

# Weathering and Its Effects on Earth's Surface

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## **Science**

**Standard II:** Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

**Objective 2:** Describe how weather and erosion change Earth's surface.

**Indicators a:** Identify the objects, process, or forces that weather and erode Earth's surface (e.g. ice, plants, animals, abrasion, gravity, water, wind).

## **Science Intended Learning Outcomes**

**1- Use science process and thinking skills—d, f, h, i**

**4- Communicate effectively using science language and reasoning—a, b, c**

## **Background Information:**

Weathering on Earth's surface is happening all around us all the time. Sometimes it happens so slowly or subtly that we don't know it is happening. Other times it can happen quickly right before our eyes. It is important for students to know what weathering is and how it is different from erosion. The definition of weathering is the physical breakdown of the rocks on Earth's surface into smaller pieces of rock or sand. The forces of temperature, water, wind, gravity, and organisms cause weathering. There are many different types of weathering. The ones that will be shown in these lessons are hot and cold temperature changes, ice expanding in cracks, rocks tumbling in a river, sand blowing in the wind, rocks falling from cliffs, plant activity and animal activity.

## **Weathering**

Definition: The physical breakdown of the rocks on Earth's surface into smaller piece of rock or sand

## **Different Types of Weathering**

**When students are learning about science the best thing the students can do is write down these ideas in a journal. Have them draw pictures of what is happening and then label the important parts. Have them write captions under the drawings describing what is happening.**

- I. Hot and Cold—Temperature Change
  - The repetition of hot and cold causes rock to crack at the surface; they can sometimes cause the rock to break apart.

**Experiments/Observations:**

- **Show pictures of rocks that have cracked because of hot and cold temperatures.**
- **Heat a brass ball and test to see if it will go through the ring.**  
**(The ball will not go through the ring.)**
- **Heat glass marbles and put into cold water.**  
**(The marbles in crack.)**
- **Go out on the playground and look for cracks in the asphalt.**

II. Water freezing in the cracks of rock

- **Melting snow in the spring will often run into the cracks and rocks. At night the water freezes, expands and breaks the rock open.**

**Experiments/Observations:**

- **Show pictures of rocks that have broken off because of ice expanding in the cracks.)**
- **Freeze water in a film canister or a drinking bottle.**  
**(It will expand and misshape the containers.)**
- **Freeze a cup of plaster with a small balloon filled with water in the middle of it.**  
**(The balloon will expand and break the plaster and possibly break through the cup.)**
- **Go out on the playground and look for broken pieces of cement around cracks in the cement.**

III. Rocks in rivers tumbling

- **Running water will carry rocks down hill. These rocks as they are tumbling will hit against each other and break them down, rounding them off so they are smooth.**

**Experiments/Observations:**

- **Show rocks that have been found at the bottom of a riverbed. Show how they would knock against each other as they tumbled in the river. Knock them together.**  
**(Small pieces will break off.)**
- **Put different rocks into a small Gatorade container. Put water in the container and put the lid on. Shake the container.**  
**(Sediments will begin to form at the bottom.)**

IV. Sand blowing in the wind

- The sand in the wind hits against existing rock and breaks them down causing unique rock formations.

**Experiments/Observations:**

- **Put salt into a low cup. With a piece of colored chalk, stir the salt.**  
(The salt will turn the color of the chalk.)
- **Show pictures of rock formations that have been sandblasted by the wind.**
- **Show a piece of windshield or glass that has been in a sand storm.**
- **If one is available, show a small rock structure that has been sand blasted.**

V. Rocks falling from cliffs

- When rocks hit the ground, the rocks hit each other and break.

**Experiments/Observations:**

- **Show pictures of rocks that have dropped to the bottom of the cliff and how they are broken up.**
- **With rocks at on the floor (on a tarp) drop some rocks from up high hitting the rocks below.**  
(They will show breakage when they hit.)

VI. Plant Activity

- Plants grow in the cracks of plants. The roots get larger and larger and break open the rock.
- Plants move back and forth across rock and wear it down.

**Experiments/Observations:**

- **Show pictures of plants that have grown out of rocks and the damage they have done.**
- **If possible, have a sample of roots that have grown into some rock cracks and broken the rocks open.**
- **Put beans into a cup that has Plaster of Paris in it that is still fluid. Let the plaster set up.**  
(The beans expand and break up the plaster.)
- **Go outside on the playground and look for plants that have grown between the cracks of the cement.**

## VII. Animal Activity

- Animals dig holes in the ground for their homes and expose the rock to the elements.
- Cave-ins can break rocks.

### **Experiments/Observations:**

- **Show pictures of fresh holes that have been dug into Earth's surface with the dirt up off the ground.**
- **Describe experiences with tunnels in the ground where they have caved in.**
- **Go outside on the playground and look for gopher holes.**

## VIII. Water dissolves rock

- The dissolving power of water break now the minerals in rock and gives the water more power to dissolve more rocks because of the salts and acids in the water.

### **Experiments/Observations:**

- **Get a ½ pint jar with water in it. Put about 50 ml of salt in a paper cup. By stirring in one spoonful at a time, see how much salt the water will hold before no more salt can be dissolved.**  
**(Large amounts of minerals can be dissolved in water and becomes an effective dissolving agent in dissolving rocks.**
- **Show a sample of a rock that has been dissolved by water.**

## IX. Lichens living on rocks

- Lichens living on rocks will break down rocks because of the acids they give off while inhabiting a rock. Water must always be present.

### **Experiments/Observations:**

- **Show samples of rocks with lichen on them.**  
**Sometimes you can see the indentations in rocks that have been eaten away where the lichen was on the rock.**
- **Show picture samples of lichen on the rocks.**
- **Go out on the playground and look to see where lichens are growing or have grown.**

## Assessment

- Look in the students' journals to make sure they are writing about the different experiments. They should be making predictions, making observations, and writing conclusions. Check for misconceptions and accuracy
- Ask questions after the experiments to make sure the students are grabbing onto the concepts being taught.
- Have the students write in their journals about each topic what they learned about each experiment.
- Have the students answer the worksheet questions about the experiments. Check for content, accuracy, and depth.
- Have the students write a summary paper of what weathering is using the ideas of the experiments that were done in class.

## **Subject Area**

### **Writing**

#### **Standard VIII:**

Students will write daily to communicate effectively for a variety of purposes and audiences.

#### **Objective 6:**

Write in different forms and genres.

**Indicators b:** Produce traditional and imaginative stories, narrative and formula poetry.

**d:** Produce writing to persuade (e.g., essays, editorials, speeches, TV scripts, responses to various media.

## **Science Connection**

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**Objective 2:** Describe how weather and erosion change Earth's surface.

1. Write a poem using Haiku, Cinquain, Diamante, or any form of your choice that describes one of the ways weathering takes place. Describe it as well as you can that will put pictures in the minds of the reading of the actual process of the type of weathering you have chosen.
2. Write a short humorous story about a rock that is being broken up by one of the processes of weathering. Bring the rock to life giving it human qualities and characteristics. What does the rock do to deter its demise? Be sure to have a beginning, middle, and end; main idea; details; setting; problem; and plot.
3. Would if we could purchase one of the weathering forces to break up rocks? Write a TV commercial that you are selling one of the weathering forces to break up some rocks in your area. Be sure it tells truthful facts about the type of weathering you are promoting
4. Write a newspaper article for the "Weathering Gazette" that tells about a tragedy of a rock that was attacked by the weathering of your choice. Tell when it happened, where the weathering came from, what it did, and how it happened. Be very descriptive so the reader can picture the story in their minds.
5. Write a journal entry of the day and the life of a rock. Write about what a rock's day would be like. Tell some challenges, dangers, happy times, sad times, and/or humorous events it would face daily.

## **Subject Area**

### **Visual Arts**

#### **Standard IV:**

The students will interpret and apply visual arts in relation to cultures, history, and all learning.

#### **Objective 3:**

Recognize the connection of visual arts to all learning.

**Indicator d:** Any works of art with which the teacher is familiar and appropriately teaches the standards and objectives of this grade level.

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With a piece of large white drawing paper or white bulletin board paper, draw a few mountains and valleys and a flat foreground. Draw in places that the seven types of weathering we talked about would take place. When you are done drawing it, label the places of weathering.

## **Subject Area**

### **Theatre**

#### **Standard I:**

The students will plan and improvise plays based on personal experiences and heritage, imagination, literature, and history of informal and formal theatre.

**Objective 3:** Describe and explain plot structure in terms of conflict.

**Indicator b:** Create and improvise an original scene in which the major conflict comes from the environment.

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In groups of twos or threes, have each group select a weathering process. Have the students create and improvise crisis scenes based on rocks. Have the students act out the type of weathering that is happening to the rock. There can be some dialogue but mostly action that show what is happening in the weathering process.

## Questions about Weathering

1. Explain how temperature change can have an effect on rock.

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2. Explain how ice can break rock.

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3. Explain how rocks that are caught in a creek, stream, or river can break down and become round.

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4. Explain how sand blowing against rocks can change the surface of a standing rock.

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5. Explain how rocks falling off cliffs can cause rocks to crack and break.

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6. Explain how plants growing in cracks of rocks can cause rocks to crack and break.

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7. Explain how animal activity can cause rocks to crack and break.

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8. In your own words, explain what weathering is.

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9. Tell what the different forces are that weather rocks.

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10. Explain why weathering is always happening everyday around us.

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