

The Nitrogen Cycle

Nitrogen is essential to living things for the production of amino acids used to synthesize proteins, and nucleic acids which are used to carry the hereditary or genetic code. Life cannot occur without these compounds. Even though the atmosphere is about 78% nitrogen gas, plants and animals are unable to use nitrogen gas directly as a source of nitrogen to make organic nitrogen compounds.

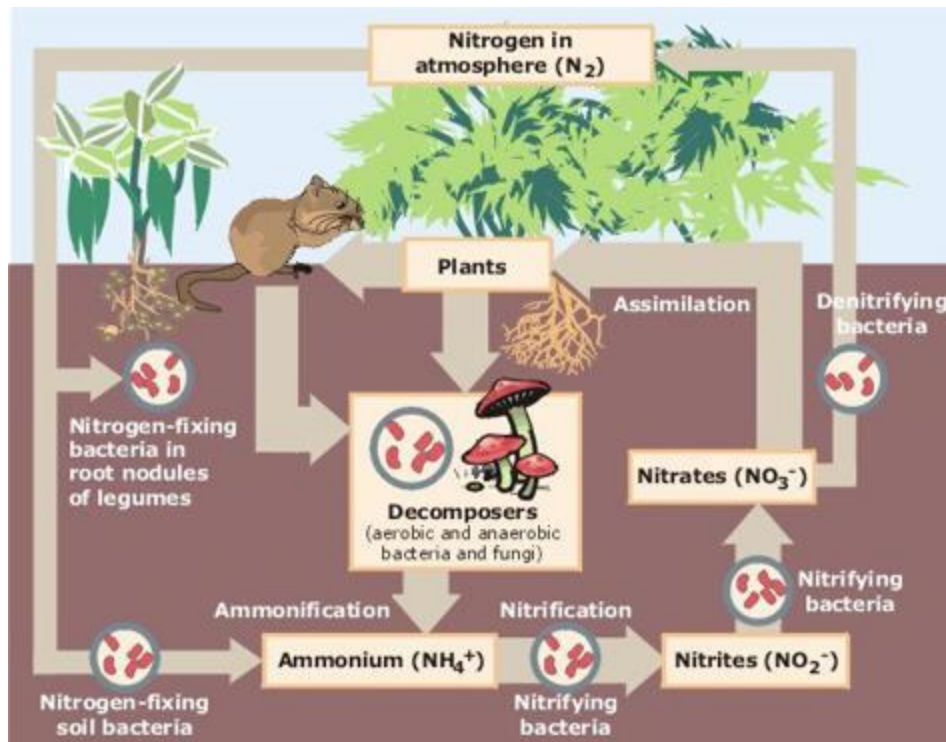
In order for plants to make use of nitrogen it must first be converted into nitrates. Some plants can make use of ammonium ions (NH_4^+) but these types of plants are relatively rare. The vast majority of plants must obtain their nitrogen in the form of nitrate ions (NO_3^-) dissolved in soil water.

The nitrogen cycle can occur in both terrestrial and aquatic ecosystems but this lesson will focus on the nitrogen cycle of terrestrial ecosystems. The nitrogen cycle is an extremely complex cycle involving many species of bacteria. The nitrogen cycle however can be simplified into 4 steps:

1. Nitrogen fixation – there are two ways nitrogen fixation can happen:
 - The first is nitrogen fixation by lightning which produces nitrates directly.
 - The second is nitrogen fixation by bacteria that live in the small lumps, called nodules on the roots of legumes (clover, peas, lupines) These bacteria enable the plants they live on to get their nitrates directly.
2. Ammonification – Waste materials from animals or dead plants and animals are decomposed by bacteria that take the nitrogen compounds that were in living things and break them down into ammonia (NH_3)
3. Nitrification – Other bacteria that take ammonia (NH_3) and convert it into nitrates (NO_3^-) for use by the plants.
4. Denitrification – Any nitrates that not used by the plants are changed back into nitrogen for release into the atmosphere by the another group of bacteria called denitrifying bacteria

Humans interfere with the natural cycling of nitrogen by using artificial fertilizers. Nitrates in fertilizers are used extensively in agriculture and extra fertilizer runs off into water supplies. The extra fertilizer causes aquatic plants called algae to grow rapidly. When they die, they are broken down by

decomposers who often use up all the oxygen in the water and this causes fish to die.



Human Interference

As a result of human activities and their technology, the dynamics of most ecosystems has been either totally destroyed or have had major components (trophic structure, energy flow, chemical cycling) disrupted. Most of the effects are local or regional (agricultural effects on nutrient cycling, accelerated eutrophication of freshwater systems, introduction of toxic compounds in food chains, etc), but some (acid rain, greenhouse effect, ozone depletion, etc) are of global scale.

Human activities (introduction of exotic species, habitat destruction, etc) are altering the distribution of species and reducing biodiversity (biodiversity crisis).

