

Erosion and Deposition

The Erosion-Deposition Process

..... Before You Read

What do you think? Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.		
Before	Statement	After
	1. Wind, water, ice, and gravity continually shape Earth's surface.	
	2. Different sizes of sediment tend to mix when being moved along by water.	

..... Read to Learn

Reshaping Earth's Surface

Have you ever seen a construction site? If so, then you have probably watched backhoes, bulldozers, and dump trucks moving dirt and other materials for the project. You might have seen the backhoes digging deep holes into the ground or the bulldozers smoothing the land to make a flat surface. Dump trucks might have been removing soil from the construction site. These changes that people make are small examples of what happens naturally to Earth's surface.

Both constructive processes and destructive processes produce landforms on Earth's surface. Constructive processes build up features on Earth's surface. For example, lava erupting from a volcano cools, hardens, and forms new land on the area where the lava falls.

Destructive processes tear down features on Earth's surface. The winds and rains from a strong hurricane can wash part of a shoreline into the sea. Constructive and destructive processes continually shape and reshape Earth's surface. ✓

Key Concepts

- How can erosion shape and sort sediment?
- How are erosion and deposition related?
- What features suggest whether erosion or deposition created a landform?

Mark the Text

Identify Main Ideas

Highlight the main idea of each paragraph. Highlight two details that support each main idea with a different color. Use your highlighted copy to review what you studied in this lesson.

Reading Check

1. Contrast How do destructive processes differ from constructive processes?

A Continual Process of Change

Imagine standing on the top of a mountain. When you look down, you might see a valley, a winding river, or the ocean. Now try to imagine what this same area might have looked like thousands of years ago. What might this same area look like thousands of years from now? Will the mountains and the river still be there? How might the ocean change? Earth is constantly changing. Many of these changes happen so slowly, however, that you do not see them. What causes these changes?

Weathering

One type of destructive process that changes Earth's surface is weathering. Weathering is any chemical or physical process that breaks down rocks. Chemical weathering changes the composition, or chemical makeup, of rocks. Physical weathering changes the sizes of rocks by breaking them into pieces. These pieces are called sediment. Gravel, sand, silt, and clay are different sizes of sediment. However, physical weathering does not change the chemical composition of rocks.

Weathering Agents Water, wind, and ice are agents, or causes, of both chemical and physical weathering. Water, for example, can dissolve minerals in rocks. Wind can grind and polish rocks by blowing particles against them. Ice or plant roots can enlarge cracks in rocks and break rocks apart. As shown in the figure below, ice weathers rocks when water freezes and expands. Plant roots growing in cracks push against rocks and break them into pieces. ✓

Different Rates of Weathering Rocks weather differently and at different rates. The minerals in some rocks are more resistant to weathering than the minerals in other rocks. Different rates of weathering can produce unusual rock formations and landforms. Weathering can break away less-resistant parts of rock and leave behind the more-resistant parts.



ACADEMIC VOCABULARY

process

(**noun**) an ongoing event or a series of related events

✓ Reading Check

2. Name three agents of weathering.

✓ Visual Check

3. Locate Circle the areas where ice weathering is occurring.

Erosion

What happens to material that is weathered? Much of it is transported to another place. **Erosion** is the removal of weathered material from one location to another. Erosion involves both the wearing away of landforms and the transportation of sediment.

Agents of erosion include water, wind, glaciers, and gravity. Muddy water in a river is evidence of erosion. The river is muddy because of the sediment it carries. ✓

The Rate of Erosion Like weathering, erosion takes place at different rates. For example, a rushing stream can erode a large quantity of material quickly. However, a gentle stream might erode a small amount of material slowly.

The major factors that affect the rate of erosion include weather, climate, the shape of the land or topography, and type of rock. For example, weathered rock is more easily eroded by heavy rain than by a gentle shower. Strong wind transports weathered rock more easily than a gentle breeze does. Weathered rock moves faster down a steep hill than across a flat area. ✓

The presence of plants as well as the way in which humans use the land also affect the rate of erosion. Erosion occurs more quickly on land that is bare than on land that is covered with plants.

Rate of Erosion and Rock Type The rate of erosion sometimes depends on the type of rock being eroded. Weathering can break some types of rock, such as sandstone, into large pieces. Weathering easily breaks other types of rock, such as shale and siltstone, into smaller pieces. The smaller pieces of shale or siltstone can be removed and transported faster by the agents of erosion than can the larger pieces of rock. Large rocks in a stream usually move only short distances every few decades. Smaller silt particles might move a kilometer or more each day.

Rounding Rock fragments bump against each other during erosion. As this happens over time, the shapes of the fragments can change. Rock fragments in sediment can range from poorly rounded to well-rounded. The more spherical, or rounded, a rock is, the more it has been polished during erosion. This is because when rock fragments bump into each other, the rough edges break off. ✓

✓ Reading Check

4. Define What is erosion? (Circle the correct answer.)

- a. the dropping of weathered materials
- b. the movement of weathered materials
- c. the breaking of rocks into smaller pieces

✓ Reading Check

5. State What are some factors that affect the rate of erosion?

✓ Key Concept Check

6. Describe How can erosion affect the shape of sediment?

Sorting Erosion also affects the level of sorting of sediment. Sorting is separating items into groups according to one or more properties. As sediment is transported, it can become sorted according to grain size. Sediment is often sorted as follows:

- Poorly sorted sediment has a wide range of sizes. It results from sediment that has been transported quickly. This often happens during a storm, a flash flood, or a volcanic eruption. Sediment left at the edges of glaciers is also poorly sorted.
- Moderately sorted sediment has a small range of sizes.
- Well-sorted sediment is all about the same size. Well-sorted sediment results when sediment has been moved by constant winds or frequent waves.

Deposition

You have just read about weathering and erosion, two destructive processes that shape Earth's surface. Weathering breaks rocks into smaller pieces. Erosion moves weathered material from one place to another. After material has been eroded, a constructive process takes place. **Deposition** is the *laying down or settling of eroded material*. As water and wind slow down, they have less energy and can hold less sediment. Some of the sediment they carry is then laid down, or deposited.

Depositional Environments Sediment is deposited in locations called depositional environments. These locations are on land, along coasts, or in oceans. They include swamps, deltas, beaches, and the ocean floor.

Environments where sediment is transported and deposited quickly are high-energy environments. High-energy environments include fast-moving rivers, ocean shores with large waves, and deserts with strong winds. Large grains of sediment tend to be deposited in high-energy environments.

Smaller grains of sediment are often transported and deposited in low-energy environments. Deep lakes, swamps, and areas of slow-moving air or water are low-energy environments. Silt and clay are deposited in low-energy environments such as swamps.

Sediment Layers Sediment deposited in water often forms layers called beds. Beds often form as layers of sediment are deposited at the bottoms of rivers, lakes, and oceans. Over time, these layers can be preserved in sedimentary rocks.

Key Concept Check

7. Explain How can erosion sort sediment?

Key Concept Check

8. Relate How are erosion and deposition related?

Reading Check

9. Define What is a depositional environment?

Interpreting Landforms

There are many different types of landforms. Mountains, valleys, plains, sea cliffs, and beaches are just a few of the landforms on Earth's surface. Landforms are always changing. All landforms have certain characteristics that provide clues as to how they formed. Some landforms were produced by destructive forces, such as erosion. Others were produced by constructive forces, such as deposition. ✓

Landforms Created by Erosion

Some landforms have features that are clearly produced by erosion. These landforms are often tall, jagged structures with cuts in layers of rock. Some of these eroded landforms are described below.

Rock Layers Rocks weather and erode differently. Landforms that are created by erosion can expose different layers of rock. The Tepees in the Painted Desert of Arizona contain several layers of different materials. Over time, erosion wore away parts of the land, leaving behind multicolored mounds.

Unusual Landforms Erosion takes place at different rates in different rocks. Some rocks erode more quickly, leaving behind the more erosion-resistant rocks. This leads to unusual landforms. Tall rock towers called hoodoos are a common feature in Bryce Canyon National Park in Utah. Over time, water and ice eroded the less-resistant sedimentary rock. The rocks that remained are more resistant.

Glacial Erosion and Coastal Erosion Glacial and coastal erosion also form unique landforms. Glaciers formed the ice-carved features of many mountains. For example, glacial erosion formed the U-shaped valleys between mountain peaks in Glacier National Park in Montana. Erosion by waves formed interesting landforms along coasts, such as sea cliffs, sea caves, and sea arches. ✓

Landforms Created by Deposition

Landforms created by deposition are often flat and low-lying. Wind deposition, for example, can gradually form deserts of sand. Deposition also occurs where mountain streams reach the gentle slopes of wide, flat valleys. Sediment often forms alluvial fans where a stream flows from a steep, narrow canyon onto a flat plain at the foot of a steep slope. An alluvial fan is a gently sloping, apron-shaped mass of sediment. ✓

✓ Reading Check

10. Name four types of landforms.

✓ Reading Check

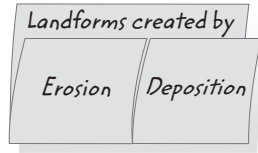
11. Name three landforms that result from wave erosion.

✓ Reading Check

12. Explain How does an alluvial fan develop?

FOLDABLES®

Make a two-tab book to describe and identify landforms created by erosion and deposition.



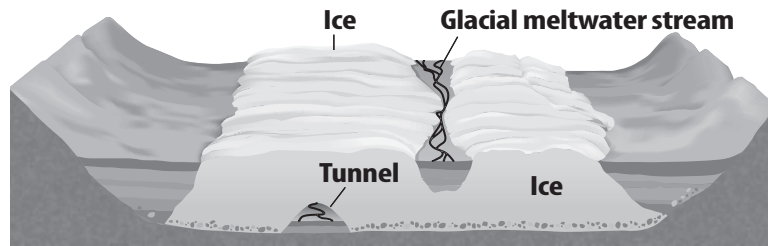
Visual Check

13. Illustrate Trace the location on the diagram of where the esker begins to form.

Deposition Along a River Deposition by moving water can produce other landforms. Water slows along a river's edges and at the bottom of the channel as a result of friction. An increase in channel width or depth also can slow the current and promote deposition. Deposition along a riverbed occurs where the speed of the water slows down. As the water slows, it loses energy and deposits the sediment that it is carrying. The deposition can form a sandbar.


Most rivers end when they reach a lake or an ocean. There, the rivers deposit sediment under water. Wave action along shorelines also moves and deposits sediment.

Deposition by Glacier As glaciers melt, they can leave behind piles of sediment and rock. Glaciers can create long, narrow deposits called eskers and moraines. The esker formation shown below is a feature often seen in northern states such as Wisconsin and New York.



Esker formation

Comparing Landforms

You have just read that landforms created by erosion are different from landforms created by deposition. Erosion creates landforms that are often tall and jagged. Landforms created by deposition are usually flat and low-lying. By observing the features of a landform, you can infer whether erosion or deposition produced it. 

Key Concept Check

14. Explain What features suggest whether erosion or deposition created a landform?

..... After You Read

Mini Glossary

deposition: the laying down or settling of eroded material

erosion: the removal of weathered material from one location to another

1. Review the terms and their definitions in the Mini Glossary. Use each of the terms in an original sentence.

2. Use what you have learned about erosion and deposition to complete the table.

Process	Constructive or Destructive?	Examples of Landforms
Erosion		
Deposition		

3. Name a landform in your state. What features lead you to think that it was made by constructive or destructive processes?

What do you think **NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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END OF LESSON