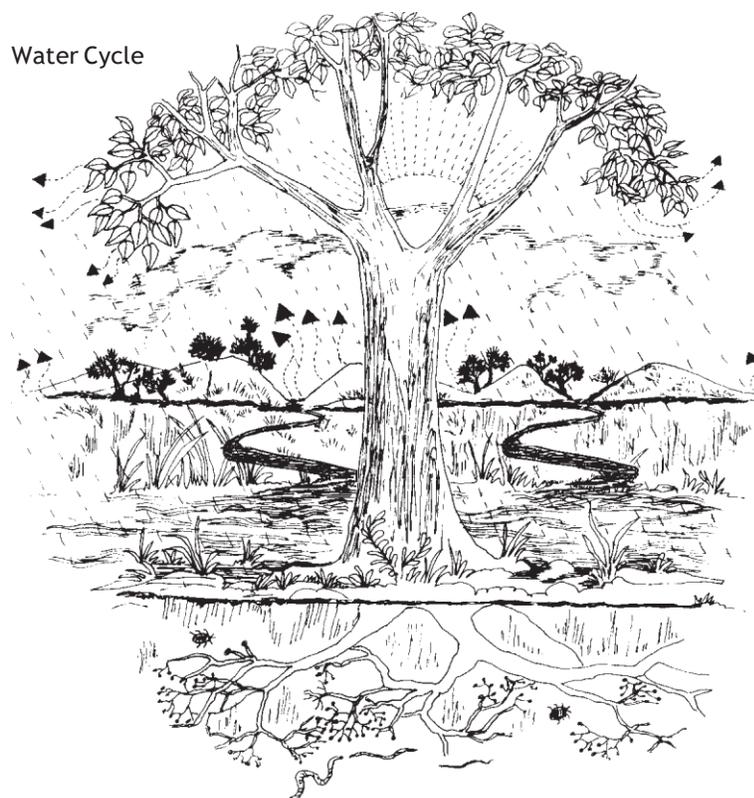


## The Water Cycle

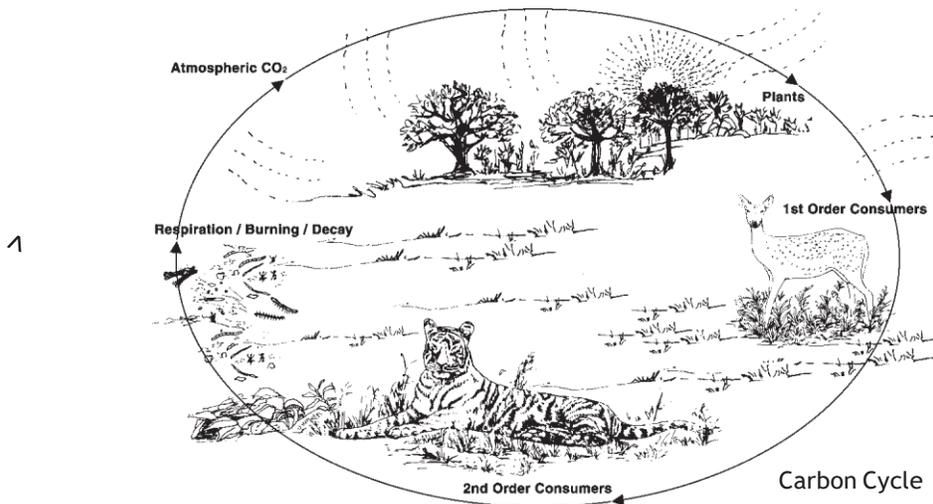
When it rains, the water runs along the ground and flows into rivers or falls directly into the sea. A part of the rainwater that falls on land percolates into the ground. This is stored underground throughout the rest of the year. Water is drawn up from the ground by plants along with the nutrients from the soil. The water is transpired from the leaves as water vapour and returned to the atmosphere. As it is lighter than air, water vapour rises and forms clouds. Winds blow the clouds for long distances and when the clouds rise higher, the vapour condenses and changes into droplets, which fall on the land as rain. Though this is an end-less cycle on which life depends, man's activities are making drastic changes in the atmosphere through pollution which is altering rainfall patterns. This is leading to prolonged drought periods extending over years in countries such as Africa, while causing floods in countries such as the US. El Nino storms due to these effects have devastated many places in the last few years



## The Carbon Cycle

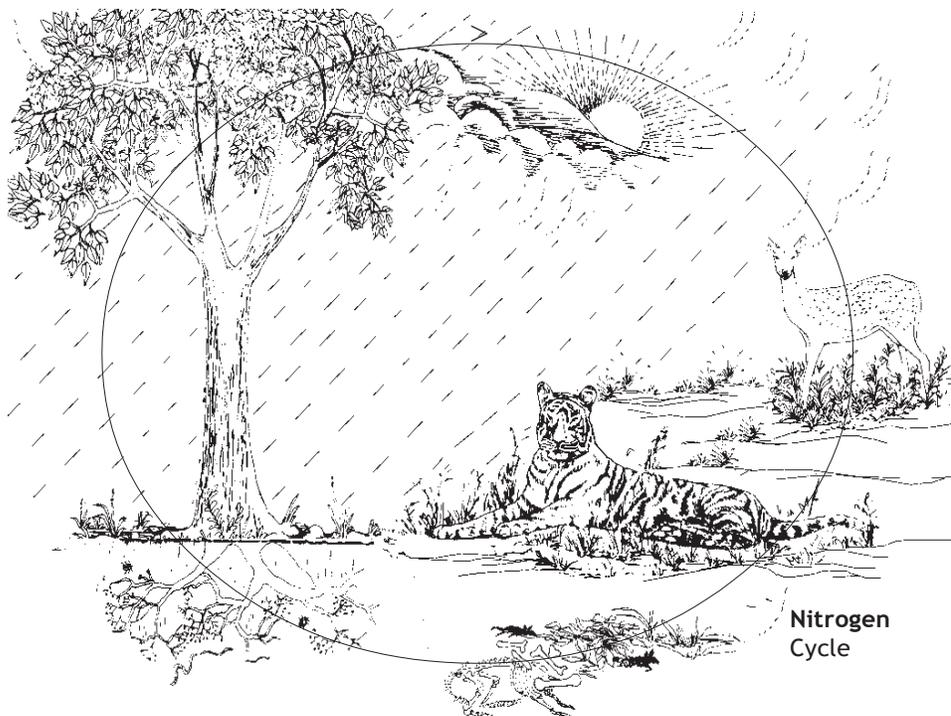
The carbon, which occurs in organic compounds, is included in both the abiotic and biotic parts of the ecosystem. Carbon is a building block of both plant and animal tissues. In the atmosphere, carbon occurs as carbon dioxide ( $\text{CO}_2$ ). In the presence of sun- light, plants take up carbon-di-oxide from the atmosphere through their leaves. The plants combine carbon dioxide with water, which is absorbed by their roots from the soil. In the presence of sunlight they are able to form carbohydrates that contain carbon. This process is known as photosynthesis. Plants use this complex mechanism for their growth and development. In this process, plants release oxygen into the atmosphere on which animals depend for their respiration. Plants therefore help in regulating and monitoring the percent- age of Oxygen and Carbon dioxide in the earth's atmosphere. All of mankind thus depends on the oxygen generated through this cycle. It also keeps the  $\text{CO}_2$  at acceptable levels.

Herbivorous animals feed on plant material, which is used by them for energy and for their growth. Both plants and animals release carbon dioxide during respiration. They also return fixed carbon to the soil in the waste they excrete. When plants and animals die they return their carbon to the soil. These processes complete the carbon cycle.



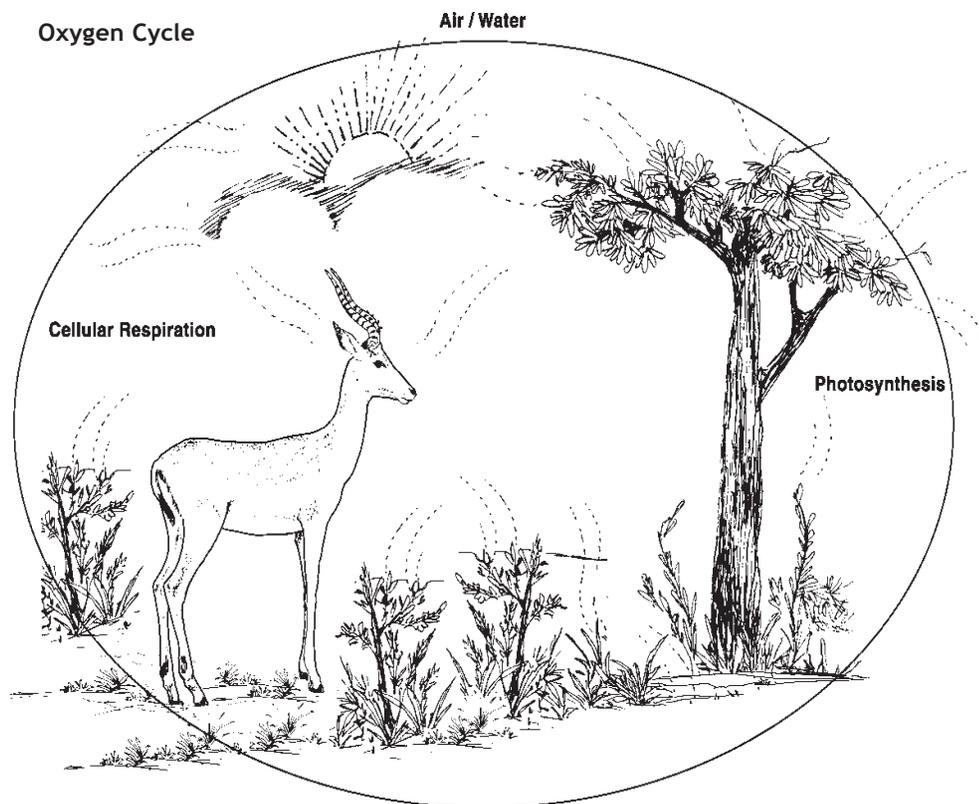
## The Nitrogen Cycle

Carnivorous animals feed on herbivorous animals that live on plants. When animals defecate, this waste material is broken down by worms and insects mostly beetles and ants. These small 'soil animals' break the waste material into smaller bits on which microscopic bacteria and fungi can act. This material is thus broken down further into nutrients that plants can absorb and use for their growth. Thus nutrients are recycled back from animals to plants. Similarly the bodies of dead animals are also broken down into nutrients that are used by the plants for their growth. Thus the nitrogen cycle on which life is dependent is completed. Nitrogen fixing bacteria and fungi in soil gives this important element to plants, which absorb it as nitrates. The nitrates are a part of the plant's metabolism, which help in forming new plant proteins. This is used by animals that feed on the plants. The nitrogen is then transferred to carnivorous animals when they feed on the herbivores. Thus our own lives are closely interlinked to soil animals, fungi and even bacteria in the soil. When we think of food webs, we usually think of the large mammals and other large forms of life. But we need to understand that it is the unseen small animals, plants and microscopic forms of life that are of great value for the functioning of the ecosystem



## The Oxygen Cycle

Oxygen is taken up by plants and animals from the air during respiration. The plants return oxygen to the atmosphere during photosynthesis. This links the Oxygen Cycle to the Carbon Cycle. Deforestation is likely to gradually reduce the oxygen levels in our atmosphere. Thus plant life plays an important role in our lives which we frequently do not appreciate. This is an important reason to participate in afforestation programs closely interlinked to soil animals, fungi and even bacteria in the soil. When we think of food webs, we usually think of the large mammals and other large forms of life. But we need to understand that it is the unseen small animals, plants and microscopic forms of life that are of great value for the functioning of the ecosystem



## **The Energy Cycle**

The energy cycle is based on the flow of energy through the ecosystem. Energy from sunlight is converted by plants themselves into growing new plant material which includes leaves, flowers, fruit, branches, trunks and roots of plants. Since plants can grow by converting the sun's energy directly into their tissues, they are known as producers in the ecosystem. The plants are used by herbivorous animals as food, which gives them energy. A large part of this energy is used up for day to day functions of these animals such as breathing, digesting food, supporting growth of tissues, maintaining blood flow and body temperature. Energy is also used for activities such as looking for food, finding shelter, breeding and bringing up young ones. The carnivores in turn depend on herbivorous animals on which they feed. Thus the different plant and animal species are linked to one another through food chains. Each food chain has three or four links. However as each plant or animal can be linked to several other plants or animals through many different link-ages, these inter-linked chains can be depicted as a complex food web. This is thus called the 'web of life' that shows that there are thousands of interrelationships in nature.

The energy in the ecosystem can be depicted in the form of a food pyramid or energy pyramid. The food pyramid has a large base of plants called 'producers'. The pyramid has a narrower middle section that depicts the number and bio-mass of herbivorous animals, which are called 'first order consumers'. The apex depicts the small biomass of carnivorous animals called 'second order consumers'. Man is one of the animals at the apex of the pyramid. Thus to support mankind, there must be a large base of herbivorous animals and an even greater quantity of plant material.

When plants and animals die, this material is returned to the soil after being broken down into simpler substances by decomposers such as insects, worms, bacteria and fungi so that plants can absorb the nutrients through their roots

Animals excrete waste products after digesting food, which goes back to the soil. This links the energy cycle to the Nitrogen cycle.

**ENERGY FLOW IN ECOSYSTEM**



**Energy Cycle**