June 17, 2023 E&PP Info #841 Volume 4, Issue 6

Insec(tc)ure*:
Are you insecure about your insect cures?

A UT Urban IPM Lab Newsletter for the Pest Management Industry

What are all of these larvae in my house? Small hive beetle

Karen Vail and Jennifer Tsuruda, UT Entomology & Plant Pathology, and

Amy Dunlap, Davidson County Extension Office

We currently lack a diagnostician at the UT Extension Soil, Plant and Pest Center (SPPC) in Nashville, so some insect submission photos are making their way to my inbox. In the June 12th submission I refer to in this article, five photos of an insect larva were attached, but no information was provided beyond the name and address of the submitter and their county Extension agent. The original images were slightly out of focus, and at first glance, the larva resembled a fly maggot, but then I noticed what looked like legs (Figure 1 A), shifting my suspicions to a larval beetle.

Figure 1. Lateral (A) and dorsal (B) views of larva in original photos. Note what looks like legs in photo A. (Credit: Robert Florence, UT SPPC)

I first compared these to images of larval stored product pests. I could almost see urogomphi at the terminal end of the larvae (Figure 1B), which would be found in a red or confused flour beetle. But, the larvae in the photos were about 1 cm (although the image measurement in Figure 1A indicates 1.388 cm) and red and confused flour beetles are much smaller and their exoskeletons are more sclerotized or hardened. I continued to compare larvae of other stored product pests, but none were a match. Striking out and not having the actual specimens in front of me to use a taxonomic key, I decided to use Google to search for "1.4 cm beetle larva" images and that's when I noticed a

strong resemblance to the small hive beetle larvae. (This beetle larva was actually 0.9 cm, but fortunately, the eggs are 1.4 mm long and the Google search found that 1.4. I'll notify the SPPC lab of the measurement inaccuracy in their photos [Figure 1]).

I indicated my suspicion to the homeowner and county agent and asked for more background information. The follow-up inquiry yielded the following slightly modified response from the homeowner:

"They are in our upstairs duct work in our 4-year-old house. They come out in the bedroom. There is also a tech room upstairs that they come out in. We don't know if they are in our hardwood floors..or WHERE they come from.

Also downstairs..at entrance to sliding glass doors they come out. Last night lots came out...after we thought we rid of them all. We had exterminator..give up...he didn't know what they were. He never treated it..saying he can not spray duct work. We are going crazy dealing with these maggots in our immaculately clean house. HELP !"

Fortunately, I was scheduled to speak at the Tennessee Department of Agriculture's Apprentice Termite Technician School in Nashville the next day. I arrived early enough to visit the SPPC and peruse Alvah Peterson's two-volume set "Larvae of Insects" which contains many line drawings of immature insects organized by orders and families. Failing to find the specimen of inquiry in this book, I stopped by the diagnostic laboratory, placed a few of the specimens in a vial of ethanol, stuffed it into my purse and headed off to the training. The next morning, I placed a larva under the microscope and confirmed that this 0.9 cm long larva was a small hive beetle, *Aethina tumida* Murray (Figure 2,3).

Figure 2. Dorsal view of the small hive beetle larva, *Aethina tumida* Murray. (Credit: Karen Vail, UT E&PP)

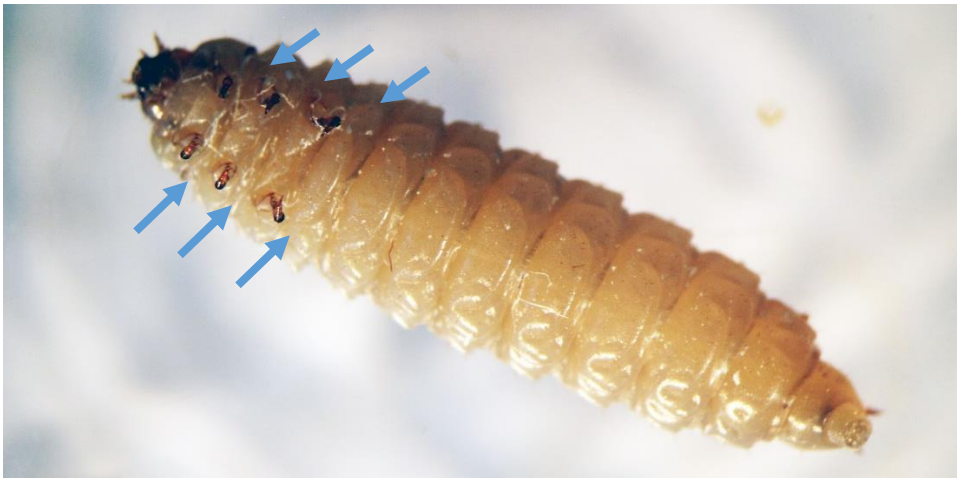


Figure 3. Ventral view of the small hive beetle larva with darkened, nimble legs visible (blue arrows). (Credit: Karen Vail, UT E&PP)

The small hive beetle (SHB) is native to sub-Saharan Africa and was first discovered in the US in the mid to late 1990s. It's now found throughout the southeastern US and beyond and is considered a significant pest of the honey bee *Apis mellifera* due to its consumption of the brood, pollen and nectar in the hives. The adult beetles emerge from the soil where they pupated and fly to bee hives in the evening (before or just after dusk) attracted by the bee and hive odors. The adult SHB (Figure 4) find a crack or crevice to hide in while worker bees attempt to keep them confined to these spaces and away from the brood combs. The beetles trick the bees into feeding them by soliciting regurgitated nourishment by stroking the bees' mandibles with the beetles' antennae. SHB eggs are laid on food sources including pollen patties or brood cells (Figure 5). With females laying 1000 – 2000 eggs in a lifetime, it's easy to see how populations explode. The larvae eclose and feed for about two weeks (larval development may be slightly quicker or substantially longer, >30 days) after which they wander away from the food source at night, and down to the ground where they pupate. When SHB builds large numbers, the honey bee colony may abandon the nest site (Figure 6).

Figure 4. An adult small hive beetle (5.7 mm, black arrow) about one-third the size of a honey bee. (Credit: Jennifer Tsuruda, UT E&PP)

Figure 5. Small hive beetle eggs (white arrow) on a pollen pattie. (Credit: Jennifer Tsuruda, UT E&PP)

Figure 6. High numbers of small hive beetle led to this honey bee colony abandoning the nest site. (Credit: Jennifer Tsuruda, UT E&PP)

SHB belongs to the family Nitidulidae and nitidulids are also called sap beetles, so, I suspected there was a honey bee colony or possibly fermenting fruits, vegetables or other organic matter somewhere indoors. Further inquiry with the homeowner revealed that gutter repairers had recently commented about the number of bees they encountered. So mystery solved – the homeowners saw all of these larvae as they exited the bee colony searching for soil in which to pupate. According to Ellis and Ellis (2019), "Larvae in the wandering stage may wander great distances from the hive to find suitable soil."

Update - Amy Dunlap, Davidson County Extension, just returned from a visit to this home. In this case, the SHB larvae may have wandered two stories in an attempt to pupate in the soil. Discussions with a local beekeeper revealed that homes in this Nashville area are more prone to honey bee infestations. He also speculated that the honey bee colony was probably in decline due to the large number of SHB larvae seen. Approximately 50 – 75 SHB larvae were found on glue boards on several levels of the home in the past week (Figure 7A). SHB larvae were downstairs on the bottom level by a sliding glass door that led outside. The highest numbers were found upstairs in two different rooms on the same side of the house. The homeowner had observed the SHB larvae on the floor, but didn't know where they originated. Amy noticed a bunch of larvae trapped in the light fixture above (Figure 7B) and bees were seen coming and going from an area outside the home that aligned with where hive beetles were seen in the light fixture (Figure 7C).

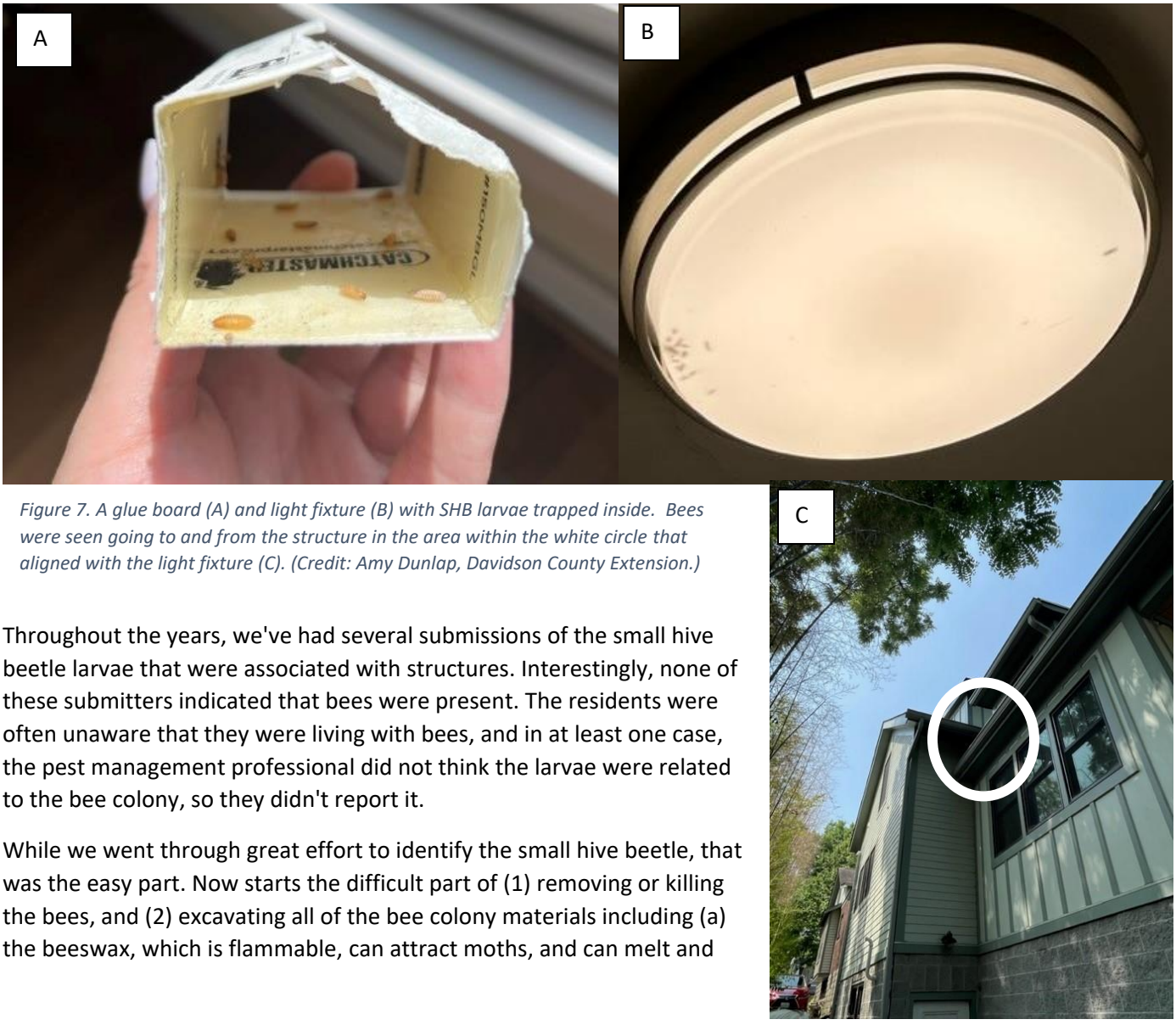


Figure 7. A glue board (A) and light fixture (B) with SHB larvae trapped inside. Bees were seen going to and from the structure in the area within the white circle that aligned with the light fixture (C). (Credit: Amy Dunlap, Davidson County Extension.)

Throughout the years, we've had several submissions of the small hive beetle larvae that were associated with structures. Interestingly, none of these submitters indicated that bees were present. The residents were often unaware that they were living with bees, and in at least one case, the pest management professional did not think the larvae were related to the bee colony, so they didn't report it.

While we went through great effort to identify the small hive beetle, that was the easy part. Now starts the difficult part of (1) removing or killing the bees, and (2) excavating all of the bee colony materials including (a) the beeswax, which is flammable, can attract moths, and can melt and

stain walls, (b) honey which can attract ants, cockroaches and mice, and (c) any brood (developing bees) which can also attract pests.

Usually, this process requires some destruction of the housing materials which must then be replaced. In the past, we've used an infrared camera and boroscope to help locate bees in a wall (Figure 8), which may also help find the nest in this situation. And if the colony is above the first floor, a cherry picker, ropes and harnesses, and/or ladders (Figures 9) may be required. It will not be a simple task, and may be a prolonged and costly process.

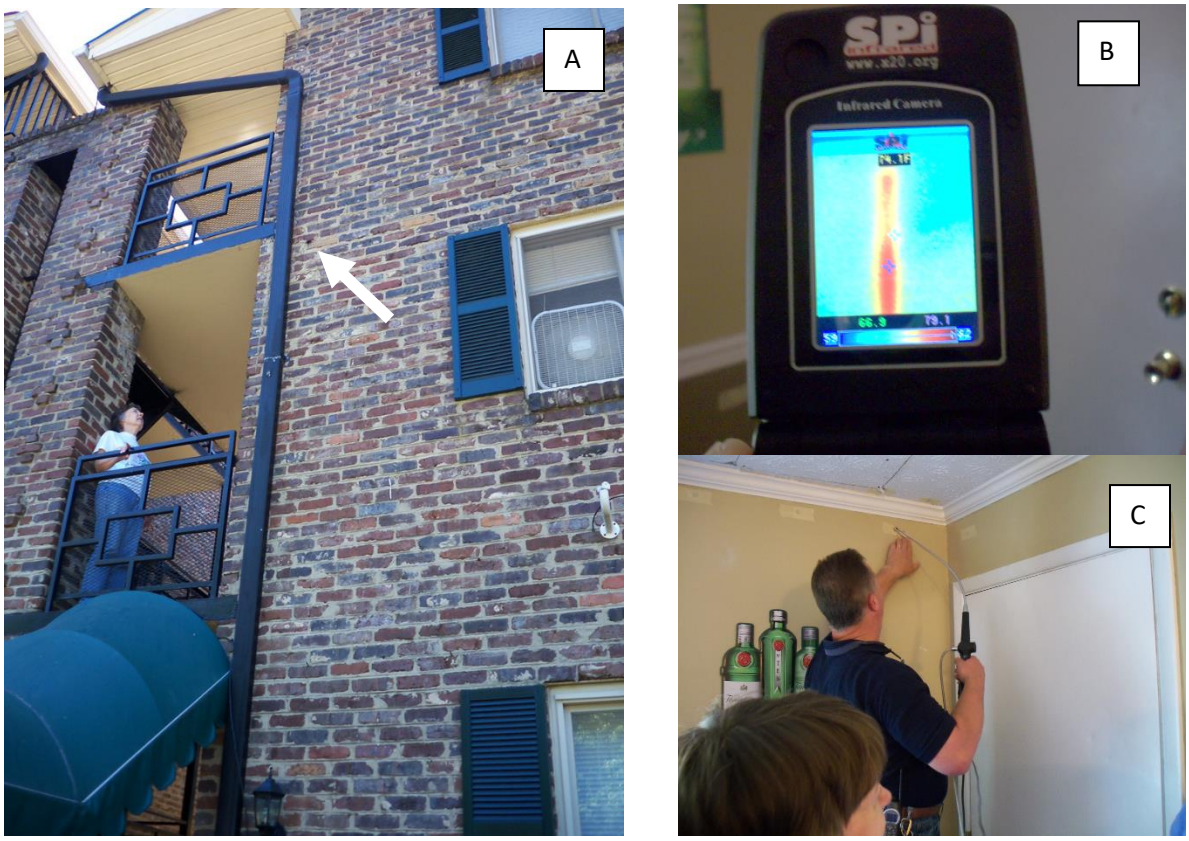


Figure 8. A honey bee colony located on the exterior wall of second-floor brick apartment building (A) was detected using an infrared camera (B) and confirmed with a boroscope (C). A hole in the brick (white arrow) allowed the bees to enter. (Credit: Karen Vail, UT E&PP).

Figure 9. Wood siding cut out from the home reveals the remains of a honey bee colony (A). A ladder and forklift assisted the removal of the remains (B). (Credit: Jennifer Tsuruda, UT E&PP)

Instead of describing the details of removing bees from a wall, we've provided a few links with comments from Jennifer Tsuruda, UT E&PP's apiculture specialist.

TN Dept of Ag's website on "Bees inside a wall" mentions removing the bees and comb from the wall due to the comb being made from beeswax, which is flammable, and the honey attracting pest insects: https://www.tn.gov/agriculture/businesses/bees/bees-inside-a-wall.html

Clemson University's factsheet on removing bees from structures - the section on removal from walls mentions how simply killing/removing the bees and leaving is risky due to the comb and its contents attracting moths, ants, and mice. The section on removal by trapping mentions the long timeframe typically involved - it can go on for months and is often still unsuccessful.
https://www.clemson.edu/extension/beekeepers/fact-sheets-publications/honey-bee-colony-removal.html

And here is a factsheet from the University of GA on Bees in Walls - this factsheet states that the entire nest, including bees and combs, must be removed and that there is a risk of the comb melting and staining walls.
https://extension.uga.edu/publications/detail.html?number=C824&title=Honey%20Bee%20Swarms%20and%20Bees%20in%20Walls

Sources:

Ellis, J. D. and A. Ellis. 2019. Featured Creatures: small hive beetle. https://entnemdept.ufl.edu/creatures/misc/bees/small_hive_beetle.htm accessed June 14 2023

Zawislak, J. 2019. Managing Small Hive Beetles. https://bee-health.extension.org/managing-small-hive-beetles/ accessed June 14 2023

Upcoming educational events by UT.

9TH ANNUAL TENNESSEE BED BUG, COCKROACH & RODENT MANAGEMENT MEETING

WEDNESDAY AUGUST 2, 2023

UNIVERSITY OF TENNESSEE CONFERENCE CENTER | 600 HENLEY STREET | KNOXVILLE, TENNESSEE 37902

Check-in starts at 8:00 AM | Meeting 8:30 – 4:30 EDT

See https://bedbugs.tennessee.edu/resources/events/ for the finalized schedule, CEU assignment and registration information.

ACE (Associate Certified Entomologist) Prep Course

Fall 2023

Are you certified in pesticide applicator category 7 with a minimum of 5 years of verifiable pest management experience in the United States? Then you may be ready to become an ACE, an associate certified entomologist. Before you can become an ACE, you will need to provide two letters of professional reference, be willing to adhere to the ACE Code of Ethics, complete the application and pay the application fee to the Entomological Society of America and pass an online test of your knowledge of structural pest control. The program and its benefits are explained in its entirety at https://entocert.org/ace. The application process is separate from the training offered below.

To help you prepare for the exam, Dr. Karen Vail, Extension Urban Entomologist of the UT Department of Entomology & Plant Pathology will provide an ACE Prep Course this fall. All training sessions will be virtual and held 5 – 6 pm on select Mondays via Zoom. A new Zoom link will be sent each week. By offering online training, we no longer limit participants to be within a few hours' drive of campus!

2023 Training Date	Subject
September 11	Integrated Pest Management and Tools
September 18	Insecticides and Modes of Actions
September 25	Pesticide Safety, Laws & Labels
October 2	Insect Biology and Morphology
October 9	Ants
October 16	Cockroaches
October 23	Flies
October 30	Stinging and Biting Arthropods
November 13	Stored Products Pests
November 20	Occasional Invaders
November 27	Wood-destroying Organisms
December 4	Common Commensal Pests/Review
December 10	Specimen review in the afternoon
December 11* 5 pm – 8 pm	**Exam (limited to 15)***

*The ACE exam will be given in room 243 Computer Lab of the Brehm Animal Science Building.

You can register for all classes of the ACE Prep Course at one time for a discounted price of $300 or pay $30 for each class as long as you register at least one week before the training date. Enrollment is limited to 25 per training date. One Tennessee recertification point per session. The course will only be held if at least 5 register before August 31st.

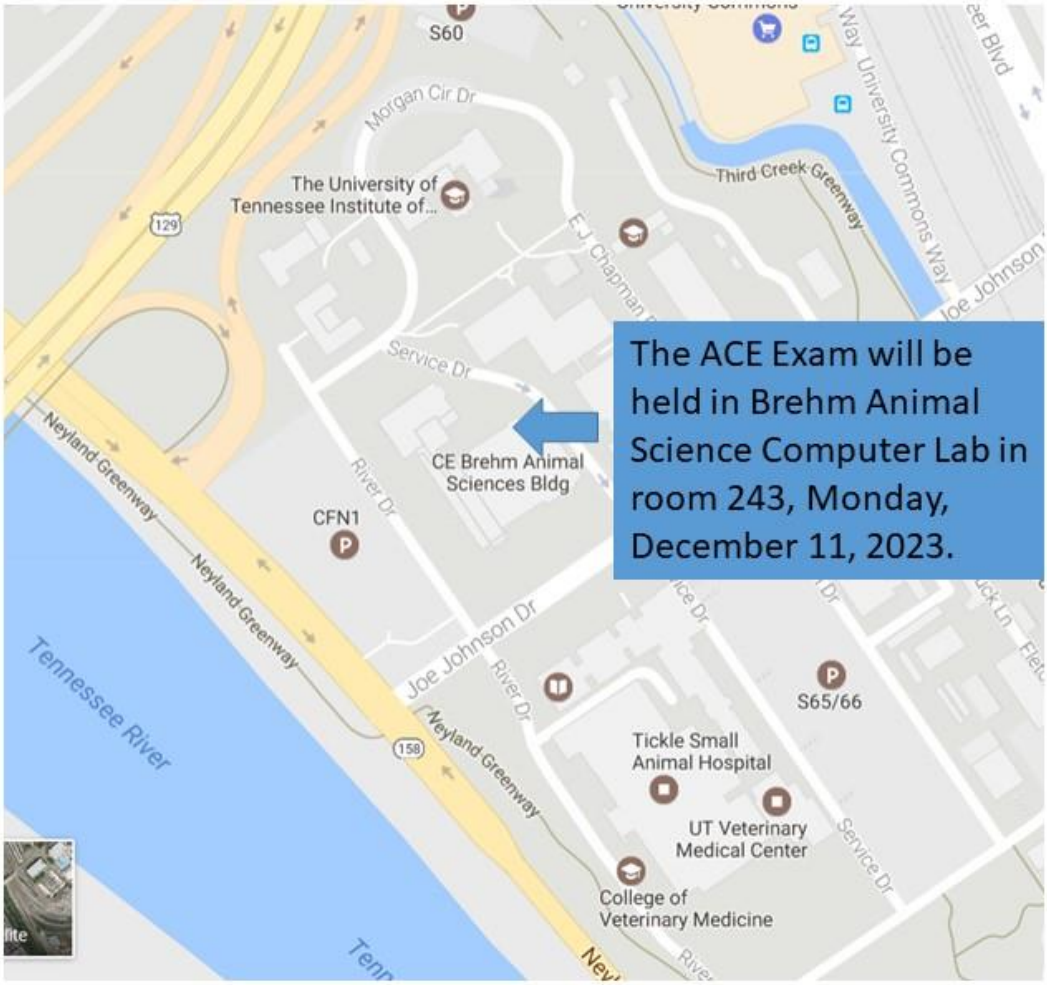
Register for the UT ACE Prep Course online at
https://tiny.utk.edu/ACEPrepFall2023

Real. Life. Solutions.™

ENTOMOLOGY & PLANT PATHOLOGY
UTIA INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

UTEXTENSION
INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

ACE Exam Location - UT Institute of Ag Campus Map



As long as it's after 5pm, you can park in lot CFN1.

We suggest you purchase the *IPM for the Urban Professional: A Study Guide for the Associate Certified Entomologist* from ESA (https://entocert.org/ace/resources) and the *NPMA Field Guide to Structural Pests* (https://ebiz6personal.npmapestworld.org/UI/ProductDetails.html?productId=703) prior to taking the training. The NPMA manual is also available as a downloadable phone app (available for Apple iOS or Google) and comes with an annual fee. The ESA study guide is discounted when you purchase it with your ACE application. In the past, shipping of the manuals has been greatly delayed, so order the manuals as soon as you sign up for the class!

Insec(tc)ure is produced by:

Karen Vail, Ph.D., Professor,
Extension Urban Entomologist
Entomology and Plant Pathology
370 Plant Biotechnology Bldg.
2505 E J Chapman Drive
Knoxville, TN 37996-4560
ph: (865) 974-7138
email: kvail@utk.edu
http://epp.tennessee.edu/people/directory/dr-karen-vail/
https://epp.tennessee.edu/urban-ipm/

Insec(tc)ure is edited by Jennifer Chandler and Pat Parkman and archived online at https://epp.tennessee.edu/urban-ipm-newsletters/

Follow us on Facebook at

https://www.facebook.com/UrbanIPMTN/

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label and registered for use in your state.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.