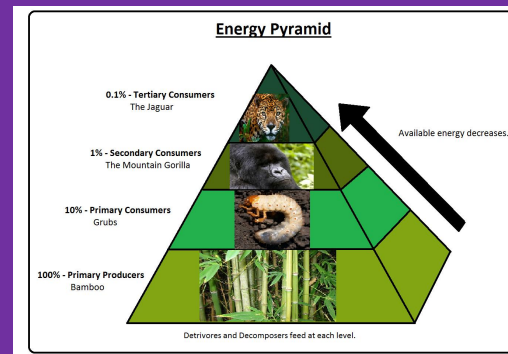
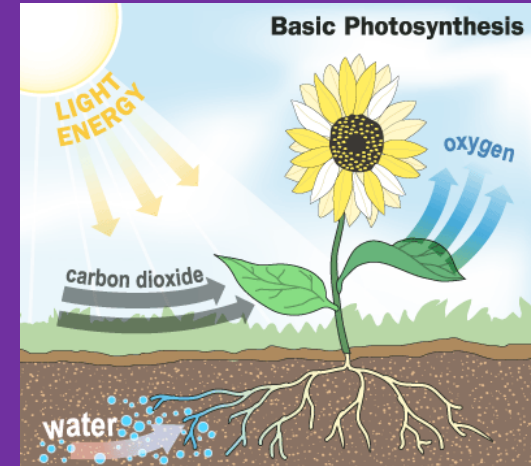
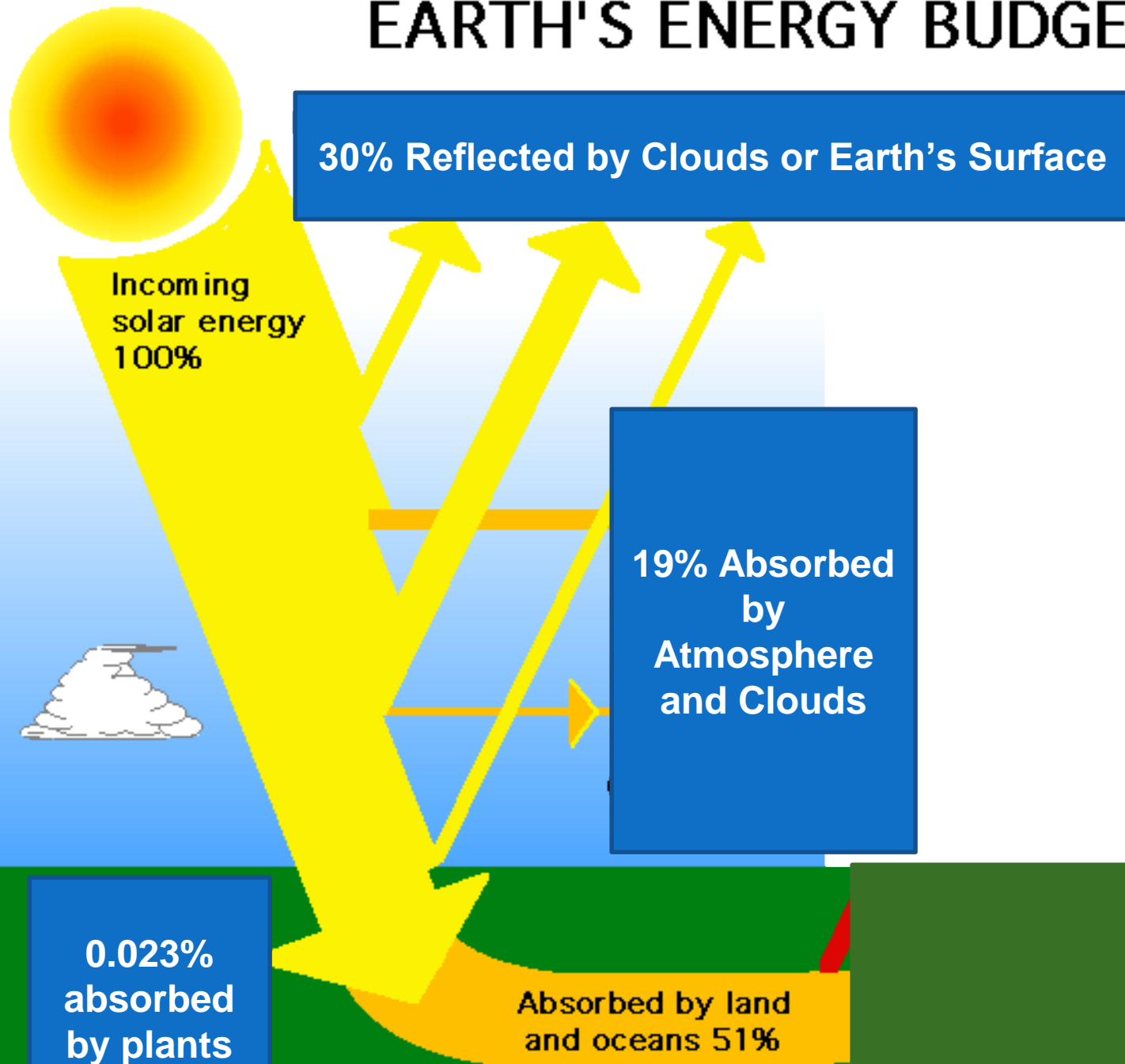


Energy Flow In Ecosystems

- Photosynthesis
- Cellular Respiration
- Ecological Niche
- Producers & Consumers
- Herbivores, Omnivores & Carnivores
- Scavenger
- Food Chain
- Trophic Levels
- Food Webs
- Ecological Pyramids

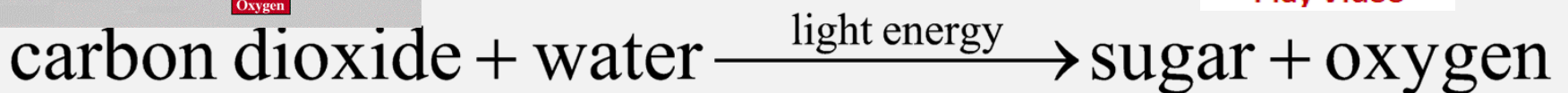
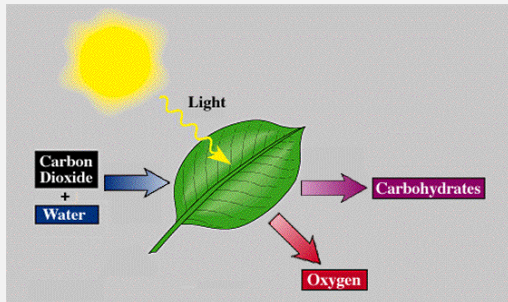


EARTH'S ENERGY BUDGET

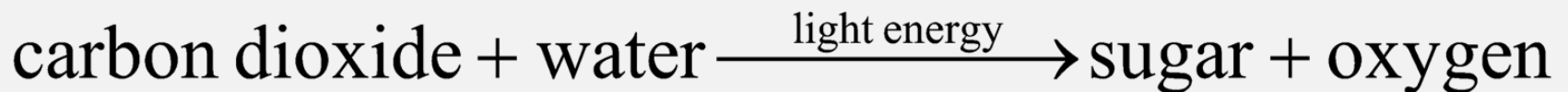
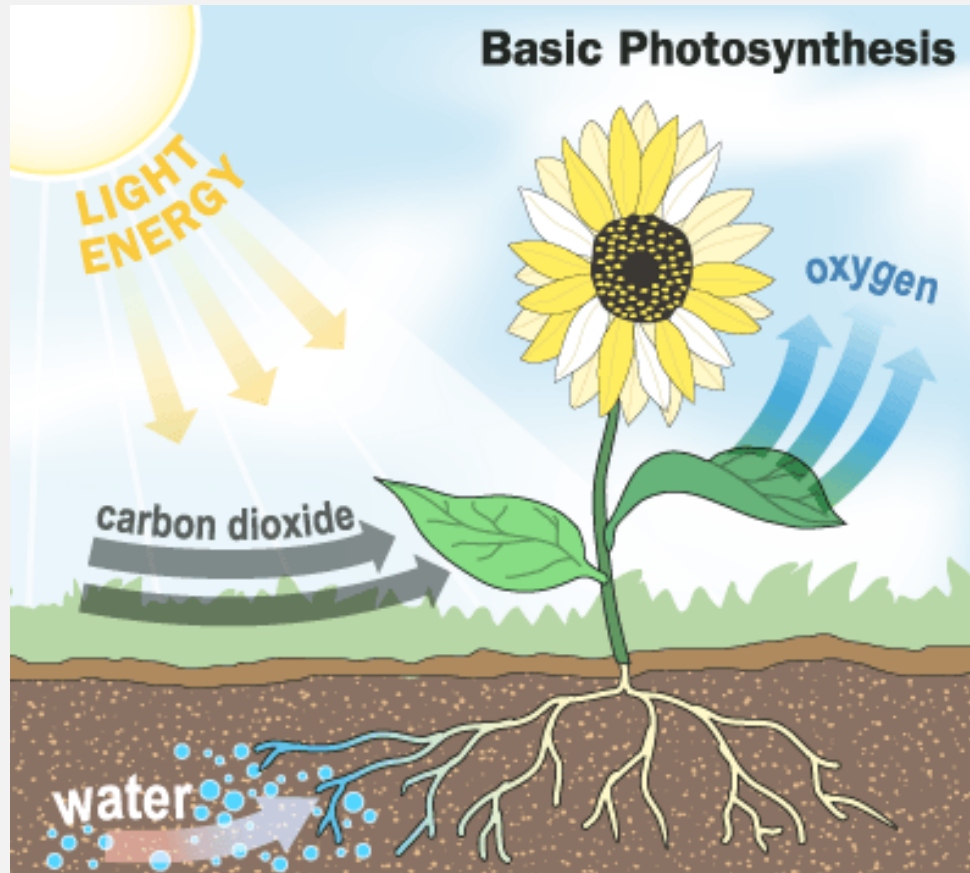


Photosynthesis

- The process where the Sun's energy is converted into chemical energy (Glucose/Sugar).
- Occurs in PLANTS!!
- Producer – an organism that makes its own energy-rich food compounds using the Sun's energy
- On land, major producers are green plants – contain chlorophyll, which captures light energy



Photosynthesis



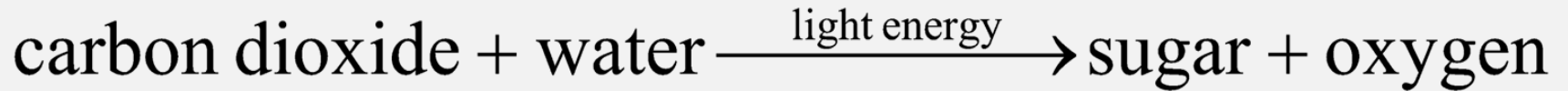
Cellular Respiration

- The process where sugar is converted into carbon dioxide, water and energy.
- The organism uses this energy to do everything.

sugar + oxygen \longrightarrow carbon dioxide + water + energy

Photosynthesis and Cellular Respiration

Photosynthesis



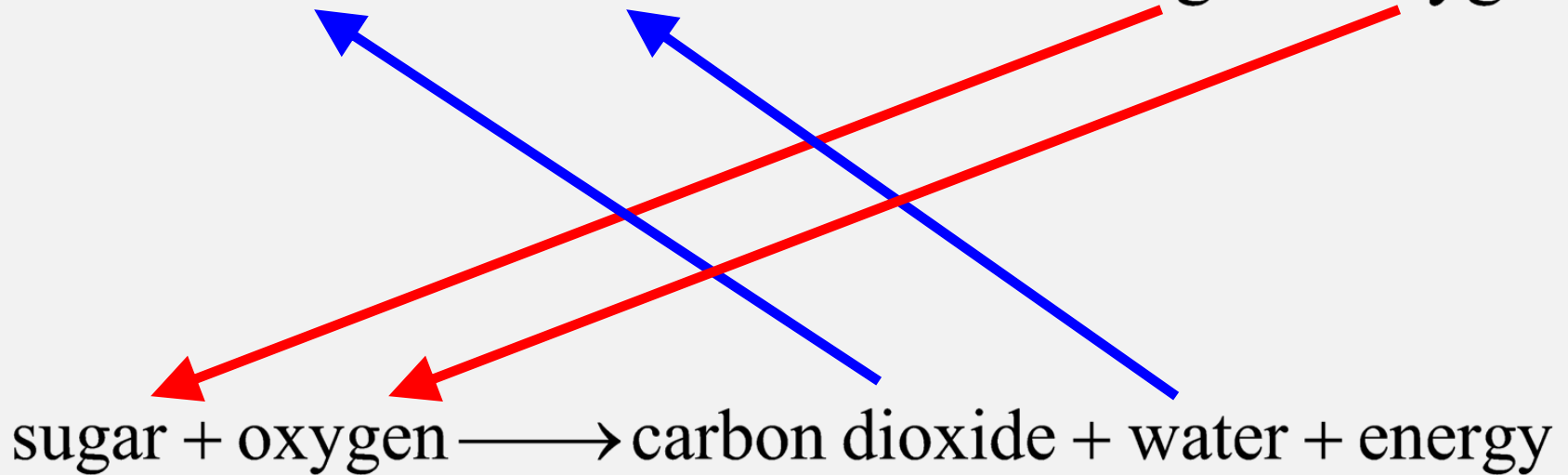
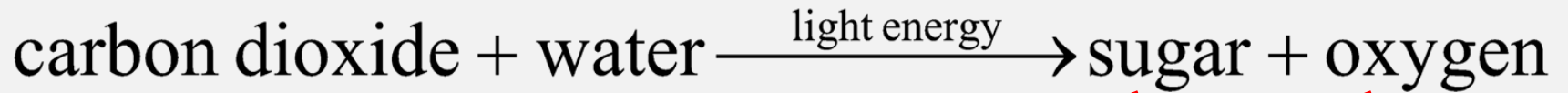
Notice Anything?



Cellular Respiration

Photosynthesis and Cellular Respiration

Photosynthesis

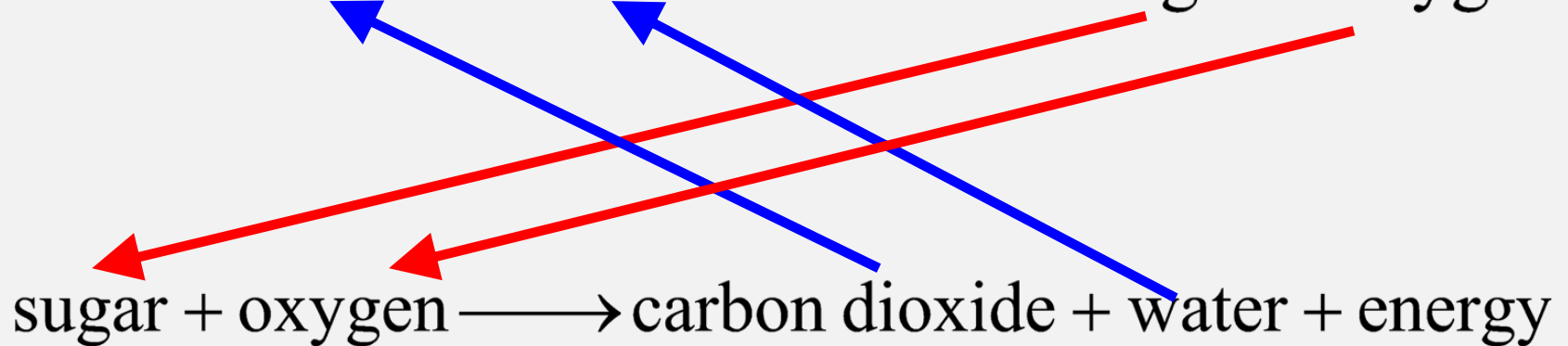
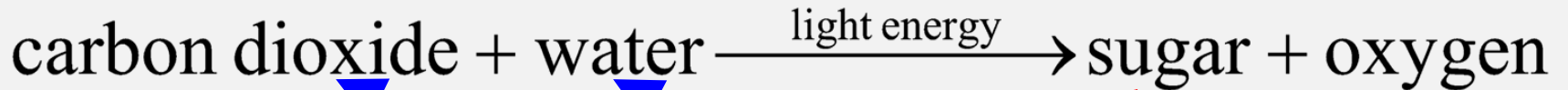


Cellular Respiration

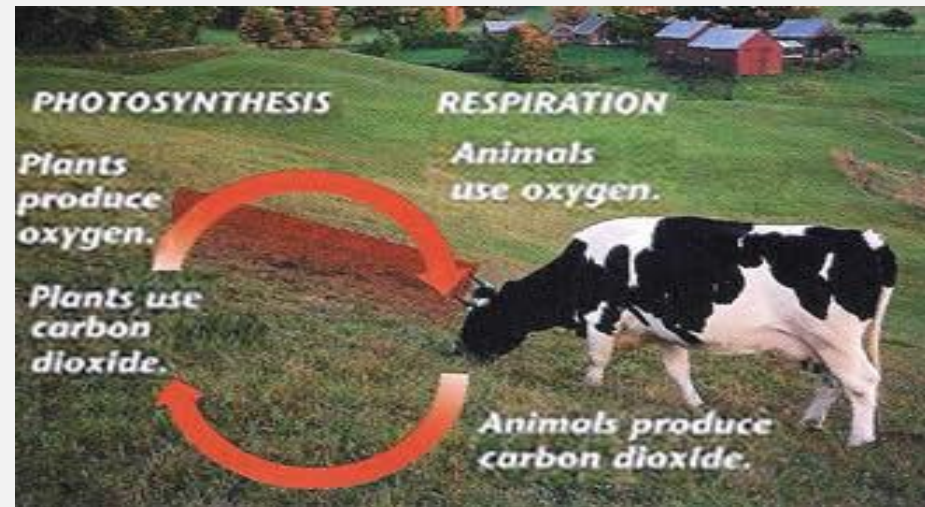
What is created in one reaction is used up in the other reaction!

Photosynthesis and Cellular Respiration

Photosynthesis



Cellular Respiration



To Photosynthesize or not to Photosynthesize that is the question

- Many organisms cannot photosynthesize (done by plants) they are called consumers
 - Consumers – an organism that obtains its energy from consuming other organisms
- **To obtain usable energy from food, consumers undergo cellular respiration.**

THEREFORE.....

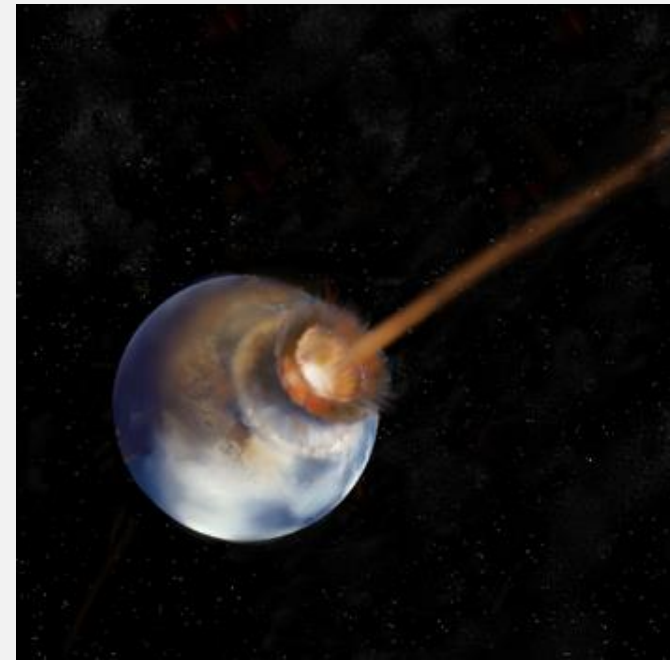
Photosynthesis and Life

- We completely rely on the Sun!
- No Sun = No Photosynthesis = No Food for plants = No Food for animals = No food for larger animals
- No Sun = No life on Earth
This is the basis behind the dinosaur extinction



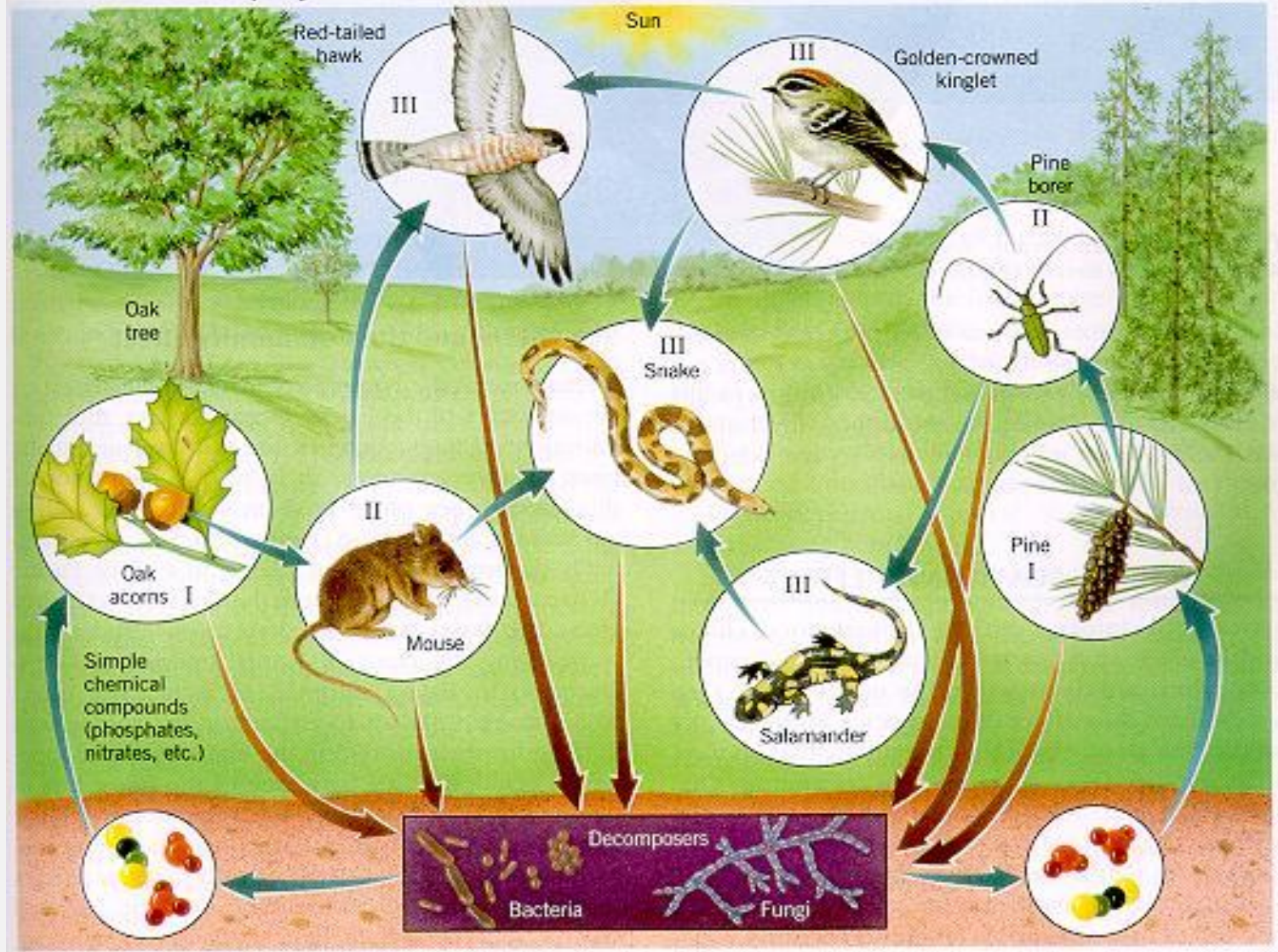
Dinosaur Extinction

- A HUGE asteroid is thought to have hit Earth near Mexico which sent up so much dust that it actually blocked the Sun for many years.
 - No Sun = No Food = No more dinosaurs



Food Webs

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

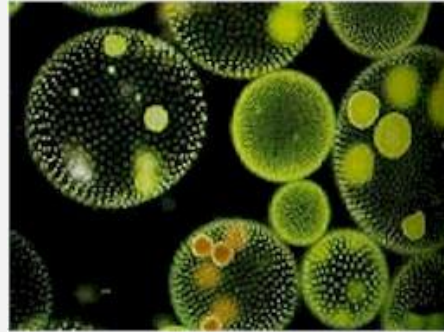


Ecological Niches

- The function a species serves in its ecosystem, including what it eats, what eats it, and how it behaves.
- No two species occupy identical niches.

Producers vs. Consumers

- Producers are most always plants (e.g. trees, grass, algae, etc.)



Algae



- **Consumers are living things that eat producers and other consumers (e.g. animals)**



Types of Consumers

- Unlike producers, there are different levels of consumers

Feeding Role	Definition
Herbivore	<u>Organisms that eats plants or other producers</u>
Carnivore	Organisms that eats other animals
Omnivore	Organisms that eats both plants and animals
Scavenger	<u>Organisms that feeds on the remains of another organism</u>

Herbivores

- Organisms that eats plants or other producers



Carnivore

- Organisms that eats other animals



Omnivore

- Organisms that eat both plants and animals



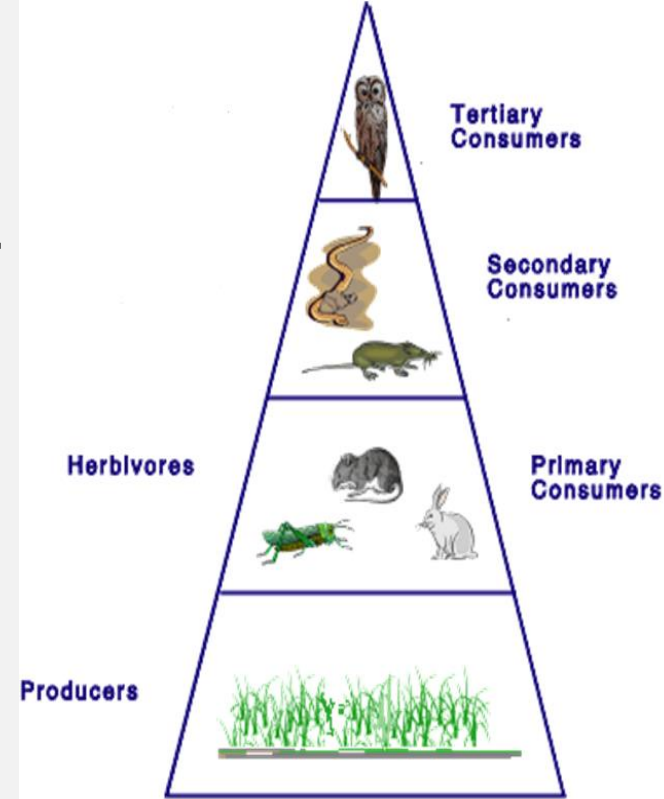
Scavenger

- Organism that feeds on the remains of another organism



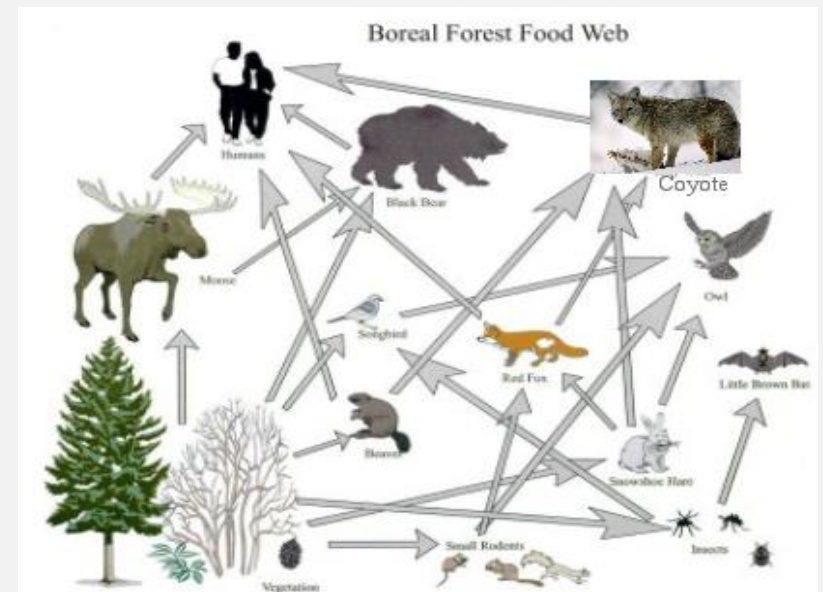
Trophic Level

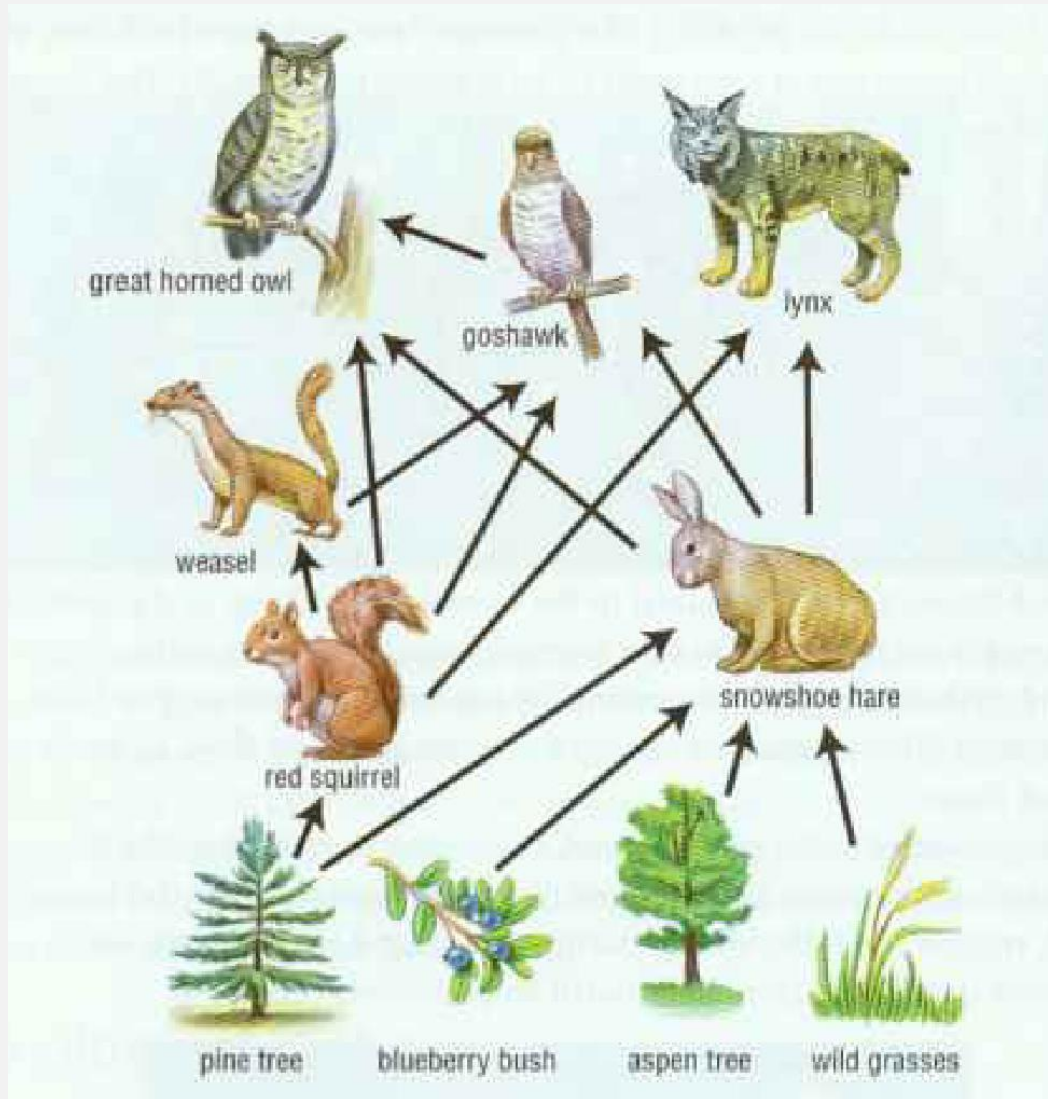
- The trophic level of an organism in an ecosystem depends on its feeding position along a food chain.
- First trophic level – producers
- Second trophic level – primary consumers
 - Will eat producers only
- Third trophic level – secondary consumers
 - Can eat primary consumers and producers
- Fourth trophic level – tertiary consumers
 - Can eat secondary consumers, primary consumers, producers



Food Webs

- A much more accurate display of who eats who
- A representation of the feeding relationships within a community.
- Highly complex – consumers feed on many species
- As in food chains, the arrow points from the thing being eaten to the thing eating it



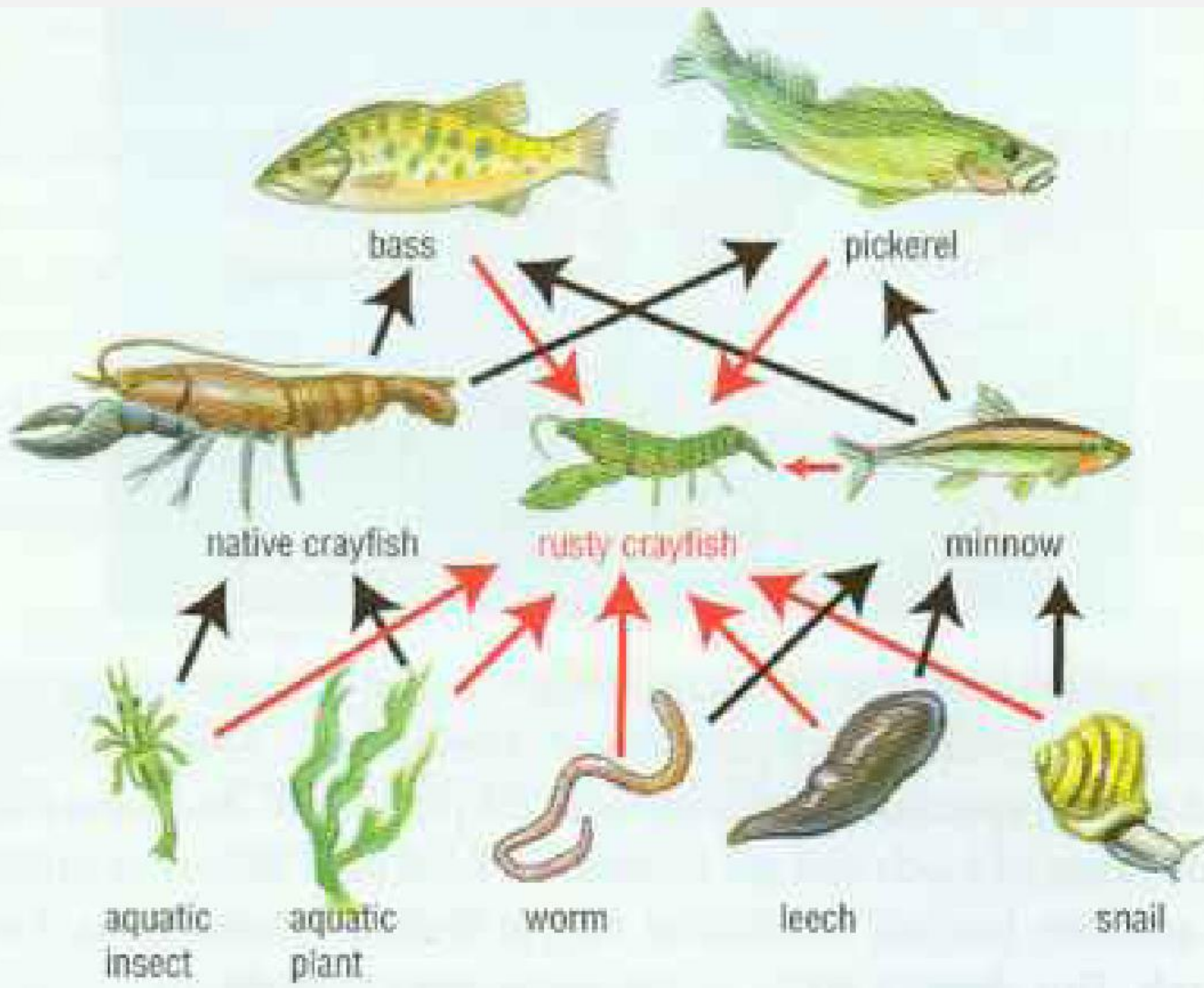


- E.g. In this food web, the goshawk is eaten by the Great Horned Owl.

- What two animals eat all the plants?

Food Webs

- Are very useful when figuring out what may happen when a species is removed from or added to an ecosystem
- If a species is removed the number of animals that would normally eat it would decrease, why?
- The introduction of a new species can also dramatically alter the food web as new feeding patterns are established



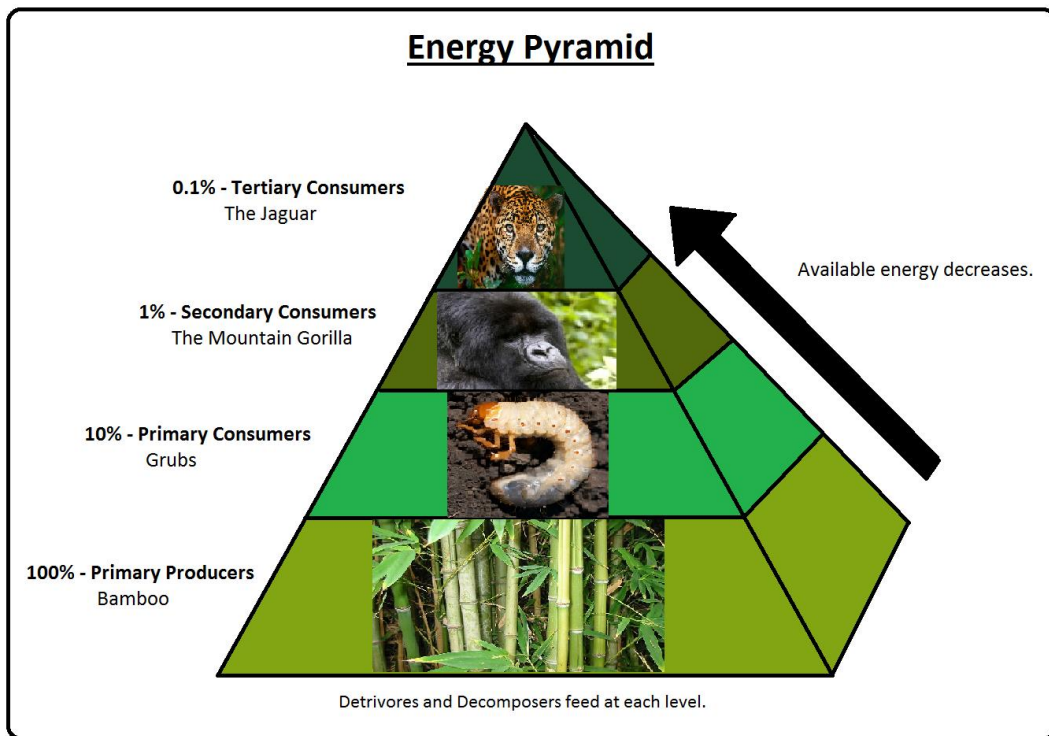
E.g. What would happen if the rusty crayfish was removed?

What would happen if you removed the aquatic insect and the aquatic plant?

Ecological Pyramids

- Ecological Pyramids display relationships between trophic levels in ecosystems
- There are three types of ecological pyramids
 - 1) **Energy**
 - 2) **Biomass**
 - 3) **Numbers**

Energy Pyramid

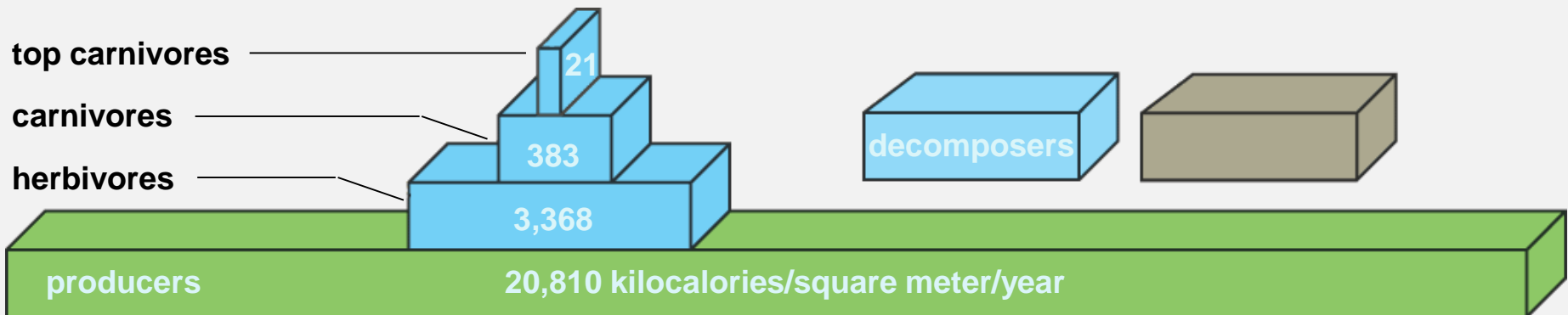


➤ Energy pyramid - Energy loss and transfer between trophic levels; the size of each layer represents the amount of energy available at that trophic level.

➤ Only about 10% of the energy taken in by the individuals at one trophic level is passed on to individuals at the next level.

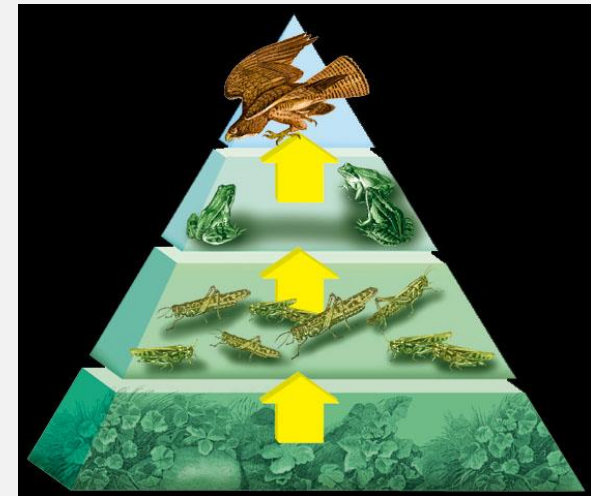
Pyramid of Energy Flow

- 10% passed on to next level
- Why??? Where did the energy go?



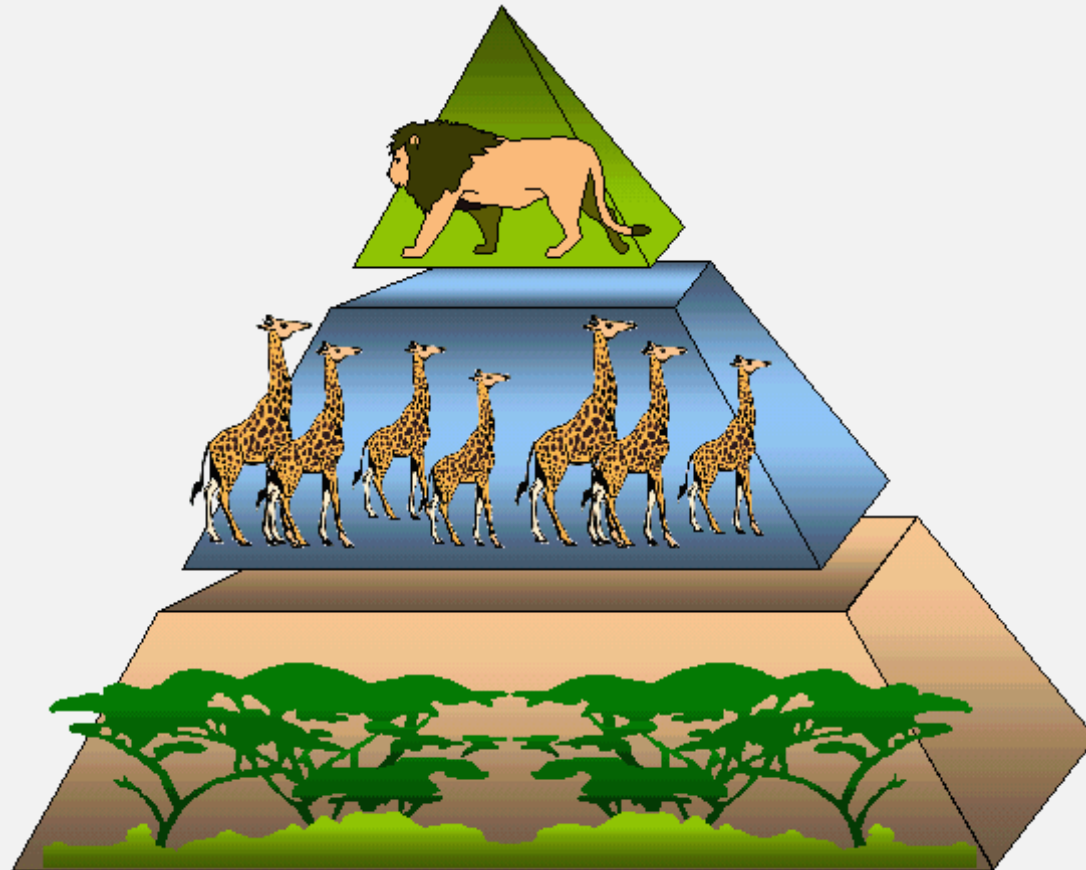
All becomes heat in the end

- At each trophic level, the bulk of the energy received from the previous level is used by the organism who obtained it.
- Less and less energy is available as we move up the pyramid
- This energy is released as heat energy and lost to the ecosystem

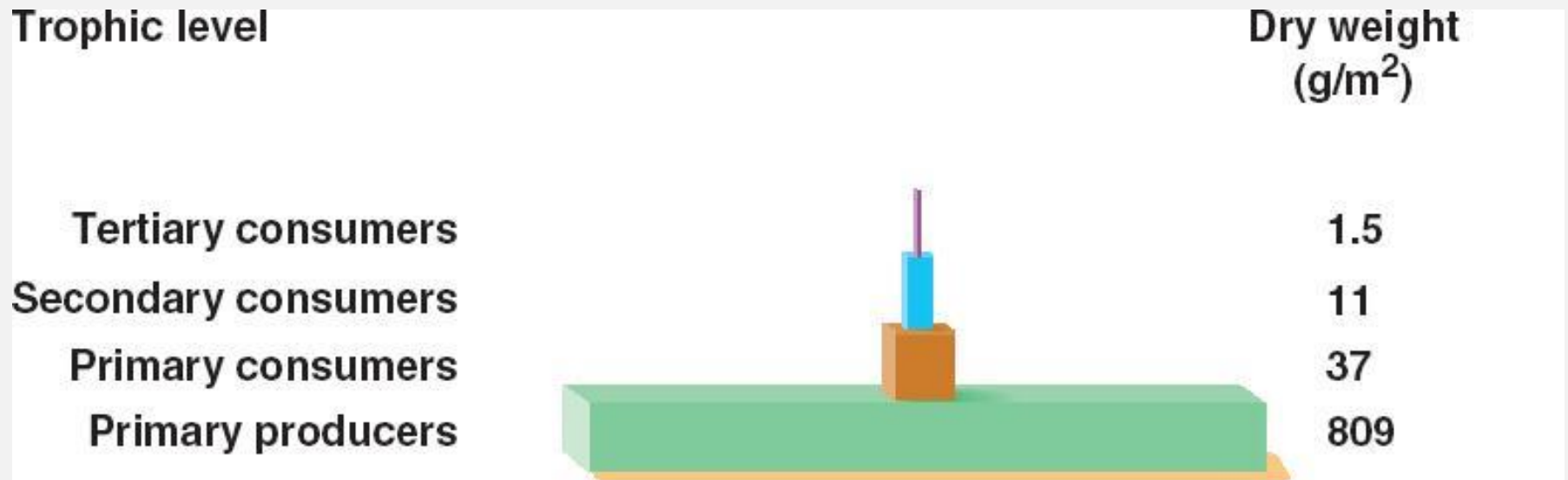


Biomass Pyramid

- Represents the mass (weight) of all the living organisms within that trophic level



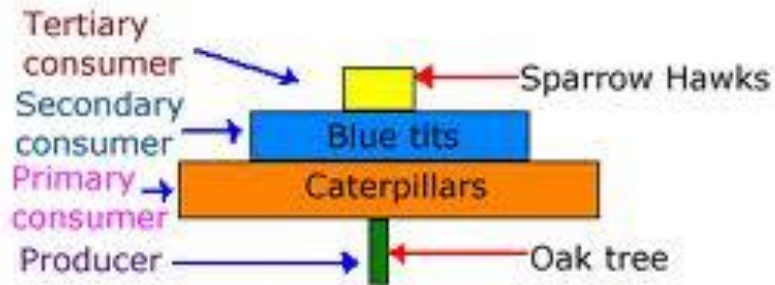
Example Biomass Pyramid



(a) Most biomass pyramids show a sharp decrease in biomass at successively higher trophic levels, as illustrated by data from a bog at Silver Springs, Florida.

Numbers Pyramid

- Represents the number of organisms that make up each trophic level
- In a forest ecosystem, the tiny plant-feeding insects in the second trophic level outnumber the trees in the first trophic level.



Pyramid of Numbers

This pyramid of numbers is not triangular because it is based on oak trees which are very large compared with the caterpillars that eat them.

