

EMERALD ASH BORER DISPERSAL IN MARYLAND: GO FORTH YOUNG PEST!

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ABSTRACT

The emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire), an exotic invasive pest from Asia, was introduced into Maryland in April 2003 via infested nursery stock shipped from Michigan to a nursery in southern Prince George's County. A nursery inspector from the Maryland Department of Agriculture (MDA) noticed EAB infested trees at the site in August 2003. A half-mile buffer zone was established around the nursery, and all ash trees within the quarantine zone were destroyed in an effort to eradicate the pest. Between September 2003 and March 2004, about 1,100 ash trees were cut down and destroyed, including 119 of the original 121 nursery stock trees that were definitively recovered through trace backs.

From 2004 to 2006, sentinel trees were established and monitored, and surveys to locate ash trees in the area were initiated. EAB were detected again in August 2006. It was assumed the new detections dated from the initial infestation in 2003, so buffer zones were expanded 1.5 miles at that time to account for the potential movement of the pest over the previous 3 years. Between 2006 and 2008, thousands of new EAB detections were made and 25,000 trees were removed on over 14,000 acres in Prince George's County by 2007. On August 18, 2008, EABs were detected in Charles County, over 4.5 miles south of the original infestation site in Prince George's County from 5 years earlier.

Our objectives were twofold. First, we wanted to determine the rate of spread of EAB in Maryland and specifically address the question of whether, within an aggressively managed quarantine zone, the average annual movement of EAB exceeded a half-mile limit. Second, we examined the possibility that the primary

direction of dispersal of EAB in Maryland followed the direction of prevailing winds during the period of adult flight.

The Prince George's County nursery infested in 2003 provided the point of origin for the EAB infestation, and historical records from the MDA of EAB detections for 2006, 2007, and 2008 were used to determine the rate and direction of dispersal in Maryland. No detections were made in 2004 and 2005. Distinct detection points were selected in 2006, 2007, and 2008 and plotted onto a map of the quarantined area that was divided into 2.5-acre grids. The four most distinct detection points occurring furthest from the introduction site were then determined for each year using GIS survey data gathered by MDA. The maximum distances (one site in each of 3 years) and average distances of 12 subsamples (four sites in each of 3 years) were regressed against time to determine the average rate of spread for the 5-year period.

Using a quadrant graph, the four most distant points from 2006, 2007, and 2008 were plotted to determine direction of dispersal of EAB. Prevailing wind direction during the flight months of EAB (May – August) was determined by consulting records from the Department of Atmospheric and Oceanic Science at the University of Maryland. Prevailing winds during those months come from the southwest.

The results show that EAB had an average annual rate of spread in Maryland of 0.61 miles/year ($y = 0.61x - 0.21$, $P = 0.02$, $r^2 = 0.94$) and a maximum annual rate of spread of 0.90 miles/year ($y = 0.90x - 0.13$, $P = 0.02$, $r^2 = 0.95$) between 2003 and 2008. This exceeds the expected

annual distance traveled of 0.5 miles that has historically been used in EAB control programs. EAB has moved outward from the original introduction site into all four quadrants cardinal directions, with four detection points each in both the NW and SE quadrants, and two detection points each in both the SW and NE quadrants. EAB therefore does not appear to be moving preferentially in the direction of prevailing winds.

In an intensively managed quarantine site in Maryland, EAB is moving at an average rate of 0.6 miles/year and a maximum rate of 0.9 miles/year. These distances exceed the 0.5-mile buffer for the eradication zone established in 2003 when EAB was first detected in Maryland, but are in agreement with a dispersal distance of 0.93 miles (1500 m) reported by Haack and Petrice (2003). EAB is moving outward from its initial site of introduction in several directions, rather than in the direction of prevailing winds. We emphasize that this study does not exclude transportation or nursery stock, firewood, or vehicular traffic as facilitating the movement of this beetle. We also acknowledge that, in addition to natural dispersal

of beetles, movement of infested nursery stock early in the period of establishment of the beetle could exacerbate the rapidity of spread. The extent to which dispersal in Maryland is natural or anthropogenic is unknown. Further investigations will examine the importance of other physical features such as riparian areas, vegetation types, roadways, and land use on patterns of movement.

Literature Cited

Haack, Robert A. and Toby R. Petrice. 2003. **Emerald ash borer adult dispersal**. In: Mastro, Victor; Reardon, Richard, comps. Emerald ash borer research and technology development meeting; 2003 September 30-October 1; Port Huron, MI. FHTET 2004-03. Morgantown, WV: U.S. Forest Service, Forest Health Technology Enterprise Team: 10.

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