Emerald ash borer in Minnesota

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The emerald ash borer (EAB), *Agrilus planipennis*, is a very destructive insect pest of ash trees (*Fraxinus* spp.), the only known hosts of this borer in North America. This exotic borer is a native of Asia with its natural range including China, Japan, Mongolia, Korea, the Russian Far East and Taiwan.

It was first discovered in North America in southeast Michigan in June, 2002, although it was likely introduced as much as 10 years earlier. It was first found in Minnesota in May 2009, in St. Paul. EAB has also been found in many other U.S. states and are shown here. It has also been discovered in the Canadian provinces of Ontario and Quebec.

Figure 1. An EAB adult - Photo Credit: Jeff Hahn

Figure 2. An EAB adult with wings open - Photo Credit: Jeff Hahn

Why is this insect important?

This destructive beetle has killed tens of millions of ash trees where it has been discovered. There are nearly one billion ash trees in Minnesota, the largest concentrations of ash of any state in the country. Not only are these trees abundant in our forests, but they are also an important component of our urban landscapes. Research has not found any resistance in our native ash. We could lose much of this resource.

How do I recognize this insect?

EAB is a slender, elongate insect about 1/3 to 1/2 inch long. It is widest just behind the head, gradually tapering back to the abdomen. It is a bright iridescent green to copper-green color, often with a copper colored area behind the head. Its body underneath the wings is a purplish-magenta color.

This borer is a type of metallic wood boring beetle (family Buprestidae) and is closely related to the bronze birch borer and the twolined chestnut borer, both native insects in Minnesota. EAB, however, is a little larger and much more brightly colored than these species.

Not every green insect you see is an EAB. There are several common insects that look similar, especially the six-spotted tiger beetle and the polydrusus weevil. A six-spotted tiger beetle is a similar size, about 3/8 to 1/2 inch long but with a conspicuous, large head and eyes. It is also a different shape with the abdomen being wider than the head. The polydrusus weevil is a small, 1/4 inch long, oval insect with a short snout. It has a black body covered with pale metallic green scales.

Also, not every insect you find attacking ash is an EAB as there are many native ash borers present in Minnesota. The most common are redheaded ash borer, bark beetles and clearwing borers. For more information see

native borers and emerald ash borer look-alikes (4.96 MB PDF).

The larvae have flat, slender, whitish colored bodies. They are 1 to 1 1/4 inches when fully grown. These larvae have a small brownish head that is just visible. They lack legs but do possess a pair of small pincher-like appendages on the tip of their abdomen.

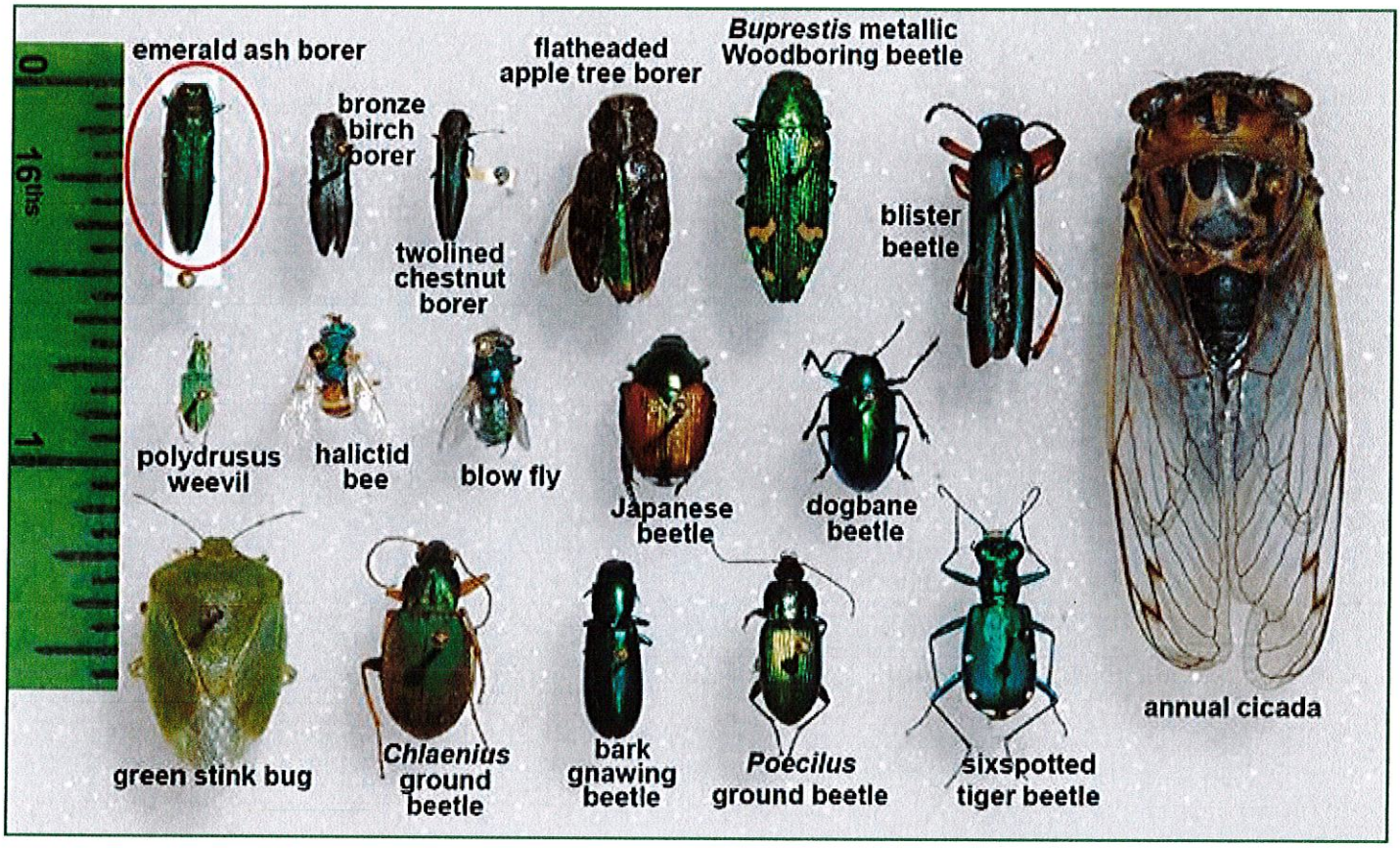

Figure 3 (above). Insects in Minnesota That May Be Confused With Emerald Ash Borer

Figure 4. An EAB larva - Photo credit: Pennsylvania Department of Conservation and Natural Resources - Forestry Archive

Symptoms and damage

Ash can tolerate small numbers of EAB larvae but trees are girdled and killed as the pest quickly increases in numbers. Trees are often killed in about four years, although it can take as little as two years.

When trees are first attacked by EABs, the symptoms are inconspicuous and hard to notice. During the second year, woodpecker pecks and thinning foliage begin to be apparent. By the third year, woodpecker activity is more common and canopy thinning is more pronounced. Vertical bark cracks (due to the tree trying to heal over old galleries) may also be present. Although woodpecker activity and vertical bark splits are not always caused by EAB, they are common symptoms in EAB infested ash trees. By the fourth year, the canopy has seriously declined and may even be dead.

When the adults emerge, the small, 1/8 inch D-shaped exit holes they create are characteristic of this insect, although they can be hard to see. If you were to remove the bark on

the trunk of a tree showing these symptoms, the S-shaped galleries formed by the larvae are also diagnostic of EAB activity. Epicormic sprouts may form on the lower trunk and major branches as the tree responds to emerald ash borer tunneling although this typically occurs when trees are almost dead and does not automatically indicate EAB.

All North American ash species are attacked, including all ash species found in Minnesota: green (*F. pennsylvanica*), black (*F. nigra*), and white ash (*F. americana*). Mountain-ash (*Sorbus.* spp.) are not true ash and are not attacked. Emerald ash borer attacks ash of different sizes from as small as one inch diameter to large mature trees. They prefer stressed and unhealthy trees, similar to the native bronze birch borer and twolined chestnut borer. However, unlike these insects, EABs will also successfully attack vigorously growing trees. Once an ash is attacked by EABs, it will be killed if it is not protected.

Keep in mind there are other problems that can cause an ash tree to decline. Go to What's Wrong With My

Figure 5. Woodpecker pecking is often a symptom of an EAB infested tree - Photo credit: Jeffrey Hahn

Biology

EABs generally have a one year life cycle although that can be extended to two years in a vigorously growing host. These insects overwinter as fully grown larvae in chambers constructed under the bark of ash trees. They pupate in early spring and emerge as adults, leaving characteristic D-shaped emergence holes. Depending on where you live in Minnesota, expect adults to emerge any time from late May to August.

Figure 6. An EAB-infested tree severely attacked by woodpeckers - Photo credit: Jeffrey Hahn

Figure 7. Vertical bark splits can be a symptom of an EAB infestation. - Photo credit: Jeffrey Hahn

After feeding on leaves, adults mate and females lay eggs on the bark or into small cracks. Eggs hatch in 7 to 10 days. The whitish larvae, called flatheaded borers, tunnel under the bark creating winding, S-shaped galleries in the phloem and outer sapwood. These tunnels girdle the trunk and branches, interrupting the flow of water and nutrients. The larvae feed until fall and then overwinter as prepupal larvae.

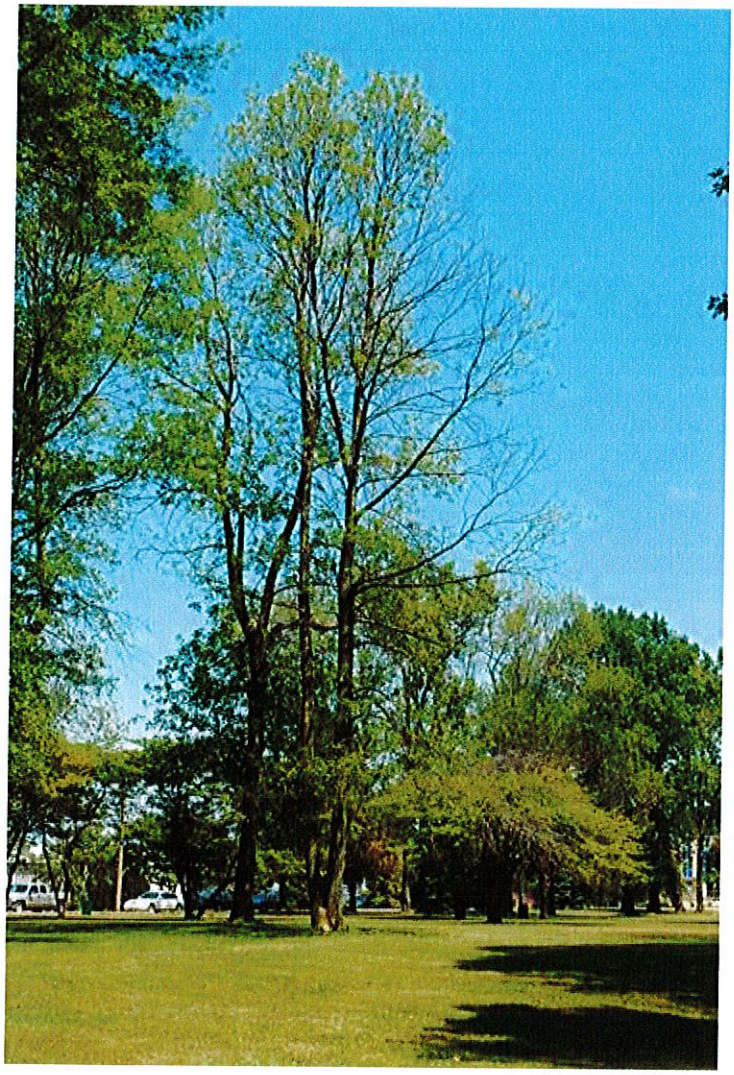

Figure 8. Examining a tree's canopy is not a good method for detecting EAB as there are other causes for ash to decline. - Photo credit: Jeffrey Hahn

Figure 9. EAB galleries. Note how they generally form an S-shape. - Photo credit: Jeffrey Hahn

What can I do to help?

First, don't transport firewood when you go camping or are buying it for home use. Buy the wood you need at local sites or at the campgrounds you are visiting. On its own, most EAB will generally move only about 1/2 to 1 mile a year from infested sites. But with help from people, it can travel hundreds of miles when carried in firewood and other wood products or nursery stock.

Next, be aware of what an EAB looks like as well as the symptoms of an EAB infested tree. Report any suspect insects or declining ash trees (see the following section "What can I do if I suspect I have found EAB?"). There have been many cases where the public was the first to find an initial infestation in an area.

Figure 9. D-shaped exit holes - Photo credit: Jeffrey Hahn

What can I do if I suspect I have found EAB?

First, use the diagnostic page (2,248 K PDF) to see if you can clearly rule out EAB. If, after you have gone through this page, you can't easily rule out EAB, then contact the Minnesota Department of Agriculture (MDA) on their Arrest the Pest phone line at 1-888-545-6684 to report your suspicions.

Should I be planting or removing ash?

Because of the overabundance of ash in urban landscapes and other sites, it is strongly recommended not to plant additional ash. Consider the other woody plant options that are available to Minnesotans. The more diverse the plantings of trees in the urban landscape are, the better neighborhoods can tolerate future pest problems.

However, if you have an ash in your yard and it is healthy, there is no reason to remove it. As long as it is a low maintenance plant, keep it in your landscape.

Should I treat my ash?

There are several factors to consider when deciding whether to treat your ash. First, if your ash tree(s) is within 15 miles of a known infestation, it is at a higher risk of being attacked by EAB. Currently, EAB has been confirmed in four counties in Minnesota: Ramsey, Hennepin, Houston, and Winona. If your tree(s) is beyond 15 miles from any known infestation, it is not advised to treat it until at least EAB is confirmed in your area. The further your ash is from a known occurrence of EAB, the less likely that it will become infested.

Also consider the health of your ash. The tree is a good candidate to protect if it still has most or all of its canopy. However, if it has lost half of its canopy or more, it is in poor health and treatment is very unlikely to be effective. Also consider the tree's importance to you. If it is a valued tree, then considering protecting it. Healthy, mature trees improve the attractiveness of a landscape, raise property values, help reduce energy costs, and decrease storm water runoff.

See also Managing Emerald Ash Borer: Decision Guide (764 K PDF)

The insecticides available for treating EAB have been shown to be effective in protecting ash in University research trials. Some products are available to residents so they can treat ash themselves. However, larger ash trees (> 15 inches d.b.h., i.e. at 4 1/2 feet above the ground) are generally best treated by a professional arborist. Trees do not build up any resistance because of the insecticide applications and need to be treated on a regular basis (every one to two years depending on the insecticide that is used). For specific information on insecticides available for treating EAB, see Emerald Ash Borer: Homeowner guide to Insecticide Selection, Use, and Environmental Protection (788 K PDF).

If you decide that you would rather not treat and protect your ash, consider removing the tree. Keep in mind that the larger the tree is, the more expensive it is to remove. Also, it is easier (and less expensive) to remove the tree while it is alive. Once an ash tree is dead, the branches become brittle making it much more challenging to cut down.

Any time you consider hiring a professional arborist to care for your trees, be sure to ask for certificates of insurance and local references. Get at least two estimates and don't rush into a decision because you are promised a discount. For more information, see How to hire a professional arborist to help care for your landscape trees.

For more information on EAB, see the Extension emerald ash borer page.

Signs and Symptoms of the Emerald Ash Borer

Mary Wilson - Michigan State University

Eric Rebek - Michigan State University Dept. of Entomology

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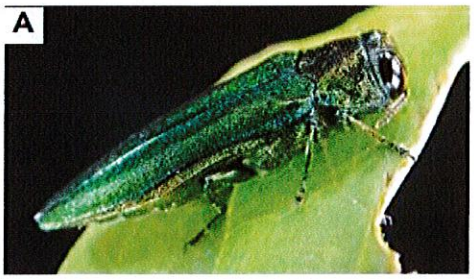
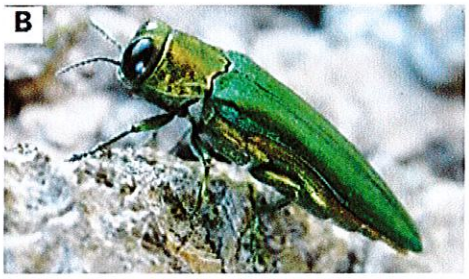
MICHIGAN STATE UNIVERSITY EXTENSION

Adult



Michigan State University



Michigan State University

- Bright, metallic green (Figs. A, B).
- 1/2 inch long, flattened back (Figs. A, B).
- Purple abdominal segments beneath wing covers.

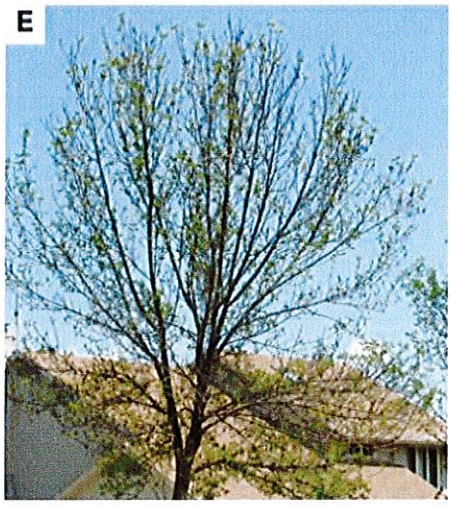
Larva

D. Cappaert, MSU

- Creamy white, legless (Fig. C).
- Flattened, bell-shaped body segments (Fig. C.).
- Terminal segment bears a pair of small appendages.

Canopy Dieback

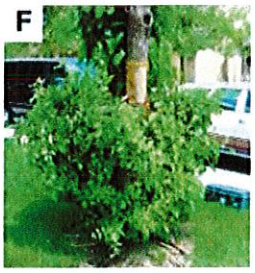
E. Rebek, MSU

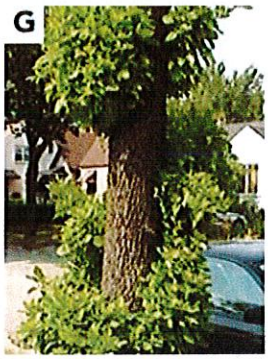


E. Rebek, MSU

- Begins in top one-third of canopy (Fig. D).
- Progresses until tree is bare (Fig. E).

Epicormic Shoots



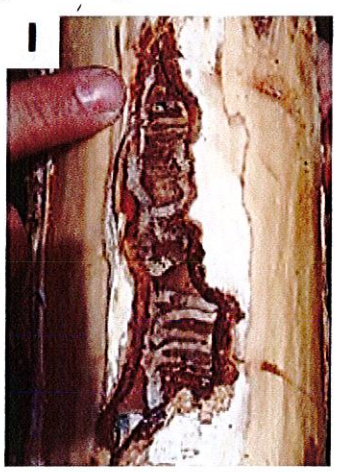


J. Smith, USDA APHIS PPQ

- Sprouts grow from roots and trunk (Figs. F, G).
- Leaves often larger than normal

Bark Splitting

J. Smith, USDA APHIS PPQ



A. Storer, Mich. Tech. Univ.

- Vertical fissures on bark (Fig. H) due to callous tissue formation (Fig. I).
- Galleries exposed under bark split.

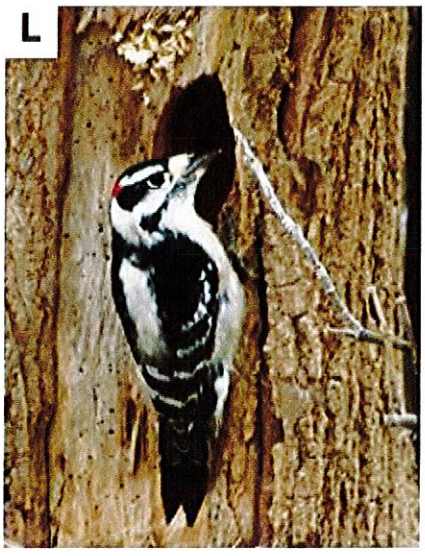
Serpentine Galleries and D-shaped Exit Holes

D. Cappaert, MSU

D. Cappaert, MSU

- Larval feeding galleries typically serpentine (Fig. J).
- Galleries weave back and forth across the woodgrain.
- Packed with frass (mix of sawdust and excrement).
- Adults form D-shaped holes upon emergence (Fig. K).

Increased Woodpecker Activity/Damage



- Several woodpecker species (Fig. L) feed on EAB larvae/pupae.
- Peck outer bark while foraging (Fig. M).
- Create large holes when extracting insects (Fig. M).