



Every Drop Counts Water Audit

Chicago Conservation Corps (C3) Student Clubs
City of Chicago Department of Environment (DOE)



By participating in this Water Audit, Club members will:

1. Learn about the importance of water conservation locally and globally.
2. Track their personal water use for one day.
3. Measure the amount of water wasted because of leaky faucets in the school.
4. Estimate the school's annual water waste and the energy use associated with it.

Overview

During this audit, Club members will learn about water consumption, waste, and conservation, and will make connections between water and energy use. First, Club members will learn that water is a limited and energy-intensive resource through some introductory activities and brainstorming. Then, by completing a **Personal Water Audit Guide and Data Sheet**, they will keep track of their own water use and be able to estimate the water use of others at the school. Club members will also measure leaks found throughout the school as they complete the "**Leaky Faucets**" **Audit**. This information will be used to help Club members determine which project(s) to complete for their Water Project.

Materials

To be provided by DOE at the Water Workshop:

- Graduated water bottle
- *Niagara Conservation* Water wheel

To be provided by the Club:

- Watches
- Sponges or (paper) towels
- Plastic bags
- Masking tape and a marker
- Cups that fit under your faucets
- Calculator
- One balance (perhaps borrowed from a science lab at the school)
- Empty, transparent/opaque one-gallon milk jug (optional)
- One-gallon (or larger) bucket (optional)

The online report for this audit is due:

Friday, April 24th

To submit your report, log-in at
www.chicagoconservationcorps.org
(click on "C3 Teachers")

Note: Teacher stipend check is contingent on the timely completion of this report.

If you have questions or concerns, contact:

Jeff Walter
Chicago Department of
Environment
312-743-9283
conservation@cityofchicago.org

Water in Chicago

Did you know that if you spread the water in the Great Lakes evenly across the continental U.S., the water would be about 9.5 feet deep? That's a LOT of water! Chicago, like many other cities in the Great Lakes region, benefits greatly from easy access to fresh water. As a result of this easy access, however, we often don't realize just how much water we use...and waste.

In Chicago, we use an average of 200 gallons of water per person per day – twice the national average. In total, that equals over 1 billion gallons of water **per day city-wide**, not including industrial water use.

What can we do to conserve water in Chicago? The first step is to identify our water uses in order to determine where water is being wasted. These areas might be target areas for your Club's water project later in this unit.



Introduce and Plan for Audit (1-2 meetings)

1. **Review** this audit guide and contact DOE with any questions.
2. **Introduce and discuss water use and conservation.** We encourage you to cover as many of the following topics as possible:
 - Conduct the **Drop in the Bucket** demonstration.
 - Fill your empty, clean milk jug to the top with water. Explain to the Club that this water represents *all* of the water in the world.
 - Tell students that you want them to guess how much of this water is available for everyday use. Have them suggest percentages.
 - Start dumping water out of the milk jug into the bucket. Tell students that you are now dumping out all of the salt water (which we can't drink, use to grow crops, use for bathing, etc.). Dump out all but ½ cup of the water. **97% of the world's water is salt water.**
 - Explain that what remains in the milk jug is fresh water, but not all of it is accessible. **About 80% of our fresh water is frozen in glaciers.** Dump this amount into the bucket. (All that should remain in the bucket is about 2 tablespoons of water).
 - Explain that not even all of the remaining water in the milk jug is available for human use. Some of that fresh water is in groundwater, mixed in with soil, or so badly polluted that it cannot be used. Dump a bit more water into the bucket.
 - What remains in the jug (1 ½ tablespoons of water) represents all of the world's fresh water that is fit for consumption and use – less than 0.5% of the world's water.
 - Of all the water that left in the jug, a large part of it is stored in the great lakes. **20% of the world's fresh water is found in the Great Lakes!**
 - Using the information from the Water Workshop's PowerPoint **presentation** and/or the **Putting the Pieces Together** activity starting on this page, explain where Chicago's water comes from and where it goes after it is used.
 - Have students **brainstorm some of their uses for water**, and some of the school's uses.

Putting the Pieces Together

Chicago has a very unique system of water management in comparison to other parts of the country. This activity clarifies the flow of the water that we use from its source in Lake Michigan, to filtration and treatment, to transport, to use, and then to treatment of wastewater.

Before the meeting:

1. **Cut out the puzzle pieces** for this activity (only the 17 *numbered* pieces from both pages).
 - They can be found in the Appendix of this guide on p.13-14, or on your Club's Water Resource CD.
2. **Place sets (17 pieces total) in envelopes.** The number of sets is up to you; the activity can be done individually, in pairs, in groups, or with the entire Club.
3. **Copy the Statement Sheet** (p. 3) for your students.
4. **Download the following two YouTube videos** onto a computer that your students can view.
 - Go to www.YouTube.com
 - In the Search field, enter "Illinois Drinking Water." With your students, view the first two hits, produced by ISAWWA:
 - **Part 1** (6 minutes, 47 seconds)
 - **Part 2** (4 minutes, 22 seconds)

During the meeting:

5. **Watch the video clips** as a group.
6. Pass out the puzzle pieces and Statement Sheet.
7. Explain that there are 17 puzzle pieces in the envelope, but that only **13 of them are correct.**
8. Each piece has a number that corresponds to a statement on the list. **If the statement is true, they should use the piece to complete the puzzle.** If the statement is false, they should return the piece to the envelope.





Putting the Pieces Together Statement Sheet

Chicago Conservation Corps (C3) Student Clubs
City of Chicago Department of Environment (DOE)



Answer the true/false statements below. *Hint: Only 4 are false!* The 13 that are true correspond to the 13 puzzle pieces you should use to complete the Water Flow puzzle. The wrong pieces will fit into the puzzle, but will not have correct information about the municipal water cycle – there might be incorrect captions or arrows. Make sure that you check your final puzzle against the answer key.

#	T/F?	Statement
1		After water goes down a drain in Chicago, it returns to Lake Michigan.
2		7.1% of electrical energy produced in the U.S. comes from hydroelectric power plants, while over 70% is generated using fossil fuels.
3		There is always new water available, so we needn't worry about conservation.
4		The Chicago region uses over 2 billion gallons of water per day.
5		Less than 1% of all the water on Earth is fresh, non-frozen, potable water.
6		Water that is taken out of Lake Michigan must be treated before it can be used by people.
7		The average Chicagoan uses 200 gallons of water per day.
8		Because energy is required to treat, heat, and transport water, about 1.65 pounds of carbon are emitted by power plants for every gallon of water a person uses.
9		Using one recreational watercraft for an hour can produce the same amount of emissions as using 348 cars for the same amount of time.
10		About 40% of all freshwater withdrawals in the United States goes towards producing energy from fossil fuels and nuclear power.
11		American water supply and treatment facilities consume about 56 billion kilowatt-hours per year, enough to power more than 5 million homes for one year.
12		One-tenth of the world's fresh water is found in the Great Lakes.
13		Allowing a faucet to run for five minutes uses about as much energy as letting a 60-watt light bulb run for 14 hours.
14		Global warming would have no effect on water supply and water quality in lakes, rivers, and aquifers.
15		About 3% of the national energy consumption is used for the transportation and treatment of drinking water and wastewater services, which equates to adding approximately 45 million tons of greenhouse gas to the atmosphere.
16		On average, 55% of precipitation in urban areas will be runoff into sewer systems and will not infiltrate the ground to nourish plants.
17		If one out of every 100 American homes installed water-efficient fixtures, about 100 million kilowatt hours of electricity would be saved per year, preventing 80,000 tons of greenhouse gas emissions. This is equal to removing 15,000 automobiles from the road for one year.



Putting the Pieces Together
Teacher Answer Key: Statement Sheet
Chicago Conservation Corps (C3) Student Clubs
 City of Chicago Department of Environment (DOE)



#	T/F?	Statement
1	F	After water goes down a drain in Chicago, it returns to Lake Michigan. <i>(YouTube clips) Answer: Water goes to the Chicago River, which empties into the Mississippi River.</i>
2	T	7.1% of electrical energy produced in the U.S. comes from hydroelectric power plants, while over 70% is generated using fossil fuels. <i>(USGS, http://ga.water.usgs.gov/edu/wuhy.html)</i>
3	F	There is always new water available, so we needn't worry about conservation. <i>(YouTube clips) Answer: Water is a limited resource. Only a small amount is available and accessible for human use.</i>
4	T	The Chicago region uses over 2 billion gallons of water per day. <i>(You Tube clips, Chicago Department of Water Management)</i>
5	T	Less than 1% of all the water on Earth is fresh, non-frozen water that could be used for drinking. <i>(YouTube clips)</i>
6	T	Water that is taken out of Lake Michigan must be treated before it can be used by people. <i>(YouTube clips)</i>
7	T	The average Chicagoan uses 200 gallons of water per day. <i>(Chicago Department of Water Management)</i>
8	T	Because energy is required to treat, heat, and transport water, about 1.65 pounds of carbon are emitted by power plants for every gallon of water a person uses. <i>(Chicago Department of Water Management)</i>
9	T	Using one recreational watercraft for an hour can produce the same amount of emissions as using 348 cars for the same amount of time. <i>(US EPA 2007)</i>
10	T	About 40% of all freshwater withdrawals in the United States goes towards producing energy from fossil fuels and nuclear power. <i>(USGS, http://pubs.usgs.gov/circ/2004/circ1268/)</i>
11	T	American water supply and treatment facilities consume about 56 billion kilowatt-hours per year, enough to power more than 5 million homes for one year. <i>(EPA, www.epa.gov/owm/water-efficiency/water/save/env_benefits.htm)</i>
12	F	One-tenth of the world's fresh water is found in the Great Lakes. <i>(YouTube clips, EPA): Answer: One-FIFTH. 20%, not 10%.</i>
13	T	Allowing a faucet to run for five minutes uses about as much energy as letting a 60-watt light bulb run for 14 hours. <i>(EPA, www.epa.gov/owm/water-efficiency/water/save/env_benefits.htm)</i>
14	F	Global warming would have no effect on water supply and water quality in lakes, rivers, and aquifers. <i>(EPA, www.epa.gov/climatechange/effects/water/northamerica.html) Answer: Global warming would negatively impact water quality by causing the water level of the Great Lakes to drop.</i>
15	T	About 3% of the national energy consumption is used for the transportation and treatment of drinking water and wastewater services, which equates to adding approximately 45 million tons of greenhouse gas to the atmosphere. <i>(EPA, www.epa.gov/waterinfrastructure/bettermanagement_energy.html)</i>
16	T	On average, 55% of precipitation in urban areas will be runoff into sewer systems and will not infiltrate the ground to nourish plants. <i>(www.lcrep.org/fieldguide/importance.htm, original source: Nonpoint Education for Municipal Officials (NEMO) publication)</i>
17	T	If one out of every 100 American homes installed water-efficient fixtures, about 100 million kilowatt hours of electricity would be saved per year, preventing 80,000 tons of greenhouse gas emissions. This is equal to removing 15,000 automobiles from the road for one year. <i>(EPA www.epa.gov/owm/water-efficiency/water/benefits.htm)</i>



Putting the Pieces Together

Discussion:

1. After all Club members have assembled their puzzle pieces, check them as a group. **Piece numbers 1, 3, 12, and 14** should NOT be in the completed puzzle.

2. **Discuss** the completed activity as a Club. Consider the following questions:

- What did you think about the **video**?
- Which steps of the **process** had you not previously considered?
- Water management in other parts of the country and world is **very different** from water management in Chicago. What are some of the aspects of Chicago's water use that might be different from other areas'? For example, how would it compare to:
 - **Phoenix, AZ**, a city in a dry climate?
 - **Detroit, MI**, another Great Lakes city that sends its wastewater directly back into the Great Lakes?
 - **Port-au-Prince, Haiti**, a city with very few public services (like water treatment)?
- How is water use connected to **climate change**?
- Why does this information matter when considering water **conservation**?
- Were any of the **true/false** statements surprising?
- Does knowing more about where our water comes from and where it goes **change how you look at your own water use**?

3. **Discuss the audit, explaining the goals of the activity.**

- Pass out copies of the **Personal Water Audit Guide and Data Sheet / Calculations Worksheet (p. 7-8)**; explain that Club members will be tracking their water use for one day.
- Explain the **“Leaky Faucets” Audit Guide and Data Sheet (p.9-10)**.
- Explain that Club members will make estimates of water *use* and *waste* based on their findings.

4. **Plan for the Personal Water Audit.**

- Determine a final date by which each Club member must have completed his or her personal audit. Alternatively, choose one day when everyone will complete their audit.

5. **Plan for the “Leaky Faucets” Audit.**

- **Brainstorm** with the Club to come up with a list of all the areas where water is used in the school (some examples might be include classrooms, science labs, kitchen, lunchroom, administrative offices, hallways, maintenance areas, sports fields, landscaped grounds, the gym and locker rooms).
- **Select** the water-use areas in the school that will be audited.
- **Assign** a Club member or group of Club members to each selected water-use area.
- **Choose the date** for the audit.
- **Notify** appropriate administration, maintenance staff and other teachers that students will be visiting different areas of the school where water is used. Find out the extent to which students will need to be supervised as they move around the school campus.
- **If appropriate**, schedule opportunities for the Club to tour areas of the school that are generally closed off to students where water is used. Examples might be the kitchen or landscaping shed. Ask the tour guide if any information about water use in these areas (gallons per day, per year, etc.) is available; if so, perhaps the tour guide could bring that information to the tour.

Conduct the Audits (2 meetings)

1. Individually, **conduct the Personal Water Audit** at the pre-determined time.
2. **Gather supplies** for the **“Leaky Faucets” Audit**, referring to the list on p.1. Depending on the shape of your school's faucets, you may need smaller cups to collect the water from the leaks; then you can pour the water from the cup into the graduated water bottle.



3. **Have students split into their groups for the “Leaky Faucets” Audit.**
 - **Distribute copies** of the “Leaky Faucets” Audit to each student (or group of students).
 - Distribute the necessary **supplies** to each Club member/group.
 - Go through the procedure for the “Leaky Faucets” Audit (outlined on the worksheet), perhaps doing a demonstration first if necessary.
 - **Conduct the audit.** Have Club members record their findings on the worksheet. They should fill in columns A and B in Step 1: Faucet Leaks, and columns A, B, and C in Step 2: Surface Leaks.

Don't forget to take photos!



4. **Take the tours** organized in Step 5 above. Ask the tour guides to talk about how they use water on a daily basis, and what current conservation technologies and practices are already in place. Have students take notes.

Analysis and Follow-up (1 meeting, combined with the first Project Meeting)

1. **Complete calculations on worksheets.**
 - **Personal Water Audit Guide and Data Sheet / Calculations Worksheet (p.7-8):** Club members should calculate all of their personal water use totals, using the back of their worksheet as a guide. They will need to know their **total daily water use** for Club calculations (on the bottom half of the Calculations Worksheet). Club members will work together to calculate an average amount of water used per day, per year, and school-wide per year.
 - **“Leaky Faucets” Activity Guide and Data Sheet (p.10) / School Water Waste Estimate (p.11):** Students should use the information from their audit to work across this guide to calculate how much water is wasted due to leaks at the water use sites they visited. Each group’s information will then be used to calculate a school-wide water waste estimate.
2. **Discuss** how these results are significant in water conservation AND energy conservation. How many pounds of greenhouse gases are released per year as a result of your water use? Your school’s water use?
3. **Brainstorm ideas** for improved water conservation in the school based on your findings. How could your Club help with this process? Consult the “Save the Source” Project Guide for more ideas.
4. Fill out the online report for this audit, due on **Friday, April 24th** (see page 1 for instructions).

More Information on Water Issues

Great Lakes Compact: <http://www.glc.org/about/glbc.html>

This legislation was created by the States and Canadian provinces bordering the Great Lakes. It was signed into law by Congress, Senate, and the President in 2008, and outlines acceptable use and treatment of the Great Lakes.

Chicago Department of Water Management: <http://www.cityofchicago.org/Water>.

Learn about how water is managed in the city of Chicago.

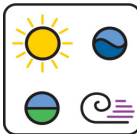
Illinois Department of Natural Resources: <http://dnr.state.il.us/OWR/chicago.htm>

The Office of Water Resources put together a comprehensive history of Chicago’s water use and management.

Metropolitan Water Reclamation District: <http://www.mwrd.org/>

Learn about wastewater treatment in Chicago.





Personal Water Audit Guide and Data Sheet Club Member Worksheet

Chicago Conservation Corps (C3) Student Clubs
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Use this worksheet to keep track of the number of times you use water and in which way for a full day.

1. Fill out the “**number of times**” column throughout the day.
2. At the end of the day, multiply the number of times by the “**average amount of water for the activity.**” Write the answer in the “**total water used**” column.
3. Add up your “**total water used**” column to get an estimate of how much water you use in a day.

Activity	# of Times (✓)	Average Amount of Water for this Activity (liters)	Total Water Used (liters)
Washing face or hands (water running)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	7.5	
Washing face or hands (water off)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	4	
Flushing toilet (standard flow toilet)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	20	
Flushing toilet (low-flow toilet)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	5.5	
Taking a shower (standard head)	# of minutes:	7.5/minute	
Taking a shower (low-flow)	# of minutes:	4/minute	
Taking a bath	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	150	
Shaving (water running)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	7.5	
Shaving (water turned off)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	4	
Brushing teeth (with water running)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	7.5	
Brushing teeth (with water turned off)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
Getting a drink (from a fountain)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
Getting a drink (in a glass)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	0.25	
Cooking a meal	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	10	
Washing dishes by hand (water running)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	110	
Washing dishes by hand (water off)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	40	
Washing dishes (with a dishwasher)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	55	
Doing a load of laundry	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	110	
Other:	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Estimate:	
TOTAL:			





Personal Water Audit Calculations Sheet

Group Calculations Worksheet

Chicago Conservation Corps (C3) Student Clubs
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Personal Water Use per Day

How much water did **you** use in **total**? Look at the total on your **Personal Water Audit Guide and Data Sheet**. _____ liters

If you have a hard time visualizing liters, a bottle of pop is 2 liters. To figure out how many pop bottles you could have filled with the water you used today, *divide* your **total** number by **2**. # of pop bottles: _____

Do you think that's a lot of water? When you think about it that way, does it seem like more than you originally thought?

Here's something else to think about: A lot of energy is required to transport and clean the water that we use. Just like we can calculate how many pounds of greenhouse gases are released into the atmosphere for every minute an appliance is left on (like you did with the Kill-a-watt), we can calculate how many pounds of greenhouse gases are released for every liter of water you use. **Multiply** the **total** number of liters of water you used today by **0.44** to get a rough estimate of the resulting greenhouse gas emissions. *Note: This estimate is based on the pre- and post-treatment, transport, and heating of water by the average Chicago resident.* **Total (from Personal Audit) x 0.44 = Greenhouse gases released (lb) = _____**

Personal Water Use: Group Calculations of Averages per Day and per Year

Use the table below to determine the average amount of water used per person per year in total and by everyone in your school per year.

A Club Members' Totals <i>Record all of your Club members' totals (in liters) below. Example: Kristen=200, Jeff=350, Sam=100</i>	B Sum of All Club Members' Water Use <i>Add up the numbers in Column A.</i>	C Average Liters of Water Used per Person per Day <i>B / # of Club Members</i>	D Average Liters of Water Used per Person per Year <i>C x 365</i>	E Total # of People in Your School (Students, Staff, Teachers)	F Estimated Liters of Water Used per Year by Everyone in Your School <i>D x E</i>

Note: Want to be able to share your Club's findings in gallons? It's easy! Just multiply the number in liters by 0.26. This will give you the number in gallons!





“Leaky Faucets” Activity Guide and Data Sheet Club Member Worksheet

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Objective:

To explore your water-use area, identify leaks, and find out how much water is wasted by those leaks.

Materials:

- Graduated water bottle and/or measuring cups
- Watch or stopwatch
- Sponges or paper towels
- Sealable plastic bags (e.g., Ziploc)
- Masking tape (or paper and Scotch tape)
- Marker
- Scale/balance

Instructions:

1. Depending on the number of water use sites being audited by your Club / the number of predicted surface leaks at those sites, assemble plastic bags and sponges / paper towels.
 - Put one sponge or paper towel in each bag.
 - Put a piece of masking tape on the outside of the bag, and label it. For example, if you were bringing that bag to the girl’s restroom, you might label the bags GR 1, GR 2, GR 3, etc.
 - Before you begin your “Leaky Faucets” Audit, record the mass of each bag (with a dry sponge) in Column J on the back of this worksheet.
2. With your stopwatch, plastic bag kits, and graduated water bottle / measuring cups, visit your water-use site and take a look around.
3. Use your worksheet (on the other side of this page) to make a list of all of the different water outlet types, such as sinks, drinking fountains, showers, and toilets.
4. Do any of your water outlets have leaks? Look for drips and pools of water along handles and countertops. Then, do one of the following to measure how much water is being wasted by the leaks.

Faucet Leaks – For the leaks that are easily caught with a graduated water bottle or cup

A1. Place the water bottle provided by C3 under the leak and start a stopwatch. Measure how many minutes it takes to collect about 100 milliliters (ml).

- Note: If the water bottle does not fit, you can use any cup and *carefully* dump the contents of the cup into the bottle to take a measurement of the water collected.

A2. On the worksheet (see other side), record the water outlet, the number of milliliters collected (Column A), and the number of seconds it took to collect the water (Column B).

Surface Leaks – For leaks where water flows out over a surface (i.e., water flows around the handles of a faucet)

- B1. Dry the area around the leak with a paper towel, and discard. Then, immediately place a dry sponge or fresh paper towel (out of one of your bags) in the path of the leaking water and start the stopwatch.
- B2. Measure how many seconds it takes for the leak to soak the sponge or paper towel and record this number in Column C.
- B3. Place the wet sponge or paper towel into the appropriate plastic bag and seal the bag.
- B4. Use a balance to determine the new mass of the bag and sponge and record this number in the appropriate location in Column B.



Did You Know?

If a faucet drips at a rate of one drop per second, you can waste 10,200 liters per year!



Faucet Leaks	Water Outlet and Location	A. Amount of water collected (milliliters)	B. Time to collect water (sec)	C. Water wasted in ml/sec (A / B)	D. Water wasted in ml/min (C x 60)	E. Water wasted in ml/hour (D x 60)	F. Water wasted in ml/day (E x 24)	G. Water wasted in liters/day (F x .001)	H. Water wasted in liters/yr (F x 365)
	Example: Boys locker room shower	100	90	1.11	66.6	3,996	95,904	95.904	35,005
	1.								
	2.								
	3.								
	4.								
5.									
TOTALS:									

Surface Leaks	Water Outlet and Location	I. Mass of dry sponge and bag (g)	J. Mass of wet sponge and bag (g)	K. Time to soak up water (sec)	L. Mass of water wasted in grams** (J-I)	M. Water wasted in ml/sec (L/K)	N. Water wasted in ml/min (M x 60)	O. Water wasted in ml/hour (N x 60)	P. Water wasted in ml/day (O x 24)	Q. Water wasted in liters/day (P x .001)	R. Water wasted in liters/yr (Q x 365)
	Example: Teachers' lounge sink	25	40	30	15	.5	30	1,800	43,200	43.2	15,768
	1.										
	2.										
	3.										
	4.										
5.											
TOTALS:											

**Also equals the *volume* of water wasted, since 1 mL of water weighs about 1 gram.

Special Challenge: Did you tour any other water-use areas of your school like the kitchen, grounds, janitor's closet, etc.? If so, do you think there are leaks in those areas? Would there be any way to calculate how much water is wasted due to leaks in those areas?





School Water Waste Estimate Group Calculations Worksheet

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“Leaky Faucets” Average per Year

Calculate how much water is wasted as a result of leaks. Using the table below, you will be able to determine an average amount of water waste per site per year, and an average amount of water waste per year school-wide.

E	F		G	H	I	J	K
# of Water Use Sites Audited	Club Members’ Totals for Water Wasted in Liters/ Year <i>Have all of your groups add their Faucet and Surface Leak totals together, then record their numbers below.</i>		Total Amount of Water Wasted due to Leaks at Audited Sites per Year in L/yr <i>Add up all of the numbers in Column F.</i>	Estimated Amount of Water Wasted per Site per Year in L/yr <i>G / E</i>	Total # of Water Use Sites at Your School	Estimated Amount of Water Wasted per Year School-Wide in L/yr <i>H x I</i>	Pounds of Greenhouse Gases Emitted per Year as a Result of Wasted Water <i>J x 0.44*</i>
Example: Our Club split into 5 groups. Each group audited one water use site. 2 groups did not find any leaks.							
5	Group 1 = 0 Group 2 = 0 Group 3 = 50,773	Group 4 = 45,322 Group 5 = 35,397	$50,773 + 45,322 + 35,397 = 131,492$	$131,492 / 5 = 26,318$	10	$26,318 \times 10 = 263,180$	$0.44 \times 263,180 = 115,799$

*Energy is required to transport and clean the water that we use. Just like you can calculate how many pounds of greenhouse gases are emitted by running an appliance, you can calculate how many pounds of greenhouse gases are emitted by consuming a certain amount of water. *This estimate is based on the pre- and post-treatment, transport, and heating of water by the average Chicago resident.*

