Erosion

Chapter 6

A family in a truck pulls onto a dirt road, heading home. Gravel kicks away from the tires as the truck climbs the steep slope. They arrive at their front yard and notice that rain water has caused ruts to form in the earthen driveway.

These changes to the land are examples of **erosion**. Erosion is a process that carries **sediment**, or the pieces of dirt and rock that have broken down over time, away from a location. Erosion is one of the processes that changes Earth continually.

Big Question

How do communities protect themselves from erosion?

Vocabulary

erosion, n. movement of sediment from one location to another

sediment, n. small pieces of rock or other hard material that has broken down over time



When erosion has carried away enough sediment gradually, more sudden movements can occur.

Slow Erosion Can Be Hazardous

Think of an oceanfront property sitting on a sand dune or cliff above the sea. The soil and sediment that hold up the home are likely to erode over time. This erosion occurs slowly due to different forces. The wind blows, ocean waves carry away bits of sediments, and even animal activity can move the sediment small pieces at a time. The point at which this movement of sediment becomes hazardous might be hard to identify. But if the process of erosion continues, that home can become vulnerable to falling into the ocean. The overall process is slow, but the danger is real.



This edge of the cliff is wearing away and the building is getting closer to falling into the sea because the sedimentary rock it is built on is eroding.



A retaining wall helps prevent soil from eroding away.

The slow creep of a sloped yard can turn into a hazard. Over time, soil is pulled downhill by gravity. If not stopped, it can slide onto walking paths, making them dangerous.

Word to Know

Creep is a word people often use to refer to the slow process of erosion.

Causes of Erosion

Water is one of the more dangerous agents of erosion. Soil that becomes saturated can collapse in a mudslide. Quickly flowing water brought on by a flood or strong storm can also erode tremendous amounts of sediment quickly.



Flowing water, such as the riverlike flood shown in this desert terrain, can cause a lot of erosion.

Living organisms can also be agents of erosion. Animals that burrow move sediment out of their way as they dig. Animals also cause erosion by climbing up hillsides, herding across plains, or building nests in riverbeds. Plants can cause weathering, but they are more likely to prevent erosion. For example, beach grasses and shrubs help sand dunes keep their shape. Plants are often a reliable way of holding soil in place.

Erosion from Weathering

Weathering occurs when rock breaks into smaller pieces—sediment. Erosion occurs when sediment moves from one location to another. Weathering occurs in different ways.

Vocabulary

weathering, n. the process of breaking rock into smaller pieces



These layers of rock were once part of the seafloor. Sediment was deposited slowly, becoming layers of sedimentary rock long ago. They are now exposed on the seashore, where fossil hunters can pick through them.

A large rock at the top of a mountain can tumble and break into smaller fragments as gravity pulls it downhill. Cracks in rock can fill with rainwater or snowmelt. If the water freezes, it expands, breaking the rock even more. Over time, this freeze-thaw cycle can break down large rocks into smaller pieces. As the pieces are knocked together, they continue to break down.

Weathering produces the sediment that can be eroded. Eventually, the force that eroded the sediment weakens or stops, and the sediment comes to rest in a new location.

Chemical Weathering

A **sinkhole** is an example of erosion that happens beneath the ground and cannot always be seen. Some areas, such as the state of Florida, are made up largely of limestone. Limestone is a sedimentary rock formed from the ancient remains of marine organisms. It can be weathered by water that is slightly acidic. This is a form of chemical weathering. The limestone breaks down into small pieces, which can then be carried away, or eroded, by the water. If a small space in the limestone is continually weathered by acidic water and the water continues to erode the sediment, the space can get larger and become a cave. If the cave happens to be below a house, the roof of the cave can collapse, and the house will fall into the sinkhole. This destroys the house and threatens the lives of anyone inside.

Vocabulary

sinkhole, n. a hole in Earth's surface that develops when the ground collapses into space beneath it





Collapsed sinkholes that flood with water can become beautiful sites for scuba diving. On the surface, however, they can be extremely destructive to homes and other things that happen to be built above them.

Erosion Hazards

Some erosion and erosion hazards can be prevented simply by leaving landscapes alone and not having human activities such as construction in those areas. When a steep coastal hillside is carved up to build a scenic highway, this can lead to more erosion because the sediment is disturbed and slopes might be steeper than they were before. This puts people in harm's way because erosion was already happening there even before any construction and now it is likely worse. Instead of building the scenic coastal highway, it might make more sense to build the highway farther inland on flatter terrain.

Highway 1 stretches along most of California's coast. Many people drive along the highway to take in some of California's most famous landmarks and to see the Pacific Ocean. But Highway 1 is threatened by erosion. Wildfires can strip the area of vegetation. Heavy rains can seep into the dirt, turning it into mud. When this happens, erosion of the soil can occur. There have been times when this erosion has even destroyed parts of the highway.



California's Highway 1 is a scenic, convenient roadway. But it is hazardous because it is built into a steep slope of sediment and rock. Erosion can weaken a section of the highway threatening the road itself.

California has taken steps to help prevent erosion of its coastline from occurring. One of these steps is to plant different species of vegetation along the coast. The species that are selected have roots that grow deep into the soil. This helps hold the soil together. Other communities work to prevent erosion by building walls or terraces, or they divert water drainage.



One way to avoid having a house collapse as the hillside is eroded is to lay down plastic that minimizes erosion.

If living or construction in a community with erosion hazards cannot be avoided, engineering can help minimize or prevent erosion. For example, if people inhabit a small area that is hilly and vulnerable to erosion, hillsides can be reinforced with netting, plants, walls, or other materials.



Surveying and Marking the Land

Erosion hazards can be better avoided if people are aware of them. Geologists can survey risky sites to assess whether the chance of hazardous erosion is changing. Weather conditions or simply the advance of the slow process that has been underway for years can both be factors to watch. Imagine a home on a cliff above a beach. The beach has been eroding for years, wearing the cliff below the house away. Geologists can help figure out how long before the house will tumble down the eroding cliff. If that point is near, it might be time for the home to be abandoned or moved to a new location. People must assess the costs and benefits and figure out when the hazards posed by erosion are too much to overcome.



Signs can warn people about erosion hazards.

Word to Know

A *survey* is a procedure of study used to examine and measure features of an area of land.



Should the parking lot be rebuilt, or is the erosion going to continue to eat away at this area?