

Lesson 12

WORDS TO KNOW

weathering

erosion

sediment

deposition

WHAT IS THE DIFFERENCE BETWEEN WEATHERING AND EROSION? SC.4.E.6.4

INTRODUCTION

Key Concept

Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around through weathering and erosion.

What I Am Going to Learn

- How to tell the difference between weathering and erosion
- How to identify and describe the physical process of weathering (wind, water, ice, temperature change, and plants)
- How to identify and describe the physical process of erosion (gravity, wind, water, and ice)

Scientific Vocabulary

As you read, it is important to understand the scientific vocabulary in this lesson.

Weathering is the process of being worn by long exposure to the atmosphere. It is the breaking down of rocks and minerals on the surface of Earth.

Erosion is a geological process in which materials are worn away and transported by natural forces such as wind and water.

Small pieces of land that break down are called **sediment**. Sediment can consist of mud, soil, sand, pebbles, rocks, minerals, fossils, or plants that travel from one place and end up in another.

Deposition occurs when wind, flowing water, or ice carry sediment and move it somewhere else.



THINK ABOUT IT

Discuss with a partner where you have seen weathering or erosion. Where did you see it, and what did you observe?

GUIDED INSTRUCTION

Earth's surface breaks down over time. It happens from erosion, a geological process in which materials are worn away and transported by natural forces such as wind and water. Weathering is when rocks

and minerals break apart or wear away. Erosion is when those small pieces of rock, soil, and minerals move. Soil, mud, sand, pebbles, rocks, minerals, fossils, or plants break down as sediment, and wind and water move them from one place to another where they are deposited. This process is called *deposition*, where rocks or particles of soil or silt are carried from one location and placed in another.

For example, you might have seen large piles of sand pushed by wind and water to one place on a beach. High tide and large waves crashing to shore also have an impact on washing away sand. Erosion is most severe where there is no vegetation. On Singer Island in Palm Beach County in Florida, Hurricane Dorian caused extensive damage from erosion. You can see from the image a wall of sand piled up. This is also what causes sand dunes. Sometimes, sand dunes are manmade to protect homes that are built too close to the water.



Deposition often results in the accumulation of eroded materials in layers. These layers, visible in rock faces, road cuts, or even along riverbanks, are often composed of different materials like sand, gravel, or clay, depending on the erosional agent (wind, water, glaciers) and the source of the eroded material. Deposition often sorts these materials based on size and weight. Fast-moving water might carry away larger rocks and pebbles, while depositing finer sand and silt in a calmer area downstream. The sorting helps distinguish between depositional areas and the original source of the eroded material.

Weathering and erosion, the powerful duo of geological change, are responsible for shaping an array of landforms over time. Erosion can create canyons, sea cliffs, arches, sand dunes, and valleys. Deposition can cause deltas and flood plains. Some of the most dramatic landforms caused by weathering and erosion are mesas and buttes, remnants of plateaus that have been eroded by wind and water, like the image on the right of Canyonlands National Park in Utah.



Ice and temperature change work together in a powerful way to cause erosion. Freeze-thaw weathering is a process that involves the expansion and contraction of water within cracks and pores of rocks. When water seeps into cracks and pores of rocks, it expands as it freezes. This expansion can exert tremendous pressure, widening the cracks and weakening the rock. During warmer periods, the ice thaws back to water. The repeated freezing and thawing cycles can cause the rock to crumble and break apart over time. This causes the most damage in areas with frequent freeze-thaw cycles.

Similarly, temperature changes can also cause rocks to expand and contract, even without water being involved. This can lead to weakening and fracturing of the rock over time, making it more prone to erosion by wind or water.

Chemical weathering is different from physical weathering. Chemical weathering involves changes in the rock's chemical composition through reactions with air. Chemical reactions cause the minerals in rocks to decompose or change into new minerals.

The main difference between weathering and erosion is whether there is movement from their original location. Weathering breaks down rocks and minerals in place, without moving them. Erosion moves rocks and soil particles by wind, water, ice, or gravity and can transport these particles from one location to another, shaping landscapes over long periods of time.



MODEL IT

Model an erosion with a baking tray, sand, water or spray bottle, spoon, and small pebbles. Fill half the tray with sand and slope it gently downward. Use the spoon to carve a winding path (riverbed) down the slope. Place pebbles along the riverbed. Slowly pour water at the top of the slope, mimicking rainfall. Observe how the water carries sand particles down the riverbed, eroding the landscape.

1. Explain how soil or little pieces of rock from the top of a mountain might end up in the sedimentary rock at the bottom of the ocean.

2. How would wind and water create a sand dune along an ocean beach?

3. You are at a sandy beach where you see dramatic rock formations. Some of them have large cracks and uneven surfaces. Others are smooth and round. There are powerful waves crashing. Based on what you learned in this lesson, describe how the processes of weathering and erosion are likely responsible for these observations. Explain how they contributed to shaping the landscape at this location.

INDEPENDENT PRACTICE

DIRECTIONS

Read each question carefully. Decide which choice is the best answer. Mark your answer.

- 1** Which of the following is an example of physical weathering?

 - A. a river carrying rocks downstream
 - B. tree roots growing in cracks of a rock, breaking it apart
 - C. sand dunes forming on a beach
 - D. a landslide causing rocks to fall down a mountain
- 2** Rain freezing inside cracks in a rock can cause the rock to break apart. What example of weathering caused this?

 - F. wind
 - G. water
 - H. gravity
 - I. plants
- 3** Over time, strong winds can blow sand across a desert, wearing down rocks. What is this process called?

 - A. erosion
 - B. chemical weathering
 - C. sedimentation
 - D. physical weathering
- 4** A riverbed slowly fills with pebbles and rocks. Of what is this an example?

 - F. physical weathering
 - G. sand dune
 - H. chemical weathering
 - I. erosion
- 5** Which of the following forces can cause both weathering and erosion?

 - A. plants
 - B. water
 - C. temperature change
 - D. deposition
- 6** You see a large crack in a sidewalk. What caused the crack?

 - F. erosion
 - G. physical weathering
 - H. chemical weathering
 - I. deposition

7 When a glacier moves, it scrapes and breaks down rocks underneath it. Of what is this an example?

- A. physical weathering
- B. chemical weathering
- C. erosion
- D. sedimentation

8 How does erosion differ from weathering?

- F. Weathering breaks down rocks, while erosion moves them.
- G. Weathering only happens by wind, while erosion happens by water and ice.
- H. Weathering only affects large rocks, while erosion affects small rocks.
- I. Weathering creates new rocks, while erosion destroys them.

9 You find a smooth, round rock at the beach. What **most likely** caused this roundness?

- A. plants growing on the rock
- B. water constantly wearing away at the rock
- C. sudden changes in temperature
- D. wind blowing sand against the rock

10 Which of the following is NOT a factor that can cause physical weathering?

- F. the growth of roots in cracks
- G. chemical reactions in the rock
- H. freezing and thawing of water
- I. changes in temperature

EXIT TICKET

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What is the difference between weathering and erosion? Fill in the chart, giving both a description and an example for each.

Process	Description	Example
Weathering		
Erosion		