

Water Flows Downhill

Grade 4

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Science Content Standards: Grade 4, 5c — *Students know* that 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 slope that water travels impacts the changes in the land.

Conceptual Flow:

- Landforms are changed by erosion, transportation, and deposition.
- Erosion can be a quick process or a slow process.
 - Storms can cause a quick dramatic change.
 - As water volume increases, erosion quickens.
 - Wind, lapping waves, normal stream and river movement can cause slow noticeable change.
 - Water, as ice, causes erosion.
- Erosion and transportation move the products of weathering from one place to another.
 - Weathering can be caused by plants and roots breaking up earth materials.
 - Water flows down hill carrying sediments.
 - Water flows downhill due to gravity.
 - The steeper the slope, the more sediment tends to be carried by the water.
 - The steeper the slope, the less meandering occurs in the water flow.
 - The steeper slope, the deeper the water cuts the land.
- Rock, gravel, and soil separate in deposition.

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, and 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*.)

Materials Needed for the Lesson:

Teacher Materials (Heading 2)

- Picture map of Lake County (“3D Map of Lake County; Oblique View” - Obtain from the County of Lake Information Technology, Lakeport)
- Transparency of “Water Flow Lab Report” (Student Handout)

Student Hands-on Materials

For 8 groups

- Sentence strips
- 8 stream tables (plastic “sweater” boxes approximately 16 inches wide, 30 inches long, and 6 inches deep)
- 8 - 2x4s (for slopes)
- 4 teaspoons (for sediment measurement)
- 2 rulers (for measuring deepness of water cut)
- 8 plastic cups with an 1/8 inch hole on the bottom
- 8 clothes pins (to fasten the cup to the stream table)
- 8 sponges (to place at the end of the stream table to catch the water)
- Disposable gloves (for students who do not want to get their hands dirty)
- 8 one-quart containers of water (from which to pour into the plastic cups)
- 3-4 cups per group of playground sand mixed with white dry clay (50/50), moistened
- For each group of four students

Student Handouts

- “Water Flow Lab Report”
- “My Thoughts About Water Flowing on Land”

To Set Up the Stream Table

Mark 20 cm from the edge on the bottom of the stream table (see “Water Flow Lab Report”). Place 3-4 cups of damp sand and clay mixture on that end of the stream table and press down (you may need to experiment with the shape of the mixture). The mixture should not extend past the 20 cm mark. On the same end, fasten the plastic cup (with the hole) with a clothespin on the edge on the stream table. Place a sponge on the other side of the stream table to catch the water. Pour water into the cup and allow the water to drain (drip) on the sand/clay. Observe the pattern the water creates on the sand/clay.

5E Lesson: Title of Lesson

Teacher Does	Student Does	Concept
<p><u>ENGAGE:</u></p> <p>Keep this part of the lesson brief, so there is more time for the “Exploration”. Show picture map of Lake County. Mention the different colors on the map and their meaning. Explain to students that</p> <ul style="list-style-type: none"> ▶ <i>the small blue lines represent creeks and show their flow into Clear Lake.</i> <p>Show the wider Cache Creek, which is the only creek flowing out of Clear Lake in the Lower Lake area.</p> <ul style="list-style-type: none"> ▶ <i>Why do these creeks flow into the lake and this creek flows out of the lake?</i> ▶ <i>Think, Pair, Share (TPS) ideas; share with your team/desk group your ideas. With your group decide on a sentence that best explains the flow of water and write it on the sentence strip.</i> <p>Have students share sentence strips and post on the board.</p> <ul style="list-style-type: none"> ▶ <i>Is all of this land flat?</i> 	<p>TPS ideas; share with team/desk group ideas. Write sentence on sentence strip.</p> <p>Share sentence strip.</p> <p>Expected Student Response (ESR): The water goes down from the top to the bottom.</p> <p>Water goes down the hills into the lake; the bottom part of the lake goes down.</p>	<p>Water flows downhill due to gravity.</p>
<p><u>EXPLORE:</u></p> <ul style="list-style-type: none"> ▶ <i>You all have some very interesting ideas about water how water flows. Today we are going to do an investigation that will give us more information about how water flows and its effects on the land.</i> <p>Set up 8 stream tables: 4 have slight slope and 4 steep slope.</p> <ul style="list-style-type: none"> ▪ 2 groups – low slope, measure the amount of sediment ▪ 1 group – low slope, draw the shape of water flow ▪ 1 group – low slope, measure the deepness of cut of the land ▪ Same set up for high slope <p>Use the stream table set up for the demonstration and show how to do the investigation with a flat slope. Demonstrate filling in the lab report on the overhead.</p>		<p>The greater the slope, the more sediment carried by the water.</p> <p>The steeper the slope, less meandering of the water flow.</p> <p>The steeper slope, the deeper the cut of the land,</p>

Teacher Does	Student Does	Concept								
<p>(Complete the “before” picture; pour water into the cup and observe the water dripping or pouring on the sand/clay. Do an “after” picture; show how to do sediment measurement (scoop up with teaspoon all sediment that flowed past the 20 cm line); show how to measure water cut using a ruler (explain exactly where to take the measurement); show how to answer shape of water flow.</p> <p>Assign a station to each group and ask groups to circle the station number on their “Water Flow Lab Report.” Provide a stream table to each group (or have groups go to stations that are already set up).</p> <p>▶ <i>Every student does their own lab report. Do a “before” observation, then do an “after” observation.</i></p> <p>Explain to students that they need to observe their station number and that they only need to answer the prompt that is the same as their station number.</p> <p>Groups share the answer to their prompt.</p> <p>Record on a large class data table. For example:</p> <table border="1" data-bbox="191 1188 737 1381"> <thead> <tr> <th>Low slope</th> <th>High slope</th> </tr> </thead> <tbody> <tr> <td>Curvy shape</td> <td>Straight shape</td> </tr> <tr> <td>1/2 tsp sediment</td> <td>2 tsp sediment</td> </tr> <tr> <td>2mm depth</td> <td>4mm depth</td> </tr> </tbody> </table> <p>Have students walk around the room to observe other stations.</p>	Low slope	High slope	Curvy shape	Straight shape	1/2 tsp sediment	2 tsp sediment	2mm depth	4mm depth	<p>Students complete the pre-done on the lab paper, then students do the lab and then complete the “after” section.</p> <p>Draw a picture of the slope before adding water. Do the investigation at their station.</p> <p>Draw a picture of the slope after the water has been added.</p> <p>Groups circle their station number and indicate whether they are assigned the low slope or high slope.</p> <p>Record observations.</p>	
Low slope	High slope									
Curvy shape	Straight shape									
1/2 tsp sediment	2 tsp sediment									
2mm depth	4mm depth									
<p>EXPLAIN:</p> <p>▶ <i>With your elbow partner, look at this data, what does it tell you about how water moves and what it does to the land?</i></p> <p>Remove class data table.</p> <p>Have students complete “My Thoughts About the Water Flowing Over Land.”</p>	<p>ESR: When the slope is steep, the water flows more straight, lots of sediment is moved and a deep cut occurs in the land.</p> <p>When the slope is not steep, the water flows curvy, not much sediment is moved and the land is not cut very deep.</p>	<p>The greater slope, more sediment is carried, less meandering of the water and the deeper cut of the land.</p>								

Teacher Does	Student Does	Concept
<p><u>EXTEND:</u></p> <ul style="list-style-type: none"> ▶ <i>How would the outcome of this experiment be changed if the hole in the cup were larger?</i> ▶ <i>What changes do you think you would observe in the stream table?</i> 		

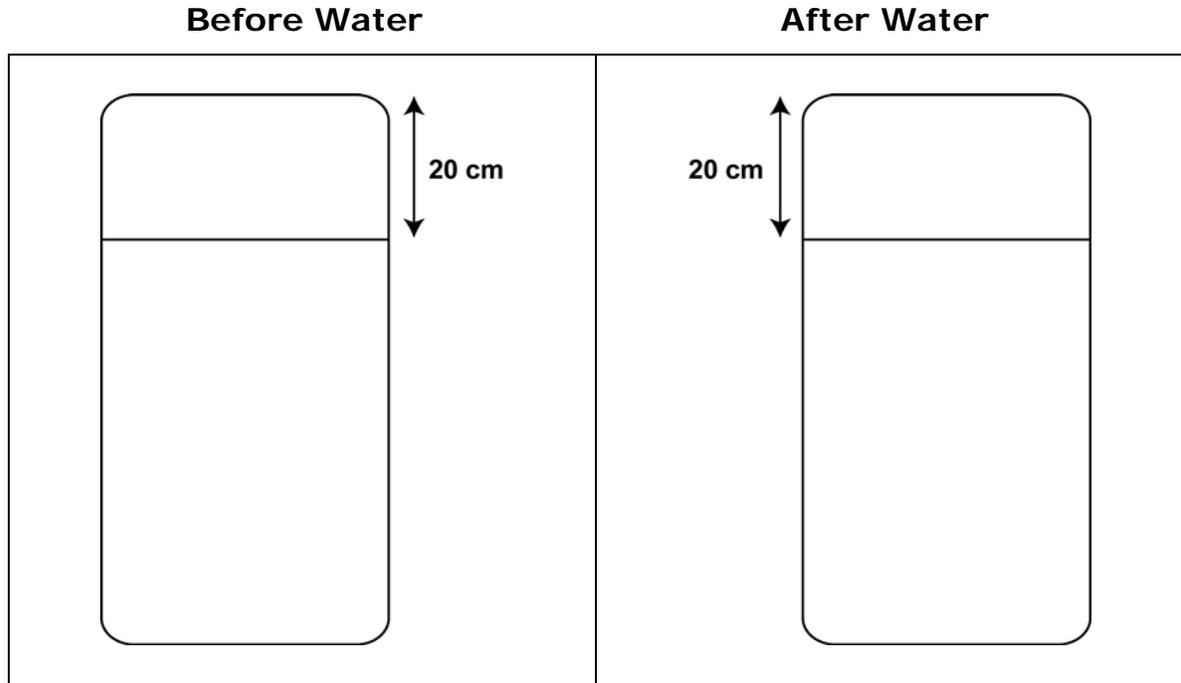
Input Question: What does your data tell you about how water moves and what it does to the land? (in Explain section)

Process Question: Why do some creeks flow into the lake and Cache Creek flows out of the lake? (in Engage section)

Output Question: How would the outcome of this experiment be changed if the hole in the cup were larger? (in Extend section)

STUDENT HANDOUT

Water Flow Lab Report



Height of Slope: _____ (Low slope or high slope)

Circle your station number below.

Station #1. Amount of sediment: _____

Station #2. Deepness of cut in the land from water flow: _____

Station #3. Shape of the water flow (straight or curvy): _____

Write at least one sentence about what you learned from this experiment:

STUDENT HANDOUT

**My Thoughts About Water
Flowing Over Land**

If the slope of a hill is **steep**:

1) The shape of the stream is (straight or curvy) _____ .

2) The cut of the land that the stream made is (deep or shallow)

_____ .

3) The amount of sediment that is moved is (more or less) _____
when a hill is steeper.