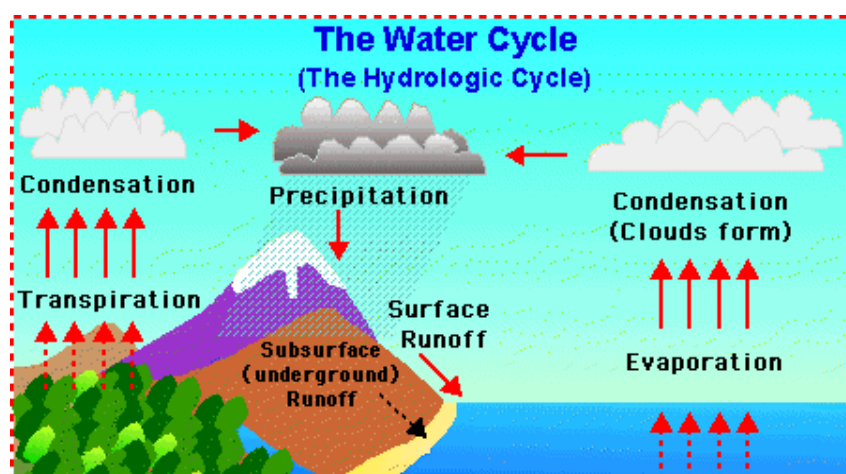


7th Science

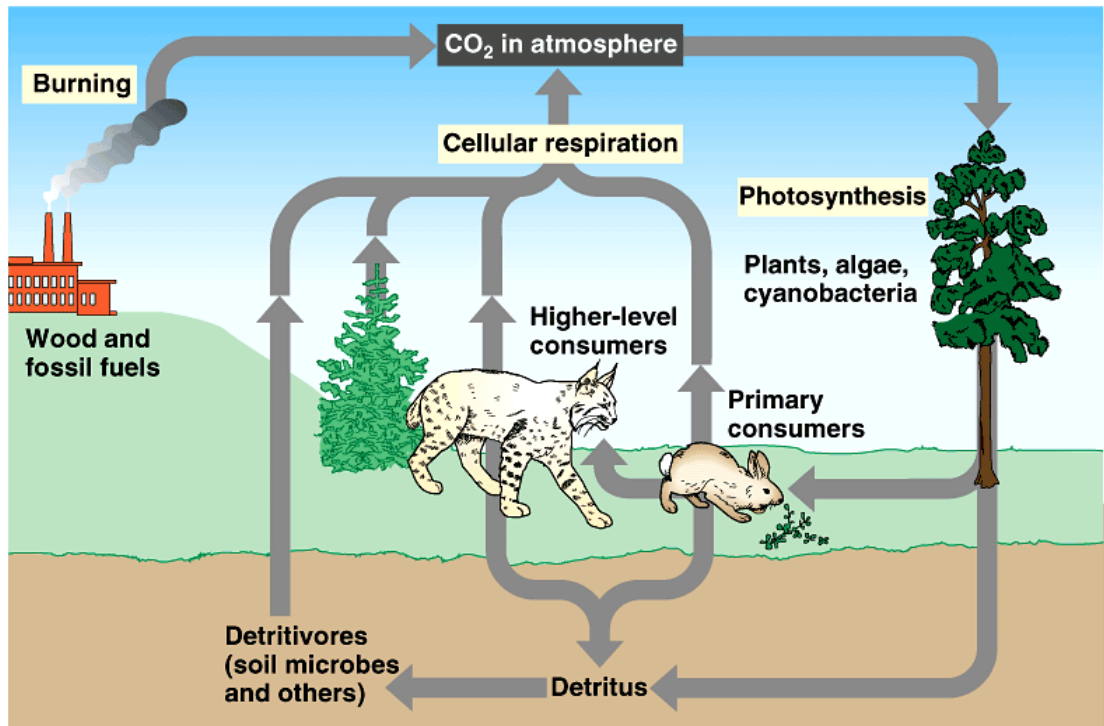
Notes on Biogeochemical Cycles Chapter 2

A) Cycles in the Earth System

- 1) **Reservoir**- A place where matter and energy are stored
- 2) **Water Cycle**- Movement of water into and out of the geosphere, hydrosphere, atmosphere, and biosphere
 - a) **Evaporation**- Water changing from a liquid to a gas and flying up into the atmosphere
 - b) **Condensation**- Water changing from a gas to a liquid and becoming visible (cloud formation)
 - c) **Precipitation**- Any form of water that falls to Earth from clouds
 - d) **Transpiration**- Water vapor released by plants
 - e) **Infiltration**- Water soaking into the ground
 - f) **Absorption**- Water soaking into plant roots
 - g) **Run-off**- water moving across impermeable land
 - h) **Respiration**- water breathed out of creatures
 - I) **Excretion**- water coming out of creatures as solid or liquid waste



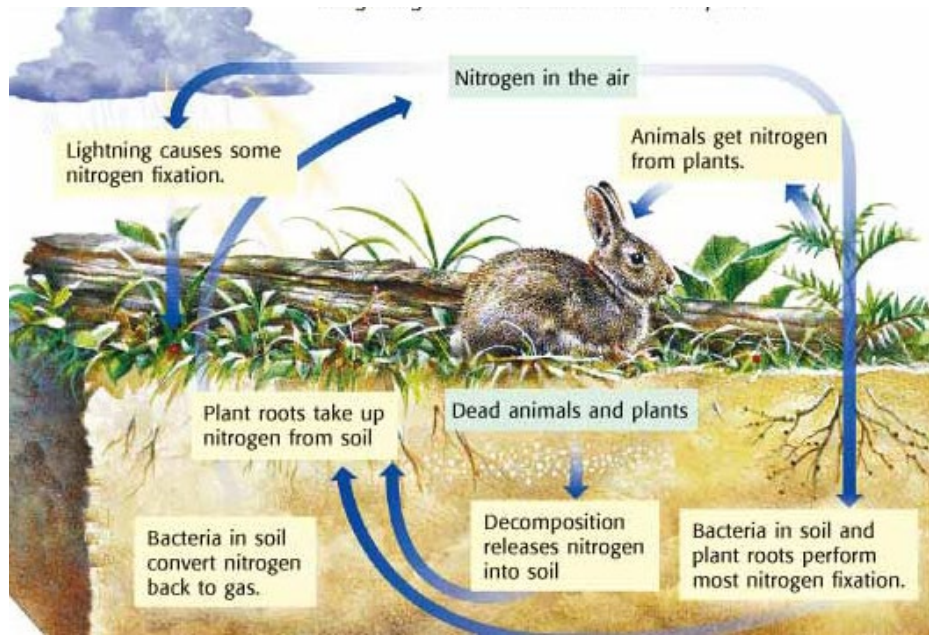
- 3) **Carbon Cycle**- Movement of carbon into and out of the geosphere, hydrosphere, atmosphere, and biosphere. Used in EVERY organic molecule. Found in every component of cells. It is the backbone of EVERYTHING living.
 - a) **Ingestion**- Process of eating. Food (carbohydrates, fats, and proteins) is full of needed carbon atoms
 - b) **Excretion**- Process whereby creatures get rid of solid and liquid waste (contains carbon)
 - c) **Photosynthesis**- Process where plants take carbon dioxide out of the air to make glucose, a carbohydrate ($C_6H_{12}O_6$).
 - d) **Respiration**- Process where glucose is broken down to release energy and carbon dioxide and water is released back into the atmosphere.
 - e) **Decomposition**- The breakdown of dead matter (contains carbon) into simpler substances like carbon dioxide and water which is then released back into atmosphere. It is bacteria doing cell respiration.
 - f) **Extraction**- the removal of fossil fuels (carbon filled) from the Earth
 - g) **Combustion**- Burning (especially carbon-filled fossil fuels) which results in the release of carbon dioxide and water back into the atmosphere.
 - h) **Diffusion**- The spontaneous movement of CO_2 in the air into lakes and oceans
 - g) **Biom mineralization**- The creation of shells (full of carbon) from the dissolved CO_2 in sea water
 - i) **Lithification**- The creation of carbon filled rock (limestone) from the shells of dead marine organisms



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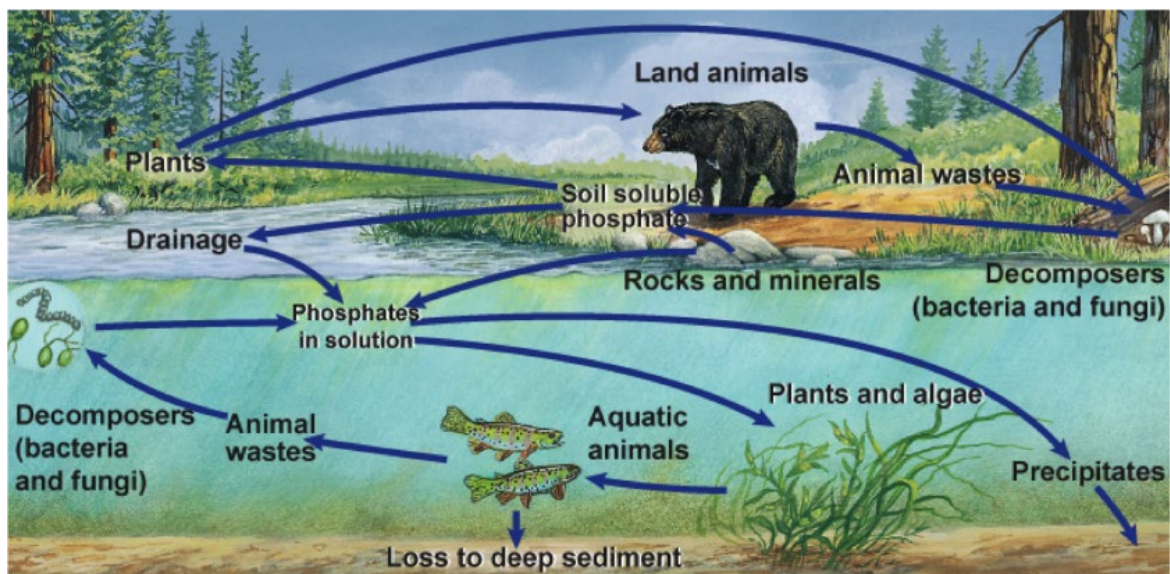
4) Nitrogen Cycle- Movement of nitrogen into and out of the geosphere, hydrosphere, atmosphere, and biosphere. (needed to make protein, DNA, RNA, Enzymes)

- a) Ingestion- Process of eating, and the only way creatures can get their nitrogen. Nitrogen in food is needed to make proteins, DNA, RNA, enzymes, etc. Nitrogen in the air cannot be breathed in and used by animals because it is in the wrong form.
- b) Excretion- the elimination of liquid and solid waste. Both are high in nitrogen.
- c) Decomposition- bacteria break down dead organisms releasing nitrogen into soil or air
- d) Denitrification- denitrifying bacteria in the soil turn nitrogen into triple bonded N₂ (unusable) and release it into the air
- a) Nitrification/ AKA Fixation- turning nitrogen into a useable form (NO₂, NO₃) so plants can assimilate it through their roots. Happens in the soil. Lightning and bacteria can perform this process.
- b) Assimilation (Absorption)- nitrogen soaking into the roots of a plant



5) Phosphorus Cycle -The movement of phosphorus between the environment and living things.
(Needed in DNA, RNA, ATP, cell membranes, bones, and teeth)

- Weathering** and **erosion** release the phosphorus rich compounds trapped in rock back into soil or water
- Plants get phosphorus from soil, (**assimilation**) and animals get phosphorus by **ingesting**
- Decomposing** bacteria release the phosphorus rich compounds found in animal waste and dead matter back into soil or water
- Phosphorus in water may be **assimilated** and used by aquatic plants
- Phosphorus enters aquatic animals through **ingestion** and exits by death/**decomposition** or **excretion**.
- Detritus** (de-TRI-dus) which is excretion, dead material and sediments, may settle to the bottom and form sedimentary rock once again.



6) Many Cycles with many connections

- Each cycle is connected in many ways, for example, nitrogen phosphorus, and carbon are carried by water in parts of the water cycle.

- 7) What happens if too much of these substances are found in one place?
- a) Too much nitrogen and phosphorus causes **hypoxic zones (dead zones)**
 - a. In spring nitrogen/phosphorus rich fresh water (caused by all the fertilizers farmers use) creates a barrier layer above the saltwater
 - b. Oxygen is now unable to mix with the salt water
 - c. The nitrogen and phosphates cause excessive algae growth (**eutrophication**)
 - d. Algae die and sink to the bottom where they decompose
 - e. Decomposers use up all the oxygen (doing cell respiration)
 - f. All creatures die, or swim away if they can
 - b) Too much carbon caused the disaster at Lake Nyos
 - a. A pocket of magma was beneath the lake
 - b. It leaked carbon dioxide (CO₂) into the water, changing it into carbonic acid.
 - c. This made it an exploding lake because it was saturated with carbon dioxide.
 - d. On August 21, 1986, possibly as the result of a landslide, Lake Nyos suddenly emitted a large cloud of CO₂, which suffocated 1,700 people and 3,500 livestock in nearby towns and villages.
 - c) Too much carbon in the air is causing global warming
 - a. excessive carbon is released into the air due to combustion of fossil fuels
 - b. the extra carbon is a greenhouse gas which traps heat like a blanket
 - c. over time the overheating atmosphere causes the earth to get warmer