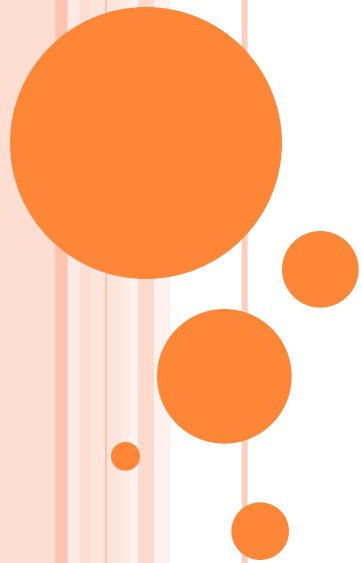


# ENERGY IN ECOSYSTEMS



# PRODUCERS PROVIDE ENERGY FOR OTHER ORGANISMS IN AN ECOSYSTEM.

- Producers = Plants
  - Producers are also known as autotrophs.
  - Producers need sunlight to make food.
  - The sun is their main source of energy.
- Consumers = Everything else!
  - Consumers are also known as heterotrophs.
  - Energy flows from producers to consumers.



# PRODUCER OR CONSUMER?



!



# PRODUCER OR CONSUMER?



# PRODUCER OR CONSUMER?



# PRODUCER OR CONSUMER?



# PRODUCER OR CONSUMER?



# PRODUCER OR CONSUMER?

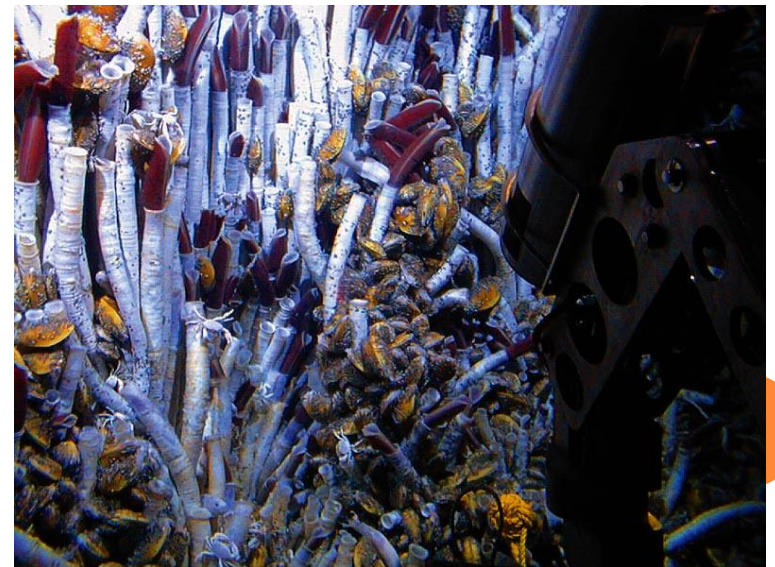
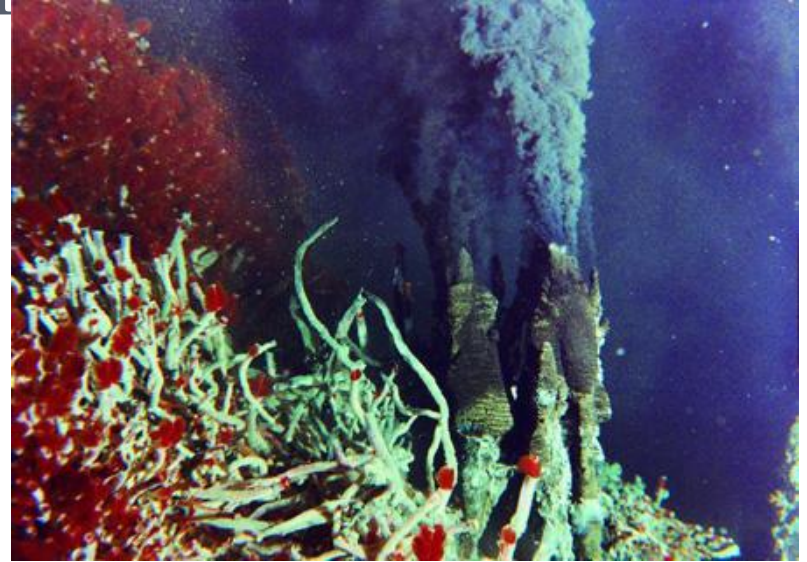




# ALMOST ALL PRODUCERS OBTAIN ENERGY FROM SUNLIGHT

## □ Chemosynthesis

- In 1977, scientists discovered the first prokaryotes (archaea) that did NOT need sunlight to make food.
- Instead, these prokaryotes utilized the chemicals in the water to form carbohydrates—this is called chemosynthesis.



# FOOD CHAINS AND FOOD WEBS



# FOOD CHAINS

- A food chain is a sequence that links species by their feeding relationships.



The Harris's hawk, a consumer, obtains its energy by eating other animals, such as desert cottontails.



The desert cottontail, a consumer, obtains its energy by eating the seeds of plants, such as grama grass.



Grama grass, a producer, obtains its energy through photosynthesis.



# TYPES OF CONSUMERS

## □ Herbivores

- Eat only plants

## □ Carnivores

- Eat only meat (includes insects)

## □ Omnivores

- Eat both plants and animals (includes insects)

## □ Detritivores

- Eat detritus, or dead organic matter

## □ Decomposers

- Are detritivores that break down organic matter into simpler compounds



# TYPES OF CONSUMERS

## □ Specialist

- A consumer that primarily eats one specific organism or feed on a very small number of organisms.



Giant Pandas are specialists. Over 95% of their diet comes from bamboo. If bamboo became scarce, the Panda would be in danger of extinction.

## □ Generalist

- Consumers that have a varying diet.



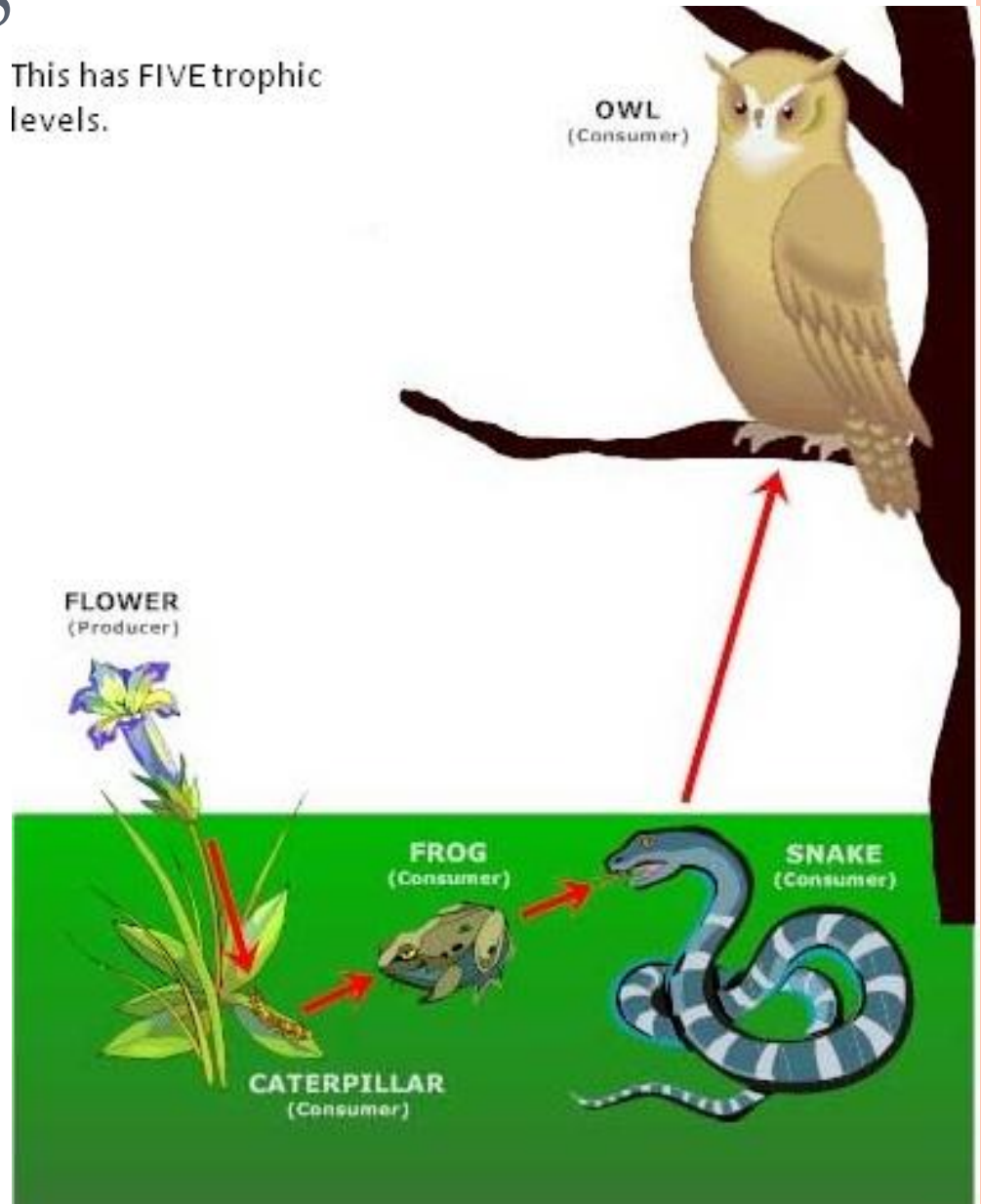
Raccoons are generalists. They can live almost anywhere, and eat almost anything.



# TROPHIC LEVELS

This has FIVE trophic levels.

- Trophic levels are the levels of nourishment in a food chain.



# TROPHIC LEVELS

## □ Producers

- Basis of all trophic levels.

## □ Primary consumers

- herbivores

## □ Secondary consumers

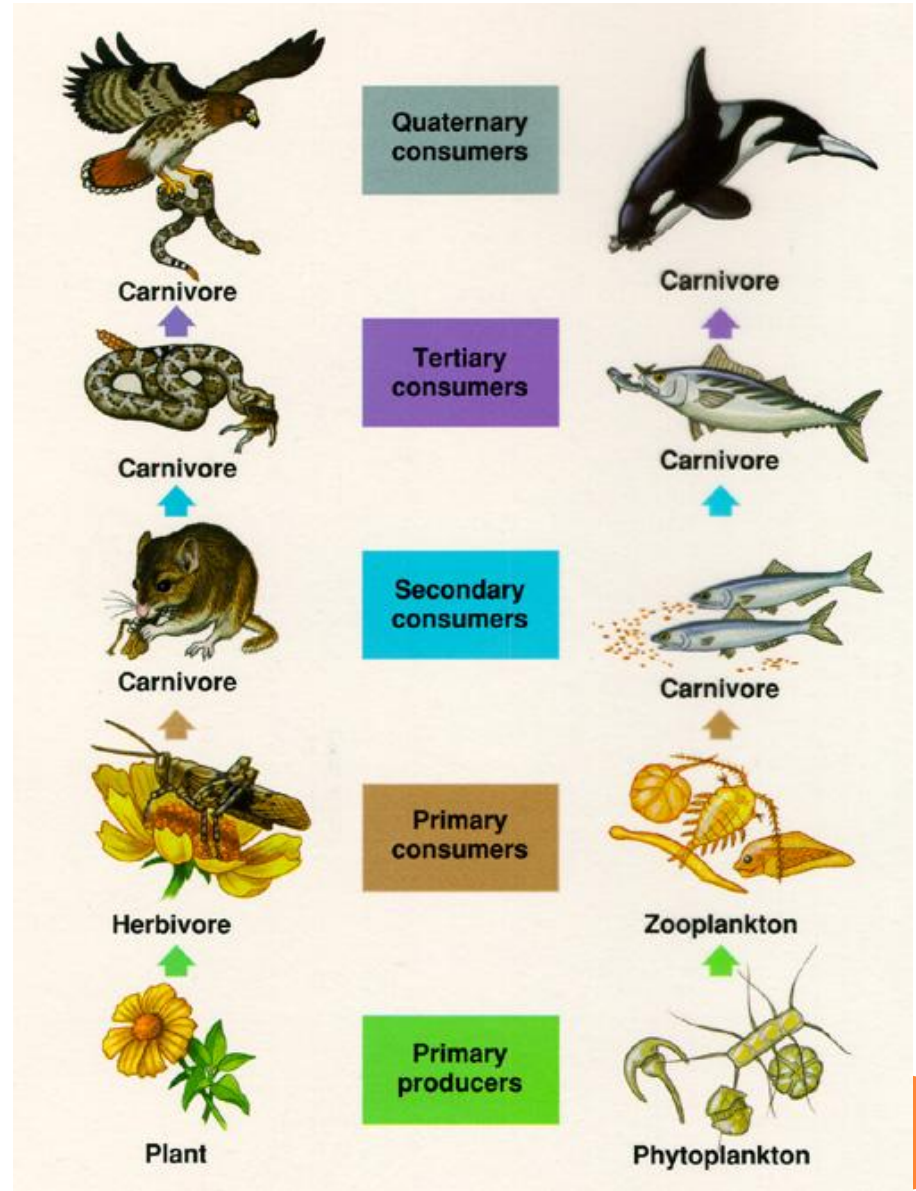
- carnivores that eat herbivores.

## □ Tertiary consumers

- carnivores that eat secondary consumers.

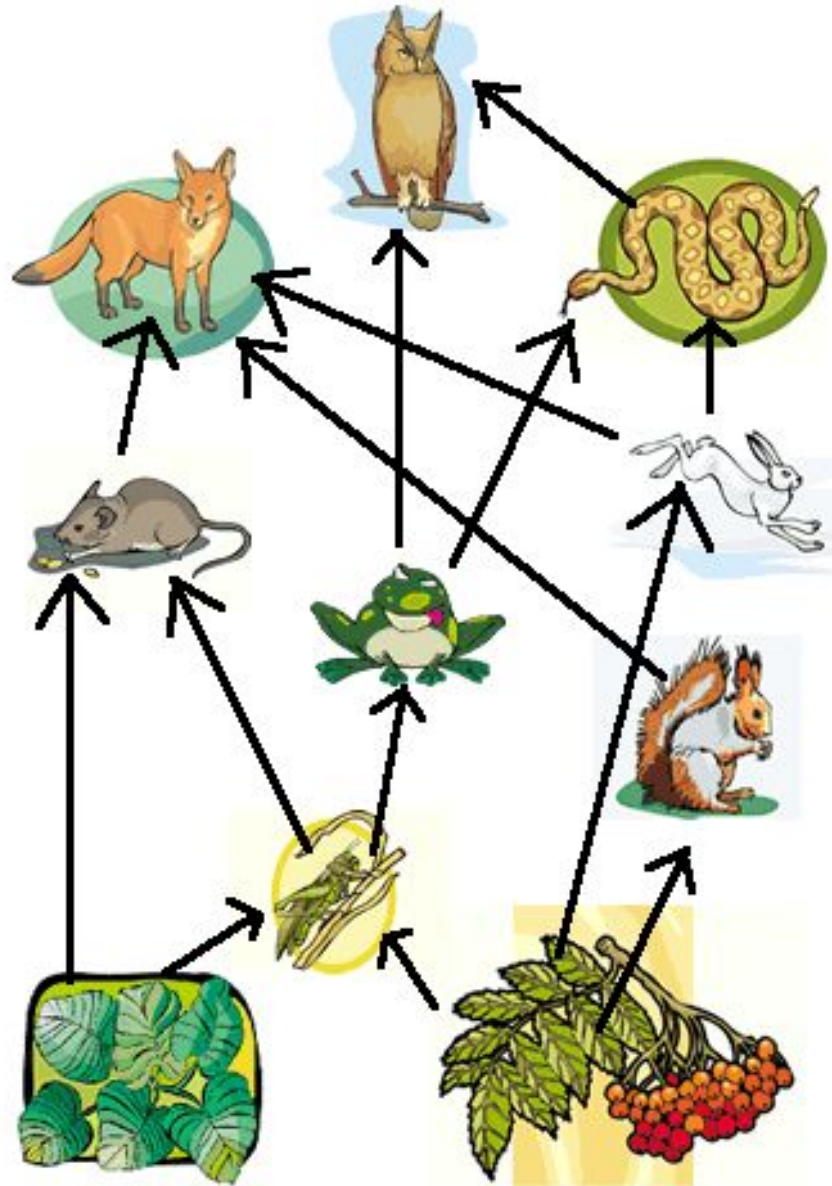
## □ Omnivores

- May be listed at different trophic levels in different food chains.



# FOOD WEBS

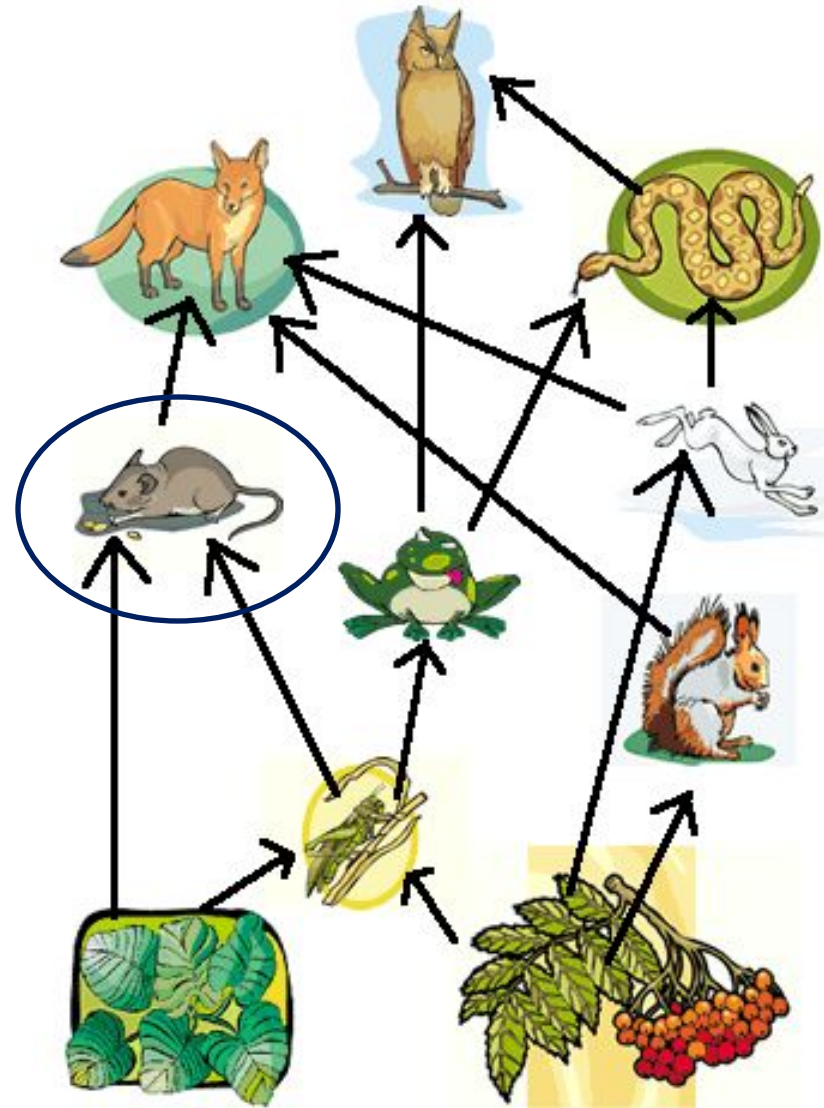
- A food web is a model that shows the complex network of feeding relationships and the flow of energy within and sometimes beyond an ecosystems.
  - At each link in a food web, some energy is stored within an organism, and some energy is dissipated into the environment.





# FOOD WEBS

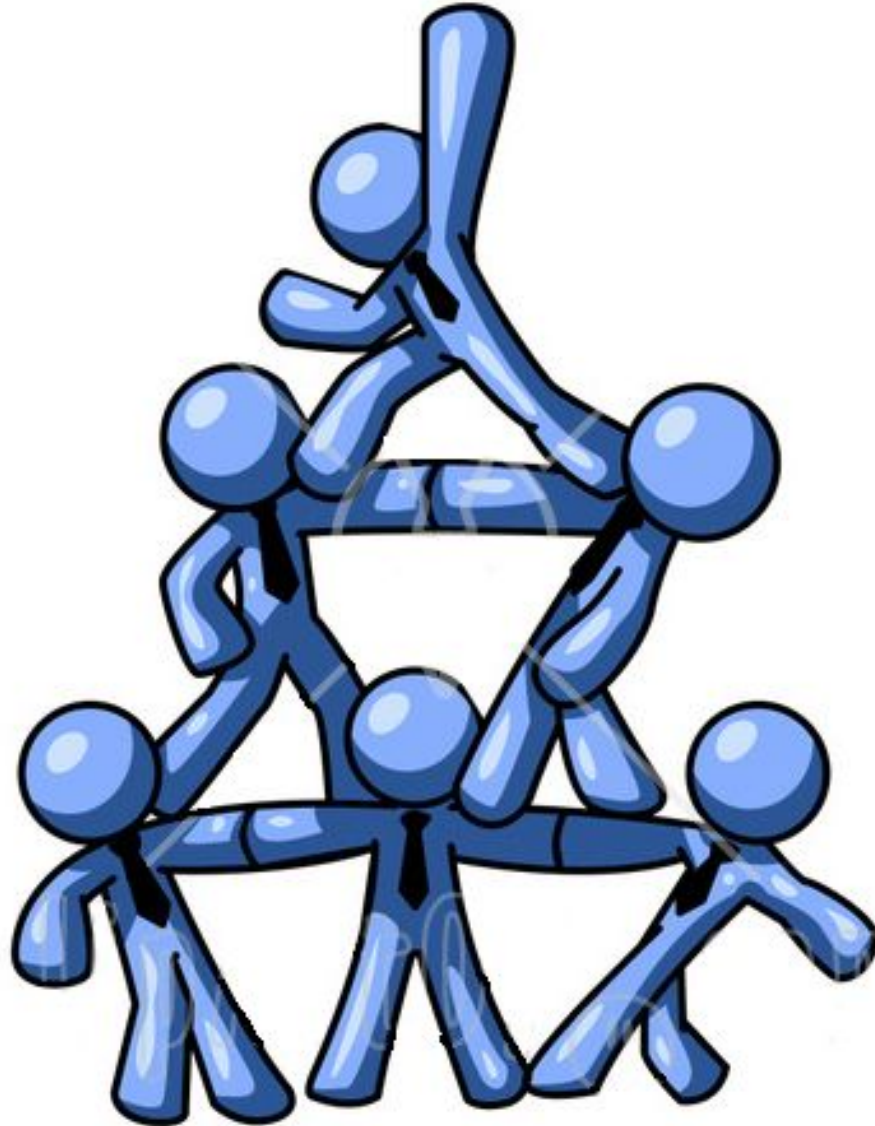
- The stability of any food web depends on the presence of producers, as they form the base of the food web.



The mouse is both a primary and secondary consumer because it eats both plants and insects in this food web.

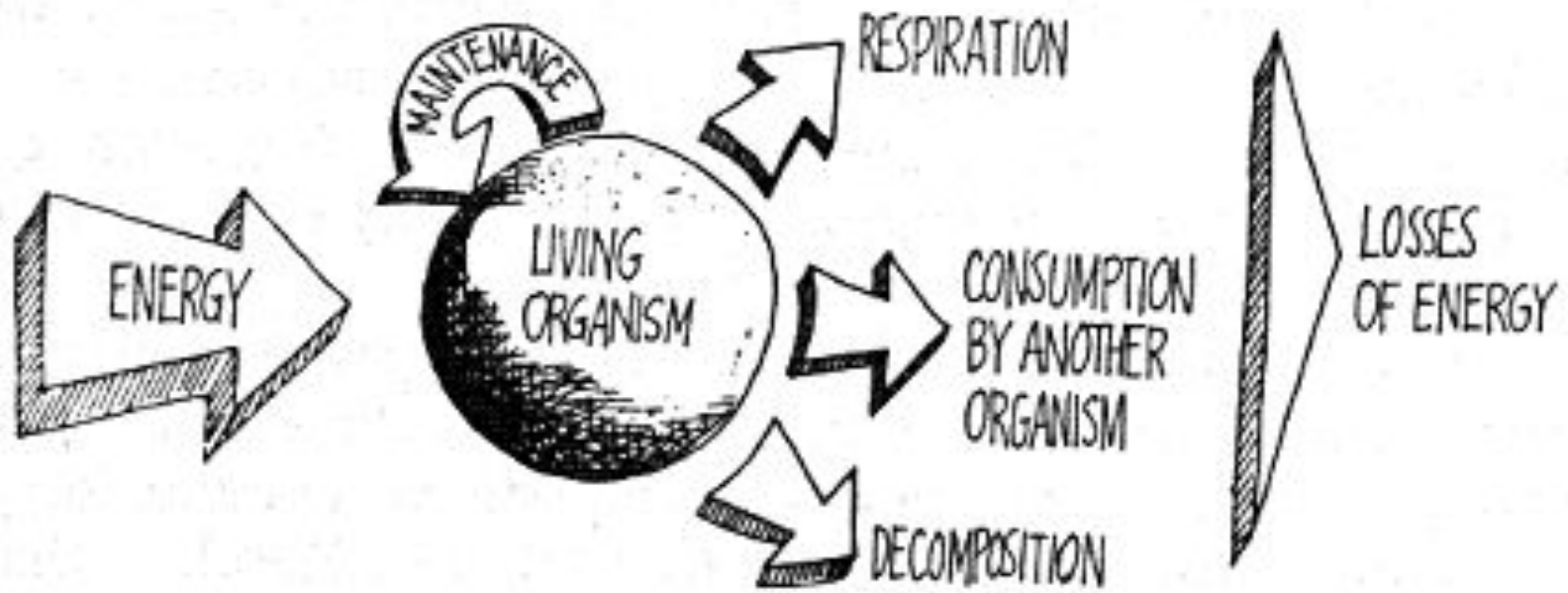


# PYRAMID MODELS



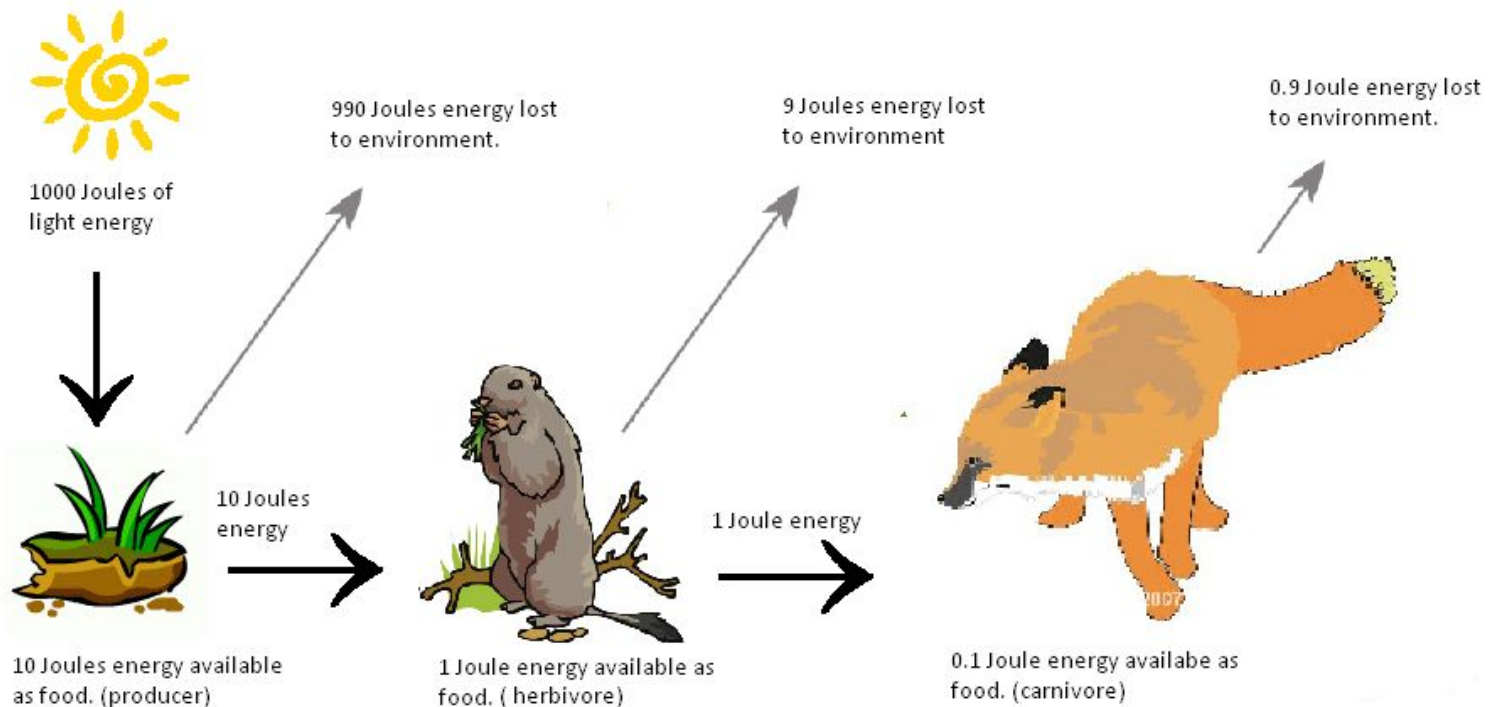
# AN ENERGY PYRAMID SHOWS THE DISTRIBUTION OF ENERGY AMONG TROPHIC LEVELS.

- Sunlight provides the energy for photosynthesis, and that energy flows up the food chain. Along the way, some of the energy is dissipated, or lost.



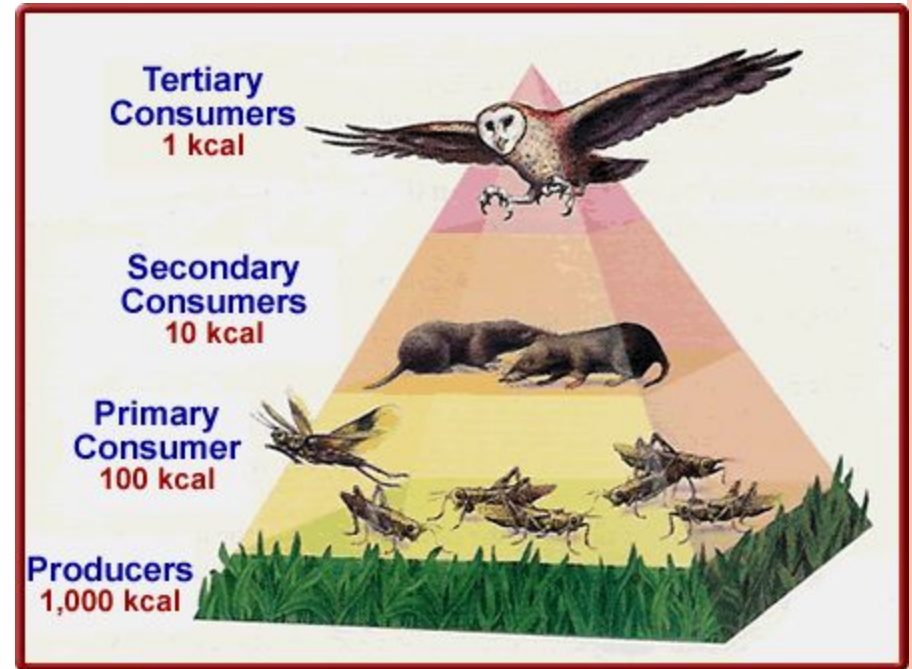
# LOSS OF AVAILABLE ENERGY

- Biomass is a measure of the total mass of organisms in a given area.
- When a consumer incorporates the biomass of a producer to its own biomass, a great deal of energy is lost in the process as heat and waste.
  - The dissipation, or loss, of energy from one trophic level to the next may be as much as 90%.
  - Only 10% of the available energy is left to transfer from one trophic level to the next.



# ENERGY PYRAMIDS

- Because energy is lost at each stage of a food chain, the longer the chain is, the more energy is lost overall.
  - The total energy used by producers far exceeds the energy used by the consumers they support.
  - An energy pyramid is a diagram that compares the energy used by producers, primary consumers, and other trophic levels.



# OTHER PYRAMID MODELS ILLUSTRATE AN ECOSYSTEM'S BIOMASS AND DISTRIBUTION OF ORGANISMS.

## □ Biomass pyramid

- Diagram that compares the biomass of different trophic levels within an ecosystem.

## □ Pyramid of numbers

- Shows the number of individual organisms at each trophic level in an ecosystem.

