BAY AREA WATER SUPPLY AND CONSERVATION AGENCY

BOARD OF DIRECTORS MEETING

March 10, 2017

Correspondence and media coverage of interest between February 13, 2017 and March 10, 2017

Media Coverage

Water Supply Conditions

Date: March 10, 2017
Source: Placer Sentinel
Article: Snowpack's Water Content Far Above Average

Date: March 9, 2017
Source: San Francisco Chronicle
Article: After near-record Northern California storms, signs of El Niño rise

Date: March 1, 2017
Source: Star Tribune
Article: Phenomenal California snowpack nears record depths

Drought

Date: March 10, 2017
Source: New York Times
Article: When is Drought Over? A Wet California Wants to Know

Date: March 6, 2017
Source: CBC News
Article: Is California's drought over? Depends how deep you dig

Date: March 6, 2017
Source: Manteca Bulletin
Article: The drought is just now beginning

Date: March 5, 2017
Source: Mercury News
Article: It's really wet – so why is Santa Barbara still mired in drought?

Date: March 2, 2017
Source: Recordnet.com
Article: Feds: Drought ends in San Joaquin

Date: February 7, 2017
Source: Daily Journal
Article: Another storm as state weighs drought rules: Rainfall drenches Bay, water suppliers contend emergency over

Water Supply Management:

Date: March 7, 2017
Source: LA Times
Article: Op-Ed Our wild, wet winter doesn't change this reality – California will be short of water forever

Date: March 4, 2017
Source: San Francisco Chronicle
Article: The mission to capture storms' water before it flows away

Date: March 3, 2017
Source: Water Deeply
Article: How Desalination Plants Are Trying to Overcome Environmental Concerns

Date: March 2, 2017
Source: Modesto Bee
Article: Sustainability, not drought, can be the future of our state

Date: February 28, 2017
Source: San Francisco Chronicle
Article: California farms given good news as reservoirs fill and snowpack builds

Water Policy

Date: March 5, 2017
Source: Record Searchlight
Article: Bill would speed up review of proposed reservoir

Date: March 5, 2017
Source: Sacramento Bee
Article: Oroville Dam's close call shows regulatory need to account for climate change

Date: February 28, 2017
Source: Sacramento Bee
Article: California water bills are starting to trickle out on Capitol Hill

San Francisco Regional Water System

Date: February 21, 2017
Source: San Francisco Chronicle
Article: SF's pure drinking water to get a new ingredient

Date: February 25, 2017
Source: Daily Journal
Article: Crystal Springs Dam kept safe over its history

Date: February 24, 2017
Source: Water Deeply
Article: How the San Francisco Bay Area Is Balancing New Development and Water

Date: February 17, 2017
Source: Union Democrat
Article: A 90-year old water tunnel gets its first checkup in decades

Snowpack's Water Content Far Above Average
Placer Sentinel | March 10, 2017 | Department of Water Resources

The Sierra Nevada snowpack continues to build during one of the wettest winters in California's recorded history. The manual snow survey by the Department of Water Resources (DWR) at Phillips Station in the Sierra Nevada found a snow water equivalent (SWE) of 43.4 inches. February's Phillips survey found 28.0 inches of SWE, and January's reading was 6.0 inches. The March 1 average at Phillips is 24.3 inches.

On average, the snowpack supplies about 30 percent of California's water needs as it melts in the spring and early summer. More telling than a survey at a single location are DWR's electronic readings from 98 stations scattered throughout the Sierra Nevada. Statewide, the snowpack today holds 45.5 inches of SWE, or 185 percent of the March 1 average (24.6 inches).

Measurements indicate the water content of the northern Sierra snowpack is 39.2 inches, 159 percent of the multi-decade March 1 average. The central and southern Sierra readings are 49.0 inches (191 percent of average) and 46.4 inches (201 percent of average) respectively.

State Climatologist Michael Anderson said the winter season has been "historic," especially in the central and southern Sierra where elevations are higher and where snowfall has been near the 1983 record amount.

The Phillips snow course, near the intersection of Highway 50 and Sierra-at-Tahoe Road, is one of hundreds surveyed manually throughout the winter. Manual measurements augment the electronic readings from about 100 sensors in the state's mountains that provide a current snapshot of the water content in the snowpack.

Frank Gehrke, chief of the California Cooperative Snow Surveys Program, conducted today's survey at Phillips and said of his findings, "It's not the record, the record being 56.4 (inches), but still a pretty phenomenal snowpack…. January and February came in with some really quite phenomenal atmospheric river storms, many of which were cold enough to really boost the snowpack."

Gehrke said the central and southern regions in the Sierra Nevada are tracking close to 1983, which had the maximum recorded snowpack statewide.

# # #

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After near-record Northern California storms, signs of El Niño rise
San Francisco Chronicle | March 9, 2017 | Kurtis Alexander

If you don't think California has seen enough rain this year, just wait. There may be more to come.

Federal forecasters said Thursday that the chances of an El Niño developing by fall are on the rise — now between 50 and 55 percent —an outlook that could skew the odds in favor of yet another wet winter.

"There are a lot of players on the (weather) field," said Emily Becker, a research scientist with the Climate Prediction Center, the federal agency that released the latest report on the El Niño climate pattern. But "El Niño is associated with an increased chance — not a 100 percent chance, but an increased chance — of higher-than-average rainfall in California."

The state is already seeing some of its wettest weather in recorded history.

According to Golden Gate Weather Services, this year's rainy season, going back to July, has seen just 0.27 inches less than the record-setting 28.30 inches of rain that had fallen — on average across the state — at this point in the soggy 1968-69 rain year.

Meanwhile, precipitation in the northern Sierra, which is crucial to the state's fickle water supply, is tracking ahead of any previous year. As of Thursday, an average 77.8 inches of precipitation had fallen between Mount Shasta and Lake Tahoe since Oct. 1 — about 212 percent of average for the period, according to the state Department of Water Resources.

The nearly constant barrage of Pacific storms, often called atmospheric rivers because of the sheer volume of water they carry, has lifted almost all of California out of a historic five-year drought.

The U.S. Drought Monitor classified just 8 percent of the state in drought Thursday, compared with 97 percent a year ago.

While the reasons behind the relentless pounding remain a subject of study, scientists recognize that the deluge came on the heels of a weak La Niña — not typically a climate signal that denotes wet weather for the Golden State.

La Niña, which is the opposite of its sibling phenomenon and is marked by cool surface temperatures in the tropical Pacific, has been associated with dry weather in California when the pattern is strong.

"By any formal metric, this winter was unanticipated," said Daniel Swain, a climate scientist at UCLA. "The deeper question of why it's happening is challenging. I don't think we have a good answer."

Swain and other forecasters were taken by surprise last year, too, when a strong El Niño produced only a moderately wet winter. With Pacific equatorial temperatures at record highs — the telltale sign of a robust El Niño — many expected loads of rain and snow in the 2015-16 season.

While the rain year left most of Southern California dry, it was still wetter statewide than prior ones and introduced what would soon become a rapid recovery from drought.

Forecasters say it’s too early to know just how strong a potential El Niño could be in the coming year. Its intensity remains key to predicting precipitation.

If the El Niño turns out to be strong, Swain said, there’s an elevated chance of another wet winter for California.

“Even though it didn’t work out for us last time,” he said, “it doesn’t mean we shouldn’t expect it to next time.”

# # #

'Phenomenal' California snowpack nears record depths
Star Tribune | March 1, 2017 | Scott Smith and Rich Pedroncelli

PHILLIPS STATION, Calif. — The Sierra Nevada snowpack is close to setting records notched more than three decades ago — a welcome sight after five years of punishing drought in California, surveyors said Wednesday.

A series of storms that doused the state in the first two months of the year brought the water content of the snowpack up to a "pretty phenomenal" 185 percent of normal, well above the 84 percent of normal a year ago, said Frank Gehrke, the state's chief snow surveyor.

Winter snowfall on the 400-mile mountain range provides roughly one-third of the water used in the nation's most populous state as the snow melts over the spring and summer and fills reservoirs supplying farmers and city dwellers.

Gehrke said the snowpack is nearing levels last seen in 1983. He noted that levels reached by April 1 are a key marker because that's the typical end to the wet season.

"We've busted through April 1 values pretty much at all snow courses throughout the state," Gehrke said.

Gehrke took a manual measurement under clear blue skies Wednesday in a meadow at Phillips Station near Lake Tahoe. He found 10 feet of snow at a spot that had been bare of snow at the height of the drought.

Nearby road signs stood half-covered in snow, and roof peaks of homes sat nestled in deep snow with tunnels dug out for access to front doors.

At the southern end of the Sierra Nevada — with the highest mountain peaks — more than double the normal amount of snow has piled up.

The deluge follows five years of drought, including two of the driest in the state's recorded history.

In April 2015, Gov. Jerry Brown attended the monthly snowpack survey near Lake Tahoe, standing in a field that was barren of any measureable snow.

Brown later ordered residents to use less water at home — a first for California. In the state that leads the nation in producing fruits, vegetables and nuts, some farmers drew down wells to grow their crops; others left fields unplanted.

The bleak scenario began to ease last year. In recent weeks, heavy storms flooded some areas of California. For a time, officials feared Oroville Dam, the nation's tallest, could burst. Tens of thousands of people were evacuated.

Flood damage statewide reached an estimated $1 billion, officials said.

The snow, however, has been good news for skiers.

At Mammoth Mountain, a popular destination in Southern California, more than 43 feet of snow has fallen. Resort spokeswoman Lauren Burke said the venue plans to stay open through Independence Day.

Farther north, Lake Tahoe is at its highest level in more than a decade and ski resorts are extending the season to the end of April.

"We've had days when we had to take a little extra time to dig out we've had so much snow," said Marcie Bradley, a spokeswoman for Northstar California. "It's been an incredible snow year."

# # #

When Is a Drought Over? A Wet California Wants to Know
New York Times | March 10, 2017 | Adam Nagourney

LOS ANGELES — The Hollywood Reservoir is nestled in a basin surrounded, usually, by dusty brown hillsides, broken up by the occasional dry wisp of shrubbery. Not these days. After yet another burst of rain the other day, the hills were transformed into lush fields of knee-high grass, spotted with purple flowers. And the reservoir? As high as it has been in years.

In Northern California, snow could be seen on top of Mount Diablo outside San Francisco last weekend. Across the state, dams are under siege and reservoirs are overflowing. The snowpack in the Sierra Nevada — a source of water once winter ends and the dry months settle in — was nearly twice its normal level last week. (And that was before even more snow arrived.)

Yet for all that, California is, at least officially, still in a drought state of emergency. That has been the case since Jan. 17, 2014, when Gov. Jerry Brown issued the order after one of the driest years in California history.

Why hasn't the drought been declared over? Here are some answers for Californians — and everyone else who has watched this story unfold — about what is going on.

So is California ever going to end its drought emergency?

The answer is yes, or at least probably yes. "Very soon, but not right away," Mr. Brown told reporters last week. "We are going to wait until the end of the rainy season." In other words, about six weeks.

Why the wait? The Sierra Nevada snowpack is now at 181 percent of normal. There was hail in San Francisco the other day. People in Los Angeles are actually learning to drive in the rain.

To appreciate just how striking that snowpack statistic is, consider this: When Mr. Brown attended the final snowpack measurement of the season in April 2015, there was not a patch of snow in sight. That was when he ordered a mandatory 25 percent reduction in urban water use, and he met little resistance.

But Mr. Brown has seen enough droughts over his 78 years in California to know the risks. The snowpack, a central cog in California's nature-defying system of providing water to 40 million people, is ephemeral: A warm April or May could melt it away. That happened, to some extent, last year. The reason is climate change.

And while most of California — 74 percent as of last week — is officially out of drought, parts of the state, such as Santa Barbara, remain alarmingly dry. "Some Central Valley communities are still depending on water tanks," said Nancy Vogel, the deputy secretary for communications at the California Natural Resources Agency.

Do Californians still have to cut back their water use an average of 25 percent from pre-drought levels?

That was the original directive by the governor, and Californians responded by meeting — and in some cases beating — the order. But because of that, and because conditions have improved, the State Water Resources Control Board eased up on the statewide mandate last year. The updated rules vary by region. In some places, there are no restrictions; in others, they remain relatively strict.

“What’s really remaining is the monthly reporting and the bans on wasteful water use — the obvious stuff like watering so much that it runs into the street, hosing down your driveway,” said Felicia Marcus, the head of the Water Resources Control Board. “The reporting and the wasteful practices are things that the governor has asked us to make permanent. And we are working on making them permanent.”

Are Californians conserving less water than they did when the order was first issued?

They are, but it’s still better than you might think.

The rule that prohibits restaurants from serving water to customers without being asked seems to have gone, um, down the drain, at least in many places. But not all the gains in water conservation were a result of behavioral changes, like taking shorter showers or watering gardens just twice a week.

At the height of the emergency, many homeowners replaced lawns with drought-resistant gardens, often with the help of subsidies from water agencies in cities like Los Angeles. New homes are being built with low-flush toilets and restrictive shower heads, and lawns have given way to desert landscaping. Those kinds of changes produce lasting effects: Urban water use was down 20.5 percent in January compared with the same month in 2013, state officials reported Tuesday.

Is the state being too cautious? Think the boy who cried wolf: Isn’t there a risk that people who responded so valiantly two years ago will take things less seriously the next time around?

That is always a risk state officials have to consider in determining when to declare the beginning or end of a drought. Beyond that, weather is, of course, ultimately unpredictable. California was girding in 2015 for a soaking El Niño weather pattern that never came. And before this winter began, some meteorologists were predicting a La Niña pattern, which would have meant drier conditions than usual. That certainly didn’t happen.

“This year may be only a wet outlier in an otherwise dry extended period,” Ms. Vogel said. “Unfortunately, the scientific ability to determine if next year will be wet or dry isn’t yet capable of delivering reliable predictions.”

In the end, has the drought been as bad as everyone worried it might be?

Probably not, though it is up there with one of the worst droughts in California’s history. The last severe drought here lasted from 1987 to 1992. At the time that Mr. Brown acted, the state was in the midst of what would turn out to be the driest three-year period in its recorded history.

California has always suffered cyclical droughts, but there was considerable concern that global warming was making conditions worse. And many people in Southern California, where growth is booming, have to rely on water that is piped in from other places, mostly from Northern California.

“I had to look at the worst-case scenario,” Ms. Marcus said. “I was worried. We had to act as if we were having our own millennial drought that would last 10 years. It was definitely DEFCON 1.”

# # #

Is California's drought over? Depends how deep you dig

The state is overflowing with water from heavy rains, but much of it just runs into the ocean

CBC News | March 6, 2017 | Kim Brunhuber

Hien Nguyen points to a spot on the siding of her San Jose home as high as her armpit. That's how high the water rose last week when Coyote Creek came for her house.

"Everything destroyed!" says the 70-year-old. "All gone."

Inside, the flood filled her bathtub with mud and sludge. The house smells like a wet sock that's been left in the washer for a week.

"Terrible!" she says, shaking her head.

Nguyen is aware of the irony: after six years of saving every drop of water, she's among hundreds living in a shelter because floods ravaged northern California, threatening dams like the one in Oroville.

Now, she says, at least one thing is certain. "We no longer have the drought."

According to the U.S. Drought Monitor, this time last year about 95 per cent of the state was in drought. This year it's about 17 per cent.

"Across the entire state so far we've had anywhere from 120 per cent of normal, to greater than 200 per cent of normal rainfall here in southern California," says Jayme Laber, senior hydrologist for the National Weather Service's Los Angeles office.

So does that mean California's historic six-year drought is finally over? The answer is yes, no or maybe, depending who you ask.

Jay Lund, director of the UC Davis Center for Watershed Sciences, says as far as surface water is concerned, the drought is 'definitely over.'

"The surface water drought is definitely over," says Jay Lund, director of the Center for Watershed Sciences at University of California Davis. "Almost all the major reservoirs in the state are at or are well above average for this time of year."

Surface water includes lakes and rivers, dams and reservoirs, as well as the water stored as snow. The Sierra Nevada snowpack, which provides a third of the state's water, was measured this week at 185 per cent of normal conditions.

That's why the U.S. Drought Monitor's spring projection shows the drought-stricken areas shrinking to a tiny brown patch bordering Arizona and Mexico.

But UC Davis groundwater hydrologist Thomas Harter insists it's still too early to herald the end of the drought.

"No it's not over," he says, shaking his head and smiling.

Harter, a groundwater hydrologist at UC Davis, says the drought is 'not over.' California needs at least several more wet winters to replenish the groundwater.

Harter likes to think of California's underground aquifers as the state's liquid bank account, which provides up to 46 per cent of the state's water supply.

Residents of the driest areas, especially farmers, have spent most of the last 17 years withdrawing water, Harter says, with only three years of deposits. Getting the groundwater balance back in the black, he says, will take a lot more than just one wet winter.

"We need, in many areas, three, four, five of those to really replenish our groundwater resources to where they were before this last drought," Harter says.

At the National Weather Service, Laber goes further: he believes even that may not be enough.

More pumping than replenishing

"The overall long-term trend is still a decline because there's been more pumping of groundwater than there has been recharge," Laber says. "They won't recover to levels that we've seen even 10, 20, 30 years ago."

David Feldman, who teaches water resource management at UC Irvine, agrees.

"According to the U.S. Geological Survey, if groundwater pumping were to cease altogether in the San Joaquin portion of the Central Valley, it could take decades to fully replenish," he says.

And even when the state is overflowing with water as it is now, Feldman says, much of it just disappears.

"Because it's coming so much so quickly, a lot of it is simply running off into our estuaries and into the ocean," Feldman says.

As Nguyen throws out spoiled food, she says she doesn't care whether the drought is officially over, as long as officials prevent floods like this from happening again.

Drought and flood have always been part of life in California, but many scientists believe both will occur more frequently in the state due in part to climate change.

Warm, dry weather creates more extreme drought, and water that would have been stored as snow will instead fall as rain. That means the state may have to change the way it stores water.

There are almost 3,000 dams and reservoirs in California, and building more, Lund says, may not be the answer.

All the cheap dams are built

"We've already built dams at the places that have the most water available for the cheapest construction cost and operation cost," Lund says.

"So the remaining dam sites are going to be economically difficult to justify. You don't want to spend more on water than what the water is worth for agricultural production or for cities."

So instead of building dams, some experts like Harter believe they should be altered.

"A large quantity of the water that has come out of these over-spilling reservoirs in the last two weeks is going out to the ocean," Harter says. "So we can perhaps take some of that additional floodwater and actually actively put it into groundwater storage."

Scientists say the floods like the one that wrecked this San Jose home may occur more frequently. (Kim Brunhuber/CBC)

In May, Gov. Jerry Brown will announce whether the drought is officially over and will set any water restriction targets for the year ahead.

But according to Feldman, asking whether this drought has ended misses the point.

"It isn't a two-dimensional situation where you're either in a drought or you're out of a drought," Feldman says. "We always want to conserve."

But Feldman admits convincing Californians to conserve when they are dealing with more water that they can handle will be tough.

'A sociological challenge'

"It's not so much a hydrological challenge as it is a sociological challenge," Feldman says. "The time to plan for droughts is when you're not in one."

Drought? No drought? As a friend helps throw out the food rotting in her broken fridge, Nguyen says she doesn't care what officials label it. The important thing is that they beef up flood protection measures so this doesn't happen again.

"I can't figure out how can I survive after, but I am a brave woman," she says and laughs. Then she goes back to throwing out food gone bad from a fridge that will have to be replaced.

# # #

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The drought is just now beginning
Manteca Bulletin | March 6, 2017 | Dennis Wyatt, Executive Editor

Is the drought over?

You might view that as an insane question given the near record snowfall for modern times in the Sierra and the fact the runoff will be testing levees for the coming months.

But before you get too giddy and think its ok to revert to old water use patterns and plant water guzzling turf all over creation, you might want to remember that there is a lot more to California water than meets the eye.

The Central Valley water aquifers during the past four years lost a third of what they did during the previous 50 years according to the United States Geological Survey California Water Service Center.

During four years of drought 37.5 percent of all wells in the state dropped 10 to 49.9 feet with another 12 percent falling 50 feet or more. Among those some plunged over 100 feet.

In normal water years, 38 percent of the state's water supplies come from groundwater. During the drought we took 60 percent of our water from aquifers.

From 2013 to 2016 ground water fell by more than 40 million acre feet. Storage in the state's largest reservoirs during the same time period fell in the highest years of loss to as much as a third of average. If the loss were a third of average for ever year that would translate to 20 million acre feet of water loss in reservoirs from 2013 to 2016.

While one heavy year of snow and rain as we are now experiencing can bounce surface water reservoirs and lakes all the way up to the brim, it takes years to decades for underground water to be replenished according to the Center for Watershed Sciences at the University of California, Davis.

In some cases, the loss of water leads to severe soil compaction meaning some ground permanently losses the ability to hold water.

What this means is simple. The meteorologist on TV may tell you the drought is over and so may your own eyes.

But a hydrologist who looks at the entire water system that includes manmade as well as nature both above and below ground will tell you different.

Then there are other nagging little issues we all like to ignore when lakes are full and it's a sunny semi-warm day with fluffy clouds in the sky and 20 feet of skiable snow in the Sierra.

Scientific research on tree rings point to the past 200 years of being abnormal for the West in terms of the abundance of precipitation. Mega-droughts historically are more the norm. They typically run 50 years or more with slight disruptions of one to three years.

Then there are the manmade problems. Decisions regarding the timing of water releases and how it is used can create manmade droughts. We view these in a vacuum as no one ever stops and thinks where fish or the environment would be if it wasn't for manmade storage and levees. The endangered Chinook salmon, as an example, would likely be extinct.

If you live in Manteca, Ripon, or Lathrop why should this concern you? After all, if you turn on the tap, water flows out.

Ripon happens to get every drop of its water from wells. Manteca gets all of its winter and early spring water from wells and just under half from the ground during the rest of the year. Lathrop relies on ground water mixed with surface water year round with the added problem that dropping ground water increases salt water intrusion from aquifers beneath the Delta.

While local groundwater tables sustained more modest drops — typically under 10 feet — they are not going to bounce back in one year.

There are several reasons for that. The most obvious but the one most can't comprehend is how water is replenished. Most potable water tables are 100 feet or deeper. That means its source of water — whether it percolates downwards originates in the Sierra or locally — takes a while to reach the aquifer. That translates into years and even decades depending upon the soil and location.

This is the reason the Groundwater Sustainability Act was passed in Sacramento that created a mandate to various groundwater basins throughout the state to strike a balance between what is taken out of aquifers and what flows in. That means a zero change over the course of a year.

In future droughts such a mandate will be impossible to reach without significantly more drastic water use curtailments than California has been under for the past five years.

It also means unless we change our water use patterns for good, growth will be impossible to support especially in communities such as Stockton that rely 100 percent on groundwater without reducing per capita consumption.

That means even if surface water is plentiful, groundwater won't be. This is a big deal when 38 percent of our water in a non-drought year comes from beneath the surface.

This will also lead to an increase in pressure to switch to surface water that could put demands on reservoirs in normal water years that mimic the pressures we've seen over the past five years.

There are only five viable solutions: Recycle and use treated wastewater, recharge groundwater with treated recycled wastewater, desalination, create more surface storage, and further per capita water use reductions through passive and non-passive conservation measures.

Again, is the drought over?

Despite the epic snow and rain it's just only starting.

# # #

It’s really wet — so why is Santa Barbara still mired in drought?
Mercury News | March 5, 2017 | Lisa M. Krieger

SANTA BARBARA — More than four inches of rain pounded the red-tiled roofs of this coastal enclave one day last month. Waves damaged a scenic pier. Historic pine trees fell, crashing into vehicles. The airport closed. The county jail relocated 200 inmates. Residents evacuated three apartment buildings. Six vacation cabins and 15 vehicles were swept down a river in a nearby canyon.

And yet, Santa Barbara remains one of the last, and perhaps worst, remnants of California’s historic drought.

Even as workers tear out the wet walls of her baby’s bedroom, Whitney Turner is doing all she can to conserve water.

“Water came down our driveway like a river,” during last month’s big storm, rushing past her family’s tiny plastic lawn trimmed with cactus and succulents, she said. “But maybe this summer, we’ll be right back to where we were.”

Extreme even in a state infamous for extremes, Santa Barbara is wet above but desperately dry below — and must grasp for solutions to cope with a future California climate that could deliver wetter storms but also deeper droughts.

Soon the city will start its long-idle $80 million desalination plant. That’s after a winter with almost twice as much rain as normal.

Winter storms have dumped more than 24 inches of rain, far above the 12-inch average, on this oceanic Eden, nestled between steep mountains and white-sand beaches.

“We’re swamped,” said Brian Dutter, operating manager of ServePro of Santa Barbara, which restores flood-damaged homes. “It’s wet and green and there are puddles. Business is up 500 percent over last year.”

Acres and acres of reservoir Lake Cachuma — until recently, littered with dry clamshells, abandoned rowboats and lost fishing lures — are once again wet.

“Water went up three feet, horizontal, in one day,” said Gabriel De la Cruz of Hesperia, who was hired to elevate the lake’s boat docks to keep up with rising water levels.

The rains are celebrated in a city that last summer cut water usage by more than one-third, or 36 percent since the drought was first declared in February 2014. Residents use an average of 60 gallons a day, down from 87 before the drought — about the same as stridently conservation-minded Santa Cruz.

So, with this verdant landscape, how is Santa Barbara still considered in a drought?

“It seems like it should be over because it rained so much,” said Turner, 35, a photographer.

Yet a deeper problem, largely invisible to the eye, remains. And it’s not fixed by even a winter as wet as this one.

Even after winter rains, the city’s wells remain perilously low. Water levels in a U.S. Geological Survey well climbed merely one-foot last month, after plummeting 110 feet over the past

decade. And Santa Barbara's reservoir, nearly completely dry in January, is still less than half, or 46.5 percent, full.

That's why Santa Barbara still has a unique distinction in the latest official U.S. Drought Monitor map: While 91 percent of California is no longer considered to be in a drought, the Santa Barbara region is still stained by an alarming patch of bright orange that means "severe drought" — signifying its status as one of California's last two holdouts after a desperately arid five years. Imperial County, at the southeastern tip of the state, is the other.

"It's still a bad situation there" in Santa Barbara, said National Oceanic and Atmospheric Administration meteorologist Richard Heim, who has tracked national drought trends for 30 years.

"The meteorological drought and agricultural drought is over," he said. "But the groundwater and reservoirs," which can take years to recover, "are still a problem."

Santa Barbara's dilemma is caused, in part, by its unique geography. Its reservoir, Lake Cachuma, sits in a "rain shadow," blocked by rocky mountains and catching only a fraction of the region's rainfall. Secondly, the city sits on a narrow shelf; the rain that pelts the mountains rushes out to sea, rather than slowly seeping into the aquifer.

The ocean is intruding into the region's precious freshwater, pushing all the way to Highway 101. Finally, the city's fate is dependent on pipelines from storage in Northern California through the State Water Project. Officials watched, with trepidation, when the Oroville Dam faltered.

Things got so bad during the drought that the city had to borrow water from Antelope Valley, on the western tip of the Mojave Desert, which it now has to repay.

But in other respects, Santa Barbara is not unlike the rest of California — and presages the problems to be delivered by climate change. That's a challenge far too big to be erased by a single wet winter.

Scientists say we'll face more extreme weather, both droughts and floods. Higher temperatures mean faster evaporation and a more arid landscape. But a hot climate could also worsen flooding because atmospheric rivers will become more common. And snow will melt more quickly, stressing reservoirs.

"California must manage water every year in preparation for dry and drier years, even as we prepare for floods," said Jay Lund of the Public Policy Institute of California and director of the Center for Watershed Sciences at UC Davis. "Drought management and flood management are the same."

"The best response is not to be complacent, or panic, but to sit back and look at the options — and figure out what is best for the long run," he said.

Affluent Santa Barbara is buying its way out of trouble. In March, it will start a desalination plant, mothballed since it was built after a previous drought. The plant cost $34 million to build, $70 million to restart and $4.1 million annually to run at full throttle.

It's an extraordinarily expensive step — and one that is too inefficient, energy-intensive and environmentally harmful for the rest of California, critics say.

The price of Santa Barbara's desalinated water is $1,400 an acre-foot, jumping to $2,400 an acre-foot when the costs of paying off the capital investment are included. By comparison, groundwater is $150 to $800; reservoir water, $300 to $400; recycled water, $1,200; and State Water Project water, $1,500 to $2,000.

But it means that the city can stop using groundwater, and repay its debts to other water agencies, said Joshua Haggmark, Santa Barbara's water resources manager. While the city hasn't officially decided whether to continue desalination after the drought ends, the water is likely to become a permanent part of its portfolio, providing about one-third of the city's needs.

"As we face drier times and wetter times, how do we build resilience? We want diversity; we don't want all our eggs in one basket," said Haggmark. "This plant won't meet all our needs. But it will ensure a baseline supply."

The historic drought, even as recent rains wash it from memory, has forever altered Santa Barbara's relationship with water — changing its cost, ease and convenience.

It's a just-in-time lesson for California, as well, said Lund, forcing us to adjust our long-term expectations for water deliveries, operations, costs and environmental sustainability.

As the evening sun set behind Lake Cachuma, De la Cruz walked up a boat ramp and gazed at bright bathtub rings etched in its banks.

"I think this lake is going to go all the way to the top and they'll still say we're in a drought," he said, "because they don't want us to waste water."

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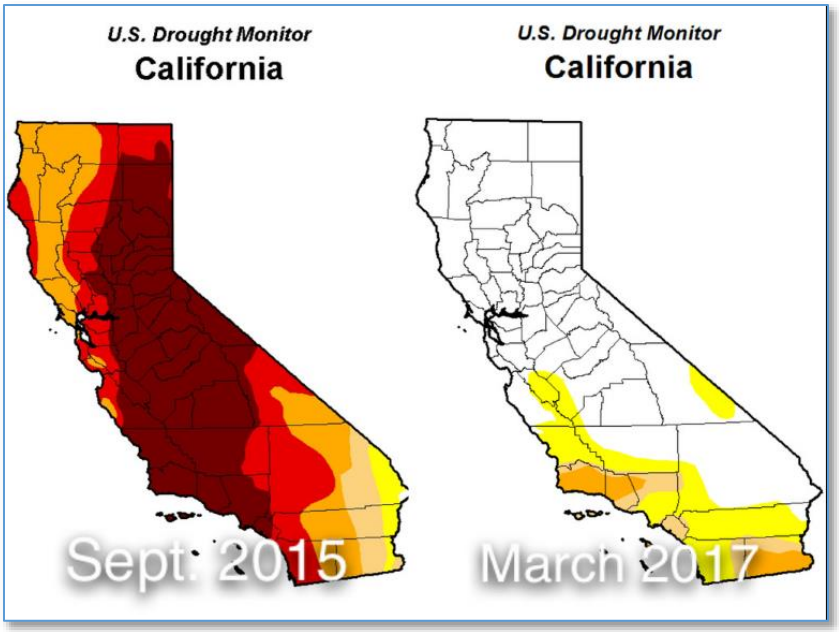
Feds: Drought ends in San Joaquin
Recordnet.com | March 2, 2017 | Alex Breitler

After 1,892 days, the drought is over in San Joaquin County.

That's the conclusion of the federal government, which Thursday morning issued new maps showing the entire county — and indeed, 79 percent of the state — free from any kind of drought designation.

For San Joaquin, it is the first time since Dec. 27, 2011.



Portions of San Joaquin had still been considered "abnormally dry" heading into this week, but the U.S. Drought Monitor lifted that finding Thursday, citing an improvement in groundwater levels across the San Joaquin Valley.

Technically, the county and state remain under declared drought emergencies. State officials have said they'll review conditions in April, when the snowpack is usually at its peak and the water supply situation for the coming year is clearer.

Whatever happens, the end of the drought doesn't mean the end of water conservation rules. Some, like the prohibition on hosing off streets or sidewalks, or using sprinklers within 48 hours of a storm, or allowing sprinkler water to escape from lawns, have been made permanent.

The end of the drought is good news, of course. In the long term, however, California still faces water scarcity problems. In a report published on Thursday, the Public Policy Institute of California says the state has over-tapped its groundwater by an average 2 million acre-feet per year over the past three decades, or an amount roughly equivalent to the state's sixth-largest reservoir.

This ongoing water shortage is concentrated within the San Joaquin Valley, which faces "unprecedented challenges and inevitable change," the PPIC wrote.

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Another storm as state weighs drought rules: Rainfall drenches Bay, water suppliers contend emergency over

Daily Journal | February 07, 2017 | Samantha Weigel

Another atmospheric river is rolling across Northern California this week with portions of San Mateo County now topping charts for experiencing some of the wettest starts to the year on record.

But despite the recent improvements from the yearslong dry spell, water regulators meeting this week are expected to extend drought regulations through spring as they note the vast state hasn't benefited equally from this winter's storms.

As rain poured down across San Mateo County Monday bringing high wind advisories and a flash flood watch in effect for the coastside, National Weather Service Meteorologist Steve Anderson said it's one of the wettest starts to the year he's seen in his nearly two decades at the regional station.

"I'd say it's not normal, we're seeing an increase in these atmospheric river events this year. Why? Unknown. But it will probably be researched quite a bit over the next several years," he said.

The storm is predicted to last through Friday with most of the county expected to receive about 1 to 2 inches of rain by Tuesday night, Anderson said. Also known as a pineapple express, he noted the storm would bring milder temperatures of around 50 degrees to 60 degrees.

A comparison of historic data from Jan. 1 through early February highlights the intensity of the recent storms — a marked distinction from nearly four years of drought. Redwood City has received 13.42 inches of rainfall so far this year, making it the fifth wettest for the same time period since 1907, Anderson said.

A monitoring station at the San Francisco International Airport — which most accurately measures San Mateo — clocked in 10.27 inches of rain, currently ranking as the sixth wettest period on record since 1946, Anderson said.

"So far this year, this is the most rain we've seen to really put a huge dent in the ongoing drought across California. Not so much in Southern California, they've missed out in the heavy rain events, but the majority of the state is rebounding quite nicely," Anderson said.

There's no shortage of snowfall either as state officials report California's snowpack is now at 173 percent of normal.

But will it be enough to break California's dry spell that prompted unprecedented action by the state including Gov. Jerry Brown's 2014 drought declaration and water officials initiating landmark mandatory conservation regulations?

"Whether it will end the drought, only the governor can declare that. … But absolutely, every bit helps to get out of the rain deficit we've been in the past four years," Anderson said.

Will emergency drought provisions remain?

Critical decisions about whether Californians should still consider themselves in an "emergency" are expected to coincide with this week's storm.

On Wednesday, Feb. 8, the State Water Resources Control Board will vote on whether to extend drought-related emergency regulations initially prompted by the governor's 2014 actions.

Staff recommends the board maintain regulations until at least the end of spring when there's a clearer picture of California's hydrology. However, many water providers — including those in San Mateo County — are urging officials to drop the emergency declaration arguing drenched areas of the state have rebounded.

Until last year, communities across California faced different conservation orders with most receiving mandatory cutbacks for nearly two years. In San Mateo County, residents were required to cut back between 8 percent and 32 percent depending upon historic usage.

But in a nod to improved hydrological conditions, the board lifted mandatory rationing last June for water suppliers that had enough supplies to withstand several years of drought.

Locally, that meant nearly all of San Mateo County and those reliant on the San Francisco Public Utilities Commission's Hetch Hetchy Reservoir System returned to just voluntary cutbacks.

However, the "emergency" declaration remains and residents can still face fines of up to $500 for wasting water — such as by irrigating landscape immediately after rainfall or letting sprinklers run into storm drains, board spokesman George Kostyrko said in an email.

Extending the emergency regulations slated to expire at the end of this month is key to providing an umbrella of enforcement for urban water suppliers who follow up on complaints of water wasters, he said.

Furthermore, although nearly 342 out of 410 water districts do not currently have mandatory regulations, there are areas of California that remain at risk. Kostyrko pointed to Santa Barbara's reservoir, which is less than 15 percent full, and the state's Office of Emergency Services having delivered bottled water to Central Valley residents weekly for the last three years.

"So the drought is not over in some parts of the state," he said.

This week's action would allow officials to postpone calling off the drought until there's a fuller picture of the state's hydrology later in the year.

But many water providers argue continuing to classify it as an emergency despite improved conditions is actually a disservice to maintaining customers' confidence, said Nicole Sandkulla, CEO of the Bay Area Water Supply and Conservation Agency, or BAWSCA.

Representing those who purchase wholesale water from the SFPUC, Sandkulla argued officials should parse drought-related rules by region, not on a statewide basis.

Currently, only three of BAWSCA's member agencies have mandatory cutbacks — Daly City at 4 percent, Sunnyvale at 5 percent, and just 2 percent for California Water Supply Company's Bear Gulch District that includes Atherton, Portola Valley and portions of Menlo Park. She noted the SFPUC's Hetch Hetchy Reservoir system was 90 percent full as of last week, significantly higher than the normal 78 percent for this time of year.

Although a strong proponent of conservation as a “way of life,” Sandkulla contends the state should drop the “emergency” for regions that have flush supplies.

“We supported the emergency regulations and the governor’s call of a drought while we were in that drought situation, but the current rainfall and snowpack have removed us from a drought,” Sandkulla said, adding BAWSCA supports permanent prohibitions against wasting water, but “the customer gets confused when you say you’re doing this because of emergency regulations and it’s hard when you look out the window and it doesn’t look like a drought. It questions our integrity as water suppliers.”

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Op-Ed Our wild, wet winter doesn't change this reality — California will be short of water forever

LA Times | March 7, 2017 | Jay Famiglietti and Michelle Miro

Over the last 18 months, California has experienced one of the driest, wettest and wildest rides in its recorded water history.

As the 2015-16 water year opened in October 2015, drought had driven the state's reservoir and groundwater levels to all-time lows. Entire towns were left without water. Reports of lakes turned to puddles, of wells running dry by the thousands, and of the cracked ground above depleted aquifers sinking several feet a year dominated state headlines.

Then came the deluge. Since last fall, a steady stream of "atmospheric river" storm systems has been battering the coast, the Sierra Nevada and almost everywhere in between, restoring reservoirs and the snowpack to their highest points in years.

All winter, Californians have been asking one question: Is the drought finally over? The federal monitor shows just a few lingering tan and yellow patches in Southern California, but for scientists, the beginning and end of drought conditions are exceptionally difficult to pinpoint. Still, after only a few more serious encounters with the "Pineapple Express," Gov. Jerry Brown may well declare the state's 3-year drought emergency over.

The great thirst of our highly productive agricultural sector has never been and will never be satisfied by the annual winter storms.

Which leads us to the second most frequently asked question of this unusually wet winter: What's our water future? The answer has been clear for a while: It's going to be a lot like our water past, but more so — California is, was and will be chronically water short.

The drought has underlined three important realities that aren't going to change.

First, the way municipalities use water can be sustainable, even as their population grows, as long as they embrace conservation, water recycling and reuse, and a diverse portfolio of management options. However, agricultural water use at today's scale in California is not sustainable. Agriculture is literally sucking the state dry.

Food production requires nearly unfathomable volumes of water, and has resulted in the long-term decline of the total available fresh water in California. The great thirst of our highly productive agricultural sector has never been and will never be satisfied by the annual winter storms that feed the state's rivers and reservoirs.

The shortfall is met by pumping groundwater at rates that greatly exceed those of replenishment. As a result, groundwater levels in much of the state, including the once-vast reserves beneath the Central Valley, have been declining for nearly a century.

It is essential to understand that wet winters like the current one will not reverse this long-term decline. Historically, even the wettest multiyear periods result in only a modest uptick in the otherwise steady loss of Central Valley groundwater.

Consequently, agriculture in California has to adapt to this dwindling supply. Farmers and ranchers will face more of the kinds of difficult decisions the drought has already forced, such as fallowing fields as groundwater levels drop, or worse, taking land out of production.

Next, we must recognize that the classic definition of water as a sustainable resource — that is, using only the surface and groundwater available on an annual, renewable basis — is no longer tenable for the entire state. Instead, water sustainability in California must now refer to efforts to slow the rate of disappearance of the state's groundwater reserves.

The landmark Sustainable Groundwater Management Act, passed in 2014 in Sacramento, acknowledges and confronts the declining availability of fresh water in California. Its requirements, however, will never result in the recovery of statewide groundwater levels, even if important efforts to enhance groundwater recharge and construct additional storage are pursued.

Finally, it is simply impossible to effectively plan for California's water future without knowing a lot more about how much water the state has, how much it needs and how these amounts are changing with time.

The amount of groundwater remaining in the state's aquifers hasn't been adequately measured; it must be quantified by exploration. This includes characterizing how its quality degrades with depth, and estimating the costs and environmental consequences of pumping and treating this deeper, lower quality groundwater.

Estimating California's diverse water needs — for food and energy production, for domestic and municipal supply, for the environment and for economic growth — requires precise measurement, as well as a partnership between water management entities and the research community so that advanced, science-based tools can help establish trade-offs among allocation options.

Climate change and population growth are the primary drivers of changing water supply and demand, but other factors will also be important in managing the gap between the two. For example, personal water-use habits, greater agricultural efficiency, new technologies like potable reuse and desalination, and changes in water pricing, rights and policy will all affect the state's water availability and needs.

At the beginning of this month, and with a few weeks of winter still to come, the snowpack in the southern Sierra measured 201% of average. That's a lot of snow and great news for a parched state. But the long-term disappearance of groundwater will persist, and water scarcity is California's once and future reality.

Embracing this distinction, understanding its causes, working to mitigate them and monitoring our water down to the last drop are the essentials of the new, post-drought era of California water.

# # #

Jay Famiglietti is a hydrologist and former professor of Earth system science and of Civil and Environmental Engineering at UC Irvine. Michelle Miro is a hydrologist and doctoral candidate in civil and environmental engineering at UCLA.

The mission to capture storms' water before it flows away
San Francisco Chronicle | March 4, 2017 | Kurtis Alexander

WATSONVILLE — With winter rains filling California rivers and reservoirs in a dramatic display of drought-ending bluster, the rush is on to capture the overflow before the bounty is squandered, washed forever to sea.

Numerous water agencies from the Central Valley to the Central Coast are busy stashing surplus water underground, a practice known as groundwater recharge in which excess from lakes and creeks is steered onto barren fields, where it soaks into the aquifer below.

But as well-meaning as these efforts are, they often lack the land to bank as much water as they could, experts say. Committing property to the low-payoff endeavor doesn't usually pencil out. And even when the investment is made, there's typically no assurance that those putting water in the ground will benefit — instead of a neighbor with a well.

Here in the rural Pajaro Valley, however, officials may have found a way to make the practice more enticing: Farmers plying this fertile stretch of strawberries and lettuce can make money offering up their private land.

Just as households with solar panels get credit for selling power back to the electric grid, landowners can offset their water bills by pushing water underground.

The pilot program, being rolled out by the local water agency in partnership with the region's conservation district and UC Santa Cruz, has just one participant so far — a berry company that's reducing its water payments by channeling hillside runoff into the ground. But others are signing up.

"The idea here is to remove some of the disincentive that's preventing landowners from doing" recharge, said Andy Fisher, a UC Santa Cruz hydrogeologist who pioneered the project. "No one has tried a program like this before, but we think it's something that could be replicated in other places."

With California's first set of groundwater regulations about to kick in, water managers across the state are looking for ways to boost underground reserves. About 40 percent of the state's water typically comes from the ground, and after decades of overpumping, most places have plenty of room for replenishment.

The new law requires communities statewide, within the next five years, to develop plans for getting their aquifers in balance.

On a recent morning, Dennis Lebow steered his Ford Explorer down a dirt road east of Watsonville to where he's doing his part to put water in the basin beneath the Pajaro Valley.

His employer, berry producer Reiter Affiliated Cos., is capturing runoff that spills from the tall, green hills above the Monterey Bay in a 4-acre percolation site between a raspberry field and an apple orchard.

"Normally, a lot of the water would run parallel to Silliman Road through a surface ditch to the Pajaro River," said Lebow, a hydrologist, pointing out how the precious liquid would be lost if the recharge system wasn't in place.

Instead, drainage from 170 acres of privately owned fields is routed — by gravity — into an intake chamber at a low-lying spot, where it's filtered before flowing to a muddy pond. There, the water percolates naturally into the aquifer.

"In a wet year like this, I'm excited to see what we can put in the ground," Lebow said. "It may be two, three, four or 10 times as much as what we've done."

The researchers from UC Santa Cruz have set up gauges to measure inflow after the rainy season. Last year, they counted 108 acre-feet of infiltration at the site, a relatively small amount but a good start, they say. An acre-foot of water can supply up to two households for a year.

With each acre-foot of water dropped into the ground, Lebow's company is credited $101.50 by the Pajaro Valley Water Management Agency. It's half of what the grower pays to pump water but helps make the effort worthwhile, Lebow says.

Land expenses aside, a small and relatively low-tech recharge site can cost from tens of thousands of dollars to a few hundred thousand dollars, with larger ones running several million or more. Grant money is sometimes available.

Brian Lockwood, interim general manager for the water agency, said that without reimbursement there would be little reason for landowners to get in the recharge business.

"Alternatively, the whole ranch has strawberries on it," he said. "They make a lot of money that way. What's the incentive for them to take 1 to 5 acres out of production to do recharge? There are costs involved to build these projects and, after they're built, there are maintenance costs."

The program is scheduled to expand to at least 10 sites over the next few years. That's enough to offset about 10 percent of the deficit caused by overpumping in the region's aquifer, organizers say — a significant amount when added to natural seepage from rain and irrigation as well as other recharge efforts initiated by the water agency.

Most recharge programs in California aren't in private hands, like a 15-acre percolation basin operated by the Pajaro Valley water department miles from Reiter's pond.

The Central Valley's big irrigation agencies are diverting flood releases from Sierra Nevada reservoirs to dirt plots they purchased exclusively for water infiltration. Consolidated Irrigation District, which serves parts of Fresno, Tulare and Kings counties, operates more than 50 such sites.

In the Bay Area, the Santa Clara Valley Water District runs nearly 100 small recharge ponds, which are, in part, being filled with piped-in excess from the Sierra.

But the real opportunity for getting more water into the ground is on private land, says Helen Dahlke, a hydrologist at UC Davis.

"You can't buy any more land and put more infiltration basins in," she said. "The agricultural landscape is really the natural place to do this."

Dahlke has been testing alfalfa fields and almond orchards across California to see if they can be safely flooded in the offseason and used as recharge basins. So far, she's found the farmland doesn't lose its vigor and crops are minimally affected. But her experiments are not yet done.

In the public consciousness, groundwater recharge remains something of a sidelight to proposals to add water storage through the more traditional method of building reservoirs.

While Proposition 1, the $7.5 billion water bond passed by voters in 2014, might provide some funding, damming rivers comes with its own set of problems — including not only the high cost, but also the difficulty of finding space on rivers and protecting fish. The leading reservoir bids would run as much as $3 billion apiece.

A Stanford University study found that storing water through groundwater recharge is nearly six times less expensive than reservoir expansion.

“Using aquifers should be the new way we capture water for longer duration,” Dahlke said. “And we don’t know when the next wet year will be, so we have to make use of this water now, while it’s available.”

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How Desalination Plants Are Trying to Overcome Environmental Concerns

Stakeholders are exploring different options to reduce the much-debated environmental impacts of desalination to make it a more attractive option for drought-hit regions.

Water Deeply | March 3, 2017 | Padma Nagappan

As California labored under a severe drought for more than five years, industry and media debated the pros and cons of desalination coming to the rescue of the drought-stricken state. About a dozen or so desalination plants have been planned or proposed up and down the Golden State's coast, with the 50 million gallon (189m liter) per day Carlsbad desalination plant opened in December 2015 and Santa Barbara's smaller desalination facility set to open this spring.

The deluge of rain across the state and snow in the mountains over the last couple months have reduced the intensity of the drought, and most of the state is drought-free. California also faces overdrafted groundwater aquifers in many places, including the agricultural hub of the San Joaquin Valley. And with climate change predicted to ensure a future with more severe drought, the state's water supply concerns will remain a primary focus for water managers.

How big a role desalination plays in future water supply decisions in California may depend on how well the industry deals with environmental concerns.

It takes about 2 gallons (7.6 liters) of seawater to produce 1 gallon of desalinated freshwater, and this process of separating freshwater from salt leads to highly concentrated brine that is then usually sent back into the ocean. This brine is toxic to bottom-dwelling marine life when it settles on the ocean floor, and can also cause hypoxia or oxygen deficiency in the ocean floor area.

The process of drawing in the seawater – the intake – also impacts marine life, with fish and crabs dying when they are trapped against the intake screen, referred to as impingement, and when smaller marine organisms like plankton and fish eggs become sucked into the intake screens and killed during the treatment process, referred to as entrainment.

Impingement and entrainment are two threats to marine life. One way to reduce this impact is to switch from surface intake to subsurface intake, which extracts seawater from beneath the sea floor or a beach, with the sand acting as a filter. As a Pacific Institute report on the marine impacts of desalination points out, this can also reduce the chemicals and energy used in the treatment process, thereby reducing operating costs.

But the desalination industry is vehemently opposed to it, since subsurface technology will add significantly to the cost of the project, sometimes making the project financially unviable. However, the State Water Resources Control Board put in place environmental regulations that require subsurface intake (or alternative technology) to mitigate marine life impacts for most projects.

A third major concern is that desalination is an energy hog. On average, it takes 15,000 kilowatt hours of power to treat 1 million gallons (3.8m liters) of sea water, which is roughly twice as much as recycling wastewater, according to a 2013 Pacific Institute report. This makes energy the biggest cost of a desalination plant's operating costs, about 55 percent, and it also makes plant operators vulnerable to spikes in energy prices.

Solar to the Rescue?

When it comes to energy input and the associated greenhouse gas emissions, the stakeholders at SolRio think they have found a way around these environmental concerns. SolRio is a nonprofit that aims to function like a water users' cooperative. It wants to tap solar energy at multiple power stations to supply a desalination plant that would not be built from scratch, but would actually adapt existing facilities at the San Onofre nuclear energy generating plant that is in the process of being decommissioned.

Is solar energy going to be feasible to power a desalination plant? And how can a nuclear plant become a desalination plant?

"If we do go ahead, it will be about 10 years or so before we build the solar plant, and solar costs are falling," said Randy Carlson, a system design consultant and SolRio's director of the board. "In Dubai, solar is delivered for less than 3 cents a kilowatt hour and makes a profit. The cost of power comes from capital cost, so the energy costs depend on the interest rates we pay. We have ways of leveraging our resources to get favorable interest rates."

Carlson said with solar, the main issue would be the need for storage, to bank the excess power generated during the day and use it at night, and to move it across transmission lines during peak periods.

"By distributing the storage capacity at different places on the grid, we can move our energy through critical transmission lines only at times when that capacity is not being used," he explained. "One of the difficulties with a project of this size is that some power lines are at full capacity, like during hot summer afternoons. If we have to move power at those times, the power lines have to be upgraded, which costs money, and there are environmental concerns."

When it comes to other environmental issues, Carlson said entrainment can be handled by locating the filtering operation as far upstream as possible, but SolRio is still looking at feasible options. As for brine, it plans to tap the diluting system that exists at San Onofre to cool the generators. The system has lengthy discharge pipes that have nozzles at each end that disperse the cooling water into the ocean, which he said could be used to dilute and dispose of brine.

"This is a fundamentally different project," he said. "We are not trying to build a desalination plant for a local population. We are trying to build a way to serve 10 percent of the Colorado River water users.

SolRio proposes to transport about 1 billion gallons of desalinated water a day from San Onofre, which is on the coast between Los Angeles and San Diego, to be used by the Metropolitan Water District of Southern California (MWD), which imports some of its water from the Colorado River and is a regional wholesaler of water to 26 member agencies that in turn supply water to 19 million people.

In comparison, the Carlsbad desalination plant that supplies parts of San Diego County with water and is the largest built in the U.S., has a capacity of 50 million gallons (189m liters) a day. To do this on such a large scale, SolRio faces technical challenges, among them the need to build a tunnel to Diamond Valley Lake, a major Southern California reservoir.

Asked if SolRio has gotten buy-in from the stakeholders it plans to draft into its co-op, Carlson said yes, it has had positive responses from the industry, but is not at liberty to reveal who they are yet.

“We’ve encountered no one who has said it can’t be done on the technical side. Nobody. The issues are entirely on the political side,” he said.

Industry Perspective on Desalination’s Hurdles

From the corporate perspective, IDE Americas, which is the U.S subsidiary of Israel-based IDE Technologies, thinks that desalination should be one of the solutions that California pursues, but not the only one.

IDE built the Carlsbad plant and is working on the Santa Barbara plant that is scheduled to come online in March or April.

Like other proponents of desalination, Gilad Cohen, CEO of IDE Americas, alluded to the control over supply that it offers, without depending on rain or the snowpack, and the advantage of guaranteed capacity and quality. He pointed out how conservation, while an essential step, does not reduce the price of water, since the customer could end up paying more. He also called for transparency in calculating the price for other sources of water, when comparing it with the price for desalinated water, which experts say costs more.

“Are we comparing apples to apples when we compare desalination with other sources? If you look at pumping water from the Sacramento River or any other point, you still have to pump it, bring it into a treatment station, and salinity needs to be reduced sometimes before it’s distributed into the system,” he pointed out. “Is desalination expensive? I’m not sure. I don’t think so. If we start putting the real numbers into calculations, not just presumed numbers, it would be interesting.”

Desalination costs versus imported water costs vary in different circumstances, but for the San Diego County Water Authority, its Water Purchase Agreement with Poseidon Water for desalinated water from the Carlsbad plant in 2017 is $2,125 to $2,368 per acre-foot, depending on the amount of water purchased. By comparison, treated water from the Metropolitan Water District is $979 an acre-foot, and Colorado River water via a transfer agreement is $1,106, although the price of imported water could become more expensive over time, but a long-term contract assuring rates for the desalinated water is in place.

Cohen said he expects to see low-energy, no-chemical sea water desalination systems that provide an environmentally friendly intake process. It has not been deployed in California so far, since it needs more permitting, but it has been in use in Australia.

Chemicals are used to clean scaling buildup in the membranes of the filtration system, but IDE has a system that constantly backwashes the membranes without taking the plant offline or using chemicals. When scaling builds up, it requires more energy to push water through the membranes, so keeping them clean reduces energy use.

IDE typically uses fewer high-pressure pumps that are bigger and more efficient in the treatment process, and this enables flexibility in increasing or decreasing capacity depending on peak electricity hours, he explained. This method works in Israel and in Carlsbad, where it also recovers 40 percent of the energy coming out of the brine in a recovery system.

Subsurface intake can mitigate marine life impacts, but it has to be economically feasible, otherwise it's not a bulletproof solution, he pointed out. In Carlsbad, because the plant is co-located with the Encino power plant, it uses water from the power plant's retake line, so it did not build a new intake, and the brine disposed is only about 10 to 20 percent more saline than ocean water, instead of being twice as saline, he said.

"The market needs to evaluate new solutions, and see if we can accelerate the adoption process for new solutions," he said. "This needs to be weighed by the regulators, industry and consumers who need the water at the end of the day."

Sustainability, not drought, can be the future of our state
Modesto Bee | March 2, 2017 | Nick Blom

From the 188,000 Oroville residents who were evacuated two weeks ago, to the 14,000 in San Jose who had to be rescued from contaminated water, no Californian has been unaffected by the historic storms beating down on our state. Sometimes it feels like it will never end, reminding us of past floods and the challenges that result from so much water coming in such a short period.

The situation is serious, which is why you might think I'm making a bad joke when I say that according to the U.S. Drought Monitor, more than 20 million Californians are still living under drought conditions. And even when this drought officially ends, it won't be the last dry spell that our state sees.

In 2014, spurred into action amid this horrific drought, California voters passed the $7.5 billion water bond, a major milestone in creating a more sustainable water future for our state. The largest bucket of funding – $2.7 billion – is allocated for water storage, yet as of today, not a cent has been awarded for spending.

Whether above ground or below, increasing water storage is key to addressing the water supply concerns of today as well as preparing our state for future droughts and the impacts of a changing climate. We cannot continue to operate with a "feast or famine" mindset, but we can't break out of this frame of mind without making drastic changes to our water infrastructure.

Millions of gallons of water are flowing directly to the ocean as wasted rainfall instead of being stored underground or in reservoirs for drier days. We must act now to create a more resilient California water future.

In my almond orchards near Modesto, I have volunteered two plots of land for groundwater recharge research, looking to refill the underground aquifers that act as California's single largest water storage system. These aquifers are a shared resource between farmers, families and businesses, so the act of replenishing them through recharge brings benefits to a much wider community.

Through this research we will understand how almond orchards across the state can play a role in storing extra flood flows like the ones we're getting this year.

This work, a potential solution for some of California's water woes, would not be possible without the collaborative effort and funding from the Almond Board of California in partnership with Sustainable Conservation, UC Davis, Land IQ and Lawrence Berkeley Labs.

The California almond community has received an unfair amount of negative attention around the drought, increased through misinformation about my industry and our farming practices. But I can say the ongoing leadership of the California almond community – a group of more than 6,800 farmers – in the areas of irrigation and water advancements is something I am immensely proud of.

While the drought did trigger this initiative, let me be clear that this project is not an isolated effort. The California almond community has invested in more than 180 water research projects since 1982 to more efficiently use, manage and protect water resources.

This long-term approach to water sustainability will help us ensure that California remains a place where crops and future generations can grow and thrive.

So we can celebrate this rain, but do not be fooled into thinking this quick fix will protect us. My hope is that when the next drought comes, we will have made fundamental changes to our water infrastructure for the better. Let’s not repeat history when solutions are within reach.

Nick Blom grows almonds in Stanislaus County and is a director of the Modesto Irrigation District. He wrote this for The Modesto Bee.

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California farms given good news as reservoirs fill and snowpack builds
San Francisco Chronicle | February 28, 2017 | Kurtis Alexander

The extraordinary turnaround in California's water picture is becoming a windfall for farm country.

Federal officials announced Tuesday that the 20 reservoirs that make up the Central Valley Project are so swollen with winter runoff that many growers will get all the water they requested this year — a remarkable change from the past few years when countless orchards and fields received no federal water at all.

The projected bump, which comes alongside similar increases expected at state-run reservoirs, is certain to benefit California's $47 billion agricultural sector, a normally booming breadbasket that has seen land dry up and crop yields slip as water turned scarce.

"After the historic five-year drought, the snowpack and rain are a tremendous blessing to an agricultural industry hammered by the critical water shortage," said Ryan Jacobsen, chief executive of the Fresno County Farm Bureau.

While the news was generally good, the U.S. Bureau of Reclamation — which runs what is considered the nation's largest network of dams, lakes and canals — did not extend the full water allocation to all of its customers. In some cases, the agency says it's still too early to know just how far supplies will stretch.

Many of those left in the dark, which include the sprawling farms in the western San Joaquin Valley as well as two urban water agencies in the Bay Area, were disappointed that the generous water commitments did not come their way.

"We're just furious," said Jason Peltier, executive director for the San Luis & Delta-Mendota Water Authority, which receives federal supplies to deliver to growers along Interstate 5 near Los Banos (Merced County). "A year ago, we could understand the delayed allocation. There wasn't a lot of water to work with. The reality this year is entirely different."

Like many California households and businesses, the farms that supply a third of the nation's vegetables and two-thirds of its nuts and fruits were forced to make big changes during the drought.

As reservoir supplies dwindled, many growers fallowed fields and grew less food. Between the 2014 and 2015 crop years, the most intense period of the drought, California agricultural revenue dropped 17 percent, according to state figures.

So many farmers turned to groundwater, and dug so deep to find fresh supplies, that overpumping caused large swaths of the the Central Valley to sink several inches.

California's portfolio of crops changed, too. With water prices surging, farmers turned to high-value goods like pistachios and almonds, which were often shipped overseas to fetch greater profits.

Lower-value crops, like rice, alfalfa and tomatoes used for canned goods, became less popular. In some cases, that had repercussions. The state's cattle industry, for example, had to deal with higher feed prices because hay became harder to find.

"You don't yank the water off the fancy wine grapes or the carrots," explained Daniel Sumner, an agricultural economist at UC Davis. "You yank the water off the things we can get someplace else."

Central Valley Project customers who have not yet been notified of this year's water allocation may be wary, but they know they'll be better off than they were in the past five years.

Federal officials said there's currently 900,000 acre-feet of water in the San Luis Reservoir in Merced County to send to those south of the Sacramento-San Joaquin River Delta who haven't been told how much water they'll get. An acre-foot is the amount needed to cover an acre with a foot of water — enough to supply one or two households for a year.

The available supply is well over the 5 percent allocation that these customers got last year — following no allocation at all the prior two years.

Central Valley Project contractors near the American River, Millerton Lake and New Melones Reservoir were given a 100 percent projected allocation. So were the longtime customers across the state known as "settlement contractors" who have historic claims on federal water.

The pecking order is determined by who has the most seniority. Many have not received a full delivery in years. The last time the system met 100 percent of the demand was 2006.

The Santa Clara Valley Water District and the Contra Costa Water District are among those that still don't know how much federal water they'll get. The initial allocation is usually made in February — to allow customers to plan ahead.

Federal officials said that while reservoirs are brimming, there are other factors that still need to be considered, including how runoff progresses in coming months as well as the needs of fish and wildlife in and along rivers.

The Bureau of Reclamation expects to announce the remainder of the allocations by late March.

While taking a cautious approach, federal officials said conditions look good for those who haven't been notified of their water allowance. In the meantime, they say, these customers will be able to obtain all the water they need because of the current bounty.

The teeming reservoirs in the Central Valley Project are the product of this winter's exceptional run of storms. The rain and snow in the mountains has sent unprecedented amounts of water downriver.

State officials are scheduled to take their monthly manual snow measurements in the Sierra on Wednesday, a largely symbolic exercise that is expected to document near-record snow. On Tuesday, computer sensors showed that statewide snowpack measured at 186 percent of average for the date.

The Central Valley Project, launched in 1933, consists of 20 dams and reservoirs, including Lake Shasta, the state's largest. The system's 500 miles of canals and aqueducts deliver water across 35 counties.

As California's biggest water supplier, the project provides for about a third of the state's irrigated farmland as well as nearly 1 million households.

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Bill would speed up review of proposed reservoir
Record Searchlight | March 5, 2017 | Damon Arthur

Citing recent events at Oroville Dam, two congressmen have introduced a bill to speed up approval of a new reservoir in Northern California.

The bill, HR1269, would accelerate federal review of the proposed Sites Reservoir and give officials a better chance at funding for the project under Proposition 1 bond funding, according to a news release from U.S. Rep. Doug LaMalfa, R-Richvale.

“The recent incident involving the Oroville Dam is testament to the fact that California needs better water infrastructure,” LaMalfa said in a statement.

Federal, state and local officials are pushing a new reservoir 10 miles west of Maxwell in Colusa County. The reservoir, about a third of the size of Lake Shasta, would be filled with water pumped in from the Sacramento River and used for irrigation and drinking water.

The authority wants to apply for funding under a $7.5 billion water bond approved by voters in 2014.

Sites Reservoir General Manager Jim Watson said last year that the project could cost about $4.4 billion, with about half that paid for through the water bond.

The reservoir would be filled when there are high flows in the Sacramento River.

The bill would speed up the federal review of the proposed reservoir so an application for funding could be submitted by the June deadline, said Fritz Durst, vice chairman of the Sites Reservoir Joint Powers Authority.

If officials with the U.S. Bureau of Reclamation and California Department of Water Resources have all their documentation completed and work together on a proposal it is more likely bond money would be approved, Durst said.

LaMalfa and U.S. Rep. John Garamendi, D-Davis, introduced a similar bill in February 2015, also hoping to speed up federal review of the reservoir. Two years later, though, the congressmen are still seeking accelerated review of the project.

Two years ago LaMalfa and Garamendi said the state's historic drought highlighted the need for more water storage in Northern California. Rains the past couple years have eased the drought in Northern California. But the reviews for Sites continue.

This time, LaMalfa is invoking the near disaster at Oroville Dam, as an argument for speeding up review of the Sites proposal. Last month some 188,000 people were evacuated downstream of the dam as officials worried the dam's emergency spillway was in imminent danger of collapse.

Durst said building Sites Reservoir would help keep other Northern California reservoirs full. He said cold water in Lake Shasta, needed by endangered winter-run chinook salmon in the Sacramento River, could be saved until it is needed in the fall.

Water for the Sacramento-San Joaquin Delta, as well as drinking water and irrigation, could come from water stored in Sites, Durst said. It would also provide enough water for some 7 million people in the state, proponents say.

LaMalfa said Sites Reservoir will give officials greater flexibility in water management.

This will help to ensure that we have adequate storage to capture more water during the wet season and allow us to use that water effectively during times of future drought," LaMalfa said.

# # #

Oroville Dam's close call shows regulatory need to account for climate change
Sacramento Bee | March 5, 2017 | Nicola Ulibarri, Special to The Bee

After the near-catastrophe at Oroville Dam, it's time to strengthen the regulatory process to ensure safer operation of dams.

Stronger federal regulations are vital for state- and locally owned dams. Oroville is operated by the California Department of Water Resources, an agency in a wealthy and progressive state. If DWR's capacity and expertise didn't prevent the spillway failure, a state with fewer resources might have been less lucky.

DWR built Oroville in 1968 and applied for its new operating license from the Federal Energy Regulatory Commission in 2007. The FERC hydropower relicensing process is an opportunity to update old infrastructure, using best practices to balance power-generating capabilities with safety, habitat and recreation. My research focuses on improving decision-making in FERC relicensing. I believe we need to fortify this process to prevent future crises.

FERC's first problem is not accounting for climate change in license renewals. Most of America's dams were built between 1930 and 1970, using the best available estimates of river flows. Since then, our climate has transformed and extreme weather events – floods, hurricanes and droughts – are expected to be more frequent and severe. Modern dams need to be ready for weather scenarios that were unthinkable 50 to 100 years ago.

Unfortunately, FERC's decisions only use historical data, so new licenses, which last 30 to 50 years, will not reflect how much water may be available on either the low or high end. If these extremes are not anticipated, surprises like the extreme flows at Oroville are more likely to cause problems. By not building licenses around climate forecasts, operators will be less efficient at saving water during drought or releasing water before it becomes a flood risk.

Additionally, by considering climate change, we may find some dams where infrastructure upgrades are needed to ensure safety. If Oroville had a lower-level spillway, officials could have drained water before nearing a crisis situation and would have had additional options during the crisis itself.

The second challenge is a lack of collaboration during relicensing. When dam owners work closely with federal and state agencies, nonprofit organizations and Indian tribes, they develop licenses that better serve the public interest. By including more opinions in the process, collaboratively developed licenses balance business interests with public concerns, from environmental protection to hunting and fishing.

During Oroville's relicensing, a consortium of nonprofit organizations commented that the dam's auxiliary spillway could erode unless it was paved with concrete. However, this concern didn't make it into FERC's recommended license. If what I've seen at other dams across the country holds true, this concern would be in the operating requirements if it were negotiated in a collaborative, face-to-face forum.

The final challenge is FERC's slow approval process, which delays new licenses' environmental, recreational and safety improvements. The application to continue operating

Oroville was submitted in 2007, and 10 years later the project is operating on one-year extensions of the old license and waiting for the new license to be issued. FERC isn't solely responsible for delay, as licensees also need approval from agencies that protect water quality and endangered species.

FERC is reducing approval time with a new licensing approach implemented after Oroville. According to my research, this approach, called the Integrated Licensing Process, shortens agency review time. However, lags still occur when agencies are understaffed or individual approval processes aren't coordinated.

Without fortifying the regulatory process, our country's numerous dams are at risk of failure. We passed one close call, but others are coming.

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# # #

California water bills are starting to trickle out on Capitol Hill
Sacramento Bee | February 28, 2017 | Michael Doyle

The lead author in the House of Representatives of a big and controversial California water bill that passed last year is back for more.

With a Republican in the White House and the GOP controlling Congress, Rep. David Valadao, R-Calif., said Tuesday that he was hoping to build on last year's legislation that was loved by farmers and loathed by environmentalists.

The bill scales back an ambitious San Joaquin River restoration program, speeds completion of California dam feasibility studies and locks in certain water deliveries to Sacramento Valley irrigation districts, among other things. Parts of the bill would not have been accepted by the Obama administration, but the Trump team is different.

"When we would negotiate in the past, it was always, 'Well, the president will never sign this,' " Valadao said in an interview. "And now, it will be the reverse. The president will sign this, or will want to sign something stronger."

The Trump administration's key water-related offices, though, remain vacant, while the president's nominee to head the Interior Department, Rep. Ryan Zinke, R-Mont., awaits Senate confirmation. A vote on Zinke is expected this week, after which crucial positions – including his deputy and the commissioner of the Bureau of Reclamation – must be filled.

Most speculation about the important deputy slot revolves around David Bernhardt, a lawyer and former lobbyist for Westlands Water District.

This year's efforts, moreover, also come amid changed climatic circumstances, which can, in turn, alter the political climate. Instead of the drought images that helped drive lawmakers in recent years, the current popular impressions of California water consist of San Jose flooding and gushers from Oroville Dam.

"We're wet," Valadao acknowledged.

Valadao put the ball back in play on the first day of the new Congress, the start of his third term representing a district that spans Kings County and portions of Fresno, Kern and Tulare counties. Thirteen House co-sponsors joined him on a 125-page bill dubbed the Gaining Responsibility on Water Act.

"We're looking to move it along as soon as possible," Valadao said, adding that the timing "will be up to leadership."

With that leadership including House Majority Leader Kevin McCarthy of Bakersfield, relatively expeditious House action could happen even in the face of resistance from Northern California lawmakers. The Senate, as always, will be much trickier, with California's freshman Democratic Sen. Kamala Harris still building her staff and formulating the role she wants to play.

Opponents fear that the Sacramento-San Joaquin Delta ecosystem would be harmed if more water is pumped south to irrigate farms in the San Joaquin Valley.

“I suspect they’ll try more of the same, more false choices, pitting fish against farms,” Rep. Jared Huffman, D-San Rafael, said in an interview Tuesday. “There will be the usual attempts to use whatever conditions are present as a pretext for jamming their agenda. It’s been drought the last five years, and now it’s going to be flood.”

Western flood control will, in fact, come into the spotlight during a Wednesday morning hearing of the House Water, Power and Oceans Subcommittee, with scheduled witnesses including Andy Fecko, director of resource development for California’s Placer County Water Agency.

Valadao’s new bill, meanwhile attempts to revive, in part, provisions that were introduced but ultimately dropped from the last big California water bill. The previous legislation cleared Congress last December, after years of struggle and over the fervent opposition of then-Sen. Barbara Boxer, D-Calif.

Valadao became the lead author of the prior bill, following earlier versions introduced by Rep. Devin Nunes, R-Tulare. In its final form, it included $558 million for assorted projects.

Some impact from last year’s bill, Valadao added, may be noticed when the federal Bureau of Reclamation announces water allocations for Central Valley Project customers.

“I’ve got communities all along the east side of the Valley that are struggling,” Valadao said.

# # #

SF's pure drinking water to get a new ingredient
San Francisco Chronicle | February 21, 2017 | Kurtis Alexander

San Francisco's famously pure High Sierra water is about to be served with a twist.

Starting next month, city water officials will begin adding local groundwater to the Yosemite supplies that have satiated the area's thirst since the 1930s and made the clean, crisp water here the envy of the nation.

While San Francisco's water supplies are at little risk of running low, thanks to this winter's drought-busting storms, city officials say diversifying their portfolio remains vital.

The new water recipe, which was planned years ago but is only now ready to hit a portion of city spigots, will hardly change the taste of the water, officials say. Although groundwater, with its sometimes unpalatable and even unhealthy deposits, is often inferior to mountain runoff, the liquid that flows deep beneath San Francisco will be introduced in such small doses, officials say, that they will be inconsequential.

"When you're pouring a glass of water from a faucet or drinking fountain, you're not going to notice a difference," said Jeff Gilman, a hydrogeologist who is spearheading the groundwater program for the San Francisco Public Utilities Commission. "When you do a side-by-side comparison, (only then) you can taste the difference."

The blend, officials say, will never include more than 15 percent of the underground cache and will be rolled out over a period of four years, starting with just 3 percent this year.

The mix is slated to be piped out to about 60 percent of the city, mostly the west side but also parts of Pacific Heights, Nob Hill, Glen Park and Bernal Heights. The blended water will not be delivered to the agency's customers on the Peninsula or in the East Bay.

The city's Hetch Hetchy Reservoir and its sister lakes and dams in and around Yosemite National Park provide nearly all of the agency's water, with a small share coming from Bay Area reservoirs. Although the Sierra supplies never reached a crisis point during the drought, dwindling runoff had water managers worried.

The introduction of groundwater, officials say, will help eliminate future anxieties by allowing mountain supplies to stretch further and providing a local water source should the imports be cut off by an earthquake or other disaster.

The water agency also faces the possibility of significant cuts to its Sierra draws as state regulators look to increase flows in California's major rivers.

"This is the first new potable water supply we've added to our system since the 1960s," said Paula Kehoe, director of water resources for the Public Utilities Commission. "This is a significant milestone."

Groundwater is commonly used by urban water agencies in California, with some communities relying entirely on underground supplies.

San Francisco's groundwater will come from six wells on the city's west side, between Lake Merced and Golden Gate Park, which will tap a large aquifer 400 feet below. The well water

then will be pumped through about five miles of pipeline to the Sunset Reservoir, and in some cases the Sutro Reservoir, where it will be blended with the surface supplies.

The first well is scheduled to fire up in mid-March, with the goal of delivering 1 million gallons of water a day by the end of the year. By 2020, the Public Utilities Commission hopes to pump 4 million gallons a day, or enough to meet about 7 percent of the city's total water demand.

Unlike the Sierra supplies, which run atop slick granite slopes that filter out sediments, the groundwater is clouded with minerals, namely calcium, magnesium, sodium and bicarbonate.

While most of these additives are benign, and sometimes even provide a small health benefit or a welcome flavor and effervescence, some are not so good.

Nitrates, a composite of nitrogen and oxygen that can make people ill when consumed in large quantities, have been detected in the aquifer at levels exceeding state standards. The compound is believed to have infiltrated from leaky sewage pipes and fertilizers.

Water officials, though, say the groundwater will be diluted as it blends with the surface supply, making the health issue moot.

"The nitrate would only be a concern if you were serving that water directly, but that's not our plan," Gilman said.

The groundwater will be treated with chlorine to kill off pathogens, just as a chlorine-ammonia mix called chloramine currently helps disinfect Hetch Hetchy water. Sodium hydroxide also will be added to the groundwater to raise its PH and reduce acidity, similar to what is done to the Sierra supplies.

The new recipe has held up in preliminary taste tests conducted by the Public Utilities Commission. In nine blind trials, the public favored the Hetch Hetchy water, but only slightly, with 20 percent having no preference.

A panel of San Francisco Chronicle food writers who sampled the new blend a little over two years ago also found that the difference was small. Some even liked the mineral quality of the blended water.

"It's more distinctive in a good way," said taster and former Chronicle wine critic Jon Bonné. "It tastes like what you want spring water to taste like."

# # #

Crystal Springs Dam kept safe over its history
Daily Journal | February 25, 2017 | Samantha Weigel

Behind the 175-foot tall Crystal Springs Dam in San Mateo is the incredible force of nearly 20 billion gallons of water used to quench the thirst of millions of Bay Area residents.

Despite some of the most extreme winter storms on record drenching the region, an elaborate monitoring system and recent improvements to the nearly 130-year-old structure are helping to ensure downstream residents are safe.

With the nation tuning in to precarious spillway incidents at the mighty Oroville and Anderson dams this month, some are wondering how the San Mateo County structure is living up to the potentially drought-busting storms.

“This year is not normal,” said David Briggs, local and regional water systems manager with the San Francisco Public Utilities Commission. “In many places in our watershed, and we operate over seven counties from San Francisco all the way to the Sierra, this has been the wettest year on record so far and the record goes back over 100 years.”

Regardless of the intense storms, the SFPUC says it’s well prepared to handle operations of nearly 15 dams, including Crystal Springs which is visible from Interstate 280 near San Mateo.

But a variety of factors have led to a somewhat unique winter for the SFPUC in managing the local dam. For example, the Peninsula reservoir wasn’t dramatically lowered in advance of the storms because the Bay Area is in the midst of a two-month cutoff from its main water source, the Hetch Hetchy Reservoir, while crews work on a massive tunnel.

Managing output

The SFPUC must ensure potable water needs are met and the long-standing dam is a key feature in meeting demands.

The concrete Crystal Springs Dam built in 1888 and marveled for its unique three-dimensional molded brick design, has needed few improvements. The most intensive upgrade undertaken occurred recently as the SFPUC finished state-mandated improvements to increase capacity of the spillway — an emergency feature that hasn’t been used in decades, Briggs said.

Instead, managing the reservoir is done through meticulously-timed controlled releases from a valve, which pipes water into the San Mateo Creek. Releases allow the utility to increase capacity in advance of forecasted rainfall; and since the start of 2017 alone, 6 billion gallons of water have been discharged. That’s 30 percent of what the reservoir typically holds, although full capacity is 22 billion gallons, according to the SFPUC.

Briggs said the SFPUC has come a long way in monitoring and balancing a variety of factors during the releases including avoiding times when runoff from other areas is also flowing into

the creek. Recalling flooding incidents during the 1998 El Niño winter, Briggs said avoiding high tide is also critical.

“We have far greater awareness of the creek downstream in terms of elevation and tide,” Briggs said. “We also make sure we’re not bringing too much water into the Bay Area then having too much water in the reservoir.”

From drought to drenched

This year brought a unique challenge as the SFPUC, weary of another potentially drought-stricken winter, kept levels at the reservoir high. The decision was due to a two-month closure of the Mountain Tunnel, the primary connection carrying Hetch Hetchy water to 2.6 million Bay Area customers. About 85 percent of the SFPUC’s supplies come from the Hetch Hetchy Reservoir through the 19-mile long tunnel, which is currently undergoing repairs and expected to return online shortly.

“The concern, believe it or not, six months ago was ‘are we going to run out of water in the Bay Area if we have an outage for that long?’ And we weren’t sure and one of the ways we planned for that was to have a lot of storage in case the winter was very very dry,” Briggs said. “If we knew this winter was going to be this wet, storage would have been lower.”

So as multiple storm systems — including several atmospheric rivers — drenched Northern California, the SFPUC like other dam operators began releasing water to make room.

The flow of controlled releases have been adjusted over the last two months to account for factors like other runoff and tides, but have generally varied from 50 cubic feet per second to 300 cfs, Briggs said. In total, the SFPUC has released 6 billion gallons to account for the extreme precipitation.

While it’s a significant amount, the dam and spillway are required to withstand a whole lot more.

Upgrading history

It’s hard to live in San Mateo County without noticing a portion of Skyline Boulevard, which actually runs atop the Crystal Springs Dam, has been closed for nearly six years. The road closure was necessitated by state-mandated spillway improvements.

Around 1982, California’s Division of Safety of Dams told the SFPUC its spillway wasn’t wide enough to meet updated standards. Instead of the prior approximate 10,000 cubic feet per second capacity, the state required the spillway be increased to withstand a release of up to 25,000 cubic feet per second, Briggs said.

The capacity isn’t meant for “a winter storm or a 100-year event; it’s a one-in-10,000-year event. It’s unconscionable, that amount of water. But for spillway design purposes, that is what we use,” Briggs said. “It’s beyond conservative.”

The new requirement forced the SFPUC to lower the reservoir level by about 8 feet and undertake a $35 million improvement to widen the spillway from 89 feet to 208 feet, according to the SFPUC.

Although improvements were completed several years ago, the level of the reservoir remained lowered as the endangered fountain thistle plant grew around the “bathtub ring of the reservoir.” The SFPUC is in the process of replanting the thistle, which only grows in San Mateo County, before it slowly raises the reservoir over the next decade.

Another somewhat unique feature at Crystal Springs is the spillway releases water over the lip of the dam — unlike others that have emergency spillways located adjacent to the main dam.

“Crystal Springs Dam is concrete and it’s wedged into a notch in a canyon and it’s keyed into rock. It’s an old dam, it was built in 1888 and normally you do not have a spillway on top of your dam, it’s not something you see in new dams,” Briggs said.

Although the SFPUC hasn’t had to use it in decades, the force from releasing such a substantial amount of water over the lip of the dam could undermine the foot of the structure. Therefore, a new “stilling basin,” which essentially is a very large concrete platform where the water would spill, was installed, Briggs said.

Another somewhat unique component of the dam is that a road was built atop of it. After beginning improvements in early 2011, the SFPUC completed the upgrades in 2012. Since then Pacific Gas and Electric as well as San Mateo County have been working on restoring the road that will sit above the spillway.

The road has been closed since late 2010 and is finally expected to reopen in late 2017, according to the county.

Although it’s taken some time, these were the first major improvements to the dam — a structure protecting thousands of San Mateo residents from billions of gallons of water.

The unique brick design was replicated by the federal government in construction of the Hoover Dam and a recent test determined the pioneering concrete mixture used at Crystal Springs is actually getting stronger, Briggs said.

Plus, despite it being located just 100 or so feet from the notoriously active San Andreas Fault, the dam has outlived every person on the planet — a history for which the SFPUC is proud.

“We love saying this,” remarked SPFUC spokeswoman Betsy Lauppe Rhodes, “the dam survived both the 1906 and the 1989 earthquakes with no damage or loss of structural integrity.”

# # #

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How the San Francisco Bay Area Is Balancing New Development and Water
Water Deeply | February 24, 2017 | Robin Meadows

Population growth in the Bay Area is spurring the need for new housing developments, but in water-stressed California this means that regional planners have to be more strategic.

The San Francisco Bay Area is likely to be a lot more crowded in the near future, adding a projected 2 million people to the 7.5 million who already live here over the next quarter century. Planners traditionally focus on meeting housing and transportation needs as a region grows. But more people also means more demand for water – and choices we make today will determine how far our water goes in the future. Now regional planners have begun to address the disconnect between land use and water supply.

Whether or not we have enough water for growth depends on factors including climate change and the way we grow. “Climate change is a little out of our control, so we should focus on what we can control: the urban form and water efficiency,” said Laura Tam, sustainable development policy director of SPUR, a nonprofit dedicated to urban planning. “If we can sustain the current rate of water conservation, we could add only a fraction of water use even if we add millions of people to the Bay Area,” she explained.

In 2010, California’s per capita water use in cities was 178 gallons (674 liters) a day. And by 2015, several years into our recent severe drought, that was down to 130 gallons (492 liters) a day. “One of the most encouraging outcomes of the drought is that we found out how much urban water use is discretionary,” Tam said.

Strategies for shrinking the water footprint of new housing include compact development, or urban infill comprising multifamily housing with shared green spaces. “The average urban housing unit is more water-efficient than a suburban house,” Tam said. Compact development has less landscaping, which typically accounts for one-third of residential water use statewide. In addition, perhaps one-tenth of California’s water supply is lost to leaks, and compact development means shorter pipelines, which inherently reduce the chance of leaks.

Compact development can also help low-income people save money, in part by letting them live closer to work. When low-income people live far from their jobs, transportation costs can be as high as housing costs, according to a 2006 report from the nonprofit Center for Housing Policy. In contrast, living near a city center decreases transportation costs by an average of 40 percent.

Another way to keep growth’s water demand in check is water-neutral development. This approach offsets the increased water needs of new housing via a combination of conservation and retrofits to existing developments. “Many old buildings have old fixtures, and the amount of water you can save with new ones is very significant,” Tam said. Installing water-efficient fixtures could save 22.5 gallons (85 liters) per person per day, according to a 2014 report by the Pacific Institute and the Natural Resources Defense Council.

The East Bay Municipal Utility District requires water offsets when new housing is annexed to its existing service area. So far, the district has struck deals on six water-neutral developments, according to a 2015 report by the Alliance for Water Efficiency. Similarly, some Bay Area cities are requiring water offsets before moving forward on proposed developments, said Nicole Sandkulla, CEO of the Bay Area Water Supply and Conservation Agency (BAWSCA), which represents 26 water suppliers in Alameda, San Mateo and Santa Clara counties.

The City of Brisbane, for example, is requiring water neutrality for the proposed Baylands development, 4,400 residential units on a former landfill and rail yard near the shores of the Bay. “The city says there’s not enough water and asked the developer to come up with it,” Sandkulla said. Likewise, Redwood City is requiring water neutrality for the proposed Saltworks development. This controversial project initially entailed up to 12,000 residential units on a former commercial salt production site on the edge of the Bay.

Moreover, the City of East Palo Alto is so tight on water that a building moratorium is in effect through the summer of 2018. And, said Sandkulla, other BAWSCA cities are short on the water needed to supply new development mandates proposed by the Association of Bay Area Governments (ABAG) under the forthcoming Plan Bay Area 2040. “ABAG is looking to push more people into the West Bay urban corridor, but some cities don’t have enough water,” she said. “ABAG needs to check in with water suppliers earlier – the focus has been on housing and transportation, but the other finite resource we have to address is water.”

In a letter to regional authorities last October, Sandkulla wrote, “We strongly urge you to work with local water suppliers to consider the long-term water supply reliability implications of your regional land use planning effort.”

ABAG’s current regional housing plan states that “local jurisdictions consider infrastructure requirements, including water and sewer capacity, when developing their general plans and neighborhood plans,” but then adds that “this information is not used to limit a jurisdiction’s housing allocation.” In addition, there is little mention of the water supply in the current Plan Bay Area, which was adopted in 2013, said ABAG resilience planner Michael Germeraad.

But he does see signs of better coordination between land use planning and the water supply. “In the past, there was less pressure on discussions of growth and water,” Germeraad said, adding, “Now, we’re moving towards considering water earlier in the process.”

ABAG’s 2015 annual meeting focused on actions cities and counties can take for drought resilience, and in 2016 the agency began facilitating meetings between elected officials and water utilities to discuss growth. “Understanding the water supply could inform the development process – for example, we could build differently to reduce water consumption of new units,” said Germeraad, citing built-in dual-pipe systems for drinking water and gray water as an example.

The need to plan our future water use is further intensified by climate change. In the years to come, the Sierra Nevada snowpack that provides much of the Bay Area’s water will likely be smaller, and the snow that does accumulate will likely melt before the end of the dry season, when we need it most. And, Germeraad pointed out, if our water supply drops as our population grows, “the water that we do have will be shared by more people.”

# # #

A 90-year-old water tunnel gets its first checkup in decades
Union Democrat | February 17, 2017 | Guy McCarthy

While local, state and federal agencies 165 miles northwest of Sonora have grappled with spillway emergencies at Oroville, Hetch Hetchy System workers have been quietly inspecting, repairing and upgrading the 19-mile Mountain Tunnel that's crucial for millions who get water from the highest reaches of the Tuolumne River watershed.

Engineers and water masters with San Francisco Public Utilities Commission, which owns Hetch Hetchy Regional Water System, shut down the Mountain Tunnel on Jan. 3, and they hope to restore water service through the giant pipe by early March.

Hetch Hetchy water impounded by O'Shaughnessy Dam in Yosemite National Park normally serves about 3,500 Groveland Community Services District customers and 2.6 million people in the Bay Area, including all of San Francisco and San Mateo counties, and portions of Alameda and Santa Clara counties.

They're all using water from alternative reservoirs for the 60-day shutdown, the first of its kind in three decades. So far, workers have found plenty of wear and tear inside the 90-year-old tunnel. But engineers and managers have been pleasantly surprised to find the subterranean, concrete-lined aqueduct is holding together well in spite of its age.

Workmanship

Built by laborers who were among Tuolumne County's early 20th century workforce, the Mountain Tunnel was completed in 1925, and it remains among the Mother Lode's oldest functioning pieces of infrastructure.

Glenn Boyce, principal engineer for the tunnel repair project, stepped through a temporary wood door set up near Priest Reservoir above Moccasin last week and into cool, dank, pitch-black darkness.

Clad in yellow raingear and knee-high rubber boots, he flipped a switch on his helmet headlamp and sloshed through water several inches deep into the 10-foot diameter tunnel.

"Every time I go in, the workmanship is impressive given its age," Glenn Boyce, principal engineer for the tunnel project, said. "It's amazing to see a tunnel 90 years old. Back in the day they didn't have all this equipment."

A supervisor fired the starter on a four-wheel, all-terrain vehicle equipped with lights, and drove about a thousand feet east and uphill into the darkness.

Boyce was helping lead a tour for Hetch Hetchy personnel from San Francisco and for news media.

Harlan Kelly Jr., general manager for San Francisco Public Utilities Commission, brought a hand-held flashlight in addition to his headlamp to get a closer look at cracks in the tunnel walls.

Since early January, workers have discovered about 20 defects, gouges in the concrete lining that exposed metal wire in places, in the first 1,000 feet of tunnel east of Priest.

Patches

Boyce showed places were cracks and gouges dug by moving water were patched over with dried sealants. He also showed unrepaired defects, some carved several feet long into the tunnel ceiling and walls.

“We have a lot of aging pipelines in the city,” Kelly said. “We have a lot of old infrastructure on Hetch Hetchy. In some situations, maintenance can be challenging because we have so much water in the system.”

Administrators with SFPUC will be reviewing data, observations and test results in coming months to decide if Hetch Hetchy’s existing Mountain Tunnel is strong enough to last.

“We’re going to go back and let the engineers see how the patches hold before we make a final decision,” Kelly said. “The thickness of the walls, they’re thicker than we thought, is probably in our favor. Based on repairs and core samples, we’ll determine the adequacy of the existing tunnel. Then we’ll decide if we want to do a bypass, or a new tunnel, or stay with the existing tunnel.”

The Mountain Tunnel helps convey water from three reservoirs: Hetch Hetchy and Eleanor in Yosemite and Cherry in Stanislaus National Forest. Hetch Hetchy System dams high up in the Tuolumne watershed were holding back more than 600,000 acre-feet of water combined this week, and they were releasing a total of about 11,000 cubic feet per second.

Hetch Hetchy uses steep, hillside pipes called penstocks to deliver water under great force to powerhouses deep in Tuolumne River canyons. But when water flows through Mountain Tunnel, the gravity-driven delivery system designed a century ago slows the water down to a pace that means it can take three hours for water to get from Hetch Hetchy dams to Priest Reservoir.

Wet season

Precipitation in the Tuolumne River watershed in the 2017 water year that started Oct. 1 is on a steep curve that matches or exceeds the wettest water year on record, 1983, Adam Mazurkiewicz, a water operations analyst/hydrologist with Hetch Hetchy, told SFPUC personnel last week.

Asked how the situation at Oroville compares with Hetch Hetchy infrastructure, Suzanne Gautier, a manager in communications and public outreach with SFPUC, said Central Sierra granite that is part of the system’s foundations is holding its own.

“This season’s weather has challenged all water providers throughout the state,” Gautier said. “Surface reservoirs are filling up all over the state.

“We have the advantage at O’Shaughnessy, the spillway is made of granite,” Gautier said. “It would be hard to find a harder rock than granite. We’re fortunate to have the granite in our system. In the same way, the tunnel being dug through granite helps sustain the structure.”

Wear and tear inside the Mountain Tunnel show cracks in the tunnel lining but not severe crumbling, Gautier said.

“Over the summer, as we evaluate what we found, we’ll determine what the next steps are,” Gautier said. “The tunnel was built to last, and it’s fair to say we’re pleased with the results of this inspection so far.”

Project details

In addition to inspecting and repairing the Mountain Tunnel, workers are upgrading and enlarging adits, man-size openings in the tunnel where vehicles and other equipment will soon be able get in and out of the tunnel when necessary.

The total cost of tunnel inspection and repairs, along with adit and access improvements during the 60-day shutdown, is about $13 million, Gautier said.

Another project underway below O’Shaughnessy Dam is a bypass at Kirkwood Powerhouse, where boulders 2 to 3 feet in diameter were found beneath a destroyed energy dissipator device in October, said Scott Riley, an asset services manager with Hetch Hetchy.

Timing for the bypass at Kirkwood worked out with the Mountain Tunnel shutdown, SFPUC spokesman Charles Sheehan said.

Having the water delivery system offline allowed engineers and workers to get in and make the fix. The Kirkwood bypass is expected to be completed before Mountain Tunnel water service is restored.

About 240 people are employed by San Francisco Public Utilities Commission in Tuolumne County, Gautier said.

A national inventory of dams maintained by the Army Corps of Engineers shows the last inspection of O’Shaughnessy Dam, which impounds Hetch Hetchy Reservoir in Yosemite National Park, was June 30, 2015.

Gautier said the California Department of Water Resources, Division of Dams Safety, is the primary regulatory agency for O’Shaughnessy Dam. Staff with SFPUC do field inspections of O’Shaughnessy Dam each year with Division of Dams Safety personnel.

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