

Soil & Cycles

Soil: made up of minerals, organic matter, water, and air; It is a RENEWABLE resource, but it takes a LONG TIME to form (result of climate, organisms, precip., and bedrock material).

Clay: Smallest particles (HIGH porosity, LOW permeability/percolation)

Silt: Medium Size Particles

Sand: Largest particle (LOW porosity, HIGH permeability/percolation)

Soil Quality:

-Acidity and Alkalinity

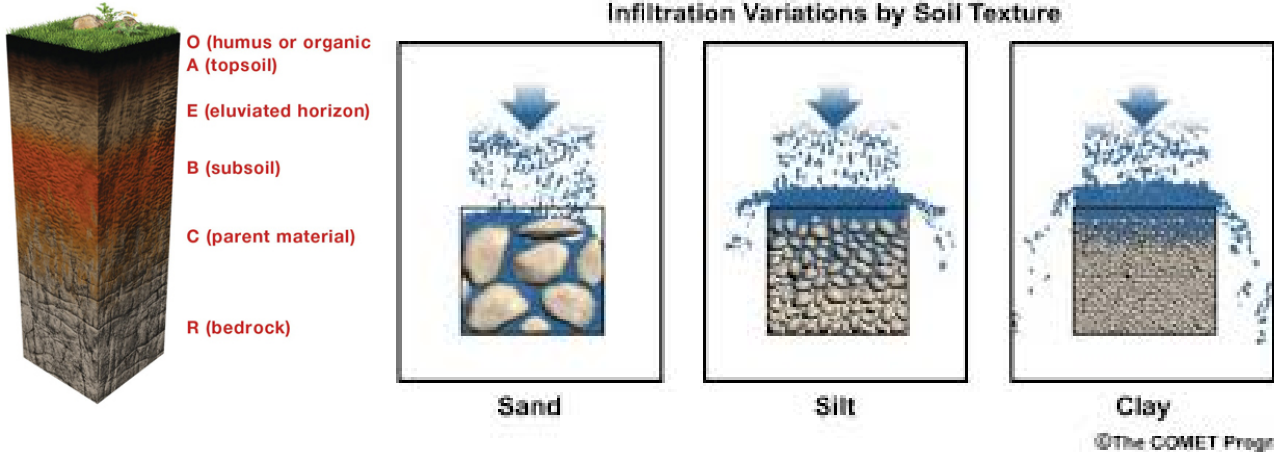
-affects solubility of nutrients... which determines what nutrients are available for plant growth!

-low pH: ions of heavy metals (Hg and Al) leach out... bad for plants/aquatic life! Cause: Acid Rain!

-Carbonates (CO₃) are a natural buffer against acids!... LIMESTONE

-N, P, K: essential nutrients needed for plant growth

-Color: Dark brown/black = lots of nutrients; Red/Yellow = low nutrients



Soil Layers:

-O horizon: upper organic layer... plant litter, decaying organic matter

-A horizon: TOPSOIL, HUMUS (organic material...nutrients!)

-E horizon: layer leached of clay, iron, and aluminum

-B horizon: where all the leached minerals end up... ZONE OF ILLUVIATION

-C horizon: larger pieces of rock

-Bedrock

Soil Classes:

-Mollisols: FERTILE, lots of humus, in temperate grasslands

-Oxisols: NOT fertile (nutrients are trapped in plants), tropical rainforests

-Alfisols: pretty fertile, moist temperate forests

-Aridisols: deserts.... Susceptible to salinization

Soil Problems:

-Monocultures: planting on ONE crop... depletes the soil of specific nutrients, more susceptible to pests/disease

-Solution: crop rotation, intercropping, polycultures

-Salinization: when soil becomes water-logged and dries out....salt is left over

-Solution: Drip Irrigation

-Erosion: removes valuable topsoil (usually from slash and burn agriculture, deforestation, overgrazing, urbanization)

-Solution: Conservation tillage

Soil Conservation:

-use organic wastes/fertilizer

-intercropping

-contour plowing and strip planting

-planting trees and other wind barriers to reduce wind (alley cropping)

-conservation tillage

Cycles

Water:

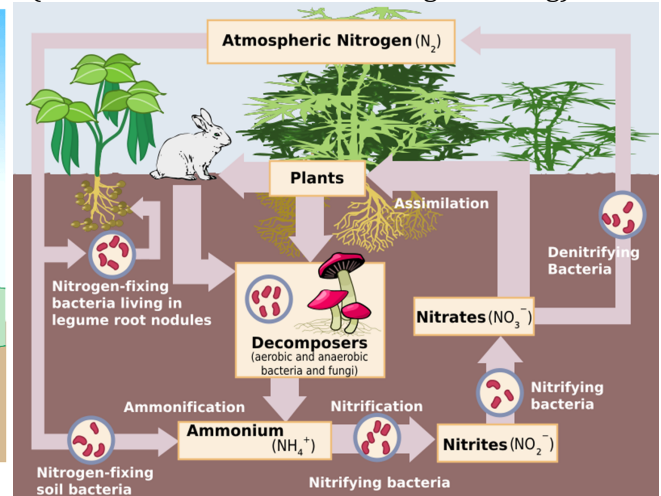
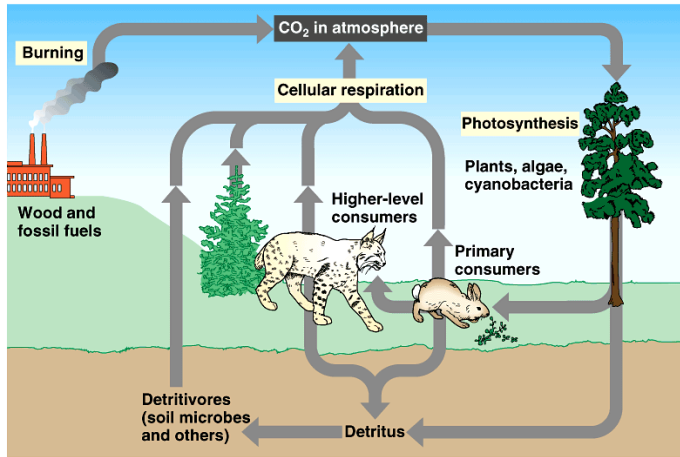
Reservoirs: Atmosphere, Oceans

- Precipitation → runoff into rivers/bodies of water OR infiltration into groundwater
- Evaporation & Condensation in clouds (reservoir)
- Evapotranspiration: plants releasing water into the atmosphere

Carbon: energy source!

Reservoirs: ocean, rocks, fossil fuels, atmosphere

-Key events: photosynthesis and respiration, fossils fuels (formation of and release through burning)



Nitrogen: needed for proteins and nucleic acids

Reservoirs: Atmosphere (N₂ ← living things can't use!) Plants/decomposers, soil

1) NITROGEN FIXATION (bacteria/legumes): N₂ → NH₃ and NH₄⁺

2) NITRIFICATION (bacteria): NH₄ → NO₂⁻ → NO₃⁻

3) ASSIMILATION: plants absorb NO₃⁻... nitrogen is now passed up the food chain!

4) AMMONIFICATION: plants/animals die and NH₄⁺ returns to the soil. living things die and decomposers convert the nitrogen found in the wastes and dead organisms back into ammonia. It can then go back through Nitrification, OR...

5) DENITRIFICATION (bacteria): NO₃⁻ → N₂ returns to atmosphere

Phosphorus: needed for nucleic acids

Reservoirs: Rocks!, organisms, fertilizer, soil, guano, NOT IN ATMOSPHERE

Sulfur: needed for proteins

Reservoirs: Rocks, Ocean sediments, decaying matter, volcanoes, atmosphere

