

HOUSEHOLD GUIDE TO water efficiency





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Revised: 2004, 2005, 2014

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The importance of water



Residential water use

Water is life. Humans, and every living thing on Earth, need water to survive.

Humans can live several weeks – even months without food, but can survive only a few days without water. Every system in our body uses water. Drinking water and other liquids provides about half the water our bodies need, the other half comes from the water embedded in the food we eat.

The water we drink, wash with or spray on our lawns and gardens has been here since the Earth was formed billions of years ago. The water in your morning coffee or your lunchtime apple could contain the molecules from the swamp water a dinosaur lapped up in the Jurassic Period.

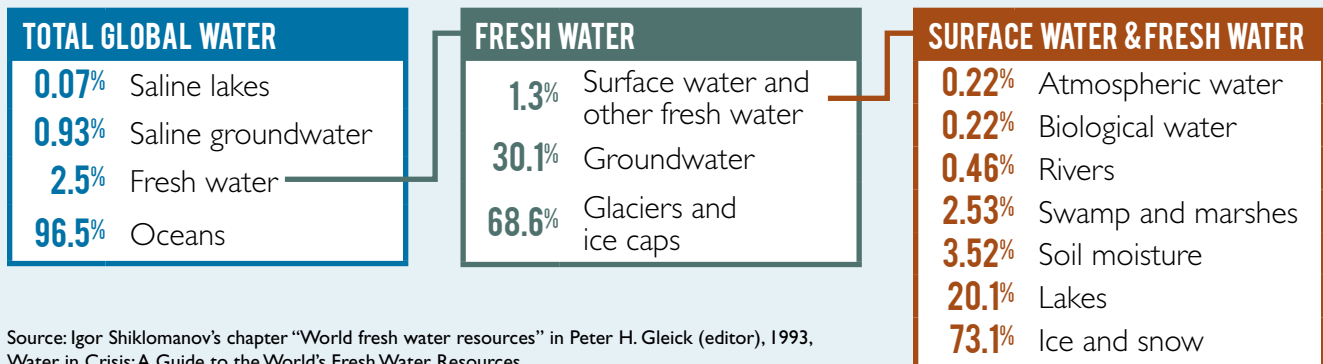
Although three-quarters of the Earth’s surface is covered with water, only about one percent is available fresh water. Ninety-seven percent of the water on the

planet is too salty for humans and most other animals and plants to consume. The remaining two-percent of fresh water is locked in glaciers.

Each and every system in our body uses water

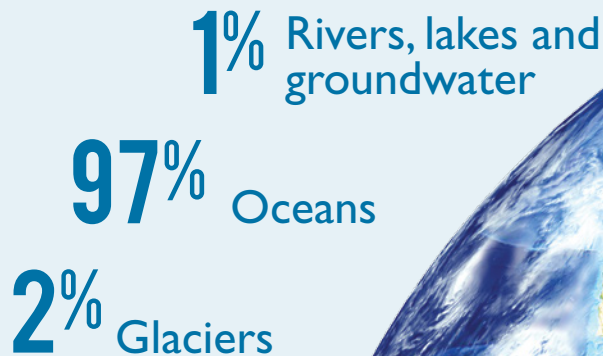
- Water makes up 83% of our blood and 25% of our bones.
- Water transports body wastes.
- Water lubricates body joints.
- Water keeps our body temperature stable.
- Water is part of every cell in the human body.

Distribution of the Earth’s water



Source: Igor Shiklomanov’s chapter “World fresh water resources” in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World’s Fresh Water Resources*.

Usable water in the world



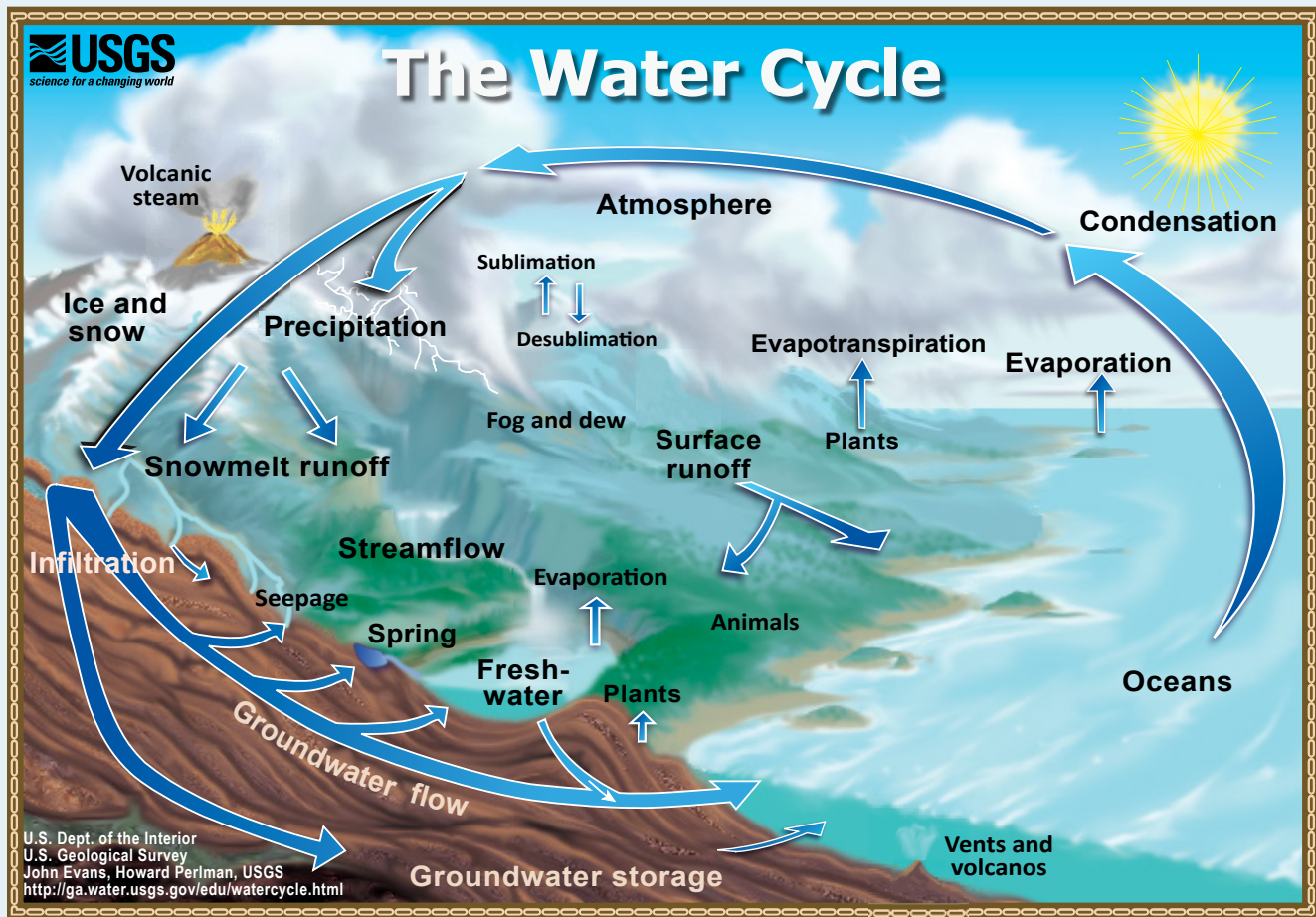
The cycle of water

The fresh water that sustains all life on this planet is continuously recycled. Water is used, purified and reused in an endless cycle known as the hydrologic cycle. There is no new supply of fresh water. What we have is all that exists.

It is through the hydrologic cycle that water is cleansed and recirculated. But the hydrologic cycle has a limited capacity to purify water. If we waste

and pollute our water supply, we compromise Nature's ability to recycle and cleanse the water and, in turn, we degrade a resource on which all life on Earth depends.

By reducing our water use and practising pollution prevention, we help the water cycle do its job and protect a life-sustaining resource.



Water use in Canada



How we use water

From flushing the toilet to watering the lawn, the residential sector is the fastest growing user of water in Canada. Worldwide, Canada is second only to the United States for individual water use. The average Canadian uses four times the amount used by the average Swede and eight times as much as the average Dane.¹ The real concern is that about half of our water use can be unnecessary and wasteful. Running taps, leaking faucets, and excessive lawn watering contribute to our very high consumption rates.

What does all this mean? It means we have plenty of opportunities to reduce our water use, lower our water bills, make better use of our water treatment and waste water infrastructure, and protect our water fresh water supplies.

Litres per person per day²

Territories	391
B.C.	353
Alberta	209
Saskatchewan	238
Manitoba	199
Ontario	225
Quebec	386
New Brunswick	394
Nova Scotia	292
P.E.I.	189
Newfoundland and Labrador	395

Water worries

There is no doubt that we have a lot of water in Canada. In fact, our lakes and rivers hold about 25% of the world's fresh surface water.

However, much of our water is in isolated locations, far from urban centres, where it is needed. Furthermore, every time water is used



¹ Conference Board of Canada www.conferenceboard.ca/hcp/details/environment/water-consumption.aspx

² Environment Canada: 2011 Municipal Water Use Report, 2009 Statistics

by residents, farmers, industries and others, it can be degraded in some way that may not make it immediately suitable for reuse.

It is important to consider that water taken from one source may not necessarily be returned to that source after use. Water taken from lakes and rivers in one area may end up either downstream in another lake, seep into the ground or even evaporate. (move closer to referential or remove

altogether is deemed unessential). Groundwater sources are particularly vulnerable. The deeper the aquifer, the longer it takes to replenish (from days to thousands of years), which can lead to depletion of these sources over time.

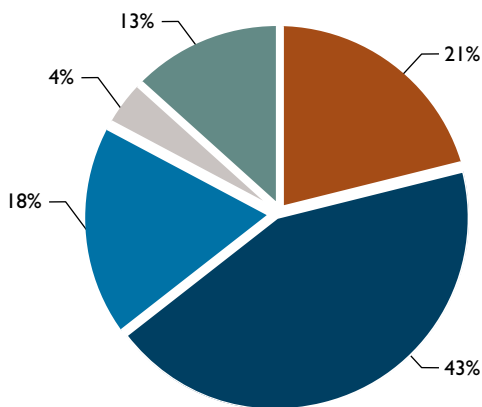
Reducing our water use and protecting our lakes, rivers, and underground aquifers from pollution helps ensure a clean supply of fresh water.

A growing demand for water

In Canada our water is treated to very high standards to make it potable", or fit for drinking. In 2011, municipal water treatment plants across Canada supplied over five million cubic metres (or five billion

litres) of highly treated potable water to households, industries and other water users³. Households use more potable water than any other sector in Canada, and water wastage is a big reason why.

Municipal water use by sector (2011)⁴



- Industrial, commercial, institutional and other non-residential
- Residential
- Unknown
- Wholesale
- Losses



³ Statistics Canada; Survey of Drinking Water Plants (2011)

⁴ *ibid*

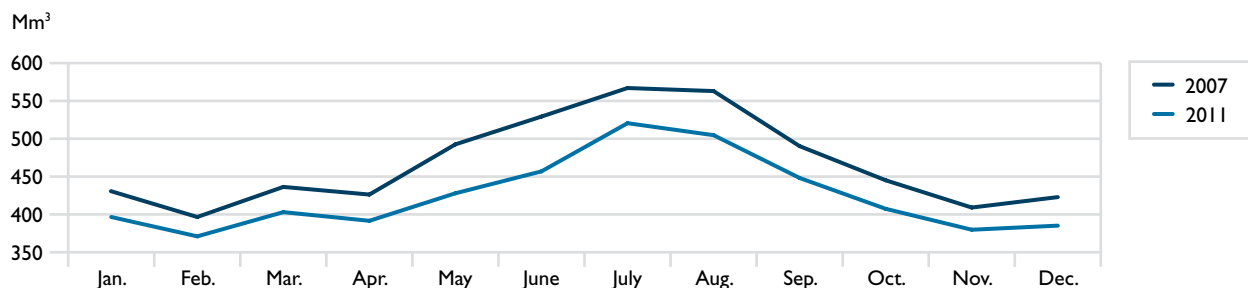
Summer Peak Demand

For much of Canada, the long, hot, dry days of summer lead to peak water use. It is the time of year when we are watering our lawn and gardens, washing our cars, filling our swimming pools and, in the process, using the most water.

Although personal water use has declined over the last several years, a growing population, increased treatment requirements, and aging municipal water infrastructure impose significant costs on municipalities. In fact, it is estimated that more than \$88 billion⁵ is required to expand and maintain our water and wastewater infrastructure—that’s about \$2,490 for every person living in Canada. By using water more efficiently, we can help contain these costs.

At the same time, much of the cost of water use is subsidized in Canada. Depending on where you live in the country, you may be paying for only a portion of the total cost of treating and supplying the water used in your home and treating the wastewater sent down the drain. Canadians pay less for municipal water than almost any industrialized country in the world. Canadians pay on average \$1.99 for a cubic metre ($m^3 = 1000$ litres) of water; compared to \$7.65 per m^3 ⁶ in Denmark and \$5.66 per m^3 in the United Kingdom. To address increasing water infrastructure costs, more municipalities are starting to meter water use and set prices to reflect true costs of water provision, distribution and treatment.

Monthly potable water volumes, Canada, 2007 and 2011



Source: Statistics Canada, 2010 and 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).



⁵ Blue Economy Initiative; *Blue City: The Water Sustainable City of the Near Future*. Econics, Jan. 2014 www.blue-economy.ca/report/blue-city

⁶ United Nations; World Water Development Report (2014) – amounts in US dollars <http://unesdoc.unesco.org/images/0022/002257/225741e.pdf>

Water efficiency in your home



Water efficiency in your home

Reducing the amount of water you and your family use doesn't have to be difficult. It is as easy as making small changes in the way you use water; repairing leaks, and replacing your old water-guzzling

fixtures and appliances with water-efficient models when the time comes. Saving water can also mean saving money. Water efficiency has many rewards.



Keep the “4Rs” of wise water use in mind every time you turn on the tap:

Reduce – Become conscious of the amount of water you are using and look for ways to use less. Don't let the faucet run when it is not needed; don't fully open the tap if you only need a small stream of water; try to take shorter showers or smaller baths; don't flush garbage down the toilet; and fill the sink when doing dishes by hand instead of letting the water run.

Replace – Choose water-efficient fixtures and appliances when it is time to replace your old models. For example, new WaterSense® approved toilets use less than half the water of many older models, yet can flush more than twice the amount of waste.

Repair – Stop the leaks! In one year, a leak of one drop per second can waste 10,000 litres of water – more than enough to supply all the water you need for cooking for one year. Many faucet leaks are easily repaired by simply changing a worn washer or cartridge.

Reuse – Consider water reuse technology. Many municipalities are considering on-site water reuse, such as rainwater or grey water from dishwashing and laundry machines for watering lawns and gardens or flushing toilets. New technologies are making it possible to collect rainwater from your home's roof or to collect greywater from your bathtubs and shower to use for irrigation or even toilet flushing. Always check with your municipality to find out what is permitted.

Visit **CMHC's website** (www.cmhc.ca) for more information on rainwater and greywater reuse for your home.

Testing for leaks

A good first step to improving the water efficiency of your home is to test for leaks. Leaks can waste large amounts of water, often going undetected for long periods of time.

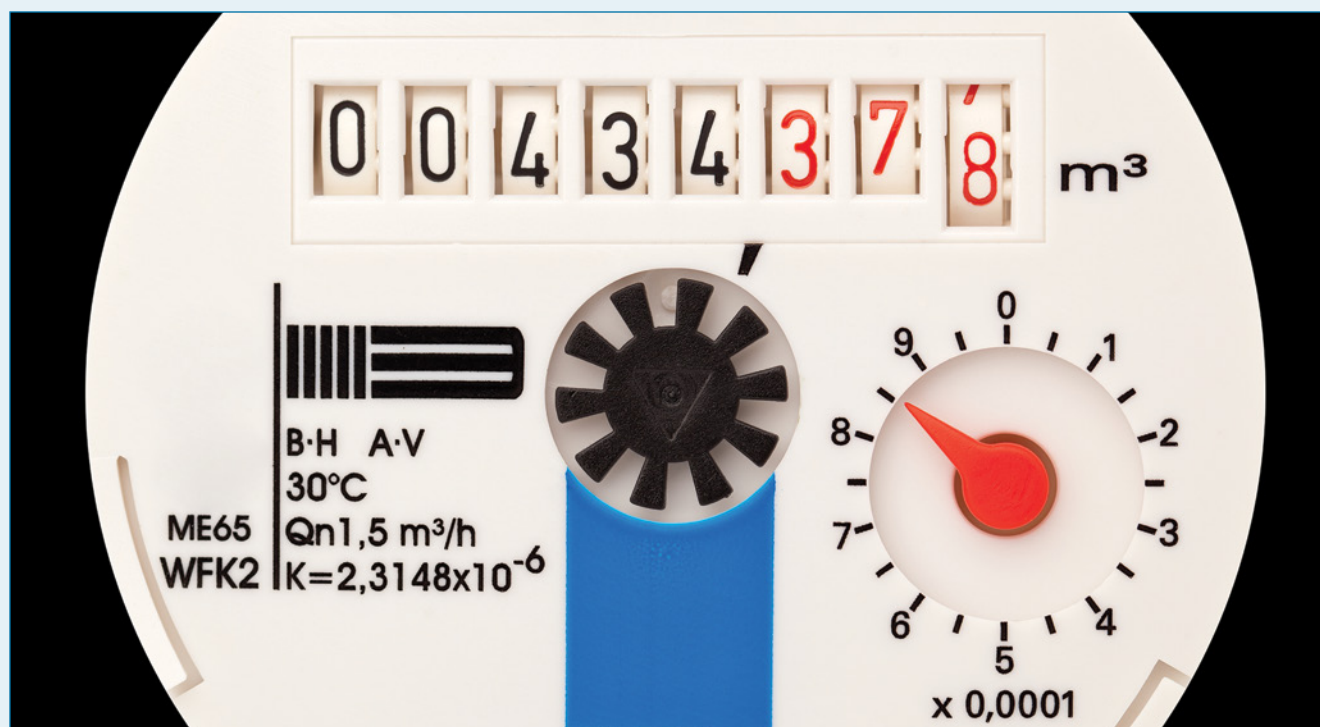
The first step is to inspect all of your water-using fixtures and appliances when the house is quiet and no water is being used. Use your eyes and ears to look and listen for leaks in the bathrooms, kitchen, laundry room and where the pipes run in the basement.

If you have a water meter, you can periodically check for hidden leaks. Try recording the water meter reading (or taking a picture of the meter) last thing in the evening after everyone in the home has finished using water. If your water meter has a dial, note the position of the sweep hand as well. The next morning, before anyone starts using water again, check the meter reading again. Compare the meter readings (and, if applicable, the position of the sweep hand). If the morning meter reading is higher (or the sweep hand has moved), someone or something in your home used water during the night (for example, a water softener or furnace mounted humidifier), or there is a leak in the

pipes, fixtures or appliances. Some water meters have a small red triangular dial (low-flow indicator) that spins when water is passing through the meter. If this dial is spinning when no water is being used in the house, you have a leak somewhere to fix.

While dripping taps can be easily identified and repaired, some leaks, such as toilet flappers, can be hidden and more difficult to find. If you hear your toilet filling occasionally even when it hasn't been used, you likely have a leaking flapper inside the toilet tank. If you can see ripples on the water surface in the bowl when the toilet has not been used, you have a leaking flapper or a leaking fill valve.

If a flapper leak is very small, it might be difficult to notice, but you can still test for it. Just lift the tank lid and add a few drops of food colouring to the water; then wait 15 to 30 minutes (don't flush the toilet). If you see the colour in the bowl, you have a flapper leak. Fortunately, toilet flappers are usually fairly inexpensive and easy to replace. However, make sure to use the correct one or you could wind up with a bigger leak.



Water efficiency in the bathroom

Generally, almost half of the water used in your home is in the bathroom, so it's a great place to look for water savings.

Toilets

If the toilets in your home are over 20 years old, they probably flush with 13 to 20 litres of water. New toilets are available that consume 6 litres or less, but not all toilets have the same flush performance. The Maximum Performance (or MaP) toilet testing program was developed to test and rate the flushing performance score for toilets so consumers can be sure to purchase one that will not only save water but also remove all waste in a single flush. The toilet flushing performance scores are available at www.map-testing.com.

The U.S. Environmental Protection Agency (EPA) has developed the WaterSense® labelling system to identify the top performing toilets that flush with no more than 4.8 litres. New technology has made water-efficient toilets even more efficient and more effective at clearing waste from the toilet bowl. For more information on WaterSense® certified toilets visit www.epa.gov/watersense.

At today's water prices in some locations, a family of four could save about \$150 a year just by replacing an old 13-litre toilet with a WaterSense® certified 4.8-litre toilet. And, because WaterSense® certified toilet models flush so well, there is less likelihood it will experience toilet blockages, require double-flushing, or expensive calls for a plumber.



Comparison of annual water consumption for water-efficient vs older toilets

	Total volume per person for 1 year
13 L x 6 flushes x 365 days	28,470 litres
6 L x 6 flushes x 365 days	13,140 litres
4.5 L x 6 flushes x 365 days	9,855 litres

Common types of residential toilets

The two most common types of residential toilets are single-flush and dual-flush models. Single-flush toilet models, as the name implies, flush the same volume of water every time the flush handle is activated. Dual-flush toilet models, on the other hand, offer the choice between selecting a larger volume of water to flush solid waste or a smaller volume of water to flush liquid waste. Dual-flush models often have two flush activation buttons—one for the full flush and one

for the reduced flush—though some models have a handle that is pushed down for one flush volume and up for the other. As such, dual-flush models, offer the potential for additional water savings over most single-flush models. However, some four-litre single-flush models approach dual-flush levels of water-saving performance. Visit www.map-testing.com for a list of MaP *premium-rated* toilets that offer high performance and flush four litres or less.



Repairing leaking toilets

Generally speaking, a leak in a standard gravity siphonic toilet (the type commonly found in North American homes) can be repaired fairly easily (see guide in Appendix I). There are some situations, however,

when calling in a licensed plumber might be a good idea if you want to avoid costly complications, if you don't have the tools, or if you are unsure what parts you might need.

Showers and baths

Generally speaking, showering uses less water than bathing. The relative efficiency of showering versus taking a bath is determined by a number of factors such as the size of bathtub, showerhead flow, and bathing preferences. While a typical eight-minute shower using a 9.5 litre-per-minute showerhead would use about 76 litres of water; a full bath may use 150 litres or more. Of course, people taking longer showers or using inefficient showerheads may use more than 76 litres, and people that only partially fill the tub when taking a bath may use less than 150 litres.

While a standard showerhead typically uses 9.5 litres per minute, a high-efficiency WaterSense® labelled showerhead uses only 7.6 litres per minute, a savings of 20%. WaterSense® labelled showerheads not only save water but also the energy used to heat the water as well. All WaterSense® showerheads are tested by independent third-party laboratories to ensure adequate spray coverage and intensity.



Switching from a standard showerhead to a WaterSense® labelled model could save a family of four about 16,000 litres of water per year with approximately half of this volume being hot water.⁷ Total water and energy savings range between \$60 to \$90 per year, which is more than the price of a new efficient showerhead⁸. See Appendix 2 for guidance on changing your showerhead.

How to measure the flow rate of your showerhead

1. Turn on your shower and set it to the position you would normally use for showering.
2. Hold a container (for example, a juice pitcher or large measuring cup) that has graduations in milli litres and/or litres under the showerhead for six seconds and then remove. Either use a clock or timer, or simply practice counting out six seconds a few times before taking the actual measurement.
3. Multiply the volume of water you collected (in litres) in six seconds by 10 to get the flow rate in litres per minute. For example, if the volume collected was 0.95 litres (950 ml = 0.95 L) the flow rate would be $10 \times 0.95 = 9.5$ litres per minute (L/pm).
4. If your showerhead has a flow rate greater than 7.6 L/pm you may want to consider replacing it with a WaterSense® labelled model to start saving money on your water and energy bills (see Appendix 2). Additional savings can be achieved through the use of a model with a “trickle” button that allows you to stop all but a trickle of water while you lather up or shampoo, and then resume showering at the same flow rate and temperature.

⁷ Based on 0.75 showers per person per day x 8 minutes/shower x 1.9 L/pm savings.

⁸ Based on electrical rates of \$0.08 per kWh, natural gas rates of \$0.20/m³, and water-sewer rates of \$2.50 per m³.

Water efficiency in the kitchen

Kitchen water use accounts for about 15% of your total indoor water use. Much of the water use in the kitchen is for filling cooking pots, juice containers, kettles and coffee pots, sinks, etc. This type of use requires a certain volume of water and, as such, is not affected by the flow rate of the faucet or aerator. However, water demands for handwashing, rinsing fruits and vegetables, or washing dishes can often be reduced by installing a more efficient faucet or aerator; adjusting the flow rate from the faucet to no more than is required, and by immediately turning off the faucet once you have finished your task.

As your dishwasher is usually connected to the household hot water supply, ensure it is ENERGY STAR® rated and remember to fully load it before running a cleaning cycle to maximize your water and energy

savings. For dishwashing, to be ENERGY STAR® rated, a standard-sized residential dishwasher can use no more than 16 litres per cycle⁹ – this is less water than would be required to fill a single average size kitchen sink to wash dishes by hand.

If you do wash dishes by hand, partially fill one sink for washing and the other for rinsing if you have two sinks. If you have only one sink, place washed dishes in a dish rack and rinse them together at the end with a spray of water.

Keep drinking water in the refrigerator in a covered container instead of running the tap and waiting for the water to get cold. Be sure to wash the container and change the water every few days. The leftover drinking water can be used to water your plants or for cleaning.



⁹ http://www.energystar.gov/index.cfm?c=dishwash.pr_crit_dishwashers

Faucet aerators

Standard faucet aerators have a maximum flow rate of 8.35 litres per minute. Reducing the flow rate of a kitchen aerator will increase the length of time it takes to fill pots, jugs, kettles, etc., while not actually reducing the volume of water used. For this reason, the benefit to reducing the flow rate of a kitchen faucet aerator below 8.35 litres per minute is only marginal and the added wait to fill a container can be a nuisance.

There can be benefits, however, to reducing the flow rate of faucets in the bathroom that are primarily used for handwashing. WaterSense® labelled lavatory faucet aerators have a maximum flow rate of only 5.7 litres per minute – or about 30% less than 8.35 litres per minute. Since lavatory faucets are only seldom used to fill containers, reducing the flow rate can result in water savings without being an inconvenience.



How to measure the flow rate of your faucet aerator

1. Turn on your faucet to the maximum flow rate.
2. Hold a container (for example, a juice pitcher) that has graduations in metric (that is, millilitres or litres) under the faucet for six seconds and then remove. Either use a clock or timer, or simply practice counting out six seconds a few times before taking the measurement. If you can't fit the container under the faucet, collect the water in a bowl or small pot and then transfer the water to the graduated container.
3. Multiply the volume of water you collected in six seconds by 10 to get the flow rate in litres per minute.
4. If it is a kitchen faucet and the flow rate is greater than 8.35 litres per minute, you may want to consider replacing it with a new 8.35 L/min model.
5. If it is a lavatory faucet and the flow rate is greater than 8.35 litres per minute, you may want to consider replacing it with a WaterSense® labelled model with a flow rate of no more than 5.7 L/min to start saving money on your water and energy bills.

Water efficiency in the laundry room

Water-efficient clothes washers

When buying a new clothes washer, consider purchasing an ENERGY STAR® certified model. Certified models use only about 50% of the water used by a standard clothes washer and can save you 20,000 litres of water per year or more. As of 2014, ENERGY STAR® had certified more than 300 front-loading models and 200 top-loading clothes washers. A full listing of certified models, along with their water and energy specifications, can be found on the ENERGY STAR® website.

In addition to water savings, high efficiency clothes washers are also able to spin the clothes at a faster rate and get more water out of them. This reduces drying time and your utility bills.

Most front-loading models automatically adjust the water level based on the size of the load, a feature now being incorporated into some top loaders. If you use a top loader that does not have an automatic water level adjustment, be sure to either wash full loads of laundry or remember to adjust the water level accordingly.



Water-efficient water heating systems

On-demand hot water systems

One of the ways that water is wasted in our homes is when we run water while waiting for hot water to arrive at the faucet or shower. The pipes in our homes are full of water and, if no water is used for an hour or so, this water cools to the surrounding room temperature. When we turn on the hot water faucet at our sink or shower, all of the room-temperature water in the pipe goes down the drain while we wait for the hot water to arrive from our water heater. Plus, because the pipe itself is at room temperature, the initial portion of hot water entering the piping cools down as it heats the pipe. As such, a lot of water can be wasted just waiting for hot water to arrive at our sink or shower.

One solution to this problem is an on-demand hot water recirculation system. Such systems pump water between the hot water pipe and the cold water pipe under the sink where hot water is wanted. The user pushes a small button (which can be hard-wired or wireless) near the faucet. The button activates a small pump that begins to move hot water from the hot

water pipe to the cold water pipe and, in doing so, draws hot water up from the water heater. Instead of the water flowing down the drain, it flows back into the household water system where it flows back to the water heater. Once the hot water has made the circuit from the water heater, through the home's hot water supply piping, and then back to the water heater, the pump shuts off. No water is lost and, if you remember to push the activation button before you need the water, you don't have to wait for hot water to arrive.

Some hot water recirculation systems use a dedicated "hot water return line" that runs back from the furthest fixture to the water heater while others use the home's cold water supply piping as the return line, as described above. The pumps are small and quiet and use only two or three dollars worth of electricity per year. Systems with dedicated return lines are more easily installed during new home construction or in homes with unfinished basements where the pipes are readily accessible. Systems that use the cold water lines as return lines require the installation of the necessary piping and an electrical receptacle for the pump in the cabinet below the sink.

Other water consumers to watch for

Residential water treatment/filtration systems

Most municipal water systems provide excellent quality water; however, if you prefer additional treatment, you could install a residential water treatment/filtration system. Systems can range in size from either a larger scale whole house, point-of-entry, system that treats all water entering the house. Alternatively, a smaller, point-of-use, system can be located under the kitchen sink to treat only the water used in the kitchen.

While Systems for treating and filtrating water at home are designed to remove impurities from your drinking water, some models use water as part of their operation. For example, some systems such as reverse osmosis filters may discharge 10 litres or more down the drain for every litre of drinking water they produce. If you have such a system, you can save on the amount of water it consumes by limiting the use of the filtered water for drinking purposes only.



Kitchen sink garbage disposal units

Sink garbage disposal units can use a considerable amount of water to flush away kitchen waste. These units, which are connected below your kitchen sink, grind up vegetable and organic matter and mix the slurry with running water before discharging the mixture down the drain.

This not only consumes water, it increases the load on your septic system or municipal wastewater plant. For these reasons, sink garbage disposal units are not permitted in some municipalities. A better alternative is to dispose of your vegetable and organic waste using a “green bin” or backyard composter.

Preventing frozen water pipes

In some of the colder regions of Canada, many households struggle each winter to keep pipes from freezing. Often the solution is to leave a tap running. In some homes a “bleeder” line is installed, which allows the water to flow

continuously through a small opening at the end of a supply line and into the wastewater system. Both of these methods for preventing pipes from freezing can consume an enormous amount of water.



Many northern municipalities use various methods to prevent pipelines from freezing while reducing water wastage, such as re-circulation systems, insulated piping, burying pipes in the ground below the freezing point (not applicable to areas where permafrost exists) and heat tracing.

Homeowners, too can take advantage of available equipment and technology to prevent pipe freeze-up while reducing or eliminating the need to keep water running continuously through the pipes. Some of the equipment options available to homeowners are relatively easy to install. Others are more difficult and best done at the time of house construction or during renovations.

Perhaps the most effective method of preventing pipes from freezing is a dual-line water system to the home. This system keeps water flowing in and out of the home on a continuous basis to prevent freezing. A pump used to circulate the water may be set up in a crawl space, utility room or similar location within the home.

If your home has a bleeder line installed, consider using a timer. Timers turn the bleeders on and off automatically, and, in the event of a power interruption, the line is left open. As well, timers allow you to shut off the flow during the warmer months of the year.

Installing a heat tracing system is another option. This will warm the water pipe, which in turn warms the water, preventing freezing. In the event of a power failure, the heat tracer can thaw any ice that has formed once power resumes. Insulating any supply pipes will reduce the amount of heat loss from the water, thus reducing the likelihood of freezing. If pipes are not readily accessible, it is often worth insulating exposed pipes and insulating others that become accessible when renovating.

Before deciding on the most suitable method to keep your water lines clear and reduce water loss, be sure to talk to a plumber and/or your municipal water works department. There are advantages and disadvantages to the options discussed, depending on your particular circumstances, so it is important that you understand these before undertaking any installation.

Water softeners

In some parts of Canada “hard” water, caused by the presence of higher than normal concentrations of certain minerals, is treated through the use of water softeners. Water softeners operate by substituting sodium or potassium (salt) for calcium, magnesium or iron minerals that can cause hard water. Depending on the type of water softener you choose, certain water softeners can consume large amounts of water.

If hard water is a problem in your area, consider using an automatic water softener with a hardness sensor control. By monitoring the hardness of the water leaving the softener, the sensor control activates the softening system only when it is needed. These units save money in the long run by reducing the amount of salt and water used by the system. These types of softeners also have the lowest impact on the environment.



Watching what goes down the drain

Have you ever cleaned a paintbrush in the laundry tub and watched the paint-coloured water or turpentine go down the drain? The disposal of solvents, paints, chemical household cleaners, motor oils and even cooking fat down the drain can damage your drainage system. These additions to your household wastewater can be very difficult or impossible to remove at the sewage treatment plant (or in your septic system) and can therefore harm the aquatic environments of our rivers, lakes and streams.

Why are these household products so dangerous? Many of them kill the bacteria that help break down organic matter in sewage. Without these bacteria, the treatment process is severely impaired. As well,

many chemicals are not removed by municipal wastewater treatment plants and remain in the water when it is returned to the river or lake where they could eventually be picked up by a municipal water system for a town or city downstream.

By switching to more environmentally friendly cleaning products, such as baking soda, vinegar, borax and lemon juice, you can reduce the chemical burden to our waterways. Other chemicals and products such as turpentine, motor oil and paint should never be put down the drain. Rather, they should be delivered to a household hazardous waste depot for proper disposal. Contact your local municipality for information about the safe disposal of household hazardous waste.



Water-efficient landscapes and more

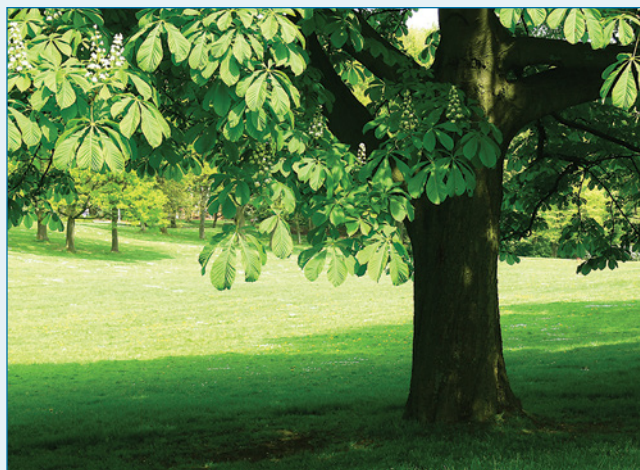


The beauty of water-efficient landscapes

It is entirely possible to create beautiful, functional outdoor living spaces that reflect your individual style while still being water-efficient. It's about understanding your landscape and making the right choices for the conditions around your property while meeting your wants and needs. Creating and maintaining beautiful, water-efficient, lawns and gardens need not be a lot of work if you take into consideration the natural conditions of your yard when planning your new landscape.

Traditional landscape design can create a constant battle against drought conditions, weed infestation, insect damage, drainage problems, trodden-down lawns, and damage due to salt and oily runoff from sidewalks, roads and driveways. By making use of plants that thrive under the various conditions that exist around your property

and working with nature, you can create a landscape that is dynamic, water-efficient, beautiful and easy to maintain.



Advantages of water-efficient landscaping

- There are many types of plant species to choose from to create varied and visually beautiful landscapes.
- They can be easier and less costly to maintain.
- There is design and colour pallet for every taste and budget.
- Plants can be matched to the conditions of your property so they will thrive without excessive watering, fertilizing and pest control.
- Plants are more resistant to weeds, insect infestation, and disease.
- "Difficult-to-grow areas," such as steep slopes, can be made into eye-catching landscapes.
- Many of the plants would attract birds and butterflies, creating a natural oasis in your own backyard.

Site conditions

Those areas of your yard exposed to direct sunlight and wind need more water than shaded areas. In fact, a shaded area can be as much as 10°C cooler than an area in full sun, and as a result, there is less water loss from the area due to evaporation. Some plants, particularly low-water species, can thrive in hot, dry areas while others prefer moist areas in shade or part-shade conditions.

Understanding how water moves and collects in your yard can help you make the best use of rain and ground water. Slopes, low-lying areas, gullies, and ditches all influence the flow or collection of water on your property. Water flows down slopes and collects in low-lying areas while leaving higher areas to dry. By taking the water conditions around your property into consideration when you select your plants, shrubs and trees, you can reduce your site irrigation needs.

Preparing areas for planting

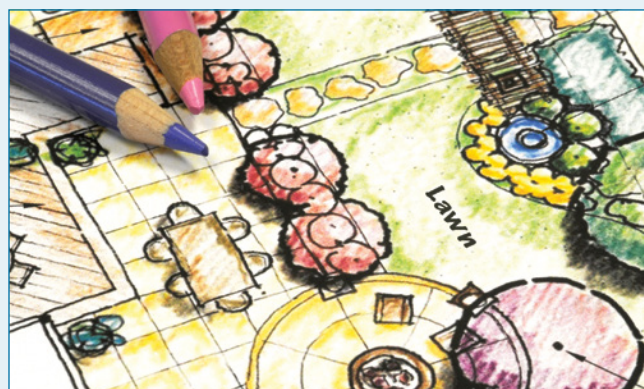
Before you plant, you need to determine the condition of your soil to better understand which plants to use and subsequent watering needs. The soil on your property can vary from one section to the next. Understanding those variations, augmenting the soil if needed and selecting appropriate plants, trees, shrubs and grasses suited to the specific soils around your landscape will help ensure a healthy vibrant landscape.

Add organic material, such as compost or manure, to help your landscape to absorb and hold water while moderating soil temperatures. If your soil holds more water and maintains a cooler temperature, then your plants, grass and other vegetation can better withstand hot, dry weather without watering. One of the best sources of organic material is home compost. If you don't have enough home compost, use a "natural" fertilizer such as sheep manure, fish meal or mushroom compost from your local garden centre or nursery.



Grouping plants by their needs

Group plants by their watering needs so you can provide water where it is needed. Some plants flourish in low, wet spots that get little sun; others do well under trees in dry shade; while still others prefer hot, dry locations. Don't be afraid to ask for advice. Local landscape contractors and garden centre personnel can provide valuable help.



Plant hardiness zones

Select plants, trees, and shrubs according to their suitability to your soil and climatic zone. Hardy plants require less watering to survive. Across Canada, climatic zones or Plant Hardiness Zones range from harshest (zone 0) to mildest (zone 8). A new Plant Hardiness Zones map developed in 2000, includes sub-zones (for example, 4a or 4b and 5a or 5b), that gardening books and plant suppliers may have yet to address. Generally, if a plant is described as hardy in zone 4, it is likely hardy in both zone 4a and 4b.



Trees and shrubs for your landscape

Trees and shrubs provide shade, act as windbreaks, form natural barriers and provide aesthetic and architectural interest. Consider

including shade trees in your landscape design as a shaded landscape is cooler; and therefore retains more water.



Selecting turf grass

Water-efficient landscapes include minimal or no lawn area. Lawns are high maintenance and require regular watering, mowing and weeding to stay green and full. Keeping lawn areas to a minimum reduces your water use and workload, frees up your time for more important things and can create an eye-catching landscape.

Some grass species thrive in areas with hot, dry summers and cold winters, such as the Prairies, while others do better where temperatures are more moderate year round. Most new varieties of grass require less moisture and fertilizer and have a greater built-in resistance to pests. The best approach when reseeding or rejuvenating your lawn is to speak with a lawn care professional and find a mix of new grass varieties well suited to the conditions around your yard. Where possible, select a mix of grasses to strengthen your lawn's resilience, thus reducing its susceptibility to disease and pests.

You may also wish to consider alternative low-water ground covers, such as thyme or periwinkle, for certain areas of your property typically reserved for lawns. For large properties, native wildflower or grass meadows are a beautiful alternative to lawns, have the added value of attracting birds and butterflies and providing visual interest throughout the year.



If you are installing or replacing a driveway, walkway or patio, consider using pavers, cobblestones, bricks or natural stone in place of concrete or asphalt to soften the appearance, blend with the surrounding landscape and increase the amount of water that infiltrates the ground and feeds your plants.

Tips for lawns

- Use lawn for a play area for the kids or to define the space around gardens.
- Avoid lawn areas around paved, asphalt, and concrete surfaces because grass is particularly susceptible to drought and runoff from driveways and sidewalks.
- Use mixed grass seed containing mostly fescues and perennial rye grasses for a deep, drought-tolerant and weed-repellant lawn.
- Ask at your local garden centre about hardy, drought tolerant grass seed mixtures or sod suitable to your location.
- Water regularly (25 mm per week) and keep soil moist until the grass is established.
- Aerate and top-dress your lawn each year to help rainwater soak in instead of running off the lawn.

Maintaining your landscape

A properly maintained landscape ensures that whatever the design, the landscape is healthy and less dependent on water and fertilizers.

What your grass and plants need

Overwatering leads to unhealthy lawns and plants. Too much water causes shallow root growth, weakening the root system and making it vulnerable to disease and pests. Shallow-rooted grass easily succumbs to drought, weed infestation, and insect damage. Garden plants given too much water become lanky and flop over and are more susceptible to slugs, snails, black rot, mildew, and other moisture induced problems.

A well-designed landscape requires little or no supplemental watering once newly planted vegetation is established. If you have vegetable gardens or favourite roses that require regular watering, installing a “soaker”

hose in the garden will keep water at the soil level where it belongs. More complex systems, such as drip or trickle irrigation, may be an option depending on the size of your property, its layout and your budget.

Drip irrigation delivers small amounts of water by way of flexible plastic tubes to the roots of plants. Drip irrigation systems are more efficient, are ideal for watering plants in gardens, and should be used for moderate to high-water-need plants. It is a good idea to secure drip lines to the soil surface and cover them with an organic, such as wood chips, to protect them from the evaporative rays of the sun and improve the garden's appearance.



Watering trees and shrubs

All types vegetation, whether it's a tree or a small flowering plant, require more regular watering from the time you plant them until they are well rooted. Depending on what you plant, it can take one month to several growing seasons before the roots are well established. Your local garden centre can provide information on the establishment time of the vegetation you select, but the general rule of thumb is that most plants and vines take one growing season to establish, while some trees and shrubs require two or more seasons to fully establish. Once the plants are established, however, they can be weaned to the point where they require little or no water other than that provided by Mother Nature. By weaning plants, they develop deeper root systems and become more drought tolerant.

To properly water trees or shrubs until they are established, direct water to the root system. The root system of trees and shrubs is located within the top 30 centimetres of the soil and at the "dripline" of the plant. The dripline is the circular area around the base of a plant defined by the outer tips of the branches. Apply water and, when needed, fertilizer just within and slightly beyond the dripline. Do not water or fertilize at the trunk. An easy way to water trees is to place a perforated hose (a flat hose with tiny holes)

or soaker hose around the dripline until the area is saturated to a depth of 20 to 25 centimetres. Remember to water before 9 a.m. in the morning to reduce water loss through evaporation.

Installing rain barrels at the downspouts of your eavestroughs is a great way to collect rainwater to use on your lawn and garden, and just as importantly, an excellent means of preventing drainage problems around your home's foundation. Be sure to purchase a rain barrel with a screened lid, childproof top, overflow mechanism and a hose attachment for watering. Remember to drain rain barrels before winter to prevent freezing.

Lawn and garden watering tips

1. Set your sprinkler to avoid watering patios, driveways, and walks.
2. Water back from the tops of slopes, as water will run down the slope and seep into the soil.
3. Sweep your driveway and walkway instead of washing with a hose.
4. Recoil your hose on a hose wheel to prevent damage.
5. Regularly check your hose for leaks.

Mulch for gardens and beds

Mulch is a must for any landscape. Mulch is a protective covering of non-living material used on soil surfaces around plants. Mulch keeps soil cool and moist, controls erosion and discourages weed growth. Mulch can be organic, inorganic, or be derived from living or non-living material. Organic mulches such as pine bark, shredded cedar, straw, leaves and wood chips make the best covering for soil. Inorganic mulches, such as lava rock, gravel and limestone retain more heat, so water loss from the landscape is greater with inorganic than with organic mulches.



Any mulch is better than no mulch at all, so if you want to use stone mulch, stick to the more neutral colours like beige or light grey, since white rocks create glare and black ones absorb more heat. Permeable plastic or landscape fabric (a mesh with small perforations that allow water to flow

through), can be placed under organic mulches to help retain moisture in the soil while still allowing water, nutrients and air to penetrate. A good time to apply mulch is in the fall, which would reduce the freezing and thawing of soil during the winter months.

Mowing lawns

Most people tend to mow too often and cut the grass too short, undermining its vigour. For typical grass species, mow grass to a height of 6 to 8 cm and never cut more than 1/3 of the grass length at each mowing. This method of lawn cutting will encourage stronger, deeper roots. The longer grass blades better

shade the soil and help keep its temperature cooler. This reduces moisture loss due to evaporation and the need for watering. To help maintain the moisture and temperature levels of soil during long periods of hot, dry weather, raise the mowing height of your lawnmower by 25 to 50%.



Aerating lawns

Aerating is used on lawns to physically perforate the soil and turf. Soils often become compacted over time, particularly on chemically treated lawns, because natural soil aerating organisms like earthworms and microorganisms have been depleted or eliminated. Aeration helps give soil a fresh start by reducing

compaction, improving water penetration, drying wet soils and helping oxygen and organic materials to reach the roots, thereby maximizing the uptake of nutrients by the grass. Aerating can be done in the early spring or fall; and when combined with top dressing and overseeding, it will improve the soil.

Thatch and your lawn

Thatch is a layer of entrenched decomposing grass between the soil and live grass. Thatch is beneficial to healthy growing grass, providing insulation from heat and evaporation. Thatch also inhibits weed seed germination, shades soil and acts as a cushion for grass, which in turn increases your lawns tolerance to wear and tear.

However, too much thatch can reduce water penetration and block the movement of oxygen and nutrients into the soil. Thatch only

becomes a problem when it exceeds 15 mm in thickness. By fertilizing and watering moderately, you can avoid excessive thatch in your lawn.

Dethatching, removing excess thatch with a thatch or fan rake, is best done in the fall. If done in the spring, dethatching can damage the roots of newly growing grass.

Top dressing lawns

After aerating, in early spring or fall, is the ideal time for top dressing your lawn. Top dressing is simply the application of a thin layer of organic

material to your lawn. The addition of organic material makes your lawn healthier because it increases the ability of the soil to retain moisture and nutrients.

Cutting down on other outdoor water uses

Activities such as washing our cars, filling our swimming pools and cleaning our windows use significant amounts of water. By following the

“Saving Water Outdoors” tips below, you’ll use less water and, in the process, save money on your monthly water bill.



Water saving tips for outdoors

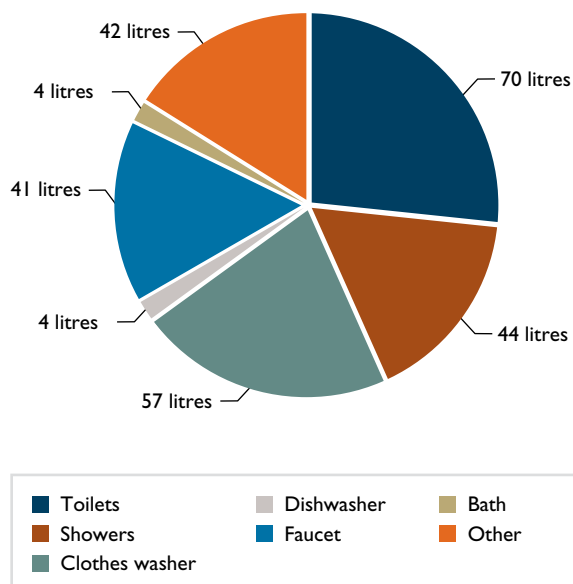
1. Use a bucket, sponge and hose with a shut-off nozzle to wash and rinse your car.
2. Sweep driveways and walks instead of using a hose.
3. Cover swimming pools when not in use to reduce evaporation.
4. Squirt guns or small plastic containers filled with water or a small wading pool are as effective at keeping children cool on a hot day as running a sprinkler.
5. Use a bucket and squeegee to wash windows.
6. Operate decorative fountains only when you're there to enjoy them.
7. Use the water from cleaning outdoor ornamental ponds to water lawns and gardens.

Adding up water savings

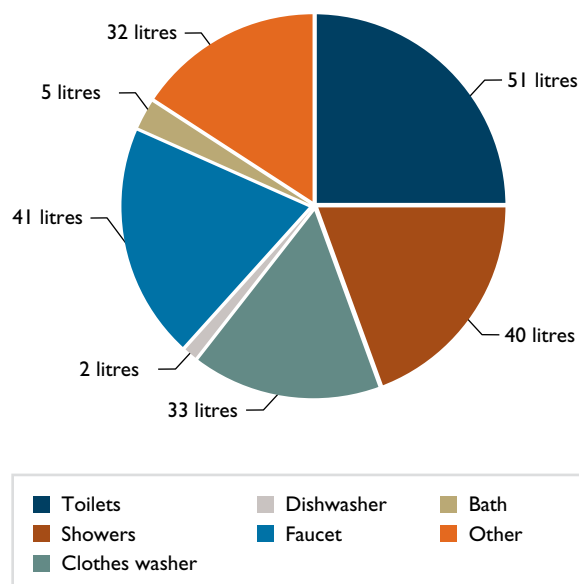
Households are becoming more water-efficient. The charts below show how and where average per capita water demands have decreased since 1999. The average per capita indoor water demand in Canada and the USA in 1999 was about 262 litres

per day. By 2013 the average demand had declined to about 204 litres per capita per day, a savings of about 22%. Homes that are fitted with water-efficient fixtures and appliances can have per capita demands of only 150 litres per day or less.

Breakdown of Per Capita Indoor Water Demands—1999
 AWWA Research Foundation: Residential End Uses of Water—Total 262 L/capita/day



Breakdown of Per Capita Indoor Water Demands—2013
 AWWA Research Foundation: Residential End Uses of Water—Total 204 L/capita/day

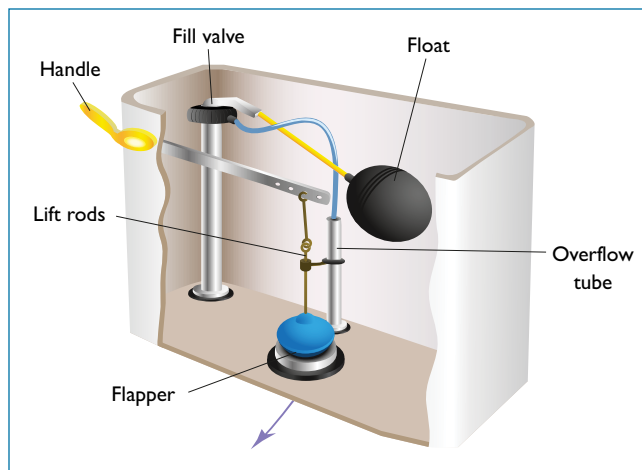


Appendix I Repairing leaking toilets

Generally speaking, a leak in a standard gravity siphonic toilet (the type commonly found in North American homes) can be repaired fairly easily. There are some situations, however, when calling in a licensed plumber might be a good idea to avoid any costly complications. Before trying to repair a toilet, you should understand how the typical toilet works.

1. When you depress the flush handle, the flush handle arm located inside the tank pulls on a chain or cord connected to the toilet flapper. The chain lifts the flapper off of its valve seat, allowing water to discharge from the tank into the bowl.
2. The flapper remains open just long enough to allow the proper volume of water to enter the bowl to push the waste down the drain and clean the bowl.
3. The falling water level in the tank causes the float on the toilet's fill valve to lower, and this opens the fill valve on the water supply line that allows water in to refill the tank. The most popular type of fill valve currently used in new toilets is called a pilot valve, though ballcock valves can still be found in some older models. After the flapper closes, the water level in the tank begins to rise, lifting the fill valve float. When the tank water reaches its proper level, the fill valve closes. A portion of the water supplied by the fill valve is directed through a small flexible hose into the toilet's overflow tube where it drains into the bowl to help ensure that sufficient water is in the bowl for the next flush.
4. Some of the water entering the bowl is discharged from a series of small holes located under the toilet bowl rim. This water helps to clean the sides of the bowl. It also helps 'push' the bowl waste into the toilet trap.

5. Some of the water entering the bowl is discharged from the siphon jet located in the bottom, or sump, of the bowl. This jet pushes water and waste into the toilet trap to start the siphon action that helps 'pull' waste from the bowl.
6. The bowl waste passes through the toilet trap and into the drain system.
7. The water level in the tank and bowl are properly restored, and the toilet is ready for the next flush.



Once it has been determined that there is a leak in your toilet, you must determine the cause. The most common reasons for toilet leaks are:

- A. The toilet flapper is not properly closing on the valve seat and needs adjusting, cleaning, or replacing.
- B. The float on the fill valve needs to be lowered so that the fill valve fully closes before the water level in the tank reaches to top of the overflow tube.
- C. The fill valve is faulty and continues to allow water to enter the tank.

To determine the most likely reason for your toilet leaking, remove the tank lid and check the water level in the tank. One way to check is to flush the toilet and then use a pencil to mark the water level after the tank has completely refilled, and then come back in 30 minutes. If the tank water level is below your pencil mark you have a leaking toilet flapper (water leaking out of the tank); if the water level is above your pencil mark you have a leaking fill valve (too much water entering the tank).

Note: if you do not feel comfortable fixing your toilet, it is recommended that you call a licensed plumber.

A. Leaking flapper

Tools and materials required:

- needle-nose pliers
- non-abrasive scouring pad
- new flapper (if needed)

1. Flapper leaks are typically caused by a warped or worn-out flapper; however, they can also be caused by misalignment of the flapper on the valve seat, of the twisted flapper chains, or by the buildup of minerals or debris on the valve seat.
2. Flappers and flapper chains can generally be realigned quickly without tools and without shutting off the water supply to the toilet. Flapper valve seats can sometimes be cleaned with a nonabrasive scouring pad, but sometimes the entire flush valve assembly (including the overflow tube and flapper valve seat) must be replaced.
3. If the flapper is warped or worn, shut off the water supply to the toilet, flush the toilet to drain the tank, and once it is empty, remove the old flapper. It is important to ensure that the replacement flapper has the same characteristics as the flapper that was removed, otherwise the flush volume or flush performance may be compromised. Where possible, use the replacement flapper recommended by the manufacturer. If you're



unable to determine the make, model, and year of production for your toilet, you could use a generic adjustable flapper; that is, a flapper that allows you to adjust the flush volume. If an adjustable flapper is used, it should be adjusted to flush with the minimum volume of water required to produce satisfactory flushing performance, which can be a trial-and-error process.

4. Before installing the new flapper, rub the valve seat with a nonabrasive scouring pad to clean the seat and remove any buildup.
5. Install the new flapper according to the manufacturer's instructions.

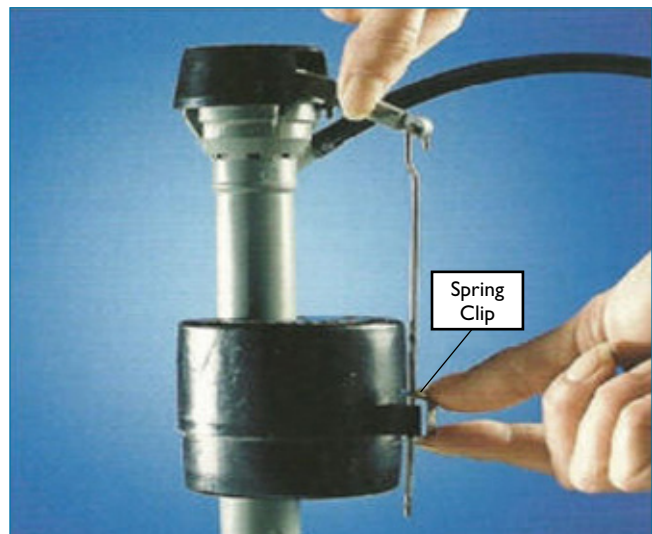
B. Float on the on fill valve is set too high: water flowing into overflow tube

Tools and materials required:

Typically none; perhaps a screwdriver.

Basic repair techniques

1. The float is typically attached to the activation arm at the top of the fill valve assembly by means of either a metal rod and spring clip or a threaded plastic rod.
2. Metal Rod and Spring Clip – Pinch both ends of the spring clip to allow it to move freely up and down the metal rod. Move the spring clip higher on the metal rod to increase (raise) the water level in the tank; move the spring clip lower on the metal rod to decrease (lower) the water level in the tank.
3. Threaded Plastic Rod – The position of the float and therefore the tank water level is adjusted by turning the threaded rod. Turn clockwise to raise the float and water level in the tank; turn counter-clockwise to lower the float and water level in the tank. A screwdriver can be used if necessary to turn the threaded rod.
4. Note, if you currently have an old style ballcock fill valve, it is recommended that you replace it with a new pilot operated anti-siphon fill valve. Unlike most ballcocks, pilot-operated fill valves maintain a constant water level in the tank regardless of changes in the water supply pressure.



C. Faulty fill valve

Tools and materials required:

- channel-lock pliers or wrench
- screwdriver
- new fill valve
- new flexible supply line, if necessary
- plumbers tape
- sponge or towels

Basic replacement techniques

1. Shut off water supply to toilet at the shut-off valve (also called an angle stop). Flush toilet to remove water from tank (continue to hold

flush handle to discharge as much water as possible). Remove remaining water in tank using sponges or towels.

2. Disconnect the supply line between the shut-off valve and the inlet to the fill valve (located on the underside of the toilet tank).
3. Remove the fill valve coupling nut from under the tank.
4. Remove the old fill valve from the tank.
5. Install the new pilot fill valve by following the instructions provided.

Note: it is typically much easier to replace a faulty fill valve than to repair it.

Appendix 2 Installing a new showerhead

Tools and materials that may be needed:

- channel-lock pliers or pipe wrench
- crescent wrench
- plumbers (thread seal) tape
- cloth rag and wire brush
- spray lubricant
- mat or small piece of carpet to stand on if you have a tub-shower combo

1. Before attempting to remove the old showerhead, check the condition of the shower arm and piping. Call for professional help if:

- your home has galvanized iron pipe, identifiable by the silver colouring and threaded fittings (galvanized pipe corrodes with age and can be difficult to work with);
- the existing showerhead cannot be removed easily, even after using spray lubricant; and
- the showerhead arm moves, twists, or leaks.

2. Read any directions that came with your new showerhead before beginning.
3. Cover the bottom of the bathtub or shower stall with the mat or carpeting to protect the surface from scratches.
4. Affix channel-lock pliers or pipe wrench securely to the shower arm, approximately 2.5 cm (1 inch) above the showerhead attachment nut. (Tip – to prevent scratching, wrap a rag, masking tape, or a piece of rubber around the showerhead pipe when removing or installing the showerhead).
5. Affix a crescent wrench to the showerhead attachment nut. To remove the old showerhead, maintain a firm hold on the channel lock pliers or pipe wrench and turn the crescent wrench slowly in a counterclockwise direction. (It may be possible to turn the showerhead attachment nut by hand).
6. If the showerhead is stuck, it may be necessary to apply a small amount of spray lubricant to soften any rust or scale. (Don't force it as this could cause the shower arm to leak inside the wall).



7. Once the showerhead is off, turn the shower on gently for a couple of seconds after the removal of the old showerhead to flush out any residue, and remove any old sealant or plumbers tape from the threads with a rag or wire brush.
8. If the pipe ends in a ball shaped fitting, it will either have to be replaced or you will need to install a ball fitting adapter.
9. Follow instructions to install the new showerhead and test fit the new showerhead (screw on gently by hand) to ensure the threads match and then remove.
10. Wrap plumbers tape a full three turns clockwise around the threaded tip of the shower arm.
 11. Install the new showerhead.
 12. Wrap cloth around the showerhead attachment nut to prevent scratching and tighten snugly (just slightly more than 'hand tight') with the crescent wrench. Be careful not to over tighten.
 13. Turn on the shower to check for leaks. If necessary, tighten the showerhead attachment nut slightly more (but remember not to twist the shower arm too much or it may develop leaks inside the wall) or remove the existing plumbers tape and reapply more than three full turns of tape. If neither of these actions stop the leak, it may be necessary to call a plumber.

Appendix 3 Installing a new faucet aerator

Tools and materials needed:

- efficient aerator
 - plumber's tape, if necessary
 - channel-lock pliers and small rag, if necessary
1. Unscrew the existing faucet aerator. Note that the existing aerator will have either inside or outside threading – your new aerator must have the same type of threading. You may need to use the channel-lock pliers but be careful not to apply too much force which could damage your existing faucet. If the aerator cannot be removed easily, if the threads are damaged, or if changing the aerator affects the hook-up of a portable dishwasher or water filter, call a professional plumber.
 2. Thread the new aerator onto the faucet, ensuring that the threads match, and tighten snugly by hand. Turn on the faucet and check for leaks. If leaks are noted, wrap a small rag around the aerator nut to prevent scratching and tighten slightly with the channel-lock pliers. If leakage continues, you can try to remove the aerator and apply plumber's tape to the threads before reapplying the aerator. If leakage still continues, call a professional plumber.

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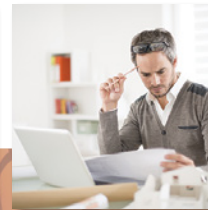
Information to Address Housing Needs

- Socio-economic research highlights
- Guides to rental and co-operative housing



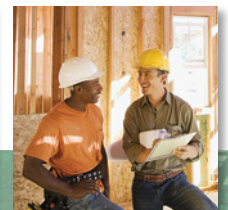
Canadian Housing Observer

- Comprehensive review of the state of Canada's housing
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HOUSEHOLD GUIDE TO WATER EFFICIENCY

Collecting and Using Rainwater at Home: A Guide for Homeowners

Canada is considered a water-rich nation. However, certain regions across the country now experience water scarcity on a seasonal or ongoing basis. Consequently, a growing number of Canadian homeowners and municipalities are interested in water conservation measures. Rainwater harvesting is a great way of reducing your consumption of municipally treated water by using what Mother Nature provides to us for free.

Collecting and Using Rainwater at Home: A Guide for Homeowners introduces the concept of rainwater harvesting for the Canadian homeowner. Information on permitted rainwater uses, catchment areas, and system sizing help to inform readers on how much rain can or should realistically be captured and stored based on need. Key system components and materials are introduced including: the collection system, conveyance system, treatment components and storage. Important aspects related to installation, maintenance, and costing are also considered. Generous use of tables, images, diagrams and checklists provide the reader with succinct helpful information when designing and planning their rainwater harvesting system.

Guidelines for Residential Rainwater Harvesting Systems Handbook

Rainwater harvesting is the ancient practice of collecting rainwater and storing it for later use. Rainwater harvesting systems are composed of a roof catchment, a conveyance network, a rainwater storage tank, a pump and fixtures where rainwater is utilized. Most systems also incorporate treatment technologies to improve the quality of rainwater before and/or after storage, and include provisions for periods of insufficient rainfall (a make-up water supply) and periods of excessive rainfall (overflow provisions).

Guidelines for Residential Rainwater Harvesting Systems Handbook is aimed at a wide audience, including homeowners, engineers, architects, contractors, developers, regulators, as well as members from municipal, provincial and federal levels of government. Background information on each aspect of a rainwater harvesting system is discussed, and relevant clauses from existing codes and regulations, standards and guidelines are presented, as well as additional design criteria derived from recent field experience and international best practices for rainwater harvesting.

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