

Food Chains (and webs)
Flow of energy through an ecosystem
Grade 5
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References:

- Columbus Public Schools Curriculum Guide- Grade 5
- GK-12 Biological Science Lesson Plans- Recyclers to the Rescue (5th Grade)
- MetroParks SEED program
- Google Images

Benchmarks & Objective:

LS-1: Describe the role of producers in the transfer of energy entering ecosystems and sunlight to chemical energy through photosynthesis.

LS-2: Explain how almost all kinds of animals' food can be traced back to plants.

LS-3: Trace the organization of simple food chains and food webs (e.g. producers, herbivores, carnivores, omnivores and decomposers).

Objectives:

The objective is to introduce the concept of a food chain and to then build that concept up and introduce food webs. During the lesson key concepts regarding ecosystem energy relationships and ecosystem predator-prey relationships will be reinforced.

Materials:

- Science Notebooks
- Set of ecosystem cards for each student (20 organisms, attached)
- Food chain template (length 3, attached)
- Large piece of construction paper
- Ball of yarn
- Starburst
- Pictures of Forests

Target Concept:

- Students introduced to terms involved in simple food chains and food webs.
- Be able to identify producers and consumers
- Be able to identify herbivores, carnivores, and omnivores
- Students understand how an organism obtains energy and how it interacts with other living things in its ecosystem. This interaction determines the organism's energy role.
- Students identify the sun as the beginning energy source for most ecosystems.

Key Definitions:

Food Chain- the path of energy from the sun to the producers to a series of consumers.

Food Web- overlapping food chains within an ecosystem or biome.

Energy Pyramid- a pyramid that shows the flow of energy through the food chain. The most plentiful organisms are on the bottom with the least plentiful in an ecosystem at the top.

Carnivore- an organism that feeds on other animals.

Herbivore- an organism that eats only plants (producers).

Omnivore- an animal that feeds on both plants and animals.

Predator- an animal that hunts, kills, and eats other animals.

Prey- an animal that is hunted, killed, and eaten by another animals.

Scavenger- an animal that feeds on the bodies of dead organisms.

Initial Introduction:

Start by bringing in a small animal to the classroom (ex. mouse). Ask the students to name things it might eat; write these up on the board. Have them also name things that might eat it, and things that might eat what eats that. As you put all their ideas on the board ask the students how you should organize the information. Here we describe how to draw arrows from the organism that gives the energy to the organism that receives the energy.

Procedure:

Day 1- Make Your Own Food Chain Cards

Initial introduction above to begin the unit. Distribute food chain cards to each student. The food chain cards should have the picture of the organism and the name of the organism. The students will be responsible for writing the energy role (Producer, Consumer, Decomposer). Do this for all the cards going over each one with the class. Try to bring in as many organisms on the card as possible. (example- worms, spiders, ants)

Day 2- Make Your Own Food Chain

While guiding students, allow class to construct a basic food chain using ecosystem cards based on “What eats what?” Put them all in a row up on the board and have students make chains using their food chain template. Describe that this is known as a ‘Food Chain’ because it describes relationships based on food (“What eats what?”) and it looks like a chain. Define **Food Chain** and have students write the definition in their science notebook. Draw arrows from the Sun to the producer and then from the producer to the consumer. Explain that the arrows show which way the energy flows in this relationship. The consumers (right) get their energy from eating other organisms (left), so the energy flows from left to right. (A good way to remember this is that energy always

goes away from the sun) Have students copy down this initial food chain in their science notebooks and label it [Example 1].

Lead the class in making another food chain in a similar manner. While doing this reinforce the concepts introduced above. During this have the students define the terms **Predator**, **Prey**, and **Scavenger**. Have the students copy down this food chain and label it [Example 2]. Ask questions that help the students identify that chains always begin with the sun, and that the energy then flows to a producer and then to a consumer.

Explain that there are ways to checking if a food chain is correct.

1. Does it start with the sun?
2. Are the arrows pointed in the correct direction?
3. Do the organism relationships 'make sense'? (It does not make sense that a snake would eat a hawk. Although it may happen from time to time, generally hawks eat snakes.)

Challenge the students to make their own food chain on their own. Walk around to check if they are correct. Once checked, students should write their food chain into their science notebooks and label it [Example 3].

Ask the students, can a food chain be longer than three? (Yes, food chains can be much longer.) Review the meaning of, and define in the science notebooks the terms **Herbivore**, **Carnivore**, and **Omnivore**. Have the students write the type of consumer (herbivore, omnivore, carnivore) on the cards. Challenge the students to make the following food chains.

[Example 4] Make a length four food chain with an herbivore and a carnivore.

[Example 5] Make a length four food chain with two omnivores.

Day 3- Make Your Own Food Web

Review food chains. Challenge them to make any length 4 food chain with their ecosystem cards. Next challenge them further. "What is the longest chain you can make with the cards?" Once checked, have students record as [Example 6] in their science notebooks. The longest I can come up with is length 9.

(Sun→Leaf→aphid→ant→insect→spider→frog→snake→hawk)

Note- When we make food chains (and food webs) we typically do not describe when animals die naturally and decompose. When students ask about "What eats what?" tell them to make an educated guess based on imagining the two organisms interacting in the wild. If they still get it incorrect, correct them and explain why.

Take the longest food chain and write it as one long chain up on the board. Draw more arrows for any other relationships in the chain. (For the example above, spiders also eat ants and aphids, and frogs also eat ants and insects). Next add a few other key parts of the

ecosystem: another producer, an omnivore like a mouse, and another top consumer. Then get the class to help draw all the arrows up on the board.

What does this look like? (web) Explain that this is a food web. Define **Food Web** and have the students write the definition in their science notebooks. Explain that today everyone is going to make their own food web.

Pass out these ecosystem cards to each student: two producers, four middle consumers and two top consumers. Explain that food webs do not have to be in any particular order. However, explain to them that there is a good way of doing it that makes food webs easier and less tangled.

- 1) Draw a circle in the bottom right hand corner of the piece of construction paper. Label it sun. The sun is the beginning of all food chains and food webs.
- 2) At the bottom of the page put the producers. Draw circles for each one and label each one. The organisms should be evenly spaced. Drawing a picture of the organisms distracts from the activity. No pictures for now (if they get done early they can decorate it with drawings of organisms)
- 3) Draw arrows from the sun to the producers to show the flow of energy. Arrows should be clear.
- 4) Above the producers, in about the middle of the page, put the middle consumers. Draw arrows from the producers to the appropriate consumers.
- 5) Draw arrows between the middle consumers for any appropriate relationships.
- 6) Above the middle consumers, at the top of the page, put the top consumers.
- 7) Draw the arrows from the middle consumers to the appropriate top consumers.

If some students get done early, give them more cards and have them add to the web. During the course of the activity you can ask questions such as: What's at the beginning of the food web? What's at the top of the food web? If you were to put humans somewhere in the food web, where would we be? What would happen to the food web if all the producers died? In general, where are the carnivores in the food web? Where are the herbivores in the food web?

[Homework #1- Photocopy of food web activity from standardized test, attached]

Graded on a 5 point scale:

0 pts- Did not complete

1 pt- Did not follow instructions

2 pts- Serious conceptual flaws

3 pts- Shows some understanding of basic concepts

4 pts- Understands concept but made one or two mistakes

5 pts- Perfect

Day 4- Energy Pyramids

Recall food webs and ask questions.

Who is at the bottom? –Producers/Plants (trees, bushes, grass, flowers)

Who is at the top? –Top Consumers (hawks, cats, owls, wolves, snakes)

Who is above producers? – Primary Consumers (grasshoppers, rabbits, ants, aphids)

Who is below the top consumers? –Top Consumers (spiders, mice, frogs, birds)

Have the students write the type of consumers (Primary, Secondary, Top) on the cards.

Inform the students that we are going to play an ESTIMATION game. In a forest the size of the school yard (or the size of a football field) how many top consumers are there?

Pass out pictures of lush forests to help them visualize this. Emphasize that you only want one number. Go through some unrealistic numbers such as 100 (bears) or 1000 (hawks).

Ask everyone to make an educated guess (ESTIMATE), and the closest estimate to the teacher's estimate gets a starburst. Take five guesses close to the teacher's estimate and find the classes MEAN. The first one to come up with the mean gets a starburst. Go through how to calculate the mean; it's the class average. Write the mean up on the board. Repeat for the middle consumers, primary consumers, and producers. (I estimated 20 top consumers, 1000 middle, 22,000 primary, and 112,000 producers)

Once this is complete, ask what shape this makes? (Triangle/Pyramid) Define Energy Pyramid and have students record in their science journals.

Which way does the energy flow in the Energy Pyramid? Compare the relative size of the organisms in the pyramid, where are the larger/smaller organisms? Which levels have the most/least number of organisms? Where would the humans be in this pyramid? Where are the predators? Where are the prey? Where are the herbivores? Where in general are the carnivores?

Target Observations:

- The sun is the beginning of the food chain.
- Consumers and Producers are all around us.
- Humans are omnivores (generally).
- Plants are typically producers.
- Animals are consumers.
- Fungi are decomposers that are neither plants or animals.

Final Target Concept:

- The sun is the energy producer for all living things on Earth.
- Producers obtain their energy by the process known as photosynthesis.
- Consumers obtain their energy by eating or feeding on other organisms.
- Decomposers are the last part of the food chain, they return the energy back to the ecosystem.

Discussion:

What's the difference between a decomposer and a scavenger?

What's the difference between a food chain and a food web?

What would happen to the energy pyramid if half the producers died, and half the primary consumers died?

How much of an area full of producers and consumers does it take to support the average American lifestyle? (22 acres)