Printable worksheet

Desertification in a tray: soil erosion experiment

A printable erosion experiment comparing bare soil with soil protected by plants or mulch under simulated rain, with a results table and reflection prompts.

Ages
8–12 (adaptable for 6–7 with adult help)

Time needed
20 minutes setup, 2 weeks for seeds to grow, 30 minutes for the test

Materials
3 shallow trays, or 3 large plastic bottles cut in half lengthways by an adult, Enough garden soil to fill all three trays to the same depth, Cress or grass seed, Dry leaves, straw or wood chips for mulch, 3 clear cups or jars, Watering can with a rose, or a plastic bottle with small holes in the cap, Measuring jug, Books or blocks to prop up the trays, Ruler, pencil and this sheet

Learning goals

By the end of this activity you will be able to:

- Explain how rain can wash soil away (erosion).
- Describe how plants and mulch protect soil.
- Carry out a fair test by changing only one thing.
- Connect what you see in the tray to land in dry regions that is losing its soil.

Your question

Does covering soil with plants or mulch stop rain washing it away?

My prediction: _____

Step-by-step instructions

1. **Two weeks before the test:** Fill tray C with soil and sprinkle cress or grass seed evenly over it. Keep it damp and in a light place until the seedlings have formed a thick mat.
2. **On test day:** Fill trays A and B with the same soil, packed to the same depth as tray C.
3. Leave **tray A** bare. Cover **tray B** with a layer of dry leaves, straw or wood chips. **Tray C** has your growing plants.
4. Prop all three trays at the same angle on books or blocks. Measure the height at the raised end so it is the same for all three.
5. Place a clear cup at the low end of each tray to catch the water that runs off.
6. Measure 500 ml of water in the jug and pour it into the watering can.
7. Hold the watering can at the same height (about 30 cm) above the top of tray A and "rain" all the water onto it slowly and evenly.
8. Repeat steps 6 and 7 for trays B and C, using the same amount of water from the same height.
9. Look at each cup straight away. Record how cloudy the water is and how much water was collected.
10. Leave the cups to stand for 30 minutes, then measure the depth of soil that has settled at the bottom of each cup with a ruler.

Results table

Tray	Soil cover	Water collected (ml)	How cloudy? (clear / a bit / very)	Depth of settled soil (mm)	Other observations
A	Bare soil				
B	Mulch				
C	Plants				

Draw what each cup looked like:

Cup A	Cup B	Cup C

Reflection questions

1. Which tray lost the most soil? How do you know?
2. Which tray lost the least soil? Why do you think this happened?
3. What did the leaves, mulch or roots do to the falling water?
4. Was your test fair? What did you keep the same?
5. In a real place with very little rain, animals might eat almost all the plants. What could happen to the soil when a heavy storm comes?
6. Name two things people could do to protect soil on a farm or in a school garden.

Safety notes

- An adult must cut the plastic bottles; cut edges can be sharp, so cover them with tape.
- Work outside or on a waterproof surface. Mop up spills straight away to prevent slipping.

- Keep water away from electrical sockets and devices.
- Use bought compost or garden soil from a clean place, away from roads and areas where animals go to the toilet.
- Wash your hands with soap after handling soil.
- Do not eat the cress grown for this experiment.

Background for adults

This experiment models the core process behind desertification: when vegetation is lost, bare soil is exposed to the force of raindrops and running water. The United Nations Convention to Combat Desertification defines desertification as land degradation in arid, semi-arid and dry sub-humid areas, and stresses that it is not the natural expansion of existing deserts (UNCCD FAQ).

Soil forms extremely slowly. As reported by UN News in 2019, an FAO official noted that it can take up to 1,000 years to form one centimetre of topsoil, and that this centimetre can be lost in a single heavy rainfall if soil cover is not protected. Children usually see muddier run-off and more settled sediment from the bare tray, which makes this point concrete.

To extend the activity, try different slopes, different amounts of mulch, or compacted versus loosened soil. Older pupils can calculate the percentage difference in sediment between trays. For teaching ideas and context, see the related article on teaching children about desertification.