THE CITY OF WASHINGTON, MISSOURI EMERALD ASH BORER MANAGEMENT PLAN

A PLAN DEVELOPED TO PRIORITIZE RECOMMENDATIONS FOR THE COST-EFFECTIVE MANAGEMENT OF ASH TREES

PRESENTED BY

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This Management Plan has been assembled form information sources and authorities believed to be reliable and accurate. The intention of this document is to provide a structure for addressing problems and important issues associated with the Emerald Ash Borer. Planning allows the City to meet the future with a plan that emphasizes the most important issues facing the City and to focus on recommendations that address those issues.

This document currently reflects the latest information available, from sources public and private, representing the collective wisdom of experienced authorities, professionals, and technical advisors. No liability whatsoever will be borne by the author for technical exactitude or appropriateness of the included information, for errors or inaccuracies, nor for situations resulting from the use or misuse of any information contained herein.

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CHAPTER 1 - EXECUTIVE SUMMARY

The landscape of Washington includes many woodlot areas, parks, open/natural areas and street trees. The urban tree canopy established within these areas is an essential component of the City's Urban Forest. Ash trees are an important native tree species within the Urban Forest that grow quickly and thrive in Washington.

Washington currently faces a threat to its public and private ash tree resource. An invasive and exotic pest known as the **Emerald Ash Borer (EAB)** has infested many ash trees within areas of St. Louis County and, so far, is responsible for the death of millions of ash trees in the USA and Canada. It is generally acknowledged as the single most destructive forest pest that has entered North America.

In accordance with the 2007 Tree Inventory conducted by the Davey Tree Company of nine of the City parks, the City of Washington has an estimated 108 ash trees located within the City's parks and open space areas. In total, ash trees represents about 9% of the City's total tree canopy and ash trees have also been a popular choice for planting in many private property landscapes within the City.

EAB was first discovered in the United States in Michigan in 2002 and is believed to have been transported to the United States from Asia on wooden shipping crates approximately five years prior to its discovery. EAB has continued to slowly spread from state to state most often through human activities like transporting infested Ash fire wood or Ash logs.

Within the past year, EAB was confirmed in the City of St. Louis, Lake St. Louis and in St. Louis County (near Creve Coeur/Maryland Heights). This puts the confirmed outbreaks within 50 miles of Washington. The spread of EAB in the Greater St. Louis Area is estimated to grow 15-20 miles per year, and although it has not been detected in Washington, it is predicted to be found in 2016 or 2017. In all probability it is likely here already but at low population levels that are presently undetected through pheromone traps and branch sampling detection methods.

The City of Washington is fortunate to be able to learn from other municipalities strategies, plans and accomplishments, together with a greater understanding of EAB itself. The lessons learned from other municipalities and the Missouri Department of Conservation, support a proactive approach for the management of EAB. EAB populations increase exponentially over time and accordingly, a proactive plan is recommended which will ensure selective ash tree protection; preserving environmental benefits and supporting public safety through a combination of monitoring, treatment, removals and replacement strategies.

The proposed *Emerald Ash Borer Management Plan* that will guide the City over the next 10 years includes:

- Inventory, Monitoring and Assessment;
- Treatments;
- Tree Removals;
- Tree Planting;
- Wood Waste Disposal; and
- Public Education and Communication.

CHAPTER 2 - INTRODUCTION

Ash trees are a significant component of Washington's urban forest on both public and private lands. The publicly-owned urban forest occurs in parks and within public open space areas. Privately-owned trees are located on residential properties, institutional and commercial properties, and in privately held woodlots that are not under the control of the City. Private tree maintenance is the responsibility of the property owner, although the City provides forestry-related information to residents.

The City of Washington has approximately 108 ash trees located within the City's parks and open spaces. There currently isn't any information available to the amount of ash trees located on private property. Ash trees are an important native tree species and a major component of woodlots, hedges and fence lines, and often grow along stream banks and disturbed areas. Ash, as a species represent up to 9% of the publicly owned tree canopy cover within the urban forest of Washington.

EAB is a non-native invasive insect with no natural predators that attacks and kills healthy ash trees. This places all *true* ash species at risk. EAB was first discovered in the United States in Michigan in 2002 and despite substantial research and control efforts continues to spread throughout the United States and Canada. It is now known that one of the principal mechanisms of the rapid spread of EAB is through the movement and transport of infested wood material, particularly firewood. Efforts to control or eradicate the pest have not been effective and the only option that remains at this time is to manage the impact of an EAB infestation. The impact of EAB on the health and biodiversity of Washington's forested landscape is highly significant.

The threat to the longevity of ash trees in the Washington landscape has been recognized for a number of years, and, for this reason, the City has not planted any new ash trees.

Ash trees along with many other species provide significant benefits to the City of Washington. These benefits include the provision of oxygen, improvements in air

quality, conservation of water, prevention of soil erosion, provision of food and shelter for wildlife and moderation of the extremes of climate. Trees also increase property values and significantly for the community, contribute to the quality of life in a neighborhood. Ash trees are an extremely important component of the urban forest in that they are one of the principal large-stature, long-lived species conferring proportionally greater benefits than many other species in our urban forest. In addition to this, ash has a high tolerance of salt, poor soils and other urban stresses which makes its use invaluable in the urban forest, particularly for planting in large right-of-way areas.

With the potential for a large scale loss of ash trees, Washington will need to consider carefully the aesthetic and environmental benefits of the ash tree component of the urban forest and determine how best to manage and compensate for the predicted losses due to EAB. As we move through the initial outbreaks of EAB, replanting the ash Component of the City's urban forest with alternative species of trees will be critical to maintaining canopy cover and the many environmental, social and economic benefits that trees give to our community.

Biology

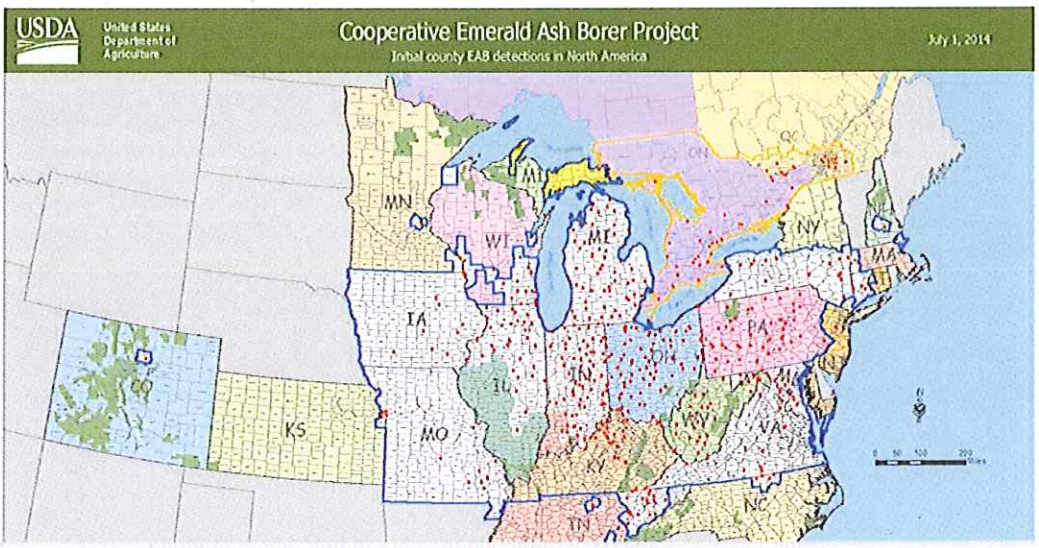
EAB belongs to a group of metallic, wood-boring beetles commonly found in Asia. The adults lay individual eggs distributed on the bark of the ash tree and the larvae bore through the bark and feed on the inner (vascular) tissues below, thereby disrupting the tree's ability to transport water and nutrients. Larvae spend approximately one season beneath the bark creating tremendous amounts of damage to the tree.

Mortality

Based on EAB infestations in other municipalities in the United States and scientific research it is known that EAB populations increase exponentially over a 5-10 year period. Tree mortality rate is slow in the first 2-3 years with an exponential increase in years 4-8; gradually leveling off as the ash population decreases.

EAB Regulation

There are currently 15 states that are impacted by EAB, and quarantines have been imposed in the entire state of Illinois, Indiana, Ohio and West Virginia, and for portions of Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Pennsylvania, Virginia, Wyoming, to limit unlawful spread of EAB by limiting the movement of infested ash wood, ash wood products and ash nursery stock through human activities to other states. Additionally, state regulatory agencies have established intrastate quarantines where EAB has been found.

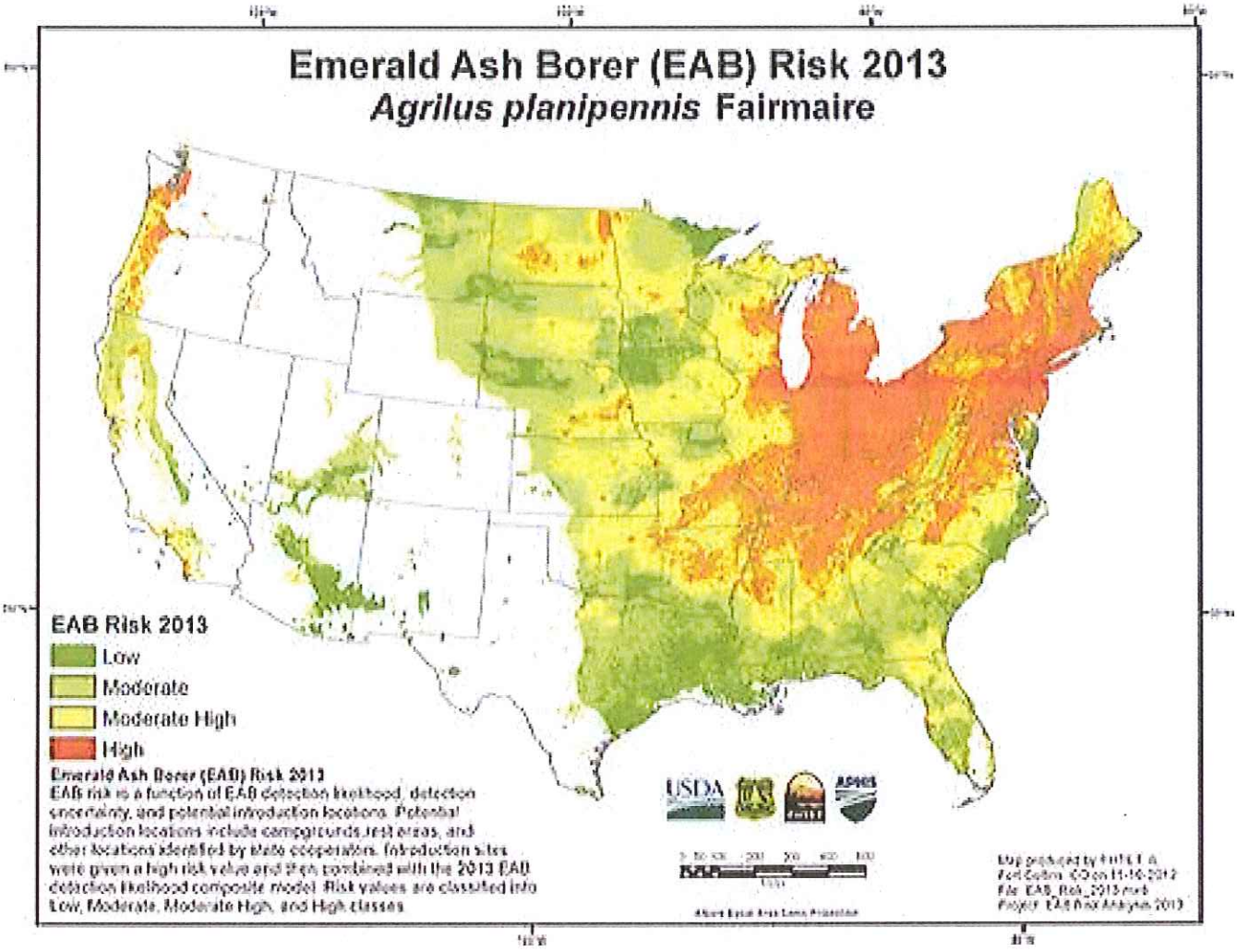


CHAPTER 3 - ROLES AND RESPONSIBILITIES

All levels of government, as well as private property owners, play a role in the management of EAB as detailed below:

United States Department of Agriculture

The United States Department of Agriculture (USDA) quarantine restricts the interstate (across state borders) movement of regulated articles that originate within the quarantine area. The USDA limits unlawful spread of EAB by limiting the movement of infested ash wood, ash wood products and ash nursery stock through human activities to other states.



State of Missouri Quarantine

The State of Missouri quarantine limits the movement of regulated articles, such as ash logs and hardwood firewood, from quarantined areas of Missouri. These regulations are intended to prevent the artificial spread of EAB though regulatory oversight.

City of Washington

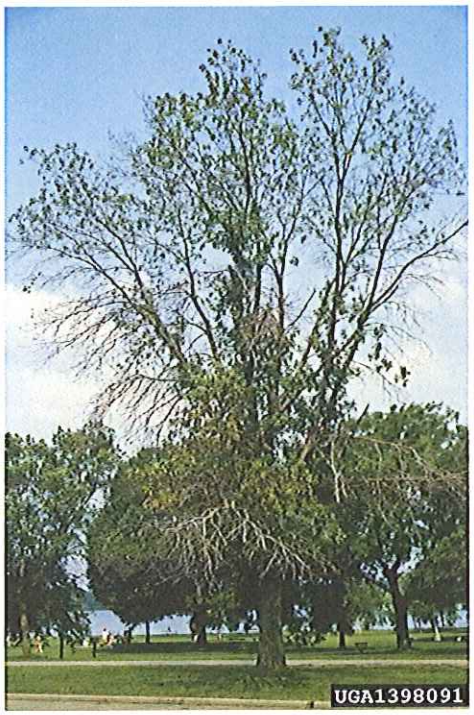
The City of Washington's Department of Parks and Recreation shall have exclusive custody and control of, and responsibility for, the street trees on the streets of Washington; trees located in parks; rights-of-way and open spaces; and other public lands and shall make rules and regulations regarding the planting, setting out, removal, maintenance, protection and care of said trees as are necessary. The department may grant permission to individuals, groups or firms to perform such services either voluntarily or by contract. In addition, the department shall itself or by contract, provide maintenance for all trees whether abutting private or public property, including but not limited to, trimming, pruning and spraying. The department shall be responsible for taking appropriate action to eliminate dangerous conditions caused by dead, dying, dangerous or diseased trees whether abutting private or public property.

Private Property Owners

Property owners are responsible for trees on their property which includes maintenance, treatment and removal. However, under City Ordinance Section 215.100 B. - G. and H., the Community Forestry Manager is authorized and empowered to inspect any vegetation upon any property whether public or private within the City and to conduct such tests and surveys and take such samples of vegetation as may be necessary or desirable to determine if any disease or other communicable disease or epidemic insect infestation exists. Tests may also be made to determine if trees are structurally deficient and are capable of causing major property damage to private or public property.

Where such inspection, test, or survey reveals the existence of disease or other communicable disease capable of causing an epidemic spread or epidemic insect infestation or imminent structural hazard, the City shall give written notice to the owner of the premises upon which the same are located of the condition(s) that exists and the correction(s) required.

CHAPTER 4 - IMPACTS OF EAB



Trees are a major component of the Urban Forest and, consequently, widespread loss of ash trees in urban forests and residential landscapes will have devastating economic, environmental and social impacts. These impacts include the costs for implementing a management plan, the loss of tree canopy and the indirect costs associated with the environmental and social value of trees.

The urban tree canopy is an important asset that requires care, preservation, and maintenance. Invasive species like EAB threaten the health of our forests and tree canopy. Retaining and maintaining the existing tree canopy maintains property values, has a positive impact on tourism and improves the quality of life within urban environments.

EAB can have a devastating impact that the loss of trees can have on a community. In some cases, it may be necessary to remove all of the dead trees changing completely, and for at least 20 years, the character of a street, park, neighborhood, or community.

Environmental Impacts

All trees are beneficial to the environment:

- Trees influence thermal comfort, energy use, and air quality by providing shade, transpiring moisture, and reducing wind speeds.
- Trees improve air quality by lowering air temperatures and removing air pollutants through their leaves.
- Trees can effect climate change by directing storing carbon within their tissues and by reducing carbon emissions from power plants through lowered building energy use.
- Trees improve water quality and reduce the need for costly storm water treatment by intercepting and retaining or slowing the flows of precipitation.
- Trees and other plants help remediate soils at landfills and other contaminated sites by absorbing, transforming, and containing a number of contaminants.

By losing the ash species, there will be many negative effects associated with a reduced tree canopy.

Economic Impacts

Trees in the urban environment increase property values and have important commercial benefits including tourism.

One study estimates EAB will cause an economic impact between $0.5 and $1 billion over the next 30 years on trees in municipalities. These numbers do not take into consideration recognized tree benefits such as increased property values, energy savings, carbon sequestration and pollution and runoff reduction gained with maintaining the existing tree canopy.

To date there is no state or federal funding for the costs associated with EAB treatments, ash tree removals or replanting. It is estimated that the overall economic impact of EAB will be in the range of $30-40 billion dollars.

Social Impact

The social impacts of EAB can be measured primarily in the loss of benefits and aesthetics to the local community. Impacts will be greater in some areas as clusters, groups and individual trees die within a short period of time and are removed. Property values will decline as areas become denuded of trees and are perceived as less desirable places to live.

There are known decreases in quality of life and increase in crime with fewer trees in a community and in a recent observational study, tree loss from the spread of EAB was associated with increased mortality related to cardiovascular and lower-respiratory systems.

Recognized tree benefits, such as carbon absorption and storage, air filtering, cooling and shading, storm water interception and increases in property values for the ash tree component of the urban forest are calculable. Using the national tree benefit calculator, the approximate annual benefit derived from each 14 inch ash tree in the rights-of-way (street tree) is approximately $138 per year, where a park tree of the same size contributes approximately $110 in benefits per year.

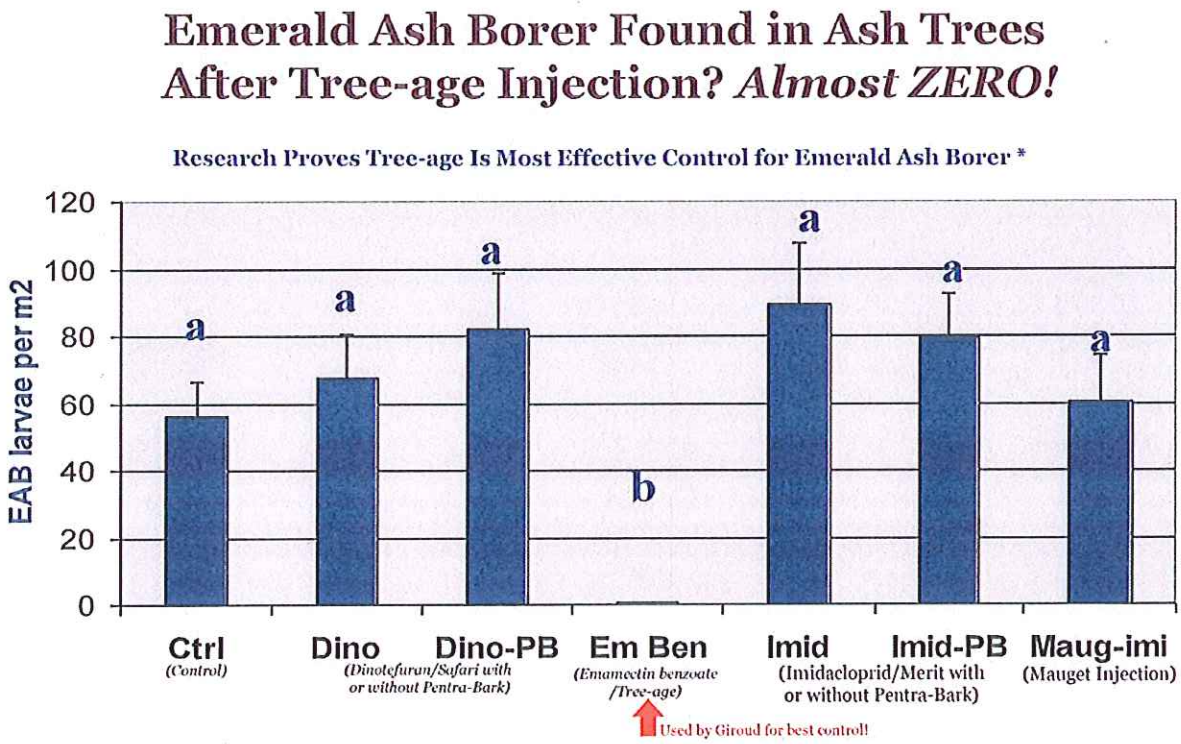
Research

For the past few years' research has continued into a variety of chemical and biological treatments to assist in controlling EAB. Multiple brands such as Tree-age are available, but the following are listed by their active ingredients:

a. Homeowners – Two products are available to homeowners: Imidacloprid and Dinotefuran.

b. Tree Care Professionals – Four products are available to licensed professional tree care professionals: Emamectin benzoate, Azadirachtin, Imidacloprid, and Dinotefuran.

Chemicals such as Tree-age are labeled to provide two years of protection against EAB from a single application.



*McCullough, et al. 2011. Journal of Economic Entomology 104:1599-1612 (Deb McCullough, PhD and Professor Depts. of Entomology and Forestry at Michigan State University)

CHAPTER 5 - MANAGEMENT PLAN ELEMENTS

The City of Washington needs to develop an effective, responsible and financially viable approach to managing the spread of EAB. The development of any such plan should be directed by the following guiding principles:

- Ensure Public Safety and Minimize Liability
- Mitigate the Loss of Significant High Value Ash Trees
- Maintain the City's Tree Canopy
- Provide Public Education and Awareness

A detailed EAB Management Plan should be structured to preserve the City's urban tree canopy, slow down the spread of EAB where possible and allow for the preservation of high value trees in order to allow more time for improved and/or other control measures to be introduced in the future.

The goal of an effective and efficient EAB Management Plan should include the following elements:

- Inventory, Monitoring and Assessment
- Treatment of Significant High Value Trees
- Tree and Stump Removal
- Tree Replacement (with a different species of tree)
- Wood Waste Disposal
- Public Education and Communication

Inventory, Monitoring and Assessment

The first and most important step in preparing for EAB is to determine the potential risk to our urban for resource. A tree inventory is crucial to effectively managing EAB. Without an inventory of publicly-owned ash trees in the rights-of-way, public parks, open spaces, woodlots and forested areas, we will not know their location, distribution, size and condition. Without this information we will not know the City's potential risk exposure or be able to strategically manage the EAB outbreak.

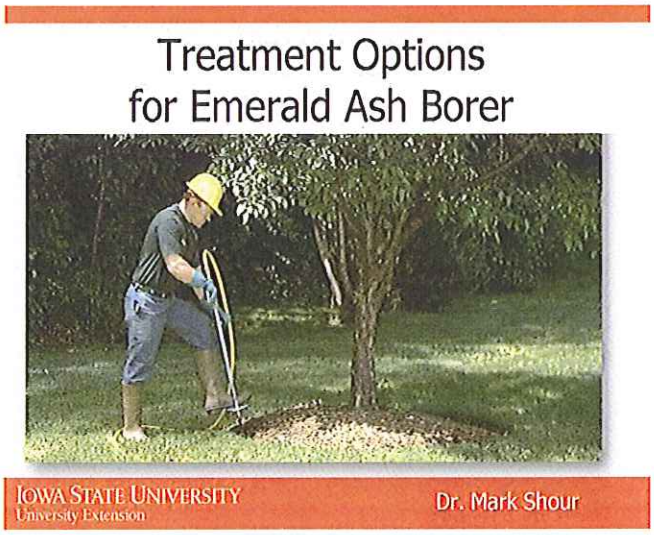
The work done to date involves a tree inventory conducted in 2007 by the Davey Tree Company of nine City parks, which is a minimal sampling of ash trees in parks and on public property. It is highly recommended that the City commission another tree inventory survey, so that we would have accurate information about the public trees that make up the urban forest within Washington. If funds are not available to conduct a complete inventory of all trees, an ash tree only inventory should be conducted at a minimum.

Another significant activity of this element is to undertake regular assessment and review of information gathered from monitoring, branch sampling, trapping and tree inventory to validate and amend further management actions.

Branch sampling involves the collection of branch samples within the ash canopy and examination by removal of the bark. Once the bark is removed, EAB feeding galleries can be seen. Any larvae found would be sent away for identification/confirmation. This is a cost-effective early-warning detection system to identify and monitor the EAB infestation. Knowing the progress of the infestation will assist in strategically managing EAB.

Treatment

High value and/or significant ash trees can become eligible (contingent on available funding) to receive injections of Tree-age (or other approved pesticide/insecticide treatments as available) for protection against EAB. Treatment will usually focus on high profile specimen trees in parks or where there is a large ash tree population and therefore greater impact with their decline. Treated ash trees require ongoing treatment every two years until the threat of EAB has passed or alternative controls are available.



Tree Removal

Based on the degree of infestation and health, ash trees need to be removed to limit hazardous conditions and minimize the safety risk associated with dead and declining trees. Ash wood is brittle by nature requiring removals to be carried out within a short period of time after tree death.

The removal of decaying and/or dead ash trees in parks and open spaces is proposed to be done on a risk management basis. Those trees in parks and open spaces that

are adjacent to public areas will be the first to be removed once they show decay or have died. Ash trees that are far away from human activity are proposed to be left to fall on their own.

Tree Replacement and Planting

To maintain the current numbers of trees, the replacement of ash trees (with a different species of tree) will be needed on a one-for-one basis, as occurs with removal at present. It may be possible to replace the canopy from lost ash trees more quickly and efficiently by utilizing and promoting the growth of existing non-ash species through strategic forestry management practices. These practices will include identifying and promoting the growth of desirable existing young and medium-sized trees (that are not ash species) within or adjacent groupings of ash trees. This has the advantage of promoting naturally-seeded and established trees. Resources will be required to maintain these areas in order to select and promote the growth of these desirable species, primarily by removing invasive plants and other competition. All of the EAB management options presented further on in this report assume implementation of these forestry management practices and thereby propose no wholesale replanting of lost trees in parks and open spaces.

Notwithstanding the above, it is likely that to sustain the present urban tree canopy, additional tree planting initiatives within parks and open spaces may also be required. However, the placement and species composition of any new planting will again require data from an inventory of all tree species in order to be in accord with strategic objectives of the Forestry Management Plan. It should be borne in mind that it can take upwards of 30 years for a newly planted tree to begin providing maximum benefits to the urban forest.

Replacement trees on public-property will be planted by the Parks and Recreation Department, volunteers, or by a qualified contractor depending on available resources and decided by the Director of Parks and Recreation Director/Community Forestry Manager. The following chart is a sample of species that could be used to replace Ash trees. Location, spacing, and site conditions will be considered by the Director of Parks and Recreation Director/Community Forestry Manager.

Common Name	Scientific Name	Variety
Red Maple	Acer rubum	Red Point, Red Sunset, Autumn Flame, October Glory
Sugar Maple	Acer saccharum	Green Mountain, Legacy, Bonfire, Caddo
Hedge Maple	Acer Campestre	Queen Elizabeth
Black Maple	Acer nigrum	Greencolumn
American Elm	Ulmus Americana	New Harmony, Valley Forge, Jefferson, Princeton
Ginkgo	Ginkgo biloba	Magyar, Autumn Gold, Lakeview, Golden Colenade
Northern Red Oak	Quercus rubra	
Red Oak	Acer x freemanii	Jeffersred, Autumn Blaze
Swamp White Oak	Quercus bicolor	
Scarlet Oak	Quercus coccinea	
Shumard Oak	Quercus shumardii	
Black Oak	Quercus veluntina	
Chinkapin Oak	Quercus muehlenbergii	
Willow Oak	Quercus phellos	
Baldcypress	Taxodium distichum	Shawnee Brave, Green Whisper
Japanese Zelkova	Zelkova serrata	Green Vase
Tulip Tree	Liriodendron tulipifera	Emerald City
Black Gum	Nyssa sylvatica	Firestarter, David Odum, Wild Fire, Afterburner
American Basswood	Tilia Americana	Redmond Linden, Legend
Amur Cork	Phellodendron amurense	Macho
Katsura	Cercidiphyllum japonicum	
London Planetree	Plantanus occidentalis	Bloodgood, Columbia, Liberty
Osage – Orange	Malclura pamifera	White Shield, Wichita

Wood Utilization and Waste Disposal

EAB infestation will result in a significant increase in the need for wood waste disposal option for public and private properties. Consideration should be given to the increased needs of residents by ensuring that there are disposal options available.

Residents and contractors can drop off yard waste materials at the Recycling Center. Loads delivered to the Recycling Center may be subject to waste disposal charges. As part of the EAB management plan, staff will investigate possible use of the wood waste as a commodity.

The majority of trees removed as a result of EAB will be "Amenity" trees, which are planted, pruned and maintained for their visual appearance rather than grown for

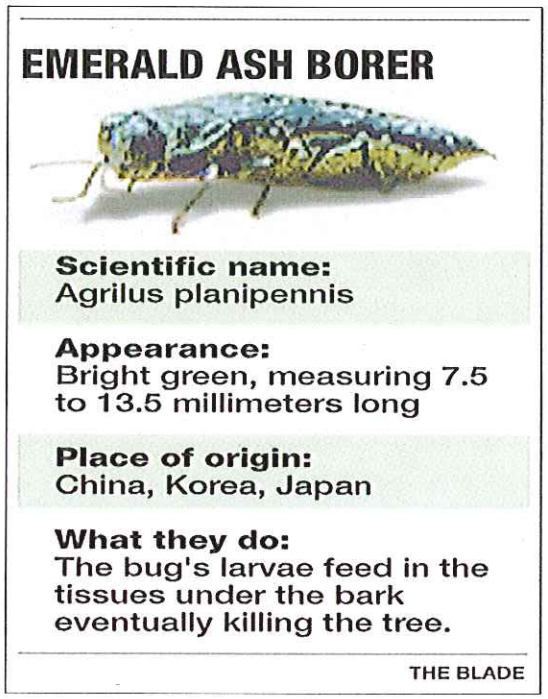
lumber production. Because these trees are often retained into a stage of decline they usually have areas of rot, decay and/or dead wood and are often poorly shaped for sawmill processing. It is likely that the primary use for the ash tree removals that arise from EAB will be as firewood. However, logging potential will also be reviewed as EAB takes effect throughout the City.

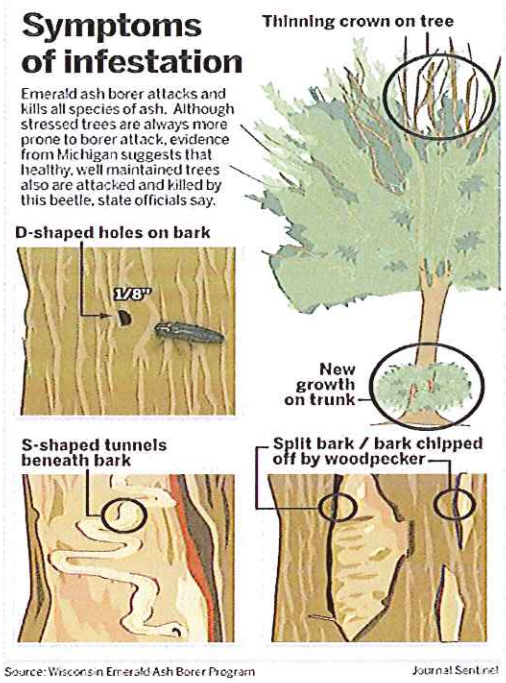
Wood waste that is not suitable for firewood can be ground into mulch using tub grinders that create a variety of mulch textures or material that can be added to other organics to create compost. The grinding and composting processes would destroy any EAB larvae under the bark of waste material.

Public Education and Communication

A program of public education and outreach is an essential part of the EAB management plan. A substantially higher number of ash trees are likely to exist in private than public ownership and their management during the EAB outbreak will impact upon the strategy employed by the City.

Use of local media and communication tools such as social media and the City's website will be used to keep the public informed, particularly in high risk areas. The City should also provide information using the growing number of leaflets and brochures available from sources such as the Missouri Department of Conservation. It is assumed that a greater effort of education and communications will be required in the earlier years with progressively less expense for this element occurring over time.





CHAPTER 6 - MANAGEMENT PLAN OPTIONS

A number of options are available when considering the development of an EAB Management Plan. Five such options are presented below. These options look at the extremes (do-nothing, try to save all trees) as well as hybrid scenarios.

Regardless of the option(s) selected, almost all elements of the management plan discussed are required. Full scale Monitoring & Assessment (including an inventory), together with Public Education and Communication must form integral parts of any Management Plan. Treatment, Removal, Replacement and Disposal will all vary according to the Management Plan option selected.

Option 1: Do Nothing

In essence, this option allows nature to take its course without any intervention on the part of the City. The exponential nature of the tree losses would concentrate the work load of removal and waste disposal over a very short, unrealistic, period of time as it relates to labor and equipment availability. City staff would have to ignore all of their existing workload, and still would not be able to keep up with the removals needed when the highest number of tree losses occurs.

Option 2: Selective Removal

Infested and other distressed or hazardous ash trees are a haven for the EAB and can promote the spread of the insect to other healthy trees; therefor these ash trees on public property must be removed.

Option 3: Selective Treatment

This option seeks to preserve a significant proportion of ash trees by targeting treatments on high value and/or significant ash trees (contingent on available funding) to receive injections of Tree-age (or other approved pesticide/insecticide treatments as available) for protection against EAB. Treatment will usually focus on high profile specimen trees in parks or where there is a large ash tree population and therefore greater impact with their decline. Treated ash trees require ongoing treatment every two years over a ten-year time period until the threat of EAB has passed or alternative controls are available.

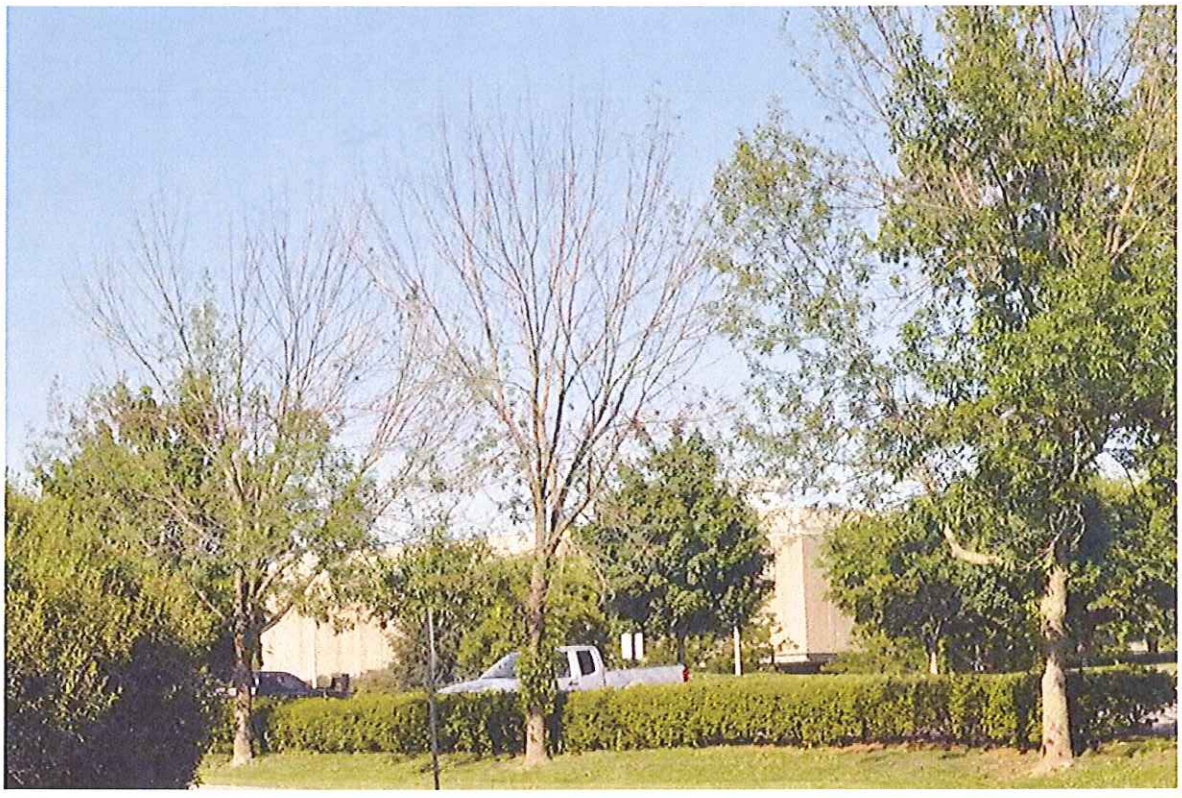
This option utilizes treatment as a tool to preserve the best quality trees and assist in managing the outbreak through staged removals, while adopting the longer-term view of gradually transitioning ash trees from the urban forest.

Option 4: Monitor

Healthy ash trees that are not showing signs of distress or infestation are a positive part of the urban forest. These trees shall be monitored and assessed on an ongoing basis and will remain until they are no longer healthy or infested, and then will be removed. This will help slow the loss of tree canopy.

Option 5: Total Removal

Infested and other distressed or hazardous ash trees are a haven for the EAB and can promote the spread of the insect to other healthy trees; therefor these ash trees on public property must be removed first; the remaining ash trees shall be monitored and assessed on an ongoing basis, and followed by staged removals of all ash trees on public property based on overall condition over a ten- year period. This will help slow the loss of tree canopy.



CHAPTER 7 - FINANCIAL CONSIDERATIONS

Cost/Benefit Analysis

It is accepted that trees provide significant social, ecological and economic value to the community and that these values exceed the life cycle cost of planting, maintenance and ultimately, removal. The National Tree Calculator (http://www.treebenefits.com/calculator/) allows a monetary value to be generated for individual trees based on the functional benefits, such as Stormwater management, pollutant removal, energy conservation and increased property values. For instance, a 20 inch diameter white ash tree located in a park setting has been calculated to provide $121.00 of benefits annually.

It is certain that the EAB is coming to Washington and that the catastrophic destruction of our ash tree population is going to cost society financially as well as result in lost functions and economic benefits.

Removal/Disposal

Determining tree removal costs will likely be one of the first priorities. This can be accomplished by using information collected during the tree inventory and through tree removal estimates and bids. From the inventory, we should have an actual or estimated total number of ash trees. Likewise, we should be able to determine an average size (diameter) for all trees from the inventory. Combining this information with an estimated removal cost for the average size tree in your community, you can estimate the total removal cost for ash trees on public property.

Example: Total number of ash trees in Washington: 108
Average diameter of ash trees in Washington: 16"
Estimated removal cost for 16"tree in Washington: $625
Anytown's estimated total ash removal cost:
$625 x 108 trees = $67,500

Local disposal cost should also be estimated as part of total tree removal cost.

Replacement

Create a cost estimate for replanting trees that have been or will be removed due to EAB. From the inventory, we should have an actual or estimated total number of ash trees. Likewise, we should be able to determine an average size (2" caliper) for all trees to be replaced. Combining this information with an estimated replacement cost for the

average size tree in your community, you can estimate the total replacement cost for ash trees on public property.

Example: Total number of ash trees in Washington: 108
Caliper of ash trees in Washington: 2"
Estimated replacement cost for 2" tree in Washington: $275
Washington's estimated total ash replacement cost:
$275 x 108 trees = $29,700

Treatment

It has been estimated that the unit price cost for treatment with insecticides would be $11/diameter inch and would be increased by 2% per year, per treatment, for five treatments over a ten-year period. The insecticide, Emamectin benzoate, has been shown to be effective for at least two years, so treatment can be performed every other year. Because the EAB population dynamics are unknown, the cost of treatment may continue after the estimated ten-year period.

Example: Total number of ash trees in Washington: 108
Average diameter of ash trees in Washington: 16"
Estimated treatment cost for 16" tree in Washington: $11/inch
Washington's estimated total ash treatment cost:
$11/in. x 16"= $176 x 108 trees = $19,008 x 5 = $95,040

Summary

The cost estimates at this time are based solely on best professional judgment on the information that is available to staff at this time. A more accurate analysis would need to be performed following the completion of a tree inventory of ash trees within the developed parks. Data generated from an inventory would allow staff to better estimate funding necessary to implement the EAB Management Plan for Washington.

CHAPTER 8 – PREPAREDNESS PLAN

Plan Goals

The difficulty in identifying management objectives is finding a balance between tree removal and treatment. The ideal would be to treat all ash trees, since this would retain the greatest ecological and social benefits; however, this is not a fiscal possibility. A realistic goal for this plan should result in identifying the ash trees that have the potential to strike a target, and then prioritizing both the high value trees to retain and the potentially hazardous trees to remove. Overall, compared to the entire population of ash trees within the City, a relatively small number of tress will ultimately be selected for removal or treatment.

Recommendation

I. It is highly recommended that the City commission another tree inventory survey, so that we would have accurate information about the public trees that make up the urban forest within Washington. If funds are not available to conduct a complete inventory of all trees, an ash tree only inventory should be conducted at a minimum.

II. In order to prevent the development of hazard trees and to preserve a portion of the native ash tree resource, the City should adopt a balanced or "selective" management approach. This approach should allow for the preservation of many of the high value trees that provide significant landscape amenities, while preemptively removing lower quality trees that will eventually pose a hazard to the public.

1. A large number of trees located in forested non-use area of parks, those trees that will never become a hazard to the public, will neither be removed nor treated, and will be allowed to die and decay in place. Dead standing trees or "snags" are important to cavity nesting and bark gleaning birds, and as they decay they contribute to soil enrichment.

2. Ash trees that will be prioritized for initial removal will be those that are unhealthy and/or defective. Defective trees will be ash trees that are leaning or trees with cracks, splits, butt rot, cavities and/or poor form. These trees are not worth saving as they are likely to die or fail in the foreseeable future from causes other than EAB. Unhealthy trees will be those infested with EAB and/or with greater than 30% canopy decline. Obvious hazard trees will also be removed regardless of species.

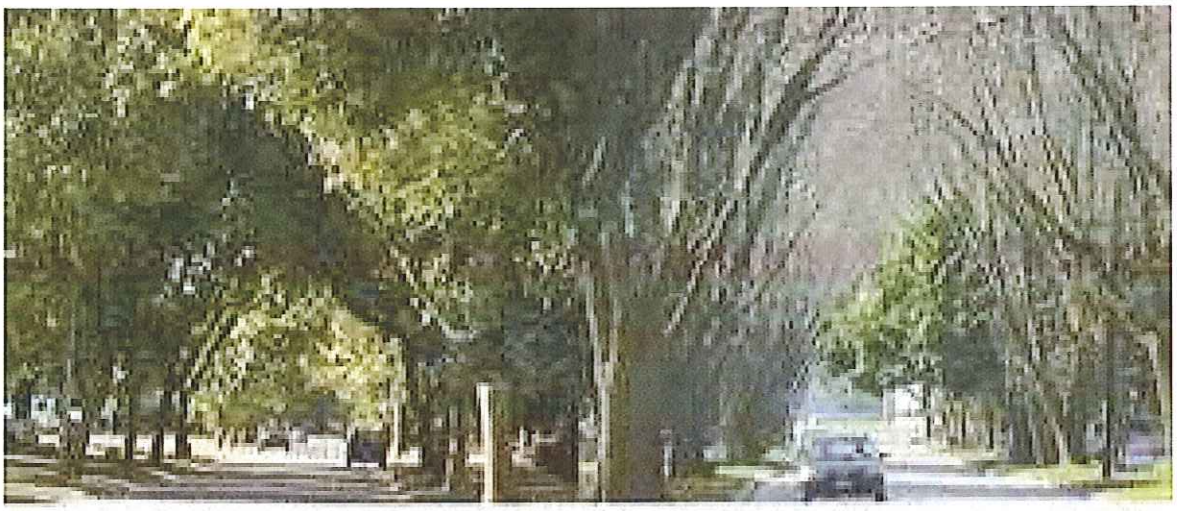
3. Healthy individual ash trees located in both developed parks and other public properties will be monitored and assessed on an ongoing basis and will remain until they are no longer healthy or infested, and then will be removed. This will help slow the loss of tree canopy.

4. Healthy individual high value and/or significant ash trees (contingent on available funding) shall receive injections of Tree-age (or other approved pesticide/insecticide treatments as available) for protection against EAB.

   Treatment should only focus on high profile specimen trees in parks or where there is a large ash tree population and therefore greater impact with their decline.

   Note that in some cases, the City may elect to treat certain trees that will be too costly or too dangerous to remove.

III. It is highly recommended that the City replant to replace trees to "jump start" the restoration of the forest canopy. Replanting along streets and in developed areas of parks shall utilize the diversity of non-host species as provided herein.



TOLEDO STREET BEFORE AND AFTER EMERALD ASH BORER

BEFORE: JUNE 2006 AFTER: AUGUST 2008

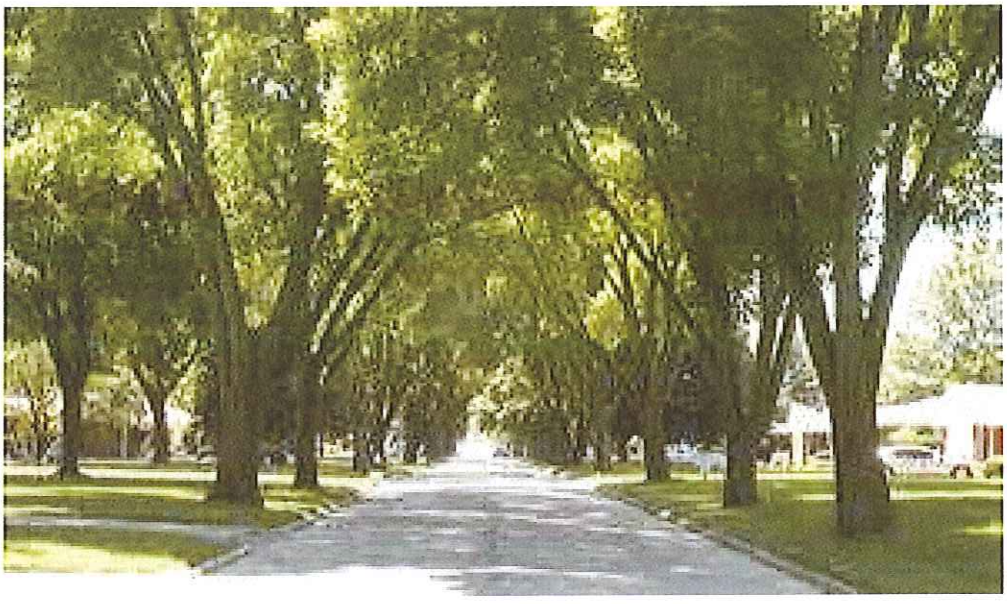
CHAPTER 9 – PLAN IMPLEMENTATION

Implementation of the EAB management plan should commence in 2016 with an informal survey and analysis of ash trees by staff. At the same time branch sampling, trapping and public education and outreach would commence. EAB is expected to be found either during 2016 or 2017 using these detection methods.

In 2016/2017, a formal inventory of all trees should be conducted. Using data from the inventory, a re-appraisal of numbers and therefore costs can be undertaken together with a review of strategy and operational planning. With the benefit of inventory data, prioritized removals of low grade, poorly structures and dead or dying trees (presenting the highest potential risk) would be carried out. The replanting program would be phased in with the existing tree replacement program.

Replanting in parks would be determinant upon inventory data that would investigate options such as promoting natural regeneration or other species and/or promoting the growth of existing non-ash species through good management practices. This strategy has the potential to quickly replace lost canopy and leaf area and thus an inventory of all species becomes a fundamental component of the entire EAB management plan.

In subsequent years through 2026 the plan continues with removals prioritized and guided by public safety and operational efficiencies. Review of the plan throughout implementation, particularly following inventory, is essential to ensure the best use of in-house and contracted resources and any potential return from removed trees. Replanting species, sizes, number and location will be guided by the inventory of all tree species to reduce costs and optimize canopy replacement and sustainability.



CHAPTER 10 – CONCLUSIONS

The City of Washington is a responsible steward of its urban forest and plays a key role in maintaining the City's tree canopy through maintenance, planting, removal, and pest management programs for publicly-owned trees. The urban tree canopy is an important component of the urban forest.

Facing a complete loss of ash trees as a result of EAB, the City of Washington will need to consider carefully the value of the urban tree canopy and determine how best to manage and compensate for the loss due to EAB.

As previously stated there are a number of options available when considering the development of an EAB Management Plan. However, it is staff's recommendation that the best approach would be an approach that would include a middle ground where a combination of treatments, removals and replanting are used to manage the short and longer-term effects of EAB. Treatments target and retain the healthy individual high value and/or significant ash trees, preserving their benefits and allowing staged removals of poor quality, undesirable, smaller and dead and dying trees. The removal and replanting of poor quality ash trees with a different species allows the transition of much of the ash tree component from the urban forest and reduces future treatment commitment. Without the benefit of a full inventory, the location, size, condition and distribution of ash trees cannot be known and the EAB outbreak cannot be managed strategically.

This report is based upon sample data from the 2007 Parks Inventory, which has produced only limited information on the number of trees, sizes, and condition, and has not provided a tree picture of the geographic distribution or density of ash trees throughout the City. The estimation of the quantity and quality of the ash tree component of the urban forest has many shortcomings such as:

- Estimates of the total number of ash trees may impact significantly on costs;
- We do not know the location of all ash trees and thus our potential risk exposure;
- Sampling does not allow grading of trees both suitable and unsuitable for treatment;
- Groupings and location of trees will impact significantly on removal costs; and
- Location and setting of trees will impact the need and/or the desirability for removal and replacement.

As data becomes available from inventory, monitoring and assessment this will allow us to refine the costs and the strategic implementation of the chosen option, producing greater efficiencies.

REFERENCES

United States Department of Agriculture

Missouri Department of Conservation

University of Missouri Extension

Iowa Department of Agriculture and Land Stewardship

Iowa Department of Natural Resources

University of Illinois Extension

University of Purdue

Pennsylvania Department of Conservation and Natural Resources

Pennsylvania Community Forests

Michigan Department of Natural Resources

Michigan Department of Agriculture

City of Lenexa, Kansas

City of Leawood, Kansas

City of Peterborough, Canada

Canadian Forest Service

Natural Resources Canada

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