

PROCESSES THAT SHAPE EARTH (4.ES.NGSS)

UNIT AT A GLANCE

ACTIVITY 1 - Weathering and Erosion Detectives

QUESTIONS: How can we make observations and collect data to provide evidence that the surface of the land changes through different kinds of erosion?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 20 min. Activity: 2 classes Lesson 1A: 60-65 min. Lesson 1B: 50-55 min.	<p>Video of a landslide and how it changes the shape of the land.</p> <p>Make observations of evidence of weathering and erosion in the schoolyard.</p>	<ul style="list-style-type: none"> • make observations to determine different kinds of weathering and erosion. • compare pictures of weathering and erosion to their schoolyard observations. • develop definitions of the terms <i>weathering</i> and <i>erosion</i>.
Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none"> • determine the different forces that cause weathering and erosion. • determine the cause-and-effect relationship between the forces of weathering and erosion and changes in the land. 	<p>Planning and Carrying Out Investigations</p> <p>Asking Questions and Defining Problems</p> <p>Constructing Explanations and Designing Solutions</p> <p>Cause and Effect</p> <p>Patterns</p>	<p>PE at Lesson Level Recognize evidence of change due to weathering and erosion. Develop an understanding of the terms <i>weathering</i> and <i>erosion</i>.</p> <p>Formative Assessment Activity Pages Science Talk</p>

ACTIVITY 2 - Different Forms of Erosion

QUESTIONS: What is the effect of different types of erosion on rocks, soils, and minerals?
How do the different types of erosion affect the shape of the land?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 25 min. Activity: 5 classes Lesson 2A: 55-60 min., 2 classes Lesson 2B: 55-60 min. Lesson 2C: 55-60 min., 2 classes	<p>Make observations of evidence of weathering and erosion caused by water, chemicals, wind, glacier movement, temperature change, and vegetation.</p>	<ul style="list-style-type: none"> • make observations and models at different weathering and erosion stations. • compare the effects of different types of erosion. • investigate the effects of thawing and freezing on rocks. • investigate the effects of a weak acid and water on rocks and minerals. • read informational text about chemicals and chemical weathering.

ACTIVITY 2 - Different Forms of Erosion - *Continued*

Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none"> determine the effects of ice wedging. develop a model that demonstrates how temperature change causes ice wedging and breaks apart rocks. Develop an investigation to determine the effects of weak acids and water on rocks and minerals. analyze data from their investigation. 	<p style="color: #0070c0; margin: 0;">Asking Questions and Defining Problems</p> <p style="color: #0070c0; margin: 0;">Planning and Carrying Out Investigations</p> <p style="color: #0070c0; margin: 0;">Analyzing and Interpreting Data</p> <p style="color: #0070c0; margin: 0;">Obtaining, Evaluating, and Communicating Information</p> <p style="color: #0070c0; margin: 0;">Developing and Using Models</p> <p style="color: #92d050; margin: 0;">Cause and Effect</p>	<p style="margin: 0;">PE at Lesson Level Determine that weathering is caused by different types of forces and reactions.</p> <p style="margin: 0;">Formative Assessment Activity Page, class chart</p> <p style="margin: 0;">Summative Assessment Activity Pages Journal Entries Science Talk Investigations</p>

ACTIVITY 3 - Fossils and Rock Layers

QUESTIONS: How do rock layers and fossils provide evidence of Earth’s past and changes over a long period of time?

Time to Complete	Phenomena	Summary: Students Will...
<p>Preparation: 20 min.</p> <p>Activity: 9 classes</p> <p>Lesson 3A: 50–55 min., 2 classes</p> <p>Lesson 3B: 50–55 min. 2 classes</p> <p>Lesson 3C: 50–55 min., 2 classes</p> <p>Lesson 3D: 50–55 min. 3 classes</p>	<p style="color: #6aa84f; margin: 0;"><i>Video: First Time Seen in 200 Million Years</i></p> <p style="color: #6aa84f; margin: 0;">Make observations of pictures of the rock layers in the sides of the Grand Canyon.</p>	<ul style="list-style-type: none"> raise questions about fossils and what information they give scientists. make observations of specimens for evidence of ancient life forms. read informational text about the Grand Canyon and fossils.
<p style="margin: 0;">Students Figure Out How To:</p> <ul style="list-style-type: none"> determine if a rock is a fossil. compare fossils with modern life forms. develop a model that explains how rock layers and fossils found in the layers give evidence of the history of Earth. obtain information from text about fossils and rock layers. 	<p style="margin: 0;">Obtaining, Evaluating, and Communicating Information</p> <p style="margin: 0;">Planning and Carrying Out Investigations</p> <p style="margin: 0;">Constructing Explanations and Designing Solutions</p> <p style="margin: 0;">Analyzing and Interpreting Data</p> <p style="margin: 0;">Patterns</p>	<p style="margin: 0;">Performance Expectations (PE) at Lesson Level and Assessment</p> <p style="margin: 0;">PE at Lesson Level Obtain information to determine how scientists use fossils and rock layers to learn about the history of Earth.</p> <p style="margin: 0;">Formative Assessment Activity Page Journal Entry</p> <p style="margin: 0;">Summative Assessment Activity Pages Journal Entry Rock layer models and presentations Science Talk</p>

ACTIVITY 4 - Earthquakes, Volcanoes, and Tsunamis

QUESTIONS: How can we use real-time data on earthquakes to determine a pattern in where they occur? What causes earthquakes?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 15 min. Activity 4: 8 classes Lesson 4A: 50–55 min., 2 classes Lesson 4B: 50–55 min., 3 classes Lesson 4C: 50–55 min. 3 classes	Make observations of the effects of an earthquake.	<ul style="list-style-type: none"> raise questions about earthquakes. use data from USGS to locate earthquakes on a map. read informational text about earthquakes, volcanoes, and tsunamis
Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none"> analyze and interpret data about the location of earthquakes to find patterns. obtain and evaluate information gathered from text to determine the cause-and-effect relationship between shifting plates and earthquakes, volcanoes, and tsunamis. develop a model to explain how the shifting tectonic plates cause earthquakes. 	Obtaining, Evaluating, and Communicating Information Analyzing and Interpreting Data Developing and Using Models Patterns	PE at the Lesson Level Obtain information about earthquakes, volcanoes, and tsunamis to determine the cause-and-effect relationship between the events and changes to the earth’s surface. Formative Assessment What We Think chart Summative Assessment Handout: Mapping Earthquakes Earthquake models and presentations Models Journal Entries Science Talk

ACTIVITY 5 - Reduce the Impact of Natural Hazards

QUESTIONS: How can we develop a plan or model that will reduce the impact of a natural hazard?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 10 min. Activity: 4-6 classes Lesson 5A: 50–55 min., 2 -3 classes Lesson 5B: 50–55 min., 2-3 classes	Engineering Design challenge: Reduce the effect of a natural hazard.	<ul style="list-style-type: none"> Use the Engineering Design Process to develop a plan or structure that reduces the impact of a natural hazard.
Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none"> Work as a team of engineers to develop a plan or structure that reduces the impact of a natural hazard. 	Constructing Explanations and Designing Solutions Developing and Using Models Cause and Effect	PE at Lesson Level Use information about natural hazards to design a solution that reduces the impact on humans and/or the environment. Formative Assessment Activity Page Charts Science Talk Summative Assessment Engineering solutions and presentation

ACTIVITY 6 - Natural Resources

QUESTIONS: How do humans change the shape of the land through the use of natural resources?
How can humans reduce the impact of the use of fossil fuels on the environment?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 15 min. Activity: 6 classes Lesson 6A: 50–55 min. 2 classes Lesson 6B: 50–55 min., 2 classes Lesson 6C: 50–55 min. 2 classes	Read the book <i>Weslandia</i> .	<ul style="list-style-type: none"> Read a book about a boy who developed his own civilization and used a plant for his natural resources. Make observations of different materials to determine what resource they are made from. Use a graphic to learn about the different steps in making glass, paper, and plastics.
Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none"> Obtain information from text in a story that relates to human use of natural resources. Classify resources as renewable and nonrenewable. Obtain information from graphics to explain how glass, plastics, and paper are manufactured. Classify material as natural or manufactured. 	<p style="color: #0070c0; margin: 0;">Constructing Explanations and Designing Solutions</p> <p style="color: #0070c0; margin: 0;">Analyzing and Interpreting Data</p> <p style="color: #92d050; margin: 0;">Cause and Effect</p>	<p>PE at the Lesson Level Determine how natural resources are used to manufacture materials for humans and that some resources are renewable and others are not.</p> <p>Formative Assessment Respond to Text Handout: Wesley’s Resources Activity Page Journal Entry Science Talk</p> <p>Summative Assessment Science Talk Classification of materials Journal Entry</p>

ACTIVITY 7 - Humans Change the Shape of the Land

QUESTIONS: How do humans change the shape of the land through the extraction or mining of natural resources?
How can humans reduce the impact of the extraction or mining of fossil fuels on the environment?

Time to Complete	Phenomena	Summary: Students Will...
Preparation: 15 minutes Activity: 6 classes Lesson 7A: 50–55 min. 2 classes Lesson 7B: 50–55 min. 2 classes Lesson 7C: 50-55 min. 2 classes	Video of mountaintop mining. Read the book <i>Oil Spill</i> .	<ul style="list-style-type: none"> Read articles about oil, coal, and gas as natural resources for energy. Read about an oil spill and how environmentalists cleaned it up and the impact on the environment. Work in teams to clean up a model of an oil spill.

ACTIVITY 7 - Humans Change the Shape of the Land - *Continued*

Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
<ul style="list-style-type: none">• Obtain information to determine how the use of fossil fuels changes the land and affects the environment.• Use information from text to develop and carry out a plan to clean up an oil spill using a model.• Use materials available to clean an oil spill.• Determine how each individual, family, and community can reduce the effect of the use of natural resources on the environment.	<p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <p>Developing and Using Models</p> <p>Obtaining, Evaluating, and Communicating Information</p> <p>Cause and Effect</p>	<p>PE at the Lesson Level Use information from text and media to determine the impact of human use of fossil fuels on the environment.</p> <p>Summative Assessment Science Talk Journal Entry/Respond to Text Student Presentations Journal Entry</p>