

ECONOMIC ASSESSMENT OF POTENTIAL EMERALD ASH BORER DAMAGE IN URBAN AREAS IN THE UNITED STATES

Robert G. Haight¹, Kent Kovacs², Andrew M. Liebhold³, and Deborah G. McCullough⁴

¹USDA Forest Service, Northern Research Station, St. Paul, MN 55108

²University of Nevada, Department of Resource Economics, Reno, NV 89557

³USDA Forest Service, Northern Research Station, Morgantown, WV 26505

⁴Michigan State University, Departments of Entomology and Forestry,
East Lansing, MI 48824

ABSTRACT

Emerald ash borer (*Agrilus planipennis*), a beetle native to Asia, was discovered in southeastern Michigan near Detroit in the summer of 2002 and by the end of 2008 it had been found in locations in 10 states. Emerald ash borer (EAB) has the potential to spread and kill native ash trees (*Fraxinus sp.*) throughout the United States. While EAB infestations may initially spread relatively slowly, humans spread the insect much farther by moving infested ash logs, firewood, or nursery stock. State and Federal agencies have responded with quarantines on the movement of ash material and surveys to detect new infestations. These programs are expensive, yet there is very little scientific literature on the number of ash trees and the aggregate cost of treating trees to prevent infestation and removing infested trees, especially in urban areas. Assessing the potential economic impacts of EAB is important to evaluate the benefits of slow-the-spread efforts, as well as investments in research on EAB biology and management. We estimate the discounted cost of ash treatment and removal in urban areas in a 16-state study area centered on Detroit under one scenario of EAB infestation over the next decade (2009-2018).

Collectively, city boundaries enclose more than 11 million hectares (ha) within the study area, including both developed and undeveloped land. We estimate the number of ash trees in the developed portion of urban land because these are the trees that will most likely be treated or removed in response to EAB infestation. A little more than half of the urban area (6 million ha) is developed, and canopy cover is about 10 percent of developed land (0.6 million ha).

We obtained urban forest inventory information for 11 cities from web sites, publications, and personal communication with city foresters. Each source includes an estimate of the total number of ash trees within a city boundary, including trees on streets, parks, and private lands. From this inventory information, we compute the number of ash trees per hectare of tree cover for each city. Average ash density is 53 trees per ha of tree cover with a range of 289 trees per ha in Chicago to 3 trees per ha in Washington, D.C.

The urban forest inventory results are the basis for estimating number of ash trees in the developed portion of urban areas. First, we divide the study area into 16 mapping zones that represent relative homogeneity of landform, soil, and vegetation. Next, we assign each city with an urban forest inventory to a mapping zone and compute average ash density (trees per ha cover) for each zone. Then, we multiply the average ash density times the developed area of tree cover to estimate number of ash trees in the mapping zone. Adding up the number of ash trees across mapping zones, we estimate about 51 million urban ash trees in the study area.

We created a scenario for the expansion of EAB infestations from their known locations in December 2008. As EAB infestations expand, we predict the number of trees that are treated and removed and sum the discounted treatment costs and removal and replacement costs using a 5 percent discount rate. Total discounted cost is \$21.16 billion, with a majority of that cost occurring in commercial districts, industrial land, and parks with the removal of relatively small ash trees. If all ash trees are treated or removed

at once, a common assumption, the total cost is \$33.94 billion, 60 percent higher.

Our estimate of total discounted cost of treatment and removal activities over a 10-year horizon, \$21.16 billion, suggests that a substantial investment can be efficiently spent to slow the spread of EAB and postpone treatment and removal costs. These investments could include enforcement of quarantines on the movement of ash material, detection of new infestations, and destruction of infested trees. Investments also include research on effective chemical and biological control agents.

While estimates of ash numbers in cities for which we have inventory information are statistically sound, expanding those numbers to places without tree inventories should be viewed with caution because we have relatively few city-level inventories and those we have do not represent a random sample of urban areas. A systematic sample of the urban forest throughout the study area is needed to obtain statistically sound estimates of urban ash.

Our estimate of discounted cost of treatment and removal activities represents an income transfer from homeowners and municipalities to the tree-care industry and does not represent a net loss to society. Further work is needed to estimate nonmarket values of ash trees that are lost because of EAB infestation. Estimates of the reduction in nonmarket values represent a loss to society.