

UNIT 1: Weathering and Erosion

Unit Summary: In this unit, students will make observations detailing the effects of weathering and erosion through water ice, wind, or vegetation. Students will test erosion based on distinct environmental factors. Students will then identify patterns in rock formations and fossils to support environmental changes to our landscape.

Concepts & Vocabulary:

Energy, fuels, renewable, resources, derived, natural processes, hazards, impacts, regional, affect, organisms, global, rock formation, sediments, gravity, articles, physical characteristics, ocean floor, rock layers, ocean trenches, weathering, vegetation

Stage 1 – Desired Results (Also see Disciplinary Core Ideas below)

Performance Expectations: (PE) (Established Goals / Content Standards)

- **4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.**
 - *Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.*
 - *Assessment Boundary: Assessment is limited to a single form of weathering or erosion.*
- **4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.**
 - *Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.*
 - *Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.*

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Planning and Carrying Out Investigations</p> <ul style="list-style-type: none"> ● Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) <p>Constructing Explanations and Designing Solutions</p> <ul style="list-style-type: none"> ● Identify the evidence that supports particular points in an explanation. (4-ESS1-1) 	<p>ESS2.A: Earth Materials and Systems</p> <ul style="list-style-type: none"> ● Rainfall helps to shape the land and affects the types of living things found in a region. ● Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) <p>ESS2.E: Biogeology</p> <ul style="list-style-type: none"> ● Living things affect the physical characteristics of their regions. (4-ESS2-1) <p>ESS1.C: The History of Planet</p>	<p>Cause and Effect</p> <ul style="list-style-type: none"> ● Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1) <p>Patterns</p> <ul style="list-style-type: none"> ● Patterns can be used as evidence to support an explanation. (4-ESS1-1)

	<p>Earth</p> <ul style="list-style-type: none"> Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) 	
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<p>Enduring Understandings (1-3 max) Students will understand that: (connects with EQ 1)</p> <ul style="list-style-type: none"> Environmental factors and living things shape the land and affects the types of living things found in a region. <p>Students will understand that: (connects with EQ 2)</p> <ul style="list-style-type: none"> Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes, hurricanes, and other weather forces. 	<p>Essential Questions <i>What do the shapes of landforms and rock formations tell us about the past?</i></p> <p>EQ 1: <i>How can evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation be observed or measured?</i></p> <p>EQ 2: <i>What can rock formations tell us about the past?</i></p>
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Stage 2 – Model Assessments	
<p>Summative Performance Task(s)</p> <p>Writing connection: Would you live in a place in which the landscape includes erosion? Include scientific evidence to support your position from science journals, articles, and multimedia supplemental clips. Students can create google slides, brochure, diagram, chart, or illustration.</p> <p>Science Journal: Students will use a phenomenon throughout the entire unit. (noted at the end of this document) Teacher will guide students on expectations of a journal entry in response to phenomena. Students will build on each idea and scientific inquiry to justify their thinking.</p>	<p>Formative Evidence for EQ 1: <i>How can evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation be observed or measured?</i></p> <ul style="list-style-type: none"> Identify, test, and use cause-and-effect relationships in order to explain change. <ul style="list-style-type: none"> Students will create a cause-and-effect journal. This will be used to identify, test, and illustrate changes in their experiment. <ul style="list-style-type: none"> cause-and-effect relationships when studying physical weathering and the rate of erosion by water, wind, ice, or vegetation. Students learn that rainfall

Below is a link to assist you in guide you in this discovery with your students.

<https://thewonderofscience.com/assessment-project/2018/3/18/stone-forest-china>

- Support and identify explanations using patterns as evidence through the use of illustrations, diagrams, and written response.
 - Identify any patterns based on observations of the rock formations
 - Make a claim or statement based on your observations, support your claims with evidence.

Audience:

- Rubric (Coming Soon)

helps to shape the land and affects the types of living things found in a region, and that living things affect the physical characteristics of a region.

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- Navigating Nonfiction- Use the skills and mini-lessons taught in this unit to read informational texts
- Make observations and/or measurements to produce evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (*Note: Assessment is limited to a single form of weathering or erosion.*) Examples of variables to test could include
 - Angle of slope in the downhill movement of water
 - Amount of vegetation
 - Relative rate of deposition
 - Volume of water flow

Formative Evidence for EQ 2: *What can rock formations tell us about the past?*

- Support and identify explanations using patterns as evidence through the use of illustrations, diagrams, and written response.
 - Identify any patterns based on observations of the rock formations
 - Make a claim or statement based on your observations, support your claims with evidence.

Explain how rock layers change overtime in our landscape provide an example that illustrates your thinking. Examples of evidence from patterns could include:

- Rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time.
- A canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut

through the rock.

Stage 3 – Learning Plan Resources and Activities

Suggested Resources for Planning:

Mystery Science, NewsELA, Tower Garden Lessons, NJCTL.org, thewonderofscience.org, and other relevant resources.

Learning Activities:

Standard: 4-ESS1-1, 4-ESS2-2

Mystery Science:

Mystery 1: [Could a volcano pop up where you live?](#)

Target:

- I can explain changes of landscape over time.
- I can provide evidence of the effects of weathering erosion over time

Thewonderofscience.com:

- [Anchor Chart](#)

NewsELA:

[Volcano-Guatemala](#)

[Volcano-Hawaii](#)

[Mystery 2: Why do some volcanoes explode?](#)

Standard:4-ESS1-1

Target:

- I can explain changes of landscape over time
- [Anchor Chart](#)-highlighting link of cause and effect

[Mystery 3: Will a mountain last forever?](#)

Standard:4-ESS1-1, 4-ESS2-1

Target:

- I can explain changes of landscape over time.
- I can provide evidence of the effects of weathering erosion over time.

NewsELA

[Tectonics Plates](#)

[Earth's Oldest Rock](#)

[Mystery 4: How could you survive a landslide?](#)

Standard:4-ESS2-1, 4-ESS3-2

Target:

- I can explain changes of landscape over time.
- I can provide evidence of the effects of weathering erosion over time.
- I can compare solutions to reduce impacts of natural Earth processes on humans.
- [Cumulative Anchor Chart](#)

Additional Resources:

More Picture-Perfect Science Lessons: "If you Find a Rock "pages 157-167.

Books:

Let's Go Rock Collecting

Eruptions

Video Links:

[Bill Nye Video-Erosion :](#)

Bill Nye, "The Science Guy", presents a video describing the effects of weathering (wind, water, ice) on landforms. Bryce Canyon is used as an example of the ways in which freezing water, plant roots, and wind weather the earth's surface creating the means for erosion. Students in video simulate effects of weathering which can be duplicated in a classroom setting. Nye also emphasizes the passage of time in millions of years as he explains the slower erosive effects of certain types of weathering.

Suggested Methods:

- Phenomena:
 - What do the shapes of landforms and rock formations tell us about the past?
 - How can evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation be observed or measured?

Links to Phenomena:

- [4-ESS1-1 How was the Grand Canyon Formed?](#)
- [4-ESS2-1 Why Do Rivers Curve?](#)
- [4-ESS2-2 The Marianas Trench - The Deepest Ocean](#)
- [4-ESS2-2, 4-ESS3-2 Yellowstone Supervolcano 4](#)
- [ESS3-2 Elephants Warn Tourists of Tsunami](#)