The Future of Designing (with) Water
WHAT ARCHITECTS NEED TO KNOW ABOUT WATER USE AND REUSE

By Bill Worthen, FAIA, LEED AP BD+C, Founding Principal, Urban Fabric, Inc.

This may come as a surprise but every drop of water you have ever consumed, bathed with, or purchased in a shiny plastic bottle at the grocery store has been recycled many times before. Water is a finite resource. The amount of water on our planet has not changed for millennia. What has changed is our need for it. Our increase in the use of fresh water resources is quickly outstripping our ability to channel the amount of fresh water we need, where we need it, when we want it. Sound like a design problem? It is.

As the global population continues to grow, so do the challenges of scaling our water systems. Across the United States, our aging water infrastructure, prolonged droughts and extreme weather events, and a changing climate are making it harder for water agencies and water districts in many regions to guarantee the sustainability of our existing water infrastructure. It is already getting harder to find water in many of the same places that we have depended on for decades. Many communities and designers have responded by trying to think differently about water. We are starting to get creative in both water policy and practice across the United States and around the world because we need to.

PERCEPTION VERSUS REALITY

If you have always lived in a home where fresh, hot, and cold water has consistently just “come out of the tap” for generations then water may be more of an expectation than something you think about as a precious resource in your daily life.

If, however, you have been asked to design a project with water conservation in mind, or achieve LEED credits related to water, irrigation, or storm water, your first thoughts as an architect may have been to call your plumbing, landscape, or civil engineer. You may also believe that the key to water conservation during the design process is to simply specify the lowest flush (toilets and urinals) and flow rate (sinks, showers, and bathtubs) fixtures possible. The desire to achieve LEED points may have taken priority over your concern for fixture performance and the satisfaction of the homeowner or end-user.

Have you experienced a prolonged water shortage or lived somewhere with diminishing access to fresh, clean water? Have you worked on a one of the growing number of projects that are designing and operating some form of on-site alternative water supply? If not, your behavior, education, and professional experience with integrating water, wastewater, and storm water design decisions (and even knowing what questions to ask) is limited.

The challenge for most architects is to understand how to better engage in a water discussion much earlier in the design process. If the first time you seriously discuss water with your client and...
plumbing engineer is at the time of bathroom and kitchen fixture selection, or when running the calculations to confirm how many LEED credits you get, you are very likely missing some interesting opportunities to collaborate and engage with your client and project team on the subject of water.

WHERE DOES OUR WATER COME FROM?

For many Americans the most common response to this seemingly simple question is the tap. The reality however is that across the United States we have a patchwork of watersheds, water districts, and a diversity of natural water sources. The water that comes out of your tap may have started its journey to you from hundreds of miles away. Where your water comes from (and its quality) has a lot to do with the geology and condition of the watersheds in the region where you live.

When we talk about our public water supply and waste water system, we are typically talking about massive, highly engineered and centralized water and waste water systems. Unlike ancient Rome, we don’t have architecturally beautiful aqueducts crossing the landscape. We have buried our water infrastructure and discounted the cost of water for so long, many of us have forgotten how precious water really is. Cities like New York, Las Vegas, Atlanta, and San Francisco have quite ingenious and very different water supply and waste water systems. With few exceptions, all water systems rely on some form of natural watershed to capture and store millions of gallons each day. How that water is moved and pumped over, under, and through mountains, valleys, and plains to get to you, can be an interesting story. And depending on where you are located in your watershed, the water you drink may also be wastewater from your neighbors upstream. We are also starting to recognize the limits of scale. Many of our largest and oldest centralized water systems are starting to show signs of stress.

“Water is always going to be here, it’s what we do with it that limits its usefulness” says Gunnar Baldwin, Water Efficiency Specialist at TOTO, USA Inc. We have been led to believe that using less water (and buying bottled water for drinking) is better than simply using the water you have around you and in more sustainable ways.

Over the last 25 years, we have seen indoor plumbing flush and flow rates go from unlimited quantities to about one gallon a flush for toilets, two gallons a minute for showers and one-eighth of a gallon per flush for urinals. We are fighting our own inertia and decades-old perceptions that low-flow water fixtures simply don’t do the job they were intended to do. Industry has gone about as far as it can go in water conservation but there is a lot of R&D going on right now about how to do less with more.

For the vast majority of architects, landscape architects, designers, civil engineers, and plumbing engineers, to engage in any meaningful discussion about alternative water sources is far out of their professional comfort zone. Not many of us have had a great deal of experience designing alternative water systems in practice. It’s just not what we were trained to do in school and rarely is alternative water supply system design a topic covered by professional education curriculum. Understanding water use, reuse, and the potential for resource recovery, at the building scale is a new concept in most design firms.

THE YUCK FACTOR

Most wastewater technology has a perception problem. Graywater, blackwater and terms like low-flow and waterless are all engineering terms that might accurately describe the subject matter at hand, but were never run by any PR department prior to writing the marketing plan. When you label something blackwater or graywater no matter how slick the technology may be, unless you are a wastewater engineer, your first reaction is probably not to consider the newest systems and technology—even if you need the LEED points. Wastewater technology has never been sexy. With names like these, it is no wonder that many A&D professionals have been slow to celebrate the benefits of alternative water sources.

One place that is bucking this trend is Singapore. They have been making high-grade recycled water that is safe to drink for quite some time. They continue to expand their water re-use infrastructure. Singapore has no natural aquifers and no natural water resources. They really had no choice. Necessity, as they say, is the mother of invention. But they don’t call it blackwater, or even recycled water. They call it NEWater. It might sound like a sales pitch, but when talking alternative water source and wastewater technology to non-technical people, the words you choose really do matter. http://www.pub.gov.sg/water/newater

A recurring phrase used quite often in the wastewater industry to justify new forms of onsite gray and blackwater technology is “it’s all been dinosaur poop.” The statement refers to the fact that the water in your tap has literally been through the bowels of dinosaurs and many other species of flora and fauna before it ever got to you. And while this colorful factoid may be technically accurate, it doesn’t help sell innovative and alternative water technologies and the merits of decentralized infrastructure. No matter how well we present waste water as a resource in the United States, we are still fighting the yuck factor.
CONTINUING EDUCATION

THE NEED FOR EDUCATION

Most water utilities are interested in helping their customers reduce and conserve the consumption of potable water. Many water utilities already have a number of programs in place to assist their customers with rebates for replacement of faucets, toilets, and showerheads to save water and lower their water bill. Some utilities also offer free on-site water audits to help their ratepayers better understand their water consumption and help eliminate waste. But what has largely been missed to date by most utilities, incentive programs, professional education, and green building credit requirements is the opportunity to look at how buildings are designed to reimagine how water is used and can be re-used in the built environment. Almost 50 percent of all the potable water used in a typical residential building is for non-potable uses, like washing your clothes or flushing the toilet. In commercial buildings, that percentage increases to around 95 percent.

WE ALL LIVE IN A WATERSHED

A watershed is the bowl you live in. A watershed is an area of land surrounded by a ridge or elevation, forming a basin. All water in a given watershed drains to the same place. Watersheds come in all shapes and sizes. They cross state, county, and national boundaries. In the continental United States, there are 2,110 watersheds. If you would like to find out more about the watershed where you live, visit the EPA’s searchable watershed database at: http://water.epa.gov/type/watersheds/
Source: water.epa.gov

The map above shows the major watersheds (aka drainage basins) around the world. Each watershed typically contains multiple hydraulic units that are nested into the multi-level drainage system (i.e., the watershed of the Ohio River is part of part of the greater Mississippi River drainage basin). Gray areas represent closed basins that do not drain to the ocean.

When it comes to low-flow fixture selection, performance really does matter.

POINTS VERSUS PERFORMANCE

Another perception problem with water use reduction is that many of the earliest green buildings had clients that elected to go-green because of their mission or because there was a large tax incentive available. Many of these projects also had a desire to distinguish themselves in their market. At the time, water use reduction credits looked easy compared to many of the other options available to garner LEED points. Selecting low-flow fixtures seemed pretty straightforward. The simplicity of the water credit calculations empowered many design teams to engage in water use reduction discussions that very likely had never happened before. That was great, but not all plumbing fixtures (especially low-flow water fixtures) are created equal. Proper fixture selection means much more than the just adding a restrictor to get to the desired flush or flow rate. When it comes to low-flow fixture selection, performance really does matter.

Even today however, some manufacturers will gladly insert the restrictor needed to get your favorite fixture down to the flow rate you need for LEED. But what value does your client receive for your services if a month or two into building operation the fixture you specified ends up getting replaced because the performance simply does meet the end user’s needs?

H2O-kinetic showerheads push water through a series of fluidic chips that contain specially designed channels to control the water’s speed, movement, and droplet size—all without moving parts—to create the feeling of up to 40 percent more water. Each showerhead and hand shower contains an internal system that sculpts the water into a unique wave pattern, creating a consumer-proven feeling of more water, all without using more water. Source: Delta Faucet Company

SPECIAL ADVERTISING SECTION
WaterSense is an EPA program that aims to save water by making it easy for consumers to find water-efficient products and by providing information about how to use water more efficiently. Like EnergyStar, WaterSense labels plumbing fixtures that meet EPA published standards. Look for the WaterSense logo and specify fixtures with the WaterSense labels in your next project.

http://www.epa.gov/watersense/index.html

The WaterSense label offers architects, designers, and your clients an easy way to identify more efficient products within the specific product category. And to be clear, WaterSense labels are available on fixtures at every possible price point and style. Water Fixtures do not have to be expensive or unattractive to be water efficient and an enjoyable to experience or use. It is hard to measure market penetration of the WaterSense label since its introduction in 2006. As of November 2013, WaterSense has labeled: 1,951 tank-type toilets, 6,799 bathroom sink faucets, 264 flushing urinals, 1,651 shower-heads, and 173 different types of weather-based irrigation controllers. You should be able to find something you like in nearly any style and at any price point. If not, ask your sales representative or go online. WaterSense also recently released criteria to label commercial kitchen pre-rinse spray valves and is currently working on a label for flush-valve toilets and soil moisture-based irrigation control technologies.

This article continues at http://go.hw.net/AR0114Course1. Go online to read the rest of the article and complete the corresponding quiz for credit.

**QUIZ**

1. Water is
   a. something to waste
   b. a finite resource
   c. easy to make
   d. something you can boil

2. Everyone lives in a
   a. house
   b. city
   c. school district
   d. watershed

3. We are starting to realize that our centralized water systems are
   a. starting to show signs of stress
   b. hitting the limits of scale
   c. can be supplemented with decentralized water systems
   d. all of the above

4. An example of nuisance water is
   a. drinking water
   b. spray irrigation
   c. foundation drainage
   d. bottled Water

5. Alternative water systems are currently most cost effective in locations where
   a. there is a drought
   b. water and sewer rates are high
   c. there is a rainy season
   d. the climate is dry

6. The EPA’s WaterSense label gives A&D professionals an easy way to
   a. identify water efficient fixtures that also meet performance criteria
   b. increase water usage
   c. design better bathrooms
   d. resell used plumbing fixtures

7. The term “water wars” refers to
   a. the battle between plumbing engineers and designers
   b. the potential scarcity and fight for control of water sources in the future
   c. a new movie
   d. the battle over who gets to shower first

8. The term blackwater refers to
   a. the color of a lake after a strong rain
   b. remote areas of the countryside
   c. a new swanky cocktail
   d. the most contaminated source of water on site

9. All of the following are alternative water sources for on-site water treatment systems except
   a. potable water
   b. graywater
   c. rainwater
   d. storm water

10. All wastewater contains valuable resources including everything except
    a. water
    b. energy
    c. milk
    d. nutrients

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The Bradley Advocate® AV-Series Lavatory System is the first touchless hand washing experience. An infrared faucet, soap dispenser and hand dryer are all housed in one sleek, compact design. The Advocate’s all-in-one design eliminates paper waste, keeps water off the floor and is ADA compliant for all commercial environments.
CONTINUING EDUCATION

CONTINUING EDUCATION

http://aridlands.org/discover/gallery

focused on design in their Drylands Design Gallery.

ALI also has inspiring projects on the subject. ALI also has inspiring projects focused on design in their Drylands Design Gallery. It takes a lot of energy to bring you your water, and a lot of water to bring you your energy.

Like more information on the water-energy nexus source means the need for more energy. If you'd like more information on the water-energy nexus the Arid Lands Institute (ALI) has published a white paper on the subject. ALI also has inspiring projects focused on design in their Drylands Design Gallery. http://aridlands.org/discover/gallery

It takes a lot of energy to bring you your water, and a lot of water to bring you your energy.

Another challenge facing innovations in water system design and decentralized infrastructure is the fact that in the United States we have subsidized and hidden the costs of building and maintaining our centralized water infrastructure for generations. Your water bill does not accurately reflect the true cost of water when you factor in all the expense to build the dams, pipes, pumps, and massive waste water treatment plants that keep water flowing into and out from your home or office. And there is a water-energy nexus most people don’t really think about.

It takes a lot of energy to bring you your water, and a lot of water to bring you your energy. That’s the problem with the water-energy nexus: it’s self-limiting. More water takes more energy and more energy generates more CO2 emissions and more CO2 in the atmosphere makes snowmelt harder to come by. And more remote water/snow source means the need for more energy. If you’d like more information on the water-energy nexus the Arid Lands Institute (ALI) has published a white paper on the subject. ALI also has inspiring projects focused on design in their Drylands Design Gallery. http://aridlands.org/discover/gallery

The amount of energy used to pump water from place to place is enormous. In the state of California, there is one pumping station at the end of the California Aqueduct that consumes five percent of the state's total energy. If you have driven over the grapevine from the Central Valley on the way to Los Angeles—you know the spot. The Edmonston Pumping Plant raises water 1,926 ft (587 m) over the Tehachapi Mountains to supply much of the L.A. basin with water. While quite an engineering achievement, that’s one big energy bill for water. The nexus of water and energy is a story we will be hearing much more about in the years to come. We are learning that bio-mimicry in water technology can sometimes do the job much more elegantly and effectively than any mechanical solution ever could.

We have already begun to see the first skirmishes in modern water wars across the United States. Alabama, Georgia, and Florida have been locked in a twenty-year fight over water access on the Chattahoochee River and who gets how much water and for what purposes from Lake Lainer. It’s so important that Georgia Public Broadcasting (GPB) has produced a one-hour documentary on the subject. http://www.waterwar.org The drought across the Southeast, from 2006 to 2009, also reawakened a 200-year-old boarder dispute between Georgia and Tennessee. Based on a surveying mistake back in 1818, the mislocated border between the two states places the Tennessee River wholly in Tennessee territory. A 2012 court decision may cut in half the amount of water Atlanta is counting on from the Chattahoochee River. This has motivated the Georgia legislature to get creative. This age-old mapping error is now being used as legal strategy to try and gain water rights to the Tennessee River. For the moment, the drought has ended in the Southeast, reducing the pressure to resolve these issues. But as Atlanta comes out of the recession and the changing climate continues to stress many of our country’s aging, highly engineered, centralized, decaying, and simply massive public water systems, Mark Twain’s quote “Whiskey is for drinking, water is for fighting over” is beginning to take on new meaning.
CIRCLING AROUND THE DRAIN

San Francisco is unique when it comes to the cost-effectiveness of water reuse technology. One of the reasons why we are seeing such a large number of projects considering alternative water strategies in the Bay Area is that many of the sunken costs of water-reuse systems—at the building scale—are already a local code requirement. San Francisco has required large scale commercial and mixed-use projects to be plumbed on the supply side with purple pipe for many years. These policies make the incremental cost of a commercial scale gray or blackwater system much less because at least half of the piping required (on the supply side) is already embedded in the cost of permitting a building in San Francisco.

But the low cost of water is still limiting the acceptance of alternative water systems. “In terms of the overall cost for on-site water treatment systems” says Paula Kehoe, Director of Water Resources at the San Francisco Public Utilities Commission, “we have looked at this and found that in general these types of systems can represent up to about a five percent increase in overall project cost depending on the alternate water source used and the end use for the water. It’s the additional plumbing required to connect these systems throughout the building that represents about 95 percent of the additional cost, not the cost of the on-site treatment equipment. And that’s part of the reason why we have created a $250,000 (per project) grant program for projects over 100,000 GSF to encourage the installation of these types of systems in San Francisco.”

This type of grant program is trying to help San Francisco get ahead of the learning curve and incentivize developers and design teams to think differently about water. As the need for fresh water continues to rise, so will water and waste water rates. When rates go up, consumers want to conserve. But the average consumer and developer still aren’t really feeling the pinch at the tap quite yet.

Not only is it important to start thinking about water early in the design process, the cost of water reuse systems needs to be incorporated into the first round of budgeting on any project. If you try to slap-in a system halfway through the budgeting process it’s not going to fly.

BLACK IS THE NEW GRAY

When we talk about onsite wastewater recycling we are talking about a variety of black and graywater treatment systems. There are many technologies and many suppliers out there. Determining what type and size of system makes the most sense on your next project is very likely a complex question. Every system has different space and energy needs. The two things that are most important in the selection of a black or graywater system are scale (the size of the project) and the local water and sewer rates. The higher the rates, the better the chances a black or graywater system will make economic sense.

If you take the time to read detailed technical descriptions of any black or graywater technology, you may begin to feel like you are installing some form of space station in your client’s basement.

But rest assured this technology really does work. The technologies described below are installed and working quite well in a variety of buildings—at a variety of scales—around the world. And no, they really do not smell.

A tidal-flow wetland (TFW) treatment system (aka a Living Machine® System) mimics the natural tidal flow wetlands in a much more compact form. TFWs consist of a primary tank and/or screen-filter to remove particulate organics, solids, and FOG (fats, oils, and grease), followed by flow-equalization tanks, and a robust fixed-film microbial ecosystem contained in a series of watertight tidal-flow wetland cells. Treatment cells can be planted with a wide assortment of attractive wetland and terrestrial plants, which help to remove residual nutrients and other water- and air-borne pollutants via a process referred to as phytoremediation. Cells are generally paired in two stages to provide optimum treatment performance and are alternately filled and drained to provide nutrients to bacteria and plants during the fill phase and oxygen to the microorganisms during the drain phase.

In a Membrane Bioreactor (MBR) water flows from the property to a collection point, where it is pumped into the MBR (aka Aquacell, GE Water, BioBarrier etc.) to begin the treatment process. The first step screens the water and efficiently reduces insoluble material to a negligible residue. This residue is either discharged to sewer or it is de-watered and compacted for disposal as solid waste. In the biological treatment stage air is diffused into the water to create optimum conditions for bacteria to consume impurities. A sustainable biomass concentration is maintained, which metabolizes all incoming waste—resulting in negligible sludge. Ultrafiltration then occurs through a special membrane of microscopic pores that prevents particles, bacteria, and viruses from passing through. The membranes are regularly air-scoured to ensure constant flow rates.

Prior to reuse, the water outflow from a TFW or MBR is typically disinfected and/or treated with ultra violet (UV) rays and chlorine to remove pathogens and meet local water discharge and storage standards. The water outflow can then be pumped
to a reuse tank for flow equalization and then used for irrigation, toilet flushing, washing, and cooling tower blow down. Below are a few questions you may want to consider before selecting any form of gray or blackwater technology.

**For the Design Team**
- What is the project water budget?
- What are the local water and sewer rates?
- Is this technology allowed by code in my jurisdiction?
- Do I have the right people on my project team to design this type of system?
- Do I understand the options for this type of technology?
- What are the jurisdictional requirements for testing and monitoring?

**For the Vendors**
- What is the replacement lifespan of the key components and is there a lifespan guarantee?
- What is the annualized replacement cost of system components?
- What is the energy cost of the system per year?
- How many similar projects are currently constructed and operating? In the USA and elsewhere?
- How long have these systems been operating?
- Is your system Title 22 approved (CA designation)?
- Do you provide stamped construction documents and onsite construction oversight?
- Do they have a licensed PE on staff in the jurisdiction you are working?
- What is the system’s performance guarantee?
- What are the operational requirements and skill sets needed to use your technology?
- Can the system be operated by facility staff or only trained operators?

As you start the journey toward designing with water, you may find that the usual players on your project team might not be the best equipped to address the design on specification of alternative water systems. Don’t expect most plumbing and civil engineers to be experts in environmental and wastewater system design. That’s not what they typically do. And be wary, there are a variety of questionable water technology companies currently moving into the market, all claiming to have a cheaper and better systems to meet your needs.

It’s okay to view gray and blackwater technology as a bit scary. What I can say, from experience, is that there is a learning curve on these types of building integrated technologies for all parties involved, even the people you look to for expertise. These types of technologies really do require an integrated design process to be most successful. Your project team should also be open to working in areas that might be slightly out of their standard practice zone.

**WATERSPEAK 101—UNDERSTANDING THE BASICS OF ON-SITE WATER TREATMENT**

**Rainwater:** Precipitation is typically clean when it falls from the sky. However rainwater may become contaminated during collection or from particulate matter in the atmosphere. Rainwater systems typically require the least amount of treatment. In general, debris excluders, first flush diverters, and filtration provide adequate treatment to maintain a rainwater system. *Disinfection of rainwater is required for all uses with potential for human contact.*

**Storm water:** Storm water treatment requirements are similar to rainwater requirements. However, precipitation collected at or below grade has a higher potential for contamination from various site-specific sources, including oil and grease, gasoline, and paint. These substances all contain volatile organic compounds (VOCs). *Monitoring of VOCs is required to ensure that storm water supplies will not harm public health.*

**Foundation drainage (nuisance water):** Like storm water, foundation drainage quality varies by location. Foundation drainage water is considered to be of superior initial water quality compared to graywater and blackwater, but may still contain unacceptable levels of bacteria or VOCs. *Therefore, foundation drainage sources must be filtered and disinfected, and are required to be monitored for VOCs.*

**Graywater:** The state of California allows graywater to be used for subsurface irrigation without treatment. Graywater used for any other purpose must be filtered and disinfected to protect public health. Graywater quality is highly variable and site specific. Graywater contains many of the same contaminants as blackwater, but in much lower quantities because it has not come into contact with food or human waste. *Filtration and disinfection is usually sufficient, without further treatment, to meet water quality criteria.*

**For the Vendors**
- Can the system be operated by facility staff or only trained operators?
- What is the annualized replacement cost of system components?
- What is the energy cost of the system per year?
- How many similar projects are currently constructed and operating? In the USA and elsewhere?
- How long have these systems been operating?
- Is your system Title 22 approved (CA designation)?
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Blackwater: Blackwater is the most contaminated source of water available on-site. However it is often one of the easiest to collect as it does not require a separate collection system and can typically be collected at a single location prior to discharge to the sewer. In addition to the filtration and disinfection requirements for all other alternate water sources, blackwater systems also require biological treatment to lower the levels of organic material in the water. This is typically achieved by introducing simple bacteria into the wastewater to digest the organic material. The bacteria are then filtered out in downstream treatment processes.

ARE WE THERE YET?

Just 10 years ago, onsite water reuse was a radical concept and it was not easy to do. We appear to be entering a new era in water use and reuse at the building and neighborhood scale. While you still can’t quite flip to the plumbing, health, or building code in most jurisdictions and read all you need to know about the installation, inspection, and operational requirements of onsite and decentralized alternative water systems, we are certainly past the point of every project being a prototype.

Today, through the hard work of many early adopter clients who believed and trusted in the abilities of their design teams, we have reached a point where at least graywater reuse requirements are fast becoming more common than not. Even in some of the more conventional and conservative, we are seeing an evolution in water policy. “We are in an interesting spot,” says Brent Bucknum of Hyphae Design Labs, “Through the Twentieth Century we developed more and more centralized water systems, and we upheld these types of systems as the cleanest and most hygienic approach. Now, the green building movement has provided incentives for more on-site and de-centralized water systems. This evolution in mindset, and design process—to include water—has been driven by the early adopters as opposed to being encouraged by more pro-active codes and regulations. It’s the designers that have been pushing the envelope, with water policy needing to catch up.”

We are in the middle of finding a meaningful balance between fully centralized and completely decentralized water infrastructure. We are heading toward a more robust, innovative, and clustered hybrid of centralized and decentralized systems. The first eco-districts, living buildings, and large scale climate-positive developments are already redefining what the term best practice means in most areas of design and construction. That includes the future of designing with water. It is impossible to have a discussion on the resiliency of cities without also having a discussion about the resiliency of our water systems at the building, neighborhood, city, municipality, and regional scale. Today, we are still hitting more regulatory challenges than design challenges to install these types of systems. And in jurisdictions with high water and waste water rates, alternative water systems are beginning to make sense.

In order to share water between properties, you will likely need an encroachment permit to connect multiple parcels. But the pendulum on water policy is swinging back to the middle. Decentralized and district scale water systems are helping to reduce stress and reinforce our centralized water infrastructure.

By no means is designing with water a core competency of every licensed design professional. Being effective not just efficient with water use and reuse is one the more sustainable ways architects can continue to demonstrate why design really does matter. We have a long way to go. The good news is, there is a lot of innovation and collaboration happening. Engage in a water discussion with your clients and don’t underestimate the potential of designing with water in mind.

INTERVIEWS AND SOURCES

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Resilient SF: The role of Golden Gate Park in disaster preparedness and resiliency. To understand how designers can make San Francisco more resilient in the face of disaster, CMG Landscape Architecture and Hyphae Design Laboratory developed a site-based proposal that seeks to fortify Golden Gate Park with sustainable infrastructure systems that allows the park to host displaced disaster victims. But also improves infrastructure for the Park’s many events and festivals. Source: Hyphae Design Labs in partnership with CMG landscape architecture