



LEARNING ACTIVITY:

Erosion in a Bottle

GRADES 6–12

MATERIALS

- Photos showing erosion
- 3 plastic 2-liter bottles
- Dry soil (enough to fill each bottle 2/3 full, not potting soil)
- Sod patch (about 10 cm x 30 cm)
- 3 plastic cups (about 16 oz.)
- Leaves and twigs
- 2 wire hangers
- Blocks to support bottles
- Sprinkling-style watering can
- Tape
- 1L water

Soil erosion is the process of moving soil by water or wind — this happens naturally or through human interference. Preventing soil erosion is important because nutrients are lost, and sediment that accumulates in waterways impacts life there. Conserving soil depends on how it is protected by plants and coverings.

You will model erosion by water and compare the amounts of runoff and soil loss generated from three different ground cover types.

PROCEDURE

- 1 Carefully cut off one side of each bottle. Twist wire hangers around the necks of the bottles to connect them.
- 2 Fill each bottle halfway with soil. Pat the soil down. Leave the soil in one bottle bare. Add twigs and leaves to cover the soil in one bottle to simulate forest soil cover. Cover the soil in another bottle with the sod patch.
- 3 Suspend the bottles at a 25-degree angle with the spouts facing downward and over the cups.
- 4 Use the watering can to slowly sprinkle equal amounts of water (about 330 mL each) evenly over the surface in each bottle.

Learning Objectives/Outcomes

- 1 To investigate the influence of vegetative cover and natural forest floors on erosion and runoff.
- 2 To investigate erosion effects on water quality and runoff volume.
- 3 To be able to define erosion, explain where eroded soil goes, and what its effects are.
- 4 To identify or determine how to protect land from erosion; ideally, to make the connection between soil erosion and sediment in surface water bodies.



Source: Soil Science Society of America.

Adapted with permission.



Credits: Emily Fuger



Discuss:

- Describe the erosion in the bottles.
- If each cup was a lake, in which would you choose to swim?
- Which would be best for fish?
- How would compressing the soil before adding water change the result?

Supplemental Worksheet: www.soils4teachers.org/esw

Optional: Quantify the soil lost from each bottle.

- 1 Measure the mass of the empty collection cups (no water or soil).
- 2 After collecting runoff water, allow the water to evaporate completely from each cup.
- 3 Measure the mass of each cup again.
- 4 Subtract the mass of the empty cups (step 1) from the mass of cups with dried soil (step 3). The difference is equal to the mass of soil eroded from each bottle.



Examples of erosion in various settings.

Credits left to right: ©iStock/COUTORUI; ©AdobeStock/Matthew J. Thomas; Bianca Moebius-Clune

NGSS CONNECTIONS

- Science and Engineering Practices — Planning and carrying out investigations
- Disciplinary Core Ideas — Earth's Materials and Systems
- Cross-Cutting Concepts — Scale proportion and quantity