

What Goes In... Aquifer Lab

In San Antonio we get our drinking water from the Edwards Aquifer. This is a limestone or Karst aquifer. To the south of our city is another kind of aquifer called the Carrizo-Wilcox Aquifer. This aquifer is composed of sand and gravel. In this lab we will see if aquifers clean the water that is stored in them.

Vocabulary: aquifer, permeable, impermeable, runoff, soluble, insoluble, recharge

Question: Do aquifers clean the water that recharges them? Is one kind of aquifer better at cleaning water than another?

Hypothesis: _____

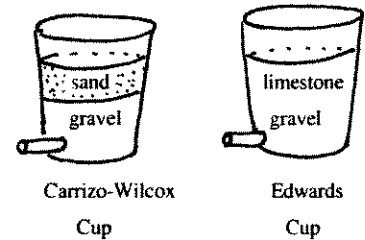
Materials: 2 regular clear plastic cups 2 clear plastic cups with straws
50 mL graduated cylinder gravel sand lab aprons
small pieces of limestone binder clip marking pen

Procedure:

1. Have one group member responsible for gathering the equipment. They will get the cups and bring them to your work area.

2. Label one of the cups with the straw "Carrizo-Wilcox".
Label the other cup with the straw "Edwards".

3. Go to the materials station and layer your Carrizo-Wilcox cup about 1/3 full of gravel. On top of that pour in enough sand to fill about 2/3 of the cup. Put a mixture of gravel and limestone pieces into the Edwards cup about enough to fill 2/3 of the cup.



4. Your teacher will give you 50 mL of recharge water. The recharge water for Trial 1 is rainwater that runs off of ranches and undeveloped land. Record your observations about this recharge water. _____

5. Place your Carrizo-Wilcox cup so that it will drain into the clear plastic cup.
6. Pour the recharge water into the Carrizo-Wilcox Aquifer cup. Let it drain for 3 minutes. Then clamp the binder clip on the end of the straw. Record your observations about this aquifer water.



How would you rate the quality of the water that comes from this aquifer? With your group determine some of the things you can rate the water on. (do **NOT** taste it!) Based on your observations, rate the water as Poor, Fair, Good or Excellent in the Water Quality Observations on Table 1. Keep this cup to compare to the Edwards.

8. Repeat the same procedure for the Edwards Aquifer cup. Record your observations about this recharge water.

How would you rate the quality of the water that comes from this aquifer? Rate it based on your observations, and record your rating under Water Quality Observations in Data Table 1. Compare the water in the 2 cups. Is it different in any way? Describe how

When you are finished, dispose of the water from both cups in the container labeled Trial 1 Waste Water

Data Table 1

<u>Aquifer Name</u>	<u>Water Quality Observations</u>
<u>Carrizo-Wilcox</u>	
<u>Edwards</u>	

9. Your teacher will give you 50 mL of recharge water for Trial 2. This is rainwater that is runoff from an area that has been developed with houses and businesses. Record your observations about this recharge water. _____

10. Repeat the procedure for the Carrizo-Wilcox cup using the 50 mL of the water from the developed area. Record your observations about this aquifer water.

How would you rate the quality of the water that comes from this aquifer? Record your observations in Data Table 2. Save the water for comparison to the Edwards cup.

11. Repeat the procedure using water from the developed area with the Edwards Aquifer cup. Record your observations about this recharge water.

How would you rate the quality of the water that comes from this aquifer? Record your observations in Data Table 2. Compare the water in the two cups. Is it different in any way? Explain how _____

Data Table 2

Aquifer Name	Water Quality Observations
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Carrizo-Wilcox	
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Edwards	
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Analysis:

Was there a difference in the water quality between Trial 1 and Trial 2 ? _____

Explain the reasons for your answer. _____

Many people and businesses in San Antonio are now building on top of the Edwards Aquifer recharge zone. How do you think this will affect the quality of water that goes into our aquifer? _____

Do aquifers clean the water that goes into them? Explain _____

Was one aquifer better at cleaning the water than the other? Explain _____

Was there anything that did not get filtered out of the recharge water? _____

Explain why _____

Was your hypothesis right or wrong? Explain why. _____

Teacher Notes for Aquifer Lab

For this lab you will need....

Lab aprons (goggles are optional)
9 ounce clear plastic cups- 4 per lab group
plastic drinking straws- 2 per group
small binder clips 1 or 2 per group
playground sand
gravel
pieces of limestone/crushed limestone
grease pencils or waterproof markers
50 mL graduated cylinders – 1 per group
a large container labeled “Wastewater from Trial 1” (each group will pour its recharge water from the first trial into this instead of down the drain)
another large container labeled “Wastewater from Trial 2” to be used for the same purpose.

You will want to assemble the aquifer cups in advance. I made a small incision near the base of the cup. I then inserted a 3 inch piece of a plastic drinking straw. I used a glue gun to secure the straw. Let these dry overnight for a good bond.

I recommend that only 1 student from each group be allowed up to get materials. This is safer and will help you maintain your sanity.

Before you give groups the water for Trial 1 you should discuss what would be in rainwater that runs off from a ranch or wooded area. (The water will carry primarily soil and organic materials.)

Recharge Water for Trial 1: In a large clear container or beaker of tap water add a small amount of topsoil, some dry grass, and a few small pebbles. This will represent rainwater runoff from ranchland and wooded areas.

Recharge Water for Trial 2: In another large container of tap water add:

- green food coloring which will represent soluble pesticides and herbicides that are commonly used on lawns.
- a small amount of cooking oil which represents oil leaks from vehicles
- confetti to represent trash
- potting soil and or topsoil to represent lawns being washed away
- anything else that you want to throw in to represent pollution

This will represent water that washes into the drainage system from lawns, streets, parking lots and urban areas.

When you are doing the discussion about aquifers cleaning the water the students will want to know why the water is still green. This is an excellent opportunity to talk about solubility. It is costly and difficult to remove soluble materials from groundwater. That is why there is so much concern about development over the recharge zone.