



Food Web Invaders

Grade

4th–8th grade

Length

20–30 minutes

Subjects/strands

Discover how a food web works by making a live model of biotic components, using the people in your class. Then explore how an invasive species disrupts that balance.

Topics

Observation, application, comparing similarities and differences, generalization, kinesthetic concept development, psycho-motor development

INTRODUCTION

In this fun, active-learning, game about food webs, each student is assigned to be a plant or animal that can be found in aquatic ecosystems. Then, they learn about the relationships between organisms as they pass a ball of yarn between students (organisms) that have a predator/prey relationship. As the ball of yarn unravels and the string is stretched between the many predator/prey relationships in the room, the large and complex food web network is revealed visually and symbolically in the room. In the final step, an invasive species is added to the room and, due to its ability to out compete the other organisms, cuts the yarn connecting the students together. The invasive species effectively destroys the classroom food web.

LEARNING OBJECTIVES

- Understand that different organisms can be grouped into trophic levels within a food web.
- Differentiate between relationships among organisms including predator-prey and producer-consumer.
- Explain the importance of niche to an organism's ability to avoid direct competition for resources.
- Explain how energy is transferred and lost as it moves from the base to higher trophic levels in a food web.

BACKGROUND

Students will have been introduced to the idea of an ecosystem, and the basic relationships in an ecosystem such as producers and consumers, herbivores and carnivores, predator/prey pairs, and some of the interrelationships of their behavior and adaptations. Middle school students will have been introduced to the idea of limiting factors, and later the idea of carrying capacity. Students will also be familiar with the concept of a food chain with a variety of trophic levels. At the intermediate level, this could include videos, field activities and artwork, as well as reading and writing activities from student magazines and textbooks. At the middle school level, this would include all of the previous, plus research projects on general or specific relationships of organisms, as well as biome studies.

MATERIALS NEEDED

- 12 balls of yarn
- 29 name-tags using the 29 biotic components of an ecosystem on the attached chart (with the associated layer number on the back)
- Whole class (25–35) people
- Masking tape (indoors) or sidewalk chalk (outside in the schoolyard)
- 1 pair scissors

VOCABULARY

Predator, prey, carnivore, herbivore, consumer, producer, limiting factors, carrying capacity, aquatic ecosystem, food webs

Food Web Invaders

PREPARATION

It is useful for the teacher and students to gain familiarity with invasive species topics before teaching this lesson. To provide the appropriate background before starting this lesson, we recommend you complete the Introductory PowerPoint, followed by the “Design an Ultimate Invader” or “Invasive Species Loteria” activities. These activities are available on MenaceToTheWest.org. Before the lesson, students should be asked questions about their understanding of the factors that would affect the success or failure of an invasive species in an ecosystem. In addition, teachers should review with students all the steps of the game (described below).

PROCEDURE

Step 1:

To begin, tape five strips of masking tape to the floor in parallel lines, around 5 feet long and 2 feet apart. Label the first strip as 1, the second as 2, and so on up to 5. Use sidewalk chalk if you are doing this lesson outside on the schoolyard blacktop.

Step 2:

Explain to students that the class is going to create a physical structure that will mirror the complicated relationships between living things in an ecosystem. Pass out a name-tag to each student participating in the food web and instruct them to look at their layer number on the back of their name-tag. Have them sit on the strip of masking tape or numbered chalk line that matches their number.

Step 3:

Tell students that they will get a yarn ball one or more times during this exercise. When they receive it they should lightly loop it around a finger and pass it on as instructed. Give a ball of yarn to one of the first layer “organisms” (ex. Lily pads) and have them stand up. Explain that the ball of yarn represents the organisms that eat this one. Pass the yarn to one of these predator organisms (ex. Frogs). Have the new organism stand as well. Continue passing the yarn up the layers of the food chain, having students stand as they join the food web.

Step 4:

When the ball of yarn gets to the uppermost layer of the food pyramid (alternative: energy, biomass) in the hands of the top predators (human, bear, eagle), explain

that the energy and matter has to move (transfer) to another level. Explain that when any organism dies, it returns back to the bottom of the pyramid, and other organisms eat it. Pass the ball of yarn to the “dead animal” and pass it back up the food web a different way. Add more balls of yarn to the first layer organisms and have any extra students help figure out which organisms to pass the yarn to, using the attached chart. Continue until the food web is relatively complex and all the students are standing and included in the food web.

Step 5:

Explain that sometimes, a new organism is introduced to an ecosystem. It is better at hunting and will take all the food from the other organisms already there. Give the example of the rusty crayfish, which out-competes the native crayfish in many areas. Explain that when the rusty crayfish invade a new area and take over, they are called an invasive species. Ask the students to hold their yarn up in the air over their heads, so they can see the complicated pattern of the web. Have one of the extra students (or the teacher) take a pair of scissors and cut through the link between the native crayfish and the things it eats. Have the students watch as the food web falls apart because the native crayfish are starving and dying, affecting the organisms beneath them. The cut strands of yarn should be dropped and the students no longer connected to the web should sit back down. In this way, the students see how an invasive species can disrupt the environment and all the organisms in it.

CONCLUSION AND EVALUATION

- 1 Ask younger students to explain how the invaders affect the food options of native animals. Have them draw two food chains; the first should include the ecosystem without the invader, and the second should include the invader. Look for differences that show a disruption in the natural flow of energy as discussed in the group.
- 2 Ask older students to get together with a group of 1-3 others and draw two food webs, using the natural relationships in one, and include the invader in the other. Students should label the biotic components, and identify the trophic levels of those components. Have groups write a descriptive paragraph explaining the effect of the invading species on the food web.

EXTENSION

Have more advanced students research food webs in their local environment, as well as some of the relevant invaders that are either already present or threatening this environment. Products could include a display, report or PowerPoint presentation.

VOCABULARY

- **Predator:** An animal that naturally preys on others.
- **Prey:** an animal that is hunted and killed by another for food.
- **Carnivore:** An animal that feeds on flesh.
- **Herbivore:** An animal that feeds on plants.
- **Consumer:** An organism that feeds on other organisms in a food chain.
- **Producer:** Organisms that make their own food.
- **Limiting factors:** Resources are environmental conditions that limit the growth, abundance, or distribution of an organism or a population of organisms in an ecosystem.
- **Carrying capacity:** The maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water, and other necessities available in the environment.
- **Aquatic ecosystem:** An ecosystem in a body of water. Communities of organisms that are dependent on each other and on their environment live in aquatic ecosystems. The two main types of aquatic ecosystems are marine ecosystems and freshwater ecosystems.
- **Food webs:** A concept that all the predator-prey interactions in a community are interrelated.

RESOURCES

Science for Kids: Food Chains and Food Webs

This web page explains all the key concepts related to food webs, and includes many links to other related topics such as biomes, and habitat.

http://www.ducksters.com/science/ecosystems/food_chain_and_web.php

Educational Computer Game: Producers, Consumers, Decomposers.

Perfect for the elementary level this game has large colorful animations that students categorize as a producer, consumer, or decomposer:

<http://sheppardsoftware.com/content/animals/kid-scorner/foodchain/producersconsumers.htm>

Food Chains, Food Webs , Energy

Education video for kids by makemegenius.com

<https://www.youtube.com/watch?v=Cd1M9xD482s>

Food Webs by Tutor Vista.com

Includes illustrations and diagrams of a food web from a variety of biomes and include trophic levels:

<http://images.tutorvista.com/content/ecosystem/food-web-terrestrial-aquatic-ecosystem.jpeg>

STANDARDS ADDRESSED

Common Core

Life Sciences (Grades 5-8)

- Ecosystems: Interactions, Energy, and Dynamics
5-LS2-1, MS-LS2-1, MS-LS2-2, MS-LS2-3, MS-LS2-4

Next Generation Science Standards

Speaking and Listening (SL) (Grades 4-8)

- Comprehension and Collaboration 4.1, 5.1, 6.1, 7.1, 8.1
- Presentation of Knowledge and Ideas 5.5, 6.5, 7.5, 8.5

Writing (W) (Grades 6-8)







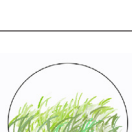
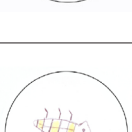
- Write Informative/Explanatory Texts 6.2, 7.2, 8.2

Did you use this lesson?

Go to MenaceToTheWest.org and take our survey.

Food Web Invaders

POND FOOD WEB ORGANISMS




Organism	Trophic Level	What they eat	What eats them
1 Dead Matter 	1	-	Everything on food web
2 Lily Pads 	1	Photosynthesis	Frog, salamander, minnow
3 Algae 	1	Photosynthesis	Worm, water skimmer, salamander, shrimp
4 Kelp 	1	Photosynthesis	Salamander, shrimp, minnow
5 Moss 	1	Photosynthesis	Salamander, mosquito
6 Fungus 	1	Photosynthesis	Shrimp
7 Grass 	1	Photosynthesis	Minnow, Robin
8 Dragonfly larvae 	1	Photosynthesis	Robin, spider, minnow

Organism	Trophic Level	What they eat	What eats them
9 Bacteria 	1	Photosynthesis	Minnow, spider
10 Cattail 	1	Photosynthesis	Robin
11 Plankton 	1	Photosynthesis	Shrimp
12 Seaweed 	1	Photosynthesis	Minnow, fish, human
13 Worm 	2	Algae, moss, kelp, grass, bacteria	Lobster, robin, fish, frog
14 Water Skimmer 	2	Algae, moss, fungus, grass, bacteria	Lobster, frog, fish, native crayfish
15 Grasshopper 	2	Fungus, bacteria, moss, algae, dead matter	Frog
16 Salamander 	2	Cattail, moss, algae, kelp	Frog, blue gill, fish
17 Minnow 	2	Grass, moss, dragonfly larvae, algae	Frog, blue gill, fish

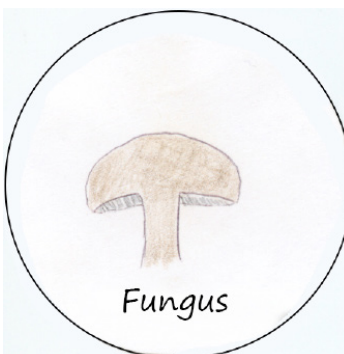
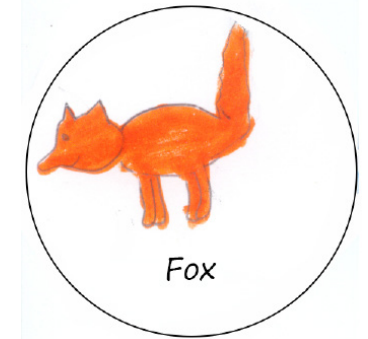
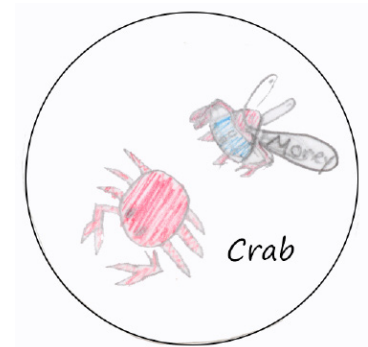
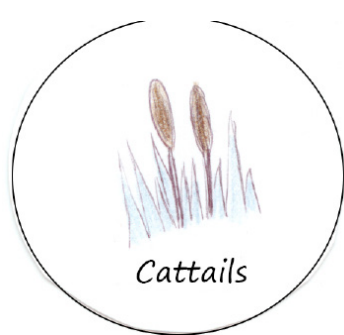
Food Web Invaders

	Organism	Trophic Level	What they eat	What eats them
18	Shrimp 	2	Plankton, seaweed, bacteria, cattails, kelp	Native Crayfish, crab
19	Spider 	2	Grass, cattail, bacteria, seaweed, plankton	Native crayfish, crab
20	Lobster 	3	Worm, water skimmer	Pelican, fox, bear
21	Frog 	3	Water skimmer, grasshopper, salamander	Pelican, fox, bear
22	Crab 	3	Worm, minnow, shrimp	Pelican, fox, bear
23	Robin 	3	Water skimmer, grasshopper, minnow, worm	Pelican, fox, bear
24	Blue Gill 	3	Worm, water skimmer, grasshopper	Pelican, fox, bear
25	Native crayfish 	3	Minnow, shrimp, spider, water skimmer	Pelican, fox, bear
26	Pelican 	4	Lobster, frog, crab, robin, blue gill, native crayfish	Human

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Organism		Trophic Level	What they eat	What eats them
27	Bear 	4	Lobster, frog, crab, robin, blue gill, native crayfish	Human
28	Fox 	4	Lobster, frog, crab, robin, blue gill, native crayfish	Human
29	Human 	5	Lobster, frog, crab, robin, blue gill, fish, native crayfish, bear, fox, pelican	Bear, fox

Food Web Invaders



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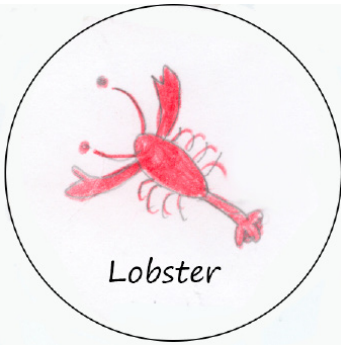
Human



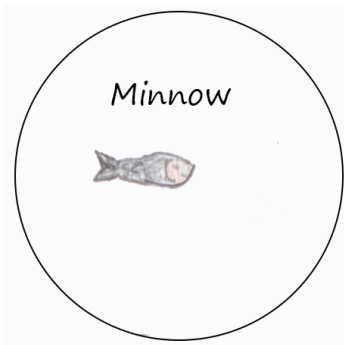
Kelp



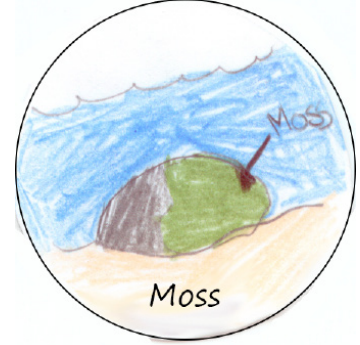
Lily pads



Lobster



Minnow



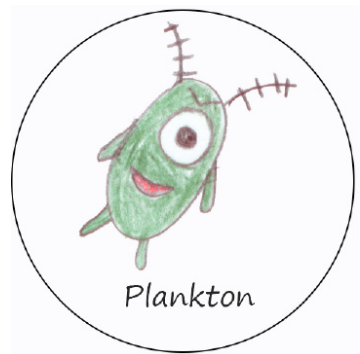
Moss



Native Crayfish



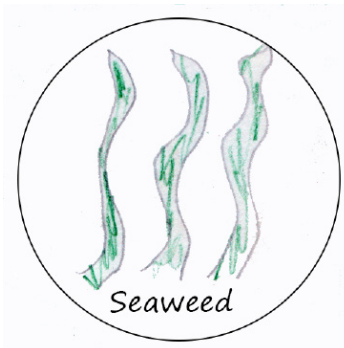
Pelican



Plankton



Robin



Seaweed



Shrimp

Food Web Invaders

