

EAB ECONOMICS,

Management Approaches, and Decision Making

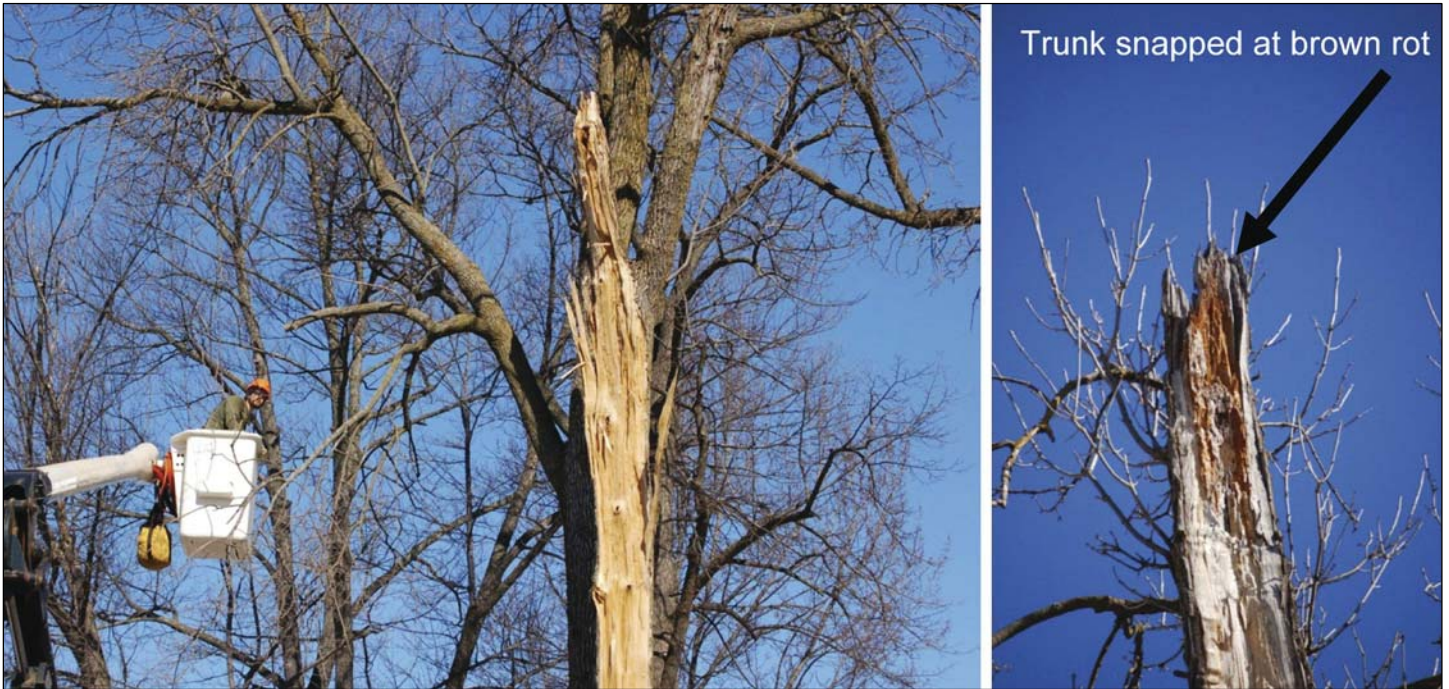


Figure 1. Removal of a 110-year-old ash tree in poor structural health is a wise safety choice rather than retention through chemical treatment. Limbs are failing periodically at locations with brown rot. All photographs and graphics by Richard J. Hauer.

By Richard J. Hauer

The discovery of emerald ash borer (*Agrilus planipennis*) in North America seems just like yesterday, even though the 10-year anniversary just occurred this July. Much has been learned about EAB during that decade. As a recap, North American ash tree species are still susceptible to EAB and tens of billions of dollars of economic impact are at stake. Tens of millions of ash trees have died and tens of millions more are facing the beetle's invasion. Resistant ash trees are being looked at within breeding programs and evaluation of the few ash survivors after EAB has killed the rest in an area has started. Progressive research with the biocontrol of EAB continues to move forward with the hope that natural predators will decrease the future impact of EAB. Municipal EAB management plans that are developed to address the pest will help to make an orderly transformation beyond ash. Scientific advancements into tree

treatments are offering exciting ways to prevent EAB from killing ash trees. The effectiveness of these chemical treatments provides an excellent way to slow the loss of ash and to conserve the ash canopy. Finally, developed economic models provide a means to address the financial impacts of EAB management approaches.

Just what should ash tree owners do is an important question? Ultimately this is a question based on the desires of ash tree owners. People make rational and irrational decisions and sometimes decide to go with a desire not so much based on economic worth, as much as you or I might desire that option. Just look at cars. A very fast and cool looking sports car will get you from A to B in the same time as a plain economy car, assuming all traffic laws are followed. Tree care is sometimes like that with clients, they desire to retain a tree longer, but the cost of the treatment might be greater than what the future tree value can justify. There is nothing wrong with that scenario if it is the desired decision.

Typically however the investment in landscape plants is a growing property asset.

Determining the benefits and costs of EAB management approaches is important to rational decision making. If ash trees have no value, the decision could be as simple as doing nothing except removing those trees in harms ways. Homeowners, residents of a community, arborists and other decision makers can debate the value of ash trees and if a do nothing approach is truly best. Others may place their efforts with removing ash trees before EAB arrives. Trees will cost money to remove anyway, so why not just preemptively remove them and be done with the problem, goes the logic. A third approach is retention of ash trees through treatments currently chemically based. In all cases, some economic consideration is a vital basis as to which management approach is used.

There are many economic approaches to account for tree value. The *Guide to Plant Appraisal*, from the Council of Tree and Landscape Appraisers (CTLA), and the i-

EAB management options

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Michigan utilizes many of these tactics (<http://www.slameab.info/>) and its effectiveness at reducing EAB population growth and spread is being closely monitored and evaluated by university, state and federal scientists. Similarly, adaptive management of EAB populations using these tactics to mitigate damage associated with EAB and slow the progression of ash mortality is underway with federal and state partners and being examined at several high-priority infestations, such as those in eastern New York State.

A study that was published in fall 2011 in the *Journal of Environmental Management* examined the influence of isolated EAB populations on projected economic damages. It showed that EAB infestations that were distant from the generally infested region of the southern Great Lakes and close to large urban areas, like New York City or Minneapolis-St. Paul, had the potential to be the most economically damaging. Slowing the expansion of just the EAB infestations detected in 2009 was estimated to reduce economic damages over



Woodpeckers are very good at locating the older EAB larvae. Courtesy USFS.

the next 10 years by \$100-700 million. This suggests that it might be cost effective for federal and state agencies to allocate significant funds to prevent the establishment of new isolated EAB populations or to slow the expansion of existing high-priority EAB infestations.

Members of the tree care industry are an especially valuable resource in detecting new EAB infestations, so it is important to be knowledgeable about EAB. Outcomes will be better with more boots on the ground and more eyes in the trees that can recognize the signs and symptoms of an EAB infestation in both

the woodlands and the urban forest. EAB is no longer only a Midwestern pest issue. Report suspected EAB infestations to your state Department of Agriculture plant pest regulatory official or State Forester. The earlier an infestation is found, the more effective these management tactics can be at mitigating EAB damage and keeping costs low.

More information regarding EAB, including how to identify EAB, locations of known infestations, treatments, quarantines and links to other state and federal EAB websites is available at <http://www.emeraldashborer.info>.

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Tree system are two common methods used to quantify the value of urban trees. Value is often used interchangeably with benefit. There is also a cost associated with every EAB management alternative. A benefit is the value associated with an asset and in contrast the cost is the resources used associated with management approaches. Money is often used as the common denominator in tree benefits and costs. Net benefits and benefit cost ratios are common ways to financially evaluate the outcomes of management approaches. A net benefit is the difference between the benefits and costs and a benefit cost is a ratio between the benefits and costs. A positive net benefit and benefit cost greater than 1 suggest more value is occurring than the cost associated with maintaining the tree.

Looking beyond EAB will cost money

Years ago as a new student to the arboriculture and urban forestry profession, I

remember a statement by Mark Stennes about Dutch elm disease that stuck in my mind: "Whether you like it or not, it will cost you money." The outcome of EAB is no different. Emerald ash borer will cost you money, whether you like it or not. As arborists and urban foresters, we are faced with making decisions that ideally minimize the expenses associated with EAB. There will certainly be costs associated with removing ash trees in locations that present a risk for injury or property damage. Tree replacements and proper establishment will also cost money. There are certainly the societal costs associated with the loss of ash tree benefits. These include the loss of shade, increased storm water runoff, air pollutants not absorbed by ash leaves, decreased property values, less desirable shopping areas, sunnier streets that decline faster, and perhaps even increased crime. If we just give up, it seems like EAB has the potential to make

the "It's a Wonderful Life" Bedford Falls urban forest into a Pottersville.

Too often the discussion of EAB rests and stops with the cost side. What will it cost to remove the tree? How much is it going to cost to treat trees? Do we even dare spend more money to replant trees on private or public landscapes? Certainly one needs to address the costs of management outcomes. The benefit side of ash trees should likewise be considered. Two tools exist to evaluate the economics of EAB management approaches. The EAB Cost Calculator is one tool located at <http://extension.entm.purdue.edu/treecomputer/>. Sadof et al. (2011) provide an excellent overview of the use of this model. The Emerald Ash Borer Planning Simulator (EAB-Plans) also allows practitioners to evaluate EAB economics <http://cnrfiles.uwsp.edu/hauer/EAB-PLANSVersionBeta.xlsx>. VanNatta et al. (2012) detail the outcomes and

MANGEMENT ALTERNATIVE ANALYSIS					
Goals & Objectives	Management Alternatives				No EAB
	Control	Treatment	Removal	Remove & Replant	
Mean Net Per Tree Value	\$963	\$946	\$211	\$233	\$988
Net Per Tree Value at Year 20	\$882	\$896	\$0	\$232	\$931
Net Total Tree Value at Year 20	\$25,915	\$525,154	\$0	\$164,901	\$621,836
Mean Net Per Tree Value Lost	\$1,329	\$1,333	\$324	\$1,293	\$1,301
Total Trees Lost After 20 Years	971	414	1,000	1,290	332
Mean Annual Tree Diameter (DBH)	12.0	13.6	2.5	6.1	13.7
Mean Number of Trees Lost Per Year	46	20	48	61	16
Trees Retained at Year 20	29	586	0	710	668
Mean Per Year Maintenance Cost	\$14,175	\$22,843	\$6,435	\$13,037	\$23,437
Total Maintenance Cost	\$297,685	\$479,698	\$135,142	\$273,770	\$492,179
Mean Per Year Removal Cost	\$12,121	\$4,849	\$14,274	\$15,426	\$3,968
Total Removal Cost	\$254,547	\$101,830	\$299,748	\$323,943	\$83,337
Mean Per Year Planting Cost	\$0	\$0	\$0	\$12,035	\$0
Total Planting Cost	\$0	\$0	\$0	\$252,742	\$0
Mean Per Year Treatment Cost	\$0	\$32,632	\$0	\$0	\$0
Total Treatment Cost	\$0	\$685,282	\$0	\$0	\$0
Total Management Cost	\$552,232	\$1,266,810	\$434,889	\$850,455	\$575,516
Mean Per Year Total Management Cost	\$26,297	\$60,324	\$20,709	\$40,498	\$27,406
Mean Per Tree Annual Management Cost	\$63	\$72	\$21	\$40	\$33

Management Alternatives	Retained Tree Analysis		Lost Tree Analysis		Benefit/Cost
	Mean Net Value	Relative Ratio	Mean Net Value	Relative Ratio	
Control	\$395,337	1.00	\$61,411	1.00	0.76
Treatment	\$749,793	1.90	\$26,297	2.34	0.64
Preemptive Removal	\$123,502	0.31	\$64,757	0.95	0.33
Remove & Replant	\$202,431	0.51	\$79,467	0.77	0.29
No EAB	\$813,048	2.06	\$20,589	2.98	1.46

Legend	
●	Most Desirable Outcome
●	
●	
●	Least Desirable Outcome

Figure 2. Comparison of four emerald ash borer (EAB) management alternatives using methods of VanNatta et al. 2012 for a 1000 ash tree population. (Retained Tree Analysis: Relative Ratio = Management Alternative in any row/ Control Alternative; Lost Tree Analysis: Relative Ratio = Control Alternative / Management Alternative in any row; Management Alternatives include treatment, preemptive removal over five years, preemptive removal and replanting over five years, and no EAB; no EAB is a scenario in that EAB is not present in the community)

assumptions of this model.

Different management approaches

Several alternative management approaches seem to compete for the title of best to use. Options such as doing nothing, treating ash trees, or preemptive removal compete regularly in the battle for the best. Doing nothing implies you let ash trees die and remove them afterward. Preemptive removal involves removing trees before they die. Treatment in contrast prolongs the longevity of the treated ash tree. Any option may win given the right context.

As suggested earlier, if little or no value is given to an ash tree, it might be economically difficult to rationally justify to treat and retain ash trees. Likewise, if ash trees have a poor structural or health condition, perhaps it is time to consider tree removal (Figure 1). High value ash trees and

those in good to excellent structure and health might be great candidates to retain as monetary resources allow.

EAB economic analysis – EAB-Plans

Approximately two years ago we set out to develop a system to evaluate EAB management approaches. An initial objective was to evaluate three commonly suggested EAB management approaches: (1) Do Nothing, (2) Preemptive Removal, and (3) Chemical Treatments. The ash

mortality rates. Tree maintenance, removal and treatment costs are part of the analysis. The number of years to preemptively remove all ash trees is entered. Finally, the cost to chemically treat ash trees and the survival rates for the selected treatment are included. The end-user can modify these variables to customize the analysis for their local situation.

What we found with many different tested scenarios was retention of ash trees was economically favored over doing nothing.

Doing nothing was economically more favorable than removing ash preemptively (Figure 2). One of the biggest reasons why chemical treatment is better than preemptive removal is current chemical treatments are low cost and effective. The chemical emamectin benzoate costs homeowners approximately 10 to 15 dollars per diameter inch to treat their ash. The cost of a chemical treatment would need to increase by 2 to 3

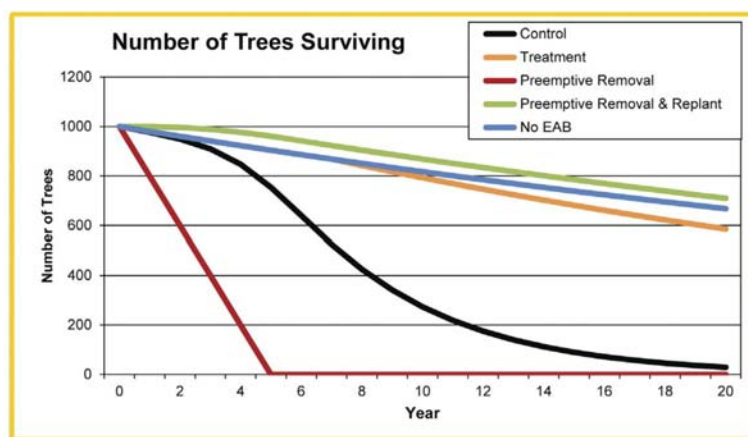


Figure 3. After 20 years, few ash trees are left with the do nothing (control) approach compared to treatment, no EAB, and preemptive removal followed by tree replacement.

times, to approximately \$30 per diameter inch, until the outcome of preemptive removal and chemical treatment had a comparable benefit/cost ratio. Other chemical treatments labeled for EAB control (i.e., imidacloprid) also consistently supported retaining ash with the outcome of a greater net value of the ash tree population.

Certainly financial resources are needed to chemically treat. Using 1,000 ash trees with a 10-inch mean diameter as an example population, approximately \$33,000 annually is needed to treat these trees at a \$10 per diameter inch cost. In large tree populations, commercial bids at the \$6 per diameter inch are reported, which lowers the cost to approximately \$20,000 per year. The City of Milwaukee, Wisconsin, has been able to economize the cost using municipal staff at \$3.25 per diameter inch. This scenario effectively reduces the cost in the example 1,000 tree population to \$10,000 per year. The trend is for EAB chemical costs to decline in price. Recent research is suggesting that not all ash trees need to be treated to get an overall significant reduction in EAB in a community. Finally, the treated ash population remaining after 20 years is comparable to a no EAB scenario (Figure 3).

Summary

Whether you like it or not, EAB will cost you money. Much is being learned about the ecology of EAB, natural predators, resistant ash species, chemical protection of ash trees, and economic models to evaluate EAB outcomes. Ideally the tree owner is looking to retain good and excellent ash trees in high value locations. As practitioners, we have several chemical based treatments that have high success rates that are economically viable options compared to doing nothing or preemptive removal of ash trees. Doing nothing and preemptive removal of ash trees are also appropriate options for ash trees in poor health or in low value settings. As part of an integrated approach to EAB management, all options should be considered.


Further Information

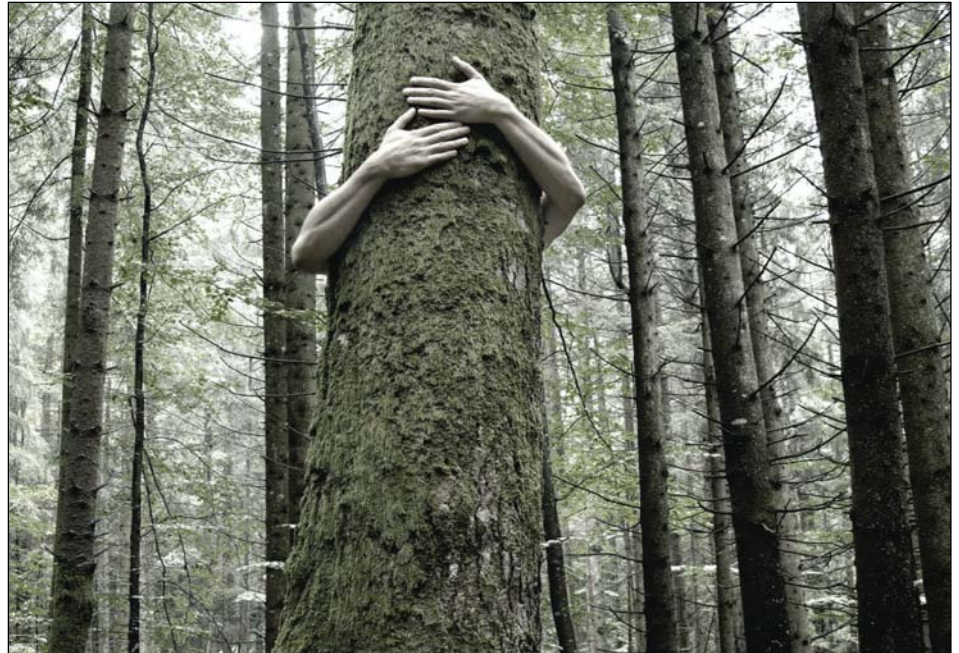
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