

Be Water Wise! School Water Audit

Teachers Guide

Introduction:

Less than 1% of Earth's water is suitable for human use, making it a very scarce and valuable resource. Recent studies have indicated that 36 states in America are anticipating local, regional, or statewide water shortages by 2013.¹

Given these shortages, it may come as a surprise that the average person uses about 100 gallons of water each day for bathing, cooking, drinking, and cleaning.² Understanding where water comes from, how it is used, and how it can be conserved is critical to protecting our water resources for years to come.

School water audits provide a fun and educational way for students to examine the ways that they use water everyday, and to encourage classmates, teachers, and school administrators to make their school more water-efficient and cost-effective. EE Week's *Be Water Wise! School Water Audit*, available at www.eeweek.org/water_wise/water_audit, guides students through their own audit of school water use, encouraging them to "find the leaks" in the water use at school and develop strategies to improve water conservation.

The following Teachers Guide assists teachers in conducting a school water audit with their students. It is comprised of five parts:

- **Before the Audit**, which helps teachers to ensure the participation of school custodians and school administration in the water audit efforts.
- **During the Audit**, which offers specific guidance on implementing a water audit.
- **After the Audit**, which details ways to take the results of a school water audit to students, teachers, administrators, and parents and suggest a range of ways to reduce water use at school.
- **Key Water Audit Terms**
- **Supplementary Water Resources**

¹ Water-Use it Wisely website, retrieved from <http://wateruseitwisely.com/blog/?p=737>.

² National Environmental Education Week website, retrieved from http://www.eeweek.org/water_wise.

Before the audit...

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:

- **Meet with your principal** and obtain copies of the school's water bills from the previous year. This will be important information for **Section A** of the audit.
- **Talk with your custodian or facility manager** and review the audit with them. Determine where his/her help will be needed, for instance in determining the source of your school's water, analyzing toilets and faucets, and examining the outdoor landscape. This will be important information for **Section B** of the audit.
- **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 watering restrictions that might be in place due to drought. Suggested grade-appropriate lesson plans to supplement the School Water Audit are available at www.eeweek.org/water_wise/water_audit.
- **Consider your students' developmental level** before beginning the audit, and consider how much of the audit they will be able to complete on their own. Elementary students will need more assistance from adults than older students. High school students should be able to complete most of the audit on their own in small groups. The amount of assistance you provide will depend on your students' abilities.
- **Predict the outcomes** of the audit and review the Report Outline available at www.eeweek.org/water_wise/water_audit. What do you hope your students will achieve by conducting the School Water Audit?

During the audit...

Section A: School Buildings

This section of the School Water Audit asks students preliminary questions about the source of their school's water, last year's water costs, etc. You may wish to have your students interview the school custodians or administration in order to obtain answers to these questions.

Section B: Indoor Water Using Devices

In this section, students conduct an analysis of the faucets, toilets, urinals, and showers in the school building, noting fixtures that leak. Depending on class size and ability level, divide students into groups and delegate which groups will collect data for the various sections. Remember not to forget about classrooms that have sinks! Ask students to complete the water use chart in Section B of the audit.

When leaks are discovered, have students determine the amount of water wasted per day due to the leaking fixture. To do this, students can 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 Section A 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.

Section C: School Grounds

For the analysis of school grounds, you can keep your students in the same groups as for Section A, or you can divide them into different groups. Delegate which groups will collect data for the various sections of your school property, making sure that the areas they are covering are large enough for them to obtain data, and still small enough that they don't have to walk large distances or risk missing an important piece of data. While outside, use markers such as trees to help students determine what area they are analyzing. Keep in mind that much of Section C asks students to determine where excess water is being applied. Therefore, make sure to complete Section C shortly after the landscape has been watered.

Note: Grade and/or developmental level will determine the amount of adult involvement in the audit. If teaching younger students, it may be wise for teachers to walk with students, asking them to count fixtures, for instance, while teachers record data.

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.

Give your students the opportunity to share their water audit results with their school custodians, students and staff, or even their school board or PTA. 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.

Key Water Audit Terms:

Cooling tower – Large structures, usually next to the Chiller (HVAC Room) of your school or on the roof, which extract heat from water that has been used for cooling buildings. Your students may be unaware of the fact that cooling the building is another way water is used at school. See Figure 1.



Figure 1. Cooling tower (Image source: HVAC Associates)

Flow rate – The volume of water flowing through an outlet in a specific time period. For example, the standard flow rate of a showerhead is 2.5 gallons/minute (**GPM**). Another measure of flow rate is gallons/flush (**GPF**), which measures the number of gallons of water used with one toilet flush. Conventional toilets have a GPF rate of about five gallons. More efficient toilets have a GPF rate of about 1.6 gallons. The flow rate is usually indicated near the rear or side of the fixture.

Landscape – For the purposes of the School Water Audit, landscape comprises the visible land features surrounding your school, including grassy areas, parking lots and sidewalks, and athletic fields. The health of your school landscape will be a key indicator of your school's water usage.

Runoff – The water flow that occurs when soil is infiltrated to a maximum capacity, causing storm water to flow over land and parking lots into sewage drains. Storm water runoff is a major cause of water pollution because it carries oil, debris, sediment and other pollutants into streams and rivers.



Figure 2. Runoff (Image source: City of Santa Fe Stormwater Management)

Water meter – A device used to measure the volume of water usage. Water meters are used at both residential and commercial buildings, and typically measure total usage in cubic feet, cubic meters, or U.S. gallons. Water meters are either buried outside of buildings or located indoors where the main water line enters the building.



Figure 3. Water meter (Image Source: Flow Meter Directory)

Supplementary Water Resources:

Be in the Know About H2O - Water Conservation Videos from the Weather Channel

<http://climate.weather.com/promo/waterconservation>

Download short video clips with water-saving tips from Forecast Earth, a program of the Weather Channel. Titles include "Give the tap a break" and "Don't be a drip...Fix leaks."

EPA's Watershed Academy Webcasts

<http://www.epa.gov/owow/watershed/wacademy/webcasts>

EPA's Office of Wetlands, Oceans, and Watersheds presents the Watershed Academy. Local watershed organizations, municipal leaders, and others are invited to sign up for these free, on-line Webcast training sessions. Past webcast topics include: Rain Gardens; Water, Energy, and Climate Change; Smart Growth and Green Infrastructure; Volunteer Water Quality Monitoring; and many others. Archived Webcasts are available and free to download.

EPA's WaterSense Program

<http://www.epa.gov/watersense>

WaterSense, a partnership program sponsored by the U.S. Environmental Protection Agency, makes it easy for Americans to save water and protect the environment. Visit the website to get water-efficiency information and tips, learn how to check for and fix leaks, and more. Many WaterSense materials are available in Spanish, and the website includes a For Kids section and a "Test Your WaterSense" game.

The Groundwater Foundation

<http://groundwater.org>

The Groundwater Foundation seeks to motivate people to care for and about groundwater by focusing on groundwater education and outreach. Many resources for educators (such as coloring sheets, activity pages, lesson plans, and puzzles) can be found at their **Kids Corner**.

H2O Conserve

<http://www.h2oconserve.org>

At H2O Conserve, visitors can calculate their water footprints, explore water and money saving tips to reduce their water footprints, download educational resources, and find links to other sites with information about conserving water.

Water Footprint

<http://www.waterfootprint.org>

People use lots of water for drinking, cooking and washing, but even more for producing things such as food, paper, cotton clothes, etc. The water footprint of an individual, community or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by the individual or community or produced by the business. This site provides a water calculator to help determine your personal water footprint.