

THREE-YEAR PROGRESSION OF EMERALD ASH BORER- INDUCED DECLINE AND MORTALITY IN SOUTHEASTERN MICHIGAN

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ABSTRACT

We monitored the progression of ash (*Fraxinus* spp.) decline and mortality due to emerald ash borer (EAB), *Agrilus planipennis*, in 38 forest stands in the upper Huron River watershed region of southeastern Michigan from 2004–2007. Black ash (*F. nigra*), green ash (*F. pennsylvanica*), and white ash (*F. americana*) were most common species in hydric, mesic, and xeric stands, respectively. A transect was established within each forest stand consisting of three 0.1-ha circular plots (114 plots total). Within each plot, all ash trees were identified to species and assigned a crown dieback rating on a scale of 1–5, with ‘1’ representing ‘no decline’ and ‘5’ indicating a dead tree.

Ash decline significantly increased over time, from a mean dieback rating of 3.5 in 2004–2005 to 4.8 in 2007. Although black ash initially experienced greater decline and mortality than white or green ash in 2004–2005, this trend was absent in 2006 and 2007, indicating that all species were declining at equal rates. A significant negative relationship was detected between percent ash tree mortality and distance from the epicenter of the infestation in the township of Canton, Michigan, from 2004 to 2006, with mortality decreasing 2% with each kilometer away from the epicenter. On average, percent mortality of ash increased 30% over the three year study period; however, the slope of line describing this relationship (2% decrease in mortality per kilometer away from the epicenter) remained unchanged. This relationship, however, was not significant in 2007, as stands farther away from the epicenter of infestation were approaching 100% ash mortality.

Cumulative survival distributions calculated for a subset of individual trees from 2003–2007 showed that white ash had the highest survival rate of the three species (~three times greater) followed by green and black ash, respectively. Over three years, survival for all species decreased 30–50%. The life expectancy of surviving white ash in summer 2007 was found to be 1.3 ± 0.01 (mean \pm SE) years, 0.92 ± 0.04 years for green ash, and 0.79 ± 0.05 years for black ash.

Overall, our results indicate that as EAB is causing large-scale mortality of the three major ash species in the upper Huron River watershed region. Thus, EAB has the potential to drastically and irreversibly alter the structure and composition of these North American central hardwood forests.