

Eroding Land

Grade 4

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Science Content Standards: Grade 4, 5c — *Students know* moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Lesson Concept: The amount of flowing water and the type of soil affects the amount of erosion.

Conceptual Flow:

- ▶ Flowing water reshapes the land by removing material from one place and depositing it in another.
- ▶ Soil moves down hill. Gravity pulls water and what's in it downhill.
- ▶ The amount of water (heavy rain versus light rain) affects the amount of erosion.
 - Transportation is the movement of soil from one place to another.
 - Deposition is soil deposited after being moved.
- ▶ Different types of soil erode differently.
- ▶ Humans can affect the way water changes the Earth.
 - New construction could contribute to landslides.
 - People can take steps to prevent or lessen erosion.

Teacher Background:

Weathering produces pebbles, sand, silt, and mud. Erosion and transportation move the products of weathering from one place to another. As erosion transports the broken and dissolved products of weathering, it alters the shape of landforms.

The most important agent of transportation is water. Water flowing in streams is energetic enough to pick up and carry silt, sand, pebbles, mud. At flood stage water can move even large boulders. Flowing water reshapes the land by removing material from one place and depositing it in another. (Excerpted from the *Science Framework for California Public Schools: Kindergarten Through Grade Twelve*.)

Note: Although the words “soil” and “dirt” are often used interchangeably, some scientists refer to soil as part of an ecosystem, containing organic matter and capable of supporting plant life. The components of typical soils are made up of rock particles, water, air, organic matter, and living things (e.g., bacteria, fungi). Dirt usually lacks some or most of those components.

Materials Needed for the Lesson:

Teacher Materials

- “Set Up for Soil Erosion Investigation” (Instructions for Teachers)
- Ruler
- Mister (spray bottle)
- Watering can
- Plastic container (“sweater” box approximately 16 inches wide, 30 inches long, and 6 inches deep) (Obtain from a discount store)
- Potting soil for the demonstration
- Measuring cup

Student Hands-on Materials

Three groups with two stations in each group:

Student Group 1: Stations 1A and 1B which have sandy soil in both of the plastic containers

Student Group 2: Stations 2A and 2B which have dirt in both of the plastic containers

Student Group 3: Stations 3A and 3B which have rocky soil in both of the plastic containers

- Five cups of soil from a garden mixed with one cup of sand (three cups each for plastic containers at Stations 1A and 1B)
- Six cups of “dirt” from playground (three cups each for plastic containers at Stations 2A and 2B)
- Six cups of pea gravel, sand, and clay (three cups each for plastic containers at Stations 3A and 3B)

- Three watering cans (one for each group)
- Three misters (spray bottles) (one for each group)
- Six plastic containers (“sweater” boxes approximately 16 inches wide, 30 inches long, and 6 inches deep) (two for each group) (Label: 1A and 1B, 2A and 2B, 3A and 3B)

- Paper towels (for clean-up)

Student Handouts

- “Soil Erosion Investigation”
- “Rainfall and Soils Investigation”

5E Lesson: Eroding Land

Teacher Does	Student Does	Concept
<p><u>ENGAGE:</u></p> <ul style="list-style-type: none"> ▶ <i>How many of you have been to Putah Creek?</i> ▶ <i>Has anyone ever noticed that the banks (sides) of Putah Creek look different at different times?</i> ▶ <i>The banks of Putah Creek do change especially in the winter. What do you think is causing this change?</i> ▶ <i>Talk in your table groups about what you think is causing this change. Share some ideas.</i> <p>Purpose: How light rain and heavy rain affect different types of soil.</p> <p>Teacher demonstration station: how to use the watering can and the mister. Hold spray bottle 1 foot away from the bottom of the box (demonstrate with ruler). Squirt 100 times in the light rain box.</p> <ul style="list-style-type: none"> ▶ <i>How did the soil get from the top of the hill to the bottom?</i> ▶ <i>Was there a difference in the amount of soil being moved with the mister and the watering can?</i> 	<p>Raise hands</p> <p>Raise hands</p> <p>Talk in their table groups</p> <p>Share out.</p> <p>Expected Student Response (ESR): People are chopping down the sides; the water moves through and wears away the sides.</p> <p>ESR: The water carried the soil down the hill.</p> <p>ESR: More dirt was moved with the watering can</p>	<p>Soil/dirt moves down hill.</p>
<p><u>EXPLORE:</u></p> <ul style="list-style-type: none"> ▶ <i>There will be three groups with 2 stations in each group: 1 A and B which is sandy soil, 2 A and B which is dirt, 3 A and B which is rocky soil. You will compare how light rain and heavy rain affects the erosion on that soil.</i> ▶ <i>What do we mean by “EROSION”?</i> ▶ <i>After you do your light rain investigation at the first station, you will move around the class and observe the other light rain stations. Then we’ll repeat the process with the heavy rain station. So everyone will visit heavy rain and light rain for 3 different types of soil.</i> 	<p>ESR: Erosion is the movement of soil from one place to another, and when that soil moves, it changes the look of the soil and landscape.</p>	<p>Different types of soil erodes differently.</p> <p>The amount of rain affects the amount of erosion.</p>

Teacher Does	Student Does	Concept
<p>Distribute observation sheet, "Erosion Investigation."</p> <ul style="list-style-type: none"> ▶ <i>Be sure to take detailed observations (make careful drawings and use specific words to describe your observations).</i> ▶ <i>It is important that you complete your tests carefully and do not disturb the soil as other students will be visiting your station to see your results and will be recording observations from your tests.</i> ▶ <i>As you visit other stations, be sure you have the good manners of scientists and do not disturb the investigations of your fellow scientists.</i> <p>Repeat so all students have visited all stations.</p> <p>Have students return to their seats.</p> <ul style="list-style-type: none"> ▶ <i>Looking at your data (your observations) do you notice any similarities?</i> ▶ <i>How is sandy soil with light rain similar to rocky soil with light rain?</i> 	<p>Do light rain test and record observations. Do heavy rain test (at teacher's signal) and record observations.</p> <p>Move to next station and record observations</p> <p>Move to next station and record observations.</p> <p>ESR: The ones with heavy rain eroded more soil.</p> <p>ESR: They both did not erode much</p>	
<p><u>EXPLAIN:</u></p> <ul style="list-style-type: none"> ▶ <i>Use your observations to answer the questions and use your data as evidence when you answer the questions. Good scientists write so others can read their writing.</i> <p>Distribute assessment paper, "Rainfall and Soils Investigation."</p> <p>Collect the papers.</p> <p>Review the questions. As students give responses, put vocabulary words on the board to discuss meaning.</p>	<p>Students will complete assessment sheet</p>	<p>Different types of soil erode differently.</p> <p>The amount of rain affects the amount of erosion.</p>

Input Question: How did the soil get from the top of the hill to the bottom? (in Engage section)

Process Question: How is sandy soil with light rain similar to rocky soil with light rain? (in Explore section)

Output Question: Compare the overall effects of heavy rainfall and light rainfall on any soil (on Student Handout). Generalize from your data.

Set up for Soil Erosion Investigations

Instructions for Teacher

#1A
Sandy Soil
Light rain

#2A
Dirt
Light rain

#3A
Rocky soil
Light rain

#1B
Sandy Soil
Heavy rain

#2B
Dirt
Heavy rain

#3B
Rocky Soil
Heavy rain

Student Group #1 ---- Station #1A and B

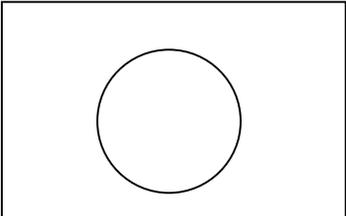
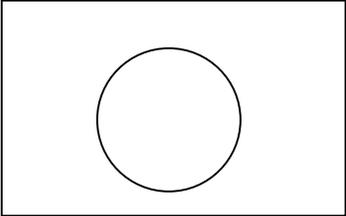
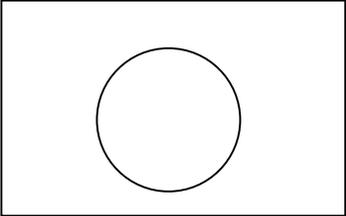
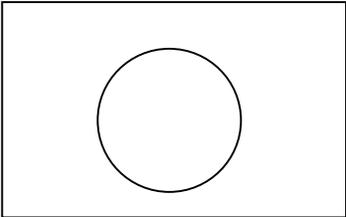
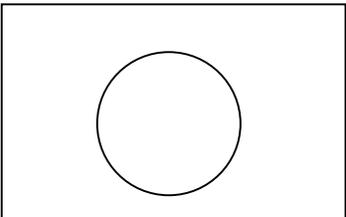
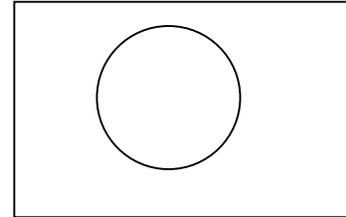
Student Group #2 ---- Station #2A and B

Student Group #3 ---- Station #3A and B

Student groups only perform the test once and then view what the other groups did. Each group of students does the light rain and heavy rain test at their station and record observations. Then Student Group #1 rotates to station #2, Student Group #2 goes to station #3 and Student Group #3 goes to station #1 and records the observations left by the previous student group. All groups rotate around to view all the stations and record their observations.

STUDENT HANDOUT Soil Erosion Investigation

Name _____

1A Sandy Soil Light Rain	2A Dirt Light Rain	3A Rocky Soil Light Rain
Describe what the soil looks like after a light rain	Describe what the dirt looks like after a light rain	Describe what the rocky soil looks like after a light rain
Draw a diagram	Draw a diagram	Draw a diagram
		
1B Sandy Soil Heavy Rain	2B Dirt Heavy Rain	3B Rocky Soil Heavy Rain
Describe what the soil looks like after a heavy rain	Describe what the dirt looks like after a heavy rain	Describe what the soil looks like after a heavy rain
Draw a diagram	Draw a diagram	Draw a diagram
		

Name _____

Date _____

STUDENT HANDOUT

Rainfall and Soils Investigation

Be a scientist! Use your scientist observations skills to answer the questions using complete sentences.

1. What happened to the soil during the heavy rain?

Sandy Soil

Dirt

Rocky Soil

2. **Compare** the overall effects of heavy rainfall and light rainfall on any soil.
