BAY AREA WATER SUPPLY AND CONSERVATION AGENCY
BOARD POLICY COMMITTEE MEETING

January 14, 2022

Correspondence and media coverage of interest between December 9, 2021 and January 11, 2022

Correspondence

From: Nicole Sandkulla, BAWSCA, Chief Executive Officer/General Manager
To: 2021 Urban and Multibenefit Drought Relief Grant Program Manager
Date: December 9, 2021
Subject: Letter of Support for the Coastside County Water District Application to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

From: Nicole Sandkulla, BAWSCA, Chief Executive Officer/General Manager
To: 2021 Urban and Multibenefit Drought Relief Grant Program Manager
Date: December 9, 2021
Subject: Letter of Support for Peninsula Drought Resiliency Program Applications to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

From: Nicole Sandkulla, BAWSCA, Chief Executive Officer/General Manager
To: 2021 Urban and Multibenefit Drought Relief Grant Program Manager
Date: December 20, 2021
Subject: Letter of Support for the City of Brisbane's Application to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

Media Coverage

Local News:

Date: January 5, 2022
Source: Daily Journal
Article: Belmont water pipe rupture leads to shutoffs

Water Supply Conditions:

Date: January 11, 2022
Source: PEW
Article: California's Drought Reckoning Could Offer Lessons for the West

Date: January 10, 2022
Source: San Francisco Chronicle
Article; Wet Season Watch: Will California get out of drought this winter?

Date: January 10, 2022
Source: Weather West
Article: As persistent West Coast ridge builds, California (mostly) warms up and dries out

Date: January 10, 2022
Source: University of Arizona News
Article: California's 'climate whiplash' has been worsening for 50 years and will continue

Date: January 9, 2022
Source: Calironia Water Blog
Article: Continued drought early in a possibly wet year

Water Supply Conditions, cont'd.:

Date: January 8, 2022
Source: Tahoe Daily Tribune
Article: State of the snowpack

Date: January 5, 2022
Source: CalMatters
Article: No, California's drought isn't over. Here's why.

Date: January 4, 2022
Source: Environmental News Bits
Article: California's water supplies are in trouble as climate change worsens natural dry spells, especially in the Sierra Nevada

Date: January 2, 2022
Source: San Francisco Chronicle
Article: Precipitation since Oct. 1 tops previous full 'water year' in California

Date: January 1, 2022
Source: Associated Press
Article: Water content of California snowpack far above normal levels, but drought not over

Date: December 31, 2021
Source: SF Gate
Article: Map shows almost all of California out of 'exceptional drought' after week's storms

Date: December 19, 2021
Source: CNN Weather
Article: California snow drought ends in dramatic fashion, while other states still deal with shortage

Water Supply Management:

Date: January 3, 2022
Source: CalMatters
Article: The importance of California's agricultural water supplies

Date: December 27, 2021
Source: San Joaquin Valley
Article: Critics say valley groundwater managers put too much emphasis on recharge, not enough on Pumping cuts

Date December 23, 2021
Source: Department of Water Resources
Material: Press Release: DWR Awards More Than $53 Million in Urban and Multibenefit Drought Relief Funding

Date: December 22, 2021
Source: AgNet West
Article: 'Unprecendented' Water Allocation for State Water Project

Water Infrastructure:

Date: January 6, 2022
Source: Mercury News
Article: Anderson Dam: Cost to rebuild key Bay Area dam nearly doubles to $1.2 billion

Water Policy:

Date: December 27, 2021
Source: LA Times
Article: Paper records and steel vaults: Can California water rights enter the digital age?

Date: December 21, 2021
Source: Pacific Institute
Article: With Another Dry Year Looming, California Moves to Set New Urban Water Use Standards

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BAWSCA
Bay Area Water Supply & Conservation Agency

December 9, 2021

2021 Urban and Multibenefit Drought Relief Grant Program Manager
California Department of Water Resources
P.O. Box 942736, Sacramento, CA 94236-0001

Subject: Letter of Support for the Coastside County Water District Application to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

Dear Program Manager,

I write on behalf of the Bay Area Water Supply and Conservation Agency (BAWSCA) in support of the Coastside County Water District's grant application for the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Funding for projects to address drought impacts in its service area, which includes the City of Half Moon Bay and several other unincorporated coastal communities in San Mateo County.

The proposed projects include replacement of existing groundwater supply and surface water diversion wells that have reached the end of their useful life and development of new groundwater supplies. Coastside County Water District and its customers are facing a water shortage emergency in the current drought and have the potential to face even more critical conditions if the drought worsens. These projects are vital to improving drought resiliency and protecting drinking water supply by improving the reliability and expanding local supply sources and reducing reliance on imported water from the San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS). Therefore, we strongly support the development of the proposed projects and application for grant funds to address the critical drought emergency.

Sincerely,

Nicole Sandkulla
Chief Executive Officer/General Manager

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BAWSCA
Bay Area Water Supply & Conservation Agency

December 9, 2021

2021 Urban and Multibenefit Drought Relief Grant Program Manager
California Department of Water Resources
P.O. Box 942736
Sacramento, CA 94236-0001

Subject: Letter of Support for Peninsula Drought Resiliency Program Applications to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

Dear Program Manager:

The Bay Area Water Supply and Conservation Agency (BAWSCA) supports the Peninsula Drought Resiliency Program grant applications to the 2021 Urban and Multibenefit Drought Relief Funding Grant Program. These applications include water supply projects proposed by retail water suppliers located in San Mateo and Santa Clara Counties, all of which are reliant on imported water from the San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS), including the City of Brisbane, the City of East Palo Alto, the Mid-Peninsula Water District, the North Coast County Water District, and the Purissima Hills Water District.

These suppliers and their customers are facing a water shortage emergency in the current drought and have the potential to face even more critical conditions if the drought worsens. These projects are vital to building drought resiliency and protecting drinking water supply by bringing local supply sources to the region.

We strongly support the development of the projects in the Peninsula Drought Resiliency Program, and the applications for grant funds to address the critical drought emergency.

Sincerely,

Nicole Sandkulla
Chief Executive Officer/General Manager

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BAWSCA
Bay Area Water Supply & Conservation Agency

December 20, 2021

2021 Urban and Multibenefit Drought Relief Grant Program Manager
California Department of Water Resources
P.O. Box 942736
Sacramento, CA 94236-0001

Subject: Letter of Support for the City of Brisbane's Application to the California Department of Water Resources 2021 Urban and Multibenefit Drought Relief Grant Program

Dear Program Manager,

This letter supports the City of Brisbane's Irrigation Supply Well project, which is applying to the California Department of Water Resources for grant funding as one of the five projects in the Peninsula Drought Resiliency Program.

The City of Brisbane is presently 100% reliant on the San Francisco Regional Water System (RWS) for water for its 4,598 residents and businesses. As a result of both the ongoing drought and the State Water Resources Control Board's recent Bay Delta Plan Amendment that severely restricts diversions from the RWS' primary source of water, the Tuolumne River, Brisbane is now facing a drought emergency coupled with a reliability concern with its water supplier.

Brisbane's current residential consumption is 46.8 gallons per capita per day, which is more efficient than 98% of the urban water agencies in the state. With only one source of water supply and an annual demand of 717 acre-feet per year (AFY), the Brisbane Irrigation Supply Well project will provide up to 21 AFY of non-potable water to irrigate public parks, thus diversifying the city's water supply portfolio, while also reducing demand on external water resources.

Approval of grant funding for the Brisbane Irrigation Supply Well project and the Peninsula Drought Resiliency Program is highly recommended.

Sincerely,

Nicole Sandkulla
Chief Executive Officer/General Manager

cc: Sepi Woods, BAWSCA Board Member, City of Brisbane
Randy Breault, BAWSCA Board Member, GVMID
Clay Holstine, City Manager, City of Brisbane

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Belmont water pipe rupture leads to shutoffs
Carlmont Shopping Center, apartments affected
Daily Journal | January 5, 2022 | Curtis Driscoll

A water pipe rupture near the Carlmont Village Shopping Center in Belmont Saturday led to water overflow over the weekend and a Monday shutoff for around 200 customers for repairs.

“It did affect some people. For a good period of the day Monday, the shopping center was out of water, as were some apartments. About 200 customers were out of water till we could repairs. But it all got done,” Rene Ramirez, Mid-Peninsula Water District operations manager said.

The break Saturday resulted in water coming out at the Alameda de las Pulgas and Carlmont Drive intersection near the Carlmont Shopping Center. Mid-Peninsula Water District provides water to Belmont residents and operates around 95 miles of water mains in Belmont, including the ruptured line. Ramirez said the shopping center, nearby apartment complexes and a nursing home were affected.

“In this particular case, we knew the shopping center could be affected, and it was,” Ramirez said.

When alerted Saturday, Mid-Peninsula asked other utilities to mark equipment to avoid hitting anything underground and mobilized staff to respond. Once staff found the issue area, workers exposed the rupture and found a ruptured tapping sleeve, which is placed over pipes to branch off from the water main. The break occurred on New Year’s Day, causing delays in getting a hold of equipment suppliers and finding the correct parts for repairs. Ramirez said Mid-Peninsula instead started contacting other water providers in the Bay Area region through the Bay Area Water Supply and Conservation Agency, or BAWSCA. Mid-Peninsula was able to eventually find the needed equipment from the city of Santa Clara.

“This was all happening on New Year’s Day. It was most of the afternoon and into the evening,” Ramirez said. “[With] our supply store, we weren’t able to get a hold of anybody there.”

Ramirez went to Santa Clara Sunday morning to pick up the part. The water agency Sunday also reached out to the Carlmont Shopping Center and surrounding areas about the upcoming shutdown Monday to repair, handing out over 200 notices in the area. The water supply was not in danger of contamination, but the current drought and the need to conserve water added to the urgency. Ramirez said the agency tried to minimize customer inconvenience, but it was impossible given the circumstances.

“In the meantime, water continued to leak out of that main. We couldn’t shut it down because if we had, we definitely would have affected the shopping center, the homes and apartments in the area,” Ramirez said.

Monday was spent successfully repairing the break and drainage, with water shut off in the area from around 9 a.m. to 5 p.m. Tuesday was spent at the scene getting rid of tree and mud debris, preparing for road construction and preparing to repave a northbound travel lane near Alameda de las Pulgas affected by the break. The lane repair area is around 8 feet wide and 10 feet long. There are no street closures or detours currently, Ramirez said. Mid-Peninsula is communicating with the city of Belmont and Belmont police about the repairs and overall situation.

While it was impossible to know how much water was lost, it was under the amount necessary to report to notify state water authorities. It is not unusual for water agencies to deal with ruptures during the winter and rainy seasons, especially with older infrastructure. While it was too early to know how the tapping sleeve broke, he suspected some bolts that held it together likely rusted off and weakened it. Ramirez said the piping that broke was likely put down in the 1970s or earlier. Tree roots can also be compressive forces on water mains, causing them to crack or split.

“We don’t exactly know what caused it. I don’t think it’s weather-related, Ramirez said.

# # #

California's Drought Reckoning Could Offer Lessons for the West
PEW | January 11, 2022 | Matt Vasilogambros

Clouds hover above Los Angeles as California received some much-needed rain this winter. After two years of drought, the Golden State can offer its Western neighbors insight into water conservation in a changing climate. Ringo Chiu via The Associated Press

MONTEREY, Calif. — The golden hills of California have turned green in recent weeks after a series of storms delivered much-needed rain and snow to a state suffering from two years of drought.

But state officials and water policy experts are still urging caution even in these wet conditions, pushing for water-saving measures as the drought is expected to continue throughout much of the West.

"Even with those rains and with that massive snowpack, the larger issues of drought in California are not resolved," said Char Miller, a professor of environmental analysis at Pomona College in Claremont, California. "No one talks about water when it's raining. We need to have the conversation now."

California remains in the grip of a dry period that has substantially depleted the state's reservoirs, facilitated some of the largest wildfires in state history and led officials to add new restrictions on water use.

This past water year (a measure that takes into account total winter precipitation), which ran from October 2020 through the end of September, was the driest in a century. Just three months into the new water year, California already has surpassed 2021's precipitation levels.

The drought has laid bare some of the challenges that California and other states face in managing their water supplies. A California conservation law being implemented over the next two decades, along with a range of actions by communities across the state, provide a preview of difficult policy choices communities across the West will have to grapple with as climate change pushes water shortages to crisis levels.

While some communities, such as Marin County just north of San Francisco, have debated building a multimillion-dollar emergency pipeline to bring in water, other communities have sought approaches that rely on reuse and recycling.

Orange County now is home to the world's largest groundwater replenishment site, a treatment plant that purifies wastewater and injects that water back into its underground aquifers, instead of pumping treated water into the Pacific Ocean.

Some communities are trying to improve their stormwater capture systems, while others are exploring turning ocean water into drinking water. San Diego County has the largest desalination plant in the western hemisphere, and other communities are considering following its example.

The infrastructure law President Joe Biden signed in November includes $82.5 billion for critical water investments nationwide, including grants, studies and federal projects.

But the problems these policies attempt to address are daunting.

California and other states swing from extreme wet to extreme dry conditions, which will only be exacerbated by the worsening climate crisis.

There's also a lack of reliable long-term weather forecasting that could predict precipitation levels throughout an entire wet season, instead of just two weeks.

"These days, it's all about being more efficient in water management," said Jeanine Jones, interstate resources manager at the California Department of Water Resources. "You need better forecasts to be more efficient."

In long dry spells, communities and farmers in many states also draw heavily on underground aquifers, many of which are being overdrafted, even in average rain years. California's Central Valley, the heart of America's produce industry, is literally sinking because of its depleting and overpumped aquifer.

Big measures are needed now to address many of these challenges, said Andrew Ayres, a research fellow at the Public Policy Institute of California, a San Francisco-based nonprofit. California has generally lagged other Western states in having comprehensive groundwater plans, Ayres said.

Arizona, for example, enacted its groundwater management act in 1980. The legislation mandated water conservation from businesses throughout the state and sought to manage groundwater consumption in five counties where overpumping was historically an issue. But some water experts have called for an update to the law to address groundwater supply issues in rural Arizona.

California policymakers enacted a law in 2014 that they hoped would increase aquifer levels through conservation efforts that not only decrease the amount being pumped but also increase water seeping back underground. The Sustainable Groundwater Management Act is still being implemented, as communities and water rights-holders have until 2040 to reach sustainable groundwater levels.

But the law's outcome is not certain, Ayres said. Water management is a complex web of state and local water authorities, long-held water rights and uncharted legal territory, he said, and the next two decades of implementing this new law will lead to difficult negotiations and sacrifices by both agricultural and urban consumers.

"There's a lot of uncertainty around solutions and what they will look like," he said.

Over the past year, the state has added other restrictions for water use, including a call by Democratic Gov. Gavin Newsom for residents to voluntarily cut their water consumption by 15%, but the state fell far short of that goal. Newsom has resisted a politically fraught statewide water conservation mandate. In 2015, then-Gov. Jerry Brown, a Democrat, ordered communities to cut water consumption by 25%. The cuts ended after a year when heavy rain saturated the state and eased the drought.

Last week, the state also issued emergency regulations that target water waste by residents, including hosing down sidewalks or watering lawns soon after it rains.

These measures have been necessary even after the recent rain and snow brought some relief.

The deluge of the past month soaked much of the Golden State, replenishing dammed reservoirs and underground aquifers, and revitalizing streams that until recently laid dormant and dusty. For a state with nearly 40 million residents in need of drinking water and the country's largest agricultural industry that provides a tenth of the nation's crops and livestock, this weather has been essential.

Throughout much of the past year, dangerously depleted reservoirs and lakes fell way below water lines, beaching boats and raising alarm statewide. Reservoirs, though many remain well below their historical average, have risen substantially with recent precipitation.

When considering drought conditions and the low reservoir and groundwater levels going into this winter, the state is still significantly behind healthy water levels, said Michael Dettinger, a

research associate at Scripps Institution of Oceanography at the University of California, San Diego.

Drought recovery depends on what Californians and the state does now, said Heather Cooley, director of research at the Pacific Institute, an Oakland-based think tank.

There are massive challenges: Overdrafting of the state's aquifers has been exacerbated by drought, engineers have detected cracks in aqueducts and shallow wells are drying up in some rural areas. And as reservoirs dry up, there are no other major rivers to dam.

Californians can do their part, said Cooley, including by upgrading old appliances (such as dishwashers and toilets), removing grass lawns and replacing them with climate-efficient plants, and fixing leaks. Some communities, from Encinitas up to Santa Clara County, have added requirements for home and business owners to replace inefficient appliances.

California's State Water Resources Control Board last week ordered local governments to stop using drinking water to water ornamental grass on street medians. Similar policies are being implemented in other drought-ridden states. Neighboring Nevada banned strictly ornamental grass on office parks, outside malls and on road medians.

Further, the state needs to improve its timely access to data and information on water levels and consumption by consumers, said Nell Green Nylen, a senior research fellow with the Wheeler Water Institute at the Center for Law, Energy & the Environment at the University of California, Berkeley, School of Law. But, she admits, this is challenging in such a complicated management system.

It's even more challenging to manage a water system that also keeps in mind ecosystems and essential habitats for fish and wildlife, she said. Last year, nearly all the endangered winter-run chinook salmon juvenile population died in the warm Sacramento River, unable to receive cold water from snowmelt.

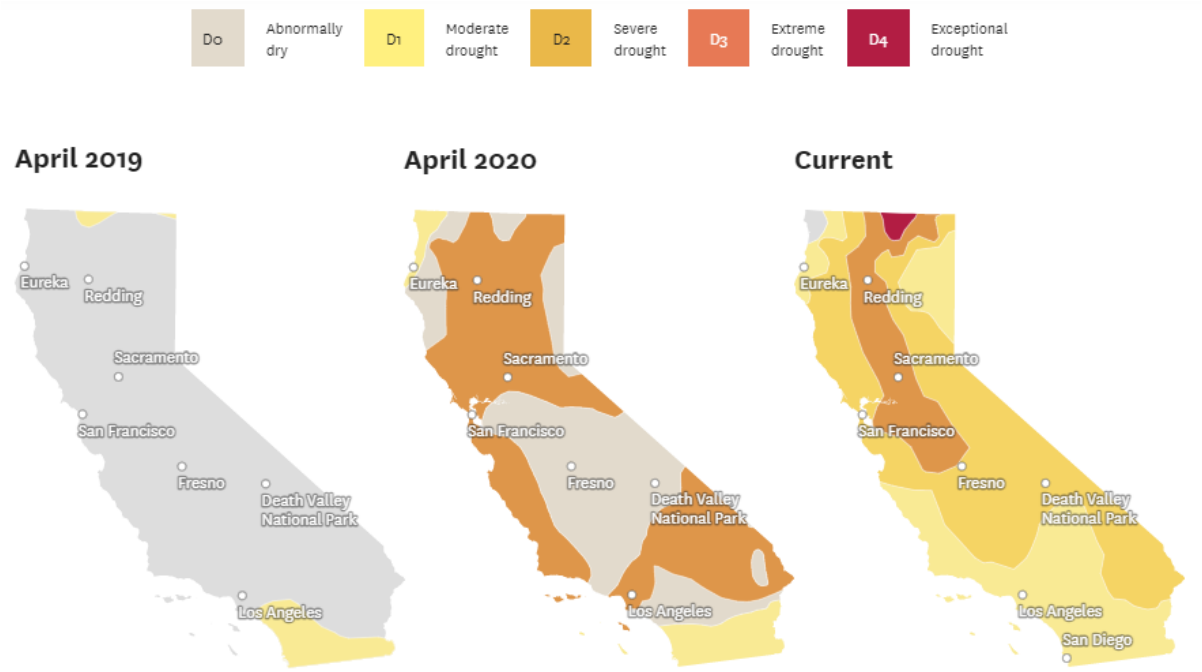
But all potential solutions require a drastic cultural shift and change of approach that entails sacrifice, Cooley said.

"That shift takes time," she said. "I think people are making it, but there's more we can do."

# # #

Wet Season Watch: Will California get out of drought this winter?

San Francisco Chronicle | January 10, 2022 | Yoohyun Jung and Kurtis Alexander



The maps above show how current drought conditions (far right, updated weekly) compare with those of April 2019 and April 2020, based on U.S. Drought Monitor data.

California is hoping for a good soaking this wet season.

After two extraordinarily dry years, water supplies are running short, low-flowing rivers have pummelled fish and wildlife, and parched forests and grasslands have increased the risk of wildfire.

Most of California's precipitation comes between December and April. Winter storms from the Pacific Ocean bring rain to thirsty hills and valleys and drop snow on mountaintops, which later melts and provides an additional burst of needed moisture.

The beginning of April is a significant time of the year because that's when accumulated snow is at its peak. It's when we know how much water will melt from the snow over spring and summer.

Water managers are monitoring these winter months closely. So are we. On this constantly updating page, we are keeping tabs on some of the most important data that help us answer the question: Will California be relieved from drought this winter?

WHAT WE'RE TRACKING
— Current drought conditions via U.S. Drought Monitor
— Monthly storage levels at major reservoirs
— Snowpack conditions through snow water content levels
— Eight-station Sierra Precipitation Index

While the wet season started strong, with record rain and snow in some parts of the state at the end of 2021, the heavy precipitation would have to continue into spring for California to claw its way out of drought.

While the wet season started strong, with record rain and snow in some parts of the state at the end of 2021, the heavy precipitation would have to continue into spring for California to claw its way out of drought.

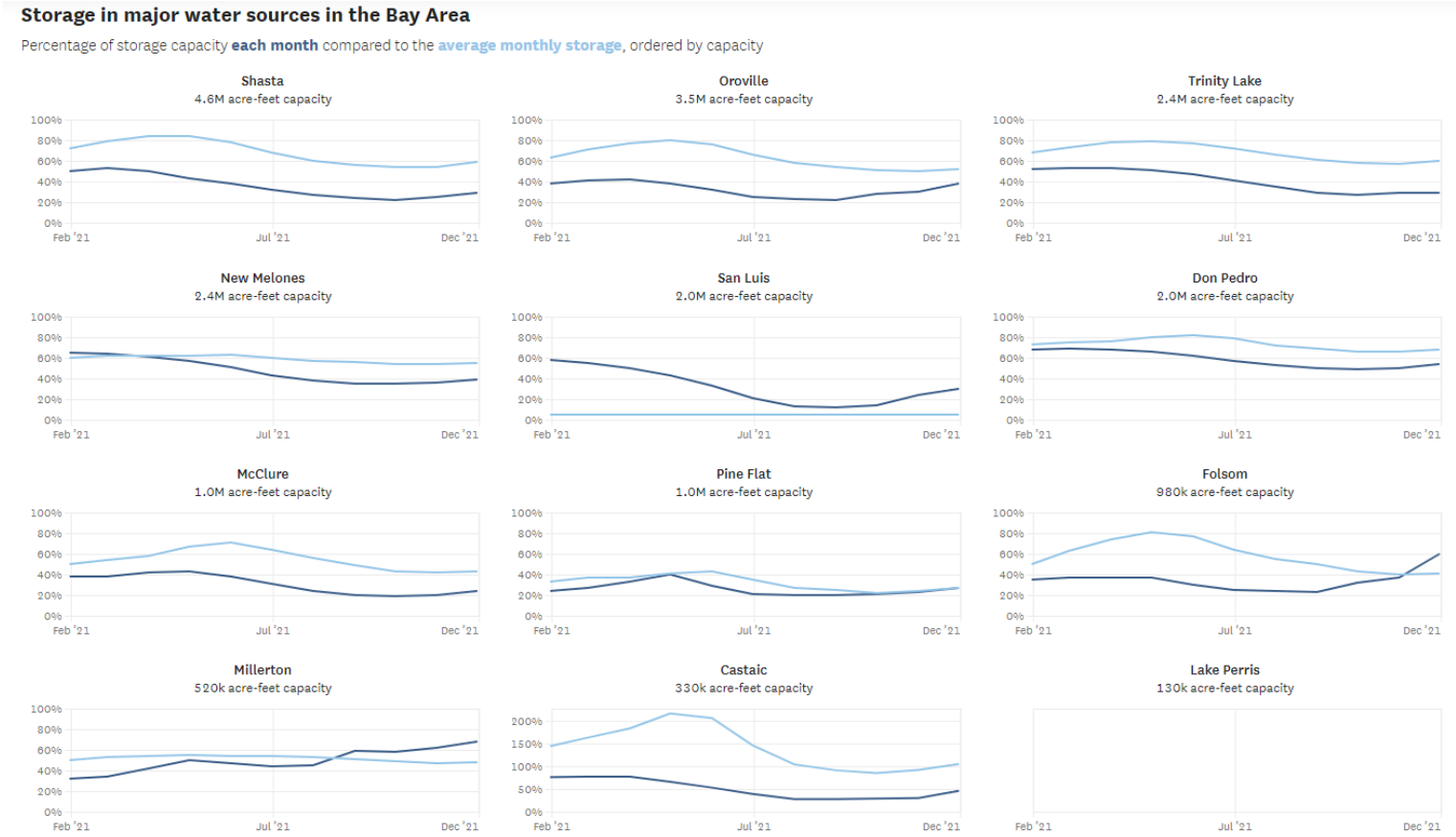
The rain and snow in California's far north is what water experts — and we — are watching most intently. Northern California receives the bulk of the state's precipitation and it's home to the biggest reservoirs. Many water experts say the wet season needs to wrap up with 140% of average precipitation for drought relief.

The Northern Sierra Eight-Station Precipitation Index and the state's snowpack survey measurements are particularly useful for gauging how the wet season is shaping up.

California's reservoirs remain thirsty

Continued drought drained and dried many of the major reservoirs that are vital to the state's water supply.

The chart below tracks the trends in storage levels of the state's major reservoirs as percentages of their total capacity, and percentages of the historical average storage level for that time of the year. The historical average is calculated based on data beginning in 1960.



Storage in major water sources in the Bay Area

Percentage of storage capacity each month compared to the average monthly storage, ordered by capacity

Source: Department of Water Resources California Data Exchange Center
Average monthly storage is based on data from 1960 to the present. 1 acre-foot is equivalent to 325,851 gallons.

State officials track the snowpack in the Sierra Nevada and the mountains of the far north by measuring its water content. This is considered the best metric for gauging how snow will boost water supplies. The measurement is expressed as a percentage of the average accumulation on April 1, when the snowpack has historically peaked, before it melts off.

The 8-station Northern Sierra Precipitation Index tracks precipitation across some of California's wettest and most important watersheds.

Current snow water content levels

Updated daily to reflect the most recent data

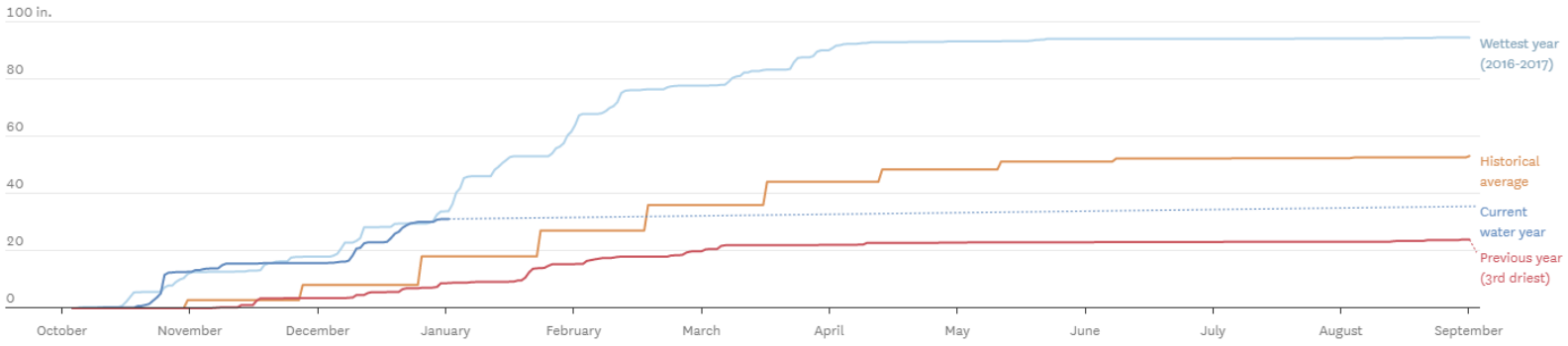
	% of normal for this date	% of April 1 average (the wettest time of year)
North	136%	57%
Central	139%	58%
South	147%	55%
Statewide	**141%**	**57%**

Source: DWR California Data Exchange Center

These watersheds drain into the state's biggest reservoirs, making the index a pertinent indicator of water supply. The average cumulative rainfall in a water year — based on data between 1991 and 2020 — is about 53.2 inches (water years run from October to September). The 2016-2017 water year was the wettest on record for the index, with nearly 95 inches of cumulative rainfall at the eight stations.

Cumulative rainfall for the Northern Sierra Precipitation 8-Station Index, current vs. historical, by water year

Updated daily to reflect most recent data



Source: DWR California Data Exchange Center

Water years run from October to September, rather than January to December.

ABOUT THE DATA

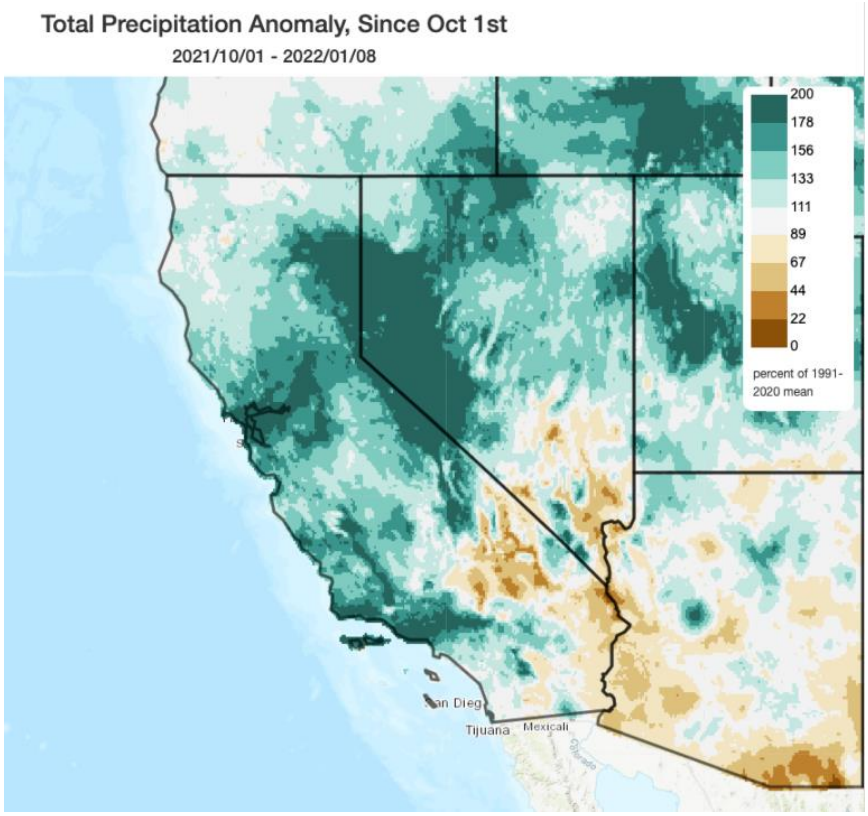
The reservoir, snowpack and precipitation data for this project come from the Department of Water Resources California Data Exchange Center.

Drought extent data comes from the U.S. Drought Monitor, a partnership between the National Drought Mitigation Center, the U.S. Department of Agriculture and the National Oceanic and Atmospheric Administration.

As persistent West Coast ridge builds, California (mostly) warms up and dries out
Weather West | January 10, 2022 | Daniel Swain

Taking stock: a good start to Water Year 2021-2022

I'll keep this part pretty short and sweet: for the Water Year to date, most of California is in pretty good shape when it comes to precipitation. And that's good news, given the historic severity of the regional drought as recently as late September. (I discuss this broader context in more detail in the second to last section of this post).



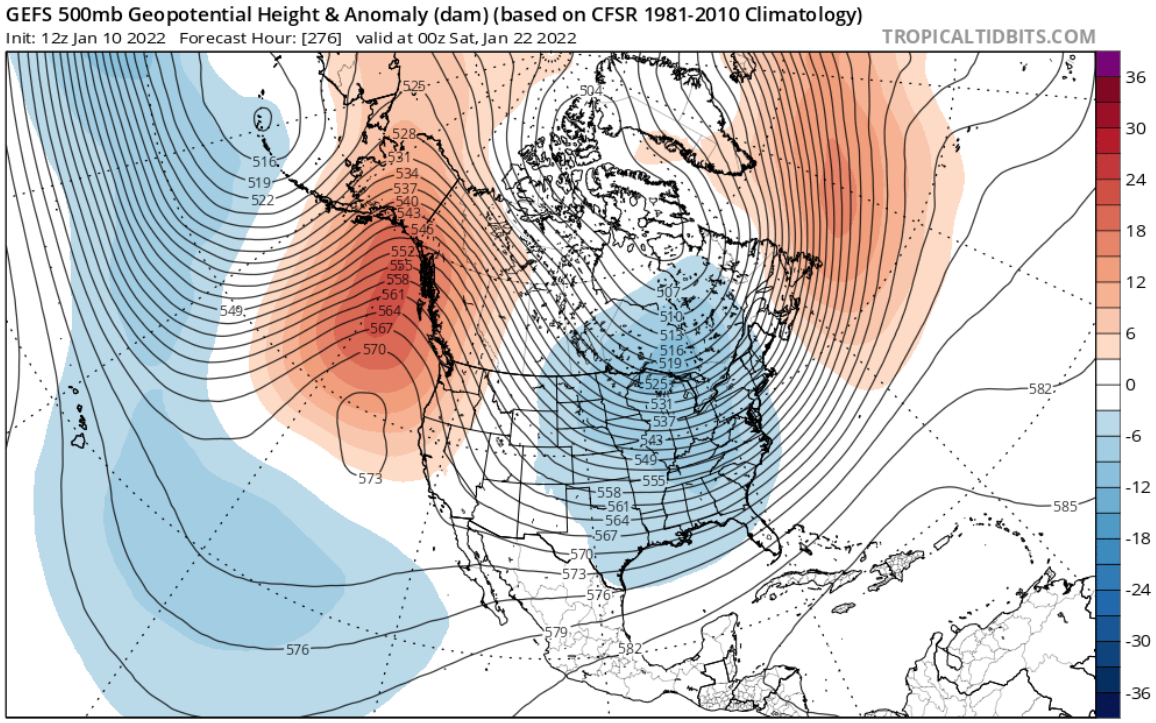
Much of California is running ahead of average precipitation do date (as of Jan 8), especially along I-80 corridor and in parts of coastal Santa Barbara and Ventura counties. Far northern and far southern parts of the state are close to average for the date. (climatetoolbox.org)

In the meantime, the insane period of sustained record warmth across the California interior (especially at higher elevations) that was much discussed this summer and early autumn has finally abated. Across most of the state, temperatures since Oct 1 have been right around average (locally a bit above or below, depending on where you are). December was still a near average month, temperature-wise, on a statewide basis– although the second (and snowy, in the mountains) half of the month was colder than average in many spots. Notably, the relatively cold December temperatures along the West Coast were in truly extreme contrast to the widespread all-time record warm conditions observed during December across much of the rest of the contiguous United States. In fact, according to NOAA, December 2021 was the warmest December on record for the contiguous U.S.

I would be remiss not to mention the very heavy and exceptionally disruptive Sierra Nevada snowfall that occurred in December–mostly notably in the lower foothills between 2,000 and 4,000 feet elevation. In that elevation band in particular, where very heavy snowfalls are much rarer than at pass level, the December snowfall has produced extreme (and in some cases,

ongoing) disruptions to transportation and electrical infrastructure. There are still at several thousand power customers who remain without electricity or road acces due to an extremely high number of downed trees and powerlines–over two weeks after the initial event (I know there are at least a couple of Weather Westers who fall into this category). Hopefully, the upcoming warm and dry spell will help crews finally clear the remaining roads and restore power to the remaining outage areas rapidly over the next day or two. It is also worth noting, as several ecologists and fire folks have already pointed out to me, that the very high volume of downed trees and branches that occurred during this event will probably increase fire risk in that foothill elevational band this coming summer/autumn due to the added dead/down fuel density and access problems on remote/forest roads that will not ordinarily be accessed by crews until needed.

Strong, persistent West Coast ridge developing; warmer and much drier for most of CA

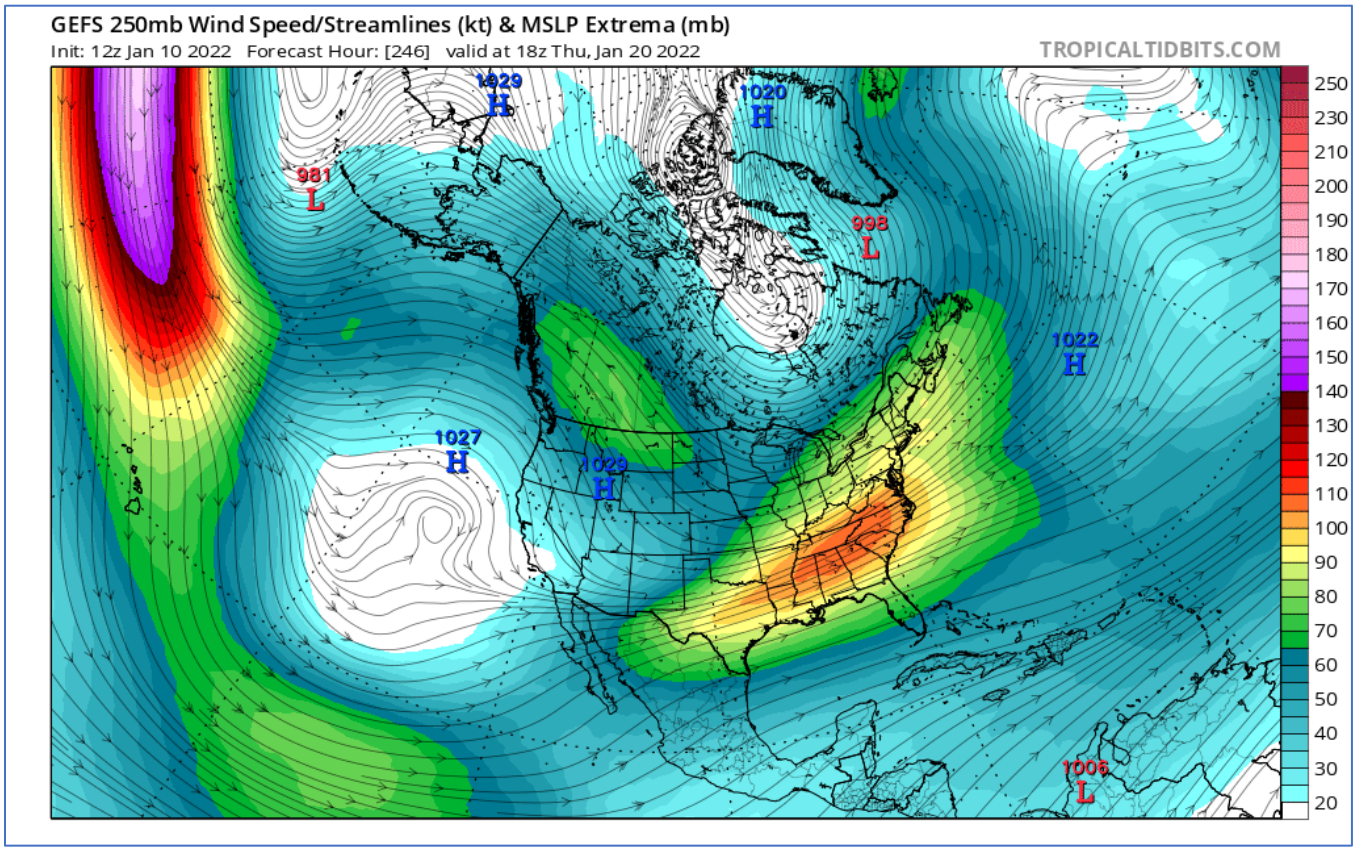


There is strong, multi-model agreement that a persistent ridge of high pressure will anchor itself just west of the West Coast for the next 2-3 weeks, although some modest undercutting due to a weak subtropical jet is possible at times.

In the coming days (and probably for the next 2-3 weeks), a persistent ridge of high pressure will set up shop just west of the West Coast–effectively blocking the jet stream and bringing an end to the December parade of cold storms across California. There is strong multi-model ensemble agreement regarding the overall persistence and (more importantly) positioning of this ridge, which will very likely keep most or all of California somewhat warmer and much drier than average for mid-January over the next 2 weeks. 2-week dry spells are not unusual in California, and indeed seem to have a slight climatological preference for the month of January. So this

multi-week ridge, in and of itself, is not especially unusual for this part of the world. How long it persists into late Jan, Feb, and beyond is more important from a seasonal and drought-busting (or not) perspective (more thoughts on that below). All in all, though, it appears this will be a prolonged period of fairly benign weather across California and much of the rest of the West. After the December deluge, and enormous Sierra Nevada snow accumulations, this pattern will cause statewide snow water equivalent "percents of average" for the date to fall precipitously– from about 133% of average for the date (as of today) to around or perhaps even below 100% of average for the date by late Jan.

Some "ridge undercutting?" possible? Yes, but odds of significant event appear low



A strong and persistent blocking ridge will re-develop much closer to the West Coast than was the case during December, essentially halting the Pacific storm track and disrupting the jet stream. However, a weak subtropical jet may try to undercut this persistent block at times.

There is one caveat to the above "dry ridging" pattern discussed above: the potential for some modest ridge undercutting by a sneaky subtropical jet. This does not appear to be a particularly robust undercutting setup, and I don't think it's likely the West Pacific jet will break through anytime soon. But a weak subtropical jet spur may develop to the southwest of California during this period, possibly favoring the development of cut-off lows south of CA. These would be most likely to bring rain to Baja California, not the state of CA, but there is a modest chance (maybe 30%) that one or two of these cut-offs could drift far enough northward to generated isolated to scattered showers/isolated thunderstorms over some portion of (mainly southern) California.

The model operational runs keep hinting at this possibility, although the ensembles suggest it's not likely to happen in any widespread sense. Hydrologically significant precipitation appears quite unlikely, despite this caveat, over the next 2+ weeks–but this could certainly make for some nice sunsets/cloud watching down south (and maybe a shower or two at some point). Every once in a while, a low-key undercutting pattern like this can become unexpectedly active–but right now, there are no indications of that.

Seasonal outlook for the rest of the Water Year: odds still favor dry (but context matters)

The January update of the seasonal models has just come out, and they're continuing to suggest a relatively high likelihood that the peak of the rainy season (Jan-Mar) as well as the spring (Apr-Jun) will be drier than average across most of California except for perhaps the very northernmost portion.

Despite some claims to the contrary, this is actually consistent with long-range seasonal predictions originally made several months ago. Signals regarding Sep-Dec were decidedly mixed–with the multi-model seasonal ensemble suggesting that Sep-Nov would be drier than usual but that December would see increased odds of being a wetter than usual month. Sep and Nov were indeed quite dry across most of California, and December was quite wet indeed. In terms of the broader atmospheric pattern: a persistent and strong blocking ridge did indeed develop, as advertised, over the far North Pacific and has thus far lasted most of the season.

To illustrate this, I pulled the following quote from the September 16th blog update:

What do the seasonal models say? Well, they appear to be making a prediction that's very consistent with what I would estimate from our own prior work–they are suggesting fairly high odds of yet another dry winter across most or all of California (with confidence highest across the southern 2/3 of the state). Interestingly, these same models are suggesting that following a dry autumn (except perhaps along the North Coast), December could potentially be a pretty wet month in parts of CA! But thereafter, there seems to be a fairly strong indication that multi-month ridging will take hold and could keep California much drier than average during the peak rainy season months of January through March (and into the spring, as well, although that's more speculative at this early juncture).

-Daniel Swain, Sep. 16, 2021 (https://weatherwest.com/archives/10965)

The real miss in that outlook was October (i.e., "Bombtomber," as it's come to be known in the comments section). That event was essentially a single atmospheric river/low pressure bomogenesis event–albeit quite an extreme one–and brought record-breaking single day precipitation to a fairly broad swath of Northern California. And it's critically important to note that seasonal predictions simply cannot, and are not designed, to capture the behavior of individual storm systems that far in advance. This single storm event was so wet that it actually brought parts of NorCal, especially around the I-80 corridor, a substantial fraction of its annual average precipitation in one fell swoop. This was clearly good news–since it has really helped

mitigate short-term drought severity along that corridor–but it was largely a matter of good luck, rather than a blown seasonal forecast.

So if the seasonal models continue to be about as correct as they have been so far this season, I'd continue to put my money on a drier than average outcome for the rest of the season. Not completely dry, of course; seasonal predictions could not tell us that anyway. But even here, the broader context matters greatly. In the long term, California had been experiencing a record-breaking, historically severe drought heading into Water Year 2021-2022. Then, following "Bombtober" and the December deluge, many folks breathed a (much needed, and justified) sigh of relief–since those two single wet months singlehandedly ended fire season, added some critically needed flow into extremely low rivers and reservoirs, and delivered an impressive early season snowpack. All of that is great news.

But much of California remains in severe to even extreme drought conditions as of early January, since a mere month or two of wet (even very wet) conditions simply cannot erase the ecological, hydrologic, and groundwater effects 2-3 extremely dry and record warm preceding years. With a dry "back half" to winter looking like the most likely outcome, it seems highly likely that California and most of the rest of the broader Southwest will still be experiencing a significant drought throughout the coming calendar year. With warming temperatures and increasing evaporative demand due to global warming, it's just getting that much harder to escape the effects of landscape-scale aridification. That said, the drought we'll likely be experiencing come summer won't be nearly as bad as it would have been had we not had the October and December we just did–arguably, parts of California just narrowly averted a pretty dire escalation of drought consequences in 2022 thanks to just a couple of storm events. Flying by the seat of our collective pants, as it were (which, although it really should be obvious by this point, is decidedly not an effective long-term water management plan).

New research: co-occurring ozone and smoke pollution events have dramatically increased in U.S. West

I wanted to highlight some new research that was published last week in Science Advances, and was led by my colleagues at WSU Vancouver (Dmitri Kalashnikov is the lead author). In this work, we looked at a type of event that most folks reading this blog post have (unfortunately) become quite familiar with in recent years: extreme air pollution episodes in the Western U.S. Specifically, we considered the frequency, geographic extent, and population exposure to co-occurrence of extreme ground-level ozone and particulate matter (PM2.5) pollution for the past two decades (the full period over which records exist). We found widespread, substantial increases in such summer co-occurrence events that have affected virtually every major population center from the Pacific Coast to the Rocky Mountain Front Range. We further found that these increases are strongly associated with a) rising summertime extreme temperatures, b) increasing wildfire extent burned, and c) increased frequency of strong warm season high pressure patterns that cover most/all of the West. Although we don't conduct formal climate change attribution in this particular analysis (we exclusively use real-world observations, not

climate model simulations), it's pretty clear that there's a strong human fingerprint on at least two of those primary factors (i.e., increasing summer heat waves and wildfire area burned).

The full paper is freely available/open access, but if you're interested in learning more I'd suggest starting with the detailed Twitter thread (first two Tweets from which are linked below).
https://www.science.org/doi/full/10.1126/sciadv.abi9386?af=R
https://www.science.org/doi/full/10.1126/sciadv.abi9386?af=R

California's 'climate whiplash' has been worsening for 50 years and will continue

Most scientists researching California's extreme weather events have focused their investigations on the last decade and predict a more tumultuous future. But new UArizona research finds that an increasing trend in extreme weather began half a century ago.

University of Arizona News | January 10, 2022 | Mikayla Mace Kelley

It may seem as if California is always either flooding or on fire. This climatic whiplash is not imagined: New University of Arizona research, published in the International Journal of Climatology, shows that while dry events are not getting drier, extreme wet events have been steadily increasing in magnitude since the middle of the last century. These increased extreme wet events can result in more dangerous flooding and also fuel wildfires.

"Most research after 2015 has been very focused on this climate variability and how it's going to get worse in the future," said lead study author Diana Zamora-Reyes, a graduate student in the Department of Hydrology and Atmospheric Sciences. "But, in this paper, the main takeaway is that this is happening right now, and that variability has been increasing for the past 50 years or so."

The team gathered data on seasonal precipitation and stream flow – the runoff that results from precipitation – throughout the state of California going back 80 years, which was when sufficient data began to be available. There's usually a lag between precipitation and stream flow because it takes time for snow to melt and water to wander through the landscape. Zamora-Reyes and her team focused on fall and winter data, since most precipitation in California occurs during those seasons.

"Going into this research, I thought that both wet events would get wetter and dry events would get drier, and that was what was causing the rise in variability," Zamora-Reyes said. "I thought it would be both, but that wasn't the case. My assumption was based on previous research that found there will be an increase in extreme precipitation events and they're occurring in a smaller window of time."

"California droughts are happening, our research just shows that they're not caused by less precipitation," said co-author Valerie Trouet, a professor of dendrochronology in the Laboratory of Tree Ring Research. "We focused on precipitation and stream flow, which are not the only variables fueling drought. Temperature plays an important part as well, and with the world getting warmer, droughts are intensifying."

The team – which also includes Bryan Black, an associate professor in the university's Laboratory of Tree-Ring Research – compared its findings from northern and southern California. These comparisons are important because southern California is home to most of the state's population but northern California is where most of the water resources are located. Both regions rely on the water supply but in different ways.

"With this increase in variability and warming, it's also important to consider that a lot of the precipitation is going to start falling as rain rather than snow," Zamora-Reyes said.

This could mean more dramatic and destructive flooding, but it could also cause a surge in plant growth. If a dry year follows, that could result in more fuel for wildfires. Less snow also means less snowmelt, which usually doles out melted water at a less destructive pace.

"These patterns are going to keep causing billions in damage and are something we need to consider, especially for infrastructure planning," Zamora-Reyes said.

The researchers also found that precipitation variability is decreasing in the northern part of California in the fall.

"That's where you get most of the water resources and also that's where you have a lot of the forested areas," Zamora-Reyes said. "We're also seeing that less of these really wet events are coming in the fall, and instead we're getting most of the precipitation concentrated in winter. We're seeing this pattern across California. If you look statewide, you see the same trend in both precipitation and stream flow."

The paper is unique because it highlights the relationship between the increasing variability in both stream flow and precipitation.

"They're completely independent records, yet they're showing the same thing," Zamora-Reyes said.

"Precipitation winds through complex processes before it ends up as stream flow," Trouet said. "Stream flow is a much slower process, so we did not expect to also see that clear of a trend in variability in stream flow but we do."

Zamora-Reyes was surprised by the team's results.

"I was expecting to see an increase in variability over the last 20 years at most," she said, "but we've been seeing a steady increase for much longer. People are noticing. I've talked to strangers about my research, and they say they've noticed what I'm talking about. It's been interesting and eye-opening to see my research play out in real time."

The researchers looked solely at data collected by sensors and instruments installed decades ago, but in the future Zamora-Reyes and Trouet want to use tree rings to study precipitation and stream flow variability going back hundreds of years.

Zamora-Reyes said that will help them answer questions such as: "How uncommon is this variability? Are there periods in the past comparable to what we're experiencing right now?"

# # #

Continued drought early in a possibly wet year
California Water Blog | January 9, 2022 | Jay Lund

California's 2021 calendar year is over, but its 2022 Water Year (which started October 2021) is already three months old and still early in its wet season. So far this wet season is actually wet.

It is a good time to assess the condition of the present drought and whether it is likely to end with this wet season. And under such conditions, what are water management activities and policy initiatives we should be doing?

A Wet Wet Season?

For the first time in three years, the wet season is wet (173% of average for the end of December), so far. For the Sacramento Valley, based on DWR's Northern Sierra 8-station Index, this October was the 2nd wettest in this 102-year record. However, November was much drier than average, the 31st driest November in 102 years. December rebounded strongly as the 23rd wettest on record. Overall, this water year through December was the 16th wettest on record, which is about what the wettest year on record (2017) was at this time. But the drought year 2013 had a bit more than this precipitation at by this time of year (Figure 1), so it is unwise to presume we are out of the drought yet (based on precipitation alone).

This year can quickly return to dry conditions. The forecast is dry for the next couple of weeks into January.

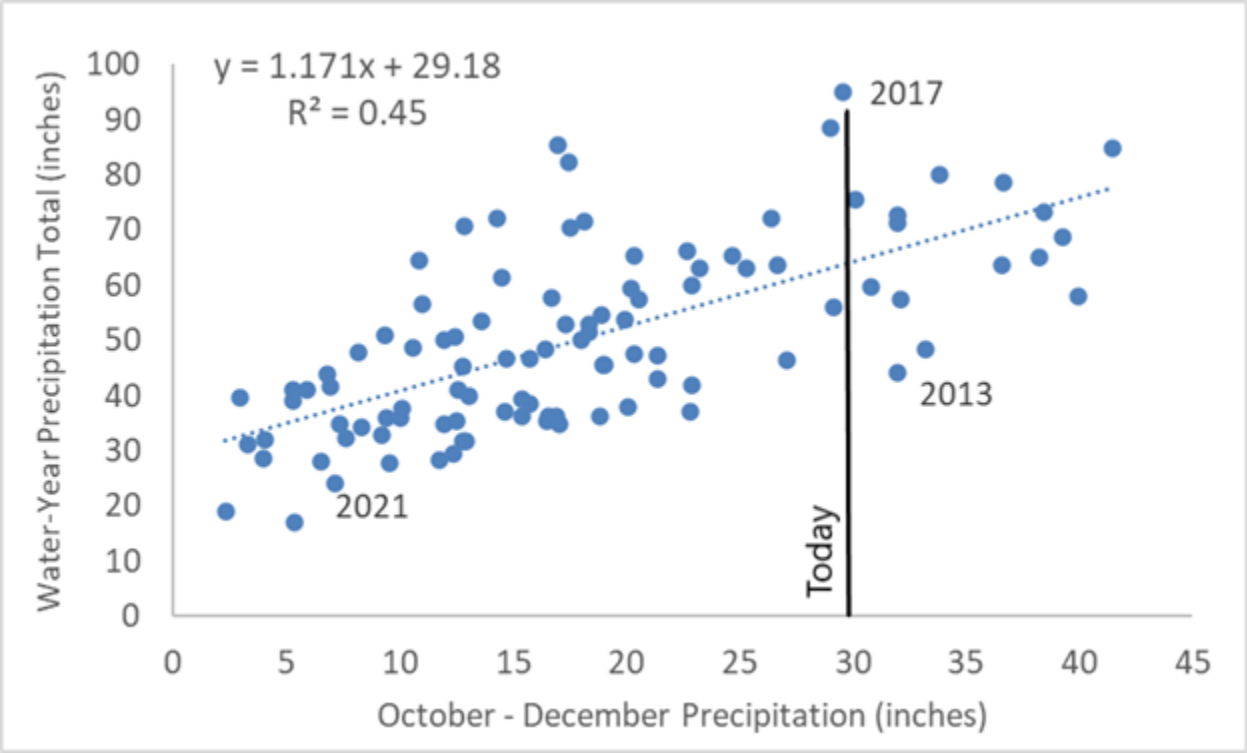


Figure 1. Historical Sacramento Valley 8-Station Index Water Year Precipitation vs. October-December Precipitation (inches) (Data from CDEC)

Snowpack is also doing well so far. Northern California's snowpack is at 145% of average for this date, so far. This is nice for skiers, and improves prospects for refilling reservoirs.

What about likely 2022 streamflows?

Prospects for water year precipitation seem good, and at the risk of counting atmospheric rivers before they hatch, what might this imply for 2022 water year streamflows?

Figure 2 shows the effectiveness of Sacramento Valley precipitation in producing runoff over 102 years of data. In wetter years, a higher proportion of precipitation becomes runoff, although there is scatter in this relationship.

Drier years can produce about half as much runoff per unit of precipitation as wet years, probably because more initial precipitation goes to replenishing soil moisture and evaporation before it can runoff to streamflow or recharge groundwater. It also seems that runoff efficiency has diminished in the last two decades, probably from the warming climate increasing evaporation and evapotranspiration rates. Alas, the plot does not include water year 2021, where runoff forecasts (and estimated runoff efficiencies) greatly over-estimated actual runoff.

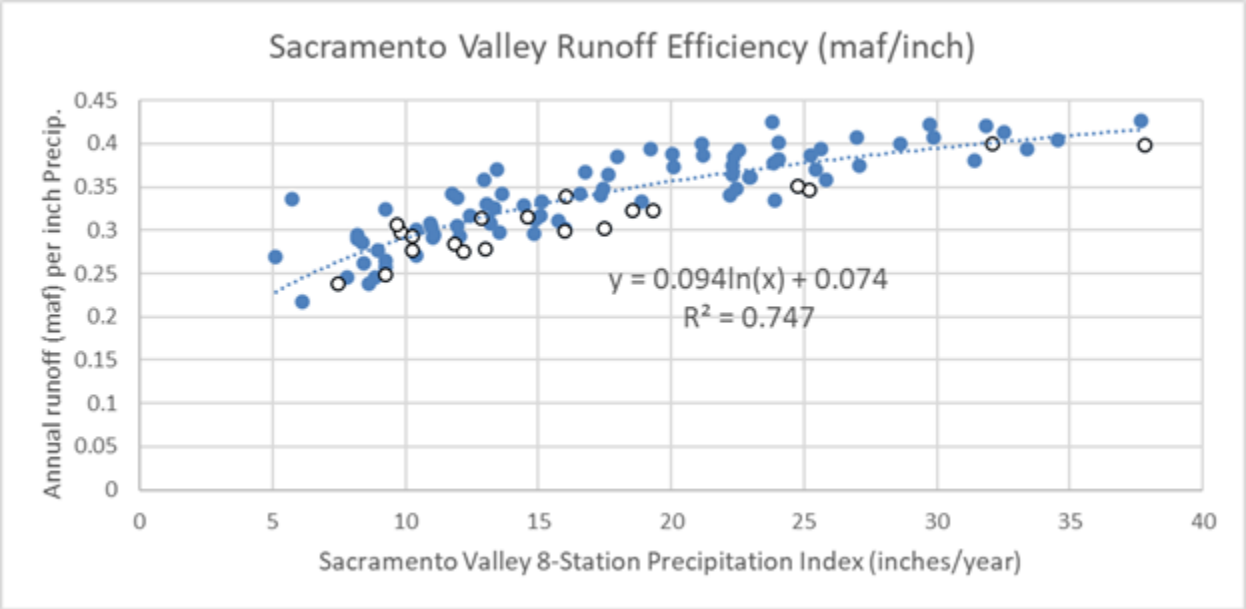


Figure 2. Sacramento Valley Runoff Efficiency from Precipitation, historical results, open circles are data since 2001 (CDEC data)

Wetter conditions help streamflows from both more precipitation and higher runoff efficiencies, but probably by less than we would have estimated in the past.

Climate change aspects

It seems likely that we are seeing two aspects of climate change in this and recent years.

- Warmer temperatures are a) increasing evaporation and evapotranspiration, depriving streams and groundwater from rain and snowmelt (a newer story, Pascolini-Campbell et al 2021) and b) making more precipitation fall as rain instead of snow, and shifting runoff

from spring snowmelt to winter rain runoff (by now, an old story, Lettenmaier and Sheer 1991).

- Variability in precipitation seems greater, with more large storms and more periods without storms (Swain et al. 2018). This increases extremes in California's already extreme-prone hydrology.

October's immense 2-day storm which largely refilled depleted soil moisture might be a consequence of both processes together. California's hydrology is becoming more variable both seasonally and between years, worsening conditions for drought, flood, and wildfire.

Water storage conditions

Reservoirs have begun to rebound, but most are not refilled. Shasta, Oroville, New Bullards Bar, San Luis, and most other large reservoirs are filling, but some still have a long way to go. Folsom reservoir is doing very well and has begun prudently releasing modest amounts of water to protect from possible floods – a normal and highly-precedented operation, even during drought.

You can see how reservoirs are progressing at this wonderful USACE website: https://www.spk-wc.usace.army.mil/plots/california_new.html

Groundwater lacks digested systematic monitoring regionally and statewide, so its changes are harder to assess. But, from past experience, Sacramento Valley groundwater seems likely to be refilling well so far. Refilling San Joaquin and Tulare basin groundwater is much more difficult, as these are much drier basins, with tremendously much more recent and historical overdraft and drought drawdown. Indeed, depleted groundwater conditions in much of the southern Central Valley will likely accelerate actions under SGMA to reduce groundwater pumping. Under SGMA, the additional pumping during the drought has increased the recent overdraft debt that must be repaid by 2040.

Floods coming?

Small amounts of local flooding are common in California in the winter (although flooding never seems small if it is happening to you). For several years, California has seen little flooding, but with wetter conditions so far this year, and the filling of Folsom reservoir and potential filling of more reservoirs, flood operations (and perhaps actual flooding) later this year is plausible. Still, even with the Oroville spillway failures in the wettest year on record in 2017, there was remarkably little actual flood damage (except the Oroville spillway) and almost no loss of life.

How this drought endures, even with a wet year

This drought, whether it ends this year or later, will have several enduring impacts:

- Extended agriculture groundwater scarcity. More reductions in groundwater pumping will be needed in wetter years to restore groundwater levels to 2015 levels to comply with SGMA requirements. Agricultural costs of this drought will therefore extend for years, and perhaps decades.

- Depletion of endangered and other native fish species. Salmon and smelt populations continue to decline and will be harder and longer to recover after this drought. For Delta Smelt, the time to recovery might be never. (Urban and agricultural drought impacts have long galvanized effective preparations for future droughts. Drought responses have been less effective for ecosystems.)
- Restored attention to rural drinking water systems. Hopefully the drought will accelerate addressing this problem, with faster connections and upgrades for more poorly performing systems to larger, better systems, improved support for counties for rural drinking water, and better stabilization and compensation for rural water problems through SGMA.
- New efforts to strengthen integrated water management portfolios. This drought has again proven the effectiveness of integrated portfolio approaches to water management for cities and agriculture, and their vulnerabilities when portfolios are limited in scope and integration. Portfolio solutions cannot solve all problems, but they can always make problems less problematic. Previous droughts greatly strengthened preparations for this and future droughts.

Jay Lund is a Professor of Civil and Environmental Engineering and a Co-Director of the Center for Watershed Sciences at the University of California – Davis.

# # #

State of the snowpack
Tahoe Daily Tribune | January 8, 2022 | Elizabeth White

Leaders at the Sierra Avalanche Center — Brandon Schwartz, James Brown, and Duncan Lee — sat down on Monday to discuss the state of the snowpack after an intense dry period was followed by record levels of snow in December.

“It amazes me how it just flipped a switch. It was like nothing to everything,” Brown said about the historic December snowstorm.

From Dec. 29 to Monday, Jan. 3, and also Wednesday, Jan. 5, the avalanche danger below the treeline has been low.

“It’s one of those wonderful times that low north aspects are just so good right now — still escaping the wind,” Schwartz said.

The first large storm toward the end of October created the first layer of snow for the season, which was followed by a long dry period.

This caused a small cycle of loose, wet avalanches on southern faces.

Despite another brief storm on Nov. 9, the following dry period caused the snow to either harden on upper northern aspects or completely melt away. Eventually, the leftover snow had begun to develop facets, which cause a weak layer in the snowpack, according to Schwartz.

“Shallow snowpack is a shallow snowpack anyplace you find it… Anytime you have that structure and the low sun angles, the nights are really long even though the days are warmer out here. Low sun angles, northern aspects sitting in the shade… there’s a lot of opportunity for those snow crystals on the ground to change crystal type and turn into faceted snow,” Schwartz said.

IN THE BACKCOUNTRY

Schwartz said that toward the end of December he knew avalanches were happening, but due to the weather conditions it was difficult to observe what was happening, as the snow was piling so quickly.

Schwartz does not believe that the facets developed earlier in the season will be a problem in terms of deep instability, but that backcountry users should be looking more toward surface instability.

“You bury it deep like we’ve got and it’s a big insulation – it really minimizes that gradient and it makes things go the other way,” Schwartz said. “It makes snow get stronger and stronger… and the crystals bond together instead of becoming more individual, like grains of sugar. We’re going to be able to be past that, which is a really nice thing from a recreation standpoint.”

Brown said wind slabs continue to be a problem – which as of Wednesday is everywhere, except for west and southwest aspects, as well as low angle terrain.

In order to avoid wind slabs, Schwartz said to look out for blowing snow and trigger points where snow is drifting.

The general size of avalanche problems happening currently are up to D2, or a large avalanche, according to Schwartz and recent forecasts.

Despite the often moderate to low danger experienced in the past week, Brown warned that it is still important to be on the lookout for potential avalanches, as there is still a possibility of danger.

“I heard somebody mention the other day, ‘it’s perfect full-send conditions right now,’ and we do have these smaller avalanche problems but they can… get really real very quick with your terrain choices. So it’s generally not ‘full send’ when we still have avalanche problems.” Brown said.

# # #

To view the latest avalanche forecast or find out more information about the latest snowpack conditions, visit the Sierra Avalanche Center’s website at http://www.sierraavalanchecenter.org/forecasts/#/central-sierra-nevada.

Elizabeth White is a staff writer with the Sierra Sun. She can be reached at ewhite@sierrasun.com

No, California's drought isn't over. Here's why.
CalMatters | January 5, 2022 | Rachel Becker

IN SUMMARY
California today issued emergency drought rules aimed at wasteful water use. Although snowpack is 150% of average today, climatologists predict dry conditions for the rest of the season. And conservation still lags.

In a clear sign that the drought persists, California today adopted new emergency regulations aimed at stopping residents from wasting the state's precious water.

The rules ban practices such as hosing down sidewalks and driveways with drinking water, washing cars without a shutoff nozzle on the hose and irrigating lawns and gardens too soon after rain.

Approved unanimously by the State Water Resources Control Board, the mandates could take effect as soon as Jan. 15 and have a one-year expiration date unless extended. Fines can reach as high as $500, but enforcement will be spotty: Local governments and water agencies are allowed to enforce them at their discretion, and they will largely be complaint-based.

"There's not going to be like a statewide force of water cops or anything like that," said Eric Oppenheimer, the water board's chief deputy director.

California's drought is not over despite a bounty of snowfall and rain over the past month: California's snowpack — a critical source of water — is 150% of average for Jan. 4. But with three months left of the wet season, it's not enough to bring an end to the severe drought and water shortages.

California still needs about another foot of snow water content — the amount of water contained in the snowpack — by the end of March to reach its historic seasonal average, according to the state data. Almost 16 inches of snow water content have accumulated by today.

"December alone will not end the drought, clearly," said Jeanine Jones, interstate resources manager for the Department of Water Resources. "December was wonderful, but now we just hope it keeps on going."

The amount of water now stored is actually worse than last year at this time: The state's reservoirs in December were projected to contain about 78% of average — compared to about 82% in 2020.

Moderate to exceptional drought still grips the entire state, and a soggy start to the rainy season does not guarantee even an average water year. California has felt that false hope before: In 2013, during the last record-breaking drought, a wet December turned into a dry January and February.

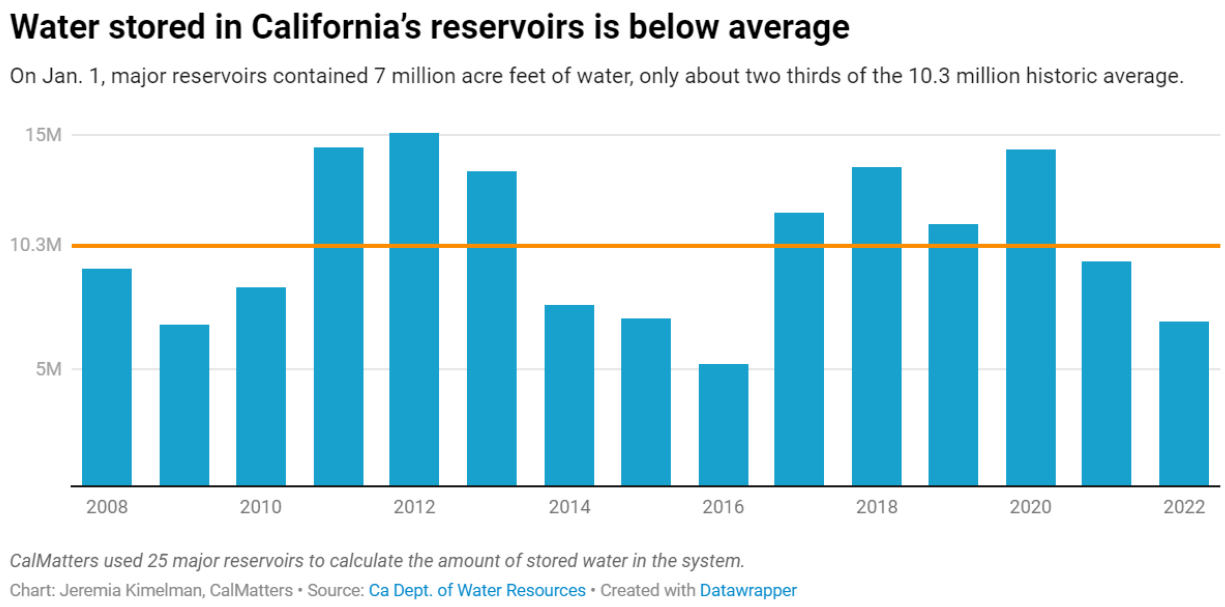
Climatologists predict that the state will dry out during the rest of the winter and spring.

“After we get through this weather system this week, things go dry. And the expectations are a drier than average January, February and March,” said California’s state climatologist Michael Anderson.

And conservation still lags. California Gov. Gavin Newsom in July called for Californians to voluntarily cut water use by 15% in the face of the ongoing drought. But state officials today announced statewide savings of only 6% from July to November compared to last year.

November, a dry month, saw only a 6.8% reduction in water use — down from 13.3% in October, which saw torrential rains. The greatest savings came from the northern half of the state; water use increased slightly by 0.8% in Southern California.

“You want to kiss every snowflake and every raindrop that comes down, because it was just so bad,” said Felicia Marcus, who chaired the State Water Resources Control Board under Gov. Jerry Brown during the last drought. “At the same time, we've got to exercise our efficiency muscles every way we can, all the time.”



Similar restrictions on wasteful water use were temporarily enacted during the last drought under former Governor Jerry Brown, who also issued a statewide water conservation mandate.

In October, Newsom instructed regulators at the State Water Resources Control Board to consider once again barring wasteful water uses when he extended the drought emergency statewide.

The emergency rules adopted today take aim at residents as well as homeowners associations, which can no longer penalize residents for brown lawns and drought-tolerant landscaping plants. Local governments may no longer use drinking water to irrigate ornamental turf on street medians.

The new rules do not affect agriculture, the leading user of water in California. And both public commenters and board member Laurel Firestone raised concerns about how penalties could affect low-income Californians — spurring the board to add new language requiring warnings and fees based on the recipient's ability to pay.

"This is not the most effective, or even in my mind appropriate policy approach to save water when we're in a drought emergency," said board member Laurel Firestone, who called for a more systemic approach rather than individual penalties. "Unfortunately, like in the last drought, we don't have a more appropriate and effective policy developed that we go to in drought emergencies."

The state's efforts to make permanent the emergency water waste rules enacted during the last drought faced opposition from powerful urban and agricultural water interests, and ultimately fizzled.

But many local water agencies have already adopted their own rules.

Sacramento, for instance, has prohibited a number of wasteful water uses since 2017, including washing down sidewalks and irrigating so much that it overflows onto sidewalks or streets.

The utilities department "takes an education-first approach to solving water waste by providing notices to residents before issuing any fines," Carlos Eliason, a spokesperson for the department, said in an email. Fines, however, can be issued to repeat offenders, and the allowable amount has doubled due to the city's "Water Alert," currently ranging from $50 to $1,000.

The East Bay Municipal Utility District also restricts certain wasteful water uses but hasn't issued any fines over the past year, said spokesperson Tracie Morales.

"Most of our water waste investigations are resolved by reaching out to our customers and providing education and resources, without having to resort to enforcement," Morales said. However, she said the district can "escalate to a formal warning letter letting them know that we may charge them for additional monitoring, and that we have the right to install a flow restrictor or even shut off their water."

"There is nothing that obligates us to take specific action and enforce" the state's new regulations, Morales said. She added, however, that the district might consider updating its rules to more closely match the state's wording.

Officials couldn’t say how much water the regulations adopted today are expected to save. Instead, they said, the focus is largely on educating consumers, rather than collecting fines.

“I don't believe that there were any fines of up to $500. There were, I believe, a small handful throughout the state of smaller fines after multiple levels of warnings and outreach,” said David Rose, senior staff counsel with the water board. “Mostly what the suppliers chose to do was to implement their own existing water waste or water use restrictions as opposed to the board's regulation.”

The timing of the decision after such a soggy start to the water year “wreaks havoc with messaging,” Marcus said.

But it’s a change that she said she hopes will persist longer term — which would require a different regulatory process.

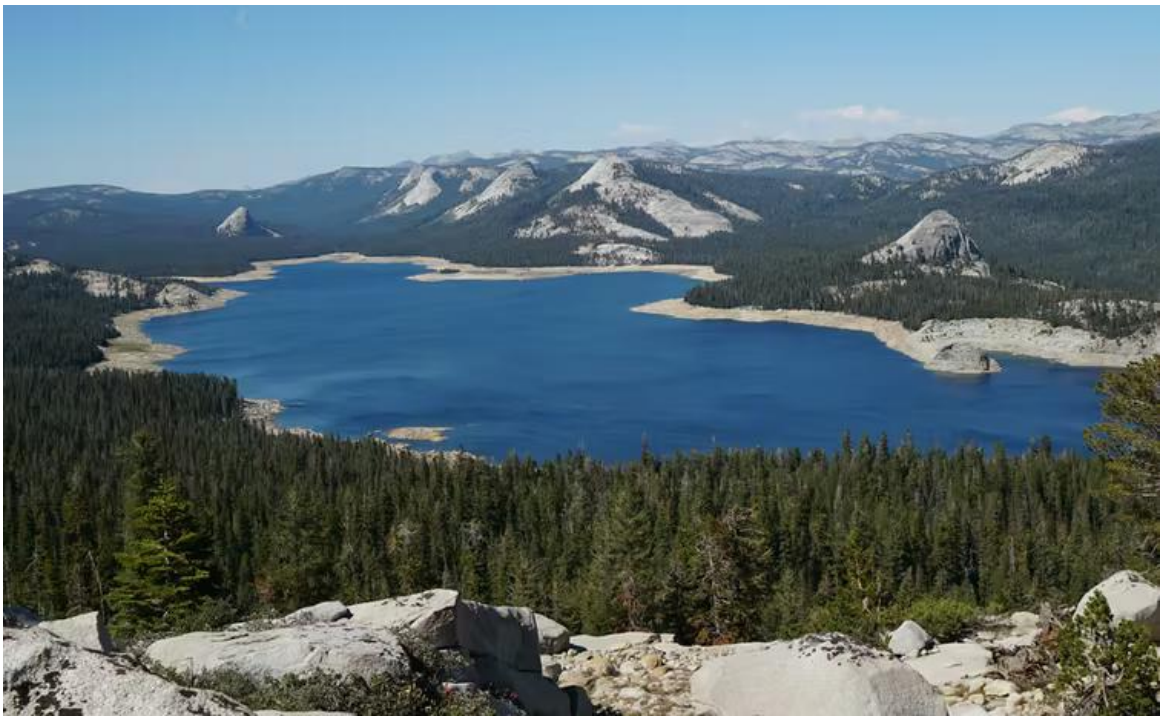
“To me, these rules are sort of the least we can do. They're primarily common sense.”

# # #

Julie Cart contributed to this story.

California's water supplies are in trouble as climate change worsens natural dry spells, especially in the Sierra Nevada

Environmental News Bits | January 4, 2022 | Roger Bales



Several of California's reservoirs were at less than one-third of their capacity in early December 2021. Martha Conklin, CC BY-ND.

California is preparing for a third straight year of drought, and officials are tightening limits on water use to levels never seen so early in the water year. Most of the state's water reservoirs are well below average, with several at less than a third of their capacity. The outlook for rain and snow this winter, when most of the state's yearly precipitation arrives, isn't promising.

Especially worrying is the outlook for the Sierra Nevada, the long mountain chain that runs through the eastern part of the state. California's cities and its farms – which grow over a third of the nation's vegetables and two-thirds of its fruit and nuts – rely on runoff from the mountains' snowpack for water.

As an engineer, I have studied California's water and climate for over 30 years. A closer look at California's water resources shows the challenge ahead and how climate change is putting the state's water supply and agriculture at greater risk.

Where California gets its water

Statewide, California averages about 2 feet of precipitation per year, about two-thirds of the global average, giving the state as a whole a semi-arid climate.

The majority of California's rain and snow falls in the mountains, primarily in winter and spring. But agriculture and coastal cities need that water to get through the dry summers. To get water to dry Southern California and help with flood control in the north, California over the past century developed a statewide system of reservoirs, tunnels and canals that brings water from the mountains. The largest of those projects, the State Water Project, delivers water from the higher-precipitation northern Sierra to the southern half of the state.

To track where the water goes, it's useful to look at the volume in acre-feet. California is about 100 million acres in area, so at 2 feet per year, its annual precipitation averages about 200 million acre-feet.

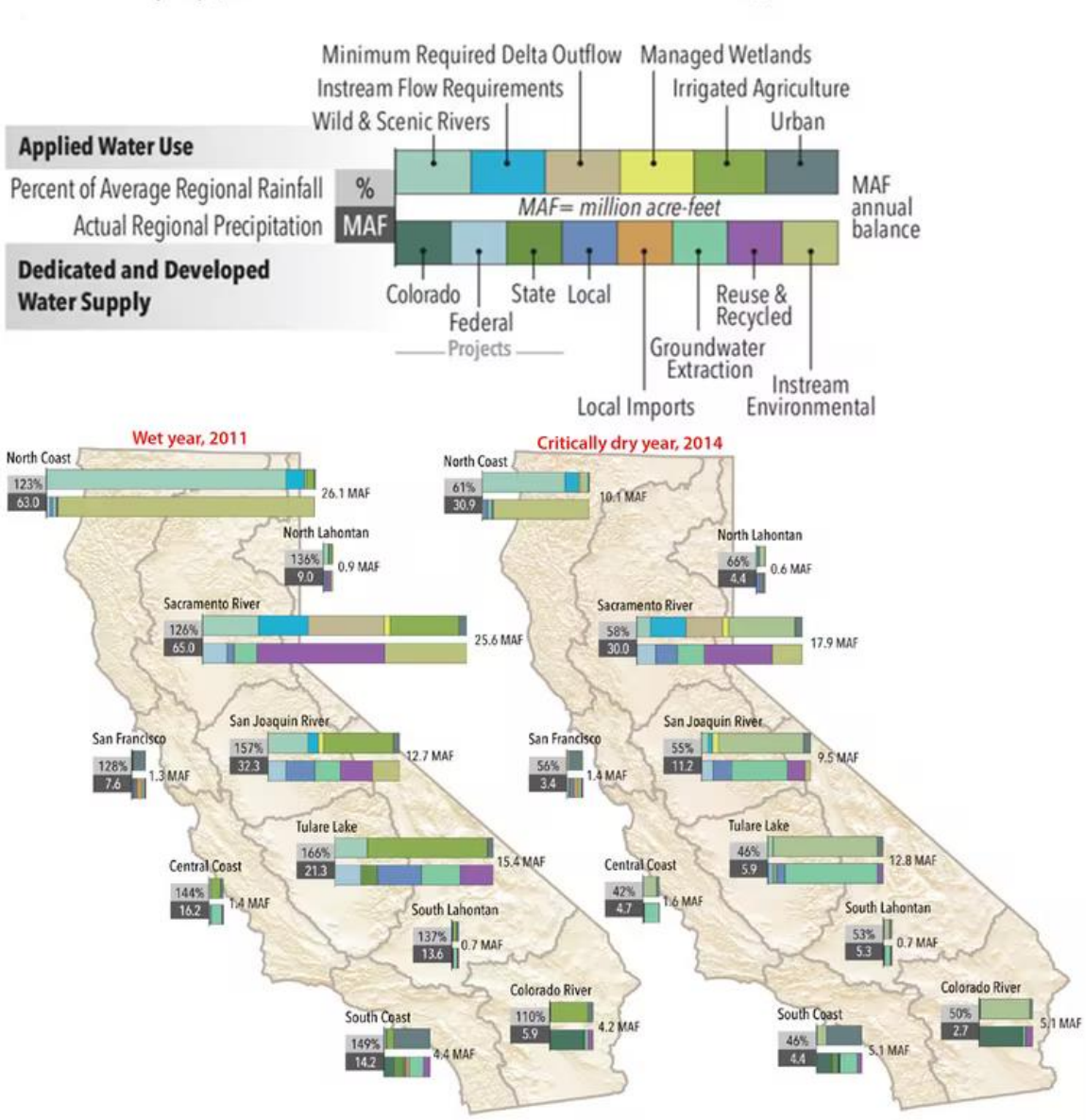
Of that 200, an average of only about 80 million acre-feet heads downstream. Much of the water returns to the atmosphere through evapotranspiration by plants and trees in the Sierra Nevada or North Coast forests. Of the 80 million acre-feet that does run off, about half remains in the aquatic environment, such as rivers flowing to the ocean. That leaves about 41 million acre-feet for downstream use. About 80% of that goes for agriculture and 20% for urban uses.

In wet years, there may be much more than 80 million acre-feet of water available, but in dry years, it can be much less.

In 2020, for example, California's precipitation was less than two-thirds of average, and the State Water Project delivered only 5% of the contracted amounts. The state's other main aqueduct systems that move water around the state also severely reduced their supplies.

The 2021 water year, which ended Sept. 30, was one of the three driest on record for the Sierra Nevada. Precipitation was about 44% of average. With limited precipitation as of December 2021 and the state in extreme drought, the State Water Project cut its preliminary allocations for water agencies to 0% for 2022, with small amounts still flowing for health and safety needs.

While conditions could improve if more storms come in the next three months, the official National Oceanic and Atmospheric Administration outlook points to below-normal precipitation being more likely than above normal.



Comparison of state maps with water uses in wet and dry years
California State Water Plan 2018

Drought and a warming climate

Multiyear dry periods, when annual precipitation is below average, are a feature of California's climate, but rising global temperatures are also having an impact.

Over the past 1,100 years, there has been at least one dry period lasting four years or longer each century. There have been two in the past 35 years – 1987-92 and 2012-15. A warmer

climate intensifies the effect of these dry periods, as drier soil and drier air stress both natural vegetation and crops.

Rising global temperatures affect runoff from the Sierra Nevada, which provides over 60% of California's developed water supply.

Over 80% of the runoff in the central and southern Sierra Nevada comes from the snow zone. In the wetter but lower-elevation northern Sierra, rainfall contributes over one-third of the annual runoff.

The average snowline, the elevation above which most precipitation is snow, goes from about 5,000 feet elevation in the north to 7,000 feet in the south. On average, each 1.8 degrees Fahrenheit (1 Celsius) of warming could push the snowline another 500 feet higher, reducing the snow total.

Shifts from snow to rain and earlier runoff also mean that more of the capacity behind existing dams will be allocated to flood control, further reducing their capacity for seasonal water-supply storage.

A wealth of research has established that the Sierra Nevada could see low- to no-snow winters for years at a time by the late 2040s if greenhouse gases emissions don't decline, with conditions worsening beyond that possible.

Warming will also increase water demand from forests as growing seasons lengthen and drive both drought stress leading to tree mortality and increased risk of high-severity wildfires.

Sustainability in a warming climate

Water storage is central to California's water security.

Communities and farms can pump more groundwater when supplies are low, but the state has been pumping out more water than it replenished in wet years. Parts of the state rely on water from the Colorado River, whose dams provide for several years of water storage, but the basin lacks the runoff to fill the dams.

Public opposition has made it difficult to build new dams, so better use of groundwater for both seasonal and multiyear storage is crucial.

The state's Sustainable Groundwater Management Act requires local agencies to develop sustainability plans. That provides some hope that groundwater pumping and replenishment can be brought into balance, most likely by leaving some cropland unplanted. Managed aquifer recharge south of the Sacramento-San Joaquin Delta is gradually expanding, and much more can be done.

If the state doesn't do more, including tactics such as applying desalination technology to make saltwater usable, urban areas can expect the 25% cuts in water use put in place during the 2012-15 drought to be more common and potentially even deeper.

California's water resources can provide for a healthy environment, robust economy and sustainable agricultural use. Achieving this will require upgrading both natural infrastructure – headwaters forests, floodplains and groundwater recharge in agricultural areas – and built infrastructure, such as canals, spillways and levees. The information is available; officials now have to follow through.

# # #

Roger Bales, Distinguished Professor of Engineering, University of California, Merced

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Precipitation since Oct. 1 tops previous full 'water year' in California
San Francisco Chronicle | January 2, 2022 | Jessica Flores

Andi Archer and John Norton of San Anselmo check out the Golden Gate Bridge on a rainy morning bike ride near Sausalito. Thanks to fierce rain and snowstorms in recent months, the National Weather Service said the state was off to a decent start for its water year. Nina Riggio/The Chronicle

More precipitation has fallen on California during its current "water year" than in the full prior 12-month span, the National Weather Service says.

The downpours and mountain storms of recent weeks have helped boost the state's precipitation volume to 33.9 trillion gallons thus far for the water year that began Oct. 1, compared to the previous water year's 33.6 trillion gallons, the service said Sunday. Lake Tahoe by comparison contains roughly 40 trillion gallons. The water year refers to 12 months of precipitation that falls starting Oct. 1, through Sept. 30.

That means California's water year is off to a decent start, meteorologists say, thanks to the atmospheric river that battered the northern part of the state in October and the relatively wet December.

Yet while much of the state and Bay Area have now emerged from the most severe drought conditions, the state's rain and record snowfall in the last two months was not enough to see full drought relief, according to the U.S. Drought Monitor.

State water officials said the 2020-2021 water years were two of the driest years in California. They noted last week that a wet start does not seal the deal for the year to conclude with above-average wetness.

“A good portion of the state has already exceeded the amount of precipitation, generally speaking, compared to the previous 12 months as a whole,” weather service meteorologist Scott Rowe in Sacramento said Sunday. But, “if we were to suddenly go dry right now, we still would not be where we should be for any given water year,” he added.

California’s average would be about 70 trillion gallons of precipitation per water year, said Rowe.

In the Sierra, state water officials conducted the first snow survey of the winter last week and found that the snowpack across California’s mountains was measuring 160% of average for the date.

While the start to the water year looks promising, meteorologists can’t know whether more rain and snow will douse the state. Long-term forecast models still suggest that the season could deliver less than normal.

“It is crucial that we get rain and snow during those months to truly ease drought impacts,” the state Department of Water Resources said in a statement last week. “The winter storms are providing our drought-stricken state with a glimmer of hope, but more storms packing a similar one-two punch of rain and snow will be needed through the winter season before we can be in a place where drought conditions are no longer of concern.”

The state officials noted that “California has the most variable weather conditions in the nation, and in the 21st Century we have seen climate change make our state’s extremes even more extreme,” with “bigger swings between wet and dry years.”

# # #

Water content of California snowpack far above normal levels, but drought not over
Associated Press | January 1, 2022

Anthony Burdock, left, and Sean de Guzman, chief of snow surveys for the California Department of Water Resources, check the depth of the snow pack during the first snow survey of the season at Phillips Station near Echo Summit, Calif., Thursday, Dec. 30, 2021. The survey found the snowpack at 78.5 inches deep with a water content of 20 inches. Statewide, the snow holds 160% of the water it normally does this time of year. (AP Photo/Randall Benton)

SACRAMENTO, Calif. — California's mountain snow holds 160% of the water it normally does this time of year, state water officials announced Thursday, marking a strong start to the drought-stricken state's traditionally wet winter season.

Still, it's too early to determine whether California will see enough rain and snow in the months to come to put a dent in the drought.

The state is “definitely not out of the woods quite yet," said Sean de Guzman, manager of the snow surveys and water supply forecasting for the California Department of Water Resources.

De Guzman spoke at Phillips Station, one of hundreds of locations where state officials make manual or electronic snowpack measurements multiple times per year.

About a third of California's water supply comes from snow as it melts and flows down from the Sierra Nevada and the Shasta-Trinity mountain range in northern California.

California just finished its second-driest year on record and many of the state's reservoirs that supply water for tens of millions of people are at historic lows. But several powerful storms swept through the state this month, dumping snow and causing some road closures and major disruptions.

The storms made for a far more positive snow reading than last December, when water levels in the snowpack were at just 52% of the historical average.

Feet of snow don't translate directly into feet of water, so state officials report both the height of the snow and the amount of water runoff it would generate. At Phillips Station, where the Thursday measurement was taken, de Guzman reported 78.5 inches (199.4 centimeters) of snow. That contains 20 inches (50.8 centimeters) of water, he said.

That's 202% of the historical average for that location and 82% of what's typically there on April 1, when the snowpack hits its peak. De Guzman said the state needs strong precipitation in the next three months to get to or above the typical April average, leaving plenty of water to run down the mountains and into California's streams and reservoirs.

Meanwhile, state Department of Water Resources Director Karla Nemeth said the strong December numbers don't change the state's plea for Californians to conserve water. Democratic Gov. Gavin Newsom called for a voluntarily 15% reduction in water use back in July, but the state is far from meeting that goal. State officials have warned mandatory water restrictions could be coming if conditions don't improve.

“We need more storms and average temperatures this winter and spring, and we can’t be sure it’s coming," Nemeth said in a statement. “So, it’s important that we continue to do our part to keep conserving — we will need that water this summer.”

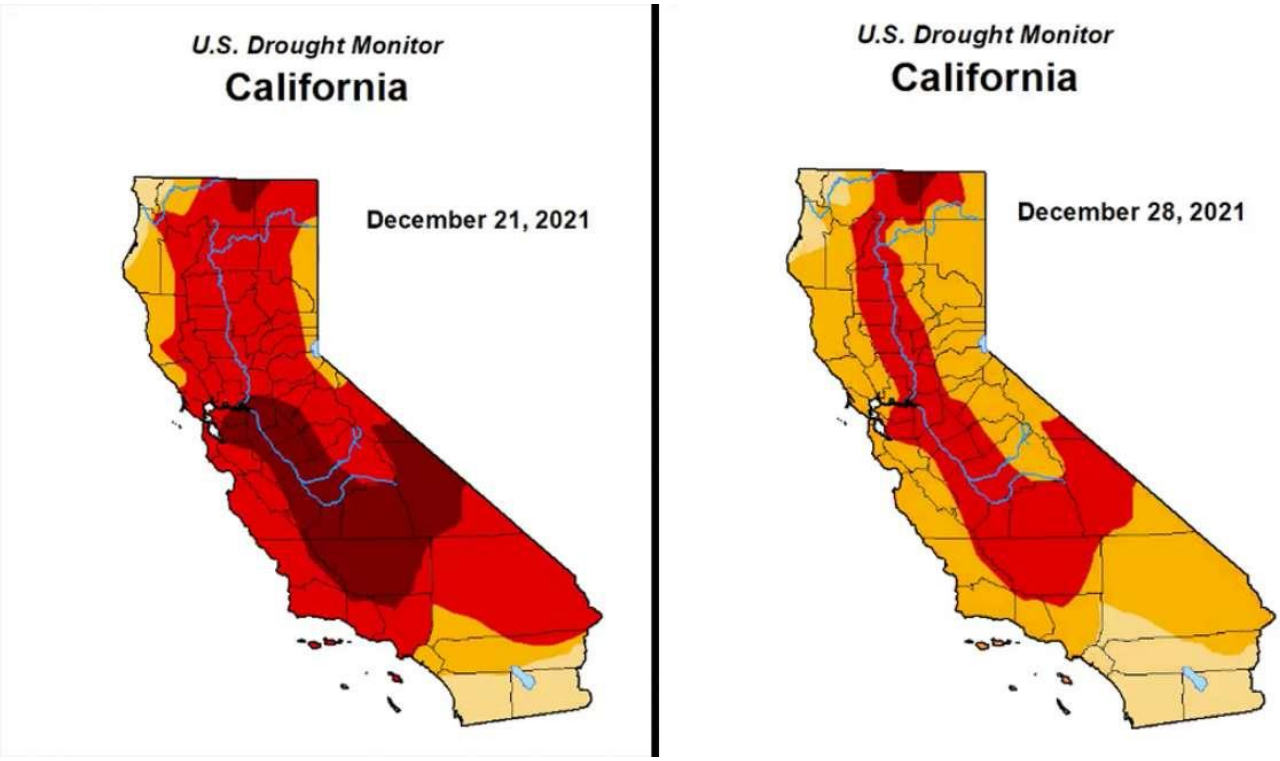
In 2013, California saw a wet December followed by an extremely dry January and February during the last drought, state officials noted in a news release.

California is in its second acute drought in the last decade. Scientists say much of the U.S. West is enveloped in a megadrought made worse by climate change.

Most of California is in a severe to extreme drought, according to the U.S. Drought Monitor. Only a small part of northern California along the Oregon border is in what's considered an “exceptional drought," the worst condition. That's down significantly from September, when 45% of the state was gripped by exceptional drought.

# # #

Map shows almost all of California out of 'exceptional drought' after week's storms
SF Gate | December 31, 2021 | Tessa McLean



A two-week comparison of the California Drought Map, from Dec. 21 (left) to Dec. 28.

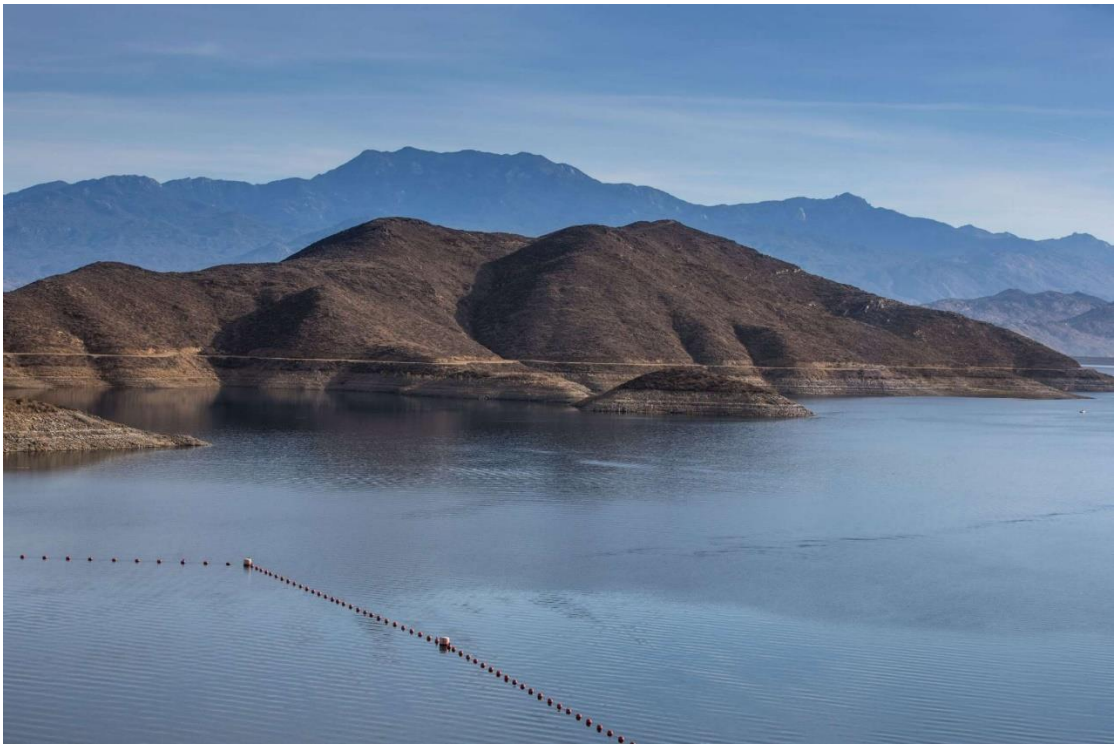
A new map from the federal U.S. Drought Monitor released Thursday shows the drastic effects of the past week's storms on the severity of drought across California.

Almost the entire state is out of "exceptional drought" levels, though much of the central part of the state remains in "extreme drought." The heavy storms during the past week contributed to a record snowfall for December, with the Central Sierra snow lab observing 193.7 inches of snow. The previous record was set in 1970 with 179 inches of snow during the month.

Conditions throughout the state could continue to improve in the following weeks, especially with above-normal precipitation predicted for Northern California next week, according to the U.S. Drought Monitor.

"Prior to the recent heavy precipitation this month, much of California was designated with extreme (D3) to exceptional (D4) drought," Brad Pugh, a meteorologist for the National Oceanic and Atmospheric Administration that assists with the map, wrote in an email. "The recent heavy precipitation and favorable snowpack resulted in 1 to 2-class improvements in the drought intensity level, but 12 to 24-month precipitation deficits continue. Additional improvements may be warranted during the next couple of weeks."

Even with these improvements, there is still no part of the state that isn’t in some level of drought.



FILE: Diamond Valley Lake, one of Southern California's largest reservoirs (800,000 acre-feet) used primarily for drinking water and agriculture, is filled with water from the Colorado River and viewed at 75% capacity on the morning of November 18, 2021, near Hemet, California. George Rose/Getty Images

The color-coded map shows the level of dry conditions from "abnormally dry" (yellow) to "exceptional drought" (maroon). Most of California remains in the “moderate drought” classification, at 53.35% of the state. That's an improvement from the map released on Dec. 21, when most of the state (56%) was in the “extreme drought” category. Less than one percent of the state is still in the “exceptional drought” category.

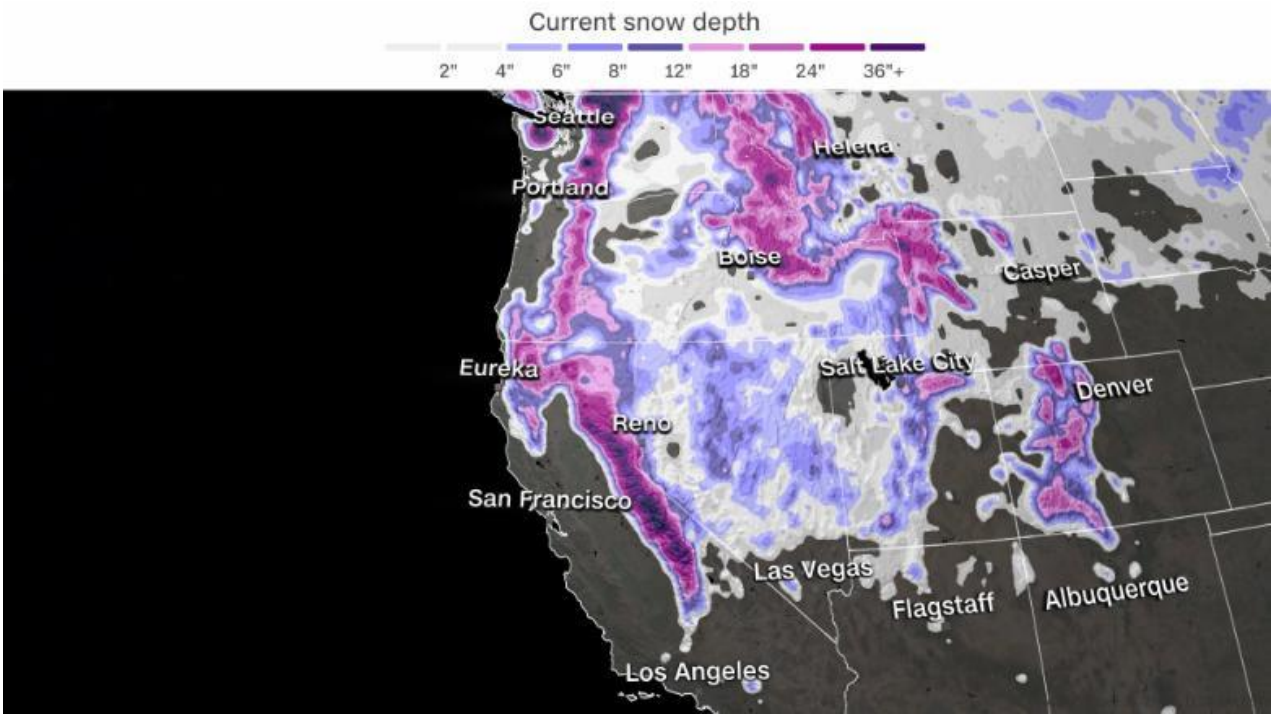
The Drought Monitor, a joint effort of the NOAA, the U.S. Department of Agriculture and the National Drought Mitigation Center at the University of Nebraska-Lincoln, takes into account precipitation totals and also indexes a wide array of indicators, including groundwater storage, river levels, soil moisture, satellite-based assessments of vegetation health and more.

"It’s the tool to serve all purposes until you look at the nuances of where your water supply comes from and it becomes more complex," Jeanine Jones, California's drought manager with the state's Department of Water Resources, told SFGATE in a previous interview. "While the map is probably most representative of conditions when it’s very wet or very dry, it’s everything in between that’s more difficult to depict."

# # #

California snow drought ends in dramatic fashion, while other states still deal with shortage

CNN Weather | December 19, 2021 | Allison Chinchar



(CNN)Thanks to multiple atmospheric river events, average snowpack in California has gone from 18% to 98% in just two weeks.

"Increases in snowpack of this size are not common, but also not unprecedented," Julie Kalansky, deputy director of operations for the Center for Western Weather and Water Extremes (CW3E), explained.

Kalansky pointed out previous studies have shown a jump on this scale can happen about twice every three years, but usually over the course of an entire winter, not just the month of December.

While they don't have the exact rankings for each month of the year, "most of the storm events in the study we referenced for the above calculation were in the second half of December and later into the season," Kalansky added.

The sudden change gives California its wettest start to the Water Year in more than 40 years, thanks to several drought-denting rain and snow systems pushing through the area in recent weeks. The Water Year runs from October 1 through September 30 of the following year.

Parts of California are known for whiplash weather, but the rapid changes are quite remarkable given the snowpack was off to such a rough start, after a very warm and dry November for much of the state.

Northern California is doing a little better in terms of its water year, compared to where it was last year. While not at record levels, the National Weather Service (NWS) office in Sacramento tweeted the Northern Sierra precipitation is above average for this time of year, and exceptionally better than the same time last year.

However, Southern California was only able to take advantage of one of the larger atmospheric river systems recently.

"The Tuesday storm that brought 1 to 2 inches of rain to the coastal and valley areas put a dent in our rainfall deficit," the NWS office in San Diego said last week.

The area was so far behind prior to last week's storm, the recent rainfall only brought the region back to where it normally should be at this time of year, rather than ahead.

California is just one state in the West, and not all states are equal in terms of moisture received by recent storms.

"While stormy weather in December increased snowpack in California, snow water equivalent is at record lows in some stations in NM, CO, UT, MT, WY, NV," the National Integrated Drought Information System (NIDIS) said in a tweet.

The Sierras can collect a lot of the moisture from big storms, but block it from entering neighboring states.

A US Department of Agriculture snow mapping tool showed while some areas of California, Oregon, Washington, Nevada, and Arizona have relatively high snow water equivalent percentages, other states such as Colorado, New Mexico, and Wyoming are struggling, compared to average totals.

Snow deficits in Colorado affect millions more people beyond the state's borders. When the snowpack melts in the spring it supplies the Colorado River Basin's water supply.

Chelsea Peters, a meteorologist with the NWS office in Las Vegas explained Intermountain West snowpack, or lack thereof, can have cascading impacts on southwestern states, especially if snowpack levels are below average for several years in a row.

"Several years of below-normal snowpack across the Intermountain West mountains that supply the Colorado River Basin will continue to increase the water supply stress, which was already in jeopardy due to population increase," Peters said. "We recently saw this impact reservoir

storage and lake levels in Lake Mead and Lake Powell. Within the last year, both Lake Powell and Lake Mead have observed their lowest reservoir storage levels in 30 years."

More storms on the way

More rain and snow is entering the West Coast thanks to three separate waves of moisture.

The first arrived Saturday in the Pacific Northwest, bringing heavy coastal rain and mountain snow, creating dangerous travel conditions along the Cascades.

Sunday, the low pressure system will shift south into Oregon and northern California.

Snowfall totals will range from 3-6 inches for interior northwestern states, with as much as 2-3 feet for the highest elevations of the Cascade, Sierra, and northern Rocky Mountains.

The CW3E is forecasting a Level 3 atmospheric river event for the western states.

An atmospheric river pumps incredible amounts of moisture off the Pacific Ocean into Western states, resulting in very heavy rain and snow.

By Monday and Tuesday, heavy precipitation will spread from Washington to central California. "Rain and snow chances return by early next week, becoming widespread by late Monday," the NWS office in Sacramento said Saturday. "A series of storms will continue this threat through the week into next weekend. Mountain travel will likely be significantly impacted at times."

Over the next five days, widespread rainfall totals of 2-4 inches are expected along the coastlines and lowlands.

# # #

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The importance of California's agricultural water supplies
CalMatters | January 3, 2022 | Guest Commentary: Chris Scheuring

IN SUMMARY
We cannot accommodate serious discussion on the demand side of water questions without working on the supply side.

Wendell Berry famously said that eating is an agricultural act. That makes all of us into farmers, and nowhere is that more true than in water terms.

For farming is irreducibly the process of mixing dirt, water and sunshine to bring forth from the ground what we need to eat. And no matter who you are, it's true: somebody, somewhere, must devote a lot of water to the process of feeding you.

Some have been sidestepping this fact in the ongoing policy evolutions over the way we must capture, store and move water in California. Yet even the most ardent urban environmentalist finds herself at the local grocery store or the farmers' market – filling her basket with California-grown nuts, fruits and vegetables.

Some of these crops can only be grown here, or in one of the few similar agricultural climates around the world, in an irrigation-based agricultural economy.

Take almonds, now and then the whipping-post of California water use: They cannot be grown in a place where it rains in the summer. Iowa, for example, is awfully cold in February – which is precisely when almonds need mild Mediterranean winter weather for their blossoms to be pollinated. Mediterranean crops need a Mediterranean climate, which usually means mild winters and hot, dry summers.

Beyond that, the case for California agriculture is made by our farming practices and their regulatory backdrop, whatever natural reticence California farmers may have about being regulated. We do it more efficiently here, and with more oversight, than in most alternative agricultural venues around the world. I would compare a California avocado favorably to an avocado anywhere else in the world, on those terms.

That's why I have always thought that a subtle strain of NIMBYism runs through the retrograde ideas that some have about "reforming" agricultural water rights here and constraining the water projects that ultimately deliver food to the world. With nearly 8 billion people on the planet, pinching off California's agricultural water supplies is a game of whack-a-mole which will cause the same water issues to arise elsewhere.

Without question, we must continue on our trajectory of making California farming more water-efficient. If you have been watching California agriculture for a generation, you already know that much of the landscape has transitioned from old-fashioned flood and sprinkler irrigation to more efficient drip and micro-sprinkler techniques – even in the case of row crops. We must

continue this path; new technologies related to irrigation continue to be developed, including better monitoring of applied water and crop water use.

We must also recognize inherent conflicts between agricultural water use and the flora and fauna that are dependent upon our rivers and streams.

Gone are the days in California when a grizzly bear might paw a salmon out of the Suisun Marsh, but we can work together to find non-zero-sum water and habitat solutions that would take advantage of opportunities to protect and rehabilitate species of concern, where it can be done without disproportionate human impact. Again and again through public enactment, California has demonstrated its will to keep the environment in mind as we move forward.

Further, we must also carry forward processes to develop new water supplies for California's farms and growing cities, whether those are storage facilities above ground or below ground, or stormwater capture and aquifer recharge, or desalination or recycling. In the face of a changing hydrology and the expected loss of snowpack, we simply cannot accommodate serious discussion on the demand side of water questions without working on the supply side. Otherwise, we are chasing a receding goalpost – and we will not get there.

Finally, remember that farming is not a question of "if," but "where." We're going to eat – all of us around the world – and we're going to farm in order to do so. So we should protect California's agricultural water supplies, because the case for California water being used on California's farms is strong.

# # #

By Chris Scheuring, Special to CalMatters
Chris Scheuring is senior counsel for water policy at the California Farm Bureau. He is also a family farmer in Yolo County, growing walnuts, almonds and pistachios.

Critics say valley groundwater managers put too much emphasis on recharge, not enough on pumping cuts

San Joaquin Valley | December 27, 2021 | Jesse Vad,

Groundwater recharge seems to be priority No. 1 in the San Joaquin Valley's scramble toward sustainability. With water restrictions on the horizon, groundwater managers can't build recharge sites fast enough. But will it be enough?

"That's something that's always on the forefront of my mind, is this going to be enough?" said Kassy Chaughan, executive officer of the North Kings groundwater sustainability agency. "The answer really is, we don't know."

Farmers have always relied on pumping groundwater in the valley for their crops, especially in drought years when surface water is in short supply. But overpumping is causing groundwater levels to plummet, land subsidence and water quality problems.

In 2014, the Sustainable Groundwater Management Act passed and created local groundwater agencies responsible for bringing groundwater back into balance, meaning more isn't pumped out than goes back in. The agencies will have until 2040 to reach that goal.

Recharge is the practice of putting excess water in wet years into ponding basins where it can percolate down and replenish the aquifer. It's a method that is being leaned on heavily by local agencies as a solution to the groundwater crisis.

Race to capture "excess" water

"Everybody is looking at recharge," said Chaughan. "We don't want to let another year pass where we can't capture every single drop of that water."

Chaughan's North Kings agency is part of the Kings Subbasin, a collection of seven groundwater agencies that cover a chunk of the valley stretching from north of Fresno down to Kingsburg. The agencies' plans vary but they all prioritize building more recharge facilities.

Over the past two years, the Kings Subbasin has invested in 600 acres of recharge land. Not all of it has been fully constructed yet, but there is much more to come, according to local managers.

The North Kings agency has built 150 acres of that new acreage and is currently constructing a 30 acre basin.

"This is just a drop in the bucket," said Chaughan. The agencies are planning for thousands more acres of recharge basins looking forward, she said.

But recharge only works in wet years. And some experts don't see recharge as a silver bullet.

No way around pumping limits

“We’re never going to capture all the water from a really wet year,” said Ellen Hanak, director of the water policy center at the Public Policy Institute of California (PPIC.)

Recharge is a tried and true method, Hanak said. It could potentially help meet up to a quarter of the historical groundwater deficit. But there may be limits on infrastructure to move water from big storms to recharge locations. And the total amount of water that agencies are looking at for recharge projects probably exceeds what is going to be available, she said. Multiple agencies are eyeing the same water.

Recharge will need to be combined with demand reduction, which means cutting back on pumping, said Hanak. In a PPIC review of valley groundwater plans, the institute found that groundwater agencies did not emphasize demand management as much as is going to be needed. Hanak thinks that will change as reality sets in over the coming years.

And when it comes to recharge, Hanak wants to see more collaborative efforts between agencies instead of a “fight over the scraps.”

“If we get to a point where no matter how much recharge we’re doing the groundwater levels are continuing to decline, then one has no choice but to look at other things like demand reduction and pumping limitations,” said Chaughan.

Off the table

Many Kings Subbasin managers say restricting pumping is not on the table for the time being.

The Central Kings groundwater agency is out of balance by about 15,000 acre feet of groundwater annually. Its plan is more recharge. The agency has purchased about 200 acres of land for recharge within the next year. In the long term, managers aim to add another 2,000 acres of recharge basins. That could provide 2,000 acre feet of water per day when there is excess surface water, said Phil Desatoff, executive director of the Central Kings groundwater agency. Desatoff said recharging that amount should more than offset their deficit.

Because of the subbasin’s access to flood water, the Kings River and its water rights, Desatoff said he doesn’t think pumping restrictions will be necessary for his district. Other areas aren’t so lucky, he added.

“Those folks without surface water are pretty much screwed,” said Desatoff. “They’re going to have to fallow land.”

In Central Kings’ case, however, an ongoing legal fight over Kings River flood water could alter Desatoff’s and other water manager’s recharge plans. A water district in Kern County has applied to the state Water Resources Control Board for flood water it says current rights holders haven’t been using. That issue will likely be settled in the coming year.

Risky move

Advocates are concerned about the lack of pumping restrictions and reliance on recharge in groundwater plans.

“Seems like they’re putting their eggs all in that basket,” said Amanda Monaco, water policy coordinator for advocacy nonprofit Leadership Counsel for Justice and Accountability. “Relying on recharge is really risky.”

While SGMA doesn’t specifically require pumping restrictions, Monaco said it will be impossible to correct overpumping without them. Hoping for wet years for recharge is a gamble and still probably wouldn’t provide enough water for all the agencies’ projects, said Monaco.

In Kern County agricultural water districts have built thousands of acres of recharge basins starting long before SGMA, yet the basin as a whole is still overdrafted by 250,000 to 300,000 acre feet a year.

California’s Department of Water Resources is reviewing agencies’ groundwater plans. On November 18, it published letters to four San Joaquin Valley agencies stating their plans were deficient on management of water quality, subsidence and chronic lowering of groundwater levels. The department has yet to announce anything about the Kings Subbasin but all plans will be approved or rejected by January of 2022.

Protecting domestic wells

Dropping groundwater levels have continually dried up residents’ private wells and community system wells throughout the valley. That’s a major that isn’t properly addressed in most groundwater plans, according to the PPIC review.

In the small, disadvantaged community of Lanare, part of the North Fork Kings groundwater agency’s area, dropping groundwater levels have caused problems for the town’s already taxed water system.

The town of about 200 people is bounded by agricultural fields and has long suffered from water quality problems. In 2018, the state paid $3.8 million in grant funds to build two new community wells for Lanare. But by 2019, one well had become contaminated with naturally occurring benzine and has been offline since.

In August, the remaining well nearly went dry as groundwater levels dropped. The pump is set at 317 feet and the water table dropped down to that depth, said a spokesperson from California Water Services, the appointed receiver that manages Lanare’s water system. The water table has rebounded a bit since then, keeping the well from going dry. But the pump will need to be dropped deeper to avoid an emergency situation.

“We’re all sucking out of the same groundwater,” said Angel Hernandez, community volunteer in Lanare and vice chair of the North Fork Kings groundwater agency’s rural community advisory committee.

Hernandez’s parents have lived in Lanare since 1989. He has been helping the community for years and saw firsthand the litany of water problems that afflicted the town over time.

He’s worried about the amount of ag pumping around Lanare and the dropping water table.

“I wonder how many acre feet they’re taking of water per night,” said Hernandez. “There’s got to be cutbacks.”

# # #

News Releases
December 23, 2021

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DWR Awards More Than $53 Million in Urban and Multibenefit Drought Relief Funding

SACRAMENTO, Calif. – The Department of Water Resources (DWR) today released its first phase of awards to 20 projects through the Urban and Multibenefit Drought Relief Grant Program. The funding awards will provide critical support to communities across the state dealing with the impacts of drought conditions.


An aerial view of low water level at Lake Oroville. Photo taken Oct. 28, 2021.

Authorized by the Budget Act of 2021, the Urban and Multibenefit Drought Relief Grant Program was allotted $200 million to assist communities facing the loss or contamination of their water supplies due to drought, help address immediate drought impacts on human health and safety, and protect fish and wildlife resources. Response to this grant program was overwhelming with over 147 projects submitted for funding in the first phase. Fourteen of the twenty projects awarded will benefit disadvantaged communities and Tribes.

“As we develop long-term strategies to address California’s changing climate and future dry conditions, we must take action now to assist local and regional agencies in managing through another historic drought,” said DWR Director Karla Nemeth. “We remain committed to investing in our communities today to ensure a future built on safe and reliable water supplies and a healthy environment.”

Among the projects set to receive grant funding:

- The City of Fort Bragg in Mendocino County will receive $8.8 million for structural lining and reconstruction of 9,250 feet of pipeline that supplies over half the water used by the city, which faced acute water supply challenges earlier this year. The project will strengthen resilience by ensuring reliable delivery of water during future drought events.
- The Tuolumne Stanislaus Integrated Regional Water Management Authority will receive $1.1 million to construct a 400,000-gallon potable water storage tank that will provide

water to 175 homes on the Tuolumne Rancheria of theTuolumne Band of Me-Wuk Indians.

- The El Dorado Irrigation District will receive $10 million to construct an intertie between drinking water sources to increase system reliability in response to major impacts to its infrastructure by this year's Caldor Fire.
- In Sacramento County, the Regional Water Authority will receive $650,000 to complete planning for the Sacramento Regional Water Bank. This will be the first federally recognized water bank in the Sacramento Valley with an estimated 2 million acre-feet of available capacity.
- The Western Municipal Water District in Riverside County will receive $1.7 million to construct a polyfluoroalkyl substances (PFAS) treatment system at the Western Water Recycling Facility. The project will allow recharge of 985 acre-feet of recycled water per year to the Arlington groundwater basin, which has declined by nearly 60 percent in the last 25 years.
- The Merced Irrigation District will receive $4 million to upgrade a structural facility on Bear Creek to accommodate flood-managed aquifer recharge operations and increase flow capacity to accommodate future storms.

A full list of the 20 awarded projects can be viewed here.

DWR will continue to accept applications for the next phase of awards until midnight January 14. Due to high demand, applicants are encouraged to submit applications that satisfy all completeness, eligibility and technical review criteria, and are as responsive as possible to one or more of the three funding priorities. Funding is currently available for public agencies, public utilities, Tribes, special districts, non-profit organizations, mutual water companies, colleges, and regional water management groups. To date, the Department has received $850 million in project funding requests.

The program is one of several drought funding programs available through the State. For information about other DWR and State drought response efforts and funding programs, visit: drought.ca.gov.

For questions about the Urban and Multibenefit Drought Relief Grant Program, please contact DWR at urbandrought@water.ca.gov.

# # #

‘Unprecedented’ Water Allocation for State Water Project
AgNet West | December 22, 2021

The Department of Water Resources (DWR) began the month with a disappointing initial water allocation for the State Water Project (SWP). Due to a fairly slow start to the 2022 water year and the current condition of water storage, expectations were for a conservative allocation. DWR has announced a zero percent allocation for SWP contractors.

“What the Department of Water Resources announced in December was unprecedented. They said that there would be zero water allocated. What was interesting in their announcement is they prioritized how they were planning on delivering water,” said Adam Borchard, Director of Government and Public Policy for the California Fresh Fruit Association. “Usually in the past when the state has an announcement like that, initially it’s just a pure numerical number with usually a statement of prognostication about how conditions are anticipated for the hydrologic year. This case was a little bit different.”

The four categories for water prioritization were identified as health and safety needs and Delta salinity control, endangered species, storage, and finally additional supply allocations if water remains available. DWR has indicated that “SWP will not be planning water deliveries through its typical allocation process until the state has a clearer picture of the hydrologic and reservoir conditions going into the spring.” While California has been experiencing a series of storms bringing much-needed rain, it may not be enough to overcome multiple years of dry conditions.

The water allocation reflects the current reservoir levels being exceptionally low and what DWR expects to be a third dry year. Fresno County Farm Bureau CEO Ryan Jacobsen said that after the dry conditions of 2021, it will take significantly more than a few rainstorms to bring water supplies back into balance.

“It’s put us into a position where you can’t help but have a pessimistic view going into 2022 just because it’s got to be an exceptional water year for us,” Jacobsen noted. “We would need a 140 percent year of average just to get back to what would be considered average because of the deficit that we find ourselves in.”

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Anderson Dam: Cost to rebuild key Bay Area dam nearly doubles to $1.2 billion
Labor, materials and permitting costs send price tag skyrocketing on major water project
Mercury News | January 6, 2022 | Paul Rogers

The cost of a huge project to rebuild Anderson Dam, near Morgan Hill, shown here in April 2020, has increased from $648 million to $1.2 billion. (Photo: Santa Clara Valley Water District)

In the latest setback for a project that has been fraught with delays and cost overruns for more than a decade, the price tag to rebuild Anderson Dam — Santa Clara County's largest — to improve earthquake safety is nearly doubling, from $648 million to $1.2 billion.

The news comes one year after the Santa Clara Valley Water District, the government agency that owns the dam near Morgan Hill, announced that another of its large construction plans, a proposal to build a huge new reservoir near Pacheco Pass, also had doubled in price, from $1.3 billion to $2.5 billion.

"It's terrible news," said Tony Estremera, chairman of the district, on Thursday of the Anderson cost increases. "It's just gotten worse and worse."

Water rate increases will pay for the additional costs, Estremera said. The board of the district, which provides drinking water and flood control to 2 million people in Santa Clara County, will hold a special meeting on Monday in San Jose to discuss the issue.

But pulling the plug on Anderson Dam's rebuilding isn't an option, Estremera said.

The 240-foot high earthen dam, built in 1950 near Highway 101 between Morgan Hill and San Jose, is a key part of Silicon Valley's water system, and the tallest dam in Santa Clara County. When its reservoir is full, Anderson holds 89,278 acre feet of water — more than the water district's other nine reservoirs combined.

The district drained it a year ago under orders from federal dam safety regulators. Crews broke ground in July on the first part of the repair job, building a huge new outlet tunnel, which is scheduled to be completed in 2024. The entire job to rebuild the dam and spillway won't be finished until 2030.

"There's no question we have to do it," Estremera said. "This is a priority. It's a safety project."

The staff of the district said Thursday that the cost overruns are a result of higher-than-expected labor and materials costs, and stringent requirements to enhance fish and wildlife by federal and state agencies that must issue permits for the massive project.

"It's unfortunate, but it's necessary," said Chris Hakes, the district's deputy operating officer for dam safety. "It's the type of thing where if we would have constructed this in 1950 all the regulators wouldn't have been involved and it would go quicker, but it would be more environmentally costly in terms of damage."

Critics said the district too often has costly overruns and is not a good steward of public money.

"This is the standard modus operandi for these folks," said Mark Hinkle, president of the Silicon Valley Taxpayers Association. "There's always more money that they need. It's never enough."

Hinkle said an outside auditor or investigator, like the Santa Clara County Civil Grand Jury, should look into the repeated delays and cost overruns on the Anderson Dam project.

When the district built the dam in 1950, scientists thought the nearby Calaveras Fault was inactive. And water district officials believed that the dam was anchored in bedrock.

But an engineering firm performing tests required by federal regulators in December 2008 found that the dam's foundation contains sand and gravel, which could shift in a major quake. Specifically, a 6.6 magnitude quake on the Calaveras Fault directly at Anderson Reservoir, or a 7.2 quake centered one mile away, could cause the huge earthen dam to slump and fail.

Although unlikely, a complete failure of Anderson Dam when the reservoir is full could send a 35-foot wall of water into downtown Morgan Hill within 14 minutes, engineers concluded. The waters would be 8-feet deep in San Jose within three hours, potentially killing thousands of people.

At first, in 2011, the district planned to strengthen the existing dam. Then, district officials said the cost would be $193 million, with construction beginning in 2017 and taking three years. But new trace faults found in the area required a new dam to be constructed, doubling the price by 2016 to $400 million.

Now the price is three times higher.

“The money we spend now is going to be a drop in the bucket compared to what we would have spent if we fixed it later,” Hakes said. “Or if there was an emergency. If something happened to the dam, it would be catastrophic to Silicon Valley.”

Frustrated at the slow pace and alarmed by the near-failure of Oroville Dam in Butte County during major storms in 2017, the Federal Energy Regulatory Commission in February 2020 issued a dramatic order requiring the district to drain Anderson and repair it.

Just before that, the district had drawn up a $563 million plan to rebuild the dam, a new outlet tunnel and new spillway over five years, between 2022 and 2027. But Hakes noted that when federal regulators issued their order to drain Anderson, they also required the district to build the outlet tunnel first to ensure the reservoir could be drained quickly in an extremely wet year.

Breaking the project into two segments — the tunnel and the dam rebuilding afterward — increased the timeline from 5 to 10 years, he said, which has further raised the price tag.

To pay the bill, Estremera said the district’s board may have to delay other projects, including flood control work and the proposed Pacheco Dam.

“We’re trying our best,” he said. “We’ll have to look at other projects to see how we can balance it out. We’re hoping we can get some help from the feds or the state, but you never know how things are going to go.”

# # #

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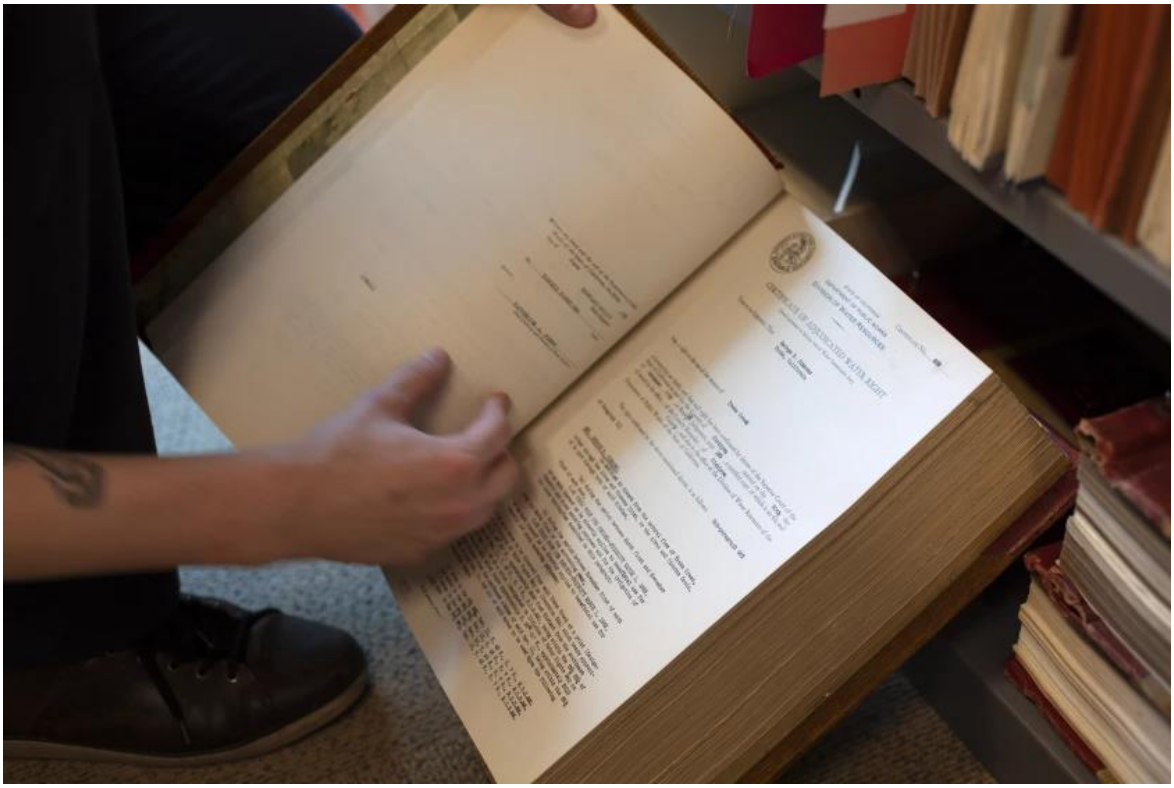
Paper records and steel vaults: Can California water rights enter the digital age?
LA Times | December 27, 2021 | Ari Plachta



Matthew Jay, an analyst at the State Water Resources Control Board, holds a thick volume of adjudicated water rights certificates. After 13 years, he knows the room better than anyone else at the agency. (Ari Plachta / Los Angeles Times)

From an unremarkable office in Sacramento, Matthew Jay can pinpoint any moment in California history when somebody was granted the right to transfer water from any particular lake, river, stream or creek.

An analyst with the California State Water Resources Control Board, he is a custodian of millions of pieces of paper. Some are over a hundred years old and are crammed into towering filing cabinets and vaults. The room is so heavy that its floor needed to be reinforced.

“When I started opening some of these files my first thought was: ‘I need to be very careful with these old, old documents.’” Jay said. “They’re printed on an equivalent to tissue paper.’”

But in the world’s fifth-largest economy — a state where global warming is contributing to ever longer and more frequent droughts — regulators say reliance on such an antiquated system is troubling. They say the lack of a comprehensive digital system and full information about who owns the right to use water and how much they actually use makes basic water management in the state mystifying at best, and inaccurate at worst.

After 13 years of working in the records room, Jay can easily rattle off the most notable water users documented there: There's Mike Yurosek, inventor of baby carrots. Coppola Wineries, the vineyard started by Francis Ford Coppola after his blockbuster "Godfather" trilogy. And Glenn-Colusa Irrigation District, which funnels enough water to rice farmers north of Sacramento to supply the city of Los Angeles several times over. Yet researching the location of every water right granted along a waterway like the Shasta River can take up to a year to complete.

California's Byzantine system of water rights dates back to the Gold Rush, when miners declared their rights to water by nailing paper notices to trees. The oldest rights holders have seniority, and when the state restricts water use in times of drought, these senior rights holders are last to be curtailed, if at all.

California's lack of timely and useful data became all too apparent during the 2012-2016 drought and prompted new regulations that populated a clunky data portal with new water use information. But problems remained during this most recent drought, as regulators used outdated and incomplete data to issue curtailments this past summer.

"We're behind the curve on this in a way that's really shocking," said Felicia Marcus, former chair of the water board under Gov. Jerry Brown and visiting fellow at Stanford University. "In the absence of workable data, people can say whatever it is convenient for them to say. So let's get the data. That's how all good water management works."

This year, Gov. Gavin Newsom approved $33 million as part of a surplus budget to modernize California's water rights information system. It's the latest effort in an uneven regulatory history that has sought to make water use in the state more transparent.

Erik Ekdahl, a deputy director at the state water board, said the process of combining water supply information from the Department of Water Resources, water rights documentation from the records room, spotty demand data reported by users themselves, and environmental needs for every watershed, is tedious and convoluted.

The forthcoming data system, currently in a contracting phase, will be mapped, searchable, and include water diversion and rights information at the click of a button. The idea is to create a spatial image of California's water use, with an ultimate goal to set up a telemetry system where water meters are directly connected to the internet.

"This isn't a changing climate, this is a changed climate… We should expect to be doing curtailments again, and maybe more frequently, maybe in two years, maybe next year," Ekdahl said. "Right now we make data-driven decisions, but the data comes at a great time and expense. We're setting the stage for making all this information actually accessible and creating the opportunity for people to make data-driven decisions themselves."

California's water data problems don't end with the digitization of paper records, information that's mainly used for long term planning. The state is uniquely in the dark about how much

water gets used, and by whom, in a given moment compared with other Western states like Colorado. That is particularly the case with agriculture — the $50-billion industry that uses roughly 80% of surface water supplies.

It was 2009 when the state issued mandates for urban and agricultural water districts to report how much water they deliver to their customers — by snail mail — without using a meter. By 2015, a new law required even more water users to measure and report yearly how much water they take from waterways.

But since that law took effect, fewer than 20% are complying according to a long “deficiency list” of rights holders who have failed to respond. An even lower percentage are following the latest reporting rules passed in the last couple years, according to the water board.

The data has glaring errors, like numbers reported in acre feet instead of gallons, and it’s a year old by the time regulators use it. Laws that govern California water may also incentivize users to claim more than the share of water they actually use, known as the “use it or lose it” doctrine.

That’s why Michael Kiparsky, director of the Water Wheeler Center at UC Berkeley, says the forthcoming system is only a step in the right direction toward effective California water management. His team researched water rights data to build a prototype — scanning, digitizing and assigning metadata to over 130,000 pages of water rights documents from the Mono Basin.

“Hopefully this database will be a piece of the puzzle that will enable people to start unlocking new ways of managing water in California that could get us to a less painful future,” Kiparsky said.

Even if it’s finished in a breakneck pace of two years, the technical and cost barriers to reporting information in rural areas as well as reticence to share information with the government will remain.

Valerie Kincaid, a water law attorney who represents water districts and farmers along the San Joaquin River, is skeptical that regulators will take quicker and better informed action in times of drought, despite access to more information.

“You have a whole group of people that have the data. They live with the data, and they don’t really trust the board to do anything good with it. They’re not thrilled about reporting because they’re afraid it’s going to be used against them,” said Kincaid. “There’s a big trust issue.”

A new technological venture using satellite-based estimates of evapotranspiration to measure water aims to be a less invasive and cost-free means for farmers to send in data. The organization, called OpenET, is a collaboration between NASA, Google Earth and the Environmental Defense Fund.

Brett Baker, a fifth-generation farmer in the Sacramento-San Joaquin River Delta and attorney representing the Central Delta Water Agency, is familiar with those longstanding trust issues and hopes the new outside technology can satisfy farmers' reporting requirements.

"Hopefully that will satisfy the reporting requirement and enlighten their understanding," he said of the water board. "I think this is a real opportunity for us to start operating in reality with real useful data, as opposed to just making stuff up to fit the narrative."

Matthew Jay, in the meantime, will help the water board digitize the water rights system as a kind of records consultant, and keep doing the most rewarding part of his job — helping people learn about water rights.

"It's about providing that customer service to folks, so they can do the research and inform themselves of what water rights there are on a property," he said, and just making people aware that water rights exist in the first place.

# # #

With Another Dry Year Looming, California Moves to Set New Urban Water Use Standards
Pacific Institute | December 21, 2021 | Cora Kammeyer, Sonali Abraham, and Heather Cooley

Key Takeaways

- Per 2018 legislation, California State agencies are developing water use standards for all urban water suppliers in the state.
- In November, the California Department of Water Resources and State Water Resources Control Board issued recommended standards to the legislature for residential indoor water use.
- Pacific Institute analysis shows most urban water suppliers are already below the recommended 2025 residential indoor water use standard.
- It is critical that California adopt strong, forward-looking water use standards given the current drought and climate crises.
- After record-breaking drought conditions in 2021, California is looking at another bleak water year in 2022. Despite the mid-December precipitation, over 90% of the state is still in severe drought, and the California Department of Water Resources (DWR) announced an initial 0% State Water Project allocation for the first time ever. In October, California Governor Gavin Newsom declared a statewide drought emergency and urged a voluntary 15% reduction in water use for California cities. So far, most areas are falling short of the target, and mandatory cutbacks are likely for next year.

In November, amid the deepening drought, the DWR and the State Water Resources Control Board (SWRCB) issued joint recommendations to the California State Legislature for new indoor residential water use standards, along with a study supporting the recommendations (hereafter the Indoor Residential Water Use Study, or IRWUS).

Background on Urban Water Efficiency Legislation

As background, in 2018, the California legislature passed and Governor Brown signed Assembly Bill 1668 (Friedman) and Senate Bill 606 (Hertzberg). This bill created a new framework for setting customized water use targets for urban water suppliers in California.

In AB 1668 and SB 606, the State of California made a commitment to use the best available data and information to set water efficiency standards for urban water suppliers. When the bills were passed, limited data were available on indoor water use and 55 gallons per capita daily (gpcd) was selected as a placeholder for the residential indoor standard. The legislation directed the state agencies to conduct necessary studies and jointly recommend a standard by 2021 that reflects current best practices.

New Urban Indoor Residential Standards

Using four detailed analytical approaches, the IRWUS estimated that statewide indoor water use averaged 48 gpcd between 2017 and 2019, well below the 55 gpcd placeholder standard. Indoor water use is expected to decline because of plumbing codes, appliance and fixture turnover, and new housing – so called “passive conservation.” The IRWUS projected that median and average indoor water use would decline to about 44 gpcd by 2030 without any active conservation efforts. Based on the study’s findings, the agencies jointly recommend that the indoor residential standard remain at 55 gpcd through 2024 and decline to 47 gpcd in 2025 and to 42 gpcd starting in 2030.

Active conservation – like utility rebates, conservation-oriented rate structures, and education programs – can provide additional water savings, though the IRWUS did not attempt to quantify the active conservation potential.

Indoor Residential Water Use in California

The Pacific Institute analyzed data reported by water suppliers in their Electronic Annual Reports (EARs) for 2017 through 2019 to get a sense of how water suppliers would stack up with the new standards. The EAR is an annual survey of public water systems that collects water-system information, including water use by sector. The EAR does not contain estimates of indoor water use, as this is not measured directly; however, indoor use can be inferred from these data using a methodology validated by DWR in the IRWUS.

Figure 1 shows current indoor residential water use and the recommended water use standards. Current residential indoor use is shown as a box-and-whisker plot. Between 2017 and 2019, indoor residential water use averaged 48 gpcd (shown as an 'X' in the blue box), with a median value of 45 gpcd (shown as the dotted line near the middle of the blue box). For 75% of water suppliers, indoor water was 54 gpcd or less (as indicated by the top of the blue box). For 25% of water suppliers, it was 39 gpcd or less between 2017 and 2019 (as indicated by the bottom of the blue box). The upper and lower 'whiskers' point to the upper and lower extremes in the data.

These data show that 78% of water suppliers were already below the current indoor standard of 55 gpcd between 2017 and 2019. Likewise, 56% of suppliers were below the 2025 standard of 47 gpcd, and 37% were below the 2030 standard of 42 gpcd.

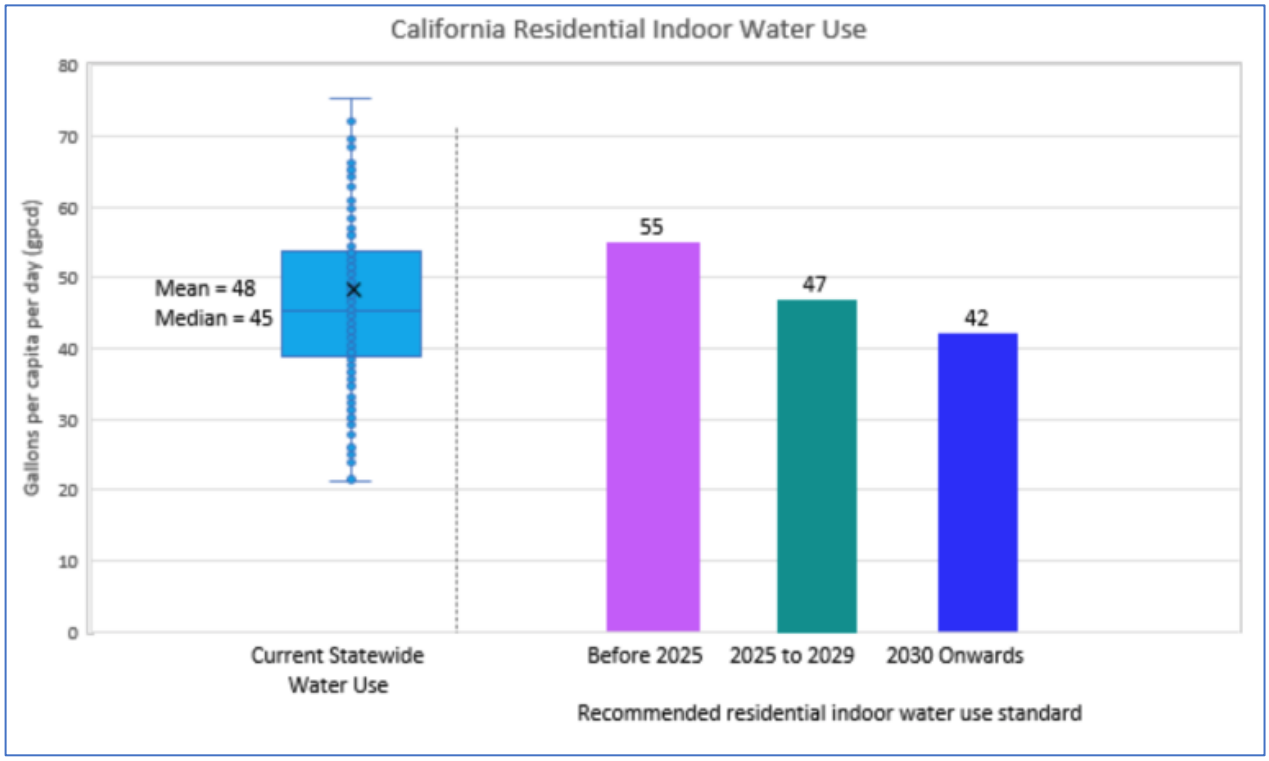


Figure 1: Current statewide residential indoor water use and new recommended standards for 2025 and beyond. *

*Note: Outliers that were "outside of the whiskers" are not shown in the figure.

Establishing Forward-Looking Urban Water Use Standards

The indoor standard is the first in a series of urban water use standards that will be submitted in 2022 in adherence with the 2018 legislation, “Making Water Conservation A California Way of Life.” Recommendations for water use standards on residential landscapes, large commercial landscapes, and water loss will follow the indoor standard during the coming months. While the indoor standard will be considered and adopted by the legislature, the remaining standards will be considered, revised as needed, and adopted by the SWRCB. Together, these standards will establish water budgets for every urban water agency in California. Regulations require that every urban water supplier meets their water budget, but there is flexibility in how to achieve it. For example, a water supplier can exceed the indoor standard as long as the total water use objective is met.

It is vital that the State adopt strong, forward-looking standards to ensure greater levels of water efficiency and conservation given the current drought and climate crises facing California. We will face more severe droughts and hotter temperatures in the years to come, putting greater pressure on water resources. Robust water efficiency standards will help ensure that the state’s drinking water supplies are available for essential uses, and not wasted. This is true not just for California, but also for the Western U.S. and many other arid regions around the world. In the face of increasing drought frequency and intensity in these places, water efficiency is the most cost-effective source of “new” water supply, and is critical tool for building long-term water resilience.

For more information about the California drought and California cities’ water use, visit www.californiadrought.org. To read more of the Pacific Institute’s work on water efficiency, visit www.pacinst.org/water-efficiency-and-reuse.

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