Runoff & Infiltration Station

Runoff and infiltration- Content Overview

Note *Leave lots of room for kids to answer questions—They usually love to guess the answers for this! A good rule of thumb is to allow three guesses for each question.*

Introduction

- **What is the water cycle?** *Answer: The process of water moving between states of matter (solid, liquid, gas)*

- **Who can describe some of the processes?**
    - **What are the four forms of precipitation?** *Answer: rain, snow, sleet, or hail.*
    - **Does anyone know what transpiration is?** *Answer: when plants soak up water and then release it back into the atmosphere as vapor (like sweating through pores!)*

- **Where does the water cycle begin?** *Answer: trick question! There is no beginning or end to the water cycle. All the processes of the water cycle (precipitation, evaporation, etc.) are happening all the time. We have the same amount of water on earth at any given time.*

A water droplet can end up in a variety of places, but today we will focus on Runoff and Infiltration. (Refer to the diagram, and have them fill in the definitions on their work sheet)

- **Runoff:** water that runs off the Earth's surface, often leading into nearby streams or rivers.
- **Infiltration:** water that soaks into the Earth's surface and is filtered into a groundwater source like an aquifer system.

Human Impacts to the water cycle

How can humans have an impact on this process? Do you think that the amount of runoff water vs water infiltration changes when humans build over land with concrete and asphalt? *Answer: Yes, impervious cover prevents infiltration and increases runoff water, which can become polluted as it runs off city streets and increases potential flooding.*

Concept check: What does "impervious cover" mean? *Answer: This is cover that does not allow water to infiltrate the soil. In other words, it's cover that cannot be soaked through, like concrete!*

*** Typically, when we have more impervious cover, we get more runoff and less infiltration! ***

Runoff and Infiltration—Model Demonstration

1) While students are still seated, explain to students that they will be working through 3 different landscape situations to simulate water runoff and infiltration:

- City parking lot
- Dry soil
- Wet soil

2) Allow students a few minutes to fill out the **"Hypotheses"** section of their worksheet before beginning the simulation

3) Students will record and evaluate the data for each scenario.

4) 600 ml of water is used for each simulation. Students can go ahead and fill in the first row of their chart "Water poured onto the model (ml)" with 600ml for each scenario.

Student Volunteer positions:

- **Rainmaker** –Students can assist with pouring the 600ml over the model.
- **Water manager** - Make sure that the stream is ready for water to flow through (beaker in place at opening to catch the water). They will also measure the runoff amount once all the water has flowed through.
- **Recorder**- Fill out the chart as students run through the activity.

Remaining students will make observations and predictions about flooding, and how it varies in each landscape. Optional: allow students to decorate the hillside landscapes with props.

5) Simulation:

- 1st - City Parking lot using urban landscape tiles.
- 2nd - "Dry" Soil with damp sponges (make sure they are squeezed out/damp prior)
- 3rd - Wet Soil with the newly saturated sponges (don't squeeze out the sponges, this is to simulate over-saturated soil)

6) Students will record runoff and calculate infiltration for each simulation by subtracting.

7) Allow students some time to complete the "Results and Hypotheses" section of their worksheet.

ALL students should be making predictions and observations for each simulation. Encourage them to think about the vocabulary they just learned.

Scenario 1: City Parking Lot

- **What kind of landscape do we have here? It's a city parking lot. What is the term for this type of cover?** *(Answer: Impervious)*

(Point out the farm and streets in this landscape, connect runoff and pollution into our river, ask students what they think will happen to the water quality).

**Make sure water managers are ready when the simulation begins! **

**While students are measuring the amount of runoff that occurred, you can start setting up the next scenario. Make sure that the bucket gets placed back under the tube before starting the next scenario. Also, it's a good idea to check the student's measurement for accuracy on the first round, and possibly in other rounds if they are struggling with reading the beaker. **

- **What happened in our scenario?** *A lot of runoff, little to no infiltration.*

Scenario 2: Dry Soil Conditions

-Make sure the sponges are moist and fully squeezed out, dry off excess water from previous scenario.

-Ask students to observe the change in runoff and infiltration when the "soil" conditions are dry.

-Repeat process with new Rainmaker volunteers. You can keep the same Water Managers as before or ask for new ones! Usually, this round will result in much less runoff.

Can someone explain why there is less runoff for this scenario? *We had a lot more infiltration happening because it was not covered by concrete or other impervious cover. Now this ground is full of water, which is what we call saturated.*

Scenario 3: Wet Soil Conditions

We are now on our third scenario! The ground is saturated, which means that all the pores and holes are filled with water. What do you think this will mean the next time we have a big rain event?

Repeat process again. This round usually results in more or equal runoff than the impervious cover round and the houses will often get washed away.

Ask students to give a thumbs up if this was the result expected and give a thumbs down if this was not expected. Look at the data table and subtract the runoff from total water poured to calculate infiltration. As students to explain the processes/fill in their worksheets.

- In Austin, we live in an area that is sometimes called "Flashflood Alley." Does anybody have any guesses as to why that is? The ground is made up of a very thin layer of topsoil over limestone. This thin layer of topsoil gets saturated very quickly when it rains. When we get too much rain for our topsoil to hold, we get a lot of flash flooding.

Ask students to fill in the rest of their manual, ask questions, etc. Clean up model for the next class.