Biogoechemical Cycles

I.) Carbon Cycle
- A.)Controls CO2 in Atmosphere
- B.) Marine Carbon Cycle
  - Photosynthesis--Respiration
  - Air-Sea Exchange
  - Carbonate System
  - $CO_2 \rightarrow HCO_3^- \rightarrow CO_3^{2-}$
  - Burial of Organic Carbon
- C.) Terrestrial Carbon Cycle
  - Photosynthesis—Respiration
  - Weathering of carbonates, kerogen
- D.) Human Impacts
  - Deforestation
  - Combustion of Fossil Fuels

II.) Nitrogen Cycle
- A.) Introduction
  - Mostly N_2 in atmosphere
  - Need to convert to usable nitrogen (nitrification)
  - Bacteria—nitrifiers
  - Fertilizer production
  - Cars
- B.) Marine
  - Surface waters stratified so limiting to photosynthesis
  - Rapid recycling
  - Upwelling
- C.) Terrestrial
  - Trapped in soils, recycled
  - Source are nitrifying bacteria (legumes), cars, fertilizer
- D.) Human Impact
  - Doubling N to coastal waters

III.) Phosphorus
- A.) No life in atmosphere
- B.) Phosphate minerals, sediments
- C.) Phosphate mining
- D.) Limiting in lakes—detergents, eutrophication

IV.) Sulfur
- A.) Needed in proteins
- B.) Different forms (H2S reduced, SOx oxidized gas, SO4-- in water
- C.) Acid Rain
- D.) Sulfate aerosols