



SECTION 21.3 | ROOTS AND STEMS  
**Reinforcement**

**KEY CONCEPT** Roots and stems form the support system of vascular plants.

Roots may make up over half of the body of a plant. They anchor the plant to the ground, and they absorb water and minerals the plant needs from the soil. In the center of a root is the **vascular cylinder**, which is made of xylem and phloem tissues that allow water, minerals, and sugars to move through the plant. A plant absorbs most of its water and minerals in the dermal tissue just above the root tips. These cells have tiny projections called **root hairs**. Root hairs greatly add to the surface area available to take up nutrients. Covering the tip of the root is the **root cap**, a small cone of cells that protects the growing part of the root as it pushes through the soil.

Just behind the root cap is where most of the root's growth occurs. The source of new cells is tissue called **meristem**. When meristem cells divide, some of the new cells become specialized. Areas of growth that lengthen the tips of roots and stems are called apical meristems. Lateral meristems, found all along woody roots and stems, increase the thickness of these plant parts.

There are two main types of roots. **Fibrous root** systems make fine branches in which most of the roots are the same size. These roots spread like a mat beneath the soil surface, and firmly anchor the plant to the ground. **Taproot** systems have a long, thick, vertical root with smaller branches. Long taproots allow plants to get water from deep in the ground. The thick taproot can sometimes store food. Radishes, carrots, and beets are examples of taproots that we eat.

Stems provide support for the plant, and house the vascular systems of the plant. They also give leaves and flowers better access to sunlight and to pollinators. Some stems are herbaceous. Herbaceous plants produce little or no wood. They are usually soft and don't grow more than two meters (6 ft) tall. Stems can also be woody. A tree trunk is an example of a woody stem. Both herbaceous and woody stems undergo primary growth. **Primary growth** is growth that makes stems grow taller and roots grow longer. Woody plants can also undergo **secondary growth**, which adds to the width of woody stems and roots.

CHAPTER 21  
Plant Structure and Function

1. What are two functions that roots provide a plant?

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2. Why can the presence of root hairs help a plant absorb more water and minerals?

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3. What type of plant undergoes secondary growth? Give an example.

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