**KEY CONCEPT**

**7.3**

Human activities affect soil.

**Sunshine State STANDARDS**

SC.D.1.3.1: The student knows that mechanical and chemical activities shape and reshape the Earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.

SC.G.2.3.1: The student knows that some resources are renewable and others are nonrenewable.

SC.H.1.3.4: The student knows the ways in which plants and animals reshape the landscape.

**BEFORE, you learned**

- Soils consist mainly of weathered rock and organic matter
- Soils vary, depending on climate
- Organisms affect the characteristics of soil
- Soil properties can be measured

**NOW, you will learn**

- Why soil is a necessary resource
- How people's use of land affects soil
- How people can conserve soil

**THINK ABOUT**

**How does land use affect soil?**

Look outside for evidence of ways that people have affected the soil. Make a list of all the things that you can see or think of. Use your list to make a two-column table with the headings “Activity” and “Effects.”

**Soil is a necessary resource.**

Soil helps sustain life on Earth—including your life. You already know that soil supports the growth of plants, which in turn supply food for animals. Therefore, soil provides you with nearly all the food you eat. But that’s not all. Many other items you use, such as cotton clothing and medicines, come from plants. Lumber in your home comes from trees. Even the oxygen you breathe comes from plants.

Besides supporting the growth of plants, soil plays other life-sustaining roles. Soil helps purify, or clean, water as it drains through the ground and into rivers, lakes, and oceans. Decomposers in soil also help recycle nutrients by breaking down the remains of plants and animals, releasing nutrients that living plants use to grow. In addition, soil provides a home for a variety of living things, from tiny one-celled organisms to small mammals.

**CHECK YOUR READING**

Why is soil a necessary resource?
**Land-use practices can harm soil.**

The way people use land can affect the levels of nutrients and pollution in soil. Any activity that exposes soil to wind and rain can lead to soil loss. Farming, construction and development, and mining are among the main activities that impact soil resources.

**Farming**

Farming is very important to society because almost all of the world’s food is grown on farms. Over the 10,000 years humans have been farming, people have continually improved their farming methods. However, farming has some harmful effects and can lead to soil loss.

Farmers often add nutrients to soil in the form of organic or artificial fertilizers to make their crops grow better. However, some fertilizers can make it difficult for microorganisms in the soil to produce nutrients naturally. Fertilizers also add to water pollution when rainwater draining from fields carries the excess nutrients to rivers, lakes, and oceans.

Over time, many farming practices lead to the loss of soil. All over the world, farmers clear trees and other plants and plow up the soil to plant crops. Without its natural plant cover, the soil is more exposed to rain and wind and is therefore more likely to get washed or blown away. American farmers lose about five metric tons of soil for each metric ton of grain they produce. In many other parts of the world, the losses are even higher.

Another problem is overgrazing. Overgrazing occurs when farm animals eat large amounts of the land cover. Overgrazing destroys natural vegetation and causes the soil to wash or blow away more easily. In many dry regions of the world, overgrazing and the clearing of land for farming have led to desertification. Desertification (dih-ZUR-tuh-fih-KAY-shuhn) is the expansion of desert conditions in areas where the natural plant cover has been destroyed.
Construction and Development

To make roads, houses, shopping malls, and other buildings, people need to dig up the soil. Some of the soil at construction sites washes or blows away because its protective plant cover has been removed. The soil that is washed or blown away ends up in nearby low-lying areas, in rivers and streams, or in downstream lakes or reservoirs. This soil can cause problems by making rivers and lakes muddy and harming the organisms that live in them. The buildup of soil on riverbeds raises the level of the rivers and may cause flooding. The soil can also fill up lakes and reservoirs.

Mining

Some methods of mining cause soil loss. For example, the digging of strip mines and open-pit mines involves the removal of plants and soil from the surface of the ground.

By exposing rocks and minerals to the air and to rainwater, these forms of mining speed up the rate of chemical weathering. In mining operations that expose sulfide minerals, the increased chemical weathering causes a type of pollution known as acid drainage. Abandoned mines can fill with rainwater. Sulfide minerals react with the air and the water to produce sulfuric acid. Then the acid water drains from the mines, polluting the soil in surrounding areas.

How do some methods of mining affect the soil?
Soil can be protected and conserved.

Soil conservation is very important, because soil can be difficult or impossible to replace once it has been lost. Soil takes a very long time to form. A soil with well-developed horizons may take hundreds of thousands of years to form! Most soil conservation methods are designed to hold soil in place and keep it fertile. Below are descriptions of a few of the many soil conservation methods that are used by farmers around the world.

**Crop rotation** is the practice of planting different crops on the same field in different years or growing seasons. Grain crops, such as wheat, use up a lot of the nitrogen—a necessary plant nutrient—in the soil. The roots of bean crops, such as soybeans, contain bacteria that restore nitrogen to the soil. By rotating these crops, farmers can help maintain soil fertility.

**Conservation tillage** includes several methods of reducing the number of times fields are tilled, or plowed, in a year. The less soil is disturbed by plowing, the less likely it is to be washed or blown away. In one method of conservation tillage, fields are not plowed at all. The remains of harvested crops are simply left on the fields to cover and protect the soil. New seeds are planted in narrow bands of soil.

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**INVESTIGATE Soil Conservation**

**How can you model Earth’s soil with an apple?**

**PROCEDURE**

1. Fill in a row of the Apple Chart as you complete each step.
2. Cut the apple into quarters. Set aside three of the quarters.
3. Cut the remaining quarter in half. Set aside one of these pieces.
4. Cut the remaining piece from step 3 into four pieces. Set aside three of them.
5. Peel the skin off the remaining piece from step 4.

**WHAT DO YOU THINK?**

- How does the amount of fertile soil on Earth compare with what you expected?
- Do you think that the amount of fertile soil on Earth is increasing or decreasing? Explain your answer.

**CHALLENGE** Invent a method of soil conservation other than the ones you have read about. How would your method help keep soil in place?
**KEY CONCEPTS**

1. Why is soil a necessary resource?
2. How do land-use practices in farming, construction and development, and mining affect soil?
3. Describe at least three methods of soil conservation.

**CRITICAL THINKING**

4. **Compare and Contrast**
   How might the problem of soil loss on flat land be different from that on sloping land?

5. **Apply**
   If you were building a new home in an undeveloped area, what steps would you take to reduce the impact of construction on the soil?

**CHALLENGE**

6. **Apply**
   You have advised an inexperienced farmer to practice strip-cropping, but the farmer wants to plant all the land in wheat in order to grow as much as possible. What argument would you use to convince the farmer?

**TERRACES** are flat, steplike areas built on a hillside to hold rainwater and prevent it from running downhill. Crops are planted on the flat tops of the terraces.

**Contour plowing** is the practice of plowing along the curves, or contours, of a slope. Contour plowing helps channel rainwater so that it does not run straight downhill, carrying away soil with it. A soil conservation method called strip-cropping is often combined with contour plowing. Strips of grasses, shrubs, or other plants are planted between bands of a grain crop along the contour of a slope. These strips of plants also help slow the runoff of water.

**Windbreaks** are rows of trees planted between fields to “break,” or reduce, the force of winds that can carry off soil.