

June 2024



WestFAST News

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NASA Satellites Find Snow Didn't Offset Southwest US Groundwater Loss

NASA June 17, 2024



Despite some years with significant snowfalls, long-term drought conditions in the Great Basin region of Nevada, California, Arizona, and Utah, along with increasing water demands, have strained water reserves in the western U.S. As a result, inland bodies of water, including the Great Salt Lake pictured here, have shrunk dramatically, exposing lakebeds that may release toxic dust when dried.

Dorothy Hall/University of Maryland

Record snowfall in recent years has not been enough to offset long-term drying conditions and increasing groundwater demands in the U.S. Southwest, according to a new analysis of NASA satellite data.

Declining water levels in the Great Salt Lake and Lake Mead have been testaments to a [megadrought afflicting western North America since 2000](#). But surface water only accounts for a fraction of the Great Basin watershed that covers most of Nevada and large portions of California, Utah, and Oregon. Far more of the region's water is underground. That has historically made it difficult to track the impact of droughts on the overall water content of the Great Basin.

A new look at [20 years of data](#) from the Gravity Recovery and Climate Experiment (GRACE) series of satellites shows that the decline in groundwater in the Great Basin far exceeds stark surface water losses. Over about the past two decades, the underground water supply in the basin has fallen by 16.5 cubic miles (68.7 cubic kilometers). That's roughly two-thirds as much water as the entire state of California uses in a year and about six times the total volume of water that was left in Lake Mead, the nation's largest reservoir, at the end of 2023.

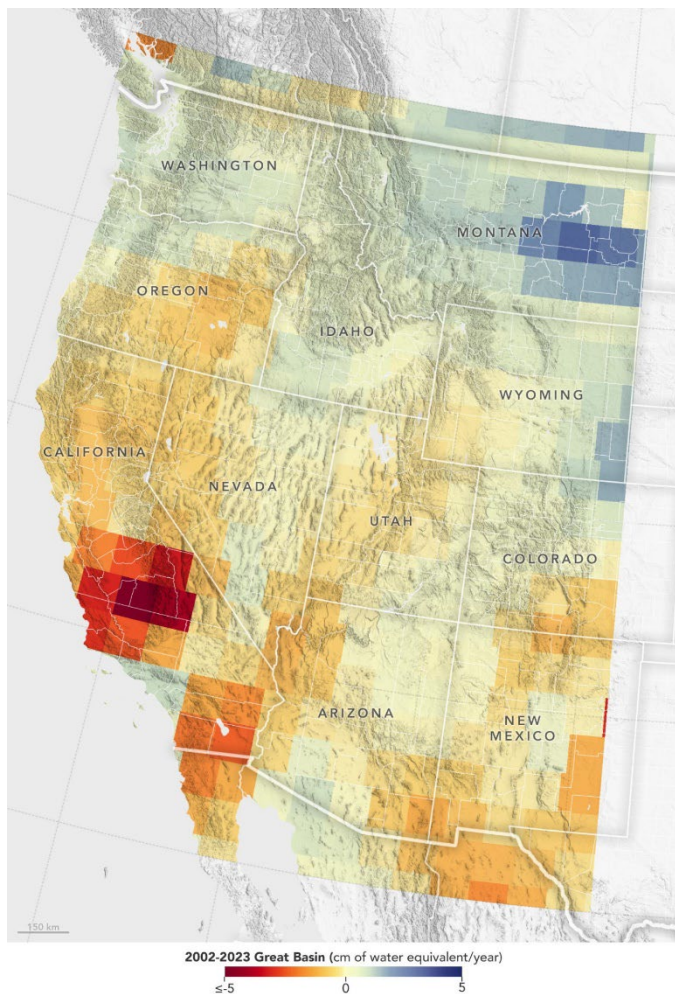
While new maps show a seasonal rise in water each spring due to melting snow from higher elevations, University of Maryland earth scientist Dorothy Hall said occasional snowy winters are unlikely to stop the dramatic water level decline that's been underway in the U.S. Southwest.

The finding came about as Hall and colleagues studied the contribution of annual snowmelt to Great Basin water levels. "In years like the 2022-23 winter, I expected that the record amount of snowfall would really help to replenish the groundwater supply," Hall said. "But overall, the

decline continued.” The research was published in March 2024 in the journal *Geophysical Research Letters*.

“A major reason for the decline is the upstream water diversion for agriculture and households,” Hall said. Populations in the states that rely on Great Basin water supplies have grown by 6% to 18% since 2010, according to the U.S. Census Bureau. “As the population increases, so does water use.”

Runoff, increased evaporation, and water needs of plants suffering hot, dry conditions in the region are amplifying the problem. “With the ongoing threat of drought,” Hall said, “farmers downstream often can’t get enough water.”



Gravity measurements from the GRACE series of satellites show that the decline in water levels in the Great Basin region from April 2002 to September 2023 has most severely affected portions of southern California (indicated in red).
D.K. Hall et al./*Geophysical Research Letters* 2024

While measurements of the water table in the Great Basin — including the depths required to connect wells to depleted aquifers — have hinted at declining groundwater, data from the joint German DLR-NASA GRACE missions provide a clearer picture of the total loss of water supply in the region. The original [GRACE satellites](#), which flew from March 2002 to October 2017, and the successor [GRACE-Follow On \(GRACE-FO\)](#) satellites, which launched in May 2018 and are still active, track changes in Earth’s gravity due primarily to shifting water mass.

GRACE-based maps of fluctuating water levels have improved recently as the team has learned to parse more and finer details from the dataset. “Improved spatial resolution helped in this study to distinguish the location of the mass trends in the Western U.S. roughly ten times better than prior analyses,” said Bryant Loomis, who leads GRACE data analysis at NASA’s Goddard Space Flight Center in Greenbelt, Maryland.

The diminishing water supplies of the U.S. Southwest could have consequences for both humans and wildlife, Hall said. In addition to affecting municipal water supplies and limiting agricultural irrigation, “It exposes the lake beds, which often harbor toxic minerals from agricultural runoff, waste, and anything else that ends up in the lakes.”

In Utah, a century of industrial chemicals accumulated in the Great Salt Lake, along with airborne pollutants from present-day mining and oil refinement, have settled in the water. The result is a hazardous muck that is uncovered and dried as the lake shrinks. Dust blown from dry lake beds, in turn, exacerbates air pollution in the region. Meanwhile, shrinking lakes are putting a strain on bird populations that rely on the lakes as stopovers during migration.

According to the new findings, Hall said, “The ultimate solution will have to include wiser water management.”

President's Investing in America Agenda Delivers More Than \$142 Million to Bolster Resilience to Drought and Boost Water Supplies

DOI June 13, 2024

Acting Deputy Secretary of the Interior Laura Daniel-Davis today announced a \$142 million investment from President Biden's Bipartisan Infrastructure Law to advance drought resilience and boost water supplies across the country, as part of the Investing in America agenda. The selected projects are expected to provide about 40,000 acre-feet of annual recycled water, enough to support more than 160,000 people a year.

President Biden's Investing in America agenda represents the largest investment in climate resilience in the nation's history and is providing much-needed resources to enhance Western communities' resilience to drought and climate change. Through the [Bipartisan Infrastructure Law](#), the Bureau of Reclamation is investing a total of \$8.3 billion over five years for water infrastructure projects, including rural water, water storage, conservation and conveyance, nature-based solutions, dam safety, water purification and reuse, and desalination. Since the Bipartisan Infrastructure Law was signed in November 2021, Reclamation has announced more than \$4.1 billion for more than 537 projects.

Acting Deputy Secretary of the Interior Daniel-Davis made the announcement after a tour of the Truckee Meadows Water Authority, which is receiving \$30 million from today's announcement to enhance water reclamation infrastructure at the Advanced Purified Water Facility.

"The Biden-Harris administration is bringing every resource to bear to ensure that we both minimize the impacts of climate-fueled drought and develop a long-term plan to build resilience and facilitate water conservation," said Acting Deputy Secretary Daniel-Davis. "Access to clean and reliable water is essential for feeding families, growing crops, sustaining wildlife and the environment, and powering agricultural businesses. We also recognize the incredible potential for economic opportunity

and job creation, as we work together to address the intensifying effects of climate change."

"We must use every tool that works to develop water sources that build resiliency throughout the West," said Reclamation Commissioner Camille Calimlim Touton. "This funding through Reclamation's water recycling and desalination construction programs enables partners to develop new water supplies through treatment of water that can be a part of the water supply portfolio."

Water Recycling Projects

Approximately \$85 million from today's announcement will go to six water recycling projects in California, Hawaii, Kansas, Nevada and Texas that reclaim and reuse wastewater and impaired ground and surface water. Funding can be used for planning, design and construction of water recycling facilities in partnership with local governments.

Desalination Projects

Another \$57.5 million from today's announcement will go to four desalination projects in southern California to increase water management flexibility and make water supplies more reliable through the treatment of seawater or brackish water.

Projects are funded through the Bipartisan Infrastructure Law and annual appropriations. View a full list of projects on the [Bureau of Reclamation's website](#).

Today's announcement builds on \$179 million announced last month for [large scale water recycling](#) projects to help communities develop local, drought-resistant water supplies by turning previously unusable water sources into clean, reliable ones. Reclamation's Large-Scale Water Recycling Program, [launched in 2023](#) as a result of new funds from the Bipartisan Infrastructure Law, incentivizes conservation projects at a larger scale, with no cap on project size, and will play an important role in helping communities develop local, drought-resistant water supplies by turning unusable water sources into clean, reliable ones.

May 2024 was Earth's Warmest May on Record

The globe saw its 12th-consecutive month of record warmth.

NOAA June 13, 2024



MARILAO, PHILIPPINES - MAY 04, 2024: Workers prepare to dump blocks of ice at a pool amid extreme heat in Marilao, Bulacan province. Sweltering conditions strained power grids, sparked health warnings, and left residents desperate for ways to stay cool. May 2024 was the world's warmest May on record. (Image credit: Ezra Acayan/Getty Images)

Last month marked a full year of record-high global temperatures, with May 2024 ranking as the warmest May on record.

Earth's ocean temperatures also set a record high for the 14th month in a row, according to data and scientists from NOAA's National Centers for Environmental Information.

Climate by the numbers May 2024

The average global May temperature was 2.12 degrees F (1.18 degrees C) above the 20th-century average of 58.6 degrees F (14.8 degrees C), ranking as the warmest May in NOAA's 175-year global record. May 2024 marked the 12th-consecutive month of record-high temperatures for the planet.

Looking at the world's land masses, temperatures were above average across most of the globe except for western North America, Greenland, southern South America, western Russia and parts of eastern Antarctica. Africa had its warmest May on record.

May 2024 was the 14th-consecutive month of record-warm ocean temperatures, a streak that has

been running since April 2023. Looking regionally, sea surface temperatures were above average over most areas (and record warm over the tropical Atlantic Ocean), while parts of the Southern, southeastern Pacific and southern Indian Ocean basins were below average.

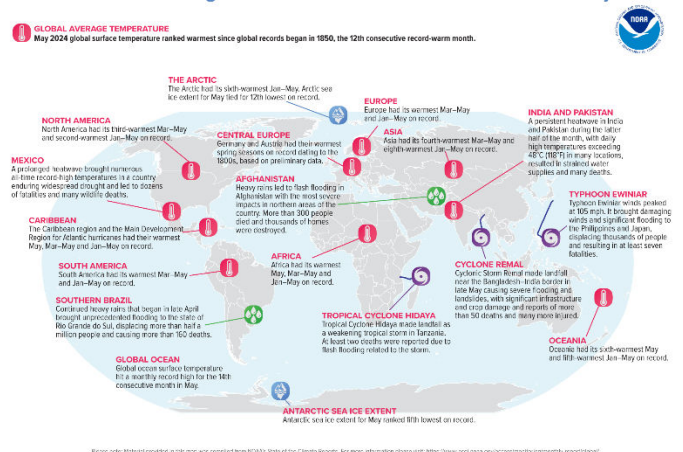
Season | Year to date

The March–May period — defined as the Northern Hemisphere's meteorological spring and the Southern Hemisphere's meteorological autumn — was the warmest on record at 2.32 degrees F (1.29 degrees C) above average.

The year-to-date (YTD, January through May 2024) global surface temperature ranked as the warmest such period on record, 2.38 degrees F (1.32 degrees C) above average. Africa, Europe and South America each had their warmest such YTD period, with North America ranking second warmest.

According to NCEI's Global Annual Temperature Rankings Outlook, there is a 50% chance that 2024 will rank as the warmest year on record and a 100% chance that it will rank in the top five.

Selected Significant Climate Anomalies and Events: May 2024



An annotated map of the world plotted with the most significant climate events of May 2024. See the story below as well as the report summary from NOAA NCEI at <http://bit.ly/Global202405>. (Image credit: NOAA/NCEI) [Download Image](#)

Other notable climate events

- **World's sea ice coverage was below average:** Global sea ice extent (coverage) was the seventh smallest in the 46-year record at 8.51 million square miles, which was 460,000 square miles below the 1991–

2020 average. Arctic sea ice extent was below average by 60,000 square miles, and Antarctic sea ice extent was below average by 390,000 square miles.

- **Tropical activity was slightly above average:** Five named storms occurred across the globe in May, which was above the 1991–2020 average of four. Two of these reached tropical cyclone strength: Tropical Cyclone Hidaya in the South Indian Ocean basin, which brought gusty winds and rain to coastal Tanzania, and Typhoon Ewiniar, which caused flooding and wind damage in the Philippines and Japan.

Upcoming Events

[2024 WSWC Summer \(204th\) Meetings](#)
July 24-26, West Fargo, North Dakota

[Federal Collaboration Certificate Course](#)
From BLM and the University of Utah
September-December 2024

Other Federal News

[BLM 6/13/24. BLM, Foundation for America's Public Lands to Address Drought](#)

[BLM 6/20/24. Biden-Harris Administration Provides Nearly \\$11 Million to Advance Wildland Fire Research](#)

[DOI 6/13/24. Biden-Harris Administration Releases Report Highlighting Historic and Ongoing Negative Impacts of Federal Columbia River Dams on Tribal Communities](#)

[DOI 6/20/24. Biden-Harris Administration Delivers Additional \\$43 Million for Rural Water Projects, as Part of Investing in America Agenda](#)

[DOI 6/28/24. Biden-Harris Administration Announces \\$700 Million from President Biden's Investing in America Agenda for Long-Term Water Conservation in the Lower Colorado River Basin](#)

[EPA 6/10/24. EPA Releases Information that States and Tribes Can Use to Protect Local Fish from Toxic Tire Chemicals](#)

[EPA 6/12/24. WaterSense Labeled Products Helped American Businesses and Homeowners Save Over a Trillion Gallons of Water in 2023](#)

[EPA 6/20/24. EPA Publishes its 2024-2027 Climate Adaptation Plan](#)

[FEMA 6/26/24. Biden-Harris Administration Announces \\$185 Million in Allocations for Rehabilitation of High Hazard Potential Dams Through Investing in America Agenda](#)

[NASA 6/25/24. NASA, SpaceX Launch NOAA's Latest Weather Satellite](#)

[NRCS 6/22/24. Biden-Harris Administration Announces Nearly \\$66M for Conservation Work with States, Tribes, Private Landowners as Part of Investing in America Agenda](#)

[USACE 6/10/24. USACE Report Offers New Approaches for Better Water Resource Planning](#)

[USACE 6/20/24. U.S. Army Corps of Engineers Releases 2024-2027 Climate Adaptation Plan](#)

[USDA 6/3/24. Biden-Harris Administration Outlines Strategic Priorities to Strengthen the Nation's Response to Wildfire](#)

[USDA 6/4/24. Agriculture and Interior Departments Invest \\$2.8 Billion to Protect Public Lands, Support Conservation Efforts Across the United States](#)

[USGS 6/5/24. USGS-led Study Estimates Lithium in Groundwater that can be used for Drinking Water](#)

[USGS 6/26/24. USGS Measures Historic Flooding Across the Upper Midwest](#)

The Western States Federal Agency Support Team (WestFAST) is a collaboration between 16 Federal agencies with water management responsibilities in the West. WestFAST was established to support the Western States Water Council (WSWC), and the Western Governors Association in coordinating Federal efforts regarding water resources.