QUICK GUIDE SERIES UCF 2014-1

Emerald Ash Borer

Much of the information for this brochure was provided by the USDA Animal and Plant Health Inspection Service, the Colorado Department of Agriculture and Colorado State University Extension.

What is the Emerald Ash Borer?

The emerald ash borer (EAB), *Agrilus planipennis*, is an exotic insect responsible for the death or decline of tens of millions of ash trees in more than 20 states and Canada. Native to Asia, the beetle most likely arrived in the U.S. in the 1990s, hidden in wood-packing materials commonly used for shipping. The first detection occurred in southeastern Michigan in 2002. EAB already has cost communities billions of dollars to treat, remove and replace ash trees. Infestations are difficult to detect, as the larvae reside under the bark, the adults generally are only present from May through September, and ash trees may be infested for up to four years before there are visible signs of decline.

Figure 1. *Adult emerald ash borers are approximately ½-inch long. Photo: David Cappaert, Michigan State University*

Potential Impacts in Colorado

In Colorado, EAB was detected for the first time in September 2013 in the City of Boulder. As a non-native insect, EAB has no native predators to keep populations in check, and threatens all true ash species (*Fraxinus spp.*). As a result, the beetle poses a serious threat to Colorado's urban forests, where ash trees comprise an estimated 15 percent to 20 percent of all trees; the Denver Metro area alone has an estimated 1.45 million ash trees. Green and white ash, including 'Autumn Purple' ash and other varietals, have been widely planted in Colorado due to their fast growth, ability to tolerate urban growing conditions and high aesthetic value. Many of the state's ash trees are located on private property and in parks and other community areas.

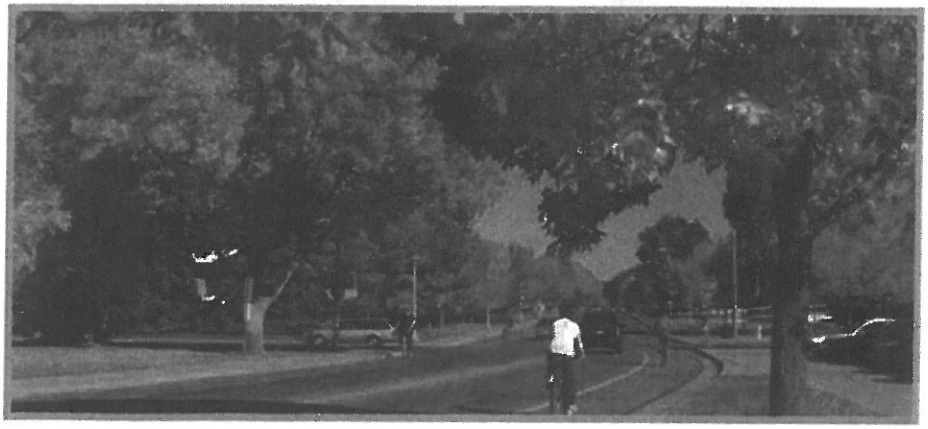

Figure 2. *Ash trees comprise an estimated 15 percent to 20 percent of all trees in Colorado cities, neighborhoods, parks and backyards. Photo: Colorado State University Facilities*

This quick guide was produced by the Colorado State Forest Service to promote knowledge transfer.

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Commonly mistaken for EAB:

Lilac/ash borer exit holes

Figure 3. *When lilac/ash borers exit an ash tree, they create irregular round holes. Photo: Whitney Cranshaw, Colorado State University*

Other metallic wood borers

Figure 4. *Several metallic green beetles are native to Colorado, including* Phaenops gentilis *(left) and* Buprestis langii *(right), both associated with declining or recently killed conifers. Photo: Whitney Cranshaw, Colorado State University*

Flatheaded appletree borer

Figure 5. *Dead and dying branches on ash trees may be infested with the flatheaded appletree borer. Photo: James Solomon, USDA Forest Service*

Life History

EAB adults are approximately ½-inch long, with a metallic, emerald-green head/back and a coppery reddish-purple abdomen. The adult beetles consume ash foliage, but cause little damage to affected trees, which allows them to remain unnoticed by homeowners.

Females lay eggs in bark crevices, where they develop into worm-like larvae in the fall. The larvae are cream colored and consist of bell-shaped segments. The EAB larvae feed on the inner bark of ash trees, girdling the tree and disrupting the transportation of water and nutrients, much like mountain pine beetle larvae affect pines.

The tunneling and feeding under the bark is what eventually kills impacted trees. Once the larvae mature into adults in the spring, they emerge from under the bark, leaving D-shaped exit holes. The adult beetles may fly up to a half-mile to infest new trees; however, under certain conditions, they are capable of flying up to several miles. Adults also may re-infest the same tree from which they emerged.

Figure 6. *S-shaped emerald ash borer galleries under the bark. Photo: David Cappaert, Michigan State University**

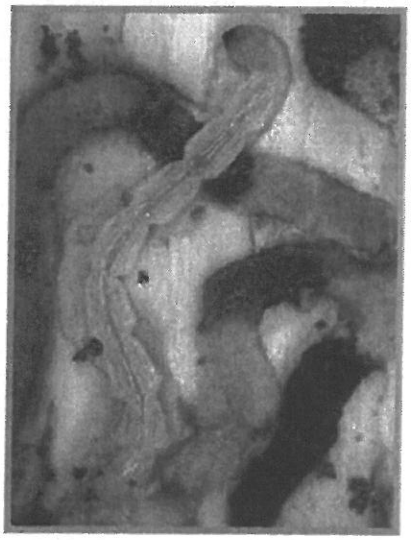

Figure 7. *Emerald ash borer larva. Photo: David Cappaert, Michigan State University**

Figure 8. *Adult beetles can fly approximately a half-mile to infest a new tree. Photo: Howard Russell, Michigan State University**

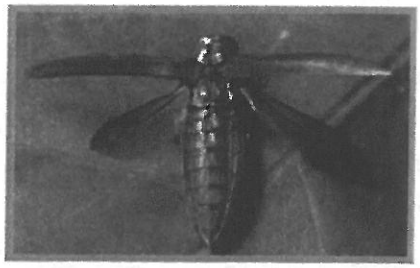

Figure 9. *EAB adults have an emerald-green head/back and a coppery reddish-purple abdomen. Photo: David Cappaert, Michigan State University**

Ash Tree Identification

Only ash trees are at risk from EAB – but all species of true ash (*Fraxinus spp.*) are at risk. To detect an EAB infestation, it is important to first identify the type of tree in question to ensure that it is an ash tree. In Colorado, ash trees can be found in most communities, although many private landowners may not realize they have them. Ash trees have the following characteristics:

- Leaves are compound, which means multiple leaflets occur on a common stalk, and typically have five to nine leaflets. The exception is single-leaf ash (*Fraxinus anomala*), which may have simple or compound leaves, with up to five leaflets.
- Leaflets are smooth or finely toothed along the edges.
- Seeds on female trees are paddle-shaped.
- Branches and buds grow in pairs, directly opposite from each other.
- Mature bark displays diamond-shaped ridges.

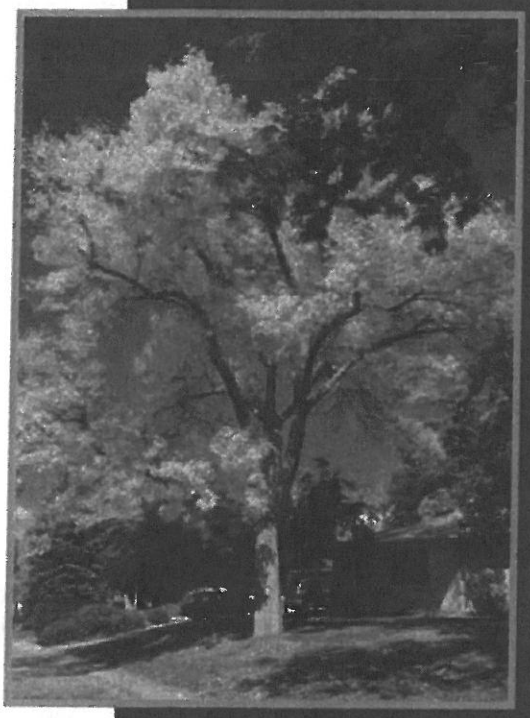

Figure 10. *Ash trees have been planted extensively in Colorado over the last 50 years because they grow quickly and can tolerate the growing conditions in urban areas. Photo: William M. Ciesla*

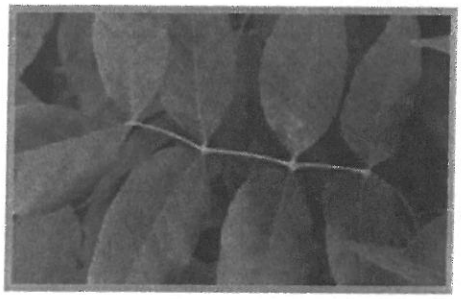

Figure 11. *Ash trees have five to nine leaflets on each stalk. Photo: Robert Vidéki, Doronicum Kft.**

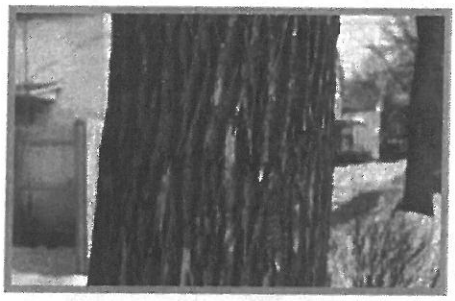

Figure 12. *The bark on mature ash trees has diamond-shaped ridges. Photo: Richard Webb, horticulturist**

Figure 13. *Seeds on ash trees are paddle-shaped. Photo: Franklin Bonner, USDA Forest Service**

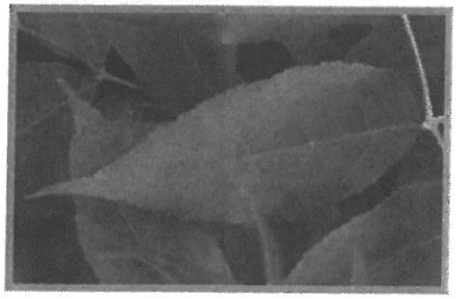

Figure 14. *Ash leaves can either have smooth or finely toothed edges. Photo: Robert Vidéki, Doronicum Kft**

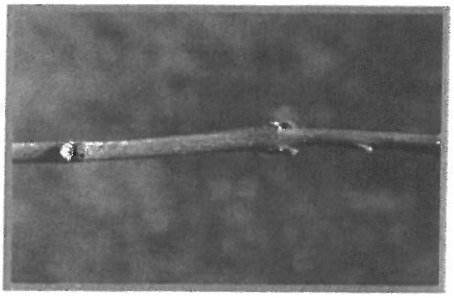

Figure 15. *The buds on ash trees grow in pairs, directly opposite from each other. Photo: Paul Wray, Iowa State University**

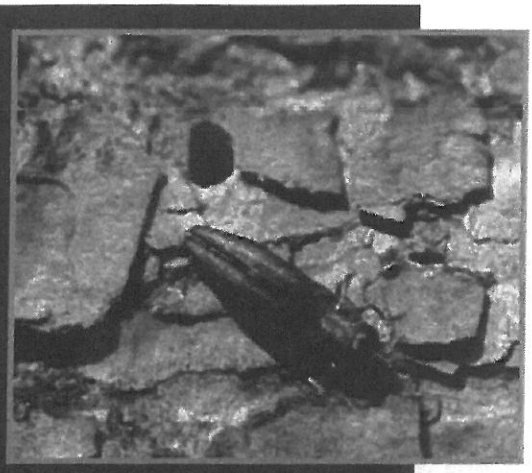

Figure 16. *EAB is responsible for the death or decline of tens of millions of ash trees in more than 20 states. Photo: Jared Spokowsky, Indiana Department of Natural Resources**

Figure 17. *New sprouts grow on the lower trunk of an ash tree infested with EAB. Photo: James W. Smith, USDA APHIS PPQ**

Figure 18. *Woodpeckers are an important predator of EAB. Photo: David Cappaert, Michigan State University**

Signs and Symptoms of EAB Infestation

Signs of EAB infestation include:

- Sparse leaves or branches in the upper part of the tree
- D-shaped exit holes approximately ⅛-inch wide
- New sprouts on the lower trunk or lower branches
- Vertical splits in the bark
- Winding, S-shaped tunnels under the bark
- Increased woodpecker activity

If an ash tree is experiencing dieback or appears unhealthy, have it examined by a professional. Landowners that suspect the presence of EAB in their ash trees should visit the website www.eabcolorado.com, contact the Colorado Department of Agriculture (CDA) at (888) 248-5535 or send an email to CAPS.program@state.co.us.

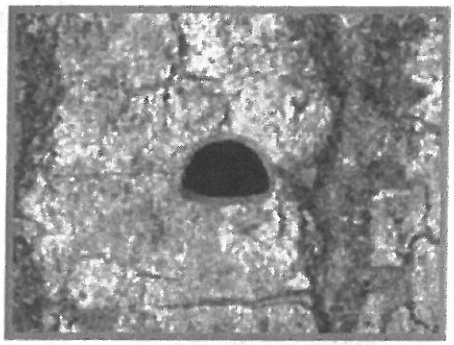

Figure 19. *D-shaped exit holes can indicate the presence of EAB. Photo: Pennsylvania Department of Conservation and Natural Resources**

Figure 20. *Ash trees may be infested with EAB for up to four years before signs of decline are visible. Photo: David Cappaert, Michigan State University**

Figure 21. *Vertical splits in the bark are another sign that EAB has infested the tree. Photo: Joseph O'Brien, International Society of Arboriculture**

Figure 22. *S-shaped tunnels or galleries can be found under the bark of an infested ash tree. Photo: Ryan Lockwood, CSFS*

Responding to EAB

Quarantines

Like many other states, Colorado has established a quarantine and detection process to prevent the spread of EAB into new areas, and to reduce the impacts of EAB on ash trees in already impacted areas. The EAB quarantine prohibits the movement of all regulated material that has not met treatment requirements – which includes ash nursery stock, green lumber, ash wood products, all hardwood firewood and related products – out of EAB-regulated areas. To legally move regulated material out of a quarantined area, it must meet the treatment options defined by the federal quarantine. For updated information on the Colorado EAB quarantine and treatment requirements, visit www.eabcolorado.com.

Figure 23. *A CSFS forester and CSU Extension specialist assess the branch of an ash tree to determine the presence of EAB. Photo: Ryan Lockwood, CSFS*

Management & Prevention

The best EAB management option depends on the value of each ash tree to a landowner, and the costs associated with each option. Options for treating at-risk or infested trees include removal, replacement and chemical treatments. For more information about treatment options, visit www.eabcolorado.com.

Tree Removal

Trees killed by EAB will need to be removed at some point, but homeowners who are concerned about future infestation also may elect to remove dying or even healthy trees. Trees may become more expensive to remove as they decline and after they have died. Dead and dying trees also may represent a hazard to surrounding property and infrastructure. When choosing to remove an ash tree, it is best to hire a licensed and insured arborist or tree service company. A list is available at http://www.isa-arbor.com/publicOutreach/findATreeCareService/index.aspx.

Figure 24. *Planning for tree replacement is an effective management strategy for EAB. Photo: Vince Urbina, CSFS*

Tree Replacement

Planning for tree replacement can begin prior to the removal of an ash tree. To reduce the impacts of EAB and other insect and disease threats in Colorado's urban and community forests, the Colorado State Forest Service encourages diversity when planting new trees. A single type of tree should comprise no more than 10 percent of all trees in a planted landscape. Ash trees (*Fraxinus* spp.) have been widely planted in Colorado, but due to the risk of EAB, future plantings are not recommended. The Colorado Tree Coalition maintains a list of trees suitable for planting in Colorado communities, which is available at www.coloradotrees.org/PDFs/TreeRecommendationList.pdf.

Chemical Treatments

Homeowners may opt to periodically apply insecticide treatments to help protect high-value trees; however, the early presence of EAB in Colorado may not warrant immediate preventive treatment. When an EAB population is low and known to occur in only a few isolated areas, treatments are not recommended for ash trees located more than 5 miles from the known boundary of the infestation. However, recommendations regarding EAB treatments in specific areas of Colorado will change over time, as the extent of the infestation broadens and EAB populations rise. Current information on the extent of the EAB infestation within the state is available at www.eabcolorado.com.

Figure 25. *A syringe-like applicator is used to inject imidacloprid to control EAB. Photo: David Cappaert, Michigan State University**

Trees not treated with an insecticide are at higher risk of EAB damage than those managed with periodic treatments. Ash trees can be chemically treated if they are healthy or are showing only early signs of EAB. If a tree appears unhealthy, or is showing many outward signs of EAB, it most likely is too late to save the tree. Talk to a forestry professional first when considering the use of chemical treatments to protect high-value trees, and only hire licensed professionals certified by the Colorado Department of Agriculture to administer treatments.

Don't Move Firewood!

Removed ash trees can be used for firewood or mulch at the removal site. However, this wood should not be transported to other locations due to the high risk of spreading EAB to healthy trees. Remember, moving regulated wood materials outside of a quarantine area is illegal and punishable by significant fines.

Never transport firewood or other untreated products from ash trees, including logs or nursery stock, as this is the most likely method of accidental spread. Transporting firewood is a primary cause of many costly insect introductions, often due to the larvae's ability to survive under the bark. When wood is moved from one place to another, pests can hitchhike to new locations and spread further. More information is available at www.dontmovefirewood.org.

For More Information

- General EAB information: www.EmeraldAshBorer.info or http://stopthebeetle.info
- EAB in Colorado (survey progress, identification, reporting, quarantine boundaries and treatment options): www.eabcolorado.com
- Facts about insects and diseases that threaten Colorado's trees (Colorado State Forest Service): www.csfs.colostate.edu
- Information about the dangers of moving firewood: www.dontmovefirewood.org
- Common problems of ash trees (Iowa State University): www.extension.iastate.edu/Publications/SUL21.pdf
- Treatment options (Colorado State University): http://bspm.agsci.colostate.edu/files/2014/02/EAB-control-options-February-11.pdf
- General tree facts (Colorado Tree Coalition): www.coloradotrees.org/find.php
- Insect Information Website (Colorado State University): http://bspm.agsci.colostate.edu/outreach-button/insect-information/

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