

Emerald Ash Borer Response Plan



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Background

Emerald Ash Borer (EAB), *Agrilus planipennis*, is a small, green metallic beetle indigenous to Asia. It was discovered in North America in 2002 in southeastern Michigan and since has spread throughout 22 states, with Colorado as the western-most state where EAB has been positively confirmed. The EAB only attacks ash trees and all *Fraxinus* species are at risk from this pest. EAB is responsible for the death of over 50 million ash trees since its initial discovery and has already cost impacted communities billions of dollars for the treatment, removal, and replacement of ash trees. This destructive pest has tremendous potential to detrimentally impact the social, communal, environmental, and economic benefits provided by ash trees as well as impact urban canopy cover and present new financial demands on budgets throughout the Colorado Front Range.



EAB kills both stressed and healthy trees and is so aggressive that if left unchecked will damage and kill all untreated ash trees in its path. The larvae of the EAB feed on the inner bark of ash trees which disrupts the ability to transport water and nutrients throughout the



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tree. Visible signs of decline of ash trees may not manifest until three or four years after the tree initially became infested. Symptoms of EAB infestation include sparse foliage or thinning of the canopy, excessive sprouting of epicormic shoots from the trunk or roots, vertical bark splitting, D-shaped emergence holes on trunk about 1/8 inch wide, increased woodpecker activity, and serpentine ("S"-shaped) galleries from larvae feeding under the bark.

A comprehensive national web site dedicated to EAB can be found at <http://www.emeraldashborer.info>, and features current distribution maps and other up-to-date EAB information. The Colorado Department of Agriculture (CDA) also administers a website devoted to the EAB infestation within the state, which can be found at

http://www.colorado.gov/cs/Satellite/ag_Plants/CBON/1251646251641. Additional information on the potential impacts of EAB to Colorado communities, ash tree identification, life history, signs and symptoms, and movement of EAB, and response strategies are summarized in the Colorado State University (CSU) quick guide series titled *“Emerald Ash Borer” (Appendix 1)*

Quarantine

EAB is a federally quarantined tree pest. The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has jurisdiction over federally quarantined pests and works with state cooperators to detect, control, and prevent the human spread of EAB. APHIS has jurisdiction over the movement of firewood and other ash wood materials between states, while the CDA has jurisdiction over movement between counties within Colorado. The goal of the quarantine is to contain the pest and prevent its spread to other states and Colorado counties.

On November 12, 2013, CDA established a quarantine zone (*Appendix 2*) around Boulder County, the majority of the Town of Erie, the two landfills located in Erie, the Republic landfill off highway 93 in Jefferson County, and a wood sorting yard located in Allenspark on the Boulder/Larimer County line with the goal to reduce or eliminate the spread of EAB to new locations through the inadvertent spread of infested wood products. The quarantine prohibits the movement of all untreated plants and plant parts of ash trees out of the quarantined area and includes, but is not limited to logs and green lumber, ash nursery stock, chips and mulch, stumps, roots, branches, and firewood of any non-coniferous (hardwood) species. The Town shall remain in compliance with all quarantine mandates. Requirements for handling of regulated ash material from an EAB quarantined area can be found in *Appendix 3*.

At this time, the CDA is currently employing a containment strategy and hopes to achieve these goals through the quarantine efforts. The status is continually evolving and may change once the delimitation surveys are completed or positive confirmations arise in other counties. An eradication strategy would have to be employed for there to be a federal mandate to removal infested trees. As of now, the CDA is deferring management options and strategies to the affected municipalities.

Ash Population and Inventory

Simply defined, an "urban forest" comprises all of the trees within a municipality or a community. Diversity plays an essential role in the long-term stability of an urban forest. An over-abundance of any single tree species increases the susceptibility of the tree to diseases or pests. A general guideline for urban forest diversity promotes the 10-20-30 rule, which states that no single tree species should make up more than 10% nor, any single genus make up more than 20% nor, any single family make up more than 30% of the total tree population.

The 2013 *Metro Denver Urban Forestry Assessment (Appendix 4)* quantifies the distribution of current tree canopy cover and also provides estimates of the dollar value of ecosystem services provided by the Metro Denver urban forest, which is comprised of twenty nine municipalities, including Erie as its northern-most municipality. Urban tree canopy (UTC), defined as the percentage of a site covered by the canopies of trees and shrubs, is the metric used to quantify the extent, function, and value of the Metro Denver urban forest. To calculate benefits of the Metro Denver urban forest canopy, field survey data from Golden, Boulder, and Fort Collins were combined with UTC mapped across the area from satellite remote sensing. The value of ecosystem services was calculated on a per tree basis utilizing the forestry analysis and benefits assessment tools of i-Tree, a suite of software which utilizes numerical models developed by the USDA Forest Service.

Erie's urban forest is comprised of approximately 73,481 trees based on the figures provided by the 2013 *Metro Denver Urban Forestry Assessment*. Ash trees comprise an estimated 15% of the Town's urban forest, or 11,000 ash trees. The loss of this species would have economic, social, and ecological impacts in the state and within Erie. According to the *Metro Denver Urban Forestry Assessment*, Erie's urban forest produces ecosystem services and property value benefits valued at \$3.6 million annually. With ash trees representing 15% of Erie's urban forest, the loss of this species would result in losing approximately \$540,081 annually of ecosystem services and property value benefits.

Phases 1 and 2 of the Town of Erie Tree Inventory Project was completed in 2013, providing the numbers, locations, condition, and sizes of ash trees located on Town-maintained properties. The Town made use of the i-Tree Streets utility to quantify and put a dollar value on the trees' annual environmental and aesthetic benefits, including energy conservation, air quality improvement, carbon dioxide reduction, stormwater control, and property value increases. The findings from Phase 1 of this project can be found in the *Town of Erie Tree Inventory Report – Phase 1 (Appendix 5)*. An up to date summary of the ash tree population on Town-maintained properties that combines the data collected in both Phases 1 and 2 of the project including the importance values, replacement values, and annual ecosystem benefits can be found in *Appendix 6*.

Distribution of the ash species on Town-maintained properties is relatively low in numbers compared to the 10-20-30 rule, neighboring communities, and Erie's urban forest as a whole due to long range planning efforts of Town personnel. Ash trees are the most predominately occurring deciduous tree species and comprise 6% of the population on Town-maintained properties. The Town maintains approximately 180 ash trees. Maps showing the locations and sizes of all Town-maintained ash tree assets can be found in *Appendix 7*.

Phase 3 of the inventory project will be initiated in Spring/Summer 2014 and aims to conduct a sample inventory that will utilize randomly chosen sample plots and then extrapolate the gathered data to apply to the entire street tree population for trees located within the Town-owned public rights-of-way (ROW). Phase 3 will provide valuable data on the composition and health of these ROWs and aid the Town in formulating strategies to address ash trees in these areas.

Results gathered from ongoing inventory operations provide valuable data to assess the overall health of ash trees and provides criteria to prioritize candidates for treatment and/or removal. Trees were inventoried by Town personnel and were assigned a condition rating. Condition indicates the current state of a tree's health, structural soundness, overall shape, and growth rate. Trees were evaluated utilizing the following rating system established by the International Society of Arboriculture® (ISA):

- **Excellent**—100% - 90% condition class.
 - The tree is nearly perfect in condition, vigor and form. This rarely used category is generally applicable to small trees measured at diameter at breast height (DBH) or shrubs that have been recently transplanted and are well established. It also applies to large trees that have established themselves successfully in the landscape.
- **Very Good**—89% - 80% condition class.
 - Overall, the tree is healthy and satisfactory in condition, vigor, and form. The tree has no major structural problems, no mechanical damage, and may have insignificant aesthetic, insect, disease, or structure problems.
- **Good**—79% - 61% condition class.
 - The tree has no major structural problems, no significant mechanical damage, may have minor aesthetic insect, disease, or structure problems, yet is in good health.
- **Fair**—60% - 41% condition class.
 - The tree may exhibit the following characteristics: minor structural problems and/or mechanical damage, significant damage from non-fatal or disfiguring diseases, minor crown imbalance or thin crown, or stunted growth compared to adjacent trees or shrubs. This condition can also include trees that have

been topped, but show reasonable vitality and show no obvious signs of decay.

- **Poor**—40% - 21% condition class.
 - The tree appears unhealthy and may have structural defects such as co-dominant stems, severe included bark, or severe trunk and/or limb decay. A tree in this category may also have severe mechanical damage, crown dieback, or poor vigor threatening its ability to thrive. Trees in poor condition may respond to appropriate maintenance procedures, although these procedures may be cost-prohibitive to undertake.
- **Critical**—20% - 1% condition class.
 - The tree has a major structural problem that presents an unacceptable risk, has very little vigor, and/or has an insect or disease problem that is potentially fatal and, if not corrected, may threaten other trees on the property

Management Strategies

EAB is a dynamic situation and the extent of infestation and how it will affect Colorado's unique landscape is unknown at this time. It is important to note that research on management of EAB remains a work in progress. There is no single "one size fits all" management strategy that can be employed to manage EAB; rather a collection of proven management tools are at the disposal of entities whom are responsible for managing either individual or large stands of ash trees. Variables such as tree health, size distribution, and numbers as well as resources available and risk thresholds often play key roles in developing individual EAB management strategies.

All ash trees are susceptible and will die from EAB if not treated with pesticides and will need to have annual or biennial pesticide treatments for the tree's remaining life. Treatments become essential maintenance to preserve ash trees once EAB is present at a site. The decision to protect an individual ash tree from EAB infestation, or attempt to preserve an already infested tree, is influenced by a multitude of factors including tree health, location, value, cost of treatment, and the likelihood of success versus other management strategies. The tree's size plays a crucial role as size distribution directly correlates to the cost associated to treat trees as pricing is determined by trunk DBH. Size also correlates to the price of removal, loss of canopy and environmental services provided, and likelihood of treatment success.

The current known EAB management options include:

- Do nothing, wait until EAB kills tree and then remove
- Preemptive removal of all ash trees and do not replace
- Preemptive removal of all or some ash trees and replacement with comparable non-ash trees
- Treat entire or select portion of the ash population with insecticides to minimize mortality

All EAB management strategies will have a cost associated with them to accomplish management goals. EAB costs will include additional time and labor required by Town personnel dedicated to control EAB infestations. Perennial increases in the Parks Division's operational budget will be needed to accommodate procurement of pesticides and equipment required to control EAB, increased dump fees, and contracted services including tree removals, installations, and pesticide treatments.

The Town will implement the greatest cost effective strategies for EAB management which will explore management strategies conducted both in-house by forestry personnel and via contractors. The Town will periodically evaluate its EAB management tactics and criteria to achieve the highest level of success. The Town will develop an annual budget for the

implementation of EAB management strategies during development of its annual operational budget, as well as during supplemental budgeting cycles as needed. Forestry personnel will annually formulate a tentative work plan (*Appendix 8*), in conjunction with the operational budget, which details what management strategies will be executed for the following year.

The Towns goal is to prolong the life of the healthiest, largest, most significant ash trees in the community, and greatest producers of economic, social, and ecological benefits located on Town-maintained properties. The recommended EAB management strategy for the Town of Erie is to employ a proactive, integrated strategy that utilizes the following management tools:

1. Active Monitoring
2. Selective Pesticide Treatment
3. Selective Ash Tree Removal
4. Ash Tree Replacement with Non-ash Species
5. Communications and Public Awareness

1. Active Monitoring

Survey efforts provide the most basic information for detecting where and when EAB is present and what responses are needed. The surveying for EAB has undergone an evolution of tactics and application since the initial U.S. discovery of EAB in 2002. Erie will continue to coordinate with federal and state partners to coordinate overall survey efforts, apply the most effective techniques, and contribute to improvement in accuracy and cost-effectiveness of survey methods.

Town of Erie forestry personnel are conducting a delimitation survey to determine the extent of the infestation on Town-maintained properties using the most recently proven branch sampling method developed by Ryall et al. (2010) and described in the technical publication "*Detection of Emerald Ash Borer in Urban Environments Using Branch Sampling*" (Appendix 9). Sampling began in November of 2013 and will continue until a representative sample is gathered of the ash population on Town-maintained properties. On-going monitoring will be necessary once an initial survey has been completed. At this time, Town personnel are concentrating surveying trees that have potential to cause damage to people or property if they are infested by EAB. For that reason, remote natural areas are not currently being surveyed and will be addressed as resources are available.

The Town is utilizing a standardized map grid (Appendix 10) provided by the CDA to aid in the survey process. The numbered grids are comprised of one square mile parcels; Erie's boundaries cover seventeen predetermined grids. The current goal is to collect samples from a minimum of five ash trees per grid number. This criterion may change if infestation is confirmed within or in close proximity to Erie.

The Town will utilize both traps and trap trees to assist in the detection, delimitation, and survey of EAB populations dependent upon resources available. Erie has participated in federally sponsored detection trapping for the last five years and will continue to utilize EAB traps, also known as "purple prism" traps, as detailed in the *2014 Emerald Ash Borer Survey Guidelines* (Appendix 11). The trap is a three-dimensional prism that has been coated with non-toxic glue on all three sides and baited with two lures. Traps will be placed in the canopy of a select few ash trees located on Town-maintained properties throughout Erie. In their adult stage, EABs fly around ash trees, feeding on leaves and looking for a mate. When an EAB lands on a purple trap, it will get stuck in the glue. In mid-summer, forestry personnel will return to the trapping sites to refresh the lures and collect any insects stuck on the traps. In the



fall, personnel will return to the trap sites a second time to collect samples and remove traps.

The Town will also utilize a select few artificially stressed trap trees in addition to the purple prism traps to aid in early detection and boundary marking of EAB infestations. Trap trees (*Appendix 12*) are purposely girdled, a process in which a band of bark and phloem around the trunk of a tree is removed, which interrupts the ability of the tree to transport carbohydrates – the food needed by the tree. Girdled trees become increasingly stressed throughout the growing season and become much more susceptible to beetle attack. All trap trees will be removed within six months of the girdling operations and meticulously examined utilizing the branch sampling method described earlier.

All traps and trap trees will be periodically monitored and all results will be documented and shared with APHIS to aid state wide tracking efforts. All trap trees will be labeled with signage to assist in communications and public awareness efforts.

Town personnel will continue to investigate and track potential EAB infestations and hazards associated with the infestation on private property as resources allow. Tracking logs will enable personnel to keep records in case suspicious trees may need to be reevaluated in the future.

2. Pesticide Treatment

CSU entomologist, Dr. Whitney Cranshaw, in conjunction with the CSU Extension, CDA, and the Colorado State Forest Service (CSFS), has developed “*Control Options for Emerald Ash Borer in Colorado*” (Appendix 13) and can be found at

<http://bspm.agsci.colostate.edu/files/2014/02/EAB-control-options-February-11.pdf>.

This publication features information on common questions related to the control of EAB including the generalized life history and nature of the damage produced by EAB, target EAB stages for control, and the different treatment methods. Another excellent resource for EAB insecticide options was developed by the North Central IPM Center and can found at <http://extension.entm.purdue.edu/EAB/PDF/NC-IPM.pdf> (Appendix 14).

The CSFS are currently recommending that property owners should consider treatment of desirable ash trees if they are located within 5 miles of a confirmed EAB infestation. The treatment of trees within 15 miles of known infestations may be warranted as infestations spread and are known to occur in several different geographic areas. At this time, treatments will not be administered by Town personnel until EAB has been confirmed within the 5 mile guideline as ill-timed treatment efforts can be a waste of financial and personnel resources and is of no benefit to the tree.

Upon confirmation of EAB within 5 miles of Erie, the Town will initiate an EAB pesticide treatment program that utilizes Integrated Pest Management (IPM) principles to focus on long-term prevention or suppression of pest problems while minimizing the impact on human health, the environment and non-target organisms. The Town is actively budgeting and procuring materials to aid personnel to implement this plan. The Town will not treat any trees located on private property or on Town-owned properties that are not maintained by them, such as areas maintained via Home Owners Associations (HOA) and Metro Districts.

Treatment costs, methods, and efficacy continue to evolve as research progresses on this subject. This plan incorporates and adopts the most recent treatments that have yielded the best national results. There are currently four viable insecticide control approaches/methods for use in management of EAB:

1. Soil applications of systemic insecticides
 - Insecticides applied to the root system and will subsequently be taken up by the roots
2. Non-invasive systemic trunk sprays
 - Insecticide applied as a coarse spray onto the trunk and will be absorbed through the bark

3. Trunk injections with systemic insecticides
 - Insecticides injected into the lower trunk of trees and then will move systemically in the tree
4. Persistent surface-applied contact insecticides
 - Persistent insecticides applied onto the trunk and branches to kill adults as they lay eggs and to kill newly hatched larvae before they enter the plant

The Town will continually evaluate its treatment methods to achieve the most successful and cost effective strategy. Criteria used to prioritize on-going treatment of selected trees will be periodically evaluated and is subject to change dependent on the financial and personnel resources available. The following criteria will be used to determine candidates for treatment priority:

- Healthy, vigorously-growing trees are ideal for preventative treatments:
 - If there is less than 40% canopy dieback treatment may be effective
 - Trees of a significant size (8 –12” DBH) are the best candidates for treatment
 - Trees receiving an Excellent, Very Good, or Good condition rating and shall be top candidates for protection
 - Trees receiving Fair condition rating will be treated dependent upon available resources and shall remain a secondary priority at this time
- Large mature trees:
 - Trees that could not be easily replaced and have significant value to the community. These are often substantial in size (>15” DBH)
- High value trees in prominent locations:
 - Smaller trees (>6” DBH) that carry a high level of value to the community in high visibility locations such as parks and municipal facilities
 - High value trees can be removed, yet it may be more fiscally responsible to protect the tree so it may contribute to canopy development
- Trees with historical value

3. Selective Tree Removal

Ash trees already infested with EAB and standing dead trees will receive top priority for removal to mitigate potential hazards. Town personnel will annually monitor specifically for hazardous trees on streets, in parks, along trails, and around the perimeter of natural areas.

The perpetual treatment of smaller trees and trees in poor health is often more expensive than removal. Pro-actively removing trees is safer, more efficient, and less expensive in comparison to removing them once they are fully infested. Preemptive removals will be performed as time and resources allow and will be staggered to reduce disruption to landscape function or the visual and emotional impact on residents. The Town will preemptively remove ash trees that meet the criteria listed below:

- Dead trees
- Unhealthy, non-vigorously growing trees
 - Trees already in decline from other factors or showing signs of stress and receiving Poor or Critical condition rating
- Ash trees already infested with EAB
 - Trees already exhibiting signs of EAB infestation with more than 40% canopy dieback
 - Trees showing many outward signs of EAB infestation, such as woodpecker damage, bark splits, and water sprouts
- Smaller size trees (< 6" DBH)
 - Smaller and lower value trees that can be removed economically
- Trees with utility or pavement conflicts
- Trees with limited space for growth/planted in poor sites
- Naturalized ash trees in open spaces
- Trees whose decline poses a hazard to individuals or infrastructure

4. Ash Tree Replacement with Non-ash Species

The Town will replace removed ash trees with a diverse palette of tree species that are conducive to individual planting sites while also taking into consideration form, function, mature size, and design intent. These trees will be planted within one planting season or as financial resources allow, expediting the renewal of urban tree canopy and numerous social, communal, environmental, and economic benefits in which it produces.

5. Proactive Communications and Public Awareness

A thorough communications and public awareness strategy is a key component to a successful EAB response plan. An educated populace of the impacts of EAB will foster greater knowledge and support for the necessary management strategies that are needed to combat the spread throughout the urban forest. A strong communications and public awareness plan will help facilitate the Town's management strategy, the impacts of EAB, quarantine implications and regulations, and provides management tools that can be employed by residents and property owners to contain the pest and prevent its spread. The Town will seek collaboration with other entities, foster partnerships, and actively seek outside funding sources and grant opportunities as they become available to achieve a consistent public awareness campaign. The Town will implement an educational public outreach network which may include all or portion of the following actions:

- Publicize and promote Town of Erie EAB Response Plan
- Provide and distribute EAB educational materials (hard copy and electronic) to help disseminate information to the public and amongst Town departments
 - Recirculate CDA, APHIS, and CSU press releases and fact sheets
 - Create and periodically update a Frequently Asked Questions (FAQ) and answers document
 - Key messages to promote may include:
 - How to identify an ash tree
 - Identification of EAB/Signs and symptoms of EAB
 - What to do if your tree has EAB
 - Who to contact if EAB is suspected
 - Treatment options for individual residents trees
 - Treatment vs removal
 - Who to call or where to go for more information
 - Don't move firewood
 - Homeowner responsibilities
 - Species selection to replant
 - Benefits and importance of trees
- Launch targeted multi-media campaigns using a variety of traditional and social media tools and outlets to raise public awareness utilizing:
 - Town website
 - Notify Me! – subscriber based email delivery system for Town residents
 - Town social media accounts
 - Local cable access
 - Leaflets in utility bills

- Designate an EAB Hotline
 - Voice recorded updates of pertinent EAB information
 - Connects residents directly to Parks Division contact
- Utilize print and digital signage to post information in parks, open spaces, and facilities
- Conduct targeted outreach and training to key audiences
 - Forestry personnel will conduct periodic training and provide updates on the current status of the infestation to other Town personnel
 - Hold public workshops/open houses on EAB for residents, civic groups, HOAs, etc.
- Forestry personnel will serve as an informational resource for management and treatment of EAB to the public as resources permit
 - Facilitate opportunities to connect licensed and certified pesticide applicators with interested private property owners who wish to treat their private ash trees at their own expense.
 - The Town will attempt to procure discounted rates for citizens for treatment of trees on private property.
- Collaborate and encourage local partnerships
 - EAB Incident Command Team
 - City of Boulder Forestry, CDA, APHIS, CSU Extension, CSFS, and University of Colorado-Boulder
 - Professional Industry Organizations
 - International Society of Arboriculture (ISA), Tree Care Industry Association (TCIA), Society of Municipal Arborists (SMA), Colorado Tree Coalition (CTC), American Society of Consulting Arborists (ASCA), Colorado Association of Lawn Care Professionals (CALCP), Colorado Nursery and Greenhouse Association (CGNA), Associated Landscape Contractors of Colorado (ALCC), Professional Landcare Network (PLANET), Colorado Parks and Recreation Association (CPRA)
 - Local municipalities
 - Universities and schools
 - HOAs, civic groups, non-profit organizations

Waste Disposal and Storage

CDA has established Approved Marshaling Yards/Sawmills where wood debris may be collected and treated for movement and use outside the quarantine area. These facilities are privately owned and fee based. Contact individual sites for their fee schedule.

Additional Approved Marshaling Yards/Sawmills located within current quarantine area will be publicized as they become available.

Approved Marshaling Yards/Sawmills located within the current quarantine area:

- Coal Creek Properties (115 Cheeseman, Erie, CO 80516) – 303-828-4558
 - Processing chips and compost
- Singing Saw Woodworks (11218 Hwy 93, Boulder, 80303) - 303-588-0349
 - Processing large logs
- Portable Saw Ryan Baldwin – 970-219-6887

All ash wood, limbs, or mulch under the care of the Town will be stored and processed at the Leon A. Wurl Service Center prior to transporting to an Approved Marshaling Yard/Sawmill. All contractors who engage in tree work for the Town will be instructed to follow the established protocols for moving, storing, and disposal of ash wood waste. The Town does not plan on taking or storing any ash wood debris from private property and all citizen inquiries will be informed that all ash wood debris must be taken to an Approved Marshaling Yard/Sawmill or one of the four landfills or sorting yards confined within the quarantine area.

Town personnel will prune ash trees on a different rotation compared to other species as to not co-mingle ash trees with others. If different species of wood trimmings, chips, etc. are co-mingled, then it is all considered under restriction. All ash wood, limbs, or mulch under the care of the Town will be sorted, stored, and processed separately than all other species and will be considered contaminated. Any pile of wood, limbs, or mulch of unknown origin or species content will be treated as contaminated to reduce the risk of transporting the infestation to new areas. Ash and co-mingled wood debris will be stored separately from all other tree waste to help minimize the spread of infestation. Co-mingled wood waste will be discarded in the same fashion as ash.