Aim: How is nitrogen cycled through the ecosphere?

a. Atmospheric Nitrogen (N_{2(g)}) (78% of troposphere) 2. Nitrogen Fixation (organic) -1. Nitrogen bacteria convert N _{2(g)} to ammonia (NH₃) $N_2 + 3H_2 \rightarrow 2NH_3$ **Fixation** (inorganic) cyanobacteria (in soil and water) rhizobium bacteria living in nodules of root systems of legumes (ex. soybeans) - lightning causes N_2 gas to combine with oxygen to b. form nitrates (NO₃⁻) that fall with the Ammonia (NH₃) and rain Ammonium (NH₄⁺)ions 3. Nitrification - aerobic bacteria convert **Denitrification** ammonia to nitrites (NO₂) which are toxic anaerobic bacteria (mainly in water-logged soils) break down nitrates (NO₃) to N₂ and N₂O (nitrous oxide) Nitrites (NO₂) gases 4. Nitrification - other bacteria convert nitrites to nitrates (NO₃) which are absorbed by plants d. Nitrates (NO₃⁻) 5. <u>Assimilation</u> - plants make DNA, amino acids, and proteins after roots absorb nitrates, ammonia, and ammonium ions 6. Ammonification - decomposers (fungi & bacteria) convert dead bodies and wastes of plants and animals back into NH₃ and NH₄⁺

HUMAN EFFECTS ON THE NITROGEN CYCLE

1. burning fossil fuels

- a. emission of nitrous oxide (N₂O) a greenhouse gas
- b. creates nitric acid (HNO₃) which contributes to acid rain that damages trees, aquatic systems, and metal & stone structures

2. agricultural practices

- a. use of nitrogen-rich synthetic/chemical fertilizers
- b. livestock waste solids and liquids are rich in nitrogen (and phosphorus) and more N_2O gas is produced
- c. cultivating nitrogen-fixing crops (or interplanting of legumes)
- d. accelerates **Eutrophication** the natural nutrient-enrichment of a body of water

oligotrophic – nutrient-poor mesotrophic – transitioning stage eutrophic – nutrient-rich

leads to ... Cultural or Artificial Eutrophication

agricultural / urban runoff from human activities adds excess nitrogen (and phosphorus) to aquatic ecosystems