



City of Cedar Rapids Emerald Ash Borer Plan

Addendum and Revision April 2015



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CHAPTER 1 · Summary and Goals

Executive Summary

Since 2010, the City of Cedar Rapids has been working on a plan to reduce the impact of the EAB. With an estimated 10,000 – 15,000 ROW ash trees, in addition to ash trees in parks and on private property, the EAB could have a devastating impact on our urban forest. The City of Cedar Rapids' EAB Plan (the "EAB Plan") proactively uses resources to manage this invasive pest while analyzing the impact on the tree canopy and ensuring public safety. The EAB Plan addresses public and private environmental, economic and social needs, and seeks to distribute the costs associated with loss of tree canopy over a manageable time.

An initial communications plan was developed in 2010 which focused primarily on communication and educational outreach. This updated plan includes tactical strategies and details of the plan with implementation and execution steps.

The City of Cedar Rapids plans to utilize the EAB Plan to process and problem solve as a collaboration with researchers on latest findings and development of cost effective and environmentally friendly solutions as a frame work for dealing with future urban forest threats.

If an EAB infestation is discovered in Cedar Rapids, Iowa Department of Natural Resources (IDNR), US Department of Agriculture (USDA) and the Animal and Plant Health Inspection Service (APHIS) response guidelines and regulations would be followed and all options for mitigating its impact would be reexamined and best options to ensure public safety, preserve the tree canopy and mitigate environmental impacts would be pursued.

Mission Statement

The City of Cedar Rapids' Emerald Ash Borer Management Plan (the EAB Plan) will maintain and enhance the City's urban forest and the long-term benefits to the community.

Goals

- Minimize the impact of the Emerald Ash Borer (EAB) on the health of our urban forest.
- Utilize the best scientific methods available.
- Pursue efforts that are as cost effective as possible.

CHAPTER 2 • Insect Background

Background on the Emerald Ash Borer (EAB)

The EAB is an exotic pest from Asia that has already been responsible for the death of over 30 million ash trees in the United States and Canada. (See Map 1) The adult beetles nibble on ash foliage but cause little damage. The larvae (the immature stage) feed in the vascular tissue of ash trees, disrupting the tree's ability to transport water and nutrients. Unlike other trees like oak or elm, which remain relatively stable after they die, ash trees lose moisture internally very quickly and begin to fall apart soon after they die.

Emerald Ash Borer was first discovered in Iowa in Allamakee County in 2010. Since that time, the Iowa Department of Natural Resources has been conducting statewide EAB surveys and placing EAB traps in one-mile increments within targeted areas searching for this insect. To date, the insect has not been found in Cedar Rapids. There have been over 20 other confirmed infestations in the state (see Map 24). The nearest known EAB infestation is in Mechanicsville, Iowa which is approximately 25 miles from Cedar Rapids, Iowa.

The adult EAB is about $\frac{1}{2}$ inches long and metallic green in color (See photo 1). During the summer and fall the EAB larvae life stage feeds and develops in the cambium region (the layer within the bark where sap moves), thereby disrupting the tree's ability to transport water and nutrients (See Diagram 1). All native ash trees (*Fraxinus* spp.) are affected by EAB. The only non-ash species known to be a host for EAB is the White Fringe tree. This is a recent finding and details are limited at this time. Fortunately, this plant is rare in the landscape. Most infestations are five to seven years old when they are found. (Hermes, D, et al. 2009). (See Appendix C: EAB Life Cycle)



Photo 1: EAB is smaller than a penny

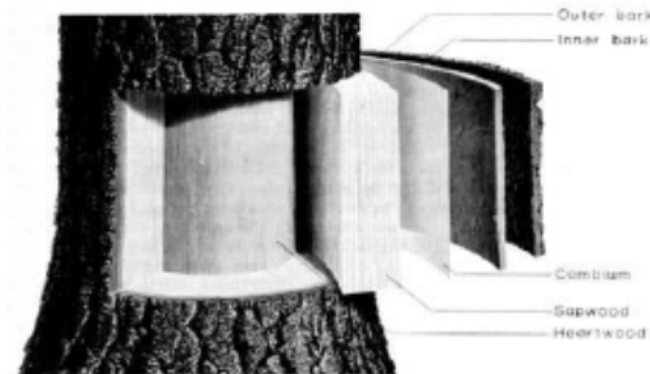
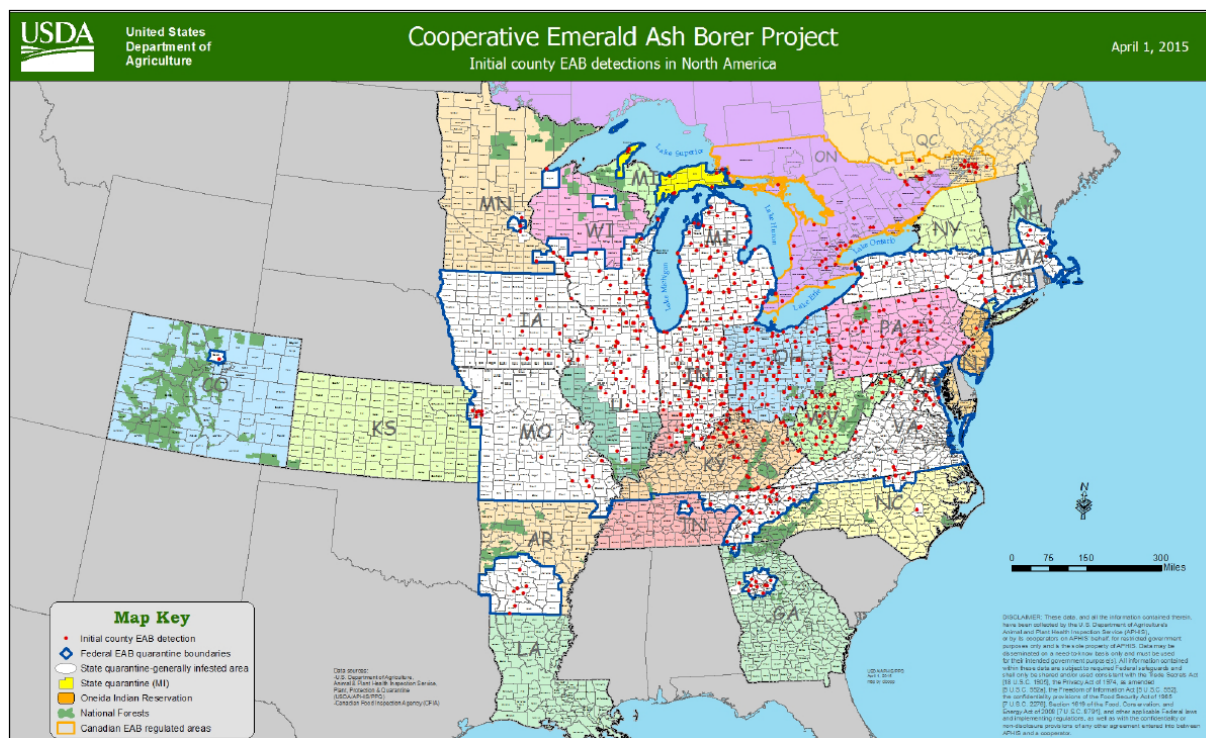
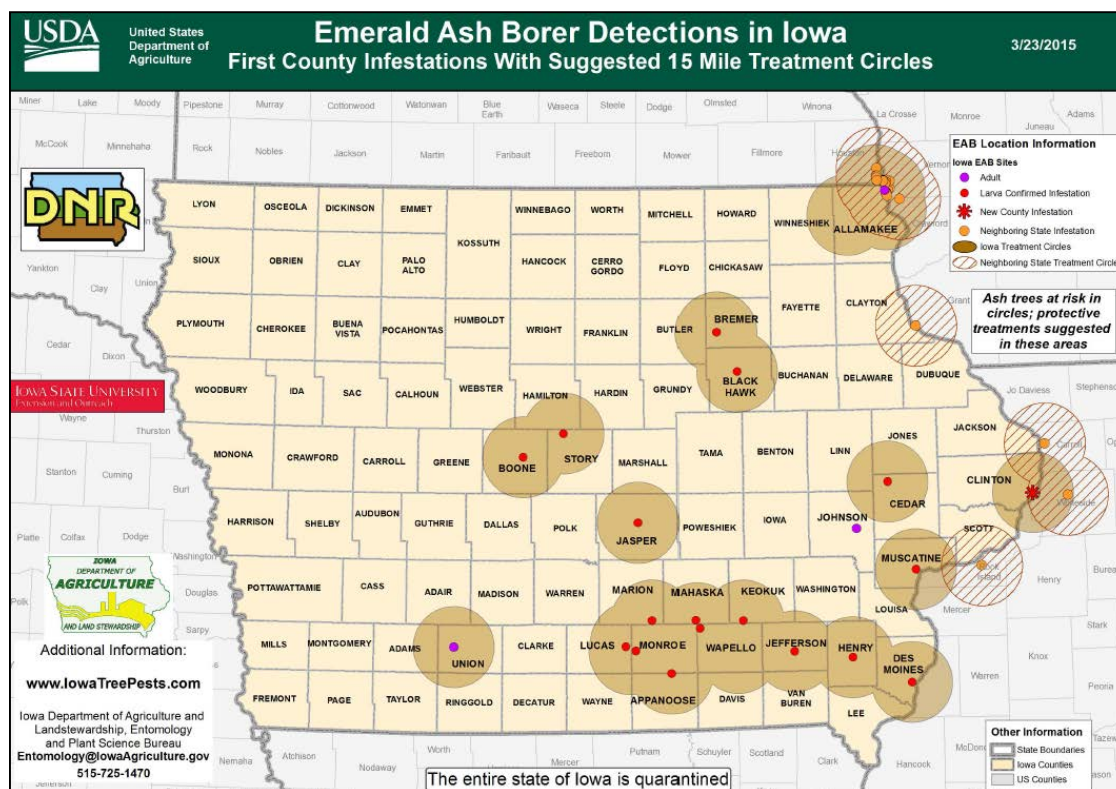


Diagram 1: Tree Physiology



Map 1. Emerald Ash Borer locations in North America as of April 2015 (Source USDA)



Map 2. Emerald Ash Borer locations in Iowa as of March 2015 (Source IDNR)

How it Spreads

Infestations can spread by moving infested ash tree nursery stock, logs and firewood into un-infested areas. Shipments of ash nursery trees and ash logs with bark are now regulated, but the transport of infested firewood remains a problem. EAB populations initially build very slowly, but later increase rapidly as more trees become infested. As EAB populations reach their peak, many trees decline and die within one or two years. (Herms, D, et al. 2009). (See Appendix C: EAB Life Cycle.)

Based on the experience of communities already dealing with EAB, there is a predictable pattern of loss (Diagram 1). At first, losses due to EAB will be minimal and current City staff levels will be adequate. However, as the infestation level increases, additional staff will be needed to keep up with the number of dying trees and to help prevent unsafe conditions as dead ash become hazards and fall apart.

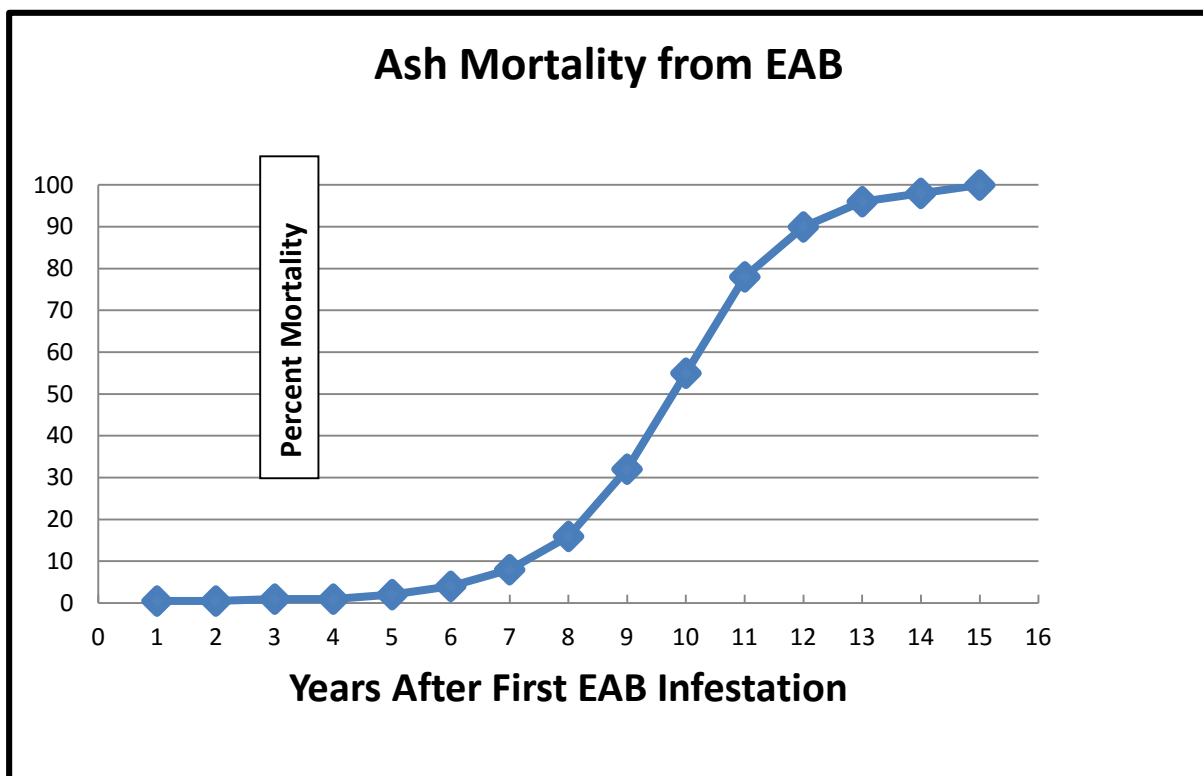


Diagram 1: A predictable pattern of loss

City of Cedar Rapids Ash Tree Population

While an official inventory is yet to be obtained, the ash tree population along Cedar Rapids streets is estimated at 10,000 – 15,000 trees (determined by calculating the number of trees per street mile, using a partial tree survey conducted by Trees Forever in 2009, and anecdotal evidence). Few ash trees reside in parks, and the loss of these trees should not adversely affect the aesthetics of Cedar Rapids' parks and green spaces. The City's golf courses do have a considerable number of ash trees, and a separate plan is underway to address those.

While the amount of private ash trees (those on private property) has not been surveyed, ash was a very popular species and it is estimated that the number of private ash trees is at least equal, if not double, the number of public ash trees. The majority of ash in the City are Green Ash, which have a lower lifespan and are more susceptible to EAB than other ash species. On average, these trees live 40 – 60 years. Many were planted between 1950 and 1970 as replacements for the American Elms that were removed due to Dutch Elm Disease.

CHAPTER 3 • Recommendations

EAB Management & Implementation Roles

EAB management is coordinated at the federal level by the U.S. Department of Agriculture. Due to diminishing federal funds, Iowa's EAB management program has eliminated its eradication efforts, instead focusing on slowing the spread and reducing the effects of EAB infestation through monitoring and regulation. If an EAB infestation is discovered in Cedar Rapids, the City's Forestry Program would follow response guidelines by the IDNR, USDA and APHIS to examine the best options that help ensure public safety, preserve the tree canopy and reduce environmental impacts.

It is likely that EAB will be discovered in Cedar Rapids at any time, and the City's Forestry Program, in collaboration with other City agencies, will be responsible for implementing the EAB Plan. The City Arborist will monitor plan implementation, report back to various governing bodies and make recommendations for changes to the plan as new research delivers different strategies for dealing with the pest.

Summary of Recommendations

The City of Cedar Rapids assessed several possible EAB Management Strategies. They include proactive approaches to addressing the need to contain the infestation, remove ash trees, replant with other species and mitigate possible financial and environmental impacts.

1. Obtain Tree Inventory for all City-Owned Public Right-of-Way (ROW) Trees
2. Develop a Chemical Treatment Strategy
3. Continue Proactively Removing Declining Ash Trees
4. Educate and Equip Property Owners to Pursue Chemical Treatment of Private Trees
5. Identify Proper Waste Wood/Quarantine Location for Removed Ash Trees
6. Allow for Increased Staffing of the Forestry Program
7. Request Budget For Treatment of up to 6,000 Ash Trees
8. Continue to Enforce Existing Code Language Pertaining to Hazardous Tree Removal
9. Replant a Diverse Stock of Trees
10. Prepare a Press Release Regarding an EAB Infestation Confirmed in Cedar

Recommendations

1. Obtain Tree Inventory for all City-Owned Public Right-of-Way (ROW) Trees

The inventory shall indicate location, size and condition; rating of existing trees; open planting locations and incorporate the iTREE suites programming. Estimated cost is \$400,000, with an additional \$6,000 per year for updates. This is a high priority item, essential to the success of the overall plan.

2. Develop a Chemical Treatment Strategy

Identify ROW trees that are good candidates for chemical treatment, excluding trees in poor condition or under power transmission lines. Recommended injection treatments include Emamectin benzoate (TreeAge or Arbormectin) instead of soil drench treatments, to ensure protection of ground and surface water quality. A maximum of 6,000 trees would be authorized for treatment.

As an interim policy, the City shall obtain an indefinite services contract with at least one company to treat trees as they are found. The treatments should be priced on a per-inch cost and account for a graduated rate of treatment. (Example: Rate X for less than 100 trees treated, rate Y for 101 – 500 trees treated, etc.). This program would be facilitated through the City's bid process and would be performed by awarded contractor.

A more structured treatment program, facilitated with a second contract nullifying the first would begin once the tree inventory is completed and EAB is detected within 15 miles of Cedar Rapids and be consistent with currently accepted Integrated Pest Management (IPM) plans.

3. Continue Proactively Removing Declining Ash Trees

Remove declining ash and replace within one year (or next appropriate planting season) with diverse tree stock to hasten renewal of urban tree canopy. Remove ash street trees designated in poor condition or that are under power transmission lines during infrastructure maintenance projects. Offer property owners the option of removing fair or good condition ash street trees during infrastructure maintenance projects, replacing with approved trees within one year (or next appropriate planting season).

It is recommended that the numbers be increased to 500 – 1,000 ash tree removals per year. Ash should be prioritized for removal:

- Residential ash street trees in poor health or with poor form.
- Ash street trees designated in poor condition which are under power transmission lines or impacted by infrastructure maintenance projects.
- Ash that have a negative impact on higher quality private or ROW trees.
- Ash located in areas where ash comprises more than 40% of the ROW trees. Strategically remove and replace up to 50% of these trees with the City's approved species within one year (or next appropriate planting season) to hasten renewal of urban tree canopy. Ensure biodiversity within the urban street tree population using the approved street tree species list.

4. Educate and Equip Property Owners to Pursue Chemical Treatment of Private Trees

Continue providing property owners with the option of chemically treating publically owned trees, at the property owners' expense and track locations (ongoing program since 2010). Structure the public tree treatment contract to allow homeowners to utilize the volume discount the City receives when treating their private ash trees, encouraging more residents to treat trees.

5. Identify Proper Waste Wood/Quarantine Location for Removed Ash Trees

Identify a location where wood waste from removed ash trees will be stored until processed. Processed wood waste, in the form of quarantine compliant wood chips, will also be stored at this location. The proposed location at this time is the former landfill. A tub grinder is already on site. Approximately 10 acres will be needed based on other City models. Evaluate the amount of debris that can be handled per week and determine if there is a need to investigate the rental of a second machine. A backup stockpile site should also be specified. This location could also be utilized if a portable sawmill is utilized to process select ash logs for a higher end use.

Wood Disposal:

The City of Cedar Rapids currently has a central storage facility with a tub grinder on site at the old landfill location. This site should be able to process much of the wood waste. However, a secondary location should be determined in case the landfill site is overwhelmed. A location may already exist, but this needs to be investigated. The City of Cedar Rapids will grind all wood debris from City sources into chips sized at less than 1-inch in two dimensions. The wood chips after processing would be available to the public or composted further. Future markets may change this policy. The City of Cedar Rapids will make concerted efforts to find alternative ways to utilize wood waste. This may include partnering with other government agencies or non-profit organizations.

Research Alternative Wood Waste Utilization:

The City will research and support alternative wood waste utilization methods beyond the current wood mulching process used to dispose of wood waste. One such method is processing ash logs for utilization in:

- Biomass fuels for large industrial boilers.
- City wood projects:
 - Book shelves, cabinets, landscape timbers, new City Facilities (flooring, shelving, cabinetry, etc.), park benches, park signs and shelter flooring.
- College or technical school education involving wood working.
- Distribution to the penal system for their use.
- Donations to wood workers for processing to a higher end use.
- High School education involving wood working.

6. Allow for Increased Staffing of the Forestry Program

The City will need to plan on hiring or reassigning more workers to assist the Forestry Program with removals, or contract the work to qualified private companies. It is recommended that this discussion occur and a plan in place by fall 2015.

Staffing: Current Forestry Program staff remove approximately 1200 trees per year in addition to completing other forestry related work such as pruning and stump grinding. Of these 1200 trees, 200-300 per year are ash specifically removed as a pro-active measure. In preparation for an EAB infestation, and the proposed work increase, the following work load levels need to be considered due to the increase in tree removal activity:

- 200 – 300 ash per year: no increase in staffing. This is planned for Calendar year 2015.
- 500 – 1,000 trees per year: In order to increase the ash removal numbers to this level, an MOU should be created that will allow 6-8 workers from other departments (Streets, Sewer & Parks) to temporarily transfer to Forestry over the winter.
- After EAB confirmation: Once the age of the EAB infestation reaches year 7 or 8, previous staffing levels will not be adequate to remove the trees before they become hazards. A staffing strategy in the form of either hiring additional temporary workers or sub-contracting work to one or more commercial tree companies will need to be determined. In addition, most other nonessential tree work will need to be stopped; only hazardous situations should be addressed. Debris pick up should be performed by Streets using existing resources. A strategy discussion should take place and a course of action determined by fall of 2015.

7. Request Budget For Treatment of 6,000 Ash Trees

This includes two key steps:

1. Drafting an open bid process.
2. Requiring an additional contract to treat specific trees based on inventory.

Estimated project costs are \$720,000 per cycle. The cycle is 2 years (per the label); however, it has been stretched to three years with success. A yearly budget item of \$250,000 would cover the cost for a three year cycle. Chemical treatments would begin when EAB is detected within the City or within the greater metropolitan area limits. Any trees to be treated utilizing taxpayer dollars shall be approved by the City Arborist, after a full evaluation of health and stability. An interim treatment contract is currently approved to treat select ash trees in the City with a budget of \$100,000.

The second section would require an additional contract to treat specific trees based on the results of the inventory. The goal would be to target ash with the best possible chance of survival and structure. While this component allows for the possible long term treatment of a small number of high quality trees, the primary goal is short term treatment to buffer the loss of a larger number of ash trees. This will allow younger trees to gain size while allowing forestry crews more time to remove infested ash before they become hazards. This contract would nullify the first.

A maximum of 6,000 ash trees or 10% total street tree population shall be treated, with a minimum of 1,000 trees treated in order to ensure the best possible pricing.

8. Continue to Enforce Existing Code Language Pertaining to Hazardous Tree Removal

Current Code requires dead and hazardous trees in the front and side yards to be removed regardless of cause. EAB caused tree death will be enforced similarly to other insects and pathogens affecting the urban forest within Cedar Rapids.

9. Replant a Diverse Stock of Trees

Starting in 2010, the City of Cedar Rapids diversified their replacement tree selection to over 60 different tree species and cultivars to diminish future impacts on the tree canopy by invasive species. Replacement planting would follow current Forestry Program planting policy to ensure a variation in tree age, canopy cover and species diversity.

10. Prepare a Press Release Regarding an EAB Infestation Confirmed in Cedar Rapids
(See Appendix I).

Additional Recommendations

- Continue bark peeling on all ash removed.
- Obtain Plan approval by City Council.
- Create a FY16 and FY17 budget item for a minimum of six staff to assist Forestry Program crews with ash removals. These may be classified as temporary positions.
- Investigate suppliers and rental costs for additional aerial lift trucks, wood chippers and tub grinder.
- With the Street and Sewer Program's create a Memorandum of Understanding (MOU) to provide labor to the Forestry Program as needed in the form of manpower and equipment to haul debris to the processing location.
- Provide for public education in the Forestry Program's operational budget for the production of public service announcements, advertisement and outreach regarding EAB and the City's response plan.
- Provide for street and park tree replacements within the Park's Capital Improvement Program.
- Increase the Reforestation CIP to \$300,000 for street tree replacement, doubling current amounts. Alternately, pass the Forestry Utility to fund reforestation efforts and other aspects of the Forestry Program. This issue is being addressed in a parallel discussion at this time. (See appendix H for details)
- Increase the Forestry Program's Capital budget within Park Operations by adding personnel, training and supplies, EAB response equipment and contract services to the Park & Recreation Department Capital budget.

Iowa DNR Recommendations

The IDNR follows the Iowa State Extension service. Their newest outreach document is PM 2084 Revised September 2013. Previous recommendations did not include a discussion of chemical treatment, State Extension Service recommended removals only, but include documents providing guidance on chemical treatments. Listed below are DNR's documents of recommendations:

- www.extension.iastate.edu/pme/Publications/EAB/AshAlternateShadetrees2013.pdf
- www.extension.iastate.edu/pme/Publications/EAB/AshAlternateSmall-staturetrees2013.pdf
- <http://www.iowadnr.gov/Environment/Forestry/ForestHealth/EmeraldAshBorer.aspx>

Summary of DNR Recommendations

- Evaluate tree health. If the tree is declining, storm damaged, and/or cost of treatment will exceed the landscape value, replace the tree with an alternate species.
- Many insecticide products must be used EACH year for the life of the tree. There are two products (Tree-Age™ and ArborMectin) that protect ash trees for two years following treatment.
- Systemic insecticides are the products of choice when dealing with the emerald ash borer. These chemicals are transported within the vascular system of the tree from the roots and trunk to the branches and leaves. Systemic insecticides reduce hazard such as drift of pesticides to non-target sites or applicator exposure, and have less impact on beneficial organisms.
- When applied properly, insecticide treatments can control EAB in your ash tree. Keep in mind that storm damage, other injuries to the tree, soil moisture, soil compaction, and other site and environmental factors can influence tree uptake and product effectiveness.
- Treatments are suggested ONLY if you live within 15 miles of a confirmed EAB infestation. Known infestations are given at www.emeraldashborer.info/. Treatment outside the risk zone is not prudent.
- Treatment before a tree is infested is most effective. Infested trees with less than 30 percent dieback of the crown due to EAB feeding may respond to treatment. The goal in any application would be to prevent further canopy dieback; those branches already killed should be removed.

CHAPTER 4 • Pesticide Background, Cost, Research and Impact

Background on Pesticide Treatment

Since the City first began preparations for EAB in 2010, new infestations have been found in Iowa. Research on potential pesticide treatments and their impact on protecting or eradicating an EAB infestation has been a critical component of the City's response plan. It is important to note that chemical treatments are not the only approved management strategy, and should supplement additional response strategies. Depending on the resources in a given municipality, removal and replacement, or a combination of the two options is justified as additional treatment methods.

Research is ongoing and the City Arborist will continue to review and track results of pesticide treatment. The City will determine which, if any, ash trees will be chemically treated based on a City-wide inventory of street ash trees, current municipal finances and the potential environmental impact of pesticide use. Because research in this field is currently evolving, the City will monitor all treatments for their effectiveness and future use.

Pesticide treatments may be applied to a publicly owned tree(s) at the residents' discretion and expense, with prior approval of and notification to the City Arborist. Treated trees will be removed if the City Arborist determines the treatments have failed and EAB infests the tree.

A Preventative Measure:

Dr. Chris Williamson is an Assistant Professor of Entomology at the University of Wisconsin-Madison. He is a research entomologist in urban landscape entomology, including turf grass (golf courses, lawns, athletic fields, and sod farms), ornamentals (nursery and landscape), Christmas trees, and greenhouses. While Dr. Williamson has found that insecticides can effectively protect ash trees from EAB, they are not effective in eradicating EAB infestations. Insecticide chemicals need to be in the leaves before the adult EAB becomes active and feeds, which is June through August. Evidence from other communities who have suffered from an EAB infestations indicate that the size of EAB populations in a specific area will change over time, initially building slowly but later rapidly increasing as more trees become infested. Thus pesticide treatment, used appropriately, can slow EAB spread and preserve tree canopy.

Best Candidates for Treatment:

Extensive testing of insecticides for control of EAB has been conducted by researchers at Michigan State University and The Ohio State University. Several leading researchers at Iowa State University agree with these findings. These tests have shown that while it is possible to protect healthy trees from EAB with insecticides, successful protection of compromised trees is less likely. By the time you see dead branches, thinning of the canopy and woodpecker activity, the ash tree is severely damaged and it may be too late to save it with insecticides (Smitley, D. 2008). Trees exhibiting more than 40 percent canopy decline are highly unlikely to recover even if treated. Research and experience suggests that EAB control with insecticides becomes less consistent on larger trees, as tests have not been done on trees larger than 25-inch in diameter. Results of some of the insecticide trials can be found at www.emeraldashborer.info.

Insecticide Options

Currently, there are four insecticides that are found to protect healthy ash trees from EAB (see Table 1. Insecticides Used for Protecting Ash Trees).

1. Imidacloprid
2. Dinotefuran
3. Eamectin benzoate
4. Azadirachtin

Imidacloprid and Dinotefuran:

These products have been in use for over 20 years and are in the neonicotinoid chemical class of insecticides. Both chemicals need to be applied annually by soil drench or soil injection. They control a variety of pests, including Japanese beetle, aphids, adelgids, emerald ash borer, scales, sawflies, bronze birch borer, two-lined chestnut borer and birch leaf miner. Imidacloprid can also be applied by trunk injection through multiple injection holes annually.

Eamectin benzoate:

This insecticide has been found to be effective against EAB for two years with recent research suggesting it may actually be good for three years. Eamectin benzoate has been studied the last three years by Michigan State University and Ohio State University by injecting ash trees in Toledo, Ohio and results have been positive. A single application of Eamectin benzoate in Mid-May through early June provided excellent control of EAB for at least two years, even under high pest pressure. To date, this is the only product that controls EAB for more than one year with a single application made by multiple injection holes into the tree; however, this pesticide is not effective on ash trees that exhibit 40- percent or greater dieback of the crown. Eamectin benzoate will be labeled as a restricted use pesticide, any person using or directing the use of the product must be a Certified Pesticide Applicator. This requirement also applies to municipal employees using pesticides and any person assisting with any activity, including drilling the treatment holes. It is unknown how many times an ash tree can be injected over time without causing extensive harm to the tree. However, current research shows that ash can seal and compartmentalize the wounds with little or no ill effects. Currently, two products contain Eamectin benzoate: TreeAge and Arbormectin.

Azadirachtin:

Based on limited availability, increased costs, lack of local certified applicators and a reduced mortality rate, Azadirachtin is not recommended as a treatment option at this time. However, due to the appeal of being a more natural alternative, the City Arborist will monitor updates regarding this option for the future.

Advantages and Disadvantages of Soil Insecticide Applications

Once you begin insecticide treatments on ash trees you must continue the treatment every year or two depending on which insecticide is used for the desired life of the tree. Insecticides have both advantages and disadvantages. The overall environmental impact of the insecticides used for protecting ash trees from EAB is unknown, but research is ongoing.

Advantages:

- Applications are quick (minutes/tree)
- Non-invasive and do not wound the tree
- Operationally predictable
- More flexible treatment period
- Equipment may be used to apply multiple products
- Minimal exposure to applicators

Disadvantages:

- Longer time to enter into and move throughout the tree before full protection is achieved
- Most soil applied insecticides require annual applications
- Soil injection requires specialized equipment
- Per acre use restrictions/potential for groundwater contamination
- Recommendation is not to use within 100 yards of water sources due to possible contamination of ground water and surface water if applied as a soil application

Insecticide Overview

Imidacloprid and Dinotefuran, based on groundwater contamination possibilities, are not recommended for use. Azadirachtin, based on limited availability, increased costs, lack of local certified applicators and a reduced mortality rate, is not recommended as a treatment option at this time. Due to the appeal of being a more natural alternative, the City Arborist will monitor updates regarding this option for the future. Emamectin benzoate, due to the trunk injection application mode utilized by this chemical, is recommended for use by the City of Cedar Rapids for any EAB treatments of ash trees.

Costs

The overall cost of treatment has been falsely portrayed as cheaper than the cost of removal and replacement. Regarding the Cedar Rapids ash population, treatment costs are slightly more expensive than removal and replacement after a 16-18 year cycle. (See Appendix A)

Calculating Cost:

The Purdue University EAB Cost calculator can be used to estimate the cost of several responses to an EAB infestation reflecting different scenarios. Once the City of Cedar Rapids has a completed tree inventory, it will be possible to load data for estimated current ash tree population statistics, (by size of tree) and then proceed to develop the costs of different scenarios. Different assumptions can also be made for chemical treatment costs, tree replacement costs, the number of years allotted to any ash tree removal plan and the cost of capital.

Replacing All Ash Trees:

The City currently estimates the number of ash trees at 10,000 – 15,000. Using an estimated ash tree population of 15,000 trees, estimating appropriate size classes, assuming a ten-year tree removal program, and using an estimated cost of replacement of \$230 per tree, the following cost estimates can be generated:

- If all ROW ash trees are removed, and none of the trees are replaced, the total estimated cost of the program would be **\$11,250,000.00 incurred over ten years**
- If all ROW ash trees are removed and replaced by trees of different species, a total estimated cost of **\$15,217,500.00 would be anticipated over ten years.**

Treating All Ash Trees:

Chemically treating trees would produce different cost estimates. This plan has the lowest annual operating costs for the initial years, but the highest anticipated costs over time. If all of the trees are treated chemically, with no preemptive tree removal, total costs of **\$3,150,000.00 could be expected for the first treatment.** This cost is based on a \$9 per diameter inch cost, on a two year cycle (this number is all inclusive, and contains provisions for both chemicals and labor). It is important to note that chemical costs are likely to increase and this price will increase as a result. Although the total number of ash trees would fall slowly over time due to natural attrition, the smaller trees at the same time become larger and consequently more expensive to treat. Treatment expenses resulting from growth of the current ash forest would therefore be expected to offset savings due to the attrition of older trees for many years to come.

Cumulative chemical treatment and other associated estimated costs of **\$26,670,000 incurred by the end of year 16** would be expected to exceed the cost of a total removal and replacement of the entire ash forest (that is, \$15,217,500.00 as noted above). Each additional treatment cycle will add to this total. In addition, the trees will still need to be removed at some point, so that cost also has to be factored in.

The “Slow the Spread” Option:

As a middle ground solution, most communities are opting to treat a smaller number of ash for a short period of time. The goal is not to save the ash forever, but to minimize the number of dead, standing trees that will become hazards on the ROW. As it relates to Cedar Rapids, it is recommended that a maximum of 6000 trees be treated, or no more than 10% of the ash population. It has also been discovered by staff that a reduced rate may be available if more than 1000 trees are treated. This reduced rate is \$5 per diameter inch. In addition, many communities are achieving acceptable results with a three year treatment cycle instead of 2 years (currently, the product label only recommends a 2 year cycle). **If 6000 trees are treated at this rate, the total project cost for an 18 year cycle (treating every three years) is \$16,129,200.00. This figure includes the removal and replacement of the outstanding 9000 ash that are not treated.** This is still more than the cost to remove and replace all of the trees, but this option may be more popular with residents.

Additional Considerations:

The EAB Cost Calculator does not take into account the ecological benefits of treating trees and maintaining canopy cover. Landscape and street trees increase property values and contribute to the quality of life in a neighborhood. Trees create more pleasant walking and exercising environments, bringing about increased exercising, talking amongst residents, pride, care of place and association of residents in their neighborhoods. In addition, trees help with energy savings. For example, the American Public Power Association (APPA) states that landscaping can reduce air conditioning costs by up to 50 percent, by shading the windows and walls of a home.

A model of the current and proposed benefits of the Cedar Rapids ash population can be found in Appendix B. Two findings stand out. First, nearly 100% of the benefits to the City can be regained by planting new trees once they reach the 15 inch DBH mark. And second, the values of the benefits the ashes provide begin to decrease after the trees reach 29-30 inches in diameter.

As ROW ash trees can be expected to live for 40 to 60 years, the chemical costs for the overall forest could be expected to continue at a declining level for up to ten more years. From an economic standpoint, chemical treatment of ash trees is therefore generally considered to be the least attractive option. However, this option could be the most cost effective option in the event of a timely scientific breakthrough that leads to cheaper, more effective treatment.

Bio-Control Research

The bio-control research on parasitoids (aka parasitic wasps) looks very promising. There is a good chance in the next five years they could become a viable option to manage EAB infestations. Success in this field could be a tremendous boost for controlling EAB. This development makes protecting larger ash trees early on in an infestation even more important. Larger ash trees can be protected by the parasitoids at that time and chemical controls can be reduced or eliminated entirely. This would help the City of Cedar Rapids maintain a high ratio of canopy cover while the urban forest recovers from the losses incurred during the early removal phase of the program.

Potential Environmental Impact of Chemical Treatment

While the current research and the evidence of other communities has shown that once treatment begins it should be continued for the life of the tree, there has been no complete conclusions on the long-term impact of the pesticides on the environment. It is unknown at this time the long-term ecological impact that chemical treatments would have on our environment, but the requirement of companies bidding on City EAB treatment projects to have all applicators licensed as Iowa Certified Pesticide Applicators in addition to having an ISA Certified Arborist on staff will ensure that best practices for protecting the environment will be followed. On-going research and testing will also be utilized to modify the chemical treatment program as appropriate.

Priority Ash Classification Recommendations

The following are priorities for chemical treatment and could be developed as designations as part of a chemical treatment strategy.

- Legacy Trees. These are ash trees that could not be easily replaced and have significant value to the community. These trees are often substantial in size (between 18 and 28 inches in diameter at breast height) and provide historical value. The trees to be treated would need to have good form and structure and be in good health with less than 20% canopy thinning.
- High Value Trees. These are ash trees that carry a high value to the community but may not be as large as a legacy tree. These trees are often in highly visible locations such as major thoroughfares, parks, City buildings and municipal golf courses.

Active Ingredient	Type of Application	Timing of Treatment	How often Re-applied?	Average Cost per 20-inch DBH ash tree	Environmental Impact
Imidacloprid	• Trunk Injection • Soil Injection • Drench	• Mid-fall • Mid- to late spring	Annually	\$20/year	• Toxic to aquatic invertebrates (can leach to shallow groundwater) • Trunk injections have fewer water quality concerns
Dinotefuran	• Systemic Bark Spray • Soil Injection	• Early May through June	Annually	\$35/year	• Strong leaching potential to shallow groundwater
Emamectin benzoate	• Trunk injection	• Early May through June	Every two years	\$62.40 every two years	• Trunk injections have fewer water quality concerns
Azadirachtin	• Trunk injection	• Early May to mid-June	Annually	\$ /per year unknown	• Classified as bio-pesticide. • Minimal or no exposure

Table 1: Insecticide Options used for Protecting Ash Trees

Chapter 5 • Code Considerations

State Code on Right of Way Trees

Cities may require adjoining property owners to maintain property “outside the lot and property lines and inside the curb lines upon the public streets except that the property owner shall not be required to remove diseased trees or dead wood on the publicly owned property or right-of-way” - Iowa Code §364.12(2)(c)

Property owners who would like to plant trees themselves in the ROW must first obtain a written permit from the Forestry Program. The Forestry Program will approve the species, size and location of the planting site. There is no cost for the permit.

Private Trees & City Code

While there is code language that requires residents to remove dead trees in a front or side yard, current City ordinance language does not allow the Forestry Program to act on backyard trees or trees that may be infested.

Code Amendments:

Current Code language (see Appendix G) requires homeowners to remove dead, hazardous trees on their private property if they are located in the front or side yard of their property. Since these areas are likely to be the primary locations of trees that will impact the public ROW, no code revisions or additions are planned at this time.

Forestry staff are aware of other code language changes in other municipalities and are prepared to forward similar code language pertinent to Cedar Rapids to the legal department for review should the need arise.

Staff Impact:

It should be noted that enforcement of this code would require additional staff hours. These hours would include inspections, notifications sent by certified mail and follow up inspections after deadlines have passed. Occasionally property owners fail to cooperate and we need to forcibly remove the tree and bill the owner. Managing EAB on private property will likely take much more of our staff's time, due to the huge number of private ashes.

Chapter 6 · Proactive Measures to Date

Summary of Measures

Since the beetle's arrival in the U.S., the City of Cedar Rapids has implemented a multi-year plan to prepare for a possible EAB infestation. The City has already removed approximately 2,000 declining public ash trees. The City follows the IDNR and Iowa State Extension Service recommendations for EAB preparations. The plan calls for continuing public education and communication, in addition to the outreach efforts already underway or completed.

Public Outreach:

- EAB Awareness Week and informational identification cards for the general public.
- Presentations to neighborhood groups, church organizations, community groups, local high schools, etc.
- FAQs on City of Cedar Rapids website.
- Outreach during public events including Farmers Market, Ecofest and open houses.
- Public forums and meetings, including the first cooperative event in the state with speakers from Iowa State University, the Iowa Department of Natural Resources, and the US Department of Agriculture.
- Media interviews in radio and print.

Department Efforts:

- The City stopped planting ash trees in 2005 in an effort to reduce the population.
- In 2008 the City Council supported additional funding to replant a more diverse stock of trees, which would reduce the impacts felt during an infestation.
- In 2009, the City began removing ash trees that met DNR criteria for removals.
- In 2012, City staff was trained on EAB identification, and all Forestry Program crews began inspecting every ash tree they remove or prune.
- Ongoing: Diversifying street tree composition through community street tree planting.
- Ongoing: Review existing tree ordinances to plant trees during development and to address future removals of hazardous trees.
- Ongoing: Review staffing needs to address infested public trees and reforestation.
- Ongoing: Inspections of areas with high concentrations of ash trees to determine potential hazards and prioritization area. Priority to school walkways, primary roads, hospital access and food/gas services.
- Ongoing: Diversification of tree canopy, now up to more than 60 different tree species to diminish impact of ash loss.

Proactive Ash Removal:

The City currently removes 200 – 300 ash per year as a proactive step to reduce the ash population. Proactive ash removal is prioritized with hazardous/high risk trees being removed first, followed by those that are no longer assets to the community (stressed, dead, dying, or diseased). Utility contractors are encouraged to remove EAB infested ash within their easements as part of their normal line clearance activities.

Ash Street Trees During Infrastructure Work:

Currently, when ash trees are encountered during sidewalk repair or street reconstruction, the Forestry Program may decide to remove the ash trees rather than designing the project and constructing around them. This removal process may be substantial and may mean an entire block will lose all their ash street trees, although every effort to retain the tree canopy for as long as possible will be made.

Considerations for Removal: (See also Appendix E - Ash Condition Criteria):

- Ash trees that show twenty percent or greater crown dieback should be removed.
- Ash trees located in ROWs four feet wide or less.
- Ash trees that would not be considered a legacy tree or a high value trees (see page 28 for definition).
- Ash trees located underneath primary electrical lines.

Chapter 7 · Forestry Program Confirmed EAB Sighting

Communication Procedures

This process will be managed through City PIO staff working in conjunction with the City Arborist.

Canopy Replacement & Budget Considerations

As the budget allows, public ash trees removed will be replaced with non-host species as determined by the Forestry Program, which will enhance the planting site and add to the diversity and general health of the urban forest. Trees will be planted in accordance with Forestry Program standards and specifications. Plantings will be budget based and prioritized by canopy cover.

Budget Strain:

The current reforestation CIP is already stressed by current planting requests and is not able to accommodate re-planting the trees that are removed annually. An increase in funding is needed. A proposed alternate source of funding is the potential Forestry Utility tax, which could provide approximately \$480,000.00 in funding yearly. This option is being analyzed in a parallel discussion.

Note: Replanting of park and golf course trees will be budgeted independently of street trees budgeting.

Prioritizing Forestry Program Services

While financial, staffing and equipment resources are focused on the EAB management plan; normal Forestry Program services will either be delayed or put on hold indefinitely. If EAB is confirmed within the City limits, Forestry Program's service will focus primarily on removing City-owned trees that are: infested with EAB, dead, diseased (oak wilt or Dutch Elm), or storm damaged and found to be a risk to the public. Pruning of City trees will be limited to public safety concerns.

Forestry Program Steps Upon Suspicion/Confirmation of EAB Infestation

Upon notification of a suspected EAB infested tree:

- City Arborist will evaluate the tree to determine whether any public threat of EAB exists.
- If EAB is suspected, the IDNR, USDA and APHIS will be contacted.
- Staff from the above organizations will evaluate the tree, collect specimens and send the specimens to a federal facility for confirmation.
- If positive, the City and the above organizations will issue a press release and possibly hold a press conference.
- The IDNR, USDA and/or APHIS staff will conduct a delimiting survey of the City to determine the extent of the infestation and offer a summary/comment/recommendation.

- The City will work with IDNR, USDA and APHIS officials using the current Interagency Response Team process.
- The EAB plan will go 100% active. There are aspects of the plan that will already be in progress.

Tree Removal Process When Infestation Confirmed

Following confirmation of an EAB infestation the following steps will be taken:

- Remove ash street trees that are declining and in poor condition within the area established by the partnering organizations IDNR, USDA and APHIS delimiting survey.
- Preemptive removal of ash street trees during infrastructure work.
- Remove or chemically treat ash street and park trees as they become infested with EAB.
- Remove ash street trees adjacent to EAB infested zones.
- Replant trees as timely as possible to re-establish urban forest canopy.
- Apply the new City nuisance code to infested private trees.

Removal of Declining Ash Trees:

Remove trees that have at least 20 percent crown dieback or a major dead limb. They may also have native insects actively boring into the trunk of the tree which continues to weaken the tree. Ash trees with large trunk wounds will also be removed (See Appendix E - Ash Condition Criteria).

Remove Ash Trees as they Become Infested with EAB

As an initial response, the removal of ash trees would begin in October and would continue throughout the winter months until March. EAB becomes a dormant insect during this time frame so there is no risk of spreading EAB to other parts of the City when transporting wood debris. As the infestation progresses, removals may need to be performed year round in the interest of public safety. Current research demonstrates that ash trees that show 40 percent or greater crown dieback are not treatable. (see Photo 2)

Infested Ash Tree Removal Prioritization:

- **High:** tree measuring 10 inches DBH or greater and trees located on major thoroughfares or in publically-owned land near publically-owned parking lots, shelters, playgrounds, benches, designated bike paths, City golf course tee boxes or fairways. Ash that is located on the border of adjacent communities.
- **Medium:** trees located on minor thoroughfares.
- **Low:** trees measuring 10 inches or less DBH and trees located in parks, conservation areas and greenways that are not located in high priority locations. Any ash trees in native, wooded areas will be left to die and fall naturally.

After EAB is found, removal of infested ROW trees will become a priority. Initially, while levels are low, planned ash reduction will likely continue for a while. However, based on other municipalities' experiences, it is likely that removal of a large number of infested trees will become necessary within a year or two of the first find.

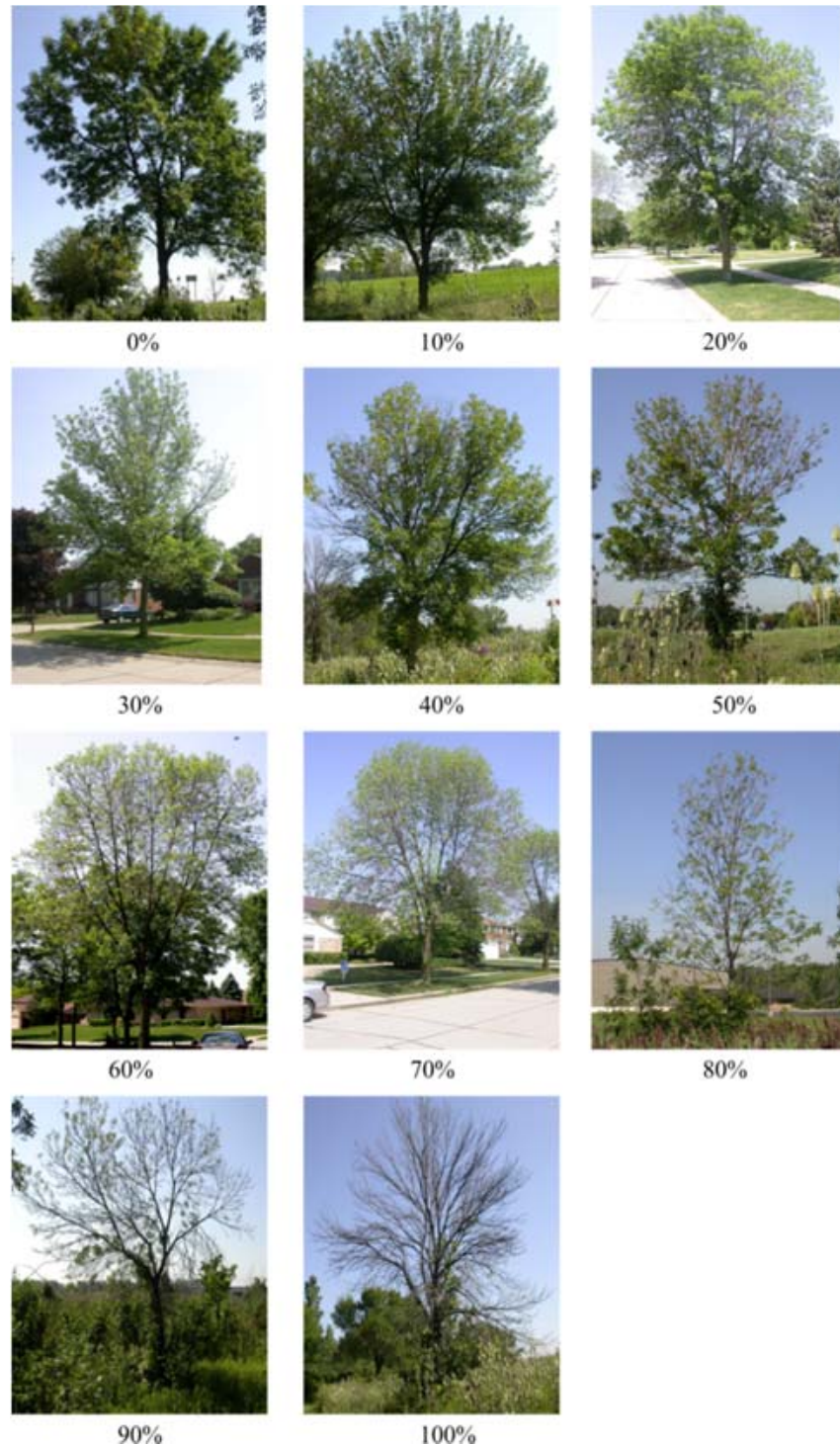


Photo 2. The stages of ash canopy thinning and dieback.

Definitions

APHIS- Animal Plant Health Inspection Service

ASDA- United States Department of Agriculture

Cambium – Thin layer of generative tissue lying between the bark and the wood of a stem, cambium produces new layers of phloem on the outside and of xylem (wood) on the inside, thus increasing the diameter of the stem.

Canopy – The upper most layer in a forest, formed by the crowns of the trees.

Crown – The upper part of a tree, including the branches with their foliage.

Diameter at Breast Height (aka DBH)- Diameter of a tree at breast, or 4 ½ feet above the ground.

EAB – The Emerald Ash Borer insect.

EAB Readiness Plan – A document delineating local EAB readiness activities and processes; includes scope and purpose, authority, responsibility, policies and procedures, actions/tasks, available resources, forms and contracts, technical references and support information (such as surveying and reporting protocols), and similar content.

High Value Trees - These are ash trees that carry a high value to the community but may not be as large as a legacy tree.

Legacy Trees - These are ash trees that could not be easily replaced and have significant value to the community. These trees are often substantial in size (larger than 15 inches in diameter at breast height) and provide historical value

Quarantine Area – A defined geographic area from which host goods may not be transported; quarantines will be established by federal or state agencies to restrict ash wood movement out of infested areas to avoid emerald ash borer infestation of new areas; quarantines can be applied to an individual property, county, or entire state.

Soil Drench - Wetting the soil surface thoroughly with a systemic insecticide so that feeder roots absorb the pesticide and then the pesticide is translocated through the trees vascular system.

Soil Injection - Utilizes a specialized tool to inject systemic insecticide under pressure into the soil under the drip line of the tree. The pesticide is taken up by feeder roots and then translocated through the tree's vascular system.

Trunk Injection – The process involves the use of injectors to apply systemic pesticides directly into a trees vascular system by means of a small drill hole into the tree trunk. The pesticide is then translocated through the trees vascular system.

References

Smitley, D.. 2008. *Professional Guide to Emerald Ash Borer Treatment Products*. Michigan State University, Department of Entomology.

Hermes, D., McCullough, D., Smitley, D., Sadof, C., Williamson, C., Nixon, P.. 2009. *Insecticide Options for Protecting Ash Trees From Emerald Ash Borer*. U.S. Dept. of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS) and U.S. Forest Service. See www.emeraldashborer.info.

The City of Madison WI EAB Action Plan

The Village of Mount Prospect IL EAB Management Plan

Appendix A:

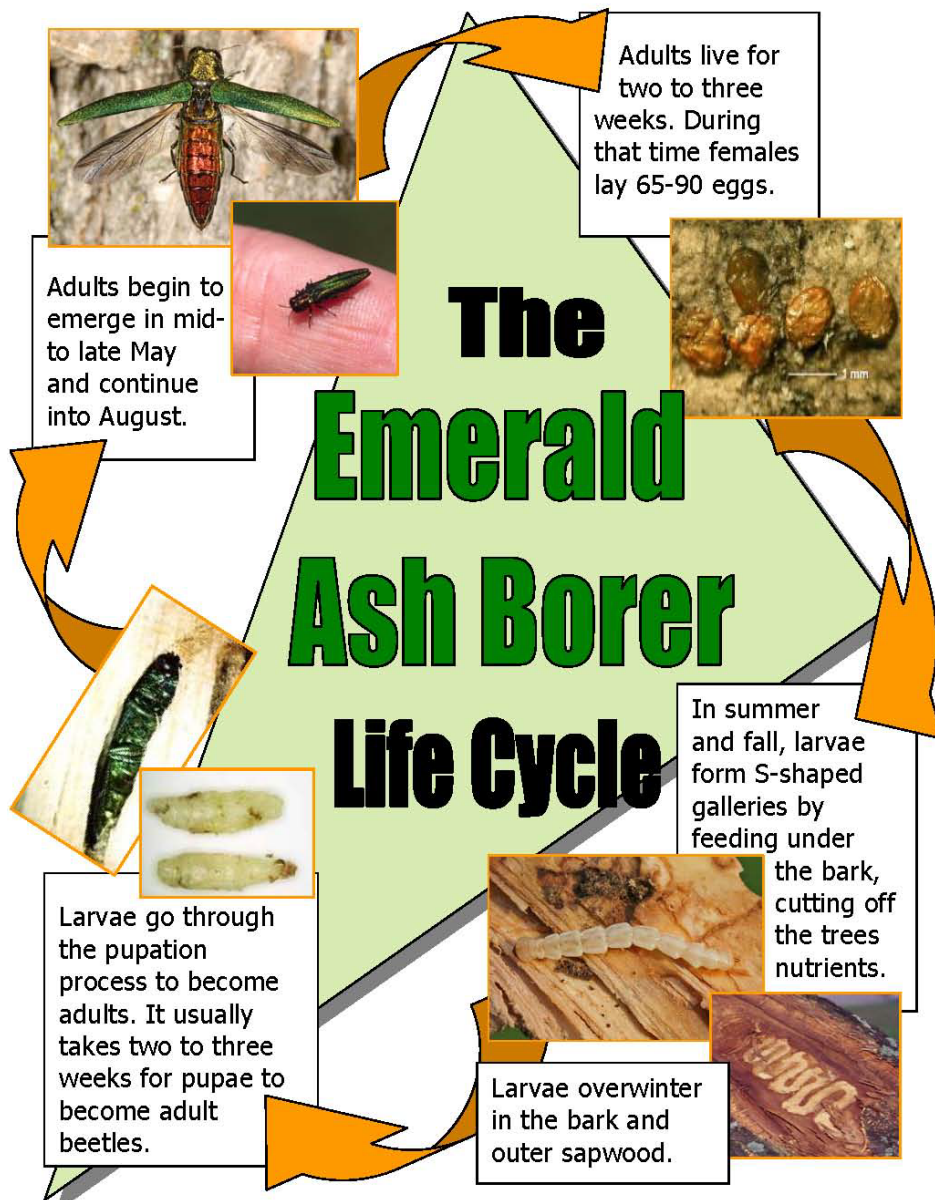
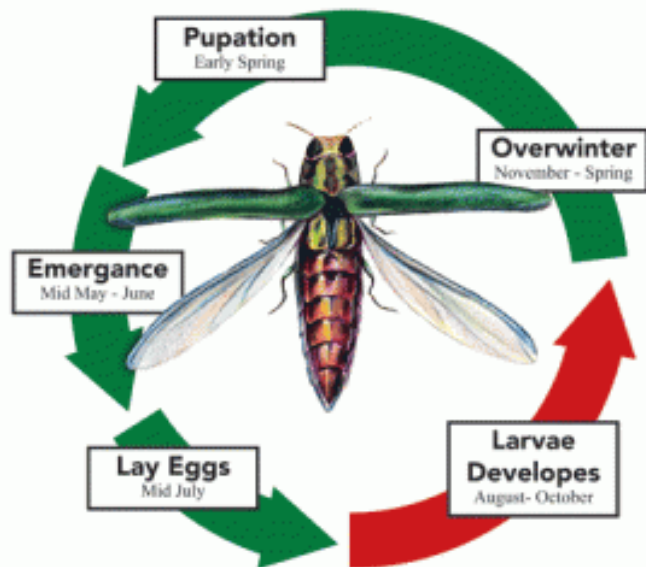
Insert PDF Chart: Cost Analysis For Various EAB Treatment Options

Appendix B: EAB Cost Benefit Estimate for all Ash Street Trees

	Proposed Tree Population				These numbers will probably be higher since the trees will be removed and replaced in stages, not all at once. Ash trees will still be providing benefits across the 16 year timeline.
	Number	Size (in. DBH*)	\$\$ Benefit /Year	Total Pop. Benefits /Year	
Current Size	15,000	2	\$10	\$150,000	
plus 5 inches	15,000	7	\$53	\$795,000	
plus 3 inches	15,000	10	\$86	\$1,290,000	
plus 5 inches	15,000	15	\$147	\$2,205,000	
	Existing Tree Population				Grand Total for Existing Trees
Current Size	3,000	14	\$130	\$390,000	\$2,853,000
	9,000	24	\$208	\$1,872,000	
	3,000	32	\$197	\$591,000	
Est. Size Increase Over 16 Years	3,000	19	\$173	\$519,000	\$3,027,000
	9,000	29	\$215	\$1,935,000	
	3,000	37	\$191	\$573,000	

It is important to note that this is merely a model estimate since there is no tree inventory. However, an interesting trend is worth noting. Somewhere between the 29-32 inch sizes, the value of the ash trees begins to decline yearly. This is significant for Cedar Rapids since the majority of our ash is in the 20 -28 inch range currently.

Appendix C: EAB Life Cycle



Appendix D: Ash Condition Criteria

Good

- Healthy, full canopy
- No structural defects
- Adequate grow space

Fair

- 10% - 30% decline
- Structural defects
- Growing under high voltage power lines
- Ash that are negatively affecting higher quality public or private trees

Poor

- 30% - 50% decline
- Multiple structural defects
- Heavily pruned for power line clearance – probably would be removed during next City Forestry Program or ITC/Alliant pruning cycle (5 years)
- Poor crown structure – ex. Storm damage, heading cuts, lions tailing, prior pruning that results in poor branch taper, poor wind load distribution and a higher risk of branch failure.
- Poor grow space – narrow terraces, vision obstructions at corners and stop signs

Remove Now

- >50% decline
- Structural defects that warrant removal

The overwhelming majority of the City's ash population is green ash in the fair, poor or remove now categories.

Appendix E: EAB Detection Methods

One of the many requirements for effective management of EAB is early detection of infestations, when densities are still low and before signs and symptoms are obvious. *Visual surveys* rely on external signs and symptoms (e.g., exit holes, larval tunnels seen through cracks in the bark, feeding by woodpeckers or squirrels) that may not be noticeable for 2 to 3 or more years after the arrival of the population, particularly if the infestation begins in the upper part of the tree (Ryall, K. L., et al. 2010).

Currently the Emerald Ash Borer can be detected by two methodologies. They are by purple traps or by branch sampling. In 2003, researchers began investigating EAB to develop an effective detection tool. For many insects, color frequently plays an important role, and EAB is no exception. Scientists found that buprestids (the insect family to which EAB belongs) in general are more attracted to red and purple hues compared to other colors. Therefore, researchers initiated a study using a variety of red and purple traps to determine which trap attracted the most beetles; the purple trap achieved the best results. To improve the purple traps' attractiveness to EAB adults, they are baited with oil from the Manuka tree. Researchers found that there are four active compounds in Manuka oil that are also produced when an ash tree is stressed.

The purple trapping process was implemented in 2009 by the U.S. Department of Agriculture. Iowa was one of 47 States that participated in the purple trap program. The trap is a three-dimensional triangle or prism. It's made out of thin, corrugated, purple plastic that has been coated with non-toxic glue on all three sides (see Photo 3). The purple prisms are about 24 inches long and hang vertically in an ash tree or are secured to the trunk of a tree or on a pole. The purple traps are placed in spring before EAB adults emerge. The trap is monitored and remains in place throughout the summer during the beetle's flight season and is removed in the fall.

The branch sampling method was developed by the Canadian Forest Service in 2009. This technique was developed using open-grown ash trees in an urban setting. In this method, a maximum of five ash trees (measuring at least 10 inches in diameter at breast height) are sampled on plot grid basis. Two live branches (measuring two inches minimum diameter at the base to six inches at the top) from the south side of tree at mid-crown are removed and labeled. The branches are then stored in a cool dry place until they can be whittled (peeled) to find the EAB larvae life stage and gallery. If the objective is only to detect EAB, then sampling can stop when the first gallery is found. If the objective is to assess densities, then it is important to count all EAB galleries and living larvae on the sample branch.

Branch sampling has an 88% success rate as a highly effective tool for detection of low level EAB populations, before outwardly signs or symptoms become apparent. The optimum time for branch sampling is January through May because the larvae galleries are easiest to see.

The City of Cedar Rapids utilizes a modified approach to branch sampling for early detection. In 2012, City staff was trained to peel bark and inspect ash for EAB. The City currently removes approximately 200-300 ash yearly as a proactive removal process aimed at

eliminating ash in poor health, with poor structure and in high density ash areas. These removals, along with any requested ash removal throughout the year, are performed in January-March of every year. City crews inspect the trees for EAB during removal and randomly peel limbs. City crews routinely bring in samples of both insects and wood for identification. IDNR and USDA staff have been to Cedar Rapids on many occasions to survey trees and evaluate locations of possible EAB infestation based on these findings. All results have been negative so far.

It is recommended that City staff continues this process and that it be formalized further, requiring that a minimum of 10-15% of the trees removed be sampled. Recent research conclusions on Purple traps have yielded less than satisfactory results and requesting traps is not recommended at this time.



Photo 3: EAB Purple Trap

Appendix F: Before and After Effects of EAB



Appendix G: Proposed Nuisance Code

The new CH. 9 would read as follows (except language in red):

9.20 - TREES IN STREETS.

- (a) **Overhanging Trees.** *Trees standing on any street, alley or parking, and trees overhanging any sidewalk, street, alley or parking shall be trimmed so that the space from the surface to the lower branches of such trees shall not be less than 10 feet over any sidewalk, 12 feet over any street, and 16 feet over streets which are primary extensions of state highways. It shall be the duty of the owner of any lot or parcel of land abutting upon any public street or alley upon which such trees are planted or maintained to keep such trees in front of or at the side of such lot or parcel of land trimmed, as well as all trees planted or maintained on such lot or parcel of land.*
- (b) **Obstructing Street Lights.** *All trees on or near any street shall be trimmed so as not to unduly obstruct or obscure streetlights.*
- (c) **Trees Prohibited.** *No person shall hereafter plant, set out, or cause to grow upon any right of way (parkway) in front or at the side of his premises, any tree on the restricted tree list as maintained by the City Arborist.*
- (d) **Dead Trees:** *All dead, damaged or unsightly trees and shrubbery on any street shall be removed by the owner of the lot or parcel of land, in front of or at the side of which such trees or shrubbery are planted and maintained.*
- (e) **Shrubbery Blocking View.** *All shrubbery, bushes, vines or plants maintained in the public streets beyond the lot lines, where such vegetation interferes with the vision of drivers of vehicles, shall be trimmed and cut, and kept trimmed and cut by the owner of the lot or parcel of land in front of, or at the side of which such shrubbery, bushes, vines, or plants are maintained so that the top thereof shall not be over 2 feet above the street level, and so as not to interfere with public travel or safety.*
- (f) **Assessment.** *Upon failure of the owner of any lot or parcel of land in front of or at the side of which such trees, shrubbery, bushes, vines or plants are maintained, to trim any such trees, shrubbery, bushes, vines or plants, or to remove any such dead, damaged or unsightly trees or shrubbery, as hereinbefore provided, the City Forrester shall, after reasonable notice to the owner of said lot or parcel of land, cause the same to be done and the cost thereof to be assessed against said lot or parcel of land in the manner and method provided for special assessments.*

Appendix H: Proposed Forestry Utility Overview

As of December 2014, the Public Works Department and the Parks & Recreation Department began researching and working on a proposal to council for a Forestry Utility to cover the cost of activities in the Forestry Program. Currently, all planting reforestation efforts within the City are funded via bonds. There is a desire to move toward self-funding. Marion implemented a Forestry Utility to fund EAB efforts, which was the inspiration for this proposal.

At this time, the proposal is set to go before council in 2016. Discussions are underway regarding the legality of the utility and educational effort for government officials and residents.

Appendix I: EAB Press Release

CEDAR RAPIDS, IA – Month XX, XXXX – The City of Cedar Rapids confirms the Emerald Ash Borer (EAB) was discovered at [insert location] the first confirmed sighting of the beetle in Cedar Rapids.

The EAB is an exotic beetle whose larvae embeds and destroys the inner bark of ash trees. City staff will immediately implement their plan to limit the spread of the insect, and will remove public ash trees within a two block radius of the site, starting [insert date].

Since the beetle's arrival in the U.S in 2002, the City of Cedar Rapids has implemented a multi-year plan to prepare for this concern to our urban forest, which includes more than 10,000 public ash trees.

Over the years, the City has worked to decrease the number of declining ash trees available to ward off an infestation as long as possible and decrease any subsequent damage. These preventative measures included planting fewer ash trees and replanting a more diverse stock of trees. These actions taken in advance will mean fewer trees to remove or replace during the infestation, saving the City money.

Residents do have the option of treating their ash trees, but it requires continual treatment for the life of the tree, and may not guarantee a tree's survival. Trees with storm damage or other safety concerns will need to be removed. If residents are interested in investing in treatment to a public tree adjacent to their property, they may contact Park Operations at 286-5760 and request to speak with City Arborist Todd Fagan for additional information.

The public can help limit the spread of EAB by using and purchasing local firewood only, as a key factor in the spread of the beetle is human activity. To learn more about EAB and other pests that are threatening Iowa's tree population, please visit www.IowaTreePests.com.

Residents who would like their ash tree inspected are encouraged to call 286-5760 or email parks@cedar-rapids.org.

For further information, visit the EAB section of the Iowa DNR Forestry website or the City website www.cedar-rapids.org.

Appendix J: Signs & Symptoms of EAB



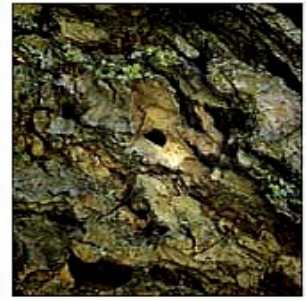
Crown Thinning



Bark Splitting



S-Shaped Tunnels



D-Shaped Exit Holes



Adult EAB Leaf Damage



Wood Pecker Flecking



Trunk Sprouts



Primary damage that causes tree mortality is s-shaped galleries that interrupt vascular function (left). Larvae feed in the vascular tissues area (right).

Appendix K: What Other Cities are Doing

It is important to note that there is no set plan or standard response to Emerald Ash Borer. Two cities with the same population could have vastly different resources, funding, resident opinion, etc. That being said, because one city has a set of plan specifics does not mean that another city nearby can simply do the same thing. There is typically curiosity regarding what other municipalities are doing as it related to the EAB challenge. Here is some data:

CITY	# of ash street trees	TREATMENT	REMOVAL
Minneapolis	40,000	None	All 40,000 – remove (will treat only as a strategy to prolong removal)
Davenport	3,000	200 for unspecified length of time	2800
Kansas City	20,000	14,000 every 3 years for 9 years then re-assess	Remove/replace 6000
Madison	21,000	15,000	6,000
Chicago	85,000	Treat 35,000/yr for 2 years to slow spread. Reassess every 3 years	15,000
Milwaukee	31,000	Treat 28,000 indefinitely	5,000

Des Moines, the largest city in Iowa, is often examined to see if their policies would work in Cedar Rapids. Des Moines initial response to EAB was slower than Cedar Rapids and has taken some significantly different management strategies:

Des Moines Response to EAB:

- 2007 stopped planting ash; removed ash from Recommended Species List
- 2010 proactive removal of small ash trees
- 2012 Community Forestry Workshop; also a “What’s Bugging Our Trees?” workshop for tree professionals
- 2012 updated Nuisance Ordinance
- 2013 removing large ash with poor structure; inspecting all removed ash for the presence of EAB

Des Moines removal program has substantially larger allocation of resources, 45% of their staff performs removals while Cedar Rapids spend less than 20%.

Des Moines’s April 2014 change: Added treatment to the program

- Treat 5800 ‘high impact’ street and park ash trees in good health with good structure
- Treat to preserve environmental benefits
- Allow time for replacement trees to develop canopy
- Goal is to remove all ROW ash within 11 years.