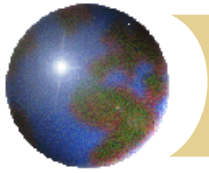


Ecology



What is ECOLOGY?

- ✚ The study of the biotic and abiotic factors in an environment and their interactions.



Biotic Factors

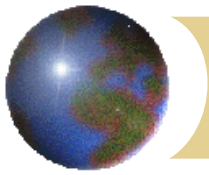
☉ Living things in the environment.

- ☒ Animals
- ☒ Plants
- ☒ Fungi
- ☒ Protists
- ☒ Bacteria

Abiotic Factors

☉ Non-living things in the environment.

- ☒ Air
- ☒ Water
- ☒ Rocks
- ☒ Soil
- ☒ Temperature
- ☒ Light



Hierarchy (organization) of Life

- ⊕ Organism
- ⊕ Populations
 - ⊞ Many organisms of the same species.
- ⊕ Communities
 - ⊞ All of the populations in an area.
- ⊕ Ecosystems
 - ⊞ The community + the abiotic factors in an environment.
- ⊕ Biosphere
 - ⊞ The part of Earth that supports life. From the atmosphere to the bottom of the ocean.



Hierarchy of Life

Example

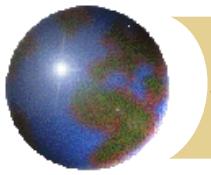
Organism (1 giraffe)

Population (a group of giraffes)

Communities (a group of giraffes, a lion pride, a pack of hyenas, a cluster of grasses, a bunch of trees.)

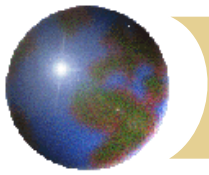
Ecosystem (a group of giraffes, a lion pride [entire community] rocks, soils, hot temperature, with a breeze and a small watering hole.)

Biosphere (Ecosystem at the bottom of the ocean, the savanna in Africa and other land ecosystems, and the ecosystem in the atmosphere. Makes up the entire planet.)



Where and how organisms live

- ✚ Niche- The role an organism plays in an environment
 - ▣ An organism's feeding relationship
 - ▣ How a species uses its environment
 - ▣ How a species affects its environment
- ✚ Habitat- The place where an organism lives



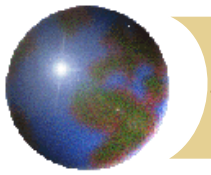
Feeding Relationships: *How organisms obtain energy?*

☉ Autotrophs/ Producers

- ☒ Make their own food
- ☒ Use energy from the sun or energy stored in chemicals

☉ Heterotrophs/ Consumers

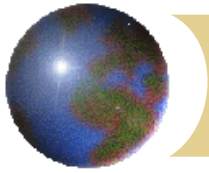
- ☒ Depend on autotrophs as their source of energy and nutrients.
- ☒ Some consumers feed only on producers, some feed on other consumers.



Types of consumers

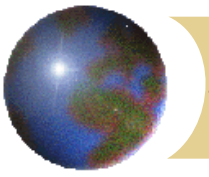
- ⊕ Carnivore- eats animals
 - ⊞ Predator- kills animals (prey) for food
 - ⊞ Scavenger- eats dead animals

- ⊕ Herbivore- eats plants
- ⊕ Omnivore- eats plants and animals
- ⊕ Decomposer- breaks down dead and decaying matter for nutrients



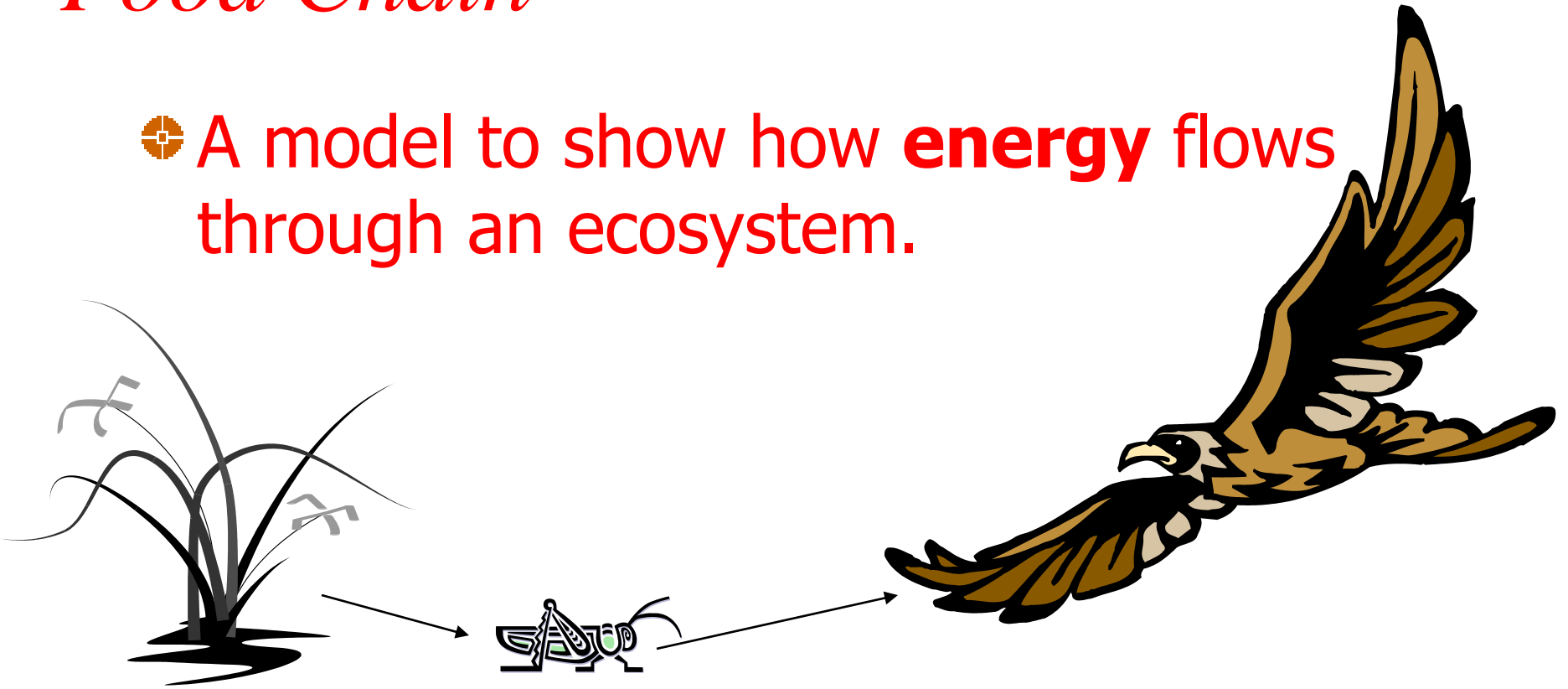
Matter & Energy in Ecosystems

- ⊕ The **initial** source of energy for all living things is the sun.
- ⊕ Energy is constantly transferred from one organism to the next in an ecosystem.



Food Chain

- ✚ A model to show how **energy** flows through an ecosystem.





Algae



Krill



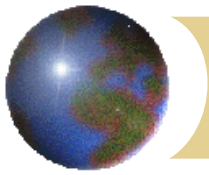
Cod



Leopard seal



Killer whale



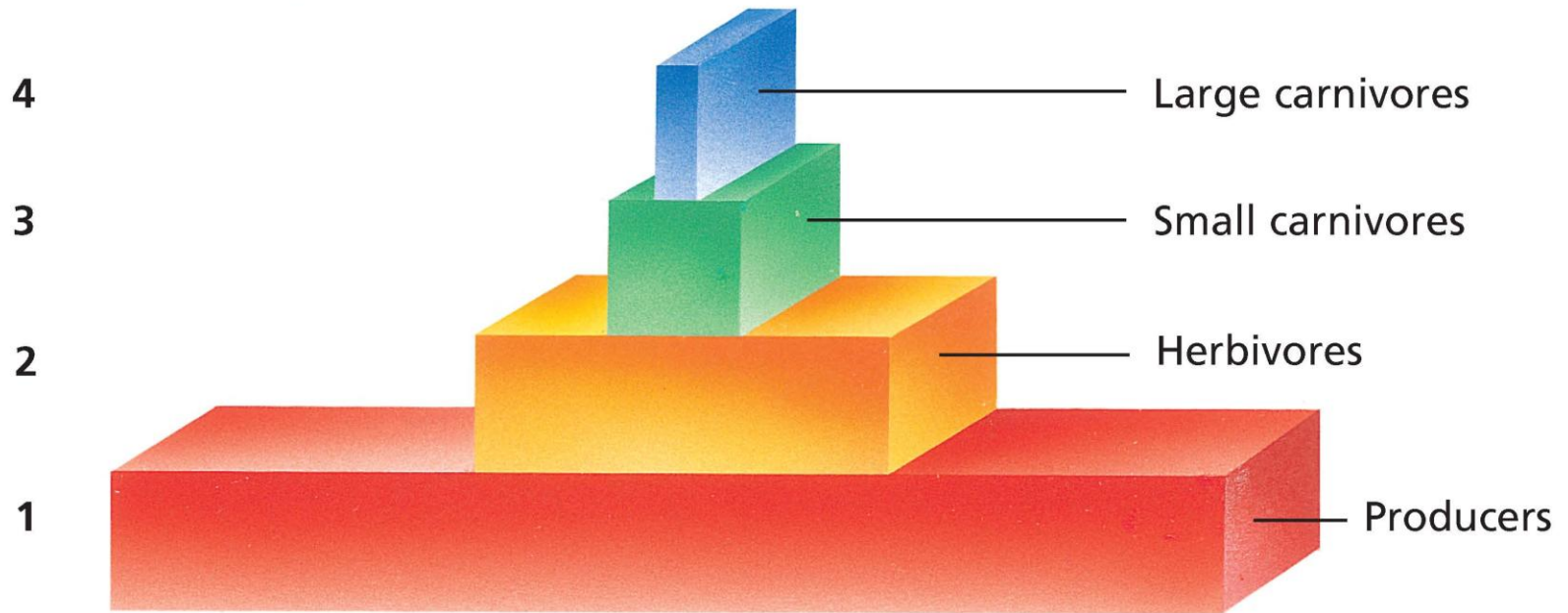
Trophic Levels

- ✦ Steps in the food chain
 - ▣ Decomposers fit at every level!
(depending on what has died)
 - ▣ Top Carnivores (third-order consumers)
 - ▣ Carnivores (second-order consumers)
 - ▣ Herbivores (first-order consumers)
 - ▣ Producers



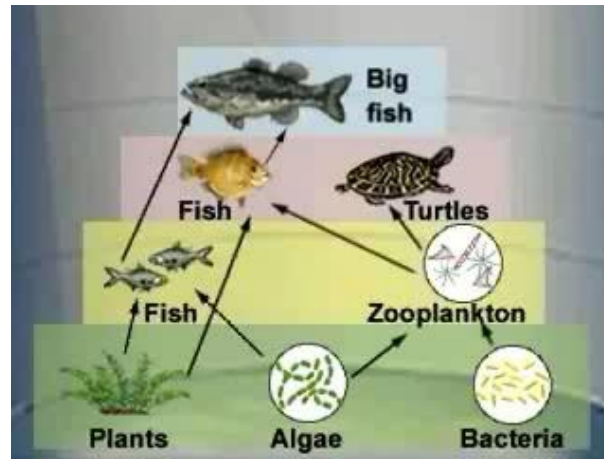
Energy Transfer Through Trophic Levels

TROPHIC LEVELS

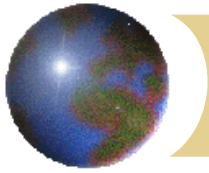




Visual Concept:

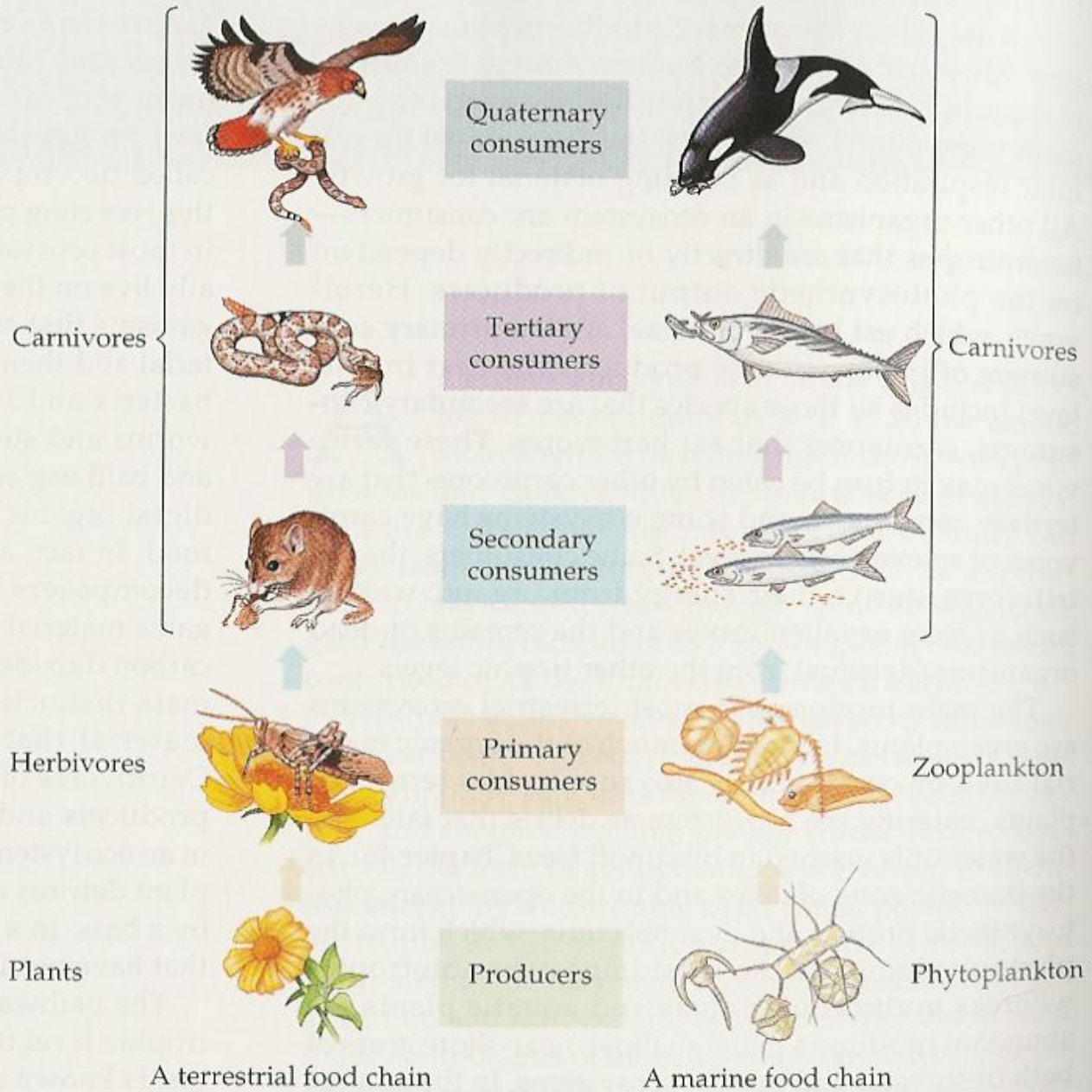
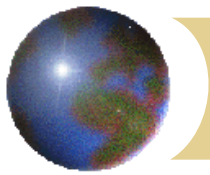


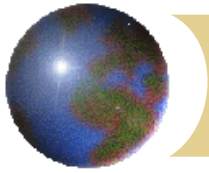
Click above to play the video.



The 10% Rule

- ⊕ Some energy gets stored in the organisms at each step of a food chain.
- ⊕ As we move up the Energy Pyramid, around 10% of the total energy stays stored in an organism's body.
- ⊕ 90% of the energy is used or converted into heat.
- ⊕ The 10% of energy that is stored is available to the organisms in the next trophic level.





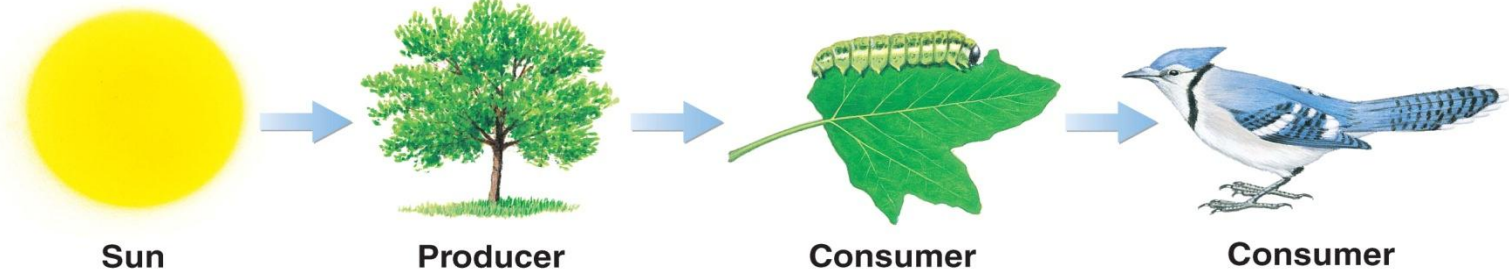
Food Chains

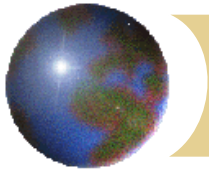
- ✚ Every step (or link) in a food chain shows one organism consuming another.
- ✚ A portion of the energy is used each step.
- ✚ After 3 or 4 links, there is very little energy remaining.



What do the arrows show?

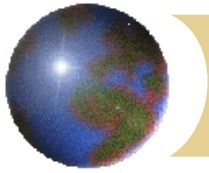
- The arrows are drawn to show the **DIRECTION OF ENERGY TRANSFER.**





Where do humans fit?

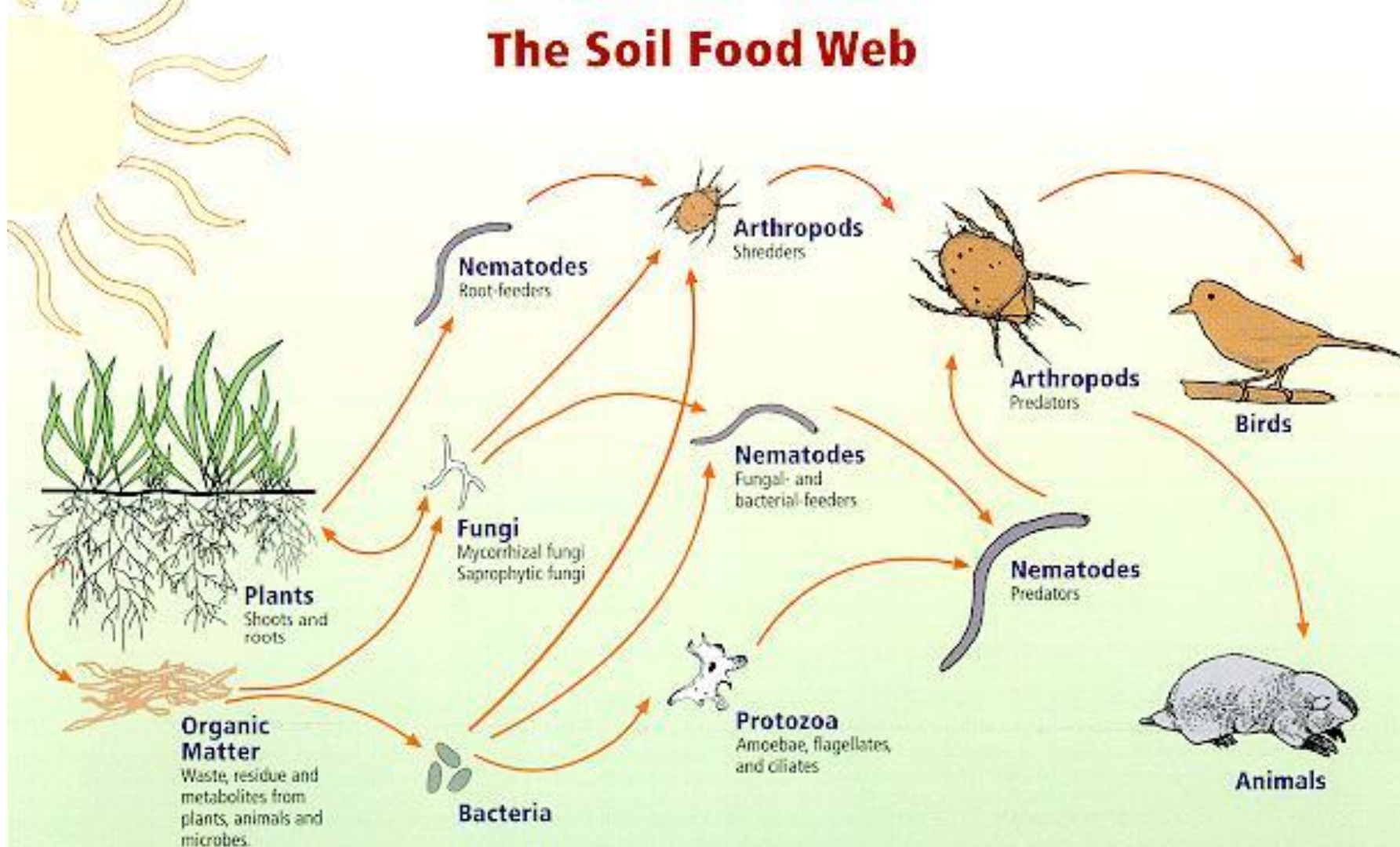
- ✦ When we categorize organisms in a trophic level, we look at one food chain.
- ✦ When are humans
 - ▣ first order consumers?
 - ▣ second order consumers?
 - ▣ third order consumers?



Food Web

- ⊕ A model to show all of the feeding relationships in a community.

The Soil Food Web



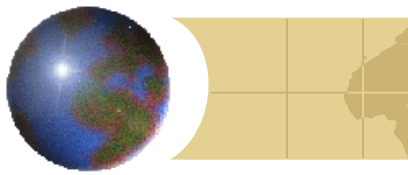
First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders

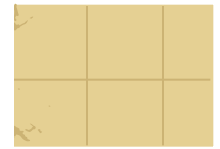
Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

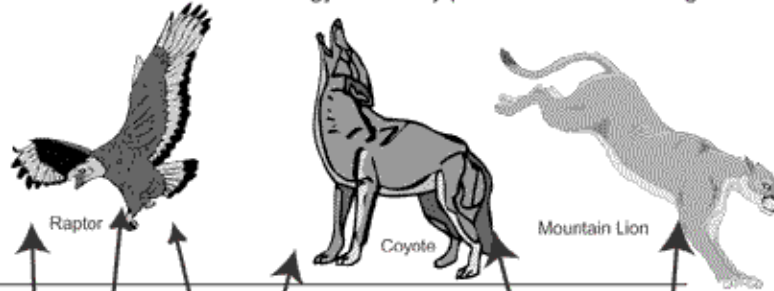


Food Web in the Sagebrush-Steppe Ecosystem

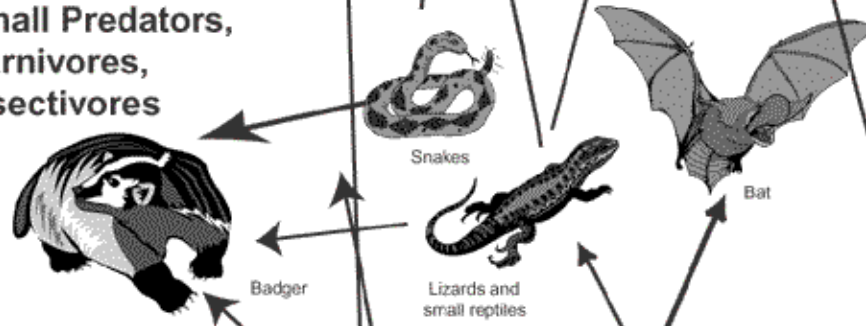


A food web is a model that shows how energy is passed in the form of food from one organism to another. The arrows between the organisms show the direction of energy flow. They point from what is being eaten to what is eating it.

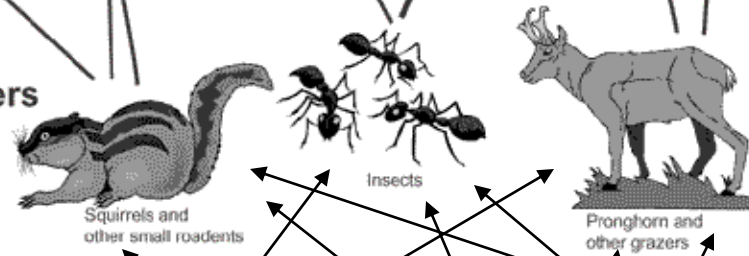
Larger Predators



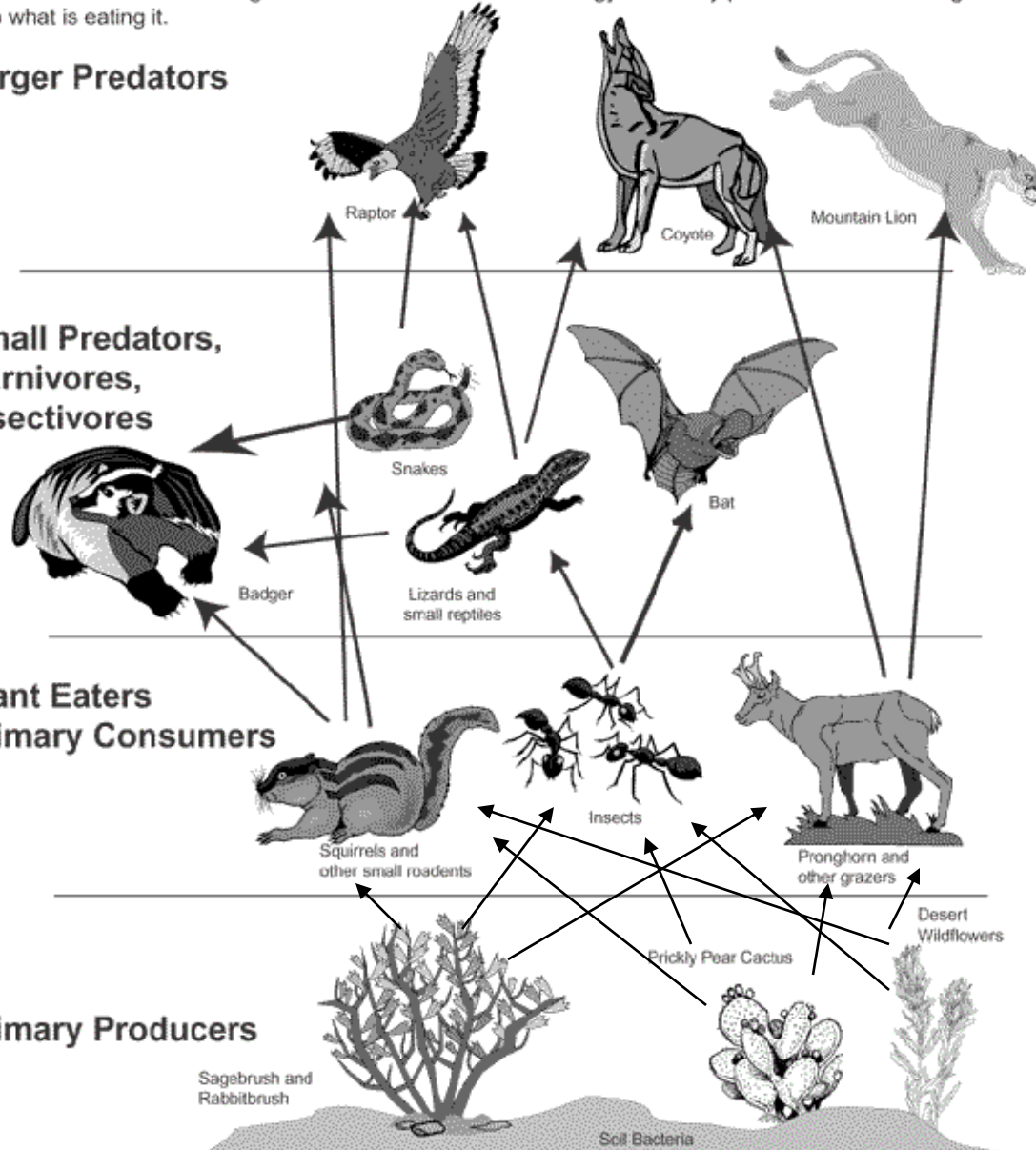
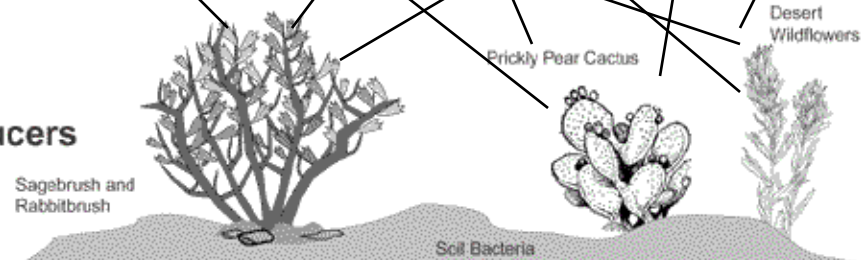
Small Predators, Carnivores, Insectivores

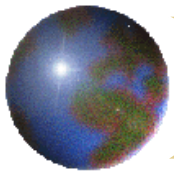


Plant Eaters Primary Consumers



Primary Producers





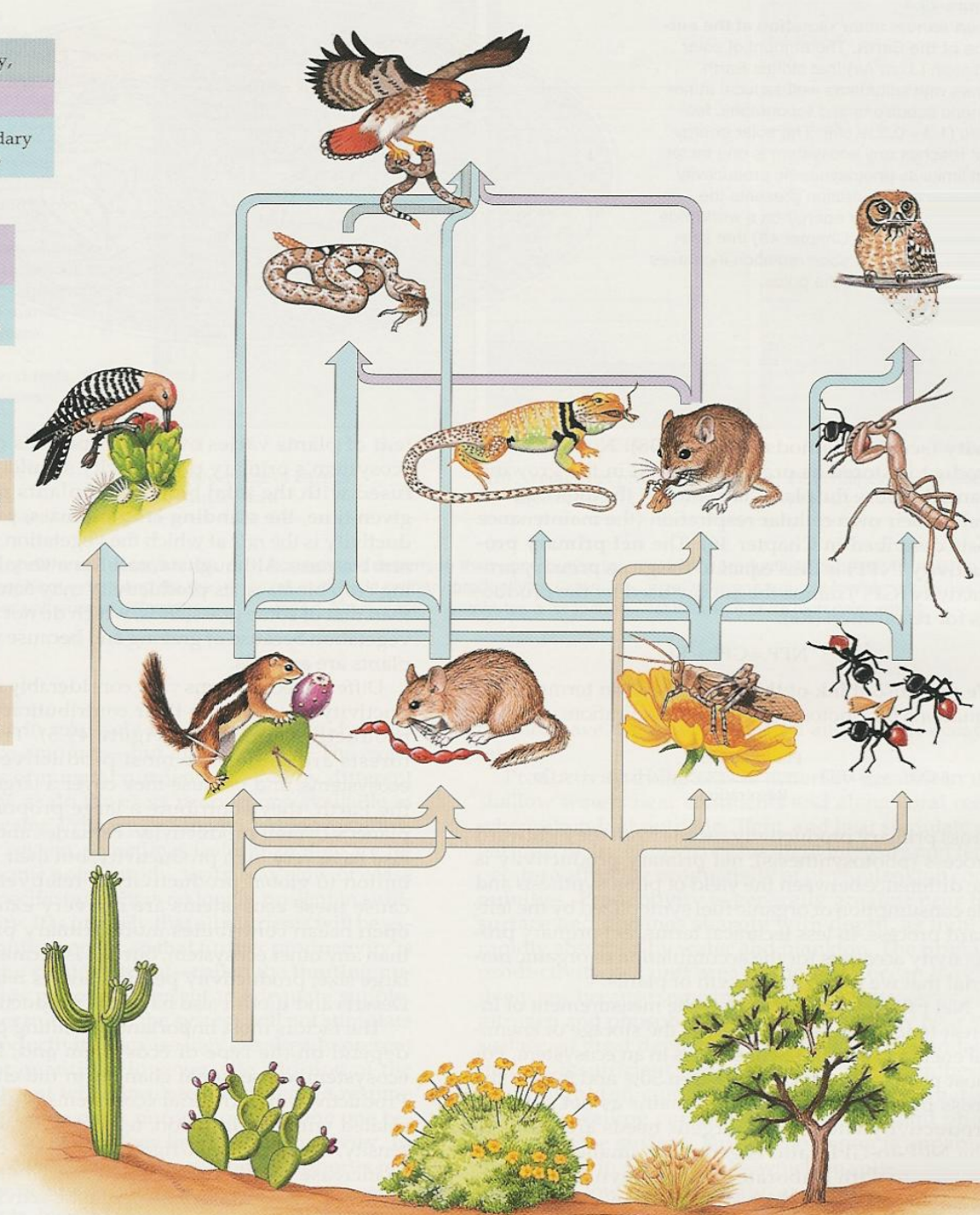
Quaternary,
tertiary,
and secondary
consumers

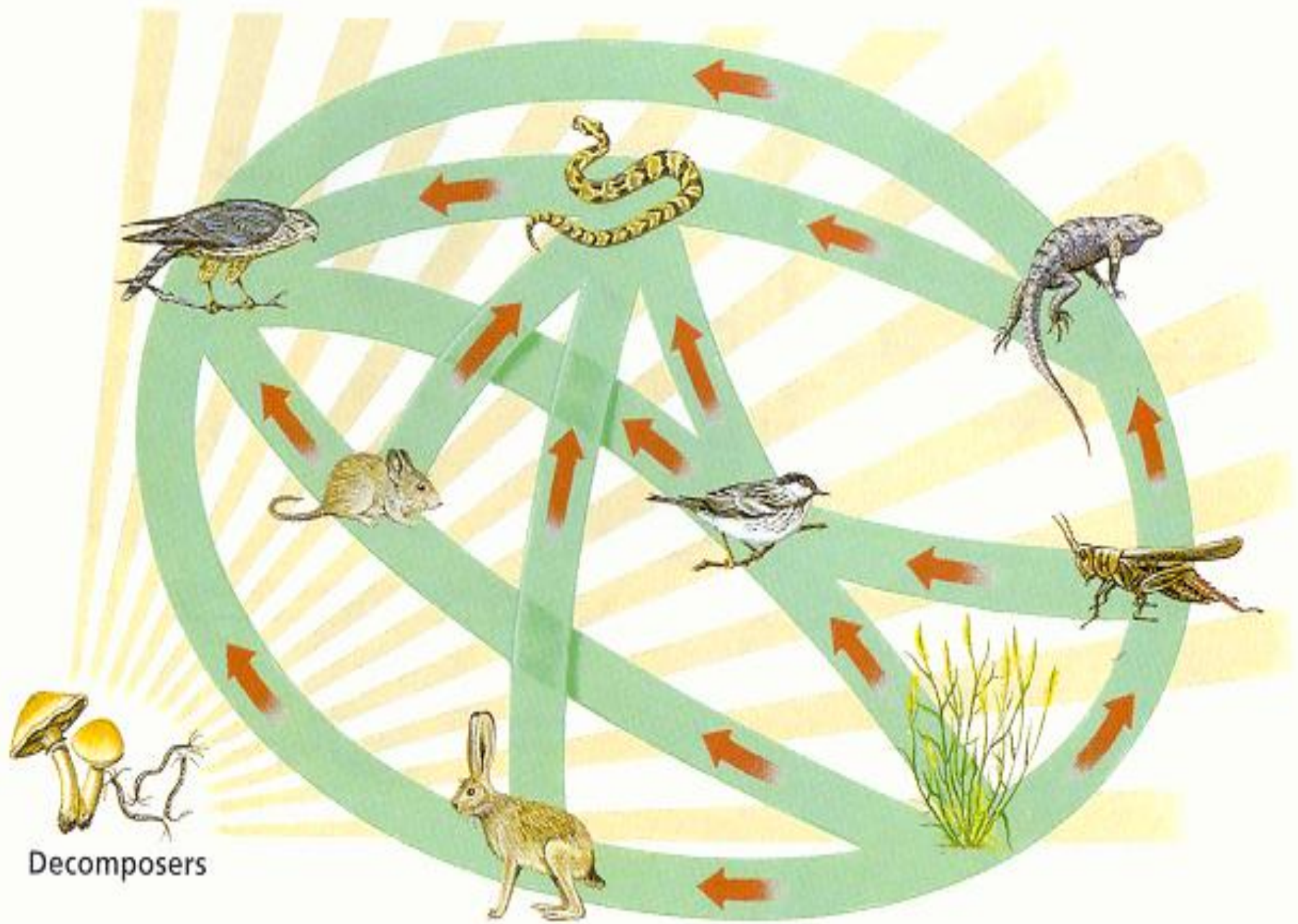
Tertiary and
secondary
consumers

Secondary and
primary
consumers

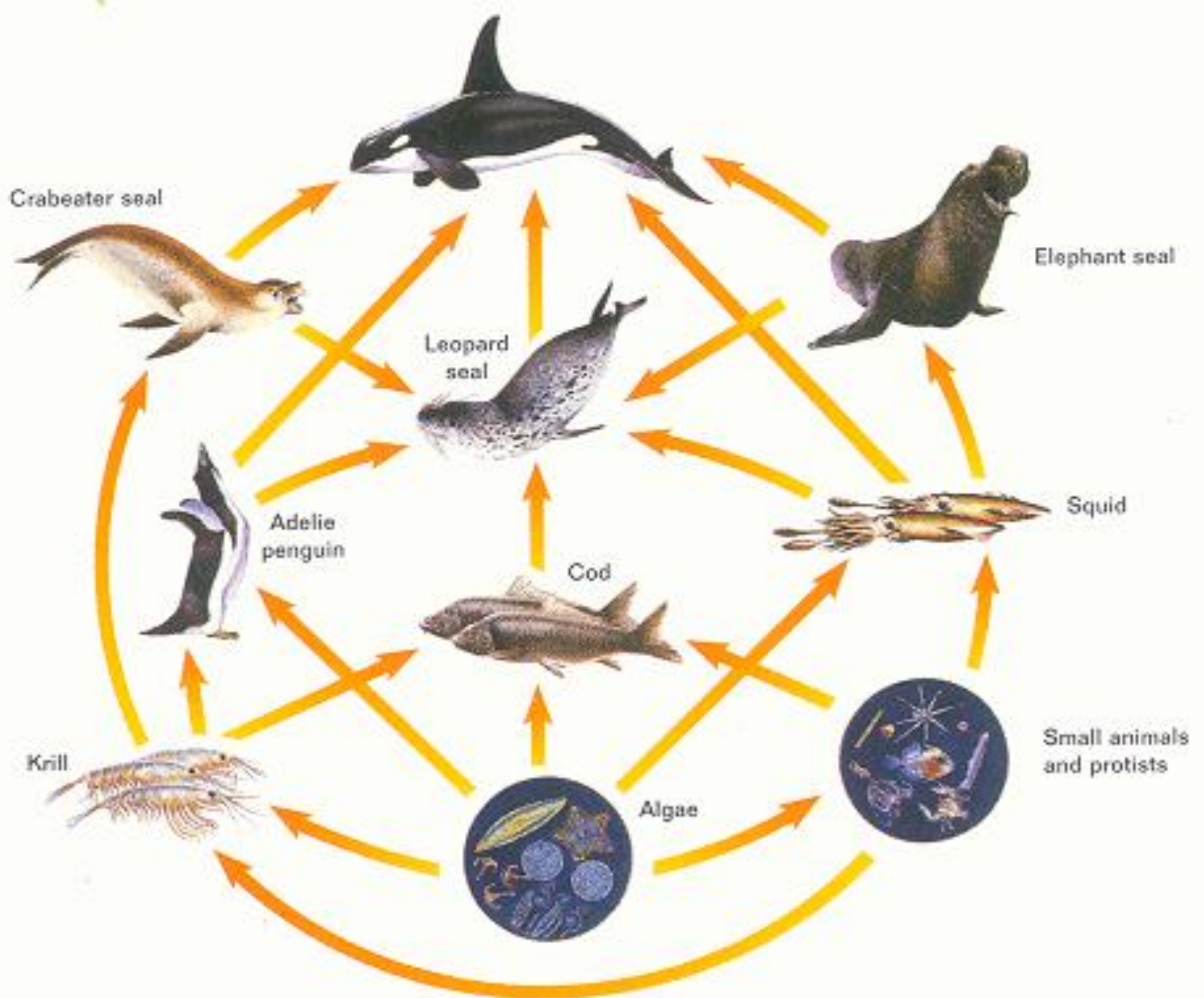
Primary
consumers

Producers
(plants)





Decomposers



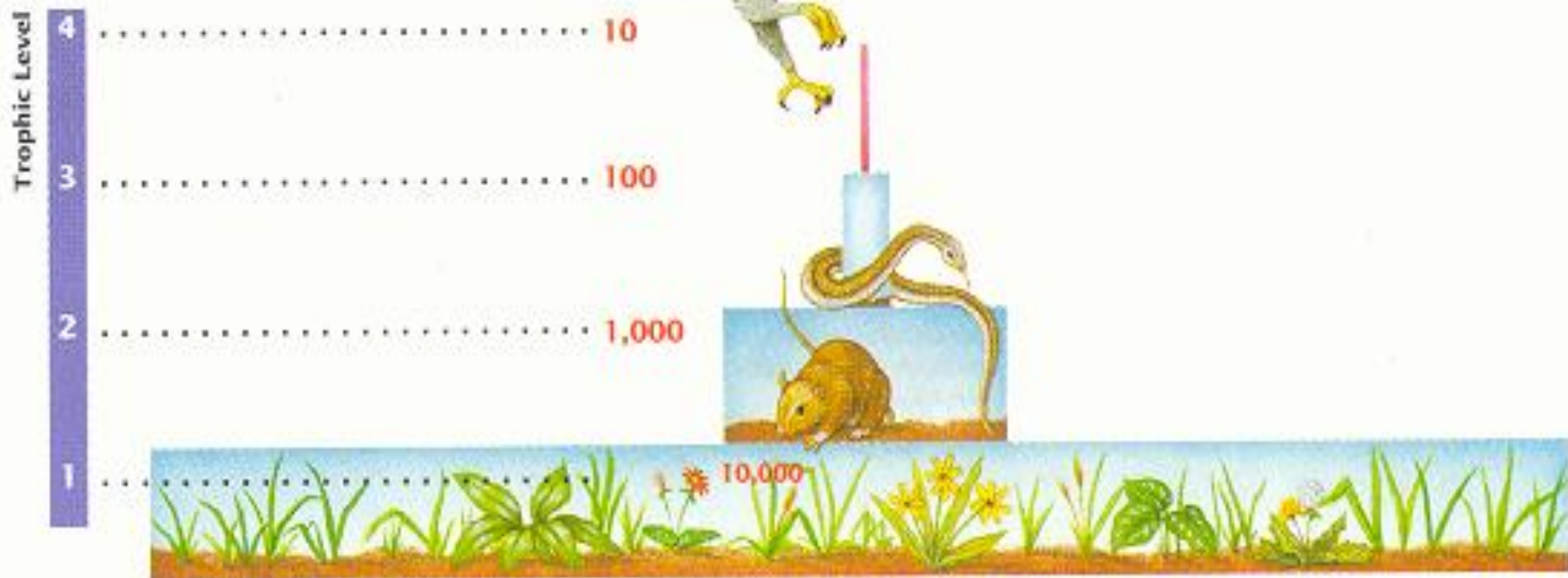


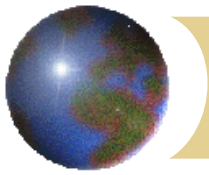
Ecological Pyramids

⊕ What can we learn from these charts?



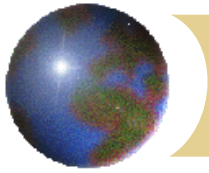
This ecological pyramid shows the amount of energy (indicated by red numbers) at each of four trophic levels in an ecosystem. There is 1,000 times more energy stored in grass at the first level than in hawks at the fourth trophic level.





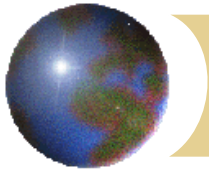
As energy passes through each level...

- ⊕ The amount of energy available decreases.
- ⊕ The number of organisms decreases.
- ⊕ The weight of living material decreases.



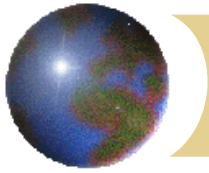
Food Chains & Food Webs show:

- ✚ Energy movement in one direction.
- ✚ The loss of energy at each level & by organisms in the form of heat.
- ✚ Because sunlight is the initial source of energy, it is always being replenished.



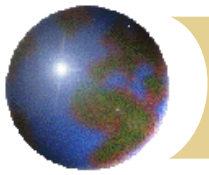
Notes Part II:

BIOMES AND SYMBIOSIS

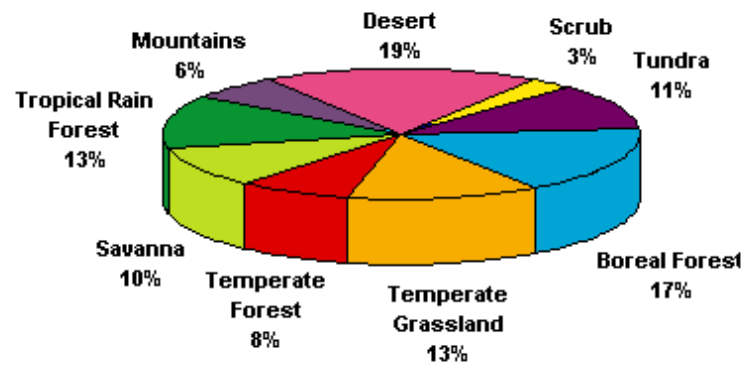
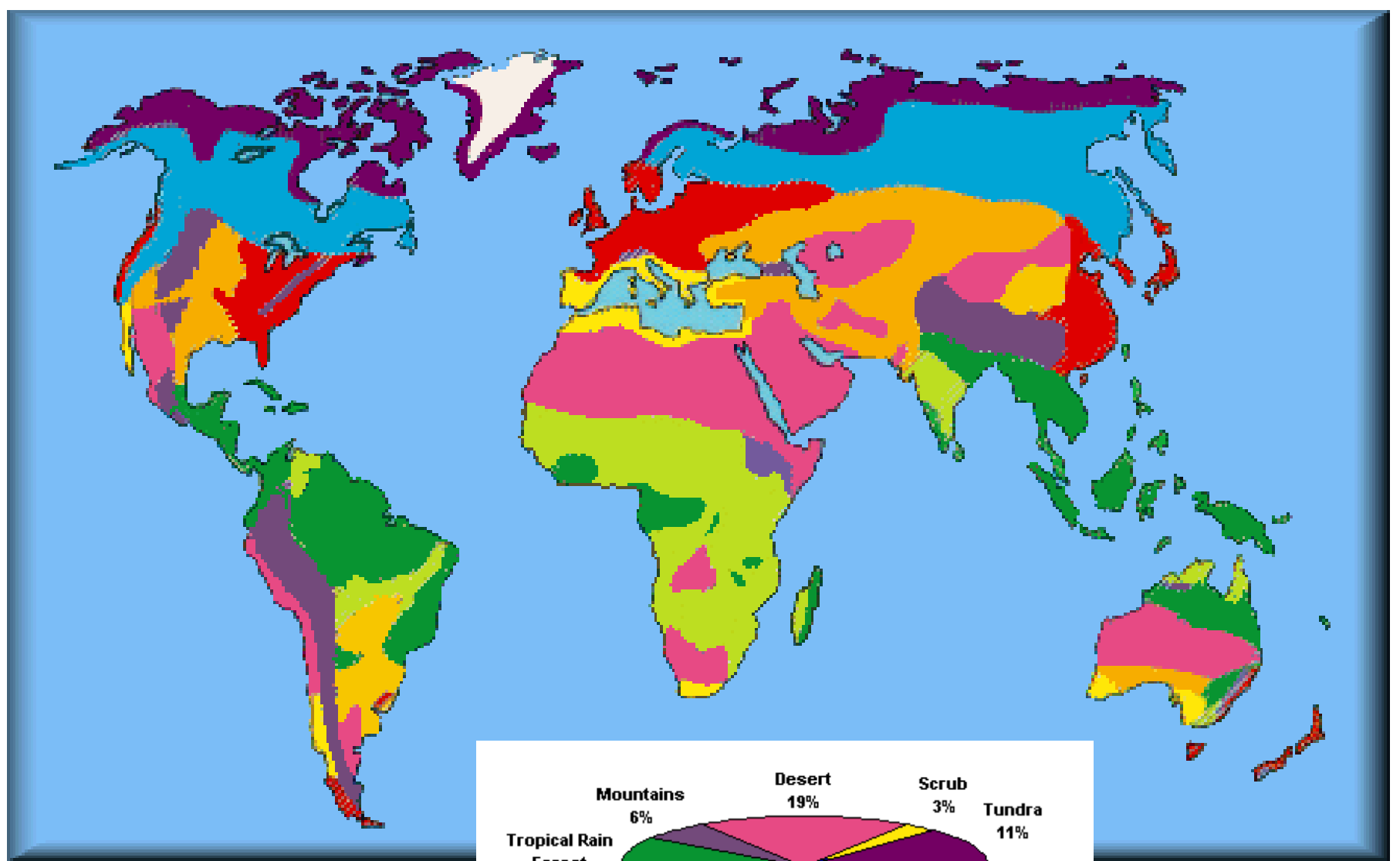


BIOMES

- ✦ **Biomes** are ecosystems that have similar communities.



- ✦ Earth's major terrestrial biomes can be grouped by latitude. Latitude affects the amount of solar energy that a biome receives and thus affects a biome's temperature range.
- ✦ Two key factors of climate that determine a biome are temperature and precipitation.





Aquatic Biomes

⊕ Marine biomes:

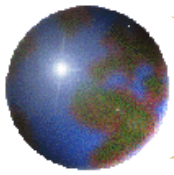
- ▣ salt water environment
- ▣ oceans

⊕ Estuaries:

- ▣ salt & freshwater mix
- ▣ tide pools

⊕ Freshwater biomes

- ▣ ponds, lakes, rivers



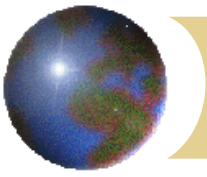
MARINE Biomes



Temperate Oceans



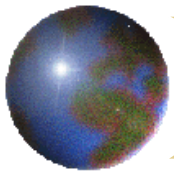
Tropical Oceans



Estuaries



National Oceanic and Atmospheric Administration/Department of Commerce



FRESHWATER BIOMES



Wetlands



Rivers and Streams

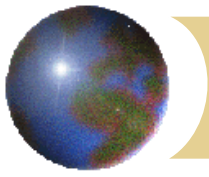


Ponds and Lakes



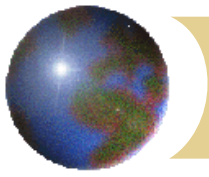
Terrestrial Biomes

- ⊕ Tundra
- ⊕ Taiga
- ⊕ Desert
- ⊕ Grassland
- ⊕ Temperate (deciduous) Forest
- ⊕ Tropical Rain Forest

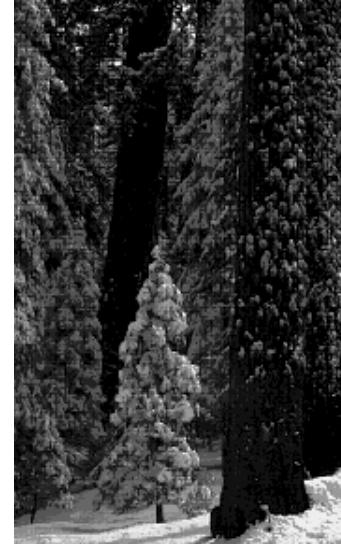


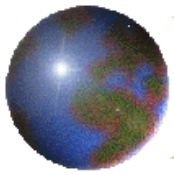
TUNDRA



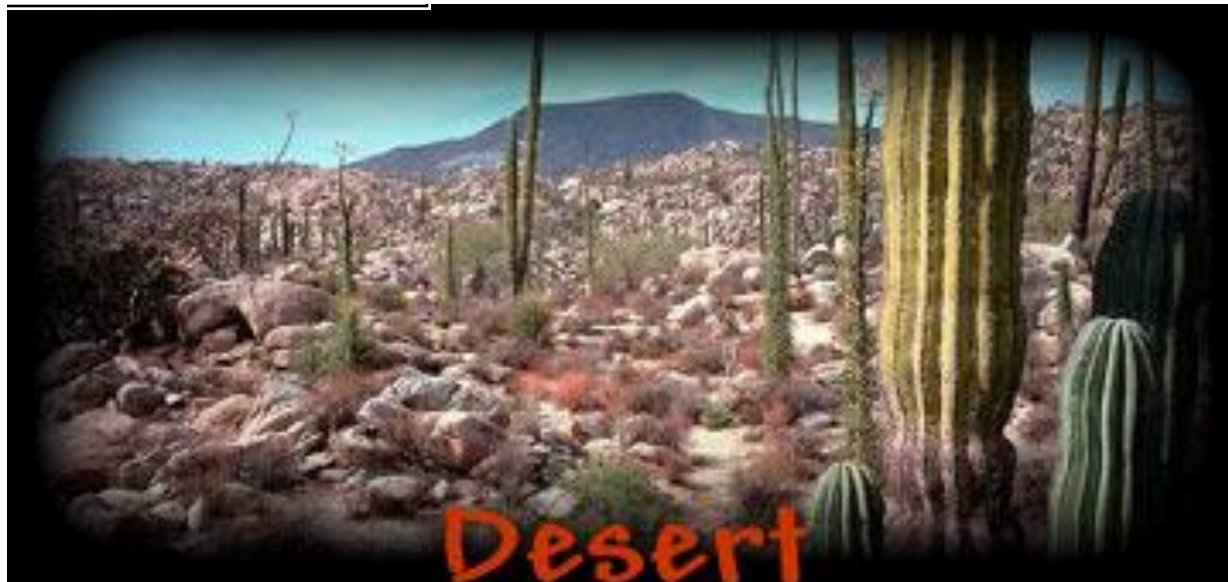


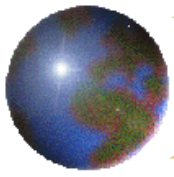
TAIGA





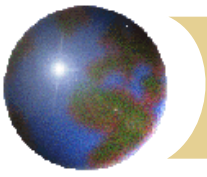
DESERT





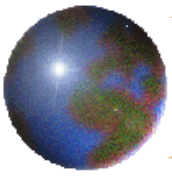
GRASSLANDS





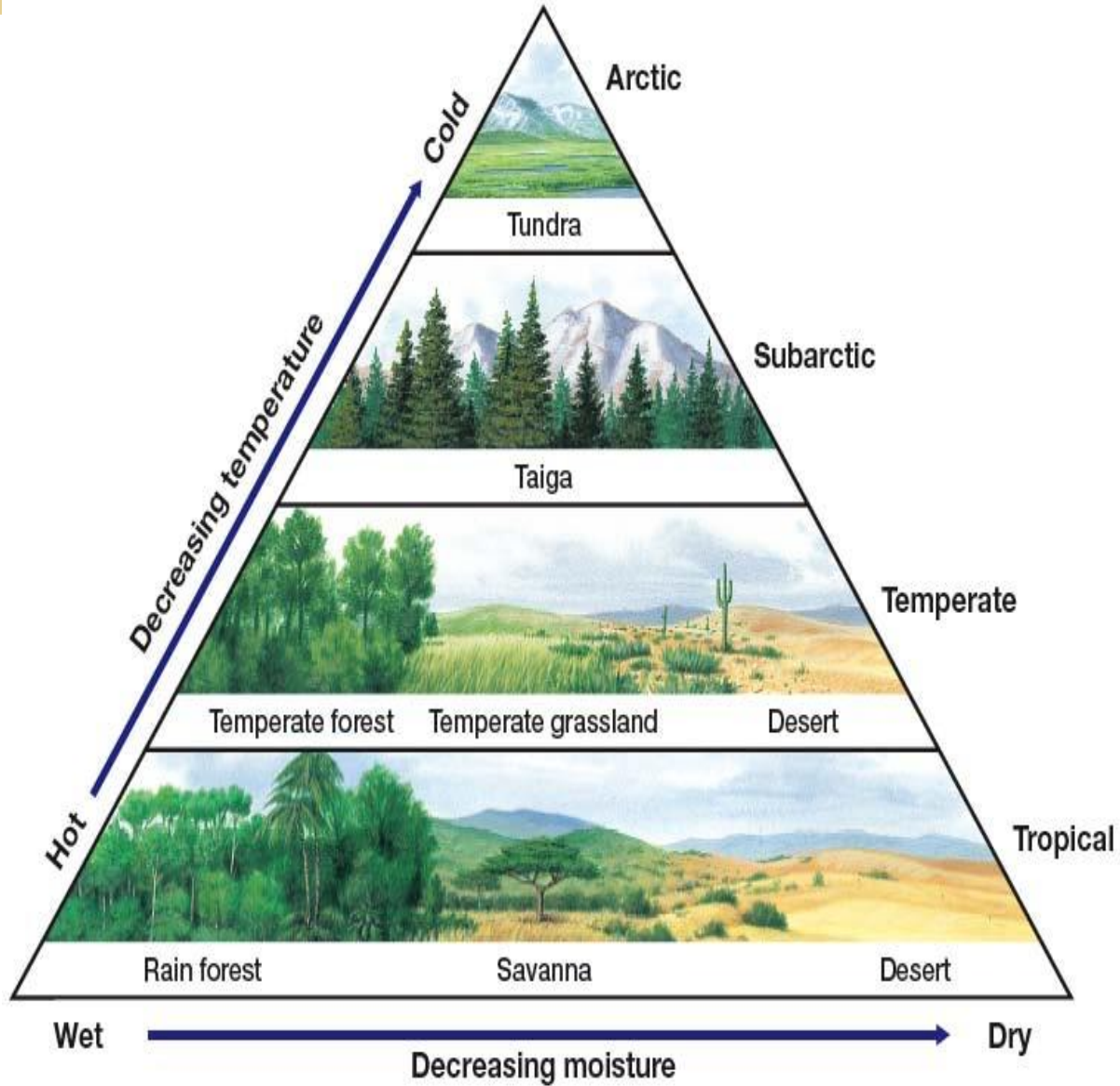
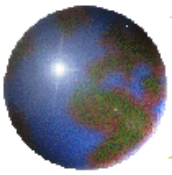
TEMPERATE (deciduous) FOREST





TROPICAL RAIN FOREST





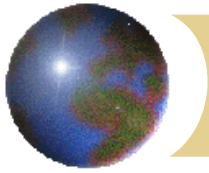


Close relationships for survival

- ⊕ Predator-Prey relationship

- ⊕ Symbiosis = living together

- ⊕ Types of symbiotic relationships:
 - ⊞ Commensalism
 - ⊞ Mutualism
 - ⊞ Parasitism



Symbiotic Relationships

⊕ Commensalism-

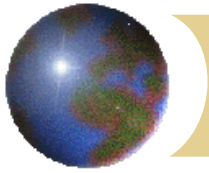
- One organism benefits and the other is neither helped nor harmed. (Think charity, nice)
- EX: Nemo and the sea anemone

⊕ Mutualism

- Both organisms benefit. (Think sharing)
- EX: Roommates; birds and fruit plants

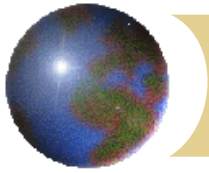
⊕ Parasitism

- One organism benefits and the other is harmed, but usually not killed. (Think mean)
- EX: Tapeworm living in an intestine



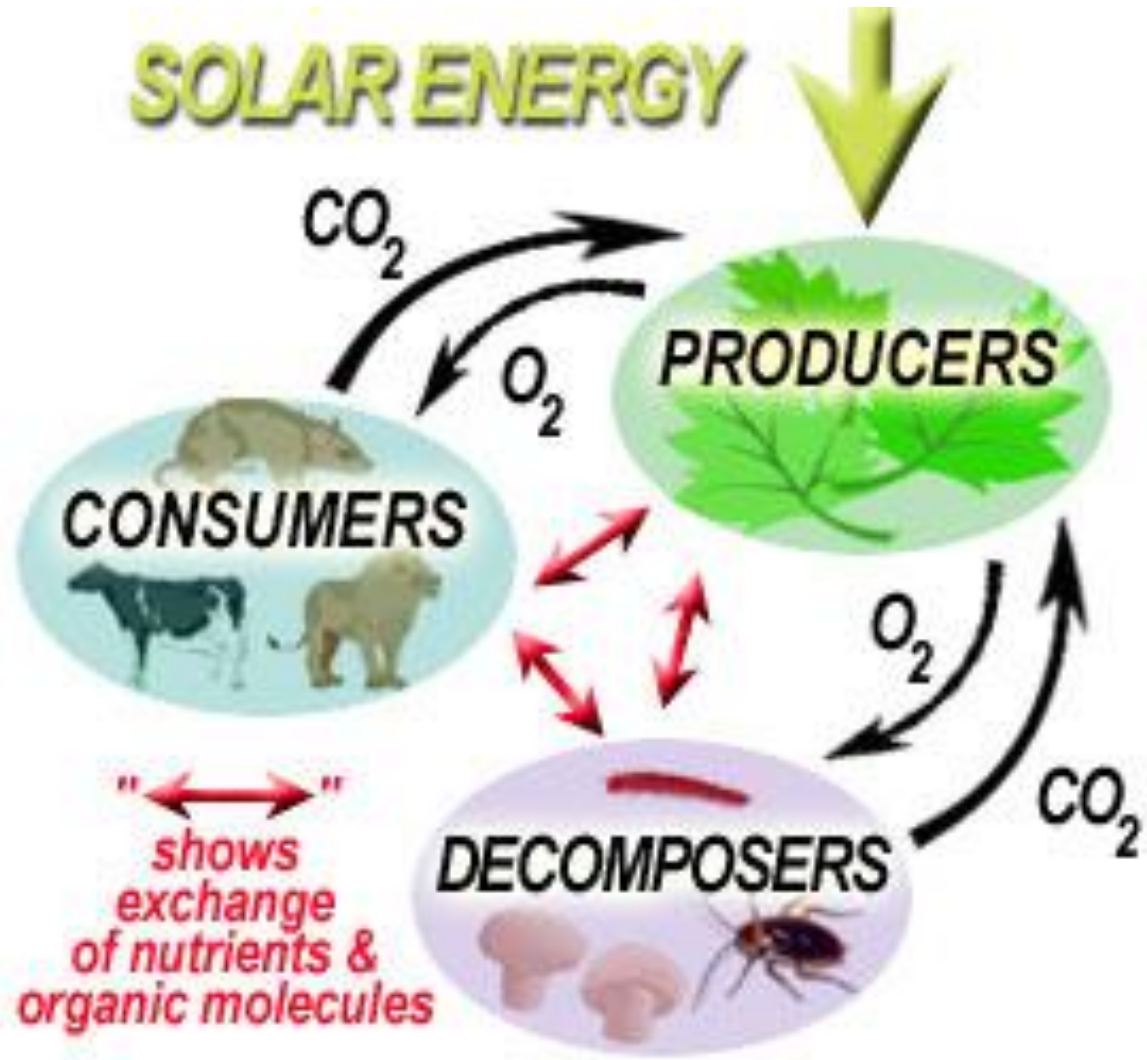
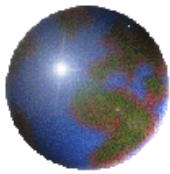
NOTES PART III

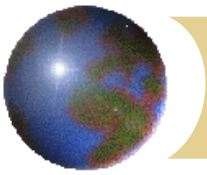
CYCLES



What about nutrients?

- ⊕ Matter also moves through the organisms at each level.
- ⊕ **BUT- Nutrients cannot be replenished, they are recycled!**



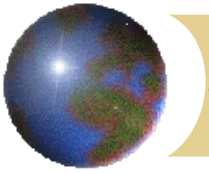


Remember PHYSICAL SCIENCE?

- ⊕ **Law of Conservation Of Matter:**
 - ⊞ Matter cannot be created nor destroyed, only changed.

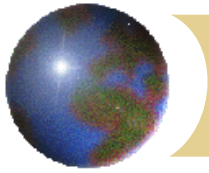
Photosynthesis:





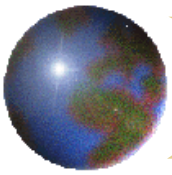
So...

- ✚ The matter that existed on Earth since life began continues to cycle through the biosphere.
- ✚ Some of the atoms in your body could have been part of a T-Rex!



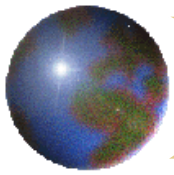
What is recycled?

- ⊕ Water, Carbon, Nitrogen, Phosphorous are just a few of the nutrients that our environment recycles.



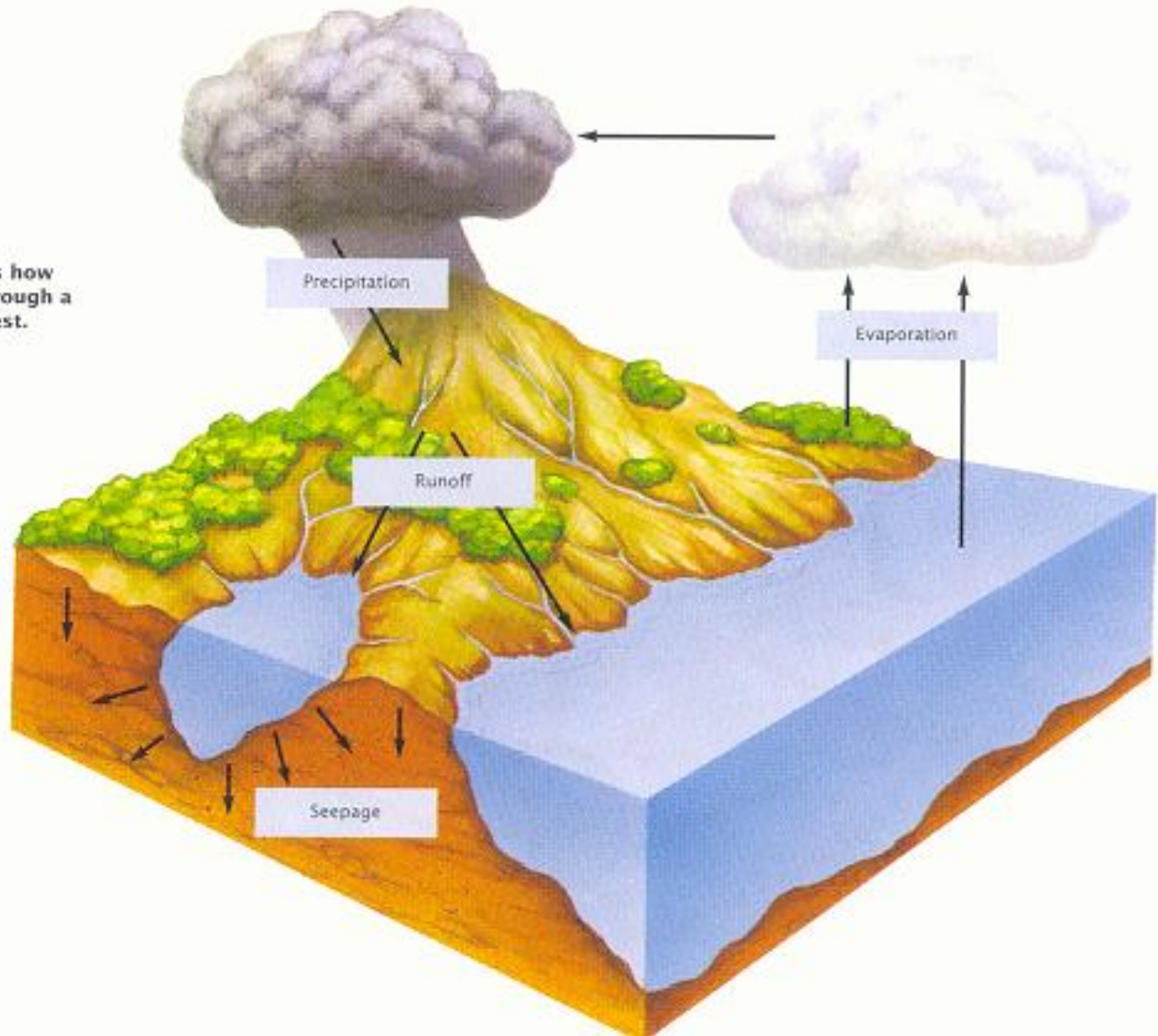
Carbon dioxide (CO₂)
in atmosphere

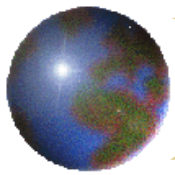
Play ▶



Water Cycle

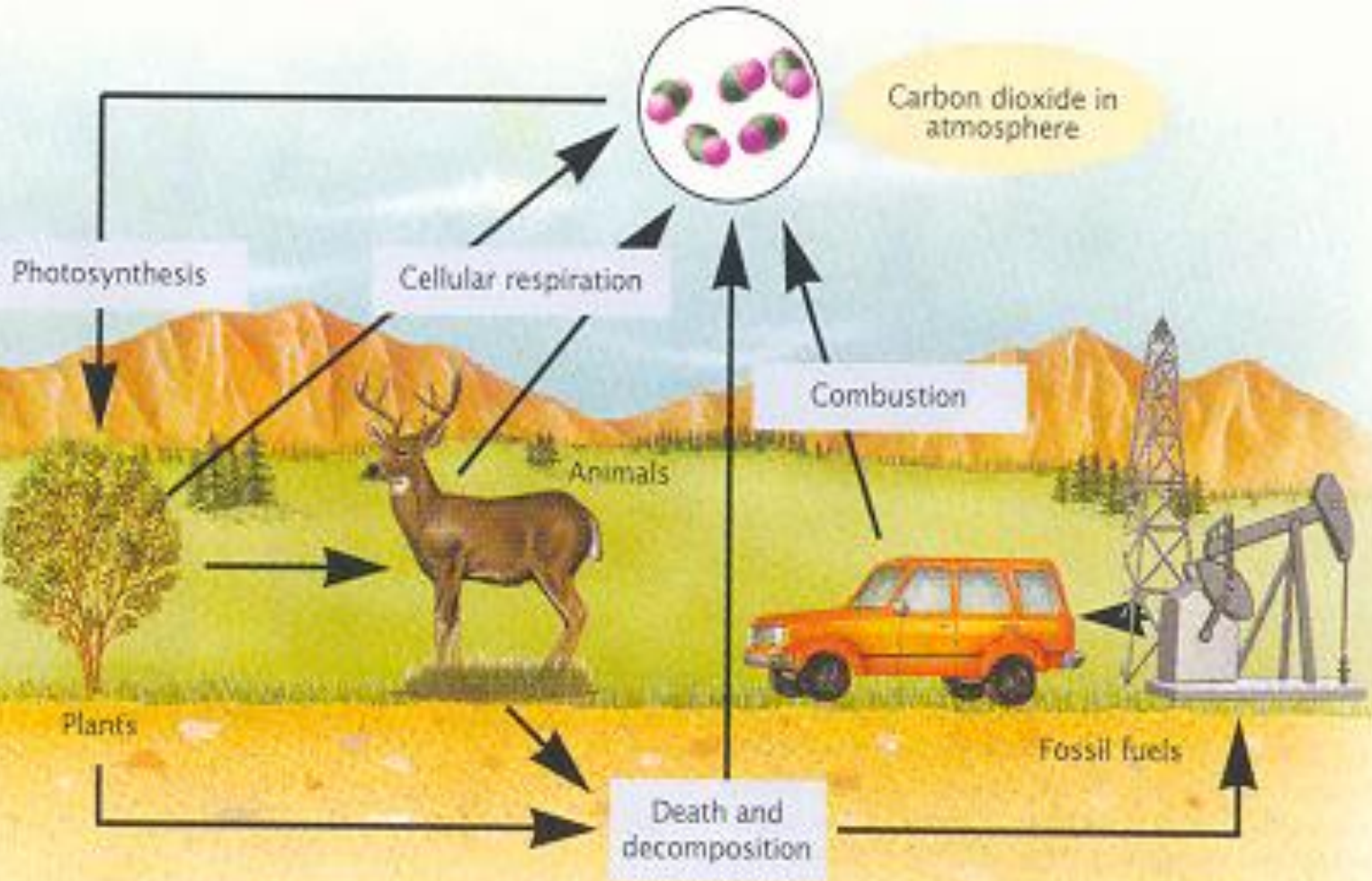
This cycle shows how water travels through a tropical rain forest.

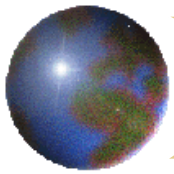




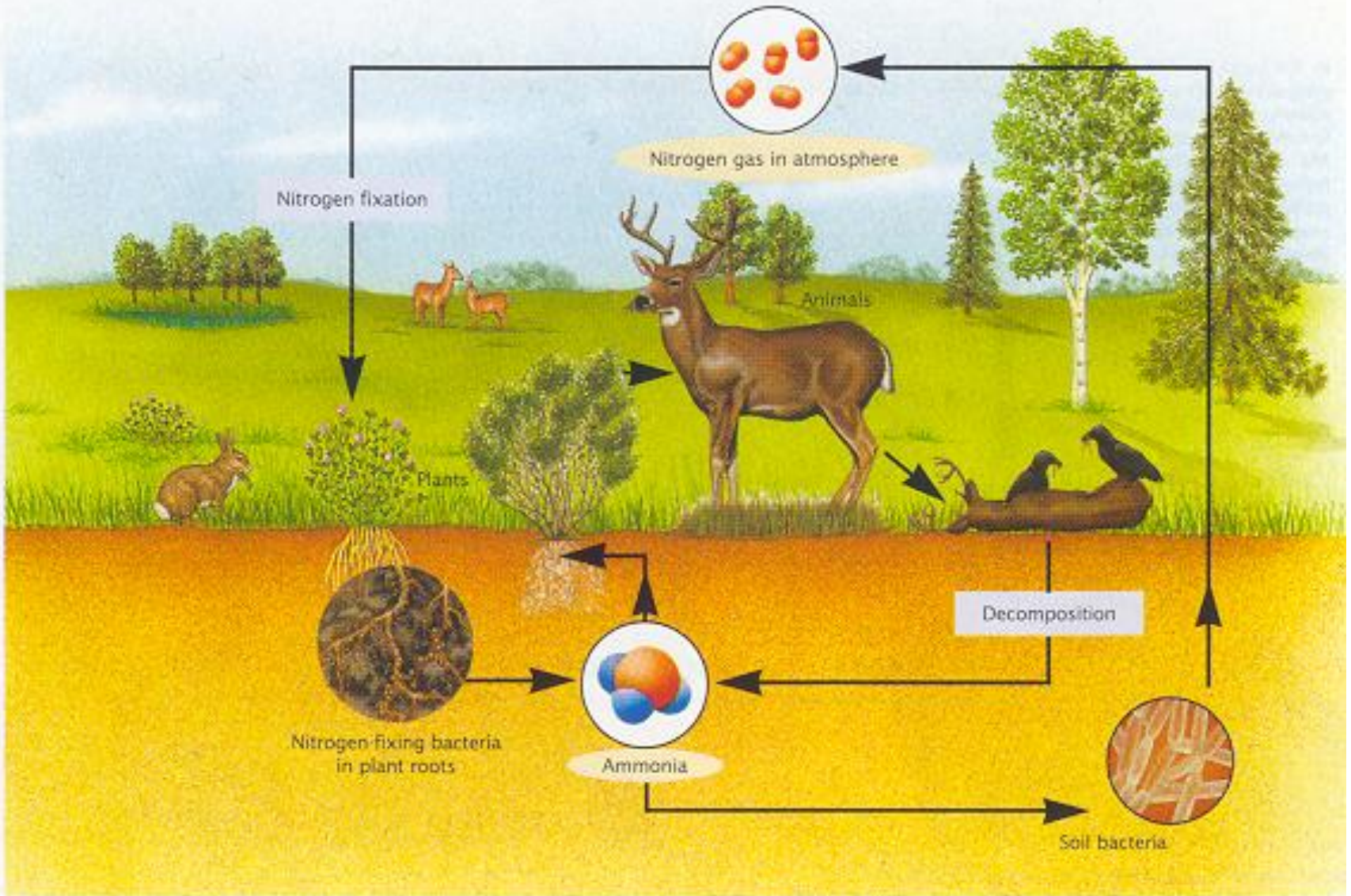
Carbon Cycle

This diagram shows how carbon cycles within an ecosystem in an industrialized nation such as the United States.





Nitrogen Cycle

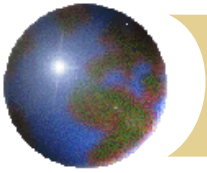




NOTES PART III

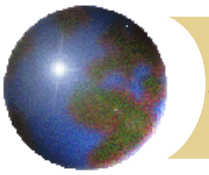
POPULATIONS





Population Growth

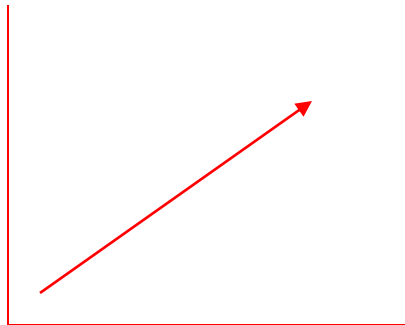
- ✚ any change in the size of a population over time



Rate of Population Growth

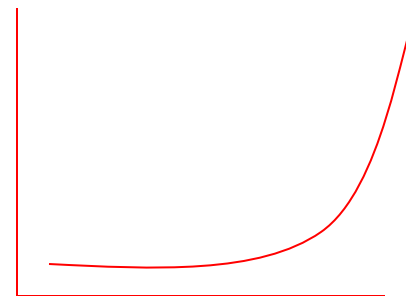
⊕ Linear Growth

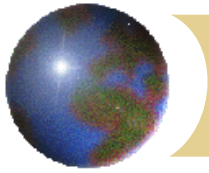
- ⊠ Salary
- ⊠ (think adding)



⊕ Exponential Growth

- ⊠ Populations
- ⊠ # of possible reproducing organisms increases
- ⊠ (think multiplying)





Carrying capacity

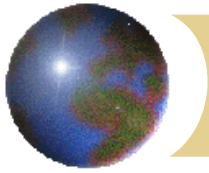
- ✦ the number of organisms that a particular environment can support
 - When a population is under carrying capacity, what is happening?
 - When a population is above carrying capacity, what is happening?



Why can't a population grow indefinitely?

⊕ Limiting Factors-

- ⊕ any condition that could limit population growth
- ⊕ can be biotic or abiotic factors



Types of Limiting Factors

⊕ Density- dependent

⊕ has a greater effect on dense populations

- ⊠ Disease
- ⊠ Competition
- ⊠ Parasites
- ⊠ Predation

⊕ Density- independent

⊕ has an effect regardless of the density of the population

- ⊠ Temperature
- ⊠ Natural Disasters