Where’s The Water?
Teacher's Guide: Grades 4-6

Aqua Team
the Next Generation
Duplication of these materials beyond limits set by copyright laws and those specified below is strictly forbidden.

Copies of these materials may be made for non-commercial, educational purposes only, provided that the following copyright notice must appear on all copies and materials:

© 2011 Beaver Water District

Written permission must be obtained to modify these materials or for commercial or non-educational use. Address all correspondence to: Chief Executive Officer, Beaver Water District, Post Office Box 400, Lowell, AR 72745.
# Contents

## Overview

Beaver Water District Building Blocks to Water Education Program ......................................................... 1
What are the project objectives? .................................................................................................................. 1
Why was this project developed? .............................................................................................................. 1
Desired student outcomes: ......................................................................................................................... 1
What is the history of the Beaver Water District - how did it come to be? ............................................. 2
Where did the name originate? .................................................................................................................. 2
What areas of Arkansas are covered by Beaver Water District? Which towns and cities benefit from Beaver Water District? ............................................................................................................. 2
How does Beaver Water District impact the Northwest Arkansas region? ............................................ 3
Further plans for developing more lessons, workshops, etc. .................................................................... 5
Frameworks .............................................................................................................................................. 6
5 Es Teaching and Learning Model ........................................................................................................ 6

### Lesson 1: "Where's The Water?" Board Game

Purpose .................................................................................................................................................. 10
Objective .............................................................................................................................................. 10
Arkansas Framework Correlation ............................................................................................................. 10
Language Arts .................................................................................................................................... 10
Mathematics ...................................................................................................................................... 10
Science .............................................................................................................................................. 11
Social Studies ................................................................................................................................. 12
Materials ........................................................................................................................................... 12
Procedure ........................................................................................................................................... 12
Part 1 - Large Group Discussion ........................................................................................................ 12
Part 2 – Playing the Game .................................................................................................................. 13
Part 3 – Journal ................................................................................................................................. 13
Discussion .......................................................................................................................................... 13
Assessment ......................................................................................................................................... 13
Additional Resources .......................................................................................................................... 14
Lesson 1 Student Worksheets ............................................................................................................... 15
KWL Chart ........................................................................................................................................ 16

### Lesson 2: "Where's The Water?" Home and School Audits

Purpose .................................................................................................................................................. 29
Objective .............................................................................................................................................. 29
Arkansas Framework Correlation ............................................................................................................. 29
Language Arts .................................................................................................................................... 29
Mathematics ...................................................................................................................................... 30
Science .............................................................................................................................................. 31
Social Studies ................................................................................................................................. 32
Materials ........................................................................................................................................... 33
Procedure ........................................................................................................................................... 33
Part 1 - Large Group Discussion ........................................................................................................ 33
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 2 – Home Water Audit</td>
<td>34</td>
</tr>
<tr>
<td>Part 3 – Water Bill &amp; Meter Reader</td>
<td>34</td>
</tr>
<tr>
<td>Part 4 – Drip Calculator</td>
<td>35</td>
</tr>
<tr>
<td>Discussion</td>
<td>35</td>
</tr>
<tr>
<td>Assessment</td>
<td>35</td>
</tr>
<tr>
<td>Resources</td>
<td>36</td>
</tr>
<tr>
<td>Lesson 2 Student Worksheets</td>
<td>37</td>
</tr>
<tr>
<td>KWL Chart</td>
<td>38</td>
</tr>
</tbody>
</table>
Overview

Beaver Water District
Building Blocks to Water Education Program

What are the project objectives?

Objectives: To develop age-appropriate educational materials to teach students about Beaver Lake watershed protection and water treatment at Beaver Water District.

The following strategies were used to develop and carry out objectives: 1) Determine interest and commitment from public school systems in Fayetteville, Springdale, Rogers, and Bentonville; 2) Ensure that materials provided are relevant to school systems' learning objectives; 3) Identify available, appropriate materials from AWWA, EPA, Corps of Engineers, Upper White River Basin, Audubon Arkansas, and other stakeholders; 4) Ensure ongoing participation from public school curriculum directors as programs are developed; test for content utility during process; 5) Test viability of program(s) in classroom setting prior to rollout; 6) Utilize hands-on learning methods where possible and encourage out-of-classroom experiences on the watershed.

Why was this project developed?

This project was developed to ensure that drinking water education and watershed education, based on Beaver Lake and the Beaver Lake Watershed, would be available in schools located in areas that receive drinking water from Beaver Water District.

Desired student outcomes:

1. Students will understand drinking water sources.
2. Students will understand that water is a valuable resource necessary for quality of life in Northwest Arkansas.
3. Students will relate watershed health to water quality in Beaver Lake.
4. Students will learn definitions related to drinking water and watershed.
5. Students will learn about activities and behaviors that will promote watershed health in Beaver Lake, and thus become stakeholders when it comes to their own water quality.
6. Students will relate this information and these behaviors to their family members and friends and others in the community.
7. Students in higher grade levels (such as high school) will understand lake zones, a natural lake vs. a manmade lake, and technical terms such as trophic, mesotrophic, oligotrophic, lacustrine zone, riverine etc.
What is the history of the Beaver Water District - how did it come to be?

**Mission:** Our mission is to serve our customers’ needs by providing high quality drinking water that meets or exceeds all regulatory requirements and is economically priced consistent with our quality standards.

**History:** Fifty years ago, visionary community leaders got together to discuss the need for a long-term supply of clean, safe water for Northwest Arkansas. With an eye to the future and knowledge that a large lake was the best source of water, these citizens worked to establish Beaver Lake Reservoir. Beaver Water District was created to pay for the drinking water supply allocation of the lake. The dam that created Beaver Reservoir and the first water treatment plant were completed in the mid-1960s. Since that time, the District has expanded facilities and improved to keep up with increased water demand and stricter drinking water standards. In addition, three other water utilities have been created to provide drinking water from Beaver Lake.

Where did the name originate?

The Beaver Water District got its name from Beaver Lake. Beaver Lake got its name from the town of Beaver, which is actually located in the Table Rock Lake region, according to the Corps of Engineers’ office in Rogers, Arkansas.

What areas of Arkansas are covered by Beaver Water District? Which towns and cities benefit from Beaver Water District?

Beaver Water District supplies safe, clean water to about 300,000 people and industries on Northwest Arkansas. The district sells water wholesale to Fayetteville, Springdale, Rogers, and Bentonville.

*Fayetteville* buys water from Beaver Water District and owns and operates the system in Fayetteville, Farmington, Greenland, Goshen, Wheeler, parts of Johnson and some rural areas in Washington County. Fayetteville also provides wholesale service to Elkins, West Fork, and Mount Olive Rural Water Association.

*Springdale* Water Utilities buys water from Beaver Water District and sells to consumers in Springdale, Bethel Heights, Elm Springs, the northern part of Johnson, the southern part of Lowell, and unincorporated areas of Washington and Benton counties that are within its designated water service boundary. Bulk sales are made to consecutive water systems operated by the cities of Cave Springs and Tontitown.

*Rogers* buys water from Beaver Water District and resells it to Rogers and a portion of Lowell and to Benton County Rural Development Authority (RDA) No. 4 Frisco Springs.

The city of *Bentonville* buys water from Beaver Water District and resells it in Bentonville and Bella Vista. You can access a diagram at the District’s website at [www.bwd2o.org](http://www.bwd2o.org).
How does Beaver Water District impact the Northwest Arkansas region?

Much has been written about the phenomenal growth of Northwest Arkansas, which adds about 1,000 new residents each month. According to a recent population study, there could be as many as 1.2 million people residing in this area by 2055. Rapid growth produces strains on infrastructure as cities in the region struggle to provide wastewater treatment, roadway expansions, traffic management, waste disposal and other services.

Through its master planning process Beaver Water District (BWD) stays ahead of a growing population’s demand for industrial and residential water supplies and reduces the strains of rapid growth on infrastructure including wastewater treatment, roadway expansions, traffic management, waste disposal, and other services.

Beaver Lake provides drinking water to more than 400,000 people and industries in Northwest Arkansas, including the largest concentration of food industries in the United States. Another way to put it is this: One out of seven people in the state of Arkansas gets his or her drinking water from Beaver Lake, which provides raw water to the District, as well as three other drinking water utilities.

The rights to water storage in Beaver Lake are allocated by Congress, and each of the water providers on the lake has an allocation and contract for water storage with the U.S. Army Corps of Engineers. Twenty percent of the lake’s water storage volume is allocated to the water providers and the other 80 percent of storage is for electric power generation.

Beaver Water District's $102 million expansion project, begun in 2002, insures that there will be drinking water supplies available to Northwest Arkansas well into the future. The Croxton plant and its expansion can produce up to 100 million gallons a day (MGD) of drinking water.

Improvements to the original Joe M. Steele Water Treatment Plant, at a cost of $26.1 million, were completed in 2009 and put another 40 MGD treatment capacity on line. This brings the Beaver Water District’s total treatment capacity to 140 MGD, enough to meet projected drinking water needs well into the future.

The District’s new administration building accommodates space needs for staff and increases accessibility to the public for educational and other purposes. The facility is built in accordance with the Leadership in Energy and Environmental Design (LEED) program, a green building rating system. Educational components of the building include a Water Education Center featuring a drinking water treatment plant model and a topographical wall sized map of the Beaver Lake Watershed, as well as educational kiosks and a self-guided walking tour of low impact development features (to be completed in Spring 2012).

In an ongoing effort, the District is identifying and acquiring land and easements for the Western Corridor Project, a proposed pipeline with a hub west of I-540 to allow District customers to access finished water in a location other than the District’s current facilities near Lowell.

Beaver Water District wants you to know that your tap water is "food grade and table ready," and it has been since the plant began operations in the 1960s. The District operates around the clock to make sure that your water is safe to drink. So, the next time you turn on the tap or read an article comparing the merits of tap water versus bottled water, think about all the people beyond the pipe who make it possible for you to have potable water in Northwest Arkansas. Consider that when you buy bottled water, you are paying about a thousand times more for one bottle of water than you would if you drank water from your tap, and there’s no plastic bottle waste to dispose of when you drink tap water or use a reusable bottle.
Mr. Harold R. Seifert P.E., Executive Director of the Southwest Section of the American Water Works Association, summed up the history of tap water and its reliability in a column that appeared in the Sept. 22, 2007, issue of the Arkansas Democrat-Gazette:

Much has been written and said during the past several months concerning the safety and reliability of the tap water provided by your local water utilities. As the Executive Director of the Southwest Section of the American Water Works Association (AWWA), which represents water utilities and their professional personnel throughout Arkansas, Louisiana and Oklahoma, I feel compelled to weigh in on this issue. There are very few countries in the world other than the United States where one can travel and feel comfortable in drinking the local tap water in any community. The United Nations estimates that there are over 1 billion people in the world today without access to safe drinking water. The results of this inequity are the deaths of millions of people each year from very preventable waterborne diseases (including approximately 1.8 million children each year). While the average American uses 100 gallons of water per day, an entire family in Africa will get by on 5 gallons. And in some locations where safe water is available, it is priced beyond the reach of those who need it most.

The availability of safe and economical drinking water in the U.S. did not develop by happenstance, but rather by the efforts over several decades of a consortium of local water utilities, state and federal regulatory agencies, academia, engineers, and national trade organizations such as AWWA. All of these groups share the common goal of doing everything within their power to provide safe drinking water to all of the citizens of this country at an economical price. An adequate supply of safe drinking water is critical in protecting your health and mine. In fact, Doctor Halfdan Mahler, who was Director-General of the World Health Organization from 1973 through 1988, once said: "The number of water taps per 1000 persons is a better indication of health than the number of hospital beds."

The water coming from the taps of those Arkansans served by community water systems is consistently safe. Regulations developed under the federal Safe Drinking Water Act of 1974 by the Environmental Protection Agency, as well as those state regulations developed by the Arkansas Department of Health (ADH), are incredibly rigorous with respect to testing, water quality standards, operator training, and consumer education. It is interesting to note that regulations now in force on the national level had been in place in Arkansas for decades prior to their enactment on the federal level. Without a doubt, the water that you drink from your local water provider has been tested numerous times by both the provider and the ADH to verify compliance with all of the federal and state drinking water regulations.

It is through the dedicated efforts of the over 2,650 licensed water operators (who hold over 3,650 Treatment and/or Distribution Certificates) in Arkansas that you can turn on your tap with confidence each morning, knowing that the water will be there and that it will be safe for you and your family. These individuals must complete nearly 100 hundred hours of classroom training before being eligible to sit for an examination, prepared specifically for Arkansas by a national organization specializing in water operator certification, in order to receive their license as a certified water operator. Additionally, they must complete 24 hours of continuing education credits every two years during their licensure period. These people work around the clock operating water treatment facilities, repairing water main breaks, and performing numerous other tasks to insure the delivery of pure, clean water to your homes and businesses.

According to national statistics, somewhere between 1% and 5% of the water produced by local water treatment facilities are actually consumed. The remaining 95% to 99% is used for washing clothes, flushing toilets, watering lawns, and other domestic uses, as well as in industrial and manufacturing processes within the local community. Nevertheless, 100% of the water delivered to your home must fully meet the standards for the 1% to 5% usage. At the same time, this safe, clean, highly tested product is consistently delivered to your home at an economical price. Many Arkansans pay about the same price for one gallon of gasoline as they do for 1,000 gallons of water!

The next time you turn on your tap, be thankful that you live in a country that places such a high value on the safety and reliability of the drinking water supply for all of its citizens.
Further plans for developing more lessons, workshops, etc.

What's Next?
On-site tours: Beginning in Fall 2012, students will be invited to visit the District’s new Water Education Center, featuring a drinking water plant model and wall sized watershed map. The grounds include a bioswale, native prairie plantings, a water feature fed by recycled water from plant effluent, and Puppy Creek Riparian Restoration Project. The building itself expands learning opportunities as a Leadership in Energy and Environmental Design (LEED) structure. Curriculum guides for 7th-8th grade BWD Field Trip, incorporating on-site tour elements, have been available since Spring 2010. A similar program for 4th-5th grades is in development with an anticipated debut date of Fall 2012.

For more information send an email to:

education@bwdh2o.org
www.bwdh2o.org
Frameworks

Arkansas Framework Correlations have been aligned within each of the unit lessons. These frameworks can be found through the *Arkansas Department of Education’s web site for curriculum*

http://arkansased.org/teachers/frameworks.html

7 Es Teaching and Learning Model

Although the 7 Es Teaching and Learning Model (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extensions) is not specifically detailed within each lesson, it is implied throughout the unit. We referenced this model from *Primary Connections* (http://www.science.org.au/primaryconnections/5Es.htm.)

Elicit

Engage

Each lesson begins with some media meant to mentally engage students with an activity or question. It captures their interest, provides an opportunity for them to express what they know about the concept or skill being developed, and helps them to make connections between what they know and the new ideas.

Explore

Students carry out hands-on activities in which they can explore the concept or skill. They grapple with the problem or phenomenon and describe it in their own words. This phase allows students to acquire a common set of experiences that they can use to help each other make sense of the new concept or skill.

Explain

Only after students have explored the concept or skill does the teacher provide the concepts and terms used by the students to develop explanations for the phenomenon they have experienced. The significant aspect of this phase is that explanation follows experience.

Elaborate

This phase provides opportunities for students to apply what they have learned to new situations and so develop a deeper understanding of the concept or greater use of the skill. It is important for students to discuss and compare their ideas with each other during this phase.
Evaluate

The final phase provides an opportunity for students to review and reflect on their own learning and new understandings and skills. It is also when students provide evidence for changes to their understandings, beliefs and skills.

Extensions
Lesson 1: “Where’s The Water?” Board Game

In This Lesson

Purpose ................................................................................................................. 10
Objective .............................................................................................................. 10
Arkansas Framework Correlation ......................................................................... 10
Materials ............................................................................................................... 12
Procedure ............................................................................................................. 12
Discussion ........................................................................................................... 13
Assessment ........................................................................................................... 13
Lesson 1 Student Worksheets ............................................................................. 15
Where's the Water?

Purpose
Students will learn concepts related to the water cycle by playing a board game.

Objective
Students will use their knowledge of the water cycle to make their way around the board and try to play their opponents.

Arkansas Framework Correlation

EDITOR’S NOTE:
Summer 2012 - AR COMMON CORE CURRICULUM CORRELATION IN PROGRESS

Language Arts

4th Grade

OV.1.4.1 Use subject-related information and vocabulary

OV.1.4.7 Give precise directions and instructions for more complex activities and tasks

OV.1.4.8 Participate in formal and informal discussions about a variety of topics including state and/or national events

OV.1.4.12 Ask and answer relevant questions and make contributions in small or large group discussions

OV.2.4.3 Listen to understand, organize, and remember directions for doing tasks and assignments. Use context clues to determine the precise meaning of new words

R.11.4.8 Add content words to sight vocabulary

5th Grade

OV.1.5.2 Use standard English in classroom discussion

OV.1.5.6 Contribute appropriately to class discussion

R.11.5.3 Add content words to sight vocabulary

R.11.5.9 Use word origins including common roots and word parts from Greek and Latin to analyze the meaning and determine pronunciation and derivations of complex words

6th Grade

OV.1.6.2 Use standard English in classroom discussion

OV.1.6.6 Contribute appropriately to class discussion

R.11.6.3 Add content words to sight vocabulary

Mathematics

4th Grade

NO.3.4.4 Solve simple problems using operations involving addition, subtraction, and multiplication using a variety of methods and tools (e.g., objects, mental computation, paper and pencil and with and without appropriate technology)

NO.3.4.5 Use estimation strategies to solve problems and judge the reasonableness of the answer

M.12.4.2 Distinguish the temperature in contextual problems using the Fahrenheit scale on a thermometer

M.13.4.6 Read temperatures on Fahrenheit and Celsius scales
5th Grade

M.13.5.2 Determine which unit of measure or measurement tool matches the context for a problem situation

6th Grade

M.13.6.2 Determine which unit of measure or measurement tool matches the context for a problem situation

Science

4th Grade

NS.1.4.1 Communicate observations orally, in writing, and in graphic organizers:
- T-charts
- pictographs
- Venn diagrams
- bar graphs
- frequency tables
- line graphs

NS.1.4.2 Refine questions that guide scientific inquiry

PS.5.4.3 Compare and contrast gases to solids and liquids

ESS.8.4.1 Locate natural divisions of Arkansas: Ozark Plateau, Ouachita Mountains, Crowly’s Ridge, Mississippi Alluvial Plain (Delta), Coastal Plain, Arkansas River Valley

ESS.8.4.2 Analyze the impact of using natural resources

ESS.8.4.3 Differentiate between renewable and non-renewable resources

ESS.8.4.4 Evaluate the impact of water pollution

ESS.8.4.5 Evaluate the impact of Arkansas’ natural resources on the economy, including but not limited to farming, timber, tourism, hunting, fishing

ESS.8.4.6 Evaluate human use of Arkansas’ natural resources on the environment

ESS.8.4.7 Describe the processes of the water cycle: precipitation, evaporation, condensation

ESS.9.4.1 Analyze changes to Earth’s surface

5th Grade

PS.5.5.4 State characteristics of physical changes.

PS.5.5.5 Identify characteristics and common examples of physical changes.

PS.5.5.6 Explain how heat influences the states of matter of a substance:
- solid
- liquid
- gas

PS.5.5.7 Demonstrate the effect of changes in the physical properties of matter.

PS.5.5.8 Model the motion and position of molecules in solids, liquids and gasses in terms of kinetic energy.

ESS.8.5.11 Investigate the formation of soil.

6th Grade

LS.2.6.5 Model and explain the function of plant organs:
- leaves
- roots
- stems

LS.2.6.7 Describe the relationship between organ function and the following needs of cells:
- water
- waste removal

LS.4.6.2 Conduct simulations demonstrating competition for resources within an ecosystem.
Social Studies

4th Grade

G.1.4.11 Explore weather changes in various regions

G.3.4.4 Explain how people are influenced by, adapt to, and alter the environment (e.g., agriculture, housing, occupation, industry, transportation, communication, acid rain, global warming, ozone depletion)

G.3.4.6 Research ways in which the school and community can improve the physical environment by practicing conservation

5th Grade

G.1.5.10 Compare and contrast major landforms characterized as physical features of Earth (e.g., plateaus, rivers, deltas, seas, oceans, peninsulas)

G.3.5.5 Identify renewable and nonrenewable resources (e.g., fossil fuels, fertile soils, timber)

G.3.5.6 Identify ways people have modified the physical environment

G.3.5.7 Discuss ways in which Arkansans adapted to and modified the environment

6th Grade

G.3.6.1 Describe the location of major cities in Arkansas and the United States and the availability of resources and transportation in those areas

G.3.6.5 Describe the physical processes that produce renewable and nonrenewable resources

Procedure

Part 1 - Large Group Discussion

1. Tape the KWL wall words where the entire class can see them.

2. Ask questions to find out what the students know about watersheds and from where our drinking water comes. Write down whatever the students say on the strips and tape them to the wall under "What We Know" (leave the strips on the wall for future reference during the watershed study).

3. When students have told "what they know," then have them wonder about what they would like to know. Use more blank strips to record their questions and tape these under "What We Want to Know."

4. As the lesson (or unit) study continues, refer back to these strips to see if the students have changed their answers or have more questions. Allow them to take a strip from the wall and change "what they know" to "what we learned" if their first answers were wrong.

Materials

- KWL wall chart words

- Where’s the Water Board Game(s) includes:
  board, game pieces, move & quiz cards  water droplets

Note: 1 game = 4 to 8 students

Resources for materials not included:

UA Center for Math & Science Education
http://www.uark.edu/~k12info/
479.575.3875

Northwest Arkansas Education Co-Op
http://starfish.k12.ar.us/web/
479.267.7450

Beaver Water District
www.bwdh2o.org
479.717.3807

Know of other resources? Please let us know!
awilson@bwdh2o.org or 479.756.3651
5. At the end of the lesson(s) or unit, go back over any of the strips that haven't been moved and address each "What We Know" and "What We Want to Know."

6. New "What We Learned" strips may be added each time a student states something that the teacher can write for the "What We Learned" column.

7. Be sure to leave the KWL wall chart on the wall through the entire lesson(s) or unit. Use it, specifically, during the Water Cycle Game introduction and wrap-up.

**Part 2 – Playing the Game**

1. The game can be implemented as part of a large group activity where there are multiple games being played at once, or as a small individually played game where students are in a station while other activities are taking place in the classroom.

2. The game can be played with 4 or 8 players (individuals or teams).

3. See Directions for the game in Lesson 1 Worksheets.

4. Game duration is at the discretion of the teacher where game play continues for a set amount of time or until the “Do” and “Don’t” drops run out.

**Part 3 – Journal**

1. Journaling is an option for long term projects.

**Assessment**

Students can work through a series of stations around the room that ask specific questions related to the Water Cycle game and the water cycle that you have created.

4. Copy or cut out questions (ideally 10) from the “What We Want to Know” KWL Strip and place them in a variety of locations around the room – on student desktops, on the countertops, or on the walls. To make them stand out, put colored paper behind them.

5. Ask students to number their paper 1 to 10 and to skip lines between numbers in order to give enough room for their responses. Point out the questions that have been placed around the room. Students move about the room to answer the questions. Have them write down the question and the answer. They have 1-2 minutes per question to respond. They can answer the questions in any order and can be completed in pairs or individually, depending on the type of assessment desired.

6. The KWL charts can be left up to be used as reference or this can be completed without references after the game is played to determine comprehension and retention of the concepts covered in the game.
7. Students return to their seats. With a partner, they turn to face each other. Have students take turns asking each other the questions. If the students have differing answers, have them highlight or circle the response so that they can tell about it during a large group discussion.

8. Students regroup as a class. Have students raise their hands if they had differences with any of their partners’ responses. Have students share the responses upon which they disagreed and discuss as a class. Guide the discussion as discovery rather than toward “right” or “wrong” answers.

9. Refer to the KWL charts to guide discussion and close.

Option: The questions may also be answered at their seats OR given individually as a quiz.

Additional Resources

EPA Water Cycle activities “Environmental Kids Club”
www.epa.gov/kids/water.htm

Water Cycle Kidzone
http://www.kidzone.ws/water/

USGS Water Cycle information
http://ga.water.usgs.gov/edu/watercyclesummary.html
Lesson 1: “Where’s The Water?” Board Game

Lesson 1 Student Worksheets
KWL Chart

• Before students begin this unit, brainstorm what they know about the *water cycle* and write their thoughts in Column 1.
• Next, have students think of questions they have about the unit or what they would like to find out about the *water cycle* and list these in column 2.
• During the unit study, Column 1 may change as new information is found and Column 2 can be added to, as students think of more questions they’d like to answer.
• At the end of the unit and/or after completing all research, fill in Column 3.
• The following chart is a suggested KWL format and may be enlarged for large group “brainstorms” or printed as is. For individual student or small group work.
<table>
<thead>
<tr>
<th>What I Know</th>
<th>What I Want to Know</th>
<th>What I Learned</th>
</tr>
</thead>
</table>

Topic _____________________________________________________
What We Know
What We Want To Know
What We Learned
Lesson 1: “Where’s The Water?” Board Game

Name ___________________________ Date: __________

What do you know about ___________________________?
Name ___________________________ Date ____________

What I know about the water cycle.

*Draw below*
Name ___________________________ Date ________

What do you want to know about____________________?
Name ___________________________  Date ___________
What did you learn about __________________________?
Today’s Water Cycle Science Journal topic is
WHERE'S the WATER?
The H2O Role Playing Game

HOW TO PLAY

PLAYERS: 4 individual players OR 8 players in teams of two.

OBJECT: Collect more “Do Drops” than your opponents, and avoid “Don’t Drops.”

PIECES:
- 1 Game Board
- 4 Game Pieces – Snow, Ice, Splash & Cloud
- 70 Move Cards – 10 each for Clouds, River, Lake, Animals, Plants, Soil and Groundwater
- 40 Quiz Cards
- 30 Do Drops
- 30 Don’t Drops

SETUP: Stack the Move Cards face down on the Game Board on their corresponding spaces – Clouds cards on the Clouds space, River cards on the River space, and so on.

Shuffle the Quiz Cards and place them face down in the lower left corner of the Game Board.

Arrange the Do Drops and Don’t Drops in two piles next to the Game Board.

Players choose their Markers and place them near the Clouds space.

The game monitor notes the time, announces the duration of play (usually 30 minutes), and tells the players to begin.

MOVING: The player closest to the Clouds space goes first. The player picks a Clouds move card, reads the instruction aloud, then follows its direction. For example, if the card says, “Water vapor condenses and falls as precipitation. Go to LAKE,” the player immediately moves his or her marker to the lake. On the other hand, if the card says, “Water vapor remains in CLOUD,” the player leaves his or her marker where it is and the turn ends. Play proceeds clockwise.

COLLECTING DO DROPS: Each time a player moves to a new space, he or she tries to earn a Do Drop by answering a Quiz Card correctly. When a player moves his or her marker, the opponent to the player’s left picks up the top Quiz Card and reads the question aloud, then returns the card face down to the bottom of the stack. If the player answers correctly, he or she may collect a Do Drop from the stack next to the Game Board OR collect a Do Drop from any opponent OR give his or her Don’t Drop to any opponent. Do Drops and Don’t Drops are stored in the indicated spaces around the border of the Game Board.

COLLECTING DON’T DROPS: If the player answers the Quiz Card incorrectly, he or she must collect a Don’t Drop from the stack next to the Game Board.

LOSE A TURN CARDS: One Move Card in each group is a LOSE A TURN Card. When a player draws this card, he or she skips play for one round.

ENDING THE GAME: Play ends when: 1) The time limit is reached or 2) players run out of Do and Don’t Drops. Players add together their Do Drops, subtract the number of Don’t Drops, and declare their total points. The player with the most totaled points is the winner.
### Assessment Sheet (Optional)

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where do you think the water cycle begins?</td>
<td></td>
</tr>
<tr>
<td>What is another name for rain, snow, sleet, hail, drizzle, and sprinkle?</td>
<td></td>
</tr>
<tr>
<td>What is likely to happen when a molecule of water (H₂O) is on the surface of a body of water?</td>
<td></td>
</tr>
<tr>
<td>Is there water under the surface of the ground? If so, what is it called? Describe the process of how it arrived under the ground.</td>
<td></td>
</tr>
<tr>
<td>Can humans impact the water cycle? How? Describe at least two examples of your responses.</td>
<td></td>
</tr>
<tr>
<td>True or False? Water flows downhill.</td>
<td></td>
</tr>
<tr>
<td>What is left behind when water evaporates?</td>
<td></td>
</tr>
<tr>
<td>Clouds are a result of a process called __________?</td>
<td></td>
</tr>
<tr>
<td>Where does transpiration take place?</td>
<td></td>
</tr>
<tr>
<td>How does temperature affect the rate of evaporation?</td>
<td></td>
</tr>
</tbody>
</table>
Lessons 2 A & B: “Where’s The Water?”
Home and School Audits

In This Lesson

Purpose........................................................................................................ 29
Objective ........................................................................................................ 29
Arkansas Framework Correlation............................................................... 29
Materials........................................................................................................ 31
Lesson 2A: Home Audit Procedure............................................................. 31
Discussion ...................................................................................................... 33
Assessment .................................................................................................... 33
Resources...................................................................................................... 34
Lesson 2A Student Worksheets................................................................. 37
Lesson 2B: School Audit Procedure .......................................................... 53
Where's the Water?

Purpose

Students will understand the connection between the water cycle and human consumption of water as a natural resource.

Objective

Students will measure and record water use in their home by evaluating monthly water bills and daily water use and reading water meters. Students understand the connection between themselves and water as a limited natural resource.

AR Frameworks Correlation

EDITOR’S NOTE: Summer 2012 - AR COMMON CORE CURRICULUM CORRELATION IN PROGRESS

Language Arts

4th Grade

OV.1.4.2 Adjust language and vocabulary to fit an audience, topic, or purpose

OV.1.4.9 Encourage others to participate in discussions (i.e., avoid monopolizing the conversation and raise pertinent questions)

OV.1.4.12 Ask and answer relevant questions and make contributions in small or large group discussions

OV.2.4.2 Listen and evaluate information

W.4.4.3 Select relevant information from a variety of sources

W.5.4.1 Write for a general audience (i.e., newspaper and website, etc.)

W.6.4.1 Use a variety of simple, compound, and complex sentences (i.e., completeness and standard word order, etc.)

W.7.4.6 Use purposeful vocabulary

5th Grade

OV.1.5.2 Use standard English in classroom discussion

OV.1.5.6 Contribute appropriately to class discussion

OV.2.5.1 Demonstrate effective listening skills by exhibiting appropriate body language

OV.3.5.1 View a variety of media (e.g., posters, film clips, periodicals, charts, cartoons, etc.) to enhance and show understanding of a specific topic

W.4.5.1 Generate ideas using such strategies as reading, discussing, focused free-writing, observing, and brainstorming

W.5.5.1 Write to describe, to inform, to entertain, to explain, and to persuade

W.6.5.1 Use a variety of simple and compound sentences of varied lengths

W.7.5.4 Use purposeful vocabulary for emphasis or elaboration

6th Grade

OV.1.6.2 Use standard English in classroom discussion

OV.1.6.6 Contribute appropriately to class discussion
OV.2.6.1 Demonstrate effective listening skills by exhibiting appropriate body language

OV.3.6.1 View a variety of media (e.g., posters, film clips, periodicals, charts, cartoons, graphs, statistics, etc.) to enhance and show understanding of a specific topic

W.4.6.1 Generate ideas using such strategies as reading, discussing, focused free-writing, observing, brainstorming, and reading logs

W.4.6.3 Demonstrate an awareness of purpose and audience for all modes of written discourse

W.4.6.14 Publish/share according to purpose and audience

**Mathematics**

**4th Grade**

NO.2.4.3 Use conventional mathematical symbols to write equations for contextual problems involving multiplication

NO.3.4.4 Solve simple problems using operations involving addition, subtraction, and multiplication using a variety of methods and tools (e.g., objects, mental computation, paper and pencil and with and without appropriate technology)

NO.3.4.5 Use estimation strategies to solve problems and judge the reasonableness of the answer

A.6.4.1 Create a chart or table to organize given information and to understand relationships and explain the results

M.12.4.2 Distinguish the temperature in contextual problems using the Fahrenheit scale on a thermometer

M.13.4.1 Using a calendar to determine elapsed time from month to month

M.13.4.2 Solve problems involving conversions between minutes and hours

M.13.4.6 Read temperatures on Fahrenheit and Celsius scales

**5th Grade**

NO.1.5.3 Identify decimal and percent equivalents for benchmark fractions

NO.3.5.3 Solve, with and without appropriate technology, two-step problems using a variety of methods and tools

A.4.5.1 Solve problems by finding the next term or missing term in a pattern or function table using real world situations

A.6.5.1 Draw conclusions and make predictions, with and without appropriate technology, from models, tables and line graphs

M.12.5.2 Make conversions within the customary measurement system in real world problems Ex. hours to minutes, feet to inches, quarts to gallons, etc

M.12.5.4 Understand when to use linear units to describe perimeter, square units to describe area or surface area, and cubic units to describe volume, in real world situations

DAP.14.5.2 Collect numerical and categorical data using surveys, observations and experiments that would result in bar graphs, line graphs, line plots and stem-and-leaf plots

DAP.15.5.1 Interpret graphs such as line graphs, double bar graphs, and circle graphs

DAP.16.5.1 Make predictions and justify conclusions based on data

**6th Grade**

NO.1.6.1 Demonstrate conceptual understanding to find a specific percent of a number, using models, real life examples, or explanations
NO.3.6.3 Solve, with and without appropriate technology, multi-step problems using a variety of methods and tools (i.e., objects, mental computation, paper and pencil)

NO.3.6.7 Determine the percent of a number and solve related problems in real world situations

A.4.6.1 Solve problems by finding the next term or missing term in a pattern or function table using real world situations

M.12.6.1 Identify and select appropriate units and tools from both systems to measure Ex. angles with degrees, distance with feet/meters

M.12.6.2 Make conversions within the same measurement system in real world problems Ex. hours to minutes to seconds, meters to centimeters, feet to inches, liters to milliliters, quarts to gallons, etc

M.13.6.2 Determine which unit of measure or measurement tool matches the context for a problem situation

DAP.15.6.1 Interpret graphs such as double line graphs and circle graphs

DAP.16.6.1 Use observations about differences in data to make justifiable inferences

Science

4th Grade

NS.1.4.1 - Communicate observations orally, in writing, and in graphic organizers:
  • T-charts
  • pictographs
  • Venn diagrams
  • bar graphs
  • frequency tables
  • line graphs

NS.1.4.2 - Refine questions that guide scientific inquiry

NS.1.4.3 - Conduct scientific investigations individually and in teams: lab activities, field studies

NS.1.4.5 - Communicate the designs, procedures, and results of scientific investigations (e.g., age-appropriate graphs, charts, and writings)

NS.1.4.6 - Estimate and measure length, mass, temperature, capacity/volume, and elapsed time using International System of Units (SI)

NS.1.4.7 - Collect and interpret measurable empirical evidence in teams and as individuals

NS.1.4.8- Develop a hypothesis based on prior knowledge and observations

NS.1.4.9 - Identify variables that affect investigations

NS.1.4.10 - Identify patterns and trends in data

NS.1.4.11 - Generate conclusions based on evidence

NS.1.4.12 - Evaluate the quality and feasibility of an idea or project

ESS.8.4.2 - Analyze the impact of using natural resources

ESS.8.4.3 - Differentiate between renewable and non-renewable resources

ESS.8.4.4 - Evaluate the impact of water pollution

ESS.8.4.5 - Evaluate the impact of Arkansas’ natural resources on the economy, including but not limited to

ESS.8.4.6- Evaluate human use of Arkansas’ natural resources on the environment

ESS.8.4.7 - Describe the processes of the water cycle:
  • precipitation
• evaporation
• condensation

5th Grade
NS.1.5.4 Interpret data using data tables.
LS.4.5.16 Evaluate positive and negative human effects on ecosystems.
NS.1.5.5 Communicate results and conclusions from scientific inquiry.
NS.1.5.9 Define and give examples of hypotheses.

6th Grade
NS.1.6.4 Construct and interpret scientific data using data tables.
NS.1.6.5 Communicate results and conclusions from scientific inquiry

Social Studies

4th Grade
G.3.4.4 Explain how people are influenced by, adapt to, and alter the environment (e.g., agriculture, housing, occupation, industry, transportation, communication, acid rain, global warming, ozone depletion)
G.3.4.6 Research ways in which the school and community can improve the physical environment by practicing conservation
E.7.4.1 Evaluate the priority of economic wants and consequences of the opportunity cost
E.7.4.3 Recognize and use the decision making model to make an economic decision: state the problem, list the alternatives, state the criteria, evaluate the criteria, make a decision
E.8.4.3 Examine the impact of scarcity of natural resources on production decisions
E.9.4.4 Research public goods and services that are provided by taxes

5th Grade
G.1.5.5 Identify a variety of charts and graphs used to display data on a variety of topics such as climate or population
G.3.5.1 Recognize factors that influence migration (e.g., employment, natural resources)
G.3.5.5 Identify renewable and nonrenewable resources (e.g., fossil fuels, fertile soils, timber)
G.3.5.7 Discuss ways in which Arkansans adapted to and modified the environment
E.7.5.1 Identify the basic economic wants and needs of all people
E.7.5.2 Recognize that choices have both present and future consequences
E.7.5.3 Identify the causes of scarcity and why scarcity of resources makes it necessary to make choices
E.7.5.5 Identify why federal, state, and local governments have to make choices because of limited resources
E.8.5.4 Examine the need for natural resources in determining settlement patterns

6th Grade
G.1.6.5 Illustrate information relating to population, climate, weather patterns, or other specific topics on selected types of charts or graphs
G.3.6.1 Describe the location of major cities in Arkansas and the United States and the availability of resources and transportation in those areas
G.3.6.5 Describe the physical processes that produce renewable and nonrenewable resources
G.3.6.6 Describe ways in which technology influences capacity to modify the physical environment

G.3.6.7 Analyze the consequences of environmental modification on Arkansas and specific areas of the United States: acid rain, global warming, ozone depletion, erosion, desertification

E.7.6.2 Demonstrate an understanding that choices have both present and future consequences

E.7.6.3 Examine the causes of scarcity and the choices made due to scarcity

E.7.6.5 Explain why federal, state, and local governments have to make choices because of limited resources

E.7.6.8 Determine why trade-offs allow people to get the most from scarce resources

## Materials

- KWL Wall Charts
- Transparencies of monthly water bills for a household (teacher or a student’s household).
- Worksheet copy of monthly water bill from students’ or teacher’s home (same as transparency)
- Meter Reader Worksheet
- Water Bill Reader Worksheet
- Eye or medicine dropper
- Calculators
- Map of Beaver Lake Watershed
- Computer lab (optional)
- Home Water Audit Data Entry Student Sheet

## Resources for materials not included:

- UA Center for Math & Science Education
  [http://www.uark.edu/~k12info/](http://www.uark.edu/~k12info/)
  479.575.3875
- Northwest Arkansas Education Co-Op
  [http://starfish.k12.ar.us/web/](http://starfish.k12.ar.us/web/)
  479.267.7450
- Beaver Water District
  [www.bwdh2o.org](http://www.bwdh2o.org)
  479.717.3807
- Know of other resources? Please let us know! awilson@bwdh2o.org or 479.756.3651

## Procedure

**Part 1 - Large Group Discussion**

1. Tape the KWL wall chart where the entire class can see them.

2. Ask questions to find out what the students know about the water cycle, where drinking water comes, and uses of drinking water. Write down whatever the students say on the strips and tape them to the wall under "What We Know" (leave the strips on the wall for future reference during the water cycle & use study).

3. When students have told "what they know," then have them wonder about what they would like to know. Use more blank strips to record their questions and tape these under "What We Want to Know."

4. As the lesson (or unit) study continues, refer back to these strips to see if the students have changed their answers or have more questions. Allow them to take a strip from the wall and change "what they know" to "what we learned" if their first answers were wrong.

5. At the end of the lesson(s) or unit, go back over any of the strips that haven't been moved and address each "What We Know" and "What We Want to Know."
6. New "What We Learned" strips may be added each time a student states something that the teacher can write for the "What We Learned" column.

7. Be sure to leave the KWL wall chart on the wall through the entire lesson(s) or unit. Use it, specifically, during the Water Audit wrap up.

**Part 2 – Home Water Audit**

1. Lead students through the KWL activity. Ask questions such as, “Where do we get our water?” or “How do we measure water?” or “What do we use water for in our home?” or “Why is it important to keep water from leaking from our faucets and pipes?”

2. Ask each student to take home the Home Water Audit sheet home and fill out with family. (Option: Ask them to bring a copy or general information from their monthly water bill.)

3. Review scores in class the next day. Use score ranges and ask groups within those scores to raise their hands. Calculate what percentage is in each group (“room for improvement,” “off to a good start,” or “doing a great job”).

4. (Option) Compare to their water bills – do they correlate? Less conservation, higher water bill? Discuss.

5. Take the class percentages and put into nationwide perspective… “If our classroom represented the whole U.S., there is ____% of the country that has ‘room for improvement’.”

6. Present a challenge to improve home water use during the next month (or water billing cycle). Repeat the following month and put into nationwide improvement perspective.

**Part 3 – Water Bill & Meter Reader**

1. Use water bill transparencies and worksheet copies (teacher’s, student’s or other – vital information can be blacked out with a marker).

2. With the water bill transparency on the wall, discuss what students know about their water bill, water meter reading and how it relates to water consumption.

3. Pass out Water Bill Worksheets. Go through the water bill and ask:
   - What was the most recent reading recorded by the meter reader?
   - When was the meter last read?
   - How many units of water were used during the service period?
   - What formula did the water company use to determine this figure? (Total gallons used divided by number of days)

4. Revisit any discussion on how the water bill relates to the meter and pass out the Water Meter Reader Worksheet.

5. Discuss where water meters may be found and that the City sends Meter Readers to measure the water usage. Relate this back to the Water Bill. Note that water meters are used by schools, businesses and homes – everyone who uses tap water has a meter.

6. Look at the Water Meter Worksheet and discuss the different types of meters:
   - Straight reading meters use gallons, resemble a car odometer, and are a straightforward recording
   - Circular reading meters measure in cubic feet and have six to seven dials. (Note: Cities measure in units of 100 cubic feet so the One Foot and 10 dial are disregarded in recording use. However, the One Foot is used to test for water leaks by turning off the water and seeing if the dial moves, which would indicate a leak.)
7. Go through worksheet together. Enter the Straight reading meter numbers and subtract current from previous. To read the Circular reading meter, start with the greatest measurement (10,000) and record the dials in descending order down to the 100Ccf dial in the chart of the worksheet. If the dial is between numbers, the lower number is recorded (enter number from image). Subtract current from previous and convert to gallons by multiplying by 748.

8. Discuss how this relates to the Home Water Audit.

Part 4 – Drip Calculator

1. Use medicine dropper to illustrate the amount of water that may drip from a leaky faucet. Demonstrate slowly at first and put in context of “drips per second.” Note: 5 drips per second amounts to a steady stream of water.

2. Estimate that ¼ mL is the amount in a drip of water (estimate based on faucet drip/drop volume of between 1/5 and 1/3 and a bathtub drip/drop at approx ½ mL). Discuss how “it seems like a drop of water down the drain is insignificant. But, what do you think happens when all those drops flow over time?” Lead students through the KWL activity. Ask questions such as “And, what happens when it is more than one sink in a home?”, “And what happens when it is multiple sinks, in multiple homes?”, “And what happens when it is multiple sinks, in multiple homes, in multiple cities?”


4. (Option) Divide into groups for a computer lab exercise. Each group can visit http://ga.water.usgs.gov/edu/sc4.html. With the baseline measurements they figured out for themselves, they can calculate up to 1 million homes with up to 5 faucets and 120 drips per minute.

5. Refer to KWL chart assumptions.

6. To add impact and illustrate how many gallons of water are being wasted, ask how many students have been to Beaver Lake. Show a map of the Beaver Lake Watershed and the Lake. There are approximately 500 billion gallons of water in Beaver Lake.

Discussion

1. At the conclusion of each or all parts of the lesson, use the KWL Wall Charts to guide discussion and emphasize important points from the science frameworks.

2. Tie in with the true/false questions that were debated during game play.

3. Discuss the connections between the Beaver Lake Watershed, the water cycle, where drinking water comes from in Northwest Arkansas as a whole and water use. Ask questions of the class such as, “What is a watershed?” and show them a map of the Beaver Lake Watershed. Pose the question, “Where in the watershed can one find the water cycle taking place?” Students may respond by mentioning the streams and the lakes. Guide them into thinking about the soil, the caves and springs of the Northwest Arkansas region. Ask them, “How do these connect to water use?”

Assessment

Students can work through a series of stations around the room that ask specific questions related to the water use that has been created.

1. Copy or cut out questions (ideally 10) from the “What We want to Know” KWL Strip and place them in a variety of locations around the room – on student desktops, on the countertops, or on the walls. To make them stand out, put colored paper behind them.
2. Ask students to number their paper 1 to 10 and to skip lines between numbers in order to give enough room for their responses. Point out the questions that have been placed around the room. Students move about the room to answer the questions. Have them write down the question and the answer. They have 1-2 minutes per question to respond. They can answer the questions in any order and can be completed in pairs or individually, depending on the type of assessment desired.

3. The KWL charts can be left up to be used as reference or this can be completed without references after the Part(s) to determine comprehension and retention of the concepts covered in the Part(s) used.

4. Students return to their seats. With a partner, they turn to face each other. Have students take turns asking each other the questions. If the students have differing answers, have them highlight or circle the response so that they can tell about it during a large group discussion.

5. Students regroup as a class. Have students raise their hands if they had differences with any of their partners’ responses. Have students share the responses upon which they disagreed and discuss as a class. Guide the discussion as discovery rather than toward “right” or “wrong” answers.

6. Refer to the KWL charts to guide discussion and close.

Option: The questions may also be answered at their seats OR given individually as a quiz.

---

Resources

**American Water Works Association – Online Drip Calculator**  

**USGS Water Science for Schools**  
Lesson 2A Student Worksheets
KWL Chart

- Before students begin this unit, brainstorm what they know about *water use, consumption, and conservation* and write their thoughts in Column 1.
- Next, have students think of questions they have about the unit or what they would like to find out about *water use, consumption, and conservation* and list these in column 2.
- During the unit study, Column 1 may change as new information is found and Column 2 can be added to, as students think of more questions they’d like to answer.
- At the end of the unit and/or after completing all research, fill in Column 3.
- The following chart is a suggested KWL format and may be enlarged for large group “brainstorms” or printed as is. For individual student or small group work.
<table>
<thead>
<tr>
<th>Topic</th>
<th>What I Know</th>
<th>What I Want to Know</th>
<th>What I Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What We Know
What We Want To Know
What We Learned
Lessons 2 A & B: “Where’s The Water?” Home and School Audits

Name __________________________ Date: __________

What do you know about ___________________________?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Name ___________________________ Date________________

What I know about water use, consumption, and conservation.

*Draw below*
Lessons 2 A & B: “Where’s The Water?” Home and School Audits

Name ___________________________________ Date __________

What do you want to know about_________________________?

........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
........................................................................................................
Name __________________________ Date _______

What did you learn about _______________________?
Lessons 2 A & B: “Where’s The Water?” Home and School Audits

Name__________________________Date________________

Today’s Water Audit Science Journal topic is:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
## Home Water Audit

<table>
<thead>
<tr>
<th>Home Habit</th>
<th>Always 3 points</th>
<th>Sometimes 2 points</th>
<th>Never 1 point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shower under 5 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fill bathtub ( \frac{1}{2} ) full or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off water while brushing teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug sink when washing face or hands (instead of running water)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only flush toilet after use (not to flush tissue or after cleaning)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use broom to clean driveway or sidewalk (not hose)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use bucket to wash cars (not running hose)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use adjustable nozzle on outdoor hose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off water faucet tightly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug kitchen sink for washing and rinsing dishes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only run dishwasher when it is full</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only run washing machine when it is full</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Score**

- **25-36 Points:** *Keep up the great work!*
- **13-24 Points:** *You’re on the right track!*
- **0-12 Points:** *Room to grow…*
Water Drip Calculation Sheet

One Gallon = 15,140 drips
One liter = 4,000 drips

Drips per second x 60 = Drips per minute
Drips per minute total x 60 = Drips per hour
Drips per hour x 24 = Drips per day
Drips per day total ÷ 15,140 = Gallons per day
Gallons per day total x 365 = Gallons per year

1) 2 drips per second equals:

_________________________________________ drips per minute
_________________________________________ drips per hour
_________________________________________ drips per day
_________________________________________ gallons per day
_________________________________________ gallons per year

2) 1 home with 3 faucets leaking 2 drips per second equals:

_________________________________________ drips per minute
_________________________________________ drips per hour
_________________________________________ drips per day
_________________________________________ gallons per day
_________________________________________ gallons per year

3) A neighborhood with 10 homes, each with 3 faucets leaking 2 drips per second equals:

_________________________________________ drips per minute
_________________________________________ drips per hour
_________________________________________ drips per day
_________________________________________ gallons per day
_________________________________________ gallons per year
# Water Meter Reader Worksheet

**STRAIGHT READING METER**

<table>
<thead>
<tr>
<th>Gallons Used</th>
<th>Ccf's Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Gallons</td>
<td>Current Ccf</td>
</tr>
<tr>
<td>Previous Gallons</td>
<td>Previous Ccf</td>
</tr>
<tr>
<td>Gallons Used</td>
<td>Ccf’s Used</td>
</tr>
<tr>
<td>Gallons Used (Ccf’s used x 748)</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 2B: School Water Audit

Purpose
Students will understand that water is a natural resource and will explore the connection between the water cycle and human consumption of water at their schools.

Objective
Students will measure and record water use in their school by evaluating water bills, daily water use, and reading water meters. Students will understand the connection between themselves and water as a limited natural resource.

Frameworks
See 4th Grade Home Water Audit

Materials
- KWL Wall Charts
- Transparencies of School’s water bills
- Worksheets (included)
- Stopwatch
- Calculators
- Beakers
- Butcher/large paper
- Map of school
- Map of Beaver Lake Watershed
- Computer lab (optional)
Introduction

Water is a valuable natural resource. To ensure that we have fresh water supplies in the future we need to be much smarter about how we use our water resources. Conducting a water audit of your school can help to identify potential water saving actions that could be implemented at your school after the audit.

By completing the activity, students and school staff will learn about the amount of water that is consumed throughout the school for activities including washing hands, drinking, watering landscaped areas and flushing toilets and urinals. This activity can be used to collect baseline data for a school water conservation project. As you complete the activity, consider the ways students and staff may work to improve water conservation throughout the building and on school grounds.

Preparation

In order for your students to conduct a thorough water audit of your school, it is important to have the support of your school custodians and administration. Before beginning the audit, be sure to:

a. Meet with your principal.
b. Obtain copies of the school’s water bills and contact the local utility for more information about billing and distribution.
c. Talk with your custodian or facility manager and review the audit with them. Determine where his/her help will be needed in determining the source of your school’s water, analyzing toilets and faucets, examining the outdoor landscape, etc.
d. Prepare your students for the audit by having them research various water topics, such as the location of your local water source and any current landscape watering restrictions that might be in place due to drought or excess precipitation.
e. Set up an interview the custodian or facility manager for both you and then for a tour with the students.

2. Before you begin a school water audit you will need to plan ahead and consider the following:
   • Who will conduct the audit? Will students work individually or in groups?
   • When will you conduct the audit? (So you don’t disrupt classes.)
3. Remember basic safety and hygiene practices, such as not running in wet areas, washing hands after visiting toilet areas, etc. Special care should be taken when inspecting hot water fixtures.
4. You will need to obtain copies of your school’s water bills. An example of a water bill is located within this lesson. A bill from your school can be obtained from the administrative office, custodian or facilities manager.
5. You will need to locate your schools water meter(s).
6. Water using items you should look out for include:
• Sinks/hand basins
• Cisterns/toilets
• Urinals
• Showers
• Kitchen/Cafeteria uses
• Standalone taps
• Hoses/sprinkler systems
• Pools/water features

7. How will you know that every area of the school has been inspected?
   • Draw or obtain a map of the school showing the buildings and main features of the grounds. Mark on the map the location of taps, toilets, showers, sinks, basins, sprinklers, etc. Ensure all areas of the school are audited.

8. Once you have developed a plan, conduct your audit using the supplied worksheets. Copy additional worksheets if more are needed.

9. Preparation for helping students read a school water meter:
   • The first thing you will need to do is locate your school water meter(s). Your school may have more than one meter. If you are unsure of the number of meters your school has, your utility account will have the meter numbers and their readings listed on the back of the account.
   • Meters are usually located at the boundary of the property. Caution should be exercised around water meters.
   • A water meter measures the volume of water you use. The meter reader reads the water meter and calculates the amount of water that has been used since the last reading. You will find directions for reading a water meter in the Worksheets section of this lesson.
Part 1 – Large Group Discussion

(This section should be the same as Part 1 of the Home Water Audit for the 4th Grade curriculum.)

Part 2 - Reading a Water Meter and a Water Bill

- Lead students through the KWL activity. Ask questions such as, “Where do we get our water?” or “How do we measure water?” or “For what do we use water at school?” or “Why is it important to keep water from leaking from faucets, pipes, toilets, sinks, etc.?“ or “How can schools be more efficient with how we use water?” or “How can a water meter demonstrate a need to conserve water?” or “How much water do you think each student uses at our school per day?” or “How does total water consumption change throughout the day at a school?”
- Share with students the types of activities that use water at a school (see handout).
- Pass out the Meter Reader worksheet to students and explain how to read the meter using the image on the worksheet.
- Ask the custodial staff member for a tour to show the students a school water meter. Students record the data onto their data collection sheet according to what they read on the meter. Students complete the Water Meter worksheets along with the staff member for practice while on the tour.
- Set up a schedule to read the water meter at the same time twice a day for one or two weeks. This can take place at the beginning and the end of the school day. The schedule should be such at each student has an opportunity to collect the water meter data and share it with the class.
- Create a chart on butcher paper similar to the Meter Reader Worksheet chart that can be displayed in class and on which students can display their data as they collect it.
- Designate students to collect data from the water meter. Students should then share their findings with the rest of the class so that the other students can record the meter readings onto their Meter Reading Worksheets. This should continue for at least one week, but preferably two weeks.
- Ask students to share what they observe within the data displayed on the chart hanging in the room. Ask them what patterns they see. Ask them what differences occurred between the start of data collection and the end of data collection. Ask students if they observe any readings that stand out from the others.
• Use the board or an overhead projector to create a line graph of the data along with students. (The date should go along the x-axis and the meter readings should go along the y-axis.)
• Ask students how this relates to doing an overall audit of water use for the school.

Part 3 - School Water Audit
• Provide students with a list of the ways that water is used within a school. Ask them if they can think of others or if they agree with the list.
• Provide students with the “School Water Use Questionnaire.” As a class, answer as many questions as possible as they relate to your school. For those questions to which students do not have answers, have them put a star next to the question so that they can ask this question on the water tour of the school building.
• Provide students with the School Water Audit Worksheets.
• Depending on class size and ability level, divide students into groups and delegate which groups will collect data for various water use categories (bathrooms, cafeteria, etc.) on the tour of the school. Remember that some classrooms have sinks!
• Along with a custodial staff member or a facilities manager, conduct tour of the school that explores the faucets, toilets, urinals, and showers in the school building, noting fixtures that leak. Use the School Water Audit Worksheets to help guide students through data collection. (Arrangements should be made ahead of time with a custodial staff member about what you need students to learn and gather from the tour.)
• When leaks are discovered, have students determine the amount of water wasted per day due to the leaking fixture. To do this, students use a beaker and a stopwatch to record the time it takes for the leak to produce a certain volume, and then use a proportion to calculate the volume of water leaked from the fixture per day.
  • Using the information in the School Water Audit Questionnaire on the cost of water, students may also determine the amount of money spent per day on water lost due to leaks. This information will help you make a strong case for water conservation when presenting the findings (Extension Activity).
• For each category to which students were assigned (designated by you) students share what they observed. Record and display their findings for the class using transparencies, a computer and a projector, etc.
• Ask students to analyze the chart and the graph of the meter readings.
• Encourage them to make inferences based on the meter readings and what they found on the tour. Are there indications of leakage? Are some areas used more than others? Are there places where the school uses water inefficiently?

• Help students develop a method to test whether or not a change in the school’s water use would affect the amount they pay based on the water meter. For example, if the leaks are fixed in the boys’ bathrooms, does this affect the readings on the water meter during the week following the improvements as compared to prior to fixing the leaks? And if so, by how much?

• Help students complete the School Water Audit Questionnaire based on your interviews with school administration. This can also be turned into a research project that students complete on their own or with a partner.

• Using the information from the School Water Audit Questionnaire, calculate the amount of money spent on water each day, week, month, and year. If there is still more information needed for the questionnaire, contact the water utility for your community or Beaver Water District.

Part 4 – After the audit
Most likely students will return from their audit with valuable findings about the school’s water use. For instance, they may have discovered leaky faucets, areas where lawns and athletic fields are being overwatered, or opportunities for the school to upgrade to more water-efficient faucets, toilets, urinals, or irrigation systems.

After the audit is completed, help your students synthesize their findings by conducting research on water conservation opportunities. Faucet aerators, faucet sensors, rain barrels, rain gardens, and smart irrigation controllers are all devices that can help your school conserve water and save money. The U.S. Environmental Protection Agency WaterSense website (www.epa.gov/watersense) provides excellent information for this research.

Extension Activity!!
Give your students the opportunity to share their water audit results with their school custodians, students, staff, parents, and even their school board. Use the Report Outline (available at www.eeweek.org/water_wise/water_audit) to guide the development of your students’ reports in letters, PowerPoint Presentations, posters, videos, etc.
KWL Charts and Sheets (Use those from the Home Water Audit)
### Examples of Water Use in Schools

- Aesthetic fountain
- Air conditioner
- Animal husbandry
- Animal watering trough
  - Art lab
  - Athletics
  - Auto shop
- Bathroom faucet
- Boiler
- Cafeteria cooking
  - Compressor
- Cooling tower
- Fire protection
- Heating and cooling
  - Janitor kitchen
- Landscaped areas
  - Locker room
  - Metal shop
  - Nurse’s office
  - Photo lab
  - Printing lab
  - Restrooms
- School garden
- Science lab
- Swimming pool
- Teacher’s lounge
- Wood shop

- Dipper well
- Dishwasher
- Drinking fountain
  - Drip hose
  - Fire hydrant
- Fire suppressing sprinkler
- Food cookers
- Garbage disposal
- Hood scrubber
- Hose ice machine
- Kitchen faucet
- Laundry
- Newspaper printing
  - Outdoor spigot
  - Photo printing equipment
- Photo processing
  - Refrigerator
  - Showers
  - Soaker hose
  - Spa
  - Sprinkler
  - Steamer
  - Toilet
  - Urinal
- Vacuum system
- Vehicle washing
- X-ray equipment
School Water Use Questionnaire

Your School’s Overall Water Use and Information
The questions in this section ask about water use at your school. You may need the assistance of the school custodian or facility manager to answer these questions. You will also need information from your school’s water bills for the past year.

1. What is the source of your school’s water supply?
   __Municipal water supply
   __School has its own well

2. If your water comes from a municipal supply, what is its source?
   __Well (aquifer)
   __Reservoir (surface water)
   __Stream (surface water)
Name of water source (name of aquifer, lake, river, reservoir): ___________________
Name of the watershed that drains the land around the water source:__________________

3. According to your school’s water bills, how many gallons of water has your school used over the past 12 months? If outdoor and indoor water was billed separately, add these together to get the total.
   Gallons used indoors: ___________
   Gallons used outdoors: ___________
   Total gallons: ___________

4. If your water comes from a municipal supply, what did your school pay last year for water?
   $ __________
   How much does the water company charge per unit of water?
   $ __________ per ___________

5. Complete the following about the students and staff at your school.

   Number of female students: __________
   Number of male students: __________
   Number of female staff: __________
   Number of male staff: __________

   Total number of students and staff: __________

6. Using your school’s water bill, think about which of those months school is in session. Total the number of gallons used during those months that fall during the school year, then use that information to calculate the gallons of water used per person per day during the school year.
Total gallons during school year ÷ Total students and staff ÷ Days in school year = __________

7. According to your school’s water bill, during which month(s) of the year is the most water used? What do you think is the reason for this?

8. According to your school’s water bill, during which month(s) is the least amount of water used? Why do you think this is true?

9. Does your school have a swimming pool?
   __Yes
   __No
   If you answered yes, is a pool cover used? (This is important because pool covers can limit evaporation)
   __Yes
   __No

10. Does your school have a cooling tower? Cooling towers are usually found outside next to the chiller (HVAC) room. Sometimes it is located on the roof above the chiller. (A cooling tower may be found on your school’s roof or outside next to the HVAC room.)
    __Yes
    __No

**Your School’s Outdoor Water Use**

In this section you will collect data about outdoor water use on the school property. Again, you may need the assistance of the custodian or facility manager to answer some of these questions. Many of these questions will be most easily answered within a few hours of watering.

1. How many water faucets are located outside of the building? __________

2. How many outdoor water faucets are leaking? __________

3. How many outdoor water faucets have been secured so that only school staff may turn them on or off? __________

4. Does your school building have gutters and/or downspouts?
   __Yes
   __No
   If yes, do they appear clear of debris, such as leaves or garbage?
   __Yes
   __No

5. Does your school have a rain collection system (such as rain barrels)?
   __Yes
   __No
6. Does your school have a rain garden?
   __Yes
   __No

7. Does your school use native or low-water-use plants (xeriscaping)?
   __Yes
   __No

8. Does your school have any outdoor fountains or artificial waterfalls?
   __Yes
   __No
   If yes, answer the following:
   a. Are they turned off in the evening?
      __Yes
      __No

   b. Are they turned off in very hot weather?
      __Yes
      __No

   c. Do they re-circulate water?
      __Yes
      __No

9. How many water meters are there at the school? ____________
   (A water meter measures and records the amount of water flowing through it at any
   moment. They may be found buried outside the building or indoors where the water line
   comes into the building.)
   Do the meters supply water for both indoor and outdoor use?
   __Yes
   __No

10. Do you see dry or soggy patches in the grass, in flowerbeds or in other landscaped
    areas?
    __Yes
    __No
    If yes, describe the location and what you see. Take photographs or sketch the area.

11. Do you see puddles or standing water resulting from irrigation runoff (Often,
    landscape irrigation runs off into parking lots or other paved areas).
    __Yes
    __No
    If yes, describe the location and what you see. Take photographs or sketch the area.
12. Do you see moss growing or slippery-wet areas on any paved areas (*Paved areas such as parking lots and sidewalks can become damaged by runoff*)?
   ___Yes
   ___No
   If yes, describe the location and what you see. Take photographs or sketch the area.

13. Do you see cracks in the pavement, uneven sidewalks where water runs off or other water damage in the pavement or parking lots?
   ___Yes
   ___No
   If yes, describe the location and what you see. Take photographs or sketch the area.

14. Do you see lots of weeds in the landscape?
   ___Yes
   ___No
   If yes, describe the location and what you see. Take photographs or sketch the area.

15. Are there slopes in the landscape (*Sloped areas in the landscape can increase runoff*)?
   ___Yes
   ___No
   If the answer is yes:
      a. Describe the location and what you see. Take photographs or sketch the area.
      b. Do you see dirt running off of the landscape due to the slopes?
         ___Yes
         ___No
         If yes, take photographs or sketch the area.
Reading a Water Meter

There are two types of water meters; the circular-reading meter and the straight-reading meter.

The example to the right is a straight-reading meter. The reading is taken from the numbers under the words “CUBIC FEET.” The meter reads 81,710, which is the total number of cubic feet of water recorded since the meter was installed. Because the water utility charges based on units of 100 cubic feet, the meter reader discards the last two numbers (the ones with the black background). This reading, therefore, would actually be 817.

If by the time the meter reader reads your bills you had used 1,200 cubic feet of water, the new reading would be 82,910 (81,710 + 1,200). The meter reader would drop the last two numbers and your official reading would be 829. Your bill would be figured by subtracting the old number (817) from the new number (829). You would then be billed for 12 units. The large sweep hand is used only for testing purposes.

The circular-reading meter is pictured to the right. For this type of meter, start with the lowest dial, in this case marked “10”, and continue reading counter clockwise up to the highest dial. Write the number right to left. If a pointer is in between two numbers, choose the lower number. For example, the dial to the right reads 30472.

If the meter reads 30472 cubic feet today and 30350 cubic feet seven days later, you’ve used 122 cubic feet of water. Multiply 122 times 7.5 to find the number of gallons of water used during the week. In this case it is 915 gallons (1 cubic foot = 7.5 gallons).
## Example Water Bill

<table>
<thead>
<tr>
<th>Service</th>
<th>Account No.</th>
<th>Meter #</th>
<th>Reading (Gallons)</th>
<th>Bill Description</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Service</td>
<td></td>
<td>05/19/2009</td>
<td>185,000.00</td>
<td>Energy Charge</td>
<td>185,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04/22/2009</td>
<td>185,000.00</td>
<td>Demand Charge</td>
<td>185,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04/22/2009</td>
<td>185,000.00</td>
<td>Fuel Charge</td>
<td>185,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04/22/2009</td>
<td>185,000.00</td>
<td>Sales Tax</td>
<td>185,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Consumption in Gallons</strong></td>
<td>185,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Current Charges - Electric</strong></td>
<td>185,000</td>
</tr>
<tr>
<td>Water Service</td>
<td></td>
<td>05/19/2009</td>
<td>940,000.00</td>
<td>Billing Rate: Inside Comm Water Off Peak</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04/22/2009</td>
<td>940,000.00</td>
<td>Customer Charge</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Current Charges - Water</strong></td>
<td>940,000</td>
</tr>
<tr>
<td>Wastewater Service</td>
<td></td>
<td></td>
<td></td>
<td>Billing Rate: Inside Comm Water Off Peak</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Customer Charge</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Current Charges - Wastewater</strong></td>
<td>940,000</td>
</tr>
<tr>
<td>Solid Waste Service</td>
<td></td>
<td></td>
<td></td>
<td>Anti-Litter Commercial</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Current Charges - Solid Waste</strong></td>
<td>940,000</td>
</tr>
<tr>
<td>Drainage/Street Service</td>
<td></td>
<td></td>
<td></td>
<td>Comprehensive Drainage Fee</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transportation User Fee</td>
<td>940,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Current Charges - Drainage Street Service</strong></td>
<td>940,000</td>
</tr>
</tbody>
</table>
School Meter Reader Worksheet

Use your school’s water meter to record the information in the table below.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time (a.m.)</th>
<th>Reading (a.m.)</th>
<th>Time (p.m.)</th>
<th>Reading (p.m.)</th>
<th>Total daily use</th>
</tr>
</thead>
</table>

Total Use (Subtract the last reading from the first reading.)
# Water Audit Worksheets

## Boys’ Bathroom

<table>
<thead>
<tr>
<th>Location</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Count the number and type of toilets.  
- Single flush
- Dual flush

Count the number of leaking/running toilets.

Count the number and type of urinals. *  
- Pull chain
- Motion sensor
- Continuous flush and fill

Count the number of leaking/running urinals.

Count the number of hand basins.

Do the spouts have aerators fitted? Yes/No

Count the number of leaking/dripping taps.

Count the number and type of showers. (If applicable)  
- Full flow
- Restricted flow

Count the number of leaking/dripping showers.

**Other**  
(Description of any other water fixtures in the toilet block)
## Girls’ Bathroom

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Count the number and type of toilets.

<table>
<thead>
<tr>
<th>Single flush</th>
<th>Dual flush</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Count the number of leaking/running toilets.

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Count the number of sinks.

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Do the spouts have aerators fitted? Yes/No

<table>
<thead>
<tr>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Count the number of leaking/dripping taps.

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Count the number and type of showers. (If applicable)

<table>
<thead>
<tr>
<th>Full flow</th>
<th>Restricted flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Count the number of leaking/dripping showers.

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Other

(Description of any other water fixtures in the toilet block)

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Staff Bathroom

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number and type of toilets.</th>
<th>Single flush</th>
<th>Dual flush</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of leaking/running toilets.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number and type of urinals.</th>
<th>Pull chain</th>
<th>Motion sensor</th>
<th>Continuous flush and fill</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of leaking/running urinals.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of hand basins.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Do the spouts have aerators? Yes/No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of leaking/dripping taps.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number and type of showers. (If applicable)</th>
<th>Full flow</th>
<th>Restricted flow</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other (Description of any other water fixtures in the staffroom)</th>
</tr>
</thead>
</table>
### Teacher Resource Room/Lounge

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Count the number of hand basins/kitchen sinks.</th>
<th>Basins</th>
<th>Sinks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do the spouts of the taps have aerators fitted? Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Count the number of leaking/dripping taps.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this staffroom have a dishwasher?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the dishwasher only turned on when full? Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this staffroom have a hot water unit?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Description of any other water fixtures in the staffroom)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
# Classroom/Science Lab

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of hand basins/sinks.</th>
<th>Basins</th>
<th>Sinks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Do the spouts have aerators? Yes/No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Count the number of leaking/dripping taps.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Description of any other water fixtures in the classroom)</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>(Description ie infants, room number, building A, etc)</td>
</tr>
<tr>
<td>Count the number of hand basins/sinks.</td>
</tr>
<tr>
<td>Do the spouts have aerators? Yes/No</td>
</tr>
<tr>
<td>Count the number of leaking/dripping taps.</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>(Description of any other water fixtures in the classroom)</td>
</tr>
</tbody>
</table>
## Cafeteria

<table>
<thead>
<tr>
<th>Count the number of hand basins/kitchen sinks.</th>
<th>Basins</th>
<th>Sinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do the spouts have aerators? Yes/No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count the number of leaking/dripping taps.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the cafeteria have a dishwasher? Yes or No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the dishwasher only turned on when full? Yes or No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the cafeteria have a hot water unit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(Description of any other water fixtures in the cafeteria.)*
## Outdoor Taps

<table>
<thead>
<tr>
<th>Description</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count the number of leaking/dripping taps.</td>
<td></td>
</tr>
<tr>
<td>Are any taps vandalized or damaged? Yes or No</td>
<td></td>
</tr>
<tr>
<td>Count the number of outdoor taps.</td>
<td></td>
</tr>
<tr>
<td>Count the number of leaking/dripping taps.</td>
<td></td>
</tr>
<tr>
<td>Are any taps vandalized or damaged? Yes or No</td>
<td></td>
</tr>
<tr>
<td>Do any of the taps have hoses attached? Yes or No</td>
<td></td>
</tr>
<tr>
<td>Do the hoses have trigger nozzles attached to the end of them? Yes or No</td>
<td></td>
</tr>
</tbody>
</table>

*Other*

*(Description of any other water fixtures located outside not including irrigation)*
## Outdoor Gardens and Landscaping

<table>
<thead>
<tr>
<th>Count the number of landscaped gardens and lawn areas.</th>
<th>Landscaped gardens</th>
<th>Lawn areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>What type of plants/trees does the school have?</td>
<td>Native</td>
<td>Exotic/Non-native</td>
</tr>
<tr>
<td>Are the garden beds mulched? Yes/No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often are the gardens/lawns watered? (Days/week and number of hours)</td>
<td>Garden beds</td>
<td>Lawns</td>
</tr>
<tr>
<td>How are the garden beds/lawns watered? (You can tick more than one)</td>
<td>Pop-up sprinklers</td>
<td>Drip/micro system</td>
</tr>
<tr>
<td>Is the sprinkler system for the gardens/lawns automated? Yes/No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often is the garden watered? (Days/week and number of hours)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the sprinkler system for the garden automated? Yes/No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Your School’s Outdoor Irrigation Water Use**
Complete the chart below as you discuss with your school custodian or facilities manager the outdoor irrigation that takes place on the school campus. Record information in the table about each irrigated area. Be sure to ask about each lawn area (such as a garden or flower bed), playing field and playground area. Ask him or her to show you the irrigation controllers and sprinklers on the school grounds.

<table>
<thead>
<tr>
<th>Name of area</th>
<th>Location and description</th>
<th>How many times per week is the area watered?</th>
<th>What time of day is the area watered?</th>
<th>For how many minutes is the area watered?</th>
<th>Is a sprinkler timer used for this area?</th>
<th>Is a rain sensor used for this area?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References
ActewAGL – School Water Audit

Beaver Water District
www.bwdh2o.org
479.717.3807

How to read your meter

National Environmental Education Foundation Program – National Environmental Education Week
Be Water Wise – School Water Audit
http://www.eeweek.org/water_wise/water_audit

Texas School Water Audit
http://www.twdb.state.tx.us/assistance/conservation/Municipal/documents/7STEPSCHOOLWATERAUDIT.pdf

Wet City