ARREST THAT PEST!

LESSON FOUR:
Looking for Clues: *Signs and Symptoms of Emerald Ash Borer Infestation*

Purpose of Lesson:
In order to cultivate environmental stewardship in youth, it is important to educate them about the threat of invasive species like the Emerald Ash Borer and the environmental and economic damage they can do to the natural and urban landscape. In this lesson, youth will learn how to identify the signs and symptoms of EAB in nature, so that they will be better able to communicate the danger of invasive species (like the emerald ash borer) to others.

Learning Objectives:
Youth will be able to:

- Explain how EAB infests and kills an ash tree.
- List and describe the signs and symptoms of EAB infestation in ash trees.

Teacher Preparation:

- Review the **Looking for Clues: *Signs and Symptoms of Emerald Ash Borer Infestation*** PowerPoint.
- Prior to the activity, it may be helpful to conduct a short vocabulary lesson to introduce/review new words. As you work with students, check for their understanding of both new vocabulary words and those introduced and discussed earlier.
- Make copies of the Research Log.
- Gather materials and tools for creating campaign artifacts.

Materials and Resources:

- Copies of assigned reading, Sections One and Two
- Copies of the EAB Research Log
- Flip chart paper or bulletin board
- Markers

Teaching Tips:

- As youth break into groups to share information from their EAB Research Logs, it is more important that they focus on discussing the questions in depth, rather than how they write. To encourage discussion and save time, have one member act as scribe for the team to record answers.

Vocabulary:

- Host species
- Bore
- Discriminate
- Resistance
- Stressed
- Natural enemies
- Canopy
- Epicormic sprouts
- Larval galleries
- Vertical splits
- Frass

Introduction:

Lesson Four reviews what youth have already learned about EAB and incorporates new information about infestation and the signs and symptoms of EAB. Youth will work cooperatively to identify the main idea and the three most important details of their assigned reading section and record them in the Research Log. After they have completed this task, the large group will reconvene to share what they have learned.

Development:

- View the **Looking for Clues: *Signs and Symptoms of Emerald Ash Borer Infestation*** Powerpoint presentation – this will reinforce what youth have learned about the Emerald Ash Borer in earlier lessons and activities and introduce new information about how EAB kills trees and the signs and symptoms they might find on an ash tree that has been infested.
- Divide youth into collaborative teams. Pass out photocopied reading sections to everyone; provide one EAB Research Log sheet to one individual that will serve as a scribe for their group.
- Have students read their EAB Background Information Sections. Remind them to look for the main idea and three important details. Students should record their answers in their EAB Research Logs.
- While the students work, visit each group to monitor progress and answer questions.

SECTION ONE: How does Emerald Ash Borer infest and kill an ash tree?

In North America, the Emerald Ash Borer (EAB) has only been found in ash trees. These trees are called a **host species**. Emerald Ash Borer will attack any size or species of ash in any location – large or small, urban or forest, healthy or stressed; among ash, the borer does not **discriminate** (Note: EAB *does not* attack Mountain Ash because it is not a true ash tree.)

The female beetles lay their eggs in the crevices found in the bark of the tree. Once these eggs hatch, the larvae chew "S" shaped tunnels called galleries underneath the the wood. There they feed on the living tissue of the tree, preventing the flow of nutrients and water from the roots to the branches and leaves of the tree. The tree literally starves to death in as little as 1 to 3 years.

Ash trees in North America have little or no **resistance** to EAB. Scientists have found that EAB adults are more attracted to **stressed** trees and that the larvae develop more rapidly in these trees, but even the healthiest trees have been killed when EAB population densities are high. Up until now, **natural enemies** have had little impact on EAB.

SECTION TWO: What are the signs and symptoms of an ash tree infested with EAB?

The **canopy** of heavily infested trees will begin to die, usually near the top of the tree and progressing down the trunk. Infested trees may produce **epicormic sprouts** or what are sometimes called "water sprouts" or "witches brooms" on the trunk or large branches where EAB damage is heavy.

Bark may crack over **larval galleries** and result in **vertical splits** through which distinctive "S" shaped galleries can be viewed. As the borer chews out these tunnels, it leaves behind insect **excrement**, or what scientists call **frass**. Adult beetles leave a characteristic "D" shaped exit hole in the bark, roughly 1/8" in diameter when they **emerge** in June.

Woodpeckers often attack larvae, especially during the winter. Woodpecker holes are larger and easier to see than the D-shaped holes left by EAB. Several infestations have been discovered because people noticed woodpecker damage in trees.

Closure:

Once youth have finished, reassemble as a large group. Cover the main ideas and other details learned from the Powerpoint presentation and reading their assigned section. Add information to a flip chart list or bulletin board. Discuss the following:

- What is an invasive species?
- What are the physical characteristics and life cycle of the Emerald Ash Borer?
- Where did EAB come from and how has continued to spread in the United States and Canada? Why?
- Explain three reasons why trees are important.
- Ask youth what kind of tree the EAB uses as a host - have them list the distinguishing characteristics of ash trees that they can remember from their research, lessons, and activities.
- Explain how EAB infests and kills an ash tree and define why it is a problem
- List the signs and symptoms of EAB infestation in ash trees - what evidence would someone see when looking for this pest?

Assessment: *Online quiz coming soon!*

Concept Extension:

Have youth work together in teams to develop outreach campaigns to get the community involved in looking for the signs and symptoms of EAB and how to prevent or reduce the spread. Students can draw or download images of the EAB, evidence of EAB, and information about ash trees at www.eabindiana.info.

- As a group, brainstorm the different ways in which people get new information. The Purdue University News Release discussed in Lesson Two was one example. What are some others?
- Make a list of the ideas presented by the students. Some examples would be flyers, newspapers, brochures, television or radio commercials, posters, websites, and word of mouth.
- Remind the students that they are using science-based research and information to solve a very real problem facing urban and rural communities across Indiana and beyond. They are learning about EAB, and their job is to teach others in the community about this insect and the threat it poses.
- Divide the students into campaign teams of 4 to 6 students to begin planning their community-outreach campaigns.
- Students should begin by determining what they want to say, to whom they want to say it, how they want to say it (theme), and how they want to present it (flyer, poster, Web page, newspaper article, etc.).

Reconvene the large group for presentations of community outreach campaign ideas. Campaigns should be judged with the following criteria in mind:

- Is the presentation appropriate for your target audience?
- Will it be effective? Why or why not? Will it hook the attention of the target audience?
- What can be improved?
- Has all the relevant information about Emerald Ash Borer and ash trees been incorporated?
- Is the campaign original and creative?
- Did the group work well as a team?