Emerald Ash Borer in Kentucky

Photo courtesy: Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org

Photo courtesy: Jeff Stringer

The emerald ash borer continues to make its way across Kentucky. Dying or dead ash trees like those at the top of the image above are unfortunately likely to increase.

by Lee Townsend

The emerald ash borer (EAB) fits the classic definition of an invasive species; a non-native organism whose introduction causes economic and environmental harm. The invasion process usually passes through a series of stages: introduction (2009 for the EAB), colonization, establishment, dispersal, and spatially distributed populations. The beetle is in the establishment stage in some areas, and established populations are present in many north central counties.

The Figure 1 map shows reported EAB activity in Kentucky. Counties marked in green indicate the known areas of infestation, counties in orange have moderate infestations, while counties in red have high infestations. Beetles may occur over extensive areas of some counties but only at specific sites in others. EAB is present along borders with West Virginia, Virginia, and Tennessee, so there is not a single front of activity.

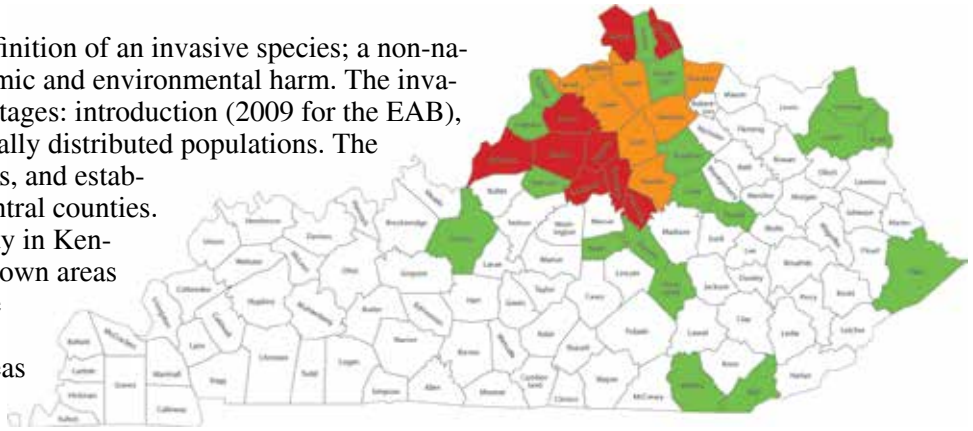

Figure 1. This map shows the distribution and intensity of EAB in Kentucky. Counties in green have a confirmed EAB presence while counties in orange have moderate infestations and counties in red have high levels of infestations.

Areas of establishment were identified by a survey. The most intense infestations of EAB as assessed by UK AG & Natural Resource and Horticulture Extension agents at the end of 2013 are depicted in Figure 1. Mortality due to the emerald ash borer is becoming increasingly evident in these areas.

EAB is dispersing slowly but surely as the beetles move from colonized areas during the summer. Females feed and disperse for several days before beginning to lay eggs. Depending on the availability of ash trees, flights may be just a few hundred yards, but the insect is capable of moving much farther. Researchers propose 10 to 20 miles per year as the natural rate of spread for the EAB.

Kentucky Regulatory and Survey Status

As of April 3, 2014, the Animal and Plant Health Inspection Service (APHIS) expanded the quarantine regulations for the emerald ash borer (EAB) to include all of Kentucky. This federal order directly affects the wood and nursery industries because it regulates the interstate movement of ash nursery stock, green lumber, waste, compost, and chips of ash species, plus firewood of all hardwood species. Ash may be moved freely within the state. Unfortunately, human-aided movement is responsible for the leapfrog dispersal that has the beetle popping up well outside of its known range in and outside of Kentucky.

An intensive surveillance program using purple pyramid traps helped to monitor the spread of the EAB. While the traps had limited effectiveness, they were at least a means of trying to identify new infestations. A limited number of traps may still be put out, but the major effort that monitored sensitive areas (interstate highway rest stops, state and federal parks and campgrounds) has ended, leaving detection to Extension agents, certified arborists, and turf and landscape managers.

Continued watchfulness by all will be necessary to limit the spread of this important invasive insect. Knowing the extent of the infestation in Kentucky and monitoring its progress provides the best chance of targeting management efforts to slow the spread of this destructive insect. Report suspected infestations to the Office of the State Entomologist or your local Cooperative Extension office for confirmation. New findings will be posted on the Kentucky Emerald Ash Borer page (http://pest.ca.uky.edu/EXT/EAB/welcomeeab.html).

Management Prospects

Several insecticides are available to protect landscape and specimen trees, but this approach is impractical for private and public woodlands. In some cases, biological control can have a significant impact on invasive species. While it is possible that some beneficial insects in Kentucky may attack an invasive species, there may be a strong preference or a better fit with the biology and behavior of native borers. This would result in minimal effectiveness against the invader.

The classical approach to biological control is to look to help from the home of the invasive species. Ideally, researchers can identify at the source of the pest natural enemies that can be mass produced and safely released to provide targeted control.

Three small wasps (Figures 3-5) have been identified and approved for release at EAB-infested sites in the U.S. Two species locate and attack EAB larvae; one attacks eggs of the insect. These wasps are not like the hornets or yellowjackets that come to mind when thinking of wasps; their activity and interest is limited to a particular invasive species.

The image below shows the dramatic impact EAB can have on woodlands that contain large percentages of ash trees which is a common occurrence in north central Kentucky.

Photo courtesy: David Cappaert, Michigan State University, Bugwood.org

Figure 3. Tetrastichus plannipennisi

Figure 4. Spathius agrilli

Photos courtesy: Houping Liu, Michigan State University, Bugwood.org

Figure 5. Oobius agrilli

Tetrastichus plannipennisi, about 0.2 inches long, drills into infested ash trees. Its larvae attack and destroy EAB larvae in their home range and can affect as much as 60 percent of the larvae in an infested tree. The organism can produce four generations each year.

Spathius agrilli, about the same size as *T. plannipennis*, also attacks EAB larvae in infested trees. It apparently can detect vibrations caused as borer larvae chew through wood. It then uses a drill-like ovipositor to its insert eggs.

Oopius agrilli is the smallest member of the trio—so small that its larva develops within an EAB egg, preventing it from hatching. *Oobius agrilli* wasps cannot sting or bite and have no known adverse effect on humans or other vertebrates.

Identifying EAB-infested areas is a key to selecting release sites that will have the greatest impact on the borer. These wasps will not be able to find their host if released where EAB does not occur. Wasps can be wasted if they are turned loose where most ash trees have already died and few EAB are present.

Successful establishment of biological control agents that can survive in Kentucky and move along with the EAB as it disperses can help to slow the spread of this destructive pest. Responsible movement of ash and vigilance in areas where the beetle is not known to exist are important ways to respond to the threat of the emerald ash borer.

About the Author:

Lee Townsend, Ph.D. is a extension entomologist at the University of Kentucky. He provides extension programs related to the management of insect pests of tobacco, forages, livestock and coordinates the pesticide applicator training program for private and commercial applicators.

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Photo courtesy: Jeff Stringer

Photo courtesy: Debbie Miller, USDA Forest Service, Bugwood.org

Emerald Ash Borer's Natural Enemies Are Here – Can They Make a Difference?

by William Davidson and Lynne Rieske-Kinney

Kentucky's forests support many native wood-boring beetles, several of which are closely related to the emerald ash borer (EAB). Populations of these native borers are usually kept in check by natural enemies, host plant resistance, and environmental pressures. Many of these natural enemies could potentially help suppress invading EAB populations if they are attracted to and can successfully attack EAB larvae.

The UK Forest Entomology lab has been releasing parasitoids and monitoring parasitization of EAB at several sites in Kentucky since 2013. The combined efforts of the Forest Entomology Lab and the Kentucky Office of the State Entomologist have resulted in the release of over 150,000 parasitoids across Kentucky's infested counties since 2010, including more than 35,000 *Spathius agrilli*, 101,000 *Tetrastichus planipennisi*, and 13,000 *Oobius agrilli*.

We recovered *T. planipennisi* from EAB-infested logs in the winter of 2014, suggesting that this classical biological control agent is becoming established in Kentucky's forests. In addition, we have discovered several native parasitoid species in association with EAB.

Photos courtesy: William Davidson

Figure 1. Atanycolus spp. (Family: Braconidae)

Atanycolus spp. (Figure 1) has been documented in EAB-infested forests in the upper Midwest and has also been found in Kentucky. At least two species in the genus *Heterospilus spp.* (Figure 2), which are known to parasitize native wood-boring beetle larvae, have been found in association with EAB-infested logs, suggesting that this genus may easily transition to EAB.

Figure 2. Heterospilus spp. (Family: Braconidae)

In addition, several species in the family Ichneumonidae, common parasitoids of a variety of forest pests, have been found in association with EAB, as have additional lesser known families.

Native natural enemies are discovering EAB populations and appear to be learning to use them as a resource, potentially helping to reduce EAB numbers.

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