

Food Chains and Food Webs: Energy

by Sophia



WHAT'S COVERED

In this lesson, we will discuss food chains and food webs. We will understand the levels in a trophic pyramid—trophic meaning feeding and nutrition—which represent the hierarchy of feeding and trophic interactions in an ecosystem. We will also explore how food chains and food webs are ways to visually represent trophic interactions. Specifically, this lesson will cover the following:

1. Trophic Pyramids

Trophic levels in an ecosystem are essentially the hierarchy of feeding and trophic interactions, including the transfer of energy, carbon, and nutrients from one organism to another.

The trophic pyramid (below) illustrates how energy is passed from one level to the next. This image only illustrates the pyramid up to the level of tertiary consumers. However, there can be up to six trophic levels in an ecosystem.

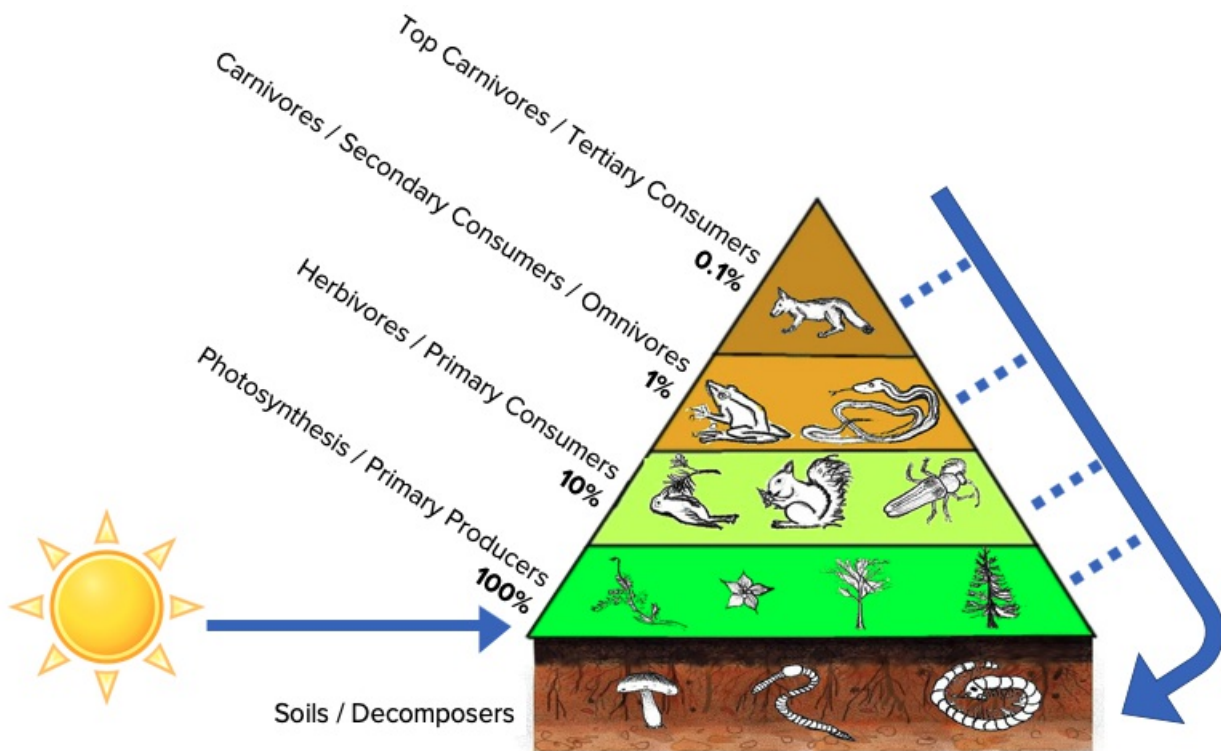
Primary producers transform energy from sunlight into biologically useful energy or sugars. Primary productivity is the rate at which producers can obtain energy from sunlight, and it is dependent on the amount of sunlight, temperature, and moisture.



DID YOU KNOW

Of the sunlight that reaches Earth's surface, less than 1% is converted into energy through photosynthesis. The energy captured by primary producers is then moved up the trophic pyramid as higher level consumers eat organisms from the levels below it.

Secondary productivity is the rate at which consumers convert organic material into biomass. In this sense, biomass describes the dry mass of organic material in an organism, and this can be used for energy. However, secondary productivity introduces no new energy into the system. It is entirely dependent on what was produced by primary productivity.



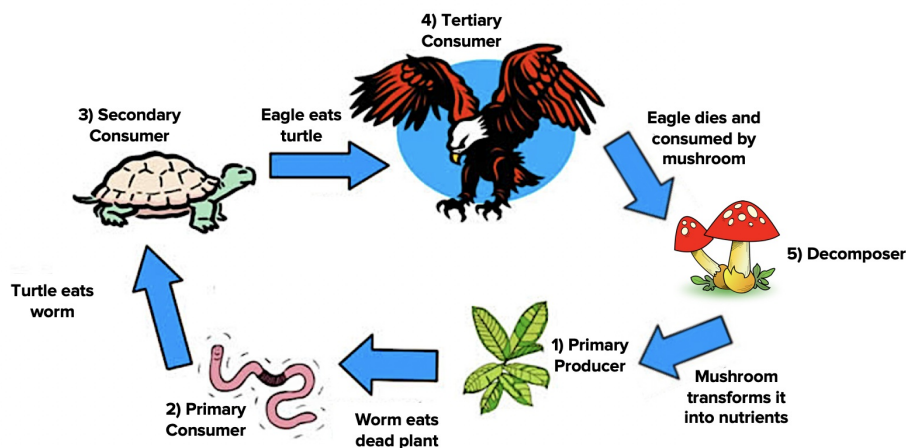
As shown in the percentages in the diagram above, as energy moves up the pyramid, only 10% of energy from the previous level is captured. The other 90% is lost as metabolic heat because of inefficient energy transfer. This loss of energy going up the pyramid is what limits the maximum number of trophic levels to six. There is not enough energy to sustain higher levels.



It is important to note that it is far more energy efficient for humans to consume organisms from lower trophic levels, like primary producers, than those from higher levels.

2. Food Chains

Food chains are representations of who eats whom in an ecosystem. This diagram demonstrates how trophic levels help us distinguish between types of organisms.



1. Primary Producer: The plant in the chain is a primary producer. It is at the primary trophic level. On land,

primary producers are usually plants, while in the oceans they can be plankton, photosynthetic bacteria, and unicellular algae.

2. Primary Consumer: The worm could be considered a primary consumer (because it is eating the plant) and also a decomposer (because it is recycling dead biomass from the plant). In this case, it is considered a primary consumer, so it is part of the second trophic level.

3. Secondary Consumer: The secondary consumer in this food chain is the turtle, and it is at the third trophic level.

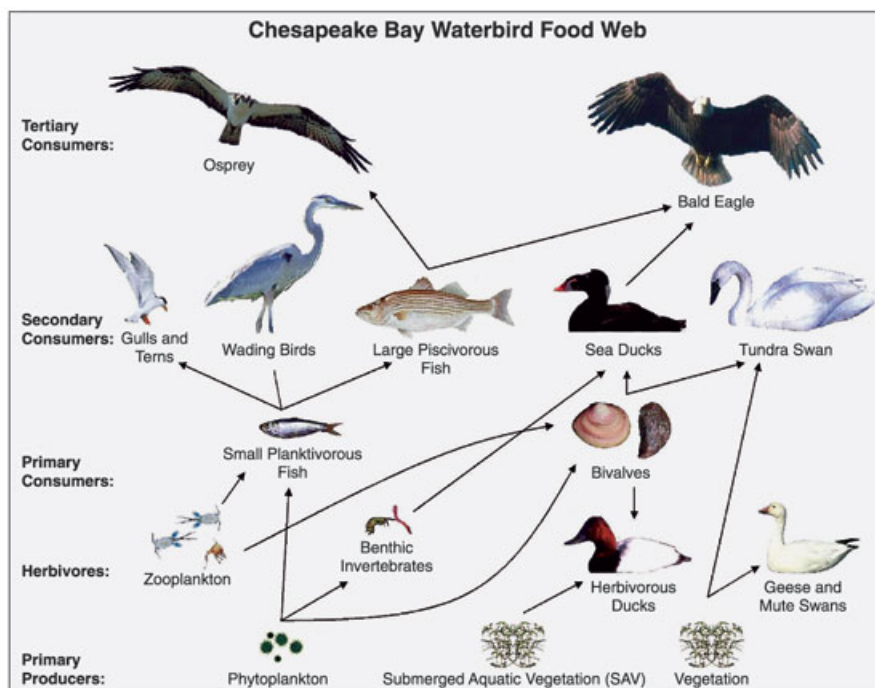
4. Tertiary Consumer: Finally, at the top, the eagle is the tertiary consumer.

5. Decomposer: The eagle will eventually die and be consumed by decomposers, such as bacteria, which will transform it into nutrients to begin the chain again.

In general, most predators consume prey smaller than they are, so as one goes up the food chain, organisms get larger and larger. Also, the larger the organism, the more space is required for that organism to find food, which results in lower population numbers at higher levels of the food chain.

3. Food Webs

Food webs, like the one shown below, are diagrams of trophic interactions. They represent ways that organisms obtain energy from other organisms. The majority of food webs are quite complex and involve many organisms and relationships.



This food web shows that the primary producers are at the first trophic level. The primary consumers represent the second trophic level, and the secondary consumers represent the third trophic level.



SUMMARY

In this lesson, we learned about trophic levels, as illustrated in a **trophic pyramid**, which show the hierarchy of feeding and energy transfer in an ecosystem. We also learned about **food chains** and

food webs, which are other ways to represent trophic interactions in an ecosystem.

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