

Low Flow



A look at fixtures and appliances that can save you money, improve community health, and help the climate. And yes, your toilet will still flush.

BY SEAN GROOM

In areas of the West, mandatory water conservation is the price for enjoying 300 sunny days a year. East of the Mississippi, conservation has become increasingly important as droughts affect areas not used to water shortages. And regardless of where you live, public water supplies are increasingly unable to meet demand for healthy water or to treat the volume of wastewater they receive. Consequently, conservation isn't just about reducing your water bill; it's an issue of water quality, public health, energy, and the environment.

Every day, we use water in toilets, showers, faucets, washing machines, and dishwashers. For every one of these points of use, there are both best-in-class and reasonable conservation targets to help you trim water waste. In the following pages, you will find some examples.

A gallon saved goes farther than you think

Because water and energy are relatively cheap in the United States, the monthly savings from conservation can seem small, and the payback period can be several years. You may ask, "What's the point?"

The point is that water is increasingly scarce, and using it requires energy. Running cold water for five minutes consumes as much energy as a 60w lightbulb does in 14 hours. It also requires energy to treat the water afterward. Nationally, it takes an average of 0.0033kwh of electricity to supply and treat each gallon.

To see how this adds up, I'm going to make some conservative assumptions. First, I'll consider only detached, single-family homes; second, I'll assume that all these houses have fixtures and appliances that meet current plumbing standards (1.6-gal.-per-flush toilets, 2.5-gal.-per-minute showerheads, etc.). If they accomplished the modest goal of reducing household-water consumption

by 20%, they each would save an average of 9670 gal. of water and around \$100 in heating costs annually.

Sounds paltry. Nationally, however, that's more than \$6 trillion saved, 774 billion gal. of water unused and that won't require treatment, and a 35-million-ton reduction in CO₂ emissions. That CO₂ reduction would be equivalent to taking 11.5 coal-fired 500-megawatt electricity plants offline. These numbers also drastically understate the savings. There are hundreds of millions of fixtures and appliances that don't meet today's minimum-efficiency standards, and I didn't factor in apartments, town houses, or condos.

A commonsense starting point

Akin to its Energy Star program for electric appliances, the EPA launched WaterSense to recognize products that meet heightened standards for water conservation. Critics of past water-conservation efforts argued the measures demanded large performance sacrifices, so WaterSense includes a performance component to weed out clogging toilets and impotent showerheads.

Unless a product is pressure-compensating, its advertised flow rate depends on water pressure. If water pressure is high, say 100 psi, then a fixture is going to use more water. If you use a public water supply, the provider can tell you the static pressure. If it's greater than 60 psi, you should install a pressure-regulating valve (www.watts.com; \$50 to \$200). For comparison purposes, I list average retail prices.

Contributing editor Sean Groom lives in Simsbury, Conn. Photos courtesy of the manufacturers, except where noted.

Down for #1, up for #2

Dual-flush toilets vary the flush volume. On the pressure-assist Mansfield EcoQuantum (model 148-119; \$400), push down the handle for a 1.1-gal. flush, and raise the handle to eliminate solid waste with a 1.6-gal. flush.

TOILETS

A huge chunk of your water bill literally is money down the toilet. Nearly 30% of indoor water use in the average American household stems from toilets. Replacing an older toilet will put a big dent in household water consumption.

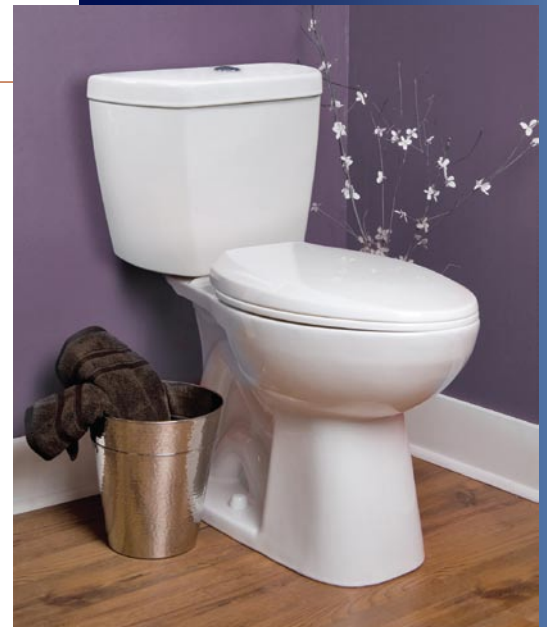
A 1992 federal standard restricts new toilets to a maximum of 1.6 gal. per flush (gpf), but the best estimate is that there are still 100 million nonconforming toilets using 3.5 gpf or even 5 gpf. WaterSense-labeled toilets are a 20% improvement over the standard. A qualifying commode must be a single-flush type using a maximum of 1.28 gpf or a dual-flush toilet using a maximum of 1.6 gal. for solids and 1.1 gal. for liquids. New high-efficiency toilets use between 0.8 and 1.28 gpf and rely on either gravity or compressed air to move water and waste out of the bowl.

New toilets Traditional toilets rely on gravity to wash waste through the trapway and into the waste lines. With 16 years of engineering behind them, gravity-flush low-flow toilets work fine at 1.28 gpf. WaterSense-qualified toilets flush at least 350 g of uncased soy balls, a tougher simulation than the voluntary test manufacturers use. The moderately priced American Standard Flowise Cadet 3 (model 2835.128; \$300) claims to flush 1000 g of waste with 1.28 gal. (That's 2.2 lb. of flushing capacity.)

Pressure-assist toilets rely on air pressure in a sealed plastic water tank hidden inside the porcelain tank to create a forceful flush with relatively little water. (The tank-within-a-tank design means no sweating.) The flush system is the heart of a pressure-assist toilet, and the top-performing Sloan Flushmate IV can be found in pressure-assist toilets across the price range. For the bargain conscious, consider Home Depot's Glacier Bay 1 gpf (model N2310E; \$198).

For the uninitiated, the loud swooshing flush of a pressure-assist toilet can be startling. Redesigning the pressurized tank to create a vacuum-assist flush allowed Niagara Conservation to develop a 0.8-gpf, nearly silent toilet, called the Stealth (\$308), which is the most efficient on the market.

Retrofit You can squeeze greater efficiency from your 1.6-gpf toilet by displacing water in the tank with a toilet-tank bank (a sealed plastic bag filled with water) or a plastic bottle with some pebbles in the bottom. A sexier way is to convert it to a dual-flush commode with the MJSI HydroRight dual-flush converter kit (\$30; reviewed on p. 24) or the One2flush 200 dual-flush retrofit kit (\$25). Relatively simple to install, these kits replace the flapper and flush lever with a new mechanism allowing for a small- and a large-volume flush. The volume of water used for both flush types can be adjusted to find the lowest volume that successfully removes waste.



Vacuum assist means half the water

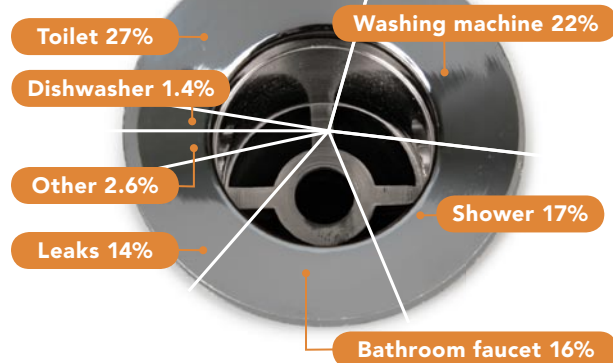
The Stealth relies on slick engineering to get by with only 0.8 gpf. As the toilet fills, rising water compresses air in the sealed inner tank. A tube transfers the compressed air to the trapway. This pressurized-air pocket raises the water level in the bowl for a larger water surface and cleaner bowl. Flushing the toilet quickly drains water from the bottom of the tank and sucks the trapway air pocket into the tank, creating a momentary vacuum. Water from the bowl rushes to fill the vacuum, sucking the waste in the bowl through the trapway. For a full review of The Stealth, see p. 101.



Where does all the water go?

One of the real surprises about water use is that leaks account for nearly as much water as bathroom faucets. Generally, the sources are easy-to-ignore dripping faucets or unseen toilet flappers allowing water to seep from the tank to the bowl. To prioritize the fixtures and appliances in your conservation efforts, compare your device's flow rate to WaterSense standards and consider its contribution to household consumption—that is, don't replace an 8-gal.-per-cycle dishwasher if you still have 5-gal.-per-flush toilets. You don't always need to replace items to make a dent in consumption. In many cases, you can retrofit accessories, like the Smart Faucet on p. 70, that help you to use water smarter for the cost of a pie at your local pizzeria.

Typical indoor water use



Water consumption limits

	Federally mandated maximum	New WaterSense standards
Toilet	1.6 gpf	1.28 gpf
Washing machine	9.5 WF	6 WF
Shower	2.5 gpm	2.0 gpm
Bathroom faucet	2.2 gpm	1.5 gpm
Leaks	0	0
Dishwasher	6.5 gal./cycle	5 gal./cycle*

*Energy Star standard as of July 2011

WASHING MACHINES



Efficiency champ

The Frigidaire Affinity (model FAFS4474; \$1100) wins both the water- and the energy-conservation categories with a WF of 2.9 and energy consumption 155% better than the federal standard.

Midprice performance

With a WF of 3.1 and energy consumption 131% better than the federal standard, Samsung's WF330 (\$675) nearly matches the Frigidaire's efficiency. It also has a drum-cleaning wash cycle to prevent odors from forming, sometimes a problem with front-loading washers.



After the toilet, the washing machine is the greatest consumer of water in the house. Most manufacturers don't quantify water usage, but the Energy Star Web site provides that data for all qualified washers (www.energystar.gov).

Washing machines come in different sizes, so a straight-up comparison of gallons per cycle is apples to oranges. A small 2.7-cu.-ft. washer might use less water per cycle than a 4.1-cu.-ft. washer, but it's also cleaning fewer clothes. (If you have to do an extra three loads a week, you're not saving water or electricity.) For a fair comparison, Energy Star calculates a water factor (WF), the number of gallons used per cycle per cubic foot of clothes-washer capacity. The lower the WF, the more water efficient the washer.

In January 2011, the federal government will for the first time restrict water usage for all washers to a WF of 9.5. Energy Star and WaterSense will both require a WF of 6. While this 37% improvement is significant, you can easily find washing machines with a WF in the 2.9 to 3.5 range, and these washers are among the most energy efficient available.

Larger capacity machines tend to generate lower WF scores, which is great for families with consistently full laundry loads. But if you know that you'll frequently run less-than-full loads, look for a model with loading-sensing technology, like the three shown here. They adjust the water level to the amount of clothing.

Easy on the wallet

With a WF of 3.2 and energy consumption 75% better than the federal standard, the LG WM2010C (\$510) was the author's choice for its balance of efficiency and price.



SHOWERHEADS

Your showerhead delivers almost 20% of your indoor water use, and most of that water is heated. A new showerhead is relatively inexpensive and an easy way to reduce both water and energy bills. Today's showerheads are limited to 2.5 gpm. But for each half-gallon per minute you reduce the flow rate, you'll reduce your water heater's annual energy consumption by about 150kwh of electricity or 750 cu. ft. of natural gas.

Despite the savings potential, people fear that less water means weak spray and poor coverage. This has been an obstacle for the adoption of low-flow showerheads, especially because you can't try one before you buy it. To overcome this hurdle, WaterSense includes testing protocols to ensure reliable, strong pressure and an even, well-dispersed spray. Fortunately, plenty of showerheads in the 1- to 2-gpm range have a nice spray pattern and plenty of force. (If you have a tankless water heater, be sure the flow rate is enough to activate it.)

Low-flow showerheads come in two varieties: aerating and nonaerating. One is not better than the other, but each produces its own type of spray. Aerating showerheads are the most common. They inject air into the water stream, in essence creating bigger, plumper droplets. By increasing the water volume, the flow is reduced, and the steady pressure and even, full spray create the impression of a more ample 2.5 gpm. The downside is that the air cools quickly, which means you'll notice the temperature drop at your feet.

Instead of pumping water droplets full of air to increase the volume of water, nonaerating showerheads use a pressure-balancing flow constrictor to increase force. The shower will be stronger, but the water may be too needlelike with some models. On the


plus side, these showerheads allow water to retain heat longer.

The other way to conserve water in the shower is to shut it off when it's not necessary. If you're hearty enough for a "Navy shower," a shutoff valve (\$5 to \$40) between the showerhead and shower arm lets you turn off the flow when you're lathering.

A less miserly but more comfortable approach reduces the amount

of water wasted before you enter the shower. If you turn on the shower and then brush your teeth while the cold water is flushed from the pipes, you're wasting both water and energy. Installing an aftermarket device like the Evolve Ladybug (shown above) between your shower arm and showerhead shuts down the flow as soon as hot water reaches the showerhead.

Custom-drilled for your water pressure




The aerating metal showerheads in Bricor's B100 series come in three flow rates: 0.55 gpm, 0.99 gpm, and 1.25 gpm. Intended for drought-stricken areas, the 0.55-gpm B100 Ultramax is a bit reminiscent of a camp shower, but the other two versions mimic the feel of a more luxurious 2.5 gpm.

No cold feet here




With Evolve's Ladybug (available in four finishes; \$30 to \$40) installed between the shower arm and showerhead, the next time you stand outside the shower waiting for hot water, it will run until the water temperature hits 95°F. Then the flow will reduce to a trickle. Step in, pull the cord, and normal temperature will resume.

Dial your flow rate

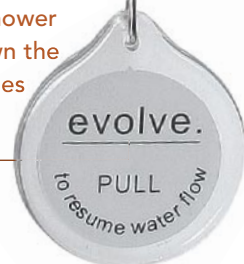


Twisting the black ring on Niagara Conservation's TriMax showerhead (\$18) switches the flow rate. The company asks you to think of the 0.5-gpm setting as soaping mode, the 1.0-gpm setting as soaking mode, and the 1.5-gpm setting as an option for high-pressure shampoo rinsing.

Less water, same force



The venerable showerhead manufacturer Speakman offers low-flow nonaerating versions of its classic Anystream 32-, 48-, and 50-spray models in 1.5 gpm, 1.75 gpm, and 2.0 gpm (\$32, \$40, \$52). A pressure-compensating device matches the force of the original and offers the same variable spray patterns.



FAUCETS

Like other fixtures, bathroom faucets come in low-flow varieties. The maximum flow rate for the industry is 2.2 gpm, while WaterSense-labeled faucets top out at 1.5 gpm. You should look at a low-flow faucet if you're redoing the bathroom, but there's no need for that kind of cash outlay to save water. Faucets work fine at less than full volume. You can cut water use immediately with every faucet's integrated flow restrictor: the handle. Because old habits are tough to break, though, spend a few bucks (\$3 to \$40) for a new low-flow aerator to ensure water savings. These inserts screw onto faucet threads, control the stream type and shape, and are available in low-flow rates of 0.5 gpm, 1 gpm, and 1.5 gpm. (Kitchen faucets aren't included in WaterSense because higher flow rates make things like filling pots easier, but you can add an aerator if you like.)

Do you turn off the water when you're scrubbing your hands and then back on again to rinse them? Probably not, so regardless of flow rate, most of the water coming out of a faucet is unused, and heated. For bigger water and energy savings, limit water flow to when it's really needed by adding an on-demand device.

Foot pedals are a higher-tech (and higher-priced) means of hands-free faucet control. Used in the kitchen or bathroom, the pedals mount in the kick space and give you control of both the hot and cold water. One pedal controls hot water, one pedal controls cold water, and stepping on both provides warm water. They are great in the kitchen when you're preparing meat and you'd normally be fumbling to turn on the faucet without actually touching it. Plus, with the elimination of the sink-top controls, you get a really clean countertop installation. In the bathroom, you need some sort of cabinet to hide the pedals' mechanicals.

Another hands-free option is an electronic faucet (\$350 and up). When the infrared beam aimed into the basin is broken, a solenoid opens water flow and closes it one second after your hands leave the sensor field.

Note that many electronic faucets don't include the mixing valve, which you need for tempered water. You'll also need to decide whether you want a set-and-forget temperature control or an external control so that you can adjust the temperature with each use.

Faucets typically have a maximum running time between 10 and 60 seconds before they shut off, regardless of whether your hands are still in the basin. If the faucet times out while you're still washing, remove your hands from the sensor field for a second to reset the faucet, then resume washing.

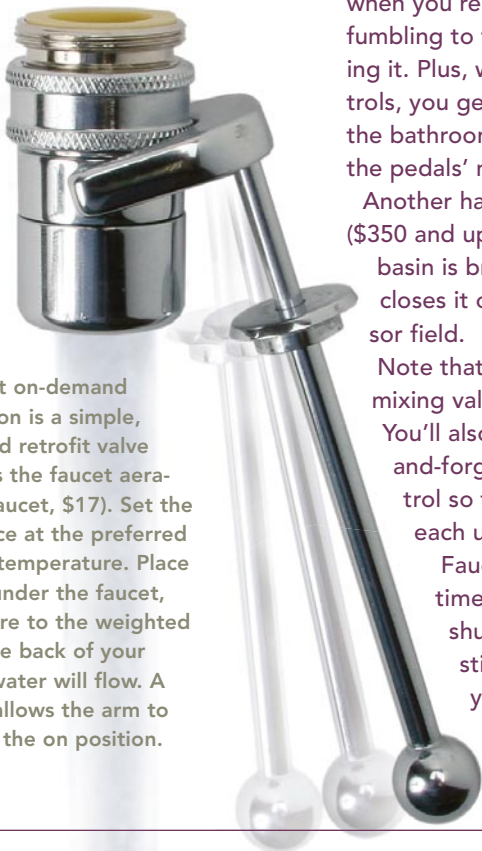
Touchless faucets require an electricity source



Sensor-operated faucets typically come with a battery pack that becomes a backup power source if you purchase an add-on plug-in or hard-wire kit. A battery pack powers Toto's Eco-power faucets (like the TEL 5GT-10; \$700, mixing valve included), but it's recharged by an inline turbine every time you turn on the water, increasing battery-life expectancy to 10 years.

Retrofit your faucet

The cheapest on-demand faucet solution is a simple, spring-loaded retrofit valve that replaces the faucet aerator (Smart Faucet, \$17). Set the handle(s) once at the preferred volume and temperature. Place your hands under the faucet, apply pressure to the weighted lever with the back of your hands, and water will flow. A sliding disk allows the arm to be locked in the on position.



Step on it



Does it bother you that you have to touch the faucet with clean hands to turn it off? Or that heated water is pouring down the drain while you're scrubbing? Foot pedals address both concerns. Chicago Faucets makes 15 different styles between \$150 and \$350 (model 625 pictured; \$150).

DISHWASHERS

It's a misconception that hand-washing dishes saves water. If you want to use water frugally, run the dishwasher. WaterSense doesn't rate dishwashers, but Energy Star incorporates water consumption in its qualifying criteria. Now, an Energy Star dishwasher must use 5.8 gal. per cycle. Come July 2011, the threshold will be 5 gal., so you may want to postpone a purchase until manufacturers retool dishwashers on the bubble.

It's important to recognize that not all Energy Star products are created equal. As a product line, you can't go wrong with Bosch. With the exception of a few Gaggenau models with matching performance, all of Bosch's models are head and shoulders above other brands when it comes to water and energy usage. Remember that efficiency figures are for normal cycles. Heavy-duty wash cycles can use significantly more water and energy. For example, Bosch's \$500 dishwasher uses 2.38 gal. for a normal cycle and 6.8 gal. for a pots-and-pans cycle. GE's \$1500 machine uses 5.2 gal. in a normal cycle and 10 gal. in pots-and-pans mode.

The lesson is that price generally tracks features, not efficiency. Of course, loading flexibility, cycle options, cleaning performance, and appearance all factor into a dishwasher purchase (see "The Dirt on Dishwashers," *FHB* #207 and online at FineHomebuilding.com), but you can improve efficiency and performance by choosing one with clean-sensing technology.

During each segment of a wash cycle, the dishwasher uses an allotted amount of water several times. As wash water collects in a sump at the bottom of the tub, a light beam measures turbidity—the volume of particles in the water and the water's opacity—throughout the cycle and uses that information to adjust the length of the wash segment. If more cleaning is needed, the water is filtered (so that food particles don't get pasted back on the dishes) and returned to the spray arms. Another water- and energy-saving feature is half-load cycles that can either reduce water use for the load size or wash only one rack.

Less water means less energy

Heating water to 130°F accounts for most of a dishwasher's energy consumption, so engineering it to use (and heat) as little water as possible saves electricity. Sensors that evaluate the size and dirtiness of the load to reduce water volume and running time further boost savings. Bosch has eight models (\$800 for the Evolution series to \$1650 for the 800+ Integra series) that use 1.56 gal. per cycle (the least of any dishwashers), and their electricity consumption is up to 180% better than the Energy Star standard.

SOURCES

TOILETS

www.americanstandard-us.com
www.glacierbaytoilets.com
www.gomjsi.com
www.mansfieldplumbing.com
www.niagaraconservation.com
www.one2flush.com
www.sinkpositive.com
www.sloanvalve.com

WASHING MACHINES

www.frigidaire.com
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SHOWERHEADS

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