Veles Water Weekly Report

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November 28th 2024

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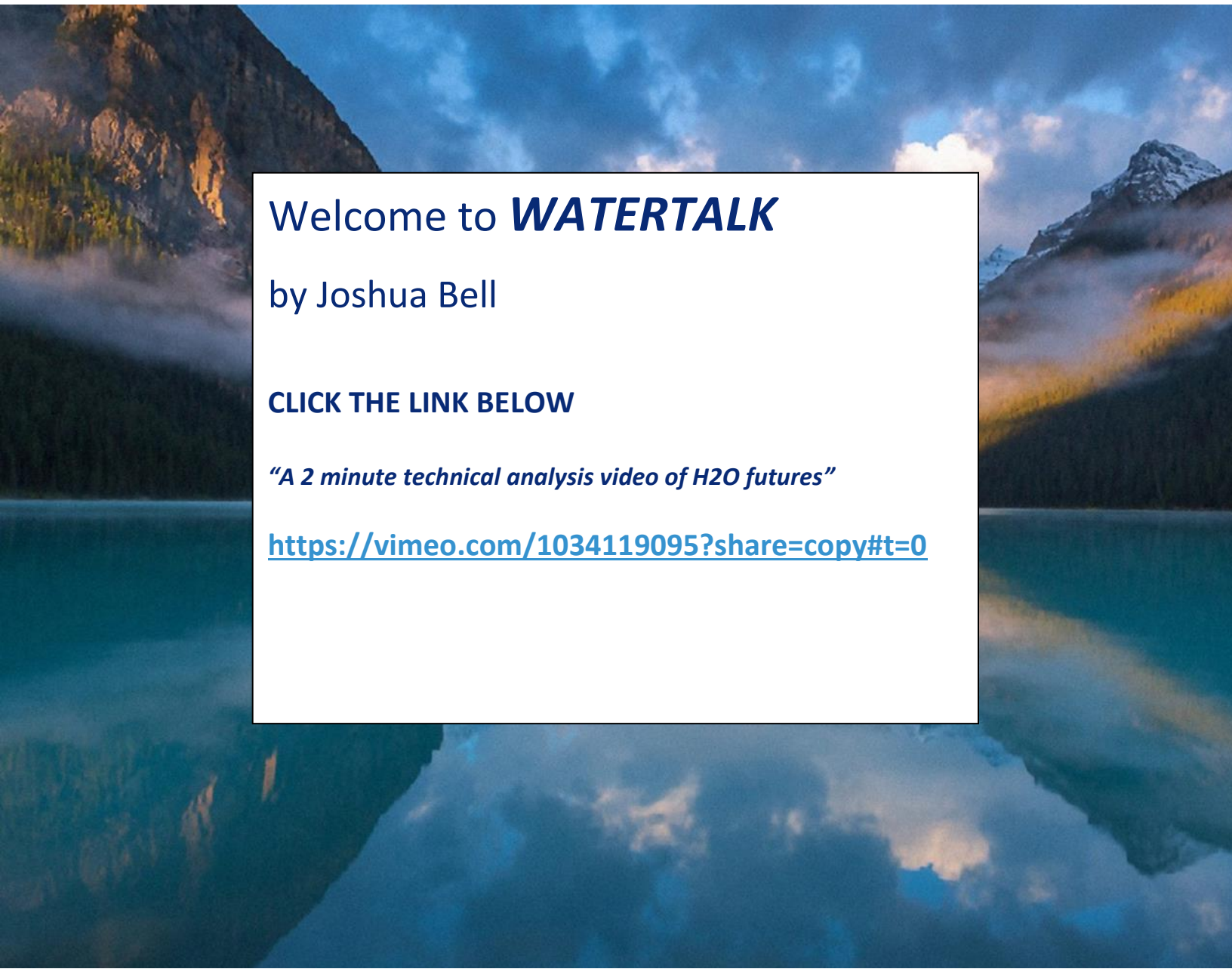
Veles Water

WATER FUTURES MARKET ANALYSIS



Welcome to ***WATERTALK***

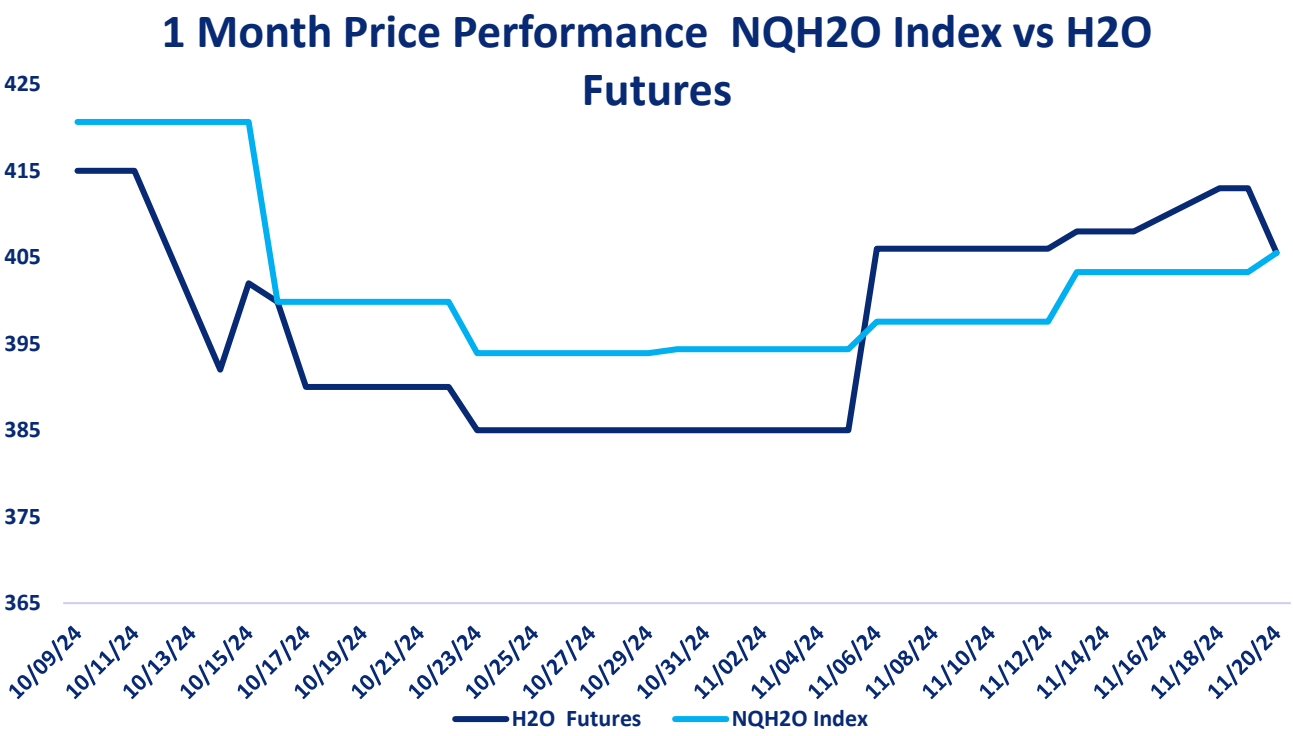
by Joshua Bell

CLICK THE LINK BELOW

"A 2 minute technical analysis video of H2O futures"

https://vimeo.com/1034119095?share=copy#t=0

NQH2O INDEX PRICE vs H2O FUTURES PRICE



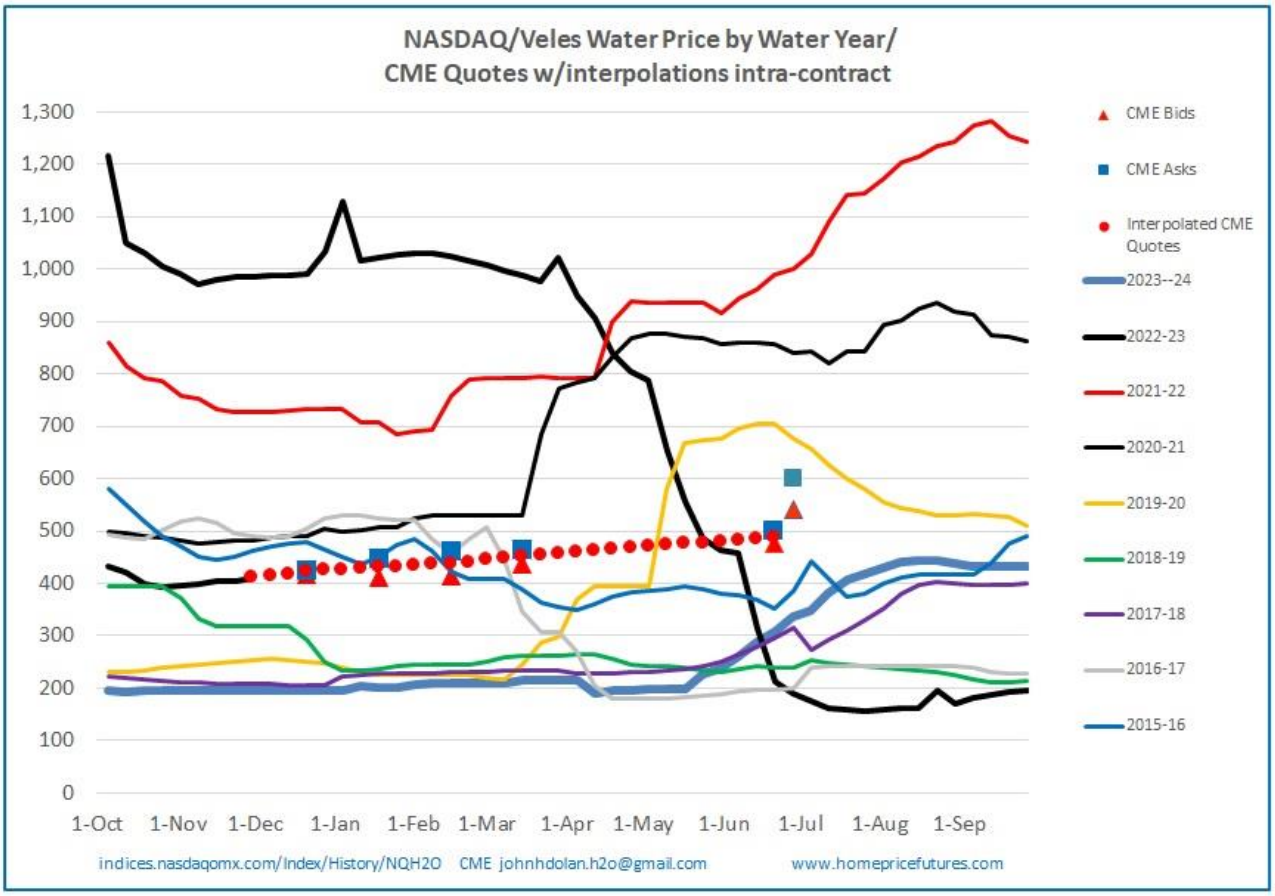
Price Chart Based upon Daily Close

The new NQH2O index level of $410.17 was published on November 27th up $4.66 or 1.15% from the previous week. The November settled at the new index level and the December contract is considered the front month. The futures prices have closed at a premium of $7.49 to $7.87 versus the index over the past week.

Below are the bid offer prices on different expiries being quoted in the market.

Dec 24	418@426
Jan 25	418@448
Feb 25	413@461
Mar 25	438@466
June 25	475@500
June 26	540@600

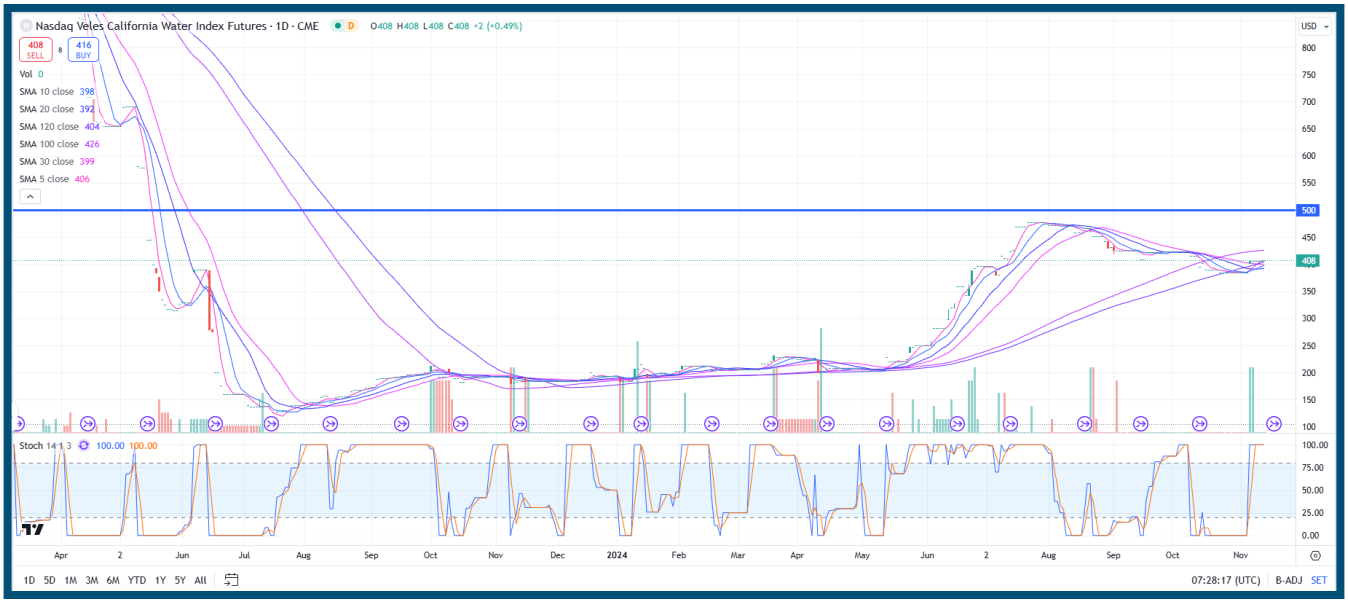
NQH2O INDEX HISTORY



The graph above shows the CME water contracts for Dec 2024, January 2025, February 2025, March 2025, June 2025 and June 2026 superimposed over historical NASDAQ Veles water indices The interpolated curves for 2024-25 and 2025-26 (to include June 2026 contract) are shown in red dots.

(John H Dolan, CME Market Maker)

H2O FUTURES TECHNICAL REPORT



Price Action

- **Current Price:** 418
- The price has increased by 1.21% in this trading session, indicating mild bullish momentum.

Moving Averages (MA) Analysis

- **MA 5 (5-day Moving Average):** 414
  - The current price is slightly above the MA 5, suggesting short-term bullish momentum.
- **MA 10 (10-day Moving Average):** 413
  - The price is above the MA 10, reinforcing continued short-term bullish momentum.
- **MA 20 (20-day Moving Average):** 405
  - The price is above the MA 20, signalling strength in the short-term trend.
- **MA 30 (30-day Moving Average):** 399
  - The price is above the MA 30, indicating medium-term bullish momentum.
- **MA 100 (100-day Moving Average):** 428
  - The price remains below the MA 100, confirming that the long-term trend is still weak compared to recent bullish sessions.
- **MA 120 (120-day Moving Average):** 417
  - The price is slightly above the MA 120, suggesting slight improvement in the long-term outlook.

Support and Resistance

- **Immediate Resistance:** 500
  - This level has been tested multiple times and remains a key resistance point for a breakout.
- **Immediate Support:** 418 (current price level)
  - The current price may act as support. If it drops below this level, the next significant support would be around the MA 100 at 428.

Stochastic Oscillator

- **Stochastic (K%: 100, D%: 100)**
  - The stochastic indicator shows that the market is in overbought territory, suggesting that while bullish momentum is strong, there could be short-term downward pressure or consolidation ahead.

Summary

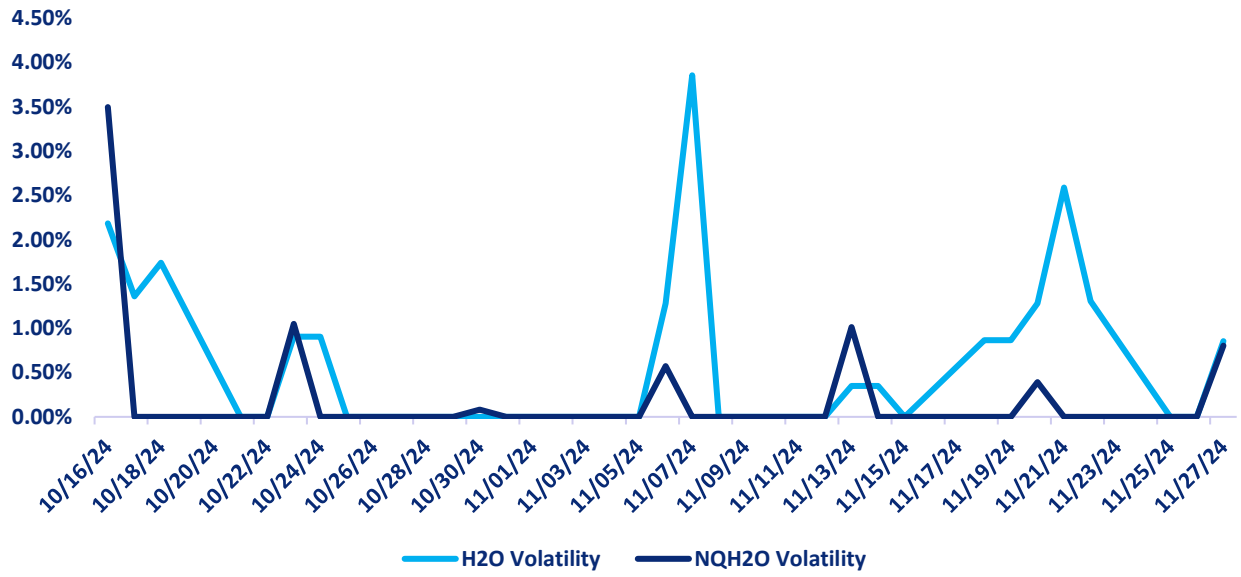
- The price is currently showing short-term and medium-term bullish momentum, as it is sitting above the MA 5, MA 10, MA 20, and MA 30.
- However, the long-term trend remains cautious, as the price is still below the MA 100, though it has moved above the MA 120, indicating some improvement.
- The stochastic indicator signals that the market is heavily overbought, suggesting the potential for a pullback or consolidation in the short term.

Key Levels to Watch:

- Immediate support at 418 and resistance at 500.
- If the price continues to rise, breaking above the MA 100 at 428 would be a positive long-term signal. Conversely, if the price declines, support around the MA 100 should be monitored closely.

H2O FUTURES AND NQH2O INDEX VOLATILITY ANALYSIS

Daily H2O Futures Volatility vs Daily NQH2O Index Volatility



DAILY VOLATILITY

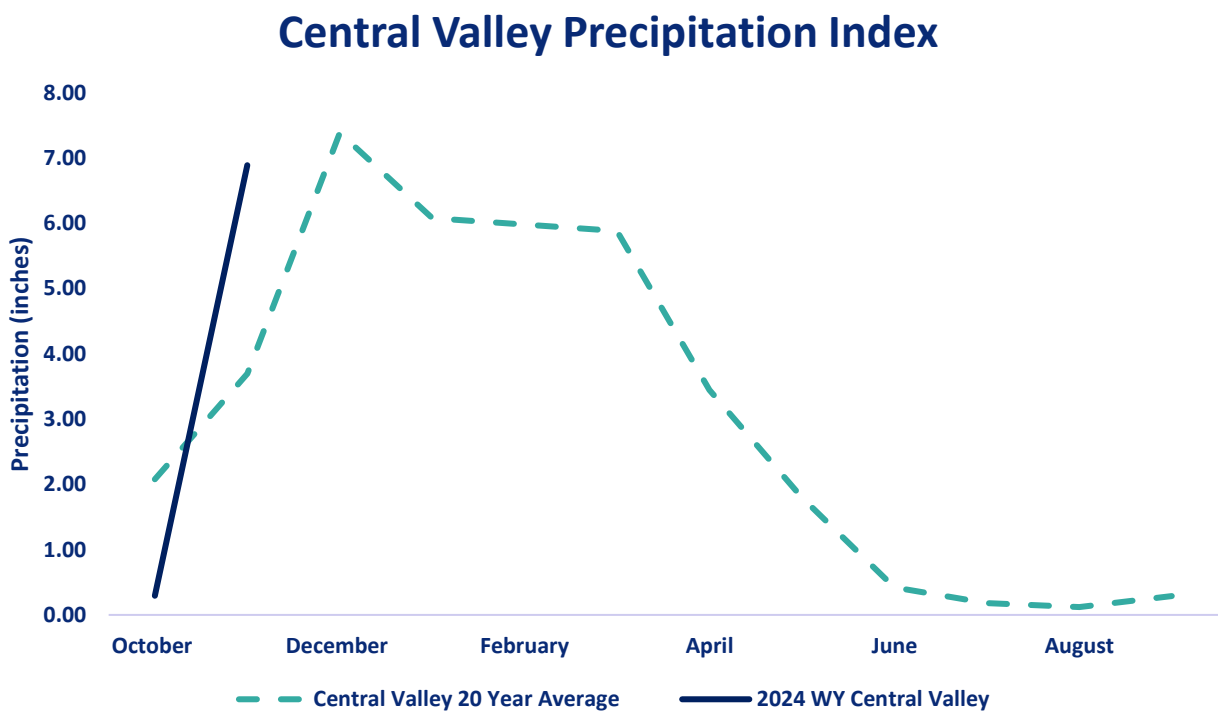
Over the last week the December contract daily future volatility has been 1.31%.

ASSET	1 YEAR (%)	2 MONTH (%)	1 MONTH (%)	1 WEEK (%)
NQH2O INDEX	29.12%	5.55%	0.90%	0.60%
H2O FUTURES	N/A	9.52%	6.17%	1.94%

For the week ending on November 27th, the two-month futures volatility is at a premium of 3.93% to the index, up 0.20% from the previous week. The one-month futures volatility is at a premium of 5.27% to the index, up 0.25% The one-week futures volatility is at a premium of 1.34% to the index, volatility.

*Above prices are all **HISTORIC VOLATILITIES**. All readings refer to closing prices as quoted by CME.*

CENTRAL VALLEY PRECIPITATION REPORT



Central Valley average is calculated using data from 19 weather stations in the Central Valley, California.
Data as of 27/11/2024

STATION	MTD (INCHES)	WEEK ON WEEK CHANGE (INCHES)	% OF 20 YEAR AVERAGE MTD	2025 WYTD VS 2024 WYTD %	2025 WY VS 20 YEAR AVERAGE TO DATE %
SAN JOAQUIN 5 STATION (5SI)	3.63	2.85	105.35	39	49
TULARE 6 STATION (6SI)	3.63	2.94	147.13	35	37
NORTHERN SIERRA 8 STATION (8SI)	13.41	11.13	259.38	54	184
CENTRAL VALLEY AVERAGE	6.89	5.64	186.50	43	90

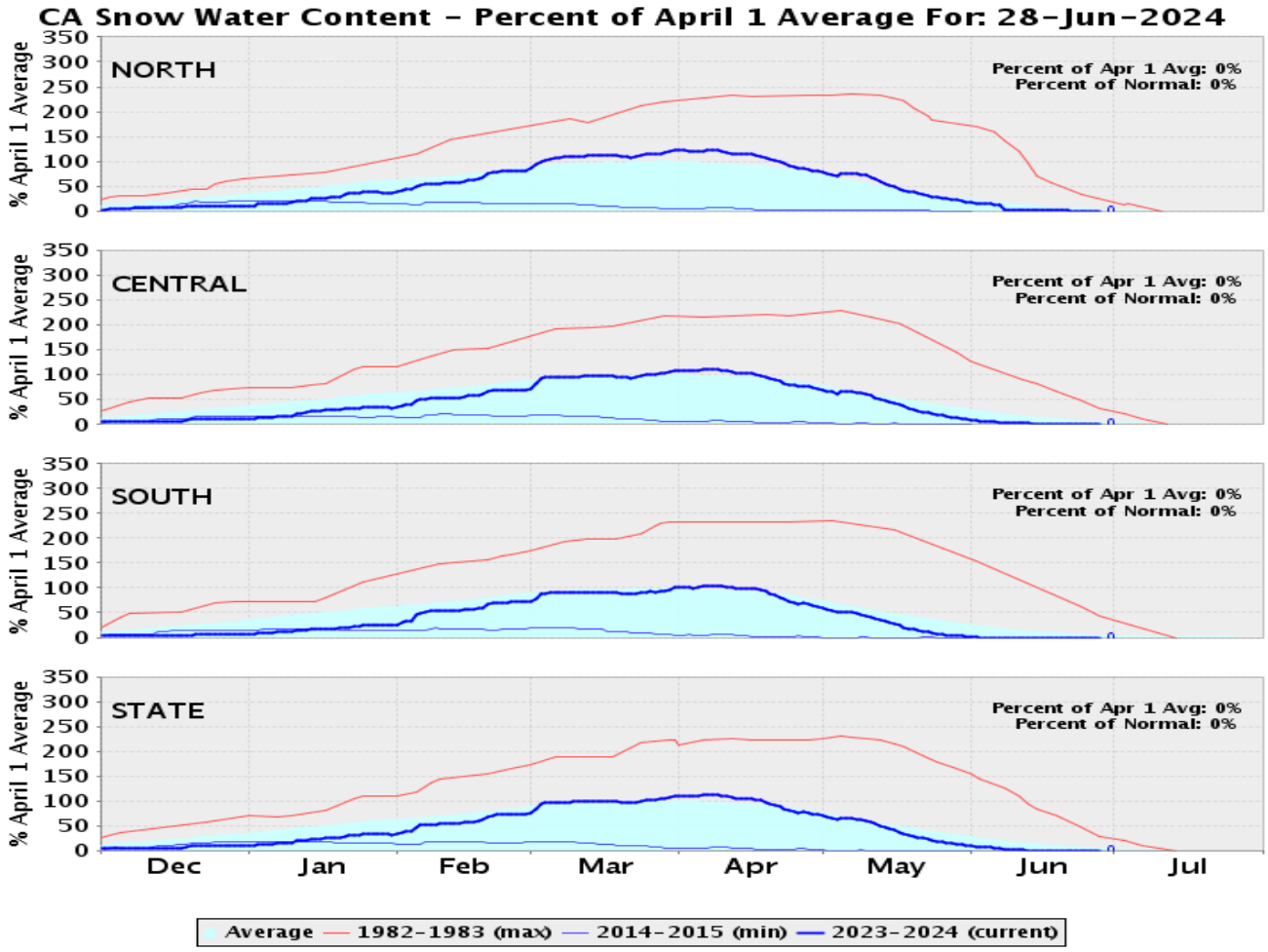
RESERVOIR STORAGE

RESERVOIR	STORAGE (AF)	% CAPACITY	LAST YEAR % CAPACITY	*% HISTORICAL AVERAGE
TRINITY LAKE	1,651,286	67	49	117
SHASTA LAKE	2,700,436	59	68	111
LAKE OROVILLE	1,859,801	46	66	105
SAN LUIS RES	1,097,244	54	58	106

*% Historical Average is based on a daily average that is interpolated from historical monthly averages. The monthly averages are computed using monthly data from water year 1991 to 2020. The monthly averages are updated every 5 years using a sliding 30 year period.

Reference: California Water Data Exchange

SNOWPACK WATER CONTENT



REGION	*SNOWPACK WATER EQUIVALENT (INCHES)	WEEK ON WEEK CHANGE (INCHES)	% OF AVERAGE LAST YEAR	% OF 20 YEAR HISTORICAL AVERAGE	% OF HISTORICAL **APRIL 1ST BENCHMARK
NORTHERN SIERRA	0	0	0	0	0
CENTRAL SIERRA	0	0	0	0	0
SOUTHERN SIERRA	0	0	0	0	0
STATEWIDE	0	0	0	0	0

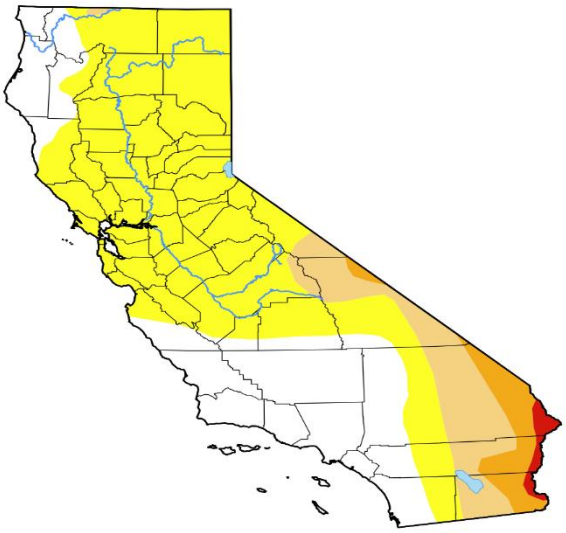
Snow Water Equivalent*, **or SWE**, is a commonly used measurement used by hydrologists and water managers to guage the amount of liquid water contained within the snowpack. In other words, it is the amount of water that will be released from the snowpack when it melts. SWE has regional variance.**

**** April 1st is used as the benchmark as it when the snowpack in California is generally deepest. It has been used the benchmark date since 1941 by DWR and can be used to predict spring river flow.**

DROUGHT MONITOR

California

Home / California



Map released: Thurs. November 21, 2024

Data valid: November 19, 2024 at 7 a.m. EST

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

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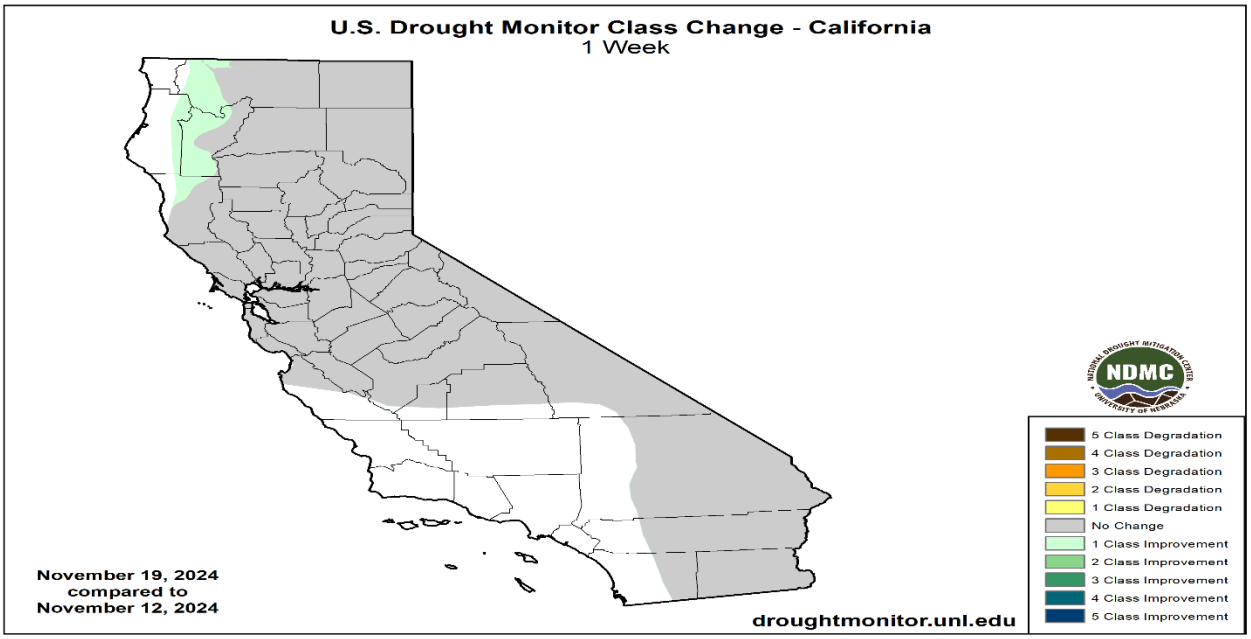
Pacific Islands and Virgin Islands Author(s):
Richard Heim, NOAA/NCEI



Week	Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
Current	2024-11-19	28.61	71.39	16.88	5.50	0.95	0.00	95
Last Week to Current	2024-11-12	25.51	74.49	17.00	5.50	0.95	0.00	98
3 Months Ago to Current	2024-08-20	66.59	33.41	6.91	0.10	0.00	0.00	40
Start of Calendar Year to Current	2023-12-26	96.65	3.35	0.00	0.00	0.00	0.00	3
Start of Water Year to Current	2024-10-01	28.40	71.60	10.67	0.08	0.00	0.00	82
One Year Ago to Current	2023-11-21	95.32	4.68	0.00	0.00	0.00	0.00	5

The U.S Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC.

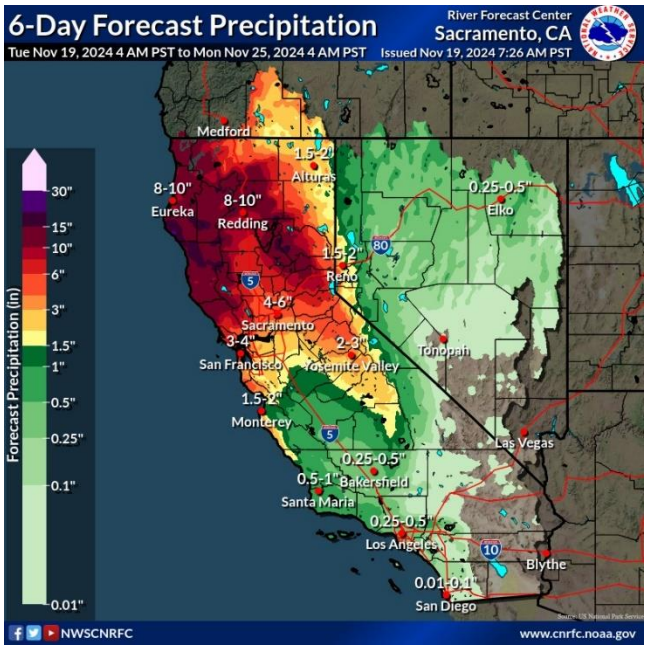
CURRENT SATELLITE IMAGERY

The Northwest is drying out after much storm activity and the whole of this region has clear skies today. This good weather stretches into the Midwest.. some moisture still flowing onshore from the Pacific onto Mexico causing some light cloud cover which stretches into southern western Texas.. a large storm system is moving across the eastern US stretching from Georgia up to Maine bringing cold wintry weather to this region.

Map Ref: Zoom Earth

10 Day Outlook

No change to the afternoon forecast as guidance continues to favor a drying trend through the long term window. Both the GFS and EC show some shower activity over southern California overnight Friday through Saturday as a weak upper low/trough progresses over the region. The afternoon forecast continued to follow the NBM and WPC predicting no precipitation through the entire forecast window. Any shower activity that does form over the weekend will be light and result in minimal accumulations.



Reference: National Weather Service / California Nevada RFC / Sacramento CA

WESTERN WEATHER DISCUSSION

Heavy to excessive precipitation in northwestern California and the Northwest from the Cascades to the Pacific Coast induced widespread 1-category improvement in these areas. Totals exceeding 3 inches were almost ubiquitous, and amounts of 5 to locally 12 inches were common in the Cascades and near the immediate coast. This amounted to peeling back D0 and D1 to the west. In Oregon, streamflows have finally begun to respond to the increased precipitation. Other areas of improvement were introduced where there was spottier moderate to heavy rain in parts of eastern Oregon, northern Idaho, and westernmost Montana. Moderate to heavy precipitation (locally up to 3 inches) also doused southeastern New Mexico adjacent to the heavy rains in western Texas, with similar 1-category improvements introduced in areas with over 1.5 inches of precipitation. Elsewhere, only scattered light precipitation was reported, and dryness and drought were primarily unchanged. Some deterioration was noted in west-central Montana (to D1) while a significant swath of eastern Montana slid into extreme drought (D3).

Reference:
Lindsay Johnson, National Drought Mitigation Center
Richard Tinker, NOAA/NWS/NCEP/CPC

WATER NEWS

CALIFORNIA WATER NEWS

Lytton Rancheria of California to Invest Up to $50M in Cadiz Groundwater Banking Project

A Letter of Intent between the Lytton Rancheria and Cadiz, Inc. was announced today, outlining the tribe's plan to invest up to $50 million in a groundwater banking project in the Mojave Desert, known as the Mojave Groundwater Bank.

This $50 million investment will be the largest water infrastructure investment off tribal land by any Native American tribe in history. The arrangement empowers Indigenous communities to take a central role in decision-making and investment in crucial water projects.

The partnership between Cadiz and Lytton marks a groundbreaking collaboration in water resource management, with tribes holding a majority ownership stake in the Mojave Groundwater Bank. The ownership structure of the deal empowers Indigenous communities to become part of the decision-making process and investments in vital water projects.

The Mojave Groundwater Bank will feature over 300 miles of pipelines connecting to California's water transportation network, delivering new sources of clean water supply and storage to underserved, disadvantaged, and tribal communities in the Mojave River Basin, the Colorado River Basin, and California's Inland Empire—regions that currently lack access to clean, reliable water.

The Mojave Groundwater Bank is a major clean water infrastructure project being developed by Cadiz in California's Mojave Desert. Located at the base of a 2,000-square-mile watershed system fed by rain and snow from the New York and Providence mountains, the underground reservoir currently holds an estimated 30 to 40 million acre-feet of water—more than the combined storage capacity of Lake Mead and Lake Powell, the two largest surface reservoirs in the United States.

The Lytton Rancheria, which is headquartered in Santa Jose, Calif. and 550 miles from the project in southern California, the investment is more than a monetary investment in the tribe's well-being. One strong selling point for the Lytton Rancheria is the anticipation other tribes will be able to use the Mojave Groundwater Bank water pipeline to supply other tribes that have had difficulty obtaining water.

"As a tribal government, we take our responsibility to be good stewards of the land and the environment seriously. Working with other tribal governments, Cadiz and other responsible environmental investors to develop a sustainable, responsibly managed water source in these shifting times is something we want to be involved in.," Lytton Tribal Chairperson Andy Mejia stated, "With tribal involvement in the direction and

operation of this project, we can ensure that all people have a chance to benefit from this critical water resource."

For Cadiz Chief Executive Officer and Chair of the Board Susan Kennedy, the project gives the tribe leverage to control its own destiny when it comes to their source of water supply.

"This gives the tribe, instead of being a zero sum fight over existing water rights, they now own the biggest water source in southern California," Kennedy said to *Native News Online.* "It gives them a lot of leverage to trade water north and south."

She said Cadiz is honored to create this groundbreaking partnership with Lytton to develop this important project for the benefit of underserved and Indigenous communities.

Original Article: Native News Online by Levi Rickert

Unstoppable invasion: How did mussels sneak into California, despite decades of state shipping rules?

After the recent discovery of a destructive mussel in the Sacramento-San Joaquin River Delta, some experts say California officials have failed to effectively enforce laws designed to protect waterways from invaders carried in ships' ballast water.

A state law enacted 20 years ago has required California officials to inspect 25% of incoming ships and sample their ballast water before it's discharged into waterways. But the tests didn't begin until two years ago — after standards for conducting them were finally set — and testing remains rare. State officials have sampled the ballast water of only 16 vessels out of the roughly 3,000 likely to have emptied their tanks nearshore.

Experts say stronger regulations are needed, as well as better enforcement.

"It's not really a surprise that another invasive species showed up in the Delta," said Karrigan Börk, a law professor and the interim director of the UC Davis Center for Watershed Sciences. "It's likely to continue happening."

Native to eastern Asia, the mussels — detected near the Port of Stockton, in a small San Joaquin Valley reservoir and several other Delta locations — were the first to be detected in North America. If the mollusc evades eradication efforts, it could spread over vast areas of California and beyond, crowd out native species and clog parts of the massive projects that export Delta water to cities and farms.

Ted Lempert, a former Bay Area Assemblymember who authored a 1999 state law aimed at preventing ships from bringing invasive species into California, said state officials "apparently took their eyes off the ball."

"We were trying to get ahead of the game, so I'm really frustrated that after all these years some of the events we were trying to prevent have come to pass," he said.

But the prospect of an invasive species colonizing a new region frequented by ships "is a numbers game" that can happen even under the most rigorous regulations and

enforcement, said Greg Ruiz, a marine ecologist with the Marine Invasions Research Laboratory at the Smithsonian Environmental Research Center. “This is not a failure in the system,” he said.

Ballast water is stored in tanks to stabilize vessels at sea. Often taken on at the port of departure and released at the port of arrival, it is a global vector of invasive species, including pathogens that cause human diseases.

“We were trying to get ahead of the game, so I’m really frustrated that after all these years some of the events we were trying to prevent have come to pass.”

Ted Lempert, former Bay Area Assemblymember

To address the threat to ecosystems and water supplies, the State Lands Commission, the U.S. Environmental Protection Agency and the U.S. Coast Guard enforce a suite of overlapping regulations.

The goal of these state and federal rules is to reduce as much as possible the number of living organisms in discharged ballast water. Vessel operators can achieve this by exposing their ballast water to ultraviolet light, filtering it and treating it with chlorine, which is then removed before discharge.

‘Highest standards in the world.’ But are they enforced?

About 1,500 ships a year entering California waters release ballast water, according to Chris Scianni, environmental program manager of the State Lands Commission’s Marine Invasive Species Program. To check for compliance, officials board and inspect nearly all of them, plus another thousand vessels prioritized for inspection for other reasons, Scianni said.

During these inspections, officers review ballast water logbooks and reporting forms, interview crew members, inspect water treatment equipment, and occasionally take water samples for testing.

“We’re the only entity in the world that’s doing this right now,” Scianni said.

A 2003 state law declares that the State Lands Commission “shall take samples of ballast water, sediment, and biofouling from at least 25% of vessels” subject to invasive species regulations. But commission officials told CalMatters they interpret it to mean that 25% of ships must be inspected, with no specific requirements for sampling.

Sampling for some ships began in 2023, after the commission enacted standards for how the tests are conducted. It’s a considerable endeavor: A cubic meter of water — which weighs a metric ton — must be collected from a ship. It can take an hour to draw, and it must be done while the vessel is actively discharging. Hours more may pass before results are ready. Federal officials have their own ballast oversight program. It leans on a system of self-reporting by vessel operators — which critics consider a weak tool for ensuring compliance. An EPA spokesperson said the agency “can assess compliance with (the rules) either through a desk audit or an on-site inspection.”

Original Article: CalMatters by Alastair Bland

California lake jumps by nearly 12 feet after atmospheric river

Levels at Lake Sonoma had jumped more than 12 feet as of Monday, raising the fill to 66% of the reservoir's capacity. Santa Rosa, the largest city in Sonoma County, experienced an unprecedented rainfall — more than 12 inches over three days. This deluge was significant enough for the National Weather Service to call it a once-in-a-thousand-years event, as SFGATE previously reported.

The historic storm ushered a tremendous amount of rain into the state early last week, causing widespread flooding, road closures and even two deaths.

Lake Shasta, California's largest reservoir, had filled to 993 feet as of Monday morning, just below levels taken at the same time in 2023 but far above 2022's low levels, due to the severe drought that year.

California reservoirs have made a massive recovery since those drought years. In 2021, houseboats on Lake Oroville, the state's second-biggest reservoir, had to cluster in the middle of the lake as water levels waned. Fill rose to 54% of the reservoir's capacity by Monday levels, reaching 775 feet and totaling 1.84 million acre-feet of water, Department of Water Resource operations manager Tracy Hinojosa told SFGATE. (An acre-foot is the amount of water it takes to cover 1 acre in 1 foot of liquid, normally about 326,000 gallons.)

DWR is "taking advantage of the recent storm systems to capture as much water as possible in Lake Oroville while continuing to support environmental and water delivery needs to 27 million Californians," Hinojosa said.

2024 has been a big recovery year for reservoirs across the state, including in Southern California. Lake Casitas, a Ventura County reservoir, reached full capacity in April for the first time in more than 25 years, while Big Bear Lake hit its highest point in over a decade.

More rain is expected to hit the Bay Area later this week, though the storm will likely be mild in comparison. Most of the precipitation is forecast to hit Monday and Tuesday, and Thanksgiving travelers are encouraged to wait until Wednesday to get into their cars if they can.

State climatologist Michael Anderson called the state's rain totals so far this year "a strong start" but said that rainfall from December through February, which is typically the wettest part of the year, will ultimately determine whether we're in a wet or dry water year. He also noted that last week's storm mostly benefited the northern part of the state, while Monday's storm could help improve precipitation totals in the central and southern parts of the state.

Original Article: SF Gate by Tessa McLean

US WATER NEWS

Texas Water Rights Clash With Mexico

Governor Abbott pushes for compliance of treaty obligations amid worsening drought conditions

Texas officials are raising alarms about water rights issues with Mexico, following recent agreements intended to manage the distribution of water to the Rio Grande Valley. Governor Greg Abbott has indicated the state's acceptance of water offered from Mexico's San Juan River, stressing the necessity of ensuring it aligns with the terms established by the 1944 Water Treaty. This treaty requires Mexico to share its water resources with Texas, which has become increasingly contentious amid growing agricultural and community needs.

The issue at hand isn't just about water delivery; it's about the adherence to treaties and the consequences of violations. "Water is fundamental for Texans along the Rio Grande Valley to grow crops and support local communities and businesses," Abbott remarked, pointing out the pressing nature of the situation. His concerns stem from what he describes as Mexico's "blatant abuse and disregard of water obligations" under the treaty, which has been a source of frustration for Texas farmers and lawmakers alike.

Under the terms of the treaty, Mexico is obligated to deliver 1.75 million acre-feet of water to Texas every five years, which translates to roughly 350,000 acre-feet annually. Abbott highlighted the disparity, stating, "Mexico's offer of 120,000 acre-feet from the San Juan River is a mere drop in the bucket relative to the 1.75 million acre-feet Mexico is required to deliver." This, he argues, is far from sufficient for the needs of Texas farmers and cities.

The situation took another turn when the International Boundary and Water Commission (IBWC) announced on November 7, shortly after the U.S. presidential election, the agreement calling for regular water deliveries from Mexico to Texas. Abbott directed the Texas Commission on Environmental Quality (TCEQ) to evaluate the water offer. His direction came after criticism of federal oversight of water rights issues.

Historically, disputes over water rights between the two nations have persisted for decades, leading to significant agricultural challenges. For example, drought conditions and the lack of water have previously forced Texas sugar growers to halt operations entirely. Lawmakers from both parties have pressed the federal government for years to compel Mexico to comply with treaty agreements.

"Mexico's deficit under the 1944 Water Treaty has never been greater," Abbott warned, indicating projections of potential water shortages down the line. By October 2025, Texas could face a staggering deficit of 1.3 million acre-feet if Mexico does not fulfill its obligations.

The Rio Grande Valley, known for its richness and productivity, is particularly vulnerable. Farmers depend heavily on the Colorado and Rio Grande rivers to cultivate their crops. Without reliable water access, livelihoods are at risk. The 1944 Treaty of Utilization of Waters was established to ameliorate these conflicts, stipulating regular water allocations to the lower Rio Grande Valley.

During the current five-year water delivery period, which commenced on October 25, 2020, Mexico is expected to provide 1.75 million acre-feet of water by the deadline of October 24, 2025. Yet, so far, their contribution has fallen short, raising alarms about the commitment to U.S. agricultural producers. Data indicates Mexico has only delivered 425,405 acre-feet during the current commitment period, dramatically undershooting their requirements.

Water availability is critically tight, as evidenced by storage levels at federal reservoirs. The combined water level at Lake Amistad and Falcon Dam has been recorded at alarmingly low rates, around 18.76%, according to IBWC figures from June, marking the lowest storage volume on record. This has heightened concerns not just among farmers but also local and state officials.

Responding to these challenges, U.S. lawmakers have taken legislative steps to link aid to Mexico's compliance with water delivery commitments. An appropriations bill passed by the U.S. House aims to hold back foreign aid until Mexico releases the quota of water it owes to Texas. This kind of hardball tactic reflects the frustration felt by agricultural communities who feel their needs have been neglected.

Notably, Abbott's administration is not backing down, signaling strong resistance to any measures perceived as compromises to Texas' water rights and security. By insisting on adherence to the treaty's guidelines, Texas officials aim to protect their agricultural sector and local economies. Abbott noted, "Texas stands firm...that those commitments may be satisfied only with water from the six named tributaries."

The underlying issue surrounding water distribution from Mexico pivots around the interpretation of the treaty and technicalities about which bodies of water count toward fulfilling obligations. Abbott maintains his stance against recognizing the San Juan River as acceptable under the treaty's terms, emphasizing, "The San Juan River isn't one of them." This statement raises the stakes for any future negotiations between the U.S. and Mexico.

Considering the complicated nature of water rights and distribution, the long-term solution may require significant diplomatic efforts combined with consistent and enforceable agreements. Farmers and communities awaiting accurate water delivery from Mexico are hoping for accountability from both U.S. and Mexican authorities as the tumultuous effects of climate change continue to threaten water availability across borders.

Original Article: The Pinnacle Gazette by Evrim Agaci

Private equity firm Sortis backs Thornburgh resort as it fights for Central Oregon water rights

The story began more than 70 years ago — with his grandfather's handshake, $5,000 and 35 cows — which is how DeLashmutt said his family bought the land in 1953.

"As a little kid, I'd ride on a water truck with my grandmother," the now 65-year-old real estate developer said. "There was no source of water, so she hauled water out to fill troughs for cattle."

The property's water supply is still tenuous, even as DeLashmutt has taken enormous loans to build a destination resort, which he described in court as "a little city."

What was once his grandparents' rangeland has become a more than $37 million investment for an embattled private equity firm, Sortis Holdings. DeLashmutt's plans for the Thornburgh resort have also become a litmus test for the future of groundwater management in Central Oregon.

The developer has been trying to permit and finance Thornburgh since the early 2000s. Now under construction, the site could eventually host 950 single-family homes, two golf courses, private lakes and a luxury hotel.

As the project draws on deep pockets to build its roads and infrastructure, its water supply has been in legal limbo due to changing views in Oregon and across the West about how groundwater should be used as drought and climate change make the resource more scarce.

In a trial that began Nov. 5, DeLashmutt asked a circuit court judge, Raymond Crutchley, to rule against the state of Oregon, laying the ground for a water rights conflict that could reverberate across the region.

Thornburgh became a test for state water policy in 2021 when the Oregon Water Resources Department decided it would not give the resort a temporary license to pump groundwater for construction. The agency found the Deschutes Basin aquifer doesn't have the capacity for Thornburgh's proposed wells, and the pumping would likely harm the public.

DeLashmutt is challenging that decision in court, with a ruling expected next year.

"This case is about a state agency throwing away decades of policy and process and suddenly changing those policies," the developer told OPB in an email.

The state's decision came amid escalating concerns about groundwater declines in Central Oregon and as regulators were finalizing a more conservative approach to wells statewide.

State attorneys and regulators have argued Thornburgh is located in a particularly problematic area.

"That means there needs to be something done. There's not enough water to sustain new uses," Oregon Department of Justice attorney YoungWoo Joh said in court.

The outcome of the case could send a message to wealthy interests about whether or not they can overturn state decisions or cow water regulators into saying "yes" to wells by threatening costly legal fights, said an attorney for WaterWatch of Oregon, Karl Anuta.

The nonprofit conservation organization joined in the state's defense, he said, largely because of the precedent the case could set.

"The agency has an obligation under the law to maintain reasonably stable groundwater levels, and in the past, they haven't been doing a good job of that," Anuta said. "In this particular instance, they started actually saying, 'No, we have to draw the line and follow the law.' And so that's a good thing."

DeLashmutt's ability to pay for his own legal fees was helped recently by a real estate investment trust backed by Sortis Holdings.

The firm started absorbing Thornburgh's debts in 2021. As of April this year, DeLashmutt's business entities owe more than $37 million, and Sortis holds liens on the property.

As money flowed out of Sortis Holdings to pay for the high desert development, the company came under scrutiny for buying Portland restaurants and then leaving some in ruin with unpaid bills. This month, several creditors filed a suit to try and force Sortis Holdings into bankruptcy. The firm publicly downplayed the lawsuit as a "preemptive tactic" in a business dispute, The Oregonian/Oregon Live reported.

DeLashmutt said he was "not at liberty" to share details of Thornburgh's financial agreement or a timeline for repaying Sortis.

Sortis did not respond to a request for comment sent through its website.

DeLashmutt said the company's management has "lots of development experience with large master planned communities, so they are very knowledgeable lenders."

Sortis' founder, Paul Brenneke and his family have a history in Central Oregon. In 2007, the Bulletin reported on the Brennekes' effort to buy a golf course in Bend's gated Broken Top neighborhood and turn it into a destination resort. The attempt failed. Last year, the newspaper reported on another deal in Bend's central district involving Sortis that fell through.

"Management [of Sortis] has been familiar with Thornburgh and myself for 15 years and are strong advocates of the project and our plans," DeLashmutt said.

He said construction is well underway at the resort site for entrance roads, the water system, a pump station, a reservoir, a lake and a golf course.

"We expect to seed the golf course [in] the summer of 2025 for play in 2026. The lake will also be completed in mid-2025."

It's unclear if this level of investment is going to factor into persuading state regulators to authorize the resort's permanent water supply.

"Developers frequently play a game where they're trying to persuade their financial investors that they're about to get the entitlements, and they're trying to persuade their government regulators that they're about to get the money," said Bill Fulton, the former planning director for San Diego, who now works as a land-use consultant around the country. Fulton is not involved with Thornburgh.

In the past, developers seeking groundwater in Central Oregon have used a process known as mitigation. The program, in place since 1998, allows people to buy surface water rights and then leave the water in the Deschutes River while they extract groundwater elsewhere.

The program was designed to help streamflows, but groundwater levels have continued to drop over the last 30 years, with a record number of home wells in Deschutes County drying up in 2022.

Back in 2013, state regulators initially agreed Thornburgh would be allowed to pump up to nearly six million gallons per day from wells. That authorization expired before DeLashmutt actually built wells, nullifying the go-ahead from the state. His efforts to renew that permit, including plans to drastically reduce the amount of water he's requested, have sparked denials and separate legal battles.

DeLashmutt said water rights have "certainly created a whole new host of issues to deal with that were not planned," but that the conflicts "led us to amend our plans, reduce our water usage and make numerous changes that will result in greater sustainability."

Currently, the resort is relying on one temporary water right to supply its wells for construction, said water resources department spokesperson Alyssa Rash.

DeLashmutt scooped up this water right through a private auction in 2020, when he and the owners of a private water-ski lake outbid the City of Bend. Thornburgh's access to this water source is valid until July 2028, Rash said.

If Thornburgh wins its latest court battle, its efforts to build will not be fully cleared. It also faces a challenge brought by the Confederated Tribes of Warm Springs. The Oregon Court of Appeals ruled this year that land-use officials must take another look at how they account for the tribes' treaty rights in approving plans for the resort.

Original Article: OPB by Emily Cureton Cook

Colorado River District seeks federal funding to acquire Shoshone rights as Trump presidency brings uncertainty

The Colorado River District seeks a substantial contribution from the U.S. Bureau of Reclamation to complete the purchase of Shoshone water rights as uncertainty surrounds future climate-related funding under President-elect Trump's administration.

Last week, the governmental entity created to represent Western Slope water users submitted its 600-page application for $40 million from the Inflation Reduction Act, which allocated $4 billion toward drought mitigation efforts. The application falls

under the Bureau of Reclamation's Upper Colorado River Basin Environmental Drought Mitigation funding opportunity, also known as the Bucket 2E funding.

The $40 million would go a long way toward the $98.5 million needed for the Colorado River District to purchase the water rights from Xcel Energy. So far, the district has raised around $56.9 million from the state legislature, its board and the various Western Slope municipalities and utilities it serves.

While the district's request for federal dollars has received support from the majority of Colorado's federal congressional delegation, the Inflation Reduction Act is likely to be targeted by Trump as he takes office in January. While the president-elect is unlikely to repeal the Inflation Reduction Act completely, he has promised to rescind any unspent funds under the act.

The bureau is expected to award the Bucket 2E grants in the spring.

Regardless of this uncertainty, Amy Moyer, the Colorado River District's director of strategic partnerships, said the district "remains steadfast in its commitment to securing the Shoshone water rights and protecting the long-term health of the Colorado River."

"The Colorado River District is confident that the Shoshone Water Rights Preservation Project funding application is comprehensive, enjoys broad bipartisan support, and aligns with the intent and criteria of this critical funding opportunity," she said.

Last week, Moyer — alongside several other river district representatives and Western Slope electeds — traveled to Washington D.C. to advocate for swift action on the district's funding application. Kathy Chandler-Henry, an outgoing Eagle County commissioner, was among the group who met with Sens. Michael Bennet and John Hickenlooper, Rep. Joe Neguse, as well as with representatives from the Bureau of Land Management, Bureau of Reclamation, U.S. Department of Agriculture and the Council for Environmental Quality.

Chandler-Henry said the group went to "stress the importance of the acquisition of those water rights for Western Slope entities and to encourage them to get it done before Jan. 20, as it's uncertain what will happen to funding for projects like that in the new administration."

"There is really a general sense of unknowing about what's going to happen with those funds for the Inflation Reduction Act and the Infrastructure Act," she added.

There is hope, however, for the Shoshone acquisition funding based on the positive feedback the group received about the application, according to Chandler-Henry.

"What we're hopeful for is if we can get a commitment for the funding and support from everyone, which we seem to have, that we'll be able to go ahead and get the funds allocated in the new administration for the project," she said.

Federal funding or not, the district intends to continue moving the acquisition forward.

"We would have to look for other funding mechanisms, and I'm not sure what those would be, but it is so critical to the Western Slope to get this done that I think we'll get

it done one way or the other," Chandler-Henry said. "We're just hopeful that the U.S. government and Bureau of Reclamation see this as a good investment with all of the work that they're doing on the Colorado River and drought contingencies and shortages up and down the basins. This is a good way to keep the water flowing in the Colorado River for everybody."

Why the Shoshone water rights matter

The Shoshone Power Plant in Glenwood Canyon has the oldest and largest non-consumptive water rights on the Colorado River. The senior water right dates back to 1905 and allows the power plant to divert 1,250 cubic feet per second of water. A secondary, junior right was established in 1929 for 158 cubic feet per second of water.

The Colorado River District has sought the acquisition of these rights for many years to ensure these flows continue as they have, regardless of what happens with the power plant.

"Xcel will continue to operate this plant for as long as they can to create hydropower," Moyer said at an Oct. 22 tour of Shoshone organized by the Water for Colorado Coalition. "What we're doing is adding another mechanism to be able to continue to use these water rights permanently in the future and allow them to be used for in-stream flow purposes and maintain this historical flow regime that we've all understood and used since this power plant has been operating for over 100 years."

This need has been exacerbated in recent years due to the risks and uncertainties around the plant's age, location and susceptibility to natural hazards including wildfires and mudslides.

In November, Aspen Journalism reported that the plant was down for 221 days in 202, 307 days in 2023, 91 days in 2022 and 143 days in 2021. Many of these extended closures were related to impacts from the 2020 Grizzly Creek fire and subsequent mudslides in 2021.

Today, during such outages, water flow continues thanks to an agreement called the Shoshone Outage Protocol. However, the river district expressed that it only offers limited protection to the senior right and none to the junior right in its federal grant application.

Proponents of the acquisition say that maintaining in-stream flow — regardless of what happens with the plant — will protect the various agriculture, recreation and ecosystem needs along the 250 miles of the Colorado River from Glenwood Canyon to the state border.

"Transmountain diverters are junior to the Shoshone call, and if we were to lose that call, it could very well end up that the water would flow east instead of west, and we would not have water from the Headwaters down," Chandler-Henry said.

Original Article: Vail Daily by Ali Longwell

Gov. Hobbs signs Northeastern Arizona, Yavapai-Apache water rights settlements

Governor Katie Hobbs signed the Northeastern Arizona Indian Water Rights Settlement Agreement (NAIWRSA) and the Yavapai-Apache Nation Water Rights Settlement Agreement (YANWRSA) on Nov. 19, settling four tribal nations' water rights claims.

The signing of the Northeastern Arizona and Yavapai-Apache tribal settlements marks a critical milestone along the path to ensure reliable and sustainable water supplies to the Navajo Nation, Hopi Tribe, the San Juan Southern Paiute Tribe, and Yavapai-Apache Nation.

For decades, generations of tribal members have fought to secure water supplies for their homelands and put an end to years of litigation. Through the extraordinary efforts of the tribes, northern Arizona communities, and the state, a resolution has been reached and an agreement brokered, providing water reliability for tribal and non-tribal parties alike.

"This is a historic moment for the State of Arizona, tribal nations, and all parties to these agreements. They create a consequential and lasting impact by securing a sustainable water supply for tens of thousands of Arizonans and helping local economies thrive," Hobbs said. "I'm proud to be a part of this solution that many Arizona families have fought to get for generations. It's a testament to their strength and determination, as well as my commitment to collaborate with Arizona's Tribal nations and protect water supplies for all Arizonans."

The NAIWRSA settles the outstanding tribal water rights claims to the Colorado River, the Little Colorado River, and groundwater sources in Northeastern Arizona. Water infrastructure funded through this settlement will help alleviate the lack of safe, reliable water supplies for members of all three tribes, and help ensure the access to clean running water that all Arizonans deserve. "I want to thank Governor Hobbs for her leadership in helping us reach this historic agreement. I also want to thank the team at the Arizona Department of Water Resources for all of their work," Navajo Nation President Buu Nygren said. "With their help, I'm confident we can build a consensus with the seven basin states to get this through Congress."

"We are closer than ever to making this historic water settlement a reality, due in no small part to Governor Hobbs' steadfast commitment to water certainty in Arizona and the dedicated efforts of Director Buschatzke and the Arizona Department of Water Resources," Hopi Tribal Chairman Timothy L. Nuvangyaoma said. "I am optimistic that this coalition of Tribal and State leadership can gain the support of the other six basin states and get this bill passed in this Congress."

Additionally, NAIWRSA ratifies a treaty, providing the San Juan Southern Paiute Tribe with 5,400 acres after sharing territory with the Navajo Nation for the last 160 years.

Passage of NAIWRSA is a monumental step in guaranteeing the Paiute Tribe has a home for generations to come.

"The San Juan Southern Paiute Tribe sincerely appreciates Governor Hobbs' steadfast support for the Northeastern Arizona Indian Water Rights Settlement Agreement," said Vice President Johnny Lehi Jr. of the San Juan Southern Paiute Tribe. "Governor Hobbs' dedication to ensuring passage of the water settlement demonstrates her commitment to the Native American Tribes in Arizona. We are grateful for her continued partnership to ensure the cultural and environmental viability of our tribal homeland."

Hobbs also signed the YANWRSA, which secures safe and sustainable water supplies for the Yavapai-Apache Nation, while also preserving and protecting the Verde River. It includes building a 60-mile water pipeline from C.C. Cragin Reservoir on the Mogollon Rim to deliver water to the Yavapai-Apache Nation, providing water certainty to the Nation and neighboring communities.

"We are proud to have reached this critical milestone for the Yavapai-Apache Nation and the Verde River, which is at the heart of our cultural way of life," said Chairwoman Tanya Lewis of the Yavapai-Apache Nation. "This comprehensive water rights settlement not only ensures water certainty for the Nation but also supports a healthy Verde River, benefiting the entire Verde Valley and our downstream neighbors in metropolitan Phoenix."

The agreements will end decades of litigation for tribes, cities, towns, farmers, companies, and others that have sought a water rights solution in Arizona since 1974. To become effective, Congress will need to pass legislation to approve the settlements and provide funding for water projects.

Original Article: Navajo Hopi Observer

This Arizona agency is asking companies for a plan to import 100 billion gallons of water

The Water Infrastructure Finance Authority of Arizona took the first steps last week to asking companies for plans to show they could import more than 100 billion gallons of water into the state.

The move comes as the authority has faced financial challenges. WIFA's funding has been cut to less than half of its original budget after the state government had to make sweeping budget cuts.

The board is looking for other options after scrapping an idea to desalinate ocean water from the Gulf of California.

Any imported water would supplement what's used by homeowners, industrial users and farmers.

Ted Cooke is a WIFA board member and says the panel is open to ideas.

"We want to have an open mind to innovative ideas that go beyond the obvious ones, And even the obvious ones have lots of potential regulatory, legal, political, permitting-type challenges," Cooke said.

The board is required by law to pull 75% of its water from out-of-state sources.

Chelsea McGuire, the authority's assistant director, says the lack of funding has hurt its reputation.

"We have potential responders or potential partners that decide they don't want to partner with WIFA because the state of Arizona clearly isn't serious about this. The state keeps taking their money. They're not going to have what they say they have. We're not going to waste our time," McGuire said.

The board is looking at bringing in surface water from other states and reclaiming wastewater, and says it is open to other options.

What the board wants from the companies are not just meaningful of how these companies technically could bring water to the desert. They want to know the price tag.

One thing is for sure: It's going to cost more than Arizonans are paying now for the mix of groundwater and surface water that comes out of their taps. But the fact is that may end up being the only option as local water supplies are drying up and even the future of state's Colorado River allocation remains uncertain.

What WIFA is pursuing is what remains of a grandiose $1 billion plan by Gov. Doug Ducey to have the state desalinate water from the Sea of Cortez in Mexico. That resulted in behind-the scenes negotiations by the WIFA board solely with Israeli-based IDE Technologies in a bid by the then-governor to have a deal inked by the time he left office in January 2023.

That all blew up when word got out and board members concluded they didn't have enough information.

At the heart of the problem is a convergence of several factors.

The obvious one is that Arizona is growing. And while some of the need for residential use can be met by retiring farmland, that isn't always an option.

Related to that is a recognition that groundwater is not an infinite resource.

Then there's the fact that the drought is putting less water in the Colorado River. And the state, which already has had its allocation reduced, is virtually certain to have to take future cuts.

Cooke said some studies have shown the total anticipated "unmet demand'' for the entire state could be as high as 5 million acre feet, with an acre foot being the amount of water that could serve two or three average families a year.

And a more focused study of the areas served by the Central Arizona Project showed projections of a need of between 100,000 and 500,000 acre feet within 10 years.

What's needed to make that work for any company ultimately chosen by WIFA, however, is having guaranteed long-term customers. And that turns on the billion-dollar question: How much are water users willing to pay.

The average monthly water bill for Phoenix is about $45 a month. It's pretty much the same for Tucson.

Multiply that out by 12 and you're talking $540 a year. That covers everything from producing and treating it to maintaining the system that delivers it to the door.

By contrast, estimates for desalination projects put the cost of treating and delivering an acre foot of water at anywhere from $2,500 to $5,000 an acre foot. Even assuming conservative use of water and that three families can be served with an acre foot, that means adding anywhere from $830 to $1,600 extra a year to a water bill.

At the same time, there are other costly -- but less expensive -- alternatives being explored to increase the supply of domestic water.

One of the most talked about is "advanced water purification,'' sometimes more colorfully referred to as "toilet to tap.'' In fact, the state Department of Environmental Quality just published the draft rules for taking water which just a few days earlier had been flushed down the toilet and delivering it to water faucets.

It's already viable technology.

Scottsdale has a plant that is treating sewage to drinking water standards, though actually delivering it to people's homes will require a DEQ permit. And Phoenix is retrofitting one of its sewage treatment facilities to produce potable water.

Cooke noted that while the law authorizing WIFA to find water requires that 75% come from out of state, that still leaves room for it to be exploring options like this.

Original Article: KJZZ by Greg Hahne

GLOBAL WATER NEWS

Extreme Weather Threatens Canada's Hydropower Future

Hydropower production in Canada is plummeting as extreme weather linked to climate change, particularly sudden swings between drought and flood, hampers output while threatening the structure of dams themselves.

A world leader in hydroelectricity, Canada has also been forced to cut exports to the United States, which have reached their lowest levels in 14 years, according to the national statistics agency.

For three straight months earlier this year, Canada had to import energy from the US -- a first in eight years, and a role reversal that highlights dramatic shortfalls in hydropower production in Canada and abroad.

The International Energy Agency said 2023 marked "a record decline" in global hydropower generation, with other major producers like China, Turkey and the US also impacted. The IEA tied the declines to "severe and prolonged drought" in major producing regions.

In Canada, which gets 60 percent of its energy from hydropower, drought has hit hard in the key production provinces of British Columbia, Manitoba and Quebec.

Production challenges are being acutely felt at Quebec's enormous Daniel-Johnson dam, northeast of Montreal, which was made with enough concrete to build a sidewalk from the North Pole to South Pole, according to Hydro-Quebec.

Hydro-Quebec engineer Pierre-Marc Rondeau said the low levels recorded at certain reservoirs in recent years has "broken records."

The public company is "starting to feel" the impacts of climate change, he said.

Water shortages have reduced profits by 30 percent through the first nine of months of this year, the company confirmed this month.

Hydro-Quebec has also had to cut exports to meet local demand this year and in 2023 -- a bitter setback for a company that has invested in new transmission lines and signed long-term supply contracts with customers in New York and Massachusetts.

"We're adjusting the ways we operate the reservoirs to be ready at any time" in the event of flood or drought, Rondeau told AFP.

The combined impacts of extreme drought and extreme floods are "exponentially increasing" the challenges facing the hydropower sector, said Reza Najafi, a professor of civil and environmental engineering at Ontario's Western University.

Original Article: Barrons.com by Mathiew Leiser

Why Europe needs a Blue Deal to secure its Green Deal

Grappling with the realities of climate change goes hand-in-hand with protecting an essential resource: water. In his new book, Planet Aqua: Rethinking Our Home in the

Universe, economic and social theorist Jeremy Rifkin urges a complete rethink of our relationship with water. He sees the need for a 'Blue Deal' to complement the EU's Green Deal.

Rifkin, known for his 'third industrial revolution' – a sustainability concept that looks to address economic instability, energy security and climate change – insists that a Blue Deal is essential to ensure the EU's resilience in an era of ecological instability.

The European Economic and Social Committee (EESC) agrees, renewing its call for a dedicated EU Blue Deal. In a recent opinion paper the EESC, which represents employers, workers and civil society groups, warns that conflicting industrial and environmental demands make a standalone strategy for water resilience essential.

Europe's water crisis is no longer hypothetical; it is visible and escalating. Climate-induced weather extremes threaten its water systems. Events such as the devastating floods in Spain, and the Rhine and Danube rivers bursting their banks, underscore the problem. As climate change intensifies, droughts and flash floods are becoming common, disrupting local communities, agriculture and key industries.

In Planet Aqua, Rifkin argues that these crises are not simply isolated events but symptoms of a larger "mismanagement of the hydrosphere" – the planet's vast network of water. He warns that we face not only a climate crisis but also a water crisis with serious consequences for public health, biodiversity and economic stability.

Rifkin envisions a Blue Deal that shifts from treating water as just another resource to recognising it as the foundation of life and society. He argues that the EU's Green Deal won't succeed without a corresponding Blue Deal that prioritises water resilience and resource preservation.

"While fossil fuels lit the fuse, it's the hydrosphere that's ringing the death knell," he tells *The Parliament*.

What is a blue economy?

A Blue Deal would support the growth of an economy built around water ecosystems. Unlike other economic models, the blue economy focuses on sustainable water management practices, recognising that sectors like agriculture, energy production and manufacturing rely heavily on water.

This approach stresses that water resources deserve protection and sustainable management, from source to sea. EESC rapporteur Florian Marin underscores this vision: "Water resilience must be widely integrated into all relevant EU policy areas," he tells *The Parliament*.

According to a recent Eurobarometer survey, 78 per cent of Europeans support additional EU measures on water resilience, with top concerns being water pollution, overconsumption and hazardous chemicals.

Strengthening water resilience

Rifkin's thesis is simple but often overlooked: climate change is about more than just carbon. The hydrosphere plays a central role, connecting climate, industry and ecosystems.
In this vein, 21 EU member states, led by Portuguese Minister of Environment and Energy Maria da Graça Carvalho, have urged the European Commission to make water a top priority. In a letter, they call on the EU executive to take "concrete action" to "boost water security and resilience across the European Union."
Original Article: The Parliament by Marilyn Wright

Cross-border Innovations in Wastewater Reuse: Can Technology Help Create More Efficient and Sustainable Solutions?

Water scarcity is a significant threat to global health, and it is expected to worsen in the coming years. Repurposing wastewater offers a new, valuable source of clean water, nutrients, and energy. This can be a game changer in addressing the global issue of water stress, yet the potential of wastewater is not yet fully exploited. EU-funded projects have tested innovative solutions to make the reuse of wastewater more feasible and efficient.

As little as 0.5% of the water on our planet is usable and available freshwater, and around 2 billion people do not have access to it. Water scarcity is exacerbated by climate change, leading to more frequent droughts, floods, and pollution. Coupled with a projected 55% increase in global water demand by 2050, this poses a significant threat to human health.
The problem is also evident in Europe, where 17% of its population could face high to extreme water scarcity risks by 2050. In some southern regions of the continent, a large majority of the population already suffers from seasonal water stress in warmer months. Wastewater from homes, businesses, industries, and agriculture is a mix of chemicals, nutrients, and metals that can be treated and repurposed to help address water scarcity. In fact, about 320 billion cubic meters of wastewater are produced worldwide every year, over ten times the capacity of current global desalination. In Europe, for example, treated water reuse could be six times higher than the current levels. According to the EU's Water Reuse Regulation, it is up to member states to decide if they want to allow water reuse in their territory or limit it only to certain areas.

"I believe one of the major issues worldwide right now is water scarcity, especially during the summer when the demand for fresh, drinkable water is even higher. Reusing wastewater can help relieve pressure on freshwater sources," Kimberly Tumlos Solon, a postdoctoral researcher at Ghent University and part of the team of EU-funded project DARROW, told Earth.Org.

"Treating wastewater to a level suitable for its intended use, known as 'water fit for purpose,' allows for its reuse for different uses such as irrigation, industrial processes, and even potable water. This approach can alleviate the strain on freshwater resources and is a sustainable way to manage water scarcity."

AI Can Make Wastewater Treatment Plants More Efficient

Wastewater treatment plants produce a vast amount of data, such as water quality measurements, water conditions, and sediment levels. To better interpret these datasets the DARROW projects developing and testing artificial intelligence (AI) tools that guide operators to optimise wastewater treatment plant performance.

"We want to focus on reducing greenhouse gas emissions. We have tools that help track emissions and provide recommendations for minimising them. Another key focus is producing more biogas, which can be converted into heat and power to be used in the plant. This helps reduce the need for external energy," Solon explained.

Analysing wastewater composition with AI tools can help the facilities run more independently and ultimately reduce energy and greenhouse gas emissions by 20% compared to traditional water treatment plants.

"We are using AI tools for three main purposes," said Solon.

"Firstly, we use AI to augment and clean missing data in order to detect anomalies in the system. Secondly, we adopt AI to control the process in the wastewater treatment plant. We believe this approach is more effective than traditional controllers, as it learns from history and from simulations to operate optimally. Finally, we have developed a decision support tool that provides recommendations on how to operate the plant more efficiently."

The developed AI tools will be tested at the wastewater treatment plant RWZI in Tilburg, one of the largest water recovery facilities in the southern Netherlands. It treats 10,000 cubic meters of wastewater daily, releasing clean water into the Zandleij River and supporting the region's environmental sustainability.

"The Tilburg plant already has the basic equipment needed to build these AI tools. It was thus a perfect scenario to run the test," said Solon. She explained that different tools are modular and flexible, meaning they can be adopted by other plants as well.

Algae and Microalgae Solutions for Circular Economy

Another problem that puts pressure on freshwater availability in Europe and the rest of the world is pollution.

Agriculture is not only consuming a third of Europe's water, but is also one of the major polluters and a major cause of water degradation in some regions across Europe. Nitrogen, phosphorus, and other nutrients are added to irrigation water to promote healthy plant growth and improve yields. However, not all nutrients are absorbed by the plants, and those in excess are washed into rivers and lakes.

Earth.Org spoke with José Luis Guzmán Sánchez, professor of automatic control and system engineering at the University of Almería and part of the team of EU-funded project REALM. The project converts the nutrient-rich wastewater from greenhouses into valuable products using microalgae.

"The microalgae absorb the nutrients and convert them into biomass, which can be utilised to produce bio-products such as bio-stimulants and biopesticides for agricultural purposes. This process not only purifies the water but also sustains the microalgae without requiring additional nutrients," explained Sánchez.

Using drain water from greenhouses to cultivate microalgae can prevent nutrient runoff, improve water quality, and conserve freshwater by removing excess nitrogen and phosphorus, which would otherwise harm aquatic ecosystems and the environment. REALM works with microalgae researchers, agricultural producers and technology experts across Europe to test this concept.

Original Article: Earth.org by Luca Arfini

Vulnerable water resources could increase price of grid decarbonisation

According to a new study published in *Nature Communications*, changes in water availability caused by climate change could decrease hydropower generation by up to 23 per cent by 2050, while electricity demand could increase by two per cent. Both these phenomena would come together in summer to compound impacts on the grid.

To adapt to these impacts, the Western United States would need to build up to 139GW of power capacity between 2030 and 2050, which is said to be equivalent to nearly three times California's peak power demand, or up to 13GW in transmission capacity during the same period. It is estimated that the total additional investment would cost up to $150bn.

The study, supported by the US Department of Energy, was co-authored by a team of Canadian and US researchers, including at the University of California San Diego.

In their study, the team accounted for the vulnerability of the Western United States to water-related climate change impacts, such as rising temperatures, changing patterns in rainfall and declining snowpack. They built simulations that link the region's water and electricity systems. They then evaluated how the region could adapt to a range of potential climate change futures from 2030 to 2050, while still trying to transition to a grid powered by carbon-free energy sources.

"Our results suggest that if [the West] ignores climate change impacts and associated water sector dynamics in planning, the grid will have insufficient resources to maintain system reliability and meet decarbonisation goals," the researchers said.

With the models used by the researchers, the Pacific Northwest would experience some increases in rainfall, while the Southwest would continue to experience drying and

droughts. Consequently, key water basins in the region, such as the Colorado River, would keep shrinking.

Hydropower, which constitutes 20 per cent of average energy generation in the West, will decline in response to these conditions. The models indicate that a mix of renewable power sources will be necessary to offset these hydropower shortfalls. In climate scenarios with lower hydropower shortfalls and lower increases in energy consumption, wind power would mostly fill the gap. In scenarios with greater shortfalls, solar power would play a large role in filling the gap, complemented by flexible battery storage and geothermal power.

An increased need for cooling buildings would drive up electricity demand, which would be especially high in the Southwestern states of California, Nevada, Arizona and New Mexico. In the Pacific Northwest – Oregon and Washington – decreased electricity use for heating could partially offset increased electricity use for cooling. The electricity demand related to water consumption is expected to increase in the Mountain region, namely Colorado, Montana, Wyoming, Idaho and Utah. Agricultural water needs, and associated electricity use for groundwater pumping, would also keep increasing in California's Central Valley.

"Without explicitly quantifying how climate change and water interdependencies may together affect future electricity supply and demand, grid planners may significantly underestimate the magnitude and type of resources needed to achieve decarbonisation goals and maintain grid reliability," the researchers said in their paper.

Next steps in the research would include evaluating how programs that seek to make demand more flexible and responsive could offset shortfalls in supply. Also, the researchers would like to explore the role of transitions in the electricity sector, such as widespread electrification of buildings and transportation systems, and their synergies with the operation of the grid. More study is needed to understand how extended and more intense droughts would impact water and electricity systems in the West.

"Finally, we need to understand and overcome the significant political barriers to transmission expansion across the West, which may make capacity additions difficult to achieve in practice," the researchers said.

Original Article: The Engineer

Study shows excessive groundwater pumping tilted Earth by 31.5 inches

The excessive groundwater pumping tilted Earth's axis by 31.5 inches in the last two decades, according to a study. The water redistribution is contributing approximately 0.24 inches to the rise in the global sea level, it said.

The study, recently published in Geophysical Research Letters, revealed that the rotational pole of the earth shifted significantly due to groundwater extraction, surpassing other climate-related factors.

The depletion of groundwater has some serious consequences impacting ecosystems, sea levels and planetary stability. To tackle this issue and mitigate its effect on climate change, experts are emphasising on the promotion and adoption of sustainable water management practices.

Ki-Weon Seo, a geophysicist at Seoul National University said, “Our study shows that among climate-related causes, the redistribution of groundwater actually has the largest impact on the drift of the rotational pole.”

What exactly is groundwater?

Groundwater is found beneath the surface of the earth filling up the spaces in soil, sand, and rock formations. This water comes from rain and other precipitation and soaks into the ground making its way down to underground reservoirs called aquifers.

Groundwater is important for the water cycle providing a steady water supply even during dry spells of the surface water, like rivers and lakes.

This water fills the essential needs of humans like drinking water, especially in rural areas where surface water is not readily available. Farmers also depend on groundwater for plenty of reasons like irrigating crops, and ensuring sufficient food production even where there is not enough water.

Industries also use groundwater for manufacturing processes and cooling systems.

Role of groundwater extraction on Earth’s tilt

The tilt in Earth is a result of the pumping of around 2,150 gigatons of groundwater, a fact revealed in a recent study that includes data from 1993 through 2010. These figures are hard to comprehend, reflecting intense water consumption for irrigation and human use.

Generally, we don't care about where the water goes after we use it, mostly it is transported to the oceans. Seo said, “Observing changes in Earth’s rotational pole is useful for understanding continent-scale water storage variations.”

Linking the water movement variation, especially in North America and Northwest India shows how our everyday actions impact the Earth on a global scale.

When the mass of water is redistributed around the planet, it causes changes to the motion of the rotational pole, around which the earth moves. “Like adding a tiny bit of weight to a spinning top,” authors quoted by Popular Mechanics say, “the Earth spins a little differently as water is moved around.”

It was Nasa in 2016 which had earlier hinted at a relationship between changes in earth’s tilt and the shifting of the mass of water on the surface of the planet. This study has added hard figures to that hypothesis.
Original Article: Business Standard by Sudeep Singh Rawat

Water for First Nations to come from Murray-Darling

The Federal Government has begun its program to spend $100 million buying up Murray-Darling irrigators’ water for First Nations cultural water.
Original Article: The Corowa Free Press by Geoff Adams

Note the attachment is not an inducement to trade and Veles Water does not give advice on investments.