

A REFERENCE FOR
**Recognizing Insect Galleries in
Ash Trees in Minnesota**



MINNESOTA DEPARTMENT
OF AGRICULTURE
PLANT PROTECTION

OVERVIEW:

The purpose of this document is to provide images of different types of damage from pests that may be found boring in ash trees in Minnesota and to contrast the appearance of these damage types with that caused by emerald ash borer (EAB). All images in this document are of insect damage found in ash trees in Minnesota unless otherwise noted. For information on external symptoms of EAB on standing trees or comparisons of larval and adult EAB with other insects, see the links below.

FOR MORE INFORMATION:

Identification of Emerald Ash Borer and Other Ash Insects:

<http://www.emeraldashborer.info/identifyeab.cfm>

<http://na.fs.fed.us/fhp/eab/pubs/fieldguide/eabfg.pdf>

<http://www.forestpests.org/ash/>

Emerald Ash Borer Information:

<http://www.emeraldashborer.info>

<http://www.mda.state.mn.us/invasives/eab>

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SCOLYTIDAE:

Unlike other insects, adult ash bark beetles feed under the bark just as the larvae do. Bark beetle galleries may take the shape of reproductive galleries like figures 3 and 4 or adult feeding galleries like figures 2 and 5.

During 2007-2008 EAB detection tree surveys, ash bark beetles (*Hylesinus* spp.) were found in ~70% of 1800+ ash trees sampled by Minnesota Department of Agriculture (MDA) across the state.



Figure 1. Bark beetle emergence holes.

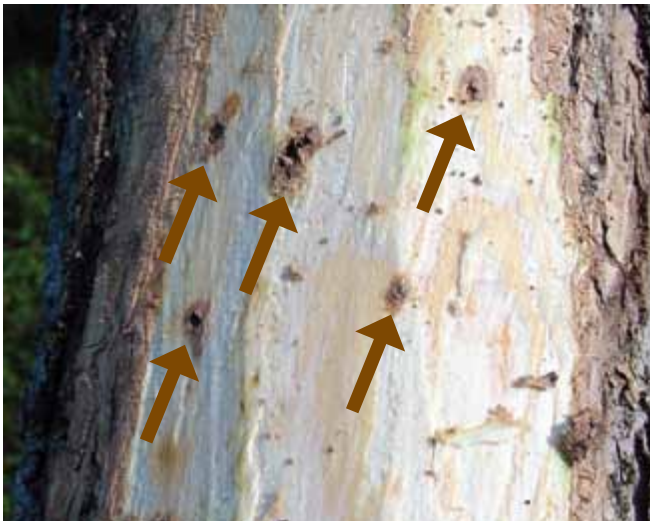


Figure 2. Feeding galleries of adult ash bark beetles beginning to show as phloem is removed.



Figure 3. Bark beetle egg-laying galleries cross the grain of the wood.



Figure 4. Larval galleries lie at right angles to egg-laying galleries and are often very closely spaced.



Figure 5. Adult ash bark beetle at knife tip next to gallery.

AGROMYZIDAE:

Ash cambium miner (*Phytobia* sp.) is a fly (Diptera) present under the bark of ash as a larva. Larva begin in branches where eggs are laid and tunnel all the way to the roots and out into the soil to pupate. Galleries tend to be at the surface of the sapwood, thin (width of pencil tip) and either straight or a broad zig-zag.

During 2007-2008 EAB detection tree surveys, evidence of ash cambium miner was found in ~30% of 1800+ sampled trees.



Figure 6. Larva of ash cambium miner.



Figure 7. Galleries of ash cambium miner.

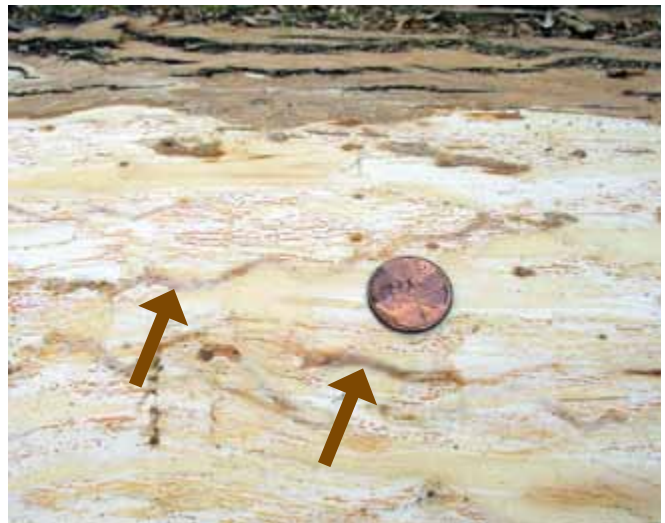


Figure 8. Galleries of ash cambium miner with a penny for reference.



Figure 9. Gallery of ash cambium miner just beginning to show as phloem is scraped away.



Figure 10. Gallery of ash cambium miner already present when tree girdled.

CERAMBYCIDAE:

A few species of this beetle family may be found under the bark of ash including: banded ash borer (*Neoclytus caprea* Say), redheaded ash borer (*Neoclytus acuminatus* Fabricius), and ash and privet borer (*Tylonotus bimaculatus* Haldeman). Galleries are generally meandering and may be nearly as wide as a pencil. Galleries eventually dive deep into the sapwood.

Galleries and/or larvae of cerambycid species were found in ~10% of 1800+ sampled trees during MDA detection tree surveys in 2007-2008.



Figure 11. *Cerambycid* larva.



Figure 12. High-density infestation of *Cerambycid* larvae – there is some similarity in appearance to a older EAB infestation.



Figure 13. Close up of figure 12 showing holes tunneled into wood.



Figure 14. Pupal chamber of a *Cerambycid* larva deep in wood.



Figure 15. Emergence hole of redheaded ash borer.

SESSIIDAE:

Galleries and/or larvae of clearwing borers, *Podesia* spp. (Lepidoptera: Sessiidae) were found in ~10% of sampled trees during MDA detection tree surveys in 2007-2008. The galleries in Figures 21, 23 and 24 are approximately the width of a felt-tip marker and deeply etched into the sapwood. Clearwing borers tunnel deeply into the wood as larvae and leave large round holes when they emerge as adults. Clearwing borer larvae have legs, distinguishing them from roundheaded and flatheaded borers.



Figure 20. Clearwing moth emergence hole (about size of pencil eraser, picture from Michigan).



Figure 21. Clearwing moth gallery starting at girdle.



Figure 22. Clearwing moth larvae.



Figure 23. Clearwing moth gallery at branch crotch.



Figure 24. Clearwing moth gallery.

BUPRESTIDAE [NOT EMERALD ASH BORER] :

Three genera of buprestids can be found boring in ash trees in Minnesota - *Agrilus* (EAB), *Chrysobothris* and *Dicerca*. Damage from *Chrysobothris* and *Dicerca* is similar and can be easily distinguished from that of *Agrilus*. During 2007-2008 EAB detection tree surveys, damage and larvae from *Chrysobothris* and *Dicerca* were found in ~10% of 1800+ sampled trees. The vast majority of larvae recovered from trees were *Chrysobothris* spp., though *Dicerca* was also represented. Two *Chrysobothris* adults were recovered from one tree and identified as *C. sexignata*. *Chrysobothris* and *Dicerca* galleries are not tightly "S"-shaped though they are sometimes sinuous in shape.



Figure 16. *Chrysobothris* larva on black ash.



Figure 17. *Chrysobothris* larva and gallery in black ash.



Figure 18. *Chrysobothris* emergence hole.



Figure 19. Early *Chrysobothris* gallery.

BUPRESTIDAE [EMERALD ASH BORER] :

Emerald ash borer (*Agrilus planipennis* Fairmaire) larvae tend to make “S”-shaped galleries, particularly during the early stages of colonization. As borers become larger and space becomes more limited, galleries tend to become more meandering (Figure 29). Adults make characteristically “D”-shaped holes when they emerge from trees. The “D”-shape will continue to wherever the EAB pupated into an adult - often in the outer sapwood (Figure 27).

Find out where EAB has been found in Minnesota:
www.mda.state.mn.us/invasives/eab



Figure 25. First instar EAB larva and gallery (about size of a dime).



Figure 26. EAB galleries in black ash (Michigan).



Figure 27. “D”-shaped emergence holes in de-barked wood (Michigan).



Figure 28. EAB gallery found beneath a woodpecker feeding site.



Figure 29. Old EAB infestation (Ohio).