

# City of Ashland Emerald Ash Borer Readiness Plan



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

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## **INTRODUCTION**

While nobody can predict when the emerald ash borer will arrive in Ashland, it is assumed that the insect *will* arrive in Ashland in the near future. Currently, the insect has been confirmed in multiple locations in Wisconsin including nearby Sawyer and Douglas Counties as well as the Upper Peninsula of Michigan. Since EAB's first detection in Wisconsin in 2008, it has spread quickly throughout the state and the nation. By all appearances it is unstoppable and is spreading quickly. The City of Ashland is anticipating proactive measures before an infestation occurs to spread costs over time and maintain public safety.

### **Purpose of Readiness Plan**

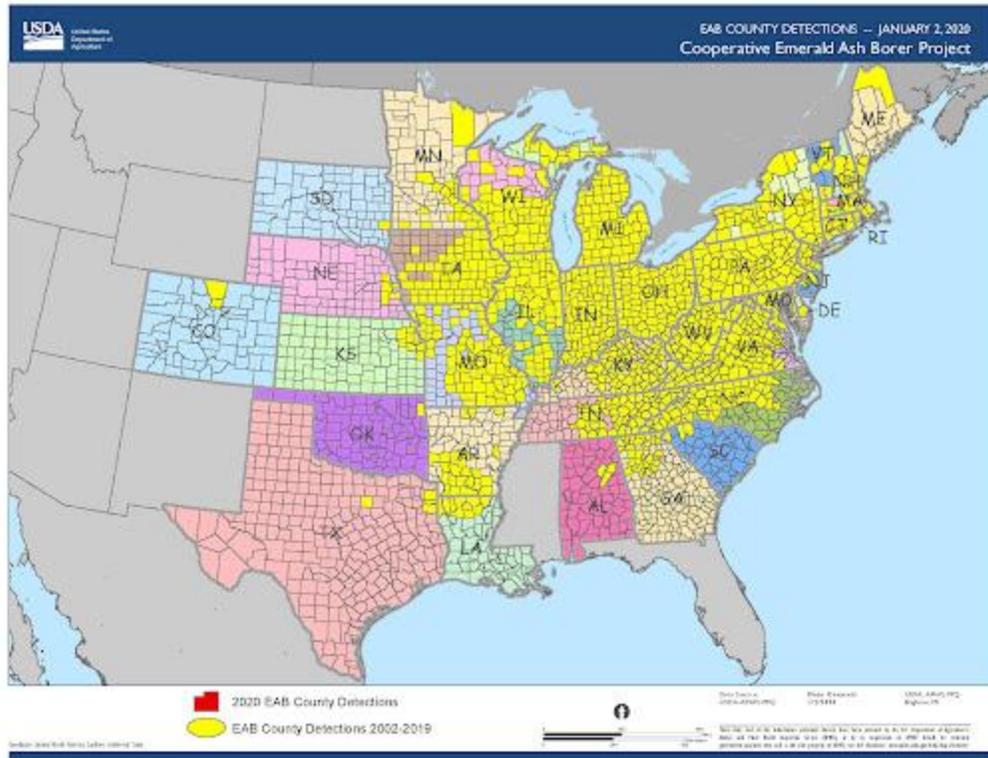
The purpose of this Emerald Ash Borer (EAB) readiness plan is to identify the essential personnel, resources, procedures, and fiscal resources to combat the Emerald Ash Borer in Ashland, Wisconsin. Thorough planning is the key to minimizing and mitigating the effects of EAB.

### **General Discussion of Emerald Ash Borer**

#### ***History of the 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.

The natural range of the emerald ash borer is eastern Russia, northern China, Japan, and Korea. Before June of 2002, it had never been found in North America. In its native environment EAB feeds on a variety of plant species but in the United States it feeds exclusively on the ash tree (*Fraxinus*). In its native range it is considered a minor pest and is controlled through natural measures. In the United States, it is known to attack green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), black ash (*Fraxinus nigra*) and blue ash (*Fraxinus quadrangulata*). It attacks both healthy and declining ash trees and has been known to attack and colonize branches as small as one inch in diameter. Since the first detection in 2002, EAB has been found throughout a large portion of the United States as well as Canada.



Current infestation map January 2, 2020

### ***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 can be 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 on uninfested trees.

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. The most commonly found ash within Ashland is green ash (*Fraxinus pennsylvanica*) and white ash (*Fraxinus americana*). There are many wood boring insects, but EAB will only attack ash trees. An ash tree is most easily identified by its opposite branching pattern (the leaves will grow opposite of 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 2 to 3 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 Trade and Consumer Protection (DATCP) hotline number which is 1-800-462-2803.



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 2 years after infestation.

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 2 years after infestation.

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.



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.

Bark splitting: Vertical splits in the bark appear and are caused by callus tissues that form 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.

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

### **Tree Inventory Findings**

Based on inventory data collected by ArborPro during the fall of 2017, the following information regarding the ash tree population in Ashland has been determined:

- **710 ash trees were inventoried.**
- **580 ash are green ash, 112 are white ash and 18 were identified as blue ash.**
- **92.2% of ash are in fair, good or very good condition. Only 7.8% are in poor or very poor condition.**
- **140 ash are growing in parks and the remaining 570 are street trees.**
- **The inventory indicates 19 ash are recommended for removal based on defects unrelated to EAB.**
- **Average diameter of ash at breast height is 12.5 inches.**

# PRE-EMERALD ASH BORER ACTIVITIES

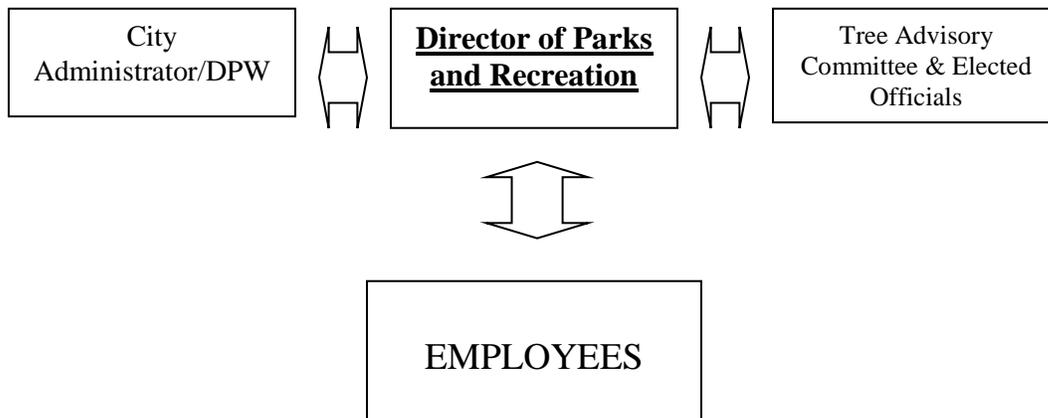
## Establish Chain of Command

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

- Prioritizing and budgeting for tree removals, treatments and replanting
- Designating crew leadership and crew work duties
- Updating City administration and advisory board members
- Public and media outreach
- Education of public
- Enforcement of ordinances
- Coordination with state and local officials
- Coordinate staff training
- Purchase equipment as needed

Ashland has designated the Director of Parks and Recreation for this role. The Director of Parks and Recreation completes most of these actions currently and is well versed with existing budgets, equipment and staffing constraints. She also works closely with City officials and this relationship will continue when EAB is confirmed within Ashland. The tree advisory board will serve in an advisory capacity to the Director of Parks and Recreation and will specifically assist with public education and replanting fund raising. The Director of Parks and Recreation will also be the official Ashland contact when dealing with DATCP, DNR and other state officials.

For EAB related activities within Ashland, the following flowchart will apply:



## **Conduct Detection Surveys**

With the tree inventory, Ashland has completed the first step of the survey process. Next, EAB/ash tree inspection should be conducted to note potential indicators of EAB activity within the City. There are several survey methods that can be utilized, but two methods in particular seem well suited to Ashland.

**Visual Survey** techniques include looking for outwardly visible signs/symptoms of EAB on ash trees by foot. Visual survey can be conducted systematically over a given area or by individually selecting trees thru the inventory. Taking into consideration Ashland's ash stocking level, number of employees and duties, it seems logical to survey only a portion of the ash tree population annually. It seems reasonable to inspect around 100 or 1/8<sup>th</sup> of the population annually. The main disadvantage of this survey method is that by the time visual symptoms of EAB are present, it usually means the infestation has been in the area for several years. However, it is the easiest and most economical means of survey and can be completed by City staff. This survey method should begin in 2022 and continue annually thereafter. The tree inventory database can be used for recordkeeping.



**Canopy Survey** methods are employed when a closer look of the tree's canopy is warranted. For example, if a tree is identified thru the visual survey as exhibiting dieback and epicormic sprouting, the tree should be more thoroughly inspected. In the tree canopy, small windows on the trunk and branches can be peeled back using a drawknife, to look for EAB larvae.

Larvae in small diameter branch. Photo courtesy of Ping Tree Service/IN DNR

The advantage of this method is that inspection occurs in the tree's canopy where EAB signs/symptoms first appear. The City does have a bucket truck and is equipped to complete this type of survey. If crew members find 2 or more symptoms of EAB on a tree they should call DATCP at 1-800-462-2803 and DATCP will assist with the inspection.

## **Decide to Remove or Chemically Treat Trees**

The first essential question that arises when a community is making decisions regarding EAB is whether to maintain an ash component within their urban forest. Simply put, 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 costs                       | Con: A unique species is lost to the forest     |
| Pro: Wise replanting selections can be chosen | Con: Mature trees are replaced with small trees |

**Save all 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: Additional staff needed for monitoring |
| Pro: Large trees continue contributing to forest | Con: The use of chemicals may be ongoing    |

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

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

**Identify Significant Ash Trees Suitable for Chemical Treatment**

It is ambitious for a community to chemically treat 710 ash trees for an indefinite number of years. A very rough estimate of cost of treatment using Tree-äge™ (Emamectin benzoate) via Arborjet is \$8/inch of tree diameter on an every-other year basis. To treat 710 trees would roughly cost \$35,000 annually. In the long-term, it is more economical to simply remove and replant ash. It is a one-time upfront fee that is dealt with and over quickly. However, considering how important a component ash is to Ashland’s city forest (the trees name is in the name of ASHland), it is reasonable to treat a smaller number of significant trees.

**Reduce Ash Tree Volume**

Once infested with EAB, ash trees typically decline and die over a period of 2-3 years depending upon insect volume. The burden of dealing with volumes of dead and dying trees within a short period of time can place an enormous strain on community budgets, personnel, and resources. The City of Ashland can take small steps now to prepare for and manage for the arrival of this pest.

Ashland should take the pro-active approach of removing non-infested, but otherwise compromised ash as a way to minimize the impacts when EAB arrives. The relative advantages and disadvantages of preemptive vs. reactive removals include:

**Preemptive Removal: Removing ash trees that are not infested with EAB.**

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>*Opportunity to spread removal costs over a longer time frame</li> <li>*Reduces issue of dealing with many dead and/or hazardous trees at one time.</li> <li>*Opportunity to start replanting process immediately</li> <li>*Greater flexibility in organizing work schedules</li> <li>*Ability to utilize ash wood for products or use it as a local source of firewood</li> </ul>	<ul style="list-style-type: none"> <li>*Immediate impacts to tree canopy and aesthetics</li> <li>*Removing healthy ash may create negative feelings within the community</li> <li>*Does not factor in research that may find an effective control for ash</li> </ul>

**Reactive Removal: Removing ash trees which are either infested with EAB or dead**

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>*Delayed impacts to tree canopy and aesthetics</li> <li>*Less negative public perceptions</li> <li>*Delayed budgetary impacts until EAB arrives</li> <li>*Further EAB research may offer effective control, minimizing needs for removal</li> </ul>	<ul style="list-style-type: none"> <li>*Budget and staff impacts will be more severe once EAB arrives in Ashland</li> <li>*Replanting funds may not be available due to extreme removal costs</li> <li>*Inability to keep up with removals increases risk from standing dead trees</li> <li>*Bigger waste stream to manage</li> </ul>

The most logical method to reduce ash volume initially is to remove ash trees identified through the inventory as in poor condition or dead. A tree identified as in very poor or poor condition is most likely considered a high risk tree regardless of EAB and therefore has an associated liability. Any tree, dead or alive, which has the potential to entirely or partially fail and impact a target, can be considered a hazard. A target can be a vehicle, building or a place where people gather (Source: Urban Tree Risk Management Guide, USDA Forest Service: [www.na.fs.fed/us/spfo/pubs/uf/utrm](http://www.na.fs.fed/us/spfo/pubs/uf/utrm)). Dead or dying ash trees, whether weakened/killed by EAB or not, pose a risk to public safety and therefore a potential liability for communities if left standing. There are 19 ash trees in poor or very poor condition.

Communities faced with EAB infestation within 1-2 years have begun removing and replanting small diameter (1-8") ash trees prior to infestation. Replanting in these locations is occurring simultaneously with the removals so that the impact of the removal on residents is lessened. The removal of small diameter ash trees is relatively easy and less expensive than large trees and it is a good opportunity to spread the expense of replanting over a longer time period. Ashland has 115 ash trees in the 1-8" dbh category. It would be advisable to remove and replant these smaller diameter trees after recommended removals are completed.

EAB infestation has been confirmed in Wisconsin in many counties and in the Upper Peninsula of Michigan. Ashland is quite close to current, active infestations. Due to the size of the current infestations and the general philosophy that there are more infestations throughout the state that have not been found yet, it seems reasonable to begin this activity immediately following removal of poor/very poor/dead trees.

## The following activities are recommended for the City of Ashland

### **Activities to be Completed in 2022:**

Complete removals from inventory (19 trees)  
Remove ash in poor condition (41 trees)  
Re-plant trees (60 trees)  
Ash tree inspections (approximately 100 trees)  
Staff member obtain pesticide applicators license

### **Activities to be Completed in 2023:**

Remove one-half of ash trees 1-8" dbh (57 trees)  
Re-plant trees (57 trees)  
Ash tree inspections (approximately 100 trees)  
Staff member obtain ISA Certified Arborist certification

### **Activities to be Completed in 2024:**

Remove one-half of ash trees 1-8" dbh (58 trees)  
Re-plant trees (57 trees)  
Ash tree inspections (approximately 100 trees)

### **Chemical Treatment of Ash (Date TBD)**

Treat one-half of ash in good, fair or very good condition (267)  
\*using emamectin benzoate

An estimate has been prepared that outlines the costs of the yearly items above.

## 2022 Activities

Activity	In-House or Contract	# of Trees	Contract Cost or Staff Hours Required	Misc. Comments
Remove ash trees recommended for removal in inventory	In-house	19	5 days for a 3 - 4 person crew	Avg dbh = 8.6" Crew removes 4 daily, including stump grinding.
Remove ash trees in poor condition	In-house	41	14 days for a 3 - 4 person crew	Avg dbh = 16.6" Crew removes 3 daily, including stump grinding.
Re-plant trees	Purchase From Supplier; Plant In-House	60	Trees = \$10,500; 6 days for a 2 person crew	Trees = \$175/each; Crew plants 10 daily
Ash tree inspections	In-house	approximately 100	2 days for Arborist	
Staff member obtain pesticide applicators license	n/a	n/a	varies	

<b>TOTAL STAFF HOURS</b>	<b>80 days</b>
<b>TOTAL CONTRACT COST</b>	<b>\$10,500</b>

~ Equipment costs not included.  
 ~Trees under/around utility lines should be completed/cleared to a safe distance by utility organization.

~Expect to purchase a potted 1.5-2.0" caliper tree for this price.  
 ~Average crew wage = \$50/hour including benefits.

## 2023 Activities

Activity	In-House or Contract	# of Trees	Contract Cost or Staff Hours Required	Misc. Comments
Remove one-half of ash trees 1-8" DBH	In-house	57	9 days for a 3 - 4 person crew	Avg dbh = 7.0" Crew removes 6 daily, including stump grinding.
Re-plant trees	Purchase From Supplier; Plant In-House	57	Trees = \$9,975; 6 days for a 2 person crew	Trees = \$175/each; Crew plants 10 daily
Ash tree inspections	In-house	approximately 100	2 days for Arborist	
Staff member obtain ISA Certified Arborist certification	n/a	n/a	varies	

<b>TOTAL STAFF HOURS/COST*</b>	<b>45 days</b>
<b>TOTAL CONTRACT COST</b>	<b>\$9,975</b>

~ Equipment costs not included.

~Trees under/around utility lines should be  
completed/cleared to a safe distance by  
utility organization.

~Expect to purchase a potted 1.5-  
2.0" caliper tree for this price.

~Average crew wage = \$50/hour  
including benefits.

## 2024 Activities

Activity	In-House or Contract	# of Trees	Contract Cost or Staff Hours Required	Misc. Comments
Remove one-half of ash trees 1-8" DBH	In-house	58	9 days for a 3 - 4 person crew	Avg dbh = 7.0" Crew removes 6 daily, including stump grinding.
Re-plant trees	Purchase From Supplier; Plant In-House	58	Trees = \$10,150; 6 days for a 2 person crew	Trees = \$175/each; Crew plants 10 daily
Ash tree inspections	In-house	approximately 100	2 days for Arborist	

<b>TOTAL STAFF HOURS/COST*</b>	<b>45 days</b>
<b>TOTAL CONTRACT COST</b>	<b>\$10,150</b>

~ Equipment costs not included.

~Trees under/around utility lines should be  
completed/cleared to a safe distance by  
utility organization.

~Expect to purchase a potted 1.5-  
2.0" caliper tree for this price.  
~Average crew wage = \$50/hour  
including benefits.

## Chemical Treatment of Ash Costs (Date TBD)

Activity	In-House or Contract	# of Trees	Contract Cost or Staff Hours Required	Misc. Comments
Treat 1/2 ash in good, fair or very good condition	In-House	267	\$2,000 (equipment) +\$26,000 chemical 18 days/1 person	Avg dbh - 12.5" Crew member will need certification Cost is \$8/diameter inch 15 treatments/day/person

<b>TOTAL STAFF HOURS/COST*</b>	<b>18 days</b>
<b>TOTAL CONTRACT COST</b>	<b>\$28,000</b>

## **Staff Training**

The City of Ashland has adequate staff and equipment to complete most activities in-house. But, this plan recommends two specific certifications be obtained as they gear up for EAB.

- One or more staff members needs to obtain Pesticide Applicator certification. This will enable city staff to treat the trees that will be preserved. Emamectin benzoate is a restricted us pesticide and so the applicator certification is needed. It is much more cost efficient to complete this task in-house. More information can be found at: <https://fyi.extension.wisc.edu/pat/>
- One staff member should also become an International Arborist Association Certified Arborist. This is a very good general certification if you are caring for municipal trees. Information on this program can be found at: <https://www.isa-arbor.com/Credentials/Types-of-Credentials/ISA-Certified-Arborist>

## **Community Education**

It would be educationally beneficial to distribute the findings of this report to residents. This is most likely to be effective through a direct mailing and through posting on the City website. Information to be discussed includes:

- Numbers of actual ash trees found in Ashland's inventory
- Ash identification tips
- Assistance to landowners in locating ash trees on their properties
- Removal of unhealthy and other ash trees in anticipation of the EAB's arrival
- Chemical treatment options and the City treatment plan
- The City focus of boulevard and park trees (not in private yards)
- Replanting efforts
- Reporting to the EAB hotline number
- Beware of hucksters selling tree treatment
- FAQs

This is a great precursor to the arrival of EAB. It would also be beneficial to develop a FAQ sheet for callers and interested individuals. Additionally, preparing a press release for print and live media would be advisable.

## **Chemical Treatment of Trees**

As discussed above, some City owned ash trees are good candidates for preservation through chemical treatment. Treatment may also be a good option for individual homeowners who wish to save their boulevard or yard trees.

An estimated cost for treatment of the trees recommended for preservation was obtained and the best industry recommendations at this time are for treatment of trees using Tree-äge™

(Emamectin benzoate) via the Arborjet delivery system. This treatment option has proven to be very effective, reasonably priced and necessary only every other year. The best statewide site for pesticide use and treatment can be found at the University of Wisconsin Cooperative Extension Entomology website at:

[www.entomology.wisc.edu/emeraldashborer/](http://www.entomology.wisc.edu/emeraldashborer/)

### **Private Ash Trees**

The majority of a community's trees are typically located on private property. In most cases, the responsibility for tree removal on private property will be that of the property owner. In situations where a hazardous condition exists on a private tree with the potential to impact a public right-of-way, Ashland should promptly address the issue. Ashland provides for the City to, in effect, condemn a tree through the nuisance provisions of their ordinances. Inspection will need to be completed on private property as safety issues arise. Again, while the City will not be removing trees on private property, the City marshalling yard will most likely be accepting wood from private trees. In regards to ash disposal, Ashland needs to be aware that they will be dealing with their own trees, but will likely be disposing of at least some private trees also.

### **Wood Utilization**

The City of Ashland will be looking at a large amount of ash debris including boles, branches and grindings. Something will need to be done with this debris. Fortunately, Ashland has the advantage of being home to a large bio-mass fueled power plant. Midwest Companies supplies bio-mass fuel to the Excel Energy power plant in Ashland. Midwest Companies is located in the far East end of Ashland, only a few blocks from the public works facility. Ashland is perfectly positioned to rid itself and earn a small bit of money from its ash waste including that deposited at the city owned marshalling yard by private homeowners.

### **Marshalling Yard Location**

A marshalling yard is a disposal site whose purpose is to help prevent ash wood which could house the EAB from being transported out of a quarantined area. Marshalling yards allow municipalities, tree service companies, utilities and private individuals to drop off ash material for disposal and processing to slow artificial spread of EAB. The City currently has such a site at their public works facility on East 6<sup>th</sup> Street. The site is currently used for wood debris disposal and so is well known to residents. The city will not need to house any of its own wood, as it can all be delivered immediately to Midwest Companies. Because Midwest Companies is so close, a large yard may not be necessary for Ashland. Use the current site unless it becomes overburdened at which time consider using the old landfill for temporary storage.

### **Replanting Strategies**

The City of Ashland will lose 175 ash trees due to EAB. While it is not always appropriate or feasible to replant all trees that are removed, replanting a portion of these trees will be an important component in Ashland's urban forest.

Replanting is one of the most often delayed or eliminated forestry operations. It takes quite a sum of money and staff-hours to replant large numbers of trees. However, the ultimate cost savings that trees generate is enormous. Some proven benefits of trees include:

"The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day."—*U.S. Department of Agriculture*

"Landscaping can reduce air conditioning costs by up to 50 percent, by shading the windows and walls of a home." — *American Public Power Association*

"If you plant a tree today on the west side of your home, in 5 years your energy bills should be 3% less. In 15 years the savings will be nearly 12%." —*Dr. E. Greg McPherson, Center for Urban Forest Research*

"A mature tree can often have an appraised value of between \$1,000 and \$10,000." —*Council of Tree and Landscape Appraisers*

"In one study, 83% of realtors believe that mature trees have a "strong or moderate impact" on the salability of homes listed for under \$150,000; on homes over \$250,000, this perception increases to 98%." —*Arbor National Mortgage & American Forests*

"Landscaping, especially with trees, can increase property values as much as 20 percent."—*Management Information Services/ICMA*

"One acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people."—*U.S. Department of Agriculture*

"Trees properly placed around buildings can reduce air conditioning needs by 30 percent and can save 20 - 50 percent in energy used for heating."—*USDA Forest Service*

"Trees can be a stimulus to economic development, attracting new business and tourism. Commercial retail areas are more attractive to shoppers, apartments rent more quickly, tenants stay longer, and space in a wooded setting is more valuable to sell or rent."—*The National Arbor Day Foundation*

"Healthy, mature trees add an average of 10 percent to a property's value."—*USDA Forest Service*

"The planting of trees means improved water quality, resulting in less runoff and erosion. This allows more recharging of the ground water supply. Wooded areas help prevent the transport of sediment and chemicals into streams."—*USDA Forest Service*

"In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension."—*Dr. Roger S. Ulrich Texas A&M University*

There are three keys to proper tree planting:

1. **Diversity.** The urban forest should be comprised of a variety of tree species that have a varied growth habits and longevities. A single species should comprise no more than 10% of the total tree population and a single tree family (oak family, maple family, etc.) should comprise no more than 20% of the total tree population. This is the single best method to lessen the impact of disease or insect infestations.

2. **Right Tree, Right Place.** One of the most important aspects of tree planting is selecting the proper tree species for the planting location. If there are overhead utilities, make certain the species you are selecting is appropriately sized to avoid interfering with power lines. If a boulevard is only 5 feet in width, do not plant an oak which may reach 3 feet in diameter and cause sidewalk and curb heaving. Choose an appropriately sized tree for the planting site. If it is a medium sized boulevard (5-6) feet choose a medium sized tree such as Turkish filbert. Large boulevards can accommodate large trees such as oak, maple and linden. Other factors to consider include light requirements, mature height and root growth habits. Selecting and planting the right tree for the right location will ensure its survival and success for years to come (see Attachment 2).

3. **Proper Planting and Mulching.** Many trees do not survive due to improper planting techniques such as planting too deeply, digging the hole too small and not backfilling correctly. Incorrect mulching, most often seen as volcano mulching (piling the mulch too high around the tree), can cause many growth problems from inadequate water uptake to trunk rot. Be sure to follow established WI DNR planting guidelines (found at <http://dnr.wi.gov/forestry/UF/index.htm>). The goal is 100% survival of newly planted trees and planting correctly is the path to get there. The city crew has been planting trees in-house for a number of years and has an exceptionally high survival rate. For best results, continue planting in-house.

Ashland 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 20% of any one genus and not more than 10% of any one species. One illustration is to plant not more than 20% maple and not more than 10% of sugar maple. This will help assure that if there is a population crash, large portions of the populations will not be lost.

The type of planting is best determined by the available site. General guidelines are as follows:

**Under power lines:** small growing trees (not to exceed 20' in height upon maturity)

**Boulevard size from 4-6' in width:** medium growing trees (measuring 30-40' in height upon maturity)

**Boulevard size 6' or greater in width:** large growing trees (measuring 40' or greater in height upon maturity)

It is recommended that no boulevard under 4' in width be planted due to the restricted growing conditions.

Ashland has a USDA hardiness zone rating of 4.

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

## Large to medium-sized Trees

***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<sup>™</sup>': 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' (Ashland Sentry<sup>®</sup>): 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<sup>®</sup>: moderately pyramidal form, 45' tall, 25' wide, slightly faster growth rate, bright yellow fall color, male, no fruit

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

'Woodstock' (Emperor<sup>™</sup>): 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-dominant branches, can break in storms

'Christie' (Halka<sup>™</sup>): 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<sup>®</sup>): symmetrical, upright, spreading form, 45' tall, 35' wide, yellow fall color, male, no pods, developed in North Dakota, hardy to zone 3b

'Impcole' (Imperial<sup>®</sup>): 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<sup>®</sup>): vase-shaped to rounded, irregular form, 45' tall, 35' wide, uniform, ascending branches, occasionally, some trees may produce pods

'Skycole' (Skyline<sup>®</sup>): 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<sup>®</sup>): 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<sup>®</sup>: broadly oval form, 40' tall, 35' wide, wider branch angles, yellow fall color, faster grower, male, no pods

'Wandell' (Perfection<sup>™</sup>): 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<sup>™</sup>): 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* × *macdenielli* 'Clemon's'**: Heritage<sup>®</sup> 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<sup>®</sup>): 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<sup>®</sup>): 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<sup>™</sup>): 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<sup>®</sup>): 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<sup>®</sup>): 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
- 'Princeton': large, leathery leaves, vase-shaped form, more resistant to elm leaf beetle
- '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 (suitable for growing under power lines)**

***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<sup>®</sup>: upright, open form, 20-30' tall, 15' wide, orange-red fall color, minimal suckering, single-stemmed

'JFS-Arb' (Spring Flurry<sup>®</sup>): upright, oval form, 30-35' tall, 20' wide, orange fall color, single-stemmed, straight central leader, newer cultivar

'Rogers' (Lustre<sup>®</sup>): 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<sup>®</sup>): 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 bronzyish-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

'Sutyzam' (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

'Excizam' (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  
'Canterzam' (Canterbury™): rounded, compact form 10' tall, 8-10' wide, light, pinkish-white flowers  
'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  
'Parsi' (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 bronzish-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<sup>™</sup>): 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<sup>™</sup>): upright, pyramidal, narrower form, 20-25' tall, 10-15' wide

***Viburnum lentago***: nannyberry viburnum, tree form, hardy to zone 2, native to northeastern and Midwestern United States and into Canada, upright with arching branches, 15-20' tall, 8-10' wide, white flower clusters in spring, rose pink fruit that turns blue-black.

## SUMMARY

This plan has one primary goal: preparation. Experience has shown that communities who develop a readiness plan and begin the preparation phase will have a much easier time managing their infestation. This plan gives Ashland a head start on EAB activities. Ashland is now armed with the knowledge of:

- The location of their publicly owned ash trees
- An estimate of the time and money required to manage EAB
- Equipment and staffing needs
- Public education strategies
- Resources available for information and assistance

Planning saves money and time. And while this process will not be easy, cheap or fast, with planning and attention to detail, it can be done well.