

Ecosystems

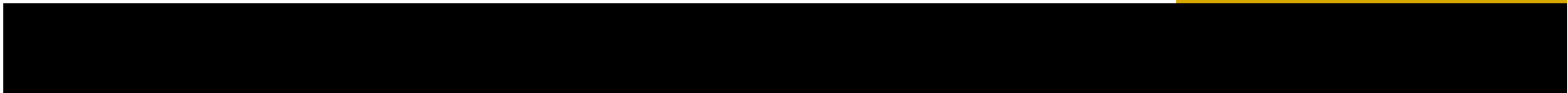
- All members of a community, along with their physical and chemical environments
 - Vary greatly in size
 - Diversity promotes stability and productivity
 - Dynamic
 - energy flow
 - chemical cycling
 - Change over time (succession)



Coral Reefs are a rich, diverse and productive ecosystems

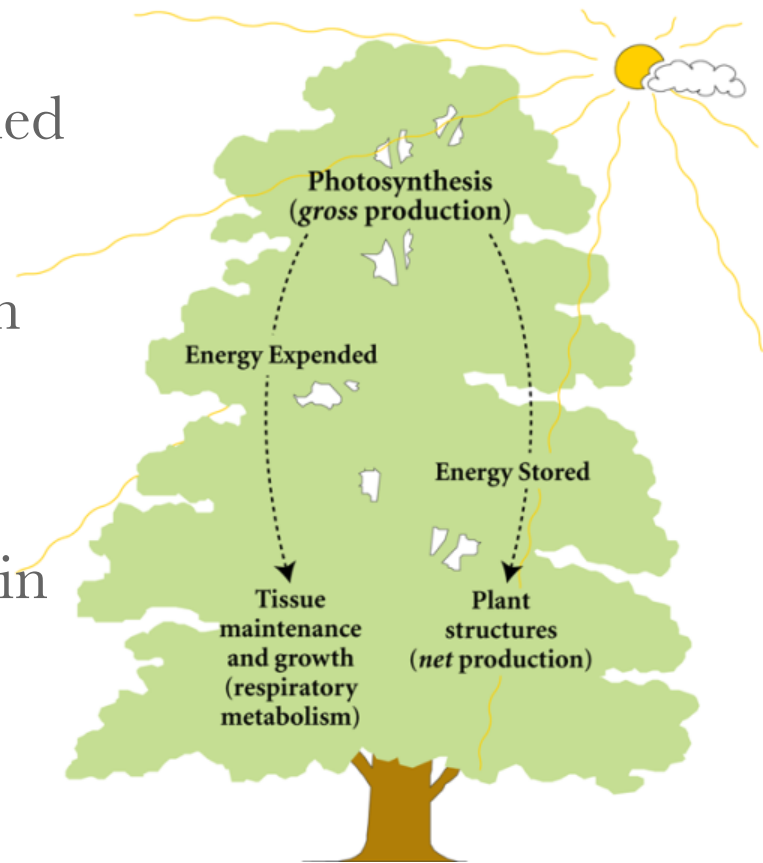


A coastal wetland on Lake Superior, Wisconsin.



Primary Production: Autotrophs

- The process of converting light energy to chemical energy is called photosynthesis.
- Plants use the energy captured in photosynthesis for maintenance and growth.
- The energy that is accumulated in plant biomass is called “net primary production.”



Primary Production: Chemoautotrophs

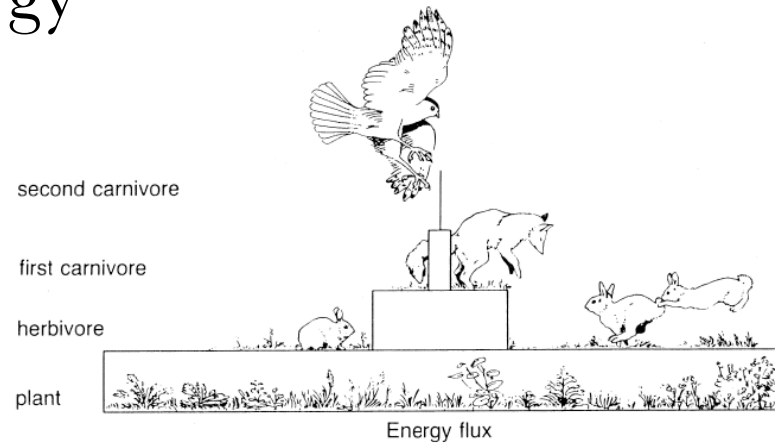
- Chemoautotrophs manufacture their own food through chemosynthesis (the oxidation of inorganic chemical compounds).
- Most are bacteria or archeobacteria that live in hostile environments such as deep sea vents or hot springs and are the primary producers in their ecosystems.
- The sulfur oxidizing bacteria found in deep sea hydrothermal vents and nitrifying bacteria found in the soil are examples.



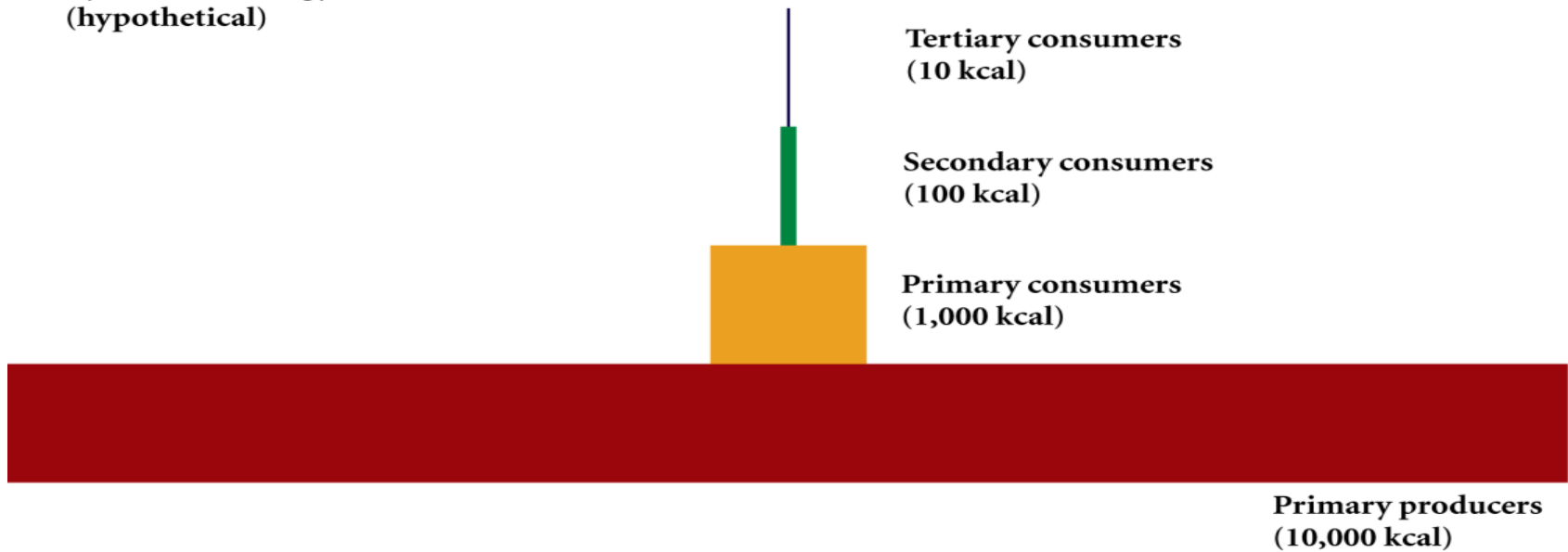
Energy Flow in Ecosystems

- Energy Roles / Trophic Levels
 - Producers (Autotrophs)
 - Consumers (Heterotrophs)
 - herbivores,
 - carnivores (some are scavengers),
 - omnivores
 - Decomposers
- Trophic Levels
 - Ecological Pyramids of Energy
 - Ecological Pyramids of Biomass

Ecological Pyramids of Energy

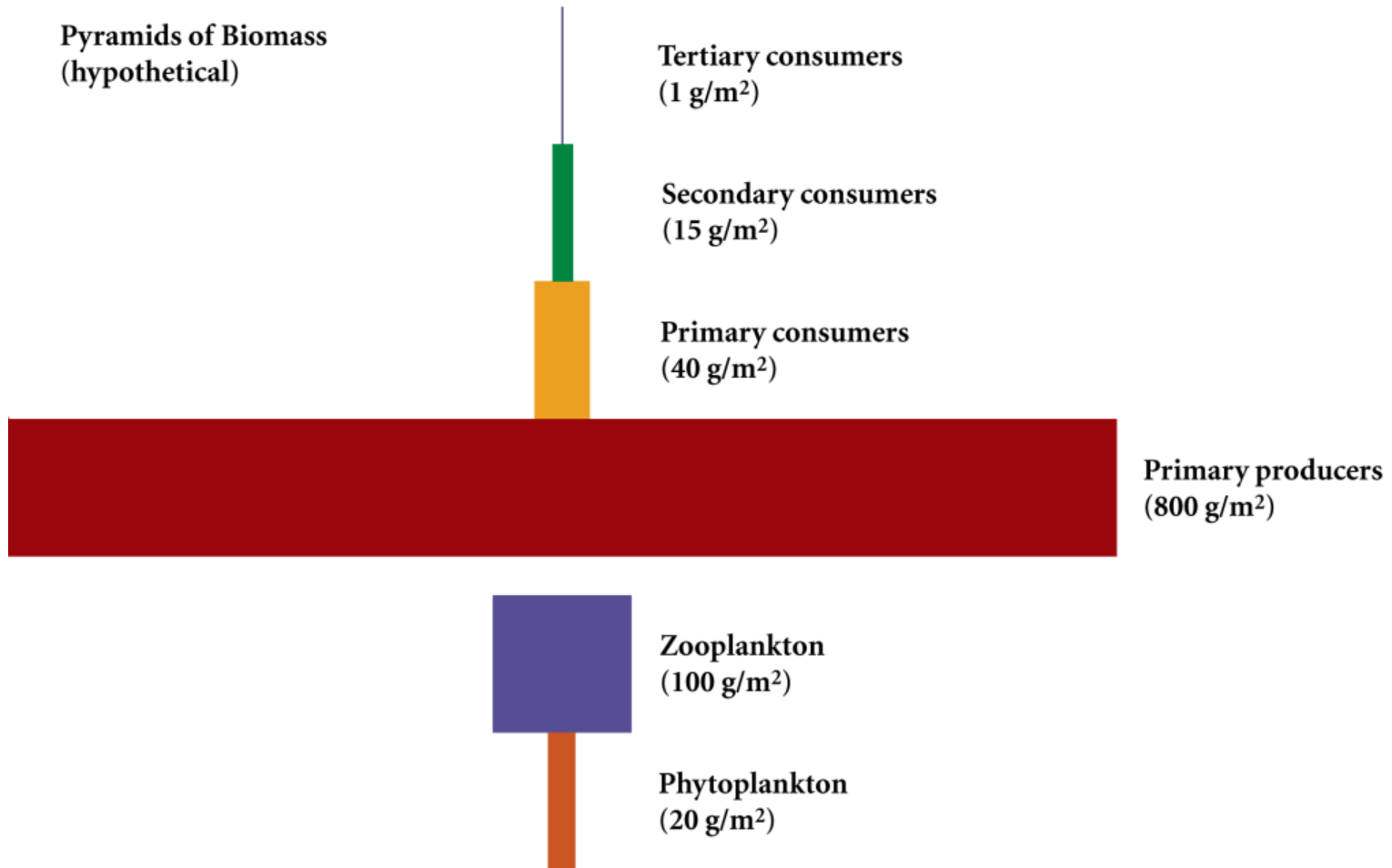


**Pyramid of Energy
(hypothetical)**



Ecological Pyramids of Biomass

Pyramids of Biomass
(hypothetical)



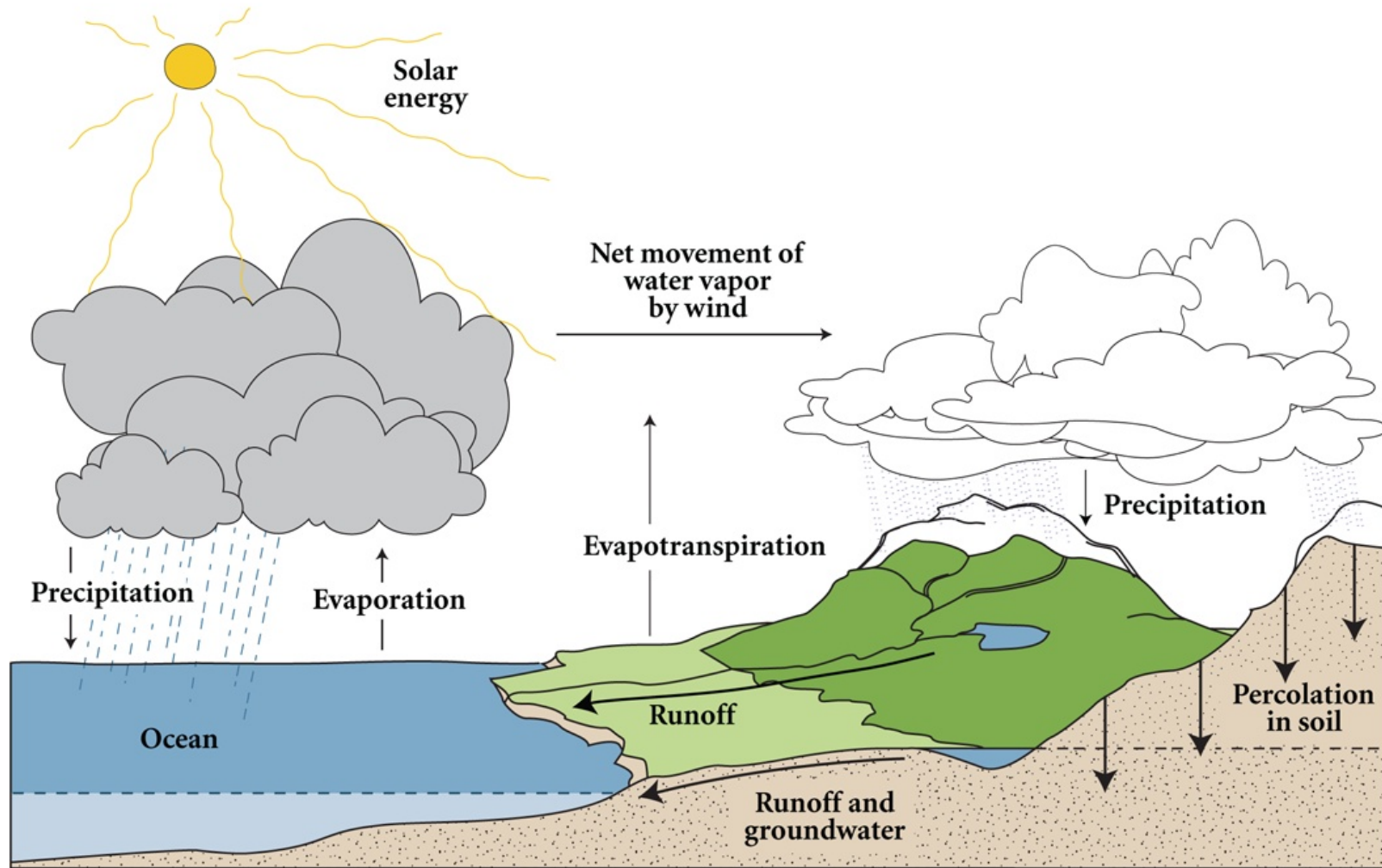
Biogeochemical Cycles

- Cycling of materials between the environment and organisms
- Chemical and biological processes
- Examples
 - Water cycle
 - Nitrogen cycle
 - Phosphorus cycle
 - Carbon cycle

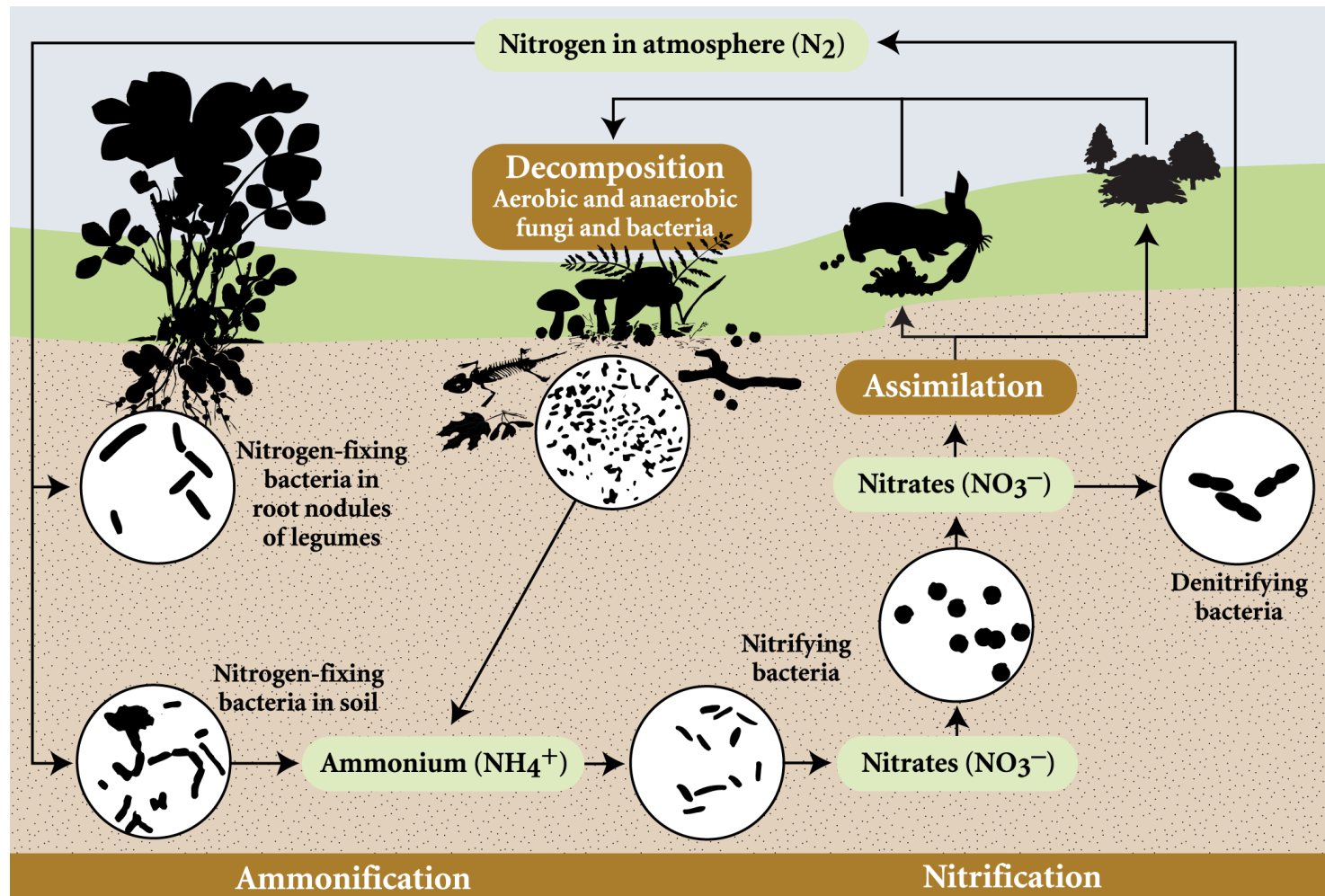


Plants obtain nitrogen from nitrogen-fixing bacteria and pass it to other organisms through the food chain

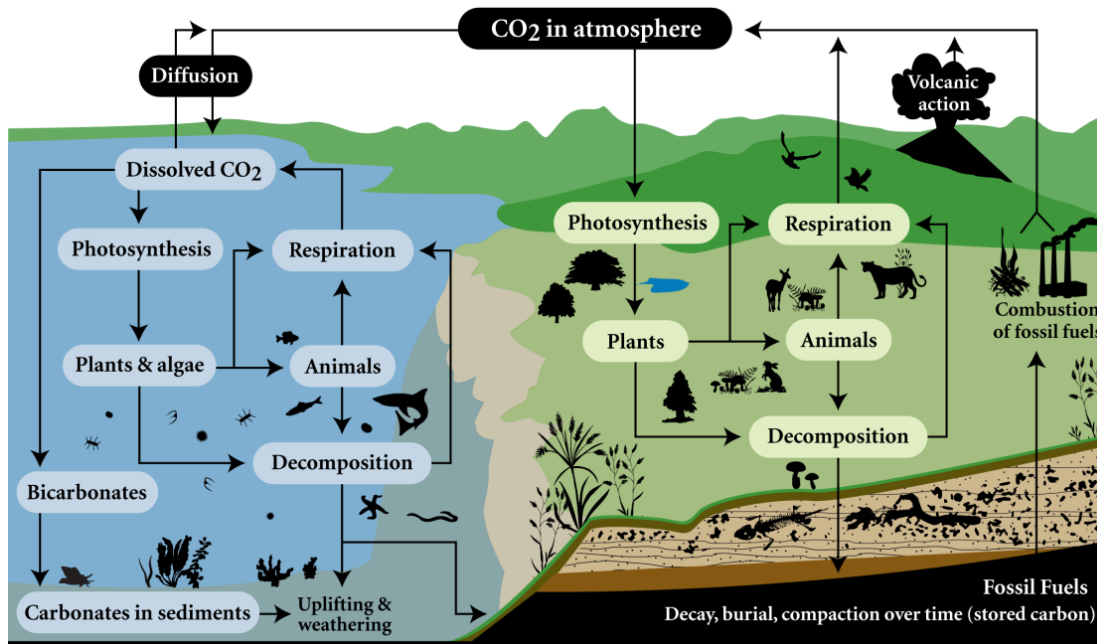
Water Cycle



Nitrogen Cycle



Carbon Cycle



Carbon in the form CO₂ = .03% of atmosphere

Carbon is incorporated into organisms through photosynthesis

Energy is needed to form organic molecules (sunlight or chemical redox)

Carbohydrate (CH₂O) has more electrons than CO₂ – burn with O₂

- burning/decomposing carbohydrates CH₂O → CO₂ + H₂O + energy as heat

- respiration C₆H₁₂O₆ + O₂ → CO₂ + H₂O + energy as ADP

- The movement of carbon, between the atmosphere, oceans, biosphere, and geosphere is described by the carbon cycle.
- several storage pools of carbon (black text) and the processes by which the various pools exchange carbon (purple arrows and numbers).
- If more carbon enters a pool than leaves it, that pool is considered a net carbon sink. If more carbon leaves a pool than enters it, that pool is considered net carbon source.

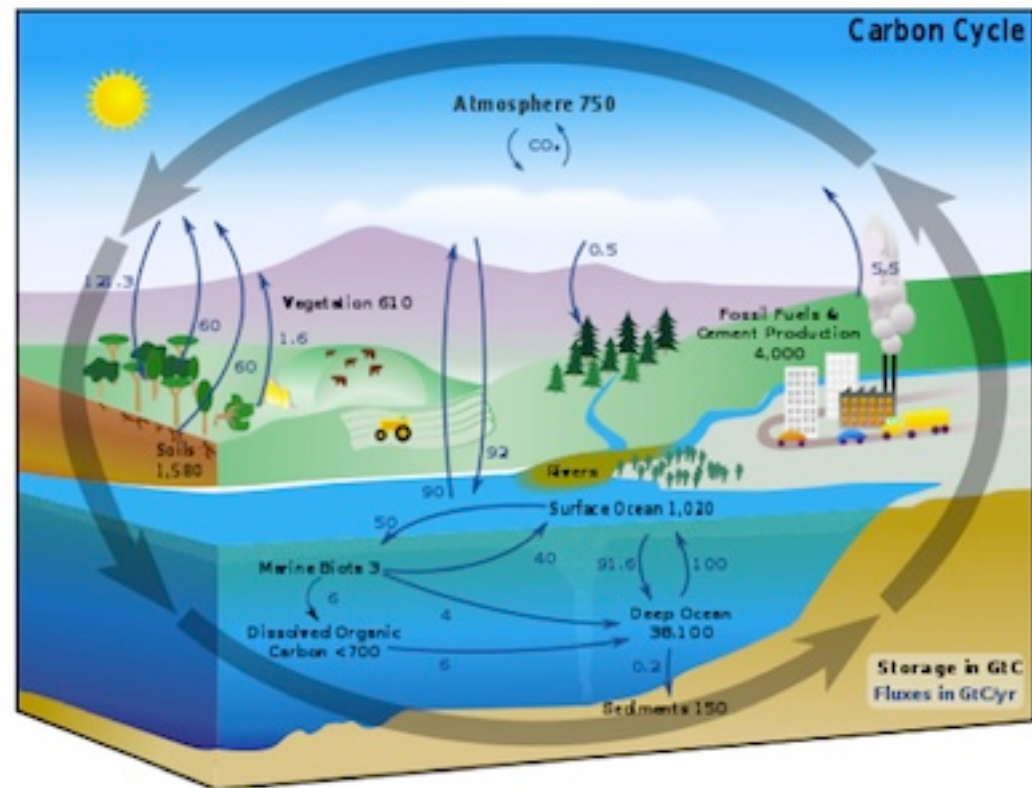
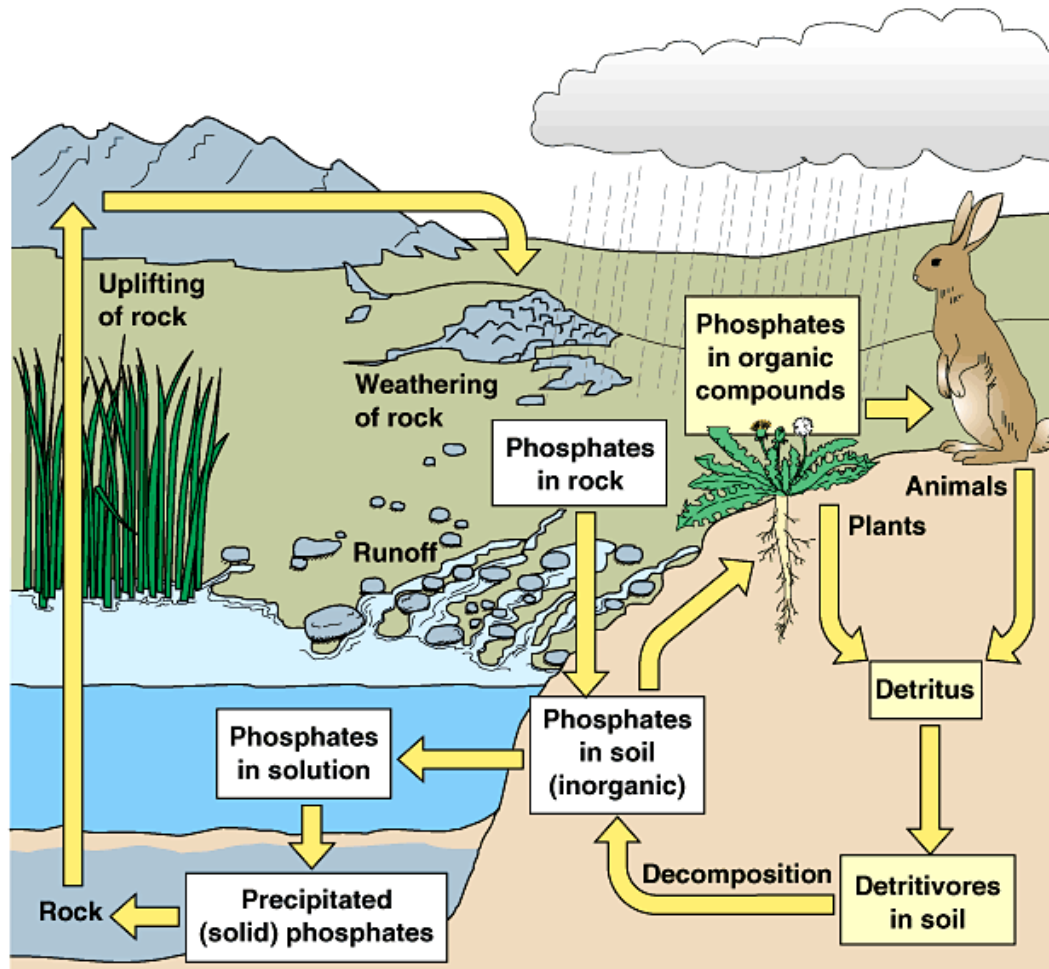


Image courtesy of earthobservatory.nasa.gov

Figure 1: A cartoon of the global carbon cycle. Pools (in black) are gigatons (1Gt = 1×10^9 Tons) of carbon, and fluxes (in purple) are Gt carbon per year.

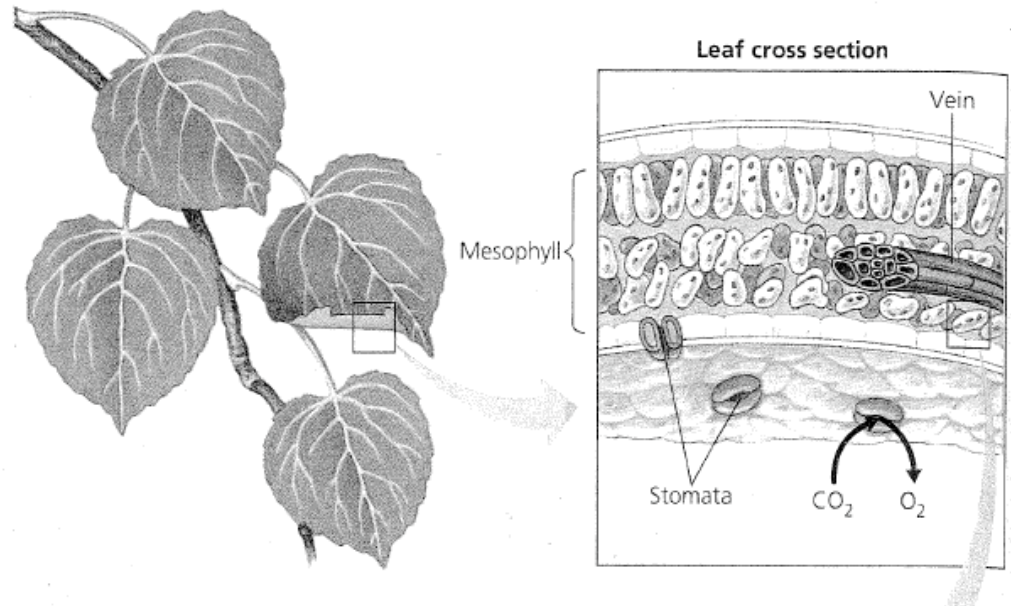
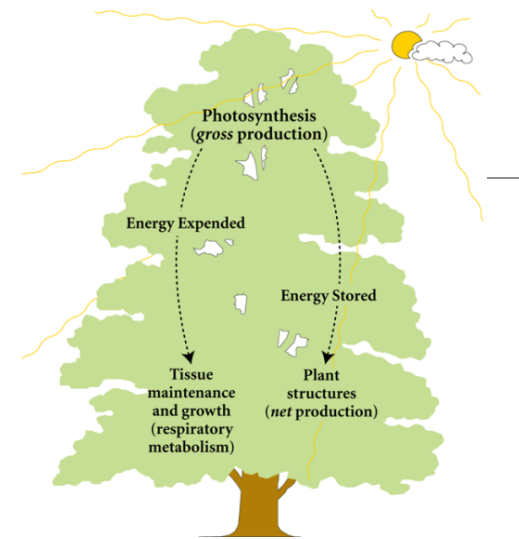
Phosphorus Cycle



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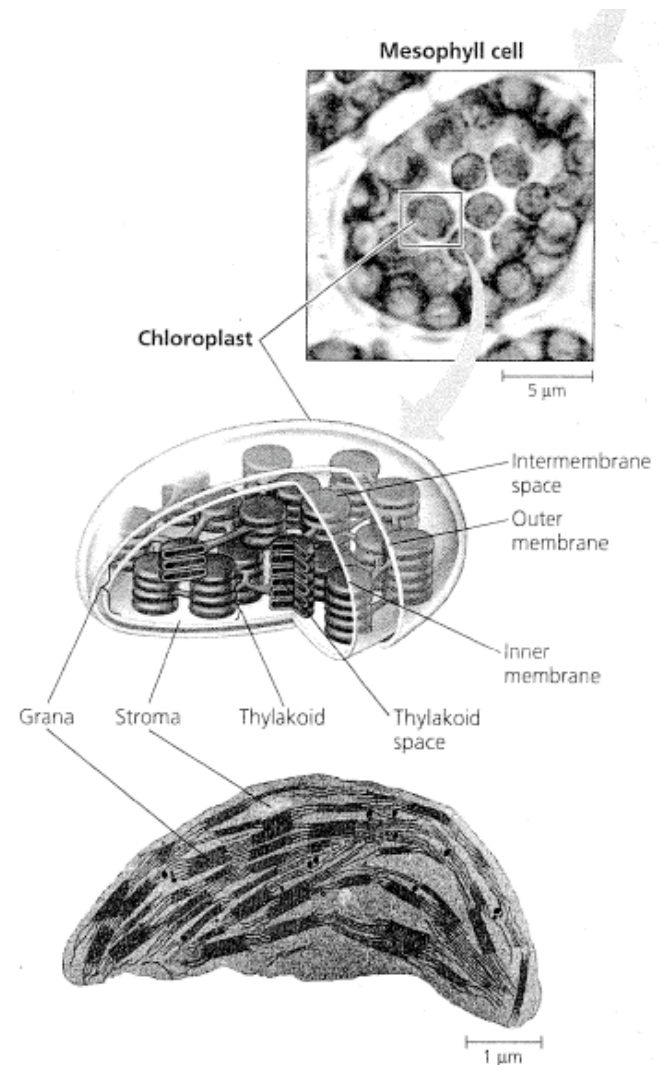
Photosynthesis & Respiration

- The process of converting light energy to chemical energy is called photosynthesis.
- CO_2 enters the **mesophyll** of the leaf through **stomata** (G stoma = mouth). O_2 leaves through the stomata
- The veins carry H_2O in and sugars out.



Photosynthesis

- Cells in the **mesophyll** contain **Chloroplasts**, the organelle where photosynthesis takes place.
- 1/2 million chloroplasts per square millimeter of leaf tissue
- Chlorophyll is the green pigment found in the thylakoid membranes of the chloroplast .
- Light Reactions – Dark reactions (Calvin Cycle)



Respiration

More
to
come