HOLD A HILL

Background

EROSION:

Soil erosion is the wearing away of the soil by wind or water. *Hold a Hill* focuses on the rate of soil erosion caused by water, and on the environmental consequences of erosion. Many factors govern the rate at which erosion occurs: the slope of the land, the plant cover, kind of soil, amount of water flowing, and length of time the water flows. The most serious soil erosion occurs when natural forces or human activities disrupt the natural plant cover. Fires, floods, and slides destroy plant cover and leave the bare soil exposed to water. Human activities such as construction and agriculture also alter the environment and may either decrease of increase the rate of soil erosion. The possibility of erosion and its effect on plants and animals is often overlooked.

Challenge

Find out how steep you can make a trail and still prevent excessive erosion.

Setting the Stage

Set the stage for *Hold a Hill* by presenting the activity in a hypothetical context. Cast your group in the role of a soil-conservation team designing a trail for your area. The specific task is to determine the maximum slope of a trail that will not result in serious soil erosion. Slope of the land is the most critical factor to investigate during the experiments, but the type of soil and soil cover will also be covered in the discussions and follow-through activities. As most trails consist of bare soil, the experiments will be more meaningful if you can find some bare soil or scrape away a little soil cover where you plan to do the experiments.

Materials

For the group:

1 data board and marking pen
1 or 2 large containers of water, a water tap, or other water supply (Each team will need 6 to 8 liters of water.)
2 slope-measuring devices*

For each team of two:
1 one-liter water source (see PREPARATION)
1 tin-can erosion collector (see PREPARATION)
1 meter tape
1 trowel or small digging tool
2-4 plastic bags or cups
Masking tape (for labels on bags or cups)

Materials to build a one-liter water source:
1 half-gallon milk carton
1 short pencil (to poke hole)
1 pair of scissors
1 meter tape

Materials to build a tin-can erosion collector:
1 tin can (soft drink, dog food, etc.)
1 can opener (to remove can bottom)
1 hammer and 2 nails, OR
1 old-fashioned can opener

See the Tool Box 1 "Measuring Slope" equipment card.

PREPARATION

You will need a couple of slope devices. Read the equipment card for instructions. You will also need a one-liter water source and a tin-can erosion collector for each team. Prepare them as follows:

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.
Push the pencil through from the inside to insure a smooth flow.

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.

ACTION: LET IT FLOW!

- Move to your hillside, preferably one with a variety of slopes. Introduce the challenge in the hypothetical context of the soil-conservation team.
- If the students are going to construct their own equipment, distribute materials and start the construction.
- **Demonstrate erosion collection**.
  a. Select a slope and measure off one meter as your experimental section. Now measure the slope of this section. Place your water source at the top of the section, and the collection can at the bottom.
  b. Scratch a shallow trench from the water source to the can to direct the flow. Remove any loose debris.
  c. Fill your water source from the water supply. Place your finger over the flow hole and carry the source into position. Let the water flow.
  d. All the runoff should go through the can. Be sure the hole is up (away from the ground) so that mud will be trapped, but water can flow out.
  e. When the flow ha stopped, carefully tip the last bit of water out. Shake the mud into a plastic cup or plastic bag.
  f. Label the experimental result with the number of the trial and the slope of the land.
- Form teams of two. Instruct the teams to take two samples from each slope they investigate, and to label the samples #1 and #2. Go!
- Organize the results. Display the results on a data board or other flat surface. Start with the gentlest slope and proceed to the steepest slope.
- Judging erosion. This part of the activity calls for a value judgment. How much erosion is acceptable? No soil in the cup is certainly acceptable, and a full cup is certainly unacceptable, but how much is too much? It is up to your group to determine the maximum slope of a trail that will not create serious erosion problems. Save your data for Trail Construction.

FOLLOW THROUGH: RUN IT BY AGAIN

- What is the effect of plant cover (dead or alive) on the rate of soil erosion? Compare two similar slopes: one with vegetation cover and one without.
- What is the effect of erosion on organisms? Run water around some plants. Do they wash away? Does the water expose the roots? Are plants and animals buried in mud?
- Modify the slope to reduce erosion. Do piles of rock, gravel, or sand across the flow stabilize the slope? Experiment and find out.
- What is the effect of long-term flow? Set up an experimental slope and collect 10 to 20 samples. Does erosion increase or decrease with each additional sample?

- Visit some areas where human activities have bared the soil to potential erosion (construction sites, agricultural areas, road cuts, etc.). Is soil erosion in process? What measures, if any, have been take to guard against erosion?

WHAT TO DO NEXT

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