

Colorado Climate Update

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Water Availability Research
November 2022



COLORADO
CLIMATE
CENTER

ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY

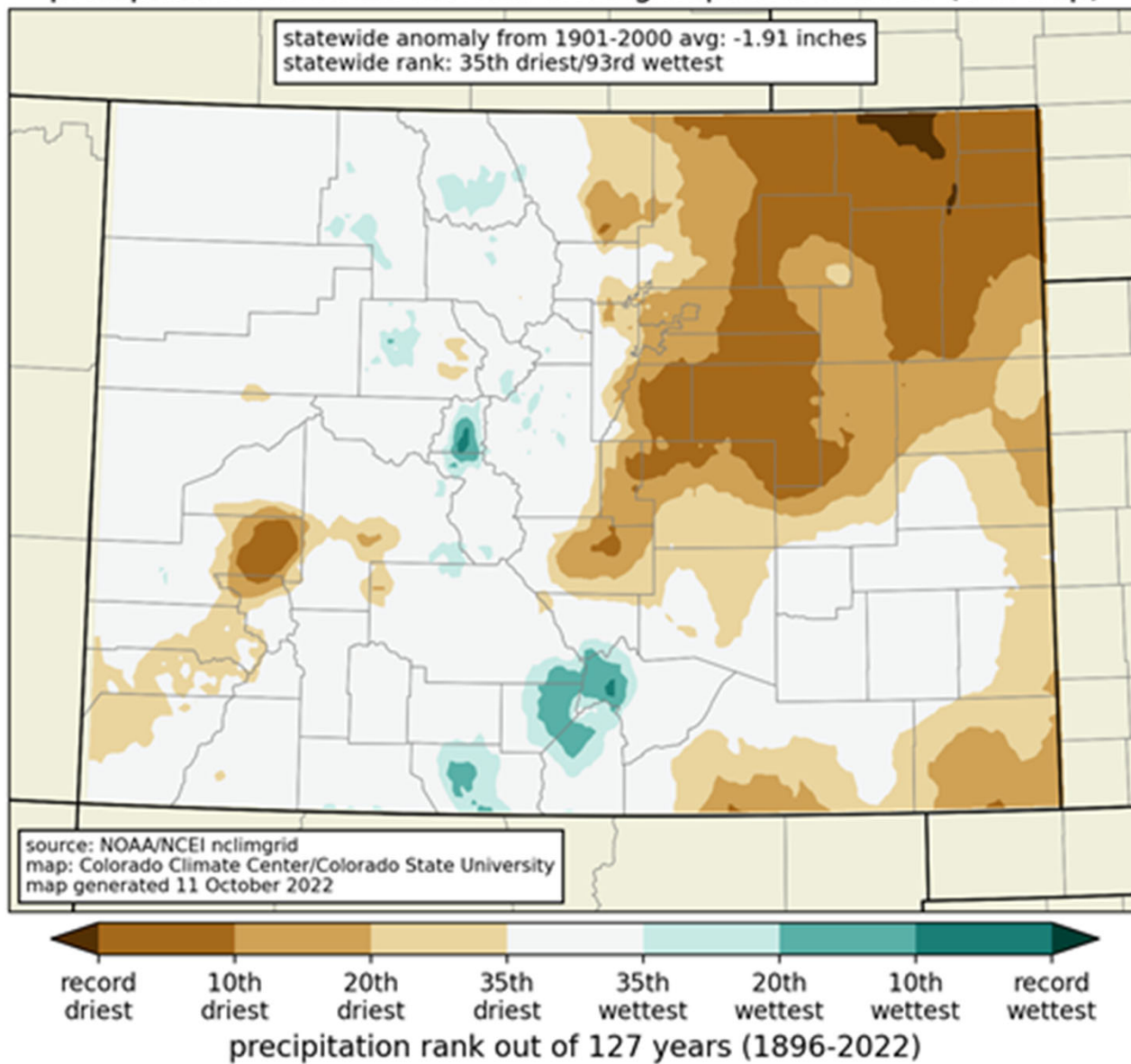
2022 Water Year Recap

Current Conditions (WY
2023 to Date)

Outlook

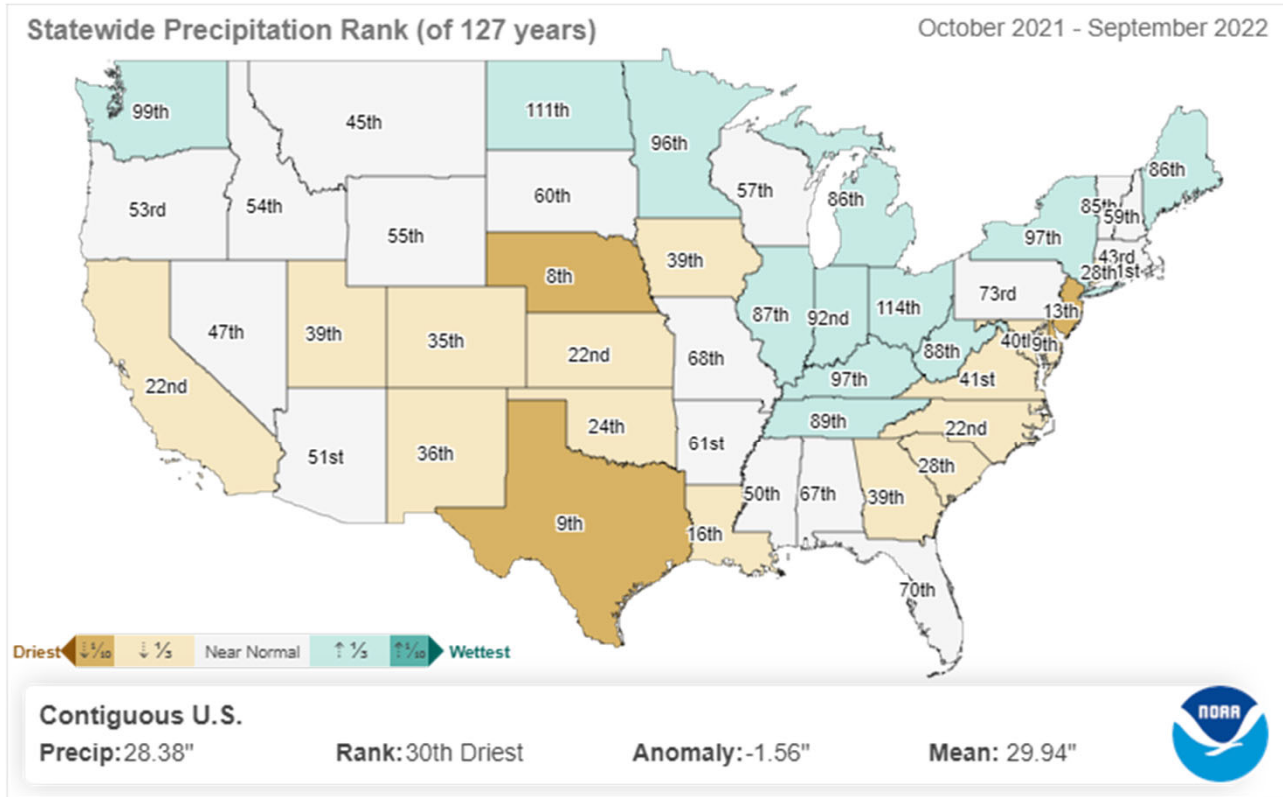


precipitation rank: 12 months ending September 2022 (Oct-Sep)



Much drier than normal for northeast Colorado

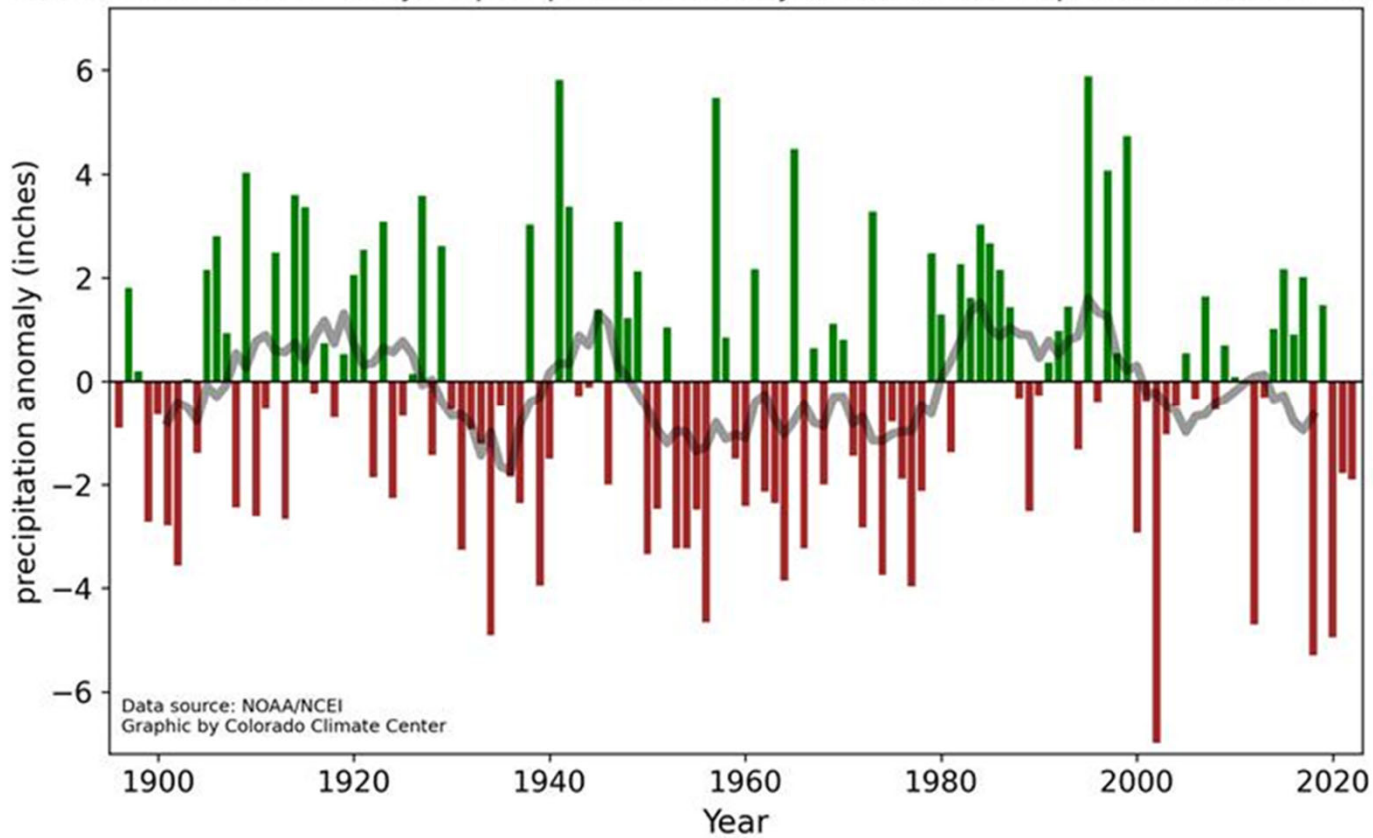
Average out west: dry spring and strong summer monsoon



Eastern Colorado part of a dry pattern across the south-central US

It was not just eastern Colorado farmers with failing dryland crops and culling herds

Colorado statewide water year precipitation anomaly (inches), with respect to 1901-2000 average



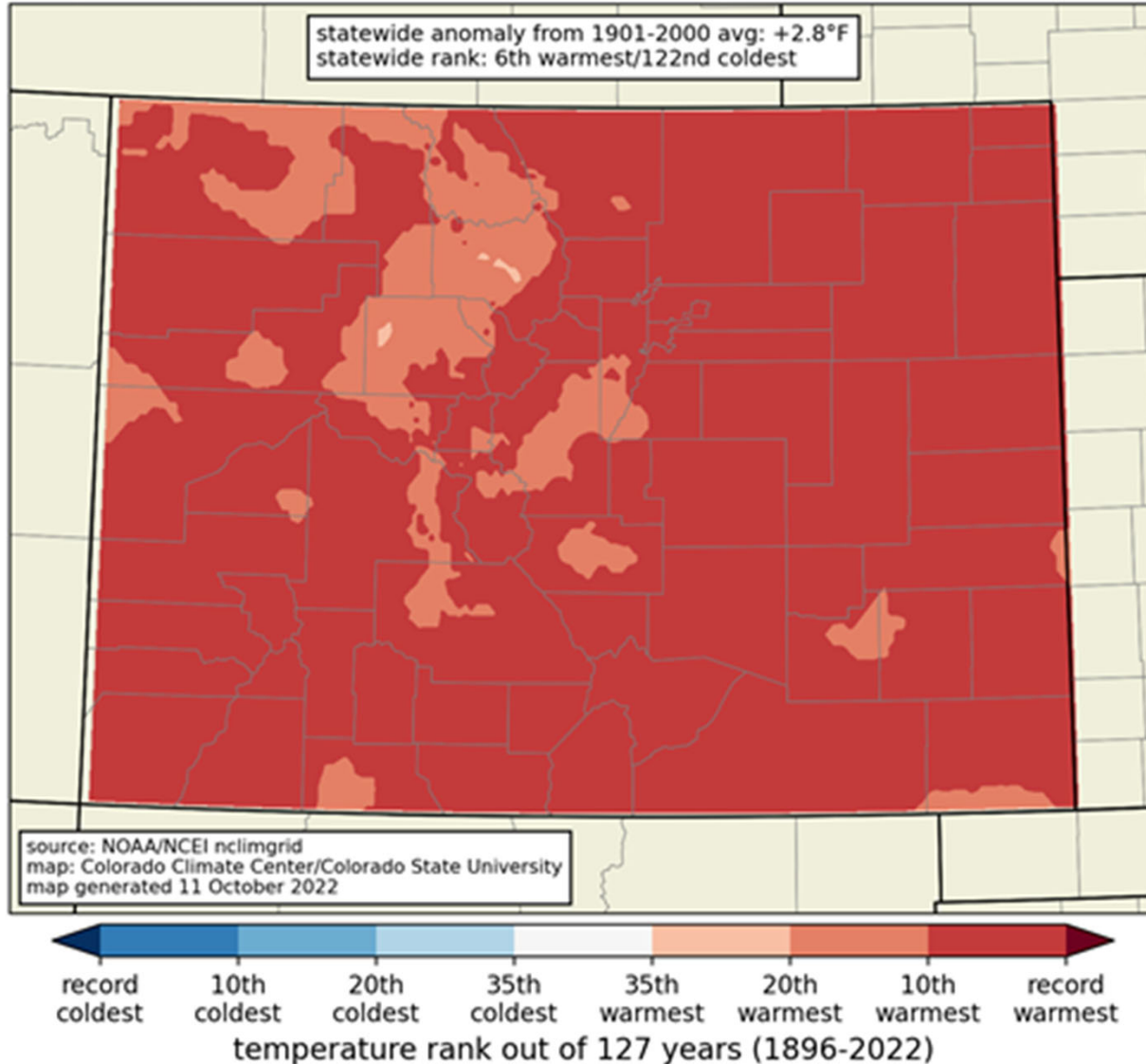
35th driest year
on record

16.19" on
average

Dry for 4/5 years
(3 in a row)

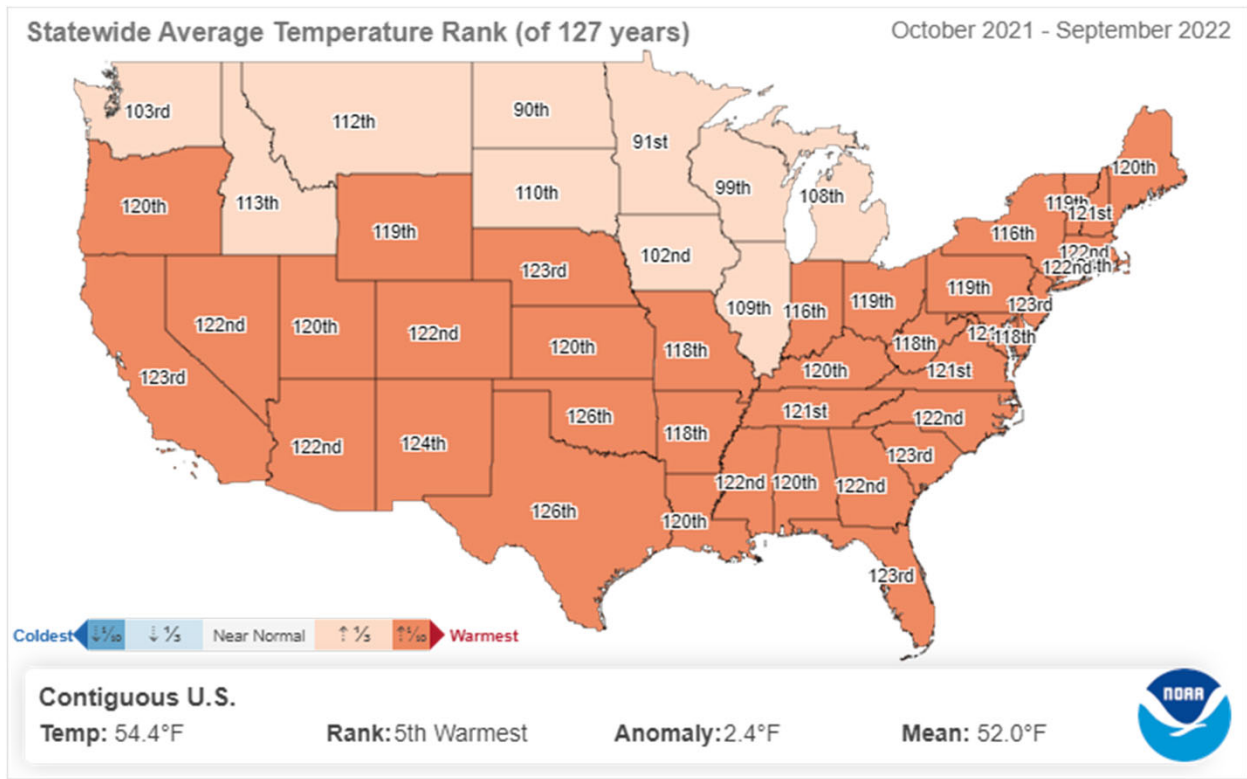


average temperature rank: 12 months ending September 2022 (Oct-Sep)



Conditions were warmer than historical averages everywhere

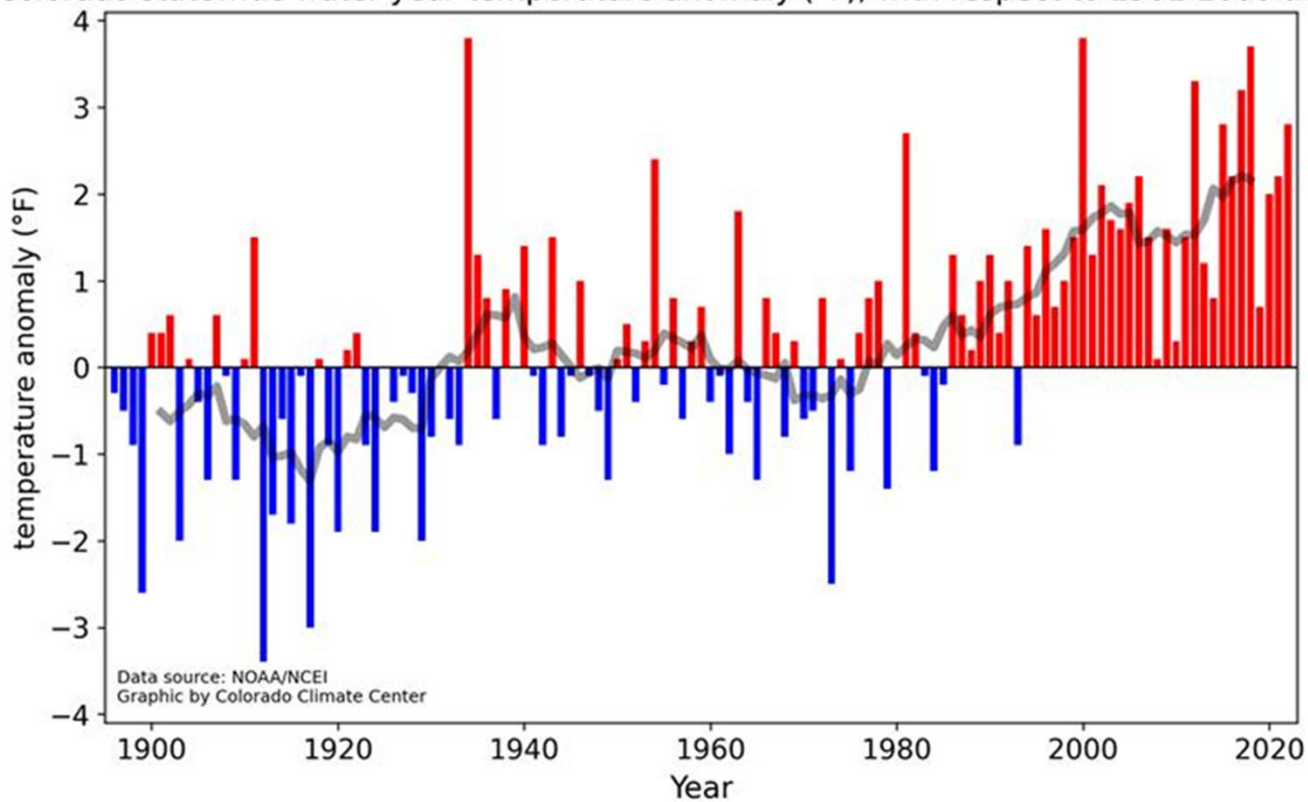
High mountain valley areas in northern Colorado experienced closer to normal temperatures. We did still record cold temperatures in late winter



Warmer than historical averages all across CONUS.

La Niña -> cooler to the north/warmer to the south. Colorado in the middle

Colorado statewide water year temperature anomaly (°F), with respect to 1901-2000 average



6th warmest year on record, but in line with recent trends

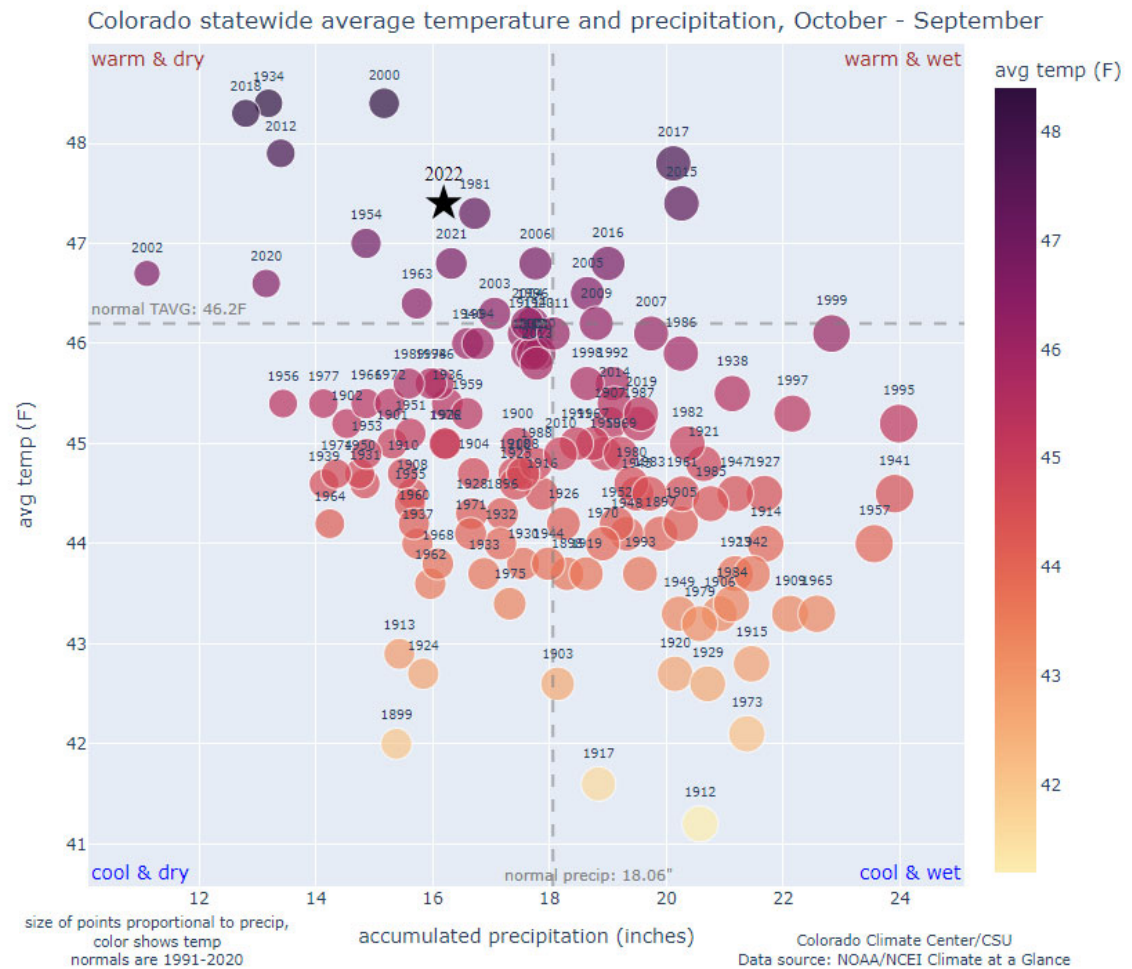
Average temperature: 47.4 °F



Still in the warm dry “quadrant”

2021 and 2022 look similar in the aggregate, but 2021 was much drier out west, and 2022 was much drier out east.

An improvement over 2020 or 2018



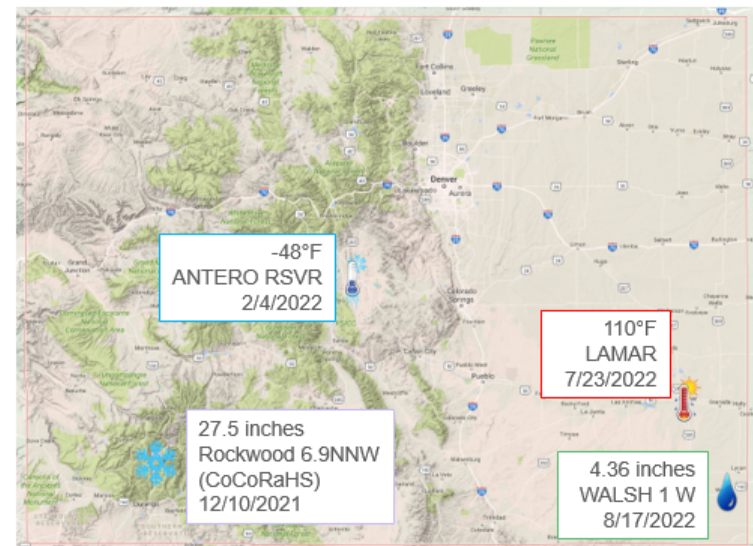
Month	T Rank (of 128 years)	Above, below, or near 20 th century avg?	Month	P Rank (of 128 years)	Above, below, or near 20 th century avg?
Oct	41 st warmest	above	Oct	62 nd driest	near avg
Nov	3 rd warmest	much above	Nov	10 th driest	much below
Dec	2 nd warmest	much above	Dec	13 th wettest	much above
Jan	33 rd warmest	above	Jan	40 th driest	below
Feb	31 st coldest	below	Feb	49 th driest	near avg
Mar	54 th warmest	near avg	Mar	62 nd wettest	near avg
Apr	49 th warmest	near avg	Apr	5 th driest	much below
May	41 st warmest	above	May	47 th driest	near avg
Jun	24 th warmest	above	Jun	57 th wettest	near avg
Jul	5 th warmest	much above	Jul	18 th wettest	above avg
Aug	14 th warmest	above	Aug	64 th wettest	near avg
Sep	3 rd warmest	much above	Sep	58 th driest	near avg



daily records broken

Month	High max T	High min T	Low max T	Low min T	Precipitation	Snowfall
October	62	101	130	16	67	8
November	182	234	1	1	19	1
December	360	358	4	12	184	9
January	71	98	39	31	111	59
February	13	6	142	188	61	48
March	252	158	318	263	81	45
April	60	91	108	44	23	9
May	128	254	172	131	92	74
June	192	340	98	27	139	5
July	64	240	55	4	104	0
August	19	167	61	11	103	0
September	291	267	5	3	43	0
TOTAL	1694	2314	1133	731	1027	258
	warm records: 4,008		cold records: 1,864			

WY2022 extremes around the state



notable events of Water Year 2022

Dates	Description
Oct - Dec	Record warmest October – December for the state
December 10	Latest first snow for Denver on record. Denver had never made it to December without snow
December 15	Dust storm blankets southeast CO, accompanied by high winds. Gust of 107 mph reported at Lamar
December 30	Record warm and dry conditions lead up to extreme windy day and the devastating Marshall Fire
February	Fifth consecutive February with below average temperatures. 30 th coldest for the state
April	CoAgMET station across northeast CO reported their windiest April on record
Apr 1 – May 18	16 inches of rapid snowpack melt in the San Juan basin resulted in record early melt out
May 21	Late season snow dumps 12-18 inches on the Palmer Divide and 5-10 inches around southern Front Range cities
July 14 – 23	Hot days and warm nights helped 4 stations break records for warmest 10-day period
July 15	Flash flooding over the Cameron Peak burn scar resulted in 2 deaths
August 7	Heavy rains in Denver caused flooding on I-70 and 19 people had to be rescued from vehicles
September 5 – 9	5 stations broke their record for hottest September maximum temperature. Additional 11 stations tied their monthly record highest temperature



Current Conditions

Temperature

Precipitation

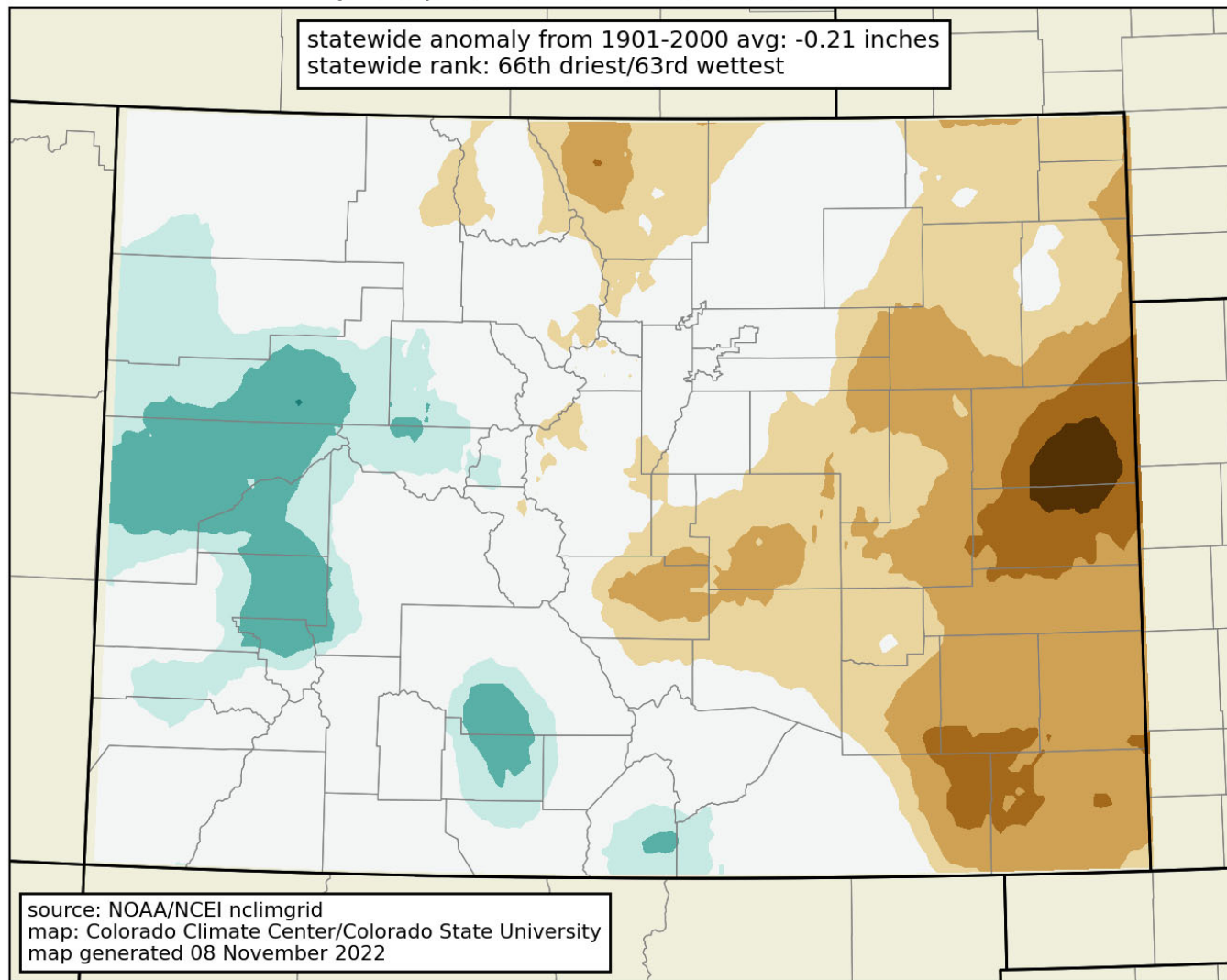
Evaporative Demand

Soil Moisture

Vegetation

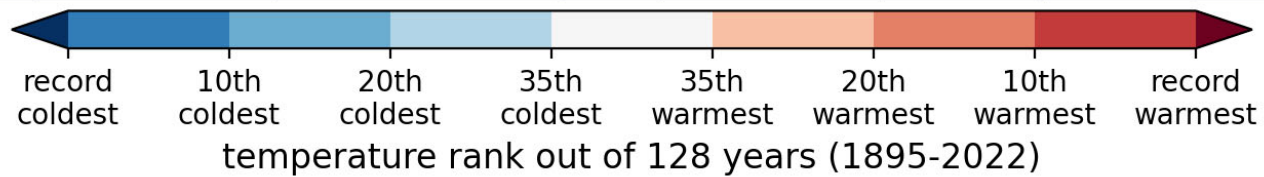
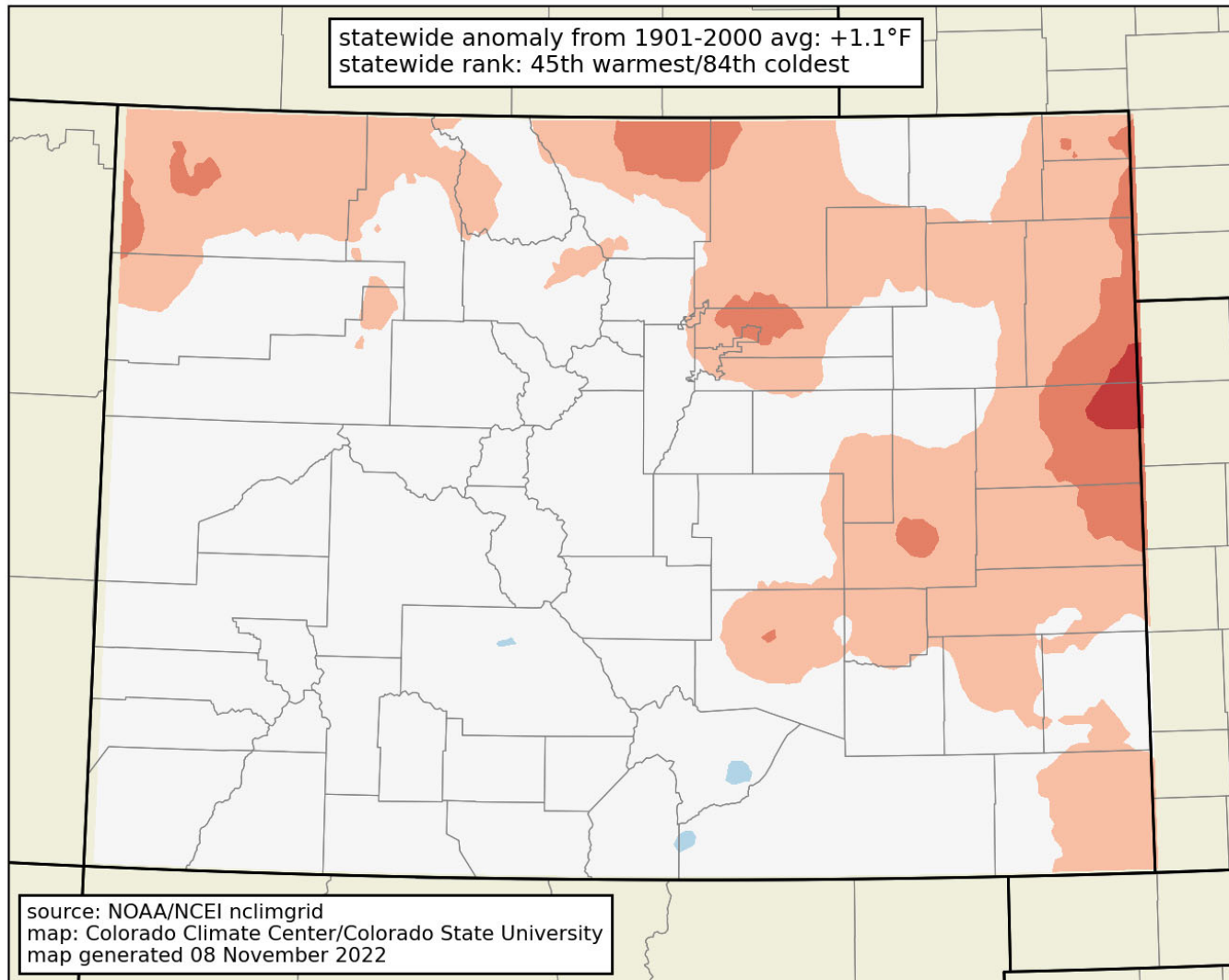


precipitation rank: October 2022



https://climate.colostate.edu/co_cag/rank_maps.html

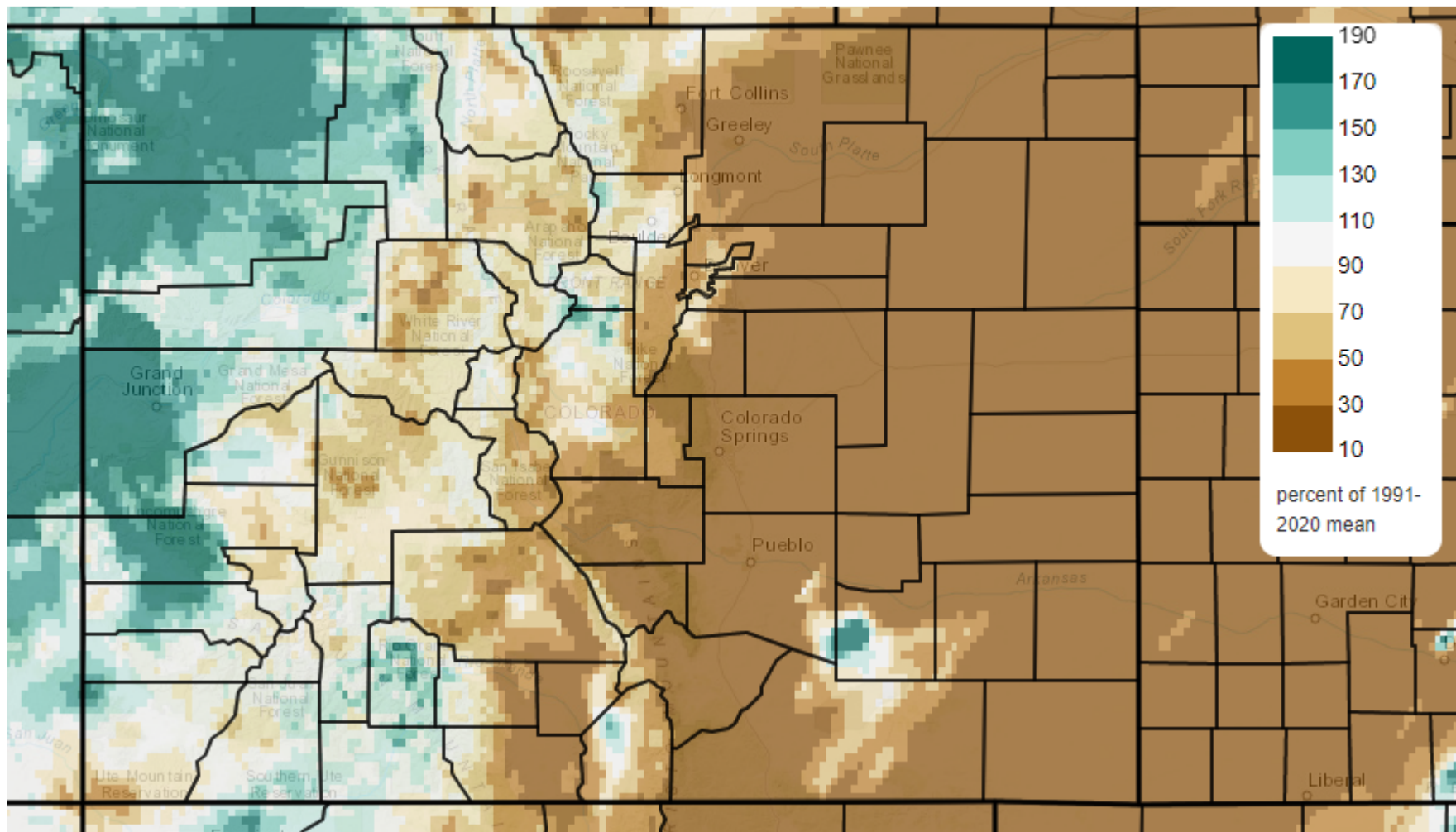
average temperature rank: October 2022



https://climate.colostate.edu/co_cag/rank_maps.html

Total Precipitation Anomaly, Last 15 Days

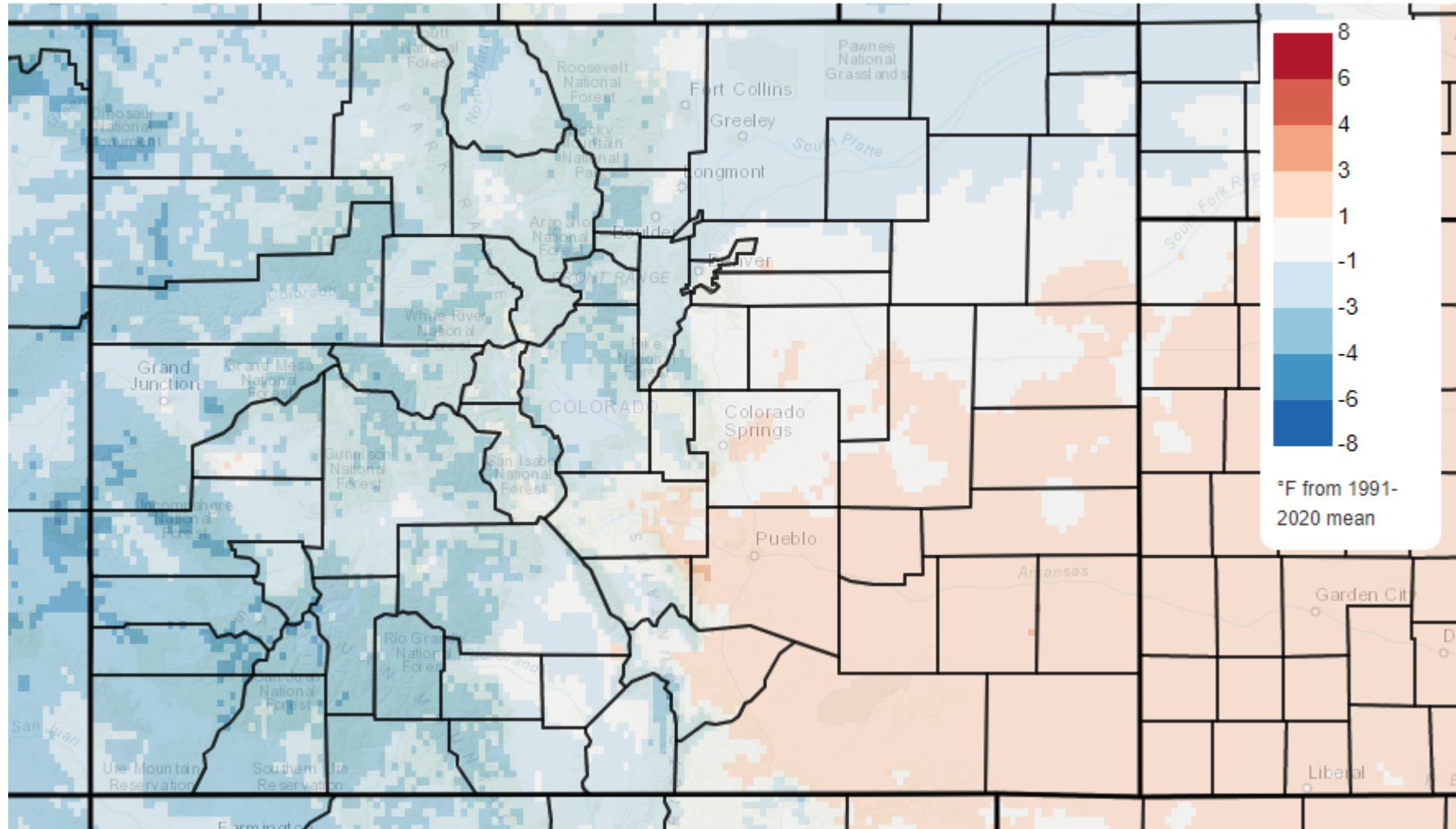
2022/10/29 - 2022/11/12



<https://climatetoolbox.org/tool/Climate-Mapper>

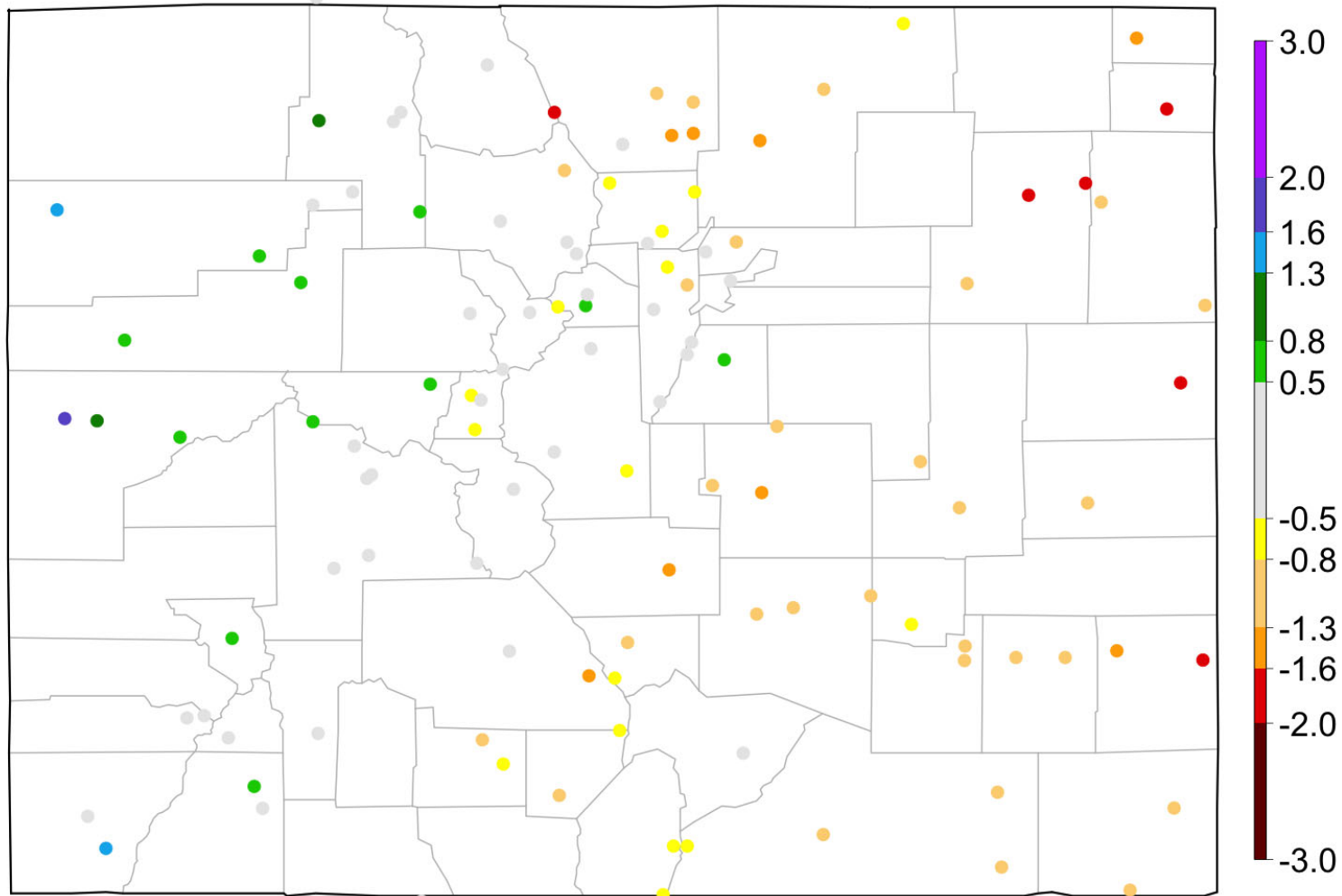
Mean Daily Temperature Anomaly, Last 15 Days

2022/10/29 - 2022/11/12



<https://climatetoolbox.org/tool/Climate-Mapper>

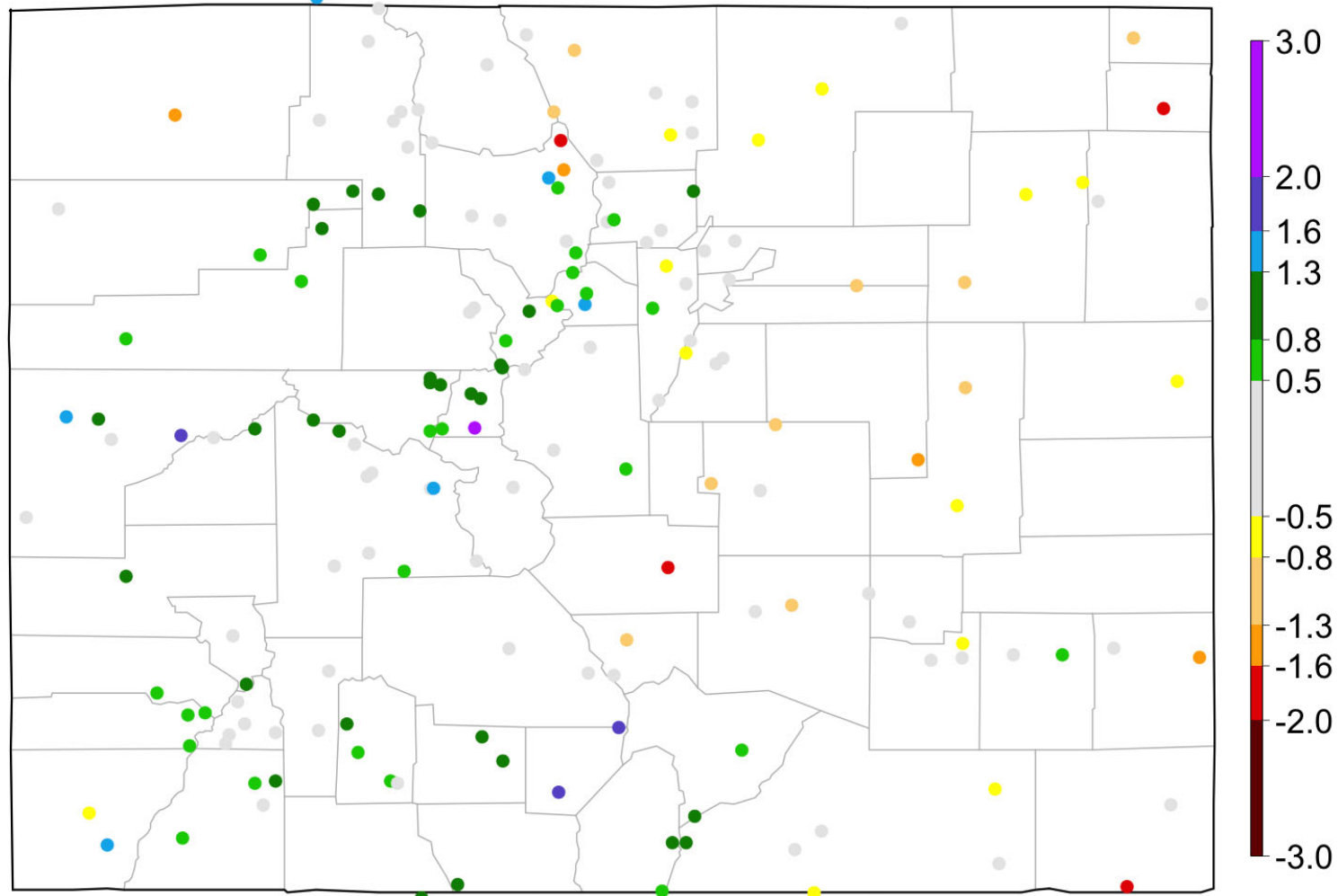
30-day SPI: 2022/10/10 - 2022/11/08



Data from High Plains Regional Climate Center and ACIS

<https://climate.colostate.edu/drought/>

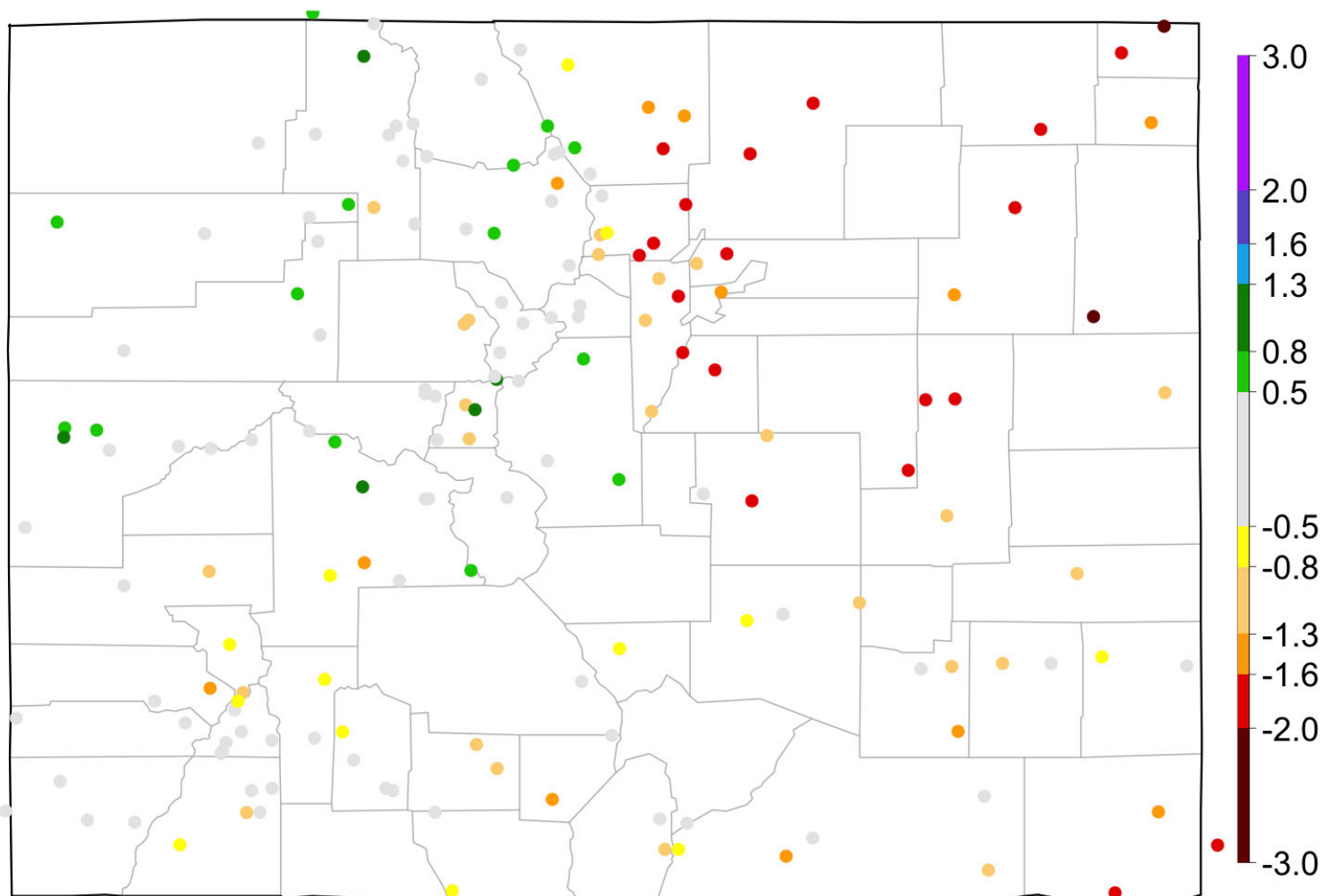
120-day SPI: 2022/07/12 - 2022/11/08



Data from High Plains Regional Climate Center and ACIS

<https://climate.colostate.edu/drought/>

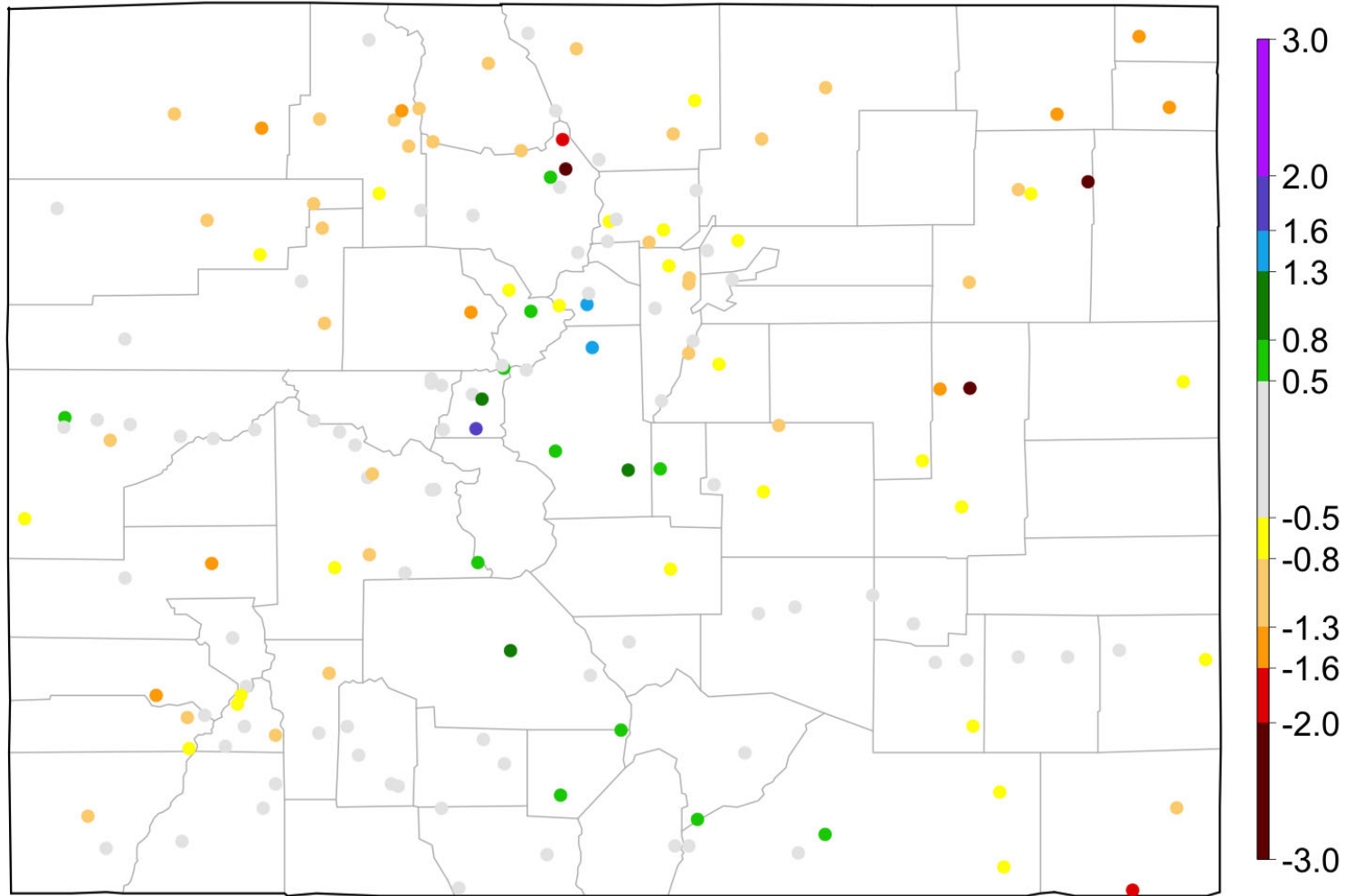
12-month SPI: 2021/07/18 - 2022/07/17



Data from High Plains Regional Climate Center and ACIS

<https://climate.colostate.edu/drought/>

24-month SPI: 2020/11/09 - 2022/11/08



Data from High Plains Regional Climate Center and ACIS



Drought

National Drought
Colorado Drought
Some Drought Facts

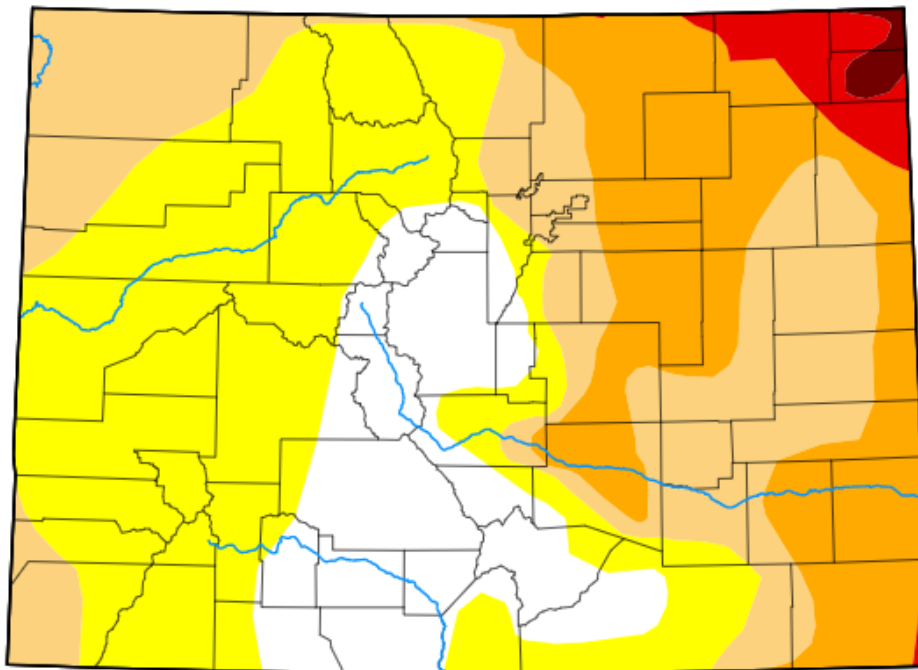


Colorado

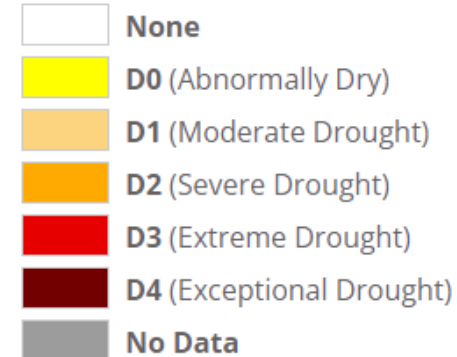
[Home](#) > Colorado

**Map released: Thurs. November 10,
2022**

Data valid: November 8, 2022 at 7 a.m. EST



Intensity



Authors

United States and Puerto Rico Author(s):

Brian Fuchs, National Drought Mitigation Center

Pacific Islands and Virgin Islands Author(s):

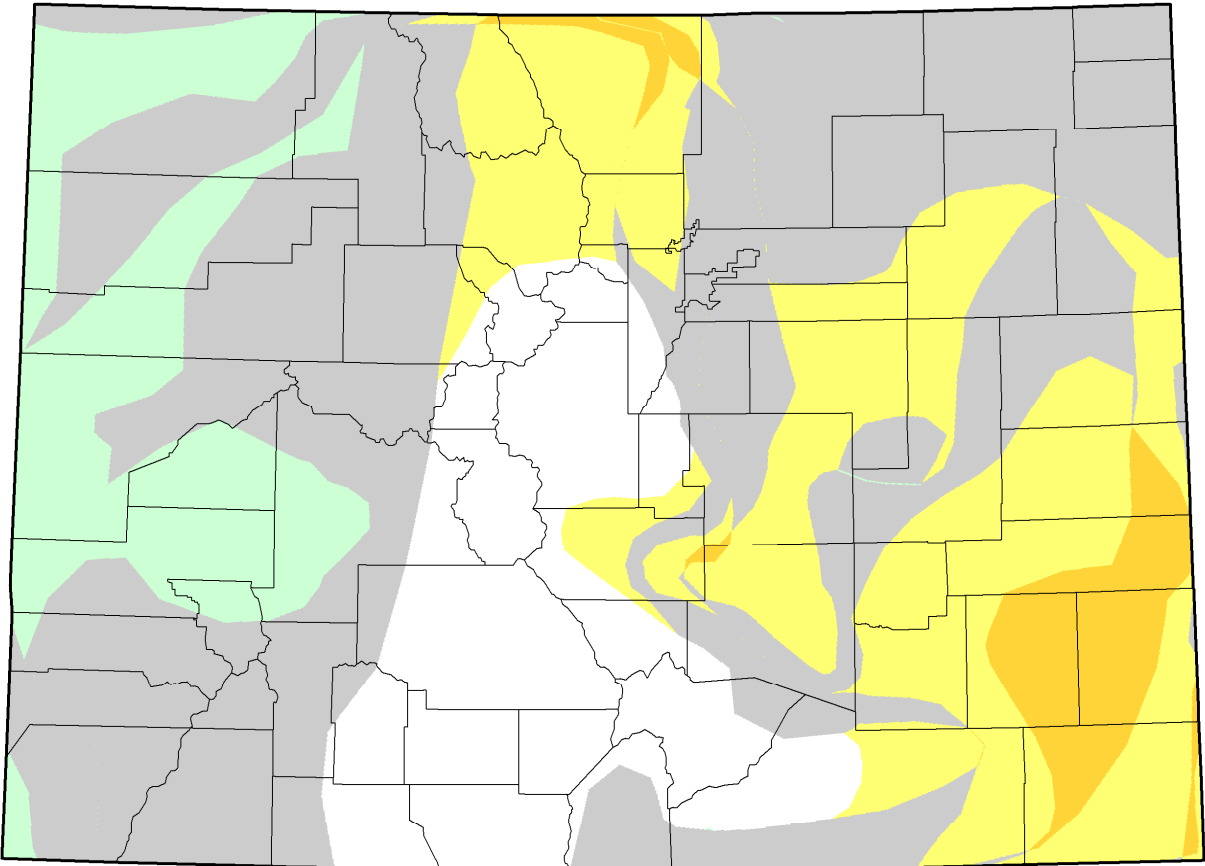
Brad Rippey, U.S. Department of Agriculture

<https://droughtmonitor.unl.edu/>



U.S. Drought Monitor Class Change - Colorado

4 Week



November 8, 2022
compared to
October 11, 2022



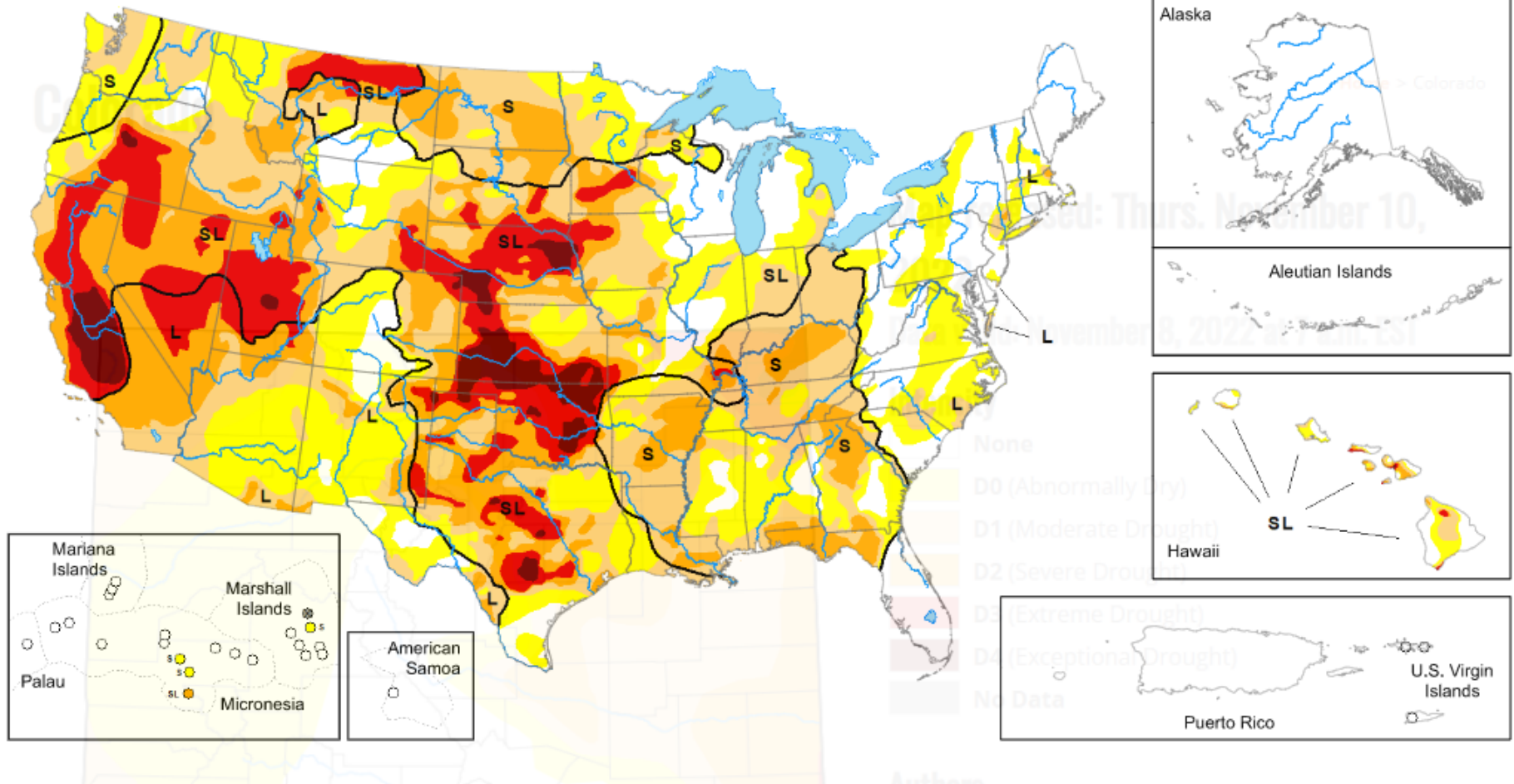
- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

droughtmonitor.unl.edu

<https://droughtmonitor.unl.edu/>

Map released: November 10, 2022

Data valid: November 8, 2022

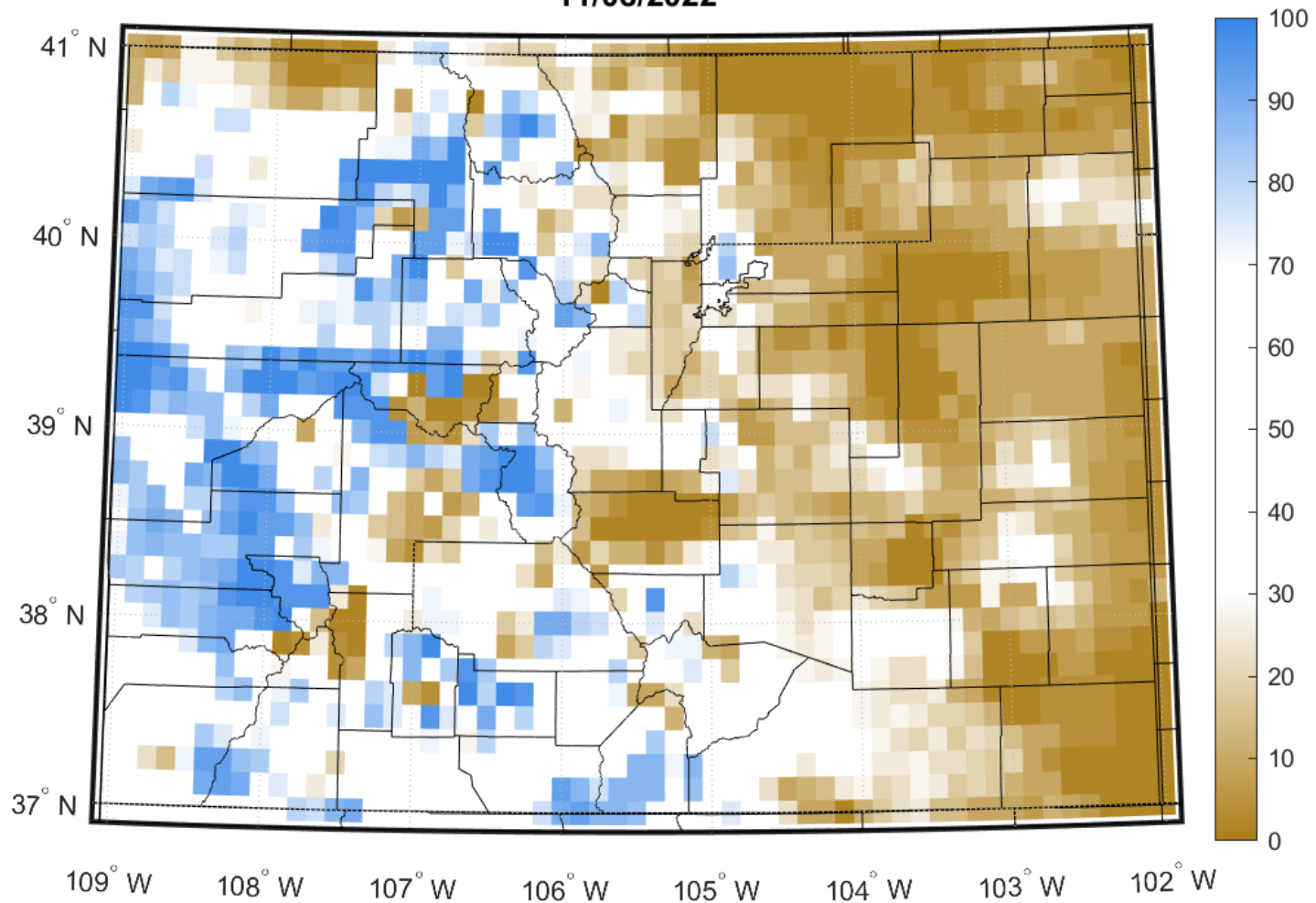


<https://droughtmonitor.unl.edu/>



Soil Moisture

Top Meter Soil Moisture Percentile
11/08/2022



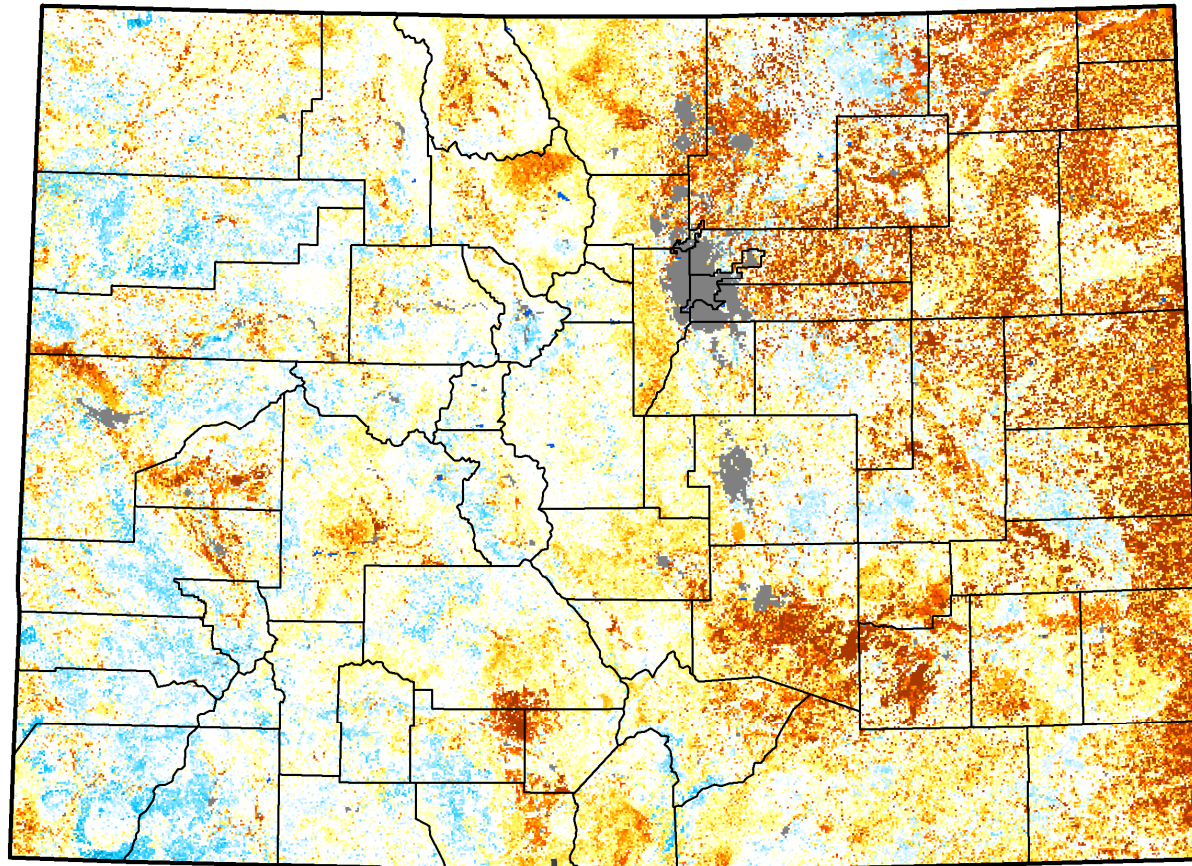
<https://climate.colostate.edu/drought>



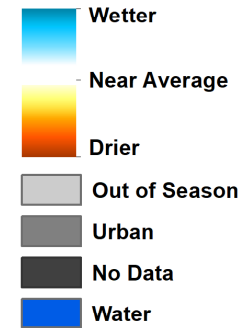
Quick Drought Response Index

Colorado

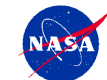
November 6, 2022
(Week 45)



Conditions Relative to
4-Week Historical Average



CALMIT
University of Nebraska - Lincoln
Center for Advanced Land Management Information Technologies

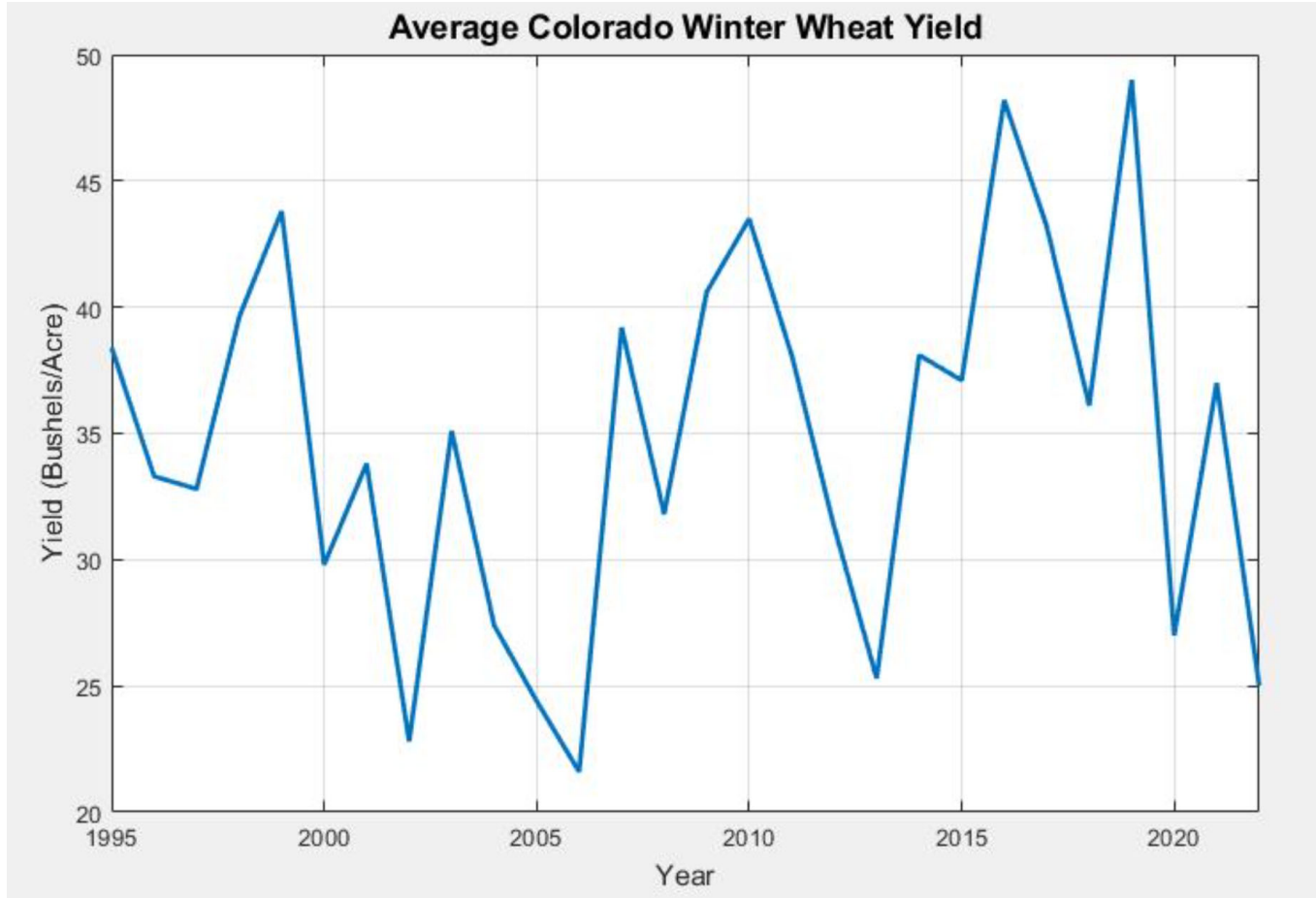


<https://climate.colostate.edu/drought>



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<https://quickstats.nass.usda.gov/>





Outlook

Next 7 days

8-14 day Outlook

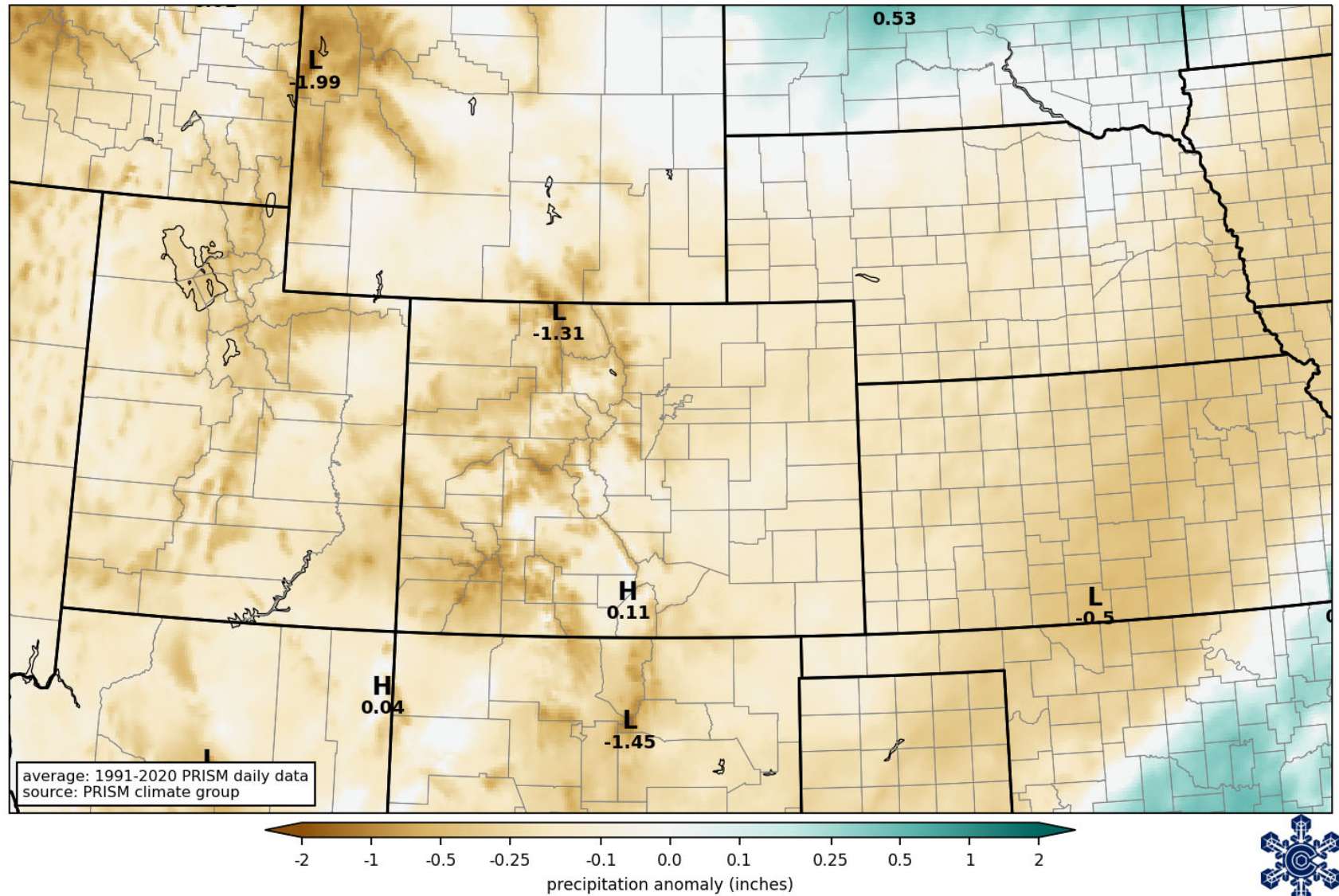
La Niña

CPC Outlooks

NOAA 7-day precip forecast

NOAA Weather Prediction Center
7-day precip forecast departure from average

forecast issued 0000 UTC Thu 10 Nov 2022
precipitation in 168 hrs ending 0000 UTC Thu 17 Nov 2022



<http://schumacher.atmos.colostate.edu/weather/>



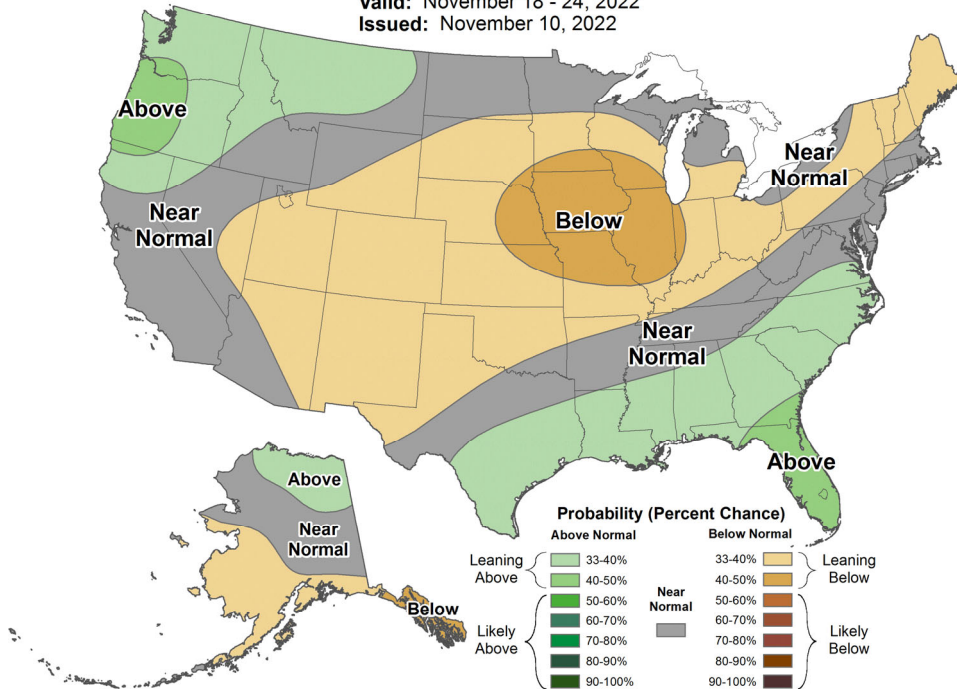
8-14 day outlook



8-14 Day Precipitation Outlook



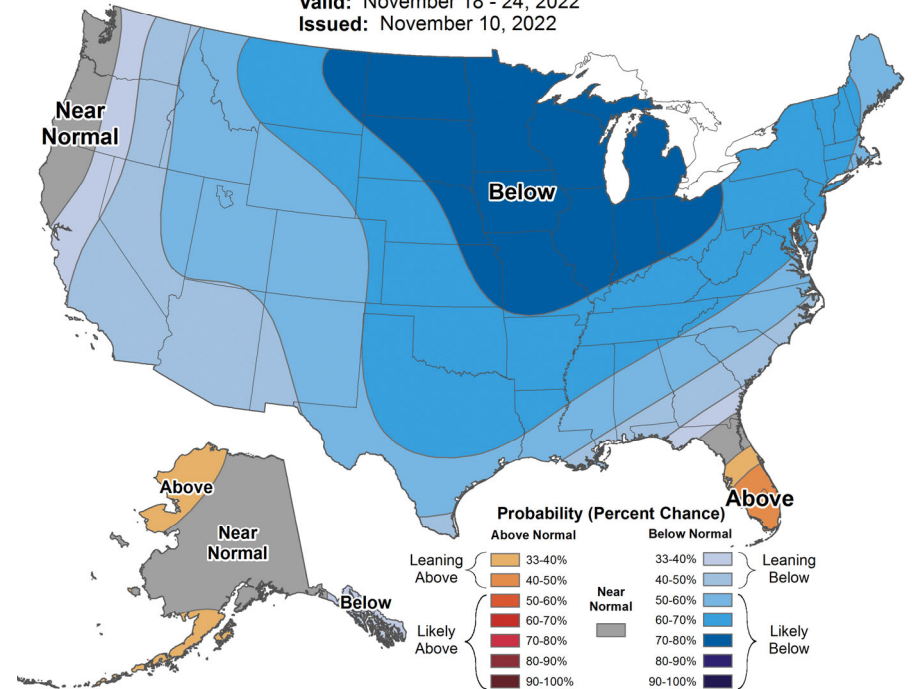
Valid: November 18 - 24, 2022
 Issued: November 10, 2022



8-14 Day Temperature Outlook



Valid: November 18 - 24, 2022
 Issued: November 10, 2022



Cooler and drier than normal conditions expected.

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

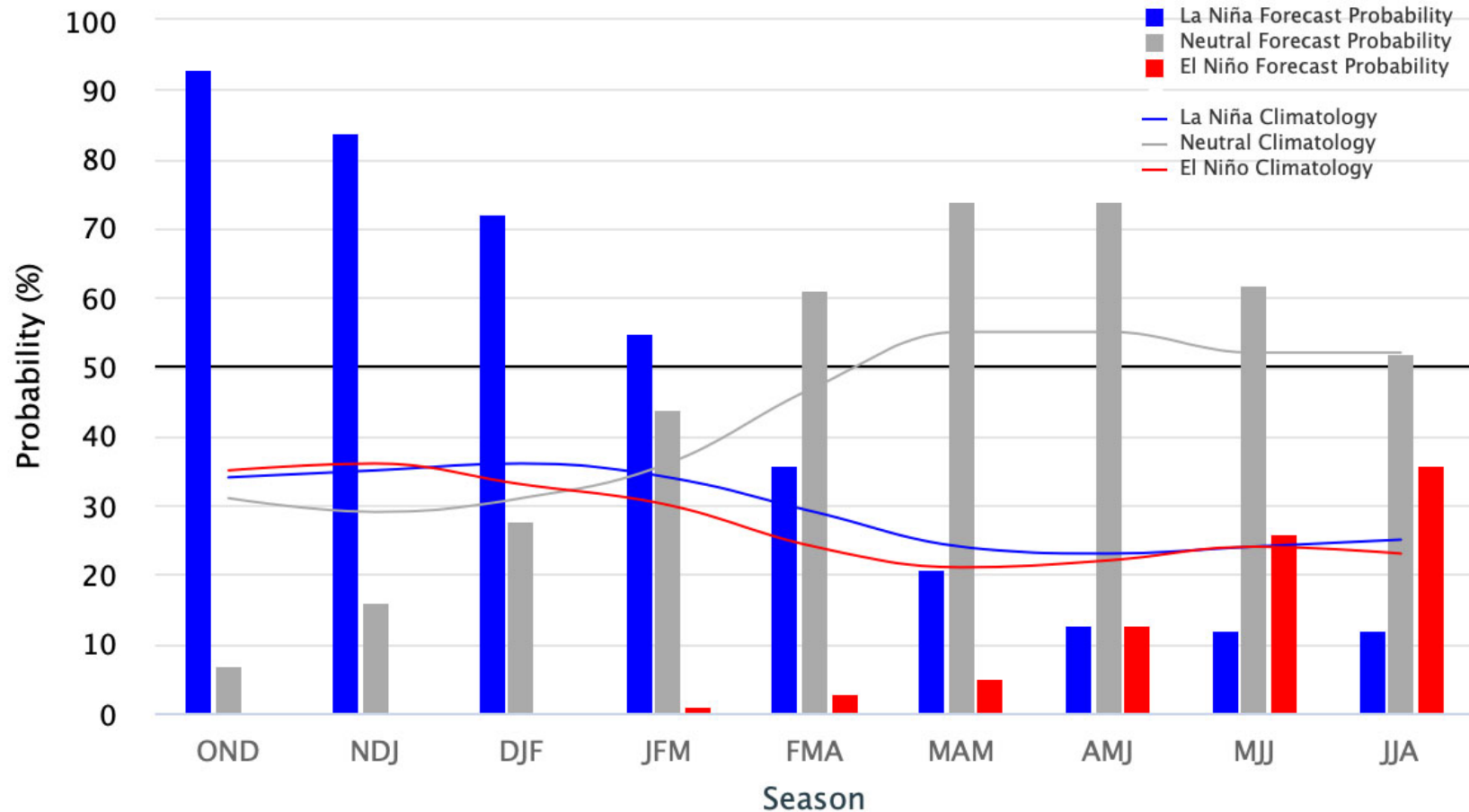


What's the ENSO forecast?

Mid-October 2022 IRI Model-Based Probabilistic ENSO Forecasts

ENSO state based on NINO3.4 SST Anomaly

Neutral ENSO: $-0.5\text{ }^{\circ}\text{C}$ to $0.5\text{ }^{\circ}\text{C}$

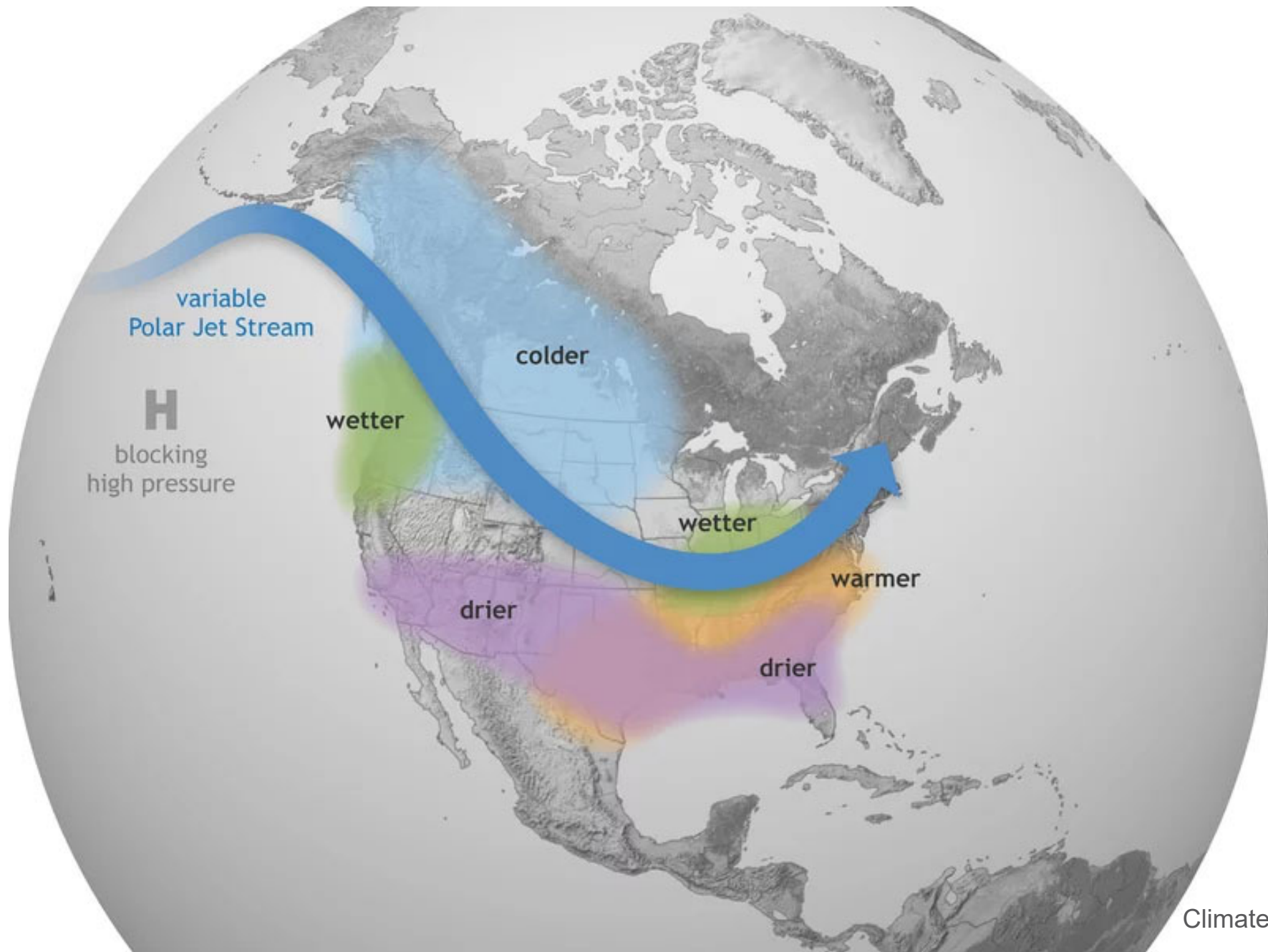


<https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>





What does La Niña
mean for the winter?



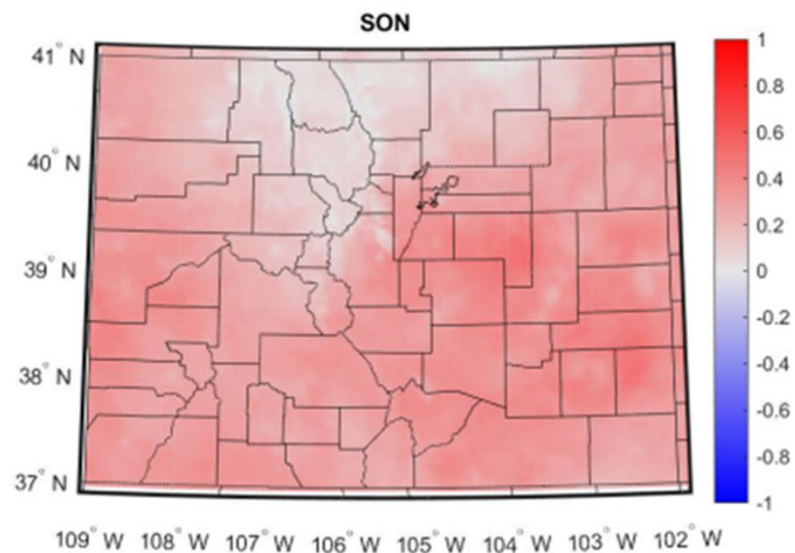
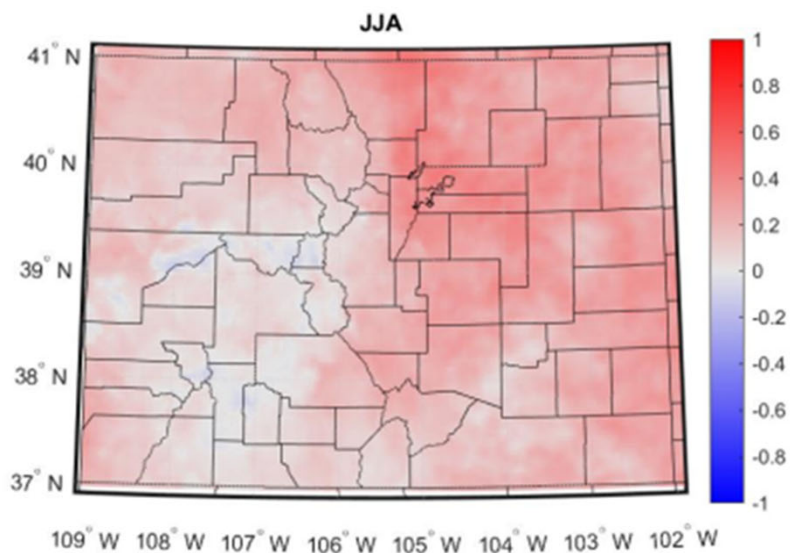
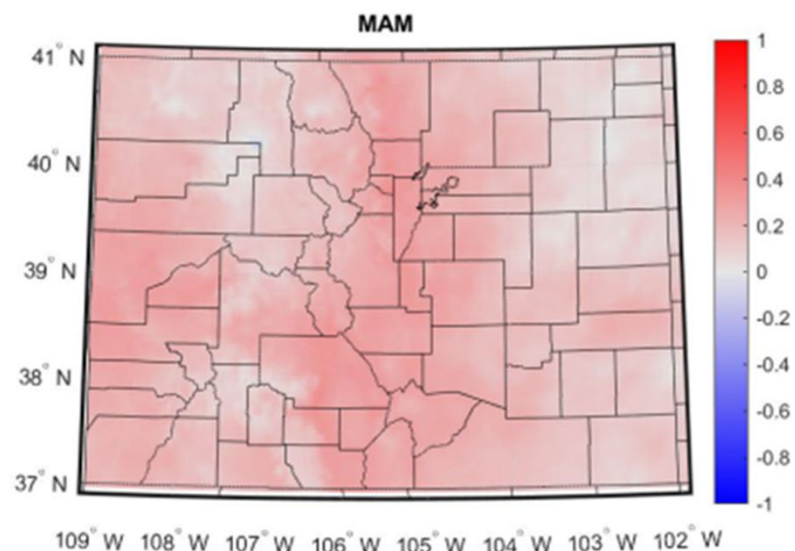
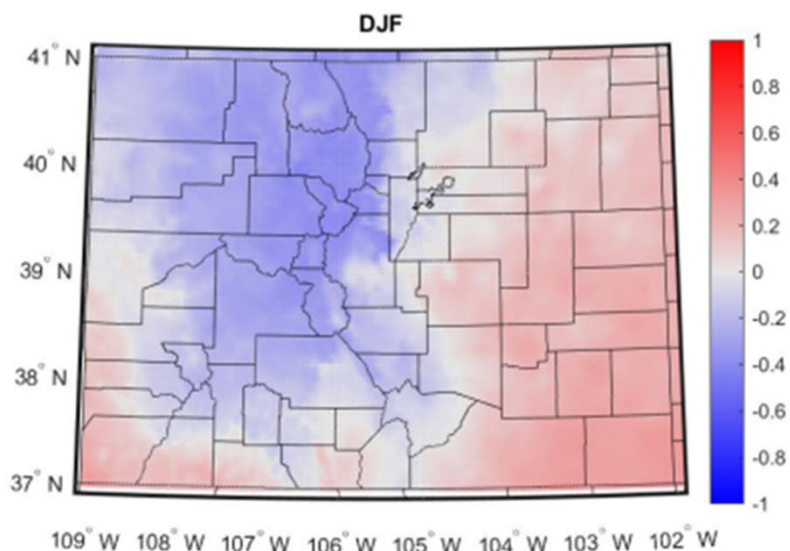
Climate.gov



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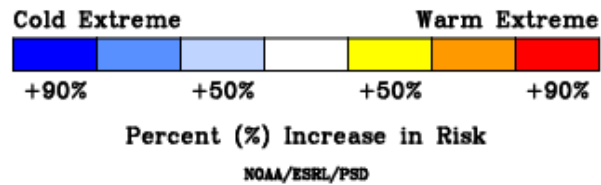
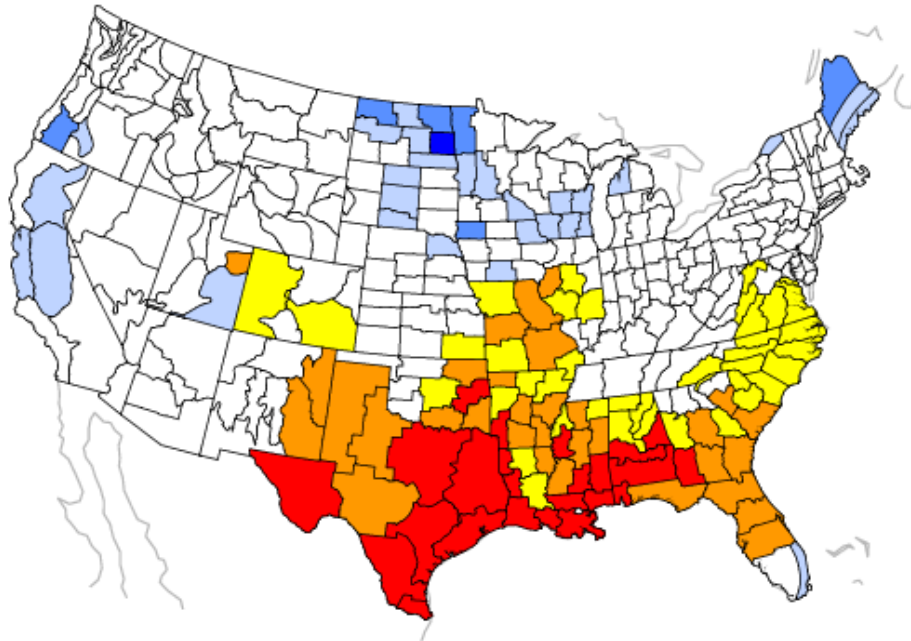
Correlation Between ENSO ONI and Seasonal Precipitation in Colorado (1951-2020)



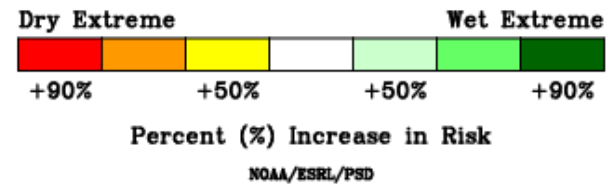
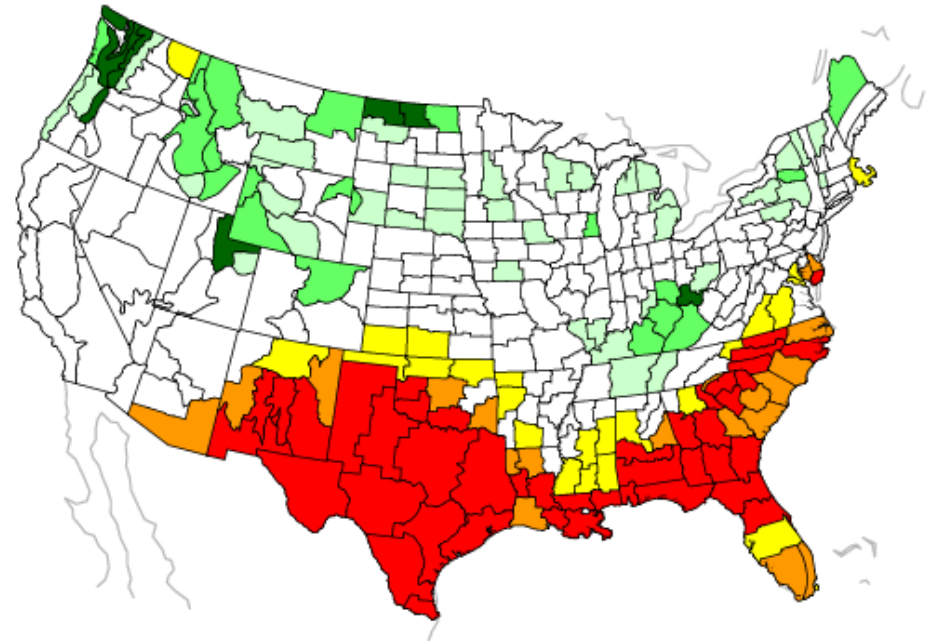
Blue = La Niña wetter Red = El Niño wetter



DJF Temperature During La Nina
Increased Risk of Warm or Cold Extremes



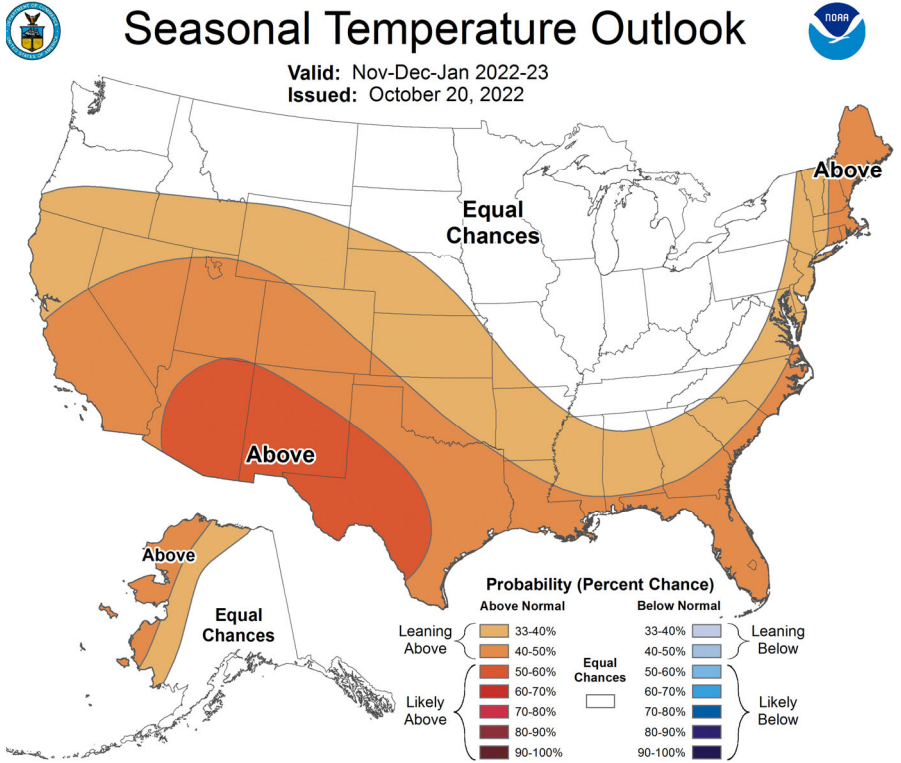
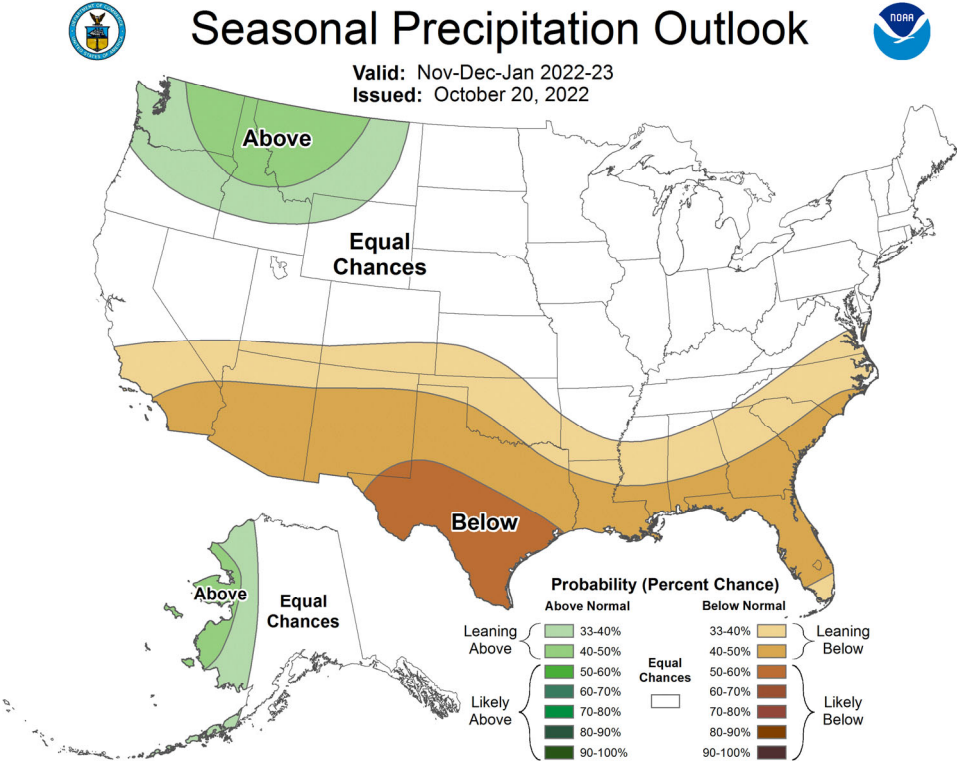
DJF Precipitation During La Nina
Increased Risk of Wet or Dry Extremes



Risk of extremes during a La Niña, from <https://psl.noaa.gov/enso/climaterisks/>

What would three La Niña winters in a row mean? Good question!

Seasonal outlook



Seasonal outlook shows a fairly typical La Niña pattern with the influence of a long-term warming trend factored in.

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

Key Takeaways

- ❑ Water year 2022 was the 6th warmest and 35th driest water year on record. Not unordinary by recent standards
- ❑ Long-term drought remains across much of the state. Yet these are the best pre-snow season hydrological conditions western Colorado has seen in years. Eastern Colorado is currently experiencing dry soils and agricultural impacts
- ❑ La Niña conditions are likely to remain into early winter, and possibly beyond. The northern Rockies are wetter than normal during La Niña on average
- ❑ La Niña winters bring their share of cold air, but this may be counteracted by warming trends



Thanks!

To view this and other presentations:
https://climate.colostate.edu/ccc_archive.html