

Teacher's Guide: *Insects Invade*

Supports Common Core State and NGSS Standards

Language Arts/Science • Grades 4–5

Dear Educator:

We hope you enjoy your class set of the student magazine *Insects Invade*, which teaches about a real-world issue facing our Nation's forests and trees. This accompanying teaching guide contains two hands-on lessons and skill-building worksheets to build upon science concepts in the magazine.

We hope you share these important materials with your students today!

Sincerely,

The U.S. Department of Agriculture, Forest Service



LESSON 1: Insects in a Normal Ecosystem

OBJECTIVE: Students understand that native insects are an important part of a natural ecosystem.

Set Up Before Reading: Have page 8 of the *Insects Invade* magazine to show students.

Set Up After Reading: Obtain a chunk of brown clay. Roll it up into a tube that is at least 6 inches long and hollow. Bring some popped popcorn and raisins to class.

Before Reading: Guide students through determining the meaning of domain-specific words. Indicate that you can find clues about a word's meaning by breaking it apart or examining related images in a text.

"Ecosystem":

- **Eco-:** Ask students to brainstorm words that start with this prefix, or ask if they know what "eco-friendly" means. *Eco-: Relating to the environment.*
- **System:** Ask students to describe systems they know (e.g., a classroom system/routine) and come up with a definition. *System: When multiple parts work together.*
- Ask students to combine the word parts. "*Ecosystem: How the parts of the environment work together.* Example: Insects recycle nutrients, pollinate plants, and/or are food for wildlife.

"Bore":

- Using page 8 of the student magazine, show the picture of what the emerald ash borer, an invasive species, does to trees.
- Based on that, ask students to determine what "bore" might mean. *Bore: To make a hole by piercing.*

After Reading: Explain that native insects can damage trees, too. The difference is that there are natural predators or other factors (such as temperature) to keep insect populations in check. Discuss the mountain pine beetle. Bring out the tube of brown clay. This represents the trunk of a lodgepole pine tree. Explain that a mountain pine beetle will burrow its way into the tree, damaging it.

Use a pencil or pen to puncture the hollow "tree" in a few places. Show a beetle (the raisin) getting inside the tree.

Sometimes the tree can fight off such attacks. It uses a milky substance in an attempt to trap the beetle outside the tree. This is called a *pitch tube*. Have different students place a piece of popcorn over some of the holes in the tree. Then show the beetle being trapped outside the tree (the raisin on top of the popcorn and outside the tree). Also, natural predators such as woodpeckers may eat them, as may clerid beetles.

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Draw a T-chart on the board. Label the columns *Native Insects* and *Invasive Insects*. Using their knowledge of the student magazine, have students reach a consensus on which column of the T-chart each insect on the following list belongs: bumblebee, Asian long-horned beetle, emerald ash borer, hawkmoth, gypsy moth, ladybug, monarch butterfly, redbay ambrosia beetle.

LESSON 2: Fighting Invasive Insects

OBJECTIVE: Students understand ways to combat the spread of invasive insects.

Set Up Before Reading: Get an empty plastic gallon container. Cut $\frac{1}{3}$ off the top. Have in hand scissors, string, water, and dishwashing detergent.

Before Reading: Explain to students that people are trying to figure out ways to detect invasive insects. One way is a pheromone trap. Show them the plastic container. Tell them that it represents real traps that scientists use to capture invasive insects. Mix the dishwashing detergent with warm water to get a soapy mix. Tell students that this mixture represents a pheromone attractant. Explain that pheromones are a kind of chemical signal, and that insects are able to detect pheromones using different smell-gathering organs on their bodies. The beetles are attracted and caught in the trap. Use scissors to put holes on each side of the top of the container, and pull a string through to show how it might hang from a tree.

After Reading: Explain that there are ways to help prevent the spread of invasive insects. These include *observing* and *taking action*. Referring to the student magazine, ask students to name some of the signs of invasive insects one can observe. Answers might include *bark damage, dead treetops, damaged leaves, eggs*. What are some actions to take to prevent the spread of invasive insects? Answers can include: *Use only local firewood, clean off your boots and equipment after hiking, don't release houseplants into the wild, teach others*.

Additional Evidence-Based Questions for Discussing Insects Invade:

- What roles do insects play in their normal habitats?
- Explain the difference between a native species and an invasive species.
- How does an insect become "invasive"?
- In what ways do insects travel from one ecosystem to another?
- In what ways do invasive insects cause trouble to trees? To forests? To ecosystems?

Skill-Building Worksheets: Distribute the worksheets to further build student understanding:

- **Map:** "Invasive Insects: Map Them!"
- **Bar Graph:** "Trees at Risk!"

Resources

- <http://invasivespeciesinfo.gov>
- <http://hungrypests.com>
- State-by-State interactive map: <http://foresthealth.fs.usda.gov/portal/Flex/FPC>

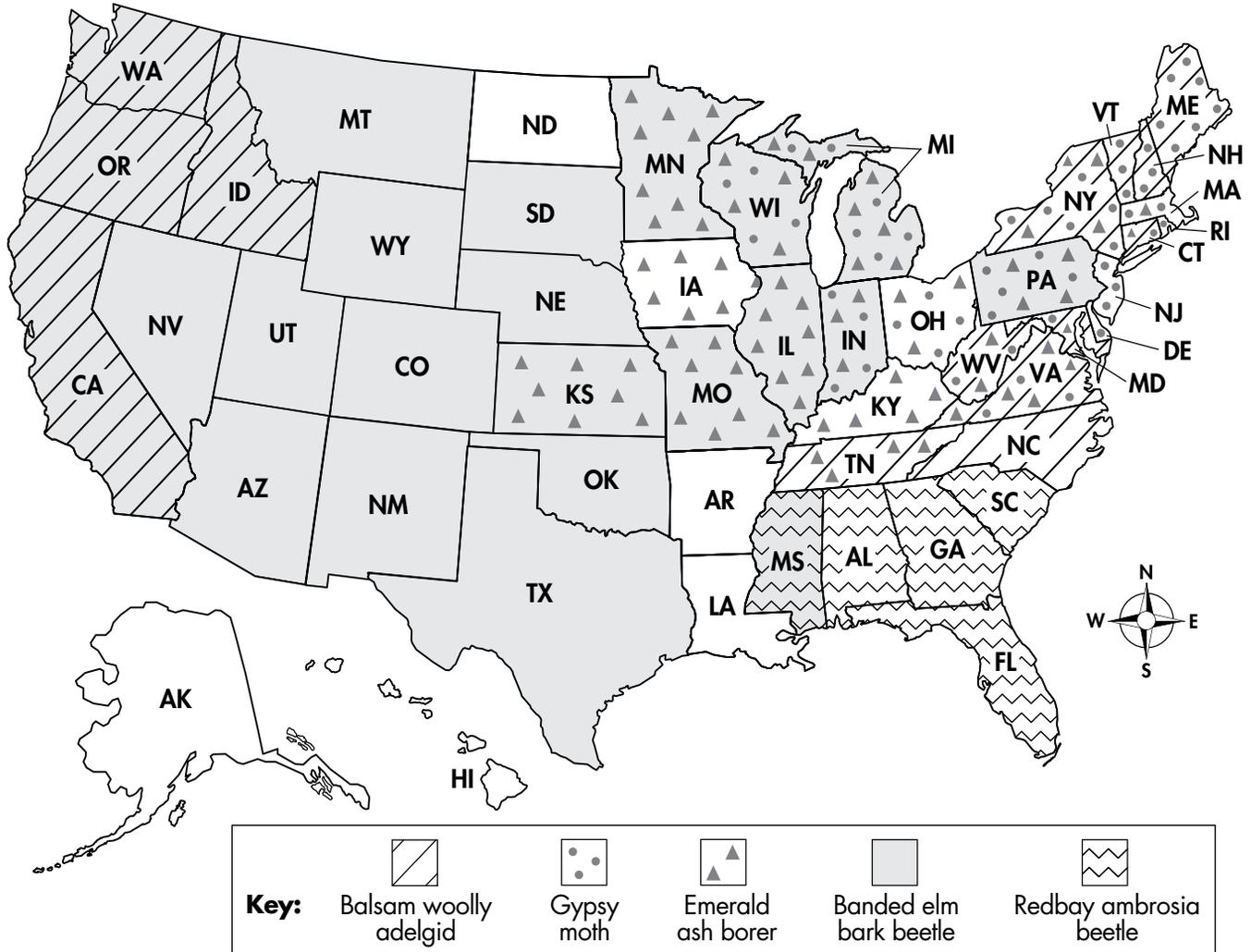
Worksheet Answers: "Invasive Insects: Map Them!" 1. balsam woolly adelgid; 2. redbay ambrosia beetle; 3. gypsy moth and emerald ash borer; 4. banded elm bark beetle. "Trees at Risk!" Graph Questions: 1. 2009; 2. 2008; 3. 2010; Take It Further: 1 and 2: See pages 4–5 of student magazine for text evidence. 3. See page 11 of student magazine for text evidence.

Standards: Grades 4–5

Common Core State Standards (CCSS) Reading: Informational Text	Magazine	Lessons	Worksheet 1	Worksheet 2
RI.4.1: Refer to details from a text when explaining or drawing inferences.	•	•		•
RI.4.4: Determine meaning of academic and domain-specific words.	•	•		
RI.5.1: Quote from a text when explaining or drawing inferences.	•			•
RI.5.4: Determine meaning of academic and domain-specific words.	•	•		
Next Generation Science Standards (NGSS) Life Sciences				
4: Structure, Function, and Information Processing	•	•	•	•
5: Matter and Energy in Organisms and Ecosystems	•	•	•	•

Invasive Insects: Map Them!

Invasive insects are a problem throughout the United States. The map below includes information about five invasive insect species in 2013. Study the map and then answer the questions below it on separate paper.



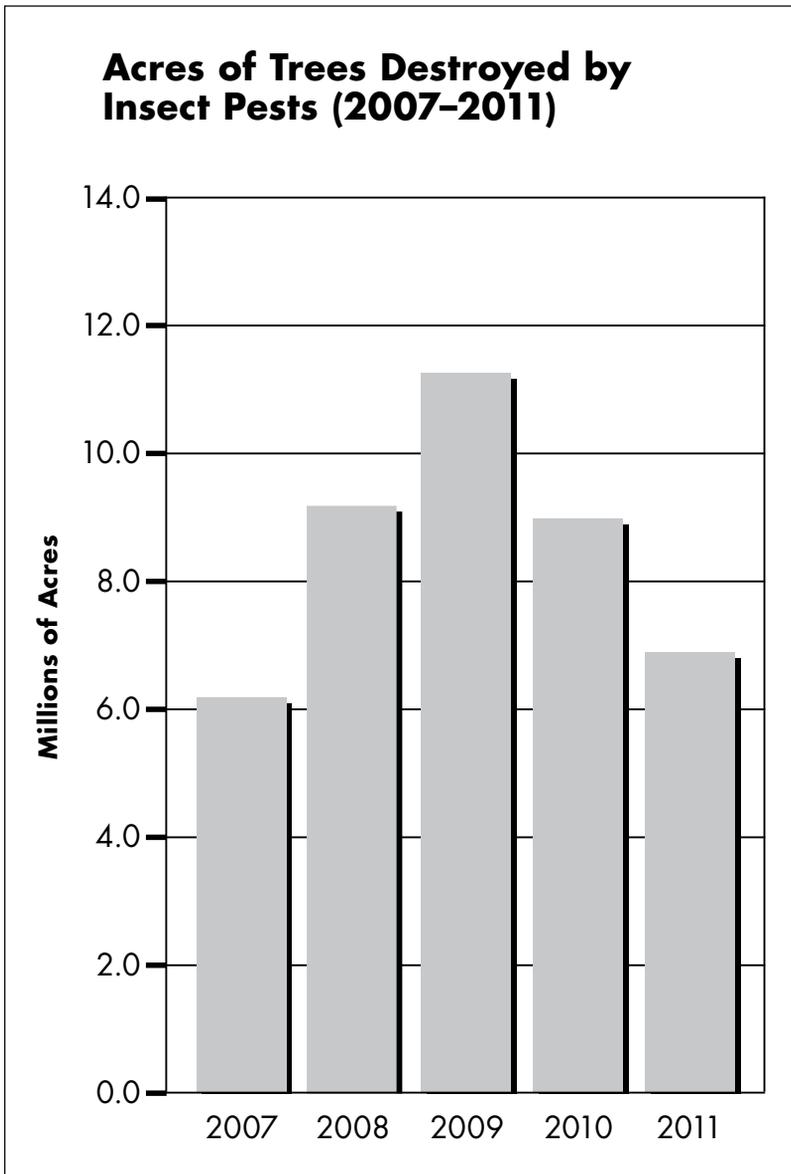
1. Which insect has invaded States on both the West Coast and the East Coast?

2. Which insect has been detected so far in only Southeastern States?

3. What two insects are widespread in both Eastern and Midwestern States?

4. Which insect has a range that includes Midwestern States and Western States?

The United States has 750 million acres of forest. Each year, the Forest Service examines the land to see how many acres of trees were damaged or destroyed by insect pests. Study the bar graph below to find out how our country's trees fared each year from 2007 to 2011. Then, answer the questions to the right of the graph on separate paper.

**Graph Questions:**

1. In which year were the most trees destroyed by insect pests?
2. Which year shows the greatest increase in trees being destroyed compared with the year before?
3. In which year did the problem first begin to decrease again?

Take It Further:

Quote evidence from the magazine *Insects Invade* to answer the following:

1. How does an insect become "invasive"?
2. In what ways do invasive insects harm forests?
3. What actions can people take to help with the problem of invasive insects?