

# Emerald Ash Borer: A Potential Future Threat to Ash Trees in Florida<sup>1</sup>

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## Overview

The emerald ash borer (EAB) is an invasive, exotic beetle that was first detected in the United States in 2002. To date, it has killed tens of millions of ash trees (*Fraxinus* spp.). It is very likely that the EAB will reach Florida in the years to come. This beetle will likely cause a significant decline of ash species in both urban and natural settings. Slowing the spread of the EAB has been difficult in the Midwest, but due to restrictions on the movement of firewood, some progress in slowing the spread has been achieved. The newest outbreak this year was in Tennessee, which is over 200 miles from the southern end of its distribution in Kentucky, far beyond the natural dispersal ability of the beetle. The Tennessee invasion is therefore likely due to human-assisted movement of the beetle on firewood or nursery stock. In order to prevent entry of the EAB and other damaging pests into Florida, residents are urged to refrain from moving firewood into and around the state.

## Introduction

The emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) was first reported in North America in June 2002 (Haack *et al.* 2002, Muirhead *et al.* 2006, Keller *et al.* 2008). The insect has since moved from Michigan into 15 states, triggering many states to set up sentinel watch programs (USDA 2010a). Figure 1 illustrates the range of the beetle as of May 2011.

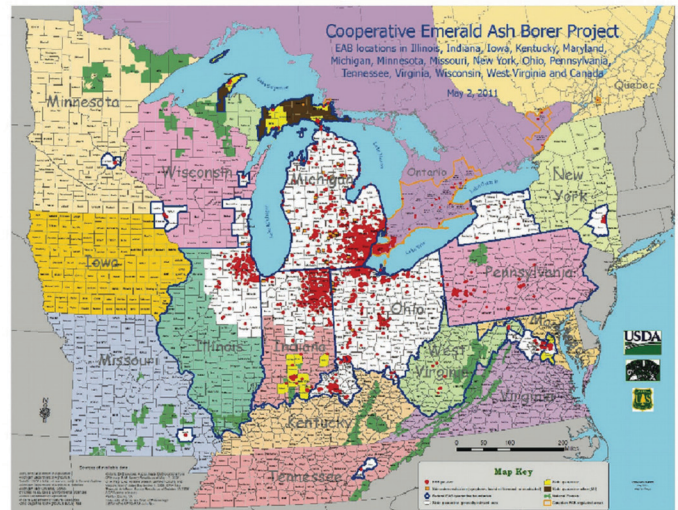


Figure 1. Map showing the range of the emerald ash borer as of May 2011. Note the dots in Missouri and Minnesota, indicating that the beetle has moved far beyond its natural dispersal ability. These infestations are likely due to the movement of firewood or nursery material infested with the emerald ash borer. [http://www.emeraldashborer.info/files/MultiState\\_EABpos.pdf](http://www.emeraldashborer.info/files/MultiState_EABpos.pdf)

Since its introduction, the beetle has moved further west, south and east. As of yet, no climatic or biological barrier has been observed; there seems to be little stopping the beetle and it is not known how far it will move. To date, this beetle has killed tens of millions of ash trees (emeraldashborer.info 2011).

The EAB is native to China, Japan, North Korea, and Taiwan (Haack *et al.* 2002). In its native range, EAB has not

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led to the wholesale destruction of hardwood forests or ash trees (*Fraxinus* spp.) (Haack *et al.* 2002). Yang *et al.* (2005) note that native Asian trees in the genera of *Fraxinus*, *Juglans*, *Ulmus*, and *Pterocarya* are reported as hosts for EAB. Additionally, the North American ornamental ash species, *Fraxinus velutina*, *F. americana*, and *F. pennsylvanica* planted in urban settings in China were attacked by the EAB. Interestingly, in North America, the genera of *Juglans* and *Ulmus* have not yet been attacked by the EAB (Anulewicz *et al.* 2006).

## Potential for EAB to occur in Florida

Florida faces a high probability of infestation from EAB since several ash species are native to the state and the beetle is tolerant of the warm climate in Taiwan, which geographically lies further south than Florida. From the Midwest to Florida, there are enough ash species in the urban and natural landscape for the EAB to naturally disperse here. Florida has three (or four depending on your taxonomic classifications) species of ash, two of which are common in the Midwest.

Ash species common in both Florida and the Midwest are white ash (*F. americana*) and green or pumpkin ash (*F. pennsylvanica*). A third species, Carolina or pop ash (*F. caroliniana*), occurs throughout Florida and ranges into the Appalachian piedmont. White ash is an upland species; Carolina and green ash are either obligate or facultative wetland species (Plant Atlas 2010).

If the EAB does arrive in Florida, tree mortality here will likely be perceived differently from ash mortality in the Midwest. This is because ash trees are not commonly used in the urban landscape in Florida as they are in the Midwest; the two more common species in Florida are restricted to wetlands. In the Midwest, ash was often used to replace elm trees killed by Dutch elm disease. As a result, a monoculture of green ash is common in many residential and urban areas. In the Midwest, management has focused on the removal of EAB-infested trees in urban areas. Since many ash trees in Florida are associated with wetlands, the presence of the EAB is not likely to be as big a concern for homeowners. It also means that there will be limited management of infested trees due the difficulty of working in wetlands. Therefore, the EAB population in Florida could explode, and decimate Florida's population of native ash trees.

## Description and Biology

The emerald ash borer is a member of the Buprestidae family, a group of insects known as metallic, jewel, or flathead borers (Borror *et al.* 1989). Seen from the side, the beetle has an iridescent green exoskeleton and a yellowish/gold abdomen (figure 2). Buprestids are beetle species that attack both living and non-living trees and create conspicuous holes on the trunks of trees. Adult EAB range in size from 1–1.5 cm (3/4 inch to 5/8 inches) and often have a metallic, coppery green sheen. The elytra (stiff outer wings) cover the entire abdomen of the beetle. If the elytra are separated, six iridescent reddish segments can be seen. The antennae of the beetle are serrate in form, arise from just below the eyes, and have eleven segments (Choate 2003).



Figure 2. An adult emerald ash borer.

Credits: David Cappaert, Michigan State University, Bugwood.org

In the summer after the adults emerge, females lay between 30–60 bright yellow eggs that turn a tawny brown color. Larvae hatch in about two weeks, develop a creamy white appearance and have companulate (bell-shaped) segments with dark spines at their posterior end (Anulewicz *et al.* 2006), (Figure 3). Larvae feed on phloem cells and may bore into the sapwood to some degree. The larvae overwinter under the bark, emerging in May or June. When they emerge as adults they leave behind a characteristic “D” shaped exit hole (Figure 4). Adults mate within a few weeks of emergence to start the cycle again (Liu *et al.* 2003, Yang *et al.* 2005, Anulewicz *et al.* 2006). During the summer when the adult beetles are outside the tree, they will feed on ash leaves; damage may or may not be obvious (Cappaert *et al.* 2005).

Ash tree decline and death is the result of the EAB larvae feeding on the sugar and water conducting cells that occur just beneath the bark. Feeding damage by the beetles disrupts the water flow in a tree, eventually starving it of water and nutrients.



Figure 3. Emerald ash borer larva.

Credits: David Cappaert, Michigan State University, Bugwood.org



Figure 4. Conspicuous "D" shaped emergence holes of the EAB.

Credits: Toby Petrice, Forest Service, Bugwood.org

## Management

In Florida, the EAB survey program is a joint effort between the USDA – Cooperative Agriculture Pest Survey program (CAPS) and the Florida Department of Agriculture and Consumer Services – Division of Plant Industry (FDACS-DPI). Currently, there are approximately 200 traps being monitored by CAPS and DPI personnel across Florida (FDACS-DPI).

The EAB outbreak in the Midwest was only on ash trees, and researchers have been able to demonstrate that in North America, the beetle preferentially chooses *Fraxinus* species over *Ulmus* (elm), *Juglans* (walnut), *Carya*

(hickory), and *Celtis* (hackberry) (Anulewicz *et al.* 2008). As long as EAB does not widen its host range, the urban management of ash trees in Florida will primarily consist of removing infested and dead trees and protecting non-infested trees in urban areas. There have been attempts to manage newly infested trees through chemical control. A variety of pesticide control techniques have been explored by Cappaert *et al.* (2005), including macro- and micro-insecticide injections, soil drenches, and protective cover sprays. As of yet, it does not appear that 100% control can be achieved. Some insecticide management has worked to keep individual trees alive, but success is affected by initial tree health, species or varieties treated, environmental conditions, and frequency of reapplication. It appears that as long as the EAB is present, chemical treatments will have to continue if ash trees are to be kept alive (Herms *et al.* 2009).

When trees die from EAB infestations, the wood should never be transported outside of the range of the nearest solid waste landfill or wood disposal site. The transport of diseased trees has greatly increased the rate at which EAB and other wood-boring insects move across the landscape (USDA 2010b).

In August 2010, in response to the threat of exotic wood boring insects, the Florida Legislature developed a rule to limit the transport of unfinished wood products in Florida, FAC Chapter 5B-65. The rule specifically targets the movement of firewood and other untreated forest products more than 50 miles. This rule exempts the movement of trees/wood that were grown for silviculture.

## Wood Management Recommendations

- Do not transport firewood into Florida from other states or move wood from place to place within Florida. Emerald ash borer and other dangerous pests and diseases can hitchhike on firewood and infest new areas.
- When building a fire, use local firewood only.
- Burn all firewood at your campsite before you leave.
- Do not take any firewood home with you from a camping trip.
- Do not move nursery stock of known hosts from infested areas to non-infested areas.

## Agencies and Institutions Working on the Emerald Ash Borer

Florida Department of Agriculture and Consumer Services,  
Division of Plant Industry

Illinois Department of Agriculture, Division of Natural  
Resources

Maryland Department of Agriculture

Michigan Department of Agriculture

Minnesota Department of Agriculture

New York State Department of Environmental  
Conservation

Pennsylvania Department of Agriculture, Department of  
Conservation and Natural Resources

Purdue University, Purdue Extension

The Ohio State University EAB Outreach Team

United State Department of Agriculture, Animal and Plant  
Health Inspection Service

United States Forest Service

University of Kentucky, School of Agriculture

University of Missouri Extension

Virginia Department of Agriculture & Consumer Services

West Virginia Department of Agriculture

Wisconsin Department of Agriculture, Trade & Consumer  
Protection

### Websites with information on EAB:

<http://na.fs.fed.us/fhp/eab/>

<http://www.emeraldashborer.info>

[http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/emerald\\_ash\\_b/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/index.shtml)

FDACS Division of Plant Industry website: Emerald Ash  
Borer

<http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Forest-Insects/Emerald-Ash-Borer>

FDACS Division of Forestry flyer: Keep an Eye Out for the  
Emerald Ash Borer

[http://www.fl-dof.com/publications/fh\\_pdfs/Keep%20an%20Eye%20Out%20for%20the%20EAB.pdf](http://www.fl-dof.com/publications/fh_pdfs/Keep%20an%20Eye%20Out%20for%20the%20EAB.pdf)

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