

## What Are Plants?

**Plants** are not like animals. Plants cannot move to find food. Instead, they must have the ability to survive where they are. They also must have the ability to make their own food. They also cannot move around to find a mate, so they have evolved unique ways to reproduce.

### Needs of Plants

Plants are somewhat limited by temperature in terms of where they can grow. They need temperatures above freezing. They can survive temperatures below freezing, but cannot grow during this period of time. They also need light, carbon dioxide, and water. These are the ingredients they need to make their own food. Like most other living things, plants need oxygen. Oxygen is required for cellular respiration. In addition, plants need minerals. The minerals are required to make proteins and other organic molecules.

### Importance of Plants

Life as we know it would not be possible without plants. Why are plants so important?

- Plants supply food to nearly all land organisms, including people. We mainly eat either plants or other living things that eat plants.
- Plants produce oxygen. Oxygen is needed by almost all the Earth's organisms.
- Plants absorb carbon dioxide from the air. This helps control the greenhouse effect and global warming.
- Plants recycle matter in ecosystems. For example, they are an important part of the water cycle. They take up liquid water from the soil through their roots. They release water vapor to the air from their leaves.
- Plants provide many products for human use. They include timber, medicines, dyes, oils, and rubber.
- Plants provide homes for many other living things. For example, a single tree may provide food and shelter to many species of animals. One example is the **Figure** to the right of a bird's nest.

Many birds build their nests in trees. Plant materials are often used to build them.



### Plant Structures

Most modern plants have several structures that help them survive and reproduce. Major structures of most plants include roots, stems, and leaves.

#### Roots

**Roots** are important organs in most modern plants. There are two types of roots. First, there are the primary roots, which grow downward. Secondly, there are the secondary roots. These roots branch out to the sides. Together, all the roots of a plant make up the plant's root system. **The figure to the right** shows two different types of plant root systems. A taproot system has a very long primary root, called a taproot. A fibrous root system has many smaller roots and no large, primary root.

The roots of plants have three major jobs. They must absorb water and minerals, anchor and support the plant, and store food.

- Roots have special features that are well suited to absorb water and dissolved minerals from the soil.
- Root systems help anchor plants to the ground. They allow plants to grow tall without falling over.
- In many plants, roots store food produced by the leaves. This process is called photosynthesis.



Taproot System:  
Dandelion



Fibrous Root System:  
Grass

## Stems

**Stems** are organs that hold plants upright. They allow plants to get the sunlight and air they need. Stems also bear leaves, flowers, cones, and smaller stems. These structures grow at points called nodes. The stem between nodes is called an internode. (See **Figure** to the right.)

Stems are needed for transport and storage. They carry water and minerals from roots to leaves. It carries dissolved sugar from the leaves to the rest of the plant. The stem is like an elevator for the plant. The stem allows movement from the top of the plant to the bottom and vice versa. Without this connection between roots and leaves, plants could not survive. In many plants, stems also store food or water during cold or dry seasons.



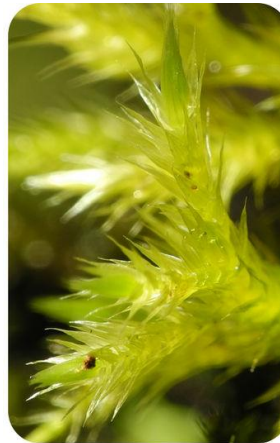
## Leaves

**Leaves** are the keys not only to plant life but to virtually all life on land. The primary role of leaves is to collect sunlight. This sunlight is needed for the plant to make food. Leaves vary in size, shape, and how they are arranged on stems. You can see examples of different types of leaves in **Figure** to the right.

Each type of leaf is well suited for the plant's environment. It maximizes light exposure while conserving water. They also reduce wind resistance. Leaves also benefit the plant in some other way in its particular habitat. For example, some leaves are divided into many smaller leaflets. This reduces wind resistance and water loss.

Leaves are basically factories for photosynthesis.

- A factory has specialized machines to produce a product. In a leaf, the "machines" are the chloroplasts.
- A factory is connected to a transportation system that supplies it with raw materials and carries away the finished product. In a leaf, transport is carried out by veins containing vascular tissue. Veins carry water and minerals to the cells of leaves. They carry away dissolved sugar.
- A factory has bricks, siding, or other external protection. A leaf is covered with dermal cells. They secrete waxy cuticle to prevent evaporation of water from the leaf.
- A factory has doors and windows to let some materials enter and leave. The surface of the leaf has tiny pores called stomata (stoma, singular). They can open and close to control the movement of gases between the leaves and the air. You can see a close-up of a stoma in **Figure below**.



Moss



Fern



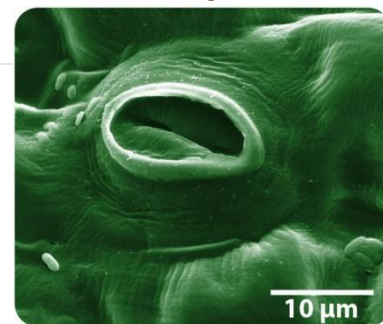
Pine tree



Maple tree

## What is Photosynthesis?

If a plant gets hungry, it cannot walk to a local restaurant and buy a slice of pizza. So, how does a plant get the "food" it needs to survive? Plants are **producers**, which means they are able to make, or produce, their own "food." They also produce the "food" for other organisms. Plants collect the **energy** from the **sun** and turn it into special chemicals. Using the energy from the sun, they produce the special chemicals using air, water and nutrients from the soil. So once again, how does a plant get the food it needs to survive? The plant is able to make its own "food" from the **sun's energy**, carbon dioxide from the air, and **water**.



Actually, almost all organisms obtain their energy from plants. For example, if a bird eats a caterpillar, then the bird gets the energy that the caterpillar gets from the plants it eats. So the bird indirectly gets energy from the plant. Therefore, the process of photosynthesis is central to sustaining life on Earth.