

Urban forests and the Emerald Ash Borer

Nº. 80

JUNIOR

Science



LESSON SUMMARY

This lesson plan is an introduction to the benefits provided by urban forests and what makes an urban forest healthy. It explores the issues of biodiversity and invasive species. Using the example of the Emerald Ash Borer (EAB), we will learn about the effect of invasive species on the urban forest and what we can do about it.



Lesson Plan Information

Estimated Duration:	45 minutes (30 minute Discussion, 15 minute activity)
Materials:	Power point presentation (optional), handling objects/EAB samples, LEAF native tree species profiles.
Setting:	Indoors/outdoors
Key Vocabulary:	Emerald Ash Borer, invasive species, native species, biodiversity, urban forest

Curriculum Connections

Grades 4-6: Science

Understanding Life Systems – This lesson touches on the Understanding Life Systems strand of the science curriculum for grades 4 (Habitats and Communities) and 6 (Biodiversity).

Understanding Earth and Space Systems – This lesson touches on the Grade 5 content of this strand of the science curriculum: Conservation of energy and resources.

Grades 4-6: Language

Oral communication Reading, Writing, Media Literacy – the activities associated with this lesson touch on aspects of the reading, writing, and media literacy strands of the language curriculum.

Grades 4-6: Social Studies

People and Environments – This lesson touches on the People and Environments strand of the social science curriculum for grade 4 (Political and Physical Regions of Canada), grade 5 (The Role of Government and Responsible Citizenship), and grade 6 (Canada's Interactions with the Global Community).

BACKGROUND

The Urban Forest:

Our urban forest includes ravines and natural areas within a city. It also includes the trees and shrubs growing in city parks, on school grounds, along streets and even in our backyards.

The trees and shrubs that line our streets, shade our parks, and grow in our backyards are part of an urban ecosystem that provides many important benefits. They produce oxygen, keep our streets and homes cool in summer, protect us from cold winter winds, remove pollutants from the air, and reduce light and noise pollution. Trees and greenspaces have been linked to better health and urban trees and shrubs are also very important for biodiversity. They provide food and habitat for wildlife as well as stopover spots for migrating birds and insects.

Trees growing in our city also impact the bigger environmental picture. The positive effects they have on wildlife, air quality, temperature, and water quality often “overflow” into nearby areas. For example, urban trees slow and capture rainfall, which helps prevent soil erosion and reduce pollution running off into the Great Lakes and the many rivers and streams that flow into them. Trees and shrubs can reduce the effects of climate change by making our cities cooler and reducing the energy we use to heat and cool our homes.

A healthy urban forest is one that includes a diversity of native tree and shrub species, and is taken care of by the human beings living within it. Our urban forest provides us with many benefits, but we also need to do our part. We can help it thrive by planting new trees and shrubs, and caring for existing ones by watering and protecting them from things like vandalism or unnecessary removal.

Some benefits of urban trees:

- Produce oxygen
- Remove pollutants from the air and improve human health
- Reduce soil erosion
- Slow and capture rainfall
- Improve quality of water entering our Great Lakes
- Reduce noise and light pollution
- Provide food, habitat and migratory pathways for wildlife
- Reduce energy costs by shading homes in summer and providing windbreaks in winter
- Reduce the effects of climate change by cooling our cities and reducing energy use
- Increase property values through beautification
- Improve quality of life for urban residents



Emerald Ash Borer exit hole.

NATIVE VERSUS INVASIVE SPECIES

Species of plants and animals that are originally from this part of the world are called “native.” These species have evolved together over time to establish a healthy ecosystem. Non-native species have been brought here from another continent or far-away area (usually by humans). Sometimes non-native species survive so well in their new environment that they begin to take over, often eating or pushing out native species. These are referred to as “invasive species,” and once they are established, they can be very hard to control.

THE EMERALD ASH BORER (EAB)

The Emerald Ash Borer (EAB) is one of the most destructive invasive species found in Ontario’s urban forests today. This insect is native to Asia (where it has natural predators), and likely arrived in North America in wood packaging materials. The adult beetle is dark metallic green and is small enough to fit on the top of a dime!

Like many insects, the EAB has four distinct life stages: adult, egg, larva, pupa. Female adult beetles lay their eggs on the ash tree during the summer. Once the eggs hatch, the tiny larvae bore underneath the bark of the tree, feeding on the layer that lies just below, creating a zigzag pattern. While they feed, they cut off the flow of water and nutrients in the tree, which causes it to die. The larvae live under the bark during the winter, then pupate in the spring. Adult beetles emerge from the tree in May and June, creating D-shaped exit holes in the trunk of the tree when they leave. The beetles then fly to other nearby ash trees, lay their eggs and the life cycle begins again.



The Emerald Ash Borer (EAB)



Bark peeled back showing larval galleries scars.

Signs of EAB infestation:

Signs of EAB infestation include loss of leaves, which usually appear in upper branches first, and small D-shaped exit holes in the bark. Infested trees may also attract wood-peckers which like to eat the EAB insects.

WHAT CAN WE DO ABOUT EAB?

We are going to lose many, if not all, of the ash trees growing in our neighbourhoods today. Replacing those ash trees by planting new native trees and shrubs of diverse species is extremely important. We also need to ensure that we select tree and shrub species that are well-suited to the planting site, by looking at things like soil type, amount of sunlight and available space. If we plant trees responsibly, we can build a stronger, fuller, and more resilient urban forest for the future.

DISCUSSION

1. Have students identify the benefits of the urban forest to the community and their role in the ecosystem.
2. Talk about the bigger picture: how can the urban forest contribute to the environment around our community? Discuss the importance of the urban forest to the Great Lakes watershed and local wildlife.
4. Discuss native and non-native species. Are all non-native species invasive? What makes a species invasive? What could be the possible consequences of introducing new species to an ecosystem?
5. Talk about invasive species using EAB as an example. Provide students with background on EAB, and discuss the potential impacts of the infestation. Provide examples of local tree loss if applicable.
6. Talk about the importance of species diversity and the need to care for and protect new trees that are planted.

ACTIVITIES**Option 1: The Biodiversity game (indoor/outdoor)**

This game illustrates how biodiversity can improve an ecosystem's resilience to invasive species infestations:

1. Have the students stand. They are all ash trees.
2. The instructor or a selected student will be the EAB. The EAB touches a nearby "tree" and this tree becomes infested with EAB.
3. The EAB then touches other nearby trees before they "die" by sitting back down. As each "tree" is touched by the EAB, it also becomes infested, and the infestation spreads through the classroom. Eventually all the students will be sitting back down.

4. Repeat the activity, but this time some students are other tree species. Since EAB only affects ash trees, these other species don't become infested.
5. After this round, the ash trees will have died, but several trees are still standing. This demonstrates that diversity could help the urban forest survive an infestation.

Option 2: Identifying Ash Trees in the Schoolyard (indoor/outdoor)

1. Have students watch LEAF's short ash tree identification video to learn about characteristics of ash trees https://www.youtube.com/watch?feature=player_embedded&v=XBwGs8qldX0&noredirect=1
These include:
 - a. Compound leaves – leaves are composed of 5 to 11 leaflets which may be smooth or toothed
 - b. Opposite branch and bud arrangement – branches and buds grow directly across from each other
 - c. Seeds in flat keys – ash tree seeds are dry and are contained in oar-shaped, flat keys that usually occur in clusters and hang on the tree until fall or early winter
 - d. Diamond-patterned bark – bark is tight with a distinct diamond-shaped pattern on mature trees, but grey and relatively smooth on young trees
2. Take a walk around your schoolyard, looking at the trees growing there. See if students can identify an ash trees growing on the property.
3. If any ash trees are found, look for signs of EAB infestation.

Option 3: Art integration (indoors, Materials: markers/crayons, construction paper or poster board)

1. Each student makes a poster on one of the following topics:
 - a. The value of urban trees
 - b. The dangers of invasive species
 - c. What we can do to help our urban forest
2. Students can display these posters around the school, or in their neighbourhoods.

EXTENSION: TAKE HOME ACTIVITY

1. Students locate at least one tree or shrub planting spot near their home using LEAF's planting guidelines. If there is no space in their backyard, they may use the backyard of a neighbour, family member or friend.
2. Students can draw, take pictures, or use a Google satellite image to describe the spot and why it would be a good place for a tree.
3. Considering the features of the planting spot, students research potential native tree and shrub species that can be planted, using the descriptions provided on the LEAF website <http://www.yourleaf.org/urban-forests-emerald-ash-borer-focus-forests-lesson-plan-extension>
4. If you live in York Region or Toronto, visit www.yourleaf.org to order trees and shrubs through LEAF's subsidized Backyard Tree Planting Program.
5. Tell your family, friends and neighbours about the importance of the urban forest, the threat posed by EAB and encourage them to plant new trees and shrubs too!
6. Download York Region's 3D Emerald Ash Borer model and check out its shiny green coat! Model can be found here: <http://www.york.ca/wps/wcm/connect/yorkpublic/21d8fef2-2a02-46e9-93fa-8bb192654863/EAB+Model+and+Instructions.pdf?MOD=AJPERES>

ADDITIONAL RESOURCES

For more information about the Emerald Ash Borer, visit LEAF's website at www.yourleaf.org, or visit the Canadian Food Inspection Agency's website at <http://www.inspection.gc.ca/>



Ash leaves.