

Teacher's Guide

AG IN THE CLASSROOM—HELPING THE NEXT GENERATION UNDERSTAND THEIR CONNECTION TO AGRICULTURE

Resources

Colorado Water Protection Project

An excellent source for information about protecting and conserving Colorado's water. They also have press kits, brochures, fact sheets and an interactive CD-ROM. Get information at <http://www.ourwater.org/>

Understanding Water Activity Book

is a 72 page activity book about water, the water cycle, water treatment, nonpoint source pollution, conservation, wastewater treatment and importance of water to agriculture. Check it out at <http://www.growingyourfuture.com>

A River's Journey: Water in the West

An interactive CD-ROM that centers around a journey down the Colorado River. Water issues are examined, explained and then augmented by extensive text and internet resources. For more information visit: <http://www.growingyourfuture.com>

Nonpoint Source Colorado

has state and national educational resources and downloadable materials. It links to ourwater.org and cfwe.org (Colorado Foundation for Water Education) and lists education web sites, etc. www.npscolorado.com

The Federal Citizen Information Center

website has information about how we use water in our homes and conservation tips as well as links to many other water resources. Find it at: http://www.pueblo.gsa.gov/cic_text/health/water/tap/ch4.htm

Comments, questions, suggestions and feedback about the Colorado Reader are welcome.

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Page 2—Fun Fact Answers

Do you think the following statements are true or false?

- A tree is 75% water. TRUE
- More than 1/2 the world's animal and plant species live in water. TRUE
- 3/4 of the earth's surface is covered with water. TRUE
- 2/3 of the world's fresh water is groundwater. TRUE
- The Great Lakes represent 18% of the earth's fresh surface water. TRUE
- 66% of the human body is water. TRUE
- All living things, from the tiniest insect to the tallest tree, need water to survive. TRUE
- 83% of human blood is water. TRUE



Page 4— Colorado's Water Story

from *Drips, Drought, Drains, Drinks: A Colorado Water Conservation Curriculum for Grades 4, 5, 6* by Judy Elliott published by the Denver Water Department

Colorado's water story begins hundreds of miles away from the state. Clouds form over the western United States and are carried by air currents over Colorado. Weather fronts build and eventually lose their moisture when confronted by a huge barrier the Rocky Mountains! Most of Colorado's precipitation falls on the western side of the mountains and on the high peaks. As a result, 70% of our water is on the western side of the mountains. The Denver area is semi-arid, receiving about 14 to 15 inches of precipitation each year. Denver is on the eastern slope of the Front Range, as is about 80% of the total population of Colorado, yet most of the water flows west.

In order to have enough water for people living in the Denver area, snowmelt from the western slope must be directed toward the east. Tunnels have been built through the mountains from western slope rivers and reservoirs. This water must be shared with other states downstream through which these rivers flow, which means that we have the right to use only a certain amount of the water that originates in Colorado. We are meeting our needs for water today; but if in the future there is an extended drought, and population growth in the Denver area continues, we would experience serious problems. We all need to use water wisely in order to conserve our supply.

DIRECTIONS:

1. Move desks or tables into the middle of the classroom to represent
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the Rocky Mountains.

2. Have 80% of your students stand on the "east side" (the Denver area) and 20% on the "west side."
3. Give students on the "east side" 3 cups of water to hold. Give students on the "west side" 7 cups of water. This represents the natural percentage of water in these areas.
4. Discuss with the students what this means in terms of how much water people have to use.
5. Brainstorm with the students how they can get more water to the "east side" of the mountains. Some may suggest going over the mountains. Point out that it is hard to make water go uphill, and since it is very cold in the winter at the higher altitudes, the water might freeze and we would have to wait for it to melt again before we could use it in Denver.

The best way is to go through the mountains. This is the way it is done through tunnels that bring water from rivers on the western side of the Rockies to Denver. The people on the western side need some of the water too, as do people in other states sharing these rivers. People on the eastern side cannot have it all. Colorado's water has to be shared by many and used carefully.

6. Help students to see that not all the states have this problem. Some states get most of their water from under the ground (groundwater in aquifers) and others have a large lake from which to draw water. Have your student take the journey down the Colorado River. The journey is found on the CD "A River's Journey-Water in the West." You can receive this CD free from CFA.

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More about Pollution

How Colorado Regulates Water Quality

There are many government agencies and private entities that govern, monitor and control how we use and protect water. The Safe Drinking Water Act regulates public drinking water quality in the United States. The Environmental Protection Agency (EPA) is the federal agency charged with overseeing our pollution laws. The Colorado Department of Public Health and Environment, Water Quality Control Division is responsible for Colorado's water quality control protection programs.

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Answers to Questions



If we look at the Rio Grande River, it's about 1,900 miles long. Its headwaters are in the San Juan Mountains of Colorado. It ends in the Gulf of Mexico. Its watershed is 335,000 square miles or about 11% of the continental United States.

What are some of the types of pollution that might occur along its path?
mining pollution - P

...in urban areas?
residential pollution going into storm drains - NP

...near farms?
fertilizer/soil washing away - NP

Are they point or non-point pollution problems? Indicate with a "P" for point or "NP" for non-point pollution.

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Clever Ways to Conserve Water

- Flush the toilet only when you need to
- Never flush bugs, kleenex or clean toilet paper down the toilet

- Use a low flush toilet
- Use a glass of water to rinse when you brush your teeth and turn off the water while brushing
- Fill a pitcher of water and put it into the refrigerator instead of running the water until it is cold for a cold drink
- Wash clothes only when there is a full load in the washing machine
- Use a water saving shower head and take

- shorter showers
 - In the summer, don't water your lawn every day
 - Use a sprinkler and garden hose to water
 - If you have a drippy faucet tell your parents so they can fix it
 - Wait for the dishwasher to be full of dirty dishes before you run it
 - When you wash dishes in sink, don't leave water running. Instead, fill the sink with water to wash
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Hands-on Science Activity:

From the *Understanding Water Activity Book* published by the Colorado Foundation for Agriculture.

Cut this box out and photocopy for students to participate in the activity and answer questions.

Identify water as liquid, solid or vapor. To do this activity you need:

- a measuring cup
- 2 small paper cups
- a paper towel
- water
- an adult with a hot plate or stove
- a pinwheel

1. Put 1/4 cup of water in the measuring cup.
2. Pour the water into one of the small paper cups.
3. Write three words that describe a liquid.

Water from a faucet is liquid.

Water in a lake is liquid.

Rain is liquid.

4. Put the cup in a freezer. Check it every two hours to see the stages of changing from a liquid to a solid. Once the water has changed to ice, remove it from the freezer.

5. Put a paper towel on a table and peel the cup away from the ice.

This is a solid.

Write three words that describe the solid.

6. Use the ice cube, the second cup and the paper towel. Try to turn the solid water back into a liquid. Write about what you did.

7. Ask the adult helping you to set up a hot plate and tea kettle filled with water. Place the pinwheel above the tea kettle when the water begins to boil. What happens to the pinwheel?



What made the pinwheel turn?

Water vapor.

Write three words that describe vapor.

What caused the changes in the water?

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More about Water Conservation

from the Denver Water Department

Every day in Denver the average home uses 500 gallons of water. Since 500 gallons are used by 168,000 homes, that means that 83,000,000 gallons are used in Denver each day and 30,000,000,000 each year. Most of this water is used for landscaping. Water is used indoors for showers, baths, toilets, dishwashers, clothes washers, brushing teeth, cooking, cleaning, watering plants and some is lost due to leaks. A lot of water goes down the drain every day! If every home in the city practiced water conservation, enough water would be saved in a year to fill Invesco Field at Mile High Stadium a mile high!

Present your students with the facts and a challenge to be water conscious. The main purpose is to change wasteful habits now and for the future. Water can be saved by taking shorter showers and using flow-restricting showerheads. Don't let water run while brushing teeth, washing hands, dishes or clothes in automatic washers. Fix leaks and be careful when watering the lawn to use just the right amount during the coolest part of the day. Wash cars at a car wash that recycles the water.

Every drop of water saved now means more for the future.

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After each student creates a water usage chart –

Ask them to identify the area in their house where the most water is wasted and write a paragraph about how they can save water. Have each student take home their water conservation ideas and share them with their parents. Students can check out H₂O Jo at <http://www.npscolorado.com/h2ojo.htm>. There is a Colorado resource section with powerpoints that can be downloaded or viewed online and national resources with water education URLs.

Creating a “Keep Water Clean” Campaign

1. Have students design “Keep Our Water Clean” posters to display throughout the school. Encourage students to illustrate methods of keeping water clean and write original slogans, poems or taglines that will attract attention.

2. Students may wish to create their own skits and plays depicting ways to keep water clean. They can be performed in front of other classes.
3. Students may create presentations or reports on the computer to share with the class.

About Groundwater

from Children's Water Education Council

Groundwater is the portion of water beneath the surface of the earth. It is stored in spaces and cracks between grains of sand, gravel and rocks. Rainfall is the main source of fresh groundwater. It may enter the ground where it falls, or it may collect in lakes or rivers and then seep into the ground.

Two characteristics that affect the movement of groundwater are porosity and permeability. Porosity is the amount of water that a material can hold in its pores. Permeability is the ability of a material to let water pass through its pores. The layers of sand, gravel or rock that contain water is called an aquifer.

Water is always moving. In order to move, it must be able to flow through spaces between sand, gravel and rock underground. If water was not able to move through these spaces, then the water cycle would be “clogged” because the water underground would not be recharging streams, rivers, lakes and oceans. This does not happen because materials underground let water pass through their pores.

Earth materials play an important role in the water cycle because they allow water to filter through their layers. Water movement underground can be very slow or very fast depending on the type of earth material. Rocks and gravel have large pore spaces. They can hold a lot of water (large porosity) and allow large amounts of water to pass through their pores. Water takes a long time to filter through clay because its grains are so close together that there is almost no space for the water to be stored or to pass through. Water can move as fast as 40 inches per day in coarse gravel but in clay it can take up to 500 days to move the same distance!

Different earth materials determine how quickly contaminants such as spilled chemicals or leaking gasoline will move through the ground layers. By knowing the type of earth materials present, we can estimate how long it will take for a particular contaminant to reach the groundwater reservoirs.