BAY AREA WATER SUPPLY AND CONSERVATION AGENCY

BOARD OF DIRECTORS MEETING

February 14, 2018

Correspondence and media coverage of interest between January 25, 2018 and February 9, 2018

Media Coverage

Water Conditions:

Date: February 9, 2018
Source: Huffington Post
Article: We Have Seen The Future Of Water, And It Is Cape Town

Date: February 9, 2018
Source: Water Education Foundation
Article: 'Ridiculously Resilient Ridge', climate Change and the Future of California's Water

Date: February 8, 2018
Source: San Francisco Chronicle
Article: How dry is this winter? Sierra snowpack on pace to shatter record low of 2015

Date: February 6, 2018
Source: Mercury News
Article: What's the chance for a 'normal' rain year now? Grim, if history is a gauge

Date: February 3, 2018
Source: USA Today
Article: U.S. drought at worst level in nearly 4 years

Date: February 1, 2018
Source: Sacramento Bee
Article: Sierra Nevada snow picture brightens, but is still just a fraction of normal

Date: February 1, 2018
Source: San Francisco Chronicle
Article: With storms skipping state, nearly half of California is back in a drought

Date: January 30, 2018
Source: Mercury News
Article: California drought returning? Sierra Nevada snowpack at 30 percent as forecast calls for two more weeks of warm, dry weather

Date: January 30, 2018
Source: Weather.com
Article: California May Be Returning to Drought Again and Sierra Snow Droughts May Become More Common

Water Supply Management:

Date: February 2018
Source: Public Policy Institute of California
Article: Alternative Water Supplies

Date: February 7, 2018
Source: EOS.org
Article: California's Water Savings Dwindle When Drought Fears Subside

Date: January 26, 2018
Source: Phys.org
Article: Cap-and-trade system of water conservation and resiliency

Water Infrastructure:

Date: February 7, 2018
Source: Sacramento Bee
Article: Jerry Brown officially downsizes Delta tunnel plan. But can he sell on tunnel?

Date: February 7, 2018
Source: SF Gate
Article: Huge delta plan for moving water cut to just 1 tunnel

Date: February 7, 2018
Source: Maven
Article: NRDC renews motion for immediate continuance of Cal Water Fix hearings in light of anticipated changes to project; DWR responds…

Date: February 7, 2018
Source: Public Policy Institute of California
Article: Governor's Budget Banks on Voters Passing Water Bond

Date: February 7, 2018
Source: Maven
Article: DWR to Invest Millions in Groundwater Sustainability for Disadvantaged Communities and Local Agencies

Date: February 2, 2018
Source: Sacramento Bee
Article: Voters OK'd $2.7 billion for new reservoirs. Critics say California won't spend it

Date: February 1, 2018
Source: Capitol Weekly
Article: Water storage needed – but keep faith with Prop. 1

Date: January 31, 2018
Source: University of Denver – College of Law
Article: A Tale of Two Tunnels: California WaterFix

Date: January 25, 2018
Source: Los Angeles Times
Article: One possible delta tunnels deal would give cheap water to farmers – and more expensive water to cities

Water Policy:

Date: February 6, 2018
Source: News-Sentinel
Article: Report calls for added protections for parts of Mokelumne

Date: January 30, 2018
Source: Lodi News-Sentinel
Article: Woodbridge Irrigation District files suit against EBMUD over water rights

Date: January 26, 2018
Source: Sacramento Bee
Article: How Trump's pumping plan is dividing California over water – again

Technology:

Date: February 7, 2018
Source: GreenBiz
Article: Why Silicon Valley should take ag tech more seriously

Date: February 6, 2018
Source: Water Deeply
Article: Robotics, Artificial Intelligence Make Headway in the Water Industry

# # #

We Have Seen The Future Of Water, And It Is Cape Town
Huffington Post | February 9, 2018 | Peter H. Gleick

Cape Town is parched. Severe drought and high water use have collided in South Africa's second largest city, and unless the drought breaks, residents may run out of water in the next few months when there simply isn't enough water left to supply the drinking water taps.

In response to this looming "Day Zero" — currently projected in May — city managers have imposed new and unprecedented restrictions, including limiting residential water use to 50 liters (around 13 gallons) per person per day. They released plans to open 200 community water points to provide emergency water in the event of a shutoff – for four million people. As the crisis worsens, water scarcity will sharpen South Africa's economic inequalities, inflaming tensions between wealthier and disadvantaged communities.

Cape Town is not alone. Water crises are getting worse all over the world. The past few years have seen more and more extreme droughts and floods around the globe. California just endured the worst five-year drought on record, followed by the wettest year on record. São Paulo, Brazil, recently suffered a severe drought that drastically cut water supplies to its 12 million inhabitants – a drought that also ended in heavy rainfall, which caused extreme flooding. Houston was devastated in 2017 by Hurricane Harvey, the most extreme precipitation event to hit any major city in the United States.

Severe droughts and floods. Water rationing. Economic and political disruption. Urban taps running dry. Is this the future of water?

Any city, in building a water system, tries to prepare for extreme weather, including floods and droughts. It also considers estimates of future population growth, projections of water use and a host of other factors. Cape Town's water system is a relatively sophisticated one, with six major storage reservoirs, pipelines, water treatment plants and an extensive distribution network. Its water managers, and South Africa's overall water expertise, are among the best in the world.

The problem is that the traditional approach for building and managing water systems rests on two key assumptions. The first is that there is always more supply to be found, somewhere, to satisfy growing populations and growing water demand. The second is that the climate isn't changing.

Neither of these assumptions is true any longer.

Many regions of the world, as in Cape Town, have reached "peak water" limits and find their traditional sources tapped out. Many rivers are dammed and diverted to the point that they no longer reach the sea. Groundwater is over pumped at rates faster than nature can replenish. And massive long-distance transfers of water from other watersheds are increasingly controversial because of high costs, environmental damages and political disagreements.

On top of this, the climate is no longer stable. It is changing because of human activities, and among the expected and observed impacts are changes to the frequency and intensity of extreme events, with impacts on both water supplies and demands.

There is evidence that the current drought in Cape Town shows the influence of climate change. Temperatures in the region have been rising in parallel with global temperatures, leading to higher evaporative losses from Cape Town's reservoirs and soils. A new analysis of rainfall data

in the Western Cape by Piotr Wolski, a researcher with the University of Cape Town's Climate System Analysis Group concluded that the current drought is extremely severe. Historical records indicate that the region is experiencing long-term reductions in regional rainfall, suggesting climate change is already altering South Africa's rainfall patterns. Such changes have been observed in other parts of the world as well.

The crisis in Cape Town has already taught us several crucial lessons. The first is that the impacts of water crises are not evenly distributed; they fall most heavily on poorer communities. Cape Town's current restriction of 50 liters per person per day is the bare minimum safe requirement for drinking, cooking, washing and sanitation. Yet South Africa's Western Cape features wealthy neighborhoods dotted with swimming pools and ornate gardens, and an agricultural sector that consumes a large fraction of the region's water. When the taps are cut off, the disparities in water use — and the ability of the wealthier communities to find and pay for alternative water sources, such as private wells and water deliveries — will become glaringly apparent. Even now, richer homeowners, anticipating further restrictions, are filling pools, drilling wells and buying and building private tanks to store large volumes of water.

Another solution being pursued by the South African government is the construction of costly desalination plants. In a region where no new traditional water supplies are available, the dream of desalinating unlimited quantities of seawater is appealing. But the inevitable higher costs for water will raise the same issues of inequity, and other countries like Australia have built desalination plants during severe droughts only to mothball them when the rains returned.

South Africa has wrestled with inequitable access to water for many years. It pioneered a policy of providing a minimum amount of water to all residents for free. But as the Cape Town crisis worsens, new fault lines will open between the water haves and have-nots. How the city handles it will be instructive for the rest of the world, as we all approach our own Day Zero.

# # #

Peter H. Gleick is a climate and water scientist, co-author of The World's Water, and a member of the U.S. National Academy of Sciences.

'Ridiculously Resilient Ridge', Climate Change and the Future of California's Water

Western Water Q&A: Climate scientist Daniel Swain

Water Education Foundation | February 9, 2018 | Gary Pitzer

Every day, people flock to Daniel Swain's social media platforms to find out the latest news and insight about California's notoriously unpredictable weather. Swain, a climate scientist at the Institute of the Environment and Sustainability at UCLA, famously coined the term "Ridiculously Resilient Ridge" in December 2013 to describe the large, formidable high-pressure mass that was parked over the West Coast during winter and diverted storms away from California, intensifying the drought.

Swain's research focuses on atmospheric processes that cause droughts and floods, along with the changing character of extreme weather events in a warming world. A lifelong Californian and alumnus of University of California, Davis, and Stanford University, Swain is best known for the widely read Weather West blog, which provides unique perspectives on weather and climate in California and the western United States. In a recent interview with Western Water, he talked about the Ridiculously Resilient Ridge, its potential long-term impact on California weather, and what may lie ahead for the state's water supply.

WW: What exactly do you see as the new weather norm for California?

Swain: What we've seen recently has been a series of extremes in weather and climate in California on both sides of the spectrum. A lot of people think, 'We just went through this severe drought, is the future of California one where it never rains again?' There is not a lot of evidence that is the future we are headed for – a state of perpetual drought.

California climate is a climate intrinsically of extremes. We have floods, we have droughts and interestingly we don't have that many years in the middle. … We have this Mediterranean climate with this well-defined dry season. And that may seem strange to somebody who hasn't spent a lot of time in California, because even that seasonal cycle is actually kind of extreme.

The fact is we only get precipitation for often less than half of the calendar year, and the rest of the year is defined by, arguably, an annual drought. We always have a drought for … six months of the year – it's called summer, early fall and late spring, and the sharpness of that season cycle defines a lot of things that are important in California. It's part of the reason why, agriculturally, we are such a productive state. …

It also means we are vulnerable to drought because if something happens and disrupts our storm pattern during the winter, then that's it for the full year. What that means is there are a few key things we care about in terms of what might happen for the future. We really care about those core winter months for precipitation, but we care about all the other months for everything else.

WW: California has built a water system premised on having snow in the Sierra and southern Cascades melt slowly to fill reservoirs and rivers. How will your projections of the new weather norm affect that system?

Swain: California water infrastructure is really predicated strongly on the continuation of our historical climate. It's predicated on what we might call a stationary climate that is largely in line with the one that was occurring when these structures were designed and built. … The climate we have today is different. … We are already starting to operate outside of that design envelope, if you will, but the changes you have seen so far are still small relative to the ones we

are likely to see in the coming decades. That does pose some challenges to a system that is largely fixed. …

It's a clever system because it uses the fact that historically we've had this big Sierra Nevada snowpack and this time-release storage of water, which means that we don't have to store every drop of water that we need for the whole year in dams. It means we can have this continual replenishment through the early spring and summer months when the snow melts into the reservoirs at the same time we are taking the water out of the reservoirs to use for agriculture or send to the cities. The problem becomes if we don't have that snowpack, we don't have that time-release storage. And so even if we are getting the same amount of water overall, we are only relying on the water that falls as liquid rain during the winter and then can store in reservoirs. By the time the end of summer rolls around there's nothing else flowing into the reservoirs.

There's a lot of evidence that we are already starting to lose snowpack. The snowline is moving up the mountain, which is important because for every 1,000 feet up in California, you lose a lot of land. … Most of that snowpack territory exists between 5,000 and 8,000 feet in elevation. For losing 500 feet of snowline every 10 years or so, pretty soon we don't have a lot of snow left in the mountains overall.

WW: How do you explain what the "Ridiculously Resilient Ridge" is and what causes it?

Swain: There is not really a super-simple explanation. But the way I like to think about it is, on average in the winter, over the north Pacific Ocean there's already a ridge in atmospheric pressure, so the typical state of things is for there to be a really weak ridge on the West Coast of North America. Every time we get active storm periods … we tend to get bursts of activity and the reason for that is that the default status is something that weakly deflects storms away from us. Something has to happen to redirect things our way. When that Pacific jet stream strengthens, it can either collapse or weaken that weak ridge and bring us storms. All of our stormy periods are when that weak ridge goes away for a little while.

The "Triple R" really is just a strong enhancement or an amplification of that typical mean, average ridge. Anything that acts to strengthen it beyond its normal magnitude or shift it slightly so it's even more effective at blocking storms produces a persistent ridge. There's evidence now that the ultimate triggers for this are sometimes random, we just get unlucky. Other times the tropical Pacific, the ocean temperatures thousands of miles away, are important, not just La Niña as we always hear about (cool equatorial water in the eastern Pacific), but also the western tropical Pacific, which does not have to do with La Niña necessarily.

Warmth there can induce ridging all the way over toward the West Coast of North America. So the tropical Pacific is important. And there's even this brand-new work out of Lawrence Livermore National Laboratory that sea ice plays a potentially significant role in this, and when we lose sea ice, these patterns maybe become more common.

What's interesting is that in our work we have detected an increase in this pattern during winter. We are still not totally sure exactly why that's occurring, but there definitely has been an increase during the observational period. This is coincided with warming of the western tropical Pacific and a lot of sea ice loss.

WW: Does the ability exist to predict the "Triple R"?

Swain: It's predictable out to a couple of weeks. In the very long run, [if] it's something that occurred in the past, it should definitely occur in the future. Now, there's some evidence that it

may actually be occurring more in the future. Even if we see more droughts in California in the future, which I think is likely just due to the temperature increase alone, there's still the expectation that overall average precipitation may not change very much. What that suggests is there has to be some compensation on the other side of things too. I've been imploring people not to ignore the flood side of the spectrum. We've thought a lot about drought lately, we had a wet winter last year and people thought about flooding a little bit … but arguably the evidence is even stronger that we are going to see some really wet years in the future.

WW: Are things any better in terms of improved forecasting for water supply managers?

Swain: It's a big challenge and an interesting physical science and human adaptation question. The time scales for drought risk and flood risk, especially in California, are very different. We don't have to worry about suddenly going into drought between this week and next week. That's something we can watch evolve over months or even the season through years. When it comes to flood risk we don't really have to worry about next year. … We can actually see a lot about flood risk within the coming week. Weather forecasts have gotten pretty good on average and while there's some misses, generally speaking, we are not going to be totally blindsided by a huge flood.

We are not so good at seasonal forecasts, though, and those are what matter for things like drought. It becomes hard to manage this … because for some of these practical decisions the long-term trends are somewhat less important than the immediate weather forecast – is there a big storm coming this week or not? I wonder if it might actually change the decision-making mentality if we're headed for a future where there is an increased likelihood of both extremes. And I think that probably should change the decision-making calculus in these operational sorts of situations.

WW: How much is the fingerprint of climate change evident in what you are seeing?

Swain: It's very clear that the temperature component of everything we've been seeing recently has a human fingerprint on it. We are at the point now where almost every unprecedented heat wave or hottest year on record has something to do with the fact the Earth is warming quickly. We are experiencing record global warmth; a lot of it really does follow from that. The temperature component is, unfortunately, kind of a slam dunk. It's very clear that there's a connection. It turns out that in the recent drought it was an important part of it. If temperatures had been close to typical average temperatures during the 20th century, the drought wouldn't have been as severe from a hydrological or agricultural perspective or from the perspective of the forests in the Sierra Nevada, which have not done well.

From the precipitation perspective there's still active work going on, although there's some increasing evidence in the literature of an increased likelihood of low precipitation years. That may not be coinciding with an overall decrease in precipitation, but we are seeing these ridge patterns more frequently. We have seen a cluster of dry years recently. And there's some evidence that may be a signature, that we may see more of these low precipitation years or these ridge years.

# # #

How dry is this winter? Sierra snowpack on pace to shatter record low of 2015
San Francisco Chronicle | February 8, 2018 | Kurtis Alexander

As relentless sunshine continued to pound California on Thursday, the Sierra Nevada hit a reckoning point: There's less snowpack now than on the same date three years ago, when the winter went down as the driest in recorded history and sent shudders through cities, farmlands and the state Capitol.

The troubling lack of snow during the winter of 2014-15 not only shortchanged the state's drinking-water reservoirs but left the Sierra nearly unrecognizable. Normally white-blanketed forests and meadows remained a springtime green, and mountain roads were free of ice.

The picture has become increasingly similar this year. Tahoe's ski resorts have been forced to close many low-elevation runs while working their snow-making machines overtime, and rangers at Yosemite National Park have had to apologize to guests for the lack of snow powering famed waterfalls.

While California's peak wet season still has several weeks to go, forecasters see no major storms for at least 10 days, raising the specter of a new seasonal low for snow in recorded history.

"This has been another remarkably warm, dry season," said Mike Dettinger, a research hydrologist for the U.S. Geological Survey. "We're really screaming into a drought in a way that we didn't see in the winter of '14-15."

On Thursday, snowpack in the Sierra measured just 23 percent of average for the date, according to the state Department of Water Resources. California officials keep a close eye on the snow because its melt-off provides nearly a third of the state's water supply.

Precipitation in the northern part of the range, where the state's biggest reservoirs catch the runoff, was 66 percent of average.

Meteorologists say an atmospheric mass of high pressure off the West Coast has been blocking storms from making landfall. Sometimes called the Ridiculously Resilient Ridge, it's the same weather pattern that was common during the five-year drought, including the record-breaking winter three years ago.

The reason for the ridge's persistence is not entirely clear, experts say. But it involves a combination of chance, short-term climate systems like La Niña in the Pacific and longer-term warming trends around the globe. Scientists agree that global warming will probably lead to more extreme weather, including longer, starker periods of drought.

"If you look decade by decade since the 1970s, each has been drier to a greater degree and over larger areas," said Leroy Westerling, a climate scientist at UC Merced.

San Francisco marked two straight weeks of rainless days with Thursday's warm weather, according to Golden Gate Weather Service. While midwinter dry spells are not uncommon in California, this one is heading for rarefied territory, said Jan Null, the service's meteorologist.

If sunny skies persist another two weeks, he said, San Francisco would see its ninth-longest midwinter rainless period in 169 years of record-keeping. If the dry spell continues through the end of the month, the city would achieve its fourth-longest stretch with no rain.

The record streak is 43 days, experienced both three years ago and in 1864. Three of the six longest midwinter dry spells have occurred in the past five years.

“What’s remarkable are all the stretches we’ve had recently,” Null said.

Around Lake Tahoe, ski resorts are trying to make the best out of yet another challenging season. Although snow is not in the forecast, resort operators are hoping for low overnight temperatures so they can manufacture as much snow as possible for the Presidents Day weekend.

“While we’re not seeing powder like we did last year, the skiing is great,” said an optimistic Sam Kieckhefer, a spokesman for Squaw Valley Ski Resort. “It’s sunny and it’s warm.”

Most of Squaw Valley’s runs are open, as are the popular slopes of Kirkwood Mountain Resort. But lower-elevation runs at some spots, including Heavenly Mountain Resort above South Lake Tahoe, have had to close because of the weather.

In Yosemite, visitors who have begun pouring into the park for the annual “firefall” may be headed for disappointment.

For about 10 days, starting next week, the setting sun casts its rays on the park’s Horsetail Fall at such an angle that the water glows like flames. With little water flowing in Yosemite Valley’s waterfalls, however, the spectacle may be meager.

“Is there going to be enough water to create a firefall effect? As of yesterday, not really,” said Yosemite spokeswoman Jamie Richards. “We’re working hard to set realistic expectations. This year is not going to be like last year, unless things dramatically change.”

While state water managers say the winter could remain dry like three years ago, they note that California is in better shape to weather the spell. Reservoirs providing water for much of the state remain mostly full after last year’s storms. It’s also possible that spring could bring binges of late-season snow and rain.

“We like to say for most water users, one dry year doesn’t make a drought,” said Jeanine Jones, interstate resources manager for the Department of Water Resources.

“Now we have to look for March,” she added. “There have been wet Marches before. We’ll have to wait and see what Mother Nature does.”

# # #

What's the chance for a 'normal' rain year now? Grim, if history is a gauge
Mercury News | February 6, 2018 | Paul Rogers

Hoping for a March Miracle to bail out California's dry winter? It's not likely.

A review of more than 100 years of rainfall records of major cities in California — including San Jose, Los Angeles, San Diego, Santa Rosa, Redding and Fresno — shows that none have ever finished the rainy season with normal rainfall totals after ending January with the amount of rain they've had so far this winter.

In San Francisco, where rainfall records date back to 1849, the odds are only a little better. Just twice has the city's rainfall total recovered to its normal level of 23.65 inches by June 30 after being where it is now, at 8.53 inches, from July 1 through Jan. 31.

In Eureka, it's happened three times since 1885. In the rest of the cities, not once, even though their weather records also date back to the late 1800s.

In other words, California winters are like Olympic ski racers. Stumble at the beginning of the race, and its very difficult to catch up by the end.

"The odds are against you with a bad start," said Jan Null, a meteorologist with Golden Gate Weather Services in Saratoga, who compiled the data. "Usually there just aren't enough opportunities to recover."

California's Mediterranean climate means that most rain every year falls during four months: December, January, February and March.

In San Francisco, 71 percent of the annual total, on average, occurs in those four months. In San Jose it's 70 percent. In Sacramento, it's 68 percent and in Los Angeles, it's 78 percent.

So far this winter, December was dry, January was about average in most areas — saved by one big storm on Jan. 8 and 9 — and February so far has been bone dry and hot, with forecasts calling for another 10 days of warm, sunny weather.

While it could still rain considerably between now and April 1, much of the state remains in a sizable rainfall deficit this winter.

"There's a reason they call it a Miracle March," said Bill Patzert, who worked for 35 years as a research scientist and oceanographer at NASA's Jet Propulsion Laboratory in Pasadena. "That's because it doesn't happen that often.

"Miracles are hard to find," he added. "There are plenty of them in the Old Testament, but there aren't that many in California when it comes to water. I wouldn't be betting what's left of your 401K on any miracles."

The rainfall totals from last July 1 through Jan. 31 are not dismal. They just aren't big enough, history shows, to get to a "normal year," by June 30, which Null defines in his research as the average rainfall between 1981 and 2010 in each area.

In San Francisco, for example, this is the 49th driest winter rain season through January back to 1849. Only two seasons this dry or drier have ended the full season with at least normal rainfall.

For San Jose, where records go back to 1892, there were 4.81 inches of rain from July 1 to Jan. 31, or 55 percent of normal. That makes this winter the 32nd driest season through January. But no seasons in San Jose that have been this dry or drier have ended with at least normal rainfall.

Los Angeles is worse off. LA has received only 1.96 inches, or 25 percent of normal, for this time of year, making this winter the 11th driest season through January. No seasons that have been this dry or drier in LA at this point in the winter have ended with at least normal rainfall.

After suffering through the worst drought in the state's recorded history from December 2011 to March 2017, California residents, water managers, farmers, fire chiefs, fisheries biologists and ski resort owners are jittery. The big fear: What if last winter's soaking storms — the deluges that drove Gov. Jerry Brown to announce an end to the drought emergency last April — were just a one-year fluke and the state is heading back into another drought?

"We had one really good atmospheric river last month," said Mike Anderson, California's state climatologist with the Department of Water Resources. "I got almost three inches of rain at my house in Davis. That was pretty exciting. But ever since then in the north we've only had a few little storms without much water vapor, and the south really hasn't had anything.

"The possibility of getting back to average this winter is pretty slim," he said. "We need to make conservation a way of life and be prepared for dry years when they show up."

Meanwhile, the Sierra Nevada snowpack, the source of one-third of the California's water, is at just 24 percent of the historic average. Lack of storms, and hot temperatures have put it at levels last seen during the drought.

The good news is that last year's storms filled many of California's largest reservoirs. Hydrologically, that's money in the bank. Combined, 46 of the biggest reservoirs in California are at 106 percent of their historic average storage level for the first week in February, according to state records.

The largest, Shasta Lake, near Redding, was 74 percent full on Monday, or 108 percent of the historic average for that date. Similarly, San Luis Reservoir, between Gilroy and Los Banos, was 85 percent full, or 106 percent of average.

The largest reservoir in Santa Cruz's water system, Loch Lomond, is 93 percent full. And although the 10 reservoirs operated by Santa Clara Valley Water District are just 26 percent full, in part because of state storage limits due to needed earthquake upgrades, the district's groundwater supplies, which make up half the total water supply in Santa Clara County, recovered entirely last year from the drought.

The seven reservoirs operated by East Bay Municipal Water District are 81 percent full.

"Our water supply isn't as worrisome right now, but the snow pack is very low, and we certainly want to see that change," said Andrea Pook, a spokeswoman for the district, which provides water to 1.4 million people in Alameda and Contra Costa counties. "We want people to remember to use water wisely, and keep that mindset."

# # #

U.S. drought at worst level in nearly 4 years
USA Today | February 3, 2018 | Doyle Rice

The dry times are back.

Drought has returned with a vengeance across much of the United States, with the worst conditions across southern and western parts of the nation.

As of Thursday, 38.4% of the continental U.S. is in a drought, according to the U.S. Drought Monitor. That is the highest percentage since the 40% recorded in May 2014.

In California, which emerged from a brutal four-year drought last year, 44% of the state is now considered to be in a moderate drought. That's a dramatic jump from just last week, when the figure was 13%.

Major winter storms have mostly bypassed the West, meaning that much-needed mountain snow has not fallen, said NOAA meteorologist Richard Heim, author of this week's Drought Monitor. This winter, snow sensors across the Sierra Nevada show the snowpack is just 30% of average for this time of year.

The Sierra provides water to millions of Californians. "It's not nearly where we'd like to be," Frank Gehrke, a state official, said after measuring winter snowfall in the Sierra on Thursday.

Extremely warm weather is causing most of the precipitation to fall as rain instead of snow. "This will have major ramifications for western water managers if they don’t get some major winter storms soon," Heim said.

Whether California heads into another drought cycle will depend largely on how much rain and snow falls during February and March.

Further east, the amount of snow on the ground is also far below average across the Colorado River Basin, where a 17-year run of mostly dry years has left reservoirs at alarmingly low levels.

"Mountain snowpack was abysmally low, reaching record low levels for this time of year in parts of New Mexico and Colorado," Heim wrote in the monitor this week.

Climate scientists and managers of water agencies describe the situation as a “snow drought,” driven in part by winter temperatures that are well above the long-term average.

The southern Plains has also been bone-dry, where some spots haven't seen a drop of rain in months. In Amarillo, Texas, for example, no measurable precipitation has fallen for a record 111 days.

"Some areas are having impacts similar to the 2012 drought," said Heim, who added that agricultural interests are seeing the worst impacts now.

In Oklahoma, pasture conditions were generally poor and deteriorating and 79% of the winter wheat crop was rated in poor to very poor condition, the Drought Monitor said.

Looking ahead, drought is expected to either persist or intensify over the next several months, the Climate Prediction Center said.

"The general trend of increasing drought coverage should continue through the end of April, as most areas of drought are expected to persist, along with development forecast in parts of southern California, central Colorado, and the southern Plains," the center said.

The lack of rain across the southern tier of the nation is typical during a La Niña winter, which is currently in effect. La Niña is a periodic natural cooling of the central Pacific Ocean that affects weather and climate in the U.S. and around the world.

Overall, some 87 million Americans are living where there's a drought. That is the highest number since last March, when over 89 million lived in drought conditions.

Another ominous sign: There have been over 3,200 wildfires so far this year, which have charred some 71,000 acres, the National Interagency Fire Center said. Both of those numbers are far above average and among the highest in the past decade.

As of early February, based on the average of the past 10 years, 1,800 fires would have occurred, scorching 39,000 acres.

Contributing: Ian James, The Desert Sun (Palm Springs, Calif.); The Associated Press.

The drought in the U.S. is at its highest level in nearly four years. (Photo: U.S. Drought Monitor)

# # #

Sierra Nevada snow picture brightens, but is still just a fraction of normal
Sacramento Bee | February 1, 2018 | Dale Kasler

The last time California officials conducted their snow survey near Echo Summit, a month ago, the ground was practically barren.

This time there was snow. Just not a lot of it.

The Department of Water Resources' monthly snow survey at Phillips Station on Thursday revealed a meager 13.6 inches of snow, or 14 percent of historical average. It was the latest evidence of a dry winter that has conjured up fears of another drought.

The snow measurement at Phillips is "not nearly where we'd like to be," said Frank Gehrke, the DWR employee who runs the snow survey.

Gehrke, who normally conducts the survey on cross-country skis, settled for boots Thursday. He did note the improvement from the Jan. 3 survey, when the snow field at Phillips was mostly grass and mud with a few patches of snow. That survey revealed just 1.3 inches of snow on average.

The results from Phillips, which sits at an elevation of 6,800 feet, are roughly in line with snow measurements taken elsewhere in the Sierra Nevada. The statewide snowpack is at an average 27 percent of normal, according to DWR statistics.

State officials say it's far too early to worry about another drought. Last winter's record rain and snow left most of California's reservoirs brimming with water, providing a cushion for this year. Gehrke, meanwhile, held out hope that this winter could turn wet at some point.

"There's still a lot of the winter left," he said. "Anything can happen as we move through the rest of the season."

The immediate forecast is far from promising, however. California is in the midst of a two-week dry spell with unseasonably warm temperatures. The National Weather Service said Sacramento will see a high temperature of 70 on Saturday. That's 8 degrees above normal.

Gehrke, however, said the warm spell won't immediately melt the snowpack. He's more concerned that the temperatures get cold again if and when more storms roll into the state this winter. Warm storms bring rain, not snow. The state relies on a healthy snowpack to replenish reservoirs and provide water through the summer and fall.

Officials are counting on additional storms. Michelle Mead, the weather service's warning coordination meteorologist in Sacramento, said California has experienced two "atmospheric rivers" this winter. An average winter brings five such storms.

# # #

With storms skipping state, nearly half of California is back in a drought
San Francisco Chronicle | February 1, 2018 | Kurtis Alexander

The T-shirt-wearing temperatures and lack of winter rain have combined to push nearly half of California into all-too-familiar territory: a state of drought.

Less than a year after Gov. Jerry Brown declared an end to one of the worst droughts in California history, a consortium of nationwide water experts reported Thursday that 44 percent of the state is again experiencing at least moderate drought conditions.

The plight is worst in Southern California, according to the U.S. Drought Monitor. Los Angeles and San Diego have received less than 2 inches of rain since July, and temperatures along the state's southern coast have soared into the 90s this week.

But the unusual drying is creeping northward. The southern Sierra Nevada is in a "moderate drought," the Drought Monitor reported, and snow levels across the 400-mile range are approaching some of the lowest levels ever recorded this time of year.

At Phillips Station south of Lake Tahoe, where state water officials base their monthly snow surveys, hydrologists on Thursday found just 13 percent of average snowpack. Only twice since record-keeping began in 1946 has there been less snow — in 2014 and 1963.

Across the Sierra, the situation wasn't much better. Snowpack measured a meager 27 percent of average for the first of February, according to the California Department of Water Resources.

The snow measurements are closely tracked because the spring and summer melt provides nearly a third of the state's water supply.

"California experiences the most variable weather in the nation," said Department of Water Resources Director Karla Nemeth. "It's vital that water conservation efforts remain consistent regardless of the year's precipitation."

While state officials are urging water savings the mandatory regulations that prompted shorter showers and brown lawns during the five-year drought are still a long way off.

For one, California's peak rainy season still has another month to go. While forecasts show little sign of wet weather through at least mid-February, a handful of late-season storms could quickly improve the water picture.

And California's biggest reservoirs are still flush with the runoff from last year's drought-ending rains. Lake Shasta on Thursday measured 109 percent of what it usually holds this time of year, and New Melones Lake near Sonora was at 139 percent. Even if the winter remains dry, most water agencies have plenty of reserves.

Additionally, the places that store and ship the bulk of California's water supply are in the northern reaches of the state, where drought conditions have yet to take hold. The Sierra is still drought-free from Yosemite National Park north, according to the Drought Monitor.

The Drought Monitor, which is a joint effort by the National Oceanic and Atmospheric Administration, the Department of Agriculture and the University of Nebraska, indexes a number of factors for its weekly update, including precipitation, river levels and soil moisture. Last week, 13 percent of California was deemed to be in some stage of drought.

The Bay Area remains neither in a drought nor in the cautionary state of “abnormally dry,” the Drought Monitor said.

Still, Felicia Marcus, chair of the State Water Resources Control Board and architect of the drought regulations that were lifted in April, said the situation has begun to warrant concern.

“Every month that it stays dry and every month that we don’t get more snowpack makes us more and more worried,” she said. “We’re all watching the weather reports with more fervor than we watch the sports pages, and this is a halftime score you don’t want to have.”

# # #

California drought returning? Sierra Nevada snowpack at 30 percent as forecast calls for two more weeks of warm, dry weather
Mercury News | January 30, 2018 | Paul Rogers

Hampered by hot weather and a stubborn high-pressure ridge that has blocked winter storms, California's Sierra Nevada snowpack — a key source of the state's water supply — on Tuesday was a paltry 30 percent of normal.

The last time there was so little Sierra snow at the end of January was in 2015, when it was 25 percent of its historic average.

By April 1 that year — after the snowpack had shrunk to an all-time low of 5 percent of average — Gov. Jerry Brown stood in a barren, rocky field in the mountains near Lake Tahoe and declared a drought emergency that included mandatory statewide water restrictions for the first time in California history.

"This historic drought demands unprecedented action," Brown said then, urging Californians to cut water use 25 percent and to "pull together and save water in every way possible."

They did. The drought ended last April after relentless winter storms that brought flooding to San Jose and wrecked Oroville Dam's spillway also filled reservoirs across California.

But now, as the state Department of Water Resources prepares on Thursday to do its monthly manual snow reading at Echo Summit, with TV cameras in tow, the continued hot, dry winter weather is raising concerns.

"February is the peak season for snow accumulation," said Daniel Swain, a climate scientist at UCLA who studies Western weather patterns. "Every week that we don't reverse this trend from here forward, it's going to be that much harder to get to where we want to be by the end of the season."

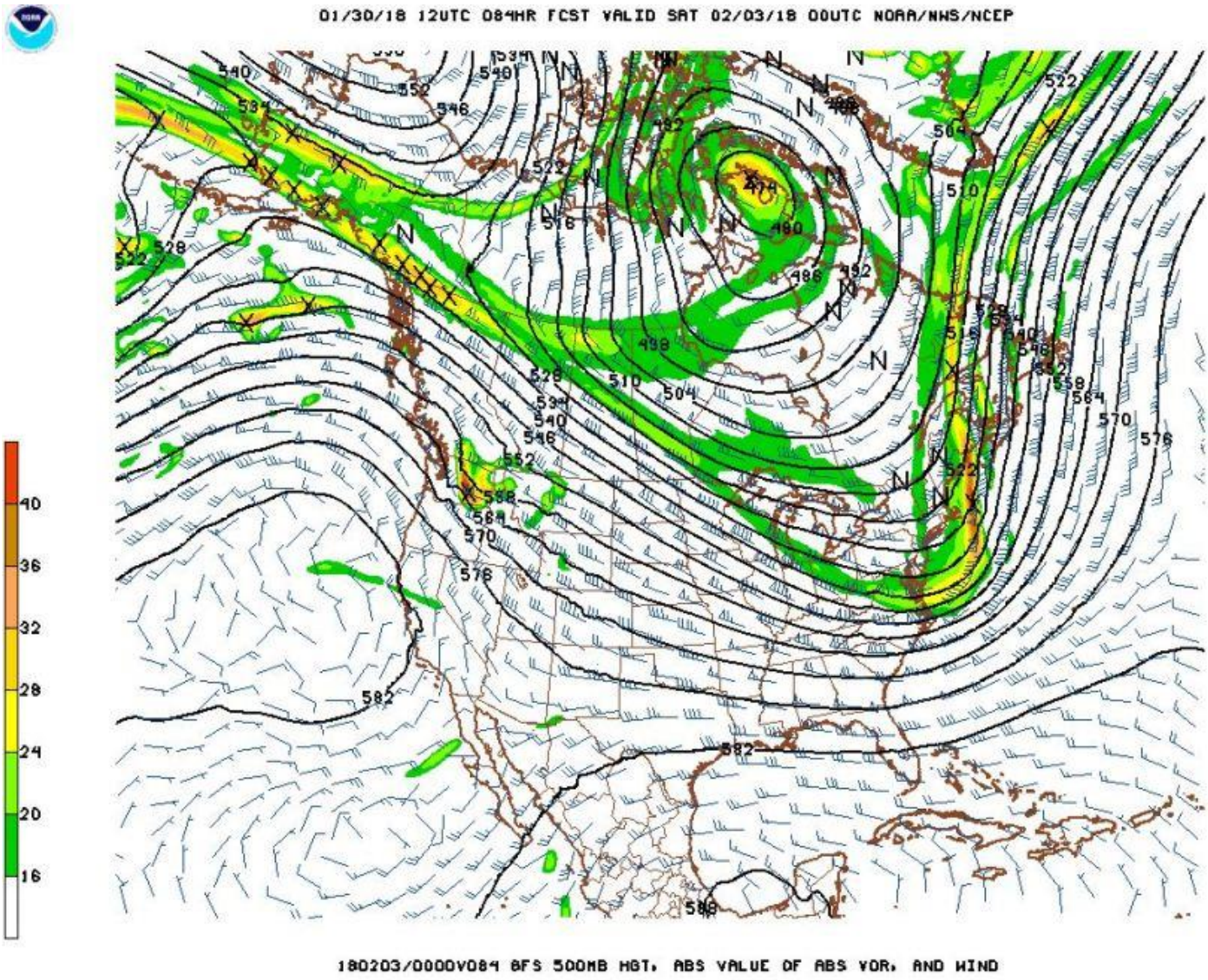
Nearly all of California's rain and snow falls between Nov. 1 and March 31. So time is running short.

"The figures don't lie," said Doug Carlson, a spokesman for the state Department of Water Resources. "We're at 30 percent snowpack right now, and last year at this time we were at 182 percent."

Ominously, the forecast for the next two weeks calls for more hot weather across the state, with almost no chance of rain or snow.

The reason: A ridge of high-pressure air, which is nearly 4 miles high and stretches from the Gulf of Alaska to the California-Mexico border, has been strengthening in recent days. Such ridges, which were the main cause of the state's 2012-2017 drought, block storms that normally bring California moisture during the winter months.

"It's like a giant boulder sitting in the stream and preventing the stream from reaching the state," Swain said. "The stream is the jet stream, and it's sending storms into Alaska and British Columbia."



This image from National Weather Service shows a ridge of high pressure strengthening this week off California. (NOAA) (NOAA)

What's particularly vexing is that precipitation levels haven't been terrible in Northern California this winter. In the Northern Sierra, after a few big storms earlier this month, total precipitation since Oct. 1 has been about 70 percent of average. It's about 50 percent of average in the Central Sierra and about 30 percent in the Southern Sierra.

But the snowpack overall is less than a third of its historic average because it's been much warmer than normal this winter, Swain said. Over the past 90 days, the average temperature in the Sierra has been about five degrees hotter than average, he noted.

"That's a big deal — especially when you are in a place where it sometimes snows and sometimes rains," he said. "And if you add 5 degrees to your temperature when it is close to freezing, you aren't close to snow any more."

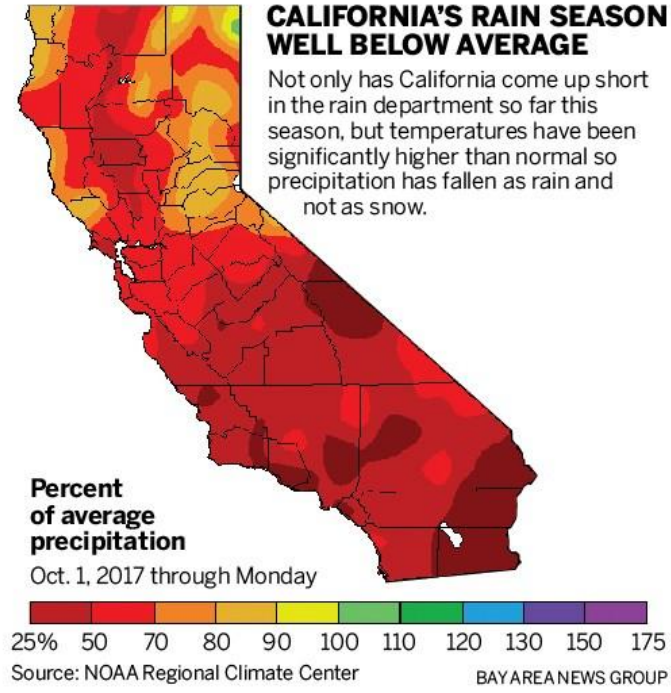
Scientists and meteorologists don't know exactly what is causing this year's temperature spikes and the return of the strong ridges. Some of it is random bad luck, they say.

Some of the problem is related to La Niña, the cooling of the sea surface in the eastern Pacific Ocean near the equator — a phenomenon that has been linked to dry weather in California in years past. But climate change is also to blame. The 10 hottest years on Earth since 1880, when modern temperature records began, have all occurred since 1998, according to NASA.

And the last three years have been the three hottest.

"Short term, we're talking weather," said Jan Null, a meteorologist with Golden Gate Weather Services in Saratoga. "When we look at enough of a history to see a pattern, decade by decade, then we are talking about climate. Everything going on is affected by the fact we have warmer oceans and a warmer atmosphere than we did years ago. We still have cold periods, but if we extend the trend line in the direction it is going now, it is certainly going to be warmer and probably drier in California in the coming decades."

The average January high temperature in Los Angeles from 1981 to 2010 was 58 degrees. On Tuesday it reached 83 degrees, according to the National Weather Service. The day before, heat records fell across Southern California as wildfire officials issued red-flag warnings. On Monday it was 91 at Long Beach Airport, breaking the previous record of 83.



Rainfall across the state has varied dramatically this winter — and is far below levels seen a year ago.

Since Oct. 1, San Francisco has been at 65 percent of normal rainfall, with 8.5 inches. Last year at the end of January, it was at 142 percent of normal after a series of drenching "Pineapple Express" storms delivered 18.45 inches.

Similarly, San Jose is now at 60 percent of its historic average, with 4.77 inches since Oct. 1. Oakland is at 70 percent, having received 7.81 inches.

But Southern California is in a much more dire situation. Los Angeles has had only 27 percent of its average rainfall at this point in the winter season, with a meager 1.89 inches. Last year at this time, the city had more than seven times as much rain, with 14.33 inches — 207 percent of normal. Some areas are even drier. Fullerton had had 18 percent normal rainfall, Irvine 6 percent.

Only two winter seasons that have been this dry through January in San Francisco have ended in a year with normal or above rainfall, according to Null's calculations, and none in San Jose or Los Angeles have occurred when January rain totals are this low.

But there have been wet March months in the past — particularly the "March Miracle" of 1991 that brought triple the average March precipitation, boosted the Sierra snowpack from 15 percent to 75 percent in 30 days and signaled the beginning of the end of the 1987-1992 drought.

And reservoirs around California are in good shape. Most are nearly full after last year's storms, reducing the chance of summer water restrictions.

"It is a reason to be somewhat concerned, but we still have a ways to go," Carlson said. "It's a good time to remember the lessons we learned in 2015 and 2016. We can save water and make conservation a way of life. That should never be out of mind."

# # #

California May Be Returning to Drought Again and Sierra Snow Droughts May Become More Common

Weather.com | January 30, 2018 | Jonathan Erdman

California's wet season is failing to deliver significant snowpack in the Sierra Nevada, and that is raising concerns the state may be slowly slipping back into drought just one year after its historic five-year drought ended.

Despite a recent blanket of 1 to 2 feet of snow, snow cover in the Sierra is at its lowest point in late January since the peak of the state's multi-year drought in 2014 and 2015, according to an analysis from NOAA's National Operational Hyrdologic Remote Sensing Center.

Tahoe City, along the north shore of Lake Tahoe, had picked up only 23.5 inches of snow this season through Jan. 30, a season-to-date snowfall deficit of 70.5 inches, or just under 6 feet.

The water content estimated in the Sierra snowpack was only 30 percent of average for the date, according to the California Department of Water Resources.

Three automated SNOTEL sensors in the Sierra – Leavitt Meadows, Mariette Lake, and Rubicon – reported record low Jan. 30 snow water content, according to the National Resources Conservation Service.

"We are currently on pace with the poor snowpack years of 2014 and 2015," said Dr. Daniel McEvoy, regional climatologist at the Western Regional Climate Center's Desert Research Institute.

McEvoy said November's atmospheric river event brought heavy precipitation, but high snow levels with little snow accumulation below 8,000 feet in the northern Sierra.

Then came a much drier period after mid-December during which little precipitation fell anywhere in California, according to McEvoy.

This is a stunning turn around from one year ago when feet of snow buried the Sierra January into February and March.

Reservoir Levels Still High

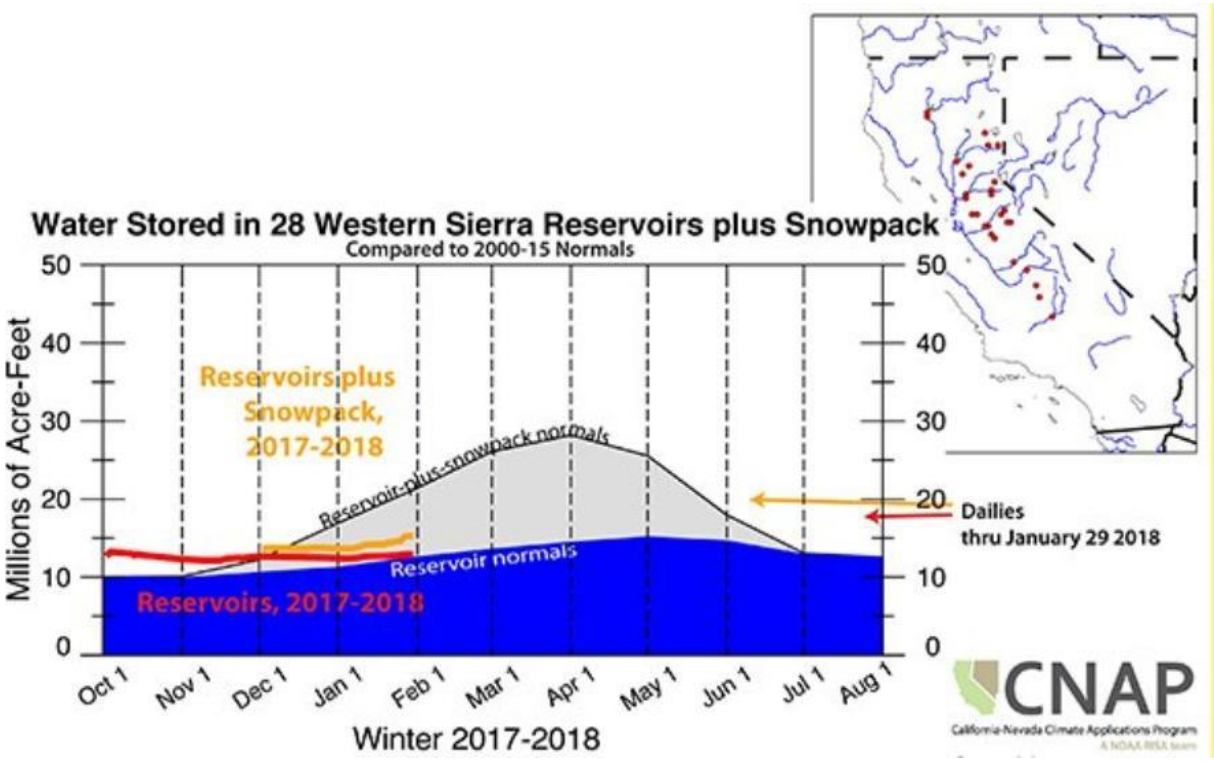
Spring and summer snowmelt of Sierra snowpack is a crucial element to California's water supply, recharging reservoirs during the state's dry summer and early fall.

While the current paltry Sierra snowpack is worrisome, it's not yet time to sound the alarm for another California drought, thanks in part to California's record wettest water year one year ago.

With the exception of Lake Oroville, being held lower as a precaution after last winter's spillway damage, most of the state's main reservoirs are near or well above average for late January.

So the concern is that if the Sierra snowpack remains low the rest of the wet season, snowmelt recharge in reservoirs would also be low when water use soars during California's hot, dry summer.

An [analysis from Dr. Michael Dettinger of the U.S. Geological Survey](#) below illustrates that concern.



Any Relief Ahead?

The culprit of this rather dry winter in California is a familiar one: namely, a dome of high pressure aloft forms either over California, or just off the West Coast.

A common jet-stream pattern responsible for the persistent dry weather during the 2017-2018 winter season in California, featuring high pressure aloft centered either over the western U.S., or just off the Pacific Coast, blocking the jet stream to the north into Canada or the Pacific Northwest.

This blocking high pressure ridge diverts the jet stream carrying wet, Pacific storms well to the north into Canada or the Pacific Northwest, leaving the Golden State high and dry.

This feature during the winter of 2013-14 and 2014-15 greatly worsened the state's five-year drought, becoming so persistent it was nicknamed the "ridiculously resilient ridge" by Dr. Daniel Swain, a UCLA climate scientist and author of the California Weather Blog.

While this pattern is expected to persist into mid-February, there is some hope on the horizon.

Using Tahoe City as an example, roughly 48 percent of the season's snow – another roughly 89 inches of snow – typically falls from February until the dry season kicks in.

"It is common to have wet periods in the late winter and spring after extended dry periods," said McEvoy.

"I will say that a snowy March is fairly common during La Niña years. The spring 2011-12 season ended as a drought year, but was saved from being one of the worst (driest) winters on record by a wet and snowy March."

But meteorologsists are quick to warn this so-called miracle March is no guarantee.

McEvoy said hopes for a miracle March in the snow-lacking seasons of 2014 and 2015 turned up dry.

Veteran California meteorologist Jan Null pointed out in a blog post that no wet season that has started out this dry in the Sierra has finished with at least average precipitation.

"I'm the eternal optimist, so I would love to see a miracle March, but I'm not holding my breath," Null said.

Snow Droughts are an Increasing Concern

Sierra snow droughts may become more common in the future, according to recent studies.

One study released in November 2017, lead by Dr. Benjamin Hatchett of the Western Regional Climate Center's Desert Research Institute, found snow levels have risen over the past 10 years in the northern Sierra.

In other words, Pacific storms are producing more rain at increasingly higher elevations – due to warmer ocean water near the coast warming the air above it – and atmospheric rivers, the narrow bands of deep moisture from the tropics ahead of some Pacific storms.

These so-called warm snow droughts are particularly bad not only in the lack of snow generated at high elevations, but also the melting of existing snowpack leading to early runoff.

If Sierra snowpack is a savings account for California's water, think of these events as depleting the savings account before it can be tapped in spring or summer.

If that wasn't enough, the blocking weather pattern dominating recent dry winters in California may be happening more often.

A December 2017 blog post from Dr. Daniel Swain cited several other studies suggesting the "ridiculously resilient ridge" pattern (when the Pacific storm track is diverted north of California) is becoming more frequent in the heart of the state's wet season.

While dry periods in the heart of winter aren't unusual in California, this recent work suggests they could become longer-lasting and more frequent.

With California's ground water supply tapped during the five-year drought not nearly replenished, all eyes will be on the rest of this spring to see if another miracle March can stop the state from sliding into drought once again.

# # #

Jonathan Erdman is a senior meteorologist at weather.com and has been an incurable weather geek since a tornado narrowly missed his childhood home in Wisconsin at age 7. Follow him on Facebook and Twitter.

Alternative Water Supplies

Public Policy Institute of California | February 2018 | Henry McCann, Alvar Escriva-Bou, Kurt Schwabe

- **Alternative supplies are a small but important part of the state's water portfolio.**

Alternative water sources—recycled wastewater, urban stormwater, and desalinated seawater and brackish water—now provide 2–3% of the state's urban and farm water supply, and they are growing rapidly. Recycled water use has more than doubled since the late 1980s to 700,000 acre-feet annually. Desalination capacity grew more than fourfold since 2006 to nearly 200,000 acre-feet in 2016. Much of this growth is due to investments by urban water agencies, particularly in Southern California. This trend is expected to continue.

Southern California communities have invested heavily in recycled water

SOURCE: State Water Resources Control Board. Municipal Wastewater Recycling Survey, 2017.
NOTES: The figure shows municipal recycled water use in 2015. Southern California includes the South Coast, Colorado River, and South Lahontan hydrologic regions. Northern California includes the North Coast, Sacramento River, and North Lahontan hydrologic regions. Urban includes groundwater recharge, landscape irrigation, commercial use, and golf courses. Other includes water used for geothermal production, preventing seawater intrusion, and other uses.

- **Having a mix of water sources improves drought resilience.**

Water managers traditionally rely on a mix of surface water and groundwater to meet water supply needs. But increasingly they're looking to alternative sources to augment supplies and buffer against drought. On-site water reuse—whether in buildings, homes, or on farms—can also reduce demand for existing supplies. Previous droughts have prompted many water managers to supplement their supply portfolios with one or more of these alternative supplies. Many utilities plan to build alternative supply projects over the next decade.

- **Some alternative water sources are particularly drought resistant.**

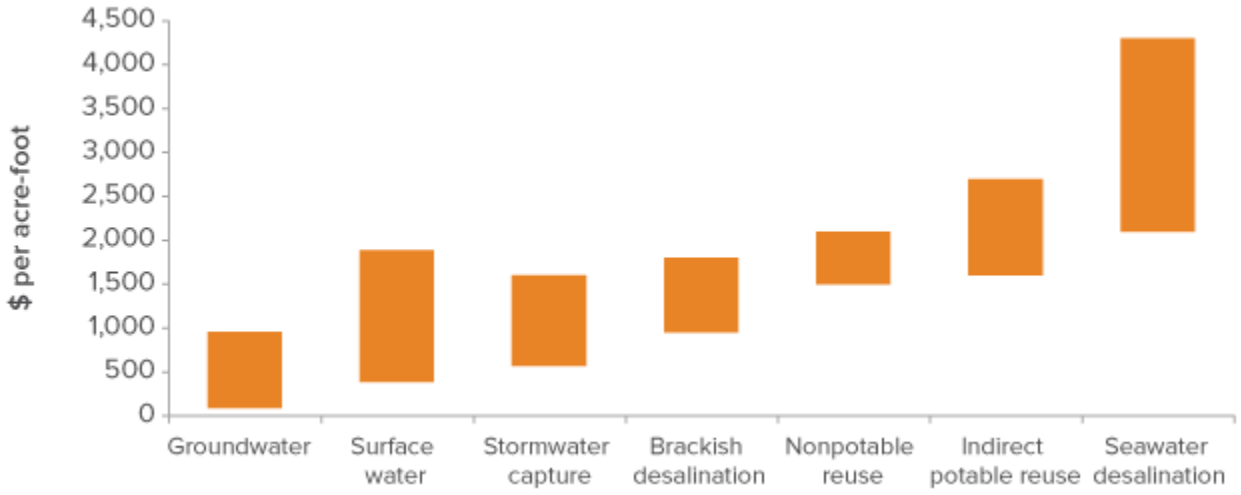
Since recycled and desalinated water are not directly linked to weather conditions, they increase reliability when traditional supplies are constrained by drought. However, a number of factors can affect the reliability or limit the use of alternative sources. For example, the amount of municipal wastewater for recycling can be limited by indoor water conservation.

Stormwater captured by retention basins, permeable pavement, or roof-top collection requires adequate rain and accessible above- or below-ground storage. Geography is also a constraint. Desalination of seawater is extremely reliable but is limited to coastal communities. Brackish water desalination is also very reliable but requires a source of saline groundwater or surface water.

- **In general, alternative water supplies are more expensive.**

While developing alternative supplies may be cheaper in some cases than investing in new surface or groundwater sources, they are often more expensive per unit of water produced than traditional supplies. Along with the initial cost of construction, recycling and desalination processes can have significant ongoing energy costs. Yet utilities may be willing to pay a premium for new alternative sources that boost reliability. Even seawater desalination—one of the most costly sources—is a viable option in some coastal communities where other supplies are not adequate to meet demands during droughts. Demand management approaches, such as water use efficiency and water trading, can make water available more cheaply than investments in new supplies. Decisions to invest in alternative supplies are complex and based on local circumstances. What works in coastal cities might not work in inland areas, and what works in Southern California might not work in Northern California.

Alternative supplies generally cost more than new surface and groundwater sources



SOURCES: Groundwater costs: Perrone, D. and M. Rohde, "Benefits and Economic Costs of Managed Aquifer Recharge in California," 2016. Surface water costs: calculated by the authors using data from the Water Storage Investment Program of the California Water Commission. All other costs: Cooley, H. and R. Phurisamban, "The Cost of Alternative Water Supply and Efficiency Options in California," Pacific Institute, 2016.

NOTES: All cost estimates include annualized capital and operations and maintenance costs. Nonpotable reuse involves the use of treated municipal wastewater for irrigating landscapes or agriculture, restoring habitat, or incorporating into industrial processes. Indirect potable reuse is the storage of treated municipal wastewater in groundwater or surface storage before it is distributed as drinking water. New surface water costs were calculated based on the cost and estimated yield of five proposed storage projects. Chart shows 2015 dollars.

- **Alternative water supplies face regulatory hurdles.**

The state is developing regulations to enable the expansion of alternative sources while addressing public health and environmental risks. Storing recycled water in groundwater basins is already authorized, and it will soon be possible to store recycled water in surface reservoirs. The state is also working on regulations for integrating recycled water directly into drinking water systems—a method that will require additional safeguards to protect public health. Regulation of on-site wastewater or stormwater reuse is challenging, as public health managers must oversee many individual and decentralized sites. The evolving statewide policy framework for on-site reuse is being informed by lessons from pioneering local efforts, such as the San Francisco Public Utilities Commission's nonpotable water program. The state's new policy for seawater desalination plants is designed to minimize harm to marine life.

# # #

Sources: For desalination capacity: California Water Plan Update 2013, Volume 3, Chapter 10: Desalination (Department of Water Resources, 2014). For recycled water use: Municipal Wastewater Recycling Survey (State Water Resources Control Board, 2017). For overall water use: Mount, J. and E. Hanak, "Water Use in California" (PPIC, 2016).

California's Water Savings Dwindle When Drought Fears Subside

Policy changes and media attention affect how much water Californians use, as well as how long these behaviors prevail. Could public awareness shift behaviors toward long-term conservation?

EOS.org | February 7, 2018 | Emily Underwood

California's population has almost doubled over the past 4 decades, growing from 22 million people in 1976 to 40 million in 2016. During that time frame the state experienced four major droughts, including the driest period on historical record, from 2012 to 2016.

Now a new study examines how the public perception of water scarcity affects Californians' urban residential water consumption. Although awareness of drought does reduce water use, that effect largely disappears once the perception of crisis fades unless more prevalent policies and messaging kick in to counteract the fading memories, the authors found. The study suggests that sustained attention from the media and policy makers is key to long-term water conservation.

California has seen a steady overall decline in per capita urban water use over the past 2 decades. This decline rapidly accelerated in 2015 because of Governor Jerry Brown's mandate to collectively achieve a 25% reduction in water use from 2013 rates, with exact cutbacks varying among different utilities. But water use by utilities and consumers tends to rebound when the perception of drought fades and restrictions are lifted. When heavy rains hit during the last few months of 2016, for example, utilities were granted the flexibility to switch back to self-determined conservation goals, and roughly 80% of utilities reduced their conservation goal to 0%.

To isolate the effect of social awareness of drought on this rebound effect, Gonzales and Ajami examined data on nearly 4 decades of urban residential water use in three San Francisco area water utilities with significantly diverse socioeconomic realities. All three districts depend on the Hetch Hetchy Reservoir near Yosemite Valley for their water supply.

The team built a computer model to simulate changing public water use trends from both structural efficiency improvements and behavioral changes, the latter influenced by a range of factors such as policy changes, media coverage, and public awareness of drought. The authors found that during the recent drought, public awareness of the drought grew rapidly in the three utilities, contributing to unprecedented water conservation levels. But these savings started to rebound in 2016, especially in the higher-income communities that had a higher water demand baseline prior to the drought. The authors suggest this rebound is related to short-term conservation measures, like not watering lawns, rather than more prevalent changes such as shifting to water-efficient appliances or adopting water-saving behaviors in day-to-day practices.

Although this capacity to prompt significant short-term conservation is an important tool for utilities to address emergency conditions, the study highlights significant variability in drought responses and public attitudes from different communities, a source of uncertainty that challenges utilities' finances and plans for the future.

Still, there are some commonalities. After California's governor declared a drought state of emergency in 2014, all three utilities cut back their water use far more than in previous droughts. A previous state of emergency declaration in 2009, in contrast, received little media

attention or public responsiveness, perhaps because an economic recession and a historic presidential election served as competing issues of public interest.

The contrast shows the power of public awareness to influence consumer behavior, the authors explained. Compared to previous water use lows of 63, 53, and 42 gallons per capita daily use (gcd) in 1991, for example, the three San Francisco area utilities in this study hit lows of 50, 45, and 35 gcd in 2015. The drop strongly correlates with local and state political actions such as the state of emergency declaration and subsequent drought-related publicity, the study found.

The results highlight a wide variety of responses to drought but also suggest that political action—and the media attention it attracts—can drive voluntary conservation across diverse communities, according to the authors. The reverse also appears to be true: When utilities and policy makers stop talking about drought, the public will to conserve water fades.

Although it's still too early to tell how urban water demand will evolve in California following the recent historic drought experience, the authors suggest further public engagement about water resources could help counteract the effect of fading drought memories. This engagement could create a shift in public understanding of drought as a new normal and prompt more prevalent water conservation behaviors.

# # #

Cap-and-trade system of water conservation and resiliency

Phys.org | January 26, 2018 | Sarah Derouin, Stanford University

California has struggled with drought for most of the last decade. From 2011-2015, the state experienced the driest four-year stretch in recorded history, leading to unprecedented water restrictions for residents, including a state mandate to reduce water use by 25 percent.

Heavy precipitation last winter relieved much of California, but dry conditions linger. Wildfires raged during the fall and early winter months, ravaging towns and hillsides from Los Angeles to Santa Rosa. A delayed start to this year's rainy season has made 44 percent of the state "abnormally dry," and fueled worries of a return to drought.

At the drought's height, water conservation was a hot topic, but conservation levels varied widely as California utilities worked independently towards their state-mandated goals. Now Stanford researchers are considering a different approach to water management, taking a page from energy and climate playbooks. Patricia Gonzales, a doctoral student at Stanford's Civil and Environmental Engineering Department and Newsha Ajami, director of Urban Water Policy at Stanford's Water in the West and NSF-ReNUWIt initiatives, have proposed a cap and trade approach to water conservation based on local supply and demand realities. Papers detailing their approach have been published in *Water Resources Research* and *Wiley Interdisciplinary Reviews: Water*.

Supply and Demand

Safe water for drinking and irrigation has grown increasingly scarce around the globe, and is expected to dwindle further as the climate changes. California's water system is no exception. In order to meet the state's future water needs, the researchers stress that understanding people's water-use behavior is key.

"People are a really big part of the water system, and they're also a really big source of uncertainty," says Gonzales, explaining that knowing more about how people use—and conserve—water and changing water supply and demand dynamics can result in better projections of demand going forward. Not always tied to population growth, demand can be impacted by socio-economic and demographic factors as well as shifting social norms. For example, wealthier communities with larger lot sizes may use more water than more populated and/or lower-income areas. Messaging about water scarcity can also help the public become more water conscious across socio-economic realities.

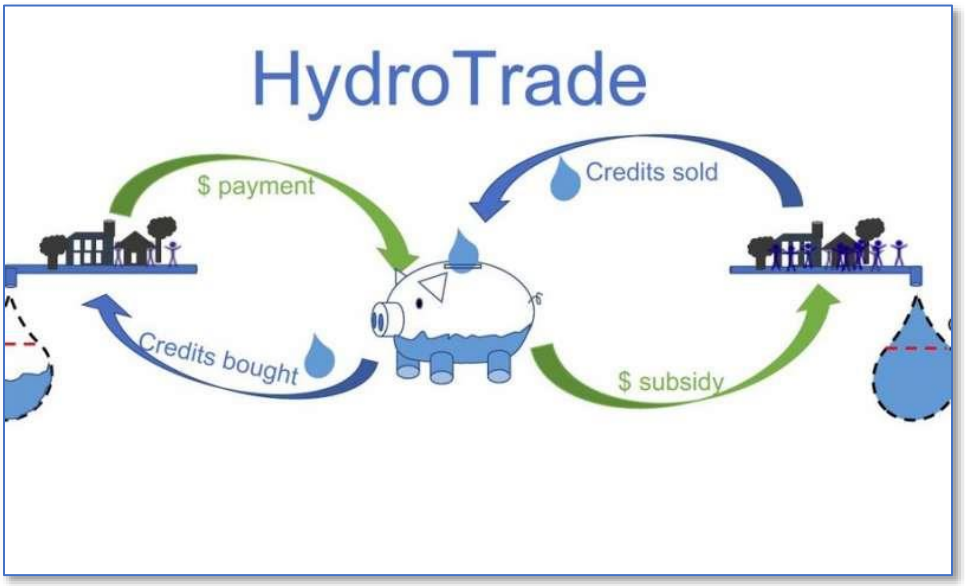
Water supply varies greatly year to year with snowpack, rain and other factors. Utilities are further constrained by where they get their water from. Some utilities rely on just one source for almost all of their water leaving little flexibility if it's compromised. For example, the San Francisco Regional Water System gets 85 percent of its water from the Tuolumne River alone, serving 27 different water utilities with a combined population of 2.4 million. The researchers argue this challenge is an opportunity for water managers and planners to embrace innovative strategies, including integrating more diverse water supply portfolios, and promoting a more collaborative governance approach to water management.

Trading a Resource

Looking at 26 communities in the Bay Area served by the San Francisco Regional Water System, the researchers explore how a system of tradable credits might allow utilities to meet

their conservation goals more effectively. This market-based program approach has been used in energy, pollution emissions and water quality trading systems around the world. But until now, it has not been applied to water conservation efforts.

During a drought where the government mandates water conservation targets, each utility is tasked with figuring out how to meet those goals. However, some communities that haven't been as forward on water efficiency strategies over the years may be able to conserve water in low-cost ways with relatively small investments, while others would have to invest in bigger projects to meet the same goals.



Credit: Stanford University

"What if instead you gave the region a target, and then you allow utilities to figure out the best way to achieve that target collectively?" says Gonzales. She and Ajami are proposing that communities, like the San Francisco Bay Area, band together and collaborate to see the smartest and most beneficial way to meet the targets.

Ajami explains that if a community has already done 'low-hanging fruit', such as replacing toilets and showers with low-water versions, they have to move to more expensive options, like paying residents to replace lawns, which may or may not be enough to achieve their target.

Instead of this expensive option, the community would contribute to the overall conservation funding pool, essentially buying conservation credits from other areas.

"For example, they can either invest $1500/acre-feet to replace lawns, or they can use the trading platform to purchase conservation credits for a lower price, which can ultimately contribute to help another community replace their toilets," says Ajami.

"The basic idea of cap and trade is to incentivize people to do things that are cost effective for them, but also potentially invest in the community and system as a whole."

Watering the Future

The team is expanding the current platform, which they have labeled HydroTrade, to allow communities to not only share conservation credits but also develop and share other water supply sources in order to enhance regional resiliency.

"We did this proof-of-concept for conservation, but our ultimate goal is to enable water portfolio diversification and reduce reliance on a single supply source or imported water," says Gonzales. Supplementing water sources by adding alternative water—like recycling water or capturing storm water—can help bolster supplies. Gonzales says, "You can use this kind of collaborative approach, not only for drought or emergency conditions, but also in terms of long-term planning and adaptation."

By taking a closer look at efficiency and conservation trends and opportunities, as well as long-term water demand patterns at the regional scale, Ajami says utilities might be able to increase reliability and resiliency of their existing water supply despite population growth by smaller and smarter investments.

"Most of our current water infrastructure was built under a different climatic reality, and is now reaching the end of its design life. Hence it is losing its operational effectiveness. As communities are debating on how to meet their future water needs it is important to take a hard look at where our demand is going. We have an opportunity to add flexibility into our existing water infrastructure system by introducing innovative operational strategies while also promoting alternative, distributed and decentralized water sources, 21st century solutions for 21st century challenges" she says.

With more climate extremes expected in the future, freeing up water for users requires smarter thinking, says Ajami. "We need to encourage regional thinking and collaboration in order to meet our future water demand more effectively while avoiding unnecessary investment in large capital-intensive infrastructure, which belongs to the previous century and is not very adaptable to future climatic and social realities."

# # #

Jerry Brown officially downsizes Delta tunnel plan. But can he sell one tunnel?
Sacramento Bee | February 7, 2018 | Dale Kasler

The troubled Delta tunnels project was officially downsized Wednesday, as Gov. Jerry Brown's administration announced it would attempt to build a single tunnel in its effort to re-engineer California's elaborate water-delivery system.

Unable to secure enough money from California's water agencies for the original twin tunnels concept, the California Department of Water Resources said it would now try to build the project in phases: one tunnel now and a second tunnel years down the road.

The long-awaited announcement doesn't appear to immediately solve the financial questions looming over the project, known officially as California WaterFix.

A letter to water agencies from DWR Director Karla Nemeth says the first tunnel would cost $10.7 billion. That's much less than the price tag for building two tunnels, now officially pegged at $16.3 billion. But the one-tunnel option also is considerably more expensive than the estimated $6 billion to $6.5 billion that's been pledged so far by participating south-of-Delta water agencies.

The administration, which has been eager to get the project on track before Brown leaves office at year's end, believes it can convince additional water agencies to pitch in. Wednesday's announcement is expected to trigger months of horse trading in which enthusiastic backers of the project would commit additional money to WaterFix, essentially "buying out" reluctant water districts.

The Metropolitan Water District of Southern California, which has already pledged more than $4 billion to the project, has indicated it might be willing to put more money in. Nemeth said Wednesday she thinks other agencies will contribute, such as the Santa Clara Valley Water District.

"We have information that the benefits are there and there's enough willing buyers for this first stage of the project," Nemeth said in an interview.

The state hasn't completely abandoned the twin-tunnels concept, said spokeswoman Lisa Lien-Mager of the Natural Resources Agency, which oversees DWR. But Wednesday's announcement gives the state the ability to move quickly on a one-tunnel approach once all permits have been obtained, she said.

Nemeth said DWR will supplement the environmental impact studies conducted on the project to reflect the change in scope, but it won't have to start that laborious process from scratch and can wrap it up by October.

The phased approach "would allow work to begin on WaterFix, as soon as all necessary environmental review and permits are complete, which is anticipated near the end of 2018," she wrote.

Critics of the project, including Delta landowners and many environmental groups, say even one tunnel would damage the Delta's fragile ecosystem. They have vowed to continue fighting WaterFix in court and in regulatory proceedings. They also argue that the necessary environmental analyses must be completely redone, a process that could add a year or more to a project that has already been in the planning stages for a decade.

“We still have all the same issues,” said Russell van Loben Sels, a prominent Delta farmer and tunnels critic. “It creates a whole host of problems for the Delta.”

The anti-tunnels group Restore the Delta said, “We remain convinced that a fifth reiteration of the project will not save ... WaterFix from failure and will ultimately deal a devastating blow to the health of the ailing San Francisco Bay-Delta estuary.”

The announcement acknowledges what had become obvious in recent months: Brown’s administration has been unable to raise the nearly $17 billion necessary to build two tunnels beneath the Sacramento-San Joaquin Delta. An unofficial count by The Sacramento Bee shows that the south-of-Delta water districts have pledged about $6.5 billion toward the project, and many of those commitments are tentative. Since October, the Brown administration has openly floated the idea of scaling back the project, or building just one tunnel as a first phase.

The tunnels are designed to fix a problem that has festered for decades. Water pumping by the State Water Project and the federal Central Valley Project has irrigated the southern half of the state but caused considerable harm to the Delta’s ecosystem. Several fish species, notably the smelt and Chinook salmon, face possible extinction.

By law, pumping often has to be curtailed or halted altogether to protect the fish, which means water destined for the pumps flows out to sea instead. This requirement has reduced water deliveries to the millions of acres of irrigated farmland that depend on the Delta, as well as the 19 million residential customers of Metropolitan, the largest water agency in the system.

How would WaterFix help? The current pumps are so powerful, they can reverse the natural river flows inside the Delta and draw the fish toward predators and the pumps. By diverting a portion of the Sacramento River at a point near Courtland, at the north end of the Delta, and shipping it through one or more underground tunnels to the pumping stations near Tracy, state officials say the WaterFix project would largely remedy the “reverse flow” problem and make the fish safer.

Critics say diverting water at Courtland, however, would actually worsen the Delta’s ecosystem. It would deprive the estuary of much of the Sacramento River’s fresh water and make the Delta more dependent on the saltier flows from the San Joaquin. That could render much of the land unsuitable for agriculture, they say. Besides, the years of construction “will create absolute chaos ... with either one tunnel or two tunnels or three tunnels or whatever,” van Loben Sels said.

Because of the staggering cost, support for the project has been far from unanimous. Urban agencies can spread the costs among millions of ratepayers; Metropolitan said its customers would pay an extra $3.10 a month. Agricultural districts, however, have only a few hundred farmers and have struggled to justify the costs. Westlands Water District, which serves Central Valley Project farmers in Fresno and Kings counties, flatly rejected the project in September. Its staff had calculated that growers’ costs would jump from $160 an acre-foot to more than $600.

Besides the urban-rural divide, there’s also a split between how WaterFix is regarded by members of the Central Valley Project and the State Water Project. The Bureau of Reclamation, which runs the federal project, instituted a cost-sharing formula that exempted certain major agricultural districts with special water rights. That put more of a financial burden on the

remaining districts, and as a result every Central Valley Project member agency has followed Westlands' lead and sat on the sidelines.

As for the State Water Project, every south-of-Delta agency has been told it must participate – or find another agency to take its share. Metropolitan has said it might put additional dollars into the project, stepping up for other agencies. That would increase its costs but give Metropolitan a greater share of the water that's shipped through the tunnels.

Metropolitan general manager Jeff Kightlinger said Wednesday the agency isn't eager to buy a greater share of the tunnels project but will consider it.

"We'll take a hard look at it, as long as the benefits are commensurate with the costs," he said. "We'll have that conversation. It won't just be Metropolitan."

# # #

Huge delta plan for moving water cut to just 1 tunnel
SF Gate | February 7, 2018 | Kurtis Alexander

California water officials announced Wednesday that a plan to build two giant tunnels for moving water supplies across the state was being reduced to a single, less costly underpass — at least initially — a setback for one of Gov. Jerry Brown's signature projects.

The director of the Department of Water Resources said the long-sought $17 billion twin tunnels beneath the Sacramento-San Joaquin River Delta did not have sufficient financial support from the water agencies that ultimately have to shoulder the bill.

An alternative single tunnel, which would traverse the same 35-mile course as the original proposal and similarly transport water from Northern California's plentiful Sacramento River to drier points in the south, would come with a smaller price tag of $10.7 billion, according to the state. It would also carry just two-thirds as much water.

State water officials said they still hope to build two tunnels, but given the limited funding would start with just one. The project, known as WaterFix, promises more reliable water shipments across the ecologically fragile delta. The estuary's crumbling canals have made it difficult to ferry supplies through the wetlands, while fish and other wildlife have been caught in the crosshairs.

"This prudent approach aligns the urgent statewide need for action with the project's current support," said Karla Nemeth, Department of Water Resources director, in a prepared statement. "We are eager to move forward with WaterFix to protect the Delta and water supplies."

Dozens of water agencies, serving more than 20 million Californians from the Bay Area to San Diego, rely on water that moves through the delta. While few of the agencies have doubted the need to improve the region's water infrastructure, some have questioned the expense. Last year, after the tunnel proposal won key regulatory approval, some of the suppliers decided not to pony up the money.

While the agencies have since been in discussion with the state about reducing the project's cost, including a potential downsizing, only Wednesday did the Department of Water Resources agree to move forward with a single tunnel. It remains to be seen whether the plan will get buy-in from the water agencies, who as beneficiaries are obligated to pay for it.

"If there's a different way of proposing it, we want to talk about it," said Sarah Woolf, a Central Valley farmer who sits on the Board Of Directors of the Fresno-based Westlands Water District, the state's largest agricultural supplier and a big importer of Northern California water.

Westlands was expected to pay more than a fifth of the cost of WaterFix but voted in September to back out, essentially dooming the original proposal. Board members said the expense was too much considering that the benefits were uncertain.

State water officials have said the project will boost reliability of water deliveries through the delta, where the presence of endangered smelt and salmon has often prompted water managers to slow pumping. However, it's unclear how much additional water supply will come with the plan.

State officials said Wednesday they're still studying the cost and benefits of the alternative proposal.

The single tunnel, according to preliminary estimates, would be able to move 6,000 cubic feet of water per second, less than the 9,000 cubic feet that was expected with two tunnels. Eventually, a second tunnel would be built and the intended capacity restored, according to the proposal.

State officials said the new two-step approach wouldn't require much additional environmental review and could get off the ground by the end of the year. The work is likely to take at least a decade.

Gov. Brown has been pushing for a tunnel project for years as a way of shoring up the state's water supplies while improving wildlife habitat and helping fish populations rebound.

Environmental groups, though, remained skeptical of the new plan. The single tunnel doesn't eliminate concerns that the project amounts to a water grab and could upset the estuary's natural flows, they said.

"We are very concerned that this new version of the WaterFix will pursue a larger tunnel than what was presented," said Barbara Barrigan-Parrilla, executive director of Restore the Delta.

She also said that, despite the state's claims, the new project needed more environmental review: "DWR's attempts to jam through a permit for one project, while working secretly with water exporters to create another, is unconscionable."

The association that represents many of the water agencies that would benefit praised the plan.

"We appreciate that the state has developed an approach that is responsive to the current funding availability, making momentum for California WaterFix stronger than ever," said Jennifer Pierre, general manager of the State Water Contractors.

Among the water agencies that will have to pay for the project, and ultimately decide its fate, are the Santa Clara Valley Water District and Alameda County Water District, as well as Southern California's Metropolitan Water District.

# # #

NRDC renews motion for immediate continuance of Cal Water Fix hearings in light of anticipated changes to project; DWR responds …
Maven | February 7, 2018 | Breaking News

NRDC renews motion for immediate continuance of hearings in light of anticipated changes to project:

"Dear Hearing Officers and Service List,

On behalf of the Natural Resources Defense Council et al, we are renewing our January 31, 2018 motion for an immediate stay or continuance of Part 2 of the hearing and request that the Hearing Officers reconsider their February 6, 2018 ruling denying NRDC's motion for stay or continuance in light of anticipated changes to the project. The February 6th ruling stated that, "News reports that Petitioners are considering a modification to the project do not constitute good cause to halt all consideration of the change petition currently before us." (emphasis in original)

However, the attached letter from DWR to State Water Project contractors dated February 7, 2018, proposes to change the WaterFix project so that a first phase will be a single tunnel with 2 intakes (6,000 cfs), with no certainty that a second phase would ever be constructed ("… stage two would begin once additional funding commitments are made from supporting water agencies."). The attached letter also makes clear that a supplemental Environmental Impact Report under CEQA and revised ESA and CESA permits will be required, and that the supplemental draft EIR will not be publicly available until June of 2018. The letter also discloses that there is substantial preliminary modeling of a single tunnel, two intake (6,000 cfs) project, which has just been posted online, the day before Part 2 of the hearing begins. DWR apparently seeks to move forward with construction of a first phase without funding commitments for the entire project, in violation of State law. These admissions are consistent with NRDC's prior motion for stay of Part 2. More information from DWR's change to the project are online at: https://www.californiawaterfix.com/staged-project-implementation/.

The changes to the project, additional modeling, and other information is clearly beyond the scope of the written testimony submitted by DWR in part 2. For the reasons stated in our motion, continuing with Part 2 of the hearing would prejudice NRDC and other protestants and is not in the public interest. In light of the major change to the WaterFix project that DWR has proposed, we renew our motion for an immediate stay or continuance of Part 2 of the hearing and request that the Hearing Officers immediately reconsider their February 6, 2018 ruling denying our motion to stay Part 2 of the hearing. Consistent with the Board's February 6, 2017 ruling, we request an immediate stay of Part 2 of the hearing until the Hearing Officers have solicited "input from the parties as to whether such modifications necessitate an amended change petition or new or supplemental CEQA analysis."

Sincerely,

Doug Obegi "

NRDC et al motion to stay Part 2 due to changed project 1-31-18

Department of Water Resources responds:

“Dear Hearing Officers Doduc and Marcus,

On February 6, 2018 your ruling directed Petitioners to update you and the parties if and when DWR decides to modify the proposed WaterFix project. DWR interprets this language to mean that you would like to remain informed of any updates to the Department’s approach to the California WaterFix. DWR is not modifying the proposed WaterFix project or the petition, but in order to keep you informed of the most current thinking with regard to construction we submit the attached memo and serve it upon all the parties to the water rights hearing.

The Department looks forward to the resumption of the hearing tomorrow, February 8th.”

# # #

Governor's Budget Banks on Voters Passing Water Bond

Public Policy Institute of California | February 7, 2018 | Caitrin Chappelle, Henry McCann

Governor Brown's proposed budget—the last of his tenure—highlights his priorities for the state. For water, the proposal includes new funding to address some pressing public safety and environmental health issues, including improving drinking water quality in low-income communities, flood protection, groundwater management, and air and water quality at the Salton Sea.

Carrying out this proposal will depend not only on passing the budget, but also on getting additional approvals from California voters and the legislature for some of the needed funds.

To pay for most of the new initiatives, the governor is banking on California voters approving a $4 billion parks and water bond (SB 5) that will be on the ballot in June. More than $400 million in proposed spending on water for 2018–19 is contingent on SB 5, including safe drinking water projects ($63 million), flood management ($99 million), groundwater sustainability ($146 million), and restoration of the Salton Sea ($30 million).

To improve water quality in impoverished communities, the budget proposes using $4.7 million of general fund dollars to administer a new program to cover the ongoing costs of providing safe water. But the governor is counting on the legislature to approve a funding stream for the program itself—on the order of $100 million annually. One current measure (SB 623) would do this by assessing fees on agricultural chemicals and water bills. Or the governor may propose a similar measure as a trailer bill to the budget. Like any new tax, this kind of fiscal measure requires approval by at least two-thirds of both houses, which can be a significant hurdle. To date, water agencies have opposed this measure.

The budget proposal's heavy reliance on bonds to pay for water projects continues a tradition that voters have supported over the past two decades. Since 2000, seven state general obligation bonds—voter-approved debt reimbursed with general fund taxes—have provided roughly $22 billion for water projects. State agencies are still awarding funds from Proposition 1—a $7.5 billion bond approved in November 2014. Bond funds have generally gone to "fiscal orphans"—areas of public and environmental health that do not have adequate alternative sources of funding. But bonds have not created a reliable way to fund ongoing needs.

The current proposal to create a steady stream of funding for the costs of safe drinking water programs is one way to break from this tradition. But it can also be a more difficult path. Setting up long-term funding streams, such as new taxes and fees, will require going beyond bonds. Leadership at the state and local levels are needed to pave the way.

# # #

DWR to Invest Millions in Groundwater Sustainability for Disadvantaged Communities and Local Agencies

Maven | February 7, 2018 | Department of Water Resources

The Department of Water Resources (DWR) today announced $85.8 million in grants for groundwater sustainability projects that directly benefit severely disadvantaged communities, and for local agency development of Groundwater Sustainability Plans (GSPs). These funds support the goals of the Sustainable Groundwater Management Act (SGMA), requiring local agencies to sustainably manage the state's groundwater basins.

"Groundwater is an important water supply, particularly during times of drought when as much as 60 percent of the state's water needs may be supplied by groundwater," said DWR Director Karla Nemeth. "Many basins have suffered from over-drafting for decades and it will take decades to bring them back into balance. It's critical that communities have plans to replenish their groundwater when conditions are wet and ensure supplies stay clean."

DWR received 78 grant applications and is recommending that all receive awards, pending public comments and review of those comments. The grants are funded by Proposition 1 passed in 2014 and awarded on a competitive basis in two funding categories: 1) Projects that serve severely disadvantaged communities; and 2) Development of Groundwater Sustainability Plans (GSPs).

Of the $85.8 million awarded:

$16.2 million is for severely disadvantaged communities to support groundwater sustainability planning and management.

$69.6 million is for local agency GSP development

$3.4 million is tentatively awarded to three basins. These awards will be held pending a further review of their eligibility.

The full list of grant applications that were submitted is available on the Sustainable Groundwater Planning Grant Program webpage.

# # #

Today's announcement begins a 15-day public comment period. The public may submit comments via email to SGWP@water.ca.gov or by U.S. Postal Service to:

Financial Assistance Branch
Division of Integrated Regional Water Management
Department of Water Resources
901 P Street
P.O. Box 942836
Sacramento, CA 94236-0001
Public comments will be considered before finalizing the awards in late February.

Voters OK'd $2.7 billion for new reservoirs. Critics say California won't spend it
Sacramento Bee | February 2, 2018 | Dale Kasler and Ryan Sabalow

It's a tantalizing pot of money, $2.7 billion for new dams and reservoirs approved by California voters during the worst of the drought.

But is the state willing to spend it?

The California Water Commission, the obscure state agency in charge of allocating the money, stunned the California water world recently by giving a decidedly lukewarm response to the 11 applications it received for funding. Farm irrigation districts and municipal water agencies applying for the money fear that the commission has raised the bar so high that few if any reservoir projects will qualify for the dollars.

"The thing that probably worries me the most is, we don't want the babies thrown out with the bathwater by the California Water Commission," said Tim Quinn of the Association of California Water Agencies.

Water Commission leaders, however, say they're prepared to spend the money. They simply need to see more and better information from the applicants about how the projects would provide "public benefits" – the hurdle that must be cleared before any dollars can flow.

"We're anxious – the commission, every single commissioner is anxious to get this money out to the projects," said Armando Quintero, chairman of the seven-member body.

The money would come from Proposition 1, a $7.5-billion bond measure approved by voters in 2014 to pay for water recycling, treatment and the like, including the nearly $3 billion set aside for reservoirs and other water-storage projects.

Backers of 11 different projects have come forward with applications for funding, including Sites Reservoir an hour north of Sacramento and Temperance Flat dam northeast of Fresno, two of the largest reservoirs proposed in California in decades. Smaller projects are seeking funding, too, including a groundwater "bank" proposed for south Sacramento County by the regional sanitation district.

The Water Commission is still six months away from making its decision, but controversy erupted at a commission meeting last month. Based on the staff analysis conducted so far, executive officer Joe Yun announced that none of the 11 projects would deliver as much public benefit as its backers claim, potentially reducing the amount of money they'd be eligible to receive. The commission said three of the projects don't appear to deliver any public benefit at all, putting them in danger of being shut out of the funding completely.

The commission says it hasn't rejected any proposals, and is giving project backers three weeks to revise their applications and provide greater detail about the public benefits their reservoirs or dams would bring to California's overstressed water system. The commission on Thursday released detailed summations of how each of the projects stacks up.

Despite its efforts to assure applicants they're still in the running, the commission's declaration has set off waves of anxiety in California's water world – and a series of denunciations by elected officials and politicos who support the projects.

State Sen. Jim Nielsen, a Sacramento Valley Republican whose district encompasses the Sites Reservoir project, said the announcement left him with “visceral anger” and a sense that the Water Commission was thwarting the will of the voters.

“The people who had supported Prop. 1, who worked hard for Prop. 1 to pass it, now they’re feeling a little bit betrayed,” Nielsen said.

Former Rep. Doug Ose, a Sacramento-area Republican candidate for governor, took to Twitter to blast “these enviro minions” on the Water Commission. The commissioners are appointed by Gov. Jerry Brown, a Democrat.

The controversy lies in the complicated system set up for allocating funds.

Under the rules of Proposition 1, officials said, the state can only pay for the elements of a project that would benefit the public at large. In other words, it won’t help build a reservoir simply so a local water agency can store its water there. But it will pay for enhanced flood control, recreation and – above all – ecosystem improvements to the troubled Sacramento-San Joaquin Delta, the hub of California’s overworked water delivery network.

Putting a dollar value on these public benefits isn’t so easy, though.

Look at Sites, a $5.1 billion reservoir that’s seeking nearly $1.7 billion of Proposition 1 money.

An “off-stream” project that would take water piped from the Sacramento River 14 miles away, Sites could store 1.8 million acre-feet of water for participating water agencies throughout the Sacramento Valley and as far away as Southern California. It would be California’s seventh-largest reservoir, and the largest built since New Melones opened on the Stanislaus River in 1979.

The water agencies promoting Sites say the reservoir would bring substantial public benefits by helping with flood control and making water available for wildlife refuges. It would also deliver crucial ecosystem benefits for California’s endangered Chinook salmon species by increasing the available pool of cold water in the Sacramento River system. During the drought, warm water killed off most of the juvenile salmon and reduced overall populations.

The Water Commission staff gave Sites credit for flood control and wildlife refuges. But the staff said it wasn’t persuaded by Sites’ claims about the value of the reservoir’s ecosystem enhancements. As a result, in the technical assessment released Thursday, the staff proposed knocking several hundred million dollars off Sites’ potential funding and told Sites’ backers to make a more compelling case.

That left Sites’ backers more than a little frustrated. They say they’re prepared to back up their claims to the Water Commission – but they worry about the hurdles involved in proving the dollar value of an improved fish population.

“Tell me what the dollar value is of a returning salmon with any accuracy,” said Jim Watson, general manager of the Sites Project Authority.

His allies note that, unlike many big water projects, Sites has the backing of some environmental groups. Sites also is tentatively supported by the Brown administration, which mentions the reservoir favorably in the California Water Action Plan, the state’s official blueprint for water project.

“This should be a relatively easy one,” said Yolo County Supervisor Matt Rexroad, who favors construction of Sites. “Yet the state of California is stepping on itself, preventing it from happening.”

Commission officials insisted they haven’t closed the door on funding Sites or any other project.

“We’re not knocking anybody off the table,” said Yun, the executive officer. “We have 11 applications. They’re all viable. This is solvable. We’re looking for information. They have three weeks to turn it around.”

# # #

Water storage needed — but keep faith with Prop. 1
Capitol Weekly | February 1, 2018 | Larry Cruff and Frank Zonneveld

In the midst of California's severe drought back in 2014, more than 67-percent of California voters helped to pass Proposition 1, the $7.5 billion water bond to fund water quality, supply, treatment and storage projects.

In the nearly four years since the bond's passage we have seen the last historic drought come to an end, but the reprieve may be short-lived. And one fact remains unchanged: California still desperately needs to develop additional storage to capture runoff in above-average water years.

The California Water Commission is currently evaluating 11 proposals that are competing for $2.7 billion of the Prop. 1 funds set aside for storage projects. In December, the applicants made their cases directly to the commissioners in Sacramento, describing their purported "public benefits" to satisfy Proposition 1's funding requirements.

Many of the projects are worthy proposals offering benefits to the public that would offset their costs. But the proposal by Kern County-based Semitropic Water Storage District (the "Tulare Lake Storage and Floodwater Protection Project"), which aims to export floodwater from the Kings River basin for the benefit of private landholders outside the area, does the very opposite of what voters were promised when they passed Proposition 1.

As the more than 40 local governments, elected officials, water districts and small business leaders that announced their opposition before the Water Commission hearing agreed, Semitropic's proposal is a half-baked, "cart before the horse" proposal costing hundreds of millions of taxpayer dollars that is full of problems too great to overcome.

As presented, this project may appear harmless, but in reality, the project proponents have failed to disclose the negative impacts to the area of origin.

Contrary to Semitropic's claims before the Water Commission, there are no actual public benefits from this project for the Kings River nor the hundreds of thousands of residents of Fresno, Kings, and Tulare counties who depend on its water. Rather, there will only be direct losses resulting from the removal of local water.

Its true benefits are instead designed for a select group of landowners in Semitropic's service area and its private partner, Sandridge Partners (as the Bakersfield Californian has previously reported, Sandridge Partners was paid $40 million by Semitropic for an easement, or right of way, on the land acquired for the project, plus granted a first priority right to 260 cubic feet per second of water from the project.

The flaws with Semitropic's proposal don't end there.

With a price tag of more than $600 million ($452 million of which would be paid for with Proposition 1 funds), the project proposes to use the California Aqueduct to transfer naturally occurring water supply from the Kings Basin, one of the most critically over-drafted basins in the state, to the Kern County groundwater basin. Yet Semitropic has no right or license to the waters of the Kings River. Furthermore, California State Water Resources Control Board has determined that the Kings River is "fully-appropriated" — there is no additional water available.

And quite significantly, Semitropic's proposal poses direct threats to people's right to access safe, clean, affordable and accessible water and threatens groundwater sustainability efforts – a right guaranteed under California law.

The Kings River service area includes 51 "disadvantaged communities" (defined as areas which most suffer from a combination of economic, health, and environmental burdens) with a combined population of 646,236. The area also includes 59 "severely disadvantaged communities" with a population of 84,510.

Denying these communities access to water and jeopardizing long-term sustainability will only make already-difficult circumstances worse.

And by exporting water from critically over-drafted groundwater basins, the Semitropic project would make it nearly impossible for the Kings and Tulare basins and their seven Groundwater Sustainability Agencies to comply with the requirements of Sustainable Groundwater Management Act.

Allowing Semitropic to violate the principal of "local water for local needs," and the precedent doing so would establish, would have wide-ranging implications extending far beyond the Kings River service area.

The California Water Commission should note the widespread opposition from throughout the region and reject Semitropic's application. Prop. 1 funds should not be granted to a project that runs directly counter to the public's interest, harms groundwater sustainability efforts, and threatens access to safe, clean, affordable and accessible water.

# # #

Ed's Note: Larry Cruff is chairman of the Kings River Water Association, and Frank Zonneveld is vice-chairman.

A Tale of Two Tunnels: California WaterFix

University of Denver, College of Law | January 31,2018 | Kate Mailliard

In the world of California water, nothing is a sure thing. But when you're Governor Jerry Brown, even one step forward can seem like two steps back.

The seventeen billion-dollar plan to build two tunnels under the Sacramento-San Joaquin Delta ("Delta") in California, currently known as California WaterFix ("CA WaterFix"), has been a concern for environmentalists and Central Valley landowners since the plan was initiated in 2005. But in the past two years, the Delta plan has experienced a rollercoaster ride of successes and setbacks. Formerly known as the Bay Delta Conservation Plan, CA WaterFix made headway this summer when, after an extensive ten-year environmental study and scientific inquiry, the Delta plan received the "go ahead" from both federal agencies responsible for the protection of species under the Endangered Species Act ("ESA") and from the state's Department of Fish and Wildlife. The U.S. Bureau of Reclamation and the California Department of Water Resources also completed their final Environmental Impact Statement and Environmental Impact Report last year in compliance with federal and state law. Despite overcoming these legal hurdles, construction of the thirty five–mile long tunnels is unlikely to start anytime soon. Experts anticipated the project could begin construction as early as next year, but concerns over cost distribution—in conjunction with current claims alleging that the plan violates the California Environmental Quality Act ("CEQA")—are likely to slow, if not kill, CA WaterFix's momentum.

Governor Brown and the California Department of Water Resources proposed the plan known as CA WaterFix. The controversial plan would take water from the Sacramento River and transport it south under several Delta islands via two tunnels located 150 feet underground. The tunnels would end at Clifton Court Forebay. Near the Forebay are pumps that send water south through California's aqueducts. Proponents hope the Delta plan would improve water flows through the Delta and allow water to flow with fewer interruptions. Roughly thirty percent of municipal water in Southern California comes from Northern California via the Sacramento-San Joaquin Delta. State officials are fearful that the Delta's current delivery system is outdated and harms the Delta's ecosystem. They expect the twin tunnels will stabilize the water supply for two-thirds of California in the face of climate change, since the majority of the state's water is located in the north, but the majority of the state's population is located in the south. Large southern water districts, like Coachella, Highland, Rialto, Indio, Palmdale and inland San Diego, are predicted to increase their water consumption in coming years. California's largest supply of clean water is dependent on fifty year–old levees, and experts worry the current system cannot adequately capture and store water when it is available.

Although state officials for the Delta plan argue that the tunnels will improve the Delta's ecosystem, many environmental groups and government agencies in the Delta region are opposed to the tunnels. They believe that CA WaterFix cannot comply with the ESA, despite biological opinions from the state and federal agencies that suggest otherwise. The possible extinction of Delta smelt has been of particular concern. Consistent abuse (by, for example, overfishing) of one of the continent's largest wetlands has contributed to the decline of Delta smelt in the area. Delta smelt, Chinook salmon, and steelhead are among the Delta-inhabiting fish protected under the ESA. Current challengers to the Delta plan's compliance with the ESA

likely hope for a result similar to the one in Tennessee Valley Authority v. Hill, 437 U.S. 153 (1978), in which the Supreme Court ordered a permanent injunction against the construction of a controversial dam and held that the ESA prohibited completion of a dam where its operation would either eradicate an endangered species or destroy its critical habitat. The dam in Hill was nearly completed when environmental groups brought suit, and Congress had already allocated large sums of public money for the project. In this case, unlike in Hill, construction of the twin tunnels has yet to begin and funding for the project is insecure.

In compliance with the 2009 Delta Reform Act and pursuant to CEQA and the National Environmental Policy Act ("NEPA"), an Environmental Impact Report and an Environmental Impact Statement were finalized last December.

CEQA has historically proven to be a powerful weapon in the courtroom. In Citizens of Goleta Valley v. Board of Supervisors, 801 P.2d 1161 (Cal. 1990), the Supreme Court of California said the courts must "scrupulously enforce all legislatively mandated CEQA requirements." CA WaterFix may be required to redo the environmental review process if the project's challengers can prove that the constructions and functioning of the tunnels will harm wildlife, like the Delta smelt. As of the August filing deadline, at least fifty-eight environmental groups and local governments have sued under CEQA in opposition to the Delta plan. The plaintiffs include Sacramento Valley water agencies, Sacramento County, and San Joaquin County.

Many of the lawsuits' main claims are that the environmental reviews were not properly conducted. The Golden Gate Salmon Association, the Natural Resources Defense Council, the Defenders of Wildlife, and The Bay Institute filed a joint claim against Secretary of Commerce Wilbur Ross, Administrator for Fisheries at the National Oceanic and Atmospheric Administration Chris Oliver, and the National Marine Fisheries Service on June 29, 2017. The plaintiffs' main claim is that "reliance on the uncertain future mitigation measures to conclude that [CA WaterFix] will not jeopardize the [Chinook salmon] species or adversely modify its critical habitat violates section 7(a)(2) of the ESA." They assert that a biological opinion's no jeopardy conclusion must be "reasonably specific, certain to occur, and capable of implementation." The Bay Institute, the Natural Resources Defense Council, and the Defenders of Wildlife filed a similar claim against Secretary of the Interior Ryan Zinke, the U.S. Fish and Wildlife Service, and its Director Greg Sheehan, also asserting that the biological opinions backing CA WaterFix's proposal are inadequate.

In addition to the legal challenges, CA WaterFix has also struggled to secure sufficient funding for the project. Many Delta and Westland farmers hold the view that construction of the tunnels will disrupt Delta residents' culture and lifestyle, so it is unsurprising that they do not want to bare any of the costs associated with the tunnels' construction—and legally, they do not have to. Brown pledged that local water districts would bear all the costs of construction; however, a recent audit by the Interior Department found the federal government improperly subsidized farmers for a portion of the tunnels' planning costs. California water districts may have to pay back the improperly contributed $85 million in taxpayer funds.

All the while, getting approval from water districts has been a whirlwind. Westlands Water District, California's largest irrigation district and a major water agency served by the Central Valley Project, decided not to join CA WaterFix. The Westlands's board voted against the project in mid-September, asserting the current financial structure of the project was not

feasible. The Westlands District said it could not afford to support the project because of a unique cost-allocation formula imposed by the U.S. Bureau of Reclamation on the Central Valley Project. The cost-allocation formula, originating in a 1939 deal from the Roosevelt administration, exempts a large group of water users in the district from helping fund the Delta tunnels. The deal inflates Westlands customers' costs by several billion dollars. Until recently, Westlands's vote appeared especially discouraging, but the project is not doomed yet. The largest water district in Southern California, Metropolitan Water District of Southern California, did approve a $4.3 billion buy-in in October to support CA WaterFix. The vote of approval does not ensure the survival of the Delta project, but it is a step in the right direction. Silicon Valley's water district, the Santa Clara Valley Water District, voted in mid-October to provide "conditional support" for the Delta project. The district offered to contribute to a smaller and less expensive project, offering $200 million instead of the expected $600 million. Brown and his administration are still advocating for twin tunnels, but if more water districts fully supported the building a single tunnel, Brown might have to seriously consider the idea.

The original plan envisioned that the largely urban agencies supplied by the State Water Project would pay fifty-five percent of the construction costs while the largely agricultural districts of the federal Central Valley Project, like Westlands, would pay forty-five percent. One suggested alternative to this financial plan is requiring wildlife refuges and farmers with senior water rights to bear some of the construction costs. However, neither group is legally obligated to contribute to the cost of construction, despite being first in line for the Delta water. It is fair to assume that farmers would be more willing to chip in for the project if it meant more water for them, but if the farmers' water rights are already being satisfied, they cannot legally enlarge their water use anyway. Another consideration is the farmers' economic stability and ability to fund a project of this size.

Major water purchasers were expected to continue to vote for or against the funding of CA WaterFix in the late months of 2017, but as of January 2018, the Department of Water Resources is still considering limiting the project to one tunnel instead. A revised plan may command a new set of environmental impact studies and other permits. The one-tunnel option also needs approval from the districts previously supporting the two-tunnels plan. It has also been suggested that rather than build the two tunnels, the state can increase water storage capacity (above and below the ground), reuse and recycle water, and build more water desalination facilities. The fifty-year old system currently in place does not allow the state to capture and store large amounts of storm water in the wetter years. Some state officials believe the Delta plan is the only option for serving the nineteen million Southern Californians. Backers have tweaked the Delta plan constantly since its introduction in 2005, and the plan might see additional changes in the future. Current lawsuits are likely to slow construction plans, especially considering the first round of biological opinions took nearly ten years. If the suits are successful and the opinions must be re-evaluated, construction could be stalled for years. To comply with environmental limits, one proposal has been to build a new diversion point in the Sacramento River in a northern delta that will feed the tunnels without harming fish populations. Current lawsuits will run their course over the next few years, but these suits are by no means a guaranteed halt on the project.

# # #

One possible delta tunnels deal would give cheap water to farmers — and more expensive water to cities

Los Angeles Times | January 25, 2018 | Bettina Boxall

Months of behind the scenes talks have failed to drum up enough money to pay the full costs of replumbing the center of California's sprawling waterworks with two giant water tunnels.

That has left the state with little choice but to scale down a roughly $17-billion water delivery project to fit a funding pot of less than $10 billion.

State officials are expected to soon announce exactly what form a revised California WaterFix would take.

While it is assumed the project will shrink from two tunnels to one constructed under the Sacramento-San Joaquin Delta, the capacity of the conveyance system hasn't been settled.

"We don't have a game plan from the state," Jeffrey Kightlinger, general manager of the Metropolitan Water District of Southern California, told an MWD board committee Tuesday.

Driven principally by big irrigation districts' reluctance to pay for a project they have long sought, the downsizing underscores the degree to which California agriculture is addicted to cheap water supplies. The changes could cause more delays in the decade-old proposal, which is designed to stem declines in water deliveries to San Joaquin Valley farms and Southern California cities.

MWD and other agencies that approved the two-tunnel proposal will have to decide if a smaller version is still to their liking. Opponents — primarily delta interests and environmental groups — will no doubt demand that an altered WaterFix undergo a new environmental review.

State officials hope to avoid that, arguing that any version of the project was evaluated in the form of alternatives outlined in thousands of pages of environmental documentation for the two-tunnel proposal.

"The odds are, almost anything within a project has been vetted in an alternative," state Natural Resources Secretary John Laird said last month.

As previously proposed, WaterFix would add a new diversion point on the Sacramento River in the north delta that would feed two 40-foot diameter tunnels connected to existing government pumping plants.

The replumbing is intended to reduce the harmful effects of the powerful pumping operations — and thus ease environmental restrictions that at times limit southbound water exports.

Critics complain that the big river diversions will simply create a different set of environmental problems.

The tunnels' funding was based on the premise that customers of the largely urban State Water Project and the largely agricultural Central Valley Project that receive supplies from the south delta would pick up the tab. Costs would be apportioned according to the size of an agency's water contract.

But that plan fell apart when Westlands Water District, the largest contractor in the federal CVP system, backed out. Accustomed to water deliveries subsidized by the federal taxpayer, the district's board said Westlands growers couldn't afford the tunnel supplies.

The federal government has also refused to cover WaterFix costs allocated to wildlife refuges and senior water rights holders that receive delta deliveries from the CVP.

WaterFix proponents, at least publicly, haven't given up hope that the federal position will change. Instead of saying the project is being scaled back, they say it can be built "in phases," with construction of a second tunnel dependent on future funding.

Though the Metropolitan Water District and other state contractors approved financing, their total WaterFix commitments fell somewhat short of the roughly $9 billion expected from them.

That has led to months of ongoing negotiations between state contractors in meetings convened by the state.

The major players have been MWD, which imports delta water to the Southland, and the Kern County Water Agency, which distributes delta supplies to farm irrigation districts in the southern San Joaquin Valley.

The MWD, the State Water Project's largest contractor, last year OKd a $4.3-billion WaterFix buy-in. But Kern, the state system's second-largest contractor, tentatively agreed to paying only about half its WaterFix share, or roughly $1 billion.

No deals have been announced. But the MWD staff has outlined various arrangements that boil down to MWD and other urban agencies shouldering a portion of Kern's unfunded WaterFix costs in exchange for a portion of Kern's tunnel deliveries.

Under one scenario, the Kern County Water Agency would gain more access to the cheapest water in the state system.

Called Article 21 deliveries after a section in state contracts, the supplies are available only when certain "excess" conditions exist in the state system.

WaterFix is expected to boost that availability by diverting water into the tunnels during high river flows.

As described in staff presentations, MWD could buy a portion of Kern's share of regular — and more expensive — tunnel deliveries. Kern, for its part, would pay for — and retain — other tunnel benefits, including more bargain Article 21 water.

"Hypothetically, that would certainly be attractive to the ag community," Curtis Creel, Kern's general manager, said last year.

Roger Patterson, MWD's assistant general manager, said it makes sense for his agency to acquire reliable tunnel deliveries from Kern, as opposed to the less frequent Article 21 supplies that "you can't count on."

But the prospect of such an arrangement has raised questions.

If the staff formally proposes that, "Why shouldn't the board be concerned about us buying only expensive water?," said Keith Lewinger, who represents the San Diego County Water Authority on the MWD board.

"Why shouldn't we get the advantage of some of that cheap water too?"

# # #

Report calls for added protections for parts of Mokelumne
News-Sentinel | February 6, 2018 | John Bays

A portion of the Mokelumne River upstream from Lodi could be designated wild and scenic.

The California Natural Resources Agency released a report last week that strengthens the case for protecting the river.

If approved by the CNRA, 37 miles of the Mokelumne River from below Salt Springs Dam in Amador and Calaveras counties to the Pardee Reservoir's flood surcharge pool near Jackson would be added to the California Wild and Scenic River System.

Established in 1968, the National Wild and Scenic River System preserves rivers with "outstanding natural, cultural and recreational values in a free-flowing condition for the enjoyment of present and future generations," according to the system's website.

Onstream dams and reservoirs would be banned for that section of the river, although the designation would not impact existing water rights, land use or agriculture.

For this reason, Foothill Conservancy President Katherine Evatt does not anticipate any noticeable effects for Lodi or any other part of the Central Valley.

"A lot of folks from Lodi come to recreate at this area. What this does for them is make sure that the places they come to recreate are there in the future. This is good for the Valley because it keeps water flowing downstream in your direction. Not only does it protect parts of the river that are free-flowing today, but if anybody wanted to file a water rights application, this shouldn't affect that process," Evatt said.

Bill Ferrero, a Lodi-born fishing guide on the Mokelumne River, supported the proposal, echoing Evatt's beliefs that Lodi would see virtually no impact if part of the Mokelumne were added to the system.

"I think it's a great idea. I don't think it would have any affect on Lodi. There are two reservoirs and miles of river before the Mokelumne reaches Lodi: Camanche (Reservoir) is used for flood control and irrigation, and Pardee (Reservoir) has an outlet to send drinking water to the East Bay. Conceptually, I don't see how it could affect Lodi's water, at all," Ferrero said.

Kathy Grant, watershed program coordinator for the City of Lodi, voiced her own support for the proposal, adding that incorporating part of the Mokelumne into the system could bring potential benefits for Lodians who enjoy recreational activities such as kayaking or fishing in the area.

"I think it's a happy compromise. We need all the water we can get down here, because our groundwater is so depleted, but I see more (effects) in terms of recreation. We need all the recreational water we can get down here, too," Grant said.

The draft Mokelumne study is now available for public review and comment. Comments are due to the California Natural Resources Agency by Feb. 28. The agency will hold a public meeting to discuss the study and hear public comments on Thursday, Feb. 15, at the Mokelumne Hill Town Hall, 8283 Main St., Mokelumne Hill, beginning at 6 p.m.

# # #

Woodbridge Irrigation District files suit against EBMUD over water rights
Lodi News-Sentinel | January 30, 2018 | John Bays

The Woodbridge Irrigation District filed suit against the East Bay Municipal Utility District in the San Joaquin Superior Court on Monday, asking the court to review WID's water rights and contracts with EBMUD.

The suit was filed after four years of negotiations between the two districts, according to WID Manager Andy Christensen, who claimed that EBMUD has been withholding water from the Mokelumne River for almost 30 years.

"Starting in 2014, we really tried to negotiate (with EBMUD). This has been going on since the late 1980s, when we had an interim agreement with them (EBMUD) that they didn't renew," Christensen said.

Two licenses issued by the California State Water Resources Control Board authorize WID to divert additional tens of thousands of acre-feet of water from the Mokelumne River during years that it was available, with priority dates of 1928 and 1941, according to a WID press release. WID claims that the licenses have seniority over EBMUD's permit for the Camanche Dam and Reservoir, which was built in the early 1960s.

Shortly after the dam's completion in 1965, WID and EBMUD agreed that EBMUD would release up to 140,000 acre-feet of surface water per year, WID stated. That agreement ended in 1988, and EBMUD now releases only 60,000 acre-feet per year, which Christensen feels does not satisfy WID's water needs.

"In certain years, we didn't get all of the water that we're entitled to under our licenses. The effects have been that growers have not received all the water they need. We sit on an overdrafted groundwater basin, and this has caused people to use more well water. This has created a bad situation for area farmers," Christensen said.

The first court hearing is scheduled for July 27, where Christensen hopes that the courts will clarify WID's water rights. He also hopes that EBMUD will operate their reservoirs and dams in a manner that respects those rights in the future, he said.

"The ideal outcome is for the court to make a thorough review of the contract between the two districts, and that EBMUD will operate their dams in accordance with our senior water rights and licenses. This would mean that we would have more water not only for agriculture, but to help alleviate groundwater overdraft here in the northern part of San Joaquin County," Christensen said.

EBMUD spokeswoman Alison Kastama said that EBMUD could not comment on the court filing, and offered the following statement:

"Woodbridge Irrigation District and EBMUD are partners on the Mokelumne River. We have been and will continue to be for years to come. Recent discussions of future water supply planning, including groundwater banking, have brought forth the need for clarifications of existing agreements between our agencies. We look forward to resolution and continuing our great work together on the Mokelumne," Kastama said.

# # #

How Trump's pumping plan is dividing California over water – again
Sacramento Bee | January 26, 2018 | Dale Kasler and Ryan Sabalow

They gathered this week at Sacramento's federal building on Capitol Mall, carrying protest signs and vowing to resist the Trump administration's plan to pump more of Northern California's water through the Delta to the southern half of the state.

The government "wants to suck our lifeblood dry," said Noah Oppenheim, leader of a group representing commercial fishermen. An ally hoisted a sign that said, "Don't pump the Delta to extinction." Dania Rose Colegrove, a Hoopa Valley Tribe member, said the Trump proposal would suck more water from the Trinity River, a place her tribe considers sacred, to keep wealthy farmers' crops growing hundreds of miles south.

The scene couldn't have been more different the following night in Los Banos, on the west side of the San Joaquin Valley, where farmers gathered at a community center to voice their support for the Trump administration's proposal. They see it as Trump making good on a campaign promise in Fresno in 2016, when he derided efforts to "protect a certain kind of 3-inch fish" – the nearly extinct Delta smelt – and promised to bring more water through the Delta to agriculture.

"I finally have some optimism," said Mitch Coit, a grower in the Los Banos area.

Nothing sharpens the political divide in California like a fight over water. Just before New Year's, the U.S. Bureau of Administration announced it would try to "maximize water deliveries" to the agricultural districts that belong to the federal government's Central Valley Project. A series of public comment hearings this week, in Sacramento, Los Banos and Chico, illustrated the vast gulf between the warring factions.

In Sacramento on Tuesday, nearly three-dozen environmentalists, tribal representatives and others held a brief protest outside the federal building, then marched inside to blast the plan in front of Bureau of Reclamation employees.

They believe moving more water through the Delta pumps would bring more environmental ruin to the troubled estuary and kill more Delta smelt, Chinook salmon and other endangered fish species. The harm would spread as far north as the Oregon border, where rivers would get sucked dry to feed the Delta pumps, they said.

Gary Mulcahy, 63, a Winnemem Wintu Tribe member from Shasta County, nearly broke down as he described a salmon population decimated by water shortages. "Now, you could sit there for hours and not see a single salmon come back," he said.

Mocking President Donald Trump's campaign slogan, Mulcahy wore a red hat that read, "Make America Sacred Again."

The Trump administration's plan, which will take about a year to finalize, is based in large part on a 2016 law signed by former President Barack Obama. The vaguely worded law creates some additional protections for the Delta but also directs pump operators to deliver more water when possible to customers of the Central Valley Project and the State Water Project. Many environmental groups condemn the law, but its backers, including California's U.S. Sen. Dianne Feinstein, said it served as a compromise between environmental and water-supply needs.

Reclamation officials said they won't run roughshod over the environment in their effort to bring more water south. Rather, they want to take a fresh look at Delta waterways to see if there's a way to help farmers while still protecting fish.

"Both sides are struggling," said Austin Ewell, a recent Trump appointee who is the Interior Department's deputy assistant secretary for water and science. "The current system is not necessarily working for whatever party."

Reclamation's effort comes at a pivotal time. Gov. Jerry Brown is expected to announce soon whether to downsize the Delta tunnels project, his $17-billion plan designed to improve fish habitats and water deliveries by rerouting how water reaches the state and federal pumping stations. Meanwhile, two federal agencies that oversee the Delta's struggling fish populations have launched a review of decade-old pumping regulations, and California's State Water Resources Control Board is examining the Delta's water quality with an eye toward reducing pumping.

Where does all that leave Reclamation's plan to "maximize" water deliveries? In Los Banos, farmers said they expect California officials, who have fought Trump on everything from immigration to climate change, to use powerful state laws to limit the effect of the Reclamation proposal or halt it altogether. State officials have vowed to protect California's fish and wildlife as they scrutinize Reclamation's plan.

"We're seeing more evidence of a state that's willing to backstop environmental protections and push back on any federal intrusion, particularly from the Trump administration," said Cannon Michael, a farmer from the Los Banos area and chairman of the San Luis & Delta-Mendota Water Authority, a major valley water agency.

Still, the mood among valley farmers and their leaders was one of cautious optimism. Rep. Jim Costa, D-Fresno, told the crowd gathered in Los Banos that Reclamation's plan could reverse more than 20 years of declining water deliveries, brought on by court decisions and regulations, that have devastated valley farm communities.

"Places like Los Banos, Dos Palos, Mendota have felt the burden of the lack of water," the congressman said. "It breaks your heart."

Among farmers, the Reclamation proposal affirms their belief that they have a friend in Washington in Trump.

"He has at least come out and said, 'We're going to do something about the water,' " said Joe Del Bosque, a prominent valley farmer from Firebaugh. "We've been through years with no water."

# # #

Why Silicon Valley should take ag tech more seriously
GreenBiz | February 7, 2018 | Arian Aghajanzadeh

The global agricultural sector consumes 2,600 terrawatt-hours of energy and emits 5.3 billion metric tons of carbon dioxide equivalent every year. That is roughly equal to the emissions from over 1 billion passenger vehicles driven for one year (more than the number of passenger vehicles currently in operation worldwide) or the emissions from 1,300 coal-fired power plants in one year (the same number of coal-fired power plants operating in the United States).

Given that data, it is clear that we cannot combat climate change without considering the agricultural sector more thoughtfully.

As smart and connected devices have become ubiquitous in our daily lives — and the disciplines of data science and artificial intelligence have given us the tools to solve ever more complex problems — the agricultural sector seems to have benefited very little from such advancements.

A 2015 report by McKinsey & Company stated that agriculture and hunting remain the least-digitized industries in the United States. However, farmers long have sought cost-effective tools to increase the efficiency of their fields. Sensors that measure air and soil, livestock biometrics and automated systems that use the internet of things (IoT) to control irrigation are just some tools already available. Precision equipment, geo-positioning systems, big data, unmanned aerial vehicles, drones and even robotics are also leaving their mark on farming.

Despite an abundance of ag-tech startups, however, not many have been able to create a breakthrough technology and revolutionize the farming industry.

One reason is the disconnect that exists between the ag-tech sector and the farm itself. Another reason is Silicon Valley's obsession with technology alone without necessarily a specific end goal in mind. Although drones, blockchains and software solutions can bring several benefits to the farm, they lack the scalability and connectivity needed for a meaningful impact.

Farmers are keen on adopting new technologies but those technologies should be worthy of their investment and not just another solution in search of a problem. Farms are significant users of energy and water, but little has been done to manage those commodities on farms. California soon will start regulating groundwater withdrawals under the Sustainable Groundwater Management Act (SGMA) but farmers, water districts and enforcement agencies are not equipped with the tools necessary to comply with such regulation. Groundwater data are hard to find, hydrological models are complex and pump tests are too costly and time-consuming.

Ag tech is what Silicon Valley should undertake next. According to AgTech Insight's market map, a tremendous amount of activity is in that area. But it is not clear whether the venture capitalists and the tech community take ag tech seriously. Despite the growth of investment in ag tech over the past few years, only $1 billion of ventor capital investments went to the ag-tech sector in 2017 — that is 1.7 percent of the total $59 billion of VC investment in the United States for that year.

As entrepreneurs provide software and hardware solutions for the farm of the future, Silicon Valley VCs can complement their efforts by providing more capital to support those activities.

Ag tech is likely to be a critical component to sustainable productivity growth. This will be an absolute necessity if we want to meet our rising food demand, while minimizing its contribution to the global GHG emissions. Ag tech could indeed make farmers smarter and improve processes in the entire value chain so that yields are improved and waste is minimized.

Michael Burry, who predicted the housing crash of 2008, is now focused on food and water. He can’t decouple those two, because food is water. Maybe predicting the housing crash was less trivial, but we have plenty of evidence that is warning us about the food and water crisis that is coming our way.

# # #

Robotics, Artificial Intelligence Make Headway in the Water Industry

Imagine H2O, a startup accelerator, is mentoring a new crop of entrepreneurs. Tom Ferguson explains how they are applying the latest technology to water treatment, leak detection and other problems in the water sector.

Water Deeply | February 6, 2018 | Matt Weiser

You Wu, chief executive of Pipeguard Robotics, holds the robot he invented, which he calls Daisy. It travels with the flow in water pipes to detect and gather data on water leaks.Photo Courtesy Pipeguard Robotics

We hear plenty these days about breakthroughs in green energy, robotics and communications. But as everyday technologies go, water management is virtually invisible to the general public.

One organization that's working to change that is Imagine H2O, a startup accelerator based in San Francisco. A nonprofit, it provides support to emerging companies working on water problems, helping them find investors and customers.

Every year, Imagine H2O hosts a competition to nurture a class of promising water entrepreneurs. The latest class attracted 206 applicants from 36 countries, each of them seeking to benefit from expert guidance in the water industry and from relationships with investors.

In January, the firm selected 13 finalists from this group. These entrepreneurs now begin a 10-month program that will include introductions with investors and potential customers, mentoring by industry experts, and opportunities to increase their visibility in the industry. At the end of that period, winners will be selected to receive grants of up to $25,000 to help advance their inventions.

To explain the process further and introduce some of the startup firms, Water Deeply recently talked to Tom Ferguson, Imagine H2O's vice president of programming.

Water Deeply: How does your selection process work?

Tom Ferguson: We enlist the help of 146 experts from our network, who serve as prejudges and as a final judging panel. The prejudges give us a very wide assessment and provide a ranking of the applicants. Then the companies go to the final judging panel.

We don't take an equity position in these companies. We're a 501(c)3, we're a nonprofit. Our mission is to help people develop and deploy technology, and create solutions to water challenges.

Water Deeply: Many of the companies in your 2018 class are involved in wastewater. Why so much interest in that?

Ferguson: What unifies them is all of them have identified a very specific niche in which we think there is a great balance between ability to solve a problem and also the acuteness of the problem – the degree to which the problem is felt within their specified target market.

For example, Aquam LLC has developed an energy-neutral solution for dealing with ultra-high-strength wastewater streams. Their initial niche is with a specific area of the food and beverage

industry. Within wastewater, you're looking at startup companies who are really good at identifying pain points within the market.

Tom Ferguson, vice president of programming at ImagineH2O, speaks at Water Gala 2017 in San Francisco. (Photo Courtesy Tom Ferguson)

I used to work in wastewater and I know that monitoring tank health is crucial. If your culture in a tank isn't right, it will throw off your whole treatment process. Another of our firms in this sector is Island Water Technologies. It's invented a bioelectrode wastewater sensor that provides real-time monitoring of microbial activity in these tanks. It's going to monitor an absolutely mission-critical element of the overall wastewater chain, to a point where people who want to sleep well at night can, because they will know when the pattern of health in the tank starts to change.

Water Deeply: There also seems to be a trend toward bringing artificial intelligence into water treatment.

Ferguson: That's a really interesting one. There have been various companies that have looked at this and said, "How do we make life easier for a data-constrained water operator?" Emagin is an example from last year. It uses artificial intelligence to help people run a whole bunch of scenario analyses to fine-tune their water treatment operations.

Everybody has a membrane system in their water treatment process. And they are looking for intelligent ways to monitor the health of that membrane and, ideally, be able to clean that membrane without having to shut down the system, remove it and clean it off.

One of our companies this year, Intelliflux, is about giving the opportunity to be more precise. By using artificial intelligence, it allows people to do the membrane maintenance when it's actually needed, rather than when the handbook is saying it's time. It's about efficiency and augmenting the role of the operator rather than the idea of going to a robot sort of treatment plant where the operator is going to be out of a job.

Water Deeply: One of your cohort this year, Pipeguard, makes robots to detect leaks. What's that all about?

Ferguson: This is the work of You Wu, a really smart guy with a PhD from Massachusetts Institute of Technology. His idea is there are so many leaks in pipes, and there's got to be a better way of doing a couple of things: detecting leaks that are already there, but also having an early warning system to detect new leaks.

His robot looks a little bit like a shuttlecock from badminton. Essentially, it goes down the pipe with the flow and provides a relatively granular look at pipe condition – regardless of the pipe material. The robot allows water companies to have more visibility into where their leaks are, especially the small leaks. The big leaks are usually self-evident – like when roads blow up. But where are the likely rupture points? We think he's got a really novel solution and that there's an appetite out there from water utilities.

Water Deeply: How does all this translate into benefits for utility ratepayers, or the person on the street?

Ferguson: For most of us, when we turn on the tap, water comes out with no trouble at all. Everybody just basically takes this for granted. Water is really, really cheap, and it should be because it's a universal human right. Everybody needs water they can afford. But everybody

who spends more than 15 minutes looking at the water industry knows it's a really tough gig. And it's practically invisible to the person on the street. It really is an unbelievable feat of engineering and dedication and everybody wanders around clueless about it.

So all of these innovations allow utilities to optimize. If you are saving money on energy or on chemicals or treatment, or if you can cut a six-step process down to two, all of those savings fall directly to the bottom line. That means there is more and more breathing space on the utilities balance sheet, reducing the likelihood of rate increases in the future.

Essentially, the benefit to the person on the street is they get to keep on taking water for granted, rather than having bad impacts on their lives.

Water Deeply: What is the market like for water innovations these days?

Ferguson: Water is still just grotesquely under-supported as an area of infrastructure and of the economy as a whole. There are a lot of headwinds. That said, for people who understand it and can figure it out, we think there are great opportunities for solid investments.

Where water entrepreneurs run into challenges is in convincing investors this is the highest and best use of their capital. In water you have long sales cycles, a conservative industry and nowhere near the kind of federal support for other sectors, like energy.

Everybody gets very excited about water when they hear as much as $1 trillion needs to be invested in water infrastructure before 2040. But the numbers in water don't lie. I really do think it's kind of America's big time bomb. It's overlooked relative to its importance in society, shall we say. It will turn. And when it does turn, the investors who have taken positions and taken time to understand this are in a position to do very well.

# # #