

Wise Water Use

Introduction

The importance of protecting our water resource cannot be overstated. In economic terms, the measurable contribution of water to the Canadian economy is difficult to estimate. In environmental terms, water is the lifeblood of the planet. Without a steady supply of clean, fresh water, all life, including human, would cease to exist.

The perception that Canada is blessed with an abundance of fresh water has led to misuse and abuse of the resource: from household toilets that use 20 litres per flush where 6 litres would do, to industrial plants -- and some municipalities -- that use water bodies as convenient sewers.

In 2004, the average Canadian daily domestic use of fresh water per capita was 329 litres.
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The quantity, quality and economic problems we face as a result of our use of water are complex but, at least one of the causes of these problems is easy to manage -- the way we waste water. And, the solution is straight forward -- **water conservation**. Simply stated, water conservation means **doing the same with less**, by using water more efficiently or reducing where appropriate, in order to protect the resource now, and for the future. Using water wisely will reduce pollution and health risks, lower water costs, and extend the useful life of existing supply and waste treatment facilities.

And it's easy. With little change to the way we do things now, or the equipment we use, we can reduce water consumption in the home, and in business, by 40% or more. These pages outline the role of water conservation in addressing problems related to water use and water quality. It also shows us what part we can play as residential consumers in finding solutions.

Sustaining our Water Supply

Water is considered a renewable resource: "renewable" referring to that portion which circulates back and forth in the [hydrologic cycle](#). However, pressures on the resource are growing. For example, between 1972 and 1996, Canada's rate of water withdrawals increased by almost 90%, from 24 billion m³/yr (cubic metres per year) to 45 billion m³/yr. But, our population increased by only 33.6% over the same period, illustrating the growth in our thirsty lifestyles. As the readily available supplies of fresh water are being used up, we begin to see that there are real limits to how much water we can count on.

Limiting factors

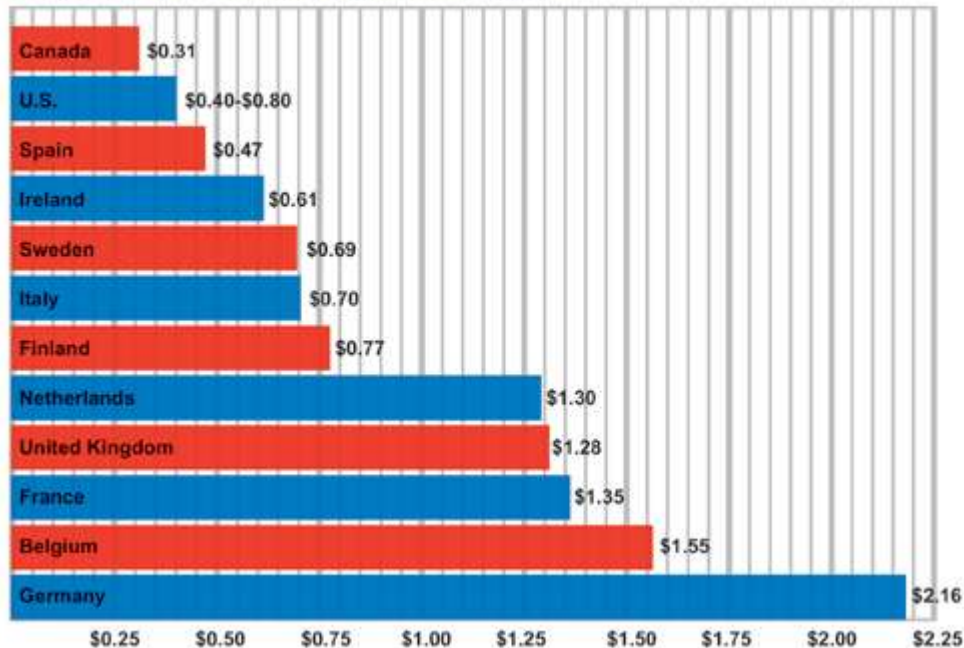
- Although Canada has a significant amount of fresh water, we possess only 7% of the world's **renewable** freshwater supply.
- In Canada, 84% of the population lives in a narrow southern band, while 60% of our water supply flows north to the Arctic Circle.
- Our growing population, and our growing thirst for water, are being concentrated in expanding metropolitan areas, and are forcing water regulators and policy makers to find ways to stretch available supplies even further.
- Increasing pollution of surface and groundwater is further reducing the supplies of readily available, clean water.
- Because our water use almost always leads to some degree of deterioration in water quality, the less water we withdraw, the less we upset the natural balance of our aquatic ecosystems. And, the less we upset the ecosystem, the less we have to spend to restore the water quality to an acceptable standard for public use.
- Finally, financing by municipal governments for the treatment of water supplies and wastewater is becoming increasingly constrained.

We take our water for granted

Because we undervalue this precious resource, we tend to overuse it and, in fact, abuse it. The apparent abundance of water is deceptive, and the capacity of our lakes and rivers -- and even of the oceans -- to purify the wastes we dump into them is much more limited than we once thought it was. There is a price for it: billions and billions of dollars to clean up or prevent pollution. It is becoming abundantly clear that water is not a free good. Sooner or later it presents us with a bill: the price of neglect. In many cases we pay less than the actual cost of processing and delivery. For example, irrigation water charges only recover about 10% of the actual costs of the service. The same is true, to a less extreme extent, for water costs to householders.

Our overuse of water begins at home. Compared to other countries, we pay very little to have water delivered to our kitchen and bathroom

Typical municipal water prices in Canada and other countries (per cubic metre)



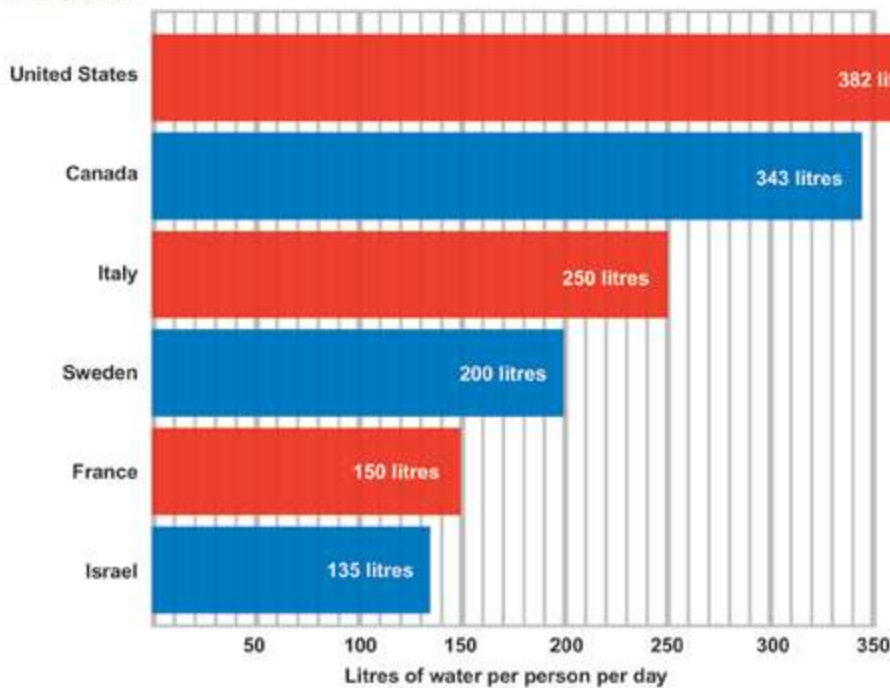
faucets.

Source: World Commission on Water for the 21st Century, 1999. "The Poor Pay Much More for Water... Use Much Less - Often Contaminated." (www.worldcouncil.org).

Note: The World Water Commission is assembling its data from a wide variety of sources, including its own research, World Bank reports, UN data, private sector surveys, non-governmental organizations and other Internet sources. The findings are preliminary rather than definitive, but do show trends.

Nevertheless, we use more water per person than most other countries.

Average daily domestic water use (per capita)



Note: Definitions and estimation methods employed by these countries may vary considerably and may change over time making water use comparison difficult.

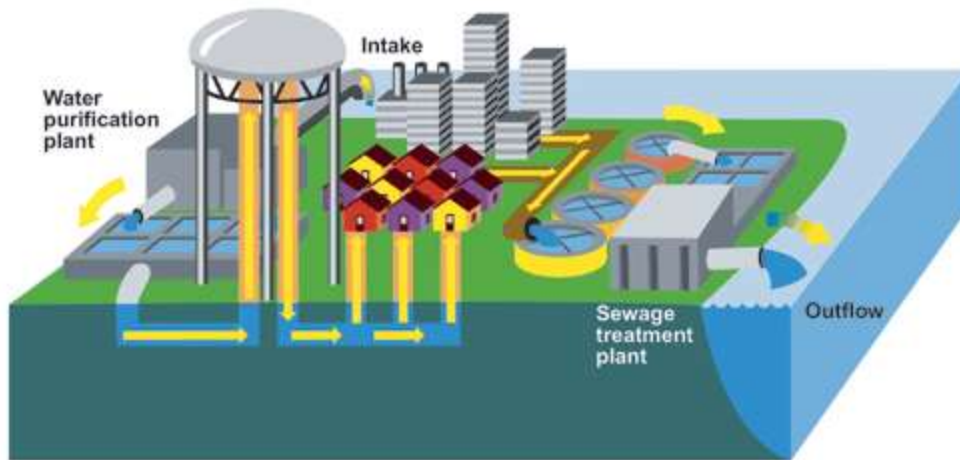
We can, however, make a significant contribution to solving these problems by reducing unnecessary levels of water use. To do so requires that we identify the areas within our homes, businesses, buildings and processes where we waste water and then make appropriate changes, either in our fixtures, or in our water-using habits.

Sustaining our Infrastructure

While many communities have access to an abundant water supply, the costs of the infrastructure that provides homes and industry with water and sewer services are straining the available municipal financial resources.

By **infrastructure**, we mean the **water treatment plants** that purify our water, the **water mains** in the ground that transport water, and the **towers** and **reservoirs** that store water. The term includes the **sewer pipes** that carry away wastewater and the **sewage treatment plants** that treat wastewater before returning it to the environment where it often becomes the source of water for communities downstream. This figure illustrates municipal water supply and sewage treatment:

Municipal water supply and sewage treatment



Experts are predicting a growing problem involving municipal water and sewer infrastructure in Canada. In 1991, the value of this investment was estimated to be worth over 90 billion dollars, of which a significant amount is deteriorating with age.

An increasing number of Canadian municipalities are considering water conservation as the key to keeping expansion needs to a minimum. Water conservation also optimizes plant efficiency, while assisting municipalities in financing the replacement of infrastructure that may be over 50 years old in some communities and up to 100 years old in several others.

Communities with older systems in need of extensive repairs or replacement face the most difficult problems. With all levels of government adopting policies of realistic water pricing and user pay principles, many municipalities have instituted **full cost pricing** to recover the total cost of providing both water and sewer services -- including the costs of financing the replacement of older systems and the upgrading of overloaded treatment plants. Higher municipal costs, in turn, mean higher water -- and sewer -- bills.

The problem of stressed treatment systems is not restricted to communities with piped water and sewer systems. Over the past 25 years, there has been a substantial migration of urban dwellers to the countryside. City-bred water using habits and attitudes are, in many instances, lowering the water table. And, the flood of wastewater produced is stressing the soil's ability to treat septic effluent adequately.

For both urban and rural communities, water conservation can extend the life of this over-stressed infrastructure.

Metering

Tied to price increases, metered households generally show reductions in water use, with the greatest savings occurring during the summer months, when water use is usually much higher due to frequency of lawn watering, car washing and other outdoor uses. In 1999, water use was

70% higher when consumers faced flat rates rather than volume-based rates. And yet, only about 56% of Canada's urban population was metered in 1999.

Metering of industry has been common for some time. What's new is the metering of the return flow to the sewer system, particularly as it relates to the industrial sector. Case studies show that including sewage treatment in rate calculations generates greater water savings. An increasing number of municipalities are applying sewer surcharges to residential water bills.

Water efficient residential technology

More than half of municipal water is used by the [residential sector](#).

As a consequence, the residential sector represents a logical target for demand management activities. Depending on the nature of the water efficiency program developed, each household can reduce water use by 40% or more.

Leak detection and repair

Up to 30% of the total water entering supply-line systems is lost to leaking pipes.

In most cases, if unaccounted for water in a municipal system exceeds 10 to 15%, a leak detection and repair program is cost-effective. For example, studies have shown that for every \$1.00 spent in communities with leak detection programs, up to \$3.00 can be saved.

Rates, pricing and public education

About 55% of Canadians served municipal water pay in ways that do not promote conservation. A 2001 study of rate structures by Environment Canada showed that in 1999, 43% of the population was under a **flat rate** structure (where the charge or assessment is fixed, regardless of the amount of water used). Another 12% were under a **declining block rate** structure (where the consumer's bill rises at a slower rate as higher volumes of water are used); i.e., the more you use, the less you pay per unit.

Only about 45% of the population served was found to be under a rate structure that provided a definite incentive to conserve water: 36% were under a **constant rate** structure (where the bill to the consumer climbs uniformly with the volume used); and 9% were under an **increasing block rate** structure (where a successively higher price is changed as larger volumes of water are used).

Introducing conservation-oriented pricing or raising the price has reduced water use in some jurisdictions, but it must be accompanied by a well articulated public education program that informs the consumer what to expect.

The Municipal Challenge

Municipal governments across Canada are beginning to take action to manage the demand for water, instead of seeking new sources of supply. **Demand management**, incorporating water efficient applications, is rapidly gaining popularity as a low cost, effective way to get more service out of existing systems, thus delaying or deferring the need for constructing new works. The benefits of water efficient techniques apply equally well to rural, private wells and septic disposal systems, as they do to central water and sewer systems in the city.

The wide range of water efficiency initiatives currently being undertaken, can be grouped under four principal categories:

1. [Structural](#),
2. [Operational](#),
3. [Economic](#), and
4. [Socio-political](#).

Most of these water conservation activities fall within the jurisdiction of municipal governments and/or public utilities.

Structural

- metering
- water recycling systems
- wastewater re-use
- flow control devices
- distribution system pressure reduction
- water saving devices (efficient fixtures, appliances and retrofits)
- drought resistant landscaping (xeriscaping)
- efficient sprinkling/irrigation technology
- new process technologies
- plant improvements

Operational

- leak detection and repair
- water use restrictions
- elimination of combined sanitary/storm sewers to reduce loadings on sewage treatment plants
- plant improvements

Economic

- rate structures
- pricing policies

- incentives through rebates and tax credits
- other sanctions (fines)

Socio-political

- public education
- information transfer and training
- regulatory (legislation, codes, standards and by-laws)

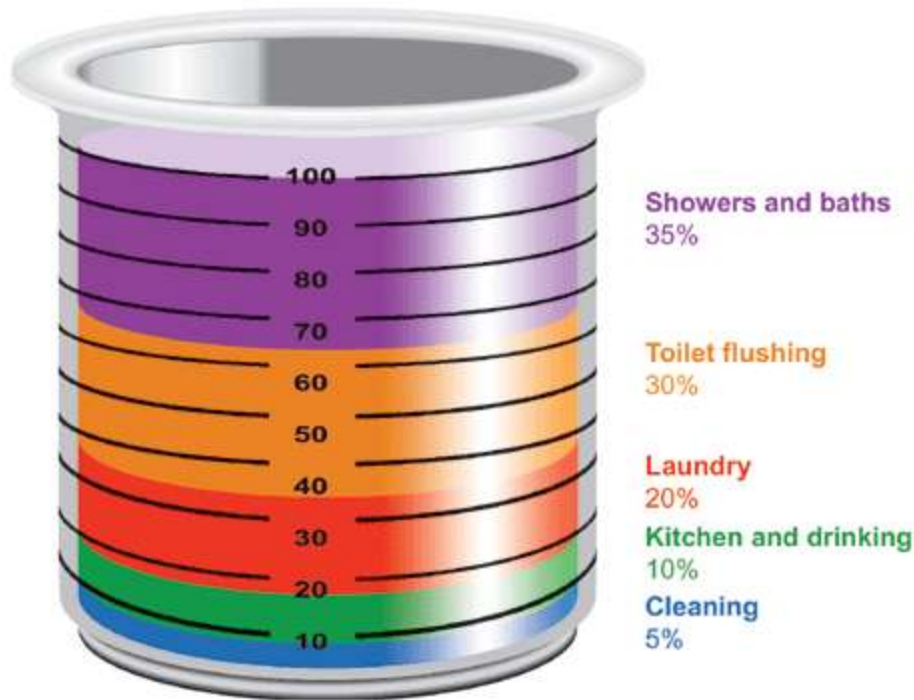
As we have seen, water quality and quantity are two sides of the same coin. How does saving water help water quality? Because water saved is water that does not end up in the wastewater stream requiring treatment. This, in turn, reduces municipal pumping and treatment costs and frees up monies that can be used for infrastructure renewal and replacement and protection of supply sources. Less wastewater in the sewage treatment plant also means that the plant has a better chance of doing the job it was intended to do.

Individual Action -- Conserving Water in the Home, Community and at Work

In the home

So where do we start? The first step is to identify where we use water in the home. Then we need to decide on what to do to reduce the amount of water we use, either by eliminating wasteful practices and habits, or by improving the efficiency of our water using fixtures and devices. Since we waste so much, this should be a relatively easy and painless process. The prime area to target is the bathroom, where nearly 65% of all indoor water use occurs.

Water use in the home



At work and in the community

Many of the suggestions made for reducing water use in the home have wider application, both in the workplace, and in the community at large. Low-flow equipment are available for most commercial and toilet applications, instituting them may mean taking a leading role yourself, for example, forming and leading a committee that would address the following questions:

- do your workplace bathrooms, kitchens, etc. have water-efficient toilets, faucets, etc. similar to those discussed for the household?
- if your workplace uses water in its production process or for washing goods or equipment, is this being done efficiently?
- does your community have a water-efficiency assistance program that helps households and business improve their water-use efficiency?
- is the water distribution system properly maintained so that no pollution leaks into it and so that no water is wasted through leaky mains?

What follows are some suggestions for how to get your house or business in order. Based on the three rules of water conservation -- reduce, repair and retrofit -- a typical household can reduce water consumption by 40% or more, with or no effect on lifestyle.

Reduce

Much of the water "consumed" in our daily activities is simply wasted. Taps are left running while we brush our teeth. Dishwashers and laundry machines are operated without full loads. Really, everywhere we use water there is room for improvement. Here are just a few examples for both indoor and outdoor water use.

- Don't use the toilet as a wastebasket or flush it unnecessarily.
- Take short showers -- five minutes or less should do. If you prefer baths, fill the tub only one-quarter full.
- Keep a bottle of drinking water in the refrigerator rather than letting your tap run to get cold water when you want a drink. (Rinse the bottle every few days.)
- More than 50% of the water applied to lawns and gardens is lost due to evaporation, or run-off because of overwatering. Find out how much water your lawn really needs. As a general rule, most lawns and gardens require little more than 2 to 3 centimeters (1 inch) of water per week.
- To reduce losses due to evaporation, water early in the morning (after the dew has dried).
- Watering off-peak helps the utility manage its load on the system and helps ensure adequate reservoir levels and water pressure for possible fire emergencies.
- When washing a car, fill a bucket with water and use a sponge. This can save about 300 litres of water.

Repair

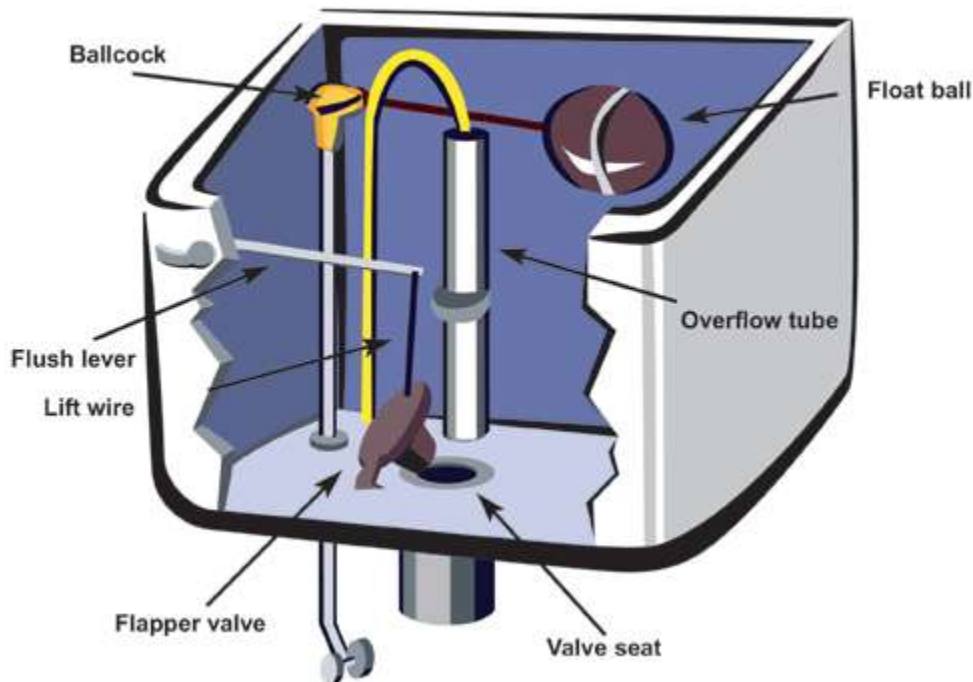
Leaks can be costly. A leak of only one drop per second wastes about 10 000 litres of water per year. Most leaks are easy to find and to fix, at very little cost.

Making repairs – saving money



- Leaking faucets are often caused by a worn out washer that costs pennies to replace. Most hardware stores will have faucet repair kits with illustrations showing how to replace a washer.
- A toilet that continues to run after flushing, if the leak is large enough, can waste up to 200 000 litres of water in a single year! To find out if your toilet is leaking, put two or three drops of food colouring in the tank at the back of the toilet. Wait a few minutes. If the colour shows up in the bowl, there's a leak.
- Toilet leaks are often due to a flush valve or flapper valve that isn't sitting properly in the valve seat, bent or misaligned flush valve lift wires, or a corroded valve seat. All of these can be fixed easily and inexpensively. To get at the valve seat, which surrounds the outlet hole at the bottom of the tank, you must first empty the tank. This is accomplished by turning off the inlet tap under the tank and flushing the toilet, making sure to keep depressing the flush lever until no more water drains out of the tank. Then, holding the valve out of the way, sand the corroded or warped valve seat smooth with a piece of emery cloth, if, however, the leak is around the base of the toilet where it sits on the floor, call a professional.

Inside the toilet tank



Retrofit

Retrofit means **adapting** or **replacing** an older water-using fixture or appliance with one of the many water-efficient devices now on the market. While these solutions cost more, they also save

the most water and money. Retrofitting offers considerable water saving potential in the home and business.

Toilet retrofits

When it comes to retrofitting, the prime fixture to target is the toilet. You can: i) adapt your existing toilet in a number of ways, by installing certain water-saving devices inside the tank at the back of the toilet; or, ii) if the toilet is more than fifteen years old -- which means it probably uses about 18 or more litres of water per flush -- you can replace it with one of the growing number of ultra-low-volume (ULV) toilets, that can be ordered from most plumbing outlets, and use only 6 litres or less per flush.

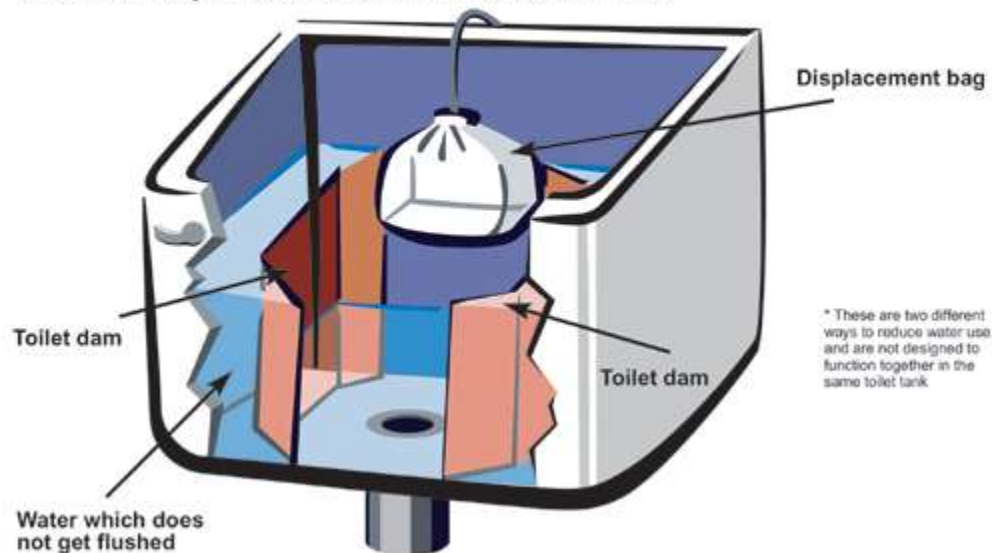
There are many **toilet adaptations** you can install in the tank of an existing toilet to reduce the amount of water used in a flush cycle. These devices fall into three generic categories:

- water retention devices;
- water displacement devices; and,
- alternate flushing devices.

The most common water retention device available is the **toilet dam**. A set will save about 5 litres per flush when installed properly. Their main attraction is their low cost (under \$10.00 per set) and the fact that they are easy to distribute and install for example, as part of a wider municipally-sponsored retrofit program. Their main disadvantage is that they tend to leak over time by slipping out of adjustment and can slip free and interfere with the moving parts inside the toilet tank, if not routinely checked.

Toilet dam and displacement bag

Two different ways to reduce the refill volume after each flush:



The water displacement devices familiar to most people are the **plastic bags** or **bottles** filled with water which are suspended inside the toilet tank. As the name implies, these devices displace several litres of water, saving an equivalent amount during each flush. Like the toilet dam, most displacement devices are inexpensive and easy to install. Their chief disadvantage is that they don't save as much water as other devices and, if they are not installed carefully, they can interfere with the proper operation of the toilet.

One displacement device to stay away from is the **brick!** It can disintegrate inside the toilet tank, leading to excessive leakage at the flapper valve and may even be heavy enough to actually crack the tank.

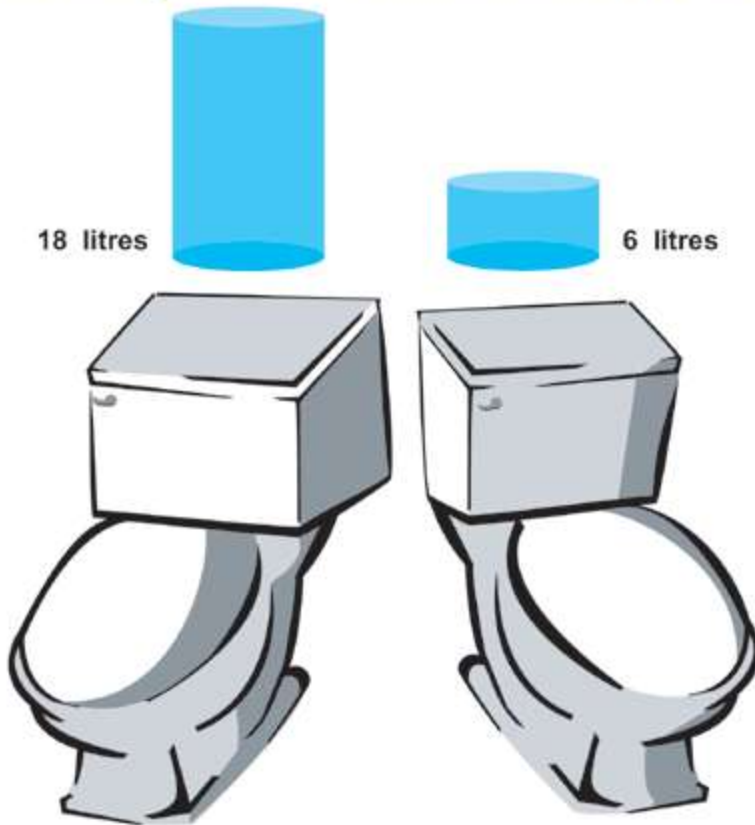
There are essentially two types of alternative flush devices: **early-closure** and **dual-flush**. They are usually attached to the overflow tube inside the toilet tank. In both cases, they close the flush valve or flapper after the tank is only partially emptied. In theory, this interruption in the flush cycle occurs after the bowl has been cleared. In the case of the dual-flush mechanism, the amount of water saved is dependent upon how long the flush lever is activated -- a partial flush for light duty or full flush or heavy duty.

While all of the above toilet adaptations appear to work as intended when first installed, their **performance** may vary considerably, depending on the toilet design. The best advice is to monitor the performance of the devices periodically. If you discover that it becomes necessary to double flush the toilet, something is in need of adjustment or replacement. Remember that double flushing defeats the purpose of your water conservation efforts and is costing you money.

If you decide that it is time for a toilet replacement in your home or business, you are well on your way to significant water savings that you can bank on over the life of the toilet. Replacing a 18 litre per flush toilet with an ultra-low-volume (ULV) 6 litre flush model represents a 70% savings in water flushed and will cut indoor water use by about 30%

Keep in mind that 18 litres per flush, assuming 4 flushes per person per day, translates into nearly 30 000 litres of clean, fresh water per year just to get rid of 650 litres of body waste. A 6 litre flush toilet only use about 10 000 litres to do the same task. Low flush toilets are available for less than \$150.00 at most plumbing and supply stores.

Water use per flush – conventional vs. ULV toilet



Remember, the ULV toilet not only uses less water, **it produces less wastewater**. If your municipality applies a sewer surcharge on your water bill, the investment in the better toilet could translate into a 50% reduction in your combined water/sewer bill. If you are on a private well and septic system, you are significantly reducing the loading on your tile field while extending its useful life. To a lesser degree, the same applies to the other water-saving devices described in these pages.

Showerheads and faucets

After the toilet, the shower and bath consume the most water inside the home. Conventional showerheads have flow rates up to 15 to 20 litres per minute. A properly designed **low-flow showerhead** can reduce that flow by half and still provide proper shower performance. Low-flow showerheads can be purchased in most plumbing supply outlets.

Depending on your preference for finish and appearance, you can select a serviceable low-flow showerhead starting at around ten dollars. Consider one with a shut-off button. The advantage of the **shut-off button** is that it allows you to be really water efficient if you so choose, by being able to interrupt the flow, while you lather up or shampoo, and then resume at the same flow rate and temperature.

Low-flow showerhead with shut-off button

Shut-off button (convenient for shutting off water temporarily while soaping or shampooing).



Beware of the type of showerhead that produce such a fine mist that the water is quite cool by the time it reaches your feet. And, stay away from so-called **flow restrictors** that are inserted inside your existing showerhead. They look like a small plastic washer and can produce a fierce, stinging spray pattern which may significantly reduce the enjoyment of taking a shower.

Conventional faucets have an average flow rate of 13.5 litres of water per minute. Install **low-flow aerators** to reduce this flow. In the bathroom, a flow rate of about 6 litres per minute should do the trick, and in the kitchen a flow rate of 6 to 9 litres per minute is sufficient. Don't bother retrofitting the tap in the utility sink; it is intended to provide large volumes of water quickly, for example, for cleaning or washing, such that low flows will only inconvenience the user.

Outdoors

During the growing season water use can increase by as much as 50%. While lawns require a lot of water, much of this water is wasted -- lost due to over-watering and evaporation.

Watering equipment also plays a part in how much water is saved and lost. Ideally, sprinklers should be suited to the size and shape of the lawn. That way, you avoid watering driveways and sidewalks. Installing timers on outdoor taps can be a wise investment.

Sprinklers that lay water down in a flat pattern are better than oscillating sprinklers which lose as much as 50% of what they disperse through evaporation. Drip irrigation systems which apply water only to the roots zone are the most efficient -- and the most expensive -- alternative.

The water you use to water your lawn doesn't have to come out of a tap. A cistern, which captures and stores rainwater, can be used as a source of irrigation water. A rain barrel can adequately fulfil this function.

Finally, consider a low-maintenance landscape -- one which requires little more water than nature provides. Often called **xeriscaping**, the principles of a low-maintenance landscape are as follows:

- a reduced amount of lawn;
- proper plant selection making use of native grasses, shrubs and trees;
- the use of rain barrels / roof drainage
- mulching to reduce evaporative losses around shrubs and trees;
- improvements to soils;
- a proper irrigation system; and
- planned maintenance.

The most significant savings of course, come from a reduction in lawn area and switching from exotic plant forms to native species which require less water. In general, lawn areas should not exceed what is useful for play and social activities, and should be limited to the backyard where the family spends the majority of its time.

Saving water outdoors



Calculate Your Water Use

Have you ever wondered how much water you use? Use the [Water Use Calculator](#) to find out.

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The Bottom Line

Water conservation. The message is clear. If we each save a little, it can add up to major savings in water, energy and money. For the average household, reductions in water use as high as 40 % or more are feasible, just by following the steps outlined on the preceding Web pages.

The benefits don't stop at the household or business. The municipal water and sewer department gets a break on the amount of water it has to pump to our homes and businesses and on the amount of wastewater it has to treat in sewage treatment plants. Water conservation can extend the useful life of municipal water supply and treatment plants, and will benefit the operating efficiency -- and life expectancy -- of private septic disposal systems.

And, finally, water conservation can generate **significant** environmental benefits. It can reduce water diverted and the pollution loadings on our lakes and rivers by reducing the volumes of wastewater which we have to treat. This can help to protect our drinking water and the ecological balance in sensitive aquatic ecosystems.

If we all practice water conservation, everyone -- and everything -- benefits.