

Lurkers Going Berserk

Invasive insects
wreaking havoc on
Wisconsin's forests

Brought to you by the
**Wisconsin Department of
Natural Resources**

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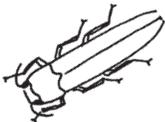
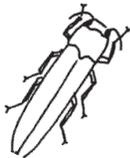
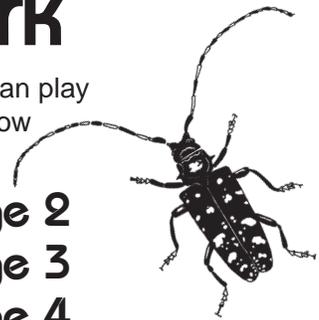
www.dnr.state.wi.us/org/land/forestry/fh/



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Lurkers Going Berserk

Here's your chance to find out about invasive forest insects. You can play some games, search for forest pests, get creative, and discover how you can help to protect Wisconsin's forests. Have fun!



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Looking for Lurkers

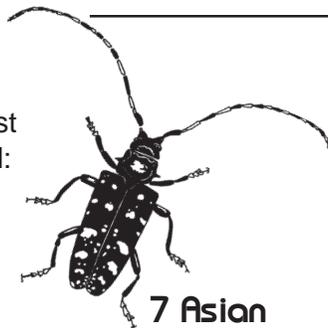
Practice finding and identifying invasive forest insects. On the pages of this book, try to find:



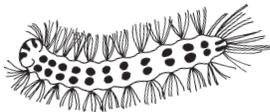
7 gypsy moth adults



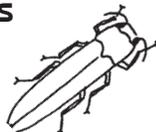
2 gypsy moth egg masses



7 Asian longhorned beetles



8 gypsy moth caterpillars



12 emerald ash borer adults



8 emerald ash borer larvae

What's Lurking in Your Woodpile?

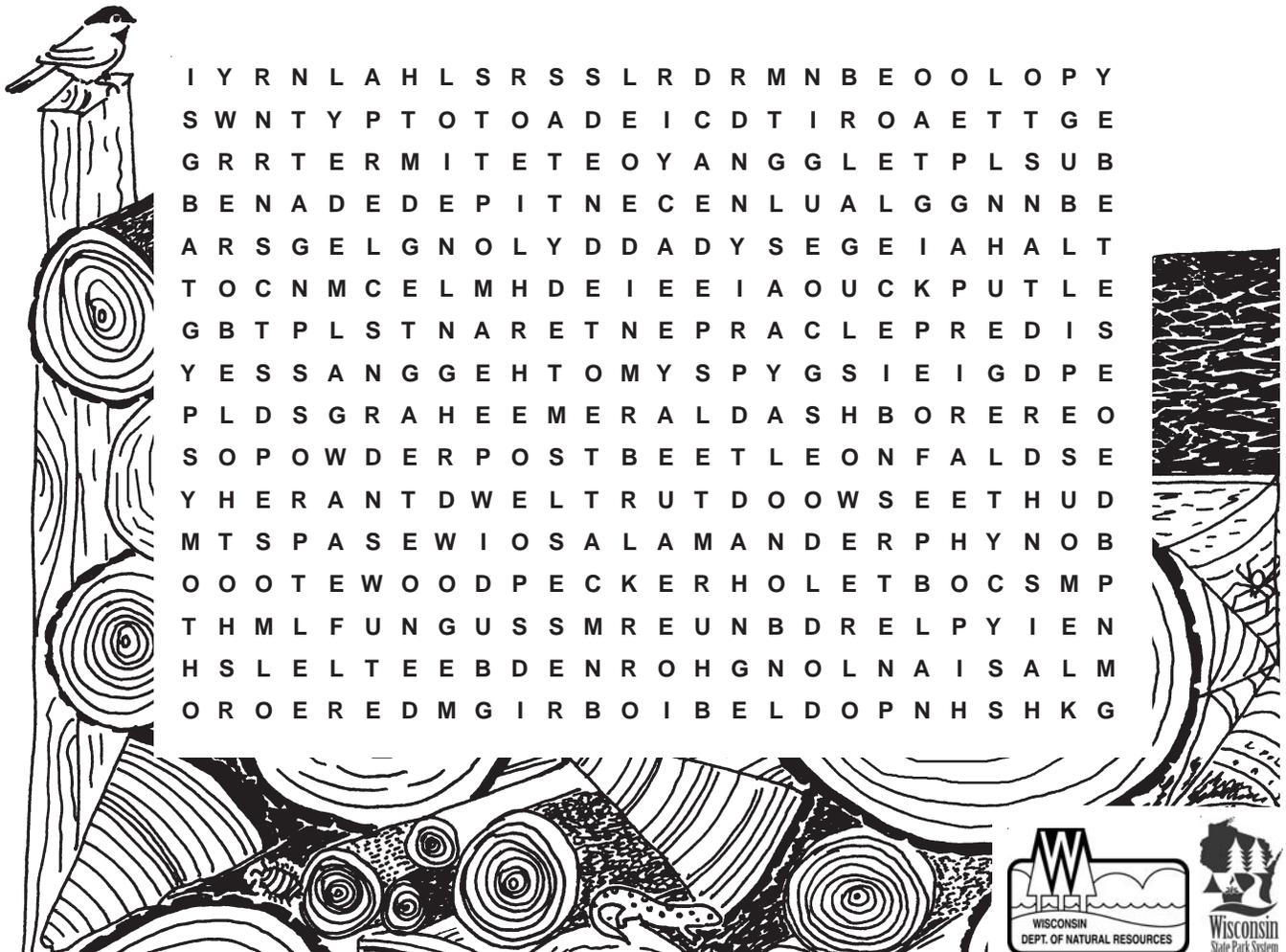
Firewood piles make great homes for all kinds of animals. Some eat the dead wood. Some eat the animals that eat the dead wood. Some are just there because a pile of wood offers protection from cold rains, drying winds, and temperature extremes. Some things in your woodpile are supposed to be there. You expect things like pill bugs and the occasional snake.

Take a closer look. Firewood can also harbor invasive insect pests from other parts of the world. These invasives don't play by the same rules as native insects. That means we have to change the rules, too. Follow the new rules. Don't move firewood, and don't give invasive forest pests a free ride!

Can you find these things in the woodpile below?

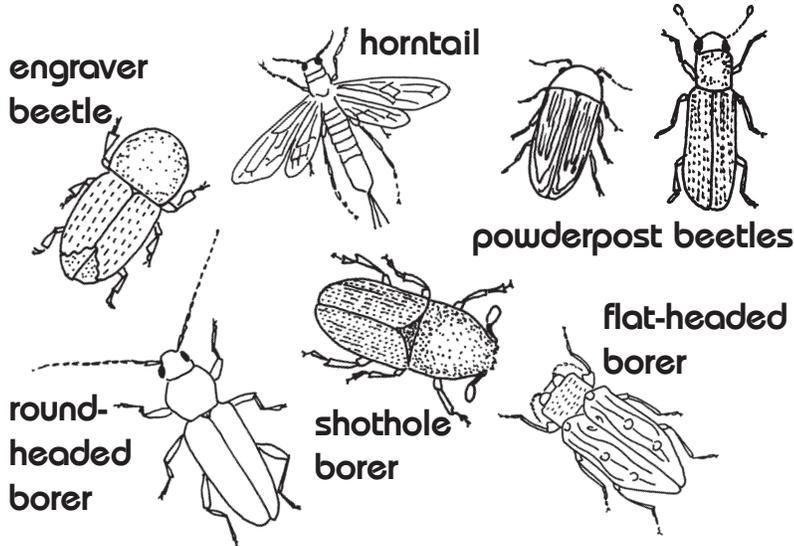
Invasive insects are shown in **bold**.

- | | | | |
|---------|-----------|-------------------|--------------------------------|
| bat | pill bug | carpenter ant | woodpecker hole |
| mouse | millipede | salamander | Asian longhorned beetle |
| snake | slug | gypsy moth | powderpost beetle |
| toad | snail | wood turtle | gypsy moth egg mass |
| termite | lichen | centipede | daddy longlegs |
| spider | fungus | shothole borer | emerald ash borer |



Recyclers or Pests?

Insects are by far the most numerous animals that live in the forest. Ones that feed on dead or dying trees are an important part of the forest ecosystem. Without them, fallen trees would pile up on the forest floor and the nutrients they contain would be trapped. Wood-eating insects recycle the wood so other plants can flourish. These insects become *pests* when they invade *living* trees.



Look on dead or dying trees and logs for these insects. Which ones did you find? Draw a picture of one!

Nature Did it First!

People have been carving wood for a long time, but maybe they got the idea from engraver beetles and wood borers. Check out some of these carvings then ask an adult if you can give woodcarving a try.

The female beetle makes the wide central carving by chewing the wood. She lays eggs along this tunnel.

The eggs hatch and the larvae start eating. They make the tunnels that radiate away from the central tunnel.

As the larvae grow, their tunnels get wider.

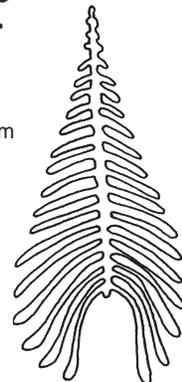
Powderpost and shothole beetles drill holes in the wood.



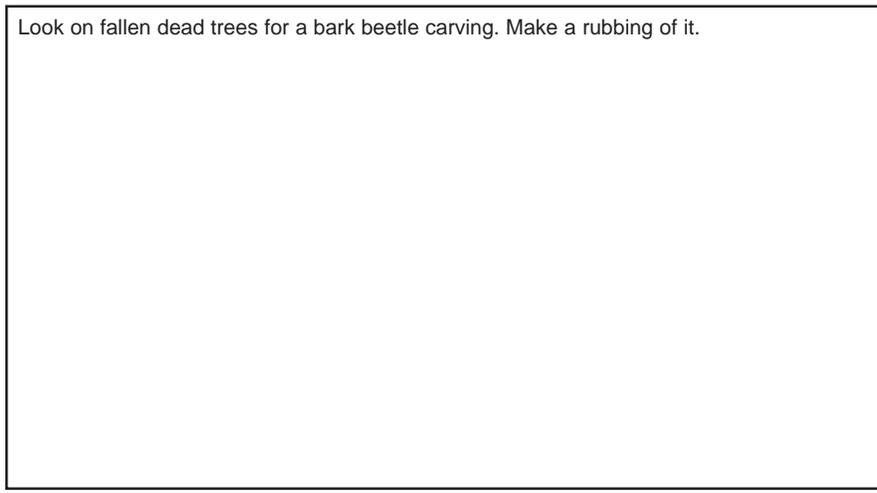
Fir engraver beetles leave behind carvings that look like sailboats. If you use your imagination, that is.



A European elm beetle left this gallery. This beetle can spread Dutch elm disease.

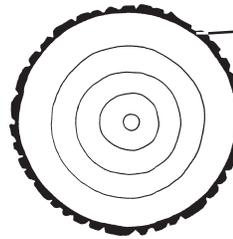


Look on fallen dead trees for a bark beetle carving. Make a rubbing of it.



Storytellers

Engraver beetles harm trees by eating away the cambium of the tree. After the tree dies, the bark falls off to reveal the carvings. If you were a beetle, what would you write to others who would see the tree? Write your message in the space below.



The cambium is the growing layer of the trunk. This is where all the tree's plumbing is made. If the cambium is damaged, water and nutrients can't move up and down the trunk.

A large, empty rectangular box with rounded corners, intended for writing a message. At the bottom of the box, the words "I love wood" are written in a large, cursive, outline font.

Remember . . .

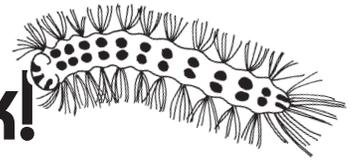
When you carve on a living tree, it harms the tree and can even kill it.



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Invasives Going Berserk!



Insects that recycle wood and nibble on leaves are vital parts of the forest food web, but the forest doesn't need millions of them! Native forest pests are eaten by predators, weakened by parasites, and killed by diseases. Their populations are usually kept under control.

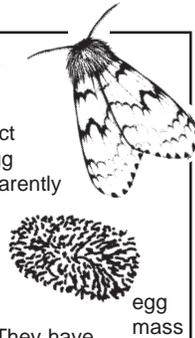
The same cannot be said for tree-eating insects that have come from other parts of the world. When they left their homelands, they also left behind all their predators, diseases, and parasites. With nothing to control their populations here, they are free to reproduce. They can spread way too fast!

History Repeats

Emerald ash borers aren't the first invaders to threaten our forests, and you can bet they won't be the last. We are a nation on the go! We work in foreign countries, take vacations to exotic places, and ship things around the globe. A step back into the past might help us to remember to be more careful in the future.

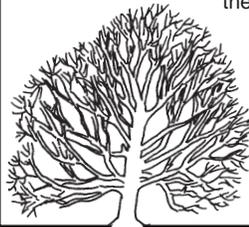
Gypsy Moth

In 1869, an amateur entomologist (insect scientist) brought some **gypsy moth** egg masses to Massachusetts. He was apparently trying to cross gypsy moths with silkworms to produce a new, heartier breed of silk-producing insects. Several gypsy moth larvae escaped, and it wasn't long before they were defoliating (eating the leaves of) trees. They have invaded most of the northeastern United States.



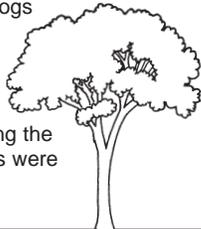
Chestnut Blight Fungus

Chestnuts were once one of the most common trees in eastern forests. Hoping to create even stronger chestnut trees, many people imported European and Asian chestnut trees to America. Along with the trees came **chestnut blight fungus**. The American trees were very susceptible to the infections caused by this fungus, and by 1940 more than 3.5 billion chestnut trees were dead. Now, scientists are searching for Chestnut trees that survived the blight and trying to breed blight-resistant chestnuts.



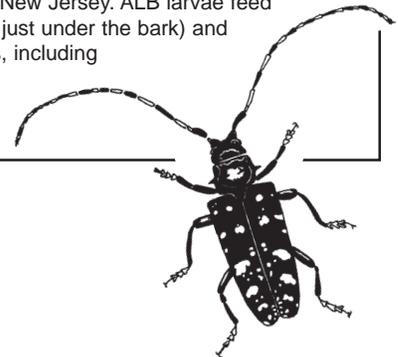
Dutch Elm Disease

In 1930, a shipment of logs from France arrived in Cleveland, Ohio. Lurking in the logs were spores of the deadly fungus that causes **Dutch elm disease**. The disease is spread underground through the trees' roots and by bark beetles carrying the spores. By 1970, 77 million trees were dead. The disease continues to spread and kill trees each year.



Asian Longhorned Beetle

In 1996, a homeowner in Brooklyn, New York reported the first infestation of the invasive **Asian longhorned beetle** (ALB). Since then, the beetle has shown up in Illinois and New Jersey. ALB larvae feed on the cambium (the growing layer just under the bark) and the wood of trees. Extensive efforts, including tree cutting and chipping, have successfully eliminated the beetle in some areas.



Emerald Ash Borer

In 2002, the **emerald ash borer** (EAB) was identified in Detroit, Michigan. The EAB probably arrived in packing containers from China six to ten years earlier. EABs are exotic, wood-boring beetles that feed on the inner bark of ash trees. They are responsible for killing millions of ash trees annually and forcing quarantines on firewood and nursery trees in several states.



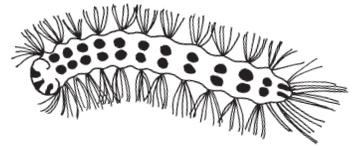
Find Out More!

Have any of these invaders spread to a forest near you? Find out by visiting these Web sites:

- National Invasive Species Information Center <www.invasivespeciesinfo.gov>
- Wisconsin Department of Natural Resources <www.dnr.state.wi.us/invasives>



Ad-libbed Aliens



Find some friends and ask them to give you random parts of speech. Then read the story aloud.

What a day for a field trip! The _____ was shining as the _____ grade class from _____ school arrived at _____ State Forest.

celestial body
rank number

adjective
noun
famous person

The kids were _____ to be missing _____, their favorite subject.

emotion
a part of the school day

After the kids stepped off the _____, they waited in the shade for directions.

noun

One especially _____ kid said, "I didn't _____ it was supposed to rain today."

adjective
verb

His _____ friend said, "It can't be _____. There isn't a _____ in the sky."

adjective
previous verb ending in "ing"
noun

This isn't rain. It's _____, and it's about the size of a/an _____.

color
noun

This stuff looks like _____."

polite term for animal droppings

"Ugh!" said the _____ kid, "It's _____! Where is it coming from?"

adjective
another polite term for animal droppings

The kids all looked up just as a shower of _____ the size of _____ fell into

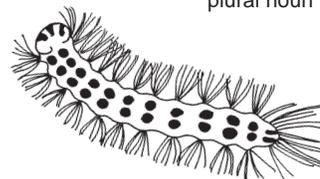
plural noun
plural noun

their _____. "It's coming from the trees," they cried.

body parts

"_____, _____ for your lives!"

verb
same verb



Truth is stranger than fiction.

During a gypsy moth outbreak, caterpillar frass (a scientific term for caterpillar poop) falls from the treetops and sounds like rain. In 1889, a Medford, Massachusetts newspaper reported "being inundated by big, hairy caterpillars, so numerous that people slipped on masses of them clustered on the ground, streets, and sidewalks" and "they gobbled away in the trees, their excrement (frass), like a shower of coffee grounds, drizzled to the ground." That many caterpillars can do a lot of damage. They can strip a tree of leaves. They can defoliate an entire forest!

Cryptogram!

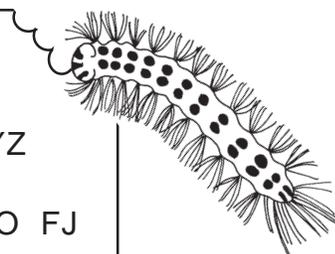
FC XH FHAZMJ GZAJ NFBBA X JOZZ FH JYZ

CKOZAJ XHW HK KHZ FA XOKVHW JK YZXO FJ

CXBB, FA FJ AJFBB WZXW?

Clue: F equals I

The cryptogram is a substitution puzzle. Every letter gets changed to another. Since "F" equals "I", it will equal "I" throughout the puzzle. Single letters and short words give you clues to locating vowels.



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Emerald Ash Borer Origami

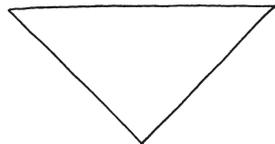
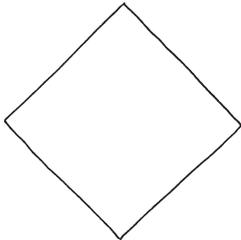
Emerald ash borers have lived in Japan, Taiwan, North Korea, South Korea, and China for a long time. Recently, they invaded North America's forests. They probably got here hidden in wooden packing materials. Without predators and diseases to keep their populations in check, emerald ash borers are rapidly killing all the ash trees in their path. Learn to recognize these beetles and don't give them a free ride anywhere!

Here's what you'll need!

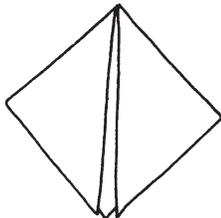
You can fold an emerald ash borer from any paper, but green metallic paper will look the best. Green foil wrapping paper looks very cool! Start with an exact square. The larger the square, the larger the beetle *and* the easier to fold. Try at least a six inch square of scrap paper for your first attempt.

Here's what you'll do!

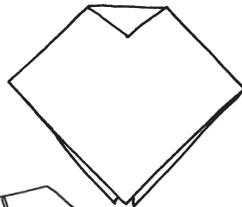
1. Place the paper shiny side down. Fold it in half, bringing the top point down to meet the bottom point. Make a sharp crease.



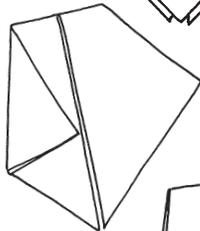
2. Now fold the left and right points down. Leave a slight gap in between the two triangles. These triangles will become the wings.



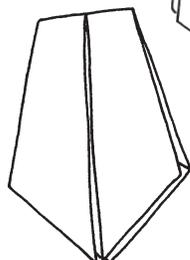
3. Turn the paper over and fold the top point down as shown. Make a sharp crease.



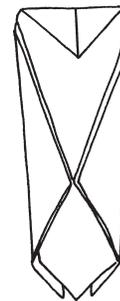
4. Turn the paper over. Make a fold on the lines shown and crease sharply.



5. Lift up the left side. Reverse the fold and push it almost to the center of the beetle. Press down so the beetle lays flat. Repeat with the right wing.



6. Turn the paper over. Fold the left side in at an angle as shown. Repeat with the right.

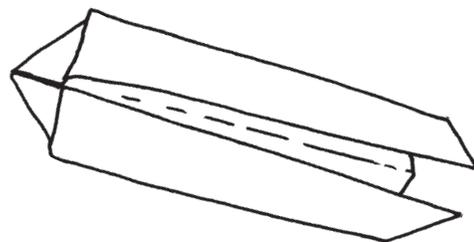


7. To make the beetle's head, fold the top point back up, making a second crease just below the first crease.



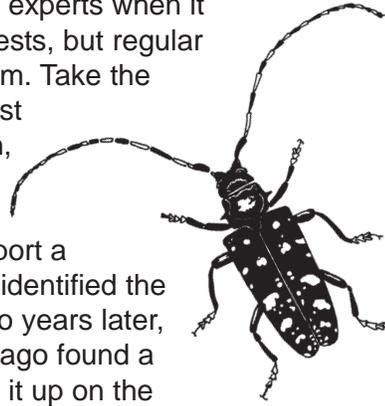
8. To make the tip of the beetle's abdomen, fold the bottom point up.

9. Turn the beetle over. Fold the body in half, then open the paper until it is not quite flat.



Aliens Spotted - Run for Cover!

Natural resource professionals might be the experts when it comes to identifying and managing forest pests, but regular people are more likely to find and report them. Take the case of the Asian longhorned beetle. The first beetle was discovered by a man in Brooklyn, New York. When he looked at his maple trees one day, he saw holes in the trunks and sawdust on the ground. He called to report a suspected case of vandalism. Investigators identified the real culprits – Asian longhorned beetles. Two years later, an alert parks department employee in Chicago found a strange beetle in some firewood and looked it up on the Internet. Four years after that, a graphic designer in Jersey City connected a beetle he had seen with one featured in a news report and alerted officials.



Internet search reveals true identity
Graphic designer spots aliens

Exotic vandals drill holes in street trees

Trees quarantined after invasion from China

Imagine you are the one who discovers the next invasive forest pest or the latest outbreak. Where were you? What were you doing? How did you know it was newsworthy? Be a reporter. Make up a sensational news headline. Tell the story.

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Draw a picture here!

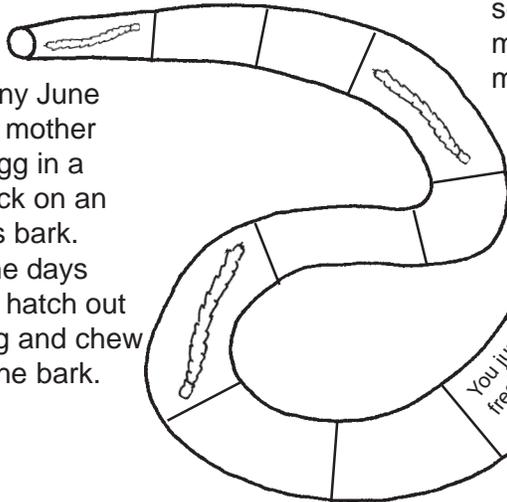


A Really Boring Game

You are an emerald ash borer (EAB) trying to complete your life cycle. Fortunately, you have invaded America, and you have a lot of advantages in your new homeland. You have few predators, diseases, or parasites. All you have to do is hatch, eat your way through an ash tree's cambium, pupate, and fly away to spread the invasion. What could possibly go wrong?

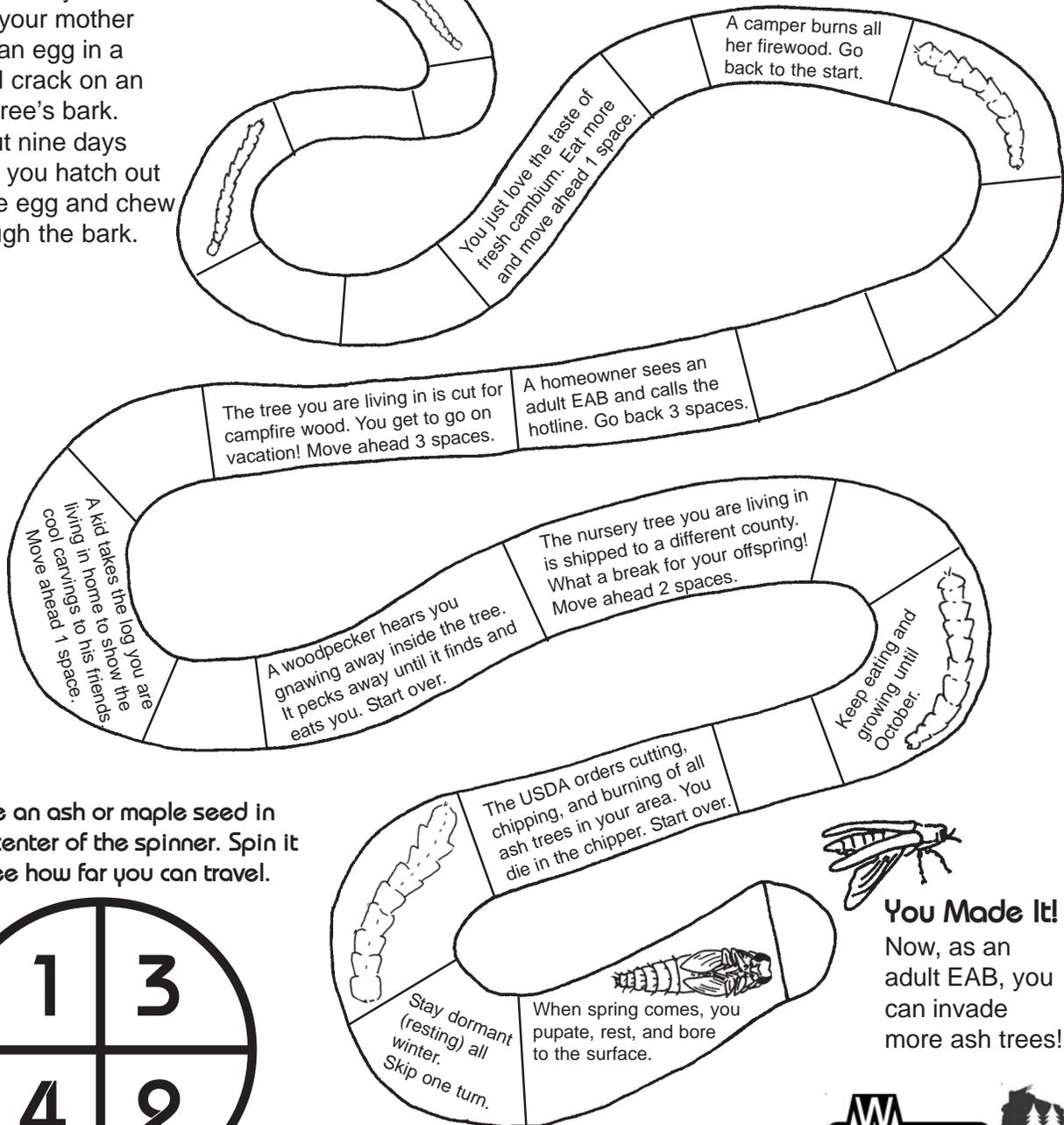
Start

On a sunny June day, your mother lays an egg in a small crack on an ash tree's bark. About nine days later, you hatch out of the egg and chew through the bark.

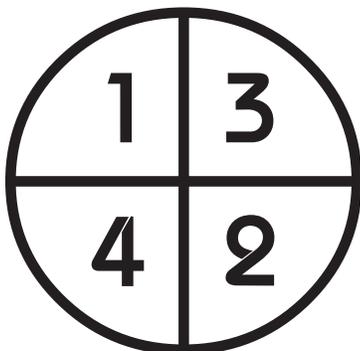


Play

You'll need someone to play with, an ash or maple seed for a spinner, and a couple of pebbles for markers. If you land on a picture of an EAB larva, move ahead one more space.



Place an ash or maple seed in the center of the spinner. Spin it to see how far you can travel.



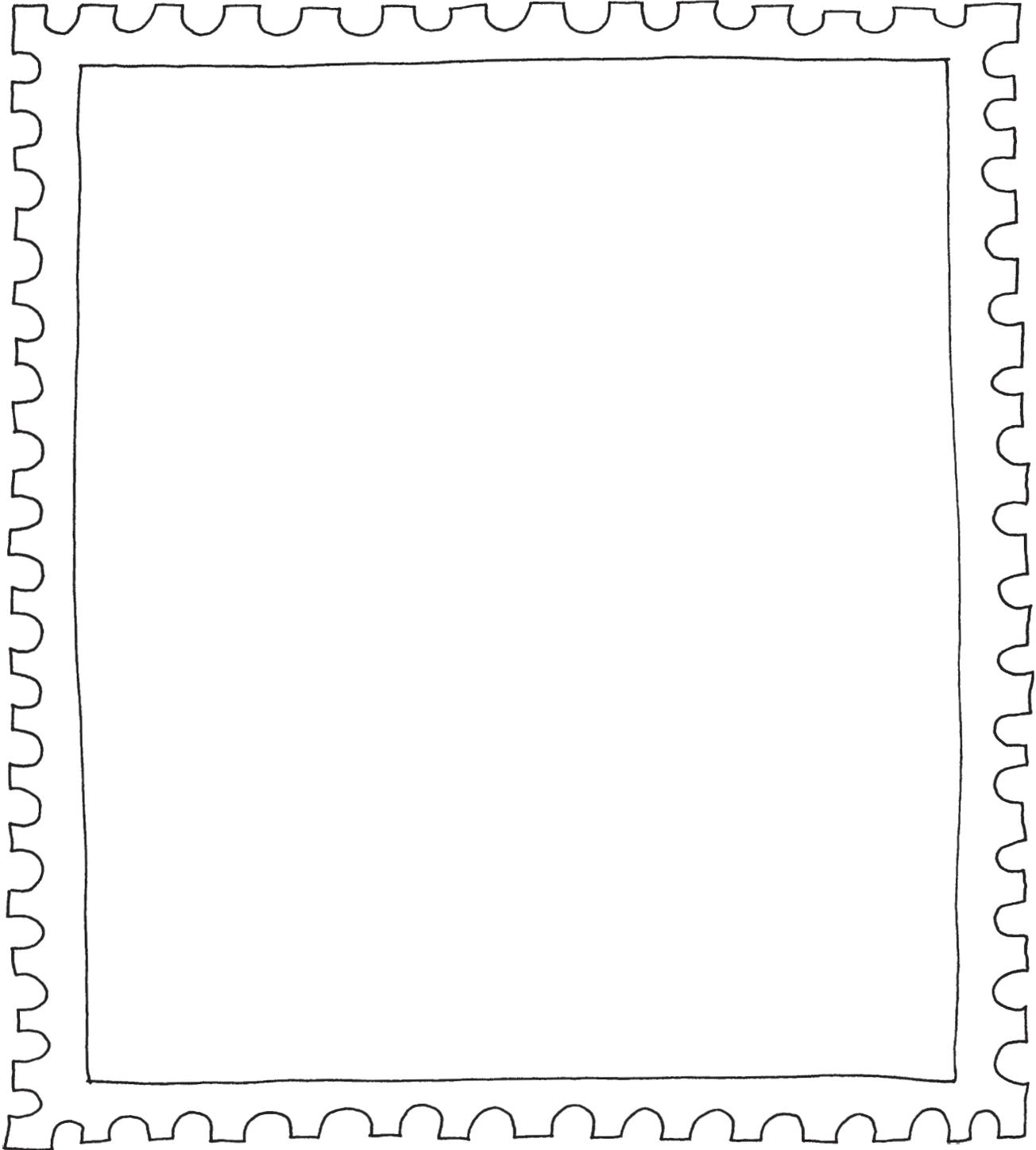
You Made It!

Now, as an adult EAB, you can invade more ash trees!

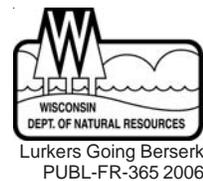


Stamp Out Invasives

The United States Postal Service issues stamps to raise public awareness about health and safety concerns. Since invasive forest insects threaten our forestry resources, the USPS has hired you to design a stamp to raise awareness about firewood pests. Use the space below to design your stamp.



Answer to Cryptogram on page 7.
If an insect pest kills a tree in the forest and no one is around to hear it fall, is it still dead?



Campfire Rings

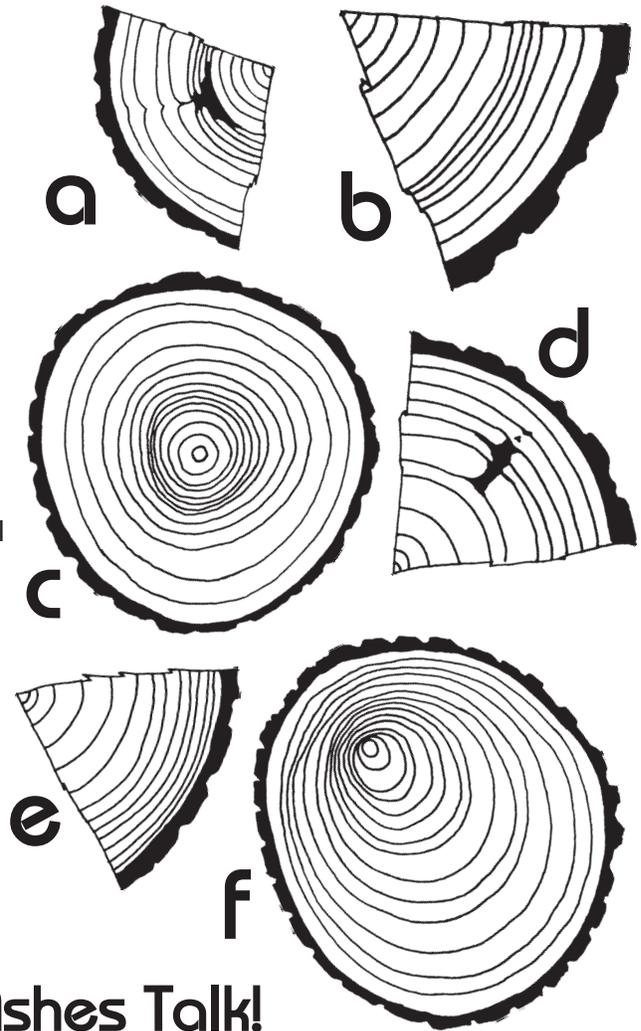
Wait! Don't just throw that wood on the campfire. Take a close look at it! Look at the rings. You probably know all about counting the rings to find out how old a tree is. But did you know there's a lot more than that to "reading" the rings? Tree rings show patterns of change in the tree's life as well as changes in the area where it grew.

Give it a try!

Think about the things that affect tree growth. For example, fire, extreme weather conditions, insect infestations, harvesting, disease outbreaks, physical damage to the tree, competition from other plants, and wind are all things that can influence the way a tree grows. Now try to read these tree rings. What do you think happened to the trees that caused them to grow rings like these?

Look at some firewood!

What about the wood you have purchased to use for your fire? Challenge each other to read the rings in the wood.

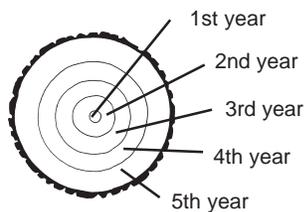


Dead Ashes Talk!

Emerald ash borers killed the ash trees they attacked, but the trees might have left clues to their deaths in their tree rings. By studying the rings, scientists are learning how fast emerald ash borer populations grow, how far their populations move, and even when the beetles first arrived in the United States.

Tree Ring Basics

Each spring and summer a tree adds new layers of wood to its trunk. The wood formed in spring grows fast. It is light-colored because it is made up of large cells. In summer, the tree grows more slowly. The wood formed in summer is dark and has smaller cells. Together the spring wood and summer wood form an annual growth ring. By counting the growth area between the rings, you can tell the age of the tree.



Cross-section of a five-year-old tree

Answers

a. A forest fire in the tree's sixth growing season caused this scar.

b. Drought, heavy insect damage, weather extremes, disease, or damage from construction could have caused the narrow rings in years nine through eleven.

c. In its ninth year, this tree began to grow more vigorously. Selective harvesting of mature trees in the area would have allowed this tree to get more sunshine, water, and nutrients. Windstorms or other natural causes could also have eliminated the competition.

d. A branch died and fell off in this tree's seventh year. Eventually, the tree healed the wound.

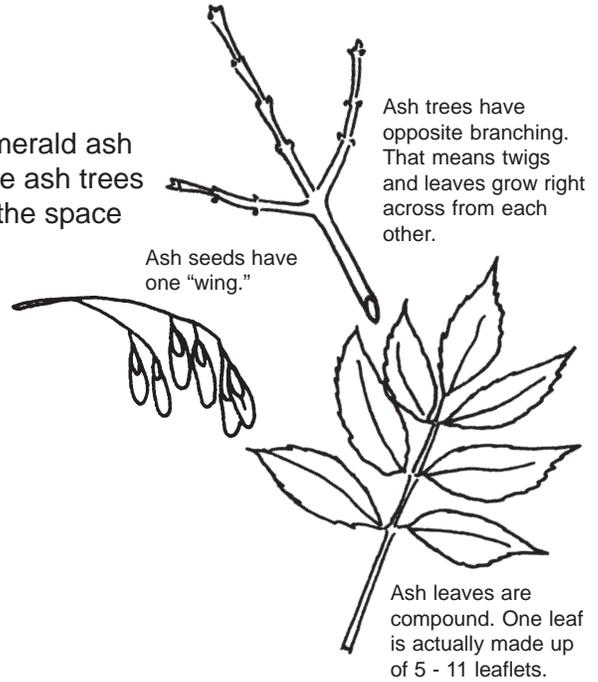
e. The rings on this tree got narrower as the tree grew older. It was probably competing with nearby trees for limited sun, water, and nutrients.

f. This tree grew more on one side than the other. Growing on a slope, growing on the edge of a forest, or having another tree fall against it could have caused this.



Tree ID

Different forest pests attack different kinds of trees. Emerald ash borers target only ash trees. Use these clues to find the ash trees in your favorite campground or your neighborhood. In the space below, make a leaf rubbing.



Don't be confused by these ash look-alikes.



Walnut

has 7 - 17 leaflets and round nuts.



Box elder

has 3 - 5 leaflets and paired seeds.



Black locust

has 6 - 20 rounded leaflets and seeds in a pod.



Hickory

usually has 5 leaflets and round nuts.



Sumac

has 11 - 31 leaflets and clusters of red hard fruits.



Tree of heaven

has 11 - 41 leaves and double-winged seeds.



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Trees in Distress

When a tree is attacked by insects or diseases, it can look sick. Leaves turn brown and curl, fungi grow on the bark, and twigs die back. Find some ash trees using the hints on page 13. Then use this checklist to watch for signs and symptoms of emerald ash borer attacks on the ash trees.

Signs that indicate emerald ash borer attacks

	<input type="checkbox"/> Legless larvae (Larvae are 1" long when full grown. They have white bell-shaped body segments.)		<input type="checkbox"/> Adult beetles (Adults are 1/2" long and metallic green.)
	<input type="checkbox"/> S-shaped galleries (Carvings wind around just under the bark and mark where the larvae feed.)		<input type="checkbox"/> D-shaped exit holes (Holes are about 1/8" in diameter. They show where the adult borer left the tree.)

Signs that *could* indicate emerald ash borers

Most of these signs are easy to see from far away, but they can be caused by several kinds of insects or diseases. If you see an ash tree showing these signs of distress, look more closely for emerald ash borers and their specific signs shown above.

	<input type="checkbox"/> Slits in the bark		
<input type="checkbox"/> Tree top dying	<input type="checkbox"/> Numerous shoots coming from base of tree		<input type="checkbox"/> Lots of woodpecker activity

If you think an ash tree is being attacked by emerald ash borers, ask a grown up to look at the tree with you. If they agree, call 1-800-462-2803.



Picture the Forest

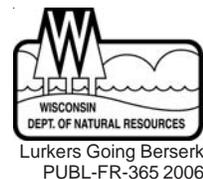
Invasive forest insects kill trees. Ash trees in areas infested by the emerald ash borer are cut down and chipped. Picture your favorite forest, tree-lined street, or shady backyard. How many ash trees are in the area? Ask permission to mark the ash trees with ribbon, string, or yarn. These trees provide homes for wild animals, produce life-sustaining oxygen, shade our campsites, protect the ground, give us wood products, and beautify our landscape. Now imagine the same area with all the ash trees gone. Draw before and after pictures.

before

after

It's a lot to lose!

Do everything you can to keep Wisconsin's forests "picture perfect"!

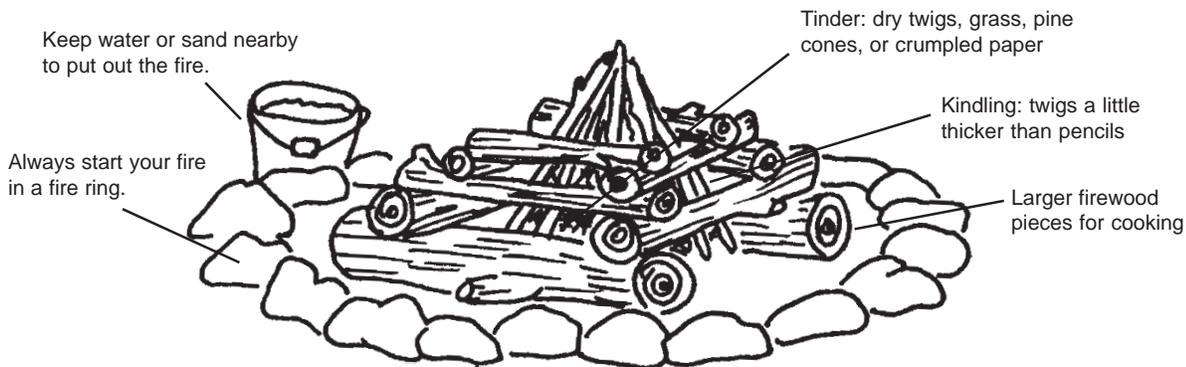


Hungry? Cold?

You and your family don't have to give up campfires, fireplaces, and woodcutting traditions. But you might have to change the way you do things. Don't transport firewood. Buy your firewood where you will have the fire. Be sure to burn up all your firewood before you move on!

Fire!

Always find out if fires are allowed before you start a fire. Do you need a permit? Are fire rings provided? Is the fire hazard too high to start a fire safely?



Food!

S'mores

You will need:
large, flat chocolate bars
graham crackers broken in half
marshmallows

Place half a chocolate bar onto a graham cracker half.

Toast a marshmallow over the campfire until it's golden brown (or darker!).

Place it on top of the chocolate, top it with the other half cracker, gently press it together, and munch away.

Try these s'more variations:

Apple S'mores - Slices of apples instead of crackers

Minty'mores - Chocolate peppermint patties instead of chocolate

Robinson Crusoes - Peanut butter or toasted peanuts instead of chocolate

Banana Boats

You will need:
bananas
chocolate chips
miniature marshmallows

Peel the banana. Cut a V-shaped slit down the center. Remove it and eat it.

Fill the slit with chocolate and marshmallows.

Wrap the banana in foil.

Grill it on warm coals for about 10 minutes.

Gingerbread Oranges

You will need:
oranges
gingerbread cake mix & the stuff you need to make it

Mix the gingerbread cake according to directions.

Cut off the top third of the orange, dig out the fruit, and eat it. Be careful not to tear the skin.

Fill the orange about 1/2 full of cake mix.

Wrap the orange in foil and set it on warm coals. Be sure it stays upright. Check after about 15 minutes to see if the cake is done. Eat!

Remember . . . Only You!

When you are done with your campfire or are leaving the area, be sure your fire is **dead out!** Pour water from a canteen into your hand and sprinkle it through your fingers onto the ashes. Stir the coals with a stick and sprinkle again. Continue until no steam rises from the coals. Before you leave the fire pit, hold your hand over the ashes to make sure they're cold.