# Colorado Reader

**AG in the Classroom**

*Helping the Next Generation Understand Their Connection to Agriculture*

Colorado Foundation for Agriculture ~ www.growingyourfuture.com

Food, Fiber and Natural Resource Literacy

# Water...

## Our Most Precious [and fun] Resource

Water is fun. We splash in it. We swim in it. We play in it.

We also often take it for granted because it seems to be everywhere. Water is in our oceans, rivers, streams and lakes. It is the clouds in the sky.

Fresh, clean, safe water flows from faucets with the turn or twist of a handle. We use it to cook, wash, clean and drink. It's in the food we eat and the things we like to drink.

Water is essential to our lives. Humans can live for days, possibly weeks, without food—as long we have enough water to drink. Depending on how hot it is, our overall health, our age and how hard our bodies are working, we can begin to suffer from a lack of water within hours, and could die in a couple of days.

Water has some other unique features. It is the only substance on Earth that naturally occurs as a liquid, a solid (ice) and as a gas (water vapor).

Maybe the most surprising thing about the water we drink is its scarcity. Less than 1 percent of all the water on the planet is suitable or available for human consumption. Ocean water is too salty. Water frozen in the polar ice caps and absorbed in soil is inaccessible. Finally, some freshwater is too polluted to drink.

On the following pages we will explore what is truly our most precious resource—water.

Water is the basis of life and the blue arteries of the earth! Everything in the non-marine environment depends on freshwater to survive.

—Sandra Postel

director and founder of the Global Water Policy Project

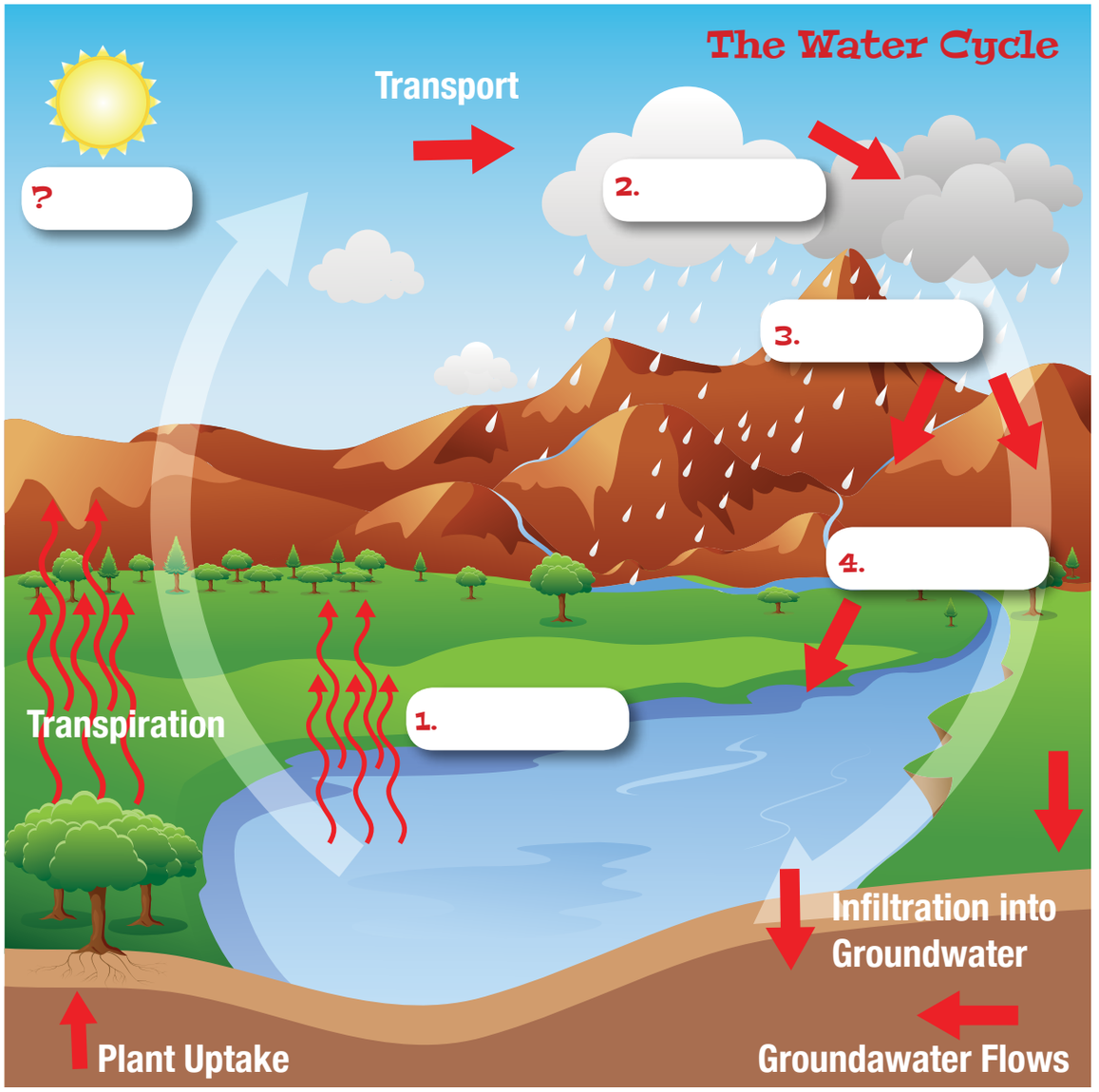
# What goes around, comes around...

*Tyrannosaurus Rex*

## The Water Cycle

The water we see and use has been around since before the dinosaurs roamed the earth. Thanks to energy from the sun, water moves through a never-ending series of transformations known as the water cycle.

Of the four primary parts of the water cycle, let's start with evaporation. Energy from the sun helps liquid water change to water vapor. Next, the water vapor in the atmosphere condenses, forming clouds. When condensation increases, the air can't hold it any more and we get step three, precipitation. Precipitation could be rain, snow, sleet or hail. The precipitation may fall back into an ocean, lake, or stream, but some will fall on the ground. The precipitation will either soak into the ground or move across the surface, forming puddles, streams, rivers and lakes. This part of the water cycle is known as collection.




*Label the four primary parts of the water cycle. In the extra box, write what the sun provides in the water cycle.*

In addition to water evaporating from the land, water vapor also comes from plants. This is known as transpiration.

As vapor condenses into clouds, it is transported through the atmosphere. A storm that starts over the Pacific Ocean may travel to Colorado and beyond.

When precipitation soaks into the ground, it moves through the soil. Water in the upper layers of the soil is available to plant roots and will move to the stems and leaves.

# Where does our water come from?

## Let it Snow

Colorado is a special place. Our landscape includes majestic mountains, dramatic foothills, high deserts and vast plains. Snow in the mountains is often measured in feet while precipitation in some areas will measure less than 12 inches a year.

Most Coloradans depend on the water that comes from snowmelt. As a matter of fact, people, plants and animals in 18 states and Mexico depend on water that comes from Colorado's high country.

The snow that collects in the winter will melt in the spring. Some snowmelt will soak into the ground, but much of it will form streams that merge to become the mighty rivers that fill lakes and reservoirs before flowing to neighboring states.

In our rivers, spring is a time of plenty, but our homes, farms and businesses need water all year. This is why we have reservoirs—to collect and store water in times of plenty for times of need.

A system of ditches, pipelines and other infrastructure brings water from reservoirs to cities, farms and industry as they need it.

In rural areas, it is common for water to be provided by wells that extract water from below the surface of the ground. Underground water sources are known as aquifers.

*The snow you play in might end up as water in a glass on your dinner table.*

## Who owns the water?

Who owns the water in Colorado is both simple and complicated.

The simple answer is that we all do. Water is a public resource, but the right to use the water is similar to a private property right—a water right can be bought, sold or rented. The right to use water is not connected to a specific piece of property, but is connected to a water system—a river or ditch for example.

The complication is compounded by the fact that there is more demand for water in Colorado and beyond than there is supply.

Colorado's system of water laws and water courts goes back to the Gold Rush period and the early days of statehood.

Most of us take for granted that there will be water to use in our homes and schools. Our legal system helps distribute water in a fair and orderly way. It also helps water managers plan for future needs of a growing state.

# Weathering the Storm

## Weather and Climate

In general, weather is what we experience in the short term. Colorado is famous for how fast its weather can change from mild to wild. Climate is the long-term summary of weather patterns. For example, when we measure the amount of snow in a given month, we are evaluating weather. When we look at the amount of snow for the month compared to the average measured over decades, we are looking at climate.

When a region experiences a period of below average rain and snow, we call this a drought. It's important to remember that what is normal precipitation for one part of Colorado might be significantly different from another region of the state. A drought can go on for months or years. Drought can have a wide impact beyond water supply. A shortage of water can also impact water quality and the frequency and severity of wildfires. Wildfires can also impact the quality of the water for years.

During 2014, much of the state received above average precipitation, but parts of southeast Colorado remain in a severe drought.

Some predictions for the coming winter call for above average precipitation and warmer than average temperatures across the region. This weather pattern is known as an El Niño condition, brought on by above average surface temperatures in the Pacific Ocean. Changes in the temperature of the oceans impact the atmosphere and the development of storms that move across the land.

*Snow, particularly in the mountains, provides the water we use all year.*

## The Mother of Rivers

Colorado is the source, or headwaters, of dozens of rivers. The Colorado, Yampa, Gunnison, South Platte, Rio Grande and Arkansas are the largest. Not only do all of the people, plants and animals in Colorado depend on these flows, so do downstream states. This gives Coloradans a special responsibility to protect water and use it wisely.

*The rainbow trout is just one example of the many fish and other wildlife that depend on rivers.*

# Water Grows Food

*A cow's milk is about 87 percent water.*

## On the Farm

Food begins with water. When a farmer plants a seed, water and the warmth of the sun start the plant growing. All the way to harvest, the plant needs to absorb moisture through its roots.

Some of the plants on the farm are for human consumption while other plants go to animal feed or fuel.

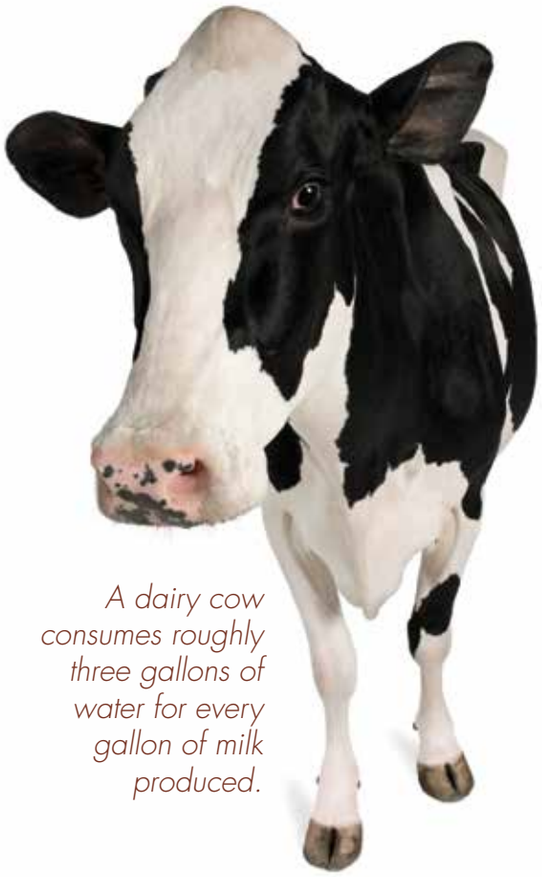
Milk is a good example of how food requires water. Milk comes from cows who need water to drink. Farmers also use water to grow food for the cow—plants like corn and alfalfa. At the dairy, water is also used to clean and maintain the facilities.

Because Colorado is a relatively dry place, farmers use water from rivers and reservoirs to supplement what falls from the sky. The use of supplemental water is called irrigation.

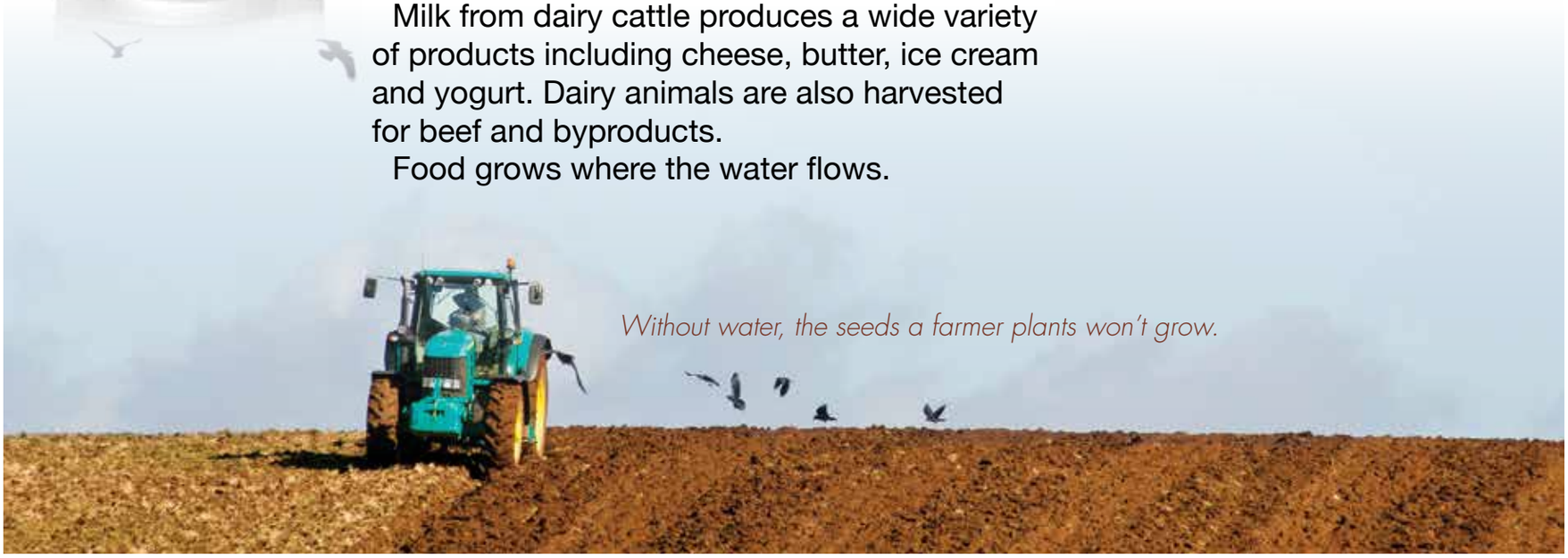
The demand for water for irrigation is highest during the hot, dry summer months. Without irrigation, Colorado's farms wouldn't be nearly as productive as they are now.

Milk from dairy cattle produces a wide variety of products including cheese, butter, ice cream and yogurt. Dairy animals are also harvested for beef and byproducts.

Food grows where the water flows.



*A dairy cow consumes roughly three gallons of water for every gallon of milk produced.*



*Without water, the seeds a farmer plants won't grow.*

# Water Does a Body Good

Your body is mostly water. Even your bones are about 31 percent water. Throughout the course of the day, your body is losing water. The hotter it is and the harder your body is working, the more water you lose. This is true for all animals.

To keep your body functioning properly, you need to replace the water you lose.

## Around the World

Not everyone has ready access to safe drinking water. The lack of clean drinking water in developing nations is a serious problem. The number one water concern is the lack of proper sanitation.

Scientists, humanitarians and educators work to find solutions. The efforts of Coloradans to conserve water and keep it clean can have far reaching effects. Freshwater is a worldwide issue.

*In many parts of the world there is a shortage of safe water for drinking and cooking. In parts of Laos, water has to be carried for use in the home. Can you find Laos on a map?*

## Water...

...regulates body temperature

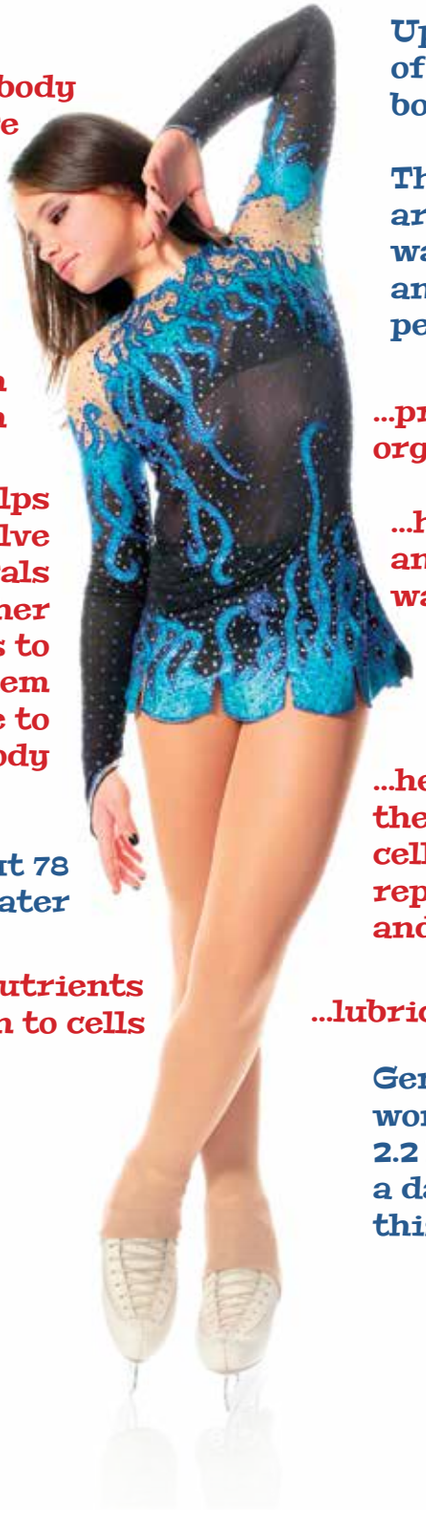
...moistens tissues for mouth, eyes and nose

...aids in digestion

...helps dissolve minerals and other nutrients to make them accessible to the body

Babies are about 78 percent water

...carries nutrients and oxygen to cells



Up to 60 percent of the human adult body is water

The brain and heart are 73 percent water while muscles and kidneys are 79 percent water

...protects body organs and tissues

...helps the kidneys and liver remove waste products

...helps the body's cells grow, reproduce and survive

...lubricates joints

Generally an adult woman requires 2.2 liters of water a day, but some of this comes in food.

# The #1 Threat to Freshwater

Freshwater supplies are limited and demand is growing. This increases our need to make good decisions about how we use and protect water supplies.

In the United States, the number one threat to clean water is runoff pollution, also called nonpoint source pollution.

Frequently, we think of pollution problems as coming from a specific point or source that can be identified and fixed. Runoff pollution is different. It comes from many sources at the same time.

For example, consider a large parking lot during a rain storm. Because the parking lot is paved, none of the water can soak into the surface. Instead it flows across the top of the surface, toward storm drains. As it flows, water carries pollutants with it. Pollutants include litter, debris and any chemicals that might be left behind from vehicles or other sources. The runoff water may be carrying oil, antifreeze, animal waste, dirt, bits of rubber, paint, excess fertilizer from nearby landscaping and more.

A single quart of motor oil can pollute up to 250,000 gallons of water. One gallon of spilled gasoline can pollute up to 750,000 gallons of water. When you add up the millions of cars and trucks in Colorado, small drips can add up to be a big problem—the Environmental Protection Agency estimates Americans spill 180 million gallons of used oil that gets into lakes, streams and rivers each year.

When polluted water enters a storm drain, it's headed to a nearby waterway or wetland, potentially harming fish, wildlife and plants. Stormwater is not treated before it reaches waterways.

You might not think one parking lot is a big problem, but the problem isn't just one parking lot. The problem is all the land area that might have pollutants. The amount of runoff is increased by hard surfaces such as parking lots, roads, sidewalks and rooftops.

As polluted water continues downstream, it becomes part of the drinking or irrigation supply for downstream users. Before going to homes, it will be treated, but the more polluted the water becomes, the more difficult and expensive it becomes to clean. That's why we say, "keep it clean, because we all live downstream."

## Protecting Water

Now that you know how important water is, it's time to take action. Answer the following:

What is the name of a nearby reservoir?

_____

What is the name of the nearest river?

_____

Name one city that is upstream and one city that is downstream of you:

_____

List three things you could personally do to help reduce runoff pollution:

_____

_____

_____

Colorado Agriculture in the Classroom

The Colorado Reader publication and Ag in the Classroom are projects of the Colorado Foundation for Agriculture. Educational projects are produced in cooperation with the Colorado Department of Agriculture, other state and federal agencies, Colorado commodity groups, Colorado agricultural associations, state universities and colleges and interested individuals. Colorado Readers are provided free to educators requesting them. For more information contact: Bette Blinde, Colorado Foundation for Agriculture, P.O. Box 10, Livermore, CO 80536 or phone (970) 881-2902 or e-mail bblinde@growingyourfuture.com.

Financial support for this reader has been provided by: Colorado Department of Public Health and Environment ~ Water Quality Control ~ NPS Program.

# Keep it Clean with H2O Jo & Flo

Runoff pollution is a bummer, but the cool thing is that it's something you can help prevent everyday. After all, this type of pollution is caused by the accumulation of many small pollutants. Part of the solution is for all of us to remove some of these small problems—adding up to big impact.

## To help prevent runoff pollution...

» Don't litter (and ask your friends not to litter).

» Clean up pet waste.

» Shovel, snow-blow, plow and/or sweep the snow. These are all effective in removing snow and minimizing ice buildup.

» Apply de-icer before snow storms to prevent snow and ice buildup. This also makes shoveling more effective.

» If leftover salt crystals are still visible after salt has been applied, then you've used too much. Sweep up the leftover salt and re-use it, or dispose of it in the trash.

Ready to find out more about how to help? Check out Flo and Jo at http://npscolorado.com.

### Watershed Defenders

Everybody likes a good comic book every now and then. You can follow the adventures of the Watershed Defenders at growingyourfuture.com. Download past issues to see our heroes battle their arch-nemesis, the Contaminator. If you enjoy the Watershed Defenders, be sure to check out Major Ag, a superhero protecting food and fiber in Colorado.


# Teacher's Guide

Ag in the Classroom - Helping the Next Generation Understand Their Connection to Agriculture

## Water Reader

### Additional Resources

***United States Geological Survey - USGS USGS collects and provides information needed to understand the nation's water resources and provides access to water data, publications, and maps. Send your students to the education page and click on the hydrology primer for some good information! www.education.usgs.gov***

Colorado Foundation for Water Education - CFWE
CFWE focuses on water education with a goal of promoting a better understanding of Colorado's water resources by providing balanced and accurate information and education.
www.cfwe.org

Colorado Foundation for Agriculture - CFA
Where have we heard that name before? The web site contains pdf files of activity books, past readers, e-lessons and more.
It's a useful site to visit any time for agriculture and natural resource topics. Water resources abound.
www.growingyourfuture.com

Additional sites containing pertinent information:
www.npscolorado.com
www.groundwater.org
www.watereducation.org

agclassroom.org
This is the national web site for Ag in the Classroom programs from across the nation. A site search will bring up a variety of lessons, books, videos and links.

**INTRODUCTION:**
Water is all around us. This essential resource seems abundant to most of us. During a drought, most of us don't notice that there is a drought as our water is still there when we turn on the faucet. We may have to cut back on watering our lawns but we are not seriously impacted. We may notice that some of the fresh food items we purchase are more expensive. A drought impacts farmers and ranchers more than the rest of us. They may have to cut back on the number of cattle they own or they may need to grow crops that don't take as much water.

**Page 2: Water Cycle**
This article has several large words you may need to review with your students:

transformations
atmosphere
condenses
condensation
precipitation
transpiration
infiltration

Write these words on the board. Have your students draw their own water cycle using these words.

**Page 3 & 4:** Have your students draw a map of Colorado. Have them look at a topographical map. Have them add the mountains on their drawing. Next have them add the rivers. Where do all the rivers start? (mountains) This is why Colorado is called a headwater state. Discuss with your students that the snow falls in the mountains in the winter and melts in the spring and provides us the water we use the rest of the year.

Discuss with your students the difference between weather and climate.

**Page 5**
Water is important to agricultural producers. They are actually converters of water into food products that are full of nutrients.
*Activity:* Show pictures of various food items and discuss their link to water. For example, bread is made from flour. Flour is ground up grains like wheat and barley. Both are grown in the ground where the plants get water from the soil. A hamburger has many connections to water, the beef comes from cattle that drink water, the bun comes from grain that gets water from the soil. Same is true of the tomato, lettuce and onion on the hamburger.

**Page 6**
Water is an important nutrient used by our bodies in many ways. Have your students make a list of the ways their bodies need water.

**Page 7**
Nonpoint source pollution or polluted runoff is the biggest threat to freshwater. There are many things we can do to keep from contributing to this type of pollution. Some of the things include:

- drive less - many kinds of pollutants come from vehicles
- pick up trash and properly dispose of it. This keeps it from getting into waterways.
- properly dispose of chemicals, oils, medicines, etc.
- recyle and reuse materials
- wash cars at a place that recycles and cleans up its water
- clean up pet waste
- join a group that cleans up highways or waterways of trash

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

Contact: Colorado Foundation for Agriculture
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www.growingyourfuture.com

There are lots of ways you can help protect the water in our environment. One of the best places to start is at home, and the easiest of all is to conserve water. It may not sound like much, but turning the water off while you are brushing your teeth is important. The less water you use, the less water has to be treated before it can be returned to the river.Some substances aren't removed during treatment. Back to the tooth brush – by turning the water on and off instead of letting it run, you could save a couple of gallons of water a day. If everybody in Colorado would save two gallons a day for a year, the savings would be more than 3.4 billion gallons of water, or almost enough water to cover a football field to a depth of 8,000 feet—more than ten times taller than Denver's tallest building.

Another thing you can do at home is help properly dispose of animal waste. That's right, pet poop. It's not that Fido is a threat to clean water, but when you add up all the poop from all the dogs in your town, well, you see the problem. In communities that have a high density of pets, pollution levels in streams rise after a rain storm because of pet waste that is washed into storm drains.

Here's another easy thing to do—don't litter. If you or someone else throw gum wrappers, pop cans or other litter on the ground, it will probably make it into a local waterway. Not only is litter ugly to look at it, it makes it harder to clean the water for household use and can harm wildlife. Would you like somebody to throw trash in your bathtub? Then why throw trash on the ground knowing it may end up in a lake. If you want to go one step farther, recycle some of your trash. About 2.5 million plastic soda pop and water bottles go in the trash every hour in the United States. Recycling helps protect the environment and saves water.

*Activity:* This issue of the Colorado Reader is about water. Ask your students fhe following questions or write them on the board. The answers to the questions all start with the letter "W".

1.This Colorado-grown product has a green rind. Cut it open and the edible part is red and juicy (it's 97% water!). It grows on a vine. This item can be considered either fruit or vegetable because of its characteristics. What is it?
2. This grass-like plant is one of the top five agriculture products grown in Colorado. The others are cattle/calves, corn, dairy products and hay. You can find it in bread. What is it?
3. Liquids have a common characteristic. If you spill a glass of water on your sleeve, you might exclaim "oh, my sleeve is _____!"
4. This Colorado county is home to the city of Greeley and the Pawnee National Grassland. It's the third largest county in the state and is the leading producer of cattle, grain and sugar beets. There's also a lot of oil and natural gas. If you drive east from Larimer County you will find yourself in ____ County.
5. There are domestic animals that include cattle, sheep, hogs, horses, llamas, mules and more. People take care of these animals and they are often referred to as livestock. Deer, elk, coyotes are not tame. They live where they can find food, water and shelter. What word is used to describe these non-domestic animals?

**Answers: watermelon, wheat, wet, Weld, wildlife**

Colorado Academic Standards and Core Curriculum State Standards
SCIENCE
GLE-3. Physical Science
1. Matter exists in different states such as solids, liquids, and gases and can change from one state to another by heating and cooling.
Relevance and Application
1. Water is distributed on Earth in different forms such as vapor, ice or glaciers, rivers, and freshwater or saltwater oceans.
2. There is only a certain amount of water available for hu¬man use.

GLE-6. Physical Science
3. The physical characteristics and changes of solid, liquid, and gas states can be explained using the particulate model.
Relevance and Application
1. Solids, liuqids, and gasses all have unique properties that make them useful in different situations.
GLE-6. Life Science
1. Changes in environmental conditions can affect the sur¬vival of individual organisms, populations, and entire species
2. Organisms interact with each other and their environ¬ment in various ways that create a flow of energy and cycling of matter in an ecosystem

GLE-6. Earth Systems Science
1. Complex interrelationships exist between Earth's struc¬ture and natural processes that over time are both con-structive and destructive.
2. Water on Earth is distributed and circulated through oceans, glaciers, rivers, groundwater, and the atmosphere.
Relevance and Application:
1. Home water quality and consumption affects health and conservation policies.
2. Water systems affect local, regional, and world popula¬tion development.
3. Water-use irrigation patterns in Colorado affect eco¬nomic development in the state.
3. Earth's natural resources provide the foundation for hu¬man society's physical needs.

ELA-LITERACY
CCSS.ELA-Literacy.CCRA.L.4
Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
CCSS.ELA-Literacy.CCRA.R.1
Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
CCSS.ELA-Literacy.CCRI.R.1
Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-Literacy.CCRI.R.3
Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
CCSS.ELA-Literacy.CCRF.R3a
3. Know and apply grade-level phonics and word analysis skills in decoding words.
a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
CCSS.ELA-Literacy.CCRF.R4
Read with sufficient accuracy and fluency to support comprehension

# Water
## Evaluation ~ 2014

## Colorado Reader ~ Agriculture in the Classroom

Please take a few minutes to evaluate your students' knowledge of this topic.
There is an area for additional comments.
Your comments help us improve future Colorado Reader issues. Thank you!

How many students used this reader? _____

How many or what percentage of your students understand that water is essential to life? _____

How many or what percentage of your students can name three steps in the water cycle? _____

How many or what percentage of your students explain the importance of snow in Colorado's mountains? _____

How many or what percentage of your students can explain the difference between climate and weather? _____

How many of your students can describe one way farmers and rancher use water to produce food? _____

How many or what percentage of your students can describe one way our bodies use water? _____

How many or what percentage of your students can identify the biggest threat to freshwater? _____

How many or what percentage of your students can name two ways to help prevent runoff pollution? _____

Additional Comments _____

_____

_____

_____

_____

_____

***SUBMIT THIS EVALUATION FOR A CHANCE TO WIN A $100 VISA CARD!***

| Please rate: | Good | | Average | | Poor |
|---|---|---|---|---|---|
| Student Activities Throughout Reader | 5 | 4 | 3 | 2 | 1 |
| Teacher's Guide | 5 | 4 | 3 | 2 | 1 |
| Reading Level | 5 | 4 | 3 | 2 | 1 |

I would like to see mor activities like: _____

School _____ Grade Level _____

Subject Area (s) _____

Name _____ Phone _____

Email _____

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Colorado Agriculture in the Classroom

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## EVALUATION

## MARK YOUR CALENDAR!

**June 2015 San Luis Valley**

**June 2015 Fort Collins**

**Food, Fiber & More Summer Institute**

Two continuing education credits

Five day course learning about Colorado agriculture and natural resource industries. The course includes classroom session, tours and a day walking in another person's boots!

See course description at www.growingyourfuture.com

## Request electronic resources!

Colorado Foundation for Agriculture

Colorado Foundation for Agriculture is converting resource materials and adding new materials in electronic format for use on I-Pads, notebooks and computers. We need some "testers" before we sign off on unlimited release. Send an email to bblinde@growingyourfuture.com. Specify the technology your students will use and the grade level.

**www.growingyourfuture.com**