



## City of Lakeville

# Emerald Ash Borer Management Plan



*EAB infested ash – Oak Shores Park, Lakeville, MN January 2018*

**November 14, 2018**

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## **Purpose**

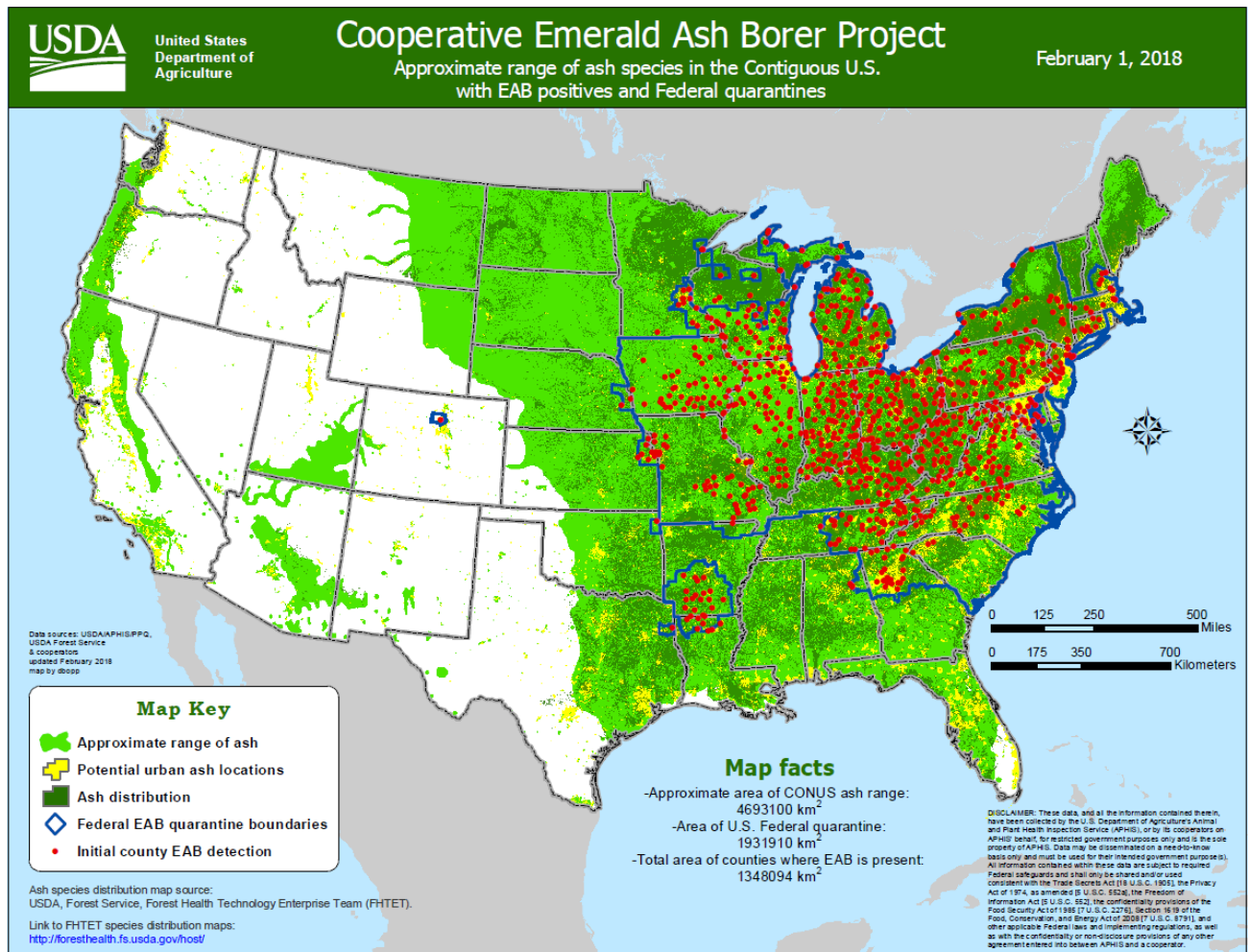
The purpose of the City of Lakeville Emerald Ash Borer Management Plan is to minimize the significant fiscal and environmental impacts of emerald ash borer (EAB). The loss of over 12,000 ash trees, about 9.5% of all trees in Lakeville will have a noticeable effect on home values, quality of life and the environment over the next two decades if it is not managed properly. The most effective way to handle the EAB in Lakeville will require a mixed approach including tree preservation by injection, tree and stump removals, replanting and adding additional staff to assist with handling the pest in a systematic way. The EAB Management Plan is consistent with the City's vision statement which seeks to offer "...exceptional parks, trails and recreational opportunities;" in addition to "...safe neighborhoods; and responsive and cost-effective public services together (to) create a place we are proud to call home."

Trees serve as part of the City's green infrastructure: they clean the air, slow down and absorb stormwater, reduce erosion, save electricity by reducing air conditioning costs, enhance property values and provide habitat for wildlife. One figure provided by the Minnesota Shade Tree Advisory Council (MnSTAC) states the loss of all urban ash trees in the state will lead to 1.7 billion gallons of water entering our stormwater systems annually. A proactive and structured approach to managing the City's ash population will distribute the impacts over 10-15 years and help ensure an orderly response while maintaining as many tree benefits as possible. The City's plan will be guided by the best management practices issued by the top three agencies researching EAB in the state; the Minnesota Department of Agriculture, the Minnesota Department of Natural Resources and the University of Minnesota. Since research is ongoing, management practices will be modified if new strategies are recommended.

## **Introduction**

Emerald ash borer (*Agrilus planipennis* Fairmaire) is a non-native invasive beetle that was discovered in the Detroit, Michigan area and Windsor, Ontario in 2002 after ash trees began to die. It was most likely introduced to North America on wood packing materials originating from Asia. Scientists believe it could have been introduced as early as 1990, so the insect had over ten years to build its population without any proactive management. Since that time, EAB has spread to at least 31 states.

**Map 1: USDA Cooperative Emerald Ash Borer Project Distribution in the United States**



In May of 2009, EAB was first confirmed in Minnesota when it was found in a St. Paul neighborhood. Most recently, within Dakota County, EAB was found in Eagan in 2014, Apple Valley in 2016, and Lakeville in 2017.

The emerald ash borer adult is very small from 3/8-1/2 inches long, and the immature stage (larvae) is about one inch long. Due to its small size, and its inconspicuous location under the bark, it can be difficult to detect in the early stages and typically infests a tree for 3-5 years before visible signs and symptoms appear. During that time, one generation of beetles can emerge from an infested tree each year and fly to nearby ash trees. Emerald ash borer spreads about one to two miles per year, which is the average flight distance of an adult beetle. The insect has spread faster than one to two miles per year due to human movement of firewood, nursery stock and other ash products.

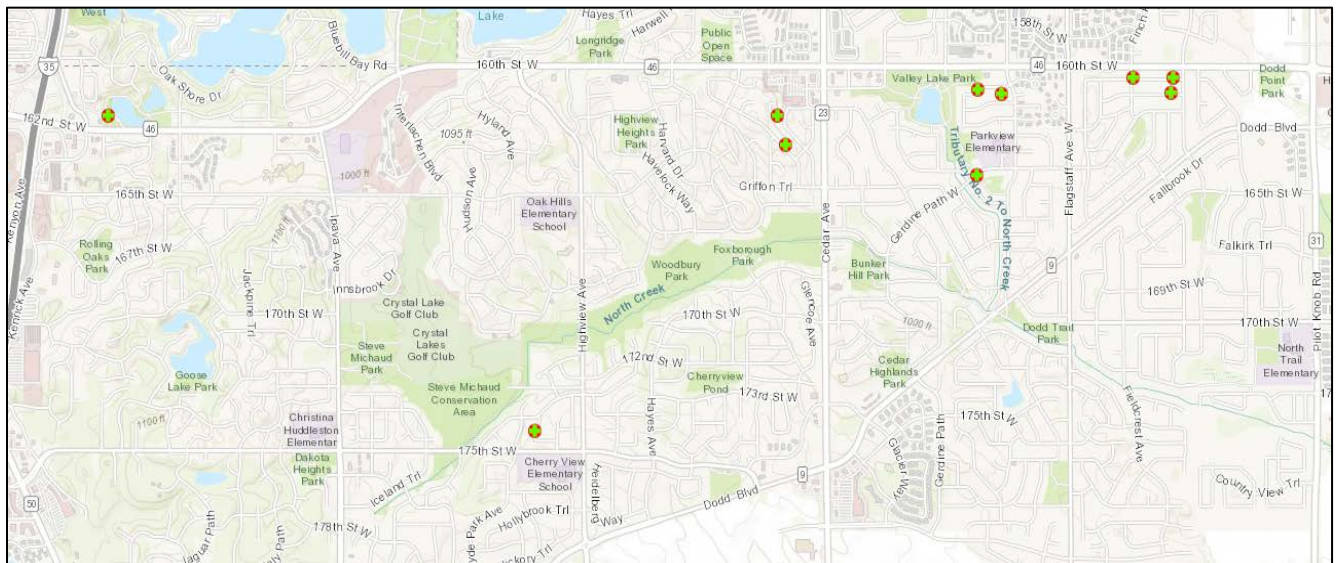
Ash trees are killed when EAB larvae (the immature stage) feeds under the bark of ash trees, disrupting the tree's ability to transport water and nutrients throughout the tree. The adults feed on ash leaves but are not the primary driver of tree mortality. Emerald ash borer has killed hundreds of millions of ash trees where it becomes established. According to the state's Department of Natural Resources, Minnesota has 2.65 million ash trees in communities, and about 1.1 billion ash trees in total growing in forests and communities, the most of any state in the country. The USDA Forest Service EAB website states "...emerald ash borer is the most destructive invasive forest insect ever to have invaded North America." Ash trees were frequently the default replacement for elm trees lost to Dutch elm disease in the late 1970's and 80s. They traditionally survive in soil conditions that many other trees cannot and are selected for difficult growing sites. According to the Minnesota Shade Tree Advisory Committee, EAB is "...more destructive than Dutch elm disease, which required a state investment of \$500 million to combat." Currently, there is no funding available from the state of Minnesota to communities like Lakeville to tackle this pest.

Beyond existing as a threat to forest health and canopy cover, emerald ash borer becomes a public safety issue because the insect accelerates the wood drying that would normally happen as a tree dies. Due to the wood properties of ash, the trees become incredibly brittle and hazardous when succumbing to EAB. As trees become more dangerous to remove, there are fewer options for safe removal by appropriately trained staff and contractors. This is a relevant issue for private property tree owners in addition to the City. There is a direct relationship between the risk associated with removing a tree and the cost when contractors are hired to remove an infested tree. As the EAB population builds in a community, tree death increases and accelerates, often referred to as the "death curve" because it is an exponential relationship. Although it is not currently possible to eradicate EAB once found, there are research-based control measures that can slow and flatten out the "curve" to spread tree losses and costs over time, which will be proposed for implementation in the plan.

## Current Emerald Ash Borer Status in Lakeville

The first infested tree was confirmed in October 2017 near Cedar Avenue and 160<sup>th</sup> Street West. In December 2017, the Minnesota Department of Agriculture (MDA) and City staff surveyed a little over half of the City in a radius around the infested tree to determine the extent of infestation. Due to the number of infested trees found, proximity to the Apple Valley infestation and the extent of wood pecker activity on the infested ash trees found, MDA staff believe the City of Lakeville infestation began in approximately 2014. Like every other community where it has been found, EAB was difficult to detect here until the larvae population was big enough to attract woodpeckers. There were about 85 infested trees that were located during the survey, most of which are growing on private property in front yards.

**Map 2: City of Lakeville Confirmed EAB Infestation Areas in 2017**



## Tree Inventory and Ash Tree Population

In 2017, a City-wide tree inventory was completed to assess the total number of ash trees on public boulevards, facilities, utility sites, parks, and select trail corridors. Trees were inventoried in the mowed, maintained (non-wooded) areas using a geographic positioning system (GPS) within a geographic information system (GIS) so that data can be updated and tracked electronically. At this time, the City does not have an inventory or estimate for the number of ash trees growing in the wooded sections of park land, City owned conservation areas, or outlots but

will budget for that project once higher-use areas such as parks and streets have started implementing BMPs.

The boulevard and private property trees were inventoried with a statistical sample that estimates the total number of trees achieving a 95% probability and a relative error of 10% or less, based on a method described in the Journal of Arboriculture, the scientific journal of urban forestry and the discipline of arboriculture. This is a cost effective, accurate and industry-approved way to estimate the City’s exposure and anticipated budget scenarios required to handle EAB. The trees growing on the City-owned lands of parks, facilities, and utilities were all inventoried if they were found in a maintained area.

**Table 1: City of Lakeville Tree Population and Ash Count Maintained Areas Only**

Categories	Ash Trees	Other Tree Species	Total Trees	Ash as a % of Total (rounded)
<b>City-owned Tree Population</b>				
Boulevard (street) trees*	1,790	7,695	9,485	19%
Parks	688	3,094	3,782	18%
Facilities	60	494	554	11%
Utility Properties	1	162	163	<1%
<b>Total City-owned</b>	<b>2,539</b>	<b>11,445</b>	<b>13,984</b>	
<b>Private Property</b>				
Single-family, Multi-Family, Schools, and Commercial all included*	9,943	107,442	117,385	8.5%
<b>Total Inventoried City &amp; Private</b>	<b>12,482</b>	<b>118,887</b>	<b>131,369</b>	

*\*statistical sample inventory*

**Program Administration and Impact**

The Public Works Department will take the lead role to implement the EAB plan and associated program. Specifically, the City Forester and Public Works Director will work collaboratively with the Parks and Recreation Department Director and associated staff to implement the best management practices (BMPs) to handle emerald ash borer and ash trees throughout Lakeville. The City Forester will ensure City ordinance requirements related to EAB infested trees on private properties are enforced as recommended by the City Council.



Implementing the proposed EAB management plan will spread out the financial and staffing requirements over a ten to fifteen-year period but will still require significant additional City resources. EAB management has financial and staffing implications that will exceed the City's current Public Works (Street, Forestry) and Park allocations.

### **Public Outreach and Education**

The City will proactively communicate about EAB through the website, cable, social media and the official newspaper. The City hosted a public presentation in December 2017, which was filmed and is available online. Beyond information sharing, the City Forester or her representatives will proactively connect with businesses, the school district, and residents to ensure best management practices become more well known. In addition, the City Forester and assigned representatives will give presentations to smaller groups, such as homeowners associations or neighborhood groups regarding EAB best management practices. From September 2017 through August 2018, the City has a GreenCorps member assisting with EAB outreach and planning efforts. City events such as the Earth Day Watershed Clean up, the Annual Tree Sale, and residential site visits will be an opportunity to educate the public about emerald ash borer. The City Forester will also attend events such as the Lakeville Landscape & Home Expo to reach a wider audience. In March 2018, the City is partnering with the Minnesota Department of Agriculture to host a free EAB Field Workshop for the community at Oak Shores Park and will continue to leverage those opportunities to amplify outreach efforts.

The historic trend demonstrates that EAB related tasks often outstrip public resources and staff during the peak years of EAB infestation. Tasks include public property ash tree inspections and removals, private property tree inspection requests, ordinance/code compliance and questions. Educating the public aggressively must be a priority to manage expectations and so they can use self-help during the peak years to handle infested ash trees appropriately before they become public safety hazards.

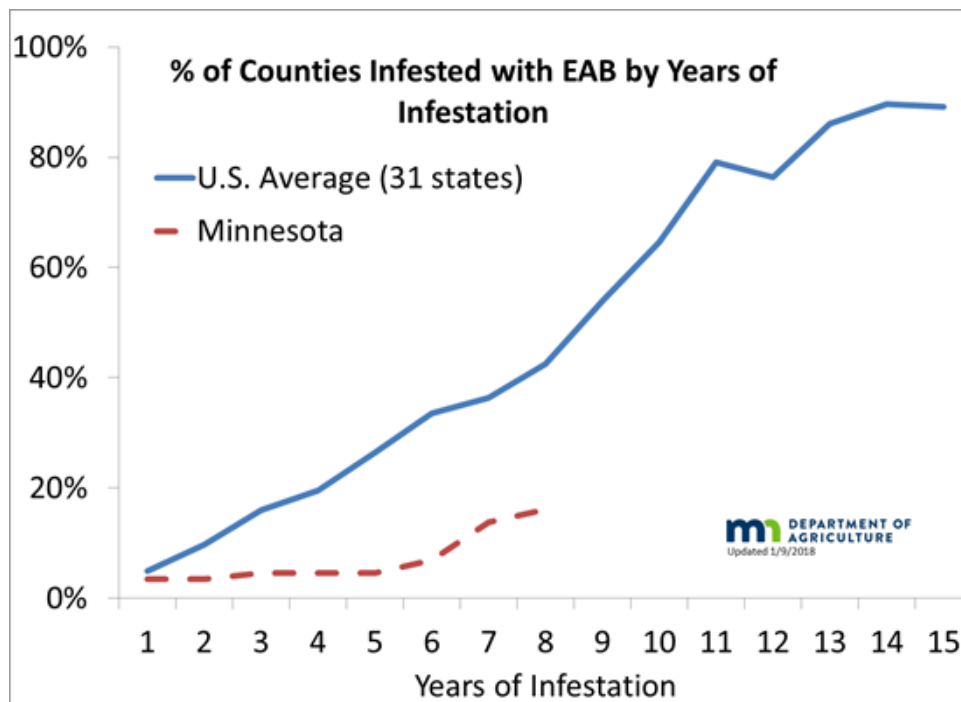
The Minnesota Department of Agriculture (MDA) and Natural Resources (DNR) have community outreach in place to discourage the movement of firewood throughout the state, including brochures, billboards, advertisements, and vehicle inspections. In addition, a statute restricts the movement of unapproved firewood onto DNR owned land and a state and federal quarantine restrict movement of firewood of any hardwood tree species into a non-quarantined county.

The City Forester and staff responsible for managing EAB will continue to attend workshops and seminars to stay current with new strategies to manage the pest. Staff will also coordinate management with neighboring cities and agencies when appropriate to improve the management of EAB.

### Management of Ash Trees with Best Management Practices (BMPs)

When EAB was first found in Michigan, several management strategies were attempted and failed. Since that time, several research-informed strategies have emerged and are now industry-accepted best management practices (BMPs) for reducing the costs and preserving tree value during the peak of EAB infestation. Minnesota has done better overall, than many of the initial states due to aggressive management, education, outreach, quarantines, sanitation and cold weather.

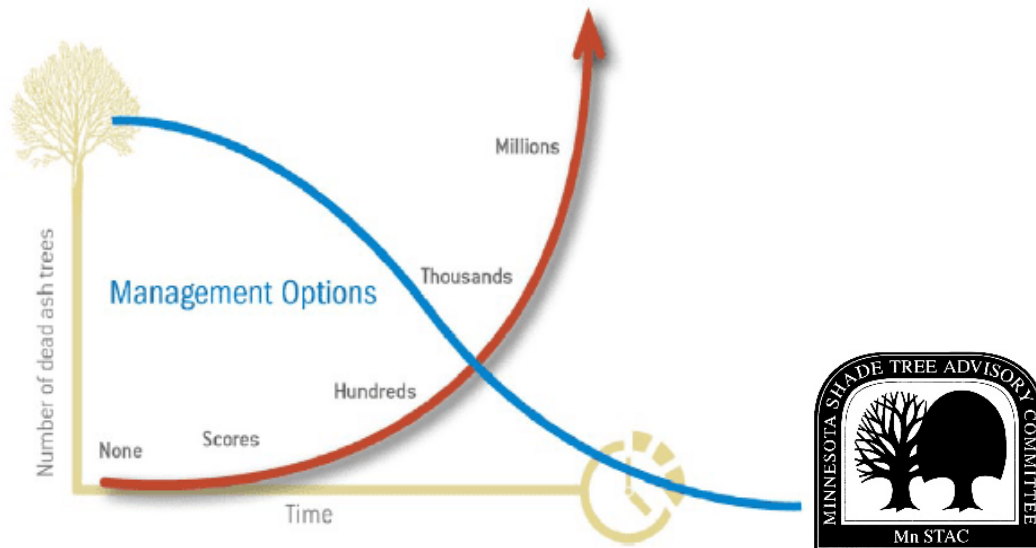
**Figure 1: Percentage of Counties Infested with EAB by Years of Infestation**



The option of “doing nothing” is not an accepted option for this pest because it will guarantee a faster buildup of the beetle population and result in the steep ash tree death curve. An accelerated rate of ash tree deaths affects City and private property-owner budgets in a dramatic way while reducing aesthetics and losing the benefits that ash trees provide to Lakeville. In addition, the “doing nothing” option costs more over a shorter period and provides a significant risk to public safety because of the exponential relationship between the beetle population and ash tree death. All of the EAB cost-calculators and modelling software indicate that focusing solely on tree removal and replanting is the most expensive option. Since Michigan was the first state where EAB was found, tree managers did not know they were in the middle of a building EAB population. Many of the small communities were faced with spending millions of dollars in less than five years to handle thousands of dying ash trees because they had no time to plan and implement management to spread the “death curve” over time. Preservation by injection was not an option for many of the earliest infested communities because the tree canopies showed more than thirty percent dieback, and the research to support the treatments had not yet occurred.

Instead of a “doing nothing” approach, the City should proactively monitor and inspect for the pest on City and private property, use trunk injected insecticides to preserve high value ash and suppress the EAB population, encourage private (non-City) property owners to proactively treat their high value ash, engage in structured removals of poor/fair condition ash trees on public property before infestation, remove EAB infested trees when they are found, and consider participating in biological controls if they become available. There is an inverse relationship between time and management options, meaning the more time that goes by, the more trees die, and the options to manage EAB through structured removal, insecticides, removal and replacement decrease (Figure 2). This section describes each of these management practices accepted by the three main agencies researching EAB in Minnesota and how they apply to the City of Lakeville.

**Figure 2: As the Number of Dead Ash Trees goes up, Management Options go Down**



### Best Management Practice 1: Monitoring and Inspection

The most efficient way to detect EAB in a tree is visual inspection for woodpecker activity in the mid to upper canopy of ash trees during the winter months. Woodpeckers fleck off the outer darker bark while looking for EAB larvae. As the woodpecker works, the inner, lighter bark is exposed (referred to as “blonding”) and dime sized oval holes appear along branches. Early in the infestation, October through April should be used to survey the City’s ash trees for signs of woodpecker activity. Late February/March is the most prolific time for identifying infested trees. Many of the woodpecker holes reveal galleries that can be seen from the ground, but binoculars may also be used. As the infestation progresses, the City may need to shift to year-round surveying and inspecting to keep up with the volume of trees showing woodpecker activity indicating EAB.

The area of most intensive inspection should start near known-infested trees and work out in a radius from each of those points. Typically, a state-Certified Tree Inspector is hired or appointed to focus almost entirely on tree inspections during the period required for EAB inspections on City and private property. In addition, all field staff who work on trees need to monitor for new EAB pockets throughout the City. Street and Park Department staff have already been trained on EAB but there will be additional opportunities offered each year by the City Forester and outside agencies to ensure they have the knowledge and capability to assist in finding newly infested

trees. In addition, a more specialized chainsaw training will be offered so crews can learn how to assess an infested ash tree and determine if it is safe to drop.

### Best Management Practice 2: Insecticide Use

Insecticides are very effective in controlling insect populations when they are applied properly at the correct time of year in the appropriate dose (rate). There are several insecticides that are registered to kill EAB in ash trees. The method advocated by the City is the trunk injection of emamectin benzoate using the current industry standard injection system that has efficacy data supporting its use on trees ten inches or greater in diameter. The applied injection is systemic, so the tree takes up the insecticide in its xylem tissues (water conducting system). The insecticide is injected where the root system and trunk interface, is pulled upward by the tree, spreads through the canopy in all the fine branches and can be detected inside the tree tissues and leaves. The insecticide has a two-year efficacy period, with early research indicating it might be possible to stretch treatments to every three years. According to the USDA Forest Service EAB website in February 2018, emamectin benzoate was "...found to be the most effective product and provided two to three years of nearly complete EAB control. All EAB adults fed leaves from trees treated with emamectin benzoate died within four days and larval densities were reduced by 99% compared to untreated trees". The insecticide is toxic to EAB larvae and adults upon ingestion. According to a handout created by the University of Minnesota and two other universities detailing *Frequently Asked Questions Regarding Potential Side Effects of Systemic Insecticides Used to Control EAB*, emamectin benzoate is "...derived from a naturally occurring soil bacterium, has been registered for more than ten years as a foliar spray to control pests in vegetable and cotton fields...and similar products are used in veterinary medicine as wormers for dogs, horses and other animals." Since the insecticide is injected into the tree, it minimizes the non-target effects.

The trunk injection can be performed on a tree 8-10 times for the price it would cost to:

- Remove the tree
- Grind the stump
- Replace the tree

At the end of the 20-year treatment cycle, a tree and all its benefits to the community have been preserved. Based on an analysis of the City's tree inventory, the average diameter of a high quality public property ash tree is about 16-inches in diameter. According to the National Tree Benefit Calculator, a 16-inch diameter green ash tree growing a Lakeville yard provides an overall benefit of \$157.00 per year and in a City park, that same tree provides benefits of \$126.00 a year. The

benefits or “ecosystem services” that the ash trees provide include reductions in stormwater, electricity, natural gas, and carbon dioxide along with improved air quality, and property values. When there are thousands of ash trees lost during a short period of time before a canopy can rebound, the lost benefits can compound. One example of that effect occurred in one of the first communities hit by EAB in Westland, Michigan. According to a study by Deborah McCollough published in the January-March 2012 *International Journal of Pest Management*; the removal of Westland’s 3,000 municipal ash trees killed by EAB “led to a 33% increase in outdoor water consumption, which subsequently caused the regional water authority to levy a 10% surcharge on the City.”

The systemic trunk injected insecticide can be compared to an insecticide spray staying on the surface of the tree, which would only remain effective for a matter of weeks until it breaks down due to sunlight and/or rain. Another less-preferred option is another systemic insecticide; the soil drench/soil injection or trunk injection of imidacloprid (both professional and homeowner formulations) which have per-acre use limits. The use limits restrict the number of trees/diameter inches that can be treated per acre. In addition, it should not be applied within 25 feet of a water body or storm drain in the street due to runoff concerns. Although the flowers of ash trees are wind pollinated (not visited by pollinators such as bees), soil applied imidacloprid can kill pollinators if there are nearby flowering trees, shrubs, and plants (which would also take up the insecticide). There is also a formulation of trunk-applied imidacloprid, but it has been found to be less effective than emamectin benzoate under heavy EAB infestation and must be applied yearly which is less convenient.

In summary, the trunk injection of emamectin benzoate is preferred to other trunk injections, spray or soil-applied insecticides because:

- Research data indicates it is the most effective to kill EAB
- It can be done every-other year
- It is a restricted-use pesticide so only state licensed pesticide applicators can use it
- The insecticide is injected inside the tree, reducing the chance that children, pets or other wildlife will encounter it while playing in a yard or park
- Since it is inside the tree, it would not runoff in the soil or overland to lakes, creeks, or other water bodies

Many cities use trunk (stem) injected emamectin benzoate to:

- Preserve high value good condition trees on a 20-year plan (10 injections)

- Preserve fair condition trees that are providing a unique aesthetic to a street corridor, or park where other trees would be hard to establish
- Stage tree removals in parks or boulevards by keeping fair/poor condition ash trees from dying and becoming hazardous while cities move through a structured removal plan
- Create a “herd immunity” effect; there is early research indicating the more trees are treated, the slower the insect population grows in the community
- Encourage property owners and other non-city properties including commercial, multi-family and the school district to preserve their ash trees and slow down widespread tree mortality and canopy loss, at least until newly planted trees can establish. Staff will consider offering a City-sponsored bid and a bulk-treatment program at no additional cost to the City which would be available to any entity in the City (town home associations, single family, etc.)

Based on the City-wide tree inventory completed in 2017, the following ash trees are eligible for injection:

**Table 2: City Ash Trees Eligible for Injection of Emamectin Benzoate**

Category of Property	Total Ash Trees	Ash Eligible for Injection
Boulevards	1,790	1,273*
Parks	688	471
Facilities	60	38
Utility Properties	1	1
TOTALS	2,539	1,783

*\*statistical sample inventory was completed for trees in the boulevard, final number may vary based on actual field inspection, this number represents the maximum possible based on size class of 10” diameter or greater*

**Table 3: Private Ash Trees Eligible for Injection of Emamectin Benzoate**

Category of Property	Total Ash Trees	Ash Eligible for Injection
Front & Back Yard	9,943	6,500*

*\*statistical sample inventory was completed for trees on private property, final number may vary based on actual field inspection, this number represents the maximum possible based on size class of 10” diameter or greater*

Best Management Practice 3: Ash Tree Removal

Ash trees that are found to be infested with EAB at any time of year should be removed during the next possible non-flight (dormant) time of October-April to eliminate a hazardous tree condition and to reduce the beetle population. Wood must be chipped into 1-inch by 1-inch sections to kill larvae and prevent them from maturing. Ash trees that are in fair or good condition with less than one-third (30%) of the canopy affected on City or private property would be eligible for removal exemption if they are treated with emamectin benzoate within the next available growing season, and when pesticide application records are remitted to the City.

The City will adopt a proactive program where at any given time during the EAB non-flight period, ash trees will be marked and removed in a series of ash reduction programs:

- a. Proactive Structured Ash Removal
- b. Poor/Fair Condition Ash Removal during City projects
- c. EAB Infested Ash Removal for Sanitation and Hazard Prevention – City Property
- d. EAB Infested Ash Removal for Sanitation and Hazard Prevention – Private Property

**a. Proactive Structured Ash Removal**

Proactive structured ash removal would call for the removal of trees that may not yet be infested on City boulevards and maintained areas of parks, facilities and utility properties. The purpose of this BMP is to spread out the cost and number of removals over a 10-year time instead of waiting for them to die, overwhelming City crews and budgets. The trees would be smaller than ten inches in diameter (ineligible to inject), in conflict with infrastructure, or in poor or fair condition with significant structural defects. It might also include reducing the number of ash trees on a City property or boulevard that has an excess of that species planted, with other established trees nearby to readily fill the canopy.



Based on tree inventory data, City departments can follow some recommended ash removal targets to ensure staff and budgets (if contractors are needed) are not overwhelmed. Most of the structured removals are front-loaded ensuring ash that do not meet injection criteria are removed before they start showing signs of infestation, making them safer to remove and less likely to become a public safety risk. Adjacent residents whose boulevard ash trees are planned for removal would be notified by mail in advance regarding the planned work. Since City parks have so few trees to remove, it is recommended they are handled within the first five years of the program to make space for replanting. Since trees are living, dynamic organisms, they change so some trees originally slated for injection may be moved to the “remove” list if they succumb to storm damage or otherwise become less desirable to treat. These numbers provide a baseline to work from.

**Structured Ash Removals on City Property:**

**Table 4: Boulevards: Recommended Minimum Targets: Proactive Structured Ash Removals by Year**

5-year increments	Number of trees to remove each year	Totals
2018-2022	69	345
2023-2027*	35	172
TOTAL		517

**Table 5: Parks: Recommended Minimum Targets: Proactive Structured Ash Removals by Year**

5-year increments	Number of trees to remove each year	Totals
2018-2022	43	217
2023-2027*	0	0
TOTAL		217

**Table 6: Facilities and Utility: Recommended Minimum Targets: Proactive Structured Ash Removals by Year**

5-year increments	Number of trees to remove each year	Totals
2018-2022	4 to 5	22
2023-2027*	0	0
TOTAL		22

*\*by this point in time, most of these trees are likely to show some signs of infestation so the removals are front-loaded to reduce the number of infested trees*

**b. Poor Condition Ash Removal during City projects**

During certain City infrastructure projects such as street reconstruction, any poor or fair condition ash trees will be removed if they do not meet the requirements for preservation by injection. The trees in this group overlap with the ash population that would be slated for the structured removal program. Since there are usually tree removals associated with planned Capital Improvement Project, removing poor and fair condition ash as part of the project would be a way to efficiently and cost-effectively accomplish the goal of ash reduction, and ensure staff and contractors are not working around a tree that would eventually be removed anyway. This would be accomplished by the City Forester, Engineering and Construction Services working collaboratively on an approach.

**c. EAB Infested Ash Removal for Sanitation and Hazard Prevention: City Property**

The City will be monitored and inspected throughout the year for EAB infested ash trees. During the insect’s dormant (non-flight) period of October through April, infested trees will be marked and removed by City staff or contractors. Trees in high use areas such as parks and boulevards should be prioritized first for removal to reduce public risk due to hazardous tree conditions.

Infested trees on edges of City outlots, conservation areas, and open space will be removed at the discretion of the City Forester or her representatives to follow best-management practices (BMPs) within budget and time constraints. Currently, the City does not have a comprehensive inventory or estimate of the number of ash trees growing in City outlots or conservation areas. As estimate may be obtained as time and budgeted funds are available. In general, infested trees found in deep wooded City out lots or conservation areas that will not impact public safety or an adjacent private property will not be removed. The reason for this is twofold: damage to adjacent natural resources often exceeds the overall environmental benefits of removal, and the costs and staff time associated with the volume of removals will likely exceed budget constraints. If an ash

tree becomes infested within a City owned natural area of any kind, it will be removed only if it is within 75-100 feet of a developed/utilized area of any property type. This practice does not provide optimum sanitation to reduce EAB but acknowledges the reality of staff and budget constraints and places a realistic focus on those trees will most impact public safety. Ash tree mature heights range from 65-80 feet tall. The following guidelines will be utilized in the field to determine if an infested ash tree would qualify for removal:

**Table 7: Infested Ash Removal Guidelines on Unmaintained (naturalized) City Property**

Infested Ash Tree is Located on this Category of City Property	Infested Ash Tree will be Marked for Removal within:
Unmaintained area Adjacent to a City Trail	75 Feet
Conservation Area, Outlot, or Natural Area Adjacent to a Public or Private Street	100 Feet
Conservation Area, Outlot, or Natural Area Adjacent to a Maintained Park, Facility, or Private Property	100 Feet

**d. EAB Infested Ash Removal for Sanitation and Hazard (High Risk) Prevention: Private Property**

The almost 10,000 ash trees growing on private property will also be monitored and inspected throughout the year for EAB infested ash trees. Although the City does not seek to encourage removals during the flight period of May-September, door hangers could be left for residents during that time if wood pecking consistent with EAB symptoms are detected. This might encourage a resident to have the tree injected or to prepare for the tree inspector to return in the winter and potentially mark the tree for removal. In addition, removal during the “flight period” may be warranted if the tree has an imminent risk of failure which would impact a target such as a home or the street. This type of public service would be dependent on staffing levels. During the insect’s dormant (non-flight) period of October through April, infested trees will be marked by a City tree inspector and removed and paid for by the resident. If the property owner does not act in the time designated on the City notices, the City would request a quote from a private tree contractor to remove the tree and invoice and/or place all costs on the property owner’s taxes as a special assessment.

Lakeville has a Shade Tree Epidemic Pest Control Ordinance in Title 4, Chapter 4 of the City Code to allow for the described program to occur, and for infested trees to be declared a

“nuisance” requiring abatement. Abatement measures would include tree removal and appropriate disposal of wood. Although it is new program to the City of Lakeville, Shade Tree Disease Control Programs have been underway controlling oak wilt, Dutch elm disease and EAB in other nearby cities including Apple Valley, Eagan, and Burnsville as well as other comparable cities throughout the metro area including Eden Prairie, Minnetonka, Plymouth, and St. Louis Park. Many of these cities have had a program for decades.

During the early infestation, all removals would need to take place by early April, so that staff would have time to take enforcement by a City designated contractor by May 1<sup>st</sup>, the earliest possible date EAB adults mature and start to fly. When the City’s infestation is so advanced that EAB infestations are covering the City, the program would shift to minimizing public safety risks from dying trees instead of minimizing the risk of spreading EAB. At that point it may become necessary to mark and require the removal of infested ash trees throughout the entire year to keep up with hazardous tree identification. Conditions will be monitored by the City Forester with assistance from the Minnesota Department of Agriculture and other Minnesota cities who have experience with later-stage infestations.

Like the City property guidelines, infested ash trees growing in “unmaintained” deep wooded lots, wetland edges, or agricultural lands that will not impact public safety or an adjacent private property will not be marked for removal unless they meet specific distance criteria:

- Infested trees growing within developed/utilized portions of a parcel will be marked.
- Infested ash trees within 100 feet from a developed/utilized portion of a private property parcel, maintained City park, City/private street will be marked.
- Infested ash trees within 75 feet from a City trail will be marked.

**Table 8: Infested Ash Removal Guidelines on Unmaintained (naturalized) Private Property**

Infested Ash Tree is in an Unmaintained Area on Private Property	Infested Ash Tree will be Marked for Removal within:
Adjacent to a Private Property Maintained area (same property owner or another)	100
Adjacent to a Maintained City Park, Public or Private Street	100
Adjacent to a City Trail	75

To assist residents with the requirement to remove infested ash trees; the following are some programs that should be implemented:

- Continue to inspect ash trees by request when they are reported to be showing signs/symptoms of EAB
- Offer workshops or neighborhood meetings to share information
- Give a “Frequently Asked Questions” information sheet in every infested tree notification letter to guide residents through the process and provide detailed assistance on the City’s website.
- Consider an “extension” of time for property owners having 75 diameter inches or more marked on their property at one time, which could be applied to commercial properties, homeowner associations or public entities such as the school district.
- Consider a nuisance abatement agreement or other agreement which would authorize the City to send their designated contractor to remove an infested tree if the property owner communicated an inability to remove the tree in the time established by the City. The tree would in many cases, get removed ahead of the removal deadline without the additional administrative burden of certified letters. This type of program would be useful in situations where an individual loses a job, experiences a death in the family, or for an individual on a fixed-income due to retirement status or disability.

The following are some program that could be considered for implementation over time:

- Solicit a private property tree removal bid from professional tree contractors to offer as an option for residents to remove their trees. This would save the resident the time and hassle of getting their own bids, but there would be no guarantee that it would be the least expensive option which would be communicated. It could also serve as a “consumer protection” option when people do not have to time to investigate whether a contractor is properly insured or licensed by the state.
- To assist residents in finding a reputable tree contractor, consider licensing tree companies at the City-level. This was done at one time in Lakeville’s history, and is common in neighboring cities. The City would need to determine a mechanism for enforcement other than Forestry staff. Currently Minnesota Statutes Chapter 18G.07 requires companies and person conducting tree care activities to be registered with the commissioner, and a searchable database is available to the public, however no liability insurance information is collected. Another option would be a voluntary list whereby

contractors could submit their insurance information and basic company information to be included on a list as a resource for residents distributed by the City. The City licensing or the resource list would not constitute a recommendation to residents, but a starting place to ensure the contractor is not a “fly by night” type operation and that they carry basic liability insurance.

#### Best Management Practice 4: Biological Control

Another option for EAB management on parcels of land 40 acres and above or in densely ash populated corridors is called biological control. The Minnesota Department of Agriculture is the lead agency that implements biological control of invasive species throughout the state.

According to that agency, biological control is defined as using “...natural enemies to bring EAB populations into balance and reduce damage.” It is the only management option that can be applied at the forest landscape level. It is being deployed in southeastern Minnesota in remote natural areas where infested trees cannot be destroyed such as along the river.

There are three types of parasitoid wasps released in Minnesota. Two species attacks the larval stage of EAB under the ash bark. The other species kills EAB eggs that are in bark crevices. These wasps are small like gnats and do not harm humans. They were selected by the US Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) and Forest Service and tested extensively to ensure that they will not negatively impact other species or the environment. APHIS rears these biological control agents at a specialized facility in Brighton, MI and provides them to states with EAB infestations.

Currently, the City of Lakeville does not have any forest land that would meet the requirement for biological control but will remain open to any new or emerging options that would reduce the environmental and economic burden of this pest.

#### **Ash Wood Disposal/Utilization**

The strategies used to dispose of ash wood must meet the current Minnesota Department of Agriculture (MDA) quarantines, which are established by county. Dakota County is under a quarantine. The quarantine prohibits removing any of the following from a quarantined county into a non-quarantined county:

- The emerald ash borer (*Agrilus planipennis*),

- Ash trees (*Fraxinus* spp.), ash limbs and branches, ash stumps and roots, ash logs, ash lumber, ash chips, ash bark chips, and
- Firewood of any hardwood (deciduous) species.

Wood and wood chips from tree removals and pruning by City crews is being deposited in the Central Maintenance Facility (CMF) yard and removed by the Shakopee Mdewakanton Sioux Community (SMSC) Organics Recycling Facility at no cost to the City. They create compost, mulch, and use the wood as renewable fuel at Koda Energy, a joint energy initiative between SMSC and Rahr Malting in Shakopee.

The City should implement:

- A contract that would guarantee removal of all wood by May 1st of each year to ensure infested trees are removed from the City before the EAB active flight season starts.
- An analysis of current space for wood waste versus future needs. An alternate waste disposal site could be considered in the event the City's yard is overloaded, or a designated "back up" area at CMF where wood debris can be stored during the peak tree removal period. Capacity needs should consider the possibility of EAB infested wood in addition to a large-scale storm event.

The City will create a list of local wood waste disposal sites to assist residents in processing infested trees properly.

The City should consider exploring:

- Utilizing ash wood for saw logs, which would require specific removal specifications and working with a sawmill operation. There would also need to be space allocated in the CMF yard for storage of saw logs.

### **Management of Ash Trees During Planning and Development Review**

In addition to a Shade Tree Ordinance, several existing ordinances and procedures that pertain to tree planting and tree preservation during the Planning and Development Review process should be updated to prohibit planting ash trees, favoring ash removal for trees under ten inches in diameter or within buffer areas adjacent to developed land. In addition, a mechanism to require replanting after ash tree removal on commercial, industrial, or multi-family housing will help ensure future screening and canopy in those spaces. An overall measure that would assist with preventing a future insect/disease wiping out an entire canopy would be to require new

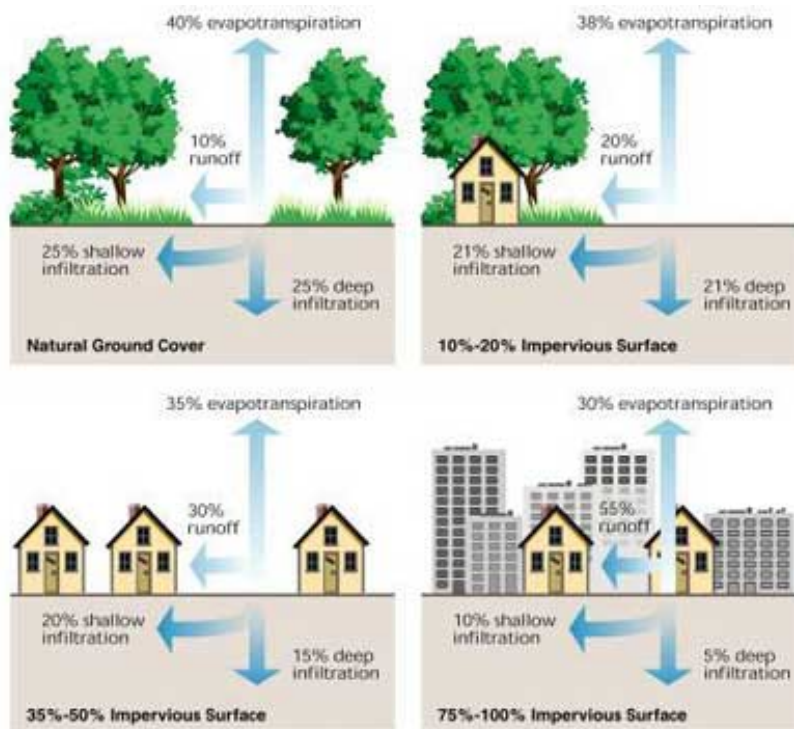
developments or redevelopments provide a more defined level of species diversity for each landscape plan that is reviewed.



## Reforestation and Canopy Replacement

According to an i-Tree Canopy analysis conducted in January 2017, the City of Lakeville's tree canopy covers approximately 27% of the entire City (based on 2017 aerial photography). The i-Tree Program is a suite of peer-reviewed, online tools created by the USDA Forest Service and several other agencies to assess and manage forests and community trees. The analysis was conducted by the City's GreenCorps member to determine canopy coverage in the first year that EAB was found in the City. The i-Tree Canopy program estimates tree cover and tree benefits for a given area with a random sampling process that allows the user to classify ground cover types. Over time, as a community develops, natural ground cover and forest land is often lost. With the loss of trees and canopy cover, the tree benefits are lost as well. In particular, a community loses the valuable natural stormwater interception services of trees to the impervious surfaces of buildings and streets which increases runoff, negatively affecting the water quality of lakes and streams in the area. Canopy cover can be maintained or increased by proper tree planting and care across the community. For example, even though the City of Saint Paul is an urban area, their canopy cover was 32.5% in 2009, the first year EAB was found.

Figure 3: Runoff Volumes will Increase Based on the Percent of Impervious Surface



*Higher volumes of runoff result in flooding, water pollution, and erosion. Photo courtesy of LEARN NC, [www.learnnc.org](http://www.learnnc.org)*

## 1. Public Property Reforestation

It is recommended that ash trees lost on maintained City parks, facilities and utility properties are all replaced at a one-for-one replacement. Each tree lost in those high value public spaces would be replaced with a tree that would improve the species diversity of that property and the entire system. Some of the ash trees slated for preservation on City property in the first six to ten years may be removed and replaced due to changes in physical condition or to slowly reduce the burden of treatment costs. Currently, the City has too many ash, crabapple, maple, spruce, and linden/basswood so those species would not be favored. In general, the “10 percent rule” by Dr. Frank Santamour, US National Arboretum geneticist will be followed. The rule proposes no more than 10 percent of any one species should make up the tree population, no more than 20 percent of any genus, and no more than 30 percent of any one family. An application of this rule would be that no more than 10 percent of Lakeville’s parks should be bur oaks, no more than 20 percent should be in the Quercus (oak) genus, and no more than 30 percent should be in the Fagaceae family (oaks, beech, chestnut). It is regarded as a rule that has some limitations, and many urban foresters believe each percentage should be even smaller, but it is a good starting point to work from. Percentages for City property can be viewed in the computer-based inventory which is updated as trees are removed and planted.

Although boulevard tree planting is prohibited in most areas, there are unique corridors that are heavily planted with ash trees. Some of the ash trees would be preserved with stem injections, but those that are too small or in poor condition should be replaced with a diverse group of trees. Examples of these corridors include along Ipava Avenue and Kensington Boulevard. Although symmetry and repetition are planting concepts often implemented with traditional landscape designs, they run in opposition with promoting species diversity. Monoculture type plantings where one to two species are utilized increase the chance an entire space is clear cut when a non-native disease or insect like EAB is introduced. Instead, there will be a less formal appearance in the boulevard planting areas; shifting to more of a specimen-based arboretum style planting. Repetition can be used, but the patterns could be more complex with a longer stretch of space before species are repeated in the planting design. In neighborhoods where boulevard trees are not eligible for preservation by injection and are lost in front of homes, residents may be angry that their trees will not be replaced. It would be useful to create a budget for the Lakeville Arbor Day Tree Sale so that the City can help reduce the cost of the trees for residents to purchase and plant on their own property. It is currently a program that pays for itself, so the cost of the trees for residents is usually more than wholesale, but less than retail on a per-tree basis.

Infested ash trees lost in city outlots, conservation areas or other natural spaces would only be replanted as part of a larger natural resource plan which would also minimize non-native invasive species like European buckthorn and garlic mustard. This program would be a joint Public Works collaboration between Environmental Resources and Forestry but would not be the main reforestation focus during the peak of EAB infestation unless significant resources were diverted.

In general, the best way to maximize the number and diversity of trees planted is to use all available planting stock types: bare root, container and balled-and-burlap (B&B). Currently most of the trees planted on City property are handled by contractors, but there are additional creative ways to plant trees without driving up a planting budget. As part of the replanting plan, the City should implement a three-year aftercare program. Stressed trees are more susceptible to diseases and insect pests. Each tree needs to be watered and checked weekly during the growing season of May through October for a minimum of three years to ensure the City’s investment is retained and the tree continues to mature and provide ecosystem services and benefits. At a minimum, one additional seasonal employee working forty hours a week should be charged with this task when tree planting on City property commences on a larger scale. New trees should not be planted at an increased rate unless new seasonal staff or resources are committed to ensure each tree is watered once weekly during the growing season.

**Table 9: Reforestation and Canopy Replacement Recommended Minimum Targets**

Property Type	Number of Trees Removed	Replant Rate	Number of Trees to Replant
Parks, Facilities, and Utilities	239 trees	100%	239
Boulevards	517	15%*	78
TOTALS	756	N/A	293

*\* Replanting in select corridors only, the City does not allow boulevard tree planting*

In addition, the City should consider:

- Installing a gravel bed to maximize the use of lower cost, quicker establishing bare root trees. A gravel bed is an above ground irrigated “box” filled with pea gravel that encourages dense root growth. Certain species do better than others in this bed, so it would not be an exclusive nursery solution, but one aspect to implement.

- Utilizing existing permanent staff and adding additional specialized seasonal staff such as Certified Tree Inspectors to assist with replanting, watering and care from May through October of each year.
- Host a planting event in the park for residents to learn from, and use trained volunteers to assist such as the MN Tree Care Advisors.
- Utilize Sentence to Serve (STS) and/or Institutional Community Work Crews (ICW crews) to assist in ensuring trees stay mulched and have tree guards and watering bags on at the appropriate time of year.
- Fund the Arbor Day Tree Sale or other tree replacement incentive program to encourage property owners to replant trees on their property (out of the boulevard) after an ash tree is removed from the boulevard.

## 2. Private Property (non-City) Reforestation

Like City property, the private property community forest has too many spruce, crabapple, ash, maple and arborvitae. The City needs to actively advocate for a more diverse palette of trees to be planted by homeowners, schools, developers, and property managers.

The City has offered the Arbor Day Tree and Shrub Sale for many years, selling 200-300 trees each year at less than retail cost. Although it is a popular program for those who are aware of it, there is a lot more room for growth. It would be ideal to have more households or Lakeville organizations participate, increasing the number of trees sold and planted in the community. Forestry and Parks staff have increased promotion of the event and will continue to do so over time. The program typically offers at least eight different lesser-known species that property owners can choose from. The species that are already overplanted in the City such as maple, spruce or crabapple will generally not be offered, since the purpose of the program is to increase canopy cover as well as insect/disease resilience throughout the community forest. The program could be expanded to encourage property owners to replant on private property after their boulevard and/or yard tree is lost due to EAB; conversely, there could be another paradigm introduced that would incentivize replanting on private property such as a “trade-a-tree” program.

Commercial, Industrial and Multiple-Family parcel-owners should be encouraged to replant after EAB infested trees are removed to improve and preserve the aesthetics of these areas in Lakeville, and to try to recapture the tree benefits over time. The current ordinances related to

trees may need to be amended to ensure the “conditions of approval” that the developments were approved with are fulfilled to ensure entire parking lots or parcels are not clear cut when ash (that are not injected) die from EAB. In some cases, ash trees will be preserved and would not need to be replaced.

## **Conclusion**

Emerald ash borer is a significant “predicable” natural disaster facing the City of Lakeville but following a systematic, proactive plan and leveraging appropriate resources to respond will minimize the fiscal and environmental impacts of the pest. The EAB Management Plan is consistent with the City’s vision statement which seeks to offer “...exceptional parks, trails and recreational opportunities;” in addition to “...safe neighborhoods; and responsive and cost-effective public services together (to) create a place we are proud to call home.” and should be implemented immediately to manage the beetle population and preserve the benefits that ash trees provide to the community.