2018 East Texas Forest Entomology Seminar 2018

Thursday April 19

Moderator: Stephen Clarke

1:00 – 1:15 State Reports

1:15 – 1:45 Reporting *Ips* Activity in Arkansas and Oklahoma

Chandler Barton, Arkansas Forestry Commission; and Dieter Rudolph, Oklahoma Forestry Services

Unlike southern pine beetle, annual survey data related to Ips bark beetles is generally limited. Furthermore, the timeliness of that data collection varies across the south. This is unfortunate considering the recurring and widespread effects of these beetles. Forest health specialists in the south are now using several approaches that allow for the capture of Ips outbreak data. We present a recent timeline of Ips activity in Arkansas and Oklahoma, and we discuss the successes and failures of monitoring the occurrence of Ips outbreaks in these states.

1:45 – 2:15 An Assessment Of Monarch Butterfly Roadkill Mortality During the Fall Migration.

R.N. Coulson, T. Kantola, and J. A. Tracy, Texas A&M University

Mortality from roadkill has been suggested to contribute the decline of the eastern migrating monarch butterfly (*Danaus plexippus*) population. Accordingly, our goal was to estimate monarch roadkill mortality during fall migration within the migration funnel from Oklahoma to Mexican overwintering sites. We surveyed for dead monarchs during four weeks of fall migration in 2016 and 2017. The surveys were conducted along roadways for 100 m transects throughout the Central Flyway in Texas. The highest monarch roadkill densities, ranging from 10 to 67 dead individuals per 100 m, were concentrated in the southern portion of the survey area along a 70 km stretch of Interstate 10 between Sheffield and Sonora, Texas in 2016. Out of 581 detected monarchs, about 62% were males. We developed and compared MaxEnt models for roadkill occurrences with 30 m and 1 km resolution for the survey area. The MaxEnt model with 1 km resolution was projected over the entire Oklahoma/Texas/Mexico funnel for the fall monarch migration. Important variables in the roadkill model included latitude and proximity to three different road types. Monarch mortality to roadkill may be highly variable between years. Projections of monarch roadkill throughout the Oklahoma/Texas/Mexico funnel may represent at least 5% of the overwintering population in Mexico in some years.

2:15 – 2:45 **EAB in LA: A Summary of Detection Efforts, Biocontrol Release Efforts, and its Impact on Two Green Ash Sites in N. LA**

Wood Johnson, Billy Bruce, Chris Steiner, Aaron Rachal, Stephen Clarke, and Ben Parpart, FHP; Balwinder Kaur and Rodrigo Diaz, LSU Dept. Entomology; Allen Smith, Texas A&M Forest Service; Chandler Barton, Arkansas Forestry Commission; and Mohammed Bataineh, University of Arkansas Monticello.

The emerald ash borer (EAB; Buprestidae: *Agrilus planipennis* Fairemaire) is a secondary woodboring pest of Oleaceae in its native range of Asia. However, since its introduction to North America in the late 1990s, it has spread throughout most of eastern NA and is directly responsible for extensive ash (*Fraxinus* spp.) mortality. It now occurs in every southeastern state except MS and FL (confirmed in AR, 2014; LA, 2015; OK and TX, 2016). We present here a summary of the progression of mortality (2015-present) in two green ash (*F. pennsylvanica*)-dominated sites in north LA, as well as the results of differing trapping approaches in surveys conducted by the TFS, AFC, and USFS in 2015-2017. Finally, we briefly summarize observed EAB life history and biocontrol release and recovery efforts in north LA.

2:45 - 3:15 Break

3:15 -3:45 **Are Outbreak SPB Deviant or Just Devious?**

Brian Sullivan, USFS-SRS, Bailey McNichol and Kamal Gandhi, University of Georgia.

Many species of insects display phenotypic plasticity, that is, expression of different traits under different circumstances. Phenotypic plasticity may play an important role in the epidemiology of eruptive species. Different selective pressures exist when the insects are at low or high population levels that favor traits that maximize fitness in either situation. SPB is an eruptive insect that should benefit from expression of traits that confer specific advantages during outbreaks. This possibility has received little attention in SPB. Phenotypes expressed specifically in erupting SPB populations could be detected in beetles from the springtime survey, and this information could be incorporated into the predictive model and thereby increase forecast accuracy. Bailey McNichol (a graduate student co-advised by me and Kamal Gandhi, University of Georgia) have been conducting studies to examine the possibility of SPB phenotypes that differ between outbreak and non-outbreak populations. Morphology of hindwings of SPB from the 2016 south-wide survey was examined with geometric morphometrics techniques to detect subtle differences in wing morphology among populations. We found significant shape variation among

wings; this variation had a weak association with beetle sex but not the state from which the beetles were derived. The sex ratio of SPB captured in pheromone-bated traps has been observed to vary considerably, and possibly in association with population density changes. However, sex ratios of beetles from the 2016 survey in both outbreak and non-outbreak states did not differ on average, although there appeared to be some difference in the distribution of these ratios, and the ratios overall were much lower than detected during the latter half of the past decade when SPB numbers were uniformly low and static across the South. Ongoing studies are examining variation in the proportions of the two species of mycangial fungi that might be related to population density and other traits. Past research showed higher rates of population increase when mycangia of females contained more *Entomocorticium* than *Ceratocystiopsis.* Our pilot studies suggest that mycangial contents may be associated with different responses to pheromone components. Other traits are being explored as possible correlates to SPB population changes.

3:45 – 4:15 SPB in Mississippi: An Appetite for Destruction.

Jim Meeker, Chris Steiner, Brian Strom, FHP

SPB activity on the NF's in MS erupted in 2017, to the worst levels in over 20 years (i.e., 1995). Districts in severe outbreak conditions included the Bienville (1,952 spots), Homochitto (1,017 spots), and Tombigbee (1,280 spots). Over 23,000 acres were impacted by SPB on the NFs in MS in 2017. Though the situation was declared and Incident in July, overwhelming beetle activity, insufficient resources, cultural resource survey needs, poor markets, wet ground conditions, and prohibitive timber sale procedures prevented a timely and comprehensive suppression response. Suppression efforts via Cut & Leave were focused on protecting high priority resources (i.e., enlarging infestations within 1/2/ mile of active RCW cavity trees and within ¼ mile of adjoining and susceptible private lands). Nearly 1,000 spots (25% of all spots) were eventually treated by Cut & Leave operations that were conducted on more than 5,000 acres. Regional Office relief and variances eventually allowed for Cut & Remove suppression/salvage sales to be implemented on the Bienville NF. These sales targeted only the green-infested and associated 300' buffer strip in advance of the active head(s). Sale areas were deigned to encompass blocks of forest/spots and to adjoin one another to provide blanket coverage for C&R going forward. By year's end 15 sales had sold, representing an additional 2,700 acres and 102,000 CCF (51 MMBF) of timber. Cut & Leave operations were halted in Nov., and C&R operations were seasonally halted due to poor ground conditions in mid Jan. Over 1,800 active infestations were left untreated in 2017, over 1,200 of which were designated for suppression measures. Early detection flights in March and April of 2018 have revealed hundreds of active carryover infestations from 2017

on the Bienville, Homochitto, and Tombigbee. The situation has again been declared an Incident for 2018 and suppression operations are slated to begin in earnest in early May, primarily via rapid implementation of C&L, and where time permits more C&R via salvage sales.

4:15 – 4:45 **SPB Collector: an App for destruction**

Chris Steiner, Jim Meeker, Brian Strom, FHP

Poster: Fired Up: Using Geocaching for Don't Move Firewood Outreach.

Jacob Smith, John Thomason, and John J. Riggins, Mississippi State University; Todd Matthews, Mississippi Forestry Commission

4:45 – 6:00 Attitude adjustment

6:00 – 7:00 Crawfish

7:00 -7:30 Evening slide presentation

Friday April 20

Moderator: David Kulhavy

8:00 – 8:30 Investigating Lethal Trap Trees for Stand-Level SPB Population Suppression.

John Thomason and John J Riggins, Mississippi State University; Steve Clarke, FHP; Don Grosman, Arborjet; Allen Smith and Ron Billings, TFS; and David Cox, Syngenta

The effectiveness of insecticide-injected trap trees deployed at the stand/landscape scale will be investigated as a means to control southern pine beetle (SPB) populations. The registered insecticide emamectin benzoate will be injected into standing (uninfested) loblolly pine trees to create lethal trap trees. Nine adjacent pine forest blocks of 9 square miles (5,760 acres) each and similar stand and beetle conditions will be assigned one of three treatments: 1) 25 lethal trap trees per block, 2) 13 lethal trap trees per block, and 3) 0 trap trees per block (untreated check) with 3 replicates per treatment. The goal is to reduce overwintering and early spring SPB populations

8:30 – 9:00 Effects of Consuming Wood Infected with Ophiostomatoid Fungi on the Physiology of Subterranean Termites

N. A. Dearing, N. Krishnan[1], C. Siegert[1], and J. J. Riggins; Mississippi State University, N. A. Clay, Louisiana Tech. University; and J. D. Tang, US Forest Service

Subterranean termites have many well-documented fungal symbionts, with relationships ranging from mutualistic to antagonistic. Until fairly recently, all fungi known to be capable of eliciting a feeding response from subterranean termites have been from the same group, Basidiomycota, and contribute to the decay of woody debris. In 2012, a new fungal associate (ophiostomatoid fungi, or "blue stain" fungi) of subterranean termites was discovered. These ascomycete fungi were the first known non-basidiomycete fungi to elicit a positive feeding response in subterranean termites. Interestingly, ophiostomatoid fungi are also closely associated with bark beetles, the primary herbivore of pine trees. In addition to being in a separate phylum, ophiostomatoid fungi metabolize sugars, proteins, starches, and fats in the sapwood as opposed to cellulose and lignin like decay fungi in Basidiomycota. The findings of Little et al. from 2012 have been backed up by further research; however, the mechanisms behind this feeding response remain unknown. Proposed research was presented, which will be

focusing on the physiological responses of native subterranean termites after feeding on wood infected with ophiostomatoid fungi. Objectives of this research are: 1.) determine if subterranean termites experience changes in cellulolytic activity after feeding on wood infected with ophiostomatoid fungi, 2.) determine if the composition or abundance of symbiotic gut biota is altered after feeding on wood infected with ophiostomatoid fungi, and 3.) further confirm the feeding preference of termites for wood infested with ophiostomatoid fungi. Termites from three distinct colonies will be allowed to feed on wooden wafers for a duration of 15 or 30 days. Feeding will occur in isolated chambers, each containing one wafer that is either infected with ophiostomatoid fungi, is a sterile control, or is lab inoculated with a non-native ophiostomatoid fungus (*Grossmania huntii).* Cellulolytic activity will be measured using RT qPCR for termite gut and mouthparts separately to assess the efficiency of cellulose digestion. A count of protists present in the gut of subterranean termites will also be performed. The microbial communities within the gut of subterranean termites change drastically with the quality of feeding medium and will be good indicators of the nutritional quality of the wooden wafers. The percent mass loss of feeding mediums from each treatment will also be compared to determine if increased feeding on wood infected with ophiostomatoid fungi occurs in a no-choice lab feeding trial.

9:00 – 9:30 Target-tree Release to Improve the Sustainability of Eastern Hemlock in the Southern Appalachians

Robert Jetton, Camcore, N.C. State University; and Bud Mayfield, USDA Forest Service, Southern Research Station

The hemlock woolly adelgid, *Adelges tsugae* (Hemiptera: Adelgidae), a native of Asia and northwestern North America, is an exotic invasive insect in eastern North America that has caused widespread decline and mortality of eastern (*Tsuga canadensis*) and Carolina (*T. caroliniana*) hemlocks since its introduction to the eastern United States in the early 1950s. The integrated effort to manage adelgid impacts on hemlock ecosystems includes chemical and biological control, host resistance breeding, and genetic resource conservation. Until recently, relatively little attention has been given to silvicultural options for managing this pest. Most early efforts focused on cultural methods to improve the health and vigor of individual high value trees in ornamental and recreational settings, or silvicultural tools to promote the next non-hemlock forest type in forest settings. In 2017, the authors received funding from the USDA Forest Service Special Technology Development Program to conduct research aimed at developing new silvicultural strategies to improve the long-term health and retention of hemlocks in Southern Appalachian forests. Target-tree release plots were established to evaluate how increasing the amount of ambient light available to the crowns of eastern hemlocks in intermediate forest canopy positions affects hemlock woolly

adelgid infestation density and the subsequent health of the tree. Ambient light around the crown of individual trees was increased by creating gaps of two sizes (small versus large) using two methods (felling versus girdling), and adelgid density and tree health responses are compared to un-released control trees. From June 2017 through February 2018, 21 five-tree study replications (105 trees total) were established in hemlock forests ranging from western Maryland south to Northern Georgia. This presentation reports on the rationale and methodology utilized in this new study.

9:30 – 10:00 Longleaf Pine Cone Collection on the Sabine National Forest during October 2014

George Weick, USFS

Longleaf pine is known as an unpredictable seed producer, with adequate or better seed crops occurring once every 5 years or longer. However, in the spring before seed fall, good cone crops can be predicted by visually counting green cones in the canopy, which by then are large enough to be seen especially when using binoculars of suitable power. During the spring of 2014, cone surveys in eastern Texas suggested that the autumn longleaf pine cone crop there could be a bumper crop. As a result, staff of the National Forests and Grasslands in Texas, in cooperation with Southern Region Forest Management staff, planned and conducted a longleaf pine cone collection that was implemented during the fall of 2014. Results were a great success, with more than 1,000 bushels of cones collected, producing nearly 1,000 pounds of seed (equivalent to approximately 5 million seedlings, enough to plant roughly 8,000 acres at typical planting rates). This seed supply will meet the needs of the National Forest and Grasslands in Texas for the foreseeable future.

10:00 -10:30 Break

10:30 – 11:00 Use of UAS DJI Phantom 4 Pro in Forestry Research—Exploring Use of the 3D Imagery from Pix4DCapture

David Kulhavy, Dan Unger, I-Kuai Hung and Yanli Zhang, Stephen F. Austin State University

11:00 – 11:30 Arthropod Herbivores at Risk from Laurel Wilt Induced Hostplant Mortality

John J. Riggins, John P. Formby, Natraj Krishnan, Richard Brown, Natalie Dearing, and Hannah Bares, Mississippi State University; Adam Chupp, University of South Alabama, Mobile; Frank H. Koch, USDA Forest Service, SRS; Marc Hughes and Jason A. Smith, University of Florida; Kelly Oten5, North Carolina Forest Service; and Don Duerr, USDA Forest Service, FHP.

Laurel wilt is an invasive non-native tree disease in the southeastern United States that involves naïve hosts in the family Lauraceae, an introduced insect vector (Xyleborus glabratus), and a pathogenic fungal symbiont (Raffaelea lauricola). All native North American shrub and tree species in the Lauraceae family that have been tested thus far are susceptible. If the mass die off of trees in the Lauraceae continues, obligate specialists of laurel wilt susceptible hosts such as the palamedes swallowtail (Papilio palamedes Drury) may be at risk. Exhaustive literature searches yielded a catalogue of native arthropods reported to have associations with Lauraceae species. Arthropods were assigned an endangerment risk rating based on the extent of their specialization on susceptible hosts. Overall, >170 native arthropod species from 7 orders were catalogued as herbivores that could be impacted by declines of their Lauraceous host plants. More than 20 insect species were identified as obligate specialists of Lauraceae. In a field trial, the mean number of palamedes swallowtails encountered in transects through laurel wilt infested stands was significantly lower than in uninfested stands. This suggests dire consequences for the palamedes swallowtail, and warrants concern for other native arthropods that are obligate specialists of laurel wilt susceptible host plants.

10:30 – 11:00 The TFS Forest Pest Control Section - A Look Back

Ron Billings, Texas A&M Forest Service (retired)

The Texas Forest Service established the Forest Pest Control Section in 1962 to address a serious outbreak of southern pine beetle (SPB). A brief history of the Section through 2017, including key accomplishments and staff members, will be discussed. In addition to focusing on SPB, the Section expanded over the years to successfully address many other forest pest problems in Texas, including oak wilt, pests of pine seed orchards and young pine plantations, other bark beetles, and invasive species.