Ash Inventory and Management Options for Emerald Ash Borer Response

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Introduction

- Emerald ash borer (*Agrilus planipennis* F., EAB)is a beetle (Fig. 1) that was accidentally introduced to North America in the 1990s (Herms et al. 2019).
- EAB, which causes ash (*Fraxinus* spp.) tree mortality, has been detected in over 35 states, including TN (Herms et al. 2014, Engelken et al. 2020).
- Ash wood becomes brittle when infected and trees die within a few years (Fig. 2).
- Ash trees (Fig. 3,4) are common in residential areas and infested trees could pose a risk to humans and houses if left untreated.

Figure 1: Metallic green, adult emerald ash borer showing size relative to a US penny. (photo credit: Howard Russell, Michigan State University, Bugwood.org)

Figure 2: D-shaped exit holes from EAB with size relative to a US nickel. (photo credit: Ecological Research Institute)

Figure 3: Image of white ash leaf with pinnately compound, opposite leaves. (Photo credit: Katy Chayka 2012)

Figure 4: Sketch of opposite branching pattern of an ash tree. (sketch credit: Purdue Extension)

Objectives

- Inventory and map ash stems to assess potential damage of EAB at Monteagle Sunday School Assembly (MSSA).
- Compare treatment options and develop a potential response plan for MSSA.

Methods

- Inventoried and mapped ash trees on leaseholds in Fall 2021.
- Each tree cataloged with date, cottage number, DBH, height (estimated and exact), percentage dieback of crown, and general notes.
- Trails, mapped with GPS in November 2021, and ash tree locations were noted.
- Chemical treatment options and costs, obtained from retail outlets, tree service providers, and online resources, were compared with mechanical options to develop a potential response plan for MSSA.

Results

- 180 stems > 2 in DBH were inventoried and mapped within the MSSA gates (124 on leaseholds, 54 on commons from 2018 inventory) (Fig. 5).
- No ash stems were found within striking distance of trails above the bluff on MSSA property, but trails below the bluff have ash that could impact trails.
- Most common targets: houses and powerlines (Fig. 6)
- Average ash DBH: 18.8 in (Fig. 7)
- 49% of ash trees had dead branches 1-2 inches in diameter (63 stems).
- 24% of the ash trees had dead branches 3 inches or larger (31 stems)

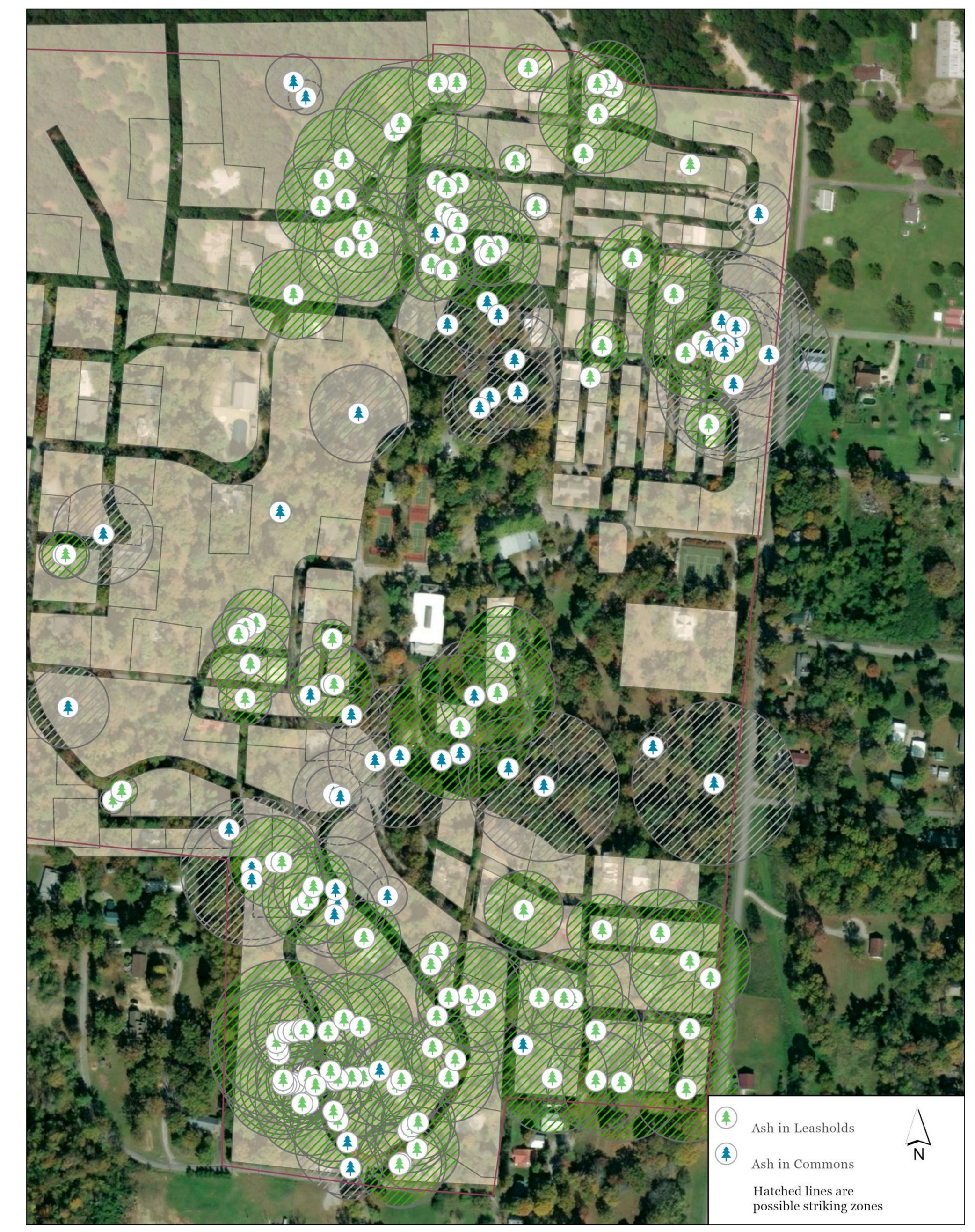

Figure 5. Map of the areas of high concentration of ash in the Monteagle Sunday School Assembly. Hatched buffers around stems represent half heights of trees, or striking zones where the tree could cause damage.

- Estimated treatments costs per tree range between $0.06-$12.00 per inch DBH and $500-$900 per tree (Table 1)

Table 1: Cost comparison of treatment options (Local vendors)

Treatment	Cost	Frequency	Total Cost
Imidacloprid	$0.06 - $0.20 per inch	Every year	$1,097 - $3,513
Emamectin Benzoate	$1.20 - $12.00 per inch	Every two years	$4,492 - $19,454
Mechanical Removal	$500 - $900 per tree	One time	$3,500 - $10,000 per day

- If all trees are chemically treated the total cost could be (Table 1)
  Imidicloprid: $1,097 - $3,513 every year
  Emamectin Benzoate: $4,492 - $19,454 every two years
- Mechanical removal of all stems is estimated to be $3,500-$10,000 per day and would take several days to complete (Table 1). Total cost will depend on access and time needed.

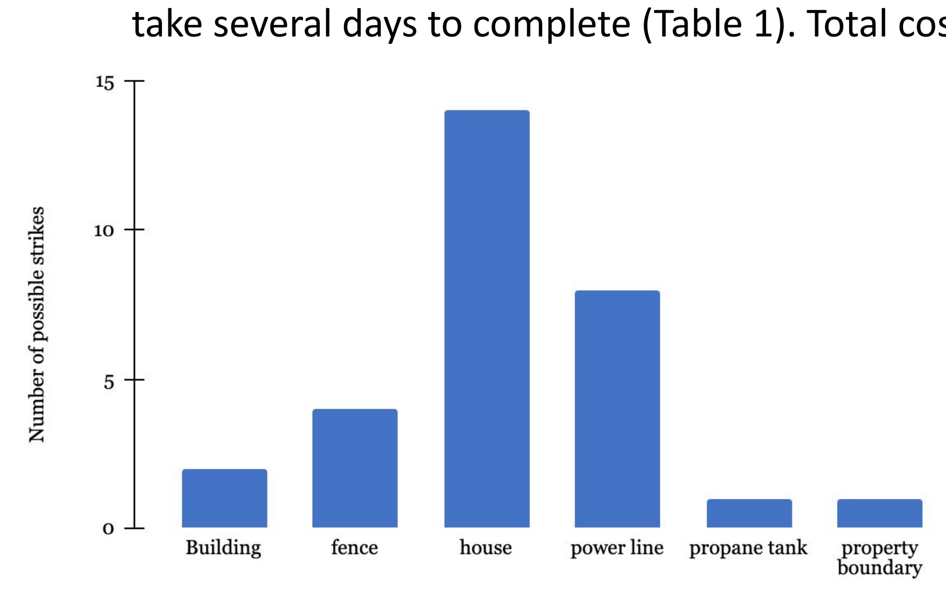

Figure 6. The type and number of targets that a falling ash tree, or dead branches could hit in the MSSA.

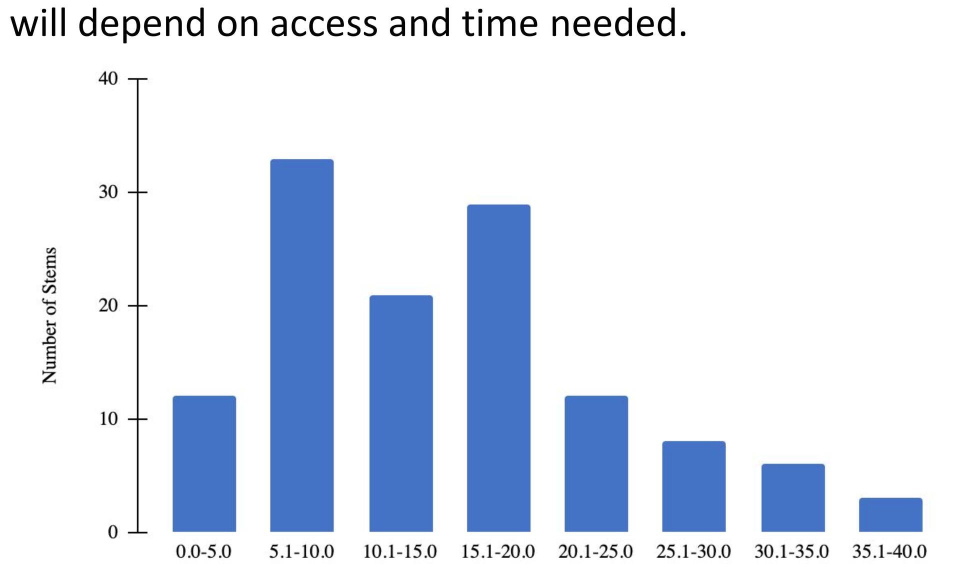

Figure 7. Number of ash trees in each 5 in diameter class in leaseholds of the MSSA in fall 2021.

Ash Treatment Options

- Three treatment options: removal, chemical treatment, and parasitoid release.
- Best results will likely require some combination of tree removal and chemical treatment.
- Chemical options need to be applied prior to 50% crown reduction to be effective.
- Imidacloprid and emamectin benzoate, systemic insecticides, are the two main chemical options. (Each is available in several formulations.)
- Imidacloprid impacts pollinators, while emamectin benzoate has less of an effect (only impacts insects that feed directly on ash flowers).
- Imidacloprid is more readily available to leaseholders, less expensive, and is applied as a soil drench, but it is less effective.
- Emamectin benzoate is more effective and protects the tree for 2-3 years, but it is a trunk injection requiring special equipment and is 4-18 x as expensive.
- Tree removal is recommended for stems with over 50% die back, those in decline, or those in close proximity to houses and roads with a high potential for damage.
- Parasitoids will be released in Sewanee forests, and they could be released on areas below the bluff in MSSA, but this study did not fully explore this option.

Conclusions

- Treating the Assembly as a whole or grouping leaseholds will be less expensive per tree than individual treatments scheduled by leaseholders.
- While chemical treatment is less expensive than removal on a short term, per tree basis, some trees that pose a threat will need to be removed (ex. close proximity to a house, signs of decline, etc.), such that response will need to include a combination of chemical treatment and removal.
- Emamectin benzoate is more highly recommended, but both insecticide options could be useful.
- Chemical treatments may allow removal costs to be put off for several years, spreading out the high cost of removal over time.
- Trees should be reevaluated on an annual basis, and they will need to be treated every 1-2 years, depending on the chemical used.
- MSSA will need to continue to monitor trees indefinitely, and they are encouraged to keep abreast of the most current response options.

References Cited

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