

## Interactions within Ecosystems

Grade 7 Biology

Lesson Plan	Safety Notes	Be careful while using scissors.
-------------	-----------------	----------------------------------

### Description

In this lesson, students will investigate interactions within the environment and identify factors that affect the balance between different components of an ecosystem. Students will also assess the impacts of human activities and technologies on the environment, specifically on lake sturgeon.

### **Materials**

- -Paper or small pompoms
- -Thick paper or cardboard toilet paper roll
- -Something to poke holes with (scissors, hole punch, wooden skewers, etc)

-Tape

-Uncooked spaghetti or wooden skewers

-One die

### Science Background

**Ecosystem:** An ecosystem is a community of organisms that are part of a physical environment. Ecosystems with higher biodiversity tend to be more stable and are more resistant and resilient to disturbances like diseases and changes in habitats. Ecosystems can either be marine, aquatic or terrestrial. Ecosystems show the transfer of energy through something called the food chain.

**Food Chain:** The food chain demonstrates who eats whom or what in an ecosystem. This chain or trophic level starts with the producers, next are the consumers. The consumer is also separated into categories which are the first consumer, the second consumer, the third consumer and sometimes even the fourth consumer, for example; seaweed (producers)  $\rightarrow$  crabs (first consumer)  $\rightarrow$  squid (second consumer)  $\rightarrow$  penguins (third consumer)  $\rightarrow$  killer whales (fourth consumer). As organisms eat other organisms, the energy is transferred and moves up the pyramid. However, only 10% of the total energy is being transferred from one organism to the next because the rest is used by the organism to grow, move, work, produce waste and heat. All living things can be classified based on what they eat:

- **Producers:** are living things that make their own food. They generally use the sunlight and nutrients in their environment to help them with their production of food.
- **Consumers:** are living things that can't make their own food, so they eat other living things. They include herbivores, omnivores and carnivores. The consumer is also separated into categories which are the first consumer, the second consumer, the third consumer and sometimes even the fourth consumer.
- **Decomposers:** are living things that eat waste or dead bodies of other organisms.

In reality animals don't only eat one organism, they eat multiple different things. For example, seaweed can not only be eaten by crabs but by other fish and snails. All of these food chains are then



interconnected and combined to form something called a **food web**. A food web is a more realistic depiction of what goes on in an ecosystem.

Unfortunately, human activities have had big impacts on ecosystems. Removing an organism from the food web can cause an unbalance in the ecosystem. For example, top consumers play an important role by keeping other populations in check. If killer whales are removed from the ecosystem, then the penguin population would increase exponentially and require more food, thus the population of squid would be in decline because there are too many penguins and not enough squid.

**Lake Sturgeons:** are one of Canada's largest freshwater fish and are in Canada's Species At Risk Act (SARA) because of human impacts. Lake sturgeons occupy a wide variety of ecosystems like shallow streams, waterfalls, large rivers and lakes. A few reasons why sturgeon are on SARA is because of overfishing for the past 150 eats, construction of hydroelectric dams, pollution, and logging. SARA helps to prevent species in Canada from disappearing, to provide recovery programs for species who are at risk and manage species so they don't become endangered or threatened. These kinds of measures allow governments, organizations and individuals to work together and help species.



**Activity Procedure (Kerplunk):** We will play a kerplunk game which will mimic a sturgeons ecosystem to show the effects of human impacts within it.

## **Building the kerplunk game:**

- 1. Place a piece of paper horizontally in front of you.
- 2. Poke small holes in the paper with scissors, a barbecue skewer, etc.
- 3. Once the paper is covered with holes, meet the left and right side of the paper. together so it forms a cylinder.
- 4. Secure the structure with a piece of tape.
- 5. This is the fun part! Place uncooked spaghetti or wooden barbecue skewers through two holes, one end of the spaghetti poking out of a hole and the other side of the spaghetti poking through another. Do this until all or most of the holes are filled. Note: You will need at least 30 uncooked spaghetti noodles for the game!
- 6. The spaghetti will serve as pillars of the ecosystem. Place paper balls or small pom poms which will be your "sturgeon" on top of the noodles within the kerplunk game and start playing!





#### Playing the kerplunk game:

- 1. Once the game is built, you will need a die and the scenarios from the included handout to play.
- 2. Start with scenario number one and roll the die. The number of sticks that you remove, which simulate the impact on your ecosystem, will be determined by the roll of the die.
- 3. Repeat this with each of the scenarios or until your ecosystem collapses, which is when the paper or pom-pom falls to the bottom of your game.
- 4. Answer questions 1- 4 on the handout to learn more about ecosystems.

#### Debrief

All organisms play an important part in their ecosystem. Keeping the balance in ecosystems is very important, one small change can throw off the balance on an entire ecosystem. Human activity has posed many threats to various ecosystems but we also have the power technology to make a change and reverse these effects.



Interactions within Ecosystems

# Handout

1. Fill in the marine food web below with the list provided:



- 2. Fill in the scenarios below with the following options: Increase, decrease, collapse, primary producer(s), first, second, third, fourth consumer(s) and any of the above-mentioned species.
- Overfishing has caused a collapse in salmon. The population of krill will \_\_\_\_\_\_.
- Squid and salmon are examples of \_\_\_\_\_\_.
- If ocean acidification caused the extinction of phytoplankton, the food chain would \_\_\_\_\_\_.
- Phytoplankton are \_\_\_\_\_\_ and orcas are \_\_\_\_\_\_.
- More squid eggs are successful than average years, the crab population will \_\_\_\_\_\_.
- The producer in the orcas food web is \_\_\_\_\_. The first consumer is \_\_\_\_\_.



- Leopard seals and elephant seals are

3. Refer to the video or lesson plan resource provided to learn how to build and play the kerplunk game. Use the scenarios below to determine how many sticks to remove.

1. Lake sturgeon typically spawn (lay their eggs) in shallow, fast-flowing water; they love areas like waterfalls or rapids with gravel or boulders at the bottom. Unfortunately, man-made barriers have restricted access to a popular spawning area.

- Less than 5 remove two sticks
- More than 5 remove one stick

2. In Ontario, lake sturgeon are currently classified as an endangered species. This means that intentionally catching and removing these fish without permission from the Ontario government (Ministry of Natural Resources and Forestry) is against the law. A boat of fisherman decides they want to take the risk and fish for sturgeon.

- Less than 5 remove three sticks
- More than 5 remove **one stick**

3. Sometimes natural occurrences can alter habitats. A terrible thunderstorm with violent winds caused a tree to fall over into a river, which is a popular feeding zone for sturgeon. The fallen tree has decreased the amount of water that flows into the river and one section has dried up.

- Less than 3 remove three sticks
- More than 3 remove two sticks

4. Lake Superior is just one of the five Great Lakes. The coastal area of Lake Superior along Highway 17 in Northern Ontario is a popular camping spot for tourists. An increased level of pollution in those areas has changed the pH level of the water. This has limited the number of microorganisms that live on the lake floor. The sturgeons are not getting enough food, thus not reaching their ideal weight or length.

- Less than 4 remove six sticks
- More than 4 remove five sticks

5. Construction of hydroelectric facilities has limited the availability of habitat for lake sturgeon. This has been reported as one of the major factors limiting the population size of the lake sturgeon.

- Less than 5 remove eight sticks
- More than 5 remove seven sticks

6. Mortality rates for the lake sturgeon larval are naturally high and few survive to adulthood. Unfortunately, few measures can change the effects of natural causes.

- Less than 2 remove two sticks
- More than 2 remove **one stick**

7. Lake sturgeon typically move from shallow to deeper water during the summer to avoid warmer water temperatures. Climate change is contributing to rising water temperatures. Unfortunately, this is not good news for our sturgeon. Even though they've managed to migrate the water is too warm.

- Less than 3 remove five sticks
- More than 3 remove four sticks

8. Adult lake sturgeon have few natural predators. However, deposited egg sacks are preyed upon by other species such as crayfish and mudpuppies. A passing crayfish hits the all you can eat "egg" buffet.

- Less than 4 remove three sticks
- More than 4 remove **two sticks**
- 4. Which scenario did the majority of the population of lake sturgeon fall through in the kerplunk game? Why is it important to have a high level of biodiversity in ecosystems?



# Handout (Answer Key)

1. Fill in the marine food web below with the list provided:



- 2. Fill in the scenarios below with the following options: Increase, decrease, collapse, primary producer(s), first, second, third, fourth consumer(s) and any of the above-mentioned species.
- Overfishing has caused a collapse in salmon. The population of krill will increase.
- Squid and salmon are examples of secondary consumers.
- If ocean acidification caused the extinction of phytoplankton, the food chain would <u>collapse</u>.
- Phytoplankton are primary producers and orcas are fourth consumers.
- More squid eggs are successful than average years, the crab population will decrease.
- The producer in the orcas food web is <u>seaweed</u>. The first consumer is <u>crabs</u>.



#### - Leopard seals and elephant seals are

#### third consumers.

3. Refer to the video or lesson plan resource provided to learn how to build and play the kerplunk game. Use the scenarios below to determine how many sticks to remove.

1. Lake sturgeon typically spawn (lay their eggs) in shallow, fast-flowing water; they love areas like waterfalls or rapids with gravel or boulders at the bottom. Unfortunately, man-made barriers have restricted access to a popular spawning area.

- Less than 5 remove two sticks
- More than 5 remove one stick

2. In Ontario, lake sturgeon are currently classified as an endangered species. This means that intentionally catching and removing these fish without permission from the Ontario government (Ministry of Natural Resources and Forestry) is against the law. A boat of fisherman decides they want to take the risk and fish for sturgeon.

- Less than 5 remove three sticks
- More than 5 remove one stick

3. Sometimes natural occurrences can alter habitats. A terrible thunderstorm with violent winds caused a tree to fall over into a river, which is a popular feeding zone for sturgeon. The fallen tree has decreased the amount of water that flows into the river and one section has dried up.

- less than 3 remove three sticks
- More than 3 remove two sticks

4. Lake Superior is just one of the five Great Lakes. The coastal area of Lake Superior along Highway 17 in Northern Ontario is a popular camping spot for tourists. An increased level of pollution in those areas has changed the pH level of the water. This has limited the number of microorganisms that live on the lake floor. The sturgeons are not getting enough food, thus not reaching their ideal weight or length.

- Less than 4 remove six sticks
- More than 4 remove **five sticks**

5. Construction of hydroelectric facilities has limited the availability of habitat for lake sturgeon. This has been reported as one of the major factors limiting the population size of the lake sturgeon.

- Less than 5 remove eight sticks
- More than 5 remove seven sticks

6. Mortality rates for the lake sturgeon larval are naturally high and few survive to adulthood. Unfortunately, few measures can change the effects of natural causes.

- Less than 2 remove two sticks
- More than 2 remove one stick

7. Lake sturgeon typically move from shallow to deeper water during the summer to avoid warmer water temperatures. Climate change is contributing to rising water temperatures. Unfortunately, this is not good news for our sturgeon. Even though they've managed to migrate the water is too warm.

- Less than 3 remove five sticks
- More than 3 remove four sticks

8. Adult lake sturgeon have few natural predators. However, deposited egg sacks are preyed upon by other species such as crayfish and mudpuppies. A passing crayfish hits the all you can eat "egg" buffet.

- Less than 4 remove three sticks
- More than 4 remove **two sticks**
- 4. Which scenario did the majority of the population of lake sturgeon fall through in the kerplunk game? Why is it important to have a high level of biodiversity in ecosystems? It is important because they are more stable and are more resistant and resilient to disturbances like diseases and changes in habitats. All organisms play an important part in their ecosystem and maintain the balance.