

BIOGEOCHEMICAL CYCLES- COMPARISON CHART

CYCLE	Why important?	Compartments? Sphere/form of nutrient/location /time frame	Flows/Processes	Additional Interesting Notes
Water	Fresh water, land use decisions, Water pollution	Lithosphere: liquid, above surface (fast), surface soils (rel. fast), deep in ground (slow, many years) Biosphere: plants, animals liquid Hydrosphere: mostly liquid (fast/slow/really slow – streams/groundwater/glaciers) Atmosphere: rel. fast precipitation	Evaporation/Transpiration Condensation/Precip. Run-off Infiltration Percolation (Absorption)	Some purification, some contamination Evapotranspiration Leaching Erosion
Carbon	C bonds=energy! organic molecules, Climate change	Bios: biomass, energy (fast) structure (slow) Atm: CO ₂ , CH ₄ (medium) important! Lithosphere: CaCO ₃ limestone (very slow) Hydrosphere: equilibrium with ocean, biomass/structure	Respiration/Photosyn Weathering, run-off Shell, rock, fuel formation Combustion, volcanoes, dissolution Sedimentation/lithification	Climate “thermostat” Sinks/sources Ocean acidification
Nitrogen	Nutrient, amino acids/ proteins/nucleic acids eutrophication	Atmosphere (main): N ₂ stable Bios: absorb into tissues, amino acids (medium) Lithosphere: NH ₃ /NH ₄ ⁺ →NO ₂ toxic→NO ₃ ⁻ (medium) Hydrosphere: run-off (short-term)	Nitrogen fixation (N ₂ to NH ₃ /NH ₄ ⁺) Nitrification (NO ₂ ⁻ /NO ₃ ⁻) Assimilation (uptake by plants/animals) Ammonification (decomp) Denitrification (to N ₂)	Lots of types of bacteria!
Sulfur	Acid rain, extreme environments	Lithosphere: (main) – gypsum, pyrite (in coal) Atmosphere: SO ₂ , H ₂ S from volcanoes, SO ₂ , SO ₄ ⁻² from combustion (fast/med), DMS Bios: less significant assim (some proteins), decomposition, some deposition on plants Hydro: SO ₄ ⁻² , forms DMS, spray	Combustion of coal Volcanoes, vents Wet/dry deposition Assimilation, Decomp. Weathering/run-off Sedimentation/lithification	More regional than global, DMS condensation nuclei, smell
Phosphorous	Often limiting nutrient, DNA, ATP Cell membranes, Eutrophication	Lithosphere: (main) – P, PO ₄ ⁻³ (slow unless mined) Bios: absorbs PO ₄ ⁻³ (medium) Hydrosphere: some in solution, sediments (slow)	Assimilation, Decomp. Weathering Leaching/run-off to rivers, to ocean. Mining, fertilizing	Upwelling → guano No atmospheric component