

*In all things there is
a law of cycles.*
- Publius Cornelius Tacitus

TOPICS INCLUDE:

- Biodiversity
- Biogeochemical
Cycles

AP ENVIRONMENTAL SCIENCE



UNIT 2: THE LIVING WORLD (PART B)

II. THE LIVING WORLD (10-15%)

- A. Ecosystem Structure** – biological populations and communities, ecological niches, interactions among species, keystone species, species diversity and edge effects, major terrestrial and aquatic biomes
- B. Energy Flow** – photosynthesis and cellular respiration, food webs and trophic levels and ecological pyramids
- C. Ecosystem Diversity** – biodiversity, natural selection, evolution, and ecosystem services
- D. Natural Ecosystem Change** – climate shifts, species movement and ecological succession
- E. Natural Biogeochemical Cycles** – carbon, nitrogen, phosphorus, sulfur, water, and conservation of matter

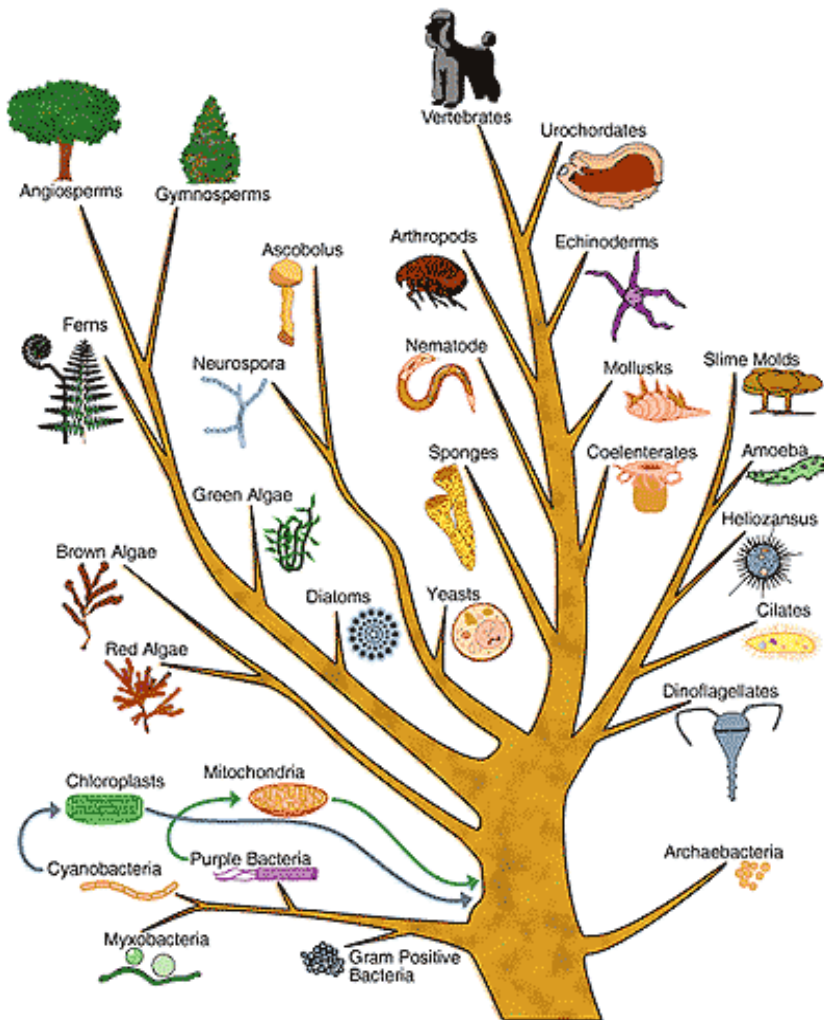


ECOSYSTEM DIVERSITY

- biodiversity: number & variety of organisms found within an ecosystem

DIVERSITY INCREASERS	DIVERSITY DECREASERS
Diverse habitats	Environmental stress
Disturbance in the habitat (e.g. fire, storms)	Extreme environments
Environmental conditions w/low variation	Extreme limitations in the supply of a fundamental resource
Trophic levels w/high diversity	Extreme amounts of disturbance
Middle states of succession	Introduction of species from other areas
Evolution	Geographic isolation

EVOLUTION

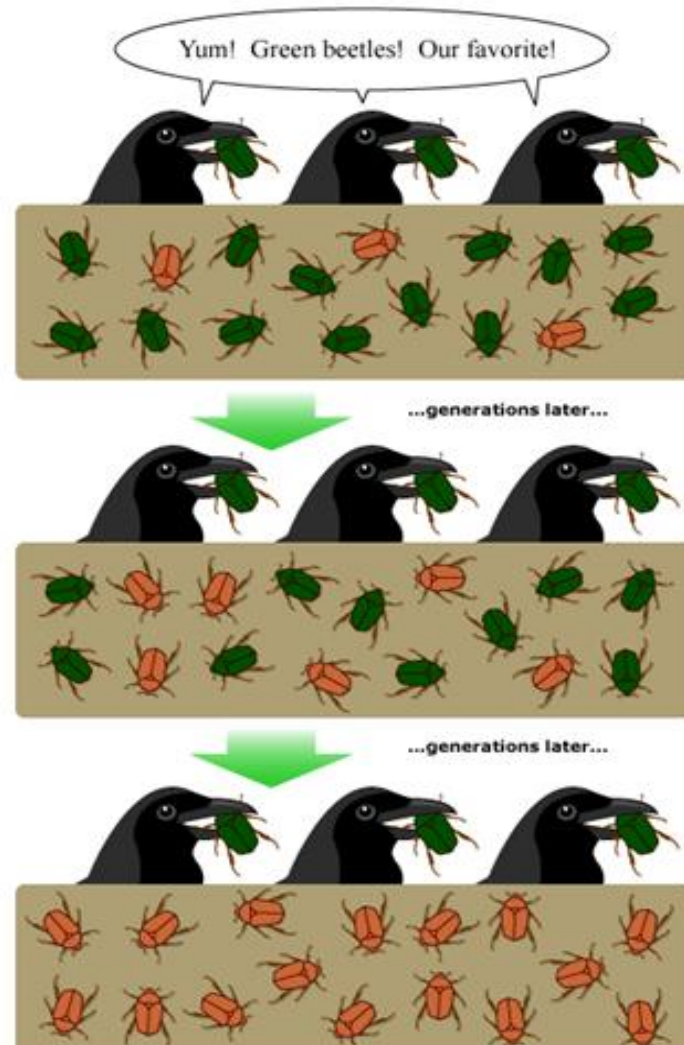


- change in the genetic composition of a population during successive generations as a result of natural selection acting on the genetic variation among individuals and resulting in the development of new species

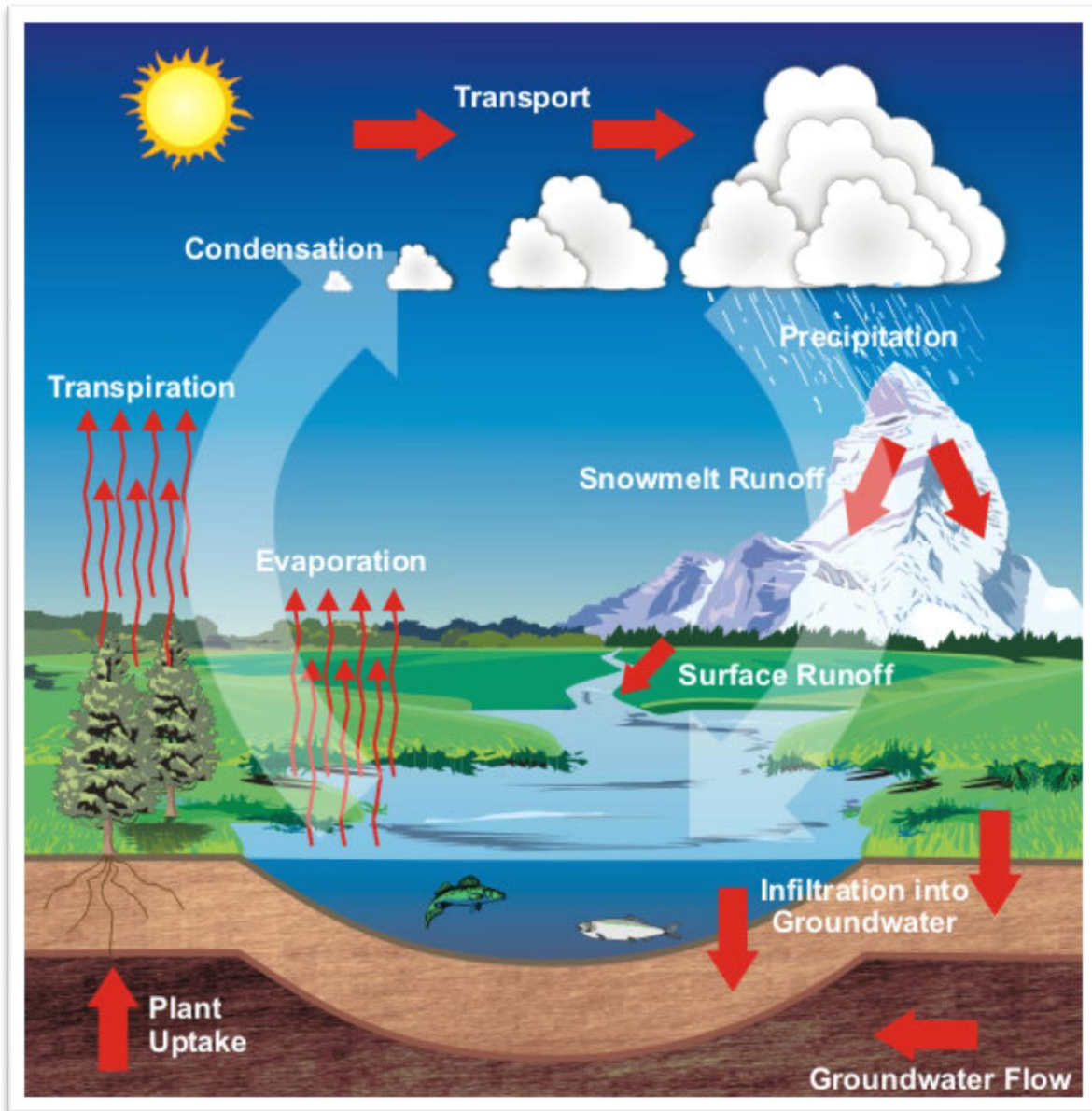
NATURAL SELECTION

- mechanism how organisms evolve
- works on the individual by determining which individuals have adaptations that allow them to survive, reproduce and pass on those adaptive traits to their offspring
- survival of the “fittest”; fittest means ability to reproduce and pass on genes to offspring

Natural selection, in a nutshell:

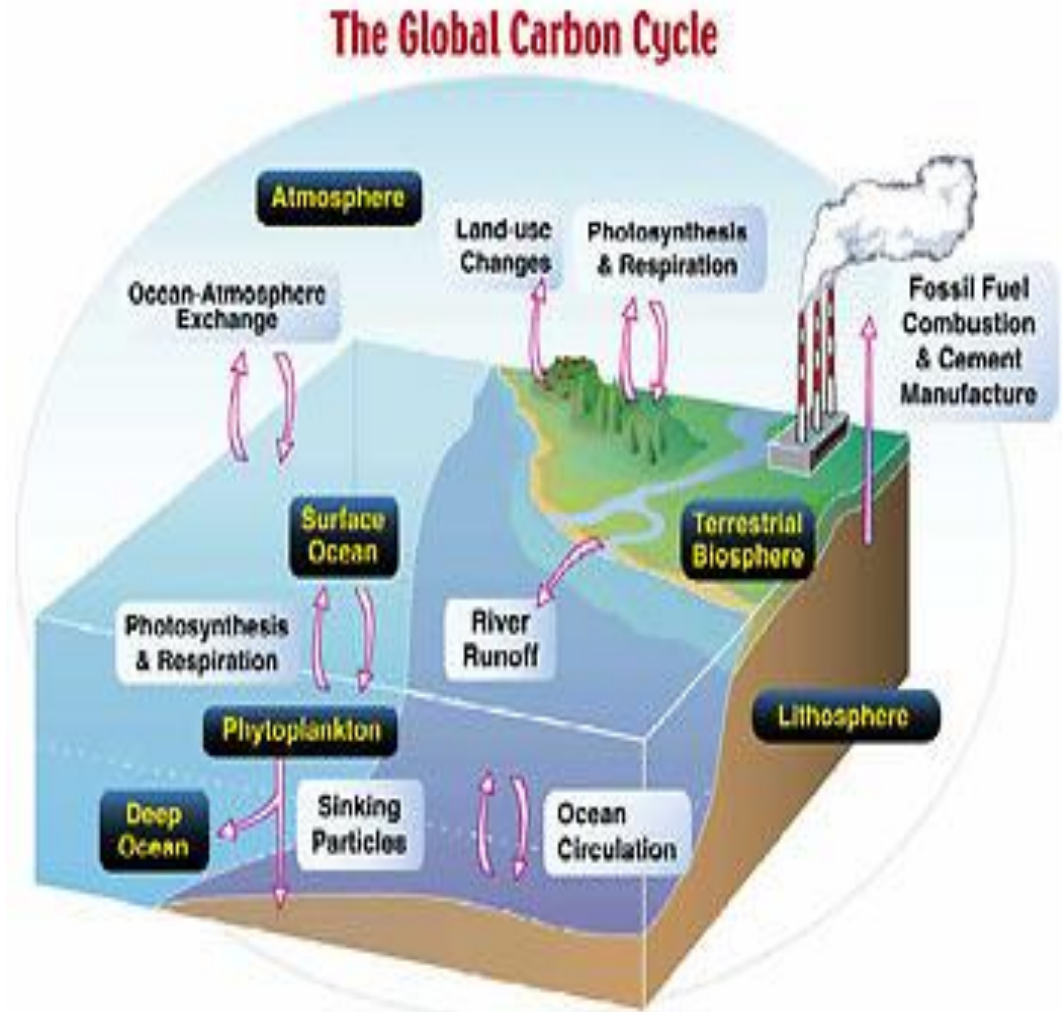


WATER CYCLE



CARBON CYCLE

- ◉ key events: photosynthesis & respiration (living things are exchange pools for carbon)
- ◉ organisms die get buried and subjected to extreme heat & pressure → organic matter converts to oil, gas and coal (fossil fuels)
- ◉ carbon reservoirs: oceans (CO_2 soluble in water) & earth's rocks (calcium carbonate)



NITROGEN CYCLE

○ STEP 1: NITROGEN FIXATION

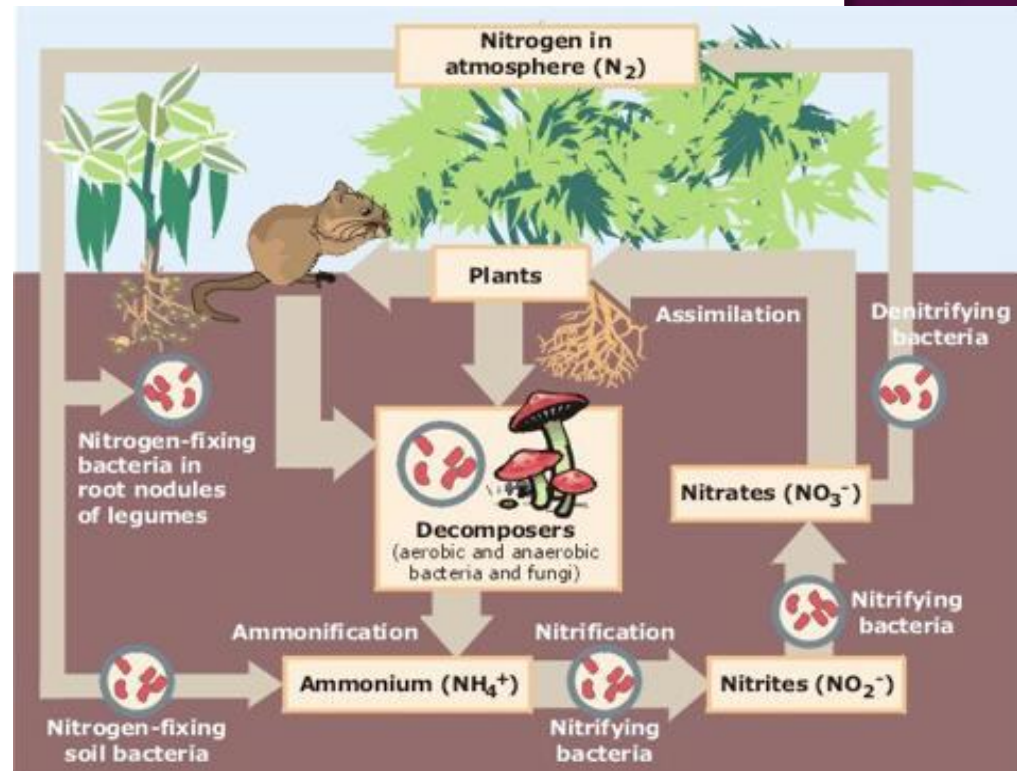
- Nitrogen must be converted (fixed) into ammonia (NH_3) or nitrates (NO_3^-) to be used by living organisms
- Occurs as result of *Rhizobium* (soil bacteria) found in roots of legumes (beans/clover) and/or atmospheric effects (lightning)

○ STEP 2: NITRIFICATION

- Soil bacteria converts ammonium ions (NH_4^+) into one of the forms used by plants; nitrate (NO_3^-)

○ STEP 3: ASSIMILATION

- plants absorb ammonium (NH_3) ammonium ions (NH_4^+) & nitrate ions (NO_3^-) through their roots (heterotrophs obtain N by consuming plants)



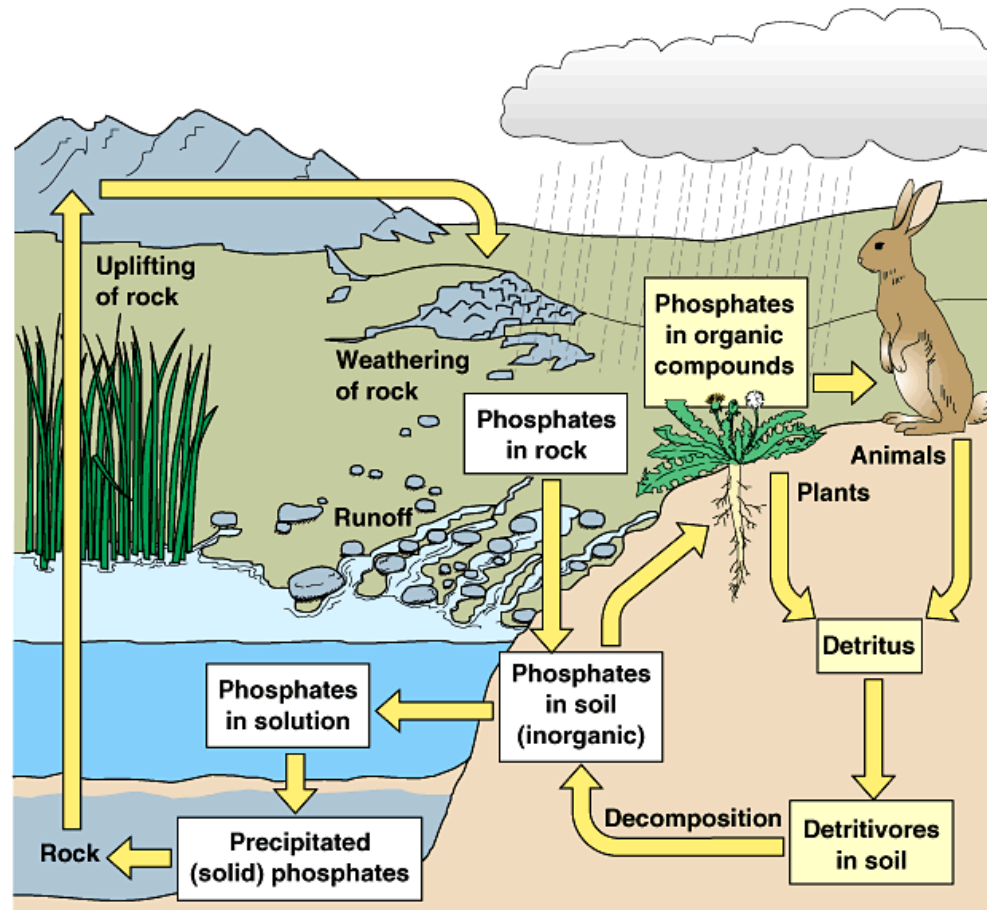
○ STEP 4: AMMONIFICATION

- decomposing bacteria convert dead organisms & other waste to ammonia (NH_3) or ammonium ions (NH_4^+) (reused by plants)

○ STEP 5: DENITRIFICATION

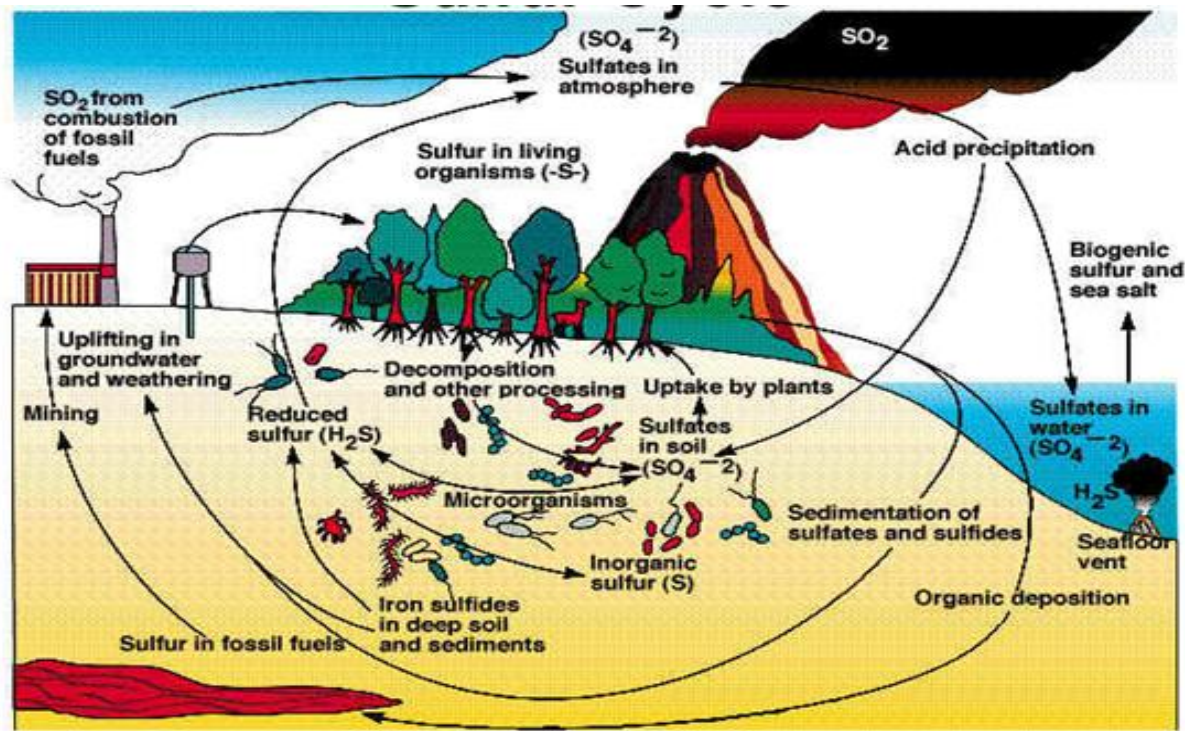
- specialized bacteria convert ammonia to NO_3^- , NO_2^- , and N_2 (release it back to atmosphere)

PHOSPHORUS CYCLE



- only exists in atmosphere as dust particles
- P is major component of nucleic acids
- found in soil, rock & sediments (released through weathering)
- released in the form of phosphate (PO_4^{3-}); soluble and absorbed through soil by plants
- often limiting factor in plant growth

SULFUR CYCLE



- makes up proteins and vitamins
- plants absorb S when dissolved in water; animals obtain it by consuming plants
- most found in rocks & salts or buried in ocean sediment
- enters atmosphere through volcanic eruptions, bacterial functions, decay of organisms, human activity