Changing Chains

PURPOSE: Students will create **food chains** from familiar animal and plant species then examine the impacts on these food chains when environmental problems and invasive species disrupt them.

SUBJECT / STRAND:	DURATION:	GROUP SIZE:	SETTING:
Grade 4 Science – Life Systems	2 x 50 minutes	4 -6 students	Classroom

EXPECTED OUTCOMES: Building on their knowledge of nature and the animal world, student groups will create their own food chains. This will demonstrate their understanding of the necessary progression of a food chain and the interdependence of the species within it. Students will then explore how this relationship is affected when outside influences disrupt the food chain. The activity wraps up with a class discussion on stewardship, followed by a descriptive article prepared by each student.

MATERIALS: Cue cards (~100), chart paper, markers, tape

ENDURING UNDERSTANDINGS: Understanding concepts related to healthy habitats; recognizing our role in maintaining healthy habitats (*stewardship*); tools for maintaining healthy habitats and protecting against invasive species.

EXPECTATIONS: 4s1, 4s2, 4s3, 4s5, 4s6, 4s17, 4s19

PROCESSES OF SCIENCE: Classifying, communicating, inferring, identifying and controlling variables, interpreting data

Lesson Sequence

Prior:

1. Draw the following table on chart paper and post for student reference.

HEALTHY HABITATS	(List Healthy Food Chains)	Notes:
HABITAT PROBLEM:	(List Disturbed Food Chains)	Notes:
INVASIVE SPECIES:	(List Invaded Food Chains)	Notes:

Keep All Our Lakes Great!
You can stop invading species

2. Review the following terms with students: **producer**, **consumer**, **herbivore**, **carnivore**, **omnivore** and **foodchain**. (See Glossary.) Ensure students have an understanding of how a food chain works.

Procedure:

1. Divide your class into groups of 4 – 6.

2. Ask each group to brainstorm on what plants and animals can be found in *and* around a local pond. (Be sure they include smaller organisms – such as algae, worms, snails, and mosquitoes – and humans.)

3. Provide 12 cue cards to each group and ask them to label and draw one plant or animal species per card.

4. Ask groups to indicate on each cue card whether the animal is a producer, consumer, herbivore, omnivore or carnivore. Some species may have more than one label (ex. carnivore and consumer).

5. Provide each group with one piece of chart paper on which they will draw a table like the one displayed.

6. Using the cards as a guide, ask each group to create as many food chains as they can and record them in the square beside the title, "Healthy Habitats". Species cards can be used more than once. Ask students to write any observations they have of their healthy habitat food chains in the adjacent "Notes" box.

7. As a class, brainstorm different types of disturbances that could happen to their local pond habitat. Discuss how theses disturbances might impact the species living there. Together pick one disturbance and determine what species may disappear from the habitat and ultimately their food chain/s. (Examples: spraying for mosquitoes; building a busy new building that may scare off shy mammals living around the pond; dumping garbage into the pond, building a busy road that requires part of the pond to be drained).

8. Ask students to remove the affected species from their set of cards. Ask students to record the type of disturbance, new chains and observations on their chart paper.

9. Students should then return the removed cards to their sets.

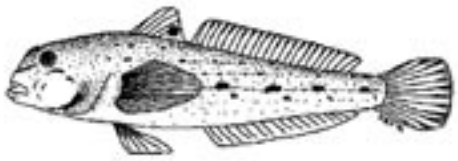
10. Explain to the class that you will now be introducing the invasive fish species, round goby, to the pond habitat. It is not native to this habitat. *What is an invasive species?* Explain or re-iterate that invasive species have few natural predators in their new habitat and that they often have adaptations that make them highly successful. Share the adaptations of round goby, the type of environment it lives in and the impact it has on ponds.

11. Ask: *How do you think it got into our local pond?* Explain to the students that invasive species are introduced to habitats through human error. In this case, we'll say it was when someone was using round goby as bait and dumped them into the local pond. Considering the impacts of this species, determine together which plants and animals will be affected. Students should remove these from their sets.

12. Ask students to make as many food chains as they can with their new set, record them on the chart and make notes.

13. Discuss:
    - *How many food chains did you make in each scenario? Were there differences between the food chains of each scenario? What were they?*

A Bit About... ROUND GOBY



Donna Francis, University of Michigan

The round goby is a spotty brown fish that lives on lake and river bottoms. Their unique adaptation, a suction-cup-like fin on the bottom of their belly, helps them stay put in fast moving currents!

Round goby were brought accidentally to the Great Lakes in the ballast water of ships from Eastern Europe. It is believed they have also spread by anglers who mistakenly used them as bait and released them into un-invaded waters after fishing. (Using round goby as bait is illegal!)

Round goby are aggressive; they compete with native fish for food (including insects) and eat their fry (baby fish) and eggs! They can also spawn several times in one season so that wherever they're found, they can quickly become the most abundant fish in the area. (For example in Lake Erie round goby can reach densities of over 125/cubic metre—that's like having over 100 round goby in your bathtub!)

- *What other observations did you make?*
- *Is there a problem with removing a few species from a habitat?*
- *Which scenario could humans have helped to avoid?*

  Explain how seemingly innocent actions, such as dumping bait into the pond, can have as drastic an effect as building a bridge. This is because when you add an invasive species to a habitat, you can alter the existing food chains, affecting many plants and animals.
- *Which type of species do you think would find it easier to survive: Producer? Consumer? Omnivore? Herbivore? Carnivore? Why?*
- *Explore whether there could have been solutions to the habitat problem that may have protected the food chain.*
- *Explore other ways invasive species can get into an aquatic habitat and how this can be avoided.*

Closure/Checks for Understanding:

Ask students to write a descriptive article of what happened to their local park habitat. Encourage them to include:

- A description of the original healthy habitat
- An explanation of the habitat problem and the impact on local species
- The introduction of an invasive species and its impact on the habitat
- The role of humans both in *creating* and *solving* both situations.

NOTES FOR TEACHER:

The round goby is an invasive aquatic species that is originally from Eastern Europe. This mottled brown fish has a feature unique to its species. On the underside of the goby, the pelvic fins join to form a suction-cup like disk. This appendage allows them to stay on a river or lake bottom in fast current. Round goby feed on insects, small fish, fish eggs and other small organisms.

The round goby was introduced to the St. Clair River via ballast water in the late 1980s. It is now found in all of the Great Lakes and have recently been discovered in inland waters of Ontario. Where they have been introduced, round goby have become very abundant. The aggressive round goby can spawn several times a year, grow up to 25 cm and compete with native bottom-dwelling fish species. These characteristics indicate the potential for impact on native fish species.

It is important to prevent or slow the spread of round gobies into Ontario's inland waters. The following preventative measures can help to reduce the spread of round goby and other invasive species:

- Remove any visible plants or animals from boats, trailers and boating equipment before leaving any body of water. Once you've left the boat launch, ensure you either: rinse the boat and equipment with hot water; or hose it down with a high pressure spray; or dry the equipment for at least 5 days before using it again.
- Drain water from the motor, live well and bilge before leaving the body of water.
- Empty bait buckets on land or in the garbage. It is illegal to release baitfish from one body of water into another or to use round goby as bait.

Report sightings or obtain more information on invading species by calling the Invading Species Hotline at 1-800-563-7711 or visiting www.invadingspecies.com

EVALUATION:

Teachers can evaluate group work while students are working together on their food chains and tables. Further evaluation can be done on the student articles.

ACCOMMODATIONS:

Ensure student groups are balanced for behaviour and tasks. Consider assigning students to roles that either support their learning style (i.e. drawing species pictures) and confidence, or challenge them if appropriate. Use of chain cards provides for kinesthetic and visual learners, group discussions accommodate auditory learners. Article writing can be supported as required.

EXTENSIONS:

Visit a local pond or aquatic habitat prior to the lesson. Ask students to see how many different plant and animal species they can identify in and around the pond. Take along a local naturalist to help identify some of the species present and determine their role(s). Are any of these invasive species? Do they see any disturbances affecting the pond habitat?

Students could create a classroom field guide for the local pond. Using a digital camera, students could take photos of a chosen species, research it and create a page or two for the class book. Students would indicate characteristics and adaptations, and identifying whether the species was a: consumer or producer, and carnivore, herbivore or omnivore.