

Principles of Ecology

Chapter 2. pp. 33-61

Flexbook. pp. 709-746

Principles of Ecology

- ❑ Ecology – the study of interactions that take place between organisms and their environments
- ❑ Living things are affected by nonliving and living parts of the environment
- ❑ Abiotic factors: nonliving parts of the environment
 - ❑ Air, temperature, moisture, light, soil
- ❑ Biotic factors: living organisms in the environment

Organisms and Environment

DIVIDING THE ENVIRONMENT



**ABIOTIC
FACTORS**

rocks, water,
air, wind
temperature,
light

Characteristics of Life (Biotic Factors)

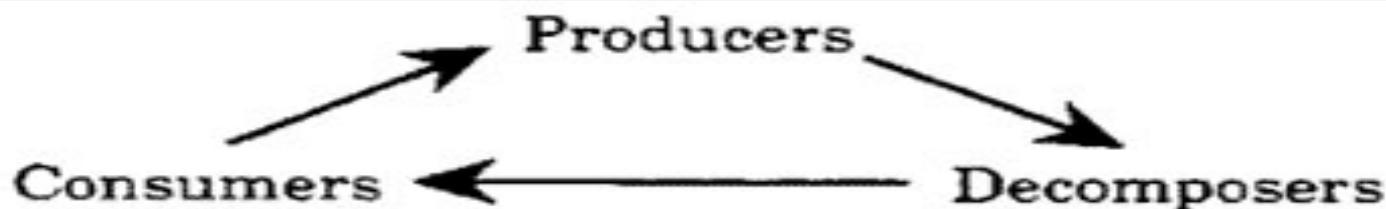
- ❑ Living things are made up of 1 or more cells that contain DNA
- ❑ Have complex chemistry
 - ❑ Carry out chemical reactions
 - ❑ Transporting molecules or carrying out metabolism
 - ❑ Metabolism – the breakdown of compounds to produce energy
- ❑ Living things can carry out reproduction
 - ❑ Reproduction: Production of offspring
 - ❑ Pass their traits onto their offspring
 - ❑ Species: group of organisms that can interbreed and produce fertile offspring in nature
- ❑ Living things grow and develop
 - ❑ Growth: an increase in the amount of living material and the formation of new structures
 - ❑ Development: All of the changes that take place during the life of an organism

Characteristics of Life (Biotic Factors) continued.

- ❑ Living things adjust to their environment
 - ❑ Environment: the air, water, weather, temperature, organisms, etc. in an area
 - ❑ **Stimulus: anything in an organisms environment that causes the organism to react**
 - ❑ **Response: the reaction of an organism to a stimulus**
 - ❑ Example: Stimulus-cold winter without food Response-bears hibernate
- ❑ **Homeostasis: Controlling an organism's internal system to maintain the conditions needed for survival**
 - ❑ Example of homeostasis: When your body starts to overheat, you sweat to cool yourself off
- ❑ Living things adapt and evolve
 - ❑ **Adaptation: A body structure, behavior, or internal process that allows an organism to respond to its environment and survive to produce offspring**
 - ❑ **Evolution: The gradual change in a species through adaptations over time**

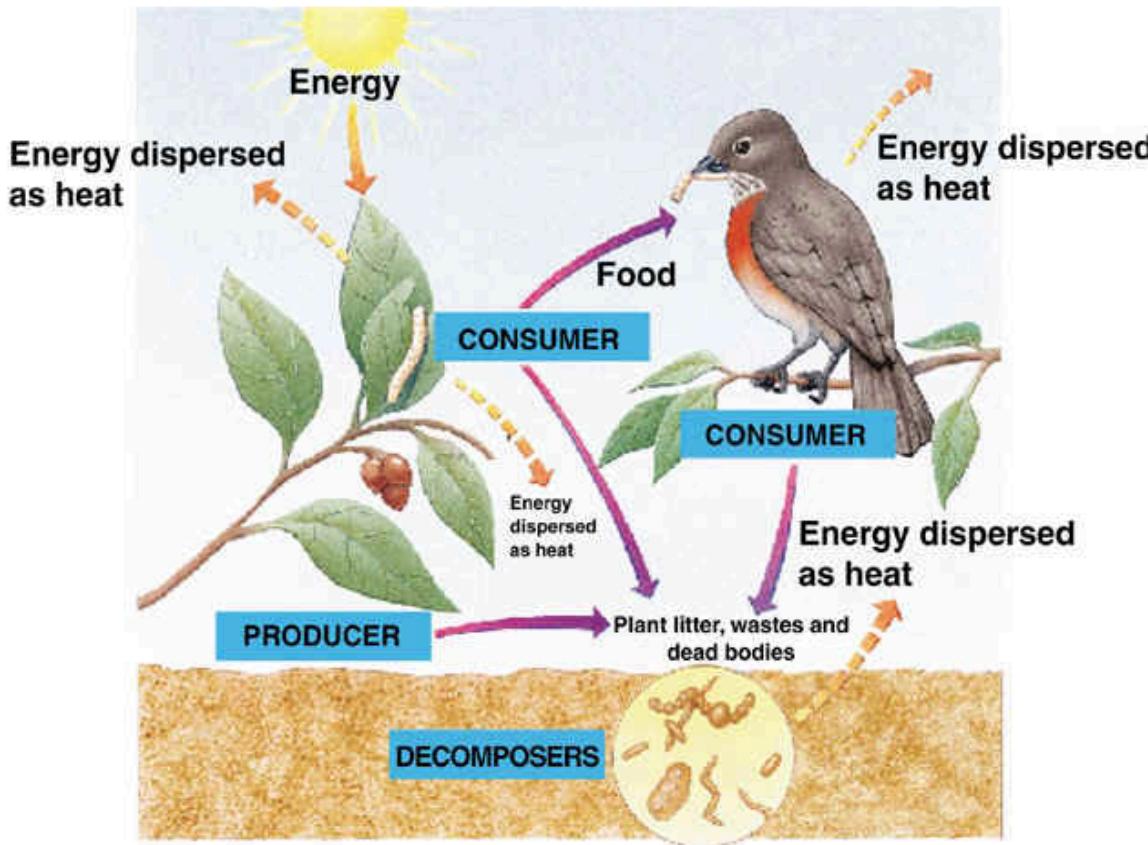
Biotic Factor Relationships

- ❑ Producers: Organisms that take in energy from their surroundings to make their own food (Plants and some bacteria)
- ❑ Consumers: Organisms that eat (consume) other organisms for energy (animals)
- ❑ Decomposers: Consumers that eat waste products for energy. Waste products are feces, urine, fallen leaves, dead animals. (Fungi, some bacteria)



Flow of Energy through Biotic Factors

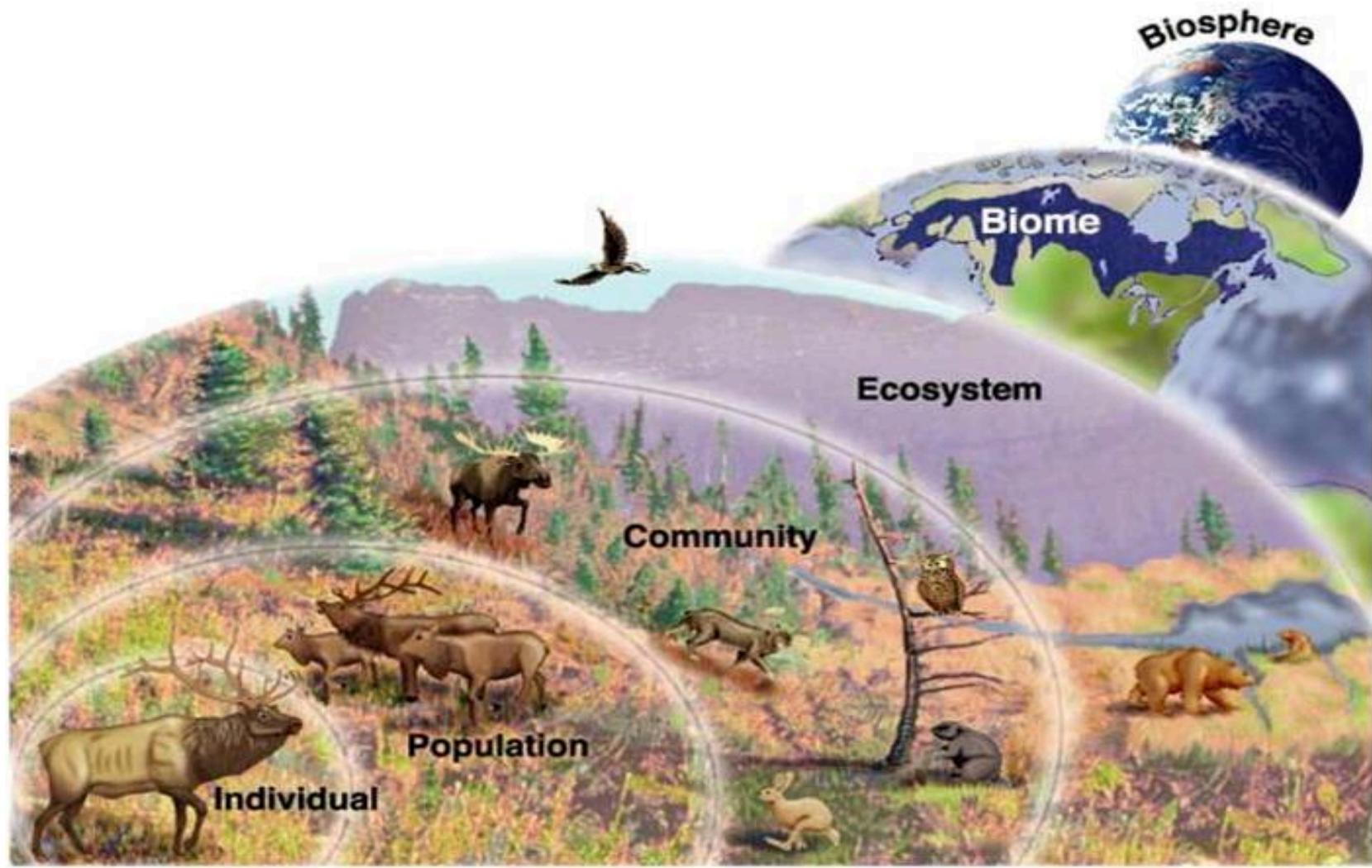
Raven/Berg, Environment, 3/e
Figure 4.6



Levels of Organization

- ❑ Ecology studies the relationship of organisms and their environment on several levels
- ❑ Organism – individual
- ❑ Population: group of organisms, all of the same species, which interbreed and live in the same area at the same time
 - ❑ Organisms may compete with each other for resources such as food, water, space, mates, etc.
- ❑ Biological community: group of populations that live in the same area at the same time
 - ❑ A change in one population can cause a change in another population
- ❑ Ecosystem: a biological community and the nonliving things in the community's environment
 - ❑ Terrestrial ecosystem: located on land
 - ❑ Aquatic ecosystem: located in water
- ❑ Biosphere: portion of the Earth that supports living things
 - ❑ Air, land, fresh water, salt water

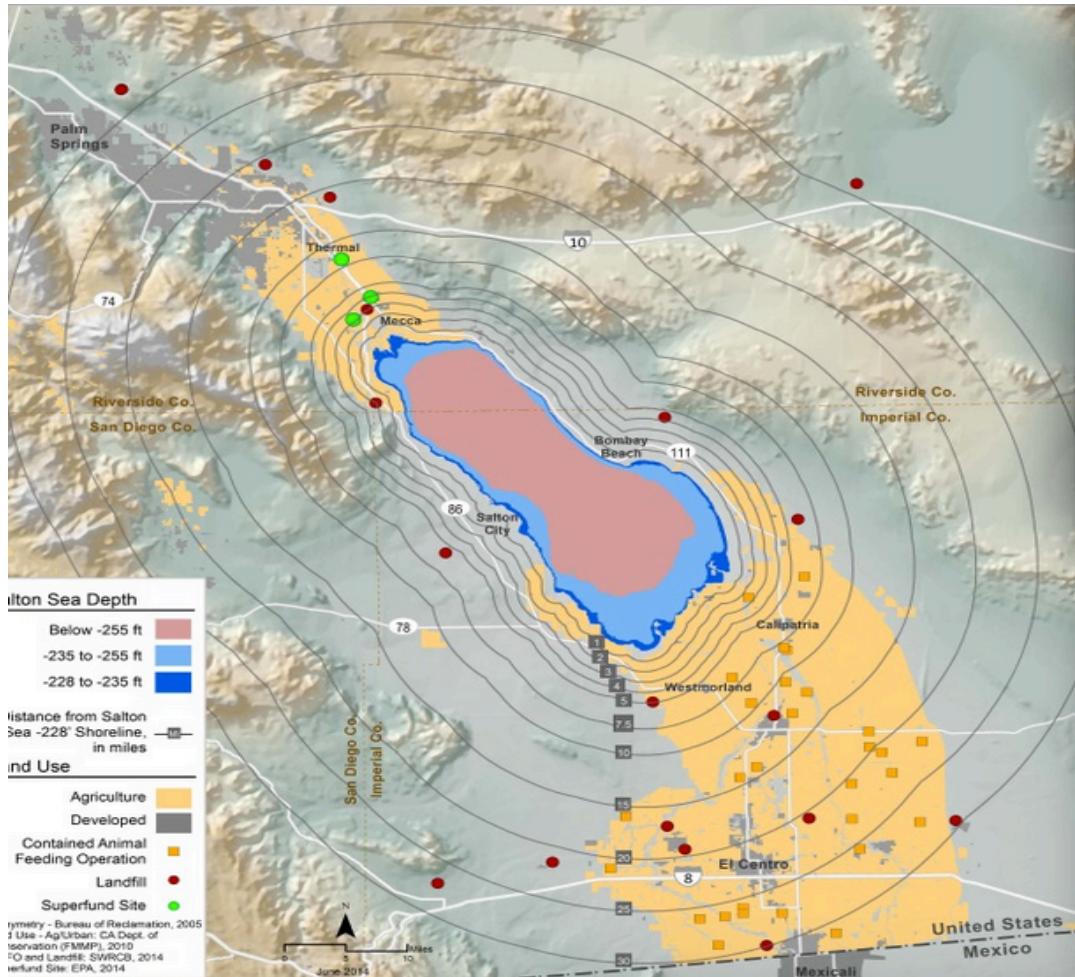
Levels of Organization



Habitat

- ❑ the place where an organism lives out its life
- ❑ Niche: all the strategies and adaptations a species uses in its environment
- ❑ Includes all its interactions with the biotic and abiotic parts of the environment
- ❑ Each type of organism occupies its own niche to avoid competition with other types of organisms
- ❑ Two species can share the same habitat but not the same niche
- ❑ Example: Ants and bacteria both live in the dirt (habitat) but have different niches. Ants eat dead insects and bacteria eat dead leaves, dead logs, and animal waste. So ants and bacteria don't compete for resources.

Case Study: Salton Sea



Survival Relationship

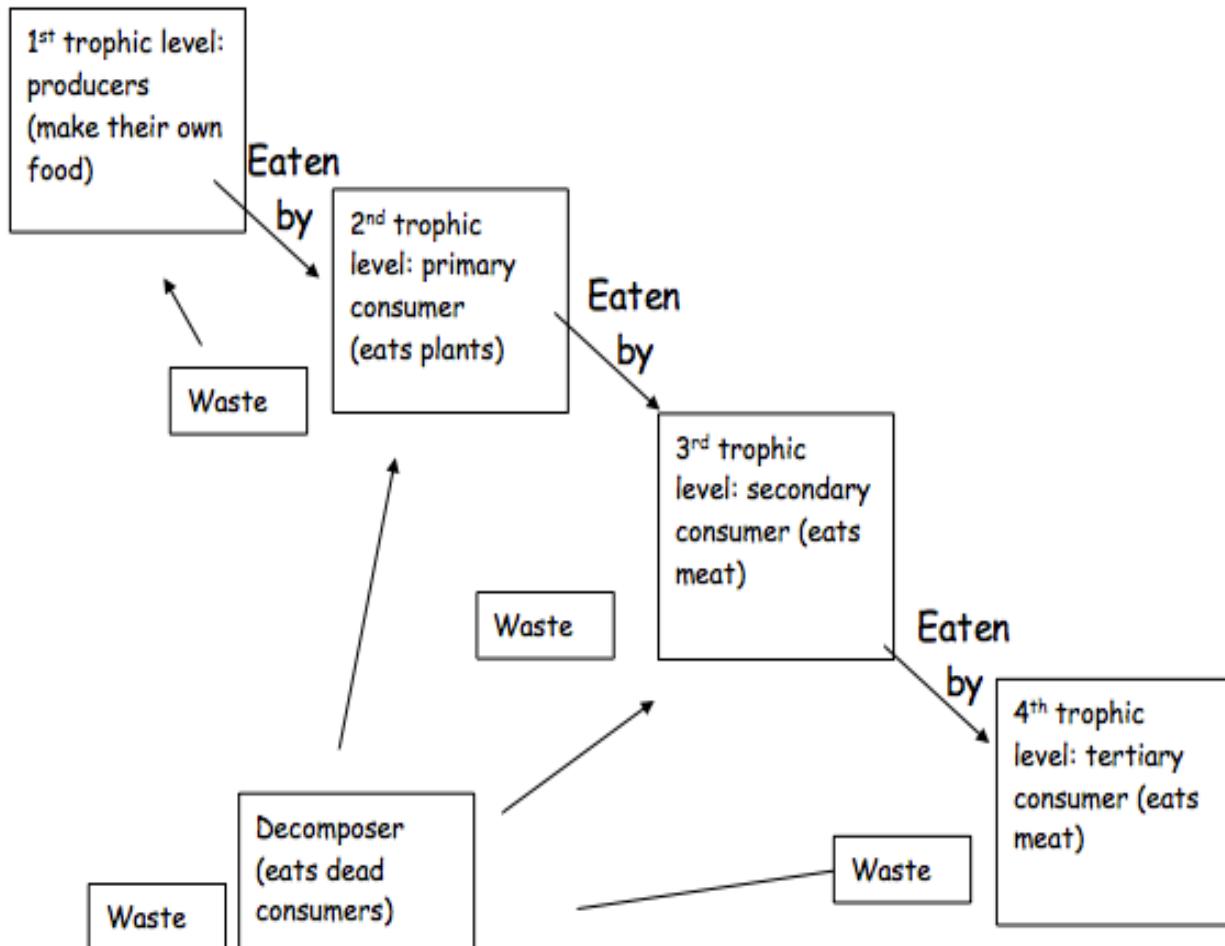
- ❑ Predator-prey: predators are consumers that hunt and eat other organisms called prey
- ❑ Symbiosis: relationship in which one species lives on, in, or near another species and affects its survival
 - ❑ There are 3 types of symbiosis
- ❑ Mutualism: type of symbiosis in which both species benefit (+/+)
 - ❑ Ants living in the tropical acacia trees- trees are protected when ants attack animals that try to feed on the tree and ants receive nectar and shelter from the tree.
- ❑ Commensalism: type of symbiosis in which one species benefits and the other species is neither harmed nor benefited (+/o)
 - ❑ Spanish moss grows on the branches of trees. The moss gets a habitat and the tree gets nothing.
- ❑ Parasitism: type of symbiosis in which one species benefits and the other species is harmed (+/-)
 - ❑ Parasite: organism that harms but does not kill another organism
 - ❑ Host: organism that is harmed by a parasite
 - ❑ Ticks feed on dogs, people, etc. The ticks get food (blood) and the hosts lose blood and can be infected with disease.

Feeding Relationships

- ❑ Autotrophs: Organisms that make their own food (plants and some bacteria)
- ❑ Heterotrophs: Organisms that cannot make their own food and must eat other organisms
- ❑ Herbivores: eat plants (cows)
- ❑ Carnivores: eat meat (wolves)
- ❑ Omnivores: eat plants and meat (humans, bears)

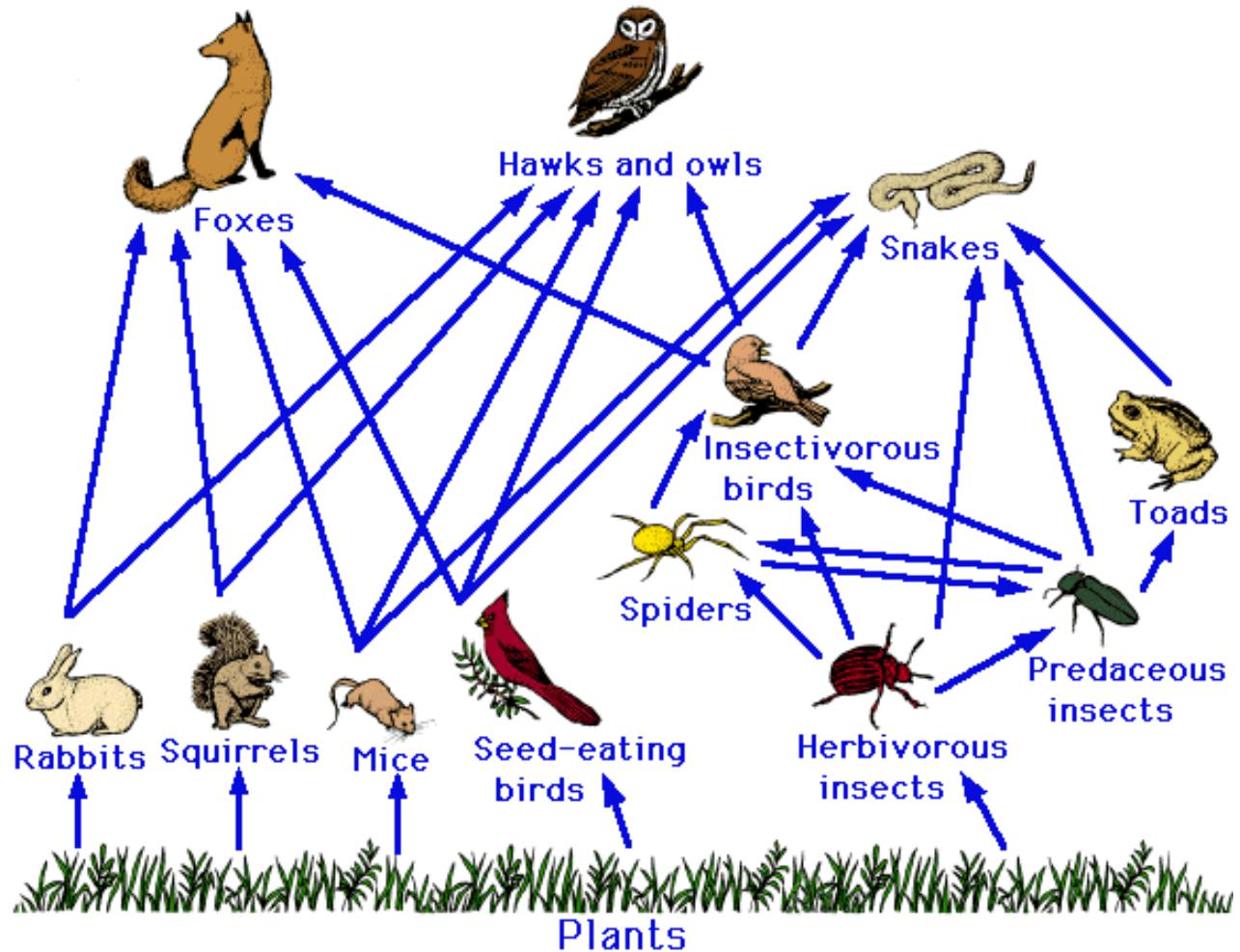
Trophic Level and Food Chains

- ❑ Trophic level: A feeding level in an ecosystem
- ❑ Food chain: lineup of organisms that shows who eats who
- ❑ Shows how matter and energy move through an ecosystem



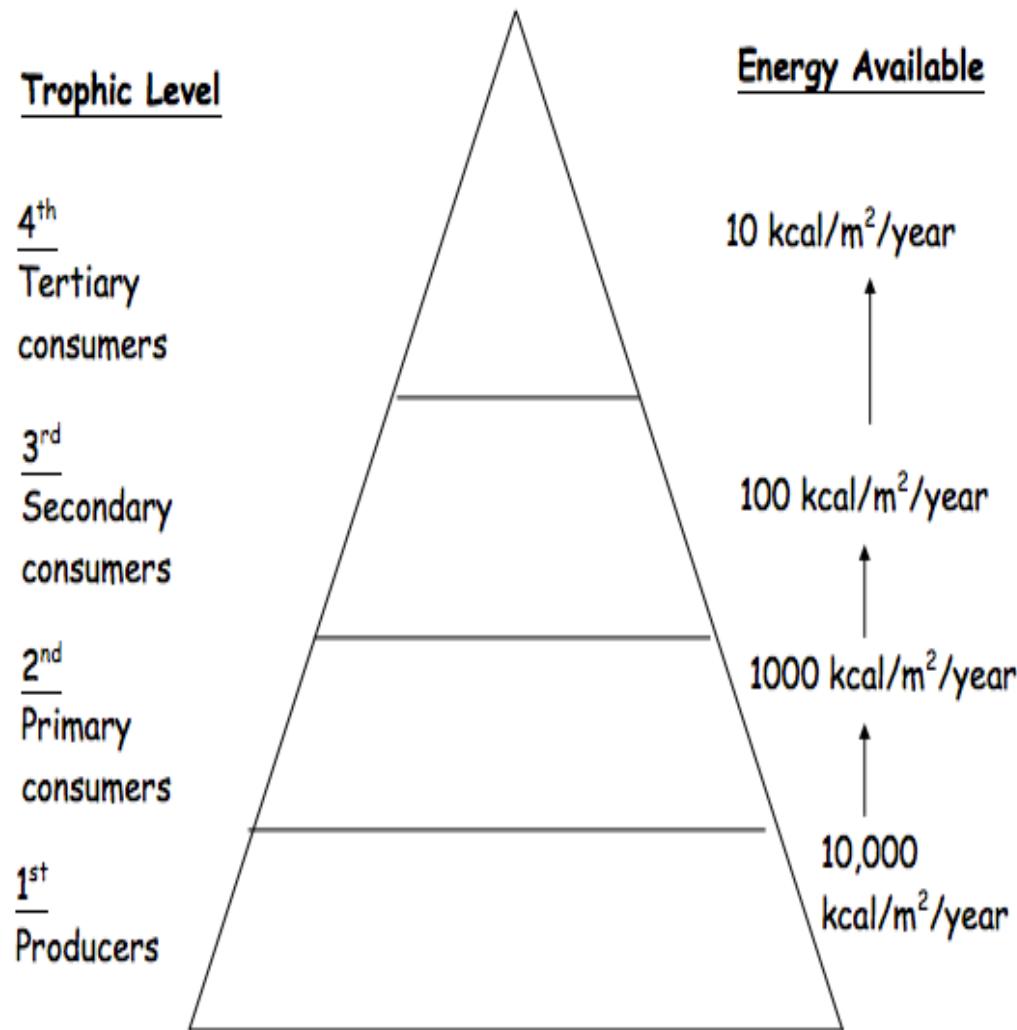
Food Web

- ❑ A network of connected food chains
- ❑ More realistic than a food chain because most organisms feed on more than one species for food (stability with complexity)



Energy Pyramid

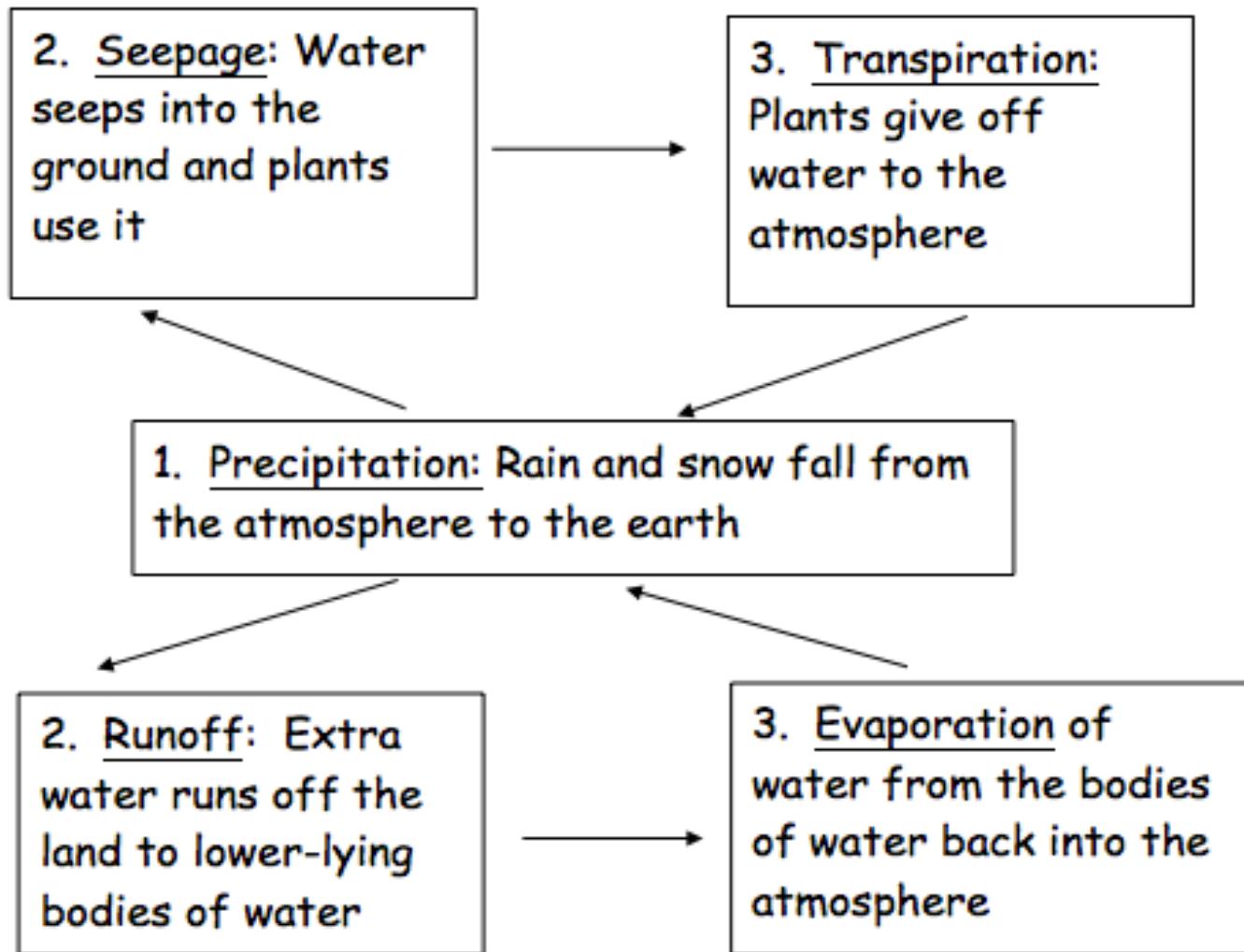
- Every time an organism eats, it obtains energy from its food
- So energy is transferred from the 1st trophic level to the 2nd trophic level to the 3rd trophic level and so on.
- Some of this energy is lost along the way during an organism's metabolism and as heat
- This energy can be measured in kilocalories (kcal)
- Energy pyramid: picture showing how much energy is transferred to the different trophic levels in a food chain



Cycles in Nature

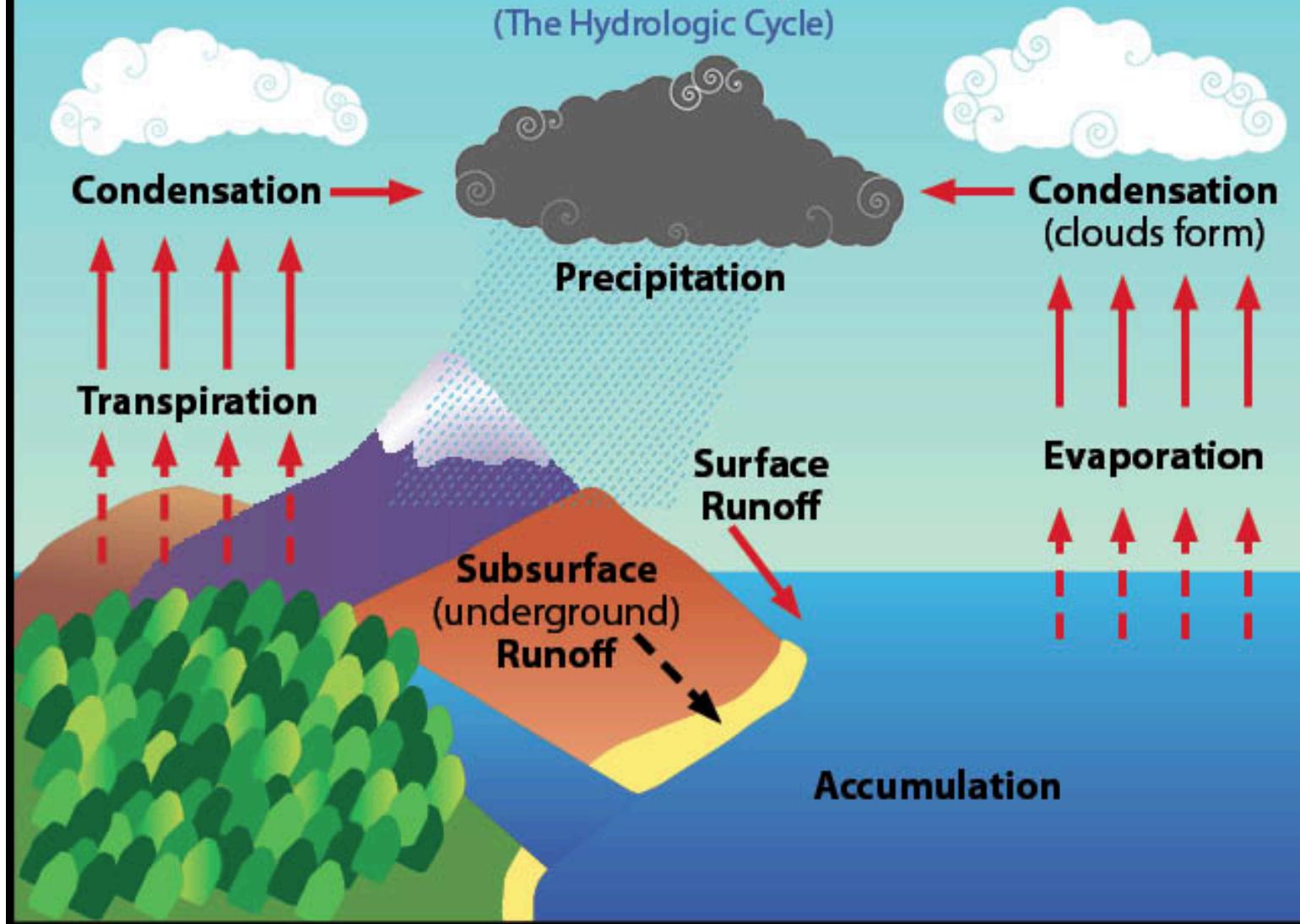
- ❑ There is only a limited amount of resources (water, oxygen, nitrogen, carbon) on the earth
- ❑ In order to keep these resources available to organisms, they must be recycled after they are used
- ❑ Cycle: a process that recycles a resource so that you end up with what you started with (water, oxygen, nitrogen, carbon)

Water Cycle

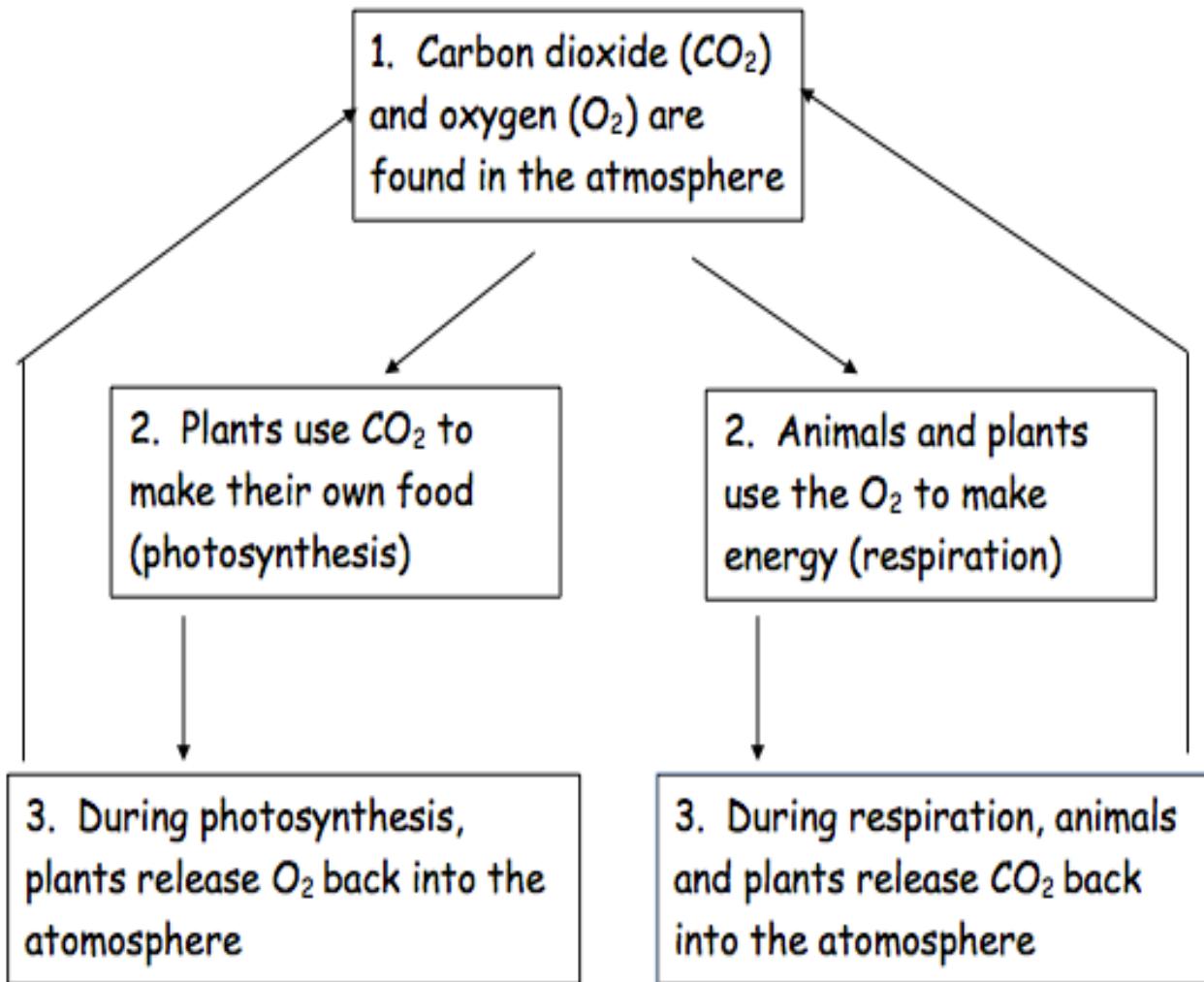


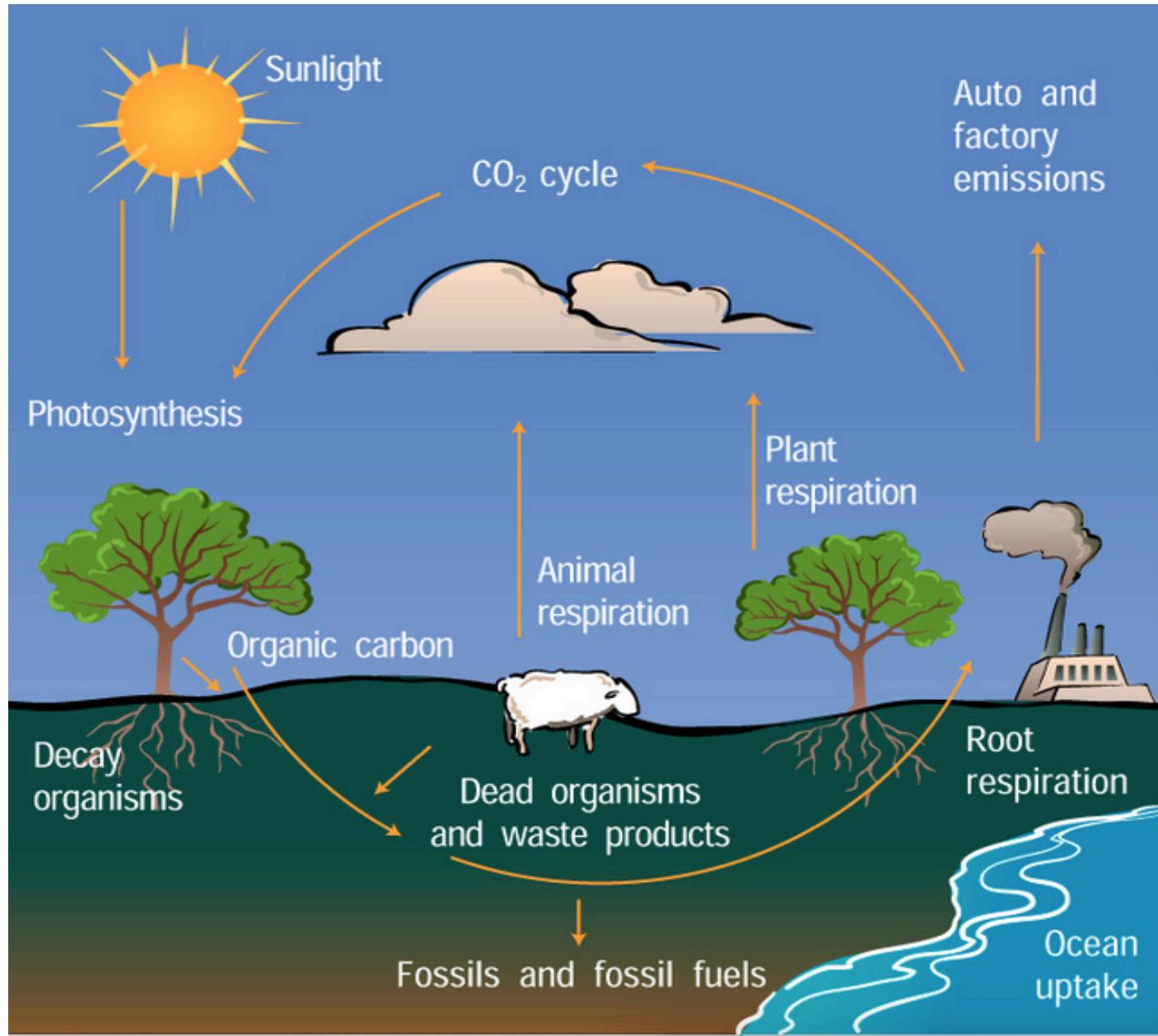
The Water Cycle

(The Hydrologic Cycle)



Oxygen-Carbon Cycle





Nitrogen Cycle

