

Name: _____

Period: _____

Hydrogeology Experiment on Surface-Groundwater Interactions: How Do Our Actions Affect Water Quantity and Quality?

Purpose/Objective: Students will learn how groundcover influences surface runoff and groundwater recharge and how pollution travels through creeks, streams, and aquifers. Students will identify potential sources of pollution and learn what they can do as individuals to help keep their water clean.

Materials: Maps of Texas Geology, Tectonics, and Aquifers; hydrogeology model; and aerial photographs of your town

Engagement Activity: In small groups look at maps of Texas (Aquifers, Geology, and Tectonics) and discuss patterns that you notice. What do the maps tell you about where you live?

What natural resource(s) does your town have that encouraged people to establish a town in this location?

Background Information on the Importance of Groundwater Resources: Water is an essential resource for all living things. Half of the drinking water for United States comes from **groundwater** sources, water stored underground in cracks and spaces in soil and rocks. An **aquifer** is a geologic formation made of a layer of permeable rock that has large pockets of water. Water can enter an aquifer through faults, fractures, sinkholes, or percolation through the soil in a process called **recharge**. How we live on our **watershed**, the area of land that drains into a body of water, can impact water quantity and quality. It is important to maintain the quantity and quality of groundwater in aquifers in order to be able to continue to use this resource.

Hydrogeology Experiment: How would you design an experiment to test how groundcover affects surface runoff and groundwater recharge? Briefly write about your experiment and/or draw your model.

Hydrogeology Model: The Effect of Groundcover on Surface Runoff and Groundwater Recharge

For this lab, a hydrogeology model has been built to demonstrate how concrete, soil, non-native grass, and native plants influence surface runoff and groundwater recharge. Discuss the features of the different groundcovers. Hypothesize what would happen if each groundcover received the same amount of rain. Before beginning the experiment, identify the research question, the variables, and your hypothesis.

Research Question: _____

Independent variable (what you will be changing): _____

Type of Groundcover	Description
Concrete	
Soil	
Grass	
Native Plants	

Dependent variables (what will respond to the change): _____

Controlled variables (what must remain the same/be held constant): _____

Hypothesis: _____

What materials will you use to test your hypothesis? _____

Pick four students to “rain” on the model for three trials. Have four water containers filled with 1,000 milliliters (mL) of water and ask the students to pour the water slowly and evenly over each groundcover.

	Concrete		Soil		Grass		Native Plants	
	Runoff	Recharge	Runoff	Recharge	Runoff	Recharge	Runoff	Recharge
Trial 1								
Trial 2								
Trial 3								
Total								
Average (Mean)								

What is the importance of doing multiple trials?

Do you think that conducting three trials was enough or should more trials be conducted? Why?

Calculate the average percent of runoff and recharge for each groundcover.

Type of Groundcover	% Runoff (average runoff)/(1,000 mL)*(100)	% Recharge (average recharge)/(1,000 mL)*(100)
Concrete		
Soil		
Grass		
Native Plants		

Graph results (think about what kind of graph(s) would most effectively convey information about the percent of runoff and recharge for different types of groundcovers).

Conclusions (restate the research question, provide important data from your chart as supporting evidence for what you learned, state any problems that you encountered, and credit your sources). Be prepared to present your findings.

We have examined how groundcover influences surface water runoff and groundwater recharge, but how do our actions affect water quality? What are potential sources of pollution for each groundcover?

Type of Groundcover	Type of Pollution	Potential Sources of Pollution
Concrete		
Soil		
Grass		
Native Plants		

Students can add one to four drops of red food coloring to each groundcover to represent pollution before “raining” on the model. The amount of pollution can either be held constant to test if the four groundcovers filter the pollution differently, or the amount can vary depending on how much pollution is expected on each type of groundcover (one drop where the least pollution is expected to four drops where the most pollution is expected). Then, other students can “rain” on the model. Document observations in the following chart.

Type of Groundcover	Runoff	Recharge
Concrete		
Soil		
Grass		
Native Plants		

Describe what happened to the pollution. Provide examples of pollution and how it could enter the aquifer.

Has this activity changed the way you think about surface runoff, groundwater recharge, and how decisions you make can influence water quantity and quality? If so, how?

What is the most interesting thing that you learned? Did anything surprise you?

What are the benefits and limitations of this model? What would you change to make the model better?

What can you do to help keep our creeks, rivers, and aquifers clean?

Extension Activity: Look at aerial photographs of your town. Identify the amount of different types of groundcover, potential sources of pollution, and what kind of impact each type of groundcover has on the water cycle. How has this changed overtime?