

**California Water and Infrastructure Report  
For May 6, 2021  
by Patrick Ruckert**

**Published weekly since July, 2014**

**An archive of all these weekly reports can be found at both links below:**

<http://www.californiadroughtupdate.org>

<https://www.facebook.com/CaliforniaDroughtUpdate>

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*“In news articles, Ingram has summarized the last 2,000 years of the climate history of the American West, emphasizing that the current drought is the worst to hit the region in 500 years. In addition, she makes the point that, especially over this 2,000-year period, the West has experienced megadroughts lasting decades, and megafloods which far surpass the famous 1861-62 flood that put Sacramento and the entire Central Valley of California under 10-20 feet of water for months. She states that the climate of the past 150 years or so is an anomaly, being one of the mildest and wettest on record, and that soon or later, per-haps now, California will return to the mega-droughts interspersed with megafloods pat-*

tern that characterized the region for millennia.”

From the book review: “*Are We Controlled by the Whims of Nature, or Will We Create Our Future?*”

## A Note To Readers

Due to scheduling, this week's report is a day late and very brief.

Of course the drought, or mega-drought that we are in the midst of is the focus, and the entire article, the final item in this report, from *National Geographic* presents it fairly well, despite the usual “its global warming” theme developed in it. While the climate is changing, and apparently warming, the claim it is caused by mankind is bogus.

### Also in this report:

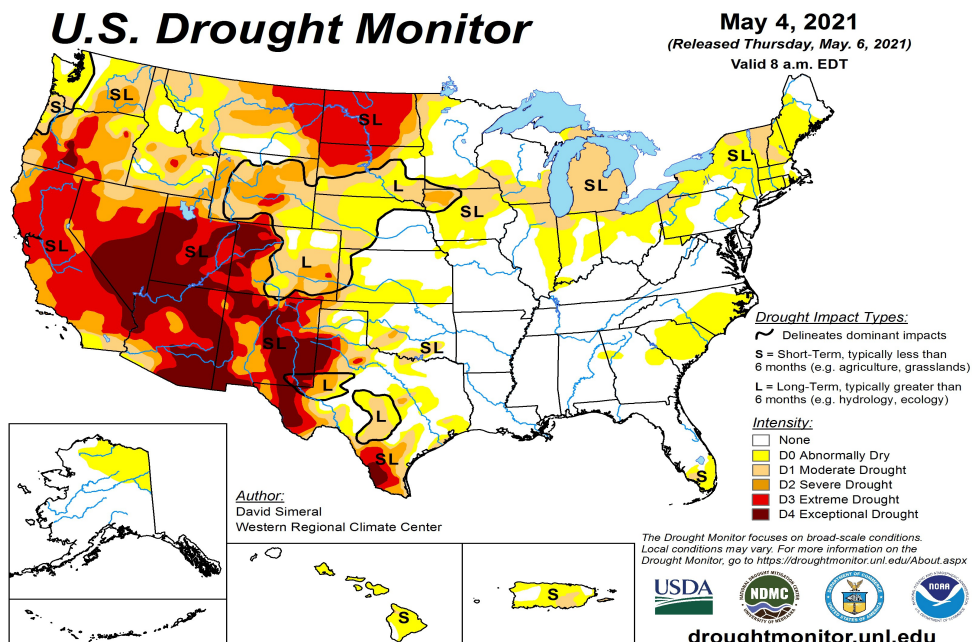
We cannot leave out the *U.S. Drought Monitor*, and we include the national map and two California maps-- one from a year ago and this week's. Please note that most of the west, that is, west of the Mississippi River is affected by drought.

For those who missed it, I include some excerpts and a link to my article of a few days ago, “*The California Water System and the Drought Crisis.*”

Eight years ago a book was published that included the statement that the past 150 years has been the wettest period in the past 1200 years. And perhaps now we are returning to the previous characteristic climate of alternating mega-droughts and mega-floods. My review of the book, “*The West Without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us About Tomorrow*” is below with some excerpts from the review.

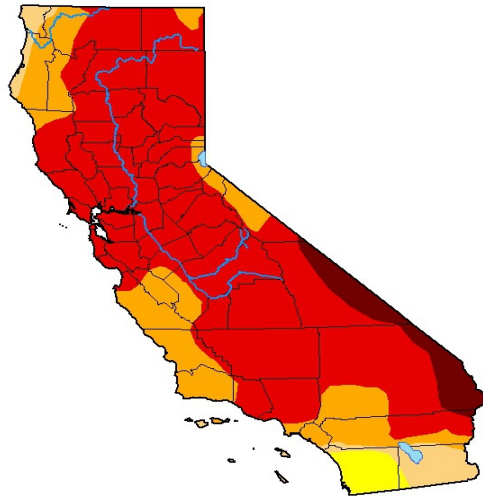
We shall return next week to our regular program, so please stand by.

## U.S. Drought Monitor



# U.S. Drought Monitor-- California May 4, 2021

## U.S. Drought Monitor California



**May 4, 2021**  
(Released Thursday, May 6, 2021)  
Valid 8 a.m. EDT

	Drought Conditions (Percent Area)						
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	
<b>Current</b>	0.00	100.00	97.52	92.88	73.31	5.36	
<b>Last Week</b> 04-27-2021	0.00	100.00	97.51	87.95	52.86	5.36	
<b>3 Months Ago</b> 02-02-2021	0.00	100.00	85.99	58.44	31.65	3.75	
<b>Start of Calendar Year</b> 12-29-2020	0.00	100.00	95.17	74.34	33.75	1.19	
<b>Start of Water Year</b> 09-29-2020	15.35	84.65	67.65	35.62	12.74	0.00	
<b>One Year Ago</b> 05-05-2020	41.80	58.20	42.87	19.56	3.94	0.00	

**Intensity:**  
 None  
 D0 Abnormally Dry  
 D1 Moderate Drought  
 D2 Severe Drought  
 D3 Extreme Drought  
 D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>*

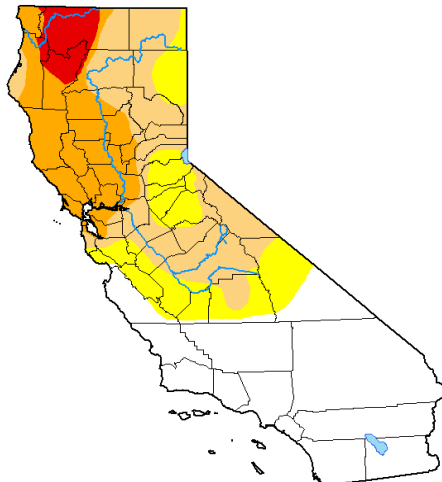
**Author:**  
David Simerali  
Western Regional Climate Center



Week	Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	<a href="#">2021-05-04</a>	0.00	100.00	97.52	92.88	73.31	5.36
<b>Last Week</b>	<a href="#">2021-04-27</a>	0.00	100.00	97.51	87.95	52.86	5.36
<b>3 Months Ago</b>	<a href="#">2021-02-02</a>	0.00	100.00	85.99	58.44	31.65	3.75
<b>Start of Calendar Year</b>	<a href="#">2020-12-29</a>	0.00	100.00	95.17	74.34	33.75	1.19
<b>Start of Water Year</b>	<a href="#">2020-09-29</a>	15.35	84.65	67.65	35.62	12.74	0.00
<b>One Year Ago</b>	<a href="#">2020-05-05</a>	41.80	58.20	42.87	19.56	3.94	0.00

# U.S. Drought Monitor-- California May 5, 2020

## U.S. Drought Monitor California



**May 5, 2020**  
(Released Thursday, May 7, 2020)  
Valid 8 a.m. EDT

	Drought Conditions (Percent Area)						
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	
<b>Current</b>	41.80	58.20	42.87	19.56	3.94	0.00	
<b>Last Week</b> 04-28-2020	41.80	58.20	41.58	19.59	4.66	0.00	
<b>3 Months Ago</b> 02-04-2020	65.72	34.28	0.00	0.00	0.00	0.00	
<b>Start of Calendar Year</b> 12-31-2019	96.43	3.57	0.00	0.00	0.00	0.00	
<b>Start of Water Year</b> 10-01-2019	95.29	4.71	2.06	0.00	0.00	0.00	
<b>One Year Ago</b> 05-01-2019	94.03	5.97	0.00	0.00	0.00	0.00	

**Intensity:**  
 None  
 D0 Abnormally Dry  
 D1 Moderate Drought  
 D2 Severe Drought  
 D3 Extreme Drought  
 D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>*

**Author:**  
Brad Pugh  
CPC/NOAA



## West

On this week's maps, areas of drought expanded across California, Oregon, and Washington following a very dry April. In California, areas of Extreme Drought (D3) expanded across the northern and central Sierra Nevada, as well as in areas of the San Joaquin Valley where water deliveries have been severely reduced due to the poor snowpack conditions across the Sierra (59% of normal on April 1 statewide) and below normal reservoir conditions. For the Water Year (since October 1), precipitation across most of California has been much below normal (bottom 10th percentile) with some locations—including areas of southeastern California, and the greater Bay Area—experiencing record or near-record dryness.

In Marin County, the Marin Water District declared a water shortage emergency on April 20 in response to Marin's total reservoir storage level dipping to 50% of capacity, whereas average storage for the date (May 4) is normally 90% of capacity. California's two largest reservoirs, Lake Shasta and Lake Oroville, were at 50% and 42% of normal, respectively, on May 4. Across the region, statewide reservoir storage levels were below normal in Arizona, California, Colorado, Idaho, Nevada, New Mexico, and Washington according to the NRCS on April 1.

On the Colorado River system, the U.S. Bureau of Reclamation (May 5) is reporting Lake Mead at 38% of capacity while upstream Lake Powell is 35% full.

In Oregon, drought-related conditions continue to deteriorate in western Oregon after a dry April. On the map, areas of D1 to D4 expanded in Oregon this week in response to a rapid decline of the mountain snowpack across the Cascades in addition to anomalously dry soils and well-below-normal streamflow levels.

For the week, average temperatures were above normal (2 to 10 deg F) across most of the West, with the exception of areas of southeastern Arizona and southern New Mexico where temperatures were 2 to 9 deg F below normal.

## The California Water System and the Drought Crisis

Here is a few paragraphs of my report from May 3, 2021. You may read the entire report here: [http://www.californiadroughtupdate.org/Western%20water%20report.pdf?\\_t=1620096992](http://www.californiadroughtupdate.org/Western%20water%20report.pdf?_t=1620096992)

**California has been unable to provide adequate water to its population and its agricultural community for three decades.**

*Before presenting the general facts of the water availability and its use by the state, it is useful to first present a picture of the present crisis.*

*The state's two major water projects, the California State Water Project and the Bureau of Reclamation's Central Valley Project, have for three decades, been unable to supply the local water district contractors, both in urban and agricultural areas, with the water they annually request.*

*Over the last 30 years, California's water demand has increased as irrigated agricultural lands, population, and environmental considerations have grown. However, California's water supplies and developed surface storage have remained relatively constant during those 30 years. This disparity has created a gap between available supplies and water demands in most years.*

Droughts are caused by nature. The question is, will we humans prepare for droughts before they create a crisis? The present drought was foreseen more than 50 years ago, and the leaders of California and of

the nation knew then that the water infrastructure that would be required for the decades ahead had to begin to be constructed now. We did not do that, and now we are in, once again, a California water crisis and the broader Western States water crisis, because we did not build what those great leaders planned to build during the 1960s. Instead, we have built near zero water supply infrastructure, and especially we did not build the North American Water and Power Alliance (NAWAPA), and we shut down President Kennedy's project to build nuclear-powered desalination plants.



The California Water Management System

This report will present both the “facts” of the state’s water supply and the current deficit of that supply’s ability to meet the minimum requirements required by the population and agriculture.

This is not a comprehensive report, but a general picture that can be of use to us as we address the current Western states megadrought, the question of reindustrializing the nation, and creating the new productive platform for the future.

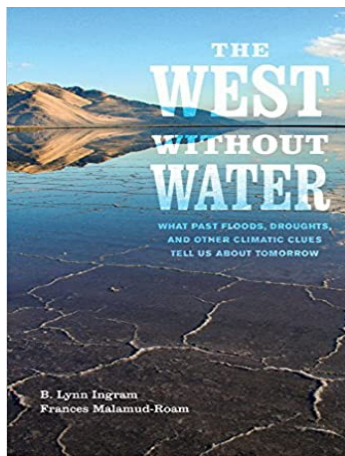
## The West Without Water

Here are a few excerpts from my book review of “The West Without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us About Tomorrow.” Of note, the book was written in 2013, in the middle of the five year drought of 2012-2016, which later the lead author of this book stated that that drought was the worst drought in this region in the past 500 years.

### *Are We Controlled by the Whims of Nature, or Will We Create Our Future?*

[https://larouchepub.com/eiw/public/2014/eirv41n19-20140509/48-52\\_4119.pdf](https://larouchepub.com/eiw/public/2014/eirv41n19-20140509/48-52_4119.pdf)

“The West Without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us About Tomorrow” by B. Lynn Ingram and Frances Malamud-Roam Berkeley: University of California Press, 2013



*Modern engineering has allowed the exploitation of all available water sources for human use, and water policy has favored water development for power, cities, and farms, over sustainability of the environment and ecosystems. These policies have allowed populations to grow right up to, and perhaps beyond, the limits that this region can support, leaving us vulnerable should drier conditions return.*

*If you agree with the above statement, you are probably reading the wrong publication. It comes from the concluding chapter of *The West Without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us About Tomorrow*, by B. Lynn Ingram and Frances Malamud-Roam, a book that provides the reader with, at least, some useful education in the paleoclimatic history of the West, and an understanding of the dynamics of the secondary causal processes that determine weather and climate, but glosses over the real controlling mechanism of climate—galactic processes and the Sun—and is polluted with malthusian statements like the above.*

*As Lyndon LaRouche has stated, we have few if any real scientists today. Most are either mere mathematicians, or they have succumbed to “going along to get along” by at least giving lip service to environmentalist stupidity and the fraud of man-caused global warming.*

*Our authors, I think, fall into the later category, as they repeatedly write, for example, “Most scientists believe that man-induced global warming will. . . .”*

*But, for now, let's put the stupidities aside and look at what is of value in the book. Paleoclimatologists study climates from the past, from both before recorded history, and the more recent human-documented climate of the past millennia or so.*

### **Climate History**

*In news articles, Ingram has summarized the last 2,000 years of the climate history of the American West, emphasizing that the current drought is the worst to hit the region in 500 years. In addition, she makes the point that, especially over this 2,000-year period, the West has experienced megadroughts lasting decades, and megafloods which far surpass the famous 1861-62 flood that put Sacramento and the entire Central Valley of California under 10-20 feet of water for months. She states that the climate of the past 150 years or so is an anomaly, being one of the mildest and wettest on record, and that soon or later, perhaps now, California will return to the mega-droughts interspersed with megafloods pattern that characterized the region for millennia.*

*The past 2.5 million years of our Earth's history is known as the Pleistocene, which has been dominated by Ice Ages, each lasting about 100,000 years, interrupted by interglacial warming periods that last about 20,000 years. The last Ice Age, or the “Last Glacial Maximum” as it is called, ended about 20,000 years ago. The authors' focus is on the last 11,000 years, the Holocene, which is*

*characterized by increased Summer temperatures thought to be caused by a slight change in the Earth's orbit around the Sun, increasing the amount of radiation received by the Earth. More generally, the Holocene has been a period of variable climate, and, beginning about 2,000 years ago, that variability has been characterized by alternating megadroughts and megafloods.*

*Regardless of whether next Winter is a wet one, merely breaking the current drought for a time will do nothing to alleviate California's larger problem: that, even without drought, there is not enough water available to the water-management system of the state to sustain its current population, not to mention another 20 million people who will live there by 2050.*

*That reality requires the immediate policy of moving our entire economy to a higher energy-flux density regime, by an urgent mobilization of the nation to achieve the scientific breakthroughs required to bring nuclear fusion on line in the next decade or so. That mobilization will also allow us to seriously take the immediate short-term measures required to deal with the present drought. We can, first, revitalize the 50-year-old policy of the John Kennedy Administration to build nuclear-powered desalination plants up and down the coast and in the Central Valley of California, to purify brackish water. By restarting the nuclear industry we can then begin to build the North American Water and Power Alliance (NAWAPA), another Kennedy-era policy, which will bring water from Alaska and northern Canada down to the Southwest and the Midwestern States.*

## **‘Megadrought’ persists in western U.S., as another extremely dry year develops**

The long-running dry stretch rivals anything in the last 1200 years, a sign of climate-change induced "aridification."

By Alejandra Borunda  
Published May 7, 2021

<https://www.nationalgeographic.com/environment/article/megadrought-persists-in-western-us-as-another-extremely-dry-year-develops>

Water levels usually peak in May at Folsom Lake in California, rising as Sierra Nevada snowpack melts away and courses down to the reservoir, near Sacramento.

But this year, the drought that has gripped much of the U.S. West is already so strong that the lake is only [half as full as normal](#). Instead of water, fields of [purple lupines](#) line vast swaths of dry lakebed.

Folsom Lake's situation is emblematic of the deepening drought across the western United States. As of May 6, 67 percent of the region was in a state of "severe" drought or worse; a stunning 21 percent is already in "exceptional" drought, the worst category in the U.S. Drought Monitor's framework. At Lake Mead, one of the two major reservoirs of the Colorado River, which some 40 million Americans depend on, water levels are creeping toward a threshold that would trigger the first official shortage declaration for the basin.

An extraordinary drought is expanding in the western U.S.

Below average precipitation last winter and dwindling snowpack in the mountains, both exacerbated by human-caused climate change, are making for a dire drought in the western United States. The U.S. Drought Monitor estimates that 57 million people are living in drought areas in western states right now.

The situation is unlikely to improve in the near future, scientists say, as 2021 shapes up to extend the “megadrought” that researchers have found to be gripping the region mostly unabated since 2000.

The region would have been in a state of drought regardless, “but it’s really climate change that pushed this event to be one of the worst in 500 years,” says Ben Cook, a climate scientist at Columbia’s Lamont Doherty Earth Observatory.

### **Dry, dry, dry**

Drought can take many forms. There’s “meteorological drought,” which compares how much rain or snow has fallen compared to a long-term average. There’s “hydrological drought,” which considers how much water flows through streams and rivers and is stored in mountain snowpack and underground aquifers. There’s the drought the soil, plants, and animals feel, called agricultural or ecological drought.

This year, by just about every measure, the West is extremely low on water. Most of California and the [Four Corners states](#) are somewhere between [25 and 50 percent](#) of their long-term averages on most of the drought indicators. Snowpack in California on April 1, its usual peak time, hit only [59 percent](#) of its long-term average and has already largely melted away, leaving it at a paltry [15 percent](#) of its average at this date. Soils [are parched](#). The Colorado and [Rio Grande rivers](#) are trickling compared to their long-term histories.

The U.S. Drought Monitor ties all of these many pieces together into a weekly, U.S.-wide snapshot, binning the on-the-ground drought situation into six categories from “none” to “exceptional.” On April 22 they reported that 21 percent of the West was in “extreme” or “exceptional” drought, the two worst levels—nearly [three times the area ever listed](#) in that category this early in the year in the Monitor’s 20-year history.

“It’s incredible, how much of the West is in extreme or exceptional drought right now,” says Sandra Postel, the director of the Global Water Policy Project, “including much of the Colorado and Rio Grande basins, the two lifelines of the Southwest.”

The conditions are influenced by many factors, including a La Niña event that began last fall, which scientists know can contribute to dry conditions in the Southwest. In a La Niña event, ocean surface waters in the Eastern tropical Pacific are relatively cool (in an El Niño, this part of the ocean is usually extra warm). That cooling shifts the position of towering high-energy clouds, which tend to form over warm water, further to the west, which in turn affects the shape of planet-spanning weather systems. The effect “is like dropping a pebble into a pond,” says Samantha Stevenson, a climate scientist at the University of California, Santa Barbara; where the pebble is dropped affects where the waves of weather move.

The shape and pattern of the big weather ripples moving away from the Eastern Pacific toward the western U.S. make it more likely that precipitation-rich storm systems curve northward toward the Pacific Northwest and Canada rather than toward the Southwest.

A healthy dose of random chance also feeds into the weather patterns that keep the West dry. But underneath the weather vagaries, human-driven climate change is making those conditions more likely.

### **Megadrought deepens**

Dry conditions are nothing new in the U.S. West, which has cycled through water booms and busts for millennia.

But the region has been in a state of drought nearly every year since 2000, when the Drought Monitor was established. That 20-year-long stretch rivals any drought in the last 1,200 years, a team of scientists



[reported last year.](#)

They knit together hundreds of tree-ring records from across northern Mexico and the U.S. West, creating a record that stretches back to about 800 AD. Trees record damp and dry years, growing more vigorously when their roots feel wetter soil and leaving behind slightly thicker rings. The team combined the tree rings with climate models to build a history of soil moisture, which indicates the intensity of drought.

In that 1,200-year-long record, the region cycled through 35 major droughts, including four “megadroughts” of particularly notable strength and duration: one in the 800s; another in the 1100s; a third in the 1200s that has been linked to the collapse of Ancestral Pueblo culture in the Southwest; and one deep, intense stretch in the late 1500s that may have added [insurmountable strain on Native communities in Mexico](#) already stressed by colonization and disease.

The previous megadroughts lasted decades—“20, 30, even 40 years, really eclipsing anything we’ve had to manage for in the last 100 years,” says Cook. In the past century, droughts like the 1920s Dust Bowl generally lasted only five to 10 years—devastating for those living through it, but significantly less disruptive than a multi-decade-long drought.

This current dry stretch is already long and intense by comparison. It comes in second in their record only to the 1500s drought, which occurred in a world unchanged by human-forced climate change. That should give us pause, says Cook, because it shows the West can swing into such drastic drought states naturally, without the extra nudge of climate change. An extra push from humans could make the effects far worse.

And, according to their analysis, that’s exactly what has occurred: This “megadrought” has been pushed into extreme territory by climate change. It would have been bad no matter what—their estimates suggest it would have been roughly the eleventh most intense in their record—but the added heat from climate change supercharged the drying, pushing it up to the second most intense drought in the last 1200 years.

### **Climate futures**

Human-caused climate change, in tandem with human reshaping of the natural hydrological systems—by damming rivers, growing vast fields of crops, and more—have shifted the baseline conditions so thoroughly that there is no way to return to what used to be considered normal. The physics are simply too different.

Hotter air is thirstier than dry, capable of holding 7 percent more moisture for each degree Celsius (1.8 degrees Fahrenheit) warmer it gets. Climate change has bumped average air temperatures up [1.6 degrees Fahrenheit in the region](#) since the early 1900s. The increase means the atmosphere more readily pulls water from streams and rivers, lakes and reservoirs, and plants and soils.

The effects can feed back on themselves, exacerbating drought under some conditions. Evaporation takes a lot of energy, which is used to transform water from liquid to gas, using up energy that would otherwise be absorbed into soil as heat. As soils dry out, there’s less water to evaporate—so solar radiation just heats the ground further.

“When we sweat, water evaporates from our skin, and that evaporation acts as a cooling mechanism for our body,” says Amir AghaKouchak, a climate scientist at the University of California, Irvine. “Earth’s surface works the same way.”

Crucially, hotter air also means the precipitation that arrives is more likely to fall as rain than snow. Snow in the high mountains acts like a water tower, storing winter precipitation until it melts in spring and summer, smoothing the boom-bust seasonal precipitation cycle. With hotter air, whatever snow

does fall often melts earlier in the year. Both contribute to a “snow drought” effect. Agha Kouchak and a colleague Laurie Huning recently found that in the western U.S., [snow droughts lasted 28 percent longer after 2000](#), compared with the previous 20 years.

And the effects cascade. Less snow can lead to drier soils, which can increase the chance of heat waves, which dry soils further.

In the face of continued climate change, some scientists and others have suggested that using the word “drought” for what’s happening now might no longer be appropriate, because it implies that the water shortages may end. Instead, we might be seeing a fundamental, long-term shift in water availability all over the West.

“Climate change is leading to a steady aridification of the western U.S.,” says Cook. “We’ve shifted the baseline drier and drier, making it easier for natural variability to send us into a drought and harder for natural variability to drag us out of an event.”

### **Impacts on the ground**

The effects of the ongoing drought are already playing out across many western states.

Along the California-Oregon border in the Klamath River basin, water reserves are so low that farmers in the region will receive only 8 percent of the water they usually get. The Yurok and Karuk tribes, which steward salmon and other fish populations along the river, [are concerned that it won’t have enough water](#) to keep the fish healthy.

The Colorado River, the source of water for almost 40 million people, is struggling as well. Even hefty March snows that pushed the overall snowpack in the headwater region up to about 85 percent of its long-term average peak couldn’t make up for the water deficit that had built up, and the snow has disappeared much more quickly than normal, says Brad Udall, a climate scientist at Colorado State University.

Lake Mead, the giant reservoir atop the Hoover Dam fed by the Colorado, is only 39 percent full, [down over 130 feet since 2000](#). If the water level drops to below 1,075 feet (it was at [1079 at the end of April](#)), a major water conservation plan will be triggered for the first time ever. The Bureau of Reclamation expects this to happen [this June](#). If that threshold is passed, water allotments to the states that rely on the Colorado’s water will adjust in 2022; states on the lower reaches of the river, like Arizona and Nevada, will be hit with major cuts.



Lake Mead

Tribes in the river basin, who have long lacked consistent access to the clean and plentiful water to which they have legal rights, are also feeling the effects of the drought.

“Navajo Nation has been the epicenter of drought for years,” says Bidtah Becker, a Navajo attorney

and co-author of a new report [outlining the water access challenges](#), highlighted by COVID-19, for tribes across the region. “This is a climate change matter, and it’s really important for the federal government to invest appropriately now so that we’re building water systems that are resilient for the future.”

The fear of another year of intense wildfire is growing across the region, as well; recent years have seen some of the largest and most disruptive fire seasons in recorded history, driven in part by extremely dry conditions. In April in California, measurements of the “fuel moisture content” in chamise, a common and flammable shrub, were at dryness levels [not usually seen before June](#).

A good run of rain or late-season snow could offset some of the worst impacts, says Udall, but the likelihood of that showing up wanes as the season marches on. “We could maybe get lucky,” he says, but luck now would simply assuage the meteorological, short-term drought—not the bigger problem.

“As warm and hot and record-setting as it has been the last few years,” he says, “what you need to keep in mind is, these are some of the coolest temperatures you’re going to experience in the next 100 years. Because it’s just going to get hotter. You ain’t seen nothing yet.”