

Feeding Relationships

Organisms perform a variety of actions in their daily lives. For example: a tree grows, a plant flowers, a fox hunts, or a rabbit reproduces. Each of these activities requires energy. Ecologists study the flow of energy through communities to discover feeding relationships.

The ultimate source of energy in any ecosystem is the sun.

Producers

Plants (and some single-celled organisms) are able to use the sun's energy to manufacture their own food. This is done by a process called **photosynthesis**:



carbon dioxide + water + energy → glucose + oxygen

Organisms that use energy from the sun to manufacture their own food are called **autotrophs**.

Consumers

Most other organisms are unable to manufacture their own food. Such organisms, called **heterotrophs**, must get their energy by eating other organisms.

Heterotrophs are generally classified according to what they eat:

1. Herbivore

- feeds only on plants
- e.g. rabbits, grasshoppers, beavers, squirrels, bees, elephants

2. Carnivore

- feeds only on other animals
- e.g. lions

3. Scavenger

- a special type of carnivore that doesn't kill their food
- they eat carrion (dead animals) and refuse (garbage)

4. Omnivore

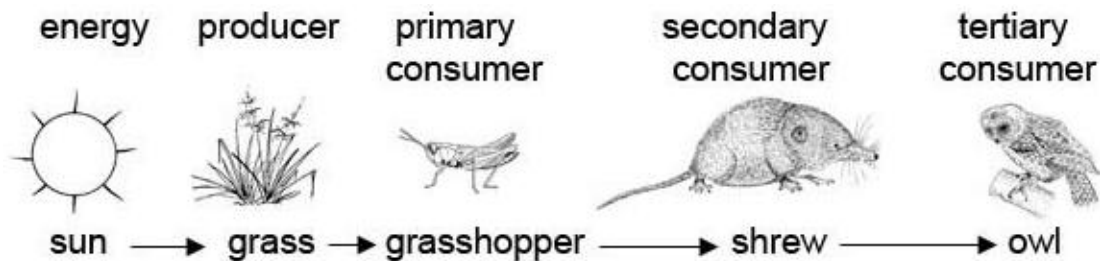
- feeds on both plants and animals
- e.g. humans, raccoons, bears

5. Decomposer

- break down dead plants and animals into simpler chemical compounds
- e.g. fungi, bacteria

Food Chains

A **food chain** is a simple model that shows how energy moves through an ecosystem. It is generally drawn using arrows to indicate the direction in which energy is transferred from one organism to the next. For example:



Each organism in a food chain represents a feeding step, or **trophic level**, in the movement of energy. Since most food chains are no more than 5 steps, we generally define 5 trophic levels:

Level 1: Plants and algae make their own food and are called primary producers.

Level 2: Herbivores eat plants and are called primary consumers.

Level 3: Carnivores which eat herbivores are called secondary consumers.

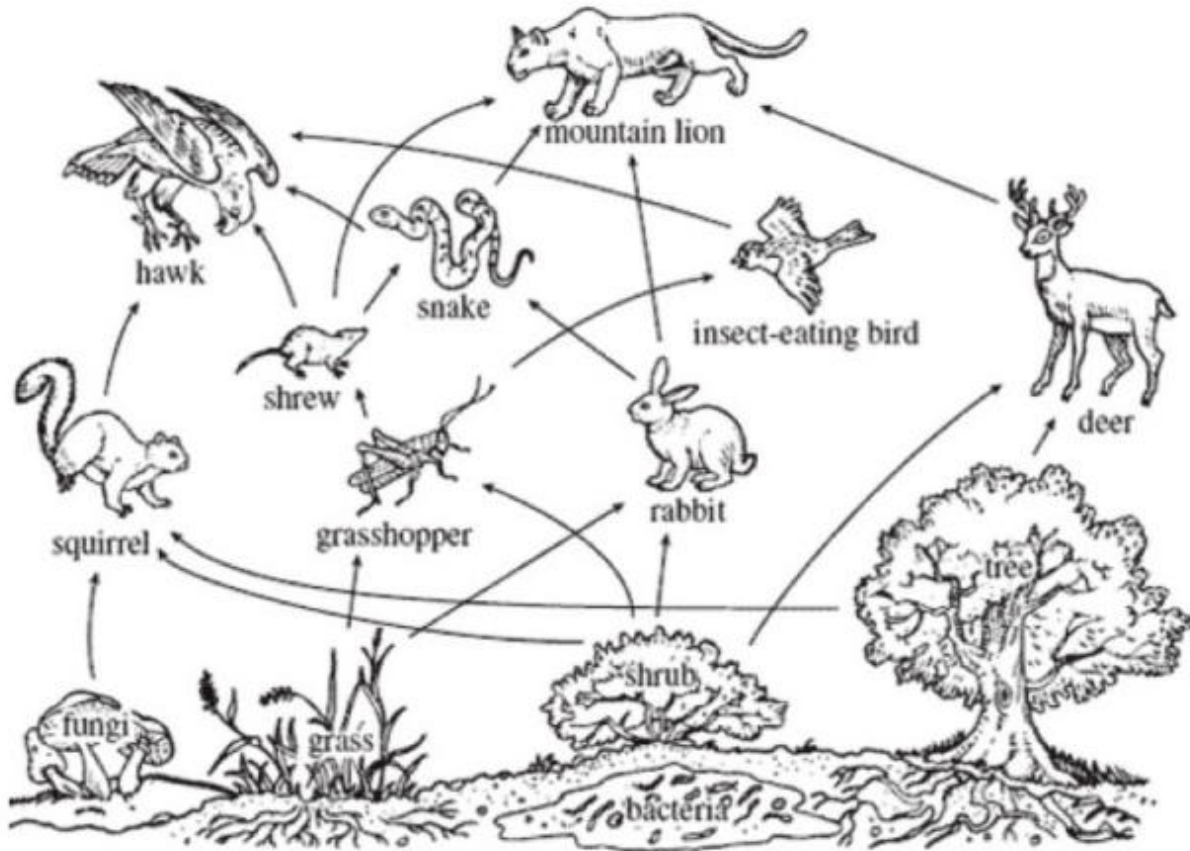
Level 4: Carnivores which eat other carnivores are called tertiary consumers.

Level 5: Apex predators, which have no predators, are at the top of the food chain.

Since decomposers can break down organisms from any step in the chain, they are often thought of as occupying their own trophic level.

Food Webs

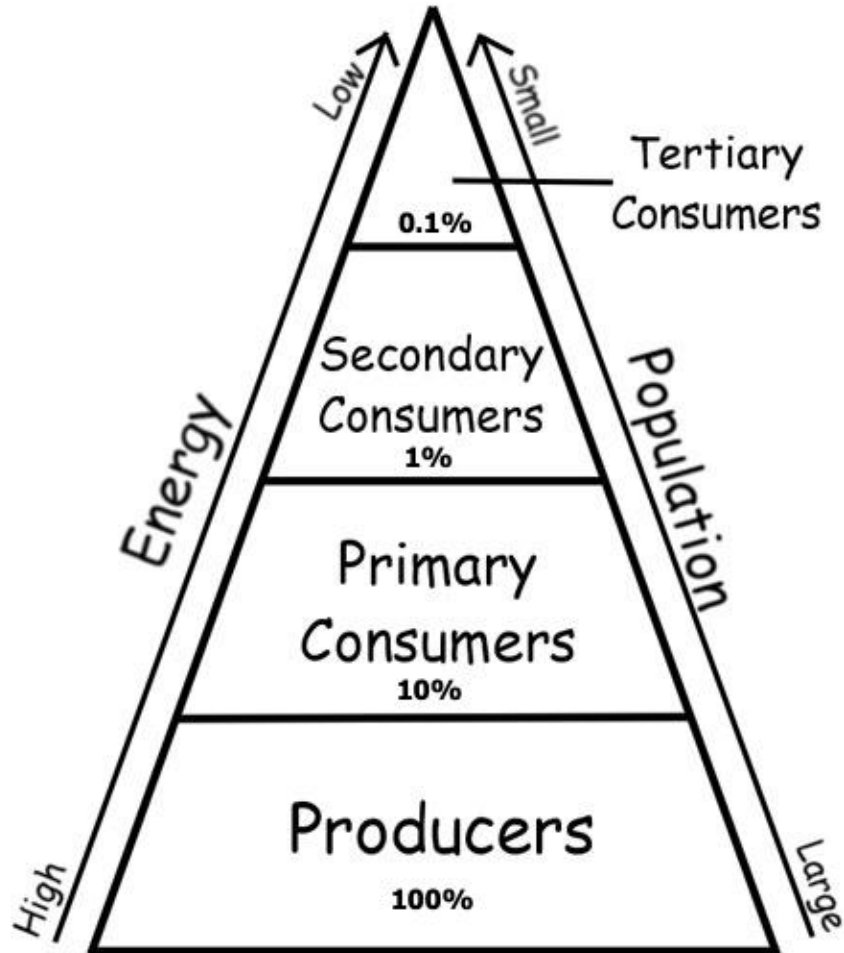
In real world ecosystems, most organisms eat more than one kind of food or are eaten by more than one type of predator. A diagram which sets out the complex network of interconnected food chains for an ecosystem is called a **food web**. A sample food web is shown below:



Ecological Pyramids

Feeding relationships transfer energy from one trophic level to another. It is important to recognize, however, that only about 10% of the energy is transferred from one trophic level to the next. As a result, there is less and less energy available as you move to higher trophic levels. It is for this reason that most food chains are 5 levels or less (there is simply not enough energy available for a 6th level).

Ecologists typically represent the amount of energy available at each trophic level using a **pyramid of energy**.



Worksheet

1. Write the chemical reaction for photosynthesis in both formulas and words.

2. Explain the difference between an autotroph and a heterotroph.

3. Examine the sample food web in your notes and answer each of the following questions.

a) Identify all the producers.

b) Identify two organisms at the third trophic level.

c) Identify two organisms that eat snakes.

d) State the trophic level of the mountain lion.

e) Identify one secondary consumer.

f) Identify a food chain with 5 levels from within the food web.