

**BAY AREA WATER SUPPLY AND CONSERVATION AGENCY  
BOARD OF DIRECTORS MEETING**

**March 11, 2016**

Correspondence and media coverage of interest between February 25, 2016 and March 11, 2016

**Correspondence**

Date: February 23, 2016  
From: Nicole Sandkulla, BAWSCA CEO/General Manager  
To: San Francisco Public Utilities Commission  
Subject: Statement about the San Francisco Public Utilities Commission's Plan to Cope with a Collapse of its Mountain Tunnel

**Media Coverage**

**Conservation:**

Date: March 11, 2016  
Source: San Mateo Daily Journal  
Article: Silicon Valley's top water savers honored: Menlo Park one of highest cumulative conservationists in state

Date: March 7, 2016  
Source: San Mateo Daily Journal  
Article: Wise up on your irrigation: San Mateo hosts annual landscape conference focusing on drought

Date: March 2, 2016  
Source: Sacramento Bee  
Article: Water conservation efforts must expand in fifth year of drought

Date: February 25, 2016  
Source: Maven  
Article: Building resilient landscapes into flood protection and infrastructure projects

**Water Supply Conditions:**

Date: March 8, 2016  
Source: San Francisco Chronicle  
Article: The early March deluge is arriving just in time across the Bay Area, the Sierra Nevada and throughout Northern California

Date: March 8, 2016  
Source: NBC Bay Area  
Article: Recent Storms Increase Water Levels At California Lakes

**Water Supply Conditions, cont'd:**

Date: March 8, 2016  
Source: Modesto Bee  
Article: MID farmers this year could get 67 percent more water

**Drought:**

Date: March 1, 2016  
Source: LA Times  
Article: Drought hasn't been all bad – we've learned some things too, California water chief says

Date: February 29, 2016  
Source: Marin Independent Journal  
Article: Marin assemblyman Levine's bill uses Australian approach to address drought

**Water Management:**

Date: March 8, 2016  
Source: SF Gate  
Article: Southern California water giant agrees to buy delta islands

Date: March 4, 2016  
Source: Chico Enterprise Record  
Article: More hard work ahead for water management says State Water Board leader

Date: February 24, 2016  
Source: Water Deeply  
Article: How Reliable are Silicon Valley Water Sources?

**Water Policy:**

Date: March 8, 2016  
Source: ACWA News  
Article: Hearing Explores Funding for State's Underfunded Water Needs

Date: March 8, 2016  
Source: CBS San Francisco  
Article: California Government Prepares For Extreme Effects of Climate Change

Date: March 8, 2016  
Source: UC Water  
Article: UC Researchers Provide Guide on Groundwater Law

Date: February 29, 2016  
Source: Business Wire  
Article: Technology Leaders Identify Imminent threats to U.S. Water Security and Call for Comprehensive Strategy to Map a Secure Water Future for the Nation

**Groundwater:**

Date: March 2016  
Source: Circle of Blue  
Article: 12 Things you should know about groundwater

Date: March 8, 2016  
Source: YubaNet  
Article: Investing for California's Future: Why Groundwater Storage Makes More Sense than New Dams

Date: February 29, 2016  
Source: Water Online  
Article: Valuing Groundwater During National Groundwater Awareness Week

**Water Quality:**

Date: March 6, 2016  
Source: Detroit Free Press  
Article: One step to help restore trust in Flint

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**Statement by CEO Nicole Sandkulla about the San Francisco  
Public Utilities Commission's Plan to Cope with a Collapse of Its Mountain Tunnel**

**February 23, 2016**

I will speak briefly about BAWSCA's review of the proposed Mountain Tunnel Emergency Response Plan (Emergency Plan) dated January 2016.

This Emergency Plan is a significant and an encouraging effort to ensure a continued supply of water to the region to cope with a collapse of the Tunnel, which would have very serious consequences for water users. This Tunnel risk was first identified by a San Francisco engineering consultant in 1989, 27 years ago, which recommended "repairs" to prevent "collapse" and "blockage" of the Tunnel. Another consultant inspected the Tunnel in 2008, eight years ago, and urged "immediate action." In September 2015, the SFPUC adopted three projects, with approved budgets and schedules, to address the necessary construction work at Mountain Tunnel to remove the risk of collapse. BAWSCA strongly supported this action.

The highest priority in this Emergency Plan is ensuring an alternative supply of water to protect the 1.7 million residents, 30,000 businesses and thousands of community agencies in Alameda, San Mateo, and Santa Clara counties whose water interests BAWSCA represents. The Tunnel work will take many years to complete, but a Tunnel collapse, shutting off all water from Hetch Hetchy Reservoir could happen any moment. Implementing the Emergency Plan must be expedited with strategies to line up the sources of an alternative water supply and to ensure delivery of it to water users at any moment.

Following a collapse of Mountain Tunnel, all water users dependent on San Francisco's water system will need alternative sources for 181 million gallons of water a day for nine months or more. The Plan lists four potential sources of that alternative water: 1) water supply in existing local reservoirs operated by San Francisco as part of the Regional Water System; 2) water exchanges with East Bay Municipal Utility District (EBMUD) and Santa Clara Valley Water District (SCVWD) through existing interties; 3) several BAWSCA member agencies shifting to other water sources contractually available to them; and 4) water purchases from other suppliers. In addition, water users might have to reduce further their daily water use.

Currently, these are just possibilities, not certainties. Immediate discussions at the highest organizational levels in various water agencies are required to ensure, with written agreements, specific amounts of alternative water from these sources. The availability of intertie infrastructure to deliver additional water in an emergency also must be confirmed in writing.

BAWSCA will work closely and cooperatively with the Commission and its staff to implement these actions, as it has with San Francisco's Water System Improvement Program. In particular, I appreciate General Manager Kelly's commitment to regular progress meetings between our respective staffs to coordinate on this critical issue.

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## **Silicon Valley's top water savers honored: Menlo Park one of highest cumulative conservationists in state**

SM Daily Journal | March 11, 2016 | Samantha Weigel

When it comes to water conservation, local environmentalists want people to take a lesson from the city of Menlo Park.

Having outpaced nearly every other utility across all of California, Menlo Park will be recognized for going above and beyond to exceed state conservation mandates.

The city is a recipient of this year's Silicon Valley Water Conservation Awards, having reined in the top honor in the water utility category — Menlo Park is its own utility, responsible for providing water to customers citywide.

"I'm very excited that we have this award and the city's being recognized and I think through getting this and [the word] out, other cities will learn from what we're doing and others will be able to conserve more. Because the drought won't be over, in spite of the rain that we're having," said Mayor Pro Tem Kirsten Keith.

Between doubling rewards for businesses or residents who ditch their lawns and offering discounted landscape design services, the city achieved a staggering cumulative 42.2 percent reduction between June 2015 and January 2016, as compared to the same time in 2013. During the summer months, the city raked in a nearly 47 percent savings. Only mandated to cut back 16 percent, Menlo Park has consistently been in the top, if not the number one, utility to exceed its requirements by the highest ratio — between 30 percent and 26 percent.

"Menlo Park residents and businesses have been very supportive of the environment and have been very aware of the drought, so that's been critical in driving participation for these kinds of programs," said Heather Abrams, the city's environmental programs manager. "It's a combination of outreach and working together, with businesses and residents, and everyone doing their part. And they really have in Menlo Park."

Utilities across California have for the first time in history, been mandated to meet tiered conservation targets as Gov. Jerry Brown seeks a statewide cumulative 25 percent savings to combat the ongoing four-year drought.

Organized by a coalition of environmental groups and civic agencies, the Silicon Valley awards program began in 2009 and recognizes those in San Mateo, Santa Clara and Alameda counties.

"This year's award winners have taken extraordinary steps to conserve water, leading the way for this critical effort to reduce our region's water use," Nicole Sandkulla, CEO of the Bay Area Water Supply and Conservation Agency, or BAWSCA, wrote in an email. "We hope that the innovative water-saving practices and technologies demonstrated by the award winners will encourage others to adopt similar best practices within their own homes and communities and to explore new ways to use water more efficiently."

Other local San Mateo County recipients include the city of South San Francisco being honored for its greenscape management as it reduced municipal water use by 57 percent since 2013; and the Menlo Park-based SLAC National Accelerator Laboratory, which saved 15 million gallons of potable water over the last two years and replaced 20,000 square feet of lawn with drought-resistant landscaping.

Abrams and Keith noted much of Menlo Park's success was due to high participation levels in programs that address outdoor irrigation — infamously known as one of the biggest drain on residential water consumption and yet the most expendable.

"About 50 percent of water use in Menlo Park was for landscaping, so I think the reductions you see are primarily from that area," Abrams said.

Menlo Park enhanced BAWSCA's Lawn Be Gone Program offering residents and businesses double, or \$2, per square foot of turf removed. It also developed a Conserve-A-Scape program that provided on-site design consultation with a professional landscape architect and customized drought-tolerant garden design, a \$400 value, for just \$50.

"I think it makes it less intimidating to do," Keith said, noting the affordable support for redoing one's landscape was an attractive offer.

Crediting Abrams for undertaking extensive community outreach, Keith added the evidence is clear when taking a stroll through the city.

"Even when I walk my dog in different neighborhoods in Menlo Park, I can see the difference visually where people have removed their lawns and put in better landscaping," Keith said.

City officials also kept a heavy presence at a variety of festivals or events making sure to hand out high-efficiency fixtures like flow aerators and shut-off hose nozzles, Abrams said. Internally, staff worked hard to reduce its own water use such as finding ways to reuse water to wash city vehicles, she added.

In looking ahead as it seeks to continue conserving, Keith noted some impressive collaborations are underway. The Sharon Heights Golf & Country Club, one of the city's largest water users, has been very supportive of innovating means to save water and is considering using recycled water for irrigation by working with the West Bay Sanitary District, which collects the city's wastewater, Keith said.

Organizers note the importance of sharing advancements being made in the conservation industry and inspiring others to learn how they can do more to cut back. This year's eighth annual awards ceremony is being held at the Google Campus March 23. Attendees will also be able to participate in a rare taste-test of the Half Moon Bay Brewing Company's beer made with highly-treated recycled water — a product being used to advocate for expanded uses of treated recycled water by brewery owner Lenny Mendonca.



With a total of 10 award recipients ranging from government agencies to students and spanning the categories of innovation to lifetime achievement, organizers hope attendees will walk away motivated to continue saving the state's most precious natural resource, according to Peter Drekmeier, policy director with the Tuolumne River Trust and co-organizer of the event.

"Our goal with the awards is to recognize outstanding efforts to conserve water, but also to inspire others," Drekmeier wrote in an email. "In our judging, we give extra weight to programs that can be replicated by others."

Visit [waterawards.org](http://waterawards.org) for more information about the Silicon Valley Water Conservation Awards.

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## **Wise up on your irrigation: San Mateo hosts annual landscape conference focusing on drought**

SM Daily Journal | March 07, 2016 | Samantha Weigel

Despite some wet weather expected to drench the Bay Area this week, California remains under the grips of one of the worst droughts in recorded history and local officials are urging residents highlight how conservation can be beautiful.

Since one can only cut back so much indoors — short of skipping a shower or forgoing some laundry here and there — conservation experts continue to recommend people turn their attention outdoors.

On Tuesday, March 8, San Mateo will host its fourth annual Water-Wise Conference to help professional landscapers comply with new state laws and highlight where residents can get the most out of their conservation efforts.

“When we look at the potential for new water conservation in this service area, making our outdoor water use more efficient is the greatest opportunity we’ve had in an area that’s been the least explored in the past. So there’s opportunity for people to make both their current irrigation practice more efficient, and what we’re encouraging people to do is really think about changing their existing landscaping to something that’s beautiful and also uses less water. Those are the greatest opportunities to help us save water during the drought,” said Nicole Sandkulla, CEO of the Bay Area Water Supply and Conservation Agency, or BAWSCA.

This year, San Mateo City Hall will not only serve as host to the free conference anticipated to attract more than 100 industry representatives and green-thumb gurus, the public facility will also show off its new drought-tolerant landscape, said Kathy Kleinbaum, sustainability coordinator with the city manager’s office.

Over the past few weeks, crews have been tearing out the grass outside City Hall, removing dying redwood trees that have been affected by the drought, replacing them with new drought-tolerant landscaping and installing a new drip irrigation system, Kleinbaum said.

A brief tour will be held and attendees will learn about the state’s new, more stringent regulations on how people can landscape their properties, Kleinbaum said.

Not watering after measurable rainfall, only irrigating on certain days and a flat-out restriction on planting new grass in many areas are part of Gov. Jerry Brown’s landmark efforts to ensure Californians conserve.

“We want to make sure people understand that the requirements are changing and they really need to think differently when they plan for landscapes,” Kleinbaum said.

The State Water Resources Control Board recently enacted rules restricting Californians from planting turf, or grass as part of a new or improved landscape. Most residential properties cannot have more than 25 percent of their landscape comprised of turf and the majority of commercial properties are forbidden from planting grass unless it's irrigated by recycled water, said Andree Johnson, BAWSCA's senior water resources specialist.

The event is being held in collaboration with the city, BAWSCA, the California Water Service Company and Ewing Irrigation.

Although the conference is geared toward landscaping industry professionals and will be lush with technical information, residents are also invited to attend and learn about available rebates as well as new products.

The event provides an opportunity to reach a valuable audience — professionals who can pass on this important information through their businesses and help keep conservation on the top of people's minds, said Susan Cordone, lead conservation coordinator with Cal Water.

"It gives us the opportunity to reach out to the landscape community and many of our programs are geared toward outdoor water use reduction. And the landscapers, they're our friends, they're the people that have a direct connection with the homeowners and can relay positive and accurate information about new technologies and devices," Cordone said. "The types of things we're actually offering to the residential community as well as the commercial community."

Some current rebates include \$1 per foot for residents who replace their turf, free high-efficiency sprinklers as well as nozzles, and more, Cordone said. Of course, she added, indoor rebate programs are ongoing and customers are encouraged to update all fixtures to conserve as much as possible.

While this particular event will focus on outdoor irrigation, sustainability experts are urging everyone to keep conservation on their minds both inside the home and out.

"Landscaping is the number one source of water use and it's really where all the difference can be made," Kleinbaum said. "It's one thing to turn off the sink when you're brushing your teeth. But to really make a difference, you have to look at your landscaping."

# # #

## **Water conservation efforts must expand in fifth year of drought**

Sacramento Bee | March 2, 2016 | Peter Gleick

A fifth year of California drought and continued water challenges now appear unavoidable, even with new storms on the horizon. Sadly, El Niño has so far failed to bring an end to four years of shortages. Some observers continue to hope that the remaining few weeks of winter will produce a “March Miracle.” Maybe. But the odds are increasingly against it.

Even worse, for the rest of winter to produce enough rain and snow to actually end the drought would mostly likely result in massive, damaging and unmanageable flooding – the other extreme from severe drought.

The drought has dried our wetlands, parched our soils, damaged fisheries, depleted our reservoirs, and hurt some farms and rural communities. According to the National Drought Mitigation Center, 99 percent of the state remains in drought, with nearly 40 percent in “exceptional drought” – the most extreme condition.

Even the moderate amounts of rain and snow we’ve received since October have done little to refill reservoirs, and there is no chance that the current levels of rain and snow will come close to recharging our dangerously overpumped groundwater, which have lost more than 8 trillion gallons (about 25 million acre feet) in the past four years.

The snowpack in the Sierra Nevada, while greater than last year’s record lows, remains below average for this time of year. Worse, a dry and hot February rapidly melted the snow that has fallen. Current statewide snow water content is about 80 percent of normal – a figure that will grow with coming storms but is still below what is needed.

Four years of drought have also drained the state’s extensive storage of water in our reservoirs. The 12 largest reservoirs began the winter with a shortfall of more than 2.2 trillion gallons of water (7 million acre feet). Even with the rains this winter, the shortfall remains at nearly 1.8 trillion gallons (5.5 million acre feet), a modest but completely insufficient improvement. That deficit is as much water as Metropolitan Water District of Southern California’s 19 million customers use in 2½ and a half years.

When it became clear the state was in a serious water crisis, Californians responded accordingly. Between June and December 2015, urban water users saved more than 330 billion gallons of water (1 million acre feet) – water that we’ve kept in our reservoirs to meet future needs. In February the State Water Board extended and revised emergency regulations to ensure urban water conservation efforts continue this year. Federal and state agencies have not announced final agricultural water deliveries, but there is zero chance that full allocations will be available, putting more strain on some farmers and farmworker communities.

What should we do? Conservation efforts must remain in place and even expand. Education about the need to save water must continue. New financial aid must be made available to rural communities without safe and reliable water and to farmers and cities seeking to modernize

water systems. And we must accelerate investments in the treatment and reuse of wastewater, stormwater capture, and programs for improving urban and agriculture water-use efficiency.

Finally, the evidence continues to grow that climate changes are making California's water problems worse. The last four years were, by far, the hottest on record, worsening evaporation from soils and reservoirs and increasing demand for water by crops and forests. Dramatic loss of Arctic ice may be altering how and when winter storms reach us. Higher sea-surface temperatures may have worsened El Niño without helping our water problems.

California will not dry up and blow away. Our economy has been robust and flexible in the face of drought. But if the drought continues, and even if it weakens, even greater efforts will be needed to ensure the most vulnerable communities and ecosystems are protected and that we invest in the infrastructure and institutions needed for a drier world and changed climate.

Dr. Peter Gleick is president of the Pacific Institute, a global water think tank in Oakland.

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## **Building resilient landscapes into flood protection and infrastructure projects**

Maven | February 25, 2016 | Conferences and Seminars

In the Bay Area, preparing for climate change impacts is one of several drivers leading flood protection agencies to pursue nature-based flood management practices. As agencies prepare to replace aging infrastructure, the next generation of flood protection can be designed to dampen the impacts of climate change, increase ecosystem resilience, and contribute to groundwater recharge.

At the State of the San Francisco Estuary conference last fall, Robin Grossinger, Senior Scientist for the San Francisco Estuary Institute, gave a presentation on the Landscape Resilience Framework, a project to provide a framework for systematically thinking about the many elements involved in integrated flood control projects.

He began by posing the question, how do we make our systems more resilient?

“Anticipating climate change, all the stresses we’re already dealing with, how do we make our ecosystems, our natural systems, and also our infrastructure that is intertwined with these systems, how do they adjust and accommodate to climate change and how do we improve that?” he said.

He started by defining what resiliency to an ecosystem means. “It’s basically the idea that a system’s functions that we care about – it could be number of salmon in the stream or riparian trees, it could be flood protection – and that service, it goes down and up a little bit. It might get hit by an event like a drought or flood, but if it’s resilient, the function persists. It doesn’t mean it doesn’t change through time, and adapt and evolve, but it maintains itself. When a big event of some kind, such as a drought or a flood or a fire, the system can crash or it can pull itself together and persist as a version of semblance of that system.”

There are drivers that are global phenomena that have impacts on our systems, but we can’t really control them locally, he said. “But there are a lot of steps in between that driver that is essentially given to us and the impact, and so what we do can amplify or we can dampen the impact,” he said. “The energy is going into the system, and we can either multiply it or increase it, or we can actually decrease it through these steps between the driver and the impact. We can have a major rainfall event, and we’re not going to control how much it rains, but what we do, I argue, will largely determine whether it is catastrophic flood or whether it’s just a big flow that stays in the channel.”

We can make our landscapes more resilient. “By looking at those arrows or those steps and seeing what we can do to affect the translation of those massive climatic drivers into system impacts, we can make our landscapes more resilient, and what we do is going to either amplify or dampen climate effects.”

Integrated approaches are the great challenge, but also the best hope. “Those solutions are going to need to be really integrated, like linking sediment and flood, how we manage water, stormwater, land use – that’s a really enormous challenge, just the way our systems are set up, but that is how we’re going to get the best results.”

A systematic framework can help. “It’s the way we create resilient landscapes, and resilient in the broadest sense too that people want to support them, people want to pay for them, they are not stopped by regulatory processes, and we think that a systematic framework can help.”

He said that in trying to apply reliance thinking, it’s a bit of a ‘hodgepodge’ of potential actions that could be taken, so a more systematic way to think through the elements that are needed to make systems more resilient and make sure they have them all, as those elements cross many disciplines and scale.

The San Francisco Estuary Institute recently developed the Landscape Resilience Framework that was developed with the guidance of a team of international and regional experts as well as local stakeholders. [Click here to download a copy of the Landscape Resilience Framework.](#)

Mr. Grossinger then gave some highlights of the framework. “The Landscape Resilience Framework has seven major principles, and each one has three or four subprinciples or tenets, and it’s a systematic way that we can think about systems in a more dynamic, less static way,” he said. “We’re thinking about processes that support the systems and the functions we want to have, thinking about the scale we need to be working at, thinking about connectivity, thinking about diversity and complexity – that’s the portfolio effect that we want to have so impacts aren’t translated the same way on all the different parts of our system – all the different ways we think about resilience. It’s actually in a lot of the ways, the way we think about resilience in our life with investments, diversification, shock absorbers or buffers – all the things we try to build into our lives, we need those in our landscapes, and they come from a lot of different dimensions.”

They worked with the experts and stakeholders to develop visions and strategies for resilient landscapes that they could then work towards through different projects and programs. “A few examples we’ve been working on is Flood Control 2.0, a vision that integrates flood protection and tidal marsh resilience to try to increase both of those through an integrated approach,” he said. “We’re working with Mike Connor and EBDA, thinking about treated wastewater and Baylands resilience and how do those integrate so we’re making more functional systems at the edge involving the water coming out of our systems. We’re working in the Delta to develop regional strategies, and we’re working more on urban redesign with Google and others including Santa Clara Valley Water District in the South Bay.”



There are flood protection challenges ahead, Mr. Grossinger pointed out. “There’s the probability of more intense unpredictable storms meaning we have to size bigger just partly for the uncertainty as well as what we know,” he said. “In the snowmelt systems, there is this huge change as the greater proportion of precipitation falls as rain, and then the greater recognition that much bigger events than what we’ve seen in the past few decades are probable, atmospheric river type events – really big storms.”

“Talking to flood managers and flood district staff, there’s are all of these other things that are equally are challenging: aging infrastructure, increasing challenges with environmental permitting, less federal funding to rely on, and low public awareness of the risk and the need for flood protection funding – because it’s been pretty effective in the last few decades,” he said. “So all these together make it potentially difficult in maintaining the level of protection that has been achieved, as well as some problem areas that still exist, but really looking towards the future and seeing there’s going to be a lot of work needed, and all of this together contributes to the larger sense of resilience or conversely vulnerability of these systems.”

“The area of overlap is where there’s a lot of opportunity to make our systems more resilient for a variety of reasons, but that’s the sweet spot where a lot of things are going to work and be successful in terms of funding, in terms of permitting, and in terms of actually being resilient for ecosystems and infrastructure,” Mr. Grossinger said.

He then gave two examples.

#### Example 1: Green infrastructure that supports or mimics natural processes

The resilience framework has a long list of actions needed for Bay Area streams, the principle of infrastructure mimicking natural processes is a fundamental change that would make our systems more resilient, Mr. Grossinger said. He gave an example from a project that the LID group at SFEI is currently monitoring at the San Francisco State University campus that collects runoff and directs it to a series of rain gardens.

He pointed out the rainfall event, noting that there had been three inches of rain the previous four days, so presumably things are pretty saturated. “That’s a fair amount of rain in a four day period,” he said. “The bars are the water coming into this series of rain gardens, and they pretty much track the rainfall, they are directly reflecting what happens. Here is the peak rainfall coming from all these hard impervious surfaces, and here’s what’s actually going out in the blue – nothing. For most of this whole storm series, and even when the storm peaks, half of what is actually coming in, so this is reducing the flood peaks, this is acting as a dampener, it’s reducing the effect of this event.”

They are working on another project funded by EPA, the San Francisco Estuary Partnership, the City of San Jose, and others looking at the sub-watershed scales and how would you get 30% runoff reduction. “The reduction of mercury and PCB loads to the bay is

actually the driver for this study, but they also looked at how that affected runoff, and in a 2 year storm, the modeling suggested it reduced the peak flow by 44%, so that's a pretty remarkable reduction. You even get a bit of groundwater recharge benefit, not huge, it's about 5% as there are clay soils in this part of the valley, but I think it would be much more in other parts of the valley."

It's an example of how you can have a big event, but have a better outcome because you've modulated things, he said. "If we look at what this arrow is, precipitation goes through all of this simplified flowchart to get to the impacts. Precipitation has to turn into runoff, it has to turn into peak flow, and these kinds of things lead to problems – some of these things are good for the ecosystem but at a certain level, they are bad for the ecosystem too, potentially, so there's all these steps, so what that project is doing is affecting the translation of precipitation to runoff, so it's dampening that effect so subsequent arrows are all smaller."

"So if we think about the actual mechanisms by which these changes are going to be carried through our systems, we can identify the opportunities for modifying them so we actually end up maintaining trees or flood protection services at the other end," he said.

#### Example 2: Riparian setbacks and floodplains

Riparian setbacks and floodplains are clearly an important aspect of resilience for these kinds of systems, he said. With the projected change of more of the precipitation falling as rain rather than snow, a three degree climate scenario has a big change – a big reduction in the amount of snowpack and with a big effect on runoff.

"A 3 degree increase creates twice as much runoff essentially from the same amount of precipitation, so in this case, we're actually amplifying the amount of precipitation by this other effect of climate change that's affecting the snowpack, so runoff and peak flow are bigger," he said. "This is why we're thinking about floodplains downstream, because you're talking about getting runoff that is potentially twice as much as what these systems were designed or even historically were used to, so a massive increase in flows, so a lot of the thinking right now is that we're probably going to need wider floodplains to deal with that."

He presented an example of a wider floodplain. "These are graphics from our Santa Clara River work, and you can see the amazing difference in the width of a river corridor historically here on a broad alluvial river and the big area of floodplain and riparian forest, and this is the area we have now on this example river," he said. "You can imagine how the same peak flow affects a system like this versus this and how much more intensity and scour and loss of riparian and potential for overbank flooding there is."

"So this is a way that we can actually impact the system back down at the peak flow level so while these vectors are changing and we may not have any control, we're still maintaining

these as not as altered, so that downstream, we hope we still are able to maintain the services and functions we want.”

### **In conclusion ...**

“In conclusion, there are many examples of how we can make our landscapes much more resilient,” Mr. Grossinger said. “In my mind, that’s the challenge of the next couple decades, I think that’s actually what we should be doing right now, we need to really mobilize and be effective at doing. We have a couple decades before those curves really ramp up, so we need to do that, and it really is every project, every time we plant a tree, every flood control project, every infrastructure project, those are all affecting the resilience of our system for the rest of the century.”

“It’s obviously a big challenge so we have to figure out how we can do that,” he continued. “Having a framework where we can organize our thinking and see the connections between the different parts of the system that usually are independently designed is critical, but I think the big challenge is how do we thinking for the environmental side is how to get this to have an effect on the big decisions made on infrastructure. I think that’s the sweet spot right here, trying to work collaboratively with different entities, the different sectors that design our landscapes and finding these sweet spots where we’re actually benefitting the full resilience of the system.”

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**The early March deluge is arriving just in time across the Bay Area, the Sierra Nevada and throughout Northern California.**

SF Chronicle | March 8, 2016 | Tom Strienstra

Across the board, the effects are immediate, and more rain and snow are on the way. Reports from near and far indicate that outdoor recreation will benefit for months to come. This comes just as the state was drying out.

The water level at Loch Lomond Reservoir, which had been closed for the past three years, rose so fast that the lake, near Ben Lomond in Santa Cruz County, was reopened for the weekend. According to estimates Sunday, the lake was about 85 percent full and climbing.

"We got so much water last night, the docks are underwater and most of the boats almost sank," said Jackson Branham, who works at the small marina at Loch Lomond.

In a 24-hour span, Ben Lomond (near the lake) got 5.64 inches of rain, and 4.44 inches fell at Boulder Creek, according to automated gauges. In nearby Big Basin Redwoods, all the waterfalls have been recharged, though trees downed in the storm are likely to provide obstacles on some remote trails.

In Marin County, lakes that are 100 percent full include Lagunitas, Bon Tempe, Alpine, Kent, Phoenix, Soulajule and Nicasio. In the watershed, Carson Falls and Cataract Falls have been recharged, along with other waterfalls across the county.

Across the East Bay foothills, the soil was drying out last week, even as golden poppies bloomed and the hills remained bright green. In Orinda, it rained 4.34 inches, saturating the soil and helping to raise water levels at nearby lakes. On Sunday, Briones was approaching 100 percent full, and Lafayette Reservoir was about 85 percent full.

Across much of the state, perennials such as poppies, iris, lilies and fiddlenecks will probably have spectacular growth and blooms once the rains pass and warm weather returns.

In addition, many small lakes filled, including Rollins near Colfax, Camp Far West near Marysville, Siskiyou at Mount Shasta and many others. Of the big reservoirs, giant Shasta came up three feet on Saturday and is 63 percent full, 85 percent of normal. The lake is 64 feet from the crest, a rise of 90 feet since early December.

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## **Recent Storms Increase Water Levels at California Lakes**

*Lake Shasta, the state's largest lake, is rising at a rate of three feet per day*

NBC Bay Area | March 8, 2016 | Mark Matthews

The recent rains in Northern California are pushing up lake levels at an impressive pace.

Lake Shasta, the state's largest lake, is rising at a rate of three feet per day. Last year, the lake was 29 percent of capacity. Today it has risen 100 feet above that low point to 67 percent full, and is climbing at a rate of 35,000 to 45,000 cubic feet per second.

"It's certainly good," said Doug Parker, who serves as director for the California Institute for Water Resources. "We're running pretty close to normal."

Parker said normal is fantastic compared to the past five years, but added the hope was water levels would be above normal.

Folsom Lake is currently 10 percent above its normal or average level for this time of year. In addition, Folsom Lake has opened its flood gates for the first time in five years.

In Santa Cruz, Loch Lomand reservoir is 85 percent full. The same can be said of Lafayette reservoir in the East Bay.

In Marin County, San Rafael-resident Gabby Ronick admits sometimes it is hard to toe the line on conservation when her kids want to play with the garden hose.

"The fact that it has been raining is the main thing we think 'We can let it slide this one time. We can let him play with the water.' We shouldn't be thinking that, but we do. It slips out," Ronick said.

Marin's water district has had a goal of cutting water use by 20 percent.

"And we're about 21 percent right now, so we're doing good." said Mike Ban with the Marin Municipal Water.

California gets 40 percent of its water not from reservoirs, but from wells. Parker said it takes a lot longer to fill an aquifer than a reservoir.

"Ground water can take anywhere from a year to five years to recharge," Parker said. "So we need a number of wet years in a row to really deal with this ground water issue, and to bring that part of the state where it needs to be."

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## **MID farmers this year could get 67 percent more water**

Modesto Bee | March 8, 2016 | Garth Stapley

A wet weekend boosted confidence enough for the Modesto Irrigation District to forecast 30-inch water allotments this year for farmers – welcome news after four years of drought and last year’s historic low of 18 inches, although missing the 42-inch average.

The MID board on Tuesday also learned that the irrigation season may start April 3.

Both predictions are subject to change, however, as the district hears from farmers in this week’s annual preseason grower meetings and as weather conditions evolve.

“It’s a good guess,” MID irrigation operations manager John Davids said when board member Nick Blom asked how solid the 30-inch estimate is. The district is expected to announce a more sure allotment at a March 22 board meeting.

“It’s looking pretty good,” board chairman Larry Byrd said. “This could be the miracle March we’ve all been hoping for.”

Early-season storms provided enthusiasm, followed by several dry and disappointing weeks. Measurements of snow and rain in mountains to the east, which drain to reservoirs critical for holding water needed through the summer, had been above average since mid-December until last week when cumulative totals actually dipped below the historical average.

But storms since Friday dumped 4.3 inches in the hills, giving MID and farmers more optimism. As of Sunday, MID had 195,564 acre-feet of water stored for the season – 43 percent more than this time last year.

Attorney Stacy Henderson, who represents some growers, said the 30-inch estimate is “wonderful.”

The March 9 meeting with growers starts at 7 p.m. at the DoubleTree Hotel, 1150 Ninth St., Modesto. Topics include a proposed water rate hike up for a board vote on April 19.

Average increases are hard to estimate, as the fixed, per-acre charge would rise from \$40 to \$44 while extra fees based on consumption could go up as much as 300 percent in wet years. Also, the board will decide April 19 whether to levy another drought surcharge.

If approved as proposed, MID’s water income would increase about 20 percent, from \$3.18 million to \$3.82 million. That amounts to 18 percent of what it costs MID – \$21.2 million – to deliver that water; the district makes up the difference with a subsidy from overcharging electricity customers tens of millions of dollars each year.

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**Drought hasn't been all bad—we've learned some things too, California water chief says**  
LA Times | March 1, 2016 | Peter King

It was the final Wednesday of a warm, dry February, and here as in much of California it seemed that spring had made an early arrival.

The sky was blue, temperatures mild. Almond and fruit trees were ablaze with blossoms. Along the highways, poppies were in full flower, competing for attention with ubiquitous Caltrans message boards that warned: "Severe drought/Limit Outdoor Watering."

Indeed, however pleasing in the abstract, the early turn of seasons has been not so welcome to those who keep watch on California water — and, in particular, to the Sacramento official who spent the last year cajoling the state's urban residents to cut back significantly on their water consumption.

"Crazy-making" is how Felicia Marcus, chair of the state water board and the political face of the ongoing drought, characterized a February in which nature suddenly turned off its taps. "Nervous-making."

This had been relentlessly ballyhooed as the year of El Niño, and the hope for a drought-busting winter tended to obscure caveats from climate specialists that, with long-term weather prognostication, there never is a sure thing.

December and January storms did create enough snow and rain to build the Sierra snowpack to somewhere near normal. Yet Marcus rated the wet year to date a "C-minus."

"After what felt like a deluge, and what felt like a massive snowfall, we now find ourselves at about average for this time of year," she said in an interview. "Obviously, the hot and dry February is disheartening for everyone. It feels weird."

That said, she is not without hope for what March and April might produce. At the mention of the drought-easing "March Miracle" of 1991, she placed her hands together as if in prayer and lifted her eyes toward the heavens, or at least the ceiling — a human emoji to aptly depict where California stands as it contemplates the possibility of a fifth year of drought.

"We will be grateful for every raindrop and every snowflake that we get," she said. "We'll be counting them. But we just can't know, so we have to cross our fingers. And hope."

She noted that the state is in better shape than a year ago, when the crucial Sierra snowpack went missing altogether.

Still, without a late-breaking miracle, the wet year has not brought enough relief to fill the major reservoirs, replenish the over-tapped aquifers or allow suburbanites to ditch their shower buckets and turn on the sprinklers full bore.

On the bright side, Marcus can look back on the last year and see any number of advances being made in how Californians capture, use and even think about water — lessons forced by drought, but with longer-term applications as the state grows and climate change alters the water landscape.

For example, that half of all urban water consumption is spent on landscaping seems to have sunk in, as has a greater appreciation for the hardiness of lawn grass. In Northern California at least, lawns that went brown in the summer and fall are now green — following the natural cycle of the foothills.

"It is hard to kill grass," Marcus said. "And while I don't think in the long run it's realistic to think people are going to keep their lawns brown forever, I do think folks have learned they don't need as much water as they have been dumping on them.... So that is a real 'aha' for people."

Also demonstrated through eight months of mandatory cutbacks is that reducing consumption by nearly 25% is doable — a mark Marcus feared would be unattainable when the order went out.

Marcus grows most animated when discussing a movement underway at many local agencies up and down the state — one aimed toward integrating traditional water delivery with enhanced recycling, storm-water capture, underground storage and the like.

Not the stuff of statues and naming rights, perhaps, but collectively these efforts have the potential to create a new day for California water.

"This is a high-value, low-glamour play," Marcus said, ticking off multiple efforts underway from the Southland to Santa Clara. It is essential work, she said, if climate change as predicted undermines the Sierra snowpack in the not-so-distant future.

"All of the conflicts we have today are going to seem like a picnic if we don't change how we use water," she said. "And that means everything. It means conservation. It means recycling. It means storm-water capture. It means desalination in the appropriate circumstances. And it means more storage, above ground and below."

In the meantime, there is the looming dry season to address.

Is she worried?

Yes.

"I worry that we are going to be in another year of drought. I am worried about those communities, particularly small rural communities in the Central Valley, that are out of water and need a respite from that....

"I worry about small farming families that don't have senior water rights and have to fallow their fields and the citrus growers who don't have groundwater they can rely on.

"I worry about how those tensions exacerbate nonproductive rhetoric that pits urban versus agriculture, or fish versus farmers, or fish versus people. Or picking on a given crop

when what we really need to be doing is embracing an all-of-the-above strategy so we can all get better together, rather than wasting time vilifying a number of very legitimate needs."

The emergency declaration that allowed mandatory conservation was extended earlier in February, a move that met with some resistance but with each dry day seems a bit more prescient.

The amount of mandated conservation, if any, will not be decided until the end of April, giving nature, and El Niño, a last chance to get busy. If it becomes necessary, Marcus is not worried that Californians, drought fatigue or not, will fail to rise to the moment, again.

"I think folks can do it again if the situation is as dire," she said. "If it is not as dire, you don't want to make them do it."

So for now it is a waiting game.

"Is this rain and snow we have gotten just a punctuation mark in a longer sentence, a longer paragraph, a longer story? Or are we going to get a year or two breather before the next one?"

Only March and April are left to provide an answer.

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## **Marin assemblyman Levine's bill uses Australian approach to address drought**

Marin Independent Journal | February 29, 2016 | Richard Halstead

Assemblyman Marc Levine has introduced a bill that could put California on the road to developing a water trading market similar to one pioneered by Australia during its "millennium drought."

"I looked at how Australia dealt with its 14-year drought and saw that water transfers had a good deal to do with them using their water more efficiently," said Levine, a Democrat who lives in Marin. "I wanted to take the best lessons from how other countries have struggled with drought and apply them to California."

Under state law, the Department of Water Resources is required to facilitate the voluntary exchange or transfer of water by maintaining a list of entities seeking to enter into water supply transfers, leases, exchanges or similar arrangements, and to keep a list of the facilities available to carry out water supply transfers.

Levine's bill, AB 2304, would mandate that this information be made available in real-time via a website.

"Water transfers are important," said Tim Anderson, who manages state legislative programs for the Sonoma County Water Agency and serves on the board of the California Groundwater Coalition. "They are a means to efficiently allocate our limited resources to where we have the greatest need. The bill that is being proposed would help create a more transparent, accessible system, which would allow us to make better decisions about water allocation."

Creation of the website would be the job of a new California Water Market Exchange that would operate within the state's existing Natural Resources Agency and be overseen by a five-member board.

The board would be charged with streamlining and expediting review and action on water transfer applications. The bill also directs the board to prioritize projects that provide environmental and community benefits, such as clean drinking water.

"Simply improving the ability to transfer water between users in California through more accessible water markets could unlock over 4 million acre feet of water," Levine said. "That is the equivalent of a new Lake Shasta."

David Festa of Mill Valley, senior vice president at Environmental Defense Fund, said Levine's bill will lay the foundation for a modern water transfer system in California. He said the state already has a set of rules for conducting water transfers.

"The problem," Festa said, "is over time those rules have become more and more complicated so it has become expensive to participate in a water transfer market."

"Also, there is not a lot of good information about who has water to sell or who wants to buy water," he said. "It's very much like the olden days before there was an Internet and you wanted to sell your car."

Under California law, the first person historically to appropriate a quantity of water from a water source for "beneficial use" holds the right to continue using that quantity of water for that

purpose. Under appropriative rights systems, such as California's, rights holders may forfeit their rights if they use less than their full water allocation.

"Agricultural users have the lion's share of the usage rights for water that California currently dedicates to human use," Festa said.

Festa said greater trading would foster more trading between farmers as well as freeing up more water for the environment and urban dwellers.

"When you have more water moving around," Festa said, "you don't have to draw on ground pumping or taking more water out of rivers so right there you create an automatic benefit for the environment."

In addition, he said there may be cases where environmental groups will purchase water to ensure that there is water in a particular stream during a time that is important to fish.

Levine said in Australia, "The government actually purchases at market cost water for the environment. Environmental advocates in Australia supported this move because they were able to know with certainty how much water they were going to have for environmental purposes."

The Australian government also purchased senior water rights from landowners. Levine said he doesn't see that happening any time soon in California.

# # #



## **Southern California water giant agrees to buy delta islands**

SF Gate | March 8, 2016 | Peter Fimrite

The powerful Metropolitan Water District of Southern California agreed Tuesday to buy four islands and a portion of a fifth in the Sacramento-San Joaquin River Delta, a bid that some conservationists believe is a blatant water grab by California's largest water agency.

The district's 37-member board of directors, representing 26 agencies in Southern California, authorized Metropolitan's general manager to enter into a purchase agreement to buy 20,369 acres of land encompassing Webb Tract, Bacon Island, Bouldin Island, most of Holland Tract and a portion of Chipps Island, in Contra Costa, San Joaquin and Solano counties.

Two of the islands — Bouldin and Bacon — are directly in the proposed path of Gov. Jerry Brown's controversial twin-tunnels project, which would divert supplies from the Sacramento River southward, including to farms and many of the 19 million people who get their water from the mammoth district.

The proposed sales price was not released, but the potential benefits to the water district are clear.

Acquiring the islands would give the district more leverage in the bitter battle for delta water, especially if California's four-year drought continues. Metropolitan would also profit from owning water rights and rights-of-way at the source of their drinking supply.

The sale would also give Metropolitan the ability to use the islands to stockpile riprap and other supplies for levee fixes and as a staging area for tunnel construction, according to an agency staff report.

"It's an exciting opportunity that perhaps instead of talking about what might be done in the delta, perhaps we can start to get some things done," said Jeffrey Kightlinger, Metropolitan's general manager.

He said the sale would also allow the Southern California agency to implement environmental benefits, including waterfowl protection, restoration of wetlands habitat for the delta smelt, carbon sequestration and turbidity studies.

Local conservationists weren't so excited. They have compared the pending sale to the movie "Chinatown," the 1974 Roman Polanski film about deceptive tactics used by Los Angeles interests in 1937 to secure water rights to the Owens Valley, east of the Sierra.

"It's definitely an existential threat to the delta and delta communities," said Barbara Barrigan-Parrilla, executive director of the conservation group Restore the Delta. "Truly, it's like having the fox right in the middle of the henhouse."

The owner of the land, Delta Wetlands Properties, a subsidiary of insurance giant Zurich, recently gained approval to build reservoirs and flood Bacon Island and Webb Tract, which are below sea level, and convert Bouldin Island and Holland Tract to wildlife habitat. But Kightlinger said the water district is not interested in using the islands, which are protected by levees, as reservoirs.

The board of directors' vote was far from unanimous — only 54 percent of the weighted vote sided with the purchase agreement, raising questions about whether the district is fully committed. Two of the biggest members, the city of Los Angeles and the San Diego County Water Authority, voted against the deal. The city of Santa Monica joined them in opposition, but failed in a motion to delay the vote.

Kightlinger will now enter into a purchase agreement, triggering a 60-day escrow period. The district board scheduled a meeting for April 26 to review the terms one last time before committing to the purchase.

# # #

## **More hard work ahead for water management says State Water Board leader**

Chico Enterprise Record | March 4, 2016 | Heather Hacking

Chico – California has water problems. Even before the drought, fish in rivers were struggling, groundwater is polluted and there is not enough water to meet demand.

That's all reality, said Felicia Marcus, chair of the State Water Resources Control Board, who was in Chico on Friday to talk water.

The event was the 24th annual meeting of Northern California Water Association attended by several hundred people at Sierra Nevada Brewery.

Marcus praised leaders in Northern California, and specifically from NCWA, for being thoughtful in their approach to water issues.

"When folks can acknowledge complexity and look for solutions that meet more than their own needs, I respect them," she said.

Water issues can make people angry and defensive, however solutions need to be considered with a more open mind, she said.

Some urban dwellers are quick to blame agriculture for the state's water problems, as an example. Marcus said she can be counted on to defend "agriculture against really dumb sound bites." People need to be reminded that it takes water to grow food and that food is not "beamed from another planet."

As for problems in the state, they're real and will only become more challenging over time. The drought dilemma is far from over.

As chair of the State Water Board, Marcus was at the center of the conservation rules for households throughout the state. It was Marcus who talked clearly about military-style showers, nozzles at the end of hoses and using a broom to clean the driveway.

Those rules were important, and remain important, because we don't know what the future has in store, Marcus said.

### **Lessons down under**

The extended drought in Australia during the early part of the 2000s was an important lesson to California, she explained.

People in Australia were accustomed to three-year drought cycles. Yet, a three-year drought cycle turned into six dry years, and six dry years turned into a dozen. During the process, Australia needed to spend billions of dollars all at once to keep the country going. One thing that can be learned from Australia is not to expect the next year to bring rain, she said.

This is one of the reasons California leaders chose to continue water conservation beyond the original deadline of February, Marcus said. The current plan is to re-evaluate mandatory conservation in early April.

Drought has touched all corners of California, creating many issues, some competing.

“Our job at the State Board is to be in the middle of everyone,” she said.

She praised Northern California water leaders, and specifically those involved with the Northern California Water Association, for providing strong advocacy for their own position but also helping to come up with solutions for the state as a whole.

This is “not only helpful, it makes us want to help you even more.”

### **Groundwater**

Coming soon will be plans for regional groundwater management, with local agencies working now to meet new rules from the state. This is entirely new to the history of California water use.

After her talk, Marcus told the Enterprise-Record that there has not been much opposition to the state groundwater rules because they were needed. Local water managers could see that land use changes could quickly draw down groundwater supplies.

Lower groundwater levels and land subsidence (permanent shifts in groundwater elevation) have occurred throughout the state, particularly in the Central Valley. In the Sacramento Valley there are only a few reports of subsidence, and people would like to keep it that way.

The deadline for the groundwater management plans is 2022. The way the rules are structured, local groups will set up the new groundwater rules. If that doesn’t work, the state is prepared to step in and be the “800-pound gorilla,” Marcus said.

### **Loss of snow**

One daunting change in store for California is climate change.

Marcus said an increase in temperature by just a few degrees will mean the loss of California’s snowpack. Snowpack is 1/3 of the state’s water storage in an average year, she explained.

Will that happen in two decades, or four decades? Marcus said no one knows. Yet, when it does, the water “conflicts of today will look like a picnic,” she said.

Any one solution is not going to solve the problem, she continued. To meet future challenges, people in California need to re-use water, conserve water and store water, she continued.

There will also be problems we can’t even envision today.

“Sea levels will rise,” she said, which “can’t be good considering how hard it is to maintain salinity levels” now in the delta.

Inevitably, the population will increase. “We are not going to eat our young,” she quipped.

However, Marcus said she maintains her optimism.

“The beauty is that we can do something about it.”

She said struggles of the future will require “our human skills” and the ability to bring respect to problem-solving.

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## How Reliable Are Silicon Valley Water Sources?

*Depending on where you live in San Mateo or Santa Clara counties there are many places your water could come from – and, as the drought has shown, some of those sources are more reliable than others. Here's a look at the pros and cons of the most important sources*

Water Deeply | February 24th, 2016 | Tara Lohan

SAN MATEO, California – Tucked in the woods off Cañada Road in Redwood City is an unusual part of California's water system. The Pulgas Water Temple is a Beaux Arts style pavilion with fluted columns that pay homage to ancient Rome. It's a fitting tribute because the temple itself is a monument not just to water, but to water engineering – something for which the Romans are lauded.

A Biblical inscription at the top reads, "I give waters in the wilderness and rivers in the desert, to give drink to my people."

The temple marks the terminus of the aqueduct that stretches more than 160 miles (255km) from the Sierra Nevada to San Mateo County. This is known as Hetch Hetchy water – named after the controversial project enabled by the Raker Act in 1913 that let San Francisco dam a valley in Yosemite National Park to capture the pristine snowmelt and runoff that flows into the upper reaches of the Tuolumne River.

The flooding of Hetch Hetchy valley for the reservoir was decried by many at the time, including famed environmentalist John Muir, but today as water stress has increased in California, most view the project as a great boon for San Francisco.

But the City by the Bay and its 837,000 residents are not the only benefactors. In fact, 2.6 million people in the Bay Area drink from the Hetchy system, among them many residents of San Mateo County and Santa Clara County.

As important as Hetchy is, though, it's not the only source of water in these Silicon Valley counties. Depending on which town you live in, your water may come from Hetchy, the State Water Project, the federal Central Valley Project, groundwater, recycled water or local surface water. In some cases it's a combination.

Each of the water sources has pluses and minuses, which are becoming more apparent as California's drought continues. How each community weathers this drought (and future ones) depends on the reliability of its water system – and that can vary by town.

For those towns in San Mateo County, understanding the reliability of the water system means understanding how the Hetchy system works because 90 percent of the water supply for the county comes from Hetchy.

But the San Francisco Public Utilities Commission (SFPUC), which runs that system, doesn't supply water directly to residents in San Mateo County as it does in San Francisco. Instead the SFPUC sells to 16 different agencies in San Mateo County, which then supply the water to local

residents and businesses. A few of these agencies are run by private water companies, but most are run by water districts or municipalities themselves. This means that even though the water supply may be the same in most places, rates can vary. At the wholesale level, Hetchy water can be among the most expensive in the state, but for good reason.

The water, which travels from the mountains to the Bay Area via a gravity-fed system, is known for being good quality and also a reliable source. One of the advantages is that it's draining snowmelt from high mountain elevations. The higher up you are, the better chances are that precipitation will fall as snow, instead of rain, which means more water in the warmer months when demand is high. Some other California water systems rely on mountain runoff too, but from headwaters much lower in elevation.

SFPUC and the other water agencies using Hetchy water also have kicked in \$4.6 billion of capital improvements to the system especially aimed at increasing reliability and resistance to earthquakes. But the system does have one big potential weakness – 85 percent of the water comes from the Tuolumne River, which means the vast majority is from one source. Sounds problematic, right?

"We used to think that the single-source agencies would be more vulnerable because they only had one supply, but with this drought, because of the way it hit the state systems harder, it turns out the agencies with multiple sources ended up having to take a greater reduction," said Nicole Sandkulla, CEO and general manager of the Bay Area Water Supply and Conservation Agency (BAWSCA). Her organization represents the 26 member agencies in San Mateo, Santa Clara and Alameda counties that are served by the Hetch Hetchy system.

"So the theory didn't prove in practice," she said and explained that while some water providers (like those in Santa Clara County) had cutbacks to their allocations because of drought, the SFPUC didn't. It did ask for 10 percent voluntary reductions from retailers, but its rather meager request was overshadowed by the 25 percent cuts mandated statewide by Gov. Jerry Brown.

As good as all this seems, that doesn't mean that San Mateo County residents are happy to sit back and watch the water flow down from the mountains. There are still other issues to contend with.

"The supply that we have from Hetch Hetchy is pretty reliable, and in normal years is a pretty comfortable feeling," said Adrienne Etherton, executive director of the nonprofit Sustainable San Mateo. "But this extended drought has really made people start to think about it a lot more and the people who are really in the know are really pushing to try and diversify and find new sources."

East Palo Alto, for example, gets its water from the Hetchy system but the town's needs exceed their supply allotment and without more water, growth will be hard. So East Palo Alto is in the process of redeveloping a groundwater well previously shuttered because of water quality issues.



A project is also underway in the northern part of the county with Daly City, San Bruno and the California Water Service Company to use a local groundwater basin to “bank” water in wet years.

“We are looking at new investments in other supplies that increase that reliability in dry years, things like doing a water transfer, looking at a brackish groundwater project locally, those types of projects,” said Sandkulla. “There is also huge interest in the region in onsite reuse and lots of talk about indirect and direct potable reuse.”

While most of San Mateo County has some tie to the Hetchy system, residents of Montara, just south of Pacifica on the coast, are in another boat entirely. They are served by the Montara Water and Sanitary District, which relies entirely on local sources – about 85 percent of which is groundwater, while the remaining 15 percent is surface water.

Clemens Heldmaier, the district’s general manager, says that despite drought, “we didn’t have any water supply issues in the past years and we don’t foresee any water supply issues in the coming years, even if the drought continues.”

But, he cautioned that no one knows how severe the drought will be and when it will end. “We have access to different aquifers and some of those are fairly drought proof,” he said. “But what ‘drought proof’ means, is not 100 percent clear.”

For Santa Clara County’s nearly 2 million residents, things are even more complicated. Just over half of the water is imported and 15 percent of that is Hetchy water. This makes up part of the water supply for eight towns: Alviso, Los Altos Hills, Milpitas, Mountain View, Palo Alto, San Jose, Santa Clara and Sunnyvale.

None of the 17 water agencies in Santa Clara County rely on a single source of water. The biggest amount of water, 40 percent, is pumped through the Sacramento-San Joaquin Delta from Sierra runoff and is delivered through either the State Water Project or the federal Central Valley Project, which also supplies water to millions of Californians across the state and much of the agricultural interests of the San Joaquin Valley. All but two water agencies in the county rely on the Delta for at least some portion of their water supply.

One of the biggest vulnerabilities of relying on water supplied by the state and federal projects through the Delta is that there are more competing interests for the water. And that makes a string of consecutive drought years especially tough. The Delta’s water issues are a political tangle as farmers, fishermen, environmentalists and urban water users jockey for limited resources.

Many farmers saw their water deliveries severely cut or eliminated altogether last year, and even the Santa Clara Valley Water District (SCVWD), a wholesaler that helps supply and manage water in Santa Clara County, received a cut in allocation.

“We had the lowest combined allocation of state and federal water in all of the years that we’ve been taking it – since the early 60s,” said SCVWD’s deputy operating officer Garth Hall.

Because of the reduction in imported water from the Delta, SCVWD's board called on its retail members across Santa Clara County to reduce water use by 20 percent in 2014 but members achieved only 13 percent reductions that year.

Shortfalls of Delta water were complemented by 10 local reservoirs and a large groundwater basin. But that, too, had its limits. "The retailers in north county resorted to groundwater pumping because our treated water supplies were reduced in 2014," said Hall. "The net result was that we had a fairly severe depletion of our groundwater basin."

Roughly 20 percent of the total annual water supply of the entire county was pulled from the groundwater in excess of what was being replenished. "So the water levels in the ground fell quite badly," he said.

In 2015 SCVWD called for 30 percent conservation, which exceeded even the governor's statewide mandate, and customers stepped up big this time, reducing water use by 27 percent, which paid off.

"We managed to halt the decline in water levels in our basin so we ended up at the end of 2015 with groundwater levels that were no worse and possibly the same as 2014."

The focus for the county continues to be on improving reliability and increasing supply for the future. Hall said they are considering whether to participate in California Water Fix, a \$15 billion plan by the governor to build two tunnels underneath the Delta in an effort to increase the reliability of water deliveries.

Closer to home there is also an \$800 million project underway to expand a water recycling facility to produce potable water that could be mixed with groundwater. It's in the planning phase now, said Hall, but they are hoping by 2020 it will provide 10 percent of the county's water supply. It will be more expensive per acre-foot than Delta water, but more reliable.

Water recycling is an effort Sustainable San Mateo's Etherton hopes gains more traction in Silicon Valley communities. "I think it's really an opportunity that we need to be putting more effort behind and trying to speed along," she said. "If we get some more rains, I hope it doesn't end that progress."

# # #

## **Hearing Explores Funding for State's Underfunded Water Needs**

ACWA News | March 8, 2016 | Pamela Martineau

California lawmakers and stakeholders from throughout the water community today focused on ways to fund the state's chronically underfunded water needs during a hearing of the Senate Natural Resources and Water Committee.

Sen. Fran Pavley (D-Agoura Hills), who chairs the committee, said the hearing was a continuation of one held last fall that focused on unfunded water needs with a focus this time on how to pay for those needs.

Rachel Ehlers, of the state's Legislative Analyst's Office, provided context on the issue by presenting a LAO brief on water-related funding. Citing a report from the Public Policy Institute of California, the brief highlighted the fact that the vast majority of water-related funding in California is at the local level. According to the PPIC report, local sources spent about \$25.6 billion between 2008 and 2011, or 84% of statewide total water spending. The typical local funding sources include fees for water and sewer services, property taxes and assessments, developer fees, other local taxes, and money from local government general funds. By contrast, spending from state sources during that time period is estimated to be \$3.7 billion, or 12% of total funds. Federal sources contributed \$1.2 billion or 4% of total funds.

The LAO report also stated that costs for local water agencies are likely to increase, in part because of aging infrastructure, higher costs to obtain water and higher regulatory requirements. At the same time costs and needs are rising, significant restrictions on local funding exist such as Proposition 218, which requires higher voter approval for certain new fees and stricter "cost-of-service" requirements for some fees.

ACWA Executive Director Timothy Quinn testified about funding constraints facing local water agencies under current law, which requires different procedures for different types of infrastructure. Agencies seeking to fund activities such as storm water capture or flood control must meet higher thresholds for voter approval, he said. In addition, agencies interested in adopting tiered rates or lifeline rates for low-income customers face some constraints under existing law.

Quinn explained that a coalition – which includes ACWA, the League of California Cities and the California State Association of Counties – has filed a potential ballot initiative that would amend the state Constitution's Article X to create a new, optional funding method local agencies could use at their discretion to finance stormwater, flood control and other water and sewer-related projects and pursue conservation-based water rates or lifeline rates for low-income households. He said the coalition would decide in coming weeks to pursue the initiative or a parallel legislative strategy.

"This demonstrates the willingness of local agencies to stand up to their responsibilities to fund local water systems and infrastructure," Quinn said. "The proposed measure is about finding additional funding to do that."

Quinn also stressed that ACWA “will continue to oppose a public goods charge as a way of financing” water system improvements and programs.

Newsha K. Ajami, director of urban water policy for Water in the West, testified that California needs a sustainable funding source to “move the water system forward.”

Laurie A. Wayburn, co-founder, co-CEO and president of the Pacific Forest Trust, outlined some of the challenges facing the state’s watersheds.

Deven Upadhyay, group manager in water resource management for the Metropolitan Water District of Southern California, testified on how future water reliability requires a diverse approach that includes demand management and local resource development.

# # #

## **California Government Prepares For Extreme Effects Of Climate Change**

CBS San Francisco | March 8, 2016 | Hannah Albarazi

SAN FRANCISCO (CBS SF) — California has released its plan to deal with the potentially extreme effects of climate change.

California's Natural Resources Agency released a final plan Tuesday that spells out how California will prepare for the extreme weather and sea level rise expected to accompany Earth's changing climate. The plan aims to enhance the state's readiness for future droughts and wildfires as well.

The report, *Safeguarding California: Implementation Action Plans*, comes in response to a 2015 executive order by California Governor Jerry Brown establishing a greenhouse gas reduction target for the state and a directive to state agencies to make informed decisions while avoiding high costs when faced with the impacts of climate change. The report takes recommendations from the 2014 report, *Safeguarding California: Reducing Climate Risk*.

More than 25 state agencies, departments, boards, and commissions, as well as members of the public, contributed to the report released Tuesday.

"From eroding sea cliffs to shrunken mountain snowpack, many effects of climate change in California are obvious," California's Natural Resources Agency Secretary John Laird writes in the report. "Other effects are not so obvious but potentially powerful. Warmer average temperatures will affect everything from whether butterflies survive to where wine grapes can grow."

The report describes the many environmental threats facing California and highlights possible mitigation and adaptation measures that can be taken by the state government to protect residents, property and natural systems.

The focus of the report is on water, agriculture, biodiversity, emergency management, energy, forestry, land use, coastal resources, public health, and transportation. The report states its aim is to ensure "that people, communities, and natural systems are able to withstand the impacts of climate disruption."

Adaptation ideas are also highlighted in the report and include concepts such as shading concrete sections of cities and retrofitting fish hatcheries to cope with warmer stream water.

Ultimately, the report states that much is known about what threatens California, but that different industries must work together to mitigate those hazards.

"We know that healthy forests clean our air and water, wetlands help absorb rising tides and storm surges, and parks, open space, and farmland sequester carbon and minimize the effects of urban heat islands," the report states.

The report states that climate change threatens California's robust, and often year-round, agricultural industry.

California's agriculture industry produces far more than the state consumes, with over 400 commodities valued at \$54 billion in 2014. California grows a third of all vegetables in the U.S. and two-thirds of the country's fruits and nuts, according to the report.

A study by the University of California at Davis estimates the total economic impact of the 2015 California drought at \$2.7 billion, with an estimated loss of 10,100 seasonal farm worker jobs.

The report states that "every sector and every lever for change in government has to be a part of the strategy."

Sections of the report also describe the threat that climate change poses to the state's most vulnerable residents and stresses the importance of "incorporating diverse voices in the planning of our adaptation strategies" in order to increase their effectiveness.

Each of the 10 state sectors will report to the Natural Resources Agency in June on the implementation action plans and, as required by state law, by January 1, 2017, the Natural Resources Agency will release a draft climate adaptation strategy.

# # #

## **UC Researchers Provide Guide on Groundwater Law**

UC Water | March 8, 2016 | Leigh Bernacchi

“Designing Effective Groundwater Sustainability Agencies” is a how-to on managing an invisible, shared water resource during a drought

Until now, California has never attempted to manage or regulate groundwater use.

But the Sustainable Groundwater Management Act of 2014 (SGMA) is historic legislation gives local entities the potential to bring their groundwater basins into sustainable condition.

To help groundwater managers succeed at this new task, a team of researchers has provided a set of guidelines based on examples from law and natural resources.

“Designing Effective Groundwater Sustainability Agencies” is available at the Berkeley Law website, and describes nine connected criteria to support the two main goals of efficacy and fairness. The researchers contend that how a groundwater sustainability agency (GSA) is formed and conducted determines how secure and sustainable the basin’s resources will be.

The UC Water research initiative, directed by University of California Merced Professor Roger Bales, partially supported the report. “The formation of effective, fair groundwater agencies to implement California’s 2014 forward-looking groundwater act may be the most important thing we do this year to provide a secure and sustainable water future for generations to come,” Bales said.

Amidst the worst drought in California’s recent history, the legislation holds agencies accountable to stop “significant and unreasonable” impacts on groundwater storage, quality and levels.

The study’s lead author, Michael Kiparsky, is the director for two water organizations: Wheeler Water Institute at the Center for Law Energy and the Environment at UC Berkeley, and the UC Berkeley campus arm of the UC Water Security and Sustainability Research Initiative. Kiparsky has written several pieces on water governance with colleagues, but this one addresses what he calls “the most significant water legislation to have come to California in decades.”

He calls the act a “tremendous opportunity.”

The report aims to help agencies overcome barriers to good management, such as the technical aspects of groundwater, the law’s fast timeline for establishing groups and plans and the need to for agencies to finance their own management.

“It’s more difficult to change an agency that has already been created and started to do its work than it is to try and create that agency with the right structure in the first place,” Kiparsky said.

Among the nine criteria to guide groundwater agencies:

- Financial resources are crucial to any agency that’s trying to achieve an unprecedented goal like groundwater sustainability in California;

- Independence, or insulation from undue and unwanted influence, will help the agency make unpopular decisions; and
- Being accountable, taking responsibility for decisions and making it clear who the agency is accountable to, locally and at the state level, helps build credibility and public trust.

All of the criteria contribute to the efficacy and fairness of management of a common pool resource, which is extraordinarily complicated.

As groundwater managers prepare their organizations and plans to meet the law's timeline, this guide will help define a path to success.

# # #

*For more information about SGMA, visit the California Department of Water Resources website: <http://www.water.ca.gov/groundwater/sgm/>.*

*Contact Michael Kiparsky with questions: [kiparsky@berkeley.edu](mailto:kiparsky@berkeley.edu).*



## **Technology Leaders Identify Imminent Threats to U.S. Water Security and Call for Comprehensive Strategy to Map a Secure Water Future for the Nation**

Business Wire |February 29, 2016 |

SAN FRANCISCO--(BUSINESS WIRE)--Today, a group of leading U.S. technology experts from across the corporate, government and academic sectors issued a joint “call to action” to develop a comprehensive water innovation strategy for the United States.

“It is time for the United States to develop a long-term water strategy designed to accelerate research, drive commitments to action, and unlock funding for the investments and innovations we need to secure a sustainable and resilient future.”

At the “Disruptive Resilience: Chief Technology Officers Map America’s 2030 Water Future” conference today, a cross-section of diverse experts and Chief Technology Officers debated and deliberated how to best leverage breakthrough technology advances to transform how the nation’s water resources are managed in order to create a secure water future for the next century.

This private gathering was convened by national leaders in the water sector including Felicia Marcus, Chair, California Water Resources Control Board; Harlan Kelly, Jr., General Manager, San Francisco Public Utilities Commission; Patrick Decker, President and CEO, Xylem Inc.; and Ambassador Paula J. Dobriansky, Vice Chair, the U.S. Water Partnership.

Leading U.S. companies represented included: Google Inc., Black & Veatch, CDM Smith, The Dow Chemical Company, McWane, Inc., OSIsoft, Inc., Valmont Industries and many others. There were also financial sector organizations including Pegasus Capital Partners, XPV Water Partners, the Westly Group, and others.

A recent National Climate Assessment report concluded that the United States will face growing water challenges related to aging infrastructure, water pollution, and climate change in the coming decades. Cities – which are projected to be the home to more than 364 million Americans by 2050 – will be increasingly vulnerable to water risks. Innovative technologies will be required to support growing demand, protect cities from floods and droughts, and protect the nation’s valuable water resources.

Ms. Marcus said, “In California and nationwide, America’s communities face enormous challenges presented by droughts, floods, aging infrastructure, and the need to keep pace with updated science and growth – issues that will only intensify in the future. Technological innovation – and access to it – is essential to building the efficient and effective water systems we need now.”

Mr. Decker followed, “It is time for the United States to develop a long-term water strategy designed to accelerate research, drive commitments to action, and unlock funding for the investments and innovations we need to secure a sustainable and resilient future.”

The assembled experts recognized the importance of collaborative innovation across business, public and private research institutions and universities, and stressed that more coordination among these sectors will accelerate progress. Based on the discussion, the conference conveners outlined specific steps to restore and rebuild the water systems for our nation's growing population in 2030 and beyond with the following call to action for national leaders, including those in Congress and the next Presidential Administration:

- Establish a Presidential Commission to draft a water strategy for the United States, drawing on leaders from state and local governments, universities, citizen organizations and the private sector to engage experts in regional dialogues that will ensure broad perspectives and innovative solutions, including funding sources and innovative financing models;
- Place technology innovation, commercialization and sustainability at the heart of this national water strategy, including increased support for basic research and development in technologies relevant to the nation's water challenges; and
- Engage the nation's extended research and development community, including innovators based in universities, national laboratories, corporations, start-ups and venture capital firms, in the identification, development and dissemination of disruptive water technologies.

The U.S. Water Partnership will work with the conference conveners and other key stakeholders to further develop this call to action in support of the upcoming White House Water Summit in Washington, D.C., to take place on World Water Day (March 22, 2016).

#### About Xylem

Xylem (XYL) is a leading global water technology provider, enabling customers to transport, treat, test and efficiently use water in public utility, residential and commercial building services, industrial and agricultural settings. The company does business in more than 150 countries through a number of market-leading product brands, and its people bring broad applications expertise with a strong focus on finding local solutions to the world's most challenging water and wastewater problems. Xylem is headquartered in Rye Brook, New York with 2015 revenues of \$3.7 billion and approximately 12,500 employees worldwide. Xylem was named to the Dow Jones Sustainability Index, North America, for the last four years for advancing sustainable business practices and solutions worldwide, and the Company has satisfied the requirements to be a constituent of the FTSE4Good Index Series each year since 2013. For more information, please visit [www.xylem.com](http://www.xylem.com).

#### About SFPUC

The San Francisco Public Utilities Commission is a department of the City and County of San Francisco that provides retail drinking water and wastewater services to San Francisco, wholesale water to three Bay Area counties, and green hydroelectric and solar power to San Francisco's residents and municipal departments.

## About California Water Resources Control Board

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Boards) protect water quality and allocate surface water rights. The State Water Resources Control Board has jurisdiction throughout California. Created by the State Legislature in 1967, the Board protects water quality by setting statewide policy, coordinating and supporting the Regional Water Board efforts, and reviewing petitions that contest Regional Board actions. There are nine regional water quality control boards that exercise rulemaking and regulatory activities by basins. This organization is a result of the landmark Porter-Cologne Act.

## About the U.S. Water Partnership

Announced in March 2012, the U.S. Water Partnership (USWP)'s mission is to unite and mobilize the best of U.S. expertise, resources and ingenuity to address global water challenges where needs are greatest. Due to the breadth of its membership and large-scale participation from the U.S. government, the USWP constitutes an unmatched catalytic platform that facilitates public-private sector collaboration. Serving as a single entry point to access the best of U.S. resources and ingenuity to address global water security challenges, the USWP provides a unique platform to engage a diverse range of expertise, thought leadership and capability to help develop solutions. A joint effort of both public and private sectors in the U.S., the USWP is supported more than one hundred partners, including government agencies, academic organizations, water coalitions, NGOs and private sector entities. For more information, please visit: <http://uswaterpartnership.org/>.

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# # #

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## 12 Things you should know about groundwater

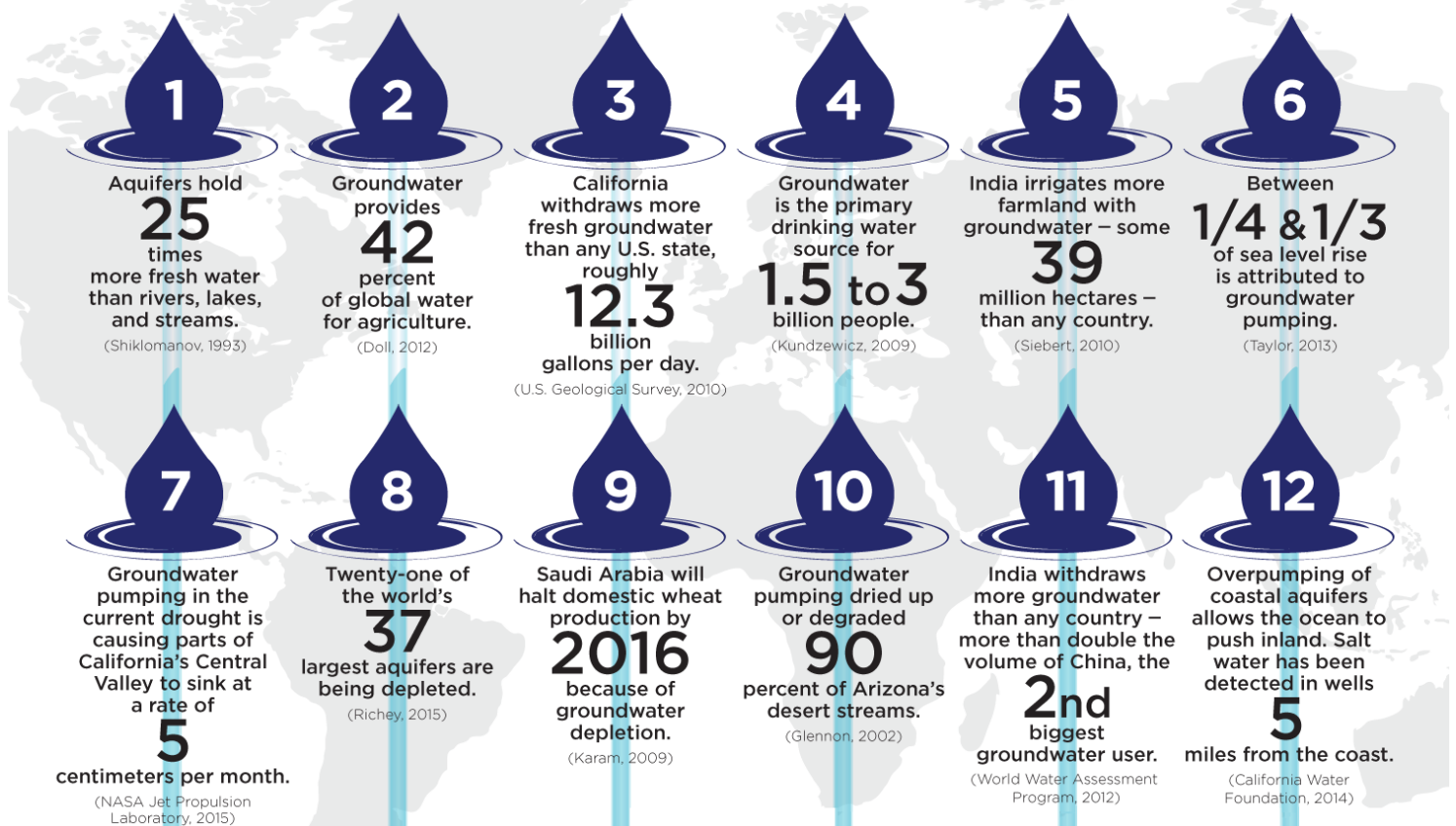
Circle of Blue | March 2016 | <http://www.circleofblue.org/u-s-groundwater/>

In 1904, just after the first airplane flight, the Texas Supreme Court ruled that groundwater was “too secret, occult, and concealed” to regulate. More than a century later, even with the ability to measure and monitor aquifer levels from space and with a growing body of scientific knowledge that aquifers are dangerously overstressed, an attitude of neglect is leading to groundwater crises in many of the world’s largest cities, most productive farmland, and most conflict-prone regions.

Groundwater is the most abundant source of liquid freshwater on the planet. Aquifers hold at least 25 times the water as rivers, lakes, and streams. Roughly two billion people rely on groundwater as a primary source of drinking water and nearly half the water used to irrigate crops comes from underground.

Yet despite its importance, groundwater is being used recklessly. Aquifer levels are plummeting in the grain belts of China and India. The Ogallala Aquifer, which gives life to America’s Great Plains, will be largely tapped out by the end of the century, at current rates of use. Parts of Indonesia’s capital, Jakarta, home to 10 million, sank 13 feet in a generation because so much groundwater was pumped that the land collapsed. Coastal cities and farmers are finding more salts in their wells as the ocean pushes inland. Groundwater in Bangladesh polluted with naturally occurring arsenic has been called the largest mass poisoning in history, with some 100 million people at risk.

## 12 THINGS YOU SHOULD KNOW ABOUT GROUNDWATER:



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## **Investing for California's Future: Why Groundwater Storage Makes More Sense than New Dams**

YubaNet | March 8, 2016 | Clean Water Action

March 3, 2016 - California has already used up the best locations for surface storage

- We have more than 1,400 dams in the state, fuelling 1,300 reservoirs.
- Every major river in California is dammed and some have two or more.
- New locations are less and less valuable in terms of water available for storage and in terms of environmental impact.

Dams wreak havoc on the environment

- In-stream dams block migrating fish, such as salmon, reducing their ability to reproduce.
- Diversions from rivers and streams to fill off-stream reservoirs reduce flow into the Delta, jeopardizing the most diverse ecosystem on the West Coast of the Americas.
- Diversions also flood thousands of acres of valuable acreage, including sensitive habitat for endangered or threatened species.

Surface water storage is less sensible than groundwater storage

- Dams and reservoirs cost six times as much as groundwater storage projects to build.
- Reservoirs deplete first in a drought, so they're not the best choice for multi-year droughts like the one we're going through now.
- In dry seasons, depending on size, dam reservoirs and diversions can evaporate more water than they store.
- Dams displace local residents who have lived on their land for generations— worldwide, large dams have forced some 40-80 million people from their lands in the past six decades.

Funding Groundwater Storage Makes More Sense

- The state has more than 500 groundwater basins, all of which would benefit from recharge.
- 21 groundwater basins are in a "critical" condition, according to a recent state report. Critical condition means significantly more water has been taken out than put back in.
- A warmer climate will make our reservoirs less useful as they'll fill up faster and spill over. But we can capture that water as it moves downstream and store it underground, reducing flood risk and restoring our groundwater basins.
- In an average water year, groundwater supports about 40 percent of the state's urban and agricultural water uses. In drought, our reliance climbs above 60 percent.

## Groundwater Storage is Cheaper than Surface Water

- \$2.7 billion can fund 8.4 million acre-feet of groundwater storage, compared to just 1.4 million acre-feet of storage.
- Groundwater depletion causes subsidence. Some of the farmland in the San Joaquin Valley sunk 13 inches in 2014 according to a NASA report. The cost of subsidence in terms of damage to roads, canals and other infrastructure has not been calculated but is likely in the tens of millions.

## Groundwater Storage is More Climate Resilient

- We will be increasingly reliant on groundwater resources as snowpack continues to shrink and reduces surface water supplies due to warming temperatures.
- Groundwater storage is more climate resilient because water stored underground is not as vulnerable to evaporation as surface water.

Clean Water Action is a one million member organization of diverse people and groups joined together to protect our environment, health, economic well-being and community quality of life. Our goals include clean, safe and affordable water; prevention of health threatening pollution; creation of environmentally safe jobs and businesses; and empowerment of people to make democracy work. [www.cleannwateraction.org](http://www.cleannwateraction.org) Read more on our blog: Groundwater storage...let's get the California Water Commission to acknowledge the elephant in the room

# # #



## **Valuing Groundwater During National Groundwater Awareness Week**

Water Online | February 29, 2016 | NGWA

If you value your life, you should value groundwater, the National Ground Water Association said recently in recognition of National Groundwater Awareness Week, March 6-12.

Quite literally, life as we know it would not be possible without groundwater.

“National Groundwater Awareness Week is a time to take stock of this most important natural resource,” said NGWA Director of General Public Outreach Cliff Treyens.

“In times of drought or groundwater contamination — when people are noticeably affected — the value of groundwater becomes clear,” said Treyens. “The principle behind what Benjamin Franklin said two centuries ago remains true today: ‘When the well runs dry, we shall know the value of water.’”

It is estimated that groundwater makes up an estimated 99 percent of all freshwater in the world. At a national level, the United States uses:

- 76 billion gallons of groundwater a day (bgd) for all purposes
- 49.5 bgd for agricultural irrigation
- 15.7 bgd for public water supplies
- 3.5 bgd for individual households through privately owned water wells
- 3 bgd for livestock and aquaculture
- 2.9 bgd for industry (self-supplied)
  - bgd for mining
- Nearly 600 million gallons per day for thermoelectric power generation.

([Click here](#) for state groundwater-use breakdowns — click on the appropriate state and then click on “groundwater use.”)

Because groundwater is “out of sight, out of mind” for most, National Groundwater Awareness Week provides a convenient opportunity for people to learn about the importance of groundwater to their lives, said Treyens. He urged the public to visit NGWA’s groundwater fundamentals web page, as well as its website, WellOwner.org, where well owners can learn information vital to take care of their water quality and their wells.

- Here are some more interesting groundwater facts:
- The 79.3 bgd a day used in the United States equals 1 billion, 586 million bathtubs full of water, enough to circle the Earth more than 60 times
- India is the largest groundwater user in the world, using 66.3 trillion gallons in one year — enough water to fill an 18-inch-diameter pipeline to the Moon and back — 2,000 times
- Groundwater is under most of the Earth’s surface
- Under Africa’s Sahara Desert, there’s 20 times more groundwater than all the surface water in the entire continent’s lakes.

## About NGWA

NGWA, the leading worldwide advocate for professionals teaming to provide, protect, manage, and remediate groundwater, conveniently and promptly delivers an extensive range of resources contributing to member success through relationships, leading edge and emerging practices, and credible new ideas and solutions.

# # #

## **One step to help restore trust in Flint**

Detroit Free Press | March 6, 2016 | Peter Gleick and Marc Edwards,

By now, most of the country is aware of the water crisis that has struck Flint and the ongoing health risks to residents and, especially children. That disaster, years in the making, was the result of a combination of bad technical decisions, gross underinvestment in the local water system, a failure to carefully monitor and publicly report water quality to the community, and inexcusable mismanagement by some local, state and federal agencies. Flint is not alone. Municipal water systems throughout the United States are deteriorating for the same reasons.

Fixing the problem in Flint — and elsewhere — will take years of hard work because the solution requires a combination of technical improvements, reinvestment and modernization of entire urban water treatment and distribution systems, the physical replacement of lead service lines to some homes, and fundamental changes in the people, regulations, and institutions responsible for protecting the public health.

In addition, rebuilding public trust in the tap water system will take a focused and substantial effort: Bad actors at the agencies worked overtime to lose the trust of Flint residents and it will be hard to earn that trust back.

But we don't have years. There are things that must be done immediately.

One key priority that could be implemented immediately would have a disproportionately positive effect on both public health and public education: Flint, together with state and federal agencies should launch a rapid and comprehensive Safe Water for Schools program.

Such a program would:

1. Test the tap water at every single school faucet and water fountain for all regulated contaminants and some new emerging ones, like *Legionella* bacteria that grow in plumbing systems.
2. Identify which taps are safe and which are not.
3. Fund and implement a pipe replacement program for every school with unsafe water, or install filters capable of treating the water to federal standards.
4. Retest the water.
5. Install new, state-of-the-art water fountains with coolers and filters, in every school, with at least one fountain per 50 students. These fountains should include top-filling capability for refillable bottles.
6. Provide every student with a refillable, reusable water bottle.
7. Create and implement an age-appropriate education program for all students that includes details on water testing, water quality and the safety of the new water fountains.
8. Require and implement a water-quality monitoring program for every school to regularly reconfirm the safety of the tap water and water fountains. For some schools, this program could include the participation of science programs and students, working with independent testing laboratories.

9. Post all testing results near each water fountain and in online venues, and send all testing results home to every family.

The United States has a remarkable municipal water system — it was once the envy of much of the rest of the world. But it suffers from neglect, underinvestment, inadequate monitoring and public reporting, and a growing loss of public confidence. As part of a broader effort to modernize the nation's water system, a Safe Water for Schools program would help guarantee that one of our most vulnerable populations — young children — will have reliable, tested and safe water. It would educate them about water issues. And it would help, over time, rebuild trust in the community.

Peter Gleick is president of the Pacific Institute, a global water think tank, and a MacArthur Fellow.

Marc Edwards is the Charles P. Lunsford Professor of Civil and Environmental Engineering at Virginia Tech and a MacArthur Fellow.

# # #