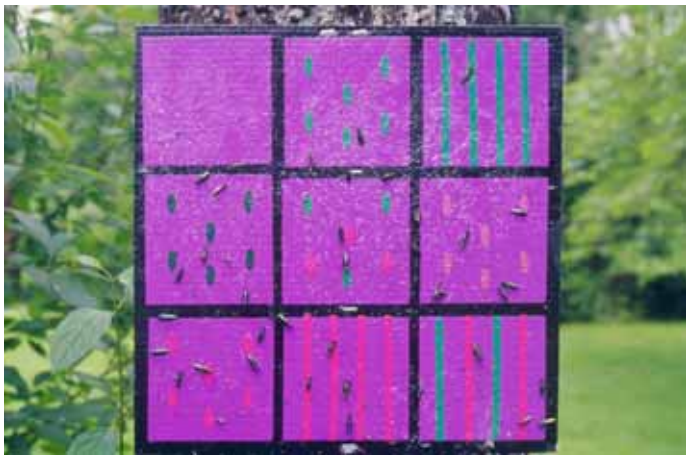

Your TREE Fund Donation Dollars at Work!

>> EMERALD ASH BORER RESEARCH UPDATE FROM GARD OTIS, U OF GUELPH, CTF JACK KIMMEL GRANT RECIPIENT

In summer 2002, the cause of extensive mortality of trees in southeastern Michigan was determined: an exotic Asian beetle that became known as the Emerald Ash Borer (EAB) was girdling and killing ash trees. Shortly thereafter it was confirmed in Windsor, Ontario. The EAB was recognized immediately as a very serious threat to ash trees (*Fraxinus* spp.). Since its introduction to North America, It has killed more nearly 20 million trees.

I was trained in the 1970s as an ecologist and entomologist. Most of my professional life has been devoted to research on honey bees and their pests. However, in spring 2002, my formal commitment to Ontario beekeepers ended, as did much of the support that facilitated my research on bees. In 2003 I applied for and received a grant from the Canadian TREE Fund which enabled me to start research on EAB.

When the EAB was discovered, nothing was known about its biology. Researchers in Canada and the USA raced to establish a wide range of projects in 2003 to fill that knowledge gap. My interest was to study the development of mating behaviour in the beetles. My goal was to investigate whether the beetles utilized a chemical mating attractant. If female beetles emit a sex pheromone, beetle surveys would be greatly facilitated, especially in areas with low EAB densities. Research assistant Tanya Turk and I observed male mate-searching behaviour on ash trees. Males would fly down to near ground level, then slowly fly upwards searching the tree trunk as they went. If they saw another beetle on the tree – male or female, dead or alive – they would land on it and attempt to mate.

Those observations indicated clearly that much of male EAB attraction to females was based on visual signals.

To get a better handle on EAB mating behaviours, Tanya observed both male and female beetles very closely for the first 12 days of their lives. From this study she concluded that the beetles have a period of 8 to10 days of maturation before they become sexually active and actually start to display courtship rituals.

Above from upper left clockwise: Female EAB showing a highly visible display. EAB decoy. EAB traps used in 2004. Rare blue ash trees planted on boulevard.

This information was important at the time because other researchers were experimenting with newly emerged beetles that were unlikely to exhibit behaviours the researchers hoped to monitor because the beetles had not yet reached sexual maturity. Interesting to us, Tanya observed in summer 2002, the cause of extensive mortality of trees in southeastern Michigan was determined: an exotic Asian beetle that became known as the Emerald Ash Borer (EAB) was girdling and killing ash trees. Shortly thereafter it was confirmed in Windsor, Ontario. The EAB was recognized immediately as a very serious threat to ash trees (*Fraxinus* spp.). Since its introduction to North America, It has killed more nearly 20 million trees.

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This information was important at the time because other researchers were experimenting with newly emerged beetles that were unlikely to exhibit behaviours the researchers hoped to monitor because the beetles had not yet reached sexual maturity. Interesting to us, Tanya observed sexually mature unmated female beetles extruding their genitalia and waving them in the air. This behaviour suggested that those females may have been emitting a pheromone as a back-up mating attractant if visually searching males fail to find and mate with them quickly. These results were relayed to US Forest Service researchers who were searching for EAB sex pheromones by trapping volatile chemicals that may be emitted by beetles.

At the EAB research meeting in the fall of 2003, James Oliver of Tennessee reported that many species of metallic woodboring beetles (family Buprestidae) are attracted to purple-coloured panels. This suggested that purple traps may be effective in monitoring the presence and spread of the EAB, a task that is particularly difficult and time intensive. With funding from the Tree Fund, I hired Melanie Youngs in summer 2004 to conduct a beetle trapping study. I purchased purple vinyl which we cut into squares and mounted on one-foot square black plastic panels, resulting in nine purple patches on a single trap board. Then, in a randomly assigned pattern, we placed various objects on these panels: green ovals, magenta (the colour of the EAB abdomen when the wings are spread in display) ovals, green bars, magenta bars, etc.). Then we coated the entire panel with sticky paste. The idea was that male beetles, attracted to purple, would orient from a distance to the overall purple colour of the trap panel, but would make finer discriminations between the nine individual squares as they approached the trap. Gary Umphrey (Mathematics and Statistics, University of Guelph) performed the statistical analysis of the data. We learned from this study that beetles are strongly attracted to ash trees (comparing pairs of panels either mounted on trees or mounted on posts about 2 metres away). We also learned that there was huge variability between traps at the same site: some trees are much more attractive to the beetles than others for reasons we do not understand. Although not statistically significant, numerically more beetles were trapped at purple panels to which we added purple and magenta bars. This suggested that coloured objects may enhance beetle trapping.

Midway through the trapping season, however, we were surprised that so few beetles were being captured on the panels given the large beetle infestations at some of the sites. We quickly established another study to test the attractiveness of purple to the beetles. We placed horizontal trap bands, one above the other, on ash trees: our purple vinyl, the purple plastic used by US researchers, and clear plastic. Although not statistically significant (because of large variation in numbers of beetles trapped on individual trees and small numbers of beetles caught in the last half of their flight period), the most beetles were caught on the clear bands! US researchers obtained similar results, suggesting that the colour purple is not attractive to EAB beetles! Purple panels have been abandoned subsequently as a survey tool. Survey for EAB infestations remains problematic.

A final project funded by ISA, summarizing the effectiveness of systemic insecticide injections into trees to control insect pests is underway and will be published in one of the ISA journals when completed.

I have shared the results of both of the projects described above with a large number of scientists and regulatory personnel at the annual EAB research meetings, and I am finishing up manuscripts on the projects this fall so the information can be accessed by a wider audience. My ISA-funded research has enabled me to expand my research with a long-term study of the forest ecosystem at Point Pelee National Park and the impact of the EAB on Pelee tree and bird communities.

Point Pelee has a relatively large population of the rare blue ash (*Fraxinus quadrangulata*), a species that exhibits more resistance to the EAB than any other Ontario ash species. None of the blue ash trees I have surveyed in the City of Windsor have been damaged by the Emerald Ash Borer! To better understand the basis of this resistance, I have initiated a study on the genetics of the species throughout its range with Dr. Brian Husband, a plant population geneticist. My research on blue ashes indicates that their apparent resistance to the EAB, coupled with drought resistance and salt tolerance, should make them a suitable species for more extensive urban planting. ♦