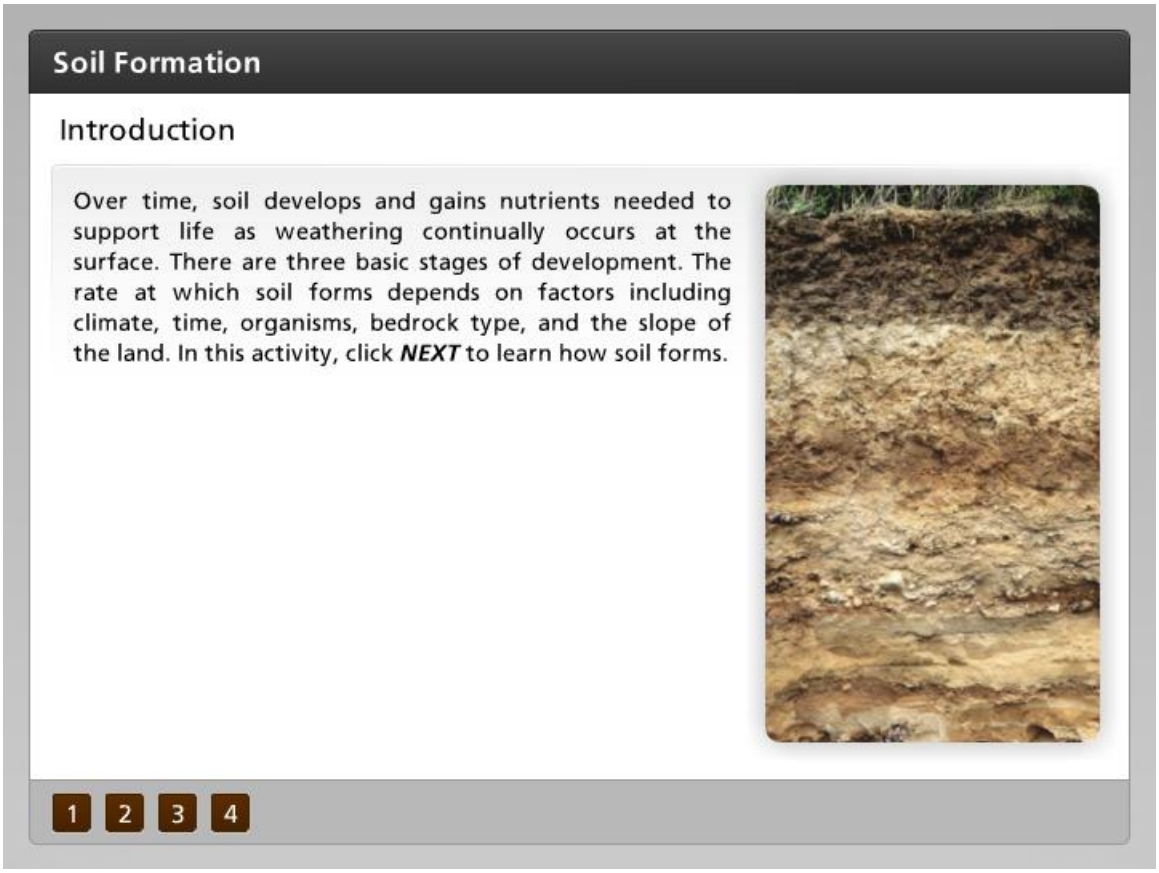
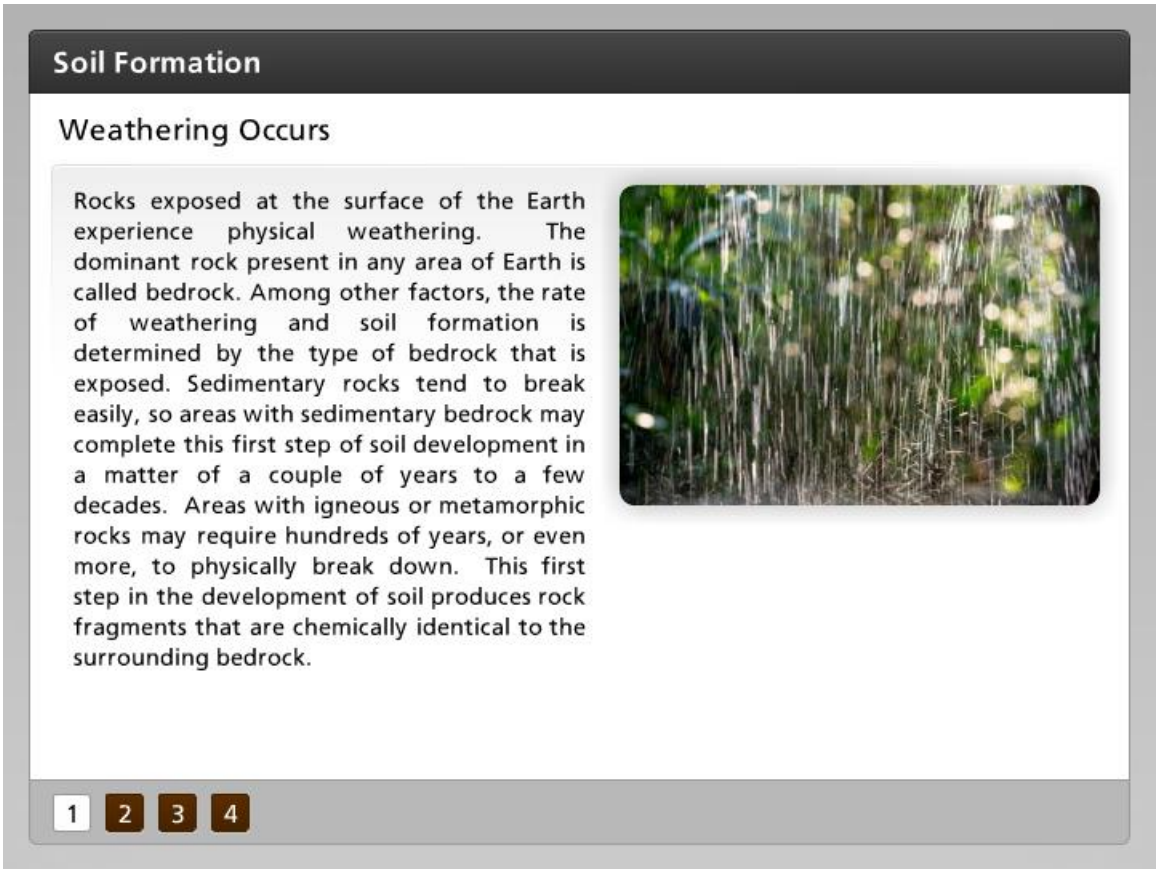
Module 8: Weathering, Erosion, and Groundwater
Topic 3 Content: Soil Formation Notes

Introduction



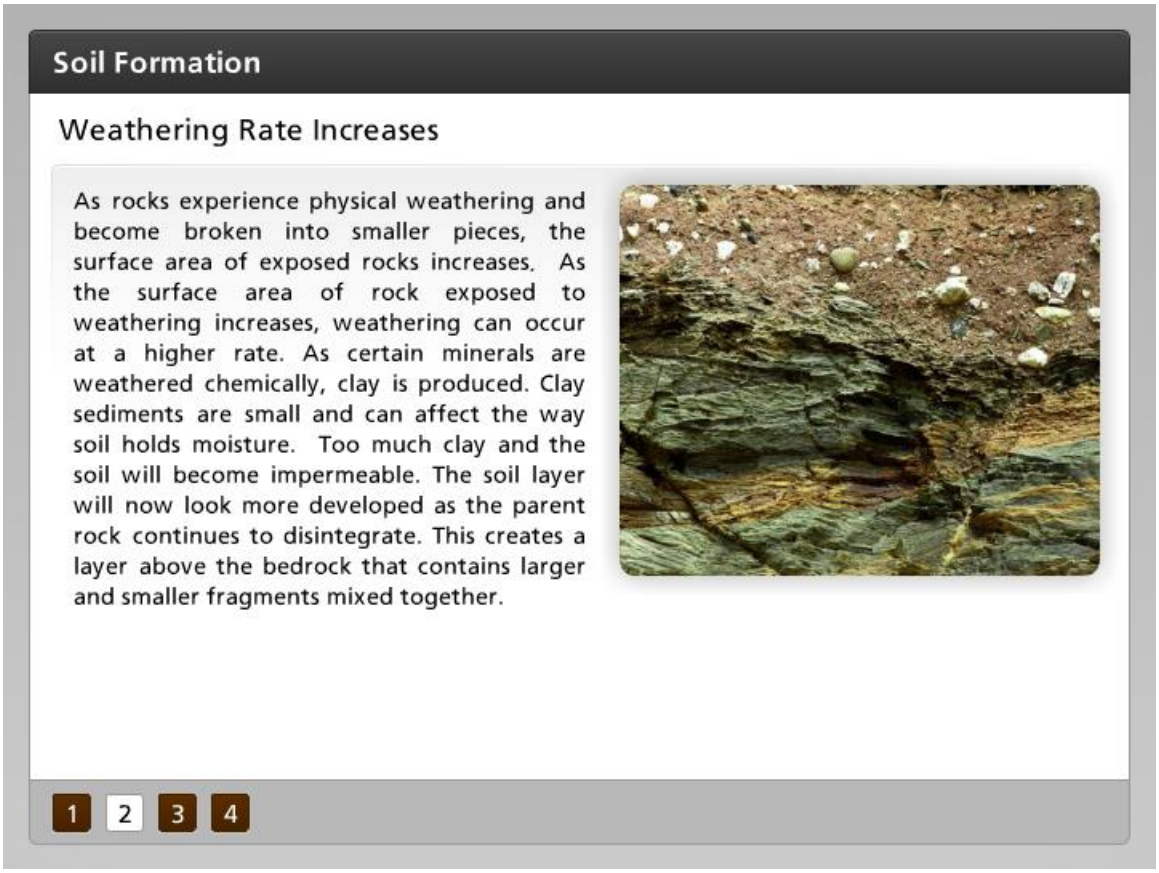
Over time, soil develops and gains nutrients needed to support life as weathering continually occurs at the surface. There are three basic stages of development. The rate at which soil forms depends on factors including climate, time, organisms, bedrock type, and the slope of the land. In this activity, click ***NEXT*** to learn how soil forms.

Weathering Occurs



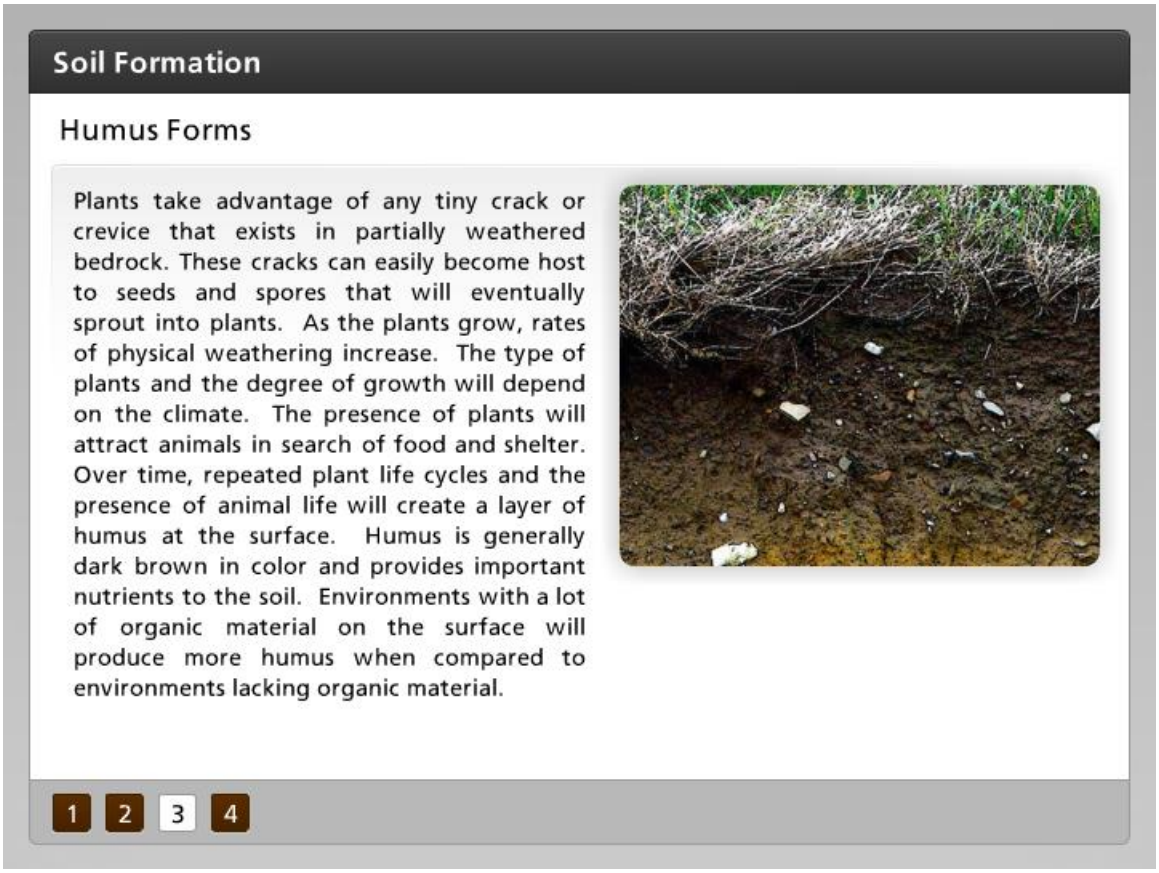
Rocks exposed at the surface of the Earth experience physical weathering. The dominant rock present in any area of Earth is called bedrock. Among other factors, the rate of weathering and soil formation is determined by the type of bedrock that is exposed. Sedimentary rocks tend to break easily, so areas with sedimentary bedrock may complete this first step of soil development in a matter of a couple of years to a few decades. Areas with igneous or metamorphic rocks may require hundreds of years, or even more, to physically break down. This first step in the development of soil produces rock fragments that are chemically identical to the surrounding bedrock.

Weathering Rate Increases



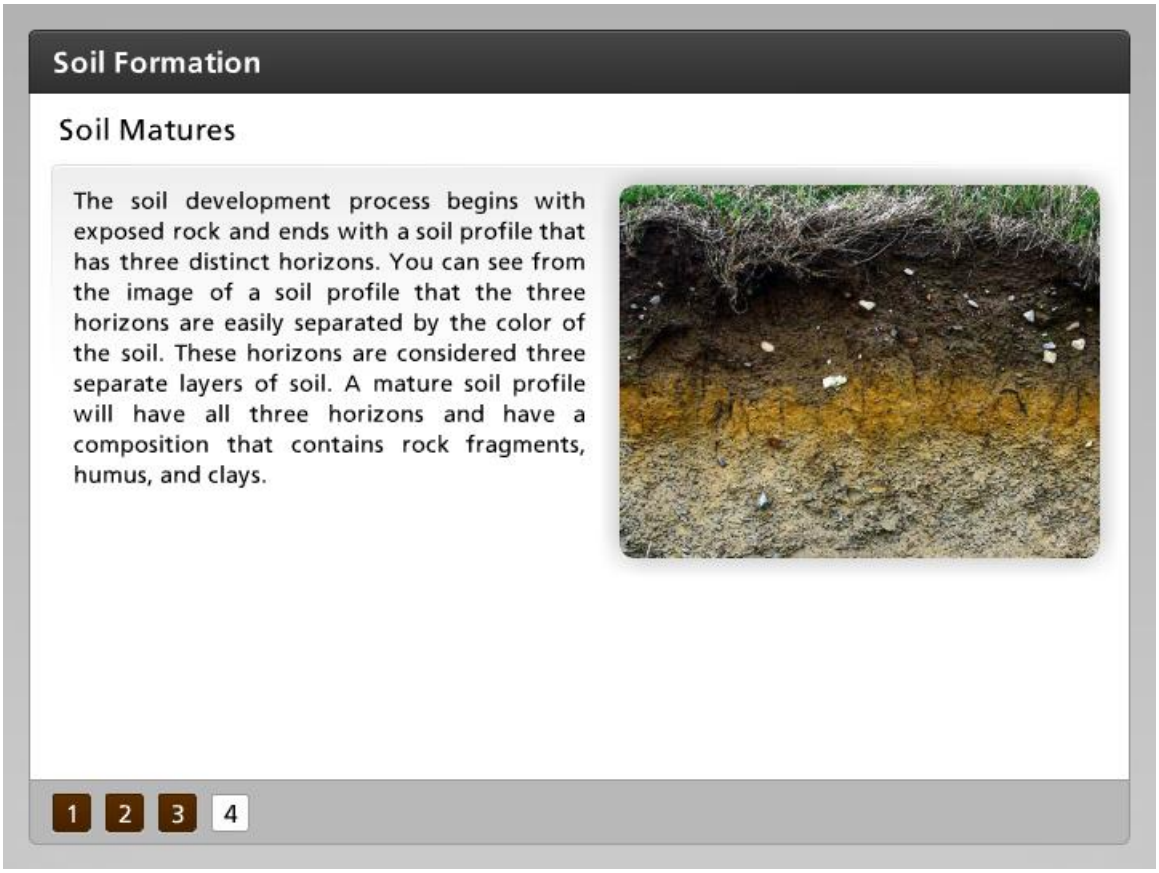
As rocks experience physical weathering and become broken into smaller pieces, the surface area of exposed rocks increases. As the surface area of rock exposed to weathering increases, weathering can occur at a higher rate. As certain minerals are weathered chemically, clay is produced. Clay sediments are small and can affect the way soil holds moisture. Too much clay and the soil will become impermeable. The soil layer will now look more developed as the parent rock continues to disintegrate. This creates a layer above the bedrock that contains larger and smaller fragments mixed together.

Humus Forms



Plants take advantage of any tiny crack or crevice that exists in partially weathered bedrock. These cracks can easily become host to seeds and spores that will eventually sprout into plants. As the plants grow, rates of physical weathering increase. The type of plants and the degree of growth will depend on the climate. The presence of plants will attract animals in search of food and shelter. Over time, repeated plant life cycles and the presence of animal life will create a layer of humus at the surface. Humus is generally dark brown in color and provides important nutrients to the soil. Environments with a lot of organic material on the surface will produce more humus when compared to environments lacking organic material.

Soil Matures



The soil development process begins with exposed rock and ends with a soil profile that has three distinct horizons. You can see from the image of a soil profile that the three horizons are easily separated by the color of the soil. These horizons are considered three separate layers of soil. A mature soil profile will have all three horizons and have a composition that contains rock fragments, humus, and clays.