



Lessons in a Backpack



GEORGIAN BAY
BIOSPHERE
MNIDOO GAMII
Spirit of the Water

Invasive Species

A Water Ecology Lesson



Description of Lesson

In this lesson students will observe, discuss, answer questions and play a game together, followed by discussion of the results and potential issues. Students can watch two videos about invasive species in aquatic ecosystems and perform an investigation regarding invasive species in Georgian Bay. Students will be divided into teams to play Jeopardy.

Connect with the Georgian Bay Biosphere

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GEORGIAN BAY
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Georgian Bay Biosphere: Lesson in a Backpack Program

At a Glance

Grade Level: 5

Learning Environment:
Classroom and gym/outside

Prep Time: 10 minutes

Length of Lesson: 2 hour and 15 minutes

Key Vocabulary: Ecology, ecosystem, biotic, abiotic, invading species, biodiversity, aquatic, alien invasion, and invasive species.

Staffing: 1 educator

Materials:
Worksheets
Yarn
Laminated Diagrams
Laminated Pictures
Computer
Internet access
Projection screen

Groupings: Whole class, teams, and groups of 5-7

Teaching/Learning Strategies:
Lesson, observation, game play, word search, and definitions.

Lesson Outline

TIME	ACTIVITY	LOCATION	MATERIALS
<i>Recommended Pre-Georgian Bay Water Festival (if participating)</i>			
15 minutes	A. Introduction	Classroom	
20 minutes	B. Ecology Web Activity	Gym or outside	Yarn
<i>Recommended Post-Georgian Bay Water Festival (if participating)</i>			
30 minutes	C. Invasive Species Crime Scene	Classroom Computer Lab	Projector Worksheets
30 minutes	D. Invasive Species Jeopardy	Classroom	Projector

Curriculum Expectations

Science and Technology Understanding Life Systems: Human Organ Systems

Overall Expectations

- Analyze the impact of human activities and technological innovations on human health.

Specific Expectations

1.1 Assess the effects of social and environmental factors on human health. Propose ways in which individuals can reduce the harmful effects of these factors and take advantage of beneficial factors instead. Assess human impacts on biodiversity and identify ways of preserving biodiversity.



Background

What is an ecosystem?

An ecosystem includes all living organisms (plants, animals bacteria, fungus) in a given area, in conjunction with non-living elements (air, water, sunlight, temperature, and energy - food) and the interactions of these groups. Living members (biotic) of an ecosystem, together with non-living (abiotic) factors, depend on each other.

Aquatic ecosystems can be disrupted and destroyed by human activities, such as introducing invasive species.

What Are Invasive Species?

An invasive species is an organism (plant, animal, fungus, or bacteria) that has been introduced to a new environment and has a negative effect on the economy, environment, and/or human health. Invasive

species can spread via natural pathways such as wind, water currents and on animals, or, more commonly, through human activity, including garden plantings, recreational activities, shipping, etc. Increases in invasive species are a sign of disturbance in terrestrial or aquatic ecosystems.

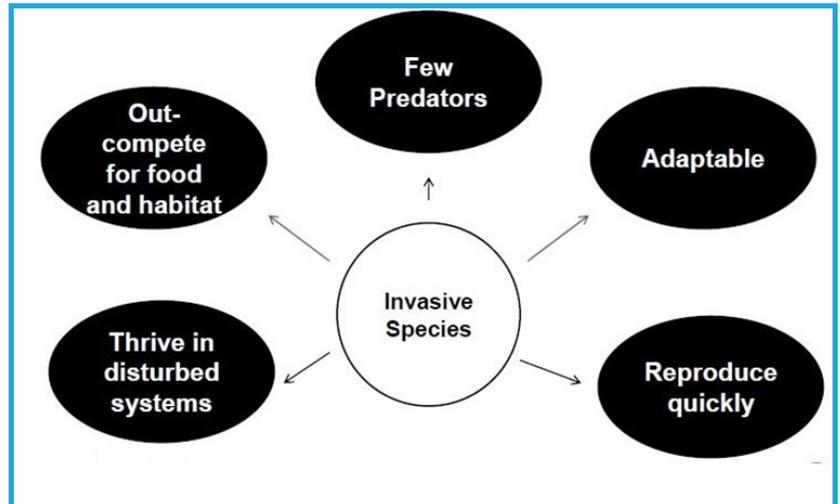
Invasive species out-compete native species, and interfere with ecosystem processes and functions, such as food webs and nutrient cycling. Invasive plants and animals are the second greatest threat to biodiversity after habitat loss.

Originating from other regions of the world, and in the absence of their natural predators or controls, invasive species can have devastating effects on native species, habitats and ecosystems. Invasive species, also called alien species, threaten the environment, the economy, society and human health. Once they are established, they are extremely difficult and costly to control and eradicate. The ecological effects are often irreversible.

The introduction and spread of invasive species is a direct consequence of increased urbanization, movement of people and goods around the globe, global transportation routes, and recreational activities.

Aquatic invasive species can be spread by:

- Aquarium, water garden and pet trades
- Ballast water of ships
- Canals and changes to waterways
- Gardening and landscaping near water bodies
- Release of live fish and bait
- Recreational and commercial boating



Invasive zebra mussels on a native clam.

Teaching and Learning

Part A. Introduction

Ask students to think of what makes up an ecosystem. What is in an ecosystem? Who is in an ecosystem? What can affect an ecosystem?

Have students work in groups of 5-7 to examine pictures of ecosystems, ask them to write a list of everything they observe.

Discuss how some of the species and elements (sun, water) might be connected. Introduce the term 'ecosystem' and challenge students to make a definition for this term. (An ecosystem is the combination of the living and nonliving components in a given area).

Ecosystems come in all sizes. They can exist in a small area such as underneath a rock, a decaying tree-trunk, or a pond, or it can exist in large forms, such as an entire lake.



(Teacherweb, 2015)

Summarize the key learnings and questions about both biotic and abiotic factors.

Part B. Ecosystem Web Activity

Have students gather in a circle in the classroom, gym or outdoors.

Hold the yarn in your hand and say "I am a _____ in the ecosystem."

Throw the yarn to a student across the circle and have them call out another component of the ecosystem. Without anyone letting go of the yarn, continue until all students are holding a piece of the yarn connecting them to the web.

*Note – you and the students must hold the yarn with one hand, tossing the ball of yarn with the opposite hand, to complete the ecology web. Once everyone has had a turn and a piece of yarn in their hand (completing the web), ask the students what they think about the way they are connected to each other.

The turtle, bird, worm, logs, water, plants, insects, muskrat, sun, fish and humans, are all interconnected now to each other by the web. Continue holding the web, discuss disturbances.

Disturbances:

- Thunderstorm where everyone shakes the web, how could this affect the ecosystem?
- Winter where everyone is frozen, how could this affect the ecosystem?
- Drought where everyone shrivels up to each other, how could this affect the ecosystem?

Teaching and Learning

Introduce invasive species. Start by being one yourself and move the string in a different way, pulling on it, jumping with it. Ask other students to do the same.

Have more students become humans and hold their string up high, get closer together, the habitat is shrinking as there are more people and you are losing biodiversity, as more students hold their strings high, the ecosystem will experience 'tension'.

Let go of the web and have two students on either side of you let go as well. Talk about these disturbances and how a breakdown in the ecosystem web can affect us, as well as the animals that rely on Georgian Bay as their home.

Once the students are back at their desks, briefly discuss invasive species. Guide students in their thinking and questions. Discuss how some plants and fish from other areas can make life for our native species difficult by, crowding our plants or by, alien fish eating too much food, making it difficult for our fish to survive.

Part C. Invasive Species Crime Scene

Review the basics of ecosystems if needed. Watch these videos:

Hinterland Who's Who www.youtube.com/watch?v=1s8jouqY44U (1 minute)

Federation of Anglers and Hunters www.youtube.com/watch?v=sieCwk-424E (2 minutes)

Hand out the Invasive Species Crime Scene Worksheet and provide 30 minutes of computer time to answer the questions.

Part E. Invasive Species Jeopardy

Download the Jeopardy PowerPoint from www.gbb.ca. Review the Jeopardy game ahead of time if needed, to get a sense of the game and style of questions.

The class is divided in two teams on opposite sides of the classroom. Explain the game rules and being the show. Click the question box to go to the question slide.

Toss a coin to determine which team goes first, allow a student to choose a question. If they answer correctly they collect points and have another turn.

When the students don't answer a question correctly the other team can answer for a chance to win the points. The scoring team chooses the topic next. Keep score on the blackboard.

Additional questions can be added or students could be asked to develop their own questions.

Review Questions:

How do invasive species affect the health of aquatic ecosystems?

What invasive species are in Georgian Bay?

How can you help to prevent the spread of invasive species?

How can you avoid introducing new invasive species to the region?

Invasive Species Crime Scene Worksheet

Use the following website to research common invasive species in eastern Georgian Bay and to identify the suspects for each crime in the crime scene report below.

Ontario's Invading Species Awareness Program: www.invadingspecies.com

Who am I?	What do I look like?	How did I get here?	Where am I from	What are my crimes?
1.	<ul style="list-style-type: none"> - Grass, up to 5 m tall - Large, dense seed head - Grows in thick stands - Stem is tan colour, leaves blue green 	Unknown	Eurasia	<ul style="list-style-type: none"> - Crowd out native plants - Reduce biodiversity - Does not provide food or habitat for wildlife - Grows quickly and lowers water levels
2.	<ul style="list-style-type: none"> - Small mussel that attaches to docks, boats, break walls and beaches - Two to four cm long - Sits flat on its underside - Triangular in shape. - Black or brown with white to yellow zigzagged patterns. 	Carried in ship's ballast water.	Black Sea region of Eurasia	<ul style="list-style-type: none"> - Clogs pipes water power and water treatment plants - Filters plankton from water, making water too clear - Increases growth of vegetation in water - Causes toxic algae to grow - Hazard for swimmers who cut feet on sharp shell
3.	<ul style="list-style-type: none"> - Zooplankton – small animals, use water currents & wind to move - Need microscope to see - Single dark eye, four pairs of legs and antennae used for swimming 	Carried in ship's ballast water.	Eurasia	<ul style="list-style-type: none"> - Because they eat other zooplankton, they reduce food supplies for small fish - Affect recreational and commercial fishing as their tail spines catch on fishing equipment and clog nets
4.	<ul style="list-style-type: none"> - Small, bottom-dwelling fish - Large frog-like eyes on the top of head - Black spot on dorsal fin - Oval-shaped pelvic fin on its underside - Brown or olive body with dark brown spots 	Carried in ship's ballast water.	Asia	<ul style="list-style-type: none"> - Reduces number of native fish by eating their eggs and young competing with them for food sources. - Linked to outbreaks of harmful bacteria and spreads infection to birds and fish that eat it

Invasive Species Crime Scene Worksheet - Teacher Answers

1. Phragmites 2. Zebra Mussel 3. Spiny Water Flea 4. Round Goby

Crime Scene Investigation - Invasive Species Discussion Questions

1. Have you ever seen any of the invasive species of Georgian Bay listed in the crime scene report? Where did you see them?

2. How do you think these species affect human communities?

3. What can we do to stop invasive species from spreading?