

# HOLD A HILL

**BIO** Experiment  
**KEY** Slope/Erosion  
Soil Conservation



## OVERVIEW

The youngsters investigate the relationship between the slope of a trail and soil erosion.



## BACKGROUND

**Soil erosion** is the wearing away of the soil by wind and water. Many factors govern the rate at which erosion occurs: the slope of the land, the plant cover, the kind of soil, the amount of water flowing and the length of time it flows, and the amount of water already in the soil.

The most serious soil erosion occurs when natural forces or human activities disrupt the natural plant cover. Fires, floods, and landslides remove plant cover, and leave the bare soil exposed to water. Human activities such as construction and agriculture can alter the environment and may either decrease or increase the rate of soil erosion. The possibility of erosion and its effect on plants and animals is often overlooked during the planning phase of a project.

**CHALLENGE: FIND OUT HOW STEEP YOU CAN MAKE A TRAIL AND STILL PREVENT EXCESSIVE EROSION.**

## MATERIALS

### For each team of two:

- 1 one-liter water source made from a half-gallon milk carton (See the "Preparation" section.)
- 1 tin-can erosion collector made from a soft-drink, dog-food, soup, or similar can (See the "Preparation" section.)
- 1 meter tape\*
- 1 trowel\* or small digging tool
- 2 to 4 small plastic bags\* or cups\* (about 250 ml capacity)
- 1 permanent-ink marking pen\* (for labeling the plastic bags or cups)

### For the group:

- 2 slope-measuring devices (See the "Measuring Slope" Equipment Card.)
- 1 or 2 containers of water, a water tap, a hose, or other water supply (Each team will need 6 to 8 liters of water.)
- 1 "Measuring Slope" Equipment Card\*
- 1 data board or large drawing pad\*
- 1 short pencil (to poke holes)
- 1 pair of scissors\*
- 1 can opener (to remove can bottoms)
- 1 hammer and 2 nails, or
- 1 wedge-shaped can opener

\* Available from Delta Education.

## PREPARATION

**Group Size.** This activity is suitable for any size group.

**Time.** Plan on fifty to sixty minutes for this activity.

**Site.** Choose a hillside that is close to a water supply. The hillside should have a variety of slopes ranging from gentle to steep. Look for patches of bare soil, because most trails consist of bare soil. If necessary, obtain permission to scrape away narrow, one-meter-long stretches of soil cover where you plan to do experiments.

### Materials

**1. Slope-Measuring Devices.** Prepare two slope-measuring devices. Practice using them so you can demonstrate their use. (See the "Measuring Slope" Equipment Card.)

**2. One-Liter Water Source.** Cut off the top of a half-gallon milk carton 12 to 13 centimeters from the bottom. Poke a hole at the bottom of one side, and push a short pencil through from the inside to insure a smooth flow of water.





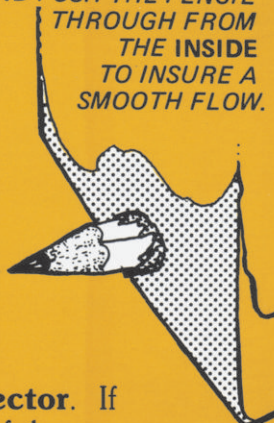


FOR THE WATER SOURCE, CUT OFF THE TOP OF THE HALF-GALLON MILK CARTON 12 to 13 cm FROM THE BOTTOM,

POKE A HOLE AT THE BOTTOM OF ONE SIDE,



AND PUSH THE PENCIL THROUGH FROM THE INSIDE TO INSURE A SMOOTH FLOW.



**3. Tin-Can Erosion Collector.** If necessary, remove the top of the can, and punch a wedge-shaped hole in the bottom, or punch 5 or 6 holes along one edge of the bottom with a nail and hammer. (You may also use a pop-top can, but will probably have to cut off the bottom.)

Note: If possible, let the youngsters make the water sources and erosion collectors.

FOR THE EROSION COLLECTOR, CUT THE TOP OFF A CAN AND WITH THE CAN OPENER PUNCH ONE HOLE IN THE BOTTOM



OR, WITH A LARGE NAIL, PUNCH 5 or 6 HOLES ALONG ONE EDGE OF THE BOTTOM

OR, USE A POP-TOP CAN WITH THE BOTTOM CUT OFF.

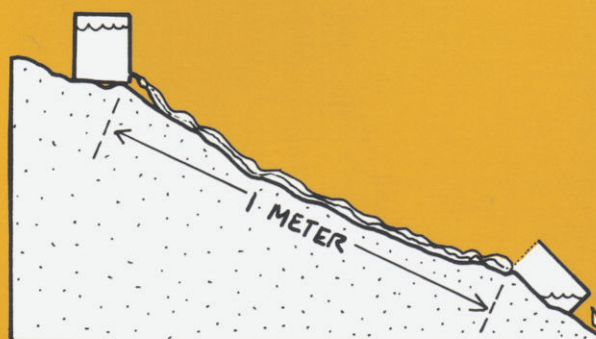
ALL CANS SHOULD BE THE SAME SIZE WITH THE SAME SIZE HOLES



to determine the maximum slope for a trail that will not result in serious soil erosion.

2. Demonstrate the following technique for collecting eroded soil.

- Select a slope, and measure off one meter as your experimental section. Measure the slope of this section with a slope-measuring device. (See the "Measuring Slope" Equipment Card.) Label a plastic bag or cup "Trial #1," and record the slope on the bag. Place your water source at the top of the slope, and place the collection can at the bottom. (It may be necessary to dig the collection can into the slope a little bit.)



- With a trowel, scratch a shallow trench to direct the flow from the water source to the can. Remove any loose debris.
- Place your finger over the hole in the water source, and fill the source with water. Place the source into the proper position, and let the water flow.
- All the dirt and water should go through the can. Make sure the hole in the collection can is up (away from the ground), so that the mud will be trapped, but the water can flow out.

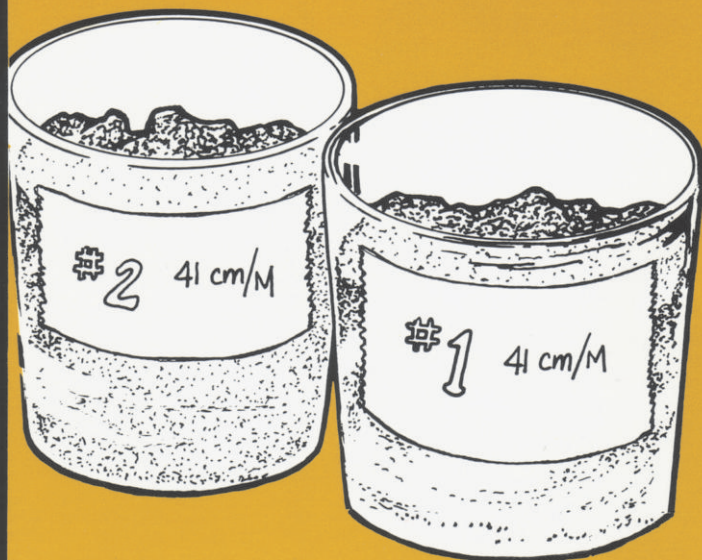


## ACTION

1. Tell the youngsters that they will pretend to be a soil-conservation team designing a trail for your area. Say that, as soil-conservation experts, they will try

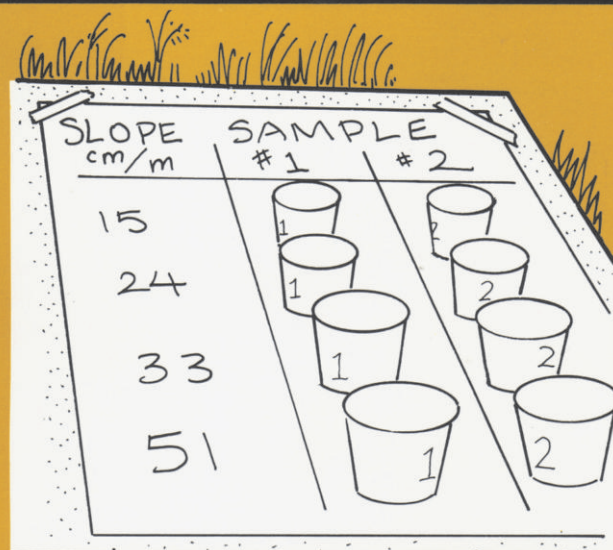


- e. When the flow has stopped, carefully tip the last bit of water out of the can. Shake the mud into the labeled plastic bag or cup.
  3. Form teams of two. Challenge the teams to test two slopes and to take two samples from each slope they investigate.
  4. Circulate among the teams, and offer assistance where needed.
  5. Call the teams together and organize the erosion samples on a data board.
- Start with the gentlest slope and proceed to the steepest slope.



## JUDGING EROSION

1. Ask the youngsters how the steepness of the slope affected the amount of soil that was washed down. Did any other factors besides slope seem to affect the amount of soil that was collected?
  2. This part of the activity calls for a value judgment. How much erosion is acceptable? An empty bag is certainly acceptable, and a full bag is certainly unacceptable, but how much is too much? It is up to your group to determine the erosion limit and hence the maximum slope for a trail in your area.
- Note: Write down the maximum acceptable slope your group decides



upon. You will need this value for the activity *Trail Construction*.

## RUN IT BY AGAIN

1. What is the effect of plant cover (dead or alive) on the rate of soil erosion? Compare two similar slopes: one with vegetation and one without.
2. What is the effect of erosion on organisms? Pour water around some plants. Do they wash away? Does the water expose the roots? Are the plants and animals buried in mud?
3. Modify the slope to reduce erosion. Do piles of rock, gravel, or sand across the flow stabilize the slope? Experiment and find out.
4. What is the effect of long-term water flow? Set up an experimental slope and collect 10 to 20 samples. Does erosion increase or decrease with each additional sample?
5. Visit some areas where human activities have bared the soil to potential erosion (e.g. construction sites, agricultural areas, road cuts, etc.). Is soil erosion in process? What measures, if any, have been taken to guard against erosion?

