THE FIREFLY

Proceedings of the 43rd Annual Meeting

of the

Tennessee Entomological Society

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BREHM ANIMAL SCIENCE BLDG.
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UNIVERSITY OF TENNESSEE
INSTITUTE OF AGRICULTURE
KNOXVILLE, TENNESSEE

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RICHARD E. CARON

OUTSTANDING ENTOMOLOGIST AWARD

NOMINATION FORM

The Awards Committee of the Tennessee Entomological Society invites nominations from any TES member for the Richard E. Caron Outstanding Entomologist Award. The award is awarded periodically to TES members who have distinguished themselves by making outstanding contributions to entomology in Tennessee.

Name of Nominee_____

Brief Description of His/Her Qualifications for the Award

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Name of Nominator _____

Phone Number of Nominee: Area Code ( )_____

Please submit your nomination by **August 1, 2017** to:

Dr. Kevin Moulton

University of Tennessee
Institute of Agriculture
432 Plant Biotechnology Building
Knoxville, TN 37996
jmoulton@utk.edu
865-974-7950

PROCEEDINGS OF THE 43rd ANNUAL MEETING

OCTOBER 6-7, 2016

Keynote Speaker

A Hundred Years of Change in Forests of the Great Smokey Mountains National Park

Jesse Webster
Forrester, National Park Service, Great Smokey Mountains National Park, Gatlinburg, TN

Student Presentations

Impacts of Cover Crops Presence on Red Maple Tree Insect Pests

Sujan Dawadi, Karla M. Addesso, Jason B. Oliver and Paul O'Neal
Tennessee State University, College of Agriculture, Human, & Natural Sciences, Otis L. Floyd Nursery Research Center, McMinnville, TN

Cover crops are a valuable tool for insect pest management in vegetable and row crop production, but are not widely used in ornamental production. Maple tree production represents an important segment of the ornamental nursery industry in Tennessee. The primary insect pests of red maples are flatheaded appletree borer (FHAB), ambrosia beetles, maple tip moth (MTM), and potato leafhopper (PLH). The current study investigated annual cover crops and drench applications of imidicloprid as means to manage these and other pests. In the first year of the study, as expected, measures of maple tree growth were reduced due to competition with the cover crop relative to trees in herbicide-treated plots. No signs of two-spotted spider mite or ambrosia beetle attacks were found during summer evaluation. In the case of MTM and maple leaf tier (MLT), the number of trees with flagged or infested shoots was expressed as a proportion of the total number of trees. The number of trees hit by MTM was similar across treatments, indicating female host search efficiency was not affected by the presence of the cover crop. In contrast, MLT attacked more individual trees in plots where the cover crop was managed with herbicide. This difference may be a result of fewer suitable leaf tips for oviposition in the cover crop plots at the time of evaluation. A visual estimation of the percentage of the canopy damaged by PLH found overall damage to be low but trees in herbicide-treated plots and imidicloprid-free plots to be more susceptible to PLH than those in cover crop plots and imidicloprid-treated plots, respectively. More work will be done to assess whether the trade-off of reduced pest load at the cost of increased competition is an economically viable option for maple growers.

Patterns in Imported Fire Ant Size, Geographical Distribution, and Hydrocarbon/Venom Alkaloid Indices and the Potential Implications for Biological Control with Phorid Flies

Manoj Pandey, Jason B. Oliver, and Karla Addesso.
Tennessee State University, College of Agriculture, Human, & Natural Sciences, Otis L. Floyd Nursery Research Center, McMinnville, TN

Imported fire ants (IFA), *Solenopsis* spp. (Hymenoptera: Formicidae) have continued to expand their range since entering Tennessee in 1987. Past surveys indicate red (*Solenopsis invicta* Buren) and black (*Solenopsis richteri* Forel) IFA and their *S. invicta* × *S. richteri* hybrid constitute about 2.3, 43.2, and 54.5% of the Tennessee IFA population, respectively. From field observations, worker ant sizes appear to vary in IFA colonies. The purpose of this study was to determine the relationship between IFA species/hybrid and worker ant size. The research is important because biological control agents like *Pseudacteon* phorid-decapitating fly species (Diptera: Phoridae) exhibit distinct preferences for worker ant size, which could affect IFA classical biological control programs. A grid with constituent 14 x 14 km sections was applied to IFA infested areas in 62 Tennessee counties, and from July to October 2015 IFA worker ant samples were collected from colonies near the center of 282 sections. Cuticular hydrocarbons and venom alkaloids of workers were collected via hexane extraction from sampled colonies and analyzed by gas chromatography and mass spectrometry. Chromatograph peaks for the hydrocarbons and alkaloids were used to calculate an index which can determine species or hybrid status of an IFA colony. A sub-sample of colony collections were randomly selected and the head capsules of 50 worker ants were photographed under a microscope and measured with imaging software. Statistical analysis was performed to determine whether ant species/ hybrid status and geographical distribution contribute to worker size. The study results indicate similar patterns of head size across colonies regardless of the hydrocarbon/ alkaloid index value and location. Consequently, worker ant size in Tennessee IFA populations is not likely to be an impediment to the establishment of different phorid species with varying IFA worker ant size preferences.

First Place:
Preparing Tennessee Cattle Producers for Current and Invasive Tick Threats

David Theuret and Rebecca Trout Fryxell
Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN

The economic success of Tennessee's beef cattle industry is threatened because producers are unprepared for ticks and tick borne disease. Ticks are parasites that damage cattle directly through their attachment and indirectly via the transmission of pathogenic microbes. Bovine Anaplasmosis is of primary concern in Tennessee, although non-native ticks and pathogens will become the most important issue for the cattle industry, causing significant economic loss. These are set to invade the U.S. due to the movement of alternative hosts, vectors, and resistance to acaricides. To address tick threats to the cattle industry, this project aims to 1) determine the diversity of ticks parasitizing beef cattle 2) elucidate seasonal and regional patterns of tick activity and 3) determine the best source for invasive monitoring. Data was collected from three University of Tennessee research and education centers, producers via extension agents, and livestock auctions. A quarter of the total herd size (or 10 animals, whichever was greater) was sampled at each location. The head, neck, ears, and tail were sampled for a maximum of 5 minutes when cattle were run through a chute. Ticks were placed into one vial per animal and identified to species, sex, life stage, and feeding status. MANOVA was conducted on infestation prevalence, tick burden, collection sources, and in conjunction with Chi Square to explore risk factors for cattle in SAS 9.4. Four tick species were identified as cattle parasites, with no significant relationship between region and infestation prevalence or burden. Seasonal activity was significantly higher during late spring and early summer. The extension and auction collections are better at capturing ticks and may serve as a sentinel. Lastly, no significant variables were identified that would correlate high tick abundance with cattle risk factors. Ultimately, this study will improve control efforts and prepare producers for invasive ticks and pathogens.

Identification of Molecular Mechanism of Cry1Fa Resistance in *Spodoptera frugiperda* Populations from Puerto Rico

Rahul Banerjee[1], Lucas Hietala[2], and Juan Jurat-Fuentes[2],
[1]Genome Science and Technology Graduate Program, University of Tennessee, Knoxville, TN
[2]Department of Entomology and Plant Pathology. University of Tennessee, Knoxville, TN

Transcriptomic Analysis of *Ctenolepisma longicaudata* in Respone to Different Cellulose Diets

Ratnasri Pothula[1], William Klingeman[2], Margaret Staton[1], and Juan Luis Jurat-Fuentes[1]
[1]Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN
[2]Department of Plant Sciences, University of Tennessee, Knoxville, TN

Bioethanol produced by fermentation of sugars from cellulose represents an alternative to finite fossil fuels. Our goal is to identify cellulolytic enzymes amenable to biotechnological application in improving bioethanol production from plant biomass. Insects are good cellulase prospecting candidates due to their capacity to digest recalcitrant cellulose through endogenous plant cell wall degrading enzymes (PCWDEs) and other cellulases from symbiotic microbes. Preliminary genomic comparisons supported species of Zygentoma as producing a high number of diverse endogenous PCWDEs compared to other insect groups. In this work we report data from a comparative transcriptomic study of the gut from the silverfish *Ctenolepisma longicaudata* Escherich after feeding on diets of distinct lignocellulose composition. Analysis of expressed enzymes combined with localization of expression in regions of the digestive tract identifies PCWDEs produced in the silverfish in response to cellulose substrates of increased recalcitrance. These data advance our understanding of lignocellulose digestion in basal hexapods and the identification of novel cellulolytic enzymes with potential application in the biofuel industry.

Second Place:
Rapid Detection of Thousand Cankers Disease: Let's Save the Walnuts!

Emel Oren[1], Romina Gazis[1], William Klingeman[2], Paris Lambdin[1], John Moulton[1], Mark Coggeshall[3], Steven J. Seybold[4] and Denita Hadziabdic[1]

[1] University of Tennessee, Department of Entomology and Plant Pathology, 370 Plant Biotechnology Building, Knoxville, TN

[2] University of Tennessee, Department of Plant Sciences, 2431 Joe Johnson Dr., 252 Ellington Plant Sciences Building, Knoxville, TN

[3] University of Missouri, Department of Forestry, 203 ABNR Building, Columbia, MO

[4] USDA Forest Service, Pacific Southwest Research Station, 1731 Research Park Drive, Davis, CA

Thousand cankers disease (TCD) complex involves *Juglans* spp., the fungal pathogen, *Geosmithia morbida,* and the vector, *Pityophthorus juglandis*. Thousand cankers disease affects nearly all species of walnut trees (*Juglans*) and several species of wingnut (*Pterocarya*). The disease has now been reported in 16 U.S. states and in northwestern Italy. Thousand cankers disease is often difficult to diagnose due to rough bark surface of the walnut that masks many of the disease symptoms. Even when symptoms are suspected, TCD is readily confused with injuries caused by other abiotic and biotic agents. Due to the relatively slow growth rate of *G. morbida*, its isolation from infected materials is confounded by other fungi that may also occur within the galleries and lesions. Consequently, there is a critical need for rapid TCD detection using molecular tools that can distinctively detect the organisms involved in the disease. To test the efficiency and sensitivity of microsatellites in the detection of TCD, we used previously developed microsatellite loci that characterize *G. morbida* and *P. juglandis*. A total of 40 walnut bolts (~ 5-8 cm diameter, 35-45 cm long) were collected from individual trees at each of three locations, either within (California, Tennessee) or outside (Missouri) the current distribution of TCD. A total of 1600 drill cores were taken and shavings from these cores were used for DNA extraction. Following PCR amplification of *G. morbida* and *P. juglandis* specific microsatellite loci, DNA samples were analyzed with a QIAxcel capillary electrophoresis system to detect the amplification of the targeted microsatellite region. Data were analyzed using the program R, and the interclass correlation coefficient was used for power calculations. Our data provides a demonstration of rapid confirmation of the presence of the pathogen/vector directly from infected material and illustrates a protocol that is highly sensitive, feasible, effective, and time efficient.

Potential Alternative Vectors for *Geosmithia morbida* (Thousand Cankers Disease) in the Native Range of Black Walnut (*Juglans nigra*)

Karandeep Chahal[1], Romina Gazis[1], Jerome Grant[1], Denita Hadziabdic[1], Paris Lambdin[1], William Klingeman[2], Dave Paulsen[1] and Mark Windham[1]

[1] University of Tennessee, Department of Entomology and Plant Pathology, 370 Plant Biotechnology Building, Knoxville, TN 37996

[2] University of Tennessee, Department of Plant Sciences, 2431 Joe Johnson Dr., 252 Ellington Plant Sciences Building, Knoxville, TN 37996

Thousand cankers disease (TCD) is a complex which involves an insect vector, *Pityophthorus juglandis* and a fungal pathogen, *Geosmithia morbida*. In the last 20 years, TCD has been attributed to severe mortality of black walnut in the western US. Even though *G. morbida* is mostly associated with *P. juglandis*, the fungus has been detected on other insects: *Stenomimus pallidus*, *Xyleborinus saxesenii* and *Xylosandrus crassiusculus*. To determine if alternative vectors of the fungus exist in east Tennessee, we installed insect traps on symptomatic black walnut trees at 3 locations. Coleopteran insects were collected using 70% ethanol filled black walnut bolts as lures. Only traps containing single species are reported here. Insect specimens were identified using morphological characters and/or the COX universal insect primers. Two fungal detection methods were used, a culture-based assay and a molecular-based method. For the culture-based assay, insects were washed with sterile water and dilutions of the wash-off were plated on nutrient media. Petri dishes were incubated and axenic cultures were obtained for identification. For the molecular-based method, each insect was crushed and DNA was extracted. *Geosmithia morbida* was confirmed by using the "GS004" primer that amplifies a microsatellite region only present in the fungal pathogen. Capillary electrophoresis was used to detect the amplification of the microsatellite region. Our results showed that five species of bark and ambrosia beetles: - *Xylobiops basilaris* (33 out of 47 tested), *Xyleborinus saxesenii* (30/56), *Cnestus mutilatus* (4/9), *Xylosandrus crassiusculus* (2/3) and *Stenomimus pallidus* (2/2) are carrying *G. morbida*. This is the first report of *X. basilaris* and *C. mutilatus* as potential vectors of *G. morbida*. These results call for awareness of the threat that these potential vectors impose to the spread of the fungus to healthy black walnut populations.

Kudzu Patch Kids: The Future of Kudzu Bug Research in East Tennessee

Amy Michael, Kadie Britt, and Jerome Grant
Dept. of Entomology & Plant Pathology, University of Tennessee, Knoxville, TN

The kudzu bug, *Megacopta cribraria* (F.), was found infesting Tennessee kudzu (*Pueraria montana* var. *lobata*) (Lour.) Merr. patches in 2012. Since its arrival, it has become an economic pest of soybeans (*Glycine max* (L.) Merr.) and a seasonal nuisance pest of homes.
Previous research at the University of Tennessee laid a foundation for more in-depth studies on kudzu bug populations in Tennessee. These included population studies of *M. cribraria* in kudzu patches throughout Knox, Blount, Monroe, McMinn, Polk, and Murray (GA) Counties in 2014-2015, a preliminary study of the entomopathogenic fungus and natural enemy (*Beauveria bassiana* (Bals.) Vuill.) of kudzu bug in 2015, and confirmation of adult kudzu bug activity on common ragweed (*Ambrosia artemisiifolia* L.) and bush honeysuckle (*Lonicera maackii* (Rupr.) Maxim.) in laboratory choice and no-choice tests.
Efforts will continue to assess kudzu bug populations in 2016 and 2017. *Beauveria bassiana* has recurred this year, and sampling has been expanded to all six counties, as near 100% control of nymphs was observed in two counties sampled in 2015. Common ragweed and bush honeysuckle will be investigated as potential reproductive hosts for kudzu bug, and differences in fertility and fitness on these plants will be compared to their confirmed reproductive hosts, soybean and kudzu. The relationship among these species, common to east Tennessee kudzu patches, and *M. cribraria* will be studied for the first time. The role of these plants during the early stages of kudzu bug emergence (mid-March to April) before kudzu is thriving in the field (mid-May) will be determined. The goals of this research are to obtain greater insight into east Tennessee kudzu bug populations for development of timed control methods, to measure impact of *B. bassiana* throughout east Tennessee, and to identify importance or non-importance of native plants to kudzu bug populations.

Beneath the Bark: Phenology of Emerald Ash Borer and its Introduced Parasitoids in Tennessee

James Palmer[1], Jerome Grant[1], Pat Parkman[1], Greg Wiggins[1], and James Vogt[2],
[1]Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN
[2]USDA Forest Service, Knoxville, TN

Going Towards the Light: Testing the Effectiveness of Light as Bait for Aquatic Macroinvertebrates

Lauren Schnorr and Steven Hamilton
Center of Excellence for Field Biology and Department of Biology, Austin Peay State University, Clarksville, TN

Second Place:
Depressed, Wet, And in The Woods: Macroinvertebrate Community Variation in Temporary Woodland Pools

Brandy Schnettler, Steven Hamilton, and Joseph Schiller
Center of Excellence for Field Biology and Department of Biology, Austin Peay State University, Clarksville, TN

Non-Student Presentations

Can Vacuuming Serve as a Stand-Alone Treatment for Bed Bug Infested Furniture?

Karen Vail, Jennifer Chandler, John Glafenhein, and Rachel Harmon
Department of Entomology and Plant Pathology,University of Tennessee, Knoxville, TN

Revisionary Studies of the Nearctic Dixidae (Diptera): The *Dixa inextricata* and *D. modesta* Species Complexes

John Moulton
Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN

Kudzu Bug Seasonal Phenology in Eastern Tennessee

Kadie Britt, Jerome Grant, Greg Wiggins, Scott Stewart and Juan Jurat-Fuentes
Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN

Scale Insect Management

Frank A. Hale
University of Tennessee Extension,
Dept. of Entomology & Plant Pathology, University of Tennessee, Nashville, TN

Scale insects are among the most problematic pests in the nursery and landscape industries. Heavy infestations can stress plants causing chlorotic leaf tissue, sunken areas, branch die-back, and even plant death. Soft scales, wax scales, and felt scales feed on photosynthate and other molecules in the phloem. Honeydew, primarily composed of carbohydrates and amino acids, is excreted by these scale types and collects on plant tissues below. Sooty mold fungi often grow on honeydew and can obscure the leaves, thereby reducing photosynthesis. Armored scales and pit scales do not produce honeydew and thus black sooty mold is not associated with their infestations. However, their armor, composed of waxy and non-waxy components, provides additional protection against predators and pesticides.

The crape myrtle bark scale was recently introduced in the U.S. and is expected to quickly spread across the range of crape myrtle. A multipronged integrated pest management approach needs to be developed to manage this pest. Most control strategies of scale insects target newly emerged crawlers since they lack armor, are mobile and therefore more readily contact insecticide-sprayed surfaces, and are less able to metabolize insecticides. Small sticky traps can monitor crawler emergence so foliar applications can be properly timed. Since crape myrtle bark scales overwinter as nymphs on trunks and branches, horticultural oil and insect growth regulator applications can be timed for the dormant to delayed dormant periods when crawlers are exposed but before immature beneficial insects are active. Neonicotinoid insecticides can also be effective in scale insect control but application methods vary and applications often must be made in advance to allow incorporation of the chemical into the plant. Pruning crape myrtles in the spring may help quell the overwintering population which may also potentially improve predator: prey ratios needed for optimized biological control. Periodic pressure washings of crape myrtles can remove scale insects, their waxy coverings, and papery bark covered with sooty mold. Further research is needed to determine the best timing for these actions for inclusion in an IPM plan.

Update on Tennessee Survey for *Solenopsis invicta* Virus (SINV) and *Kneallhazia solenopsae* and Discussion on the Possible Need to Introduce These Pathogens

Jason Oliver[1], Karla Addesso[1], Steven Valles[2], Nadeer Youssef[1], Anne-Marie Callcott[3], Manoj Pandey[1], Paul O'Neal[1], Joshua Basham[1], Debbie Eskandarnia[1], Garrett Roper[1], Joseph Lampley[1], Megan Patton[1] and Walker Haun[4]

[1] Tennessee State University, College of Agriculture, Human, & Natural Sciences, Otis L. Floyd Nursery Research Center, 472 Cadillac Lane, McMinnville, TN
[2] USDA-ARS Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL
[3] USDA-APHIS-PPQ Biloxi Station, Biloxi, MS
[4] Tennessee Department of Agriculture Plant Certification, Ellington Ag. Center, Nashville, TN

Imported fire ants (*Solenopsis* spp.; IFA) infest 62 Tennessee counties (~17 million acres). The U.S. IFA impact is ~$6.8 billion/yr. Red (*Solenopsis invicta* Buren), black (*Solenopsis richteri* Forel), and hybrid IFA are more diverse in Tennessee than red IFA dominated areas further south, possibly hindering classical biocontrol. This study determined incidence of IFA pathogens in Tennessee, including *Kneallhazia solenopsae* Kneall Alan Hazard and *Solenopsis invicta* viruses (SINV-1, -2, and -3). These pathogens infect all IFA stages and castes, are transmitted vertically and horizontally, and can cause unapparent to high colony morbidity depending on environment. Tennessee Federal IFA quarantine areas were divided into 14 by 14 km grids, one colony sampled near grid centers, and locations mapped by GPS unit. Samples were collected in 95% ethanol for molecular pathogen assessment and extra samples for IFA species determination and other possible tests. A total of 439 summer (August−October) and 234 winter (January−April) samples were collected in 2015 and 2016. SINV-3 is more prevalent during cooler months. To date, 72% (n=315) of the summer samples have been processed with 8.5, 0.0, 0.35, and 1.06% of the samples being positive for SINV-1, -2, -3, and *Kneallhazia*, respectively. SINV-1 was statewide, but SINV-3 only occurred at one Franklin Co. site. *Kneallhazia* was found in Hardeman, Henderson, and Madison Co. monogyne colonies (one site per county). Other samples are being processed. Tennessee SINV infection rate (8.85%) is <73% and 93% infection rates in Florida red IFA monogyne and polygyne colonies, respectively (1). Likewise, 13 and 33% of Florida monogyne and polygyne colonies had multiple SINV infections, respectively (1), but to date no Tennessee colonies had more than one SINV species infection. Results indicate low Tennessee colony infection rates and possible need for inoculations of SINV and *Kneallhazia* to improve regional prevalence and impact on IFA populations.

A Stress-Mitigating Product to Reduce Ambrosia Beetle Attacks on Trees

Karla M. Addesso, Fulya Baysal-Gurel, Jason B. Oliver and Paul A. O'Neal
Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN

Ambrosia beetles (Coleoptera: Scolytidae) are economically important insects found damaging woody ornamentals. Most species are considered beneficial due to the part they play in forest decomposition, but some species are considered pests in nursery production settings due to the mortality they cause in young trees. Ambrosia beetles attack stressed plants by cuing in on the ethanol signal released during anaerobic respiration. Despite our understanding of basic ambrosia beetle ecology, trapping and insecticide treatments for nursery stock, the only certain way to prevent ambrosia beetle attacks is to prevent or reduce plant stress. In this study, redbud and yellow poplar trees were treated with a product reported to have stress priming activity. Twenty trees of each species were exposed to the following treatments: product and no product. Ten trees in each treatment were subsequently inoculated with *Phytophthora cinnamomi* resulting in four treatment combinations: untreated, product, inoculum and product + inoculum. All trees were flooded by submerging root balls in water up to the root collar. Trees were deployed along a wood lot to evaluate ambrosia beetle attacks. Product treated trees had the fewest hits, while untreated trees had the most. Treated and untreated trees inoculated with a soilborne pathogen had intermediate numbers of ambrosia beetle attacks. Product treated trees consistently had lower root damage ratings. Measurements of ethanol production via SPME and GC-MS showed that all treatments emitted ethanol following drowning. No statistical differences were observed between the treatments due to large variation in the amount of ethanol emitted. The objective of this study was to evaluate stress mitigating products for ambrosia beetle management as stand-alone applications or as components of an integrated management strategy. While pre-treatment of trees with the test product did reduce ambrosia beetle attacks, lack of ethanol emission does not appear to be the primary cause.

Entomological Hot Topic: Zika Virus

Becky Trout Fryxell
Department of Entomology and Plant Pathology at the University of Tennessee, Knoxville, TN

Most vector-borne diseases (VBDs) are preventative, but they account for more than 25% of infectious disease deaths. Outbreaks are common and there is currently a Zika virus outbreak in Latin America and the Caribbean (May 2015-present), a yellow fever outbreak in Angola (December 2015 – present), and a contained dengue fever outbreak in Hawaii (September 2015 - April 2016). This presentation focused on updating the society on the Zika virus outbreak. Zika virus was first identified in 1947 within a macaque in the Zika forest of Uganda, it was then found within *Aedes africanus* in 1948 and a human in 1954. There are currently two serotypes of the virus, the older African serotype and the newer Asian serotype which was accidentally introduced eastward across the Atlantic and into South America. Zika virus can be transmitted either via the bite of an infected mosquito (*Aedes aegypti* and *Aedes albopictus)* or sexually. The virus has been linked to microcephaly, and it appears to have an affinity for developing cells such as semen. It has also been isolated from urine, saliva, and tears. As of October 3, Tennessee has had 52 travel-associated cases. The United States has had 3565 travel-associated cases, 30 sexually acquired, and 124 locally acquired cases (all in Florida). Of these cases, 12 have resulted in Guillain-Barre syndrome and 808 cases are in currently pregnant women. Additionally, the situation in the US territories is severe as there are 21,988 confirmed cases, of which 1490 are in currently pregnant women. There are still a number of questions such as vector/reservoir/pathogen associations, clinical presentations vs outcomes, risks/outcomes after exposure, and the duration of viremia/viral shedding.

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Secretary-Treasurer	Term	Affiliation
Jimmy White	'73 - '76	Tenn. Dept. of Agriculture
Harold Bancroft	'76 - '79	Memphis State University
Lyle Klostermeyer	'79 - '82	University of Tennessee
Bill Shamiyeh	'82 - '85	University of Tennessee
Richard Caron	'85 - '91	University of Tennessee

Secretaries of the Tennessee Entomological Society (1991 - Present)

Secretary	Term	Affiliation
Gary Lentz	91 - '02	University of Tennessee
Gene Burgess	'02 - '08	University of Tennessee
Steve Murphree	08 - '17	Belmont University

Treasurers of the Tennessee Entomological Society (1991 - present)

Treasurer	Term	Affiliation
Harvey Barton	‘91- '97	Arkansas State University
Steve Powell	‘97- ‘17	TN Dept. of Agriculture

Editors of the Tennessee Entomological Society (1991 - present)

Editor	Term	Affiliation
Gray Haun	‘91 – ‘99	TN Dept. of Agriculture
Lynn Snodderly	‘00 – ‘01	TN Dept. of Agriculture
Gray Haun	‘01 – ‘09	TN Dept. of Agriculture
Jerome Grant	‘09 – ‘12	University of Tennessee
Karla Addesso	‘16 – ‘17	Tennessee State University

Members at Large

Member	Term	Affiliation
Gary Lentz	'87 - '88	University of Tennessee
Blake Bevill	'87 - '88	Arkansas State University
Michael E. Cooper	'88 - '89	TN Dept. Agriculture
Jay P. Avery	'88 - '89	University of Tennessee
Joe Dunn	'89 - '90	American Cyanamid Company
Charles Pless	'89 - '90	University of Tennessee
Paris Lambdin	'90 - '91	University of Tennessee
Jim Keener	'90 - '91	TN Dept. of Agriculture
Steve Powell	'91 - '92	TN Dept. of Agriculture
Lee Greer	'91 - '92	Valent
Alan Hopkins	'92 - '93	Miles, Inc.
Donald Ourth	'92 - '93	University of Memphis
Mark Carder	'93 - '94	University of Tennessee
Rich Emerson	'93 - '94	TN Dept. of Agriculture
Ray Nabors	94 - '95	Univ. of Missouri
Alan Hopkins	94 - '95	Miles, Inc.
Steve Powell	95 - '96	TN Dept. of Agriculture
Jim Bogard	95 - '96	TN Dept of Agriculture (Retired)
Hans Chaudhary	96 - '97	TN Dept. of Agriculture
Cletus Youmans	96 - '97	American Cyanamid
Larry Latson	97 - '98	Lipscomb University
Catharine Mannion	97 - '98	TN State University
Karen Vail	98 - '99	University of Tennessee
Roberto Pereira	98 - '99	University of Tennessee
Jim Keener	00 - '01	TN Dept. of Agriculture
Lee Greer	00 - '01	Valent
Frank Hale	01 - '02	University of Tennessee
Ray McDonnell	'01 - '02	TN Dept. of Agriculture
David Cook	'06 - '07	University of Tennessee

Steve Murphree	'06 - '07	Belmont University
Steve Hamilton	'07 - '08	Austin Peay State University
Clint Strohmeyer	'07 - '08	TN Division of Forestry
Gray Haun	'08 - '09	TN Dept. of Agriculture
Mike Studer	'08 - '09	TN Dept. of Agriculture
Steve Hamilton	'09 - '10	Austin Peay State University
Mike Studer	'09 - '10	TN Dept. of Agriculture
Steve Hamilton	'10 - '11	Austin Peay State University
Mike Studer	'10 - '11	TN Dept. of Agriculture
David Cook	'11 - '12	University of Tennessee
Steve Hamilton	'11 - '12	Austin Peay State University
Amy Dismukes	12 - '13	University of Tennessee
Amy Dismukes	12 - '13	University of Tennessee
David Cook	13 - '14	University of Tennessee
Amy Dismukes	13 - '14	University of Tennessee
Karla Addesso	14 - '15	TN State University
David Cook	'14 - '15	University of Tennessee
Karla Addesso	15 - '16	TN State University
David Cook	'15 - '16	University of Tennessee
Gene Burgess	16 - '17	University of Tennessee (ret.)
Gray Haun	'16 - '17	TN Dept. of Agriculture (ret.)

Historians of the Tennessee Entomological Society (1973 - Present)

Historian	Term	Affiliation
Charles Pless	'73 - '76	Univ. of Tennessee
Herb Morgan	'76 - '79	USDA
Mendell Snodgrass	'79 - '82	USDA
Russ Patrick	'82 - '92	Univ. of Tennessee
Harry Williams	'92 - '01	Univ. of Tennessee (retired)
Frank Hale	'01 - '17	Univ. of Tennessee

Honorary Members of the Tennessee Entomological Society (1982 - Present)

Honorary Member	Year	Affiliation
Jimmy White	1982	Tenn. Dept. of Agric.
Mendell Snodgrass	1983	USDA
Carl Brown	1985	Memphis State
Myrtice Snodgrass	1985	Knoxville, TN
John A. Hammett	1987	Tenn. Dept. of Agric.
Joe C. Dunn	1990	American Cyanamid
Harry Williams	1997	Univ. of TN (retired)

Harry E. Williams Award (est. 2002)

Recipient	Year	Location
Kim Woodard	2002	Trousdale Co.
Liam Black and Kimberly Woodard	2003	Hardeman Co. and Trousdale Co.
Reed Avent	2006	Bolivar, TN
Andy Brown	2008	Coffee Co.
Phillip Adams	2009	Burns, TN
Jonathan Belcher	2010	Rutherford Co.
Kade Parker	2011	Maryville, TN
Kade Parker	2012	Maryville, TN
Steven Davis	2013	Loudin Co.
Angel Chaffin	2014	Sevier Co.
Perrein Heselschwerdt	2015	Claiborne Co.
-----	2016	(No award given)

Howard Bruer Award (est. 1975)
Recipients of the Tennessee Entomological Society (1975 - Present)

Recipient	Year	Location
Whitney Eckler	1975	Memphis, TN
Joe Martin	1976	Bolivar, TN
Bryan Peters	1977	College Grove, TN
Tidus Pollard	1978	Huron, TN
John Bentley	1979	
Melissa Hart	1980	Watertown, TN
Gary Miller	1981	Knoxville, TN
Harold Glass	1982	Knoxville, TN
-----	1983	(No award given)
-----	1984	(No award given)
Penny Thompson	1985	Davidson County
Matthew Fumich	1986	Munford, TN
Christie Greer	1987	Greene Co.
Dottie Hodges	1988	Hamblen Co.
-----	1989	(No award given)
Tim Gentry	1990	Woodbury, TN
Jennifer Hartsell	1991	Hamblen Co.
Jessica Taylor	1992	Lincoln Co.
Jennifer Lenter	1993	Fayetteville Co.
Jeremy Smith	1994	Savannah Co.
George Carroll	1995	Anderson Co.
Stacy Milhahn	1996	Lincoln Co
Nancy Warden	1997	Marshall Co.
Denise Byrum	1998	Moore Co.
James Johnson	1999	Bolivar, TN
Wade Black	2000	Hardeman Co.
Sara List	2006	Coffee Co.
-----	2008	(No award given)
Grant Fisher	2009	Sevierville, TN
Julia Britto	2012	Oak Ridge, TN
Swasti Mishra	2013	Davidson Co.
-----	2014	(No award given)
-----	2015	(No award given)
-----	2016	(No award given)

Outstanding Entomologist (Tennessee Entomologist of the Year) Award (est. 1981) Recipients of the Tennessee Entomological Society (1981 - Present)

Recipient	Year	Affiliation
Myron Smith	1981	Hill Smith Pest Control
Harry Williams	1985	Univ. of Tennessee
John A. Hammett	1987	Tenn. Dept. of Agric.
Joe C. Dunn	1991	American Cyanamid

Richard E. Caron Outstanding Entomologist Award

Recipient	Year	Affiliation
Harry Williams	1995	Univ. of TN (Retired)
Harvey Barton	1996	Arkansas State Univ. (Retired)
Carroll Southards	1997	Univ. of TN (Retired)
Harold Bancroft	2001	Univ. of Memphis
Charles Pless	2002	Univ. of Tennessee (retired)
Gary Lentz	2008	Univ. of Tennessee (retired)
Reid Gerhardt	2009	Univ. of Tennessee (retired)
Gene Burgess	2011	Univ. of Tennessee (retired)

Undergraduate Student Award (est. 2015) Recipients of the Tennessee Entomological Society

Recipient	Year	Location
Erik Hearn (1st)	2015	University of Tennessee
Rachel Harmon (2nd)	2015	University of Tennessee

Graduate Student Award (est. 1986) Recipients of the Tennessee Entomological Society (1986 - Present)

Recipient	Year	Location
Jay Avery	1986	Knoxville, TN
Laura Rogers	1987	Knoxville, TN
Jason Oliver	1988	Knoxville, TN
Steve D. Powell	1989	Knoxville, TN
Robert C. Brown	1990	Knoxville, TN
Donald L. Sudbrink, Jr.	1991	Knoxville, TN
Deborah Landau	1992	Knoxville, TN
Deanna Colby	1993	Knoxville, TN
Lee Holt	1994	Knoxville, TN
Kenneth Copley	1995	Knoxville, TN
Dina Roberts	1996	Memphis, TN
Bryan Hed	1997	Knoxville, TN
Gary Moughler	1998	Knoxville, TN
Andrew Beld	1999	Nashville, TN
Lacey McNally	2000	Baton Rouge, LA
Ken Davenport	2001	Clarksville, TN
Debra Hoyme	2002	Knoxville, TN
Amy Kovach	2003	Knoxville, TN
Andrew Haddow	2004	Knoxville, TN
Greg Wiggins (1st)	2005	University of Tennessee
Issac Deal (2nd)	2005	University of Tennessee
Auora Teonnisson (1st)	2006	University of Tennessee
Derek Bailey (2nd)	2006	University of Tennessee
Eric Janson (1st)	2007	Vanderbilt University
Carla Dilling (2nd)	2007	University of Tennessee
Jonathan Willis (1st)	2008	University of Tennessee
Greg Wiggins (2nd)	2008	University of Tennessee
Robert Brucker (1st)	2009	Vanderbilt University
Paul Rhoades (2nd)	2009	University of Tennessee
Abdul Hakeem (1st)	2010	University of Tennessee
Keith Post (2nd)	2010	University of Tennessee
Carla Coots (1st)	2011	University of Tennessee
Angelina Fisher (2nd)	2011	Austin Peay State University
Abdul Hakeem (1st)	2012	University of Tennessee
Brittney Jones (2nd)	2012	Austin Peay State University
Elizabeth Benton (1st)	2013	University of Tennessee
Katheryne Nix (2nd)	2013	University of Tennessee
Elizabeth Benton (1st)	2014	University of Tennessee

Sara Mays (2nd)	2014	University of Tennessee
Elizabeth Benton (1st)	2015	University of Tennessee
Katie Britt (2nd)	2015	University of Tennessee
David Theuret (1st)	2016	University of Tennessee
Emel Oren (2nd)	2016	University of Tennessee
Brandy Schnettler (2nd)	2016	Austin Peay State University

TES Predictions and Evaluations 2016

In 2016, 7 new counties were found to be infested with Emerald Ash Borer in Tennessee. They were Bedford, Dekalb, Lincoln, Marion, Unicoi, Van Buren, and White County (Unicoi County was already quarantined). Additional counties quarantined for EAB in 2016 (due to likelihood of being infested and proximity to known infested counties) were Cannon, Coffee, Grundy, Moore, Sequatchie, and Warren. There are now 59 counties in Tennessee quarantined for EAB with 45 county records. In 2016, there was a large increase (from 34 to 122) in the number of Gypsy Moths captured in the trapping program compared to 2015. By county, the catches were as follows: Carter (5), Coffee (1), Cumberland (1), Davidson (9), Greene (3), Hamilton (2), Hardeman (1), Hawkins (1), Johnson (45), Madison (1), McMinn (1), Montgomery (1), Polk (1), Sevier (9), Shelby (1), Sullivan (22), Sumner (1), Unicoi (14), Washington (2), and Wilson (1). There are no areas in Tennessee considered to be infested with Gypsy Moth at this time. Two sites (one in Johnson County and one in Sullivan County) will be surveyed for Gypsy Moth egg masses late in 2016. To date, there have been no changes in the Imported Fire Ant Quarantine in Tennessee since those made on September 30, 2015. The kudzu bug is continuing to spread throughout Tennessee (refer to www.kudzubug.org for additional information and a current distribution map.) Walnut Twig Beetle is becoming increasingly difficult to find in Tennessee. There have been no new county records (to date) for Walnut Twig Beetle in 2016. The Walnut Twig Beetle has been found in Tennessee in the following counties during 2016: Knox County (UT and TDA), Rhea County (UT), and Sequatchie County (TDA).

Alcohol Trap catches of Ambrosia Beetles and Other Insects – Traps placed March 7, 2016
Ellington Agricultural Center, Nashville, TN

Granulate ambrosia beetle Xylosandrus crassiculus	First catch 3/16; Peak catch 4/19; Total catch 264 Final catch 10/26
Fruit-tree pinhole borer Xyleborinus saxesineii	First catch 3/10; Peak catch 4/19; Total catch 320 Final catch 11/09
Camphor shot beetle Cnestus mutilatus	First catch 4/09; Peak catch 4/19; Total catch 255 Final catch 10/13
Red-shouldered bostrichid Xylobiops basilaris	First catch 6/09; Peak catch 6/09; Total catch 2 Final catch 10/20
Apple wood stainer Monarthium mali	Final catch 6/02; Peak catch 6/02; Total catch 6 Final catch 10/26
Yellow-banded ambrosia beetle Monarthium fasciatum	Final catch 9/15; Peak catch 9/15; Total catch 2 Final catch 11/03
An ambrosia beetle Ambrosiodmus tachygraphus	First catch 3/10; Peak catch 3/10; Total catch 31 Final catch 4/19
Black stem borer Xylosandrus germanus	First catch 4/25; Peak catch 4/25; Total catch 1 Final catch 4/25
Spotted-winged drosophila through 01/10/17	First catch 7/22; Peak catch 1/04/17; Total catch 135 Final catch 1/04/17
An ambrosia beetle Xyleborus affinis	First catch; Peak catch; Final catch 4/19; Total catch 2
An ambrosia beetle Dryoxylon onoharaensis	First catch; Peak catch; Final catch 4/19; Total catch 5
An ambrosia beetle Ambrosoidmus rubicollis	First catch 5/6; Peak catch 5/12; Total catch 17 Final catch 5/24
An ambrosia beetle Ambrosiophilus atratus	First catch 3/16; Peak catch 3/21; Total catch 18 Final catch 4/19
African fig fly	First catch 8/17; Peak catch 9/08; Total catch 143 Final catch 11/17
A bostrichid Prostephanus punctatus	First catch 5/06; Peak 5/06; Total catch 14 Final catch 6/02
A clerid Madoniella dislocata	First catch 5/12; Peak catch 6/02; Total catch 15 Final catch 6/16
Planthoppers	First catch; Peak catch; Final catch 10/26; Total catch 2
Eastern wood weevil	First catch; Peak catch; Final catch 6/02; Total catch 1

Hexarthrum ulkei

A clerid Pyticeroides laticornis	First catch 5/12; Peak catch 5/12; Total catch 3 Final catch 10/05
An ambrosia beetle Euwallea validus	First catch; Peak catch; Final catch 6/09; Total catch 1
A bark beetle Pityophthorus sp (lautus?)	First catch 9/15; Peak catch 9/15; Total catch 3 Final catch 10/20
Psyllids	First catch 9/22; Peak 11/03; Total catch 14 Final catch 11/03
Minute brown scavenger beetle Corticaria serrata	First catch; Peak catch; Final catch 10/05; Total catch 2
A bark beetle Hypothenemus sp	First catch; Peak catch; Final catch 9/08; Total catch 1

<u>Phenology - Plant Species Flowering – 2016</u>
Forsythia – Full flowers 3/21
Blueberry – First flowers 3/16; Full flowers 3/29 – 4/05 (depending on cultivar)
Loropetalum – First Flowers 3/16; Full flowers 4/05
Redbud – Full flowers 3/16
Dogwood – Full flowers 4/05
Yoshino cherry – Full flowers 3/29
Black locust – First flowers 4/19
Blackberry – First flowers 4/19
Red buckeye – Full flowers 4/19

Granulate ambrosia beetle, fruit-tree pinhole borer & camphor shot beetle peaked with the first flowers of blackberry & black locust & full flowers of red buckeye on 4/19. The first flowering of some blueberry cultivars and loropetalum as well as the full flowering of redbud may signal the first catch of the granulate ambrosia beetle on 3/16.

Catches of ambrosia beetles were up on most species this year with camphor shot beetles totals the highest since monitoring began. Spotted winged drosophila numbers were down this year, while African fig flies were up. First catches of the following insects were made this year: minute brown scavenger beetles; eastern wood weevil; planthoppers; 2 clerid species (see above); 1 bostrichid (Prostephanus punctatus). Some of these new catches may be due to the presence of flowering plants and high winds drawing insects to the trap.

Deer feeding or deer breakage – blackberry; loropetalum; forsythia; oakleaf hydrangea; arborvitae

USDA United States Department of Agriculture

Pest Alert

Emerald Ash Borer

Emerald ash borer (*Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae)) is a wood-boring beetle from Asia that was identified in July 2002 as the cause of widespread ash tree (*Fraxinus* spp.) decline and mortality in southeastern Michigan and adjacent parts of Ontario, Canada. Larval feeding between the bark and sapwood disrupts transport of nutrients and water in a tree, causing dieback of the branches and eventually death of the tree. Tens of millions of ash trees in forest, rural, and urban areas have already been killed, and many more are rapidly declining from this pest.

Emerald ash borer (EAB) infestations have since been confirmed in all or parts of 24 States and the Canadian Provinces of Ontario and Quebec. While most of the detections have occurred in eastern North America, the insect has been found as far west as Colorado. New EAB detections in other areas are likely as surveys continue (see www.emeraldashborer.info/ for periodic updates). Evidence indicates that EAB is often established in an area for several years before it is detected.

The broad distribution of this pest in the United States and Canada is primarily due to commerce and the inadvertent transport of infested ash firewood, unprocessed logs, nursery stock, and other ash commodities. Federal and State quarantines now regulate the movement of these products from the infested areas to areas not known to have EAB.

Identification

Adult beetles (Fig. 1) are slender, elongate, and 7.5 to 13.5 mm (0.3 to 0.5 in.) long. They generally have dark, metallic emerald green wing covers and bodies that are bronze, golden, or reddish green. The dorsal side of the abdomen is metallic purplish red and can be seen when the wings are spread (Fig. 2). Males are smaller than females and have fine hairs, which the females lack, on the ventral side of the thorax. The prothorax, the segment behind the head and to which the first pair of legs is attached, is slightly wider than the head and the same width as the wing covers. Adult EAB are generally larger and brighter green than the native North American *Agrilus* species.

Larvae reach a length of 26 to 32 mm (1.0 to 1.3 in.), are white to cream colored, and dorso-ventrally flattened (Fig. 3). The brown head is mostly retracted into the prothorax, and only the mouthparts are visible. The abdomen has 10 segments, and the last segment has a pair of brown, pincer-like appendages.

Figure 1. Adult emerald ash borer

Figure 2. Purplish red abdomen on adult beetle.

Figure 3. (Bottom to top) Second, third, and fourth stage larvae.

Figure 4. Gallery of an emerald ash borer larva

Biology

EAB generally has a 1-year life cycle. In the upper Midwest, adult beetles begin emerging in May or early June. Beetle activity peaks between mid June and early July, and continues into August. Adults probably live for about 3 weeks, although some have survived for more than 6 weeks in the laboratory. Beetles generally are most active during the day, particularly when it is warm and sunny, and move to protected locations in bark crevices or cling to foliage during inclement weather.

Adult beetles feed on ash foliage, usually leaving small, irregularly shaped patches along the leaf margins, causing negligible damage to the tree. At least a few days of feeding are needed before beetles mate, and an additional 1 to 2 weeks of feeding may be needed before females begin laying eggs. Females can mate multiple times. Each female probably lays 30 to 60 eggs during an average lifespan, but a long-lived female may lay more than 200 eggs. Eggs are deposited individually in bark crevices or under bark flaps on the trunk or branches, and soon darken to a reddish brown. Eggs hatch in 7 to 10 days.

Newly hatched larvae chew through the bark and into the phloem and cambial region of the tree. Larvae feed on phloem for several weeks, creating serpentine (S-shaped) galleries packed with fine sawdust-like frass. As a larva grows, its gallery becomes progressively wider (Fig. 4), often etching the outer sapwood. The length of the gallery generally ranges from 10 to 50 cm (about 4 to 20 in.). Feeding is usually completed in autumn.

Prepupal larvae overwinter in shallow chambers, roughly 1 cm (0.4 in.) deep, excavated in the outer sapwood or in the bark on thick-barked trees. Pupation begins in late April or May. Newly eclosed adults often remain in the pupal chamber or bark for 1 to 2 weeks before emerging head-first through a D-shaped exit hole that is 3 to 4 mm (0.1 to 0.2 in.) in diameter (Fig. 5).

Figure 5. D-shaped hole where an adult beetle emerged.

Two-year development of EAB larvae is typical in newly infested ash trees that are relatively healthy. In these trees, many larvae overwinter as early instars, feed a second summer, overwinter as prepupae, and emerge the following summer. However, in trees stressed by physical injury, high EAB densities, or other problems, many or all larvae may develop in a single year. Whether a 2-year life cycle will occur in warmer southern States is not yet known.

Distribution and Hosts

EAB is native to Asia and is found in China and Korea. It is also reported in Japan, Mongolia, the Russian Far East, and Taiwan. In China, high populations of EAB occur primarily in *Fraxinus chinensis* and *F. rhynchophylla*, usually when those trees are stressed by drought or injury. Other Asian hosts (*F. mandshurica* var. *japonica*, *Ulmus davidiana* var. *japonica*, *Juglans mandshurica* var. *sieboldiana*, and *Pterocarya rhoifolia*) may be colonized by this or a related species.

In North America EAB has attacked only ash trees. Host preference of EAB or resistance among North American ash species may vary. Green ash (*F. pennsylvanica*) and black ash (*F. nigra*), for example, appear to be highly preferred, while white ash (*F. americana*) and blue ash (*F. quadrangulata*) are less preferred. At this time all species and varieties of native ash in North America appear to be at risk from this pest. Recently EAB was found on white fringetree (*Chionanthus virginicus*); however, its role as a susceptible host or as a secondary host in areas of high EAB densities is not fully understood and continues to be evaluated.

Signs and Symptoms

It is difficult to detect EAB in newly infested trees because they exhibit few, if any, external symptoms. Jagged holes excavated by woodpeckers feeding on late instar or prepupal larvae may be the first sign that a tree is infested (Fig. 6). D-shaped exit holes left by emerging adult beetles may be seen on branches or the trunk, especially on trees with smooth bark (Fig. 5). Bark may split vertically over larval feeding galleries. When the bark is removed from infested trees, the distinct, frass-filled, serpentine larval galleries that etch the outer sapwood and phloem are readily visible (Fig. 4 and Fig. 7). An elliptical area of discolored sapwood, usually a result of secondary infection by fungal pathogens, sometimes surrounds galleries.

Left to right:

Figure 6. Jagged holes left by woodpeckers feeding on larvae.

Figure 7. Ash tree killed by emerald ash borer. Note the serpentine galleries.

As EAB densities build, foliage wilts, branches die, and the tree canopy becomes increasingly thin. Many trees appear to lose about 30 to 50 percent of the canopy after only a few years of infestation. Trees may die after 3 to 4 years of heavy infestation (Fig. 7). Epicormic shoots may arise on the trunk or branches of the tree (Fig. 8), often at the margin of live and dead tissues. Dense root sprouting sometimes occurs after trees die.

Figure 8. Epicormic branching on a heavily infested ash tree.

EAB larvae have developed in branches and trunks ranging from 2.5 to 140 cm (1 to 55 in.) in diameter. Although stressed trees are initially more attractive to EAB than healthy trees are, in many areas all or nearly all ash trees greater than 3 cm (1.2 in.) in diameter have been colonized by this invasive beetle.

Prepared by:

Deborah G. McCullough, professor, Departments of Entomology and Forestry, Michigan State University

Noel F. Schneeberger, **Steven A. Katovich**, and **Nathan W. Siegert**, forest entomologists, Northeastern Area State and Private Forestry, Forest Health Protection, USDA Forest Service

Photo credits:

David L. Cappaert and Howard Russell, Michigan State University, www.forestryimages.org

Steven A. Katovich, USDA Forest Service, www.forestryimages.org

Edward Czerwinski, Ontario Ministry of Natural Resources, www.forestryimages.org

Additional Resources

For the latest information on EAB in your area:

Contact your State Department of Agriculture, State Forester, or Cooperative Extension Office; and visit the following Web sites:

www.emeraldashborer.info
www.hungrypests.com

Northeastern Area
State and Private Forestry
11 Campus Boulevard, Suite 200
Newtown Square, PA 19073
www.na.fs.fed.us

TN Department of Agriculture

Tennessee Emerald Ash Borer Quarantine

Protect TN Forests.org

Emerald Ash Borer Quarantined Areas

In Tennessee, EAB quarantines exist for 59 counties. They include **Anderson, Bedford, Bledsoe, Blount, Bradley, Campbell, Cannon, Carter, Claiborne, Clay, Cocke, Coffee, Cumberland, Davidson, DeKalb, Fentress, Franklin, Grainger, Greene, Grundy, Hamblen, Hamilton, Hancock, Hawkins, Jackson, Jefferson, Johnson, Knox, Lincoln, Loudon, Macon, Marion, Marshall, McMinn, Meigs, Monroe, Moore, Morgan, Overton, Pickett, Polk, Putnam, Rhea, Roane, Rutherford, Scott, Sequatchie, Sevier, Smith, Sullivan, Trousdale, Unicoi, Union, Van Buren, Warren, Washington, White, Williamson and Wilson Counties**.

The following are regulated articles:

- (a) Emerald Ash Borer; firewood of all hardwood (non-coniferous) species; nursery stock, green lumber, and other material living, dead, cut, or fallen, including logs, stumps,roots, branches, mulch and composted and uncomposted chips of the genus *Fraxinus*.
- (b) Any other article, product, or means of conveyance not listed in paragraph (a) of this section may be designated as a regulated article if the Commissioner determines that it presents a risk of spreading Emerald Ash Borer and notifies the person in possession of the article, product, or means of conveyance that it is subject to these regulations.

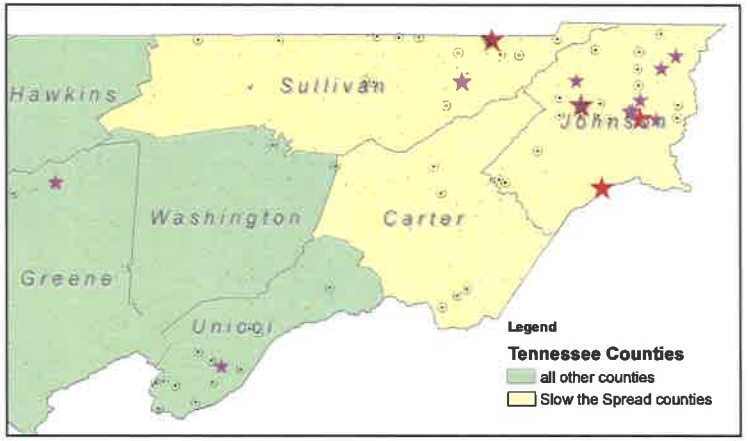
2016 Gypsy Moth Catches

County	Total Number of Moths Caught		
	1 moth / trap	2 moths / trap	3 moths / trap
Carter	5		
Coffee	1		
Cumberland	1		
Davidson	7	2	
Greene	1	2	
Hamilton	2		
Hardeman	1		
Hawkins	1		
Johnson	20	16	9
Madison	1		
McMinn	1		
Montgomery	1		
Polk	1		
Sevier	9		
Shelby	1		
Sullivan	17	2	3
Sumner	1		
Unicoi	12	2	
Washington	2		
Wilson	1		
Totals:	**86**	**24**	**12**
	Grand Total:	**122**	

Legend

2016 Gypsy Moth Trap Data

- 1 moth per trap
- 2 moths per trap
- 3 moths per trap

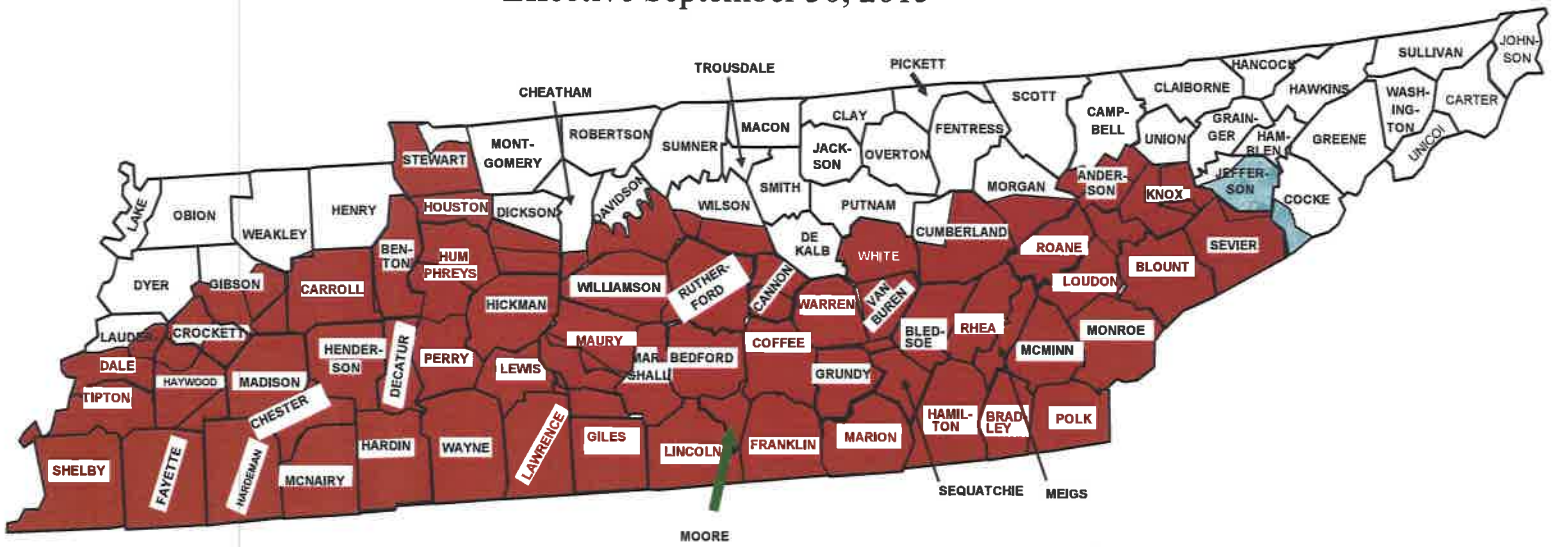


TN Department of Agriculture | Forestry

22 Sept 2016

2015
TENNESSEE
IFA Quarantine

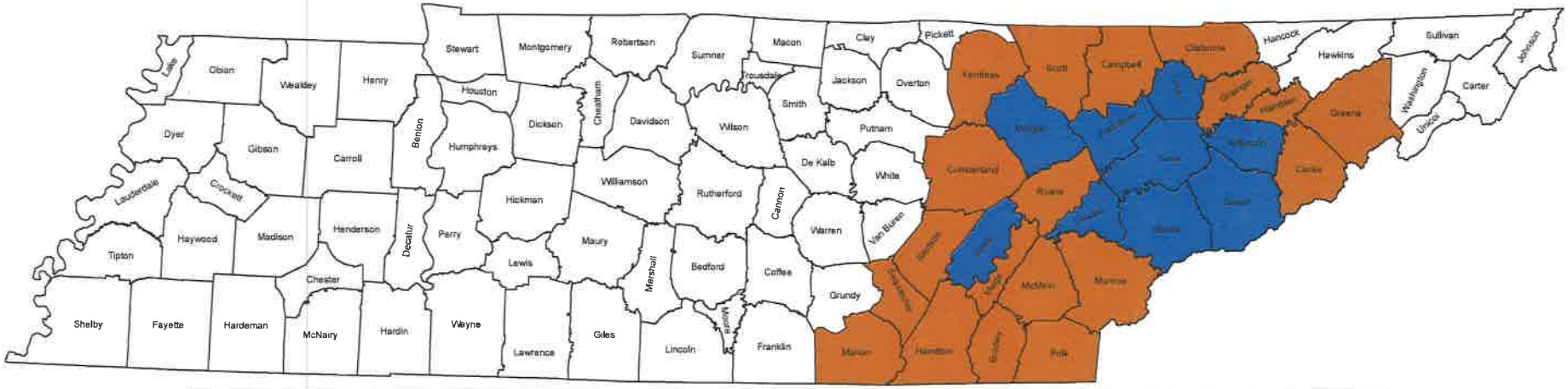
Effective September 30, 2015



= Imported Fire Ant Regulated Areas 2015

= Imported Fire Ant Regulated Areas 1989 - 2014

Tennessee
Thousand Cankers Disease
Quarantine and Buffer Regulated Areas



Thousand Cankers Disease Quarantined Areas

Anderson, Blount, Jefferson, Knox, Loudon, Morgan, Rhea, Sevier and Union counties.

Citizens in these counties cannot move walnut tree products and hardwood firewood outside the quarantined counties.

Thousand Cankers Disease Buffer Regulated Areas

Bledsoe, Bradley, Campbell, Claiborne, Cocke, Cumberland, Fentress, Grainger, Greene, Hamblen, Hamilton, Marion, McMinn, Meigs, Monroe, Polk, Roane, Scott and Sequatchie counties.

Citizens in buffer counties/areas can move walnut tree products and hardwood firewood within buffer counties, but not outside. Product can also be moved into a quarantine county, but not taken back out.

November 21, 2014

http://tn.gov/agriculture/regulatory/tcd.html

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Kudzu Bugs Around Homes

The kudzu bug, scientifically known as *Megacopta cribraria,* is a new pest in South Carolina. It is not a beetle, as many people think, but is more closely related to stink bugs. It has also been called a bean plataspid due to its insect family name: Plataspidae. Kudzu bugs were first detected in northeastern Georgia during October 2009. They are now spread throughout Georgia, South Carolina, and other southern states.

Identification

Adults of the kudzu bug are about the same size as adult lady beetles and are small, almost square-appearing insects, approximately ¼ inch long; light brown with an olive-green hue (Figure 1). The immature stages are similarly shaped but smaller and very "hairy" in appearance (Figure 2). Eggs of kudzu bugs (Figure 3) are a light tan color, barrel-shaped, and often placed on plant leaves in two rows.

Figure 1. Adult kudzu bug.

Figure 2. Nymphs of kudzu bug on kudzu stem.

Figure 3. Egg mass of kudzu bug on soybean leaf.

Life Cycle

Depending on temperature, it takes approximately 6 weeks for a kudzu bug to go from an egg to an adult. Current research has found that there are two generations of kudzu bugs in the southeastern United States each year. Much of the kudzu bug populations develop on kudzu or wisteria for the first complete generation, and the second generation completes its development on soybeans and other cultivated and wild hosts (kudzu, wisteria, etc., included). Overall, second generation kudzu bugs have a preference for bean related plants.

Habits

Kudzu bugs feed on kudzu and on many other plants such as wisteria, soybeans, and most any bean plant. Some types of wisteria are invasive plants from the same region of the world as kudzu. In the fall, large numbers of kudzu bugs will move from plants to sheltered areas to overwinter.

Many overwintering sites include leaf-litter and crevices on trees or shrubs. Unfortunately, many of the protected places they also seek are cracks, crevices, and voids around homes and other buildings. Research has found that they prefer light colors on houses, particularly white. Kudzu bugs are often observed around window trim, doorframes, gutters, and sunlit areas that are often brightly colored (Figure 4).

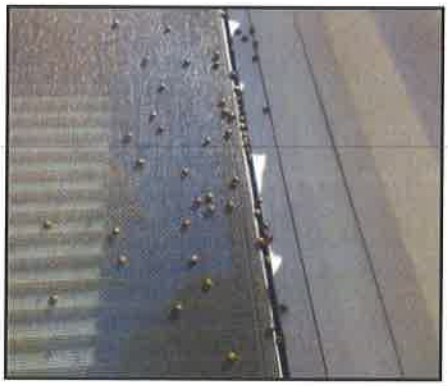

Figure 4. Overwintering adult kudzu bugs on window screening and trim.

During the spring, kudzu bugs become active again and move from their sheltered areas to search for suitable host plants for feeding and reproduction. They are often observed aggregating on numerous kinds of plants during the spring while waiting for their preferred hosts to leaf-out.

Large numbers of kudzu bugs are a nuisance in and around structures. Their body secretions produce a foul odor and can stain fabrics and wall coverings. Directly handling kudzu bugs can cause staining of the skin and even blistering and moderate discomfort in some sensitive individuals.

Control

Non-chemical Control

In the fall, large numbers of kudzu bugs will move from kudzu and other plants to find sheltered locations for overwintering. Cutting back kudzu patches or even other plants such as wisteria that can be removed before the fall should help reduce kudzu bugs around the home. Kudzu bugs are good fliers, so they may move to a house or structure from plants outside of the property area.

Sealing as many cracks and crevices as possible on structures will help prevent kudzu bugs from entering structures. Screens will also help prevent kudzu bug entry. It is important to make sure soffit vents and peak vents on homes have good screening in addition to window and door screening.

Large numbers of kudzu bugs found indoors should be vacuumed, not sprayed. Avoid crushing them to prevent their body secretions from staining fabrics or wall coverings. If possible, use a shop vacuum rather than a conventional vacuum. Kudzu bug odor may linger in a conventional vacuum. A shop vacuum with some soapy water (1 to 2 tablespoons of dish soap per gallon of water) in the canister will kill the bugs. After use, the soapy water should be discarded. If a regular vacuum with a bag is used, discard the bag after vacuuming.

Chemical Control

Most insecticides available to homeowners will kill kudzu bugs. If you are spraying vegetation, make sure you use a product that is labeled for treating plants. If you spray your home, make sure you use a product that is labeled for structural use. Spray outdoor surfaces where kudzu bugs are likely to land, or directly spray bugs on your house before they move into recessed areas. Try to limit your sprays to small-targeted areas. In the fall, spray during daylight when nighttime temperatures begin to cool, around 50° F or cooler. This will provide fresh materials to kill the bugs while they are active (during the day). Rain and direct sunlight will degrade treatments in open areas, so reapplications may be needed.

If you do spray and kill large numbers of kudzu bugs, try to remove them, especially in indoor locations. Large numbers of bugs can produce a foul odor over time and attract secondary pests such as carpet beetles and ants. In the spring, kudzu bugs move from structures back to plants. It may be best to let them go without spraying. If they need to be sprayed, try to treat them directly on sunny, cool mornings before they become active.

If control measures seem complicated, or if kudzu bug numbers are very high and continue to reinvade your home, consider hiring a pest management professional. If you do your own chemical control, make sure you follow all label directions.

Clemson University is doing research to produce more information on kudzu bugs and their control. Check for revised fact sheets or other materials as new research information becomes available. For more information on kudzu bugs, visit our website: http://www.clemson.edu/extension/kudzubugs/index.htm.

For other publications in our Entomology Insect Information Series visit our web site at http://www.clemson.edu/cafls/departments/esps/factsheets/index.htm.

Prepared by Eric P. Benson, Extension Entomologist/ Professor, and Jeremy Greene, Extension Entomologist/ Associate Professor, School of Agricultural, Forest, and Environmental Sciences, Clemson University.

PENNSTATE

College of Agricultural Sciences • Cooperative Extension

Entomological Notes

Department of Entomology

BROWN MARMORATED STINK BUG

Halyomorpha halys

DISCLAIMER

The brown marmorated stink bug (BMSB), an insect not previously seen on our continent, was apparently accidentally introduced into eastern Pennsylvania. It was first collected in September of 1998 in Allentown, but probably arrived several years earlier. As of September 2010, Halyomorpha halys has been recorded from the following 37 counties, although it is probable that they are in all counties:

Adams, Allegheny, Armstrong, Beaver, Berks, Blair, Bucks, Butler, Cambria, Carbon, Centre, Chester, Clinton, Columbia, Cumberland, Dauphin, Delaware, Elk, Franklin, Indiana, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Mercer, Mifflin, Monroe, Montgomery, Northampton, Northumberland, Perry, Philadelphia, Pike, Snyder, Washington, Westmoreland and York

It is also recorded from many other states such as:

California, Connecticut, Delaware, Indiana, Kentucky, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Washington, D.C. and West Virginia

Sightings have also been reported in the following states however this is not to imply that there are reproducing populations in those states:

Alabama, Arizona, Colorado, Florida, Georgia, Illinois, Iowa, Michigan, Minnesota, Missouri, Nebraska, Vermont, Washington, and Wisconsin

This true bug in the insect family Pentatomidae is known as an agricultural pest in its native range of China, Japan, Korea and Taiwan. Recently, the BMSB has become a serious pests of fruit, vegetables and farm crops in the Mid-Atlantic region and it is probable that it will become a pest of these commodities in other areas in the United States.

BMSB becomes a nuisance pest both indoors and out when it is attracted to the outside of houses on warm fall days in search of protected, overwintering sites. BMSB occasionally reappears during warmer sunny periods throughout the winter, and again as it emerges in the spring.

DESCRIPTION

Adults are approximately 17 mm long (25 mm = one inch) and are shades of brown on both the upper and lower body surfaces (Fig. 1). They are the typical "shield" shape of other stink bugs, almost as wide as they are long. To distinguish them from other stink bugs, look for lighter bands on the antennae and darker bands on the membranous, overlapping part at the rear of the front pair of wings. They have patches of coppery or bluish-me-

Figure 1. Adult brown marmorated stink bug.

Figure 2. BMSB nymphs on Trumpet Creeper.

tallic colored puntures (small rounded depressions) on the head and pronotum. The name "stink bug" refers to the scent glands located on the dorsal surface of the abdomen and the underside of the thorax.

The eggs are elliptical (1.6 x 1.3 mm), light yellow to yellow-red with minute spines forming fine lines. They are attached, side-by-side, to the underside of leaves in masses of 20 to 30 eggs.

There are five nymphal instars (immature stages). They range in size from the first instar at 2.4 mm to the fifth instar that is 12 mm in length. The eyes are a deep red. The abdomen is a yellowish red in the first instar and progresses to off-white with reddish spots in the fifth instar. Protuberances are found before each of the abdominal scent glands on the dorsal surface. The legs, head and thorax are black. Spines are located on the femur, before each eye, and several on the lateral margins of the thorax (Fig. 2).

LIFE HISTORY

This species probably has a single generation per year in Pennsylvania depending on the temperatures. Warm spring and summer conditions could permit the development of two or three generations. However, in parts of sub-tropical China, records indicate from four to possibly six generations per year. Adults will emerge sometime in the spring of the year (late April to mid-May), and mate and deposit eggs from May through August. The eggs hatch into small black and red nymphs that go through five molts. Adults begin to search for overwintering sites starting in September through the first half of October.

DAMAGE

In its native range, it feeds on a wide variety of host plants. Fruits attacked include apples, peaches, figs, mulberries, citrus fruits and persimmons. This true bug has also been reported on many ornamental plants, weeds, soybeans and beans for human consumption. Feeding on tree fruits such as apple results in a characteristic distortion referred to as "cat facing," that renders the fruit unmarketable as a fresh product.

Apple Damage

Sweet Corn Damage

Peach Damage

This insect is becoming an important agricultural pest in Pennsylvania. In 2010, it produced severe losses in some apple and peach orchards by damaging peaches and apples. It also has been found feeding on blackberry, sweet corn, field corn and soybeans. In neighboring states it has been observed damaging tomatoes, lima beans and green peppers.

These insects are not known to cause harm to humans, although homeowners become alarmed when the bugs enter their homes and noisily fly about. The stink bug will not reproduce inside structures or cause damages. If many of them are squashed or pulled into a vacuum cleaner, their smell can be quite apparent.

MANAGEMENT FOR BMSB IN HOMES

Before Bugs Enter a Building

Mechanical exclusion is the best method to keep stink bugs from entering homes and buildings. Cracks around windows, doors, siding, utility pipes, behind chimneys, and underneath the wood fascia and other openings should be sealed with good quality silicone or silicone-latex caulk. Damaged screens on doors and windows should be repaired or replaced.

Exterior applications of insecticides may offer some minor relief from infestations where the task of completely sealing the exterior is difficult or impossible. Applications should consist of a synthetic pyrethroid (i.e. deltamethrin, cyfluthrin, lambda-cyhalothrin, cypermethrin, sumithrin or tralomethrin) and should be applied by a licensed pest control operator in the fall just prior to bug congregation. Unfortunately, because insecticides are broken down by sunlight, the residual effect of the material will be greatly decreased and may not kill the insects much beyond several days or a week.

After Stink Bugs Have Entered the Structure

If numerous bugs are entering the living areas of the home, attempt to locate the openings where the insects gain access. Typically, stink bugs will emerge from cracks under or behind baseboards, around window and door trim, and around exhaust fans or lights in ceilings. Seal these openings with caulk or other suitable materials to prevent the insects from crawling out. Both live and dead stink bugs can be removed from interior areas with the aid of a vacuum cleaner - however, the vacuum may acquire the smell of stink bugs for a period of time.

It is not advisable to use an insecticide inside after the insects have gained access to the wall voids or attic areas. Although insecticidal dust treatments to these voids may kill hundreds of bugs, there is the possibility that carpet beetles will feed on the dead stink bugs and subsequently attack woolens, stored dry goods or other natural products in the home. Although aerosol-type pyrethrum foggers will kill stink bugs that have amassed on ceilings and walls in living areas, it will not prevent more of the insects from emerging shortly after the room is aerated. For this reason use of these materials is not considered a good solution to long-term management of the problem. Spray insecticides, directed into cracks and crevices, will not prevent the bugs from emerging and is not a viable or recommended treatment.

WARNING

Pesticides are poisonous. Read and follow directions and safety precautions on labels. Handle carefully and store in original labeled containers out of the reach of children, pets, and livestock. Dispose of empty containers right away, in a safe manner and place. Do not contaminate forage, streams, or ponds.

Steve Jacobs Sr. Extension Associate
Department of Entomology

PH-1
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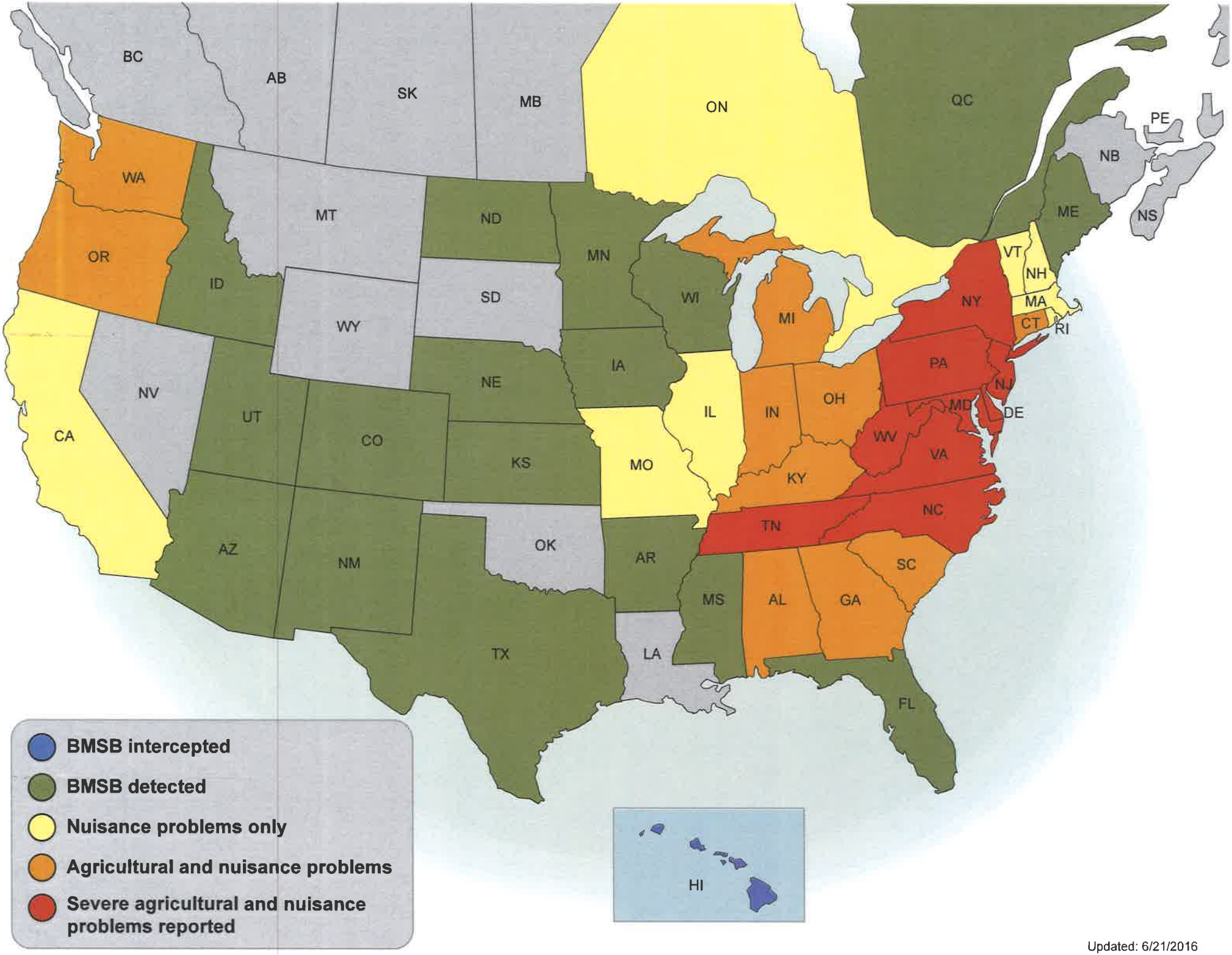
This publication is available in alternative media on request.

Where trade names are used, no discrimination is intended and no endorsement by The Pennsylvania State University or Pennsylvania Department of Agriculture is implied.

Entomological Notes are intended to serve as a quick reference guide and should not be used as a substitute for product label information. Although every attempt is made to produce Entomological Notes that are complete, timely, and accurate, the pesticide user bears the responsibility of consulting the pesticide label and adhering to those directions.

Issued in furtherance of Cooperative Extension Works, Acts of Congress May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and the Pennsylvania Legislature. D. Calvin, Director of Cooperative Extension, The Pennsylvania State University.



Updated: 6/21/2016

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

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Crapemyrtle Bark Scale: A New Insect Pest

James Robbins
Professor and Extension Horticulture Specialist - Ornamentals

John Hopkins
Associate Professor and Extension Entomologist - Urban

Mike Merchant
Professor and Extension Urban Entomologist
Texas A&M AgriLife Extension Service

Mengmeng Gu
Assistant Professor and Extension Ornamental Horticulturist
Texas A&M AgriLife Extension Service

History

A relatively new insect is appearing on crapemyrtles (*Lagerstroemia*) across the Southeast, including Arkansas (Figure 1). The insect was first noticed in a north Dallas, Texas, suburb in 2004. At that time, entomologists suggested it was morphologically identical to azalea scale (*Eriococcus azalea*), but the scientists noted that molecular investigation might eventually identify it as *E. lagerstroemiae*, known to be a pest on crapemyrtle and pomegranate (*Punica*) in Asia. Although the exact taxonomy is still not known, the insect is most commonly referred to as crapemyrtle bark scale (CMBS).

Since the initial sighting in 2004, the insect has been spreading at an alarming rate across the Southeast. The insect was first noted in McKinney, Texas (self-designated as America's "crapemyrtle city"), in 2005 and had spread throughout most of the Dallas-Fort Worth area by 2010. The scale was reported in Ardmore, Okla., and Shreveport, La., in 2012 and Houma, La. (60 miles southwest of New Orleans) in 2013. In October 2013, the insect was confirmed in Germantown, Tenn. (Memphis area), and in Little Rock, Ark., in January 2014.

Heightened concern about this new pest is based on the speed at which it is spreading and the common use of crapemyrtles in landscapes across a large part of the U.S. To date there has been no research to evaluate whether there is a range in susceptibility to this insect across the hundreds of crapemyrtle cultivars; however, ancecdotal observations from McKinney, Texas, suggest the scale may be worse on hybrids (fauriei × indica).

Figure 1. Crapemyrtle bark scale (CMBS)

Insect Description

Crapemyrtle bark scale is easy to identify since, in the U.S., it is the first and only known bark scale to occur on crapemyrtles. The adult

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Figure 2. Adult female CMBS on crapemyrtle bark

Figure 3. Heavy infestation of CMBS on most recent flush of growth

Figure 4. Sooty mold from heavy CMBS infestation

females appear as white or gray felt-like encrustations (Figure 2) on small twigs to large trunks, often appearing near pruning wounds or in branch crotches on older wood. On the most current flush of growth and under heavy infestation, distribution may be more uniform (Figure 3). Up close, CMBS is white to gray in color and approximately 2 mm in length. Careful examination may reveal dozens of pink eggs or crawlers under some of the larger white scale covers. Most gardeners will be alerted to CMBS by black sooty mold which appears on the bark (Figure 4). The presence of sooty mold may confuse the diagnosis since that is also commonly associated with a significant aphid problem. This felt scale is not classified as either an armored or soft scale.

Life Cycle

As female nymphs mature, they secrete white threads (Figure 5) that become felted or matted into a thick, whitish to grayish scale covering over the entire body (Figure 6). Adult females under this covering are wingless and sessile (attached and incapable of moving). It is thought that for this species of scale, eggs are laid under the covering (probably late April to mid-May in Arkansas) and the female then dies. When the eggs hatch into first instar nymphs, these nymphs have legs and antenna and are mobile, thus the term *crawlers* (Figure 7). These crawlers emerge from under the "'mother scale" and disperse over a short period (about one to two days). We suspect that this emergence occurs beginning mid-May to early June in Arkansas; however, crawlers were observed on a warm day in January 2014. After the first molt, nymphs lose their legs and antenna and become sessile (Figure 5). During the last instar, males are quiescent (pupal type stage) and develop external wings. Upon emergence, males find a sessile female and mate, completing the life cycle. At present in the Southern U.S., the number of generations completed in a year for this species is unknown, but it is suspected that CMBS may complete at least two generations in Arkansas. It is possible that adult females and eggs overwinter, but crawlers and later stage nymphs have been observed overwintering in Arkansas under loose bark and in cracks and crevices (Figure 8).

Figure 5. CMBS nymphs exuding white threads that ultimately form the felt cover

Figure 6. Adult female CMBS

Figure 8. Settled CMBS nymphs under loose bark

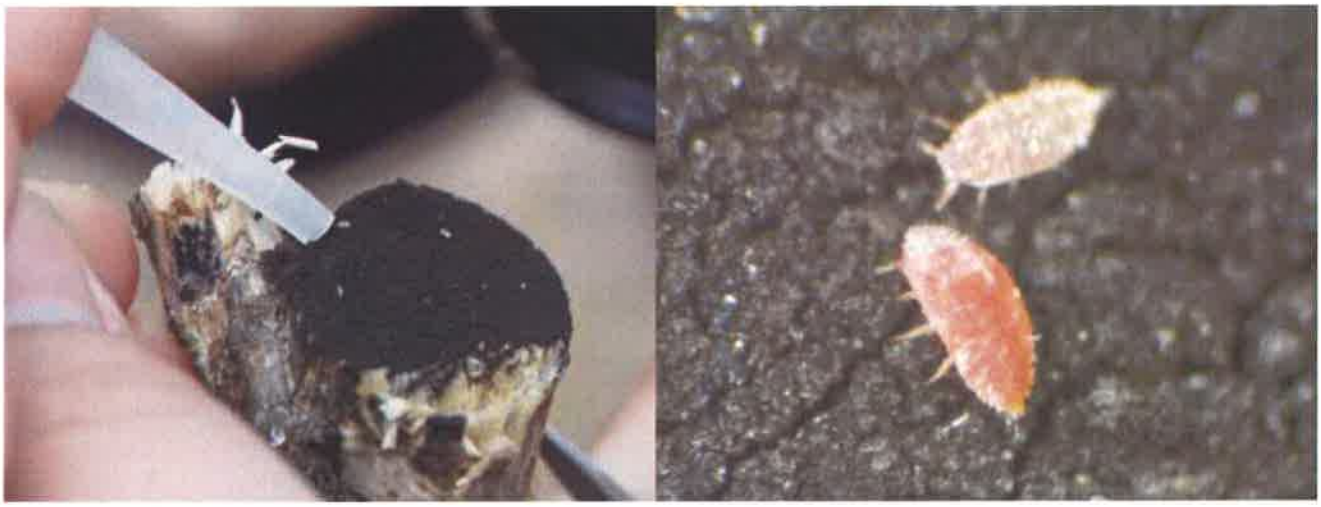

Figure 7. CMBS crawlers on pruning cuts (L) and close-up of crawlers (R)

Control

Based on our limited experience with this pest, it does not appear that CMBS will be easy to control, though soil-applied neonicotinoids do provide significant suppression. Our current best suggestions for control of this insect include:

- For heavily infested plants, wash the trunk and reachable limbs with a soft brush and mild solution of dishwashing soap. This will remove many of the female scales and egg masses and make insecticide control more effective. Also, washing will remove much of the black mold that builds up on the bark on infested trees.

- Horticultural oil has not yet been shown to be effective against this insect; however, a winter application of **dormant oil** to the bark and crotches of the plants where scales shelter may be beneficial. Be sure to use sufficient volume to allow for penetration behind loose bark and into cracks and crevices. Winter is an especially good time to treat for scales because a higher (winter) application rate can be used without damaging the plant. Thorough coverage of the tree is especially important when treating with oil.

- Application of systemic insecticides as a drench applied to the root zone has shown the most promise in tests to date. Imidacloprid (Merit® or Bayer Advanced™ Garden Tree and Shrub Insect Control), thiomethoxam (Meridian®) and dinotefuran (Greenlight Tree and Shrub Insect Control with Safari) have shown best control when applied between May and July. When drenching the soil with a systemic insecticide, allow several

weeks for the product to be distributed throughout the plant. Additionally, acetamiprid and clothianidin, also neonicotinoids, have demonstrated good control.

- Certain insect growth regulators (IGRs) are recommended for scale control in woody ornamentals (MP144, *Insecticide Recommendations for Arkansas*) but have not yet been evaluated on CMBS.

- Lady beetles should be preserved, as the twice-stabbed lady beetle is an efficient predator of this scale (Figure 9).

Figure 9. Pupa of lady beetle, predator of CMBS

If you notice symptoms of scale insect infestation on your crapemyrtles in Arkansas, please contact the office of your local Cooperative Extension Service or the Arkansas State Plant Board.

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DR. JAMES ROBBINS is professor and Extension horticulture specialist and **DR. JOHN HOPKINS** is associate professor and Extension entomologist - urban, University of Arkansas Division of Agriculture, Little Rock. **DR. MIKE MERCHANT** is professor and Extension urban entomologist and **DR. MENGMENG GU** is assistant professor and Extension ornamental horticulturist, Texas A&M AgriLife Extension Service, College Station.

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CONSTITUTION
of the
TENNESSEE ENTOMOLOGICAL SOCIETY
(as of October 1991)

Article 1. Name

This Society is formed in the name and style of the "Tennessee Entomological Society", as an educational institution, not contemplating financial gain or profit. It is herein and after called the Society.

Article 2. Purpose

The purpose and object of the Society is to foster entomological accomplishment among its members and to promote the welfare of all of the State of Tennessee through the encouragement of: (1) the preparation, reading, and/or publication of papers, (2) association and free discussion among all members, (3) the dissemination of entomological information to the general public, and (4) cooperative efforts in statewide insect surveys.

Article 3. Membership

Section 1. Original Members: Any person designated at the organizational meeting of the Society to occupy the status of "Member" shall be considered as and be a Charter Member. Thereafter, the organizational membership shall have no authority to name or appoint members of the Society.

Section 2. Membership: Membership shall be open to all persons interested in Entomology.

Section 3. Sustaining Membership: Sustaining Membership is open to commercial or industrial organizations upon meeting approval and requirements of the Board of Directors.

Section 4. Honorary Membership: Honorary Members may be selected from time to time by a majority vote of the Board of Directors.

Section 5. Student Membership: Student Membership is open to students enrolled in any education institution and meeting the requirements of the Board of Directors.

Section 6. Procedure to Obtain Membership: Any person desiring to become a member of the Society shall do so by application and payment of dues to the Treasurer. After approval of the majority of the Board of Directors, said applicant shall become a duly constituted member.

Section 7. Members in Good Standing: A member who is current in payment of dues.

Article 4. Membership Rights

Section 1. Voting: Each member in good standing shall be entitled to one vote at any regular or special meeting or by mail. Voting by proxy shall not be allowed.

Section 2. Privileges: All members in good standing shall have equal privileges in the presentation of papers and discussions at meetings.

Article 5. Membership Certificates

Section 1. Certificates: The Board of Directors shall decide upon what evidence of membership each member in good standing shall be entitled to receive.

Section 2. Transfer: Evidence of membership in the Society will not be transferable or assignable.

Article 6. Dues

Section 1. Annual Dues: The amount of the annual dues for membership in the Society will be established by the Board of Directors from time to time. The use or uses of dues collected shall also be determined by the Board.

Section 2. Time of Payment: The Board of Directors shall set such times during each year as it deems advisable for the payment of annual dues by members. Generally, annual dues shall be paid during registration at the annual meetings. However, a member may mail dues to the Treasurer of the Society if the member cannot attend a given annual meeting. If a member fails to pay dues two (2) years in a row, such member shall be dropped from the rolls.

Section 3. Honorary Members: There shall be no dues required for Honorary Members or others specially designated by the Board of Directors.

Article 7. Meetings of the Society

Section 1. Annual Meetings: The Society shall hold annual meetings at such times and places as may be designated by the Board of Directors and specified in the notice thereof, for the election of officers and any other business as may be properly brought before the meeting.

Section 2. Registration Fee: A registration fee, in the amount to be determined by the Board of Directors, shall be paid at each annual meeting by all members and non-members who attend. The Board of Directors will determine the use of these fees.

Section 3. Special Meetings: Special meetings of the Society shall be held at any time and place as specified in the notice thereof whenever called by the President or any two (2) or more members of the Board of Directors.

Section 4. Notice: Notice of all meetings of the Society, annual or special, stating time, place, and agenda shall be mailed to each member by the President, Secretary, Treasurer, or Directors calling the meeting not less than seven (7) days prior to the meeting.

Article 8. Officers

Section 1. Officers: The officers of the Society shall consist of a President, President-elect, Secretary, Treasurer, Editor, and Historian, all of whom, except the President, shall be elected by and from the membership by a majority vote of members or by mail. The first President of the Society shall be elected by and from the membership at the organizational meeting for a term extending to the beginning of the first annual meeting. Thenceforth, the President-Elect shall automatically accede to the office of President at each annual meeting, or when the President is unable or unwilling to act for any reason. Nominees for each elective office of the Society shall be selected by a nominating committee of three (3) members appointed at the annual meeting by the President. Nominations may also be presented from the floor. The President and President-Elect shall hold office from the date of election at the annual meeting until the election of their successors at the next annual meeting, and shall not be eligible for re-election to the same office for a successive term. The Secretary, Treasurer, and Editor shall hold office from the date of election at the annual meeting until the election of a successor at the third following annual meeting and shall be eligible for re-election. The Historian shall hold office from the date of election at the annual meeting until the election of a successor at the fifth following annual meeting and shall be eligible for re-election. No member shall occupy more than one office at any one time.

Section 2. Duties and Powers of the President: The President shall be the Chief Executive Officer of the Society and shall preside at all meetings of the Society and the Board of Directors, have and exercise general and active management of the Society, execute and enforce all orders and resolutions and regulations duly adopted by the Board of Directors, execute all contracts in the name of the Society, and perform such other duties as assigned by the Board of Directors.

Section 3. Duties and Powers of the President-Elect: In the absence of the President, or in the case of failure to act, the President-Elect shall have all the powers of the President and shall perform such other duties as shall be imposed by the Board of Directors from time to time.

Section 4. Duties and Powers of the Secretary: The Secretary shall attend and keep the minutes of all meetings of the Board of Directors and the Society, shall have charge of the records and seal of the Society, and shall, in general, perform all the duties incident to the office of Secretary of the Society.

Section 5. Duties and Powers of the Treasurer: The Treasurer shall keep full and accurate accounts of the books of the Society and shall deposit all monies and the valuable properties and effects in the name of and to the credit of the Society in such depository or depositories as may be designated by the Board of Directors. The Treasurer shall disperse funds as may be ordered by the Board, getting proper receipts for such disbursements; and shall render to the Board of Directors whenever required by it, an accounting of all transactions as Treasurer. During each

annual meeting, the Treasurer shall give a report on the annual financial condition of the Society. The Treasurer shall, in general, perform all the duties incident to the office of Treasurer of the Society.

Section 6. Duties and Powers of the Editor: The Editor shall be a member of the Board of Directors and Chair of the Publication and Editorial Committee and be responsible for editing and publishing such publications as directed by the Board of Directors and passed by the majority of the voting membership at a called meeting.

Section 7. Duties and Powers of the Historian: The Historian shall maintain and be responsible for keeping a complete and accurate history of the activities of the Society from year to year.

Section 8. Vacancies in Office: Any vacancy in the office of President-Elect, Secretary, Treasurer, Editor, or Historian, however occasioned, may be filled, pending the election of a successor by the Society, by a majority vote of the remaining Directors. Should an office be filled by vote of the Board of Directors, the person so elected shall not become the officer upon the next annual meeting unless elected as such by the Society according to the procedures set forth for the election of officers of the Society in Article 8, Section 1, of this Constitution.

Article 9. Board of Directors

Section 1. Makeup and Responsibilities: The Board of Directors shall consist of the immediate past-President, the President, President-Elect, Secretary, Treasurer, Editor, and Historian of the Society and two members-at-large. The members-at-large shall be elected at the Annual Meeting of the Society and shall serve a term of one year. Any three (3) Directors shall constitute a quorum for the transaction of business. All properties, property rights, objects and purposes of the Society shall be managed, promoted, and regulated generally by the Board of Directors.

Section 2. Installation and Term of Office: The members of the Board of Directors shall be installed after their election as officers of the Society as set forth in Article 8, Section 1, of this Constitution, at the annual meeting of the Society, or at any adjourned meeting, or at any special meeting called for that purpose. All installed Directors shall serve for a term corresponding to that of the office in the Society to which each was elected by the members and thereafter until their successors are elected, accept office, and are installed.

Section 3. Annual Meetings: The Board of Directors shall meet immediately after the adjournment of the annual meeting of the members for the transaction of such business as may come before the Board. No notice of such meeting shall be required, and should a majority of the newly-elected Directors fail to be present, those present may adjourn, without further notice to a specified future time.

Section 4. Other Meetings: The Board of Directors shall not be required by this Constitution to hold regular meetings but may, by resolution or otherwise, establish such order of meetings as it

deems desirable. Special meetings of the Board shall be held at any time at such places as may be specified in the notice thereof, whenever called by the President or any two (2) or more Directors.

Section 5. Notice: Notice of all meetings of the Board of Directors, other than the annual meeting, starting time, place, and agenda for which the meeting was called, shall be given to each Director by the President or Directors calling the meeting not less than three (3) days prior to the meeting.

Section 6. Vacancies in Board of Directors: Any vacancy in the office of any Director, however occasioned, may be filled, pending the election of a successor by the Society, by a majority vote of the remaining Directors.

Article 10. Miscellaneous Provisions

Section 1. All checks and drafts shall be signed in such manner as the Board of Directors may from time to time determine.

Section 2. At all duly constituted meetings of the Society or Board of Directors of the Society, 10% of the eligible members, or 3 Directors, respectively, present shall constitute a quorum for the transaction of any business presented at such meetings.

Section 3. All notices required to be given by this Constitution relative to any regular or special meeting of the Society or the Board of Directors may be waived by the Directors or members entitled to such notice, either before or on the date of the meeting and shall be deemed equivalent thereto. Attendance at any meeting of the Society of the Board of Directors shall be deemed a waiver of notice thereof.

Section 4. General Prohibitions: Notwithstanding any provision of this Constitution and By-Laws which might be susceptible to a contrary construction. A. No part of the activities of the Society shall consist of carrying on propaganda, or otherwise attempting to influence legislation. B. This Society shall not participate in, or intervene in, (including the publishing or distribution of statements), any political campaign on behalf of a candidate for public office.

Article 11. Amendments

Section 1. This Constitution may be altered or amended or By-Laws adopted by a majority vote of the quorum present at any annual or special meeting of the Society membership, provided that notice of such proposed amendment or By-Laws shall have been given to the membership prior to the meeting.

OPERATING PROCEDURES OF THE TENNESSEE ENTOMOLOGICAL SOCIETY

The Tennessee Entomological Society (TES) is an organization formed for the purpose of fostering entomological accomplishment among its members and to promote the welfare of all of the State of Tennessee through the encouragement of: (1) the preparation, reading, and/or publication of papers, (2) association and free discussion among all members, (3) the dissemination of entomological information to the general public, and (4) cooperative efforts in statewide insect surveys. All necessary permanent records are maintained by person or persons designated by the Board of Directors and the President of the Organization.

Changes in Operating Procedures

The Constitution or By-laws may be altered or amended by a majority vote of the quorum present at any annual or special meeting of the Society membership, provided that notice of such proposed amendment or By-laws shall have been given to the membership prior to the meeting; the operating procedures of TES should be more flexible. The Constitution and Operating Procedures Committee is charged with the responsibility of studying these procedures each year to recommend possible improvements. Proposed changes in procedures are recommended to the Board of Directors for final action.

Registration and Dues

Registration and dues shall be set by majority vote of the Board of Directors. Dues for voting members will be collected by the membership committee at the time of the annual meeting.

The Board of Directors

The Board of Directors shall:

1. Consist of the immediate past-President, the President, President-Elect, Secretary, Treasurer, Editor, and Historian of the Society and two members-at-large.

2. Be responsible for management of the TES and conduct the affairs of the organization.

3. Conduct such business of the organization as is not delegated to the officers or committees and receive from the officers and committees reports and recommendations requiring specific board action or requiring recommendation for action by the membership.

4. Be responsible for changes in the manual of operating procedures after study and recommendation by the Constitution and Operating Procedures Committee.

5. Be responsible for transacting any official business.

6. Be responsible for assembling the board meetings.
7. Nominate honorary members to be voted on by membership.

President

The President shall:

1. Serve as Chairman of the Board of Directors, prepare an agenda for meetings of the Board of Directors and preside at such meetings.

2. Be responsible for determining that the decisions of the Board of Directors are correctly enforced within the framework of the organization's Constitution and By-laws.

3. Select chairman of committees at annual meeting and appoint committee members.

4. Serve as ex-officio member of all committees, maintain close liaison with the chairman of the committees, and encourage and assist them with development of program beneficial to the organization.

5. Work with the chairman of the program and local arrangements committees in planning the programs for annual meetings.

6. Preside at the general or introductory session of the annual meeting.

7. Advise all officers and board members on significant activities of the organization and solicit their suggestions.

8. Serve as the official representative for TES, when appropriate.

President-Elect

The President-Elect shall:

1. Perform the duties of the President if he cannot serve.

2. Serve as chairman of the program committee, and select the membership of that committee with the President and Board of Directors' approval.

3. Work with the Local Arrangements Chairman in the planning of all details of the annual meeting.

4. Prepare and mail announcements of the annual meeting. Assist with the printing of programs and mailing of programs.

5. Prepare and have the program of the annual meeting in print.

6. Be responsible for reminding speakers at each annual meeting to prepare papers before the meeting according to prescribed standards of the organization and to have these papers at the time of the presentation.

Secretary

The Secretary shall:

1. Have charge of the records and seal of the TES.

2. Take the minutes of all official business meetings of the association. Supply a copy of these minutes to the membership, Board of Directors and committee chairmen as necessary.

3. Consult with the President and inform all officers and board members of occurrences of any official meetings of the Board of Directors.

4. Maintain current lists of members and provide these along with the minutes of the annual business meeting to those persons with official need to know.

5. Make any mailing to the membership as needed or designated by the President or Board of Directors. Maintain a supply of the organizational supplies and letterhead paper for use by the officers.

6. Maintain a supply of operating procedures and provide copies to officers and board members and committee chairmen.

7. Serve as a member of the membership committee.

Editor

The Editor shall:

1. Chair the Publication and Editorial Committee.
2. Perform or be responsible for all editorial duties of the organization including the newsletter and any other publication of the organization.

Treasurer

The Treasurer shall:

1. Be responsible for the financial affairs of the TES. This includes depositing all

money received by the TES into appropriate Association accounts, handling the TES's money for maximum income (upon consultation with the Finance Committee), and paying of all expenses and invoices received by the TES.

2. Serve as a member of the Finance Committee.

3. Provide a written financial report to the Board of Directors at least annually, and for the published business meeting minutes. Make an oral financial report as the annual business meeting and at Board of Director meetings as necessary. Provide the necessary information for the Auditing Committee's activities.

Immediate Past-President

The Immediate Past-President shall:

1. Serve as a member of the Board of Directors during the year following his term of Presidency.

Committees

All committees and members of committees are selected by the President (or President-Elect). Each committee shall attempt to complete his/her assigned duties during the term of their appointment. The chairman of each committee shall solicit the assistance of his/her members as necessary. The standing committees are as follows:

Program Committee

The Program Committee shall:

1. Plan the general program format to fit the annual meeting time established by the general membership.

2. Contact invitational speakers and make arrangements for an honorarium, if appropriate.

3. Request papers from the general membership and establish a deadline for submittal of titles.

4. Prepare a program outline for printing.

5. Arrange to have chairpersons for each session.

6. Compile abstracts from program speakers for the proceedings of the program.

Local Arrangements Committee

The Local Arrangements Committee shall:

1. Be responsible for all physical arrangements for the Annual Meeting, working cooperatively with the Officers.

2. Reserve meeting rooms for estimated attendance at the Annual Meeting.

3. Specific Responsibilities will include:

    a. Arranging for visual and audio equipment, including projectors.

    b. Liaison with Treasurer regarding registration help, convention typewriters, etc.

    c. Signs for sessions and activities; coordinate with Program Chairman.

    d. Helping arrange transportation or lodging of guest speakers if needed; coordinate with Program Chairman.

    e. Preparing a report of activities for inclusion in the minutes of the business meeting.

    f. Approving all expenses incurred in conjunction with the Annual Meeting and forwarding invoices to the Treasurer for payment.

4. In addition to the above, be responsible for special functions carried out in conjunction with the Annual Meeting. This may include such special activities as coordinating exhibits at the Annual Meeting, as well as door prizes, with representatives of other organizations joining in this meeting, if desired. If necessary, the Local Arrangements Committee will be appointed with a sufficient number of members that these functions may be designated as the responsibilities of sub-committees of the overall committee.

5. Insure that sufficient facilities are available for morning and afternoon breaks.

6. A sponsored or dutch banquet and/or mixer could also be in order. Arrangements for banquet facilities, an after-dinner speaker and door prizes may be desired.

Membership Committee

The Membership Committee shall:

1. Encourage any interested person in Entomology to join our Society.

2. Send information about the Society to heads of Biology and Zoology Departments at all colleges and universities in the state, enclosing a few applications.
3. Encourage interested people of Pest Control organizations and other agricultural businesses to join the Society.

4. The Secretary shall send at least two blank membership applications to each member asking them to give to good prospects.

5. Each committee member should make a conscientious effort to enroll as many new members during the year as possible.

6. When notices of annual meetings are sent to major newspapers, television, and radio stations, an invitation to interested people could be given at that time.

7. The Chairman should coordinate this committee's efforts with the publicity and other committees when appropriate.

8. Collect dues at the annual meeting.

Auditing Committee

The Auditing Committee shall:

1. Review and certify the accuracy of the financial records and books of the Treasurer prior to the general business session of each Annual Meeting.

2. Conduct special audits as may be directed by the President or the Board of Directors.

3. Report any mistakes or misuses found by the committee to the President for appropriate action prior to the general business session.

4. Prepare a report of the committee's findings, with recommendations, for presentation at the general business session.

Nominating Committee

The Nominating Committee shall:

1. Present a slate of nominees from the active membership of the TES which will include a nominee for President-elect, and two nominees for members-at-large on the Board of Directors every year. The Secretary, Editor and Treasurer hold office for three years, and shall be eligible for re-election. In each case, it is suggested that the Nominating Committee present more than one nominee for each position.

2. Secure the prior approval of all nominees before their names are put before the membership.

3. Submit a written report to the Board of Directors consisting of current committee actions and suggestions for improvement.

Awards Committee

The Awards Committee shall:

1. Consist of 5-6 TES members including a Chair. who are selected following the business meeting of the annual meeting.

2. Obtain name(s) of state 4-H winner (level II), the entomology winner of the Mid-South Fair (Tennessee resident), or other outstanding young entomologist(s) and select the Howard Bruer Award recipient.1/

3. Arrange to have a plaque made honoring the Howard Bruer Award recipient (contact TES treasurer) and deliver the plaque and news release information to the recipient's county agent for presentation/publicity at a later date.2/

4. Obtain commitments from 3-5 TES members to serve as judges of the Student Paper Competition at the upcoming annual meeting (It is preferable that none of the judges have students in the competition).

5. Contact the TES Treasurer about preparing a $150.00 and $75.00 check to be given to the Student Paper Competition 1st and 2nd place winners during the business meeting of the annual meeting.

6. Have Student Paper Competition Evaluation Forms (with student names and presentation titles) ready for the judges the morning before the competition and assist in determining the winner following the competition.

7. Arrange to have a plaque made honoring the outgoing TES President (contact the TES Treasurer) and present it to him/her when asked by the new President during the business meeting of the annual meeting.2/

8. Determine if it is appropriate to award the Richard E. Caron Outstanding Entomologist Award to a TES member at the upcoming annual meeting and submit for review by the Board of Directors. This award will be given periodically to individuals who have distinguished themselves by making outstanding contributions to entomology in Tennessee during their career. If a recipient is chosen, arrangements should be made to have a plaque made (contact the TES Treasurer) to be presented at the business meeting.2/

1/ Contact Award Committee Chair at least one month prior to the annual meeting.

[2/] Contact Award Committee Chair and President about having plaques made at least one month before the annual meeting.

9. Have a committee meeting immediately following the second paper session at the annual meeting.

Prediction, Evaluation Committee

The Prediction and Evaluation Committee shall:

1. List major agricultural commodities in Tennessee (Plant & Animal)
    a. Approximate percent commodity loss due to various insect pests.
    b. Approximate monetary loss due to each pest on various crops.
    c. Approximate cost of control for each pest.
2. List insects which face a serious threat and crops which may be affected.
3. Major household, structural, and nuisance insects.
    a. List major insects.
    b. Approximate amount of money spent each year in control.
    c. Approximate damage and loss from pest.

Constitution and Operating Procedures Committee

The Constitution and Operating Procedures Committee shall:

1. Annually review the Constitution and Operating Procedures and develop recommendations for improvements or needed changes and submit these to the Board of Directors for study and approval.
2. The Chairman of the Constitution Committee shall prepare adoption of amendments at any annual or special meeting.
3. The Chairman of the Constitution Committee shall coordinate with the Secretary in inserting such amendments into the notice and proceedings of the meeting.

Publication and Editorial Committee

The publication and Editorial Committee shall:

1. Determine and make recommendations to the Society of the type of publication suitable to the Society's needs and when such a publication should be initiated.

2. Set up guidelines and standards for such a publication, and investigate possible mechanisms for implementation upon decision of the organization.

3. Be responsible for soliciting and gathering of articles for publication.

4. Act as an editorial committee in screening such articles to be published.
5. The chairman will be responsible for the coordination of this committee's responsibilities with the Board, Secretary-Treasurer, and other committees as necessary.

Publicity Committee

The Publicity Committee shall:

1. Be responsible for developing and implementing an effective public relations program for the Tennessee Entomological Society.

2. Prepare general news releases on the society's activities and accomplishments and publicize the meetings. Specifically, these things should be done:

    a. Prepare and release general news release as soon as Program Committee has planned a theme or area of interest for either meeting. Also, include location of meeting and time. This should begin by mid-summer and meeting dates should be sent to magazines and trade publications such as Delta Farm Press, Southeast Farm Press, Tennessee Market Bulletin, Ag Pesticide Notes, newspapers, etc.

    b. A follow-up news release should be issued about one month before each meeting. Location of meeting, date, time, and outstanding invitational speakers could be mentioned.

    c. Prepare follow-up news release after the meeting for use by news media.

    d. Send notice to Entomological Society of America and other state societies.

3. Maintain close liaison with the Program Committee in obtaining early copies of the program of both meetings for publicity purposes.

4. Arrange for radio, television, and press coverage of society's meetings by contacting

area radio and TV stations just prior to the meetings and by calling the news rooms of local newspapers on the first day of the meetings.

5. Arrange for group photos of outgoing and in-coming officers and directors of the Association at the Annual meeting.

6. Prepare a report of the year's activities for the committee for presentation at the annual business meeting.

7. Post notices on the bulletin boards of the Entomology, Biology, and Zoology Departments in the colleges and universities across the state.

8. Direct mail to members.

Dates ('00), ('01) refer to last meeting attendance or last dues payment.

H = Honorary Member

TENNESSEE ENTOMOLOGICAL SOCIETY

MEMBERSHIP LIST

OCTOBER 2016

THE MEMBERSHIP LIST IS NOT AVAILABLE.

For information on members, please contact the Secretary of the Tennessee Entomological Society.

Application for Membership in the

TENNESSEE ENTOMOLOGICAL SOCIETY

I (we), herewith, submit this application for membership in the Tennessee Entomological Society.

PLEASE CHECK HERE IF YOU ARE A NEW MEMBER_____

NAME:_____

ADDRESS:_____

_____

_____

_____ZIP_____

PHONE:_____

FAX: _____

E-MAIL: _____

AFFILIATION:_____

REGISTRATION: $30.00 _____ STUDENT DUES: $5.00 _____

REGULAR DUES: $10.00 _____ DONATION: _____

CORPORATE DUES: $50.00 _____ SUSTAINING DUES: $50.00 _____

TOTAL: $_____ Received by: _____
(Treasurer)

Please Remit to:

Steve Powell
Tennessee Department of Agriculture
Regulatory Services
Plant Certification
Nashville, TN
Steve.Powell@tn.gov

All checks should be made payable to the Tennessee Entomological Society.