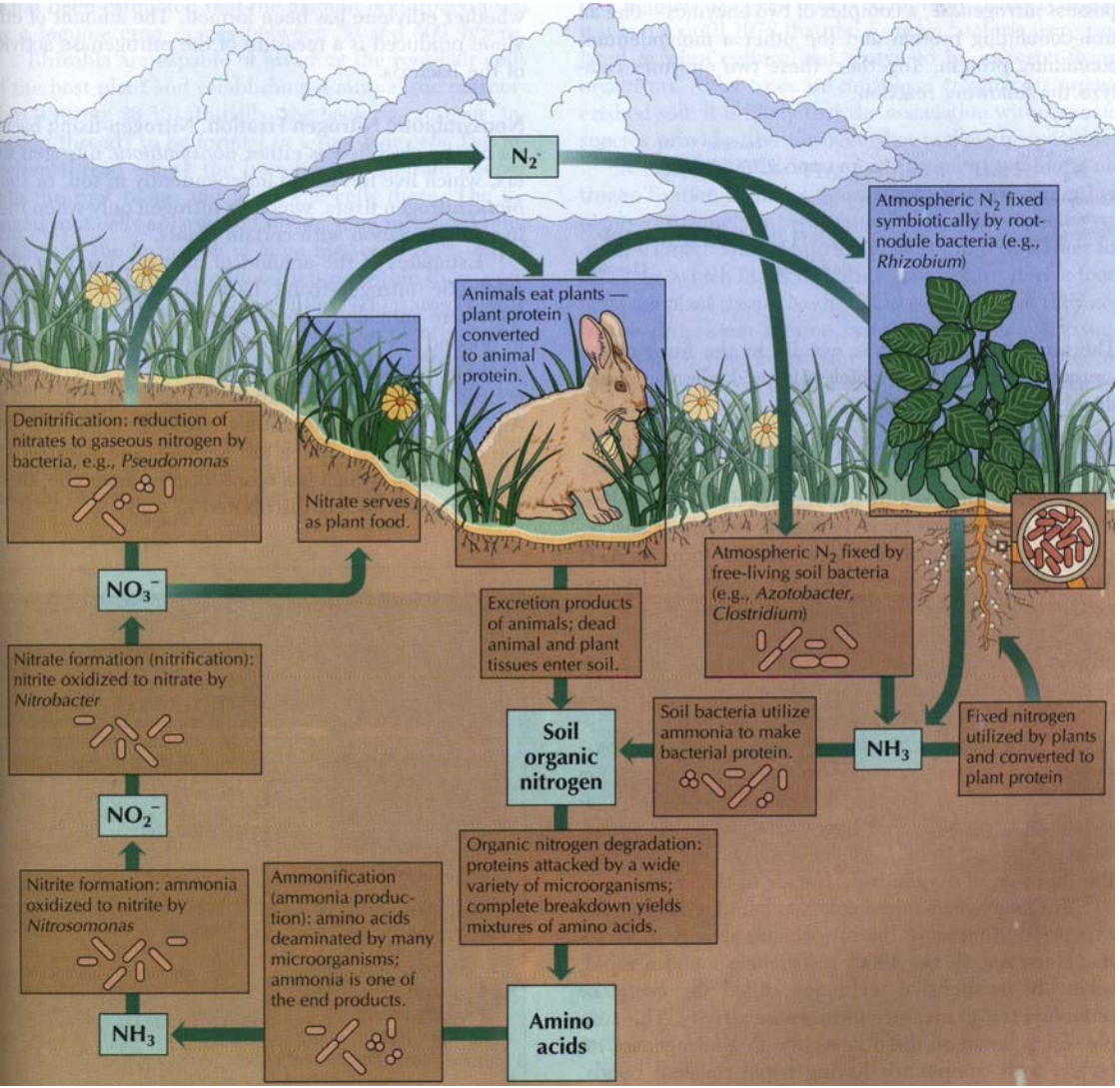
N_2
Atmospheric N_2 fixed symbiotically by root-nodule bacteria (e.g., *Rhizobium*)
Animals eat plants — plant protein converted to animal protein.
Denitrification: reduction of nitrates to gaseous nitrogen by bacteria, e.g., *Pseudomonas*
Nitrate serves as plant food.
NO_3^-
Atmospheric N_2 fixed by free-living soil bacteria (e.g., *Azotobacter, Clostridium*)
Excretion products of animals; dead animal and plant tissues enter soil.
Nitrate formation (nitrification): nitrite oxidized to nitrate by *Nitrobacter*
Soil organic nitrogen
Soil bacteria utilize ammonia to make bacterial protein.
NH_3
Fixed nitrogen utilized by plants and converted to plant protein
NO_2^-
Organic nitrogen degradation: proteins attacked by a wide variety of microorganisms; complete breakdown yields mixtures of amino acids.
Nitrite formation: ammonia oxidized to nitrite by *Nitrosomonas*
Ammonification (ammonia production): amino acids deaminated by many microorganisms; ammonia is one of the end products.
NH_3
Amino acids