

# Colorado Climate Center – *WATF Climate Update*

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Peter Goble – Research Associate

Water Availability Task Force

September 25<sup>th</sup>, 2019



ATMOSPHERIC SCIENCE  
COLORADO STATE UNIVERSITY

## 2019 Water Year To Date

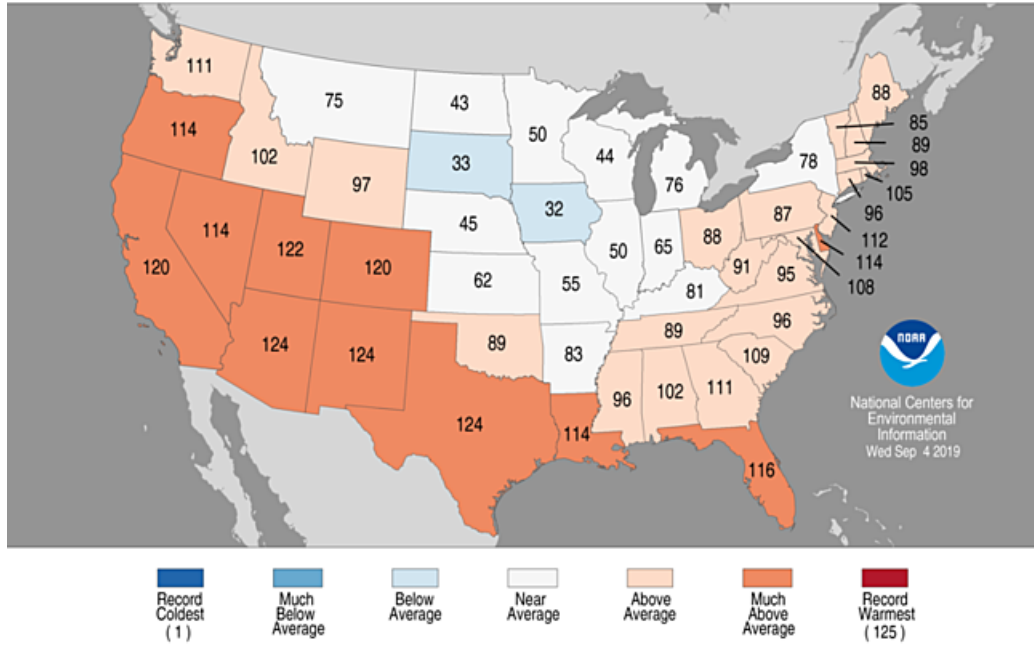
temperature, precipitation,  
evaporative demand

**West Magnolia Trail. September  
22<sup>nd</sup>, 2019**

**Photo Credit: Dr. Katie McCaffrey**



Statewide Average Temperature Ranks  
 August 2019  
 Period: 1895–2019

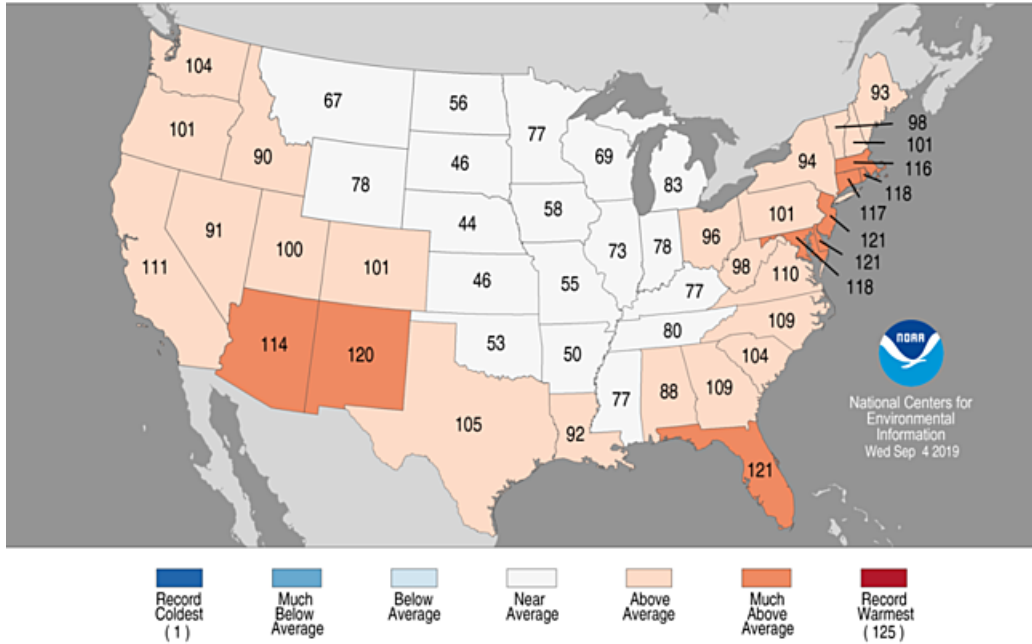


Month	T Rank (of 125 years)	Above, below, or near avg?
Oct	35 <sup>th</sup>	below
Nov	39 <sup>th</sup>	below
Dec	80 <sup>th</sup>	near
Jan	90 <sup>th</sup>	above
Feb	28 <sup>th</sup>	below
Mar	66 <sup>th</sup>	near
Apr	108 <sup>th</sup>	above
May	5 <sup>th</sup>	much below
June	42 <sup>nd</sup>	below
July	104 <sup>th</sup>	above
August	120 <sup>th</sup>	much above

Water year thus far: 0.1<sup>T</sup> above the 20<sup>th</sup> century average  
 Coldest(?) since 2010



Statewide Average Temperature Ranks  
June–August 2019  
Period: 1895–2019

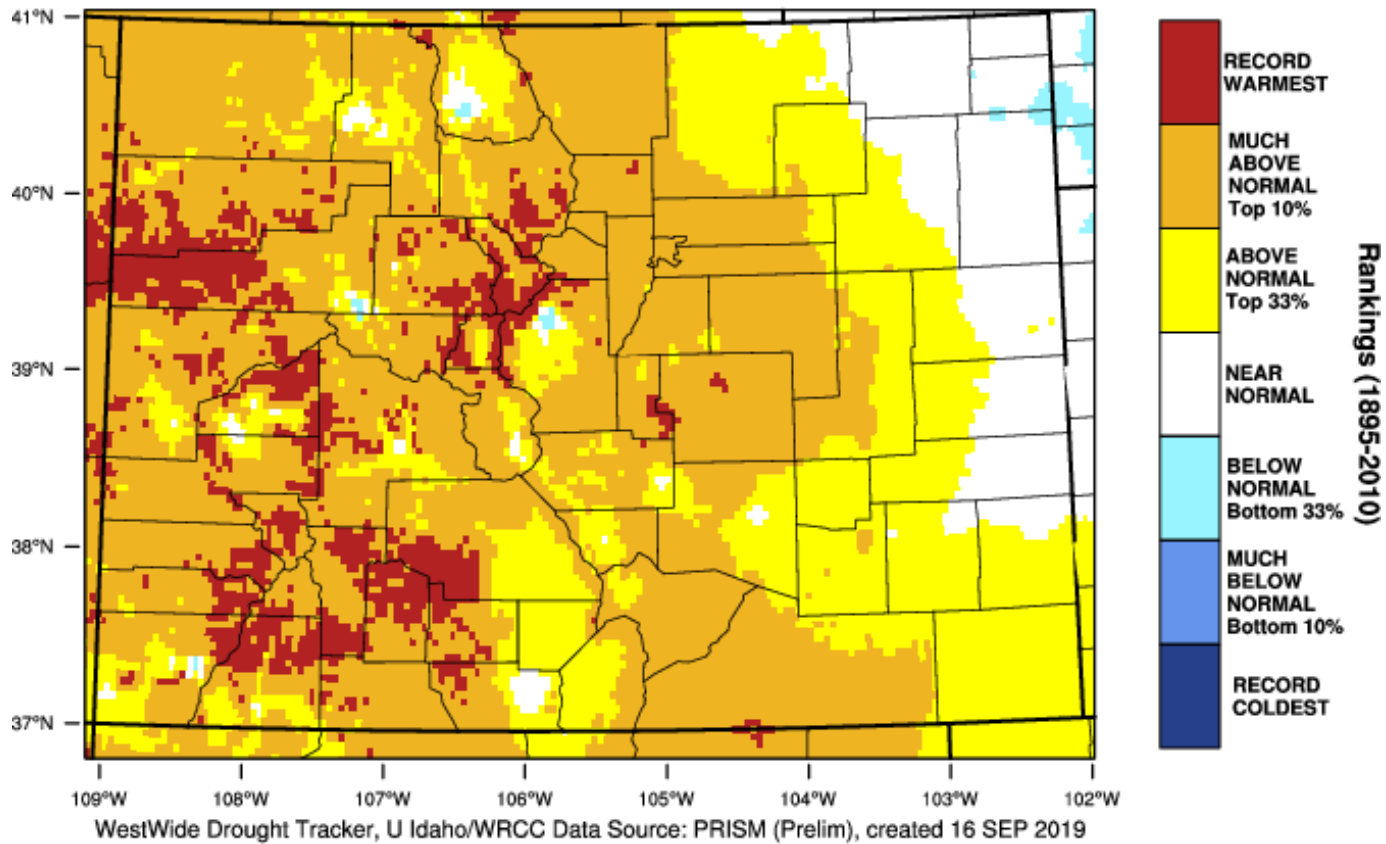


Water year thus far: 0.1°F above the 20<sup>th</sup> century average  
Coldest(?) since 2010

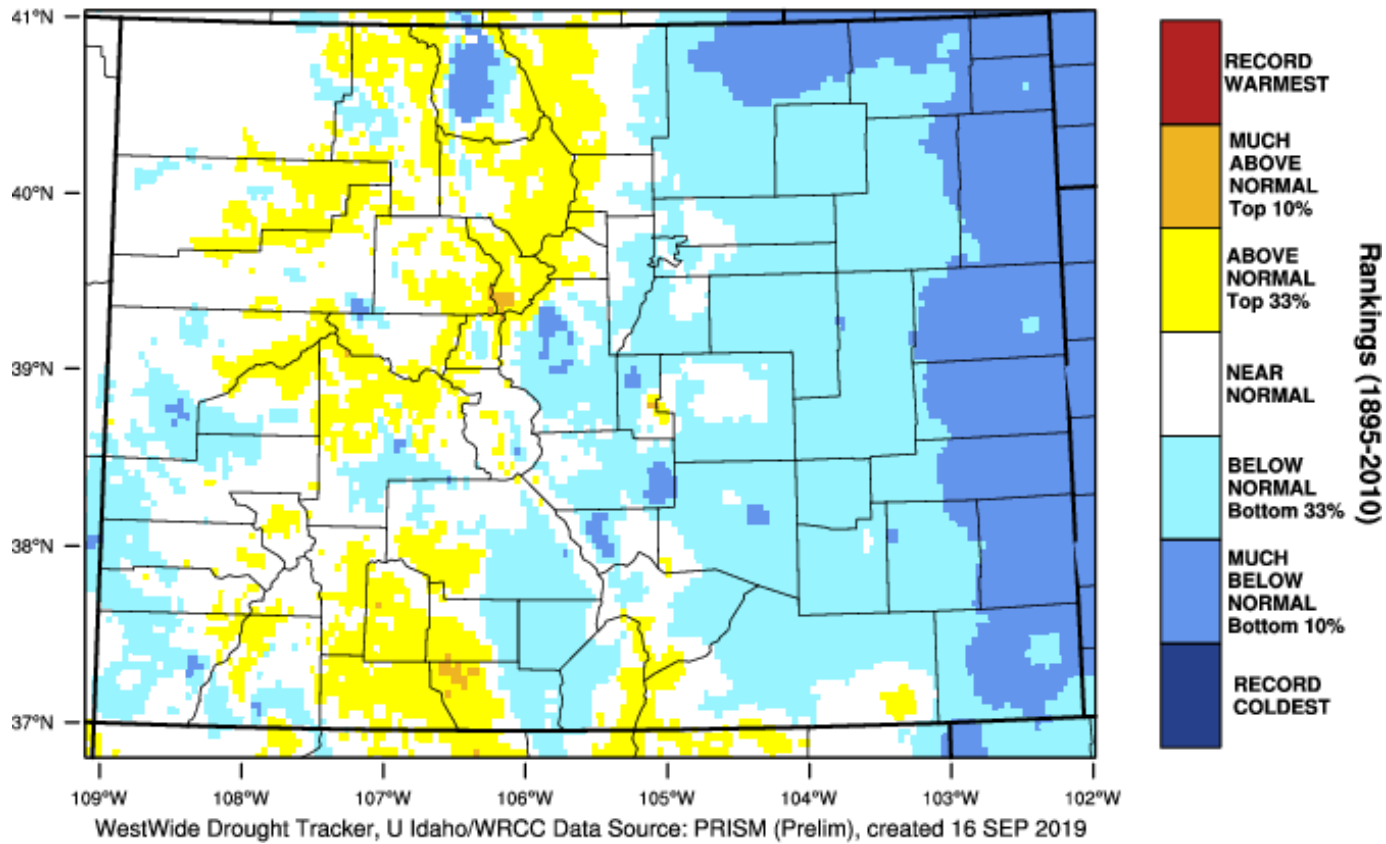
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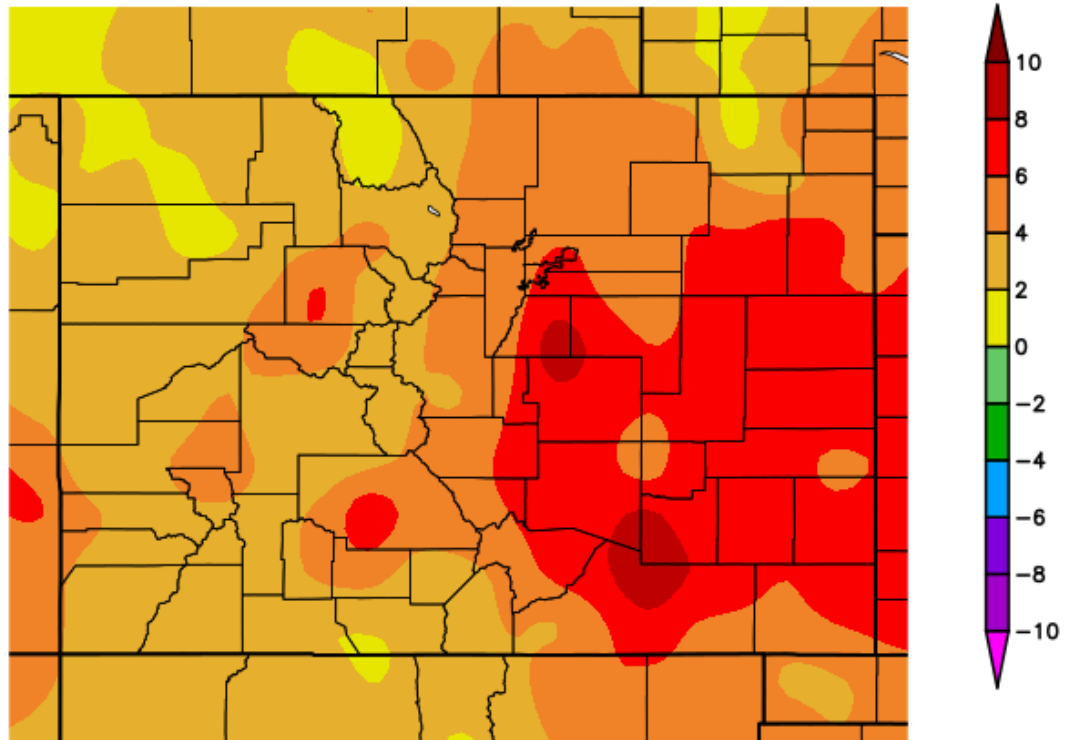
### Colorado - Mean Temperature August 2019 Percentile



### Colorado - Mean Temperature October-August 2019 Percentile



Departure from Normal Temperature (F)  
9/1/2019 - 9/23/2019



Generated 9/24/2019 at HPRCC using provisional data.

NOAA Regional Climate Centers



# 90-Degree Days

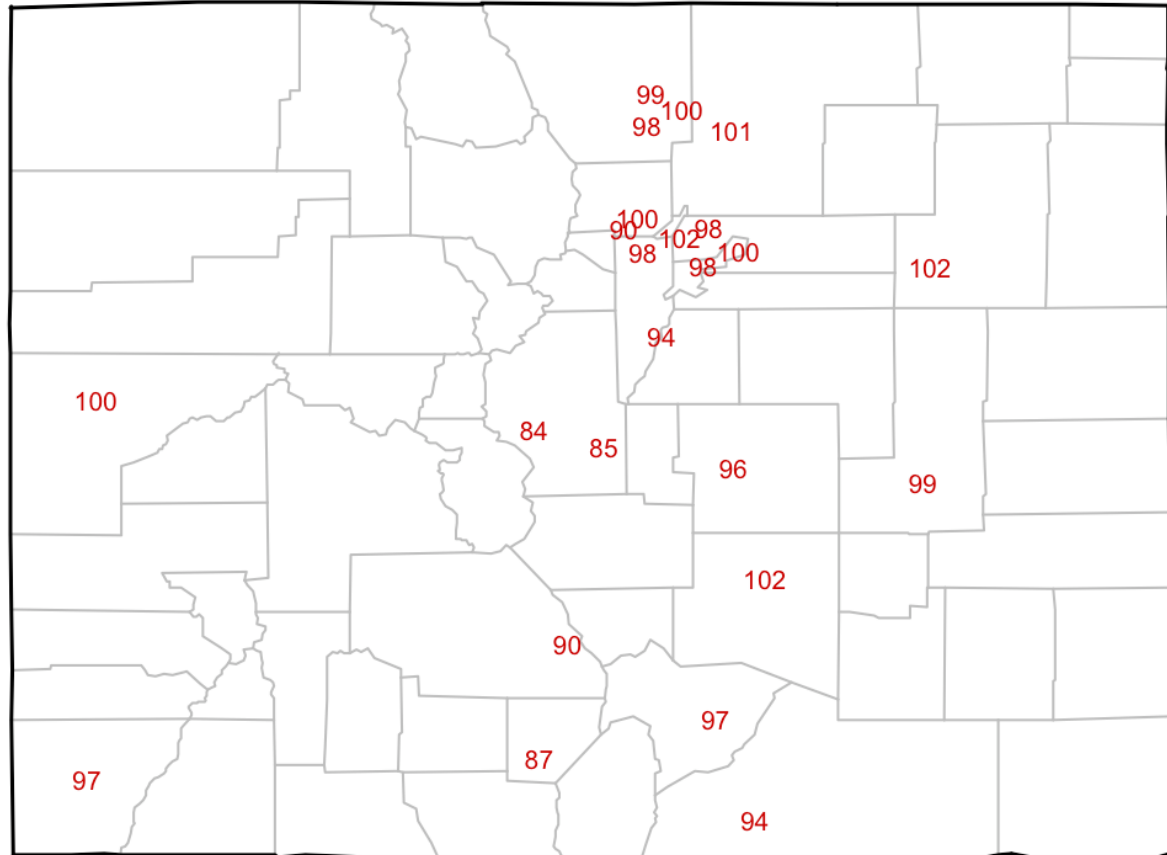
Location	2019 Total	2018
Fort Collins	36	37
Denver	46	53
Boulder	41	46
Colorado Springs	36	34
Pueblo	76	83
Akron	34	51
Lamar	73	77
Alamosa	0	5
Cortez	58	60
Grand Junction	73	90
Dillon	0	0





# Labor Day Weekend Heat

Hottest September Temperature Records Broken in 2019



Stations with more 30+ years of data, also including DIA  
Map by Colorado Climate Center, data from ACIS

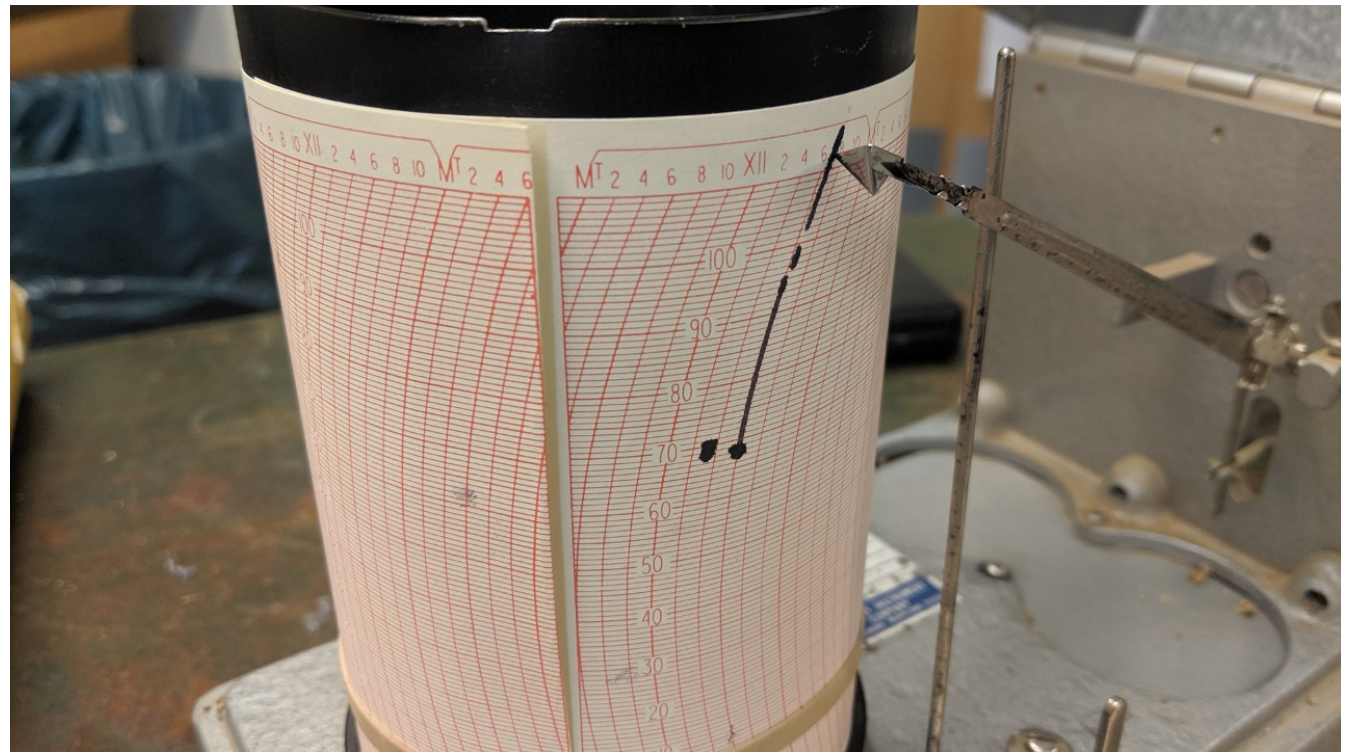


# State Temperature Record Pending Approval from NCEI

A temperature of 115 F was recorded on July 20<sup>th</sup>, 2019 at the Cooperative Observer Network Site at John Martin Dam on

The thermograph responsible was tested at the Colorado State College of Engineering

No official announcement yet



# Daily records

(Water year thus far:  
Oct 1 –Sep 21)

Weather Record Broken	Record broken for a day	Record broken for a month
Highest max temperature	510	62
Highest min temperature	1251	78
Lowest max temperature	1374	20
Lowest min temperature	720	6
Precipitation	1272	46
Snowfall	364	9

Source: <https://www.ncdc.noaa.gov/cdo-web/datatools/records>



Compare to  
last water  
year:

NUMBER OF DAILY AND MONTHLY STATION RECORDS BROKEN in CO

Weather Record Broken	Record broken for a day	Record broken for a month
Highest Max Temperature	1,696	22
Highest Min Temperature	2,971	100
Lowest Max Temperature	560	0
Lowest Min Temperature	292	0
Highest Precipitation	786	17
Highest Snowfall	196	2

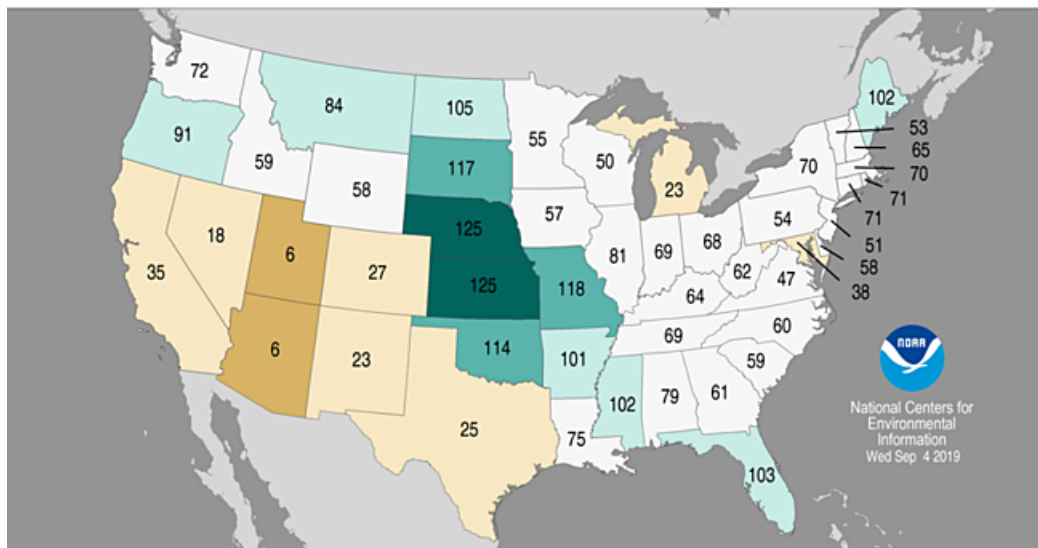
From NOAA NCEP's Select U.S. Records: [www.ncdc.noaa.gov/extremes/records](http://www.ncdc.noaa.gov/extremes/records)



## Statewide Precipitation Ranks

August 2019

Period: 1895–2019

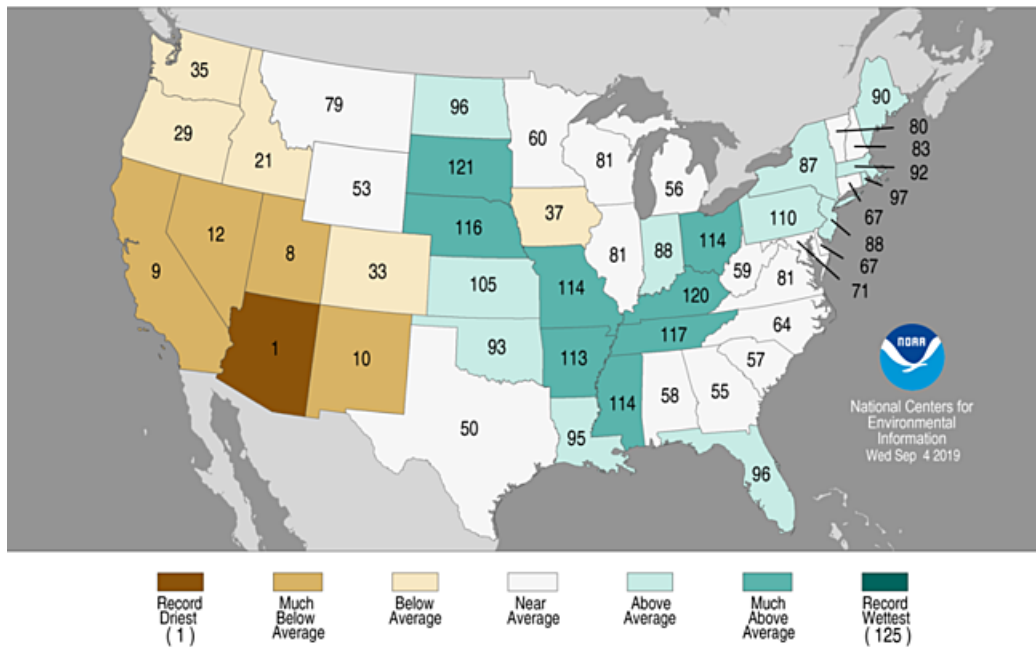


**27<sup>th</sup> wettest October – August**

Month	P Rank (of 125 years)	Above, below, or near avg?
Oct	112 <sup>th</sup>	above
Nov	45 <sup>th</sup>	near
Dec	31 <sup>st</sup>	below
Jan	94 <sup>th</sup>	above
Feb	109 <sup>th</sup>	above
Mar	120 <sup>th</sup>	much above
Apr	42 <sup>nd</sup>	below
May	111 <sup>th</sup>	above
June	82 <sup>nd</sup>	near
July	29 <sup>th</sup>	below
August	27 <sup>th</sup>	below



Statewide Precipitation Ranks  
 June–August 2019  
 Period: 1895–2019

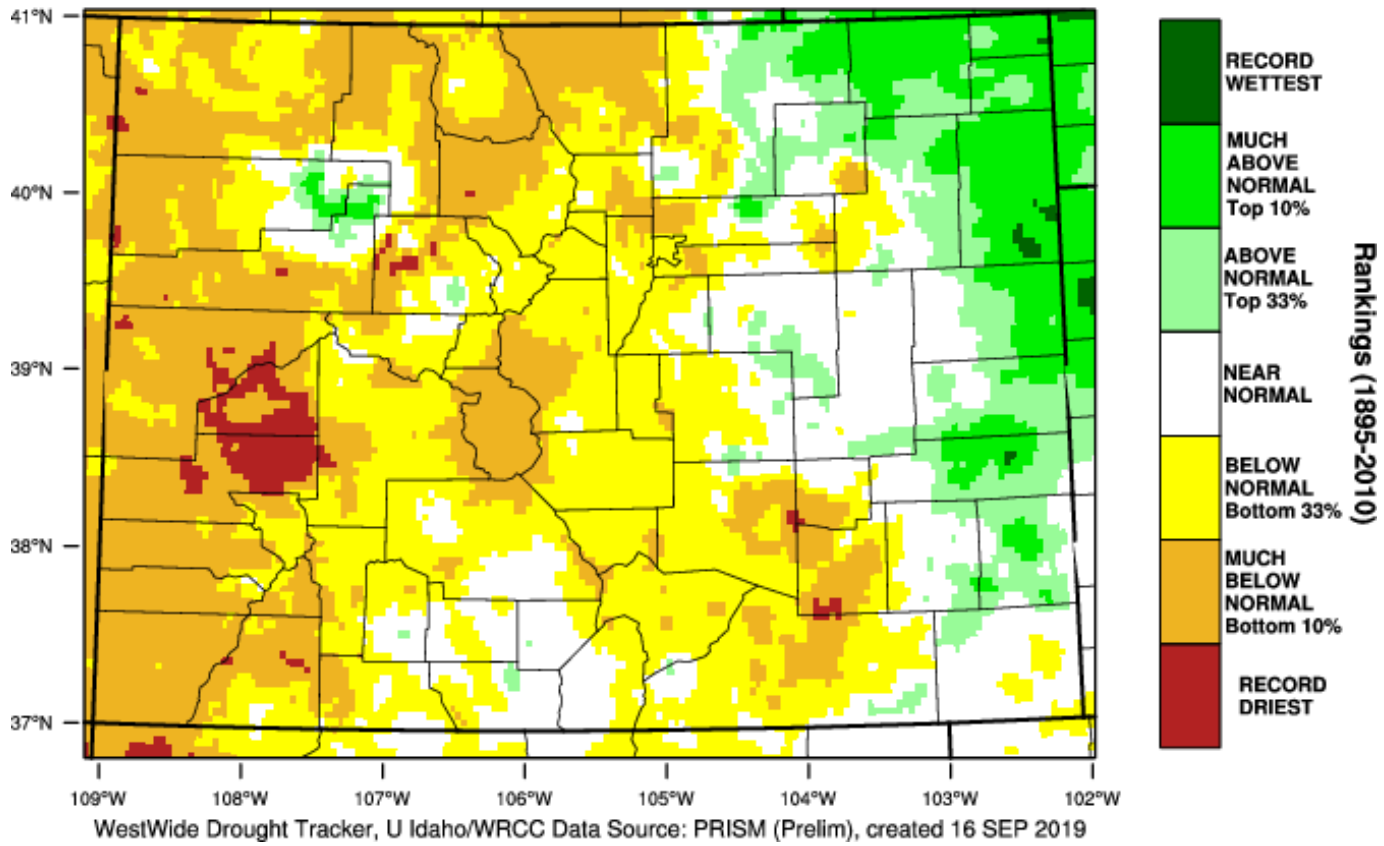


**27<sup>th</sup> wettest October – August**

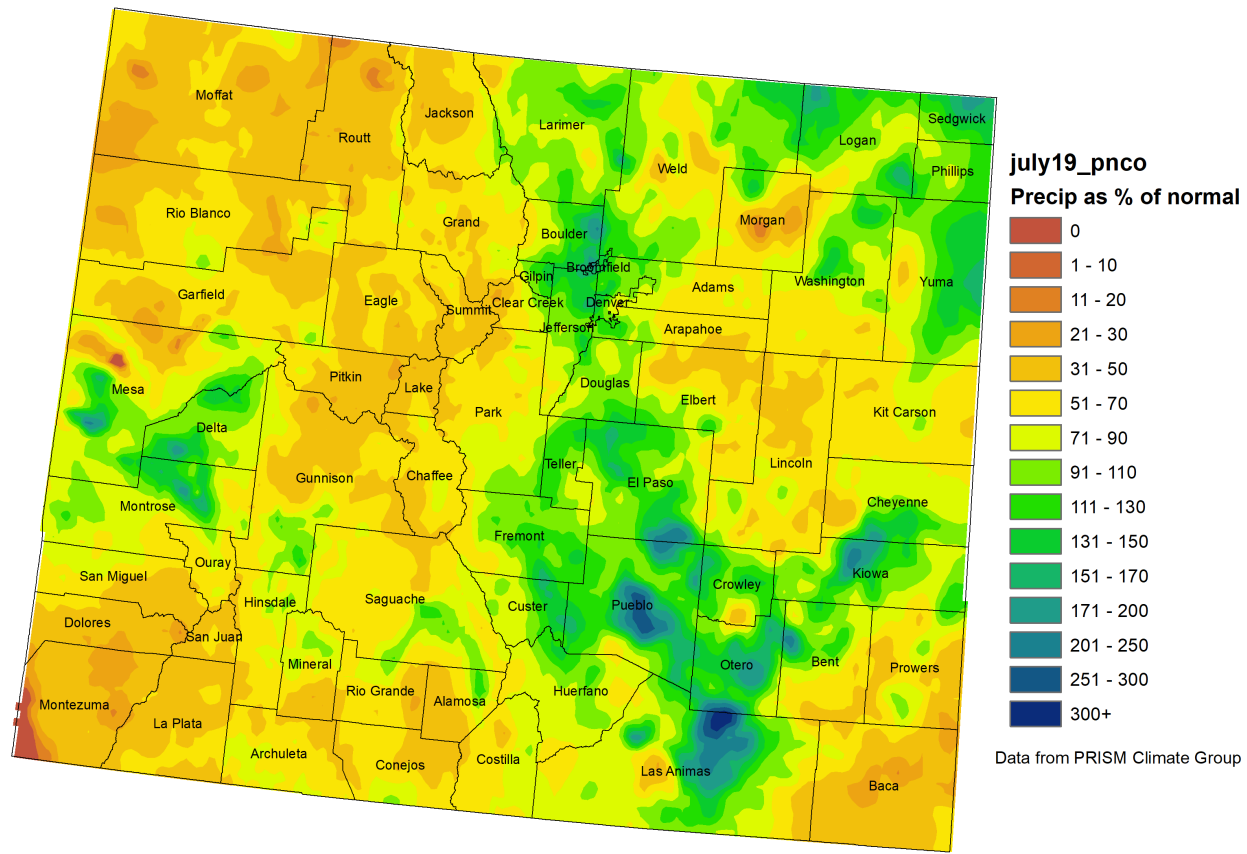
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### Colorado - Precipitation August 2019 Percentile

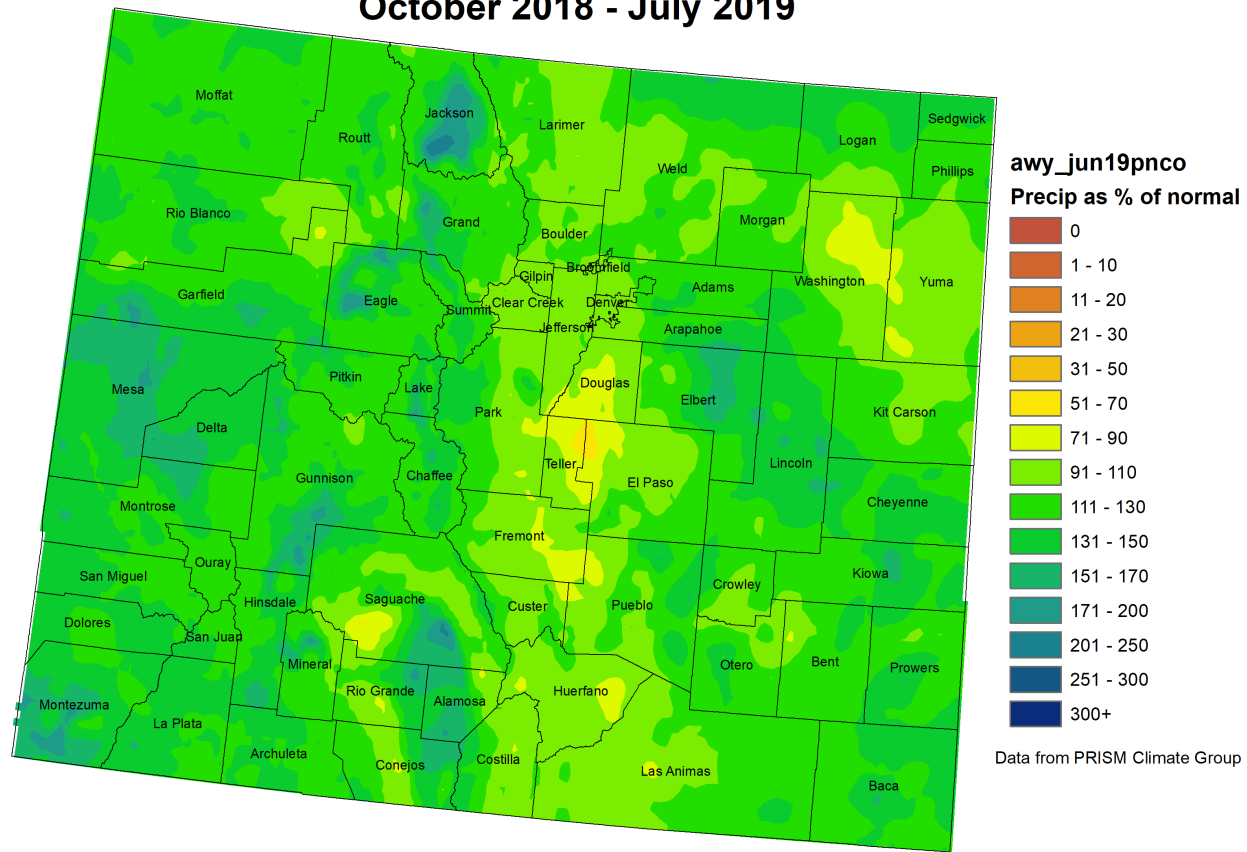


## Colorado July 2019 Precipitation as a Percentage of Normal

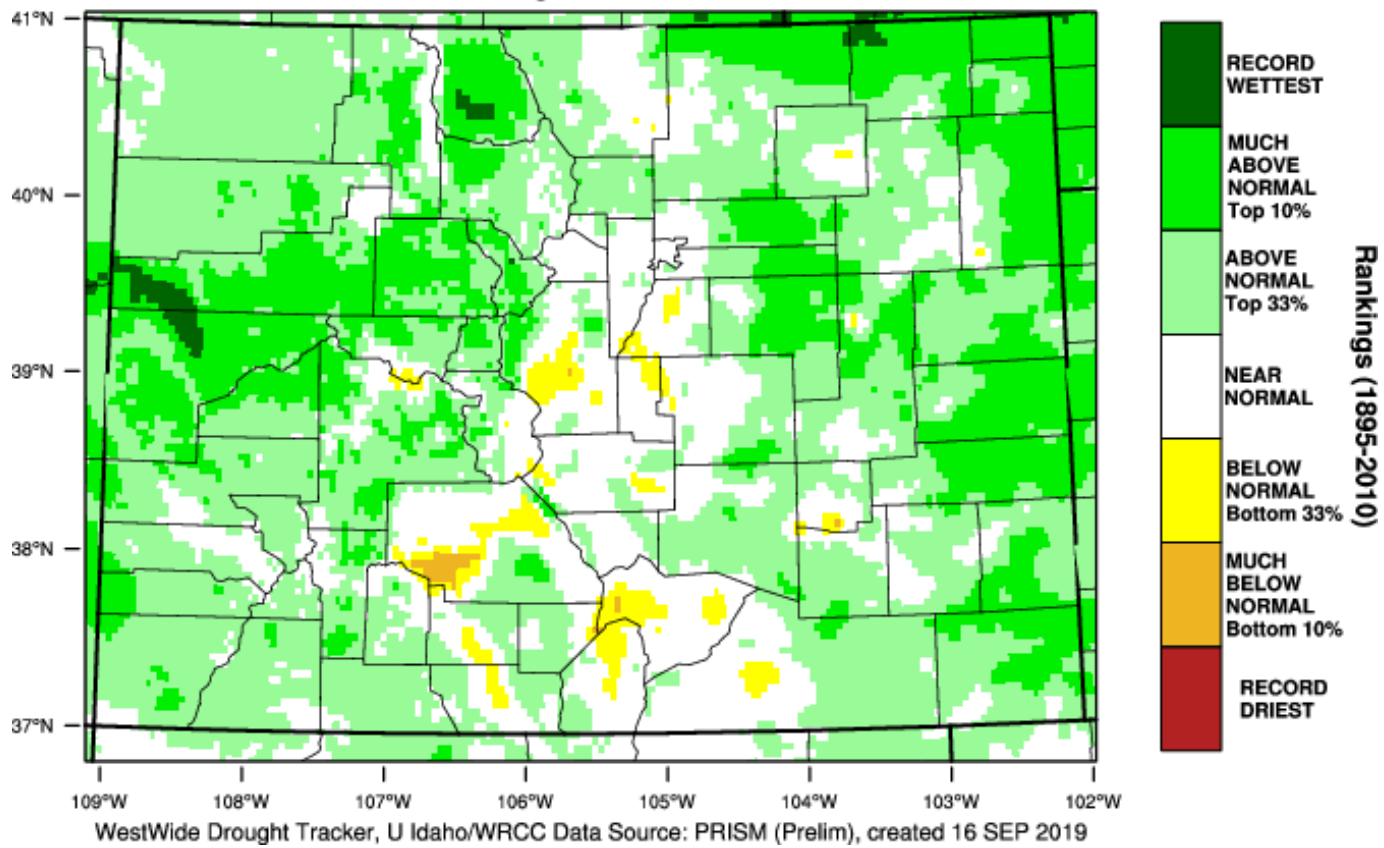


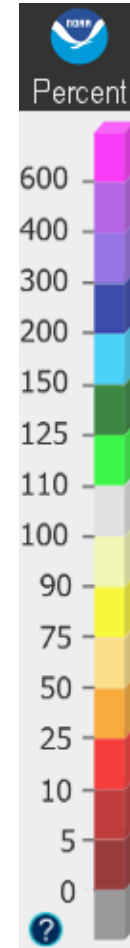
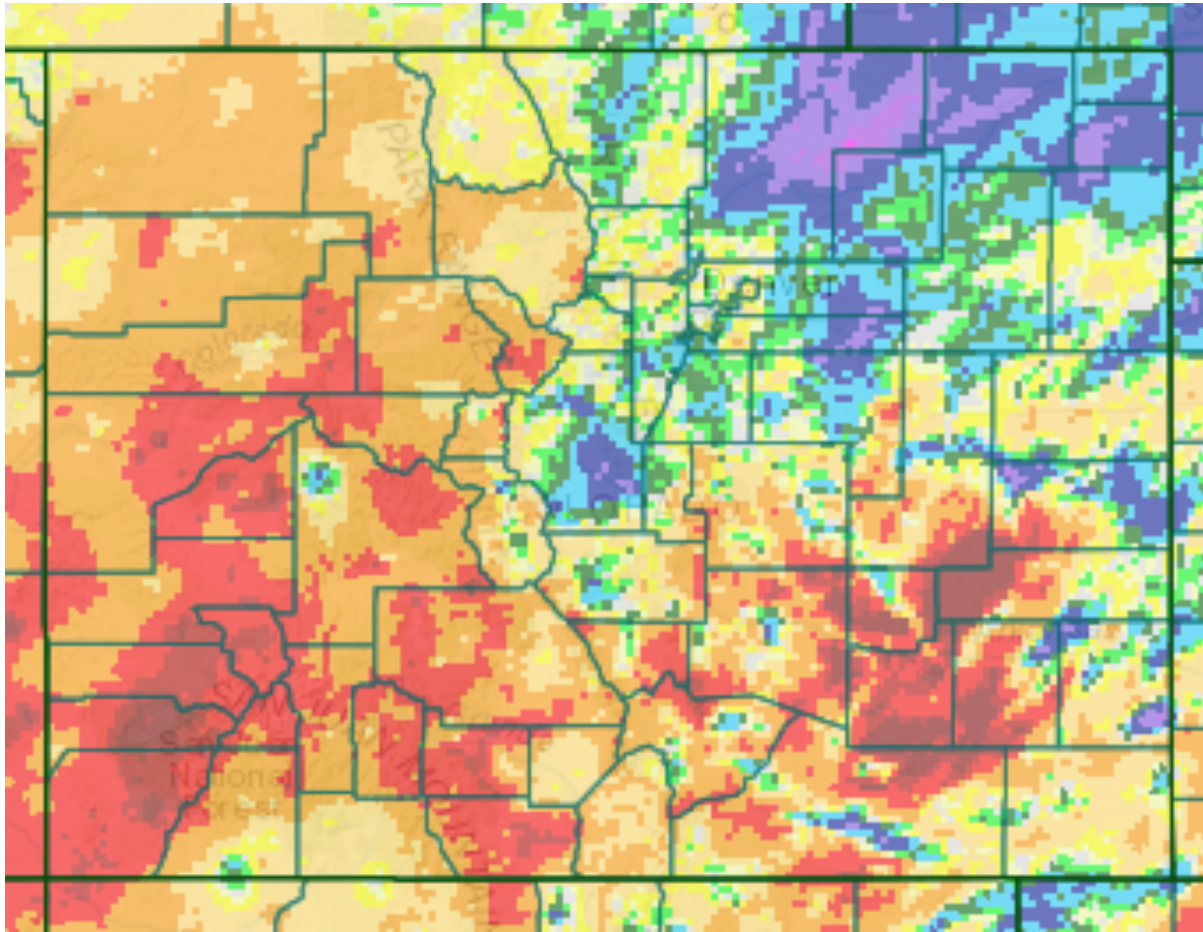


## Colorado Water Year 2019 Precipitation as a Percentage of Normal October 2018 - July 2019



### Colorado - Precipitation October-August 2019 Percentile

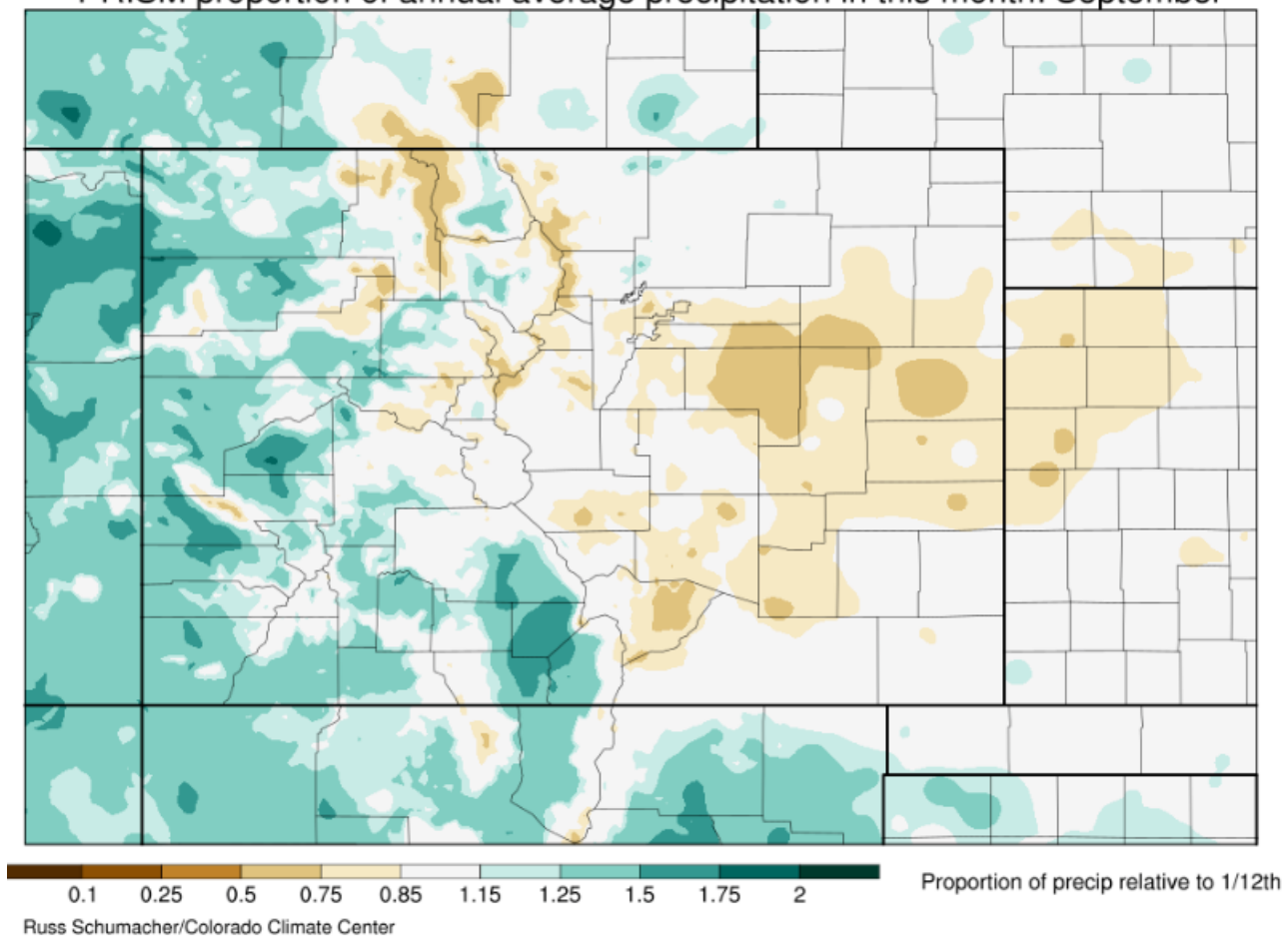




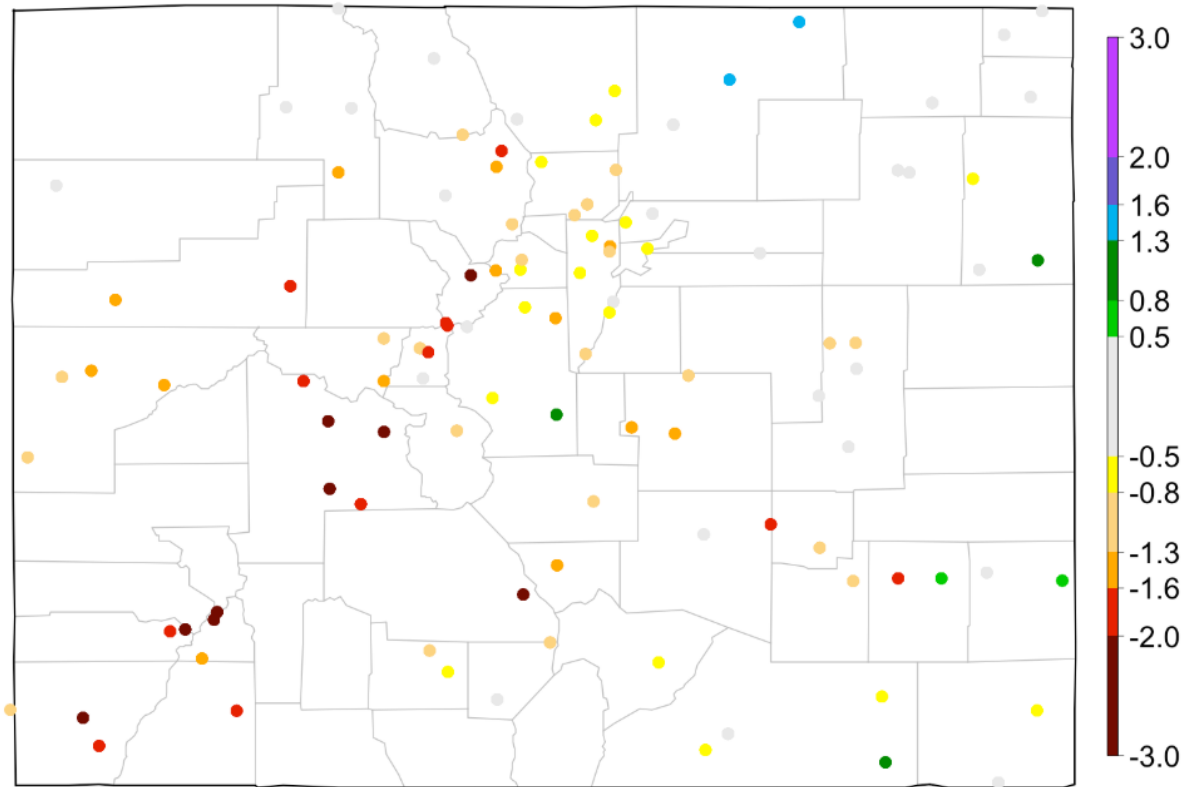
September  
month to date  
percent of  
normal  
precipitation



PRISM proportion of annual average precipitation in this month: September



30-day SPI: 8/23/2019 - 9/21/2019

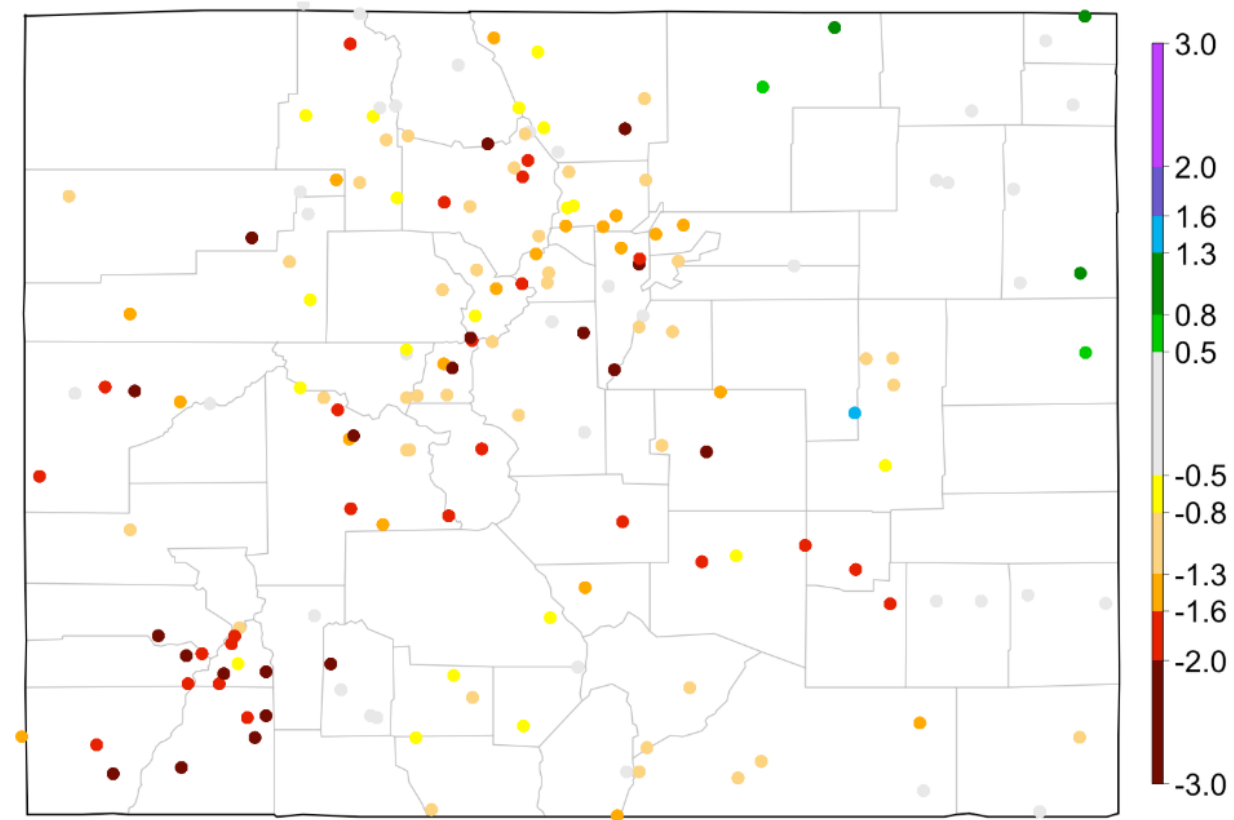


Data from High Plains Regional Climate Center and ACIS

<http://climate.colostate.edu/~drought/spi.html>



60-day SPI: 7/24/2019 - 9/21/2019

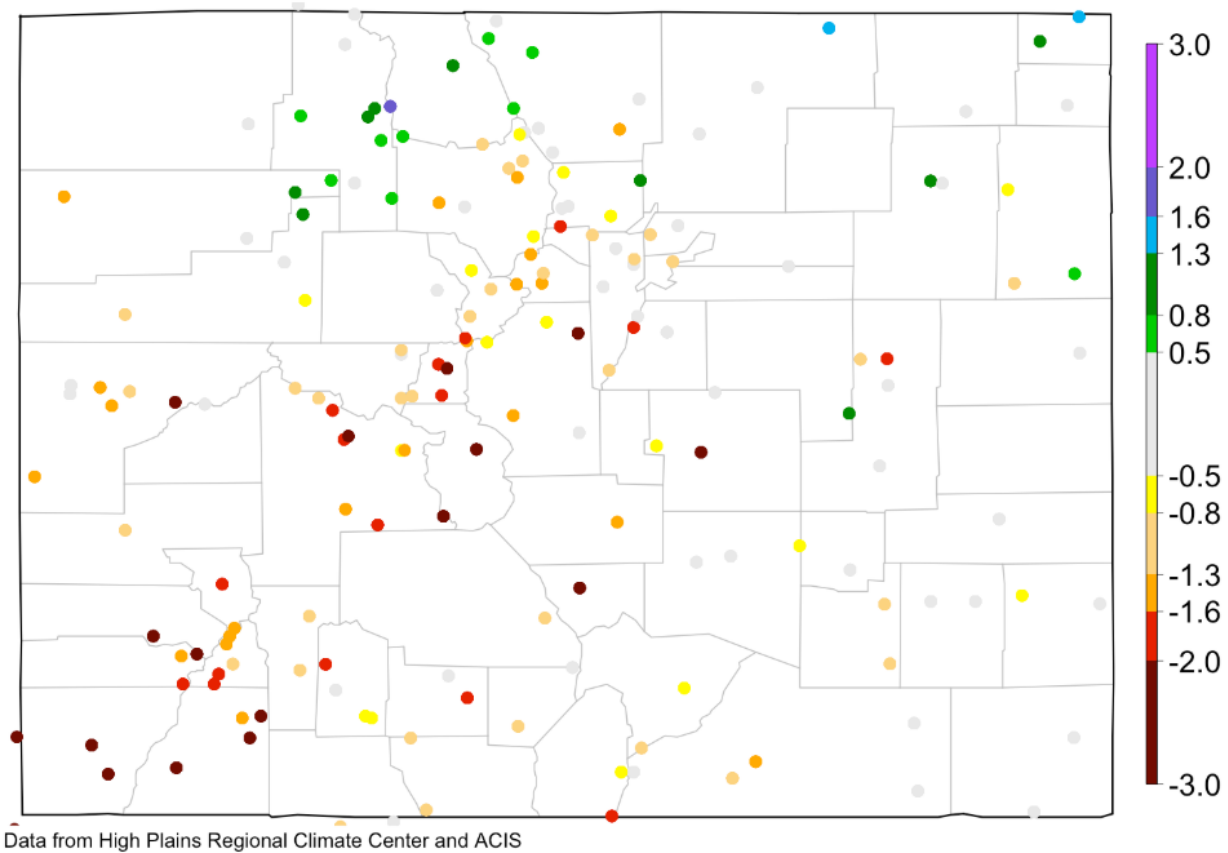


Data from High Plains Regional Climate Center and ACIS

<http://climate.colostate.edu/~drought/spi.html>



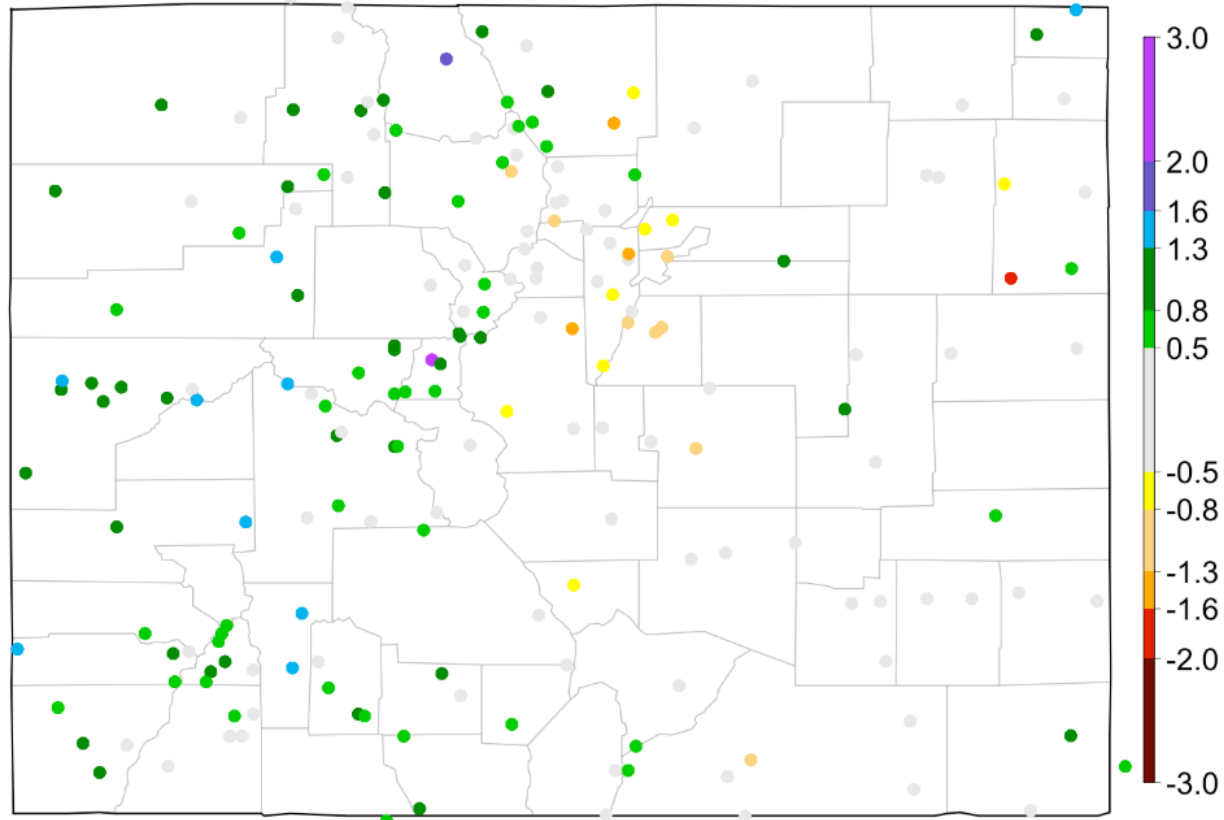
120-day SPI: 5/25/2019 - 9/21/2019



<http://climate.colostate.edu/~drought/spi.html>



12-month SPI: 9/22/2018 - 9/21/2019



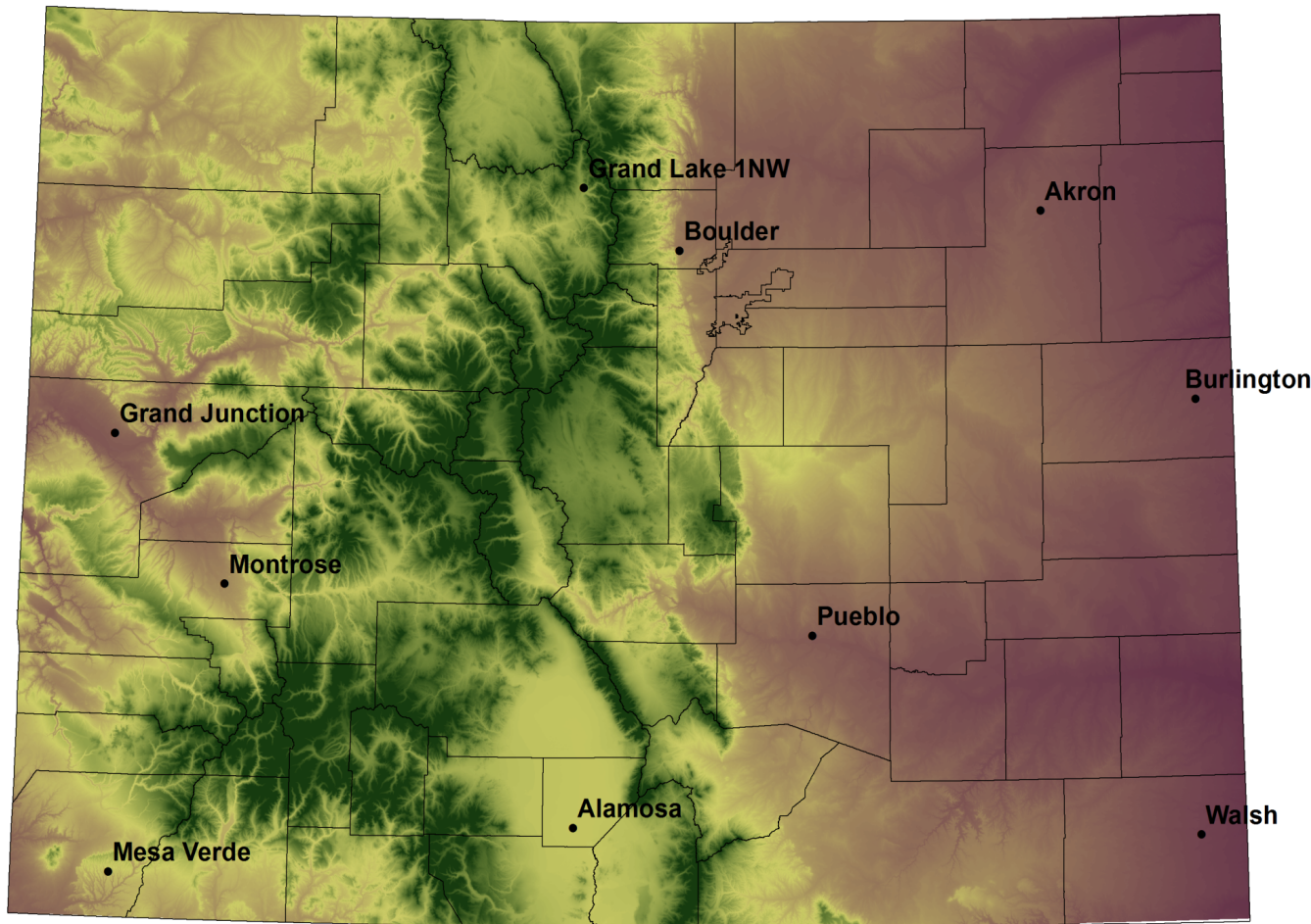
Data from High Plains Regional Climate Center and ACIS

<http://climate.colostate.edu/~drought/spi.html>





## NWS Cooperative Stations for WATF



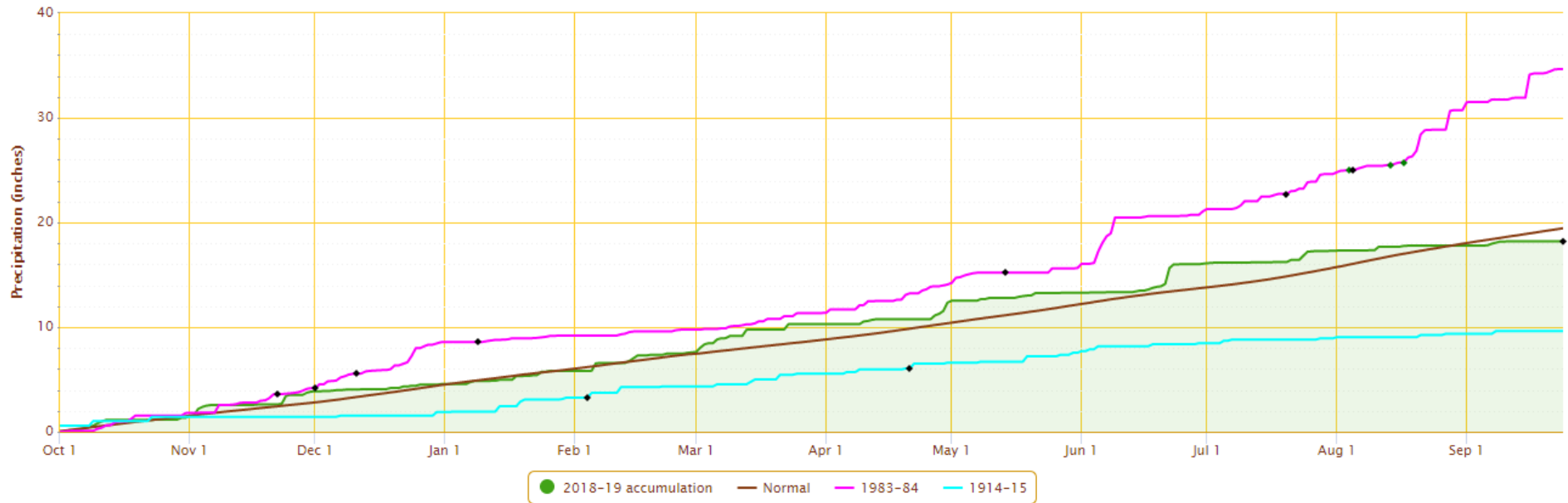
## Water Year 2019 – Station Updates



# Grand Lake

## Accumulated Precipitation - GRAND LAKE 1 NW, CO

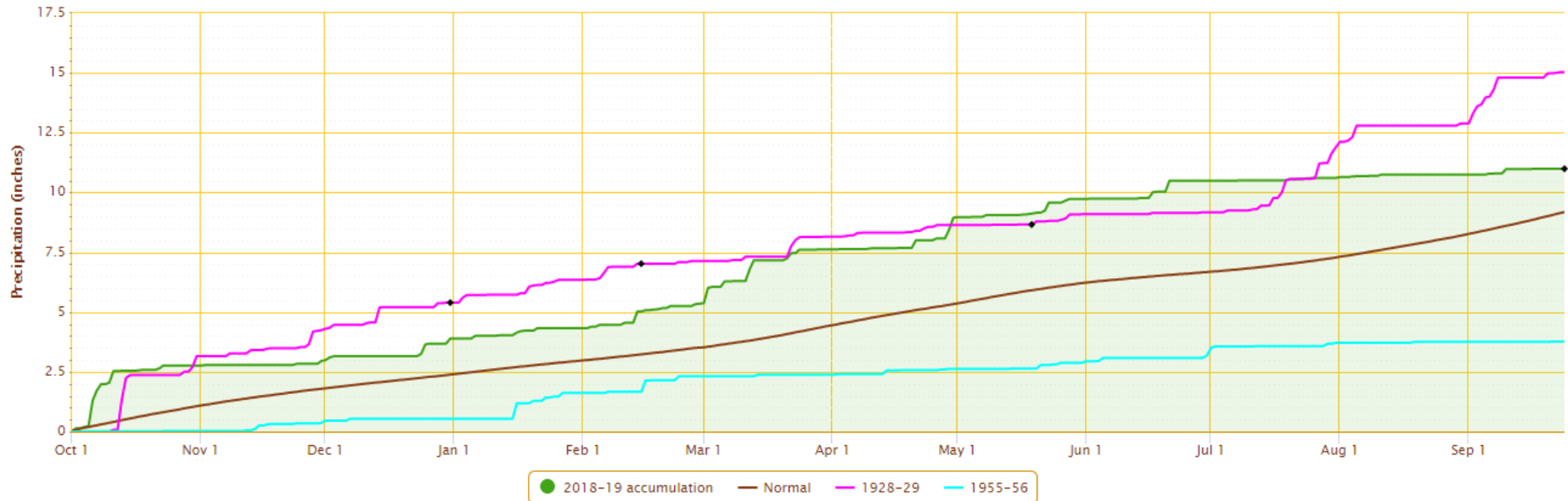
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



# Grand Junction

Accumulated Precipitation – GRAND JUNCTION WALKER FIELD, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



17<sup>th</sup> wettest on record through this point in the water year

2.7" above average

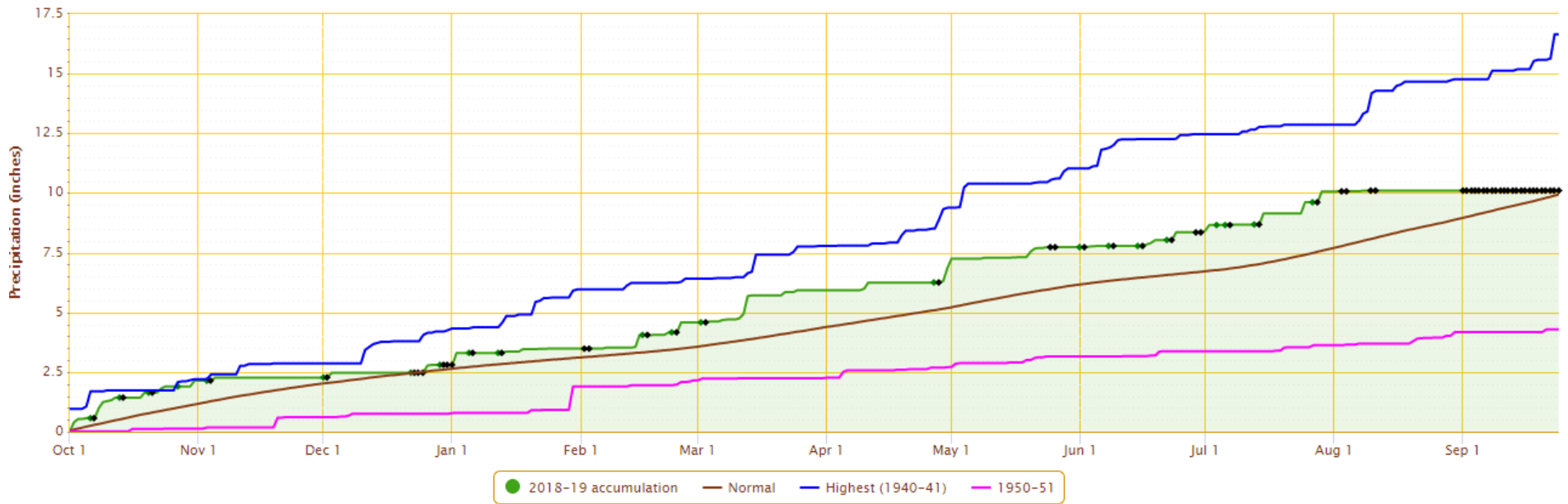
Driest year on record since the start of July at 0.50", over twice as dry as 2018



# Montrose

## Accumulated Precipitation - MONTROSE NO 2, CO

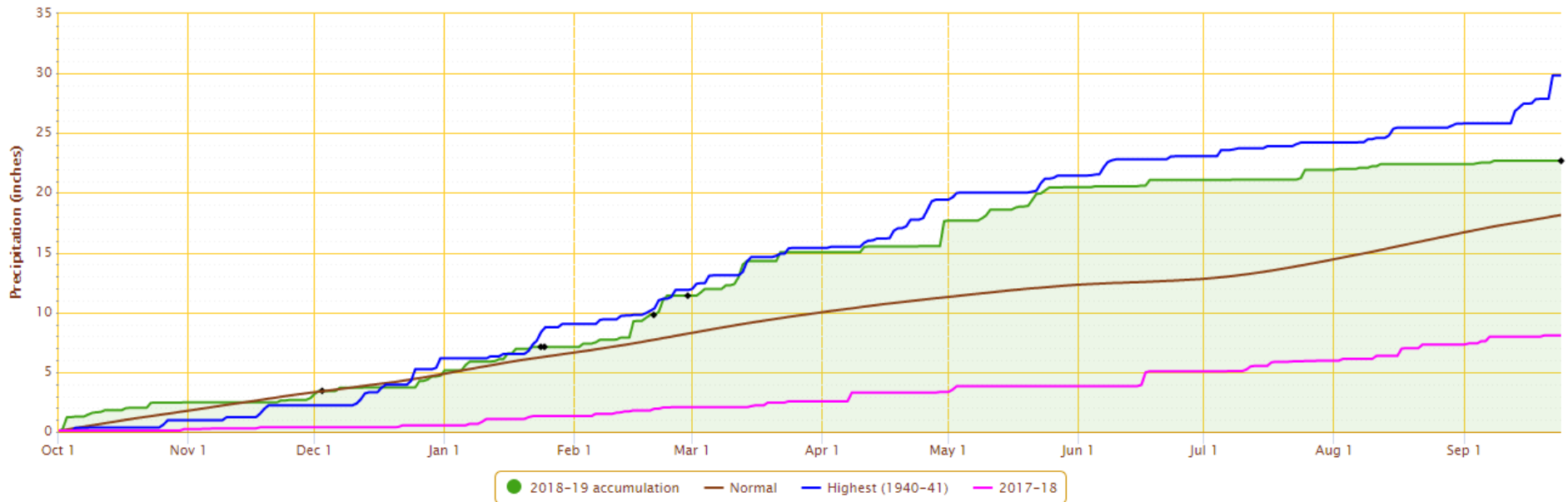
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



# Mesa Verde NP

Accumulated Precipitation - MESA VERDE NP, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



4<sup>th</sup> driest year since July 1<sup>st</sup>, drier than 2018

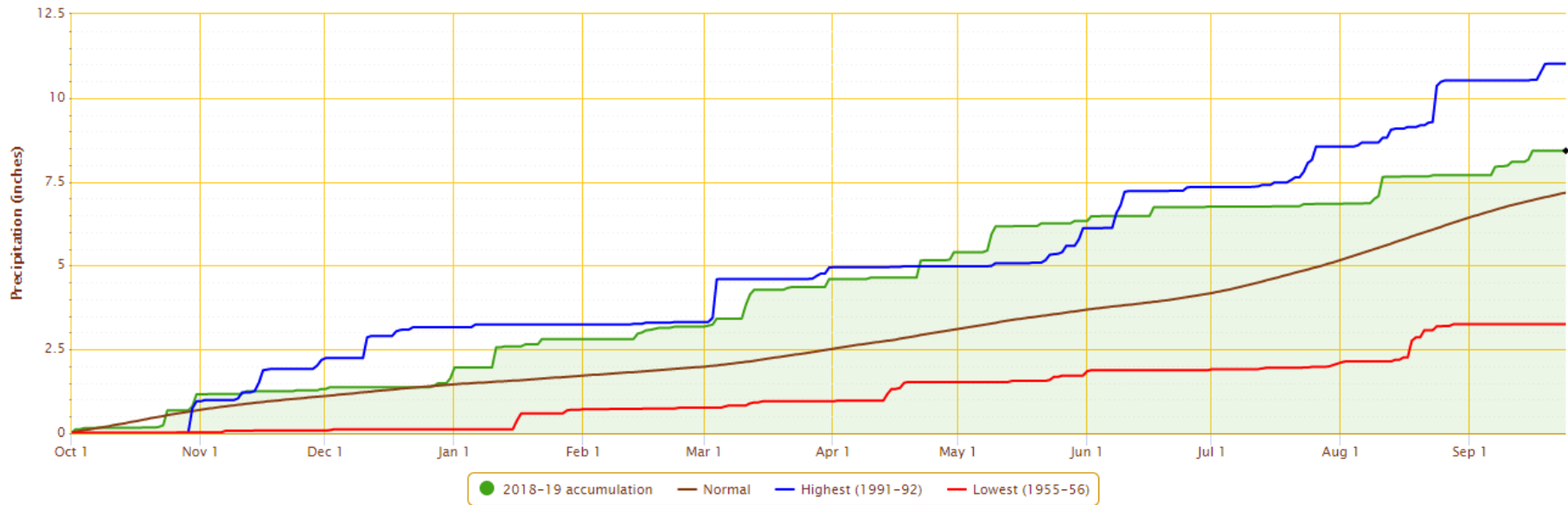
Still 4.53" above average



# Alamosa

## Accumulated Precipitation – ALAMOSA SAN LUIS VALLEY REGIONAL AP, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

1.25" above average

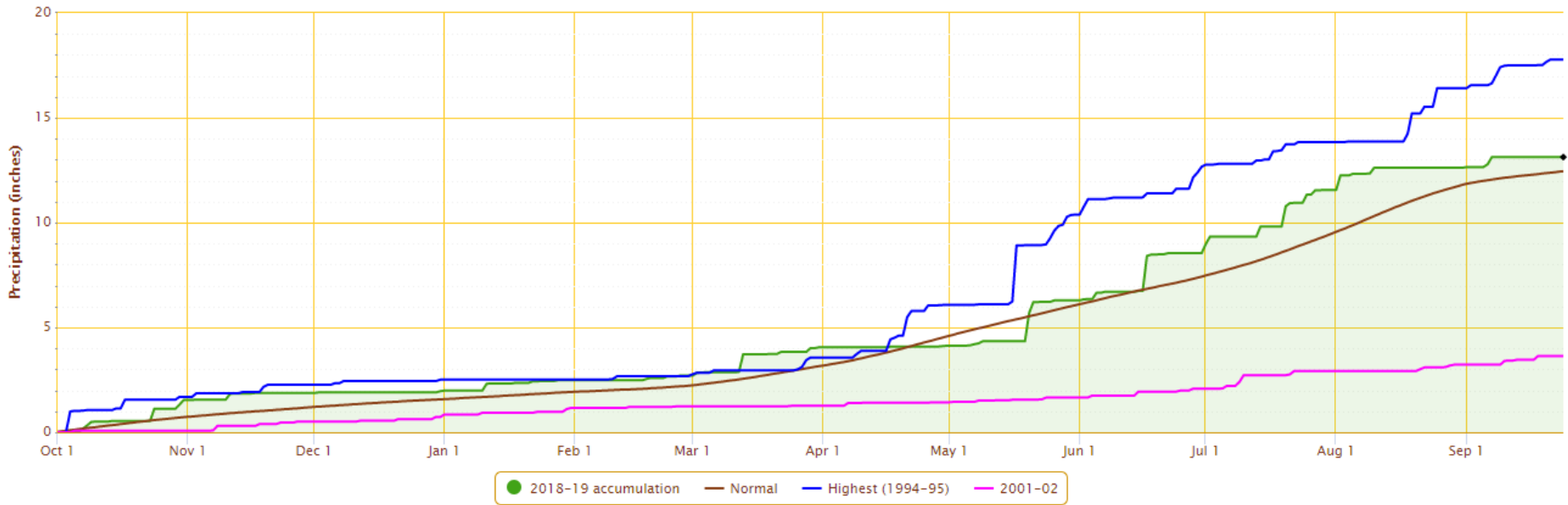


# Pueblo

## Accumulated Precipitation – PUEBLO MEMORIAL AP, CO



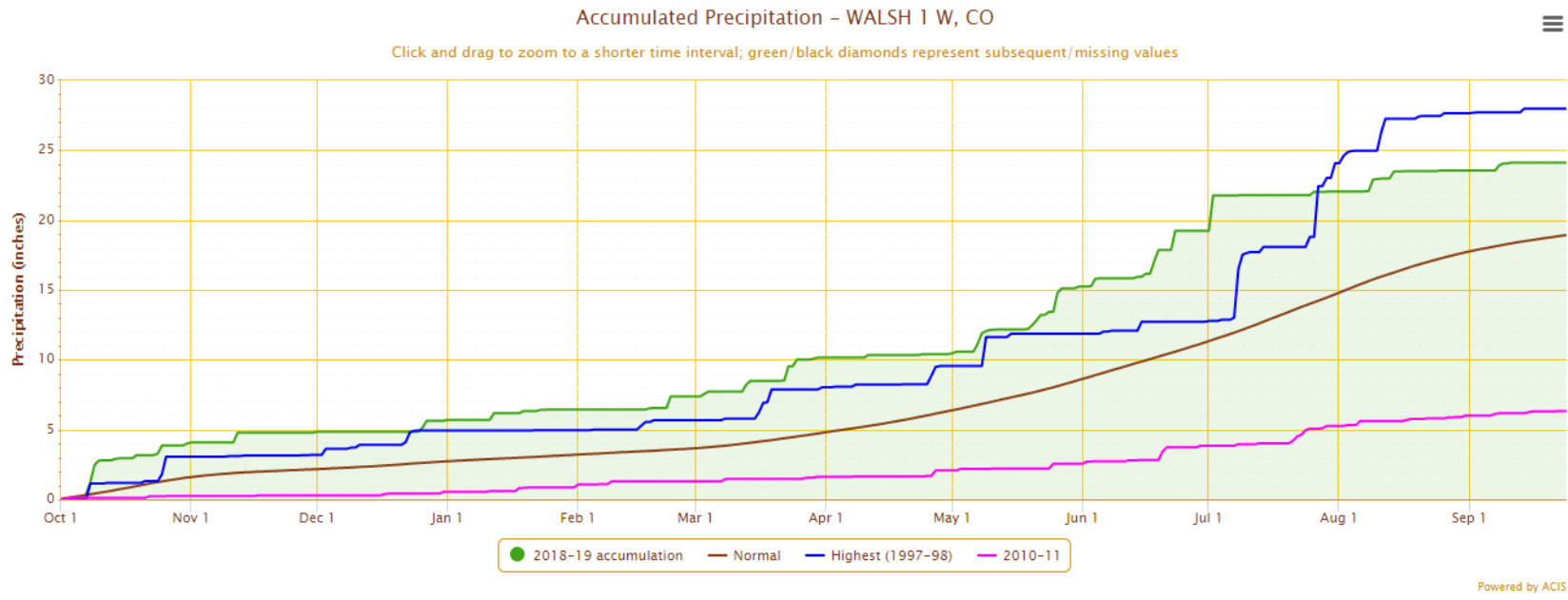
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS



# Walsh



6<sup>th</sup> wettest on record through this point in the water year

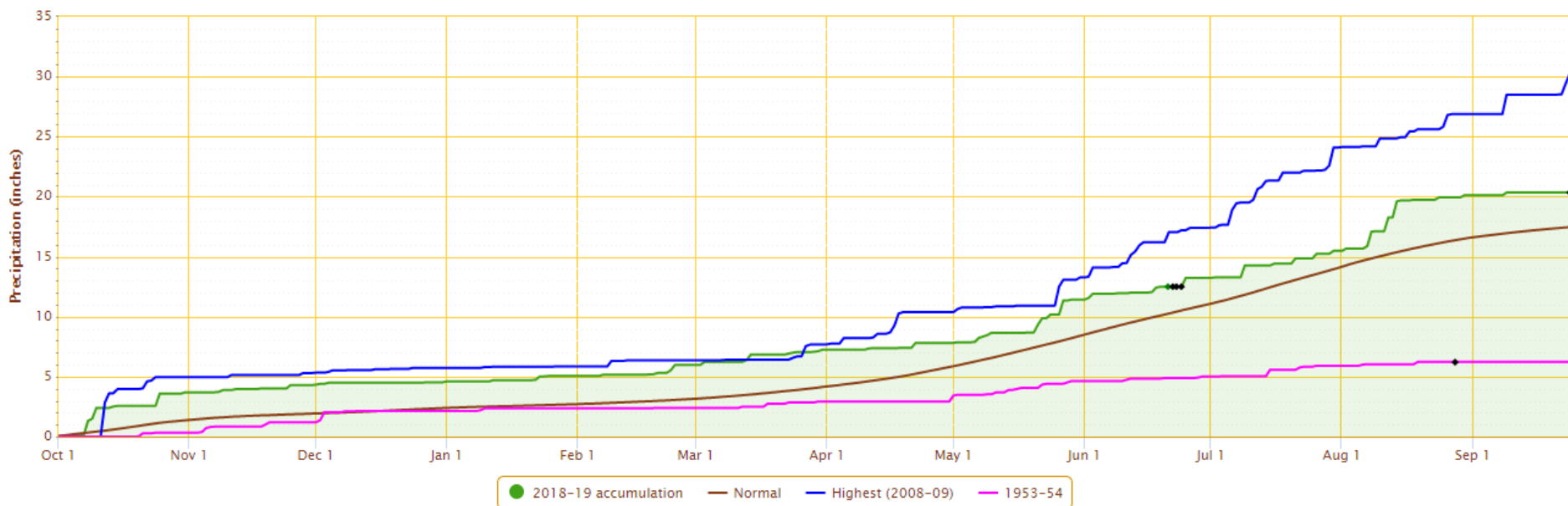




# Burlington

## Accumulated Precipitation – BURLINGTON, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



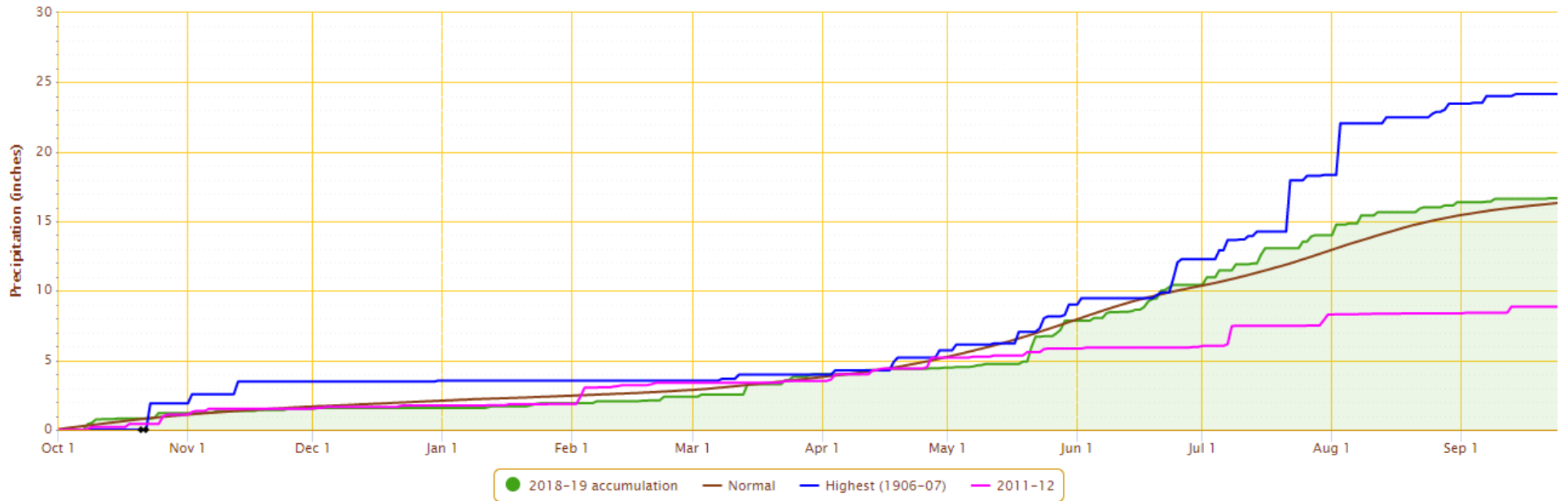
Powered by ACIS



# Akron

## Accumulated Precipitation – AKRON 4 E, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



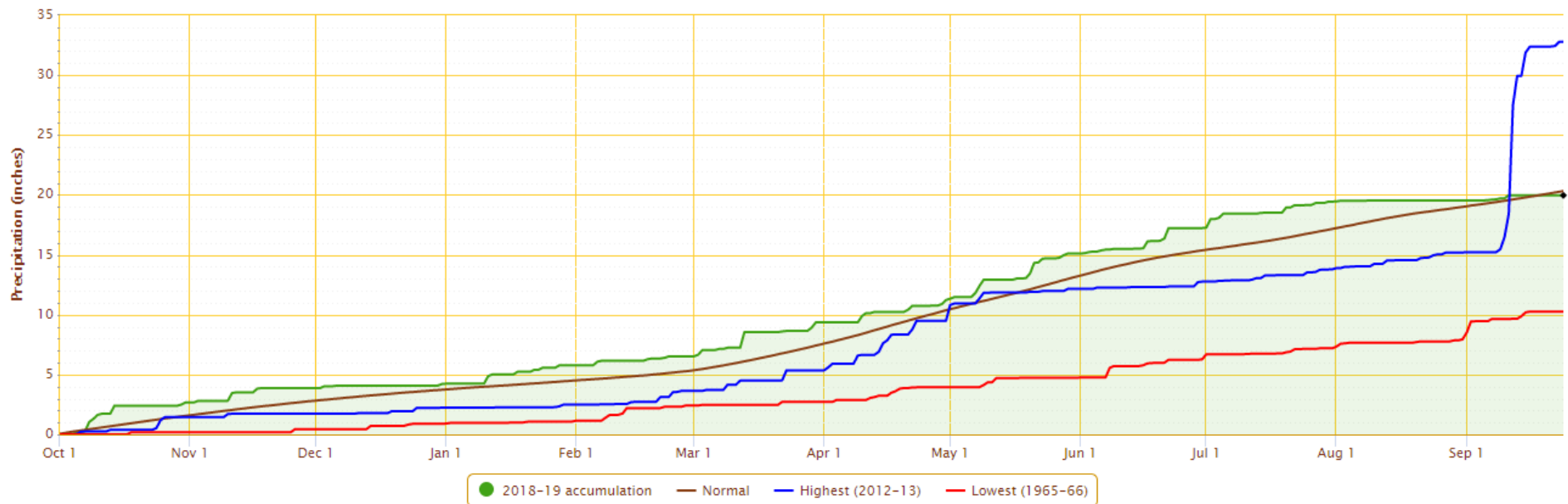
Powered by ACIS



# Boulder

## Accumulated Precipitation – BOULDER, CO

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

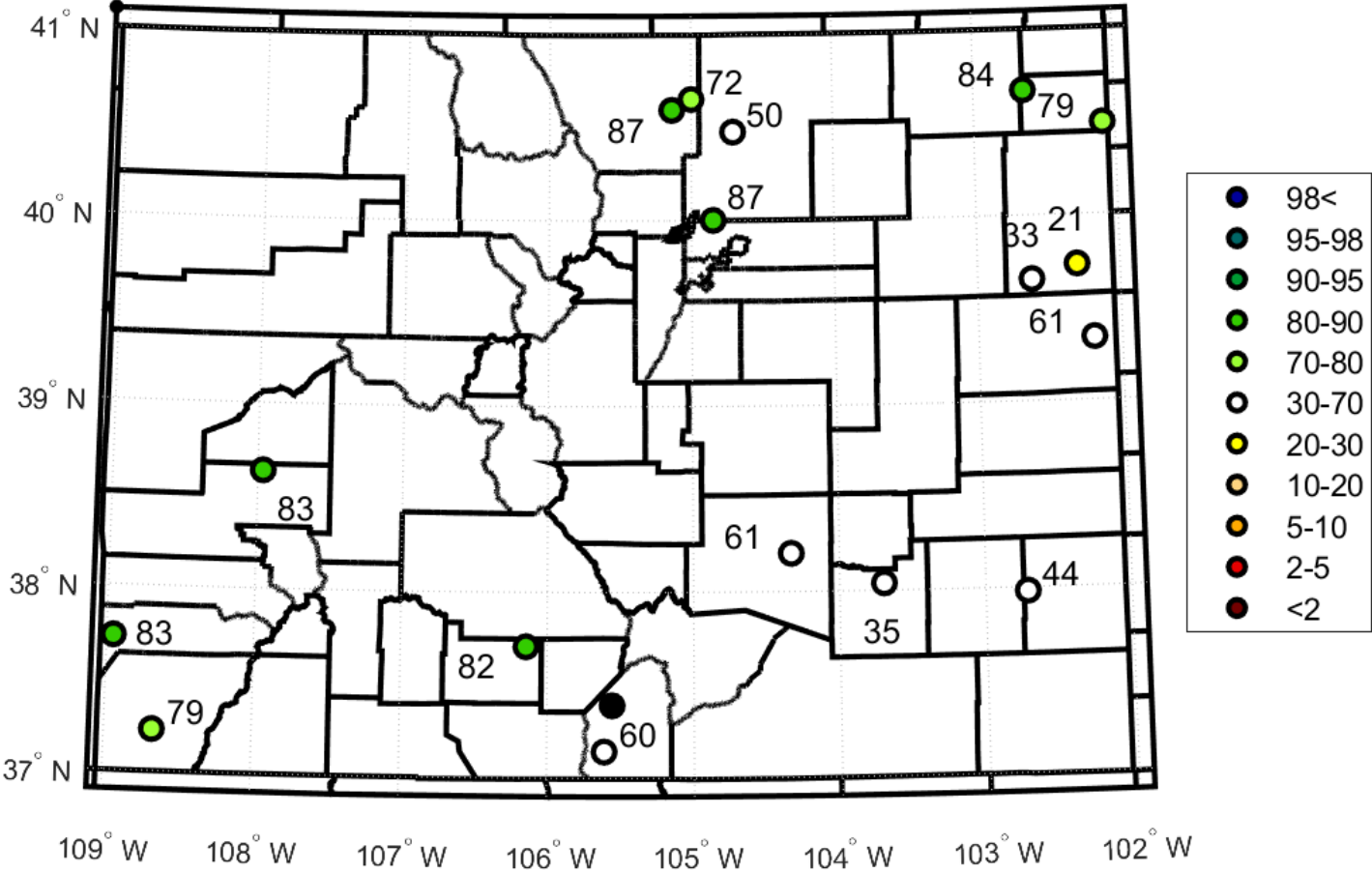
Fell below the water year average for the first time since October this week



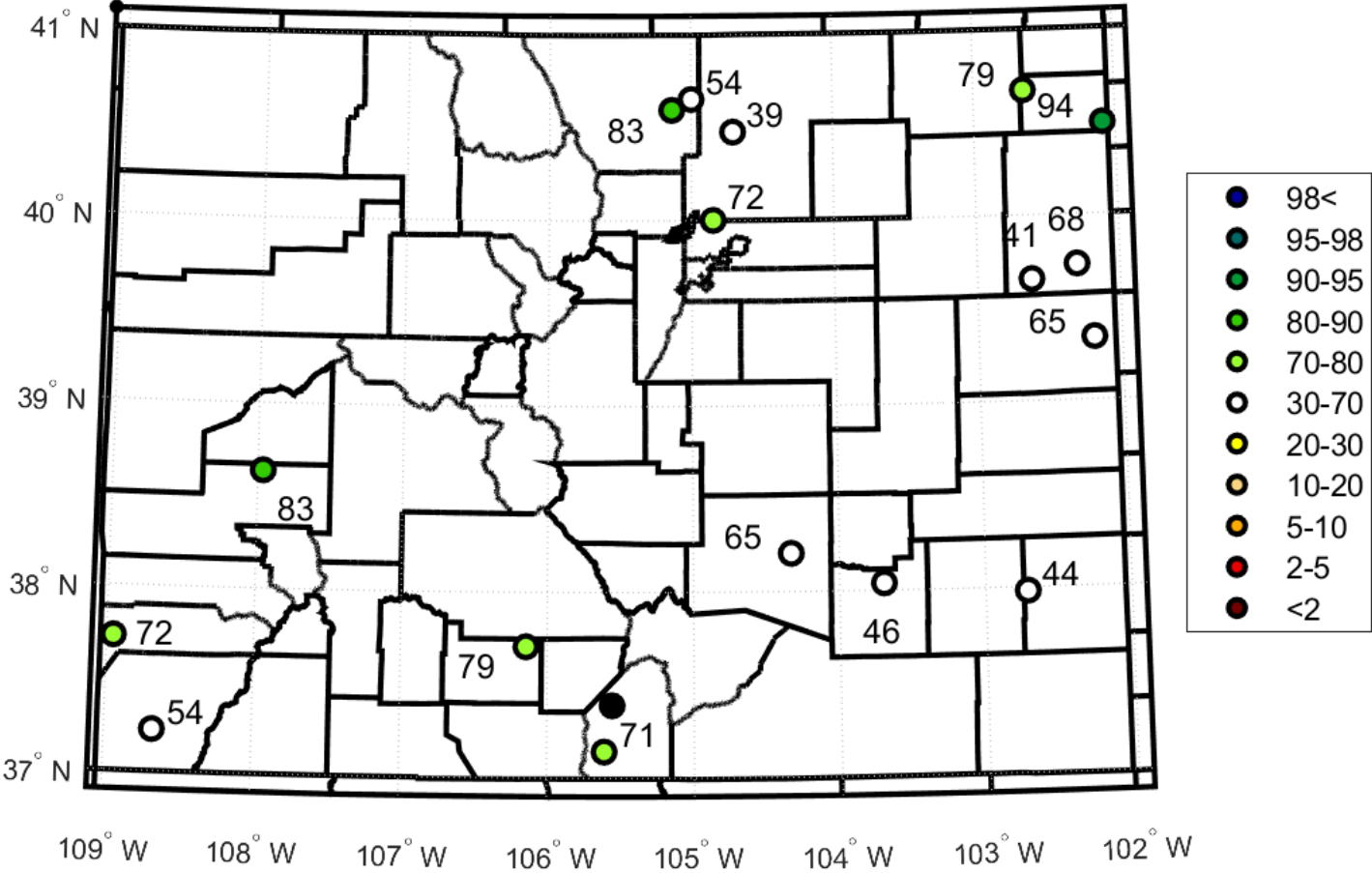
COLORADO CLIMATE CENTER



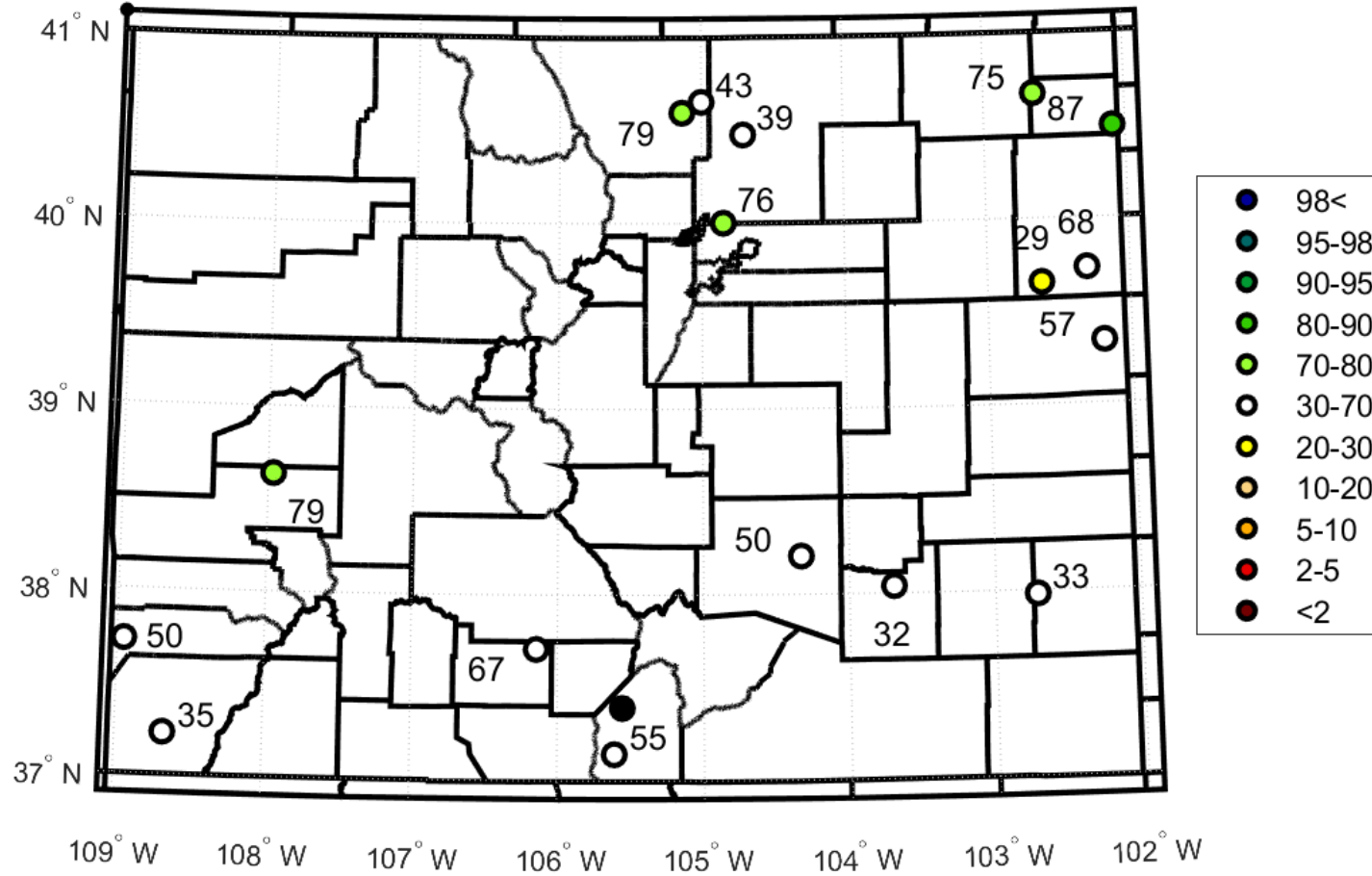
### Growing Season Water Balance (P/PET) Percentiles July 19, 2019

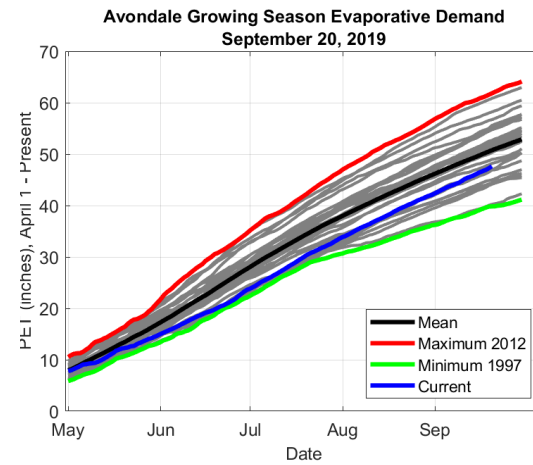
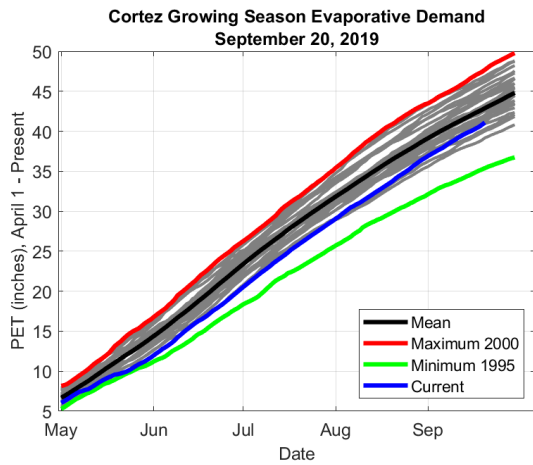
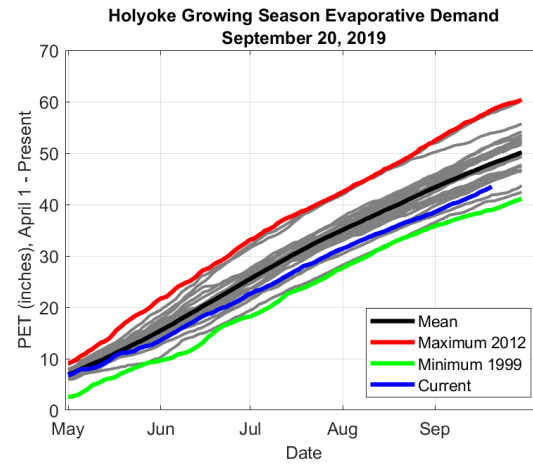
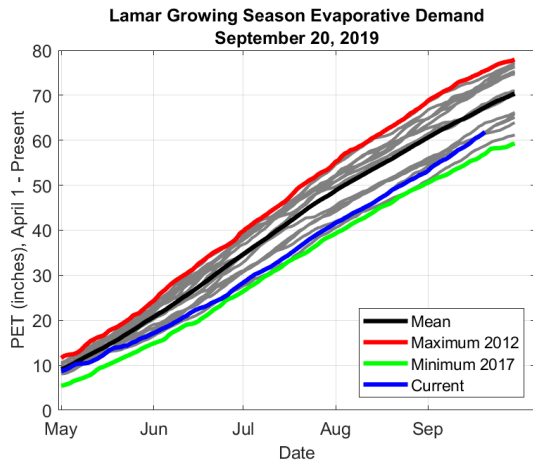


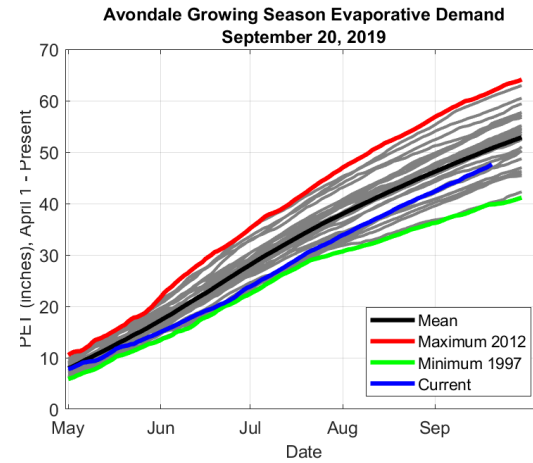
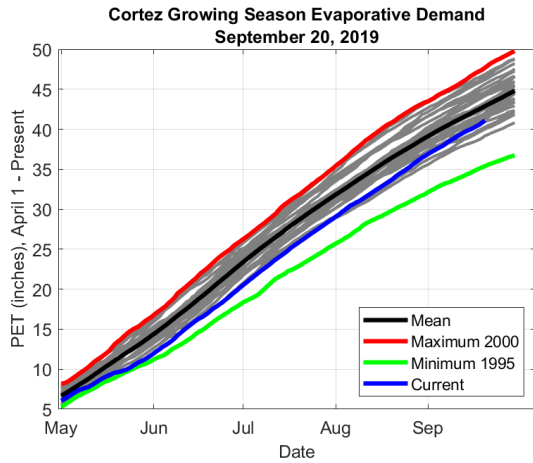
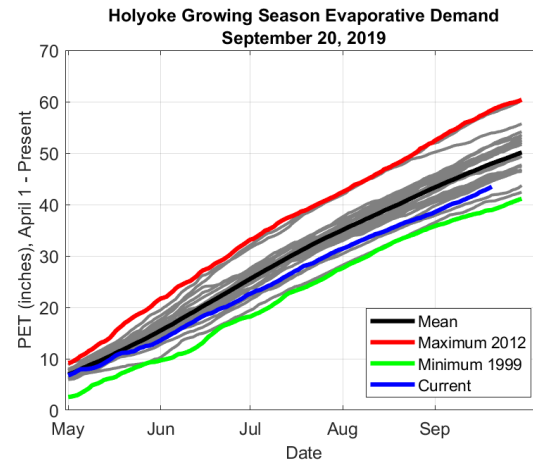
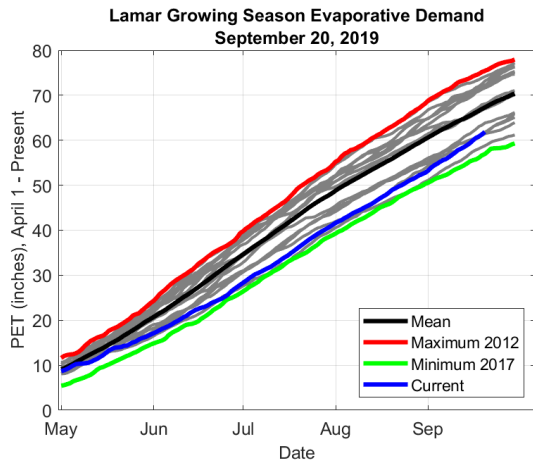
# Growing Season Water Balance (P/PET) Percentiles August 23, 2019



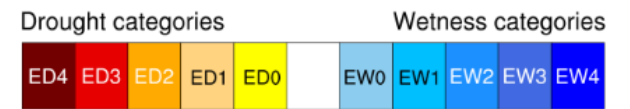
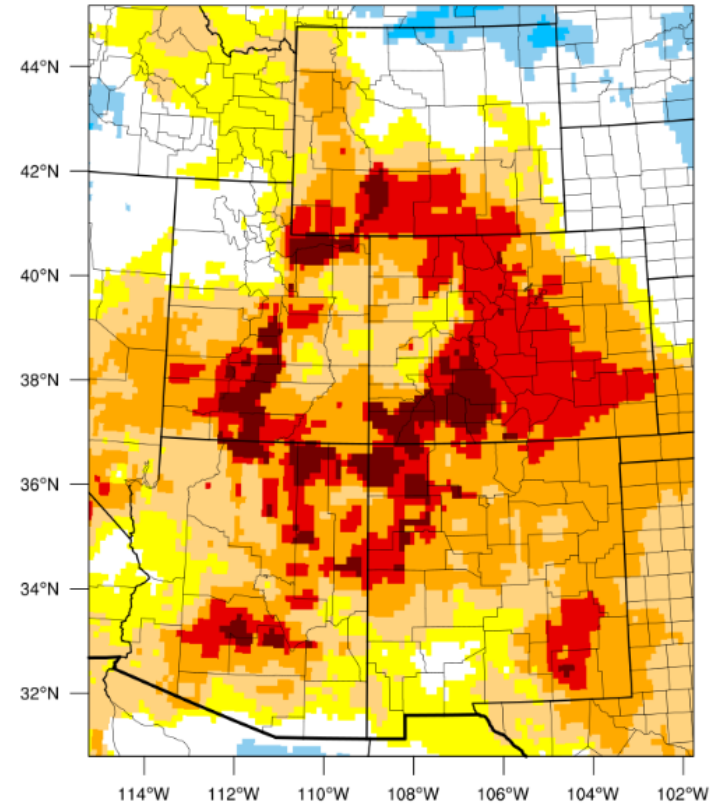
## Growing Season Water Balance (P/PET) Percentiles September 20, 2019







1-month EDDI categories for September 19, 2019

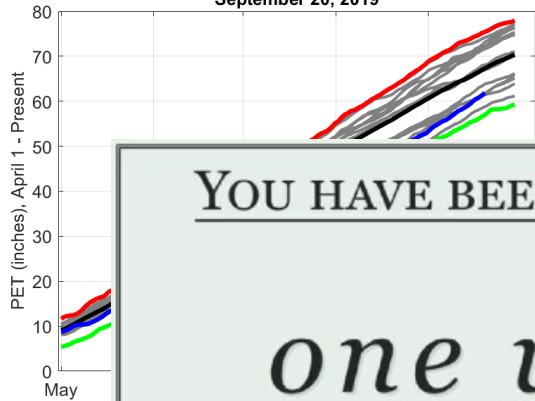


100% 98% 95% 90% 80% 70% 30% 20% 10% 5% 2% 0%  
(EDDI-percentile category breaks: 100% = driest; 0% = wettest)

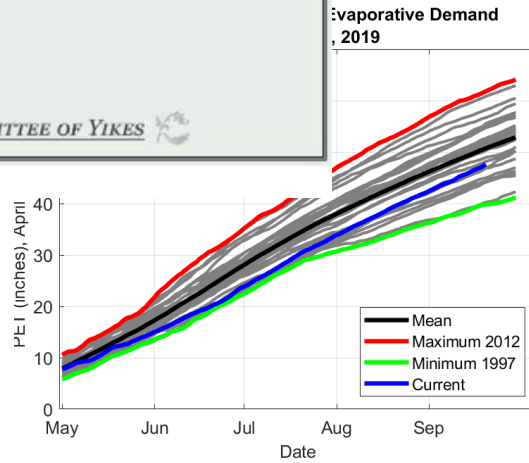
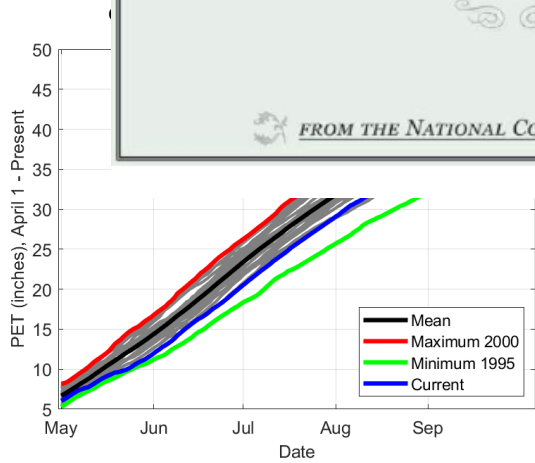
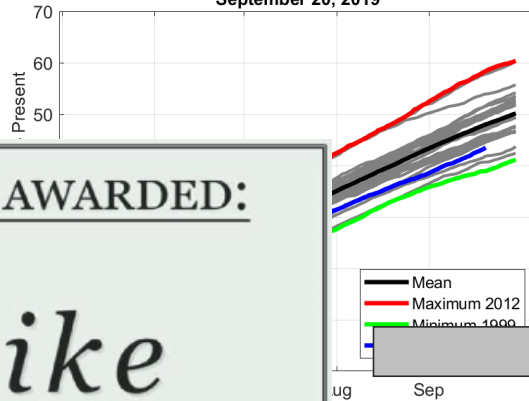




Lamar Growing Season Evaporative Demand  
September 20, 2019



Holyoke Growing Season Evaporative Demand  
September 20, 2019

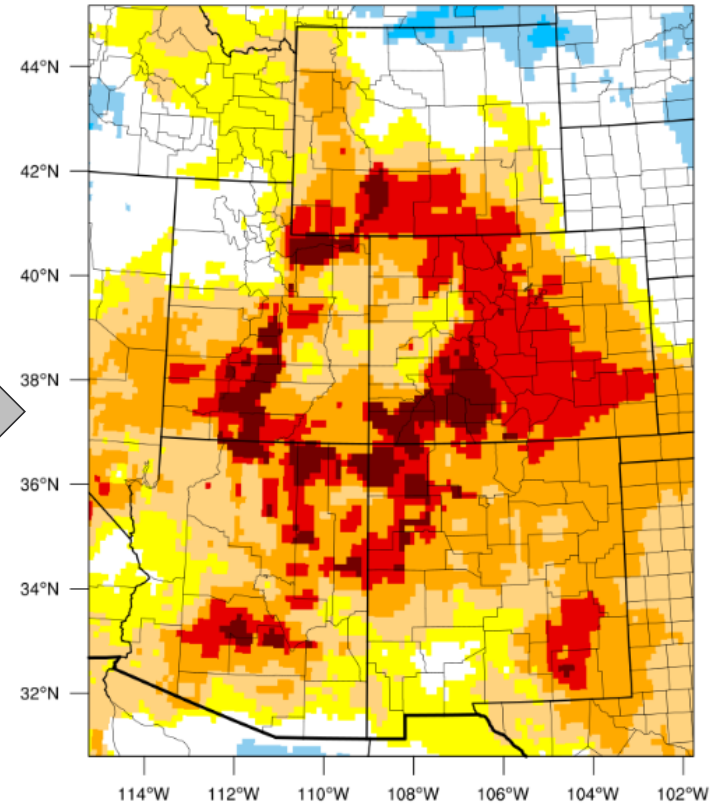


**YOU HAVE BEEN AWARDED:**

*one yike*

FROM THE NATIONAL COMMITTEE OF YIKES

1-month EDDI categories for September 19, 2019



Drought categories

Wetness categories



100% 98% 95% 90% 80% 70% 30% 20% 10% 5% 2% 0%  
(EDDI-percentile category breaks: 100% = driest; 0% = wettest)





# Drought

National Drought

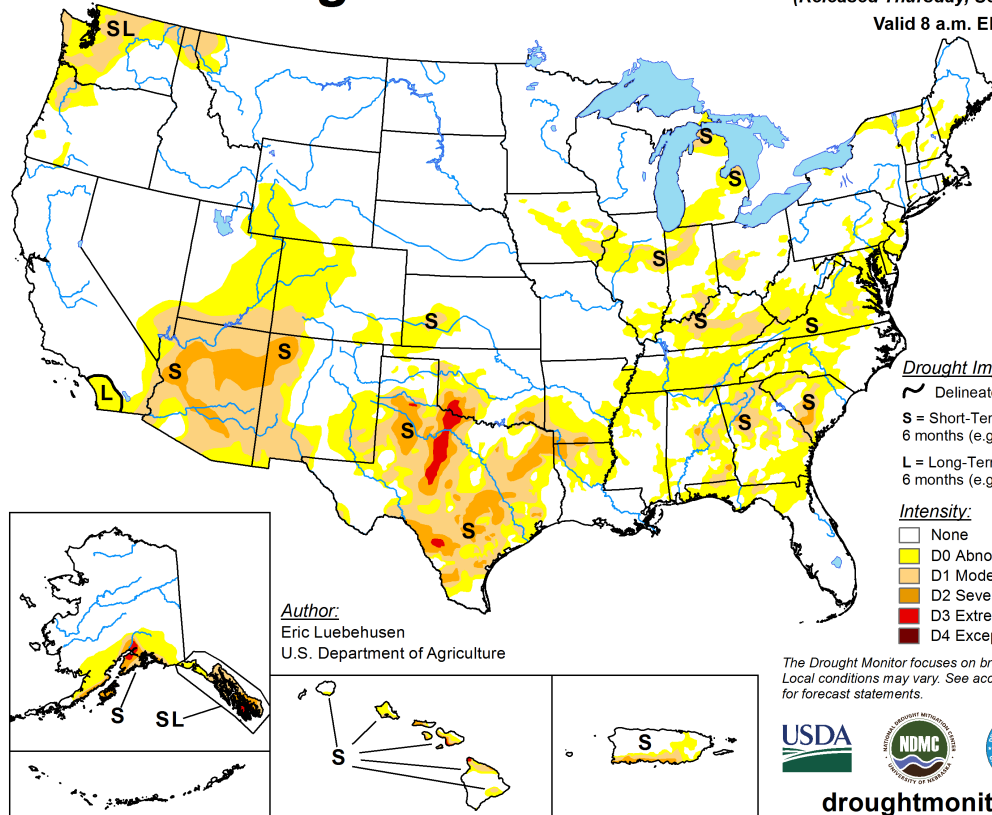
Colorado Drought

Colorado Drought Facts



# U.S. Drought Monitor

September 17, 2019  
 (Released Thursday, Sep. 19, 2019)  
 Valid 8 a.m. EDT



**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:*  
 Eric Luebehusen  
 U.S. Department of Agriculture

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

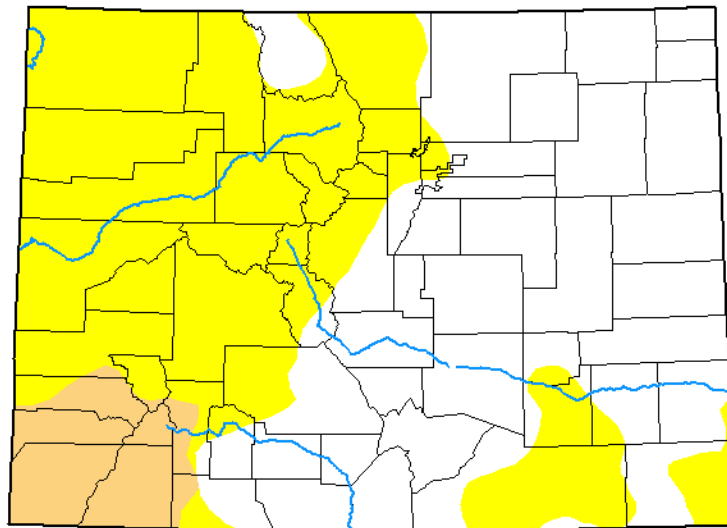


[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)



# U.S. Drought Monitor Colorado

**September 17, 2019**  
(Released Thursday, Sep. 19, 2019)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	50.45	49.55	6.68	0.00	0.00	0.00
<b>Last Week</b> <i>09-10-2019</i>	50.45	49.55	6.68	0.00	0.00	0.00
<b>3 Months Ago</b> <i>06-18-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	17.94	82.06	66.26	54.91	27.11	11.22
<b>Start of Water Year</b> <i>09-25-2018</i>	14.19	85.81	72.30	64.41	48.47	16.21
<b>One Year Ago</b> <i>09-18-2018</i>	16.89	83.11	71.59	63.93	44.29	12.62

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. See accompanying text summary for forecast statements.*

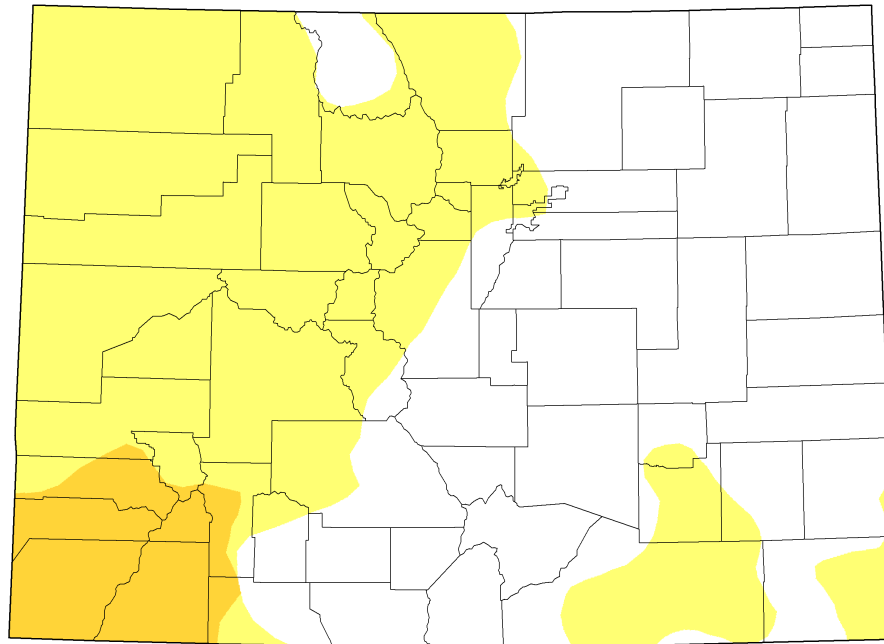
Author:

Eric Luebehusen  
U.S. Department of Agriculture



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

### U.S. Drought Monitor Class Change - Colorado 3 Months



September 17, 2019  
compared to  
June 25, 2019

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



- 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



# Colorado Drought Monitor Facts

- Prior to May of this year:
  - Since the beginning of the US Drought Monitor, our state had never been completely free of D0 – D4.
  - Our previous record smallest amount of D0 occurred in May 2001, when only 0.13% of our state showed D0.
- As of May 28, 2019:
  - We became the last state to finally report a week of no D0-D4.
  - We had 8 straight weeks of an empty map, but that streak ended on July 23

Week	None	D0-D4
2019-05-21	99.99	0.01
2019-05-28	100.00	0.00
2019-06-04	100.00	0.00
2019-06-11	100.00	0.00
2019-06-18	100.00	0.00
2019-06-25	100.00	0.00
2019-07-02	100.00	0.00
2019-07-09	100.00	0.00
2019-07-16	100.00	0.00
2019-07-23	96.93	3.07



## Outlook

Next 7 days

8-14 day Outlook

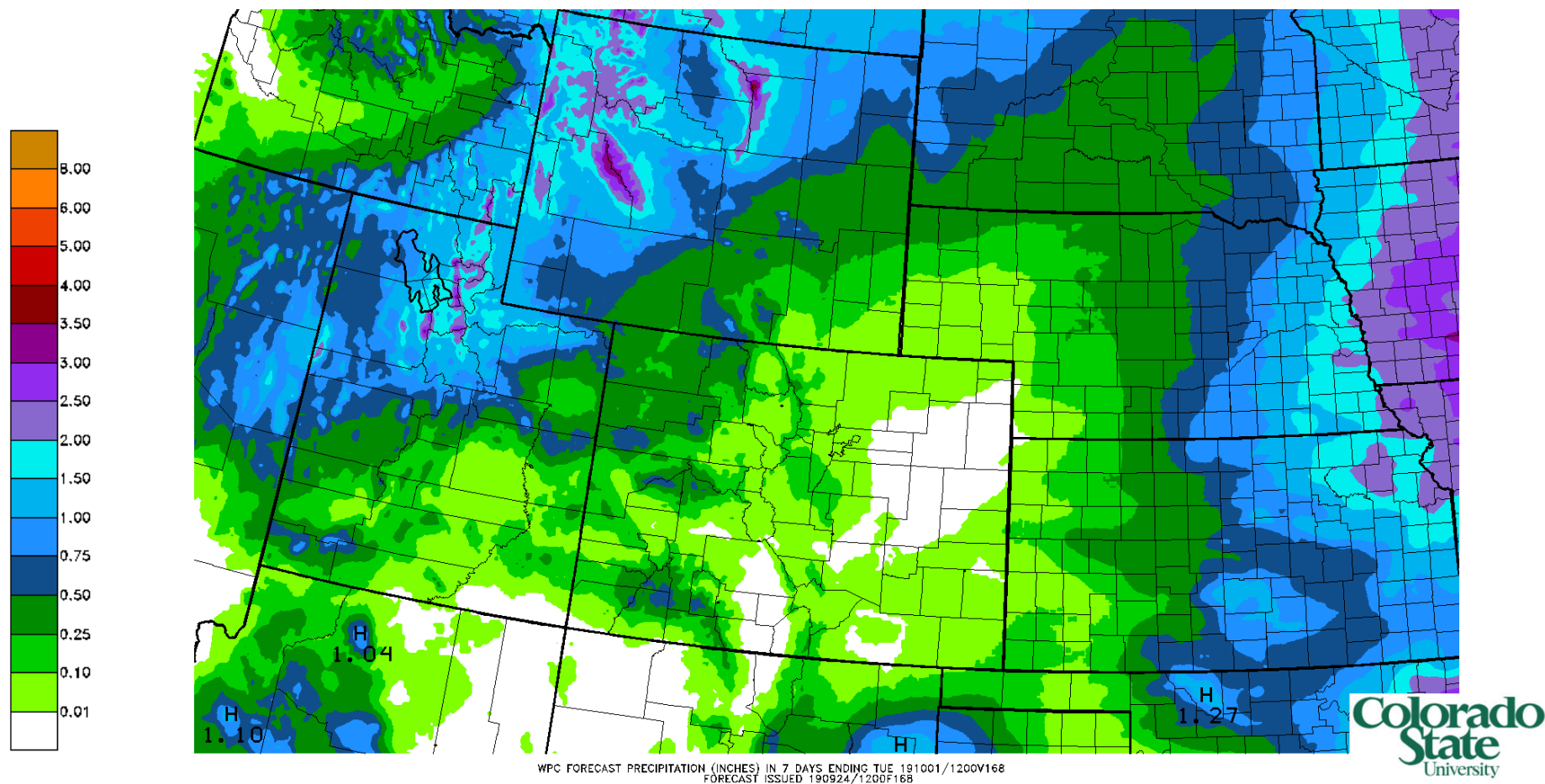
CPC Outlooks

Precipitation Projections

What is happening with El Niño?

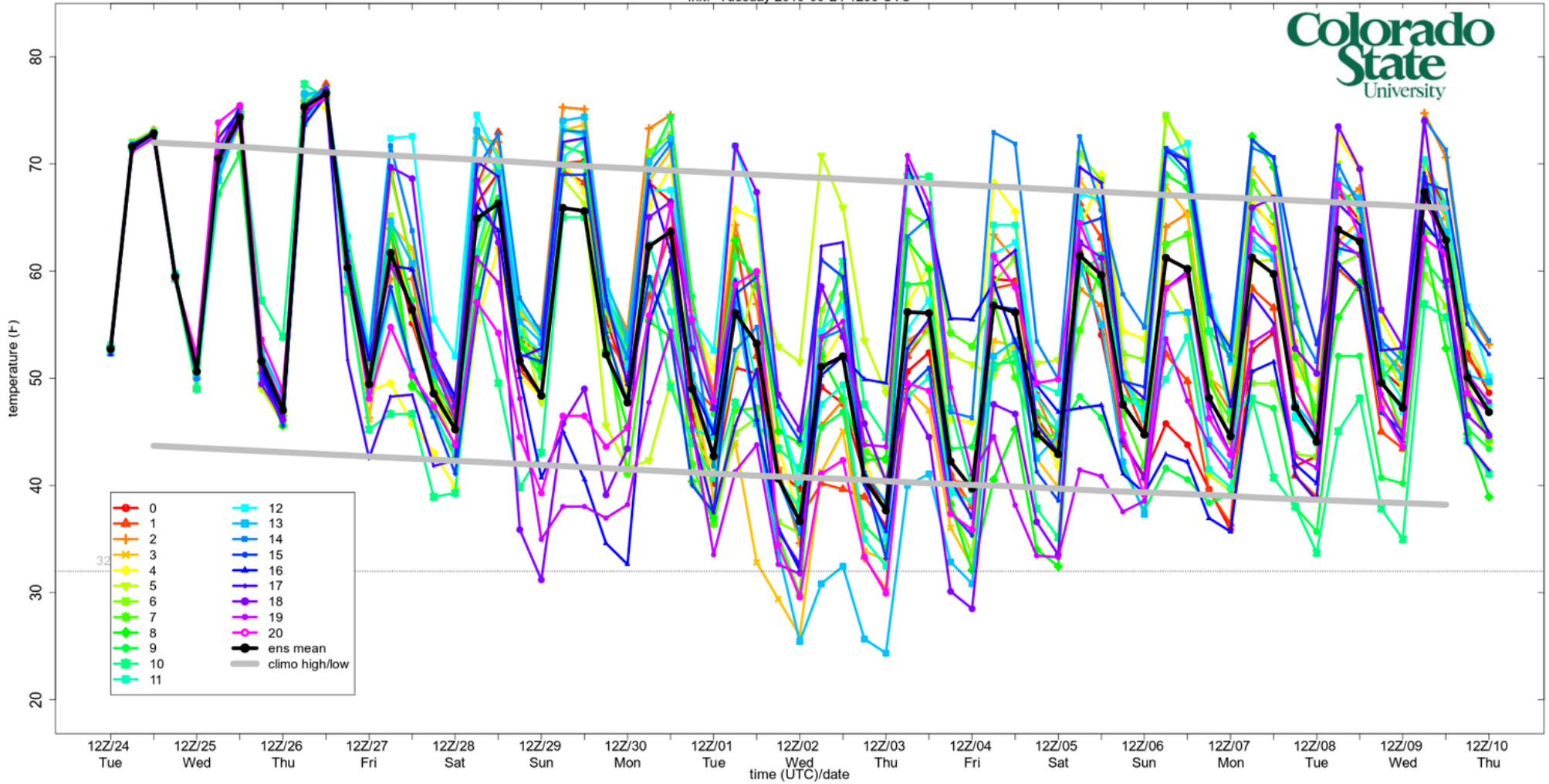


# NOAA 7-day precip forecast

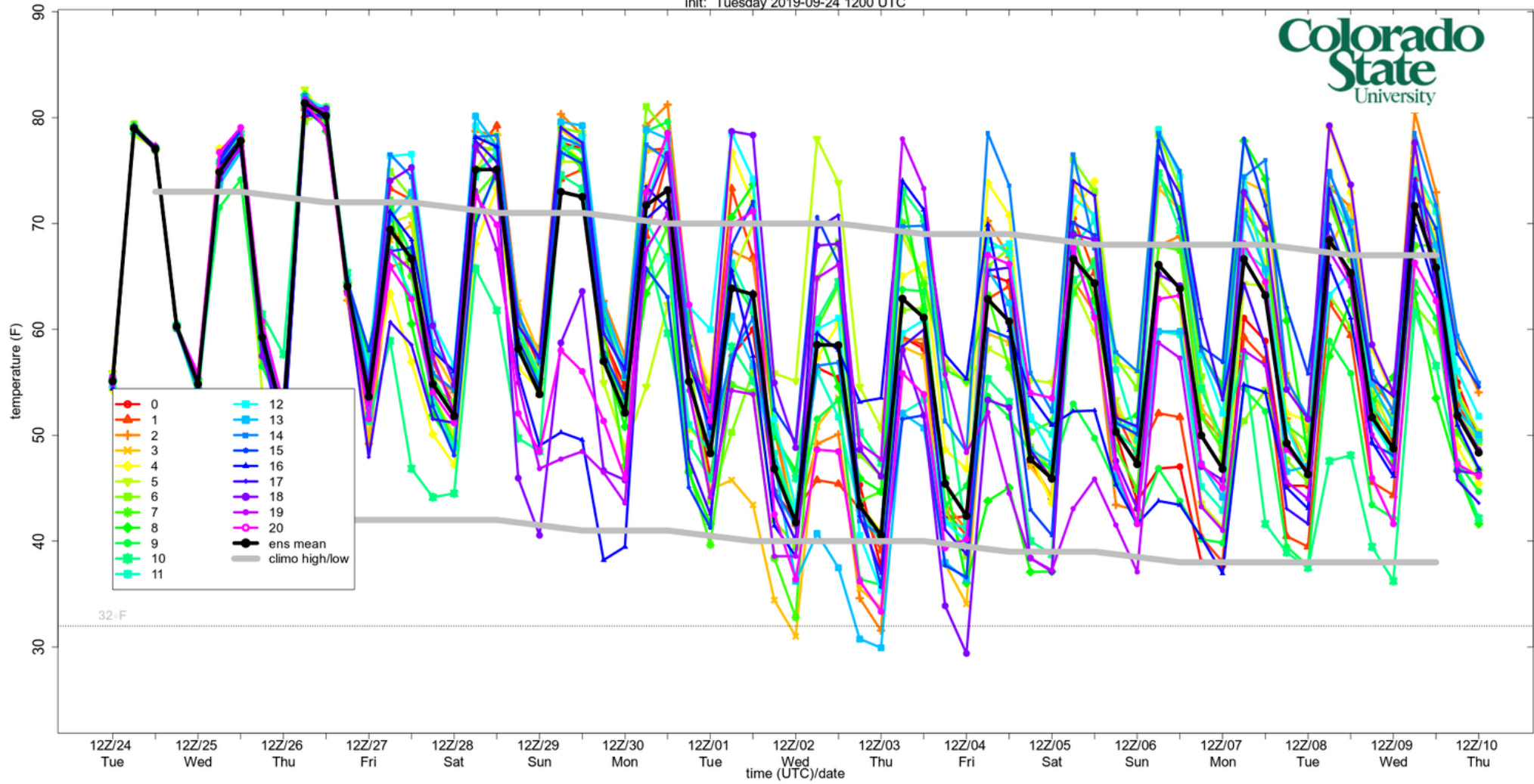




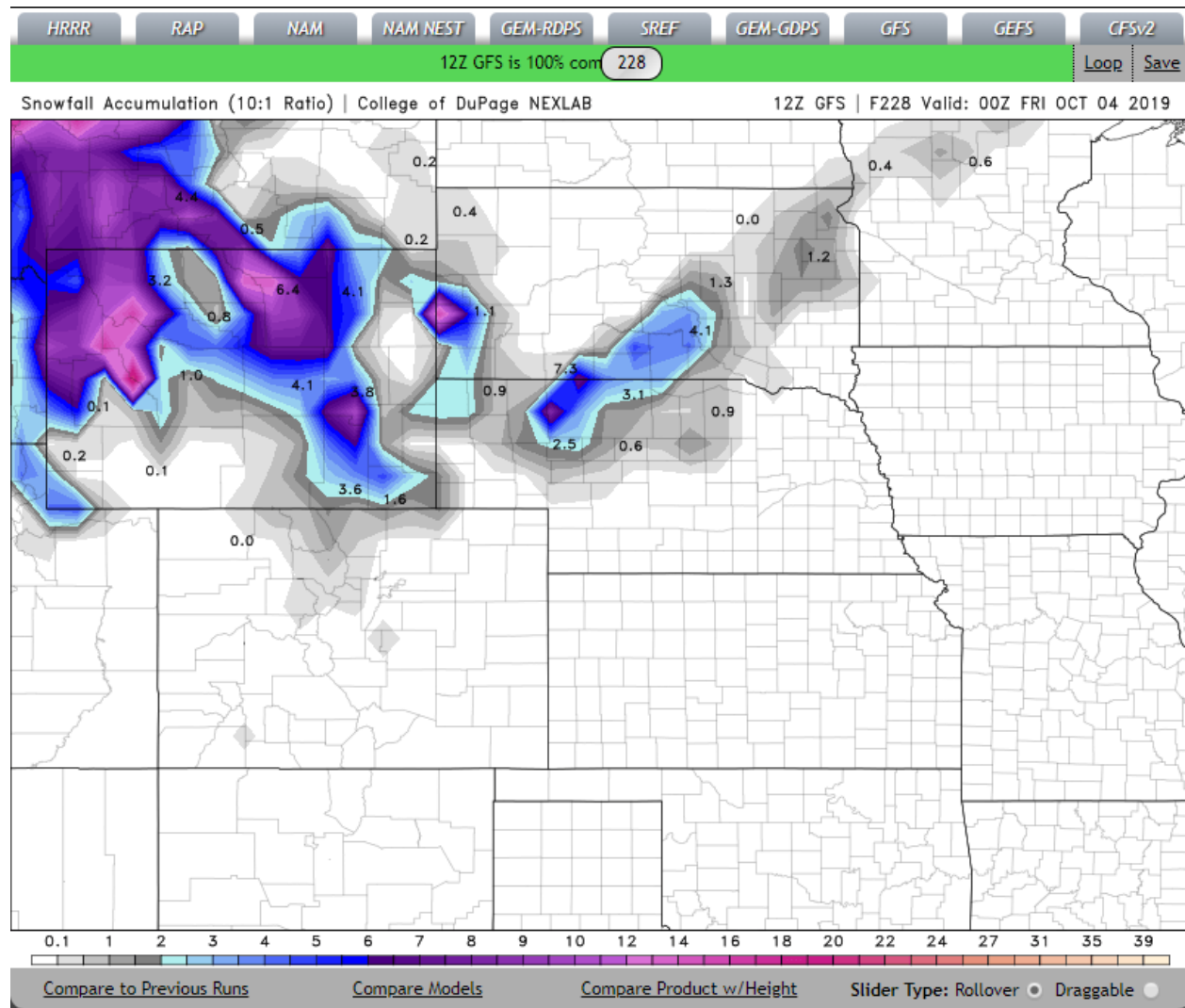
NCEP GEFS 2-m temperature at Fort Collins  
init: Tuesday 2019-09-24 1200 UTC



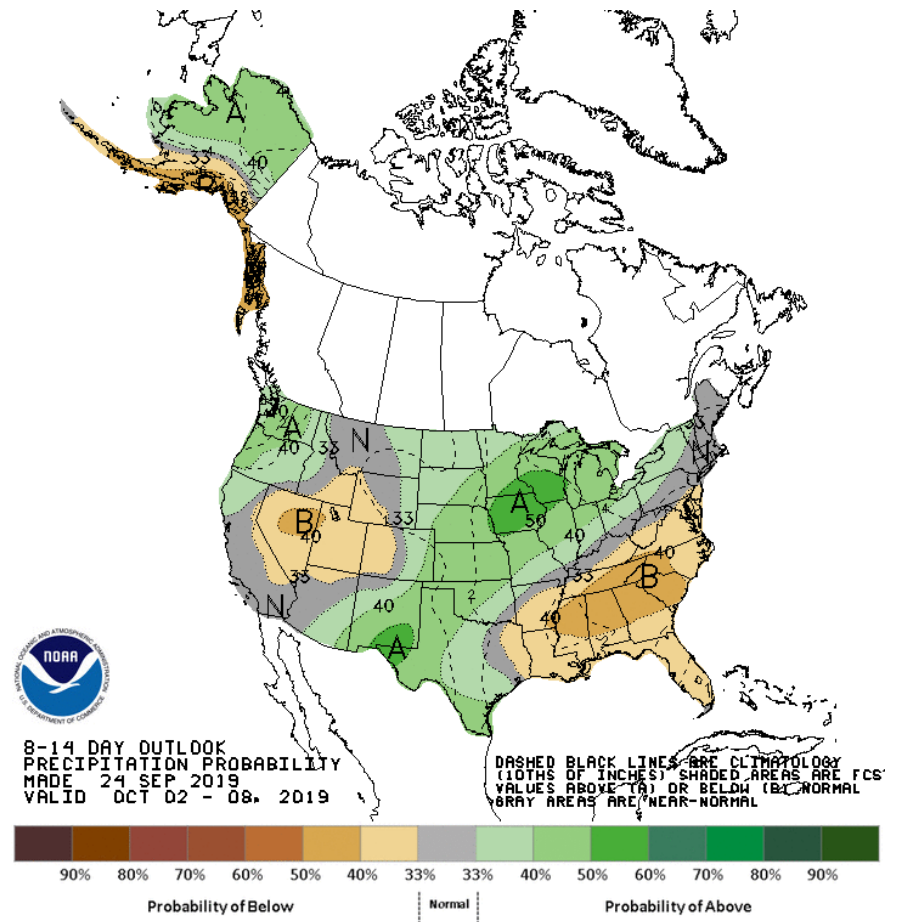
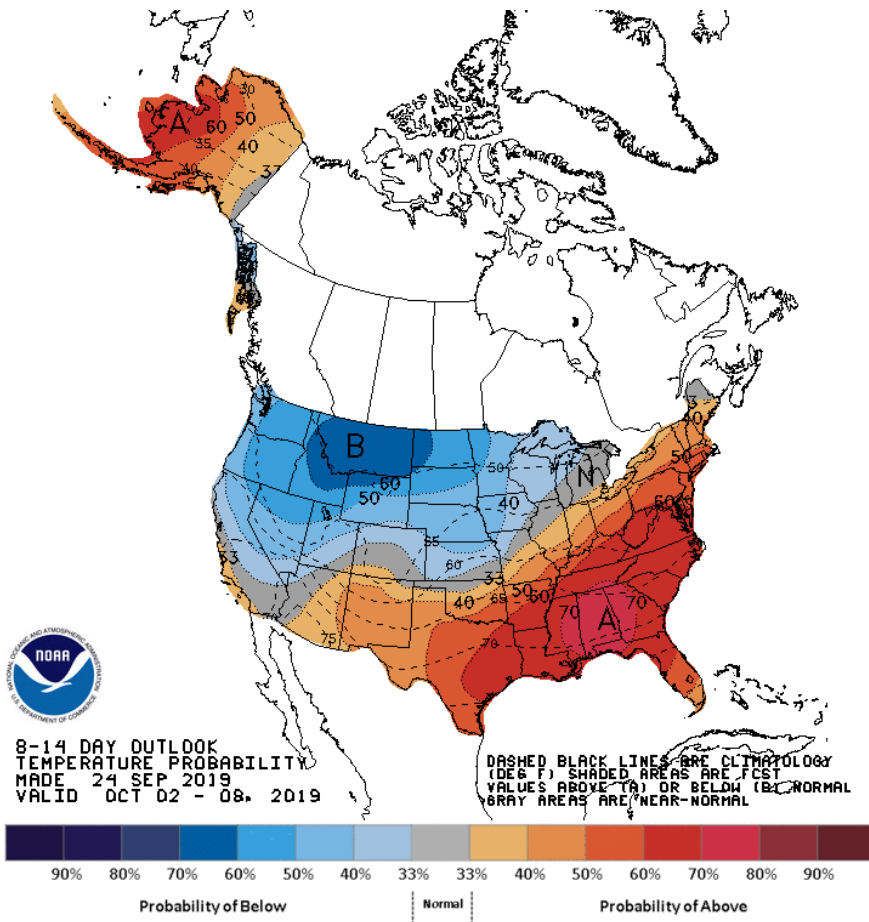
NCEP GEFS 2-m temperature at Denver  
init: Tuesday 2019-09-24 1200 UTC



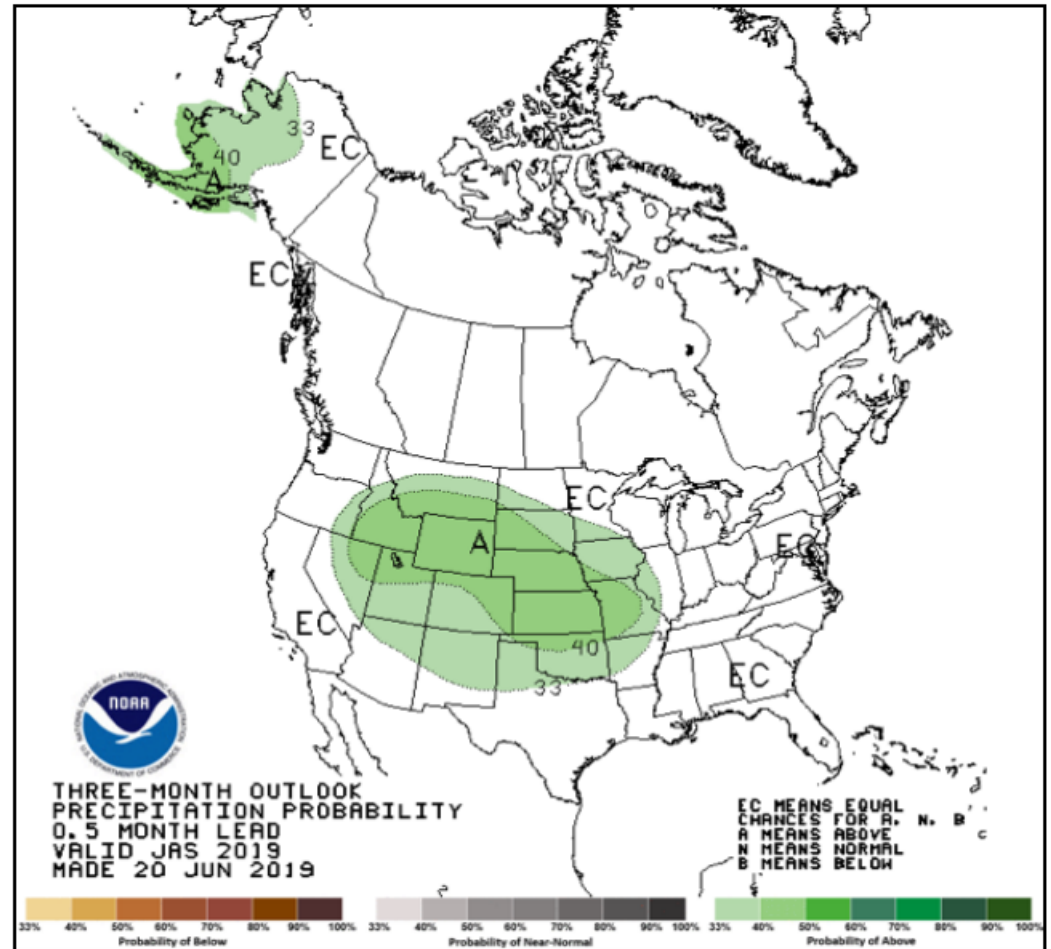
Modeled Snowfall,  
yes you heard that  
right, snowfall,  
accumulation by next  
Friday Morning



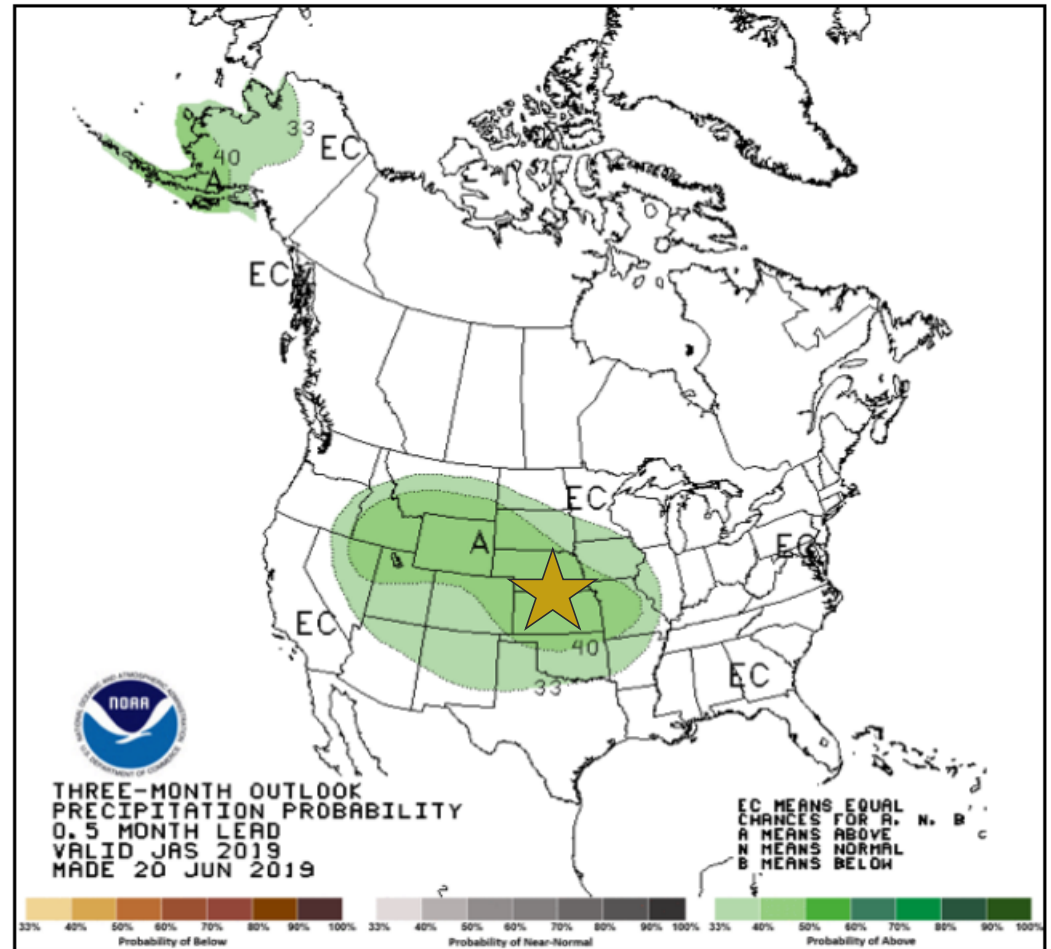
# 8-14 day outlook



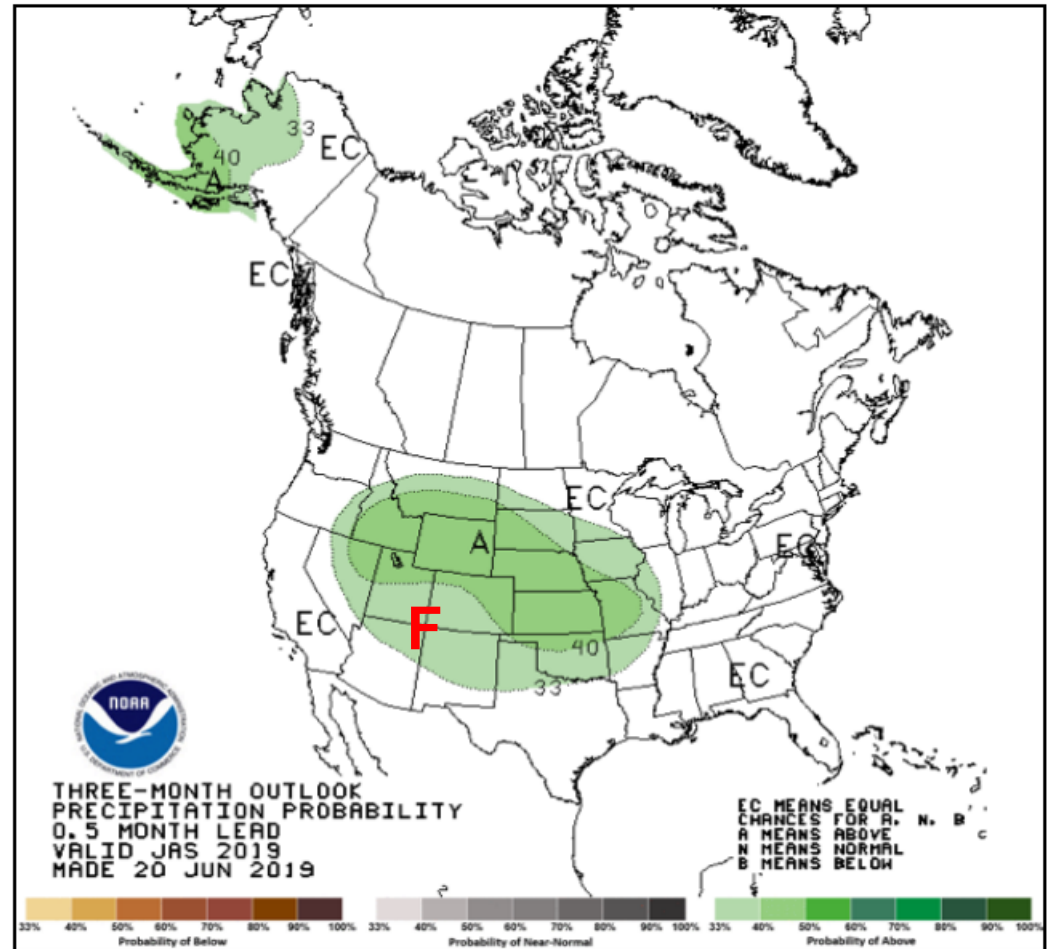
# Looking back at the July- September Outlook...



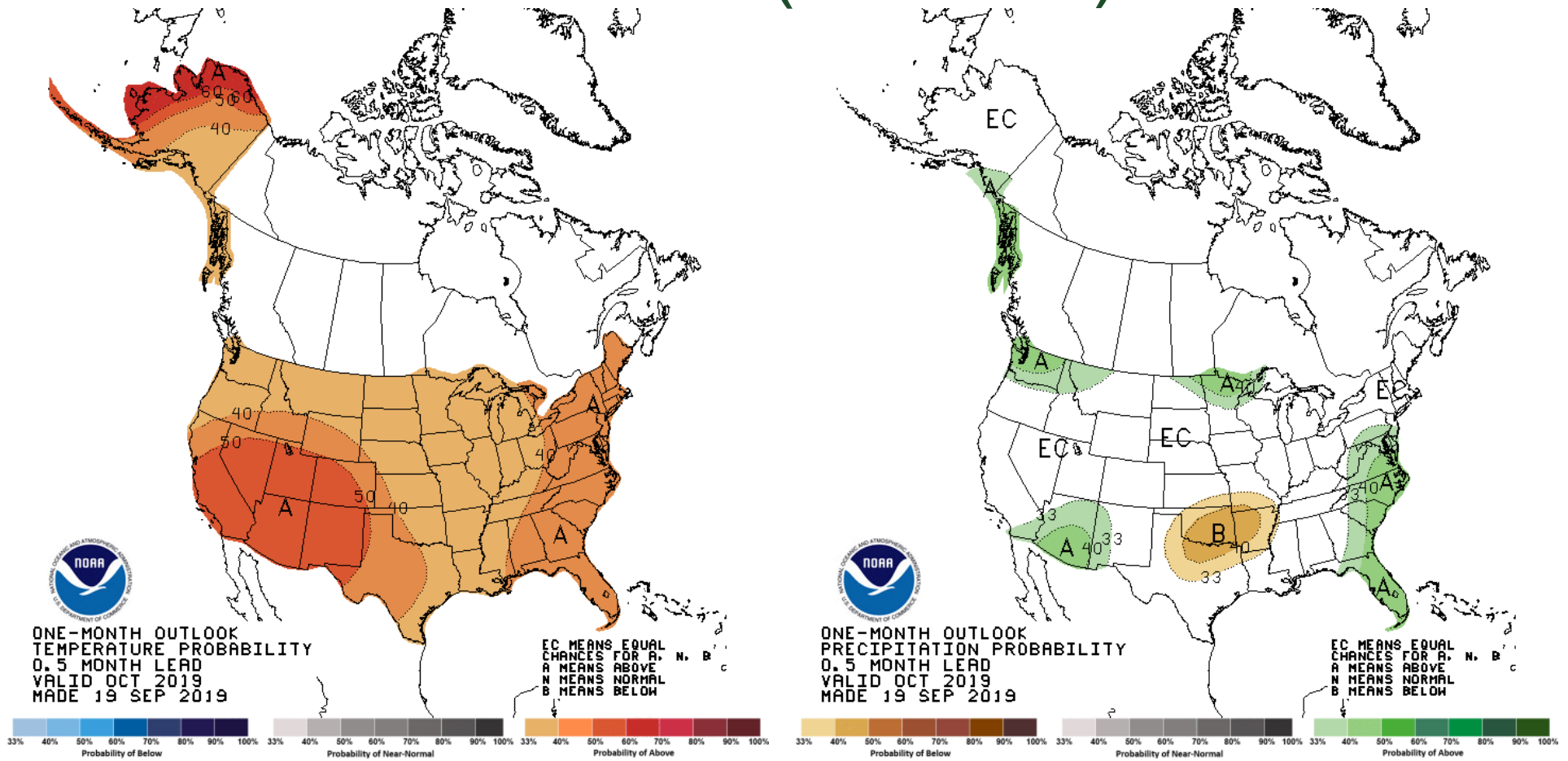
# Looking back at the July- September Outlook...



# Looking back at the July- September Outlook...

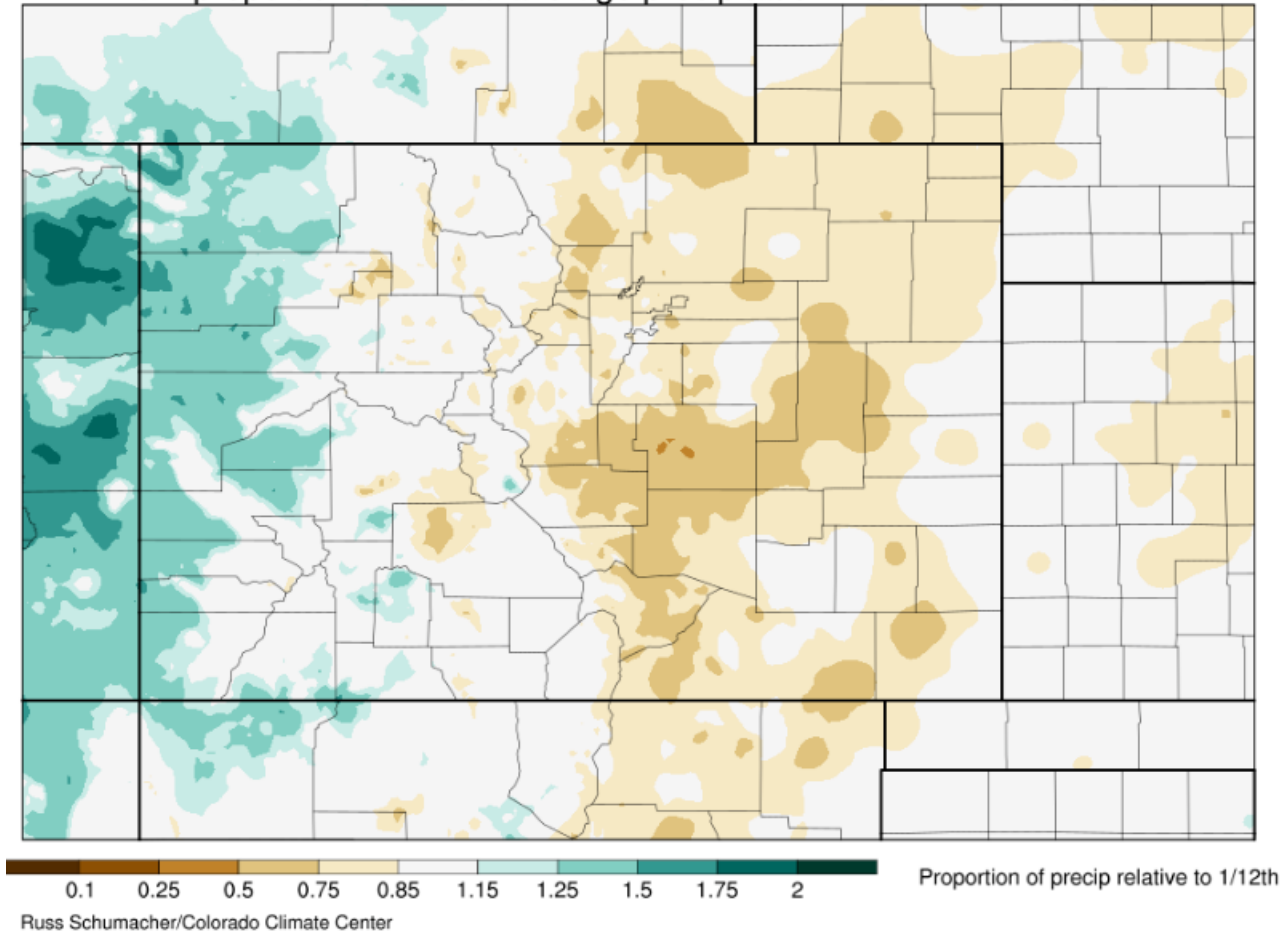


# One month outlook (October)

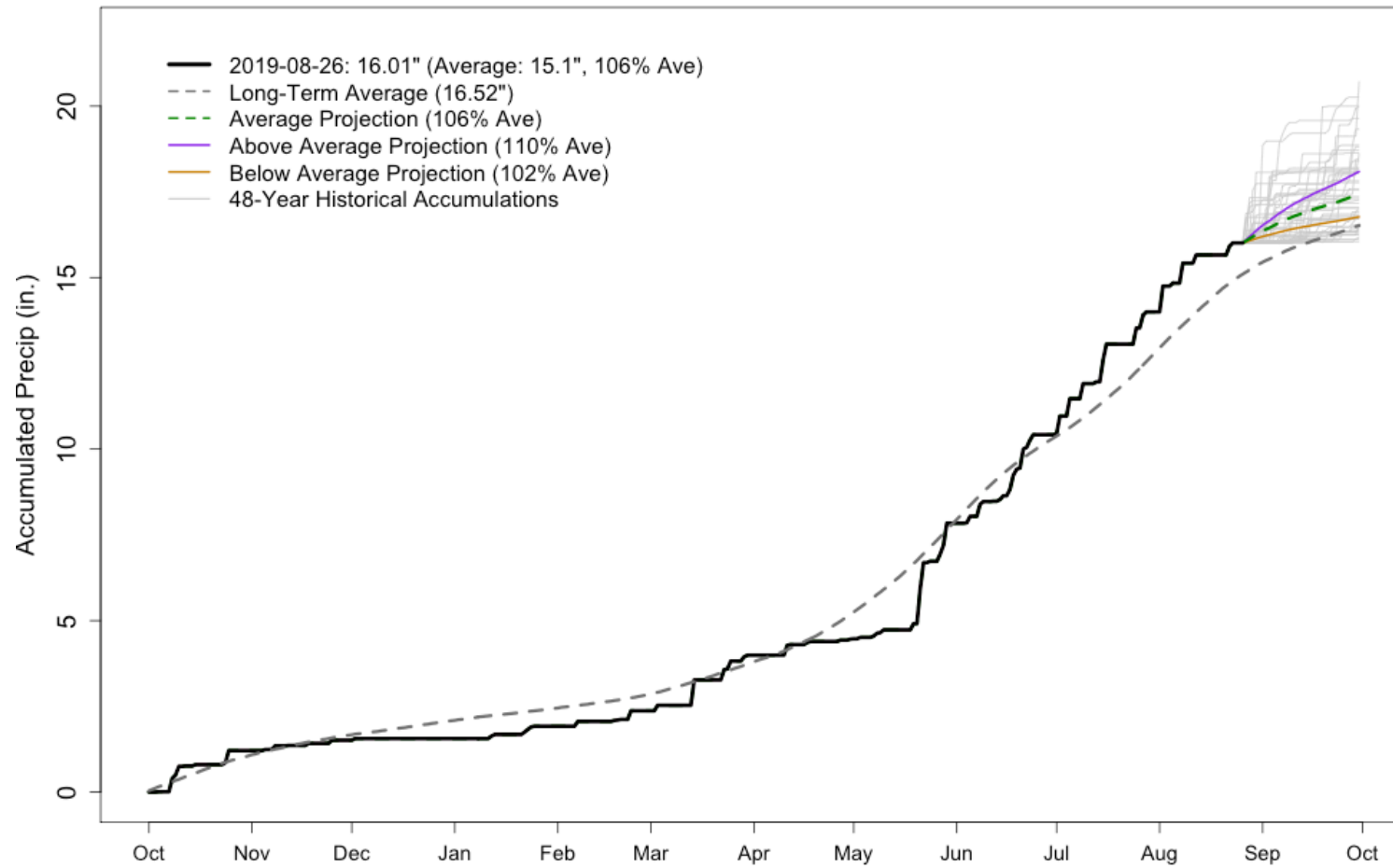




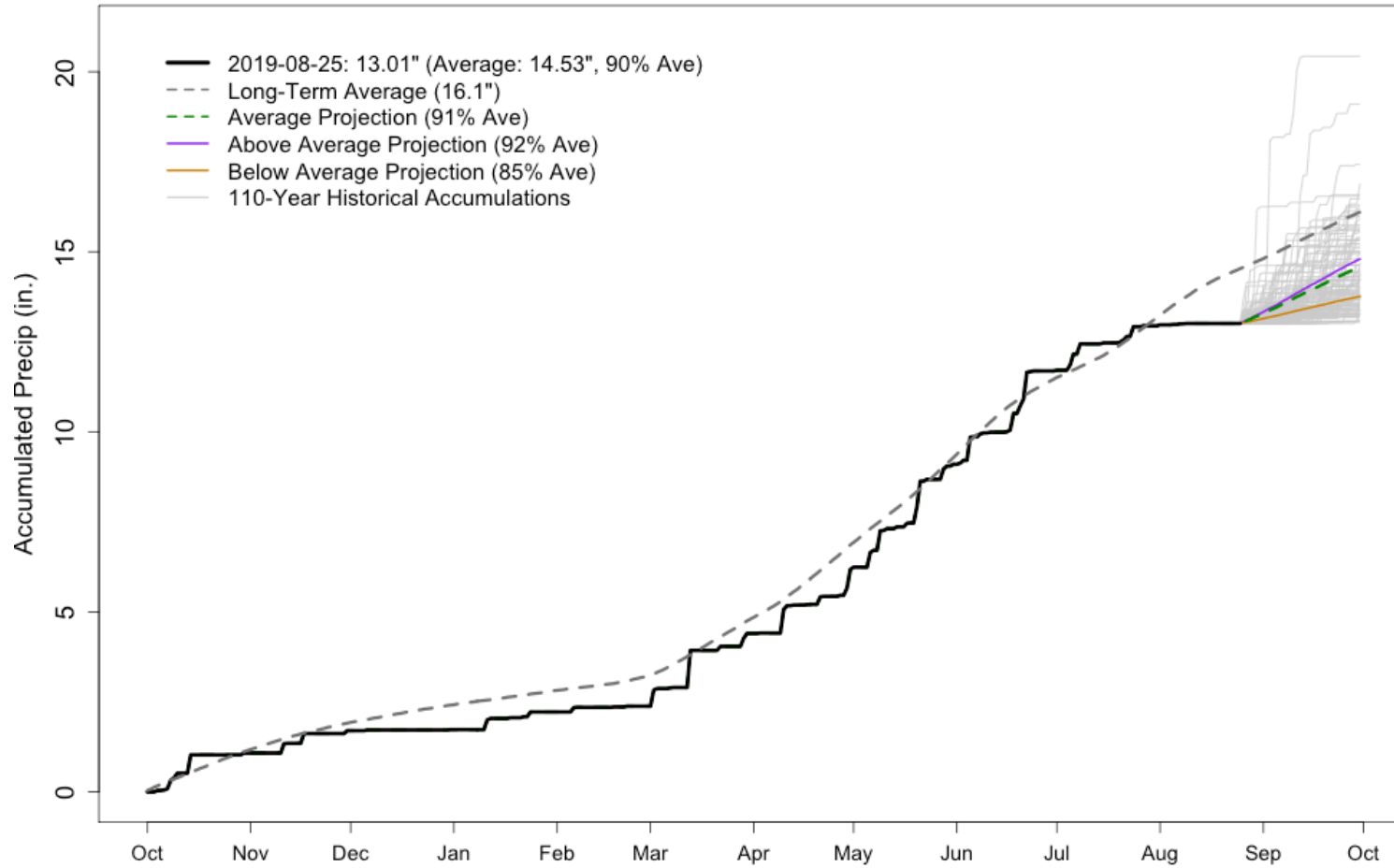
PRISM proportion of annual average precipitation in this month: October



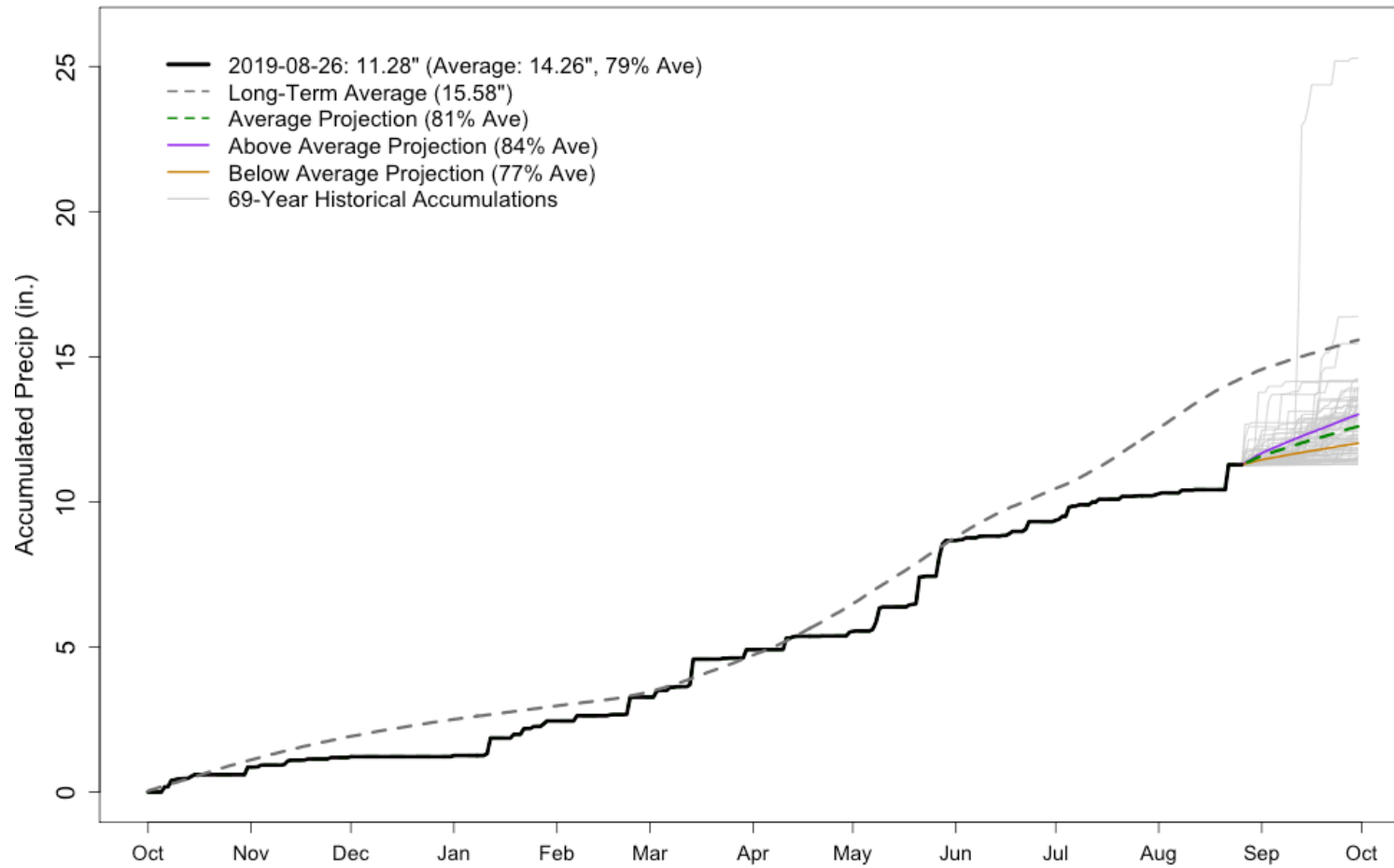
## AKRON 4 E WY2019 Precipitation Projections



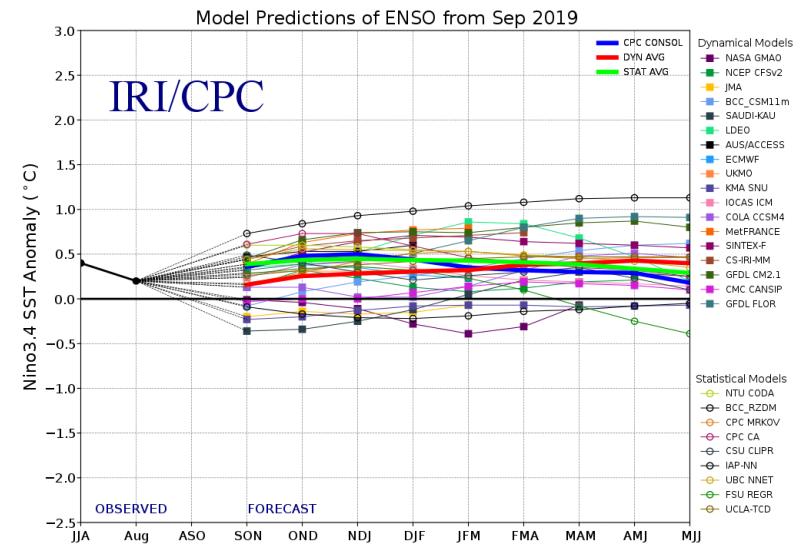
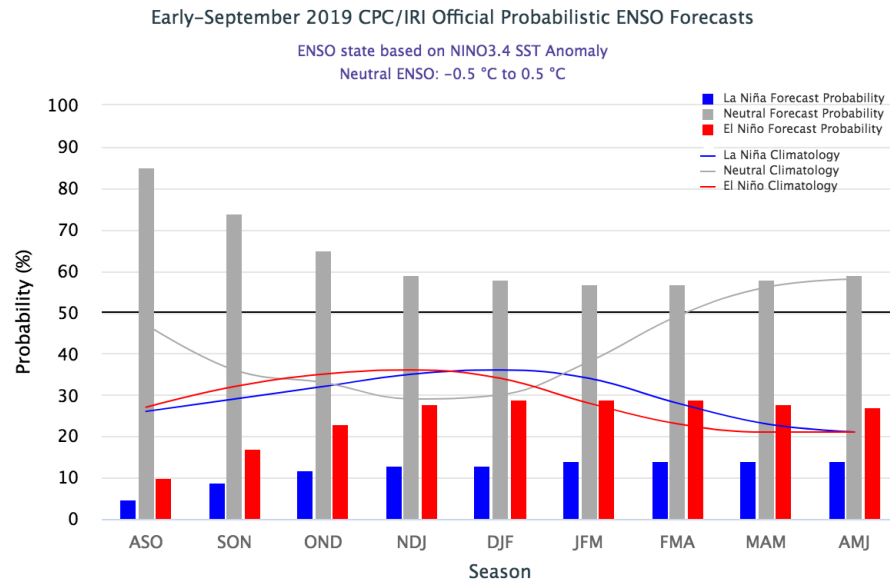
## FORT COLLINS WY2019 Precipitation Projections



## DENVER-STAPLETON WY2019 Precipitation Projections



# What's the El Niño forecast?



The El Niño is now over...back to neutral conditions  
Neutral conditions more than 50% likely to continue through winter



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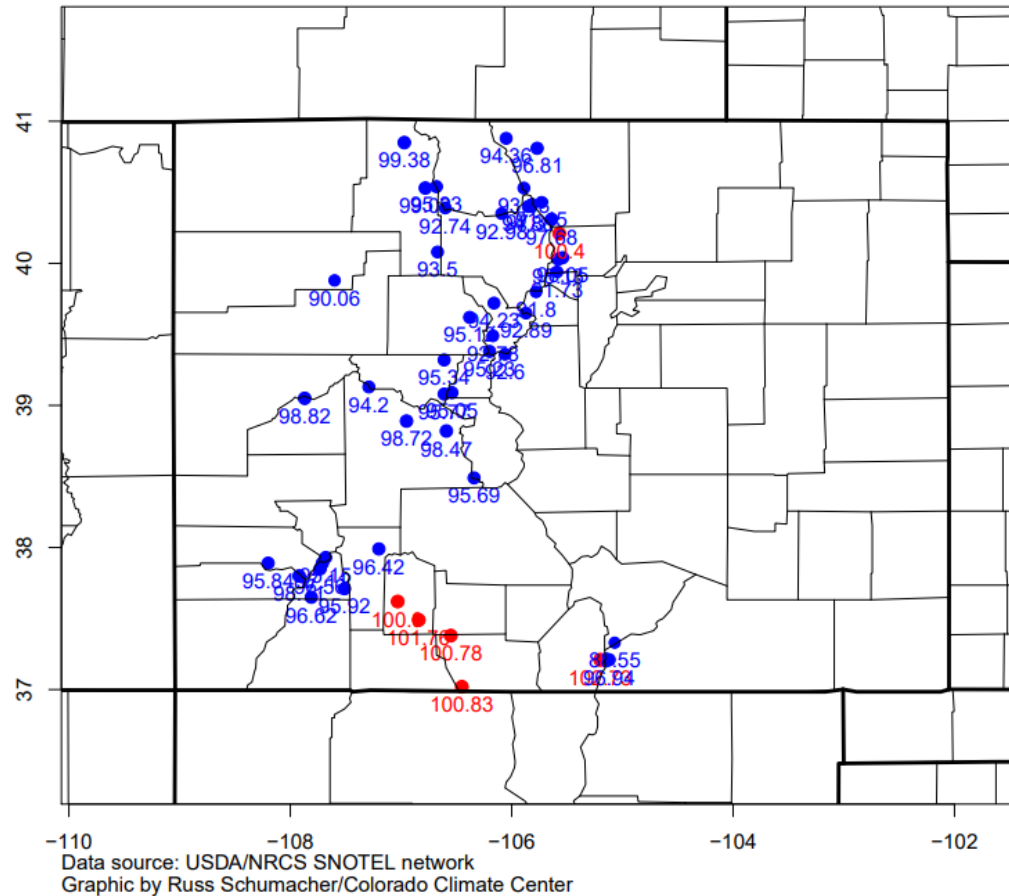
# Sorry, skiers, but we're probably not going to have another epic snow year

We're not in El Niño or La Niña, which typically means slightly below-normal snow, state climatologist says



1. Peak Snow Water Equivalent leans lower in neutral years than El Niño or La Niña years
2. More importantly, peak SWE is trending downward with time due to climate change
3. The combination of the two explains nowhere near all the variance in peak SWE. Could we have a terrific winter? Yes.

average percent of normal peak SWE during ENSO-neutral (using MEIv2)



# Sept-Oct-Nov Outlook

**Select Lead** ▾

## Seasonal Outlook

*September 2019-November 2019 (Lead 1)*

**Temperature**

● Outlook

**Opacity: 60%**

▬

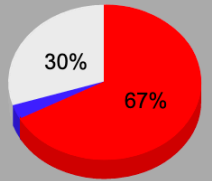
**Precipitation**

● Outlook

<< **Below Normal** | **Above Normal** >>

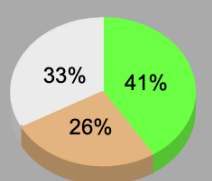
[7 Day Forecast for Durango, CO](#)

**Three Category Temperature Outlook**  
 Normal Maximum Temperature: **54**  
 Normal Minimum Temperature: **28**



- Above Normal
- Below Normal
- Near Normal

**Three Category Precipitation Outlook**  
 Normal Precipitation: **10.86**



- Above Normal
- Below Normal
- Near Normal





# Sept-Oct-Nov Outlook

Tendency toward warm, wet conditions projected through January

**Seasonal Outlook**  
September 2019-November 2019 (Lead 1)

**Temperature**

● Outlook

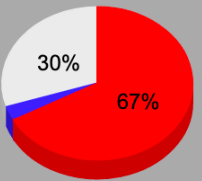
Opacity: 60%

◁ Below Normal    Above Normal ▷

**Precipitation**

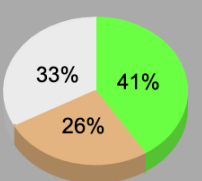
● Outlook

**Three Category Temperature Outlook**  
Normal Maximum Temperature: **54**  
Normal Minimum Temperature: **28**

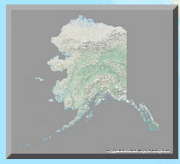


- Above Normal
- Below Normal
- Near Normal

**Three Category Precipitation Outlook**  
Normal Precipitation: **10.86**



- Above Normal
- Below Normal
- Near Normal



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# Summary points

- The monsoon has failed us
- July through September has been an historically hot, dry period for much of western CO. More seasonal on the eastern plains
- Drought has returned to Colorado, just D1
- A wet winter, and cool/wet spring saved our bacon! With recent hot and dry conditions, surface water supplies have regressed into the normal range (more from NRCS)
- El Niño has ended and neutral conditions likely to continue through winter
- ENSO-neutral winters tend to be a little less snowy in the mountains, but don't lean too heavily on that forecast yet



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[http://climate.colostate.edu/ccc\\_archive.html](http://climate.colostate.edu/ccc_archive.html)

Let's keep in touch

Peter Goble – [peter.goble@colostate.edu](mailto:peter.goble@colostate.edu)

Russ Schumacher (State Climatologist) – [russ.schumacher@colostate.edu](mailto:russ.schumacher@colostate.edu)

Becky Bolinger (Assistant State Climatologist) – [becky.bolinger@colostate.edu](mailto:becky.bolinger@colostate.edu)

Thank you!

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