City Of Northfield Minnesota

Management Plan for the Emerald Ash Borer

July 2017

Executive Summary

Purpose:

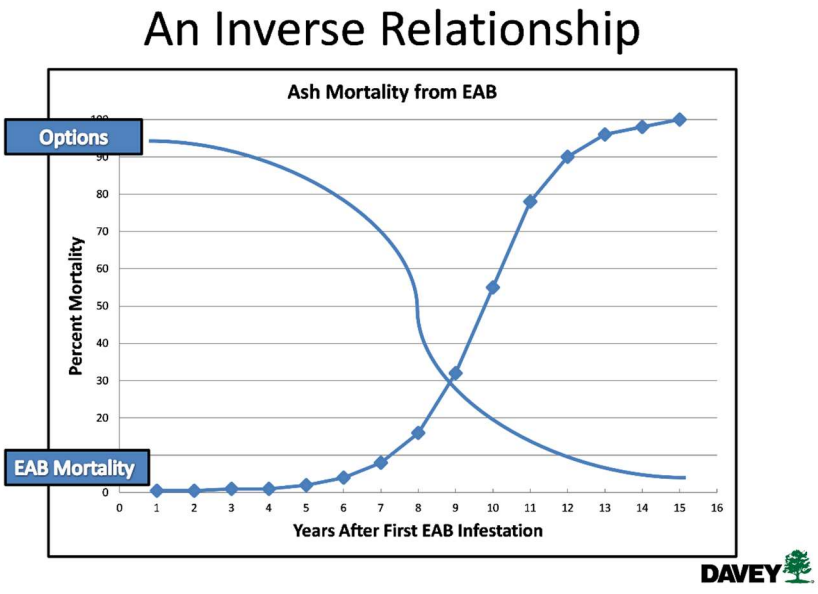
To guide the City of Northfield in limiting the economic and environmental effects of an Emerald Ash Borer (EAB) infestation.

Overview:

EAB was first detected in St. Paul, Minnesota in 2009. It then spread across several counties, including some that border Rice County. Although it has not been officially detected in Northfield or Rice County it is likely already here. Northfield has 1,909 Ash trees on its boulevards and parks all of which will become infested and die if they are not treated.

Key Elements to Understanding the Threat Posed by EAB:

- It can take years for EAB to build a large enough population to infest an entire tree.
- Ash trees can survive with a low level infestation for a few years.
- EAB typically isn't detected until it has been in the area for 2-4 years.
- EAB infestations follow an exponential growth rate (See graph below).
- After 5-6 years of an infestation the number of dead trees skyrockets often overwhelming the city if there is no plan in place.
- Without treatment Ash trees have virtually zero chance of survival.
- Once a tree shows symptoms it will generally die within 1-2 years.
- Dead trees are a liability to the City as they become brittle and are inclined to fall making them hazardous to the general public.



Goals:

1. **Preserve High Quality Ash Trees** - This allows the City to continue to receive benefits provided by the trees while reducing the economic, environmental and aesthetic impact resulting from the rapid demise of Northfield's Ash tree population.
2. **Slow the Spread** - By beginning treatment soon, the City should be able to slow the infestation rate through the reduction of pest pressure.
3. **Improve Tree Diversity** - Replacing removed Ash trees with a diverse range of tree species will not only help with reforestation, but also eliminate monocultures that could leave the City susceptible to yet another large die off in the future.
4. **Postpone and Decrease Peak Ash Mortality** - Due to the exponential infestation rate of EAB, the vast majority of trees will die during a 3-5 year period beginning around year 4 of the infestation. Pre-emptive removal and treatment will help spread out the cost and reduce the number of dying trees.
5. **Minimize Public Costs -** Using treatment will reduce the annual costs during the peak mortality period.

Plan Recommendation:

On July 13th, 2017, the Environmental Quality Commission (EQC) reviewed five options[1] for managing EAB. Based on these goals and the constraints of the City budget, the EQC voted to recommend option three, the 50-50-50 plan, which is summarized as follows:

- Remove approximately 50% of all Ash trees
- Replace the removed 50% at a 1:1 ratio with new, more diverse tree species
- Treat the remaining 50% bi-annually with an injection known as Emamectin Benzoate

Budget:

Outcome	Timeframe	Number of Trees	Anticipated Total Cost
Remove	1-8 years	963	$265,563
Replace	1-10 years	963	$337,400
Treat	1-10 years	946	$623,295
Total			**$1,226,258**

Key Recommendations:

- Begin treatment/removal as soon as possible and reevaluate plan on yearly basis.
- Communicate with the public via the City website, utility bills and public forums.

[1] Details on these recommendations can be found in the original plan that was presented to the EQC

- Remove smaller trees sooner while they are still cheaper to cut.

Additional Background

Definitions:

Biomass - The total mass of organisms in a given area or volume.
Diameter at Breast Height (DBH) - The diameter of a tree measured from approximately 4.5' off the ground.

Background:

Emerald Ash Borer, an invasive beetle from Asia, was first discovered in Michigan in 2002. In the years since it has spread to 29 states costing billions of dollars to manage and decimating Ash tree populations across the country. Found in St. Paul back in 2009, EAB is established and moving across the state.

Current Situation:

Based off the tree inventory completed in August of 2016, the City of Northfield has 1,909 ash trees on its property, which account for about 16% of the city's urban forest and 23% of its biomass[2]. Although there are currently no known EAB infestations in Northfield or Rice County, both are at high risk due to infestations in the neighboring counties of Scott, Dakota and Goodhue. There is no way to prevent an infestation from occurring however, with proactive management, Northfield can mitigate the effects and spread out the cost. Currently there is a $65,000 budget to maintain the urban forest on public land such as boulevards. In 2016 approximately $45,000[3] of it was spent on removing/grinding/replacing 110 trees. The remaining money was used for pruning and other maintenance related costs. There is an additional $5,000 allocated to the maintenance of park trees. The City should expect a significant increase in budget needs stemming from EAB.

Factors to Consider:

Benefits of Trees

Trees provide numerous economic, health and environmental benefits to the City of Northfield. From an economic perspective, healthy trees lower energy costs, increase property values, and reduce pressure on storm drainage systems[4]. Health wise, trees decrease the amount of pollutants in the air, improve water quality and have a positive effect on mental health[5]. Finally trees support the ecosystem and help combat the effects of climate change by removing carbon dioxide from the air.

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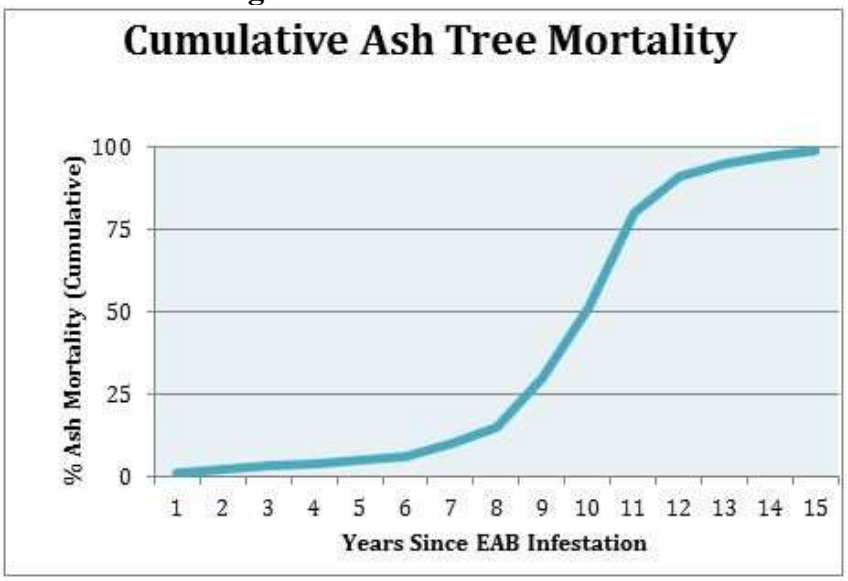
[2] Source: Northfield Urban Forest Asset Management Plan developed by Katie Himanga on February 3rd, 2014.
[3] Estimates based off GIS data and prices stated in current contract with Cannon River Tree Care LLC
[4] Source: https://www.arborday.org/trees/benefits.cfm
[5] Ibid

Infestation Pattern

Evidence from other states indicate it takes 5-10 years for EAB to infest and kill the majority of trees in an area. Although the infestation typically starts off small, it grows exponentially as shown in Figure 1. Once an area develops an EAB infestation it typically takes about eight years before all untreated Ash trees succumb to the infestation and die. Tree deaths follow a death curve that grows exponentially, so the majority of the trees will die between years four and eight. Ash trees typically die two years after showing symptoms of EAB[6] although this depends on both size of the tree and the degree of the infestation. It is difficult to place where Northfield is on this model although it is likely the City is at least one to three years into the infestation. Since Ash trees generally don't show visible symptoms of EAB until they are highly infested, it is difficult to detect. Once EAB is found it is generally safe to assume it has been in the area for three to four years.

Figure 1: EAB Death Curve



EQC Recommendation (50-50-50 Plan):

General Overview

This plan aims to spread out the cost of dealing with EAB by only removing half of Northfield's Ash trees and preserving the rest through treatment. This also allows the City to continue to receive benefits from the trees while reducing environmental and aesthetic effects of removing all the trees at once. Finally, by treating trees, the City maintains the ability to switch to other methods as newer EAB prevention strategies are developed. Figure 2 offers a generalized cost breakdown by outcome and the time frame associated with those costs. Figure 3

[6] http://www.emeraldashborer.info/faq.php

offers a more detailed breakdown of the trees and the outcome based on size and condition.

Figure 2

YEAR	REMOVAL COST	REPLACEMENT COST	TREATMENT COST	YEARLY COST
1	$33,195	$33,740	$58,098	$125,033
2	$33,195	$33,740	$58,055	$124,990
3	$33,195	$33,740	$60,245	$127,180
4	$33,195	$33,740	$60,161	$127,096
5	$33,195	$33,740	$62,391	$129,326
6	$33,195	$33,740	$62,267	$129,202
7	$33,195	$33,740	$64,538	$131,473
8	$33,195	$33,740	$64,373	$131,308
9		$33,740	$66,684	$100,424
10		$33,740	$66,479	$100,219

Figure 3

Condition of Tree	DBH Range	Total Number of Trees	Number of Trees Removed and Replaced	Number of Trees Treated
<13" DBH	<13"	842	842	0
Unknown	8-23"	1	1	0
Very Poor	8-23"	1	1	0
Poor	18-42"	5	5	0
Fair	13-36"	25	25	0
Good	<19"	89	89	0
	>19"	177	0	177
Very Good	13-38"	652	0	652
Excellent	13-35"	117	0	117
Total		**1909**	**963**	**946**

Plan Specifics:

Removal

Trees selected for removal met the following conditions:

- DBH less than 13 inches regardless of condition
- Had a rating of Fair or worse
- Were given a Good rating but were less than 19 inches

In addition to low quality trees, smaller trees were selected because they are both cheaper to remove and offer the city fewer benefits.

After Ash trees become infested it is important to remove them as quickly as possible. Once dead, Ash trees become brittle making them apt to fall and cause damage for which the City is liable. In addition dead Ash trees are hazardous to remove. Some cities, such as Minneapolis, have found that immediate removal of infested trees reduces the rate at which EAB spreads.

Replacement

This plan calls for the replacement of all 963 removed Ash trees. Although the City should try to replace the trees as they are removed, this may not be possible. In this case, the City could delay the replacement of some Ash trees.

Treatment

Emamectin Benzoate, the injection recommended for treatment, is effective for two years and has no known effect on pollinators or other organisms. The original recommendation for this plan assumes all the trees are treated every two years for ten year period with each tree receiving a total of five treatments in that time frame. After the ten year mark the City will reevaluate and decide whether to continue with treatment at all or if the frequency or number of trees treated can be reduced. Although bi-annual treatment is assumed, recent research has suggested that Emamectin Benzoate may be effective for up to three years or longer depending on pest pressure.

Budget:

The budget was calculated using a model developed by Rainbow TreeCare.

Description of Model Used

The purpose of this Simplified Model is to generate cost-benefit estimates for 11 variables: Number and average size of ash trees in two categories (high-quality and low-quality trees); percent treated, treatment frequency, and treatment cost; average removal cost; tree replacement rate; and the average cost for the purchase, installation, and additional maintenance for a new tree. The estimates are based on the cost-benefit assumptions in the full EAB analysis developed by Rainbow TreeCare. The full EAB analysis compares 2 primary scenarios over a 20-year

study period: **The Base Case** (emphasis added by author) represents the strategy used by cities first hit by EAB (and some cities currently). It assumes no preemptive actions are taken but trees are replaced as they succumb to the infestation. Scientific advancements have since shown that this original strategy is the most economically and environmentally damaging approach. The Ash Tree Preservation (ATP) Plan incorporates the most current science-based research designed to minimize the economic and environmental impacts of the infestation. The ATP Plan assumes the removal and replacement of low-quality ash trees and the long-term treatment of healthy trees in order to minimize costs, especially peak-period costs (Years 4-8), minimize peak-period debris management, preserve tree benefits, and enable the orderly transition to a more diversified urban forest. Unlike the full EAB analysis, these estimations cannot account for additional scenarios that include the effects of preemptive removals, hazard tree removals, treatments for staged removals, or subsidy programs for trees on private property.

Table 1: 10 Year Budget Comparison of 50-50-50 Plan vs Base Case

Years 1-10		Base Case	50-50-50 Plan
Costs			
	Removal Costs	$833,163	$265,563
	New Tree Costs	$668,500	$337,400
	Treatment Costs		$623,295
	Total Costs	$1,501,663	$1,226,258
	Cost Savings		**$275,405**
Cumulative Tree Value		$1,715,546	$3,379,952

The benefits quantified in this model are as follows: Increase in property values, intercepted storm water, energy conservation (electricity and natural gas), CO2 reduction and avoided health care costs. This model also takes into consideration that only about 70% of trees in an urban forest are high value trees.

Summary: After reviewing five options, the EQC voted to recommend the 50-50-50 plan. By treating 50% of Northfield's larger, high quality Ash trees, the City reduces the environmental and economic impact of an EAB infestation, while expanding the City's timeframe for finding better solutions for managing EAB. Removing and replacing the remaining 50% of Northfield's smaller, lower quality Ash trees allows the City to begin a shift to a more diverse urban canopy while lowering removal costs.