Unless you have spent a lot of time with soil, you may think of it as a kind of uniform “dirt.” If you dig down beneath the surface, however, you will find something more interesting. In natural ecosystems, soil forms distinct layers. Each layer has unique properties.

Soil scientists call the complete set of soil layers from one location a **soil profile**. The type of bedrock in an area affects the characteristics of the area’s soil profile. Some types of bedrock form more sand as they weather. Other types form more clay. Various types of bedrock add different minerals to soil. This, in turn, affects the soil’s acidity, or pH level, and the types of nutrients it contains.

Climate also affects soil characteristics. For example, in wet regions, nutrients may be washed out of the soil. Some minerals may be washed down the soil profile. This creates a hard layer that plant roots cannot penetrate. Waterlogged soils may contain very little air for roots to grow or soil organisms to live. In hot, dry areas that have clay-rich soil, the dry clay forms a layer that cannot absorb much water. The packed clay also leaves little room for plant roots or soil organisms.

Soil scientists can learn a lot about an ecosystem by examining soil profiles, soil particle size, soil water content, and chemical composition. The properties of a soil play an important role in determining the plants that will grow in it. Plants need to take in water, nutrients, and minerals from the soil. Soil conditions like pH and water drainage affect plant roots. The types of plants that can grow in an area, in turn, determine the type of ecosystem that can develop. Take a look at a few examples of ecosystems and their soils to see how this works in nature.
Many plants do well in slightly acidic soils. Soils that are more acidic favor pine, spruce, and other conifers. These trees can grow large where acidic soils are loose and well-drained. Stands of large conifers provide forest habitat for a variety of birds, reptiles, amphibians, and mammals. These include owls, eagles, hawks, snakes, frogs, bears, coyote, and mountain lions. Coniferous forest ecosystems are found in many mountainous areas of North America.

Soils that are very porous drain water quickly. These dry, thin soils often cannot support large trees. Grassland ecosystems, like savannas, tend to develop on these soils. Savannahs are dry grassland ecosystems common in central Africa. They contain a variety of grasses and some small broad-leaved plants. These grassy, open fields support large herbivores, like gazelle and zebra. These, in turn, support large, fast carnivores like lions and cheetahs. Think for a moment about why speed is an adaptation for animals in the savannah.
Clay-rich soils can be very poorly drained. They hold water so well that the soil may be wet most of the time. Wet clay also can be acidic. Plants that can grow in wet, acidic soil environments include peat moss and ferns. These plants form the basis of a bog ecosystem. Some kinds of shrubs, including cranberry, also are adapted to the bog environment. The moist conditions in a bog can create very cool temperatures compared to the surrounding areas. Insects, including dragonflies, and frogs are the most common animals that live in bogs.

Check for Understanding
1. Explain how well-drained acidic soil supports the development of a coniferous forest ecosystem.
2. Explain how very porous soil affects the type of ecosystem that can develop.