Collins Emerald Ash Borer (EAB) Management and Response Plan

Updated December 2020

Introduction and Background

Introduction:

The emerald ash borer (EAB) is an extremely destructive wood boring beetle (*Agrilus plannipennis)* of Asian origin that has become established in many parts of the United States and Canada. It is lethal to all North American species of ash (*Fraxinus*). Colorado communities overplanted both green and white ash in the wake of Dutch Elm Disease starting back in the 1960's. Ash make up large percentages of North American urban forest canopies which makes EAB far more damaging to community forests than any other insect to date. Emerald ash borer experts have predicted nearly 100% mortality for any North American ash that are not chemically treated. Since the introduction of this pest in the Detroit area (most likely in the mid to late 1990's), many millions of ash trees have been killed, resulting in billions of dollars of lost resources all across the Midwest and eastern half of the United States and Canada. As a note of interest, the White Fringe Tree has been identified as a North American host for EAB, but with far, far less significant impacts to community forests.

***Colorado Detections*:**

Colorado's first detection occurred in September of 2013 in the City of Boulder. Between 2013 and 2020 EAB spread throughout most of the ash containing incorporated or unincorporated urban areas within Boulder County. In 2019 EAB was detected in Broomfield, Westminster and Larimer Counties marking the first detections outside of Boulder County. The City of Arvada announced that EAB had been detected there in early June of 2020. Emerald ash borer was detected in Fort Collins on May 8th and confirmed by proper authorities on May 11, 2020.

***Brief History*:**

The USDA-APHIS (Animal and Plant Health Inspection Service) and CDA (the Colorado Department of Agriculture) established a State funded quarantine of Boulder County in 2013 as an effort to help slow the spread of EAB. Having served its purpose and lacking State funding to continue, the Boulder County quarantine was revoked in December of 2019. The entire State of Colorado remains under the Federal quarantine until such day that USDA-APHIS (APHIS) officially revokes the quarantine nationally. APHIS is currently working towards dropping all EAB quarantines in the United States and diverting the money to EAB biological control development and dispersal programs.

***Detection in Fort Collins*:**
In May of 2020 State and City experts confirmed the presence of emerald ash borer (EAB) on the north end of Fort Collins, right on the border of City Limits. The most likely means of arrival was through the transport of infested material from an area already containing EAB. The infested ash tree was located on private property, near the intersection of Hwy 287 and Hwy 1. A vigilant, private, licensed arborist company alerted City Forestry of the suspicious tree, samples were collected by City Forestry staff, and EAB was confirmed by CSU entomologists. This detection represents the second detection in the county, and the fourth confirmation of EAB in Colorado outside of Boulder County. EAB, as a pest, tends to move slowly through natural spread and quickly through human transport.

***Damage*:**
Emerald ash borers damage trees by tunneling under the bark, producing girdling wounds that interfere with movement of water and nutrients. The damage is progressive, with more effects of infestation becoming visible as increasing numbers of insects develop and feed within the tree.

EAB is extremely hard to detect when it first arrives in a community. Populations start low but increase exponentially so that by the 3rd or 4th year of infestation it may be possible to detect dead and dying trees in a community. In fact, the tree in which EAB was discovered in Fort Collins was not yet exhibiting many crown symptoms, probably due to the low numbers of beetles in the tree.

The main symptoms to look for other than death, are thinning canopies, dead sections of branches in the upper crown, and epicormic sprouting from trunks and larger branches. Exit holes that have a distinct “D” shape are found on the lower trunk only after much of the upper canopy of the tree has been killed. Tree mortality rates increase as beetle populations increase.

Natural spread occurs through the flight of adult beetles but is limited by how far the beetles can fly. The primary cause of longer distance movement of emerald ash borer is transport of infested ash material by humans. Portions of ash harboring viable eggs, larvae, pupae, or adults can be moved very easily from one place to another. The EAB life stages are hardy enough to survive such transport and complete their life cycles wherever they end up. This allows for quick movement over very long distances, which is the most probable means by which it was carried across the eastern plains and introduced into the City of Boulder. Other infestations in Colorado, including the one in Fort Collins, were very likely caused by movement of infested ash material by humans.

***Generalized Life Cycle/Epidemiology of the Emerald Ash Borer*:**
Emerald ash borer has a life cycle that generally takes one year to complete. The winter life stage is a full-grown larva that lives within a chamber tunneled into the outer sapwood of a host tree. In the spring, the larva will transition through pupal phases and then into the adult beetle form which will emerge through the bark. When beetle population levels are low, this life cycle may occasionally take two years to complete.

Adult emerald ash borers emerge from the tree by cutting through the bark, producing a distinct D-shaped exit hole. They normally begin to emerge in early to mid-May, with peak emergence in June. However, some beetle emergence extends into midsummer. First emergence timing in Colorado has often coincided with the blooming of black locust (*Robinia pseudoacacia*).

After emergence, adults will feed on ash leaves making small cuts along the edges. Males will feed for a week and then seek females to mate with. A few days after mating, females will begin to deposit single eggs into cracks and crevices in the bark. Females typically live for about a month and during this time will lay several dozen eggs.

Eggs hatch in about a week and the tiny larvae burrow through the bark and begin to feed on the tissues under the bark including the phloem, cambium, and outer sapwood. This is where the entire larval stage occurs. While feeding, the larvae produce serpentine galleries that progressively widen as the larvae grow. Ultimately the gallery produced by a single larva may range over an area from 4 to 20 inches (10-50 cm) in length. When cooler fall temperatures arrive, larvae will cease feeding and prepare to overwinter by tunneling a bit deeper into the sapwood and producing an overwintering chamber.

When beetle numbers become high enough, ash trees of all size and condition classes are vulnerable to infestation, leading to death, unless chemically treated. When EAB originally colonizes a community, beetle populations are relatively low, and trees may sustain very little damage during this “establishment” phase. However, EAB populations build exponentially, and ash infestation/mortality rates also increase exponentially unless steps are taken to “flatten the curve”; this means to manage so that mortality is slowed down each year. Early detection of the pest in a community is one step in helping to flatten the curve. Other steps will be discussed in the post-detection portion of this document.

As a preservation method, the timely use of effective systemic pesticides can prevent much of the injury caused by EAB in ash trees. Treatments may also stabilize the

effects of injury in trees that already have EAB. However, the main question to ask is: “Is the tree worth treating?”

City of Fort Collins Emerald Ash Borer Response Plan[1]

Management Plan Implementation

Inventory and Resource Analysis:

City Forestry recently updated the street and park ash tree inventory. A current and accurate tree inventory of City owned trees is vital to any effort in managing an EAB invasion. The inventory provides current data on the number, size, and placement of all ash trees on developed City-owned properties. This data is critical in determining the value of public ash within the City and will enable us to develop cost/benefit analysis estimates for various treatment options to begin in 2021. The inventory has also allowed us to identify the condition of individual ash trees, and from this we have determined which trees meet the criteria set for treatment and which do not. Forestry is currently responsible for approximately 55,000 trees on City property and 14% of those trees are ash (approximately 7500 to 7600 total ash trees on City property).

Forestry utilized tree benefit calculators to establish values and contributions that City owned ash trees make to the community in terms of property values, storm water management, carbon storage, energy savings, water savings, and other beneficial factors. In 2016, the total ecological benefits were determined to be $1.3 million per year for the ash trees on City property (*Fort Collins, CO Community Forest Assessment*, DRG 2016).

During the summer of 2015, Davey Resource Group conducted an *i-Tree Eco* analysis of trees in Fort Collins using data from 200 randomly distributed plots. The data estimated that there were approximately 67,000+ ash trees within the City's urban growth area. This represented 15% of the total tree population at the time, yet ash trees accounted for almost 33% of the total canopy cover. The study also gave us the total ecological benefits that the ash tree population provides each year. For example, Fort Collins' ash population stored about 21,193 tons of carbon (about 24% of the total carbon stored in trees) with an associated value of a little over $1.5 million. Similarly, ash trees accounted for 26% of the total forest carbon sequestration going on in Fort Collins each year with a value estimated at $62,160. This information shows that the loss of thousands of ash trees will have significant environmental, social, and economic impacts on Fort Collins.

[1] This document will remain dynamic and sensitive to current conditions as EAB progresses and moves within and through our community.

Public Ash Trees:

As of December 2020, there are approximately 7550 ash trees on City-owned land. This means that ash species now make up about 14% of the public tree population. Industry standards indicate that no single species should comprise more than 10% of the total tree population in urban areas. When any species exceeds 10%, forest resilience decreases due to increased risk of large-scale pest epidemics.

In August 2016, Forestry staff began evaluating public ash trees with the goal of determining which trees would be treated. Every ash in the inventory was reevaluated in 2019 as a precautionary update since EAB had spread beyond Boulder County. Information within the ash inventory include attributes, such as diameter, condition, priority of EAB treatment, address information, irrigation status and some notes on why certain trees will not be treated. Using these criteria approximately 2,100 trees were identified for long- or shorter-term treatments. Knowing how many trees will be treated shows how many ash will need to be removed (approximately 5,450). This information will be used to determine how to continue providing Forestry core services before, during and after the EAB infestation reaches its maximum damage levels. For further detail on what criteria City Forestry used to evaluate ash trees for treatment, please see Appendix A.

The 2,100 ash to be treated will be subdivided into 3 groups (approximately 700 trees per group) creating a three-year treatment rotation starting with the trees closest to where EAB was first detected (Figure 1). As EAB populations begin to grow, some trees initially identified for treatment will be taken off the treatment list. The goal will be to remove and replace each tree based on either a change in tree condition, public safety, or to aid Forestry in reaching management goals for improving species diversity and resilience.

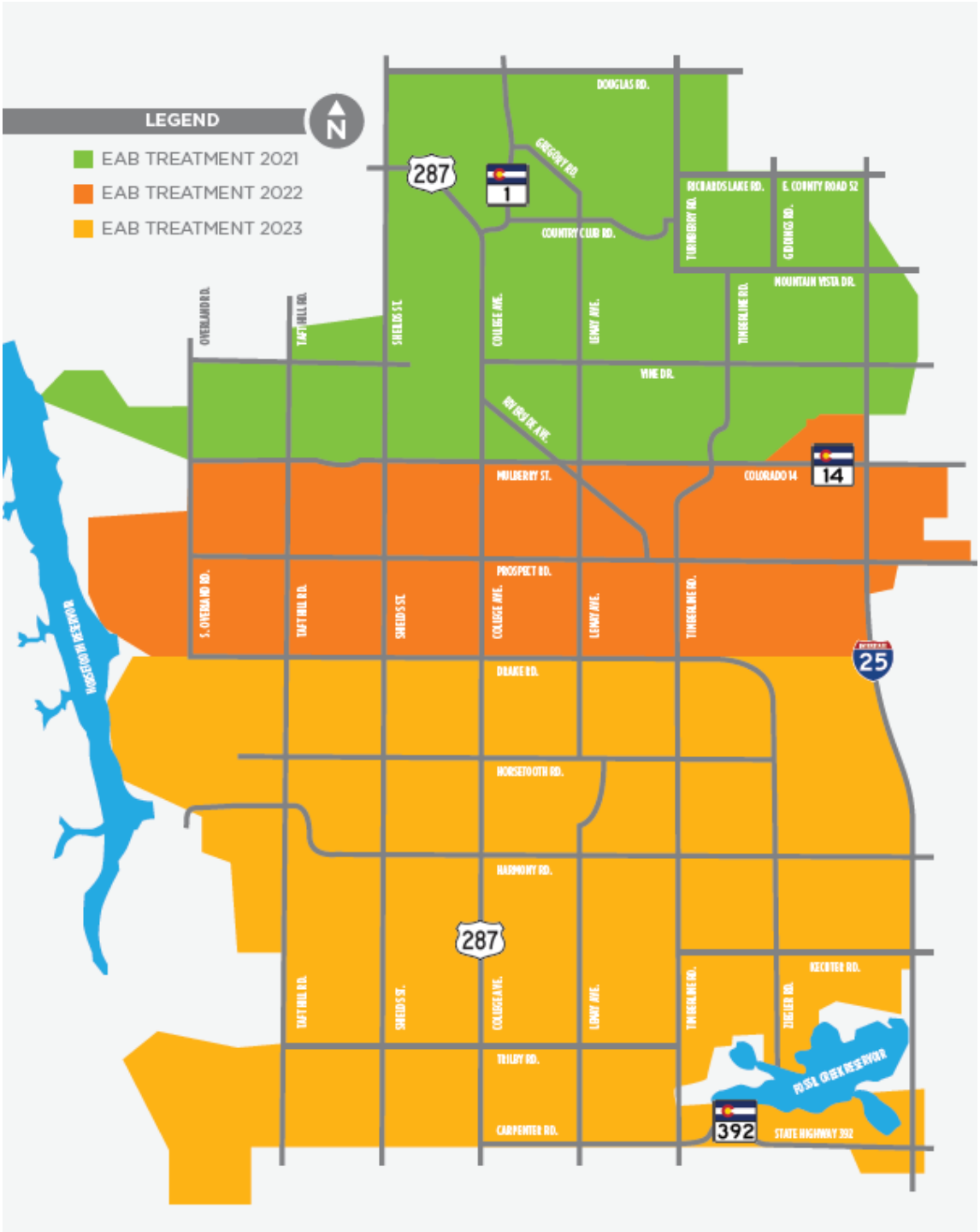

Figure 1. Emerald ash borer 3-year ash tree treatment rotation.

***Management Considerations on City Land**:*
Based on current research and resources, emerald ash borer cannot be eradicated once it is established in a community, but it can be managed. Key components of the management plan include the following:

- Procure adequate and secure funding through the BFO process, or other supplemental means, to effectively manage this pest while continuing to provide other critical forest management services
- Use pesticide treatments for long term protection and preservation of worthy ash trees in an economically and socially equitable way while limiting negative environmental impacts
- Use short-term pesticide treatments on trees that will not be preserved for the long term to spread ash mortality out to a more manageable time frame
- Efficiently remove public ash trees before they become a safety risk
    - Research indicates that an ash tree killed by EAB can become a significant safety risk within 1 to 2 years of death
- Replant every suitable space produced when ash trees are removed using a diverse and resilient palette of tree species, and provide adequate aftercare for each newly planted tree
- Effectively utilize all wood from City owned ash tree removals
- Solidify, enhance, and educate about the options for utilizing ash wood from private trees apart from disposing of it into the landfill waste stream or utilizing the Larimer County Landfill Greenwaste facility
- Pursue relevant options to address EAB issues on private property including grant research, planting programs, as well as public safety related enforcement

Resourcing EAB management efforts on City owned ash trees:
Successful management of EAB on City owned land will require adequate resourcing for all aspects of plan implementation including:

- Adequate staffing to implement the programs and demands associated with EAB management
- Annual treatment costs for trees to be protected long and short term
- Tree removal costs, including time spent on managing public safety risks created by dead ash on private property
- Reforestation
    - Replacing each tree that is removed is an arduous and expensive task but is crucial to the future of our greatly diversified urban forest canopy.
    - Tree replanting is the first part of reforestation. All efforts must be made to ensure **establishment** of each newly planted tree
    - Great care will be taken to select trees of good quality using resilient species that are well adapted to Fort Collins semi-arid climate

Monetary resources must primarily be established through ongoing funding in the Budgeting for Outcomes (BFO) process. Using RFP's and trends seen in other Colorado communities, funding offers can be submitted with a certain degree of confidence for a two-year budget cycle, however, midcycle adjustments may be needed.

Utilize an Integrated Pest Management (IPM) Approach:

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means and with the least possible hazard to people, property, off-target organisms, and the environment. IPM takes advantage of all appropriate pest management options such biological controls, cultural and mechanical control methods, and responsible use of pesticides (chemical control). IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls taking into consideration the public, the environment and city resources.

Biological Controls as Management Options:

Research is being conducted by federal agencies to identify natural predators of EAB. At least four parasitoid wasps have been found in Asia which attack EAB. These wasps have been released in the Midwest and appear to have some potential positive results in slowing the spread of EAB. Even though these parasitoids are wasps, they do not sting humans. In 2014, Boulder began releasing some of these parasitoid wasps and have had good success with the species establishing themselves within the EAB population. Based on availability and the most current research, Fort Collins Forestry will consider releasing these wasps as one of the management options as early as 2021. It is important to note that this wasp may slow the tree mortality rate, but it will not eradicate the EAB pest. It may take years before any substantial results at slowing the spread of EAB are seen in our community.

Cultural Forest Management:

Cultural controls can include both the planting of diverse species as well as maintaining healthy trees long term. In anticipation of the future need to remove mature trees, the need to replace every tree and fill the gaps of the urban forest are more important than ever before. Increased planting and replacement with diverse species will be a strong focus as ash trees succumb to EAB. Forestry includes a portion of these efforts with the budgeting for outcomes process but will also look for grant opportunities to help fund these efforts.

Forestry will continually monitor our city tree inventory to ensure that no one species exceeds the 10% threshold as the tree population continues to grow and as ash are removed and replaced. Increased tree species diversity throughout the city will greatly increase a sustainable balance throughout our urban forest community.

City trees are structural assets that appreciate in value as they grow. Educating the public to be good tree stewards with proper watering, pruning and pest management care, should improve the health of our urban forest over time. Keeping trees as healthy as possible increases the benefits that trees provide to our community and decreases vulnerability to many pests.

Mechanical Management Options:

Mechanical management techniques are important tools within our urban forest management toolbox. The removal of EAB infested ash trees may aid in slowing the spread of this beetle, but only to a limited degree. On another level, quick removal of trees killed by EAB will be necessary to help keep our community safe. Research shows that ash trees become brittle starting about one year after dying from EAB. It is imperative to remove large, dead ash trees before they reach the point of becoming brittle and uncontrolled failure could occur.

Chemical Treatment Options:

There are currently three methods of insecticidal treatment for protecting ash trees from EAB. They are: (1) systemic insecticides applied as trunk injections; (2) systemic insecticides applied as lower trunk sprays; and (3) systemic insecticides that are applied as soil injections or drenches. Based on all environmental and efficacy considerations, City Forestry plans on using a trunk injection method on a strategically selected percentage of our ash population. Approximately 2,100 ash, broken out to about 700 per year, are scheduled to be treated over a 3-year period beginning in late Spring 2021. As research continues, better treatment options may become available; Forestry would take that into consideration and modify practices accordingly.

Forestry plans on using the pesticide, ***Emamectin benzoate*** (Eb) as our primary chemical treatment. Eb is a pesticide that is injected into the trunk, around the base of a tree. Research has shown that appropriate rates can give three-years of control against EAB.

Another chemical that Forestry would consider is ***Azadirachtin*** (TreeAzin) which is another trunk injection. This chemical has proven to be more expensive than Eb and

TreeAzin is labeled for only one-year of control when EAB populations are at their peak. TreeAzin would only be utilized in special conditions.

The City of Fort Collins will not be utilizing any neonicotinoid-based chemicals for EAB management on City property because of potential negative impacts to pollinators and the environment. Nor will permits be issued to private parties to treat public trees with neonicotinoids.

In summary, all research has indicated that very few, if any North American ash trees survive an EAB epidemic unless they are treated chemically. Experience and knowledge of observing treatment outcomes from other Colorado communities dealing with EAB has been helpful in knowing how ash trees in Colorado (a stressful, arid, and undulating climate to grow in) respond to chemical treatments and to EAB itself. Keeping informed on current EAB research and what other communities are doing is imperative in managing EAB within our community.

Projected Impacts to City Forestry Resources

There are a lot of additional costs that are associated with the emerald ash borer and its impacts on a community. These costs include, but are not limited to treatments, removals, replacement trees and associated establishment costs, wood processing/utilization, and the costs/impacts of deferred maintenance from normal core services. A multi-year plan is the best option to spread these costs out over time. These impacts are explained in more detail below.

Treatment Costs:
During pre-detection efforts, Forestry conducted ash tree evaluations to establish baseline treatment information. Forestry, as of December 2020, has approximately 7,500 ash trees within the public tree inventory. Forestry plans to treat 2,100 ash trees over a 3-year period on a repeated cycle. These would be trees that are 12-inches in diameter or greater and in “Fair” or better condition. To meet the objective, approximately 700 ash trees would need to be treated each year of the 3-year cycle. Private trees would not be part of this program.

It is important to note that once treatments begin, they must continue for the entire life of each tree because EAB does not go away. Forestry has targeted 2,100 ash trees to be treated if adequate funding is available. Over time, Forestry would adjust the total number of ash treated down to a more sustainable level. The climate in the northern Front Range of Colorado can be super hard on trees with early or late frosts, extreme fluctuating temperatures, and drought. As these types of events occur, trees may become weakened

and may no longer be worthy of treatment. These trees would then be omitted from the treatment rotation and dealt with accordingly based on the condition of the tree at that time. Heavy snowstorms and strong wind events are also possible and can impact the health, structure, and condition of a treated ash tree at any time.

Based on contracted treatment work in Boulder and Longmont, current treatment costs are averaging about $7 per trunk diameter inch. For example, a 15-inch diameter tree would cost about $105, where a 33-inch diameter tree would cost about $231 for one treatment, every third year.

Once a 3-year cycle is completed, Forestry will consider if all 2,100 trees should continue to be treated. Out of the 2,100 trees treated approximately 300 of them will not continue to receive treatments as time and the EAB infestation move forward. This strategy spreads ash mortality out over a more manageable time frame. If mortality is spread out, Forestry has a better chance of keeping up with the tasks of removing non-treated ash trees, as well as other critical non-ash related forest management priorities.

Managing Chemical Treatment Options:

Chemical treatments are currently the most effective way to preserve desirable ash trees within infested areas. Ongoing research may help modify treatment options as each year goes by. Forestry staff will continue to stay up to date regarding the most current recommendations to maximize control efforts while attempting to keep costs at a manageable level.

Additionally, it is imperative to consider the environmental effects of pesticide use. Each application of a pesticide involves trade-offs with the environment. As research progresses, Forestry staff will undoubtably learn more about how to minimize negative environmental impacts while still preserving a segment of the ash population.

This becomes even more critical as we look at ash on private property. Up to 90% of the ash in Fort Collins may be on private property. The potential environmental impacts of pesticide use will be much greater from private property applications than from those on City property. It is important to continue to educate pesticide applicators and property owners on the most current treatment recommendations available and help them determine if a tree should be treated or not.

Treatment Permits for Adjacent Property Owners:

The Forestry Division has been and will continue to issue free street tree treatment permits to adjacent property owners or businesses. However, the treatment application standards shall follow the same standards that the Forestry Division will be utilizing and ash under 8-inches will not be permitted for treatment. These permitting efforts have

added additional strain on the Division which further expresses the need for a full-time classified Senior Forestry Coordinator to lead these efforts.

Removal Costs:

Prompt removal of heavily infested ash trees before EAB adults emerge can aid in reducing the spread of the invasive insect. The hours that will be spent on ash tree removals either by the Forestry Crews and/or private contractors is daunting. With the projected 2100 ash trees to be treated over three years from the beginning of infestation, there will be approximately 5450 ash trees to remove. Approximately 3600 of these ash trees are less than or equal to 11-inches in diameter. The remaining 1900 ash trees are 12-inches and greater in diameter and will take more time and resources to remove (based on the summer of 2019 Tree Inventory). These numbers will change based on funding for continued proactive and reactive ash removal and replacement work.

Tree Replacement Costs:

For every tree that is removed, Forestry plans to plant a replacement tree if the site is adequate for proper growth. It costs $350 to $450 for a tree to be purchased and planted based on 2020 pricing. This will greatly affect Forestry's resources since tree removals will increase as we reach peak infestation levels of EAB. A lesser known component of tree replacement is the aftercare of a tree once the tree is planted. Forestry currently tank waters every tree that is planted (in-house and contractually) every week through the growing season, for the first two years after being planted. This is a huge task and currently takes a minimum of four trucks running 8-hours a day, 5 days per week, from mid-March through October. Since planting efforts need to expand, plans for watering also need to be put in place. Contractual watering is too expensive to really consider as an option. Ideally, Forestry would need to expand to add another water truck and hourly operator.

Wood Processing and Utilization Costs:

All ash removals from City property will be disposed of and processed at our 4-acre Hoffman Mill Wood Lot. The City will make concerted efforts to find alternative ways to utilize ash wood and debris. The Hoffman Mill Wood Lot will be able to handle all ash removals from City Property. However, trees removed from private property will not be accepted at this site due to limited capacity and possible legalities surrounding private citizens entering an active work zone. Pre-EAB data for industrial grinding costs from regular Forestry core services is on average about $36,000 per year (average of 2016 to 2019). This cost may increase during peak infestation/mortality stage. City ash tree removals that meet the set criteria for milling will be sorted, salvaged, and handled appropriately to ensure that EAB is not spread by alternative wood utilization efforts.

The issue of private ash wood debris is a major one. Larimer County has a green waste recycling site at the landfill which may be able to handle a portion of the private ash tree removals. However, it is believed that this site and other local businesses that recycle or otherwise utilize tree removal material, may not be able to handle all the ash logs and branches for tree removal when EAB caused mortality peaks. Forestry will continue to find ways to manage and utilize ash material. Currently, the City is working with CSU to help understand and utilize potential market opportunities, help identify what and where vulnerable populations are within the City, and how to tap into or help them, respectively.

Deferred Maintenance Impacts:

Forestry currently (2020 and going into 2021) maintains an urban forest of 55,000 trees which are on a 5 and 7-year pruning rotation; five years for trees 17-inches or less in diameter and seven years for every tree 18-inches and greater in diameter. Now that EAB is in Fort Collins, crew and staff time will be focused on managing treatment contracts within the first year. Experiences shared from other communities with EAB, such as Boulder and Longmont, indicate that core services provided by City Forestry can fall short simply from the overwhelming demand of EAB management. Deferred maintenance of these core services is a big concern for Forestry as it will impact the desired, critical pruning rotation schedule. The health of the urban forest and the safety of our community depend on meeting the rotation schedule. Spreading out ash mortality will help, but it is likely that extra contractual money or additional staff would be needed to offset the deferred maintenance impacts throughout the EAB infestation cycle. Not only does the presence of EAB greatly increase our removal and replacement labor costs, but it necessitates additional administrative duties, and continual vigilance to track treatments, removal, and hazard trees.

Enforcement:

The City of Fort Collins Forestry Division can enforce action on dead, dying, or diseased trees on private property that pose a safety concern to the public and public property. Research in the eastern states has shown that as ash trees die from EAB, the trees become brittle and have a high risk of failure as early as one year after death. This poses a large concern for public safety as EAB begins to hit the peak of the ash mortality curve. According to the “Community Forest Assessment” (Davey Resource Group, April 2016), Fort Collins has an estimated 70,000 ash trees on private property. Enforcement to remove these trees, once they reach the point of posing a significant risk to public safety, will take a lot of effort, coordination, and cooperation with City residents to reduce the risk to the community. As the number of dead trees begins to increase, it is imperative that Forestry take a proactive approach to enforcement rather than a reactive approach—for the benefit of both public safety and effective time management. An annual windshield

survey in mid to late summer each year could be an aid in identifying dead ash related safety risks to be enforced on.

Another variable of enforcement is the potential influx of private tree care companies that are not licensed with the City of Fort Collins. As natural disasters, such as EAB, move into an area so do many companies looking for work. Forestry must ensure that all annual licenses are up to date and will need to ramp up the enforcement on companies who are not licensed through the city. This will add extra pressure on Forestry, Neighborhood Services, and the Municipal Court.

Urban Canopy Renewal, Diversity, and Resiliency:

Resilient reforestation may be the most critical component of an urban forest management plan. Forestry must make every effort to replace trees where they have been removed on public property. As with all critical Forestry operations, ongoing and adequate funding is the only way to carry out reforestation efforts. Forestry has always had a goal of planting at least one tree for every tree that is removed. With this being the case, diverse tree species selection is extremely important to our urban forest's resiliency to climatic fluctuations and to help avoid future problems with insect and disease epidemics. When selecting a replacement tree, a good resource is *Front Range Tree Recommendation List©,* which is currently being updated. Forestry will strive to have less than 10% of any one tree species within the inventory and will also consider diversity on each individual street block.

City Resources:

The Forestry Division will attempt to provide its core services while effectively managing all other elements accompanying an EAB outbreak. The added responsibilities that EAB will place on Forestry staff will increase workloads, defer regular maintenance cycles, and slow response times. Forestry staff estimates that EAB related work will significantly impact this community for the next fifteen to twenty-five years starting in 2020. The additional staff and equipment added in the 2017-2018 budget cycle will help with field operations, but Forestry resources will still be strained.

Even though EAB will be in the community from now on, once EAB peaks and begins to decline in numbers in the community, Forestry will re-evaluate management strategies. Efforts will be initiated to catch up on any deferred maintenance and re-establish pruning rotation cycles back to levels optimal for a healthy urban forest. This will not be easy; therefore, it is Forestry's goal to minimize the amount of deferred maintenance to the degree possible based on the EAB population and funding received during peak infestation.

Summary

The emerald ash borer (EAB) will have a significant impact on the Fort Collins Community. Because the impacts of EAB can be acutely high, a well-planned response can help by spreading out costs over time. Public education and outreach to Fort Collins residents will remain a high priority during this infestation. The plan is designed to inform the public of new infestations, treatment options, and removal requirements, and to provide a comprehensive, proactive approach to addressing the EAB infestation. An integrated pest management approach will be implemented consisting of a balance of selective tree removal, chemical treatments, tree replacements and continued efforts to provide core services. Emphasis will be made towards treating to protect and preserve large, high value ash trees. EAB is very elusive, as it can be present in a tree for 3 to 4 years prior to detection. Preventative treatments are the best option for success in saving ash trees, but this must be balanced with minimum environmental impact and available funding. Managing EAB will eventually become a program that we manage as a core service to the Fort Collins community, similar to the pruning rotation or tree replacement program. Fort Collins' EAB Management and Response Plan will remain dynamic and adaptable as the situation in our community changes.

APPENDIX A – Ash Evaluation Material

Ash Evaluation Criteria for Treatment:

EAB Treatment Categories

- *Priority 1* - Ash tree shall be treated.
- *Priority 2* - Ash tree shall be treated if funding allows.
- *Priority 3* - Ash tree shall be treated initially to delay removal.
- *Do Not Treat* - The ash tree does not meet treatment criteria and shall not be treated.
- *Remove* - The ash tree shall be removed because of various factors such as: the tree is in poor health, growing in the wrong place, and/or poses public safety risks.

General Criteria for Evaluating Ash Trees:

- *Size*: Tree is 12 inches or greater
- *Condition*: Tree is in fair to good condition
    - Fair, Fair Plus, and Good will be candidates for treatment
- *Canopy*: Tree has a health canopy
    - A healthy canopy is important for pesticide uptake.
- *Structure*: The tree has overall good structure
    - No poor angles of attachment and had been pruned properly in the past, etc.
- *Health*: Is the tree diseased, and/or is there evidence of insect damage (other than EAB)?
- *Trunk wounds present (Y/N)*: Are there trunk wounds from lawn mowers, weed whackers, or vehicles?
    - Good intact bark is imperative for trunk injections

- If trunk wounds are not compartmentalizing, then omit from treatment

Pruning Criteria based on Treatment Plan:

Check TreeKeeper to see what the "EAB Treatment" classification is for each ash tree.

A. If the tree is slated for treatment (Priority 1, 2, or 3):
    - Perform a **complete prune** as usual.
        - Clearance
        - Structure cuts
        - Large deadwood
        - Broken or crossing branches

B. If the tree is not slated for treatment:
    - If the tree is in pretty good health, greater than 12-inches and not slated for treatment – prune the tree for safety (broken, large diameter deadwood) and street and sidewalk clearance.
    - Assess the overall condition of the tree. If it has been compromised by lilac ash borer, ash bark beetle, lawn mowers/weed whackers, or in really poor condition – work with the Homeowner and discuss removal and replacement.