

Water shapes our homes and lives, every day. This issue explores how architects design with this essential element in mind.

We can't live without it, but we also have to protect ourselves from it. It takes power to use it, but it can also provide power. Just the sight of it can bring us serenity, as long as that sight isn't a puddle in the basement.

Water is fascinating and full of contradictions. And for architects and designers, it's a creative inspiration as well as a practical challenge.

What would make a desert home feel like an oasis? (Look to ancient water gardens.) Can architecture save lives in high-risk coastal flooding zones? (Think Styrofoam-filled steel pontoons.) Can a water budget make your home renovation dreams come true? (See how an architect can keep you on track.)

Directing it, diverting it, reclaiming it, and reusing it: Here, we explore how architects design with this essential element in mind.

This is WATER.

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Spring 2015: Water — Balancing water scarcity and sustainability

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SPRING 2015: WATER

TECHNOLOGY

Balancing water scarcity and sustainability

A day at a resort floats by like one long lazy river ride—the water flows freely, the children laugh, and the well-groomed greens beckon.

But after a summer of droughts and water cutbacks, vacationers may wonder: *Are we just splashing around while Rome burns?*

To get the answer, you need to go beneath the surface, to what a resort guest can't see: a network of sensors scanning for leaks, rainwater storage tanks, evaporation collection systems, water filtration and recycling, programmed irrigation systems—all working to conserve and clean water, cut energy use, and, of course, save money: water can amount to a tenth of a resort's utility bill.

"We have a whole lot of techniques and equipment that can help deal with water scarcity," says Steven Perkins, AIA, of [Smith Architects](#) in Richmond, which counts among its projects The Homestead Resort in Virginia and the La Costa Spa & Resort in San Diego. "Architects have been at the forefront of making the public aware of the use of scarce resources.

"In the resort industry, we've known what we need to do for a while. Some are slowly embracing it, and some are taking big jumps forward."

"We've treated water like we've treated waste—it's always there, and we can always get it away," says Greg Nello, FMAA, of [SmithGroupJJR](#). At the forefront of water conservation, he worked on the first LEED Platinum building in the world. "But we're slowly realizing, with droughts and incidents like Sandy and Katrina, that that's not the case."

"Everything we create has a resource footprint, and we have to start thinking about water footprints. Water touches everything."

Counting gallons and measuring drops

Pop quiz: What uses the most potable water at a resort: the golf course, the spa, the water park and pools, or the restaurant?

Often, it's the last. Golf courses are increasingly being outfitted to use rainwater and other sources. A typical resort water park takes about a half-million gallons to fill on opening day—but less than 1 percent of that on a daily basis to refill; most park and pool water is filtered, cleaned, and flowed back in, over and over. The spa is the smallest water user of all, taking up as little as 1 percent of the property.

In fact, shutting a little-used restaurant area can be one of the first steps during water scarcity by architect and appraiser Eric Hansen, AIA, with consulting firm [Hotel & Leisure Advisors](#). "When people don't use water on a continuous basis, it ends up consuming more water."

The biggest water conservation challenges for resorts are much the same as those for homeowners: change behavior; and stop the spills, drips, and leaks.

Behavior change is starting to net returns. If you think the cards urging guests to re-use towels are greenwashing, think again—they're one of the biggest sources of savings.

Starwood Hotels and Resorts, Hansen points out, reward guests with food and beverage points for skipping housekeeping, pointing out that a day without it adds up to 40 gallons of water saved—one person's drinking water for nearly a year.

Tracking waste and leaks in a building, however, is a little tougher than it is for a homeowner. That's a legacy from when water was cheap and plentiful just about everywhere, and some extra water use was no big deal.

"It's new, thinking about water as a resource that will not always be there," says Celeste Novak, FMAA, and author of a new book on [greenwater harvesting](#). "People realize that this could be a crisis. They're repeating the mantra that water is the new oil."

High-tech sensors and monitors may not be the sexiest aspect of architecture, but they're a surprisingly simple key to effective water conservation. A sensor can track a washing toilet (200 gallons a day wasted, says the EPA). A monitor on the golf course can be linked to a weather station and soil sensors to let an irrigation sprinkler know it won't be needed on a particular day.

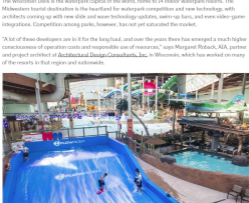
"I think that there is a misconception that water conservation is difficult," Novak says. "Many of the new water-conserving fixtures are no longer poor performers," she says, pointing to new showerheads, for instance, that deliver force without waste.

Putting together all these water-saving opportunities on a large property is like solving a giant design puzzle. It can take a team of more than 50 professionals, from mechanical engineers to water slide design consultants, with different types of architects coordinating and contributing.

Is the waterside a water hog? Not so fast...

The Wisconsin Dells is the waterpark capital of the world, home to 14 indoor waterpark resorts. The Midwestern tourist destination is the heartland for waterpark competition and new technology, with architects coming up with new slide and wave technology updates, swim-up bars, and even video-game integrations. Competition among parks, however, has not yet saturated the market.

"A lot of these developers are in it for the long haul, and over the years there has emerged a much higher consciousness of operation costs and responsible use of resources," says Margaret Roback, AIA, partner and project architect at [Architectural Design Consultants, Inc.](#) in Wisconsin, which has worked on many of the resorts in that region and nationwide.



Aquatica, the 125,000 square-foot, multi-level indoor waterpark in Pennsylvania, is one of many massive waterparks that surprisingly don't waste much water. (photo courtesy of Camelback Lodge Aquatica)

Such family-oriented resorts have seen a surge in growth that's tapering slightly, but not before seeing the opening of the largest to date, Camelback Lodge Aquatica in Pennsylvania, which features a water roller coaster.

Factors behind the mini-boom? It's an easy way to bump a ski resort into a year-round destination or turn a hotel into a family magnet. The benefits work in reverse, as well—waterpark resorts are putting in conference centers and spas; Dollywood's Splash Country recently added a hotel. Even the upscale Homestead has water slides and a tubing "river."

But guests have shown an uptick in concern with resources as well, prompting the industry to get the word out that while a waterpark may involve a lot of water, a relatively small amount of it goes to waste.

One driver is regenerative media filter technology, put into use in the past 5 to 8 years, which allows pools to recycle water with minimum loss. It also leaves water cleaner than old past filters, and does it without changing the water temperature much—meaning less use of chemicals and energy to re-heat water to the comfort zone.

What's the next conservation challenge? Evaporation, says Richard Scott, AIA, who owns [Aquatic Excellence consultants](#), whose projects include the Atlanta Olympics pools. He's working with a partner on technology that could in a year help an indoor pool complex recover enough evaporation to fill an Olympic-size pool.

Finally, Scott and other designers seek to conserve resources by leveraging water's ability to heat up a space—or cool it down. Simple changes in canopy designs or spray fountains can help regulate an outdoor pool park's temperature, saving power or cutting evaporation, says designer Brian Farling at Jones Studio in Phoenix.

Putting together a waterpark is the conservation environment is "a major collaborative effort," Roback says, "but when you're able to see families enjoying their experience, it's very rewarding."

Keeping it green on the golf course

Golf courses have been on the water conservation case for decades—because that's how long it can take to develop grasses, plants, and technology that can stand up to drought. The need for water is huge, but the motivation for conservation is equally strong.

The Phoenix area, for instance, uses more water for golf courses than any other area in the country, according to the most recent US Geological Survey report. And the area has been in and out of a drought state for years. Yet the state says golf brings Arizona more than \$3 billion a year. Finding solutions is worth it.

Some courses go for sustainability by design, such as Oregon's Bandon Dunes, where golfers walk (no carts allowed) a course riddled with natural beach grasses. Other courses are sipping the use of saline and less-thrifty plants, talking with and harvesting rainwater from roofs. They're working to change the perception that "everything needs to be manicured from edge-to-edge in a perfect way," says Kimberly Erusha, PhD, managing director of the U.S. Golf Association's Green Section.

Conservation moves don't do much good unless they're "based on research and solid scientific information," Erusha says, so new measurement and monitoring technology is important: Irrigation systems that collect weather data shut down when rain is coming, and monitors measure evaporation and adjust watering accordingly.

Another tool being tested uses golfers themselves to collect data. A golfer is given a small, Fitbit-like GPS device to carry on the course. The course then combines and cratches the GPS data to pinpoint which areas of the course get little use, and targets those areas for low-maintenance, low-water landscaping.

Solutions to stave off future shortages

Efficiently using rainwater and greywater, such as dishwater and runoff from showers, is a current challenge for architects and engineers. Existing methods of dual piping systems needed to use greywater for watering plants and greens can be expensive and difficult to install.

Perkins sees desalination, making ocean water useable, as a technology with potential for resort projects in areas with the hot trick: water scarcity, high sunlight (to leverage solar power), and ocean proximity.

But no matter how difficult using water may become, we're not ready to give up on our golf courses and water parks.

It's up to architects to stay positive and celebrate the resource, even as they apply a designer's mentality to mitigating wastefulness and finding creative ways to do more with less, according to Novak.

"If you start questioning recreational uses of water, you start questioning what we are doing here in the first place," Farling says, speaking from the blooming city of Phoenix in the Sonoran desert. "Consciousness is a work in progress."

Extreme water conservation at NYC golf course

A new project being built in New York City combines some of the best of water conservation with golf. The city needed a new water filtration plant for the Croton watershed, sending water from upstate to the city through a tunnel 300 feet underground. The best place for the city to connect to the tunnel was beneath Moshulu Golf Course in the Bronx. Could the golf space be preserved—and improved?

Grinlike architects saw an opportunity in the challenge. It created a design with the filtration plant underground. On top of the plant would be the driving range and clubhouse, also with a green roof, covered with plants. Both "roofs" are equipped with rainwater collection. Aboveground portions of the filtration plant are surrounded by vegetation and moats—serving double duty as security for the plant, and for water storage.

Rainwater from the roofs along with any seepage collects in a massive underground tank. [Grinlike](#) associate principal David Berke, AIA, estimates about 100,000 gallons of such groundwater per day would have been simply pumped into the sewer, but now it can be put to work watering the course.

To top things off, the collected water, which naturally maintains a constant temperature of about 50 degrees Fahrenheit, circulates through a heat exchange system to supplement the heating and cooling system for the clubhouse.

Construction is under way, and neighbors should be hearing "Fore!" on the range in about two years.

Water is essential to all of our lives. [Learn more](#) about how architects keep things flowing.

Photo courtesy of Moshulu Golf Course