

## **Vectors of Spread: Invasive Species Getaway Vehicles!**

*This hands-on activity helps Grades 2-7 students appreciate how invasive species can spread from one area to another*

By **Sue Staniforth**

One of the greatest problems with invasive species is their prolific ability to reproduce and spread from one area to another. Invasive plants reproduce by seed or by stolons or runners above the ground, rhizomes below ground, or plant fragments that can take root. The stems of a single plant of baby's breath, sought after by florists for flower arrangements, can produce more than 10,000 seeds, and these are distributed over long distances when the whole stalk breaks off at ground levels and rolls like a tumbleweed! Often, the seeds of invasive plants can remain viable for years or even decades: gorse seeds have a hard coat and can persist in the soil for 25 to 40 years.

Invasive species travel further with the help of water, wind, people, pets, vehicles, soil, gravel, and equipment. Many of these invaders are spread by humans, either through industry such as logging and mining, recreational activities like boating and camping, and gardening and horticulture. Invasive animals such as the zebra mussel, an invasive species from Europe that has established itself in the Great Lakes, can produce up to 1 million eggs a year. Tiny eggs and larvae can easily be transported from lake to lake in the water in the bottom of your boat.

Terrestrial plants have a wide variety of adaptations for dispersing their seeds to new places. Light fluffy seeds move with the wind for long distances, flattened seeds flutter a short distance and then may float down a river or across a lake. Burred seeds have tiny hooks that will stick to skin, fur, feathers and clothing. Once they are attached, they can cling for long distances and when they eventually fall to the ground, they may have moved many kilometres.

Aquatic plants and animals move easily within a water body such as a lake or river and will eventually occupy the suitable habitat in that water body. Aquatic plants and animals sometimes adapt to survive out of water for short periods of time. This adaptation allows them to hitch-hike with people on our toys, vehicles, equipment, clothing, and pets or livestock. In this way, invasive plants and animals can be transported to new locations by mistake. Sometimes a small piece of a plant is enough to start a new colony. Some animals, such as zebra or quagga mussels, have very small juvenile stages that can be very difficult to see. To avoid accidentally transporting invasive species, we need to inspect and clean vehicles, clothing and equipment before leaving an area, particularly if we know the area is infested with an invasive species.

This activity engages students in exploring some of the methods of dispersal of invasive species, through visiting a series of lab stations where they experiment with different materials to discover how invasive species spread.

**Objectives:**

- learn some main characteristics that make a species invasive: prolific reproduction and effective methods of spread.
- investigate several vectors of spread through hands-on demonstrations
- explain how some plants and animals are adapted to spread to new places, even from small fragments and cells.
- explain how seeds are transported by vehicles, pets, and equipment
- explain why people should not release any animals, plants or water into lakes, rivers, and wetlands.
- understand and apply strategies and methods to prevent the spread of invasive species.

**Grade Levels:** 2 – 7

**Subject areas:** Science, Social Studies, Geography

**Method:**

Students rotate through several lab stations to explore methods that invasive species use to spread. With younger students you may want to reduce the number of stations, and/or demonstrate the procedures at each station before allowing them to experiment.

**Materials:****Station 1: Aquatic Hitchhikers:**

Three water bins - marked Lake 1, Lake 2 and Lake 3

A toy boat that fits into the water bins

Bag of dill weed - 1 tsp. per group of students

Measuring spoon (1 tsp. / 5 ml)

Coffee filters

Water

**Station 2: Bag the Burrs!**

One or two Velcro pieces

A selection of different seeds including several seeds with hooks (e.g. burrs from burdock or hound's tongue plants), some large seeds (e.g. corn or beans), some small seeds (e.g. flax, poppy, mustard), some seeds with "parachutes" (e.g. dandelions, milkweed) seeds with "wings" (e.g. maple keys).

Plastic garbage bags

Magnifying glasses

Three plates - to set the seeds on while looking at them;

Wool or cotton sock or shoe lace

A toy stuffed animal

A feather

Rubber or work gloves (for pulling the burrs off)

### **Station 3: Stowaways – Edible Seeds**

Blackberries or raspberries;

Small plastic baggies;

Cola beverage

¼ cup measurer

Coffee filters

Optional: other berries such as blueberries or strawberries.

### **Station 4: Terrestrial Hitchhikers**

Soil or mud

Small seeds - poppy or mustard

Toy truck with knobby tires

One bin that comfortably fits the toy truck

Long pieces of cloth or paper towel or clear space - to drive the toy over

Toothbrush and small container of water

### **Station 5: Pond Jumpers**

Two plastic or styrofoam egg cartons

Two colours of Food colouring- red and blue preferably

A 500 ml measuring cup

A spoon

Water

A large bin big enough to contain the egg cartons and other supplies to reduce the chance for spillage.

Towel

### **Procedure:**

1. Set up each station before the class, and label them well. Print out and laminate (if possible) the instruction sheets for each station, and provide towels beside the “wet” station sites.
2. Begin with a class brainstorm to list some ways that humans have brought or can bring invasive species into the country. Answers may include: garden plants, boats, recreation equipment, seed mixes, agriculture, clothing, on pets, etc.

Then discuss “What industries could move invasive species around, once they are established?” Answers may include: logging, mining, road construction, home building, recreation (fishing and hunting, tourism industry).

3. Divide the class up into five equal sized groups and have students rotate through the stations, experimenting with each set of equipment as they go. Allow 5 – 10 minutes per station.

4. Once all students have visited all the stations, gather the class together for a final discussion: Ask students to list things that we can do to stop invasive plants and animals from coming to this region or from moving them around.

Answers may include; watch what you plant, do not plant invasive plants, dispose of invasive plants properly in a landfill, do not cut invasive flowers, stay on marked trails so you don't walk through patches of plants, clip or pull invasive plants so they don't go to seed, pick any seeds on your boots, laces, clothing and pets, and dispose of them properly, wash recreational equipment (including bikes, car and truck tires and bumpers, and ATV's), clean, drain and dry boats; never dispose of aquarium water or pets in ponds or ditches.

### **Station Setup Directions and Instruction Sheets**

#### **Station 1: Aquatic Hitchhikers**

Here students use a toy boat and some dill weed to investigate how some plants and animals are adapted to spread or disperse to new places, even from small fragments and cells. Fill the bins with enough water to allow the toy to be submerged without overflowing. Note: It works best to have a water tap nearby to wash the toy and change the water in the bins after each group. Provide a towel.

Option: Have students use a coffee filter to collect the dillweed from Lakes Two and Three and then weigh it, to determine the amount of material that was transported.

#### **Station 1: Aquatic Hitchhikers Instruction Sheet:**

These three bins represent three lakes in your area. The first lake gets infested with an invasive species called Eurasian watermilfoil, which we'll represent using the dillweed.

1. Put 5 ml of dill weed into Lake One water bin. This lake is now 'infested'.
2. Put the clean toy into the infested water bin – this is a boat spending the day on Lake One. "Drive" it around in the lake for a minute.
3. Take the toy out of Lake One. Notice how much dill weed is clinging to it. Put the toy into Lake Two. Note what happens to the water in the lake: Where is the milfoil going? Notice how much plant material comes off the boat.
4. Put the toy into Lake Three. Now where is the milfoil? Notice how much plant material comes off.
5. Rinse out all three bins and fill them up again for the next group of students.

#### **Station 2: Bag the Burrs**

Students experience how seeds can be moved to other locations by clinging to fur, feathers or clothing. Have students experiment with different seeds to see which ones stick and which ones don't. Larger seeds such as corn or beans or peas don't stick and even some smaller seeds don't stick. Some other seeds might be small enough to get stuck in fabric even without hooks.

#### **Option: Grow Your Sock!**

Have each student wear a large woolly sock over their shoe and walk through an area of weed plants for 2 – 3 minutes to collect and count the seeds that they have collected.

Each student needs a large sock (they could bring an old sock from home) and a plastic bag to bag the sock in after their stroll.

*Note:* it's important to collect and sort the seeds in an indoor space where seeds cannot be spread! Bring socks (in their bags) to an indoor space and pick through them to count seeds. You can have prizes for the most number of seeds, least number of seeds, largest seed, etc. Ensure that all seeds are bagged and carefully disposed of by burning them, or taking them to the dump to be buried deeply. Reinforce the importance of checking socks and gear (adapted from *Sock Seeds*; PBS Education Resources: Living Systems, 2002).

### **Adaptations/Variations:**

#### **Grow Soil!**

Have students go to an area near the school, a park or their home and collect 1 – 2 cups of soil. Put the soil in a small pot and tend it by watering it regularly and letting it get sunlight. See what begins to grow. Are there any invasive plants there? Identify and list the plants that appear, and put your pot on display. Be careful not to let any invasive plants go to seed, and dispose of them in the garbage.

#### **Station 2: Bag the Burrs Instruction Sheet**

Most of us have had the experience of going for a hike and noticing later that our socks, bootlaces and pant legs, and maybe even our dog is covered in burrs. Burrs are plant seeds that are adapted to hook on to fur, clothing and skin.

1. Using the magnifying glass, look closely at the burrs and then the Velcro pieces to see the little hooks.
2. Use a wool sock and the stuffed toy to pick up the burrs and Velcro pieces.
3. Put on the gloves to take the burrs off the sock and toy. Put the burrs back onto the plate or in a plastic garbage bag. Bagging the burrs keeps them from growing in a new location. *\*\*Invasive plant seeds cannot be composted!*
4. Try sticking some of the other seeds to the sock or stuffed toy: what seeds stick and what seeds don't?
5. Try picking up the burrs with the feather. Feathers don't get caught as easily, but small birds have been trapped by burdock burrs.

*Did you know? The clinging burr seeds of burdock were the inspiration for developing Velcro!*

#### **Station 3: Stowaway Seeds – Edible Seeds**

Many plant seeds (and some small animals) are able to survive the digestion process. There are many plants that have edible fruits surrounding their seeds: e.g. apples, peaches, tomatoes, berries. As with many soft fruits, when the animal eats the fruit, often the seeds are not digested. This demonstration will illustrate how the seeds inside a fruit can survive the digestion process; this is an adaptation that some plants have.

#### **Station 3: Stowaway Seeds – Edible Seeds Instruction Sheet**

This demonstration will illustrate how the seeds inside a fruit can survive the digestion process; this is an adaptation that some plants have. Fruits like apples, blackberries and

blueberries carry their plant's seeds inside. Some fruits are tasty and some are not; some are poisonous. Being surrounded by tasty, nutritious food (eg. fruit), the seed will get transported to new places by the animals that eat it. Many fruits are not from invasive species, but some are invasive, such as Himalayan blackberries.

1. Put a few blackberries or raspberries into a small plastic bag.
2. Add a little bit of cola beverage (1/4 cup) to represent digestive juices.
3. Zip up the bag, making sure it is sealed.
4. Press and mush the berries and cola together inside the bag, to "chew and digest" the fruit. The fruit part of the berry will become mushy and liquid but the seeds stay whole.
5. See and feel the blackberry seeds inside the bag without opening it.
6. Now pour the contents into a coffee filter to see the seeds left behind with some of the fruit pulp that wasn't digested.
7. Try the same experiment with different seeds/fruits to see different seeds.

#### **Station 4: Terrestrial Hitchhikers**

At this station, students use a toy vehicle to illustrate how people with vehicles that have mud caked onto them can accidentally transport invasive species long distances. Plant seeds and some small animals are often accidentally transported in the mud that clings to vehicles, equipment, footwear, and toys. This is why it is important to inspect and clean your vehicle before leaving an area.

#### **Station 4: Terrestrial Hitchhikers Instruction Sheet**

If you have ever planted a garden and spilled a few seeds, you know how difficult it can be to spot a plant seed once it is mixed into the soil. Some plant seeds and animals are so small and blend in so well, that we might not realize they are mixed into the mud on our vehicles, toys, pant legs and pets. New Zealand mudsnails, for example, are between 3 and 5mm long when fully grown. They can fit unnoticed into tire treads, horse hooves, pet fur and paws, muddy pant legs, and muddy boots. Since first being found in Idaho in 1987, these little snails have spread throughout the USA and southern Canada.

1. Put a small spoonful of seeds into the mud and mix it up. Can you still see the seeds?
2. Put the toy truck into the muddy bin and run it back and forth to get mud on the tire treads.

3. Now run the truck back and forth a few times on the clear space or towel provided. Can you see the seeds in the mud that came off of the tire tracks?

To avoid accidentally spreading an invasive species, it is a good practice to clean any mud, plants or 'small creatures' from your vehicle, boat, toys, clothing, and pets before leaving an area.

4. Clean off the truck with the toothbrush for the next group of students.

#### **Station 5: Pond Jumpers**

Here egg cartons are used to represent watersheds, and coloured water is used to illustrate how species can spread from lake to lake. Note: This is a good activity to demonstrate yourself, to save time and cleanup.

Before having students do this activity (or demonstrating it) review the definition of a watershed with the class. A watershed is an area of land where all the water that runs through it drains into the same place divided by mountains. Two lakes that are very close to each other may drain into completely different watersheds. Although they might seem like similar habitats, they may be completely different communities. All of the water in all of the different water bodies within a watershed is connected.

Aquatic organisms do not travel between watersheds naturally; however people sometimes move organisms from one lake or river to another. Ask students how this might happen (e.g. live fish bait being dumped into lakes; unwanted aquarium pets being released into ponds; eggs and larvae of aquatic animals being transported in boat bilge water between lakes). If organisms that are moved to new watersheds happen to be invasive species, they have an opportunity to invade a whole new watershed, not just a single body of water.

Aquarium water should be poured down an indoor drain or poured out on the ground where it will dry out and won't reach a stream. There may be invasive algae or eggs and larvae of non-native animals that you don't want to release into a new watershed.

#### **Station 5: Pond Jumpers Instruction Sheet**

When you put an invasive species into a lake or river, it can spread into a whole new watershed. Here, food colouring represents an invasive species that has been put into one lake in a watershed (one cup of an egg carton).

1. Fill both egg cartons with plain water.
2. Put one colour of food colouring into one of the egg cups in one of the cartons, to represent a native species.
3. Put some water in the measuring cup, and add a different colour of food colouring to represent an invasive species.
4. Pour the "invasive species" water slowly into the egg cup with the 'native species' and observe what happens.
5. Continue pouring slowly: when the water level reaches the tops of the egg cups, observe that the water in the cup that had a few drops of food colouring, changes colour and moves from cup to cup throughout the watershed.
5. Now use the spoon to scoop some of the water from the egg carton that is infested with the invasive species and put it into the second egg carton. This would be like transferring yellow perch or Eurasian milfoil (invasive species) from one watershed to another.
6. Discuss what this transfer would mean in a real watershed. (Once a species is introduced to one body of water, it can travel through water systems to other water bodies).
7. Pour from your measuring cup into the newly infested watershed. This represents the invading animal or plant reproducing and is able to spread throughout the new watershed.

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## **Resources and References**

*Tackle Invasives Hands-on with Your Students! Education Activities & Teacher Resources* (2014). Invasive Species Council of BC (ISCBC)  
<http://bcinvasives.ca/resources/education/>

*Invasives in the Classroom: A Practical Teacher's Guide for Intermediate Levels* (2012)  
ISCBC: <http://bcinvasives.ca/resources/education/>

*Making Waves! Protecting Ontario's Aquatic Habitat: Grade 4 curriculum kit*  
A fun, informative, activity-filled teacher resource kit that introduces children to the concept of healthy habitats and communities and our role in protecting them from aquatic invasive species. Invading Species Awareness Program: Ontario Federation of Anglers and Hunters / Ontario Ministry of Natural Resources  
[www.invadingspecies.com](http://www.invadingspecies.com)