The Oxygen Cycle

Almost all living things need oxygen. They use this oxygen during the process of creating energy in living cells.

Just as water moves from the sky to the earth and back in the hydrologic cycle, oxygen is also cycled through the environment. Plants mark the beginning of the oxygen cycle. Plants are able to use the energy of sunlight to convert carbon dioxide and water into carbohydrates and oxygen in a process called photosynthesis.

\[ \text{O}_2 + \text{carbohydrates} \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{energy} \]

This means that plants "breathe" in carbon dioxide and "breathe" out oxygen.

Animals form the other half of the oxygen cycle. We breathe in oxygen which we use to break carbohydrates down into energy in a process called respiration.
Carbon dioxide produced during respiration is breathed out by animals into the air.

So oxygen is created in plants and used up by animals, as is shown in the picture above. But the oxygen cycle is not actually quite that simple. Plants must break carbohydrates down into energy just as animals do. During the day, plants hold onto a bit of the oxygen which they produced in photosynthesis and use that oxygen to break down carbohydrates. But in order to maintain their metabolism and continue respiration at night, the plants must absorb oxygen from the air and give off carbon dioxide just as animals do. Even though plants produce approximately ten times as much oxygen during the day as they consume at night, the night-time consumption of oxygen by plants can create low oxygen conditions in some water habitats.

**Oxygen in Water**

Oxygen in water is known as dissolved oxygen or DO. In nature, oxygen enters water when water runs over rocks and creates tremendous amounts of surface
area. The high surface area allows oxygen to transfer from the air into the water very quickly.

When the water in a stream enters a pond, microorganisms in the pond begin to metabolize (break down) organic matter, consuming oxygen in the process. This is another form of oxygen cycle - oxygen enters water in rapids and leaves water in pools.

Oxygen uptake rate (O.U.R.) is the rate at which oxygen is consumed by living organisms in the water. Since organisms are constantly using up oxygen in the water and oxygen is constantly reentering the water from the air, the amount of oxygen in water remains relatively constant. In a healthy ecosystem, the rates of oxygen transfer (being used up) and oxygen uptake are balanced in the water.