

SGI Ecology: Activity 8 • Living on Earth

The Nitrogen Cycle

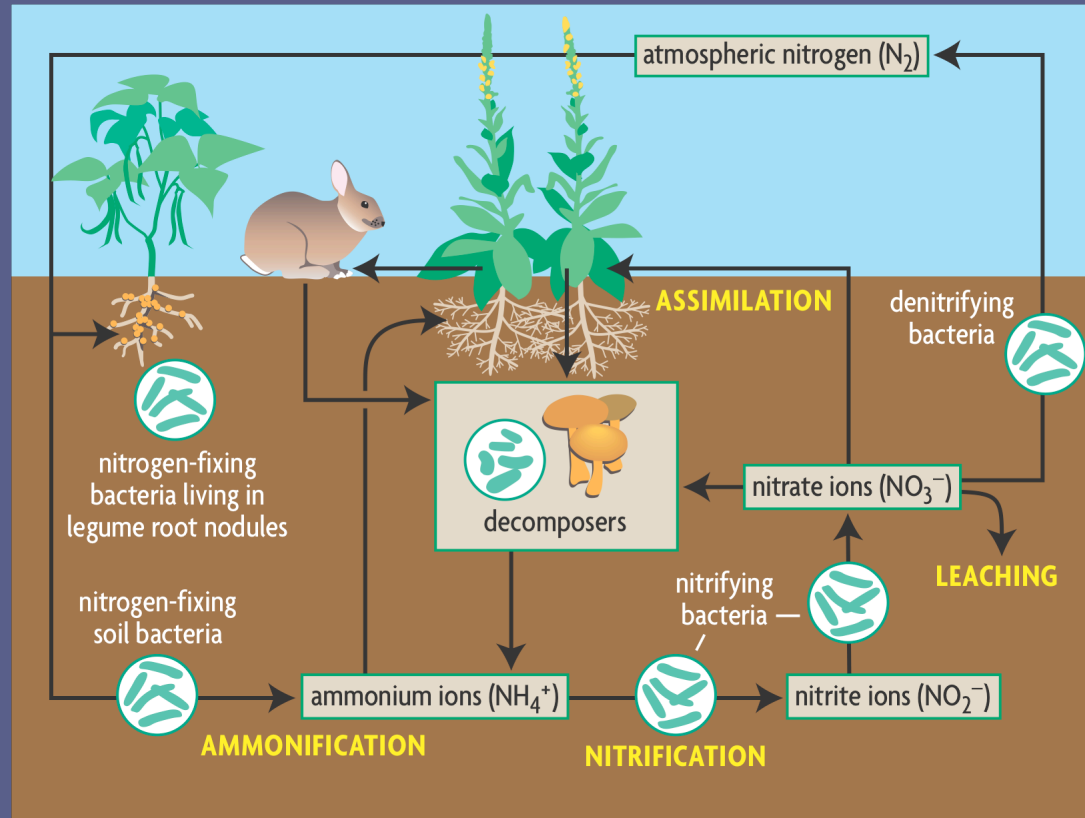
Why is nitrogen important?

- Nitrogen is essential to living organisms
- It is found in all amino acids, which make up proteins
- It is part of DNA and RNA

Where does nitrogen come from?

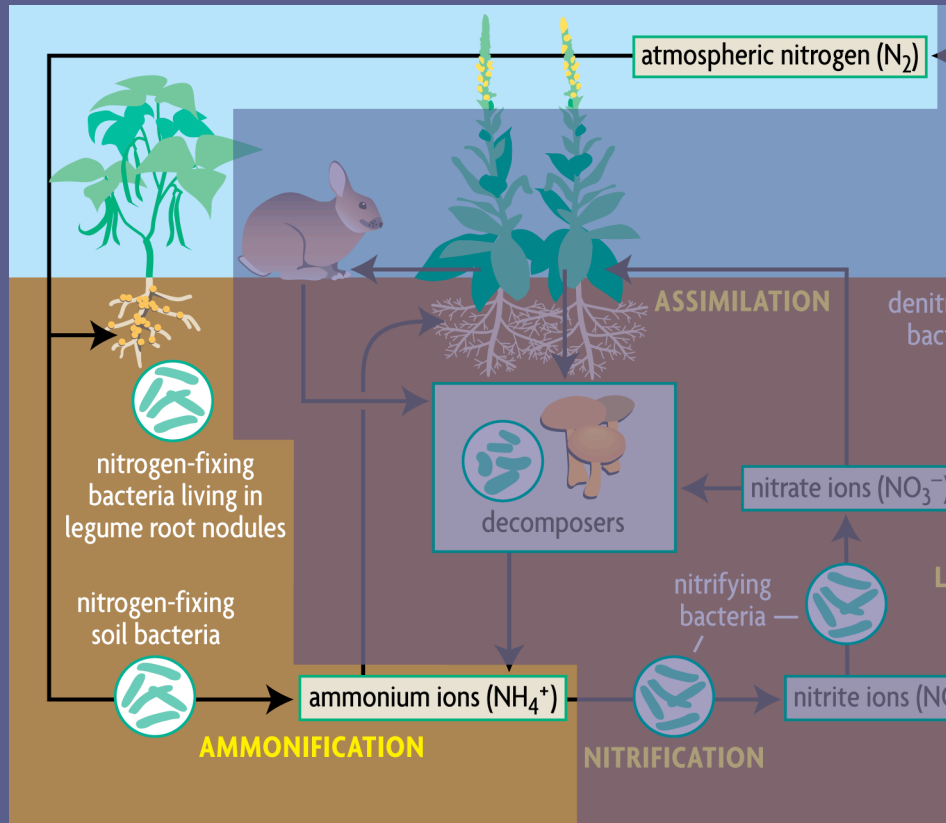
- Nitrogen is found in many chemical forms (ammonia, nitrates, etc), only some of which can be used by organisms
- Nitrogen makes up 78% of the air, but most organisms cannot use nitrogen directly from the air
- Nitrogen is cycled between the atmosphere, organisms, and different reservoirs in a process called the nitrogen cycle
- During this cycle nitrogen is transformed into several chemical forms

The Nitrogen Cycle



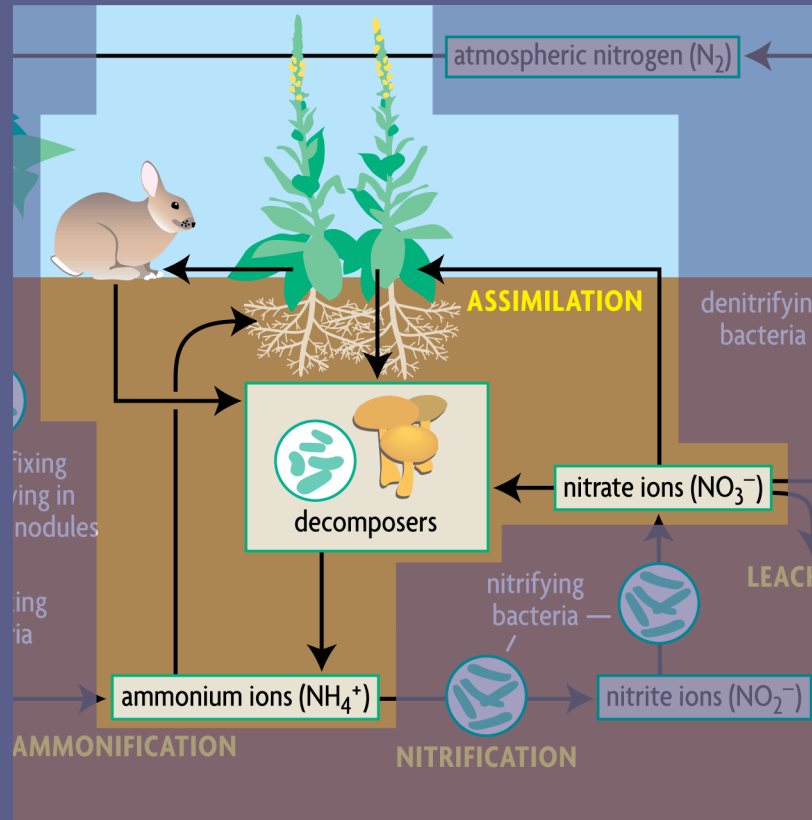
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Nitrogen-fixing Bacteria



- Nitrogen-fixing bacteria transform atmospheric nitrogen (N_2) into ammonium compounds (NH_4^+)
- Symbiotic nitrogen-fixing bacteria live in roots of legume family plant (soy-beans, peanuts, etc)
- Other types of nitrogen-fixing bacteria are found in the soil

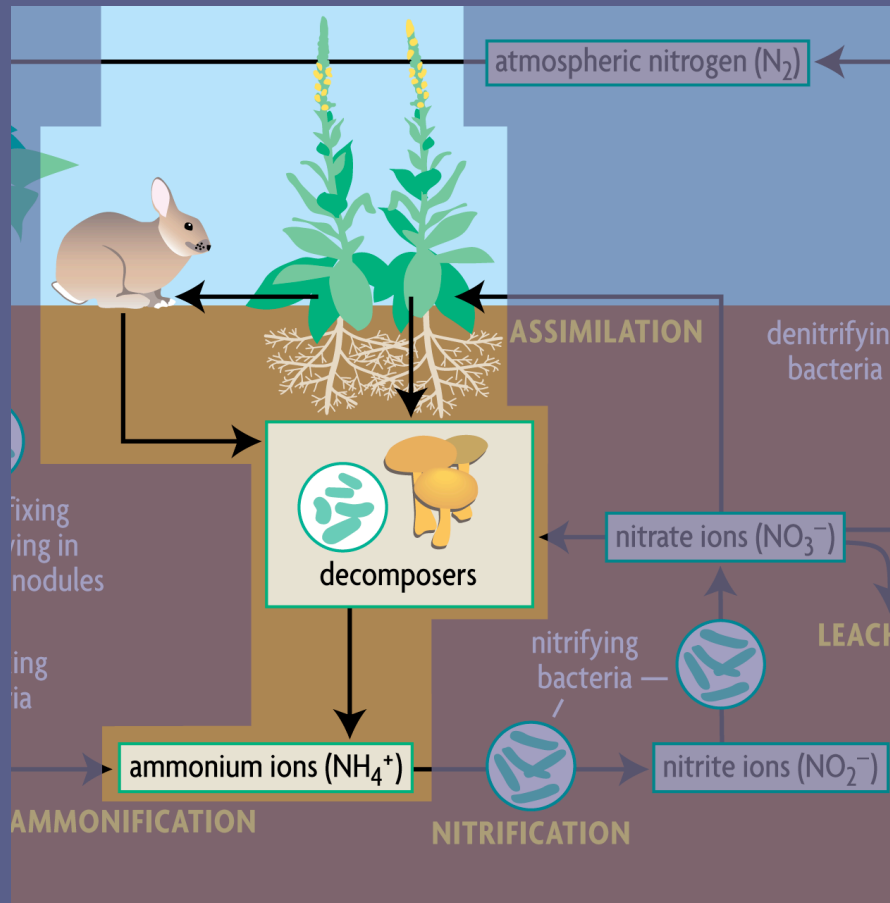
Organisms and Nitrogen



- Plants and other producers assimilate nitrogen, transforming it from nitrate (NO_3^-) or ammonium (NH_4^+) ions to form biomass.
- Consumers obtain nitrogen from eating producers, or from eating other organisms that have eaten producers.

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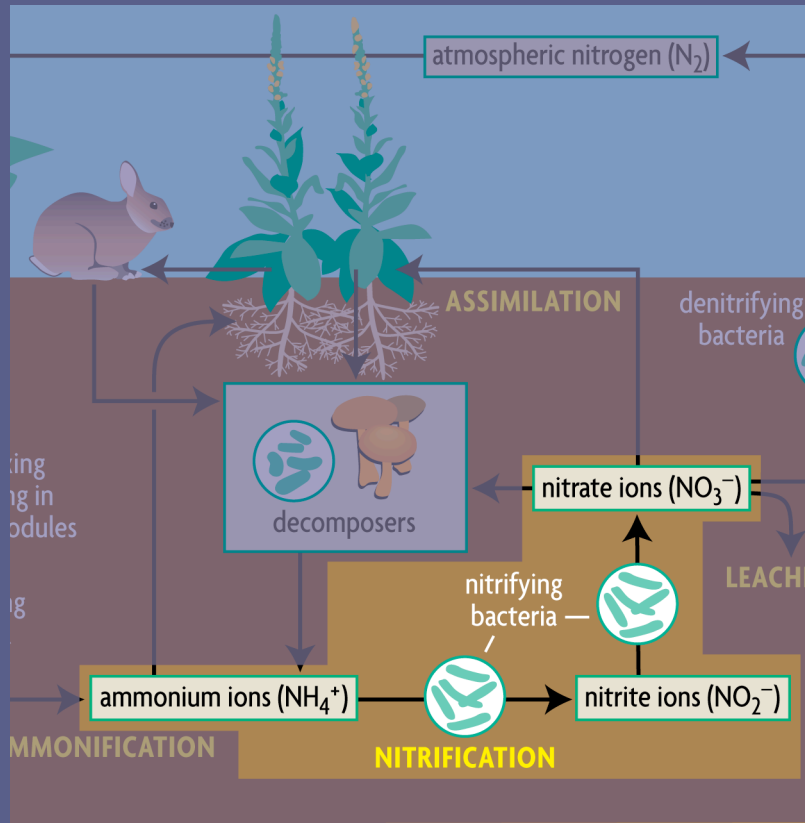
Decomposers and Nitrogen



- Decomposers, primarily bacteria and fungi, break down dead organisms.
- Decomposers transform nitrogen from organisms into ammonium (NH_4^+) which goes into the soil.

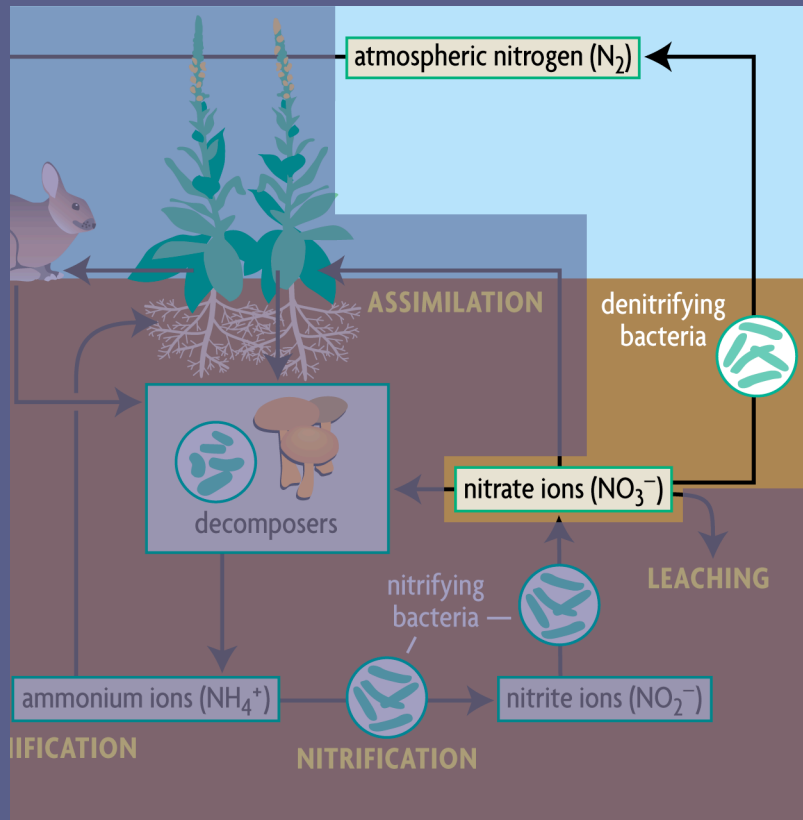
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Nitrifying Bacteria



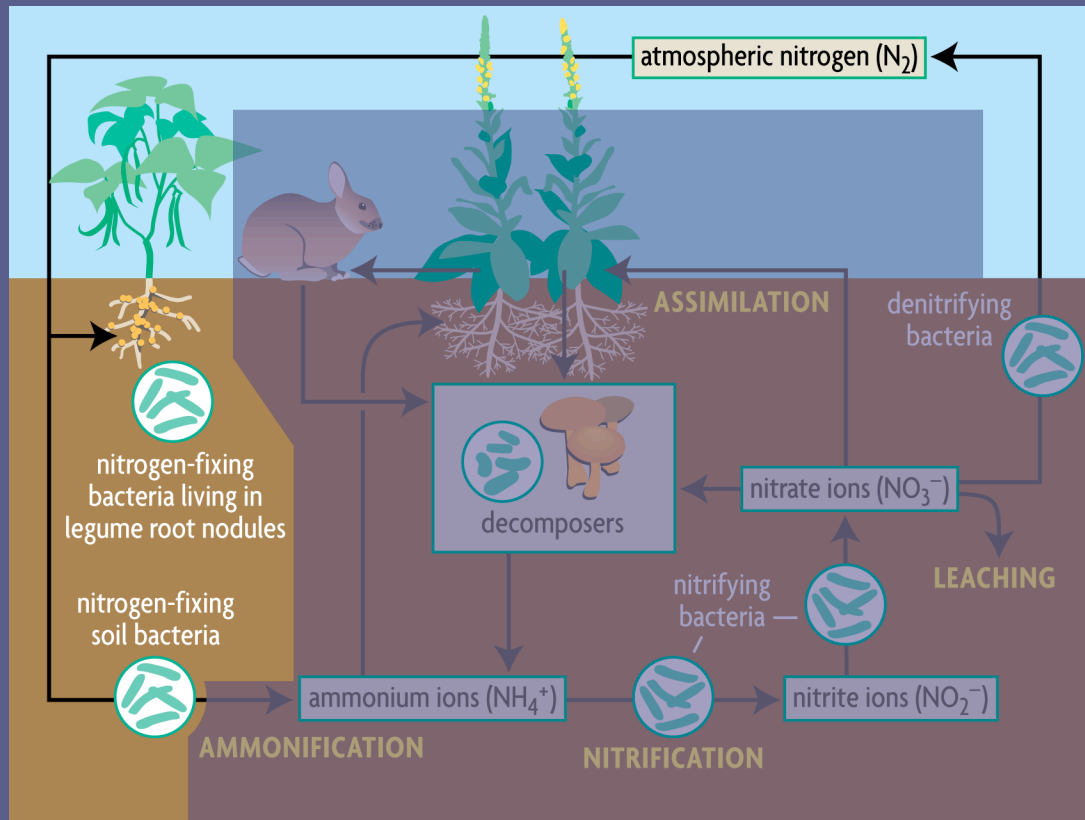
- Nitrifying bacteria break down ammonium (NH₄⁺) into nitrite (NO₂⁻) and then into nitrate (NO₃⁻)
- Nitrate (NO₃⁻) is assimilated by organisms or transformed by denitrifying bacteria

Denitrifying Bacteria



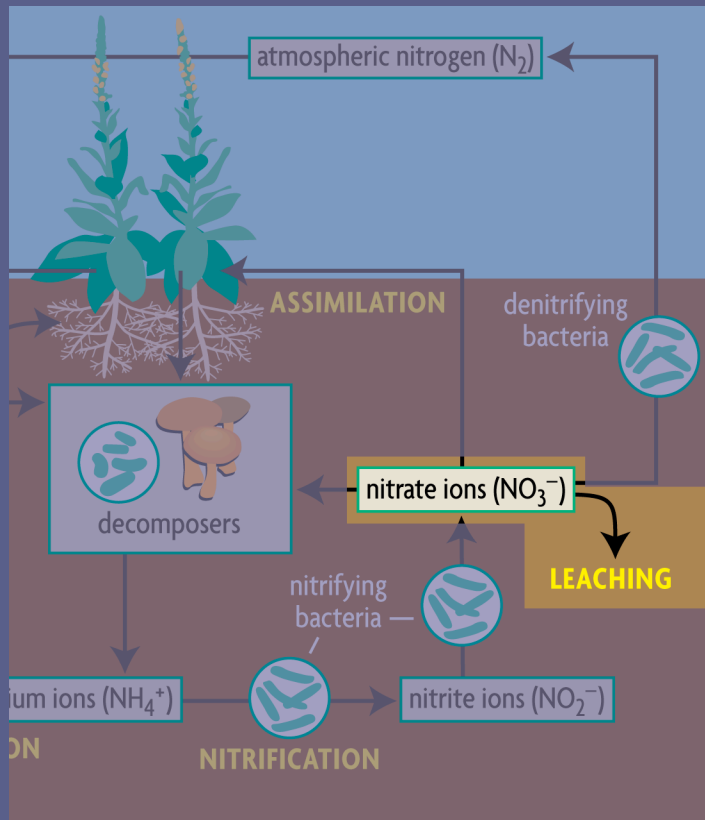
- Nitrate (NO_3^-) in the soil is transformed by denitrifying bacteria into atmospheric nitrogen (N_2).
- Denitrifying bacteria also produce N_2O , which contributes to the greenhouse effect.

Atmospheric Nitrogen



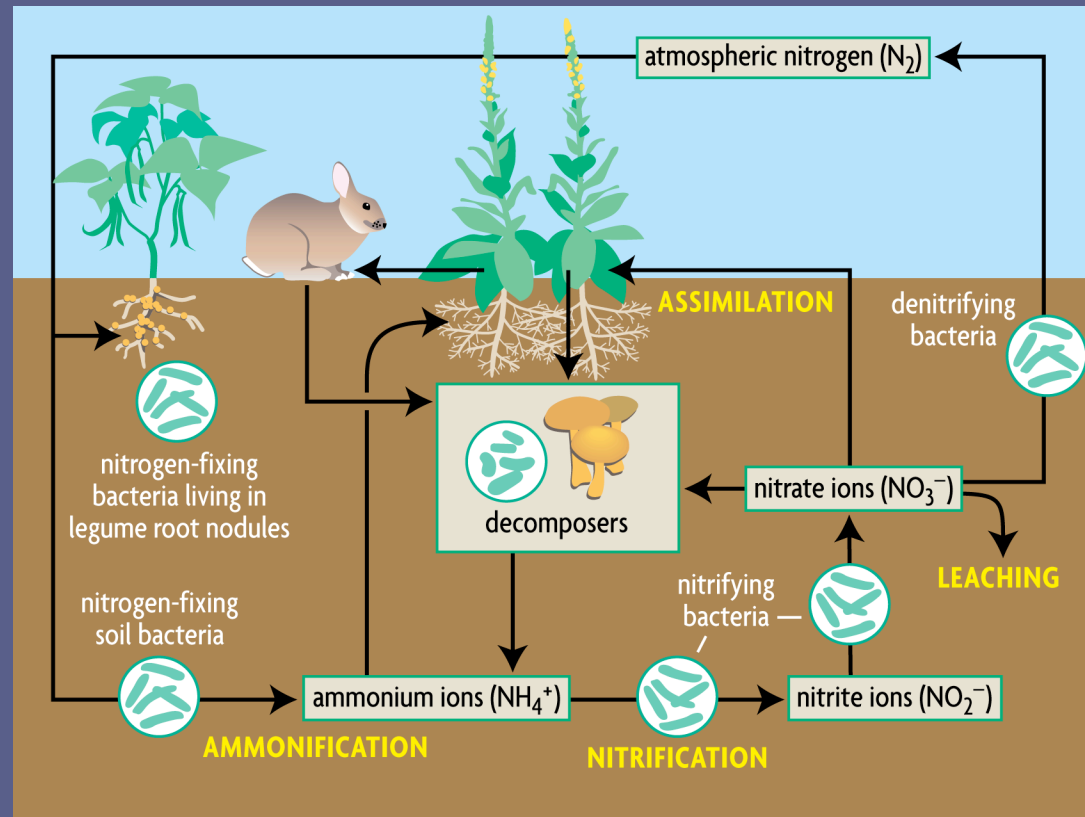
- Atmospheric nitrogen (N_2) cannot be used directly by most producers or consumers and must be transformed by bacteria.

Leaching



- Nitrate ions are lost from the soil through leaching.
- Water-soluble nitrate ions move with water through the soil and can contaminate nearby ground water or bodies of water.
- Leaching can lead to poor soil conditions and eutrophication of contaminated water bodies.

The Nitrogen Cycle



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