BY RICH BINSACCA

THE WATER-EFFICIENT HOME

HOW TO SET PRIORITIES AND MEET NEW GUIDELINES FOR WATER USE.

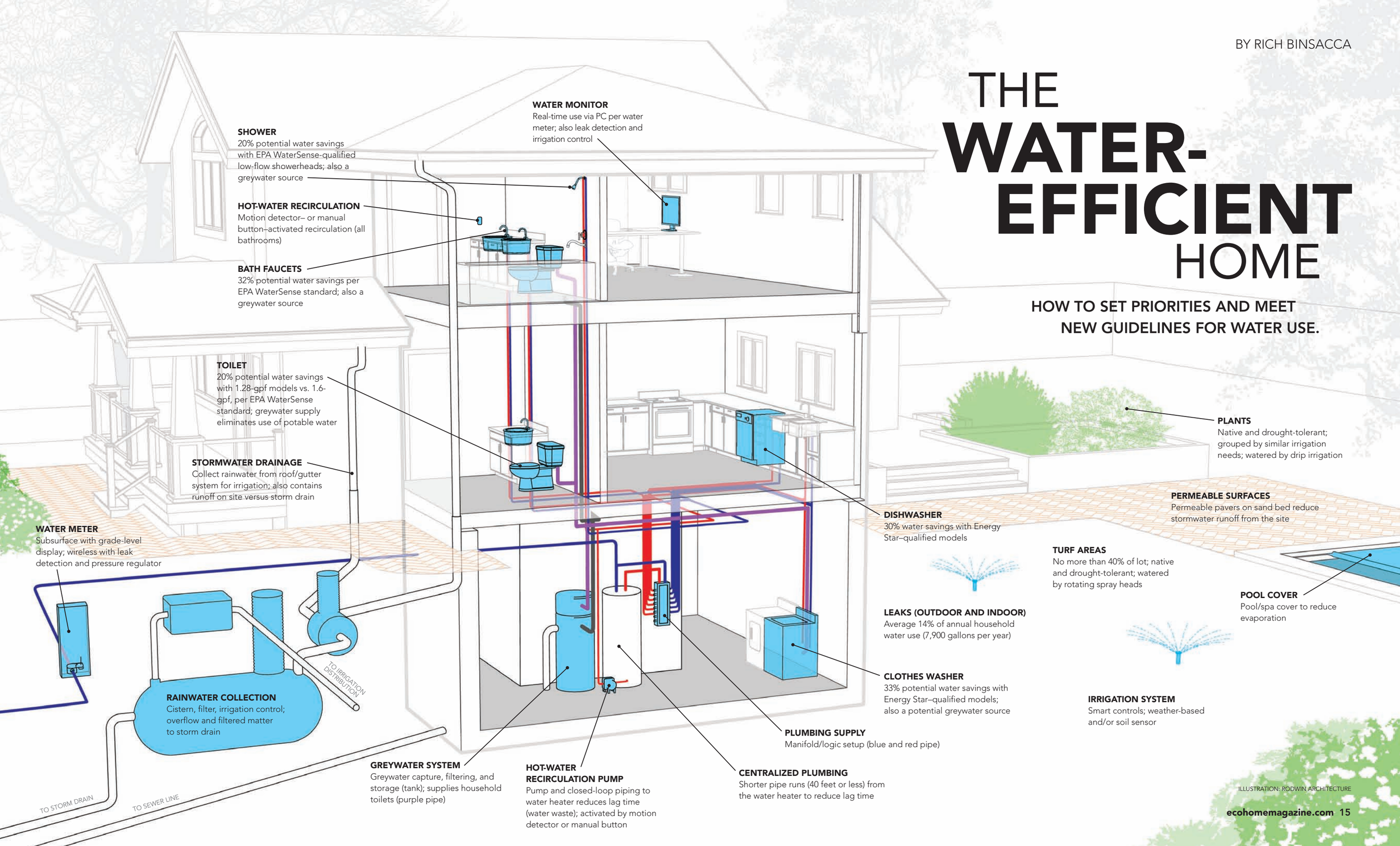


ILLUSTRATION: RODWIN ARCHITECTURE

When you got ready for work this morning, you probably turned on the shower and then turned away to let the water heat up, busying yourself in the meantime while gallons of clean, cold water (and perhaps some hot) went down the drain.

But so what? Water's cheap and easy, right? You lift a lid or a lever, push a button or pull a knob, and it's there, every time. And when you get your water bill at the end of the month the number is far from frightening. Pay it and forget it.

For now, maybe. Declining freshwater sources, nationally mandated water utility upgrades, and higher energy costs have already boosted rates 10% nationwide since 2009. "If anyone thinks that their water rates or residential tap fees are going to get cheaper in the future, they're out to lunch," says Drew Beckwith, water policy manager with Western Resource Advocates in Boulder, Colo. "Water is only going to get more scarce, more contentious, and more expensive."

So at some point sooner rather than later, homeowners will see their water and sewer bills go up and use of city-supplied potable water restricted—actions that may spur them to care enough to ask for and pay for water-efficient homes. "We're at the tip of the iceberg of consumer demand," says Pete DeMarco, director of special programs for the International Association of Plumbing and Mechanical Officials (IAPMO), which writes the Uniform Plumbing Code (UPC) and the Green Plumbing and Mechanical Code, and certifies the efficiency of water-using products. "Most people are unaware of the provisions and potential out there."

An increasing number of your green-minded peers, big and small, are already incorporating water-saving systems, products, and practices into their new homes and their sales efforts.

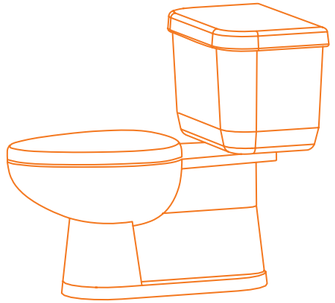
"We're always researching new technologies and ways to put money in our buyer's pockets," says Chris Apostolopoulos, president of the Northern California division of KB Home, the first builder in the country to build to the EPA's WaterSense for New Homes standards. "It's a competitive advantage."

WHERE TO START

Though the most potential for household water savings is outdoors, the easiest way to reduce consumption and maintain lower use is inside.

In addition to water savings, you can reassure buyers that gaining those efficiencies requires little (if any) change in lifestyle habits and also will have a positive impact on the home's energy use. Simply, most of the savings are embedded in the various and available plumbing fixtures, appliances, and systems, and the technology has advanced to make a near-seamless transition to a water-wise home.

Attack the Baths. Bathrooms are your first and best opportunities to save water inside the house. Conventional toilets, showers, and faucets combine to consume an average of 41 gallons per person per day, or about 60% of a home's daily indoor drain (and 12% of total daily consumption), according to the American Water Works Association (AWWA).



#2 WATER-USE CULPRIT (#1 INDOORS): TOILETS

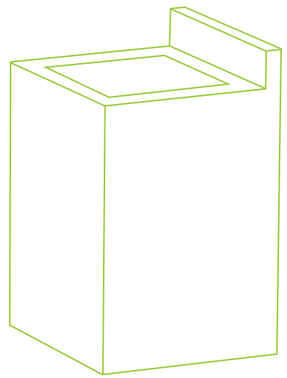
- **Average Use/Home:** 18.5 gpcd (15,396 gallons/year/home)
- **Conventional Specs:** Gravity-type, 3.4 gallons per flush (gpf) (26.7% of daily indoor use)
- **Water-Saving Options:**
  1. 1.6 gpf (est. 56% use reduction to 8.2 gpcd; 18% of daily indoor use)
  2. 1.28 gpf (est. 65% use reduction to 6.56 gpcd; current IGCC and EPA WaterSense standard)
  3. 0.8/1.6 gpf dual-flush (est. 71% use reduction to 5.37 gpcd)
  4. Greywater (no municipal water required)
- **Codes and Standards:** IAPMO Green Plumbing and Mechanical Code; ICC International Green Construction Code; EPA WaterSense

Installing low-flow alternatives, namely the 1.28-gpf toilets now required by the International Green Construction Code, and more water-efficient showerheads and faucets, drops daily consumption by 36% or about 15 gallons per capita—a potential savings of 12,500 gallons of water a year per household.

Before your buyers start whining that such products cause users to flush twice or suffer a weak shower spray, rest assured that performance issues are a thing of the past. "Standards testing has become smart and savvy concerning a product's service requirements as much as its water savings," says Beckwith. "People get just as clean with a low-flow showerhead."

The efficiency of those fixtures and fittings, however, only accounts for the difference in flow rates between conventional and low-flow products; they also are tested at a water pressure that is far higher than the real world, thus overstating the potential savings, according to Craig Selover, director of plumbing product technology at Masco R&D. In addition, the bulk of the bathroom efficiencies (about 12 gallons per capita, or 80%) are achieved by using high-efficiency toilets alone.

That's because water use at faucets and showers, even with flow restrictors that result in some measure of savings, is more a function of lag time—that dead zone spent waiting for hot water to reach the showerhead or lav faucet not calculated in a flow-rate-only comparison. Lessen lag time, and the water savings really kick in at those locations. (See "Go With the Flow," page 23, for more on fixtures.)



#3 WATER-USE CULPRIT: CLOTHES WASHER

- **Average Use/Home:** 15.0 gpcd (12,483 gallons/year/home)
- **Conventional Specs:** Water Factor of 9.5 or less (21.7% of daily indoor use)
- **Water-Saving Option:** Water Factor of 6.0 or less (est. 33% use reduction to 10.0 gpcd; 22.1% of daily indoor use)
- **Codes and Standards:** IAPMO Green Plumbing and Mechanical Code; ICC International Green Construction Code; Energy Star

Systems Approach. Reducing lag time means rethinking the home's hot-water delivery scheme. A centralized water heater, shorter (and insulated) pipe runs, and a closed-loop configuration for recirculating hot water to selected taps combine to hasten hot-water delivery and reduce waste.

Basically, a dedicated closed-loop line for hot water is fitted with a pump activated by occupancy sensors or manual switches or buttons in the bathrooms to more quickly replace the cold water standing in the pipes with hot water; if a sensor or switch is activated upon entry into the bathroom, hot water may already be waiting at the shower or faucet by the time the user calls for it.

And, by looping back to the water heater, a recirculating system also helps save energy. "The flow back into the water heater [to replenish the tank] is warmer than the city water supply," says Alec Nord, an associate project manager at Uponor. That results in lower heating demand for an appliance that accounts for an estimated 20% of a home's energy use.

Perhaps most important, hot-water recirculating systems arguably hold the key to selling the value and investment in water savings to an ambivalent buying public. "Convenience and satisfaction are the main concerns for homeowners compared to the amount of water they can save," says Selover, who directed a research project that found a 30% drop in shower water consumption among the households tested with low-flow products and recirculation pumps.

Elsewhere Indoors. Among the other water-using fixtures, fittings, and appliances within a home, only upgrading the clothes washer results in sizeable savings.

A federal Energy Star–qualified unit is rated to use at least half the amount of water as a non-qualified product, and potentially far less. The program calculates and lists each machine's Water Factor to indicate its efficiency; the lower the number, the more water it saves, and some units are far below the baseline standard.

Problem is, only about a third of new homes include laundry equipment, and occupant behavior—such as running only full loads—is critical to optimizing the machine's estimated water and energy savings.

Energy Star dishwashers, meanwhile, use about 30% less water than non-qualified counterparts, but their impact on a home's overall water use ranks low, reducing their investment value in that regard. Still, qualified dishwashers are 80% more water efficient than hand-washing. (See "Awash in Savings," page 31, for more on washers and dishwashers.)

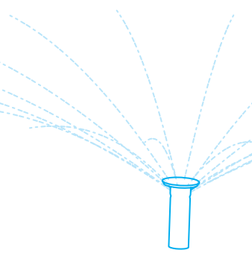
#4 WATER-USE CULPRIT: SHOWERHEADS

- **Average Use/Home:** 11.6 gpcd (9,654 gallons/year/home)
- **Conventional Specs:** 2.5-gpm showerhead (16.8% of daily indoor use)
- **Water-Saving Option:** 2.0-gpm showerhead (est. 20% use reduction to 8.8 gpcd; 19.5% of daily indoor use)
- **Codes and Standards:** IAPMO Green Plumbing and Mechanical Code; ICC International Green Construction Code; EPA WaterSense

OUTSIDE EFFICIENCIES

By far the greatest consumption of household potable water—more than 55% on average, according to the AWWA—occurs outside, primarily for landscape irrigation and more precisely for turf areas. Not only that, but a good measure of outdoor water is wasted from a combination of overwatering, leaks, poor planning, and bad habits.

While significantly reducing that use is certainly possible with proven technologies and tactics, it's a more complex formula compared to indoor options; not only are relatively few builders required to provide comprehensive landscaping plans



#1 WATER-USE CULPRIT: OUTDOOR USE

- **Average Use/Home:** 84.2 gallons/capita/day (gpcd) (70,000 gallons/year/home)
- 54.9% of daily household use
- **Water-Saving Options:** Multiple; potential to replace all potable outdoor water consumption
- **Codes and Standards:** IAPMO Green Plumbing and Mechanical Code; ICC International Green Construction Code; EPA WaterSense

and irrigation systems for the homes they build, but regulatory barriers, higher costs, and ongoing maintenance chores may thwart the potential to reduce water consumption.

Still, some builders, especially those committed to sustainable design and construction practices, are extending those efforts outside. "There's a disconnect between the green goals of the house and what can be achieved in the landscaping," says Michael Lenahan, president of Aurora Custom Homes in Ponte Vedra Beach, Fla., who includes a line item in the construction budget for the cost of a landscape designer and a comprehensive plan and irrigation system. "It's a true systems approach to sustainability."

In addition to using plants that are indigenous to a given location and thus able to survive (and perhaps thrive) on only what nature provides, water-wise landscape plans feature less turf area within the total footprint, plants grouped by their water needs, and irrigation water delivered mostly via ground-level drippers or subsoil systems that put water at the base of the plants instead of on their foliage.

Meanwhile, what little turf area remains—less than 40% of the overall parcel, per the IGCC and WaterSense standards—is irrigated with smaller, rotating, low-flow spray heads that mitigate overspray onto hardscape areas; less turf also reduces energy and fossil fuel emissions from mowing, a chore that consumes an EPA-estimated 800 million gallons of gas a year and accounts for 5% of our nation's air pollution.

But the key is control. The most sophisticated irrigation systems feature moisture-sensing timers that not only activate at the right time of day (early morning), but also only when necessary. If it rains the night before, they're smart enough to shut off until the ground is sufficiently dry; like a structured wiring control hub, they also enable additional modules and reconfigurations to serve new plans and plants.

That level of technology takes money, however; while most low-flow indoor plumbing fixtures are priced competitively with their wasteful counterparts, high-tech irrigation components and control systems often come at a premium and may not be readily available—hurdles that often put the burden back on the homeowner to watchdog the watering schedule.

"The WaterSense standard can be quite different than the norm," says Jim Szasz of J&R Custom Landscaping in Kissimmee, Fla., who pays four times as much for rotating spray heads, among other premiums, to achieve qualified landscaping and irrigation systems for KB Home's Central Florida division—a region among those most threatened by freshwater scarcity. "But the water savings is about 80%." (See "Ground Rules" page 37, for more on landscaping and irrigation.)

WATER INDEPENDENCE

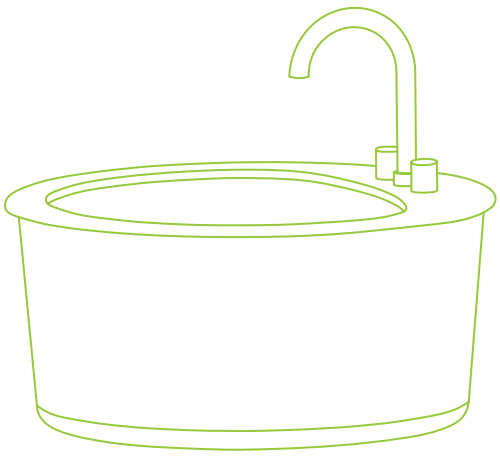
As with any green building practice, there are indoor and outdoor water-efficiency options on the fringe of marketability and affordability that can shed a homeowner's dependence on a municipal water supply—and the rising rates and use restrictions that come with it.

Greywater Reuse. Greywater is generally defined as water collected from bath faucets, showers, bathtubs, and occasionally clothes washers that is then mechanically filtered and reused to refill the home's toilets. It is carried by a dedicated, purple-hued, sanitary pipe in a closed loop that keeps it from mixing with potable city water or the sewer lines.

Greywater for toilet flushing has the potential to replace an estimated 7,000 gallons of city-supplied potable water per year for a house fitted with 1.6-gpf toilets, also reducing the burden on municipal supplies and management. "A homeowner effectively uses the water twice before it enters the sanitary system," says Nord.

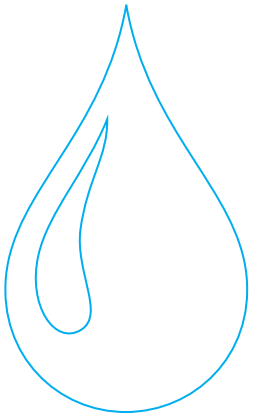
Recycled greywater also has been allowed for landscape irrigation under the UPC since the mid-1990s, but what's collected usually must be used within 24 hours to mitigate potential health hazards, which has limited its use in that regard.

Available greywater can account for perhaps half of a typical home's indoor water consumption, according to a 2010 white paper by the WateReuse Association. The paper reports that 7% of U.S.



#5 WATER-USE CULPRIT: FAUCETS (KITCHEN AND BATHROOMS)

- **Average Use/Home:** 10.9 gpcd (9,071 gallons/year/home)
- **Conventional Specs:** 2.2-gpm lav and kitchen/bar faucets (15.7% of daily indoor use)
- **Water-Saving Option:** 1.5-gpm lav faucets (no change to kitchen/bar faucets) (no change in estimated gpcd; 23.9% of daily indoor use)
- **Codes and Standards:** IAPMO Green Plumbing and Mechanical Code; ICC International Green Construction Code; EPA WaterSense



#6 WATER-USE CULPRIT: LEAKS

- **Average Use/Home:** 9.5 gpcd (7,906 gallons/year/home; 13.7% of daily household use)
- **Mitigation:** Detection, repair, and replacement results in an estimated 58% reduction to 4.0 gpcd; 8.8% of daily household use
- **Codes and Standards:** None

households in 2000—led by those in California, Texas, and Pennsylvania—were using some measure of greywater to offset municipal sources, a rate expected to increase to 10%, or more than 14 million households, by 2030. (See "Second Time Around," page 45, for more on greywater.)

Stormwater Reuse. Similar to greywater, storm (or rain) water collection is regulated in terms of allowable household uses; not every jurisdiction allows it, but its generally "cleaner" sources—primarily a home's roof and gutter system—make it far less restricted than greywater for landscape irrigation and other outdoor uses.

Generally, passive or non-pressurized catchments sold at retail outlets consist of 50-gallon barrels fed by the gutter system; a spout near the bottom accepts a garden hose to help supplement a potable water irrigation scheme.

"There's a disconnect between the green goals of the house and what can be achieved in the landscaping."

–MICHAEL LENAHAN, PRESIDENT, AURORA CUSTOM HOMES

But more sophisticated systems designed for meaningful water savings comprise underground cisterns, filters, and pumps to manage water drawn not only from gutters and downspouts but also the condensate from air conditioning units (perhaps 20,000 gallons a year alone)—in some cases to completely offset city-supplied water for outdoor use.

That's the case in Richmond, Va., where Hollyport Ventures built the city's first LEED-certified house, including a comprehensive rainwater collection and reuse plan anchored by a 1,400-gallon underground cistern that supports the toilets inside and all outdoor demand.

The pressurized system allows the first 900 gallons in a full cistern to be used for landscape irrigation, car washing, and anything else outdoors—free from occasional citywide use restrictions in the summer. But if the cistern's capacity dips below 500 gallons, the system automatically reverts to serving only the toilets. And if the power goes out, rendering the pumps inactive, the toilets automatically switch to pressurized city water through second lines into each fixture—a redundancy that costs extra but delivers peace of mind and a hassle-free experience.

The rest of Hollyport's outdoor water-saving plan includes turf areas that account for only 25% of the entire parcel, water-permeable hardscapes that return runoff to the ground, automated irrigation, and mulched planting areas that work with the cistern to contain 78% of the rainwater runoff on the home's lot instead of taxing Richmond's storm/sewer system, which the city is upgrading with a $25 annual tax on residents.

Next Tech. Beyond greywater- and rainwater-reuse systems, a few other technologies are emerging to further boost efficiency.

Advanced home humidifiers, for example, use far less water than older versions, while whole-house water softeners ease wear and tear on pipes and water heaters, allowing them to work at peak efficiency.

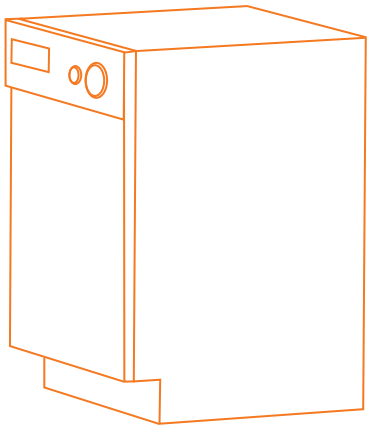
Hydronic (or radiant) heating systems, meanwhile, are being designed to follow the lead of hot-water recirculation with closed-loop schemes that require less make-up water and heating energy to perform effectively.

Meanwhile, next-gen water meters installed by an increasing number of utilities to help manage resources are able to detect leaks (which can account for an average of 14% of a home's water consumption) and provide real-time water usage and other account data online, allowing homeowners to gain some control of their consumption and alter their lifestyle habits to conserve more.

"Empowerment is the future of water conservation," says Kathy Nguyen, senior project manager for the Cobb County Water System, which serves the Atlanta area. Financial incentives, such as rebates, fines, and incremental pricing structures, she says, "will only get you so far."

THE BEST OF THE REST

DISHWASHER



Average Use/Home: 832 gallons/year/home; 1.4% of daily indoor use; Energy Star–qualified units result in estimated 30% water-use savings, as specified in the ICC International Green Construction Code

END GAME

If you're still not convinced that significant water savings is not only achievable, but also marketable, at least consider that the bulk of the technology and tactics are available and affordable to incorporate into a green building protocol.

Saving water also enables homeowners to gain some power over big environmental issues. "Water is a resource that's generally indigenous to a region. You have to use what's there," says Alicia Marrs, outreach coordinator for the EPA's WaterSense program, in contrast to energy, which can be imported. "Homeowners who save water are being responsible for the sustainable growth of their communities."

But the battle over saving water, and instilling its importance and impact on both builders and homeowners, remains in relative infancy. "Right now, and unlike energy, builders will generally do what's required by code and not go beyond that," says Nguyen, who is working to add the WaterSense standards to Cobb County's building code given her area's limited access to new water sources. "But it's just as important, and maybe more so. I mean, we can't live without water."

Rich Binsacca is a contributing editor for EcoHome.