

# Emerald Ash Borer in Colorado - Identification of Insects and Damage of Similar Appearance

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Figure 1. Emerald ash borer larvae. Photo courtesy of David Cappaert



Figure 2. Emerald ash borer adult. Photo courtesy of David Cappaert

The emerald ash borer (*Agrilus plannipennis*) is a wood boring beetle of Asian origin that has become established in parts of the upper Midwest. It is extremely damaging to all North America species of ash (*Fraxinus*), including green ash and white ash that are very commonly grown in Colorado landscape settings.

Damage by this insect will continue to spread in the areas where it has become established - which currently (2008) includes much of Michigan and parts of Illinois, Ohio, Indiana and West Virginia. Ultimately it will likely extend into much of the eastern half of North America where ash is native and grows in continuous stands.

Potential establishment in Colorado through natural spread is unlikely. The largely ash tree-free Great Plains that cover the eastern areas of the state provide a serious ecological barrier to movement of this insect. Potentially it may some day move along river ways, although this will not likely occur soon, should be slow and will be so limited in distribution that it may be effectively contained.

However, introduction of emerald ash borer into Colorado is very possible through the careless movement into the state of ash firewood or nursery stock that contains developing stages of the insect. If this occurs, it will be important to identify infestations at an early stage. In Colorado, early identification may likely allow successful efforts to eradicate introductions that do occur or allow their containment.

## Methods to Monitor Emerald Ash Borer in Colorado

Despite major effort that continues, to date there are no highly effective traps or lures for this insect. Its detection is largely dependent on interested individuals being able to identify adult insects and/or the pattern of injury larvae do to ash trees. Suspect insects or suspicious infestations should then be immediately brought to the attention of the Colorado State University extension, through a local county office.

## Identification of the Emerald Ash Borer

Emerald ash borer (Figure 2 and 3) has a general bullet-form body, typical of most beetles in the metallic wood borer/flatheaded borer family - Buprestidae. Emerald ash borer is about 9-13 mm in length, very large for members of the genus *Agrilus*, but mid-sized for members of this insect family. Perhaps the most conspicuous feature is that the emerald ash borer has uniformly green bright, metallic wing covers. The thorax may be more metallic brown and underneath the wing covers the abdomen is purple.

Several other metallic wood borers, as well as some leaf beetles, occur in Colorado that have some metallic green coloration. However, these either are not uniformly green and/or are distinctly smaller or larger than the emerald ash borer. These are discussed below.



Figure 3. Emerald ash borer adult. Photo courtesy of PA-DCNR

## Diagnosis of Emerald Ash Borer Injury

Emerald ash borer only develops in ash (*Fraxinus* species). Larvae (Figure 1) are a type of flatheaded borer that feed by chewing the cambium layer under the bark producing meandering tunnels (Figure 4) packed with fine sawdust-like excrement.

When full grown, the larvae chew into the heartwood of the trunk and there make a small chamber in which they pupate. After transformation to the adult beetle, they chew through the bark and emerge, *making a D-shaped exit hole* (Figure 5).

Presently in Colorado, there are no other flatheaded borers found in ash that create meandering tunnels just under the bark. Their excrement is tightly packed in their tunnels and fine grained. Emerald ash borer *does not expel sawdust* from the tree.



Figure 5. Emerald ash borer characteristic "D shape" exit hole. Photo courtesy of David Cappaert

Similarly, the D-shaped exit hole made upon exiting the tree is unique to metallic wood borers and may be the best indication of possible infestation of ash by this insect. Existing wood borers in Colorado that develop in ash make oval or circular exit holes.

(NOTE: In the Midwest the flatheaded appletree borer (*Chrysobothris femorata*) rarely will be found in highly stressed ash and similarly makes a D-shaped exit hole. However, this species makes larger and more deeply gouging wounds that often show evidence on the bark as a weeping site from oozing sap. (These are not produced by emerald ash borer injury.)



Figure 4. Emerald ash borer larval tunnels. Photo courtesy of Art Wagner USDA-APHIS

## Regional Insects Similar in Appearance to Emerald Ash Borer

The emerald ash borer is a colorful beetle of moderate size that produces distinctive injuries that can be used to identify infestations. However, a few insect species found in the Colorado do have appearance or habits that may cause them to be mistaken for emerald ash borer. The following metallic green wood borers are native to Colorado and are most associated with forested areas.



Figure 6. *Cypriacus aurulenta*. Photo courtesy of the Ken Gray Collection



Figure 7. *Cypriacus intricata*.



Figure 8. *Cypriacus langii*. Photo courtesy of the Ken Gray Collection

***Cypriacis* spp.** Three species of large metallic green wood borers in the genus *Cypriacis* occur in Colorado, *Cypriacus aurulenta*, *C. intricata* and *C. langii* (Figures 6, 7, and 8 respectively). The wing covers are metallic green, but there is some purplish striping on the body with *C. aurulenta* and *C. intricata* and a few yellow spots may be present on the wing of *C. langii*. These beetles may range considerably in size, from 9-25 mm, but most all will be substantially larger than the emerald ash borer and the wings have furrows running their length. The *Cypriacis* spp. beetles develop in recently killed conifers including pines, spruce, and Douglas-fir.

***Buprestis confluenta*.** This is a large (12-20 mm) metallic wood borer with green wing covers (occasionally a coppery-brown or purpley-blue) marked with yellow spots (Figure 9). These yellow spots are not found on any other species and make it easily distinguishable from other metallic green wood borers including the emerald ash borer. *Buprestis confluenta* develops in aspen and cottonwood (*Populus* spp.)



Figure 9. *Buprestis confluenta*



Figure 10. *Phaenops gentilis*

***Phaenops gentilis*.** Known as the green flatheaded pine borer, *P. gentilis* (Figure 10) is likely to be the beetle most commonly encountered in Colorado that can be mistaken for emerald ash borer. It is approximately the same size as the emerald ash borer (9-13 mm) but has a broader body form and the wings are covered with minute punctures. The adults are bright bluish green and have no yellow spots. *Phaenops gentilis* develops in several species of pine.

***Chrysophana placida*.** This is a moderately sized (6-10 mm) metallic wood borer found in the trunk and branches of dead and injured pines, true firs, Douglas-fir, and hemlock. *C. placida* (Figure 11) ranges in color from green to red and usually has a reddish-bronze stripe on each wing cover. This species is common in many areas of the west, but is not considered an economically important pest species of native trees.



Figure 11. *Chrysophana placida*

**Native *Agrilus* species.** Several wood borers well established in parts of Colorado are in the genus *Agrilus*, the genus to which the emerald ash borer also belongs. At least three may have metallic green hues of their wing covers, although all are smaller in size and less intensively colored than is the emerald ash borer. Most common is *Agrilus cyanescens* (Figure 12), a blue-green beetle about 6-mm in length that develops as a borer in honeysuckle. *Agrilus pulchellus* (Figure 13) has wings with a green center band, but the wings are bordered by reddish purple. It is known from Weld County and ranges in size from 7-11 mm. In southeastern Colorado *Agrilus pulchellus* is present. It is usually bronze, but greenish forms exist.





Figure 12. *Agrilus cyanescens*



Figure 13. *Agrilus pulchrellus*



Figure 14. *Agrilus lacustris*

In addition there are other kinds of beetles that have metallic coloration and may be mistaken for emerald ash borer. This includes some tiger beetles, which are active insects that sometimes rest on tree trunks. Several species of leaf beetles, usually found on leaves, also have metallic green coloration.

### Regional Insects that Produce Injuries Similar to Emerald Ash Borer Injury

There are several species of wood boring insects that have long been established in Colorado.



Figure 15. Lilac/ash borer damage to trunk.

**Lilac/ash borer.** By far the most common wood borer in ash, larvae of the lilac ash/borer (*Podosesia syringae*) makes gouging wounds under the bark and may tunnel into the sapwood (Figure 15). In addition, they often expel coarse sawdust from the tree during later stages of feeding. (In contrast the tunnels of emerald ash borer are meandering trails confined to the cambium and no external sawdust is present.) The larvae are caterpillars that have very short prolegs on the abdomen that are tipped with a series of

hooks (crochets). They pupate just underneath the bark and when they emerge the old pupal skin is left behind, partially protruding from the trunk. The exit hole is irregularly rounded (Figure 16).

Adults (Figure 17) are a clearwing borer moth that superficially resembles a paper wasp. The lilac ash borer moths usually emerge from ash in early May through mid-June. A related species that may be present in Colorado is the banded ash clearwing, *Podosesia aureocincta*. The banded ash clearwing emerges in summer, rather than late spring.



Figure 16. Lilac/ash borer rounded exit holes.



Figure 17. A mating pair of the Lilac/ash borer.

**Redheaded ash borer/Banded ash borer.** The larvae of these two *Neoclytus* species are roundheaded borers that tunnel deeply into the trunk. They can be separated from the lilac/ash borer by the absence of prolegs. Larvae lack the flattened area behind the head of the emerald ash borer and do not cause the cambium mining. Exit holes are round or oval.



Figure 18. Redheaded ash borer. Photo courtesy of Howard Ensign Evans



Figure 19. Banded ash borer. Photo courtesy of James Solomon

Adults of these two species (Figure 18 and 19) are a type of longhorned beetle, although their antennae are not particularly long compared to other members of this insect family.

**Ash bark beetles.** The ash bark beetles are much smaller than the above borers in ash. Adults (Figure 20) are tiny beetles, ca 3-mm and the larvae are legless grubs, that somewhat resemble a grain of rice with a dark head. They make tunnels typical of other bark beetles with a central egg gallery and perpendicular larval galleries. Exit holes adults make when emerging through the bark are round and a bit thicker than a pencil lead (Figure 21). Multiple exit holes are usually present in branches that were earlier infested with ash bark beetles.



Figure 20. Ash bark beetle. *Photo courtesy of David Leatherman*



Figure 21. Ash bark beetle exit holes. *Photo courtesy of James Solomon*