

Guidelines for Managing Emerald Ash Borer in Minnesota Communities

Department of Natural Resources – Division of Forestry

November, 2009

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Introduction

Emerald Ash Borer (*Agrilus planipennis*) was first identified in North America in 2002 in Detroit and surrounding communities. At that time, thousands of ash trees were observed declining and dying. Attempts at containment and eradication resulted in millions of ash trees being removed and destroyed in southeast Michigan. In successive years, populations of EAB were found in Ohio, Indiana, Ontario, Illinois, Maryland, Missouri, Wisconsin, and West Virginia. Minnesota's first EAB infestation was identified in St. Paul in the spring of 2009. In addition, an infestation in Wisconsin was identified just across the Mississippi River from Houston County

Emerald Ash Borer is not native to North America. It is native to parts of Asia, including China and Korea. It is assumed that the beetle arrived in Detroit in wooden pallets or crating material used for shipping. Entomologists believe that the infestation existed in the Detroit area for 10 years or more before widespread tree mortality brought it to the attention of city foresters.

All ash species native to North America are susceptible to EAB. In Minnesota that includes green ash, white ash, and black ash. The beetle seems to have a stronger attraction to ash trees that are under stress, but as populations increase the beetles readily attack trees regardless of their vigor. There has been no natural resistance observed in our native ash populations; ash mortality is nearly 100% in heavily infested areas.

The purpose of this document is to assist Minnesota communities with planning for the eventual arrival of Emerald Ash Borer and managing its impact on their community forest. This is intended as a guide to identify the major issues confronting communities and establishing a framework to deal with them.

In Minnesota, state and federal agencies have defined roles in dealing with EAB and other invasive, non-native plant pests. These roles are specified in the **Minnesota Emerald Ash Borer Readiness Plan**. See <http://www.mda.state.mn.us/plants/pestmanagement/eab/eabplanning.aspx> .

USDA Animal and Plant Health Inspection Service is the federal regulatory agency responsible for EAB confirmation, federal quarantine and compliance agreements;

Minnesota Department of Agriculture is the state regulatory agency responsible for survey and delimiting new infestations, state quarantine and compliance agreements;

Minnesota Department of Natural Resources is the state agency responsible for long-term management once EAB has become widely established, wood utilization, reforestation, state and private land assistance, and financial assistance (if available);

University of Minnesota is responsible for research and control recommendations;

Minnesota Extension Service helps to distribute science-based information to homeowners.

USDA Forest Service provides technical assistance to states and communities on inventory, planning, reforestation and wood utilization.

Discussion

The first EAB infestations in Minnesota will be subject to significant regulatory action. Quarantines will be put in place by state or federal agencies to regulate the movement of any potentially infested ash material – firewood, nursery stock, logs, brush, and chips. State quarantines typically follow county boundaries and federal quarantines typically follow state boundaries. Ash material may be moved within the quarantine zone, but cannot be moved outside the quarantine unless it meets standards that assure it is harmless and it is covered by a compliance agreement with the appropriate agency. Depending on specific circumstances, early or isolated infestations may also be subject to additional measures such as tree removal and establishment of trap trees in an attempt to define and contain the infestation.

As more infestations are found and the infested areas begin to coalesce into a larger area, quarantine areas will expand. Control tactics will change somewhat and there will be more emphasis on long-term management across a wider landscape.

This document is intended to help communities prepare for EAB before it has been identified within or adjacent to the community. If communities take immediate action to prepare for EAB the eventual impact may be spread over a decade or more rather than being absorbed in a relatively short period of time.

Preparedness Plan

1. Inventory

The first step to managing a resource is to know what you have, where it's located, and its condition. Communities need to have an up-to-date tree inventory to fully understand the potential impact of EAB on the community's forest resource. If the community has an existing street tree inventory, that's a great place to start. If the community does not have an inventory, managers should strongly consider a complete inventory.

A complete street tree inventory will provide information on all species, not just ash. This will allow analysis of the total population including predictions on the impact of removal of all ash trees. USDA Forest Service has an excellent tool for making this sort of analysis called STRATUM as part of their i-Tree software suite. It can be accessed through www.itreetools.org.

If a complete inventory seems cost-prohibitive, consider a sample inventory. In this process, the community is divided into zones based on land use and a subset of representative street segments are selected. The sample inventory can be completed much more quickly than a complete street tree inventory. It doesn't provide the same level of management detail, but sample findings can be extrapolated across the whole community.

Another alternative is to make a quick survey of just the ash resource. This may be the fastest and least expensive alternative, but it does not provide information on the total tree population.

Whatever system is selected, it need not be elaborate or highly detailed, unless the community forestry manager can use a high degree of detail. At the simplest level, the inventory will provide location information, species, size class, and condition rating. Detailed information on conducting a street tree inventory can be found in DNR's MN ReLeaf Grant Guidelines. See the "Inventory Decision Model" at :

http://files.dnr.state.mn.us/assistance/grants/forestmgmt/releaf_appendixc.pdf.

In addition to a street tree inventory, community managers should make an assessment of the ash population on private property and in natural areas within and adjacent to the community.

2. Analysis and Cost Calculation

With inventory data in hand, community managers can estimate the costs anticipated with managing EAB. All ash trees that are not chemically treated will likely die once an infestation gets established and beetle populations build. If communities do little or nothing, tree losses will occur within a relatively short period of time after tree mortality is first observed. Street and park trees and trees on private property will need to be removed regardless of the community's decisions on EAB management. If the community makes diligent efforts at control before and during an infestation, the losses may be spread over a decade or more, distributing the costs over several budget cycles. This approach will reduce short-term environmental impact in the community and also reduce emotional and economic stress on community residents.

EAB Associated Costs

Survey -- additional field staff will be required to survey and track an infestation; include additional vehicle costs and overhead costs;

Tree removal – estimate removal costs based on ash size class; delaying removal will only make the process more expensive as trees become brittle and hazardous;

Disposal and utilization site – operation of a disposal site(s) may require staff time, equipment, land, and other associated costs;

Chemical treatment – some communities may decide to treat some public trees with insecticides and/or cost-share treatments with adjacent property owners;

Reforestation – even as costs increase for tree removal, citizens may demand prompt reforestation;

Management and administration – EAB workload will place additional demands on managerial and clerical workers for planning, contract administration, and communication.

Purdue University has developed an on-line cost calculator that can help communities estimate what future costs will be. This tool can be found at

<http://extension.entm.purdue.edu/treecomputer/index.php>

3. Surveying for EAB

In the early stages of EAB, Minnesota Department of Agriculture coordinates the statewide detection survey in cooperation with USDA–APHIS. Survey techniques consist of a network of ash “trap trees” and purple sticky traps that are placed in or adjacent to ash trees. Adult EAB seem to have some preference for the color purple and are attracted by a lure suspended inside the trap. As beetles are drawn to the trap during their summer flight period, they may be caught on the sticky surface of the trap. Adult beetles also have a preference for ash trees that are under stress, so trap trees that have been girdled with a chainsaw or other tool may be used to attract any adult beetles that are present in the community. At the end of the growing season, the trap trees will be felled and peeled to search for larval galleries. Communities are urged to assist the Minnesota Department of Agriculture by helping them identify locations for the purple traps and offering up ash trees that can be destroyed as trap trees. At this point, communities should not set up their own trap trees without involving the Minnesota Department of Agriculture as this could interfere with the effectiveness of their survey.

Once a new infestation has been identified, state and federal agencies will follow up with intensive surveys to determine the extent of the infestation. Community cooperation will be critical for this effort. Communities should be ready to contribute staff time for survey as well as communication with the public.

Once EAB becomes more widely established around the state, MDA’s role for survey will likely diminish within quarantined zones. At this point communities will likely be expected to pick up more of their own survey similar to the work Certified Tree Inspectors have done for Dutch elm disease and oak wilt for years. Early detection of EAB is much more difficult than Dutch elm disease. Tree inspectors will receive training on identifying suspect ash trees based on woodpecker activity in the crown, foliar symptoms, branch dieback, epicormic sprouting, EAB exit holes, and bark splitting. Positive confirmation of EAB may require observation of larval galleries under the bark or the presence of one or more EAB life stages.

With current technology, it is impossible to detect emerald ash borer as they invade individual trees or communities. Often, “new” infestations are not detected until several years after the initial infestation. Once a tree has begun to exhibit even subtle signs of EAB infestation, several generations of beetles will have been produced in the tree. The goal of an effective community program is to keep the rate of ash mortality relatively low by holding the beetle population at low levels. At low levels, emerging adult beetles frequently re-infest the same tree or fly only a short distance to infest another tree. As beetle populations build up, adult beetles travel farther to infest host trees, and the rate of ash mortality increases rapidly.

Communities will have to determine a trigger point at which infested ash trees must be removed and the wood properly disposed or utilized.

4. Ordinance

Communities that have a tree health ordinance that was put in place years ago for control of Dutch elm disease and oak wilt will have to amend their ordinance to allow them to manage new invasive pests like Emerald Ash Borer. State statutes have changed and authority that was once directed through the Minnesota Department of Agriculture regulated pest statutes has shifted to Department of Natural Resources forest pest statutes. State agencies, the Minnesota Shade Tree Advisory Committee, and the League of Minnesota Cities have developed an ordinance template that communities can use to amend their local ordinances. It is important to note that local ordinances need to be changed now to accommodate emerald ash borer and other invasive pests, even if the community is currently managing only Dutch elm disease and oak wilt as they have in the past.

The ordinance template can be found at the DNR Community Forestry page under “Preparing for and Dealing with EAB” at <http://www.dnr.state.mn.us/forestry/urban/index.html>.

5. Ash Phloem Reduction

State and federal agencies around the country are developing a set of strategies known as Slow Ash mortality (SLAM). These strategies recognize that EAB is nearly impossible to stop because it is so difficult to detect in the early stages of infestation. However, if landowners at all levels (federal, state, county, municipal, and private) work together, it may be possible to slow the spread of EAB and to keep annual mortality rates at an acceptable level. One of the primary strategies in place under SLAM is to reduce the total amount of ash phloem (the inner bark that transports carbohydrates throughout the tree) available to EAB for larval development.

In communities, that means gradually reducing the number of ash in the total community population even before EAB has been detected. Communities will have to make their own decisions on how to approach this strategy. Based on inventory data, communities should consider setting a target for removal of 5% or more of the total ash population per year. It makes sense to start with ash that are already under stress or declining for whatever reason. Managers may also want to start with trees that are competing with healthy trees of other species. If trees are going to be lost because of a construction project, try to focus those impacts on ash trees while preserving trees of other species.

Without a doubt, removing public ash trees that appear healthy will be controversial. Program managers are going to have to be very clear in their public communication on why trees are being removed and what criteria are used to select individual trees. Communities may want to give homeowners or citizen groups the option of selecting valuable shade trees for chemical treatment rather than removal. Current scientific recommendations discourage chemical treatment until EAB has been discovered within 15 miles of the tree, so identifying trees that may be chemically treated at some future date can create record-keeping challenges. Local program managers will have to develop their own policies that can be supported by elected officials and clearly communicated to property owners.

Natural areas and woodlots within and adjacent to communities present another challenge. Local managers and landowners may want to consider setting up timber sales to remove the volume of large ash trees that will eventually die from EAB while they still have some value. For more information on SLAM strategies, go to “Strategies for Managing EAB Infestations in Minnesota” at <http://www.mda.state.mn.us/plants/pestmanagement/eab/eabstrategies.aspx> .

6. Chemical Options

There are several effective insecticides labeled for EAB control. The toolkit of chemical options and application techniques is likely to change as research advances. This document will not attempt to summarize the options currently available, but will provide a general discussion of the options. For specific information on insecticides, application techniques, rates, timing, and treatment interval, go to

<http://www.extension.umn.edu/issues/eab/EABInsecticideFactSheet.pdf>

Systemic insecticides are an effective tool for the prevention of EAB infestation in individual trees. Research and anecdotal evidence indicates that lightly infested trees may also be treated successfully. Trees that are heavily infested may be too far gone to be saved, but that decision will take experience on the part of applicators on a case by case basis.

Research is ongoing to refine application rates and methods for trunk injections and soil injections. In general, trunk injections seem to provide faster protection and better distribution throughout the tree, but the application method causes wounds in the tree. The wounds are quite small and may not be a factor in the long-term health of the tree, especially with some studies indicating as much as three years of protection. Soil injections are less invasive to the tree, but distribution throughout the tree seems to be less consistent. Some chemicals used for soil injection or soil drench are available for use by homeowners.

In general, the cost of chemical injection is reasonable compared to the cost of removal and the social and environmental value of a healthy, mature ash tree. However, applications must be repeated on an interval from one to three years depending on the chemical and application technique. Even at a reasonable cost it seems unlikely that municipalities or property owners will be willing to treat a high percentage of the ash existing in Minnesota communities. Local program managers will have to determine how many ash trees they can afford to treat and at what point it is more cost effective to remove the tree and replace it with a different species.

Homeowners may ask the city for permission to treat a boulevard tree if the city decides it cannot treat the tree as part of the public program. Program managers need to set criteria to determine if the tree should be injected at all, even with private funds. The Ash Canopy Condition Rating was developed by US Forest Service scientists in Michigan, and it may provide a good basis for setting criteria. Program managers will have to develop a system to track public (and perhaps private) trees that have been injected because this may be considered when deciding on condemnation of infested trees. The city may require written proof that trees were

injected by an applicator that meets certain standards (Licensed Pesticide Applicator, ISA Certified Arborist, etc.).

Research is also underway on the effectiveness of trunk sprays and foliar sprays for control of EAB, with promising results, especially on smaller trees. However, both of these methods offer a greater risk of off-target exposure to the chemicals. Research on the practicality and effectiveness of these methods is ongoing.

7. Tree Removal

In addition to tree removals for the purpose of ash phloem reduction, trees will eventually need to be removed as a necessary step in controlling the size of an existing beetle population. By condemning and removing trees that are known to be infested (or suspected), communities can attempt to manage beetle populations below the threshold where ash mortality becomes epidemic.

Visual signs and symptoms are often indistinct and easily confused with stress and decline from other factors. Positive confirmation of EAB by removing bark from limbs in the middle and upper part of the crown can be very time consuming. Therefore the process of survey and condemnation may require some difficult decisions and continual communication with the public. The Ash Canopy Condition Rating may provide an objective standard along with other visual symptoms and signs (woodpecker activity, foliar feeding or “notching”, epicormic sprouting, and D-shaped exit holes) for identifying suspect trees. If a private homeowner contests the condemnation, then tree inspectors may have to confirm the presence of EAB by cutting removing bark to find larval galleries. Homeowners have to recognize that all untreated ash in the community are likely to die in fairly short order once beetle populations reach a critical level. It is often much cheaper to remove a tree that is still green than to wait for the tree to die and become brittle or hazardous.

Tree removal should be done between September 1 and April 30 of the following year. During the summer months (May through August) adult beetles will be flying in search of an ash tree to feed and lay eggs. At low and moderate population levels, EAB adults often re-infest the tree from which they just emerged. Leaving infested ash trees standing through the summer will allow adult beetles to lay their eggs. After the period of adult flight and egg laying, the trees can be removed and properly treated to prevent the next generation of beetles from developing. Doing removals through the fall and winter, which is generally the off-season for city crews and private contractors, is more cost-effective as well.

Local managers may choose to sacrifice a few ash trees each year as “beetle sinks”. Similar to the technique of creating trap trees, healthy ash trees are girdled in the spring to put them under stress and become more attractive to adult beetles. The trees will be removed in the fall or winter. This technique is not so much a detection tool as it is an attempt to draw free-flying adult beetles that would otherwise find and infest healthy ash trees.

8. Wood Utilization and Disposal

It is important to understand some of regulatory implications of EAB for your management program:

State and Federal quarantines prohibit movement of ash trees, wood and debris out of quarantined areas (<http://www.mda.state.mn.us/plants/pestmanagement/eabquarantine.htm>) MDA has a list of tree waste disposal sites in Ramsey-Hennepin-Houston County. They are in the process of developing lists for other MN Counties , when quarantined areas expand: (<http://www.mda.state.mn.us/news/publications/pestsplants/pestmanagement/ashtreewaste.pdf>).

- Encourage homeowners/tree care companies to dispose of tree waste close to its origin, regardless of whether or not it is diagnosed.
- If companies/residents are going to utilize ash wood and move it out of an infested/quarantine area, ensure they have contacted MDA/USDA to verify treatment of material through compliance agreements.
- Push for the non-movement of firewood from residents, unless treated and approved.
- Educating residents and tree care companies will be key in helping to slow the spread. Inform them of their disposal/utilization options.

If a city is providing residents with waste from ash trees in the form of chips/firewood, encourage residents to keep the material in the City. MDA has sample signs for cities to use at collection sites.

9. Reforestation

EAB and the resulting decline in ash tree populations presents residents, communities & rural landowners with an opportunity to diversify our forests and to think more strategically about where and for what purpose we will plant new trees. Numerous resources are available to assist you in your reforestation efforts. Following are some tools that city foresters have said are the most useful. If you find other technical resources you like, please share them with state agency and U of M staff, so we can post them on line.

- “The Road to a Thoughtful Street Tree Master Plan” is an interactive tool, available on compact disc or at <http://www.lrrb.org/pdf/200832.pdf>
- Series of Recommended Trees for Minnesota Ecoregions:

[Recommended Trees for: Northwest and Central Minnesota](#)

[Recommended Trees for: Southeast Minnesota](#)

[Recommended Trees for: Southwest Minnesota](#)

[Recommended Trees for: Northern Tallgrass Prairie](#)

- The “Midwest Community Tree Guide: Benefits , Costs and Strategic Planting” at <http://na.fs.fed.us/urban/treespayusback/vol1/page4.html>