

## Host Range and Host Preference of Emerald Ash Borer

Deborah G. McCullough<sup>1,2</sup>, Andrea Agius<sup>1</sup>, David Cappaert<sup>1</sup>, Therese Poland<sup>3</sup>,  
Debbie Miller<sup>3</sup> and Leah Bauer<sup>3</sup>

<sup>1</sup>Dept. of Entomology and <sup>2</sup>Dept. of Forestry, Michigan State University

<sup>3</sup>USDA Forest Service, North Central Research Station

### Summary:

Currently, emerald ash borer (EAB), *Agrilus planipennis* Fairmaire, is known to infest only ash (*Fraxinus* sp.) trees. Reports from Asia, however, indicate that this or a closely related beetle, have been collected from Asian species of elm, walnut and *Pterocarya* sp. (wingnut). The ability of emerald ash borer to utilize alternative hosts would obviously have major implications for survey activities the overall success of the eradication effort. In addition, we have observed that North American ash species may differ in their susceptibility to emerald ash borer or in their vulnerability once infested. Green ash (*F. pennsylvanica*) trees, for example, appear to decline more rapidly than white ash (*F. americana*) trees, even when trees are growing in the same area and subject to similar infestation pressure.

### Objective 1:

Our first objective is to evaluate alternate species of concern to determine whether they are acceptable to ovipositing adult beetles and whether they are suitable for larval development. In addition, we are comparing attack rates and damage between green and white ash and assessing whether stressed trees are more attractive to beetles than vigorous trees.

The primary focus in summer 2003 was on potential alternate host species for EAB. We conducted controlled studies in the laboratory to evaluate oviposition preference by caging adult females with green ash leaves and small sections of wood (with bark) of potential alternate hosts. Alternate hosts evaluated in this study included green, white and black ash (*F. nigra*), black walnut (*Juglans nigra*), American elm (*Ulmus americana*), privet (*Ligustrum* sp. and same family as ash), shagbark hickory (*Carya ovata*), and hackberry (*Celtis occidentalis* and related to elm). Females were allowed to feed and oviposit until they died. Four weeks later, the wood sections were carefully examined and number of eggs recorded. The sections were dissected and the number of first stage larval galleries per cm<sup>2</sup> of phloem were quantified.

### Results:

Results showed that there were roughly twice as many eggs laid on the ash species as on elm, walnut, hickory and hackberry, while privet was intermediate. First stage larval galleries were found on at least one section of all species except hickory. Gallery density was highest for the ash species and privet, and relatively low for elm, walnut and hackberry. Galleries on the alternate species appeared to be small and malformed, suggesting larvae would be unlikely to complete development.

## **Objective 2:**

We also assessed alternate hosts with a series of field tests. In one test, similarly-sized green ash, walnut and elm logs (roughly 10 cm diam, 60 cm long) were tied together and attached to the upper trunk in the canopy of heavily infested green ash trees. The three logs were suspended from five large trees in two sites where emerald ash borer density was high (30 logs total). Our goal was to see if emerald ash borer females would make a mistake and oviposit on either the elm or walnut logs. Logs were retrieved in August, held for 4 weeks, then dissected. There were roughly 40 first stage galleries on the ten ash logs, 1 small gallery on a walnut log and no galleries on the elm logs.

In another test, logs of green ash, white ash, black ash, hickory, hackberry, elm and black walnut were attached to t-posts at 4 heavily infested sites. Black drain pipe was cut to a similar length and used as a control." Plastic shrink wrap and tanglefoot were applied to half of the logs and drain pipe sections. The tanglefoot bands were checked weekly to monitor adult landing rates. Adults were collected in relatively higher numbers from all logs than from the drain pipe, but there were no substantial difference among log species. Dissection of logs is in progress to quantify first stage larval galleries.

We also inserted first and second instar larvae just under the bark on live green ash, walnut and elm trees and freshly cut sections of each species at one site. Larvae were left undisturbed for 8 weeks. Dissection of the branches and the insertion areas on live trees is in progress.

## **Results:**

Preliminary results of our host range work suggest that under no-choice conditions, female beetles will oviposit on alternate species. Ovipositional "mistakes" do occur in the field, but appear to be rare. First stage larvae fed readily on all three ash species. A few larvae attempted to feed on the alternate species, but development appeared to be impaired. Privet, however, did appear to be suitable for first stage larvae in the lab test. Privet and other species related to ash warrant additional evaluation.