

Erosion

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About **Erosion**

DeltaScienceModules, THIRD EDITION

Students explore erosion, the carrying away of weathered material by wind and water. They discover how and why Earth's crust is constantly changing because of erosion. First, they build stream tables and adjust the inclination to propel the erosion process. Then they simulate flood conditions to determine the permeability and erosion resistance of different soils. They test planted and unplanted soils as erosion deterrents. Stream tables become beaches, and students construct breakwaters to reduce shoreline erosion. They study river sediment samples to better understand how moving water deposits streambed objects. Finally, students investigate the massive impact of glacial erosion.

In the Delta Science Reader *Erosion*, students read about Earth's structure. They find out about the slowly moving plates that make up Earth's surface and how they are related to mountain building, trenches, earthquakes, and volcanoes. They learn about physical and chemical weathering and how they contribute to soil formation. They are introduced to the causes of erosion and deposition and the landforms that are the results of these forces. They also read about soil conservationists and the ways they work to conserve soil and control erosion. Finally, students learn about floods.

Overview Chart for Hands-on Activities

Hands-on Activity	Student Objectives
1 Weathering <i>page 13</i>	<ul style="list-style-type: none"> • discuss physical and chemical weathering • observe and record signs of physical weathering on their way to and from school • simulate the chemical weathering of a mineral sample
2 Erosion <i>page 21</i>	<ul style="list-style-type: none"> • construct a stream table • observe erosion caused by moving water • discuss the landforms created by erosion
3 The Roots of Erosion <i>page 29</i>	<ul style="list-style-type: none"> • plant grass seed and observe plant growth over a 10-day period • compare the amount of soil erosion that occurs in the presence and in the absence of plants
4 Rock Races <i>page 37</i>	<ul style="list-style-type: none"> • measure, record, and compare the rates at which different-sized particles (samples of gravel, sand, and soil) settle in water
5 Is It Inclined to Erode? <i>page 43</i>	<ul style="list-style-type: none"> • construct a stream table to investigate the effect of slope on erosion • run water down the stream table at three different slopes • observe erosion and deposition characteristics that result from the different slopes of terrain
6 Erosion and Flooding <i>page 51</i>	<ul style="list-style-type: none"> • simulate flood conditions in their stream tables by increasing the rate of water flow into the tables • observe erosion and deposition caused by flood conditions • record and discuss their results
7 Water In, Water Out <i>page 59</i>	<ul style="list-style-type: none"> • compare the amount of time it takes for water to pass through gravel, sand, and clay soil • compare the amount of time it takes for water to be absorbed by the three materials after they have become saturated • graph the results of their experiments
8 Two Soil Types <i>page 67</i>	<ul style="list-style-type: none"> • examine the erosion and deposition characteristics of two types of soil • compare the results with those obtained using sand
9 River Sediment <i>page 75</i>	<ul style="list-style-type: none"> • compare and contrast several samples of river sediment • examine a map of a hypothetical river • identify on the map probable sites of sample extraction
10 Shoreline Erosion <i>page 83</i>	<ul style="list-style-type: none"> • simulate the erosive effect of wave action in their stream tables • compare the erosion caused by large and small waves • predict and then observe the effects of a breakwater on shoreline erosion
11 Wind Erosion <i>page 91</i>	<ul style="list-style-type: none"> • use their stream tables to simulate the erosion of sand by wind at the shoreline • use the class stream table from Activity 3 to simulate the erosion of soil by wind in a field • observe the ability of vegetation to hamper wind erosion • predict and observe the effects of a windbreak on erosion
12 Erosion and Glaciers <i>page 99</i>	<ul style="list-style-type: none"> • discuss the origin of glaciers • observe the erosive effects of a moving glacier • observe the deposition of glacial till
Assessment <i>page 105</i>	<ul style="list-style-type: none"> • See page 105.

Process Skills	Vocabulary	Delta Science Reader
observe, hypothesize, experiment, infer	acid rain, chemical weathering, oxidation, physical weathering, weathering	pages 5–6
make and use models, observe, define based on observations	alluvial fan, base level, delta, erosion, floodplain, levee, meander, sediment	pages 8, 9
hypothesize, experiment, use variables, predict, compare	soil	pages 7, 12, 14
measure; collect, record, display, or interpret data; infer	deposition, particle	pages 7, 8, 9
measure, use variables, observe, compare, infer	slope, variable	page 11
make and use models; collect, record, display, or interpret data; infer	dike, runoff	page 15
measure; compare; collect, record, display, or interpret data; infer	permeable, saturated	pages 7, 8
predict, observe, compare, communicate		pages 7, 14
observe, compare, infer		page 9
predict; compare; make and use models; collect, record, display, or interpret data	breakwater, tidal action, wave	page 10
predict, observe, infer	dune, windbreak	page 12
communicate, make and use models, observe, compare	debris, glacial till, glacier	page 13

See the following page for the Delta Science Reader Overview Chart.

Overview Chart for Delta Science Reader

Erosion

Selections	Vocabulary	Related Activity
Think About...		
<p>What Is Earth's Structure? page 2</p> <ul style="list-style-type: none"> • Layers page 2 • Moving Plates page 2 • Earthquakes and Volcanoes page 4 	<p>core, crust, mantle</p> <p>convection, plates, sea-floor spreading, subduction</p> <p>earthquake, volcanic island, volcano</p>	
<p>What Is Weathering? page 5</p> <ul style="list-style-type: none"> • Physical Weathering page 5 • Chemical Weathering page 6 • Soil Formation page 7 	<p>weathering</p> <p>physical weathering, rock</p> <p>chemical weathering, mineral</p> <p>humus, soil, soil horizon, soil profile</p>	<p>Activity 1</p> <p>Activity 1</p> <p>Activities 3, 4, 7, 8</p>
<p>What Causes Erosion and Deposition? page 8</p> <ul style="list-style-type: none"> • Running Water page 9 • Waves page 10 • Gravity and Mass Movement page 11 • Groundwater page 12 • Wind page 12 • Glaciers page 13 	<p>deposition, erosion, landforms</p> <p>delta, gravity, oxbow lake, runoff, sediment</p> <p>arch, barrier island, sandbar, stack</p> <p>mass movement</p> <p>groundwater, sinkhole</p> <p>dune</p> <p>continental glacier, glacial till, glacier, moraine, valley glacier</p>	<p>Activities 2, 4, 7</p> <p>Activities 2, 4, 9</p> <p>Activity 10</p> <p>Activity 5</p> <p>Activity 3</p> <p>Activity 11</p> <p>Activity 12</p>
People in Science		
<ul style="list-style-type: none"> • Soil Conservationists page 14 	<p>soil conservationist</p>	<p>Activities 3, 8</p>
Did You Know?		
<ul style="list-style-type: none"> • About Floods page 15 	<p>fertile, flood, floodplain</p>	<p>Activity 6</p>

See pages 113–122 for teaching suggestions for the Delta Science Reader.

MATERIALS LIST

Erosion

Quantity	Description	Quantity	Description
1	aluminum foil*	TEACHER-PROVIDED ITEMS	
1	bag, reclosable, 15 cm × 15 cm*	8	cardboard boxes, large
8	beakers, plastic	3	ice cube trays
8	blocks, wooden	–	items to elevate stream tables
2	bottles, dropper, p/4	1	marking pen
1	calcite chips, p/20*	1	measuring cup
20	caps, for tubes	–	newspaper*
1	clay, modeling, 1 lb*	1	paper towels*
16	containers, 1-L	–	pebbles or small stones
8	containers, plastic, with large hole	8	pencils
8	containers, plastic, with small hole	–	photograph of breakwaters (optional)
50	cups, foam, 8-oz	1	pitcher
2	gravel, 5 lb*‡	8	rulers, metric
9	grids, stream table†	32	safety goggles
9	grommets, stream table†	1	scissors
1	labels, p/50*	16	stopwatches or clock
8	magnifiers	–	water, tap*
1	nylon mesh, p/40*		
8	pegboards		
8	sand, 6 lb‡		
1	sand, 6 lb*‡		
1	seed, grass, 1 tsp		
5	soil, clay, 5 lb*‡		
6	soil, potting, 4 qt*‡		
4	spoons, measuring, 1-Tbsp		
1	sticks, wooden, p/100*		
9	stream tables†		
1	tape, masking*		
16	trays, plastic		
20	tubes, plastic		
1	tubing, vinyl, 27 ft		
1	vinegar, 16 oz*		
1	Teacher's Guide		
8	Delta Science Readers		

* = consumable item
† = in separate box

‡ = in Sand and Soil box

ACTIVITY SUMMARY

In this Delta Science Module, students investigate erosion—how it is caused and how its effects can be reduced.

ACTIVITY 1 Students are introduced to weathering, the constant breaking down—physically or chemically—of rocks and minerals on Earth’s surface. They record examples of physical weathering that they observe on their way to and from school. They investigate chemical weathering by observing a mild acid solution (vinegar, used to simulate acid rain) dissolving a mineral sample (calcite).

ACTIVITY 2 Students are introduced to erosion, the carrying away of weathered materials. They set up stream tables, simulate the movement of water in a stream, and identify landforms created by material that was carried away or deposited by the moving water.

ACTIVITY 3 Students find out how vegetation affects erosion by running water over two soil surfaces—one bare and one covered with grass—and comparing the amount of erosion that occurs on each.

ACTIVITY 4 Students investigate how a particle’s size, weight, and composition determine when and where it will be deposited by moving water. They conduct “rock races” and observe the deposition characteristics of earth materials.

ACTIVITY 5 Students discover that increasing the slope (incline) of the stream table increases the speed of the moving water and, therefore, the amount of erosion of the streambed material.

ACTIVITY 6 Students simulate flood conditions. They observe that increasing the rate of flow of water running over the streambed increases the extent of erosion.

ACTIVITY 7 Students pour water over several different types of earth materials to determine the permeability of each. They relate this characteristic to the material’s tendency to produce runoff—water that is unable to pass through the ground. Thus they discover that the type of soil in an area affects its likelihood to be flooded.

ACTIVITY 8 Students investigate and compare the erosion characteristics of two types of soil: clay and potting. The results are then compared with those obtained in Activity 6 using sand.

ACTIVITY 9 Students apply what they have learned about the patterns of erosion and the characteristics of different types of earth materials to determine where, along the path of a hypothetical river, each of four river sediment samples was taken. Students examine the samples and study a map describing several areas along the river in order to identify the site where each sample was most likely obtained.

ACTIVITY 10 Stream tables become beaches as students investigate shoreline erosion caused by waves. They design and construct breakwaters and evaluate their effectiveness in reducing shoreline erosion.

ACTIVITY 11 Students investigate another contributor to erosion: wind. Students demonstrate how wind can erode sand. Then they design and build a windbreak and test its effectiveness at protecting their “house on the beach.”

ACTIVITY 12 Students investigate the erosion caused by the movement of huge masses of slow-moving ice—glaciers. The students observe the erosion caused by a debris-filled glacier, as well as the deposition of glacial till—unsorted and unstratified rock materials left under a moving glacier or along its sides as it melts.