

Weathering and Erosion



Grade Level: 3-4

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Classroom Procedure:

1. Ask students: What are landforms? What problems does weather sometimes cause the landforms of the Earth?
2. Allow for responses and discussion. Students should know some examples of landforms, and then tell some effects of weather on these landforms.
3. Ask students what other ways landforms may be affected either by weather or other causes.
4. Allow for responses and discussion. Introduce Weathering and Erosion.
5. Distribute *Weathering and Erosion* content pages. Read and review the information with the students. Save the final question for the lesson closing. Use the additional resources to enhance understanding.
6. Distribute Activity pages. Read and review the instructions. Students may make rough drawings of the BEFORE and AFTER, but the explanations must be accurate.
7. Once students are completed with the drawings, allow sharing either with the class or with other students individually. Display final images. (Responses and images will vary.)
8. Distribute Practice page. Check and review the students' responses.
9. Distribute the Homework page. The next day, check and review the students' responses.
10. In closing, ask students: *Can you think of some advantages of weathering and erosion?*
11. Allow for responses and discussion. Responses may include the uncovering of fossil or other archeological finds, new habitats may form for organisms, soil may become enriched with nutrients, toxins on farming land may be removed, weathering brings about new soil.

Approximate Grade Level: 3 – 4

Objectives:

The students will be able to define weathering and erosion and observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice; explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains.

TEKS:

Science Grade 3: b.7.A

Science Grade 4: b.7.B

Class Sessions (45 minutes):

At least 2 class sessions.

Teaching Materials/Worksheets:

Weathering and Erosion content pages (3), Activity pages (2), Practice page, Homework page

Student Supplies:

handouts

Prepare Ahead of Time:

Copy handouts.

Options for Lesson:

Students may work in pairs for the activity. Use construction paper for the activity. Increase or decrease the number of drawings for the activity. One student draws the *before*, and another student draws the *after*. Obtain supplies, such as soil, water, rocks, etc., for students to show erosion using an experiment. Students create poems using erosion and weathering as a topic. Invite a geologist to speak with the class about weathering and erosion.





Teacher Notes

The lesson introduces students to weathering and erosion, including the difference between the two terms. Many students understand the changes of geological structures, but often may not know how these changes take place. The use of videos and images from websites is highly recommended to help students see the effects of weathering and erosion over a long period of time. In-class hands-on experiments are also recommended. The lesson may be used in conjunction with other lessons related to geology.



Additional Resources:

Content:

- <http://www.onegeology.org/extra/kids/earthprocesses/weathering.html>
- http://www.ducksters.com/science/earth_science/erosion.php
- <http://www.scienceforkidsclub.com/erosion.html>
- <http://www.kidsgeo.com/geology-for-kids/0059-introduction-to-erosion.php>
- <http://easyscienceforkids.com/all-about-erosion/>

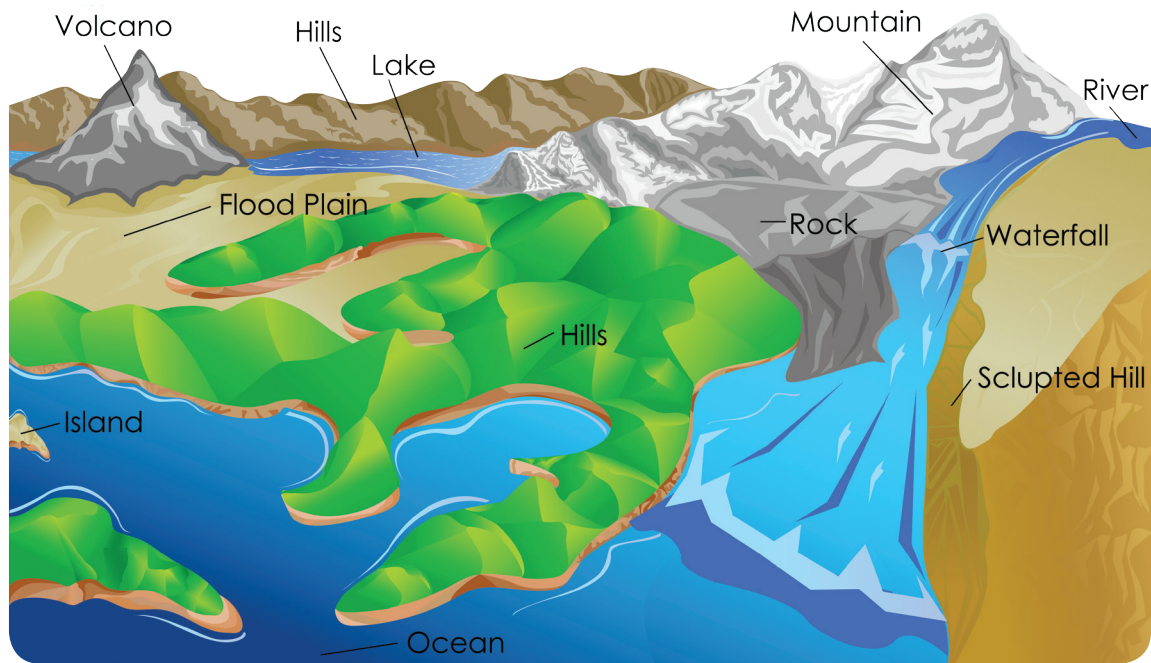
Worksheets:

- <https://www.education.com/worksheet/article/weathering-and-erosion/>
- <http://www.gowcsd.com/schools.cfm?subpage=267785>
- <https://www.havefunteaching.com/products/worksheets/science-worksheets/weathering-and-erosion-worksheets/>
- https://www.edhelper.com/teach/teach_Weathering.htm
- <http://www.cpalms.org/Public/PreviewResourceUpload/Preview/30802>

Videos:

- <https://www.youtube.com/watch?v=R-lak3Wvh9c> (4 min)
- <https://www.youtube.com/watch?v=exS9gFXgib0> (5 min)
- <https://www.youtube.com/watch?v=J-ULcVdeqqE> (5 min)
- <http://kids.britannica.com/students/assembly/view/189387> (5 min)
- <https://www.youtube.com/watch?v=qGZa1n-9e6o> (3 min-song)





Landforms and Changes

There are mountains, valleys, lakes, rivers, oceans, deserts and many other landforms that make up the earth's surface. Many of them you may have experienced. A **landform** is a natural feature of the earth's surface. It is often formed over a long period of time, sometimes millions of years.

During the millions of years, landforms change. For example, a small stream may change into a raging river, or a mountain may turn into a **plateau** (flat area but higher than the land around it). Islands have formed due to volcanic eruptions in the oceans, and valleys are created by rivers that have flowed down from the tops and sides of mountains.

Landforms are constantly changing, though you may not see the changes, they are taking place. A **geologist** studies how landforms are created, how they interact with each other, and how they change. There are some landforms that can be manmade, like lakes, ponds, and small hills, but most landforms in the world are natural.

Landforms are usually made up of rocks, soil, mud, clay, minerals, and other debris. The movement of these **sediments** is caused by weathering and erosion. Without weathering and erosion, the landforms throughout the world would never change. The Grand Canyon would not exist, rivers would stay flowing like streams, and there would be more mountains and fewer valleys.

Often, people confuse the meanings of weathering and erosion. **Weathering** is the process of decomposing, breaking up, or changing the color of rocks.

Erosion, on the other hand, is the movement of the rocks and sediment that have been broken apart by weathering.

Think of it this way: If a rock is changed or broken due to weather, it is called weathering. However, when the broken pieces of the rock are moved away, it is called erosion.



Weathering

When you hear the word *weather* you probably think of cold and heat, rain and snow, or air and wind. Geologists study weathering that is caused by water, air, chemicals, plants or animals. There are three types of weathering, and each type can lead to erosion and changes in landforms.

Type	Description	Example
Chemical	Involves changes in the minerals of the rock, or on the surface of the rock, that makes the rock change its shape or color. Carbon dioxide, oxygen, water, and acids may cause chemical weathering.	Some rocks include minerals, such as iron, and the iron is exposed to oxygen. This causes the rocks to soften, and can easily become broken into smaller pieces.
Mechanical	Involves breaking larger rocks into smaller pieces, but the minerals of the rock do not change. It is caused by frost, ice, moving water, or heat from the sun.	Water seeps inside a rock and the water freezes, it expands causing cracks in the rock, and eventually the rock breaks apart into smaller pieces.
Biological	The process of larger rocks broken into smaller pieces, which is caused by plants, animals, or other living organisms. It may also lead to chemical weathering.	The roots of a plant work their way into an opening of a rock, and as the plant grows, the rock breaks apart into smaller pieces.

There are many other examples of chemical, mechanical, and biological weathering but they can easily be identified based on asking the question: **How did the rock break apart?**

If it broke apart because of chemicals, it is chemical weathering; if it breaks apart but is still the same rock but only smaller, it is mechanical weathering. Finally, if a living organism causes changes to the rock, it is biological weathering. Of course, following biological or chemical weathering, it is still possible for a rock to be changed through chemical weathering.



Erosion

Weathering causes the breakup of rocks, but usually those smaller pieces begin to move by wind, water, ice, or even animals. When these smaller pieces, called pebbles, sand, or soil, begin to move by natural forces, it is called erosion. However, if you use a shovel to move rocks or soil, it is not erosion.



Erosion may take place in just a few minutes, or it could occur over thousands or millions of years, very slowly. The main cause of erosion on the Earth is water. If you have ever been to the beach, and have seen the waves of the ocean, the ocean water is constantly moving the sands of a beach.

The two other main forces that cause erosion is wind and ice. At the same beach on a windy day, you might feel the grains of sand on your body and face as the wind causes the sand to travel from place to place. Finally, glaciers of ice slowly move carving out valleys and forming mountains.

Overall, there are many different causes of erosion taking place on the Earth.

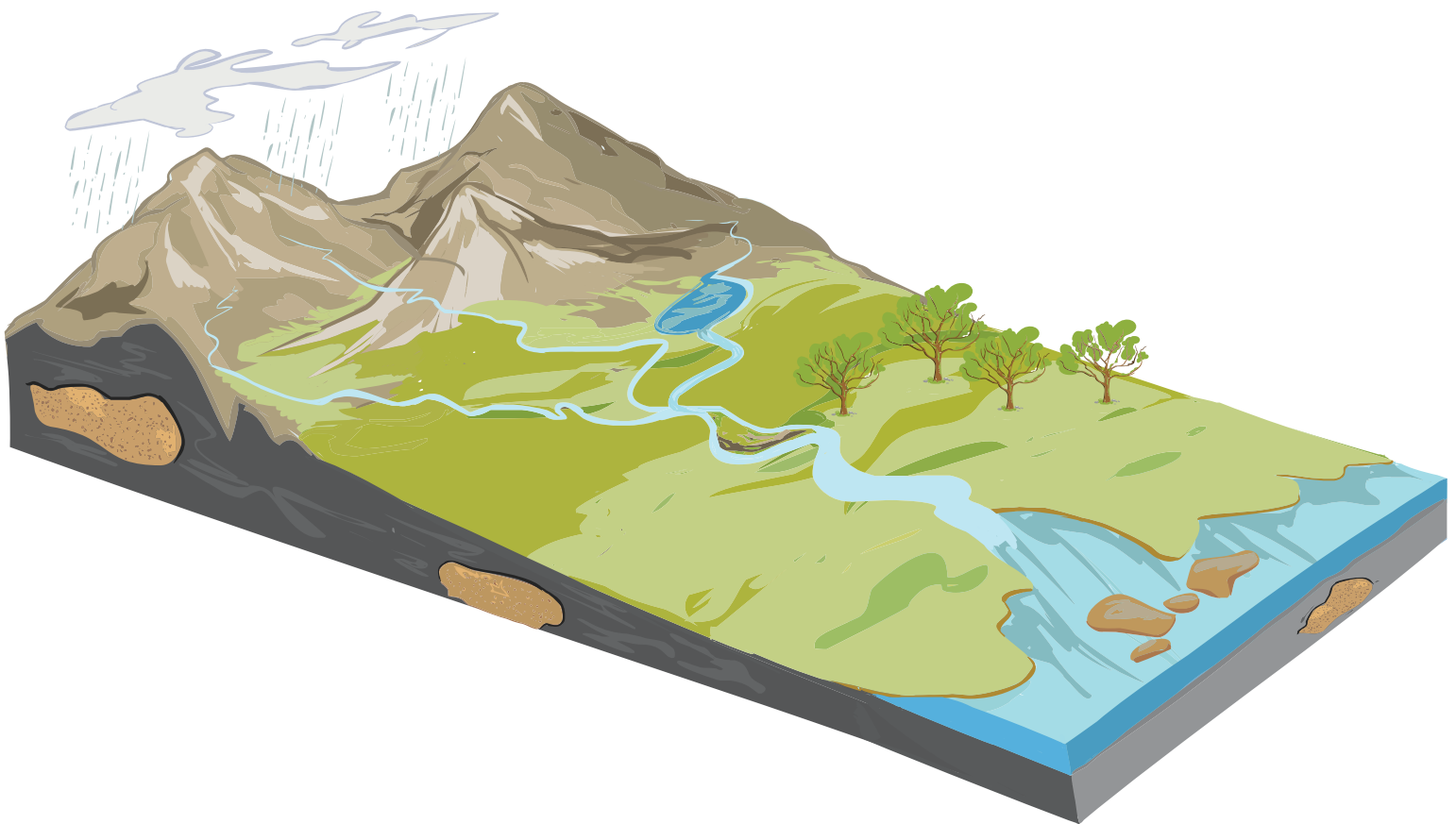
Cause	How
Precipitation	Rain hits the earth's surface, sometimes called splash erosion. The drops of rain gather together and flow like small streams, moving debris as it flows.
Rivers	Particles along the bottom of a river are carried downstream causing erosion over time, and many geologists believe the Grand Canyon was formed by the Colorado River.
Waves	Ocean waves cause a coastline to erode, breaking pieces of rock. Usually over long period of time, the shape of a coastline may change. However, during a hurricane, damage from erosion can take place in the matter of hours.
Floods	Flooding allows water to move and wash out everything in its path. Often, following heavy rains or storms, flooding leads to damage and destruction from erosion.
Wind	In dry areas, wind picks up and carries loose particles and dust, sometimes crashing into other land parts and breaking off more particles (abrasion).
Glaciers	Like rivers of ice, glaciers' movement cause erosion and have formed mountains and valleys throughout the world. The Ice Age led to landform changes.
Gravity	The force of gravity is a cause of erosion, as landslides or rock slides occur down the side of a mountain or cliff.
Living Organisms	Many small animals move through the soil and rocks of the Earth, moving the particles from one place to another, which often leads wind or water carrying it away.
Humans	Though it is not natural erosion, humans cause erosion through farming, cutting down trees, and building roads and structures.



Weathering and erosion never stops. The processes are always occurring naturally throughout the world. You may not see it taking place, but the next time there is a heavy rain, with permission, take a walk through your neighborhood. You will notice the rain water moving through areas like a stream carrying debris such as soil and rocks to other places.

Finally, once the movement of sediment, such as pebbles, sand, mud, or even boulders are reach their final (or temporary) resting place, it is called **deposition**. It is the laying down of sediment carried by wind, water, ice or other causes of erosion. The sediment may be deposited at mouths of rivers, the bases of mountains, and many other places, or perhaps in your front yard.

In summary, weathering causes rocks and minerals to be broken down into smaller pieces. However, erosion is the cause of these broken pieces to be carried away to other places. There are three types of weathering: chemical, mechanical, and biological. There are several causes of erosion, but water is the the main force followed by wind and ice.



Can you think of some advantages of weathering and erosion?



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Activity

Name _____ Date _____

Choose four weathering and erosion causes. Draw BEFORE and AFTER images for each. Include an explanation for the changes. For example, in a BEFORE image, a drawing of a hillside along a road may be shown, in the AFTER image, there is a landslide shown, which includes an explanation related to the event. You may add other details.

BEFORE	AFTER
Explanation:	
BEFORE	AFTER





Activity

Name _____ Date _____

Explanation:

BEFORE

AFTER

Explanation:

BEFORE

AFTER

Explanation:





Practice

Name _____ Date _____

Match the definition with the correct term.

- | | | |
|---------|---|---------------------|
| 1 ____ | Time-period on Earth when glaciers caused erosion. | A Abrasion |
| 2 ____ | Rocks crashing into other rocks breaking off more particles. | B Deposition |
| 3 ____ | Decomposing, breaking up, or changing the color of rocks. | C Erosion |
| 4 ____ | Flat area of land that is higher than the land surrounding it. | D Geologist |
| 5 ____ | Movement of rocks and sediment that have broken apart. | E Geology |
| 6 ____ | May include sand, rocks, pebbles, soil, dust and other particles. | F Ice Age |
| 7 ____ | The person who studies rocks and minerals. | G Landform |
| 8 ____ | A natural feature of the Earth's surface. | H Plateau |
| 9 ____ | The study of rocks and minerals. | I Sediments |
| 10 ____ | The process of sediments reaching their destination. | J Weathering |

Tell whether each example is **Chemical (C)**, **Mechanical (M)**, or **Biological (B)** weathering.

- 11 ____ Baseball-sized hail began to smash against the hillside breaking apart the soil.
- 12 ____ Salt water enters a rock, water dries, salt crystals grow and wedge the rock apart.
- 13 ____ Minerals in rocks dissolve forming stalactites/stalagmites in a cave.
- 14 ____ The tree roots are causing the concrete slabs of a sidewalk to break apart.
- 15 ____ The wind and rain has caused damage to the tombstones in a cemetery.
- 16 ____ A seed has found its way into a rock and a plant is beginning to split the small stone.
- 17 ____ The pollution has recently been high, and acid rain is destroying some monuments.
- 18 ____ A combination of fungi and algae grow upon the surface of a rock slowly "eating it away".
- 19 ____ Flooding has caused a landslide and part of the hillside has been affected.
- 20 ____ The salty water of the ocean is eating away the concrete support posts of the pier.





Homework

Name _____ Date _____

Match the statement with the correct cause of erosion.

- | | | |
|----|---|---------------------------|
| 1 | The coastlines of oceans & beaches have shrunk over time. | A Precipitation |
| 2 | The raindrops washed away the seeds and soil in the garden. | B Rivers |
| 3 | The winter snow is melting and is rapidly moving debris. | C Waves |
| 4 | A tunneling rabbit has led to a small sinkhole in the yard. | D Floods |
| 5 | A small canyon was formed due to a fast-moving waterway. | E Wind |
| 6 | A dust storm in the west is causing problems for farmers. | F Glaciers |
| 7 | The woods have cut down and replaced by hundreds of homes. | G Gravity |
| 8 | The road was closed following a rock slide along the highway. | H Living organisms |
| 9 | It has rained for five days; the streets have been washed away. | I Human |
| 10 | Mountains of ice carved out areas where lakes are now located. | |

Answer each question.

11. What is the movement of sediments caused by? _____
12. Give two examples of manmade landforms: _____
13. Name four things weathering can be caused by: _____
14. Name three main methods smaller pieces of rock move: _____
15. Name two places sediment may be deposited: _____
16. Using the terms from the content pages, explain what may have caused the openings in the hillside, and what may happen in the future?





Match the definition with the correct term.

- | | | | |
|----|----------|---|---------------------|
| 1 | <u>F</u> | Time-period on Earth when glaciers caused erosion. | A Abrasion |
| 2 | <u>A</u> | Rocks crashing into other rocks breaking off more particles. | B Deposition |
| 3 | <u>J</u> | Decomposing, breaking up, or changing the color of rocks. | C Erosion |
| 4 | <u>H</u> | Flat area of land that is higher than the land surrounding it. | D Geologist |
| 5 | <u>C</u> | Movement of rocks and sediment that have broken apart. | E Geology |
| 6 | <u>I</u> | May include sand, rocks, pebbles, soil, dust and other particles. | F Ice Age |
| 7 | <u>D</u> | The person who studies rocks and minerals. | G Landform |
| 8 | <u>G</u> | A natural feature of the Earth's surface. | H Plateau |
| 9 | <u>E</u> | The study of rocks and minerals. | I Sediments |
| 10 | <u>B</u> | The process of sediments reaching their destination. | J Weathering |

Tell whether each example is Chemical (C), Mechanical (M), or Biological (B) weathering.

- 11 M Baseball-sized hail began to smash against the hillside breaking apart the soil.
- 12 M Salt water enters a rock, water dries, salt crystals grow and wedge the rock apart.
- 13 C Minerals in rocks dissolve forming stalactites/stalagmites in a cave.
- 14 B The tree roots are causing the concrete slabs of a sidewalk to break apart.
- 15 M The wind and rain has caused damage to the tombstones in a cemetery.
- 16 B A seed has found its way into a rock and a plant is beginning to split the small stone.
- 17 C The pollution has recently been high, and acid rain is destroying some monuments.
- 18 B A combination of fungi and algae grow upon the surface of a rock slowly "eating it away".
- 19 M Flooding has caused a landslide and part of the hillside has been affected.
- 20 C The salty water of the ocean is eating away the concrete support posts of the pier.





Match the statement with the correct cause of erosion.

- | | | | |
|----|----------|---|---------------------------|
| 1 | <u>C</u> | The coastlines of oceans & beaches have shrunk over time. | A Precipitation |
| 2 | <u>A</u> | The raindrops washed away the seeds and soil in the garden. | B Rivers |
| 3 | <u>A</u> | The winter snow is melting and is rapidly moving debris. | C Waves |
| 4 | <u>H</u> | A tunneling rabbit has led to a small sinkhole in the yard. | D Floods |
| 5 | <u>B</u> | A small canyon was formed due to a fast-moving waterway. | E Wind |
| 6 | <u>E</u> | A dust storm in the west is causing problems for farmers. | F Glaciers |
| 7 | <u>I</u> | The woods have cut down and replaced by hundreds of homes. | G Gravity |
| 8 | <u>G</u> | The road was closed following a rock slide along the highway. | H Living organisms |
| 9 | <u>D</u> | It has rained for five days; the streets have been washed away. | I Human |
| 10 | <u>F</u> | Mountains of ice carved out areas where lakes are now located. | |

Answer each question.

11. What is the movement of sediments caused by? **Weathering and erosion**
12. Give two examples of manmade landforms: **lakes, ponds, hills**
13. Name four things weathering can be caused by: **water, air, chemicals, plants, animals**
14. Name three main methods smaller pieces of rock move: **wind, water, ice**
15. Name two places sediment may be deposited: **mouths of rivers, bases of mountains**
16. Using the terms from the content pages, explain what may have caused the openings in the hillside, and what may happen in the future?[Use image or similar from: <http://www.hendersoncountync.org/engineering/erosion/>]

Mechanical weathering has taken place, and the hillside openings may have been caused by moving water, either from flooding, heavy rainfall, or both. The soil or other sediments have been moved due to erosion. In the future, valleys could form, or possibly streams.

