

City of South Milwaukee Emerald Ash Borer Readiness Plan



Declining ash on Fairview Avenue



Source: David Cappaert, Michigan State University, Bugwood.org

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INTRODUCTION & EXECUTIVE SUMMARY

EAB was confirmed in South Milwaukee in June of 2013 and in the summer and fall of 2013, Bluestem Forestry Consulting Inc. conducted a street & park tree inventory throughout the City of South Milwaukee for the purpose of preparing a plan to minimize the economic and social impacts of an emerald ash borer (EAB) infestation.

Some findings/recommendations of this plan include:

- ❖ 745 public ash trees were inventoried. This represents 16.6% of total tree population. Levels recommended by the WI DNR are not more than 5% of any one species and not more than 10% of any one genus per community. Following these recommendations will assure that large numbers of trees do not die from disease or insect in a short period of time. South Milwaukee's ash component is over these recommended limits.
- ❖ Three ash species were inventoried. These are: green ash (*Fraxinus pennsylvanica*) (639 trees), white ash (*Fraxinus Americana*) (102 trees) and black ash (*Fraxinus nigra*) (4 trees). Mountain ash (*Sorbus aucuparia*) is not a true ash and is therefore not susceptible to EAB.
- ❖ Public ash trees in South Milwaukee have been fairly well maintained. In fact most all of the trees in South Milwaukee have been well maintained. Presently, the City does not provide any tree maintenance for street trees and homeowners are expected to provide all care. The City does care for park trees.
- ❖ 42 ash are located in the Arboretum/Little League Field or at City Hall. 703 ash are located on street rights-of-way.
- ❖ Bluestem recommends chemically treating healthy ash with diameters greater than or equal to 12". Chemical treatments are very effective, but must be applied annually or biannually (every other year) depending upon the chemical used. 397 trees are recommended for preservation.
- ❖ Ash on the removal list due to a high risk defect (143 trees) and trees 1-11 inch in diameter (205) are recommended for removal and replanting.
- ❖ The 'City of South Milwaukee Urban Forestry Plan and Inventory Summary' is a companion guide discussing all inventory findings.
- Several options exist for funding the cost of street tree right-of-way related activities. These options include:
 - Continue existing policy requiring homeowners to complete street tree maintenance
 - Fully fund a municipal forestry program
 - Partially fund street tree activities via a flat 'subsidy' per tree-related activity (fixed fee to abutting property owner)
 - Cost share with homeowners (percentage fee to abutting property owner)
 - Forestry fee (annual forestry fee per property)Each of these options are discussed in depth with estimated prices for each option.
- ❖ The average ash diameter is 16.6" at breast height. This middle-aged diameter indicates that with treatment, most ash can be expected to contribute to the urban forest for many decades to come.
- ❖ The ash population is relatively healthy with an average condition rating of good. New infestations are popping up quickly. An up-to-date map of current infestations can be found at: <http://www.emeraldashborer.info/surveyinfo.cfm>.
- ❖ The total estimated replacement value of inventoried ash is \$1,915,254.74. Bluestem Forestry Consulting Inc. uses the International Society of Arboriculture Valuation of Landscape Trees, Shrubs and Other Plants: A Guide to the Methods and Procedures for Appraising Amenity Plants (Ninth Edition) to determine valuation.

EAB HOTLINE 1-800-462-2803

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Purpose of Readiness Plan

The purpose of this Emerald Ash Borer readiness plan is to identify the essential personnel, resources, procedures and fiscal resources to manage Emerald Ash Borer within the city.

Significance of Emerald Ash Borer

The Emerald Ash Borer (*Agrilus planipennis*) is an exotic pest native to Asia that was identified in southeastern Michigan near Detroit in the summer of 2002. The adult beetles munch on ash foliage but cause little damage. The real damage is caused by the EAB larvae that feed on the inner bark of ash trees, disrupting the tree's ability to transport water and nutrients. It is suspected that the insect was initially introduced to the United States via solid wood packing material carried in cargo ships or airplanes originating in its native Asia. Thousands of dead and dying ash trees were infested indicating the EAB had been introduced several years prior to 2002. Before it was detected, EAB spread to several other states unchecked by regulation or control. Efforts to eradicate EAB have been unsuccessful in part because infestations are usually well established before they are detected.

No North American ash species have been found to be resistant to EAB. Nearly all untreated, infested ash trees die within a few years of infestation. Twenty counties are under a quarantine that restricts the movement of certain items such as hardwood firewood that could transport the pest.

Emerald Ash Borer Quarantined Counties



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Tree Inventory Findings

Bluestem conducted an individual tree inventory of all trees within maintained areas of streets rights-of-ways and certain parks/municipal properties during the summer and fall of 2013. Public areas inventoried included City Hall, the Arboretum, Little League Fields and the City Library. Wooded and county-owned areas were not inventoried. This plan specifically addresses the ash inventoried and details management options for ash/EAB.

A total of 745 ash trees were inventoried in South Milwaukee. Only 33 of these are located in parks and the remaining 712 are located on street rights-of-way. The total street tree population in South Milwaukee is 4,491 trees. Ash accounts for 16.6% of the public urban forest in South Milwaukee. Species diversity guidelines developed by the Wisconsin Department of Natural Resources recommends not more than 5% of any one species and not more than 10% of any one family. For example, green ash is an individual species and these can be found within the ash family. Following these recommendations will assure that large numbers of trees do not die from disease or insect in a short period of time. As with nearly all communities in Wisconsin, the ash population in South Milwaukee is beyond recommended limits.

The average condition of the ash tree population is good. However, 65 ash are recommended for removal due to decline or defect and another 78 are in poor condition. While not confirmed, it is extremely likely that many ash are already infested with EAB and are experiencing a decline in health/condition as a result. If removal rate is used as a gauge for health, the ash removal rate is a higher than average at 8.7%. This is calculated by dividing the number of ash removals by the total number of ash trees:

$$65 \text{ ash removals} \div 745 \text{ total ash trees} = 0.0872 = 8.7\%$$

The entire inventory removal rate is:

$$336 \text{ tree removals} \div 4,491 \text{ total trees} = 0.0748 = 7.5\%$$

South Milwaukee's ash trees are already showing signs of infestation and it is imperative that measures be taken to preserve the ash population during this EAB crisis. If trees are not preserved, the City will fully lose 16% of its entire public tree population. Some additional findings of ash in South Milwaukee include:

Count of Ash	
Condition	Trees
Good	301 (40.4%)
Fair	249 (33.2%)
Very Poor/Dead	65 (8.7%)
Poor	78 (10.7%)
Excellent	52 (7.0%)
TOTAL	745

Count of Ash	
DBH	Trees
1-12"	269 (36.1%)
13-18"	174 (23.4%)
19-24"	193 (25.9%)
25-32"	94 (12.6%)
≥33"	15 (2.0%)
TOTAL	745

A definition of terms and an in-depth discussion of all inventory data can be found in the 'City of South Milwaukee Urban Forestry Plan and Inventory Summary'. A database listing each individual tree and its attributes has been provided to the City by MSA Professional Services. A map of ash locations within the City can be found as attachment 1.

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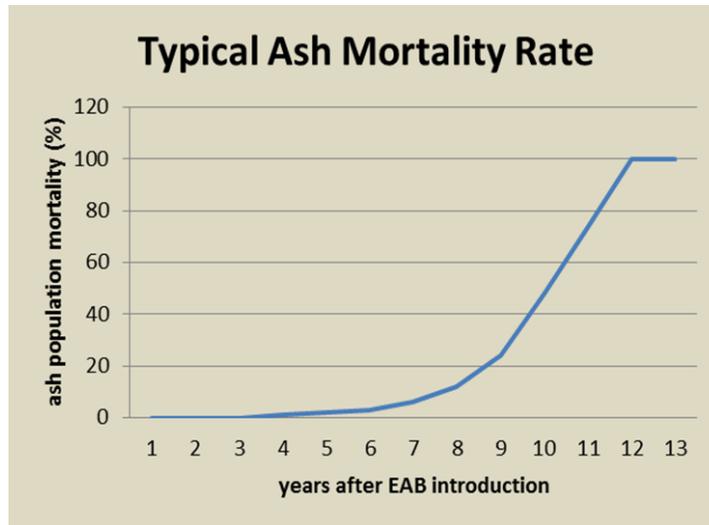
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IMMEDIATE DECISIONS AND ACTIONS

Because EAB is already confirmed and well established in South Milwaukee, the following actions need to take place quickly. The graph below illustrates the ash mortality rate beginning at infestation until death. While the timeline may seem to stretch over many years, it is estimated that South Milwaukee is at year five or six. Ash mortality begins to greatly increase between years six and seven. Likewise, South Milwaukee can expect ash mortality to increase dramatically in the next year or two.



Waiting to begin activities is not an option for three primary reasons.

First, public safety is paramount. To wait and tackle this issue when 745 ash trees are standing dead in parks/municipal areas and on street rights-of-way creates an enormous public safety issue. Allowing ash trees, or any tree for that matter, to remain dead or with major dieback in a municipality is an unacceptable public safety risk. Removals and treatments should begin immediately to avoid this scenario.

Second, tree removal cost is greatly affected by the degree of deadwood or condition of a tree. Experience has shown that dead ash trees dry more quickly than a typical tree due to the damage caused by the insect. Dead ash dull saw blades much more quickly than green trees resulting in increased equipment costs. Dead ash trees shatter upon impact with the ground resulting in increased removal cleanup costs and time. Regardless of who is ultimately responsible for payment of tree removal, removing the tree prior to death will reduce cost.

Third, treatment is an option only when trees are still relatively healthy and experiencing only minor deadwood. Treatment is not effective when trees have dieback greater than approximately 25%. Ideally, treatment would begin prior to any branch death. Treatment will *not* bring dead branches and limbs back to life, it will, however, protect trees that are still living. To be effective, treatment needs to begin throughout the City immediately.

Establish Chain of Command & Contract with Forester

A successful action plan always has a designee who is charged with directing the response. This individual will essentially function as a lead for the City. They will coordinate all EAB related activities. This EAB project leader will have many responsibilities and duties. Some of these duties will include:

- Completing tree inspections and causing tree maintenance to be completed
- Prioritizing and budgeting for tree removals, treatments and replanting
- Contacting homeowners
- Fielding all forestry related questions
- Directing EAB related work on public properties
- Updating City administration and council members
- Public and media outreach
- Education of public
- Enforcement of ordinances
- Coordination with state and local officials

The City does not have a City Forester or Forestry Department. The Municipal Code delegates some forestry duties (such as inspection and vision clearance) to the City Engineer. The City Engineer also fields most forestry related questions, enforces ordinances and obtained grant funding for this inventory project. The Public Works/Street Department issues order for trimming where tree limbs interfere with equipment operation.

The City Engineer has been able to manage forestry duties on a very limited basis, with help from Public Works, because the volume and need has been fairly low. The City can expect a huge increase in forestry related issues and duties such as tree inspections, tree maintenance enforcement, training prunes and as a result of EAB and other problems identified through the inventory. It is completely unreasonable and unfeasible to expect the City Engineer to complete increased forestry management and still complete his primary duty as Engineer. The City will need an individual to fill this role. The Engineer & Public Works will certainly remain engaged, but the addition of a forester will allow existing staff to continue successfully completing their current job duties.

Two options exist for filling the forestry staff void. The first is for City to add a forester to City staff. The second is to contract with a professional forester.

Adding City staff will mean that the City will have access to an expert at all times. But based on tree population, it may not be necessary to staff a forester once the EAB crisis has been managed.

Contracting with a professional forester means that the City will have access to an expert, but will need to be more flexible with timing of activities and expectations. When EAB activities have decreased it will be easy to decrease contract forestry services.

It is estimated that beginning in 2014 South Milwaukee will need an individual between 20-30 hours weekly to implement this plan and the recommendations in the 'City of South Milwaukee Urban Forestry Plan and Inventory Summary.' This level of service is expected to continue for 3-4 years and will then begin to taper off. Taking into consideration costs, duties and time commitments this plan recommends contracting with a

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professional forester. This scenario should be re-evaluated annually during budget time to determine if it is more reasonable to hire an in-house forester. The City can expect the cost of a contract forester to range from \$50,000-\$70,000 annually depending upon the level of urban forestry desired.

Select Trees for Removal or Preservation

One of the first questions that arise when a community is making decisions regarding EAB is whether to maintain an ash component within their public urban forest. Any untreated tree can be expected to die. The options that exist are:

- ✓ *Remove all ash from the public urban forest*
- ✓ *Save all ash thru the use of chemical treatments*
- ✓ *Treat a portion of trees deemed significant and remove the remaining ash trees*

There are pros and cons to each choice:

Removing all ash from the public forest (and replanting):

- | | |
|--|---|
| Pro: Costs are definitive and finite | Con: High initial cost |
| Pro: No long term chemical treatment costs | Con: A unique species is lost to the forest |
| Pro: Diverse # of species replanted | Con: Mature trees are replaced with small trees |
| | Con: Public sentiment against removal |

Save suitable ash thru the use of chemical treatments:

- | | |
|--|--|
| Pro: Ash remains a component of forest | Con: Long term treatment costs are incurred |
| Pro: Public is generally supportive | Con: Potential environmental effects unknown |
| Pro: Large trees continue contributing to forest | |

Remove a portion of trees and treat a portion of trees:

- | | |
|---|--|
| Pro: Ash remains a native component of forest | Con: Long term treatment costs are incurred |
| Pro: Reduces high initial removal costs | Con: Public disapproval of decision criteria |
| Pro: Only trees in good condition retained | |

The City of South Milwaukee's most reasonable approach is to preserve a portion of ash trees and remove a portion. A significant number of ash trees are recommended for preservation thru the use of chemical treatments, but unfortunately, some will need to be removed due to defect, size or decline.

The rationale/need for some tree removals is:

Remove ash trees identified as 'removal' or 'very poor' or 'poor' in the inventory. The most logical method to reduce ash volume initially is to remove ash trees identified through the inventory as in need of removal or those in 'very poor' or 'poor' condition. The trees on this list have a significant defect that presents a high risk. Any tree, which has the potential to entirely or partially fail and impact a target, can be considered a higher risk. A target can be a person, vehicle, building or any place where people gather

(Source: Urban Tree Risk Management Guide, USDA Forest Service: www.na.fs.fed.us/spfo/pubs/uf/utrm). There are 143 ash trees on this list. These removals and replantings should occur in 2014.

Remove and replace small diameter ash trees. According to research, chemical treatments to preserve ash will need to continue for the lifespan of the tree. When treatment stops, the tree begins to die. Smaller diameter trees are typically not worth preserving for a variety of reasons.

- They will require treatments for many, many decades
- They contribute less overall benefits than large diameter trees
- Removal with immediate replanting results in less impact than would removing a very large tree

For these reasons, removal of small diameter ash (1-11") are recommended for removal and replanting. There are 205 ash of this size in South Milwaukee. These should be scheduled for removal and replanting beginning in 2015.

Chemically treat all other ash. After removals, 397 public ash will remain in the population. These trees are larger diameter ($\geq 12"$) ash that are in fair to excellent health. These are the trees that should be targeted for preservation. This activity should begin in 2014.

The two most common treatments are soil applied and injected. The soil applied insecticide must be applied annually and are not recommended for trees over 16" in diameter. The trunk injected insecticides must be applied every-other year, can only be applied by a certified applicator and are effective are larger diameter trees. Both treatments are effective, but procedures for application including rate and timing must be followed closely.

Treatments are meant to be evaluated after each treatment cycle (2 years). A treatment program is not envisioned to last 30 or even 20 years. It is meant to provide a more gradual transition towards the disappearance of ash in Kenosha County public spaces.

Insecticide treatment options are discussed in Attachment 5 and additional information can be found at: http://www.emeraldashborer.info/files/multistate_eab_insecticide_fact_sheet.pdf.

Select a Funding Mechanism

The City currently cares for trees in park/municipal properties only. The care of street right-of-way trees has been the responsibility of individual homeowners. Most municipalities within Wisconsin assume the responsibility of tree care and management within both public properties and street rights-of-way. The South Milwaukee City Attorney has reviewed the current policy and provided an opinion that City ordinances requiring property owners' obligation to maintain street trees will not relieve the City of liability, and the ordinance cannot shift the liability to the abutting property owner, although it may shift the cost of maintenance.

This plan recommends that the City cause tree maintenance to occur. The City should institute a minimum program of tree inspections and risk/hazard reduction (see more detailed risk reduction recommendations later in this plan). Ideally, a complete urban forestry program maintenance program including scheduled pruning, pest management, planting and other forms of tree care is also instituted.

Causing tree maintenance in rights-of-way will require a source of funding. This plan presents several funding scenarios for future forestry management of street right-of-way trees. These are:

- A. Continue existing policy requiring homeowners to complete street tree maintenance**
- B. Fully fund a municipal forestry program**
- C. Partially fund street tree activities via a flat ‘subsidy’ per tree-related activity** (fixed fee to abutting property owner)
- D. Cost share with homeowners** (percentage fee to abutting property owner)
- E. Forestry Fee** (annual forestry fee per property)

Option A is to continue the existing policy of requiring homeowners to fund all street tree maintenance. This is the least expensive option for the City. However, even this option will incur costs due to EAB and other issues identified during the inventory. As discussed earlier, a forester needs to be retained to coordinate activities with homeowners and assure that actions are being completed.

Option B is the most common municipal forestry program scenario. Most municipalities fund management of public/park trees as well as street right-of-way trees.

Option C is presented to span the gap between Options A & B. Both plans that have been created as a result of the inventory recommend a large amount of forestry work. Whether the recommendation is to treat an ash tree for preservation or remove a high risk tree, there are homeowners who will find it difficult to fully pay for the cost of tree maintenance of their street right-of-way trees. This option would establish a flat fee per activity to lower the cost to homeowners with the City funding the balance.

Option D is similar to Option C, but results in less finite costs to the City. Instead of a flat-fee, the City would simply cost share all street tree maintenance costs with homeowners. For instance, if an EAB treatment costs \$100, the City could pay a straight percentage, for example, 50%. This will result in greater cost fluctuations because the cost of removal of a 20” tree can vary greatly depending upon where the tree is located and what is nearby.

Option E would establish a fee for urban forestry similar to storm water and utility fees are collected. For example, a property owner may pay \$0.30/ft/year or a flat annual fee into an urban forestry fund. Then those fees are used to fund an urban forestry program.

At a minimum, the City should be prepared to fund two activities immediately.

1. **Forester.** Again, a forester needs to be retained to coordinate activities with homeowners and assure that actions are being completed regardless of the funding option chosen. This plan estimates EAB related costs **only**. A separate companion document “City of South Milwaukee Urban Forestry Plan & Tree Inventory Summary” was prepared that documents all forestry duties, both standard and EAB related.
2. **Replanting.** The City should strongly consider funding all planting efforts. To assure a healthy tree

canopy cover, South Milwaukee must plant trees. This plan recommends removing 350 ash from the population in addition to those recommended in the Inventory Summary. Replanting is critical to a healthy, livable community. The photos below clearly illustrate the result of planting and not planting.



Nearly complete street right-of-way canopy coverage (Fairview Avenue)



Very poor canopy coverage (Sycamore Avenue)

Estimated Costs

Rough cost estimates were obtained from a local contractor who routinely provides forestry services in the South Milwaukee area. Each activity identified in this plan has an associated cost and these appear in the following tables.

Activity 1: Forester (2014)								
TOTAL Cost (Annual Expense)	\$50,000-\$70,000							
Activity 2: Remove & Replant 143 Ash with Significant Defects (2014)								
DBH	Estimated Cost of Removal per Tree	Estimated Cost of Replanting per Tree	# of Street Trees	# of Municipal Trees	Estimated Steet Tree Cost	Estimated Municipal Tree Cost	Estimated Replanting Cost	TOTAL Cost
1-12"	\$240	\$400	26	3	\$6,240	\$720	\$11,600	\$18,560
13-18"	\$460	\$400	41		\$18,860	\$0	\$16,400	\$35,260
19-24"	\$575	\$400	38	1	\$21,850	\$575	\$15,600	\$38,025
25-31"	\$750	\$400	21		\$15,750	\$0	\$8,400	\$24,150
≥32"	\$1,125	\$400	13		\$14,625	\$0	\$5,200	\$19,825
					\$77,325	\$1,295	\$57,200	\$115,995
Activity 3: Remove & Replant 205 Small Diameter (1-11") Ash (2015)								
Estimated Cost of Removal per Tree	Estimated Cost of Replanting per Tree	# of Street Trees	# of Municipal Trees	Estimated Steet Tree Cost	Estimated Municipal Tree Cost	Estimated Replanting Cost	TOTAL Cost	
\$240	\$400	193	12	\$46,320	\$2,880	\$82,000	\$131,200	
Activity 4: Chemical Treatment of Remaining 369 Ash (2014)*								
# of Street Trees	# of Municipal Trees	Estimated Steet Tree Cost	Estimated Municipal Tree Cost	TOTAL Cost				
369	26	\$81,620	\$6,006	\$87,626				

*based on using TREE-age on an everyother year cycle

Community Education

It would be beneficial to distribute the findings of this action plan and general EAB information to residents. This is most likely to be effective through a direct mailing and through posting on the City website. Information to be discussed may include:

- Numbers of public ash trees found in South Milwaukee
- Ash tree and EAB identification tips, lookalike insects, signs/symptoms of EAB
- Reporting hotline
- Assistance to landowners locating ash trees on their properties
- Disposal site location
- Removal of unhealthy and other ash trees in anticipation of the EAB's arrival
- Chemical treatment options and the City treatment plan
- Replanting efforts
- FAQs and link to WI EAB website (<http://www.emeraldashborer.wi.gov/>)
- Homeowner's Guide to EAB Treatment (Attachment 5)

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Community meeting(s) are also strongly encouraged. This is a very effective way to distribute information, present experts and their findings and gauge the will of the public. From discussions with residents during the inventory fieldwork, it is expected that many members of the public strongly support urban forestry and preservation of South Milwaukee's ash resource. This is also an activity the professional Forester can complete.

Miscellaneous Concerns

Ordinances. Ordinances are being revised as a portion of this project. It is recommended that they be adopted and enforced.

Marshalling Yard. The City currently has a yard waste site that is quite large. Because they will be contracting out nearly all tree work, municipal wood waste should not be an issue. However, as EAB progresses the City may need to develop additional policies to manage private wood waste from residents.

Private Trees. While private trees are not expressly a problem managed by the City, there will be impacts. Wood waste from private trees may become a problem and policies should be developed to manage the wood waste flow. Additionally, the City will need to monitor private trees for nuisances as defined by ordinances and issue notices. This is another duty the contracted forester can complete.

Tree Species for Planting. An extensive list of trees and cultivars suitable for planting can be found as Attachment 3. A short list by common name is found below. Maples far exceed the recommended species limits and should be planted only when extremely special circumstances dictate. As always, match the tree size with planting site. Additional planting information can be found in the accompanying inventory summary document. Some suitable species include:

Good **large** selections include:

swamp white oak (*Quercus bicolor*)
hackberry (*Celtis occidentalis*)
bur oak (*Quercus macrocarpa*)
American linden (*Tilia americana*)
elm (*Ulmus* spp.)
American Liberty elm (*Ulmus americana* 'Liberty')
Kentucky coffeetree (*Gymnocladus dioica*)
ginkgo (*Ginkgo biloba*)
honeylocust (*Gleditsia triacanthos*)
Turkish filbert (*Corylus colurna*)

Good **medium** selections include:

Amur cork tree (*Phellodendron amurense*)
river birch (*Betula nigra*)
amur chokecherry (*Prunus maackii*)
horsechestnuts (*Aesculus* spp.)
amur maackia (*Maackia amurensis*)

Smaller sites can be filled with:

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Japanese tree lilac (*Syringa reticulata*)
serviceberry (*Amelanchier x grandiflora*)
hophornbeam (*Ostrya virginiana*)
American hornbeam (*Carpinus caroliniana*)
crabapple (*Malus* spp.)
Hawthorn (*Crateagus* spp.)



ACTION CHECKLIST

1. _____ Contract with professional Forester (2014)
2. _____ Decide upon funding mechanism (2014)
3. _____ Complete risk tree removals & replant – 143 trees (2014)
4. _____ Begin treatments for ash tree preservation – 397 trees(2014)
5. _____ Complete small diameter removals & replant – 205 trees (2015)
6. _____ Start community education program (2014)
7. _____ Prepare and distribute EAB education items
8. _____ Adopt revised ordinance (2014)
9. _____ Contact regional DNR urban forester for updates and new information (ongoing)

Attachment 1:

Map highlighting ash locations in South Milwaukee

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Attachment 2:

Additional EAB/Ash Tree Information Including:

Description and Lifecycle of EAB

Ash Tree Identification

Host Tree Signs and Symptoms

Description and Lifecycle of EAB

The Emerald Ash Borer adults are dark metallic green in color and belong to a group of wood boring beetles known as Buprestidae. Adults are approximately 1/2" long and 1/8" wide with very short antennae. The larvae are white in color with flattened segmented bodies and may grow to a length of one inch.

Adults emerge through the bark of ash trees in early summer, creating a D-shaped exit hole in the process. Adult emergence is thought to be staggered, beginning in May and peaking in late June. Adults live approximately 3 weeks and have been observed into August. Adults are most active during the daytime under warm, sunny conditions and have been seen feeding on the ash tree leaves. Mating occurs soon after emergence and females will begin to lay eggs about 2 weeks after emergence. A single female will lay between 60 and 90 eggs in her lifetime.

Eggs hatch in 1-2 weeks, and the tiny larvae bore through the bark and into the cambium - the area between the bark and wood where nutrient levels are high. As the larvae feed they wind back and forth, creating characteristic S-shaped or serpentine galleries in phloem and outer sapwood. The larvae feed under the bark for several weeks, usually from late July or early August through October. As mature larvae complete feeding they create a pre-pupal chamber in the outer bark or in the outer inch of wood and overwinter in this small chamber. Pupation occurs in spring and the new generation of adults will emerge in May or early June, to begin the cycle again. At low levels of infestation, the insect can take two years to complete development and females will continue to lay eggs on the same tree they emerged from until that tree's food source is depleted.

Unaided, the beetle is thought to move slowly through the landscape, approximately one mile annually, though the rate of spread varies by insect and host tree abundance. However, humans greatly accelerate the spread of the insect by moving infested nursery stock, firewood and logs to un-infested areas. Emerald ash borer movement into parts of Michigan outside of the Detroit area, Ohio, and Indiana has been the direct result of moving these ash products.

Ash Tree Identification

In North America, the emerald ash borer feeds exclusively on ash trees. Green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*) and black ash (*Fraxinus nigra*) are all found within South Milwaukee's public urban forest. An ash tree is most easily identified by its opposite branching pattern (the

leaves grow opposite one another at the same spot on the branch/twig) and compound leaves with 5-11 leaflets each. The leaflets will have minor serration (teeth) along their margins. The following photographs are representative of white ash bark and green ash leaves.



Source: Paul Wray, Iowa State University, Bugwood.org



Source: Paul Wray, Iowa State University, Bugwood.org

Signs and Symptoms

The symptoms associated with EAB infestations are very similar to those of other common ash pests or diseases including other wood boring insects that attack ash trees. It is important to look for a combination of at least 2 or more symptoms before concluding that the borer may be present. EAB is extremely difficult to detect at low populations and by the time severe symptoms are evident the trees are generally heavily infested. Tree death is not instantaneous; it generally takes 4 to 5 years for a tree to die.

Local governments and residents are not expected to be able to diagnose EAB. They should call the Department of Agriculture and Consumer Trade Protection (DATCP) and DATCP will determine whether follow-up is necessary. The DATCP hotline number is 1-800-462-2803. This number can also be found on the cover of this plan and at the bottom of each page.

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Crown dieback: Trees begin to show dead branches throughout the canopy beginning at the top. Foliage at top of tree is thin and sickly. This photo represents severe, late-stage infestation most likely 4-5 years after infestation.

UGA5171036

Source: Daniel Herms, The Ohio State University, Bugwood.org



Epicormic sprouting: Sprouting at the base or along the trunk of the tree. This is often referred to as suckering. This photo represents severe, late-stage infestation most likely 4-5 years after infestation.

UGA1241004

Source: Michigan Department of Agriculture, Bugwood.org

D-shaped exit holes: As adults emerge from within the tree they create an exit hole approximately 1/8" in diameter that looks distinctly like a capital 'D.'

Increased woodpecker damage: Some older infestations have increased woodpecker activity as the birds try to feed on the EAB larvae. This usually occurs in the upper portions of the tree and may be accompanied by branch dieback.

EAB HOTLINE 1-800-462-2803

City of South Milwaukee Emerald Ash Borer Readiness Plan

Prepared by Bluestem Forestry Consulting Inc.

December 11, 2013

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Serpentine larval galleries: The larvae feed just underneath the bark of the ash tree. As the insect larvae feed they wind back and forth creating serpentine or s-shaped larval galleries. Various other insects form larval feeding galleries beneath ash tree bark; the distinctive s-shaped pattern is unique to EAB.

Photo of serpentine larval galleries. Source: Toby Petrice, USDA Forest Service, Bugwood.org

Bark splitting: Vertical splits in the bark appear and are caused by callus tissue that forms around larval galleries. Larval galleries can often be seen beneath the splits.

Presence of larvae or adults: The actual presence of the adult insect or of EAB larvae is confirmation of an infestation. Again, there are similar-looking wood boring insects and DATCP will need to confirm an infestation.

Attachment 3:

Recommended species for planting

South Milwaukee will be replanting large numbers of trees in a short time frame. It is important to diversify the forest as much as possible to help mitigate the effects of disease and insects. The general population guidelines are to plant not more than 10% of any one genus and not more than 5% of any one species. One illustration is to plant not more than 10% oak and not more than 5% of bur oak. This will help assure that if there is a population crash, large portions of the tree canopy will not be lost.

Native species are a good choice in certain circumstances and should be encouraged. However, not all native species are hardy to urban settings and may be better suited to park situations than street settings. Many of our urban street soils are not native and native species can be difficult to establish and grow in these situations. Consider all available species for the site and choose the one that will thrive and provide the most benefit to South Milwaukee.

South Milwaukee has a USDA hardiness zone rating of 4.

The following are some species recommended for planting in the City of South Milwaukee (partially compiled from: Alternative to Ash Trees: Commercially Available Species and Cultivars by Dr. Laura G. Jull, Department of Horticulture, University of Wisconsin-Madison).

****Maple trees should be planted only in special circumstances as they are beyond the WI DNR recommended limit of not more than 10% of any one genera. No ash of any kind should be planted.****

Some of these trees are suitable for street/boulevard planting sites and some are better suited to park sites. Each site should be evaluated for tree suitability.

Large to medium-sized Trees

Acer x freemanii: Freeman maple, Zone 3b-4 (depends on cultivar), native hybrid of red and silver maple, oval to rounded form, ascending branches, 40-60' tall, 35-40' wide, moderate to fast growth rate, yellow, orange to red fall color, smooth, light gray bark when young, red samaras in spring, not fall, adaptable to most soils and pH, some cultivars can get chlorotic at very high pH, tolerant to wet soils, drought and urban conditions, moderate salt tolerance, can get verticillium wilt and leaf hoppers, some cultivars prone to included bark formation and narrow branch crotch angles, dioecious (separate male and female flowers produced on separate plants)

'Armstrong': narrow, fastigate form, 45' tall, 15' wide, yellow fall color, female, produces seeds

'Celzam' (Celebration[®]): upright to oval form, 45' tall, 25-30' wide, better branch angles and straight central leader, yellow fall color, fast grower, male, seedless, drought tolerant

'DTR 102' (Autumn Fantasy[®]): broadly oval form, upright branches, 50' tall, 40' wide, bright to dark red fall color, female, produces seeds

'Indian Summer' or 'Morgan': broadly oval to rounded form, 45' tall, 40' wide, early, bright rosy-red fall color, vigorous, female, produces seeds, very sensitive to flooded soils

- 'Jeffersred' (Autumn Blaze[®]): broadly oval form with upright branches, 50' tall, 40' wide, bright orange-red to red fall color that is longer lasting, male, seedless, drought tolerant, tends to develop narrow crotch angles, included bark, and multiple leaders
- 'Marmo': upright, oval form, 55' tall, 45' wide, early, fair, mottled blend of deep red and green fall color starts at leaf tips and gradually works its way down leaf, good branching with straight central leader, male, seedless, slower grower
- 'Scarsen' (Scarlet Sentinel[®]): upright form becoming oval, 40' tall, 20' wide, yellow-orange to orange-red fall color, fast grower, male, seedless
- 'Sienna' (Sienna Glen[®]): pyramidal form, 50' tall, 35' wide, rusty orange to burgundy fall color, male, seedless, wider branch angles, from northern seed source, less susceptible to frost crack, hardy to zone 3

Acer rubrum: red maple (in acidic soils (pH below 7) only or else very chlorotic), hardy to zone 3b-5b (depends on cultivar), native to eastern and central U.S., Canada, and Wisconsin, oval to rounded to irregular form, 40-60' tall, 25-35' wide, moderate to fast grower, yellow, orange to bright red fall color, smooth, light gray bark when young, reddish flowers in early spring, red samaras in spring, not fall, dioecious (separate male and female flowers produced on separate plants), adaptable to most soils, requires acid pH or else develops serious chlorosis due to lack of manganese, not iron, easy to transplant, tolerant to wet soils (some cultivars), sensitive to salt and air pollution, susceptible to verticillium wilt, leaf hoppers, frost crack, girdling roots, prone to included bark formation and narrow, branch crotch angles, shallow roots

- Autumn Flame[®]: dense, rounded with spreading branches, 40' tall, 35' wide, early, bright red fall color, male, seedless, slower grower
- Autumn Radiance[®]: rounded, open, symmetrical form, 60' tall, 40' wide, early red-orange fall color
- 'Autumn Spire': narrow to oval form, 40-50' tall, 30' wide, bright red fall color, male, seedless, from a northern seed source, newer cultivar, Zone 3
- 'Bailcraig' (Scarlet Jewell[™]): upright form, 60' tall, 30' wide, early, deep crimson-red fall color, from a northern seed source, Zone 3, new cultivar
- 'Bowhall': upright, very narrow form, 40-50' tall, 15' wide, yellowish-orange to reddish fall color, female, produces seed, prone to included bark formation
- 'Brandywine': oval form 40' tall, 30' wide, deep red fall color for a longer period, male, seedless, newer cultivar
- Fairview Flame[™]: good branching, 45' tall, fast growing, later, orange-red fall color
- 'Frank Jr.' (Redpointe[™]): broadly pyramidal form, 45' tall, 30' wide, bright red fall color, faster growing, straight central leader, better branch crotch angles, new cultivar
- 'Franksred' (Red Sunset[®]): upright, dense, oval form, symmetrical form, bright red to orange fall color, fast grower, 45-50' tall, 35' wide, female, produces seeds, dark green, glossy leaves, older cultivar
- Karpick[®]: narrow, oval, dense form, 40' tall, 20' wide, yellow to orange fall color, male, seedless, prone to included bark formation
- 'Magnificent Magenta' (Burgundy Belle[®]): oval to rounded form, 45' tall, 40' wide, bright red fall color that changes to burgundy, symmetrical form, heat tolerant, prone to leafhoppers and witches' broom
- 'New World': upright, narrow-oval form, 40' tall, 20' wide, orange-yellow to orange-red fall color, male, seedless
- 'Northwood': symmetrical, broadly oval to rounded form, ascending branches, 40' tall, 35' wide, early orange to reddish fall color, male, seedless, from a northern seed source, Zone 3
- 'Olson' (Northfire[®]): oval form, 50' tall, 35' wide, early, bright red fall color, northern seed source,
- Zone 3
'PNI 0268' (October Glory[®]): not hardy, zone 5b-6a, broadly oval to rounded form, 40' tall, 35' wide, red fall color for a longer period, female, produces seeds, old cultivar
- 'Polara' (Ruby Frost[™]): upright, dense, broad oval form, 45' tall, 40' wide, ruby-red fall color, selected in NW Wisconsin, Zone 3

'Red Rocket': narrow, columnar form, 35' tall, 8' wide, red fall color, northern seed source, tolerant to leaf hopper

'Schlesinger': broadly vase-shaped to rounded, 45' tall, 35' wide, very early orange to purplish-red fall color, female, produced seed

'Somerset': broadly oval to rounded form, 45' tall, 35' wide, red fall color, leaf hopper resistant newer cultivar

Summer Red[®]: dense, broad oval form, 20' tall, 10' wide, burgundy red new leaves that turn purplish-green, yellow to orange to purple fall color, leaf hopper resistant, Zone 5

'Sun Valley': oval, symmetrical form, densely branched, 40' tall, 35' wide, bright red fall color

Acer saccharum: sugar maple, hardy to zone 3a-5 (depends on cultivar), native to eastern U.S., Canada, and Wisconsin (our state tree), upright, oval to rounded form, 60-75' tall, 35-50' wide, showy, bright yellow to orange-red fall color, prefers a fertile, moist, well-drained soil, will not tolerate heavy clay, poorly drained, or dry soils, sensitive to drought, salt and air pollution, susceptible to leaf tatter and leaf scorch, verticillium wilt, basal rot, girdling roots, leaf hoppers

'Astis' (Steeple[®]): narrow oval form, 45' tall, 20' wide, yellow-orange fall color

'Autumn Splendor': broadly oval to rounded form, 45' tall, 40' wide, glossy leaves, orange-red fall color, resistant to heat drought and leaf tatter, Zone 5, newer cultivar

'Bailsta' (Fall Fiesta[®]): broadly ovate to rounded form, 50' tall, 40' wide, glossy, leathery leaves, yellow-orange to red fall color, leaf tatter and leaf hopper resistant, faster grower, newer cultivar

'Barrett Cole' (Apollo[®]): symmetrical, narrow, columnar form, 35' tall, 10' wide, yellow-orange to red fall color

Bonfire[™]: broadly oval form, 50' tall, 40' wide, orange to red fall color, more heat tolerant, fast grower

Commemoration[®]: oval to rounded, dense form, 50' tall, 35' wide, thick, glossy, dark green leaves, yellow-orange to red fall color, vigorous, faster grower, resistant to leaf tatter

'Endowment': broad columnar form, 50' tall, 20' wide, bright yellow fall color, no leaf scorch

'Heartland' (Autumn Faith[™]): oval to vase-shape, dense form, 35' tall, 20' wide, new leaves are bronze opening to dark green, bronze fall color, slow grower

'Flax Mill' (Majesty[®]): broadly oval, symmetrical form, 50' tall, 40' wide, thicker leaves, orange to reddish fall color

'Jefcan' (Unity[®]): upright, oval form, 50' tall, 30' wide, yellow to orange-red fall color, selected for harsh prairie climate, from Canada, slower grower, resistant to frost crack, newer cultivar, zone 3

Legacy[®]: oval to rounded, dense form, 50' tall, 35' wide, glossy, thick, dark green leaves, later reddish-orange to red fall color or none, leaf scorch and leaf tatter resistant, faster grower, heat tolerant,

Morton' (Cresendo[™]): broadly oval form, 45' tall, 40' wide, orange-red to red fall color, heat tolerant

'PNI 0285' (Green Mountain[®]): broadly oval form, 45-50' tall, 35' wide, reddish-orange to red fall color, leathery leaves less subject to leaf scorch, faster growing, more heat tolerant

'Wright Brothers': oval form, 50' tall, 35' wide, yellow-orange to red fall color, resistant to leaf scorch and frost crack, faster growing

Celtis occidentalis: common hackberry, zone 3b, native to eastern and central U.S., Canada, and Wisconsin, vase-shaped when young becoming rounded with drooping branches, moderate to fast growth rate, 50-70' tall, 40-60' wide, corky, warty looking bark, small, pea-sized, purplish-black fruit in fall, adaptable to most soils and pH, tolerates dry, sandy, rocky, and compact, heavy clay soils, slow to establish, plant in spring, drought, urban, wind, and wet soils tolerant, but sensitive to salt, susceptible to hackberry nipple gall on leaves, witches' brooming of twigs, resistant to DED, sensitive to Dicamba herbicides used near tree, branches tend to break in storms, prone to included bark formation, need to train to develop good branch structure

'Chicagoland': broad pyramidal form with upright branches, 55' tall, 40' wide, forms a straight central leader, rich green leaves, yellow fall color, warty bark

'Windy City': upright, spreading form, straight, central leader, fast grower

Corylus colurna: Turkish filbert, hardy to zone 4b, native to southeastern Europe and western Asia, broad, pyramidal form, formal looking even with age, dense, coarse texture, 40-50' tall, 20-25' wide, no fall color, scaly to corky, gray-brown bark, long, pendulous catkins in early spring are showy, may produce nuts, difficult to transplant, heat, urban, and drought tolerant, once established, sensitive to salt

Ginkgo biloba: ginkgo, maidenhair tree, hardy to zone 4b, native to eastern China, living fossil, found in fossil records dating back 150 million years ago, deciduous gymnosperm, pyramidal when young, becoming wide-spreading with age to upright, slow grower, 50-80' tall, 30-60' wide, very interesting, fan-shaped leaves, golden-yellow fall color, dioecious (separate male and female flowers produced on separate plants), female trees produce smelly, messy fruit, but not until 20 years old, so plant male cultivars only, tolerant to most soils and pH, prefers a sandy, deep soil, difficult to transplant, plant in spring, heat, salt, urban, and drought tolerant, no pests

'Autumn Gold': broadly pyramidal, symmetrical form, 45' tall, 35' wide, golden yellow fall color, male, no fruit, good, uniform branching

'Fairmount': dense, upright, pyramidal form, straight central leader, male, no fruit

'Halka': broadly pyramidal becoming oval, 45' tall, 40' wide, bright yellow fall color, male, no fruit

'Golden Globe[™]: broad, rounded form, 60' tall, 40' wide, slightly faster growth rate, male, no fruit, dense form, golden yellow fall color, Zone 5

'Magyar': upright form, 50' tall, 30' wide, bright yellow fall color, male, no fruit

'PNI 22720' (South Milwaukee Sentry[®]): narrow pyramidal, upright form, 50' tall, 20-30' wide, bright yellow fall color, male, no fruit

'Saratoga': compact, dense, rounded form, with straight central leader, 20-30' tall, 15-20' wide, pendulous leaves, soft yellow fall color, slower and smaller than other ginkgos, male, no fruit

'Shangri-La[®]: moderately pyramidal form, 45' tall, 25' wide, slightly faster growth rate, bright yellow fall color, male, no fruit

'Windover Gold[®]: upright, oval form, 40-60' tall, 30-40' wide, golden yellow fall color, strong grower, male, no fruit

'Woodstock' (Emperor[™]): uniform, oval form, strong, central leader, good branching, male, no fruit

Gleditsia triacanthos var. inermis: thornless honeylocust, hardy to zone 4a, native to central U.S. and southern Wisconsin (thorny type native, not var. *inermis*), fine texture, fast growing, vase-shaped form becoming flat-topped, spreading branches, open, 50-70' tall, 40-50' wide, early, bright golden-yellow fall color, no thorns, dioecious (separate male and female flowers produced on separate plants), female plants produce long, twisted, black pods that make a slippery, litter mess, tolerant to most soils and pH, tolerant to compacted, heavy clay soil, drought, salt, and urban tolerant, tolerant to periodic flooding, susceptible to leaf hoppers, plant bug, cankers, sunscald on trunk, high maintenance pruning, tends to develop co-dominate branches, can break in storms

'Christie' (Halka[™]): broad, oval to rounded form, 40' tall, 40' wide, horizontal branches, some pods, fast growing, yellowish fall color

'Emerald Cascade': irregular, weeping form with pendulous branches, grafted, 16' tall, male, no pods

'Harve' (Northern Acclaim[®]): symmetrical, upright, spreading form, 45' tall, 35' wide, yellow fall color, male, no pods, developed in North Dakota, hardy to zone 3b

'Impcole' (Imperial[®]): rounded form, symmetrical, wide-spreading, with good branching, 35' tall, 35' wide, seedless but can throw a few pods, susceptible to leaf hoppers and plant bug

'Moraine': uniform, rounded crown with vase-shaped branching, male, no pods, older cultivar

- 'PNI 2835' (Shademaster[®]): vase-shaped to rounded, irregular form, 45' tall, 35' wide, uniform, ascending branches, occasionally, some trees may produce pods
- 'Skycole' (Skyline[®]): broadly pyramidal form, ascending branches with wider crotch angles, 45' tall, 35' wide, develops a strong, central leader better than any other cultivar, male, no pods, bright golden yellow fall color
- 'Suncole' (Sunburst[®]): irregular, oval form, 40' tall, 35' wide, 8" of new leaves are bright yellow then fades to green, yellowish fall color, susceptible to leaf hoppers, plant bug, and canker, male, no pods
- True Shade[®]: broadly oval form, 40' tall, 35' wide, wider branch angles, yellow fall color, faster grower, male, no pods
- 'Wandell' (Perfection[™]): develops a good crown at a younger age, 35' tall, 30' wide, dark green leaves, male, no pods

Gymnocladus dioica: Kentucky coffeetree, hardy to zone 4a, native to central U.S., southern Ontario, and Wisconsin (scattered distribution), vase-shaped form with upright branches becoming irregular and open, 50-75' tall, 40-50' wide, slow to moderate grower, coarse texture in winter with sparse branching when young, lacy texture when in leaf, yellow fall color, large, bluish-green leaves, ashy-gray, deeply furrowed bark with exfoliating plates, dioecious (separate male and female flowers produced on separate plants), females produce thick, sausage-like, pendulous pods, that can be a litter problem along with the leaf rachis in fall, adaptable to most soils and pH, slow to establish, tolerates compacted, heavy clay soil, salt, drought, periodic flooding, and urban conditions, no pests, can look a bit "gauntly" when young due to sparse branching

- 'Espresso': oval to vase-shaped form with arching branches, 50' tall, 35' wide, large, blue-green leaves, yellowish fall color, male, no pods, newer cultivar
- 'J.C. McDaniel' (Prairie Titan[™]): oval to vase-shaped form, 50' tall, 35' wide, large, blue-green leaves, yellowish fall color, male, no pods, newer cultivar

Phellodendron amurense '**Macho**': Macho Amur corktree, hardy to zone 3b, native to northern China and Japan, broadly vase-shape, upright form, 40' tall, 30' wide, ascending branches, thick, dark green leaves, yellowish-green fall color, male, no fruit, corky bark when older, adaptable to most soils and pH, slow to establish, urban tolerant, moderate salt tolerance, no pests, shallow roots, low branching, avoid female trees as they produce invasive seeds

Quercus bicolor: swamp white oak, hardy to zone 4a, native to eastern U.S. and Wisconsin, pyramidal when young, becoming broad, rounded, wide-spreading with age, 50-60' tall, 50-60' wide, slow to moderate growth rate, easier to transplant than bur oak, prefers acidic to neutral pH, but will tolerate a bit higher, but at very high pH, it will get chlorotic, adaptable to most soils including heavy clay, tolerant to wet soil, drought, and urban conditions

Quercus macrocarpa: bur oak, hardy to zone 3a, native to eastern and midwestern U.S. and Wisconsin, pyramidal when young, becoming very wide-spreading, rounded, 70-80' tall, 60-80' wide, slow growing, coarse texture, deeply furrowed bark, no fall color, adaptable to most soils and pH, drought and urban tolerant, difficult to transplant

Quercus* × *macednielli '**Clemon's**': Heritage[®] oak, hardy to zone 4, hybrid of *Q. robur* × *Q. macrocarpa*, broadly pyramidal becoming oval form, 60-80' tall, 40-50' wide, dark green, glossy leaves, no fall color, mildew resistant, vigorous, zone 4

Quercus* × *schuettei: swamp bur oak, hybrid of *Q. bicolor* × *Q. macrocarpa*, broad, rounded form, 75' tall, 70' wide, faster growing, better tolerance to high pH and easier to transplant, may be susceptible to leaf/twig galls, zone 3b

Tilia americana: American linden, basswood, hardy to zone 3a, native to northeast and central U.S., Canada, and Wisconsin, pyramidal when young becoming upright-oval with age, 60-80' tall, 40-50'

wide, fragrant, pale yellow flowers in early summer, small nutlet fruit attached to bract, large, heart-shaped leaves, prefers a deep, fertile soil, pH adaptable, easy to transplant, tolerant to wetter soils, sensitive to salt and air pollution, susceptible to Japanese beetle, linden borer, gypsy moth, basal and stem rots, sunscald on bark, tends to sucker at base, can break in storms, prone to included bark formation and narrow, branch crotch angles, girdling roots

'Bailyard' (Front Yard[®]): broadly pyramidal when young becoming rounded and dense, symmetrical form, 60-75' tall, 40' wide

'Boulevard': narrowly pyramidal form, 50' tall, 25' wide, ascending branches, yellow fall color

'DTR 123' (Legend[®]): broadly pyramidal form, 40' tall, 30' wide, well-spaced branches, thicker leaves, single leader, yellow fall color

'Lincoln': pyramidal, compact, dense form, 40' tall, 25' wide, upright branches, dark green leaves, yellow fall color

'Mcksentry' (American Sentry[™]): symmetrical, pyramidal form with straight central leader, 45' tall, 30' wide, better branch angles, lighter gray bark, yellow fall color

Tilia 'Redmond': Redmond linden, hardy to zone 4, hybrid of *T. americana* × *T. × euchlora*, pyramidal to oval form, upright branches with terminal leader above the foliage, reddish stems and buds, can sucker at base, 50-70' tall, 30-40' wide, fragrant, pale yellow flowers in early summer, small nutlet fruit attached to bract, large, heart-shaped leaves

Tilia tomentosa: silver linden, hardy to zone 4b, native to southeastern Europe and western Asia, broad-pyramidal form becoming upright-oval, formal looking, dark green leaves with silvery-white undersides, pale yellow flowers in summer, small nutlet fruit attached to a bract, no fall color, prefers a deep, fertile soil, but is adaptable, pH adaptable, easy to transplant, more heat, drought, and urban tolerant than other lindens, does not tolerate poorly-drained, compacted soils, same pests as American linden

'PNI 6051' (Green Mountain[®]): broadly pyramidal to oval form, 50' tall, 35' wide, dark green leaves with silvery undersides, yellowish fall color, prone to included bark formation

'Wandell' (Sterling[®]): broadly pyramidal form, 45' tall, 35' wide, green leaves with silvery undersides, yellowish fall color, prone to included bark formation

Ulmus americana: American elm (DED resistant cultivars), hardy to zone 3a, native to eastern and central U.S., Canada and Wisconsin, all have vase-shaped form with pendulous branches, 70-80' tall, 60-70' wide, yellow fall color, adaptable to most soils and pH, tolerant to compacted, heavy clay soils, easy to transplant, tolerant to periodic flooding, salt, urban, air pollution, and drought tolerant, pest prone

'New Harmony' (from U.S. National Arboretum): broad, vase-shaped form, arching branches, good form, easier to grow

'Valley Forge' (from U.S. National Arboretum): broad, vase-shaped form with arching branches, 70' tall, 70' wide, wild looking form and branching, vigorous, needs training

Ulmus hybrids: hybrid elms, most are hardy to zone 4-5, all Dutch elm disease resistant, needs pruning in nursery to develop good form, adaptable to most soils and pH, tolerant to compacted, heavy clay soils, moderate salt tolerance, drought, urban, and air pollution tolerant

'Cathedral' (UW-Madison intro): hybrid of *U. japonica* × *U. pumila*, broadly vase-shaped, spreading form, 40-50' tall, 40-60' wide, prone to elm leaf beetle, zone 4

'Frontier' (from U.S. National Arboretum): hybrid of *U. carpinifolia* × *U. parvifolia*, broadly oval form, 35' tall, 25' wide, ascending branches, glossy, small, dark green, glossy leaves, late, burgundy fall color, can get elm leaf beetle, Zone 5

'Homestead' (from U.S. National Arboretum): hybrid of *U. pumila* × (*U. × hollandica* × *U. carpinifolia*), upright, narrow to oval form, 55' tall, 35' wide, upright, arching branches, prone to elm leaf beetle, fast growing, Zone 4b

- 'Morton' (Accolade[®]) (from Morton Arboretum): hybrid of *U. japonica* × *U. wilsoniana*, vase-shaped form with arching branches, 70' tall, 60' wide, resistant to elm leaf beetle, vigorous, resistant to elm leaf beetle, dark green, glossy leaves, zone 4
- 'Morton Glossy' (Triumph[™]) (from Morton Arboretum): hybrid of *U.* 'Morton Plainsman' × *U.* 'Morton', upright oval to vase-shape, 55' tall, 45' wide, very glossy, dark green leaves, good form, some elm leaf beetle, excellent drought tolerance, zone 4
- 'Morton Plainsman' (Vanguard[™]) (from Morton Arboretum): hybrid of *U. japonica* × *U. pumila*, rounded, vase-shaped form, 45' tall, 40' wide, glossy, dark green leaves, prone to elm leaf beetle, zone 4
- 'Morton Red Tip' (Danada Charm[™]) (from Morton Arboretum): complex hybrid of (*U. japonica* × *U. wilsoniana*) × *U. pumila* vase-shape form with arching branches, 70' tall, 60' wide, reddish new leaves, new leaves, prone to elm leaf beetle, zone 4
- 'Morton Stalwart' (Commendation[™]) (from Morton Arboretum): complex hybrid of *U.* 'Morton' × (*U. pumila* × *U. carpinifolia*), upright, oval form, 60' tall, 50' wide, zone 5
- 'New Horizon' (UW-Madison intro): hybrid of *U. japonica* × *U. pumila*, upright, compact form, 50' tall, 25' wide, dark green leaves, wide crotch angles, susceptible to verticillium wilt, zone 3b
- 'Patriot' (from U.S. National Arboretum): complex hybrid of *U. wilsoniana* × *U. pumila* × *U. carpinifolia* × *U. glabra*, stiffly upright branches, narrow, vase-shape form, 50' tall, 40' wide, dark green leaves, straight central leader, zone 5
- 'Pioneer' (from U.S. National Arboretum): hybrid of *U. glabra* × *U. carpinifolia*, rounded form, 50' tall, 50' wide, dark green, glossy leaves, prone to elm leaf beetle, zone 5
- 'Regal' (UW-Madison intro): complex hybrid of *U. carpinifolia* × (*U. pumila* × *U. × hollandica*), upright, pyramidal form, 50-60' tall, 30' wide, prone to double leaders and narrow crotches, stiff branches, zone 4

***Ulmus japonica* 'Discovery'**: Discovery Japanese elm, hardy to zone 3, native to Japan and Asia, upright, vase-shape, compact form, 35-40' tall, 35-40' wide, resistant to DED and elm leaf beetle, yellow fall color

Small Sized Trees

Acer tataricum* subsp. *ginnala: Amur maple, Zone 3a, native to China, Manchuria, and Japan, very invasive, do not plant near any natural areas, multi-stemmed, rounded form, low branches, 15-18' tall and wide (smaller cultivars are available), dagger-shaped leaves, orange to bright red fall color, red samaras in summer turn brown in fall, adaptable to most soils and pH, easy to transplant, drought, salt, and urban tolerant, very susceptible to verticillium wilt

'Compactum' or 'Bailey Compact': dense, compact, rounded, shrubby form, 6-8' tall, 6-8' wide, slower grower, orange to scarlet fall color

'Embers': rounded form, 15-20' tall, 15' wide, bright red samaras, scarlet fall color

'Emerald Elf': compact, rounded, dense, shrubby form, 5-6' tall and wide, scarlet to purple fall color

'Flame': multi-stemmed, spreading, irregular form, 15-20' tall, 20-25' wide, bright orange-red to deep red fall color

'JFS-UGA' (Red November[™]): multi-stemmed, low, rounded form, 18' tall, 24' wide, later, bright red fall color, heat tolerant, Zone 5

Amelanchier* × *grandiflora: apple serviceberry, hardy to zone 3a, native hybrid of downy and Allegheny serviceberry, multi or single-stemmed tree to large shrub, upright to irregular form, no suckers, 15-30' tall, 15-25' wide, produces bronze to purplish-red, fuzzy leaves in spring that turn smooth and green, white flowers in early spring, edible fruit in June, smooth, gray bark, yellowish-orange to red fall color, can develop chlorosis at high pH, prefers loamy soil, does poorly in poorly drained soils, difficult to transplant, plant in spring

'Autumn Brilliance': upright, spreading form, 20-25' tall, 15' wide, orange-red fall color, leaf spot resistant, multi-stemmed
'Cole's Select': upright, spreading form, 15-20' tall, 15' wide, multi-stemmed, orange-red fall color, leaf spot resistant, thicker, glossier leaf
'Forest Prince': oval form, 20' tall, 15' wide, red-orange fall color
'Princess Diana': wide spreading form, 15-20' tall, 15' wide, multi-stemmed, red-orange fall color, leaf spot resistant
'Robin Hill': upright, open form, 20-30' tall, 15-20' wide, flowers pink in bud open to pale pink fading to white, red fall color, single-stemmed

Amelanchier laevis: Allegheny serviceberry, hardy to zone 4a, native to eastern and central U.S., Canada, and Wisconsin, upright form, single or multi-stemmed tree, 15-25' tall, 15-20' wide, can sucker, produces white flowers in early spring, bronze to purplish-red new leaves in spring that turn green, edible fruit in June, orange to reddish-bronze fall color, prefers moist, loamy soils, does poorly in poorly drained soils, difficult to transplant, plant in spring

Cumulus[®]: upright, open form, 20-30' tall, 15' wide, orange-red fall color, minimal suckering, single-stemmed
'JFS-Arb' (Spring Flurry[®]): upright, oval form, 30-35' tall, 20' wide, orange fall color, single-stemmed, straight central leader, newer cultivar
'Rogers' (Lustre[®]): upright, open form, 20-30' tall, 15-20' wide, orange-red fall color, minimal suckering, single-stemmed
'Snowcloud': upright, oval form, 25' tall, 15' wide, scarlet fall color, single-stemmed

Cornus mas: Corneliancherry dogwood (more of a boulevard tree), hardy to zone 4b, native to Europe and western Asia, bright yellow flowers in early spring, long lasting, fruit is in summer and is bright red changing to dark purple and becoming edible, but tart, adaptable to most soils, but prefers rich soils, pH adaptable, easy to transplant, tolerates partial shade, straight species is sensitive to drought, but cultivars are more tolerant, sensitive to salt, no pest problems, hardy to zone 4b

'Golden Glory': narrow, upright form, 20-25' tall, 10' wide, much better form and darker green, glossy, thicker leaves, more flowers and fruit, good substitute to invasive tallhedge buckthorn!
'Pyramidalis': upright, pyramidal to upright form, 20' tall, 10-15' wide, dark green leaves

Crataegus crus-galli var. inermis: thornless cockspur hawthorn, hardy to zone 4a, native to eastern and central U.S., Canada, and Wisconsin, multi-stemmed tree, broad, spreading, horizontal, low branches, flat-topped crown, 20-30' tall, 20-35' wide, adaptable to most soils and pH, difficult to transplant, plant in spring, drought, salt, and urban tolerant, susceptible to cedar quince rust (on fruit) or cedar hawthorn rust (leaves), this variety has no thorns, white flowers in late spring, deep red fruit in early to mid fall that drops creating a litter problem, bronzy-orange to reddish fall color, dark green, leathery, spoon-shaped leaves

'Cruzam' (Crusader[®]): rounded form, 15' tall, 15' wide, thornless, bright red fruit, orange fall color

Crataegus phaenopyrum: Washington hawthorn, hardy to zone 4b, native to eastern U.S. and Canada, multi-stemmed tree, vase-shaped to broadly oval form, horizontal, low branches, 20-30' tall, 20-25' wide, adaptable to most soils and pH, difficult to transplant, plant in spring, tolerant to poor, sandy soils, drought and urban tolerant, moderate salt tolerance, susceptible to cedar quince rust (on fruit) or cedar hawthorn rust (leaves), has long, sharp thorns, white flowers in late spring to early summer, showy, persistent, glossy, bright-orange-red fruit fall to winter

'Westwood I' (Washington Lustre[®]): rounded, upright form, 20-25' tall, 20-25' wide, has fewer thorns than species, vigorous

***Crataegus viridis* 'Winter King'**: Winter King hawthorn, hardy to 4b, native to eastern U.S., vase-shaped to rounded, wide-spreading form, horizontal, low branches, adaptable to most soils and pH, difficult to transplant, plant in spring, drought and urban tolerant, moderate salt tolerance, less susceptible to cedar hawthorn rust but can get cedar quince rust on fruit, white flowers in late spring, very showy, bright orange-red, persistent fruit from mid fall to winter, silvery-gray bark that exfoliates on the trunk revealing orange inner bark, has few if any thorns, yellowish-purple fall color

Maackia amurensis: Amur maackia, hardy to zone 4a, native to Manchuria, vase-shaped to rounded form, upright, arching branches, 20-30' tall, 20-30' wide, slow grower, silvery and fuzzy leaves in spring turn olive-green and smooth, coppery-green to bronzy-brown, slightly exfoliating bark, off-white flowers in summer, small pods in fall, tolerant to most soils and pH, roots fix atmospheric N, tolerant to poor, infertile soils, urban and salt tolerant, prone to included bark formation, needs pruning when young, no pests, not invasive

'Starburst': upright, vase-shaped form with rounded crown, 25-30' tall, 20' wide, dark green leaves

Summertime[®]: upright, rounded form, 18-20' tall, 12-15' wide, white flowers in summer

***Malus* spp.**: flowering crabapple, most are hardy to zone 4a and are hybrids with parents originating from Asia, Europe and U.S., size and form are quite variable, adaptable to most soils and pH, prefers low nitrogen to decrease disease susceptibility, drought and urban tolerant, apple scab resistant species and cultivars listed below and have smaller fruit, some cultivars prone to suckering and watersprouts on branches

White Flowers/Red Fruit

'Adirondack': narrow, upright form, 18' tall, 10' wide, persistent fruit

'Guinzam' (Guinevere[®]): rounded form, 8-10' tall, 10' wide, persistent fruit

'Jewelcole' (Red Jewel[®]): upright, pyramidal form, 15' tall, 12' wide, persistent fruit, can get fireblight

'Kinarzam' (King Arthur[®]): upright, rounded form, 12' tall, 10' wide, can sucker from base

'Sutzam' (Sugar Tyme[®]): upright, spreading, oval form, 18' tall, 15' wide, persistent fruit

Malus baccata 'Jackii': Jackii crabapple, hardy to zone 3, rounded form, 20' tall, 20' wide, glossy leaves, zone 3

Malus sargentii: Sargent crabapple, low, spreading form, 8' tall, 12' wide, alternate bearing, persistent fruit

'Select A' (Firebird[®]): rounded, spreading form, 7' tall, 9' wide, persistent fruit, bears annually, persistent fruit

'Tina': small, rounded, dwarf form, 5' tall, 6' wide, slow growing

Malus × *zumi* var. *calocarpa*: redbud crabapple, rounded, spreading form, 20' tall, 24' wide, persistent fruit

White Flowers/Yellow Fruit

'Bob White': dense, rounded form, 20' tall, 20' wide, persistent fruit, but is a watersprouter

'Cinzam' (Cinderella[®]): dwarf, rounded to upright form, 8' tall, 5' wide, persistent fruit

'Excazam' (Excalibur[™]): upright form, 10' tall, 8-10' wide, good form

'Hargozam' (Harvest Gold[®]): upright, oval form, 22' tall, 18' wide, persistent fruit, may get some scab

'Lanzam' (Lancelot[®]): compact, upright, dense form, 8-10' tall, 8' wide, persistent fruit

'Ormiston Roy': broad, rounded form, 20-25' tall, 25' wide, furrowed, orangish bark, yellow fruit with a rosy blush turn orange-brown after a hard frost

Pink or Reddish Flowers/Red to Purplish-Red Fruit

'Camzam' (Camelot[™]): rounded form, 10' tall, 8' wide, pinkish-white flowers, burgundy-green leaves, persistent fruit

Malus sargentii 'Candy mint': low, spreading, horizontal form, 10' tall, 15' wide, purple tinted foliage becoming bronze-green

flowers 'Canterzam' (Canterbury™): rounded, compact form 10' tall, 8-10' wide, light, pinkish- white

'Cardinal': irregular, spreading form, 16' tall, 22' wide, dark purplish-red, glossy leaves

'JFS-KW5' (Royal Raindrops®): upright, spreading form, 20' tall, 15' wide, cutleaf, purple leaves, orange-red fall color, persistent fruit

'Orange Crush': spreading form, 12-15' tall, 12-15' wide, bronze to purplish-green leaves

green 'Parrisi' (Pink Princess®): low, spreading form, 8' tall, 12' wide, purple leaves become bronze-green

'Prairifire': upright, spreading to rounded form, 20' tall, 20' wide, slower growing, purple leaves become reddish-green

'Prairie Maid': rounded to spreading form, 20' tall, 25' wide, burgundy tinged leaves in spring, but is a watersprouter

'Purple Prince': rounded form, 20' tall, 20' wide, purple leaves become bronzyish-green,

'Coral Cascade': semi-weeping form, 15' tall, 20' wide, white flowers, coral fruit,

'Louisa': graceful weeper, 15' tall, 15' wide, pink flowers, fruit are yellow turning orange-brown, not showy or persistent

'Luwick': graceful, low weeper, 7' tall, 14' wide, deep pink buds open to light pink to whitish flowers, bright red fruit

'Manbeck Weeper' (Anne E.®): wide spreading, horizontal weeper, 10-12' tall, 10-12' wide, white flowers, cherry-red fruit, persistent fruit, is difficult to find, but is one of the nicest crabs

'Molazam' (Molten Lava®): broadly weeping form, 14' tall, 20' wide, white flowers, bright red fruit

Pyrus calleryana: callery pear, hardy to zone 4b, native to China and Korea, upright, pyramidal to oval form, 25-35' tall, 20-30' wide, adaptable to most soils and pH, drought, urban, and salt tolerant, can get fireblight, fast grower, dark green, glossy, leathery leaves, late, reddish-orange to purple fall color, white flowers in mid spring, small, brown, rounded fruit

'Aristocrat®': pyramidal form with open branching, 35' tall, 25' wide, yellow to red fall color but is inconsistent for fall color, wider branch crotch angles

'Autumn Blaze': rounded form, 30' tall, 25' wide, earlier, bright red to purplish fall color, wide crotch angles, less prone to included bark formation

'Cambridge': upright, narrowly pyramidal form, 35' tall, 15' wide, bright orange fall color

'Capital': narrow, columnar form, 30' tall, 12' wide, reddish-purple fall color, susceptible to limb breakage in storms, susceptible to fireblight, zone 5

'Cleveland Select' or 'Glenn's Form' (Chanticleer®): formal, upright, narrowly pyramidal form, 25-30' tall, 15' wide, late orangish to reddish fall color, not as good as other cultivars for fall color, rarely produces fruit

'Redspire': pyramidal, dense, symmetrical form, 35' tall, 25' wide, yellow to reddish fall color or none at all, susceptible to fireblight, slower grower

'XP-005' (Trinity®): broadly oval to rounded form, 30' tall, 25' wide, glossy, lighter green leaves, orange-red fall color

Syringa reticulata: Japanese tree lilac, hardy to zone 3a, native to Japan and Manchuria, upright with a rounded to oval form, 20-25' tall, 15-20' wide, no fall color to yellowish, reddish-brown, shiny bark, creamy-white, large flowers in early summer that do not smell like lilacs but rather like a privet, tends to flower heavily every other year, adaptable to most soils and pH, easy to transplant, salt and urban tolerant, susceptible to bacterial blight and verticillium wilt, resistant to mildew

'Elliott' (Snowcap™): upright, more compact form, 15-20' tall 10-12' wide, uniform branching, thick, dark green leaves, good form

'Golden Eclipse': upright, compact form, 18-24' tall, 8-14' wide, new leaves in spring emerge green with a darker center, the edge of the leaf gradually turns bright gold with the dark green center remaining

'Ivory Silk': over used, upright, spreading becoming oval to rounded, 20' tall, 15' wide, susceptible to bacterial blight

'Summer Snow': broad, rounded, compact form, 20' tall, 15' wide, good form, glossy, dark green leaves

'Williamette' (Ivory Pillar[™]): upright, pyramidal, narrower form, 20-25' tall, 10-15' wide

Attachment 4:

Sources of Information

Additional sources of information include:

www.emeraldashborer.wi.gov/ - EAB portal for the state of Wisconsin

www.emeraldashborer.info/ - EAB web page administered by Michigan State University

www.dnr.state.wi.us/org/land/Forestry/Ash/index.htm - WI-DNR EAB web site

www.entomology.wisc.edu/emeraldashborer/ - UW-Extension, Dept of Entomology EAB website

www.datcp.state.wi.us/arm/environment/insects/emerald-ash-borer/index.isp - WI DATCP EAB website

<http://dnr.wi.gov/forestry/uf/eab/> - EAB toolkit developed by the WI DNR

<http://dnr.wi.gov/forestry/fh/pdf/WIEABResponsePlan.pdf> - State of Wisconsin EAB response plan

www.entomology.wisc.edu/emeraldashborer/ - University of Wisconsin Cooperative Extension Entomology website describing pesticide treatments for EAB

<http://dnr.wi.gov/forestry/UF/index.htm> - WI DNR tree planting guidelines

www.woodindustry.forest.wisc.edu/apps/search.asp - Wisconsin Primary Wood Using Facilities

Attachment 5: Homeowner's Guide to EAB Treatment

EAB HOTLINE 1-800-462-2803

City of South Milwaukee Emerald Ash Borer Readiness Plan
Prepared by Bluestem Forestry Consulting Inc.
December 11, 2013

Emerald Ash Borer: Homeowner Guide to Insecticide Selection, Use, and Environmental Protection



Before Using an Insecticide Consider the Following

✓ **Identify if EAB is Near**

Start insecticide treatments only when your property is within 15 miles of an EAB infestation, or if you are within a county that is quarantined for EAB. Check [MDA's Interactive EAB Survey Map](#) for current infestations in Minnesota.

✓ **Remove and Replace Ash Trees on Your Property**

It may be more cost effective to replace a small or struggling ash tree than to pay the cost of ongoing treatments. In addition, trees in poor health are not likely to respond well to treatments. Do not treat trees showing more than 50 percent canopy decline; these ash trees are unlikely to recover even if treated.

✓ **Treatment Requires a Long-Term Commitment**

Once EAB arrives in an area, it will remain a constant threat to ash trees. It is likely that protective insecticide treatments will be needed for the rest of the tree's life at a potentially significant cost.

✓ **Check Your Calendar – Timing is Everything**

To ensure the insecticide is in the leaves by the time adults emerge to feed in early June, products are most effective when applied mid-April until the end of June.

RECOMMENDED TREATMENT DATES ARE SHADED

APRIL							MAY							JUNE						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3						1			1	2	3	4	5	
4	5	6	7	8	9	10	2	3	4	5	6	7	8	6	7	8	9	10	11	12
11	12	13	14	15	16	17	9	10	11	12	13	14	15	13	14	15	16	17	18	19
18	19	20	21	22	23	24	16	17	18	19	20	21	22	20	21	22	23	24	25	26
25	26	27	28	29	30		23	24	25	26	27	28	29	27	28	29	30			
							30	31												

✓ **Contact a Certified Arborist or City Forester to Evaluate Treatment Options**

When contacting a professional, consider the following:

- Your city or township may have requirements or prohibitions related to the treatment of EAB, especially for ash trees located on city property, which may include trees planted on or near boulevards or sidewalks. Check with your city's park and recreation or forestry departments.
- Many effective products are best administered by professionals. If hiring a professional, check to make sure that they are licensed in Minnesota as a Commercial Pesticide Applicator for category "E: Turf and Ornamentals."

✓ **Have a Professional Treat Large Ash Trees**

There are homeowner treatment options for small ash trees, though these require careful application to avoid unintended environmental impacts. Homeowners wishing to protect trees larger than 48 inches in circumference (as measured 4½ feet above ground level) should have their trees professionally treated.



Insecticide Treatment Options

Professionals have access to some products that are not available to homeowners.
This document does not endorse the listed insecticide products over other options.



Products Marketed to Professionals and Arborists				
Insecticide Active Ingredient	Examples of Products	Treatment Frequency	Application Methods	Environmental Profile
Emamectin benzoate	<ul style="list-style-type: none"> • TREE-age <p><i>Restricted Use Pesticide</i> <i>Any person using this product is required to be a licensed or certified pesticide applicator.</i></p>	Every 2 years	Trunk injection	<ul style="list-style-type: none"> • Persistent in tree tissue, relatively immobile in the environment.
Azadirachtin, (neem tree seed oil)	<ul style="list-style-type: none"> • TreeAzin 	Once per year	Trunk injection	<ul style="list-style-type: none"> • Classified as a biopesticide, minimal or no exposure or risk to non-target organisms, habitats or water.
Dinotefuran	<ul style="list-style-type: none"> • Safari • Transtect 	Once per year (bark spray) 1 – 2 times per year (other methods)	Bark spray, soil injection, soil-applied drench	<ul style="list-style-type: none"> • Strong potential to leach to shallow groundwater. • Potential exposure to adjacent water bodies through spray drift and runoff events.
Imidacloprid	<ul style="list-style-type: none"> • Merit products • Xytect 2F • Ima-jet 	1 - 2 times per year	Trunk injection, soil injection, soil-applied drench	<ul style="list-style-type: none"> • Highly toxic to aquatic life. • Potential to leach to shallow groundwater or be transported in runoff when using soil injection or drench.

Products Marketed to Homeowners				
Insecticide Active Ingredient	Examples of Products	Treatment Frequency	Application Methods	Environmental Profile
Dinotefuran	<ul style="list-style-type: none"> • Green Light Tree and Shrub Insect Control with Safari 	Once per year	Granular soil-applied product	<ul style="list-style-type: none"> • Strong potential to leach to shallow groundwater. • Potential exposure to adjacent water bodies through runoff events.
Imidacloprid	<ul style="list-style-type: none"> • Bayer Advanced Tree and Shrub Insect Control • Bonide Tree and Shrub Insect Control • Ferti-lome Systemic Insect Drench • Ortho Max Tree and Shrub Insect Control 	Once per year ¹	Soil-applied drench	<ul style="list-style-type: none"> • Highly toxic to aquatic life. • Potential to leach to shallow groundwater or be transported in runoff.
Imidacloprid	<ul style="list-style-type: none"> • Bonide Systemic Insect Spray 	Check with an arborist, may not be practical for trees > 20-25 ft. in height ²	Insecticide spray to tree canopy or bark	<ul style="list-style-type: none"> • Highly toxic to aquatic life. • Tree canopy (foliar) sprays can lead to drift, posing risks to surface water, children, pets and nearby flowering plants (with potentially toxic effects to bees and other pollinators).

1. Recommended only for trees less than 48 inches in circumference (as measured 4½ feet above ground level)
2. Due to the chances of insecticide drift to other areas during a canopy or bark spray, they are best applied by professionals. Additionally, there is little research to support the efficacy of canopy spray products.

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Follow These Recommendations to Protect Water Quality

Generally, professionally applied tree injections have significantly fewer concerns for water quality.

For soil-applied products, bark sprays or sprays applied to tree canopies, the following considerations are important:

- Do not use within 25 feet of water bodies; such as, streams, lakes, ponds, wetlands or conduits to surface water or groundwater such as street curbs, storm drains, sumps, or well heads.
- Do not apply when heavy rainfall is expected within 24 hours of the planned treatment.
- Do not allow sprays to drift. Avoid spraying trees when there is wind. These sprays pose exposure risks to surface water, children, pets and nearby flowering plants (with potentially toxic affects to bees and other pollinators).

Avoid situations that could cause insecticides to wash away or leach, potentially contaminating water resources

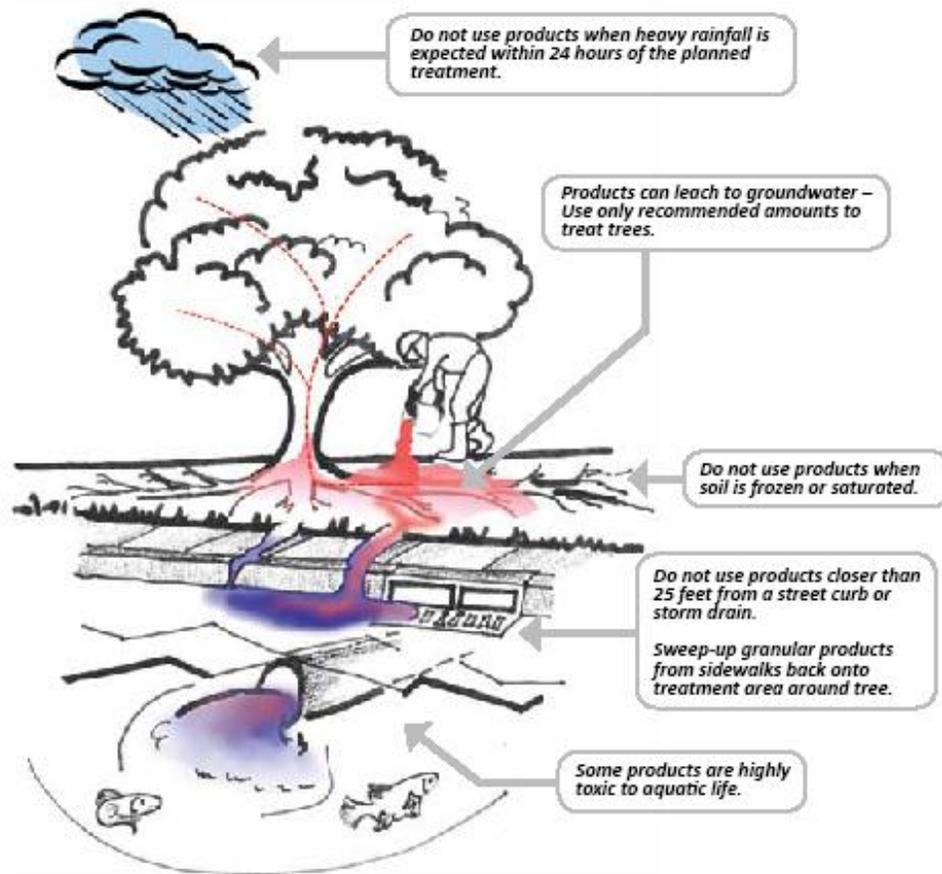


Illustration adapted from Dreistadt, S.H., J.K. Clark, M.L. Flint. 2004. Pests of Landscape Trees and Shrubs, An Integrated Pest Management Guide. Publ. 3359. Page 13, and, Flint, M.L. 2009. Lawn and Residential Landscape Pest Control, A Guide for Maintenance Gardeners- Workbook. Publ. 3510. Page 44.

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Making Sense of EAB Insecticide Labels

Read the Label! It is your legal responsibility to read, clearly understand, and follow all current label directions for the specific insecticide product being used.

Selecting an Insecticide:

- Look for products marketed to control emerald ash borer (see table in this guide).
- Read the *Environmental Hazard Statements* on the insecticide label. Products applied as a canopy spray are likely to result in a considerable amount of insecticide drift, even when conditions are ideal.

Using an Insecticide:

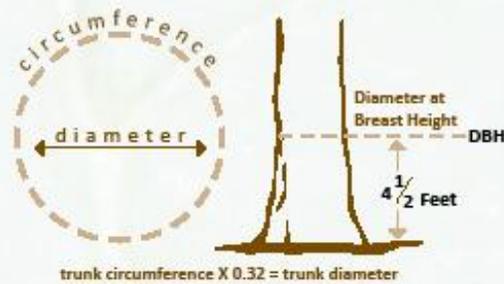
- To facilitate uptake, soil-applied insecticides should be applied when the soil is moist but not saturated or excessively dry.
- For soil drenches remove or rake any mulch or dead leaves, then pour the insecticide solution directly onto soil.
- Do not allow children and pets to re-enter treatment area until sprays or drenches have dried.
- Store insecticides where children cannot reach them.
- Many homeowner products only allow one soil drench application per year.

Disposing an Insecticide:

- When using the last of a liquid insecticide container, triple-rinse before disposal, then apply the rinse water as you would apply the insecticide.
- Unusable and unwanted insecticides must be disposed of according to the label directions, or at a county household hazardous waste disposal event.
- It is illegal to bury or burn a insecticide.

Measure your Ash Trees

Soil-applied insecticide treatments available to the general public are most effective on smaller trees, less than 48 inches in circumference.



CONVERSION TABLE	
Tree Measurements at 4 1/2 Feet Above Ground Level	
Circumference – Inches	Diameter at Breast Height (DBH) – Inches
15	5
20	6
25	8
30	9.5
35	11
40	13
45	14
> 48 inches	> 15 inches
Large trees should be treated by a professional	

Additional Resources

For more information on this publication, contact the “Arrest the Pest” Hotline at 651-201-6684 or 888-545-6684.

Pesticide Disposal

For more information about disposing of unusable or unwanted pesticides, visit MDA online at www.mda.state.mn.us/chemicals/spills/wastepesticides/schedule.aspx or 651-201-6562.

Reporting and Investigating Pesticide Spills and Misuse

Complaints can be reported to the Minnesota Duty Officer at 800-422-0798.

MDA staff will evaluate the information provided and if a pesticide misuse is suspected, an MDA inspector will be assigned.

More information is available online at www.mda.state.mn.us/chemicals/pesticides/complaints.aspx

Emerald Ash Borer Online Resources

- Minnesota Department of Agriculture – <http://www.mda.state.mn.us/eab>
- University of Minnesota Extension – www.extension.umn.edu/issues/eab
- USDA-APHIS – www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b
- Minnesota Department of Natural Resources – www.dnr.state.mn.us/invasives/terrestrialanimals/eab
- City of St. Paul – www.stpaul.gov/index.aspx?NID=2495
- Minneapolis Park and Recreation Board – www.minneapolisparkeboard.org/default.asp?PageID=1059
- EAB Multi-State Site – www.emeraldashborer.info