

Ecology



Ecology—the scientific study of interactions between different organisms and between organisms and their environment or surroundings



Producers

A. Sunlight is the main energy source for life on earth

B. Also called autotrophs

C. Use light or chemical energy to make food

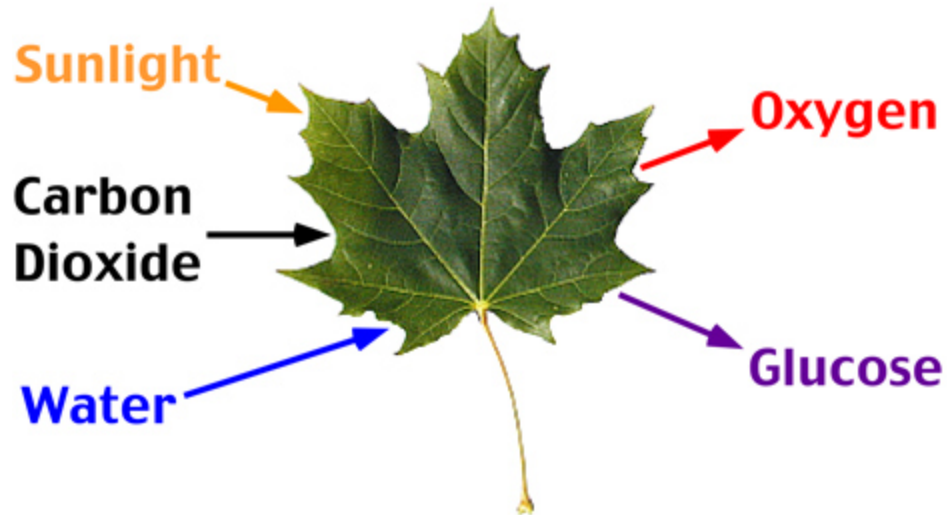
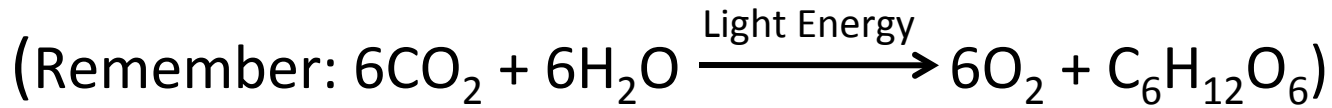
1. Plants

2. plant-like protists (algae)

3. Bacteria



D. Photosynthesis—use light energy to convert carbon dioxide and water into oxygen and carbohydrates



E. Chemosynthesis—performed by bacteria, use chemical energy to produce carbohydrates

Consumers

- A. Organisms that rely on other organisms for their energy and food supply
- B. Also called heterotrophs



Herbivores—obtain energy by eating **only plants**



Carnivores—eat **only animals**

Omnivores—eat **both** plants and animals



Decomposers—breaks down dead organic matter

Niche—the ecological niche involves both the **place** where an organism lives and the **roles** that an organism has in its **habitat**.

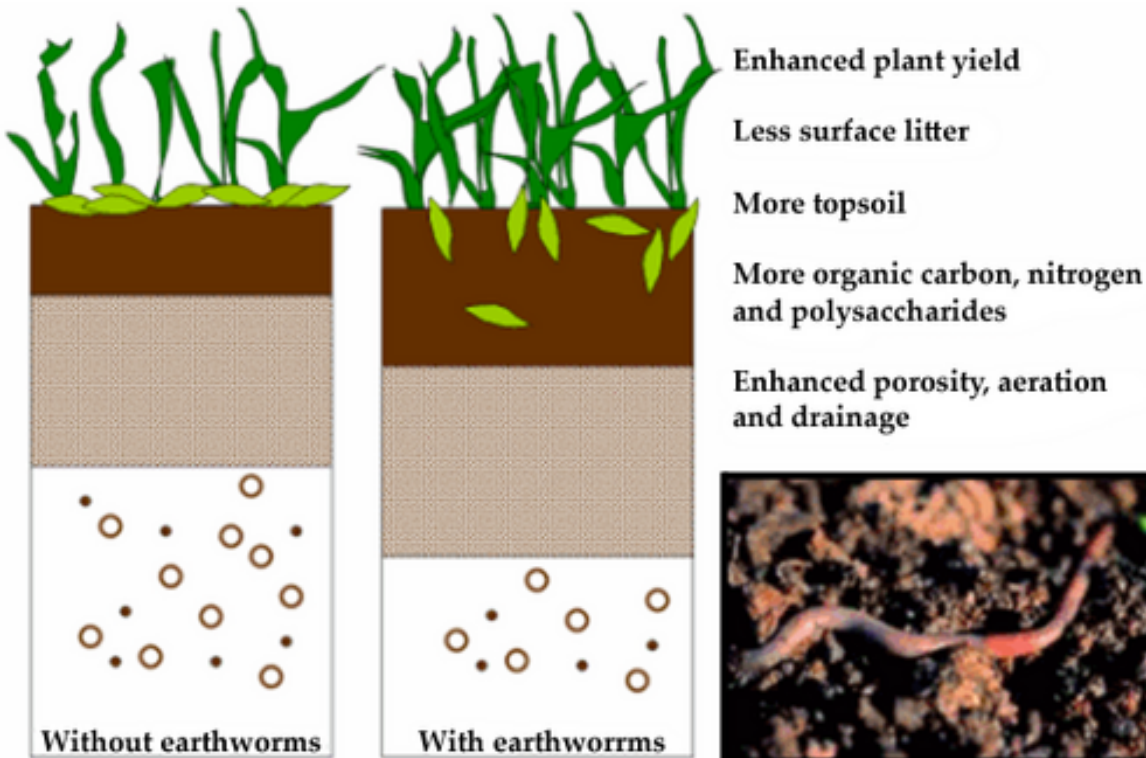
Example: The ecological niche of a **sunflower** growing in the backyard includes absorbing light, water and nutrients (for photosynthesis), providing shelter and food for other organisms (e.g. bees, ants, etc.), and giving off oxygen into the atmosphere.



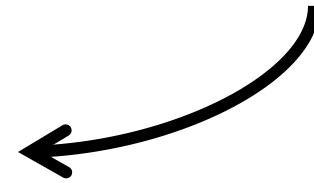
The ecological niche of an organism depends not only on where it lives but also on what it does. By analogy, it may be said that the habitat is the organism's "address", and the niche is its "profession", biologically speaking.

"Address"—Soil, Ground, etc.

Worm's Niche

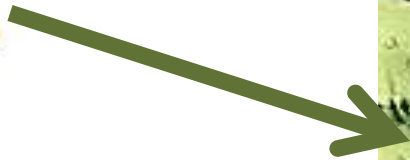


"Profession"—Mix-up soil



Feeding Interactions

Energy flows through an ecosystem in one direction from the sun or inorganic compounds to autotrophs (producers) and then to heterotrophs (consumers)

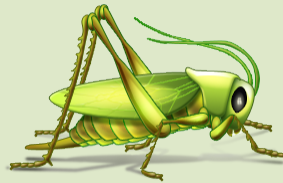


"Just think... our pies feed the soil, the soil feeds the grass, the grass feed us..."

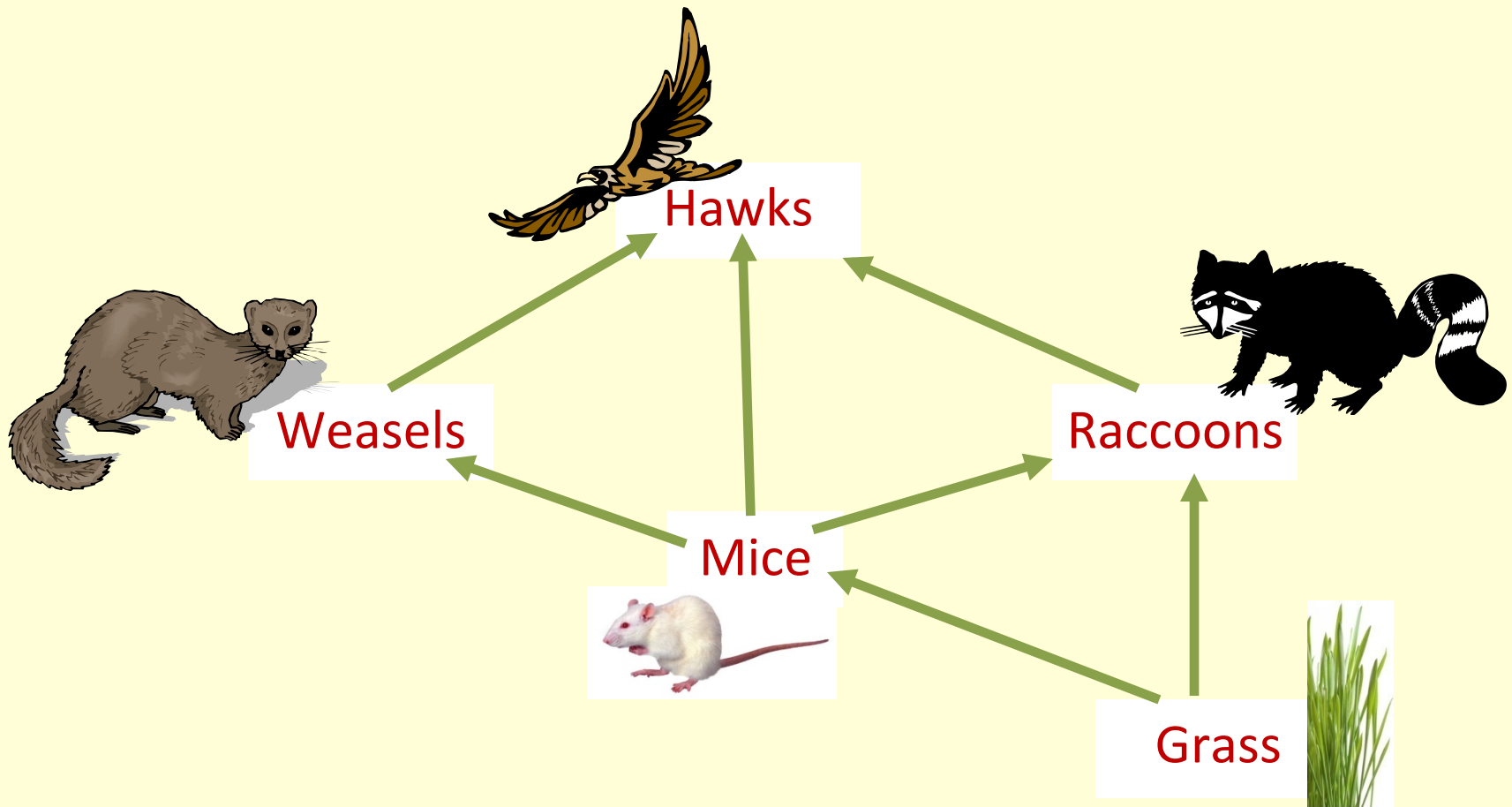
Food Chain—series of steps in which organisms **transfer energy** by eating and being eaten

- Arrows go in the **direction** of how energy is **transferred**
- Start with **producer** and end with top **consumer** or carnivore

Ex: **grass** → **cricket** → **frog** → **raccoon**



Food Web—network of food chains within an ecosystem



Which of the organisms above is the producer? **Grass**

Which of the organisms above is the top consumer? **Hawks**

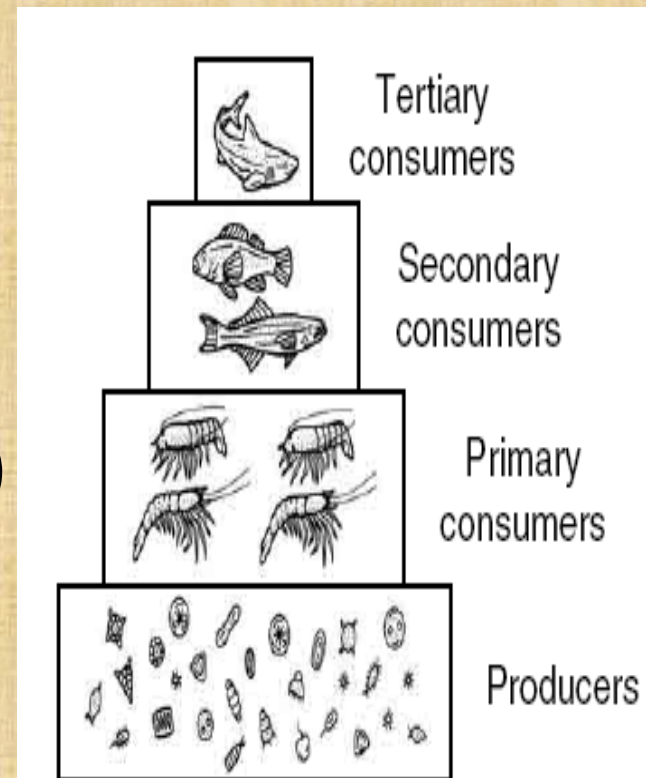
Trophic Levels—each step in a food chain or food web

Level 1—Producers (autotrophs)

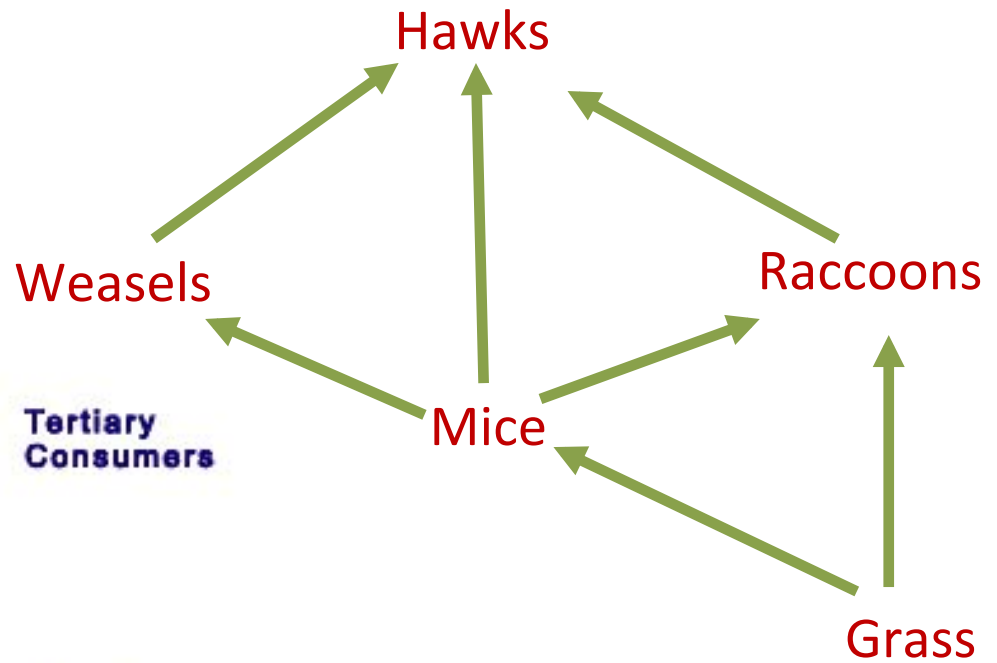
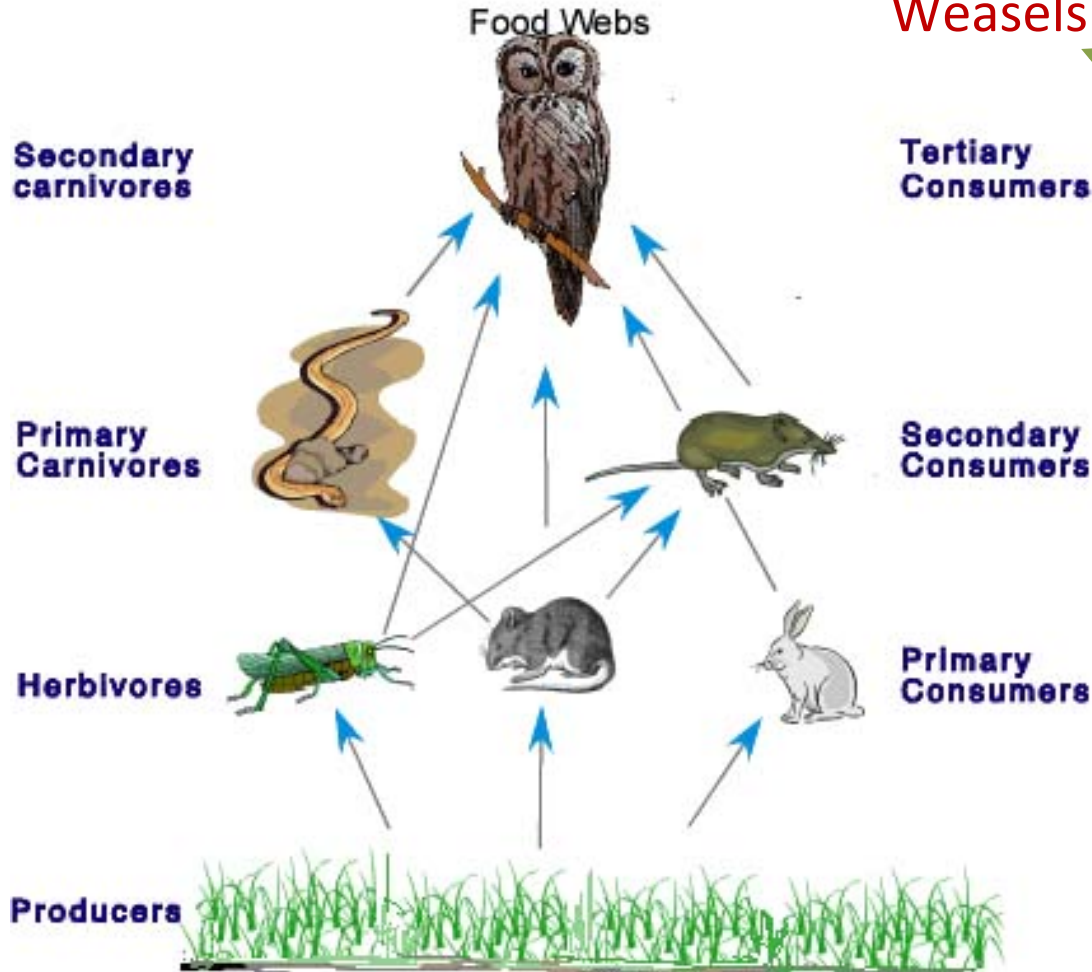
Level 2—Primary Consumers (herbivores)

Level 3—Secondary Consumers
(carnivores or omnivores)

Level 4—Tertiary Consumers
(carnivore—usually top carnivore)



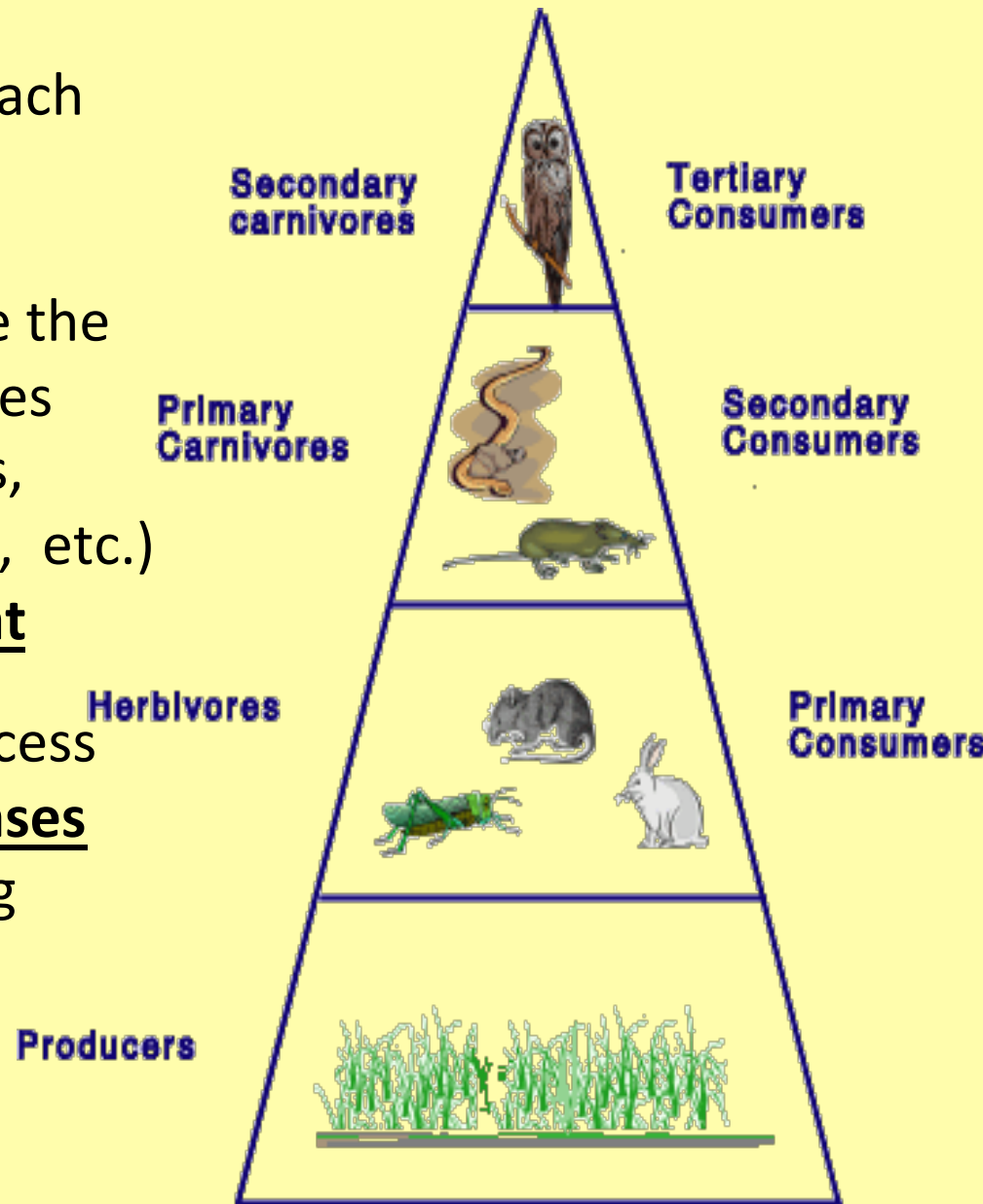
Food Webs



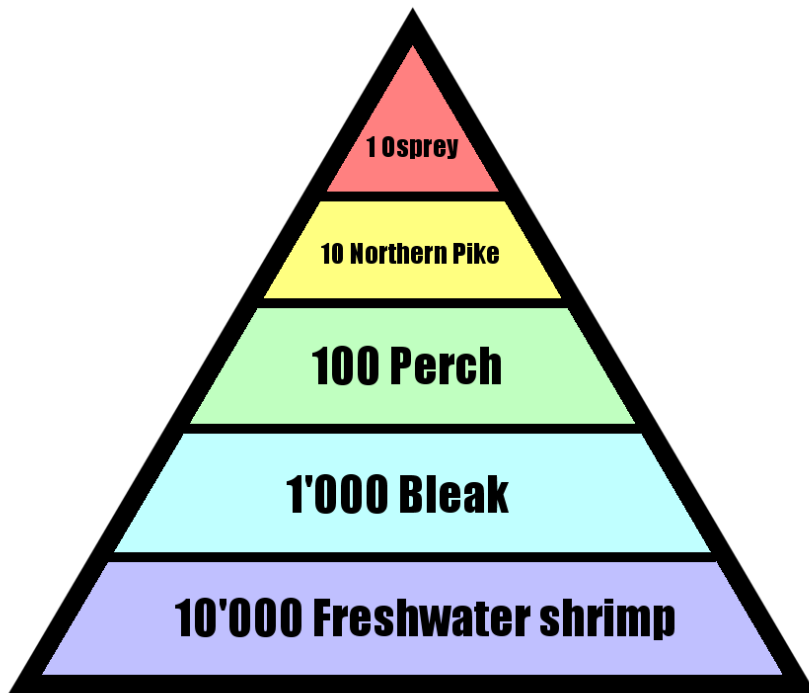
Energy Pyramid shows relative amount of energy available at each trophic level

Organisms in a trophic level use the available **energy** for life processes (such as growth, photosynthesis, cellular respiration, metabolism, etc.) and release some energy as **heat**

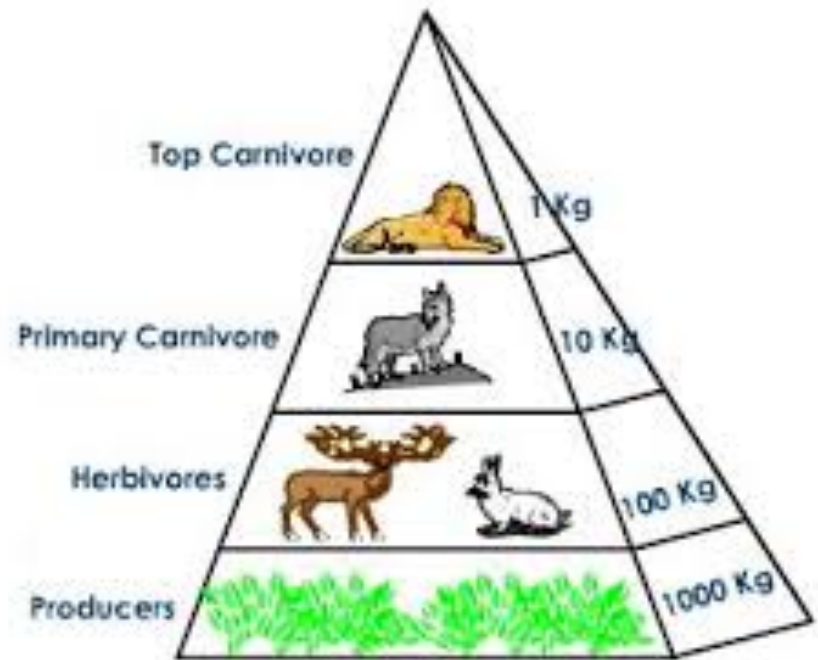
Remember: Every chemical process that happens in your body **releases** **heat** as a byproduct (ex: burning calories).



Pyramid of Numbers-
number of **individuals** in each
population in a food chain.



Biomass Pyramid—
represents the amount of **living, organic matter** at
each trophic level



Upright Pyramid of biomass in a Terrestrial Ecosystem

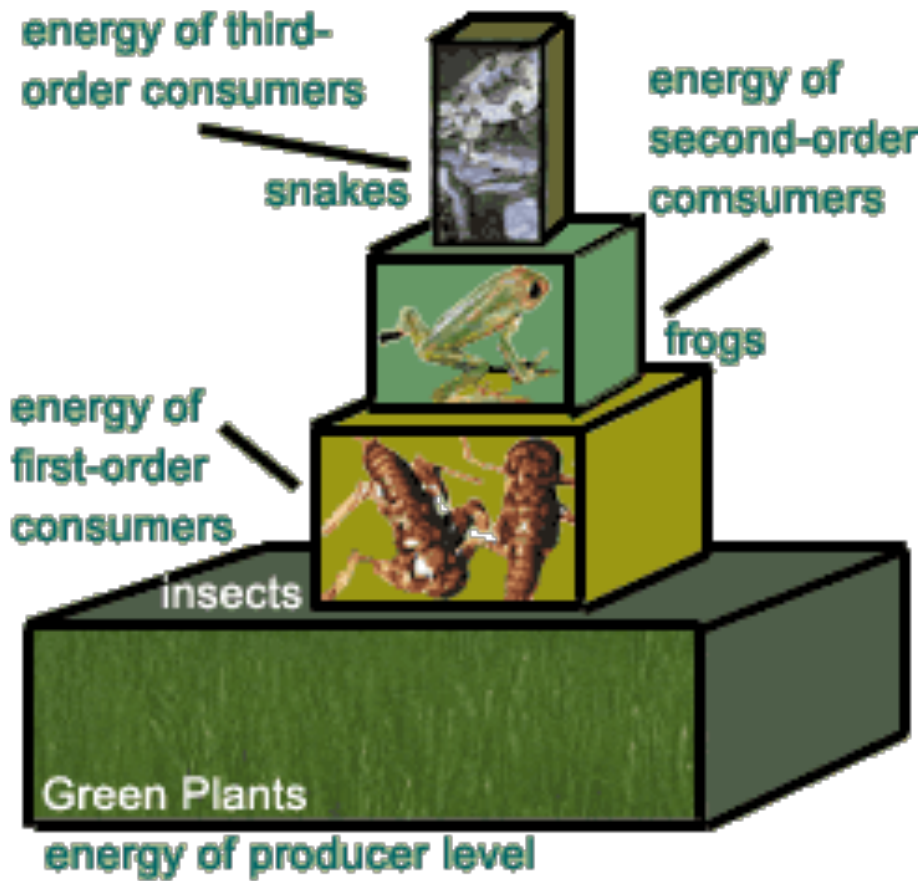
Rule of 10—only **about 10%** of the available energy within a trophic level is **transferred** to the next higher trophic level

Food chain:

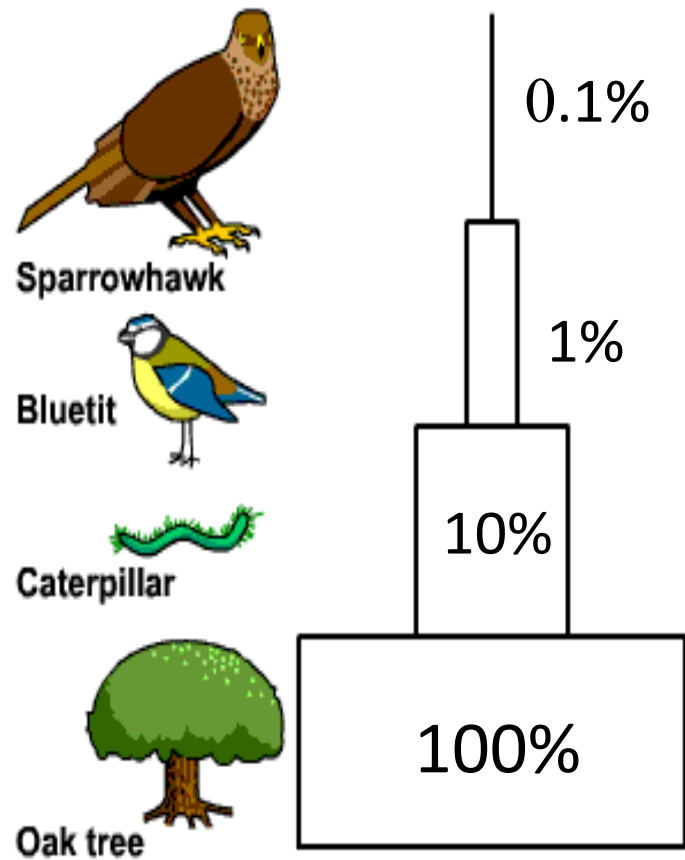
Plants → Grasshoppers → Mice → Owls



Don't forget
about the
Scavengers &
Decomposers

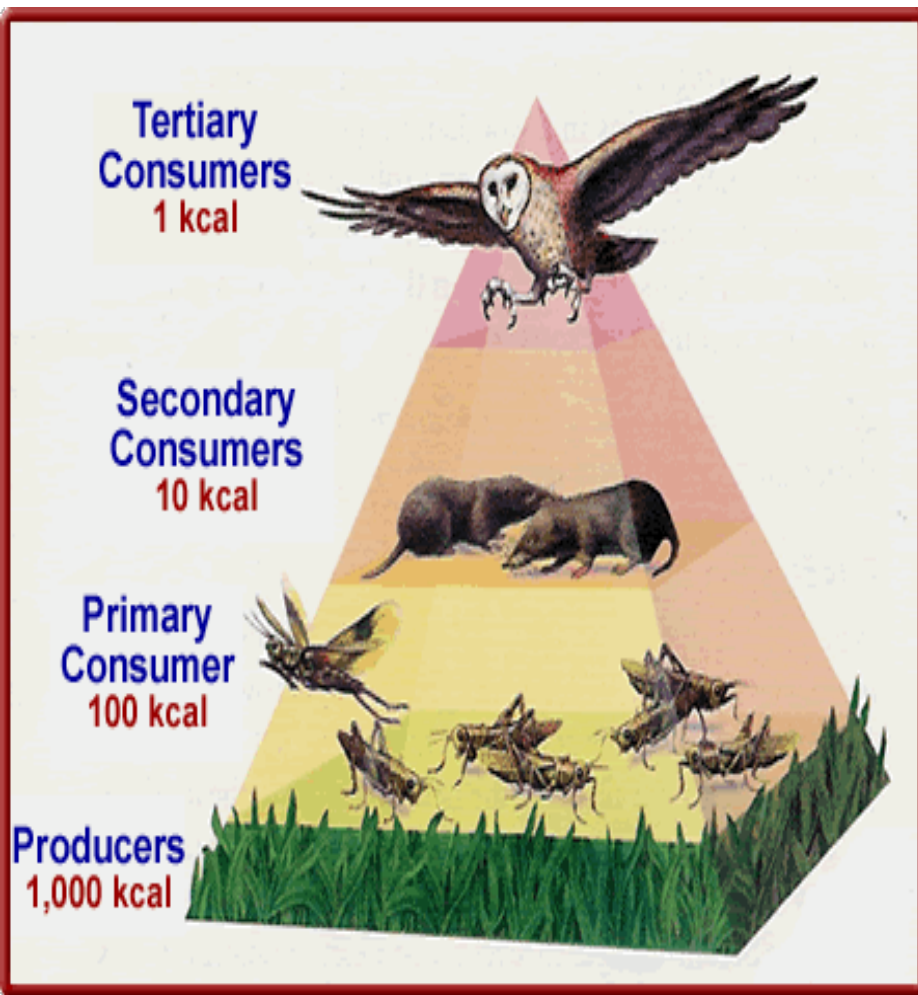


Energy Pyramid



Biomass Pyramid

Energy and Biomass Pyramid (together)



Represents amount of energy available at each level as well as amount of living tissue—both decrease with each increasing trophic level

Symbiosis—any relationship in which two species live closely together (3 Types)

1. **Mutualism**—both species benefit (WIN-WIN)

Ex: **insects and flowers**

Can you think of any other examples that we've talked about in class?



2. **Commensalism**—one member of the association benefits and the other is neither helped nor harmed.
(WIN-0)

Example: **barnacles on a whale**





The Remora fish attaches to the shark and gets a free ride.



Commensalism

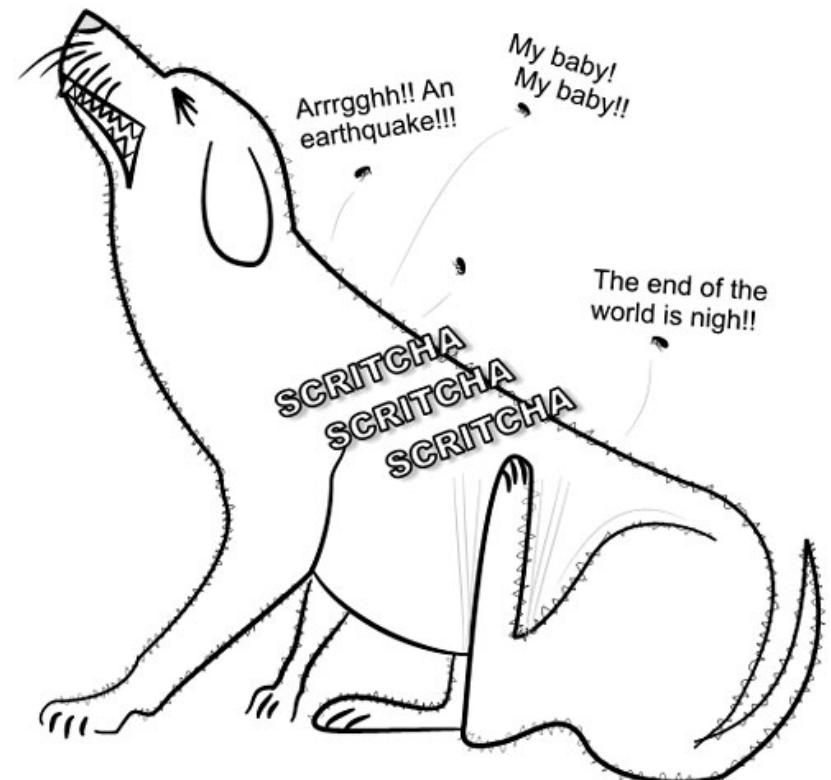
Birds build nests in trees.



3. Parasitism—one organisms lives on or inside another organism (host) and harms it.

The parasite obtains all or part of its nutritional needs from the host. (WIN-LOSE)

Example: **fleas on a dog**





Wasp eggs on back of caterpillar.



Sea lampreys feed on fluids of other fish.
Invasive Species!

Parasitism



Mosquito biting a human.

Mutualism, Commensalism or Parasitism??

Parasitism



Mutualism

Ecological Interactions between organisms

Competition—when two organisms of the same or different species attempt to use an ecological resource in the same place at the same time.

Ex: **food, water, shelter**





Monkeys compete with each other and other animals for food.

Rams compete with each other for mates.



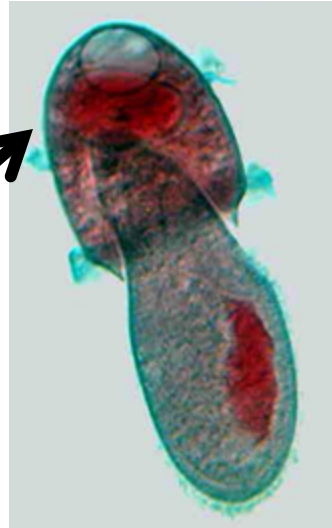


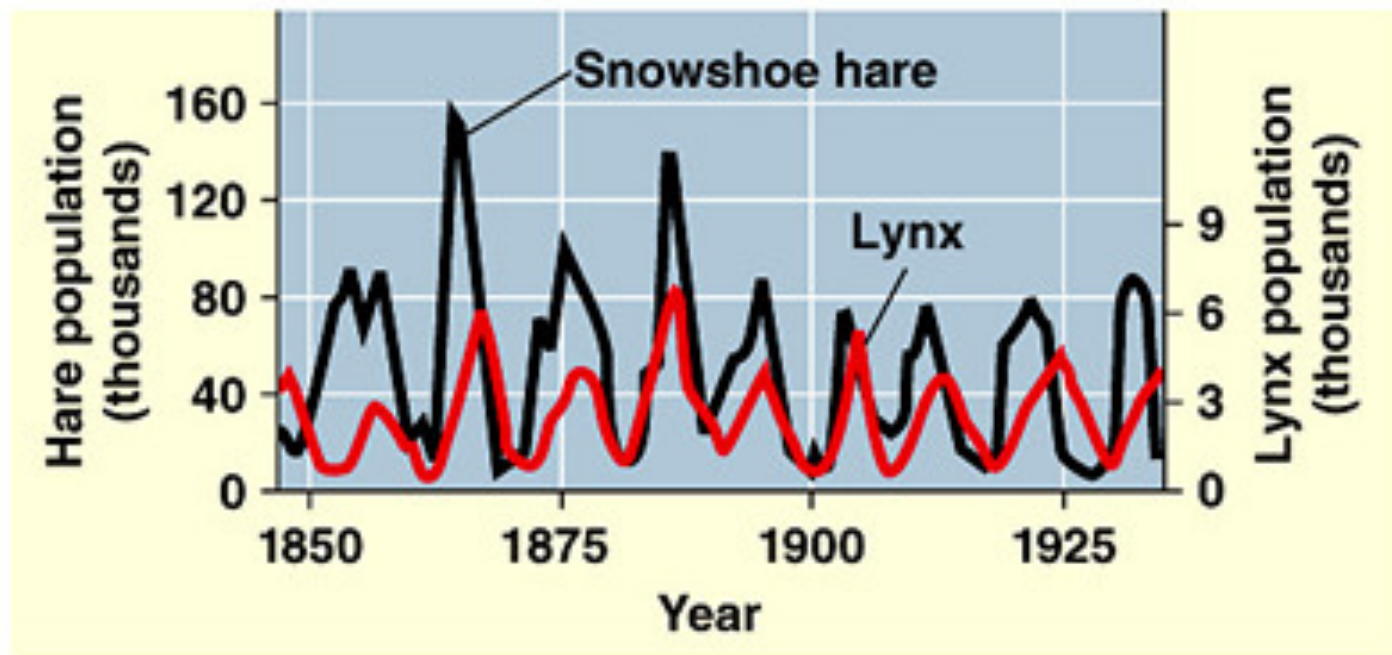
Until Americans introduced gray squirrels into parts of England in the early 20th century, red squirrels had been the only species of squirrel in the country. The gray squirrels were larger and bred faster and successfully competed for resources. Within a couple years of overlap in an area, the red squirrels disappeared.

Predation—one organism captures and feeds on another organism

Predator—one that does the killing

Prey—one that is the food

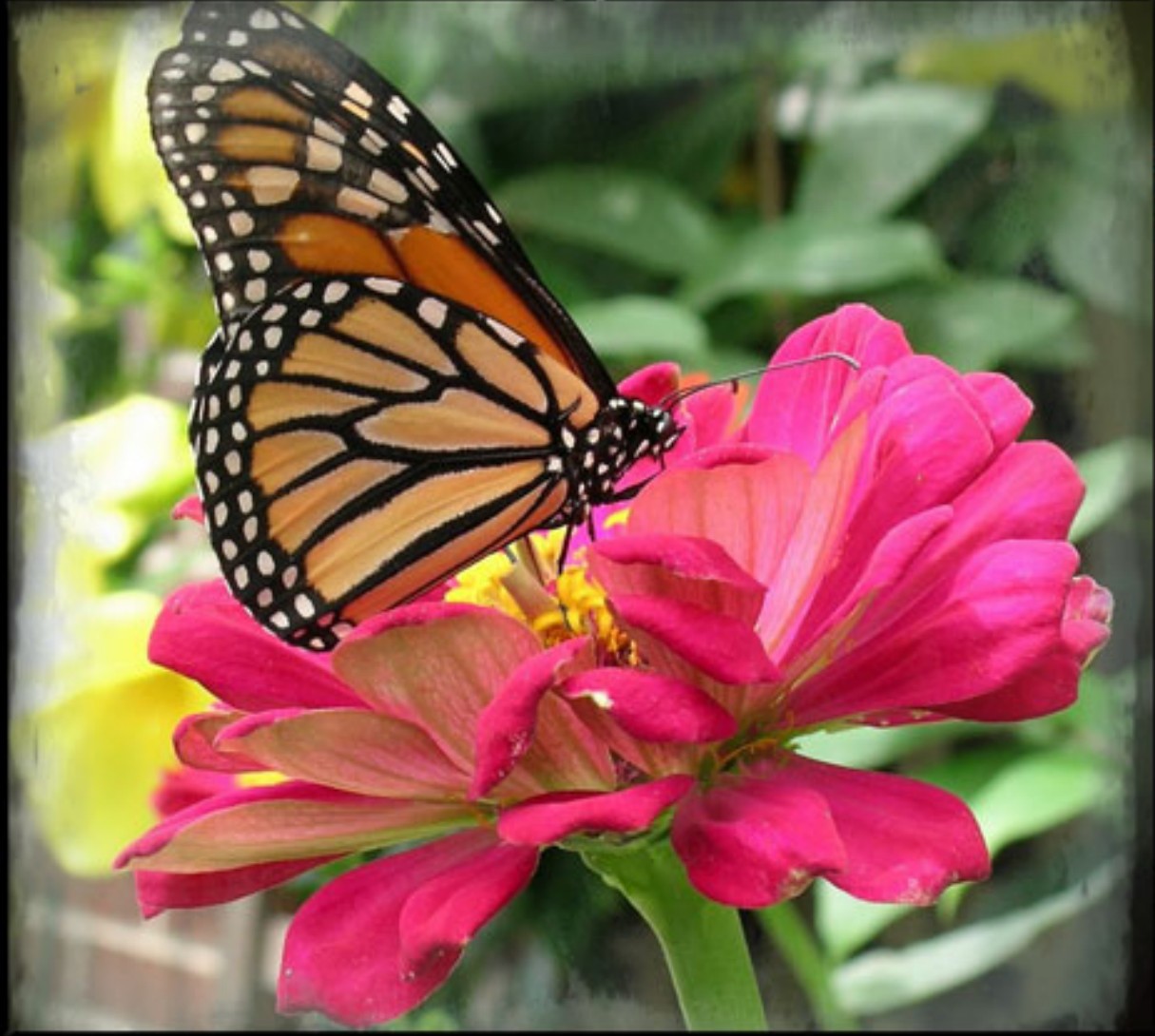




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