

Matter Cycles

Real World Ecosystems Backgrounder

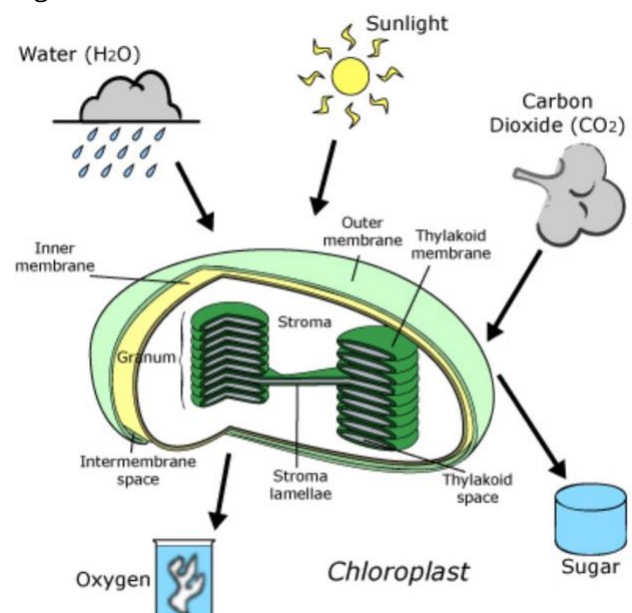


Did you know that living organisms have literally changed the face of the Earth itself? The activities of living organisms involve **interactions** (Actions or effects between plants, between animals, or between plant and animal species) with the non-living portion of the Earth and, in those interactions, the composition of the **atmosphere** (The mixture of gases (air) that surrounds the Earth) oceans and even the Earth's crust are changed.

Although the sun provides the source of energy needed to rearrange the atoms to form carbohydrates, lipids and proteins formed during **photosynthesis**, (the chemical process during which green plants convert light energy, carbon dioxide and water in the presence of chlorophyll into carbohydrates. Oxygen is produced as a by-product) the energy that enters the ecosystem is only temporarily stored within chemical bonds before leaving in the form of heat. Fortunately for us, the energy from the sun is more or less continuous and the energy lost as heat is constantly replaced. Energy flows through ecosystems.

Did you know? Tilting, turning Earth changes seasons and daylight hours. Do you know why we have seasons and a change in the number of daylight hours? As the Earth revolves around the sun, it is rotating on an axis tilted 23.5 degrees. If the Earth was not tilted there would be no seasonal changes, and the number of hours of day light would be the same all year.

You already know that energy from the sun is used by green plants in the process of photosynthesis to rearrange the atoms that make up carbon dioxide and water to form simple carbohydrate molecules that begin all food chains and webs. In addition, plant roots actively take in other elements from the soil and those elements are made part of even more complex organic molecules such as lipids and proteins. These organic molecules are the ultimate source of chemical energy for almost every living organism.



Earth's first modern tree. Did you know that the first modern tree that appeared on Earth was called Archaeopteris? The Archaeopteris appeared about

370 million years ago. It looked very much like a Christmas tree. It was the first tree to have wood, branches and strong stem.

Unlike energy, the Earth itself is the source of the atoms involved in the formation of carbohydrates, lipids and proteins. For all practical purposes, the number of those atoms is fixed and in limited supply. The only new source atoms is from dust that filters into our atmosphere from space or from meteors that burn up in our atmosphere, however this amount can be easily ignored. Plants take in elements and molecules from the air, water and soil surrounding them to form organic molecules. The molecules involved are passed through food webs and eventually are returned to the air, water and soil as simple inorganic molecules by the action of decomposers. Matter cycles within ecosystems.

Although you could detail the stages involved in the cycling of many of the atoms that make up organic molecules this activity will focus on three of the most important cycles:

1. The Carbon Cycle
2. The Nitrogen Cycle
3. The Water Cycle

Key Points

- Unlike energy in an ecosystem, the amount of matter on the Earth is a fixed quantity, therefore matter is continuously recycled and reused.
- There are many stages involved in the cycling of atoms that make up organic molecules, the carbon, nitrogen and water cycles are three very important cycles.
- The sun provides a constant source of energy which is needed to rearrange the atoms to form carbohydrates, lipids and proteins formed during photosynthesis.
- All living organisms are composed of organic molecules that are, ultimately, chains of carbon atoms.
- The simplest organic molecules are composed of carbon, hydrogen and oxygen atoms, formed during photosynthesis and will be modified to form more complex molecules

by metabolic activities.

- The issue of global warming and limits to greenhouse gas emissions is a common news topic on an almost daily basis with implications for human society on a global basis.