Lesson Plan Four - Alien Invaders

Reference to: Understanding Life Systems, Interactions in the Environment

- 2.3 use scientific inquiry/ research skills to investigate occurrences (e.g. of invasive species such as zebra mussels in a local lake or purple loosestrife in a wetland habitat) that affect the balance within a local ecosystem.
- 3.1 demonstrate an understanding of an ecosystem as a system of interactions between living organisms and their environment.
- 3.8 describe ways in which human activities and technologies alter balances and interactions in the environment.

Resources

- Native or Invasive? Information sheet (NOT a class set, just requires one teacher copy)
- Internet for research
- Worksheet - Invasive Species News (class set)

Vocabulary

- Alien species
- Exotic species
- Invasive organism
- Native organism
- Natural range

Summary

Students learn examples of invasive organisms and assess their impacts upon the Great Lakes ecosystem. They produce a newspaper article about a local invasive species.

Objectives

Students will:

- Name examples of local invasive species.
- Research how the balance of an ecosystem is affected by the presence of an invasive species and what can be done to control the situation

Background

Invasive species are organisms which are living outside of their natural environment and out competing native species. (They can come from within the same country or from the other side of the world).
Exotic or Alien species are organisms which live outside of their natural range, they may or may not become invasive (they only become "invasive" if they compete with native animals and cause an imbalance in the ecosystem). Canada has hundreds of invasive species including mammals, birds, reptiles, amphibians, insects, molluscs, crustaceans and plants. The can be introduced intentionally or accidentally. Over 140 exotic organisms have made the Great lakes their homes since the 1800's.

Starter Activity

Native or Invasive?

Description
This interactive activity allows for whole class participation. The class is involved in deciding if a species is native to Canada or invasive. The students stand up if you say an invasive species and remain seated if you say a native species. They may be surprised at the number of invasive species.

Instructions

- Explain to the students what an invasive species is (see background notes) and what a native species is.
- Tell the students they are to remain seated if you say a native species and they are to stand if you say an invasive species.
- Go through the list of species, one at a time, from **– Native or Invasive? Information sheet.**

Main Activity

Invasive Species News

Description

This activity will have to be completed over a few lessons or for home work. Students are to pick an invasive species found in The North American Great Lakes region from a list on the **Invasive Species News worksheet**. They are to research their chosen species and produce a newspaper report including the following information:

- A picture of the species
- A description of the species
- When was in first introduced into the Great Lakes region?
- How did it get into the Great Lakes? Was it introduced by mistake or on purpose?

- What effect is this invading species having on the ecosystem – how is affecting other organisms living there?
- Are there any measures being taken to try to control the species?
- They could include quotes from a local environmentalist/homeowner/fisherman regarding how they feel about the issue
- Include information on how we can avoid other invasive species from making the Great Lakes region their home

Answers to the above questions, for the given invasive species on the Invasive Species News worksheet, can be found in the **Notes on Invading Organisms** information table.

Instructions

- Give the students the **Invasive Species News worksheet.**
- They are to use the internet to research their chosen invasive species. If the internet is not available the notes **on Invading Organisms** information table could be copied and distributed as an alternative.
- If the students are creating the newspaper article by hand and not on a computer, they will need to be provided with paper – the Invasive Species News Worksheet only contains instructions for the students.

Variations

Students could produce a radio or television report.

Extension

Students could complete research on one of the given invasive species and another one of their choice.

Plenary Activity

Sharing Findings

Description

This plenary activity involves the students sharing their research with follow students, and then discussing similarities. Ideally, the students sharing their findings will have completed research on different invasive species, that way the students will have in depth knowledge about two species.

Instructions

- Students read another student's article, preferably on a different invasive species, the pair are then to discuss similarities and between the two.
- If pairs have researched the same invasive species they can compare their findings and see if they have any differing information.

Extension Activity

North American Great Lakes cartoon

Description

This activity is a cartoon detailing the history of the North American Great Lakes region and problems the lakes are facing. Students are to create images to go with the text.

Instructions

- The pupils are to draw pictures corresponding to the text in the first six boxes.
  They are then to complete the text in the last two boxes and draw appropriate pictures.

Native or Invasive? Information

Species	Native or Invasive	Notes
Forest tent caterpillar	Native	
Giant hogweed	Invasive	Plant
Sea Lamprey	Invasive	Fish
Tiger salamander	Native	Amphibian
Japanese knotweed	Invasive	Plant from Asia
American chestnut	Native	Tree
Northern prairie skink	Native	lizard
Round goby	Invasive	Fish from S. Europe
Zebra Mussels	Invasive	From Asia
Norway rat	Invasive	Mammal from central Asia
Blanding's turtle	Native	
Butternut canker	Invasive	Tree disease
Leopard frog	Native	
Acadian flycatcher	Native	Bird
Green crab	Invasive	Lives in ocean
European starling	Invasive	Bird
Peewee	Native	Bird
American badger	Native	Mammal
Purple loosestrife	Invasive	Plant from Europe
Poison ivy	Native	
Eastern flying squirrel	Native	
Emerald ash borer	Invasive	Beetle from Asia

Invasive Species News Worksheet

1. Choose one of the following invasive species found in the North American Great Lakes region:

1. Sea lamprey
2. Zebra mussel
3. Spiny water flea
4. Purple loosestrife (plant)

2. Write a newspaper article about your chosen invasive species. Include the information below in your report.

- A picture of the species.
- A description of the species.
- When was in first introduced into the Great Lakes?
- How did it get into the Great Lakes? Was it introduced by mistake or on purpose?
- What effect is this invading species having on the ecosystem – how is affecting other organisms living there?
- Is there anything being done to try to solve the problem?

You could also think about including:

- Quotes from a local environmentalist/homeowner/fisherman saying how they feel about the problem.
- Information on how we can avoid other invasive species from making the Great Lakes their homes.

Notes on Invading Organisms

Organism	Description	When introduced	Effects of invasion	What can be done to control the invading organism
Sea Lamprey	A jawless fish. It is a parasite that feeds upon the flesh of other fish. It has an oval mouth containing rings of sharp teeth and a long bony tongue. It has a brown or grey back with white or grey on the underside. It can be up to 90cm long.	It is not certain whether they are native to Lake Ontario, or if they entered from New York via the Erie Canal. They were first noticed in the 1830's. In 1919 the Welland canal allowed them to spread from Lake Ontario to the rest of the Great Lakes.	• Uses its tooth filled, suction-cup like mouth to attach itself to other fish and eats away at their flesh with its teeth and long probing tongue. Fish die from blood loss or infections. • It has killed many native predators in the Lakes allowing the populations of prey fish to explode (as they have a reduced number of predators eating them). • As the number of small fish increases, so does the competition for their food source – plankton.	• Electric currents • Chemical lampricides (chemicals which kills lampreys) • Barriers can be built to stop the sea lampreys from traveling to their breeding sites.
Zebra mussel	A small species of freshwater mussel. The size of a fingernail with a stripped pattern on their shell.	Introduced in the mid 1980's. Accidentally introduced in ballast water of ships. Originally from the Black and Caspian Seas.	• They feed on plankton so compete with other plankton feeders, such as small fish. This competition reduces the number of small fish, which, in turn, reduces the amount of food for the larger predator fishes, so the whole food chain is disrupted. • They also compete for food with native mussels, and attach themselves to their shell often killing them. • Thought to be the source of avian botulism poisoning that has killed thousands of birds. • As they are filter feeders one good thing they do is clean pollution from the lake. • However, as they store these pollutants in their flesh, this can make its way through the food chain, by animals feeding upon them. • Zebra mussels blocking pipes to water treatment plants and power stations costs millions of dollars per year to remove. • Sharp shells cut people's feet.	• No way to remove them when they are in a waterway. • Best thing to do is prevent them from entering. • Sailors need to make sure they clean their boats properly when moving to other bodies of water. • Boats can be coated in copper-nickel alloys, which the mussels cannot attach to.

Organism	Description	When Introduced	Effects of invasion	What can be done to control the invading organism
Spiny Water flea	NOT an insect. It is a tiny crustacean with a long, sharp, barbed tail.	Early 1980's from Europe and Asia. Arrived in ballast water of ships.	• Sharp tail makes it difficult for small fish to feed upon these crustaceans. • Their number increases, while their food supply (plankton) decreases. • They compete with native plankton eaters for food.	• The only thing that can be done is to prevent the organism from spreading to other bodies of water. • People need to make sure they clean their fishing tackle and boats, as eggs can attach on to these and then be transported to a new location by the fisherman. • Boats and bait containers should be drained of water, so that the animals and eggs are not carried elsewhere.
Purple loosestrife	Flower spike made up of many small pink-purple flowers with yellow centers.	Arrived in early 1800's. Brought to N. America by settlers for their flower gardens. Seeds also present in ballast water of ships from Europe.	• This is a very hardy plant – meaning it can survive well, even if conditions are not perfect. So it has spread very successfully. • It is a big issue in wetlands. Wetlands are the most diverse, productive component of our ecosystems, and are important for keeping water clean – they act as a big filter. • This plant is replacing many native wetland species and habitat where wildlife feed and shelter. The plant also clogs up irrigation and drainage ditches.	• The best thing that individuals can do is to make sure they do not plant any loosestrife in their garden. If they find it growing in their garden they should dig it up before it develops seeds. The plant should then be burnt or put in a plastic bag and sent to landfill. • For large scale control, **biological control** (using a living organism) can be used. Two beetle species, the plants natural enemy from Europe, have been released which eat the plants. • Herbicides can also be used (chemical weed killers).

The North American Great Lakes Cartoon

10,000 years ago…	1800's…	1900's…	
People first started to use the lakes' many resources – game, fertile soil and water. They caused few lasting changes to the countryside.	Development of the Great Lakes area began; factories were built, lots of farming, logging and commercial fishing took place. Industrial waste dumped into water.	The number of fish starts to decrease, the commercial fisheries also decrease. Cottages built, altering the shore line, with loss of wetland and forests.	Since the 1800's more than 140 exotic organisms including plants, fish, algae and molluscs have made the Great Lakes their home e.g. Zebra Mussels.

	Today…	Future A	Future B
Over fishing, pollution, habitat destruction and accidental and deliberate introductions of exotic species have affected the Great Lakes ecosystem.	Toxic contaminants could cause the closure of the remaining fisheries. Atlantic salmon extirpated from Lake Ontario. Redside dace, Eastern sand darter and the American eel are all species at risk.	To save the Great Lakes…	If we don't do anything…