

Landforms

Landforms > Investigation 1: *Schoolyard Models* >

Part 1: *Schoolyard Models*, page 8

Schoolyard Models Outdoors

When to Go Out

Following Step 5, go outdoors to help students build more accurate models. Refer to pages 8–15 of the FOSS Teacher Guide for complete instructions.

Outdoor Objective

Students will create more accurate models based on observation of the schoolyard, and use sticks, stones, and natural materials to enhance their models.

Getting Ready

Site: Make sure students will be in view when they are working on their models. Select a level area to work. Rocks or sticks may be used to prop up the tray. Some students will work better on a low seat wall or at tables rather than sitting on the ground.

Seasonal Tips: If the weather is too cold to build the models outdoors walk the school grounds as a class and discuss the primary structures and landforms. Take digital photographs of the structures and landforms for students to observe indoors.

Conservation: Encourage students to use objects they find on the ground in their models, but not to pick *living* flowers, leaves, or twigs.

Guiding the Investigation

1. Bring materials outdoors and take a few minutes to tour the schoolyard. Help students distinguish permanent structures and landforms from temporary features (snow banks and dirt piles).
2. Give students a few minutes to physically explore the area they will be modeling to get a feel for the size and relationships of the structures and landforms it contains. Students might pace out the length of one feature to compare with another; or use outstretched arms to estimate size or compare the distances between structures. Students might try lying down on the ground to compare the angle of different slopes.

Outdoor Activities At a Glance

Investigation 1

Part 1: **Schoolyard Models Outdoors**

Investigation 2

Parts 1 and 2: **Erosion and Deposition**

Look for Erosion and Deposition in the Schoolyard
(FOSS® Extension)

Investigation 3

Parts 1 and 2: **Slope and Flood Water on an Outdoor Slope**
(BSI Extension)

Schoolyard “Mountain” Model
(BSI Extension)

Investigation 4

Making Model Mountains in the Schoolyard
(BSI Extension)

Investigation 5

Find the Slope
(FOSS® Extension)

Priority activities appear in **green**.

“I took my class outside to walk the perimeter of the schoolyard, stopping every so often to note important schoolyard features. They were excited.”

Judean Patten-Clark
Science Specialist

“We did this on a windy day. My students saw the surface of their plateau blowing away and instantly made the connection that wind can contribute to erosion.”

Erica Beck Spencer
Science Specialist

Landforms > Investigation 2: *Stream Tables* >

Part 1: *Erosion*, page 8 and Part 2: *Deposition*, page 16

Erosion and Deposition

When to Go Out

Parts 1 and 2 may be conducted outdoors. Refer to page 8 (Part 1) and page 16 (Part 2) of the FOSS Teacher Guide for complete instructions.

Outdoor Objective

In Parts 1 and 2 respectively, students will see and feel the natural elements, such as wind, acting upon their stream tables and use sticks and rocks to affect the flow of water. Students will compare their classroom and outdoor investigations.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For Each Group	Sealed bags for earth materials
	1 Pitcher of water
	Sticks and/or rocks

Getting Ready

Time: 30–50 min. for each part

Site: Select an area that allows students to spread out to maximize their work space.

Safety Note: Remind students not to throw rocks or point sticks at others during Part 2.

Conservation: At the end of the activity, pour any unused water on plants in the schoolyard.

Guiding the Investigation

1. Ask students to record stream-table observations in their notebooks while they are outdoors. Use the questions in the FOSS Teacher Guide to guide their observations. If time allows, have students rotate to look at other groups' stream tables and note differences or similarities.
2. During Part 2, students may want to use sticks or rocks they find outdoors to alter the stream's course.

Landforms > Investigation 2: *Stream Tables* >

Part 1: Erosion, page 8 and **Part 2: Deposition**, page 16

Look for Erosion and Deposition in the Schoolyard

FOSS® Extension, page 24

When to Go Out

Following Parts 1 and 2, go outside to look for evidence of erosion and deposition in the schoolyard. You may want to go out several times during this investigation to see if there are visible changes (especially after a hard rain).

Outdoor Objective

Students will observe erosion and deposition at work in the schoolyard, and see how the processes they observed in the stream tables affect earth materials in a real landscape.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
	Student sheet no. 8 <i>Landform Vocabulary</i>
For the Teacher	3–8 vials for collecting sediment

Getting Ready

Time: 10–20 min.

Site: Go out ahead of time to scout out the most visible signs of erosion. In addition to bare dirt areas, or pronounced hills, look carefully at sloping asphalt, the area surrounding storm drains and sewers, and along the edges where pavement and earth materials meet.

Seasonal Tip: In the winter, there may be signs of snow melt having carried and deposited sediment toward storm drains.

Guiding the Investigation

1. Review what students have observed in their stream tables.
Ask, Could we find examples of erosion and deposition in the schoolyard? Where? Why do you think so?
2. Begin looking as a whole class at one of the areas of the schoolyard where students predicted they might find erosion.
Ask, What evidence, if any, is there that water has flowed here? What course did the water take? What direction was it flowing? How do you

What You Might Find:

If students don't record what they are observing in their stream tables they may forget what they saw.

Carrying the trays back inside may disturb some of the key features in the stream tables.

What You Might Find:

In addition to sediment, you may find pine needles, leaf litter, or paper debris that have been carried by water.

know? Was sediment or other material carried along by the water? Was it deposited in different places according to the size of the sediment?

- Students will search the schoolyard for additional signs of erosion and deposition. Ask them to note the location and to sketch and label each example they find using student sheet no. 8 *Landform Vocabulary*.
- If it has recently rained, stop to look at the material at the edge of a puddle. Collect some of this earth material in a vial. When you are back in the classroom, fill the vial with water, shake, and observe the layers of sediment. Look at the vials again the next day to observe the settling of the sediment. Have students identify the layers as sand, silt, or clay.

Landforms > Investigation 3: *Go With the Flow* >

Part 1: *Slope*, page 8 and Part 2: *Flood*, page 15

Slope and Flood

When to Go Out

Parts 1 and 2 may be conducted outdoors. Refer to page 8 (Part 1) and page 15 (Part 2) of the FOSS Teacher Guide for complete instructions.

Outdoor Objective

Students will make connections between what they are observing in the stream tables and what happens to the earth.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For Each Group	Stream tables
	1 Pitcher of water
	Standard or flood cups
For the Teacher	Extra sand/clay mixture

Getting Ready

Time: 30–50 min. for each part

Site: Select an area that allows groups to spread out.

Conservation: At the end of the activity, pour any unused water on plants in the schoolyard.

Guiding the Investigation

1. Set up the stream tables indoors and review student sheet no. 10 *Stream-Table Map*.
2. Carry supplies outdoors and set up the stream tables, making sure they are level.
3. Distribute water and let the streams flow.
4. When students have finished recording their observations, give them a few minutes to circulate to look at other groups' stream tables and record differences or similarities in their science notebooks.

Landforms > Investigation 3: *Go With the Flow* >

Part 1: *Slope*, page 8

Water on an Outdoor Slope

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 1, take students outside to compare the carrying capacity and resulting erosion of water poured on four different slopes. Due to the size of this experiment and the amounts of water used, this works best as a classroom demonstration.

A note on rain: After heavy rains, water on a steep dirt slope may not run down the hill as predicted but will quickly soak into the ground. When the weather has been relatively dry, students will usually see that the water on the steepest slope runs faster and travels furthest (with the exception of the water poured on pavement which may travel further since none is absorbed and there are few, if any, obstructions). If the water on a steep slope soaked into the ground immediately, discuss the results with your students. Try the lesson again when it is drier and compare the results. Students are capable of understanding these difficult concepts, but should be prompted to think and write about why what they observed occurred.

Outdoor Objective

Students will confirm that the slope of the land affects erosion and deposition in the schoolyard as it did in the stream tables. They will also observe how steeper slopes result in faster flowing water which can carry larger loads of material.

“The level of excitement that comes with this activity is just incredible.”

Michelle Teleau
Science Specialist

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For the Class	4–5 Pitchers of water

Getting Ready

Time: 45 min.

Site: Select four slopes in the schoolyard on which to pour water. Using bare dirt is ideal, but pavement could be used if sediment, leaf litter, or other debris is available to be carried by the water.

Safety Note: If doing this activity in the winter be careful not to pour the water on areas which will be hazardous if iced over.

Guiding the Investigation

1. Review with students how the slopes in their stream tables affected the flow of water. Discuss what they think will happen as you slowly and steadily pour equal amounts of water on the selected slopes in the schoolyard.
2. Have students set up their notebooks before going out, leaving at least half a page to take notes on each of the slopes they will be testing.
3. Begin with the first slope. Ask students not to block the streams of water with their shoes or any other object but if the water naturally flows toward a rock or stick leave it in place and observe what happens. Ask students to watch for differences in how fast the water flows and how much sediment it carries with it.
4. As students watch the water move, encourage them to talk about where it will end up, and whether it will deposit any material along the way. Ask, *Is the water carrying sediment with it when it flows? Where is the sediment being deposited? How does the movement on the gradual slope compare with the steeper slope?*
5. Give students time to record observations in their notebooks as soon as the water has stopped moving. Repeat the procedure at each location to compare the speed, force, and carrying capacity of the water on different slopes and surfaces. Ask, *What happens on bare dirt compared to the pavement? Is the earth material in the stream’s course eroding? What happens if you pour all the pitchers at once?*

6. Summarize the discussion back in the classroom. Ask, *How was what you saw in the classroom similar to what happened in your stream tables?*

Landforms > Investigation 3: *Go With the Flow*

Schoolyard “Mountain” Model

Boston Schoolyard Initiative Extension

When to Go Out

Following the previous “Water on an Outdoor Slope” outdoor extension.

Outdoor Objective

Students will observe and describe the effect of pouring water on top of a model mountain and compare their results to those in the stream-table slope activity.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For the Class	A model “mountain” of mounded earth
	1 Pitcher of water
	2 Standard cups

Getting Ready

Time: 20–30 min.

Site: Go out ahead of time to find a dirt area and dig a large hole using 1–2 meters of the dirt to create a model mountain. Plant rocks, pebbles, and sticks in the mountain to represent different types of land formations. Pat down the base of the mountain firmly and leave the top a little looser. The mountain should have various contours. Leave the mountain intact so you can return to it for Investigation 4. Make sure there is enough room around the mountain for the whole class to stand and observe.

Seasonal Tip: In the winter, the ground will be frozen so you may need to bring in several bags of potting soil.

Safety Note: If you dig a hole to get the dirt, make sure you cover the hole so no one falls or trips.

“Going outside to do this activity helped students gain a better understanding of the concept of erosion and deposition because they were able to see how the water eroded the mountain over time, and also how the water can carry sediment and other things down stream with it.”

Dean Martin
Science Specialist

“My students were better able to understand the topographical maps once it came time to look at them. City hall will often have contour maps. Look for an area next to your school that has a large hill or slope and see if students can find it on a contour map.”

Dean Martin
Science Specialist

Guiding the Investigation

1. Gather students around Mount “Your School Name” and discuss the various ways that erosion can happen.
2. Blow over the top of the mountain and have students observe the earth’s material being moved by your breath. Make sure students understand that wind is one way that erosion happens.
3. Next, have students observe and record in their science notebooks the effects of water on the mountain to simulate how rivers and strong rains can impact erosion. Pour the water through the standard cup used during the stream-table experiments.

Landforms > Investigation 4: *Build a Mountain* >

Part 1: *Making a Topographic Map*, page 8

Making Model Mountains in the Schoolyard

Boston Schoolyard Initiative Extension

Outdoor Objective

Following Part 1, students will build model mountains (or hills) out of earth materials and observe them from various perspectives to better understand topography.

Getting Ready

Time: 20 min. (10 min. to build and 10 min. to discuss)

Site: Make sure there are enough stones, large and small rocks, dirt, and wood pieces for students to build with.

Guiding the Investigation

1. Instruct groups that they will have 10 minutes to build a miniature mountain or hill using stones, dirt, and wood pieces they find on the ground.
2. After students have built their model mountains, call for attention and discuss “bird’s eye view” and how this is represented on a topographical map.

Landforms > Investigation 5: *Bird’s-Eye View* >

Part 1: *Mt. Shasta Topographic Map*, page 8

Find the Slope

FOSS® Extension, page 35

Refer to the FOSS Teacher Guide for complete instructions for how to find the slope of a small schoolyard landform.