

INTRODUCTION

Water, Water, Everywhere—except for California; How the Golden State Is Coping with Its Drought

By Bill Whalen

Russian by birth and a New Yorker by trade, the great songwriter Irving Berlin is now a Californian in spirit. For it's his 1919 tune, "How Dry I Am," that best sums up the Golden State's parched status.

California, in case you haven't seen or heard, is in the midst of a four-year drought. How bad of a dry spell, you ask? Actually, it's an "extreme to exceptional drought"—meaning widespread water shortages in reservoirs, streams and wells, major crop and pasture losses, plus a need for water restrictions.

It's not the first time California has faced such hardship. The Golden State endured a six-year drought beginning in 1929, a two-year drought from 1976–1977, and another six-year "event" that ran through 1992.

But those occurred in a different California—with smaller populations and, one could argue, less political and social friction.

What the present drought does represent is one of those rare times—in a state with a diverse population and diverse interests—when misery and inconvenience transcends economics, social status, and geography.

Not to mention: a challenge for a state that's arguably the world's most imaginative society to envision a way out of such troubles as:

- For the first time since the latter half of the 1970s, California has ordered a cutback in farmers' water rights.
- Cities and towns have been told to trim back their water use by more than one-third. For California's 38 million residents, that means the dawn of a new era of having to make do with less—not an easy transition for a state that loves its emerald lawns and pristine swimming pools.
- According to University of California–Davis researchers, more than 540,000 acres of land have been fallowed. In 2015, California farmers had nearly 9 million fewer acre-feet of surface water for irrigation—about one-third of acre-feet normally used in a year.
- In California's cities, less water means less revenue for utilities—some \$600 million less by the end of 2015, which could mean higher rates in the months and years ahead.
- Conspicuous water wasters—i.e., folks hosing down driveways or using drinking water in decorative fountains—face fines of \$500 a day (although, so far, there's been a wide disparity in actual enforcement).
- The drought has also thrown California's fauna and flora for a loop. Climate change, wildfires—even odd animal behavior—have been linked to the prolonged dry spell.
- And, yes, the drought has affected Californians' lifestyles. Homeowners are looking at a new trend in exterior design—a less thirsty outside décor (picture cacti, rock gardens, and faux grass).

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So much for the times when California could rely on the fragile balance of dry summers and wet winters. About this coming winter: California is on watch for an El Niño event later this year—warm Pacific waters that supposedly will be bringing loads of rain to the Golden State.

However, such an event won't end the drought for multiple reasons: too much water likely will get lost in runoffs, and warm rains aren't the best way to build a higher-altitude Sierra snowpack that keeps California awash for the rest of the year.

Quick fixes to ending the drought, it seems, are as sparse as rain itself. Ocean desalination, for example, has its own set of headaches (starting with energy costs). Dam construction is complicated by funding, environmental laws, and finding suitable areas to build (California's ten largest reservoirs all were built from 1927–1979).

Now, some good news: California cities cut their water use by a combined 31% in July, exceeding Governor Jerry Brown's statewide mandate to make do with at least 25% less (in June, the cities cut back by 27%).

The bad news: it remains to be seen if this is a sustainable trend. California apartment dwellers, for example, are notoriously loath to cut back on their water consumption (the threat of fines for water overuse seems to work better on homeowners and farmers than apartment renters, whose units are largely unmetered).

And there's the tricky matter of California's rich-poor divide. Some of California's biggest water-guzzling communities also happen to be some of the state's wealthiest—homes with eight-digit value, where the attitude among some is: "We're not all equal when it comes to water". Their future? Maybe one of fines and forced cutbacks—even public shaming if need be.

In this issue of *Eureka*, we explore the ramifications of California's epic drought—residents' attitudes toward a new age of recycling and restrictions; innovation on the part of water providers; other policies the state should consider moving forward, plus the impact the historic dry spell's had on California's farming way of life.

That includes:

- A new Golden State Poll examining the public's willingness to go along with new approaches to water policy; Hoover research fellow Carson Bruno has an analysis on the poll's results;
- Hoover senior fellow Victor Davis Hanson details the drought's impact on the Golden State's agriculture sector

and the Central Valley's traditions—for Hanson, a very personal concern, as he's a fifth-generation California farmer;

- Newsha Ajami, director of urban water policy for Stanford's Woods Institute on the Environment, highlights some smart approaches for California moving forward;
- And finally, Cathy Green, president of the Board of Directors for the Orange County Water Board, showcases how innovations are already underway in Southern California.

And before all of that, we have this podcast offering insights into our poll's findings and the social, political, and policy facets of the drought



ASSESSING THE GOLDEN STATE'S DRY SPELL: WHAT TO DO ABOUT THIS DROUGHT AND THE NEXT
Participants: Bill Whalen, Carson Bruno, and Bruce Cain
Recorded Sept. 22, 2015

We hope you enjoy this latest installment of *Eureka*—and that it gets you thinking about where California stands and if we're moving in the right direction.

Bill Whalen is a Hoover Institution research fellow, primarily studying California's political trends. From 1995 to 1999, Bill served as Chief Speechwriter and Director of Public Affairs for former California Governor Pete Wilson.



POLL ANALYSIS

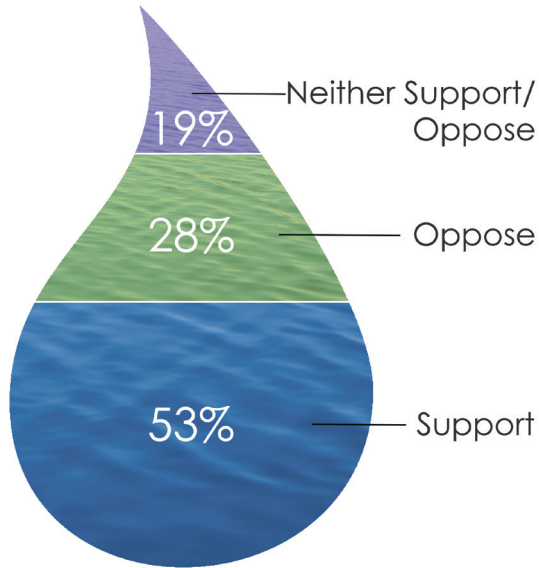
Sacramento Shouldn't Waste This Opportunity to Enact Serious Water System Reforms

By Carson Bruno

Winston Churchill once quipped, "Never let a good crisis go to waste." For California, nothing is less apt a statement than how to deal with the four-year (and counting) drought and what to do to prevent or lesson future ones. The Hoover Institution's new Golden State Poll explored just that, surveying Californians living in the Bay Area, Central Valley, and Southern California on topics pertaining to the drought, including two experiments that highlight the crucial nature of informing voters about these, sometimes, complex issues.



SUPPORT OR OPPOSE RELAXING ENVIRONMENTAL LAWS TO TRY ADDRESSING FUTURE DROUGHTS?



Source: September 2015 Golden State Poll

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Despite the cacophony of topics, a key theme emerges from the September 2015 Golden State Poll's results. Californians are largely unified in their belief that an "all-of-the-above" approach is not only needed, but imperative to deal with this and future droughts. This is particularly interesting given the very dominant regional differences in California as well as considering our country's increasingly partisan nature. This Golden State Poll should put Sacramento and the state's leaders on notice: Californians want action and want it now.




The most immediate issue during a drought is how to curtail current water use to ensure existing resources remain sufficient. In this regard, Governor Jerry Brown implemented a statewide 25% conservation mandate. So far, Californians have responded well to Sacramento's conservation-only approach, cutting water use by 31% in July 2015 compared to two years ago. But it hasn't been without critics. One such criticism is that many communities were already implementing conservation efforts prior to 2013—the benchmark for the current mandate. These communities argue that they shouldn't have to cut their use as much as others who were idly standing by until the mandate. Californians, however, have mixed feeling regarding this critique: 45% vs. 36% of likely voters say they support all communities reducing their

water use compared to 2013 regardless of whether the community had made efforts to conserve before 2013 or not.

But likely voters don't just stop there; 67% support restricting water use even if the community has access to groundwater supplies, and 62% support requiring neighboring communities to share groundwater supplies—both of which are of particular importance in the Central Valley where some communities are completely without water. Moreover, even though many accuse California's environmental interests of wasting water on fish while many are making do with less, 64%—including 48% of Republicans and 56% of Central Valley residents—support required water cutbacks to protect the state's aqua-life. That said, however, 53% of likely voters support relaxing environmental laws in order to make it easier to build new storage and conveyance systems.

While water use is the more immediate concern, this drought has exposed serious deficiencies in California's water supply. With the Sierra Nevada Mountains snowpack at a 500-year low, California's system of turning snowpack into usable water may no longer be sufficient and on ways to increase the water supply, Californians are quite comprehensive. Seventy percent of likely voters support building more dams and reservoirs, while 89% support storing more water in the underground aquifer. Here we have a paradox, though. California's groundwater aquifer requires mountain runoff or surface water irrigation to replenish (and increase) its supply. Capturing more runoff in reservoirs only helps if that water is then transferred to farms for irrigation. Ninety-one percent

CALIFORNIA WATER USE BY CATEGORY

			
	Environmental Protection	Agriculture	Municipal
Total Water Use	50%	40%	10%
Just Developed Water Use	33%	53%	14%

Source: Public Policy Institute of California, "Water for the Environment"



Claims that agriculture uses 80% of California's water ignore the crucial non-human, environmental protection water demands.

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of likely voters support collecting and treating storm water—although for what use remains unknown—and finally, despite its environmental and energy-use concerns 82%—including 77% of Bay Area residents and 80% of Democrats—support building **DESALINATION** plants along the state's coastline.

Beyond what policies Californians would support, this Golden State Poll evaluated how information can affect Californians' views on two important and controversial issues that are receiving more scrutiny because of the drought: agriculture's share of California water use and Orange County's expansive wastewater treatment system. Using a control group that received no information about these issues and two other groups who received differing details, we clearly find that information changes perception, even among the most skeptical.

The control group for whether agriculture's share of water should be transferred to municipal uses was effectively split between support, opposition, and not being sure. However, when told that agriculture contributes just 2% of the state's GDP, but by some estimates they use 80% of the state's water, support for redirecting some of agriculture's water to municipal uses jumps from 29% among likely voters to 47%. Opposition among Republicans drops from 58% in the control group to 40% in the 2%/80% group. (Note: keep in mind sample sizes are small for these crosstabs leading to larger margins of error.) However, when told a more balanced and comprehensive picture of California's water use—40% to agriculture, 10% to municipalities, and 50% to environmental protection efforts—support and opposition levels reflect the control group with support among Democrats dropping from 60% in the 2%/80% group to 44%.

Cathy Green's piece in this issue of *Eureka* explores the very implementation of the second experiment. When Orange County decided to recycle wastewater to replenish its groundwater aquifer, it had to undergo an extensive public relations campaign to prevent a public revolt. To highlight how information impedes the perception of wastewater consider this: when given no information of wastewater treatment, just 10% said they'd be okay with drinking treated wastewater; yet when given a detailed explanation of Orange County's treatment process, those saying they'd be fine with drinking such water doubles.

In January 2015, 69% of Californians said the drought should be Sacramento's top priority, second only to the economy. Now, almost 81% say such. It is clear that Californians see the drought as a crisis and one that its leaders ought not let go to waste. Now is the time to seriously reform California's

water use and supply systems, and everything should be on the table when determining the Golden State's next steps.

Carson Bruno is a Hoover Institution research fellow, studying California's political, electoral, and policy landscapes. Prior to joining Hoover, Carson structured municipal bond issuances at J.P. Morgan Securities, Inc.



CALNOTES:

DESALINATION



Used in over 120 countries producing over 3.5 billion gallons of potable water per day, desalination purifies water using reverse osmosis, i.e., pulling the water through semi-permeable membranes. This removes not only salt and other minerals, but also biological and organic compounds, making it suitable for seawater, wastewater, contaminated groundwater and runoff, and lake and river water. While the reverse osmosis process is energy intensive (and hence, costly), researchers are developing thinner membranes—some just one atom thick—which would make the process cost effective.

FEATURED COMMENTARY

The Underbelly of the California Drought

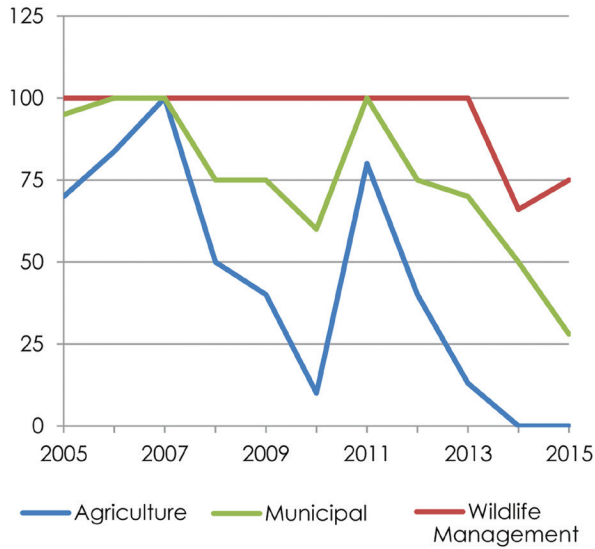
By Victor Davis Hanson

It is September in California, year four of a scorching drought. Forest fires are blackening the arid state, from Napa Valley to the Sierra Nevada Mountains. Fly over the High Sierra and about every tenth evergreen below appears dead. Even the high mountain lakes and reservoirs are about empty—and equally void of vacationers who have few places to boat, fish, and ski, and are unsure where the next forest fire will break out and force evacuations on often one-lane winding mountain roads.

Four years of warnings of the consequences of government culpability—from cancelling water projects to releasing millions of acre-feet of precious stored reservoir water in utopian efforts to restore 19th-century salmon runs in the San Joaquin River or to rebound a bait fish population in the San Joaquin-Sacramento River Delta—are no longer written off as shrill.



ANNUAL CENTRAL VALLEY PROJECT WATER ALLOCATIONS AS % OF CONTRACTED AMOUNTS (BY END USER)



Source: Wall Street Journal, "California's Farm-Water Scapegoat," data from Bureau of Reclamation

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Only meteorologists offer hope. They reassure that the cause of the drought was never global warming, as the president and governor in demagogic fashion insisted. Rather, periodic fluctuations in oceanic temperatures, especially warming and cooling of the equatorial Pacific Ocean known as El Niño, determine whether northern winter storms skirt or hit California. Preliminary data now suggest that perhaps El Niño is finally back to change storm trajectories and that next year might see the end of the four-year absence of snow and rain.

In the meantime, few talk about the underbelly of the drought. There is a well-drilling craze from one end of the 400-mile long Central Valley to the other. Prices-per-foot of well and casing have tripled and quadrupled. Irony abounds. Valley farmers were the first to feel the drought when their contracted surface water was cut off years ago. But many of them will also be the last to survive, given the state's **AQUIFER** is only deep in the state's center and can be tapped for years more—if one has the money and clout to find a well rig to drill ever deeper than one's neighbor.

There is little, if any, clean hydroelectric power being generated, at precisely the time farmers are using their power-gulping pumps to keep their farms alive until canals and ditches flow again. Many of us have paid steep taxes for four years to local irrigation districts, but have not received a drop of water. Instead, the farm's electric pumps go on in

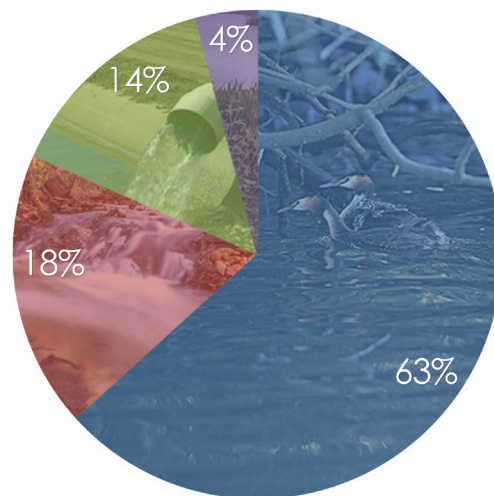
April and stay on until October. The aquifer plunges a foot or two per week. Few remember how holistic was the system of our grandfathers in which surface irrigation recharged the aquifer relegating pumping to back-up insurance rarely drawn upon.

Farmers survive the soaring electricity costs and the huge capital investments of new pumps and wells only through record commodity prices—nuts and fresh fruits especially—that will likely continue to climb as the drought cuts commodity production and the Asian consumer market grows. Another oddity: there is a land boom too, at least along a ten-mile radius of the 99 Freeway in the center of the state. There, an acre of farmland, with the water table still only 100 feet below, can go for between \$30,000 and \$40,000 per acre. Prices have climbed \$10,000 an acre in just the last year.

Investors rightly see the narrow agricultural corridor as the last place in the populated central and southern part of the state that will go dry. Farms with a good aquifer thus represent a reasonable gamble that they will manage to produce crops that will bring in more cash than it will cost to irrigate them.

Meanwhile, farmers of the 3-million acre West Side of the Central Valley, nearer the I-5 Interstate, have been mostly

BREAKDOWN OF CALIFORNIA ENVIRONMENTAL PROTECTION WATER USE



- Wildlife/Scenic Rivers
- Delta Salinity Maintenance
- Maintaining "Instream Flows"
- Wetland Management

Source: KPCC, "Drought: 10 Things to Know About California Water Use"

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cut off from the California Water Project and Central Valley Project irrigation water from Northern California. Unfortunately, the aquifer is of little help on the West Side. Water is found only from 600 to 1,500 feet below the surface, and is usually of poor quality. Many larger conglomerates are hedging bets by leasing or buying eastern valley land, which in turn only adds to the anomaly of soaring land prices even as agriculture is declared doomed.

The two great population centers of the state—the Los Angeles Basin and the San Francisco Bay Area—have so far not been greatly affected by the drought given both areas have the best claims on the vast transfers of water from Northern California and the Sierra. Another of the ironies of the four-year crisis has been the resistance of these urban interests to building new reservoirs, raising dams, building the peripheral canal, and keeping reservoirs full—despite their complete reliance on such fossilized water infrastructure.

Advocacy for massive releases of stored water for fish restoration and river enhancement were pet projects of Bay Area progressives. Cynics would attribute such green politics to the fact that millions of urbanites could cut off the contracted water of distant others only because their own supplies were sacrosanct.

But that surety will disappear in 2016 should El Niño not reappear, the drought continues, and the last of California municipality-contracted water disappears. The back-up aquifers in these vast urban centers are inadequate to replace northern and Sierra transfers. When Hollywood and Google go dry, we may, too late, hear of the need to finish California's water projects that were largely cancelled when the state's population was 20, not the present-day 40, million people.

The solutions for the drought are simple: complete the envisioned reservoirs and dams of the California Water Project; cease releasing water from reservoirs for theoretic fish restoration; and lift government regulations on how water is bought and sold.

In the meantime, we pray for the long-awaited Christmas-time return of El Niño—a divine gift of warmer ocean temperatures.

Victor Davis Hanson is the Hoover Institution's Martin and Illie Anderson Senior Fellow, focusing his research on the classics and military history. Victor is also a 5th-generation Central Valley raisin grape farmer.



CALNOTES:

CALIFORNIA GROUNDWATER AQUIFER



Typically 30% of the state's water supply, California's 450 groundwater aquifers store about 425,000 acre-feet of cost-effective and usable water. California's largest aquifer lies under the Central Valley, which collects water runoff from the Sierra Nevada Mountain range. During drought years, the aquifer can provide over 60% of the state's water—even more for farmers. This depletes the supply, however, which can only be replenished via gradual Sierra Nevada runoff or surface water transfers for irrigation, which then seep down into the aquifer to recharge it.

California's Water Sector Moves into the 21st century

By Newsha Ajami

California's water sector is going through a paradigm shift.

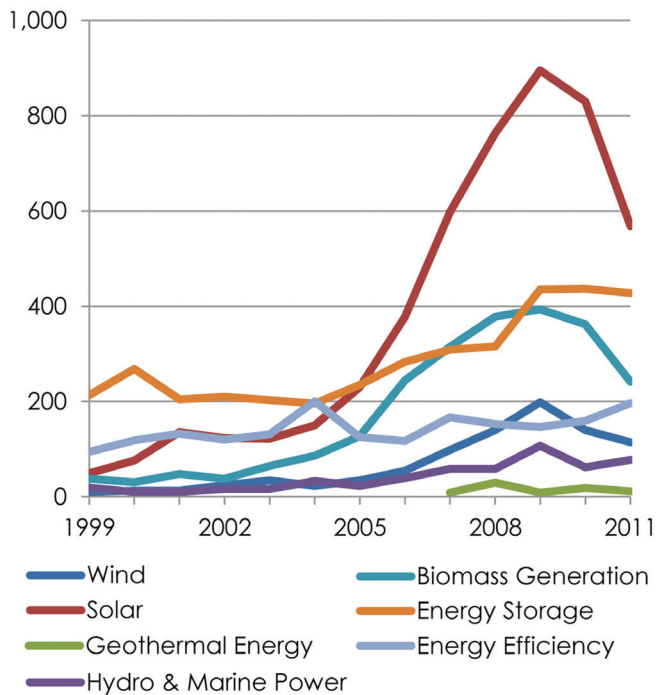
Four years into a historic drought, the state has taken multiple steps to ease its impacts on our water resource availability through a series of legislative and regulatory efforts including the passage of Proposition 1—California's \$7.5 billion water bond—the first ever comprehensive **STATE-WIDE GROUNDWATER LAW**, and measures to curb water use and expedite water recycling. Some of these efforts have a forward-looking perspective and will change the way our water resources are managed in the years to come.

As various communities throughout the state are debating how to overcome the current water shortages and secure reliable supplies for the future, there is an opportunity to rethink our current water supply portfolio and how we want it to look like in the future.

Over the past century, California has invested heavily in one of the most sophisticated and complex centralized engineered water systems in the world, encompassing a series of dams, aqueducts, channels, pipes, pumps, and purification and treatment plants, to import water from water rich regions of the state (such as the Sierra Nevada Mountain ranges) to meet our residential, industrial, and agricultural needs.



NUMBER OF US PATENTS FILED IN THE CLEAN ENERGY SUB-SECTOR



Source: Stanford Woods Institute for the Environment, "The Path to Water Innovation," chart provided by Newsha Ajami
 Note: Number of patents here used as a proxy for rate of innovation
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Nevertheless, aging infrastructure, population growth, ecosystem and environmental degradation, and recurring droughts in various magnitudes during the past few decades have stress tested the functionality and reliability of this world-class water system. The current drought has highlighted some of these challenges. Four years into a historic drought, California has just suffered one of the driest winters on record. Many of the state's reservoirs are less than half full, and the natural reservoir that the state relies on for a third of its water supplies, the Sierra Nevada snowpack, hardly had any snow. To make up for the current surface water supply shortages, the state's groundwater resources are under increasing pressure and are being extracted at an unsustainable rate.

OPPORTUNITY KNOCKS

While California's water sector offers many opportunities to innovate and deploy new strategic solutions, in practice the sector has barely tapped this potential. The existing drought offers an opportunity to aim at building a reliable water future for California. As the state gets ready to invest in its water system and implement the

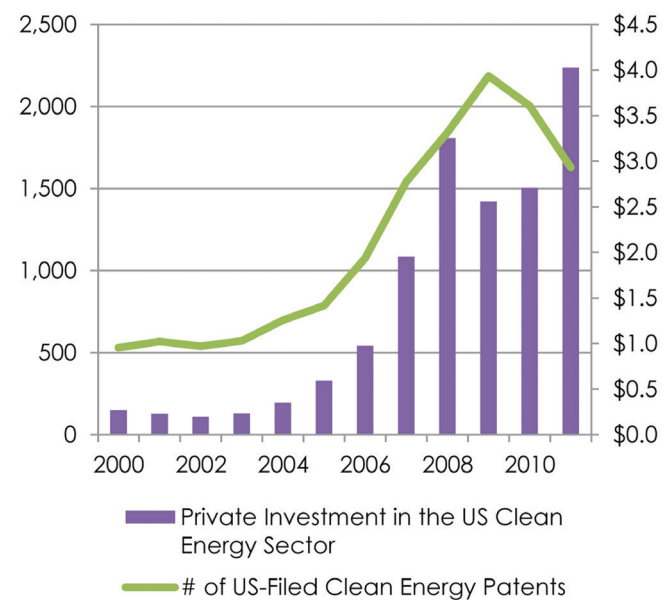
new regulatory requirements to ease the impact of the drought, we should not lose sight of our long-term challenges with water availability and reliability and how these short-term solutions fit into our future water management strategy. Long-term thinking is crucial.

Here I offer two thoughts, which I believe to be essential in moving the state forward on an innovative path toward a secure water future.

INNOVATIVE AND DIVERSE WATER PORTFOLIO

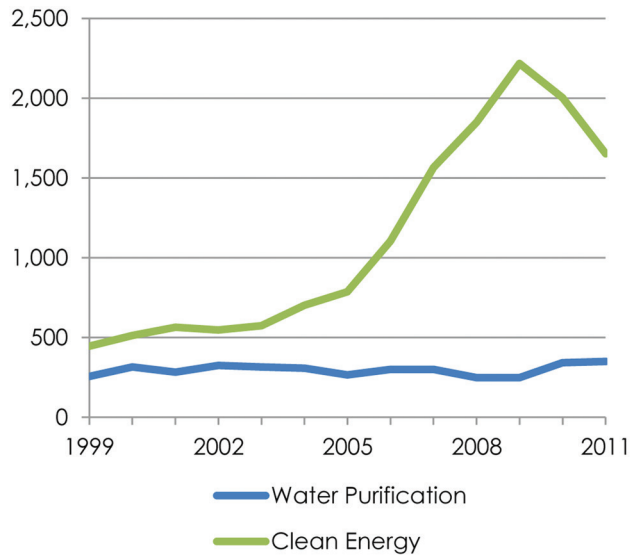
California's energy sector provides a great example on how to turn a crisis into an opportunity. California's energy crisis of the 1990s instigated a fundamental change in the energy sector. The growth in the clean energy sector in California was partly driven by the new energy policies and the sectors movement toward clean and renewable energy portfolio standards, which ultimately created new energy markets—such as solar and wind energy—and led to diversification of our energy portfolio. This strategic paradigm shift also spurred private investment in the clean energy sector nationwide, which ultimately increased the rate of innovation in the sector, since California is one of the largest economies in the world and the most populated state in the US.

PRIVATE INVESTMENT IN THE US CLEAN ENERGY SECTOR (\$ BILLIONS) VS. PATENTS FILED



Source: Stanford Woods Institute for the Environment, "The Path to Water Innovation," chart provided by Newsha Ajami
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COMPARISON OF US PATENTS FILED UNDER THE PATENT COOPERATION TREATY



Source: Stanford Woods Institute for the Environment, "The Path to Water Innovation," chart provided by Newsha Ajami
 Note: Purification is the only water sub-sector with significant number of patents filed

FACTS ON THE ISSUE

There is no lack of innovative solutions that can transform our current water sector and diversify California's water supply portfolio. Innovative strategies that embrace new thinking by emphasizing creating a portfolio of solutions including a combination of effective governance, demand management, and unconventional water supply augmentation are currently being developed in California and elsewhere. California can take the torch and act as a living laboratory to test and demonstrate some of these promising solutions. It can replicate the success it has had with the electricity sector and become the leader in transforming the water sector. It can establish new markets by strategically investing in research and development and reducing the risk and cost of scaling and commercialization of innovative solutions.

RELIABLE FINANCING PORTFOLIO

Indeed, many communities in California are considering a new water management model to tackle their current water challenges. Some of these communities are moving away from the centralized grey infrastructure strategy and trying to reimagine conventional water management by taking a more holistic, integrated, and innovative approach to regional and local water resource management and diversifying their water supply portfolio. This

new model has the potential to manage stormwater, wastewater, drinking water, reclaimed water, and natural water resources in an integrated and synergistic manner while offering more flexibility in responding to changing climate and meeting regulatory obligations.

However, one of the challenges these communities are facing is access to stable and sustainable financing options. While there is no single solution to financing the necessary improvements in California's water systems, the state must establish a more comprehensive and stable financing portfolio to help coordinate local, regional, and statewide efforts, and to expand the scope and scale of the projects that can be pursued.

Some of the innovative solutions in the sector fall outside the scale and scope of traditional financing options, such as large government loans, municipal bonds, and conventional public-private partnership. Financing and funding mechanisms—such as a public benefit charge on water—can help raise sufficient funds to bring down the cost of development and implementation of innovative solutions. In addition, an increase in public investment can spur growth in private sector investment, which can have a multiplying effect in moving the sector forward.

WATER, A KNOWN UNKNOWN

We as a society often forget the complexity of the system that ensures uninterrupted access to this essential resource. We do not know where our water is coming from and what we are paying for. Another important element in securing a reliable financing portfolio for the water sector is fundamentally revisiting the way we value water as a resources. The water sector has to adjust the water rate structure and pricing policies in a way that would capture the full cost of delivery, decouple revenue from the quantity of water sold, and correctly reflect the marginal cost of consumption and scarcity. Unless the water sector moves to comprehensive and accurate water pricing and explores new, more innovative financing strategies, as well as a more innovative and friendly regulatory environment, California's pressing water problems will remain underfunded and unresolved.

Newsha K. Ajami, PhD., is the director of Urban Water Policy with Stanford University's Water in the West and NSF-ReNUWIt initiatives and a lecturer with the Public Policy Program.





CALNOTES:
SUSTAINABLE GROUNDWATER MANAGEMENT ACT OF 2014

Signed in September 2014 by Governor Jerry Brown, the Sustainable Groundwater Management Act of 2014, for the first time in California's history, codifies local control of groundwater resources and empowers regulation of such resources. The Act consists of three bills—AB 1739, SB 1168, and SB 1319—which creates local groundwater sustainability agencies charged with implementing long-term groundwater resource availability and sustainability plans and protects the agencies from undue state intervention. Prior to the law, there was little-to-no oversight on the pumping of groundwater within communities.

The Big Gamble that Helped Drought-Proof Orange County

By Cathy Green

In 1997, the Orange County Water District (OCWD; the District) started a very risky venture. It managed a large groundwater basin in Southern California, but, due to a growing population, cyclical droughts, and the need for additional freshwater barriers to push back seawater intrusion from the Pacific Ocean, OCWD needed another reliable source of water. The solution could be treated wastewater. However, would the government, potential partners, and local public “swallow” that?

Groundwater in the District is pumped from more than 400 wells operated by local water agencies, cities, and other groundwater users. Approximately 70% of north and central Orange County’s drinking water supply comes from the Orange County Groundwater Basin.

A groundwater basin that holds more than 20 trillion gallons of water would be seemingly impervious to any drought or local water demands. Unfortunately, only a tiny portion is useable. OCWD must remain within a 500,000 acre-foot (162.9 billion gallons) operating range, pumping out, and replacing or recharging billions of gallons annually in order to maintain a “basin balance” so as to keep it safe from subsidence and seawater contamination. Santa Ana River flows were becoming more inconsistent, and imported water from the California State Water Project and the Colorado River flows were expensive and unpredictable. OCWD’s staff and

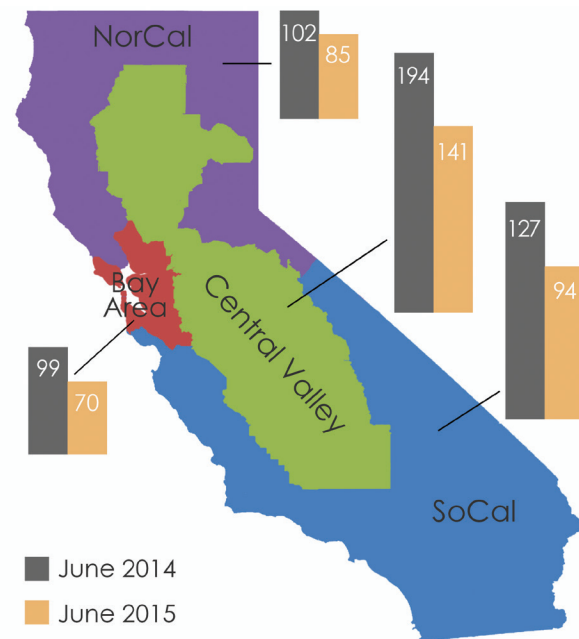
board agreed. These sources of freshwater would not be reliable for future demands.

CREDIBILITY & PARTNERSHIP

Increased freshwater pumping in the 1950s and 1960s had drawn seawater inland about four miles and rendered some freshwater wells useless. The problem would only get worse without intervention. In 1975, OCWD created Water Factory 21 (WF 21), the world’s first advanced water treatment plant utilizing reverse osmosis to purify wastewater to near distilled water quality. This water could be injected into the groundwater basin providing a barrier to the seawater intrusion.

RESIDENTIAL GALLONS PER CAPITA DAY (R-GPCD)

(BY GROUPED HYDROLOGICAL REGION, JUNE 2014 VS. JUNE 2015)

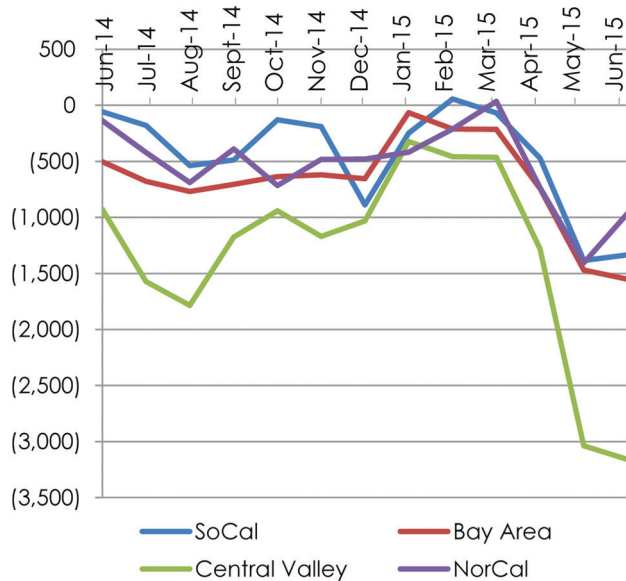


Source: State Water Resources Control Board, California Environmental Protection Agency
 Note: NorCal = North Coast/North Lahontan Regions; Bay Area = San Francisco Bay Area Region; Central Valley = Sacramento River/ San Joaquin River/Tulare Lake Regions; SoCal = Central Coast/Southern Coast/South Lahontan/Colorado River Regions

Statewide R-GPCD dropped from 133 R-GPCD in June 2014 to 97 R-GPCD in June 2015 (a 27% decrease).

FACTS ON THE ISSUE

TOTAL MONTHLY POTABLE WATER USE PER CAPITA DIFFERENCE RELATIVE TO 2013
(BY GROUPED HYDROLOGICAL REGION)



Source: State Water Resources Control Board, California Environmental Protection Agency
 Note: NorCal = North Coast/North Lahontan Regions; Bay Area = San Francisco Bay Area Region; Central Valley = Sacramento River/San Joaquin River/Tulare Lake Regions; SoCal = Central Coast/Southern Coast/South Lahontan/Colorado River Regions

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In 1991, the California Department of Health Services granted OCWD a permit—the first ever—to inject 100% recycled wastewater into the barrier, without blending. At the same time, Orange County was reeling from a near doubling of its population since the 1970s. WF 21’s injection capacity couldn’t keep up with freshwater pumping and ensure the soundness of the barrier. A new system would need to be devised.

It wasn’t a big leap for OCWD to move into larger scale recycling, with help from its partner, the Orange County Sanitation District (OCS), which was, itself, faced with creating a very costly second outfall to the ocean.

In 2008, the 10-year collaborative venture became reality, and the **GROUNDWATER REPLENISHMENT SYSTEM** (GWRS), which initially produced 70 million gallons per day (MGD) of water, came online.

The GWRS purifies the OCS treated wastewater through microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide. This state-of-the-art water purification

project—the largest of its kind in the world—recently expanded and now has the capacity to produce 100 MGD of high-quality water. This is enough water to meet the needs of nearly 850,000 people. A second future expansion will increase the output to 130 MGD.

GETTING OVER THE “YUCK” FACTOR

In the late 1990s, when the GWRS was being designed, there was little concern from outside the industry given to water supplies or potential shortages. OCWD had to convince stakeholders of the need for an advanced water purification project.

OCWD had learned from the mistakes of two failed water-recycling projects: one in Los Angeles County and one in San Diego County. The District took that knowledge to help formulate its marketing campaign for public approval.

Staff met with the editorial boards of the *Orange County Register*, *San Diego Union Tribune*, and the *Los Angeles Times* to prevent misinformed editorials. Staff and board members also implemented an extensive speakers’ bureau, making nearly 1,200 presentations over the span of 10 years.

By 2007, Southern California and many US cities were experiencing a multi-year drought and anticipating water supply shortages, and global warming was dominating policy debates and media coverage. The tide had turned, and editorial coverage was overwhelmingly in favor of water recycling as a solution to current and future water supply shortages. Media still used sensational “toilet-to-tap” headlines, but science, technology, and water quality data validated the safety and reliability of wastewater recycling.

As media coverage grew, so did the acceptance of recycled water and GWRS’s reputation as the industry standard.

SOUND INVESTMENT

Both agencies shared the cost of constructing the GWRS (\$481 million). OCS supplied OCWD with stringently controlled, secondary treated wastewater at no charge. OCWD in turn agreed to manage and fund the GWRS operations. Through this collaboration, the GWRS emerged as one of the most celebrated civil engineering and water reuse projects in the world. The GWRS has received more than 40 local, regional, national, and international awards.

It has benefitted both agencies, the community, and is also environmentally sound—using one-third the energy required to desalinate seawater; it protects the vibrant coastline by reusing a precious resource. It also decreases dependence



on costly imported water from Northern California and the Colorado River and, most importantly, it is reliable.

“The supply is always going to be drought-resilient. It’s something we can control, locally produce, and it’s always going to be better with improved technology,” says OCWD General Manager Mike Markus. “The risk paid off and will continue to do so.”

Some may argue that OCWD took a political and public relations risk by building the GWRS, but solid science and state-of-the-art technologies helped guide OCWD’s development and investment decisions and will continue to be cornerstones of OCWD’s commitments for sound planning and water reliability.

CALNOTES:
**GROUNDWATER
 REPLENISHMENT SYSTEM**



The Groundwater Replenishment System uses a three-step advanced treatment process to recycle wastewater into drinkable water that otherwise would have flowed into the Pacific Ocean. First, the wastewater is pulled through tiny holes in polypropylene hollow fibers to filter out solids, protozoa, bacteria, and other viruses. Then, the water is forced through semi-permeable polyamide polymer membranes; this water is so pure minerals have to be added back into it. Finally, high-intensity ultraviolet light and hydrogen peroxide disinfects and destroys any trace organic compounds that may remain.

Cathy Green is president of the Orange County Water District and has served on the board since 2010. She is a former mayor and city council member of Huntington Beach, California.



EUREKA

ABOUT THE PUBLICATION

Eureka was created to serve as an occasional discussion of the policy, political, and economic issues confronting California. Like the Golden State motto from which this forum’s title was borrowed, the goal here is one of discovery—identifying underlying problems and offering reasonable and common-sense reforms for America’s great nation-state.

Ever since Archimedes supposedly first uttered the word, *eureka* has meant joy, satisfaction, and a sense of accomplishment. Drawing on the combined wisdom of Hoover’s policy experts and leading California thinkers, we hope that you’ll find enlightenment in these pages. Hoover research fellow Bill Whalen, who has nearly two decades of experience in California politics and public policy, serves as this forum’s editor.

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