South Carolina Aquarium

3-5 Food Chains and Webs Activity

Overview

Focus Question
How do organisms depend on one another? What is a food chain, what is a food web and how do they relate to one another?

Activity Synopsis
The students will use organism cards to build a pond food chain. They will learn the name of each organism's role in the food chain (producer, consumer, apex consumer, and decomposer). They will then take those food chains and build an interconnected pond food web to see the complex relationships between organisms in the habitat.

Time Frame
1 hour

Objectives
The learner will be able to:

- Describe a pond habitat.
- Explain that the energy in a food chain comes from an energy source which is most often the sun.
- Define the terms producer, consumer, apex consumer, and decomposer.
- Build food chains with organism cards and identify roles in the food chain - producer, consumer, apex consumer, and decomposer.
- Draw a food chain diagram with arrows that shows how energy is passed in a food chain.
- Make an interconnected food web.
- Understand the impact of one organism on another in a food web.

Student Key Terms

- food chain
- food web
- producer
- consumer
- apex consumer
- decomposer

Teacher Key Terms

- niche
- trophic level
- tertiary consumer
- primary consumer
- secondary consumer
- organism
- photosynthesis

Standards

2014 Academic Standards and Performance Indicators for Science

3rd Grade: 3.S.1A.6, 3.S.1A.8, 3.L.5A.1, **3.L.5A.2,** 3.L.5B.1, 3.L.5B.2
4th Grade: 4.S.1A.6, 4.S.1A.8, 4.L.5B.2, 4.L.5B.3
5th Grade: 5.S.1A.6, 5.S.1A.8, 5.L.4A.2, **5.L.4B.1**, **5.L.4B.2, 5.L.4B.3,** 5.L.4B.4

*** Bold standards are the main standards addressed in this activity**

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Third Grade Performance Indicators

3.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
3.L.5A.1 Analyze and interpret data about the characteristics of environments (including salt and fresh water, deserts, grasslands, forests, rain forests, and polar lands) to describe how the environment supports a variety of organisms.
3.L.5A.2 Develop and use a food chain model to classify organisms as producers, consumers, and decomposers and to describe how organisms obtain energy.
3.L.5B.1 Obtain and communicate information to explain how changes in habitats (such as those that occur naturally or those caused by organisms) can be beneficial or harmful to the organisms that live there.
3.L.5B.2 Develop and use models to explain how changes in a habitat cause plants and animals to respond in different ways (such as hibernating, migrating, responding to light, death, or extinction).

Fourth Grade Performance Indicators

4.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
4.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
4.L.5B.2 Construct explanations for how structural adaptations (such as the types of roots, stems, or leaves; color of flowers; or seed dispersal) allow plants to survive and reproduce.
4.L.5B.3 Construct explanations for how structural adaptations (such as methods for defense, locomotion, obtaining resources, or camouflage) allow animals to survive in the environment.

Fifth Grade Performance Indicators

5.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
5.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
5.L.4A.2 Obtain and communicate information to describe and compare the biotic factors (including individual organisms, populations, and communities) of different terrestrial and aquatic ecosystems.
5.L.4B.1 Analyze and interpret data to explain how organisms obtain their energy and classify an organisms as producers, consumers (including herbivore, carnivore, and omnivore), or decomposers (such as fungi and bacteria).
5.L.4B.2 Develop and use models of food chains and food webs to describe the flow of energy in an ecosystem.
5.L.4B.3 Construct explanations for how organisms interact with each other in an ecosystem (including predators and prey, and parasites and hosts).
5.L.4B.4 Construct scientific arguments to explain how limiting factors (including food, water, space, and shelter) or a newly introduced organism can affect an ecosystem.

Cross Curricular Standards

South Carolina College and Career Standards for ELA

Inquiry (I) – 3-1.1, 3-2.1, 3-3.1, 3-3.2, 3-4.1, 3-4.2, 3-4.3, 3-5.1, 3-5.2, 3-5.3, 4-1.1, 4-2.1, 4-3.1, 4-3.2, 4-4.1, 4-4.2, 4-4.3, 4-5.1, 4-5.2, 4-5.3, 5-1.1, 5-2.1, 5-3.1, 5-3.2, 5-4.1, 5-4.2, 5-4.3, 5-5.1, 5-5.2, 5-5.3
Writing (W) – 3-3.1, 4-3.1, 5-3.1
Communication (C) – 3-1.1, 3-1.2, 3-1.4, 4-1.1, 4-1.2, 4-1.4, 5-1.1, 5-1.2, 5-1.4

Common Core ELA Standards

Reading Informational – 3.1, 4.7, 5.7

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Writing – 3.1, 3.2, 3.3, 3.9, 4.1, 4.2, 4.3, 4.7, 4.8, 5.1, 5.2, 5.3, 5.8
Speaking/Listening – 3.1, 4.1, 5.1

Background

Key Points
Key Points will give you the main information you should know to teach the activity.

- A **food chain** is a series of **organisms** linked together in order of who eats whom that shows how energy moves from one organism to the next.
- All the energy in a most food chains comes from the sun.
- The organisms in a food chain occupy different **niches**. Plants are **producers**, because they can make their own food from the energy of the sun. Animals are consumers, because they can only get their food by eating other organisms. The species at the top of a food chain that is not eaten by anything else is known as an **apex consumer**. **Decomposers** are a special type of consumer that breaks down dead organisms and returns those nutrients into the ecosystem for producers to use.
- The energy produced by plants will not transfer in its entirety across the food chain to the apex consumer. Only 10 to 20% of the energy received by one consumer will pass to the next consumer. Some of the energy will be lost in indigestible food parts and some will be used by the various organisms in the food chain to perform their life functions (breathing, moving, growing, etc.).
- A food chain shows the path of energy between organisms in one specific chain.
- A **food web** shows the predator/prey relationships between many organisms in an environment by focusing on all the food chains.
- Food webs are a great opportunity to see the impact of one organism on another and how fragile an ecosystem can be with subtle decreases and increases of different organisms.

Detailed Information
Detailed Information gives more in-depth background to increase your own knowledge, in case you want to expand upon the activity or you are asked detailed questions by students.

The terms **food chain** and **food web** are often confused. Although both are grounded in similar theory, a food chain is very different from a food web. A food chain is a simplified illustration of the predator-prey relationships between a few **organisms** (living things) within an environment. A food chain depicts the transfer of energy from **trophic level** (feeding level) to another trophic level. A food web, on the other hand, shows the predator/prey relationships of many organisms in an environment. A food web is the elaborate, interconnected feeding relationships of who eats whom in an ecosystem. An illustration of a food web, with lines drawn between predators and prey, creates a web of relationships. In fact, a food web may have many different food chains embedded in it.

If we follow the energy that flows through a food chain, we discover that much of the original energy from the sun is lost from one step in the food chain to the other; thus the shape of an energy pyramid. The loss of energy starts with the plants. Plants are not very efficient at converting the sun's energy into food. The sun provides solar energy to plants. Plants change this energy through the process of **photosynthesis** into food (starch). Plants are only able to convert 1-3% of the light that falls on them into food.

Animals are not very efficient either. They are not able to digest 100% of the energy stored in the foods they eat. A lot of the energy is lost via indigestible pieces and in the production of heat. In fact, the amount of energy that moves from one step in the food chain to another is only about 10-20%. Eventually the energy runs out. The food chain cannot go on forever. Some food chains can support up to five trophic levels, while others can only support two or three.

Because there is less energy available at each feeding level (trophic level), there are also fewer individual organisms at each level, as well. Therefore, there are fewer **secondary consumers** than **primary consumers**, and fewer primary consumers than autotrophs. Scientists often depict the flow of energy within a community or ecosystem as a pyramid of energy. The triangular shape represents two things:

1. As you move up the food chain, more of the original energy from the sun is lost
2. As you move up the food chain, there are fewer organisms at each feeding level (trophic level).

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It takes a lot of energy and a lot of organisms at the bottom of a food chain to support a few organisms at the top.

This activity will focus on one of South Carolina's many aquatic environments- the pond habitat. A pond is a freshwater aquatic environment. Ponds can be home to a great diversity of organisms within the pond, but also provide water and food for a variety of organisms that live in the surrounding area. For this reason, the pond is a good environment to use for a food chain activity to depict aquatic and land food chain connections.

There are many different possible food chains in a pond, all of which can be taking place at the same time. This activity will focus on potential food chains consisting of approximately 30 organisms to allow the ability to build a complex food web. All the food chains in this activity will always start with **phytoplankton** and end with one of the **apex consumers**. Phytoplankton are microscopic plants that live in the water like diatoms small, single-celled algae. Phytoplankton use sunlight to make food through the process of photosynthesis. Since phytoplankton produces its own food they are called **producers**. Phytoplankton is the first stage, or trophic level, of these food chains. The next link in the chain can be a variety of organisms from insects and insect larvae to tadpoles and small fish. These organisms are herbivores, or primary consumers. An herbivore, or primary consumer, is an animal that only eats plants. The next trophic level will consist of carnivores (they eat other animals) and, in this food chain, are considered to be secondary consumers. Secondary consumers are animals that eat herbivores. This level could consist of bluegill or sunfish, bull frogs, ducks, turtles or even salamanders. The next trophic level will be the **tertiary consumers** and could consist of a bald eagle as an apex consumer or a large mouth bass as just another **consumer** in the food chain that could be eaten by another organism. An apex consumer is the final link in a food chain.

Some examples of possible pond food chains are as follows:

- Phytoplankton – tadpole – blue gill fish – eagle
- Phytoplankton – bluespotted sunfish (small fish) – bluegill (medium fish) – largemouth bass (large fish) – eagle
- Phytoplankton – snail – raccoon – eagle
- Phytoplankton – water strider (insect) – bullfrog – snake – eagle

South Carolina Aquarium Spotlight Organisms

Phytoplankton (Producer)
Phytoplankton is aquatic plants that use the sun's energy in the process of photosynthesis to create sugars for food energy and oxygen. This producer is consumed by a variety of animals – tadpoles, snails, insects, and even small fish. A microscope is often needed to see phytoplankton.

Pond snail (Primary Consumer)
Eastern pond snails are freshwater snails that live in ponds, lakes and marshes. The tan shell that spirals to a point can grow up to 2 inches. The body of the snail is inside the shell what you see when it moves around is it foot. It uses this mucus covered foot to move around and find food. Snails eat mostly plants from phytoplankton and algae to cattails and lily pads. Predators of pond snails include fish, herons, ducks, eels, some amphibians (salamanders and newts), muskrats, and raccoons.

Bluespotted sunfish – small fish (Primary or Secondary Consumer)
Bluespotted sunfish are small, freshwater fish that can grow up to 4 inches. They have small mouths for eating small crustaceans, insects and plants. Bluespotted sunfish are most commonly found in sluggish waters like swamps, ponds, streams and roadside ditches.

Tadpole (Primary Consumer)
Bullfrog tadpoles can grow 4 to 6 inches before turning into frogs. Tadpoles usually eat plants, but are known to consume aquatic insects. Predators include medium and large fish, turtles, water birds, baby alligators, raccoons, and water snakes.

Water strider insect (Primary Consumer)
Many insects like the water strider consumer tiny plants and animals (phytoplankton and zooplankton) in their aquatic habitat. Water striders can be spotted on still or slow moving water throughout the US. Predators include small and medium carnivorous fish, frogs, salamanders, newts, crayfish, and birds.

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Bluegill fish (Secondary Consumer)
Bluegill fish are medium-sized, freshwater fish that can grow up to 16 inches. They often prey on insects, crayfish, snails, and smaller fish. Bluegills are prey to many other larger animals including larger fish, otters, muskrats, birds of prey, and turtles. Bluegill fish have a greenish color on the back and sides and are often black on the caudal (tail) fin. During breeding season males become violet to bluish in color. The scientific name for this fish is *Lepomis macrochirus*. Macrochirus is Latin for "large hand" which refers to the general shape of the fish.

Chicken turtle (Secondary Consumer)
This freshwater turtle can grow to 10 inches and will eat a variety of organisms such as plants, snails, tadpoles, worms, fish and insects. Chicken turtles would be prey items for raccoons, herons, snapping turtles, foxes, hawks, crows, snakes, bullfrogs, largemouth bass and bald eagles. This turtle has a dark, yellow-lined top shell and yellow bottom shell. The front legs have broad yellow bands. This turtle historically was hunted and sold for their meat. Many describe the taste like chicken, hence the common name.

Bullfrog (Secondary Consumer)
The Bullfrog is the largest frog in North America growing up to 8 inches. Bullfrogs like to ambush their prey and eat just about anything that they can fit in their mouths such as insects, crayfish, worms, fish, other frogs, small turtles, baby birds, small mammals, and even snakes. Bullfrogs have to be on the lookout for animals that would consider them to be tasty like herons, largemouth bass, raccoons, owls hawks, snakes, muskrats, opossums, turtles, otters, and bald eagles. Bullfrogs have eardrums behind their eyes. Males have larger eardrum circles and females have smaller eardrum circles.

Crayfish (Secondary Consumer or Decomposer)
Crayfish can be found in just about anybody of fresh water that isn't over polluted. They often hide under rocks in the water. They are nocturnal hunters and will eat both plants and animals including dead organisms. They are known to consume worms, insects, tadpoles, and eggs from fish, frogs, and salamanders. Crayfish predators include raccoons, opossums, muskrats, foxes, owls, hawks, medium and large fish, turtles, snakes and otters.

Raccoon (Secondary or Tertiary Consumer)
Raccoons are nocturnal mammals that love to den in the hollows of trees near a freshwater source. They are omnivores and will eat a diet including berries, nuts, leaves, grasshoppers, worms, large insects, frogs, salamanders, snails, clams, crayfish, snakes, turtles, and eggs of reptiles and birds. Younger raccoons have to worry about predators including hawks, owls, eagles, fox, bears, and alligators.

Black rat snake (Secondary or Tertiary Consumer)
Black rat snakes are found in forests, fields, marshes, and around freshwater sources like lakes, rivers, and ponds. Rat snakes are powerful constrictors and can eat birds, eggs, lizards, frogs and small mammals like mice, squirrels and shrews. Rat snakes are skillful climbers and use that adaptation to look for eggs in nests to eat. Black rat snakes have countershading with black scales on top and white scales on their belly. Predators include eagles, hawks, owls, raccoons, foxes and bobcats.

Largemouth bass fish (Secondary or Tertiary Consumer)
Largemouth bass can grow over 2 feet long and live in lakes, ponds, reservoirs, large rivers, and slow-moving streams. This freshwater fish will hide among plants or in shadows to shield them from unsuspecting prey. They mostly eat smaller fish, but will also eat frogs, crayfish, large aquatic insects and insects on the surface of the water. Largemouth bass have to be on the lookout for predators like Great blue herons, snapping turtles, bald eagles, muskrats and otters.

Bald eagle (Tertiary Consumer or Apex Consumer)
Bald eagles are birds of prey that can be most readily identified by its brown body and bright white head and tail feathers. Their vision is excellent. They can see 4 times better than even the best human eye. 1000 ft above the ground, they can spot prey over a 3 square mi area. Bald eagles can have a wingspan up to 7.5 feet. Occasionally adult bald eagles will fight each other over territory. Raccoons and other scavengers may target eagle eggs for food. Humans are by far the largest threat to bald eagles. Bald eagles are skilled opportunistic hunters that primarily prey on fish, although they will also target small mammals such as rabbits and deer fawn, smaller birds such as ducks and geese, and even reptiles and amphibians. During lean winters they may scavenge carrion (dead animals).

River otter (Tertiary Consumer or Apex Consumer)
River otters are mammals with an elongate body, webbed toes with claws and a thick coat of brown fur. They can grow to a length of three to four feet and a weight of 11-23 pounds. River otters live in aquatic habitats from coastal estuaries and lower river systems to mountain streams, where they eat fish, crayfish, crabs, turtles, amphibians and even bird eggs. Young otters are prey to bobcats, eagles, and alligators. Adult otters are considered apex consumers in many habitats. River otters can swim up to 12 mph and can hold their breath for four to eight minutes.

Procedures

Materials

- Food Chains and Webs Organism Cards (1 set per group, print front and back so animal descriptions are on the backs of the pictures)
- Pond Background (1 per group)
- Pond Report (1 per group)
- Scissors
- Paper
- Student notebooks (or paper if you don't use notebooks)
- Large paper or poster (for students create their food web)
- Tape
- Markers or pencils
- Food Web Answer Key (for teacher only)

Procedure
This will be a Part 1 and Part 2 activity that could be divided up.
Part 1 will be learning food chain terms and putting together different food chains examples from a pond habitat.
Part 2, once they master food chains, they switch to building a food web of the pond and discuss the interconnectedness of organisms in the ecosystem.

Part 1: Food Chains

1. Introduce the term food chain to the students. Have the students' think of an animal from an environment they are familiar with, such as the ocean, and then construct a food chain around the animal. For example, the students might suggest a shark. From there they might suggest that a shark would eat a smaller fish, the fish would eat a shrimp and the shrimp would eat algae or seaweed. Write their responses on the board so the students can see how the animals link in the food chain.

Algae/Seaweed → Shrimp → Smaller fish → Shark

2. Explain to students that one of the reasons we eat food is to provide energy (calories) for our bodies. This energy passes from one organism to another through a food chain. Ask the students to discuss where the energy comes from that travels through the food chain. For hints, think about how plants get the energy to make food and what provides energy for our entire planet (Answer: the sun). Ask them if all of the energy made by the plants will make it the entire way through the food chain? Is there a point in the food chain where energy no longer gets passed along?

3. Discuss the role of each part of this food chain. The algae or seaweed is a plant and would be considered a producer. Producers make their own food from sun. Shrimp would be a consumer (specifically a primary consumer) because it has to eat or consume another organism to get energy to survive. The smaller fish would be another consumer (specifically a secondary consumer). Finally, the shark would be another consumer (specifically a tertiary consumer), but is actually a very special type of consumer. The shark is an apex consumer, or top consumer, because it is an organism that doesn't have to worry about being eaten most of the time. It's at the top of the food chain.

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Sun (Energy Source) → Seaweed (Producer) → Shrimp (Consumer)→ Smaller fish (Consumer) → Shark (Apex Consumer)

4. Discuss with students that there is another important component to our food chain. We need decomposers that can break down the dead organisms and return the nutrients back to the ecosystem. Decomposers could consist of fungi, bacteria or even some invertebrates (like worms, bugs, or crabs).

5. Ask students if they have ever heard of or seen a pond. Explain that they are going to learn about this habitat and then create a pond food chain.

6. In the classroom, divide the class into small groups. Have students individually or in small groups read the Pond Background article and complete the Pond Report. This will allow the students to get comfortable with the pond habitat as well as strengthen their literacy skills.

7. After students have this background information on the pond habitat, each group will be given a group set of organism cards. (Note: You can have students cut out cards or cut them out and laminate them for reuse from year to year)

8. Review with the students where the energy comes from in most food chains – the sun. Then producers play an important role because they can take the suns energy and make their own food. All other life depends on their ability to do this. Ask students if they have a producer card. They should all have phytoplankton. Have student build a simple food chain and share what they build. What organisms might eat this producer? What organism would eat that? And so forth.

9. Let groups report their created food chain with the cards and make sure they remember to include the sun (the start of the food chain and source of energy) and the decomposer that would break down the dead organisms and return the nutrients back to the ecosystem.

10. Once all the groups have reported one food chain correctly, challenge them to see how many different food chains they can create with their cards in 10 minutes. Make sure students write down their food chains in their notebooks or on paper to be able to report back to the class and to be able to refer back to when they make their food web.

11. See which group has the most food chains and point out the big picture that there are a lot of food chains in an ecosystem. So to get a better picture of a particular habitat it's more helpful to look at energy flow through the perspective of a food web.

Part 2: Food Webs

1. Explain that a food web is made of many different food chains and shows the different possible flows of energy between several different organisms. Show an example with your marine food chain example from earlier.

Algae/Seaweed → Shrimp → Smaller fish → Shark

<u>More Marine Food Chains:</u>
Algae/Seaweed → Small fish → Octopus → Shark
Algae/Seaweed → Clam → Conch snail → Sea turtle
Algae/Seaweed → Clam → Octopus → Shark

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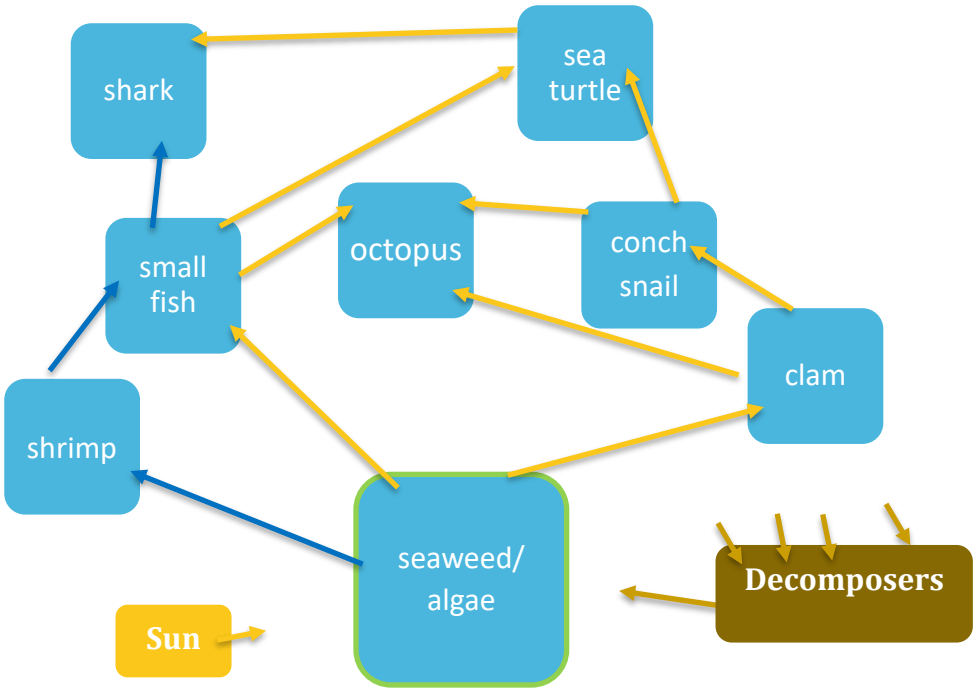
Marine Food Web:



2. Have students look back at their food chains that they recorded earlier and use those to start making their food web. They can use a large paper or poster to organize cards and a pencil or marker to record energy flow signified by arrows. Students can label the role of the food chain below the card as they make the food web. Students can tape down cards and show their food webs.

3. Now have students pick a card (any card) on their food web and imagine that the number of that organism increased. How would that impact other parts of the food web? Now imagine that the number of that organism decreased. How would that impact other organisms? Organisms depend on each other for balance in the ecosystem. If there are too many apex consumers, they will deplete their prey items and eventually have to move to new territory or starve from an imbalance in that ecosystem. If there are too few apex consumers, then the prey items will increase in number and decrease their prey items. This could lead to another devastating imbalance to the populations. Each organism plays an important role in an ecosystem and we have to keep that in mind our protection practices.

*Note: The following are possible food chain examples that could be used in making a food web.

Pond Food Chains to build a Pond Food Web

1. Sun → phytoplankton → pond snail → largemouth bass (large fish) → eagle/otter
2. Sun → phytoplankton → pond snail → bluegill (medium fish) → eagle/otter
3. Sun → phytoplankton → pond snail → bluegill (medium fish) → largemouth bass (large fish)
4. Sun → phytoplankton → pond snail → bluegill (medium fish) → largemouth bass (large fish) → eagle/otter
5. Sun → phytoplankton → pond snail → chicken turtle → raccoon
6. Sun → phytoplankton → pond snail → raccoon
7. Sun → phytoplankton → pond snail → raccoon → eagle/otter
8. Sun → phytoplankton → bluespotted sunfish (small fish) → bullfrog → eagle/otter
9. Sun → phytoplankton → bluespotted sunfish (small fish) → bullfrog → black rat snake → eagle
10. Sun → phytoplankton → bluespotted sunfish (small fish) → bullfrog → largemouth bass (large fish) → eagle/otter
11. Sun → phytoplankton → bluespotted sunfish (small fish) → bluegill (medium fish) → largemouth bass (large fish) → eagle/otter

12. Sun → phytoplankton → bluespotted sunfish (small fish) → bluegill (medium fish) → eagle/otter
13. Sun → phytoplankton → bluespotted sunfish (small fish) → bullfrog → black rat snake → eagle/otter
14. Sun → phytoplankton → bluespotted sunfish (small fish) → chicken turtle → raccoon
15. Sun → phytoplankton → bluespotted sunfish (small fish) → chicken turtle → raccoon → eagle
16. Sun → phytoplankton → bluespotted sunfish (small fish) → chicken turtle → river otter
17. Sun → phytoplankton → tadpole → chicken turtle → river otter
18. Sun → phytoplankton → tadpole → chicken turtle → raccoon → eagle
19. Sun → phytoplankton → tadpole → bluegill (medium fish) → otter/eagle
20. Sun → phytoplankton → tadpole → bluegill (medium fish) → largemouth bass (large fish) → eagle/otter
21. Sun → phytoplankton → tadpole → raccoon → eagle
22. Sun → phytoplankton → tadpole → bullfrog → snake → eagle
23. Sun → phytoplankton → tadpole → bullfrog → largemouth bass → otter/eagle
24. Sun → phytoplankton → water strider insect → bullfrog → largemouth bass → otter/eagle
25. Sun → phytoplankton → water strider insect → bullfrog → snake → eagle
26. Sun → phytoplankton → water strider insect → crayfish → raccoon → eagle
27. Sun → phytoplankton → water strider insect → crayfish → raccoon → eagle
28. Sun → phytoplankton → water strider insect → crayfish → chicken turtle → raccoon → eagle
29. Sun → phytoplankton → water strider insect → crayfish → otter
30. Sun → phytoplankton → water strider insect → crayfish → largemouth bass → eagle/otter
31. Sun → phytoplankton → water strider insect → crayfish → bluegill → largemouth bass → eagle/otter
32. Sun → phytoplankton → water strider insect → crayfish → bluegill → eagle/otter
33. Sun → phytoplankton → water strider insect → bluegill → largemouth bass → eagle/otter
34. Sun → phytoplankton → water strider insect → bluegill → eagle/otter

Note: All food chains end would as have a decomposer, a special consumer that breaks down and consumes dead organisms to return nutrients to the ecosystem. Decomposers can include fungi, bacteria, and some invertebrates like beetles, worms, or crustaceans.

Follow-Up Questions

- How many food chains are found in an ecosystem?
- Can you think of other organisms that would live in or around a pond habitat that could be included in our food chains and web?
- What would happen to the food chains of the world if our human population doubled?

At-home Learning and Virtual Modifications

At-home Learning: Ask students to complete the Food Chains and Webs Worksheet. It will ask them to cut out pictures and create a pond food chain and then food web.

Food Chain and Webs Worksheet

Virtual: Use the nearpod lesson to teach about food chains and webs. Information covered in this interactive nearpod includes food chains, producers, consumers, apex consumers, decomposers and food webs.

Teacher led lesson without student interaction

Teacher led lesson with student interaction - directions

1. Create a free nearpod account (https://nearpod.com/)
2. Ask Aquarium to send you the Food Chain and Webs nearpod link (email education@scaquarium.org)
3. After you receive Aquarium link, add lesson to your nearpod activities by clicking “Add to My Library”
4. Send to students using Live Participation

5. You'll be able to see their answers and interactions

Assessments

Assessment #1

Grade student's Pond Reports from Part 1. Be sure to have students put all group member's names on report before turning it in.

Scoring rubric out of 100 points

Good pond description:	**30 points**
Correctly indicate that most ponds are freshwater:	**10 points**
Correctly list 2 plants in a pond:	**10 points**
Correctly list 3 animals in a pond:	**10 points**
Correctly lists one producer:	**10 points**
Correctly lists one consumer:	**10 points**
Correctly lists one apex consumer:	**10 points**
Correctly lists one decomposer:	**10 points**

Assessment #2

Have students write and draw diagrams in their notebooks to assess their understanding of food chains and webs.

1. Given the following organisms, have students make and label (producer, consumer, apex consumer, decomposer) one food chain.
   - snake, plant, rabbit, mouse, eagle, sun, fly
2. What is a food chain?
4. Make a food web with the organisms above.
5. What is a food web?

Scoring rubric out of 100 points

Correctly creates and labels each food chains:	**30 points**
Correctly creates and labels food web:	**30 points**
Correctly explains food chain:	**20 points**
Correctly explains food web:	**20 points**

Assessment #3:

Have students select an ecosystem different than the pond which was used for the activity (like a saltmarsh, river, forest, desert, arctic…) and design a food chain using drawings or pictures of organisms found in that ecosystem. They should label each organism as a producer, consumer, apex consumer and decomposer. Secondly, have them create a food web that incorporates this chain as well as others.

Scoring rubric out of 100 points

For correctly creating a food chain:	**30 points**
For correctly labeling producer, consumer, apex consumer and decomposer:	**40 points** (10 points each)
For correctly creating a food web:	**30 points**

Cross Curricular Extensions

STEM Extension

3-5 Food Chains and Webs Activity

Have students build a habitat using Legos. The habitat should have at least 5 plants and animals to fulfill a food chain. Next, have them build a food web for the same habitat. Students can then explain the interactions of the food chain or food web to the class and ask for comments or suggestions. The students can then make improvements based on the class ideas.

STEM Extension
Have students use a computer or tablet to make a bar graph of the different parts of the food chain. Which group has the most animals? Which has the least?

Science Extension
Have students group animals in the food web into categories.

- Vertebrates and Invertebrates
- Mammals, Fish, Reptiles, Birds, Amphibians, Invertebrates
- Herbivores, Carnivores, Omnivores

Resources

Teacher Reference Books

Audesirk, Gerald and Teresa Audesirk. *Biology: Life on Earth.* Macmillan Publishing Company, New York, 1993.
Do not be afraid of college textbooks. They are often the best sources for detailed information on general subjects such as biology and food chain ecology.

Hickman, Cleveland, Allan Larson and Larry Roberts. *Integrated Principles of Zoology.* Wm. C. Brown Publishers, 1996.
Another college textbook and another good source of information on animals.

Ricklefs, Robert E. and Gary L. Miller. *Ecology*, W.H. Freeman Company, 1999.
This college textbook is a great resource for finding out how wildlife communities interact with each other as well as the abiotic factors of their environment.

Teacher Reference Videos

Attenborough, Sir David. *Trials of Life* (Video series), Turner Home Entertainment, 1995.
This is the most famous work of heralded nature documentary filmmaker Sir David Attenborough. This series shows the various behaviors animals have adapted in order to survive, including much on feeding. Though the entire series may be too advanced for elementary students, it is a wonderful resource for teachers.

Teacher Reference Websites

Animal Planet
http://animal.discovery.com
This site contains information and interactive games on a variety of animals

Food chains: Prey and Predators
http://www.cas.psu.edu/DOCS/WEBCOURSE/WETLAND/WET1/main.html
This website created by Pennsylvania State University contains activities and information on food chains.

National Geographic Food Web
http://nationalgeographic.org/encyclopedia/food-web/
This site breaks down the concepts of food webs, trophic levels, food chains, biomass, and bioaccumulation.

Intro to Ecosystems
https://www.khanacademy.org/science/biology/ecology/intro-to-ecosystems/a/food-chains-food-webs

Khan Academy created a website to go through tutorials on ecosystems, food chains, food webs, energy flow and primary productivity.

Bonus:
http://www.differencebtw.com/difference-between-food-chain-and-food-web/
https://sciencebob.com/what-is-the-difference-between-food-chain-and-a-food-web/
http://www.primaryhomeworkhelp.co.uk/foodchains.htm
https://en.wikipedia.org/wiki/Ecological_pyramid

Chomp Food Chain Card Game
http://www.gamewright.com/gamewright/index.php?section=games&page=game&show=64
Gamewrite created a oceanic food chain card game that is fast pace and reinforces science standards.
Rules: http://www.gamewright.com/gamewright/pdfs/Rules/ChompTM-RULES.pdf

Online Games

Sheppard – Producer Consumer Decomposer Game
http://www.sheppardsoftware.com/content/animals/kidscorner/games/producersconsumersgame.htm
Decide each organism's role in the food chain and then watch them come to life.

Sheppard - Food Chain Game
http://www.sheppardsoftware.com/content/animals/kidscorner/games/foodchaingame.htm
Put together a series of land and aquatic cartoon food chains and then watch it come to life.

Harcourt – Food Web Game
http://www.harcourtschool.com/activity/food/food_menu.html
Build basic food webs in different habitats (Meadow, Arctic, and Pond)

Cool Projects - Food Web Game
http://coolclassroom.org/cool_windows/home.html
Build a marine food chain and learn about different marine organisms.

Antarctic Good Web Game
http://www.pbslearningmedia.org/resource/lsps07.sci.life.eco.oceanfoodweb/antarctic-food-web-game/
A quick review of Food Chains and Food webs and then students get to practice making their own food web.

Scholastic Food Web Game
http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/foodweb_play.htm
Build a land-based food web.

Student Reference Books

Bennett, Paul. *Nature's Secrets: Catching A Meal.* Thomson Learning, New York, 1994.
Uses photographs and simple text to show the variety of different adaptations animals have developed to help them catch their prey.

Brooks, Bruce. *Predator!* Farrar Straus Giroux, New York, 1991.
A more in-depth look at how animals get the food they need that uses photographs and text.

Eyewitness Books: Plant, Alfred A. Knopf, Inc, New York, 1988.
These very attractive books use photographs, illustrations and text to teach the readers about plants and trees. Contains everything from photographs that show how a seedling grows to photographs that show how fallen leaves decompose.

Eyewitness Science: Ecology, Dorling Kindersley, New York, 1993.
These very attractive books use photographs, illustrations and text to teach the readers about ecology, communities and the interactions of plants and animals. Includes information on food chains and producers and consumers.

Kalman, Bobbie D. *How A Plant Grows,* Crabtree Publishing Company, 1996.
Text for students on plants that includes information on photosynthesis and the importance of plants to food chains. Includes experiment activities.

Matthews, Downs. *Wetlands,* Simon & Schuster Books, New York, 1994.
This book describes different types of wetlands and the plants and animals found there.

Curricula

Aquatic Project WILD
Aquatic Project WILD is an interdisciplinary curriculum for K-12 teachers on aquatic wildlife and ecosystems. The activities cover a broad range of environmental and conservation topics.
For more information click on http://www.projectwild.org/ProjectWILDK-12AquaticcurriculumandActivityGuide.htm

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