

Climate, weather, and drought in Nevada: Looking back at the past and ahead towards the future

Mount Rose Ski Area, NV November 13, 2022

Dan McEvoy,
Regional
Climatologist

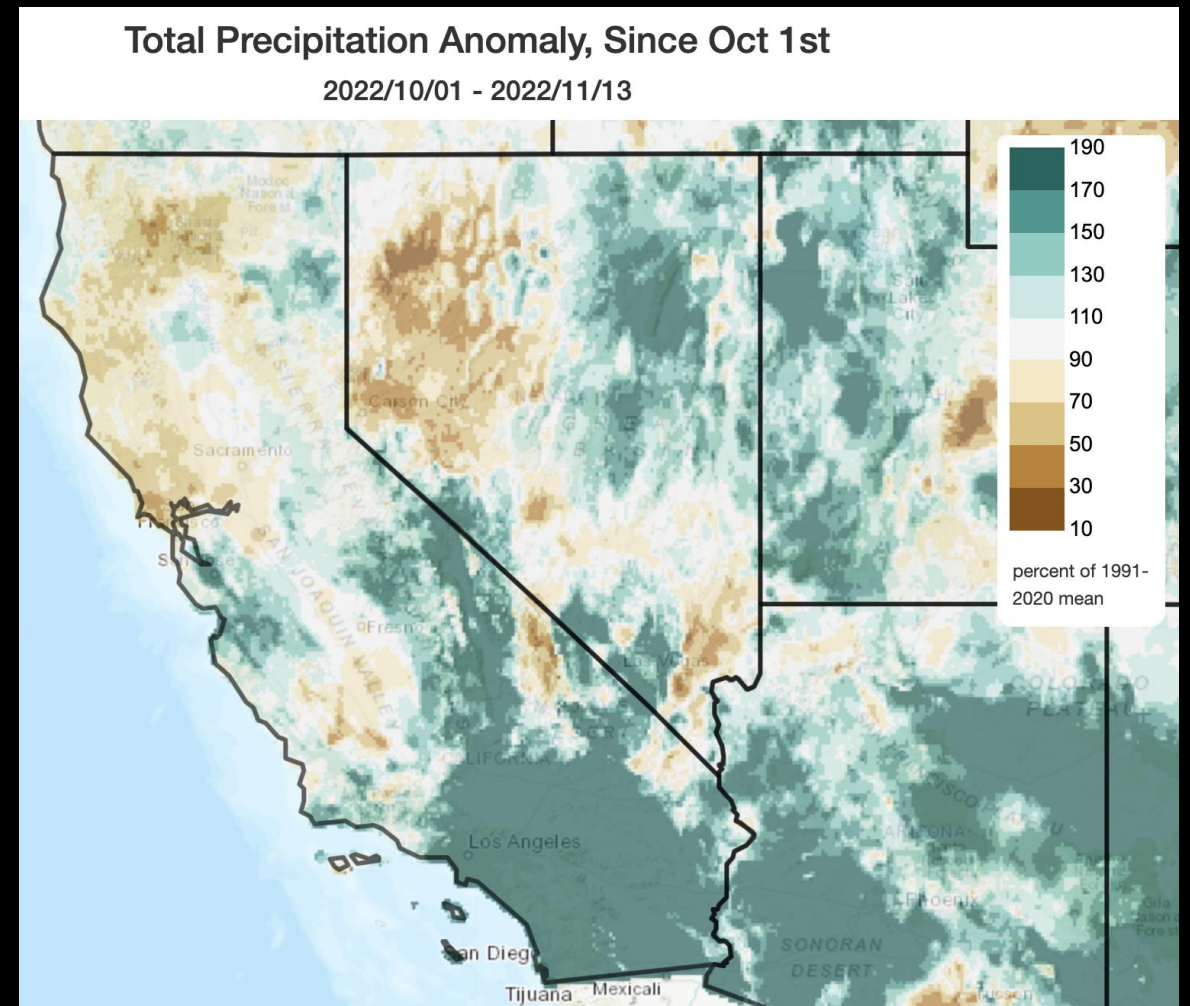
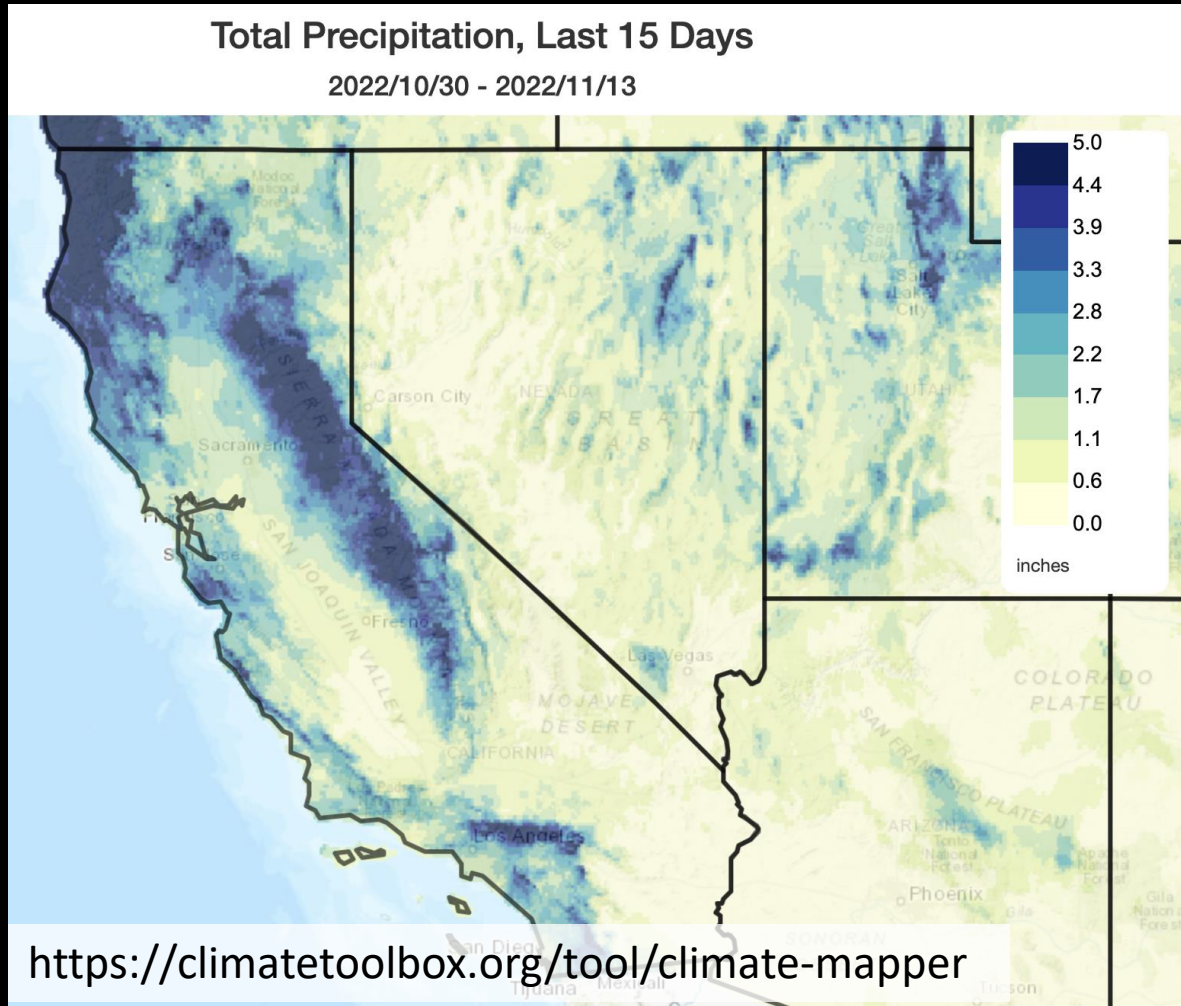
Western Regional
Climate Center,
Desert Research
Institute

Nevada Association
of Conservation
Districts Annual
Meeting

November 16,
2022, Fallon,
Nevada



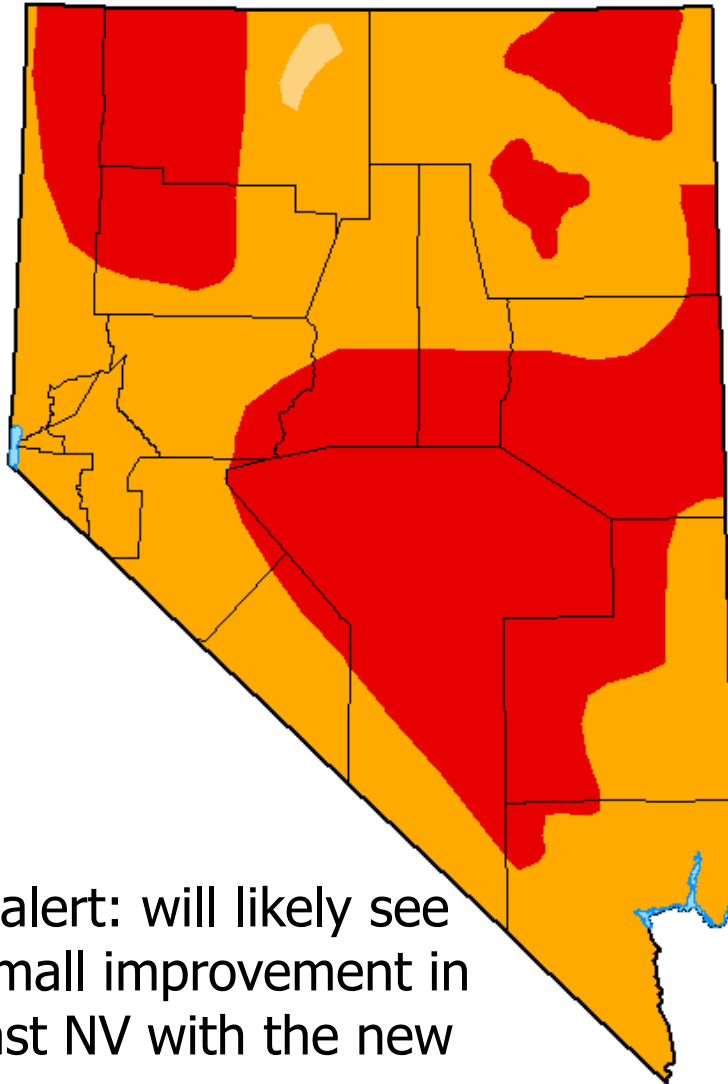
Several storms with rain and snow so far in November...



...but is it enough to reduce drought conditions?

U.S. Drought Monitor Nevada

November 8, 2022
(Released Thursday, Nov. 10, 2022)
Valid 7 a.m. EST



Spoiler alert: will likely see some small improvement in northeast NV with the new map tomorrow

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.52	44.61	0.00
Last Week <i>11-01-2022</i>	0.00	100.00	100.00	99.52	44.61	0.00
3 Months Ago <i>08-09-2022</i>	0.00	100.00	100.00	99.52	53.68	4.17
Start of Calendar Year <i>01-04-2022</i>	0.00	100.00	100.00	68.07	24.21	7.50
Start of Water Year <i>09-27-2022</i>	0.00	100.00	100.00	99.52	45.85	0.00
One Year Ago <i>11-09-2021</i>	0.00	100.00	100.00	95.25	56.81	25.02

Intensity:



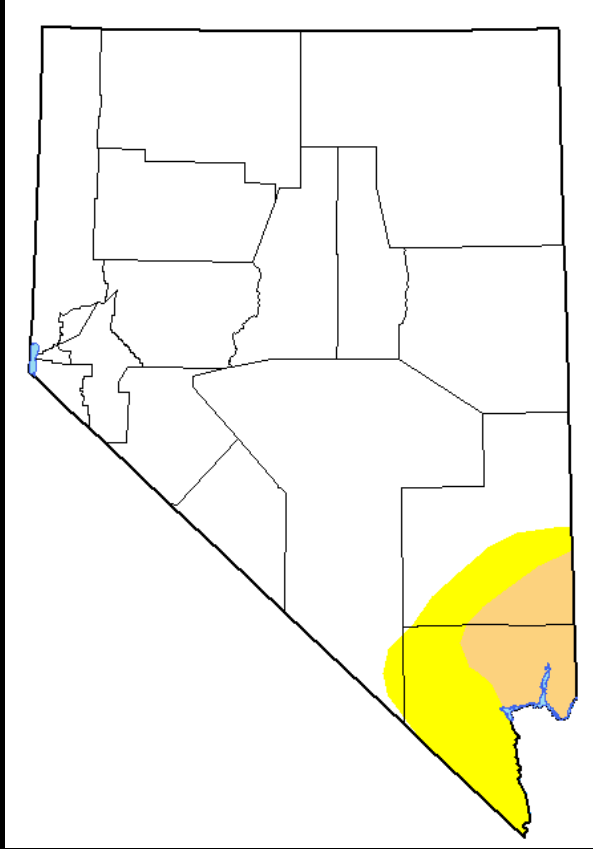
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

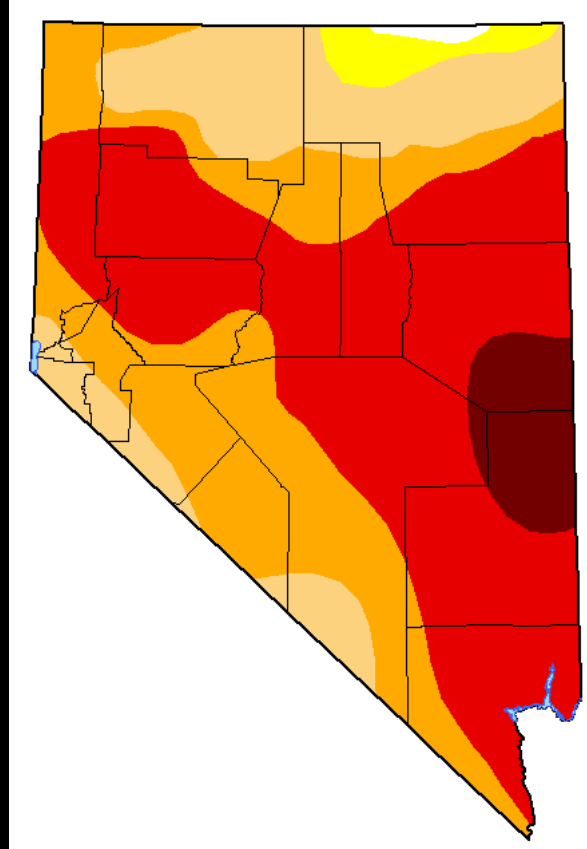
Brian Fuchs
National Drought Mitigation Center



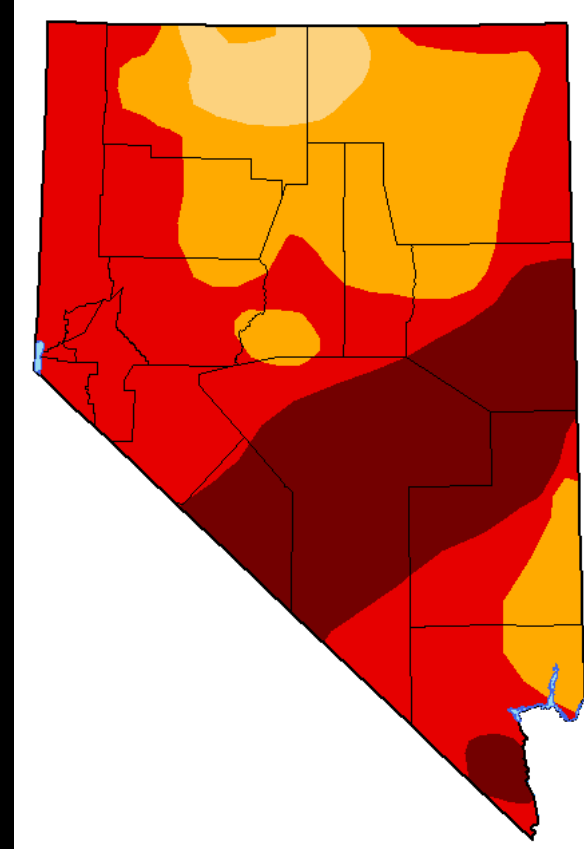
September 24,
2019



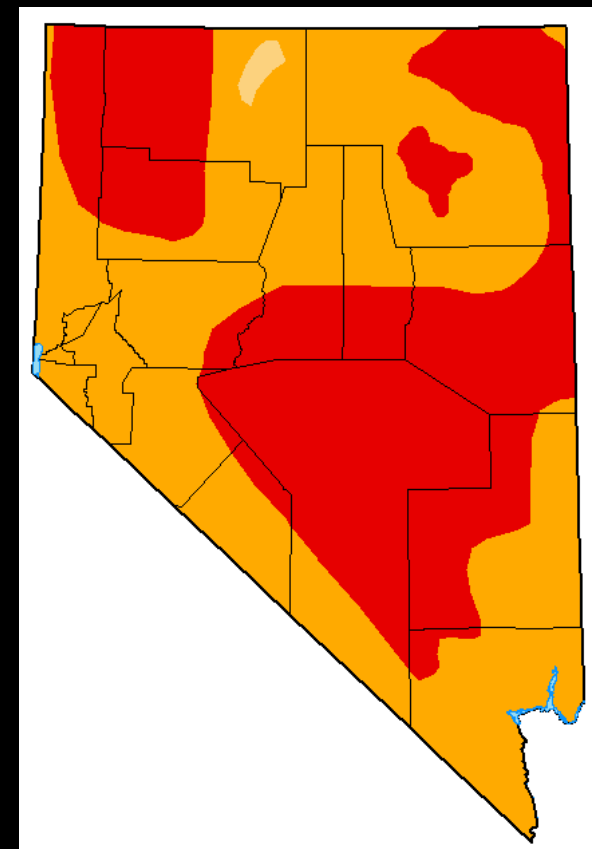
September 29,
2020



September 28,
2021



September 20,
2022



A few storms can't erase the deficits that
have accumulated the past three years.

Intensity:

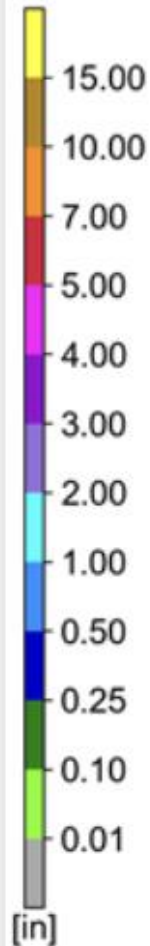
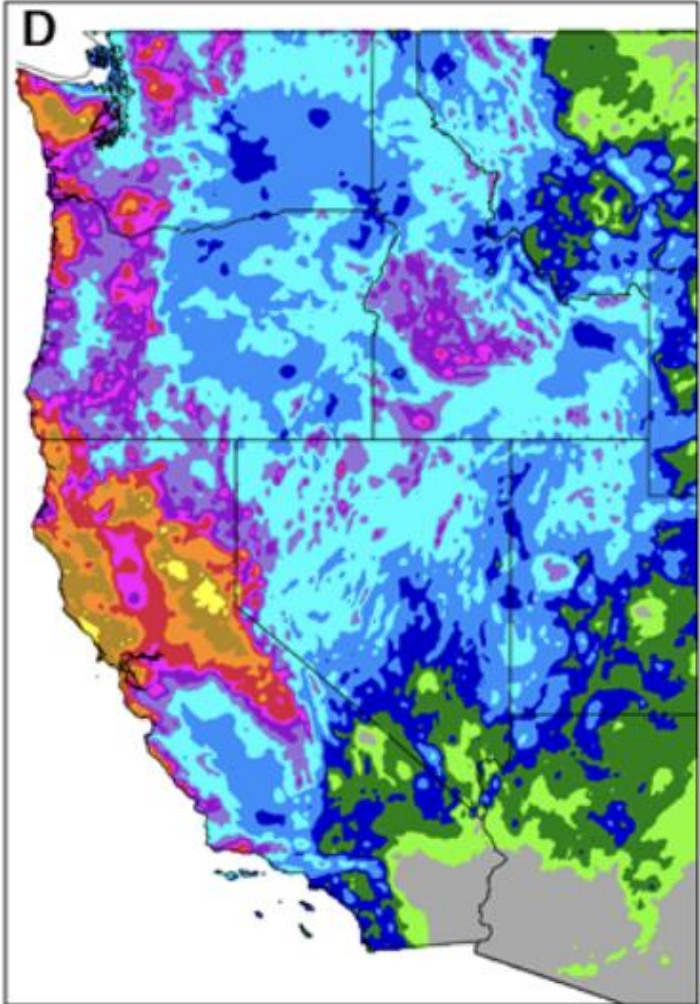


Let's briefly backtrack to the 2021-2022 water year
(October-September)

October 2021 brought hope for drought relief

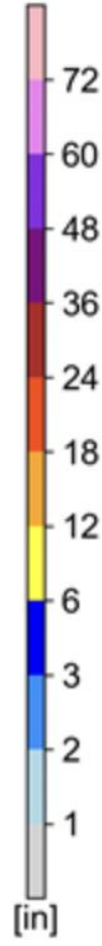
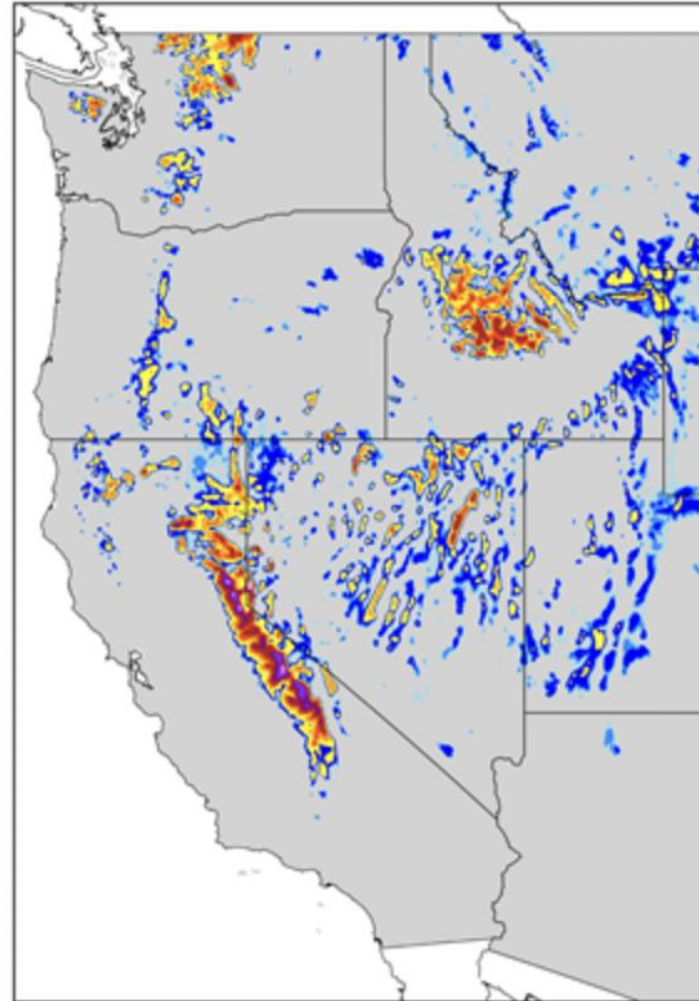
NCEP Stage IV 7-day QPE

Valid: 5 AM PT 19–26 Oct



72-h Interpolated Snowfall

Valid: 5 AM PT 23–26 Oct



Heavy rainfall and high elevation snowfall impacted nearly the entire state

Reno:

- Wettest October 3.14"
- 4th wettest day, October 24 1.88"

Capital Weather Gang

Record December snow in West brings major drought relief, hope for 2022

Reservoir levels are rising and snowpack is piling up, but there's still a ways to go for full drought recovery



A vehicle is stuck in the snow Dec. 27 in Grass Valley, Calif., on the western foothills of the Sierra Nevada. (Elias Funez/AP)

By Diana Leonard

December 30, 2021 at 9:38 a.m. EST



NOW
Sale

reno gazette journal

vs | Sports Business Life Opinion Obituaries E-Edition Legals

NEWS

Tahoe shatters 50-year December snowfall record with more than 16 feet of snow



Amy Alonzo

Reno Gazette Journal

Published 3:51 p.m. PT Dec. 27, 2021 | Updated 3:54 p.m. PT Dec. 27, 2021

View Comments



With four days left to go in the month, Tahoe has already broken the record for December snowfall set 50 years ago.

On Monday, December snow totals at the UC Berkeley Central Sierra Snow Lab reached 193.7 inches, blowing a 1970 record of 179 inches out of the water.

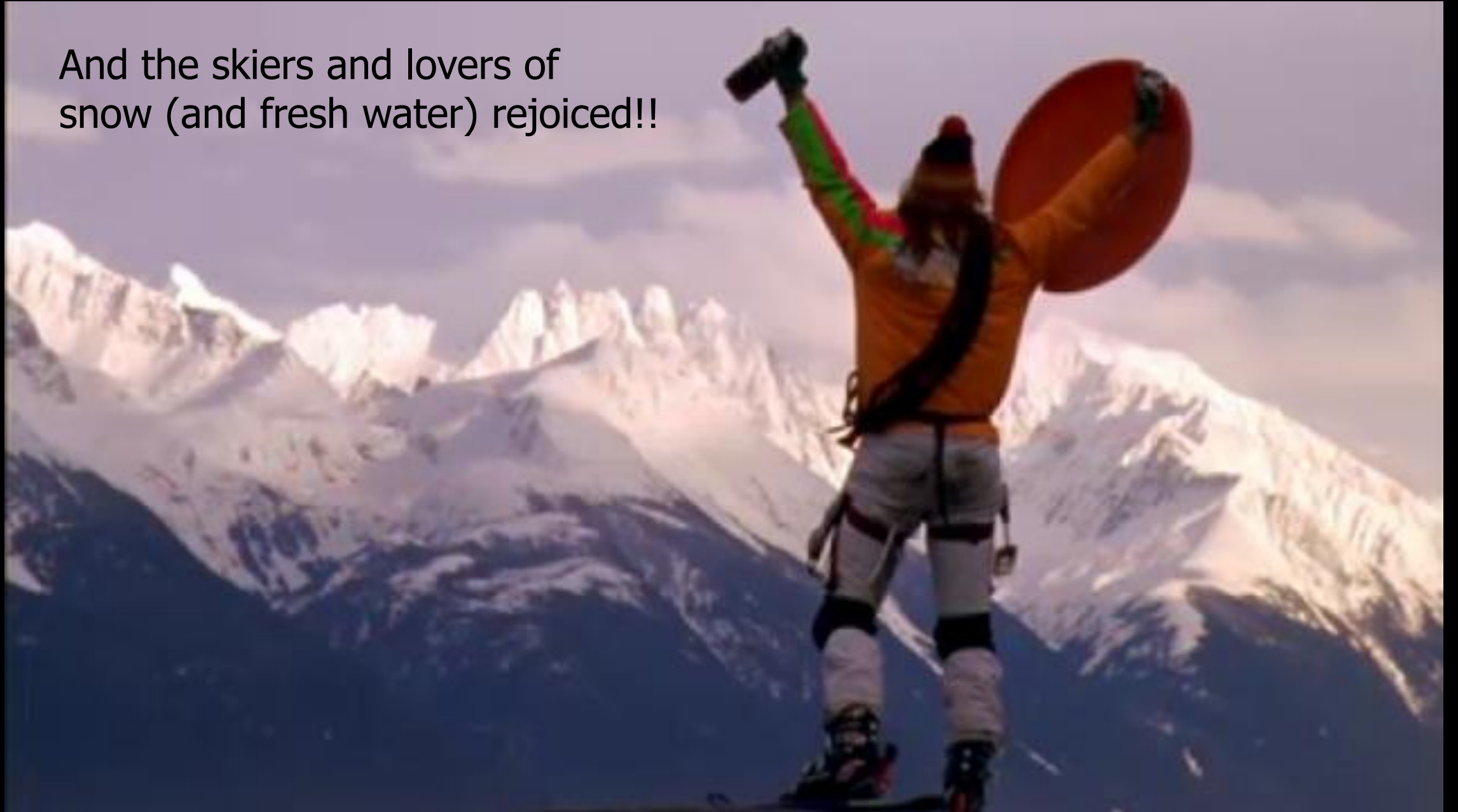
The lab, located at Donner Pass, has received roughly 39 inches of snow in the past 24 hours and could break the 200-inch mark today.



A photo of Washoe Valley seen on Dec. 26, 2021. A storm hit Northern Nevada on Christmas and continued to cause mountain passes to sclose Photo Provided By To The RGJ By Riley Dillon

Record snow: [Tahoe prepped for epic skiing and riding conditions, if highways](#)

And the skiers and lovers of
snow (and fresh water) rejoiced!!



California drought: Sierra snowpack falls to one of lowest levels in 70 years

January-March was driest such three-month period in San Francisco since records began during Gold Rush



Nick Ellis, Lauren Alkire, and Sean de Guzman of the California Department of Water Resources, take measurements March 1, 2022 during a snow survey at Phillips Station in the Sierra Nevada west of Lake Tahoe off Highway 50 in El Dorado County. (Photo: Ken James / California Department of Water Resources)

By **PAUL ROGERS** | progers@bayareanewsgroup.com | Bay Area News Group

PUBLISHED: April 1, 2022 at 5:45 a.m. | UPDATED: April 3, 2022 at 5:57 a.m.

Smith's FRESH FOR EVERYBODY

THIS WEEK'S CIRCULAR

HOVER FOR CIRCULAR

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SNOW WATER EQUIVALENT IN LAKE TAHOE

Lake Tahoe Basin

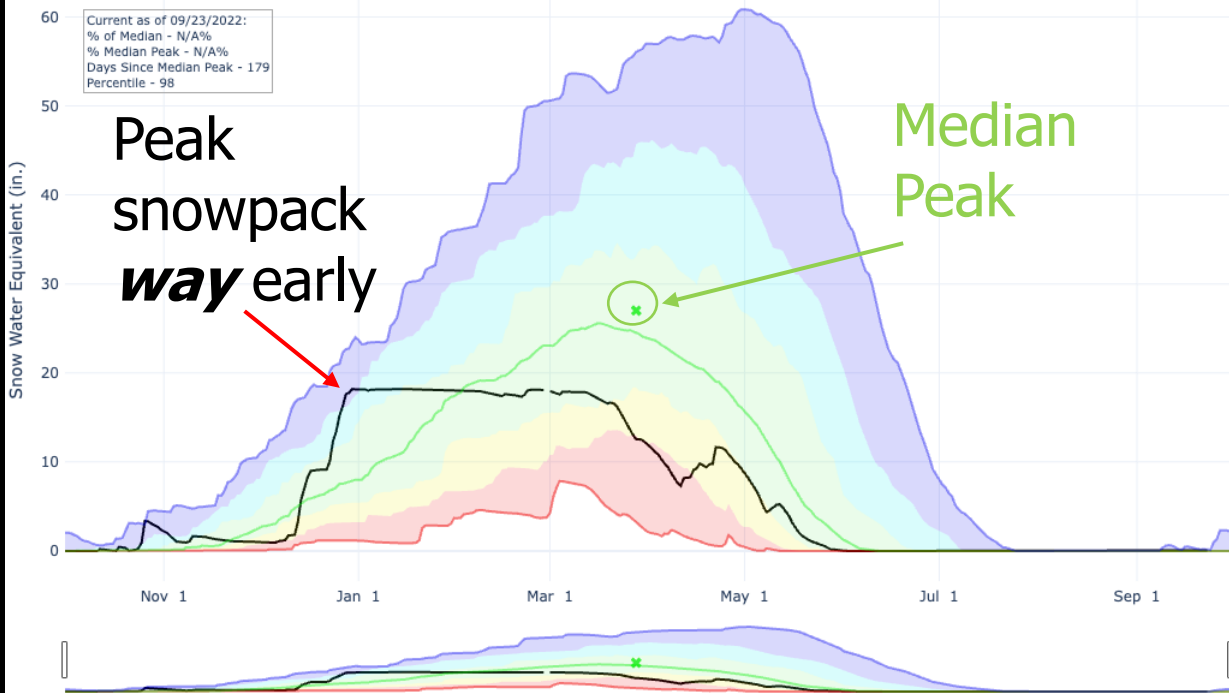
Reset Range

Link to data: CSV / JSON

Station List

Current as of 09/23/2022:
% of Median - N/A%
% Median Peak - N/A%
Days Since Median Peak - 179
Percentile - 98

- Median Peak SWE
- Max
- Median (POR)
- Median ('91-'20)
- Min
- Stats. Shading
- 2022 (11 sites)
- 2021 (11 sites)
- 2020 (11 sites)
- 2019 (11 sites)
- 2018 (11 sites)
- 2017 (11 sites)
- 2016 (11 sites)
- 2015 (11 sites)
- 2014 (11 sites)
- 2013 (11 sites)
- 2012 (11 sites)
- 2011 (11 sites)
- 2010 (11 sites)
- 2009 (11 sites)
- 2008 (11 sites)
- 2007 (11 sites)
- 2006 (11 sites)
- 2005 (11 sites)
- 2004 (10 sites)
- 2003 (10 sites)



Peak snowpack *way* early

Median Peak



Some spring storms in northeast NV but peak still early and below average

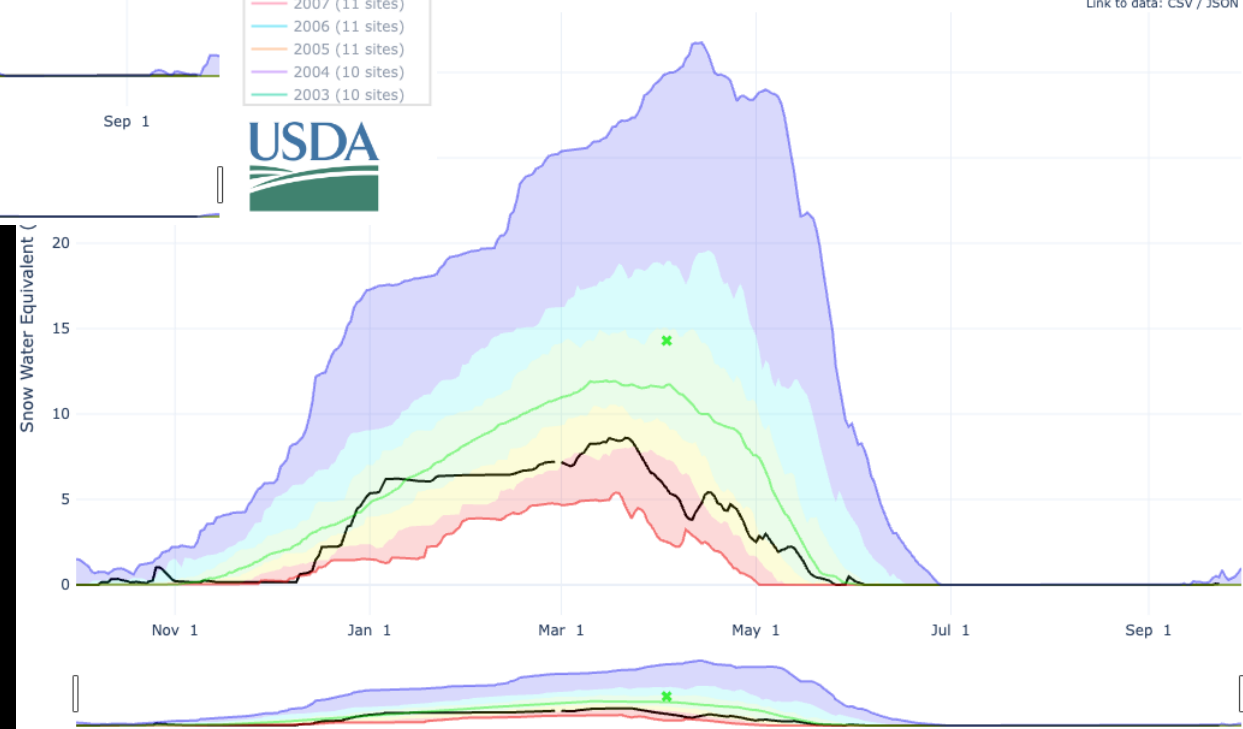
Snowpack in the Sierra peaked around *January 1!*

Upper Humboldt Basin, NV

Link to data: CSV / JSON

Station List

- Median Peak SWE
- Max
- Median (POR)
- Median ('91-'20)
- Min
- Stats. Shading
- 2022 (10 sites)
- 2021 (10 sites)
- 2020 (10 sites)
- 2019 (10 sites)
- 2018 (10 sites)
- 2017 (10 sites)
- 2016 (10 sites)
- 2015 (10 sites)
- 2014 (10 sites)
- 2013 (9 sites)
- 2012 (9 sites)
- 2011 (9 sites)
- 2010 (9 sites)
- 2009 (9 sites)
- 2008 (9 sites)
- 2007 (9 sites)
- 2006 (9 sites)
- 2005 (9 sites)
- 2004 (9 sites)
- 2003 (9 sites)



RECORD HEAT



Reno, NV
106°F

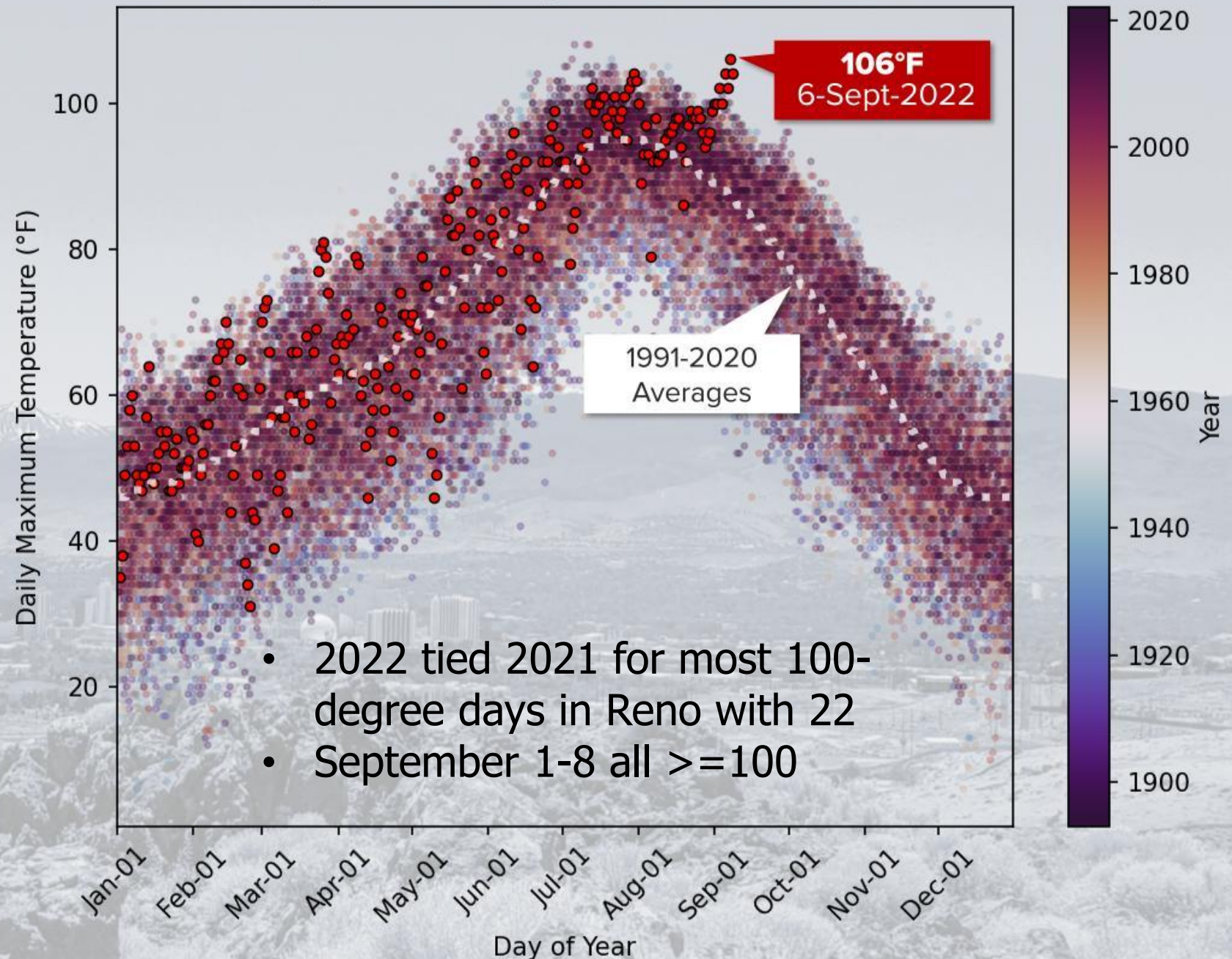
Tuesday, September 6th, 2022

Reno (KRNO) high of 106°F was the second highest temperature since records began, tying with July 4, 2007. The highest temperature ever recorded at KRNO was 108°F in July 2002, 2007.

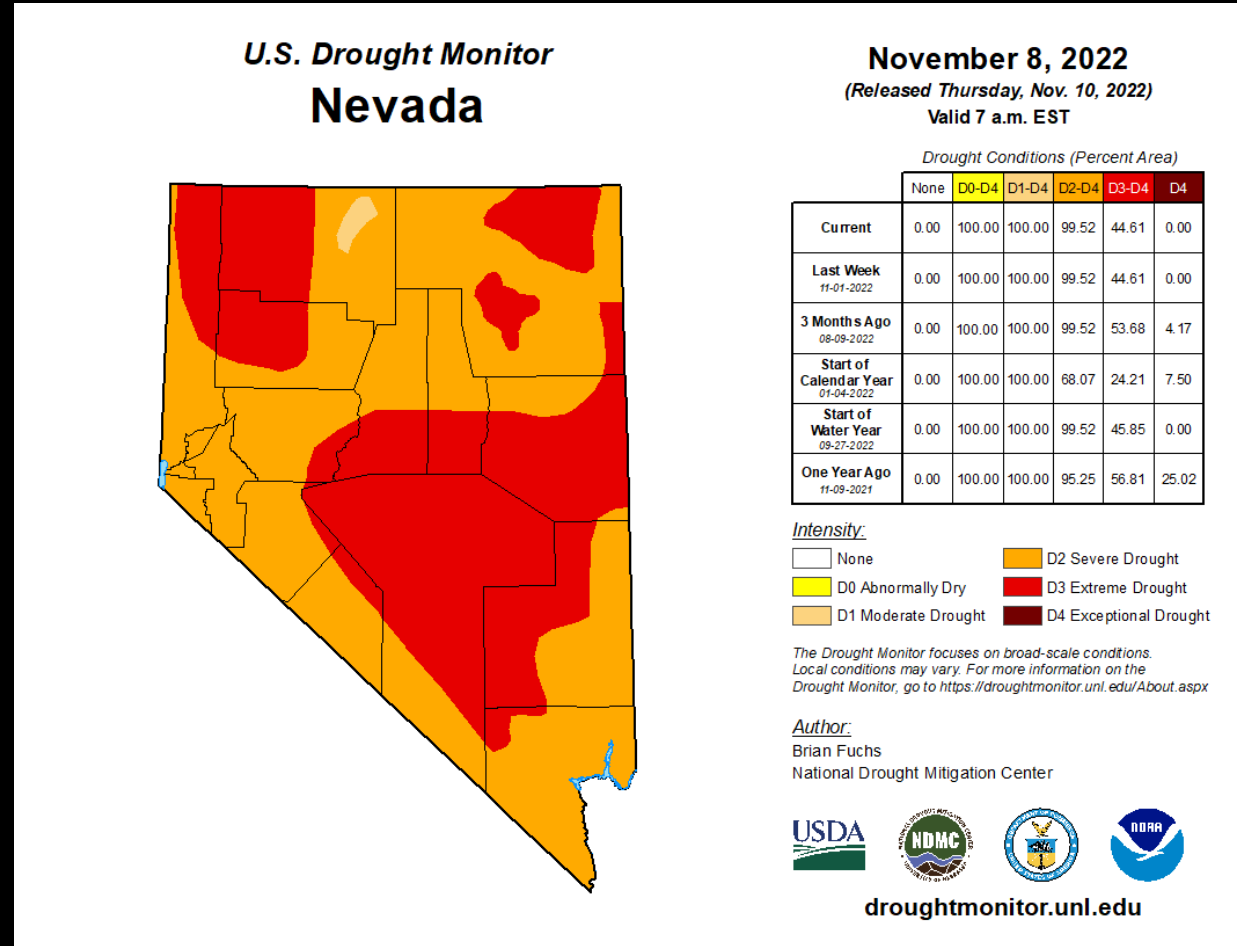
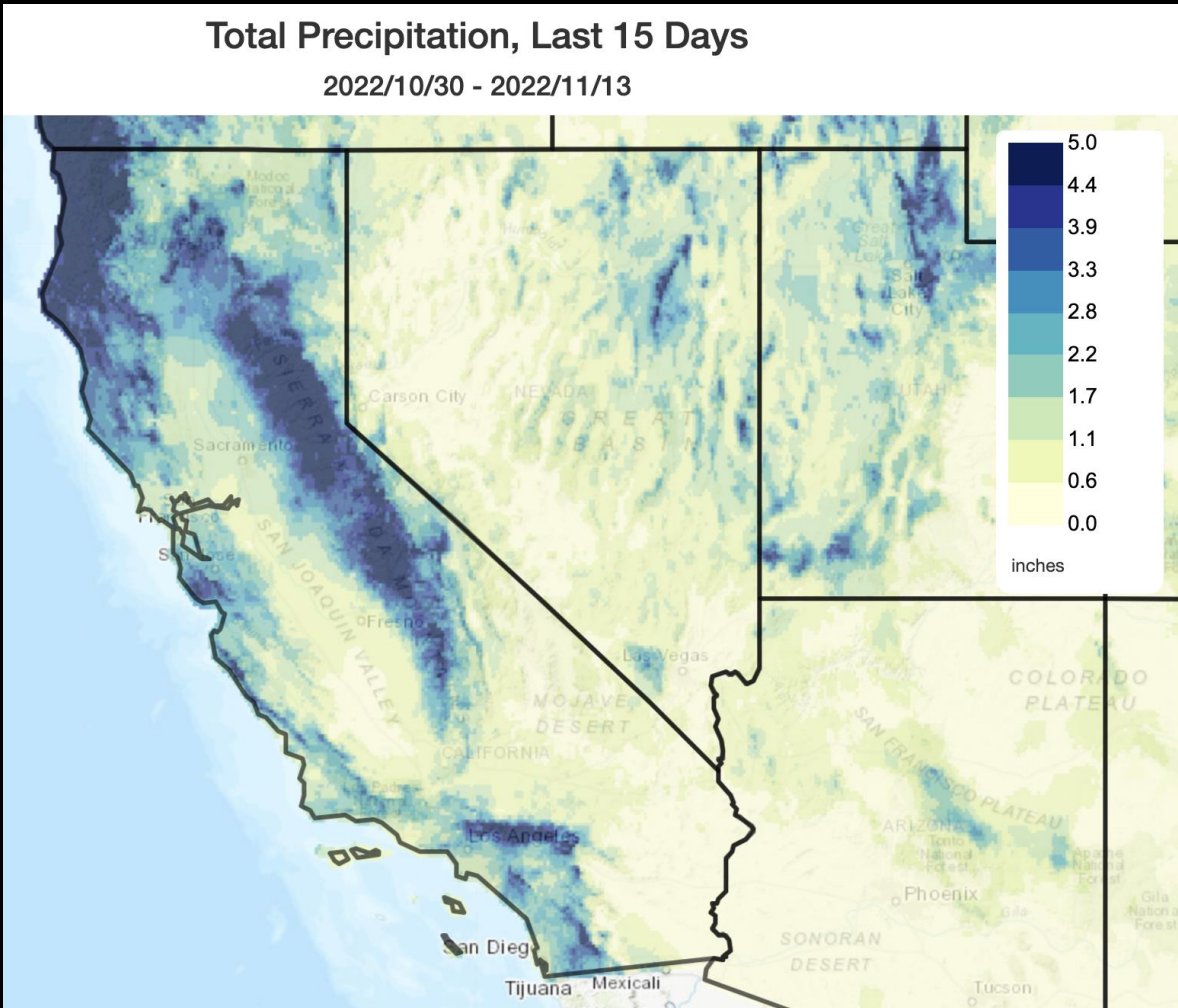


weather.gov/**Reno**
National Weather Service • Reno, NV

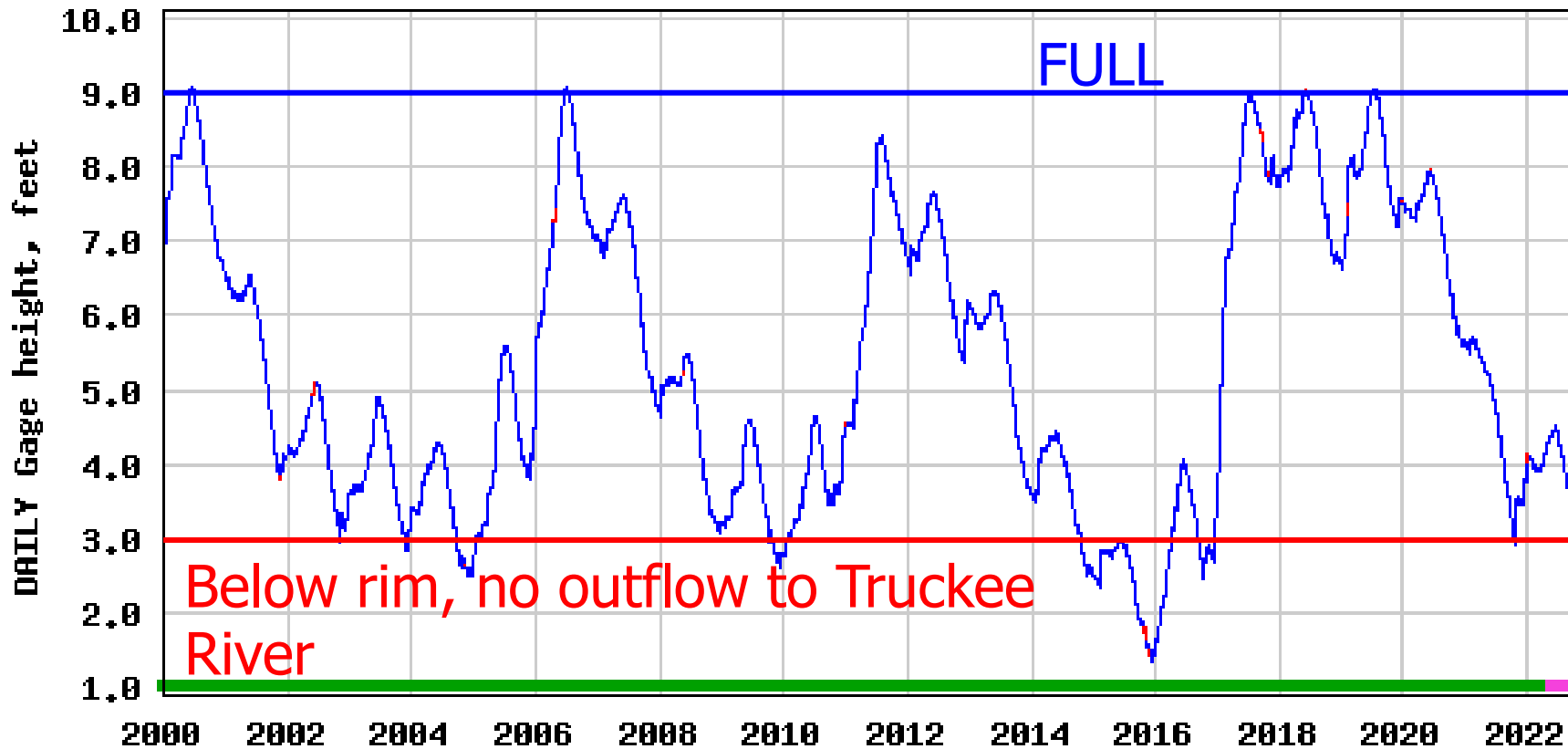
Reno, NV Max Temperatures 1893-2022



Recent storms helpful but long-term drought still impacting the region



USGS 10337000 LAKE TAHOE A TAHOE CITY CA



- Daily observation at midnight gage height
- Estimated daily observation at midnight gage height
- Period of approved data
- Period of provisional data

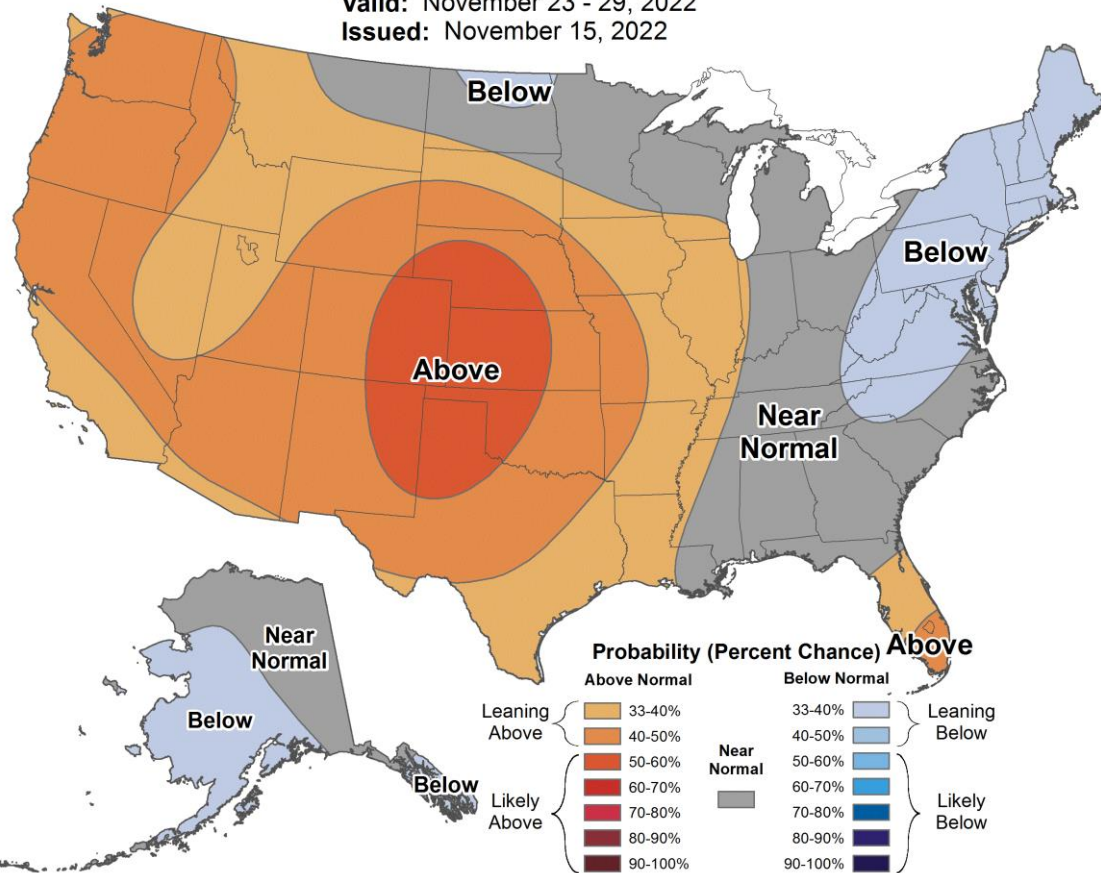
Surface water supply in most regional reservoirs is still very low and at drought levels

Lahontan and Rye Patch are also both very low right now

A look ahead shows wetter pattern, but also warmer, possible Thanksgiving week

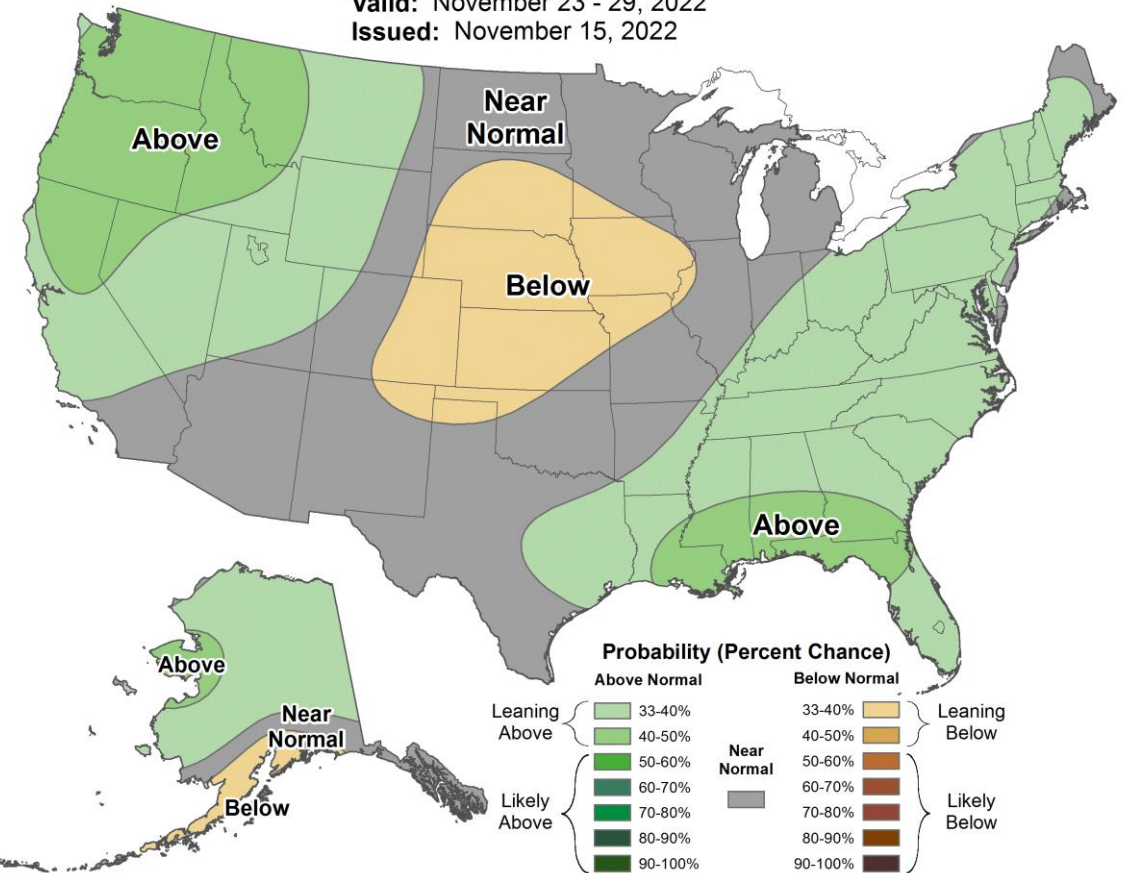
8-14 Day Temperature Outlook

Valid: November 23 - 29, 2022
 Issued: November 15, 2022



8-14 Day Precipitation Outlook

Valid: November 23 - 29, 2022
 Issued: November 15, 2022

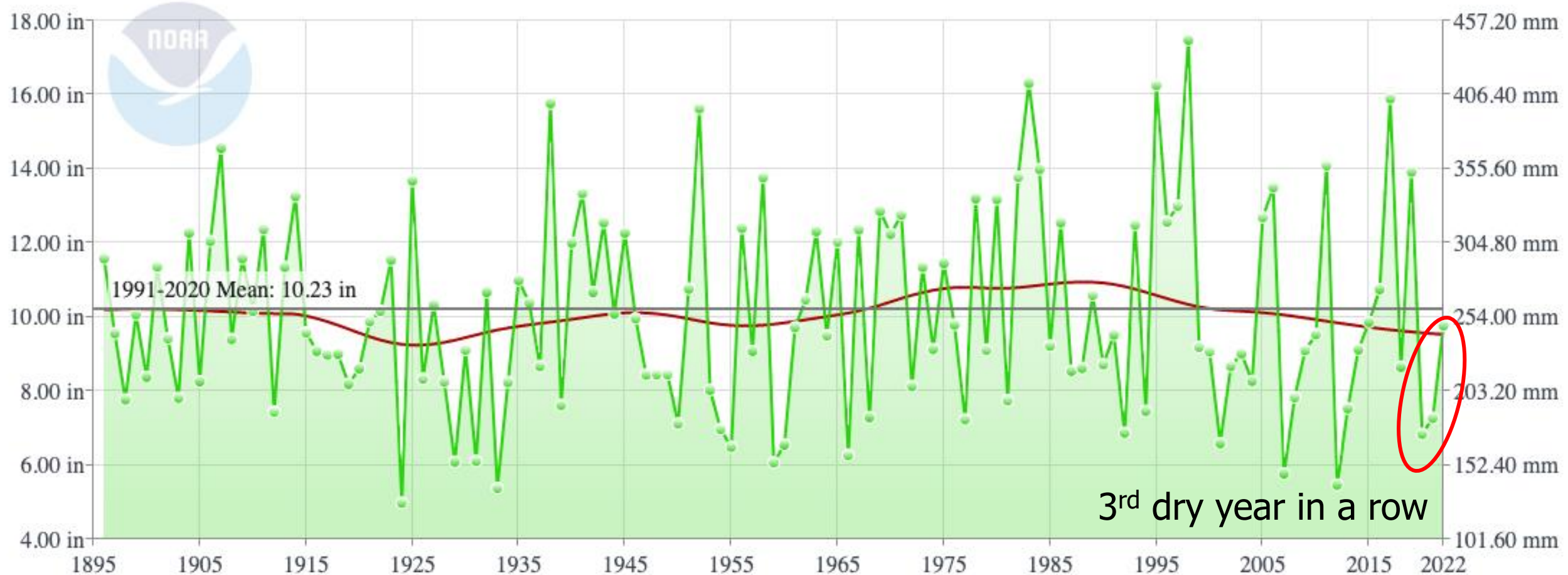


Nevada Statewide October-September Precipitation

Nevada, Climate Division 1 Precipitation
October-September

1895-2022

— LOESS

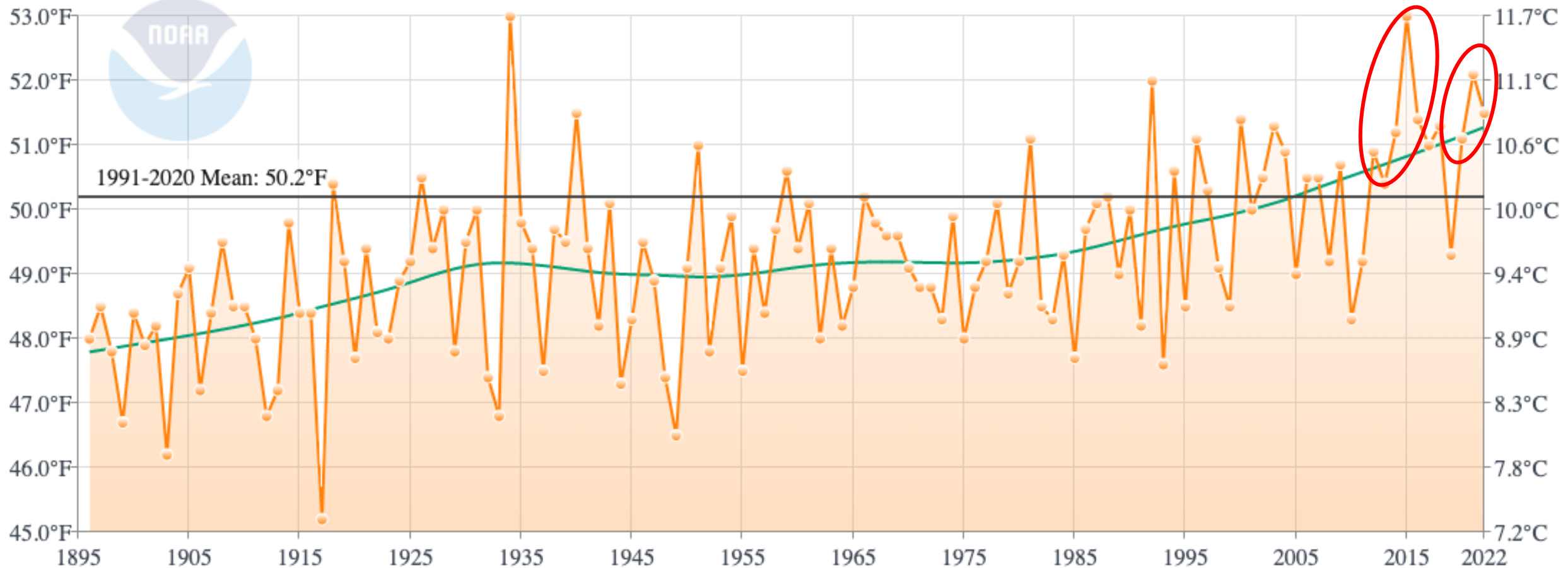


But what has changed the most during recent droughts?

Nevada Statewide October-September Temperature

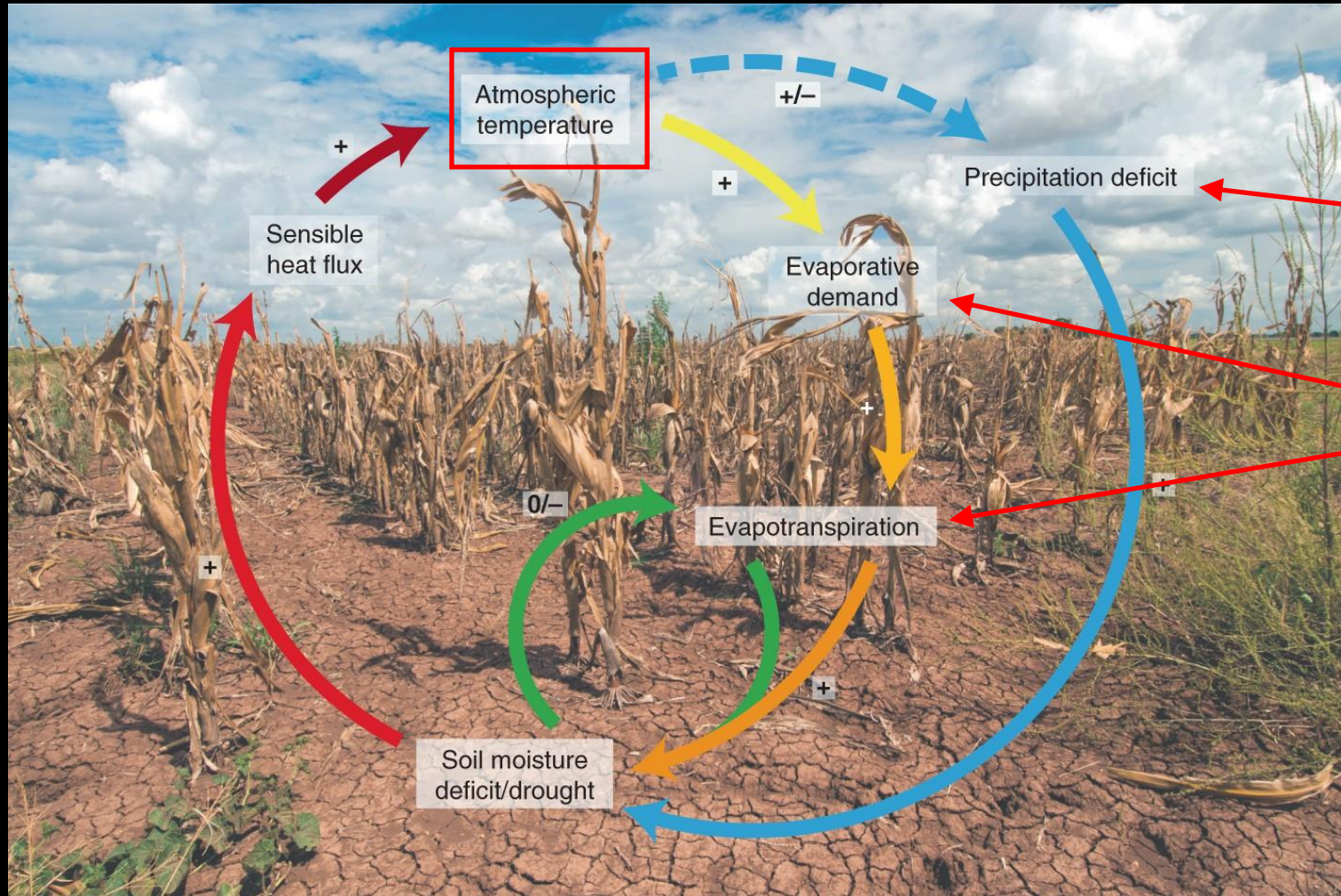
Nevada, Climate Division 1 Average Temperature
October-September
1895-2022

Hot droughts are now the norm!



In a warming world the demand side of drought is becoming just as important as the supply

Temperature a critical component in atmospheric demand for water



Supply side of drought

Demand side of drought

Evaporative Demand Increase Across Lower 48 Means Less Water Supplies, Drier Vegetation, and Higher Fire Risk

Albano, C. M., Abatzoglou, J. T., McEvoy, D. J., Huntington, J. L., Morton, C. G., Dettinger, M. D., & Ott, T. J. (2022). A Multidataset Assessment of Climatic Drivers and Uncertainties of Recent Trends in Evaporative Demand across the Continental United States. *Journal of Hydrometeorology*, 23(4), 505-519.

Changes In Atmospheric Thirst From 1980-2020, Measured In Terms of Reference Evapotranspiration (Mm)

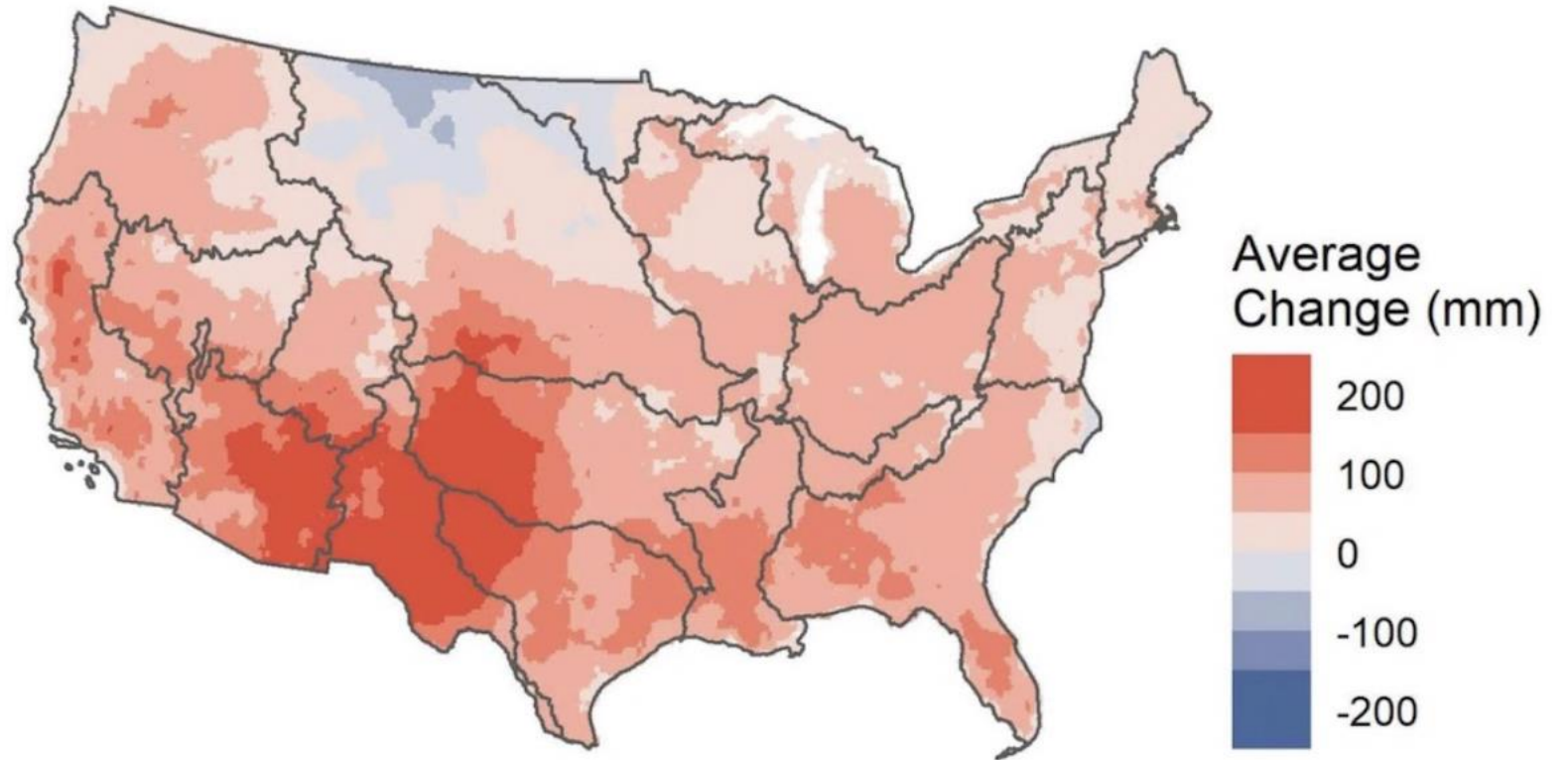


Figure 1. Changes in atmospheric thirst, measured in terms of reference evapotranspiration (mm), from 1980–2020. The largest changes are centered over the Rio Grande region of the southwestern U.S. Credit: Desert Research Institute.



OUR STRATEGY.

<https://climateaction.nv.gov/our-strategy/>

NEVADA'S CLIMATE STRATEGY

The *State Climate Strategy* is an integrated, economy-wide roadmap for the Silver State to accelerate climate action necessary to achieve Nevada's climate goals and capture the health and economic benefits of the clean energy and technology revolution. The Strategy is just the beginning of future climate action in Nevada. As a living document, the Strategy will be adapted and updated as the impacts of climate change evolve and new climate-friendly technologies become available.

[CLICK HERE TO DOWNLOAD THE FULL STATE CLIMATE STRATEGY](#)

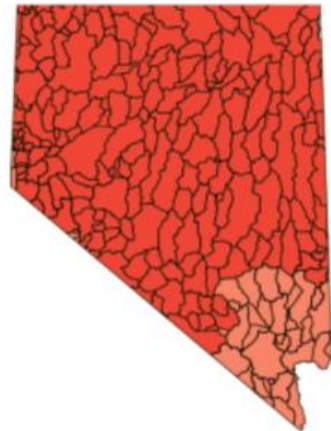
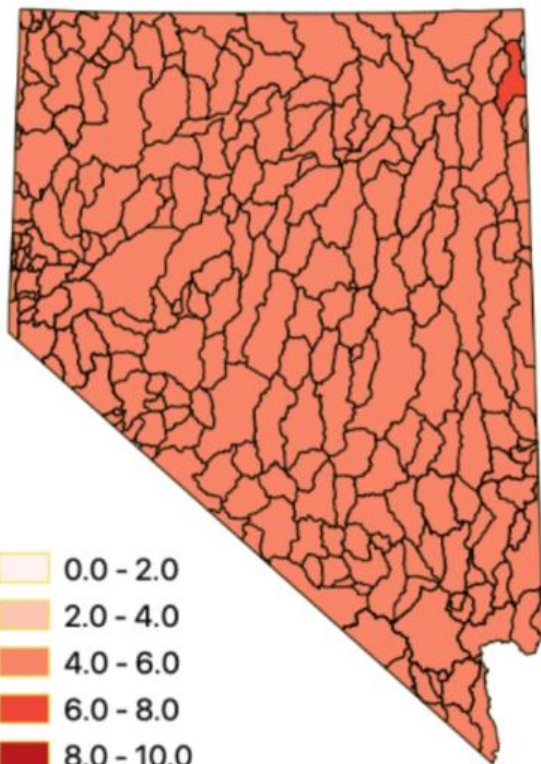
Table 1. Climate Impacts in Nevada

	Heat & Heat Waves	Drought	Loss of Snow	Floods	Wildfire Risk
CLIMATE SCIENCE					
Historical Trends	Increasing temp; Rates of increase are higher in urban areas than rural areas	Increasing evaporative demand; More drought that not in last 10 years	Decrease between 20-60% from 1955-2016	No historical trends; Most recent flooding events are 2017 and 2006	Between 1984-2017, 4 of the 5 years with the largest area burned have occurred since 2005.
Projected Trend & Confidence	Increase in average temp; Increase in frequency and severity of heat waves HIGH Confidence	Increase in frequency and intensity Confident	By the end of this century, projections indicate a potential 30-50% reduction in April snowpacks;; Earlier snow melt HIGH Confidence	More frequent flooding; Confident	Increase of invasive species, increasing fire spread; Increase drying of fuels; Increase precipitation variability affecting fuel production HIGH Confidence
IMPACTS					
Ag and Ranching	Health impacts of being outdoors during heat waves; Heat impacts to livestock health and milk production; Longer growing seasons and new crop varieties; Impacts to plant health and crop production; Delayed or reduced production from adapting to shifting seasons and crop performance	Potential decrease on crop yield and production; Decreased forage quantity, range condition; Water hauling needs; Reduction in use of federal land; Increased need of feeding hay; Reduction in land available for production	Earlier and longer duration of irrigation needs due to decrease in run-off later in the season; Reduced irrigation capacity due to lack of water availability; Reduction in rangeland production	Increase erosion and soil loss; Potential crop loss/damage; Damage to water holding and confinement structures; Microbial contamination of crops	Direct livestock losses; Potential impact on forage production due to wildfire-induced changes in vegetation cover including noxious weeds; Crop and forage loss; Federal land permits closed or temporally closed due to fire; Loss of infrastructure

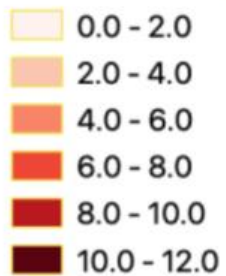
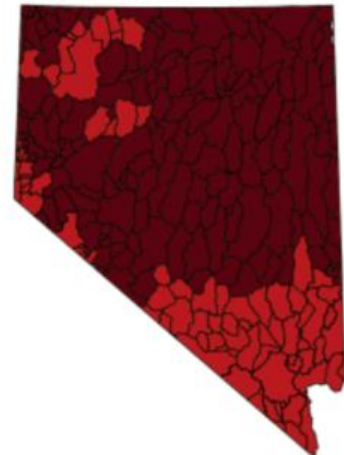
Annual Average Temperature Change (°F)

RCP 8.5 2030-2059

RCP 4.5 2070-2099



RCP 8.5 2070-2099

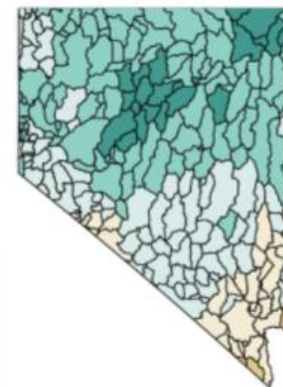
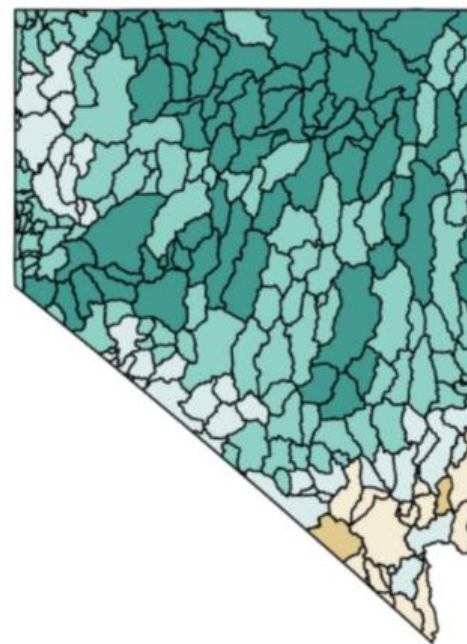


NV Climate Strategy

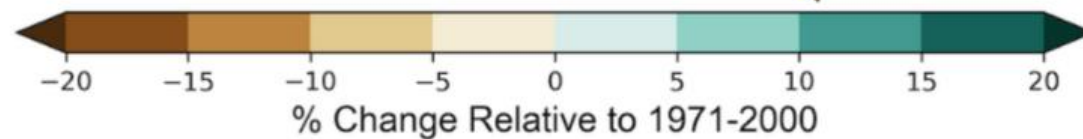
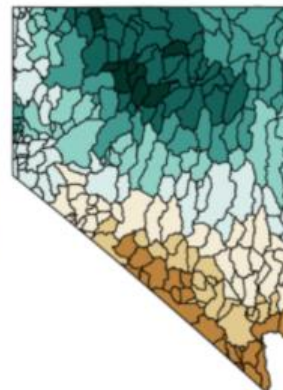
Average Water Year Precipitation Change (%)

RCP 4.5 2070-2099

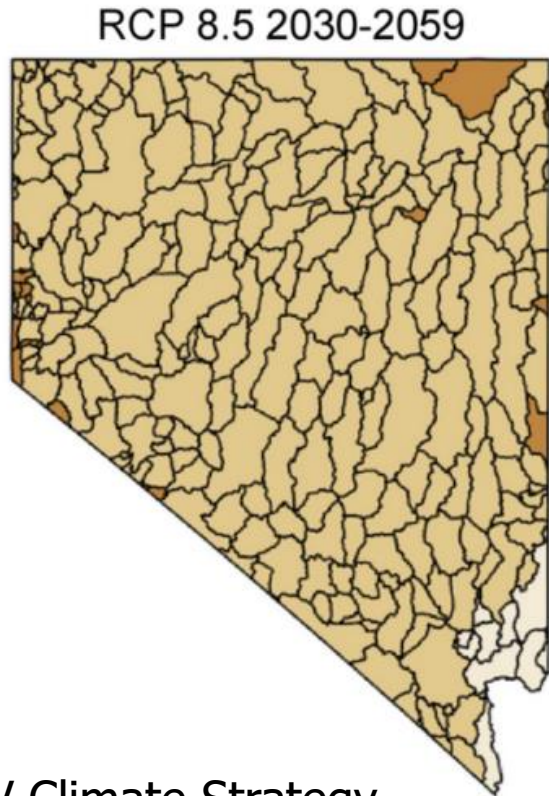
RCP 8.5 2030-2059



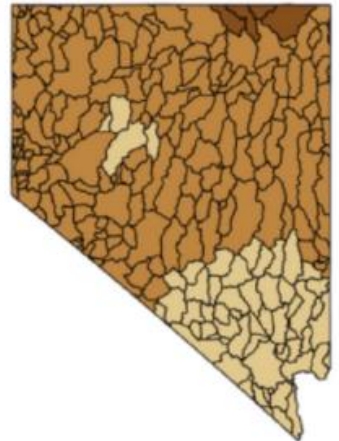
RCP 8.5 2070-2099



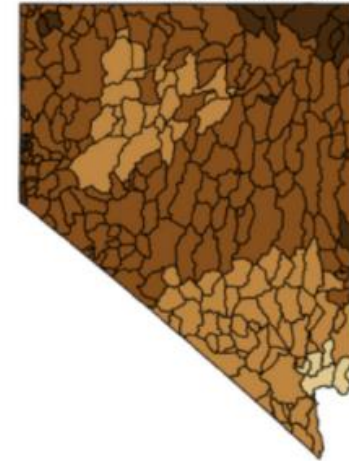
Average Water Year
Evaporative Demand Change (%)



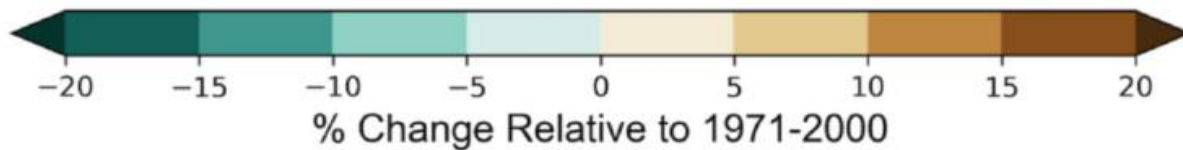
RCP 4.5 2070-2099



RCP 8.5 2070-2099



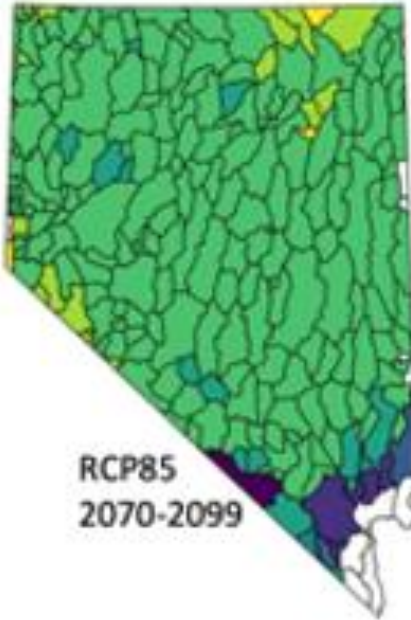
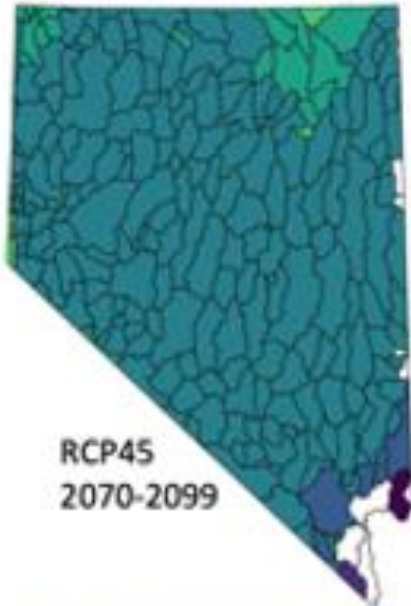
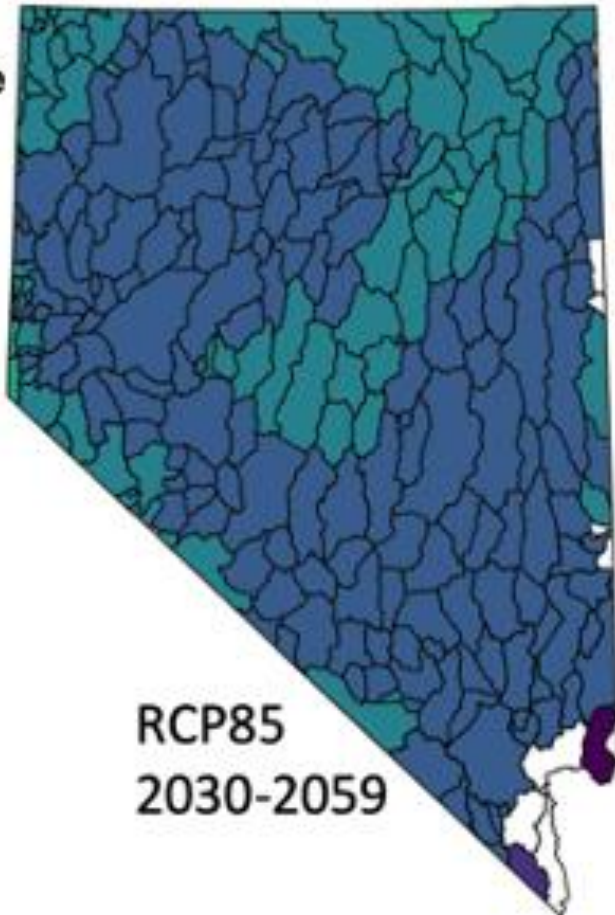
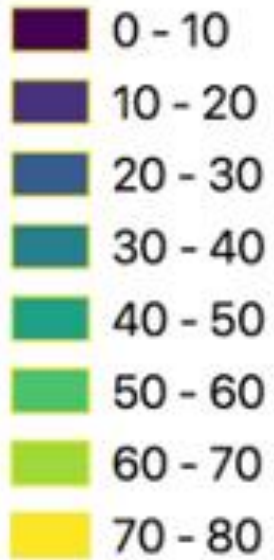
NV Climate Strategy



Evaporative demand =
atmospheric thirst for moisture
from the ground

Uniform increases across Nevada
driven largely by increased
temperatures

Project Change
in Growing
Season Days



Not *all* climate change impacts will be negative

Growing season length expected to increase

However, there will also be more atmospheric demand for water and more time irrigating

NV Climate Strategy

Summary

- Nevada still long-term drought; recent storms helpful for short-term impacts
- 8 of last 11 years have been drought years in Nevada
- Increased temperatures driving more rapid and more severe drought impacts
- Water year 2021-22 was a wild one that still ended in a drought year
- A warmer and possibly wetter future is projected for Nevada
- Similar to recent droughts the ***warmer temperatures*** and ***increased evaporative demand*** will be a major factor in future droughts

Thank you!
Email: mcevoyd@dri.edu

???



Parkdale, OR, June 13, 2022
Photo: Dan McEvoy