

SECTION

2

Seedless Plants

When you think of plants, you probably think of plants, such as trees and flowers, that make seeds. But two groups of plants don't make seeds.

One group of seedless plants is the nonvascular plants—mosses, liverworts, and hornworts. The other group is seedless vascular plants—ferns, horsetails, and club mosses.

What You Will Learn

- List three nonvascular plants and three seedless vascular plants.
- Explain how seedless plants are important to the environment.
- Describe the relationship between seedless vascular plants and coal.

Vocabulary

rhizoid
rhizome

READING STRATEGY

Paired Summarizing Read this section silently. In pairs, take turns summarizing the material. Stop to discuss ideas that seem confusing.

rhizoid a rootlike structure in nonvascular plants that holds the plants in place and helps plants get water and nutrients

Nonvascular Plants

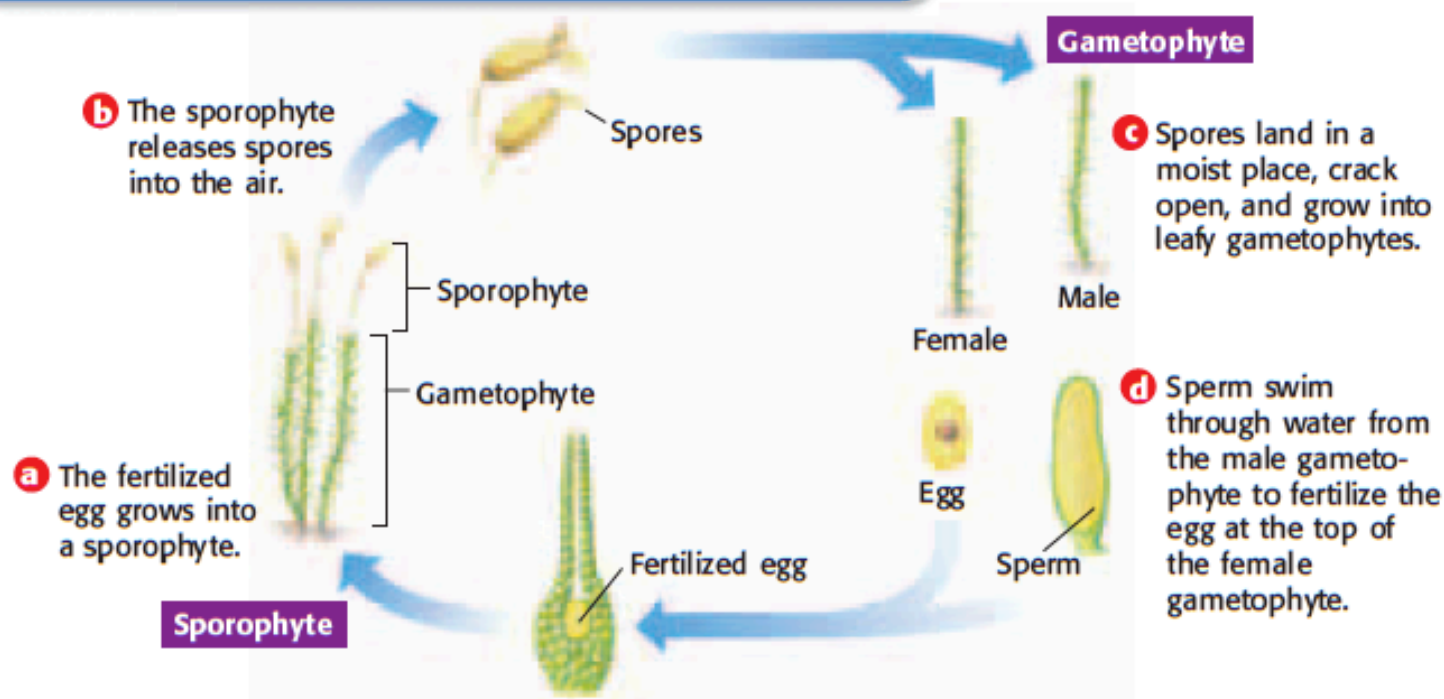
Mosses, liverworts, and hornworts are small. They grow on soil, the bark of trees, and rocks. These plants don't have vascular tissue. So, nonvascular plants usually live in places that are damp. Each cell of the plant must get water from the environment or from a nearby cell.

Mosses, liverworts, and hornworts don't have true stems, roots, or leaves. They do, however, have structures that carry out the activities of stems, roots, and leaves.

Mosses

Mosses often live together in large groups. They cover soil or rocks with a mat of tiny green plants. Mosses have leafy stalks and rhizoids (RIE ZOYDZ). A **rhizoid** is a rootlike structure that holds nonvascular plants in place. Rhizoids help the plants get water and nutrients. As you can see in **Figure 1**, mosses have two stages in their life cycle.

Figure 1 Moss Life Cycle




The Importance of Seedless Vascular Plants

Seedless vascular plants play important roles in the environment. Ferns, horsetails, and club mosses help form soil. They also help prevent soil erosion. In rocky areas, ferns can play a role in the formation of communities. After lichens and mosses create a layer of soil, ferns may take over. Ferns add to soil depth, which allows other plants to grow.

Ferns and some club mosses are popular houseplants. The fiddleheads of some ferns can be cooked and eaten. Young horsetail shoots and their roots are also edible. Horsetails are used in some dietary supplements, shampoos, and skin-care products.

Seedless vascular plants that lived and died about 300 million years ago are among the most important to humans. The remains of these ancient ferns, horsetails, and club mosses formed coal. Coal is a fossil fuel that humans mine from the Earth's crust. Humans rely on coal for energy.

 **Reading Check** How are seedless vascular plants important to the environment?

CONNECTION TO Language Arts

WRITING SKILL

Selling Plants

Imagine that you work for an advertising agency. Your next assignment is to promote seedless vascular plants. Write an advertisement describing seedless vascular plants and ways people benefit from them. Your advertisement should be exciting and persuasive.

SECTION Review

Summary

- Nonvascular plants include mosses, liverworts, and hornworts.
- Seedless vascular plants include ferns, horsetails, and club mosses.
- The rhizoids and rhizomes of seedless plants prevent erosion by holding soil in place.
- The remains of seedless vascular plants that lived and died about 300 million years ago formed coal. Humans rely on coal for energy.

Using Key Terms

1. Use each of the following terms in a separate sentence: *rhizoid* and *rhizome*.

Understanding Key Ideas

2. Seedless plants
 - a. help form communities.
 - b. reduce soil erosion.
 - c. add to soil depth.
 - d. All of the above
3. Describe six kinds of seedless plants.
4. What is the relationship between coal and seedless vascular plants?

Math Skills

5. Club mosses once grew as tall as 40 m. Now, they grow no taller than 20 cm. What is the difference in height between ancient and modern club mosses?

Critical Thinking

6. **Making Inferences** Imagine a very damp area. Mosses cover the rocks and trees in this area. Liverworts and hornworts are also very abundant. What might happen if the area dries out? Explain your answer.
7. **Applying Concepts** Modern ferns, horsetails, and club mosses are smaller than they were millions of years ago. Why might these plants be smaller?

SCILINKS.

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For a variety of links related to this chapter, go to www.scilinks.org

Topic: Seedless Plants
SciLinks code: HSM1368

Ferns

Ferns grow in many places, from the cold Arctic to warm, humid tropical forests. Many ferns are small plants. But some tropical tree ferns grow as tall as 24 m. Most ferns have a rhizome. A **rhizome** is an underground stem from which new leaves and roots grow. At first, fern leaves, or fronds, are tightly coiled. These fronds look like the end of a violin, or fiddle. So, they are called *fiddleheads*. You are probably most familiar with the leafy fern sporophyte. The fern gametophyte is a tiny plant about half the size of one of your fingernails. The fern gametophyte is green and flat. It is usually shaped like a tiny heart. The life cycle of ferns is shown in **Figure 3**.

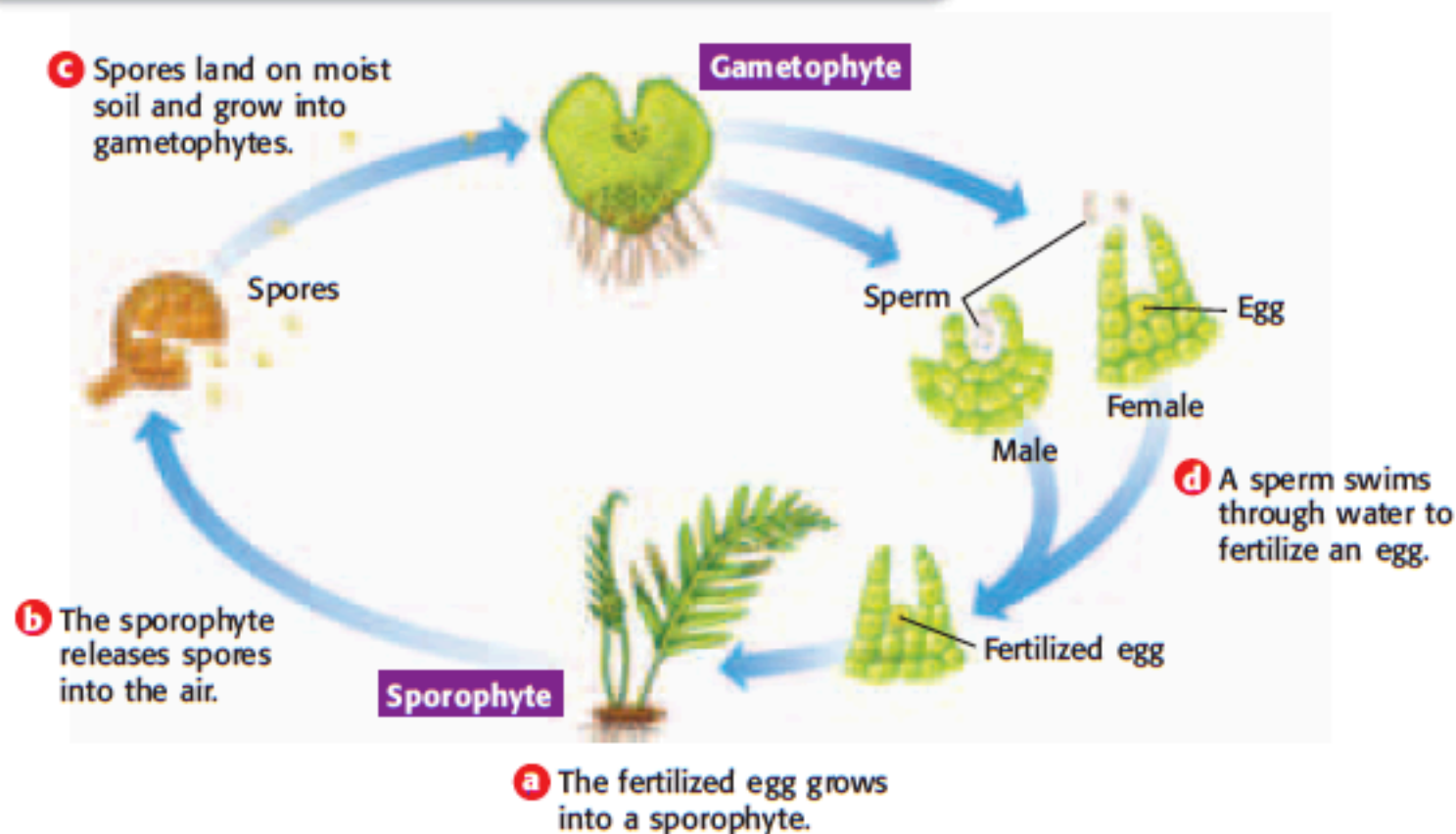
Horsetails and Club Mosses

Modern horsetails can be as tall as 8 m. But many horsetails are smaller. They usually grow in wet, marshy places. Their stems are hollow and contain silica. The silica gives horsetails a gritty texture. In fact, early American pioneers referred to horsetails as *scouring rushes*. They used horsetails to scrub pots and pans. Horsetails and ferns have similar life cycles.

Club mosses are often about 20 cm tall. They grow in woodlands. Club mosses are not actually mosses. Unlike mosses, club mosses have vascular tissue. The life cycle of club mosses is similar to the fern life cycle.

rhizome a horizontal, underground stem that produces new leaves, shoots, and roots

Figure 3 Fern Life Cycle




Liverworts and Hornworts

Like mosses, liverworts and hornworts are small, nonvascular plants that usually live in damp places. The life cycles of liverworts and hornworts are similar to the life cycle of mosses. The gametophytes of liverworts can be leafy and mosslike or broad and flattened. Hornworts also have broad, flattened gametophytes. Both liverworts and hornworts have rhizoids.

The Importance of Nonvascular Plants

Nonvascular plants have an important role in the environment. They are usually the first plants to live in a new environment, such as newly exposed rock. When these nonvascular plants die, they form a thin layer of soil. New plants can grow in this soil. More nonvascular plants may grow and hold the soil in place. This reduces soil erosion. Some animals eat nonvascular plants. Other animals use these plants for nesting material.

Peat mosses are important to humans. Peat mosses grow in bogs and other wet places. In some places, dead peat mosses have built up over time. This peat can be dried and burned as a fuel. Peat mosses are also used in potting soil.

 **Reading Check** How are nonvascular plants important to the environment? (See the Appendix for answers to Reading Checks.)

Seedless Vascular Plants

Ancient ferns, horsetails, and club mosses grew very tall. Club mosses grew to 40 m in ancient forests. Horsetails once grew to 18 m tall. Some ferns grew to 8 m tall. Today, ferns, horsetails, and club mosses are usually much smaller. But because they have vascular tissue, they are often larger than nonvascular plants. **Figure 2** shows club mosses and horsetails.



Quick Lab

Moss Mass

1. Determine the mass of a small sample of **dry sphagnum moss**.
2. Observe what happens when you put a small piece of the moss in **water**. Predict what will happen if you put the entire sample in water.
3. Place the moss sample in a **large beaker of water** for 10 to 15 minutes.
4. Remove the wet moss from the beaker, and determine the mass of the moss.
5. How much mass did the moss gain? Compare your result with your prediction.
6. What could this plant be used for?

Figure 2 Seedless vascular plants include club mosses (left) and horsetails (right).

