

Freshwater • Reflection Section Answer Guide *continued*

much of the variation was controlled in this study's design, that any changes in when fish emerged would almost have to be the result of the differences in water temperature. Therefore, students should feel that the results of this research are convincing.

UNDER WHERE?

Introduction

Does water flow underground in your region? Why do you think so?

Students may not know this answer. However, if students realize that water flows underground in a desert and emerges in some areas as an oasis, they should induce that water flows underground in the region they live.

What is surprising about figure 5? *Students should be surprised at the extent of underground aquifers across the United States.*

Do you think other areas across the planet have aquifers? Why or why not? *Students will have individual answers to this question. They should reason, however, that if the United States has extensive underground aquifers, other regions across the planet also have extensive underground aquifers.*

If you have not read “Thinking About the Environment,” do so now. Using the information in “Thinking About the Environment” and in the “Introduction” as clues, how do you think the scientists answered their first research question? *Students should guess that the scientists used chemistry to answer their first question.*

Methods

Why did the scientists sample catchments at two different elevations?

Students should realize that to answer their question about the amount of snow and rain contributing to streams, the scientists had to sample from areas that had much snowfall and from areas that did not have much snowfall.

Look at figure 14 and reread its caption. Why do you think an air line was connected to the sampler?

Students will have individual answers to this question. Encourage them to think about trying to suck water through a straw from a jar of water that is otherwise airtight. They should realize that air is needed to pump liquid out of a closed container.

Findings

What force is at work in the underground movement of water? Explain how this force affects underground water movement.

The force is gravity, which exerts a downward pull on objects. Gravity is at work when water runs downhill on the ground's surface. It is also at work when water infiltrates into the ground and percolates. Gravity causes water to run downhill, even when it is underground. Gravity causes water to move downward and fill crevices in between gravel and rocks until it hits bedrock. Gravity causes water to flow in aquifers because of the continual downward supply of water from above.

Read the last sentence in the “Findings” section. Based on this finding, what do you think was the answer to the scientists’ second research question? (Hint: See the end of the “Introduction” section, page 110.)

Students will have individual answers to this

question. They should, however, realize that if the total amount of precipitation does not change, the percentage of precipitation as snow or rain should not affect groundwater's contribution to streamflow.

Discussion

Explain why the scientists expect that a lower percentage of snowfall and a higher percentage of rainfall in the future will not affect the flow of groundwater into streams.

Students may need assistance answering this question. The key is to focus on the percentage of water falling as snow or rain, not the total amount of precipitation. The scientists found that the type of precipitation falling (snow or rain) did not impact the amount of underground water contributing to streamflow.

In a changing climate, some areas might receive less precipitation. Imagine that the scientists had also considered the trend in the total amount of precipitation falling in the area over time. How might their findings change if they discovered a trend toward less total precipitation over time?

Students will have individual answers to this question. If the scientists noted a trend toward less precipitation over time, they might conclude that although a lower percentage of snowfall would not impact streamflow, a trend toward less total precipitation would likely have an impact on the amount of groundwater from all sources contributing to streamflow.