

CHAPTER 1

Trophic Levels

- Define trophic level.
- Identify trophic levels in a food chain or web.
- Describe an ecological pyramid.



Why are pyramids important in ecology?

The classic example of a pyramid is shown here. But the pyramid structure can also represent the decrease in a measured substance from the lowest level on up. In ecology, pyramids model the use of energy from the producers through the ecosystem.

Trophic Levels

The feeding positions in a food chain or web are called **trophic levels**. The different trophic levels are defined in the **Table 1.1**. Examples are also given in the table. All food chains and webs have at least two or three trophic levels. Generally, there are a maximum of four trophic levels.

TABLE 1.1: Trophic Levels

Trophic Level	Where It Gets Food	Example
1st Trophic Level: Producer	Makes its own food	Plants make food
2nd Trophic Level: Primary Consumer	Consumes producers	Mice eat plant seeds
3rd Trophic Level: Secondary Consumer	Consumes primary consumers	Snakes eat mice
4th Trophic Level: Tertiary Consumer	Consumes secondary consumers	Hawks eat snakes

Many consumers feed at more than one trophic level. Humans, for example, are primary consumers when they eat plants such as vegetables. They are secondary consumers when they eat cows. They are tertiary consumers when they eat salmon.

Trophic Levels and Energy

Energy is passed up a food chain or web from lower to higher trophic levels. However, generally only about 10 percent of the energy at one level is available to the next level. This is represented by the **ecological pyramid** in **Figure 1.1**. What happens to the other 90 percent of energy? It is used for metabolic processes or given off to the environment as heat. This loss of energy explains why there are rarely more than four trophic levels in a food chain or web. Sometimes there may be a fifth trophic level, but usually there's not enough energy left to support any additional levels.

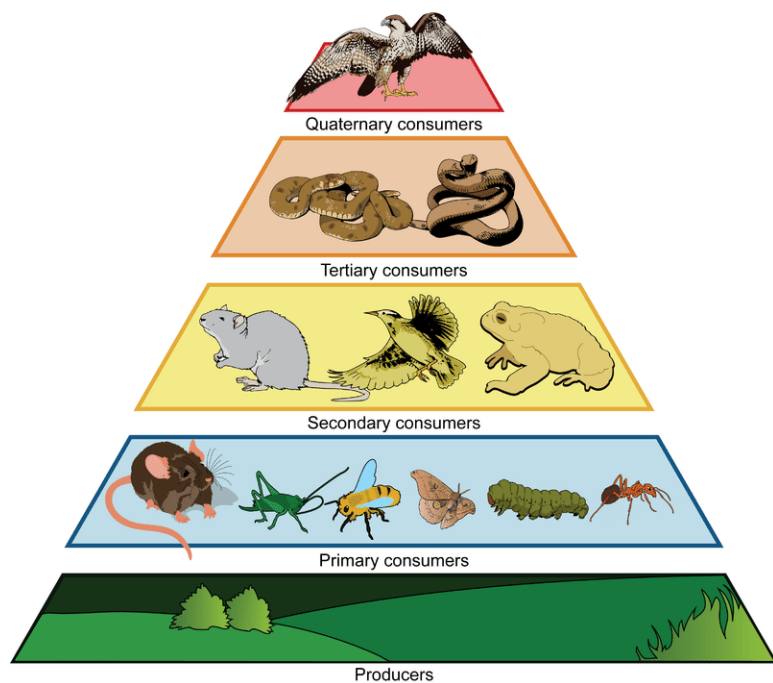


FIGURE 1.1

Ecological Pyramid. This pyramid shows how energy and biomass decrease from lower to higher trophic levels. Assume that producers in this pyramid have 1,000,000 kilocalories of energy. How much energy is available to primary consumers?

Ecological pyramids can demonstrate the decrease in energy, biomass or numbers within an ecosystem.

Trophic Levels and Biomass

With less energy at higher trophic levels, there are usually fewer organisms as well. Organisms tend to be larger in size at higher trophic levels, but their smaller numbers result in less biomass. **Biomass** is the total mass of organisms at a trophic level. The decrease in biomass from lower to higher levels is also represented by **Figure 1.1**.



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Summary

- The different feeding positions in a food chain or web are called trophic levels.
- Generally, there are no more than four trophic levels because energy and biomass decrease from lower to higher levels.

Review

1. What is a trophic level?
2. What do energy pyramids depict?
3. Explain how energy limits the number of trophic levels in a food chain or web.
4. Draw a terrestrial food chain that includes four trophic levels. Identify the trophic level of each organism in the food chain.

References

1. Mariana Ruiz Villarreal (LadyofHats) for CK-12 Foundation. [An example of an ecological pyramid](#) . CC BY-NC 3.0