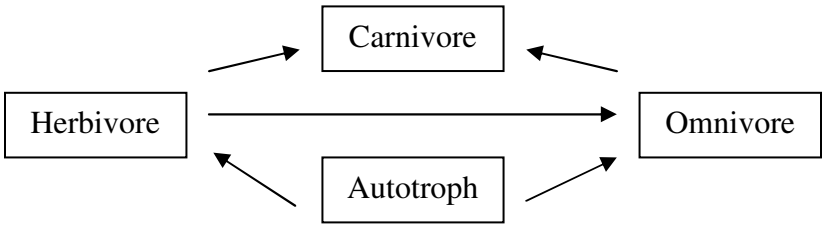
Matter and Energy in Ecosystems

The interactions that take place among biotic and abiotic factors lead to transfers of energy and matter. Every species has a particular role, or **niche**, in an ecosystem.

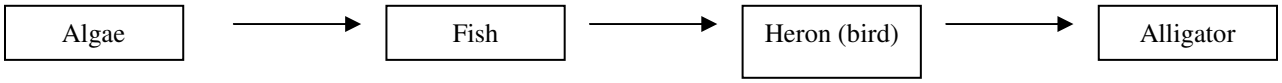
Autotrophs are organisms that use energy from the sun to produce their own food. (Autotrophs are also known as **producers.**)

Heterotrophs are organisms that depend on other organisms for food. (Because they consume rather than make food, heterotrophs are also known as **consumers.)** A heterotroph that eats only plants is known as an **herbivore**. Heterotrophs that eat meat (other heterotrophs) are called **carnivores**. **Omnivores** are heterotrophs that eat both plants and animals. Also, **scavengers** are heterotrophs that feed on animals that are already dead. For example, vultures clean up the bodies of dead animals. **Decomposers** are consumers that break down and absorb nutrients from dead or decaying organisms. Many bacteria and most fungi are decomposers.

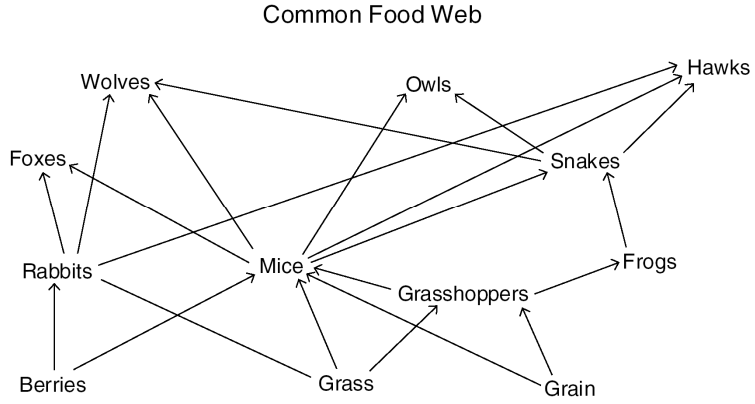


Food chains and **food webs** are pictures that show relationships among organisms. Each link in a food chain/ web represents a feeing step (trophic level). The arrows in a food chain or food web show the direction of energy flow. (That is, *arrows point to the organism that receives the energy*.) **Only about 10% of energy passes to the next level of a food chain. At each level, the other 90% of energy is "lost" to the environment as heat.** Most food chains are only 3-4 links long because by the last link, only a small portion of the original energy is left.

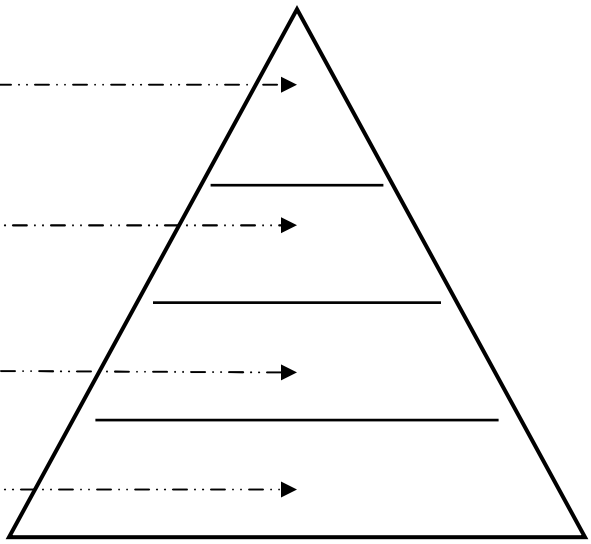
A **food chain** represents one possible path for the transfer of energy in an ecosystem:



A **food web** shows many possible feeding relationships:



Trophic levels: steps that energy passes through

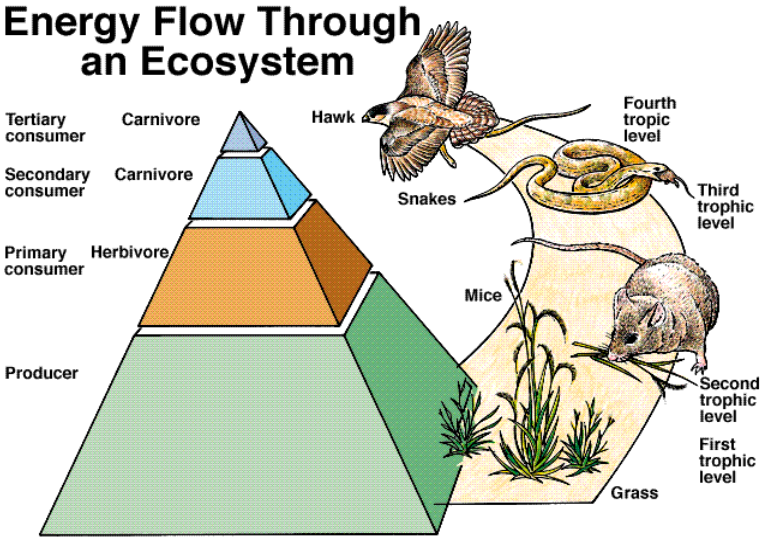


4th trophic level: tertiary consumer
(the third organism that eats)- usually a "top" carnivore

3rd trophic level: secondary consumer
(the second organism that eats)- a **carnivore**
(meat eater)

2nd trophic level: primary consumer
(the first organism that eats)-
always an **herbivore** (plant eater)

1st trophic level: always a **producer**
(an organism that carries out photosynthesis)
(Energy for producers is provided by the sun.)



The passage of energy through an ecosystem is accurately represented as a pyramid because the producers contain the most energy. **Only about 10% of energy passes from one level to the next. At each higher step, some energy is "lost" to the environment as <u>heat.</u>**

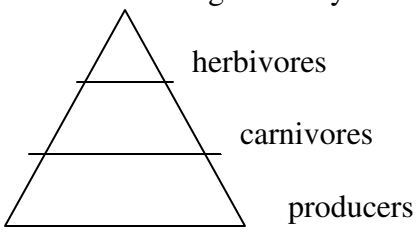
Practice

1. Which of the following is a <u>biotic</u> factor in an ecosystem?
   A. Air
   B. Soil
   C. Water
   D. Tree

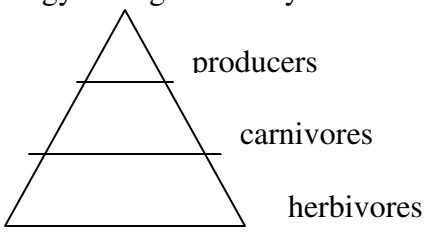
2. Only 10% of energy is passed from one trophic level to the next. What happens to the energy that is not passed on?

3. Which of the following correctly illustrates the flow of energy through an ecosystem?

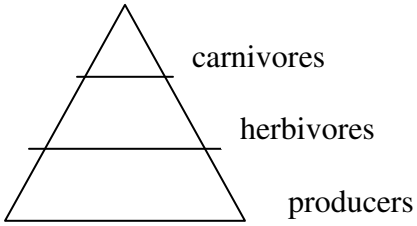
A.



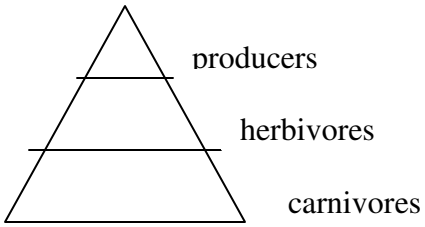
C.



B.



D.



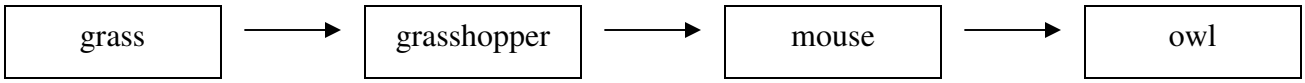
4. Ultimately, what is the source of all energy for life on Earth?

5. Which level of an energy pyramid contains the most energy?

A. producer
B. primary consumer
C. tertiary consumer
D. secondary consumer

6. In the food chain below, the mouse is the _____.

A. producer
B. primary consumer
C. competitor
D. secondary consumer



7. Which of the following are "nature's recyclers"?

A. producers
B. decomposers
C. consumers
D. plants

8. An ecological pyramid is sometimes referred to as a pyramid of numbers. Which level in a pyramid of numbers would contain the fewest organisms?

A. producers
B. primary consumers
C. secondary consumers
D. tertiary consumers

9. Food webs show the feeding relationships that exist in an ecosystem. What can impact the stability and therefore the feeding relationships that exist in an ecosystem?

A. presence of adaptations
B. lack of mutations
C. an environmental change
D. zero population growth