



Kern River Snow and Water Report – January 2, 2023

“The earth, the air, the land, and the water are not an inheritance from our forefathers but on loan from our children. So, we have to handover to them at least as it was handed over to us.”

Mahatma Gandhi

Published Monthly from December 1, 2022, to June 1, 2023

Current Conditions: La Niña conditions are ongoing¹. As of today, the data from eight snow pillows report an average of 12” snow water content and 167% of average in the Kern River Basin. The seventeen Kern River basin snow courses have not yet reported data online. Observed precipitation in the Upper Kern basin (North Fork) is 134% of average or 12.06” (average water year to date is 9.00”)². Observed precipitation in the South Fork Kern River basin is 116% of average or 5.71” (average water year to date is 4.93”)³. Observed water year to date Kern River basin flow is 60% of average or 38,800-acre feet (af)⁴. Lake Isabella storage is 51,685 af or 9% of capacity⁵.

Outlook: La Niña is expected to continue into the winter, with equal chances of La Niña and ENSO-neutral during January-March 2023. In February-April 2023, there is a 71% chance of ENSO-neutral.

¹ La Niña is an oceanic and atmospheric phenomenon that is the colder counterpart of El Niño, as part of the broader El Niño–Southern Oscillation (ENSO) climate pattern.

² Upper Kern Water Year Average 30.17”. South Fork Kern Water Year Average 17.19”.

³ The water year is from October 1 to September 30.

⁴ Historic Kern River Basin Mean Water Year Volume is 725,600 af.

⁵ Lake Isabella’s total capacity is 568,000 af.

Kern River Basin Snow Water Content

Station Name	ID	Elevation	Date/Time	Snow Water Content (inches)
BEACH MEADOWS	BCH	7650'	01/02/2023 10:00	7.90
CASA VIEJA MEADOWS	CSV	8300'	01/02/2023 10:00	11.86
CHAGOOPA PLATEAU	CHP	10300'	01/02/2023 10:00	15.36
CRABTREE MEADOW	CBT	10700'	01/02/2023 10:00	10.12
PASCOES	PSC	9150'	01/02/2023 07:00	15.78
TUNNEL GUARD STATION	TUN	8900'	01/02/2023 10:00	7.98
UPPER TYNDALL CREEK	UTY	11400'	01/02/2023 07:00	13.14
WET MEADOWS	WTM	8950'	01/02/2023 07:00	14.89
Average				12.13

To Date Precipitation (selected stations)

Station	Elev	Monthly Precipitation (inches)								Total
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Blackrock	8,114'	0.00	1.10	3.59						4.69
Breckenridge	7,485'	0.00	1.59	3.48						5.07
Democrat	2,364'	0.00	2.17	4.08						6.25
Johnsondale	4,684'	0.00	0.45	0.51 ⁶						0.96
Lake Isabella Dam	2,680'	0.00	1.67	3.37						5.04
Peppermint	7,385'	0.00	2.56	9.17						11.73
Piute Mountains	6,648'	0.00	0.92	3.70						4.62
Riverkern ⁷	3,044'	0.00	1.43	3.00						4.43
Walker Pass	5,572'	0.00	0.49	2.06						2.55
Wofford Heights	3,935'	0.00	2.39	5.82						8.21

To Date Notable Very Low Rainfall

Death Valley National Park Furnace Creek Visitor Center: 0.00", Elevation -193'

Historic Kern River Basin Flows

Notable High-Volume Years

2019 - 1,201,000 af
 2017 - 1,811,000 af
 1983 - 2,318,000 af
 1969 - 2,227,000 af

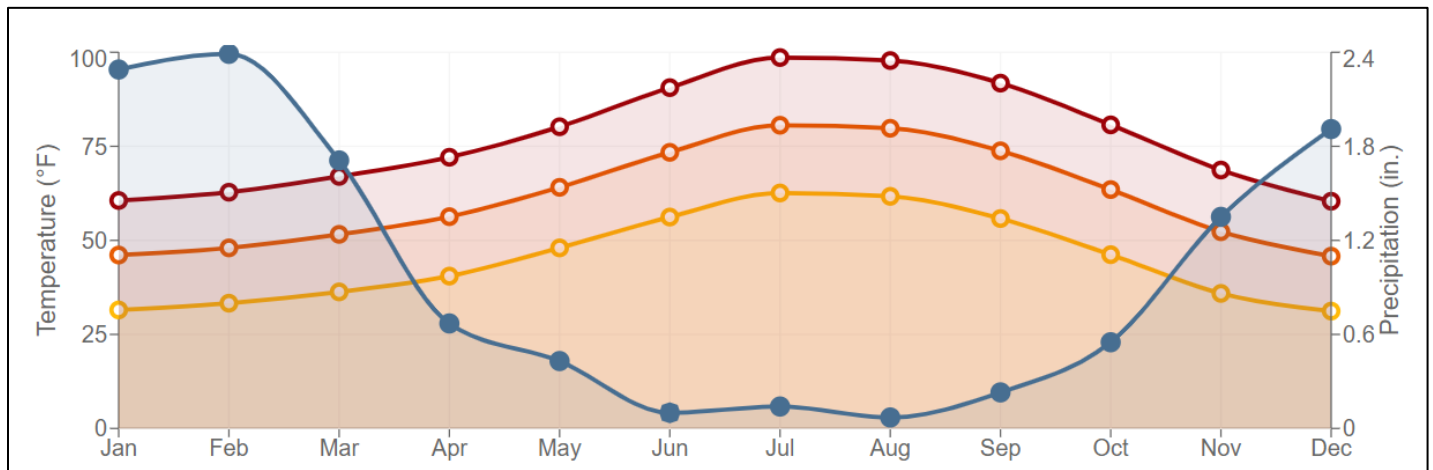
Notable Low-Volume Years

2021 - 167,800 af
 2015 - 130,400 af
 1977 - 186,000 af
 1961 - 175,000, af

⁶ Data appears to be incomplete.

⁷ Kern River Powerhouse Number 3 thirty-year (1991-2020) average annual rainfall is 11.84".

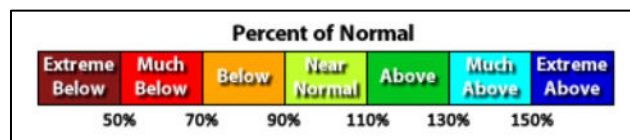
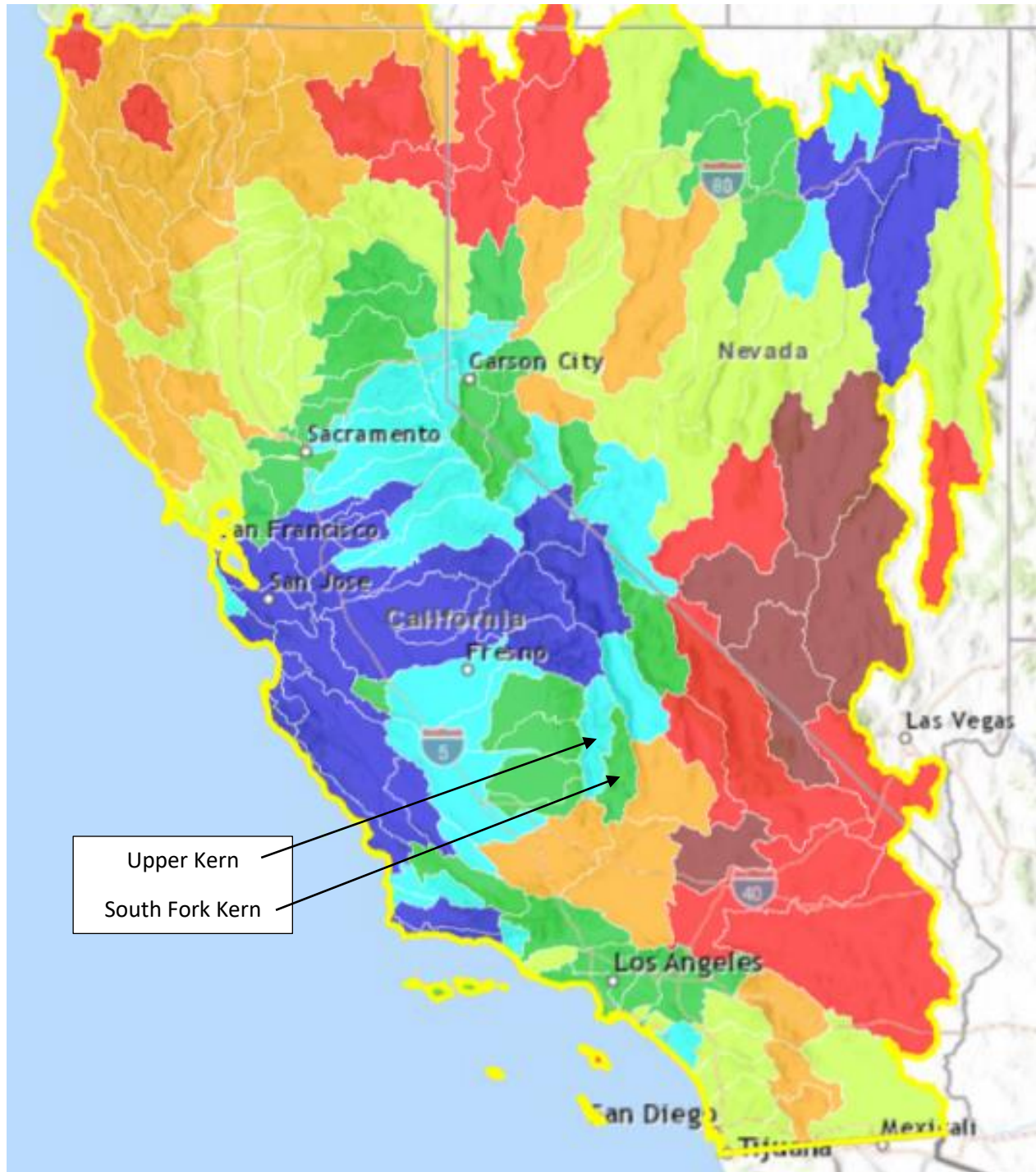
Kern River Powerhouse #3 (Riverkern) Monthly Weather 1991-2000



NOAA U.S. Climate Normal Quick Access

<https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&location=CA&station=USC00044523>

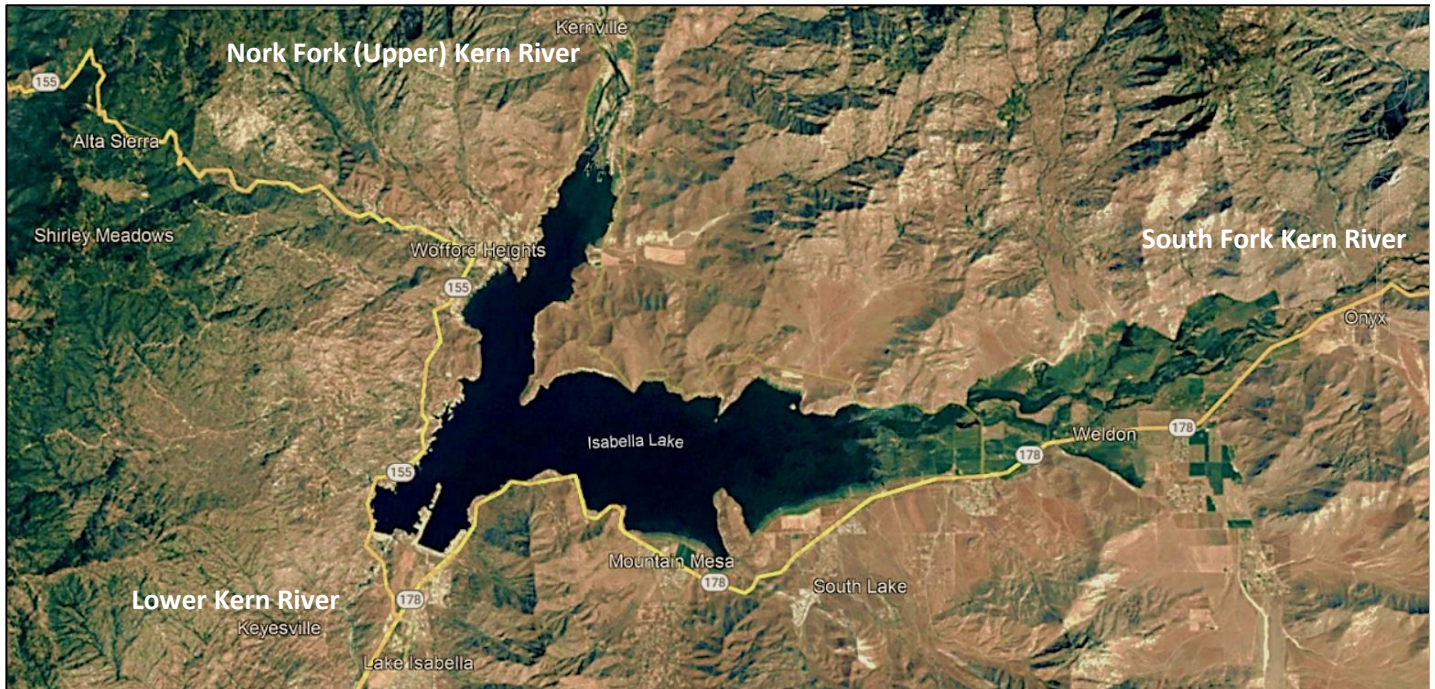
Percent of Normal Precipitation



NOAA California Nevada River Forecast Center

<https://www.cnrfc.noaa.gov/?product=hucPrecipSeasonal&lat=37.796&lng=-119.412&COUNTIES=true>

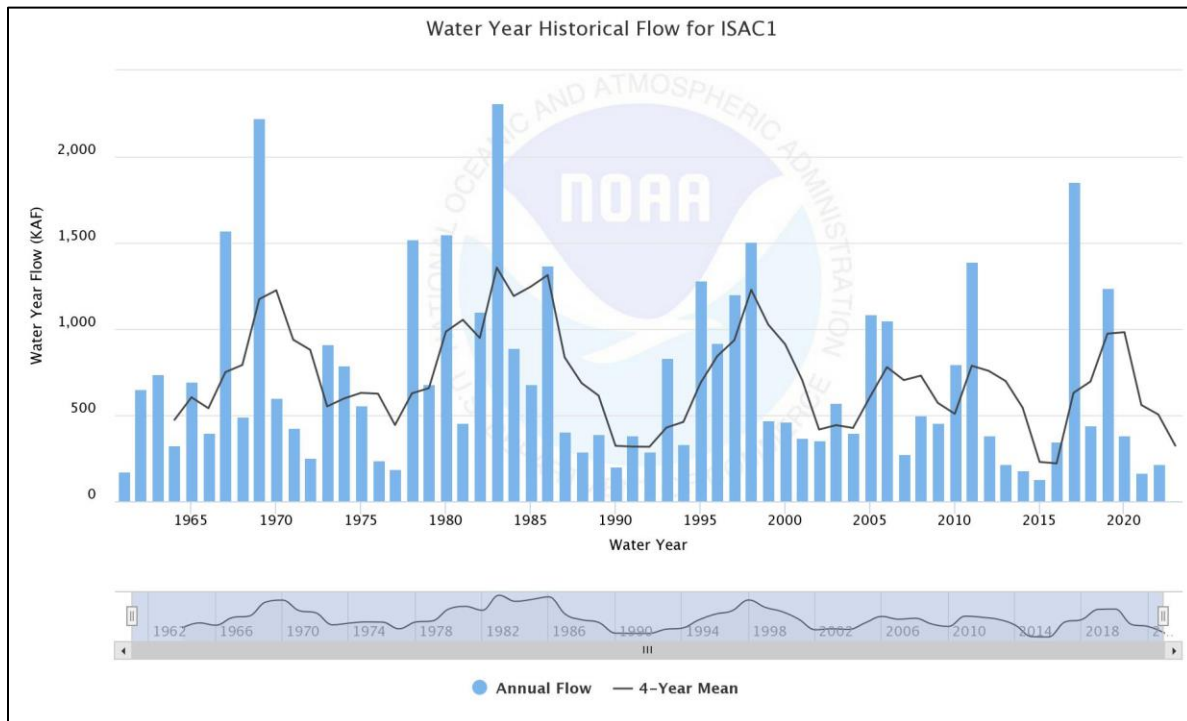
A Full Lake Isabella in 1986



Annual Lake Isabella Flows From 1961 to 2022

The water year is from October 1 to September 30

KAF = thousands of acre feet

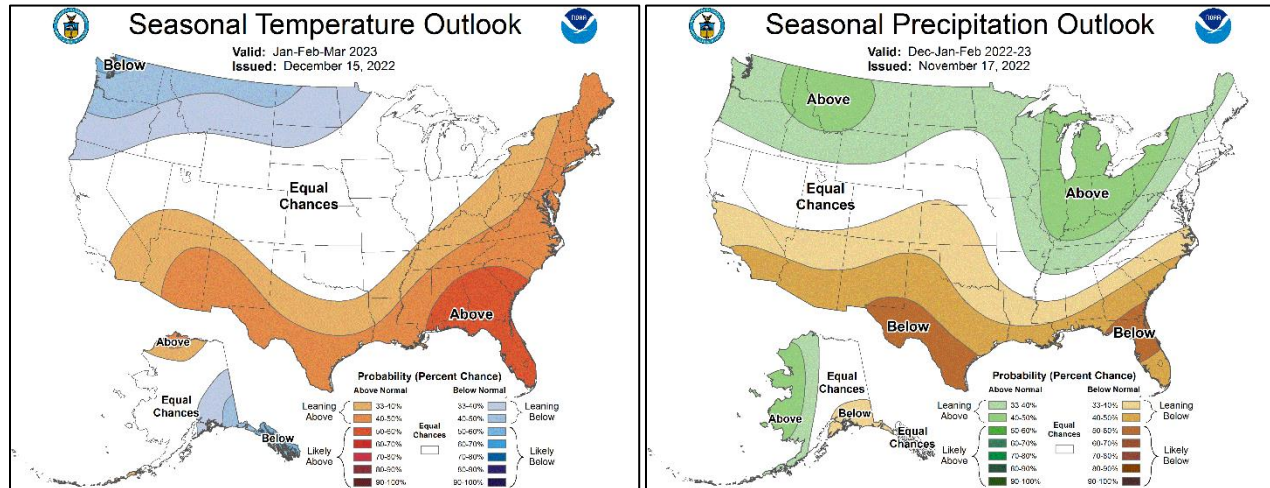


Kern River - Lake Isabella (ISAC1)

<https://www.cnrfc.noaa.gov/ensembleProduct.php?id=ISAC1&prodID=12>

National Weather Service Climate Prediction Center Seasonal Outlook

The Climate Prediction Center is forecasting an equal chance for normal temperatures and below normal precipitation for the southern Sierra Nevada from January 2023 to March 2023.

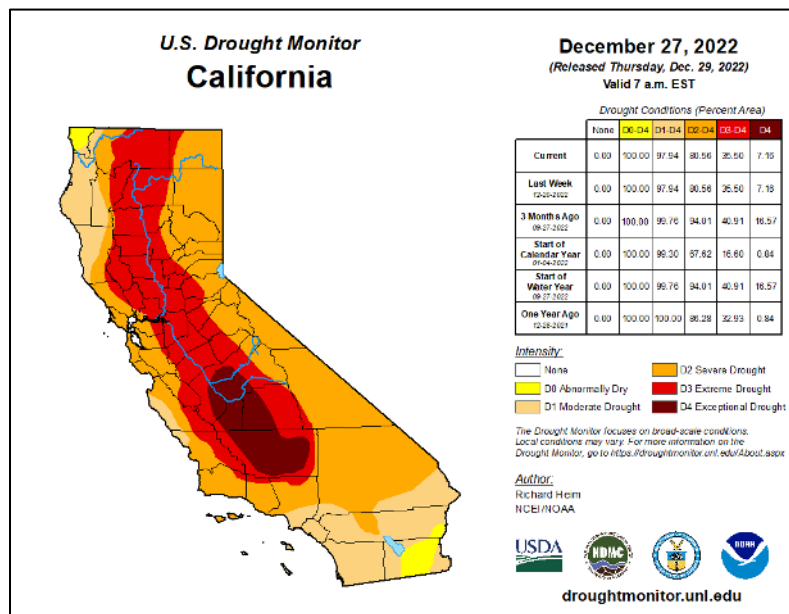


National Weather Service Climate Prediction Center Seasonal Outlook

<https://www.cpc.ncep.noaa.gov/>

U.S. Drought Monitor⁸

The U.S. Drought Monitor shows the western portion of Tulare County and most of Kern County is in exceptional drought.



⁸ The U.S. Drought Monitor is not a statistical model, although numeric inputs are many: the Palmer Drought Severity Index, the Standardized Precipitation Index, and other climatological inputs; the Keech-Byram Drought Index for fire, satellite-based assessments of vegetation health, and various indicators of soil moisture; and hydrologic data, particularly in the West, such as the Surface Water Supply Index and snowpack. U.S. Drought Monitor <https://droughtmonitor.unl.edu/>

Fun Facts

- The 2022 Kern River water year volume was 219,600-acre feet and that amount of water is the equivalent of a water column that is one-acre square in area by 42 miles high. In 1983 the Kern River water volume was 2,318,000-acre feet or equivalent to a one-acre square in area of water by 439 miles high.
- The International Space Station orbits the earth at about 230 miles above the earth's surface or the equivalent of a one-acre square water column that is 1,214,400 feet high.
- QUESTION: What is the measurement of flow in a river?
ANSWER: The measurement used to determine the flow in a river is "CFS", which is Cubic Feet per Second flowing past a measurement point. Gauges along the river indicate how much water is moving past a given point. The higher the "CFS" the higher the flow.
- The Kern River supplies 20% of Kern County's municipal, industrial and agricultural water usage.
- QUESTION: Annually, who uses the water in Kern County?
ANSWER: Municipal and Industrial: 166,000 acre-feet; Agricultural: 2,294,000 acre-feet.
- In 2021 Kern County's highest value agricultural commodities were:

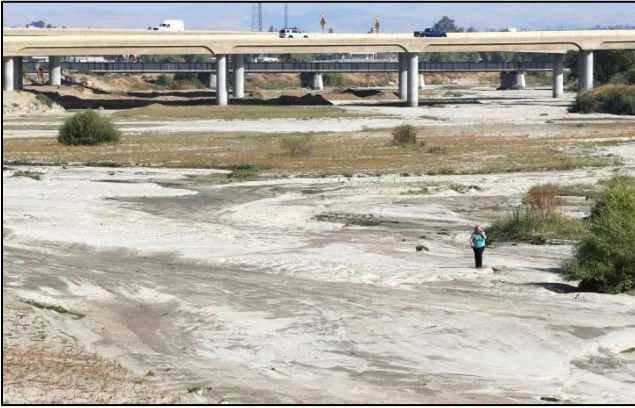
1. Grapes, All	\$1,871,328,000
2. Citrus, Fresh & Processing	\$1,347,686,000
3. Pistachios	\$1,216,593,000
4. Almond, Including By-Products	\$1,185,822,000
5. Milk, Market & Manufacturing	\$688,624,000
6. Carrots, Fresh & Processing	\$419,617,000
7. Cattle & Calves	\$207,214,000
8. Garlic, Fresh & Processing	\$114,432,000
9. Apiary	\$107,363,000
10. Potatoes	\$107,319,000

Kern County 2020 Crop Report: http://www.kernag.com/dept/news/2022/2021_Kern_County_Crop_Report.pdf

Check Out the Kern County Crop Map: <https://maps.kerncounty.com/H5/Index.html?Viewer=Agriculture>

- QUESTION: Why does the Kern River not run through Bakersfield?

ANSWER: In all but the wettest of years in Bakersfield, all of the Kern's flows are diverted out of the river channel into canals to support farming. Much of this water flows parallel to the riverbed throughout the year, particularly during the summer.

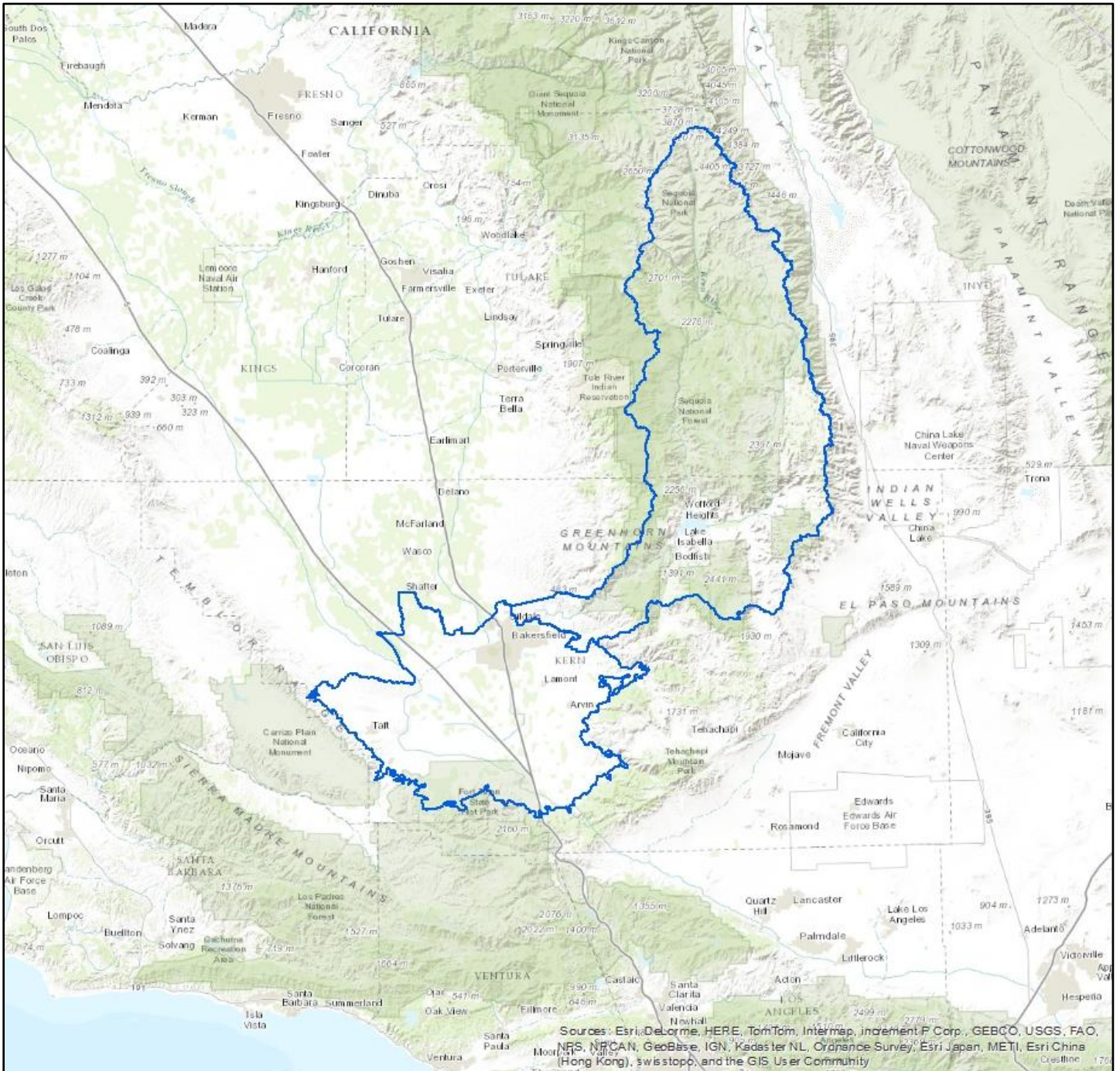


This leaves Bakersfield residents without the aesthetic centerpiece of their city and makes the [Kern River Parkway](https://www.bringbackthekern.org/) a mere shadow of what it could be as a quality of life amenity.

Support "BRING BACK THE KERN"
<https://www.bringbackthekern.org/>



Kern River Basin



Source

- Kings-Kern Divide
- Location: Sequoia National Park
- Elevation: 13,608 feet (4,148 m)

Mouth

- Buena Vista Lakebed
- Location: San Joaquin Valley
- Elevation: 299 feet (91 m)

River Length: 164 miles (264 km)

Basin Size: 3,612 square miles (9,360 km²)

Snow Depth and Density



The most important characteristic of snow to water managers and hydrologists is its water content. However, depth is of interest to many people also. Our data collection equipment measures the weight of the snowpack, and therefore its water content.

DENSITY

New-fallen snow can range in density depending on the air temperature and intensity of the storm. In California, densities of 12% are common. This means that for every 10 inches of snow that accumulates, it will melt to a pool of water 1.2 inches deep.

After it falls, it settles and compacts. The snowpack gets less and less deep, but the snow doesn't melt or go anywhere. Rather, its density increases. When conditions are cold, such as at high elevations in January, it will compact until its density is around 33%. As time goes on, and more snow falls on top, the snow beneath will further compact. At this point, varying levels in a column of snow will have different densities.

Therefore, snow depth is a fleeting indicator of the snowpack. By obtaining a measure of the water content of the snow, which doesn't change unless more precipitation occurs or the pack melts, we have a good handle on how the rivers will react in the spring.

DEPTH

By examining field measurements of depth and water content from the past 90 years, we have a general idea of how deep the snowpack is for a given water content each month. Snow depths on an average-weather year can be approximated by multiplying Snow Water Content values reported near the first of each month by the following factor:

- January 3.0
- February 2.8
- March 2.5
- April 2.25
- May 2.0

After May, the snowpack will probably remain at slightly above 50% density as it melts. Rain falling on this snow may accelerate its melt rate, but the intense sunshine of late spring and summer is the principal melting energy source.

Information provided by the California Cooperative Snow Surveys:
<http://cdec.water.ca.gov/snow/>

California Snow Survey



At the California Department of Water Resources, the snow surveyor's job is a year-round one. Before the first snow of the season falls, special teams' journey to the "snow country" to stock cabins with food and provisions for the winter months. Some of the cabins are so remote that the only way to reach them is by horseback and pack animal. The table shows the seventeen snow survey courses that are in the Kern River drainage.

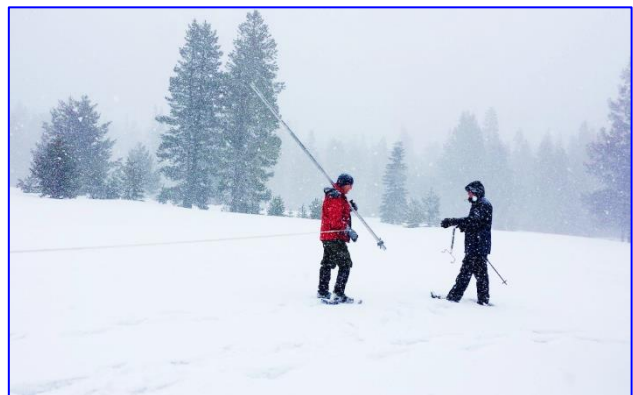
Snow Course Number	Name and Location	Elevation
265	Beach Meadows	7,650
257	Big Whitney Meadow	9,750
250	Bighorn Plateau	11,350
261	Bonita Meadows	8,300
262	Casa Vieja Meadows	8,300
251	Cottonwood Pass	11,050
253	Crabtree Meadow	10,700
249	Dead Horse Meadow	7,300
254	Guyot Flat	10,650
260	Little Whitney Meadow	8,500
264	Quinn Ranger Station	8,350
259	Ramshaw Meadows	8,700
256	Rock Creek	9,600
258	Round Meadow	9,000
275	Sandy Meadows	10,650
252	Siberian Pass	10,900
255	Tyndall Creek	10,650



Other field work undertaken during the summer includes installing, operating, and evaluating experimental equipment to provide cooperating agencies with information for designing future automatic snow data collection networks.

Back at State headquarters in Sacramento the snow surveys personnel revise historic data and coordinate activities with other agencies so that it will be "all systems go" when the year's first surveys begin in January. On or about the first day of each winter month surveyors from cooperating agencies venture into the mountains. Each of the State's 300-plus snow courses is visited at least once by snow surveyors for data gathering. Even at stations monitored automatically, data must be verified.

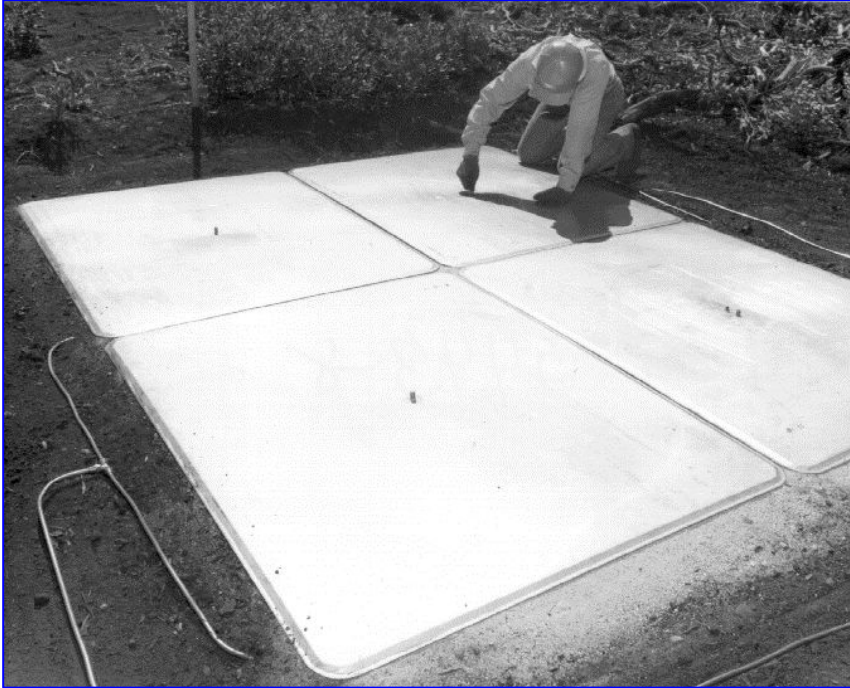
An average snow course is 1,000 feet long. Most courses consist of about ten sample points to insure sound statistical data. From two to six courses are measured in a day, depending upon how severe the weather is and whether the snow surveyors travel on skis, snowshoes, over snow vehicle, such as a snow cat or snowmobile, or by helicopter. In wilderness areas motorized equipment is not allowed so the surveyors travel on cross-country skis and stay overnight in backcountry cabins.



Automated Snow Sampling

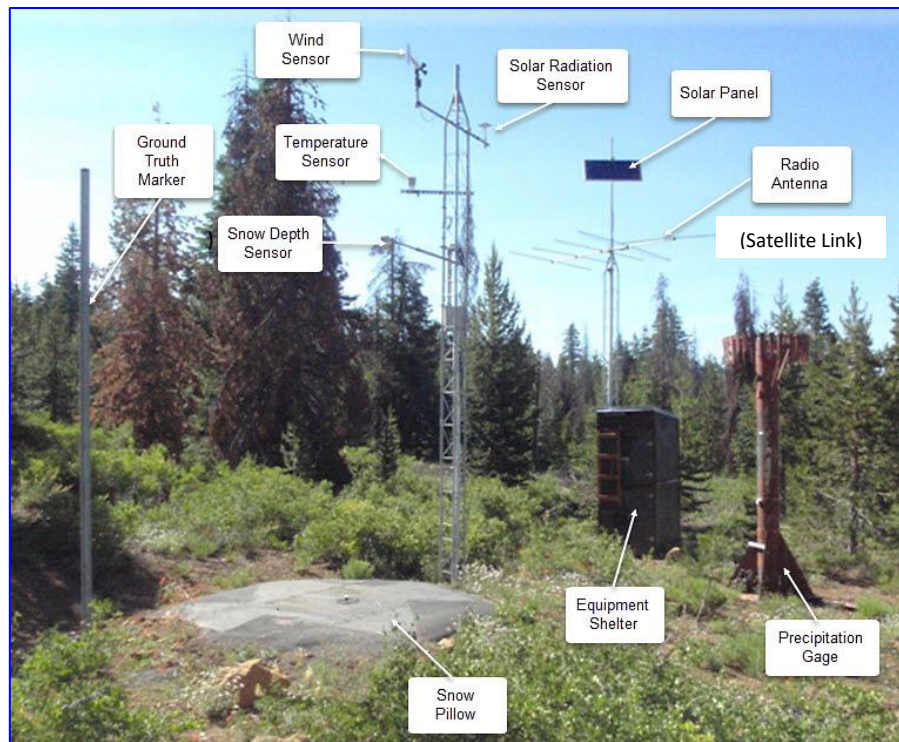


A snow pillow is an automated device that measures snowpack water content 24 hours per day and transmits the data collected each hour via satellite communications. The snow pillow measures the water equivalent of the snowpack based on hydrostatic pressure created by overlying snow. In the Kern River drainage there are eight snow pillows shown in the table.



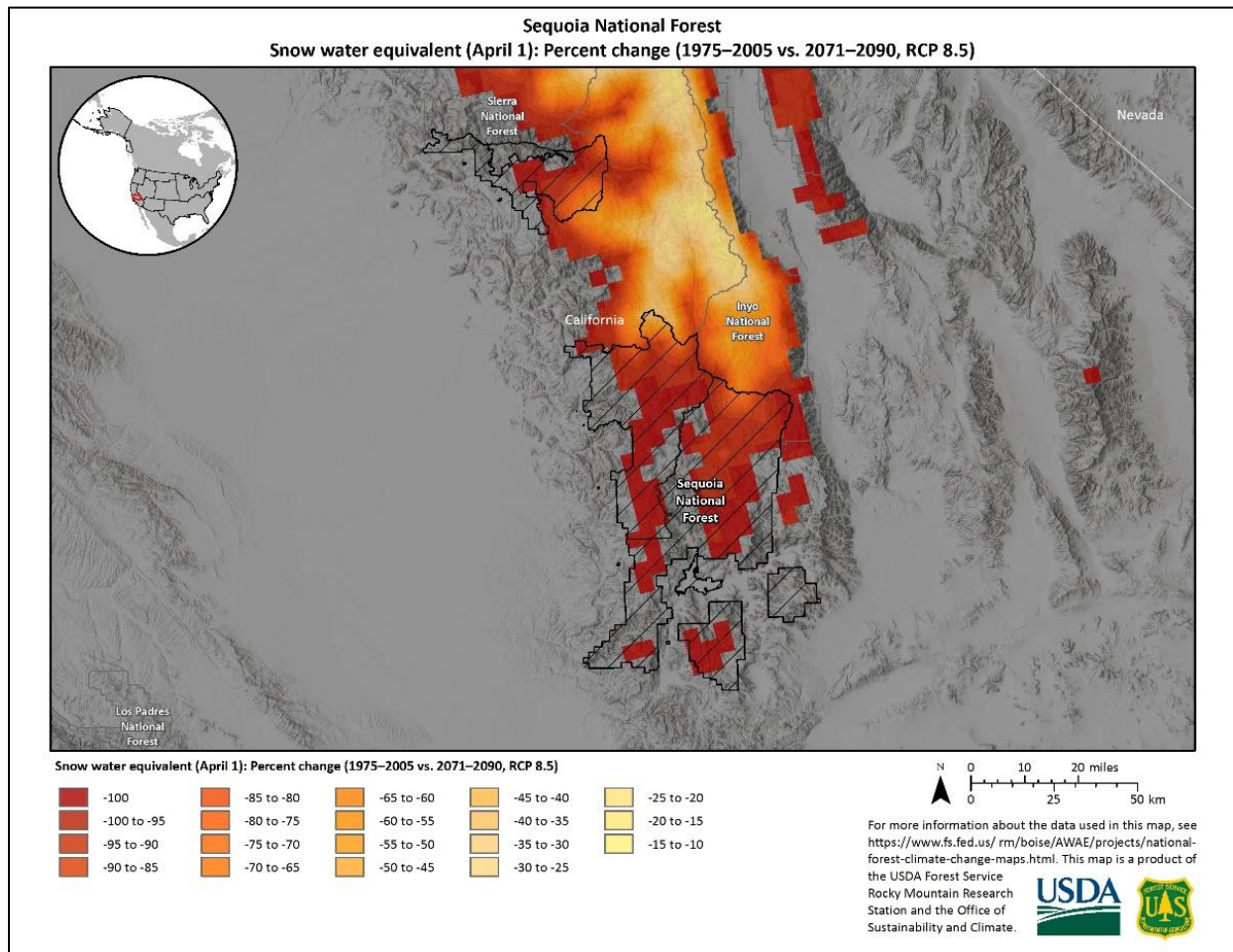
Name and Location	Elevation
Beach Meadows	7,650
Casa Vieja Meadows	8,300
Chagoopa Plateau	10,300
Crabtree Meadow	10,700
Pascoes	9,150
Tunnel Guard Station	8,900
Upper Tyndall Creek	11,400
Wet Meadows	8,950

Snow pillows were developed in the early 1960s.

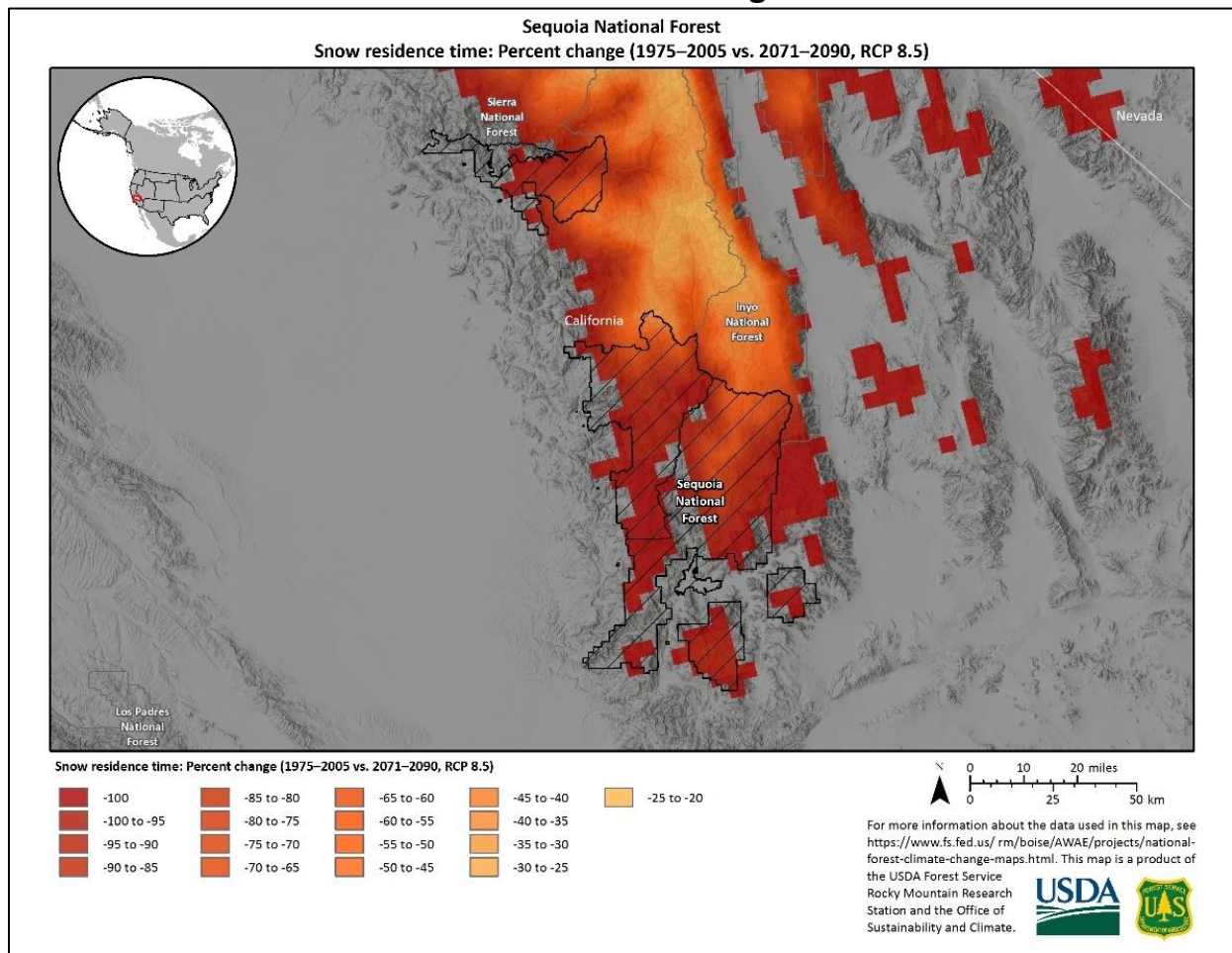


Climate Change is Forecast to Reduce Snowpack

Forecast Snow Water Equivalent (April 1) Percent Change 1975-2005 vs. 2071-2090



Forecast Snow Residence Time Percent Change 1975-2005 vs. 2071-2090



USDA Forest Service Climate Map Exporter

<https://usfs.maps.arcgis.com/apps/Cascade/index.html?appid=84d0b8b9388343149f5365de517a6689>

Additional Links

Most Recent Snow (Water Content) Data

http://cdec.water.ca.gov/cgi-progs/getAll?sens_num=3

El Niño/Southern Oscillation (ENSO) Diagnostic Discussion

https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

California Nevada River Forecast Center Interactive Map Interface

<https://www.cnrfc.noaa.gov/ol.php?type=snow>

California Daily Reservoir Storage Summary

<http://cdec.water.ca.gov/reportapp3/javareports?name=RES>

Send Inquires and Suggestions To:

scottwilliams.sierranevada@gmail.com

The Kern River Snow and Water Report was a free educational service provided by the Keepers of the Kern up until their retirement. The report is compiled by Scott Williams and is not copyrighted so please share. Science!

**The Kern River is Cold and Swift
Learn How to Stay Safe**

**El río Kern es frío y rápido
Aprenda a mantenerse seguro**

KernWaterSafety.com



See the Magnificent Sierra Nevada in Real Time:

Sierra Nevada California Webcams

"The Best Webcams in the West"

"If it's worth doing, it's worth overdoing"
The MythBusters