



UTAH Nature Explorers

Time:

6 Day Unit—

45 minutes session of fieldwork (plus travel time)
(5) 45 minute classroom sessions

Level:

Secondary Science – Earth Science

Goals:

Students will form a sound argument backed up with relevant evidence with relation to the topic of who should have the most access to water in times of a drought.

Objectives:

Students will be able to –

1. Describe the need for water shared by various groups
2. Evaluate and adjust their arguments based on their understanding of each group's need for water
3. Design arguments that will contain the best evidence in favor of their position and refute the best evidence from other competing groups

Materials listed with each individual activity.

Dynamic Droughts

by Steven Haderlie, Neicca Butts, and Mark Larese; Casanova

Correlations to Core Curriculum:

Secondary Science – Earth Science

- Standard 4: Students will understand the dynamics of the hydrosphere.
 - Objective 2: Analyze the characteristics and importance of freshwater found on Earth's surface and its effect on living systems.
 - Indicator d: Research and report how communities manage water resources (e.g., distribution, shortages, quality, flood control) to address social, economic, and environmental concerns.

Background Information:

Water Uses

At all times, but especially during times of drought, water is in limited supply in Utah. Competing groups of individuals all want water, and they don't want their use of water to be restricted. Because water is scarcer during times of drought, some groups in a community may have to make do with less water than they would prefer. Water use in a community could be categorized as follows:

- Agricultural use (including crop irrigation, livestock drinking water, and water used for farming operations, such as milking cows)
- Household use (drinking water, washing clothes, toilet, showers, etc.)
- Household irrigation (watering household lawns and gardens)
- Industrial use (use in industrial plants and commercial buildings)
- Public irrigation (lawns and grounds irrigation for public facilities such as schools, courthouses, city halls, community centers, libraries, parks, etc.)
- Recreational use (water features/creeks/ponds etc. at golf courses and parks; lakes and streams used for boating, swimming, fishing, etc.; commercial and private swimming pools.)

It may be helpful for teachers to contact local water authorities to determine the actual usage of water by these different groups and organizations in their communities. In general, agriculture and

Did you know?

Put dye tablets or food coloring in your toilet tank and wait to see if the color appears in the bowl (without flushing). If it does, you have a leak!

<http://www.conservewater.utah.gov/Tips/TipsList.asp?n=Bathroom&ID=1&d=Conserve%20in%20the%20Bathroom>

irrigation take by far the lion's share of the water available in any community.

Managing Drought

Drought should not be viewed as merely a natural phenomenon or event. Its impact on society is often a result of the interplay between the natural event (reduced precipitation) and the way society responds with management of existing supplies. People often compound the impacts of drought through the mismanagement of available supplies. One example of this occurs when outdoor watering restrictions imposed by community leadership are actually perceived by the general public as being premature or unnecessary. Often in these instances while people comply with the letter of the law, water use actually rises. Consequently, an informed and caring general public is an important ingredient to successful drought management.

Utah's successful management of drought will in large part be a function of leadership providing the necessary information to the public, and people in turn responding positively. Utah's current Drought Response plan was written during the drought of the late 80's and early 90's.

The plan uses the SWSI to describe five drought conditions. The SWSI is a relative scale with 0 representing average conditions. A positive number indicates that water supplies are above normal, while a negative number indicates that water supplies are below normal. The first condition, Normal to wet, is really a nongdrought condition and the plan merely calls for the periodic updating of SWSI data and maps. When the SWSI moves into the 0 to 1.0 range, conditions are still considered normal, with water supplies only slightly below average. Although this is not a true drought condition it is called "Emerging Drought" in the plan, primarily because of the potential for worsening conditions. During this phase, the plan merely calls for increased monitoring of data.

When the SWSI moves below 1.0, the condition is a Phase I Drought. At this point the state's Water Supply and Availability Committee is activated and begins to closely monitor water supply data and initiates the dissemination of information to the media and general public. When the SWSI moves below 2.0, it is a Phase II drought condition. At this time a Drought Review and Reporting Committee and Drought Task forces are created with members of various state agencies to coordinate drought response actions and facilitate the timely dissemination of data and information. The Governor's Proclamation of Drought Emergency, rather than a SWSI number, triggers drought Phase III. The Governor's declaration of

Did you know?

In August 2012, drought conditions extended over 70 percent of the United States. Counties in 33 states were designated “disaster counties” by the government. In the beginning of 2013, drought still affected more than 60 percent of the country.

http://education.nationalgeographic.com/education/encyclopedia/drought/?ar_a=1

Materials:

Supplies

- Science journals, pencils (one per student)
- 20 plastic, clear cups (disposable)
- 10 cups of dry soil
- (20) 4”x4” pieces of plastic wrap (enough to cover the tops of cups)
- 5g10 Bright lamps or area with direct sunlight and heat

drought emergency is the initial and necessary step to make available many of the state and federal drought assistance programs.

<http://www.water.utah.gov/droughtconditions/whatisdrought/>

6 Day Unit Plan:

1. Introduce droughts, water conservation, and do a ‘water conservation’ lab experience
2. Fieldwork
3. Have a guest speaker discuss water uses in the community (or present statistics on your own)
4. Students will research and create a presentation on assigned water use category
5. Continue researching, finalize presentation
6. Students will present information on their category to the class in a 3 minute presentation, a class vote will be taken on which categories should have water restrictions placed on them first in a “Water Council Meeting”

Activities:

Day 1 (Classroom)

Engage (10 minutes) – Start by watching the video clip, “Hope for Rivers During Drought,” created by National Geographic. The video can be found at the following link:

<http://video.nationalgeographic.com/video/yampagriverrgdroughtglease>, and the length of the clip is 5:18. As students watch the movie, have them write down who and what droughts negatively affect (i.e. farmers, recreation, economy, etc.)

After finishing watching the video clip, discuss the negative effects of a drought as seen in the video clip. Add any other negative effects that students can think of.

Discuss that during droughts, which are somewhat common in Utah, we have to evaluate and minimize our usage of water. Ask students to list where water is being used throughout the community. Make

- 2 cups of water, measured into amounts of 50 mL each

Equipment

- Internet access
- Ability to show/project video clips
- Whiteboard/SmartBoard

a list on the board. (Look in the background information section for more information on categories of where water is used in our communities.)

Tell students that they are going to be studying how much water is often used for different purposes in our community, and how we can more effectively save water and prevent (or get out of) a drought.

Explore (25 minutes) – Separate students into small groups (approximately 4 people per group). Each group will start by doing the ‘Drought Simulation’ Activity. Teach students how to build their ‘wet’ and ‘dry’ climate (see background information section for directions), and have students set their ‘climate cups’ under direct sunlight or a bright lamp. Tell the students that they will be making observations after their cups sit under light for 5 minutes, and then again in 15 minutes.

While waiting to observe their climate cups, [insert drought activity here.](#)

Explain (10 minutes) LL

Hold a class discussion in which students can share what they observed about their climate cups. Encourage students to describe what they saw as time went on, and their comparisons between their wet and dry cups. Relate this experiment to drought in the real world. How are real droughts similar to this activity? How are they different?

Day Two (Fieldwork)

Engage (10 minutes) – Show students a chart with common water uses (found at the end of the lesson plan). Discuss which activities used more water than they expected and less than they expected. Tell students that they will have the opportunity to measure some of the water usage in their community. Before leaving on the field trip, make sure students have their science notebook, their calculator, and a pencil.

Explore (30 minutes) LL Take students on a field trip to streams that feed exclusively one category, such as an irrigation canal for crops, a stream feeding into golf course water features, or something similar. Have students measure the volume of water flowing past. Students will use the process where they time the velocity of a stream using a golf ball, and then take separate measurements of depth in intervals across the stream. By multiplying the square

Materials:

Supplies gg

- Common Water Uses paper (1 copy)
- Science journals and pencils (1 per student)

Equipment gg

- Document Camera or projector
- Calculators (1 per student)
- Golf balls (At least 10)

- 5g10 Measuring tapes

footage of water height by the distance in feet that the water travels per second, they can calculate the volume of water that passes a given point each second.

Students should write down their calculations and observations in their science journals.

This activity can be done as a whole group, or students can be separated into smaller groups to do the activity.

Explain (10 minutes) – Before leaving to go back to the school, hold a brief discussion in which students can talk about the results of their test. Ask the students whether or not they think that this is a justified use for the water in their city. Ask, “Should this use of water be restricted more in order to prevent a drought? Why or why not?”

Materials:

Supplies gg

- Science journals and pencils (1 per student)

Equipment gg

- Guest speaker or city water statistics

Day 3 (Classroom) –

Contact your local city/county water department, and ask representatives to come to the classroom to present on how water is used in the community and to speak about the different groups and organizations that need water. If they cannot come, simply obtain the information and present it to the class.

Day 4 (Classroom) –

Materials:

Supplies gg

- Science journals and pencils (1 per student)

Equipment gg

- Computers, IPads, or other tool for researching
- Software – PowerPoint, Word, Prezi, etc.

Engage (10 minutes) – Briefly discuss what has been learned over the past 2 days about water use in their community. Explain that today, students will be separated into groups of 4g6 people each, and each group will represent one of the ‘water needs’ throughout the community. They will have the next 2 days of class time to research why that particular group needs water, and to design a persuasive paper (that they can present) or another presentation on why their water needs are more important than others. Explain that their facts and reasoning will be helpful to them as they participate in the magnetic debate which will be held later in the unit.

Assign 4g6 students to each of the following groups:

- Agricultural use (including crop irrigation, livestock drinking water, and water used for farming operations, such as milking cows)
- Household use (drinking water, washing clothes, toilet,

showers, etc.)

- Household irrigation (watering household lawns and gardens)
- Industrial use (use in industrial plants and commercial buildings)
- Public irrigation (lawns and grounds irrigation for public facilities such as schools, courthouses, city halls, community centers, libraries, parks, etc.)
- Recreational use (water features/creeks/ponds etc. at golf courses and parks; lakes and streams used for boating, swimming, fishing, etc.; commercial and private swimming pools.)

Each group of students should construct a well-supported argumentative essay or presentation detailing the importance of their organization's water needs and supporting the argument that their water use should not be restricted even during this time of drought. They may also wish to explain why other groups don't necessarily need as much water and why restricting their water use wouldn't be as big of a deal.

Each group must then make a presentation to the class to try to persuade class members that their water rights should be protected and not restricted. Students in the audience will be allowed to ask questions of the group presenting.

Explore, Explain (35 minutes) – Give students the remainder of their class time to research and create a presentation on their assigned topic. Walk around to answer questions or clarify information frequently.

Day 5 (Classroom) –

Allow students to spend their entire class period finishing their research and creating their presentation. Remind them that they will be presenting their information to a 'water council' (made up of classmates) the following day.

Materials:

Supplies gg

- Science journals and pencils (1 per student)

Equipment gg

- Computers, iPads, or other tool for researching
- Software – PowerPoint, Word, Prezi, etc.

Materials:

Supplies gg

- Water Council agenda (1 per student, attached at end of lesson plan)
- Science Journals and pencils
- 'Who Loses Some Water Rights' worksheet (1 per student)

Equipment gg

- Ability to show presentations – Smartboard, projector, etc.
- Software – PowerPoint, Word, Prezi, etc.

Day 6 (Classroom) –

Engage (5 minutes) – As head of the 'water council,' welcome students to the council meeting, and pass out agendas describing the discussion points for the day. Remind the council members (the students) that your city is experiencing a drought, and that if action isn't taken soon, the water needs of the community are only going to get worse. Remind the council that at the end of the presentations (the agenda items), they will each need to choose 3 categories of water use that should be restricted first in their community. Ask council members to critically evaluate what would be best for their community as they listen to the presentation of each agenda item.

Explore (20 minutes) – Allow each group to present their 3g5 minute presentation on why their category's water rights are so important. At the end of each presentation, allow for up to 3 questions from the 'audience'. Encourage council members to keep notes in their science notebook so that they can remember critical points and answers to questions from each presentation.

Explain (15 minutes) – After all agenda items (presentations) have been covered, hand out the "Who Loses Some Water Rights?" worksheet. Tell students to circle the three categories that they believe should have restrictions placed on their water use first, before any restrictions are placed on the other three. After students have made their choices, collect the papers to tally up the totals. If needed, you may choose to have students write their journal entry (below), while you tally the answers. Announce the results of the council vote at the end of the day to inform the council which categories will have their water rights restricted first, before the others receive any restrictions.

Elaborate (5 minutes) LL – Remind students that, although we chose 3 classroom winners for most important water rights, every category is important and necessary in our community. Have them answer the following prompt in their science journal: "What is one way you can conserve water in our community?"

Announce the results of the survey. If time is still available, discuss the results and allow students to share their responses to the journal prompt.

Did you know?

Even a silent toilet leak (one you normally can't hear), can leak between 30g 500 gallons of water every day!

http://www.exploratorium.edu/imagining/station/activities/classroom/characteristics/ca_characteristics.php

Assessment:

This assessment for this unit is the three minute presentation created by groups. A rubric is attached at the end of the lesson plan. This rubric should be given to students before they start their presentations, so that they are aware of what the expectations and requirements for the project are as they create their presentation.

Extensions:

- The USGS Water Science School has created a short survey that students can take to see how much water they are using each day. The survey takes about 5 minutes, and is a good way for students to see how much water they really use, sometimes without even realizing it. <http://water.usgs.gov/edu/sq3.html>
- Utah Beaurau of Land Reclamation and Utah State University Extension have created a video to show you how to conserve water in simple ways, such as making sure your sprinkler system is working at its maximum efficiency. Watch the short video clip at the following link: <http://www.conservewater.utah.gov/Media1/TVspots/EZH2O/PageContent.asp>
- On the 'Slow the Flow' website, <http://www.slowtheflow.org/>, you can have students take a customized survey to see how much of a water conservationist they are, get indoor and outdoor water tips, and learn about realtime water conservation efforts in their area.

Resources:

Books

- *Utah Master Naturalists Watershed Textbook* (http://extension.usu.edu/utahmasternaturalist/files/uploads/UMNP_Watersheds_Text.pdf)

Websites

- Utah Division of Water Resources (Click on the 'Water Education' section for teacher freebies and resources) gg. <http://www.water.utah.gov/>
- Slow the Flow, Save H2O gg <http://www.slowtheflow.org/>
- USGS Water Science School gg <http://water.usgs.gov/edu/sq3.html>
- National Geographic Definition gg http://education.nationalgeographic.com/education/encyclopedia/drought/?ar_a=1

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Common Water Uses

- Brushing teeth without tap running = .25 gallons
- Brushing teeth with tap running = 2 gallons/minute
- Washing Machine (not high efficiency) = 40 gallons
- One toilet flush = 3 gallons
- Dishwasher = 10g20 gallons
- Dishwashing by hand = 4 gallons/minute
- Bath = 40 gallons
- 5 minute shower = 10 gallons
- Hose/sprinkler = 140 gallons/hour

These amounts are general, average amounts. Energy; efficient washing machines, toilets, and dishwashers use significantly less water, as do low; flow showerheads. These amounts are meant to give a general idea of how much water is used for daily activities.



August 25, 2008

Oliver City Water Council

Water Council Agenda

Opening Remarks/Welcome

Given by Council President, Mrs. Burbank

Upcoming Events

- 'Slow the Flow' fair at Crystal View Elementary, September 5th at 6 pm
- Next Water Council meeting – September 28th at 7:30 pm

Agenda Items

- Agricultural Water Use
Presented by Candyce, Shawn, Dezmond, and Ariel
- Household Water Use
Presented by Abby, Josh, Caydee, and Samuel
- Household Irrigation Water Use
Presented by Boe, Brian, Mary, and Ashlyn
- Industrial Water Use
Presented by Alaura, Scotty, Andrew, and Sarah
- Public Irrigation Water Use
Presented by McKenzie, Alan, Ryan, and Sierra
- Recreational Water Use
Presented by Rebecca, Tyler, Ben, and Kacie

Hold Water Council Vote on restrictions

Results, as presented by Water Council President:

Water Rights Presentation

The group presentation lasts 3g5 minutes. <i>(10 points)</i>	The group presentation lasts less than 3 minutes or more than 5 minutes <i>(5 points)</i>	No presentation is given <i>(0 points)</i>
During the presentation, each group member is involved and presents part of the information. <i>(20 points)</i>	During the presentation some group members are involved and present the information. <i>(10 points)</i>	The group is not working together to present the information <i>(0 points)</i>
The group presents at least 4 reasons why their water category is important. <i>(20 points)</i>	The group presents at least 2 reasons why their water category is important. <i>(10 points)</i>	The group gives 1 or less reason why their water category is important. <i>(0 points)</i>
The group turns in a bibliography cited in MLA format with at least 3 sources. <i>(15 points)</i>	The group turns in a bibliography that, at minimum, lists three website URLs where they found information. <i>(8 points)</i>	The group turns in less than 3 sources, or does not turn in a bibliography. <i>(0 points)</i>

Student Name:

Points: /65

*Note to teachers – A sample PowerPoint has been created so that you can get an idea of what student presentations may look like. If you would like to download it, visit www.utahnatureexplorers.com, and look in the files attached to this lesson plan. It has been created in a simple way intentionally, to demonstrate what kind of presentation would meet the criteria in your classroom. This PowerPoint should help you in grading other presentations, and maybe a helpful demonstration for your class to show them what is expected of them in this presentation assignment.