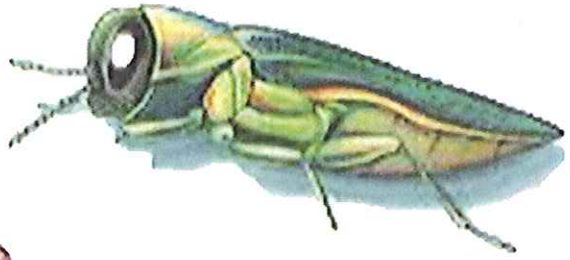
Emerald Ash Borer Information Guide



Marion Tree Board

What's Inside

Section 1

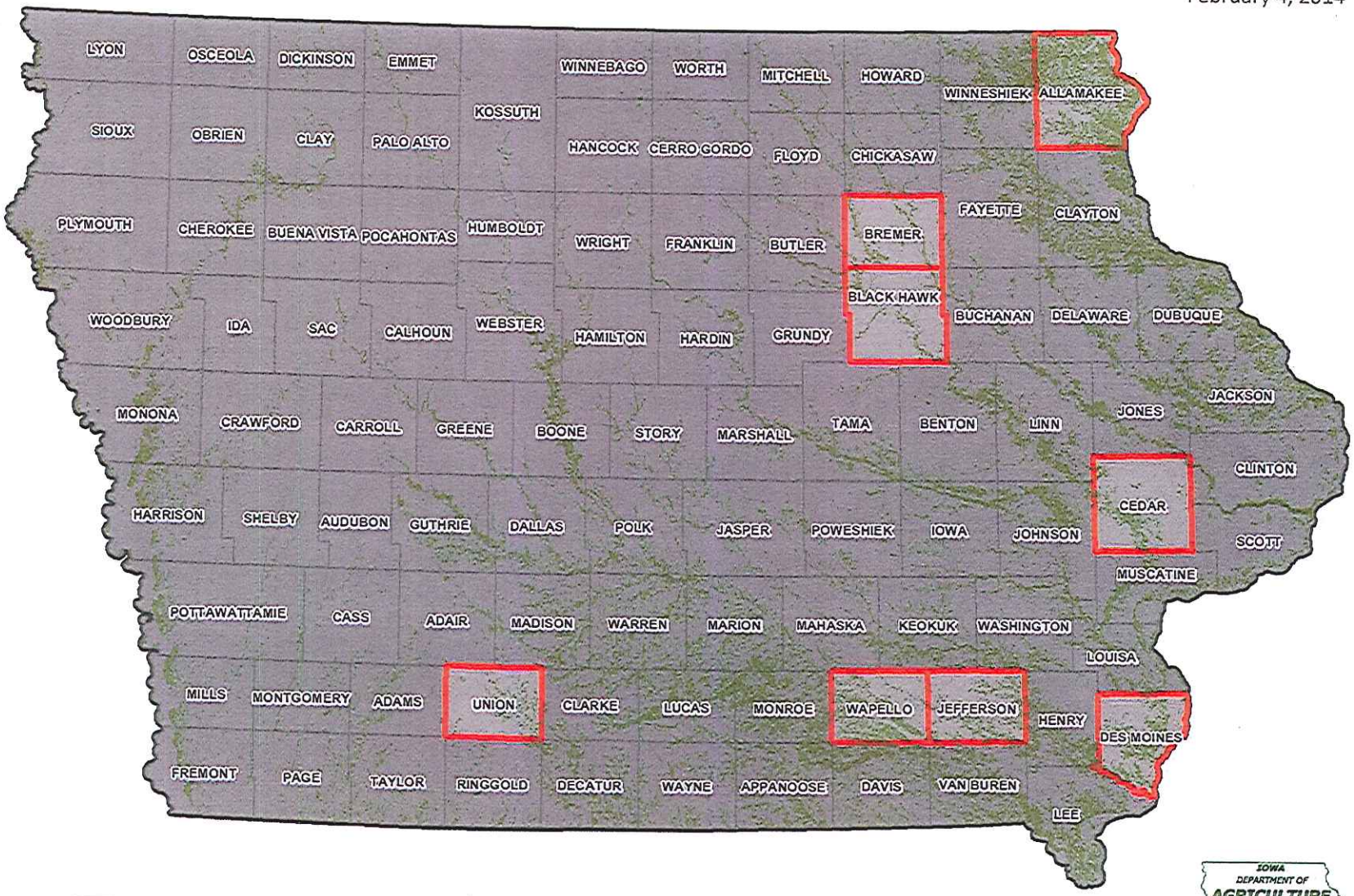
EAB Iowa Quarantine Area

A single piece
of firewood
can DESTROY
millions of trees.

DON'T MOVE
FIREWOOD

Iowa Emerald Ash Borer (EAB) Quarantine Order ENT-14-1

Effective
February 4, 2014

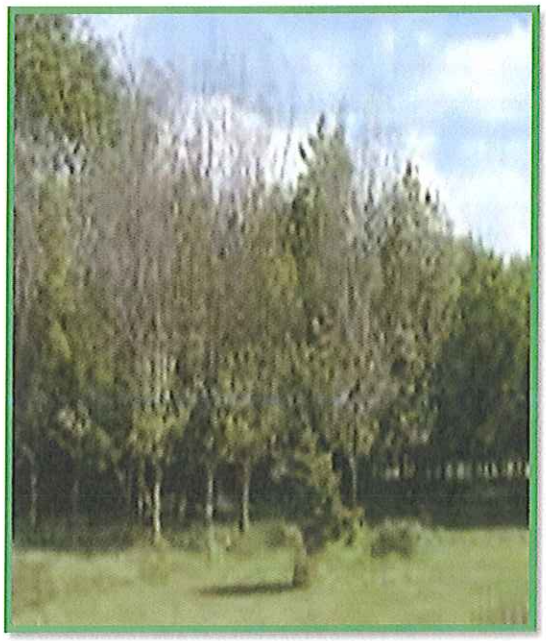


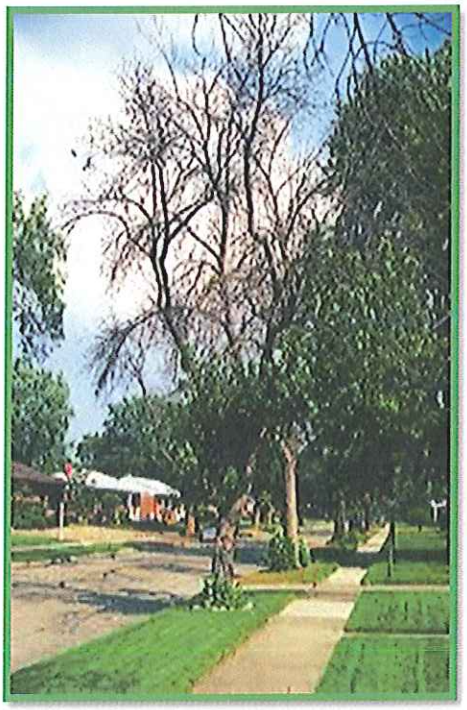
Iowa Department of Agriculture & Land Stewardship, Entomology & Plant Science Bureau, Entomology@IowaAgriculture.gov, 515-725-1470

Updated February 19, 2014

Section 2

Ash Tree Identification





ASH TREE IDENTIFICATION GUIDE

David L. Roberts, Ph.D.
Michigan State University Extension

ASH TREE BRANCHES 7/2003

Welcome

Ash Identification Guide:

Ash trees (*Fraxinus* species) are easily identified if several simple factors are understood. Ash is unique from other trees because of the following distinctive characteristics: opposite branching and compound leaf according to the following descriptions of pictures. Remember, mountain ash (*Sorbus*) is not a true ash (*Fraxinus*), and is not affected by the Emerald Ash Borer.

Opposite Branching - MAD Horse:

Very few trees in our landscapes and forests have opposite branching. The predominant types are Maple, Ash, Dogwood and Horsechestnut. A simple phrase to remember when identifying trees with opposite branching is to use the acronym *MAD Horse* representing Maple, Ash, Dogwood& Horsechestnut. When looking for opposite branching in trees, please consider that buds or limbs may die; hence not every single branch will have an opposite mate.

Red dots mark opposing branches

Underneath side of another branch

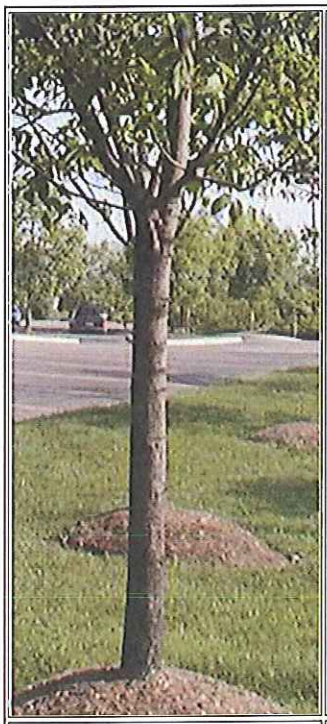
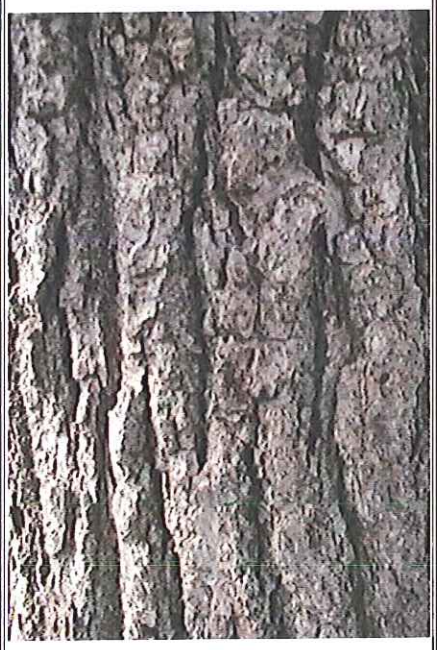
Another example of opposing branches

A fall skeleton of an ash branch.

Seeds and bark of ash are also unique. Some older ash trees have a characteristic diamond pattern to their bark.

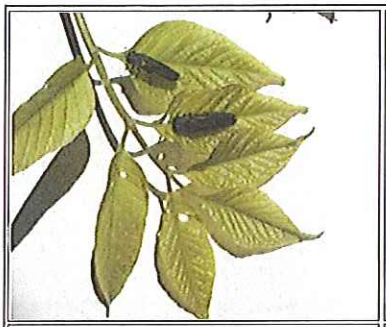
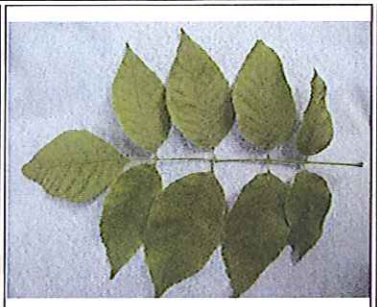
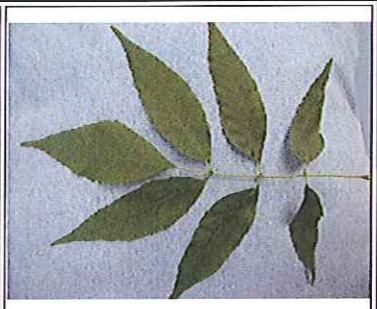
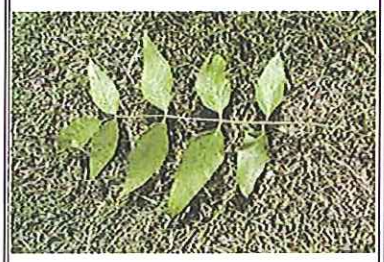
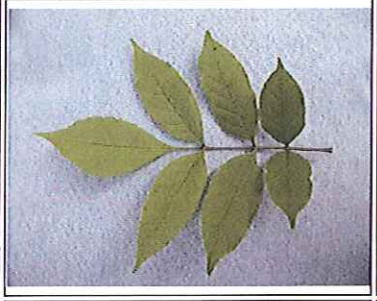
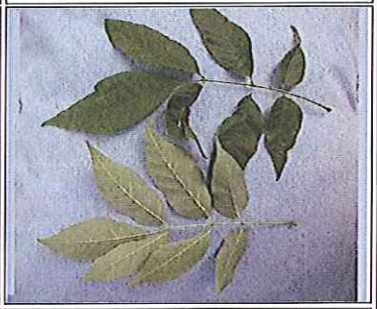
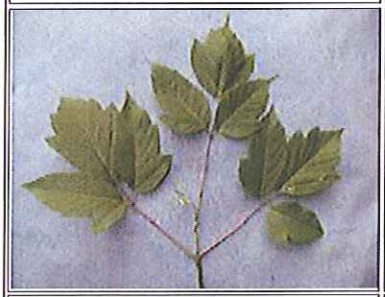
A close-up of a healthy ash branch with seeds!

Nice details on this mature ash trunk and branches

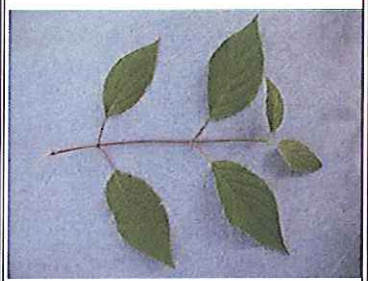
		
The bark on a younger ash tree is relatively smooth.	**Green ash - As** the tree ages the bark thickens and a diamond-like pattern in the raised bark is noticeable.	This ridged trunk section is from a very mature ash tree.

Compound Leaf:

A simple leaf is a single leaf defined by having a bud at the base of the leaf stem (also known as a petiole).
A compound leaf is one that has more than one leaflet while the entire leaf, as defined, has a bud at its stem base (petiole). Ash typically have approximately 5-9 leaflets per leaf.

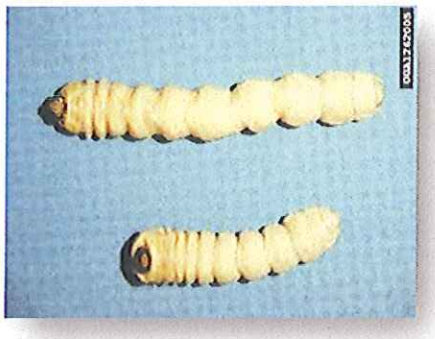
		
Very young ash leaf with adult EAB.	**Ash** One leaf, 9 leaflets	**Green Ash** One leaf, 7 leaflets
		
Ash One leaf, 9 leaflets	**Black Ash** One leaf, 7 leaflets	**White Ash** top/bottom One leaf, 7 leaflets
		
Box Elder - Branches with 3 leaves shown; each having 3 leaflets. Same as Maple leaves.		

Following are leaves of Maple, Ash, and Dogwood, which have <u>opposite branching</u>
(MAD Horse)

		
Maple - one leaf	**Ash - one leaf with 9 leaflets**	**Dogwood - 6 leaves on branch**

Section 3

EAB Identification



SYMPTOMS AND SIGNS of Emerald Ash Borer

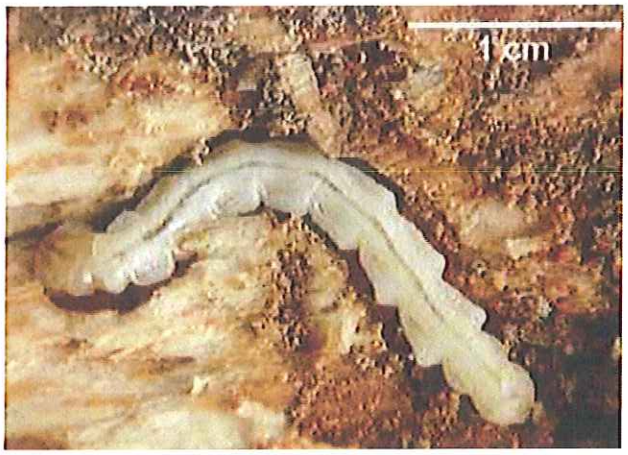
5. Branches in canopy decline and die.

6. Suckers grow on trunk and branches below EAB activity.

7. EAB adult beetle.

8. D-shaped 1/8 inch exit holes are made through bark by EAB adults.

9. Winding tunnels under the bark are caused by EAB larvae.



10. Fully-grown EAB larva in gallery under bark as it would appear in the fall.

Ash trees have other problems in addition to EAB including decline, other insects, and diseases.

Decline

- **A gradual, generally irreversible decline in tree health. Symptoms include reduced growth, branch dieback, and a thinning canopy.**
- **Environmental stress and poor site conditions may contribute to decline.**
- **To prevent decline avoid injuring the trunk, soil compaction, and disturbance near the tree.**
- **If a tree is in decline, have it evaluated periodically by a trained arborist to make certain it is not a hazard.**

PROBLEMS that can be confused with Emerald Ash Borer

11. Weed trimmer damage to trunk.

12. Damage by vehicle and poor site conditions.

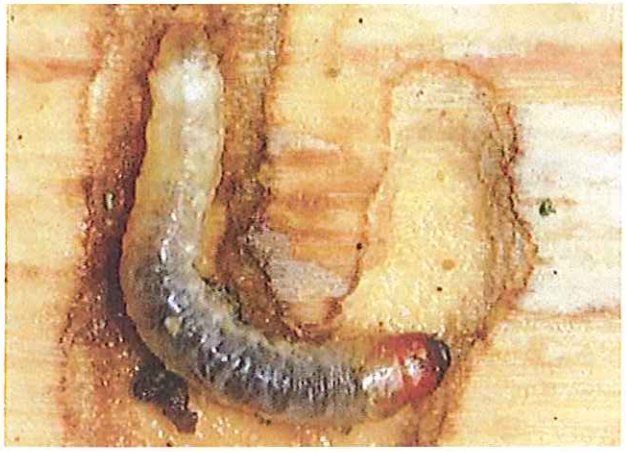
13. Planting too deeply can lead to decline. The trunk should flare out like a bell where it meets the ground.

14. Limited rooting area and site disturbances such as construction activity can lead to decline.

BORERS

In addition to EAB, there are native insects that feed beneath the bark of ash. These borers tend to attack only stressed ash trees, unlike EAB that also will attack healthy trees. Symptoms and signs include tree decline, exit holes, and insects under the bark.

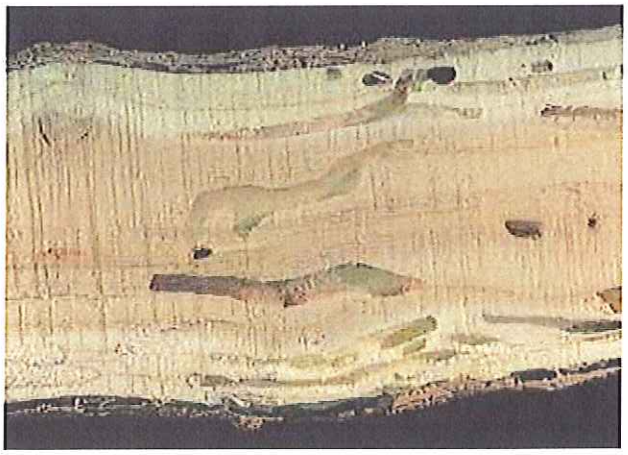
Prevention: Keep the tree healthy by providing water during dry periods, removing dead or storm-injured branches, and by reducing or preventing stress.
Control: Insecticides do not provide good control of wood-boring insects. Have the tree evaluated by an arborist to determine if it is a hazard tree.



15. Ash/lilac borer larvae create deep tunnels low in the trunks and limbs of ash, lilac, and privet. This insect causes a gradual decline of the tree over several years.

16. Ash bark beetles are small insects that create winding tunnels beneath ash tree bark and buckshot-size exit holes in the bark.

17. Flatheaded appletree borers are white, legless larvae that feed under the bark, hollowing out the inner bark in a small area. Adults leave a D-shaped exit hole that is larger in size than the EAB. Flatheaded appletree borers can kill newly transplanted, young trees.



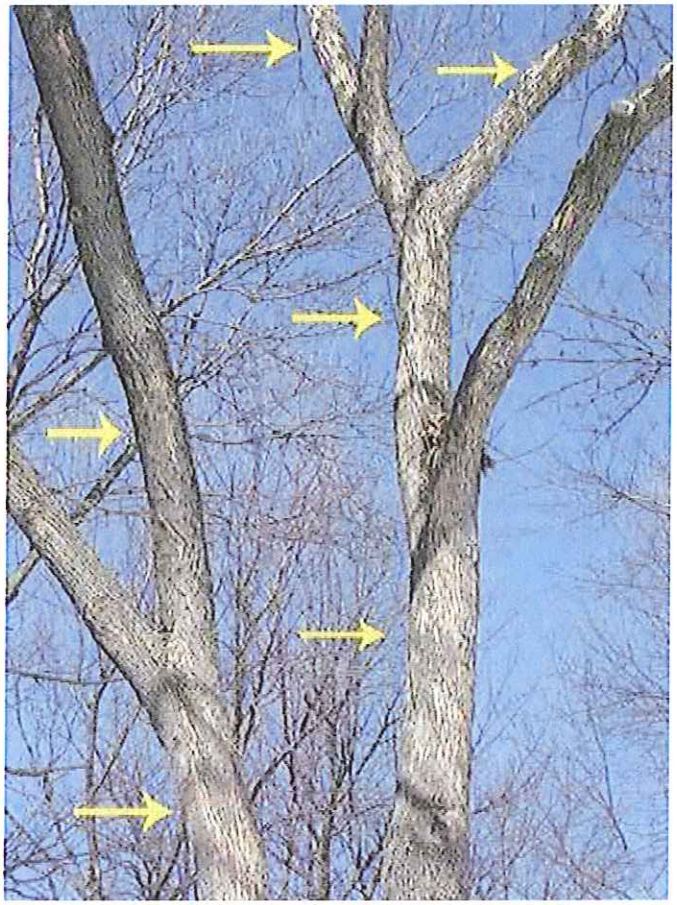
18. Roundheaded borer larvae tunnel deeply into the wood with no apparent pattern. Adults make large round exit holes. Two common roundheaded borers feeding on ash are the redheaded ash borer and banded ash borer.

Use this chart to compare common symptoms of Emerald Ash Borer infestation with other problems of ash trees.

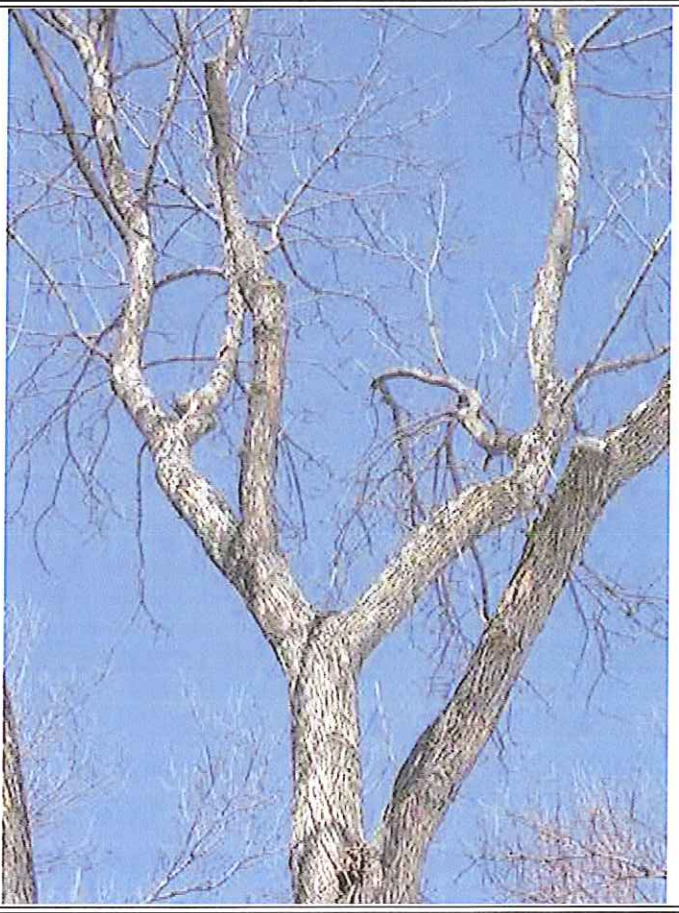
SYMPTOM COMPARISON CHART

for Emerald Ash Borer infestation and other problems of ash trees

PROBLEMS	SYMPTOMS: Branch dieback	Thinning canopy	Epicormic sprouts	D-shaped exit holes	S-shaped larval galleries	Woodpecker damage
Emerald ash borer	✖	✖	✖	✖	✖	✖
Planted too deeply	✖	✖				
Trunk injury	✖	✖	✖			
Poor site conditions	✖	✖	✖			
Ash anthracnose		✖				
Ash rust						
Verticillium wilt	✖	✖	✖			
Ash decline	✖	✖				
Ash plant bug	✖	✖				
Ash sawfly		✖				
Leafcurl ash aphid		✖				
Ash flower gall mite		✖				
Oystershell scale	✖	✖	✖			
Ash/lilac borers	✖	✖				✖
Eastern ash bark beetle	✖	✖				✖
Flatheaded borers	✖	✖		✖		✖
Roundheaded borers	✖	✖	✖			✖



Notice all of the woodpecker holes in these upper branches. From this extensive woodpecker activity, we can deduce that there is far more EAB damage beneath the bark than what is readily apparent. It is doubtful that this branch would even produce leaves in the coming spring. (Fig.53)

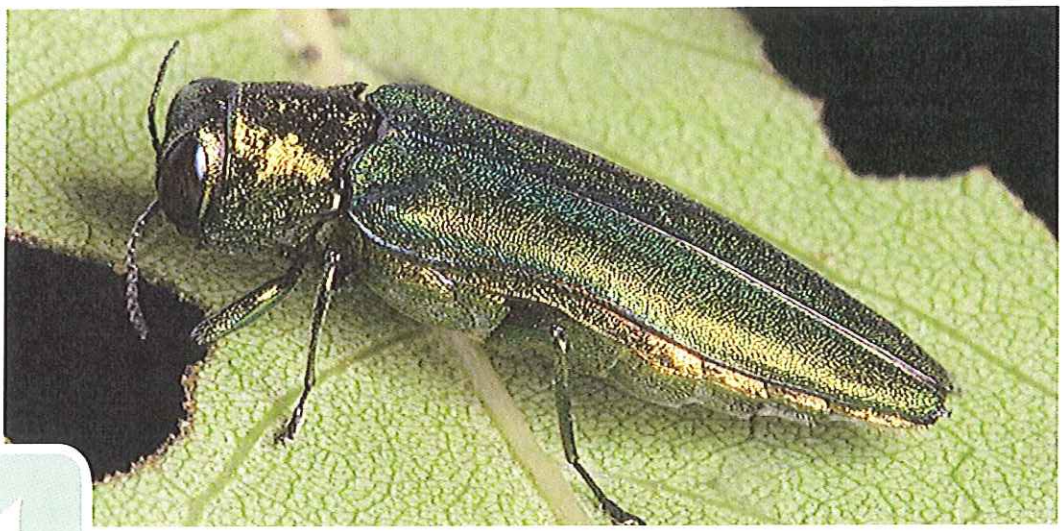


Crown of the TREE:

Note extensive woodpecker activity (bark stripped off- indicated by the lighter wood areas) which are first clues of EAB infestations. (Fig. 54)

Section 4

EAB Management Options



Emerald Ash Borer Management Options

The emerald ash borer (EAB) is an exotic insect that is destructive to ash trees (*Fraxinus* species). Although the adult stage causes minor feeding damage to ash foliage, the larval stage feeds beneath the bark and disrupts water and nutrient flow within the tree, which leads to tree death. Larvae are actively feeding from early summer through fall.

The insecticide products listed in this publication work best as **preventive** treatments for **healthy** ash trees planted along streets or in yard settings. Healthy trees have full crowns, elongating branches, and bark held tightly to the trunk/branches. It is not practical or cost effective to treat woodlot trees with insecticides where timber production is the primary goal.

Before using an insecticide, several factors must be considered:

- Identify the tree as ash. For an identification aid, see ***www.extension.iastate.edu/forestry/iowa_trees/tree_id.html***
- Determine if your ash tree has EAB signs and symptoms: ***www.extension.iastate.edu/Publications/SUL21.pdf***
- Estimate the tree's value in the community (see Table 1). Some benefits of urban trees include helping clean the air, slow storm water runoff, raise property values, sequester carbon, and reduce energy costs.

Table 1. Estimated annual economic benefit of ash trees for a single family residence in Des Moines, Iowa*

Trunk Diameter (in)	Black Ash	Green Ash	White Ash
5	$35	$34	$33
10	$88	$88	$97
15	$144	$150	$181
20	$185	$201	$270
25	$219	$254	$365
30	$213	$306	$485
35	$195	$352	$496

* Based on National Tree Benefit Calculator (***www.treebenefits.com***).

PM 2084 Revised September 2013

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- Evaluate tree health. If the tree is declining, storm damaged, and/or cost of treatment will exceed the landscape value, replace the tree with an alternate species:
  - ***www.extension.iastate.edu/pme/Publications/EAB/AshAlternateShadetrees2013.pdf*** or
  - ***www.extension.iastate.edu/pme/Publications/EAB/AshAlternateSmall-staturetrees2013.pdf***
- Many insecticide products must be used EACH year for the life of the tree. There is one product (Tree-Age™) that protects ash trees for two years following treatment.
- Systemic insecticides are the products of choice when dealing with the emerald ash borer. These chemicals are transported within the vascular system of the tree from the roots and trunk to the branches and leaves. Systemic insecticides reduce hazard such as drift of pesticides to nontarget sites or applicator exposure, and have less impact on beneficial organisms.
- When applied properly, insecticide treatments can control EAB in your ash tree. Keep in mind that storm damage, other injuries to the tree, soil moisture, soil compaction, and other site and environmental factors can influence tree uptake and product effectiveness.

- Treatments are suggested ONLY if you live within **15 miles** of a confirmed EAB infestation. Known infestations are given at ***www.emeraldashborer.info/***. Treatment outside the risk zone is not prudent.
- Treatment before a tree is infested is most effective. Infested trees with less than 30 percent dieback of the crown due to EAB feeding may respond to treatment. The goal in any application would be to prevent further canopy dieback; those branches already killed should be removed.

Table 2. Products for Homeowners – carefully follow label directions[1]

Type of Application	Active Ingredient	Tree Size – trunk circumference (diameter at 4.5 ft [dbh])	Time of Application[2]
Soil drench[3]	Imidacloprid (1.47%)[4]	Up to 60" (20" dbh)	early April to mid-May **OR** late Aug through Sept
Soil drench[3]	Imidacloprid (21.4%)[5]	Up to 60" (20" dbh)	late Aug through Sept
Soil drench[3]	Imidacloprid (0.74%) + Clothianidin (0.37%)[6]	Up to 60" (20" dbh)	early April to mid-May **OR** late Aug through Sept
Granular[7]	Dinotefuran (2%)[8]	Up to 36" (12" dbh)	early April to mid-May
Granular[7]	Imidacloprid (0.55%) + Clothianidin (0.275%)[9]	Up to 36" (12" dbh)	early April to mid-May
Granular[7]	Imidacloprid (2.5%)[10]	Up to 36" (12" dbh)	early April to mid-May

[1] The amount of insecticide required depends on the tree's circumference in inches; see product label directions.

[2] If the product label lists spring and fall as possible treatment times, homeowners can treat only ONCE per year. Research suggests spring applications may be preferable to fall at the low rate of imidacloprid soil applications.

[3] Before applying a soil drench, pull back any mulch or dead leaves 12" from the base of the tree. Replace any mulch over the treated area after the mixture has been absorbed into the soil. For trees larger than 60" circumference, enlist the services of a commercial pesticide applicator. Do not make soil applications when soil is saturated or frozen.

[4] Examples of products include: Bayer Advanced 12 month Tree & Shrub Insect Control, Bonide Annual Tree & Shrub Insect Control with Systemaxx, Compare N Save Systemic Tree & Shrub Insect Drench, Ferti-Lome Systemic Insect Spray, Gordon's Tree & Shrub Insect Killer, Green Light Tree & Shrub Systemic Insect Killer, Ortho Bug B Gon Year-Long Shrub Insect Control Concentrate, and Ortho Tree & Shrub Insect Killer Ready-Spray II

[5] An example of product is Optrol Insecticide

[6] An example of product is Bayer Advanced 12 month Tree & Shrub Protect & Feed Concentrate II

[7] Spread granules evenly on the soil around the base of the plant within 18" of the trunk. Irrigate after application with enough water to dissolve granules and move product into root zone.

[8] Examples of products include: Green Light Tree & Shrub Insect Control with Safari 2G, Ortho Tree & Shrub Insect Control Granules

[9] An example of product is Bayer Advanced 12 month Tree & Shrub Protect & Feed RTU Granules II

[10] An example of product is Ortho Tree & Shrub Insect Control RTU Granules

Some insecticides used to control EAB have annual per acre use limits. Refer to product labels and the following publication for more information: ***www.mda.state.mn.us/plants/pestmanagement/~/media/Files/chemicals/pesticides/eablabelguide.ashx***

Table 3. Products for Commercial Pesticide Applicators

Product (Formulation)	Active Ingredient	Application Method (rate a.i./inch dbh)	Time of Application	Tree Size – trunk circumference (diameter at 4.5 ft [dbh])
IMA-Jet™	Imidacloprid	Trunk injection	**Spring:** Full canopy	All healthy ash trees
Imicide®	Imidacloprid	Trunk injection	**Spring:** Full canopy	All healthy ash trees
Merit® (75WP, 75WSP, 2F)	Imidacloprid	Soil injection or drench (1.4 g)	**Spring:** Early April to mid-May	All healthy ash trees
Merit® (75WP, 75WSP, 2F)	Imidacloprid	Soil injection or drench (2.8 g)	**Spring:** Early April to mid-May	All healthy ash trees
Merit® (75WP, 75WSP, 2F)	Imidacloprid	Soil injection or drench (2.8 g)	**Fall:** Late Aug through Sept	All healthy ash trees
Safari® (20SG)	Dinotefuran	Soil injection (3 to 12 g/in dbh)	**Spring:** Mid-May to mid-July	Up to 36" (12" dbh)
Safari® (2SG)	Dinotefuran	Soil application (2 to 4 oz/in dbh)	**Spring:** Mid-May to mid-July	Up to 36" (12" dbh)
Transtect™ (70WSP)	Dinotefuran	Basal Bark Spray (4 to 60" above soil)	**Spring:** Early April to mid-May	Up to 36" (12" dbh)
Transtect™ (70WSP)	Dinotefuran	Soil injection or drench	**Spring:** Early April to mid-May	Up to 36" (12" dbh)
Tree-Age®	Emamectin benzoate	Trunk injection (0.1 to 0.4 g)	Full canopy in early spring – mid-Sept with good soil moisture	All healthy ash trees
TreeAzin™	Azadirachtin	Trunk injection (5 ml – 10 ml/in dbh)	**Spring:** Early May to mid-June	All healthy ash trees
Xytect™ (75WSP, 2F)	Imidacloprid	Soil injection or drench (1.4 g)	**Spring:** Early April to mid-May	All healthy ash trees
Xytect™ (75WSP, 2F)	Imidacloprid	Soil injection or drench (2.8 g)	**Spring:** Early April to mid-May	All healthy ash trees
Xytect™ (75WSP, 2F)	Imidacloprid	Soil injection or drench (2.8 g)	**Fall:** Late Aug through Sept	All healthy ash trees

Notes

- Trunk injections have the advantage of being absorbed and distributed throughout the tree more quickly (1 to 4 weeks) than soil applications (4 to 8 weeks), and are useful where soil treatments are not practical (excessively wet soils, compacted sites, or restricted surface areas). Research has shown that tree injections are tolerated in healthy green ash trees, especially if treatments are applied once every two years, small volumes of product are injected, and injection holes are small and shallow. Rotate annual trunk injections with other management options to decrease the possibility of long-term damage.
- Before applying a soil drench, pull back any mulch or dead leaves 12" from the base of the tree. Replace any mulch over the treated area after the mixture has been absorbed into the soil. Do not make soil applications when soil is saturated or frozen.
- Soil injections should be made within 12 to 18 inches of the trunk, and the solution placed 2 to 4 inches beneath the soil surface.
- Emamectin benzoate has been shown to protect ash trees for 2 years from one application.
- Canopy sprays are not recommended because of limited effectiveness, the need for special equipment, spray drift, and possible adverse effects to nontarget organisms.
- Some insecticides used to control EAB have annual per acre use limits. Refer to product labels and the following publication: ***www.mda.state.mn.us/plants/pestmanagement/~/media/Files/chemicals/pesticides/eablabelguide.ashx***

For more information:

Contact your Iowa State University Extension and Outreach office or see the following website for additional information: ***www.extension.iastate.edu/pme/EmeraldAshBorer.html***

Prepared by Mark Shour, Laura Jesse, Donald Lewis, Extension Entomologists; Jeff Iles, Extension Horticulturist; and Jesse Randall, Extension Forester, Iowa State University.

Extension Bulletin E-2955 Revised March 2007

Homeowner Guide to Emerald Ash Borer Treatments

Dave Cappaert, MSU

Emerald ash borer adult

Several insecticide products are available to homeowners for control of emerald ash borer (EAB). Treatments are needed every year to protect trees from EAB. Treatments are recommended only for homeowners in the quarantined area; it is not necessary to treat ash trees outside of this area. Treatments may be more effective if overall tree health is maintained. Therefore, it is important to fertilize trees in the fall or spring and water regularly.

Treatment Considerations

Because of the expense of yearly treatments, it is important to weigh the decision to treat carefully. Consider the value of the tree in relation to treatment costs. Also consider the health of the tree. Research suggests that insecticide treatments may be able to save infested trees exhibiting low to moderate dieback (20 to 40 percent), but the outcome is less certain than with healthy trees showing little or no sign of infestation.

Healthy ash tree: no dieback.

Treatment Options

The insecticide product available for home use is Bayer Advanced Garden™ Tree and Shrub Insect Control. For additional treatment options, contact a local professional arborist. Caution: read all label instructions before using any pesticide, avoid skin contact, and store pesticides where children cannot reach them.

Eric Rebek, MSU

Ash tree exhibiting 40 percent dieback.

Active ingredient	Product	Timing	Type of application and instructions
Imidacloprid	Bayer Advanced Garden™ Tree and Shrub Insect Control	May to early June	Soil drench Mix with water and drench around base of tree

Emerald Ash Borer

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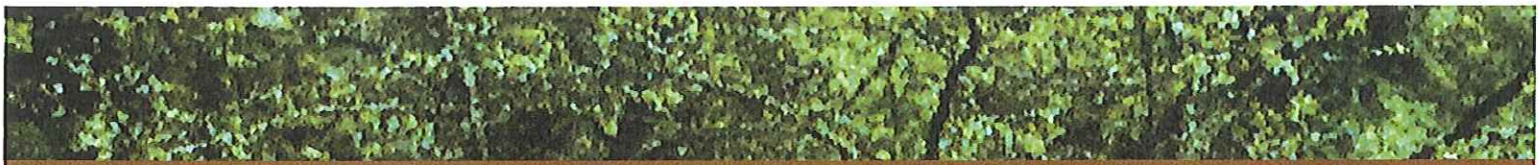

Homeowner Guide to Emerald Ash Borer Treatments

Eric Rebek, MSU

Application of soil drench around tree base.

Product Descriptions

Bayer Advanced Garden™ Tree and Shrub Insect Control is a systemic insecticide applied as a soil drench around the base of a tree. There are several Bayer Advanced Garden™ products — be sure to purchase the one with "Tree and Shrub" in large print on the label and imidacloprid as the active ingredient. Label instructions say to use 1 ounce of the insecticide for every inch of distance around the tree trunk (circumference). Applications should be made in May or early June. This product is available at most local hardware and garden stores. More information about the product is available at **www.bayeradvanced.com**.

Treatment Recommendations

- Research results indicate that the soil drench provides excellent protection for small ash trees (less than 6 inches in diameter at breast height) in the first year following treatment, but larger trees may require two years of treatment before they are protected. Therefore, it is important to begin treating large trees before they become infested. Treatment must continue each year.
- At sites where infested ash trees have been treated with a soil drench for 3 years, about half of the trees survived and look very healthy; the other half have died. These trees were heavily infested when the test began. Better results are possible if treatments begin a year or two earlier.
- Note: Homeowners may also contact tree care professionals to treat their trees. Professionals have access to **some products that are not available to homeowners**. Michigan State University does not **endorse the** insecticide products discussed in the bulletin over other options. **These products are discussed because they have been evaluated in MSU research tests on emerald ash borer.**

Authors: Kimberly A. Rebek and David R. Smitley
Michigan State University

For more information, visit:
www.emeraldashborer.info.

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Section 5

Suggested Tree Species List

Community Trees

Street Trees for Iowa

Introduction

Most Iowans are aware of the environmental and psychological benefits street trees impart to our small towns and large cities. This awareness has inspired many communities to establish tree planting programs and form citizen-run tree boards to manage this valuable resource.

Site Evaluation

Not all sites are appropriate for trees. Before planting, envision how the mature tree will fit the site. Will the tree interfere with overhead utility lines, underground sewers, lighting, street traffic, or parking? Will the street be widened or disrupted in the future, and what problems will this pose for the tree? Will the tree create unusual maintenance problems (messy fruit, leaf litter, roosting site for birds, etc.)? And will the city budget allow for annual tree maintenance? Problems and conflicts will be lessened when communities choose attractive, durable trees, install them in appropriate sites, and provide necessary yearly maintenance.

Tree Diversity

There are aesthetic advantages to planting a street to a single species or cultivar. But painful lessons learned with American elms, and more recently with honeylocusts that became insect-ridden when planted in monocultures (with other honeylocusts) and with short-lived 'Bradford' pears, are reminders that tree diversity is a community's best hedge against potential disaster. Communities can diversify street tree plantings by using a single species or cultivar on one street or block, and planting other species on adjacent streets. In newer developments with winding streets or in areas with existing trees, several kinds of trees might be combined, as long as the species are visually and spatially compatible. Mixed plantings, in which different tree species are arranged in orderly patterns, is another way to introduce diversity.

For maximum protection against insects, disease, or environmental stress, the urban/suburban tree population should reflect:

1. No more than 10 percent of any single tree species.

2. No more than 20 percent of species in any tree genus.

3. No more than 30 percent of species in any tree family.

Recommended Trees

As the Emerald Ash Borer (EAB) continues to infest and kill native ash species in the Midwest (Illinois, Indiana, Michigan, Ohio, and Pennsylvania), nursery and landscape professionals in Iowa appropriately are reducing or eliminating green, white, black, and blue ash from their inventories and designs, replacing them with a host of other useful, pest-resistant tree species. Many suitable alternatives to ash (*Fraxinus* spp.) can be found at local nurseries and garden centers and a sampling of those species and cultivars are described in this publication.

Medium-to-Large Trees

Freeman maple – *Acer* × *freemanii*
Size: 45 to 50 feet in height with ascending branches; usually taller than broad
Hardiness zone: 4
Growth rate: Fast
Leaf characteristics: Rich green summer leaves change to orange and red in fall.
Remarks: A durable group of maples considered hybrids of red maple *(Acer rubrum)* and silver maple *(Acer saccharinum)*.
Useful cultivars: 'DTR 102' (Autumn Fantasy®), 'Jeffersred' (Autumn Blaze®), 'Marmo', and 'Sienna' (Sienna Glen®)

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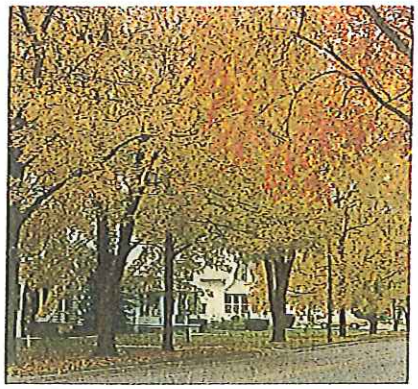


Sugar maples are best used in residential areas.

Miyabe maple – *Acer miyabei*
Size: 40 to 45 feet in height, spreading 20 to 25 feet wide
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Medium green tatter-resistant foliage turns golden-yellow in the fall.
Remarks: An excellent residential street tree with few (if any) significant insect and disease problems.
Useful cultivar: 'Morton' (State Street®)

Norway maple – *Acer platanoides*
Size: 40 to 50 feet in height with an equal spread
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Dark green summer leaves change to yellow in fall.
Remarks: This species tolerates a variety of soil conditions but tends to be shallow-rooted and will heave sidewalks if planted too close. Purple-leaf cultivars have performed poorly in Iowa. Avoid planting where root growth is restricted.
Useful cultivars: 'Deborah', 'Ezestre' (Easy Street™), 'Fairview', 'Pond' (Emerald Lustre™), 'Emerald Queen', and 'Princeton Gold'
Related species: *Acer truncatum* × *Acer platanoides* 'Keithsform' (Norwegian Sunset®)–35 feet tall and 25 feet wide, 'Warrenred' (Pacific Sunset®)–30 feet tall and 25 feet wide

Red maple – *Acer rubrum*
Size: 40 to 50 feet in height with an equal spread
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Glossy green leaves turn shades of orange and red in fall.
Remarks: Good residential yard tree. Does not tolerate high pH soils.
Useful cultivars: 'Magnificent Magenta' (Burgundy Belle®), 'Franksred' (Red Sunset®), 'Bailcraig' (Scarlet Jewell™), 'Frank Jr.' (Redpointe™), 'Brandywine', 'New World', and 'Somerset'

Sugar maple – *Acer saccharum*
Size: 60 to 75 feet tall, spreading to two-thirds its height
Hardiness zone: 4
Growth rate: Slow to medium
Leaf characteristics: Medium to dark green summer leaves turn yellow and orange tones in autumn.
Remarks: Best used in residential areas. Not appropriate for planter boxes, narrow boulevards, or other restricted sites.
Useful cultivars: 'Autumn Splendor', Commemoration', 'Morton' (Crescendo™), 'Endowment', 'Bailsta' (Fall Fiesta®), 'Green Mountain', and 'Legacy'

Hackberry – *Celtis occidentalis*
Size: 40 to 60 feet in height with equal spread; can grow to 100 feet tall
Hardiness zone: 3
Growth rate: Slow to medium
Leaf characteristics: Dull green summer leaves become yellow-green in fall.
Remarks: Not a prime specimen tree but will tolerate the harshest of urban conditions. Has several insect problems, but none are serious.
Useful cultivars: 'Chicagoland', 'Praire Pride', and 'Windy City'

Turkish filbert – *Corylus colurna*
Size: 45 to 60 feet tall, spreading 25 to 35 feet wide
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Deep green leaves turn yellow to purple in fall. Resistant to scorch.
Remarks: A stately, symmetrical tree perfect for boulevard or use as a specimen tree. Somewhat difficult to transplant, and fruit may pose a litter problem.

Ginkgo – *Ginkgo biloba*
Size: 50 to 80 feet tall, spreading 40 to 50 feet
Hardiness zone: 4
Growth rate: Slow
Leaf characteristics: Interesting fan-shaped leaves are bright green in summer, changing to bright yellow in fall.
Remarks: Female trees produce messy, rank smelling fruit and should be avoided. Pest-free. An outstanding residential tree.
Useful cultivars: 'Autumn Gold', 'The President' (Presidential Gold™), 'Princeton Sentry', 'Magyar', and 'Woodstock' (Emperor™)

Use male (fruitless) ginko along busy streets.

Thornless common honeylocust – *Gleditsia triacanthos* var. *inermis*
Size: Variable; 30 to 70 feet tall with comparable spread
Hardiness zone: 4
Growth rate: Medium to fast
Leaf characteristics: Small leaflets are bright green in summer, changing to clear yellow in fall.
Remarks: Minimal fall clean-up because of small leaves. Monoculture plantings may result in severe insect problems.
Useful cultivars: 'Harve' Northern Acclaim®), 'PNI 2835' (Shademaster®), and 'Skycole' (Skyline®)

Kentucky coffeetree – *Gymnocladus dioicus*
Size: 50 to 75 feet tall, spreading 40 to 50 feet wide
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Dark blue-green summer foliage turns yellow-brown in fall.
Remarks: Handsome bark, bold winter texture, and durability make this an excellent tree for urban areas. Falling fruit pods may pose a maintenance problem.

American hophornbeam – *Ostrya virginiana*
Size: 25 to 40 feet tall, spreading to 20 feet
Hardiness zone: 3
Growth rate: Slow
Leaf characteristics: Leaves are dark green in summer, turning yellow in fall.
Remarks: Excellent small tree for narrow boulevards. Best planted in early spring. Very sensitive to de-icing salt.

Corktree – *Phellodendron* spp.
Size: 30 to 40 feet tall with an equal spread resulting in a broad, vase-shaped crown
Hardiness zone: 4
Growth Rate: Medium
Leaf characteristics: Medium green summer foliage turns yellow to bright yellow in autumn.
Remarks: Male (fruitless) selections (listed below) are favored. All selections are tough and durable with interesting corky bark.
Useful cultivar: 'Macho', 'Longenecker' (Eye Stopper™), and 'His Majesty'

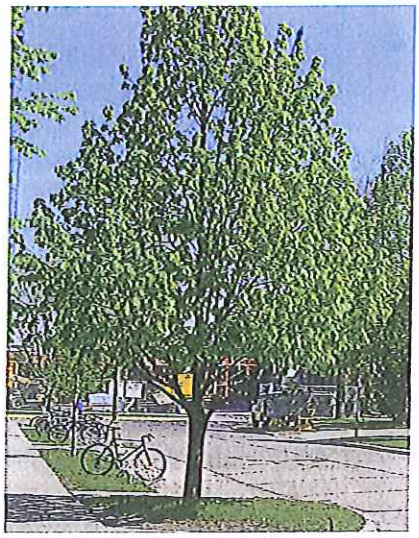
Callery pear – *Pyrus calleryana*
Size: 30 to 40 feet tall, spreading 20 to 25 feet wide
Hardiness zone: 5
Growth rate: Medium
Leaf characteristics: Glossy, dark green summer leaves change to shades of yellow, scarlet, orange, and purple in fall.
Flowers: Profuse white blooms form in late April.
Remarks: 'Bradford' is no longer recommended because of poor branch habit and marginal winter hardiness.
Useful cultivars: 'Aristocrat', 'Autumn Blaze', 'Cambridge', Glen's Form' (Chanticleer®), and 'Trinity'

Swamp white oak – *Quercus bicolor*
Size: 50 to 80 feet tall with an equal or greater spread
Hardiness zone: 3
Growth rate: Slow to medium
Leaf characteristics: Summer leaves are dark, lustrous green above, and whitish or velvety grayish green beneath. Fall color is usually yellow.
Remarks: Tough, drought tolerant tree, but leaves will become chlorotic (yellow) when planted on highly alkaline soils. Allow plenty of room for this tree to grow.

English oak – *Quercus robur*
Size: 40 to 60 feet tall with comparable spread
Hardiness zone: 5
Growth rate: Slow to medium
Leaf characteristics: Dark green summer leaves turn brown in fall and persist through winter.
Remarks: Tolerant of high pH and deicing salts. Persistent leaves create an interesting winter effect.

Red oak – *Quercus rubra*
Size: 60 to 75 feet tall and 40 to 50 feet wide
Hardiness zone: 4
Growth rate: Medium to fast
Leaf characteristics: Leaves are reddish when first emerging, dark shiny green in summer, finally turning russet-red to bright red in fall.
Remarks: Durable tree, tolerant of high pH soils. But red oak is extremely susceptible to the oak wilt fungus. Do not plant where red oak populations are high.

Hybrid oaks:
'Clemons' (Heritage®)–50 feet tall and 40 feet wide
'Long' (Regal Prince®)–45 feet tall and 20 feet wide
'Crimschmidt' (Crimson Spire™)–45 feet tall and 15 feet wide



Lindens are excellent trees for boulevards, malls, or planters.

American linden – *Tilia americana*
Size: 60 to 80 feet tall, spreading to two-thirds of its height
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Large, heart-shaped leaves are dark green in summer, changing to yellow-brown in fall.
Remarks: Neat, pyramidal growth habit makes this tree perfect for boulevard plantings.
Useful cultivars: 'Boulevard', 'DTR 123' (Legend®), 'McKSentry' (American Sentry™), 'Lincoln', and 'Redmond'

Littleleaf linden – *Tilia cordata*
Size: 40 to 60 feet tall and 30 to 40 feet wide
Hardiness zone: 4
Growth rate: Medium
Leaf characteristics: Shiny green leaves turn a pale yellow in fall.
Remarks: Outstanding street, mall, or planter tree. Withstands moderate compaction but has poor salt and drought tolerance. Pleasing pyramidal form.
Useful cultivars:
'Baileyi' (Shamrock®), 'Corzam' (Corinthian®), 'Glenleven', 'June Bride', and 'Ronald' (Norlin™)

Related species:
Mongolian linden – *Tilia mongolica* 'Harvest Gold' (40 feet tall and 25 feet wide)

Silver linden – *Tilia tomentosa*
Size: 40 to 60 feet tall and 30 to 50 feet wide
Hardiness zone: 5
Growth rate: Medium
Leaf characteristics: Leaves a lustrous, dark green on upper surface, and silver-gray beneath.
Remarks: Two-toned leaves create a pleasing effect. Heat and drought tolerant, and resistant to Japanese beetle.
Useful cultivar: 'PNI 6051' (Green Mountain®), 'Sashazam' (Satin Shadow™), and 'Wandell' (Sterling Silver®)

American elm – *Ulmus americana*
Size: 60 to 80 feet tall with arching limbs
Hardiness zone: 4
Growth rate: Fast
Leaf characteristics: Leaves are medium green in summer, becoming golden-yellow in fall.
Remarks: Several Dutch elm disease-tolerant or resistant selections can be found in the nursery trade.
Useful cultivars: 'Jefferson', 'Lewis & Clark' (Prairie Expedition™), New Harmony', 'Princeton', and 'Valley Forge'

Other useful DED-resistant elms:
'Frontier'–45 feet tall and 25 feet wide
'Pioneer'–50 feet tall and wide
'Morton' (Accolade™)–70 feet tall and 60 feet wide
'Morton Glossy' (Triumph™)–55 feet tall and 50 feet wide
'New Horizon'–40 feet tall and 25 feet wide
'Prospector'–40 feet tall and 30 feet wide
'Discovery'–50 feet tall and 40 feet wide

IOWA URBAN AND COMMUNITY FORESTRY COUNCIL

Contact Organizations

Forestry Division/Iowa Department of Natural Resources
Wallace Building, 502 E. 9th St.
Des Moines, IA 50319-0034
(515) 281-5918
www.iowadnr.gov/forestry

Iowa State University Extension Distribution Center
Ames, IA 50011
(515) 294-5247
www.extension.iastate.edu/store

Forestry
Ames, IA 50011-3221
(515) 294-1168
www.forestry.iastate.edu

Horticulture
Ames, IA 50011
(515) 294-2751
www.yardandgarden.extension.iastate.edu

Trees Forever
770 7th Avenue, Marion, IA 52302
(319) 373-0650
www.treesforever.org

Prepared by Jeff Iles, extension horticulturist, in conjunction with the Iowa Urban and Community Forestry Council.

File: Forestry 4

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914 in cooperation with the U.S. Department of Agriculture. Jack M. Payne, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.

Section 6

Who to Contact

Marion Parks and Recreation
Thomas Park Administrative Offices
343 Marion Blvd, Marion, IA 52302
(319) 447-3580
www.cityofmarion.org

Trees Forever
770 7th Avenue, Marion, IA 52302
(319) 373-0650
www.treesforever.org

Iowa DNR
www.iowadnr.gov

Emerald Ash Borer website
Sponsored by USDA Forest Service
www.emeraldashborer.info

Frequently Asked Questions/Answers on Emerald Ash Borer (EAB)

1. **What is the emerald ash borer?** It is a very small, shiny green beetle (½ inch long x ⅛ inch wide; about the size of Mr. Lincoln's image on a penny).

2. **What does EAB eat?** Hosts are species (and cultivars) of ash in the genus *Fraxinus*. Hosts include green ash (e.g., 'Marshall Seedless', 'Patmore', and 'Summit'), white ash (e.g., Autumn Purple®) black ash, blue ash, and pumpkin ash. Manchurian and Chinese ash trees are primary hosts in its homeland [Eurasia]. Mountain ashes (*Sorbus* species) are NOT hosts.

3. **Where is EAB from?** This beetle is native to Asia and is found in China and Korea. It also has been reported in Japan, Mongolia, the Russian Far East, and Taiwan. EAB arrived in the United States sometime before 2002 in wood packing materials.

4. **How did it get to Iowa?** Most EAB infestations in the United States have been started by people unknowingly moving infested firewood, nursery plants, or sawmill logs. The adult beetle also can fly short distances (2 to 5 miles).

5. **Should I be concerned about EAB?** Yes. It kills ash trees, usually in 2-4 years. In the Midwest, millions of ash trees have been killed by EAB since 2002. There are about 3.1 million urban ash trees and an estimated 52 million ash trees in forests in the state of Iowa. Statewide, Iowa averages 16-17% ash on city property, though the ash component in tree inventories can reach 87%.

6. **How do I know if I have an ash tree in my yard?** Two sources to check on tree identification are: https://store.extension.iastate.edu/ItemDetail.aspx?ProductID=1482 and http://www.extension.iastate.edu/forestry/iowa_trees/tree_id.html

7. **How do I know if my ash tree is infested?** Look for the following symptoms:
    a. Thinning or dying branches in the top of the tree
    b. Water sprouts (suckers) halfway up the trunk
    c. Feeding notches on edge of leaflets
    d. Woodpecker feeding sites/many bark flakes on lawn
    e. S-shaped feeding galleries under dead bark
    f. D-shaped exit holes (1/8 inch diameter)

8. **Who can help me determine if my tree is infested?** Contact one of the following if you suspect EAB in your tree:
    a. State Entomologist Office, IDALS: 515-725-1465
    b. Iowa DNR Forestry, 515-281-4915
    c. ISU Extension and Outreach 515-294-1101

9. **Who should be thinking about treating ash trees?** If you are a homeowner within 15 miles of a known infested area, you can consider treatment of a healthy ash tree during the growing season (see #10 below). If you are not in a known infested area we do not recommend treatment at this time.

10. **Ash Borer Management Options** www.extension.iastate.edu/Publications/PM2084.pdf
    a. Ash trees can be protected with insecticide applied by a commercial pesticide applicator or the homeowner. Trees must be healthy, vigorously growing, and valuable to your landscape.
    b. Most of the treatments must be done each year for the life of the tree. There is one treatment that lasts for two years (Tree-Äge).

Prepared by Mark Shour, Laura Jesse, and Donald Lewis, Iowa State University Extension and Outreach – February 19, 2014

c. Keep in mind that treatment may ***not*** be effective for a given tree due to past injuries, age of the tree, soil moisture, soil compaction, and other site and environmental factors.
d. Preventive treatments are most effective. Infested trees with less than 30% dieback of the crown ***might be*** saved for a few years, but the tree's crown will be misshaped as a result of removing the dead branches.
e. Preventive treatments for EAB are NOT recommended until a confirmed EAB site is 15 miles away. Treatment outside this risk zone is not prudent.
f. Systemic insecticides require time and active tree growth for distribution in the ash tree. **Most products must be applied in early spring to be effective. One product, Tree-Äge, can be trunk-injected throughout the growing season by a commercial pesticide applicator.**
g. Soil drench homeowner treatments are effective for ash trees up to 60 inches in circumference (20 inches diameter), while granular treatments are recommended for trees up to 36 inches in circumference (12 inches diameter). Homeowners can make only one application per year.
h. There are several treatment options available for ash trees when a commercial pesticide applicator makes the application. Always use a certified applicator with experience in treating trees.
i. There is a per acre use limitation for soil treatments and basal bark treatments; consult the product label when planning applications.
j. ISU Extension and Outreach does NOT recommend canopy sprays because of limited effectiveness, the need for specialized equipment, spray drift, and possible adverse effects to nontarget organisms.

11. **If I am contacted by a pesticide applicator to treat ash trees for EAB in the fall or winter, what course should I take?** The best time to make a preventive application for EAB is spring; some products can be used throughout the summer and early fall (before leaf color starts to change). IF you live within 15 miles of a confirmed EAB infested site, get an estimate for the treatment. It is best to get at least one additional estimate before any work is done. IF you live outside the risk zone, thank the applicator for showing interest and keep the company information on file.

12. **Where has EAB been found in Iowa?** EAB has been found in eight Iowa counties:
    a. Allamakee –New Albin, Lansing, Black Hawk Point, Plough Slough
    b. Black Hawk–Waterloo
    c. Bremer–Waverly
    d. Cedar – Mechanicsville
    e. Des Moines – Burlington
    f. Jefferson – Fairfield
    g. Union – Creston
    g. Wapello – Eddyville

13. **Now that EAB has come to Iowa, is there some plan to manage/contain this pest?** Yes, a detailed plan has been developed by collaborative agencies. The EAB Response Plan and other current Iowa information about EAB are given at: www.extension.iastate.edu/pme/EmeraldAshBorer.html

14. **What does an EAB quarantine mean?** A quarantine by state and U.S. agriculture departments means that hardwood firewood, ash logs, and wood chips cannot be moved out of the area without a permit. Homeowners must not remove their ash tree or firewood from their tree to an area outside the quarantine. Tree removal companies must not haul logs or firewood outside the quarantine area unless inspected and treated as required by the regulations.

15. **How many counties in Iowa have been quarantined?** The entire state (99 counties) of Iowa has been quarantined for EAB.

16. **What should a homeowner or tree care company do with ash trees cut down in or near the infested area?** Dispose or use the wood within the quarantined area.

17. **What general recommendations are available to communities?** The Iowa Department of Natural Resources – Forestry Bureau has worked with several communities to deal with EAB infestations. Contact Tivon Feeley (515-281-4915) or Emma Hanigan (515-281-5600) for more information.

18. **Where can I find current information about EAB on the Internet?** Sites to gather current information about this exotic pest include:
    a. National site: www.emeraldashborer.info
    b. ISU Extension & Outreach site: www.extension.iastate.edu/pme/EmeraldAshBorer.html
    c. IDALS site: www.IowaTreePests.com
    d. IDNR site: www.iowadnr.gov/Environment/Forestry/ForestHealth/EmeraldAshBorer.aspx