TEXAS A&M AGRILIFE EXTENSION

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Emerald Ash Borer in Texas

Wizzie Brown[1], Molly Keck[1], Rafia Khan[2], Ryan Selking[3], and Patrick Porter[4]

Emerald ash borer (EAB, *Agrilus planipennis*) is a beetle native to eastern Russia, northern China, Japan, and Korea. It was first found in the United States near Detroit, Michigan, in 2002. It has since spread throughout the United States and parts of Canada. It was discovered in Harrison County in northeast Texas in 2016 and is now found in 24 counties as of June 2024.

Figure 1. Emerald ash borer adult
(Photo courtesy of Randy King)

Figure 2. Emerald ash borer adult
(Photo courtesy of Randy King)

Adult emerald ash borers are bright, metallic green to dark dingy green, and 0.25 to 0.5 inch in length. After overwintering under bark as prepupae or pupae, adult beetles chew their way out of trees in spring. They then fly and mate, and females then lay eggs in crevices of ash tree bark. Larvae hatch from eggs in about 2 weeks and burrow into the tree. The larval stage is the damaging stage, building galleries below the bark in the phloem and cambium layers, girdling the tree. Girdling cuts off the transport of water and nutrients from the root zone into the canopy, and results in the tree dying from the top down.

Larvae are translucent pale yellow with a wide head that is light tan. The body segments behind the head are "bell-shaped," giving larvae a serrated look. Mature larvae are 1 to 1.25 inches long. Larval galleries are often serpentine, winding from side to side, and widening as larvae grow. Since galleries occur under the bark, they are not visible from the outside of the tree.

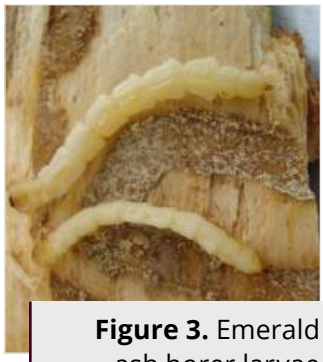

Figure 3. Emerald ash borer larvae
(Photo courtesy of Kenneth Law, USDA APHIS PPQ, Bugwood.org).

Ash borer adults move steadily to new ash trees over time. After emerging as adults, beetles readily fly to other ash trees within

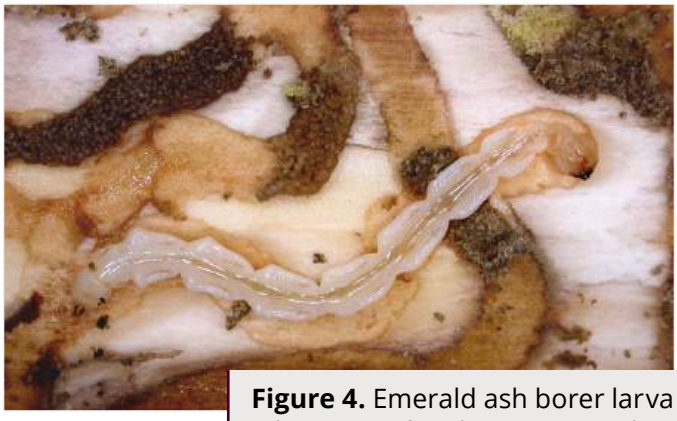

Figure 4. Emerald ash borer larva
(Photo courtesy of David Cappaert, Bugwood.org)

[1]Senior Extension Program Specialist-IPM; Texas A&M AgriLife Extension Service
[2]Assistant Professor, Department of Entomology, College of Agriculture and Life Sciences, Texas A&M University
[3]Assistant Editor, Educational Development and Engagement, Texas A&M AgriLife Extension Service
[4]Professor, Department of Entomology, College of Agriculture and Life Sciences, Texas A&M University

half a mile. Estimates of maximum movement per year, if unaided by human activity, are between 10 and 12 miles. However, humans increase beetle dispersal by transporting infested firewood and nursery trees, and by moving other wood products from areas infested with EABs. These travel routes can enable the insect to disperse many miles in a short time, compared to what might take several years to accomplish with moving from tree to tree in a natural system.

Unlike many tree pests that prefer to infest stressed or dying trees, EABs infest both healthy and stressed trees, and can attack all ash species (*Fraxinus* spp.). European olive (*Olea europaea*) and white fringetrees *(Chionanthus* spp.) are also known to be hosts (Entomology Today, 2016). It is only recently that the EAB has expanded its range to olive-growing areas, so the threat to olive production has not been quantified. Egg-laying has been shown to occur in ash trees as small as 1 inch in diameter, and in branches of similar size. Essentially any size of ash trees are at risk. All seven native ash species in Texas are susceptible, as are all the non-native species. The Texas A&M Forest Service says that no natural resistance has been observed in ash species found in Texas, and mortality in heavily infested areas is nearly 100 percent for unprotected trees.

Signs of infestation include thinning in the upper tree canopy; the presence of epicormic shoots, sometimes called "tree suckers," on the lower third of the trunk; increased woodpecker activity; and split bark revealing serpentine galleries. Epicormic shoots are a signal that the tree is stressed and attempting to gain nutrition. Perhaps the most telling sign of the EAB is the distinct and very characteristic "D-shaped" exit holes adults make as they emerge from the tree after completing development. Exit holes are 1/8 inch wide and D-shaped, which is not the case for other insects that bore out of ash trees.

Figure 6. Epicormic shoots *(Photo courtesy of Aaron Lincoln)*

High populations of EABs in a tree cause upper branches and leaves to die. This takes approximately 2 years or more after initial infestation. Large trees can be killed in 3 to 4 years after infestation, with smaller trees dying after a shorter period. Trees with greater than 30 to 40 percent decline of leaves in the upper canopy are beyond saving and should be removed. Infested

Figure 7. Emerald ash borer larval galleries *(Photo courtesy of Troy Kimoto, Canadian Food Inspection Agency, Bugwood.org)*

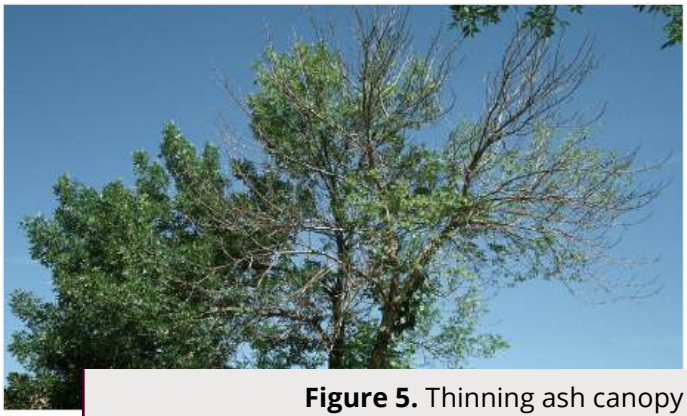

Figure 5. Thinning ash canopy *(Photo courtesy of Joseph Obrien, USDA Forest Service, Bugwood.org)*

Figure 8. Exit hole *(Photo courtesy of Aaron Lincoln)*

trees can be burned, mulched, or used as firewood or lumber, but must stay within the county the tree was last alive in to stay within quarantine regulations (see the section below that discusses quarantine). Those with less damage might be saved by an insecticidal treatment. Because there is a 2-year lag between infestation and signs of damage, prophylactic treatments of high-value ash trees within a 30-mile radius of known emerald ash borers is recommended to protect trees not yet known to be infested.

It is important to identify EABs before assuming a dying ash is infested. This is partly because there are many ash species, such as Arizona ash, that were planted in urban developments in the 1980s and 90s that are at the end of their natural life.

Homeowners and municipalities that wish to preserve valuable ash trees, provided they have not suffered too much damage, have the following options:

- Soil-applied systemic insecticides
  - Remain effective for about 1 year
  - You may benefit working with a tree care professional as they have access to a wider range of insecticide products than homeowners
  - Treatments must be repeated over time if trees are to remain protected
- Direct insecticide injections
  - Injection treatments usually last 1 to 3 years depending on the product used
  - Injections should be carried out by a professional with access to proper equipment and specialized knowledge required for proper treatment
  - Treatments must be repeated over time if trees are to remain protected

Midwestern experts who have dealt with EABs for many years suggest that all trees over 20 inches in diameter at breast height (DBH) should be cared for by a professional. This is because treatment of large trees is a complicated endeavor. An authoritative list of professional and homeowner products for EAB control is available from the North Central IPM Center. The document also addresses frequently asked questions around EAB control.

Many Texas cities have ash trees as part of their urban landscapes. These will all be attacked eventually, and those not protected with insecticide will be killed as emerald ash borers move throughout the state. Ash trees killed by EABs that are not removed become very brittle and are prone to falling. Municipalities with ash trees should prepare to budget significantly more money for ash tree removal and replanting them with non-ash species. This cost may be significant to municipal governments and landowners. The Texas A&M Forest Service has conservatively estimated the average cost of tree removal at $250 per tree, and then $300 to replant a species not susceptible to EABs. Larger trees will be more expensive to remove, and Midwestern estimates put the cost of removing a large urban ash tree at more than $1,000. Property values in areas with a high density of ash trees may see a significant decline as trees are killed and removed. The Texas A&M Forest Service has worksheets available for municipalities to estimate future costs. They also have a summary of potential economic impacts to industry, rural, and metropolitan areas.

Emerald ash borers are not going to go away. Until resistant varieties of ash trees are discovered and enter the market, there is no future in planting ash trees in Texas. Many other tree species are available to replace ash. Things to consider when choosing a replacement tree:

- Trees that are native to your area of Texas
- Evergreen or deciduous
- Maximum size of the tree regarding landscape space
- Light and water requirements
- Type of soil

The Texas A&M Forest Service has a tool to help select a tree: Texas Tree Planting Guide.

The Texas A&M Forest Service also has information on how to properly plant a tree: Arbor Day: Planting Trees in 12 Easy Steps.

It is unknown what impacts EABs will have on local ecology. When it comes to ecological destruction, the EAB is practically unmatched among exotic insect pests. In areas where established, EABs wipe out virtually all species of ash trees in the genus *Fraxinus*. In 2017, scientists at the International Union for Conservation of Nature declared five major species of ash trees in the U.S. on the brink of extinction due to the borer. Ash trees are generally found in wetter areas of Texas, and are often found along waterways, streams, and rivers. The death of these trees might decrease soil holding and promote movement of soil into rivers and streams. The potential effect on wildlife is unknown.

The Texas Department of Agriculture (TDA) has a quarantine in effect for counties known to have EABs. The purpose of the quarantine is to slow the spread of the insect, and delay its economic and environmental effects. The quarantine includes restricting movement of some forest products, nursery stock, and firewood from quarantined areas. Quarantine regulations can be found on TDA's website: Emerald Ash Borer (EAB). A map of quarantined counties is also given: Emerald Ash Borer Quarantine Map. Note that infested trees can be used for firewood, timber, furniture, landscaping materials, etc., but these must be kept within the quarantine zone. Moving them out of the quarantined zone risks spreading the EAB infestation.

The following counties are known to have EABs, so residents should be prepared to protect the ash trees they wish to preserve: Bowie, Camp, Cass, Collin, Cooke, Dallas, Denton, Franklin, Grayson, Harrison, Hill, Hood, Hopkins, Johnson, Marion, McLennan, Morris, Palo Pinto, Parker, Red River, Rusk, Tarrant, Titus, and Wise. One possible county that may be added soon is Bosque. Check the TDA map regularly as it is updated to see when new counties are added. Because it takes many years to detect EAB infestations, residents of adjacent counties should monitor ash trees for signs of infestation. They might also want to start protective insecticidal treatments for the ash trees they wish to preserve.

The Texas A&M Forest Service is operating EAB traps in counties currently known and not known to have EABs, the latter with the goal of early detection. However, trapping is not especially effective at picking up low numbers of beetles, and is better at finding them after they have become established. If you suspect that you have an EAB infestation, call the hotline to report it: (866) 322-4512 (U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Austin, Texas). When you call the hotline, they will ask for your contact information, address, and the location you suspect you found EABs. You will also be asked to confirm if the tree is an ash tree, and what the symptoms on the tree are. To this end, record and take a picture of any symptoms, especially D-shaped exit holes. Put a size reference in the photo, such as a tape measure or coin. Lastly, you will also be asked to provide insect specimens or photos of them, so if you suspect you have an adult EAB, collect it. They are not dangerous to humans and can be collected by hand. Preserve them in at least 70 percent alcohol, in hand sanitizer, or place them in the freezer. Additionally, there is a web page you can report EABs to: Report EAB and Ash Tree Damage.

You can find more information on EABs at TexasInvasives.org. The Texas Invasives web page has more information on how to positively identify the pest, as many other metallic green beetles are also found in Texas. Many photos of EABs can be found on the image plates starting here on BugGuide: Species *Agrilus planipennis* - Emerald Ash Borer. There are many species in the genus Agrilus along with the EAB, and BugGuide has many images encompassing most American species: Genus *Agrilus*. The bronze birch borer and a species called *Agrilus lacustris* both look similar to the EAB, but they do not infest ash. They are both pictured on BugGuide as well: *Agrilus anxius* and *Agrilus lacustris*.

References

Entomology Today. (2016, October 24). Emerald Ash Borer May Become a Problem for Olive Growers. *Entomology Today*. https://entomologytoday.org/2016/10/24/emerald-ash-borer-may-become-a-problem-for-olive-growers/