Crescenta Valley Water District

Weekly News Articles

January 15, 2023

Fox News

January 13, 2023

Why atmospheric rivers could become more frequent as world transitions out of La Nina

Climatologists believe there is a high chance that neutral conditions will be in control during the spring as the Pacific Ocean transitions out of La Niña and tries to head towards an El Niño. Signs, like the continual atmospheric rivers in California, point to an exit out of La Niña.

The meaning of El Nino and La Nina

The status of whether the world is being impacted by an El Nino or a La Nina is determined by water temperatures in the central and eastern Pacific. (NOAA)

As critical areas of the Pacific Ocean warm and the world marches out of a La Niña towards neutral status, North America might be in store for changes in weather patterns not seen in several years.

A rare triple-dip La Niña has been in place since 2020 and was one of the main driving forces behind megadroughts, severe weather outbreaks and hurricanes.

Signs are pointing to a quickly approaching shift that the National Oceanic and Atmospheric Administration believes will arrive during the spring. In fact, the Climate Prediction Center said there is an 82 percent chance that the El Niño-Southern Oscillation index will reach neutral status during either March, April or May, with a 50 percent chance that El Niño could become dominant by late summer or early fall.

END OF TRIPLE-DIP LA NINA IN SIGHT: WHAT IT COULD MEAN FOR SPRING SEVERE WEATHER SEASON

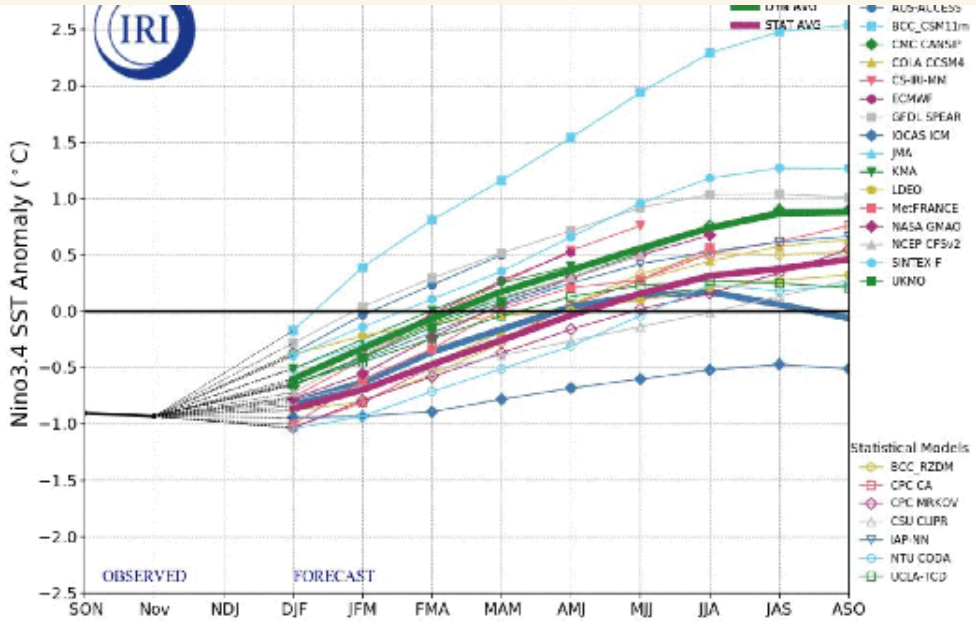


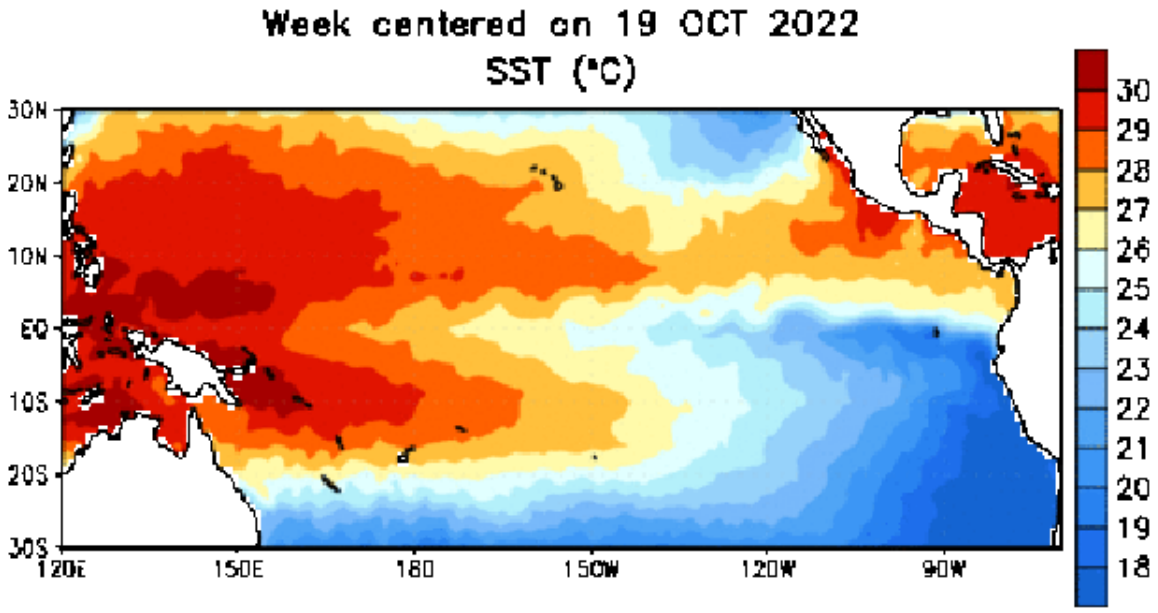
Figure 6. Forecasts of sea surface temperature (SST) anomalies for the Niño 3.4 region (5°N-5°S, 120°W-170°W). Figure updated 19 December 2022 by the International Research

"We are still more than 6 months away, and the probabilities for neutral+La Niña are still pretty close to even with El Niño. Also, since ENSO is a seasonal pattern, we need to be able to expect that El Niño's characteristic warmer-than-average tropical Pacific would be present for more than one or two months in a row. We don't have strong physical signs right now, either, like a large amount of warmer-than-average water looming under the surface, and the Walker circulation is still amped up. Stay tuned, for sure—but for the moment, we are not issuing an El Niño Watch," Emily Becker, an atmospheric scientist at NOAA, posted in a recent blog update.

CALIFORNIA SCENES SHOW DEVASTATION FROM FLOODING, SINKHOLES AMID BARRAGE OF ATMOSPHERIC RIVERS

Meteorologists will be closely watching ocean temperatures in the central and eastern Pacific to determine when the La Niña ends and the next phase begins.

Once water temperature anomalies reach between -0.5 °C and 0.5 °C for an extended time period, the world will wave goodbye to La Niña and officially be in a neutral stage.



The stage is vital in determining available moisture and locations of jet streams, which critically influence weather patterns across North America.

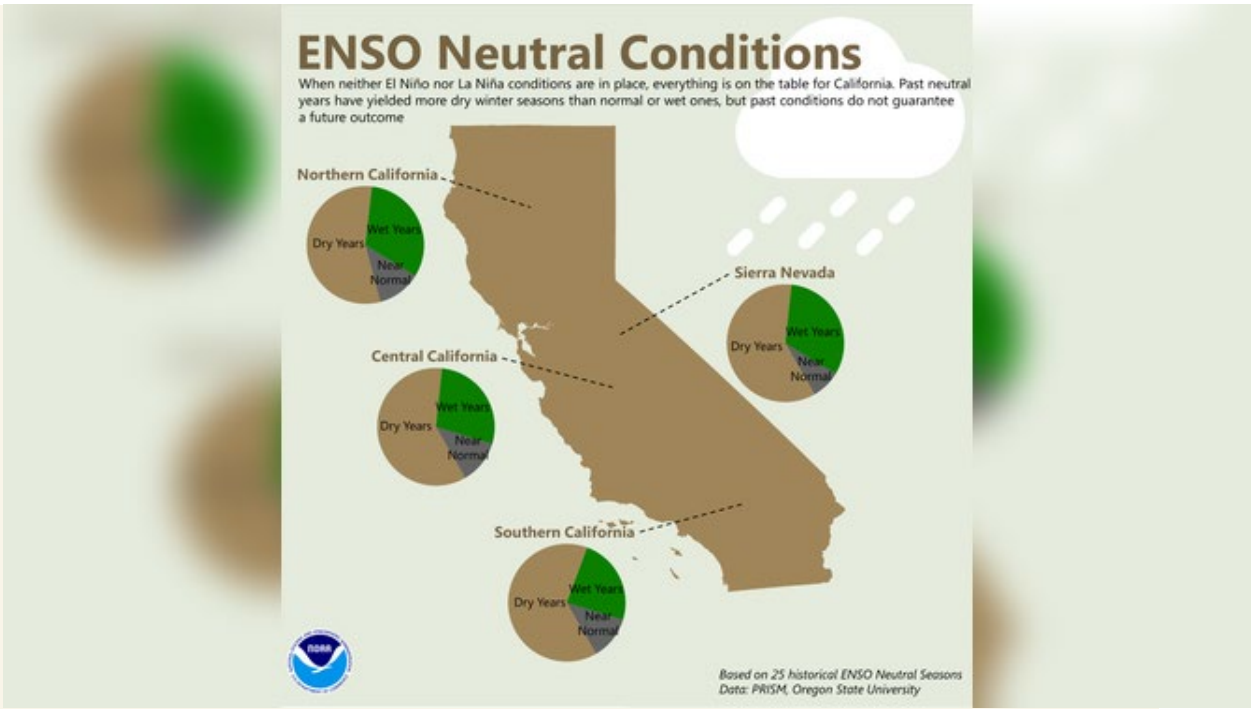
Signs point to an exit out of La Niña is underway

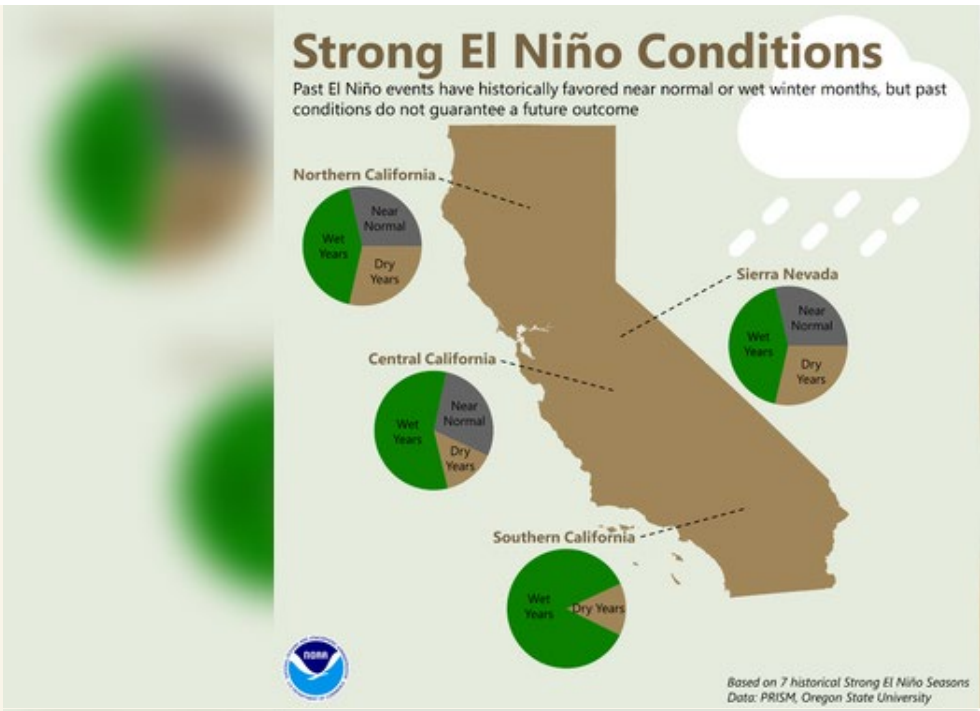
During a neutral or even El Niño stage, experts say the West Coast typically fairs better with rainfall, with areas in the heartland typically picking up less.

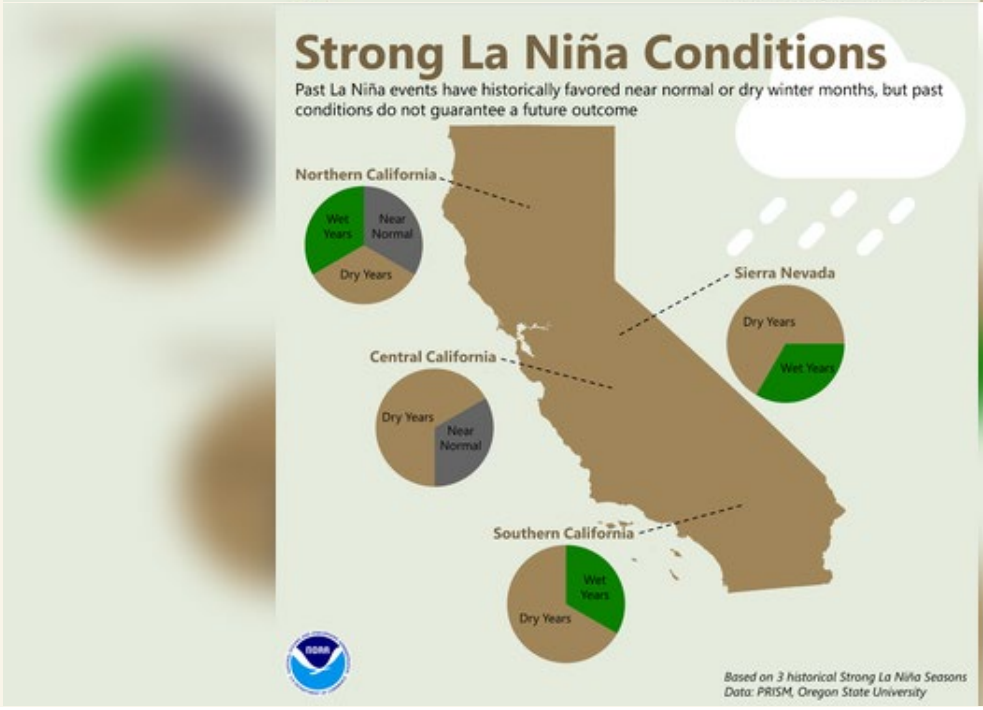
With a coastline of around 800 miles, California is typically hard to miss with atmospheric river events and bomb cyclones. Both can produce substantial amounts of valley rain and mountain snow in a short time period -- similar to what millions of residents have experienced to start the new year.

NOAA says it is important to monitor the northern and central parts of the Golden State because it is here where the region's major reservoirs reside.

An increase in rain and snow can not only be beneficial for vegetation but also help restore water supplies that are important for both commercial and residential uses.



- 

- 

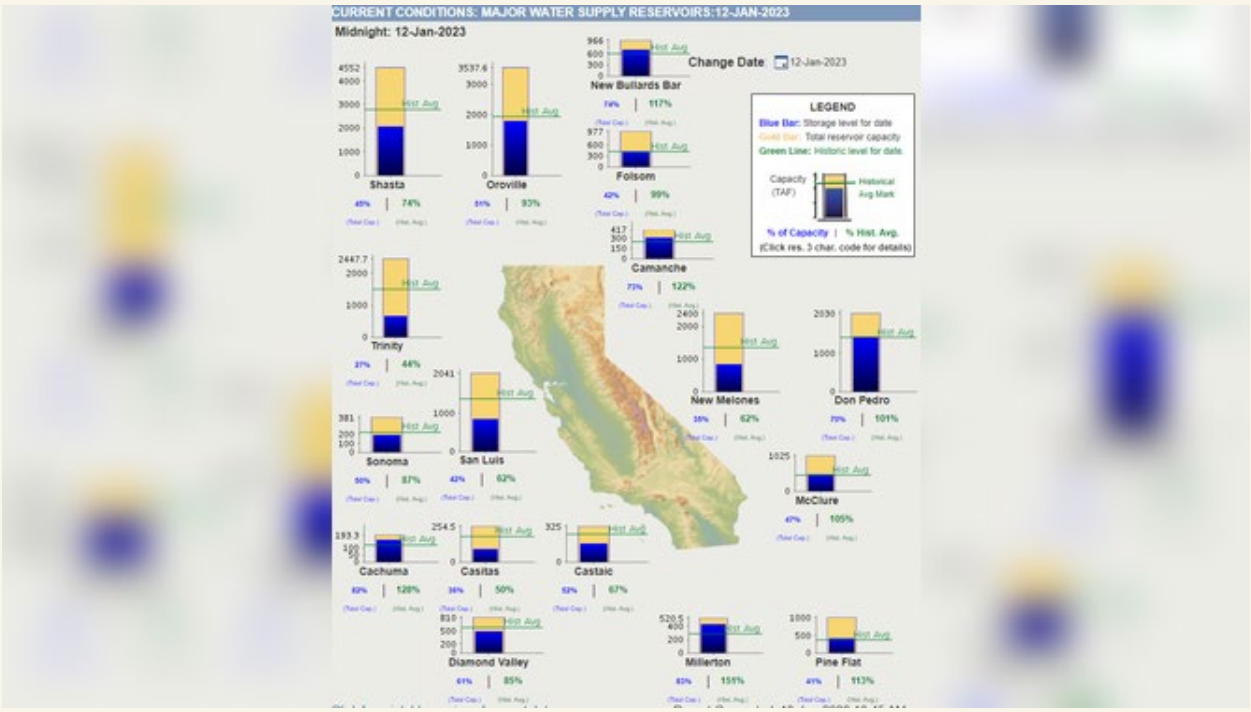
WHAT ARE EL NINO AND LA NINA CLIMATE PATTERNS?

As of mid-January, only around 30 percent of significant reservoirs had water levels above their average, despite historic rainfall.

What climatologists and meteorologists agree is that it will take much more rain to end the megadrought and restore critical waterways.

According to the U.S. Drought Monitor, the entire state is still experiencing drought conditions, but the severity has been reduced in several communities.

Areas suffering from severe or extreme drought are now faced with more moderate levels, which could be wiped away if rains keep coming.



Meteorologists caution that past global weather patterns do not guarantee a future outcome, and each El Niño, La El Niña and neutral event is unique.

7 FACTS TO KNOW ABOUT HURRICANES

As the calendar ticks deeper into 2023, forecasters will be paying close attention to the ENSO status to make predictions about the upcoming hurricane season.

Experts were caught off guard by the amount of inactivity in 2022 and are hoping to rebound with higher accuracy for 2023's season predictions.

The hurricane season is slated to begin on June 1, with major outlooks expected to be released starting in April.

https://www.foxweather.com/weather-news/tracking-la-nina-status-pacific-weather-patterns

DWR

January 13, 2023

State Agencies Fast-track Groundwater Recharge Pilot Project to Capture Flood Waters for Underground Storage

An aerial view of agricultural fields covered with water in Butte County.

SACRAMENTO, Calif. – The Department of Water Resources (DWR) is partnering with the State Water Resources Control Board to fast-track efforts to capture flood waters to recharge groundwater basins. Water captured during extreme wet periods such as the one California is now experiencing will be stored in groundwater basins for use during dry periods.

Governor Newsom's "California Water Supply Strategy, Adapting to a Hotter, Drier Future" calls on DWR and the State Water Board to work with local agencies to significantly expand the State's ability to capture water from winter storms and adapt to more extreme weather patterns caused by climate change. DWR and the board are working together to expedite the regulatory steps necessary to store significant rainfall and excess water underground, while still ensuring protections for the environment and other water users as required in State law.

"The State is capturing more water supply by accelerating groundwater recharge permitting and projects that mitigate the impacts of prolonged drought and support long-term sustainable groundwater management," said DWR Director Karla Nemeth. "Projects that capture available precipitation, stormwater, or floodwaters to recharge depleted groundwater basins need to be ready to capture high flows when they are available during each wet season, typically October through April in California."

The State's efforts reached a milestone January 6 when the State Water Board approved a six-month permit that will enable multiple landowners to divert excess flows from Mariposa creek near the City of Merced to recharge a key groundwater basin. The Merced Project permit, the first approved under a new pilot regulatory assistance program, is expected to pave the way for future projects to allow water from wet-weather storms to be captured and diverted. The permit will cover multiple diversions by multiple landowners in a coordinated fashion managed by a groundwater sustainability agency.

The pilot program began in August 2022 with an application from the Merced Irrigation District and the Merced Irrigation-Urban Groundwater Sustainability Agency to divert and store water from the Mariposa creek. The permit application authorizes diversion of up to 10,000 acre-feet of water from the creek during periods of high flows that would otherwise likely flow through the system. The Merced Subbasin is one of 21 basins in the state of California identified as Critically Overdrafted by DWR.

“The review process for these permits is complex and must consider impacts to the environment and existing water rights, including those dependent on specific Delta conditions and state and federal water project requirements,” said State Water Board Chair Joaquin Esquivel. “In acknowledgement of this complexity, we have streamlined the process so we issue them in a timely way and help local agencies succeed in capturing stormwater for recharge and bringing stressed groundwater basins into balance.”

Since 2016, the State Water Board has approved 20 temporary permits. Currently there are five applications pending, with two more projected to be approved next week. The remaining three are going through a public noticing process.

The Merced Project’s permit includes multiple points of diversion. Diversions will be directed to a number of agricultural fields to support groundwater recharge consistent with the Merced Subbasin Groundwater Sustainability Plan. Water diverted for recharge purposes will be applied to working agricultural lands only, and water stored will be accounted for in the upcoming growing season as the first irrigation water to be pumped from the aquifers.

“Merced Irrigation District is excited to partner with DWR supporting GSAs with this crucial pilot project intended to help groundwater basins become sustainable by turning potential flood waters into groundwater recharge opportunities,” said Hicham Eltal, Deputy General Manager, Merced Irrigation District. “The project is intended to show that the subsidence being experienced in part of the Merced Groundwater Basin along the San Joaquin River can be addressed while simultaneously reducing recurring flood events from local creeks tributary to the San Joaquin River. The goal is that this effort paves the way for acquiring temporary permits to divert flood flows by GSAs throughout the State to help groundwater basins reach sustainability.”

As part of the Newsom's Administration water supply strategy, the State is looking to expand groundwater recharge by at least 500,000 acre-feet in potential capacity. By expediting groundwater recharge projects, the State can help local agencies prepare now to take advantage of future heavy precipitation events. Early pilot project efforts, like the Merced Project, will demonstrate the feasibility of capturing available high flows for groundwater recharge while minimizing flood risks, and provide insight to support further streamlining of this process.

Groundwater basins serve as the state's water savings account and are intended to provide a reliable water source when we have less rain and snowmelt. As weather patterns have become more variable and extreme from the effects of climate change, resulting in more frequent and consequential droughts and high flow events, replenishment of depleted groundwater basins is an essential part of California's long-term water resilience and drought mitigation efforts. Significant expansion of groundwater recharge projects such as the Merced Project will be required to support environment, agricultural uses, and ability to withstand future droughts.

https://water.ca.gov/News/News-Releases/2023/Jan-23/State-Agencies-Fast-track-Groundwater-Recharge-Pilot-Project

Newsweek

January 13, 2023

Sinkholes Set to Swallow Chunks of California After Rain and Flooding

California has been hit by heavy rain and flooding since the end of 2022, resulting in the formation of sinkholes in some locations, and with more wet weather ahead for the state, it's possible more could open up.

Sinkholes are gaping holes that form when the ground below the land surface cannot support the material above. They can vary in size from a few feet to hundreds of feet across, and from a few feet to tens of feet deep.

Sinkholes typically form very slowly, to the extent that the change in the ground is barely noticeable. But sometimes the collapse of the ground can happen suddenly.

Heavy rain and flooding can increase the likelihood of these sinkholes forming, as evidenced by the recent weather in California.

The state has been struck by several "atmospheric river" events since late December that dumped huge amounts of rain and snow, causing widespread destruction and the deaths of at least 18 people.

Amid the wet conditions, the formation of a number of sinkholes was reported in the state. One large sinkhole opened up in the middle of a street in the Chatsworth neighborhood of Los Angeles during a day of relentless rain, swallowing two cars in the process, the Associated Press reported. The drivers subsequently had to be rescued by firefighters.

Another damaged more than a dozen homes in the rural community of Orcutt, in Santa Barbara County. And authorities had to close a highway in Half Moon Bay—a small coastal city south of San Francisco—due to the formation of a sinkhole.

But how does this phenomenon occur?

"Sinkholes form in regions where there are many subterranean cavities and the bedrock experiences structural failure," Steve Brenner, a professor in the Department of Geography and Environment at Bar Ilan University, Israel, told *Newsweek*.

This structural failure may occur in so-called "karst" regions where the bedrock consists of soluble rocks, such as limestone.

It may also occur due to human activities where there is a significant withdrawal of groundwater due to extensive development and building or where there are extensive man-made cavities, such as tunnels or mines.

"When these regions are suddenly inundated with massive amounts of water from torrential rainfall or flooding, for example from storms or

from broken water mains, the soil layer above the cavities will become saturated, dissolution of the already fractured bedrock may accelerate, and the significant additional weight above the weakened bedrock or cavities will lead to collapse and opening of the sinkhole," Brenner said.

Timothy Bechtel, a professor of geosciences at Franklin & Marshall College in Lancaster, Pennsylvania, told *Newsweek* there is a "very strong and well-established" link between heavy rain or flooding and the formation of sinkholes.

"It is not just a possibility, it is a certainty in the right settings," Bechtel said.

The enabling factor when it comes to sinkhole formation are environments where there are open spaces or voids underground, with soil above them.

"This is inherently meta-stable—that is, gravity would like to pull the soil down into the void. Water is always the causative factor. Infiltrating water can find cracks that lead to the void, and the water will carry soils or soil 'fines'—the smallest particles—with it into the void," Bechtel said.

"The initial void can be a cave in karst areas," he continued. "The karst caves form over millions of years, but the overlying soils can be flushed into them in a matter of hours during intense rain storms or flooding. In urbanized areas, the void may be a sewer pipe, or subway tunnel, or any bit of infrastructure that represents an opening underground."

Sinkholes are relatively uncommon in California. The most damage from these events tends to occur in states like Florida, Texas, Alabama, Missouri, Kentucky, Tennessee and Pennsylvania, data from the U.S. Geological Survey shows. But with meteorologists forecasting more flooding and rain for California over the next few days, there is every chance more sinkholes will form in the state.

The National Weather Service (NWS) Los Angeles said Thursday that a series of approaching storms to affect southwestern California over the next five days could bring occasional "moderate to heavy" rain. Meanwhile, NWS Sacramento said Friday that "multiple rounds of

moderate to heavy rain and mountain snow will bring renewed flooding concerns and dangerous mountain travel impacts over the next few days" to northern parts of the state.

Sinkholes pose a number of risks to people and property, sometimes resulting in injuries and death.

Multiple rounds of moderate to heavy rain and mountain snow will bring renewed flooding concerns and dangerous mountain travel impacts over the next few days. Thunderstorms will also be possible today with better chances Saturday. Stay weather aware! #CAwx pic.twitter.com/nHusBTi3ju

— NWS Sacramento (@NWSSacramento) January 13, 2023

"All kinds of bad things happen when the earth opens up beneath you," Bechtel said. "Buildings are damaged, utilities rupture, people fall in—and are sometimes not recovered."

Vehicles and even entire buildings have been documented falling into larger sinkholes.

Particularly powerful storms such as hurricanes can significantly increase the risk of sinkhole formation in regions of the United States that are prone to such events.

"The link between hurricanes and sinkholes will be most noticeable in areas affected by hurricanes that have sinkhole-favorable subterranean conditions, such as the state of Florida, which has large regions with limestone bedrock," Brenner said.

A sinkhole risk map for Florida published in 2017 showed that the central and north-central parts of the state have the most favorable conditions for sinkhole formation. Following hurricane Irma in September 2017, for example, more than 400 new sinkholes were reported across the state.

"There are some indications it may also be happening after hurricane Ian which hit in September of 2022," Brenner said.

https://www.newsweek.com/sinkholes-could-swallow-chunks-california-after-rain-flooding-1773660

Salon Magazine

January 14, 2023

Why West Coast weather will be chaotic in the future, according to a climate scientist

"We might be oscillating from more severe drought to super wet," climate scientist Christine Shields warns

When I moved to San Francisco in 2013, the state of California was in a drought. As a transplant from the Midwest, I discovered that this manifested itself often at restaurants. Accustomed to water being excessively offered at a restaurant table, I remember waiters telling me that, because of the drought, they were only serving water upon request and in very small quantities. At that moment, I began to understand why Californians bring their own water bottles everywhere.

This week, water is not hard to come by in California. In fact, it's overflowing in the streets around my house as I write this very sentence, flooding my neighbors' houses and businesses. Earlier this week, my power went out because of flooding around electrical equipment; this scenario might have seemed unthinkable a decade ago.

"A typical atmospheric river actually has as much [water] as twice the Amazon River.

Indeed, California's series of "atmospheric river" storms have splashed across national headlines. From flooding, knocked out trees, power outages and closed highways, the series of storms has caused over $30 billion in damage, according to Bloomberg.

While atmospheric rivers are not a new weather phenomenon in California, the density of such storms this winter is certainly surprising. And given the ways in which climate change has upset normal weather patterns, an obvious question to ask is whether these unusually powerful and destructive west coast storms are connected to the continued emissions of greenhouse gases from human industrial civilization.

To better understand if this is the "new normal" in California— as in weeks of heavy rain that cause damage to much of the state's infrastructure — I interviewed Christine Shields, a climate scientist at The National Center for Atmospheric Research (NCAR). This interview has been condense and edited for clarity.

Can you explain to people who aren't familiar with meteorology what an atmospheric river is?

Shields: Atmospheric rivers are these weather features that transport a lot of water in the atmosphere. So if you think of a river on land, you like to think of it like the Amazon River or the Mississippi River, there's a certain amount of water that goes through these rivers, right? So this is sort of similar except it's water vapor and it's in the sky. And they can hold just as much water as the Amazon or Mississippi rivers. In fact, a typical atmospheric river actually has as much [water] as twice the Amazon River.

So these are really big ways of moving water from lower latitudes to higher latitudes. And for the Western U.S. a very common type of

atmospheric river is called a Pineapple Express. And this is called the Pineapple Express because it moves water from like the Hawaiian Island region, which is where you get the word pineapple from, and you move the water from the subtropical region where Hawaii sort of lives across the Pacific Ocean and north to the west coast of North America. And California (and Southern California in particular) get a lot of these Pineapple Express atmospheric rivers.

Fascinating.

Yeah and there are two ingredients to an atmospheric river: the water is one ingredient and the wind is another ingredient and the way we measure atmospheric rivers usually takes these two components and sort of condenses it into one metric. And we can quantify how intense these atmospheric rivers are by looking at this combination of wind and water and so it's just a retrofit actually. They're also long and narrow. When you look at it from a satellite picture, you can really pick it out because you can see the clouds associated with the atmospheric river, this narrow band of clouds that are thousands of miles long and hundreds of miles wide.

What is making this specific series of atmospheric rivers really newsworthy right now?

"As the global temperature increases, the amount of water that we can evaporate into the atmosphere will also increase... guaranteeing that we'll have more water available to atmospheric rivers."

When you have one atmospheric river, it can hold a lot of water content. And even one atmospheric river can actually lift California out of a drought. But what's happening now is what we call families of atmospheric rivers, where it's one right after the other. And the overall weather pattern in the atmosphere is basically the jet stream is just bringing one storm after the other across the Pacific Ocean. We have this jet stream that's just barreling into California. This is something that happens, actually, pretty commonly, maybe not every year, but definitely, you know, there's definitely different instances of this. For example, the year that the Oroville dam collapsed in February of 2017. We're just seeing a really great example of this jet stream in the right position and these families of atmospheric rivers that are just coming one right after the other.

Why have we been hearing more about atmospheric rivers?

The term was actually coined just from an academic standpoint relatively recently, like in the 1990s. These things have always been around. But what we're calling them and how we understand them has changed.

Do you think this is the 'new normal' for California?

As I said, these things have happened in the past and we definitely expect them to happen in the future.

One of the things that I do in terms of climate change research is to try to understand what's going to happen to these types of things in the future. And so if we just separate this out into water and wind again, we know very clearly what's going to happen with atmospheric rivers in terms of the water content. As the global temperature increases, the amount of water that we can evaporate into the atmosphere will also increase. So just by the fact that we have warmer surface temperatures in the troposphere— which is the lower part of the atmosphere — is just guaranteeing that we'll have more water available to atmospheric rivers. So the atmospheric rivers will tend to be definitely wetter, with potentially more intensive rain periods.

But one of the things that is really ongoing research is whether or not the numbers of atmospheric rivers — if there will be more or if there will be less. We're seeing there's research out there, not mine, that suggests that you're going to have more of these, you're gonna have more drought and then more intense rain periods. And so we might be oscillating from more severe drought to super wet, super dry, super wet, super dry — these swings that can be potentially destructive.

https://www.salon.com/2023/01/14/climate-scientist-explains-future-california-weather-patterns

Washington Post

January 15, 2023

In California, a drought turned to floods. Forecasters didn't see it coming.

California storms prompt questions about accuracy of seasonal predictions

Coming into this winter, California was mired in a three-year drought, with forecasts offering little hope of relief anytime soon. Fast forward to today, and the state is waterlogged with as much as 10 to 20 inches of rain and up to 200 inches of snow that have fallen in some locations in the past three weeks. The drought isn't over, but parched farmland and declining reservoir levels have been supplanted by raging rivers and deadly flooding.

The National Oceanic and Atmospheric Administration's Climate Prediction Center (CPC) issues seasonal forecasts of precipitation and temperature for one to 13 months into the future. The CPC's initial outlook for this winter, issued on Oct. 20, favored below-normal precipitation in Southern California and did not lean toward either drier- or wetter-than-normal conditions in Northern California.

However, after a series of intense moisture-laden storms known as atmospheric rivers, most of California has seen rainfall totals 200 to 600 percent above normal over the past month, with 24 trillion gallons of water having fallen in the state since late December.

The stark contrast between the staggering amount of precipitation in recent weeks and the CPC's seasonal precipitation outlook issued before the winter, which leaned toward below-normal precipitation for at least half of California, has water managers lamenting the unreliability of seasonal forecasts.

“You have no idea come Dec. 1 what your winter is going to look like because our seasonal forecasts are so bad,” said Jeffrey Mount, a senior fellow with the Public Policy Institute of California’s Water Policy Center, in an interview. “They are just not reliable enough to make definitive water supply decisions.”

An evolving forecast

The CPC’s seasonal and monthly outlooks do not provide specific forecasts of precipitation amounts, but rather the probability that precipitation will be above or below average. Such information is intended to “help communities prepare for what is likely to come in the months ahead and minimize weather’s impacts on lives and livelihoods,” NOAA stated in its winter outlook.

The precipitation forecast for California remained virtually unchanged in the CPC’s Nov. 17 update to the winter outlook. That forecast called for a 33 to 50 percent chance of below-normal precipitation in the southern half of California, and equal chances of precipitation being above or below normal in the northern half of the state.

CPC Director David DeWitt said the outlook was heavily influenced by the expected continuation of La Niña conditions. El Niño and La Niña — the cyclical warming and cooling of the eastern tropical Pacific Ocean that influences weather patterns around the globe — often have an outsize effect on prevailing seasonal conditions in many parts of the world.

“Forecasting on a seasonal time scale is dominated by the El Niño/La Niña cycle,” DeWitt said in an interview. “La Niña conditions are generally characterized or associated with below-normal precipitation for central and Southern California. Northern California is kind of a dice roll.”

Back in mid-November, chances were seen as high that La Niña would continue for a third winter in a row, which it has thus far, although it appears to be weakening. In both of the two previous “three-peat” La Niña winters since 1950, much of California recorded below-normal precipitation.

Despite their typically strong influence on seasonal conditions, El Niño and La Niña aren't the only game in town. They can be counteracted by other large-scale atmospheric phenomena that evolve on shorter time scales. One such factor is a cluster of storms in the tropics, known as the Madden-Julian Oscillation, that travels around the globe approximately every 30 to 60 days.

While such factors "can leave a big imprint on average winter conditions … they're very difficult to predict more than a few weeks in advance," wrote Nat Johnson, a researcher and meteorologist with the Geophysical Fluid Dynamics Laboratory at Princeton, in a blog post about NOAA's winter outlook.

As these additional factors started to come into focus in mid-December, the CPC began to shift its forecast for California. For example, its monthly precipitation outlook for January, issued on Dec. 15, showed a smaller portion of the state expected to see below-normal precipitation.

The first signs of above-normal precipitation for California did not appear until Dec. 19, when CPC issued its precipitation outlook for the next eight to 14 days. That outlook, which covered the period from Dec. 27 to Jan. 2, called for a 33 to 70 percent chance of above-normal precipitation across all of California, with the highest chances in the northern part of the state.

"Those day eight-to-14 products are really generally going to have much higher skill than a monthly or seasonal outlook because of that shorter time scale," DeWitt said.

On Dec. 31, with what would become a weeks-long drenching already underway, CPC issued a monthly precipitation outlook suggesting the wet weather could continue through January.

'Can't rely' on long-range forecast

Experts say that seasonal precipitation outlooks should be viewed with caution, and not interpreted as weather forecasts.

“They are meant to show end users how the odds are stacked one way or another for wet, dry or normal conditions based on all relevant available information at the start of the water year,” Michael DeFlorio, a research analyst with the Center for Western Weather and Water Extremes at Scripps Institution of Oceanography in San Diego, wrote in an email.

Such outlooks are particularly difficult for California, which experiences wild year-to-year swings between wet and dry conditions.

“California receives a large fraction of its annual precipitation from a small number of intense storms, often in the form of atmospheric rivers,” Johnson wrote in an email. “That means that California’s seasonal-to-annual precipitation totals can be significantly influenced by the chaotic weather variability that occurs only within a few days.”

The winter guessing game has been a long-standing challenge for state officials and water managers who need to make decisions about how much water to allocate to farms and cities, plan reservoir and dam releases, and prepare for effects on agricultural production and hydropower generation.

Climate change has made the task even more complicated, because historical experience may no longer be a useful guide for estimating the severity of droughts and floods.

“Conditions are shifting,” Mount said. “What we’re seeing in long-term trends is drier dry periods and wetter wet periods.”

At the local level, agencies may use seasonal outlooks for background guidance but not necessarily for critical decisions.

“We plan to be able to manage anything that comes our way,” said Willie Whittlesey, general manager for the Yuba Water Agency, which manages flood risk and water supply on the Yuba River northeast of Sacramento, in an interview. “Even during La Niña, you can have significant storms at the watershed level — you really can’t rely on the general longer-range forecast for watershed management.”

Pathways to better precipitation forecasts

Ongoing research at Scripps Institution of Oceanography is aiming to improve shorter-range forecasts for atmospheric rivers. This winter, data from reconnaissance flights into these sprawling storms has been fed into forecast models in real time, helping to boost their accuracy at the five- to 10-day range, and possibly beyond that, Whittlesey said. Researchers also are tackling the problem of predicting extreme rainfall with new tools, such as artificial intelligence.

However, the known gap in subseasonal-to-seasonal prediction remains.

“Precipitation forecasts beyond two weeks are inherently valuable to society,” DeWitt said. “They have inherently low skill because of the state of the science.”

To improve precipitation forecasts, DeWitt points to the importance of programs that span from research to operations, such as NOAA’s Precipitation Prediction Grand Challenge. That program’s strategy aims to provide more accurate precipitation forecasts — at time scales from a day to a decade — by addressing major gaps in observations of the atmosphere, reducing model errors and developing products that more effectively communicate the forecast.

“We continue to pursue getting that program funded at a sufficient and sustained level because that is what it’s going to take. … That will accelerate our ability to improve precipitation forecasts for stakeholders,” DeWitt said.

As evidence of what the Precipitation Prediction Grand Challenge could accomplish, DeWitt cites the success of NOAA’s Hurricane Forecast Improvement Program, a research-to-operations program that began in 2009. The program achieved its original goal of reducing hurricane track and intensity errors by 20 percent in five years and continues to strive for further increases in hurricane forecast accuracy.

“We would like to do the same thing for precipitation forecasts across time scales, but especially on the subseasonal-to-seasonal time scales,” Dewitt said.

https://wapo.st/3Zx2TeN

KTLA

January 16, 2023

Los Angeles County collects 33 billion gallons of rainwater in recent storms

Good news has surfaced in Los Angeles County's ongoing battle with water scarcity.

The Los Angeles County Public Works Department announced Monday that more than 33 billion gallons of stormwater have been captured in the early months of the California winter storm season.

It will be used as drinking water and is enough to supply 816,000 people with enough water for an entire year, according to Los Angeles County Public Works Director Mark Pestrella.

"This is great news for the county and the region," Pestrella said in a news release. "We're working with our water partners to increase the region's capacity to capture, clean and conserve stormwater runoff, while investing with equity in communities through the Safe Clean Water Program."

L.A. County's Public Works Department operates a regional stormwater network that includes 14 major dams and more than 620 miles of rivers and flood channels and 3,400 miles of underground storm drains.

The system is tasked with regional flood protection throughout the Los Angeles Basin and is responsible for recharging groundwater aquifers that supply about one-third of the area's drinking water.

The Public Works Department also manages the Safe Clean Water Program, an initiative passed in 2018 that aims to increase local water supplies by capturing stormwater.

Several recapture projects have been completed since the adoption of the Safe Clean Water Program. So far, the projects have resulted in 228 million gallons of stormwater being collected each year.

More infrastructure projects are underway with funding through the program, Public Works officials said. Once completed, those projects are expected to provide capacity to serve an additional 500,000 people across L.A. County.

https://ktla.com/news/local-news/los-angeles-county-collects-33-billion-gallons-of-rainwater-in-recent-storms/

The Guardian

January 19, 2023

Saved by a rainy day? Californians ‘harvest’ water during historic storms

Faced with a sudden influx of water, residents of drought-struck California ask how to keep it around for good

When Kitty Bolte looked at her yard at the start of California’s powerful winter storms, she saw more than half a foot of standing water behind her house. At first Bolte, a horticulturalist by trade, contemplated pumping it out on to the street. But with the historic rains coming in the midst of a historic drought, that seemed oddly wasteful.

So instead, she and her boyfriend decided to save it. They found a neighbor selling IBC totes – large 330-gallon plastic containers surrounded by wire – on Craigslist, and filled them up using an inexpensive Home Depot pump. They also dragged some spare garbage cans outside to sit under the downpour, gathering 800 gallons in all.

California has experienced some of the heaviest winter storms in memory this month, causing widespread and destructive flooding. But

the influx of water has also prompted another, more hopeful question – how can we keep some of it around for good?

It's a question the state is asking at a macro level, as depleted reservoirs refill and the snowpack reaches record levels. But many like Bolte are looking at the skies and taking smaller, more localized steps to make a difference.

Bolte's plan is to store the water she gathered and use it in the summer to water their native trees, which helps assuage her guilt about cultivating a garden in a drought. "This makes me feel relieved to keep them alive in the summer by not using water that could be used for other sources."

Even before the storms hit, rainwater harvesting has been popular in the drought-stricken US west. Rainwater harvesting was the top gardening trend on Pinterest for 2023, and advocates say it comes with a host of benefits.

The practice can be as simple as putting out a bucket when it rains. It saves money by reducing future water bills. It also keeps stormwater from carrying trash, chemical and pet waste into the Pacific Ocean – reducing the bacterial spikes that happen after storms. Harvesting also saves energy: 20% of all the power generated in California goes into moving, treating and using water. And when water enters a yard instead of the streets it helps to replenish underground aquifers.

In Oakland, Elizabeth Dougherty collects water in giant cisterns. Dougherty, who runs a sustainable water non-profit organization, points out that urban water users account for only 20% of the water used in California – while agriculture sucks up the other 80%.

But of that 20%, half goes to outdoor irrigation. "If I can cut out 50% of my water use, that's a big deal," Dougherty says.

One inch of rain on a 1,000 sq ft roof can result in 600 gallons of water – enough to water a 4ft by 8 ft food garden for 30 weeks. In her cisterns, Dougherty collects much more – 2,000 gallons at a time that are stored in large plastic vessels that can be closed off.

Those cisterns are also a bank vault in case of an emergency, she says. In the case of a large earthquake, people in her area could be left without water for months – but she'd be able to access her 2,000 gallons of water and have enough for herself, and for neighbors. Doughterty says rain is relatively clean water and in an emergency she'd filter it with a Big Berkey water filter to treat it properly.

Paul Racs, director of the office of community beautification in the city of Los Angeles – an agency that helps residents improve and beautify their neighborhoods – has found a unique way to repurpose 55-gallon industrial ingredient barrels and provide them for free for residents: his office has teamed up with Coca-Cola to take big drums that once held soda syrup and reconfigure them with nozzles to become rain barrels, he explains. "It keeps the barrels out of the waste stream and helps people capture storm runoff water."

Racs has a couple rain barrels at home, but they tend to fill up quickly – so he says he saves milk jugs to hold water as well, and then sets them in

the back of his garage. Buckets can work too, as long as they have a lid to keep mosquitoes from laying eggs in the standing water.

His main advice is to plan ahead – the city typically has distribution events in the fall to get barrels into the hands of people who can use them before the rainy season starts.

Hadyn Wiesenfeld started collecting rainwater in a barrel during the pandemic. Her house in Santa Monica doesn't have gutters, but she noticed a spot where two parts of the roof came together that shot water on to the front porch. "Water was washing off the concrete down the front pathway, which was just silly," she says. "It was an easy place to put a barrel."

Wiesenfeld's husband was skeptical that the barrel would fill – there wasn't enough rain, he said. Both were blown away at how quickly a 65-gallon container was filled with water, in any kind of rain event. They use the water every few weeks to keep the front yard green – and to help propagate new plantings.

Anyone who wants to start harvesting the rain should check local ordinances first, experts say – there are some states that restrict how much water residents can collect. (Rainwater harvesting was illegal in California until former governor Jerry Brown passed the Rainwater Capture Act in 2012.) Other places have free barrel giveaways – or even rainwater rebates to encourage people to harvest more water from the sky.

Before starting, people also need to think about what the water will be used for and how much they'll need – most rain barrels are 40 to 90 gallons. Even one barrel with screens to keep leaves or branches out, placed underneath a roof downspout, can work to water some plants.

If residents want to maintain large amounts of water they will need slightly more complex systems, like connecting barrels. Make sure the barrels are covered and sealed for safe keeping, and make sure pets and people aren't drinking the water from barrels – rainwater can carry bacteria, parasites, viruses and chemicals that could make you sick, and it has been linked to disease outbreaks.

Dougherty hopes that storms like this winter's deluge will encourage people to start pondering the provenance of their water. "We need to sync up with the water cycle to learn what it means to be a responsible engager with water," says Dougherty. "Not just water users, but water engagers."

https://www.theguardian.com/us-news/2023/jan/19/california-water-harvesting-historic-storms-drought

Federal News Network

January 19, 2023

California storms feed systems set up to capture rainwater

LOS ANGELES (AP) — As Californians tally the damage from recent storms, some are taking stock of the rainwater captured by cisterns, catches, wells and underground basins — many built in recent years to provide relief to a state locked in decades of drought.

The banked rainwater is a rare bright spot from downpours that killed at least 20 people, crumbled hillsides and damaged thousands of homes.

LOS ANGELES (AP) — As Californians tally the damage from recent storms, some are taking stock of the rainwater captured by cisterns, catches, wells and underground basins — many built in recent years to provide relief to a state locked in decades of drought.

The banked rainwater is a rare bright spot from downpours that killed at least 20 people, crumbled hillsides and damaged thousands of homes.

Los Angeles County, which has 88 cities and 10 million people, collected enough water from the storms to supply roughly 800,000 people for a year, said Mark Pestrella, director of the Los Angeles County Public Works department.

In the four years since Californians approved a measure to invest hundreds of millions of dollars each year to build small and medium-sized infrastructure projects that collect rainwater, experts say progress has been gradual, but not insignificant.

In Santa Monica, a new water project captured nearly 2 million gallons (7,600 cubic meters) of runoff that once treated gets used for plumbing, irrigation or pumped back into the city's aquifer.

Sunny Wang, water resources manager for the city, said the project will eventually save an average of about 40 million gallons (151,000 cubic meters) per year.

The vast majority of rainwater in California's cities eventually flows into the ocean. In Los Angeles, a complex system of dams and paved flood control channels steer water away from roads and buildings and out to sea as fast as possible. The century-old infrastructure was designed to prevent urban flooding.

From the concrete-lined Los Angeles River alone, which starts in the San Fernando Valley and ends in the ocean in Long Beach, 58,000 acre-feet of stormwater was sent out to sea during the recent storms, said Kerjon Lee, spokesman for the Los Angeles County Department of Public Works. That's about 20% of Nevada's allotment from the Colorado River each year.

"It's a big number we're capturing, but it's a small percentage of the watershed," Wang said. "Billions of gallons of stormwater enter Santa Monica Bay each year, so 40 million sounds like a lot but it's just a first step towards more investments we need to make."

Santa Monica says its Sustainable Water Infrastructure Project is the first of its kind in California. Most people would hardly know it exists.

Hidden under a newly paved parking lot next to a county courthouse, the wastewater treatment plant filters and purifies sewage and runoff simultaneously to produce water that exceeds state and federal drinking water regulations.

County officials say the water being saved matters — not just to bolster water supplies but also to prevent contaminants picked up by rainwater from flowing into the Pacific Ocean.

Pestrella, the county's public works chief, said the stormwater captured over the past few weeks could be enough to prevent the Metropolitan Water District of Southern California, which supplies major population centers including Los Angeles and San Diego, from imposing the strictest water restrictions next spring and summer.

To escape the drought, Pestrella added, “we need at least three years of this kind of rain.”

Most of Los Angeles’ water isn’t from its own watershed, but from a vast storage and delivery system that carries snowmelt from the Sierra Nevada range in Northern California and the Colorado River to the east.

County officials say the government has invested $400 million from the statewide effort to increase local water supplies by rainwater capture in more than 100 regional projects, most of them new, over the past two years. Officials expect the projects in Southern California to be completed within eight years and said they could provide enough water for 500,000 more people in Los Angeles County.

The county’s longer-term goal — over the next 30 years — is to collect 300,000 acre-feet from captured stormwater, or enough to serve up to 900,000 households annually.

Bruce Reznik, executive director of the environmental nonprofit Los Angeles Waterkeeper, called scaling up rainwater capture projects in Los Angeles “a race against time,” because of drought and the state’s over-tapped water sources. He said a sluggish permitting process is partly to blame.

“We’re starting to make strides, but we obviously need to be doing better,” Reznik said. “In the last few years, people have gotten increasingly serious.”

In the Willowbrook area of South Los Angeles, Earvin “Magic” Johnson Park sits on a former oil storage field that later was partly developed into a housing project. Now, the 104-acre park with two lakes, a playground, exercise equipment, and a community center also collects runoff from storms.

The renovation was finished in 2021. For the majority of people walking around the lakes, the park is simply a nice place to walk. Ducks circle the lake in pairs while Canada geese honk from a small island.

“It’s safe, quite peaceful and it’s just beautiful,” said Barbara Washington Prudhomme, a retired postal worker.

She was unaware of the other benefits of the park — that a small structure near the lake was recycling filthy stormwater runoff captured from storm drains that would have flowed out to sea and using it to fill the lake or irrigate the grass when needed.

When told about the park’s design that allows it to capture and divert up to 4 million gallons (roughly 15,000 cubic meters) per storm, she was impressed.

“That’s a good system if it works,” she said.

https://federalnewsnetwork.com/government-news/2023/01/california-storms-feed-systems-set-up-to-capture-rainwater/

Fox Weather

January 20, 2023

Relentless California atmospheric rivers drop 32 trillion gallons of water over 3 weeks

The FOX Forecast Center calculates an estimated average of 11 inches of rain fell across California as a series of nine atmospheric rivers drenched the state over a three-week period.

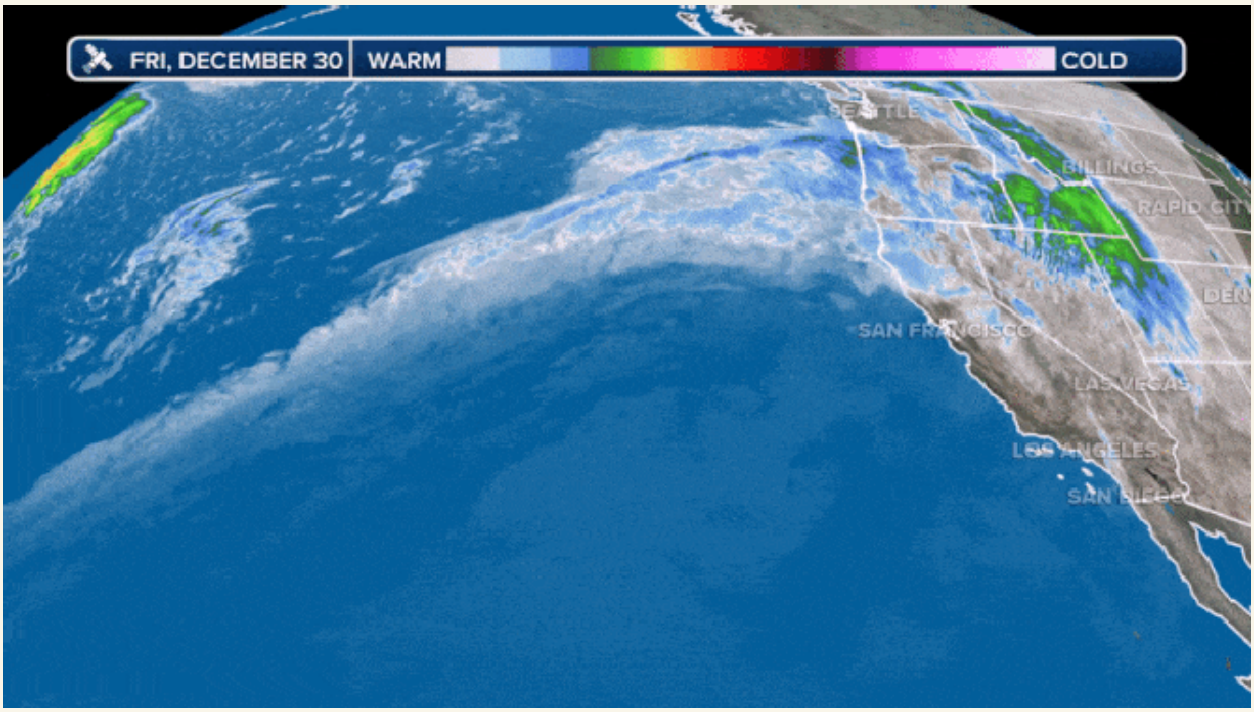
For nearly a month, California was rocked by a barrage of atmospheric river storms. So far, at least 20 deaths have been blamed on the dangerous series of storms.

SAN FRANCISCO – It's been three-plus weeks of nearly non-stop rain in California as a stubborn weather pattern sent wave after wave of tropically-infused atmospheric rivers, triggering widespread flooding, landslides and power outages across the state. At the same time, the mountains were buried under several feet of snow. California Gov. Gavin Newsom said Thursday that 21 people died in the storms, with one child still reported missing.

The first wave of rain rolled ashore on Dec. 26. After a break that lasted a couple of days, a bomb cyclone tapped into a Pineapple Express-type atmospheric river as 2022 came to an end to nearly set San Francisco's all-time daily rain record with more than 5 inches of rain.

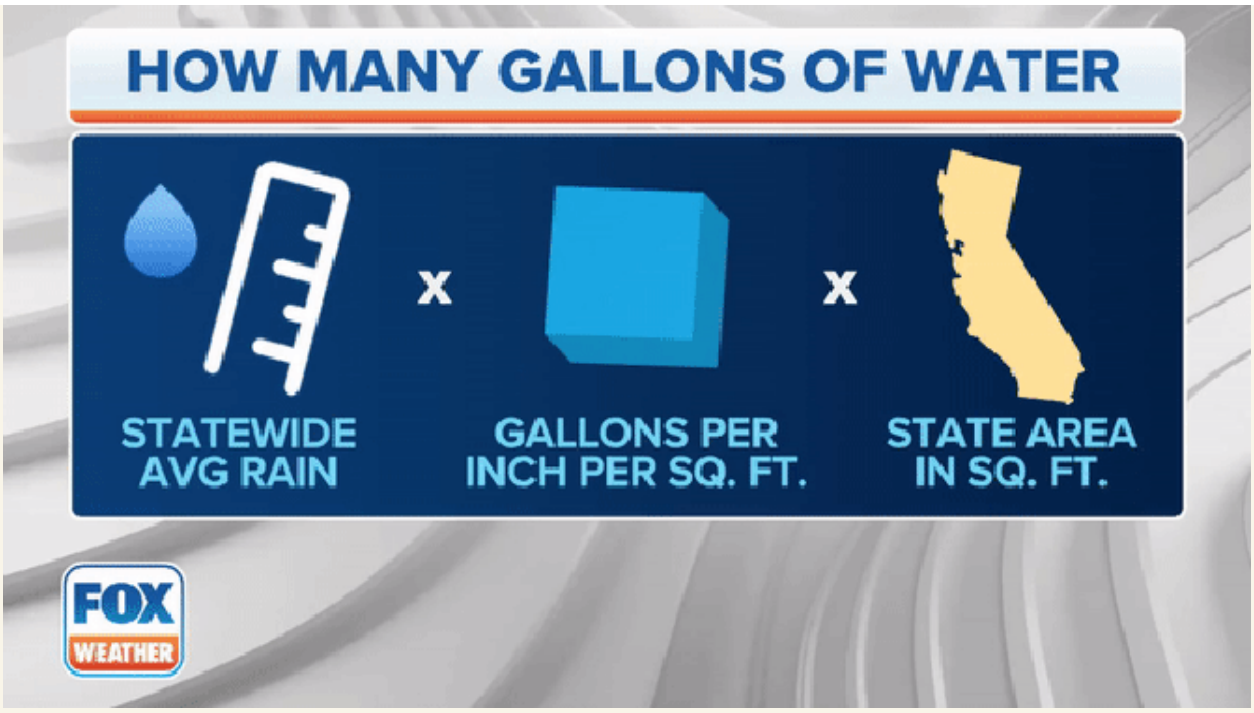
The calendar flipped to 2023, but the weather pattern didn't budge. A total of nine atmospheric rivers in rapid succession drenched the state from north to south and back again with inches – or in some cases, over a foot – of rain, punctuated by days of damaging wind gusts. It didn't matter if you were in Eureka, the San Francisco Bay Area, Sacramento,

Los Angeles, San Diego or the central valleys; it rained nearly every day for over three weeks.



San Francisco reported measurable rain on 17 of the 23 days between Dec. 26 and Jan. 17, including 12 days that featured at least a half inch and four days with an inch or more. Los Angeles reported rain on 14 of those 23 dates. A dry Jan. 1 was the only day stopping Arcata from experiencing 25 consecutive days with measurable precipitation.

Overall, the FOX Forecast Center calculated an estimated average of 11 inches of rain fell across the entire state through the prolonged period. That translates to roughly 32 trillion gallons of water in the state between the heavy lowland rains and feet of snow in the Sierra Nevada mountain range and the Siskiyou Mountains that fell since Dec. 24.

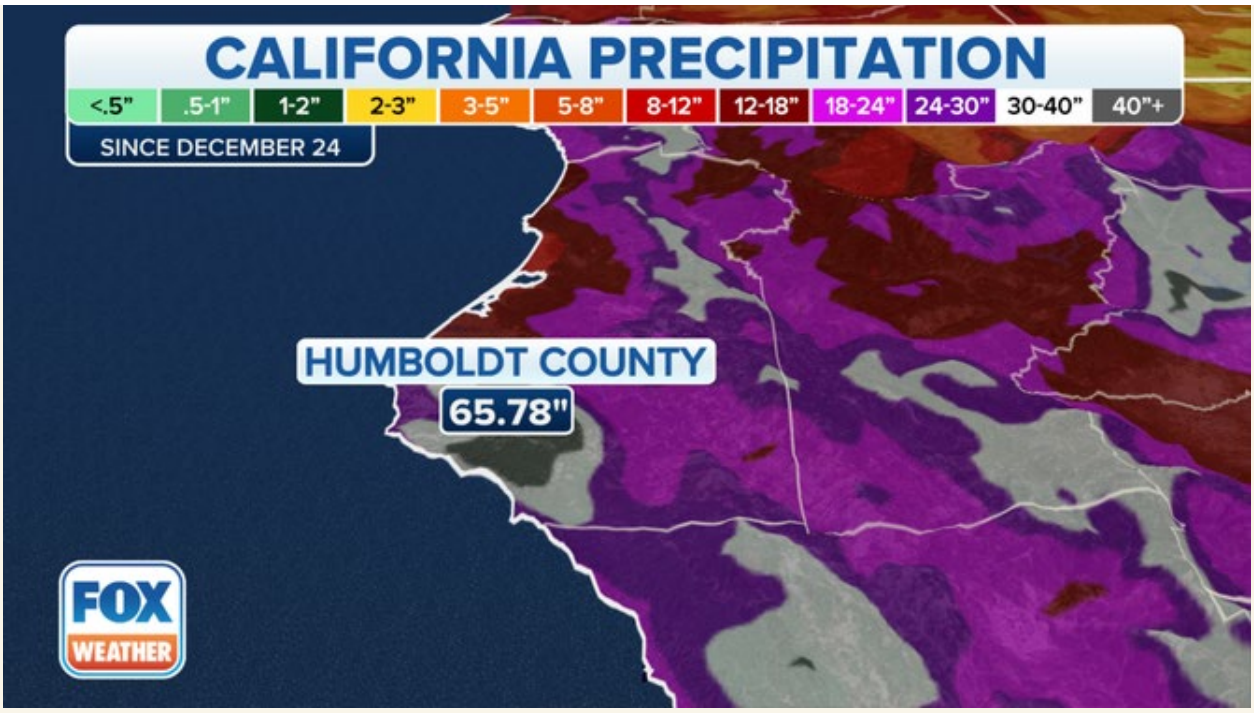


California bowled over with rain

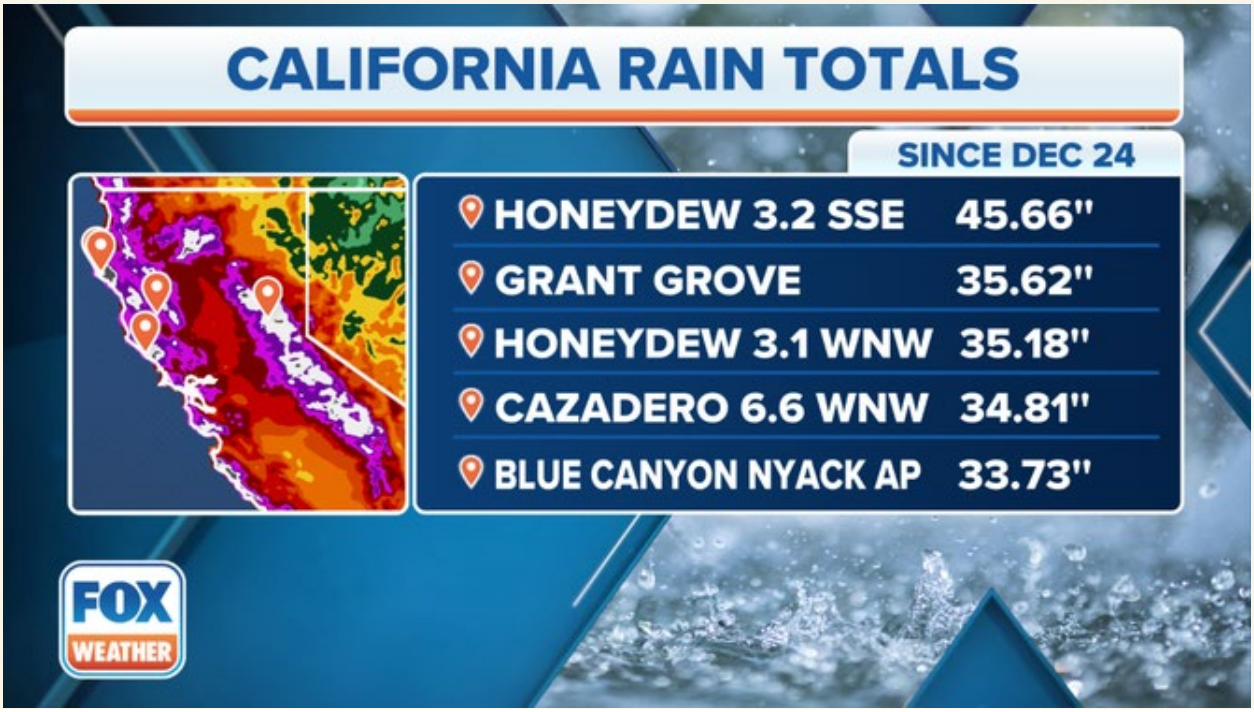
That 32 trillion gallons would be enough to fill over 210,000 Rose Bowl stadiums with water, according to rough estimates by the FOX Forecast Center.

Put another way, you could place a Rose Bowl stadium on every square mile in California, have enough rainwater to fill each to the brim and still have enough water leftover to fill another 50,000 of the iconic stadiums.

The wettest spot since the storms began was in southwestern Humboldt County along the northern California coast, where estimates show just more than 5 feet of rain (65.78 inches) fell during the storms.

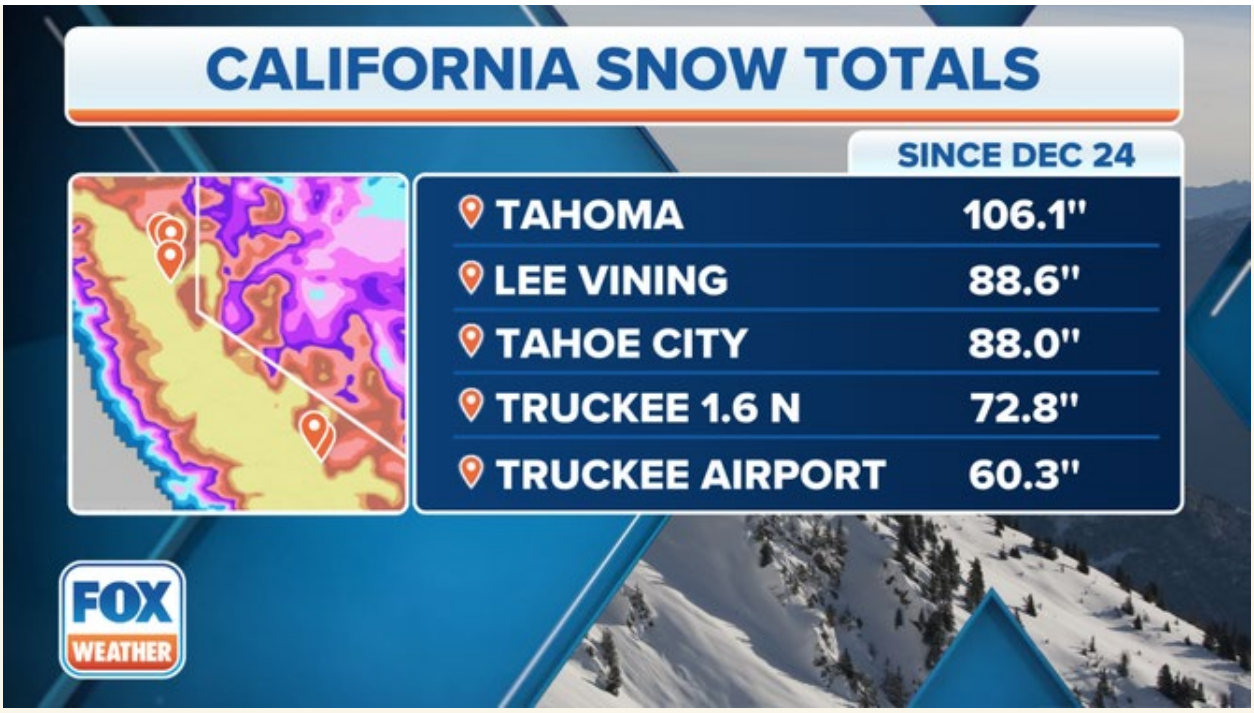


Rain gauges near Honeydew recorded 35-45 inches of rainfall through the storms, while Blue Canyon had just over 33 inches of rain.



For the top snowfall amount, change that last measurement from inches to feet. Mt. Solomons, at 13,040 feet elevation, received an estimated 33.1 feet of snow.

Closer to civilization, Tahoma reported 106.1 inches of snow, while Tahoe City received 88 inches and Truckee had just more than 60 inches.

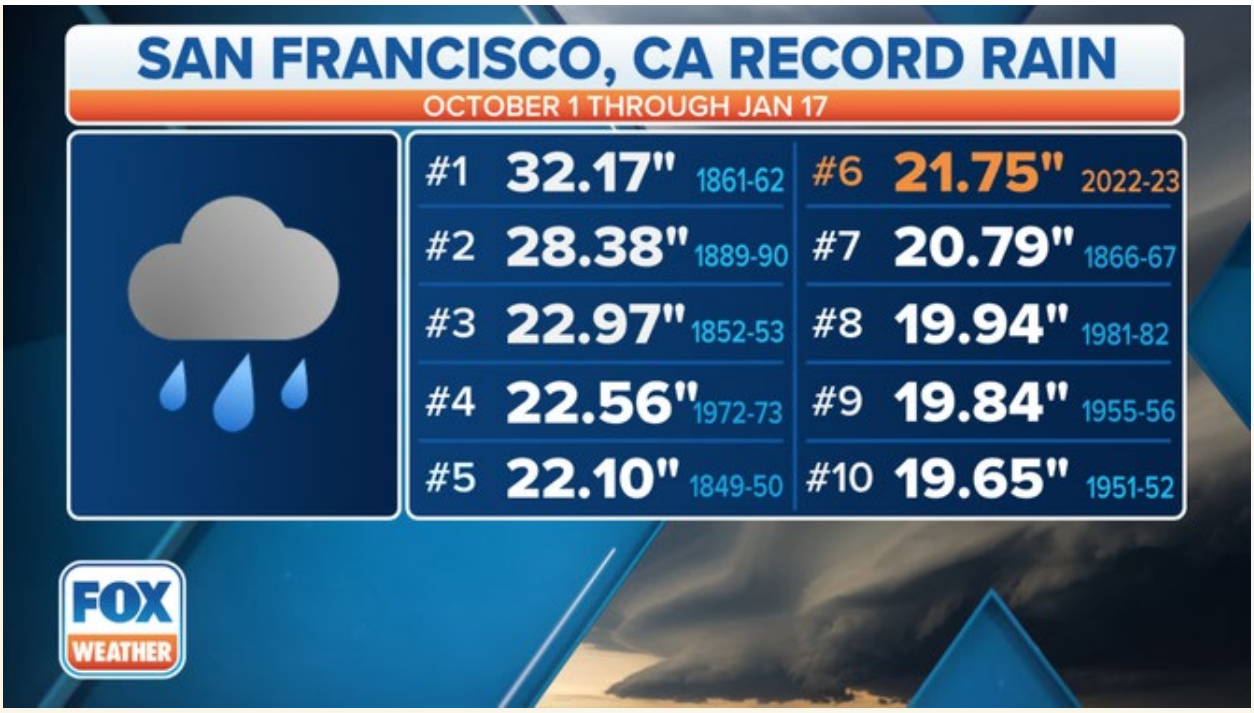


Even without another drop in 2023, one California town has reached annual average

Bishop, California, has received 5.55 inches of rain so far in 2023 – already exceeding their annual rainfall average (4.94 inches) before two weeks had even passed into the new year.

WHAT DOES A 'CATEGORY 5' ATMOSPHERIC RIVER MEAN? SCALE AIMS TO RATE NATURE'S LARGEST SOAKERS

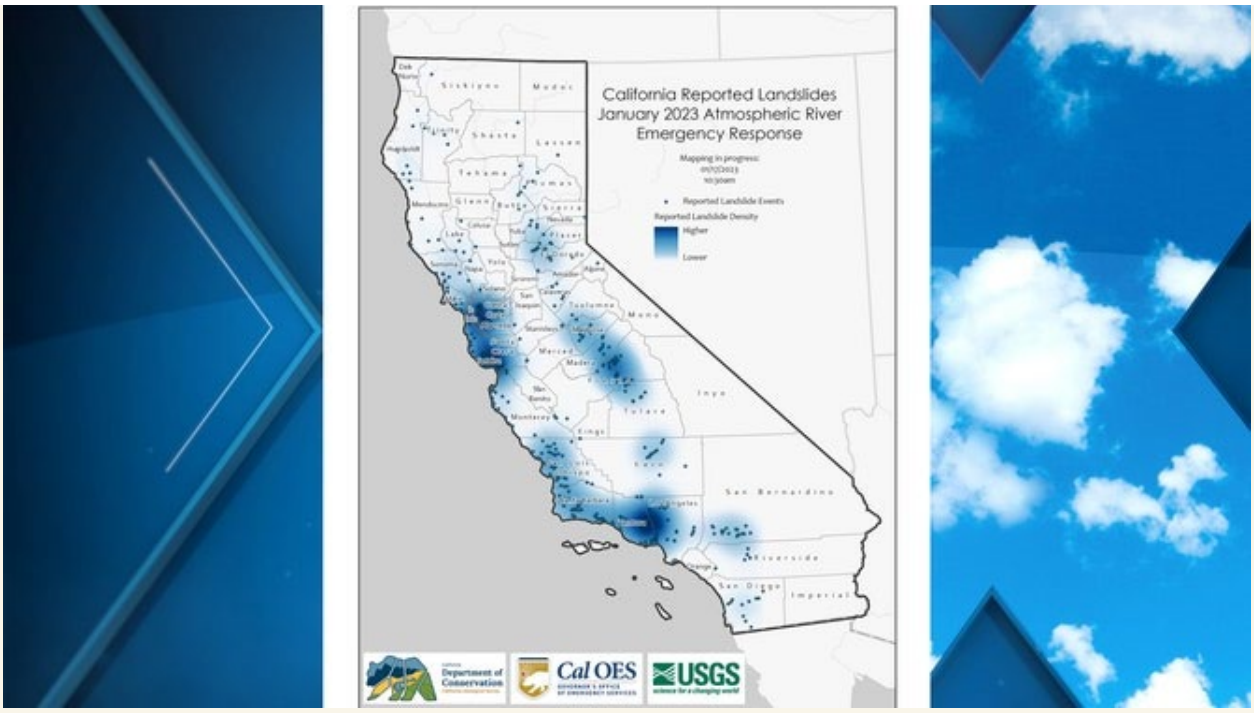
Spots like San Francisco, Oakland, Santa Barbara, Sacramento, Modesto and Stockton have their wettest meteorological winter on record to date (since Dec. 1), according to the FOX Forecast Center. Tahoe City is nearly 14 inches above average for rainfall since Oct. 1. Oakland and San Francisco are almost a foot above average.



Hundreds of mudslides plague California

The saturated soils have led to hundreds of landslides and mudslides across the state that have wiped out roads and closed buildings.

The Department of Conservation's California Geological Survey and the U.S. Geological Survey have mapped more than 500 landsides, creating damages and disruptions across the state.



As more satellite imagery is reviewed and reports come into the state, it's possible the number could reach into the thousands, state geologists told FOX Weather.

The weather pattern was finally changing this week, with an extended dry period expected for California starting Thursday morning and lasting well into the end of January.

https://www.foxweather.com/weather-news/california-atmospheric-rivers-32-trillion-gallons-rain-water

The Hill

January 22, 2023

How Arizona, California and other states are trying to generate a whole new water supply

Underground storage may be a key for Western states navigating water shortages and extreme weather.

Aquifers under the ground have served as a reliable source of water for years. During rainy years, the aquifers would fill up naturally, helping areas get by in the dry years.

But growing demand for water coupled with climate change has resulted in shortages as states pump out water from aquifers faster than they can be replenished.

The fallout can also lead to damaged vegetation and wildlife as streams run dry and damage to aqueducts and flood control structures from sinking land.

Municipalities and researchers across the country are working on ways to more efficiently replenish emptied-out aquifers.

By overpumping aquifers “you’ve created space. There’s space under the ground that used to be filled with water,” explained Michael Kiparsky, water program director at the Center for Law, Energy & the Environment at the University of California, Berkeley School of Law.

“And what we can do with these groundwater recharge projects is take advantage of that space, which is vastly greater than the sum of all of the surface storage reservoirs that exist now or could be built,” he said.

Several communities across California, Arizona and other states have been using managed aquifer recharge for years to better regulate local water supplies.

If implemented on a wide enough scale, recharge projects hold the potential to bolster water security in drought-stricken regions while improving the health of the environment.

Kiparsky said if it can be pulled off, “it holds the promise of being able to generate a whole new water supply we really didn’t even know that we had.”

Regional efforts

In California — where 85 percent of the population relies on groundwater for some portion of their supply — more than 340 recharge projects have already been proposed.

The California Department of Water Resources announced this month it will expedite the permitting process for recharge projects to help meet its goal of expanding average groundwater recharge by at least 500,000 acre-feet each year.

In Orange County alone, officials pump 65 million gallons of treated water into recharge basins in Anaheim each day. The county began recharging water through infiltration basins in 1936 and serves as a model for other communities looking to implement managed aquifer recharge projects.

“If we want to maintain our groundwater systems and sustain them, not deplete them, not mine the water, and we want to have enough water for everything else — for agriculture, for cities, for the environment, for the streams — so forth, we have to put a lot of water into the ground,” said Andrew Fisher, a professor of earth and planetary sciences at the University of California, Santa Cruz. “There is literally no choice if we do not do that.”

Groundwater recharge projects can take many different forms.

Communities could create percolation basins, where stormwater or excess river flows are collected in basins that are intentionally left open. Over time, water settles itself into the soil below and eventually into aquifers. Dry wells, which stop above the water table and allow water to percolate the rest of the way, can be constructed, along with injection wells, which lead water directly into aquifers.

Arizona has a long history of managed aquifer recharge efforts, thanks in part to the 1996 establishment of the Arizona Water Banking Authority (AWBA). Since its inception, the authority has used recharge to store nearly 5,600 million cubic meters of surface water from the Colorado River, as of 2019.

The number and capacity of recharge projects increased throughout Arizona during the early 2000s, with researchers crediting the project's success to local political consensus, favorable hydrogeology and public funding, along with other factors.

"AWBA is an important example of how a strong regulatory framework, coupled with public institutions and funding can help support the adoption of [managed aquifer recharge] on a large scale, and how [managed aquifer recharge] can achieve broad water management and public policy objectives," a 2021 Unesco report said of the practice.

The city of Tucson also serves as a model example thanks to its flexible approach to using renewable surface water supplies.

In 2018, the city stored and recovered 76 million cubic meters in the same year, while an additional 76 million cubic meters was stored for long-term use.

The city uses "soils as the treatment method for the surface water," explained Sharon B. Megdal, director of the University of Arizona Water Resources Research Center in an interview with Changing America.

The surface water infiltrates into the aquifers and mixes with the existing groundwater, and then officials can pull out that blended mixed water to serve customers, she said.

Despite the established nature of Arizona's programs, groundwater is still over pumped in some areas, and aquifer levels continue to decline.

"Arizona has quite an extensive history of utilizing managed aquifer recharge successfully, and yet there are still more opportunities," said Megdal. "We don't have all the answers. We still have lots to do. But from the basic point of what's going on in managed aquifer recharge, we've done quite a lot successfully."

When it comes to expanding the scope of recharge operations, "it's very important that you have the right regulatory framework for it both for sufficient protections — because there are water quality implications, other types of implications — as well as predictability," Megdal said.

Challenges remain

One type of groundwater recharge project is called Flood-MAR, or flood-managed aquifer recharge. As part of this process, water managers could divert water accumulated in rivers during big flows to other areas, flooding land during the winter, or wet season, and farming the land in the summer.

"Part of the challenge for flood recharge is finding land that's not already in use for other things, houses or fields. And finding areas where there's enough infiltration capacity, which is a term of art that means where water can flow quickly underground and into the groundwater aquifers," Kiparsky explained. Legal questions also come into play when projects aim to capture floodwater, as claims on downstream flows may already exist.

Additional challenges with recharge projects arise when water is collected in urban settings. Cities may not be located above opportune geological conditions for water to seep into aquifers. Groundwater in urban areas can also be contaminated with oil drippings or bits of tires from cars. Although this water can be treated before it's put into the aquifer, treatment can be expensive.

For other projects, communities need to determine the best sites for recharge to mitigate the need for building new transfer infrastructure.

“In some cases, some of that stored water has to remain in the aquifer and can’t be pulled out later on,” said Megdal. That’s because groundwater is in motion, and communities may not be able to get back all the water they put in before it moves on.

Despite the many challenges unique to collecting different types of water at different times, through different means and in different areas, “there’s a lot of opportunity to implement [managed aquifer recharge] depending upon what water source you’re talking about, what ultimate use you’re talking about,” said Megdal.

“People are recognizing that we have to look at all sources of water and opportunities to make wise use of them,” added Megdal.

Not only can increased water storage help with water security in the future, but higher groundwater levels can also reconnect with streams, improving conditions for fish and vegetation along the stream’s corridor.

“We have and will continue to have too much water when we don’t want it and not enough when we do, and so storage is the key,” said Kiparsky.

“The fact that we’ve created this massive space underground holds the key to that problem,” added Kiparsky.

https://www.google.com/url?rct=j&sa=t&url=https://thehill.com/policy/equilibrium-sustainability/3824483-how-arizona-california-and-other-states-are-trying-to-generate-a-whole-new-water-supply/&ct=ga&cd=CAEYAyoTNjU2MDkyMDI4MjE2OTE5NDY5MzIcOTI2MGM4OTY3NzEzMmMzZTpjb206ZW46VVM6Ug&usg=AOvVaw1mxm2PcF1uGtt5vUssFY5Z