

Recycling of Matter Within Ecosystems



Essential Standard 2.7

Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.

Learning Objective 2.7.2

Explain why biodiversity is important to the biosphere.

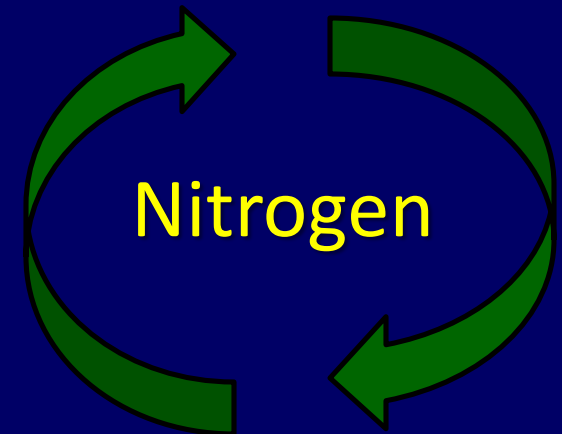
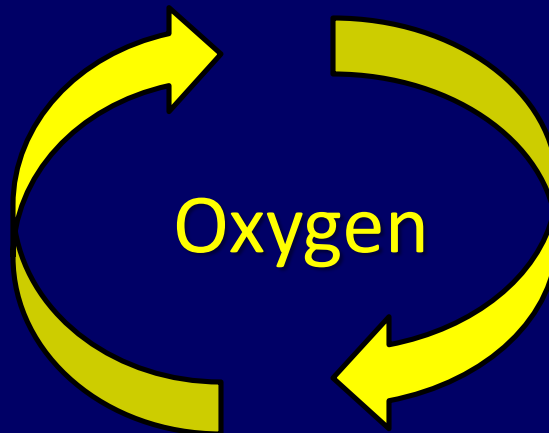
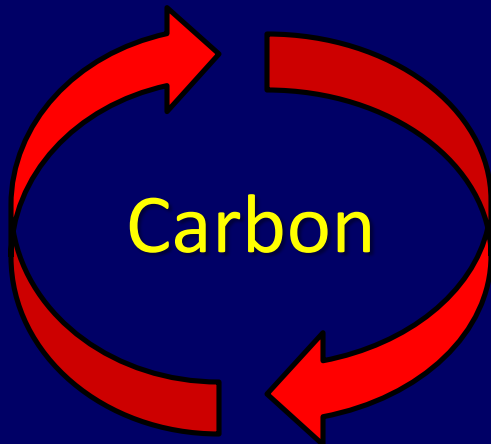
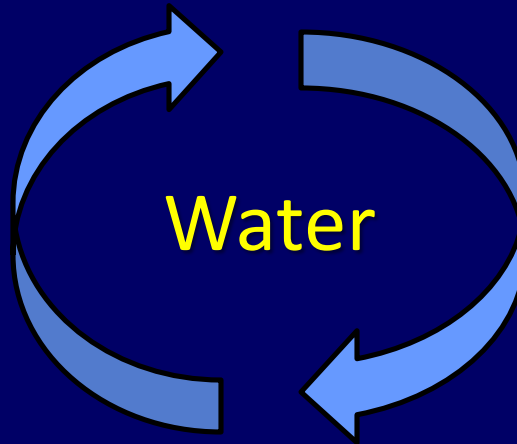
I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can describe how water is recycled in an ecosystem.
- I can explain carbon is recycled in an ecosystem.
- I can explain how oxygen is recycled in an ecosystem.
- I can explain how nitrogen is recycled in an ecosystem.

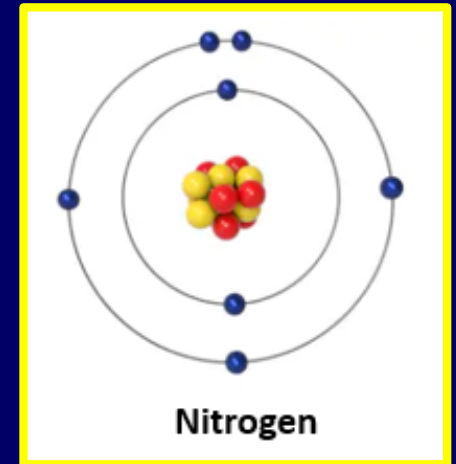
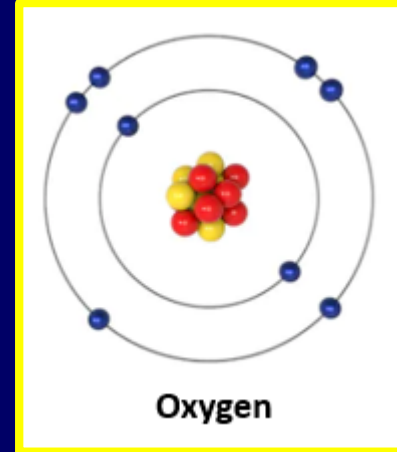
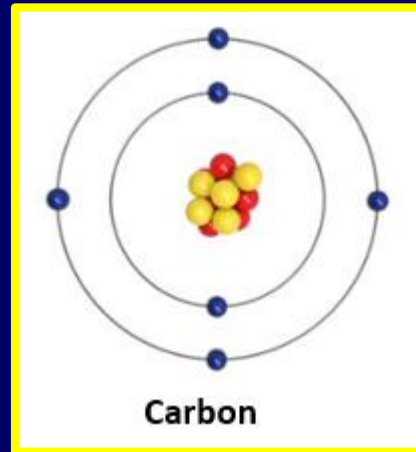
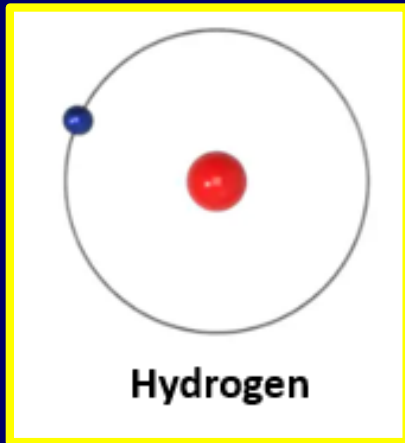
Matter is Recycled

While energy flows through an ecosystem, water and minerals are recycled.



Matter is Recycled

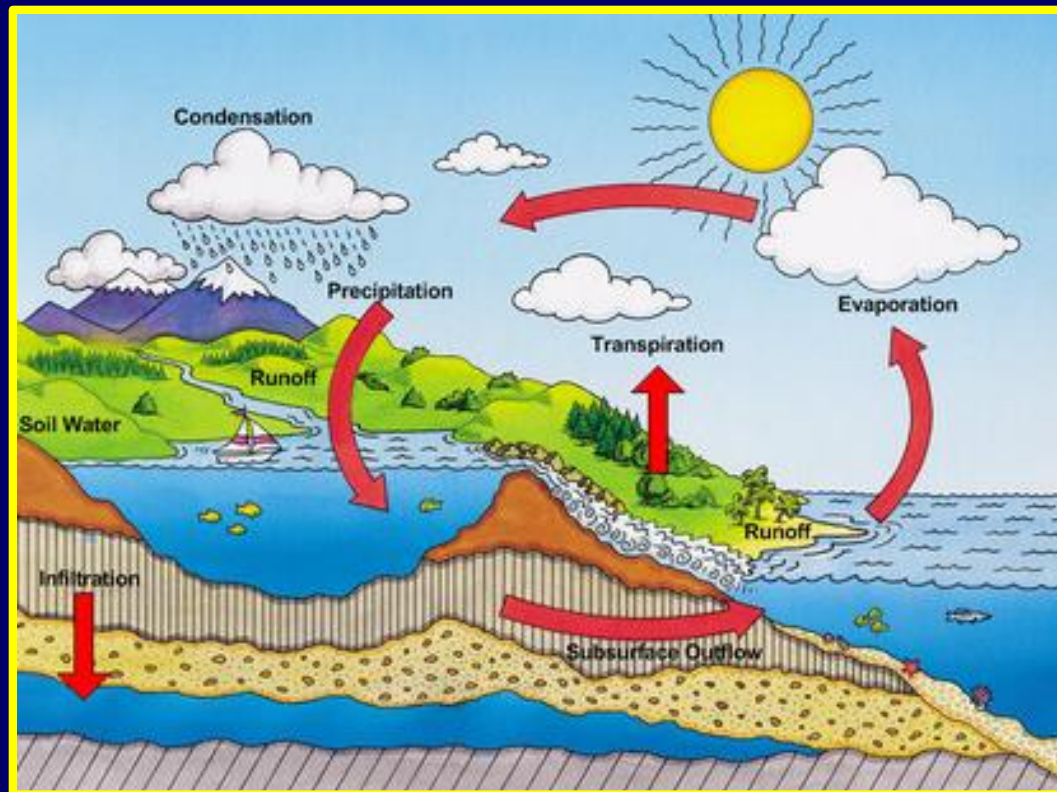
The same atoms that make up all of matter on Earth, that were here when Earth first began, are still here.



They are just recycled over and over again through chemical reactions.

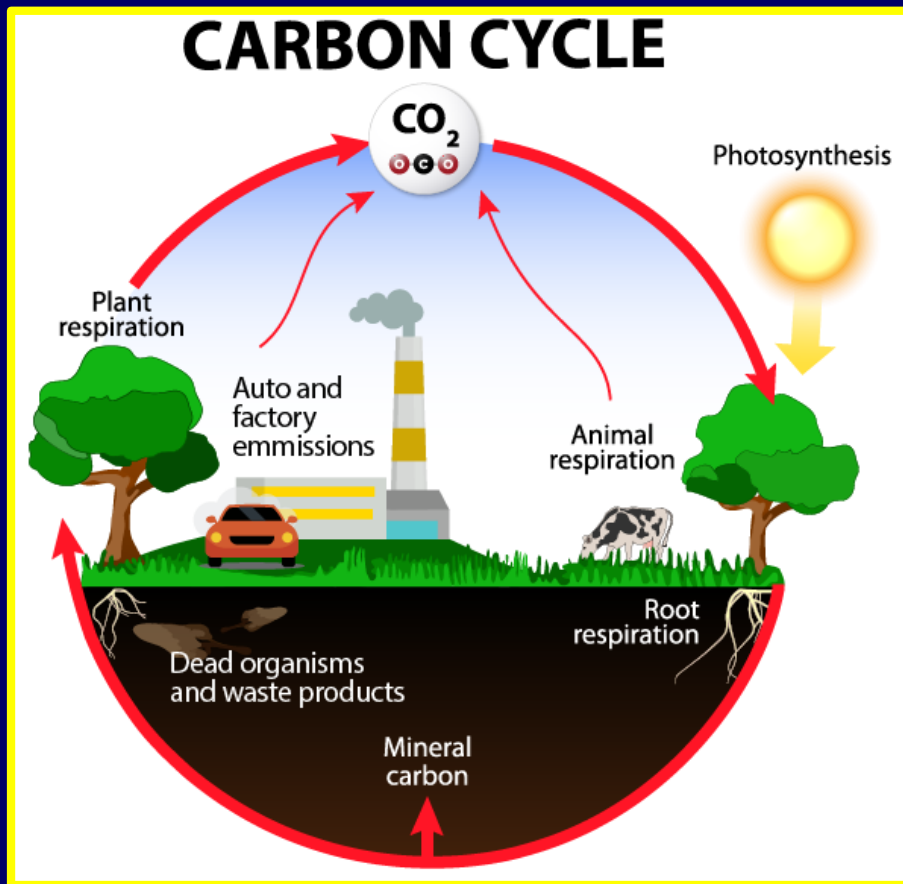
Water Cycle

Recall that water is recycled through the water cycle during evaporation, transpiration, condensation, precipitation, freezing, and melting.



Carbon Cycle

Recall that carbon is recycled through the carbon cycle.

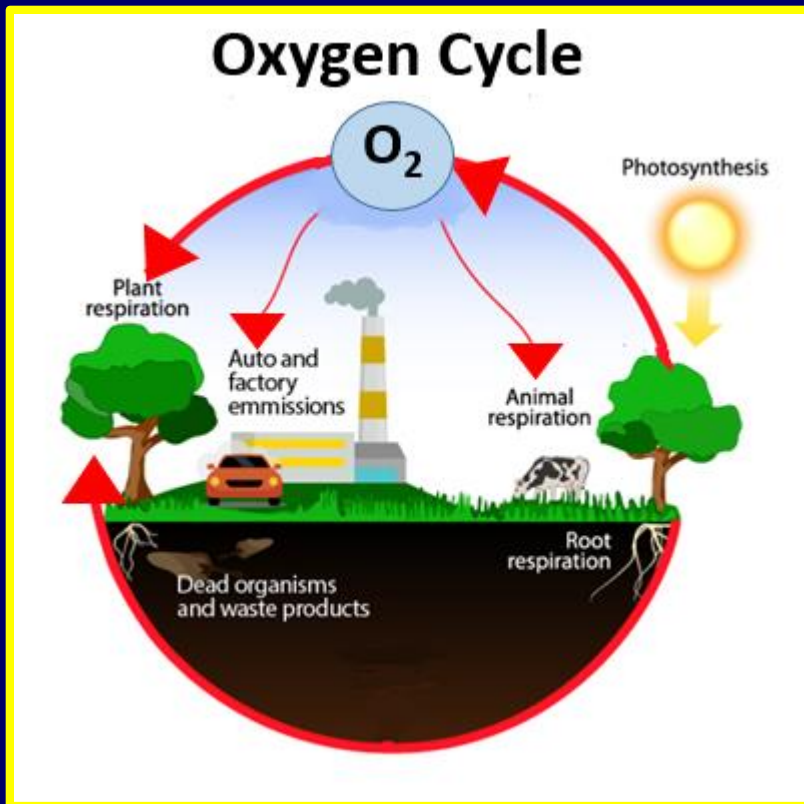


During photosynthesis, carbon is removed from the atmosphere.

During respiration, decomposition, and combustion, carbon is returned to the atmosphere.

Oxygen Cycle

The oxygen cycle recycles oxygen through the exact same processes as the carbon cycle, but the oxygen travels in the opposite direction.

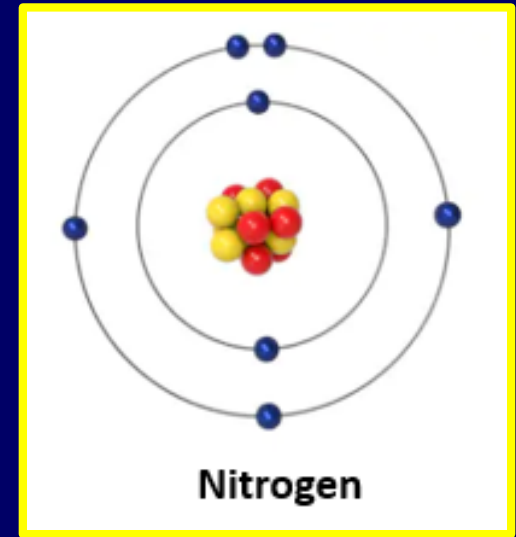


During photosynthesis, oxygen is returned to the atmosphere.

During respiration, decomposition, and combustion, oxygen is removed from the atmosphere.

Nitrogen Cycle

Nitrogen is another essential element for all life and is used to form proteins and nucleic acids.



Periodic Table of the Elements

1 IA 1A																		2 VIII A 8A																	
1 H Hydrogen 1.008																		2 He Helium 4.001																	
3 IIA 2A																		17 VIIA 7A		18 VIIIA 8A															
3 Li Lithium 6.941		4 Be Beryllium 9.012																9 F Fluorine 18.998		10 Ne Neon 20.180															
11 Na Sodium 22.990		12 Mg Magnesium 24.305		3 IIIB 3B		4 IVB 4B		5 VB 5B		6 VIB 6B		7 VIIB 7B		8 VIII 8		9 VIII 8		10 VIII 8		11 IIB 1B		12 IIB 2B		13 IIIA 3A		14 IVA 4A		15 VA 5A		16 VIA 6A		17 VIIA 7A		18 VIIIA 8A	
19 K Potassium 39.098		20 Ca Calcium 40.078		21 Sc Scandium 44.956		22 Ti Titanium 47.88		23 V Vanadium 50.942		24 Cr Chromium 51.996		25 Mn Manganese 54.938		26 Fe Iron 55.845		27 Co Cobalt 58.933		28 Ni Nickel 58.693		29 Cu Copper 63.546		30 Zn Zinc 65.38		31 Ga Gallium 69.723		32 Ge Germanium 72.61		33 As Arsenic 74.922		34 Se Selenium 78.96		35 Br Bromine 79.904		36 Kr Krypton 83.80	
37 Rb Rubidium 85.468		38 Sr Strontium 87.62		39 Y Yttrium 88.906		40 Zr Zirconium 91.224		41 Nb Niobium 92.906		42 Mo Molybdenum 95.94		43 Tc Technetium 98.906		44 Ru Ruthenium 101.07		45 Rh Rhodium 102.906		46 Pd Palladium 106.42		47 Ag Silver 107.868		48 Cd Cadmium 112.411		49 In Indium 114.818		50 Sn Tin 118.710		51 Sb Antimony 121.760		52 Te Tellurium 127.6		53 I Iodine 126.905		54 Xe Xenon 131.29	
55 Cs Cesium 132.905		56 Ba Barium 137.327		57-71 Lanthanide Series		72 Hf Hafnium 178.49		73 Ta Tantalum 180.948		74 W Tungsten 183.85		75 Re Rhenium 186.207		76 Os Osmium 190.23		77 Ir Iridium 192.22		78 Pt Platinum 195.08		79 Au Gold 196.967		80 Hg Mercury 200.59		81 Tl Thallium 204.381		82 Pb Lead 207.2		83 Bi Bismuth 208.980		84 Po Polonium 209		85 At Astatine 209		86 Rn Radon 222	
87 Fr Francium 223		88 Ra Radium 226.025		89-103 Actinide Series		104 Rf Rutherfordium 261		105 Db Dubnium 262		106 Sg Seaborgium 263		107 Bh Bohrium 264		108 Hs Hassium 265		109 Mt Meitnerium 266		110 Ds Darmstadtium 267		111 Rg Roentgenium 268		112 Cn Copernicium 273		113 Uut Ununtrium unknown		114 Fl Flerovium 285		115 Uup Ununpentium unknown		116 Lv Livermorium 286		117 Uus Ununseptium unknown		118 Uuo Ununoctium unknown	
57 La Lanthanum 138.905		58 Ce Cerium 140.12		59 Pr Praseodymium 140.908		60 Nd Neodymium 144.24		61 Pm Promethium 144.913		62 Sm Samarium 150.36		63 Eu Europium 151.964		64 Gd Gadolinium 157.25		65 Tb Terbium 158.925		66 Dy Dysprosium 162.50		67 Ho Holmium 164.930		68 Er Erbium 167.26		69 Tm Thulium 168.934		70 Yb Ytterbium 173.054		71 Lu Lutetium 174.967							
89 Ac Actinium 227.033		90 Th Thorium 232.038		91 Pa Protactinium 231.036		92 U Uranium 238.029		93 Np Neptunium 237.048		94 Pu Plutonium 244.064		95 Am Americium 243.061		96 Cm Curium 247.070		97 Bk Berkelium 247.070		98 Cf Californium 251.08		99 Es Einsteinium 252.083		100 Fm Fermium 257.10		101 Md Mendelevium 258.10		102 No Nobelium 259		103 Lr Lawrencium 260							

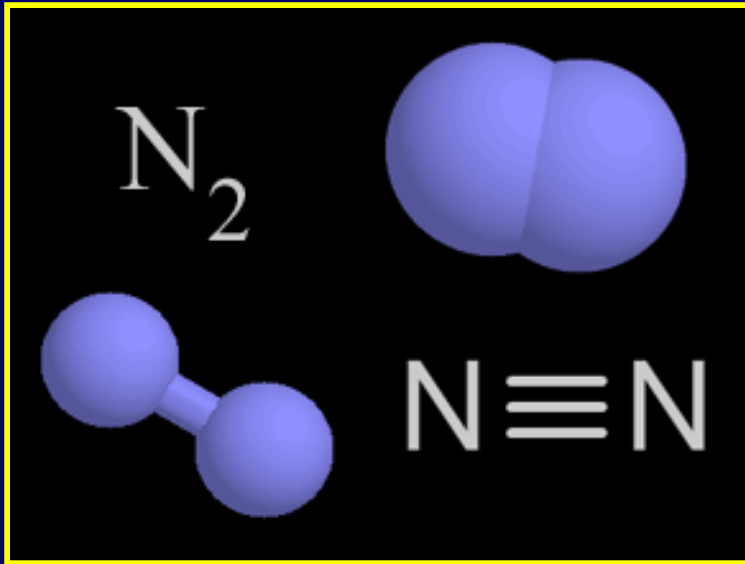
Alkali Metal
Alkaline Earth
Transition Metal
Basic Metal
Semimetal
Nonmetal
Halogen
Noble Gas
Lanthanide
Actinide

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Nitrogen
makes up 78%
of the
atmosphere

Nitrogen Cycle

Atmospheric Nitrogen consists of two nitrogen atoms bonded together to form the nitrogen molecule, N_2 .

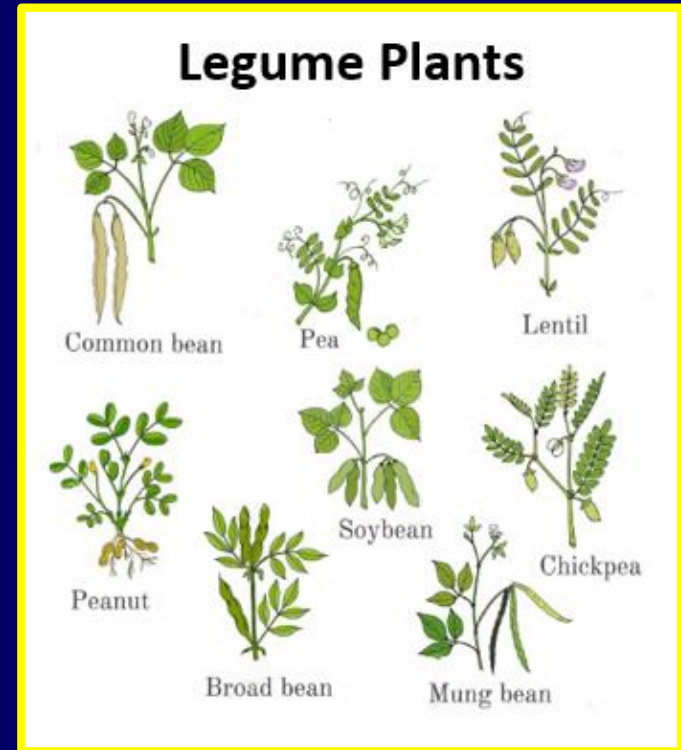
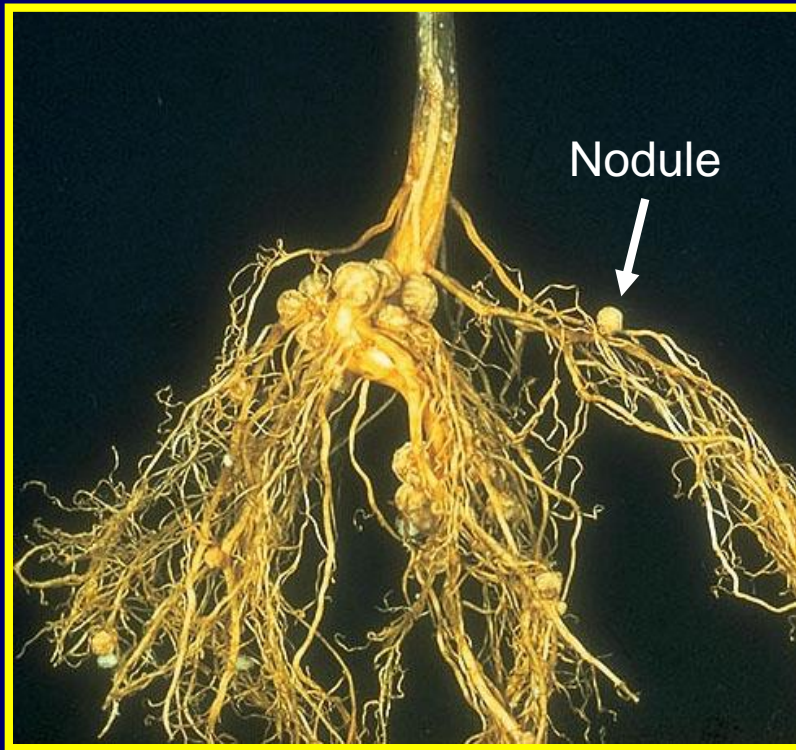


Most organisms cannot break that triple bond, in order to use the nitrogen atom.

Both plants and animals breathe in nitrogen molecules, N_2 , and breathe them right back out again.

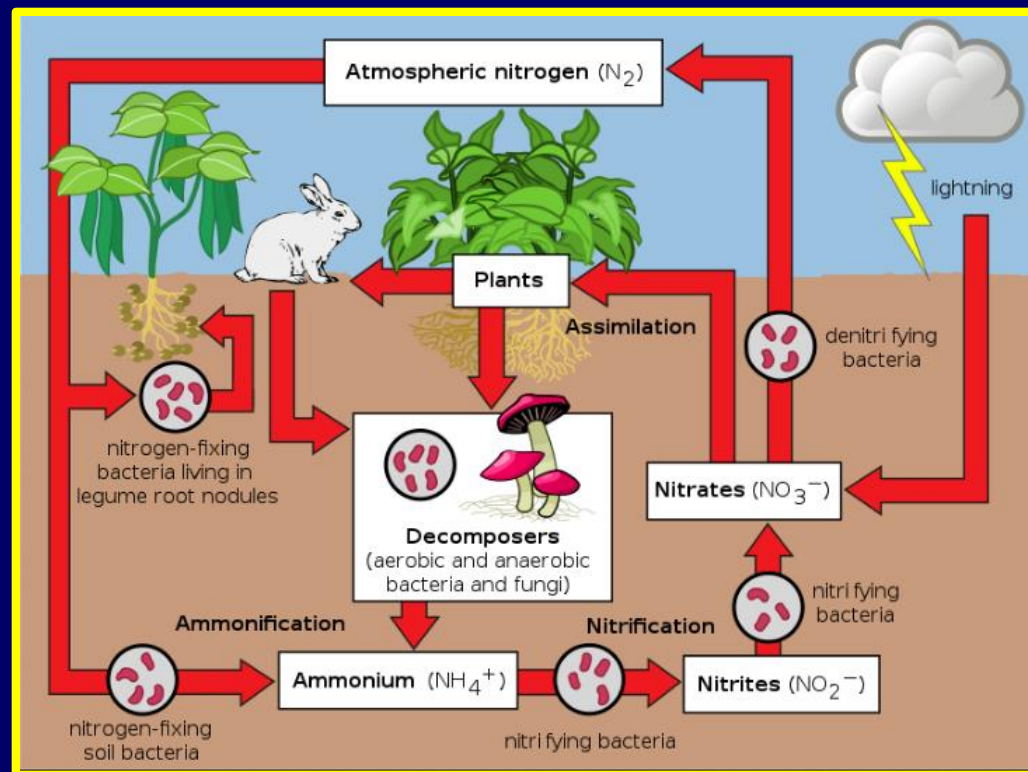
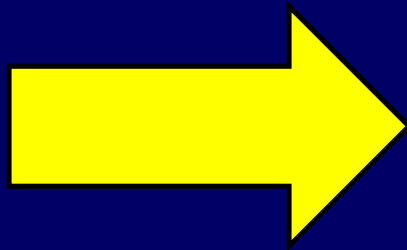
Nitrogen Cycle

The only organisms that are capable of breaking apart a nitrogen molecule, N_2 , into individual atoms of nitrogen, are nitrogen fixing bacteria that live in nodules on the roots of legume plants.



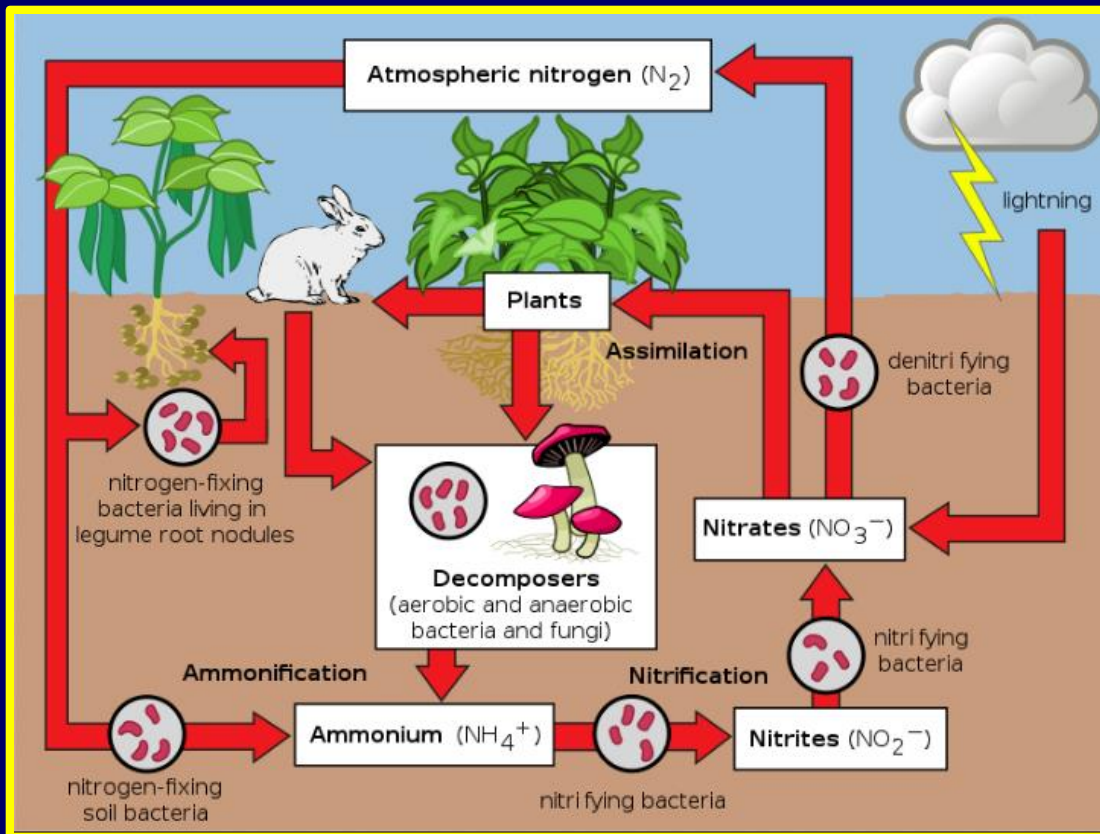
Nitrogen Cycle

Nitrogen fixing bacteria break apart atmospheric nitrogen (N_2) and chemically combine the nitrogen atoms (N) with hydrogen atoms (H), to form ammonium molecules (NH_4^+).



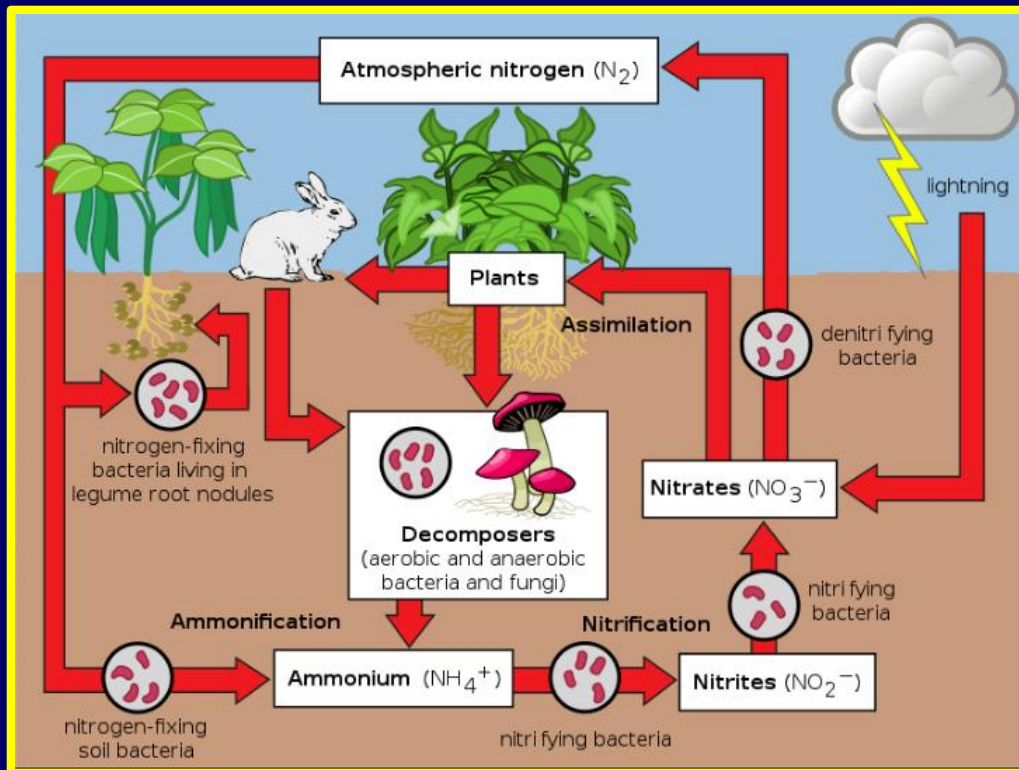
Nitrogen Cycle

Other bacteria then chemically combine ammonium molecules (NH_4^+) with oxygen molecule (O_2) to form nitrites (NO_2^-) and nitrates (NO_3^-).



Nitrogen Cycle

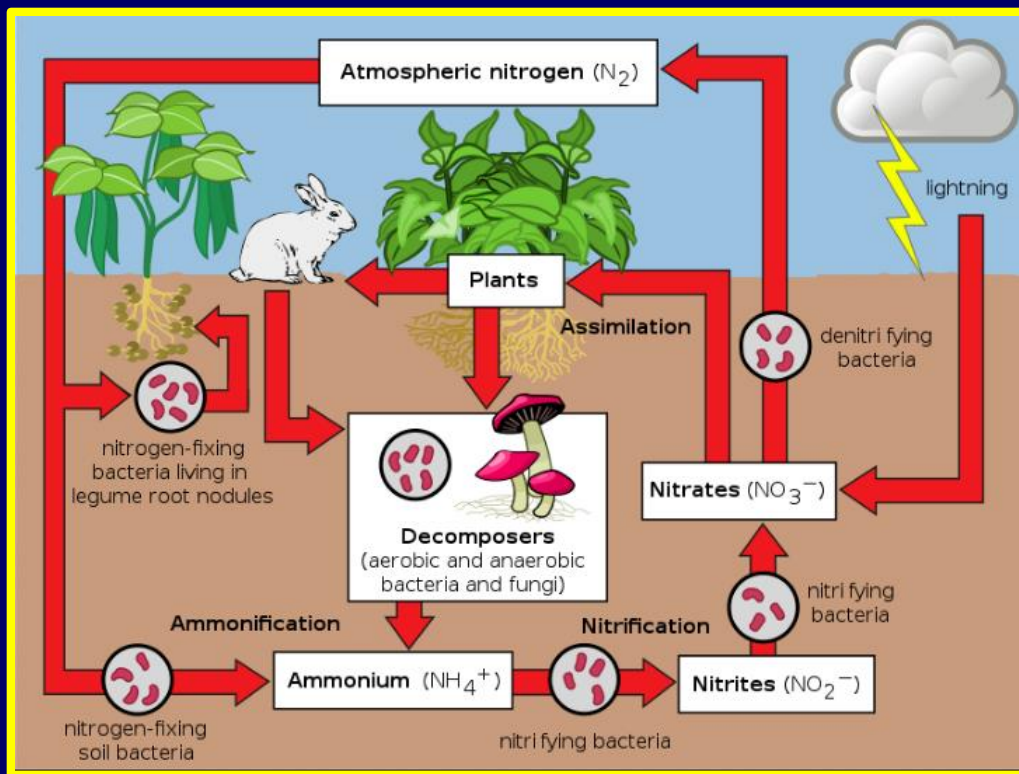
Plants take up nitrites (NO_2^-) and nitrates (NO_3^-) from the soil and use it to build DNA and proteins molecules.



Animals obtain nitrogen, in order to make their own DNA and protein molecules, by eating plants or by eating other animals that already ate the plants.

Nitrogen Cycle

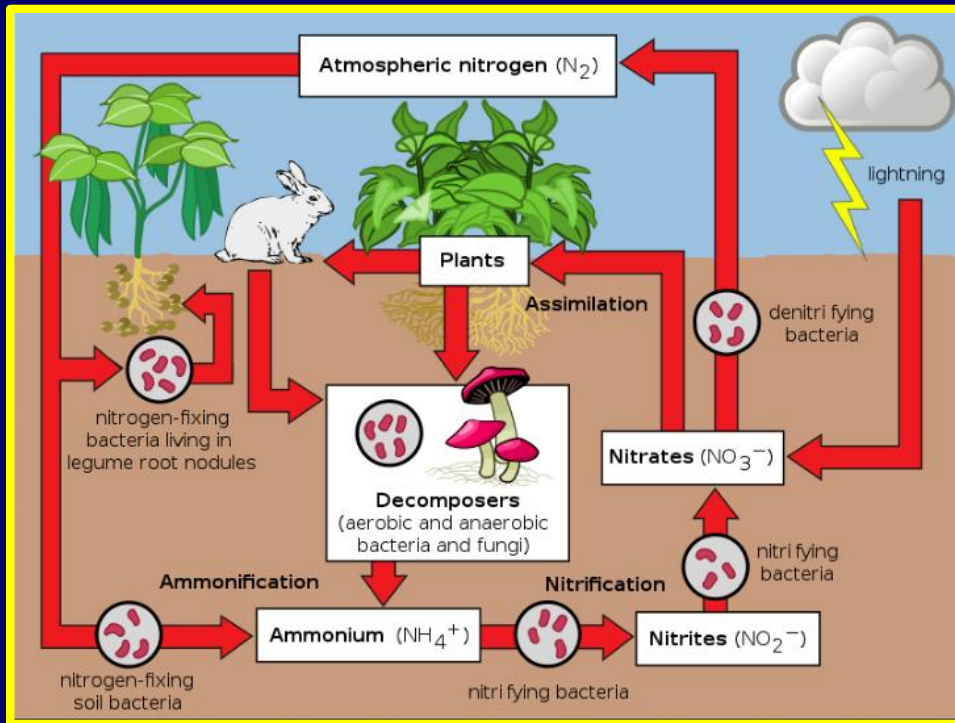
When plants shed their leaves or die and when animals excrete wastes or die, decomposers break down the wastes and return the nitrogen to the soil.



Denitrifying bacteria, in anaerobic soil, then return the nitrogen to the atmosphere.

Nitrogen Cycle

While most of the nitrogen cycle is driven by various types of bacteria, lightning can also convert atmospheric nitrogen (N_2) into a form that plants can use.



The End

