

SECTION 4 The Effect of Gravity on Erosion and Deposition

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What is mass movement?
- How does mass movement shape Earth's surface?
- How can mass movement affect living things?

National Science Education Standards
ES 1c, 2a

What Is Mass Movement?

Gravity can cause erosion and deposition. Gravity makes water and ice move. It also causes rock, soil, snow, or other material to move downhill in a process called **mass movement**.

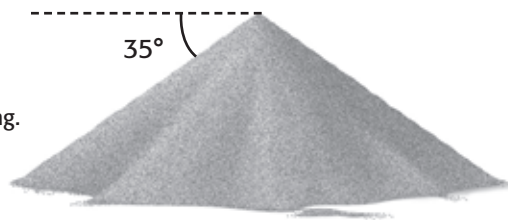
STUDY TIP

Ask Questions As you read this section, write down any questions you have. Talk about your questions in a small group.

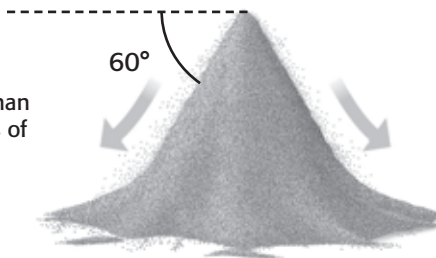
ANGLE OF REPOSE

Particles in a steep sand pile move downhill. They stop when the slope of the pile becomes stable. The *angle of repose* is the steepest angle, or slope, at which the loose material no longer moves downhill. If the slope of a pile of material is larger than the angle of repose, mass movement happens. ✓

The slope of this pile of sand is equal to the sand's angle of repose. The sand pile is stable. The sand particles are not moving.



The slope of this pile of sand is larger than the angle of repose. Therefore, particles of sand move down the slope of the pile.



READING CHECK

1. Define What is the angle of repose?

TAKE A LOOK

2. Explain Why are sand particles moving downhill in the bottom picture?

The angle of repose can be different in different situations. The composition, size, weight, and shape of the particles in a material affect its angle of repose. The amount of water in a material can also change the material's angle of repose.

SECTION 4 The Effect of Gravity on Erosion and Deposition *continued*

What Are the Kinds of Mass Movement?

Mass movement can happen suddenly and quickly. Rapid mass movement can be very dangerous. It can destroy or bury everything in its path.

LANDSLIDES

A **landslide** happens when a large amount of rock and soil moves suddenly and rapidly downhill. Landslides can carry away or bury plants and animals and destroy their habitats. Several factors can make landslides more likely. ✓

- Heavy rains can make soil wet and heavy, which makes the soil more likely to move downhill.
- Tree roots help to keep land from moving. Therefore, *deforestation*, or cutting down trees, can make landslides more likely.
- Earthquakes can cause rock and soil to start moving.
- People may build houses and other buildings on unstable hillsides. The extra weight of the buildings can cause a landslide. ✓

The most common kind of landslide is a *slump*. Slumps happen when a block of material moves downhill along a curved surface.

ROCK FALLS

A **rock fall** happens when loose rocks fall down a steep slope. Many such slopes are found on the sides of roads that run through mountains. Gravity can cause the loose and broken rocks above the road to fall. The rocks in a rock fall may be many different sizes.

MUDFLOWS

A **mudflow** is a rapid movement of a large amount of mud. Mudflows can happen when a lot of water mixes with soil and rock. The water makes the slippery mud flow downhill very quickly. A mudflow can carry away cars, trees, houses, and other objects that are in its path.

Mudflows are common in mountain regions when a long dry season is followed by heavy rain. Mudflows may also happen when trees and other plants are cut down. Without plant roots to hold soil in place and help water drain away, large amounts of mud can quickly form.

✓ **READING CHECK**

3. Describe How can landslides affect wildlife habitats?

✓ **READING CHECK**

4. Identify Give three factors that can make landslides more likely.

Critical Thinking

5. Infer Does water probably increase or decrease the angle of repose of soil? Explain your answer.

SECTION 4 The Effect of Gravity on Erosion and Deposition *continued***LAHARS**

Volcanic eruptions can produce dangerous mudflows called *lahars*. A volcanic eruption on a snowy peak can suddenly melt a great amount of snow and ice. The water mixes with soil and ash to produce a hot flow that rushes downhill. Lahars can travel faster than 80 km/h.

CREEP

Not all mass movement is fast. In fact, very slow mass movement is happening on almost all slopes. **Creep** is the name given to this very slow movement of material downhill. Even though creep happens very slowly, it can move large amounts of material over a long period of time. ✓

Many factors can affect creep. Water can loosen soil and rock so that they move more easily. Plant roots can cause rocks to crack and can push soil particles apart. Burrowing animals, such as moles and gophers, can loosen rock and soil particles. All of these factors may make creep more likely.

 **READING CHECK**

6. Compare How is creep different from the other kinds of mass movement that are discussed in this section?

Type of Mass Movement	Description
Landslide	Material moves suddenly and rapidly down a slope.
Rock fall	
Mudflow	
	Water mixes with volcanic ash to produce a fast-moving, dangerous mudflow.
	Material moves downhill very slowly.

TAKE A LOOK

7. Describe Fill in the blank spaces in the table.

Section 4 Review

NSES ES 1c, 2a

SECTION VOCABULARY

<p>creep the slow downhill movement of weathered rock material</p> <p>landslide the sudden movement of rock and soil down a slope</p> <p>mass movement the movement of a large mass of sediment or a section of land down a slope</p>	<p>mudflow the flow of a mass of mud or rock and soil mixed with a large amount of water</p> <p>rock fall the rapid mass movement of rock down a steep slope or cliff</p>
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1. **List** What are four kinds of mass movement?

2. **Infer** Why is it important for people to think about mass movement when they decide how to use land?

3. **Identify Relationships** How is mass movement related to the angle of repose?

4. **Identify** What force causes mass movements?

5. **Compare** How are landslides different from mudflows?

6. **List** Give four things that can affect a material's angle of repose.
