

INVASION OF THE **EMERALD ASH BORER**



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Canada



SCIENCE
EAST



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Origin Story:

INVASIVE SPECIES

Have you ever gone on a cross-country camping trip? Or have you brought home souvenirs from another country? Ordered a cool pet or plant online? Did you know that you could be bringing invasive species to an ecosystem near you?

Invasive species are any plants, animals, or other living things that come to a new habitat and cause damage to the new environment. The Canadian Council on Invasive Species defines them as “those species whose introduction or spread negatively impacts the environment, economy, and/or society (including human health).” The damage they cause to their new environment can be to food, shelter, or the population of other species since predators that would normally limit their population in their native habitat are no longer limiting.

North American ash trees are currently facing devastating losses because of an invasive species: the emerald ash borer. Emerald ash borers, which scientists call EABs, are insects that are not native to North America. The larvae dig S-shaped holes in the layer of wood beneath the bark which damages the tree’s ability to take up food and nutrients, eventually killing the tree. The threat imposed by the EAB has cultural, economic, and ecological impacts. This is why researchers and tree-care specialists are working hard to find tools that can monitor and control this invasive pest.

How to Stop an Invasion:

RESEARCH!

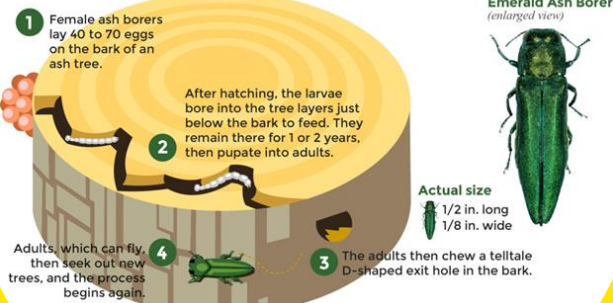
Researchers suspect that the emerald ash borer came to Canada by stowing away on shipping pallets traveling from Asia. EABs first showed up in Canada in 2002 around Windsor, Ontario. Since then, the EAB has moved East to Quebec, New Brunswick, and Nova Scotia as well as West to Manitoba causing immense damage to ash trees along the way.

This is a problem because ash trees are culturally significant to various First Nations groups. They also provide a number of environmental services including capturing carbon, preventing erosion, cooling and insulating, serving as a habitat to wildlife, and providing aesthetic value - just to name a few. Loss of these trees means loss of diversity in our rural and urban landscapes. This can create a cascade of effects on other species like birds, beneficial insects, fungi, and humans!

One of the first actions taken by the Canadian Food Inspection Agency was to promote the Don’t Move Firewood campaign. This was especially targeted at campers moving wood from different locations to campgrounds. Research done in 2018 found that moving firewood between campgrounds is most likely how the EAB jumped from Ontario to New Brunswick. Pests can very easily hide in bundles of firewood, so it is important to only use firewood that comes from the area where you plan to have your fire. In other words, buy it where you burn it.

Researchers, including Kate Van Rooyen from Natural Resources Canada, have also been doing their part to reduce the spread of EAB by studying different traps. Ongoing experiments test different trap types and the placement height of the traps. Scientists are also developing lures to attract the EAB into the traps as well as to repel the EABs away from ash trees. Did you know that insects have a color preference when it comes to attracting them to traps? Or that insects live in different parts of a tree depending on what stage of their lifecycle they are in? Kate Van Rooyen and her colleagues found that when the EAB population is low, the best way to detect EAB is a green trap that is either prism-shaped or funnel-shaped placed high up in the tree’s canopy and lined with a chemical lure. This finding helps federal, provincial, municipal, and private groups, such as homeowners know where to place their traps if they want to monitor effectively for EAB.

LIFE CYCLE OF THE EMERALD ASH BORER



Time for **GENACTION!**

Protecting the Ash Trees

Rather than trapping the EAB, some researchers are focusing on ways to attack and kill the insects before they can damage the ash trees. Parasitoids are small insects that grow and develop by attaching themselves to another insect, which scientists call the host. If we can find a reliable parasitoid that uses the EAB as a host, then the invasive species will be exterminated without harming the environment. Another natural method is using a fungus that specifically targets and kills insects, which scientists term an entomopathogenic fungus. These fungi are naturally occurring and can help control the spread of EAB.

Protecting the ash trees from the EAB is crucial because there are only 126 native tree species in Canada, so the loss of the North American ash tree would be devastating. To prevent this, Canada's National Tree Seed Centre collects and preserves ash tree seeds for future generations. The combined efforts of the Canadian government, scientists and researchers, and the general public means we have our best chance of preserving these trees that work so hard to clean the air we breathe and reduce the effects of greenhouse gas emissions.

Climate Action:

DON'T MOVE FIREWOOD

Preventing the damage done by emerald ash borers and other wood boring species is all about limiting their spread. EAB is spread through the movement of wood and wood products. You can participate in the Don't Move Firewood campaign by taking the following actions:

- When you go camping, do not bring firewood from home
- Buy your firewood locally
- Burn all of your firewood before you leave
- Do not bring home leftover firewood - leave it for the next camper or give it to the park to dispose of it properly

Try This at Home:

IDENTIFICATION

Learn to identify North American ash trees to help fight the spread of the emerald ash borer. In the summer, you can identify ash trees by their leaves. They have **pinnate** leaves, which means each leaf has a bunch of smaller leaflets that are arranged on either side of a main stalk. Ash trees are **deciduous** which means they lose their leaves in the winter. Use pictures of ash trees to compare with trees in your neighbourhood. Can you find any North American ash trees?



Zeleznick, Joseph. "Ash Tree Identification — Publications." NDSU-North Dakota State University, January 2019. <https://www.ag.ndsu.edu/publications/lawns-gardens-trees/ash-tree-identification#section-1>.

Once you find some ash trees, now you can try identifying the effects of the EAB. Are the leaves chewed on? Are they growing in unusual spots along the tree trunk? Is there any chewing or woodpecker holes along the trunk of a tree? If so, you may have EAB in your tree. If you look even closer, you may find the characteristic D-shaped exit holes. Compare with pictures of EAB bore holes, can you find any?

If you suspect there are Emerald Ash Borers or other invasive species in your urban trees, contact your city's parks and recreation group, and the Canadian Food Inspection Agency.

MEET OUR LOCAL CLIMATE HEROES:



Kate Van Rooyen is an Invasive Species Technician at Natural Resources Canada. She works with researchers to deploy and test monitoring and management projects that aid in the suppression and control of EAB. Right now, this includes the use of naturally occurring pathogenic fungi that are picked up by the EAB.

Brigitte Richard is the Communications Manager at Natural Resources Canada. As a science communicator, she supports and promotes the work of scientists, technicians and others through various media platforms.

Cory Hughes is an Invasive Species technician at Natural Resources Canada. He is currently working with researchers on an EAB biocontrol parasitoid release project with the aim to promote parasitoids that help control EAB populations.

Climate Change

Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a **greenhouse**, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of carbon dioxide gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions. Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all indigenous Peoples across what we now know as Canada. We give thanks to the indigenous Peoples Who care for this land since time immemorial and pay respect To their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

