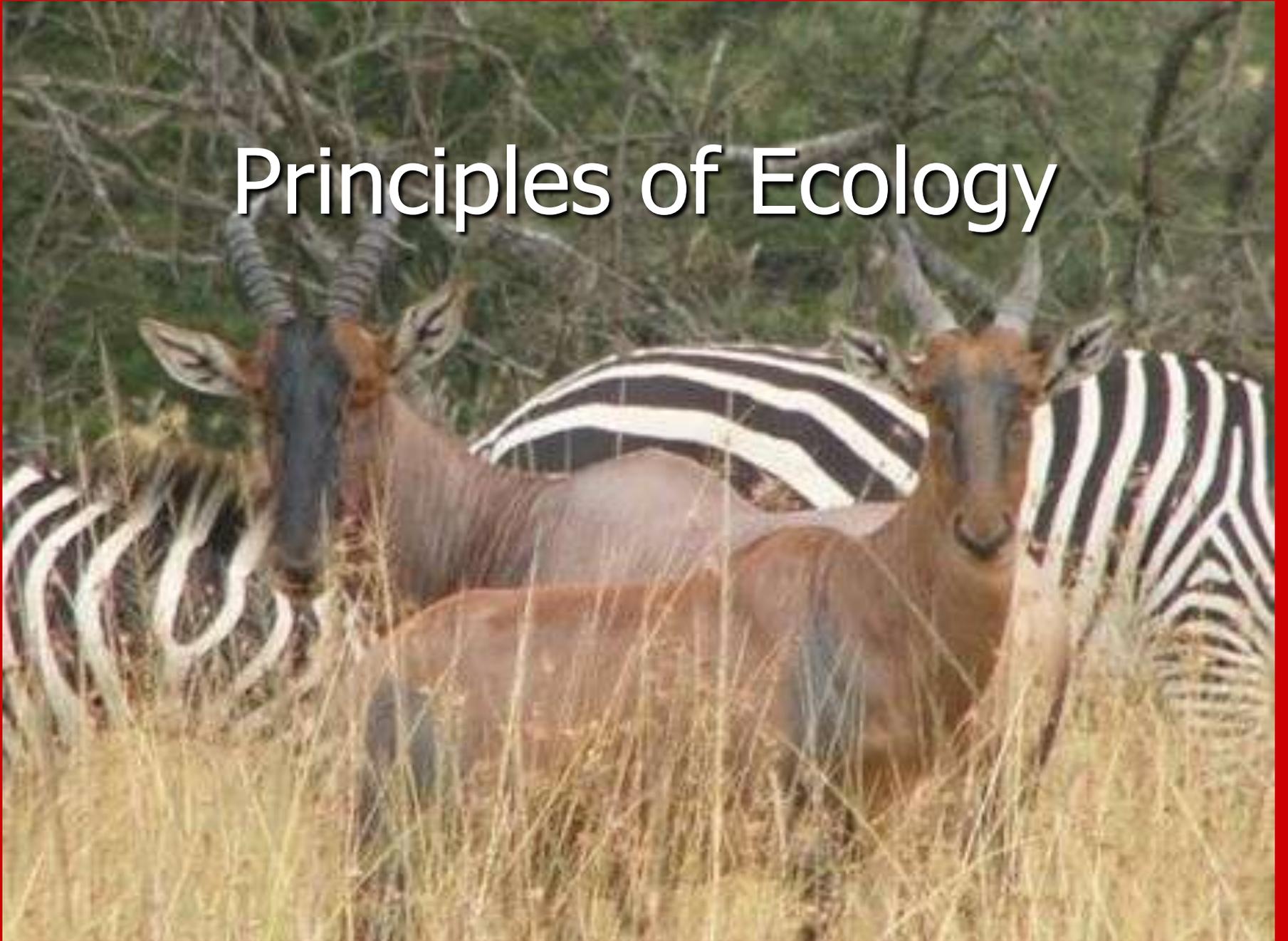


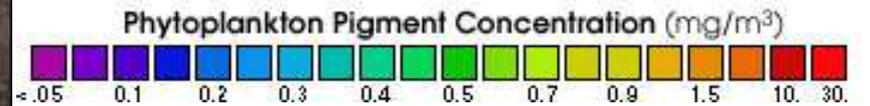
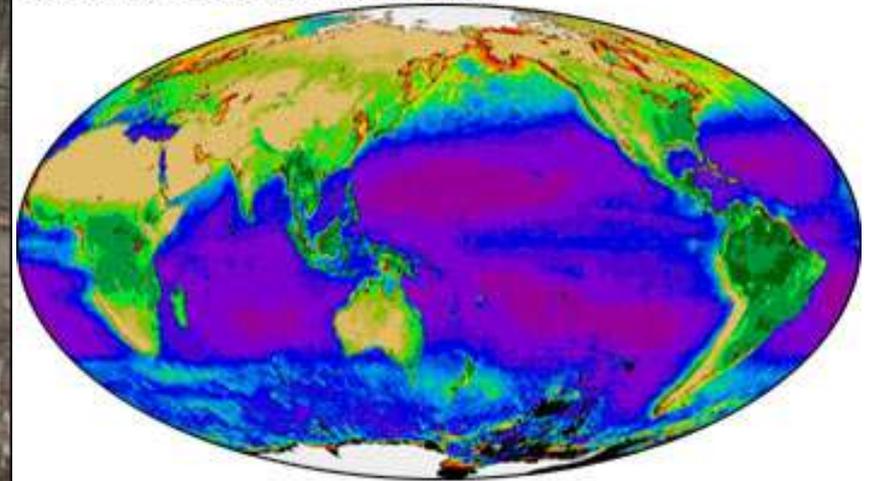
Principles of Ecology



- *Ecology*: The study of interactions among organisms and their environment



Global Biosphere (AVHRR & CZCS)



- *Biosphere*: The part of the Earth that sustains life.

- ***Abiotic Factors:*** Anything that is part of an organism's environment, and is **not living**.
 - Ex. Wind, water, temperature, soil, sunlight



- ***Biotic Factors:*** Anything that is part of an organism's environment, and is **living**.



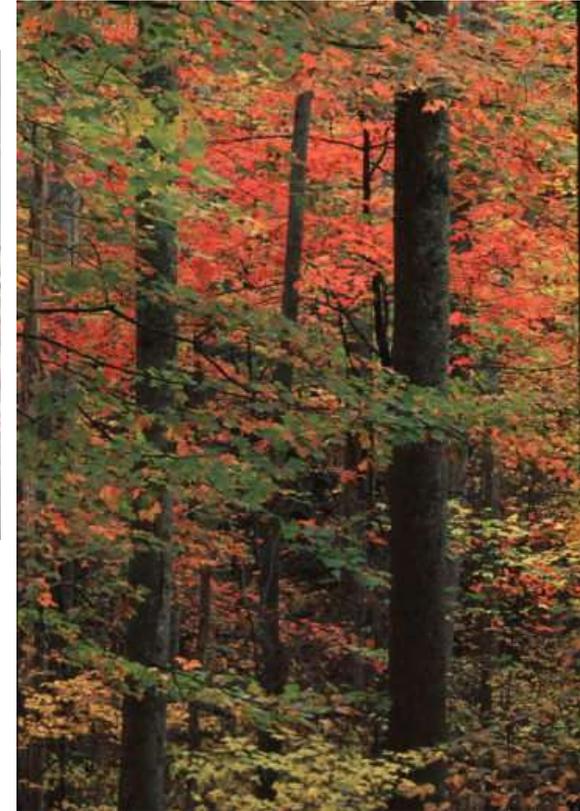
- Ex. Plants, animals, fungi, protists, bacteria

■ Interactions

- Population: members of 1 species that live in the same place and interbreed.



- Community:
Group of interacting populations



- *ecosystem* -the interactions of the community and the **abiotic factors**

- Types of ecosystems:

- Terrestrial-land
- Aquatic-water
 - Marine-salt water
 - Freshwater



- Habitat: The place where an organism lives out its life.
 - Habitats can change, or even disappear.



- Niche: The role a species plays in its habitat.
 - Includes how it gets food, is it food?



Organisms and their Relationships

- Species may form relationships with other species to increase chance of survival
- **Symbiosis-**
a relationship between organisms of different species



- *Commensalism*: a symbiotic relationship in which one species benefits and the other is unaffected.

- Spanish moss.



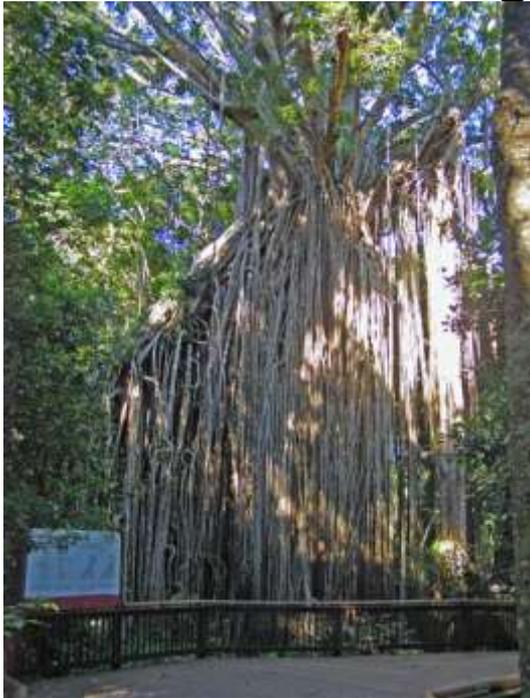
- *Mutualism*: a symbiotic relationship in which both species benefit.

- Ants and acacia trees,
- teeth cleaner birds



Ants and Acacia
Tree Video

- *Parasitism*: a symbiotic relationship in which one species benefits and the other is harmed.
 - Ex. Ticks, tapeworms, tree fungus, diseases.



Ecology - Nutrition and Energy Flow



All organisms need to acquire energy to survive.

- **Autotrophs**- “self feed”
 - use energy from the sun or chemicals to make their own food.
 - Photosynthesis or chemosynthesis

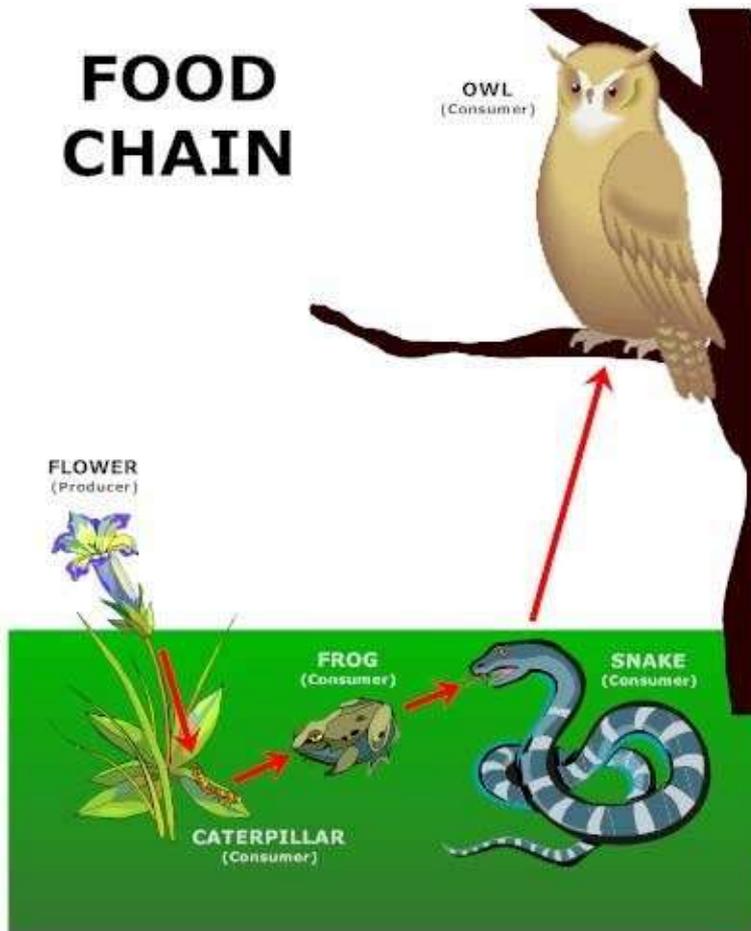
- Heterotrophs-
“other feed”
 - eat plants, animals, fungi, protists or bacteria (autotrophs or other heterotrophs) in order to get energy.



■ Types of heterotrophs:

- **Carnivore**- feeds on animals
- **Herbivore**-feeds on plants
- **Omnivore**- feeds on both plants and animals
- **Scavenger**- feeds on dead animals
- **Decomposer**- breaks down and absorbs dead organisms and wastes

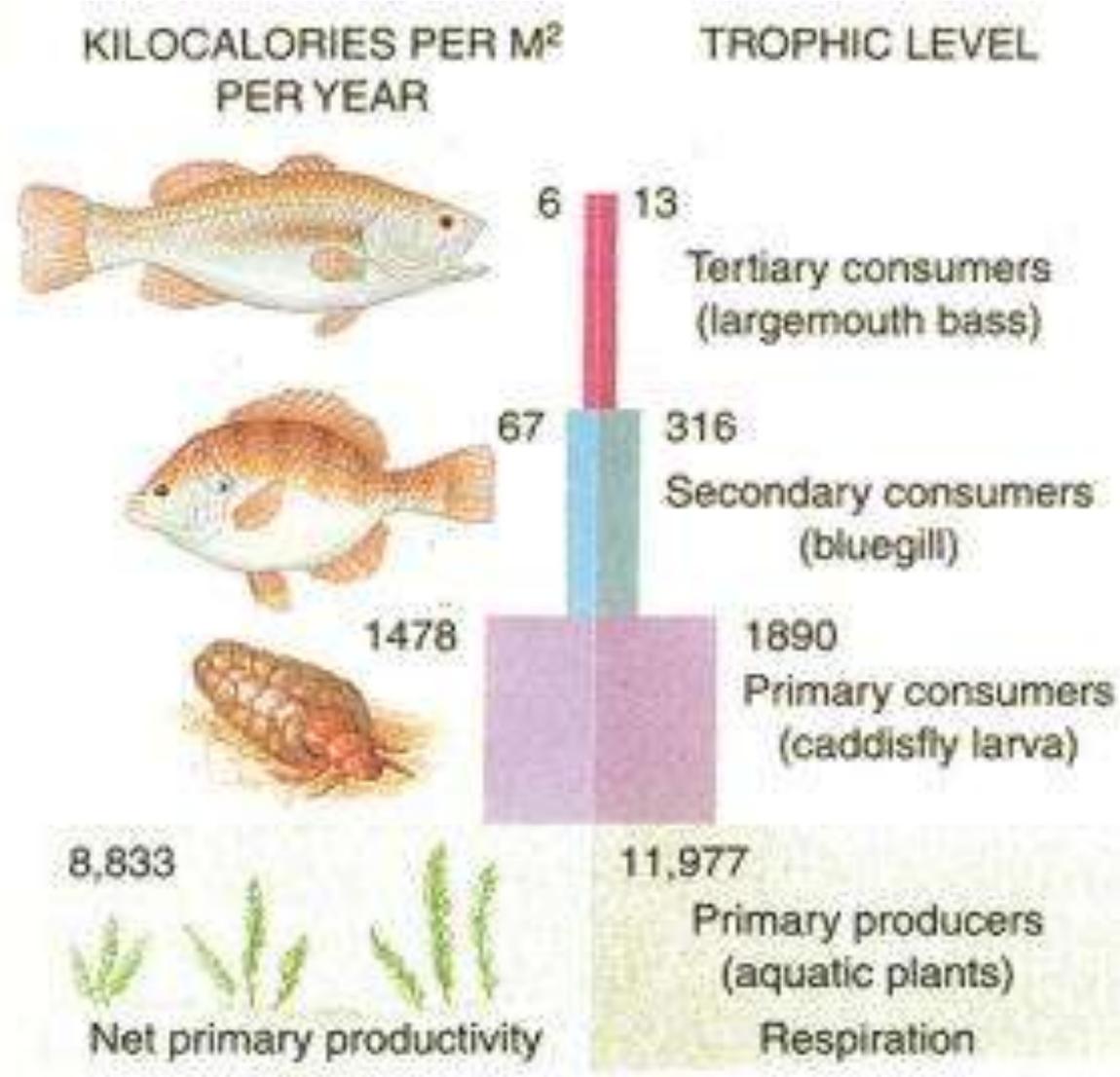
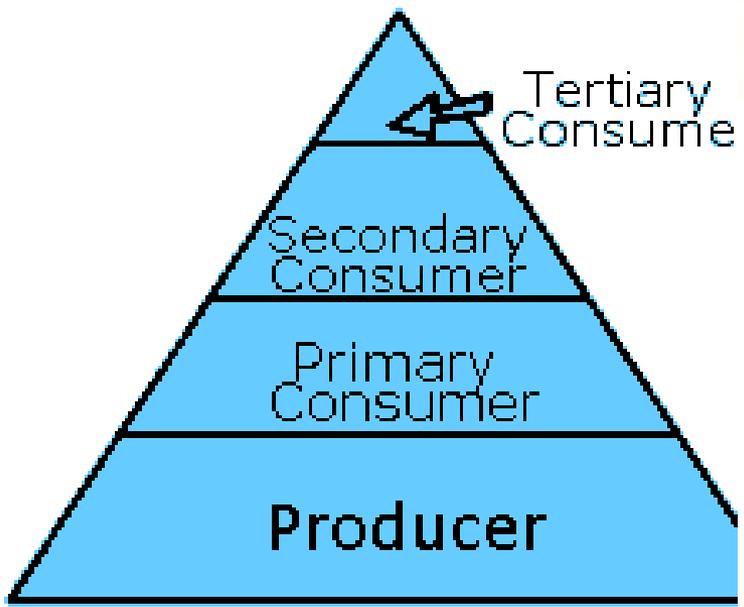




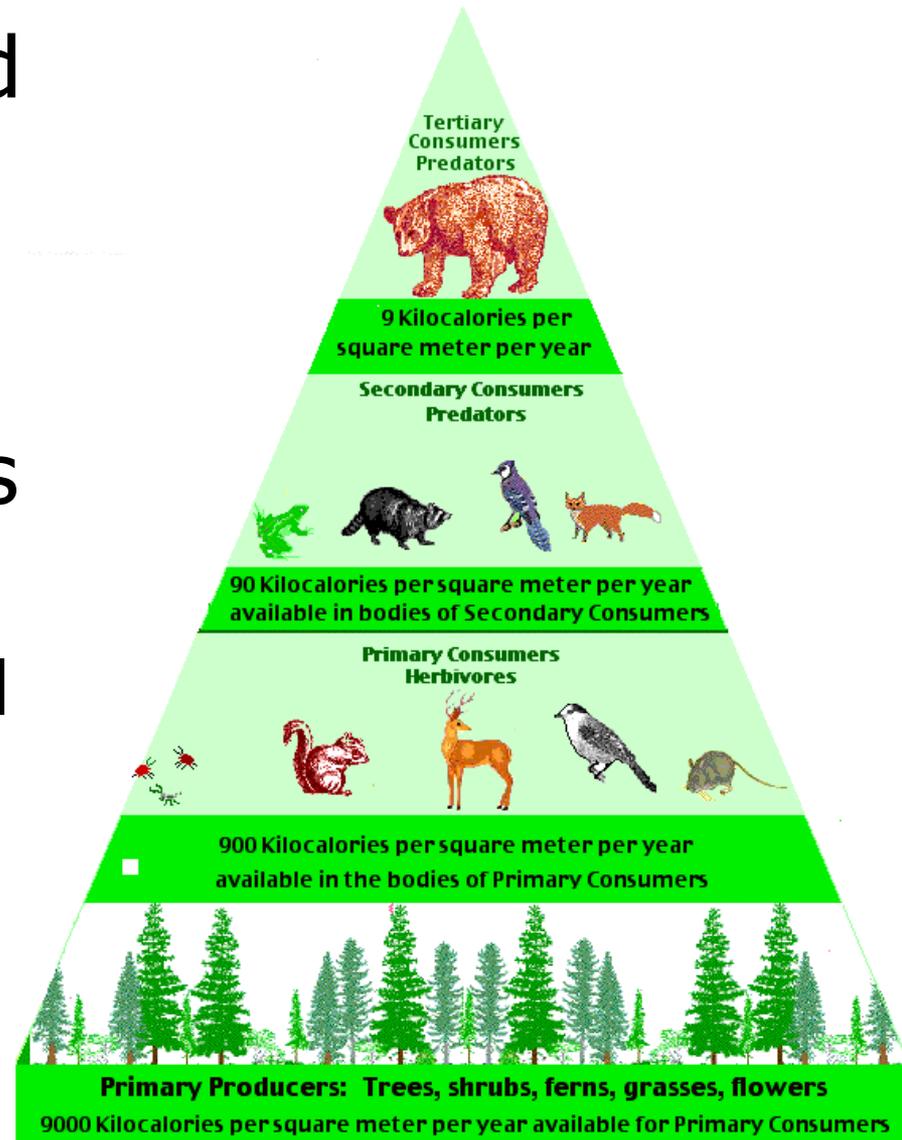
- A food chain illustrates the flow of energy through an ecosystem.
- Food chains usually have no more than five steps.
- With each step the amount of energy transferred **decreases**
- Each organism represents a different **trophic level**

Chain Reaction Game

- The **first** trophic level consists of **producers**.
 - Produce their own food
- The **second** trophic level are the **primary consumers**:
 - herbivores which eat the producers.
- The **third** trophic level are **secondary consumers**:
 - carnivores which eat the herbivores.
- The **fourth** trophic level are the **tertiary consumers**:
 - Carnivores which eat other carnivores



- An ecological pyramid can describe the flow of energy or it can describe the amount of *biomass* that exists at that trophic level.
 - Biomass is the actual weight of all of the organisms at that trophic level.



- In the ecological pyramid, the amount of energy retained decreases as you go up to the top.
- With every passing level, 90% of all energy is lost!
 - Only 10% of the producer's energy actually makes it into the herbivore's system!
 - Only 10% of the herbivore's energy actually makes it to the first carnivore in the chain!
 - And so on...

- The energy is lost in many different ways.
 - The food must be digested
 - Body tissues must be built (muscle, skin, etc.)
 - Some is given off as waste
 - Some as heat
- The only energy the eater gets is that which is stored in the body tissues!

- In order to survive, a 3 pound hawk eats 30 pounds of lizards in a month. In that same month in order to survive, those lizards have to eat 300 pounds of crickets. How many pounds of grass do those crickets have to eat in order to survive?

3000 pounds!

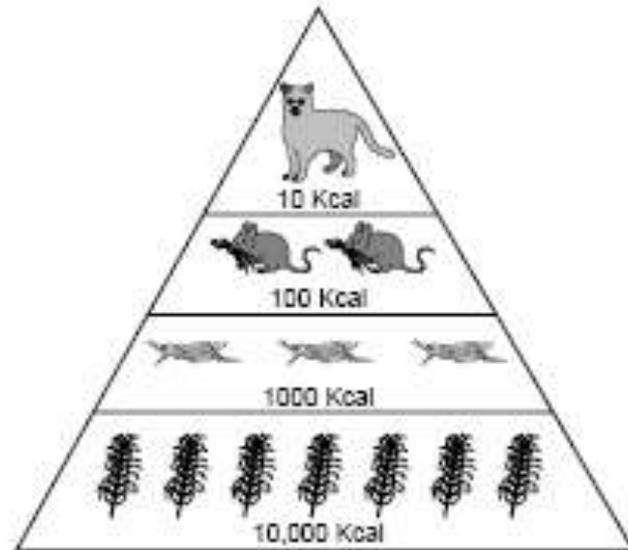
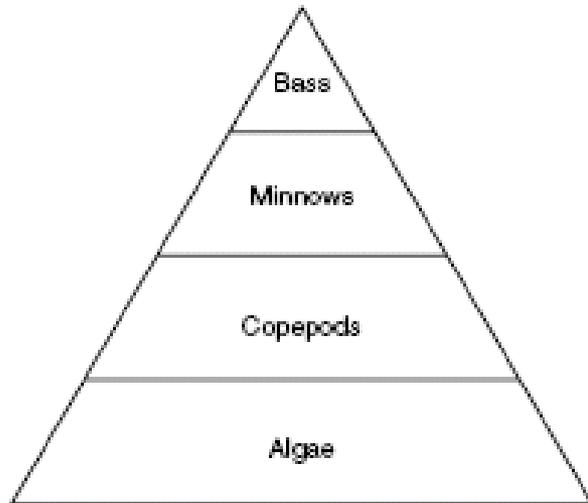


- There are 9000 pounds of grass in one particular habitat.
 - How many crickets can this habitat sustain?
 - How many lizards?
 - Hawks?

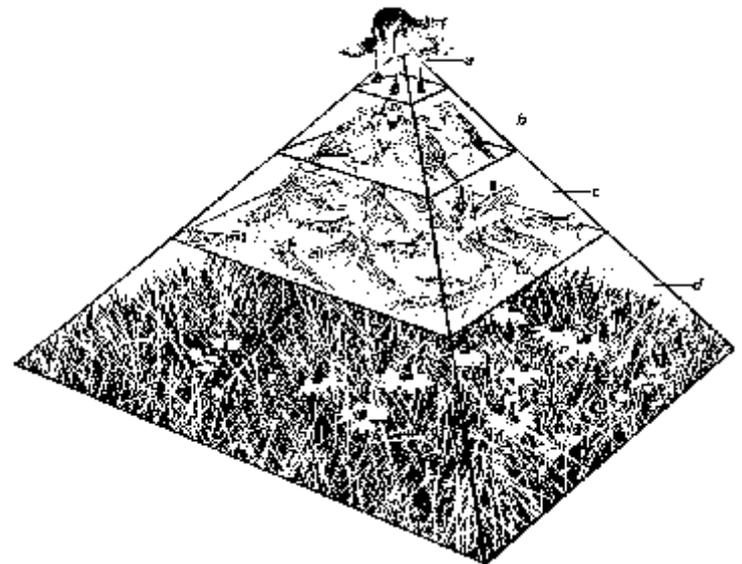
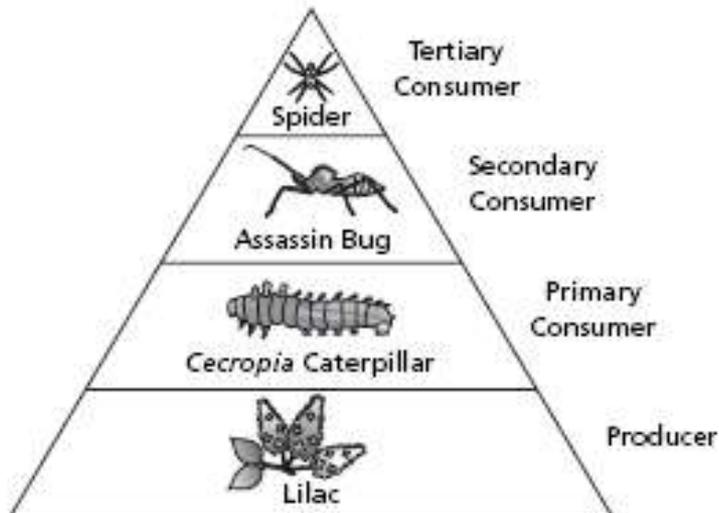


- There are **9000** pounds of grass in one particular habitat.
 - How many crickets can this habitat sustain? **900 pounds**
 - How many lizards? **90 pounds**
 - Hawks? **3**
(**9 pounds** =
3 hawks
@ 3 pounds each)





ENERGY PYRAMID

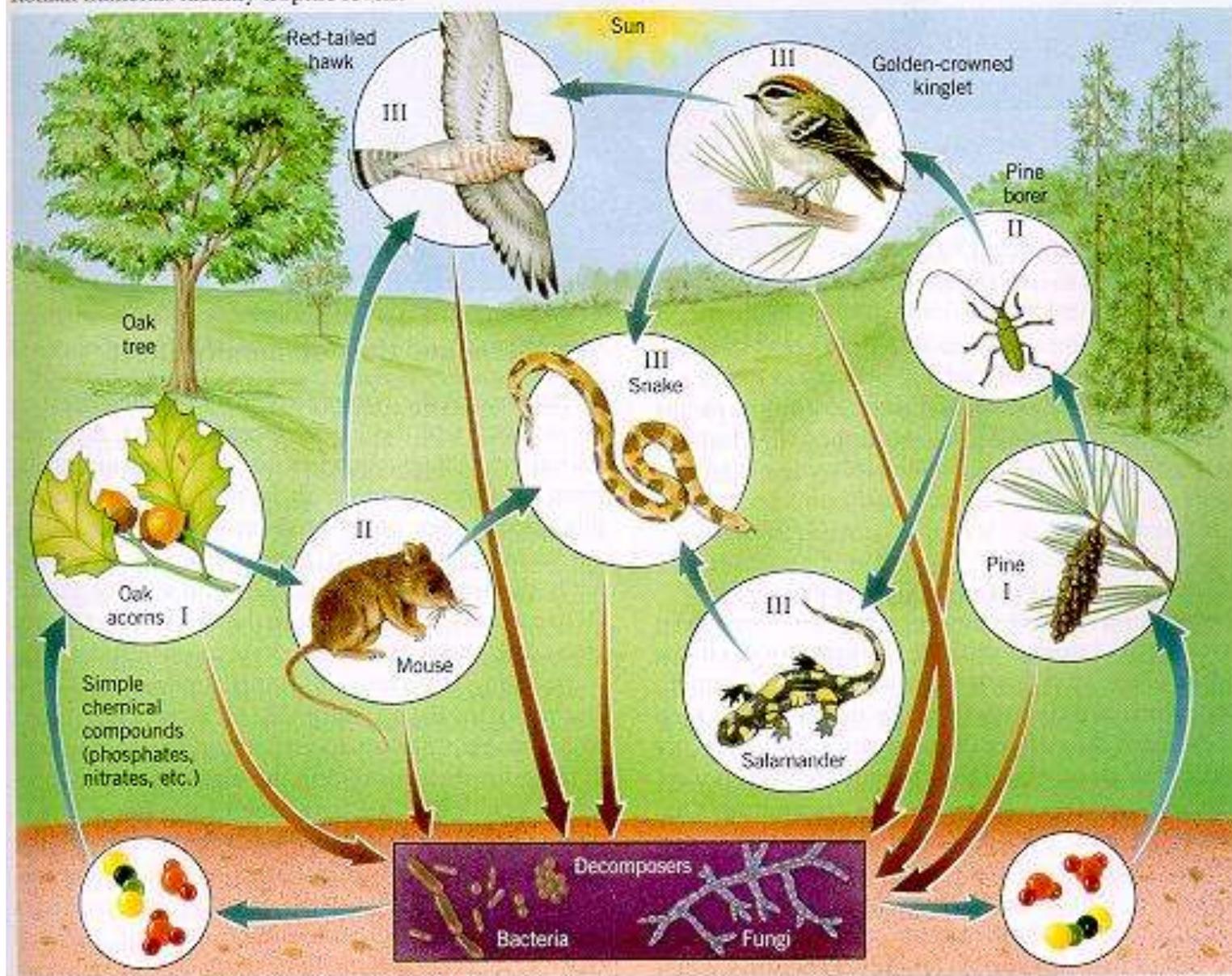


- A food web is more involved, and describes all of the possible feeding relationships in an ecosystem.
- Arrows indicate the flow of energy from where energy was stored (prey) to where the energy is going (predator)

food webs

bioaccumulation

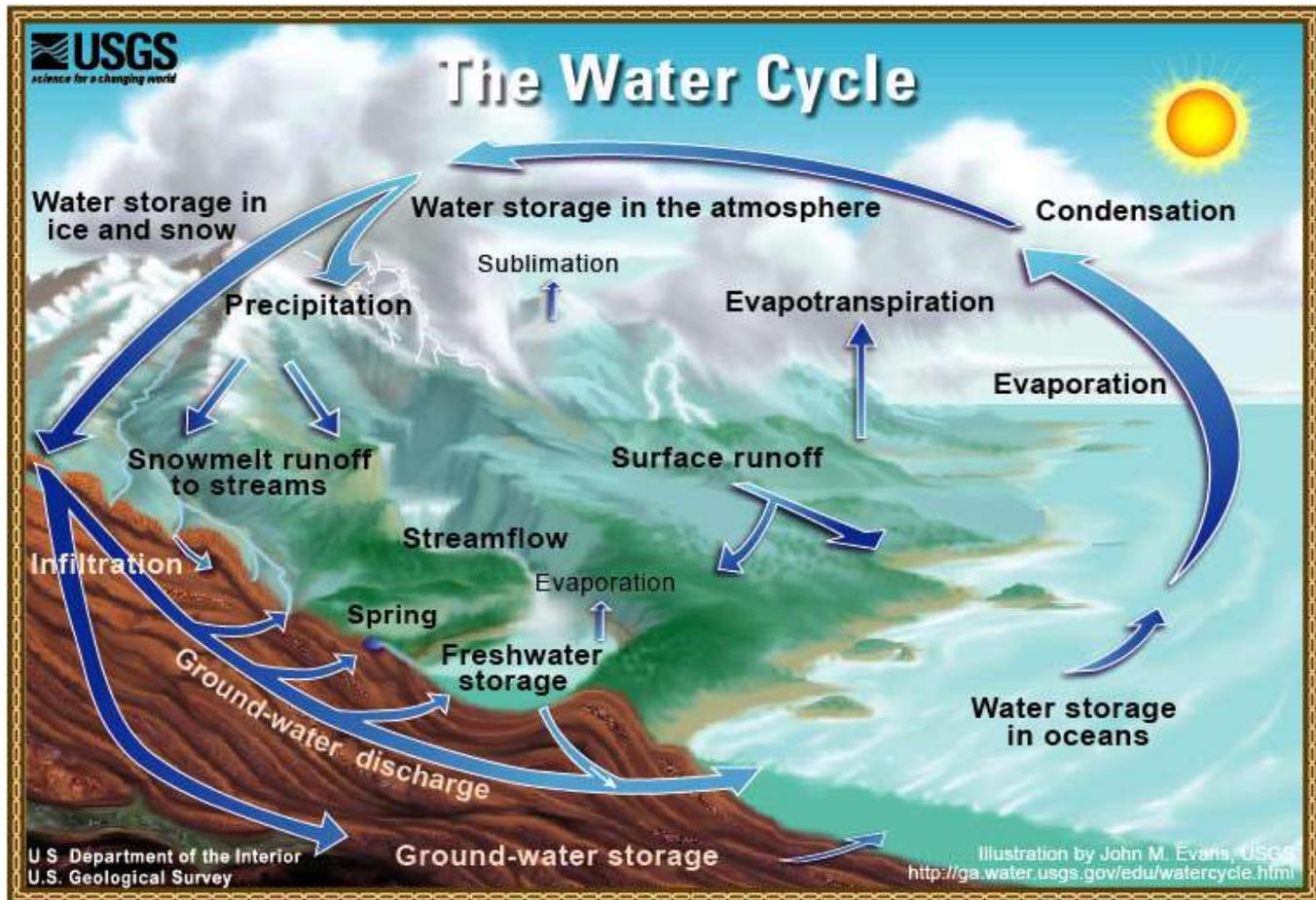
FIGURE 6.3 Food webs: (a) a typical terrestrial food web. Roman numerals identify trophic levels.



Cycles in Nature

- Water

water cycle



Cycles in Nature

■ Carbon

Carbon Cycle

