

Minnesota State Agency Report

Emerald Ash Borer
in Minnesota | 2019

DRAFT



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This report was prepared by the Environmental Quality Board (EQB) with assistance from staff of the Minnesota Departments of Agriculture (MDA), Commerce, Health (MDH), and Natural Resources (DNR), the Minnesota Pollution Control Agency (MPCA), and the Metropolitan Council.

The EQB's mission is to enhance Minnesota's environmental quality for current and future generations by leading interagency work to advance meaningful public engagement and facilitate informed decision-making on critical environmental issues.

The EQB is reducing printing and mailing costs by using the internet to distribute reports and information to a wider audience. Visit our website for more information: www.eqb.state.mn.us/EAB.



Although Minnesota is best known for our lakes and water resources, our state would not be what it is today without our storied and beloved trees.

The emerald ash borer is an invasive insect that attacks and kills ash trees. We have watched as many states further east have experienced the devastating effects of these insects destroying their front yards, parks, and forests. Their communities have struggled to keep up with the pace of tree infestations and watched EAB decimate their ash tree resources.

No state has more ash trees than we have in Minnesota, and we are on the precipice of unprecedented loss. The results, already occurring in 21 of our counties, will change our communities and landscapes forever.

This infestation echoes a previous natural tragedy many remember from the 1970s when Dutch elm disease destroyed entire blocks of large boulevard trees along our neighborhood streets. Unfortunately, we replanted many of those trees with ash, and now we face a similar situation fifty years later. The emerald ash borer's impacts are on a larger scale, however, and the loss of ash trees poses a significant climate threat.

So far, Minnesota has been lucky. EAB is spreading more slowly across our state than in other states. This is in large part due to the great work of our state agencies, partners, and communities who have been working on this issue for over a decade now.

We cannot let this relative success lull us into a false sense of security from EAB and its many impacts. The EAB infestation will get worse and it will affect every single ash tree in our state. Our efforts have helped slow the spread of EAB and begin to address the impacts, but we need to do more to avoid the acceleration of EAB's spread and the unnecessary management costs. We have the power to predict and manage this crisis - if we act now.

Sincerely,

Tim Walz
Governor of Minnesota



Introduction

Ten years have passed since emerald ash borer (EAB) was discovered in St. Paul in 2009. Nearly a quarter of Minnesota's counties have infestations, and all will eventually

**EAB is a climate issue.
Over 1 billion trees are at risk.**

be infested. The state has more than 1 billion ash trees, mostly in forests, while 1 in 5 trees in Minnesota's communities is ash. Losing these trees poses a serious threat to community and rural forests across the state. Unfortunately, federal efforts to limit the spread of EAB will disappear and communities and land managers lack sufficient funding and capacity to adapt to the destructive effects of this pest.

State and federal quarantines have

assisted in slowing the spread of EAB into and throughout the state. However, the federal government is considering lifting their interstate quarantine, requiring states to take on enforcement. Without effective quarantines and enforcement, transportation of infested wood will speed the spread of EAB.

In 2019, the Minnesota Legislature approved \$1,000,000 in funding for communities to respond to EAB.

These funds will help communities complete tree inventories, develop management plans, and remove and replace ash trees. While these funds will be put to good use, they will address only a fraction of the need.

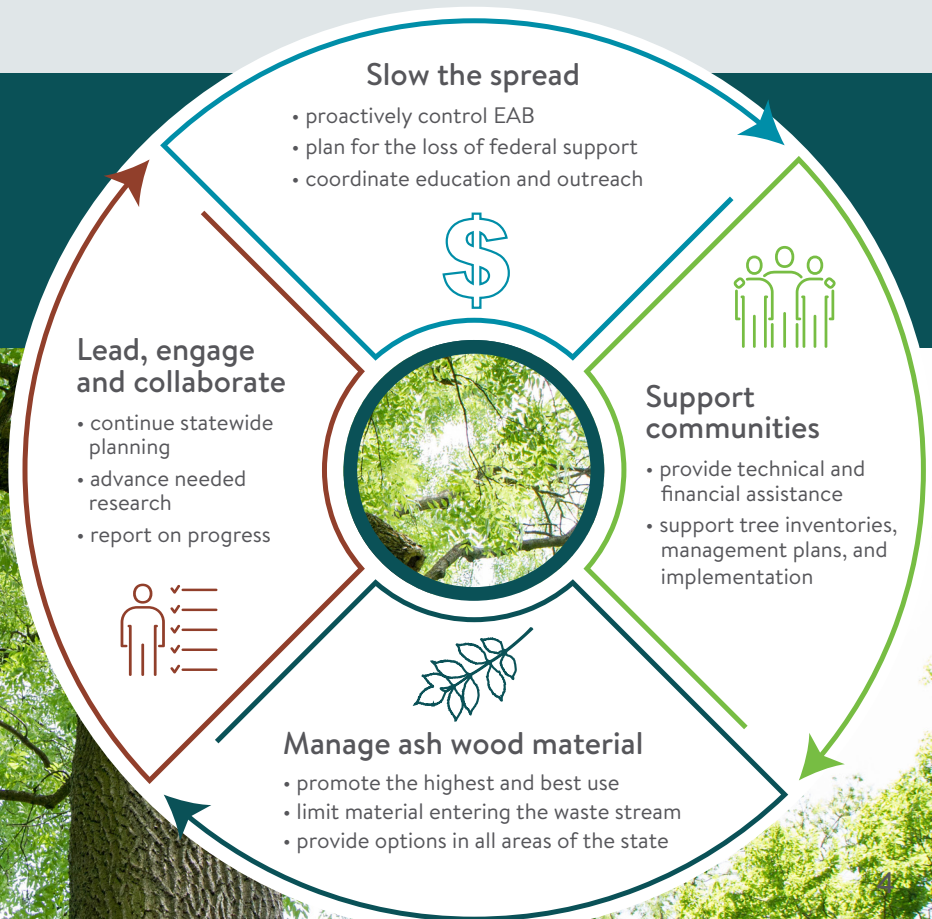
By adequately supporting communities, we could keep EAB out of Minnesota's ash-dominated forests for as long as possible. Infestation in these forests carries a significant climate risk and will likely have long-

term environmental effects. Not only could Minnesota lose one billion ash trees in our forests, but over one million acres of forests could convert to non-forest ecosystems and sequester far less carbon over the long term. How we manage standing ash trees matters, too. If we have a proactive and organized response, we can put ash wood to its highest and best use and avoid overwhelming our waste stream.

The purpose of this report is to provide recommendations for action on EAB to Minnesota's leaders. Although community forests and forested lands have different challenges, this report attempts to address both. We cannot avoid the impacts of EAB entirely. However, if we take action now, we can avoid many unnecessary costs and impacts while laying the groundwork for healthy, resilient forests in our communities, working lands, and protected lands.

This report is a call to action.

OUR KEY RECOMMENDATIONS...



What is emerald ash borer?

Native to eastern Asia, the invasive emerald ash borer (*Agrilus planipennis*) is a small, iridescent green beetle – just under ½-inch in length. First detected in Detroit, Michigan in 2002, EAB has since spread to 35 U.S. states, including Minnesota. As of September 18, 2019, 21 of Minnesota’s 87 counties have EAB infestations.

All ash species native to Minnesota will be eradicated by EAB if nothing is done to protect the trees. The larvae feed on the inner bark of ash trees, creating S-shaped tunnels that disrupt the movement of nutrients and water within the tree, eventually killing it. Larvae overwinter in the tree and emerge as adult beetles through a D-shaped exit hole in the bark.

EAB can only move a few miles on its own each year. Unfortunately, humans have artificially accelerated the spread of EAB, mostly by moving infested firewood, woodchips, and other wood products.

Because the insect itself is difficult to detect, woodpecker activity or splitting bark on infested trees may be the first signs of an infestation. Once trees have started to show symptoms, they generally die within 1-3 years.



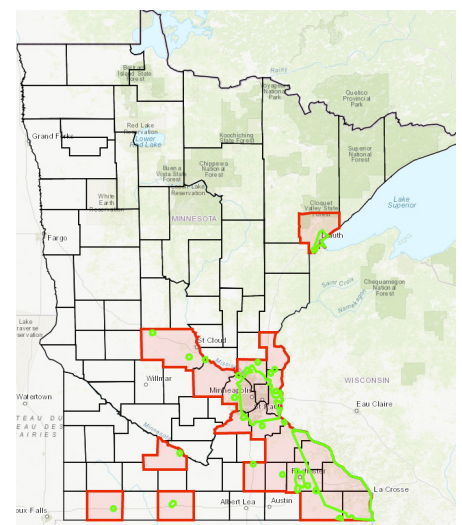
An EAB shown to scale.
Source: Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org



The signature D-shaped hole that an adult beetle creates when exiting an ash tree.
Source: Debbie Miller, USDA Forest Service, Bugwood.org



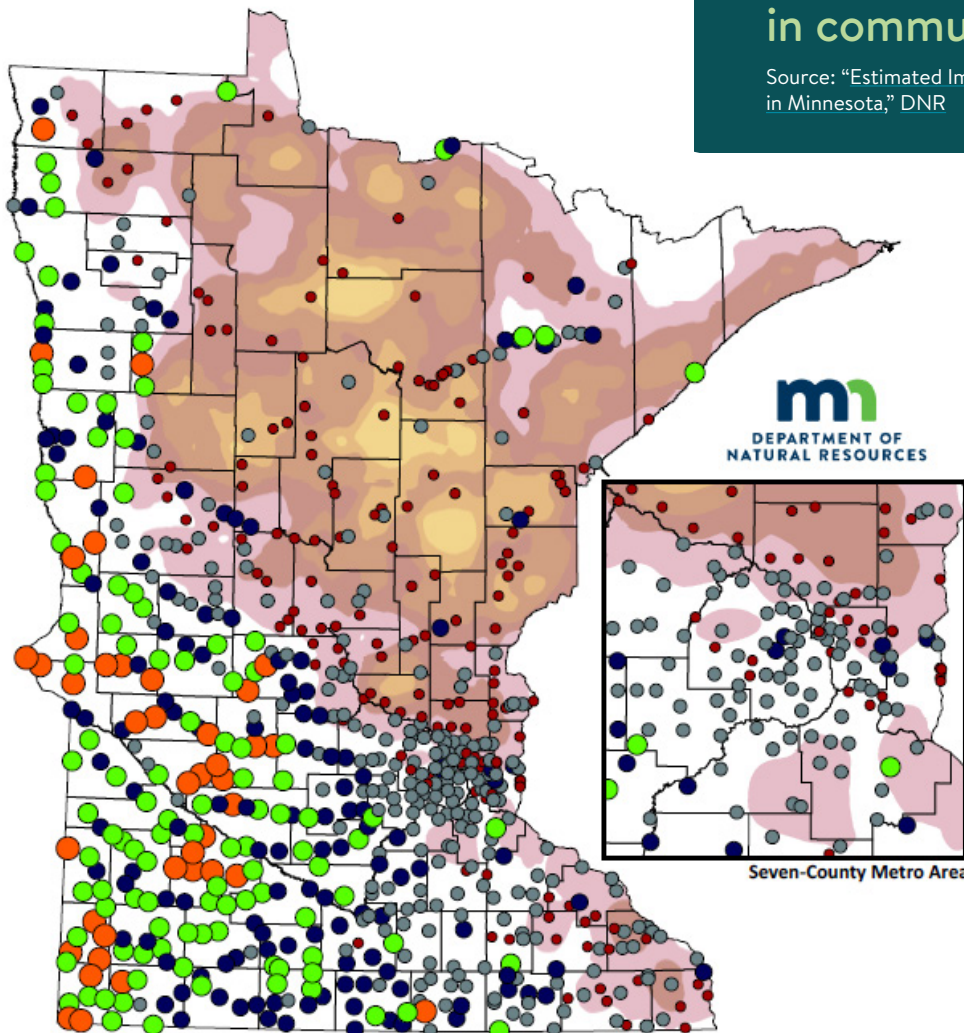
Woodpeckers cause flecking as they attempt to dig out the EAB larvae under the bark.
Source: City of Burnsville, MN



EAB continues to spread across the State of Minnesota. The Minnesota Department of Agriculture maps new infestation sites (green) and lists quarantined areas (red).
Source: MDA

Why are we concerned about emerald ash borer in Minnesota?

Community and Forest Ash Trees in Minnesota



An analysis of ash populations and density by municipality.
 Source: 2010 Rapid Assessment, DNR
 "Percentage of trees of the genus Fraxinus (Ash) inside of municipal boundaries in 2010 and Black Ash Concentration in Cords per Acre"

EAB could kill up to 360,000 trees in forested areas and 25,000 trees in community forests, annually.

Source: "Estimated Impacts of Emerald Ash Borer (EAB) on Ash Timber Supply in Minnesota," DNR

With over 1 billion ash trees, 2.65 million of which are located in communities, EAB is a major threat to Minnesota's ash resource. Minnesota has more than one million acres of forest dominated by ash - more than any other state in the country. The State of Minnesota manages 170,000 acres of ash-dominated forestland.

Trees in communities	Black ash in forests
Total Ash as a Percentage of Total Trees Reported on 2010 Rapid Assessment (RA) (RA surveyed maintained areas)	Black Ash Forest Concentrations (2017 FIA) Cords per Acre
<ul style="list-style-type: none"> ● 0.1% - 10% ● 10.1% - 20% ● 20.1% - 30% ● 30.1% - 40% ● 40.1% - 60% 	<ul style="list-style-type: none"> Low to None 2 - 5 5 - 8 8 - 10 10 - 13 13 - 19

Ash Trees in Communities

Though ash trees in communities represent only a tiny fraction of all ash trees in Minnesota, they play an important role in human and environmental health. Community trees reduce heat stress, cool buildings, improve water and air quality, reduce flooding risks, increase property values, and enhance green space. When EAB kills ash trees, we lose the benefits that add value to those trees.

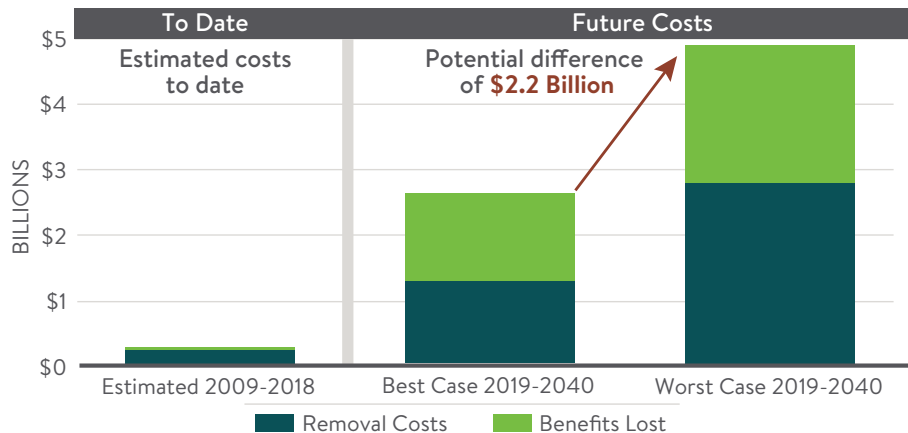
Key Benefits Lost

Cooling

Ash provide a benefit to residents by cooling summer temperatures around homes and shaded areas. The urban heat island effect occurs in built-up areas that retain heat. This can cause as much as a 22°F difference between the urban area and surrounding rural area at night. When ash trees die or are removed, the urban heat island effect is more pronounced and people are more vulnerable to heat-related illness and death. (www.health.mn.gov; www.metrocouncil.org)

Trees properly placed around

Estimated Cost of EAB to Communities through 2040



As EAB spreads, management costs increase and the amount of benefits lost will create a financial burden, amounting to significantly more than what has been realized to date.
Source: MDA

buildings can reduce air conditioning needs by 15 to 50 percent.

(www.energy.gov)

Water quality

When precipitation falls on the land, it picks up pollutants such as leaves and salt before entering our lakes, rivers, and groundwater. On average, a single ash tree captures 1,800 gallons of stormwater each year. Trees slow water down, reducing flooding and water pollution. Cleaner stormwater means lower costs for water treatment for drinking water and cleaner surface

waters for swimming and fishing. (www.MnSTAC.org)

A 2017 study of the West Side neighborhood of St. Paul shows that ash trees provided the greatest stormwater reductions, intercepting 28 percent of the total stormwater volume each year even though ash only make up 22 percent of the total trees in the neighborhood.

(www.stpaul.gov)

Air Quality

Community trees play an important role in reducing air pollution. Trees remove pollutants from the air we



On average, a single ash tree captures 1,800 gallons of stormwater each year.



Over 100 communities applied for the Managing Ash for EAB grant in 2018, with over 60% of the applicants requesting the maximum grant dollars. The DNR only had funds for four of the applications received.



A street in Toledo, Ohio before and after EAB. Source: Dan Herms, Ohio State University.

breathe. Reducing air pollution helps reduce health conditions such as asthma and cancer.

Aesthetics

Community trees play an important role in increasing property values and enhancing green space in areas that typically have small boulevards and less access to parks, which is especially important in low-income areas.

Management Costs

The potential impact of EAB on Minnesota communities is substantial, and state and local governments have only paid a fraction of overall EAB costs to-date. Unfortunately, the faster EAB spreads, the greater the economic burden becomes. If Minnesota is not able to maintain a relatively low rate of spread over the next 20 years, communities could pay an additional \$2.2 billion through tree benefits lost and accelerated management costs (figure on page 7).

Managing community ash trees is expensive. Depending on the

situation, communities and private land owners may preemptively remove uninfested ash trees, treat uninfested ash trees with pesticides to protect them from EAB, or remove infested ash trees. By delaying EAB damage for just one year, Minnesota communities could save approximately **\$140 million** in management costs and property value reduction. (www.leg.state.mn.us)

After tree removal, planting new trees can be another significant cost. Low-income communities may be disproportionately affected by EAB if they must rely on their own community taxes to manage and remove ash trees and plant new trees. Between three and nine years

after EAB first infests a community, management costs soar and strain budgets. If all community ash trees in Minnesota were removed and new trees planted, it could cost upwards of \$3 billion.

Because EAB-infested trees are hazards to community safety, communities and landowners with infestations cannot defer ash tree management. Dying ash trees are brittle and can drop limbs on sidewalks, streets, buildings, and power lines.

Unfortunately, communities may need to delay replanting efforts as they prioritize removal of hazard trees, and some homeowners may lack the

Average costs of ash tree management in Minnesota	
Action	Costs
Tree Removal	\$1,000 for communities Up to \$4,000 for homeowners
Treatment (every 2-3 years for a 20-inch tree)	\$50-\$200
Tree Planting (6-foot hardwood with labor costs)	\$40-\$300



COMMUNITY SPOTLIGHT

Winona

The City of Winona knew EAB was coming, so they completed a plan in 2012 – two years before EAB was discovered there. Since then, Winona has employed several strategies to address EAB infestations. The City treated 950 trees in 2018 with injectable insecticides, which helps to maintain the benefits of mature ash trees in the community. Treatment also allows Winona staff to keep up with the needed tree removals and spread the cost over time.

City staff consider any untreated ash tree as infested, dying, or dead. The city increased its rate of tree removal from about 200 trees the year before EAB first appeared to 300 trees per year since its arrival. City staff noted that ash are predictably difficult to remove. They will “hold strong until they don’t hold at all,” making them a public safety concern.

To replace trees as quickly and economically as possible, Winona is incorporating tree planting in road construction projects and has secured grant funding for 50 new trees. However, city staff have

noticed a significant increase in the price of planting stock, up to \$200-\$300 per tree. A Minnesota GreenCorps member completed a tree inventory and built an irrigated gravel bed that allows Winona to purchase lower cost bare-root stock and hold it in an irrigated space until it can be planted in the autumn.

Even with these EAB response strategies, Winona faces many challenges. As city staff focus their community forestry efforts on treatment and removals, they must put other forestry needs on hold. Despite recently adding an additional staff member, Winona staff will not be able to prune other public trees for another two to three years, and it takes up to a year and a half to manage the ash stumps. To compound matters, city staff has a hard time finding contractors to help because area tree care companies are overwhelmed with residential work.

Winona will continue to look for ways to address the challenge of EAB while reducing impacts to the community.

Source: City of Winona

funds to replace trees on their own property. As the climate gets warmer and wetter in Minnesota, communities need mature trees to provide cooling and manage stormwater more than ever.

Ash Trees in Forests

The vast majority of Minnesota’s ash trees are in northern forests. These ash-dominated forests provide substantial environmental benefits, including sequestering large amounts of carbon, keeping the water table in check, and providing wildlife habitat. Ash trees are significant in many American Indian cultures, and they are important for outdoor recreation in Minnesota.

EAB is expected to have dramatic impacts in Minnesota’s ash forests because of the high concentration of ash trees, wet conditions, and extensive amount of area covered in the state. While initial research on the effects of EAB on northern ash forests has provided some valuable insights, there are still many unknowns. As EAB infestations spread across these forests, we will be in uncharted territory – Minnesota has the largest concentration of ash forests in the United States.

**Over 1 billion
ash trees are
located in
Minnesota’s
forests.**

U.S. trees killed by invasive forest pests, such as EAB, release the same amount of carbon each year as 4.4 million cars.

Source: Northern Research Station, USDA Forest Service

The loss of black ash will likely result in higher water tables and changes to hydrology.



Black ash stand in swampy land in the Chippewa National Forest. Source: [Louis Iverson, USDA Forest Service](#)

Key benefits lost

Carbon sequestration and storage

Forests are “carbon sinks” — they sequester, or pull in carbon dioxide, a greenhouse gas. A 20-year old ash tree sequesters between 23.2 and 41.0 pounds of carbon per tree, annually. In total, Minnesota ash forest types store approximately 187 million tons of carbon dioxide, mostly in the forest soil. It is unclear how much of this carbon would be lost to the atmosphere if ash trees die rapidly in coming years, but it is expected to be significant (www.epa.gov, www.nrs.fs.fed.us/fia)

To compound matters, EAB infestations may cause black ash

forests to convert to non-forest ecosystems, further reducing carbon sequestration over 1 million acres.

Water storage and quality

In areas of the northern Minnesota wetlands, black ash make up 40-100 percent of the tree canopy. Ash trees act as water pumps, taking up large amounts of water. The loss of black ash is likely to lead to less water absorption on the landscape and increase the potential for localized flooding.

Habitat

Changes to ash forest ecosystems due to EAB may be striking, with

substantial loss of habitat for migrating birds and other species. Unfortunately, many habitat impacts of EAB are unknown.

As EAB kills ash trees, Minnesota’s black ash-dominated forests are at risk of becoming open-water wetlands populated by non-tree species such as cattails and sedges. Widespread black ash mortality will also affect aquatic systems because ash is a common wetland tree that contributes food and habitat to water bodies. As ash die, the increase in leaf litter and debris may overburden the aquatic ecosystem with nutrients, resulting in algal blooms.



Green ash provide windbreaks in agricultural areas such as Polk County, Minnesota. Source: USDA-NRCS



Three black ash-bark baskets created at the North House Folk School in Grand Marais
Source: Dave Wilsey, 2010

Cultural uses

Many American Indian traditions rely on ash trees for various tools and medicines. Native cultures use black ash to make baskets, ceremonial pipes or flutes, lacrosse sticks, and snowshoes.

Forests play a crucial role in Minnesota’s outdoor tourism and recreation industry. Seventy percent of Minnesota residents participate in outdoor recreation of some sort every year. As EAB reduces Minnesota’s ash tree population, changes to parks, trails, and other recreational areas may result in job and economic disruptions.

Management challenges

There are many challenges to managing ash forests in the face of EAB. Given the host of environmental concerns including climate and water quality, researchers are interested in finding different trees that can be planted to replace ash trees. We need more information to determine the best trees to plant and reforestation strategies to prevent the conversion to non-forest ecosystems and keep

forests forested.

Time is of the essence to harvest ash to avoid climate impacts and make use of this resource before it is degraded. Dead and dying ash trees release carbon into the atmosphere, contributing to climate change. By harvesting ash prior to EAB infestations, we can diversify ash forests with species that may be more resilient to climate change and put the wood to its highest and best use.

Harvesting ash trees can be difficult because many ash tree stands are only accessible to crews while the ground is frozen due to wet site conditions. Minnesota’s harvest window is limited due to shorter winters. Quarantines can create complications for logging, milling, transport, and markets. Without incentives, there are no significant ash wood markets that could move ash trees off the landscape in advance of EAB.

Lastly, landowners may choose to burn the wood in recreational fires or debris piles as ash trees die across the state. Burning affects local air

quality and increases the risk of wildfires and structural fires.

Power outages caused by downed limbs can disrupt entire communities by impacting electricity to health care providers, schools, emergency response facilities, and other critical infrastructure.

Insurance rates and premiums can increase due to property damage caused by dead and dying ash trees. EAB-infested trees on private property are likely to be located near structures, vehicles, and people, creating a hazard. Property owners may not realize the risk associated with an infested tree.

Material management challenges

EAB-infested trees die within a few years. Right now, there is not enough capacity in Minnesota’s wood use industry or in disposal, processing, composting, biomass, and biofuel facilities to handle

HIERARCHY OF ASH TREE MATERIAL MANAGEMENT

Most preferred environmental option



Least preferred environmental option

Nagaajiwanaang Ishkoniganing Gidagoshin



Fond du Lac Reservation

COMMUNITY SPOTLIGHT

Fond du Lac Band of Lake Superior Chippewa

The Fond du Lac Band of Lake Superior's community members have a close relationship with baapaagimaak (literal translation "snowshoe making tree"), also known as black ash. It is used for many ceremonial purposes and many plant foods and medicines can be gathered from baapaagimaak stands. There are also unique macroinvertebrates and animals that rely on these wet forest ecosystems and contribute to their functions.

Many of Fond du Lac's baapaagimaak stands occur within the watershed that feeds and drains the manoomin (wild rice) lakes. Because manoomin is a crucial component of Anishinaabe culture and subsistence lifestyle, the Fond du Lac band must consider the hydrological effects of baapaagimaak loss on the entire watershed. Fond du Lac has taken an integrated ecosystem management approach as well as incorporating Indigenous Knowledge into planning for the loss of baapaagimaak in these unique ecosystems. It is crucial to look at more than the monetary value of baapaagimaak itself when planning for the effects of the inevitable infestation of emerald ash borer.

Fond du Lac's forests have over two square miles of baapaagimaak stands. The rapid loss of ash could greatly reduce the volume of water taken up by the trees. This may alter water tables and surface runoff, potentially stressing a watershed already greatly affected by the ditching that occurred in the early 1900s. Manoomin is very sensitive to water level fluctuations and EAB will likely exacerbate this problem. Hard-to-access locations and small stand size present a logistical and practical barrier for any large-scale preemptive or post-EAB infestation treatments.

Fond du Lac's Forestry and Wetlands programs have collaborated on a research project since 2015 to assess the viability of planting non-ash trees in baapaagimaak stands. The goal is ultimately maintaining the hydrology of these systems in the event of EAB-induced mortality (i.e., keeping forested wetlands forested). In collaboration with the University of Minnesota-Duluth, Fond du Lac is collecting sap flow data from non-ash tree species occurring in baapaagimaak stands to better understand tree hydrology. The early and ongoing results of this project and other projects are helping guide current and future planting efforts.

Other management strategies include methods to slow the spread of emerald ash borer, preserve ecosystem function and condition, and preserve baapaagimaak for cultural use. Fond du Lac supports existing state regulations of ash and other hardwood movement and storage. Monitoring efforts are also carried out by the Fond du Lac Invasive Species program in collaboration with the USDA's Animal and Plant Health Inspection Service division.

With no effective remedy for EAB, prevention and adaptation are essential to maintaining the health of these forested wetlands and the ecosystems and watersheds they impact.

the total amount of tree material the EAB infestation will generate, which has been estimated to total approximately 1.5 million U.S. tons over the course of the infestation, in urban areas alone. (Michael Orange, [Minnesota RETAP](#))

All of the material management options for ash wood require transportation and storage. Infested ash trees can continue to harbor EAB after they are cut and transported for use in wood-burning facilities or as firewood.

Large wood debris yards are prone to rodent and insect infestations and are susceptible to fire, as made evident with the onset of Dutch elm disease. Without a secure market for the wood, storage sites may inadvertently turn into unpermitted and unsafe compost heaps.

Waste prevention

The State of Minnesota strives to find ways to prevent waste and use materials otherwise destined for the waste stream. Preferred methods of material management like waste prevention and efforts to repurpose and reuse are preferred over composting, waste to energy, landfilling, or burning.

Tree preservation

Treating ash trees with insecticide extends the life and delays the entry of the tree into the material management system. By reducing the volume of removed trees in any given year, we will be able to spread out the material management challenge over a longer period of time.

Harvesting

Whenever possible, harvesting ash trees for use as lumber, pulp, or other products is preferable to managing ash tree waste. Harvesting ash trees may be done prior to an EAB infestation, therefore preserving the quality of the wood and providing the potential to selectively harvest quality trees for a higher resale value. An alternative is to harvest after the trees have been infested but before they are entirely dead. In fact, EAB larvae only affect the outer 1.5 inches of the wood and the remainder can be used for lumber and pulp.

A large influx of ash wood will saturate a currently limited wood-use market that has little room to expand, resulting in significant economic impacts. Current markets, which include limited uses for pulp and paper, lumber and energy, will not be able to absorb the future

addition of ash. It is not anticipated that production capacity for specific wood products will increase significantly in response to the increased availability of ash wood.

Between 2008 and 2014, ash wood harvested across all ownerships in Minnesota averaged around 66,000 cords a year. The DNR estimates the long-term sustainable harvest level for ash is about 353,000 cords per year. However, that is much less than the estimated 1.9 million cords of ash that could be added to the market each year if trees aren't left to decompose where they fall.

(www.dnr.state.mn.us)

While challenging, some harvesting of wood from community forests is possible and some creative models exist. The U.S. Department of Agriculture (USDA) Forest Service has worked with some neighboring Midwest states to develop the [Urban Wood Network](#), which is identifying community-based solutions to deal with an abundance of urban ash wood. The ability to sell ash wood in markets decreases the financial burden for communities and landowners who need to pay for ash removal and new tree plantings.

According to the [Minnesota Residential Wood Fuel Use](#) report, ash firewood is the second most common species burned by Minnesotans, and firewood is the number one market for ash harvested in the state.

(www.pca.state.mn.us)

EAB-infested ash trees do not need to become waste - they can be used to make products like furniture, paper, flooring, baseball bats or woodchips.

Composting

As with any organic material, ash tree waste can be composted, including EAB-infested wood. Minnesota has [124 compost sites](#) that accept yard waste with the appropriate permits from the MPCA to accept EAB-infested wood. However, many do not accept brush or limit the type, quantity, or size of wood waste that they accept. Additionally, they lack the capacity to handle the large volume of wood waste expected as EAB spreads.

Unfortunately, in order to transport EAB-infested wood from a quarantined county into a non-quarantined county, the wood must be chipped to one-inch or

less, which is too small for suitable composting but it could be used in some biomass facilities.

Biomass

Ash wood is a biomass resource that can be used as a renewable energy resource in a variety of heat and electricity generation systems like industrial boilers, utility power plants, and waste-to-energy facilities.

As the need to dispose of material continues to grow, the changing economics of using biomass for energy compared to other low cost renewable energy resources needs to be considered. It is estimated that over 1.67 million tons of ash wood material will require disposal in the

seven county metro area, alone.

Public policy could potentially support counties to use material as a low carbon, renewable source of energy. There is the potential to generate approximately 763,000 megawatt hours of electricity from the estimated metropolitan EAB-affected ash material using three average efficiency 29 megawatt biomass plants. This is equivalent to powering 64,610 home's energy use for a year. (www.epa.gov)

Open burning

Large-scale burning of ash wood is not legal without DNR permits due to concerns about forest fires and air quality.



The state's largest biomass combined heat and power (CHP) plant provides heat to District Energy St. Paul which uses up to 650 tons of wood chips per day, or an average of 250,000 tons per year, sourced from the Twin Cities metropolitan area. CHP produces hot water, steam, or chilled water and distributes it through underground pipes to downtown buildings. District Energy produces up to 33 megawatts of renewable electricity and approximately 50 percent of downtown heating needs, annually. If they switched to 100% natural gas for hot water and steam only and stopped burning wood, District Energy would emit between 130,000 and 135,000 tons of carbon dioxide per year.

Source: [District Energy St. Paul](#)



DUTCH ELM DISEASE: LESSONS LEARNED

Dutch elm disease (DED), a fungus deadly to elm, was discovered in Minnesota in 1961. At the time, Minnesota had close to 140 million elm trees. Like ash, it was a preferred boulevard and right-of-way community tree.

Although it took ten years for DED to become established in Minnesota, once it did, trees started dying rapidly: In 1971, only 421 elm trees died as a result of the disease; by 1977, that number had ballooned to 192,211 in the Twin Cities alone.

Between 1977 and 1982, the State of Minnesota invested over \$77 million to combat Dutch elm disease. Today, that would equate to about \$290 million. The investment came after the disease had become widespread across Minnesota and a significant number of trees were dying. A proactive approach may have lightened the financial burden.

In the early 1980s, the State funded the equivalent of \$290 million dollars to combat Dutch elm disease, affecting 140 million elm trees.

Today, Minnesota faces EAB impact to more than 1 billion ash trees.

The State invested in city grant funds to assist residents with managing private elms. Some Metropolitan cities were able to offer residents up to 100 percent reimbursement for elm tree removals to encourage quick and efficient sanitation of infested trees and to protect uninfested trees. This investment helped in diagnosing diseased trees, proper removal, and replacement of those trees.

Disposal of elm presented a problem for many communities. The Minnesota Pollution Control Agency did not allow communities to burn elm piles.

Given this, the State looked for creative ways to

use infected elm, including producing fuel from elm debris at the Stillwater prison and mandating all highway sound barriers be made of elm.

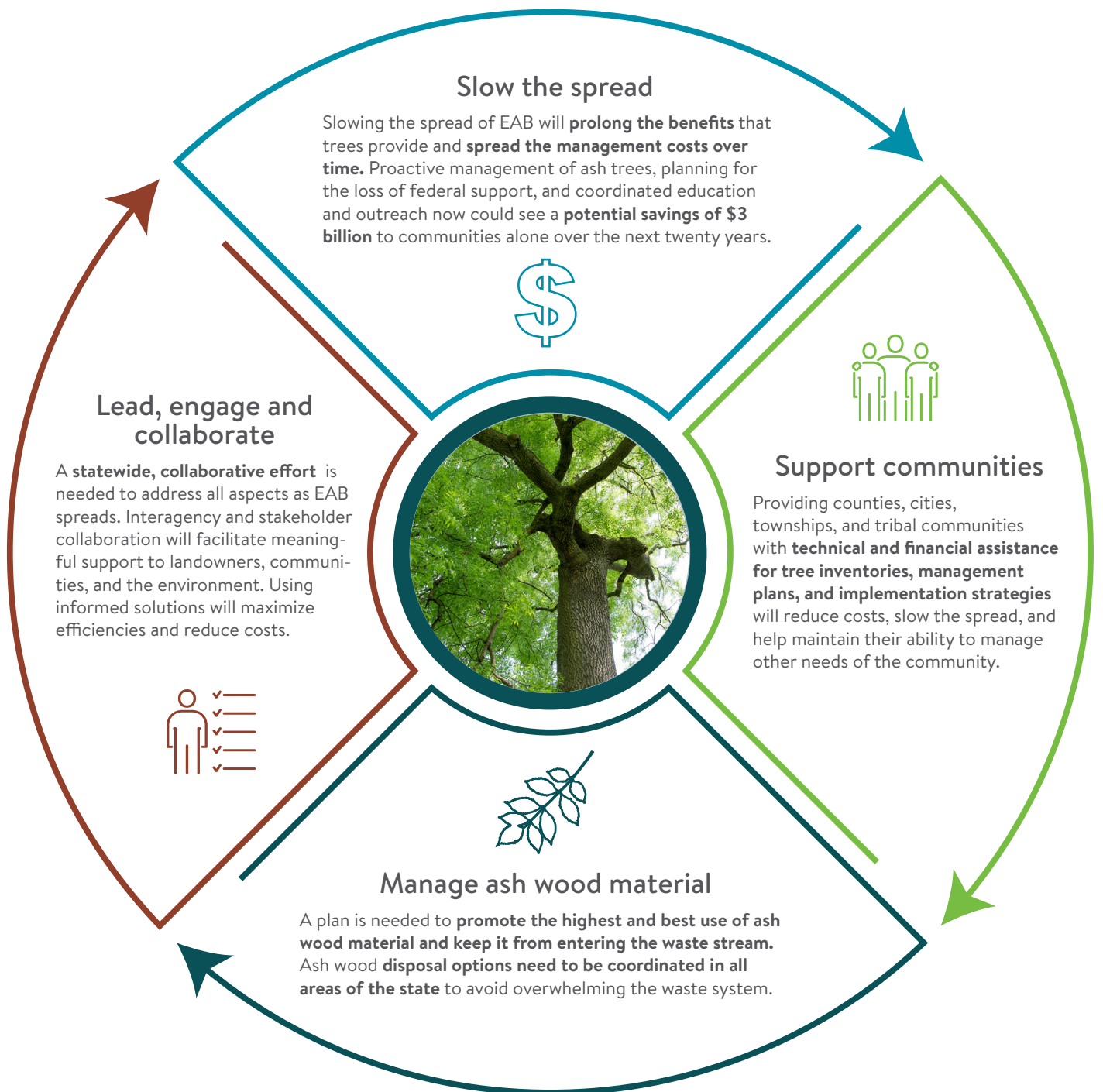
The State also offered grants to communities to buy debarkers and chippers. The use of this equipment – along with log splitters, trucks, and front-end loaders purchased with federal money – resulted in more efficient disposal of elm. The State also allowed elm to be used as recreational firewood.

Thirty years later, Minnesota is not completely devoid of elms. They are a tenacious species and likely will always be with us, at least in our forested areas. We just won't have as many large ones. The addition of hybrid DED-resistant elm has brought elm back to the urban landscape.

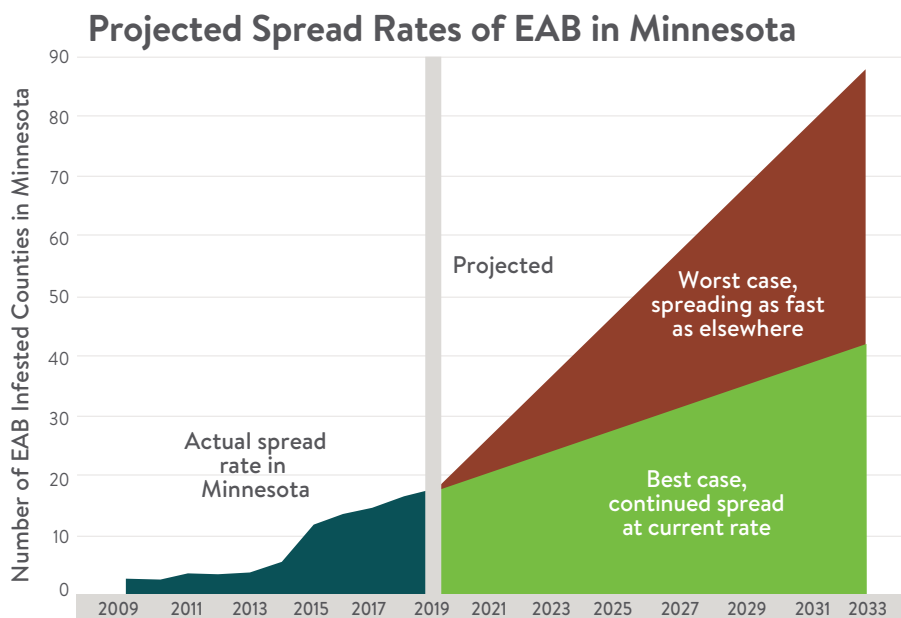
Dutch elm disease demonstrated the risks of relying heavily on a single tree species in urban areas. We often replanted one tree type on each street block – something that did not result in the diversity needed to fend off EAB.

Source: DNR, [Forest Protection Plan](#), Forest Protection Task Force and [History of Dutch Elm Disease in Minnesota](#), David French, University of Minnesota, www.dollartimes.com/inflation

Key Recommendations



Slow the spread



Past and projected spread rates of EAB have been slower in Minnesota than the national average. In the worst-case scenario, all 87 counties will have EAB infestations by 2031, as calculated with the national average rate of spread. Under a best-case scenario, with EAB spreading no faster than it has in Minnesota to date, EAB will be present in 39 counties by the same date. Source: MDA



While Minnesota can no longer prevent the introduction of EAB into the state and we cannot stop EAB from spreading, there are techniques and tools that we can use to slow the spread, like those identified in the MDA’s [“Guidelines to slow the growth and spread of emerald ash borer.”](#)

Slowing the spread of EAB helps maintain the benefits that ash trees provide for our communities, landowners, forests, and wildlife.

The larger and healthier a tree is, the more air it can clean, shade it can provide, and visual appeal it can offer.

Every year that an ash tree can be kept alive and thriving allows additional time for planning and preparing for EAB’s arrival, while also delaying the unavoidable costs associated with the impacts. A slower spread will also reduce the high influx of ash waste into markets and disposal facilities. Current facilities will not be able to meet the high

influx of ash waste as EAB spreads across the state.

The best opportunity for minimizing the impacts of EAB is to prevent it from reaching uninfested areas for as long as possible. An informal analysis conducted by the MDA determined that the impact to communities alone over the next 20 years could double if the current rate of spread in Minnesota accelerates to a worst-case scenario.



Emamectin benzoate, a systemic non-neonicotinoid insecticide treatment on ash is required every 2-3 years to prevent EAB larvae within a tree.
Source: Rainbow Treecare Scientific Advancement

Proactively control EAB

While Minnesota’s extreme cold (below negative 20-30°F) can decrease the EAB population, not all will die and the population will recover.

Insecticides, strategic tree removals, and releasing parasitic wasps are control methods used in Minnesota today.

Insecticides are very effective as long as the trees are healthy enough to distribute the chemical treatment. EAB insecticides move throughout the tree and protect it for one to three years. Treatments may be needed for the life of the tree to protect it from EAB.

By keeping ash trees healthy and free of EAB infestations, other nearby ash trees are indirectly protected. According to the [“Evaluation of potential strategies to Slow Ash Mortality \(SLAM\) caused by emerald ash borer”](#) study, models indicate that just twenty percent of the ash tree population needs to be chemically treated in order to provide a significant

amount of protection for the rest of the tree population.

In many situations, tree removal and replacement is the best strategy, particularly when long-term impact, safety, aesthetics, and community resources are considered.

Strategic removal of ash trees can reduce EAB’s population growth and provide the opportunity to plant new, diverse tree species as quickly as possible.

Communities and landowners with ash shade trees will face the need to either treat or remove most ash trees in landscaped areas.

In forested areas, large-scale insecticide treatment is not economically feasible. On some sites, commercial timber harvest is an available tool. Unfortunately, leaving infested ash in place may be the only option for a large portion of the landscape.

Managed by the State, biological control uses EAB’s natural enemies to decrease the pest’s populations and reduce damage. With support provided by the Environmental and Natural Resource Trust Fund, the MDA launched a [biological control research project](#). About 500,000 parasitoid wasps have been released in more than 30 areas across Minnesota to monitor their effects on the beetles. Preliminary results indicate that the wasps are becoming established as parasites of EAB, but the ultimate impact on EAB is not yet clear.

The University of Minnesota Extension has a volunteer-led [Wasp Watchers](#) biosurveillance (the detection of biological threats) program. Citizen science volunteers look for the smoky winged beetle bandit wasp that preys on EAB and other similar beetles. The program may provide early detection of EAB.



A Duluth resident walks past ash boulevard trees posted for treatment or removal.
Source: City of Duluth

Plan for the loss of federal regulation and support

Maintain a state-organized quarantine

The purpose of the emerald ash borer quarantine is to limit the transport of infested firewood, mulch and other ash wood material to non-quarantined areas. A publicly communicated quarantine should help slow the spread of EAB to neighboring areas, but only if state and local resources are available to enforce the quarantine.

When EAB is identified in a new county, the MDA places that county under quarantine and the online [map](#) provides an up-to-date status. As of October 2019, 20 counties and a portion of St. Louis County are quarantined. There are no federal funds available to states to enforce quarantine boundaries, and state funds for this work are limited.

The USDA currently works with states to quarantine new EAB-infested areas and much of the U.S. east of Minnesota is quarantined. However, the USDA has been discussing deregulating EAB, which would lift the federal restrictions. States would be free to determine how and whether or not they continue to regulate EAB.



The DNR's campaign to "Buy Local. Burn Local." restricts campers from transporting their own firewood.

Source: Minnesota DNR

While federal and state regulations exist to prevent the movement of EAB-infested wood to uninfested areas, those regulations are difficult to enforce because of the ease in moving firewood.

The MDA maintains a [firewood certification program](#) which certifies firewood that has been heat-treated to kill any EAB infesting the wood. There are currently nine certified firewood producers in Minnesota.

Develop alternative funding sources

The state needs to develop or identify new funding to support necessary efforts. The State of Minnesota has depended on federal funds to support the development of quarantine policies, education efforts, and community grant programs. However, federal funds related to EAB have been declining and will be eliminated.

Coordinate education and outreach

Initial efforts have contributed significantly to reducing the spread of EAB.

Educational campaigns

Efforts to inform Minnesotans on the importance of identifying ash trees and EAB, transporting

firewood correctly, how to manage an infested tree and additional information should be shared through advertisements, billboards, and other materials to the general public or targeted audiences.

Firewood is the main source of human-caused EAB spread. When people don't follow the [transportation guidelines](#) for EAB-infested wood, EAB is able to travel farther than their natural ability allows.

Report new cases

An important step in slowing the spread of EAB is to properly report any new infestations and respond accordingly. The MDA maintains a reporting system called [Arrest the Pest](#) that provides a way for citizens and communities to report a suspected EAB infestation.

Provide additional training

The DNR and the University of Minnesota conduct annual [Tree Inspector](#) trainings. Certified tree inspectors typically work for municipal governments and receive training in EAB identification and management, wood identification, and community forest management. Continued and additional training for tree-care professionals, communities, and citizens is key to slowing the spread of EAB.

Support communities

Many Minnesota communities have an abundance of ash trees. In some communities, ash trees make up 60 percent of their community trees. EAB infestations can overburden budgets and make it difficult to address other needs. Many communities do not have full-time forestry professionals on staff who can provide the guidance and support needed to combat EAB.

Increase technical and financial assistance for preparedness and response

Inventory community trees

To prepare for EAB, a community needs to complete a tree inventory that identifies how many ash trees are in the community and where they are located. This basic information is needed to properly plan for and respond to EAB infestations.



Provide community management plan and implementation assistance

Before EAB infests a community, it is important to have a management plan in place. This includes a community discussion about how to manage ash through treatments and removals, where to prioritize efforts, and ways to spread the costs and losses associated with the impacts of EAB. Assistance to communities to integrate community forestry into climate, energy, resiliency, and disaster planning efforts at the local level is important for long-term preparedness.

The [Minnesota Emerald Ash Borer Community Preparedness Manual](#) provides information to help Minnesota communities develop their own EAB community preparedness and response plans. The [Model EAB Management Plan](#) provides a framework for local governments to adopt a plan.

However, without technical assistance many communities do not initiate management plans. Communities need technical expertise to implement best management practices and ensure the proper implementation of a management plan.



**1 in 5 trees
in Minnesota
communities
are ash**

At least \$8.5 million is needed each year to provide grants to communities to develop and implement ash management plans, and provide education and technical assistance to professionals and homeowners.

Promote planting more diverse urban forests

As we learned from Dutch elm disease in the 1960s through the 1980s, communities need to plant a more diverse urban forest after ash trees are removed. Diversification is key to reducing the risk of impacts from other invasive species. Offering incentives to homeowners may be necessary to ensure that diverse tree species are planted on private land. In addition, planning for tree species that will be able to survive a changing climate will create a healthy community forest in the future.

Provide training for local governments

Tailored trainings and education events are needed so local governments can both plan ahead and make informed decisions about ash management. Supporting local governments and partners to conduct outreach on EAB and provide community trainings on management options is an effective way to reach residents so they, in turn, can make wise decisions for their yards and woodlots.



Hennepin County

About fifteen percent of all trees in Hennepin County are ash trees. In all, about 400,000 ash trees are located on public property, which is managed between 45 cities and park districts. While it is easy to estimate how many trees are in the county, only one-third of the cities located in the county have completed an ash tree inventory. To address this, the county will be promoting a grant program to entice cities to conduct an inventory.

The estimated cost to conduct an inventory can range from one to two dollars per tree. Depending on the size of the community and the number of public trees, the amount could cost up to \$200,000 for one city. As a number of communities have done, the county encourages cities to utilize eager and knowledgeable community volunteers, but consultants may be available for hire.

Source: Hennepin County

Manage ash wood material

As EAB infests more than one billion ash across the state, an influx of dead ash will overwhelm the material management options in Minnesota. Slowing the spread of EAB will reduce the volume of ash wood entering the market at any one time, which can allow Minnesotans time to develop reuse options. We need to plan ahead to ensure the highest and best use of the wood and avoid wasting a valuable resource.

Transportation needs, differences in disposal costs, and any quarantine restrictions must be taken into account. Consideration of the need to allow for faster development, funding, and permitting of facilities may be necessary to accommodate the disposal options for ash wood waste.

Promote the highest and best use of ash wood material

Incentivize ash wood markets

We need to incentivize markets to increase the capacity of industries to accept an influx of harvested ash

wood while reducing the use of other tree species. Adequate markets for the best use of ash wood can reduce material from ending up in the waste stream. Incentives for businesses could help them expand their business and increase their use of ash wood. In order to increase demand, any state funded projects could require the use of ash wood products and support existing businesses that manage ash wood material.



Deploy mobile ash wood processing systems

As EAB spreads across Minnesota, we need to identify regional gaps in management options and ensure that equitable solutions are available to all Minnesotans. Some areas of the state will have limited access to tree care companies who can remove or process dead ash trees. Biomass facilities are stationary and located only in certain regions. A transportable system, such as a “fuel depot” that includes equipment for wood chipping, fuel preparation, and composting that can be moved around the state as necessary, may be needed to address gaps.

Develop workforce solutions

As EAB peaks in areas around the state, tree care companies and foresters may not be able to keep up with the demand of ash tree treatments, removals, and tree plantings. Markets that are able to take ash trees have the potential to expand as EAB spreads across the state. Employment and economic development assistance should be established to address this potential.

Lead, engage and collaborate

Minnesotans look for leadership from all levels of government as new emerging environmental threats spread across the state. With many individuals involved in addressing EAB and even more impacted by the loss of ash trees, the state must be a strong partner in the fight to control invasive species, like emerald ash borer.

Continue statewide planning, coordination and support

In order to best address the threats posed by EAB to community forests and shade trees, state agencies need ongoing coordination and collaboration to:

- regularly review the impacts associated with EAB,
- track the research and best practices in EAB management and mitigation,
- identify and deploy existing and new solutions for mitigation and management, and
- support local partners in their mitigation and management efforts.

Coordination is also needed among state, local, private and federal forestland managers to diversify ash stands, improve forest inventories and generally enhance forest health to help keep trees on the landscape in the face of EAB.

Interagency efforts should also reflect regional and local differences in impact and response capacity, and should include consultation with American Indian communities and low-income populations.

Ongoing interagency planning is critical to tracking the effectiveness of existing efforts; identifying any gaps; and proposing and implementing policies, regulations, incentives, and any other means to best support those impacted by EAB and the loss of ash trees. A coordinated effort is needed to implement the recommendations of this report to slow the spread of EAB; save money and spread the costs over time; and preserve the valuable economic, cultural, and environmental benefits that ash trees provide.

Advance needed research

Research specific to Minnesota has been conducted over the years, providing most of the knowledge base that is needed to fight the spread of EAB. However, research on the impacts of EAB on black ash forests and how EAB affects Minnesota climate change are particularly limited. Additional research of EAB best management practices and new techniques and tools should continue.

Report on progress

As with any ongoing effort, it is important to set goals and evaluate the progress over time. Interagency partners should regularly report to the Environmental Quality Board for transparency and accountability.





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