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CANADIAN FOREST SERVICE

Science HIGHLIGHTS

INVASIVE SPECIES AND BIODIVERSITY

# How is the emerald ash borer jeopardizing the role of ash-dominated forests?

## The devastating impact of the emerald ash borer extends beyond the loss of trees—researchers also want to understand how it is threatening biodiversity and shaping pest-management strategies

The emerald ash borer is a non-native insect that poses an enormous threat to Canada's urban and rural forests. Not much bigger than a large grain of rice (about 10 mm long), its larvae kill ash trees by feeding under the bark and disrupting the flow of nutrients and water in the tree. Ash trees are often found in urban and rural forests along ravines, streams and wetlands. These riparian—or waterside—forests provide unique habitat conditions that support rich biodiversity and play important roles in protecting water quality and aquatic ecosystem health.

"Losing these trees to the emerald ash borer could have significant, long-term impacts on forest structure, productive habitats and ecosystem biodiversity," says Dave Kreutzweiser, a research scientist who specializes in aquatic ecology and eco-toxicology with the Canadian Forest Service–Natural Resources Canada at the Great Lakes Forestry Centre in Sault Ste. Marie.

The emerald ash borer attacks all species of native ash in North America, potentially putting millions of trees at risk. Since it was first discovered in Canada in 2002, the emerald ash borer has been spreading rapidly throughout southern Ontario and Québec.

### What role do ash trees play in forest ecosystems?

Kreutzweiser and his colleagues are conducting a large-scale, integrated field study near London, Ontario, to determine the environmental and biodiversity implications of ash mortality from emerald ash borers in ecologically sensitive areas including ravine forests, woodlots, and wetlands. The study is also investigating the contributions ash trees make to the ecosystem, often referred to as "ecological services." These services include maintaining water quality, providing amphibian, bird and plant habitats, and cycling forest nutrients. A central part of the study is determining what happens to vegetation once the forest canopy opens up after ash trees die. Around water bodies this can be a problem, as water temperatures rise once a tree canopy disappears.

The study will also help determine the extent to which ash trees are present in these kinds of forests across southwestern Ontario. Researchers are aware that the ash borer will spread into other parts of Ontario, and this study will help to

### Overview

Millions of ash trees have been killed by the emerald ash borer in North America. Millions more are at risk.

Researchers want to determine the environmental and biodiversity implications of ash mortality from emerald ash borers in ecologically sensitive areas including ravine forests, woodlots and wetlands.

The emerald ash borer is too well entrenched to be eradicated. But an integrated pest-management plan could delay, reduce and potentially control the damage it does.

Adult emerald ash borer

predict and manage emerald ash borer damage in other areas.

## What impact do emerald ash borer control strategies have on forest ecosystems?

The project is also focusing on optimizing pest-management strategies. "We are working with a private company developing a tree-injection pesticide that can be used in an environmentally responsible manner," Kreutzweiser says. He is measuring things like the residual amounts of pesticide that is indirectly introduced to aquatic systems when leaves fall or the insecticide leaches into the water. How beneficial aquatic insects respond to this pesticide is also being tracked.

"We want to improve pest-management methods and control products that can be used in these high-value trees," Kreutzweiser says. For example, he tested whether other types of insects would detect and avoid leaves from trees treated with pesticides targeting the emerald ash borer. His work showed that some pesticides at realistic concentrations in leaves are undetected by other insects. This led to high insect mortality and meant leaves were left uneaten, potentially upsetting the forest ecosystem's natural balance. The decomposition of leaves is a critical ecosystem process that ensures nutrient cycling and sustains biodiversity. If this process is inhibited, it could result in reduced nutrient availability and declines in some key decomposing organisms.

## Using forest science to help forest managers

Kreutzweiser is also using his expertise to help municipalities and other landowners who are combating the emerald ash borer. A workshop held in the winter of 2010 in Burlington, Ontario, attracted more than 100 officials who manage ash forests. Kreutzweiser's advice was practical. For example, he encouraged landowners to focus integrated pest management plans on ecologically-important areas such as ravines where there may be high concentrations of ash trees. "Ravine forests are key ecosystems but they are often tucked away and can be ignored," notes Kreutzweiser.

The emerald ash borer is too well entrenched to be eradicated. But Kreutzweiser is hopeful that an integrated pest management plan—a plan to manage forests pests with minimal pesticide use and low environmental impact—for ecologically sensitive areas "could delay, reduce and potentially control the damage done by the emerald ash borer."

Emerald ash borer-killed trees in a riparian forest