

Title: Humans’ Need for Water

Grade level: 7-12 grades

Time Frame (in minutes): 120 minutes

Standards Connection:

National Geography Standards	State/District Geography Standards
Standard 4 : The Physical and Human Characteristics of Places	Standard 2: Students know the physical and human characteristics of places, and use this knowledge to define and study regions and their patterns of change.
Standard 14: How human actions modify the physical environment	Standard 5: Students understand the effects of interactions between human and physical systems and the changes in meaning, use, distribution, and importance of resources
Standard 18: How to apply geography to interpret the present and plan for the future	Standard 6: Students apply knowledge of people, places, and environments to understand the past and present and to plan for the future

Expectations (objectives):

1. Students will list the major water basins in Colorado
2. Students will list the major rivers in Colorado
3. Students will describe where local drinking water is harvested
4. Students will describe the population’s effect on the water storage systems in Colorado
5. Students will understand the difference between ground and surface water, including the concept of water rights.

Inquiry (Essential) Questions:

What are the water basins in Colorado?

Where does the water come from for commercial, agricultural, and municipality use in our community and other communities?

What are the issues facing Colorado’s commercial and agriculture use of water?

Materials:

Colorado County map with population percentages
 Physical Geographic Map of Colorado identifying Colorado’s water basins and major rivers

Map of Colorado's storage water systems
Green, blue, pink, and yellow paper (used to make game pieces)

Teacher Background and Student Preparation:

This lesson might be taught as a unit on how human needs impact our environment. It is mandatory for our future on this planet that human beings be responsible as we interact with our environment. As the human population increases in our state and demands on the environment also increase, students need to be aware of the future problems of water usage. Industrial, agricultural, commercial, and recreational users of water will have to work together to solve our future water problems. Also explain water rights and how this legal determination of water distribution can affect communities.

The game used in the motivation/warm-up will have been set up prior to class. The four different color papers should be cut into pieces approximately 4 inches by 3 inches. The color papers should be labeled with the following symbols; green= \$, blue=H₂O, pink= humanity, yellow=agricultural/industrial needs. Depending on the class size, approximately eight green cards, four blue cards, four yellow, and eight pink cards per group are needed. The ratio to keep the human population alive should be: one pink card: two blue cards: one yellow card. This game will show the students how the growth in the different areas of Colorado affects the demand and supply of water.

There are several maps of Colorado being used in this lesson. These maps can be either shown through multi media methods, student class atlases or individual maps passed out for students to use in this game and to save for future reference in their studies. As the maps are being discussed students can add information to their own maps and also take notes.

Getting Started/Motivation/Warm-Up:

Separate the class into groups each representing a different water basin of Colorado. Inform the students they are going to play a chance game. Every game turn covers 10 to 15 years in the human life span. These life cards are used to keep the human population alive using water and having the population interact with agriculture/industry. Explain to the students the ratio that is needed to keep the population alive; the green money cards can be used to trade with other groups for the needed yellow or blue cards. Explain the ratio that is needed to keep the population alive. If this ratio is not met, then start taking away the population cards.

For the first turn, hand out one card of every color to each group. This will be year one. Now ask students to discuss how in the next 10 to 15 years Colorado may be so changed that it will impact human life. Some examples would be drought, global warming, forest fires, overpopulation, war, recession, economic depression, etc. Have the game take 3-4 turns, at every turn the teacher hands out these color cards to the different groups. The teacher needs to make sure the Eastern basins get more pink and green cards, while the Western basins get more blue cards. Hand out the yellow cards in every turn, but decrease the cards as the turns progress. Briefly discuss with the students why the cards are changing in ratio for the different groups. Population on the Eastern basin brings money but also decreases the space for agricultural/industrial uses and at the

same time increases the need for additional water. The Western basins have an adequate supply of water, but lack the population and money to develop this resource. A wild card could be introduced that would represent legal water rights and how this can alter the distribution of water in a community. This game should be limited to about 15-20 minutes.

Lesson Development/Activities:

1. After the game, have the students leave their groups and record on their own paper three strategies that their group used to maintain their human population. Briefly discuss how this game can be related to our world. Discuss how the population demands on one region greatly affect another region. Point out this effect can be seen in Colorado and our demands for water. Show students the Colorado county map with their population percentages. Have the students identify and record the top ten counties by population.
2. Next display the Colorado physical feature map. Discuss as a class why the top ten populated counties are located where they are in the state. Have the students record their written conclusions.
3. Also using the Colorado physical feature map identify and label water basins and the major river outflows for the state. Have students compare where the majority of the water flows and also where the majority of the population lives. Have the students think over the problem of how the population gets water if the majority of the flow is on the other side of the state. Have each student record their answer.
4. Show the map of Colorado's storage water systems. Show the students that the majority of the water is on the western slope, yet the population demands for water is on the eastern side. Also, explain why the storage water systems are located in the mountains; the high altitude helps with low evaporation rates, natural flow to the pump sites for the eastern water systems, and natural valleys for man made reservoirs. Discuss projects like the Homestake Collection System and the Big Thompson Water Project. These water projects have reservoirs that pump water from the western slopes to the eastern slopes. Have the students briefly compare their answer for meeting the water demands with what was shown and discussed. Identify the lakes in Colorado which are man made, have students record possibly how these man made lakes have affected the environment locally and state wide. Briefly discuss answers.
5. Restate the needs of human survival: water, shelter, and food. Shelter and food uses water to produce and manufacture goods. Presently in Colorado agriculture uses approximately 85% of our water and industry uses 1.9%. The growing population will increase their percentage needed as more houses are built and more water based needs are constructed such as schools, parks, lawns, swimming pools, golf courses, etc. This growth is a concern for future water consumption. Relate back to the game the students played in the beginning of class when water was becoming scarce. What did the groups do to meet the needs of the population? Unfortunately, in our world the blue cards of water are limited and eventually as in the game there will be no more blue cards available, only pink cards. What will have to change for the future? Have the students

divide back into their groups to develop possible solutions that could help with water problems in the future. Make sure the groups record their discussion, limit their responses to two or three ideas.

Closure:

As a class have each group share the solutions that they came up with. As the groups share their solutions, point out to the students that these solutions could be the answer to future water problems. Relate to the students that water issues are already a pressing problem and that it is imperative for the problem to be resolved. Have the students record on their individual papers three ideas they heard during the group presentations which they felt had merit.

Assessment:

1. As a mastery of the content, have students draw a map of Colorado identifying the water basins and the major river sources. Have the students identify and label the major populated areas, and lastly have them draw in the method of how water is transferred from the western slope to the Front Range of Colorado.
2. Have the students respond to the following in writing:

In this lesson, you have learned about the water resources in Colorado and the impact the human population has on it. As the human population increases our water resources will start to decrease due to a multitude of demands. As a team, you have come up with some solutions to help reduce the demand for water. Also you have heard from classmates other solutions to the water problem. What is the number one solution that you feel could be put into practice next year? What are three to four steps that would have to happen to make this idea a reality? Write an expository paragraph describing the advantage of your plan.

Extending the Lesson:

1. A map of cropland in Colorado could be shown, with an additional map to show the irrigated land. An evaluation of crops grown and the amount of water needed to grow them then compared. Crop selection could be addressed to make sure the best use of land and water was being practiced. Also, the types of irrigation processes used through-out the state with advantages and disadvantages of each type.
2. Research into water issues that other states are addressing and solutions that could be effective in Colorado.
3. Comparison of ground water and surface water; amounts, periods when used, and methods used to apply the water to agricultural practices.

Dear Cara,

It's hard to believe that it has been three months since the COGA summer institute. Rebecca and I have been busy with a variety of COGA events and we have seen some of you since the summer. Rebecca and I feel that it is important that we spread good information about classroom activities that other teachers can use. To that end we have reviewed the lesson plans that you sent us and have some comments about your plan. We are trying to insure that we have an excellent product to offer on our web site. Please review our comments and respond to those comments by altering your lesson plans. After you have done the requested changes we will be uploading your lesson plan on the COGA web site. With your permission we will be associating your contact information with your lesson plan so that if other teachers have questions they can ask you for more information. We know that you are all dedicated teachers who take pride in your work and we recognize that dedication in your lesson plans. Our target for getting these lesson plans on the web is November 1. Please let us know if you are unable to meet that deadline.

This is a very comprehensive lesson plan of a good engaging, interactive set of activities.

One addition to Extending the Lesson would be a comparison of the use of ground water with surface water. This will start discussion of how the two types of use are different and the same.

Steve and Rebecca