WAYNE COUNTY
SOIL & WATER CONSERVATION DISTRICT

INVASIVE SPECIES ACTIVITY WORKBOOK

Resource for Educators

Top: Water chestnut, center: Japanese knotweed, bottom: Hydrilla

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

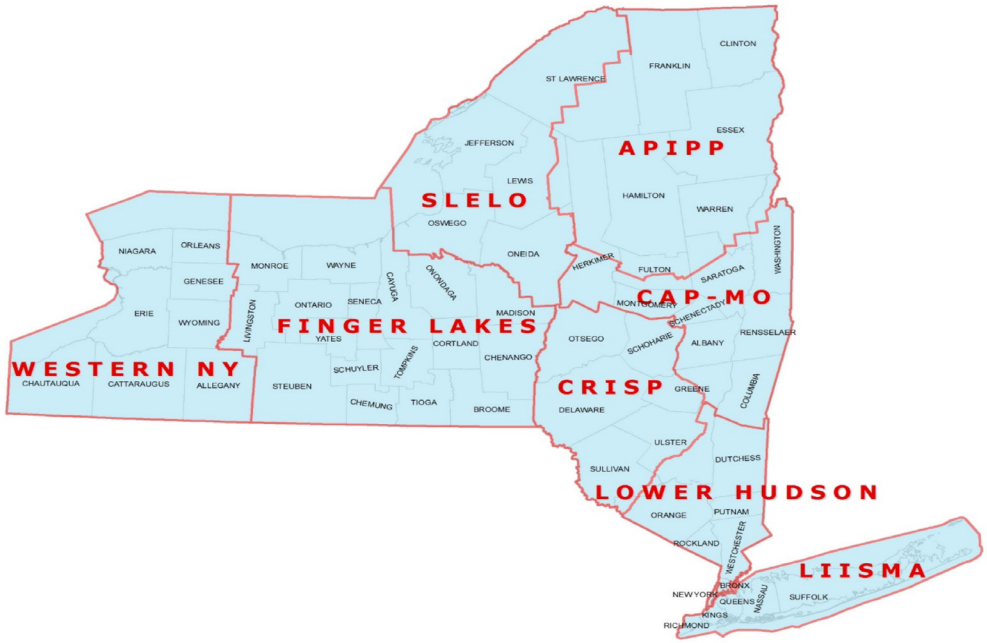
HOBART AND WILLIAM SMITH COLLEGES
FINGER LAKES INSTITUTE

FINGER LAKES PRISM
Partnership for Regional Invasive Species Management

Finger Lakes Partnership for Regional Invasive Species Management (PRISM)

Mission Statement:

To reduce the introduction, spread and impact of invasive species within the Finger Lakes PRISM region through coordinated education, detection, prevention and control measures.



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The Invasive Species Activity Guide was produced with a grant from the USFWS and NYS DEC in partnership with Finger Lakes PRISM and Finger Lakes Institute at Hobart and William Smith College, Wayne County Soil and Water Conservation District and the Finger Lakes - Lake Ontario Watershed Protection Alliance (FLLOWPA)

What is an invasive species?

An **invasive species** is defined as a species that is non-native to the ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Economic:
Impacts on agriculture food and fiber sources, recreation, wood/ forest products, trade/shipping, tourism, utilities (power plants) and management costs.

Environmental:
Impacts on biodiversity, food chains, structural diversity, natural processes, aesthetics, ecosystem function and services.

Human Health:
Impacts on soil, water and air quality, flooding, injury, and disease/illness.

- Invasive species effect biodiversity in ecosystems and threaten native species by outcompeting for food and habitat.

- Invasive species have no natural enemies, a high rate of reproduction and great adaptations that help to increase survival in the harshest of conditions.

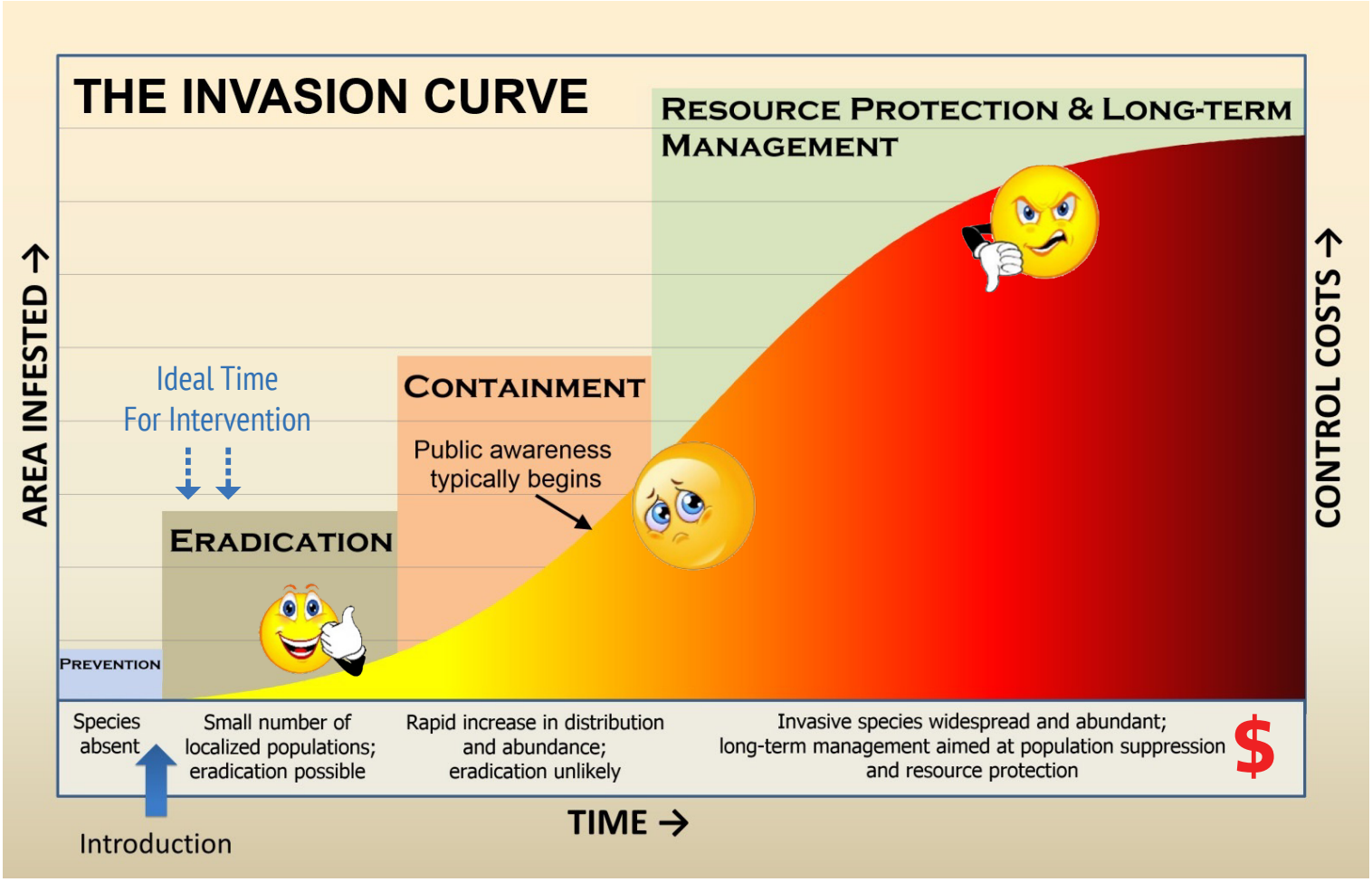
Know - Observe- Report

The Invasion Curve:

Understanding How to Manage Invasive Species

Non-native species often spread quickly. Research and monitoring can help anticipate which species will cause harm before it is too late to remove them. Identifying where a species is on the invasion curve is the first step to taking management action.

The invasion curve shows that eradication of an invasive species becomes less likely and control costs increase as an invasive species spreads over time. Prevention is the most cost-effective solution, followed by eradication. If a species is not detected and removed early; intense and long-term control efforts will be unavoidable.



Lesson Length:

20 minutes, great as an ice-breaker or introductory activity

Lesson Materials:

Printed set of Invasive Species Matching Game Cards

Procedures:

1) Shuffle cards and hand out to students

2) Students will be matching cards with an invasive species to the way that invasive species is spread

3) Once students find their match, have the students work with their match to:

   a. Describe/brainstorm how the invasive species is spread by human activity
   b. Identify the type of habitat the invasive species is found
   c. Come up with ways to prevent the spread of the invasive species

Activity Objectives:

1) Become familiar with common invasive species and the role of humans in spreading or preventing the spread of invasive species

2) Identify habitats where invasive species are commonly found

3) Understand how invasive species spread, ecological impacts and measures to prevent the spread of invasive species.

Adapted from Project WILD: Aquatic WILD K-12 curriculum & activity guide

INVASIVE SPECIES MATCHING GAME
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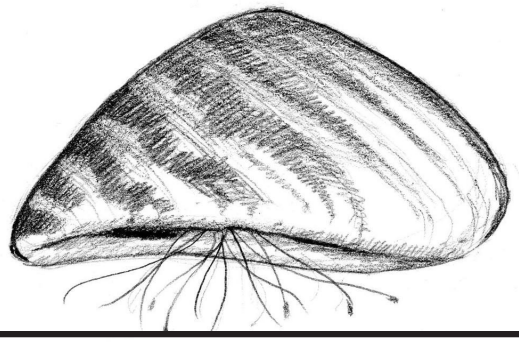
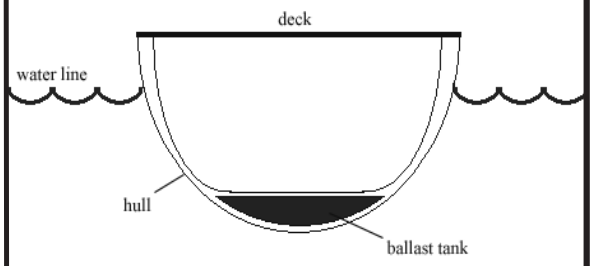
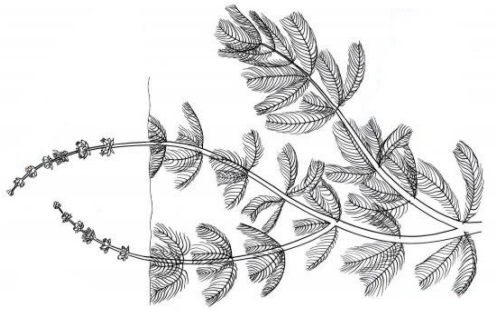
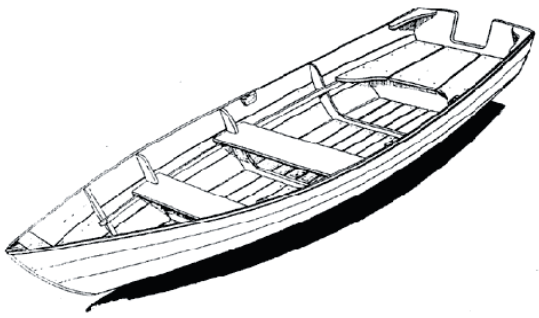
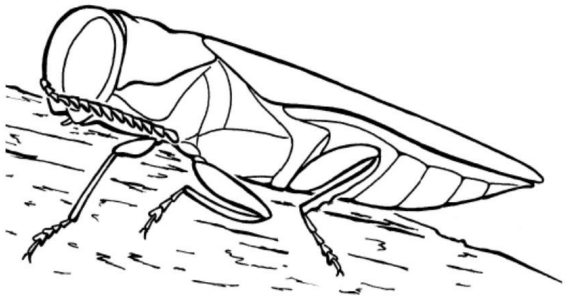
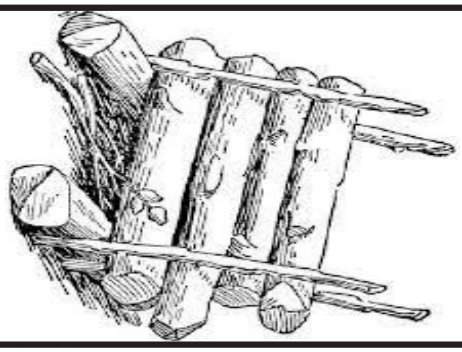
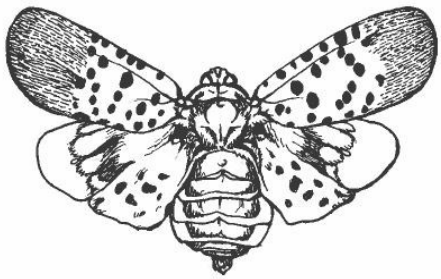
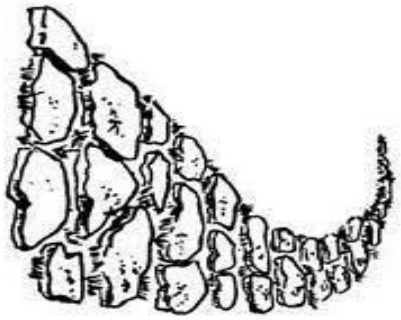
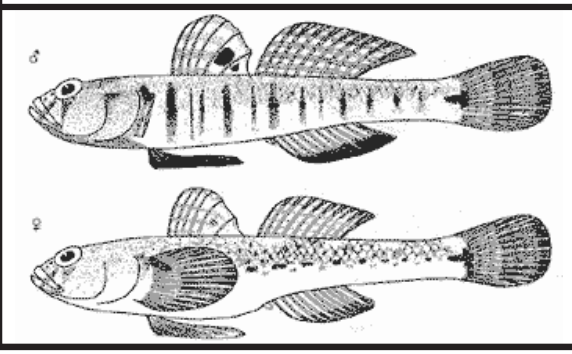
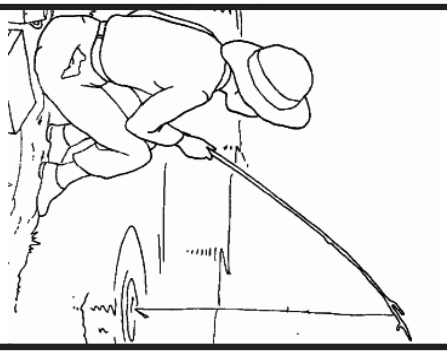
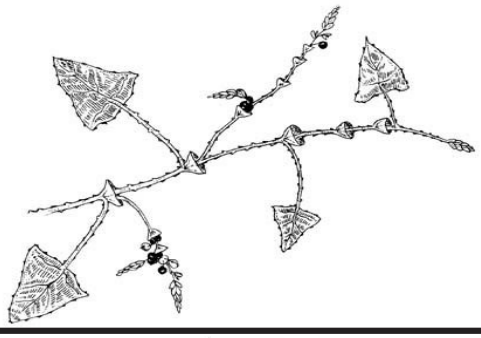
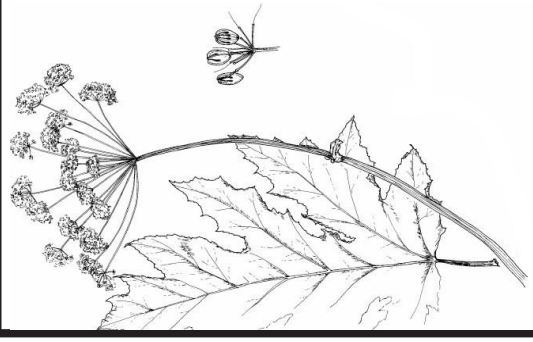
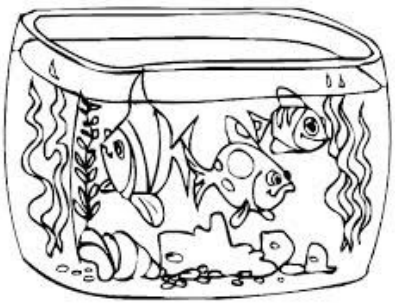
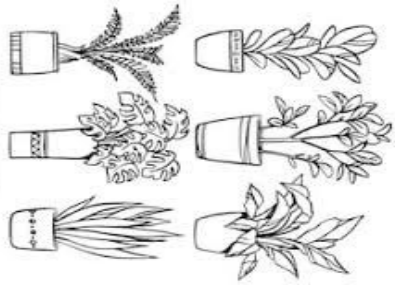
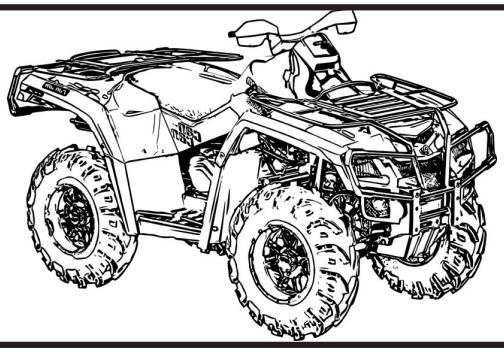
Zebra Mussel (Ballast Water)			Ballast Water (Zebra Mussels)
Eurasian Water Milfoil (Recreational Boating)			Recreational Boating (Eurasian Water Milfoil)
Emerald Ash Borer (Firewood)			Firewood (Emerald Ash Borer)
Spotted Lanternfly (Landscaping)			Landscaping (Spotted Lanternfly)
Round Goby (Fishing Bait)			Fishing Bait (Round Goby)

Hydrilla (Aquarium)	Japanese Barberry (Plant Nursery)	Swallow-wort (All-Terrain Vehicle)	Mile A-Minute **(Work Boots)**	Giant Hogweed (Backhoe Loader)
				
Aquarium (Hydrilla)	Plant Nursery (Japanese Barberry)	All-Terrain Vehicles (Swallow-wort)	**Work** Boots (Mile A-Minute)	Backhoe Loader (Giant Hogweed)
				

INVASIVE SPECIES IN THE GREAT LAKES
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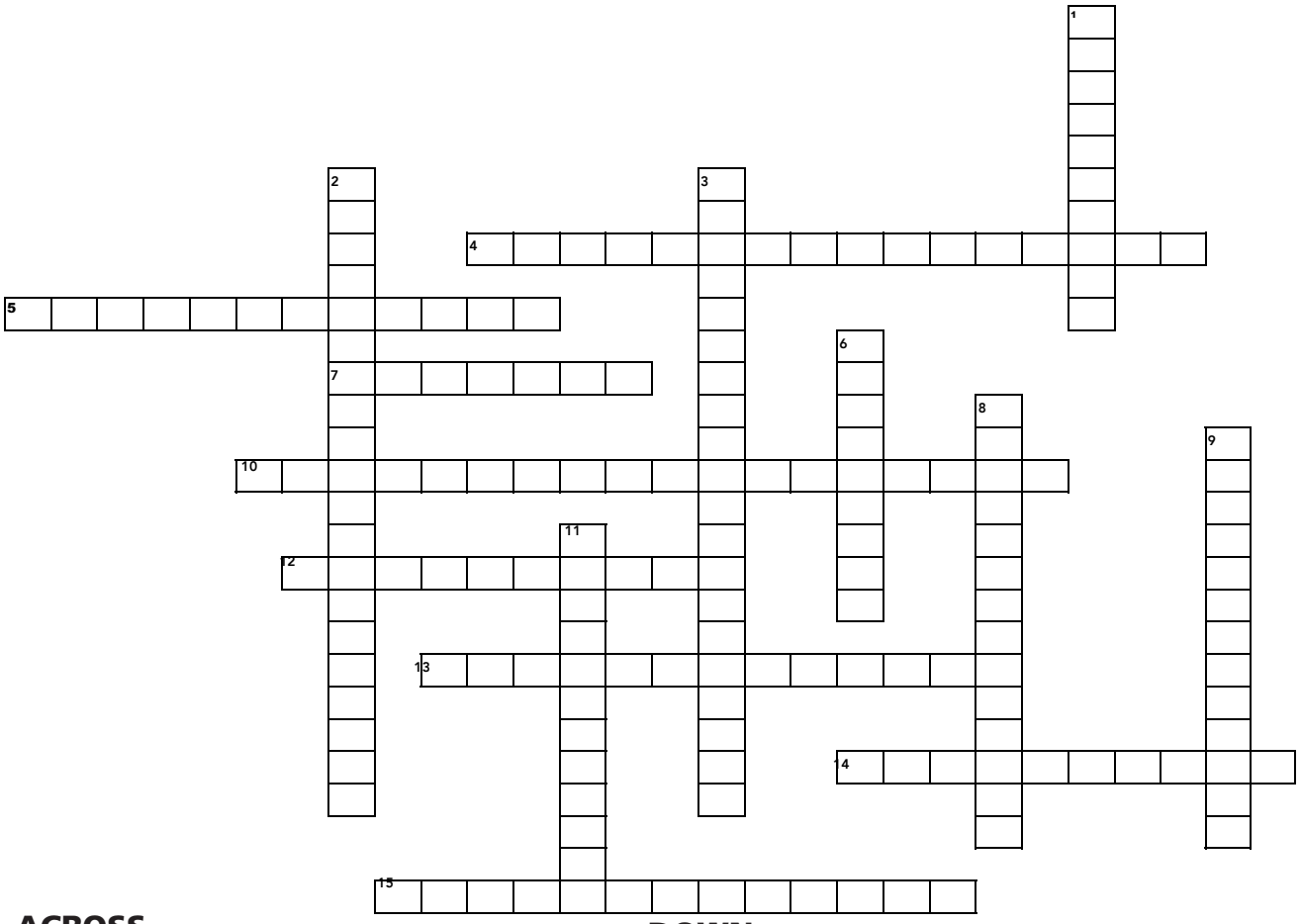

ACROSS

4. a broad shield-shaped leaves with a flat base with asparagus like stalks in the spring.

5. a small freshwater mollusk named for the striped pattern often found on its shells.

7. a small herring that is silvery blue/green in color.

10. a rotifer, which is a type of small zooplankton.

12. A group of five freshwater lakes of central North America between the United States and Canada, including Lakes Superior, Michigan, Huron, Erie, and Ontario.

13. a small fish that resembles a yellow perch with walleye markings.

14. a fish that is eel-like in appearance.

15. An aquatic Invasive species with sharp nuts.

DOWN

1. also known as Phragmites australis.

2. a plant that grows rooted to the bottom whose leaves are divided into thread-like leaflets, usually in pairs of more than 12 to 14, forming a feathery shape.

3. an invertebrate zooplankton species also called a cyclopoid copepod.

6. a small, bottom-dwelling fish with raised eyes.

8. Also known as Bythotrephes longimanus.

9. a small freshwater mollusk that has hinged shells like clams.

11. water carried in ships' ballast tanks to improve stability, balance and trim.

WORD BANK

Thermocyclops
Crassus
Sea lamprey
Ballast water
Alewife
Japanese knotweed
Eurasian watermilfoil
Common Reed
Brachionus Leydigii
Quagga mussels
Round goby
Spiny water flea
Water Chestnut
Zebra mussels
Eurasian ruffe
Great Lakes

Description: Most invasive species are incredibly adaptable and can take advantage of opportunities for invasion. However, they rarely swim across oceans, walk over mountain ranges, or hop continents without help from people! A box full of 'teasers' will help students figure out ways that people knowingly and unknowingly assist invasive plants and animals.

Getting Ready: Look through the items in the Means & Modes box and choose the ones appropriate to your audience, topic, and personal knowledge level.

Introduction: Have you ever been arrested for picking up a hitchhiker, smuggling an alien through customs, or purchasing an illegal substance? Assuming not, you're lucky! No doubt at some point in your life you have, either knowingly or unknowingly, helped a potentially invasive species enter new territory. Let's find out how invasive species get around and how we might stop giving them a hand.

Objectives:

- List everyday activities that can contribute to the spread of invasive species.
- Realize that people spread invasive species both knowingly and unknowingly.
- Analyze personal actions related to the introduction and spread of invasive species.

Means and Modes Items

Aquatics

- Bait container – What do you do with leftover bait? Have you ever dumped store-bought worms on the ground?
- Boat – How do you think a boat could move plants and animals from one body of water to another? Bilge water? Propellor?
- Ballast water?
- Aquarium fish – What happens to fish when their owners have to move and can't take their fish with them? Can fish survive a toilet flush? Is it more humane to destroy a sick pet fish or "give it a chance" in the local pond?
- Aquarium plant - What happens to these aquatic plants when someone empties an aquarium into a pond or lake?
- Rubber crayfish lure - Have you ever thrown store-bought minnows or crayfish in the water? Did you know that it is illegal in some states to be in possession of live crayfish and fishing equipment at the same time?
- Live frog habitat – What do you think might happen to these frogs when the novelty wears off?
- Bobber – Could fishing equipment transport invasive species? What are fishhook waterfleas?

Terrestrial

- Shoestring from hiking boot – How could shoestrings spread invasives? Have you ever gotten seeds stuck in your shoestrings? What did you do with them? What do you do with the mud that gets stuck in your boot tread?
- Butterfly release envelope – Where do you buy butterflies for release at weddings and other events? What happens to the butterflies after the release?

Doing the Activity

1. Select items from the box. Let students select items from the Means & Modes box. If you have more students than items, ask students to work in pairs.

2. Brainstorm connections. Ask students to think about their items and brainstorm how they might be connected to the spread of invasive species. The items in the box simply serve as springboards for ideas. There are no right or wrong answers. Encourage them to think creatively!

3. Share ideas. Allow students to share how they think their items contribute to the spread of invasives.
Note: Refrain from telling everything you know about each item. Keep the activity moving! Wrap up the activity.

Ask some of these questions on page 2 of the activity.

Activity Questions

- Certified "weed free" hay for pack animals – How could the diet of a pack animal be related to the spread of invasive species? When would you have to start feeding special hay to your pack animal before taking a trip into a restricted area?
- Dirt bike tread – How could vehicles like 4X4s, dirt bikes, and SUVs transport invasive plants? How might an "off road" or "off trail" vehicle damage the landscape? How could this damage increase the number of invasive plants?
- Landscape tag - Does this tree's name indicate that it is a native tree? Why do you think nurseries sell plants that are known invasives?
- Mailable seed packet – What are some problems with picking up seeds on vacation and mailing them to your friends? How can seeds native to one state/country be a problem in another?
- Dog – Do seeds ever get stuck in pet fur? What do you do with the seeds?
- Birdseed bag – What kinds of seeds are in birdseed? Do birds completely digest all the seeds they eat? What problems could undigested seeds cause?
- Tent stake – Have you ever had seeds or soil stuck on your camping equipment? What have you done with the seeds? What kinds of seeds do you think invasive plants might have?
- Military equipment – Military equipment is used all over the world. What kind of species could military equipment transport?
- Plane – How could the inside or outside of a plane transport invasive species?
- Luggage with bananas – People travel all over the world. What could happen if they decide to carry food items, plant specimens, seeds, or wild animals from place to place?
- Firewood – What kinds of invasive species could firewood transport?
- Livestock – How could cattle, sheep, pigs, or other livestock transport invasive species? Think about what happens to the food they ate before they were transported.
- Construction equipment – How does development add to the problem of invasive species? Besides moving invasives on tires, can you think of ways the disturbance caused by construction adds to the problems with invasives?
- Big cat – In what ways could zoos, circuses, private organizations, and individuals contribute to the problem? What kinds of animals can you purchase? How has the Internet influenced the international pet trade?
- Wooden crate – How could wood used for containers harbor invasive species?
- Carabiner – What precautions should people take when they venture into wilderness areas to participate in extreme sports?
- Tractor – How could raising crops encourage invasive species?
- Blaze orange cloth – Could hunters transport invasive species to new areas? How could hunters be sure they don't move invasives?

Wrap Up

Did this activity help you think of a time when you might have transported an invasive species? Would you share the circumstances with the group?

Now that you know more about how potential invasive species move from place to place, what will you do about it?

Can any of these pathways of invasion be controlled or stopped? How?

Do you think it is the job of the government or individuals to control the spread of potentially invasive species? Why?

Assessing Student Learning

Observe student participation in the discussion. Ask students to choose an item from the box, find out which invasive species might be spread by that item, and suggest ways to prevent the spread. For example, if you wear hiking boots in an area infested with garlic mustard, you are likely to pick up garlic mustard seeds. Thoroughly cleaning the mud off boots before leaving the infested area helps to prevent the accidental spread of seeds into new areas.

NNIS Non-native Invasive Species

Grade: 9 to Adult
Length: ***Varies from a few minutes to an entire class period, depending on purpose***
Prep: minimal

INVASIVE SPECIES WORD SEARCH
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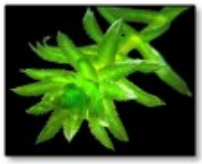
Can you catch all 12 invasive species in this word search?
Tip: Don't forget to check diagonals and ones that go backwards!

Asian Carp

Giant Hogweed

Hemlock Wooly Adelgid



Hydrilla

Quagga Mussel

Round Goby

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I	P	I	A	R	Q	M	Q	C	J	J	Z	I	I	F
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I	I	U	D	N	T	S	F	W	G	Y	N	E	W	A
R	U	S	T	Y	C	R	A	Y	F	I	S	H	T	W
H	Q	P	M	M	A	P	Z	T	I	S	C	K	H	Z

Rusty Crayfish

Spiny Waterflea

Spotted Lanternfly

Starry Stonewort

Water Chestnut

Zebra Mussel

Description

We face dilemmas every day. Sometimes we can't realize the long-term repercussions of our decisions. In this activity, students read real-life dilemmas that they might face and discuss possible solutions and consequences.

Getting Ready

1. Ensure that you have enough copies of the dilemmas for group size.

Introduction

Every day we face choices. Some of the choices are easy – like whether to eat hot or cold cereal for breakfast. Some are fun –like whether to go to a movie or just rent a DVD. Other choices seem easy and fun until you think about the consequences. Your lifestyle and the decisions you make can have negative or positive influences on the environment. The influence of one person making one decision might seem insignificant, but one decision times the millions of decisions made over a lifetime times the more than 6 billion people on the earth really adds up.

Doing the Activity

1. Divide into small groups. Give each group one or more Sticky Situation cards. You can:

- Give each group the same situation and allow time for discussion.
- Give each group a different situation and allow time for discussion.
- Give each group several situations and let them work through the dilemmas as a group.

2. Bring the class together for wrap-up discussion.

Assessing Student Learning

Create your own dilemmas. How would your friends, family members, or classmates respond to other tough challenges?Create your own dilemmas and think about what you would do. Here are some ideas to get you started:

- Jet skiing is cool – Will you ski right through the hydrilla and break it to
- pieces? Did you know that fragments of hydrilla can start whole new
- plants?
- Pets love to wander – Will you keep your pets "on leash" and "on trail"
- or will you let them run wherever they desire?
- Trails are muddy – Do you walk right through or make a new trail?
- Luck is with you – Your decoys brought in a whole flock of ducks and
- you had a successful hunt. When you haul in your decoys, will you take
- the time to clean off the aquatic plants and mud from the lines and
- anchors?
- Dreams are fulfilled – You've always wanted a prairie dog and now your
- uncle has found a source on the Internet. Will you get this exotic pet,
- even though they have been made illegal?

Objectives

- Recognize that simple choices we make on a daily basis can have a negative or positive infuence on the environment.
- Express personal opinions concerning the choices available and the consequences of those choices.

Grades

6 - 12

Group Size

Maximum 30, divided into groups of 3 - 5

Prep Time

Minimal

Activity Time

10 - 50 minutes

Setting

Anywhere

Materials in Kit

- laminated *Sticky Situation* cards (3 sets of 8 cards)

Materials in Booklet

- *Sticky Situation* cards to copy if you don't have the kit

National Education Standards

Grades 6 - 8

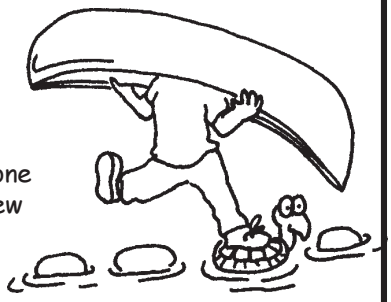
- Environmental Education: 2.4.A - Human/Environment Interactions
- Environmental Education: 4.D - Accepting Personal Responsibility
- Social Studies: IX - Global Connections (d)

Grades 9 - 12

- Environmental Education: 2.3.A - Individuals and Groups
- Environmental Education: 4.D - Accepting Personal Responsibility
- Science: F - Environmental Quality
- Social Studies: IX: Global Connections (d and h)

Sticky Situation 1

Your family loves to canoe camp. Your favorite thing to do is travel from one lake to another. You don't mind the portages, but your dad's obsession with cleaning all the vegetation and aquatic animals off the canoe is driving you crazy. He even makes you clean the mud off your shoes! Now you are old enough to canoe on your own with some friends. You are leaving one lake for a new one. Do you clean the canoe?



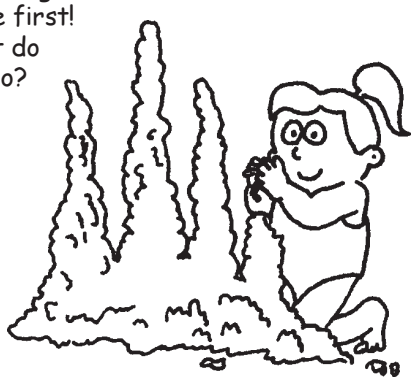
OK, maybe dads can be a little unreasonable at times, but this time Dad has the right idea. Non-native plants and animals move easily from lake to lake on you, your shoes, clothes, packs, tents, canoes, pets, bait buckets, and anything else you use. If everyone was as careful as your dad, we might be able to control the spread of non-natives like zebra mussels, Eurasian milfoil, and spiny water fleas.

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 2

You can easily see the trail with switchbacks leading down to the shore. The sign says, "Please stay on the trail." Your friends have just taken a well-used shortcut that heads straight for the water. They are going to get there first! What do you do?



Shortcuts are tempting! But the plants growing on shores protect the area and provide valuable habitat. Taking shortcuts increases shoreline erosion. But that's not all! Once the native plants along the shoreline have been disturbed, the likelihood of invasive plants taking root is much higher.

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Sticky Situation 3

You've always wanted to see a desert and now here you are! The colors, shades, and textures are like nothing you've ever experienced. Could the perfect souvenir help you keep this feeling forever? You look around and several things catch your eye: a cactus blooming in the morning sun, a lizard racing across the sand, a spider hanging from a cactus. What should you take home to capture this moment?

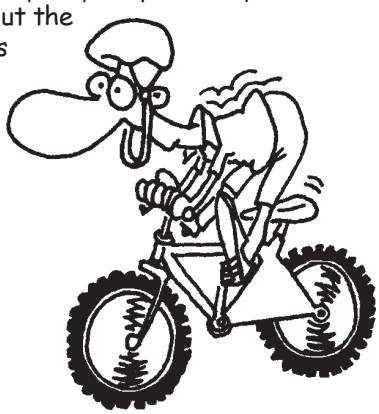
Whoa, let's think this through. If everyone who visited the desert took "something special" home, what would be left? And that's only half the problem! Fast forward a few months or years. What are you going to do with that plant or animal when you get tired of taking care of it, it gets sick, or it escapes? What might happen if you plant it in your garden or set it free outside? Have you considered a nice photo?

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 4

You're out mountain biking with friends. After that last gravity check, you and your bike are covered with dirt, plants, and blood. You're bonked, so you pack up the bike until another day. You'll go home and do a mud-ectomy on your poor body. But what about the bike? It's covered with mud too!



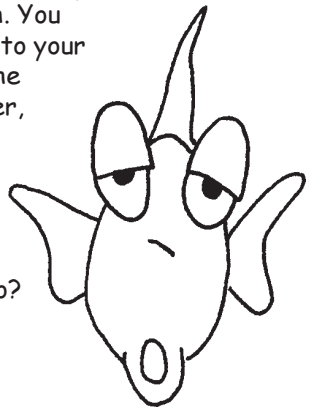
*Bike trails are usually disturbed areas - often with a lot of weedy vegetation. Your bike isn't **just** muddy! It's a moving seed catalog. To avoid carrying seeds and plant parts to other areas, you should clean the bike thoroughly. Even the tread. Be especially careful when moving the bike from one part of the country to another or when traveling into natural areas on bike trails. Oh, and stay on the trails so you don't thrash the surroundings.*

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 5

You and your family are moving across the country. While your parents promised that you could restock your aquarium after the move, they won't let you move your fish. You offered them to your best friend, the science teacher, and a dozen other people. No one is interested. Now what are you going to do?



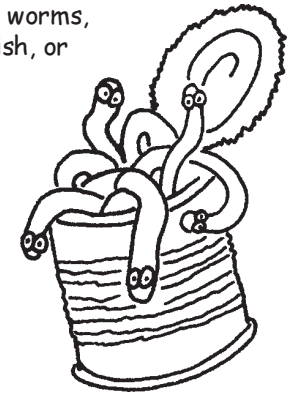
You might be tempted to release them in a local waterway. At least, you figure, they would have a chance. The truth is that they will either quickly die, or they will survive and pose a risk to the plants and animals already living there. If you can't find a hobbyist, museum, zoo, nursing home, school, or anyone to take care of them, try to return them to the store for resale or trade. If that doesn't work, don't be tempted to bury them at sea! Ask a vet to put them to sleep or place them in water and put them in the freezer. This is considered a humane method of euthanasia.

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 6

Your family likes to joke that you knew how to fish before you could walk. While you prefer lures, you enjoy experimenting with live bait. But at the end of the day, you are never quite sure what to do with leftover worms, larvae, crayfish, or minnows. One friend just dumps them in the water. What will you do?



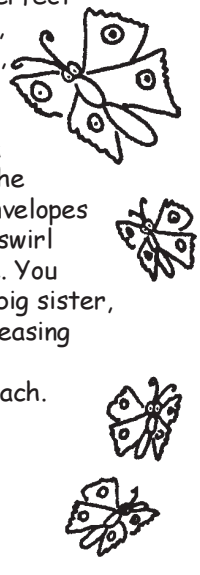
If your friend jumped off a bridge, would you do that too? First, think about where you got the live bait. If you caught it yourself in the spot where you are fishing, it's ok to return it to the water. If you bought the bait at a bait shop or collected it from any other body of water, then you should dispose of any leftover bait in the trash. Never dump leftover worms on the ground. Improper disposal of live bait is one way that invasive species are spreading.

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 7

Your big sister is finally getting married to that guy she's been dating forever. Of course, they want the perfect wedding: garden setting, string quartet, black tie, sunset. Your "job" is to give each guest a small envelope that contains a live butterfly. On cue, the guests will open their envelopes and the butterflies will swirl around the happy couple. You want the best for your big sister, but something about releasing butterflies is giving you butterflies in your stomach. What do you do?



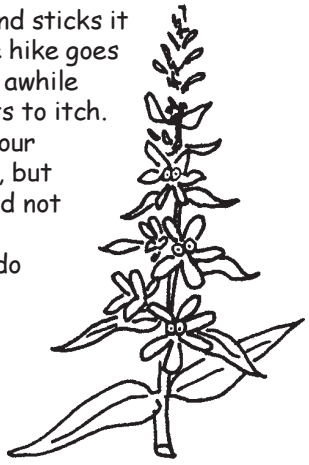
You have good reason to be concerned. Ask your sister to find out about the butterflies she is planning to release and to read about potential problems with releases. Are the butterflies from a licensed butterfly breeder? Is it likely to be warm and sunny when they are released? Is the butterfly species native to the area? If not, they shouldn't be released. Even species that are native to the area but raised from butterflies collected somewhere else can be a problem. When the released butterflies mate with local butterflies, they introduce genes that are not adapted to local conditions. Is her "perfect wedding" more important than the lives of local butterflies?

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

Sticky Situation 8

You and your family are taking a long hike into the forest. Dad parks at the trailhead and everyone gets ready to go. Just off the parking lot, there is a beautiful purple flower. Your mom picks one and sticks it in your hair. The hike goes great, but after awhile the flower starts to itch. You carry it in your hand for a while, but it's all droopy and not that beautiful anymore. What do you do with it?



If you guessed that the weed might be purple loosestrife, you could be right. You don't know for sure. It could be invasive; it could be endangered. However, invasives are a lot more common around parking lots where the soil has been disturbed and there is a lot of human activity. Now that you are far from the source, don't drop it on the ground and spread its seeds. Put it in a bag and throw it in the trash when you get home. Remember: It would be best not to pick any wildflower. Period.

Non-native Invasive Species Learning Kit - United States Forest Service - Eastern Region

NNIS Non-native Invasive Species

WANTED

Invasive Species Name: _____

(add photo or sketch)

This invasive species is originally from: _____

How does this invasive species spread? _____

_____

Describe the habitat that this invasive species lives in.: _____

_____

_____

Where is this invasive species found in the United States? _____

_____

What are the threats/impacts from this invasive species? _____

_____

Lesson Length:

Two (2) 40 minute sessions, indoors
(less time needed if background on invasive species is not needed)

Program Materials:

Printed "Wanted Poster" template
Computer for electronic access to field guides for background information
Finger Lakes Field Guide* (pdf) http://fingerlakesinvasives.org/resources/field-guides/)

**Note- The field guide is a large file, if printing, only print selected invasive species. Introductory information about invasive species, if needed. A printed field guide is available by request.*

Procedure:

1) If needed, share background information about invasive species:
   a. What is an invasive species?
   b. What are examples of some invasive species?
   c. What can we do?
2) Have each student or pair of students choose one of the common invasive species for your region (see link above for Finger Lakes Field Guide)
3) Students will investigate background information about the invasive species
4) Using the information from the background research, students will create a "Wanted Poster" with the following information:
   a. Name of invasive species.
   b. A photo or sketch of the invasive species.
   c. Where the invasive species originally came from?
   d. How does this invasive species spread?
   e. A description of the habitat the invasive species lives in.
   f. Where is it found in the United States?
   g. What are the impacts/threats of this invasive species?

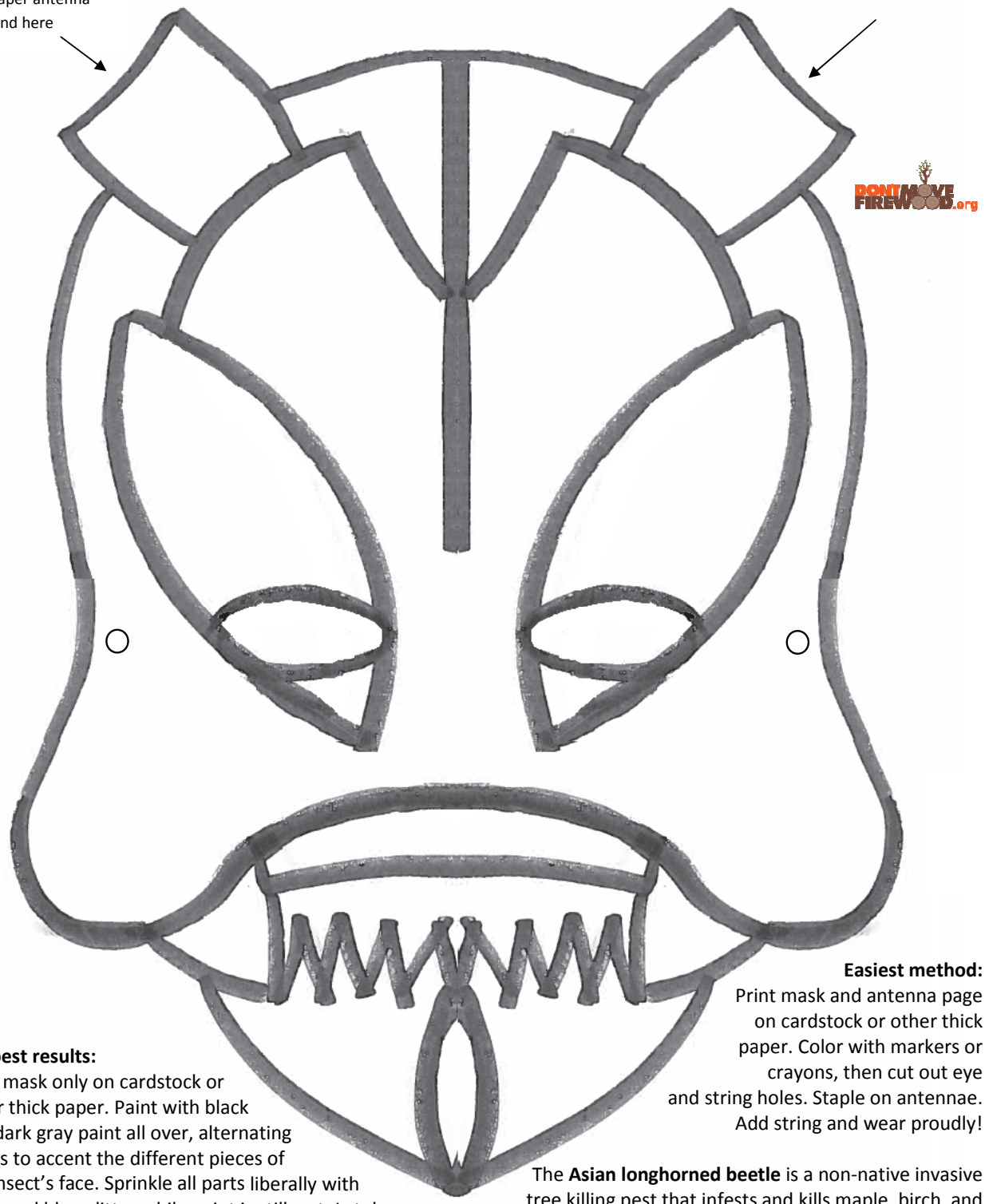
Activity Objectives:

1) Become familiar with common invasive species.
2) Identify habitats where invasive species are commonly found.
3) Understand how invasive species spread, ecological impacts and measures to prevent the spread of invasive species.

INVASIVE SPECIES MASK
Page 1 of 2

Staple pipe cleaners or paper antenna behind here

Asian longhorned beetle mask



For best results:
Print mask only on cardstock or other thick paper. Paint with black and dark gray paint all over, alternating colors to accent the different pieces of the insect's face. Sprinkle all parts liberally with silver and blue glitter while paint is still wet. Let dry. Attach twisted white and black (or pale blue and black) pipe cleaners to emerge from top as show. Cut out eye and string holes. Add string and wear proudly!

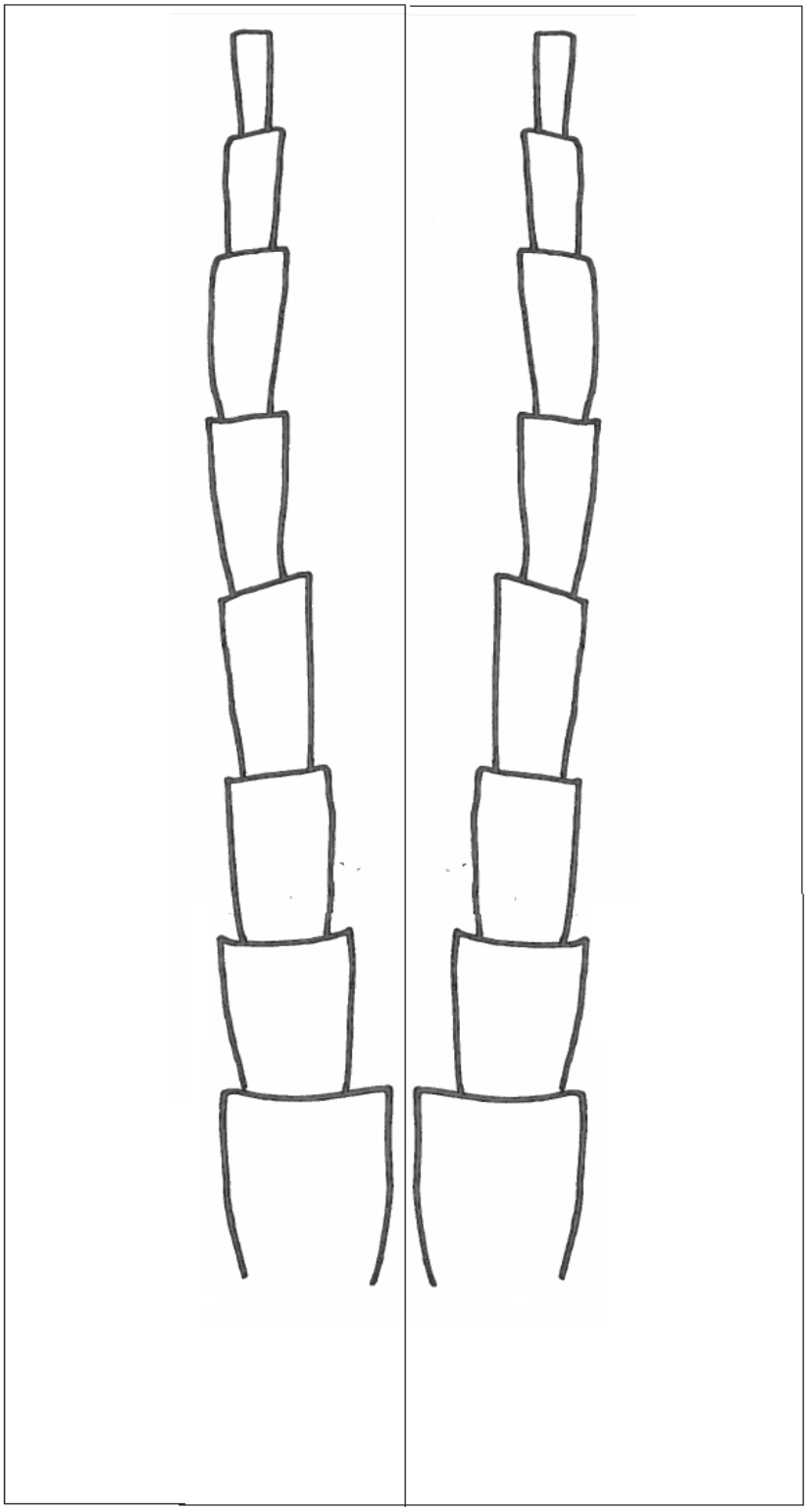
Easiest method:
Print mask and antenna page on cardstock or other thick paper. Color with markers or crayons, then cut out eye and string holes. Staple on antennae. Add string and wear proudly!

The **Asian longhorned beetle** is a non-native invasive tree killing pest that infests and kills maple, birch, and other deciduous trees. You can prevent the spread of this pest by buying local firewood, or certified heat-treated firewood before you go.

Don't Move Firewood has made several bug masks for you to use with your forest pest and pathogen outreach. To find these masks and lots more, visit **Don't Move Firewood** at **dontmovefirewood.org**, or email **info@dontmovefirewood.org**

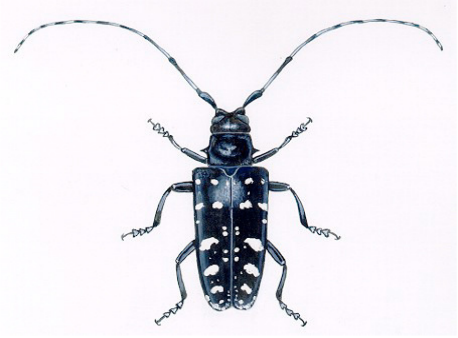
INVASIVE SPECIES MASK
Page 2 of 2

Antenna page: Print out this page if you do not have pipe cleaners available.



Instructions:

Cut out each rectangle; do not follow contour of the antenna, it will be too floppy for the mask. Color antenna segments- white or blue on the bottom of each segment and black on the top of each segment. Fold the rectangle in half lengthwise, and staple the long thin rectangle shut. Staple antennae onto mask using the white space at the bottom.



approximate actual size

The Asian longhorned beetle is ¾" to 1 ½ " long with antennae longer than their body. They are very shiny and often have a powder blue color on their feet.

To learn more, visit **asianlonghornedbeetle.com**

Report any beetles you see that may be the Asian longhorned beetle at asianlonghornedbeetle.com or 1-866-702-9938

Don't Move Firewood has made several bug masks for you to use with your forest pest and pathogen outreach. To find these masks and lots more, visit **Don't Move Firewood** at **dontmovefirewood.org**, or email **info@dontmovefirewood.org**

INVASIVE SPECIES

SCAVENGER HUNT

Can you identify these invasive species?

Ok, here's the plan

1. Students will identify invasive plant species in a given site boundary, such as a park or around school.
2. Students will discuss the effects of invasive species on the land and water.
3. Students will explain how invasive plant species spread.
4. Students will use a GPS device or the IMAP Invasives app to make the GPS location for where the plants are located.

*i*MapInvasives

Name:_____

GPS Location: _____

Site Boundary _____

_____

Name:_____

GPS Location: _____

Site Boundary _____

_____

INVASIVE SPECIES SCAVENGER HUNT
Page 2 of 2

Name:_____

GPS Location: _____

Site Boundary _____

_____

Name:_____

GPS Location: _____

Site Boundary _____

_____

Name:_____

GPS Location: _____

Site Boundary _____

_____

Name:_____

GPS Location: _____

Site Boundary _____

_____

Objectives

Exercises in this lesson help students achieve the following objectives:

- Understand how wind disperses weed seeds
- Design weed seeds for dispersal by the wind
- Quantify seed dispersal by the wind through experimentation
- Summarize and analyze data in graphical form

Introduction

Weeds have developed excellent adaptations to aid in dispersal of their seeds. A weed's ability to readily disperse its seeds contributes to the weed problem. Wind plays an important role in the dispersal of many of the most problematic weed seeds. Students will design weed seeds and test the seeds to determine how long they remain aloft and how far they travel by wind.

For best results, conduct the *Activity* in late summer or early fall when most weeds have gone to seed. Before teaching this lesson, read the entire lesson and make sure all materials are available.

Background

Plants are unable to thrive when they live too close to other plants. Plants compete for nutrients in the soil, sunlight, and other resources. Plants must disperse to share resources, otherwise they risk extinction by crowding out each other.

Preparation

Materials

- copies of the *Amazing Travelers* worksheet – Have available one copy for each student.
- collection of assorted weed and plant seeds
- portable fan
- stopwatch
- wind meter
- sunflower seeds – Have available at least one seed for each student.
- pipe cleaners, tissue paper, and other materials to construct a seed
- graph paper

Competition among plants of the same species is even more pronounced because these plants compete within their own niche.

Weeds have developed excellent seed **dispersal** techniques. Some weeds, such as burdock and hound's tongue, produce burs with hooks that attach to fur and clothing. Animals or humans then disperse the seeds. Leafy spurge produces capsules with a spring-like mechanism that launches its seeds up to ten feet from the parent plant.

Tansy, purple loosestrife, and other weeds disperse their seeds through water. Some seeds, like those of the Brazilian pepper tree in Florida, pass through the digestive system of birds and mammals unharmed. These seeds are dispersed when the animal eats the weed and moves on before defecating.

Wind disperses the seeds from many weeds. Some plants, such as dandelions, western salsify, and Canada thistle, have developed seeds with a parachute, which enables the seeds to disperse over great distances. Some invasive tree species have developed seeds with wings, similar to those found on a maple tree. These seeds disperse relatively short distances from the parent tree. A removable sheath encloses tumbling mustard seeds. The parent plant dries, breaks off, and tumbles across the ground as it's pushed by wind. As the plant moves along, the sheath falls off, and the seeds inside disperse over miles of land.

Two important factors determine how effectively wind disperses weed seeds: time aloft and distance traveled. Shape, mass or density, and wind speed determine the distance a seed can be dispersed.

---

1 Give each student a copy of the *Amazing Travelers* worksheet, which lists weeds that have unusual dispersal adaptations. Discuss information about weed seeds. (See *Background* earlier in this lesson.)

2 See the charts below for samples of weed seeds to have available so students can view seed adaptations.

3 Explain that students will design a seed and test the seed to determine the amount of time it remains aloft and how far it travels by wind.

Have available a seed from this plant:	To show this adaptation:
bitter nightshade	red berries that attract birds
mesquite	seed pods that attract animals
curly dock or purple loosestrife	floating characteristics of seeds
houndstongue or burdock	hitch-hiking capabilities of seeds

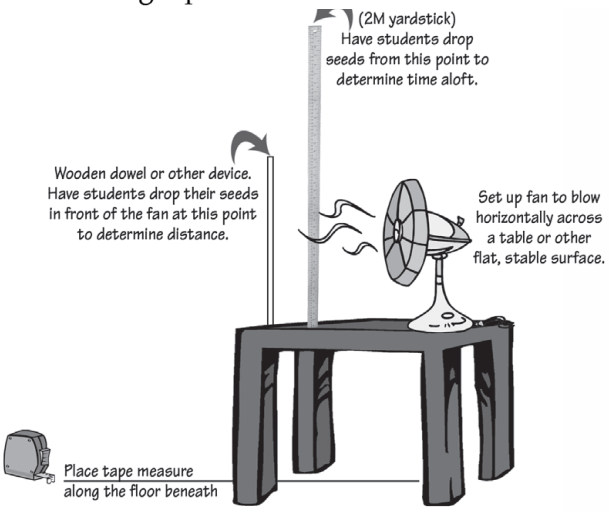
Have available a seed from this plant:	To show these adaptations for dispersal by wind:
salsify, dandelion, milkweed	parachute
tumbling mustard	removable sheath and stem that breaks off and tumbles
green ash, maple, box elder	wings
cattails	tufted seeds

If actual weed-seed samples are unavailable, use photos from reference books, or use your favorite search engine to search for images on the Internet.

Activity

Materials

- copies of the *Wind Dispersal* worksheet – Have available one copy for each student.
- one copy of the *Seed Test Results* chart
- measuring tape



1 After students have viewed the weed seed samples, give each student a copy of the *Wind Dispersal* worksheet and explain the exercise to students. To motivate students, tell them that whomever builds the best seed will receive extra credit or have no homework for one night.

2 Distribute materials and ask students to design one seed for dispersal by the wind. Students will use the sunflower seed as the basis for their creation.

3 Set up the window fan and prepare the measuring tape. Use a wind meter to check the approximate speed of the wind.

4 Have students drop their seed in front of the window fan three times; measure and record the distance the seed travels each time. Calculate the average distance traveled.

5 Record the results on the *Seed Test Results* chart.

6 Have students drop the same seed from a height of two meters, three times. Using a stopwatch, determine the time aloft. Record the time aloft each time. Calculate the average time aloft.

7 Record the results on the *Seed Test Results* chart.

8 After students have tested all of their seeds and recorded results on the classroom chart, ask students to graph the results. Determine if there is a correlation between time aloft and distance traveled.

Conclusion and Evaluation

- Conclude the lesson by having students answer the questions under Evaluating a Seed on the *Wind Dispersal* worksheet.
- Evaluate students based on the seed they created and their answers to the questions on the worksheet.

Grade: 9 to 12
Length: variable
Subjects: life science, math
Topics: seed dispersal

Creating and Testing a Seed

Your job is to design a seed that can be dispersed very effectively by wind.

Materials

- two sunflower seeds
- 1 pipe cleaner
- tissue paper, clear tape
- stopwatch
- large fan

1 After examining the samples of weed seeds that your teacher has provided, decide what size and shape to make the seed to achieve maximum time aloft and maximum distance traveled.

2 After deciding on an efficient design, build a seed using the materials provided.

3 Drop the seed in front of a large window fan and measure the distance it travels. Repeat three times, record the results below, and calculate the average. Record the average on the *Seed Test Results* chart.

Distance seed traveled: Trial 1 _____
Trial 2 _____
Trial 3 _____
Average distance traveled: _____

4 Drop the seed from a height of two meters and record the time aloft. Repeat three times, record the results below, and calculate the average. Record the average on the *Seed Test Results* chart.

Time aloft: Trial 1 _____
Trial 2 _____
Average time aloft: Trial 3 _____
_____

Evaluating a Seed

1 Explain how you designed your seed and why you chose this design.

2 Describe the design of the seed(s) that traveled the farthest and stayed aloft the longest. Was it built stronger and lighter? How much paper or tape did this design have?

3 Did it matter how the student dropped the seed in front of the fan?

4 What are the advantages and disadvantages of wind dispersal?

5 Is wind dispersal more likely to occur in dry or fleshy seeds?

Wind Dispersal Worksheet

Time Aloft

Student	Avg. Dist	Student	Avg. Dist

Distance Traveled

Student	Avg. Time	Student	Avg. Time

Resources: National Botanical Association.
http://www.Mcintosh.botany.org/bsa/misc/Mcintosh
Adapted from "sailing seeds"

It's Your Niche

Activity Objective

Students will be able to define habitat and niche and create business cards for native, non-native, and invasive aquatic species.

Materials

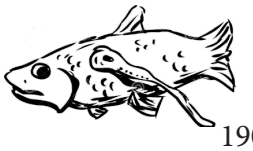
- 3"x5" blank index cards
- Coloring materials
- Animal ID guides/ posters/internet
- *Large paper

Grade Level

Second through eighth

Classroom Instructions

1. Review habitat with students (food, water, shelter and space in a suitable arrangement). Tell students that habitat can be considered an animal's address. Explain to students that in this activity they will be not only looking at animals' addresses, but animals' jobs (niche), as well.
2. Talk about roles in the environment. What makes an invasive species good at his job? (Reproduces fast/a lot, can eat anything/ more, flexible habitat, etc.) Invasive carp are a great example.
3. Discuss the neighborhood the students live in. Everyone has an address and most people have jobs. The job might be a role that a person plays in the community. Animals have roles in the ecosystem or community they live in. This role is called the animal's ecological niche. It includes such things as where and how it gathers its food; its role in the food chain; what it gives and does for the community; its habits, periods of activity, etc. It can also be described as what an animal does for a living. What happens if they are not there? What if someone steals their niche?
4. Allow students time to choose and research an aquatic species found in the Great Lakes. They should find out its niche and choose one thing this animal does well.
5. Their assignment will be to create a business card for that animal advertising its job in the community. To help them, you may want to bring in a few "real" business cards to look at.
6. Here is an example of an animal business card.
7. Business cards should include the following: name of animal, job title, company name, address, phone number, slogan and illustration or symbol for business.
8. Hang business cards on the bulletin board and call it "Whose Niche?" Discuss the ecosystem you have created. How do invasive species play a role?
9. *Extension—have students work to create billboards for their animals business on large paper.



T.F.M. Lamprey
Plasma Collection Services
1905 Lake Ontario Way
Salmon City, NY
Once we latch, we finish the job!
Call 1-800-we-slurp

Adapted from *the* "Aquatic Invasive Education Project": Michigan DEC, Michigan DNR, Michigan Ag & Rural Development, Great Lakes Restoration Funds

Appendix

Multiflora Rose *(Rosa multiflora)*-

Leaves: Compound, 5-11 serrated leaflets
Stem: Smooth, green, thorny
Flower: White, 5 petals
Fruit: Red "hips" produced late summer

Citation: Rob Routledge, Sault College, Bugwood.org

Common Reed *(Phragmites australis)*-

Leaves: Alternately arranged, can reach > 1 ft in length, smooth and lance shaped
Stem: Hollow and rough in texture
Flower: Terminal, composed of densely packed fruit bearing projections, almost feathery in texture

Citation: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Oriental Bittersweet (*Celastrus orbiculatus*)-

Leaves: Alternately arranged along the stem, and often teardrop shaped
Stem: Sprawling vine climbs along other woody plants/trees, bark is rough and brown
Flower: Small and green with 5 petals, forms clusters of 3-7
Fruit: Form clusters of 1-3 along the stem, and are typically bright red, can persist through winter

Citation: James R. Allison, Georgia Department of Natural Resources, Bugwood.org

Japanese Barberry *(Berberis thunbergii)*-

Leaves: Paddle-shaped leaves are alternately arranged, various colors
Stem: Gray/brown bark, sharp thorns along the stem
Flower: Pale yellow, forming small clusters
Fruit: Shiny red egg shaped berries

Citation: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Japanese Knotweed *(Fallopia japonica)*-

Leaves: Broad shield-shaped leaves with a flat base, as if they have been cut with scissors
Stem: Zig-zag in shape and are green and speckled with purple coloration
Flower: Creamy white in color and form clusters of spikes along the stem

Citation: Ohio State Weed Lab, The Ohio State University, Bugwood.org

Common Buckthorn *(Rhamnus cathartica)*-

Leaves: Alternatively arranged along the stem, oval shaped and deeply veined
Stem: Gray back is covered with dimple like marks, inner bark is a bright orange color, stem tips often crowned with sharp thorn
Flower: Yellow-green in color
Fruit: Plant produces many round shiny purple-black berry-like fruits Aug-Sept
Citation: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Mugwort *(Artemisia vulgaris)*-

Leaves: Alternately arranged, pinnately veined, oval shaped, and deeply lo
Stem: Greenish-white in color, smooth.
Flower: Greenish in color and inconspicuous.

Citation: Steve Young, New York State Natural Heritage Program)

Honeysuckle *(Lonicera spp.)*-

Leaves: Oppositely arranged, oval shaped.
Stem: Hollow stem with shredding bark.
Flower: Fragrant delicate flowers are typically white, yellow, or light pink, with long slender stamens.
Fruit: When fruiting, many small red berries are produced in pairs along stem.

Citation: John M. Randall, The Nature Conservancy, Bugwood.org

Garlic Mustard *(Alliaria petiolata)*-

Leaves: First year plant has a small rosette of hoof shaped leaves with scalloped edges. Second year plants have heart shaped leaves with toothed margins that are alternately arranged along the stem.
Stem: Smooth and green.
Flower: Second year plants have flowers in a rounded cluster at the top of the plant. There are 4 small white petals per flower.
Fruit: Thin pods which extend outward from the plant are produced in the second year form and contain a row of many black seeds.
Citation: Chris Evans, University of Illinois, Bugwood.org

Purple Loosestrife *(Lythrum salicaria)*-

Leaves: Oppositely arranged or in whorls, lance shaped, and have smooth margins. Small hairs may sometimes be present on leaves or stems.
Stem: Green, stiff and square in shape.
Flower: Stems end in a bushy flower spike composed of many small bright pink/purple flowers with 5-7 petals each.

Citation: (Linda Wilson, University of Idaho, Bugwood.org)

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

PARTNERSHIPS FOR REGIONAL INVASIVE SPECIES MANAGEMENT

New York State PRISMs

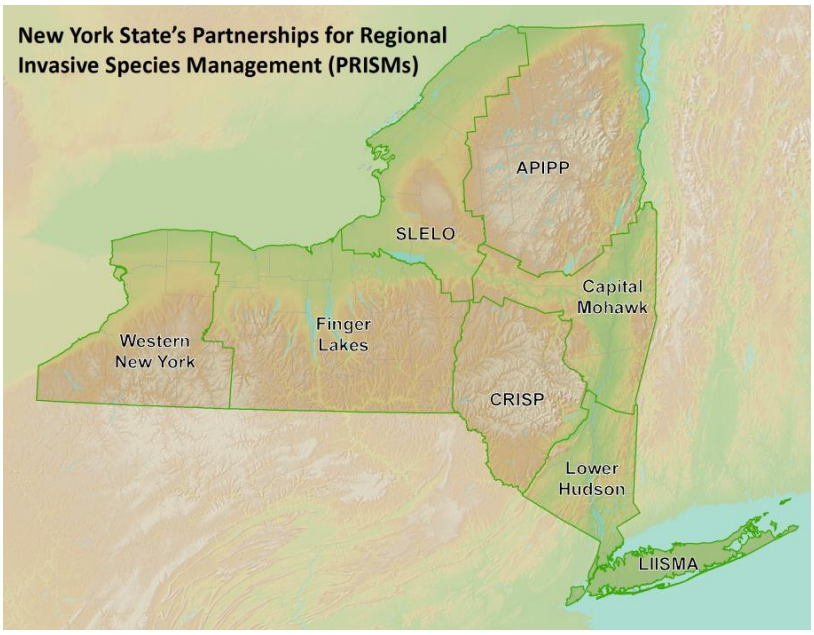
NEW YORK STATE OF OPPORTUNITY | Division of Lands and Forests

Invasive species means a species that is nonnative to the ecosystem under consideration, and whose introduction causes or is likely to cause harm to the environment, the economy, or the health of humans.

What are PRISMs?

Partnerships for Regional Invasive Species Management (PRISMs), comprising diverse stakeholder groups, were created to address threats posed by invasive species across New York State. PRISMs are key to New York's integrated approach to invasive species management. Partners include federal and state agencies, resource managers, non-governmental organizations, industry, recreationists, and interested citizens. The New York State Department of Environmental Conservation provides financial support, via the Environmental Protection Fund, to the host organizations that coordinate each of the eight PRISMs, resulting in statewide coverage.

What Do PRISMs Do?



- Plan regional invasive species management activities
- Implement invasive species prevention programs
- Conduct surveillance and mapping of invasive species infestations
- Detect new infestations early and respond rapidly
- Implement control projects
- Implement habitat restoration and monitoring
- Educate stakeholders on invasive species and their impacts
- Coordinate PRISM partners
- Recruit and train volunteers
- Support research through citizen science in collaboration with the Invasive Species Research Institute http://www.nyisri.org/
- Report observations to iMapInvasives http://www.nyimapinvasives.org/
- Act as regional communication hubs

If you are interested in helping NY "stop the invasion," PRISMs are a great way to get involved by volunteering for monitoring, outreach, or management projects. All are welcome to participate in statewide PRISM monthly conference calls to receive updates, hear excellent presentations and learn about upcoming events. Contact a PRISM leader for more information, or visit WWW.NYIS.INFO

STOP THE INVASION – PROTECT NEW YORK FROM INVASIVE SPECIES

A Division of the New York State Department of Environmental Conservation **www.dec.ny.gov**

Regional PRISM Contacts			
PRISM	**Host**	**Contact**	**Listserve & Websites**
APIPP Adirondack Park Invasive Plant Program	The Nature Conservancy	Brendan Quirion 518-576-2082 bquirion@tnc.org	• cce-apipp-l-request@cornell.edu • http://adkinvasives.com/
Capital Mohawk	Cornell Cooperative Extension of Saratoga County	Laurel Gailor 518-885-8995 lrg6@cornell.edu	• cce-capitalprism-l-request@cornell.edu • http://www.capitalmohawkprism.org/
CRISP Catskill Regional Invasive Species Partnership	Catskill Center for Conservation and Development	John Thompson 845-586-2611 jthompson@catskillcenter.org	• cce-crisp-l-request@cornell.edu • http://catskillcenter.org/crisp/
Finger Lakes	Hobart and William Smith Colleges	Hilary Mosher 315-781-4385 mosher@hws.edu	• cce-flprism-l-request@cornell.edu • http://fingerlakesinvasives.org/
LIISMA Long Island Invasive Species Management Area	Long Island Native Plant Initiative	Polly Weigand 631-560-9945 info@linpi.org	• cce-liisma-l-request@cornell.edu • http://www.liisma.org/
Lower Hudson	New York - New Jersey Trail Conference	Linda Rohleder 201-512-9348 lrohleder@nynjtc.org	• cce-hudsonprism-l-request@cornell.edu • http://lhprism.org/
SLELO Saint Lawrence and Eastern Lake Ontario	The Nature Conservancy	Rob Williams 315-387-3600 rwilliams@tnc.org	• cce-slelo-l-request@cornell.edu • http://www.sleloinvasives.org/
Western New York	Buffalo State	Andrea Locke 716-878-4708 lockeas@buffalostate.edu	• cce-westernprism-l-request@cornell.edu • http://www.wnyprism.org/

How Do I Join a PRISM?

For more information on PRISM meetings and activities and how you can become involved, visit the website of the PRISM in which you are interested, or contact the coordinator listed above for the PRISM.

To improve communication within and among PRISMs, e-mail listserves, managed by the Cornell Cooperative Extension Invasive Species Program, have been established for each of the eight PRISMs. To subscribe to a PRISM listserve, e-mail the appropriate listserve address in the table above. In the subject line, type the single word “join” (without the quotes). Leave the body of the message blank; do not include a signature block or any other text in the body of the e-mail.

CONTACT INFORMATION

Invasive Species Coordination Unit
Division of Lands and Forests

New York State Department of Environmental Conservation
625 Broadway, Floor 5, Albany, New York 12233-4250
P: 518-402-9405 | F: 518-402-9028 | isinfo@dec.ny.gov
www.dec.ny.gov

iMap Invasives

A Collaborative Online Tool for Invasive Species Reporting and Data Management

iMapInvasives

Invasive species pose a significant and growing threat to native biodiversity. They compete with native species for resources and often have no native predators to keep their numbers in check. Any large scale effort to protect biodiversity and the environment must be able to deal with the effects of invasive species. Early detection is often the key to successful eradication.

iMapInvasives is a cloud-based application for tracking and managing invasive species.

iMapInvasives is designed to share and manage invasive species information for stakeholders within your state or province. This information includes species maps, treatment efforts and effectiveness, and areas where invasive species were searched for but were not found. iMapInvasives is a growing, collaborative partnership of participating states and provinces, with a collaborative network of professionals and shared resources to help combat the threat of invasive species.

What are the benefits of iMapInvasives?

The greatest strength of iMapInvasives is its network: a partnership of programs with shared goals, diverse expertise, ties to the wider NatureServe network, and an atmosphere of collaboration and support. In addition, the iMapInvasives platform provides a detailed and standardized geospatial data model for tracking information important to the casual user as well as the natural resource manager.

Each iMapInvasives program is overseen by an administrator who vets species lists, confirms observations, and closely collaborates with local and regional organizations to collect, manage, and share invasive species data.

The iMapInvasives platform also includes several built-in query and reporting tools as well as detailed mapping **and recordkeeping for more complex data such as treatment and survey information.**

Using the iMapInvasives App Report Invasive Species Locations on Your Smart Phone

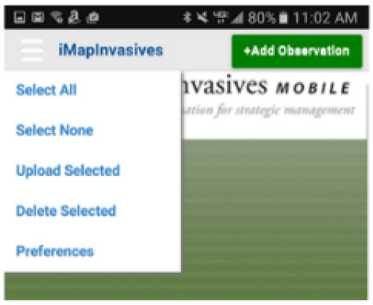
Photo Courtesy NYS Parks

First you will need to create a free iMapInvasives account online at: www.NYiMapinvasives.org

Download app from Google Play or iOS App Store (search for "imapinvasives")

Preferences

"Preferences" are your customized user settings. You will need to fill in your iMapInvasives account information to upload reports to the database.



1. Select State

2. User ID (email) and Password (must match online account!)

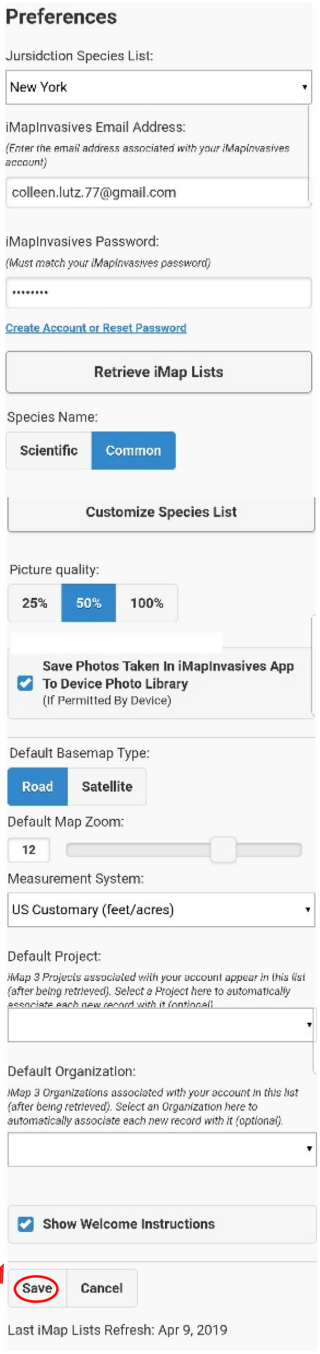
3. Select species name and create a custom list (optional).

4. Save your picture to your devices photo library (optional)

5. Select map preference and zoom

6. Select project (optional)

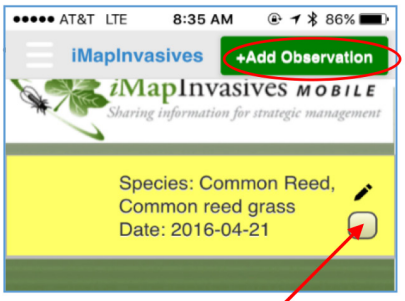
7. Select organization (optional)



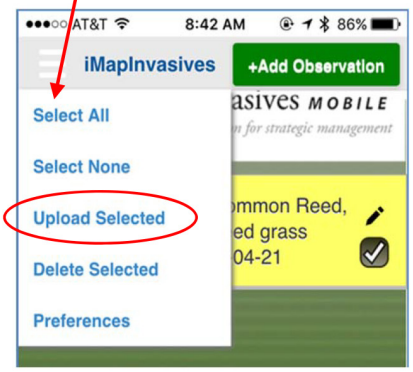
Save Changes

Home Page

From the home page users can add a new observation record, view records already collected and access all other functionality via the menu.



Manually select **box** or choose **Select All** from the menu



Questions? Contact:
Imapinvasives@nynhp.org

Observation Record

Make new reports of invasive species and edit existing records here!

Take Photo →

Select Species →

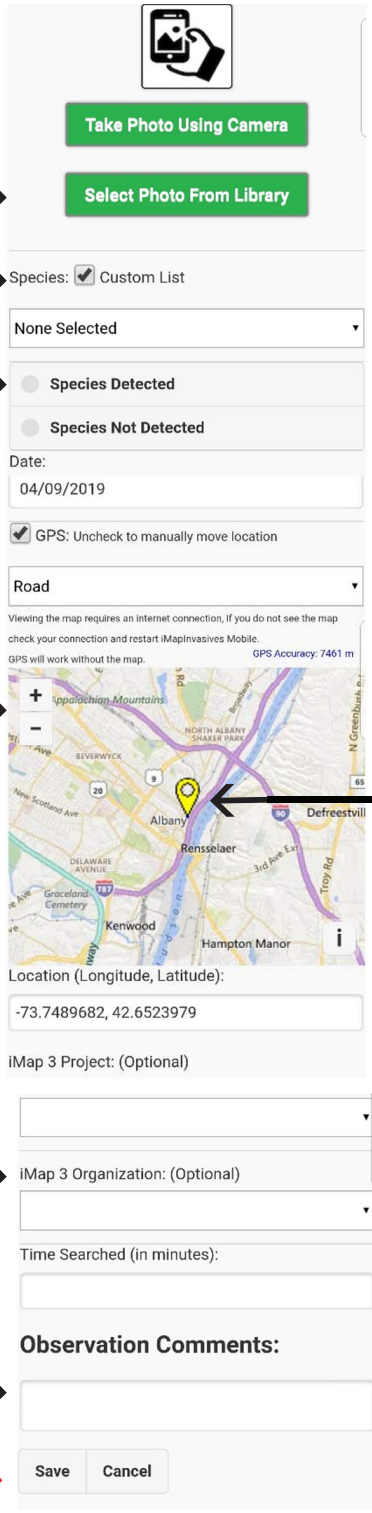
Select Detected or Not Detected →

Zoom In or Out →

Select your project and/or organization. If you don't see it listed contact your administrator. →

Enter observations or comments →

Save →



← Enable your custom species list

← Select Date

To manually edit location, uncheck the GPS box, touch and hold the map push pin. Drag it to the location of the invasive. ←

← If 0,0 is displaying in the Location box, please make sure your GPS is enabled on your device.

ImapInvasives is supported by:

New York Natural Heritage Program

NatureServe