STATE OF RHODE ISLAND

RI DEM

EMERALD ASH BORER STATEWIDE TECHNICAL RESPONSE PLAN

January 2019

INTRODUCTION

Emerald ash borer (EAB), *Agrilus planipennis*, is an exotic invasive beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002.

EAB is believed to have arrived on solid wood packing material carried in cargo ships or airplanes originating in its native Asia. Since 2002 EAB has spread into Canada, throughout most of the Northeast, Midwest, and Mid-Atlantic states, and continues to expand its range throughout North America wherever native ash grows.

Adult EAB beetles nibble on ash tree foliage but cause little harm. EAB larvae (the immature stage) feed on the inner bark of ash trees, disrupting the tree's ability to transport water and nutrients. Larvae are difficult to detect and can cause significant tree decline before symptoms become evident. Symptoms include thinning crowns, epicormic shoots near the base of the tree, and D-shaped exit holes, seen on the bark of the main stem. Infested trees eventually die, and mortality rates are nearly 100%.

Currently EAB has no known effective natural enemies in North America. If it is not contained or its effects mitigated, this insect will continue to attack all North American species of Ash (genus *Fraxinus*). EAB was also found in white fringetree (*Chionanthus virginicus*) though widespread attack of this species has not been reported.

Since its discovery, EAB has:

- Killed hundreds of millions of Ash in North America
- Caused regulatory agencies and the USDA to establish quarantines and fines to prevent potentially infested Ash logs or hardwood firewood (and other "regulated material") from moving out of areas where EAB occurs
- Cost municipalities, property owners, nursery operators, and forest products industries hundreds of millions of dollars.[1]

This *Emerald Ash Borer Statewide Technical Response Plan* (the "Plan") outlines DEM's role as it relates EAB, and provides technical assistance and direction to communities, private land owners, and others who may be affected.

Working in conjunction with federal, state, tribal, university, community, and private partners & stakeholders, DEM presents this plan based on the combined knowledge of these same groups from states that have already experienced the impact of an EAB infestation. This plan does not dictate potential responses by our partners (unless required by regulation or law), but rather shares current best management practices and strategies, and identifies opportunities for partnerships and collaborative efforts.

AGENCY ROLES AND RESPONSIBILITIES

Federal and State roles and responsibilities vary regarding the type of assistance each can provide. For this reason, this document has been developed as a cooperative effort between the Rhode Island Department of Environmental Management's Division of Forest Environment (DFE) and

[1] www.emeraldashborer.info

Division of Agriculture (DAG) with assistance from the University of Rhode Island (URI), National Grid (NG), US Division of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and the USDA Forest Service, State & Private Forestry (USFS).

The lead federal agency responsible for responding to EAB is USDA APHIS, Plant Protection and Quarantine (PPQ), which has regulatory authority for exotic/invasive species issues. The corresponding agency at the State level is the RIDEM Division of Agriculture (DAG). APHIS assists DAG in detection surveys, preparedness planning, outreach, technical assistance, and training. If warranted DAG can also promulgate and enforce State regulations.

Similarly, the RIDEM Division of Forest Environment (DFE) and her federal partner the USDA Forest Service (FS), may also conduct detection surveys, assist communities with preparedness planning, and provide technical support, outreach, and training.

In addition to outlining DEM's role, this document is meant to guide Rhode Island communities, homeowners, woodland property owners, and other stakeholders, as they prepare for, manage, and recover from local level emerald ash borer (EAB) impacts.

Generally, the areas of expertise for each agency/institution are listed below:

- **DFE –** Assistance with tree inventories, surveys, forest management plans, ordinances, tree planting, state and private lands assistance, wood utilization, outreach, and education
- **DAG -** State regulations and state quarantine (if established), surveys, compliance agreements, outreach, and education
- **URI -** Research, treatment options, plant diagnostics, outreach, and education
- **APHIS -** Federal regulations and federal quarantine and compliance agreements, EAB confirmation
- **NG** - Transmission lines/R.O.W. protection, tree planting, outreach, and education
- **USFS -** Technical and financial forestry assistance, outreach and education

Contact information for these agencies is provided in **Appendix A.**

Rhode Island Department of Environmental Management Mission Statement

The Rhode Island Department of Environmental Management (DEM) serves as the chief steward of the state's natural resources – from beautiful Narragansett Bay to our local waters and green spaces to the air we breathe. Our mission put simply is to protect, restore, and promote our environment to ensure Rhode Island remains a wonderful place to live, visit, and raise a family.

DEM's strategy for EAB (and all other invasive, and/or exotic pests) remains "prevention, preparedness, response, and recovery." When preventative efforts fail, the next best protection tool is intensive surveying and monitoring, which enables the location of infestations to be detected quickly and early, while they are relatively small. Early detections can then be delimited and evaluated to determine their extent, intensity and (where possible) age. Information gathered from these surveys assists us when choosing appropriate response options.

GOALS AND OBJECTIVES

The goal of the plan is to address the destructive effects of EAB on Rhode Island's ash resources. To be successful DEM must:

- communicate and educate stakeholders, landowners, communities and partners
- maintain state detection, monitoring and planning efforts
- manage any in-state quarantines
- support local efforts to manage and recover from the loss of ash in local communities
- manage state-owned land responsibly

To attain this goal, DEM will strive to implement four objectives:

- Prevent the spread of EAB spread to un-infested areas within, or beyond the State
- Prepare for EAB through surveying, and planning, at state, local, and private property levels.
- Respond to EAB through communication/outreach, monitoring, mitigation, and if needed, promulgation of regulations/legislation.
- Recover values lost due to the loss of ash as a component of our Urban, Suburban, and Rural communities through replanting

PREVENTION

DEM's Divisions of Agriculture and Forest Environment have focused preventative efforts on outreach and education programs implemented with cooperators [not exhaustive list] including the Animal Plant Health Inspection Service (APHIS) , USDA Forest Service, Natural Resource Conservation Service, the University of Rhode Island, along with "Green Industry" organizations such as the Rhode Island Landscape & Nursery Association, RI Forest Conservators Organization (RIFCO), the RI Tree Wardens, the Rhode Island Tree Council, and the URI Master Gardeners Program.

Emerald ash borer generally does not fly more than two miles on its own. (Taylor et.al 2006) but can travel great distances via human transport.; The most likely pathway for the spread of EAB within Rhode Island is in infested wood products, particularly firewood. Anyone moving firewood within Rhode Island for recreational or other uses could potentially harbor a variety of non-native insects and diseases, including EAB.

DEM has adopted The Nature Conservancy's (TNC) "Don't Move Firewood" campaign and uses outreach materials developed by TNC to spread this message. "Slowing the Spread" of EAB within the state gives the State, communities, tribes, industry, and landowners time to plan, prepare and implement their own response options. Annually, DEM distributes outreach materials to State and privately-owned campgrounds to reinforce this important message. Hopefully this outreach campaign will continue to "Slow the Spread" within our borders and prevent the spread beyond currently infested areas elsewhere. These same materials are routinely available at most all outreach events.

PREPAREDNESS

Preparation lessens issues that arise when trying to implement an appropriate response. This is especially true with EAB due to its potential to cause rapid tree mortality. The difficulty of addressing the needs of diverse City/Town jurisdictions, and of public or private lands in urban,

suburban, and/or rural settings, further complicates matters. Surveying for EAB aids in selection of appropriate management responses. Planning is an ongoing process essential to cope with the myriad issues that will arise as EAB spreads throughout the State.

Surveying

Since 2009, DEM's Division of Agriculture has installed and monitored EAB traps throughout the state. Beginning in 2012, trap placement was based upon a survey sampling design developed in collaboration between the APHIS EAB program and the US Forest Service's Health Technology Enterprise Team (FHTET). Purple Prism Traps were hung in designated ash trees throughout the state and baited with a pheromone specific lure for EAB. The survey sampling design model preselects geographical locations (cells) to deploy EAB traps resulting in the highest probability of pest detection. EAB was originally detected in Rhode Island (6/18) using this method.

DEM's Division of Forest Environment, URI, and APHIS have also seasonally conducted "biosurveillance" surveys; monitoring sites where the *Cerceris fumipennis* wasp nests. *Cerceris* wasps are native to North America east of the Rockies and are a solitary ground-nesting wasp that specifically preys on buprestid beetles such as EAB. These wasps nest at sites with hard-packed sandy soil such as campsites, ball fields and dirt trails. The *Cerceris fumipennis* survey technique has proven effective in other States for the early detection of EAB.

Additionally, DEM has developed and implemented a web-based system where the public can report sightings of suspected invasive species.

Planning

DEM's planning process includes preparing not only state agencies for this event, but also to assist communities, and private property owners, with information and guidance to cope with EAB and its impacts. Fortunately for us, the unfortunate circumstance of other State's experience in dealing with EAB has led to the development of plan "templates" and "Best Management Practices" to facilitate planning processes. As applicable, links to those templates and practices are included herein.

Reports of suspected invasive species sightings may be submitted to RIDEM via the following:

Web: RI Invasive Species Reporting Form
Email: DEM.ForestPest@dem.ri.gov
Phone: (401)222-2781

State. State agencies and public institutions within Rhode Island have widely varied responsibilities, authorities, and capacities when faced with a situation such as EAB. As these groups make their own preparations, DEM shall continue to inform and encourage those agencies/institutions with up-to-date information on the status of the infestation, current best management practices for mitigation and recovery, and advice – from planning through recovery.

Communities. Because ash has been widely planted in urban public areas; as landscape and shade trees on streets, campuses, lawns, in parks, and urban woodlots, Communities may be severely impacted by EAB. A compromised ash tree may represent a significant potential risk to public

health and safety because of the public use of these areas. Therefore, communities are encouraged to draft and adopt their own EAB response plans. The DEM Urban and Community Forester can assist communities with this process.

A well-designed plan should establish a timeline and budget, identify essential personnel, resources, and procedures, and be flexible enough to adjust to changing information. The reality is that communities may be forced to deal with tough economic, environmental, legal, and social issues. Planning in advance allows a community/institution to be better prepared to minimize the severity of these impacts and establish a solid foundation for recovery. **Appendix B** provides communities an example of those elements essential to a quality response plan. **Appendix C** provides a case study of the City of Westland, Michigan and their EAB response plan.

Private Properties - Forest Landowners. Overall, ash is a minor component of the forests within the state, but it may be a major component of any individual woodland owner's property. Forest land owners are encouraged to know how to identify ash trees, and to be able to recognize signs of the emerald ash borer infestation.

DEM Division of Forest Environment coordinates a program of forest landowner assistance that is helpful in getting forest landowners "on the road" to good forest management. The DEM Stewardship Forester can provide advice and direction to private forest landowners. This can be an excellent starting point for those concerned about what to do regarding the ash on their property. The most important message to a forest landowner would be to prepare and follow a written forest stewardship plan. If landowners already have and are following a Forest Stewardship plan, they should check to see if it addresses EAB. If not, amending the plan is strongly recommended. The standards for a well written Forest Stewardship Plan can be found in **Appendix I.**

As providers of woodland management and harvesting services, private sector foresters, and loggers, ("forest practitioners") are in an excellent position to provide information to this group. By keeping informed as to the status of EAB and sharing their knowledge, forest practitioners play an important role in protecting the forest. It is especially important that they help direct their clients to the right course of action.

The wood of ash trees can be valuable - as timber and as firewood. It is also an important tree for wildlife, providing cover, food, and nesting habitat. Woodland owners are cautioned to be careful regarding solicitations for the pre-emptive removal of ash trees from their land because of the value of wood from ash trees. Before selling trees, woodland owners are encouraged to seek the services of a professional forester.

Private Properties - Other. This group includes all privately-owned lands other than private "forested land"; everything from small residential properties to commercial/industrial lands (e.g. office parks, retail developments, and private institutions). Combined, this group owns the greatest amount of property in the State. These properties tend to be in Urban and Suburban areas where ash tends to be planted as individual "lawn" or "specimen" trees for shade or other purposes. Unfortunately, property owner's in this group are the least likely to be aware of the problem of EAB, and therefore less likely to have planned for when ash decline and mortality occurs. While individual property owners will be responsible for the care and/or removal of trees, there is help available. Arborists are uniquely qualified to provide this group with information and services in the care, maintenance, and removal of trees.

The RIDEM Division of Forest Environment maintains an up-to-date list of licensed arborists, and strongly recommends that property owners check with the DEM Division of Forest Environment to make sure the individual providing the tree care is a Rhode Island licensed arborist in good standing. For information on choosing an arborist, please visit the DEM website "How to choose a Licensed Arborist".

Each communities Tree Warden may be able to further assist private property owners. DEM will provide support and training for these valuable resources. Contact your local governmental office for more information.

RESPONSE

Response to EAB will be different for each user group, and for the individuals within the group. If they have been fortunate enough to have already developed a plan, all that needs to be done is to implement the plan. Plans should constantly be re-evaluated, and if needed, adjusted to meet plan goals and objectives.

DEM's response strategies will be both technical and informational, and will focus in four core areas: communication/outreach, monitoring, mitigation, and if necessary, regulation.

Communication/Outreach

DEM will continue EAB outreach activities by hosting table displays at various events throughout the state, providing educational sessions at schools, libraries, and woodland owner workshops, and, as appropriate, by conducting train-the trainer sessions. Much of this information will also be available on DEM's webpage and social media outlets, either directly or via hyperlink.

DEM will also continue to meet with partners to share the latest information, discuss potential response options, and assure a unified message is given to each constituent group.

DEM will:

1. Post DEM's EAB Technical Response Plan and other pertinent information on DEM's website, social media, and through other outlets identified in the *Communications Plan*.
2. Continue its outreach and education programs as outlined in the PREVENTION section above.
3. Provide guidance and support to community leaders and elected officials, arborists, forest practitioners, and other stakeholders.
4. Continue to communicate management strategies to assist in slowing the movement of EAB to non-infested states.

Monitoring

Although EAB has already been detected within the State, it is still important to monitor the extent of the infestation. Knowing the location and extent of EAB, and communicating that information to the public at large, provides those with at risk trees information needed to select and implement management options.

DEM will monitor the spread of EAB through any of the following methods:

- Delimiting surveys around known infested areas.
- Surveying ash in areas that are at risk of EAB attack.

- Conduct and evaluate information obtained through informal surveys/public reporting such as an EAB hotline, online website, and/or social media platforms.

Mitigation

DEM will focus on efforts to mitigate the impacts caused by this invasive species. Examples include attempting to "slow the spread" within and out of the State, community planning, and to assist/advise communities with the replanting of removed trees.

While progress has been made in the field of mechanisms to "slow the spread", at this time eradication is not possible. Regardless of which options are chosen, proper planning is critical to successful mitigation.

Ash trees can quickly succumb to an EAB infestation and become "Hazard Trees", threatening public health and safety, as well as infrastructure. On state lands, management options shall make the protection of public health and safety, and infrastructure a top priority.

Wherever feasible DEM shall use silvicultural practices to reduce ash volumes in forested stands. When undertaking harvests, DEM will be guided by three objectives:

- Conserve economic value –pre-salvage ash saw timber while it still has value
- Maintain ash as a component in our forests – use silviculture to reduce ash stocking but not eliminate it; introduce biological controls
- Eliminate hazard trees

State Parks/Recreational/Developed areas

Surveys will be taken to identify ash trees on properties under the care and custody of the DEM nearest the locus of infestations, with a focus on high risk areas such as parks, campgrounds, beaches, parking lots, bike paths, hiking trails, etc**.** Trees which threaten public safety or infrastructure will be prioritized for removal.

State Forestlands/Undeveloped areas

The State has three options to address impacts to ash from EAB, each of which is a viable alternative:

- Opportunistically harvest ash when stands are found that make it economically feasible.
- Include nearby ash when conducting harvests in non-ash stands.
- Do nothing where location or access is limited.

DEM shall use whatever forest stand inventories are available to find forest cover types likely to have ash (northern hardwoods, white pine-red oak-white ash, red maple lowlands) when considering proactive harvesting. Prioritize and recon stands for evaluation/harvesting. When harvesting, reduce ash component to less than 10% of total basal area, but not eliminating it. In general, the recommendations are to try to meet residual stand basal area targets consistent with silvicultural guidelines for that forest type. Harvesting ash trees reduces the amount of phloem available to developing EAB larvae, which should slow the growth of the population and possibly its spread. Remove all trees with live crown ratios < 30% as they are already declining. Focus on removing all commercially valuable ash first. The residual ash stand's value is in the possible genetic resistance to EAB.

- Stands with higher percentages of ash shall have higher priority when planning harvests.
- If a timber sale is scheduled adjacent to an area with ash, the ash stand shall be included in the sale.
- If there is an ongoing timber harvest and ash is discovered nearby, every effort shall be made to try to sell the ash to the Buyer since he is already there and logistically it makes sense. Because ash doesn't often grow in large pure stands, there probably won't be enough volume to merit a separate sale. The latest Southern New England Stumpage Report will be used for a guide to current prices, however it may be advisable to sell for less than current market value to reduce or eliminate a future liability.
- If contemplating a sale in an un-infested area, removal of ash shall be a priority.
- Timber sale contracts shall stipulate that harvests be completed in a timely manner as delays in implementing a harvest can dramatically reduce the economic value of ash trees. Sawmills generally will not take sawlogs from dead ash trees.
- Pole size ash stands shall be retained. Removing one sawtimber ash has a much greater effect on reducing the amount of phloem available to EAB than numerous pole trees.
- After a salvage cut, the stand shall be monitored for signs of EAB resistant Ash trees which could be a valuable source of seed.
- Ash usually grows in rich, moist but well drained sites, which unfortunately often have an understory of exotic, invasive shrubs such as Japanese barberry and multiflora rose. These invasive plants should be eradicated before the canopy opens up, creating optimum growing conditions for these species.
- On poorly drained sites EAB will be allowed to run its course as harvesting in wet areas may stress all trees, not just ash.

Disposal of Infested Ash Material shall be done in accordance with federal guidelines to ensure EAB is not spread to new sites. Disposal includes bark removal, chipping, mulching, or composting by the criteria outlined in the USDA Emerald Ash Borer Program, *Agrilus planipennis* (Fairmaire), ver 1.6 (USDA-APHIS 2015). Treatments include:

- Bark Removal – remove all bark and an additional half inch of wood.
- Chipping – wood must be chipped into pieces that are no larger than one inch in at least two dimensions in order to save for landscape use.
- Mulching & Composting – chipped wood that does not meet the size specifications above may be mulched or composted.

Biocontrol Agents have been shown to slow the spread of EAB but become less effective as the EAB population grows and spreads. When appropriate and feasible, RI DEM (or its partners), may release approved biocontrol agents in accordance with the "Emerald Ash Borer Biological Control and Release Recovery Guidelines" 2016, (https://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/downloads/EAB-FieldRelease-Guidelines.pdf) or other nationally accepted and approved standards.
Currently, the four permitted biological control agents for release in the United States are parasitoid wasps: *Oobius agrili, Spathius agrili, Tetrastichus planipennisi and Spathius galinae.*

Pesticides
Currently, insecticides are the most feasible option for controlling EAB populations to retain live ash, with systemic pesticides most commonly used. These are applied 1) to the exterior of the lower trunk as a spray, 2) to the soil as a drench or granules, or 3) injected directly into the tree stem where they dissipate through the vascular system. Systemic pesticides are most effective when used as a preventative measure.

In a ten-year simulation comparing the cost of treating trees with the most effective insecticide, emamectin benzoate (brand name TreeAge®), the cumulative costs of removing and replacing trees were four times higher than the cumulative costs of treating up to 50% of the ash trees with systemic insecticide (McCullough and Mercader 2012). Emerald Ash borer feed in and damage a tree's vascular system, so if their damage is extensive, the tree will not be able to adequately transport the chemical.

For an overview of Insecticide options for EAB see:
http://emeraldashborer.info/documents/Multistate_EAB_Insecticide_Fact_Sheet.pdf

For frequently asked questions about potential side effects of systemic insecticides for EAB:
http://emeraldashborer.info/documents/Potential_Side_Effects_of_EAB_Insecticides_FAQ.pdf
Homeowners and licensed applicators should contact the DEM's Division of Agriculture- Pesticide Registration to make sure that the products that they are planning to use are registered for use and application in Rhode Island. Pesticide registration changes over time with some options added or excluded so it is the responsibility of the homeowner and licensed applicator to check current registration information.

Homeowners and licensed applicators are responsible for reading and following all pesticide labels. Many pesticides are toxic to aquatic organisms and pollinators, especially bees, so care should be taken not to apply the product near water or while bees are foraging. Bees can also contact the pesticide when foraging on flowering plants growing where the insecticide was injected into the soil.

Regulations, both Federal and State, have one goal in mind: to prevent the spread of EAB to non-infested areas. Current regulations restrict or prohibit the movement of ash, and products made of ash ("regulated articles") into, out of, and/or through non-infested areas.

Interstate and Intrastate regulation.

1. Regulation of EAB involves preventing movement of EAB with host material including firewood, timber, and nursery stock. Host material is defined as wood and wood products of any tree in the *Fraxinus* genus including ash, as well as Chinese fringetree. USDA-APHIS_PPQ regulates *interstate* movement of host material. *Intrastate* movement is regulated by DEM/DAG, with the state and federal agencies working in concert to regulate specific areas. Each agency enacts and enforces laws to accomplish this goal.

2. Compliance agreements between a state or federal agency and a wood utilization business allow for movement of ash wood from an infested area to non-infested areas. The agreement allows the business to move wood under certain conditions that

will protect against an EAB introduction and at the same time allow the business to continue their operation.

3. Monitoring of nurseries and mills that process logs is part of an ongoing regulatory activities and uses established relationships. Additionally, in the last several years, monitoring for wood-boring pests has been included at manufacturing businesses that receive shipment from overseas that may be associated with wood packing material. Since firewood has been most effective vehicle for EAB transport, efforts will be made to discourage the movement of firewood.

4. A Federal Quarantine prohibits movement of all ash tree materials and hardwood firewood out of states that have EAB detections to non-infested states, unless the wood is federally certified. Violations of the state and/or Federal Quarantines may result in a monetary fine.

Locations subject to these regulations are constantly changing, as are the regulations themselves. Whenever transporting "regulated materials" out of the state, it is important to check the regulations for any state you may be traveling through, and at your destination. RI DEM encourages all to be aware of the requirement for documentation regarding the transport of firewood within and beyond the federal quarantine area. Failure to comply with federal quarantine regulations can result in significant penalties.

RECOVERY

Historically emerald ash borer advances quickly into un-infested areas, on average advancing about 15 miles/year. Ash mortality begins about 3 years after initial infestation, with peak mortality occurring between years 11 & 16. Final mortality is generally greater than 99%.

Recovery efforts should be concentrated on replanting tree species appropriate for the site.

Forest Stewardship plans should guide forest landowners should the recovery response option be to replace lost trees.

Replanting Community after EAB[2]

How a community plans on replanting after EAB is important element that should be included in any community's plan. Trees provide numerous benefits to the residents that live, work and play in a community. Trees remove pollutants from the air, help improve summer temperatures, reduce storm water runoff, and provide social and psychological benefits. Trees are also one of the only components of the urban environment that increases in value each year.

- Diversity - The goal of a community's replanting efforts should be the use of a diverse mix of tree species. Following the loss of American elm to Dutch elm disease, communities looked for a tree that had the shape and stature of their beloved American elm, and they found ash. Ash trees were relatively insect and disease resistant, could survive in almost any landscape, and grew tall and fast; consequently, they became a favorite among municipalities, developers and

[2] https://www.arborday.org/trees/planting/

landscapers. This reliance on the ash tree caused many communities to lose sight of diversity and resulted in ash trees making up a large percentage of the tree population in select communities.

Tree species diversity means planting a variety of tree species on streets, in parks, and around a community. A community will have an idea of the tree species composition of its urban forest once a tree inventory is completed. A community should add a few new tree species to its planting projects each year to make increasing species diversity easy. If a community has a high percentage (>15%) of any genus (example: *Acer*- maple), consider reducing or eliminating their planting until a greater species diversity is present in the community.

Right Tree, Right Place - One important aspect of tree planting is selecting the proper tree species for the planting location. Always contact Dig Safe (811) before planting to locate overhead and underground utilities. If there are overhead utilities, make certain that the tree species you are selecting are appropriately sized for the site to avoid interfering with power lines when they reach mature size. Other factors to consider are soil and light requirements, mature height, and size of planting location. Selecting and planting the right tree for the right location will help ensure its survival and success for years to come.

Proper Planting and Mulching - Many trees do not survive due to improper planting techniques such as planting too shallow or too deep, digging the hole too small, and not backfilling the soil correctly. Incorrect mulching, most often seen as volcano mulch (piling the mulch high around the trunk) can cause a myriad of growth problems from inadequate water to trunk rot.

- Maintenance- The first three years following planting are the most critical to ensure long-term tree survival. An EAB plan should ensure that tree maintenance such as watering, pruning, and mulching, including who will be responsible for implementing these tasks, has been addressed.

- Tree Planting with Community Volunteers- Volunteers can play an important role in a community's tree planting efforts. Utilizing volunteers is a good way to make community resources go farther, while providing residents with an opportunity to make a positive difference in their community. Local community groups (i.e. rotary clubs, Girl/Boy Scouts, church groups, school groups, master gardeners, neighborhood associations) are a great place to find eager volunteers interested in participating in tree planting projects. A volunteer tree planting campaign can also provide a community with an opportunity to educate residents on proper tree planting and maintenance techniques that they can apply to the project.

APPENDIX A: STATE OF RI/FEDERAL CONTACTS

RI DEM Department of Natural Resources, Division of Forest Environment
Website: http://www.dem.ri.gov/programs/forestry/
Phone: 401-222-2445

RI DEM Department of Natural Resources, Division of Agriculture
Website: http://www.dem.ri.gov/programs/agriculture/
Phone: 401-222-2781

National Grid
Website: https://www.nationalgridus.com/RI-Home/
Phone: 1-800-322-3223

University of RI Extension Office
Website: http://web.uri.edu/riaes/extension/
Phone: 401-874-1000

USDA Animal and Plant Health Inspection Service
Website: http://www.aphis.usda.gov
Phone: 866-322-4512

US Forest Service
Website: http://www.fs.fed.us
Phone: 603-868-7709

Don't Move Firewood
Website: http://www.dontmovefirewood.org/

APPENDIX B: EAB PREPAREDNESS PLAN ELEMENTS

The elements of an EAB Preparedness Plan described below will help develop the framework for a community action plan. These elements are offered as suggestions. A community must develop a plan specific to their community's needs and circumstances while being flexible and including realistic tasks, goals, timelines, and budgets.

Developing a timeline for task completion is just as important as identifying the tasks themselves. A timeline will assist in tracking plan progress and be critical in budget creation - identifying need and financial resources.

In developing a plan, it is recommended that a community start with an outline to help organize thoughts and identify tasks. A sample outline has been provided in **Appendix D**.

ELEMENT 1: THE TREE INVENTORY

The first step in preparing for EAB is to determine the potential risk to a community's urban forest resource. This risk can be identified using information contained in a street tree inventory. If a community has an existing inventory, this should be used or updated. If a community does not, an inventory should be one of its first priorities.

A tree inventory is the process of counting, characterizing, and recording information about the public trees that make up a community's urban forest. It is a useful tool that documents important information related to the total number of trees, their condition, location and species composition. It is invaluable in determining the extent of ash trees in a community.[3]

At a minimum, the following information should be collected for each tree as part of the inventory:

- species
- size
- condition
- location and accessibility for removal

Inventories can be simple or detailed and sophisticated depending on the needs and capacity of a community. For example, if a community decides to use removed trees for lumber and mulch the inventory should also include information on available logs. Following is a description of three basic types of inventory/survey.

1. A ***"windshield survey"*** is an inexpensive, quick and effective procedure whereby a cursory visual inspection and count are made by trained personnel from a vehicle. A follow-up ground survey should be conducted to detect more subtle problems

[3] Fazio, J.R. "How to Conduct a Street Tree Inventory" (Tree City Bulletin #23, National Arbor Day Foundation)- www.arborday.org
Bassuk, N.L. "Conducting a Street Tree Inventory" (Cornell University)- www.hort.cornell.edu/commfor/inventory/utilizing.html
i-Tree - Tools for Assessing and Managing Urban Forests" (USDA Forest Service)- www.itreetools.org

such as decay. Inspection may include all public trees or a representative sample.

2. A ***"complete" inventory*** is a systematic approach that examines and records detailed information about all trees on public property including parks. This type of inventory is labor and time intensive and requires trained professionals. Consequently, the expense can be significant.

3. An ***"ash only" inventory*** examines only ash trees on public property. It can be completed relatively quickly and efficiently by in-house staff, by volunteers with minimal training, or by professionals. Inspection may include all public trees or a representative sample.

Ideally, the goal should be a complete community forest inventory.

When a complete inventory is not practical or feasible, a rough estimate of the total number of ash trees along public rights- of-way (ROW) can be determined quickly by sampling parts of the community as follows:

1. Determine the total number of community street miles.

2. Survey* all ash along a representative sample of street miles.

3. Extrapolate results to estimate total number of ROW ash in community.

Example: Total street miles = 12
Number of street miles sampled = 3
Number of ash trees sampled = 150
Average number of ash per street mile = 50 (150/3 = 50)
Estimated total ROW ash = 600 (12x50 = 600)

**size class & condition should also be noted during this survey.*

A community that determines they have a minor component of ash and EAB may not be a threat, a more generalized urban forest management plan that incorporates a section on invasive/exotic pests may be appropriate. Refer to contacts in **Appendix A** *for assistance with an urban forest management plan.*

ELEMENT 2: SURVEYING FOR EAB

The next step in creating a plan is to develop and implement an EAB survey and detection strategy. Below is a brief description of EAB signs and symptoms, followed by a discussion on EAB survey techniques. The survey techniques are based on methodologies developed and utilized by Missouri State University and the Missouri Department of Agriculture.

EAB Signs and Symptoms[4]

An ash tree may have EAB for a few years before outward symptoms of tree decline. Signs and symptoms of an EAB infested tree include:

- Delayed leaf-out in spring (symptom)
- Thinning canopy or crown (symptom)
- Branch dieback from top of tree (symptom)
- S-shaped galleries (tunneling) under the bark (sign)
- Woodpecker damage (symptom)
- Epicormic shoots/water sprouts (symptom)
- Bark splits (symptom)
- D-shaped exit holes - first spotted in upper branches of tree (sign)

For assistance on identifying ash trees and EAB, see contacts in **Appendix A**.

EAB Surveys and Inspections

The EAB adults typically begin to emerge from ash trees in late May and will continue to emerge, mate and lay eggs through late summer (August-September). Identifying infestations early will give a community more time to implement a management plan before their ash trees are in a late state of decline and become hazardous. There are several methods of surveying for EAB, each of which has advantages and disadvantages. A community may choose to use a variety of techniques, finding some more suitable for widespread surveys and others best for high-risk locations. A brief description of these methods is discussed below, and further details and methodology can be found in **Appendix E**.

- **Visual Survey** techniques include looking for the outwardly visible signs/symptoms of EAB on ash trees. Surveys can be conducted systematically over a given area or by individually selecting trees through an inventory. This survey method requires the least amount of resources, and a large area can be covered in a short amount of time. The main disadvantage is that by the time visual symptoms of EAB are present, it usually means the infestation has been in the area for several years, and protection measures may not be warranted.

- **Tree Climbing** methods are employed when a closer look of the tree's canopy is warranted. Professional tree climbers should be utilized in this situation. In the tree canopy, small windows on the trunk and branches are peeled back using a drawknife, to look for EAB larvae. An advantage of this method is that inspection occurs in the tree's canopy where EAB signs/symptoms appear first. Time and cost are the main disadvantages to this method.

[4] For photographs of EAB signs and symptoms and an electronic version of the Michigan State University Extension Bulletin *E-2938 "Signs and Symptoms of Emerald Ash Borer."* www.emeraldashborer.info.

Destructive Sampling includes the removal and/or peeling of an ash tree to look for EAB larvae and larval galleries. Ash trees that are destructively sampled can be of any size, but are most efficient to peel when they are between 4"-12" diameter at breast height (DBH= 4.5 feet above the ground). The advantage of this method is the discovery of early EAB infestations. A disadvantage is the destructively sampled ash tree is destroyed.

Detection Trees are created by artificially wounding an ash tree to purposely stress it, which research has shown will attract EAB. The most effective way to wound a tree to attract EAB is to remove a band of bark around the trunk of an ash tree (girdling). This will disrupt the conductive tissues within the tree, and it will no longer be able to transfer water and nutrients. Detection trees are currently the most effective tool available for proactively surveying for EAB. Unfortunately, this method also destroys the ash tree that is used for surveying.

Areas to Survey

The artificial movement of EAB through human activity remains the most important risk-factor for the establishment of EAB populations. Ash nursery stock, sawlogs, and firewood are the primary means of artificial movement of EAB. Focusing survey activities in areas where these articles may be transported is essential for the efficient use of resources and the effectiveness of the survey. The following list summarizes the highest risk sites:

- **Nursery Stock**: nurseries, newly landscaped public, commercial, residential areas
- **Firewood**: campgrounds, recreational lakes, cottage communities
- **Sawlogs**: sawmills, pallet operations, other wood utilization firms

ELEMENT 3: THE ASH MANAGEMENT POLICY

This element will describe how a community intends to manage its ash trees and will guide decision-making relative to how the community will address issues such as:

- Removal/Disposal
- Historic/Significant trees
- Hazard tree assessment
- Woodlot management
- Private property trees
- Replanting
- Treatment

Cost Options and Estimates

Removal/Disposal: Determining tree removal costs will likely be one a community's first priorities. This cost can be accomplished by using information collected during the tree inventory and through tree removal estimates and bids. From an inventory, a community should have an actual or estimated total number of ash trees, including average size (diameter) for all trees from the inventory. Combining this information with an estimated

removal cost for the average size ash tree a community can estimate the total removal cost for ash trees on public property.

Example: Total number of ash trees in *Townville*: 600
Average diameter of ash trees in *Townville*: 18”
Estimated removal cost for 18” tree in *Townville*: $625
Townville’s estimated total ash removal cost:
$625 x 600 trees = $375,000

Local disposal costs should also be estimated as part of total tree removal cost. Keep in mind that, in some areas, disposal costs may be lowered by partnering with neighboring communities and/or local industries that can find profitable uses for the removed trees. Refer to **Appendix F & G** for assistance in determining in-house removal costs and a sample tree removal cost bid sheet.

Replacement: Create a cost estimate for replanting trees that have been or will be removed due to EAB. Take the number of trees that need to be replaced and contact local nurseries to get price estimates on the size and species of tree you would like to use in replanting. Remember, tree species diversity is the key to creating a healthy urban forest.

Treatment: Before beginning any treatment program, a community should know the condition of its ash trees and carefully research the available treatment options. Be advised that no treatment option has been proven 100% effective against EAB. Any company that offers chemical treatment services must have a Pesticide Applicators License, as well as a Pesticide Application Certification through the RI Division of Agriculture[5].

In addition to costs for materials and contractors, removal/disposal, replacement and treatment activities may result in some in-house labor and equipment costs that should be included in overall estimates.

<u>Historic/Significant Tree Policy</u>

Many communities have trees designated as heritage, historic, memorial or otherwise significant by policy or ordinance. Special consideration may need to be given to the management of ash trees that have been designated as such. In these cases, treatment may be warranted where it would not be otherwise. A licensed arborist[6] can assist with determining if treatment is a viable alternative based on the level of infestation apparent in the tree. It is important to remember that timing is critical in terms of treatment, so a decision on treating historic/significant trees should be made as soon as possible.

If a decision is made to remove a historic/significant tree, a community may want to consider

[5] http://www.dem.ri.gov/pubs/regs/regs/agric/pestrg06.pdf
[6] http://www.dem.ri.gov/pubs/regs/regs/forest/arborist.pdf

creating a monument or memorial with the removed wood. Carved statues, furniture, or other lasting wooden structures can be created from these special trees, allowing them to continue to play a prominent role in the community. Remember to review community ordinances and policies to determine if a replacement of the removed tree is required.

Woodlot Management

Community owned woodlots in parks and other public spaces should be considered when creating an EAB preparedness plan. If a community woodlot has a management plan in place (i.e. forest management plan, Forest Stewardship plan, etc.), it should be reviewed/updated to address EAB and be referenced in the preparedness plan. If a plan is not in place, a community may want to contact a consulting forester who can assist in the development of one. A management plan should include goals for the woodlot (i.e. recreation, wildlife, aesthetics and/or timber production), a woodlot inventory, and recommended management activities (i.e. timber harvest, no action). The plan should also specifically discuss whether ash trees are present that will be impacted by EAB, and what the overall impact of potential EAB infestation will have on uses of the woodlot for the goals identified.

The plan's prescriptions should include measures to mitigate any adverse impacts, including steps to identify and manage potential hazard trees as EAB spreads in the surrounding landscape. In woodlots with very little ash, or only sapling sized ash trees, the impacts may be minimal, and no modifications may be needed to the management plan. In woodlots where ash composition is much greater and impacts due to mortality more severe, it may be appropriate for the plan to describe measures to ensure prompt reforestation, or to improve future woodlot species composition in line community goals for the woodlot.

Communities should contact a consulting forester[7] to assist with any woodlot management activities, including harvesting. A consulting forester can determine which forestry techniques can be used to reduce the percentage (or dominance) of ash and improve the overall health of the woodlot, as well as design a timber harvest that is profitable.

Removals

The process of ash tree removals can be undertaken by a community using in-house crews, contractors, or a combination of the two. For example, a community may use in- house crews to remove ash trees that are less than 10" DBH, and hire a contractor to remove trees larger than 10" DBH. In some communities, utility companies, and the RI Department of Transportation may also have tree care responsibilities; a community must remember to discuss tree removal duties with these entities as appropriate.

In-House Removals: If a community chooses to do all or some of the ash removals in-house, several factors should be taken into consideration. The list below is intended to help you begin the process of identifying how a municipality will remove its ash trees, and if in-house removals are a safe and economical method to choose based upon available resources; it is

[7] http://www.dem.ri.gov/programs/bnatres/forest/pdf/consults.pdf

not intended to be an exhaustive list.

- Size of the community's forestry staff
- Proper equipment for tree removal (record type and condition)
  - Chainsaws
  - Personal protective equipment for staff (head, ear and eye protection, gloves, leg chaps, & heavy work boots)
  - Chipper (capable of chipping large diameter trees such as 20" tow behind)
  - Chip Trailer/Dump Truck
  - Front end loader (for loading logs, brush, etc.)
  - Grapple hooks and winches which will assist in hauling logs from remote areas
  - Trailers for moving equipment and logs
- Staff Training
  - Electrical hazard awareness training for work near utilities
  - Chainsaw training
  - Certified arborist training
- Determine tree sizes community crews can safely remove
- Determine staff's ability to identify ash in all seasons
- Ash tree removal budget
- Timeline for ash tree removals
  - Determine crew's ability to meet timelines
- Determine Union rules on contracting tree removal work
- Plan for ash utilization and disposal of chips
- Identify if there is a need within the community and/or local industry for wood products that could be made from the removed trees (mulch, lumber, fuel, etc.).

Contracting Removals**:** When considering a contractor to handle some or part of a community's ash tree removals, it is important to understand the bid process and have clear expectations for the contractor. Be as specific as possible when developing the contract and bid language. If a community would like the contractor to do the stump removal (grinding), be sure to include it in the contract language. If stump removal will be done in-house, the contract should detail the maximum stump height the contractor can leave. Who retains ownership of the trees once they have been cut should also be established in the contract.

It is recommended that a community choose tree removal firms that are fully insured and are licensed RI arborists. Do not be afraid to ask for references or talk with other communities that use contractors for tree removal and tree care activities. *Arborists are required by State Law to be licensed*.

Infested vs. Non-Infested Trees - Proactive and Reactive Tree Removals: Once infested with EAB, ash trees typically begin declining over a period of 2-3 years. The burden of dealing with hundreds of dead and dying trees in a short period of time can place an enormous strain on community budgets, personnel and resources.

Communities may take the approach of preemptively removing a portion of their non-infested

ash trees annually to minimize these impacts over time. Communities that are reluctant or not financially capable of doing so, may choose to remove only infested or dead ash trees. In general, communities can decide to coordinate ash tree removals in either a proactive or reactive manner. Following are details for each method, including pros and cons.

Proactive Removal - Removing ash trees that are not infested with EAB.
Pros:

- Opportunity to spread removal costs over longer time frame.
- Reduces problem of dealing with many dead &/or hazardous ash trees at one time.
- Opportunity to start the replanting/recovery process right away.
- Greater flexibility in organizing removal and routine work schedules.
- Ability to utilize ash wood for products or use it as a local source of firewood.

Cons:

- Immediate impacts to tree canopy and aesthetics.
- Removing healthy ash may create negative feelings within the community.
- Does not consider that research may find an effective control for EAB.

Reactive Removal - Removing ash trees which are either infested with EAB or dead
Pros:

- Delayed impacts to tree canopy and aesthetics.
- No negative public perception of removing healthy trees.
- Delayed budgetary impacts until EAB hits.
- Further EAB research may offer effective control, minimizing need for removals.

Cons:

- Budget impacts can be severe once EAB is in community.
- Replanting funds may not be available due to extreme removal costs.

Hazard Trees and Liability[8] Any tree, dead or alive, which has the potential to entirely or partially fail and impact a target, can be considered a hazard. A target can be a vehicle, building, or a place where people gather such as a park bench, picnic table, street, or backyard. Dead and dying ash trees, weakened or killed by EAB, pose a great risk to public safety and therefore are a potential liability for communities if left standing along streets, sidewalks, or other public spaces.

In general, a healthy ash tree would be considered lower risk for breakage or failure by its inherent wood strength characteristics. However, standing dead ash trees have been observed to deteriorate relatively quickly after being killed by EAB. Initially, trees begin losing their bark as the inner wood tissue dries and separates.

[8] How to Recognize Hazardous Trees USDA Forest Service: www.na.fs.fed.us/spfo/pubs/howtos/ht_haz/ht_haz.htm Urban Tree Risk Management Guide USDA Forest Service: www.na.fs.fed.us/spfo/pubs/uf/utrmm

Subsequently, branches and limbs become brittle and susceptible to breakage from wind, snow and ice. Likewise, root systems may deteriorate over time, increasing the potential for windthrow and whole tree failure at the ground level.

To minimize possible liability issues, communities should review and/or establish a policy and protocol for identifying, marking and mitigating all hazardous trees on public property. Inspecting trees for potential hazard liability is one of the most important components of any tree management plan. Below are some points to consider in developing a hazard tree plan for your community:

- Appropriate frequency and intensity of inspection
- Training of inspectors
- Mapping and marking of trees
- Minimum DBH (diameter at breast height = 4.5 ft. above ground)
- Documentation and reporting

Communities that think an "act of God" (i.e. wind, rain, and lightning) is a good defense against liability are advised to discuss tree liability issues with an attorney. While this type of defense has been used widely in the past, it is unacceptable in most cases today.

Generally, to qualify as an act of God in negligence cases, all the following elements are needed:

1. The accident must have happened from a force of nature that was both unexpected and unforeseeable.
2. That force must have been the sole cause of the accident.
3. The accident could not have been prevented by using reasonable care.

Prioritization - Regardless of whether a community is removing trees proactively or reactively, there should be a process for prioritizing the order of tree removal. The key to this process is having a current inventory and database of ash trees. The inventory and database will help determine location, size and condition of trees and track and prioritize removals.

In general, tree removal should be prioritized as follows:

1. Hazardous trees
2. Dead, dying, diseased trees
3. Poor structure/condition trees
4. Trees causing infrastructure damage
5. Trees planted or growing in undesirable locations
6. All other trees

Utility contractors should be encouraged to remove ash trees within their easements as part of regular line clearance activities. Utility companies are excellent partners in replacement tree planting and communicating messages about proper site and species selection.

Financial:

Create a budget including a timeline for the EAB Preparedness Plan.

- Budget should include costs for:
    - Developing the plan.
    - Conducting or updating a tree inventory.
    - Ash tree removals.
    - Tree replacement.
- Timeline should include:
    - Timeframe for completing each task.

Assess the current budget for forestry and tree care operations.

- Can the implementation of the EAB plan fit seamlessly into the existing budget?
- Identify any financial constraints that may hamper its implementation.

Understanding the financial situation of your community will assist in creating a realistic budget and timeline for implementing the EAB preparedness plan.

Personnel/Volunteers:

- For each task in the plan, identify the number of trained staff available to complete it.
- Identify the number of hours and/or days per week staff can devote to the task.
- Identify tasks in which volunteers may be useful.
    - Identify sources of skilled volunteers (example: RI Tree Stewards).

Understanding the personnel and volunteer resources and needs will help determine which tasks can be accomplished in-house and which tasks may need to be contracted out. Take into consideration personnel when creating the timeline for implementation.

Facilities/Equipment: A community should take an inventory of what facilities and equipment are needed to implement the plan and which are currently owned/leased by the community and identify if there is a budget to purchase/lease/repair needed equipment, facilities, or space.

Ordinances: Tree ordinances typically outline the authorities and persons responsible for tree planting, care and removal of trees on public property and in certain cases, private property.

Basic components of a tree ordinance include:

- Goals
- Tree Board Establishment
- Authorities/Responsibilities
- Basic Performance Standards
- Enforcement/Penalties

Through code/ordinance, communities may exercise their authority to require infested private property trees to be removed to prevent further spread of the insect or disease. This type of policy, referred to as a “condemnation clause”, is still being utilized by

communities across the country in response to Dutch elm disease. Removal or nuisance abatement costs are subsequently billed to the property owner directly or added to their property taxes.

Private Property Ash Trees: Most of a community's trees are typically located on private property. In most cases, the responsibility for tree removal on private property will be that of the property owner. In situations where a hazardous condition exists on a private tree with potential to impact a public right-of-way (ROW), communities should promptly address the problem. This may be accomplished through discussions with the property owner or through corrective actions taken by the community to resolve the issue. Additional authorities related to private tree removals are often contained in municipal ordinances and codes (see section on *Ordinances*). To assist private property owners with ash tree removals, communities may wish to offer curbside pickup, chipping and disposal of infested trees.

Communication

Developing and utilizing communication procedures to disseminate EAB information internally to local officials/staff and externally to community residents should be an important component in the preparedness plan. Providing timely, accurate and consistent communication will greatly enhance credibility and community support of your plan and actions.

If a community does not have internal or external communications protocols, the information below can helpful in protocol development. If a community is using existing protocols, the following may be useful in creating EAB specific procedures. Communication protocols should accurately represent how information is disseminated within a community's structure.

Internal Communication Procedure**:** This is used for disseminating information to a community's local officials and staff. Below is an example of an internal communication protocol:

- Educate and inform all municipal leaders and officials.
  - Develop an EAB frequently asked questions (FAQ) document.
    - If EAB has been found, information should be provided on exact location of infestation and plans of how it will be addressed.
    - If EAB has not been found, information should be provided on how the community is addressing EAB though the development of the preparedness plan.
  - Identify person(s) who can answer EAB related questions and provide their contact information.

- All municipal leaders should disseminate information to their respective department staff and provide them with the FAQ document and appropriate contact person(s).

- It is very important that all staff and local officials that have interaction with residents (public) be provided with accurate, timely and up to date information.

External Communication Procedure**:** These procedures can be utilized for disseminating information to community residents. An external communication protocol should work in tandem with the internal protocol.

- Inform the community through local media outlets, direct or indirect mailings (i.e. tax/utility bills), newsletters, fliers, public meeting, neighborhood associations and local garden clubs. Always identify a contact person where residents' questions can be directed.
  - If EAB has been found, provide information on EAB[9], the location of infestation, and the community's plans for addressing it.
  - If EAB has not been found, provide information on how the community is addressing EAB through the development of the preparedness plan.

It is important that a community is prepared for any and all responses that residents may have regarding EAB. Procedures should be in place to handle positive and negative comments from residents.

Ash Wood Utilization and Wood Waste Disposal[9]

By finding creative ways to develop value-added products from the wood generated from ash tree removals, a community can lessen the economic impact of the insect's damage while strengthening local wood product industries. Communities may find it worthwhile to partner with local members of the wood industry. In some cases, they have lowered disposal costs by allowing businesses to use removed trees for mulch or fuel. Communities may also work directly with local sawmills to see their trees turned into lumber and other products, many of which can be used for community projects. Regardless of which option is pursued, residents generally respond positively to wood reuse programs, satisfied that their community trees are not going to waste.

The following strategies are recommended in developing a utilization plan for EAB-related tree removals. Refer to **Appendix H** for more detailed information on wood utilization.

- Decide whether your community has specific needs for wood products. A utilization plan may differ depending on whether the community needs mulch, lumber, or other products.

[9] Bratkovich, S. *Utilizing Municipal Trees: Ideas From Across the Country*. NA-TP-06-01. USDA Forest Service. www.treesearch.fs.fed.us

Cesa, E.T.; Lempicki, E.A.; and Knotts, H. 2003. *Recycling Municipal Trees: A Guide for Marketing Sawlogs from Street Tree Removals in Municipalities*. NA-TP-02-94. USDA Forest Service. www.fs.fed.us/na/morgantown/frm/cesa/rmt/rmt_index.html

- Contact local stakeholders immediately to develop a thorough outline of needs, available resources, limitation, partners, and timelines. Some major groups to include in discussions are: RI DEM staff, RIDOA staff, foresters, wood industry representatives (sawmill operators, biomass energy facilities, firewood and mulch dealers), non-profits and community organizations (RC&D Councils, Conservation Districts, etc.), tree care companies, and others.

- Create collection yards for wood residues by using existing industry or municipal yards, if possible. The use of wood disposal yards has proven to be an effective way to collect the infested wood harvested by various groups (public, private, and homeowners) into one accessible location where it can be sorted, processed, and merchandised. These yards may also play a regulatory role (as "marshalling yards"), enabling state and federal officials to contain large amounts of affected material and inspect finished products efficiently.

- Maintain ongoing discussions with industry partners and federal and state regulatory agencies to ensure that proper compliance agreements are used and that wood products are transported safely.

- Create a strong educational plan to combat misconceptions about the dangers of using EAB-affected trees. Conduct outreach to educate staff, industry, contractors, homeowners, and potential buyers of wood products about the safety of products and use of compliance agreements. Additionally, both wood generators and wood processors may benefit from additional training on how to work together effectively and safely process the material.

- Create demonstration projects to showcase community utilization projects. While these types of projects require outside funding, the successful partnership of a city and a portable mill or the installation of a reclaimed wood floor in a city building can go a long way in building community support for the EAB program. Non-profit and community organizations may be key partners in this type of project.

APPENDIX C: WESTLAND, MI EAB RESPONSE PLAN CASE STUDY

The Discovery of EAB

In 1999, the City of Westland, Michigan, a 217-square mile community in southeast Michigan, noticed its ash trees were declining. "In 1999, we began trimming the tops out of our ash trees because we knew there was something going on, but didn't know what it was," said Kevin Buford, Superintendent for the City of Westland's Department of Public Services. In the summer of 2002, they received the news that a new insect, the emerald ash borer (*Agrilus planipennis),* was responsible for the death and decline of ash trees in the metropolitan Detroit area.

The City's Ash Trees

In 2002, the City began an aggressive campaign to remove the 3217 ash trees that lined their streets and 1200 of the 2000 ash trees that were in parks and other city owned properties. They were lucky - by conducting a tree inventory in 1998, they knew the locations of all of the publicly owned ash trees in the City. "Our tree inventory was tremendously helpful," said Mr. Buford. "We knew the exact locations of our ash trees, their diameter, year they were planted, if any health issues had been documented, and what we were facing. We were able to be very aggressive with our removals because we knew what we were up against. Without an inventory we would have been lost."

The City started major ash tree removals in 2002 and finished in late 2004 at a cost of over $1,000,000 (includes removals and some stump grinding and site restoration). Their ash trees ranged in size from 4" in diameter up to 48" in diameter, with a median removal cost of $635 per tree. The City of Westland hosted a Michigan Department of Agriculture marshalling yard (a program that no longer exists), which provided a grinder to the City and paid for the transportation costs to haul the chips away. The City was responsible for providing and paying for staff to operate the marshalling yard six days per week. The marshalling yard took ash logs from anyone in the EAB quarantined counties.

A majority of ash trees, approximately 3000, were removed by in-house City staff. Contractors were hired to remove about 1200 ash trees. The Highway Maintenance Division, with a staff of 22 within the Department of Public Services, is responsible for tree care as well as snow plowing, salting, site restoration, road repair, and leaf pick-up. On a typical day, there are six to eight staff dedicated to tree maintenance, removals and site restoration. During the peak of their aggressive ash tree removal campaign, Mr. Buford had access to all 84 employees in the Department of Public Services.

The City funded their tree removal efforts primarily with the use of general fund dollars (approximately $50,000 for equipment and $250,000 for staff per year) and by utilizing some Federal Community Development Block Grant funds (where appropriate).

Replanting after EAB

With the rapid removal of ash trees, the City also undertook the process of replanting new

trees after the loss. “We have concentrated our replanting efforts on our streets first. One of our hardest hit streets was lined with 90 mature trees; 87 of these trees were ash, and they all had to be removed. The street was left with three trees, which had an enormous impact on the character of the neighborhood,” said Mr. Buford. By utilizing contractors, they have planted approximately 800 replacement trees at an average cost of $205/tree (includes planting). Tree replacement has been funded through the City’s Tree Development Fund and DNR tree planting grants. Money from the Tree Development Fund comes from developers who are required to deposit money into the fund to replace trees lost during development. The Fund money is strictly for the replacement of trees. The City plans on replacing all of the ash trees lost to EAB by 2012.

The City of Westland Residents

“Our residents have been shocked and concerned about the loss of city owned ash trees to EAB,” said Mr. Buford. “They have been really patient and understanding of our EAB plans. Our main focus was the removal of the ash trees, with the most hazardous ones as our top priority. We worked hard to help homeowners understand that it would take a while for stump removal and site restoration to occur after the city owned tree was removed in front of their house. We really had to prioritize the removal of hazards, and then we could focus on restoring the site.”

The City provided education to their homeowners, condominium complexes and apartment building owners by holding EAB meetings around the City. The status of EAB was also discussed at town hall meetings and placed on their Community Access channel.

Lessons Learned

When asked what advice Mr. Buford had for communities preparing for EAB, he said, “It’s very important that they have a tree inventory to understand what they have. Like I mentioned earlier, you’ll be lost without one. Once they have a tree inventory and know what they have, tackle the worst trees first. Once we removed the hazard trees, we had two crews doing removals. We sent one crew to one end of the City and another crew to the opposite end, and they removed ash trees in each section while working toward each other. This made it easier for us to remove trees systematically instead of jumping around the City. When a homeowner contacted us about removing their tree, we would explain our plan and let them know, realistically, how long it might be before their tree was removed. Have a detailed, organized plan to remove the rest of the ash trees and stick to it.”

APPENDIX D: SAMPLE EAB PREPAREDNESS OUTLINE

1) Purpose of the EAB Preparedness Plan

2) Elements of an EAB preparedness plan
   a) Tree Inventory (number, conditions, size and location)

   b) Surveying for EAB

   c) Ash Management Policy
      i) Cost estimates for:
         (1) Removal/disposal
         (2) Treatment
         (3) Replacement
      ii) Historic/significant tree policy
      iii) Ash Tree Removals
         (1) Evaluate In-house vs. contracted ash tree removals
         (2) Infested vs. non-infested trees (Reactive vs. Proactive Removals)
         (3) Hazard trees
         (4) Prioritization
         (5) Private property trees
         (6) Permits and Regulations (Local, State & Federal)

   d) Identification of internal (community) resources and needs
      i) Financial
      ii) Personnel/volunteers
      iii) Facilities/equipment
      iv) Ordinances
         (1) Enforcement mechanisms (penalties)

   e) Identify funding decision makers and person(s) responsible for tree care

   f) Communication & Public Education
      i) Development of internal (municipal staff) communication protocol
      ii) Development of external (residents) communication protocol
         (1) Public Education
            (a) Adult and K-12

   g) Wood Waste Disposal and Utilization

   h) Replanting/Maintenance

APPENDIX E: EAB SURVEY METHODS

Visual Survey techniques include looking for the outwardly visible symptoms of EAB on ash trees. Surveys can be conducted systematically over a given area or by individually selected trees through an inventory. Visual surveys are conducted by persons on the ground evaluating individual ash trees for EAB symptoms. The canopy of the tree should be surveyed for a thinning crown. The use of binoculars can assist in focusing on bark splits or woodpecker damage in the crown of the ash tree. The trunk of the ash tree should be examined for D-shaped exit holes, bark splits, and epicormic shoots. If any of these symptoms are present, the tree is most likely infested with EAB. To determine a positive tree, a life stage of the insect should be obtained by peeling portions of the tree to observe the presence of larvae.

The advantages of visual surveying techniques include few resources that can cover a large area in a short amount of time, as well as the ability to not sacrifice trees to be utilized as traps. The disadvantages are that by the time visual symptoms of EAB are present, it usually means the infestation has been in the area for several years, and protection measures may not be warranted.

Tree Climbing methods are employed when a closer look of the tree's canopy is warranted. Professional tree climbers should be utilized in these situations and be trained in an Electrical Hazard Awareness Program. Once in the canopy of the tree, small windows of the canopy's trunk and branches can be peeled back, using a drawknife, to look for EAB larvae. Areas to focus on are thinning branches, bark splits, and woodpecker damage.

Advantages of incorporating tree climbing techniques into surveying methods include a close-up view of the canopy of an ash tree (the area of the tree which will show EAB symptoms first). The disadvantages include the costs of using specialized people and the time it takes to perform this inspection on individual trees.

Destructive Sampling: includes the removal and/or peeling of an ash tree to look for EAB larvae and larval galleries. Ash trees are selected and removed at the base. Ash trees that are destructively sampled can be of any size, but are the most efficient to peel when they are between 4"-12" Diameter at Breast Height (DBH). The tree should be kept in one piece to aid in the efficiency of peeling. The bark from the tree should be peeled in thin layers, using a draw knife from the top to bottom. Focus first on peeling areas of the tree that include weak branches, bark cracks, epicormic shoots, or woodpecker damage. Keep in mind that the size of the larvae galleries may be very small in young infestations and can even be as small as the size of a dime.

One advantage of destructively sampling ash trees for EAB is the discovery of early infestations. This is a significant factor in determining appropriate management solutions for infested areas. A disadvantage of this technique is the fact that once the tree is removed and peeled, it is destroyed. An example of the types of trees that could be used in this type of survey are trees in road rights-of-ways, ditches, fencerows, edges of woodlots, and trees

already exhibiting EAB symptoms where the observation of a life stage is warranted.

Detection Trees[10]: Detection trees are one of the most effective tools available in surveying for EAB. Unfortunately, this method also destroys the ash tree that is used. Research conducted by the U.S. Forest Service and Michigan State University has shown that EAB beetles are more attracted to stressed trees and prefer to lay their eggs on trees that are weak versus trees that are healthy effective girdling of an ash tree includes the following methods:

- Choose a tree between 4"-12" DBH
- Make two parallel cuts in the tree approximately 8" apart (using chainsaw or drawknife)
- The cuts should completely encircle the trunk as removing the bark from only a portion of the base of the tree is not as effective.
- Remove the bark and phloem (spongy tissue just beneath the bark) between the two cuts.

Traps such as purple panel traps, or lindgren funnel traps, use pheromone lures to attract adult EAB after they have emerged in mid-summer. These traps are hung in locations where ash is prevalent, and/or near known or suspected EAB activity. While similarly effective, there are pros and cons to each of these methods, especially as it pertains to installation, manpower, and maintenance demands, so careful consideration should be given when choosing which method to use.

Biosurveillance using *Cerceris fumipennis* wasps to capture EAB is also very effective. This technique requires little training, but a lot of time afield so the availability of manpower should be considered.

[10] For additional information on using detection trees, see the MSU, MDA and USFS document titled "Using Girdled TrapTrees Effectively for EAB Detection, Delimination & Survey" at www.emeraldashborer.info.

APPENDIX F: CITY OF TOLEDO LABOR WORKSHEET FOR DETERMINING TREE REMOVAL COSTS (EXAMPLE)

Maintenance	Diameter Class	Number of Trees	Hours per Tree*	Estimated Hours	Cost per Hour¨	Estimated Cost^	Total Est. Hours	Total Est. Cost	Average Cost/Tree^^
Removal[1]	01" - 06"		**0.22**		**$52.464**				**$11.54**
	06" - 12"		**0.94**		**$52.464**				**$49.32**
	12" - 18"		**1.32**		**$73.435**				**$96.93**
	18" - 24"		**1.88**		**$73.435**				**$138.06**
	24" - 30"		**2.92**		**$76.611**				**$223.70**
	30" - 36"		**4.71**		**$76.611**				**$360.84**
	36" - 42"		**6.12**		**$76.611**				**$468.86**
	42" - 48"		**6.61**		**$76.611**				**$506.40**
	48" - 54"		**7.61**		**$97.582**				**$742.60**
Removal Total:							**$0.00**	**$0.00**	
Trim[2]	01" - 06"		**0.39**		**$52.464**				**$20.46**
	06" - 12"		**0.72**		**$52.464**				**$37.77**
	12" - 18"		**0.79**		**$73.435**				**$58.01**
	18" - 24"		**1.08**		**$73.435**				**$79.31**
	24" - 30"		**1.13**		**$76.611**				**$86.57**
	30" - 36"		**1.48**		**$76.611**				**$113.38**
	36" - 42"		**1.67**		**$76.611**				**$127.94**
	42" - 48"		**1.67**		**$76.611**				**$127.94**
	48" - 54"		**2.43**		**$76.611**				**$186.16**
Trim Total:							**$0.00**	**$0.00**	
Stump[3]	01" - 06"		**0.32**		**$41.942**				**$13.42**
	06" - 12"		**0.32**		**$41.942**				**$13.42**
	12" - 18"		**0.32**		**$41.942**				**$13.42**
	18" - 24"		**0.38**		**$41.942**				**$15.94**
	24" - 30"		**0.44**		**$41.942**				**$18.45**
	30" - 36"		**0.59**		**$41.942**				**$24.75**
	36" - 42"		**1.00**		**$41.942**				**$41.94**
	42" - 48"		**1.59**		**$41.942**				**$66.69**
	48" - 54"		**2.21**		**$41.942**				**$92.69**
Stump Total:							**$0.00**	**$0.00**	
TOTAL							**$0.00**	**$0.00**	

APPENDIX G: CITY OF TOLEDO REMOVAL COST BID SHEET (SAMPLE)

Removal estimate for approximately XXXX trees in city of Toledo using 2005 contract pricing. Residual wood to be disposed of by Contractor at Contractor sites.

***** DBH reflects tree diameter at 4.5' above ground. *****

DBH (upper limit of 6" size class)	**Quantity**	**Bid Price** (per size class)	**Cumulative Price** (per size class)
18"		$241.43	$0.00
24"		$475.00	$0.00
30"		$650.00	$0.00
36"		$1,002.00	$0.00
42"		$1,366.67	$0.00
48"		$1,400.00	$0.00
54"		$1,800.00	$0.00
60"		$2,500.00	$0.00
	0		**$0.0**

Cumulative Total (all size classes) _____

APPENDIX H: WOOD UTILIZATION

Despite the opportunities that exist for successfully utilizing removed ash trees, several major challenges exist:

- **Location**: While much EAB-infested ash resides within "traditional" forested ecosystems, communities are faced with removing high volumes of trees in urban areas. The larger forest product industries do not typically operate in urban forests, making organizing and implementing utilization much more difficult in these areas. Smaller companies (portable sawmills, etc.) and urban-based businesses (mulch industries) are more likely to be interested in partnering with communities.

- **Existing markets**: Ash prices on the general timber markets have been declining in recent years. While this is likely in some part due to EAB, it also may be due to a variety of other factors that bring about fluctuations in timber prices. Due to these relatively low values, most larger-scale buyers of timber are not likely to be interested in ash-only salvage sales. However, this problem can be eliminated by pursuing smaller and/or local markets or by including additional species in sales.

- **Scale**: Urban areas can be challenging for collecting wood residues. Systems which rely on single logs being picked up from a variety of areas are inefficient and have little chance of being successful over the long term. Infrastructure must be developed to allow for residues to be collected, sorted, and merchandised as efficiently as possible, which may necessitate a cooperative effort among many public and private entities.

- **Timeline**: Often, the timeline set for tree removals is quite short once an infestation is discovered in an area. This leaves little time for arranging utilization options once removing trees and clearing debris becomes top priority. Utilization programs have the best chance of success if much of the early groundwork (finding industry partners, organizing collection and transportation, etc.) is completed as much in advance as possible.

- **Expense:** The tree removals, wood disposal, and replanting associated with an EAB outbreak all create huge economic burdens for affected communities. This often makes "one-source solutions" appealing to communities when one company is willing to remove trees and haul away all of the residue. However, this approach may leave out other creative options for higher-value utilization that could further lower the disposal costs.

- **Transportation**: High gasoline prices and congested traffic in urban areas make transporting loads of wood difficult and expensive. Additionally, in most cases, few companies in urban areas have the equipment necessary to lift and transport whole logs. Partnering with multiple businesses, or even multiple communities, may allow access to suitable resources.

- **Varying support from communities**: Community departments are often short-staffed and struggling with tight budgets. Developing and/or incorporating new ideas for how they dispose of wood waste can often be difficult, even if it will result in savings for the city. In many cases, community managers do not prefer how wood is disposed of, as long as it is removed from public areas in a timely manner. Following the models of other experienced cities may help in easing the shift to this type of new system.

- **Varying support from local industry:** Often the larger wood products industries in a region may not be interested in salvaged or reclaimed wood (due to concerns about metal, contaminates, and poor log quality). They usually have their own reliable sources for wood resources and are hesitant to try a new untested source. It is important to survey many different types (and sizes) of local industries to find successful partnerships.

APPENDIX I: FOREST STEWARDSHIP PLAN STANDARDS

As a condition of enrollment in the Farm, Forest and Open Space Program Forest Stewardship Plans must meet the following minimum specifications.

1. Title Page.

Owner and Preparer Information including contact information
Property Information including plat and lot number, deed book and page, and acreage enrolled in the program as well as excluded acreage.

2. Signature Page

- Signatures of the landowner, plan preparer and State Forester's representative
-Date the plan was prepared.

3. Property Overview.

A brief discussion of adjacent land uses as well as significant resources and features on the property that may impact management decisions. The discussion shall include:

 Biodiversity
 Threatened and rare plant and animal species
 Riparian and wetland areas
 Soil and water quality – Watershed Protection
 Forest health
 Wildlife management
 Forest products
 Cultural Resources
 Recreation and aesthetic considerations
 Wildfire Risk Assessment
 Carbon Cycle
 Estate Planning

4. Management Unit Information
For each management unit (or stand) reference to the property map and description of:
 Forest Type
 Acreage to nearest whole acre
 Stand Description, including
 Stocking level
 Basal area
 Average tree diameter
 Trees per acre
 Volume of forest products per acre (optional)
 Site index
 Soil Type
 Landowner's Management Objectives for the area
 Other characteristics important to the management of the area

5. Management Recommendations

Recommended forest management practices to meet the landowner's objectives, including activity, acreage involved and year to be accomplished.

6. Maps.

 Topography Map with property boundaries on a scale no greater than 1" – 1000'.

 Locus Map of the property showing the property boundaries and property location in relation to the nearest major roadway intersection.

 Soils Map

 Forest Vegetation/Stand Map. 8 ½ x 11 (or folded to that size) showing the location of forest types as well as other significant features. The map must include:

 Name and address of landowner and town(s) where the property is located.

 Date map was prepared and person who prepared the map

 Scale and north arrow

 Property and other boundaries (e.g. town lines) depicted and labeled.

 Eligible land and ineligible or non-committed land, delineated with acreage

7. Activity Schedule

Summary of Recommended actions for all management units, including measurable outcome and year to be accomplished.