

Colorado Reader

Food, Fiber and Natural Resource Literacy

AG in the Classroom

Helping the Next Generation Understand Their Connection to Agriculture

Colorado Foundation for Agriculture ~ www.growingyourfuture.com



Colorado's Water Plan

According to Colorado's Water Plan: "People love Colorado. Our state's population has grown from one million in 1930 to more than five million today. It is projected to grow at even faster rates in the future. So how do we make sure that this population growth doesn't hurt what we know and love about our state? The way we manage our water resource will make a big difference."

If we manage Colorado's water well, our state has enough water to meet our needs into the future. We will need a good plan of action. The main challenge is not in the amount of water we have, but in the way we manage the water we have. Colorado has a unique water legal system. It has citizens with different water needs and values. In 2013 Governor Hickenlooper issued an executive order for the development of a water plan for the state.

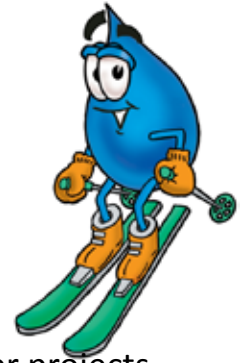
The Colorado Water Conservation Board (CWCB) has been the leader in the development of Colorado's Water Plan. The Colorado Water Conservation Board is Colorado's water planning and policy agency. It is responsible for

- stream, watershed and lake protection;
- water conservation;
- flood mitigation;
- stream restoration;
- drought planning;
- water supply planning; and
- water project financing.

CWCB is also responsible for working with other states on water issues.



Why do we need a water plan?



A water plan is a guide to future decision-making. It is a way to meet water challenges using a team approach.

Big challenges face Colorado water management

● **Growing water supply gap:** As cities grow, they may not have enough water to supply people and businesses. Conserving water and storing additional water will help. However by 2050 it is expected that the state will be short more than 500,000 acre-feet of water. (Today, an acre-foot of water provides water for five people.)

● **Agricultural dry-up:** The sale of agricultural water rights to cities is causing irrigated agriculture to disappear. At the current rate of transfer, there will be a major reduction in Colorado's agricultural lands. Our agricultural lands provide us with food, open spaces and wildlife habitat. Losing these

agricultural lands could affect Colorado's economy and food security. In addition, rural communities will suffer as agricultural businesses go away.

● **Critical environmental concerns:** Coloradans are proud of our natural environment. We enjoy nature in this state. We enjoy the recreation our streams and lakes provide. As the climate changes and the demand for water increases, we need to protect water quality, watershed health, and ecosystems. Environmental challenges will arise as the demand for water increases.

● **Changing climate conditions:** Climate change could make it more difficult to meet Colorado's future water needs. Variability in the amounts of precipitation make it hard to know how much water we will have in the future.

● **Inefficient regulatory process:** Colorado needs a better regulatory process if we are to respond to our water challenges. By working together and setting priorities, Colorado can do

its part to move water projects forward more quickly. For example, it often takes 15 to 20 years to get all the approvals necessary to build a reservoir.

● **Increase funding for water projects:** Colorado should investigate options to raise the money necessary to address the above challenges.

Math Activities

1. If an acre-foot of water provides enough water for 5 people for a year, how many people would 500,000 acre-feet provide water to? _____
2. If an acre-foot would provide enough water for 7 people for a year, how many people would 500,000 acre-feet provide water to? _____
3. How many more people is this?

4. An acre-foot equals 325,851 gallons of water. If 5 people were using an acre-foot of water in a year, how much water would one person be using? Round to the nearest whole gallon.

5. If 7 people were using an acre-foot of water, how much water would one person be using?

How did the state develop a water plan?

Our state is very diverse. It has high mountains with forests as well as grasslands and semi desert areas. The water needs in these geographically different areas are also different. The state was divided into eight areas. These areas followed the watershed of different river systems called **basins**. Roundtable discussions were held in all of these basins. Regional water plans were developed called Basin Implementation Plans. These plans were used to build the state-wide water plan. The draft of the plan was distributed to get comments on it. It took two years and over 30,000 comments from people to develop Colorado's Water Plan.

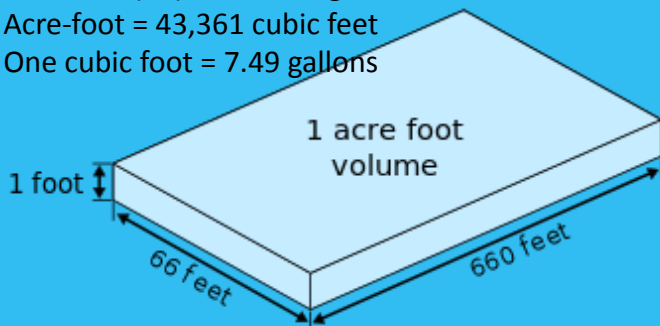
All of Colorado's major rivers flow downstream to eighteen states and Mexico. As Colorado and its downstream neighbors grew, disputes arose among states over the water in the rivers.

Colorado negotiated nine formal agreements with downstream states. These **interstate water compacts** are federal law, state law, and legally binding contracts among the states.

Colorado water law is rooted in the **doctrine of prior appropriation**. First, it stipulates that water rights are property rights that can be bought, sold and transferred to new users. Second, it establishes which rights have priority.

In 1988, people from Colorado, Wyoming, and Utah established the Upper Colorado River Endangered Fish Recovery Program. This partnership seeks to recover four endangered fish species: Humpback chub, bonytail, razorback sucker, and Colorado pikeminnow. The Program seeks to recover these fish by managing habitat, stocking hatchery-raised fish, and managing predatory non-native fish species throughout the Colorado River Basin. This Program has set an example of cooperation, and serves as a model for other endangered fish recovery programs.



Acre-foot (AF) = 325,851 gallons
Acre-foot = 43,361 cubic feet
One cubic foot = 7.49 gallons



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Let's Explore the Eight Basins

Basin	Location	Description	Water Challenges
Arkansas Basin 	<p>The Arkansas Basin is the largest river basin in Colorado covering an area of 28,268 square miles, or 27 percent of the state. It is located in the southeast part of the state. The largest cities in the basin are Colorado Springs and Pueblo.</p>	<p>Steep slopes and forests of the Rocky Mountains are found at the western part of the Arkansas Basin. Flat short grass prairies are found on the eastern portion. The headwaters of the Arkansas River begin near Leadville at an elevation of more than 14,000 feet and drop to 3,340 feet at the Colorado/Kansas state line.</p>	<ul style="list-style-type: none"> • There is little to no water availability for new uses. • Growth in the headwaters region will create new demands for water. • Transferring agricultural water to cities is hurting rural economies especially in the basin downstream of Pueblo. • Concern over water quality and suitable drinking water are key concerns in the lower basin. • Building of two major water projects are key to meeting future water needs.
Colorado Basin 	<p>The Colorado Basin is about 9,830 square miles. It is located in the western part of Colorado. The largest cities in the basin are Grand Junction and Glenwood Springs.</p>	<p>Elevations in the basin range from higher than 13,000 feet in the headwater areas to about 4,300 feet where the Colorado River exits the state. The basin's mountainous headwaters areas gradually give way to a series of canyons and gentler terrain as the river follows along the Interstate 70 corridor toward Grand Junction, the Grand Mesa, and the Utah border.</p>	<ul style="list-style-type: none"> • Basin is experiencing rapid population growth but there is lack of available water and areas to store water. • Agriculture and recreation are economically important in the basin so it is important to have enough water for each of these activities. • The success of the Upper Colorado Recovery Implementation Program for Colorado River Endangered Fish is important. • There is concern for not being able to supply enough water to other states during severe drought. • There is concern with water being moved from this basin to the eastern slope.

Geography Activities

On the next three pages is information on the eight basins. Study the maps and answer the questions.




In which basin do you live?




What are two major cities in your basin?

Describe the terrain in your basin.

What is one major water challenge of your basin?



Basin	Location	Description	Water Challenges
<p data-bbox="98 153 556 233">Dolores/San Juan /San Miguel Basin</p> 	<p data-bbox="592 153 876 838">The Dolores/ San Juan/San Miguel Basin is located in the southwest corner of Colorado. It is about 10,169 square miles. The largest cities in the basin are Durango and Cortez. The Upper San Juan River and its tributaries flow through two Native American reservations: Ute Mountain Ute Reservation Southern Ute Indian Reservation.</p>	<p data-bbox="889 153 1191 838">Elevations in the San Juan River system range from higher than 14,000 feet in headwater areas of the Animas and Los Pinos Rivers, down to 4,500 feet where the Mancos River exits the state just east of the Four Corners. The San Juan Basin is characterized by rugged terrain including mesas terraces, escarpments, canyons dry washes arroyos and mountains.</p>	<ul data-bbox="1211 153 1899 838" style="list-style-type: none"> • This area of the state is extremely diverse with changing demographics. Pagosa Springs, Bayfield and Durango are rapidly growing. They have areas experiencing localized water shortages. The communities are changing from mining and agriculture to tourism and recreation. Many people are retiring to this area. The Cortez area remains strongly agricultural but is also seeing rapid growth with retirees moving to the area. The San Miguel area is a mix of recreation and tourism. Its residents have a strong desire to maintain agriculture. • The basin needs more water infrastructure. • The success of the Upper Colorado Recovery Implementation Program for Colorado River Endangered Fish is important. • Agreements to supply water to other states reduces how water can be used in this basin.
<p data-bbox="98 858 334 889">Gunnison Basin</p> 	<p data-bbox="592 858 876 1342">The Gunnison Basin stretches over 8,000 square miles of western Colorado, extending from the Continental Divide to the confluence of the Gunnison and Colorado Rivers near Grand Junction. The largest cities in the basin are Montrose, Delta and Gunnison.</p>	<p data-bbox="889 858 1191 1342">The Gunnison Basin is largely forested. It lies between the Elk Range to the north, the Sawatch Range in the east, the San Juan Mountains to the south, and the Uncompahgre Plateau to the southwest. Water from these mountain drops more than 9,500 feet.</p>	<ul data-bbox="1211 858 1899 1342" style="list-style-type: none"> • Population growth in the headwaters will require additional water. • There are agricultural water shortages in the upper portion of the basin and it lacks money to build water projects. • There are some people who want to move water from this basin to the eastern slope. There is concern this will harm the basin. • There are disagreements with National Park Service about water in the Black Canyon. • Changing population demographics is changing how land is used.
<p data-bbox="98 1362 374 1393">North Platte Basin</p> 	<p data-bbox="592 1362 876 1665">The North Platte Basin is located in north central Colorado in Jackson and a small portion of Larimer Counties. It is about 2050 square miles.</p>	<p data-bbox="889 1362 1191 1705">This basin is made up of forests, shrublands and grasslands. It has the Park Range on the west, Front Range on the east, Rabbit Ears Range on the south and Wyoming on the north.</p>	<ul data-bbox="1211 1362 1899 1806" style="list-style-type: none"> • This basin does not have the population growth that the rest of the state is experiencing. • This basin wants to protect its existing water supply and is concerned about lack of forest management and its impact on water. • Endangered Species issues may cause problems with water use. • Current water agreements limit the amount of water available for irrigation. • • •

Basin	Location	Description	Water Challenges
<p data-bbox="96 183 358 217">Rio Grande Basin</p> 	<p data-bbox="624 183 901 560">The Colorado portion of the Rio Grande Basin is located in south central Colorado. It is about 7,543 square miles. The largest towns in the basin are Alamosa and Monte Vista.</p>	<p data-bbox="917 183 1286 641">The San Juan Mountains in the west, the Sangre de Cristo Range in the north and east, the Culebra Range in the southeast and the Colorado New Mexico state line in the south define the Rio Grande Basin. The San Luis Valley is a primary feature of this basin. It relies on agriculture economically.</p>	<ul data-bbox="1302 183 1911 526" style="list-style-type: none"> • The Rio Grande Compact and the effects of drought make new water development very difficult. • Agriculture is using water at unsustainable levels. The economic impacts of reducing irrigation would harm the region. • Groundwater is a key component of water use in the basin. Overuse of groundwater supplies will be difficult to address.
<p data-bbox="96 651 381 685">South Platte Basin</p> 	<p data-bbox="624 651 895 1028">The South Platte Basin (including the Republican River Basin) is about 27,660 square miles in northeast Colorado. The largest cities in the basin are Denver, Aurora , and Lakewood.</p>	<p data-bbox="917 651 1278 949">The basin starts in the west in the forested mountains. It extends east where it becomes grasslands and cultivated ground. Agriculture is an important economic contributor to this basin.</p>	<ul data-bbox="1302 651 1897 1332" style="list-style-type: none"> • This is Colorado’s most diverse and industrialized basin. Agriculture uses the most water but changes are occurring with cities buying more and more agriculture water. Some rural communities are in decline. • Competition for water is fierce and it is unclear how much competition there is for the same water supplies. • The lack of any new major water storage in the last 20 years has led to reliance on non-renewable groundwater in Douglas, Arapahoe, and northern El Paso counties. • Explosive growth in these counties and the lack of surface water has led to the creation of multiple small water districts. This makes coordinated water development hard and less efficient.
<p data-bbox="96 1348 508 1382">Yampa/White/Green Basin</p> 	<p data-bbox="624 1348 895 1647">The Yampa/White/Green Basin is more than 10,500 square miles in northwest Colorado. The largest towns in the basin are Steamboat Springs and Craig.</p>	<p data-bbox="917 1348 1272 1842">Large portions of the basin are federally owned lands. Livestock, grazing, and recreation are the main land uses. Steamboat Springs is a destination ski resort and is likely to experience continued population growth. The basin has steep mountain slopes, high plateaus, rolling hills, sandstone canyons and broad valleys and floodplains.</p>	<ul data-bbox="1302 1348 1903 1802" style="list-style-type: none"> • Agriculture, tourism, and recreation are important to this basin’s economy. • Industrial uses, especially energy production, are a major water use. Future energy development opportunities exist but are less certain. • The success of the Upper Colorado Recovery Implementation Program for Colorado River Endangered Fish is important. • There is concern that the basin will not get its “fair share” of water under the Colorado River Compact.

What does the Water Plan recommend?

It is projected that there will be a 560,000 acre-foot gap in the amount of water needed in Colorado in 2050 and what is available. Colorado's Water Plan is a guide to solve this problem.



Conservation:

Goal: To conserve 400,000 acre-feet of water used by industry, cities and towns through conservation efforts.

Every acre-foot of conserved water used to meet new demands is an acre-foot of water that does not need to come from existing uses.

Better Land Use:

Goal: 75 percent of Coloradans will live in places that have incorporated water-saving actions into their communities.

Colorado's Water Plan calls for partnerships among water suppliers and communities. This partnership will work to add water-saving actions into land-use planning. For example, using more drip irrigation and landscaping that does not need water in parks and other areas.



Agriculture:

Goal: Make it easier for agriculture producers to voluntarily share their water with cities. Share 50,000 acre-feet of agricultural water.

Without a water plan, Colorado could lose up to 700,000 more acres of irri-

gated agricultural lands—that equals 20 percent of irrigated agricultural lands. 35 percent of this land is in Colorado's most agriculturally productive basin, the South Platte.

The right to buy or sell water rights must not be eliminated. Colorado's Water Plan describes other options to "buying-and-drying" of farm land. The State will encourage agricultural producers to maximize the use of every drop of their water through new irrigation technologies.

Water Storage:

Goal: Attaining 400,000 acre-feet of new water storage.

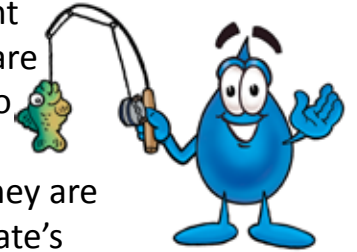


Colorado must also develop additional storage to meet growing needs and face the changing climate. New storage projects will be innovative, and will use technologies such as aquifer storage and recharge. Storage also needs to be added more rapidly. To do this, Colorado needs to address the broken permitting system that now takes 15 to 20 years for projects to be approved.

Watershed Health, Environment, and Recreation:

Goal: All of Colorado rivers, lakes and streams will have plans in place to protect their water quality.

The environment and recreation are too important to Colorado not to protect both. They are critical to the state's economy and our way of life.



Funding:

Goal: To raise revenue in the amount of \$100 million annually. Such funds could establish a repayment fund and green bond program. The green bond fund would focus on funding environmental and recreational projects. Funds will be used to support urban conservation, agricultural conservation, alternative transfer methods, education, outreach, and other plan priorities.



Education, Outreach and Innovation:

Goal: To improve the level of public awareness and involvement regarding water issues. Colorado's Water Plan will expand outreach and education efforts that engage the public to promote discussion and decision making regarding balanced water solutions.



Conserving Water

Water conservation is an important part of the Colorado Water Plan. Conservation of water means using less water because you want to use less, not because you have to use less (rationing). If your family uses an acre-foot of water in a year (325,851 gallons) how much water will they save using 10% less water? _____

If your family can do things that will result in using 20% less water, how many gallons of water would be saved? _____

Brainstorm with your fellow students, what could you do to save water? _____

Let's go down the drain...
Find which way the water flows through the pipes to reach the wastewater treatment plant.

START

WASTEWATER TREATMENT

Family Conservation Checklist

As a family activity, fill out the water conservation inventory form. Use your answers to learn what you can do to be a water conservationist.

INDOORS

	YES	NO
Do you check faucets, toilets and showerheads for leaks?	<input type="checkbox"/>	<input type="checkbox"/>
Have you fixed any leaks?	<input type="checkbox"/>	<input type="checkbox"/>
Do you use the toilet as a trash can?	<input type="checkbox"/>	<input type="checkbox"/>
Is your toilet a high-efficiency model?	<input type="checkbox"/>	<input type="checkbox"/>
Do you take baths?	<input type="checkbox"/>	<input type="checkbox"/>
Do you take showers?	<input type="checkbox"/>	<input type="checkbox"/>
Do you have a low-flow showerhead?	<input type="checkbox"/>	<input type="checkbox"/>
Do your faucets have low-flow nozzles?	<input type="checkbox"/>	<input type="checkbox"/>
Do you let water run while you brush your teeth?	<input type="checkbox"/>	<input type="checkbox"/>
Do you run your dishwasher when it's not full?	<input type="checkbox"/>	<input type="checkbox"/>
Do you let water run while washing vegetables or dishes?	<input type="checkbox"/>	<input type="checkbox"/>
Do you keep a pitcher of water in the refrigerator instead of running the faucet until the water gets cold?	<input type="checkbox"/>	<input type="checkbox"/>
When you wash dishes by hand, do you use two basins one for washing and one for rinsing - instead of letting the water run?	<input type="checkbox"/>	<input type="checkbox"/>

OUTDOORS

	YES	NO
Do you sweep the driveways, walks and patio instead of cleaning them with a hose and water?	<input type="checkbox"/>	<input type="checkbox"/>
Have you checked faucets for leaks and fixed any you found?	<input type="checkbox"/>	<input type="checkbox"/>
Do you use a sponge and bucket to wash the car, or go to a commercial car wash, instead of using a hose with running water?	<input type="checkbox"/>	<input type="checkbox"/>
Do you water the lawn in the early morning or evening to avoid evaporation?	<input type="checkbox"/>	<input type="checkbox"/>
Do you water only when your landscape needs it?	<input type="checkbox"/>	<input type="checkbox"/>
Do you use drip irrigation to water slowly, deeply, thoroughly and infrequently to encourage root growth?	<input type="checkbox"/>	<input type="checkbox"/>
Do you mow your lawn to two inches or more and leave the clippings?	<input type="checkbox"/>	<input type="checkbox"/>
Do you water trees and shrubs separately from the lawn?	<input type="checkbox"/>	<input type="checkbox"/>
Do you use mulch to reduce evaporation?	<input type="checkbox"/>	<input type="checkbox"/>
Have you planted native plants in your landscaping?	<input type="checkbox"/>	<input type="checkbox"/>
Do you collect rainwater to use in the garden?	<input type="checkbox"/>	<input type="checkbox"/>
Do you put litter and garbage in trash cans?	<input type="checkbox"/>	<input type="checkbox"/>
Do you recycle?	<input type="checkbox"/>	<input type="checkbox"/>
Do you compost leaves and other garden growth?	<input type="checkbox"/>	<input type="checkbox"/>
Have you learned the right way to throw away leftover paint containers, garden chemical containers and cleaning product containers?	<input type="checkbox"/>	<input type="checkbox"/>

If you are a water conservationist your answers match the following:
INDOORS: yes, yes, no, yes, no, yes, yes, yes, no, no, no, yes, yes.
OUTDOORS: all yes.

