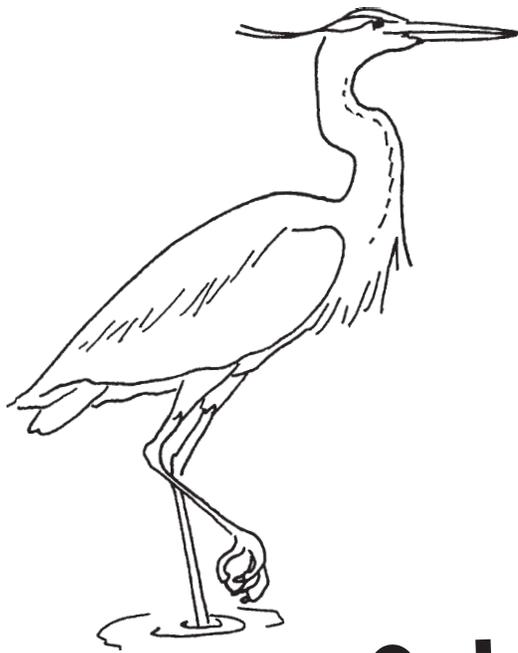


~~NNIS~~

Non-native Invasive Species Learning Kit



Get a Grip on Biodiversity!



United States Forest Service - Eastern Region

Non-Native Invasive Species

They're munching our trees, invading our waters, and taking over our favorite natural communities. *They* are invasive species! *They* are plants, animals, and pathogens from other parts of the world – even other parts of our own country! They outcompete, outlast, and outlive our natives. The threat to natural communities posed by invasive species is second only to habitat loss. But before you get too tough on them, remember, they couldn't do it without us! People are the ones who travel around the world, trade with other countries, and transport invasive species to places they could never have gone by themselves.

Everyday, people cross international borders, vacation in pristine natural areas, travel to developing countries, ship materials across the oceans, and obtain plants and animals for fun and profit. Each move, each transaction, each development opens a door.

To stop the invasion, we have to become aware of the threat and become uncomfortable about what we might be losing. This *Non-native Invasive Species Learning Kit* includes four modules designed to take people from awareness of the problem to taking action. Activities in the modules are designed for use by USFS staff, teachers, and non-formal educators with people of all ages.

Get a Grip on Biodiversity! - This is the module you have!

Celebrate diversity through story and art, check out what happens when invasives take over an area, and get ready to learn more about invasive species. Activities include: *The Salamander Room*, *Web of Life*, *Freeze Frame*, *There's a Hair in My Dirt!*, and *Jargon Unplugged*.

Meet the Invaders!

Confront some invasive species, discover their adaptations, and find out why they are such a problem. Activities include: *Ad-libbed Aliens*, *Bioblunder Tribunal*, *Super Alien*, *Outwit-Outplant-Outlast*, and *Meadow in a Can*.

Close the Doors!

Track down invasive species in your own neighborhood, discover how they arrived, and find out how you can prevent further introductions. Activities include: *BioBlitz*, *Means & Modes*, *Sticky Situations*, and *Homeland Security*.

Do Something!

Measure the spread of invasives, discover how everyday decisions can make a difference, and create invasive species artwork. Activities include: *Biodiversity Index*, *Rival for Survival*, *Pet Detective*, *Miss Rumphius Revisited*, and *Inspired by Wrath*.



Produced by

United States Forest Service, Eastern Region

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Writer and Designer: Beth Mittermaier, EARTH Ltd.

Get a Grip on Biodiversity!

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Use these tables to help you find the right activity. Activities are categorized by audience, subject, message, logistics, and level of instructor's knowledge.	



The Salamander Room

Description

Using the book, *The Salamander Room* by Anne Mazer, and learning kit props, the students will turn Brian's "room" into a salamander paradise and find out that animals need diverse places to survive.

Getting Ready

1. Read the story and decide how you will present it.
2. However you choose to present the story, be sure to practice!

Introduction

Pets are special animal friends that depend on us for everything they need. If you have a pet fish, guinea pig, cat, or dog, you must give it food, water, and exercise everyday. Some pets are easy to take care of and fit right into our families. This story will help us think about what could happen if we tried to keep a wild animal for a pet. A wild animal is an animal that lives on its own. It finds its own home and food. Having a wild animal for a pet sounds exciting, but it may not be very easy.

Doing the Activity

1. **Introduce the story.** Ask the students if they ever wished they had a wild animal for a pet. What about a salamander? Introduce Brian, the boy in the story, and the salamander that he finds in the woods.
2. **Share the story.** There are many ways that you can use the materials in the learning kit. Here are some suggestions:
 - Read the book. Spread out the burgandy story cloth and invite the students to sit in a circle around it. (Hint: If they sit on the edge of the cloth, they will be less likely to creep closer to you and block the view for the rest of the group.) As you read, move the book slowly around the circle so the students can see the illustrations. After reading the story, pass out several story props to each child. Now, read the story again. This time invite the students to add the props to the story cloth as they appear in the story. For example, when the story

Objectives

- Discover that wild animals need diverse habitats to survive.
- Consider the consequences of providing a home for a wild animal.
- Appreciate the diversity of natural habitats.

Grades

Preschool – grade 3

Group Size

Maximum 20 preferred

Prep Time

Minimal

Activity Time

10 – 20 minutes for story and discussion

Setting

Indoors

Materials in the Kit

- *The Salamander Room* by Anne Mazer
- story cloth
- blanket and pillow
- rocks (3)
- tree stump
- moss pillow
- pools of water (2)
- salamander replicas (3)
- frog replicas (2)
- stuffed bird
- insect replicas (15)
- leaves (many)
- mushrooms (3)

National Education Standards

see next page



National Education Standards

Grades K -3

- English Language Arts: 1
- Environmental Education: 2.2.C - Systems and Connections
- Science: C - Characteristics of Organisms

mentions the pools of water, invite the child with the water to spread the blue fabric on the story cloth. Allow time for students to place the props before continuing with the story.

- Tell the beginning of the story with the props. Use the book to show how Brian continues to transform his room into a forest.
 - Read the story using the book pictures and props to illustrate. You can place the props yourself, or hand them to students to place.
3. **Talk about the story.** Discuss some of these questions:
- What happened to Brian's room? (It changed into a forest!)
 - Why? (That's where a salamander lives. A forest is where it finds everything it needs to stay alive.)
 - What did the salamander need? (A salamander needs a variety of foods, places to hide, water, fresh air, and other animals.) With older students, discuss how the salamander connects with other animals in the story.
 - Look at all the different kinds of insects and the different shapes of leaves. Why does the salamander need so many kinds of plants and animals to survive? (The variety of plants provide food and homes for a variety of insects and other living things. These plants and animals all depend on each other to live.)
 - Brian was willing to make some big changes to his room so that the salamander could live with him. Name some things Brian did that you could do to your room. Name some things that *he* did that *you* could not do!
 - What if a salamander took you to its home? What would the salamander have to do to make you comfortable? What is special about where you live? What do you need to survive? Could a salamander turn *its* home into a place where *you* could live? If the salamander did change its home, would it still be able to live there?

Assessing Student Learning

Ask students to imagine keeping wild animals in their own bedrooms. Ask them to make a list of all the things their animals need to survive. Invite them to draw pictures of their bedrooms and show how they would have to change them if they were going to keep wild animals.

Extending the Learning

Encourage free play. After reading the story, put the book and the props in the story corner and encourage the children to reenact the story themselves using the props.

Investigate diversity outdoors. Take a short hike outdoors to look for animal homes. Check out the variety of plants present in a natural area by looking for different shapes, colors, and sizes of leaves. Celebrate the variety of life that surrounds us!

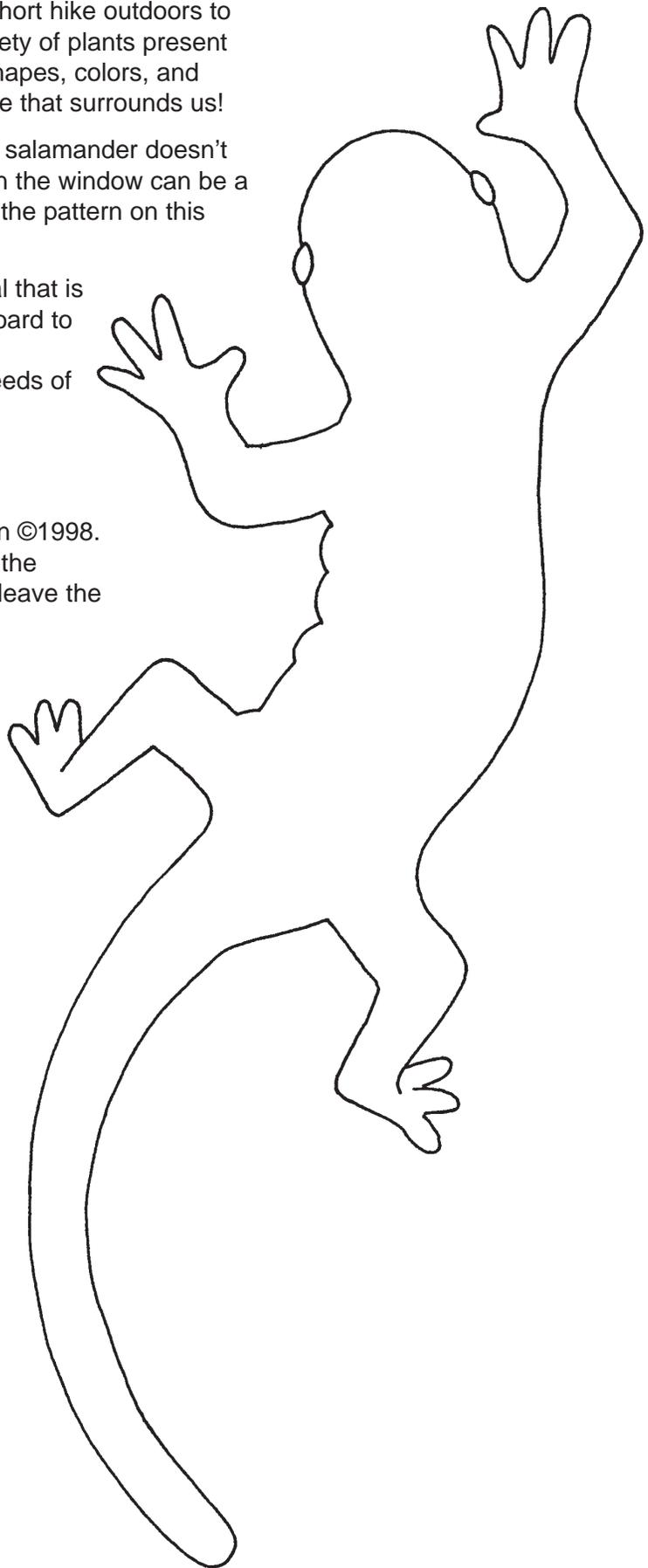
Make salamander stickees. While a real salamander doesn't make a good pet, a salamander stickee on the window can be a great reminder of the diversity of life. See the pattern on this page and the directions on page 8.

Bring it close to home. Choose an animal that is familiar to the children. Create a flannel board to show how you would have to change your classroom or nature center to meet the needs of the animal.

Finding Out More!

A Salamander's Life by John Himmelman ©1998. *Nature Upclose* series. Enter the world of the salamander. Watch it grow hind legs and leave the pond at the end of summer. Grades K - 3.

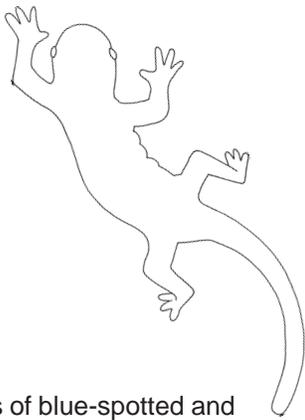
Snakes, Salamanders, and Lizards by Diane L. Burns ©1998. *Take-Along Guide* series. A field guide introducing 30 species of snakes, salamanders, and lizards. Includes activity suggestions and blank pages for drawings and notes. Grades 2 - 5.



Did you know?

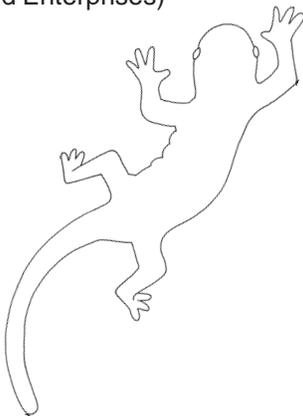
Non-native earthworms are invading our forests. A study at Cornell University found that salamanders declined in earthworm-invaded forests.

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Materials

- pictures of blue-spotted and tiger salamanders (see *Snakes, Salamanders, and Lizards*)
- yellow or blue transparent vinyl (available at fabric stores)
- pattern
- permanent markers
- scissors
- scrap paper (8 ½" X 11")
- piece of plastic wrap larger than the salamander shape
- rubbing alcohol
- paper towels
- paintbrushes
- black paint designed for plastic (e.g., *Paint for Plastic* by Plaid Enterprises)



Salamander Stickees

Cut salamander shapes out of vinyl and decorate them with paint to make tiger salamanders and blue-spotted salamanders.

How to make stickees

1. Show the children pictures of salamanders. Invite them to choose a tiger salamander (use black paint on yellow vinyl leaving yellow splotches), a blue-spotted salamander (use black paint on blue vinyl leaving blue spots), or a local salamander of your choice.
2. Cut salamander shapes out of vinyl using the pattern on page 7 or the children's own designs. Precut shapes for small children.
3. For each child, layer a piece of scrap paper, a piece of plastic wrap, and a vinyl salamander.
4. Clean the backside of each salamander with a paper towel soaked in rubbing alcohol. Then turn the salamanders over and clean the front with rubbing alcohol. Be sure the plastic wrap is smooth under the salamanders and that the edges of the salamanders are sealed to the plastic wrap. This will keep paint from oozing under the wrap and ensure that the salamanders will stick to windows when the project is complete.
5. Paint. Supervise small children! The paint is permanent! Wash any paint that spills on clothes or furnishings immediately with soap and water. Monitor the thickness of the paint. If it's too thick, it doesn't dry properly. If you are working with small children and do not have adequate adult supervision, consider using permanent markers instead of paint. The color is not as intense, and the chance for disaster isn't either!
6. Allow salamanders to dry without moving for at least 30 minutes. Allow more time if the paint is thick. Send the salamanders home attached to the plastic wrap. Although the paint will not be completely cured for 24 hours, the children can remove the salamanders from the plastic and stick them to windows when they get home.

Web of Life

Description

In this simulation game, students represent plants and animals living in an aquatic habitat. Sitting in a circle, they connect themselves to each other using string to represent the ways they depend on each other. As they make connections, the string forms a visual web of life. Then, they will experience what happens when an invasive species enters their watery world.

Getting Ready

1. Choose the cards you will use in the activity based on your location and the students' familiarity with the plants and animals on the cards. **Caution:** These learning kits cover a large area of northeastern and midwestern United States. A plant or animal native to one location may not be native in another. Check with local authorities if you are unsure of the local ecological status of the plants and animals in this game.
2. Arrange for an adult leader for each group of 8 – 15 children.
3. Optional: Make additional cards for plants or animals that are unique to your location. Use the blank cards and transparency pen provided in the kit.

Introduction

Have you ever seen a perfect spider web? The rays reach out and connect to tree trunks, rocks, and fences. They hold the web in place. The spirals are evenly spaced. They tie the rays together. If you follow the strands of silk, you can eventually get to any place on the web!

Now picture a river, lake, or pond. An aquatic ecosystem is made up of living and nonliving things that are connected to each other. Some of the connections are obvious; some are amazing. Algae need the light of the sun to live and grow. Insect larvae eat the algae. Fish eat the insect larvae. If we could take a pencil and magically draw the connections under the water, the picture might start to look something like a crazy spider web. Let's play a game to see how this might work.

Objectives

- Describe an aquatic food web.
- Identify the connections between plants and animals in an aquatic ecosystem.
- Explain how the introduction of an invasive species impacts an aquatic food web.

Grades

3 - 8

Group Size

Maximum 30, divided into small groups of 8 - 15

Prep Time

Minimal, unless you make additional cards for your unique location

Activity Time

10 – 20 minutes

Setting

Anywhere

Materials in the Kit

- clip-on name badges (32)
- *Wisconsin Wildcards* - native species (2 sets of 17)
- photo cards (2 sets of 4)
- "sun" cards (2)
- *Wisconsin Wildcards - Alien Invaders* (11)
- blank cards for adding site-specific species (8)
- transparency pen
- bobbins with string (2)

National Education Standards

see next page



National Education Standards

Grades 3 - 4

- Environmental Education: 2.2.C - Systems and Connections
- Environmental Education: 2.2.D - Flow of Matter and Energy
- Science: C - Organisms and their Environments
- Science: F - Changes in Environments
- Social Studies: III - People, Places, and Environments (h)

Grades 5 - 8

- Science: C - Populations and Ecosystems

Doing the Activity

1. **Divide the students into groups.** Maximum group size is 15. The ideal size would be 8 – 12. Each group should sit in a circle with an adult leader.
2. **Assign each student an identity.** Give each student a clip-on name badge with a plant or animal card. Give students a few minutes to read the backs of their cards. Younger students may need help with the vocabulary. To play the game, they will need to know what they eat. The box on page 14 divides the plants and animals used in the game into producers, plant eaters, meat eaters, and decomposers.
3. **Start the game.** Show the ball of string and explain that the string will let us see the connections between plants and animals. Put on the “sun” badge, and explain that you will start, because all energy comes from the sun. Model the game by saying, “I am the sun. I am passing the ball of string to the cat-tail because I give it energy to grow.” You hold onto the string and pass the ball to the cat-tail.
4. **Continue the play.** The “cat-tail” now chooses a plant or animal in the circle that is connected to it in some way. The “cat-tail” holds onto the string and passes the ball to another plant or animal in the circle. For example, the cat-tail might pass the ball to the muskrat that uses its leaves to build a house, the riffle beetle larva that eats its leaves, or the dragonfly larva that hides among its leaves. Keep the string tight, but not too tight! Play continues until everyone is holding onto the string. Some plants or animals might have more connections, but everyone should be a part of the crazy web!
5. **Show the power of the sun.** Explain that you, representing the sun, are very important. Ask what might happen if the sun suddenly stopped shining. Briefly discuss some of the consequences. (Obviously, it would be dark! Without the sun to provide warmth, the earth would cool off. The wind would stop blowing, which would reduce the amount of oxygen in the water. Plants would eventually die. Animals that eat the plants would die. When we used up our food reserves, we would die too.) Ask everyone to sit still. Begin to tug gently on your part of the string. Tell the students that when they feel the tug, they should begin to tug gently. Ask them to watch as the tug moves through the web. Finally, the whole web will be shaking! Everything is connected to everything else.
6. **Explore other connections.** It is easy to understand how the sun influences the connections between plants and animals, because the sun is the source of all energy. What would happen if the sowbug (or some other plant or animal)

disappeared? Sowbugs aren't that important, are they? Try the game again with the sowbug gently tugging on the web. As each plant or animal in the circle feels the tug, he/she should call out the plant or animal he/she represents.

7. Discuss impacts to the web. Talk about things that might happen that would change the way the plants and animals are connected. Here are some possibilities:

- no rain falls for months
- fertilizers or pesticides get washed into the water
- too much rain falls
- part of the aquatic area is filled for construction

8. Consider invasive species. Ask what might happen if a new plant or animal came into the aquatic environment. Choose an aquatic invasive species that is common in your area. Ask the students how this new species might affect the plants and animals of your little circle. See the list below for some ideas. Identify one plant or animal that the new invasive species will displace. Change the nametag of that student. Follow the connections from that student to other plants and animals in the circle. Ask the student to let go of the string. What happens to the web? Ask the other students to pull gently on the string. Watch as the web unravels.

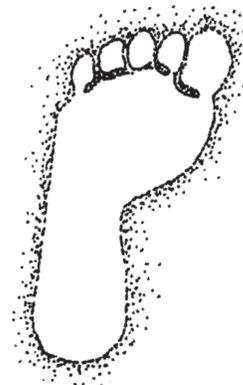
- Cat-tail – Outcompetes native plants. An aquatic area dominated by cat-tails does not support the variety of life that is found in a diverse wetland area. There are several species of cat-tails. Some may be native in your location; others may be non-native.
- Common reed grass – Decreases native biodiversity and the quality of the aquatic habitat especially for birds. Common reed displaces native cat-tails, rushes, and reeds. It has little food value for wildlife such as the muskrat. Fish do not reproduce in stands of common reed.
- Eurasian Water-milfoil – Forms dense stands that crowd out native plant species. Water-milfoil isn't as nutritious as the aquatic plants that it replaces, so it supports fewer invertebrates and fish than native aquatic plants. Dense stands also entangle boat motor propellers and interfere with swimming.
- Human – Alters environments through road construction, agriculture, and urban development. Introduces non-native species. Changes that humans make to aquatic environments increase populations of some species and decrease populations of others.
- Purple loosestrife – Crowds out native plants. Dense stands of purple loosestrife change the whole ecology of the aquatic environment and reduce the populations of aquatic insects, mammals, birds, fish, reptiles, and amphibians.



What do you think?

Some people consider humans to be invasive species. What do you think? Are we invasive species when we travel to other regions of the world? If we are invasive species, what can we do to make less of an impact on the habitats we *invade*?

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Non-native Invasive Species



Can natives go "bad"?

Native plants are usually not invasive, but sometimes they can go "bad" and they usually have our help!

When we disturb a community through construction or agriculture, we can alter the way water moves through the area and tip the balance in favor of one plant over another. Cat-tails appear to be winning in roadside ditches, construction areas, and other disturbed sites. In these places, cat-tails can establish a population quickly and spread, crowding out nearby native species.

NNIS
Non-native Invasive Species

- Rainbow smelt – Eats mayfly larvae, sowbugs, riffle beetle larvae, and crane fly larvae. Competes with yellow perch, pumpkinseeds, and young walleye for food. Adult smelt also eat young walleye.
- Round goby – Outcompetes native fish for food, partly because it can eat in total darkness! Eats small fish. Pushes native fish from their habitat, eats their eggs and young, survives in poor water quality, and spawns several times a year. Gobies even eat the bait right off of angler's hooks!
- Rusty crayfish – Eats a lot of just about everything! Eats aquatic plants, insect larvae, sowbugs, fish eggs, small fish, and decaying plants and animals. Since rusty crayfish have such huge appetites, they compete with many native animals for food. They also destroy aquatic plant beds that provide food and cover for other animals. Note: Rusty crayfish are thought to be native to the Ohio River Basin and portions of Ohio, Kentucky, Tennessee, Indiana, and Illinois.
- Spiny and fishhook waterflea – Eats larval fish. Competes with small fish for food. Large fish eat them, but it is hard for small fish to swallow them because of their spines. They also collect in masses and make fishing lines and equipment unusable.
- Three spine stickleback – Competes with yellow perch, pumpkinseeds, and dragonfly larvae for food. Three spine sticklebacks are very aggressive fish that have few predators because of the spines on their backs.
- White perch – Competes with native fish for food, especially walleye and yellow perch. Eats the eggs of game fish like walleye and smallmouth bass.
- Zebra mussel – Filters algae and organic debris from the water so efficiently that there is little food left in the water for mayfly larvae, caddisfly larvae, and small fish like common shiners. Very few animals eat zebra mussels. Zebra mussels also clog water intake pipes and attach to the sides of boats and docks.

Assessing Student Learning

Students each choose one plant or animal from the game. Using a large sheet of paper, each student should draw a plant or animal in the center of the paper. Instruct students to draw or write the names of the other plants and animals from the game around their central drawings. Tell them to draw lines from their chosen plants or animals to other parts of the aquatic ecosystem that are connected to them in any way. Older students should describe the connections along the lines (e.g., "mayfly larvae eat diatoms"). Encourage students to add nonliving things (e.g., rain, rocks, or soil) or other plants and animals that live in an aquatic habitat and connect to them.

Extending the Learning

Try a Habitat Lap Sit. After they try this activity, students will definitely understand why everything in a lake or pond depends on everything else! Tell students that they are going to represent the plants and animals that live together in an aquatic habitat. Find some soft grass or carpet! Have students stand in a circle with shoulders almost touching. Instruct everyone to turn to the right and put their hands on the hips of the person in front of them. On the count of three, they should gently guide the person in front of them onto their lap. If it works correctly, everyone will be sitting on the lap of another person in a huge continuous lap sit! It may take a few attempts to get it right. Adjust the distance between people to match the sizes of your students. Caution: People with back or knee problems should sit this one out!

Encourage students to play with the cards individually.

- Put the cards on a bulletin board and use string to connect them to each other in a web of life.
- Use the cards at a learning station and encourage students to play Dominoes. Starting with one card, students should place cards end to end. Each time they place a card, they must describe the connections between the new card and the card on the table.

Play *Web of Life* outdoors. Take the game outside! Create a *Web of Life* in the schoolyard or a nearby park. Start by tying a string to a tree or other plant. Connect the green plant to living and nonliving things. Use animal signs instead of real animals! Don't forget to clean up your string!

Finding Out More!

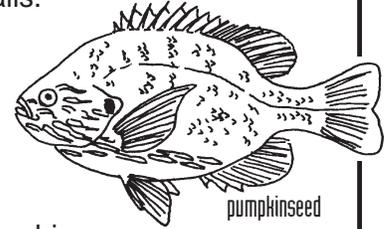
Who Eats What? Food Chains and Food Webs by Patricia Lauber ©1995. *Let's-Read-And-Find-Out Science* series – Stage 2 Book. Explains the concept of a food chain and how plants, animals, and humans are ecologically linked. Grades 1 - 4.

Who's Who?

This list is intended to help you play the Web of Life game. You will notice that some animals are listed more than once. Many animals are opportunistic feeders, eating whatever comes their way. These lists reflect the main food sources for each animal.

Producers

cat-tails – The Wisconsin Wildcard features both native and non-native cat-tails.
diatoms
cladophora
chrysophytes



pumpkinseed

Aquatic Plant Eaters

caddisfly larva
riffle beetle larva
mayfly larva

common shiner
muskrat
raccoon

Aquatic Meat Eaters

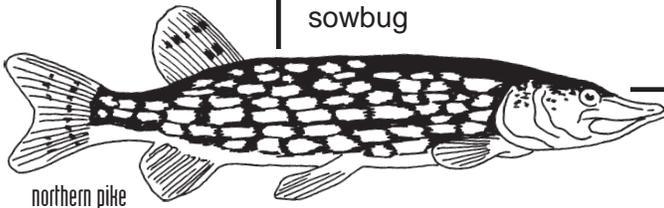
dragonfly larva
caddisfly larva
walleye
northern pike
yellow perch
brown bullhead

pumpkinseed
common shiner
Blanding's turtle
Blanchard's cricket frog
raccoon
human

Decomposers/Scavengers

crane fly larva
caddisfly larva
sowbug

brown bullhead
raccoon



northern pike

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Freeze Frame

Description

Sometimes it's difficult to focus on the beauty of a single part of nature. Using picture mats, students "frame" their favorite plants or scenes. As a group, take a tour through your spontaneous art gallery allowing students to be the art experts for their selections. If you have time and art supplies, allow students to create their own masterpieces!

Getting Ready

1. Set the *Freeze Frame* sign at the trailhead you plan to use.
2. Choose several "masterpieces" and frame them using the picture mats in the kit. Consider framing a wildflower in bloom, a mushroom, some interesting bark, or a nature scene. Choose a variety of images and scales.
3. Plan how you will introduce the works of art.

Introduction

Welcome to **Freeze Frame**, nature's art gallery! In this beautiful gallery, you will find works of art in all stages of completion. Some works are only on display a few days each year; other works have taken hundreds of years to be formed and will remain relatively unchanged for years to come. This gallery is always changing. We have little control over the lighting in the gallery, so the artworks can change right before your eyes and throughout the day. We also encourage you to visit in different seasons because the works do reflect amazing seasonal variations.

Due to the size of the gallery, you will find small works displayed within much larger works. Attention to detail will enhance your experience in the gallery. Watch for repeating patterns and subtle changes in color. Without further delay, let's enter and enjoy nature's art gallery.

Doing the Activity

Follow these directions for students in grade 5 and up.

1. **Enter the gallery.** Welcome the group to the *Freeze Frame* art gallery. Use the introduction to set the stage for your tour.

Objectives

- Observe a natural area from a unique perspective.
- Locate plants or scenery that are personally meaningful.
- Describe natural works of art for others to view and appreciate.
- Appreciate the beauty and diversity of a natural area.

Grades

Preschool – adult

Group Size

Maximum 30, 10 – 15 preferred; divide larger groups into teams of 2 or 3 students each

Prep Time

15 - 20 minutes

Activity Time

10 - 30 minutes

Setting

Outdoors

Materials in the Kit

- picture mats (24)
- *Freeze Frame* sign

National Education Standards

see next page



National Education Standards

Grades K - 4

- Environmental Education: 2.4.C - Environment and Society, Places
- Science: D - Changes in the Earth and Sky
- Social Studies: IV - Individual Development and Identity (b)

Grades 5 - 8

- English Language Arts: 4
- Science: D. Structure of the Earth System and Earth's History
- Social Studies: IV - Individual Development and Identity (b)

Grades 9 - 12

- English Language Arts: 4
- Environmental Education: 2.1.A - The Earth as a Physical System, Processes that Shape the Earth
- Science: D - The Origin and Evolution of the Earth System
- Social Studies: IV - Individual Development and Identity (a)

2. **Give your introductory tour.** Stop at the frames you previously set up and act the part of a gallery curator.

Introduce the artwork by sharing:

- Title of the work
- Artist (e.g., Father Time, Mother Nature, wind, water, or insects)
- Composition of the piece (e.g., notice the subtle use of color and shading)
- Age of the work
- Some interesting bit of information about the art

Here are some additional hints:

- Show as much variety in your selections as possible. Choose a close-up work. Place one frame so that the viewer must stand in a particular location for the best view.
- Encourage polite applause after viewing each piece.
- Model behavior that respects the area and all things living in it.
- Play the part, as you feel comfortable. Dress up! Use an accent! You can even act a little snobbish!

3. **Invite the students to become curators.** After viewing your exhibits, invite the students to become art curators. Individuals or small groups should select a frame and find a "masterpiece" to share with the rest of the group. Frames can be propped against natural objects, held in mid-air by the curator, or hung in branches. Remind students that they should be ready to introduce the art they chose.

Caution students to be careful in the gallery. Set rules for what students can or cannot do. For example, stay on trails, leave living things where they are, take care not to harm nearby artwork when selecting or showcasing chosen masterpieces.

4. **Encourage the young curators.** Wander around as students look for their masterpieces. Give them permission to interpret, imagine, and speculate. Ask questions to help them think about the art they find:
 - Who created this masterpiece?
 - When did the artist begin work? Is it a work-in-progress?
 - How old is the artwork? Will the artwork be here tomorrow? Will it look the same in a year or two?
 - If you were the artist, would you have done anything differently?
5. **Tour the gallery.** When everyone has found a masterpiece to share, gather for the tour. Curators should tell visitors where to stand to best view the artwork they have selected.

Prompt the curators to share the title, artist, and interesting information about the artwork. Allow spectators to ask questions, but permit the curators to leave some questions unanswered. Don't forget the applause!

6. **Remember this hint.** While this activity can lead to all types of discussions, don't be tempted to share everything you know about the items inside the picture frames. It really doesn't matter if they chose a rare flower, a glacial feature, or an ordinary leaf! Keep things moving and allow the art to speak for itself!

Adapted from an activity by teacher Mural Adams.

Follow these directions for students in preschool through grade 4.

1. **Welcome the group.** Tell the students that you were out for a walk earlier and you found some beautiful "pictures". Ask them if they would like to see what you found.
2. **Show the pictures.** Stop at the pictures and tell the students why you like them. Here are some things you might share depending on the age of the students:
 - Color - "I really like this flower because purple is my favorite color." or "I'm amazed at how many different colors of brown there are in this tree's bark."
 - Shape - "This mushroom looks like a ball." or "I like this leaf because it is shaped like a feather."
 - Size - "Look how tall this tree is." or "I chose a little frame for this moss because the moss is so tiny. The little frame helps you to see the moss better!"
 - Texture - "I love the rough look of this rock." or "This lichen reminds me of the surface of the moon."
3. **Pass out picture mats.** Give students picture mats and encourage them to use the frames to find pictures that they like. When they have each found the perfect picture, tell them to leave the frames and return to a predetermined meeting spot.
4. **Take a tour.** As a group, walk through the area. When you come across a frame, ask the student who placed it to tell about the picture. You can prompt students by asking:
 - Why did you choose this picture?
 - What do you like about _____?
 - Is there anything special about it that we might not know?
5. **Play with the picture mats.** Stand, sit, or lie down together and use the picture frames to frame trees, clouds, or landscapes. Take a few moments to share your personal thoughts. Tell why the place where you are is so special to you. Encourage the students to do the same.



pixie cup lichen

Assessing Student Learning

Observe students' attention to detail and design. Assess their oral presentations. Ask older students to write entries for a museum tour book that describes the pieces they selected.

Extending the Learning

Witness the impact of invasives. Visit an area that invasive species have overtaken. How are the chosen works of art in the invaded area different from the ones in the first area visited? Which location is more inspirational? Which location shows more diversity and interest?

Create personal masterpieces. Offer watercolors, paints, crayons, or other art supplies so students can create their own natural masterpieces. Hold the art session outdoors if possible so that nature can be an inspiration. Express feelings of appreciation for nature or frustration with invasives by creating collages of pictures and/or words cut from magazines.

Finding Out More!

Drawing from Nature by Jim Arnosky ©1987. Instructions for drawing water, land, plants, and animals. Grades 4 - 8.



Charcoal drawing by
Sarah, age 12

There's a Hair in My Dirt!

Description

Gary Larson, creator of *The Far Side* cartoons, uses a worm family to help us see how we often view nature through rose-tinted glasses. After a few good laughs, students will be ready to talk about the difference between loving nature and understanding it. The story also prompts discussions about how our view of nature influences resource management decisions.

Getting Ready

1. Read the story ahead of time.

Introduction

*Do you remember **The Far Side** cartoons? The creator, Gary Larson, often picks biology-related topics for his cartoons. He is very good at pointing out the irony in situations and helping people to rethink the way they look at nature.*

Doing the Activity

1. **Before reading the story, discuss these questions:**
 - What are some of the things you like the most about nature?
 - What are some plants and animals that you don't like?
2. **Read the story.** Share the story with the group, showing select pictures as you read, or have students read the story in small groups.
3. **Discuss the story.** When everyone is familiar with the story, discuss these questions:
 - Have you ever romanticized a part of nature because you thought it was cute, touching, or picturesque only to find out you didn't have the whole story? Encourage the students to share stories and experiences of times when they discovered "the rest of the story".
 - Think about your favorite plants and animals. Why do you like them? Think about the plants and animals you don't like. What is it that bothers you? Where do we get these different attitudes towards living things?

Objectives

- Discuss how our perceptions of nature influence how we care for it.
- Understand that resource management decisions are viewed differently by different people.
- Realize the benefits of becoming more ecologically literate.

Grades

9 – adult

Group Size

10 - 20 preferred

Prep Time

Minimal

Activity Time

45 - 60 minutes

Setting

Anywhere comfortable

Materials in Kit

- *There's a Hair in My Dirt! A Worm's Story* by Gary Larson

National Education Standards

see next page



National Education Standards

Grades 9 - 12

- English Language Arts - 1
- Environmental Education:
2.2.C - Systems and Connections
- Environmental Education:
2.4.A - Human/Environment Interactions
- Science: F - Natural Resources
- Science: F - Environmental Quality



white-footed mouse

- Harriet didn't just observe nature; she meddled with it. What are some of the things that Harriet tried to "fix"? For example, she threw the turtle in the pond, fed introduced squirrels, "saved" a baby bird, and "rescued" a prey animal. Have you ever acted like Harriet and tried to "fix" nature?
- Are natural resource managers trying to "fix" nature when they set hunting seasons, conduct prescribed burns, harvest trees, and control invasive species? Harriet's attempts to "fix" nature appear to be based on her emotions. How are natural resource managers' decisions different?
- Why do decisions concerning the care of natural resources stir such deep feelings within us? Do we respond in the same way regardless of where the resources are located? For example, would your response to the misuse of natural resources in a distant rain forest be the same as your response to the misuse of resources in your own community?
- At times, it seems Harriet thought nature was simply there for her enjoyment. How can me-centered views of nature influence decisions about the environment? How might decisions made from the heart be different from decisions made from the head? Is one way of reaching decisions better than the other way? Is there any common ground?
- People brought many invasives to America for emotional reasons, without considering ecological consequences. For example, Eugene Schieffelin introduced starlings into New York's Central Park because he liked Shakespeare. He wanted the birds that Shakespeare wrote about to live in America. Starlings often take the best nesting sites and leave native birds with less desirable homes. Now that people have introduced starlings to America, do we have a responsibility to manage their populations and minimize their impacts on native species? Can you think of other examples?
- Some people get very upset when organizations, agencies, or individuals try to control the populations of invasive species. For example, mute swans are an invasive species that is growing rapidly in population. Scientists claim that swans are displacing native water birds and disturbing the habitats where they live. Efforts to control populations of mute swans by hunting, sharp shooting, or egg addling are usually met with "save the swan" protests. What are some reasons why people would want to control swan populations? What are some reasons why people would want to leave the swans alone?

- Some people get upset when others cut invasive buckthorn. They view buckthorn as green vegetation with berries that birds will eat. They don't think that a native shrub is more valuable. Killing one plant to plant another leaves the area temporarily barren, takes away nesting sites, and costs money. From an ecological perspective, the buckthorn is replacing native vegetation that has provided food and cover for a diversity of species for generations. Are there wrong and right sides to this issue?
- Do you think you are getting the information/education you need to make decisions about the management of natural resources?
- What did the author mean when he said, "loving nature is not the same as understanding it"? Do you think that you "love" nature or "understand" it? Do you think it would be best to "love" it, "understand" it, or "love and understand" it?
- What are some things you could do to become more ecologically literate?

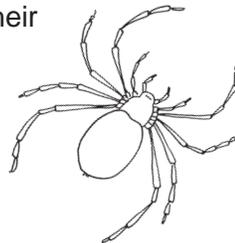
Assessing Student Learning

Observe student participation during the discussion.

Extending the Learning

Check out the funnies. Gary Larson has published numerous collections of *The Far Side* cartoons. Ask students to find cartoons that deal with issues of ecological literacy or that show insights into how the natural world works. Share the cartoons in class. Then invite students to create their own ecology-based cartoons.

Make it personal. Harriet was ecologically illiterate. She looked at nature through very human eyes and saw beauty vs. destruction and love vs. injustice. Ask students to choose one thing in nature that they "love" and one thing that they "hate." Then encourage them to find out at least one fact that helps them rethink their feelings. For example, a student might "hate" spiders, but learn to respect the diversity of webs that different species of spiders make. Another student's "love" of bunnies might be shaken by the knowledge that cute bunnies eat their own droppings.



Jargon Unplugged

Description

With each new subject of study comes a new set of words. Students will have fun playing this word game while they become familiar with the terminology used to talk about invasive species.

Getting Ready

1. Select about 10 words from pages 27 -31 that you would like to introduce to your students.
2. Copy one set of the word cards for each group.
3. Prepare pieces of identical scrap paper. For a class of 30 students, you will need about 300 pieces of paper to introduce 10 words.

Introduction

Words are often the key to knowledge. Since words mean different things to different people in different situations, it is important to be familiar with the meanings of words in a particular field of study.

Consider the word “noxious”. What images come to your mind? What would “noxious” mean to you if you were a member of a hazardous materials team or a wastewater treatment specialist? Here are a few other professions and the thoughts the word “noxious” might invoke:

- *A chef might immediately remember how Teflon pans produce noxious fumes when used at high temperatures.*
- *A psychologist might think about a patient with aerophobia (the fear of drafts and airborne noxious substances).*
- *A doctor would probably remember a case of chemical pneumonitis caused by the inhalation of noxious chlorine gas.*
- *An ethicist would recall a recent news story that illustrates the corruption of society by noxious doctrines.*
- *A plant ecologist would think about a noxious weed that is dangerous to human health or damaging to the environment.*

As you can see, words can have special meanings when associated with a particular field of study. When you are familiar

Objectives

- Define key vocabulary associated with invasive species.
- Write dictionary style definitions for unfamiliar words.

Grades

5 - 12

Group Size

Divide large groups into small groups of 3 - 10 students (about 6 is ideal!)

Prep Time

Minimal

Activity Time

20 - 40 minutes

Setting

Anywhere

Materials in Booklet

- copies of words and definitions (pp. 27 - 31)

Materials Not Included

- pieces of identical scrap paper
- pencil for each student

National Education Standards

Grades 5 - 12

- English Language Arts: 3



with the vocabulary, the subject is easier to understand. Have fun learning these new words as they relate to non-native invasive species.

Doing the Activity

1. **Introduce the object of the game.** See page 25.
2. **Review the directions for playing and scoring.** See page 25.
3. **Answer any questions.** See FAQs on page 26.
4. **Divide the students into groups.** While a group of 6 is ideal, group sizes can vary from 3 to 10 students.
5. **Play!**

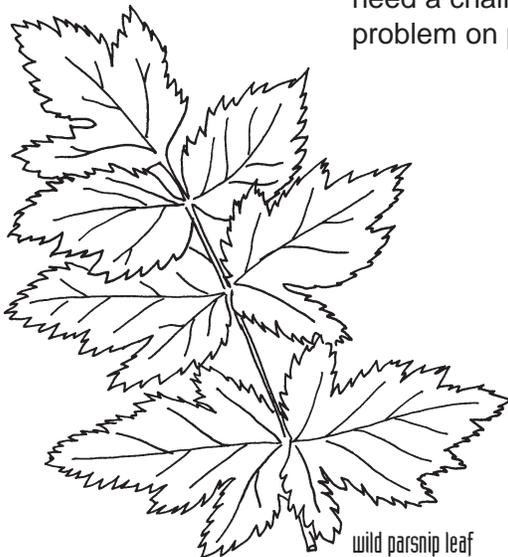
Assessing Student Learning

Instruct students to use the vocabulary words in a new way. Here are some ideas:

- Create a crossword puzzle.
- Develop questions for a game show like *Who Wants to be a Millionaire?* or *Jeopardy*.
- Write a story that uses the words in context.
- Illustrate the words.
- Dramatize the vocabulary using words or actions.

Extending the Learning

Solve an invasive logic problem. High school students who need a challenging use of their new vocabulary could tackle the problem on page 32.



Jargon Unplugged Game Directions

Object of Game

To score the most points by (a) inventing phony definitions that trick fellow players and/or (b) choosing the correct definitions.

How to Play

1. The youngest person in the group is the leader.
2. The leader begins the game by secretly choosing a word card, pronouncing the word, and spelling it for the other players.
3. The other players write the word down on their scraps of paper, invent phony definitions, and initial their papers.
4. While the other players are creating their definitions, the leader copies the correct definition from the card onto an identical piece of scrap paper and hides the card.
5. The leader collects all the definitions, shuffles them, and glances through them.
6. The leader reads all the definitions aloud to the rest of the players.
7. The leader then reads the definitions a second time so that the other players can decide which definition they will vote for as the “correct” definition.
8. Moving clockwise from the leader, each player indicates which definition he/she thinks is the correct one. As each player chooses a definition, the leader writes the player’s initials on the corresponding scrap of paper.
9. After every player has guessed, the leader reveals the true meaning and totals the scores.
10. The leader reads the *Jargon Unplugged* section on the card to learn more about how the word is used to talk about invasive species.
11. The player to the leader’s left becomes the new leader, and play continues in the same manner.

How to Score

The first player with 20 points wins the game.

- **3 points** - Awarded to any player who writes a definition that is correct or very close to correct.
- **3 points** - Awarded to the leader if no one picks the correct definition.
- **2 points** - Awarded to each player who picks the correct definition.
- **1 point** - Awarded to a player for each vote his/her phony definition receives.

FAQs

What if a player knows the correct definition of the word in play?

The player should write the definition on his/her scrap paper and turn it in. If the definition is similar or very close, the leader should tell the player that the definition is correct, award the player 3 points, remind him/her not to vote in this round, and remove the player's definition from the game.

What if more than one player knows the correct definition?

The leader reads the correct definition and cancels the round. Every player who submitted a correct definition receives 3 points. The play then continues with the next person clockwise as the new leader.

Why should the leader take the time to look through all the definitions before starting to read them?

It is in the best interest of the leader to read the definitions convincingly without stumbling on poor handwriting or misspelled words. Remember, if no one guesses the correct definition, the leader gets 3 points.

How do you trick people into choosing your definition?

It helps to read the dictionary regularly! Try to be creative, yet believable. Pick up on something familiar about the word and invent a definition around it. If you can't get people to vote for your definitions, try to get people to laugh at them!

Why do we have to use identical pieces of scrap paper?

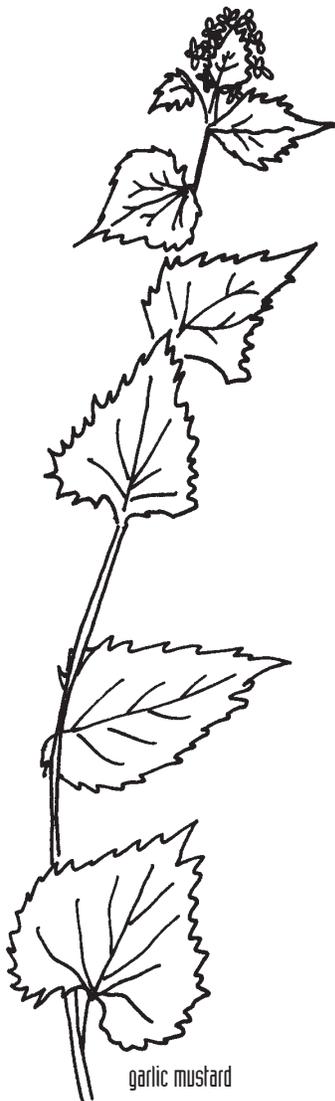
Some over-observant players may use the paper as a clue to who wrote which definition.

Can you vote for your own definition?

Yes. You might do that to throw other players off, but you don't get a point for your vote.

Isn't the person with the best vocabulary going to win?

Not necessarily. You don't have to know the definitions to win. If you can write definitions that will trick other players and keep a straight face as the leaders read your definitions, you will do great.



garlic mustard

Allelopathic

[al-lee-luh-PATH-ik]

adj. producing chemical compounds that can affect the growth of nearby plants

Jargon Unplugged

Under laboratory conditions, invasive spotted knapweed appears to be an allelopathic plant. It produces a chemical that can inhibit the germination and root growth of native grasses and trees, increasing its competitive advantage.

Air Bladder

[air BLAD-er]

n. a sac containing air that helps to maintain buoyancy and assists in respiration

Jargon Unplugged

Invasive snakehead fish are capable of breathing air using an air bladder that works as a primitive lung. Most fish don't have air bladders. An air bladder is just one of several special adaptations that allow invasive snakehead fish to outcompete native fish.

Ballast

[BAL-est]

n. extra weight in the hull of a ship to improve its stability

Jargon Unplugged

Many non-native species arrived in America in the ballast of ships. A long time ago, ships used soil for ballast. These ships carried the seeds and roots of many terrestrial non-native plants such as spotted knapweed. More recently, ships using water for ballast transported aquatic invasive species such as zebra mussels.

Biennial

[byu-EN-nee-ahl]

n. a plant that completes its life cycle in two years

Jargon Unplugged

Many invasive species are biennials. The first year they grow a rosette of leaves and a strong root. The second year they send up a flowering stalk. Garlic mustard is an example of an invasive biennial.

Biota

[byu-OH-tuh]

n. all the plants (flora) and animals (fauna) of a particular region

Jargon Unplugged

The biota of the Eastern Region of the United States includes native, non-native, and invasive species (i.e., all flowering plants, non-flowering plants, animals, fungi, and microbes).

Cathartic

[ka-THAR-tik]

adj. inducing the purging of the intestines, especially a laxative

Jargon Unplugged

When a bird eats buckthorn berries, it gets a severe case of diarrhea. The diarrhea causes the bird to become dehydrated and prevents it from getting the nutrition it needs to survive. Unfortunately, birds quickly spread buckthorn seeds when they eat the cathartic berries.

Co-carcinogen

[CO-kar-SIN-uh-jen]

n. a substance or factor that will not promote cancer by itself, but can make cancer-causing agents more powerful

Jargon Unplugged

The latex that oozes out of leafy spurge plants can cause severe dermatitis in humans and animals. The sap is also a co-carcinogen.

Defoliate

[dee-FOE-lee-ate]

v. to deprive of leaves, especially prematurely

Jargon Unplugged

Gypsy moths are an invasive insect pest of northeastern forests. Each summer, the hungry larvae can defoliate over 500 species of trees and shrubs covering thousands of acres.

Endemic

[en-DEM-ik]

adj. native to a particular area or region

Jargon Unplugged

We consider most plants and animals native to the United States if they were present here before European settlement. Chickadees are endemic to New York state. Starlings, which people introduced in the 1800s, are not endemic.

Eradicate

[i-RAD-uh-kate]

v. to eliminate

Jargon Unplugged

Because invasive species damage native habitats, many people would like to eradicate them from natural areas.

Flavivirus

[FLAY-veh-VI-russ]

n. a disease-causing virus that is carried by arthropods (e.g., yellow fever virus, St. Louis encephalitis virus, and dengue virus)

Jargon Unplugged

Plants and animals aren't the only invasive species that should be cause for concern. West Nile Virus is an invasive flavivirus from Africa, Europe, and the Middle East that spreads to humans through mosquitoes.

Forage

[FOR-idge]

n. food for domestic animals; fodder; animal food for browsing or grazing

Jargon Unplugged

Most domestic animals eat non-native forage such as timothy hay, wheat, and oats.

Fragmentation

[FRAG-men-TAY-shun]

n. a type of asexual reproduction that occurs when part of a parent plant breaks off and begins to grow independently

Jargon Unplugged

When boat motors cut hydrilla into pieces, the pieces can form new plants. Fragmentation enables hydrilla to be extremely invasive.

Frass

[frass]

n. debris or excrement produced by insects

Jargon Unplugged

When gypsy moth caterpillar populations are extremely high, you don't have to look hard to find the caterpillars. Simply stand still in the forest. You will be able to hear the caterpillars munching on leaves! Not only that, their frass sounds like rain falling to the ground!

Homogocene

[hoe-MODGE-a-scene]

adj. relating to the current period marked by a blending of species around the globe

Jargon Unplugged

Some scientists call the current geological period the Homogocene Era because invasive species are blurring the distinctions between natural communities. If this trend continues, scientists fear that a small number of very aggressive plants and animals will dominate the world's ecosystems.

Invasive

[In-VAY-siv]

adj. tending to invade healthy habitats

Jargon Unplugged

Not all non-native species are invasive. However, when a non-native species invades a natural area, spreads rapidly, and displaces native species, it is an invasive species.

Monoculture

[MON-oh-CUL-chure]

n. a community consisting of only one species

Jargon Unplugged

When garlic mustard invaded the forest, it outcompeted the native understory vegetation and left behind a monoculture of garlic mustard.

We also cultivate monocultures of non-native wheat, rice, oats, and other crops.

Native

[NAYT-iv]

adj. naturally occurring in a specific area, not introduced

Jargon Unplugged

Scientists consider most plants and animals native to the United States if they were present in a given area before European settlement. These species are adapted to local growing conditions, including predators and climate. Prairie cordgrass is native to wet prairies in Illinois.

Naturalized

[NACH-ruh-LYZED]

adj. occurring without the aid and/or benefits of cultivation

Jargon Unplugged

People brought Queen Anne's lace here from Europe. Now it grows in fields, ditches, fencerows, and pastures without any help from people. It is a naturalized plant that is common throughout eastern North America.

Nonindigenous

[NON-in-DIDGE-uh-nuss]

adj. not found living naturally in a particular region or environment

Jargon Unplugged

Nonindigenous species come from other parts of the country or the world. While the wild boar is native in its home countries in Eurasia, it is a nonindigenous species here in the United States.

Non-native

[non-NAYT-iv]

adj. not originating in a particular place or vicinity

Jargon Unplugged

Every species is native to somewhere! When people introduce a species native to one part of the world into a new area, it is considered a non-native species in that area. Black locust, which is native to southern Ohio, is a non-native species in northern Ohio.

Noxious

[KNOCK-shus]

adj. harmful or destructive to agriculture or human health

Jargon Unplugged

Scientists placed giant hogweed on the federal noxious weed list because of its potential menace as a public health hazard. Because it is a noxious weed, people cannot legally sell, trade, or plant giant hogweed.

Palatable

[PAL-uh-uh-bull]

adj. tasty or edible

Jargon Unplugged

If leafy spurge leaves were palatable, livestock might be more likely to eat them. Because livestock do not eat them, leafy spurge thrives while livestock consume the diminishing numbers of native plants.

Photodermatitis

[FOE-toe-dur-muh-TIE-tiss]

n. inflammation of the skin caused by exposure to ultraviolet light

Jargon Unplugged

Wild parsnip sap sensitizes the skin to ultraviolet radiation. This can result in severe blistering and painful photodermatitis. Because the inflammation is caused by plant juices, it is called phyto-photodermatitis.

Prolific

[pruh-LIF-ik]

adj. producing abundant quantities of young or fruit

Jargon Unplugged

One female zebra mussel can produce 30,000 to 1,000,000 eggs in one year. Because they are so prolific, they can outcompete other aquatic organisms.

Propagule

[PROP-uh-GYOOOL]

n. a vegetative portion of a plant, such as a bud or other offshoot, that is capable of forming a new plant

Jargon Unplugged

Hydrilla plants produce turions (dormant buds) on the stems and tubers on the roots. These propagules can easily develop into new plants. Both turions and tubers help hydrilla spread rapidly.

Seed bank

n. seeds that lie dormant in the soil until conditions are right for germination

Jargon Unplugged

One reason it is so hard to get rid of invasive plants is that the seeds can lie dormant in the soil for years. Control efforts must continue until all the seeds have germinated and the seed bank is exhausted.

Weed

n. a plant growing where it is not wanted

Jargon Unplugged

Homeowners plant cornflowers in flowerbeds to beautify their homes. They carefully remove dandelions and other weeds so the cornflowers look nice. If the cornflowers escape into nearby natural areas, ecologists consider them invasive weeds. Weeds can be native species or non-native species.



Hints:

1. Be sure you are familiar with the terms used in the problem. While most logic problems contain everything you need to solve them, it will help you to know the definitions of the words in italics. See page 33.
2. While every clue gives you information, not every clue gives you information needed to solve the problem! Try to sort out the clues that help you solve the problem and focus on them.
3. Read the clues several times. Each time you will probably pick up another hint or connection.

Invasive Logic Problem

It was a beautiful summer day, so Ashley decided to go for a walk. She lived in northern Ohio and often walked along the country roads near her home. On her walk, she saw six plants. When she returned home, she identified the plants and, to her dismay, discovered that all of them were invasive species! People had introduced most of them from other locations. The plants had done well in northern Ohio, and now they were completely naturalized. They had done so well, in fact, that not only were they reproducing rapidly without the aid of cultivation, they were taking over the landscape! Can you name the plants she saw, their native country/region, and their invasive category in northern Ohio?

1. Black locust, crown vetch, the plant on the *invasive species watch list*, the *targeted invasive species*, and the plant from southeastern Eurasia are all non-native invasive species.
2. The *noxious weed* has been in North America for about 400 years. It probably arrived here in soil ballast.
3. The plant from central Europe arrived in North America as a contaminant in hay.
4. The shrub from Eurasia is common buckthorn.
5. Canada thistle, the plant on the *invasive species watch list*, black locust, the *targeted invasive species*, and the plant from Europe are all naturalized in northern Ohio.
6. Starting in the 1950s, road crews planted crown vetch in the ditches and along the steep slopes of new highway construction. Unfortunately, crown vetch is now an *established invasive species* in many parts of North America, including Ashley's community.
7. Box elder has grown naturally in northern Ohio for as long as there have been records.
8. The plant that is native to southern Ohio is a *regional invasive* in northern Ohio. Farmers planted it because it could fix nitrogen in the soil, and the wood made strong fenceposts.
9. The plant from southeastern Eurasia is a *noxious weed*.
10. Spotted knapweed is present in several Ohio counties. Ecologists are concerned that it will become as invasive here as it is in other states.
11. The plant from Europe grows quickly and spreads rapidly, making it ideal for controlling soil erosion.
12. Most native species are not invasive. However, the plant that is native to northern Ohio is a *native invasive* in disturbed areas.

13. Even though the plant from southeastern United States is a native of southern Ohio, it is not native to northern Ohio.
14. It is illegal to sell, trade, or plant Canada thistle.
15. One of Ohio's *targeted invasive species* is a shrub from Eurasia. Nurseries still sell these shrubs as ornamentals even though they are highly invasive.

Solving the Problem

There are two ways to solve the problem. The table method is often simpler, but the grid method is more foolproof!

- **Table Method** - Cut out small pieces of paper and write one piece of information on each paper. For this problem, you will need 18 pieces of paper (i.e., 6 with plant names, 6 with invasive categories, and 6 with countries/regions of origin). Then make a table to keep track of the clues. As you uncover information, place the pieces of paper in columns and rows to reflect what you know and don't know.
- **Grid Method** - Make a grid like the one shown below. Your goal is to isolate the solution by eliminating all other possibilities. Use an "X" to indicate that you have ruled a possibility out. Use an "O" to indicate that you have deduced a possibility to be true. When you place an "O", remember to "X" all the other boxes in the same row and column! Also, be sure to transfer information to both of the "region" grids whenever possible.

	noxious weed	established invasive	targeted invasive	invasive species watch list	regional invasive	native invasive	central Europe	Eurasia	Europe	northern Ohio	southeastern Eurasia	southeastern United States
black locust												
box elder												
Canada thistle												
common buckthorn												
crown vetch												
spotted knapweed												
central Europe												
Eurasia												
Europe												
northern Ohio												
southeastern Eurasia												
southeastern United States												

Definitions

Native or indigenous species have been present in a region for a long time. Ecologists consider a species native to North America if it was here before European settlement. Synonym: indigenous

Non-native species are not native or naturally occurring within a defined geographic area. Synonyms: nonindigenous, exotic, alien

Naturalized species are non-native species that can survive outside of their native range without the aid and/or benefits of cultivation. This means they regularly reproduce in the wild, they spread and multiply to some degree, and their populations persist over time.

Invasive species are naturalized, non-native species that invade native communities. Invasive species display rapid growth and spread, reproduce at high levels by producing many offspring (seeds or young), establish over large areas, persist, outcompete native species, and disrupt ecological processes.

Noxious species are invasive species that pose a risk to human health, agriculture, commerce, or wildlife resources. Noxious species cannot be sold, traded, or planted. Some plants are on a federal noxious weed list; others are on state, county, or community lists.

Targeted invasive species are invasive species that a country, state, or community is actively trying to control. The goal with these species is to prevent them from entering an area, stop them from spreading any further, or, ideally, to eliminate existing populations.

Plants on an **invasive species watch list** are known to be highly invasive and difficult to control in neighboring areas. Ecologists place them on a watch list until they can determine their local distribution and invasiveness.

Established invasive species have been present in an area for an extended period. There is little possibility of removing them. Often efforts focus on preventing their spread to new locations.

An **invasive native** is less common than a non-native invasive is, but it is possible. Sometimes a native plant becomes invasive when a site becomes disturbed or other local conditions change.

A **regional invasive** is a species that is native to the country, but not native to the local area. Species can naturally extend their ranges. However, ecologists use the term regional invasive to refer to a species that people moved into a new area, either accidentally or intentionally.



purple
loosestrife

Solution

There are many ways to solve the problem. If students are stuck, give them parts of the solution and allow them to try again. The order that clues are incorporated doesn't matter. Here is one way to use the clues to solve the problem.

The five plants that are non-native invasive species are in the first clue (1). The sixth plant is box elder that grows in northern Ohio, as well as other parts of eastern and central United States (7).

black locust		
crown vetch		
	invasive species watch list	
	targeted invasive species	
		southeastern Eurasia
box elder		northern Ohio

The plant from southeastern Eurasia is a noxious weed (9), and Canada thistle must be the noxious weed because it is illegal to sell, trade, or plant it (14). Crown vetch is an established invasive species (6).

black locust		
crown vetch	established invasive	
	invasive species watch list	
	targeted invasive species	
Canada thistle	noxious weed	southeastern Eurasia
box elder		northern Ohio

The targeted invasive species is a shrub from Eurasia (15), and the shrub from Eurasia is common buckthorn (4).

black locust		
crown vetch	established invasive	
	invasive species watch list	
common buckthorn	targeted invasive species	Eurasia
Canada thistle	noxious weed	southeastern Eurasia
box elder		northern Ohio

The plant from southern Ohio is a regional invasive (8, 13). There is only one place in the table this information can fit. That means, unless you figured this out long ago, box elder is the invasive native (7, 12), and spotted knapweed is the plant on the invasive species watch list (10).

black locust	regional invasive	southeastern United States
crown vetch	established invasive	
spotted knapweed	invasive species watch list	
common buckthorn	targeted invasive species	Eurasia
Canada thistle	noxious weed	southeastern Eurasia
box elder	invasive native	northern Ohio

The plant from Europe is used to control soil erosion (11), and crown vetch was used for this purpose (6). So, by process of elimination, you have solved the puzzle!

black locust	regional invasive	southeastern United States
crown vetch	established invasive	Europe
spotted knapweed	invasive species watch list	central Europe
common buckthorn	targeted invasive species	Eurasia
Canada thistle	noxious weed	southeastern Eurasia
box elder	invasive native	northern Ohio

You didn't need clues 2, 3, and 5 to solve the problem. However, clue 5 would be a good test to be sure you are on the right track.

Activity Crosswalk

	Activities	The Salamander Room	Web of Life	Freeze Frame	There's a Hair in My Dirt!	Jargon Unplugged
Target Audiences	Preschool - Grade 1	■		■		
	Grade 2 - 4	■	■	■		
	Middle School		■	■		■
	High School			■	■	■
	Adult			■	■	
Subject Areas	Science	■	■		■	■
	Social Studies				■	■
	Math					
	Language Arts	■			■	■
	Fine Arts			■		
Primary Teaching Methods	Hands-on Investigation			■		
	Game/Simulation	■	■			■
	Creative Expression			■		
	Analysis/Synthesis				■	■
	Discussion/Ethics				■	
	Story	■			■	
	Dramatic Presentation					
Logistics	Inside	■	■		■	■
	Outside		■	■	■	
	Time	10-20 min.	10-20 min.	10-30 min.	45-60 min.	20-40 min.
	Group Size	maximum 20 preferred	maximum 30, divided into groups of 8-15	maximum 30, 10-15 preferred	10-20 preferred	maximum 30, divided into groups of 3 - 10

	Activities	The Salamander Room	Web of Life	Freeze Frame	There's a Hair in My Dirt!	Jargon Unplugged
Key Messages	Biodiversity	■	■	■	■	
	Identification/Adaptations		■			
	Prevention					
	Early Detection/ Rapid Response					
	Control/Management/ Restoration					
NWIS	Aquatic Ecosystems		■	■	■	■
	Terrestrial Ecosystems	■		■	■	■
	Invasive Plants		■	■	■	■
	Invasive Animals		■		■	■
Instructor's Knowledge	Miminal Background	■		■		
	Average		■			■
	Advanced Knowledge				■	