PHOSPHORUS CYCLE

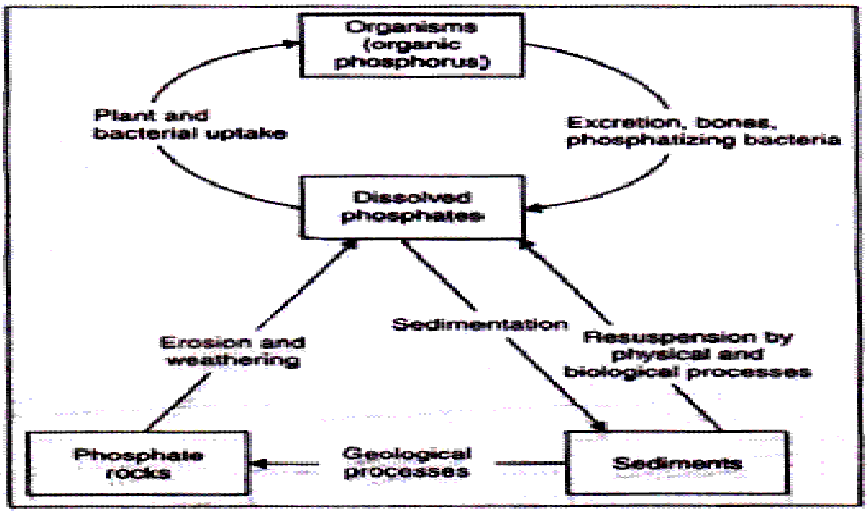
The Phosphorus cycle, unlike those of Carbon and Nitrogen cycles lacks an atmospheric component.

The global phosphorus cycle involves only aquatic and soil compartments. As a basic constituent of nucleic acids, phospholipids and numerous phosphorylated compounds, phosphorus is one of the nutrients of major importance to biological systems.

Further, as Hutchinson has noted, because the ratio of phosphorus to other elements in organisms tends to be considerably greater than the ratio of phosphorus in the available and primary sources, phosphorus becomes ecologically significant as the most likely limiting or regulating element in productivity.

Basic source and the great reservoir of phosphorus are the rocks or other deposits which have been formed in the past geological ages. These are gradually eroding, releasing phosphates to ecosystems. But much phosphate escapes into the sea where part of it is deposited in the shallow sediments and part of it is lost to the deep sediments.

However, the means of returning phosphorus to the cycle are inadequate to compensate for the loss. The principal global flux of phosphorus consists of the movement of about 21 x 10^{12} g P yr^{-1} from the terrestrial pool to the oceans through the rivers. Phosphate fertilizers, used in agriculture, are added to the soil at a rate of about 14 x 10^{12} g yr^{-1}, which is also carried into the oceans by runoff and



rivers.

Much phosphate becomes lost to this central cycle by physical processes, such as sedimentation, which take it out of the reach of upwelling and major water circulation. Biological process, such as the formation of teeth and bone, and excretion also account for considerable losses from the major portion of cycle.

1. Mineralization: Conversion of Organic Phosphorus into Insoluble Inorganic Phosphates:

Many soil microorganisms produce enzymes that attack many of the organic phosphorus compounds in the soil and release inorganic phosphate. This process is comparable to the mineralization of organic nitrogen compounds. The enzymes involved in these reactions are collectively called 'phosphatases' which have a broad range of substrate specificity.

2. Solubilization: Conversion of Insoluble Inorganic Phosphates into Soluble Inorganic Phosphates:

The availability of phosphorus depends on the degree of solubilization by various organic and inorganic acids produced by microorganisms in soil. These are the solubilized form of insoluble inorganic phosphates which are taken in by the plants.

Fungi, e.g., *Aspergillus*sp., *Penicillium*sp., *Fusarium*sp. are the most important of the soil microorganisms which produce substantial amounts of these acids; others are the bacteria, namely, *Bacillus*sp., *Pseudomonas* sp., *Micrococcus*sp., *Flavobacterium*sp., etc.