

Teacher's Guide

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

Resources

Nonpoint Source Colorado has downloadable powerpoints in two languages and the links to water education url's. The site also has links to *ourwater.org* and Colorado Foundation for Water Education (*cfwe.org*) as well as the local water and conservancy districts that have localized water info and programs. Check it out at *npscolorado.com*.

Understanding Water Activity Book is a 72 page activity book about water, the water cycle, water treatment, polluted runoff, 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>

Colorado Foundation for Water Education seeks to promote better understanding of Colorado's water resources and issues by providing information and educational resources. Their website can be found at <http://www.cfwe.org>

WET: Water Education for Teachers: The Western Watercourse
Project WET is a nonprofit water education program for educators and young people ages 5-18. The program facilitates and promotes awareness, appreciation, knowledge, and stewardship of water resources. Check out their website at <http://www.projectwet.org/>

Comments, questions, suggestions and feedback about the Colorado Reader are welcome. Contact: Colorado Reader Publisher: Colorado Foundation for Agriculture, Bette Blinde, Director, P.O. Box 10, Livermore, CO 80536 Phone (970) 881-2902, Fax: (970) 881-2587

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Definition – Nonpoint Pollution:

forms of pollution caused by sediment, organic and inorganic chemicals, biological, radiological, and other toxic substances originating from land use activities, which are carried to lakes and streams by surface runoff.

"Land use activities" is a phrase that is used to group human-made sources of pollution. Land use activities include any activities that disturb soil. These activities can provide pollutants that can be carried into rivers by runoff.

Agriculture activities that can add to polluted runoff are plowing, bug control, fertilizing, irrigating and raising livestock.

Construction activities that can create polluted runoff include land clearing, grading and building roads.

Forestry, which includes timber harvesting, building roads, fire control and weed control can add pollutants to streams and rivers.

Mining moves dirt and gravel. Toxic materials can result from some mining methods. Mining related nonpoint source (NPS) pollution in Colorado is widespread and diverse. Acid rock drainage is generated from coal and metal mine adits and waste piles, lowering the pH of receiving water and mobilizing heavy metal contaminants. Alkaline runoff, high in salts and sediments, also occurs. Radioactive minerals were mined in several locations in the Colorado Mineral Belt, and extensively in southwestern Colorado.

Construction activities that can create polluted runoff include: land clearing, grading and building roads.

Septic systems are a form of human waste disposal that use land as a filter. Septic systems need to be managed and maintained to prevent adding pollution to our water system.

Urban storm runoff can include oil, animal waste, gas, antifreeze, fertilizers, pesticides, paints, trash, etc. Lawns, gardens and landscaping are major sources of pollution. Rubber from our tires and copper from our brakes is left on roads every time we drive. Spilled household cleaners, paints, car fluids, etc., or their containers, can add to pollution.

Land Use Discussion:

Ask your students what kind of land-use activities they have seen in their community. Discuss how various pollutants can enter the water system and possible methods to prevent this pollution. Plan a field trip to a nearby farm, construction site, mine or water treatment plant and talk about what they are doing to manage nonpoint pollution in their particular business. Take a walk around the block to see how many potential polluted runoff sources your students can spot.

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Colorado Rivers Discussion:

Have your students review the names and locations of Colorado's rivers. Discuss the recreational uses of rivers and reservoirs including: rafting, boating, canoeing, swimming, water skiing, tubing and fishing. Have your students find out where their water comes from. Have students look at a map and make a list of communities that are located upstream from their *(continued from page 1)* water source.

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

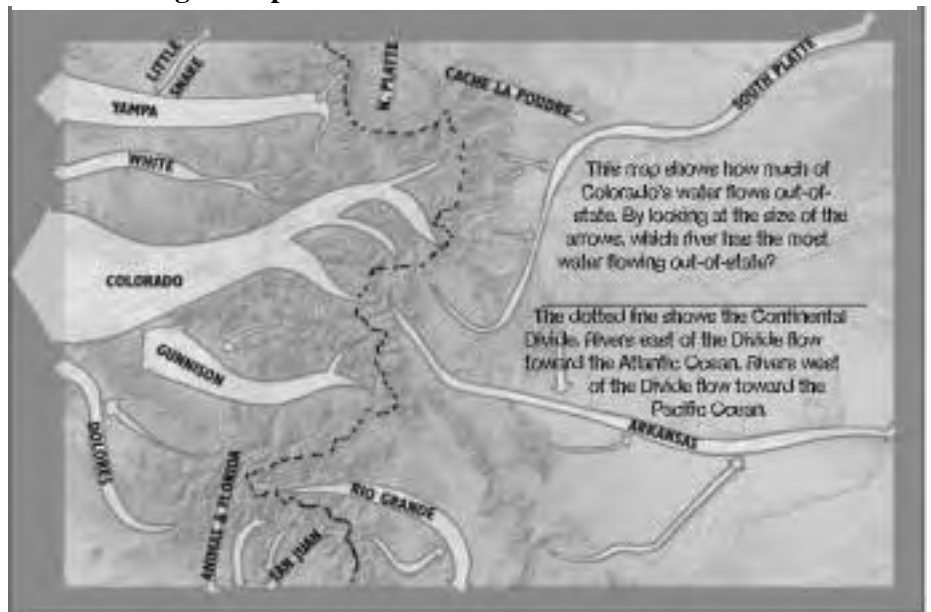
Colorado's water story begins hundreds of miles west of the state. Clouds form over the western United States and are carried east by air currents. Weather fronts build and eventually lose their moisture when confronted by a huge barrier – the Rocky Mountains! Most of Colorado's precipitation falls on 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 must be directed downhill toward the east, and tunnels built through the mountains from Western Slope rivers. 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 a 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 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 done through tunnels that bring water from rivers on the western side of the Rockies to Denver. Colorado has legal obligations and compacts requiring that water be shared.
6. Help students to see that not all the states have this problem. Some states get most of their water from under the ground (ground water in aquifers) and

Answer to Page 3 Map



As citizens of Colorado, each of us can play a role in protecting our water and environment. One thing each of us can each do is to conserve. Earlier we had an example where we compared the soapy runoff from washing one car to washing ten thousand cars. Saving one gallon of water per day may not seem like much, but what if everybody did?

There are about 4.6 million people currently living in Colorado. If each person saved 1 gallon of water, how many gallons would be saved each day? 4,600,000 gallons.

others have large lakes 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.

Additional questions:

- Q. Why has The Colorado River been called "The Mother of Rivers?"
A. More rivers begin in Colorado than in any other state.

- Q. Most of Colorado's rivers flow in what direction?
A. West
Q. Name four states that border Colorado and share Colorado's water.
A. Wyoming, Utah, New Mexico, Kansas and Nebraska
Q. Look up the word "tributary" in the dictionary, What does it mean?
A. A stream or river that flows into a large one.
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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.

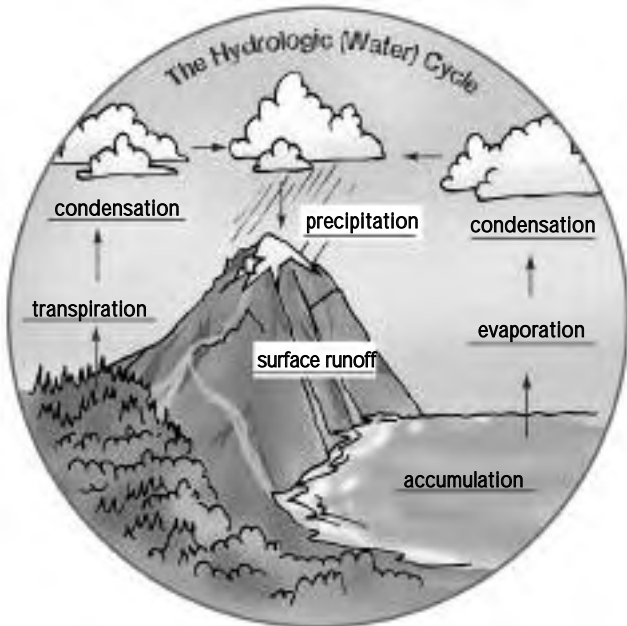
Write three words that describe vapor.

What caused the changes in the water?

Answers to Matter Quiz



Answers to Water Cycle Quiz



(continued from page 5)

About 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 state water quality protection programs.

Water Cycle Hands-on Activity from Denver Water Department: What Goes Up Must Come Down!

Build a mini-water cycle (terrarium) in your classroom. Use a large glass container with a lid. Put a one-inch layer of gravel on the bottom for drainage. Add a layer of peat moss and then a layer of soil. Put a variety of plants (particularly those native to Colorado) in the soil, water lightly and cover the container. The plants will take up moisture from the soil and release it through their leaves (transpiration). The water molecules will condense on the glass and "rain" back into the soil.

More about Water Conservation from the Denver Water Department

Every day in Denver, people in the average home use about 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. About 54% of this water is used for landscaping. Water is used indoors for showers, baths, toilets, dishwashers, clothes washers, brushing teeth, cooking, watering plants and some is lost due to leaks. A lot of water goes down the drain every day! The water is not wasted, but used downstream. If every home in the city practiced water conservation, enough water would be saved in a year to fill 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 or dishes. Only wash full loads of dishes or clothes in a machine. 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 business that recycles the wash water or at home by using a bucket of sudsy water and turning the hose off when not rinsing.

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

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 and perform their own skits and plays depicting ways to keep water clean.