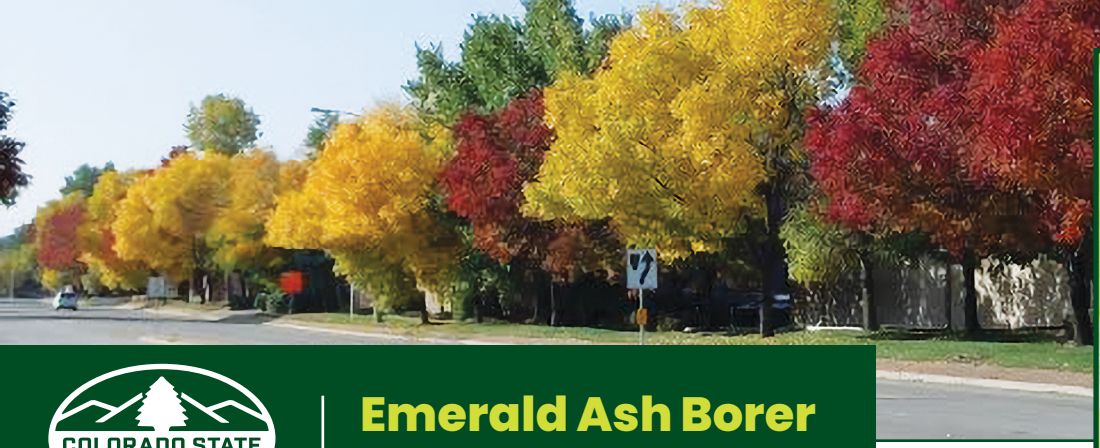




Emerald Ash Borer

Quick Guide Series UCF 2026-1

Left photo: Kathleen Alexander, Boulder Forestry. Right photo: Dan West, CSFS

What is emerald ash borer?

Emerald ash borer (*Agrilus planipennis*; EAB) is an invasive insect responsible for the death of tens of millions of ash trees throughout the eastern United States and Canada. EAB is native to Asia. The first detection of the beetle in the U.S. occurred in southeastern Michigan in 2002, most likely arriving in the 1990s, hidden in wood-packing materials commonly used for shipping.

Since then, EAB has spread in the U.S. and Canada and cost communities billions of dollars to treat, remove and replace ash trees. Infested trees are difficult to detect. The larvae are found under the bark, and adults generally are only visible from May through September. Adults tend to attack the tops of trees first, so ash trees may be infested for three to four years before there are visible signs of decline.

Impacts in Colorado

In Colorado, EAB was first detected in 2013 in the City of Boulder. As a non-native insect, EAB has few native predators to keep populations in check. EAB 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% of all trees. A 2025 study from the Colorado State Forest Service estimated that 18% of the trees in the Metro Denver area are ash trees, amounting to tens of thousands of trees.

Green and white ash, including Autumn Purple® ash and other varieties, have been widely planted in Colorado due to their fast growth, ability to tolerate urban growing conditions and beautiful fall color. Many of the state's ash trees are located on private property and in parks and other community areas. The future costs of EAB in Colorado, in terms of ash tree treatments, removals and replacements, could exceed several billion dollars.



Ash trees comprise an estimated 15% of all trees in Colorado cities, neighborhoods, parks and backyards. Photo: Colorado State University Facilities

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

The Colorado State Forest Service produced this quick guide to promote knowledge transfer.

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csfs.colostate.edu

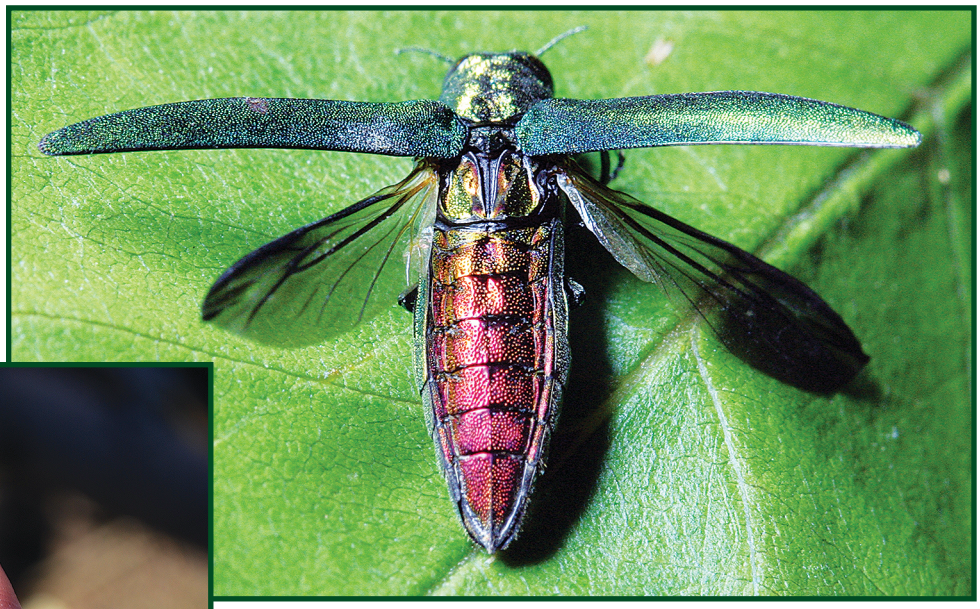
Life history

EAB adults are approximately a half-inch long with a metallic, emerald-green head and 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 until the tree begins to show signs of decline.

Females lay eggs in bark crevices in early summer. After one to two weeks, the eggs hatch and the worm-like larvae chew their way under the bark. The larvae are cream-colored, consist of bell-shaped segments and can average 1 inch in length when fully grown. EAB larvae feed on the inner bark of ash trees, creating S-shaped galleries that harm the tree by disrupting the movement of water and nutrients. The tunneling and feeding under the bark is what eventually kills infested trees.

The larvae mature into adults in the spring of the following year when they emerge through the bark, leaving small, D-shaped exit holes 1/8-inch wide. EAB normally completes its life cycle in one year. The beetles may fly up to several miles to infest new trees or lay eggs in a new portion of the same tree from which they emerged.

*Adult emerald ash borers have an emerald-green head and back and a coppery reddish-purple abdomen. Photo: David Cappaert, Michigan State University**





Emerald ash borer larvae consist of bell-shaped segments. Photo: Ryan Lockwood, CSFS

*An adult emerald ash borer is approximately a half-inch long. Photo: Howard Russell, Michigan State University**



Ash tree identification

EAB only infests ash, olive and white fringetrees. This includes all species of true ash (*Fraxinus* spp.) but does not include mountain ash (*Sorbus* spp.) since it is not a true ash species. In Colorado, ash trees are much more common than olive trees (*Olea europaea*) and white fringetrees (*Chionanthus virginicus*), so the focus in this guide is on ash tree identification.

To detect an EAB infestation, it is important first to identify the tree species to ensure it is an ash tree. In Colorado, ash trees are found in most communities and have the following characteristics:

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

More guidance on ash tree identification is available at **csfs.colostate.edu/eab**.



This green ash tree grows along a street in Grand Junction. Ash trees were planted extensively in Colorado for many decades because they grow quickly and can tolerate the conditions in urban areas. Because of the risk of EAB, ash and fringetree are no longer recommended to plant in Colorado and are restricted by code in most communities.
Photo: Kamie Long, CSFS



Ash trees have five to nine leaflets on each stalk.
Photo: Ryan Lockwood, CSFS



Ash buds are a sooty black or brown, with one larger bud at the end of each shoot bracketed by a pair of smaller buds. Photo: Kamie Long, CSFS



Branches and buds on ash trees grow in pairs, directly opposite each other. Photo: Ryan Lockwood, CSFS



Seeds on female ash trees are paddle shaped.
Photo: Kamie Long, CSFS



The bark on mature ash trees has diamond-shaped ridges. Photo: Ryan Lockwood, CSFS

Signs and symptoms of EAB infestation

When an ash tree is in poor health, it can be difficult to determine if it is impacted by EAB or another issue.

The following are indicators of an EAB infestation:

- Sparse leaves or branches in the upper part of the tree
- New sprouts on the lower trunk or lower branches
- Increased woodpecker activity, including flecking where they may expose the lighter inner bark
- Vertical splits in the bark
- D-shaped exit holes approximately 1/8-inch wide, found on the trunk or branches larger than 1 inch in diameter
- Winding, S-shaped galleries under the bark

Homeowners who suspect the presence of EAB in their ash trees should contact their local municipality, CSU Extension office (**extension.colostate.edu**) or an International Society of Arboriculture (ISA) Certified Arborist (**isa-arbor.com**).



EAB larvae create erratic, S-shaped galleries under the bark. Photo: CSFS



D-shaped exit holes 1/8-inch wide can indicate the presence of EAB. Photo: Ryan Lockwood, CSFS



Ash trees infested with EAB may show sparse leaves and decline in the upper part of the tree. Photo: Ryan Lockwood, CSFS



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

Insects often mistaken for EAB

Other insects may infest ash trees in Colorado, and these pests are commonly mistaken for EAB. A stressed tree could be infested with multiple types of insects. These pests may infest a tree but are not the direct cause of the tree's decline. Identification of the pest is critical, since EAB and other pests require different management strategies.

More information for recognizing wood-boring insects of ash trees in Colorado is available through CSU Extension: **extension.colostate.edu**



*One of the most common ash tree pests, the lilac/ash borer (*Podosesia syringae*) creates irregular round holes visible on the trunk when it exits an ash tree. Photo: Whitney Cranshaw, Colorado State University*



*The flatheaded appletree borer (*Chrysobothris femorata*) can cause dead and dying branches on an ash tree. This borer also leaves D-shaped exit holes, but the holes are slightly larger and wider than EAB. Photo: James Solomon, USDA Forest Service*



*Ash bark beetles (*Hylesinus *spp.) create tiny, pin-sized exit holes in branches. Dieback can be common with branches heavily infested with this beetle. Photo: Kamie Long, CSFS*

Responding to EAB

Ash trees near known infestations are at a higher risk of being attacked by EAB, which can fly several miles to infest new trees. EAB can also be spread by humans through the movement of infested wood. Homeowners who have ash on their property and live near areas where EAB is present should consider management options. The Colorado State Forest Service provides information on locations of EAB infestations in Colorado at **csfs.colostate.edu/eab**.

The best management option to address EAB depends on the value of each ash tree to a homeowner, as well as the costs associated with each option. Options for treating high-value at-risk or infested trees include insecticide treatments and planting a replacement tree nearby. For low-value at-risk or infested trees, options include removal and replacement.



This ash tree in Fort Collins receives an injection of insecticide to prevent an EAB infestation. Photo: Teddy Parker-Renga, CSFS

Insecticide treatments

Ash trees do not have natural defenses for EAB, so trees not regularly treated with insecticide will likely die once infested. Treatment is recommended only if EAB infestations have been verified in a community. If treatment is advised, homeowners can protect high-value trees with treatment by a licensed pesticide applicator every two to four years, based on label instructions and current population levels of EAB. Insecticides will be more effective on healthy trees, trees exhibiting no more than 20-40% canopy decline and trees receiving good tree care, such as proper watering and pruning.

Homeowners should educate themselves and use caution when purchasing products that claim to protect trees against a pest such as EAB. Some of these chemicals can be harmful to beneficial insects. Homeowners should contact their local municipality or CSU Extension office if unsure about a product.



Hiring a professional is recommended for ash tree removal. Photo: Boulder Forestry

Tree removal

Homeowners may elect to remove ash trees prior to infestation if they are unhealthy to allow for future tree replacement, reduced risk and cost savings. In the case of healthy trees, homeowners should weigh the price of removal against treatment. Treatment is much less expensive if the tree is in relatively good condition and can help retain the tree canopy, which provides environmental, economic and other benefits to the home and neighborhood. Trees may become more expensive to remove as they decline.

Trees heavily impacted or killed by EAB result in the wood rapidly becoming brittle, which creates a higher risk for branch or tree failure. If choosing to remove an ash tree, it is best to hire a licensed and insured tree service company with ISA Certified Arborists on staff. A list of certified arborists is available at **isa-arbor.com**. Also, homeowners should contact their local municipality to determine if there are restrictions on who can provide tree care based on local ordinances and if there is a list of licensed arborists.

Tree replacement

Planning for tree replacement can begin prior to the removal of an ash tree, as can planting young trees under existing ash to give them a head start. To reduce the impacts of EAB and other pests in Colorado's urban forests, the Colorado State Forest Service encourages diversity when selecting new trees. A single type of tree species should comprise no more than 10% 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 of ash trees are not recommended.

Many municipalities have programs to support tree replacements or provide recommended tree lists and planting guidelines. The Colorado Tree Coalition also offers a list of the best replacement trees for ash at **coloradotrees.org**.



Planting a replacement tree is an effective strategy for EAB. Photo: Vince Urbina, CSFS

Tips for hiring a tree care professional

- Contact your local municipality to learn if there are ordinances restricting who can provide tree services in your community.
- Make sure the professional is an ISA Certified Arborist; you can verify a certification at **isa-arbor.com**.
- Ask for a written scope of work.
- Verify the professional is insured with both liability insurance and workers' compensation.
- Confirm the professional is a licensed pesticide applicator through the Colorado Department of Agriculture (for insecticide treatment only).
- Contact multiple companies to get at least three quotes.
- Look for customer references.
- Don't fall for high-pressure sales tactics.
- Specify who will remove wood waste and how it will be removed in writing (e.g., mulching).
- Discuss and specify stump removal preferences.

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** Photos are from forestryimages.org.*

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Homeowners should consult a certified arborist, tree service company or licensed pesticide applicator when considering the use of chemical treatments to protect high-value ash trees. They should only hire pesticide applicators licensed by the Colorado Department of Agriculture (**ag.colorado.gov**) to administer treatments.

Don't move firewood!

Never transport firewood or other untreated wood 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 ability of larvae 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 **dontmovefirewood.org**.

DONTMOVEFIREWOOD.org

Ash wood utilization

Removed ash trees can be used for firewood, lumber or mulch at the removal site. However, these materials should not be transported to other locations due to the high risk of spreading EAB to healthy trees.

When you need to transport or dispose of EAB-infested wood, the best method is to remove the tree outside the typical adult flight window and debark the trunk and large limbs or chip the wood into pieces smaller than 1 inch by 1 inch prior to moving it. Removals should be made between October and late April to prevent adults from emerging from the wood during transport. Trees that must be removed during the summer should be taken to a landfill for quick disposal.

EAB resources

The following organizations provide additional information about EAB and tree selection, planting and care in Colorado. Homeowners can also contact their local CSU Extension office or municipality.

Colorado State Forest Service: csfs.colostate.edu/eab

CSU Extension: extension.colostate.edu

Colorado Tree Coalition: coloradotrees.org

Emerald Ash Borer Information Network: emeraldashborer.info

More information about insecticides used to control emerald ash borer on residential shade trees is available through CSU Extension: **extension.colostate.edu**

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