

# Colorado climate update

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Along with: Becky Bolinger, Peter Goble, Zach Schwalbe



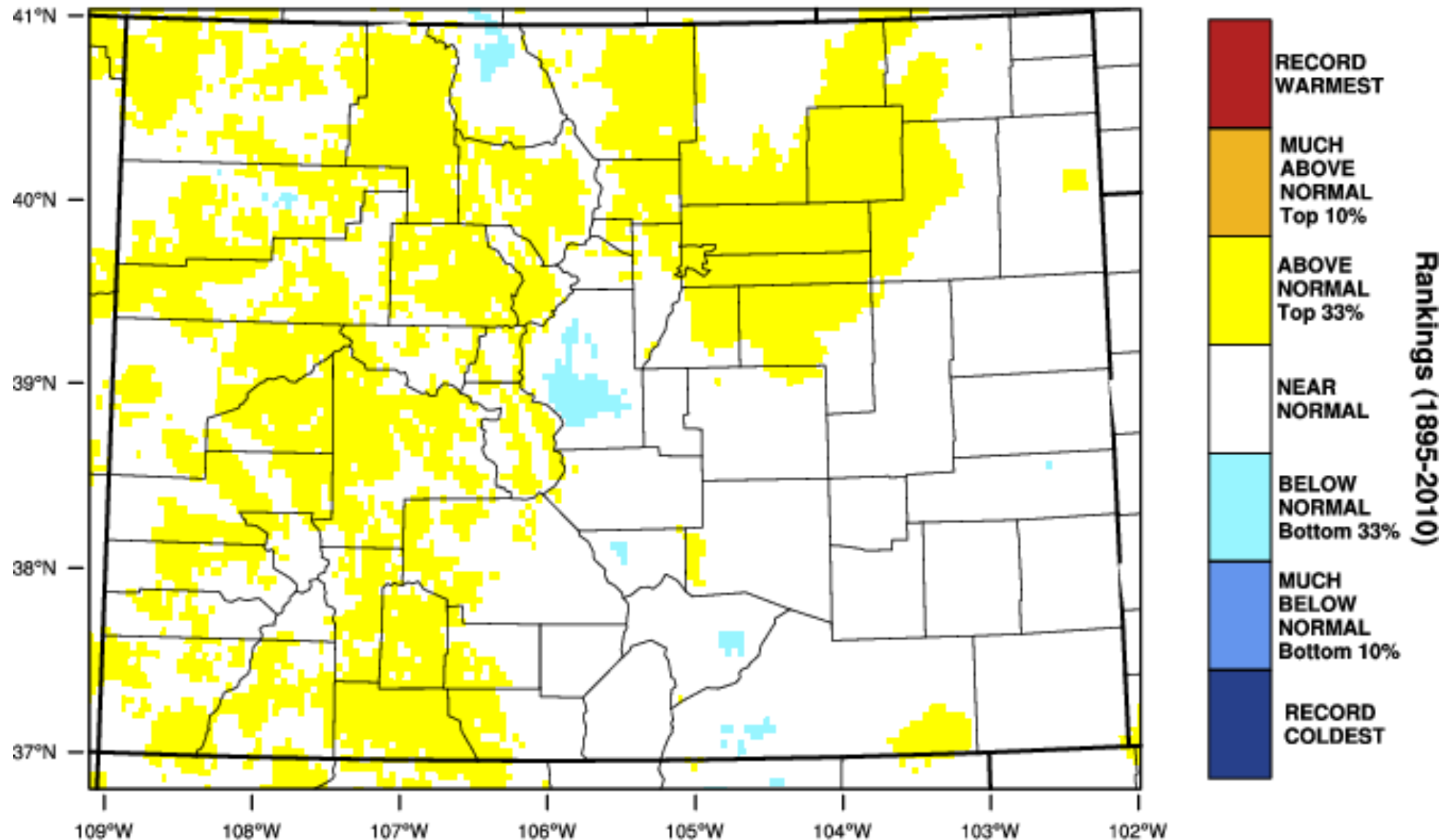
Colorado Water Congress  
February 2021



ATMOSPHERIC SCIENCE  
COLORADO STATE UNIVERSITY

# Colorado - Mean Temperature

## January 2021 Percentile

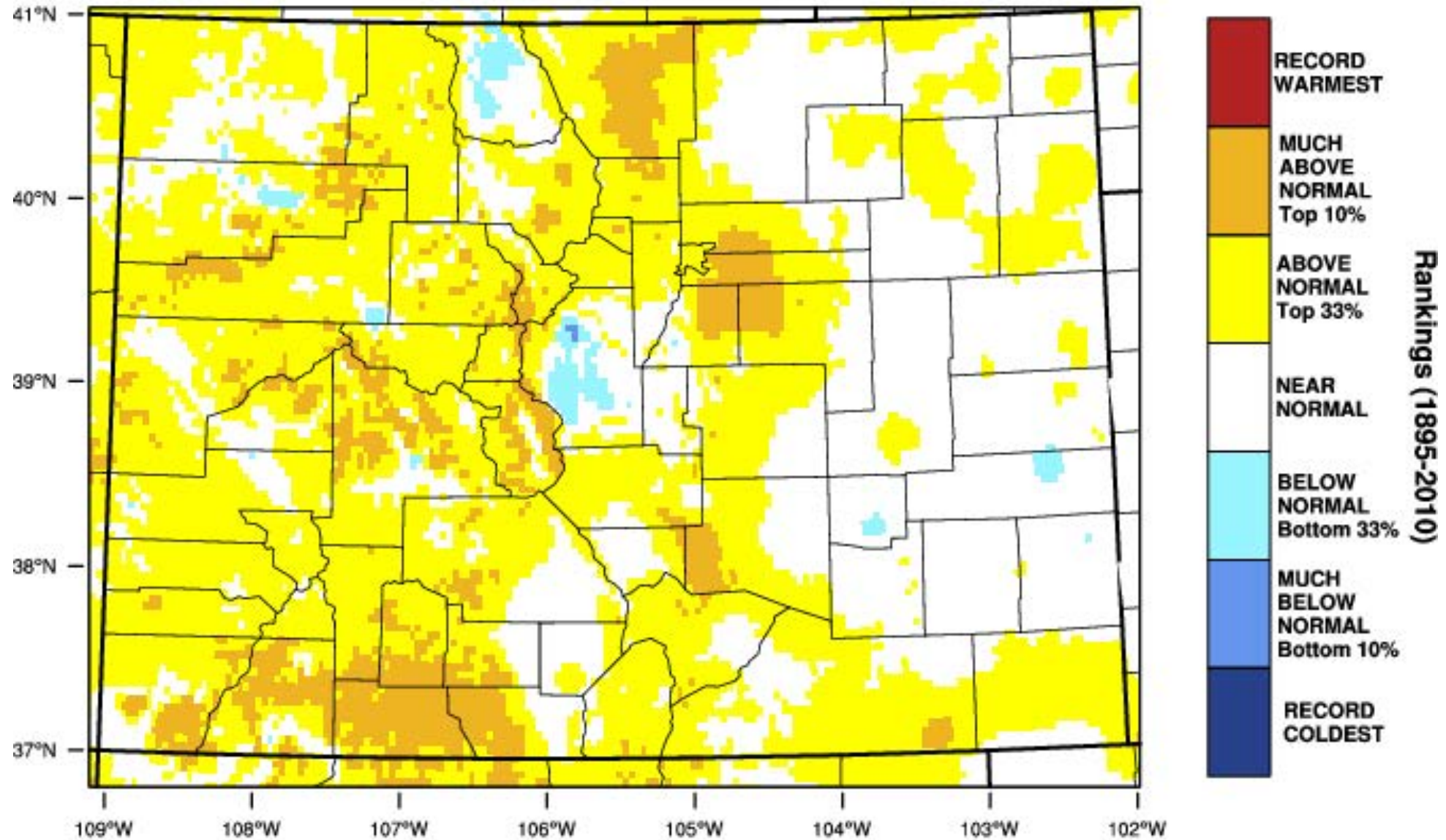


WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 2 FEB 2021



# Colorado - Mean Temperature

## October-January 2021 Percentile



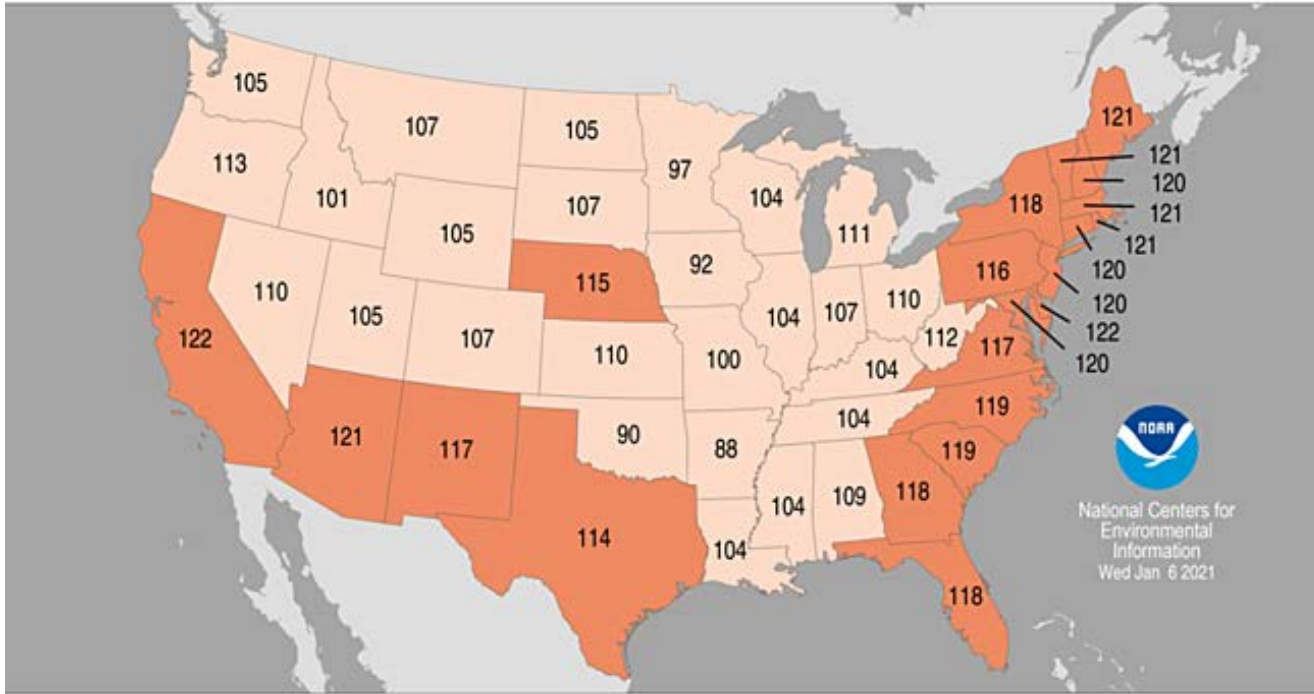
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 2 FEB 2021



# Statewide Average Temperature Ranks

October – December 2020

Period: 1895–2020



Statewide: 20<sup>th</sup> warmest October - December

Month	T Rank (of 126 years)	Above, below, or near avg?
Oct	54 <sup>th</sup> warmest	near avg
Nov	7 <sup>th</sup> warmest	<b>much above</b>
Dec	46 <sup>th</sup> warmest	near avg

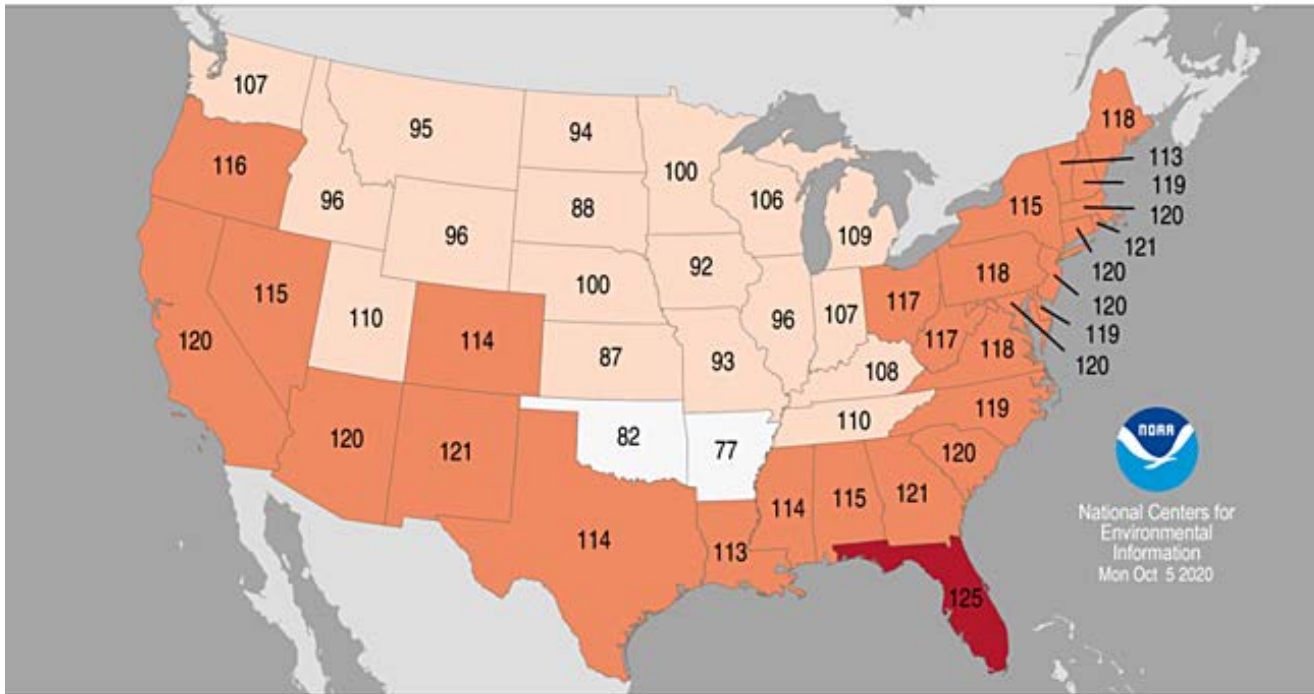
Although the numbers show it, you can't really call **October 2020** a near-average month!



# Statewide Average Temperature Ranks

October 2019 – September 2020

Period: 1895–2020



Statewide: 12<sup>th</sup> warmest water year (out of 125)  
3<sup>rd</sup> warmest summer

Calendar year 2020 was tied for the 7<sup>th</sup> warmest on record. 6 of the 8 warmest calendar years have been since 2012

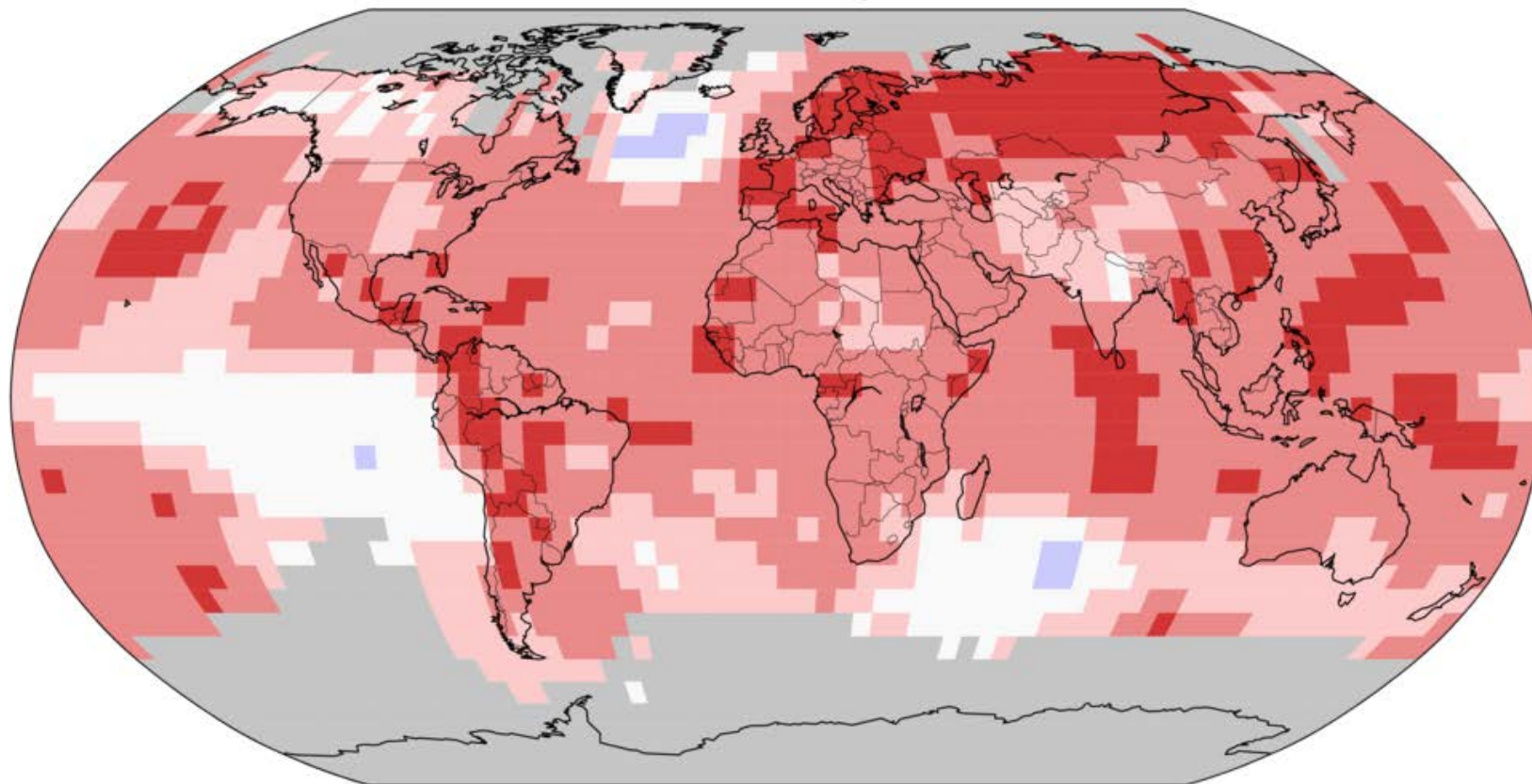
Month	T Rank (of 126 years)	Above, below, or near avg?
Oct	3 <sup>rd</sup> coolest	much below
Nov	39 <sup>th</sup> warmest	above
Dec	25 <sup>th</sup> warmest	above
Jan	25 <sup>th</sup> warmest	above
Feb	51 <sup>st</sup> coolest	near avg
Mar	14 <sup>th</sup> warmest	above
Apr	58 <sup>th</sup> warmest	near avg
May	4 <sup>th</sup> warmest	much above
June	15 <sup>th</sup> warmest	above
July	20 <sup>th</sup> warmest	above
August	1 <sup>st</sup> warmest	record
September	40 <sup>th</sup> warmest	above



# Land & Ocean Temperature Percentiles Jan–Dec 2020

NOAA's National Centers for Environmental Information

Data Source: NOAA GlobalTemp v5.0.0–20210106




**Globally, 2020 was the 2<sup>nd</sup> warmest year on record, trailing only 2016**



  
Record Coldest

  
Much Cooler than Average

  
Cooler than Average

  
Near Average

  
Warmer than Average

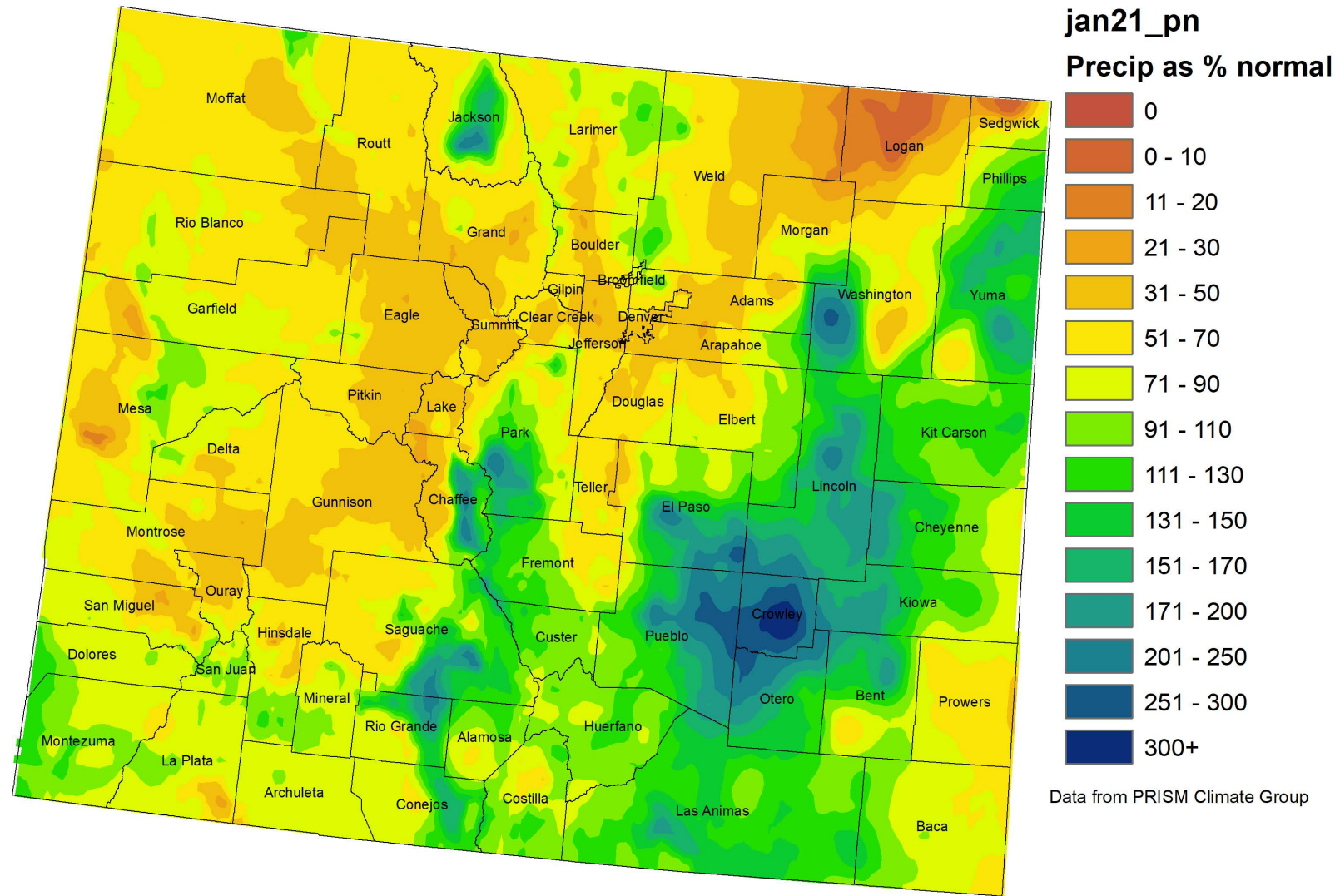
  
Much Warmer than Average

  
Record Warmest

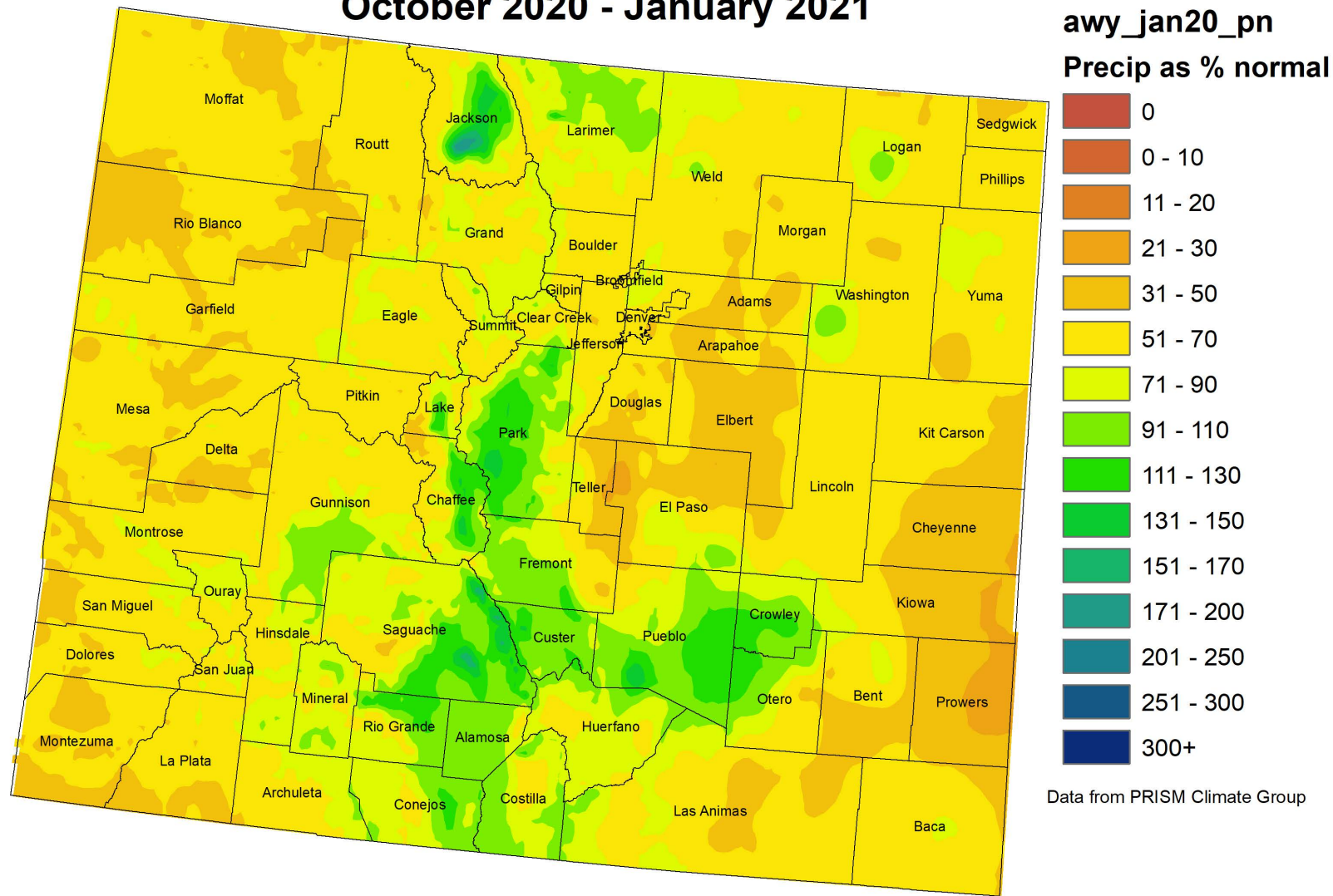
GHCNM v4.0.1.20210105.qfe



# Colorado January 2021 Precipitation as a Percentage of Normal

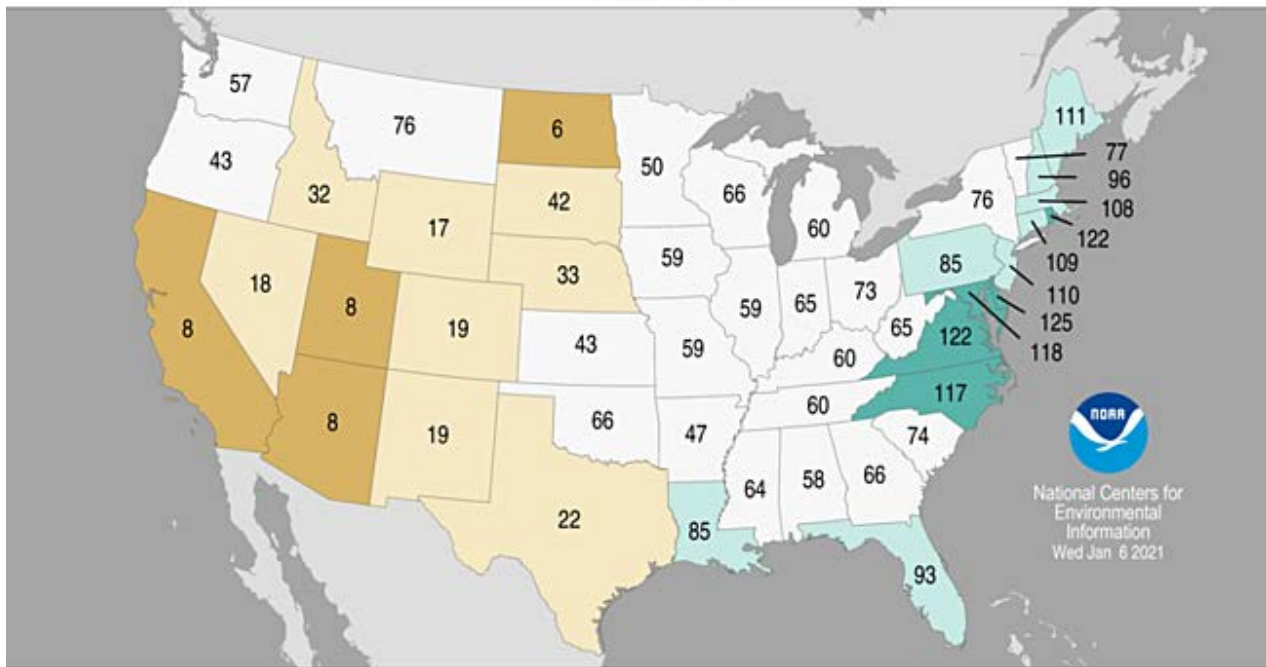


# Colorado Water Year 2021 Precipitation as a Percentage of Normal October 2020 - January 2021



## Statewide Precipitation Ranks

October – December 2020  
Period: 1895–2020



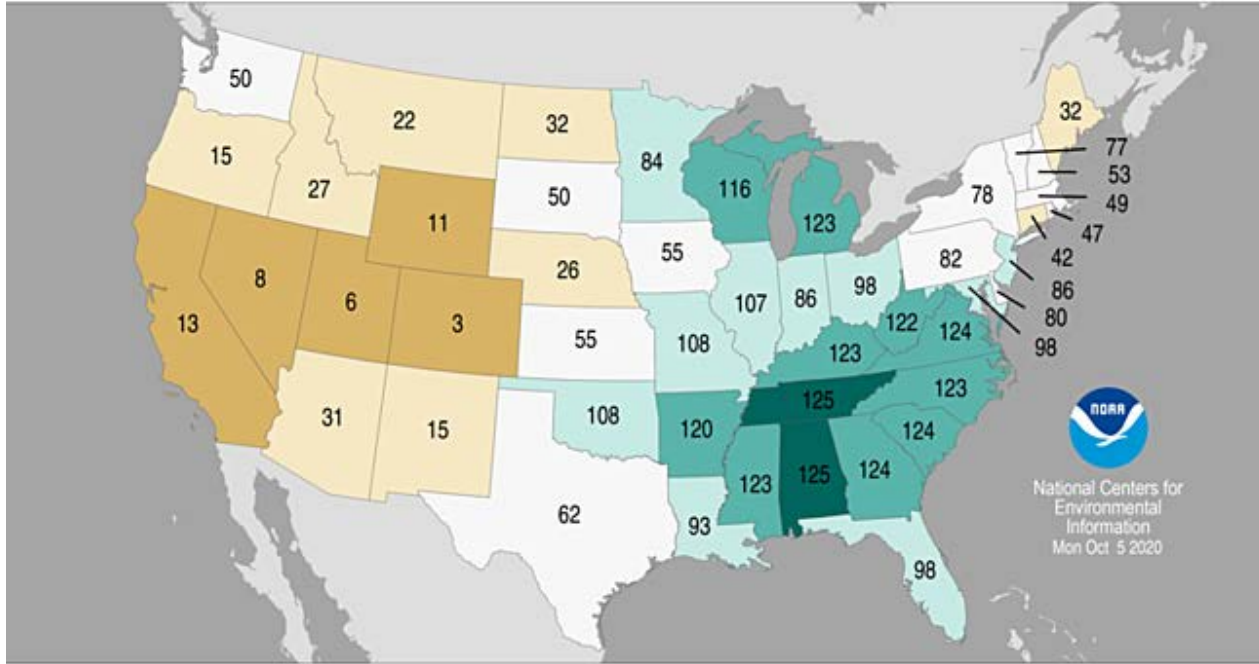
Month	P Rank (of 126 years)	Above, below, or near avg?
Oct	16 <sup>th</sup> driest	below
Nov	44 <sup>th</sup> driest	near avg
Dec	56 <sup>th</sup> driest	near avg

Statewide: 19<sup>th</sup> driest October-December



## Statewide Precipitation Ranks

October 2019 – September 2020  
Period: 1895–2020



Statewide: 2020 was 3<sup>rd</sup> driest water year (out of 125), only 2002 and 2018 drier

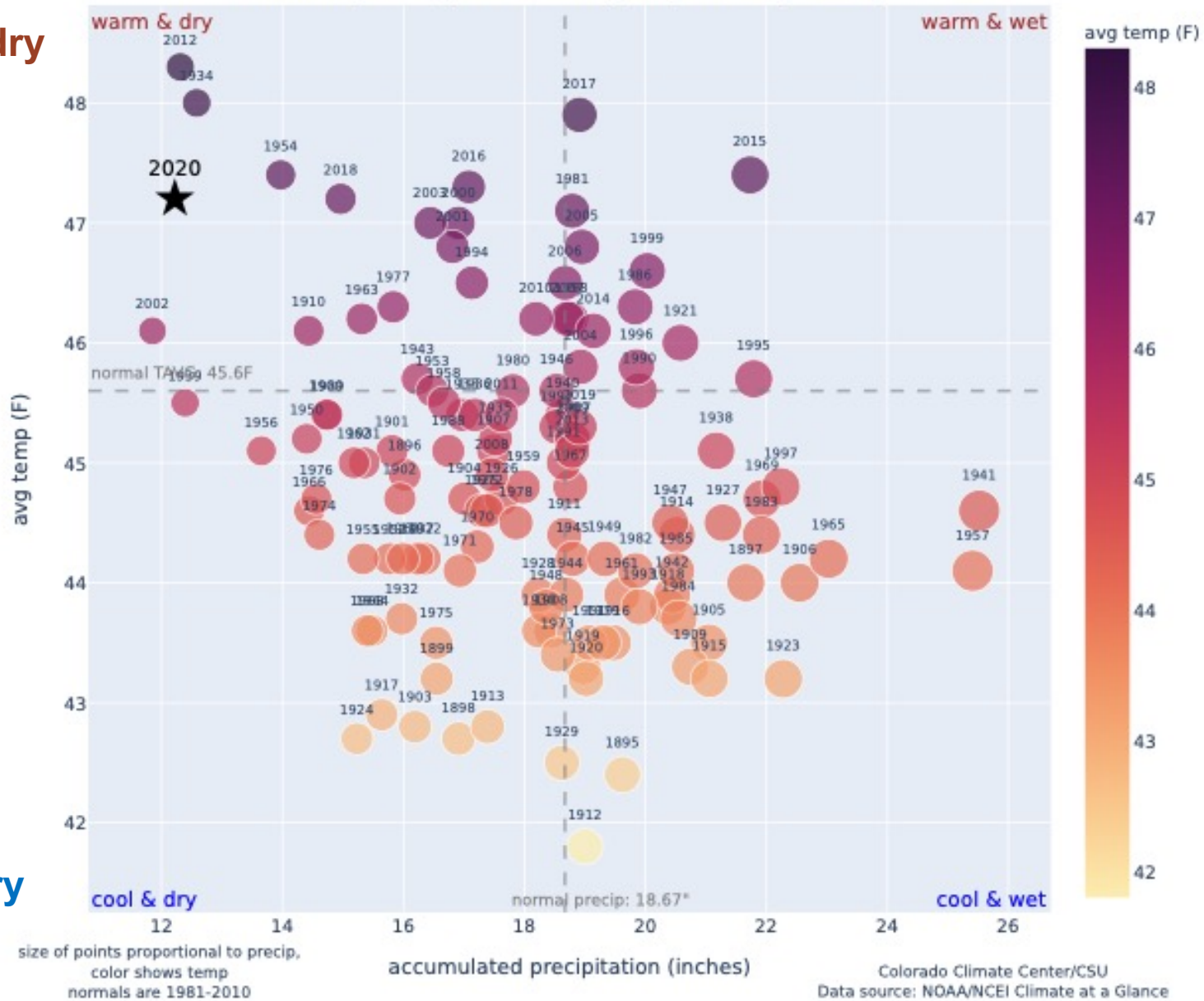
Month	P Rank (of 126 years)	Above, below, or near avg?
Oct	40 <sup>th</sup> driest	below
Nov	52 <sup>nd</sup> wettest	near avg
Dec	41 <sup>st</sup> wettest	above
Jan	34 <sup>th</sup> driest	below
Feb	58 <sup>th</sup> wettest	near avg
Mar	55 <sup>th</sup> driest	near avg
Apr	7 <sup>th</sup> driest	much below
May	18 <sup>th</sup> driest	below
June	43 <sup>rd</sup> driest	near avg
July	41 <sup>st</sup> driest	below
August	5 <sup>th</sup> driest	much below
Sept	39 <sup>th</sup> driest	below



# Colorado average temperature and precipitation, January - December

Warm & dry

Warm & wet



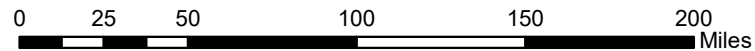
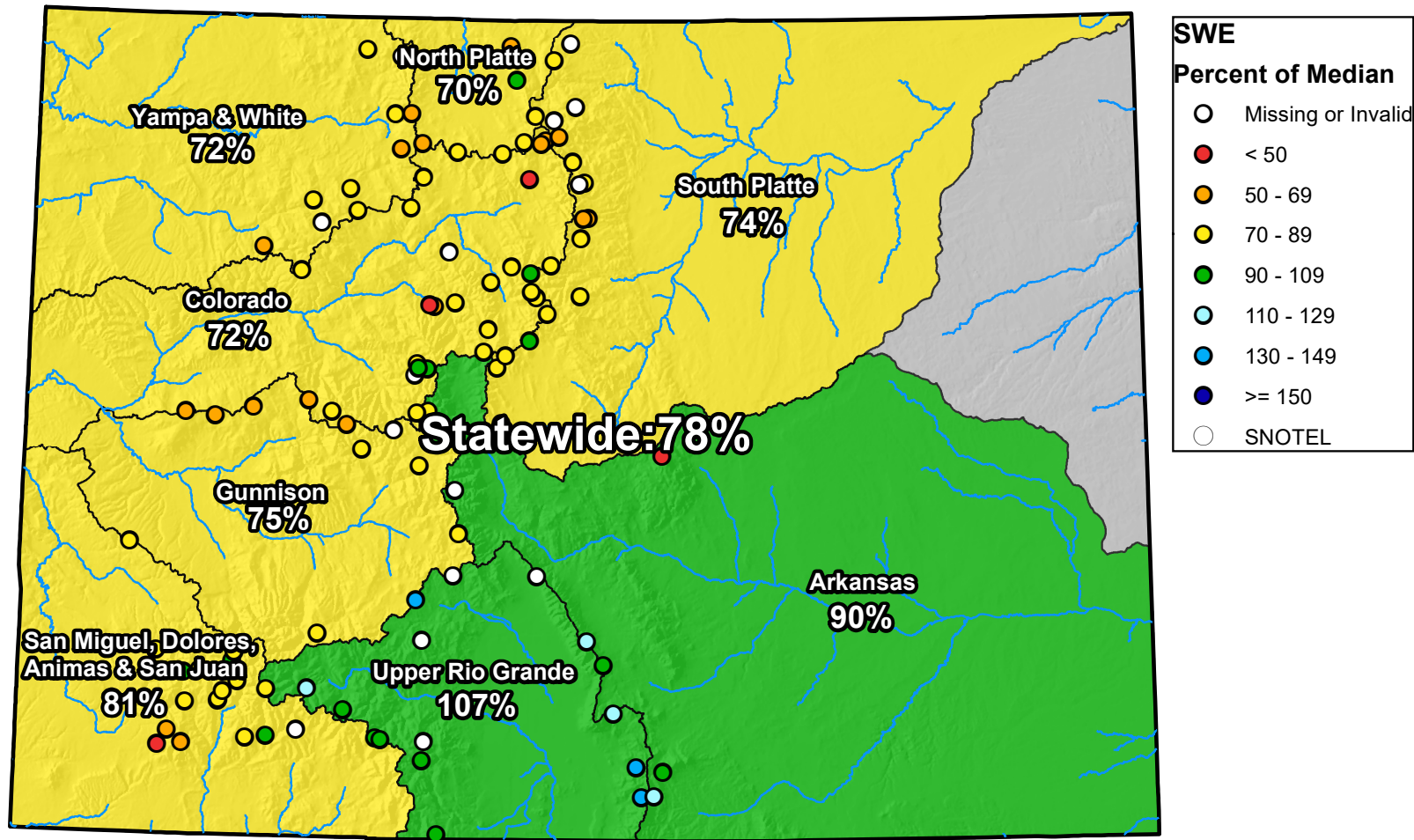
Cool & dry

Cool & wet



# Colorado SNOTEL Snow Water Equivalent (SWE) Update Map with Site Data

Current as of Feb 03, 2021



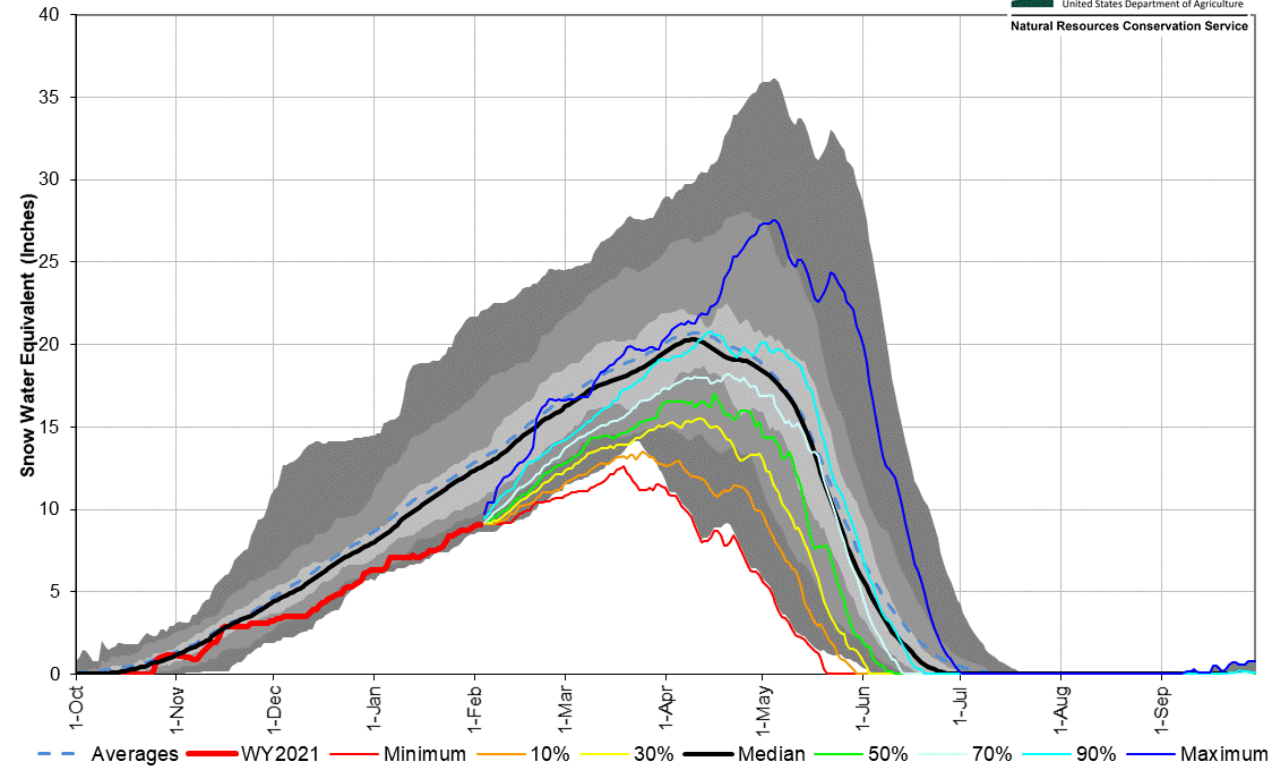
United States Department of Agriculture

Natural Resources Conservation Service



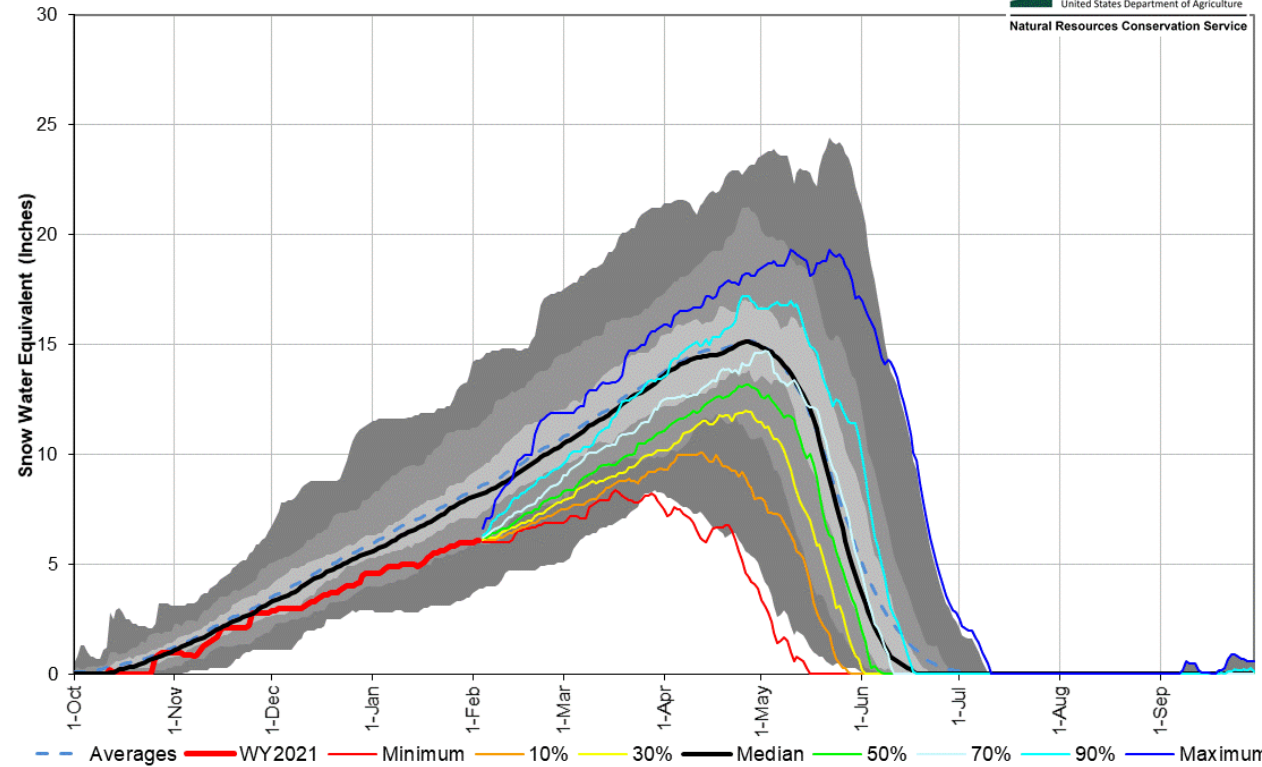
# Yampa/White

Yampa, White & North Platte River Basins with Non-Exceedence Projections  
Based on Provisional SNOTEL Data as of Feb 03, 2021



# South Platte

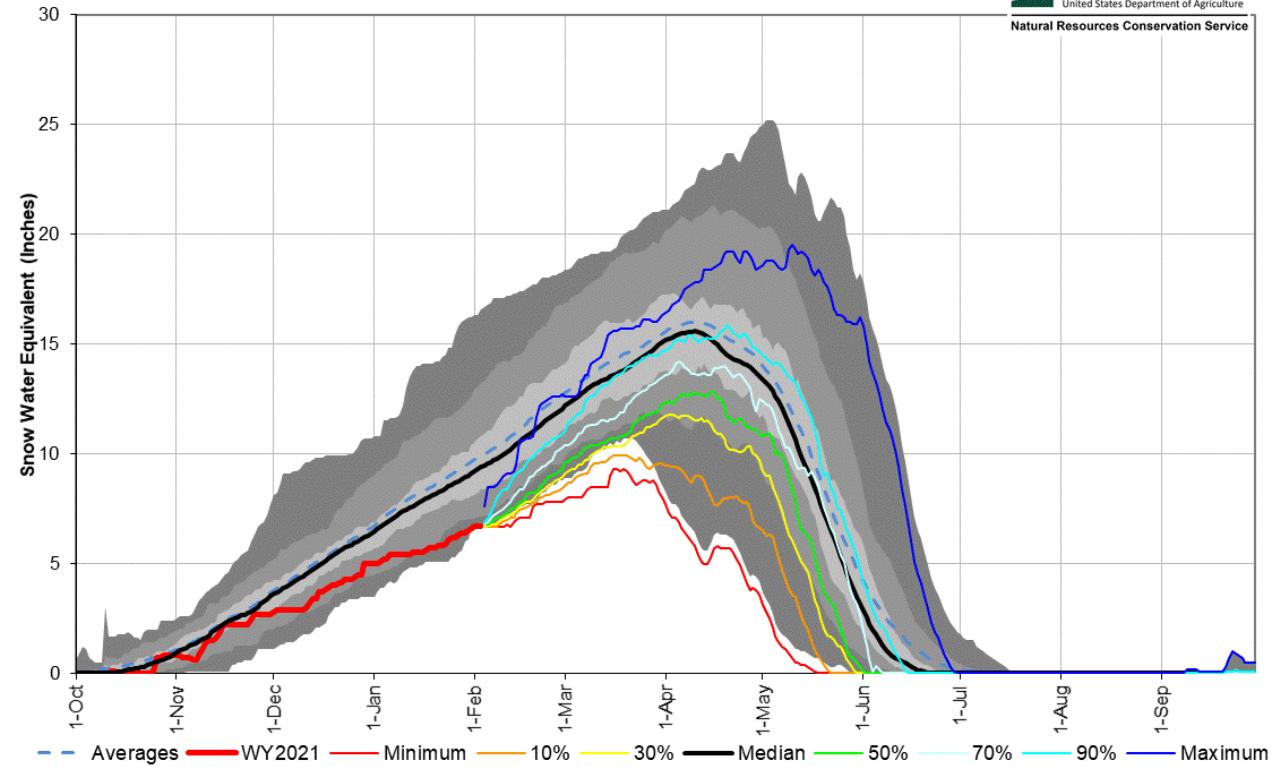
South Platte River Basin with Non-Exceedence Projections  
Based on Provisional SNOTEL Data as of Feb 03, 2021



# Colorado headwaters

**Colorado River Basin with Non-Exceedence Projections**  
*Based on Provisional SNOTEL Data as of Feb 03, 2021*

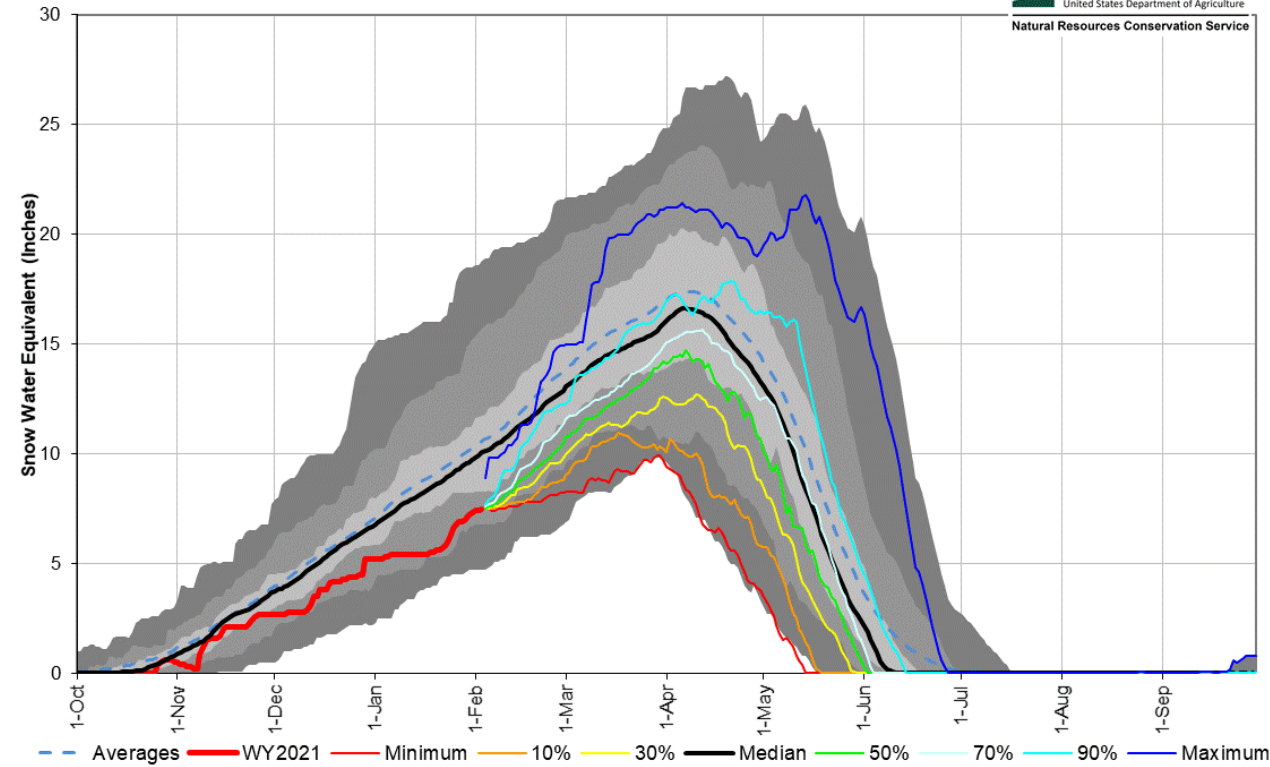
USDA  
 United States Department of Agriculture  
 Natural Resources Conservation Service



# Gunnison

**Gunnison River Basin with Non-Exceedence Projections**  
*Based on Provisional SNOTEL Data as of Feb 03, 2021*

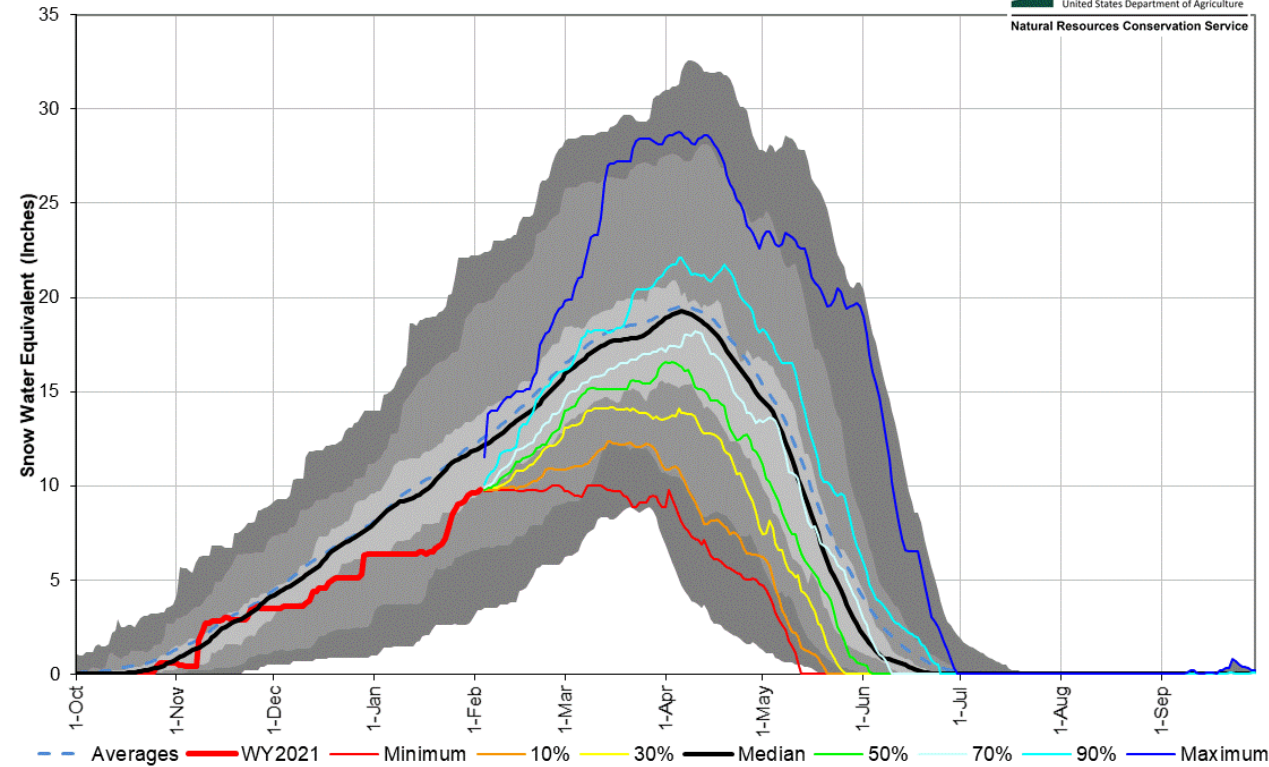
USDA  
 United States Department of Agriculture  
 Natural Resources Conservation Service



# Southwest basins

San Miguel, Dolores, Animas & San Juan River Basins with Non-Exceedence Projections  
 Based on Provisional SNOTEL Data as of Feb 03, 2021

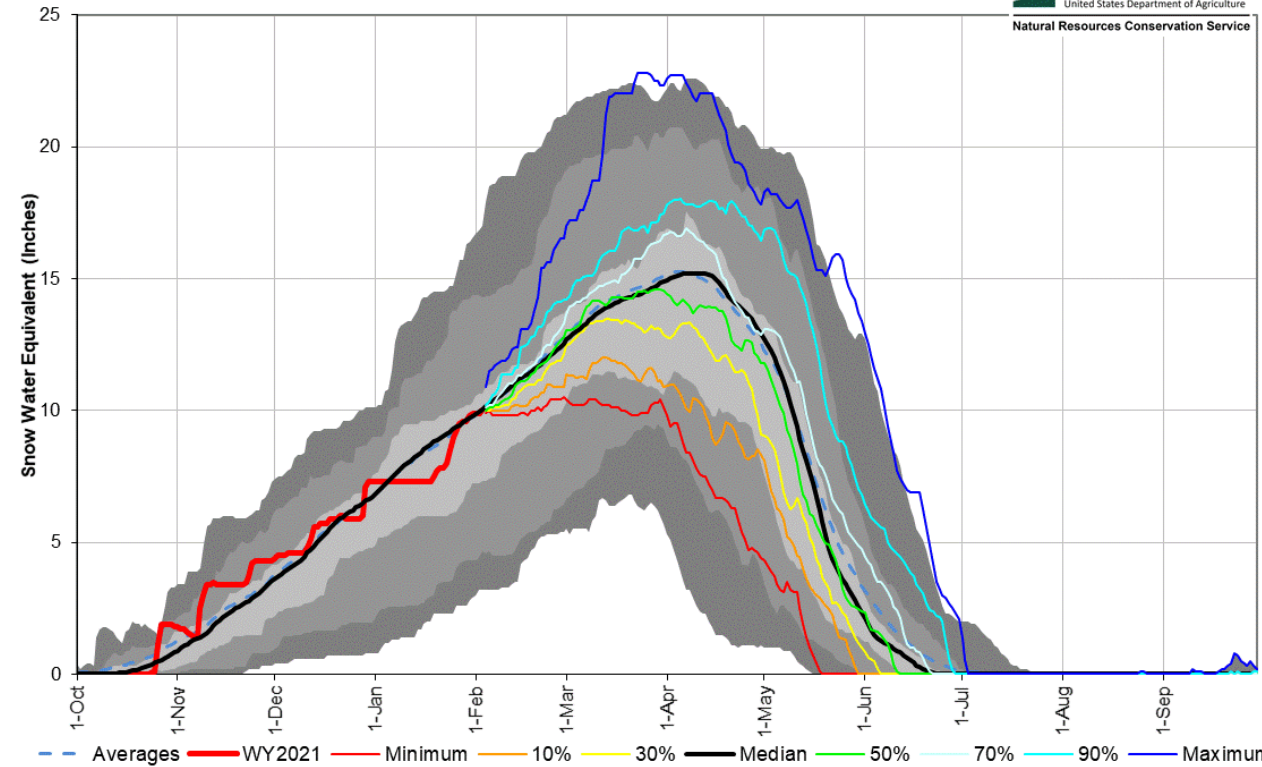
USDA  
 United States Department of Agriculture  
 Natural Resources Conservation Service



# Upper Rio Grande

Upper Rio Grande Basin with Non-Exceedence Projections  
 Based on Provisional SNOTEL Data as of Feb 03, 2021

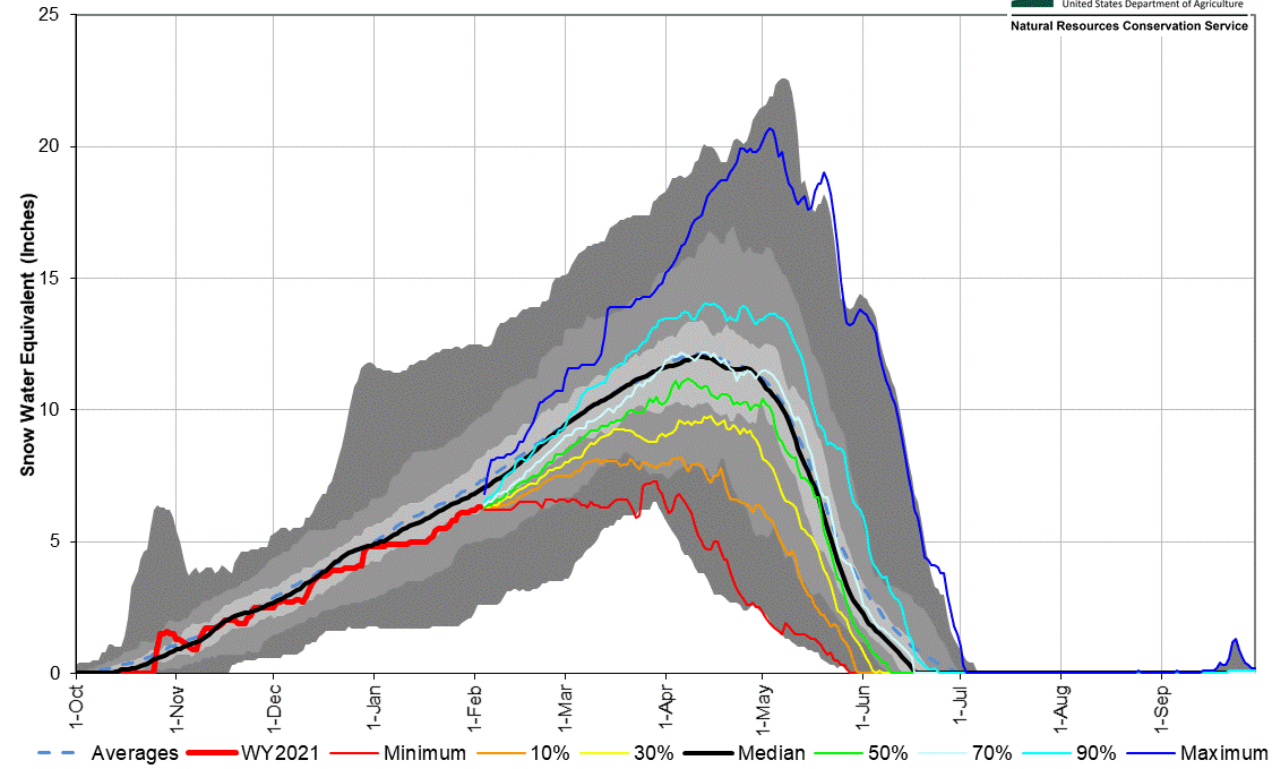
USDA  
 United States Department of Agriculture  
 Natural Resources Conservation Service



# Arkansas

Arkansas River Basin with Non-Exceedence Projections  
Based on Provisional SNOTEL Data as of Feb 03, 2021

USDA  
United States Department of Agriculture  
Natural Resources Conservation Service



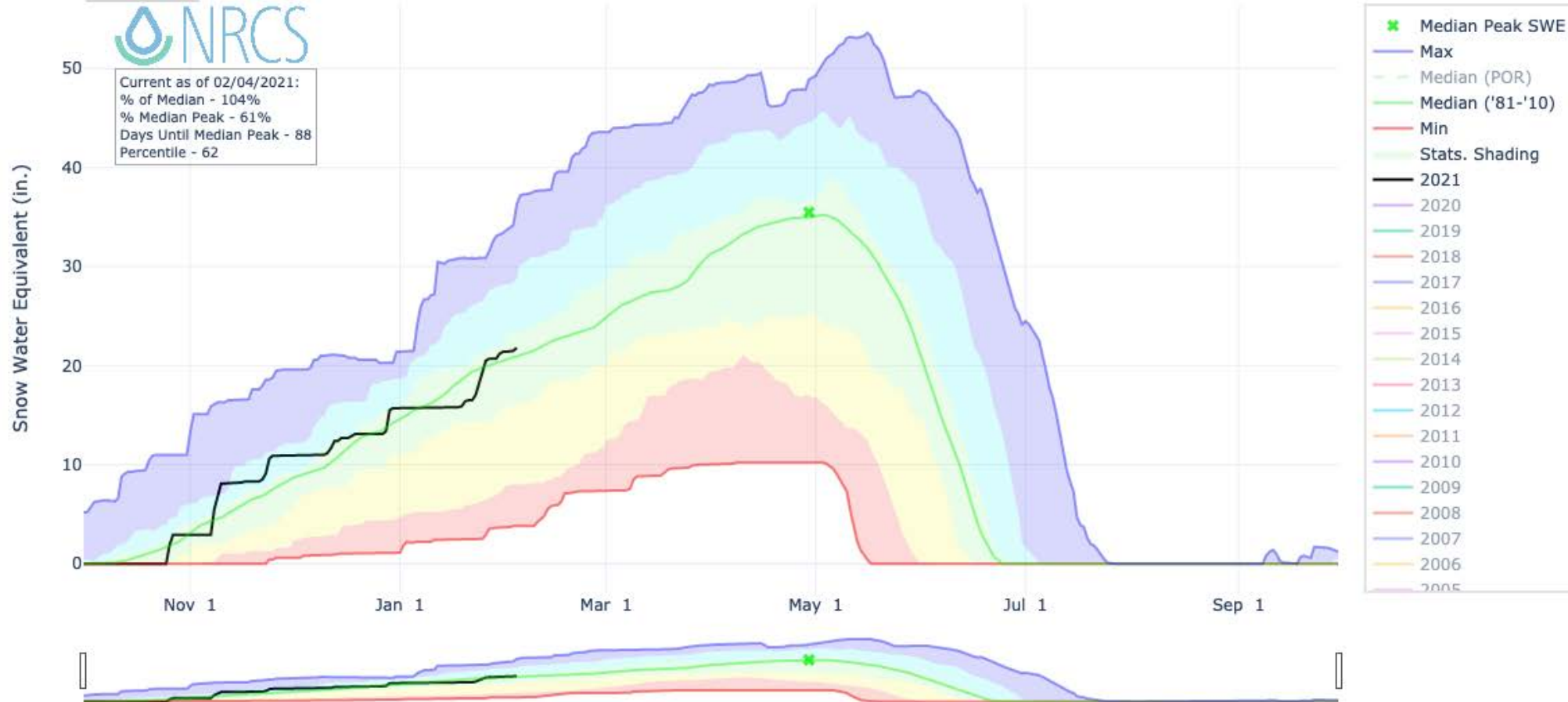
# SNOW WATER EQUIVALENT AT WOLF CREEK SUMMIT

Reset Range

[Link to data: CSV / JSON](#)



Current as of 02/04/2021:  
 % of Median - 104%  
 % Median Peak - 61%  
 Days Until Median Peak - 88  
 Percentile - 62



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.  
 For more information visit: [30 year normals calculation description.](#)

Wolf Creek Summit SNOTEL site: 104% of average



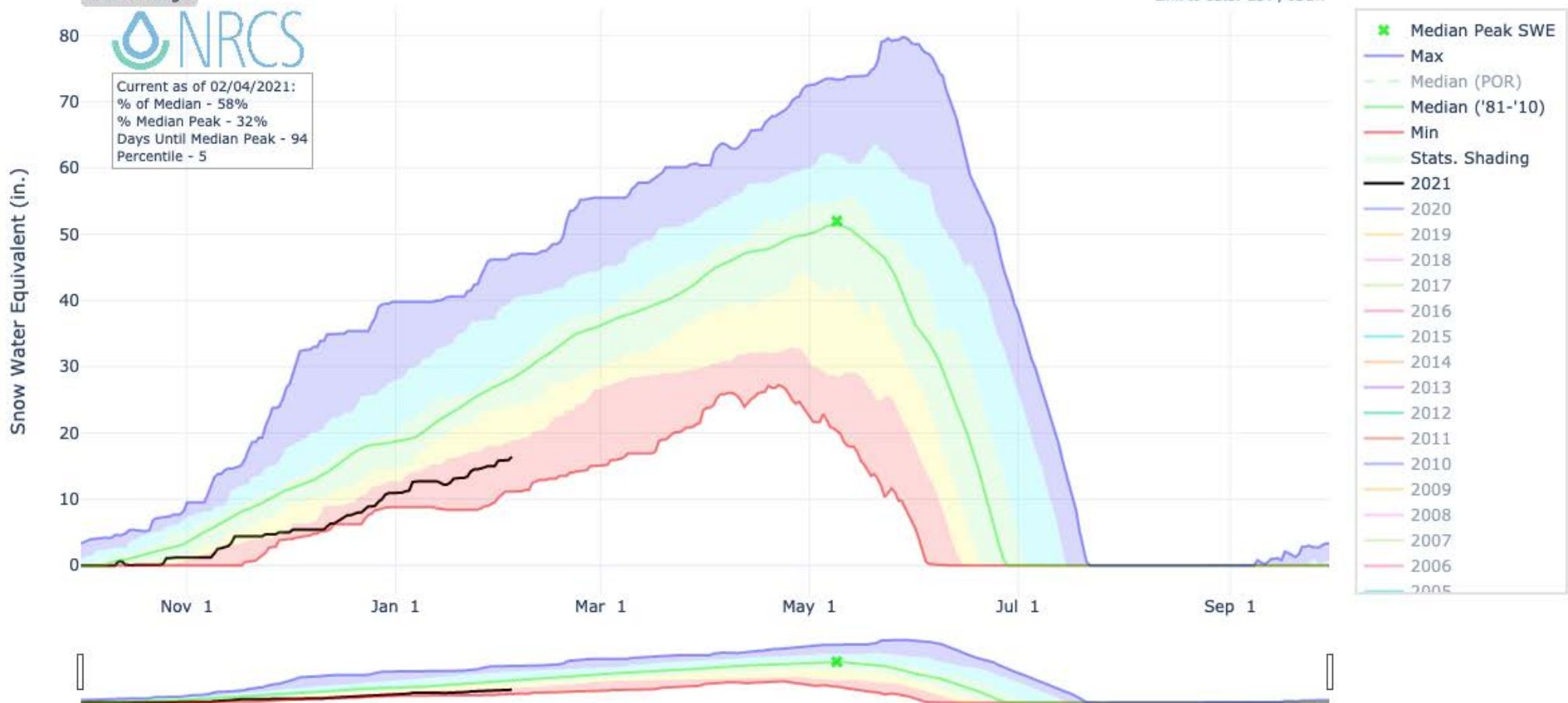
# SNOW WATER EQUIVALENT AT TOWER

Reset Range

[Link to data: CSV / JSON](#)



Current as of 02/04/2021:  
 % of Median - 58%  
 % Median Peak - 32%  
 Days Until Median Peak - 94  
 Percentile - 5



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.  
 For more information visit: [30 year normals calculation description.](#)

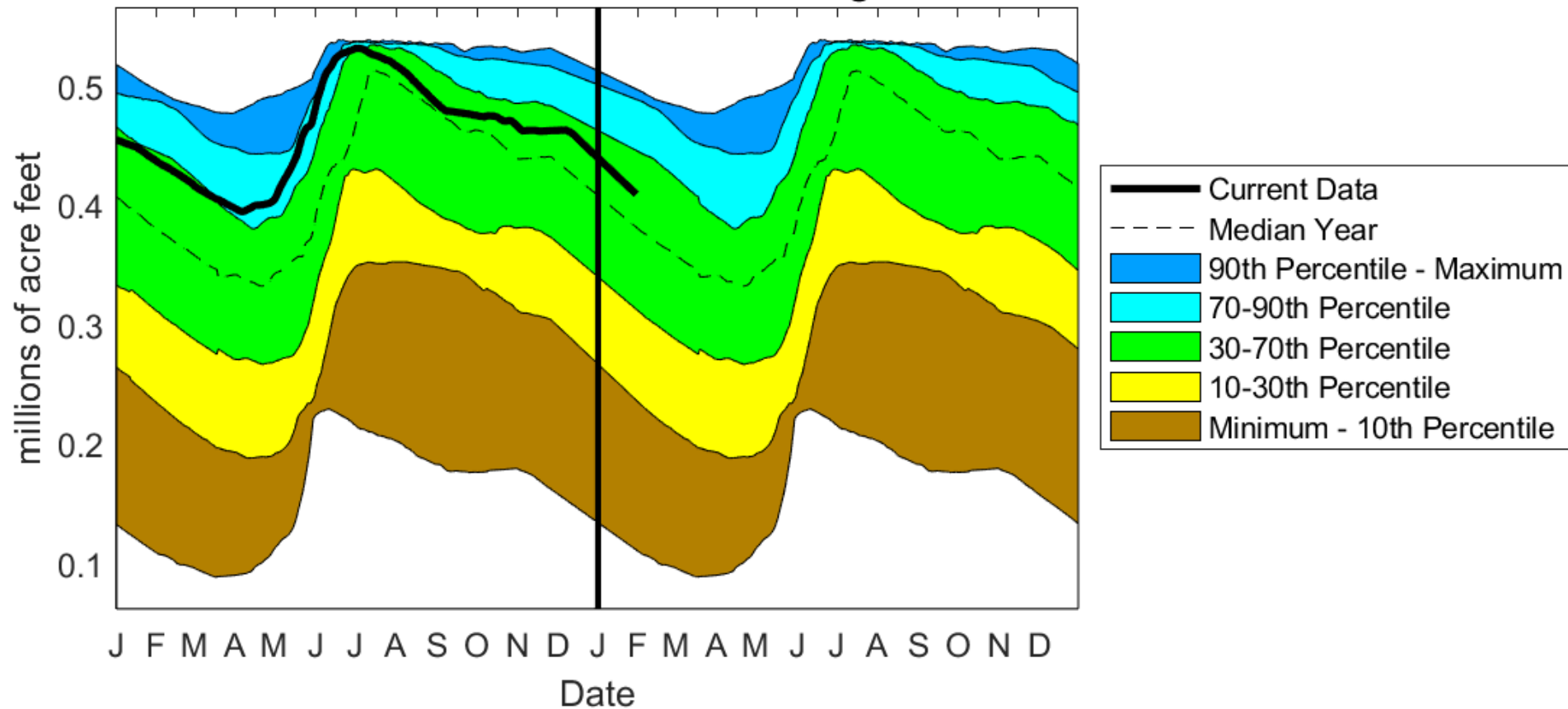
Tower (Routt county) SNOTEL site: worst since 1981 for early February (on par with 2012), about a 12” deficit in SWE



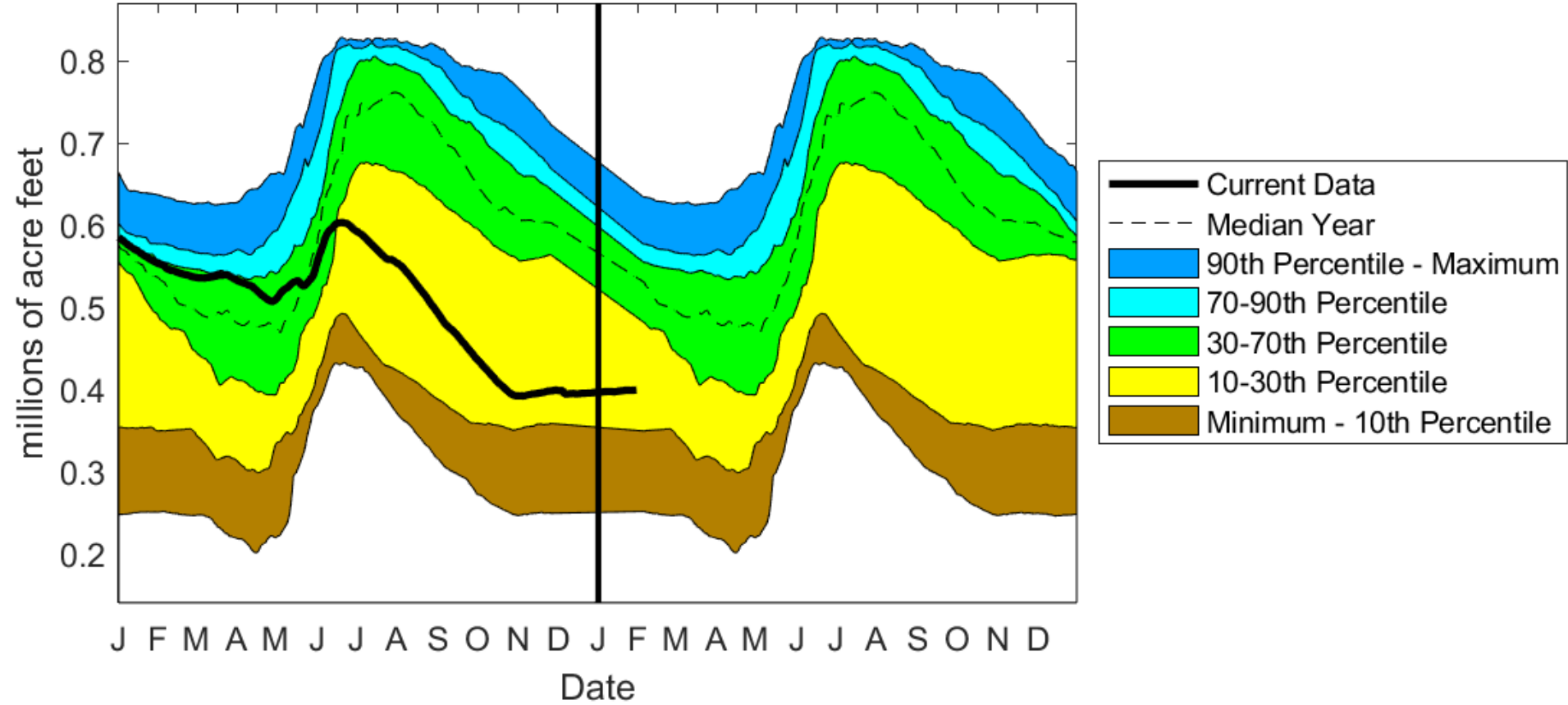
# Reservoirs



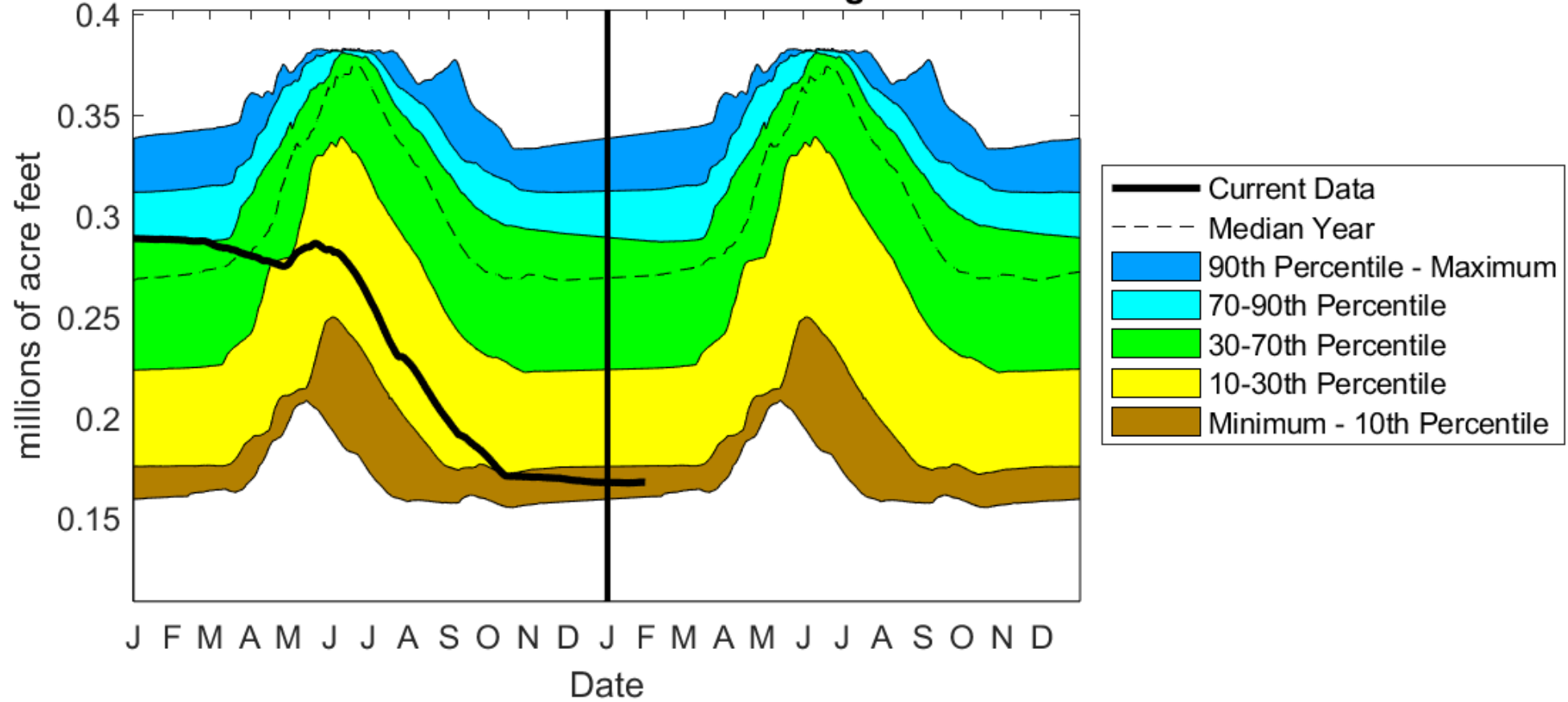
### Lake Granby Level 01/30/2021 111 Percent of 1981-2019 Average



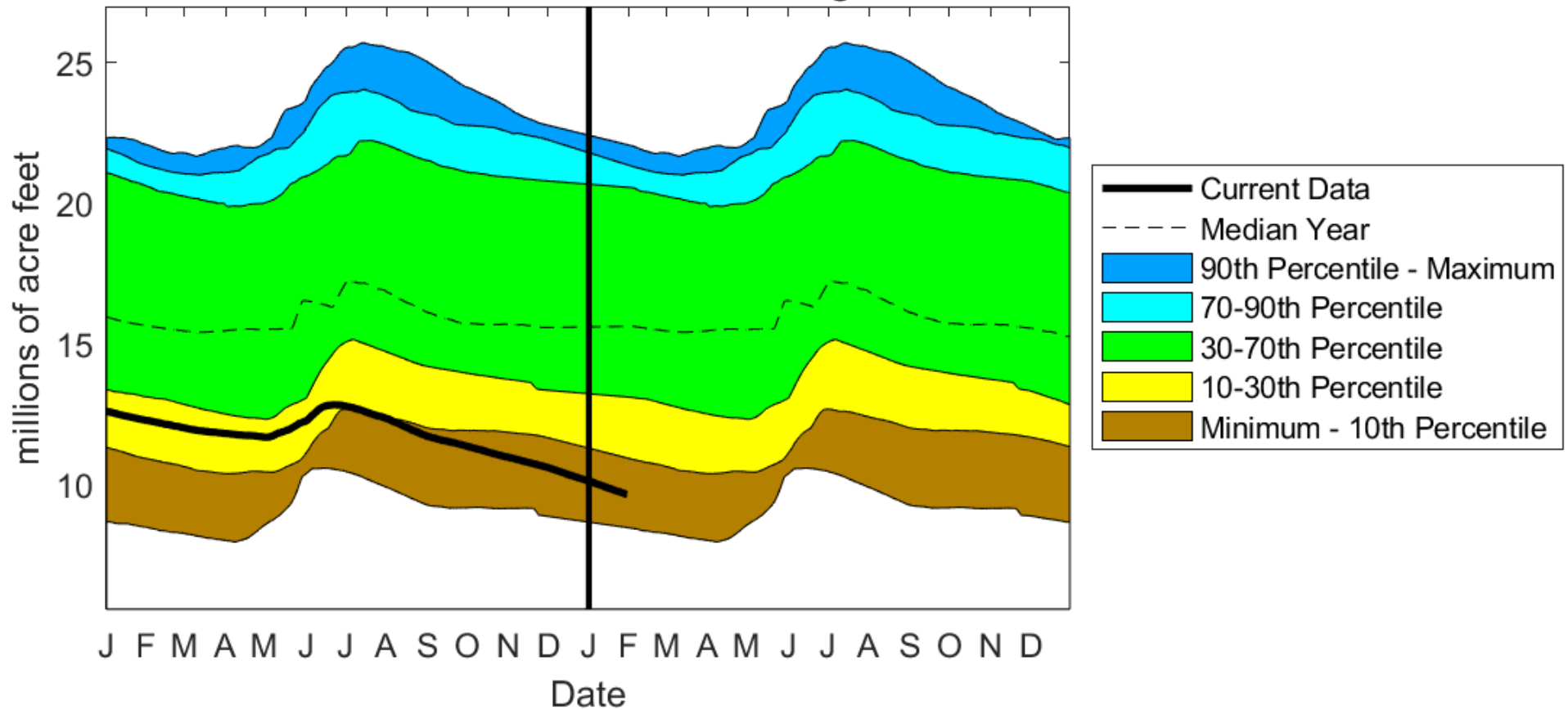
### Blue Mesa Reservoir Level 01/30/2021 79 Percent of 1981-2019 Average



### McPhee Reservoir Level 01/30/2021 66 Percent of 1981-2019 Average

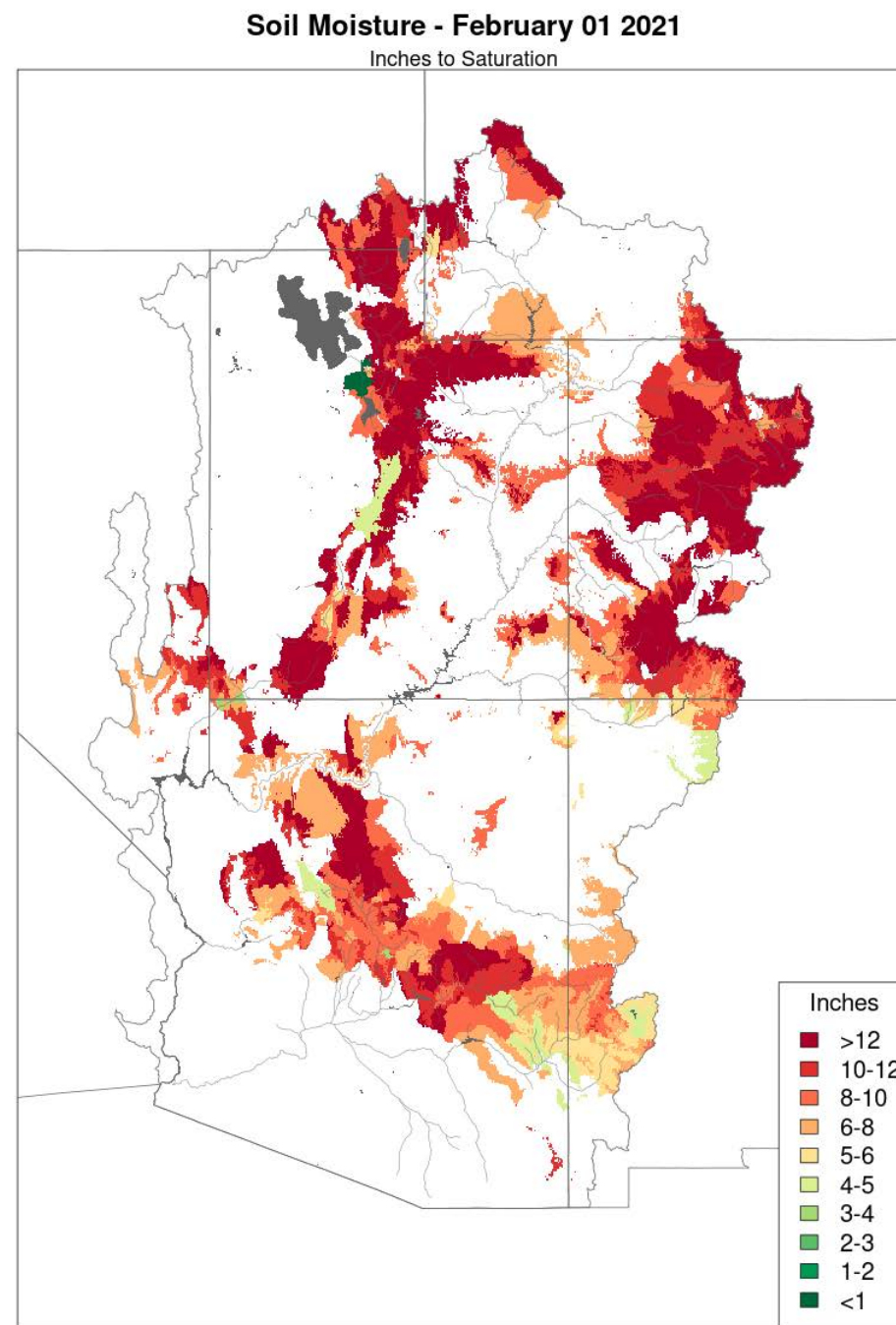


### Lake Powell Level 01/30/2021 60 Percent of 1981-2019 Average



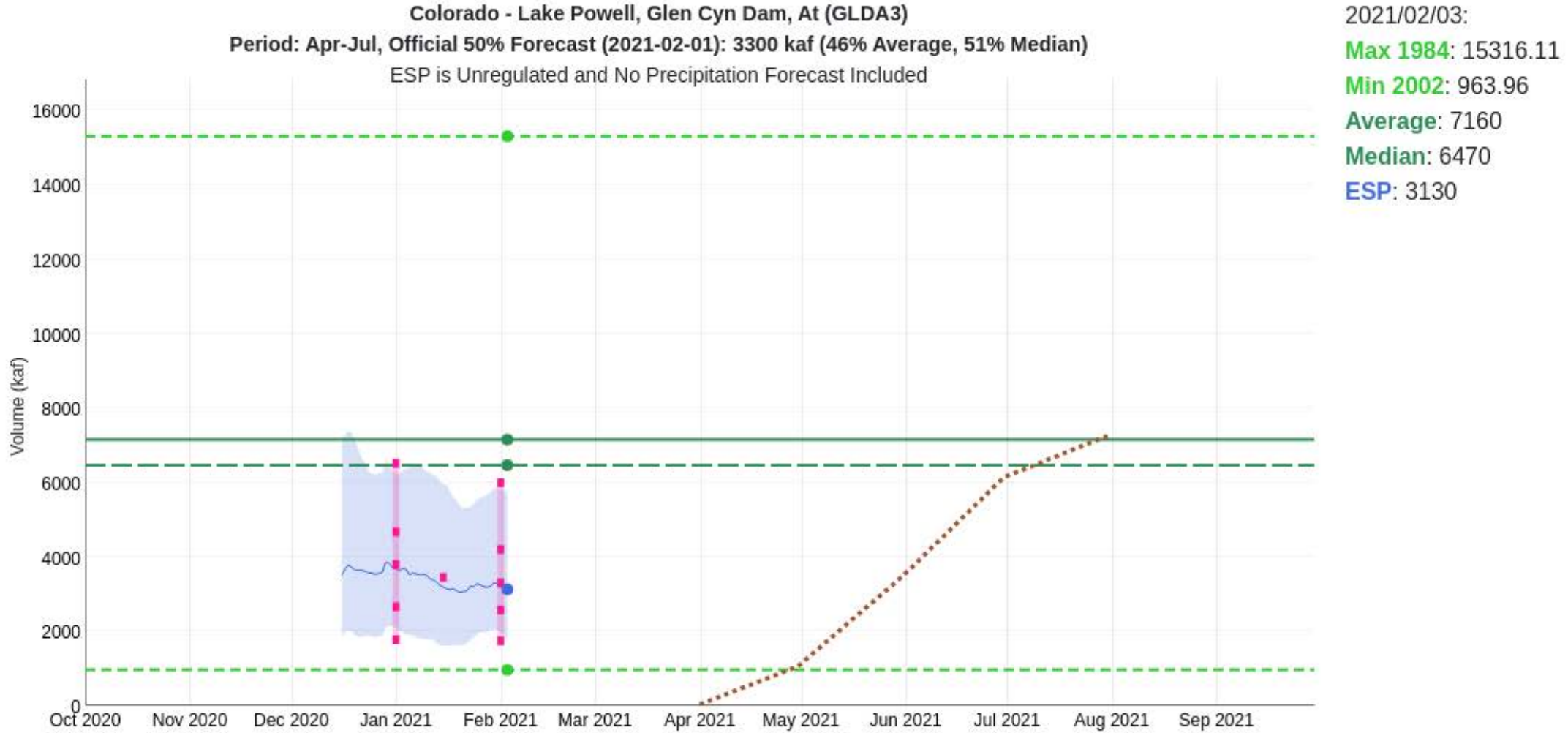
## CBRFC soil moisture: inches to saturation

10+ inches across much of the Colorado River Basin



Prepared by NOAA, Colorado Basin River Forecast Center  
Salt Lake City, Utah, [www.cbrfc.noaa.gov](http://www.cbrfc.noaa.gov)

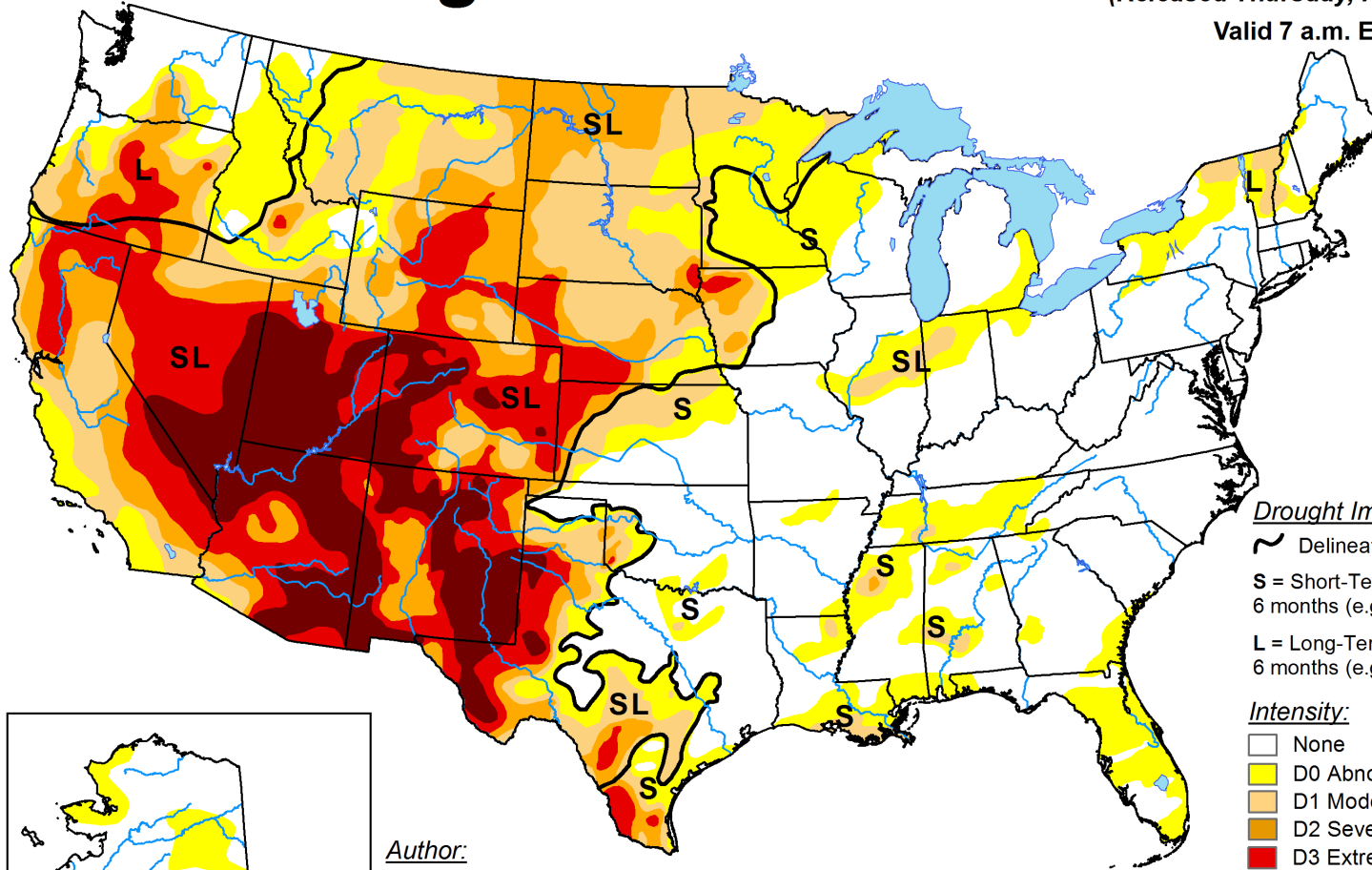
# CBRFC February 1 forecast: 46% of average April-July flow into Lake Powell



# U.S. Drought Monitor

February 2, 2021  
(Released Thursday, Feb. 4, 2021)

Valid 7 a.m. EST

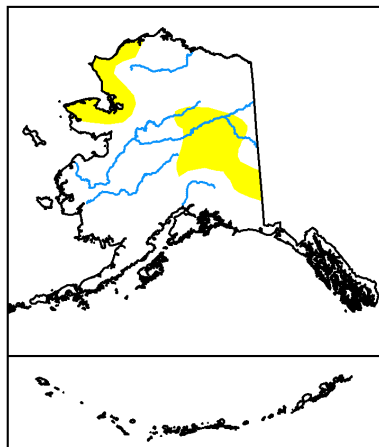


Drought Impact Types:

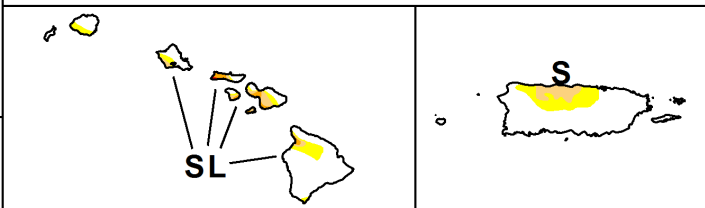
- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought



Author:  
Brad Rippey  
U.S. Department of Agriculture



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>

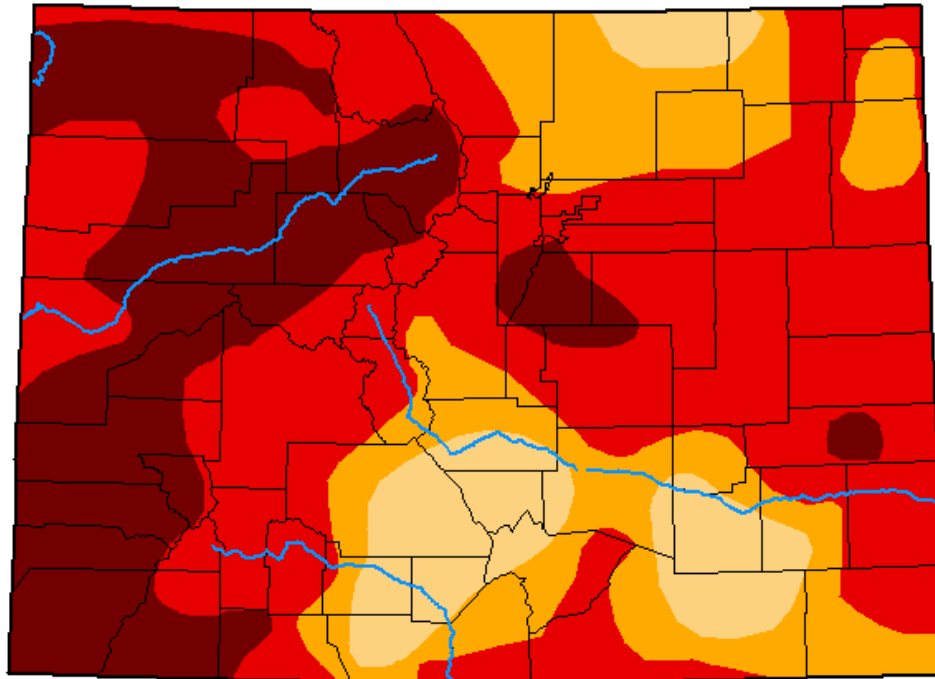


[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)



# U.S. Drought Monitor Colorado

**February 2, 2021**  
(Released Thursday, Feb. 4, 2021)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	0.00	100.00	100.00	90.24	70.73	24.79
<b>Last Week</b> 01-26-2021	0.00	100.00	100.00	90.65	73.11	24.91
<b>3 Months Ago</b> 11-03-2020	0.00	100.00	100.00	93.71	74.08	24.39
<b>Start of Calendar Year</b> 12-29-2020	0.00	100.00	100.00	93.73	76.17	27.60
<b>Start of Water Year</b> 09-29-2020	0.00	100.00	99.29	89.35	52.88	2.64
<b>One Year Ago</b> 02-04-2020	22.39	77.61	51.12	3.30	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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Author:

Brad Rippey  
U.S. Department of Agriculture



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# U.S. Drought Monitor Colorado

July 28, 2020

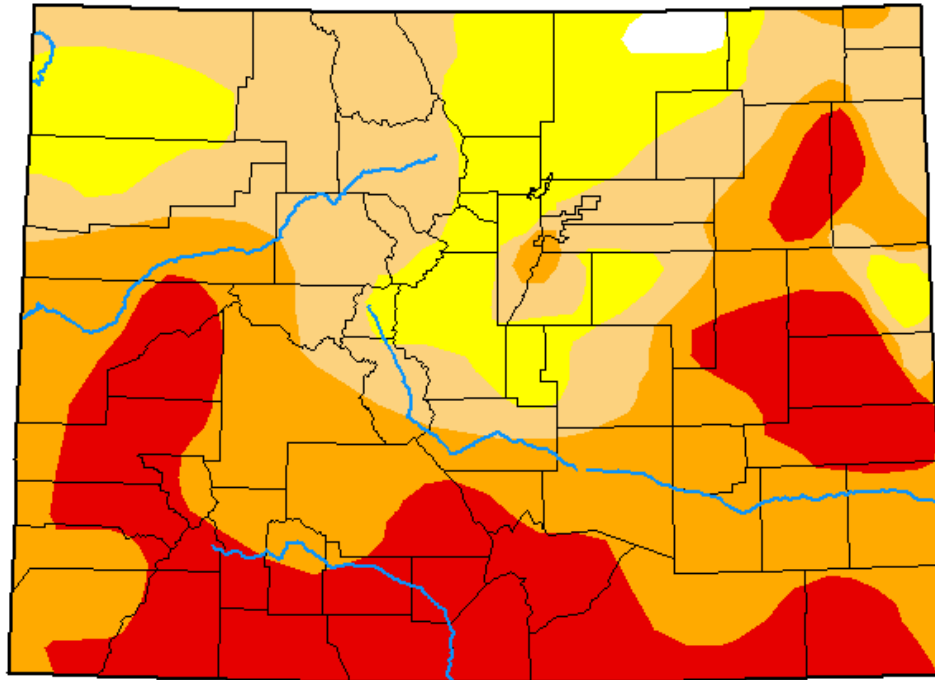
Six months ago

(Released Thursday, Jul. 30, 2020)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	0.65	99.35	83.72	58.79	26.64	0.00
<b>Last Week</b> <i>07-21-2020</i>	2.95	97.05	73.99	60.34	31.77	0.00
<b>3 Months Ago</b> <i>04-28-2020</i>	24.47	75.53	56.64	32.72	0.00	0.00
<b>Start of Calendar Year</b> <i>12-31-2019</i>	31.72	68.28	51.19	20.11	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	30.14	69.86	27.53	0.00	0.00	0.00
<b>One Year Ago</b> <i>07-30-2019</i>	95.32	4.68	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

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**Author:**

Richard Heim  
NCEI/NOAA



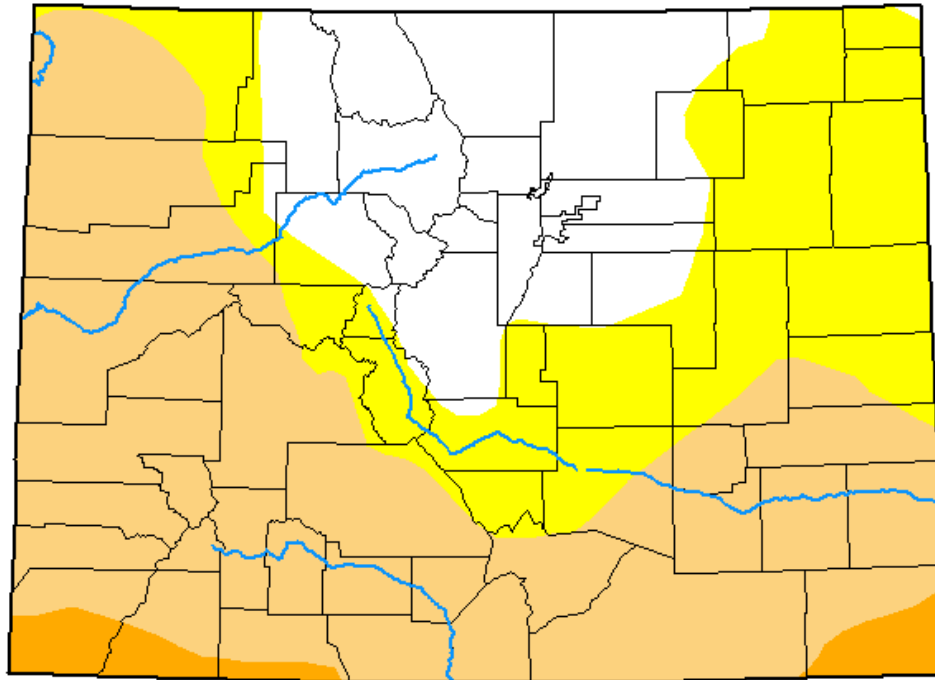
[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)



# U.S. Drought Monitor Colorado

January 28, 2020  
(Released Thursday, Jan. 30, 2020)  
Valid 7 a.m. EST

One year ago



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	22.39	77.61	51.19	3.30	0.00	0.00
<b>Last Week</b> 01-21-2020	22.39	77.61	51.19	13.84	0.00	0.00
<b>3 Months Ago</b> 10-29-2019	18.73	81.27	58.24	27.41	0.00	0.00
<b>Start of Calendar Year</b> 12-31-2019	31.72	68.28	51.19	20.11	0.00	0.00
<b>Start of Water Year</b> 10-01-2019	30.14	69.86	27.53	0.00	0.00	0.00
<b>One Year Ago</b> 01-29-2019	15.91	84.09	66.35	41.02	22.04	2.79

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
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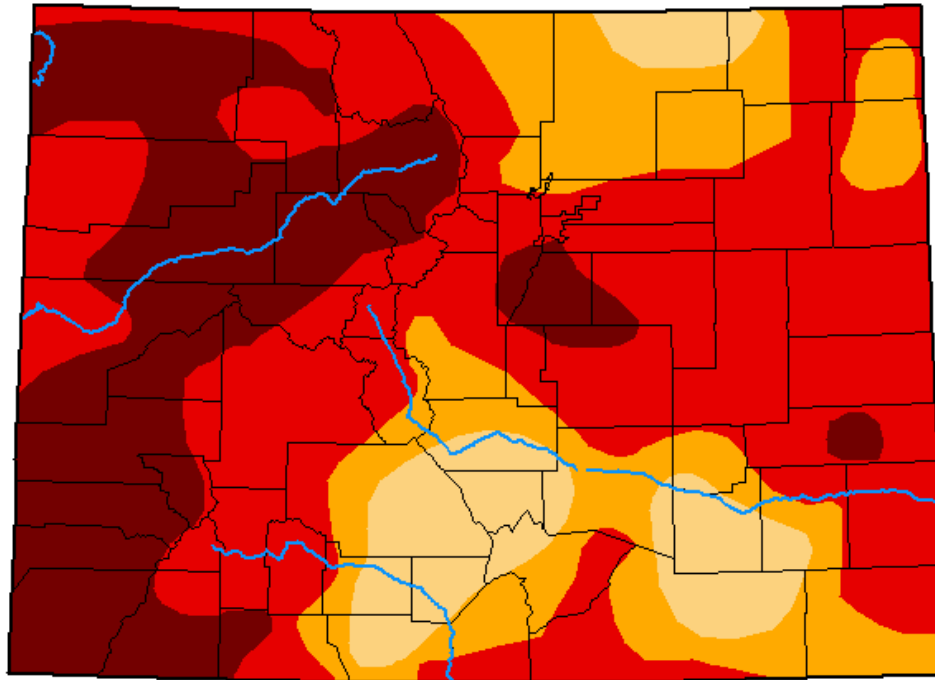


[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)



# U.S. Drought Monitor Colorado

**February 2, 2021**  
(Released Thursday, Feb. 4, 2021)  
Valid 7 a.m. EST



*Drought Conditions (Percent Area)*

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<b>Current</b>	0.00	100.00	100.00	90.24	70.73	24.79
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Author:

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U.S. Department of Agriculture

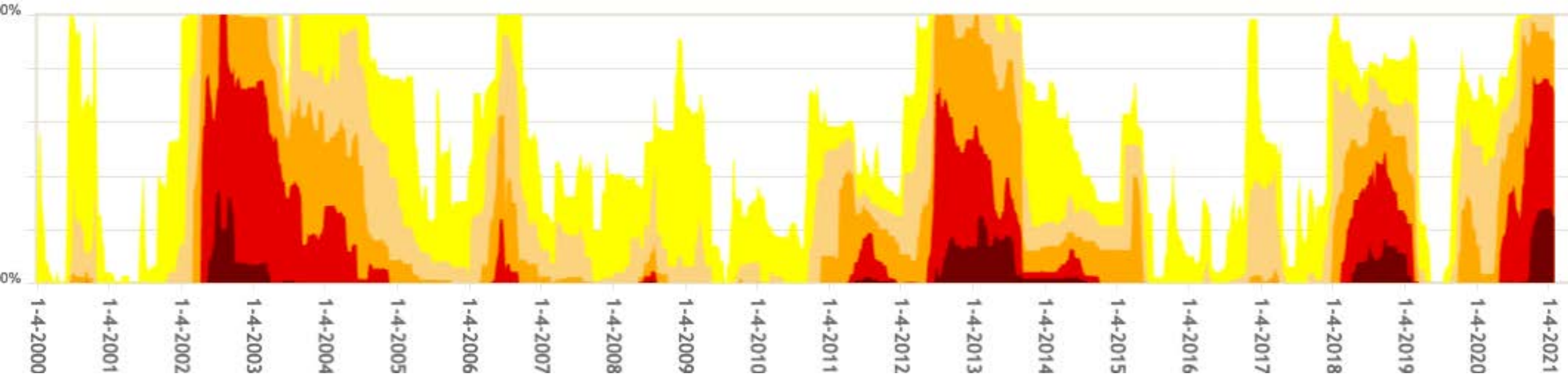


[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)



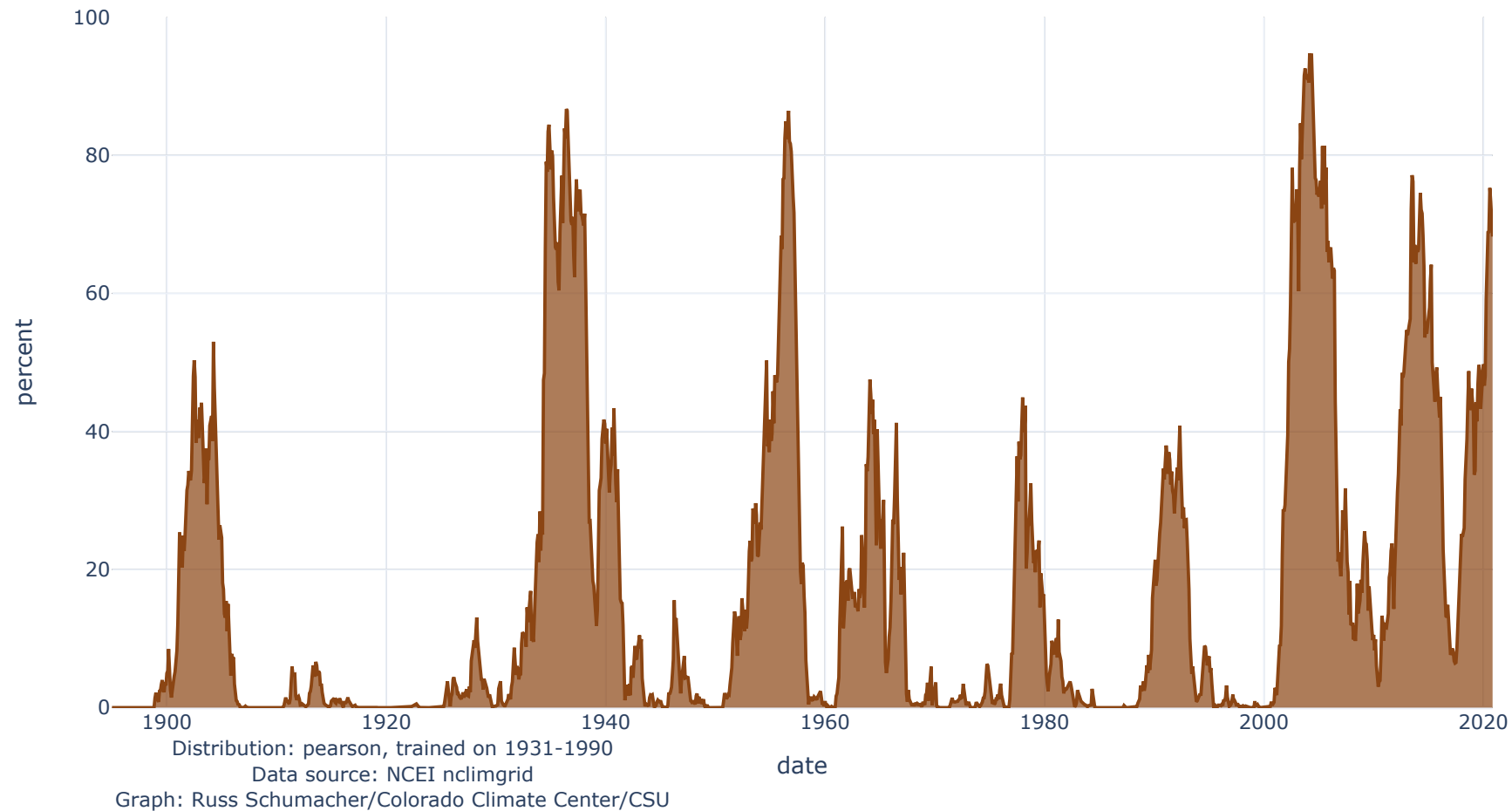
# Percent of Colorado in drought (since 2000)

Colorado Percent Area

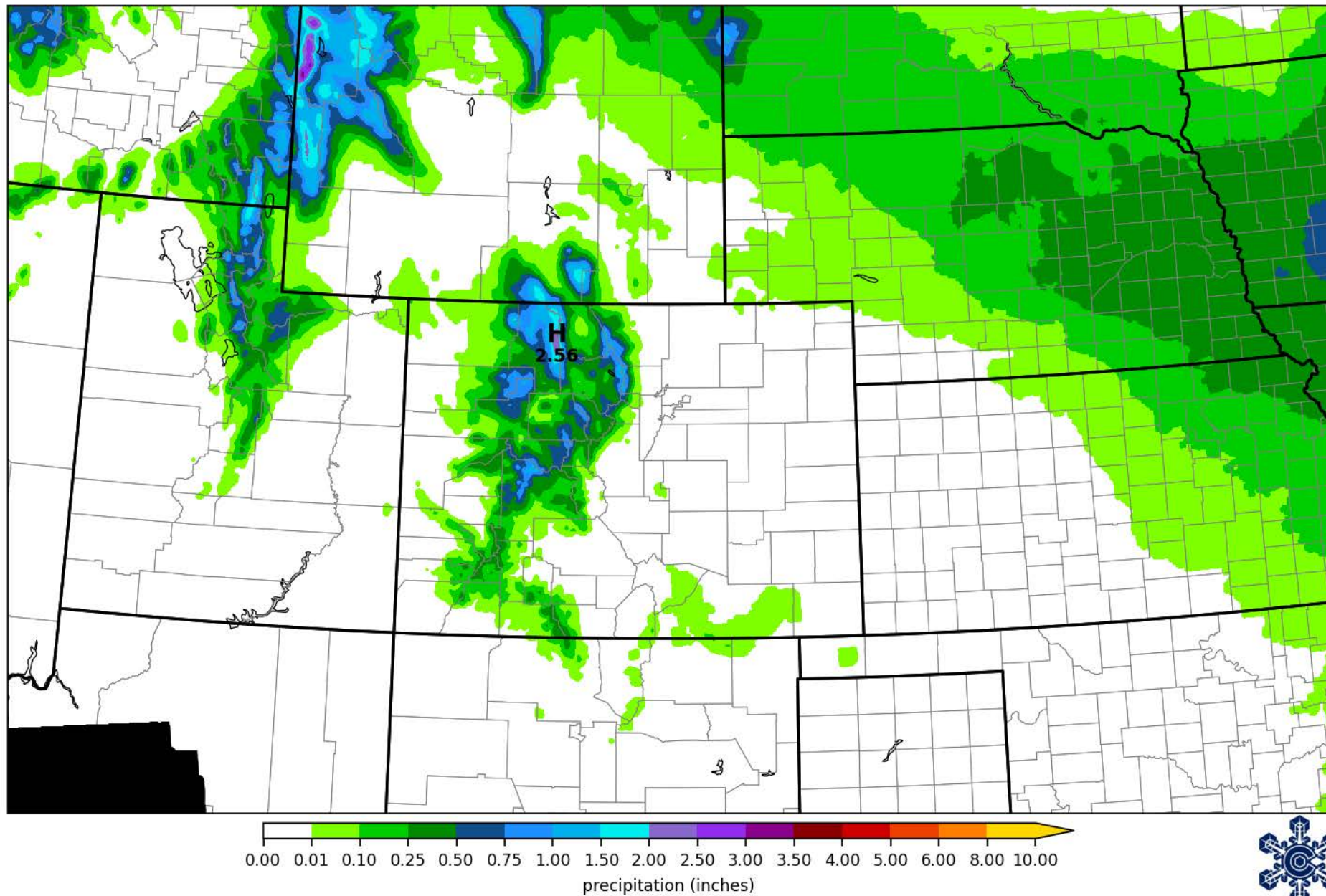


# Percent of Colorado in long-term drought (since 1895)

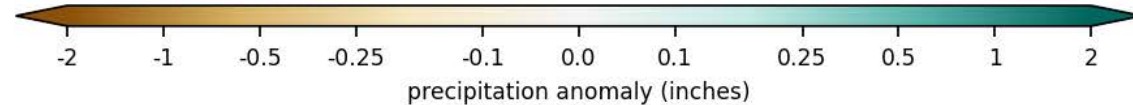
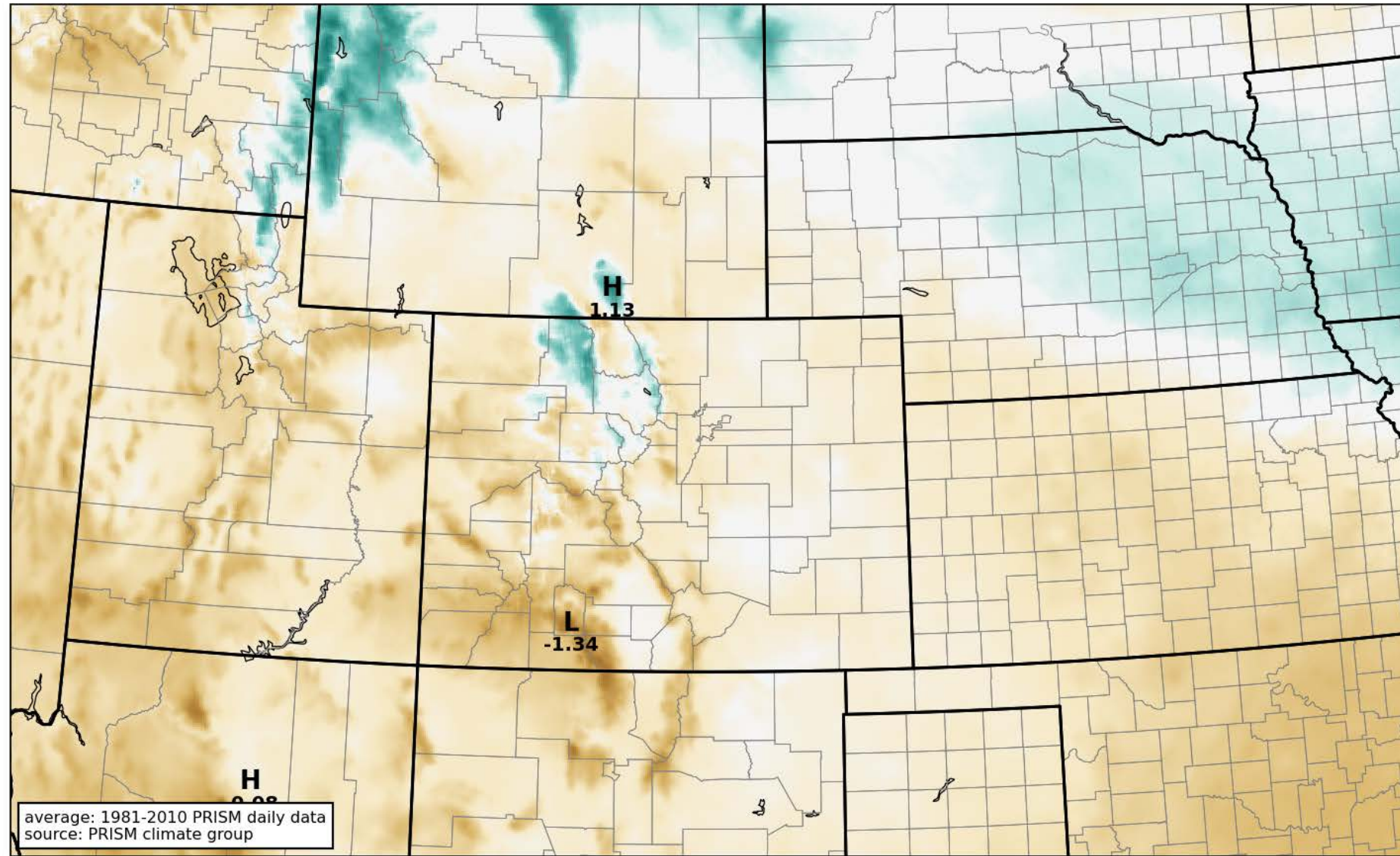
Percentage of Colorado with 48-month SPEI < -1



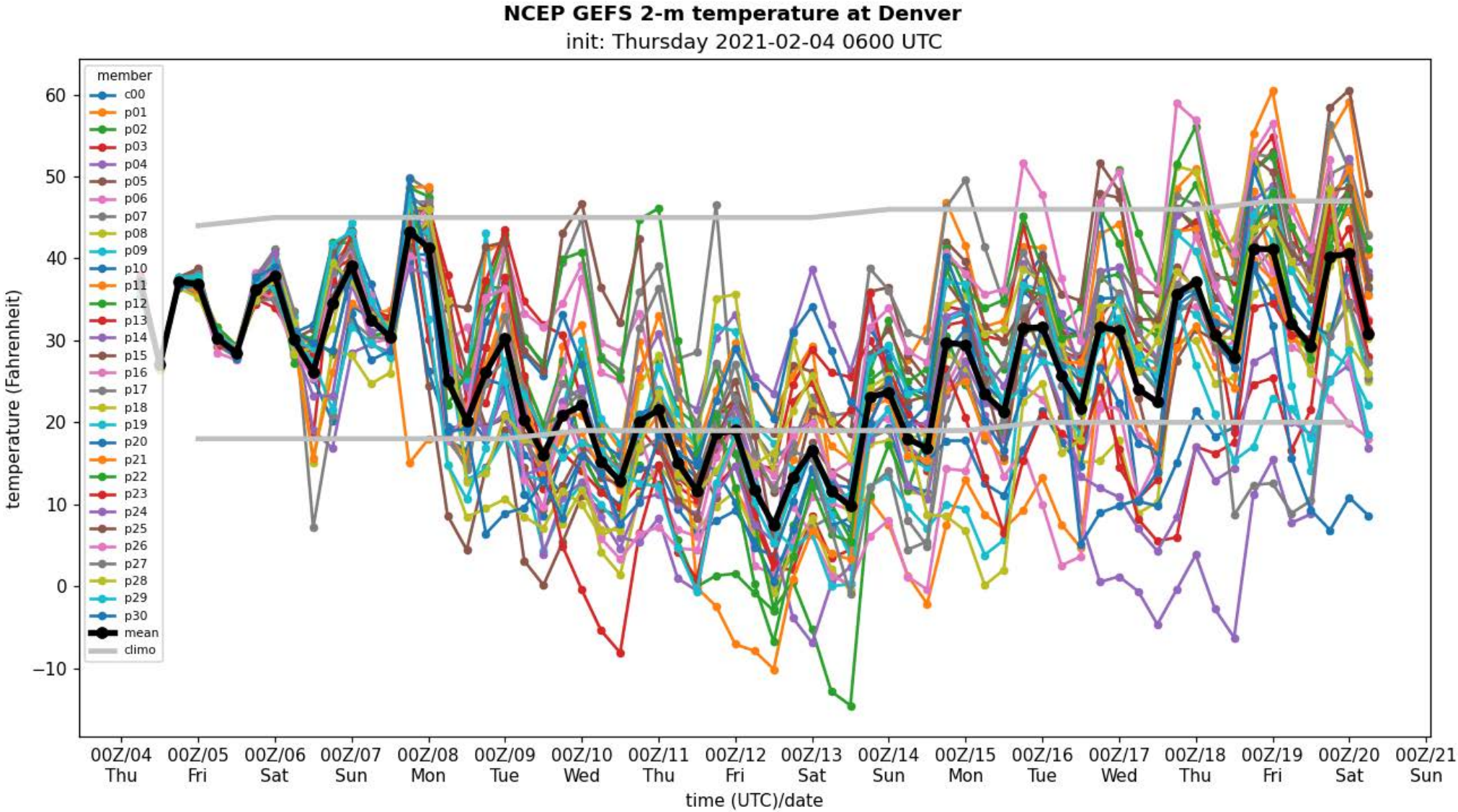
# NOAA 7-day precipitation forecast

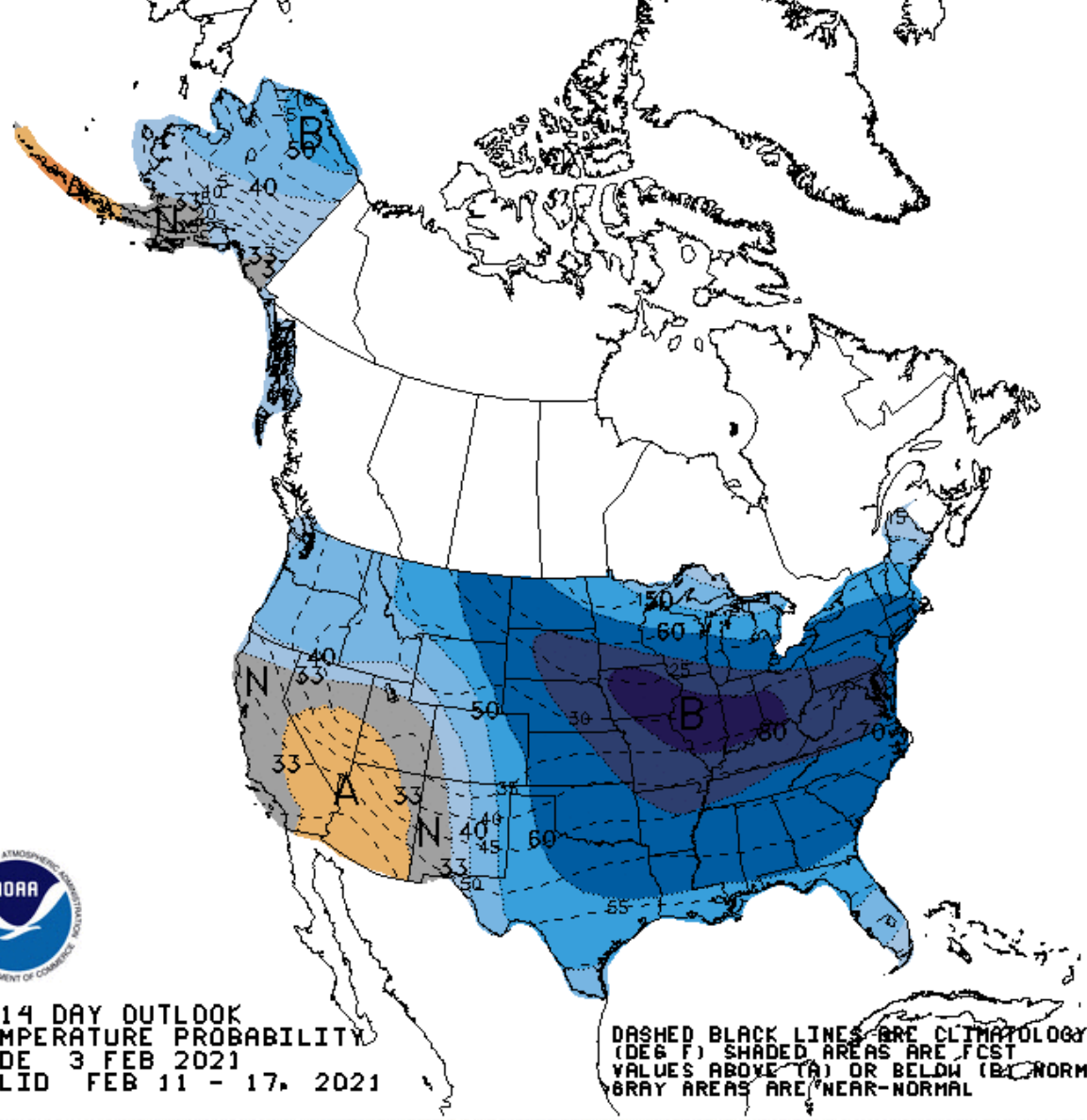


# NOAA 7-day precipitation forecast (difference from average)

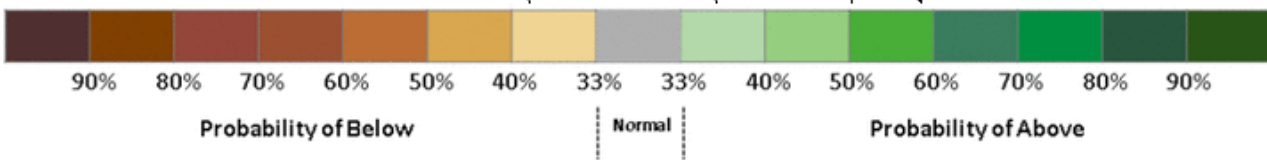
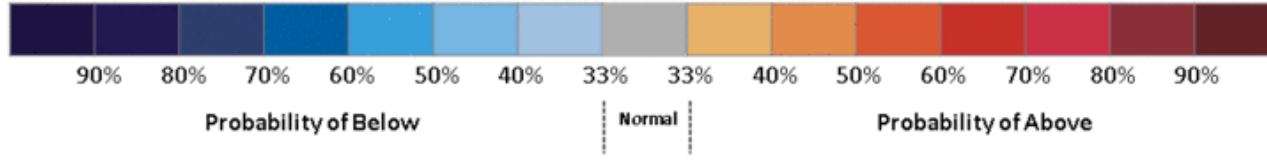
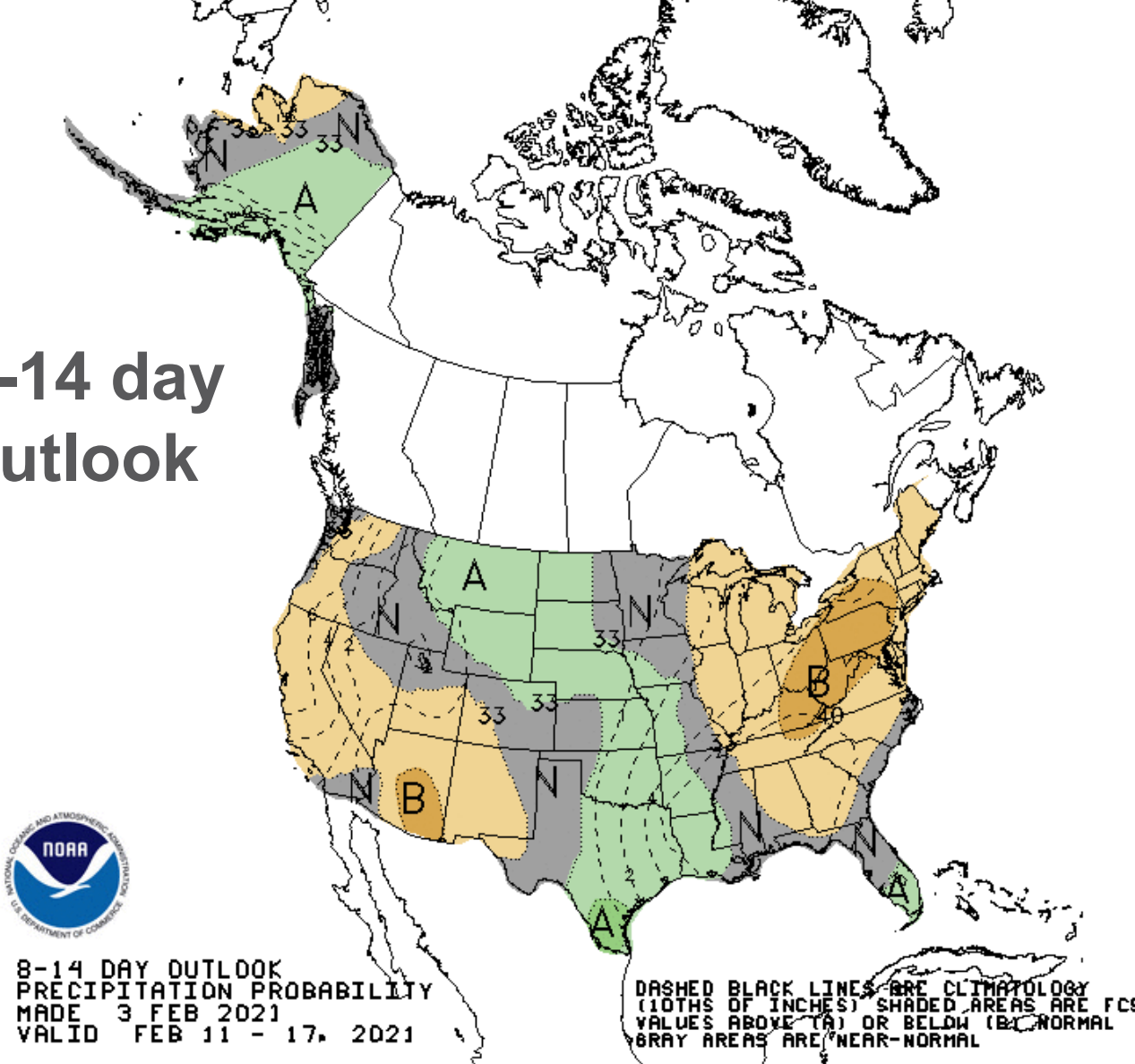


Looks to stay cold through next week; active in the northern mountains but dry on the plains

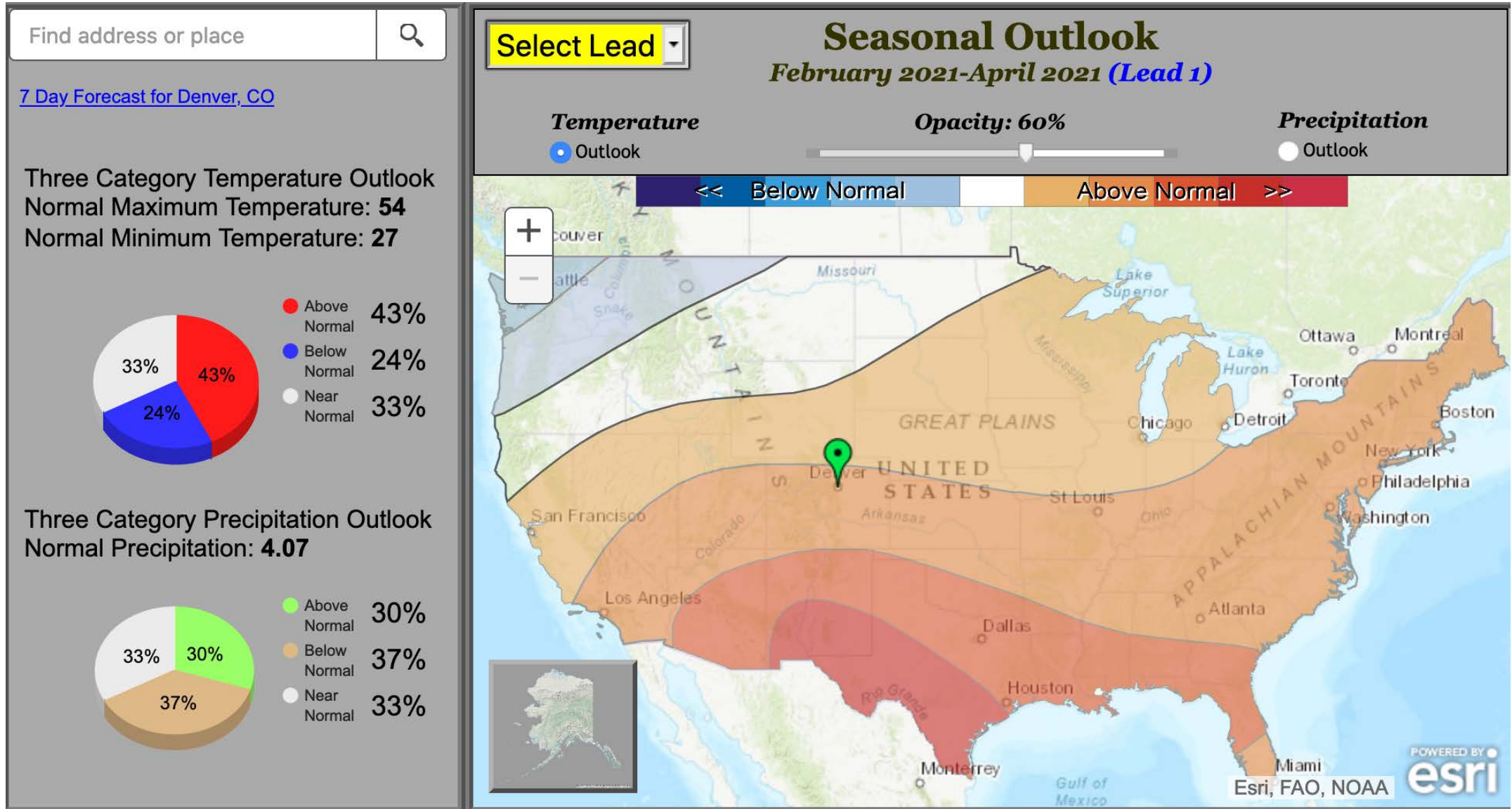




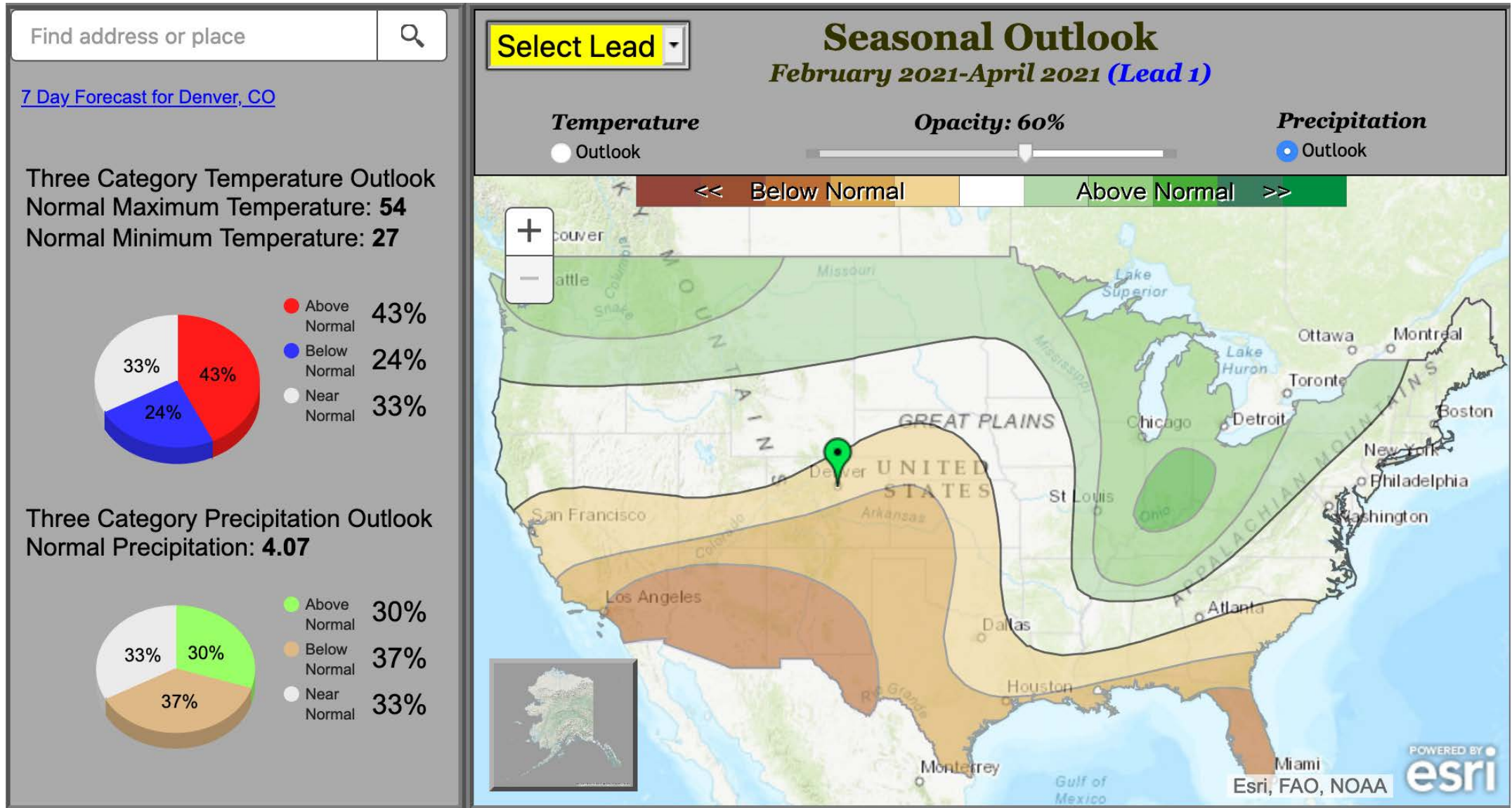
## 8-14 day outlook



# February-March-April outlook



# February-March-April outlook



# La Niña ongoing; may weaken by spring

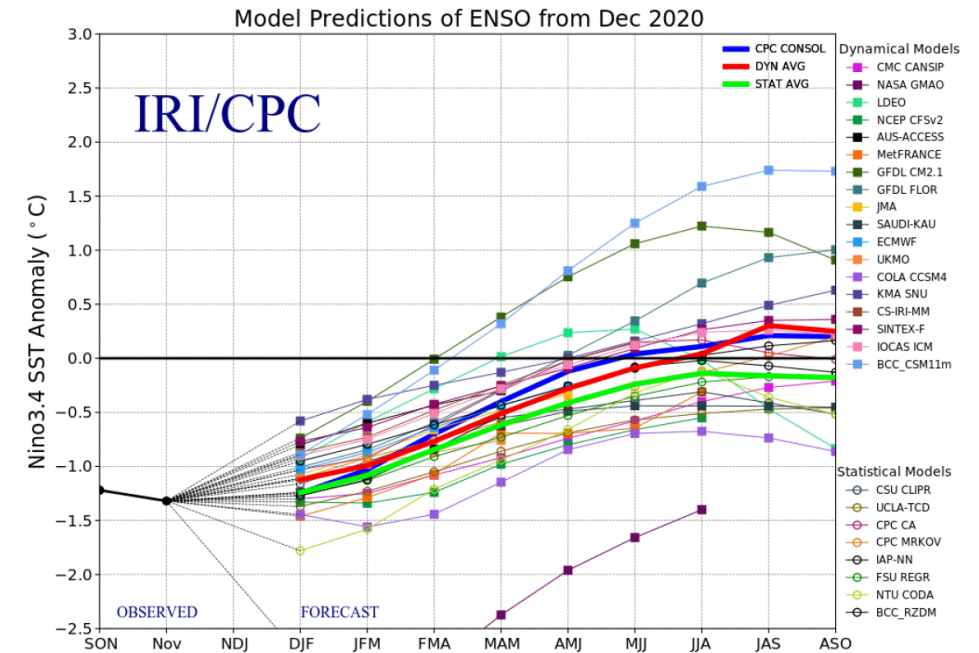
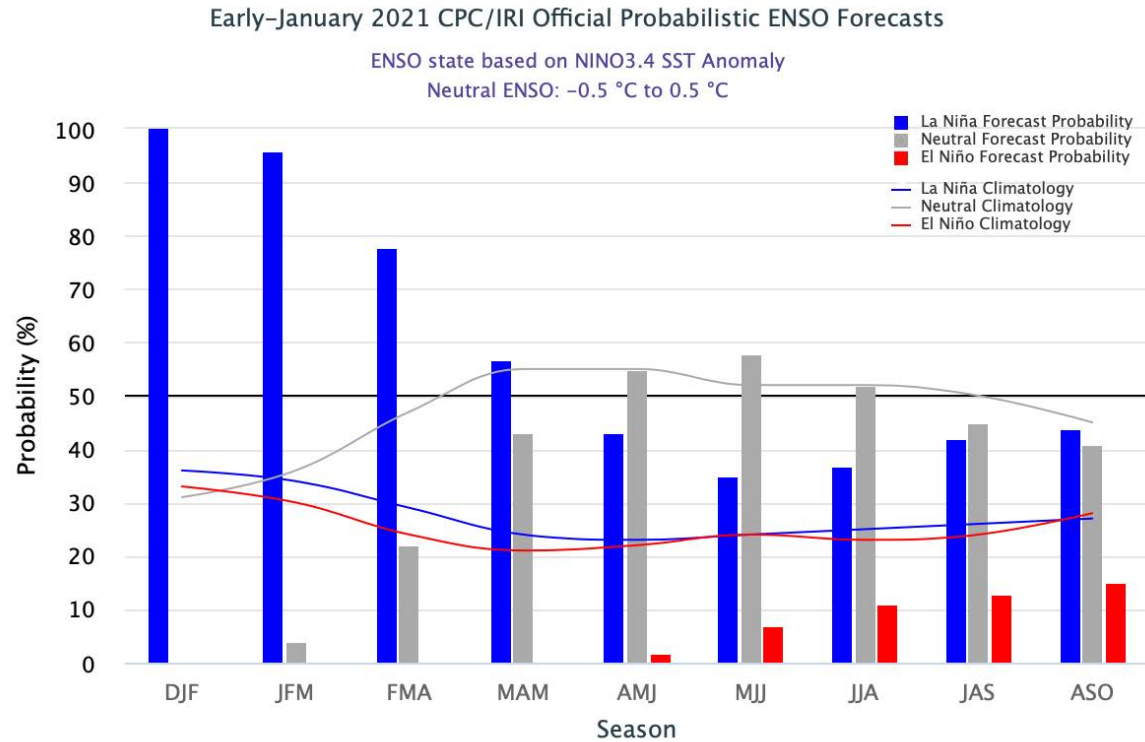


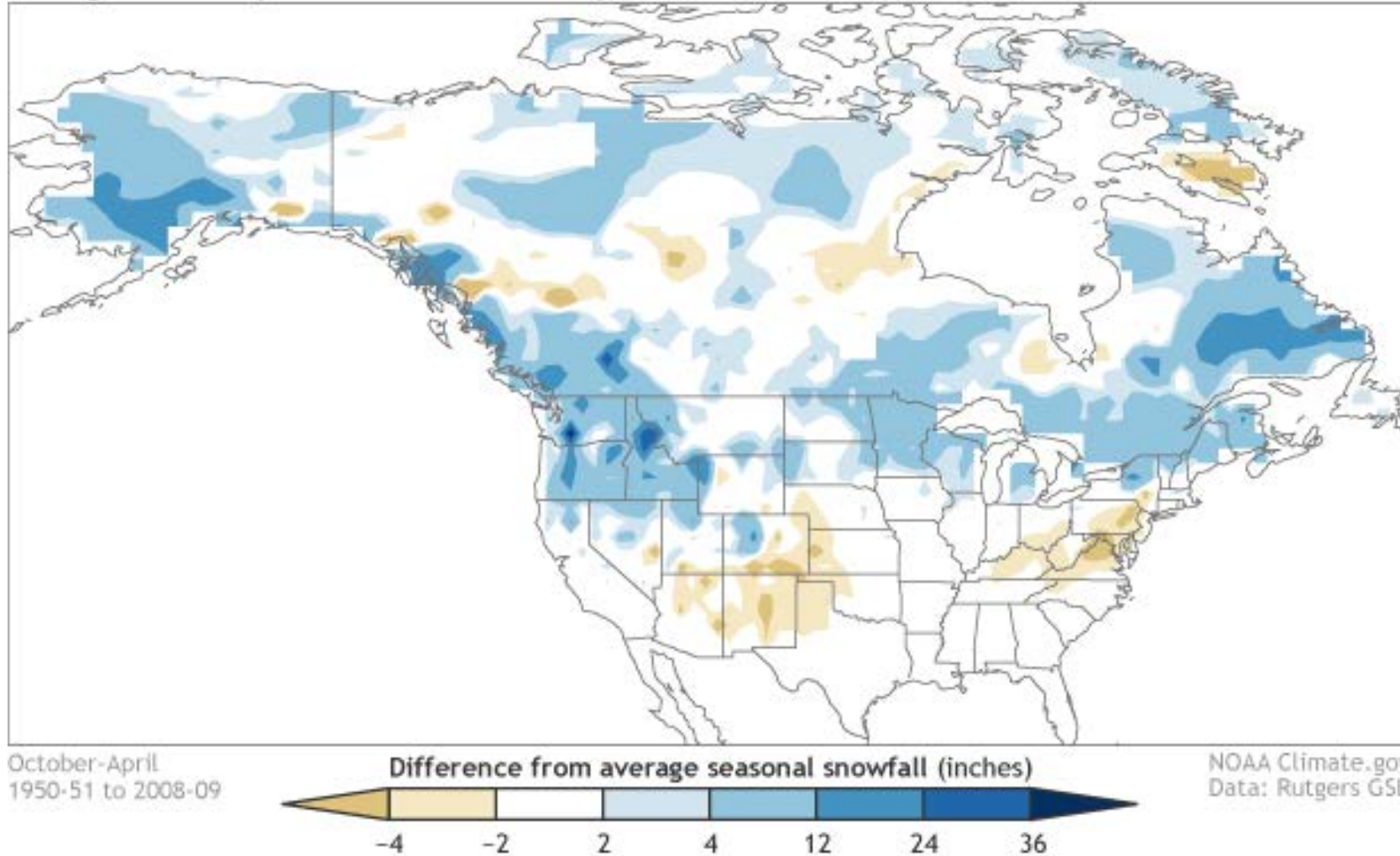
Figure 6. Forecasts of sea surface temperature (SST) anomalies for the Niño 3.4 region (5°N-5°S, 120°W-170°W). Figure updated 19 December 2020.

We're in a La Niña advisory. 95% chance that La Niña conditions will continue through the winter; 55% chance it transitions back to neutral in spring



# What's La Niña mean for snow?

Average snowfall patterns for all La Niña years

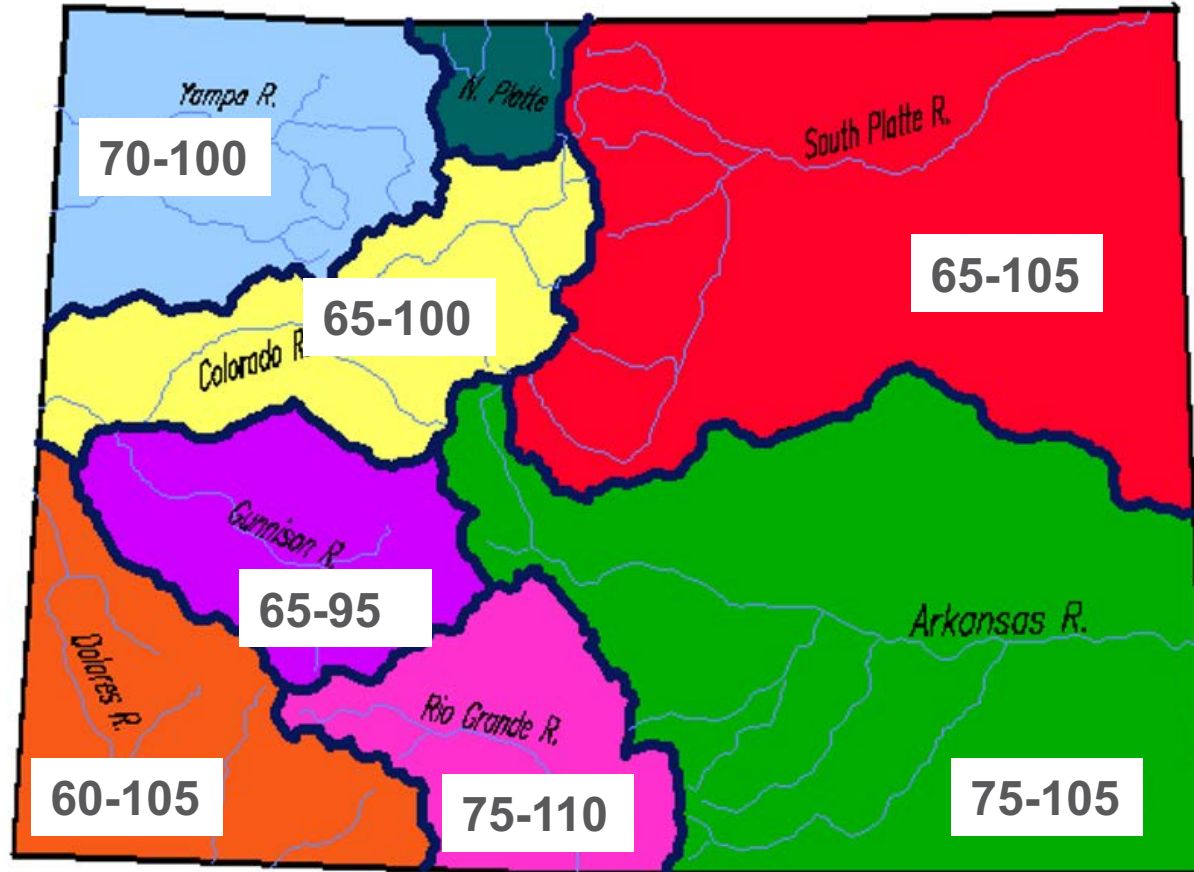


Not really what we're seeing so far this winter!

<https://www.climate.gov/news-features/blogs/enso/what-about-snow-during-la-niña-winters>



# Peak Snowpack Projection 20-80<sup>th</sup> percentile range



- Snowpack likely to peak well below normal
- Lots of time left in the mountain snow season, but the seasonal forecast leads us to expect numbers closer to the low end of the range

# Takeaways

- Colorado remains firmly in the clutches of drought. Impacts to this point have been largely agricultural and ecological, but the hydrologic impacts may be imminent
- January was warm and dry in the mountains. Current snowpack is well on the low end of normal statewide (the Rio Grande and Ark basins are near normal)
- We remain in a La Niña pattern, but this La Niña has not been typical. La Niña in winter is supposed to be a good thing for NW CO snowpack
- La Niña springs tend to lean dry, and rarely see a wet extreme
- We should be prepared for a low runoff year



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Thank you!

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