center, ³USDA-FS-FHP, ⁴Northern Arizona University, ⁵USDA-FS-NRS, ⁶South Carolina Forestry Commission, ⁷CFS-Atlantic Forestry Center.

11. Spatial dynamics and temporal variation of saproxylic Coleoptera in mountains

Jamie Bookwalter¹, Berta Caballero², Bernat Claramunt¹; ¹Universitat Autònoma de Barcelona, ²Museu de Ciències Naturals de Barcelona

12. Presence and proportions of mycangial fungi and sex ratio of trap-captured southern pine beetles as potential predictors of population fluctuations

William Shepherd¹, Bailey McNichol², JoAnne Barrett¹, Kamal Gandhi², Brian Sullivan¹; ¹USDA-FS-SRS, ²University of Georgia

[**Abstract:** Forest managers use a model that includes counts of southern pine beetle (SPB; *Dendroctonus frontalis*) and a major predator, *Thanasimus dubius*, from spring trapping surveys to forecast severity of SPB outbreaks later in the year. We looked at two additional types of data that can be collected from the surveys which potentially could improve our ability to predict SPB population fluctuations: SPB sex ratio and presence/absence of two fungal symbionts carried in

the mycangium of female beetles. In a previous experiment, female SPB were captured in significantly lower proportions inside infestations than outside, and in a region experiencing a severe outbreak than in a region with low infestation levels. Our preliminary examinations of two years of spring survey catches similarly found a significant correlation between the proportion of captured females and distance to the nearest SPB infestation. The presence of the mycangial fungus, *Entomocorticium* sp. A (a basidiomycete) in female SPB has been shown to be positively correlated with beetle size, fecundity, and brood survival, when compared to beetles carrying only the mycangial fungus, *Ceratocystiopsis ranaculosus* (an ascomycete). While females captured either inside or outside infestations did not differ in the presence of either or both mycangial fungi, analyses of 2018 spring survey trapping data found that females captured in Mississippi (abundant infestations: stable, epidemic population) had significantly higher numbers of mycangia with no fungus present and a higher proportion of the basidiomycete relative to the ascomycete than females in Louisiana (no infestations: stable, latent population). These preliminary data suggest that both SPB sex ratio and mycangial fungi might have some predictive value for assessing infestation risk and forecasting beetle population trends.]

13. A report of hickory decline in Louisiana

Rabiu Olatinwo¹, Jaesoon Hwang², Wood Johnson²; ¹USDA-FS-SRS, ²USDA-FS-FHP

[Abstract: Hickory decline has been reported in Iowa, Maryland, Missouri, New York, Pennsylvania, West Virginia, and Wisconsin on bitternut hickory (*Carya cordiformis*) and shagbark hickory (*C. ovata*) (Steinman, 2004; Park et al. 2013). In 2016, a landowner noticed several (ca. one dozen) declining/dead mockernut hickory (*Carya tomentosa* Sarg.) trees on his property in northeast Tangipahoa Parish, Louisiana. The affected trees showed moderate to severe canopy decline, including fine twig dieback, epicormic sprouts along branches, and evidence of secondary insect and fungal colonization, and were predominantly in the dominant or codominant crown position. Our objective was to identify and document the insect pests and fungal pathogens associated with the dead and declining hickories in Louisiana.

Three symptomatic trees (ca. 65-75 years of age) were felled and evaluated. Tissue samples were collected to identify insect pests (beetles) and fungal isolates associated with the observed symptoms. Fungal fruiting bodies found on infected tissues were identified based on morphological characteristics and PCR amplification of the rDNA ITS sequences using the ITS1F and ITS4R primers. We observed evidence of Cerambycidae larval feeding and ambrosia beetle entrance/exit holes in branches and the bole of all felled trees, but in contrast to reports of hickory decline in the northern U.S., we observed little evidence of hickory bark beetle (*Scolytus quadrispinosus* Say) colonization. Among the ambrosia beetle species recovered, the most abundant was *Xyleborus celsus* Eichhoff, a scolytine species also reported in dying hickories in the northern U.S. Analysis of the sequenced ITS region showed the consistently isolated fungal species associated with symptomatic hickories in Louisiana had only 81% similarity with *Ceratocystis smalleyi* (GU190738.1), suggesting a different species may be present in LA. Because the *Ceratocystis* species we isolated did not show sufficiently close similarity with any known *Ceratocystis* species in the GenBank database (www.ncbi.nlm.nih.gov), further investigation is on-going. *Fusarium solani* was also isolated from some tissue samples. Both fungal species have been linked to dying hickory trees in other parts of the US (Steinman, 2004; Park et al. 2013).

Although mockernut hickory is a species appropriate for the site, repeated wet years (2014, 2016) and a flash drought (2015) could be an exacerbating factor leading to the dieback observed. Whether a novel insect/pathogen is playing more than a secondary role in mortality is yet unknown.

References: Park, J.-H., Juzwik, J., and Cavender-Bares, J. 2013. *Phytopathology* 103:565-574.; Steinman, J. 2004. NA-TP-OI -04. US Department of Agriculture Forest Service, Northeastern Area, Newtown Square. PA. 46 pp.]

14. Response of subcortical beetles to windthrow, salvaging, and prescribed burning following Hurricane Michael

Benjamin Gochnour¹, Brittany Barnes¹, Thomas Sheehan², Caterina Villari¹, Kier Klepzig², Kamal Gandhi¹; ¹University of Georgia, ²The Jones Center at Ichauway

[Abstract: The *Ips* pine engraver and woodboring beetles (Coleoptera: Cerambycidae and Curculionidae) are economically and ecologically important taxa that colonizes pine trees in the southeastern US. Beetle populations are often influenced by forest disturbances such as drought, lightning strikes, and wind damage. These events can lead to population outbreaks where the beetles begin to attack healthy trees as well as stressed and dying trees. On 10 October 2019, Hurricane Michael made landfall on the Florida panhandle and subsequently traveled across The Jones Center at Ichauway, in the Southwest corner of Georgia. Two thirds of Ichauway's nearly 30,000 acre property is comprised of upland pine grassland habitats, most of which is dominated by longleaf pine (*Pinus palustris*). Windthrow on the property is estimated to be overall 21% with some areas experiencing up to 70%. In this study, we are examining the effects of windthrow on *Ips* pine engraver beetle populations and how land management practices (salvage logging and prescribed burning) may influence this relationship. Three distinct treatments were chosen for this study: 1) windthrow only (not salvaged, not burned); 2) windthrow with subsequent prescription burning (not salvaged, burned); and 3) windthrow with subsequent salvage logging and prescription burning (salvaged and burned). These three treatments were replicated five times each on the landscape for a total of 15 sites. We deployed three Lindgren funnels and three cross vein traps per site, staggering them along a transect at ~20 m intervals. Lindgren funnel traps were baited with *Ips* pheromones including ipsenol, ipsdienol, and cis-verbenol, and cross vein traps were baited with woodborer attractants including high release ethanol and Sirex blend. We sampled from the traps weekly from April to September 2019. We are undertaking species identifications of *Ips* beetles and woodborers, and plan to resample these sites in 2020. Overall, results from our study may provide critical information on how these species may respond to catastrophic wind disturbances and whether these land-area management techniques may reduce or increase their populations in the future.]

15. Response of root feeding weevils and fungal associates to wind disturbance, salvage operations, and root damage following Hurricane Michael

Crystal Bishop^{1,2}, Thomas Sheehan², Brittany Barnes¹, Kier Klepzig², Kamal Gandhi¹, Caterina Villari¹; ¹University of Georgia, ²The Jones Center at Ichauway

16. Composition and activity of dung and carrion beetles in predator free environments
Kelsea Young^{1,2}, Thomas Sheehan¹, Kier Klepzig¹, Jessica Hartshorn²; ¹The Jones Center at Ichauway, ²Clemson University

17. Evaluating pest-specific gene silencing for effects on a non-target pollinator
Hannah Hollowell, Flávia Pampolini, Lynne Rieske; University of Kentucky

[Abstract: Gene silencing using RNA interference (RNAi) causes mortality in the non-native, tree-killing emerald ash borer (EAB), but as a pest management strategy the technology is in its early stages. Demonstrating the specificity of RNAi to the target pest is essential to moving this new technology forward. We evaluated the common eastern bumblebee (*Bombus impatiens*) to assess the effects of EAB-specific gene-silencing on an important, widespread pollinator. In a

laboratory assay we evaluated four treatments (N = 9-10 bees/treatment): a target used for gene-silencing in emerald ash borer (dsHSP, 33 µg/µL), two negative controls (dsGFP, 33 µg/µL, and sucrose, 50%) and one positive control (potassium arsenate, 0.5%) (N = 3). Bees were kept in modified Petri dishes and fed on the treatment for 3 days, followed by feeding only on the sucrose solution. Mortality was assessed daily for 10 days. The positive potassium arsenate control caused 100% mortality within 24 hours, while the target gene (dsHSP) showed mortality rates consistent with the negative controls. Further field studies analyzing sublethal effects of gene-silencing on bumblebees could be pursued by feeding target genes to commercial *B. impatiens* hives and evaluating fitness (hive weight, number of workers, and number of brood) after 6 weeks. By evaluating the non-target effects of gene-silencing techniques on common pollinators, these genes can be assessed for safety before being released as a management tool for emerald ash borer, ensuring it is both effective against the target pest while still maintaining the health of vital pollinators.]

18. Pollinators of rhododendron in the Great Smoky Mountains National Park
David Bechtel¹, Jerome Grant¹, Greg Wiggins¹, Becky Nichols², Jesse Webster²;
¹University of Tennessee, ²National Park Service
19. Kudzu bug: Nature finds a way
Jerome Grant¹, Amy Michael²; ¹University of Tennessee, ²Arkansas Agriculture Department
20. Africa: A new frontier for tree invaders?
Ignazio Graziosi^{1,2}, Mathias Tembo³, Jean Kuate⁴, Alice Muchugi¹; ¹World Agroforestry Centre, ²University of Kentucky, ³Zambia Agriculture Research Institute, ⁴Institute of Agricultural Research for Development
21. Pitch canker disease and poor stem form in a loblolly pine plantation near a poultry operation
Wood Johnson¹, Jim Meeker¹, Roger Menard¹, Mary Anne Sayer², Shi-Jean Susana Sung², Billy Bruce¹, Jacob Floyd², Ben Parpart¹, Aaron Rachal¹, Kristi Wharton²;
¹USDA-FS-FHP, ²USDA-FS-SRS
22. Ongoing forest health research at Clemson
James Palmer, Jess Hartshorn; Clemson University
23. Combining selection, breeding and in vitro mass propagation to generate emerald ash borer-resistant ash clones
Scott Merkle¹, Jennifer Koch², Ryan Tull¹, David Carey², Paul Montello¹, Brittany Barnes¹, Daniel Herms³, Kamal Gandhi¹; ¹University of Georgia, ²USFS-NRS, ³Davey Tree Expert Company

[Abstract: Genetically-based resistance or tolerance to emerald ash borer (EAB; *Agrilus planipennis*) existing in the native ash population may offer a route to restoration of these valuable trees. Individual native white ash (*Fraxinus americana*) and green ash (*F. pennsylvanica*) trees have been identified as potentially EAB-resistant by their persistence in populations where EAB-induced mortality exceeds 99%. These so called “lingering ash” trees constitute a potential source of genetic resistance that could be used in selection and breeding programs, and combined with mass clonal propagation to generate EAB-resistant varieties for restoration programs. Over the past five years, we have initiated embryogenic cultures by culturing immature zygotic embryos from open-pollinated (OP) seeds collected from several surviving white ash and green ash trees in Michigan, Minnesota, Pennsylvania, Virginia and

North Carolina. In addition, in 2018, we initiated cultures from crosses made between lingering green ash parents by USDA Forest Service personnel in Delaware, Ohio. Following induction and proliferation of embryogenic cultures on semisolid induction-maintenance medium (IMM) with 2 mg/L 2,4-D, they were transferred to liquid IMM to establish suspension cultures. Suspension cultures were size-fractionated on stainless steel sieves and the desired cell-cluster size range was collected on nylon mesh and plated on semisolid embryo development medium (same as IMM but lacking 2,4-D) to produce synchronous populations of somatic embryos. These embryos were used in experiments to test different plantlet production treatments, which indicated that germination (radicle elongation), shoot production and conversion (complete plantlet production) were all increased by treatment with 1 mg/L gibberellic acid, regardless of whether the embryos had received a cold pre-germination treatment. Cold treatment alone also improved germination and conversion. Somatic seedlings were potted in potting mix and acclimatized to greenhouse conditions using clear plastic dome-covered trays containing water-saturated perlite. Ash somatic seedlings derived from OP explants grew rapidly following transfer to potting mix and 42 somatic seedlings representing 10 ash clones were successfully acclimatized, grown in the greenhouse and planted in a preliminary field test, along with EAB-resistant (*Fraxinus mandshurica*) and EAB-susceptible control seedlings. Trees planted in April 2018 established well during the 2018 growing season with the loss of only 3 somatic seedlings. Trees leafed out strongly in April 2019 and have continued growth. The greatest growth rate was observed for lingering white ash somatic seedlings, followed by green, white, and Manchurian ash seedlings. We are currently monitoring these trees for EAB activity to assess pest selection and relative susceptibility to EAB. Future work will include embryogenesis research on more rare ash species such as Texas ash (*Fraxinus texensis*) and blue ash (*Fraxinus quadrangulata*), and an assessment of EAB colonization activity on trees planted in a common garden study.]

24. Exploring Silvicultural Release to Improve the Health of Eastern Hemlocks Infested with Hemlock Woolly Adelgid

Albert Mayfield¹, Robert Jetton², Tara Keyser¹, and Rusty Rhea³; ¹USDA-FS-SRS, ²North Carolina State University, ³USDA-FS-FHP

[Abstract: Hemlock woolly adelgid (HWA) is an invasive insect herbivore that threatens the sustainable management of eastern and Carolina hemlocks in North America. Additional tools to complement existing chemical and biological management tactics for HWA are desired. Previous research has shown that elevated sunlight levels reduce HWA densities and provide physiological benefits to young hemlock trees, and suggests that silvicultural release treatments could be used to reduce HWA impact. This study is examining the effect of small canopy gaps on HWA densities, hemlock health, and competing vegetation in mixed conifer-deciduous forests of the Appalachian Mountains. Twenty-one replicates of four different gap treatments (plus a control treatment) were installed in 2017-2018 across three latitudinal bands: southern (9 reps in North Carolina, Tennessee, and Georgia), central (5 reps in Virginia), and northern (3 reps in Maryland). Gaps were created around intermediate eastern hemlock “target trees” using two different methods (fell vs. girdle the non-hemlock trees) and two different gap sizes (small: equal to the crown diameter of the target tree, vs. large: extending the small gap diameter by 25% of dominant tree height).

Preliminary results: In the southern latitudinal band, large gaps created by felling (Large-Fell) significantly suppressed HWA density the summer immediately after treatment, but this effect on HWA density did not persist into the following summer. By the second summer post-treatment, despite similar HWA densities among treatments, hemlock branch health (measured by new shoot production) was significantly better in the Large-Fell treatment compared to girdled or control plots in both the southern and central latitudinal bands. In the northern band,

HWA populations crashed in all treatments immediately after gap installation, presumably due to climatic conditions unrelated to the treatments. Gap effects on hemlock health in the northern band may not be evident until adelgid populations rebound. These preliminary results suggest silvicultural release can be used to produce beneficial, short-term changes in HWA densities and hemlock health, but the study continues to evaluate the consistency of these effects over an extended time frame and geographically variable environmental conditions.]

Minutes of the SFIWC Opening Business Meeting
Wednesday, July 24, 2019
Savannah Marriott Riverfront
Savannah, Georgia

Chairman Robert Jetton called the 60th meeting of the Southern Forest Insect Work Conference to order at 8:10 AM, following a welcome to Savannah by Chuck Williams, Director of the Georgia Forestry Commission. Chairman Jetton thanked Will Shepherd, Chip Bates, Dave Coyle, and Kelly Oten for organizing the event. Chip Bates gave an update on the Field Trip (a tour of the East Coast Terminal), leaving Thursday at 1:45 PM, and invited participants' significant others to attend. He asked first-time attendees to stand and introduce themselves. The group then paused for a moment of silence in remembrance of SFIWC members, Bob Thatcher (charter member and recipient of 1987 A.D. Hopkins Award), Jordan Burke (former student of Kamal Gandhi at University of Georgia), Robbie Hollingsworth (former student of Fred Hain at NC State University), and Bill Stambaugh (forest pathologist at Duke University), who passed away since the 2018 meeting. Members were invited to share announcements of professional transitions or retirements (none).

Reports

Secretary-Treasurer Will Shepherd reported that minutes of the 2018 meeting in San Antonio, Texas are available in the Proceedings on the SFIWC website. Financially, SFIWC had a checking account balance of \$7,185.81 on 12/31/18. Expenses for the San Antonio meeting exceeded income by \$395.10. Will thanked Don Grosman and Arborjet, Inc. for sponsoring a vendor table at SFIWC.

Paul Merten read the Historian's Report (see attached) with highlights of the three meetings previously held in Georgia.

Photo Salon – Brittany Barnes thanked everyone who submitted pictures for this year's Photo Salon and noted the high number of submissions. She said that winners would be announced at the Awards Banquet on Thursday, with "Best in Show" winning \$50 and a spot on next year's SFIWC program cover. She also asked that everyone participate in the group photos during the first break.

A.D. Hopkins Award – Lynne Rieske-Kinney, Chair, reported that there this year's recipient would be announced at the Thursday banquet.

Roger F. Anderson Award – Kamal Gandhi, 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 invited everyone to visit the new-and-improved SFIWC website. The website administrators at Bugwood are still updating it and need more pictures.

Theses and Dissertations – David Kulhavy not present.

Steve Clarke 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 America's Second Harvest of Coastal Georgia.

Steve Clarke gave details on the Frustrana Cup "ladder toss" tournament to be held on Thursday afternoon at the Moon River Brewing Company.

Bob Coulson stated that Frontalis Cup participants would play on Thursday at The Club at Savannah Harbor Golf Course.

Old Business

Robert Jetton briefed the membership on the Executive Committee's (EC) efforts to make SFIWC more inclusive to non-entomologists, including a possible name change. Everyone on the EC recognized the need to broaden the scope of our group and agreed to send out a nonbinding survey to the membership (after the meeting) in order to gather input on the topic. It was viewed as important to include all SFIWC members in the discussion. There is no hurry to move forward, as the earliest changes wouldn't occur until at least the 2022 meeting due to the North American Forest Insect Work Conference (NAFIWC) in 2021.

Chairman Jetton also discussed the proposed change in meeting schedule, beginning in 2022. The EC unanimously decided to shift the meeting times to start on Tuesday morning and end on Thursday evening. This would open up all of Monday and Friday as travel days and help to ensure a larger attendance for the last few sessions and closing business meeting.

New Business

Robert Jetton and Lynne Rieske-Kinney announced that the A.D. Hopkins Award guidelines are being updated, with the aim to find more well-qualified nominees who may not meet all of the current requirements. The EC will send a draft of the new guidelines to the membership (after the meeting) for comments.

Nominations – SFIWC needs a new Counselor to replace Kamal Gandhi for a three-year term on the EC. Voting on nominees will be held during the closing business meeting. Contact Robert Jetton (Chair) or Kamal (Counselor) if you wish to submit a nomination. It was mentioned that due to the current makeup of the EC, a State employee would be preferred.

Lynne Rieske-Kinney (Chair-Elect, Local Arrangements Co-Chair) gave a formal invitation to and some details on the 2020 SFIWC, which will be held June 16-19 in Lexington, Kentucky at the Lexington Marriott City Center.

NAFIWC 2021 – Jess Hartshorn reminded everyone that the meeting will be held May 25-28 in Duluth, Minnesota. Helping Jess with organizing are Rachel Arango, Brian Aukema, Kier Klepzig, and Bob Rabaglia. The Program Committee includes Rich Hofstetter (Co-Chair), Kier Klepzig (Co-Chair), and Jeff Garnas. The theme is "Coming Together," and the organizers are currently seeking committee chairs and plenary speakers.

Jess Hartshorn introduced the idea of a SFIWC student travel award, in honor of Fred Stephen. It would likely include a waived registration fee and a fixed monetary award. The membership generally agreed that more details were needed, and Jess stated that she would prepare a formal proposal for the membership to review.

Chris Asaro invited anyone interested in receiving a copy of FHAAST's new tree atlas to check out the sample copy and sign-up sheet which are available at the registration table.

Will Shepherd stated that CFEs from SAF will be available after the conclusion of the meeting for anyone who requested them.

Graduate Student Session – Robert Jetton invited everyone to the session this afternoon, which was organized by Elizabeth McCarty (Graduate Student Session Coordinator).

Poster Session – Robert Jetton asked everyone to attend the Wednesday night poster reception.

Chairman Jetton announced the SFIWC Awards Banquet on Thursday evening, where the A.D. Hopkins, Roger F. Anderson, and Graduate Student Presentation Awards will be presented.

Steve Clarke asked that a portion of the currently closed Forest Health Committee meeting, held before the official start of SFIWC, be open to non-invitees (similar to the former State Cooperators Meeting). The membership agreed that this was a good idea.

There being no further business, the meeting adjourned at 9:00 AM.

Minutes of the Awards Banquet

Thursday, July 25, 2019

Savannah Marriott Riverfront
Savannah, Georgia

Chairman Robert Jetton called the awards ceremony to order at 7:48 PM.

Photo Salon – Brittany Barnes stated that over 90 photos and 6 videos were submitted this year from 18 photographers, whom she thanked along with judges: Paul Merten, Zack Parker, and Tom Sheehan. She announced the 1st Place winners in each category, as well as the Best in Show winner, Paul Merten (see attached). Paul received \$50, and his picture will be featured on the cover of the SFIWC 2020 program. Pictures will be forwarded to the Bugwood website.

Graduate Student Presentation Awards – Elizabeth McCarty, Graduate Student Session Chair, presented the Runner-Up award (tie) and \$100 to **Carrie Jubb**, an M.S. student of Scott Salom at Virginia Tech, and **Sarah Pellecchia**, an M.S. student of Lynne Rieske-Kinney at University of Kentucky. The 1st Place award and \$200 were presented to **Bethany Kyre**, a Ph.D. student of Lynne Rieske-Kinney at University of Kentucky. Elizabeth thanked the students and four judges: Bob Coulson, Molly Darr, Kier Klepzig, and John Riggins.

Roger F. Anderson Award – Jess Hartshorn, on behalf of Kamal Gandhi, Chair, thanked committee members, Chris Asaro, Bob Coulson, Jess Hartshorn, and Elizabeth McCarty. She announced that **Bethany Kyre** received the 2019 award. Bethany was presented a check for \$300; her personalized award plaque will be mailed to her in a few weeks.

A.D. Hopkins Award – Lynne Rieske-Kinney, Chair, thanked committee members, Lori Chamberlin, Don Grosman, Jiri Hulcr, Abe Nielsen, Scott Salom, and JT Vogt. She reported that this year's winner is **Stephen Clarke**, USDA Forest Service. Lynne presented Steve with the A.D. Hopkins framed picture and letter. A personalized award plaque will be presented to Steve at the 2020 SFIWC.

Steve Clarke again asked attendees to give generously to the food drive.

Chairman Jetton adjourned the awards ceremony at 8:13 PM.

Minutes of the SFIWC Closing Business Meeting
Friday, July 26, 2019
Savannah Marriott Riverfront
Savannah, Georgia

Chairman Robert Jetton called the meeting to order at 11:31 AM.

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

Old Business

SFIWC Food Drive – Steve Clarke thanked everyone for their donations of 4 bags of food and cash, totaling \$547.00!

Frustrana Cup – Steve Clarke reported that the team of Robert Jetton and JT Vogt won the “ladder toss” tournament on Thursday afternoon.

Frontalis Cup – Bob Coulson announced that Mac Stephen (Fred Stephen’s son) won the 2019 Frontalis Cup golf tournament.

Election of Counselor – Chandler Barton and Lori Chamberlin were nominated as candidates for SFIWC Counselor, 2019-2023. The members voted, and Chandler was elected.

Jess Hartshorn started a discussion of the proposed SFIWC student travel award, noting that it could help alleviate costs for students and new faculty. Some ideas mentioned included tying the award to meeting participation and requiring an application from interested students along with a supporting letter from faculty. It was generally agreed that Jess should form a committee to prepare a detailed proposal for a future vote.

SFIWC 2020 – Molly Darr and Katlin Mooneyham volunteered to be Program Co-Chairs for next year’s meeting in Lexington, Kentucky.

Chairman Jetton reminded everyone that a survey seeking input for SFIWC’s increased inclusivity and possible name change would be sent out to the entire membership sometime after the meeting.

New Business

None.

There being no further business, Chairman Jetton adjourned the meeting at 11:59 AM.

Respectfully submitted,

William P. Shepherd, Secretary-Treasurer

SFIWC Financial Report, CY 2019

SFIWC Income & Expenditures January 1, 2019 – December 31, 2019

Balance on hand, 1/1/19	\$7,185.81
Income	
Registration, Vendor, and Banquet fees	<u>\$30,061.67</u>
Available Funds	\$37,247.48
Expenses	
2019 Meeting	\$28,950.17
Awards & Administration	\$929.59
SFIWC Website Redesign	<u>\$2000.00</u>
Total Expenses	<u>\$31,879.76</u>
Balance on hand, 12/31/19	<u>\$5,367.72</u>

Historians Report

60th SFIWC

Savannah, Georgia

This is the 60th annual meeting of the Southern Forest Insect Work Conference, and the eleventh time SFIWC has been hosted in the state of Georgia. So far, SFIWC has been hosted in Georgia the most of the other 13 USFS Southern Region states with the next most frequent host state of Louisiana which has hosted SFIWC a total of 7 times. The first SFIWC meeting back in 1956 was also held in Georgia, but that session was held in Athens. Unbelievably, this meeting has not been in Savannah since 1958 which was the third SFIWC meeting.

The 1958 meeting was led by Chairman R.J. Kowal and program Chair was C.F. Speers with a total of 41 individuals including: 24 federal, 9 university, 6 industry and 2 state scientists. The only state agency with folks in attendance was the Virginia Division of Forestry (Caleb Morris and Hubbard Trafts). The theme of the 1958 meeting was “Forest Insect Research in the South with specific reference to three insects: Southern Pine Beetle, Reproduction Weevils, and Nantucket Tip Moth”. There was also discussion about inter-relationships between State, Federal and industry and their respective roles in the forest insect research program. Abstracts included research on some of the following:

- Attempts to cage rear SPB
- Insecticidal control trials for SPB were conducted, benzene hexachloride (BHC) proved most effective
- Needs for efficient SPB survey and detection including the need for some states to develop legislation and funding for providing and facilitating forest pest control
- Research needs on what exactly drives a SPB outbreak
- Population studies on pine reproduction weevils
- Seedling treatment trials for pine reproduction weevils where lead arsenate was found to give the best control
- Resistance screening for pine seedlings more resistant to Nantucket Pine Tip Moth
- Numerous spray and timing trials for NTPM including ground and aerial applications of DDT in a fuel oil emulsion.
- Role of Virginia Division of Forestry in Forest Insect problems

For a little perspective, below are some things outside of entomology happening back in 1958:

- The once very popular president Dwight D. Eisenhower’s struggled as American economy was suffering a recession with an unemployment rate of 7%
- Average Income: \$4,650 (\$41,205); average house: \$10,450 (\$92,600); average new car: \$2,155 (\$19,100); average rent: \$95 (\$842).
- The fervor of the “Cold War” is ongoing, there are two accidental US bomb “mishaps” or “broken arrows” including a hydrogen bomb lost off the coast of Savannah, and an accidental dropping of an atom bomb on Mars Bluff, SC

- The National Aeronautics and Space Administration (NASA), and Federal Aviation Agency (FAA) are formed
- The first successful American satellite (Explorer 1) is launched into orbit
- Elvis Presley gets drafted and inducted into the army
- VISA and American Express cards are introduced
- The microchip was co-invented
- The Ford Edsel makes its first appearance
- The first Toyotas and Datsuns are imported
- Top song of the year was “Volare” by Italian artist Domenico Modugno
- Top movie of the year was “Vertigo” by Alfred Hitchcock
- Wham-O company introduces the Hula Hoop; over 100 million were sold

The last meeting held in Georgia was held on Jekyll Island in 2007, this was the 50th SFIWC. Scott Salom served as Program Chair, and Jim Meeker as SFIWC Chairman. One hundred-fourteen people registered for this meeting including: 19 students, 6 retirees, 3 honored guests, and 86 regular members. Since this was a memorable 50th anniversary meeting, several esteemed honored guests namely Robert Thatcher and Harry Yates presented on the Perspectives and Remembrances of SFIWC and entomology through the past five decades. Research topics on Hemlock Woolly Adelgid continued to be prevalent but now more of the research was trending toward the potential impacts of chemical treatments. Southern Pine Beetle research continued to be strong with a wide variety of topics including population dynamics, climatic interactions, hazard modeling, semiochemicals and others. Laurel Wilt/Redbay Ambrosia Beetle research was in full swing with many early development topics including lifecycle biology, risk rating, host preferences, and survey detection were discussed. The Georgia Forestry Commission conducted a fieldtrip showing the impact of Laurel Wilt on the island and their effort to control the insects spread.

Not to minimize the importance of the first SFIWC also being held in Athens, Georgia back in 1956; a portion of Bob Thatcher and Harry Yates synopsis “SFIWC Perspectives and Remembrances” is included below. The entire 25-year-by-year document can be accessed on the 50th proceedings on the SFIWC website.

Prepared by Paul Merten, SFIWC Historian; July 16, 2019

SFIWC Perspectives and Remembrances

The First Twenty-five Years

Bob Thatcher and Harry Yates (U.S. Forest Service, retired)

Plenary Session – July 24, 2007

Circumstances that led to formation of Southern Forest Insect Work Conference

In the early and mid-fifties, the South was in the grips of a severe drought. There was a serious forest fire situation. Major bark beetle outbreaks were occurring across the region.

Interest in forest entomology was growing, particularly due to the passage of the Forest Pest Control Act. This was especially true for Federal and State forestry organizations.

Additional funds were appropriated which permitted the organizations to increase their hiring of trained forest entomologists and to expand research and survey activities. This stimulated universities to increase their emphasis on forest entomology education.

State organizations and some companies began to show increased concern for protecting their forests from insect attack. However, opportunities for organizations to meet together as a group to share information and develop unified approaches to dealing with emerging problems were lacking. In other words, there was no central forum for dealing with these problems.

Probably, the single most important insect responsible for bringing a group together was the southern pine beetle which was killing thousands of trees each month in the southern region. In addition, the black turpentine beetle was killing thousands of trees in Florida and Georgia. And, *Ips* beetles were doing the same in south Georgia.

These circumstances plus the success of a work conference in the West led to the need to implement a similar conference in the South.

Who took leadership in organizing a southern conference?

Joe Kowal, Chief of Forest Insect Research at the Southeastern Station at Asheville, can be credited with leading the drive to form a southern conference. Les Orr, who held a similar position at the Southern Station, collaborated with Joe in developing ideas and planning for such a conference during the latter part of 1955.

The Western Forest Insect Work Conference, made up of forest entomologists from the western states and Canada, was already in its sixth year of operation.

When and where was an organizational meeting held to form and seek support for a southern conference?

An organizational meeting was held in February 1956 in association with the annual meeting of the Association of Southern Agricultural Workers in Atlanta, Georgia. A 6-

member steering committee composed of Roger Anderson (Duke Cr.), Bob Lee (Union Camp), Caleb Morris (Va. Div. of For.) and three others attended. Les Orr and Joe Kowal presented a preliminary draft of guidelines for a Southern Forest Insect Work Conference. Les identified three objectives of the organization: 1) to advance the science and practice of forest entomology, 2) to provide a medium of exchange of professional thought, and 3) to serve as a clearing house for technical information to form and manage a southern conference on southern forest insect problems. Following agreement to proceed, officers were elected.

What were some highlights of conferences that followed?

First conference in Athens, GA, September 1956 – Joe Kowal (U.S. For. Serv.) was the 1st conference chairman.

A final draft of the operating guidelines was presented to and accepted by the attendees. Larry Hetrick (Univ. Fla.) was appointed chair for the Insect Common Names Committee.

Proposed common names were forwarded to the ESA for acceptance and publication. Status reports of insect conditions in the South were presented and general discussion followed which provided an organized approach to control efforts and detection surveys. At that time, very limited research on forest insects was going on at Asheville, Duke and the University of Florida.

Thatcher, Robert C., Yates, Harry O., “SFIWC Perspectives and Remembrances, The First Twenty-five Years.” Proceedings 50th Southern Forest Insect Work Conference, July 23-26, 2007. Foltz, John L., et al., editors. 2008. pp 12-13.

Photo Salon Awards
2019 SFIWC – Savannah, Georgia
Brittany Barnes, Organizer

Forest Insect

1st Place Thomas Whitney – Douglas-fir weevil

Forest Insect Damage

1st Place Paul Merten – Fraser fir aftermath forest following balsam woolly adelgid infestation on Clingmans Dome GSMNP

Series

1st Place Joe Pase – Pupa, adult, mating pair: swamp milkweed leaf beetle

Other

1st Place Bud Mayfield – Land snail, Chattahoochee National Forest, Georgia

Entomologists or Forest Health Specialists at Work

1st Place Bud Mayfield – Eastern hemlock release via silvicultural gap treatment

Video

1st Place Bud Mayfield – Releasing silver flies (*Leucopis* spp.) on hemlock woolly adelgid

Humor

1st Place Bud Mayfield – Bud dancing

Best in Show

Paul Merten – Fraser fir aftermath forest following balsam woolly adelgid infestation on Clingmans Dome GSMNP

Judges: Paul Merten, Zack Parker, and Tom Sheehan

Officers and Committees – 2018-2019

Officers

CHAIR 2017-2019

Robert Jetton, Camcore, North Carolina State University, Dept. of Forestry & Environmental Resources, Campus Box 8008, Raleigh NC 27695. 919-515-6425. Email rmjetton@ncsu.edu

COUNSELOR 2015-2019

Kamal Gandhi, University of Georgia, Warnell School of Forestry & Natural Resources, 180 E. Green St., Rm. 4-331, Athens GA 30602. 706-542-4614, Fax 706-542-8356. Email kjgandhi@uga.edu

COUNSELOR 2017-2020

JT Vogt, USDA Forest Service SRS, 320 E. Green St., Athens GA 30602. 706-559-4272, Fax 706-559-4220. Email james.t.vogt@usda.gov

COUNSELOR 2018-2022

Jessica Hartshorn, Clemson University, Dept. of Forestry and Environmental Conservation, Lehotsky 264, Clemson SC 29634. 864-656-4861. Email jhartsh@clemson.edu

IMMEDIATE PAST CHAIR

Kier Klepzig, Joseph W. Jones Ecological Research Center, 3988 Jones Center Dr., Newton GA 39870. 229-734-4706. Email kier.klepzig@jonesctr.org

CHAIR-ELECT 2018-2019

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SECRETARY-TREASURER

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