

Water Is Life

And as stewards, we must protect our freshwater.
We can't build our way out of this predicament

Editor's note: In this special issue, we explore our most precious resource—water. Starting with this introduction, we take close-up looks at the sobering realities facing Texas. It's no longer enough to simply be concerned about future water supplies, state officials and conservationists say. Drastic action is required now, starting with conservation, education and long-range plans. Is there hope? Yes. But it takes everybody working together. Every drop counts.

NOT LONG AGO, I SPENT AN AFTERNOON WITH David Baker, who lives near the headwaters of Cypress Creek in Hays County at a lovely spring known as Jacob's Well. Baker, originally an artist, has spent most of his adult life fighting to protect "the well," as he calls it, and to keep it flowing and nourishing the creek, one of Texas' most beautiful streams.

On the day we walked its banks, the creek was dry, and Jacob's Well had stopped flowing for only the second time in history. The first time was in 2000, and the trend is ominous. For Baker, the possibility that the next generation of Texans will not have the opportunity to experience this iconic spring and many others throughout the Texas Hill Country is unimaginable.

It could happen.

Though the recent drought has helped to focus the attention of Texans on our water problems, to knowledgeable observers, they have been developing for a long time. "You can go without cable TV. You can even go without air conditioning, but you can't go without water," says Tom Mason, former general manager of the Lower Colorado River Authority, one of our state's largest water providers.

The bottom line is that our population here in Texas is expected to almost double in the next 50 years or so, and we have already given permission for more water to be withdrawn from many of our rivers and lakes than is actually in them.

Our vast system of reservoirs was built following the last big drought, the one we call "the drought of record" in the 1940s and 1950s. At that time, most Texans lived in small towns

supported largely by agriculture or on farms and ranches. Thus, the drought affected almost everyone directly. As a result, we got serious and embarked on a massive reservoir construction program and initiated a water planning strategy that we still rely on today.

The 2012 edition of the state water plan from the Texas Water Development Board was compiled by 16 regional planning groups across the state and has a price tag of \$53 billion for new water infrastructure. We clearly need to invest in providing water for our future. But even if we could come up with that kind of money, the reality of other noninfrastructure challenges suggests that we cannot simply build our way out of this predicament.

The stream along which Baker and I walked that day eventually flows into the Blanco River. The Blanco originates in Kendall County and winds its way to the Guadalupe River in Hays County. On the way, much of its flow goes right back into the ground from the riverbed. The water runs underground to Jacob's Well, where it comes back to the surface, forming Cypress Creek, which flows down through the villages of Woodcreek and Wimberley and back into the Blanco. The reality is that obtaining a permit from the state to remove water from the river today would likely be impossible—but if you wanted to drill a hole and take it out of the ground above Jacob's Well, you would have little or no restrictions to keep you from doing so.

Unfortunately, Texas law treats the same water differently depending on whether it is on the surface or underground. This practice is unsustainable and exacerbated by a recent Texas Supreme Court ruling, which declared that groundwater is the property of private landowners.

As stewards of more than 95 percent of the landscape in Texas, private landowners do have a huge role to play in our water future, and they are not getting much help. Texas loses rural and agricultural land faster than any other state, and this continued fragmentation of family lands is irrevocably impairing the function of our watersheds and aquifer recharge zones, as well as increasing non-point source pollution, which is runoff from agricultural fields, highways, parking lots and an increasingly paved-over countryside.

We waste too much water.

At home, we use as much as 70 percent of our household drinking water to irrigate our lawns, and much of that is wasted. Before the water even gets to our residences, many Texas cities and water utilities lose up to 25 or 30 percent of their water through leaking water mains or otherwise poorly maintained distribution systems. The cheapest way for us to provide more water for the future is to begin using it more efficiently.

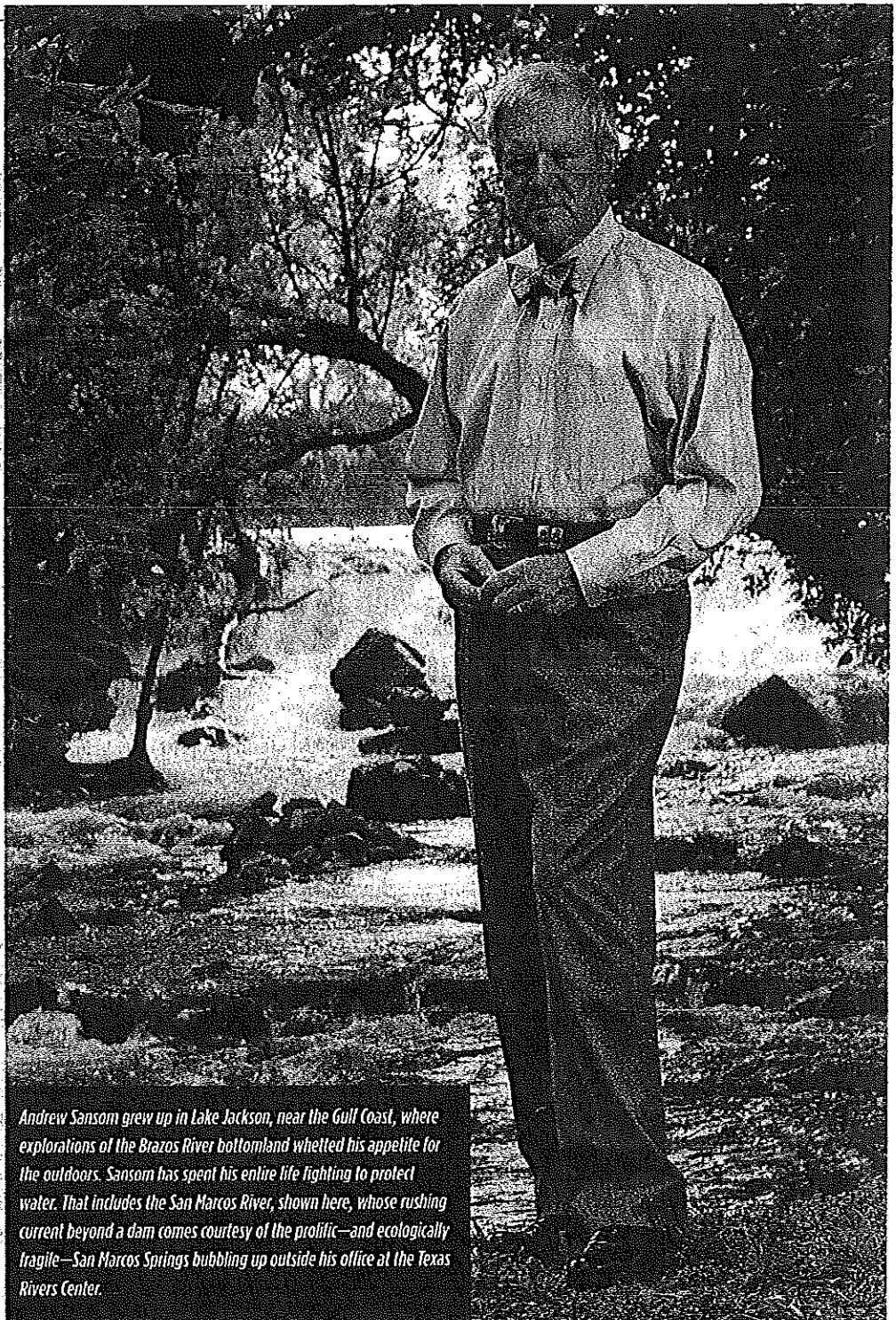
In this regard, most water rights in Texas are dedicated to agricultural use for irrigation, and much of this use remains antiquated and inefficient. The inefficiency magnifies a conundrum: While so much of our water is committed to agriculture, a sector of our economy that is basically flat, municipal growth is booming and thus producing the greatest future demands for water.

Finally, though the Legislature in 2007 established a process for protecting the aquatic ecosystems of our rivers, streams, bays and estuaries by requiring "environmental flow" standards for each, implementation of the law has been spotty at best. Without greater attention to the freshwater requirements of the environment itself, our inland aquatic ecosystems and extraordinary coastal resources are increasingly impaired.

Against this sobering backdrop, we can celebrate some real successes where water is concerned. Our rivers and streams are demonstrably cleaner than they were a generation ago, thanks to passage and implementation of the Clean Water Act. In the area of water conservation, the cities of San Antonio and El Paso have lowered their consumption of water per capita by a full 40 percent. On the landscape, the cities of Austin and San Antonio and Hays County and other local governments have approved hundreds of millions of dollars in bonds to create conservation easements on private lands in important watersheds and recharge areas.

The bond money is used to compensate landowners in exchange for their agreement to a legal covenant that limits development. The farmer or rancher retains ownership of the land, and a vital resource for the community is protected.

Back along Cypress Creek at this time of year, insects are hatching and swarming along the shore. If you are lucky, you can observe the native sunfish slipping up to the bank and battling vegetation with their tails, knocking their prey into the



Andrew Sansom grew up in Lake Jackson, near the Gulf Coast, where explorations of the Brazos River bottomland whetted his appetite for the outdoors. Sansom has spent his entire life fighting to protect water. That includes the San Marcos River, shown here, whose rushing current beyond a dam comes courtesy of the prolific—and ecologically fragile—San Marcos Springs bubbling up outside his office at the Texas Rivers Center.

water so they can feed. Such experiences can only leave one with a deep sense of respect for the living freshwater of Texas and the understanding that we are its stewards on behalf of both the economy and the environment of future generations. Water is life.

Andrew Sansom, executive director of the River Systems Institute at Texas State University in San Marcos, is one of Texas' leading conservationists and author of *Water In Texas: An Introduction* (University of Texas Press, 2008). He is a former executive director of the Texas Parks and Wildlife Department, executive director of the Texas Nature Conservancy and founder of The Parks and Wildlife Foundation of Texas.

It's All the Same Water

Once deemed too 'secret, occult and concealed' to regulate, groundwater remains a vexing subject too deep to capture for today's lawmakers

WATER IS WATER, EXCEPT IN TEXAS.

All of Texas' freshwater comes from precipitation. Where it goes when it falls makes all the difference in the world.

Surface water, meaning creeks, rivers and lakes, is considered a public resource commonly owned by the people of Texas. Simple enough.

Groundwater, that is all water that you can't see below the surface of the Earth, is a whole other matter. That water, contained in aquifers and bolsons (Spanish for "bag" in this case meaning hollowed basins), found tens, hundreds and sometimes thousands of feet below the surface, is regarded like oil or other minerals—a resource owned by the owner of the land above it.

Got that?

In 1904, the Texas Supreme Court determined in the *Houston & T.C. Railway Co. v. East* case that property owners could pump as much groundwater as they pleased without regard to the effects on neighbors' wells. Groundwater, the court ruled, was too "secret, occult and concealed" to regulate. No one understood how groundwater worked, so the court applied rule of capture, a remnant of British common law, to the case.

In February 2012, the Texas Supreme Court's ruling in the *Day v. Edwards Aquifer Authority* case affirmed that the property owner of the ground also owned the water under that ground.

The problem with both decisions is that groundwater does not observe property lines. Some aquifers are so large they span several counties. Some, hydrologists have learned over the past century, are actually moving rivers. Plus, no matter

how groundwater moves, what's clear is more water is being pumped from underground than is being put back in through recharge.

That explains why other states in the American West have developed different laws and strategies regarding management of groundwater. Texas is the only Western state where rule of capture is law. That may work well for property owners wanting to sell their groundwater, or sell their mineral rights, but not so great for most of the rest of the population that relies on water as a life source.

Where water is abundant, rule of capture works fine, because whatever water is pumped out from underground is usually replenished. But in arid, water-short regions, such as all of the state west of the 98th parallel (roughly following U.S. Interstate 35), the devil's in the details. Consider this: It's perfectly legal for a single landowner, taking advantage of his or her property rights, to drain so much groundwater that neighbors' wells go dry or the groundwater underneath their property disappears.

The most notorious case illustrating that point is when Clayton Williams Sr. and other businessmen pumped groundwater below land they owned west of Fort Stockton to create a pecan orchard in the desert. Because of their actions, Comanche Springs, the largest springs in West Texas, went dry, forcing more than 200 truck farms east of town to go under. Williams' right was upheld by the Texas Supreme Court in 1954.

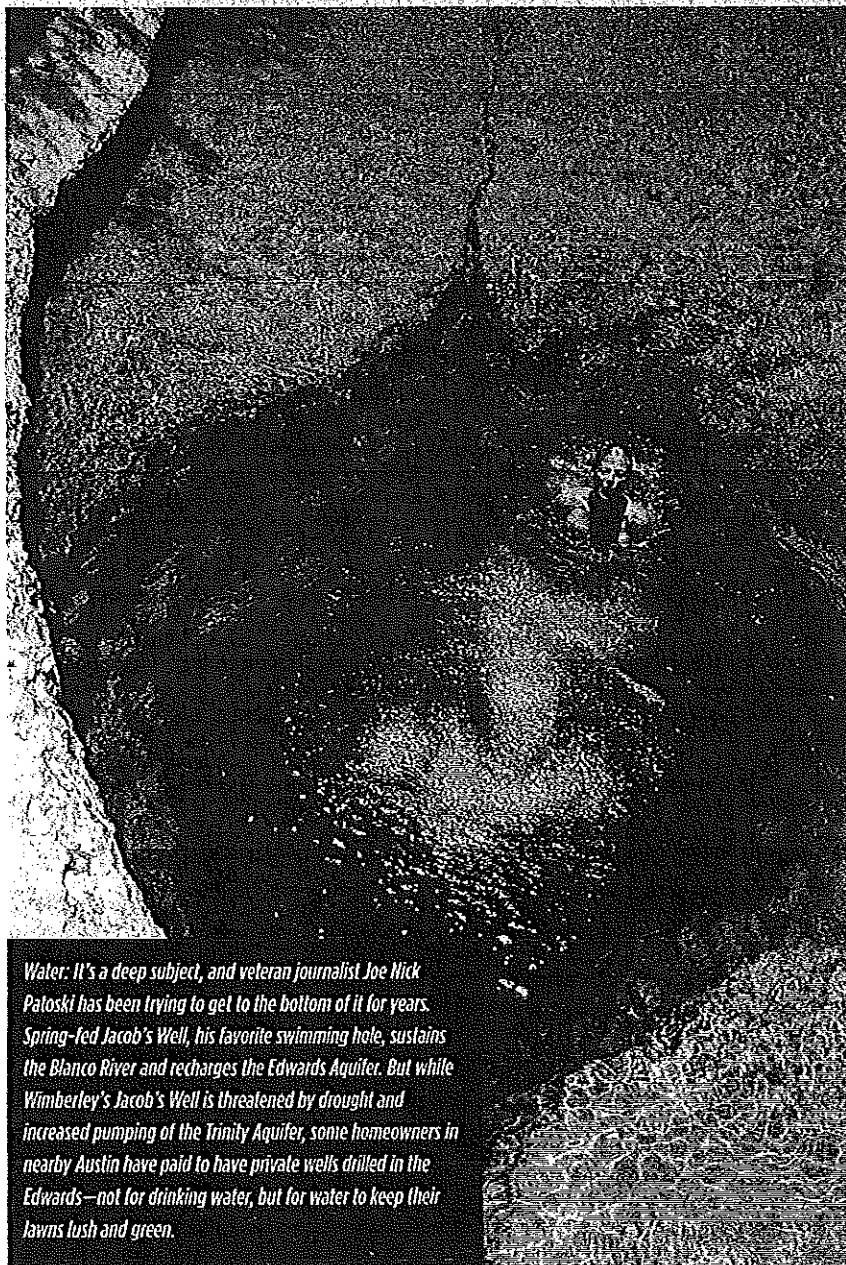
The Texas court has since reaffirmed property owners' right to underground water; in 1999, the court upheld the right of Ozarka to mine a spring in East Texas for commercial

purposes, even though it caused neighbors' wells to go dry.

The Texas Supreme Court's decision in early 2012 affirmed that Texas landowners own the groundwater "in place" beneath their property, and that they may have a valid claim for compensation from the government if regulations go too far in limiting their ability to capitalize on their groundwater.

Still, there are limits to unregulated pumping.

The withdrawal rate of pumping groundwater from the Ogallala Aquifer—one of the world's largest underground aquifer systems that covers most of the Great Plains, including the Texas Panhandle and South Plains—has exceeded recharge of the aquifer through rain and snowmelt over the past century. Parts of the water table in Texas have been drained, while less than half of the underground aquifer's original ground water supply remains. Pumping costs have increased to the point where many Texas farmers have quit irrigated farming altogether, even if groundwater is available. In other words, pumping without regulation is unsustainable.



Water: It's a deep subject, and veteran journalist Joe Nick Patoski has been trying to get to the bottom of it for years. Spring-fed Jacob's Well, his favorite swimming hole, sustains the Blanco River and recharges the Edwards Aquifer. But while Wimberley's Jacob's Well is threatened by drought and increased pumping of the Trinity Aquifer, some homeowners in nearby Austin have paid to have private wells drilled in the Edwards—not for drinking water, but for water to keep their lawns lush and green.

In 1993, Federal District Judge Lucius D. Bunton III ordered the U.S. Fish and Wildlife Service to set pumping limits in the Edwards Aquifer—which at the time supplied San Antonio with all its drinking water—to protect endangered species dependent on the Comal and San Marcos springs, the biggest spring systems in Texas.

"Without a fundamental change in the value the region places on freshwater, a major effort to conserve and reuse Aquifer water, and implemented plans to import supplemental supplies of water, the region's quality of life and economic future are imperiled," Bunton wrote in his decision.

Bunton's ruling led to the creation of the Edwards Aquifer Authority by the Texas Legislature. The authority regulates pumping from the Edwards Aquifer.

In 1997, the Texas Legislature passed Senate Bill 1, establishing statewide water planning for the next 50 years. The bill and subsequent legislation have stated that the best means of local management of groundwater are the 101 groundwater districts

established across the state. The rub after the Texas Supreme Court's 2012 decision is, if a groundwater district or other government entity limits a landowner's desire to pump, the landowner can sue the district for a "taking" of private property.

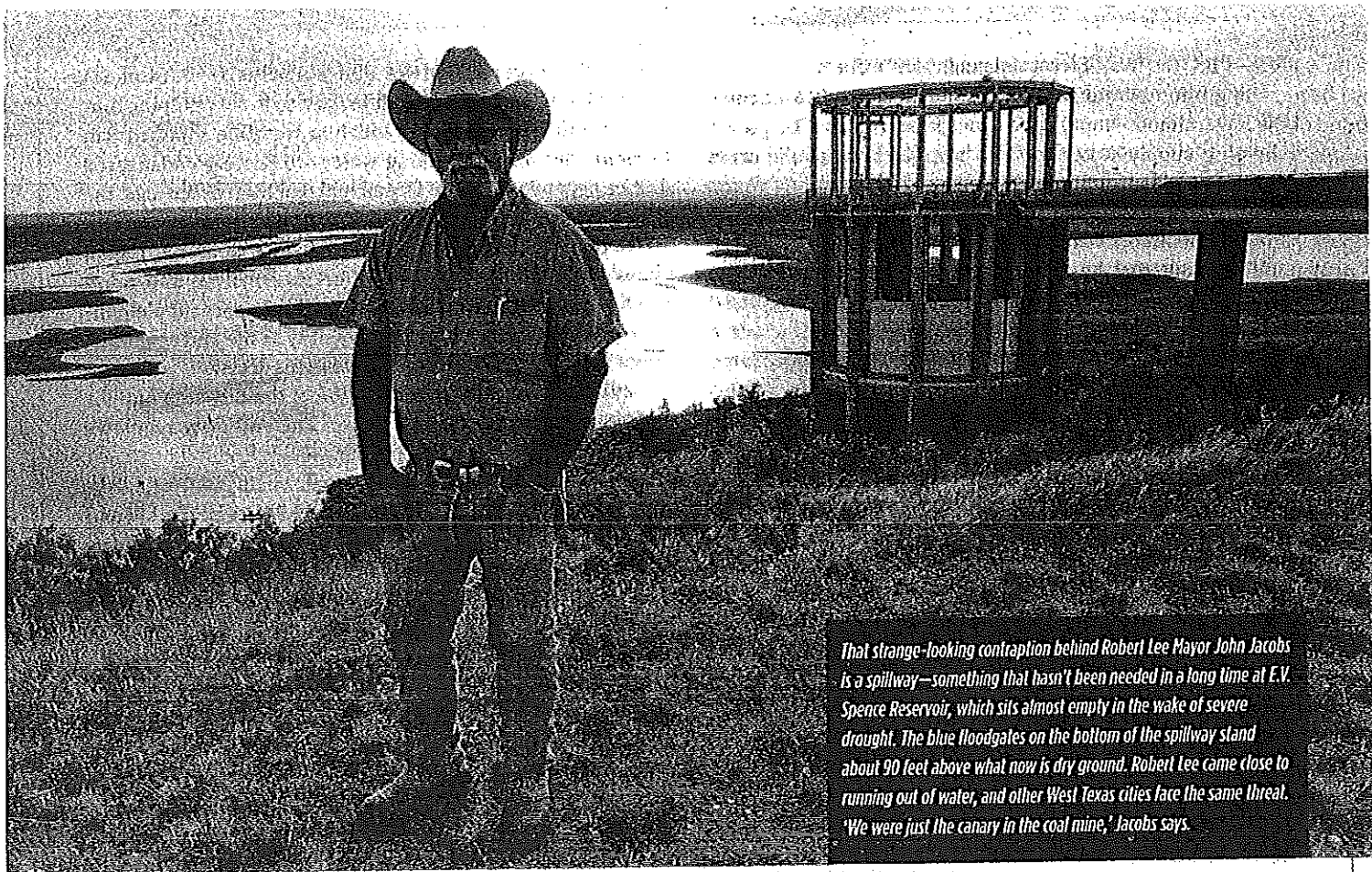
"While the Texas Supreme Court's ruling in the Day case makes clear that landowners own the groundwater in place beneath their property, it is much less clear how far a groundwater district may limit pumping before it amounts to a taking of private property," says attorney Tom Mason, the former general manager of the Lower Colorado River Authority who now specializes in water law in Austin.

Which means groundwater districts, regional planning groups and state water authorities, in order to ensure sufficient water supplies 50 years from now, will have a hard time managing groundwater in a way that allows long-term, sustainable use by a variety of landowners/pumpers.

So, groundwater is a property right, and as such requires a whole lot of trust and awareness of the unwritten "law of the biggest pump" when it comes to management of groundwater resources locally, regionally or statewide. Otherwise, if all property owners exercised their right to pump, there wouldn't be any groundwater left to fight over.

Surface water, on the other hand, is owned by all Texans, even though despite the different laws, really, it's all the same water.

Joe Nick Patoski is the author of nine books, including *Generations on the Land: A Conservation Legacy* (Texas A&M University Press, 2010). Patoski, an avid swimmer and kayaker, lives in Wimberley, in the Hill Country.



That strange-looking contraption behind Robert Lee Mayor John Jacobs is a spillway—something that hasn't been needed in a long time at E.V. Spence Reservoir, which sits almost empty in the wake of severe drought. The blue floodgates on the bottom of the spillway stand about 90 feet above what now is dry ground. Robert Lee came close to running out of water, and other West Texas cities face the same threat. 'We were just the canary in the coal mine,' Jacobs says.

Water For All?

If Texans don't wake up to the realities of drought and absolute musts of conservation, we're going to experience water shortages of epic proportions

BY CAMILLE WHEELER • PHOTOS BY WOODY WELCH

'Why worry? they said. It would rain this fall. It always had. But it didn't. And many a boy would become a man before the land was green again.'

From *THE TIME IT NEVER RAINED*, by Elmer Kelton

ON A WARM APRIL MORNING NORTH OF SAN ANGELO, thick yellow wildflowers cover roadside ditches like luxurious rugs. But as

State Highway 208 winds toward the tiny town of Robert Lee, the eye snags on the inescapable, charred, dead trees standing sentry on hills still bald from vicious wildfires a year ago.

Inside City Hall, Robert Lee Mayor John Jacobs steps out of his office, offering a cheery, weatherproof grin beneath his horsehoe moustache. Yes ma'am, come on in. You think he'd be sick of the drill by now: For the past several months, major

media outlets—PBS, the Wall Street Journal, MSNBC, etc.—have been rolling into town to gawk at the cracked, parched ground of the huge, almost-empty E.V. Spence Reservoir that's no longer helping supply water for half a million people, including the 1,050 residents of Robert Lee.

But Jacobs, a gentleman who removes his cowboy hat indoors, patiently chauffeurs visitors around town. He even let a German TV crew see that he wouldn't get trampled while slinging out range cubes for his cattle.

Like Charlie Flagg, the fictional protagonist in *The Time It Never Rained*, the 66-year-old Jacobs is a multigenerational rancher with deep West Texas roots. Both men call San Angelo the nearest big city. And both understand a fundamental truth: Water is life.

His cattle sold, Flagg's character resorts to "burning pear," burning the spines off prickly pear cacti for his Angora goats to eat during the prolonged drought of the 1950s.

During that same real-life drought, Jacobs was about 6 when he learned to drive, working the clutch and stick shift on a Ford pickup. His father, walking behind the vehicle, burned pear for his hungry cattle with a handheld torch connected by hose to a propane tank in the pickup bed.

Decades later in 2011, when record heat, fire and drought scorched the land, Jacobs didn't bother with the practice. Cacti pears were so dry and shrunken, he says, his cattle wouldn't have been interested.

Jacobs, who has downsized his herd from 80 to 30 mother cows, has endured his share of drought. But, he allows, he'd

never seen, or heard, anything like last year when big rocks—*pow!* he says, remembering the sound—exploded in pastures during hellishly hot wildfires. And nobody, he says, ever dreamed of seeing the day when E.V. Spence—which at capacity holds 488,760 acre-feet, almost 160 billion gallons—would sit drained and useless, like a swimming pool in which somebody pulled the plug.

The Colorado River Municipal Water District, which owns and operates E.V. Spence, stopped pumping from it in September 2011. The district permitted Robert Lee, a longtime customer, to keep drawing water from the reservoir on its own, but by early 2012, the remaining water was too shallow and salty for pumping.

So here it is April, and on this day, Robert Lee is pumping and treating water from Mountain Creek Lake—essentially a large stock tank in town, built around 1950—that once met all of Robert Lee's water needs. Needless to say, residents are conserving water. Nobody's yard is green. And everybody's counting the days until a 12-mile emergency water pipeline from nearby Bronte is connected.

Yes, Jacobs says, E.V. Spence Reservoir is a depressing sight. But he ruefully smiles and grabs his hat and pickup keys. Come on. I'll drive you out there.

From an overlook, it's hard to believe that the sprawling basin below, slowly being overtaken by tumbleweeds and salt cedar, was once a full, artificial lake. Over there, Jacobs says, gesturing toward a nearby cliff, is where his two sons, as teenagers, used to jump into the reservoir, plunging into water

'We're All in This Together'

Electric co-ops to members: We won't leave you high and dry

There's no escaping the discussion: From the Panhandle—big stretches of which remained in extreme drought conditions at press time—to the Rio Grande Valley, people are worried about water.

Not long ago, Texas Electric Cooperatives President/CEO Mike Williams visited Deaf Smith Electric Cooperative in Hereford. The scheduled conversation with President/General Manager Steve Louder and the co-op's board of directors was about electricity. But they wound up talking about—you guessed it—drought and water.

More than 70 percent of the demand for the co-op's power comes from irrigation pumping of the Ogallala Aquifer, which is being depleted faster than it is being recharged. After last year's record-setting drought, and in light of the declining water table, there's a real question about whether people can continue to make a living in some parts of the Panhandle.

It's a dialogue, Williams says, in which the electric co-op model plays a vital role. For 75 years, he says, co-ops have been in the life-improvement business, specifically by providing safe, reliable and affordable electricity. Now, in the face of statewide water shortages, co-ops play critical roles as communication catalysts, bringing together public, private and governmental entities in search of the

answer to the big question: What can we do?

For starters, Williams says, "Co-ops have walked the talk that we really are in the quality-of-life business. We're more than invested. We're not going anywhere. There's no us and them—we're all in this together."

Co-ops, Williams says, care about people as members, friends and neighbors. "Electric cooperatives, their directors, their staffs, the people who work there—they live in those communities," he says. "Their future as an electric cooperative is inextricably tied to the health and welfare of those communities. They care about whether the water runs out or not because if it does, then maybe those communities don't continue to exist."

In Hereford, the discussion focused on risk management related to water, the region's economic engine. If the Ogallala's level continues to steadily drop, the growth and welfare of the entire region will be affected. Without water, Louder says, farmers will have to start growing dryland crops or change occupations—or even move away.

"But the members of Deaf Smith Electric Cooperative are resourceful, and we will work together with them to make whatever adjustments we must," Louder says.

so deep they never worried about hitting bottom.

Today, from that same cliff, it's almost a straight 100-foot-plus drop to a dry beach of scrub brush and rocks. You could rappel down and start walking all the way across the bottom of the barren lake bed between shallow pools in which ducks nonchalantly swim.

Jacobs stares across the desolate expanse, remembering bass fishing tournaments held here and boats so thick on the water you couldn't stir 'em with a stick. Now the reservoir is a skeleton, with its bones—reddish, rocky earth—exposed. "That," a grim-faced Jacobs says, "is the picture of drought."

'We're Running Out of Water'

AND THIS IS THE PICTURE OF FEAR: On May 21, Mountain Creek Lake was down to about its last 8 inches. On May 22, Robert Lee—desperately pumping the last drops from what had become an emaciated pond—started receiving piped water from its neighbor, Bronte.

"We cut it close," Jacobs dryly understates. What's happening in West Texas is a wake-up call: Water shortages, say state water officials and conservationists, could happen anywhere

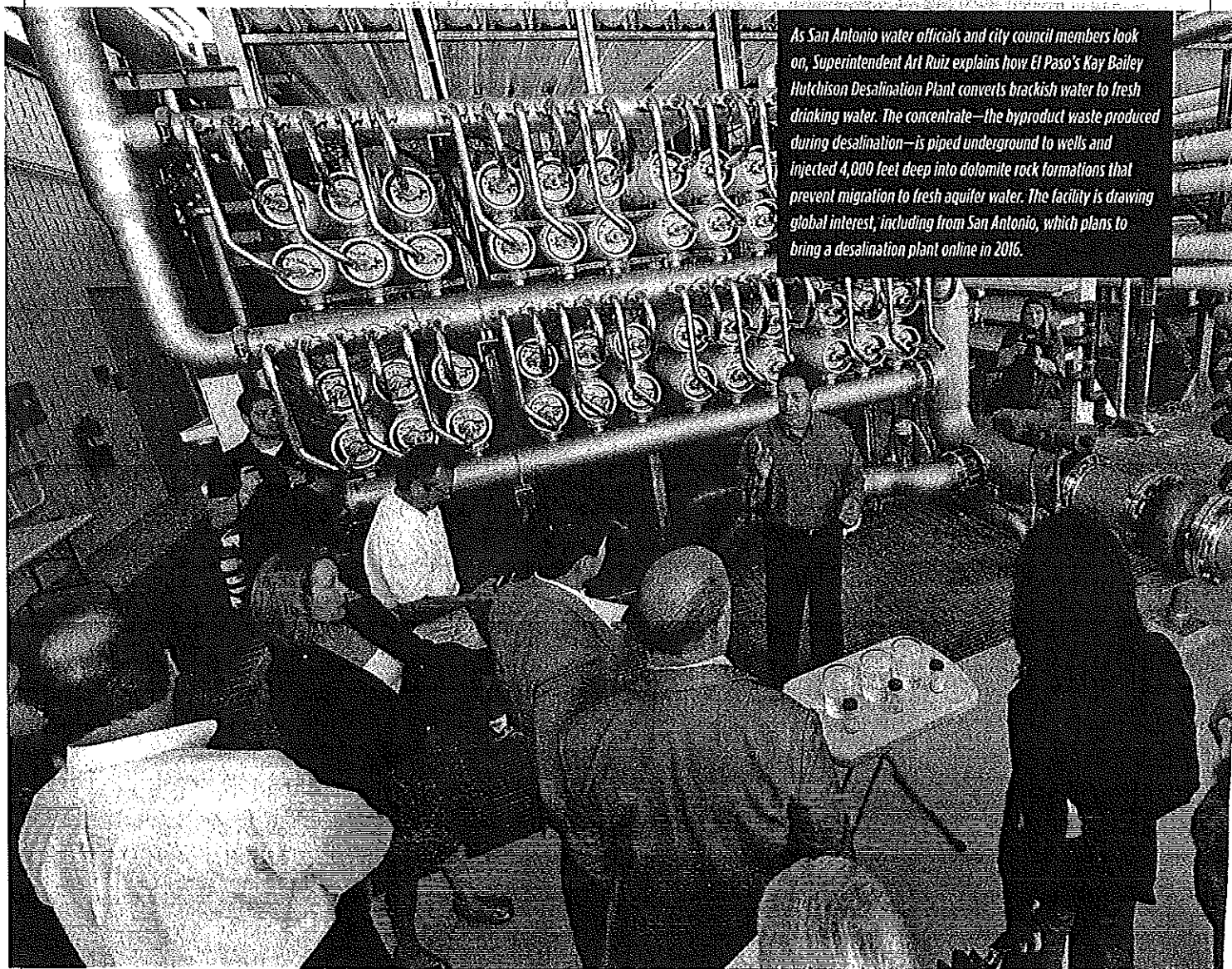
in the state. We're all in the same boat. "People tell me to quit talking about it," Jacobs says, "but we're running out of water."

The Robert Lee mayor gets no argument from the Texas Water Development Board, whose 2012 state water plan (see "Water for Texas," Page 16) sounds the alarm: During times of drought, the state does not have enough existing water supplies.

It's an ominous projection on many levels, including this one: More than 11,000 megawatts of Texas electric power generation rely on cooling water from lakes and reservoirs at historically low levels, according to a 2011 drought impact report from the state comptroller's office. Without sufficient rainfall, that capacity could be jeopardized.

"You can't run a modern society without electricity," says State Climatologist John Nielsen-Gammon, who compares Texas' water woes to the calm before the 2005 storm of Hurricane Katrina, when experts agreed that New Orleans' levee system was insufficient—and no one reinforced it. "Nobody's willing to do it until, whoops, catastrophe," he says.

"And that's what it might take for this state," Nielsen-Gammon continues. "We might actually have to have an urban area run out of water or have major blackouts for people to



As San Antonio water officials and city council members look on, Superintendent Art Ruiz explains how El Paso's Kay Bailey Hutchison Desalination Plant converts brackish water to fresh drinking water. The concentrate—the byproduct waste produced during desalination—is piped underground to wells and injected 4,000 feet deep into dolomite rock formations that prevent migration to fresh aquifer water. The facility is drawing global interest, including from San Antonio, which plans to bring a desalination plant online in 2016.

recognize that this is something important enough that it has to be dealt with, not just on paper, but in practice."

'Drought Happens'

PERHAPS NOTHING BETTER ILLUSTRATES water officials' frustrations than the tongue-in-cheek "hydro-illogic" cycle being circulated at closed-door meetings. The chart describes people's perceived attitudes toward weather: drought—concern; severe drought—panic; rain—apathy.

As of June, much of the state had received above-average rainfall for the year, but some of the highest amounts fell in the Dallas, Houston and San Antonio metropolitan areas, Nielsen-Gammon says, tending to steer public perception toward a false conclusion: Everything is nice and green here, so the drought must be over.

Yet in early summer, more than half of Texas remained in drought conditions, with three areas suffering the most: the Big Bend region, the extreme western portion of the Panhandle, and a triangle formed by Abilene, Childress and Lubbock. You'd better believe those people know where water comes from. Meanwhile, there are those who don't have a clue:

- Years ago, in response to the TWDB's annual water-use survey, one mayor mailed back his responses with a politely stated letter: "We do not use ground or surface water. Our water comes from a water tower."

- In 2011, as Texas' drought became severe, the TWDB received several phone calls from individuals wanting to know—seriously—where the state's water pipeline was and how they could tap into it.

If only it worked that way—someone could just wave a magic wand over Texas' driest spots and render them lush and green. Instead, we're left with cold-hearted science: Most water planners use what's considered the state's drought of record—a six- or seven-year period starting in 1950, depending on location—as a worst-case scenario. But a study published last year in the Texas Water Journal is making officials rethink that conclusion. Research of tree rings—bald cypress in South Central Texas, Douglas fir in West Texas and post oak in Central Texas—indicates that several extended droughts were longer and/or more intense than the 1950s dry spell.

Further, note the study's authors—from the University of Arkansas, the Guadalupe-Blanco River Authority and The University of Texas—Texas has suffered severe decadal-scale droughts at least once a century since the 1500s. The authors don't mince words: "When water managers consider past droughts, population growth, and climate change, it becomes highly probable that the future poses unprecedented challenges."

In other words, even as we put the horrific images of 2011 behind us, it can still get worse. Or, as Nielsen-Gammon says: "Drought Happens," the slogan the state climatologist jokes about putting on a T-shirt.

To some urbanites, the idea of a reservoir—or a town—running out of water is simply unfathomable. By way of education, Nielsen-Gammon likens drought to a child maturing into adulthood: The longer an extreme dry spell lasts, the more strength it gains. It takes years for reservoirs to fill up, and it takes years for them to go down. In semi-arid areas, such as West Texas, reservoir levels can drop each successive year, until finally, if the drought doesn't break, they hit bottom.

To be fair, plenty of Texans comprehend drought. And many people understand that, depending upon where they live, water comes from aquifers, rivers, reservoirs and, of course, the sky. But, as Robert Lee's Jacobs reminds: "Only the good Lord can make it rain."

Water from Water

FLYING INTO EL PASO, gazing out the window at the desert floor coming into sharper view, it suddenly seems unwise to relinquish a plastic cup of ice as we start our descent. Save for scattered shrubs and cacti whose coloring blends with the chalky-brown dirt below, the bleak terrain offers few signs of life. No green. No water for miles and miles and miles.

As the plane's landing gear unfolds, and the flight attendants swoop down the aisle to scoop up drinks, finished or not, it's hard to let go. Just looking at the desert is enough to make one thirsty. But a quiet chuckle comes: As a visitor to El Paso, it's easy to succumb to hyperbolic thinking. Water, after all, is what brought this reporter here.

Water. Cold, precious water that's being saved, reclaimed, protected and transformed in this far West Texas city tucked into the northern corner of the Chihuahuan Desert where the average annual rainfall of 8.8 inches is more than 20 inches below the norm around much of the state.

Yet in what approximates a modern-day miracle, El Paso

'Water for Texas'

The Texas Water Development Board's 2012 proposal, called "Water for Texas," requests \$53 billion from the Legislature to cover capital costs. The message to state lawmakers, who convene for regular session in January, is this: "In serious drought conditions, Texas does not and will not have enough water to meet the needs of its people, its businesses and its agricultural enterprises."

Here's a snapshot:

- **Texas' population:** Projected to increase 82 percent by 2060
- **Total existing water supplies:** Projected to decrease about 10 percent; groundwater supplies projected to decrease about 30 percent.
- **Without new water-supply projects:** Texas is projected to be 8.3 million acre-feet (1 acre-foot equals 325,851 gallons) short by 2060.
- **Recommended volumes of total water management strategies by 2060:** Conservation and reuse, one-third; infrastructure for existing water supplies (i.e., new pipelines), one-third; and water-supply development (including new reservoirs, brackish water and seawater desalination, aquifer storage and recovery), one-third.
- **Shifting water needs:** By 2060, municipal needs—not agricultural irrigation, the current biggest user—will represent the largest share of Texas' total water demand.
- **Recommendations to Legislature include:** Construction of 26 additional major reservoirs (storage capacity of 5,000 acre-feet or more) projected to produce 1.5 million acre-feet of water by 2060; elimination of restrictions on transference of surface water from one river basin to another.

Save It for a Sunny Day

Even during drought, rainwater harvesting is more than a drop in the bucket

BY CAROL MOCZYGEMBA

Hard-packed, fractured stretches of bone-dry earth and pale, cloudless skies with months of unrelenting heat isn't exactly an appropriate backdrop for a conversation about rainwater harvesting.

Or is it?

Sanjeev Kalaswad, rainwater harvesting coordinator with the Texas Water Development Board, thinks it's just the right context for enlightening Texans about collecting and storing rainwater. The severity of ongoing drought in some parts of the state pits us in a stare-down with our worst fears: What if we run out of water?

Kalaswad offers a bit of consolation: "Even during a drought we get some rain," he says. And even if it's less than an inch, or a weak drizzle, a surprising amount of water can be collected with the right system, he says.

No matter when you decide to install a rainwater collection system, it's a pretty safe bet that over time you will reap the benefits. Although the size and complexity of collection systems run the gamut between a few barrels connected to a downspout, and massive, multithousand-gallon concrete tanks fed with a network of pipes, the basic principle is the same: Use the roof of your house or some other building to channel rainwater into a main artery hooked to a cistern, or water storage vessel.

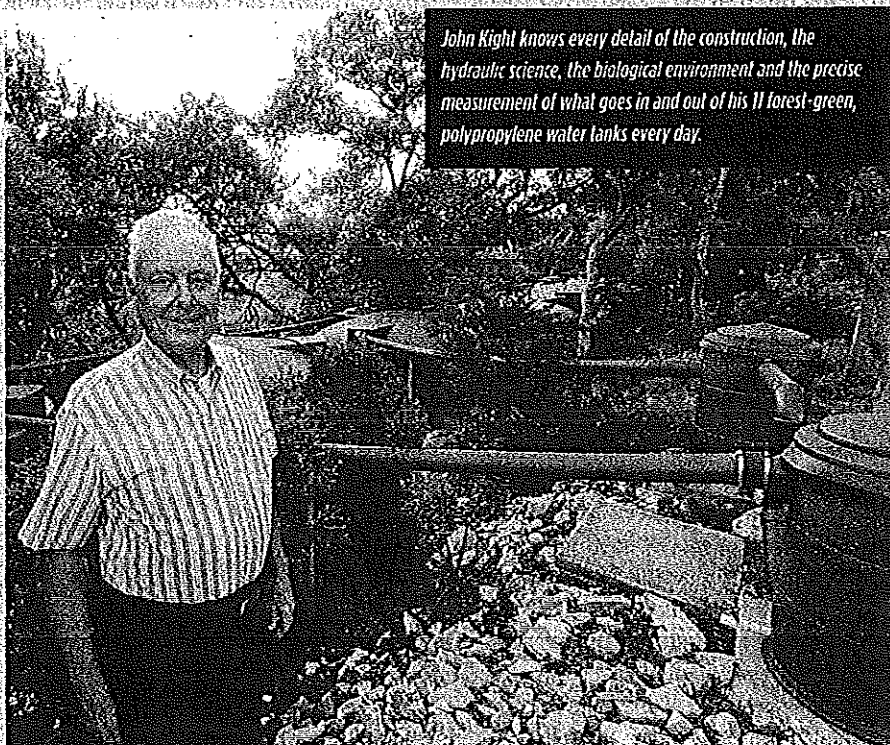
Under average conditions, it's possible to harvest 620 gallons of rainwater for every inch of rain that falls on a 1,000-square-foot roof. In a 2006 report to the Texas Legislature, the Texas Rainwater Harvesting Evaluation Committee stated, "Approximately 38 billion gallons of water would be conserved annually if 10 percent of the roof area in Texas could be used for rainwater harvesting."

A great success story comes from the Hill Country: When Bandera Electric Cooperative members John Kight and his wife, Mary Evelyn, started construction on their Boerne home in 2000, they installed a rainwater collection system to support their total water needs, from a kitchen faucet to an outdoor sprinkler. "It would have cost \$26,000 to dig a well, and the water had sulfur and iron in it and was very hard," said Kight, a retired civil engineer. "It tasted bad."

He did the numbers. For \$14,500, he could build a 30,000-gallon rainwater harvesting system that would sustain the couple through scant rainfall.

Kight's rainwater collection system has been operating since 2001 and has not run dry. In the meantime, Kight has become a rainwater-harvesting evangelist and conducts regular workshops on the subject at the Cibola Nature Center in Boerne. He helped lobby the Legislature

John Kight knows every detail of the construction, the hydraulic science, the biological environment and the precise measurement of what goes in and out of his 11 forest-green, polypropylene water tanks every day.



to allow local taxing authorities to exempt all or part of the assessed value of property used for rainwater conservation systems; provide sales tax exemptions for rainwater harvesting equipment and materials; and prevent homeowners' associations from banning rainwater harvesting systems.

At the height of the 2011 drought in August, Kight had recorded one-hundredth of an inch of rainfall, with 21,150 gallons of water left in the 40,500-gallon capacity system. (Kight added five tanks after 2001.) In that same month, he and Mary Evelyn used an average of 44 gallons of potable and 42 gallons of nonpotable water per day. Kight notes that the average national water use is 60 gallons per person daily, but rainwater harvesters typically use only 35 gallons a day per person.

Rainwater, free of the minerals usually present in groundwater, cuts down on housekeeping, too. There's no calcium buildup around the tub or the kitchen sink. The dishwasher doesn't get clogged with mineral deposits, the coffeemaker doesn't need a vinegar bath, and you can pour plain tap water into the steam iron.

But there's something else that's even better. Kight dips his hand into the refrigerator's icemaker and presents a palm full of small, crystal-clear ice cubes. He puts them in a sparkling glass and fills it with tap water. It's pure and cool, like liquid satin on the tongue. Water never tasted so good.

Carol Moczygemba, executive editor

On TexasCoopPower.com

More about rainwater harvesting: texascooppower.com/rainwater

officials proudly point to the statistics: Since 1991, when its water conservation ordinance was enacted, El Paso projects it has saved more than 231 billion gallons of water. And through a diverse conservation and water management program, the city estimates it is saving almost 19 billion gallons a year.

No, you can't change the desert. But, says Ed Archuleta, president and CEO of the El Paso Water Utilities Public Service Board, you can change the culture. What that meant in 1989, when Archuleta arrived in El Paso to oversee the department, was the start of an aggressive conservation program and a 50-year water management plan designed to protect the city's primary water sources: the Hueco and Mesilla bolsons, or aquifers, and the Rio Grande, whose flow relies on seasonal snowmelt from Colorado and New Mexico mountains.

That foresight has yielded remarkable results: Per one of the city's slogans—"Water shouldn't only be used once!"—El Pasoans use more than 2 billion gallons of reclaimed effluent (treated wastewater) each year, including for industrial use, golf course and residential property irrigation, and power-generation cooling at El Paso Electric.

And then there's a magnetic message—making water from water—that's attracting researchers from around the globe, including desert countries such as Saudi Arabia, to the \$91 million Kay Bailey Hutchison Desalination Plant. The world's largest such inland facility has the capacity to produce 27.5 million gallons of freshwater a day, boosting the El Paso Water Utilities' daily freshwater production by 25 percent.

Hutchison, a U.S. senator who lives in Dallas, helped secure \$26 million in federal funding for the plant, the largest project of its kind involving the U.S. Department of Defense and a community. It serves El Paso, which owns the facility, and Fort Bliss, an Army post that owns the land. In 2011, more than 734 million gallons from the plant were blended into Fort Bliss' freshwater supply.

Through reverse osmosis, a process in which pressurized raw water passes through fine membranes, separating salts and other contaminants, the plant turns salty brackish water pumped from the Hueco Bolson into drinkable water. The permeate, the desalted water, is blended into daily freshwater supplies.

The concentrate—the water containing everything removed during desalination—is pumped 22 miles underground to solar-powered deep-well injection sites on Fort Bliss property surrounded by open desert.

It's a win-win-win situation: For El Paso, for Fort Bliss and for the Hueco Bolson, in which pumping captures the flow of brackish water toward freshwater wells. The aquifer was dropping 1½ to 3 feet a year by the early 1990s. Now, incredibly, despite drought and little rain runoff, it is stable and at 1960s levels thanks to conservation efforts, city officials say.

"Show me an aquifer that's been depleted and is now recovering or at least stable," Archuleta says. "I don't think you'll find too many."

On a mid-April morning inside the desalination plant, the pleasant hum of electric generator units sounds like a waterfall. Standing beside rows of gleaming, stainless steel-encased membranes, Plant Superintendent Art Ruiz fills two paper-cone cups beneath spigots. "Go ahead and tell me what it tastes like," he says.

Timid sip. Hmmm ... it's uh ... pretty good. Is this a trick?

Ruiz smiles, handing over the second cup. "Now, with your

finger, taste that." Whoa! WAY salty. Yep, that's the concentrate. And the first cup was the permeate. Amazing. It tasted just fine.

Innovation. Conservation. Reclamation. Education. Diversification of water strategies, Archuleta says, is what keeps El Paso afloat. Too many cities, he muses, suffer from short-term thinking. The drought's over, it's raining, we can put water issues on the back burner. "If you continue that fallacy, it'll burn you after a while," he says.

Take a lesson from the water experts: "El Paso," Archuleta says, "always has a plan."

Camille Wheeler, former associate editor

On TexasCoopPower.com

"It's culture shock out here," Manager John Grant says as reservoirs go dry and the Colorado River Municipal Water District runs out of surface water.

You can't make it rain, but in Texas, you can make water: The state has 40 active brackish-water desalination plants, and construction of a seawater desalination facility is scheduled to start in 2013 on South Padre Island.

History bluntly indicates that drought will hit us hard, time and again. So what gives? The answer: We do. Two huge cities—Dallas and San Antonio—show us how to save water.

Every Drop Counts

"Landscaping," says Ed Archuleta, president and CEO of El Paso Water Utilities, "is not a requirement for living." So should we stop grooming our green lawns? Not necessarily—but we should be smarter about how we grow grass and consider switching to water-friendly xeriscaping, which isn't just for the desert. Consider cultivating these conservation tips designed to save you water—and money.

Indoors Texans can save at least 20 gallons per day simply by installing water-efficient fixtures and repairing leaks.

- Toilets can account for 30 percent of home water use. Replace old toilets with high-efficiency ones (less than 1.3 gallons per flush) and fix toilet leaks, which can waste up to 200 gallons of water per year.
- To check for leaks, turn off all faucets and water-using appliances, then record the water-meter reading. After 20 minutes, if no water has been used and the reading has changed, a leak exists somewhere.
- Run the dishwasher and washing machine only when full.
- Use a water-efficient showerhead.

Outdoors Summer outdoor water use can account for up to 80 percent of total residential water use.

- To prevent evaporation: Don't water when it's windy; water lawns early in the morning during summer heat; and use drip-irrigation systems for bedded plants, trees and shrubs.
- Grow drought-tolerant grass, such as Turfalo (a hybrid buffalo grass developed by Texas Tech University), Bermuda, buffalo and zoysia.
- When running the sprinkler, set an empty tuna-fish can upright in the yard. When the can is full, the grass has received enough water.
- Don't hose off sidewalks or driveways—use a broom.