

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

April 6, 2023

Correspondence and media coverage of interest between March 16, 2023 and April 3, 2023

Correspondence

From: Dennis Herrera, SFPUC General Manager
To: Joaquin Esquivel, Chair, State Water Resources Control Board
Karla Nemeth, Director, California Department of Water Resources
Date: March 16, 2023
Subject: Governor's emergency drought proclamations and executive orders

Press Release

From: Office of Governor Newsom
Date: March 24, 2023
Press Release: Governor Newsom Eases Drought Restrictions

From: Department of Water Resources
Date: March 24, 2023
Press Release: DWR Announces Interagency Drought Task Force Members Planning Resources for Counties

Media Coverage

Water Supply Conditions:

Date: April 3, 2023
Source: Maven Breaking News
Article: This Just In: California's Snowpack is Now One of the Largest Ever, Bringing Drought Relief, Flooding Concerns

Date: April 1, 2023
Source: San Francisco Chronicle
Article: California's near-record snowpack isn't all good news. Here's why

Date: March 27, 2023
Source: Mercury News
Article: Looming atmospheric river may put California at highest snowpack level ever. What's Your forecast?

Drought:

Date: April 1, 2023
Source: The Guardian
Article: Drought or no drought? California left pondering after record winter deluge

Date: March 24, 2023
Source: KQED
Article: California Lifts Water Restrictions, Amid Exceptionally Wet Winter

Drought, cont'd.:

Date: March 24, 2023
Source: NBC Bay Area
Article: California Eases Water Restrictions, But Drought Isn't Over

Water Supply Management:

Date: March 28, 2023
Source: Maven Breaking News
Article: This Just In: Reclamation increases Central Valley Project 2023 water supply allocations

Date: March 24, 2023
Source: Maven Breaking News
Article: This Just In: Harnessing Series of Winter Storms, California Increases State Water project Allocations to 75%

Water Policy:

Date: March 2023
Source: Estuary News
Article: VA Agreement Highlights Habitat Questions



March 16, 2023

Joaquin Esquivel, Chair
State Water Resources Control Board
1001 I Street Sacramento, CA 95814

Karla Nemeth, Director
California Department of Water Resources
1416 Ninth Street, Sacramento, CA 95814

Dear Chair Esquivel and Director Nemeth,

The San Francisco Public Utilities Commission (SFPUC) is submitting this letter for your consideration of recommended changes to the Governor's emergency drought proclamations and executive orders currently in effect.

The Governor's February 2023 Executive Order N-3-23 extended the duration of existing emergency drought proclamations and orders and requested State agencies to provide recommendations for what further actions, if any, are necessary for ongoing emergency drought response, and whether any existing provisions are no longer needed to prepare for and mitigate the effects of the drought conditions.

Given the dramatic improvement in water supply conditions in much of California, we recommend State emergency drought regulations be modified to rescind requirements for Water Shortage Contingency Plan Level 2 response actions from water suppliers with demonstrated sufficient supplies that face no water shortages.

The SFPUC's regional system serves 2.7 million people in four Bay Area counties. Starting in 2021, to align with the State's escalating drought response actions, the SFPUC adopted a local declaration of drought emergency, seeking systemwide reductions and imposing a drought surcharge on our retail customers and water budgets on our wholesale customers. In 2022, we modified our local declaration to reflect the Governor's March 2022 Executive Order N-7-22, that among other things, directed urban water suppliers to implement Level 2 shortage response actions. We also conducted a major drought outreach campaign across our system and provided extensive conservation assistance through our ongoing programs. Our customers responded positively, and we met our systemwide 11 percent reduction goal.

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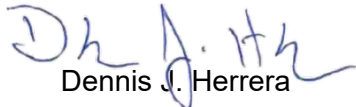
Dennis J. Herrera
General Manager



We expect our regional water system to fill this year. Extremely wet conditions since December 2022 show that hydrologically we are in good shape. Through March 12, 2023 our Sierra precipitation index was 52.86 inches compared to an annual average total of 36.68 inches. Similarly, our Bay Area precipitation index was 37.44 inches compared to an annual average total of 22.80 inches. Our reservoirs, including our Water Bank in Don Pedro Reservoir, after snowmelt will be 100% full this year. But rain or shine, we continue to implement a robust conservation program for our retail service area and across our regional system through the Bay Area Water Supply and Conservation Agency that represents our wholesale customers.

We hope you will consider our recommendation that the State's emergency drought regulations be modified to rescind requirements for Level 2 response actions from suppliers like the SFPUC with ample supplies, no foreseeable water shortages, and ongoing comprehensive demand management programs.

Sincerely,



Dennis J. Herrera
General Manager

cc: Nicole Sandkulla, CEO and General Manager, BAWSCA



Published: Mar 24, 2023

Governor Newsom Eases Drought Restrictions

WHAT TO KNOW: Climate change has made California's dry and wet spells more extreme and unpredictable – after the three driest years on record, recent rain and snowfall have dramatically changed conditions in many parts of the state. The state has also advanced actions to boost storage and supply. Today's action eases drought emergency provisions that are no longer needed while maintaining others to support impacted communities statewide.

Harnessing water captured and stored from recent storms, the state also announced a major increase in expected State Water Project deliveries to local agencies – now an anticipated 75% allocation.

YOLO COUNTY – Governor Gavin Newsom today rolled back some drought emergency provisions that are no longer needed due to current water conditions, while maintaining other measures that support regions and communities still facing water supply challenges, and that continue building up long-term water resilience. Amid climate-driven weather whiplash, the state has taken action to boost water supplies through groundwater recharge, stormwater capture, reservoir storage, and more.

Today's action comes as the state announced increased water deliveries to 29 public water agencies that serve 27 million Californians, now expecting to deliver 75% of requested water supplies – up from 35% announced in February, and the highest since 2017.

While recent storms have helped ease drought impacts, regions and communities across the state continue to experience water supply shortages, especially communities that rely on groundwater supplies that have been severely depleted in recent years. Today's order is responsive to current conditions while preserving smart water measures:

- Ends the voluntary 15% water conservation target, while continuing to encourage that Californians make conservation a way of life;
- Ends the requirement that local water agencies implement level 2 of their drought contingency plans;
- Maintains the ban on wasteful water uses, such as watering ornamental grass on commercial properties;
- Preserves all current emergency orders focused on groundwater supply, where the effects of the multi-year drought continue to be devastating;
- Maintains orders focused on specific watersheds that have not benefited as much from recent rains, including the Klamath River and Colorado River basins, which both remain in drought;
- Retains a state of emergency for all 58 counties to allow for drought response and recovery efforts to continue.

Click to view [A copy of today's executive order.](#)

Since Governor Newsom announced the 15% voluntary conservation goal, Californians conserved 600,000 acre-feet of water – representing 1.2 million households' yearly usage. The Governor today visited the Dunnigan Groundwater Recharge Project in Yolo County, where he highlighted the state's work to accelerate and increase groundwater recharge to make the most of winter storms. California is working to expand groundwater recharge by at least 500,000 acre-feet in potential capacity as part of our water supply strategy.

Leveraging the state's [long-term water supply strategy](#) and more than \$8.6 billion committed by Governor Newsom and the Legislature in the last two budget cycles to build water resilience, California is taking aggressive action to prepare for hotter and drier conditions driven by climate change that could reduce the state's water supply by up to 10% by 2040. In the 2023-24 state budget, Governor Newsom is proposing an additional \$202 million for flood protection and \$125 million for drought-related actions.

Click here to view [Easing Drought Restrictions](#)

Here are other actions that Governor Newsom and the Legislature have taken to boost water supply, expand storage, and improve infrastructure:

- **EXPANDING SUPPLY & STORAGE BY 1.1 MILLION ACRE-FEET:** California has bolstered supply and storage through groundwater recharge and other projects, including a combined 1.1 million acre-feet of water – enough for 2.2 million households' yearly usage.
- **EXECUTIVE ORDERS TO CAPTURE & STORE MORE WATER:** During recent storms, Governor Newsom signed executive orders to accelerate stormwater capture to boost groundwater recharge and other conservation measures.
- **FAST-TRACKING GROUNDWATER RECHARGE:** The state is expanding groundwater recharge by at least 500,000 acre-feet in potential capacity – streamlining permits and \$1 billion for groundwater recharge projects for 88,000 more acre-feet per year.
- **MAXIMIZING STORMWATER CAPTURE:** \$176 million for 67 stormwater projects and streamlining permitting to take advantage of major storm events.
- **EXPANDING STORAGE ABOVE & BELOW GROUND:** California is supporting seven locally-driven water storage projects that would expand the state's capacity by 2.77 million acre-feet – about three times as much water as Folsom Lake can hold. And, California is working to expand San Luis Reservoir by 135,000 acre-feet to store more storm runoff.
- **ADVANCING CLEAR, AMBITIOUS TARGETS:** 142 actions to improve water resilience and bolster water supplies, and a roadmap for expanding urban stormwater capture capacity by 250,000 acre-feet and adding 4 million acre-feet of water storage capacity.
- **MODERNIZING WATER INFRASTRUCTURE:** California is working to modernize aging water conveyance systems across the state to safeguard long-term water reliability and help carry winter storm runoff into storage.

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CALIFORNIA DEPARTMENT OF WATER RESOURCES

Published: March 24, 2023

Contact:

Allison Armstrong, Information Officer, Public Affair
Department of Water Resources
916-820-7652 | media@water.ca.gov

DWR Announces Interagency Drought Task Force Members Planning Resources for Counties



An installer rolls a 1500 gallon potable water tank into place at a residence in Glenn County, California, where wells have run dry.

SACRAMENTO, Calif. – With swings between extreme weather patterns becoming more intense, the Department of Water Resources (DWR) is proactively collaborating with local communities and interagency partners to strengthen drought resilience and better prepare for future dry conditions.

In accordance with Senate Bill 552 of 2021, DWR has released a suite of resources to assist counties in planning for future water shortage events. It has also launched a 26-member interagency drought task force that will help address drought planning and emergency response.

“The recent storms have provided a huge improvement to the state’s surface water supplies. But our state’s groundwater basins are still recovering, and if these shifts between extreme weather patterns have taught us anything, it’s to be prepared for an eventual return to dry conditions,” said DWR Director Karla Nemeth. “We’re prioritizing collaboration among local county governments and diverse water users to help empower communities with the tools and resources they need to plan for future drought events and response.

The new interagency drought task force, formally known as the Drought Resilience Interagency and Partners (DRIP) Collaborative, includes members representing all water users from local governments, community-based organizations, Tribes, nonprofit technical assistance providers, the general public, agriculture, environmental representatives, public water systems, small water suppliers or urban water agencies, and experts in land use planning, water resilience, or water infrastructure. A full list of the selected members is available on DWR’s DRIP Collaborative webpage.

The selected members will lead the DRIP Collaborative in discussions to address drought-related issues and solutions including current and projected drought conditions, potential impacts in small water supplier and rural communities, challenges on-the-ground based on water community expertise, and align state programs, funding, and strategies to anticipate and

proactively address climate-driven impacts. The first DRIP Collaborative meeting is scheduled for April 6 and interested parties or members of the public can stay up to date with the latest DRIP Collaborative announcements and meetings through DWR's email subscription list.

Additional resources include tools, direct assistance and long-term support to help counties throughout the planning process. Counties can now access a County Drought Resilience Planning Guidebook, updated Drought and Water Shortage Risk Tool, and a portal from DWR to foster learning. These materials were created using feedback gathered by counties and small water suppliers over the past year through workshops led by DWR and the State Water Resources Control Board.

For counties that require additional assistance, DWR is offering direct financial or technical support for planning activities. Interested counties can choose to receive up to \$125,000 in reimbursement funds for eligible planning expenses or solicit direct technical experience when preparing their plans. All counties are eligible to apply for one form of assistance and can apply now on DWR's County Drought Resilience Planning webpage.

###

THIS JUST IN ... California's Snowpack is Now One of the Largest Ever, Bringing Drought Relief, Flooding Concerns

Statewide Snowpack at 237 Percent of Average, Ranks Among Highest in State History

Maven Breaking News | April 3, 2023 | Department of Water Resources

The Department of Water Resources (DWR) today conducted the fourth snow survey of the season at Phillips Station. The manual survey recorded 126.5 inches of snow depth and a snow water equivalent of 54 inches, which is 221 percent of average for this location on April 3. The snow water equivalent measures the amount of water contained in the snowpack and is a key component of DWR's water supply forecast. DWR's electronic readings from 130 snow sensors placed throughout the state indicate the statewide snowpack's snow water equivalent is 61.1 inches, or 237 percent of average for this date.

"This year's severe storms and flooding is the latest example that California's climate is becoming more extreme," said DWR Director Karla Nemeth. "After the driest three years on record and devastating drought impacts to communities across the state, DWR has rapidly shifted to flood response and forecasting for the upcoming snowmelt. We have provided flood assistance to many communities who just a few months ago were facing severe drought impacts."

Just as the drought years demonstrated that California's water system is facing new climate challenges, this year is showing how the state's flood infrastructure will continue to face climate-driven challenges for moving and storing as much of these flood water as possible.

This year's April 1 result from the statewide snow sensor network is higher than any other reading since the snow sensor network was established in the mid-1980s. Before the network was established, the 1983 April 1 statewide summary from manual snow course measurements was 227 percent of average. The 1952 April 1 statewide summary for snow course measurements was 237 percent of average.

"This year's result will go down as one of the largest snowpack years on record in California," said Sean de Guzman, manager of DWR's Snow Surveys and Water Supply Forecasting Unit. "While 1952's snow course measurements showed a similar result, there were fewer snow courses at that time, making it difficult to compare to today's results. Because additional snow courses were added over the years, it is difficult to compare results accurately across the decades with precision, but this year's snowpack is definitely one of the biggest the state has seen since the 1950s."

For California's snow course measurements, only 1952, 1969 and 1983 recorded statewide results above 200 percent of the April 1 average. While above average across the state this year, snowpack varies considerably by region. The Southern Sierra snowpack is currently 300 percent of its April 1 average and the Central Sierra is at 237 percent of its April 1 average. However, the critical Northern Sierra, where the state's largest surface water reservoirs are located, is at 192 percent of its April 1 average.

The size and distribution of this year's snowpack is also posing severe flood risk to areas of the state, especially the Southern San Joaquin Valley. DWR's State-Federal Flood Operations Center (FOC) is supporting emergency response in the Tulare Lake Basin and Lower San Joaquin River by providing flood fight specialists to support ongoing flood response activities and by providing longer-term advanced planning activities. The FOC and DWR's Snow Surveys and Water Supply Forecasting Unit are helping local agencies plan for the spring snowmelt season by providing hydraulic and hydrologic modeling and snowmelt forecasts specific to the Tulare Lake Basin that are informed by DWR's snowmelt forecasting tools, including Airborne Snow Observatory (ASO) surveys.

Storms this year have caused impacts across the state including flooding in the community of Pajaro and communities in Sacramento, Tulare, and Merced counties. The FOC has helped Californians by providing over 1.4 million sandbags, over 1 million square feet of plastic sheeting, and over 9,000 feet of reinforcing muscle wall, across the state since January.

On March 24, DWR announced an increase in the forecasted State Water Project (SWP) deliveries to 75 percent, up from 35 percent announced in February, due to the improvement in the state's water supplies. Governor Newsom has rolled back some drought emergency provisions that are no longer needed due to improved water conditions, while maintaining other measures that continue building up long-term water resilience and that support regions and communities still facing water supply challenges.

While winter storms have helped the snowpack and reservoirs, groundwater basins are much slower to recover. Many rural areas are still experiencing water supply challenges, especially communities that rely on groundwater supplies which have been depleted due to prolonged drought. Long-term drought conditions in the Colorado River Basin will also continue to impact the water supply for millions of Californians. The state continues to encourage Californians to make water conservation a way of life as more swings between wet and dry conditions will continue in the future.

DWR conducts five media-oriented snow surveys at Phillips Station each winter near the first of each month, January through April and, if necessary, May. Given the size of this year's snowpack with more snow in the forecast, DWR anticipates conducting a May snow survey at Phillips Station. That is tentatively scheduled for May 1.

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California's near-record snowpack isn't all good news. Here's why

The state's April snow measurements, which record the peak accumulation, will show more than 235% of average snowpack — the most in 70 years.

San Francisco Chronicle | April 1, 2023 | Kurtis Alexander

California's snowpack will peak this year at what may be its highest level in modern times, an epic accumulation that has buried the drought in the history books and, going forward, poses widespread risk of flooding.

State water officials, who are scheduled to conduct their traditional April snow survey on Monday, are expected to find more than 235% of average snowpack for the month in the Sierra Nevada and southern Cascades.

The last time California had a similar amount of snow was 1952, when winter storms famously trapped a luxury train near Donner Pass, crushed a mining camp outside Bishop and closed roads across the mountains for months. The snowpack that April measured 237% of average, similar to what this year's level is approaching, but state officials note the surveys were done differently then.

"It is difficult to compare years across the decades due to the increase in number of survey sites over time, but this year will certainly be in the top," Sean de Guzman, manager of snow surveys and water supply forecasting for the California Department of Water Resources, said in an email before Monday's measurements.

The April snow survey in 1983, another big winter, recorded 227% of average snowpack, though the methodology also differed then.

California average snowpack, 1952-2023

Percentage of April 1 average

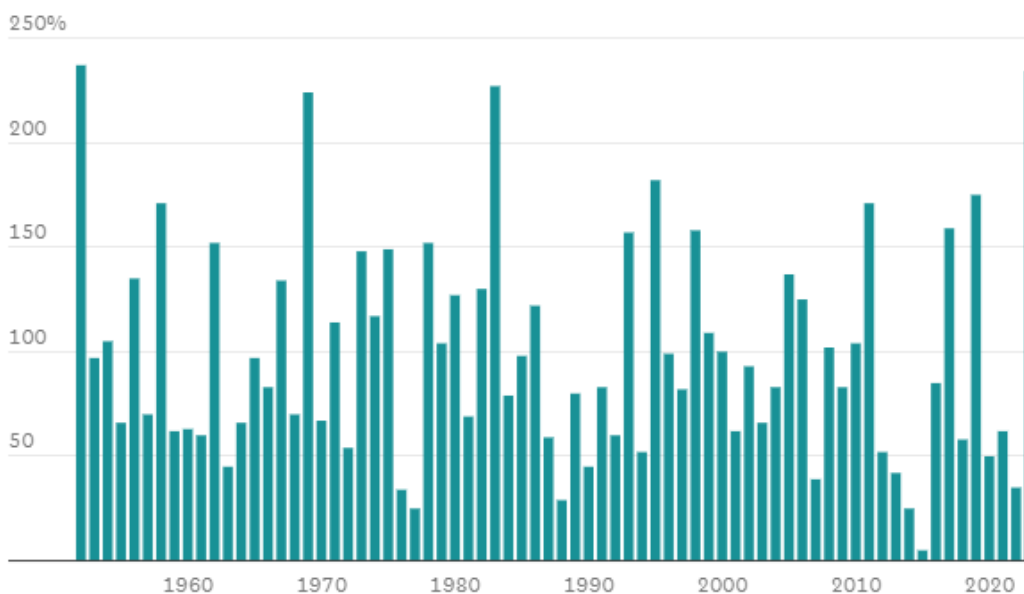


Chart: Amy Chen / The Chronicle • Source: [California Data Exchange Center](#) via California Department of Water Resources

Regardless of how many decades you have to go back to find comparable snow, ski resorts this year will vouch for the current bounty.

Mammoth Mountain Ski Area, one of the snowiest, recently surpassed its previous high of 668 inches of snow at its main lodge. On the summit, it counted 879 inches Friday. Resorts throughout the Sierra will likely stay open into July.

The big winter also has been marked by inconvenience, if not outright hardship.

Communities from the San Bernardino Mountains to Lake Tahoe have been buried in snow for weeks with roofs of homes collapsing, water lines freezing and power lines toppling. An avalanche has closed Highway 395 in the eastern Sierra, north of Lee Vining, since February. Yosemite and Sequoia and Kings Canyon national parks both have had unprecedented shutdowns because of storms.

The state Department of Water Resources conducts its snow surveys every month in winter and spring, but the April measurement is most crucial. It reflects snow levels at their peak, allowing surveyors to gauge how much melt-off will pour from the mountains and provide for cities and farms in the coming year. Nearly a third of the state's water supply typically comes from snow.

Already, winter storms have lifted the state's big reservoirs from near historical lows during the drought to mostly above-average levels. Shasta Lake, the state's biggest reservoir, has risen nearly 120 feet since Dec. 1, more than doubling its volume and, as of this week, was holding 104% of the water it averages at this point in the year.

Most reservoirs, which are much smaller than Shasta, have begun releasing water in order to make room for the anticipated crush of snowmelt.

Concerns of flooding are running high, perhaps greatest in the southern San Joaquin Valley. The mountains nearby have received the brunt of this year's storms, with the southern Sierra logging a record 298% of average snowpack as of Friday. Already runoff is overwhelming the region's infrastructure.

A vast lake that once sprawled across the floor of the valley has re-emerged in the Tulare Lake basin, putting farms, roads, homes and even a few small communities under water. The situation is expected to worsen over the next few months as the snowmelt picks up.

The National Guard, Cal Fire and the Department of Water Resources have already begun sending supplies and personnel to assist with the flooding. Gov. Gavin Newsom has requested a presidential disaster declaration to bolster the emergency response.

State surveyors measure snowpack in terms of its water content, not its depth or another metric, in order to best forecast water supplies. Data is collected at more than 260 sites between the southern Sierra and Oregon border, mostly electronically and in real-time so cumulative results can be gauged before the official start-of-the-month manual surveys.

Friday's statewide snowpack measured 236% of the April 1 average.

On Monday, the state's measurements at Phillips Station, which has a long and celebrated history of recording snowpack with snow tubes and other instruments, are scheduled. The results will feed into the updated start-of-the-month total.

What has been as spectacular as this winter's sheer bounty of snow is the fact that it comes after the state's driest three-year stretch on record.

"This is California's hydrology," said Jay Lund, director for the Center for Watershed Sciences at UC Davis and a professor of civil and environmental engineering. "We have more flood and drought years than average years, and the way the climate is changing, we're probably going to see even more of that."

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Looming atmospheric river may put California at highest snowpack level ever. What's your forecast?

Yet another atmospheric river speeds towards California, promising to deliver several inches of rain to the Bay Area and several feet of snow to portions of the Sierra

Mercury News | March 27, 2023 | Scooty Nickerson



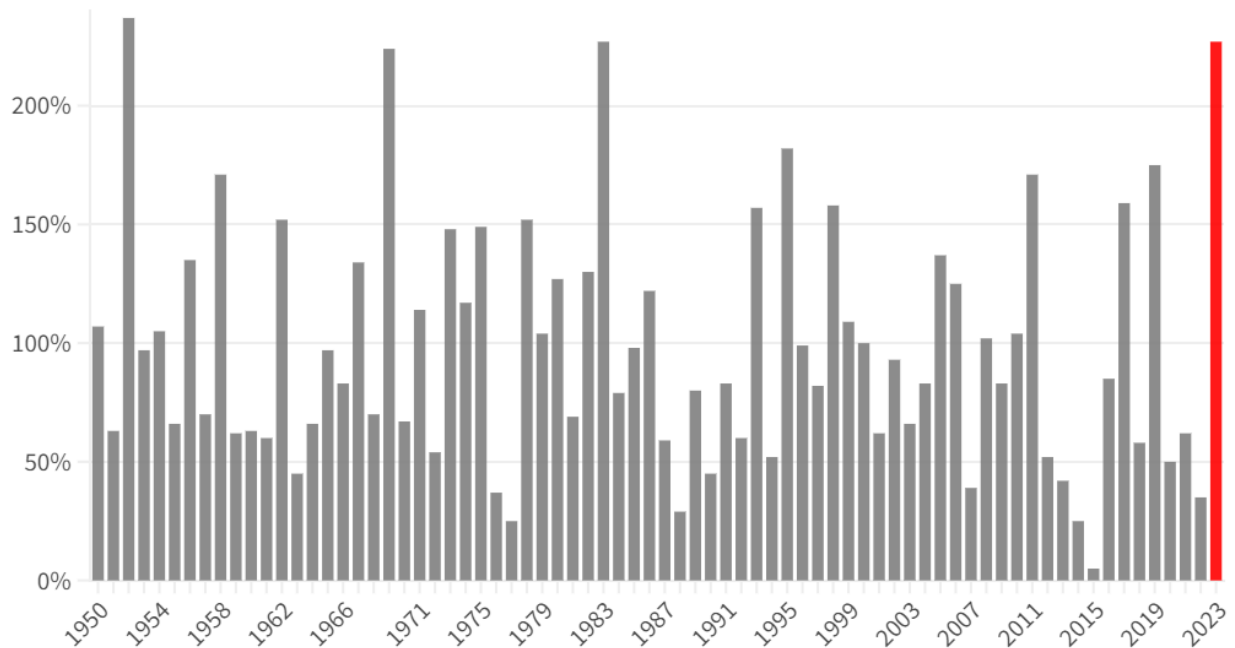
Cristian Nunez shovels a snowbank at a motel as snow continues to fall in the Sierra Nevada mountains in the wake of an atmospheric river event on March 11, 2023 in Mammoth Lakes, California. The eastern Sierra Nevada currently is holding 243 percent of its regular snowpack for this time of the year. (Photo by Mario Tama/Getty Images)

Call it the Greatest Snow on Earth. Well, at least the largest ever recorded in the state of California.

As yet another atmospheric river speeds toward the Golden State, threatening to deliver several inches of rain to the Bay Area and several new feet of snow to portions of the Sierra by Wednesday evening, the Sierra snowpack is on track to top 1952 as the snowiest season on record.

California snowpack at 70 year high, may soon eclipse record

Several feet of additional snow is expected to blanket the Sierra in the coming days



Source: [California Department of Water Resources](#) • By Scooty Nickerson, Data Journalist with the Bay Area News Group

That's right. The last time California had this much snow at the end of March, Harry Truman was president, gasoline cost 27 cents a gallon, and the film "The Greatest Show on Earth" was No.1 at the box office.

This year, the greatest show in the Golden State has no doubt been the drought-busting series of storms that have pounded us all winter, toppling trees, fueling major river floods along the Central Coast and dumping 60 feet or more of fresh snow on some of the highest peaks of the Sierra. As of Monday, the statewide average snowpack was 227% of normal.

That's already the second highest mark in more than 70 years of records for this time of year, when California measures its snowpack to gauge how much water the state can count on when the snow melts. Typically, the snowpack accounts for one-third of the state's water needs. Only on April 1, 1952, was the snowpack higher, clocking in at 237% of normal.

And the record is now in sight. With up to 4 feet of additional snow forecast in parts of the Sierra by Wednesday and more possible Friday, this year could eclipse the 1952 record.

"It's rad, I mean, I've never seen anything like it in my life," said John Aicono, assistant manager at BlueZone Sports in South Lake Tahoe. He said the snow gear store he manages is as busy as ever. "It's definitely one for the books"

This week's atmospheric river is expected to arrive in the North Bay on Monday night and move to the South Bay by Tuesday morning. The heaviest rain and wind is forecast for late afternoon Tuesday.

For those of you who still haven't finished your cataclysmic California weather Bingo cards, this week may be your chance. In addition to power-line threatening winds, the Bay Area may also get some scattered thunder and lightning, according to Rick Canepa, meteorologist with the National Weather Service in Monterey.

"There may be a few thunderstorms developing ... (and) enough wind to cause problems with saturated soils, tilted trees, trees ready to fall with the wind," Canepa said. "There's potential for additional power outages."

Much of San Jose will get less than an inch of rain in the next 72 hours. Oakland and San Francisco will get up to 1.5 inches of rain, while portions of the North Bay will get 2 or more inches.

And in the Sierra?

"If folks are looking at going up to the mountains, their window is quickly closing," said Scott Rowe, meteorologist with the National Weather Service in Sacramento. Rowe says the current forecast estimates 2 to 4 feet of snow will blanket higher elevations of the Sierra by Wednesday evening.

Later in the week, the Bay Area may get hit by the occasional light rain shower. The Sierra, meanwhile, will get buffeted by yet another significant snow storm Friday evening, bringing up to 18 inches of snowfall to portions of the Northern Sierra.

The bountiful snowpack is great news for Tahoe ski resorts, some of which are expected to stay open past Memorial Day. But state officials warn that when all the snowpack melts, it could cause flooding.

"It's going to be a very long duration snowmelt," said Karla Nemeth, director of the California Department of Water Resources, at a press briefing on Friday. "You just really need to look at 2017, which experienced (flooding) damage to communities and agriculture. Obviously we want to avoid as much of that as possible, but at some point we do realize that there is too much water."

And the rainy season is not over yet. The storm window will likely stay open for at least the next two weeks, according to Canepa.

"At some point it (the series of storms) will slow down and stop," Canepa said, "but it has quite the momentum to it, as we saw this whole winter."

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Drought or no drought? California left pondering after record winter deluge

Severe storms may have filled reservoirs but in the Golden State, a dry spell is 'always lurking in the background'

The Guardian | April 1, 2023 | Maanvi Singh



Lake Oroville, the state's second largest reservoir, has risen from historic lows to 69% full at 900 ft. Composite: Justin Sullivan/Getty Images

Just a few months ago, millions in California were living under mandatory water conservation rules. The driest three years on record had transformed the state, depleted reservoirs and desiccated landscapes.

Then came a deluge. A dozen atmospheric river storms and several “bomb cyclones” have broken levees and buried mountain communities in snow, but they have also delivered a boon. Reservoirs are refilling. Brown hills are blooming once again.

So, is the drought finally over?

The consensus among water experts and climate scientists is – sort of.

The record snowpack and rains have erased the most severe signs of drought in many parts of the state. The US Drought Monitor has reported that only 9% of California is experiencing “severe” or “exceptional” drought conditions this month, down from 55% last fall. But the changes are largely surface-level – literally. Groundwater reserves remain critically low. And the state's farms and cities are still using far more water than is available.

“We’ve had an enormous amount of water in the form of rain and snow,” said Peter Gleick, a hydrologist and co-founder of the Pacific Institute in Oakland. “So in that way, the way most people think about this problem, the drought is clearly over ... But California’s water problems are not over.”

Caitlin Peterson, associate director and research fellow at the PPIC Water Policy Center, agrees. “For me, these rains, if anything, feel like a temporary relief,” she said. “The drought is always kind of lurking in the background.”

Even California’s governor, Gavin Newsom, was torn. “Are we out of the drought?” he said at a recent news conference. “Mostly but not completely.” Newsom last week rolled back some of the state’s most severe drought restrictions, but stopped short of lifting the drought emergency he had declared last year.



Above: Drought-shrunk Horseshoe Lake, near Mammoth Lakes, California as seen on 28 July 2022. Right: Snow seen in higher elevations on 27 March 2023 near Mammoth Lakes, California. Photograph: David McNew/Getty Images



“In California, the drought is not tied any more to how much precipitation we get,” said J Pablo Ortiz-Partida, a senior water and climate scientist for the Union of Concerned Scientists. “For many communities, there has always been a drought.”

Decades of water mismanagement have drained California's groundwater aquifers, which have supplied 60% of the state's water during drought years. A recent study found that groundwater depletion has been accelerating in recent years, and estimated that groundwater in the Central Valley shrunk by about 36m acre-feet since 2003. That's greater than the total capacity of Lake Mead, the biggest US surface reservoir.

The state's groundwater has declined so much that in parts of the agricultural Central Valley, where water is pumped to irrigate vast fields as well as cities and towns, the ground has been sinking by about 1ft every year. As water levels drop, layers of soil and clay are collapsing and compacting down as well.

The rains this winter will replenish underground water reserves to some extent. "But one really good water year like this year isn't going to be enough to fill up the massive groundwater reservoirs that we've overdrafted for decades," Gleick said.

Even during wet years, California's farms pump more groundwater than is ever replenished, while rural communities across the state suffer from chronic shortfalls.

Thousands of households in California have been living without potable water for years. As megafarms overpump groundwater, many small communities in the state's rural, agricultural regions are left without potable water for their homes. Almost 1,500 wells were tapped out last year, and despite the deluge, more than 120 dry wells were reported to the state this year.

"In California, the drought is not tied any more to how much precipitation we get"
J Pablo Ortiz-Partida

At the moment, nearly one million Californians are affected by failing water systems, according to the state auditor. Low-income communities made up of mostly Latino and Black residents are most affected.

Some towns have had to get their drinking water trucked in, at great expense. Others, like the historically Black town of Allensworth – the first that was founded, financed and governed by African Americans – were deliberately denied access to ground and surface water.

"For me the drought is not going to be over until all Californians can access their human right to water," Ortiz-Partida said. "How can we start talking about having enough water this year, if so many people in California don't have any?"

And although many parts of California have seen a reprieve after several punishing years of water restrictions, the rains have not fallen evenly. Parts of northern California and much of the south-west have remained relatively dry.

Deep water deficits are also affecting cities and farms that draw water from the Colorado River's reservoirs, which have been depleted by a two-decade-long "megadrought" in the south-west that scientists have classified as the worst in 1,200 years. About 40 million people – almost half of whom live in California – draw from the Colorado river, and seven US states are currently negotiating

cutbacks. Northern California's Klamath basin has also remained relatively dry this year, and Trinity Lake, the largest reservoir in that region, remains far below its historic level.

Even in regions that have seen lots of rain and snow, that may do little to revive ecosystems ravaged by years of drought, especially given that many aquatic species are still competing with people for water supplies. This year, California has cancelled the salmon fishing season altogether after Chinook salmon were decimated by extreme heatwaves and low water levels last year. And while this year's rains will probably help, "evolving ocean conditions and ongoing climate disruptions" will have lasting effects on the species, and the ecosystems built around them, the state fish and wildlife service said.

Another dry spell could follow. Although California has always swung from wet to dry, the climate crisis is expected to fuel more intense droughts and floods, more extreme climate whiplash.

And determining when a drought begins and ends is subjective. Before this winter, heavy precipitation in 2017 ended a dry period between 2012 and 2016. But across a 15-year timescale, only three years – 2011, 2017 and 2019 have been wet – so some water experts consider California to have been in a period of extended drought that entire time.

"There really is no agreed upon definition of drought," said Gleick. "Sometimes it's, it's a hydrologic drought – referring to how much water is available to nature. Sometimes it's a meteorological drought – related to how much rain and snow we get. And sometimes it's a political drought."

But California's water issues run deep. "I'd describe a drought as when we don't have as much water to do all of the things that we want," he added. "And in California I'm afraid that problem has not gone away."

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California Lifts Water Restrictions, Amid Exceptionally Wet Winter

KQED | March 24, 2023 | Alastair Bland



The City of Los Angeles Department of Water and Power Los Angeles Aquaduct south of Owens Lake in the Owens Valley on Wednesday, March 22, 2023 in Olancho. Water flow from the Eastern Sierras flooded the area damaging the aquaduct causing it to breach. (Gary Coronado/Los Angeles Times via Getty Images)

With the Sierra Nevada smothered in snow, large swaths of the Central Valley flooded and many Californians weary of water, state officials announced today that they are lifting some drought-related provisions on water use.

“Our water supply conditions have improved markedly,” said Wade Crowfoot, secretary of the California Natural Resources Agency.

The state is rescinding its request for voluntary 15% water conservation statewide, which was issued in July 2021 and instead, Crowfoot said, shifting to an approach of making conservation a “way of life.”

“We need to maintain our vigilance,” he said. “It’s not about going back to normal anymore. It’s really adjusting to a new normal.”

Some of the state's emergency provisions were ended and some were left in place. Wasteful uses of water, such as hosing down sidewalks and watering ornamental grass on commercial property, remain banned, according to state officials.

The state, however, is ending its requirement that local water agencies implement Level 2 drought contingency plans, which are locally written water use regulations — such as limits on watering lawns — that are invoked during water shortages.

In total, 81 drought-related provisions were enacted since April 2021. Just 33 remain in place, said Gov. Gavin Newsom at a press briefing today.

State officials also announced today a large increase in the amounts of water that local suppliers will get from the State Water Project, increasing from 35% announced last month to 75% of requested supplies. The water is provided to 750,000 acres of farmland and 27 million people, mostly in Southern California.

The announcements come as some of the state's reservoirs near capacity, with some of the state's largest expected to fill by late spring. And the snowpack of the Sierra Nevada, nearing record levels in the southern portion of the range, continues to grow.

When Newsom issued his voluntary conservation target almost two years ago, many water experts said he should have made it mandatory, as former Gov. Jerry Brown did during the previous drought. They also criticized him for failing to reduce use by farmers, who consume 80% of the state's delivered water supply.

State officials say even though the 15% target was voluntary, it worked. However, the data does not back that up: Californians used 6% less water from July 2021 through December 2022 compared to 2020 — falling far short of Newsom's 15% goal.

'The reality is we don't have water to waste in California. We need to continue investing in water efficiency to prepare for a hotter, drier future and more intense droughts.'
Heather Cooley, director of research, Pacific Institute

In spite of wet weather, the state's largest water supply — its groundwater basins — remain depleted.

“Even though reservoirs are recovering, groundwater aquifers remain depleted. The Colorado River — a major water source for Southern California — is also facing a massive deficit,” Cooley said. “The reality is we don't have water to waste in California. We need to continue investing in water efficiency to prepare for a hotter, drier future and more intense droughts.”

Mike McNutt, spokesperson for the Las Virgenes Municipal Water District in Los Angeles County, said the retraction of the conservation target “sends the wrong message” to the public.

“Why put out messaging that says something different, that says, ‘You can conserve if you want to, but you don’t need to?’” said McNutt, whose district serving 75,000 people is totally reliant on water from the state aqueduct.

“The next drought is certainly just around the corner,” he added.

Californians did cut their average water use by 600,000 acre-feet in almost two years. That’s almost two-thirds the volume of Folsom Reservoir and enough water to serve 1.2 million households in a year.

‘We need to maintain our vigilance. It’s not about going back to normal anymore. It’s really adjusting to a new normal.’

Wade Crowfoot, secretary, California Natural Resources Agency

Crowfoot stressed that the drought is not over, noting that drought status “is not a completely binary situation.” In some parts of the state, drought conditions have dramatically eased, but not in others. Crowfoot said the Klamath River basin and the region of Southern California that relies on Colorado River water continue to face “acute water shortages.”

Thousands of households lack drinking water due to depleted groundwater basins, which have been overdrafted for decades, and experts agree they will not rebound in a single rainy winter.

Joaquin Esquivel, chair of the State Water Resources Control Board, said the hope is that cities “are not just rebounding” to old ways of water use.

“Conservation remains a priority,” Crowfoot agreed.

Michael Anderson, climatologist with the California Department of Water Resources, said snowpack is at 278% of normal, with another storm system expected to hit the North Coast and move inland and south from there starting Monday. The system, he said, will deliver a relatively cold storm originating in the Gulf of Alaska, unlike some recent blasts of tropical moisture. This means it will drop more snow in the mountains.

“Not massive accumulations, but could be locally heavy,” he said.

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California Eases Water Restrictions, But Drought Isn't Over

NBC Bay Area | March 24, 2023 | Adam Beam

California Gov. Gavin Newsom ended some of the state's water restrictions on Friday because a winter of relentless rain and snow has replenished the state's reservoirs and eased fears of a shortage after three years of severe drought.

Newsom was careful not to declare the drought to be over, noting water shortages remain in the Klamath River basin along the California-Oregon line and in densely populated Southern California, which relies heavily on the struggling Colorado River system to supply millions of people.

But Newsom did say he would stop asking people to voluntarily cut their water use by 15%, a request he first made nearly two years ago while standing at the edge of a nearly dry Lopez Lake in the state's Central Coast region — a lake that today is so full from recent storms it is almost spilling over.

"None of us could have imagined ... a few months ago that we'd be where we are today," Newsom said Friday from a farm northwest of Sacramento that has flooded some of its fields with excess water so it will seep underground and refill groundwater basins. "Are we out of the drought? Mostly — but not completely."

Newsom's call for voluntary conservation had mixed results. Californians did reduce their water use, but only by 6.2% overall, according to data from the State Water Resources Control Board. Newsom never ordered statewide, mandatory water restrictions — but he did require water agencies to impose some limits on their customers.

Friday, Newsom said he was easing those rules. That change will impact people in different ways depending on where they live. For most people, it means they won't be limited to watering their lawns on only certain days of the week or at certain times of the day. Other restrictions will remain in place indefinitely, including a ban on watering decorative grass for businesses.

"We've got to conserve as a way of life," Newsom said.

Newsom could ease some restrictions in part because California's reservoirs are now so full that cities will get more than double the amount of drinking water this year compared to a previous allocation announced last month. Now, water districts that serve 27 million people will get at least 75% of the water they requested from state supplies. Last year, they only got 5% as California endured three of the driest years ever since modern recordkeeping began in 1896.

"This wet winter, which has led to a large increase in our (water) allocation, is not a signal that we can relax," said Adel Hagekhalil, general manager of the Metropolitan Water District of Southern California that supplies water to 19 million people. "It is an alarm to act and accelerate

our efforts to respond to rapidly changing conditions, including conservation, storage, recycling and reuse.”

Last week the district ended mandatory drought restrictions for about 7 million people who rely almost exclusively on state supplies for their water.

California and the western United States have been in an extended drought for about two decades, a period of abnormal dryness punctuated by occasional intense seasons of storms. It would be tough for a governor “of a large, diverse state that has very diverse water supplies and water demands” to say when a drought has started or ended, said Jay Lund, vice director for the Center for Watershed Sciences at the University of California, Davis.

Lund said the drought is over from many perspectives in California, including urban water supply and reservoirs. But it's not over for the state's fragile ecosystems and the groundwater aquifers that were depleted during recent drought years.

“We might never recover them completely,” he said.

Three years of little rain or snow in California had depleted reservoirs to the point the state couldn't generate electricity from hydroelectric power plants. It dried up wells in rural areas and state officials had to truck in water supplies for some communities. And it reduced the flow of the state's major rivers and streams, killing off endangered fish and other species.

But since December, no less than 12 powerful storms have hit California, packing so much rain and snow that meteorologists call them “atmospheric rivers.” These storms have flooded homes, closed ski resorts and trapped people in mountain communities for days with no electricity, prompting emergency declarations from President Joe Biden.

“That kind of whiplash is something that we’ve experienced in a very intense way in California that I think is unique across the western U.S.,” said Karla Nemeth, director of the California Department of Water Resources.

Water has been steadily pouring into the state's reservoirs since December. Of California's 17 major reservoirs, 12 of them are either at or above their historical averages for this time of year.

And more water is coming. Statewide, the amount of snow piled up in the mountains is already 223% above the April 1 average — the date when the snowpack is typically at its peak. Most of that snow will melt in the coming months, flowing into reservoirs and posing more flooding threats downstream.

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THIS JUST IN ... Reclamation increases Central Valley Project 2023 water supply allocations

Maven Breaking News | March 28, 2023 | From the Bureau of Reclamation

South of Delta ag boosted to 80%

Today, the Bureau of Reclamation announced an increase in Central Valley Project 2023 water supply allocations. After below average precipitation in February, Reclamation announced a conservative initial water supply allocation for the CVP on Feb. 22. Additional atmospheric river systems have since boosted hydrological conditions and storage volumes, allowing for a more robust water supply allocation.

Since making initial allocations last month, Shasta Reservoir, the cornerstone of the Central Valley Project, has increased from 59% to 81%, and San Luis Reservoir, the largest reservoir south-of-Delta, from 64% to 97%. Record-breaking snowpack conditions currently exist in the Southern Sierra coupled with significant snowpack in the Central Sierra and Northern Sierra/Trinity.

Based on current hydrology and forecasting, Reclamation is announcing the following increases to CVP water supply allocations:

North-of-Delta Contractors

- Irrigation water service and repayment contractors north-of-Delta are increased to 80% from 35% of their contract total.
- Municipal and industrial water service and repayment contractors north-of-Delta are increased to 100% from 75% of their historic use.

South-of-Delta Contractors

- Irrigation water service and repayment contractors south-of-Delta are increased to 80% from 35% of their contract total.
- M&I water service and repayment contractors south-of-Delta are increased to 100% from 75% of their historical use.

Friant Division Contractors

- Friant Division contractors' water supply is delivered from Millerton Reservoir on the upper San Joaquin River and categorized by Class 1 and Class 2. The first 800,000 acre-feet of available water supply is considered Class 1; Class 2 is considered the next amount of available water supply up to 1.4 million acre-feet. Class 1 remains at 100% and Class 2 was previously increased from 20% to 70% on March 7.

Friant Dam is currently being operated for flood control purposes; as long as these conditions exist contractors are able to take delivery of all available water from Friant Dam to the maximum extent of their respective contracts.

All other CVP water supply allocations remain the same as noted in the Feb. 22 announcement.

As the water year progresses, changes in hydrology, actions that impact operations, and opportunities to deliver additional water will influence future allocations. Reclamation will continue to monitor hydrology and may adjust basin-specific allocations if conditions warrant an update. Water supply updates and past year's allocations are posted on Reclamation California-Great Basin Region's website.

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THIS JUST IN ... Harnessing Series of Winter Storms, California Increases State Water Project Allocation to 75%

Maven Breaking News | March 24, 2023

From the Department of Water Resources:

The Department of Water Resources (DWR) today announced a significant boost in the forecasted [State Water Project](#) (SWP) deliveries this year due to continued winter storms in March and a massive Sierra snowpack. DWR now expects to deliver 75 percent of requested water supplies, up from 35 percent announced in February. The increase translates to an additional 1.7 million acre-feet of water for the 29 public water agencies that serve 27 million Californians.

Consistent storms in late February and March have built up the [Sierra snowpack](#) to more than double the amount that California typically sees this time of year. Rainfall has also allowed for robust flows through the system, providing adequate water supply for the environment and endangered fish species while allowing the SWP to pump the maximum amount of water allowed under state and federal permits into reservoir storage south of the Sacramento-San Joaquin Delta.

“California continues to experience weather whiplash, going from extreme drought to at least 19 [atmospheric rivers](#) since late December. It really demonstrates that in times of plenty, we need to move as much water into storage as is feasible,” said DWR Director Karla Nemeth. “We’ve been able to manage the system to the benefit of communities, agriculture and the environment. It’s certainly been a welcome improvement following the three driest years on record for California.”

Taking advantage of the extreme high flows in the system, the SWP is making additional water available to any contractor that has the ability to store the water in its own system, including through [groundwater recharge](#). Formally known as Article 21 water, this water does not count toward formal SWP allocation amounts.

The SWP typically evaluates the allocation forecasts monthly using the latest snow survey data, reservoir storage and spring runoff forecasts. The 75 percent forecasted allocation announced today takes into account that data from March. Further adjustments to the forecasted allocation are likely following the milestone April snow survey measurements. April 1 is traditionally when California’s snowpack peaks and starts to melt. DWR is planning to host its April snow survey on Monday, April 3, at Phillips Station, weather conditions permitting.

DWR now expects San Luis Reservoir in Merced County to end the wet season at capacity. Lake Oroville, the [State Water Project](#)’s largest reservoir, is at 119 percent of average for this time of year and currently releasing water through the Oroville Spillway to reduce flood risk for downstream communities in anticipation of the spring snowmelt. The SWP will continue to optimize water storage in Lake Oroville to support environmental needs in the summer and allow for carryover storage for next year if dry conditions return.

Preparing California for extreme weather swings will require the rehabilitation and modernization of SWP infrastructure. As the backbone of water supply delivery, California must address subsidence along the California Aqueduct in the Central Valley and advance the [Delta Conveyance Project](#) so that the state can move as much water as possible during high flow events.

While California's surface water conditions have greatly improved this year following three years of historic drought, several water supply challenges remain in parts of the state.

The Colorado River Basin, which is a critical water supply source for Southern California, is still in the midst of a 23-year drought. Millions of Californians also rely on groundwater supplies as a sole source of water, and the state's groundwater basins will be slow to recover following the extreme drought. Californians should continue to use water wisely to help the state adapt to a hotter, drier future.

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VA Agreement Highlights Habitat Questions

Estuary News | March 2023 | Cariad Hayes Thronson



Restoring marsh and wetland habitat can have significant benefits for dozens of species throughout the Bay and Delta—that’s beyond dispute. But when it comes to saving the Estuary’s most imperiled fish, how much habitat improvements can help in the absence of dramatically increased freshwater flows is a question that has dogged and divided scientists and policy makers for years. As the State Water Resources Control Board considers the latest proposal from the State and water agencies for a flows agreement that would restore thousands of riparian and wetland acres—while dedicating less water to the environment than proposed under an alternative regulatory framework—critics argue that science doesn’t support its underlying assumptions. The debate highlights how much there still is to learn about what restoration efforts can and cannot do for the Delta’s ravaged ecosystem.

In January the State Board released the Draft Scientific Basis Report analyzing a voluntary agreement (VA) on freshwater flows into and through the Delta from the Sacramento and Mokelumne Rivers that was proposed by a group of water districts and state and federal resource agencies last spring. The Board is considering adopting the agreement as a pathway to implementing its long-delayed update to the Bay-Delta Plan Water Quality Control Plan. The new report supplements a 2017 Scientific Basis Report supporting Board staff recommendations for minimum unimpaired flows to protect native fish and wildlife.

The proposed agreement outlines an eight-year program that proponents say would add up to 825,000 acre-feet of freshwater flows for the environment annually and restore more than 27,000 acres of spawning, rearing, and floodplain habitat to reverse the decline of salmon and other native fish populations. Twenty-thousand acres of that habitat would consist of restored and reconnected floodplain in the Sacramento River. (See Setbacks and Swallows.)

The new science basis report finds that the proposed flows would benefit longfin smelt, Sacramento splittail, starry flounder, and California bay shrimp, among other species. “The results show that we would see an improvement in abundance indices for some Delta species related to flow measures,” says Department of Water Resources lead scientist Louise Conrad. The report does not, however, measure the effect of the proposed flows on salmon or steelhead abundance.

Sacramento River flows after January 2023 storms. Photo: Kenneth James, DWR

Floodwaters from recent winter storms spike flows on the Sacramento River. Photo: Ken James, DWR

The proposed flow regimes aren’t nearly large enough to protect endangered species and fisheries, critics say.

For starters, the amount of water the VA would actually provide depends on the baseline used. Critics say the 825,000 acre-feet number is misleading, since it uses a baseline that includes the flows required under discredited 2019 Biological Opinions for endangered fish that dramatically increased permissible water exports. (California sued the federal government to invalidate those BiOps on the grounds that they did not protect fish, and in 2021 the Bureau of Reclamation launched a process that will lead to new BiOps, probably by 2024.) The new science basis report notes that the VA baseline “does not fully reflect the Delta outflow conditions of the environmental baseline” used in the 2017 science basis report, and adjusts its analysis accordingly. Using this “apples to apples” approach, a chart included in the report indicates that the VA would provide much less than 825,000 af in all year types—although the report does not spell that out, leaving the reader to compare flows using different baselines and do the math.

And whatever the baseline, critics also like to point to the State Board’s own 2018 framework for the Sacramento River, which called for 45% to 65% of unimpaired flows from the river and its tributaries into and through the Delta—much more than 825,000 acre-feet.

Critics are not entirely convinced, either, that more habitat necessarily means more fish, an assumption upon which the voluntary agreement rests.

“They’re trading habitat for flow, but this doesn’t have a basis in science,” says San Francisco Baykeeper science director Jon Rosenfield.

Jennifer Pierre, general manager for the State Water Contractors, who helped negotiate the voluntary agreement, rejects the premise that it trades water for habitat. “We are certainly combining habitat and water, but it’s a huge amount of water,” she says.

Finding the balance of habitat and water needed for a healthy ecosystem is the holy grail of restoration in the Estuary. The Bay-Delta Plan calls for doubling wild salmon populations relative to

the 1967 to 1991 average; the VA's target is to restore 25% of the habitat needed to meet that goal by the end of its eight-year term. The draft science basis report evaluated the effect of the agreement on spawning and rearing habitat in the American, Feather, Mokelumne, Sacramento, and Yuba river watersheds and concluded that although habitat would increase under the VA, the program would not meet its target for rearing habitat in three of the five watersheds. Spawning habitat would meet the target in all the watersheds whether the VA is implemented or not. (The Mokelumne watershed already exceeds 100% for both types of habitat.)

Underlying the VA proposal is the assumption that physical habitat in the Delta is a limiting factor for salmonid populations. However, says BayKeeper's Rosenfield, "We have research that shows that at current levels of flow, and current levels of returning adults, the habitat we already have in the Delta is not limiting. It's not occupied in most years, so creating more of this habitat is not expected to do anything."

Another hypothesis built into the voluntary agreement proposal is that restoring tidal marsh will benefit native fish by exporting zooplankton like copepods, small crustaceans that are a mainstay of fish diets, throughout the Estuary. But, in keeping with previous research addressing this question, a 2022 study led by San Francisco State University biologist Rowan Yelton found that a restored tidal marsh in the Delta did not provide a net delivery of copepods to a nearby channel. "The idea that tidal wetlands export copepods to adjacent areas is not supported," wrote Yelton and his co-authors. "No study yet has found a persistent export of zooplankton from wetlands to open water in the San Francisco Estuary or, as far as we know, anywhere else."

DWR's Conrad notes that even if they don't export zooplankton, shallow-water habitats like wetlands and floodplains are "more likely to be productive of other types of fish food, such as drift invertebrates." This also benefits native fishes, she says.

A different multi-year study published in 2017 by Department of Water Resources environmental scientist Lynn Takata found that Chinook salmon raised on floodplains had an increased growth rate. However, there was no evidence that restoring floodplains would boost salmon populations. "Despite the known growth advantages of floodplain rearing, we did not detect significant differences in survival to the ocean fishery between releases in the Yolo Bypass and the Sacramento River," wrote Takata and her co-authors.

"Failure to find evidence is not the same as disproving a hypothesis," Rosenfield allows. "But if we're banking an entire program on less flow, we'd better know that more habitat works and we don't have that." In contrast, he continues, "we know flow works."

But survival isn't the whole story, says Conrad. "Life history diversity is a key factor for population viability of salmon, and it is related to habitat diversity. When you have increased diversity of habitats, you build resilience into the population," she says. "I think that we are on very firm ground to say that by restoring access to floodplains we are supporting outmigration to occur in a way that [gives fish] more options, so that it's not a simple firehose," pushing fish out through the Estuary to the sea.

Everyone seems to agree that flows and habitat improvements need to go hand in hand for ecosystem restoration to succeed. "It's not enough to have flow without habitat. It's also not enough to

have habitat without flow,” says Conrad. “The voluntary agreement proposal as a package is trying to meet both of those needs.”

The sticking point is whether the VA will provide enough water to make habitat restoration successful.

“You need to put flow down the river to make restoration work,” says Julie Zimmerman, who directs The Nature Conservancy’s Science for Water Program in California. Habitat and flows work hand in hand, she says, adding that one issue is how the VA defines habitat. “They’re defining habitat as simply depths and velocity of water, and it’s more than that. When you create habitat with flow, there’s a lot more going on,” she says, citing the effects of flows on temperature, gravel flushing, and sediment deposit. “We need to start with these functional flows and then shape the habitat to support them. With the voluntary agreements, there’s not enough water to do this.”

The scale of the habitat improvements in the VA are also a concern, says Zimmerman. “The basic river ecology concept is that flow is the master variable of a river,” she says. “If you put flow down a river, you’re affecting all these different ecosystem processes, and you’re doing it everywhere. [But] when you go out with a bulldozer and you create habitat, you’re [mainly affecting] this one little parcel in one place in the system. Even if habitat was limiting, the scale of it relative to the whole river isn’t enough to change the trajectory of a population.”



The Dutch Slough tidal marsh restoration project site, pictured here in 2021, is restoring 1,187 acres into a tidal marsh to provide habitat for salmon and other native fish and wildlife. Photo: Jonathan Wong, DWR

The water contractors' Pierre believes that implementation of the voluntary agreement may provide for new scientific insights. "I'm hoping that this is enough of a resource for us to really start to test some of our hypotheses, to understand what are the effects of restoration on its own, as well as the effect of restoration combined with targeted flows," she says.

Jeffrey Mount, a Public Policy Institute of California geomorphologist specializing in rivers and wetlands, also says the science supporting the voluntary agreement proposal is lacking. But, in the face of tremendous pushback on environmental flows from water users, he supports the concept of a collaborative approach that integrates flows and habitat. "We think voluntary agreements are the way to go," he says. "Just more water for fish is not enough. The only way to manage risk is to take risks—you can't set rigid flow standards that won't make anyone happy; you need to manage them as a package with physical habitat."

The science basis report concluded that the combination of flows and habitat restoration proposed in the VA "is expected to improve conditions for salmonids and other estuarine species," while noting that the "actual outcomes...are not certain at this time," due to "uncertainty arising from assumptions and simplifications." The Board held a public workshop on the draft on January 19. Staff are now reviewing comments and revising the draft, which will undergo independent peer review before becoming final.

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