Where Rain Goes

Investigate how water and soil interact on a slope

ES.ESS2.5 "Plan and conduct investigations of how the structure and resulting properties of water interact with the Earth's materials and surface processes."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the property of water that helps it interact with soil, circle what changes between the trays, and number the measurements the class makes. These marks will help you evaluate what the investigation can show.

A Storm in Two Trays

1. After a storm, runoff can carry a muddy ribbon of soil into a creek. To investigate why, a class compares loose sand with clay-rich soil on small slopes. Water molecules are polar: one end has a slight negative charge, and the other has a slight positive charge. This structure lets water molecules attract one another and stick to many mineral surfaces. Water can soak into gaps in Earth materials, cling to particles, or flow over a surface. Which route it takes helps determine how much soil leaves a slope during rain.

2. The class puts equal volumes of dry sand and dry clay-rich soil in separate trays. Each tray has the same slope and exposed area. Students pour 200 mL of water over each tray in two minutes, using the same method each time. They collect water that runs off the lower edge in a cup and measure its volume. Then they dry the sediment left in each cup and measure its mass. The class runs three trials per soil type, using fresh soil for each trial. This setup lets them compare runoff and erosion under controlled conditions.

3. If the clay-rich trays yield more runoff and sediment, the class can conclude that the two soil types behaved differently under the tested conditions. Water may remain near the surface of some soils rather than draining through them, so flowing water can pick up loose particles. Attraction between water and mineral surfaces can also help retain water within soil. Clay-rich soil and sand differ in several ways, including particle size, packing, and mineral makeup. Because these features change together, this test cannot show that particle size alone caused any difference. Repeated trials make an unusual result easier to spot.

2 ANSWER WITH EVIDENCE

Use the passage

1. What does the class change between trays? Name two conditions it keeps the same for a fair comparison.

2. Which two measurements let the class compare runoff and erosion? Explain where each measurement comes from.

3. How does a property of water help explain why some water may stay in soil instead of running off?

4. If one soil type produces more runoff, what can the class conclude? Why can it not identify particle size as the only cause?

3 YOUR TURN

Your own words

Plan a new investigation to test whether a layer of leaf litter changes how much rainwater carries soil off a slope. Describe what you would change, keep the same, and measure, how you would repeat the test, and how one property of water relates to the process.

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PART 1 · READ AND MARK

Underline the property of water that helps it interact with soil, circle what changes between the trays, and number the measurements the class makes. These marks will help you evaluate what the investigation can show. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What does the class change between trays? Name two conditions it keeps the same for a fair comparison.	**The class changes the soil type. It keeps the slope and exposed area the same. It also uses the same water volume and pouring time.**
2	Which two measurements let the class compare runoff and erosion? Explain where each measurement comes from.	**Runoff is the volume of water collected at each tray's lower edge. Erosion is measured by the mass of dried sediment left in each cup.**
3	How does a property of water help explain why some water may stay in soil instead of running off?	**Water is polar, so its molecules can stick to mineral surfaces. This attraction can help retain water within soil.**
4	If one soil type produces more runoff, what can the class conclude? Why can it not identify particle size as the only cause?	**The soil types produced different amounts of runoff under the tested conditions. They also differ in packing and mineral makeup, so particle size was not tested on its own.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would fill two identical trays with the same dry soil and set them at the same slope. I would cover one tray with leaf litter and leave the other bare. I would pour the same volume of water over each tray at the same rate. After collecting runoff from each lower edge, I would dry and weigh the sediment in each cup. I would repeat the test three times with fresh soil. Water molecules attract one another, helping water flow across a surface and carry loose soil.

Accept any two controls stated in the passage for question 1. For the open task, accept a fair comparison that changes only the leaf litter cover, measures transported sediment, includes repeated trials, and accurately connects a water property to the process.