Invasive Species Council of BC

TD Friends of the Environment Foundation

Take Action Against Invasive Species!

An Educator's Guide

ISCBC

HEALTHY LANDSCAPES AND
COMMUNITIES FREE OF INVASIVE SPECIES

Table of Contents

About This Guide

This guide was developed to provide a range of activities that inform, engage and inspire participants to take action again invasive species in British Columbia. The activities are suitable for use in both formal school programs and for informal youth groups, camps and recreation programming, and can be done in any sequence. The activities are listed with suggested age / grade categories, but most of them can be adapted to suit almost any age and audience.

May is Invasive Species Action Month in BC, and an ideal time to engage students and youth groups in invasive species activities, whether in the classroom or outdoors in the schoolyard or on field trips. See page 8 for more information on ways to celebrate this event. Of course, these activities can be used at any time of the year to engage your students, help them investigate invasive species in BC and their impacts, and explore ways we all can help prevent their spread.

This guide compliments existing educator resources that can be found on the ISCBC's website, including *Tackle Invasive Species Hands-on With Your Students!, Aquatic Invaders! An Activity Guide for Teachers and Youth Leaders,* and the *Invasive-Wise Youth Challenge*. The Invasive Species Action Month website is updated annually in the early spring - check for new resources and contests. This guide also provides new activities that highlight some of the messages that the Month profiles.

Special thanks to TD Friends of the Environment Fund for supporting the development of the guide.

All feedback, comments and adaptations are welcome – let us know how you have used these activities and your experiences with them. For more information or to provide suggestions and feedback, please contact ISCBC's Education and Outreach Manager at education@bcinvasives.ca.

Thank you for your interest and support of invasive species education!

Invasive Species – A Backgrounder

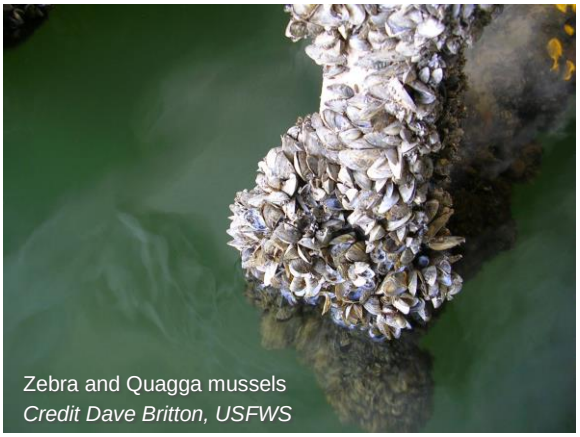
WHAT IS A NATIVE SPECIES?

A native species is one that naturally occurs in an area. A native plant, for example, is a plant that has lived and evolved in a certain place for a long time (i.e. thousands of years) and is part of the natural ecosystem. Native species have co-evolved with other competing species, predators, diseases and climate factors of a region, and are part of a natural, balanced system.

WHAT ARE ALIEN, NON-NATIVE AND INVASIVE SPECIES?

Non-native or alien species are animals and plants from other parts of the world that do not naturally occur in an area, and were likely brought by humans, either accidentally or intentionally. Also known as "non-native", “introduced” and "exotic," they include the Canada thistle, the Norway rat, Zebra mussels and Japanese knotweed. A non-native species has not evolved as part of the native ecosystem and does not have the same place or role in the system. Some non-native species are called invasive because they are able to spread and dominate or push out native species. Many of them can cause environmental and economic harm, as there are no natural predators or diseases to keep them in balance. However, not all non-native species are invasive – many ornamental plants such as roses and tulips won’t survive outside our gardens. Other introduced species such as tomatoes and wheat are beneficial food resources.

Knotweed growing through parking lot surface
Credit CABI



Zebra and Quagga mussels
Credit Dave Britton, USFWS

WHAT MAKES A SPECIES INVASIVE?

Invasive species are alien species that cause economic, environmental or social harm, and that can spread rapidly to new areas. Many people are surprised to learn that some of the plants they have in their gardens or see along roadsides are invasive.

Invasive species have four main characteristics:

1. They can be prolific seed producers / reproducers:

A single Purple loosestrife plant can produce over 300, 000 seeds/year, and one Zebra mussel can produce up to 1 million eggs a year!

2. Their seeds spread easily and effectively:

Hounds-tongue and Burdock burrs attach to animals, vehicles and clothing; thistle seeds blow easily in the wind.

3. They can quickly establish and thrive on disturbed and open ground, displacing native plants:

Tansy ragwort and Dalmatian toadflax will sprout from roots, root pieces and crown buds!

4. They usually lack the natural predators or diseases that control them in their homeland, and so can move into a habitat and completely take over from the original vegetation:

Sulphur cinquefoil & Orange hawkweed are not palatable, so livestock or wildlife won't graze them; they can spread widely, displacing other forage plants.

Burs from Burdock on livestock
Credit L Scott

HOW DID THEY GET HERE?

Non-native and invasive species reach new environments in many ways. People usually have a role to play, sometimes by accident, and sometimes on purpose. For example:

» Gardening and agriculture. Cultivated plants escape from gardens and farms to

wetlands, grasslands, and roadsides. Purple loosestrife was sold in garden centres for its lovely purple flowers but has now spread across Canada and covers millions of hectares.

- Recreation. Plants and animals often hitch rides on boats, mountain bikes, all-terrain vehicles, hiking boots, and fishing gear.
- Shipping. A major source of aquatic invasive species is ballast water that ships take on for stability and later dump into harbours worldwide. Species that have come to Canada this way include the Zebra mussel, Round goby, and Spiny water flea. Other plants and animals arrive as stowaways hidden in cargo on ships, trains, trucks, and planes.
- Pets. The release of unwanted aquarium and house pets has introduced Red-eared slider turtles, goldfish, European wall lizards, and domestic rabbits into the wild.

Puncturevine on bike
Credit L Scott

- Intentional releases. European starlings and House sparrows let loose in New York City's Central Park in the 19th century now blanket the Western Hemisphere.

Invasive goldfish
Credit USFWS, bugwood.org

WHY SHOULD WE CARE?

Invasive species have far-reaching impacts to our economy, environment, and society. These invaders often take over the food, shelter and space of native species, reducing biodiversity and destroying habitats that support whole ecosystems. They can spread disease, introduce parasites, disrupt food webs and compete with native species for resources. For example:

- Eurasian watermilfoil displaces native plants and makes water bodies unsuitable for fish.
- Noxious plants can be dangerous to livestock and other animals when eaten, or cause injury due to burrs, spines or toxic sap.
- Species such as knapweed infest rangelands and reduce forage quality.

Invasive species have big impacts on our economy, damaging the agriculture, forestry, and hydro-electric industries and impacting human health, tourism, recreation and even land values. According to Environment Canada, the estimated annual lost revenue caused by just 16 invasive species is between $13 and $35 billion dollars! Estimated crop losses in the BC agriculture industry are over $50 million annually. The damage caused by zebra mussels covering pipelines, boats, buoys, and fishing gear in Canada exceeds $100 million annually.


Spotted knapweed
Credit B Stewart


Eurasian watermilfoil
Credit R Johnson; bugwood.org

Invaders also impact society and human health. Giant hogweed sap causes severe burns to skin when it is exposed to sunlight. Hydrilla causes thick mats to grow on lake surfaces that are dangerous to boat or swim through. Puncturevine can pop tires, rending mountain biking and ATV trails unusable. Invasive species can also outcompete native plants traditionally used for medicine and can alter the sacred landscapes/territories of Indigenous peoples and nations.

WHAT CAN I DO TO HELP?

We all play an important role in preventing the spread of invasive species. It is important to be able to recognize invasive species, understand how to prevent their spread, and how to help control the ones that are already established.

May is Invasive Species Action Month in BC!

WHAT IS INVASIVE SPECIES ACTION MONTH?

Invasive Species Action Month (ISAM) has been officially proclaimed by the BC Ministry of Justice for the month of May to raise awareness about invasive species and inspire and support citizens of all ages to take positive actions to stop their introduction and spread. May is a great time to highlight invasive species, as it is usually the time people start spending more time in the great outdoors. Families start camping, gardeners are prepping beds and deciding what to plant, and boaters are gearing up for the season. School classes and youth groups also begin heading outside for fun in the sun and field trips; this guide provides activities and games to support educators in highlighting the importance of preventing invasive species!

The Invasive Species Action Month website bcinvasivesmonth.com highlights new events taking place across the province each year. The website is home to a range of free resources, including downloadable youth activities, videos, photos and contests. A special calendar highlights events happening in communities across BC and can be a great way to showcase activities of your class or youth group. ISAM is usually divided into weekly themes that focus on key audiences, activities and messages. Weekly themes are often based around provincial programs such as Play Clean Go – a program targeting hikers, campers and other recreationists, PlantWise that targets gardeners and the horticultural industry, Clean Drain Dry for paddlers, boaters and anglers, Buy Local Burn Local that focuses on not moving firewood, and Don't Let it Loose that targets responsible pet owners. Help raise awareness about invasive species and the actions we can all take to prevent their introduction and spread and check out the activities listed in this guide – there is something for everyone! Actions to take:

- Stop the Spread: when spending time in nature, check your boots, clothing, vehicles, and bike for seeds and plant pieces, and never transport non-native plant samples from one site to another.
- Check your garden for invasive plants: many nurseries still sell them! Check the ISCBC web site beplantwise.ca for lists of common invasive plants and the Grow Me Instead brochures for alternatives.
- Identification: learn about native and invasive plants and animals, and how to tell them apart.
- Go on a Weed Tour: visit ISCBC's contact map to connect with a regional invasive species group near you.
    - https://bcinvasives.ca/about/partners/invasive-species-contacts-bc/
- Educate Your Community: Investigate the impacts of invasive species in your area, and then host a display for your school and community through posters, flyers and presentations.
- Plan a site visit: Plan a visit to a local garden, plant nursery, garden center, park or botanical garden and check out the plants there. Discuss invasive plants and their characteristics, look for any that may be growing or on sale, and purchase some native or non-invasive seeds to grow.
- Pull Together: Organize or join in on a local weed pull. Check out the ISAM website bcinvasivesmonth.com, or ISCBC's website bcinvasives.ca for more information and to connect with a regional invasive species group near you that can help.
- Field Trip to an Airport or Border Crossing: Request a tour with a Canadian Food Inspection Agency official. Students can ask questions about how officials prevent travelers from transporting plants and animals illegally in and out of the country.

Visit us online and follow us on Facebook, Twitter, Instagram and YouTube:

- Facebook: @BCinvasives
- Twitter: @ISCBC
- Instagram: @ISCBC
- YouTube: @ISCBC

If you have any suggestions for BC's Invasive Species Action Month, or want more information, please email events@bcinvasives.ca.

Overview of Activities

ELEMENTARY LEVEL FOCUS:

1. A Biodiversity ABC or Picture Scavenger Hunt

Age / Grade levels: Primary / Elementary (ages 4 - 9)

A good introductory activity for younger students to practice their observation skills, get to know their local “natural” neighbourhood or park, and explore the concepts of living and non-living things by filling out a scavenger hunt sheet.

2. Activity: Weed Wear! Take Action with Fashion!

Age / Grade levels: K – 6 grades (ages 5 – 12)

Students explore the power of clothing as a public awareness and outreach tool, and design and create gloves and t-shirts to wear while pulling invasive plants.

3. Activity: Invasive Species Swat! An Active Card Game

Age / Grade levels: K – 6 grades (ages 5 – 12)

Students learn some vocabulary of invasive plants and animals in BC through playing an active card game.

4. Activity: Native or Not? A Relay Race Game!

Age / Grade levels: Grade 4 – 6 level (ages 9 – 12)

Students identify non-native species in an active relay race, where teams take turns racing to select species photos or pressed plant specimens from a pile.

5. Activity: Don't Let it Loose! An Aquarium Poster Activity

Age / Grade levels: Elementary - Grades 3 – 6 (ages 8 – 12)

Students create educational posters to display at school, libraries, pet shops and city aquariums that remind the public of their responsibilities as pet owners.

6. Activity: Build a Fairy Garden… Invasive-Free!

Age / Grade levels: Grades K – 5 (ages 5 – 12)

Students each create and display a fairy garden that highlights their favorite outdoor activity and describes how the introduction and/or spread of invasive plants can be prevented.

MIDDLE SCHOOL / SECONDARY LEVEL FOCUS

7. Invasive Plant “UN-Wanted” Poster

Age / Grade levels: Elementary – Secondary (Ages 10 – 16)

A fun art and research activity where students study an invasive species of BC and design a creative “Wanted” poster using the template provided.

8. Activity: Pressing Invasive Plants - Make A Collection

Age / Grade levels: Grade 6 – secondary level (ages 12 – 16)

Students learn to distinguish between native and non-native plant species of BC and prepare pressed invasive plants for a collection.

9. Activity: Design a Native Plant Garden

Age / Grade level: Grades 7-12 (ages 13 – 17)

Students design a native plant garden for their school and present a poster of their designs.

10. Activity: Mapping Invasives in your Schoolground / Community

Age / Grade levels: Secondary - Grades 9 – 12 (ages 14 – 17)

A field skills activity where students do a survey using transects or quadrants of a nearby park or natural area, and map existing invasive species.

Activities

1) A BIODIVERSITY ABC OR PICTURE SCAVENGER HUNT

Age / Grade levels: Primary / Elementary (ages 4 - 9)

Subject Areas: Science, Communities, Social Studies, Phys Ed

Duration: 1 period (about 45 minutes)

This is a good introductory activity for younger students to practice their observation skills, get to know their local "natural" neighbourhood or park, and explore the concepts of living and non-living things. Note: This is also a good "buddy" class activity, where older students help younger ones complete their list.

Materials

- Biodiversity ABC Scavenger Hunt Checklist OR Picture list (for non-readers) of local natural things: one for each student (see pages 13 and 14)
- Clipboards, pencils, traffic cones or markers to delineate hunt area

Procedure

1. Provide each student with a copy of the Scavenger Hunt checklist included in this activity. For children unable to read well, use the Biodiversity Scavenger Hunt Picture list to help them search for local natural items (e.g. a snail, a slug, a bug, a fern, several shapes of leaves, common birds, clouds, specially shaped rocks, etc.) You can make your own list as well to suit your area: it does not have to be an alphabet list but just items in nature that children can find easily.
2. Before heading outside, give students a few examples of things in nature that they could match to the letters: e.g. Ant, Bark, Clouds, Dandelion, etc.
3. Set some guidelines with the students (e.g. do not select human-made things, do not pick live plants, leave things the way you found them, stay on trails to prevent erosion) and describe the physical boundaries for the activity e.g. explain where the children can go: set out markers such as traffic cones or surveyor's tape if needed to outline the area for safety; or establish the rule that they must keep the teacher /leaders in sight at all times.
4. Have the students head out on a neighbourhood scavenger hunt. Ask them to find and draw or list something in nature for each letter of the alphabet on the scavenger hunt list or put a check beside each picture that they find.
5. Back in class, have the children work to categorize their lists into living and non-living things. Discuss the lists as a group and how they came up with their category selections.

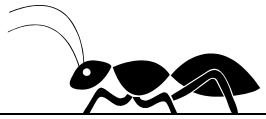
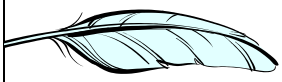
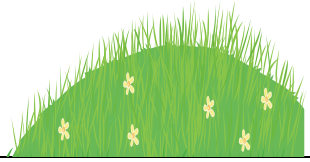
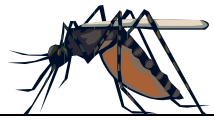
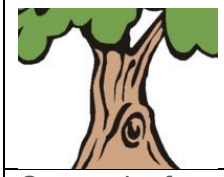
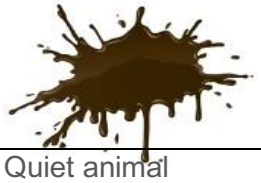
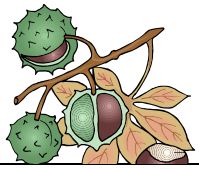
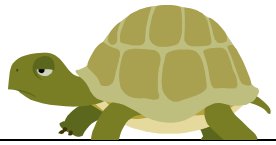
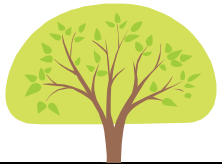
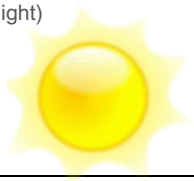
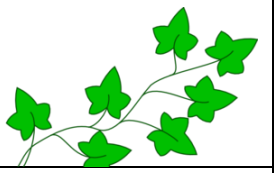
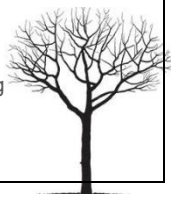
BIODIVERSITY SCAVENGER HUNT ABC

Write or draw something that you find in nature for each letter of the alphabet.

My name:		A	B
C	D	E	F
G	H	I	J
K	L	M	N
O	P	Q	R
S	T	U	V
W	X	Y	Z

BIODIVERSITY SCAVENGER HUNT CHECKLIST

Can you find these nature items?

My name:		Ant 	Bird 
Caterpillar 	Dirt 	Evergreen tree 	Feather 
Grass 	Honey bee 	Insect (any kind) 	Jumping insect or animal 
Knot on a tree 	Leaf 	Mud 	Nut 
Orange leaf 	Pinecone 	Quiet animal (any kind) 	Rock 
Spider web 	Tree 	Ultraviolet rays (sunlight) 	Vine 
Weed 	X marks the spot (a place to hide treasure - could be a hollow log) 	Yellow flower 	Zzzz – a dormant tree (it is sleeping and doesn't have leaves) 

2) ACTIVITY: WEED WEAR! TAKE ACTION WITH FASHION!

Age / Grade levels: K – 6 grades (ages 5 – 12)

Subject Areas: Art - Visual Art; Science, Social Studies

Duration: 1-2 periods (about 45 minutes to 1 ½ hours)

Students will understand the power of clothing as a public awareness and outreach tool and will design and create gloves and t-shirts to wear while pulling invasive plants.

Materials

- Cloth gardening gloves (white or gray)
- Permanent markers (all colors)
- T-shirts (white or light colours are best)
- Scanner
- Ink-jet printer or copy machine
- Iron-on transfer paper (available in the t-shirt making section of craft stores. Transfer paper is available for use with both ink-jet printers and copy machines)
- Iron and ironing board
- Scissors

Background

Making “weed wear” clothing is an excellent way for students to get creative and educate the people around them on invasive plants. Encourage your students to wear their “Weed Wear” around town, and to any weed pull activities or presentations. The more people who see them, the more people who will be familiar with invasive species issues in BC.

Figure 1: “Weed Destroyer” garden gloves designed by Jack, age 7, Alaska and students from Barlow Creek Elementary School, Quesnel, BC.

Procedure

Making Weed Pull Garden Gloves:

1. Have students illustrate designs with permanent markers on the back of white or grey cloth garden gloves.
2. Encourage the use of colour, illustrations of invasive species, their favourite outdoor space they want to protect from invaders, ways they can stop the spread of invaders, or catchy slogans in their design. Brainstorm ideas and images beforehand on the board.

Making Weed Awareness T-shirts:

1. Have students create a T-shirt design on a sheet of paper. Designs should be bold and in black and white (if using copy machine compatible transfer paper) or colour (if using ink-jet printer compatible transfer paper).
2. For ink-jet printer designs, scan designs into the computer. Add slogans or invasive plant awareness information using word art software.
3. Print or copy designs on iron-on transfer paper.
4. Trim excess paper from the edges of the design.
5. Set iron to cotton setting. Peel paper from the back of the design and position on t-shirt. Hold iron in place for 15-20 seconds on all parts of the design.
6. Follow iron-on transfer paper manufacturer’s instructions for washing t-shirts with designs.
7. Have students wear their t-shirts to invasive species awareness events including science fairs or community weed pulls.

Evaluation

- Create a rubric to assess the student effort, drawing quality, slogan, and creativity on the “Weed Wear” projects.
- Activity adapted from WEED WACKERS! K-6 Educators Guide to Invasive Plants of Alaska; Pg. 233. http://www.kenaiweeds.org/user_images/WEED%20WACKERS%20K-6%20guide%20for%20AK.pdf

3) ACTIVITY: INVASIVE SPECIES SWAT! AN ACTIVE CARD GAME

Age / Grade levels: K – 6 grades (ages 5 – 12)

Subject Areas: Science: Life Systems, Ecosystems, Impacts, Social Studies

Duration: 1 -2 periods (45 minutes to 1 ½ hours)

Students will learn pertinent vocabulary for the exploration of invasive plants and animals in BC through playing an active game. Students will demonstrate their understanding of the meaning of "native species," "non-native/ alien / exotic species," "invasive species," and "weeds."

Materials

- Scissors
- Species Word Cards
- Species Question Cards
- Photos of a range of plants (native, non-native, invasive)
- Don't Let It Loose videos:
    - Pet and Aquarium Owners - Don't Let It Loose https://www.youtube.com/watch?v=1b6AoZSYzNU
    - Don't Let It Loose https://www.youtube.com/watch?v=oiQdVLQwSiw&feature=youtu.be
- Containers for each group to hold the question cards
- Fly swatters for each student

Preparation

Make enough copies of the Species Word Cards for every student to have their own set.

Make copies of the Species Question Cards, one set for each small group of students.

Background

Several terms are used when talking about invasive species ecology and management. The goal of this lesson is to clarify and define terms that are commonly used when discussing invasive species.

Native Species - A plant or animal that lives and grows naturally in a particular region.

Alien, Exotic or Non-Native Species - A plant or animal whose presence in a given area is due to the accidental or intentional introduction by humans. Alien, exotic, and non-native are terms that are also used. Note – not all non-native species are invasive – e.g. many plants, like tomatoes, will not survive outside our gardens.

Weed - A weed is any plant whose presence is undesirable to people in a particular time and place. A weed could be either native or non-native (e.g. a native willow seedling growing in your

garden is a weed if you don't want it there). In common usage, however, people use "weed" to describe quickly growing, abundant non-native plants.

Invasive Plants - Non-native plants that produce large numbers of offspring, have the potential to establish and spread in natural areas and have a negative effect on ecosystems, economies and society.

Procedure

1. Introduce the words "native," "non-native," "alien," "exotic," "invasive," and "weed" to the class. What do you think they mean? Have students come up with definitions orally.
2. Revise and refine student definitions into accurate definitions and record them on the board. Point out the three synonyms: alien, non-native and exotic. Emphasize the similarities and differences between the terms. Show that invasive plants are a specific type of non-native plant that are harmful to natural ecosystems and human communities; for example, purple loosestrife will completely take over a lake or wetland area, and Knotweeds are so invasive that they can grow through house foundations and paved roads! Students should understand that invasive plants are not bad or evil in and of themselves, and that not all introduced plants are harmful. Some non-native plants are quite useful to humans and do not spread on their own. Have you ever seen a tomato growing in the wilderness?!
3. Show the class the two short Don't Let It Loose videos on the ISCBC website. Non-native animals can become invasive as well – ask students if they have ever seen domestic rabbits running wild in their neighbourhoods, or goldfish or red-eared slider turtles in local ponds. These animals are not native and were probably let loose by pet owners, a cruel and illegal activity, but also one that can spread diseases and impact local wildlife.
4. Have students scan the room for plants growing in the classroom, plants growing outside the window, pictures of plants on posters and books, or pass around plant photos. Which do they think are native to BC and which do they think are introduced alien? Are any of these plants weeds? How would you know if they were? Are any of the introduced alien plants invasive? How would you know?
5. Play the Invasive Species Swat! game in small groups.

INVASIVE SPECIES SWAT! GAME

Preparation

Students cut out their Species Word Cards. Each group cuts out one set of Species Question Cards and places them in a container.

To Play the Game

Grades 3 - 6

Each student lays their set of Species Word Cards face-up in the middle of the group. Students take turns choosing a Species Question from the container and reading it to the group. All

students (except the question reader) smack what they think the answer to that question is with the flyswatter. The student who smacks the correct answer first keeps the Species Word Card. The student with most Species Word Cards wins.

Grades K - 2

Stick the Species Word Cards up on the board or wall or place them on a table. Students take turns in pairs to come up and play the game.

The teacher reads the questions and students swat the correct answer.

The winner of the round challenges a new student. A round consists of being the first player to get 3 answers correct. Play goes on as the students go up and take turns challenging the previous winner. The teacher can end the game at any time. If motivation is high, play the game until all the students have had a turn.

Extension

- Older students can write their own Species Question Cards to play with in groups.

Activity adapted from WEED WACKERS! K-6 Educators Guide to Invasive Plants of Alaska; Pg. 233. http://www.kenaiweeds.org/user_images/WEED%20WACKERS%20K-6%20guide%20for%20AK.pdf

INVASIVE SPECIES SWAT | SPECIES WORD CARDS

Photocopy 1 per student

Alien	Invasive
Exotic	Non-native
Native	Weed

INVASIVE SPECIES SWAT - SPECIES QUESTION CARDS

I am a willow seedling growing in your strawberry patch.	
What am I?	Answer: Weed
I am a plant that originally came from Europe.	
What am I?	Answer: Alien, Exotic or Non-Native
I don't usually grow in BC, but I hitchhiked up here as a seed on a truck tire.	
What am I?	Answer: Alien, Exotic or Non-Native
I came up to BC from Alberta in some hay for horses and now I am spreading all over the riding trails.	
What am I?	Answer: Invasive
I am a Douglas fir tree, a species that who has been growing in BC for thousands of years.	
What am I?	Answer: Native
I am a goldfish – I was a classroom pet but got released into the local pond and have had hundreds of babies.	
What am I?	Answer: Invasive
I started out as a pretty flower patch planted in a garden, but now I'm moving into the forest. Just try to stop me!	
What am I?	Answer: Invasive
I am a dandelion growing in your green grass. You don't like me there and want to pull me up.	
What am I?	Answer: Weed
I was brought to BC by people a long time ago as a favourite food, but I can't seem to move anywhere without the help of humans.	
What am I?	Answer: Alien, Exotic or Non-Native
I am a feral pig – I was brought to BC to be raised on a farm but was let loose and now I run wild with lots of my relatives, dig up acres of ground, and eat the eggs of ducks and other birds.	
What am I?	Answer: Invasive
I am growing up in the cracks in the sidewalk at your school, but the janitor is	

always trying to kill me, so I don't make the cement crumble.	
What am I?	Answer: Weed
I've grown naturally in BC since before humans even lived here.	
What am I?	Answer: Native
I am a yellow perch who was brought to BC by a fisherman and had many babies who have spread to other lakes and eat baby salmon and trout!	
What am I?	Answer: Invasive
I am a kiwi – a delicious fruit, but I can't seem to grow well outside of a warm garden with lots of fertilizer.	
What am I?	Answer: Alien, Exotic or Non-Native
Write your own:	
What am I?	Answer:
What am I?	Answer:
What am I?	Answer:
What am I?	Answer:

4) ACTIVITY: NATIVE OR NOT? A RELAY RACE GAME!

Age / Grade levels: Grade 4 – 6 (ages 9 – 12)

Subject Areas: Science: Life Systems, Ecosystems, Impacts; Phys Ed

Duration: 1 period (about 45 minutes)

Students will practice identifying non-native species by sight in an active relay race game. This game is a fun way to see how much students have learned after they have studied native and invasive species and/or completed some of the activities in this guide. Students are divided into teams and take turns racing to select non-native species photos or pressed plant specimens from a pile.

Materials

- Selection of photos of native, non-native and invasive species of plants and/or animals.

Note: these can be downloaded from the internet, cut out of magazines and nursery catalogues or they can be photos taken by students. You can also use the pressed invasive plant specimens that students collected during the activity *Pressing Invasive Plants - Make A Collection.* (Cover any labels denoting native/invasive species that may be on the photo or specimens with tape – green painters tape works best to not damage the photo or specimen.)

Procedure

1. Divide the class into three or four teams.
2. On a table on the opposite side of the classroom, lay out all the photos and/or prepared plant specimen. Note: remind students that not all non-native plants are invasive!
3. On a signal, students will take turns racing to the other side of the classroom and "pulling" a *non-native* species to bring back to the team. The team then decides if they agree with the selection. If they agree, they keep the photo / plant and send the next member of the team to select another. If a team does not think the plant pulled is a non-native, they will send the same team member back to the table to return the photo. This team member does not get a second chance at choosing a plant, and the turn switches to the next team member.
4. Play ends when all team members have had a chance to select a plant.
5. To score, teams count how many non-native species they collected. If the teams collected any native plants or species, they subtract the number of natives from their score. The team with the highest score wins. You can play this game using native species as the ones to find as well.

Adaptation for Primary students:

Play the relay game similar to above, but have the students identify samples of their focal plant - one plant that they have all recently studied - among other photos and samples of non-native and native pressed plants. Ask how they were able to identify the focal plant e.g. what is special about the stem, the leaves, the flower, or the roots?

5) ACTIVITY: DON'T LET IT LOOSE! AQUARIUM POSTER ACTIVITY

Grade levels: Grades 3 – 6 (Ages 8 – 12)

Subject Areas: Art – Visual Art; Science: Life Systems, Ecosystems, Impacts

Duration: 1-2 periods (about 45 minutes to 1 ½ hours)

Students will take action by creating educational posters to display at school, libraries, pet shops and city aquariums that remind the public of their responsibilities as pet owners. As an art activity, this project will be used to explore tint, shade and texture.

Students will learn that when they release aquatic pets and plants into local waterways there can be negative impacts on habitats and communities.

Through the creation and display of educational posters, students will demonstrate their understanding of responsible pet ownership and the importance of being an active community member in preventing the spread of invasive species.

Materials

- White paper, water colour paint kits / tempura paints
- 1 cardboard square or plastic palette per student, paint brushes, water OR use markers;
- Scrap paper, pencils, rulers, glitter, sand, wool, tissue paper
- Examples of public information posters
- Poster Messages (see below: write on board or copy for students).
- Don't Let It Loose videos (ISCBC website and YouTube channel)
    - https://www.youtube.com/watch?v=1b6AoZSYzNU
    - https://www.youtube.com/watch?v=oiQdVLQwSiw&feature=youtu.be

Procedure

1. Discuss: Who has or has had an aquarium? An aquarium is a simple, contained and created habitat, and the animals and plants that live in it (along with its human host) are a community. Ask students to describe the aquarium food chain. Could this habitat survive without human interaction?
2. Ask: What would you do if you had to move far away and couldn't look after your aquarium anymore? Why might someone think it would be good to empty an aquarium into a local water system? Why could this be a bad idea? Explain that plant and animal species sold in pet shops are very often non-native species. What would happen if they were dumped into a pond?

    If they are potentially invasive species, they:

    - Have few natural enemies or predators

- Reproduce quickly and often
- Adapt to many conditions
- Out-compete native species for food and habitat

Note that some aquarium species like exotic salamanders or fish like piranha may not become invasive but could have disease or parasites that could infect our native species.

Ask: How does this compare to their life (role in the food chain) in the aquarium?

3. In two separate columns on the board, brainstorm the following questions:

a) How can aquarium owners best care for their pets and plants when they can no longer look after them? (E.g. donate to schools or seniors' homes, give back to pet stores, give to responsible friends, dry the plants out in the sun.)

b) How as a class can we let people know about careful aquarium care? (Prompt: "create posters for community spaces, pet shops", if needed.)

4. Ask students to each create a special poster that will educate citizens on the importance of being a responsible aquarium owner. Explain that it must contain one message from the Poster Messages list (see below). Write the list on the board or hand photocopy out to students. Go over the messages together to ensure that students understand them and have them use their own words to edit messages to their liking.

Poster Messages

- Releasing aquarium pets and plants into the wild is harmful to local habitats!
- Never release or flush aquarium pets or water into drains, toilets, ditches, or natural waterways.
- Drain aquarium water on dry land – it can be good for the garden!
- Burials on land are better than burials at sea. Don't flush dead pets away. They could harm our habitats!
- When finished with aquarium plants, dry them out in the sun and put them in the garbage (not in the compost)!
- Donate unwanted aquarium fish, snails, reptiles and plants to a pet store, school or aquarium hobbyist. Offer them for free!
- Contact a local aquarium club or the Canadian Association of Aquarium Clubs, at (905) 682-2991 (www.caoac.on.ca) and ask about a fish rescue program for unwanted aquarium pets, or contact the Invasive Species Council of BC
- Be responsible for your aquarium pets and plants. The release of aquarium pets into BC waters is illegal. Help prevent the spread of non-native aquatic

species!

5. Ask students to close their eyes and imagine they are swimming underwater in a pond or aquarium. What do you see? Now swim down to the bottom. Is it lighter or darker there? Why? Tell students that they will adjust the lightness and darkness of the blue water in their painting using white paint and black paint. On the chalkboard, define shade and tint for the students. (Suggest they start by painting the middle of the pond or aquarium in plain blue.)
6. Ask: Describe the different textures in the water you were swimming in. Explain that there are many things in a pond or aquarium that aren't smooth. What can we do in our paintings to show different textures? Discuss (and demonstrate) brush technique and the addition of sand to paint (mix it into the paint on the palette before applying) to create textures for pond and aquarium bottoms, plants and fish. (Optional: Students can also use materials like glitter for fish scales and wool or tissue paper for aquatic plants.)
7. Ask students to choose a poster message and using shade, tint and texture, create a picture depicting it. Write these criteria on the board and review with the class:

   Posters will:

   - Include a large aquarium or pond in tints and shades of blue
   - Explore texture with brush strokes and the use of added materials
   - Communicate a message to the public about aquarium pet stewardship

Note: Students should ensure there is message space on the top or bottom of their poster by marking it out ahead of time with a ruler. Once complete, have students present posters to the class or a buddy class, explaining the art techniques they used and how their message is depicted. Determine a method for delivering the posters to libraries, a community hall, mall or local pet shop. The ISCBC would love to see your students' posters as well – send any photos to education@bcinvasives.ca.

Notes for Teacher

Most aquarium fish, plants and invertebrates are not native to British Columbia. By releasing them into open waterways, these species could establish beyond their native range and have negative impacts on the environment. An example is the red-eared slider turtle, a popular species sold in pet stores. Red-eared sliders look cute when they're babies but can grow to dinner-plate size as adults! When released into BC's waterways, red-eared sliders compete with the Western Painted Turtle, BC's only native freshwater turtle, for food and nesting areas, and can also carry salmonella, a bacterium that can be easily transferred up the food chain.

Bullfrogs, native to eastern North America, were brought to BC in the early 1900's to farm for their meaty legs. They have spread throughout southern BC and are out-competing BC's native frogs as well as eating them! (Bullfrogs will eat almost anything they can fit in their mouth, including other frogs, salamanders, fish, even small mammals and birds!) Bullfrog tadpoles are large (as are the frogs themselves), making them a preferred pet for kids to capture and raise. Once they grow into frogs, they are usually released into new habitats, increasing their spread.

Evaluation

- Posters can be evaluated for art concepts (tint, shade and texture) while presentations will indicate whether students recognize the need for human action to protect against the impact of invasive species. Students should be able to make connections to healthy habitats and communities and provide specific examples of what aquarium owners can do to protect local habitats.

Adapted from: *Making Waves! Protecting Ontario's Aquatic Habitats*; Invading Species Awareness Program

- www.invadingspecies.com

6) ACTIVITY: BUILD A FAIRY GARDEN… INVASIVE-FREE!

Grade levels: Grades K – 5 (ages 5 – 11)

Subject Areas: Art - Visual Art; Science: Life Systems, Ecosystems, Impacts; Social Studies

Duration: 2 periods (about 1 ½ to 2 hours)

Students will each create a fairy garden that highlights a favorite outdoor activity and describe how the introduction of invasive plants can be prevented or the spread of existing infestations can be controlled.

Time of year: This activity is easiest to do in the spring, when flats of annuals and soil are readily available. As an additional step, students could select seeds of non-invasive, easy-to-grow annuals in the winter and grow their own plants for the fairy gardens to be created in May during Invasive Species Action Month!

Many thanks to Kari Bondaroff, Manager of Invasive Plants, Environmental Services and Field Services Program, Peace River Regional District, Dawson Creek, BC for permission to use this activity.

Materials

- Invasive plant ID booklets and/or carabineers
- Invasive plant photos or poster
- Samples of a dandelion and a grass (or photos)
- White board or flip chart
- Unlined paper, coloured pencils, markers
- Containers for gardens (Tupperware, take-out containers – re-use/recycle if possible!)
- Garden creation craft materials e.g. popsicle sticks, clay, rocks, 1-2 bags of soil, small toy animals and other characters, paint, hot glue-gun, glue sticks, moss, crystals, shells,
- Plants for the gardens: small, non-invasive annuals of different shapes and sizes: ensure you have enough for one per student.
- Fairy garden books

Procedure

Class Discussion – Day 1

1. Ask the following questions and write the answers on the board.
    - What do you know about invasive plants?
    - What do you want to know about invasive plants?

2. Pass around some photos of local invasive plants or put up a poster (See Resources Section) for the students to see. Include a picture of Burdock or Hounds' tongue burrs. Discuss:
    - Have you seen any of these plants before?
    - Can you recall where you saw them? What were you doing?
3. Differences between a native plant, a weed, and an invader or invasive plant. Pass around a sample of a grass and a sample of a dandelion (or photos) and discuss:
    - What are these plants that we are passing around?
    - Are they considered weeds? Why?
    - What makes these plants weeds? Define a weed as a class on the board. (A plant that is growing in an area where it is not wanted)
    - What is an invader or an invasive plant?
    - Are all introduced plants invasive? (many garden and food plants are not from here, and won't thrive outside our gardens or farms)
    - What makes a plant invasive?
    - How can we define an invasive plant? (They are plants that originated elsewhere and are often introduced unintentionally to our area, arriving without the natural predators that kept them in check in their native homelands.)
4. Ask students to each describe one activity that they love to do outside. List them all on the board and add one for yourself. Ask them that if they see their activity on the board already, think of another one to add.
5. Using the teacher's activity as the example, ask the following questions:
    - How do you think this activity could unintentionally spread invasive plants?
    - What actions could we do to prevent introducing or spreading invasive plants?

Write sentences on the board to highlight several of the listed activities, using the statement… *"When I am… I can prevent spreading invasive plants by… "*

6. Pass out blank paper and coloured pencils. Have students draw/sketch a scene of themselves performing their favorite outdoor activity. Then ask them to write two or three sentences describing the activity that they love and how they are going to prevent the introduction or spread of invasive plants while performing that activity.
7. Next, have them create a list of materials required to create that scene. Provide some materials if possible and ask students to bring some from home. Post a list of materials that you can provide, such as popsicle sticks, clay, glue, rocks, plants, soil, etc.). Ensure that students don't forget the containers for their gardens… ask them to be creative and use recycled containers when possible. Ensure you have enough small plants for one per student.

Fairy Garden Creation – Day 2

Students will each create a fairy garden that highlights a favorite outdoor activity and describe how the introduction of invasive plants can be prevented or the spread of existing infestations can be controlled. Complete the following steps to ensure proper planning and efficient use of materials:

1. Ensure that each student has their own container, sketch and materials list.
2. Spread out the garden materials on tables or on the floor and use a tarp to help collect excess soil. If feasible, do the activity outdoors.
3. To help ensure that students do no overuse materials, have them come up individually and show their sketch and material list before picking up their materials.
4. Have students create their fairy gardens using one plant and whatever else they select. Have them display their two sentences somewhere on the garden. It may be a sign or a sticker label, but it must be neat and visible with their name on it. See the following photos for examples, thanks to students from Dawson Creek, Chetwynd and Tumbler Ridge, BC.

Resources

- *Fairy Gardening: Creating Your Own Magical Miniature Garden* by Julie Bawden-Davis, Beverly Turner; 2013, Skyhorse Publishing.
- *Fairy Garden Handbook* by Liza Gardner Walsh, 2013, Down East Books.
- *How to Build a Fairy Garden* video https://www.youtube.com/watch?v=IZlyWoW7Rww

How I can prevent spreading invasive plants while riding horses

My favorite thing to do while I'm outside is riding horses. I can prevent spreading invasive plants by picking out my horse's hooves. I can also pick any burs or seeds off my horses.


My activity is going to the lake. I can prevent
the weed from spreading by wiping my self off
after I step on the ground so no seeds spread.

7) INVASIVE PLANT "UNWANTED" POSTER

Age / Grade levels: Elementary / Intermediate / Secondary (Ages 10 – 16)

Subject Areas: Art - Visual Art; Science: Life Systems, Ecosystems, Impacts

Duration: 1 period (about 45 minutes)

A fun art and research activity where students study an invasive plant of BC and design a creative "Unwanted" poster for the plant.

Materials

- A copy of the UNWANTED Poster template for each student (see Appendix 1)
- Felt pens/pencil crayons, paints
- Field guide to invasive species (visit bcinvasives.ca/resources/publications) or information from internet

Procedure

1. Discuss the difference between native, introduced and invasive plants as a group. Then have each student select an invasive plant from your region and make a *"Wanted: Dead or Alive"* Poster about it using the template. Sketch out an example on the board to help students remember all the elements for the poster.
2. On the poster, have students include examples of how the four main characteristics of invasive plants are represented: Write these on the board or example poster to help students remember them.
    - They are usually prolific seed producers (many produce thousands of seeds)
    - Their seeds spread easily and effectively
    - They establish and spread quickly
    - They lack natural predators and diseases that keep their population under control in their native locations
3. Also have students include on their poster: the plant's common and Latin name ("also known as"). The common name is the name that the plant is usually called by, while the Latin name is its scientific name (genus species). For example, Purple loosestrife is also known as *Lythrum salicaria.*
4. The poster should also include characteristics (colour, shape, size, etc.), "Crimes committed" (impacts it has on the ecosystem), "Last seen" (where it is found) and draw a picture of the plant. Have them add as much humour as they'd like! Share your "Unwanted" posters with your community: ask to make a display in your local community centre, library or mall.

Adapted from ISCBC: *Intermediate Activities – Invasives in the Classroom.*

8) ACTIVITY: PRESSING INVASIVE PLANTS - MAKE A COLLECTION!

Age / Grade levels: Grade 6 – secondary level (ages 12 – 17)

Subject Areas: Science: Life Systems, Ecosystems, Impacts

Duration: 2 periods

Students will learn to distinguish between native and non-native plant species of BC and collect and prepare pressed invasive plants for a collection from a local area. Students should have previous experience and knowledge of invasive and native plant identification.

Materials

- Fresh invasive plant specimen (if teaching lesson in late spring- early fall)
- Prepared pressed invasive and native plant specimens (if no fresh plant specimens available)
- Plant press (or heavy books, cardboard, and newspaper) OR make your own (see instructions below)
- Index cards (cut in half), Sticky notes
- Acid-free cardstock paper
- Contact paper
- Plant identification books (see Resources section)
- Gloves (gardening) for each student
- Plastic grocery bags or large freezer bags

Background

In this lesson, students will learn to collect and press invasive plants, and will use their pressed plant specimen to learn the difference between native and non-native species in their area.

A specimen is simply an individual plant that is taken to represent other plants of the same species. Preserved plants can help people learn to identify plants and study how a single species varies in different areas. A plant collection can reveal a snapshot in time of all the species of plants that inhabited an area. They can also record the introduction of new species.

A herbarium is a special place where plant collections are held that allows the plants to stay preserved in dry, pest-free cabinets. The ability to correctly identify plants is a key skill in the fight against invasive plants. We don't want to go around pulling up the native plants in BC's ecosystems!

Lesson 1

Have students research invasive plants that are common in their region. They can work in pairs or be assigned an invasive plant species each. Contact the regional invasive species committee

nearest you, who can provide information on common invasive plants and locations for collection. They may be able to come out and provide a weed tour or a weed pull activity (see map: https://bcinvasives.ca/about/partners/bc-stakeholders/).

Remind students that it is easy to confuse plants based on the colour of the flowers or the shape of the plant. For example, the invasive plant Purple loosestrife looks very similar to our native Fireweed. Both plants have light purple or dark pink petals with flowers that are arranged in a tall spike. When you take a closer look, you see that even though the plants look similar, they are not even in the same family.


Purple loosestrife
Credit R Mueller


Fireweed
Credit L Scott

Plant families are groupings of plants based largely on a plant's flowers or reproductive structures. For example, Purple loosestrife is in the Loosestrife Family *(Lythraceae*). Fireweed is in the Evening Primrose Family (*Onagraceae*) whose flower parts occur in multiples of 2 or 4. Take a look. Fireweed has four petals, while Purple loosestrife has six petals. In BC, there are many families of plants that have both native and non-native species occurring. When trying to tell a native plant from a non-native plant within the same family, you must look very carefully at the flowers, leaves, and stem. Some of the major families with both native and non-native species in BC are the Aster Family (*Asteraceae*), the Grass Family (*Poaceae*), and the Pea Family (*Fabaceae*). Plant guides are very helpful in determining whether a plant is native or non-native. Often plant guides that include both native and non-native plants, will refer to non-native plants as "introduced" plants.

Identification Resources:

Check out the provincial data base "e-flora" http://ibis.geog.ubc.ca/biodiversity/eflora/ or check

out the field guides listed in the Resources section of this guide.

Before the activity:

Find an area where students can work to collect invasive plant species. Note – it is illegal to collect plants from any park or reserve, although some parks will allow removal of invasive plants. Check with your local regional invasive species committee, park or municipal office for a location, as well as for tips on what invasive plants may be there. Ask about having a staff person come to support your weed pull. Otherwise, make sure you know the area you can collect from - e.g. a vacant lot, a field or woodland - and ask permission to collect plants from the owner of the land. Assemble all materials. Cut index cards in half. Pre-cut 8.5”x11” pieces of contact paper.

Note: Students should have a working knowledge of identifying invasive plants or be accompanied by a regional expert. Review the rules of plant collecting with the students before they head out: it is useful to get them to generate the rules themselves during a class discussion, write them on the board, and then review any that they may have missed. See below for a summary of collection rules.

Lesson 2: Collecting and pressing the plants

Students to work together in small groups.

Note: The invasive plants to be collected would have been outlined and researched by students in an earlier lesson. Take plastic bags or large ziplock bags and go hunt for invasive plants, wearing protective gloves. Each group of students should look for as many different species as they can find.

Some Rules for Collecting Plants

- Pick all the known invasive plants that you want.
- The best specimens have all the plant parts included: try to take a specimen with a flower, leaves, full stem, roots, and seeds.
- Remember that this all must fit on one piece of paper, so don’t go digging up any trees!
- Important - If you are unsure if a plant is native or invasive, *do not pick it!* Endangered and threatened plants are extremely rare; take a photograph instead for later identification.

Back in the classroom, students will identify their specimens using plant identification books. On an index card, students will record the common name of the species, the scientific name, the family the plant belongs to, the date, the location that the plant was collected, and the name of the person who collected the specimen.

How to Press a Plant

1. Open the plant press and lay a layer of cardboard and blotter paper on the wooden frame. Lay down a few sheets of newsprint paper.
2. Arrange plant on the paper so that most of the plant parts don’t overlap. Try to arrange leaves and flowers so that they will be flattened straight. Place the index card with all the identification information into the press with the plant.

3. Place another few sheets of newsprint on top of your plant, then add another layer of blotter paper and cardboard.
4. Continue to layer cardboard, paper, and plant specimens until all your samples are in the stack. Top the stack with cardboard and the other wooden frame. Pull the buckle strap around the two ends of the stack and pull the strap as tight as you can.
5. Wait. Your sample will be dry in a few days to a few weeks, depending on the original moisture content of the plant. For plants with higher moisture content or in moist climates, you may have to change out the paper in the plant press.

Make Your Own Plant Press

You can build your own plant press using the backs of old clipboards or 3-ring binders (with the rings cut out to make 2 covers), plywood, or pegboard as the frame. Use layers of cardboard and newspaper, and tie the frame closed with string or large elastic bands or bungee cords. While a plant press provides the best results, you can even preserve plants simply by placing your specimens in newspaper or inside an old telephone book under a heavy pile of books.

Preserving Specimens

Have students seal their dried plants in contact paper. This will allow students to manipulate the specimen and use them in further activities. Take a piece of acid free cardstock paper and arrange the pressed plant on the paper. Place the half index card on the bottom right hand corner of the paper. Peel the paper backing off the 8.5" x 11" piece of contact paper. Starting at the top of the paper, gently lay contact paper in line with the edge of the cardstock paper. Seal the contact paper into the plant specimen and cardstock paper slowly to help prevent bubbles from forming.

Using their preserved specimen, have students sort the plants into family or genus categories. What are the similarities and differences among the plants? Can you see any patterns within the specimens of a single family? How do they look alike? Are there any families that had both native and non-native species present? What native plant species in the region might be threatened by the invasive plant species?

Activity adapted from *WEED WACKERS! K-6 Educators Guide to Invasive Plants of Alaska*; http://www.kenaiweeds.org/user_images/WEED%20WACKERS%20K-6%20guide%20for%20AK.pdf

9) ACTIVITY: DESIGN A NATIVE PLANT GARDEN

Age / grade level: Grades 7-12 (ages 13 – 17)

Subject Areas: Science 8 - 10: Life Systems, Ecosystems; Biology 11, 12; Social Studies, Phys Ed

Duration: 2 periods (about 1 ½ hour to 2 hours)

Students will design a native plant garden for their school and present a poster of their design.

Materials

- Paper, pens / coloured markers
- Background / research material on native gardens (e.g. Naturescape resources and other native plant guides - see Resources section)
- Map of school grounds (ask the school district for a copy)

Background

Invasive species impact BC's biodiversity by competing with native species for habitat, food and water and impacting ecosystems and habitats. Responsibility for the province's biodiversity is everyone's concern. Students will identify local native and invasive plants in the region, list options for native plant landscapes, and research and develop a native plant garden for their school or another location (library, senior's home, etc.). Students will present their plan to the class and/or school administration/parent advisory council.

In this activity, students will design a garden with native wildlife habitat, wildlife and water conservation in mind. Gardening with minimal use of water is called xeriscaping and native plants can be great options. Using native plants in the garden supports wildlife biodiversity in the region, including important pollinators, insects and birds. The activity also raises awareness of invasive plant species established in the region as well as those sold at nurseries and promotes efficient water use.

A native plant is one that occurs naturally in our region, as opposed to the many plants that have been introduced by settlers, farmers, and gardeners. Native plants are adapted to growing in our soils and climate and, as a result, tend to do well in local climate conditions if planted in an appropriate way. In addition, they provide food, shelter, and nesting sites for wildlife and are important food and habitat for key pollinators including native bees, butterflies and hummingbirds. Native plants are particularly valuable for native animals because they help wildlife survive in areas of urbanization or habitat fragmentation. Making a native plant garden increases wildlife habitat and can also conserve water – a true "win/win" situation.

Procedure

Prior to class, gather the following background material:

Naturescape British Columbia – Caring for Wildlife Habitat at Home;
https://hctfeducation.ca/product-category/books-and-guides/

Download the appropriate guide for your region of BC:

- Central Interior
- Coast and Mountains
- Georgia Basin
- Northern Region
- Southern Interior

Student background information: Native Plant Garden Design

1. 1. Class discussion. Introduce the concept of the importance of native plants to BC's biodiversity. British Columbia - truly "Super Natural BC" - is home to more species of plants and animals than any other province, including 72% of Canada's land mammal species, 50% of Canada's amphibian species, 60% of Canada's plant species and 70% of Canada's nesting bird species! Invasive species are a serious issue world-wide, representing the second greatest threat to global biodiversity after habitat loss, and costing governments and communities tens of millions of dollars in control efforts.

   Invasive species can have severe impacts on ecosystems: they compete directly with native species, reduce or alter habitats for native organisms, lead to erosion and water siltation, increase fire hazards and can have significant impacts on human health.
2. Explain that one way we can support wildlife in BC is by creating native plant garden designs that support local pollinators, birds and other species. Native plant gardens are a beautiful way to create gardens that thrive in our climate all year long and grow with little, if any, irrigation – a bonus for schools and other institutions that are not active through the summer months.
3. Divide students into Native Plant Garden Design teams; alternatively, students can work individually. Tell students that they are going to design a native plant garden for the school or another site, such as a local library or seniors' residence. After identifying a site, have students research sample native plant garden designs for their region, using the Naturescape resources, others listed below, as well as online sources. Remind them that the plants need to be native to their region of BC: some plants native to southern BC will not survive further north! A map or drawing of the school grounds or chosen site is useful for designing the garden's dimensions.
4. Have each student or group design a native plant garden for their selected site. Each garden design should:
   - Identify the native plant species used in the design;
   - List how any plants selected were used by Indigenous people (Traditional Ecological Knowledge) and their importance;
   - Identify wildlife habitat created in the design;
   - Identify any special features of the garden.
5. The garden design should be presented on a poster board or paper and include garden dimensions and a list of materials / plants needed to complete the garden.

Evaluation

Have students:

- Describe the importance of native plants to several local wildlife species (e.g. pollinators, birds, mammals) and explain their value.
- Describe the importance of native plants to Indigenous people and contemporary societies and explain their value.
- Describe how the native plant garden will conserve water.

Extensions

- Do a soil lab session outside on your school grounds.
- Select and grow plants for the garden. Students can further their knowledge and skills by growing some of the plants that are in their garden design. Sample native plant seeds may be obtained from several nurseries in BC. When plants are grown to a suitable size, they may be transplanted into the school garden or taken home by students to plant in a home garden.
- Students research different garden styles (meditation, healing, butterfly sanctuary, cuttings, scent gardens, vegetable or herb gardens).

Resources

- Pettinger, April and B. Costanzo (2002). Native Plants in the Coastal Garden, (Revised).
- Whitecap books, North Vancouver B.C.
- Food Plants of Coastal First Peoples. 1995. by Nancy J. Turner. Royal British Columbia Museum Handbook.
- *Naturescape British Columbia – Caring for Wildlife Habitat at Home;* https://hctfeducation.ca/product-category/books-and-guides/ Download the appropriate guide for your region of BC:
- Backyard Habitat for Canada's Wildlife Guidebook. Canadian Wildlife Federation. http://www.wildeducation.org
- Plants of Coastal British Columbia. Pojar, Jim and A. MacKinnon (eds.). 1994. Lone Pine Press.
- Trees, Shrubs, and Flowers to know in British Columbia and Washington. Lyons, C.P. and B. Meriless. 1995. Lone Pine Press.

10) ACTIVITY: MAPPING INVASIVES IN YOUR SCHOOLGROUND /COMMUNITY

Age/ Grade levels: Secondary - Grades 9 – 12 (ages 14 – 17)

Subject Areas: Math, Social Studies (Geography), Science: Life Systems, Ecosystems

Duration: 2 periods (about 1 ½ hours to 2 hours)

A field skills activity: students do a survey using transects or quadrants of a nearby park or natural area, and map existing invasive species and native species present.

Materials

- Field guides to native and invasive plants of the region
- Outdoor natural area, park to survey
- 25m tape measure or length of rope,
- Quadrat frames with legs OR a 2m length of rope OR a hula hoop for each group of 3 students
- Clipboards with pencils
- Rulers (to measure size of species)
- Student field sheet (on waterproof paper if needed)
- Hand lenses
- Cameras/cell phones

Background

Monitoring of plant life - both native and non-native - can be done several ways: a popular method is called a *quadrat study*. A quadrat study is a method to look at what kinds of plants live in an area and how abundant they are using quadrat frames – square frames that are placed along a set transect line. These studies generate information that can demonstrate how a specific site compares to other sites in a region. Most importantly, these studies can be done over time, and the data compiled and analyzed to reveal changes to the biological composition of an area. This information can be invaluable to scientists, land managers, and concerned citizens.

Alternately, a simpler method is to use a *transect line* without the quadrat frames – a long piece of rope with 2m pieces of rope placed perpendicular to the transect line along set measurements. Both methods generate information about the kinds of plant species found in an area and their relative abundance.

Protocols help ensure that land managers collect accurate and consistent data when conducting a plant inventory. For example, land managers need to know the locations of specific weeds, whether the weeds are spreading, and the effectiveness of weed management practices. Inventories help provide this information. Students will learn how to follow a protocol properly and collect accurate data by setting up a transect line.

There are different types of inventories. Sometimes, an inventory covers a large area in a broad sweep. Other inventories provide detailed information about a small area. The main thing is that information collected during the inventory be accurate and reliable – following specific protocols or procedures when collecting information. This lesson focuses on protocols for using a transect line and counting stems in study plots.

Setting up a transect line

A transect line is a straight line laid out randomly or systematically within a study area. One or more transect lines may be set up within a study area. Before setting up a transect line, determine the length of the line – this often depends on the size of the study area. Researchers often divide the area along the transect line into small plots and observe and record plants that occur within the plots.

Conducting stem counts

By counting the number of live plant and weed stems within a plot, land managers can estimate the density of weeds in a study area.

Preparation

1. Students should have the ability to identify invasive plants in their study area. If necessary, help students learn to identify invasive species / weeds and review the main ones in the region.
2. Discuss the importance of following protocols when conducting an invasive plant inventory. Discuss transect lines and weed stem counts.
3. Explain that students will set up a transect line outdoors, count the number of live plant and weed stems in plots along the transect line, and estimate the population of weeds, based on their stem counts.

Procedure

Before the Field Day

1. Brainstorm what the students know about the plants that live in their region. List as many native and non-native plants as possible.
2. Have students write a list of questions about invasive plants / pair share with another student, combine questions, then make a class list of questions on the board.
3. Have students select a plant and gather information about it (optional).
4. Identify some of the key characteristics of invasive plants with students:
    - they are usually prolific seed producers,
    - their seeds spread easily and effectively,
    - they establish and spread quickly,
    - they lack natural predators and diseases that keep them under control in their native locations.
5. Show the class the provincial Invasive Alien Plant Program Map display, which maps invasive plants across BC as a good example of collected inventory data. You can

zoom in to your community to see what invasive plants are present. http://maps.gov.bc.ca/ess/hm/iapp/

Prior to the Field Trip

Prepare an observation sheet that will help students inventory a few examples of the following items:

- Native species: What Indigenous animals and plants are present? Are there any rare or endangered species?
- Non-native species: What invasive or non-native plants are present? Where are they located and how much space do they occupy?
- Interrelationships: Is there evidence of interaction among species? Are there signs of predation or competition between native and non-native species?
- Positive impacts: How do alien species appear to be benefiting other animals and plants? For example, are pollinating insects drawn to invasive plants such as Orange hawkweed and Himalayan blackberry?
- Negative impacts: What harmful effects can be attributed to invasive plants? Look for signs of monocultures (plant communities dominated by a single species) and native animals and plants that are crowded out of their homes.
- Habitat elements: Are there natural food sources, like fruits, seeds, and nectar? Is there a river, marsh or other source of water? Can wildlife find shelter in places like rock piles, thickets, tree hollows, and submerged logs? Is there space to grow and multiply?

Field Day

1. Organize students into teams of two or three. With the class, list as many native and non-native plants as possible, and review their pictures and identifying features in the field guides.
2. Gather equipment and head into the school grounds, or travel to the park or outdoor natural area you'll be working in. Select a site that looks representative of the vegetation in the area to survey.
3. Explain that the students will set up a transect line in a specific area, count the number of live invasive plants (weed stems) and native plant stems in plots along the transect line, and estimate the population of invasive plants, based on their stem counts. By counting the number of live invasive plants within a plot, weed managers can estimate the density of invasive plants in a study area.
4. Have the students work to gather data and complete the observation sheet. Have them sketch a map of the survey site - including borders, habitat elements, native and alien animals and plants, evidence of positive and negative impacts, plus human components, like fences, buildings, and parking lots - on a sheet of graph paper.
5. *Setting up a transect line:* A transect line is a straight line laid out randomly or systematically within a study area. Use a 25m rope marked off into metre lengths (use a Sharpie marker) or a tape measure and lay it out. The line length often depends on the size of the study area. Scientists often divide the area along the transect line into

small plots and observe and record plants that occur within the plots.

6. Place students in teams of three along the transect line every 5 - 10 meters (depending on the size of the area) with their field equipment (quadrat, hula hoop or 2m rope; a hand lens; clipboard/paper/pencil, camera, plant field guides). The quadrat, hula hoop or 2 metre rope should be placed perpendicular to a central point on the transect. If you do not have enough participants to complete all stations at once, spread them out evenly over the area to be surveyed.
7. Once the student teams are in place, the data can be recorded: have one student record, and one count invasive plants and native plants in the quadrat or along the rope, and the third consult field guides to help identify the plants. If they can't identify a plant, have them draw or photograph it – noting where it was found. Be sure that each study area (at 0m, 5m, 10m etc.) is numbered and noted on their data sheet.

   Have the students record:

   - Non-native species: What invasive or naturalized plants are present? How many? Where are they located and how much space do they occupy?
   - Native species: What Indigenous animals and plants are present? How many are along the rope? (or in the quadrat?) Are there any rare or endangered species?
   - Interrelationships: Is there evidence of interaction among species? Are there signs of competition between native and non-native species (is there a monoculture - or a lot of one type of plant – in the area?)
   - Negative impacts: What harmful effects can be attributed to non-native species? Look for signs of monocultures (plant communities dominated by a single species) and native animals and plants that are crowded out of their homes.
8. Back in class, have students re-create their transect line on a large sheet of paper, drawing and labeling the plants that live in the area. Note species abundance and compare the transects. Have students look for plant communities: which plants/animals tend to live together? Which ones are predominant?
9. Ask each group to prepare a report summarizing their findings. Have them share their observations with the rest of the class, compare maps of the site, ask questions to clarify each other's findings, and discuss any differences of opinion concerning the presence and environmental impacts of alien/invasive species.
10. Develop a full class list of all the native and invasive plants that were found on your survey. Submit your list to your local regional invasive species organization or to the ISCBC - they would love to see your data!

Evaluation

Evaluate students by observing students as they complete the field work, asking pertinent questions to determine students' level of understanding, and determining if students estimated the population density correctly.

Have students:

- Determine percentages of each native and non-native plant found at the different quadrat sites (0,5,10,15,20 m. etc.) and graph the results;
- Develop an invasive species removal plan, complete with research on the best ways to remove the invasive plants found, safety precautions, and the best plants to use in restoring the site.

Extension: Using iPad Technology in the Mapping Exercise

Objectives for this mapping exercise can be expanded using simple mapping applications that are available online for free or for a very nominal cost (less than $20.00). This mapping exercise can be adjusted to any age or grade depending on the amount of information the students can collect. iPads can be used to simply locate a feature. Using Google Earth, Google Satellite (both free to use) or the GPS Kit app, a student can locate his/her position on the school yard.

- http://gpskit.garafa.com/GPSKit/GPS_Kit_for_iPhone_%26_iPad.html
- https://www.avenza.com/avenza-maps/

The imagery could then be used to identify features to map on paper.

GPS apps can collect the following types of data to help create the map of your school ground or park:

- Point: Examples include single plants for features that are best captured using a single symbol like a pin or triangle.
- Line: Trails and roads can be walked, and their length calculated using the GSP app. This information can be used to create a more accurate map and features.
- Polygons: Patches of invasive plants, playground structures and buildings can be mapped using the polygon feature. The surface area of these features can be recorded with the help of the technology.
- Photographs can be taken with the device of the features to create a visual record of the status of the features. This is very helpful when used for invasive plant infestations. An overview photo showing nearby landmarks helps to locate the infestation site in the future. A close-up photograph of the infestation will allow students to monitor changes to the plant site. Photo monitoring can be a very useful and easy scientific method to use. It can be incorporated into the transect method above.
- Data Export: most of the apps can export the data via email or social media. The information can be exported and opened on Google Earth as an easy and accessible way to view your data. Google Earth is free to download and easy to use.

Adapted from the ISCBC Mapping Invasive Species Activity (2017), the Lillooet Regional Invasive Species Society iPad mapping activity (http://lriss.ca/) and the Rangeland Vegetation Inventory Field Lab Manual, by Juley Hankins and Karen Launchbaugh, University of Idaho Department of Rangeland Ecology and Management, Moscow, Idaho 83844-1135.

Education Resources & Links

This section provides a range of resource links for educators. Please contact ISCBC if you have questions or need more information – they would love to hear from you and learn more about the work you are involved with!

Sue Staniforth, Education & Outreach Manager, Invasive Species Council of BC

Phone: (250) 655-6300

Email: education@bcinvasives.ca

Invasive Species Council of BC

Website

- https://bcinvasives.ca

In the Resources section there are several education resources for both formal and informal educators

- https://bcinvasives.ca/resources/education/

Educational Activities and Resources

Tackle Invasive Species Hands-On with Your Students! A set of 8 activities and resources for teachers and other educators; suitable for use in both formal school programs and for informal youth groups and can be done in any sequence.

- https://bcinvasives.ca/documents/Education_Teacher_Resources_FINAL_06-02-2014.pdf

Aquatic Invaders: An Activity Package for Teachers and Youth Leaders (2016)

This resource contains a range of activities to help students and youth groups learn about invasive species and their impacts, and ways we can all help prevent their spread. They are primarily focused on aquatic invasive species but can be adapted for any invasive species exploration. Activities are listed with suggested age and grade categories, with most adaptable to suit any age and audience.

- https://bcinvasives.ca/resources/publications/aquatic-invaders-an-activity-package-for-teachers-and-youth-leaders-2016

Invader Ranger Youth Activity Book

Fun activities for grades 3-6 that involve learning about invasive plants through coloring, word searches, a crossword, weedy widget, dodecahedron, and more!

- https://bcinvasives.ca/documents/Youth_Activity_Book_07_18_2014.pdf

Plant Field Guides

- Backyard Habitat for Canada's Wildlife Guidebook. Canadian Wildlife Federation.
  - http://www.wildeducation.org

- *Naturescape British Columbia – Caring for Wildlife Habitat at Home;* https://hctfeducation.ca/product-category/books-and-guides/

  Download the appropriate guide for your region of BC:

  - Central Interior
  - Coast and Mountains
  - Georgia Basin
  - Northern Region
  - Southern Interior

- Plants of the Western Boreal Forest and Aspen Parkland. Johnson, D., L. Kershaw, A. MacKinnon, J. Pojar. 1995. Lone Pine Publisher, Edmonton, Canada.
- Native Plants in the Coastal Garden, (Revised). Pettinger, April and B. Costanzo (2002).
- Plants of Coastal British Columbia. Pojar, Jim and A. MacKinnon (eds.). 1994. Lone Pine Press.
- Plants of Southern Interior British Columbia. Parish, R., R. Coupé, D. Lloyd (eds.). 1996. B.C. Ministry of Forests and Lone Pine Publishing, Vancouver.
- Plants of the Rocky Mountains. Kershaw, Linda, Andy MacKinnon and Jim Pojar. Lone Pine Publishing, Vancouver.
- Trees, Shrubs, and Flowers to know in British Columbia and Washington. Lyons, C.P. and B. Meriless. 1995. Lone Pine Press, Whitecap books, North Vancouver B.C.
- Food Plants of Coastal First Peoples. 1995. by Nancy J. Turner. Royal British Columbia Museum Handbook.

Weeds / Invasive Species Field Guides

- Field Guide to Noxious Weeds and Other Selected Weeds of BC. Royer, F., and R. Dickinson. 2004.
- Weeds of Northern U.S. and Canada. University of Alberta Press, Edmonton, Canada.
- Field Guide to Noxious Weeds and Other Selected Invasive Plants of BC. Invasive Species Council of BC.
  - https://bcinvasives.ca/resources/publication

Other Invasive Species Resources

Canada:

- Alien Invaders Challenge: Girl Guides of BC

Note: these activities, although developed for Girl Guides, can also be adapted for all elementary grade kids aged 11-14. Older kids to adults can also participate by helping younger kids in these activities

- http://bc-girlguides.org/web/Documents/BC/program/AlienInvaders.pdf

» Green Teacher - Teaching About Invasive Species (2014) A Green Teacher publication.

A 74-page book containing perspectives, program ideas, activities and games to engage young people from 6 – 19 years of age in this challenging topic.

- http://greenteacher.com/books/teaching-about-invasive-species/

» Making Waves Protecting Ontario's Aquatic Habitat

- http://www.invadingspecies.com

» Biodiversity Education & Awareness Network

- http://biodiversityeducation.ca/formal/

USA

» Invasives on the Move

A U.S. based on-line teaching resource for teachers who want to integrate the topic of invasive plants into the classroom curriculum that is adaptable to Canada: K – 12 curriculums; Oregon Natural Resources Education Program (ONREP)

- http://www.weedinvasion.org

» Center for Invasive Species Management: Montana

This website has a good list of resources for K-12.

- http://www.weedcenter.org/education/k-12.html

» Citizen Science Handbook: Invaders of Texas

- http://www.texasinvasives.org/invaders/toolkit.php

» Community Stewardship Projects on Exotic Aquatic Species

A booklet of activities and community stewardship projects from Sea Grant

- http://www.seagrant.umn.edu/downloads/x78b.pdf

» Invasive Species Kids Activity Book

Idaho Department of Agriculture | 2012 | Grades: Elementary School. This activity booklet was designed to teach youth about invasive species and the threats they pose to the natural world.

- https://www.fws.gov/idaho/education/InvasiveSpeciesactivitybook.pdf

» Nature's Invaders: Exploring the Effects of Invasive Species on Local Ecosystems

New York Times Learning Network | 2010 | Middle School – High School
In this lesson, students learn how an invasive species and a native species

experiencing a population explosion may threaten some of the world's oldest trees, bristlecone pines in the western United States.

- https://learning.blogs.nytimes.com/2010/09/29/natures-invaders-exploring-the-effects-of-invasive-species-on-local-ecosystems/

» Designing the Perfect Plant: Activities to Investigate Plant Ecology

Science Scope | 2008 | Middle School. This series of activities introduces students to plant ecology and the ecological trade-offs associated with different types of plant and plant attributes.

- https://weedawareness.org/assets/documents/Science_Scope_Article[1].pdf

» It's (Not) Just a Bug

New York Times Learning Network | 2007 | Middle School – High School
In this lesson, students reflect on challenges that face farmers in cultivating crops, including insects. They then simulate how crops are affected by insect populations and the options farmers have to protect their crops. Finally, they create an agricultural plan from the perspective of a farmer.

- https://learning.blogs.nytimes.com/2007/06/19/its-not-just-a-bug/

» Alien Invasions: Examining Invasive Plant Species in Your Community

New York Times Learning Network | 2005 | Middle School
In this lesson, students create an educational pamphlet on the origins, spread, and impact of invasive plant species in their community.

- https://learning.blogs.nytimes.com/2005/07/26/alien-invasions/

» Real-life Aliens: Introduced Species (PDF)

Action Bioscience | 2002 | High School – College Undergraduate. This lesson examines issues stemming from introduced and invasive species. Students can gather statistical information about local invasives, interview animal and plant inspectors at an international airport, investigate the pet parrot trade, and more!

- http://www.actionbioscience.org/biodiversity/lessons/simberlofflessons.pdf

» Invasive Species Lesson Plan: The Invasion Game by BrainPOP Educators

- https://educators.brainpop.com/lesson-plan/invasive-species-lesson-plan-the-invasion-game/

» National Geographic: Introduction to Invasive Species - Activities for Grades 6 – 8.

Students learn what invasive species are, reasons they are introduced to new locations, and how invasive species harm ecosystems.

- https://www.nationalgeographic.org/activity/introduction-invasive-species/

Appendix 1: Unwanted Poster Template

UNWANTED

ALIAS _____

FOR CRIMES AGAINST BIODIVERSITY

FILL THE BOX FOR ALL DESCRIPTIONS THAT APPLY ■

- ☐ TAKES OVER HABITAT
- ☐ CAUSES INJURIES
- ☐ KILLS THE NEIGHBOURS
- ☐ TASTES TERRIBLE
- ☐ LOTS OF BABIES
- ☐ NO PREDATORS
- ☐ ALIEN
- ☐ POISONOUS

ISC Invasive Species Council of BC

BCINVASIVES.CA