

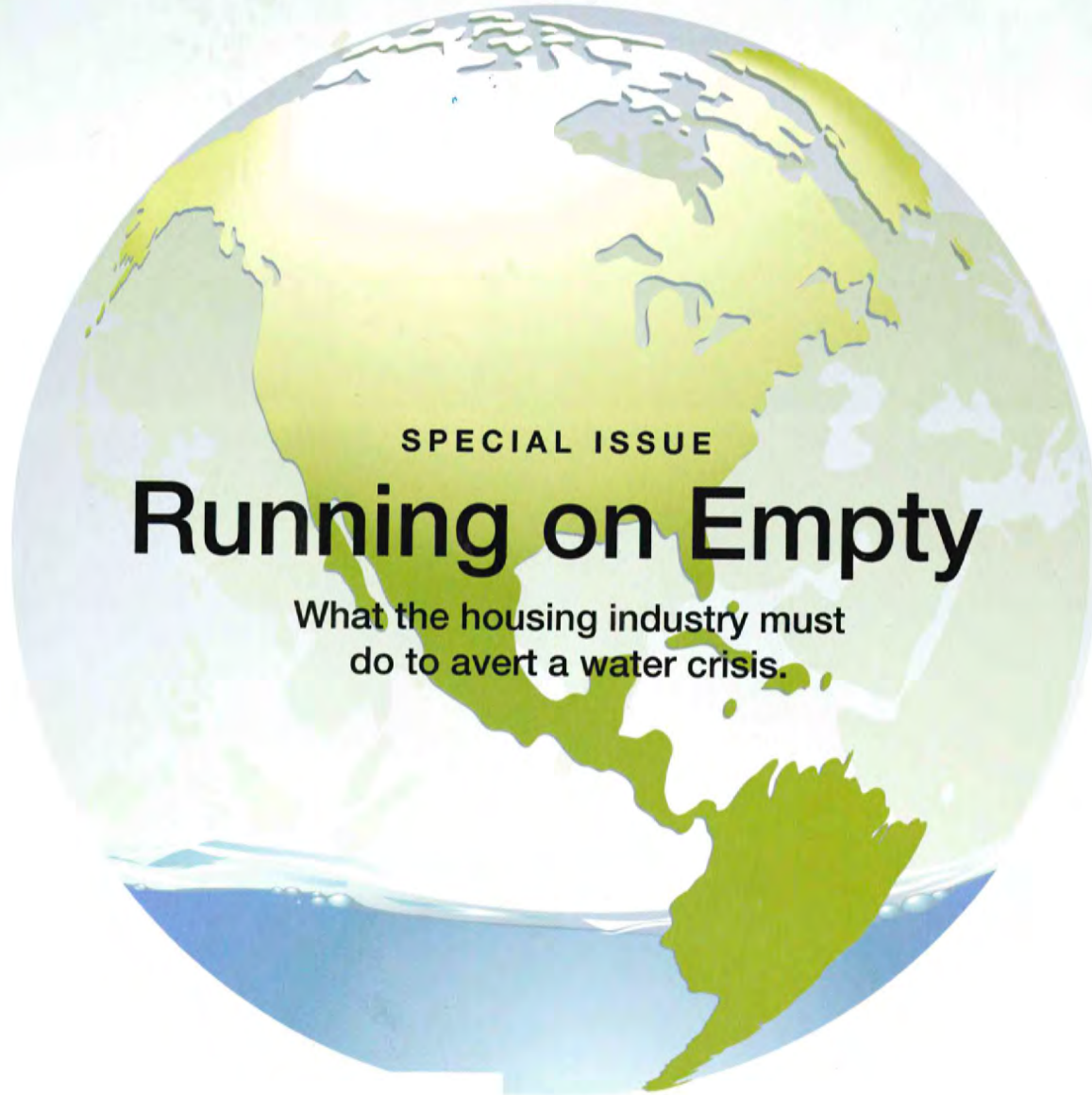
* The Case for Conservation | Anatomy of a Water-Efficient Home | Best Practices From Nevada to Australia

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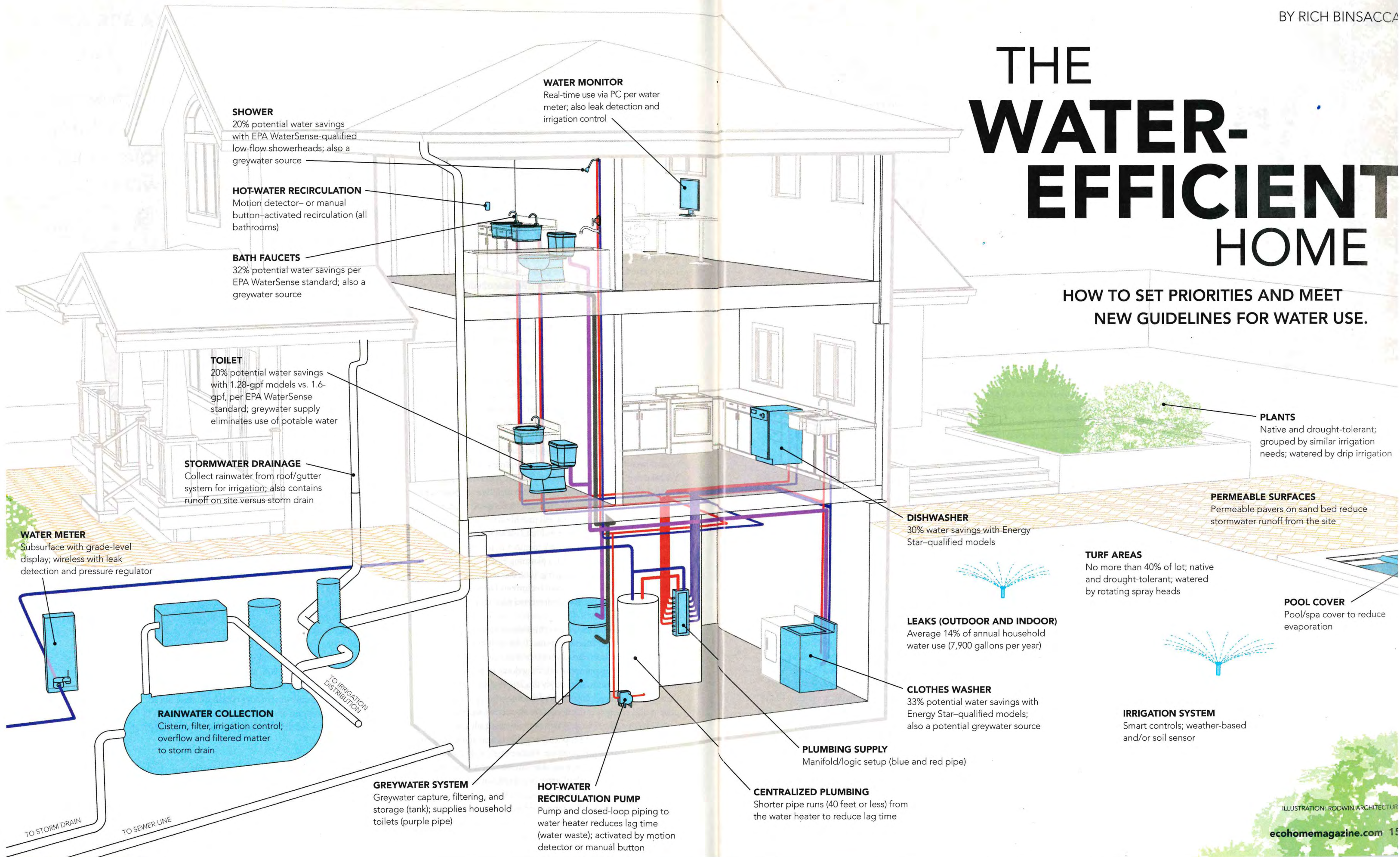
SPECIAL ISSUE

Running on Empty

**What the housing industry must
do to avert a water crisis.**

THE WATER-EFFICIENT HOME

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



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.

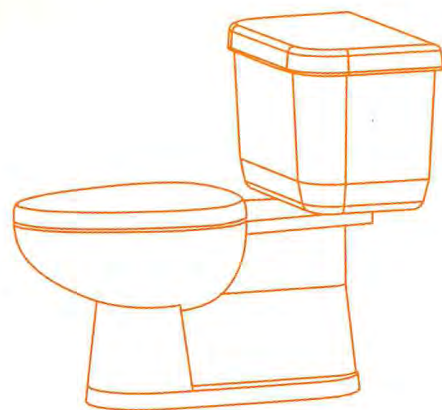
"We're always researching new technologies and ways to put money in our buyer's pockets," says Chris Apostolopoulos, president of the Northern California division of KB Home, the first builder in the country to build to the EPA's WaterSense for New Homes standards. "It's a competitive advantage."

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

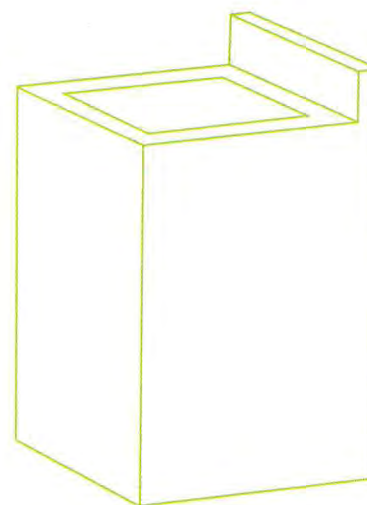
Installing low-flow alternatives, namely the 1.28-gpf toilets now required by the International Green Construction Code, and more water-efficient showerheads and faucets, drops daily consumption by 36% or about 15 gallons per capita—a potential savings of 12,500 gallons of water a year per household.

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



#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



#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

at those locations..(See "Go With the Flow," page 23, for more on fixtures.)

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.)

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

THE WATER-EFFICIENT HOME

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.

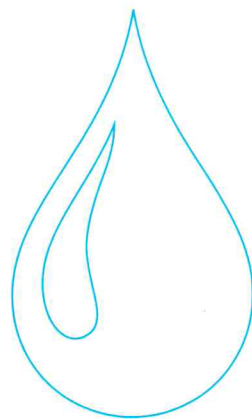
But the key is control. The most sophisticated irrigation systems feature moisture-sensing timers that not only activate at the right time of day (early morning), but also only when necessary. If it rains the night before, they’re smart enough to shut off until the ground is sufficiently dry; like a 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



#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

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 WaterReuse 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



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