



What is Emerald Ash Borer?

Daniel A. Herms, Associate Professor, Department of Entomology, Ohio Agricultural Research and Development Center, and State Specialist, Ohio State University Extension

Emerald ash borer (*Agrilus planipennis*) is an exotic, invasive wood-boring insect that infests and kills native North American ash trees (*Fraxinus* spp.), both in forests and landscape plantings. Just like chestnut blight and Dutch elm disease before it, EAB is capable of eliminating an entire tree species from forests and cities throughout the land. This makes it one of the most serious environmental threats now facing North American forests.



History

Emerald ash borer was unknown in North America until June 2002, when it was discovered killing ash trees in southeast Michigan and neighboring Windsor, Ontario. It is native to eastern Russia, northeastern China, Mongolia, Taiwan, Japan and Korea, where it occurs on several species of ash. It was probably imported into Michigan via infested ash crating or pallets at least 15–20 years ago. Since its accidental importation, EAB has infested and killed millions of trees in southeast Michigan and northwest Ohio.

Economic and Ecological Impact

All major North American ash species have been killed by emerald ash borer, which infests trees ranging in size from saplings to fully mature trees in forests. While most native borers kill only severely weakened trees, emerald ash borer kills healthy trees as well, making it especially devastating.



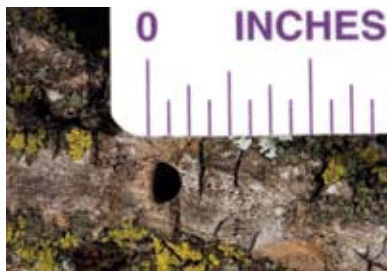
The economic and ecological impact of emerald ash borer has already been substantial, and it will be staggering as this exotic pest continues to spread. EAB has the potential to virtually eliminate ash from North American forests, with dramatic effects on ecosystem processes as well as plant and animal communities. Ash species, which inhabit a variety of soils and ecosystems, are dominant throughout the forests of eastern North America. A study by the U.S. Forest Service found there to be more than 3.8 billion white ash trees in Ohio, and the Ohio Department of Natural Resources estimates that one in every 10 trees in the state is an ash. The standing ash timber in Ohio is valued at more than \$1 billion. Prior to the arrival of EAB, ash was one of the most important nursery and landscape species in the United States. According to the U.S. Department of Agriculture, wholesale value of ash sold by Ohio nurseries exceeded \$2 million in 1998, and the Ohio Nursery and Landscape Association reported that the value of the standing crop exceeded \$20 million, a market that has been eliminated by this diminutive insect.



The costs of removing dead and dying ash trees have overwhelmed municipal budgets in many of the affected counties, and private property owners must often pay in excess of \$1,000 per tree for removal of large shade trees. Alternatively, they are faced with annual costs of insecticide treatments, which can quickly exceed that amount. A quarantine on ash timber has also had a negative economic impact on sawmills, tool handle factories, and firewood dealers in Michigan and Ohio.

Taxonomy and Biology

Taxonomically, emerald ash borer is a beetle (Coleoptera) belonging to the family known as metallic wood-borers (Buprestidae). Adults of many species in this family are brightly colored with a metallic glint, making them favorites of collectors. Larvae of these beetles are known as flatheaded borers, deriving their common name from the larval stage, which appears to have a broadly flattened head (it is actually the thorax which mostly conceals the much smaller head). EAB larvae are white with a long (about one inch when mature) narrow, segmented abdomen that is also flattened, which gives them the appearance of small tapeworms. Adults are elongate, half inch-long beetles with striking, metallic green coloration.



Emerald ash borer belongs to the same genus (*Agrilus*) as bronze birch borer (*A. anxius*) and twolined chestnut borer (*A. bilineatus*), which are both native to North America. The biology of emerald ash borer is quite similar to its native relatives. Typically, there is one generation each year, although development can take two years in newly infested trees that are still healthy. Adults emerge from late May through early August, with emergence peaking in early July. As adults emerge, they leave small (one-eighth of an inch), distinctly D-shaped exit holes in the trunk and main branches, which is a sure sign of infestation. Adults feed on foliage for one to two weeks prior to

mating. Females produce about 50 to 100 eggs, which are laid individually on the bark surface or within bark cracks and crevices. Observations indicate that higher branches and upper portions of the trunk are colonized initially, making it difficult to detect early infestations.

As larvae hatch, they tunnel into the tree, where they feed through the summer and early fall on the phloem and outer sapwood, excavating S-shaped, serpentine galleries just under the bark. Larvae continue to feed through summer and into the fall, with most completing their development prior to over-wintering in the outer bark or just under the inner bark within the outer inch of sapwood. Pupation occurs in mid- to late-spring. Adults emerge soon thereafter to complete the typical one-year cycle.

Host Plants and Host Impact

Ash species known to be infested by emerald ash borer include green (*Fraxinus pennsylvanica*), white (*F. americana*), black (*F. nigra*), and blue ash (*F. quadrangulata*), as well as horticultural cultivars of these species. Only living trees are colonized. EAB will not colonize a dead tree. Native host plants in Asia also include ash species, with Manchurian ash (*F. mandshurica*) and *F. chinensis* being primary hosts.

Adult beetles feed on foliage, resulting in irregular, jagged-edged patches of missing tissue along the leaf margin, the impact of which is negligible. The larva is the damaging stage, girdling the tree as it tunnels under the bark where it feeds primarily on phloem and xylem tissue. This disrupts the flow of carbohydrates and water between the canopy and roots, which results in canopy thinning, branch dieback, and finally tree death, typically within two to four years of initial infestation.

For more information, check out <http://ashalert.osu.edu>.

The Ohio State University
College of Food, Agricultural, and Environmental Sciences
Section of Communications and Technology

