



## Controlling the Emerald Ash Borer: The Secret is in the Fungi

If a pair of flies were able to reproduce unimpeded for 5 years, the Earth's surface would be covered with a 1.5-metre thick layer of buzzing insects. Fortunately, this could never happen because natural control mechanisms keep insect populations in check. Entomopathogenic fungi, which cause disease in insects, constitute an important control factor. These naturally occurring fungi, which target specific insects, are being used increasingly to control insect pests, and they may prove to be invaluable allies against pests like the emerald ash borer. Let's see how Canadian Forest Service (CFS) researchers are making use of them.

Originally from Asia, emerald ash borers probably arrived in North America in the early 1990s, but they were only discovered in the Windsor, Ontario and Detroit, Michigan area in 2002. The first ones probably travelled in wood packaging material during the transport of goods by sea, and then they spread rapidly throughout Canada and the United States. Their rapid dispersal over long distances is attributable to the transport of firewood. Because they have few natural enemies in North America, this exotic pest quickly became a very serious threat to all ash trees. Since their arrival in North America, emerald ash borers have destroyed millions of trees and continue to spread. Although it is too late to think about eradicating this pest in Canada, CFS research work is providing new possibilities for controlling emerald ash borer populations and curbing their spread within Canada. Some of these possibilities include the use of Lindgren traps to disseminate a disease among emerald ash borers.

### All things green can be misleading

Lindgren traps are widely used to trap certain species of insects that create serpentine galleries or tunnels under the bark of trees. These detection traps are baited with specific scent baits to capture harmful forest insects. Could these traps be used for other purposes?



Lindgren trap used for the emerald ash borer.  
Photo: NRCan



Photo: NRCan

CFS researchers associated with the ECOBIOM group (see box) modified a Lindgren trap by adding a special chamber containing spores from a fungus pathogenic to the ash borer to the bottom of the trap. When an adult insect (male or female) is attracted to the lure and enters the trap, it rubs against the walls, then lands on a cushion containing millions of white spores of the fungus.

### Visiting the trap seems harmless, but the consequences are lethal

Once contaminated with the fungus spores, the insect leaves the trap, but from that point on, its days are numbered. It is a case of two birds, one stone. The insect becomes contaminated while in the trap and then transmits the lethal spores to other insects of its kind during mating. Under laboratory conditions, 80% of insects die within the first 4 days following contamination. Field tests have been conducted in southern Ontario since 2011 and traps were used in Montreal in 2014 to validate the effectiveness of this method.

### Seeking a balance

Over the longer term, it may be possible to strike a new biological balance whereby diseases, parasites and other control agents will be used to keep emerald ash borer populations at an acceptable level. However, these efforts will be futile without the active participation of the public in limiting the spread of the emerald ash borer. In particular, it is

necessary to comply with directives relative to the movement of wood in areas regulated by the Canadian Food Inspection Agency.

Partnerships with the Canadian Food Inspection Agency, the Department of National Defence, the ministère des Forêts, de la Faune et des Parcs du Québec and cities and municipalities affected by the emerald ash borer have played a significant role in the development of knowledge and in the implementation of these innovative control methods.

### Useful links

Protecting ash trees from the emerald ash borer  
<http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/31746.pdf>

Forest invasive alien species  
<http://www.exoticpests.gc.ca/>

Canadian Food Inspection Agency  
<http://www.inspection.gc.ca/plants/plant-protection/insects/emerald-ash-borer/eng/133727382117/1337273975030>

### ECOBIOM

The ECOBIOM (extended collaboration on biological control of forest insects or pathogenic micro-organisms) research group is working to increase knowledge of the biology and the use of fungi as control agents for forest insect pests and diseases. Since 2007, two members of this group — Robert Lavallée (CFS) and Claude Guertin (Institut national de la recherche scientifique, INRS) — have been investigating the potential for using entomopathogenic fungi as biological control agents. Their initial biocontrol studies using entomopathogenic fungi focused on bark beetles (such as the emerald ash borer), which are very difficult to control using traditional pest control methods, and led to the idea of self-inoculation.

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