

Know about Emerald Ash Borer

Introduction

The emerald ash borer (*Agrilus planipennis*) is an exotic pest, native to Asia, currently threatening the ash (*Fraxinus* spp.) tree resource in the Great Lakes region. The emerald ash borer belongs to a group of insects known as metallic wood-boring beetles (*Buprestidae*). Since its discovery in southeastern Michigan in 2002 it has continued to spread in Michigan and throughout the Midwest.

Infestations also exist in Illinois, Ohio, Indiana, Maryland, Pennsylvania, West Virginia and Ontario, Canada. For a current map of infested areas, go to <http://www.emeraldashborer.info>. Transmission of this pest is accelerated by the transportation of larvae in logs, firewood and nursery stock. The subcortical (beneath the bark) feeding habits of emerald ash borer larvae cause extensive damage to an ash tree's vascular system, depriving the crown of water and nutrients.

The emerald ash borer appears to attack both stressed and healthy trees, typically killing its host in 1-3 years. In Michigan, this insect has caused wide-ranging mortality, including white, green and black ash species. Likewise, Wisconsin's ash resource is threatened by emerald ash borer infestation. Forest inventory and analysis data shows that Wisconsin has approximately 727 million ash trees in its forests. As of late 2007, the emerald ash borer has not been found in Wisconsin, but it may already be here. We need you to be on the lookout for this pest. Early detection, isolation and eradication are our best defenses against this pest.



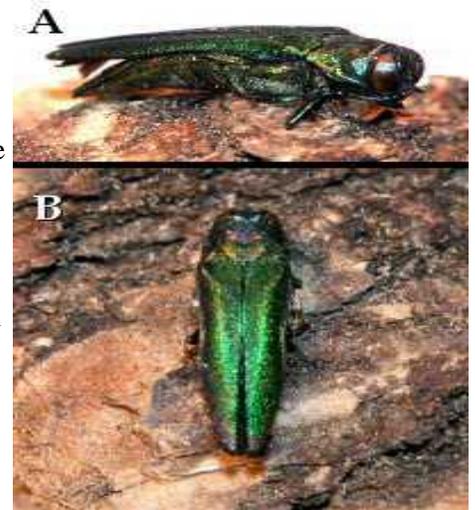
Emerald ash borer

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Identification and Biology

The emerald ash borer adults are metallic green in color and belong to a group of insects known as the metallic wood-boring beetles (*Buprestidae*). Adults are 3/8 - 1/2 inch long and 1/16 inch wide. Adult emerald ash borer emerge through the bark of ash trees in the early summer, creating a D-shaped exit hole as they chew their way out of the tree. Based on observations of emerald ash borer populations in Michigan, adult emergence is staggered, beginning in early June and continuing through late July. Emerald ash borer adults live approximately three weeks and have been observed well into August. Adults are most active during the day, favoring warm, sunny weather. Adults are often found feeding on the margin of ash tree foliage. Mating occurs soon after adult emergence, with egg laying occurring a few days later. Eggs are laid singularly in bark crevices, with females laying 60-90 eggs throughout their lifetime. As eggs hatch first instar larvae chew into the bark until they reach the cambial region.

Emerald ash borer larvae are white in color, slightly flattened and have a conspicuous pair of brown pincher-like appendages (*urogomphi*) on the last abdominal segment. The size of larvae varies as they pass through each instar, with mature larvae averaging 1¼ inches in length. As larvae feed they wind back and forth, creating characteristic serpentine shaped galleries in the phloem and outer sapwood. As mature larvae complete feeding in the fall they excavate a pre-pupal chamber in the outer sapwood where they stay to overwinter. Pupation occurs in this same chamber the following spring, thus completing the life cycle.



Emerald ash borer adult.

A) Side View and B) top view.

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Host Trees

The emerald ash borer appears to feed exclusively on ash tree species in North America. Thus, the four native species of ash in Wisconsin, white (*Fraxinus americana*), green (*Fraxinus pennsylvanica*), black (*Fraxinus nigra*) and blue (*Fraxinus quadrangulata*) are all susceptible to this pest. Ash trees are quite abundant in Wisconsin, with estimates as high as 727 million trees total, and are commonly found in both urban and forest settings. Ash is a component of three forest types in Wisconsin including 1) Elm / Ash / Cottonwood, 2) Northern Hardwood and 3) Oak / Hickory. An ash tree is most easily identified by its opposite branching pattern (two branches come off the main stem, one on each side and opposite each other) and compound leaves with 5-11 leaflets. Leaflets are moderately toothed and may be stalked or sessile.



**Compound Leaf with 7
toothed leaflets.**

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**Opposite branching pattern of ash
trees.**

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Symptoms and Signs

The symptoms associated with emerald ash borer infestations are almost identical to those of other common ash pests and diseases. Therefore, it is important to look for a combination of at least 2 or more symptoms or signs before concluding that the emerald ash borer is present. The following symptoms and signs are commonly associated with emerald ash borer infestations.

Symptoms



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Carlson, WI DNR

Crown dieback:

Dieback of the upper and outer crown. Trees begin to show dead branches throughout the canopy, beginning at the top. Foliage in the top of the tree is thin and discolored.



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Sprouting:

Sprouting at the base and/or on the bole of the tree. Trees may sucker excessively both at the base of the tree and on the trunk, often just above where the larvae are feeding.



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Bark splits:

Vertical splits in the bark are caused due to callus tissue that develops around larval galleries. Larval galleries can often be seen beneath splits.

Signs



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D-shaped emergence holes:

As adults emerge from under the bark they create an emergence hole approximately 1/8 inch in diameter.



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S-shaped larval galleries:

As larvae feed under the bark they wind back and forth, thus creating galleries that are packed with frass and follow a serpentine pattern.



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Larvae:

Larvae are cream-colored, dorso-ventrally flattened and have pincher-like appendages (*urogomphi*) at the end of their abdomen. Mature larvae reach 1 1/4 inches in length and all larvae are found feeding beneath the bark.



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Adults:

Adult beetles are metallic green in color and are 3/8 - 1/2 inch in length and 1/16 inch in width.

Other Pests and Diseases

There are a number of pests and diseases that cause symptoms similar to those induced by the emerald ash borer. It is important to note that when determining whether the emerald ash borer is present you will typically find a combination of at least two of the symptoms or signs previously described.

Insect Pests

Other wood-boring and phloem-feeding pests of ash include moth, beetle and fly larvae. A distinguishing characteristic between these pests and the emerald ash borer is that the exit holes of the former are circular while those of the emerald ash borer are D-shaped. The following pests are the most commonly found developing in ash trees:

Clear winged moths (*Lepidoptera: Sesiidae*)

- Banded Ash Clearwing (*Podosesia aureocincta*)
- Ash borer (trunk borer) (*Podosesia syringae*)

Bark beetle (*Coleoptera: Curculionidae*)

- Eastern ash bark beetle (*Hylesinus aculeatus*)
- Northern Ash Bark Beetle (*Hylesinus criddlei*)
- White-Banded Ash Bark Beetle (*Hylesinus fasciatus*)

Long-horned beetles (*Coleoptera: Cerambycidae*)

- Redheaded ash borer (*Neoclytus acuminatus*)
- Banded Ash Borer (*Neoclytus caprea*)

Diptera: Agromyzidae

- Ash cambium miner (*Phytobia* spp.)

Disease, Decline and Environmental Stressors

Fungi, phytoplasmas and environmental stressors can also be found negatively impacting ash tree vigor in Wisconsin. These biotic and abiotic agents typically induce gradual decline and branch dieback, symptoms similar to those caused by the emerald ash borer. Thus, it is important to look for additional symptoms caused by the emerald ash borer such as D-shaped exit holes and S-shaped larval galleries on and under the bark, respectively. The following biotic and abiotic stressors are typical of ash in Wisconsin:

- Verticillium wilt (*Verticillium dahliae*, *V. albo-atrum*)
- Ash yellows (*phytoplasmas*)
- Ash decline (environmental agents)
- Drought (environmental)

Links

Detailed information on these pests & diseases can be found at:

The Bugwood Network at: <http://forestpests.org/ash/index.html>

Wisconsin Garden Facts at: <http://uwex.edu/ces/wihort/GardenFacts.html>

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Circular exit hole damage produced by ash bark beetles.
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Brooming symptom of ash yellows on ash. Note the lack of apical dominance in the brooms that is typical of ash yellows.
© photo by Mark Guthmiller, WI DNR

What You Can Do

There are a few simple precautionary measures you can take to prohibit the transmission and spread of this pest into Wisconsin.



Firewood Facts, Rules & Advice

<http://dnr.wi.gov/invasives/firewood>

- Be on the lookout for this pest!
- Be cautious when transporting or purchasing firewood by knowing where it came from. Never bring firewood from a known emerald ash borer infested area into Wisconsin.
- Keep an eye on the ash trees near your surroundings and maintain tree vigor by watering trees if the weather has been overly dry.
- Report any suspected emerald ash borer infestations (if 2 or more symptoms or signs are present) by contacting the Department of Agriculture, Trade and Consumer Protection on the emerald ash borer Hotline at 1-800-462-2803.