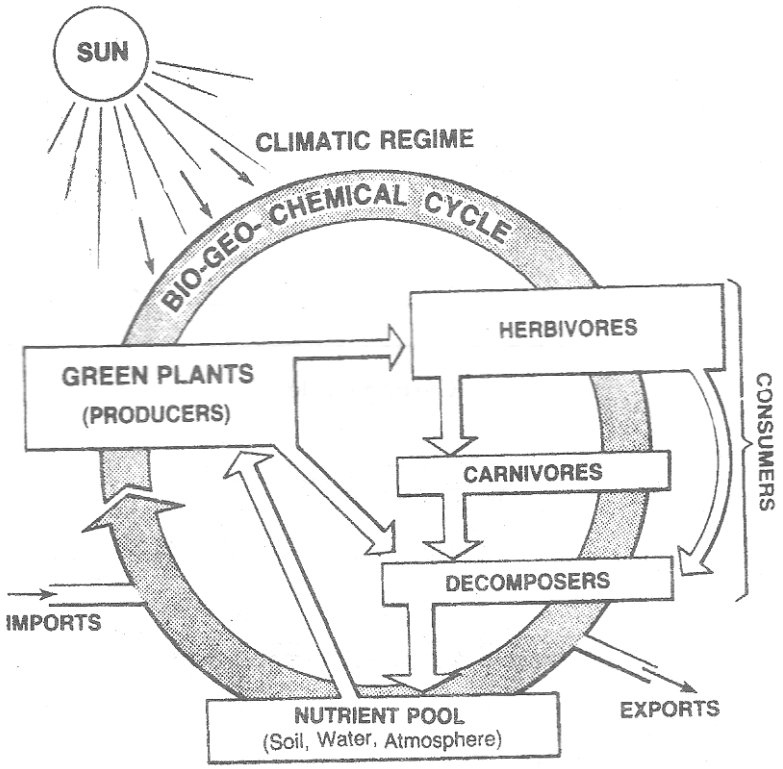
BIO - GEO CHEMICAL CYCLE

Bio	-	Living organism
Geo	-	Rock, Soil, Air, Water
Chemical	-	Material or Nutrients
Cycle	-	Path

All the types of material required by ecosystem in addition of energy, are available continuously to system through recycling. Thus there is a constant exchange of materials between the living organism and their biotic environment through the recycling of materials. This phenomenon is called Bio-geo chemical cycle.
The mineral elements taken up from the environment (soil as well as air) by the green plant - the producers, are again returned to the environment through consumers and decomposers.



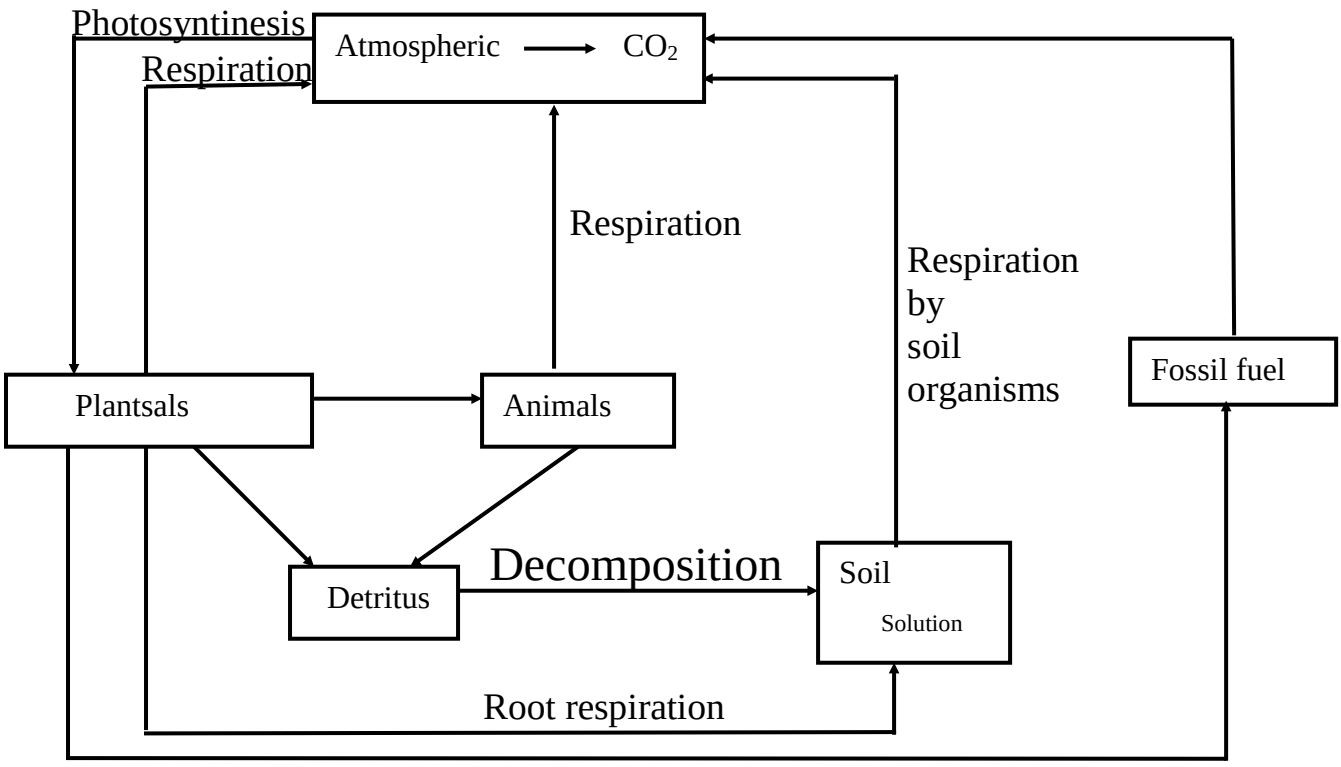
Biogeochemical Cycle

(i) Gaseous Cycle - C, H, N, O cycle. Reservoir is in the atmosphere (air) or in Hydrosphere (water).
(ii) Sedimentary cycle - P, S, Ca cycles reservoirs are in earth's crust (lithosphere)

Note : In these cycles, the bulk material remains in the inactive reservoir on earth crust like sediment of sea, or water bodies.

CARBON CYCLE

The main source of carbon is **atmosphere** and in hydrosphere it is rocks of carbonates. Carbon present in lithosphere in the form of coal and petroleum. The carbon released from them is present in the atmosphere in the form of carbondioxide. The green autotrophs utilize CO_2 from the air to synthesise food materials which is obtained by other organisms as food. Carnivores obtain their carbonic food from the herbivores. These carbonic matter produce CO_2 through the oxidation or respiration which dissolve in air or water and again utilized by the plants.



Carbon Cycle

NITROGEN CYCLE

Atmosphere is the only source of nitrogen 78% nitrogen is present in atmospheric air. Plants absorb nitrogen in the form of nitrate ions.

Nitrogen cycle is completed in following steps

1. Nitrogen fixation -

In this process first of all some bacteria and blue green algae converts atmospheric nitrogen in to nitrogenous, compounds viz ammonia, amino acid or nitrate salts.

e.g.

Bacteria - Rhizobium, Aerorhizobium, Azospirillum
Frankia, Clostridium, Azotobacter
} Inseveral tropical grasses

Blue green algae - Anabaena, Aulosira, Nostonc $\rightarrow$ In flooded rice field in tropics

Note :

(1) Azotobacter is aerobic bacteria

(2) Clostridium is anaerobic bacteria

(3) Symbiotic relationship where the nitrogen fixing bacteria does not penetrate deep into host tissue, is known as **associative symbiosis.**

2. Nitrification -

Conversion of ammonia into nitrate is called nitrification.

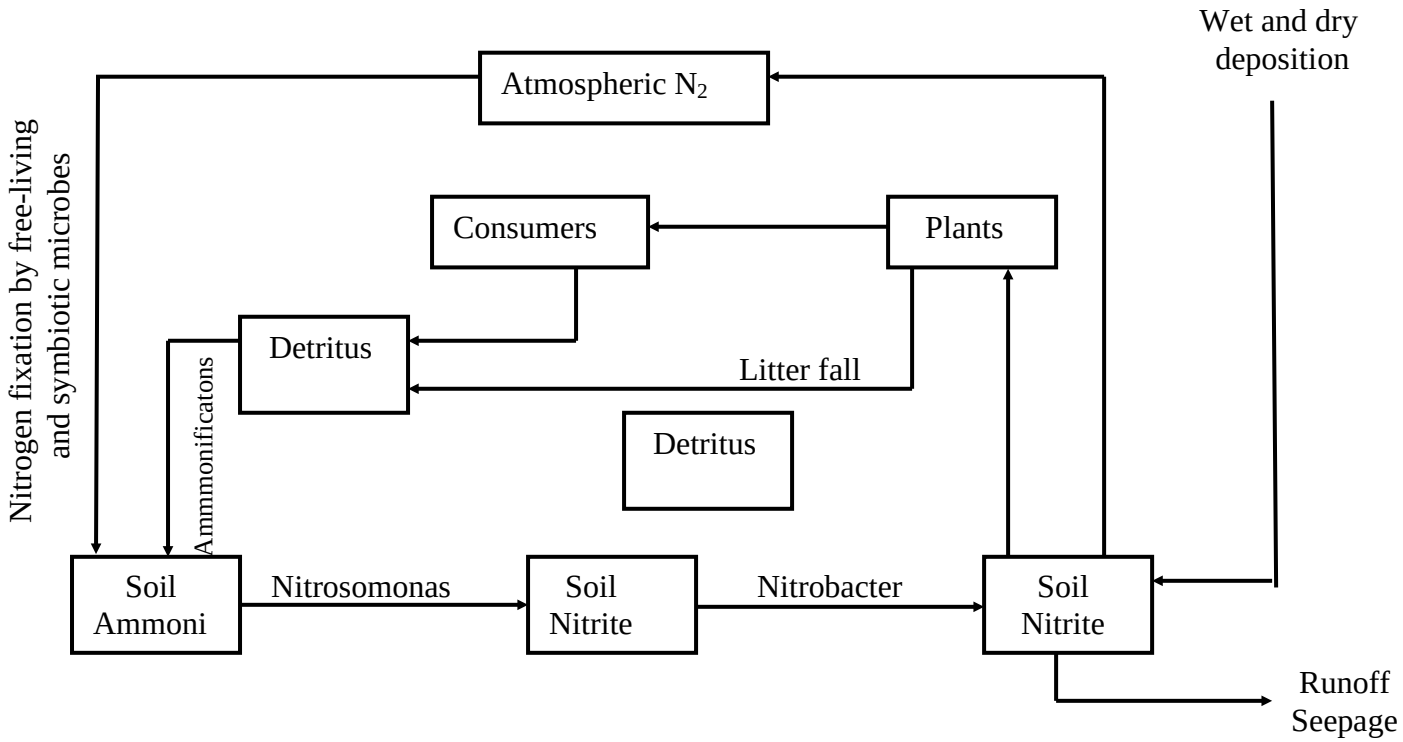
Nitrification process complete in two steps.

$$NH_3 \xrightarrow{\text{Nitrosomonas}} NO_2^- \xrightarrow{\text{Nitrobacter}}$$

Note :

(a) Few quantity of nitrate comes in soil by electrochemical or photochemical process.

(b) Now few quantity of this nitrate absorb by plants.



3. Nitrogen assimilation -

Plants absorb nitrate from the soil and form protein. When consumers eat these plants, these plant proteins is transferred into consumer.

After the death of plants and consumers litter is formed in which protein is present.

4. Ammonification -

Protein present in litter, is converted into ammonia by some ammonifiying bacteria.

e.g. Bacillus vulgaris, Bacillus mycoides, Bacillus ramosus

5. Denitrification -

Some quantity of nitrate which is not used by plants is converted into nitrogen by denitrifying bacteria.

e.g. Thiobacillus denitrificans, Pseudomonas denitrificans

Note : Some nitrate washed out from the ecosystem through seepage.

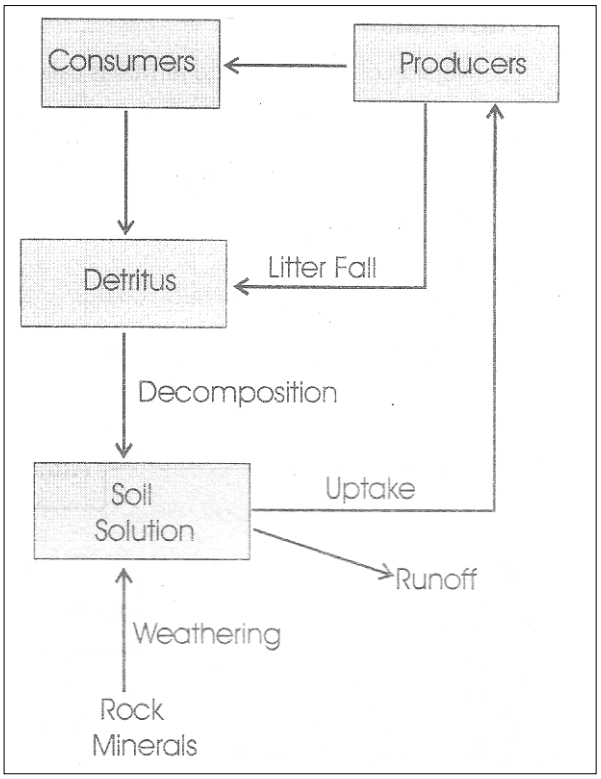
PHOSPHORUS CYCLE

Phosphorus is the main constituents of protoplasm plasma membrane, bones and teeth. Main source of phosphorus is **rocks**. It comes from the weathering of phosphorus containing rock in the soil. Plants absorb this phosphorus from the soil and transfer this phosphate to animals and after the death of animals it is released again into the lithosphere by the action of decomposers.

Sometimes some of the elements like phosphorus and calcium reach into the sea through water, form where they transform into rocks. They separate from the cycle for a long time so it is also knows as **sedimentary cycle.**

But when these rocks breaks after sometimes then this phosphorus is again made available to the sea plant or sea weeds which pass into fish and sea birds. The excretory materials of birds on the rocks of sea shore is called **Guano** and it is a source of phosphorus.

Note :- Plants absorb phosphate from the soil in the form of orthophosphate (Po_4^{3-})



WATER CYCLE

Water is indispensable for life. Sea is the main source of water on earth; water is always present in the atmosphere in the form of water vapour. Water is also evaporated from other places from where it reaches into the atmosphere. These vapours form clouds in the atmosphere, condensation of water vapour forms clouds, mist, fog and ice at high altitudes. It comes again on the earth is above forms.

Water cycle plays a significant role on the earth. Plants and animals receive water or absorb water. Water participates in various metabolic activities of the body of organisms and again it is formed. Water is converted into food through the photosynthesis in plants water is also present in protoplasm of all organisms. This water again comes into the atmosphere through transpiration from the plants and evaporation and seating from the animals. Thus, this cycle goes on continuously. The oxygen cycle and hydrogen cycle is also found in the ecosystem as above cycles.

Note :

1. Water cycle is directly operated by solar radiation and it is under the control of forests.
2. The term "Cycle" is used for the movement of matter and the term "Flow" is used for the movement of energy.

