

# Colorado Climate Center – *WATF Climate Update*

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Zach Schwalbe  
Colorado Climate Center

Water Availability Task Force  
September 11, 2018



Colorado State University



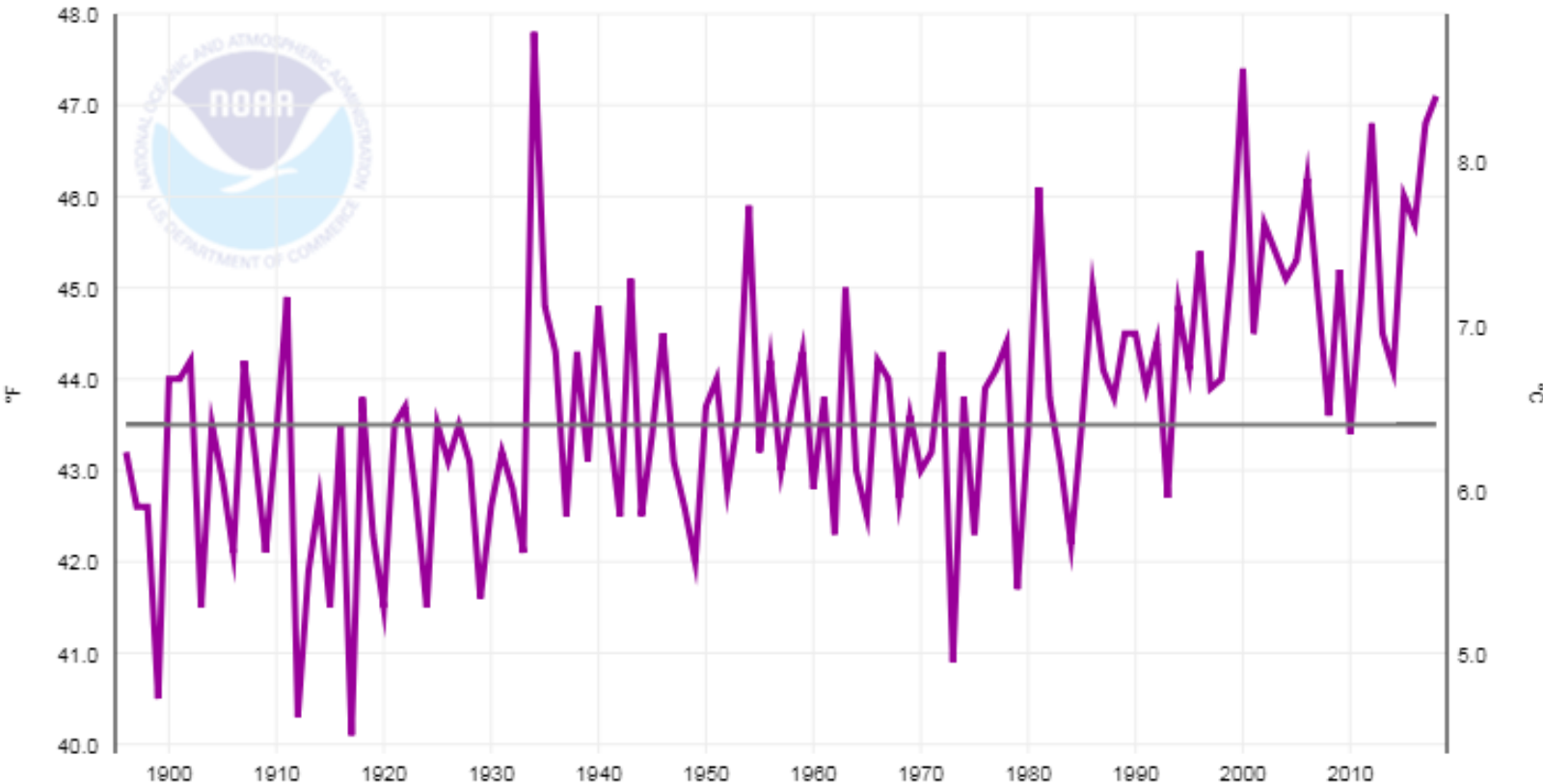
## Water Year 2018 – Temperature



3<sup>rd</sup> warmest in 123-year record (only WY 1934 and 2000 warmer);  
 +3.6°F above 47.1°F average

Colorado, Average Temperature, October-August

— Avg Temperature      — 1901-2000 Mean: 43.5°F

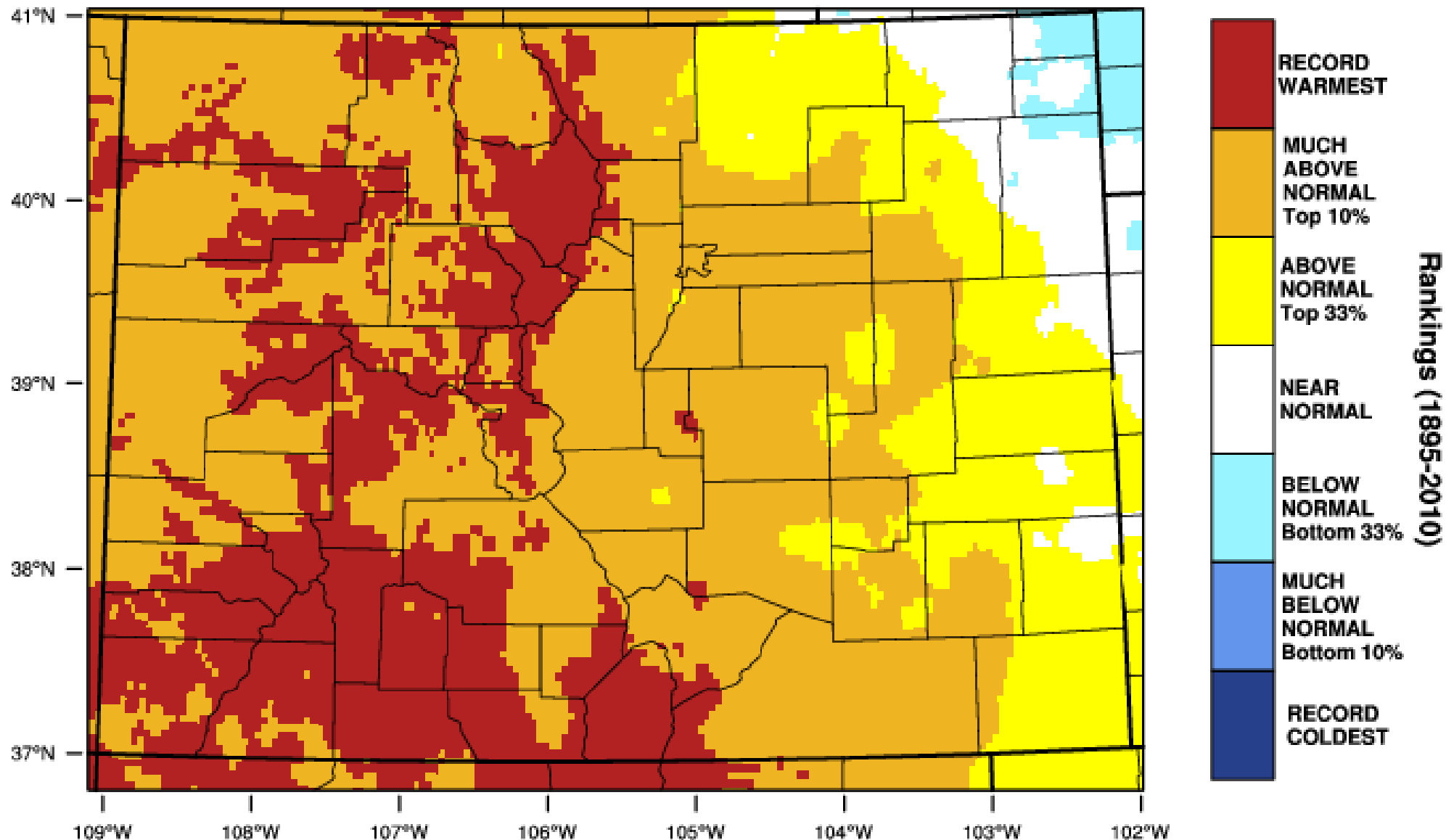


MONTH	RANK
Oct 2017	near average
Nov 2017	1 <sup>st</sup> warmest
Dec 2017	8 <sup>th</sup> warmest
Jan 2018	8 <sup>th</sup> warmest
Feb 2018	near average
Mar 2018	25 <sup>th</sup> warmest
Apr 2018	near average
May 2018	2 <sup>nd</sup> warmest
Jun 2018	3 <sup>rd</sup> warmest
Jul 2018	10 <sup>th</sup> warmest
Aug 2018	33 <sup>rd</sup> warmest



# Colorado - Mean Temperature

## October-August 2018 Percentile



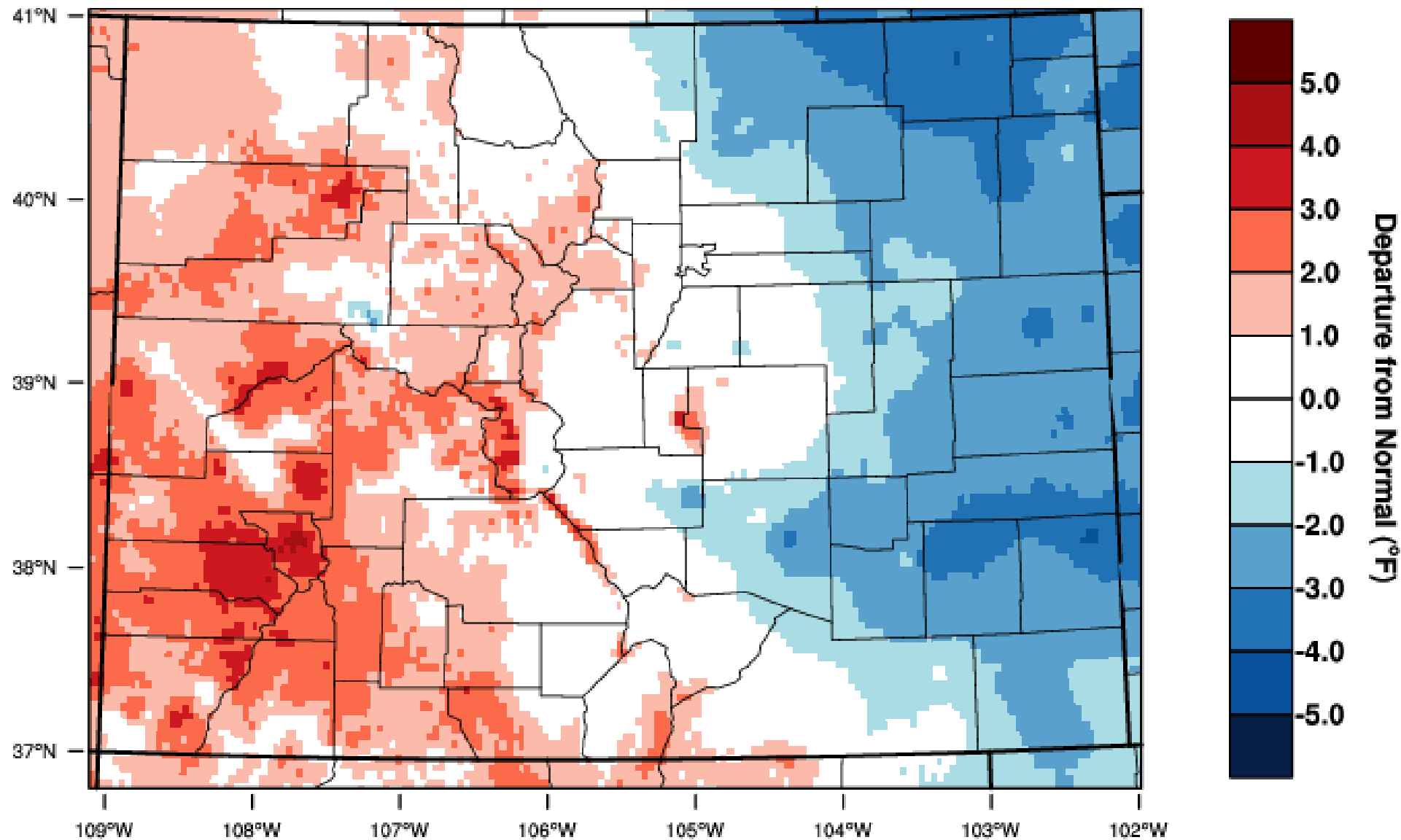
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 SEP 2018





# Colorado - Mean Temperature

August 2018 Departure from 1981-2010 Normal

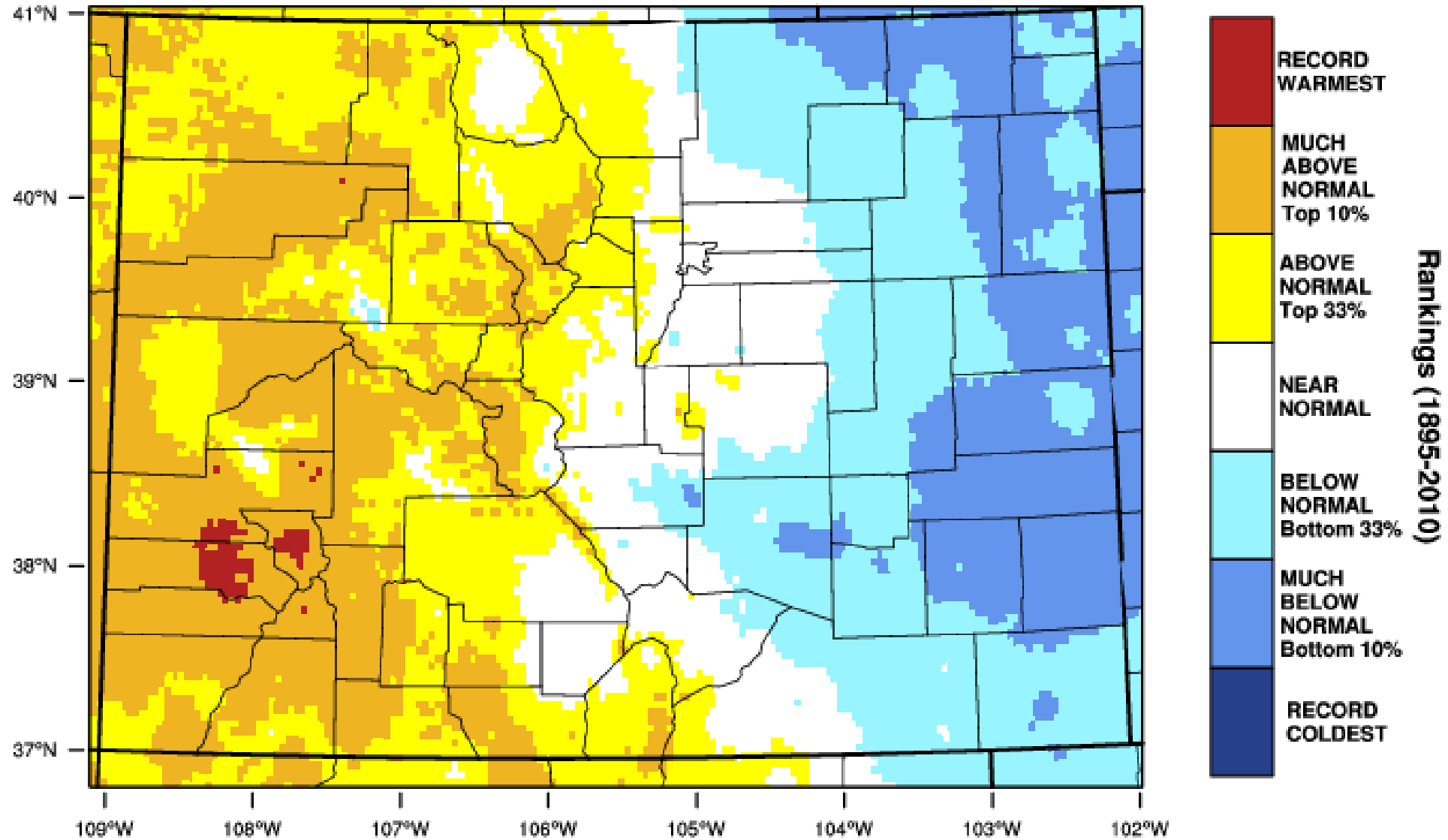


WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 SEP 2018



# Colorado - Mean Temperature

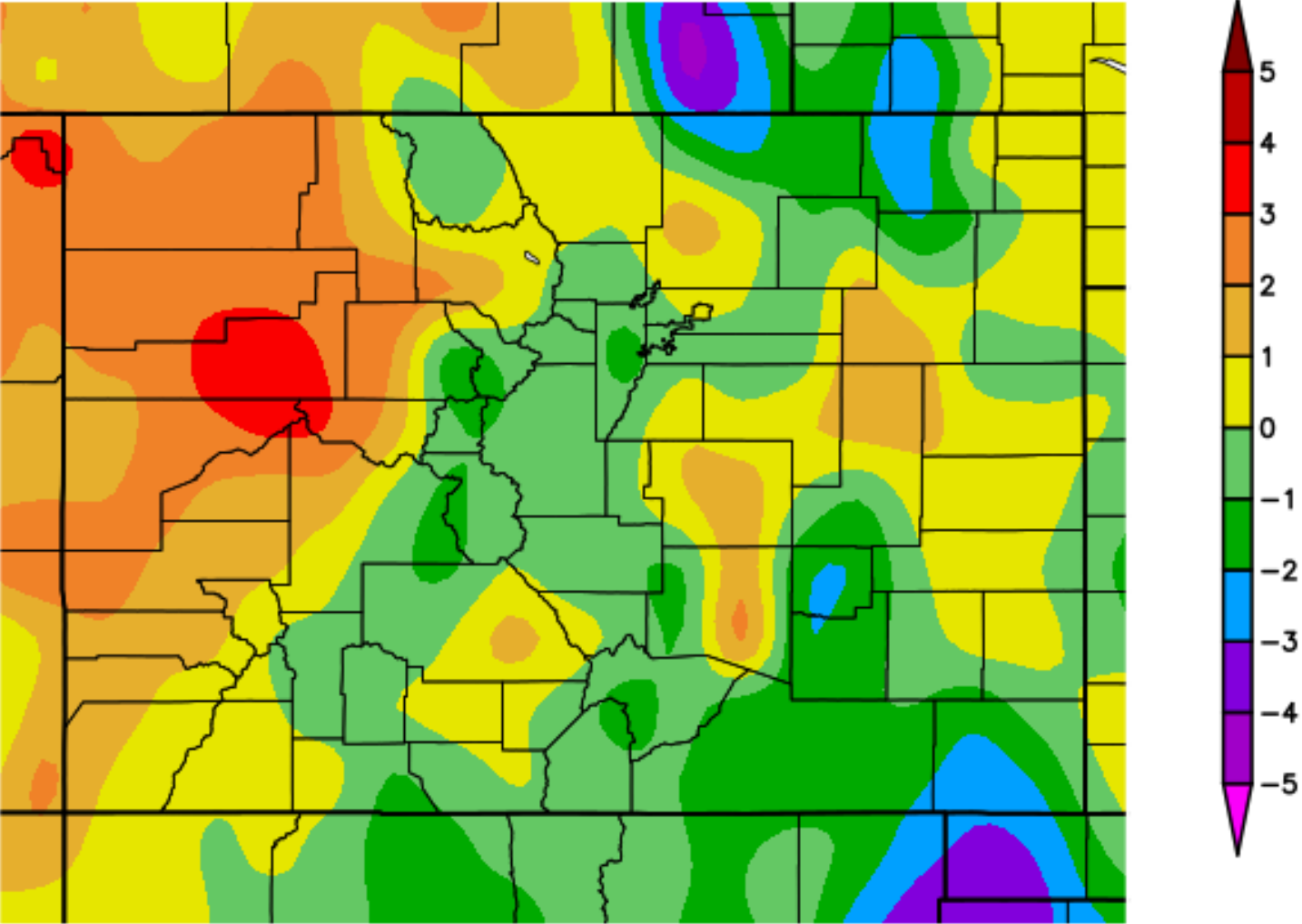
## August 2018 Percentile



WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 SEP 2018



# Departure from Normal Temperature (F) 9/1/2018 - 9/9/2018



Generated 9/10/2018 at HPRCC using provisional data.

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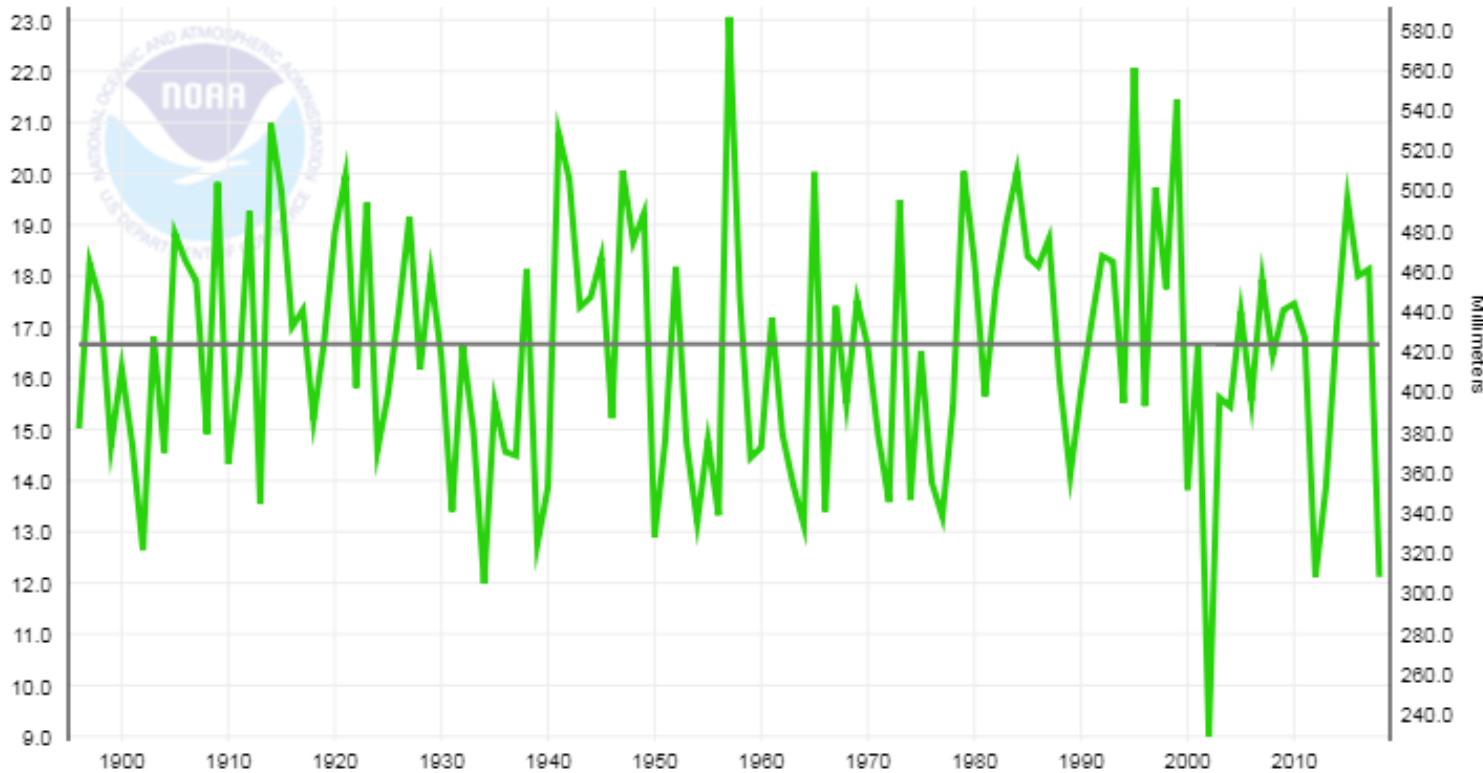
# Water Year 2018 – Precipitation



4th driest in 123-year record (behind WY 2002, WY 1934, WY 2012)  
 -4.55" below 16.67" average

Colorado, Precipitation, October-August

Precip 1901-2000 Mean: 16.67"



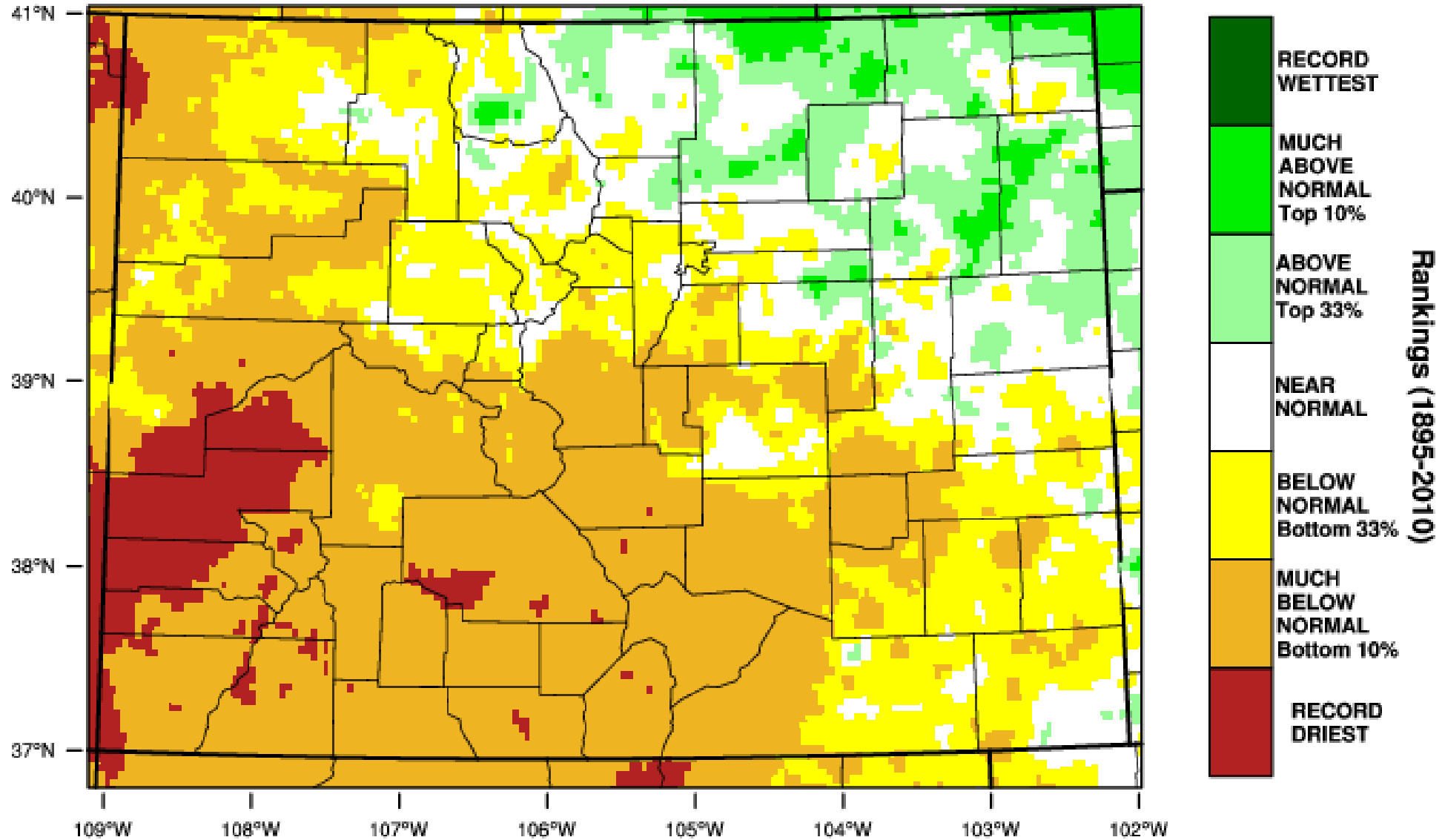
MONTH	RANK
Oct 2017	37 <sup>th</sup> driest
Nov 2017	18 <sup>th</sup> driest
Dec 2017	7 <sup>th</sup> driest
Jan 2018	37 <sup>th</sup> driest
Feb 2018	near average
Mar 2018	26 <sup>th</sup> driest
Apr 2018	34 <sup>th</sup> driest
May 2018	38 <sup>th</sup> driest
Jun 2018	26 <sup>th</sup> driest
Jul 2018	near average
Aug 2018	25 <sup>th</sup> driest





# Colorado - Precipitation

## October-August 2018 Percentile

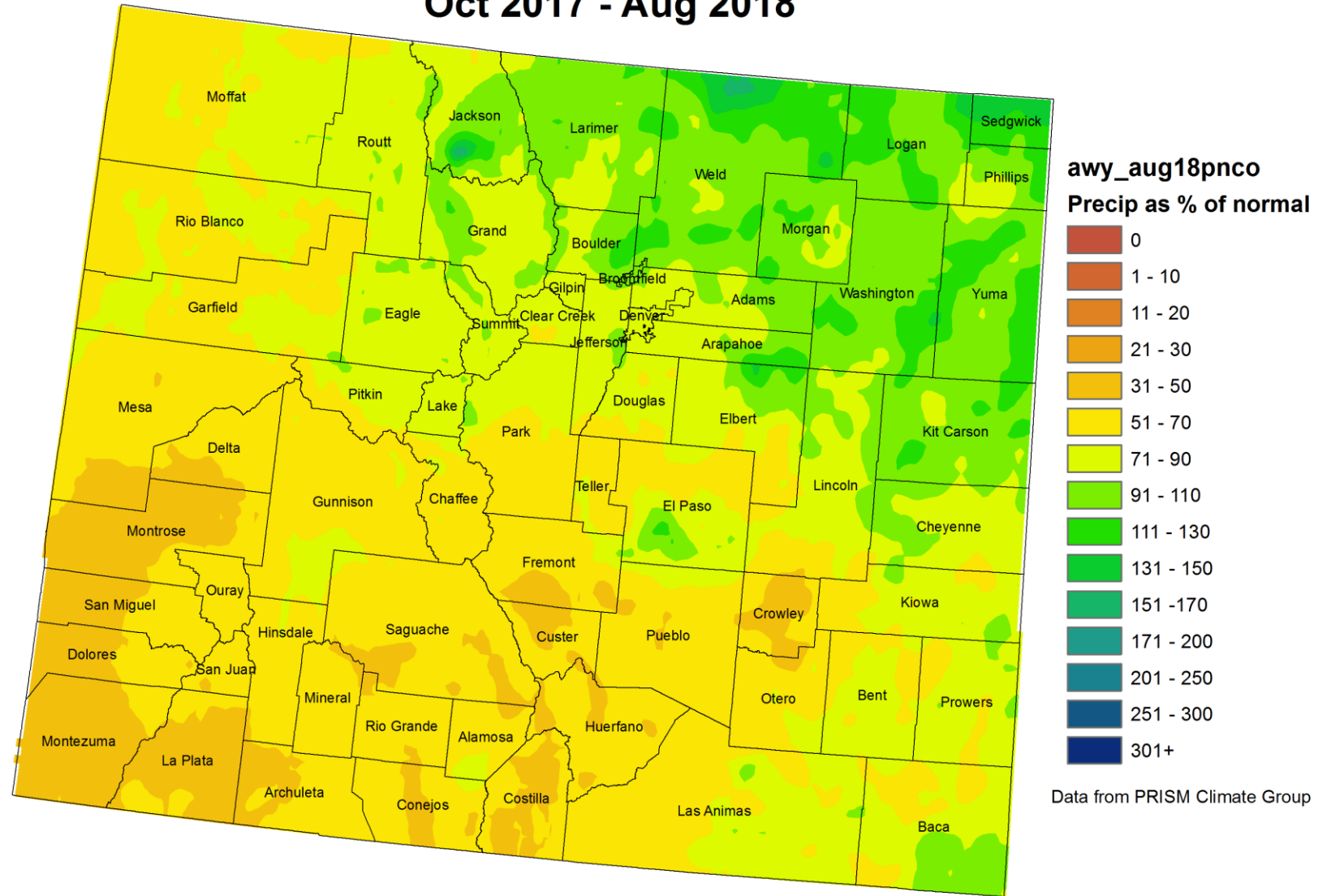


WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 SEP 2018

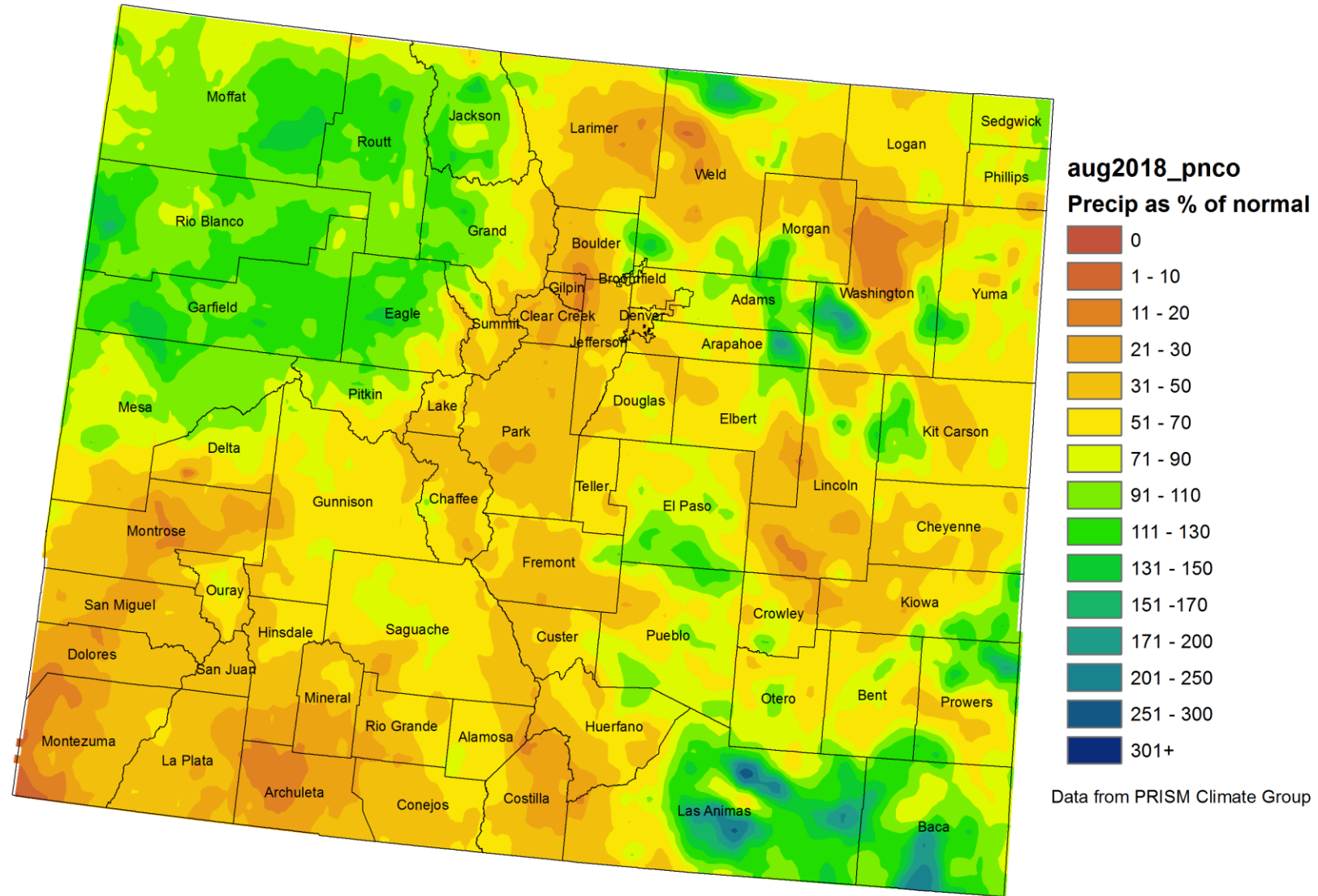




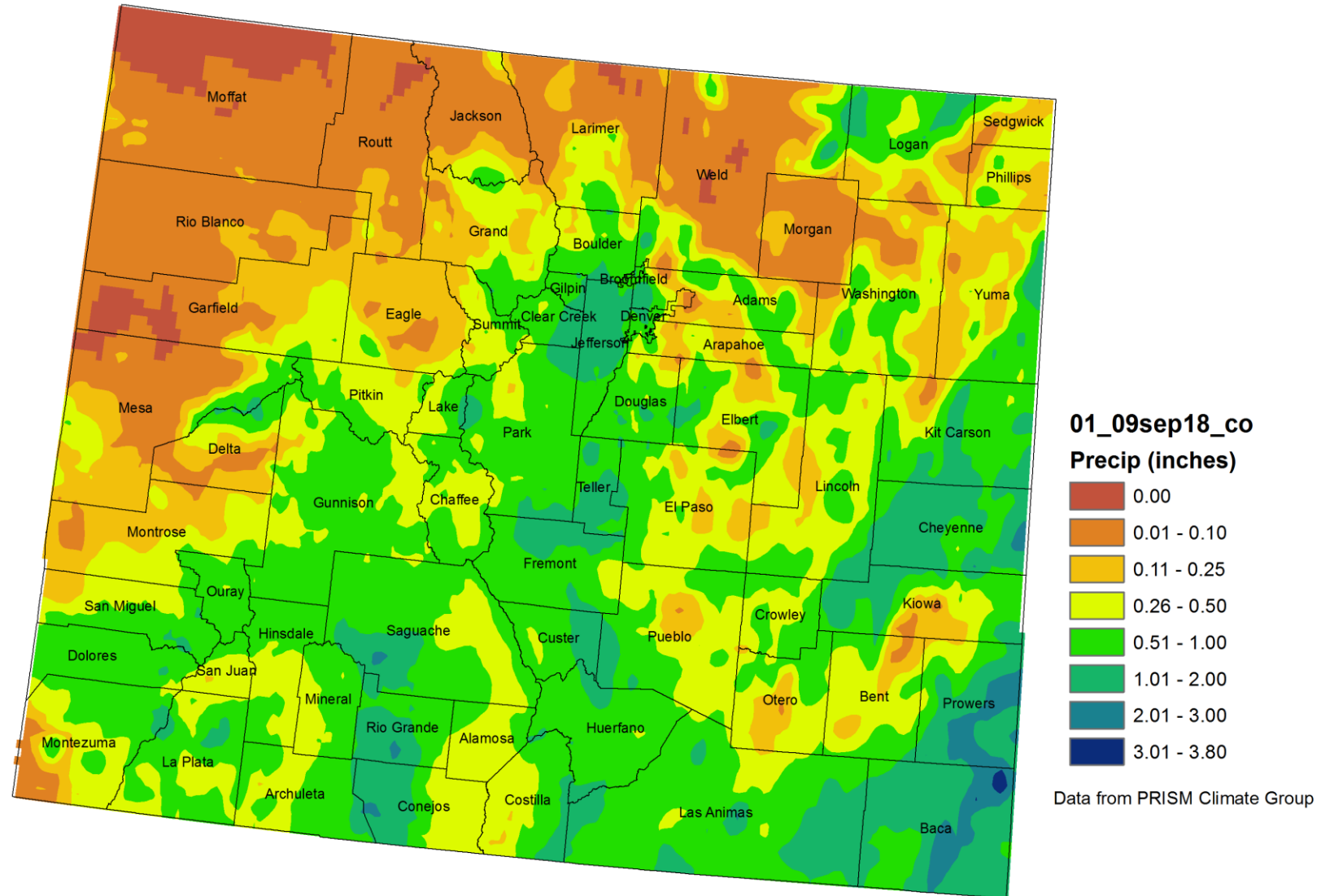
# Colorado Water Year 2018 Precipitation as a Percentage of Normal Oct 2017 - Aug 2018



# Colorado August 2018 Precipitation as a Percentage of Normal

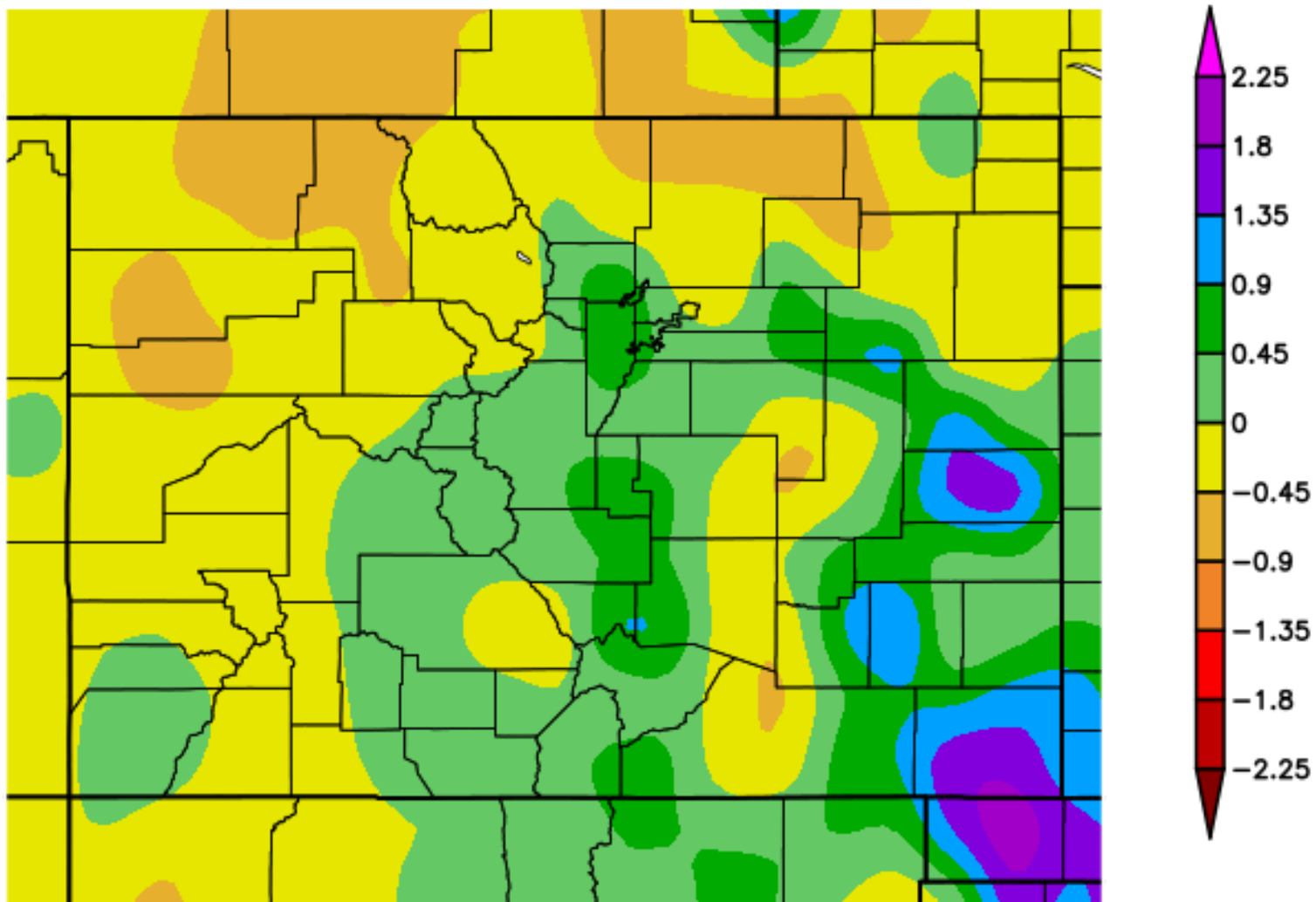


# Colorado Month to Date Precipitation 1 - 9 September 2018



# Departure from Normal Precipitation (in)

## 9/1/2018 - 9/9/2018



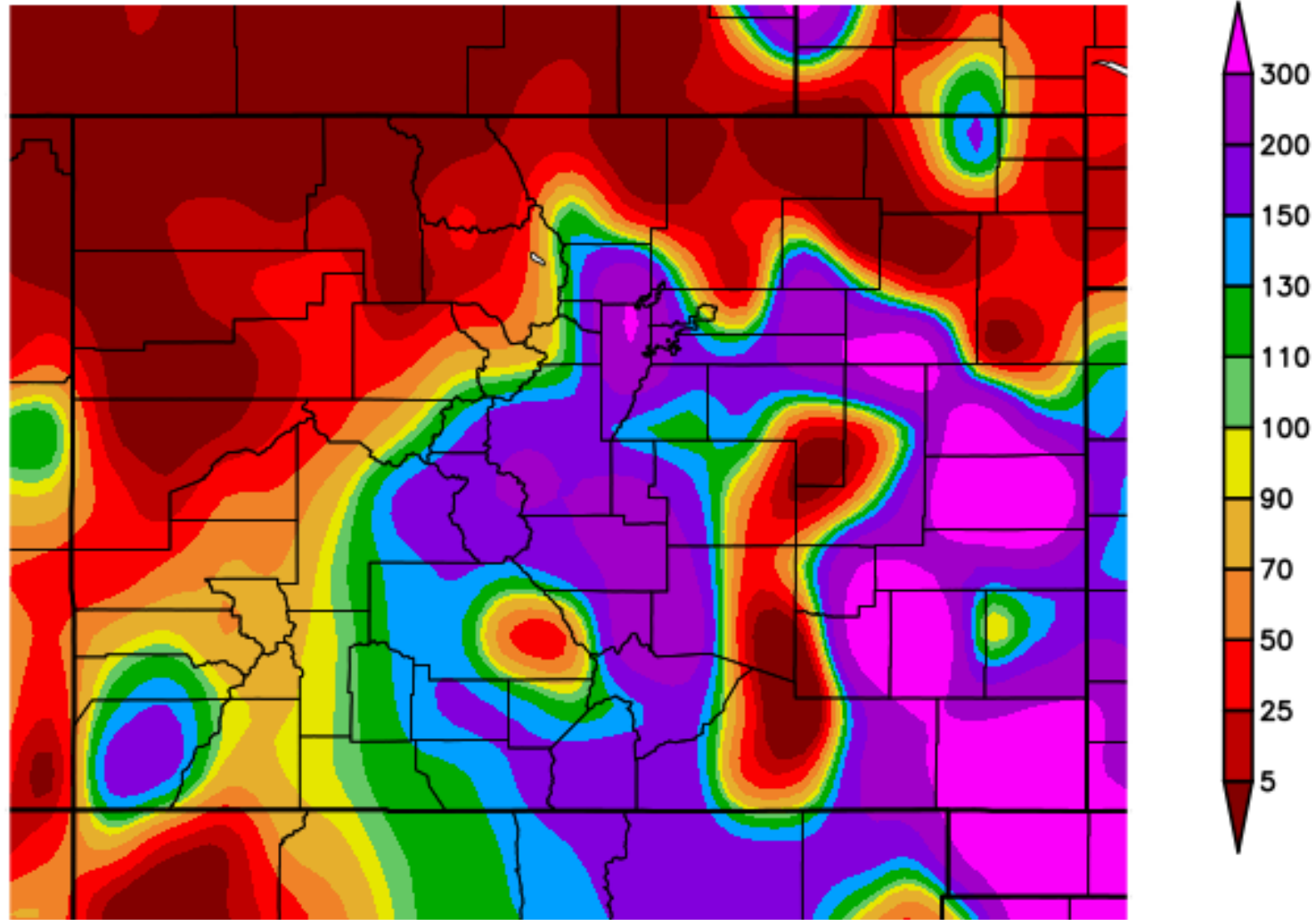
Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers



# Percent of Normal Precipitation (%)

## 9/1/2018 - 9/9/2018



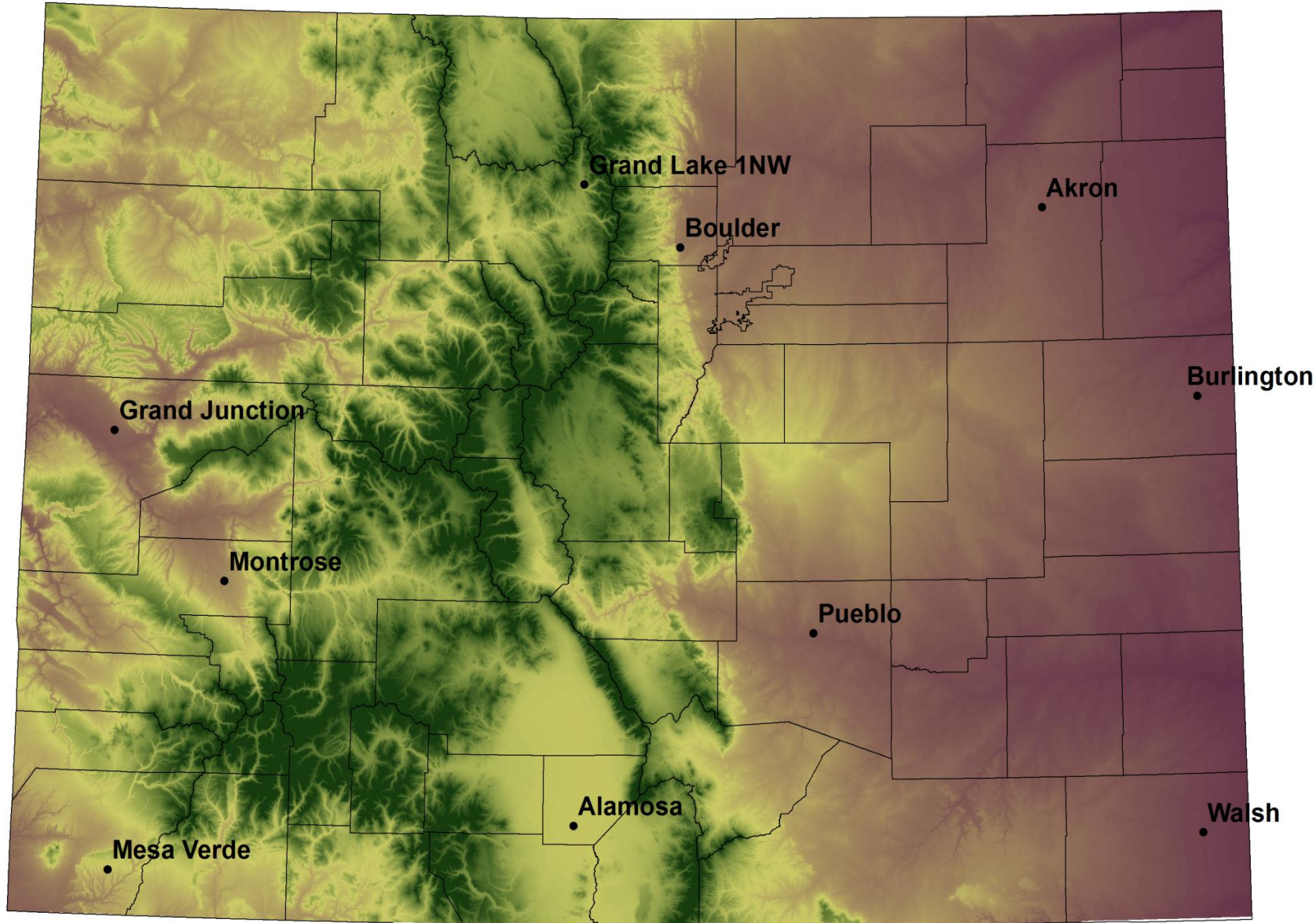
Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers





# NWS Cooperative Stations for WATF



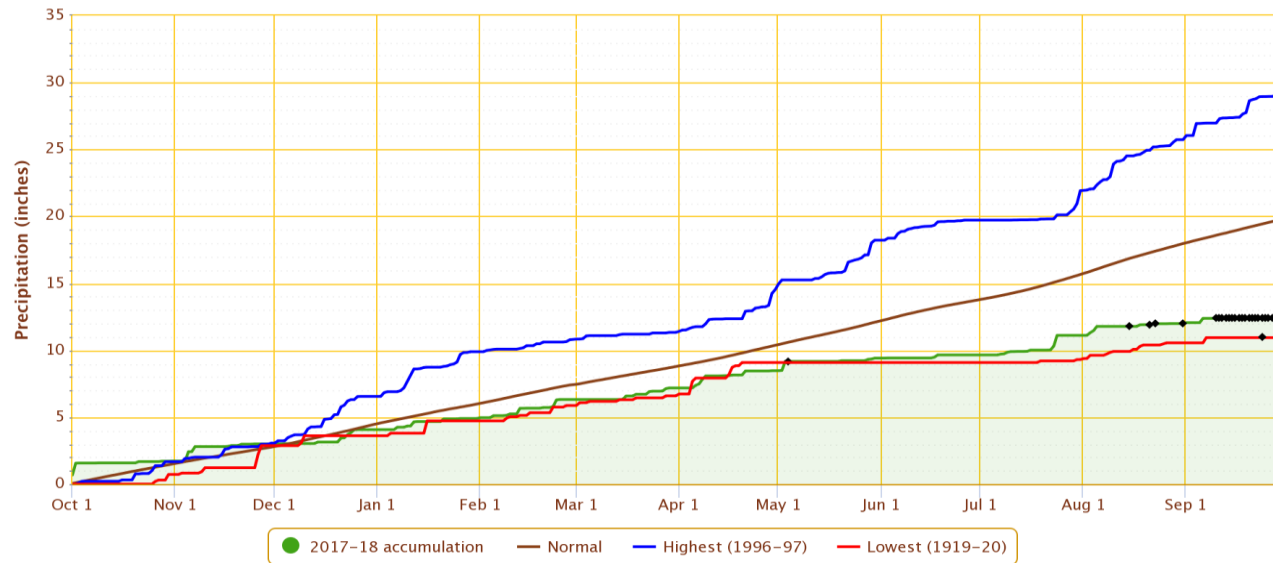
## Water Year 2018 – Station Updates





### Accumulated Precipitation – GRAND LAKE 1 NW, CO

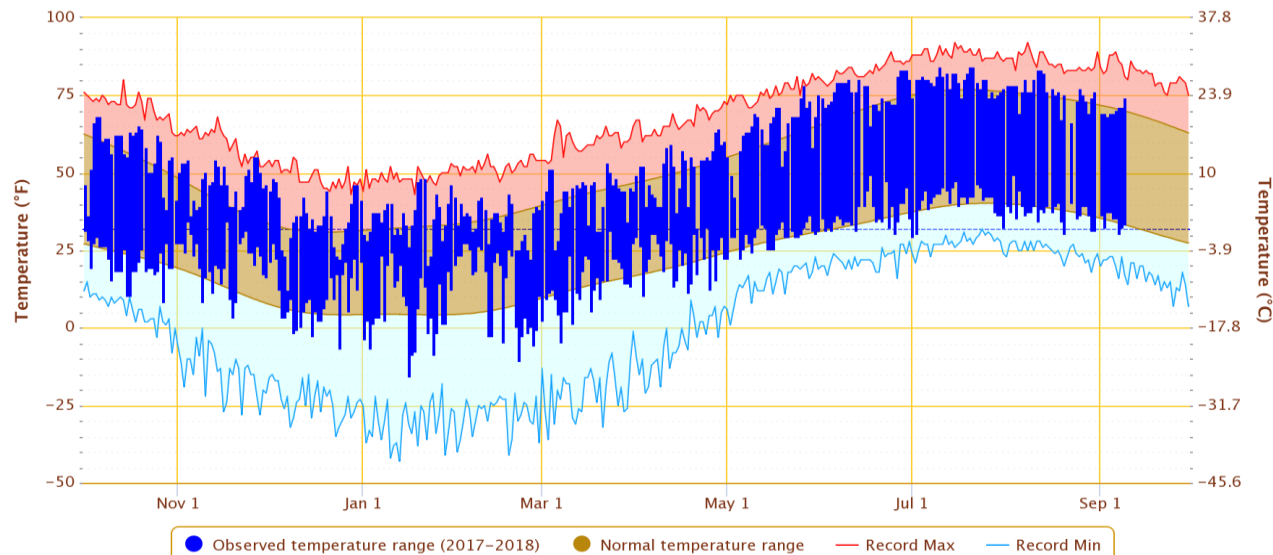
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

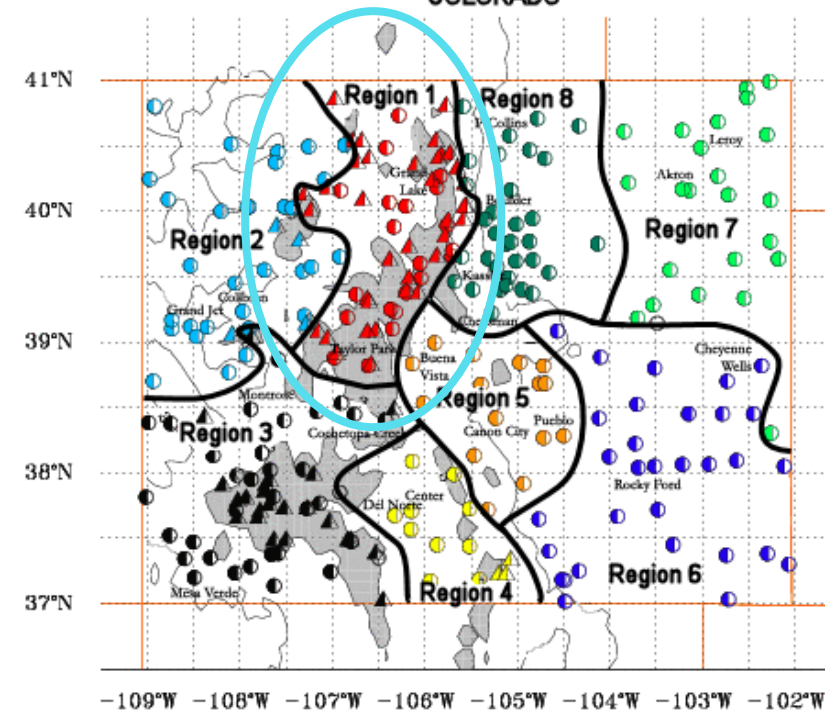
### Daily Temperature Data – GRAND LAKE 1 NW, CO

Period of Record – 1939-10-01 to 2018-09-09. Normals period: 1981-2010. Click and drag to zoom chart.



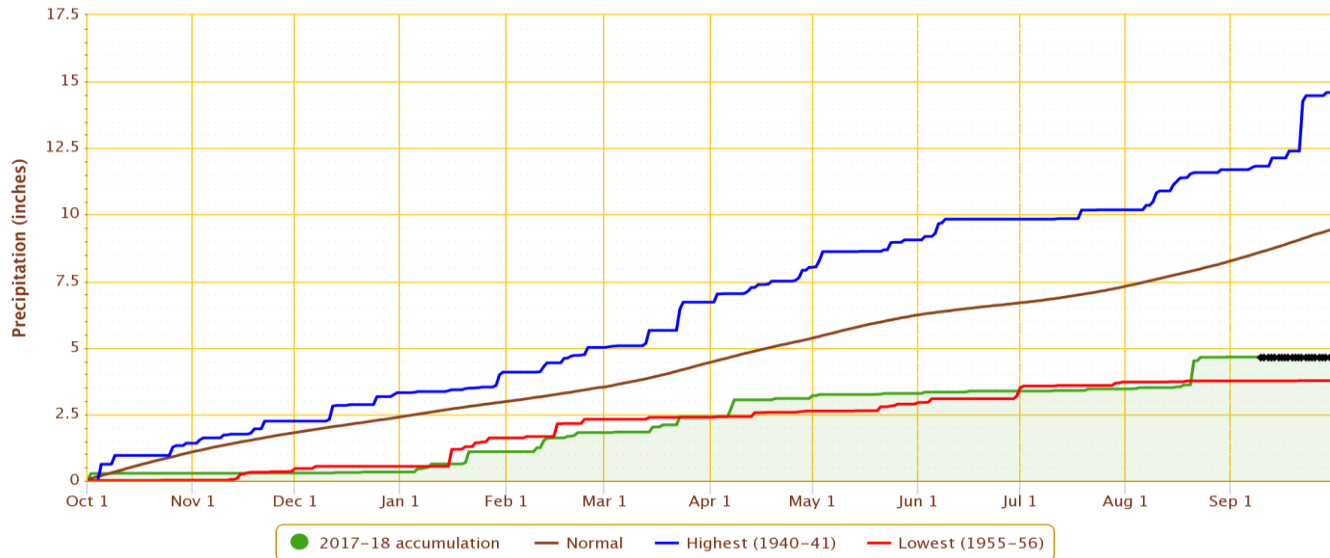
Powered by ACIS

### COLORADO



### Accumulated Precipitation – GRAND JUNCTION WALKER FIELD, CO

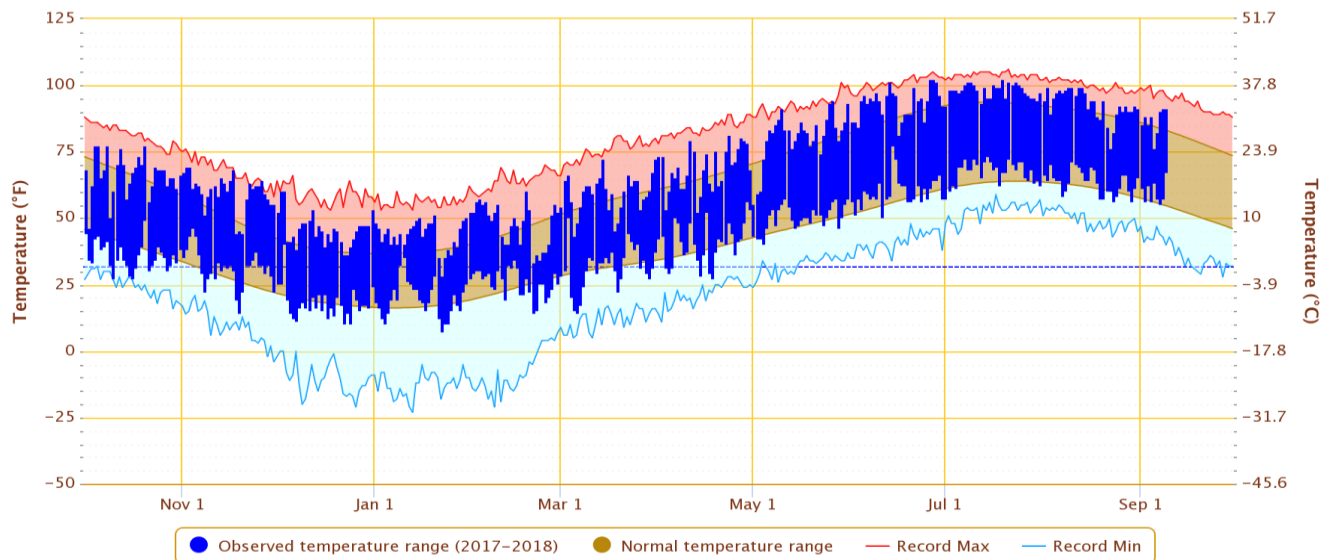
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



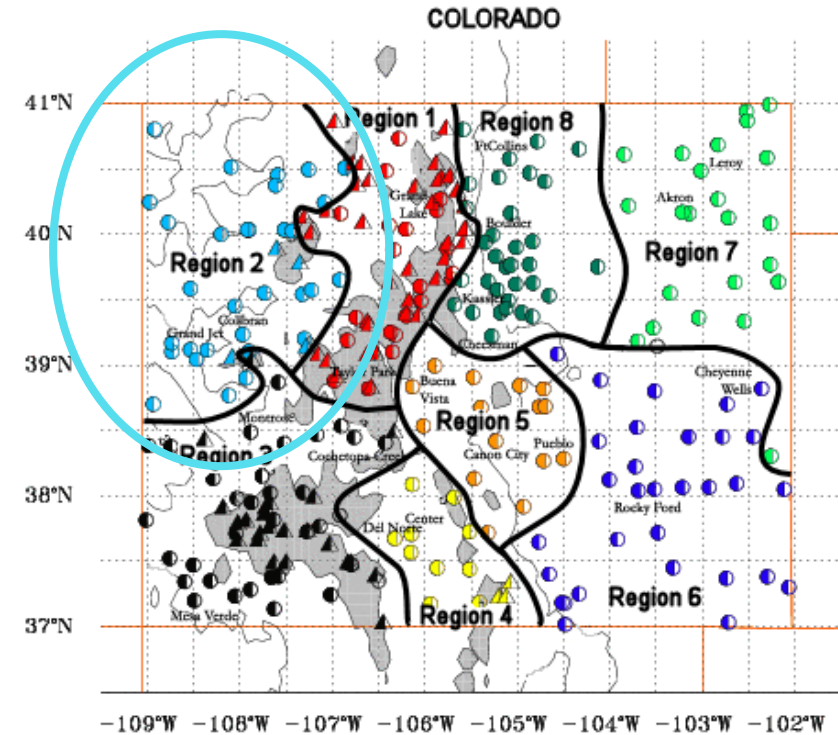
Powered by ACIS

### Daily Temperature Data – GRAND JUNCTION WALKER FIELD, CO

Period of Record – 1900-01-01 to 2018-09-09. Normals period: 1981-2010. Click and drag to zoom chart.

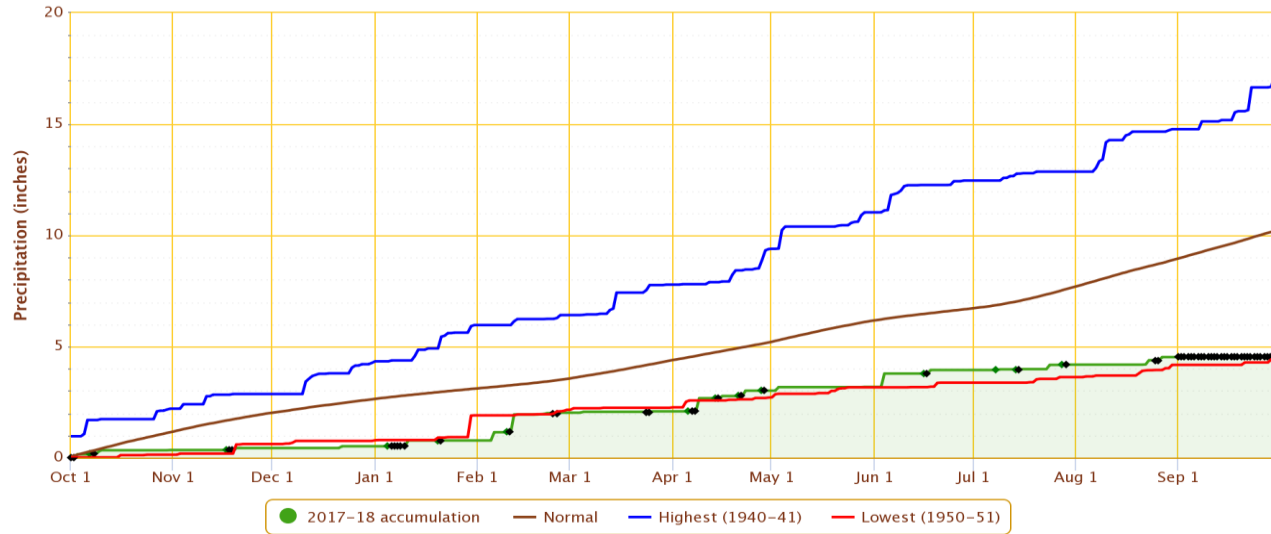


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### Accumulated Precipitation – MONTROSE NO 2, CO

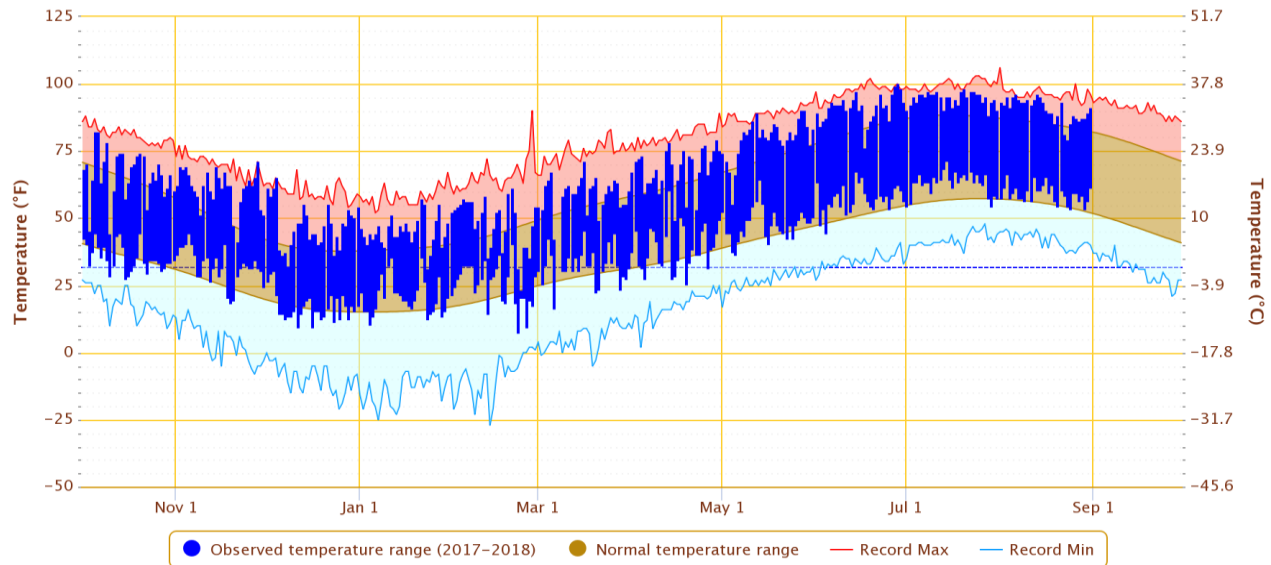
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

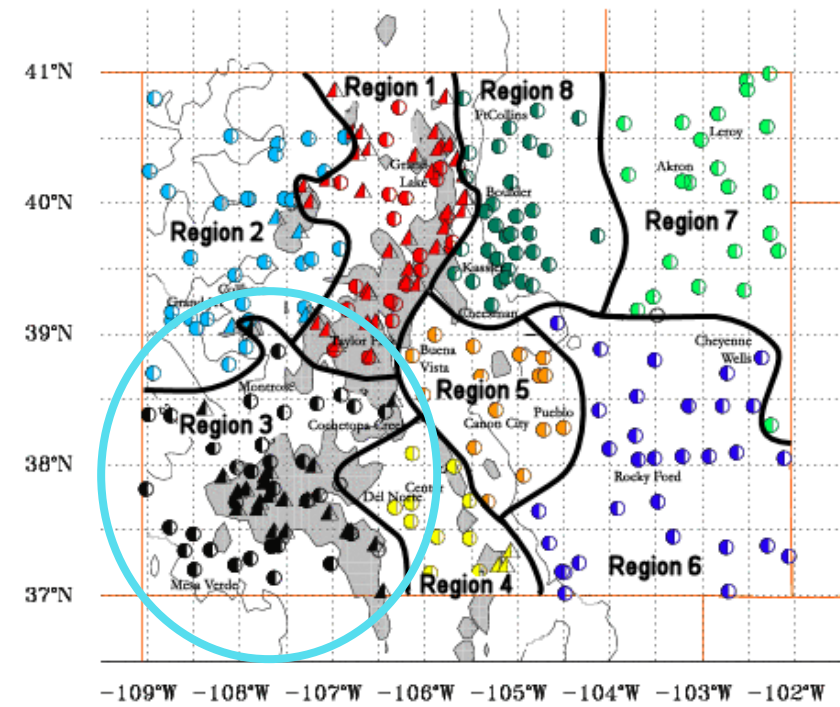
### Daily Temperature Data – MONTROSE NO 2, CO

Period of Record – 1895-10-01 to 2018-08-31. Normals period: 1981-2010. Click and drag to zoom chart.



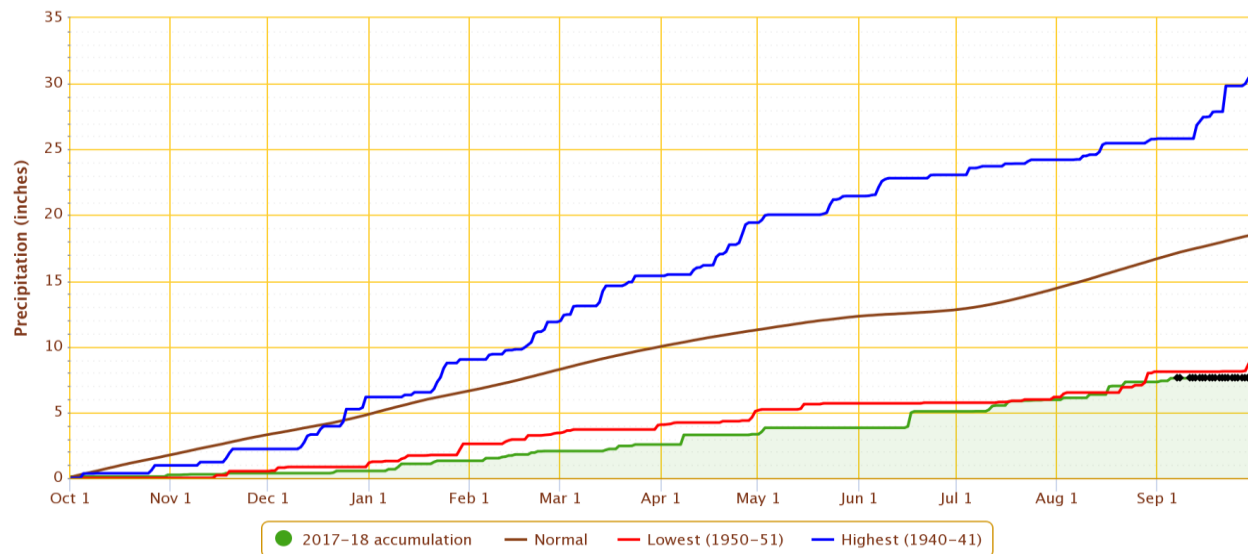
Powered by ACIS

### COLORADO



### Accumulated Precipitation – MESA VERDE NP, CO

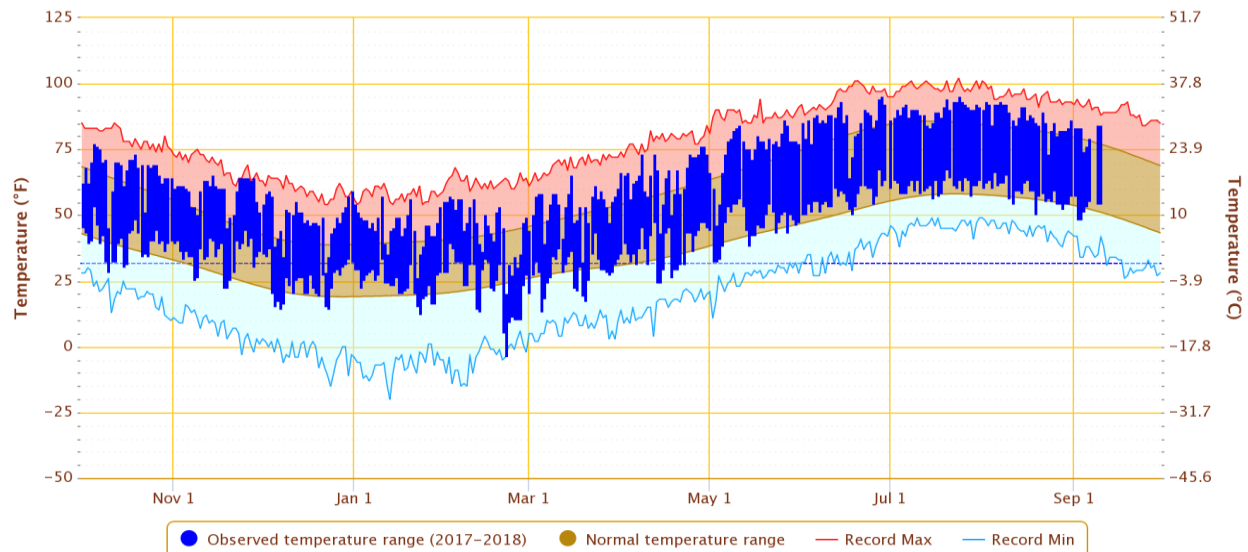
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

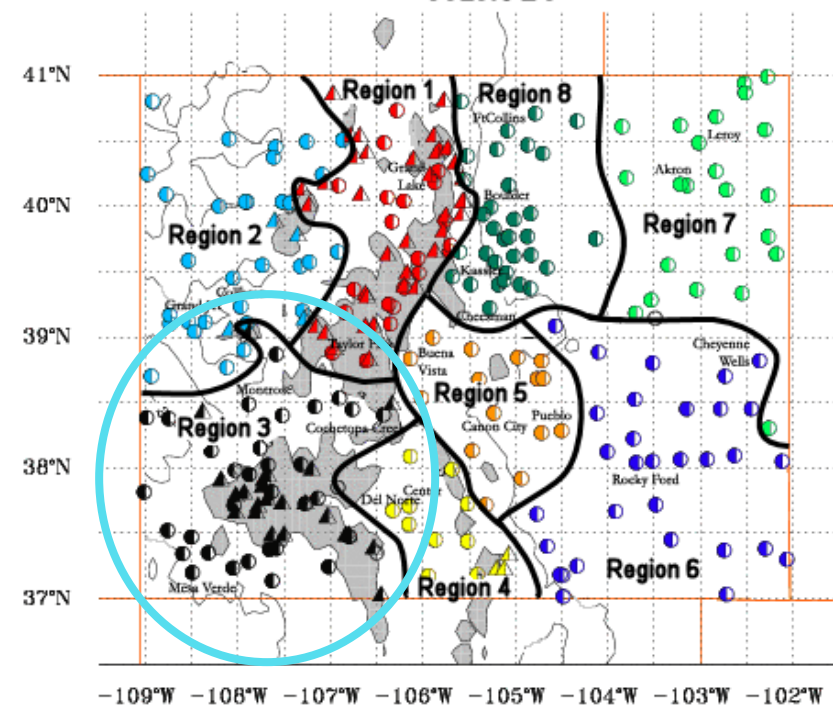
### Daily Temperature Data – MESA VERDE NP, CO

Period of Record – 1922-02-16 to 2018-09-10. Normals period: 1981-2010. Click and drag to zoom chart.



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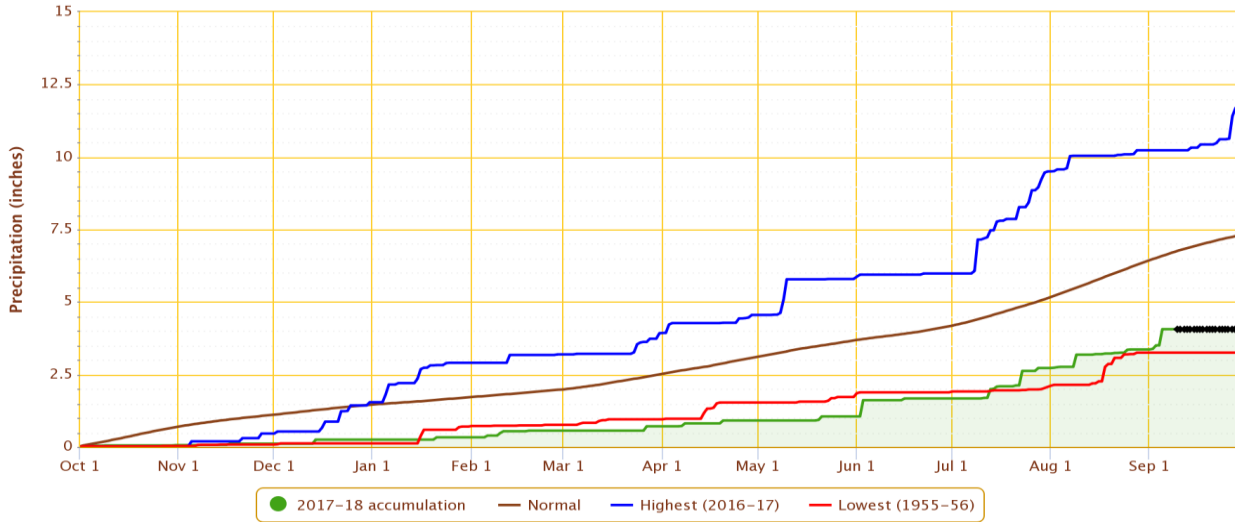
### COLORADO





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

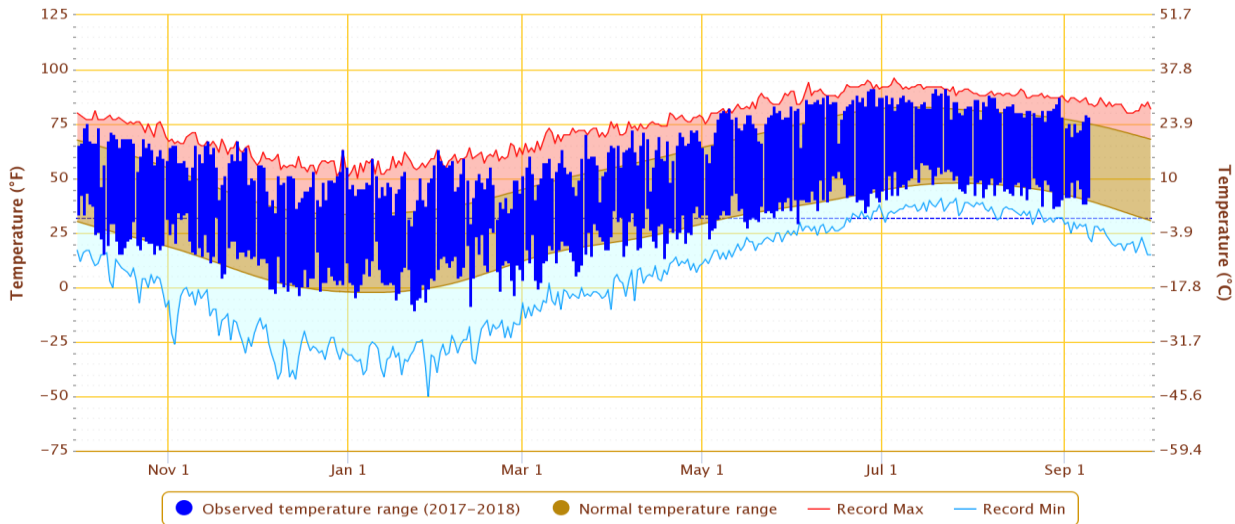
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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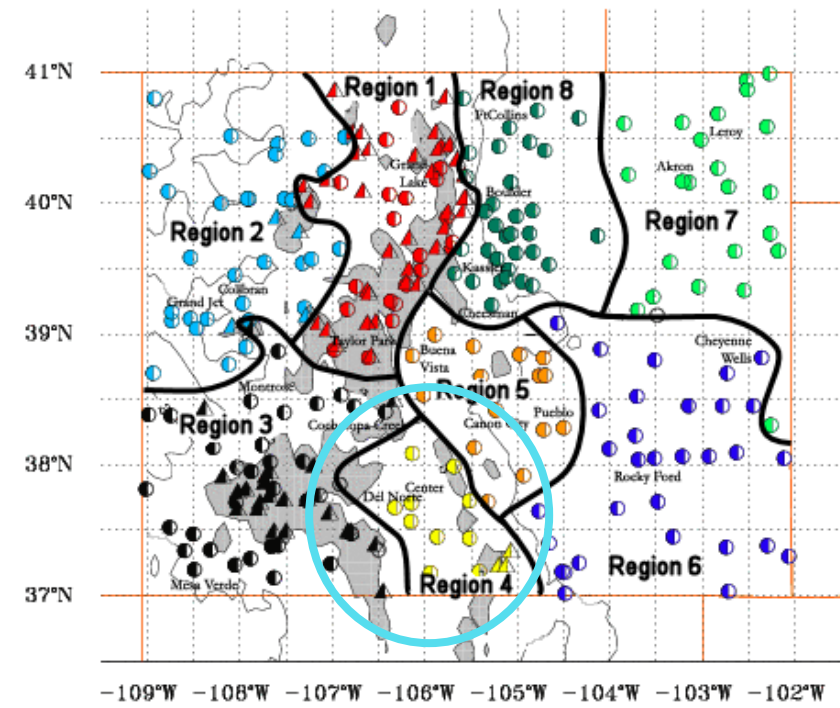
### Daily Temperature Data – ALAMOSA SAN LUIS VALLEY REGIONAL AP, CO

Period of Record – 1948-01-01 to 2018-09-09. Normals period: 1981-2010. Click and drag to zoom chart.



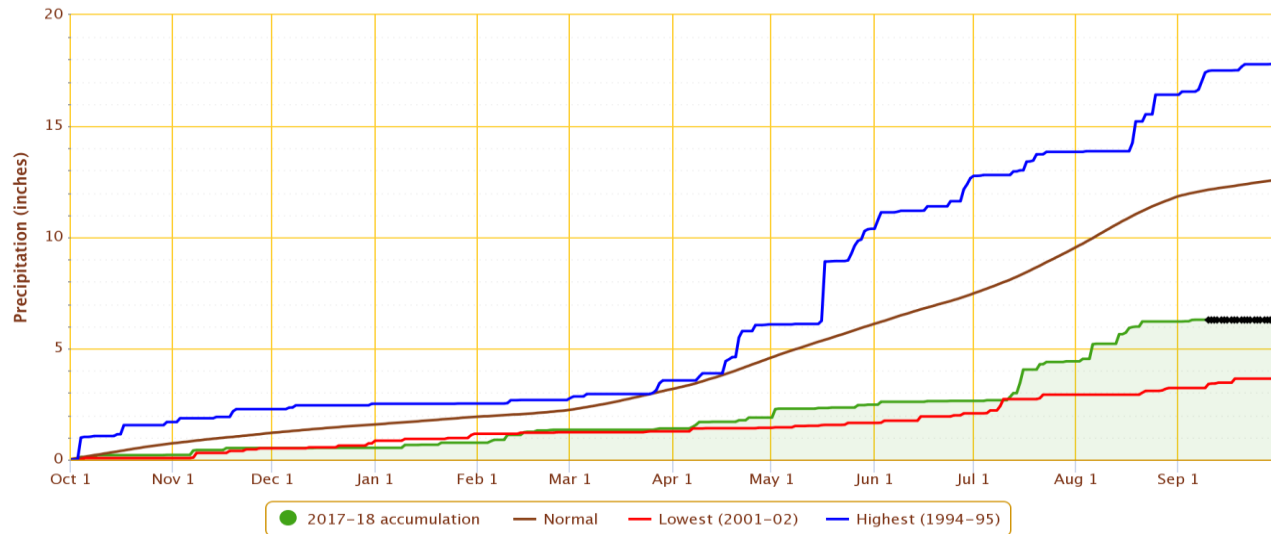
Powered by ACIS

### COLORADO



### Accumulated Precipitation – PUEBLO MEMORIAL AP, CO

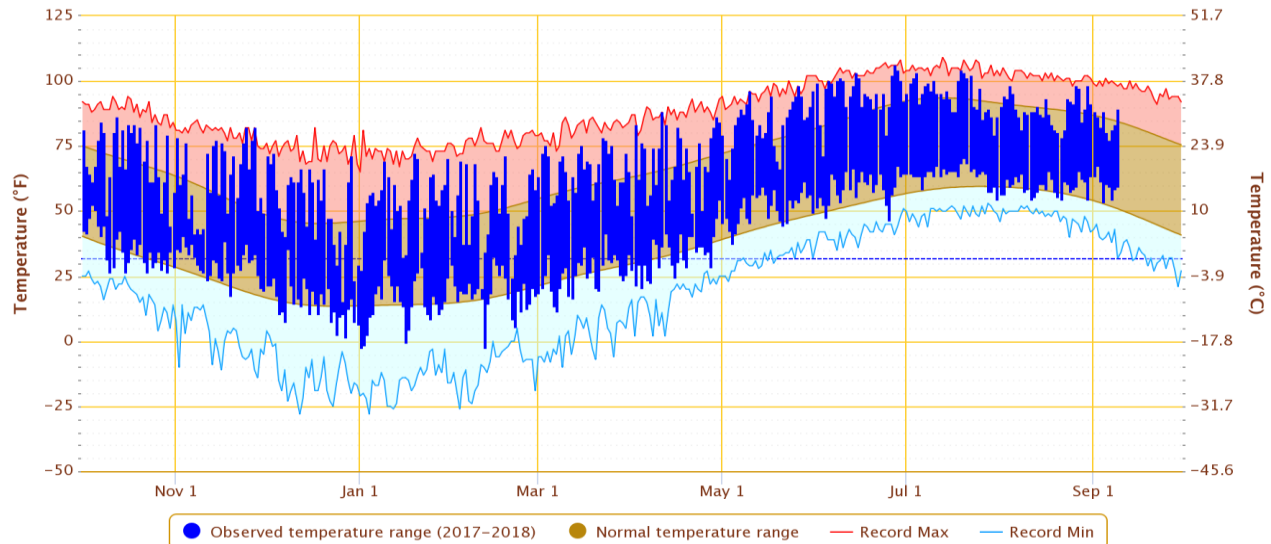
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



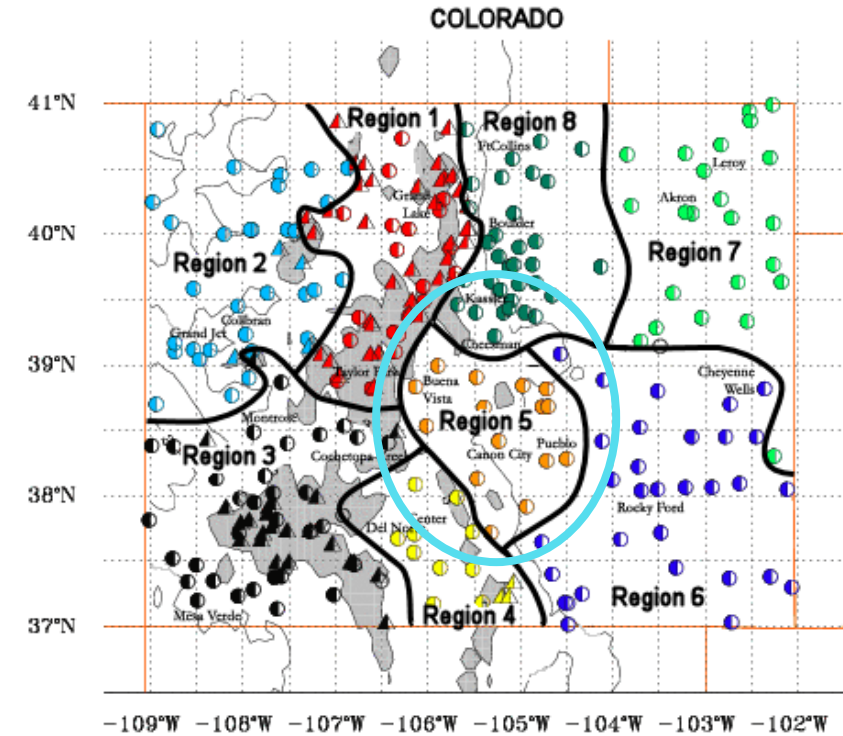
Powered by ACIS

### Daily Temperature Data – PUEBLO MEMORIAL AP, CO

Period of Record – 1954-06-16 to 2018-09-09. Normals period: 1981-2010. Click and drag to zoom chart.



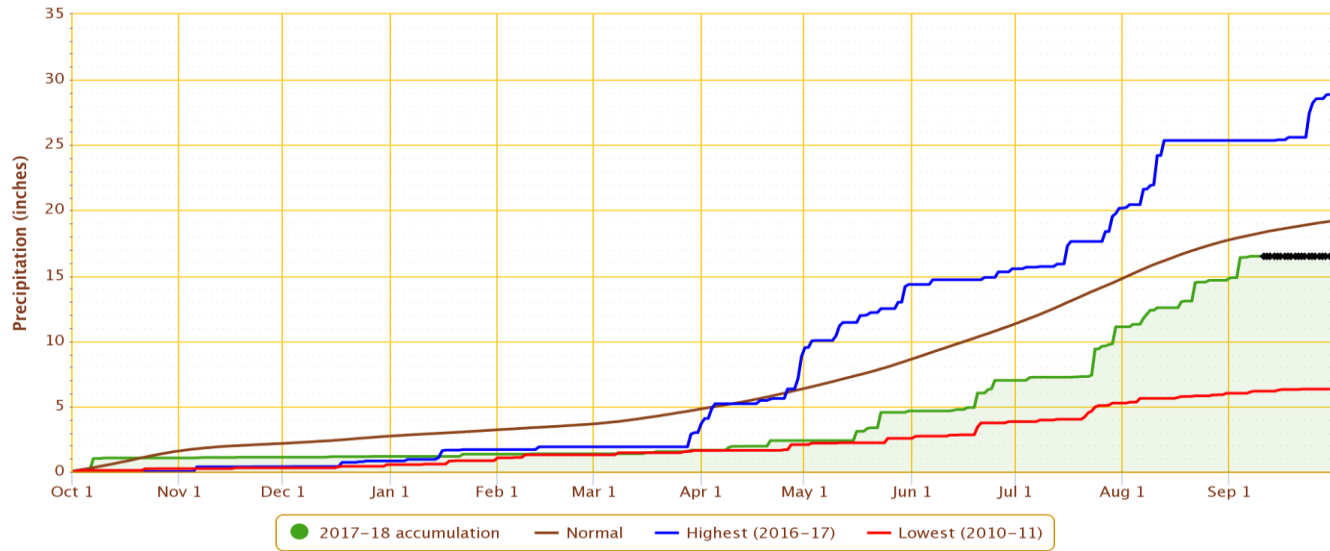
Powered by ACIS





### Accumulated Precipitation – WALSH 1 W, CO

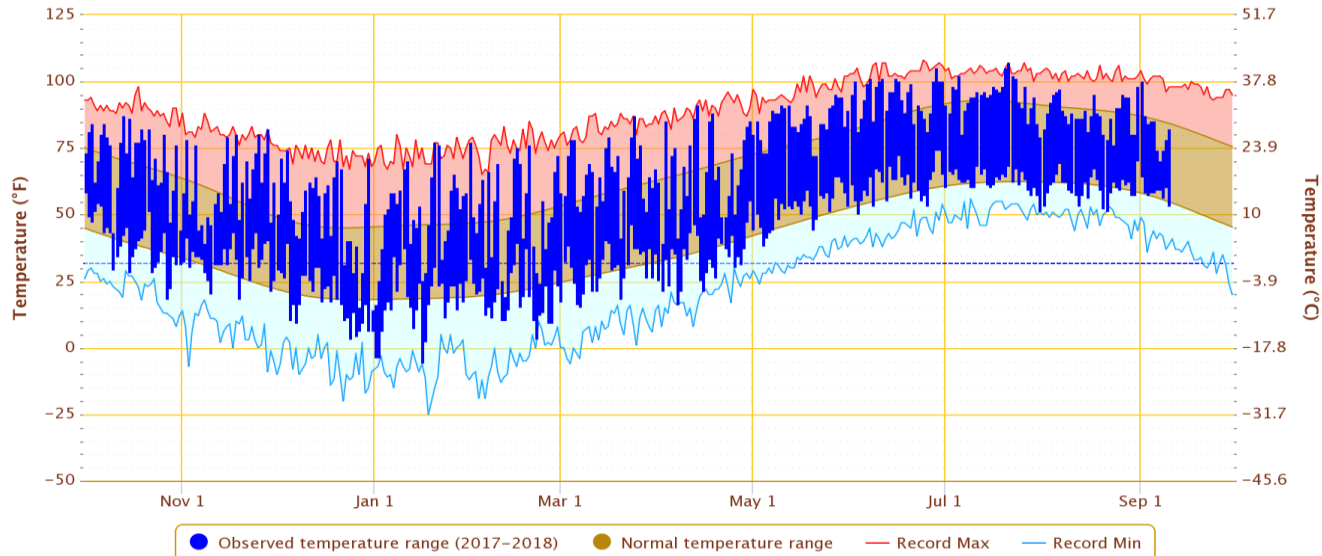
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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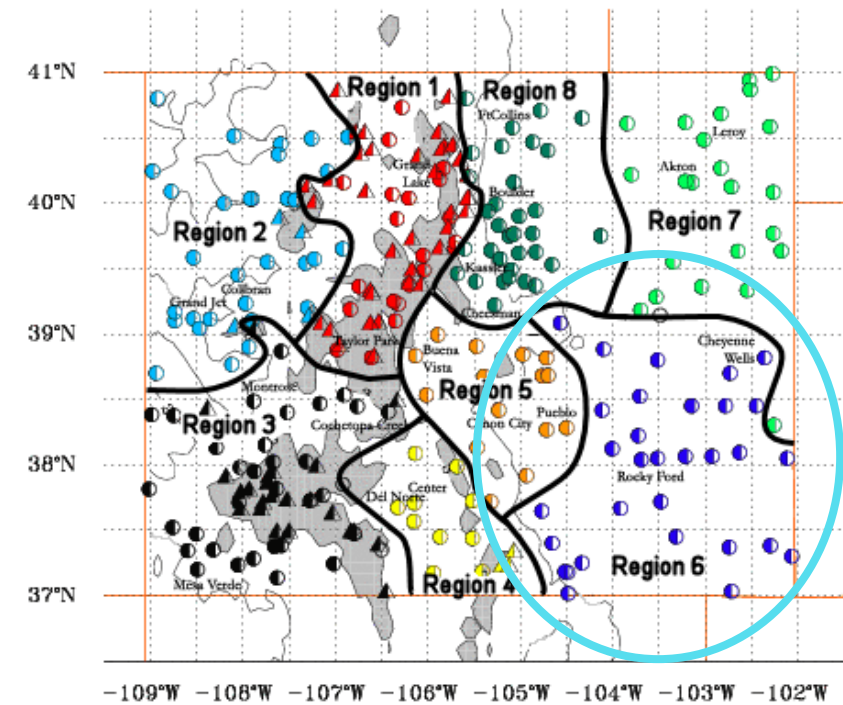
### Daily Temperature Data – WALSH 1 W, CO

Period of Record – 1967-09-01 to 2018-09-10. Normals period: 1981-2010. Click and drag to zoom chart.



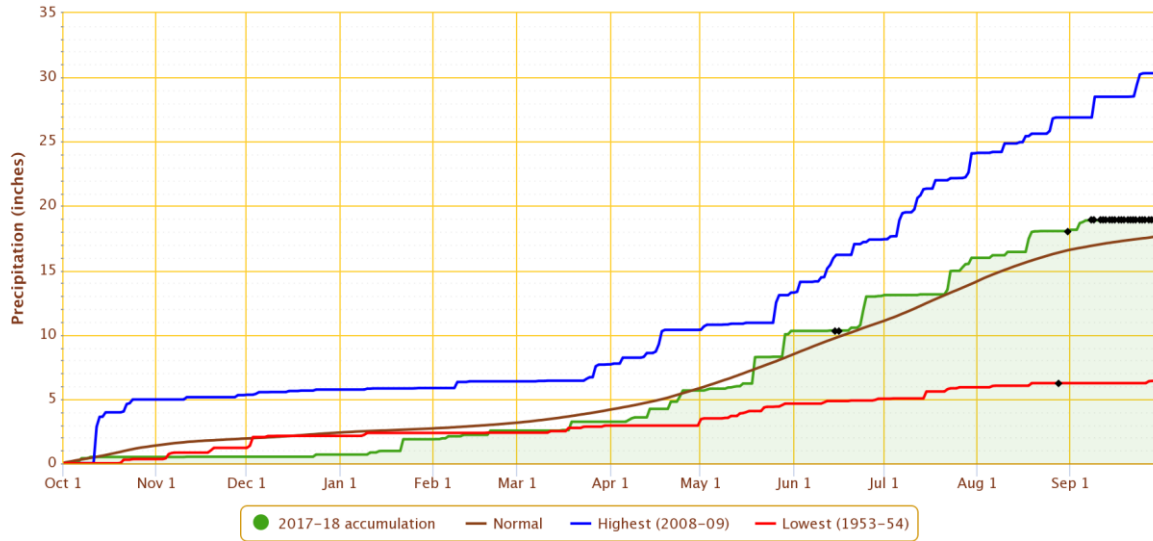
Powered by ACIS

### COLORADO



### Accumulated Precipitation – BURLINGTON, CO

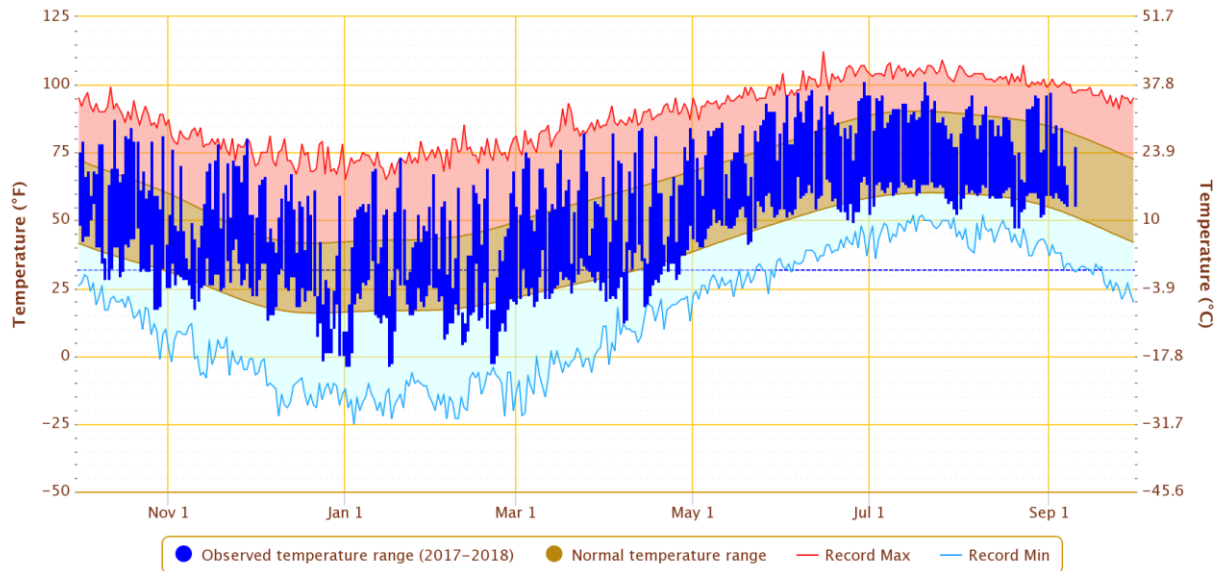
Click and drag to zoom to a shorter time interval, green/black diamonds represent subsequent/missing values



Powered by ACIS

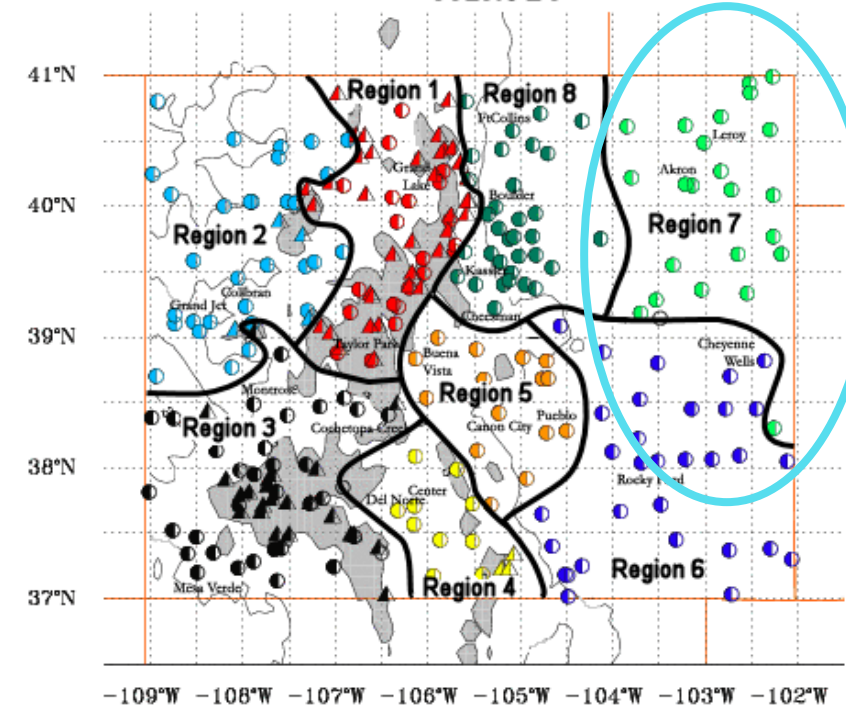
### Daily Temperature Data – BURLINGTON, CO

Period of Record – 1903-12-01 to 2018-09-10. Normals period: 1981-2010. Click and drag to zoom chart.



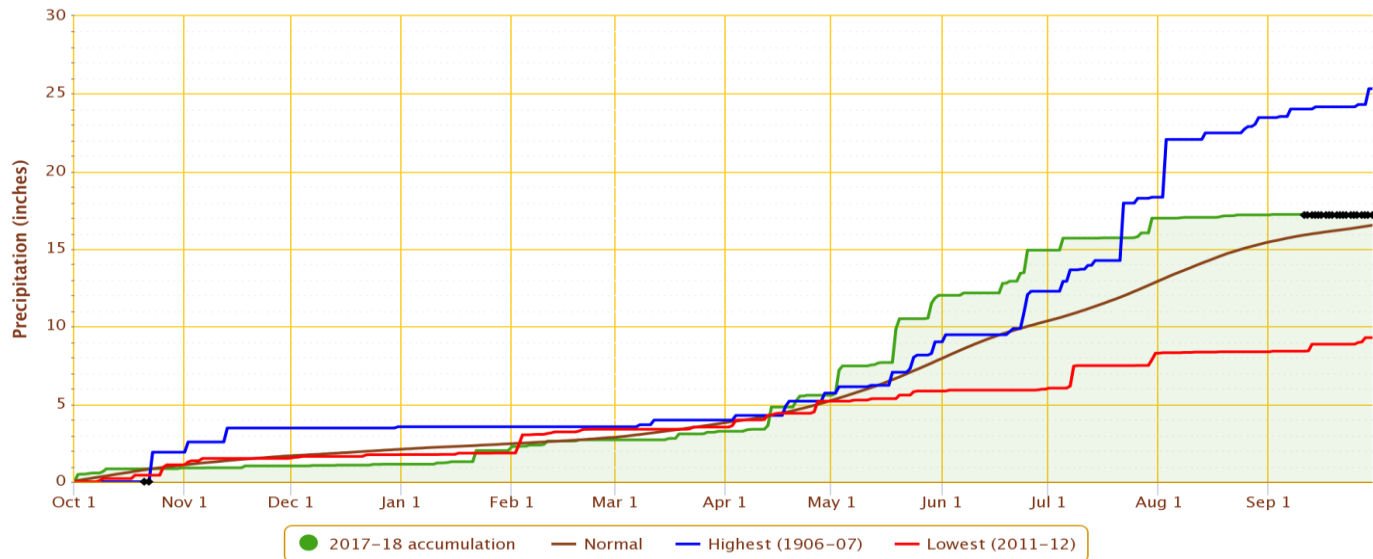
Powered by ACIS

### COLORADO



### Accumulated Precipitation – AKRON 4 E, CO

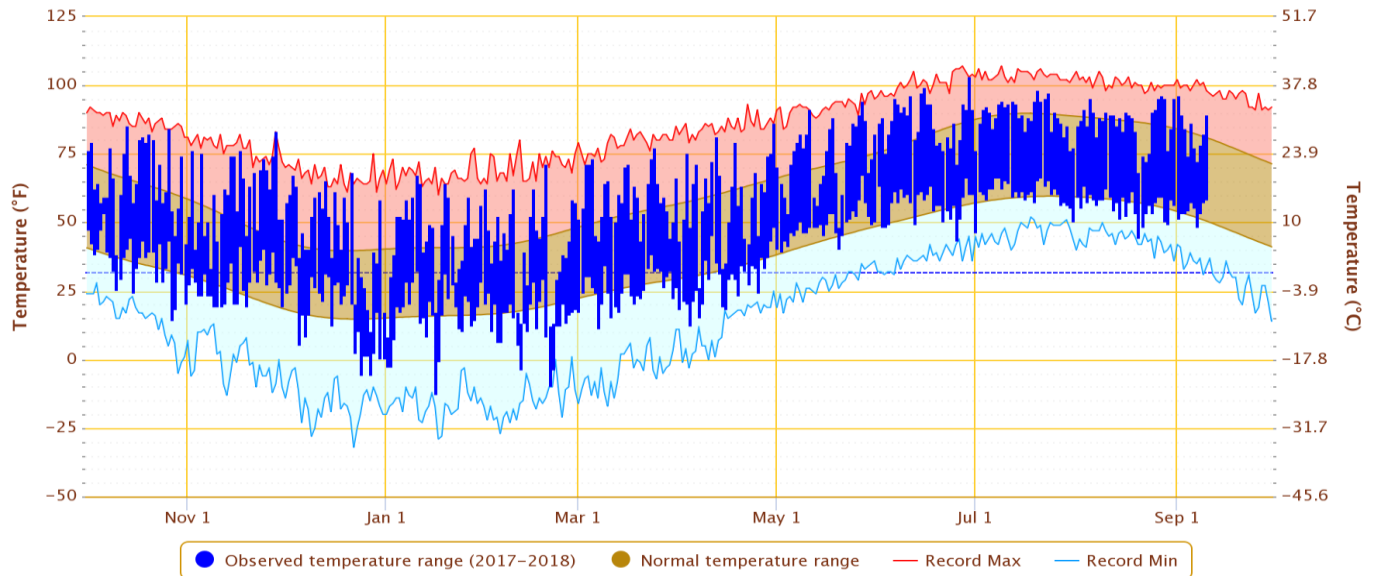
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

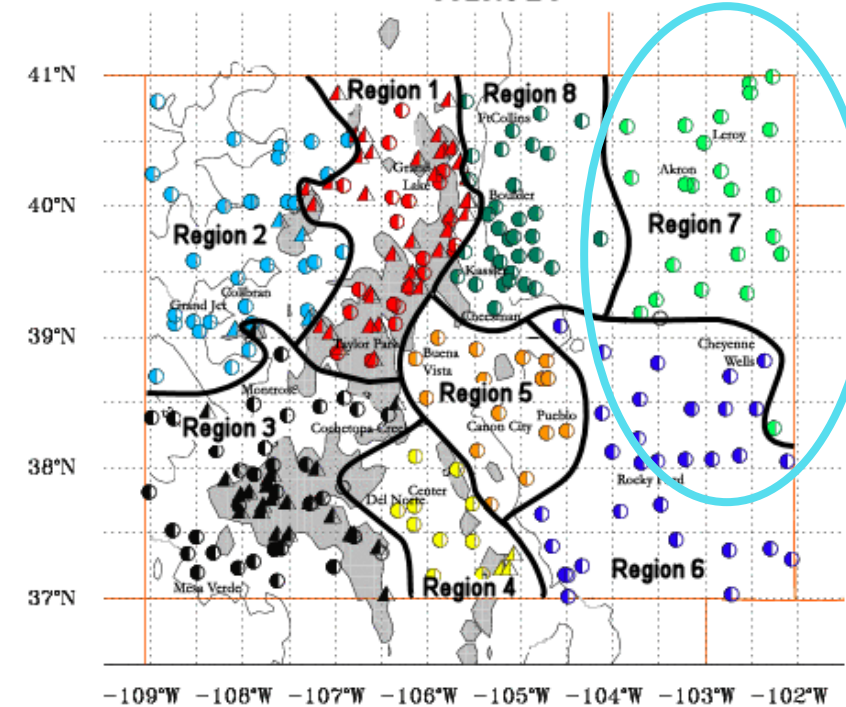
### Daily Temperature Data – AKRON 4 E, CO

Period of Record – 1893-06-01 to 2018-09-10. Normals period: 1981-2010. Click and drag to zoom chart.



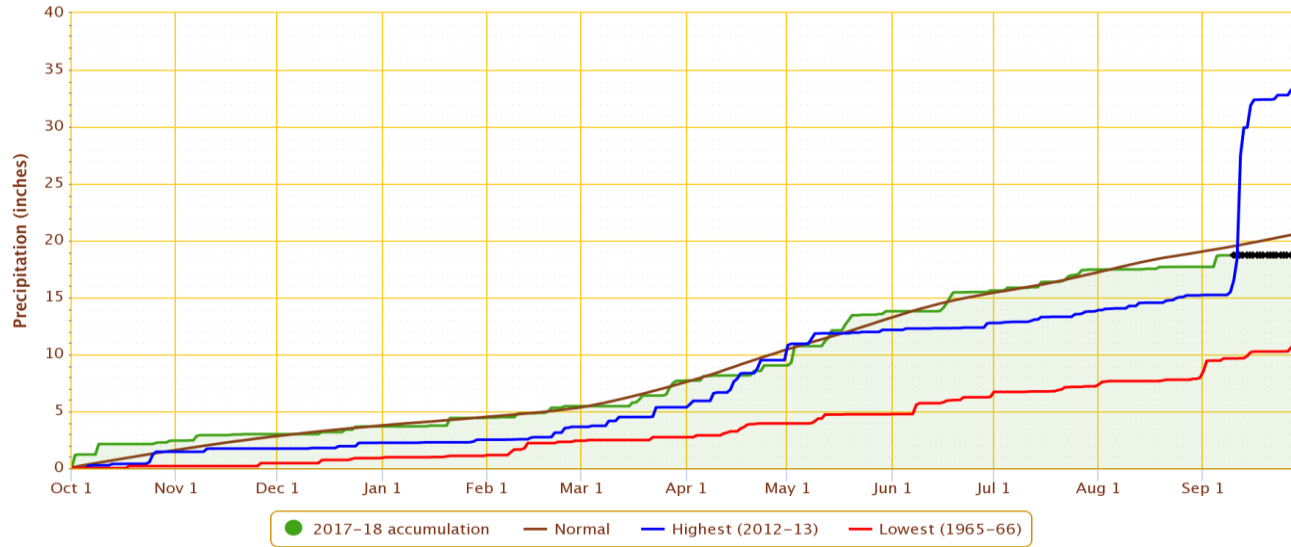
Powered by ACIS

### COLORADO



### Accumulated Precipitation – BOULDER, CO

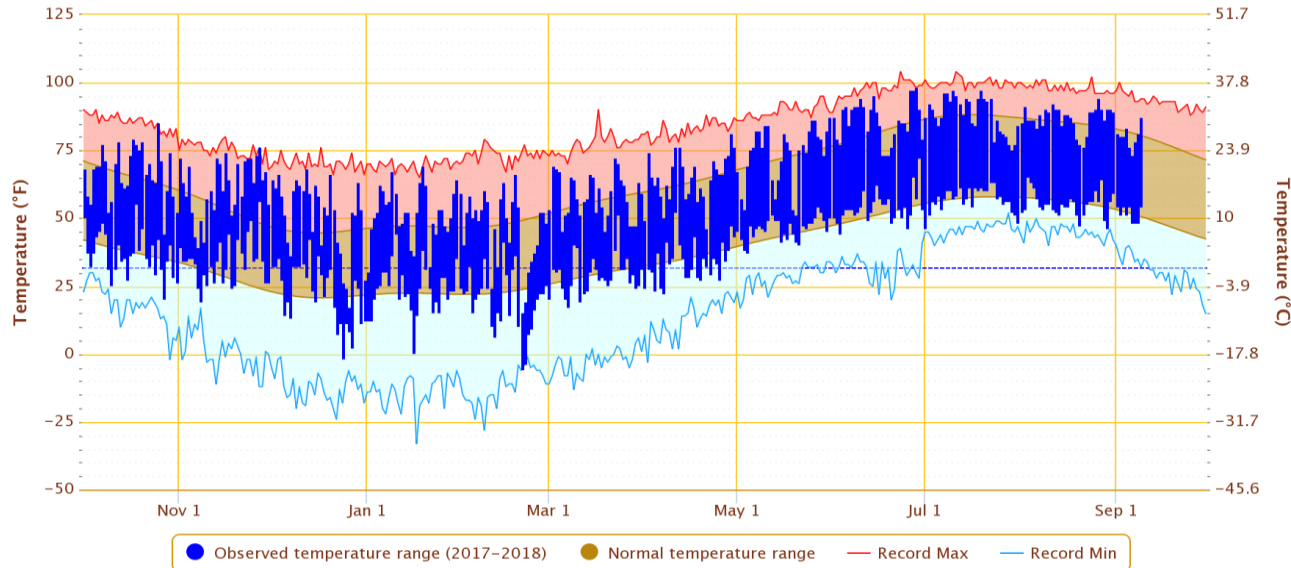
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

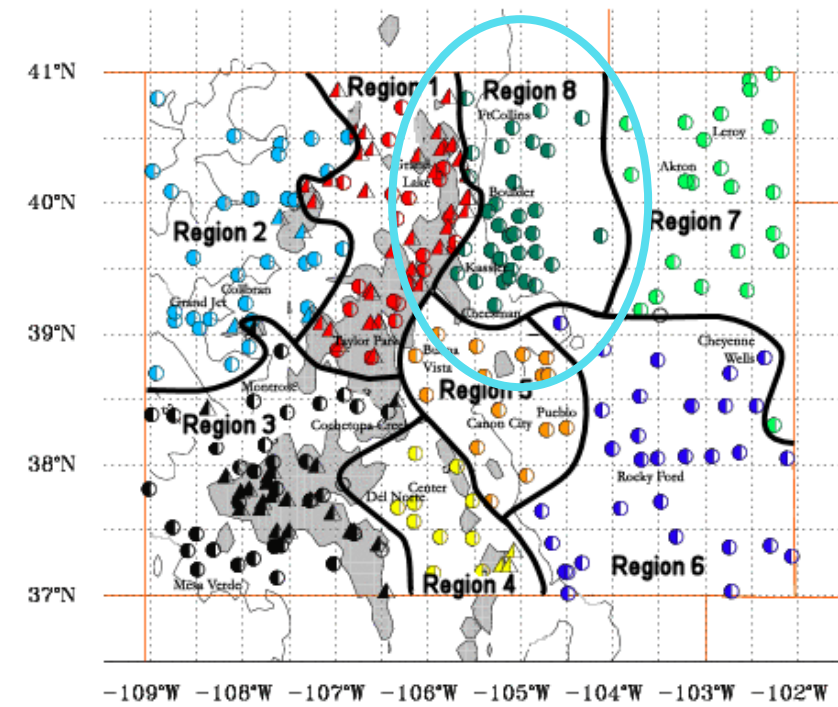
### Daily Temperature Data – BOULDER, CO

Period of Record – 1893-10-01 to 2018-09-09. Normals period: 1981-2010. Click and drag to zoom chart.



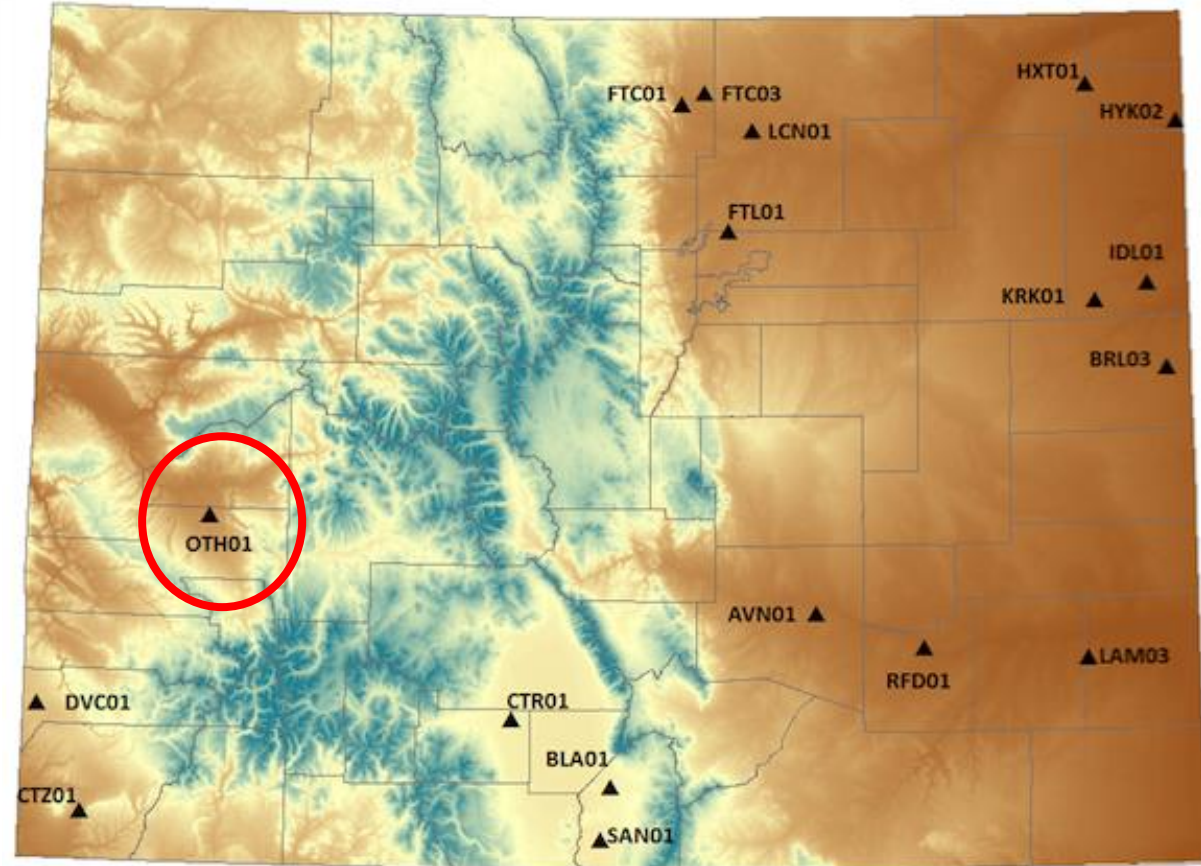
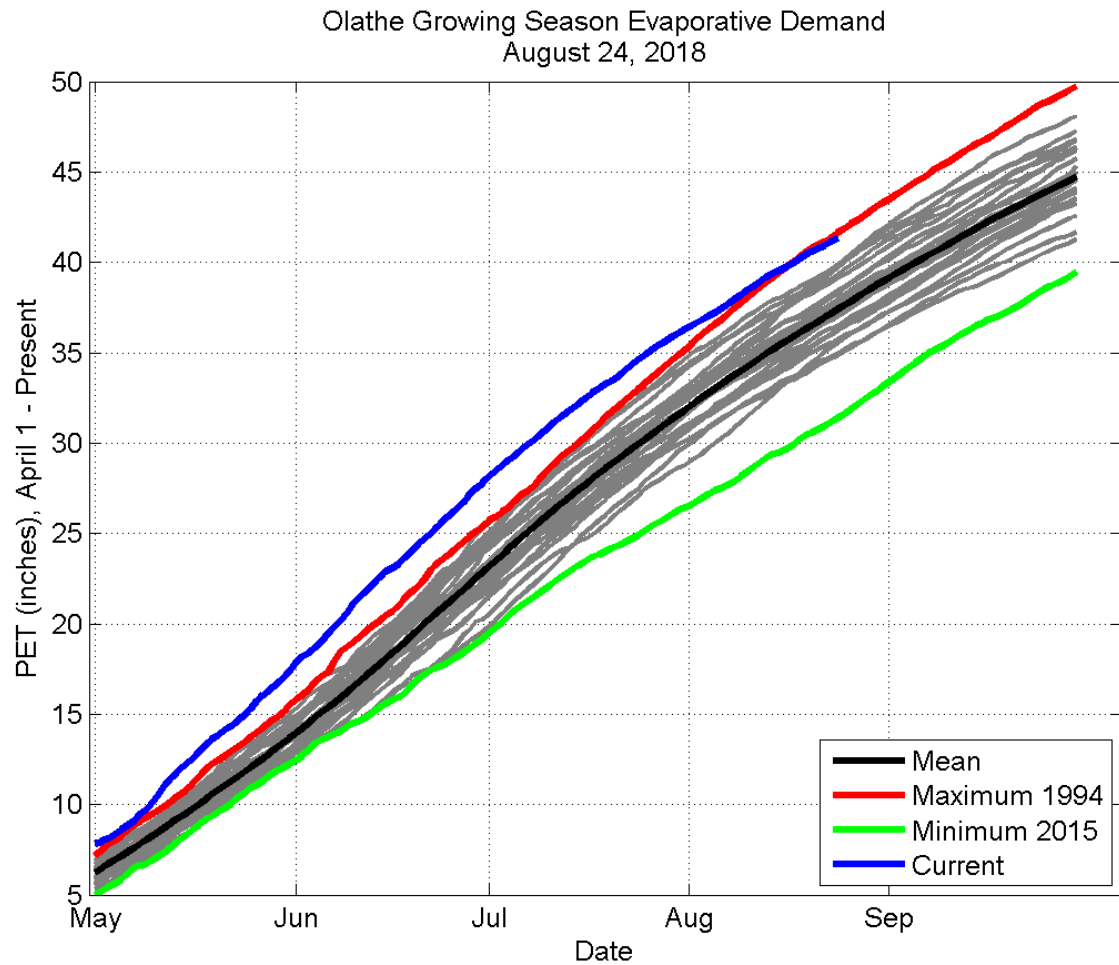
Powered by ACIS

### COLORADO



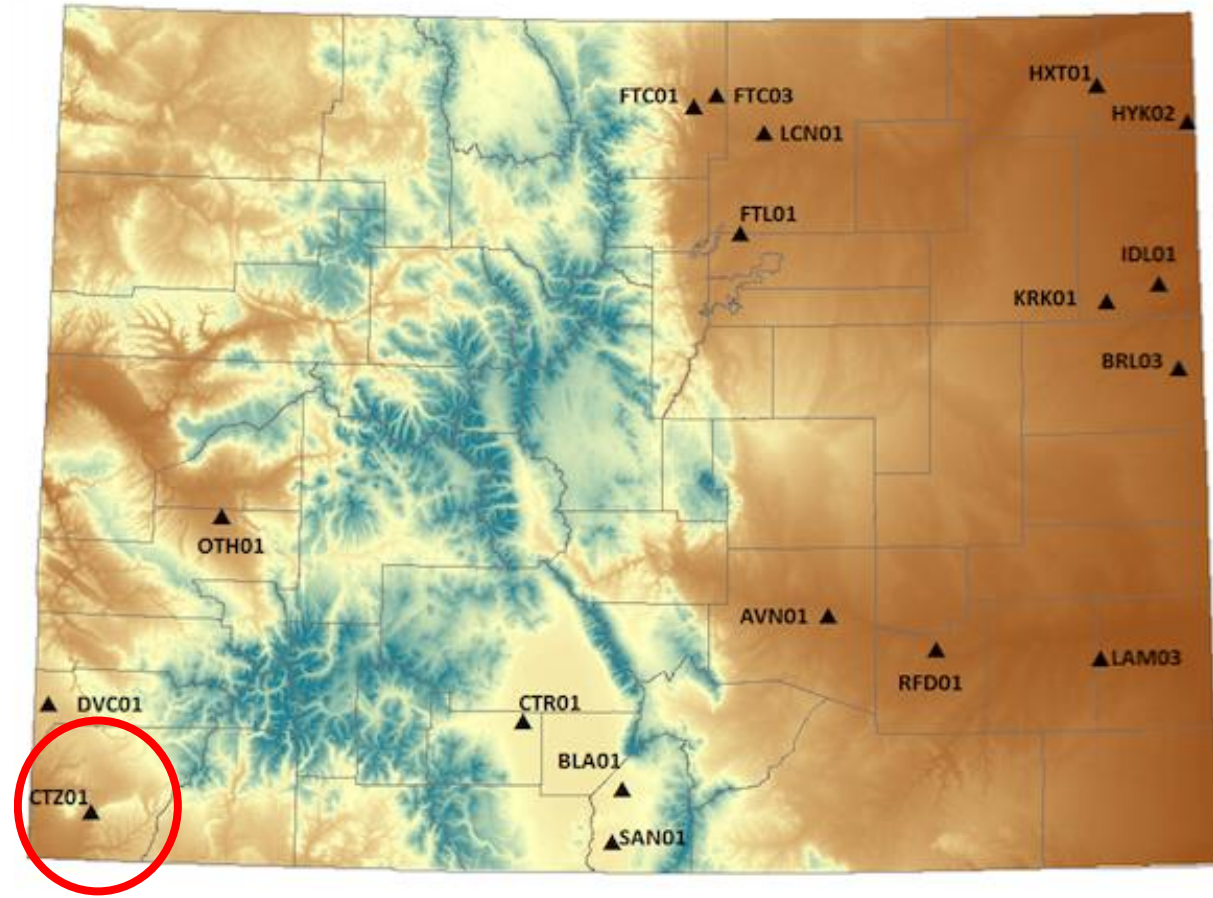
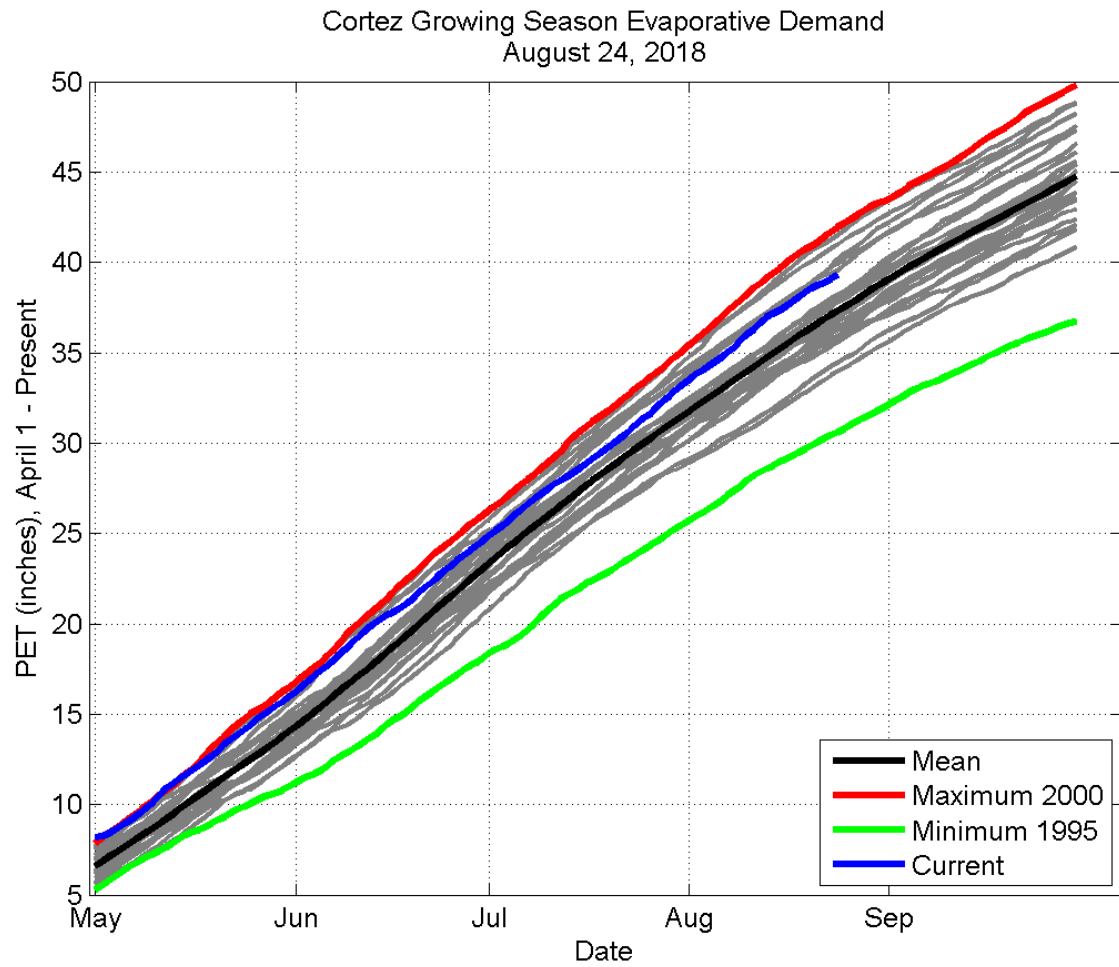


# Evaporative demand from CoAgMET



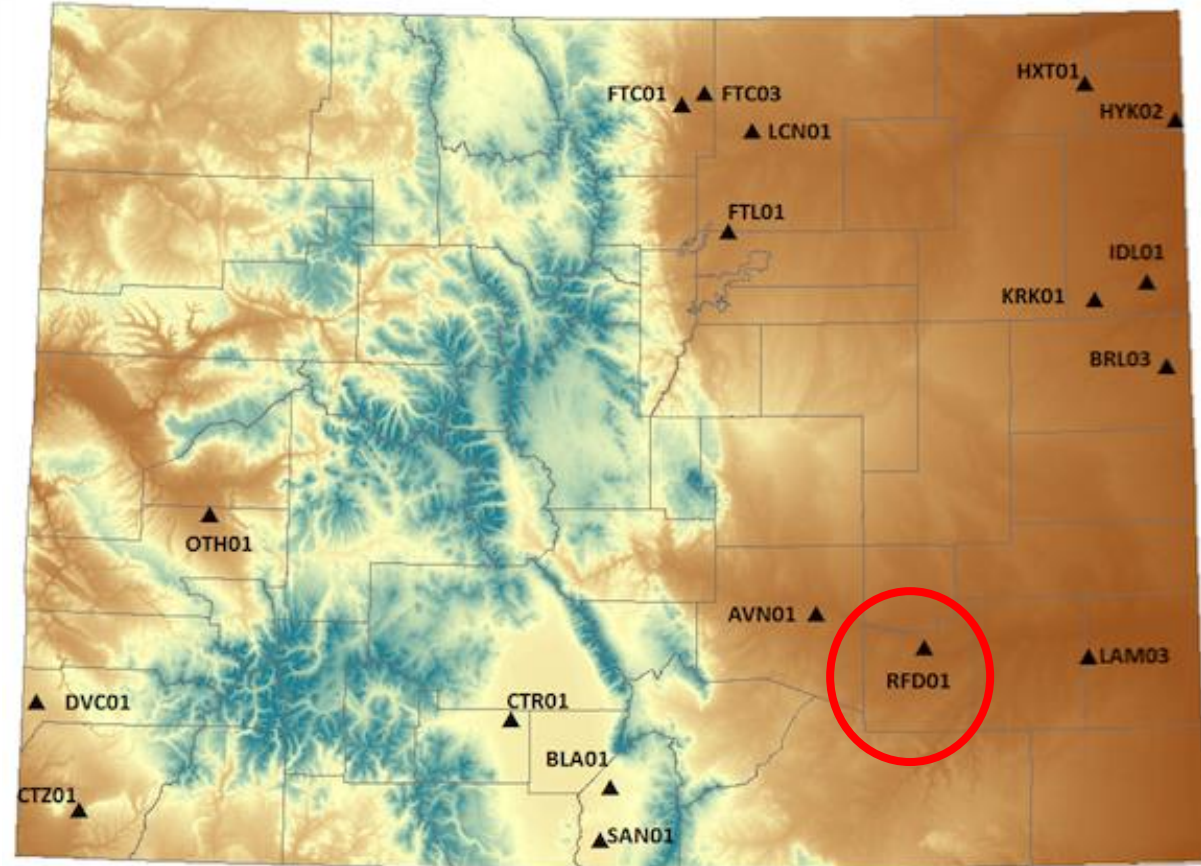
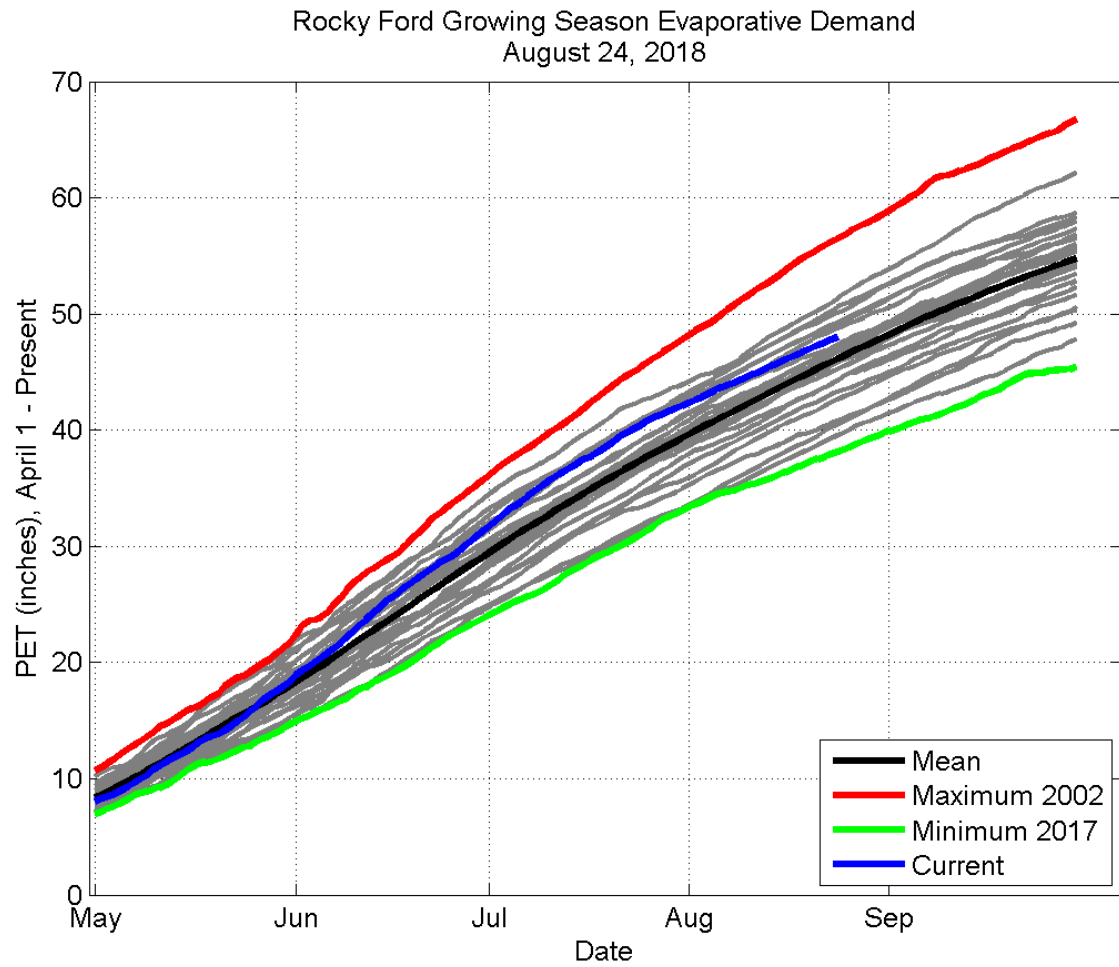
Above average = atmosphere has been “thirsty”  
(warm, windy, sunny conditions)

# Evaporative demand from CoAgMET

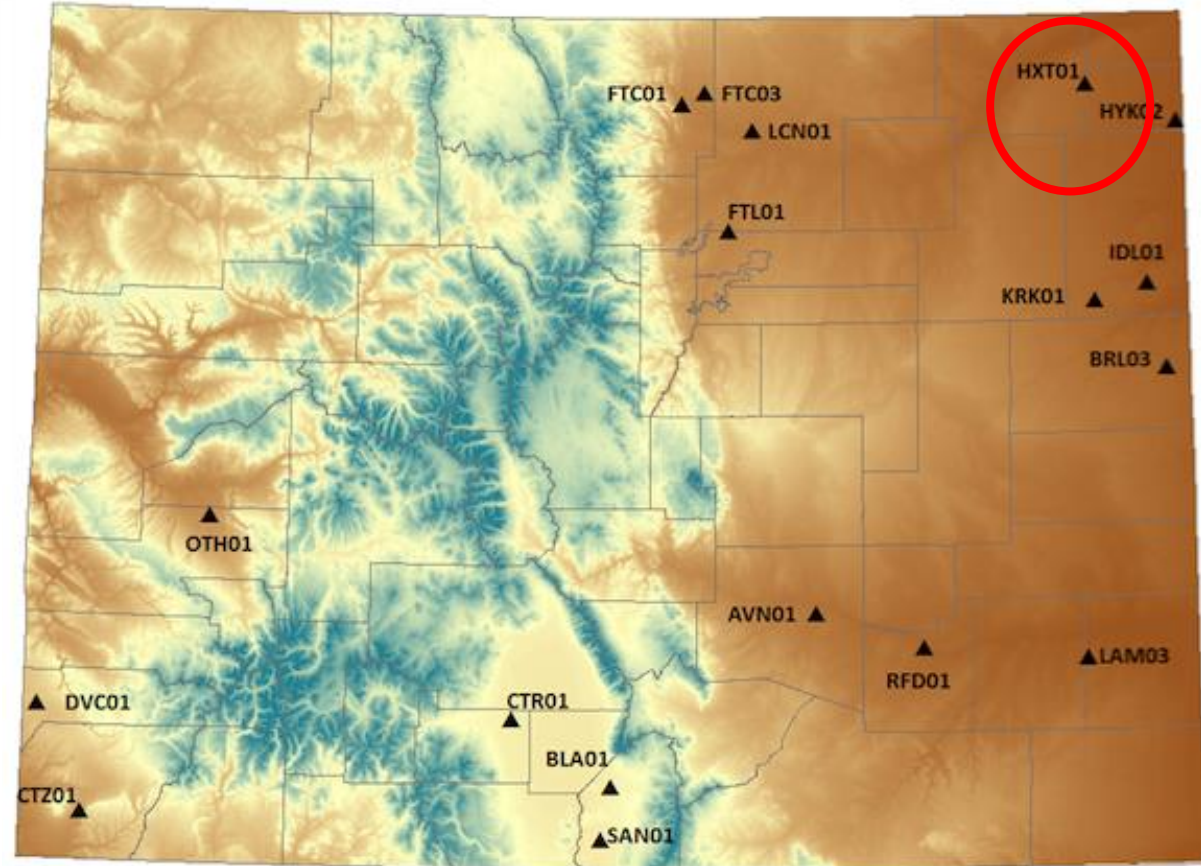
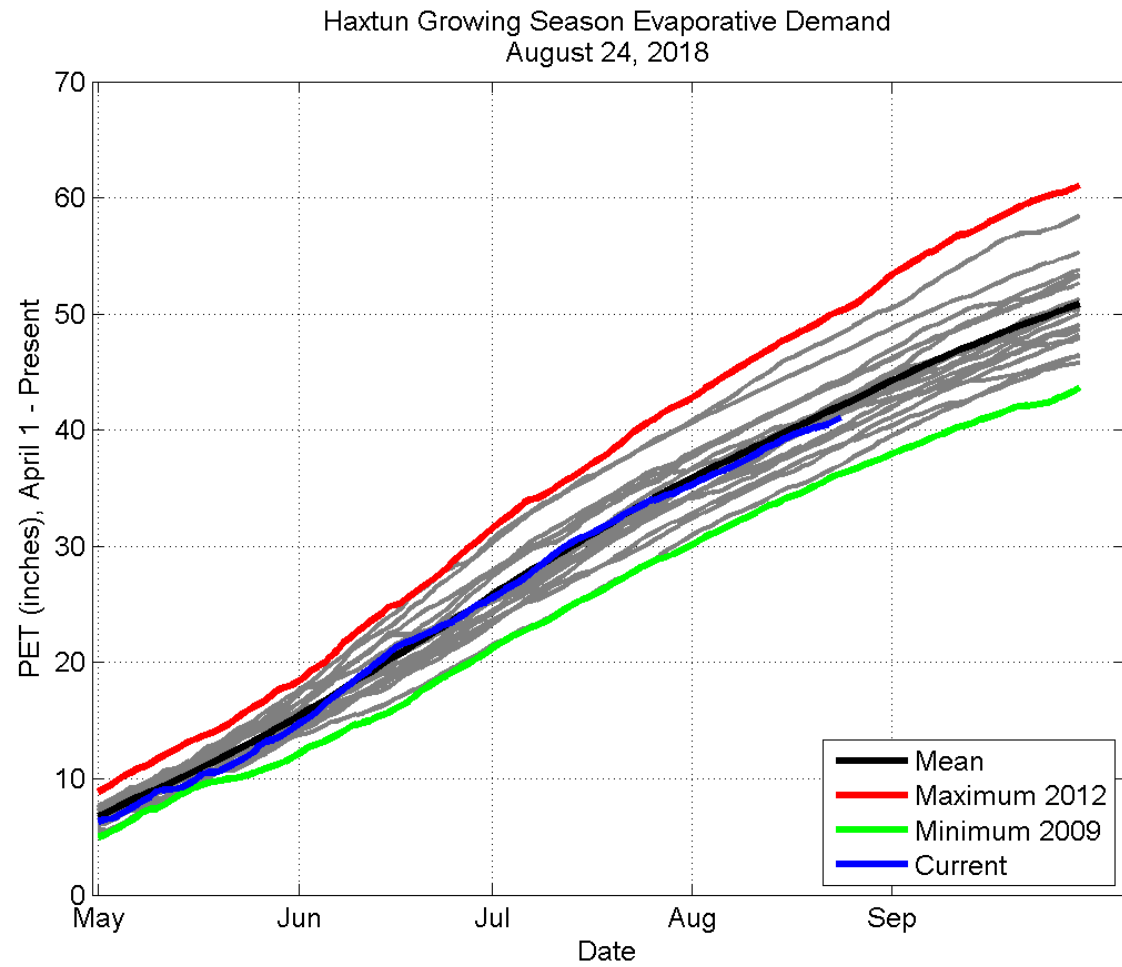




# Evaporative demand from CoAgMET



# Evaporative demand from CoAgMET



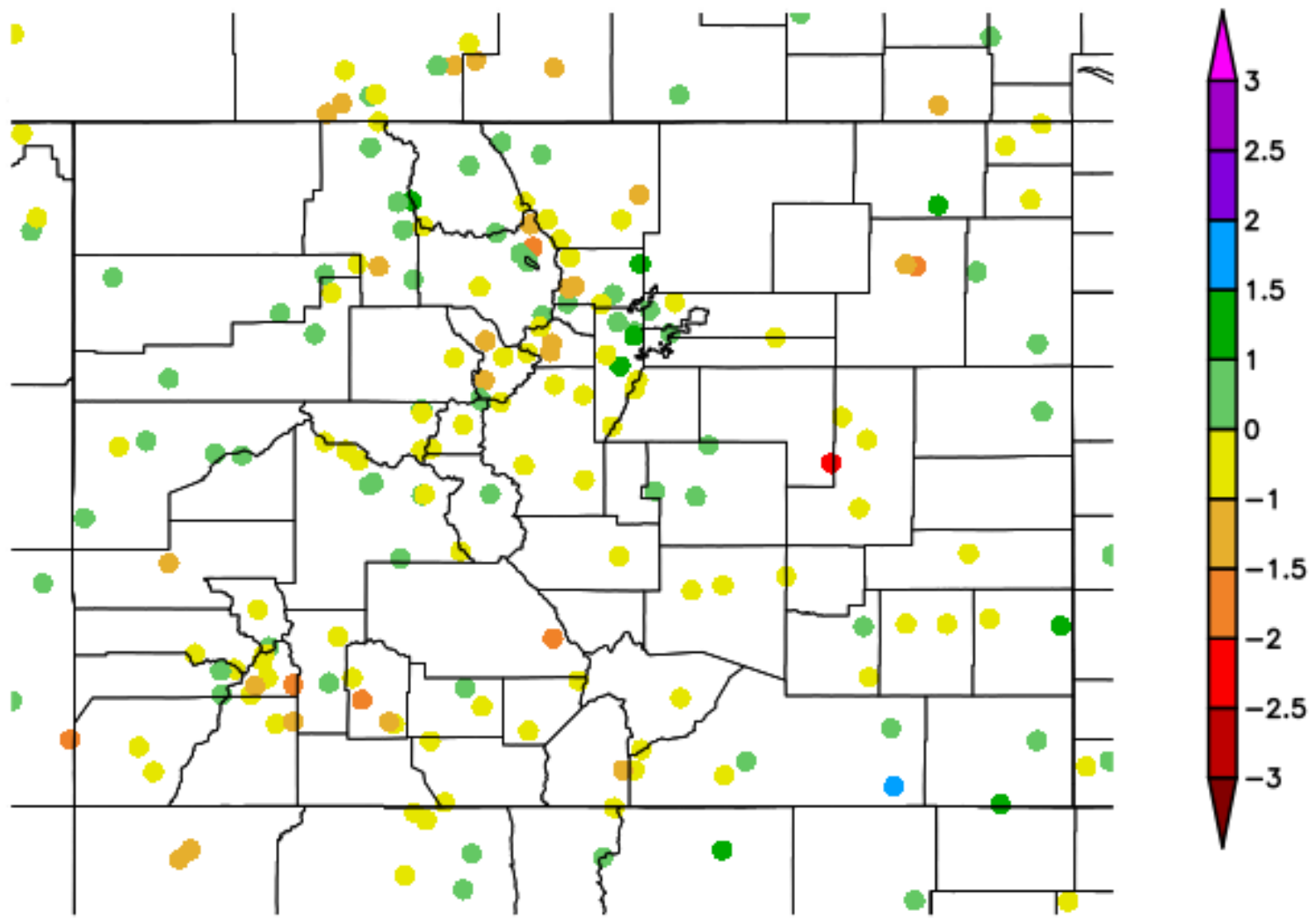




## Colorado Drought



# 30 Day SPI 8/11/2018 - 9/9/2018

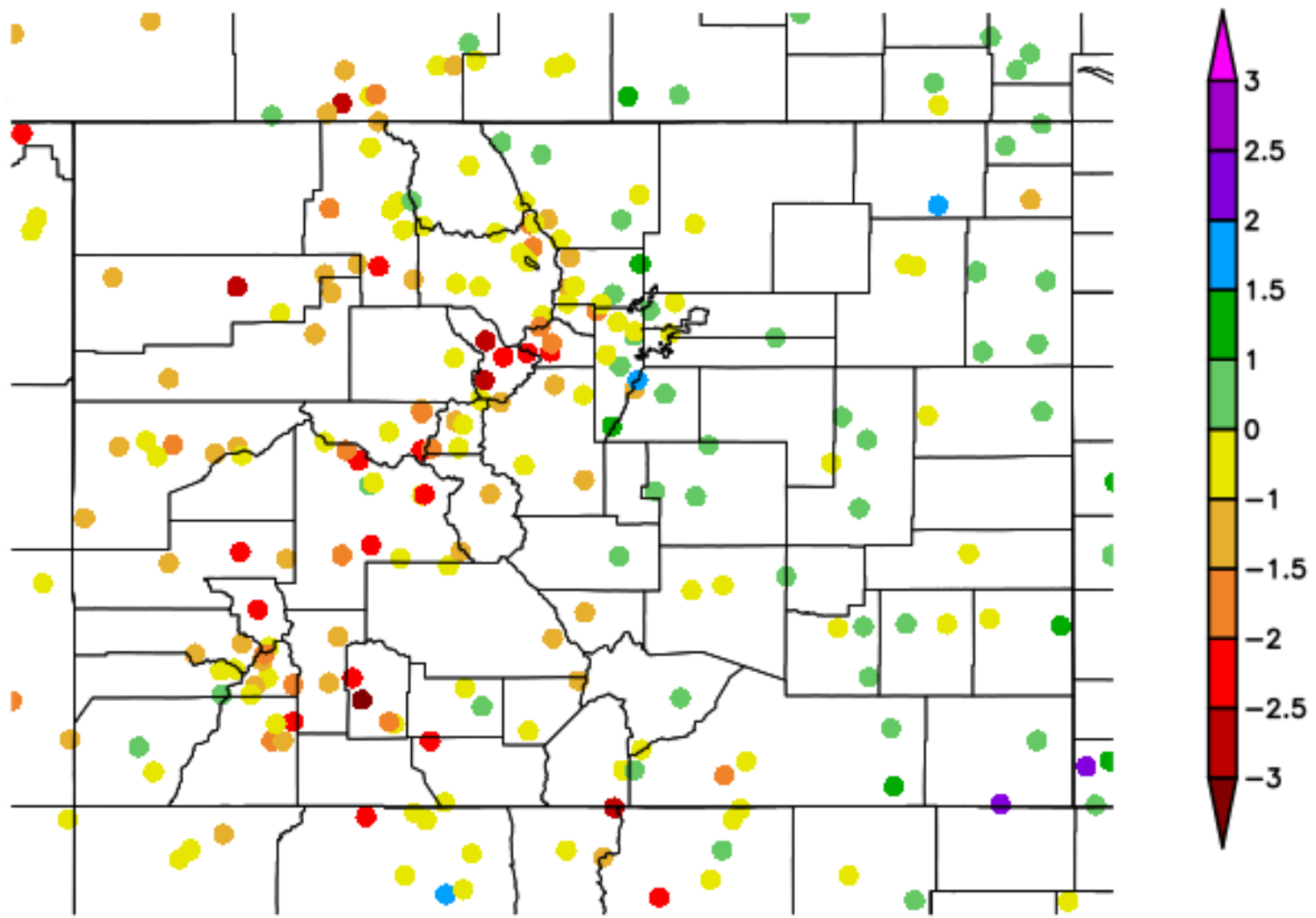


Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers



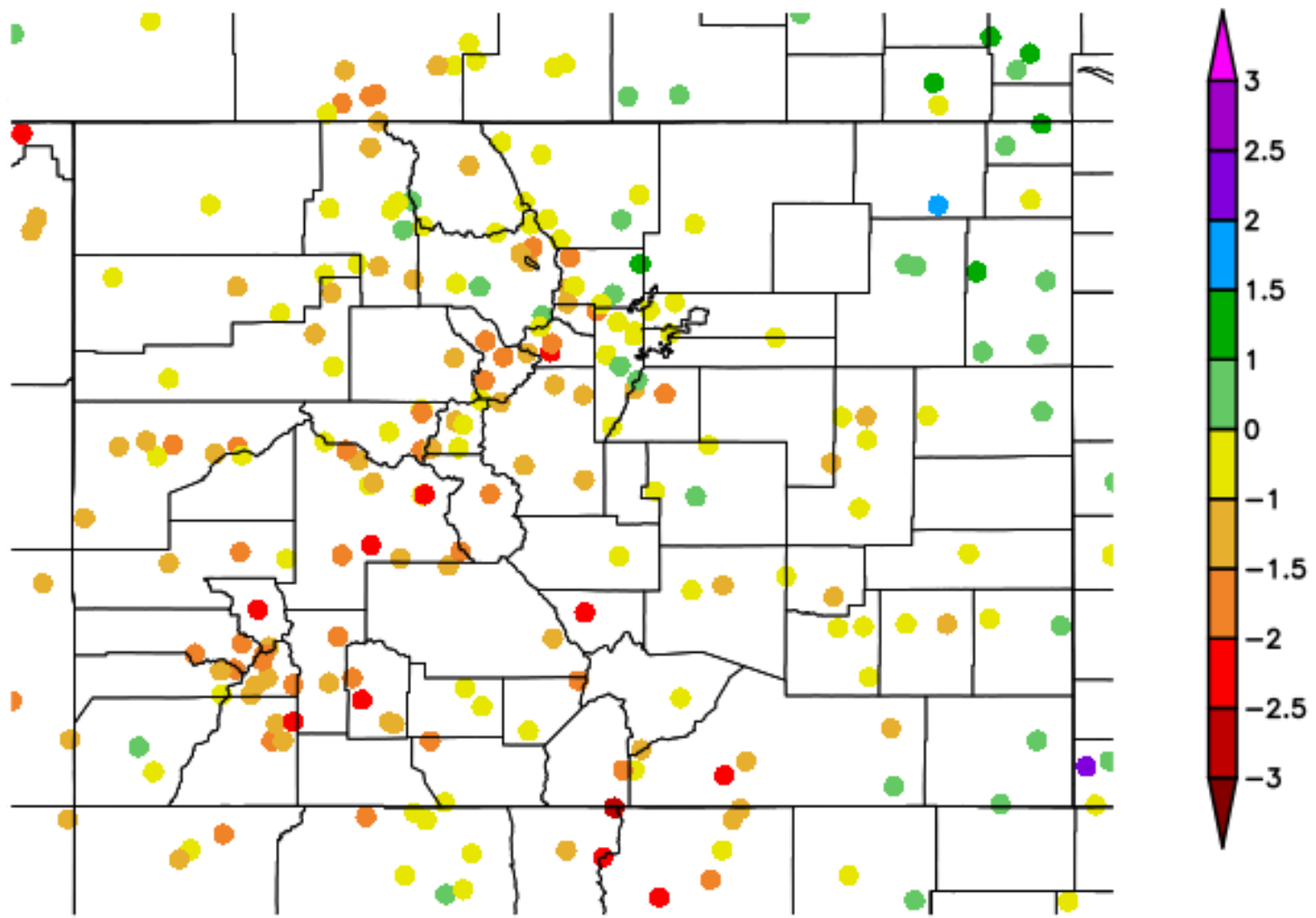
# 90 Day SPI 6/12/2018 - 9/9/2018



Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers

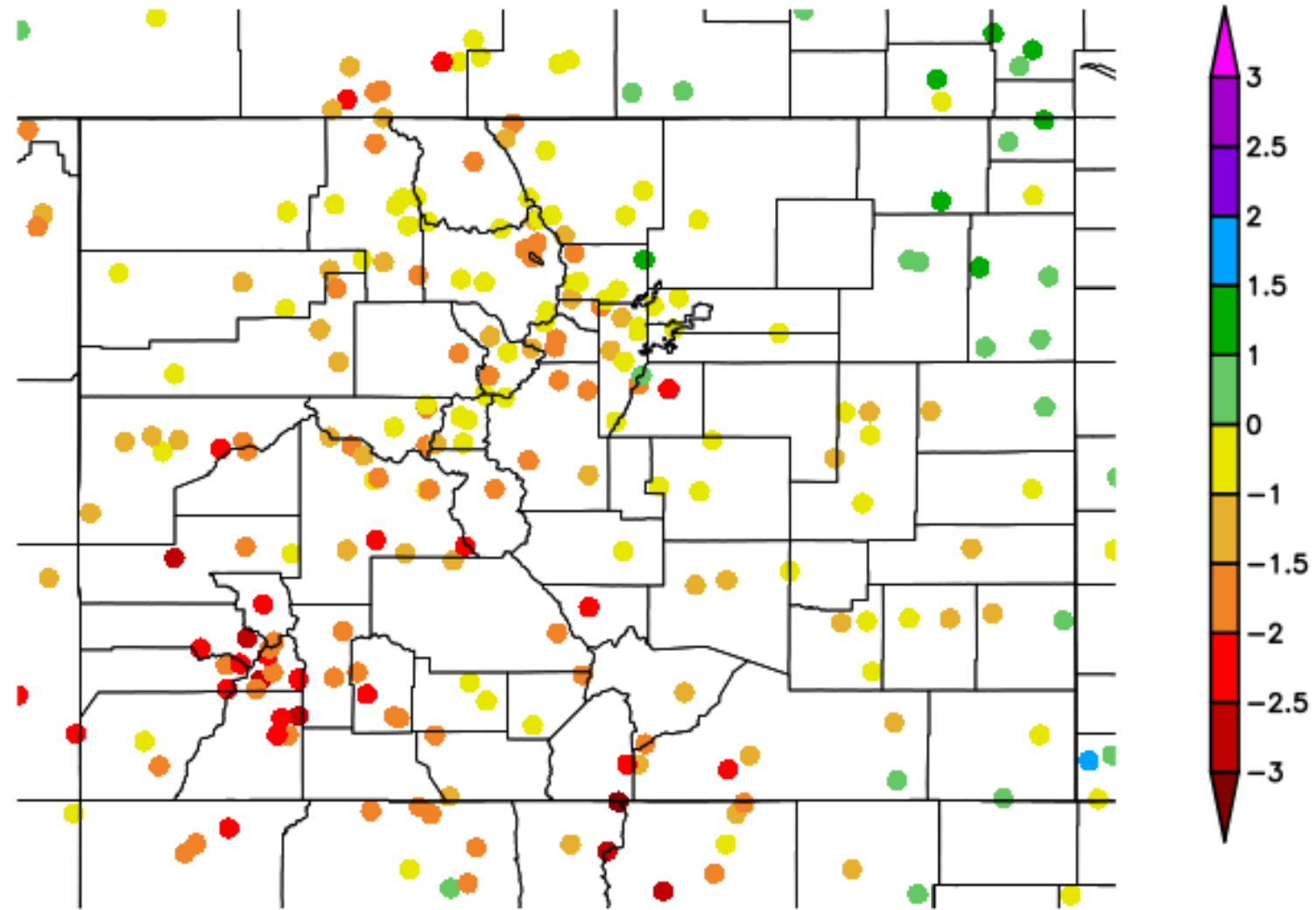
# 6 Month SPI 3/10/2018 - 9/9/2018



Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers

# 9 Month SPI 12/10/2017 - 9/9/2018



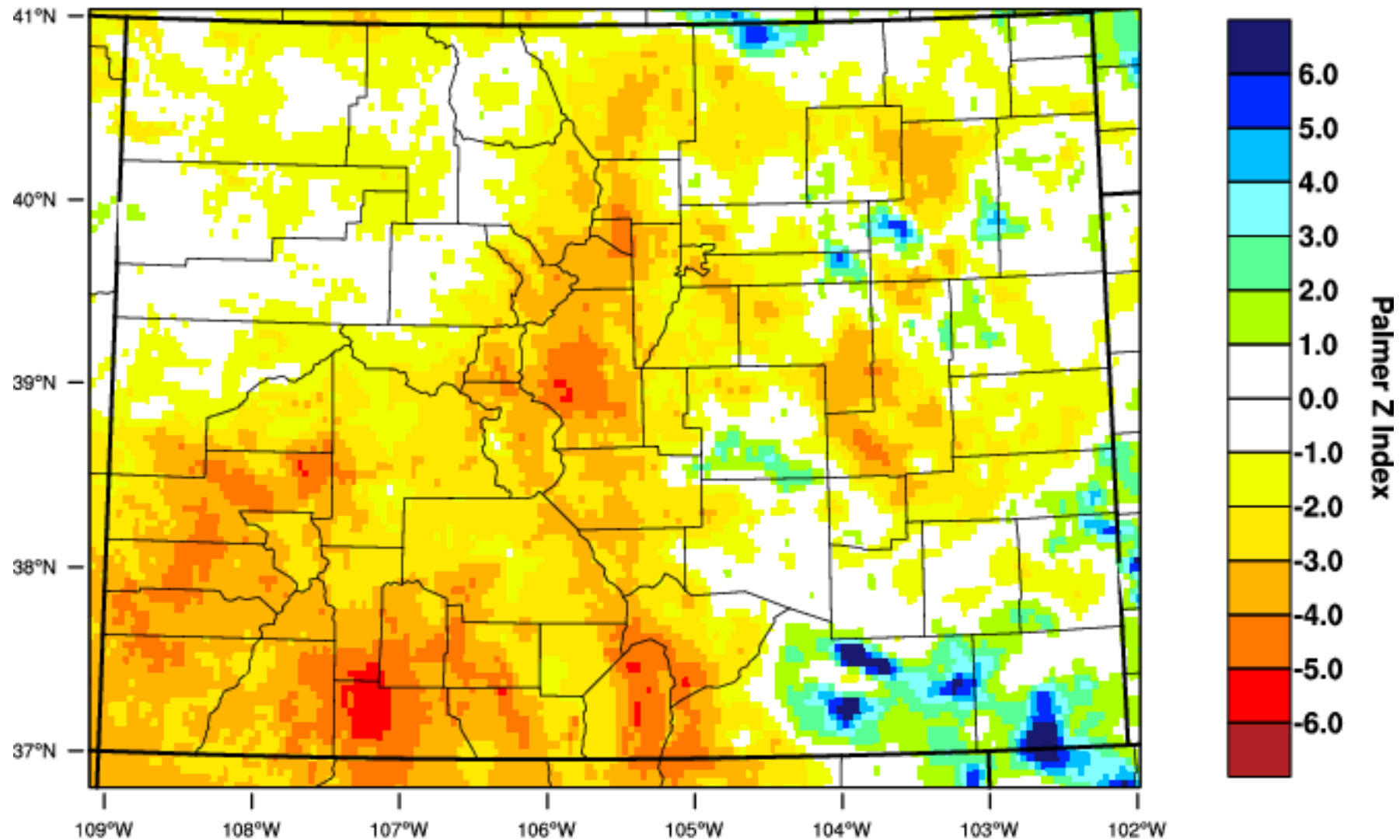
Generated 9/10/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers



# Colorado - Palmer Z-Index

## August 2018



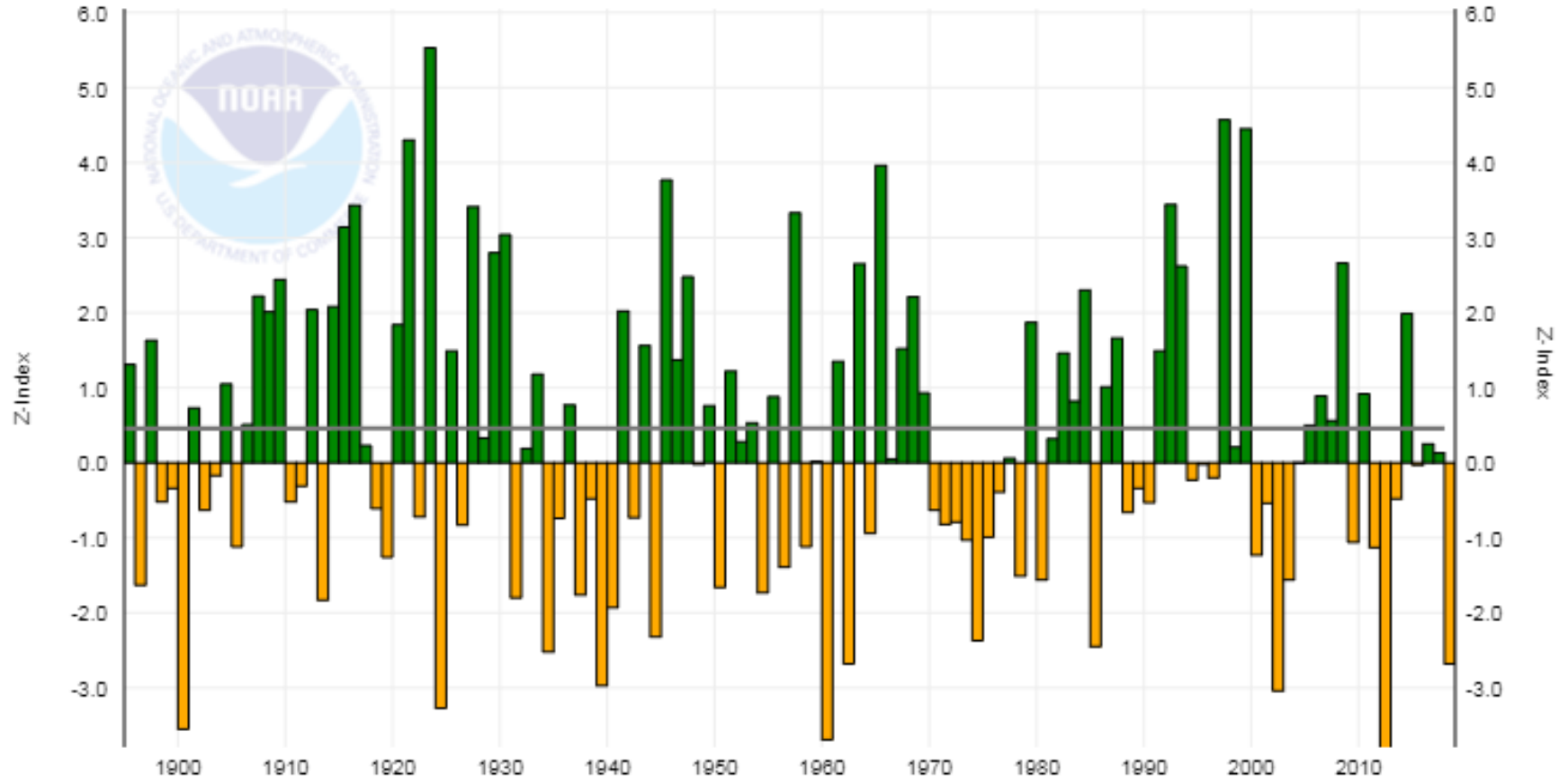
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 SEP 2018





# Colorado, Palmer Z-Index, August

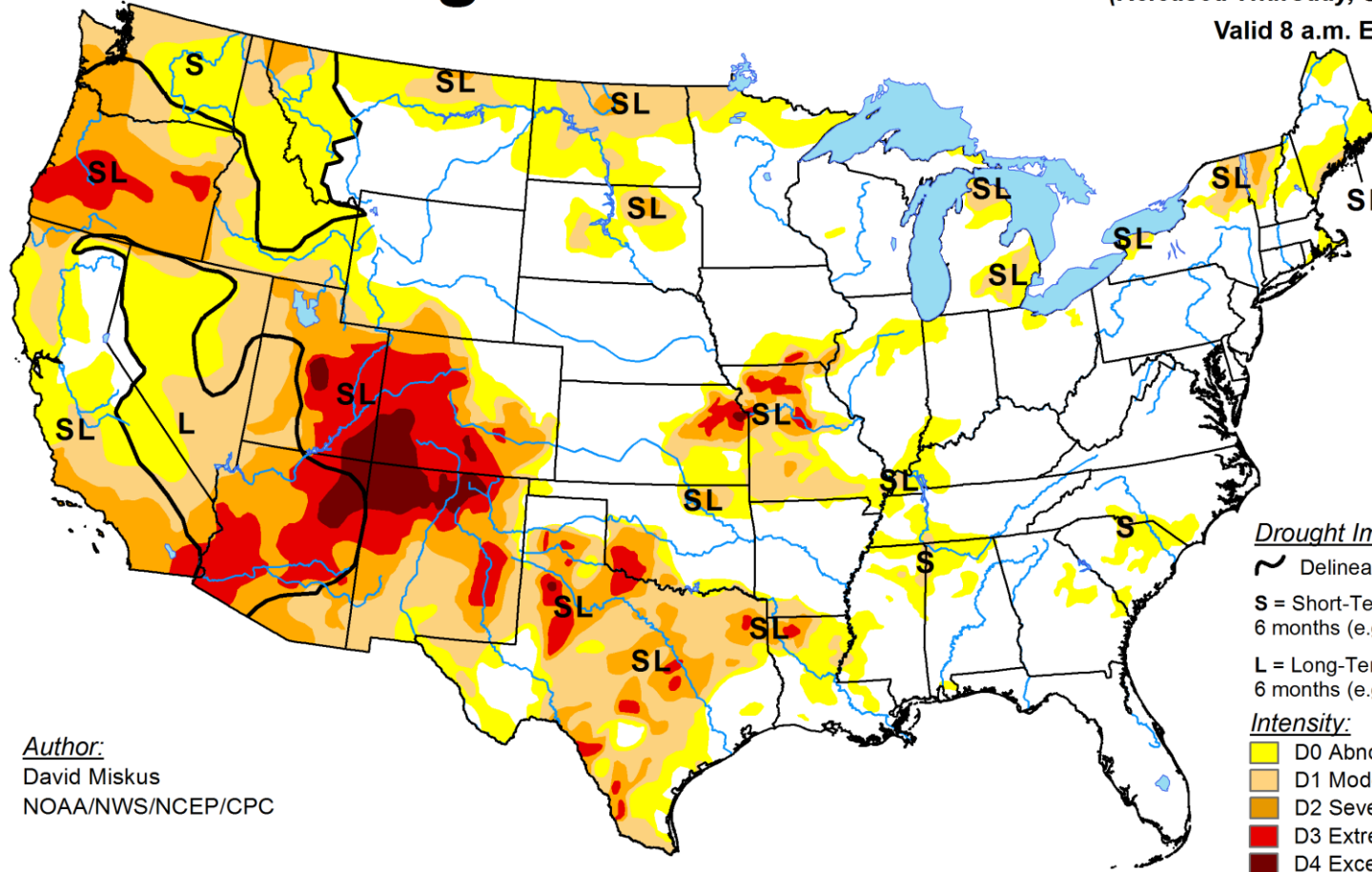
Z-Index      1901-2000 Mean: 0.46



# U.S. Drought Monitor

September 4, 2018  
(Released Thursday, Sep. 6, 2018)

Valid 8 a.m. EDT



*Author:*  
David Miskus  
NOAA/NWS/NCEP/CPC

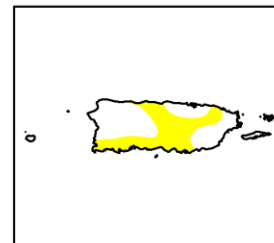
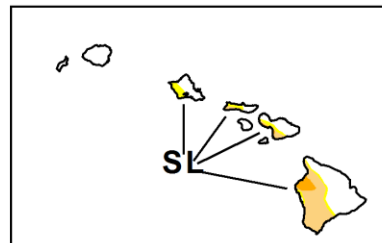
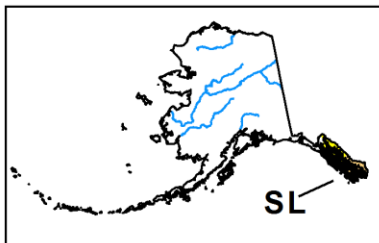
### Drought Impact Types:

- ~ 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:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Dark Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

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



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



# U.S. Drought Monitor Colorado

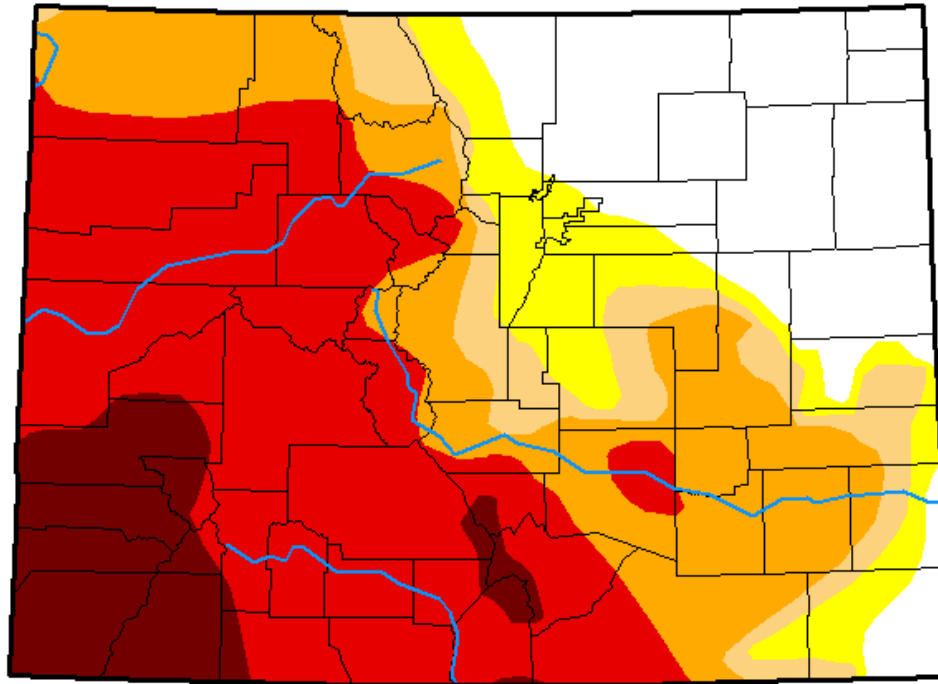
September 4, 2018

(Released Thursday, Sep. 6, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	19.99	80.01	71.39	63.93	44.30	9.72
<b>Last Week</b> <i>08-28-2018</i>	18.57	81.43	72.80	64.63	44.30	8.50
<b>3 Months Ago</b> <i>06-05-2018</i>	24.69	75.31	63.91	50.80	35.13	7.79
<b>Start of Calendar Year</b> <i>01-02-2018</i>	6.57	93.43	33.53	7.27	0.00	0.00
<b>Start of Water Year</b> <i>09-26-2017</i>	67.63	32.37	3.72	0.00	0.00	0.00
<b>One Year Ago</b> <i>09-05-2017</i>	67.49	32.51	3.72	0.00	0.00	0.00



Intensity:

- 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:

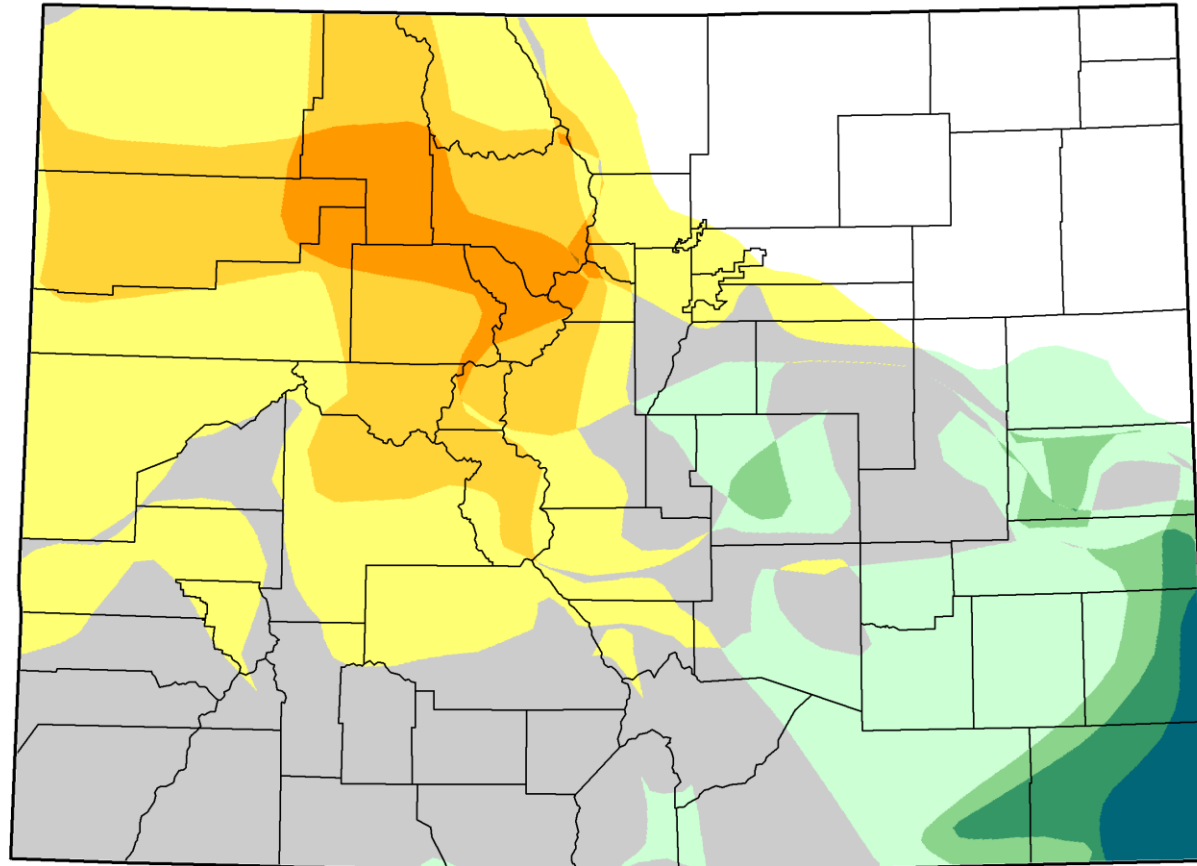
David Miskus  
NOAA/NWS/NCEP/CPC



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



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



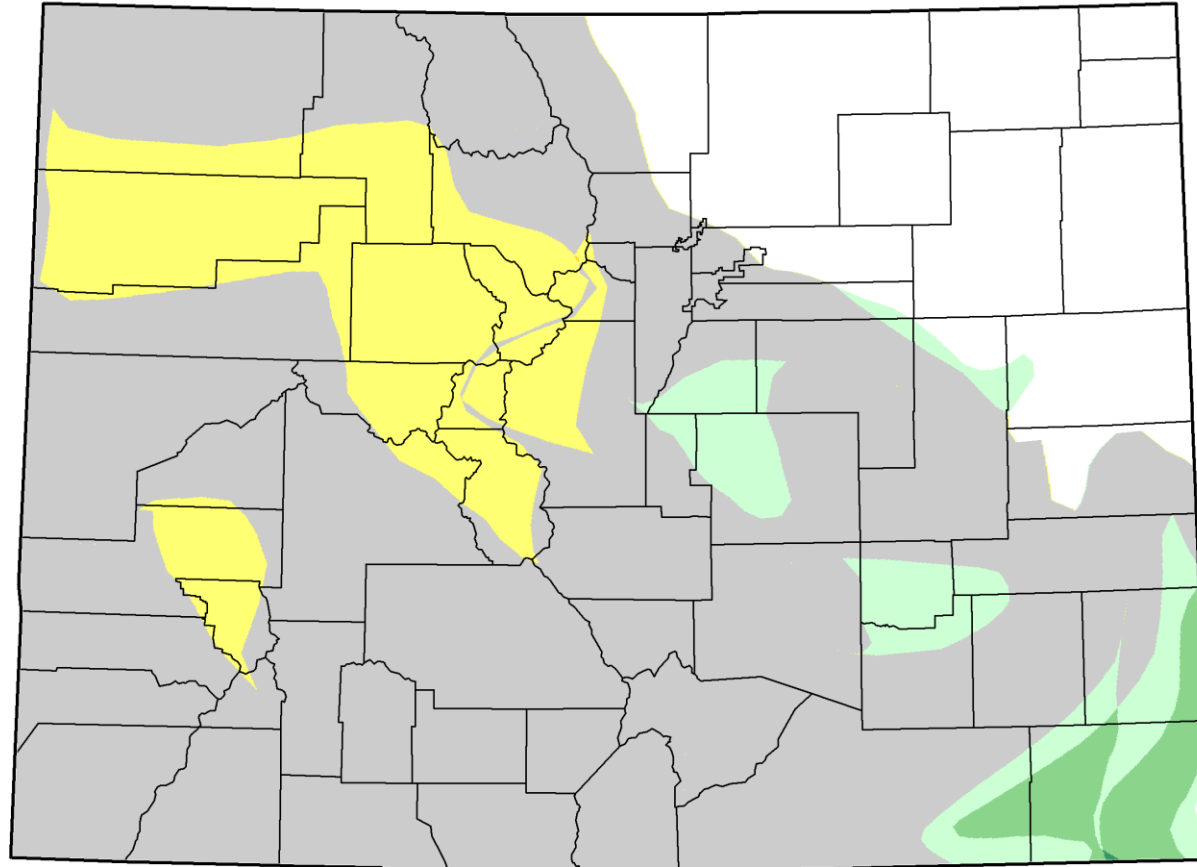
September 4, 2018  
compared to  
June 12, 2018

<http://droughtmonitor.unl.edu>





# U.S. Drought Monitor Class Change - Colorado 1 Month

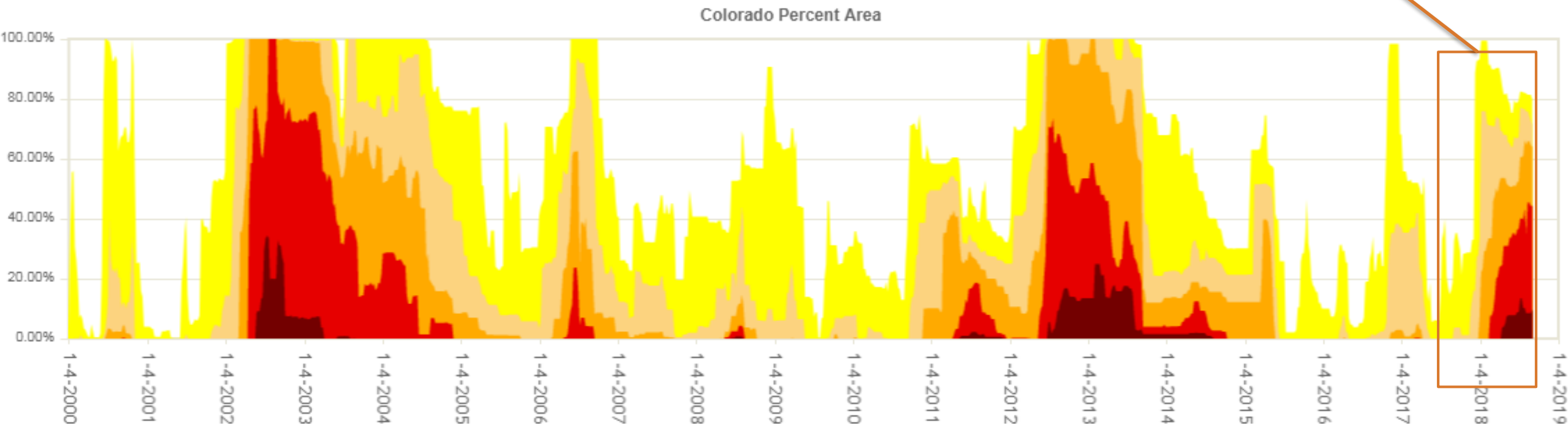
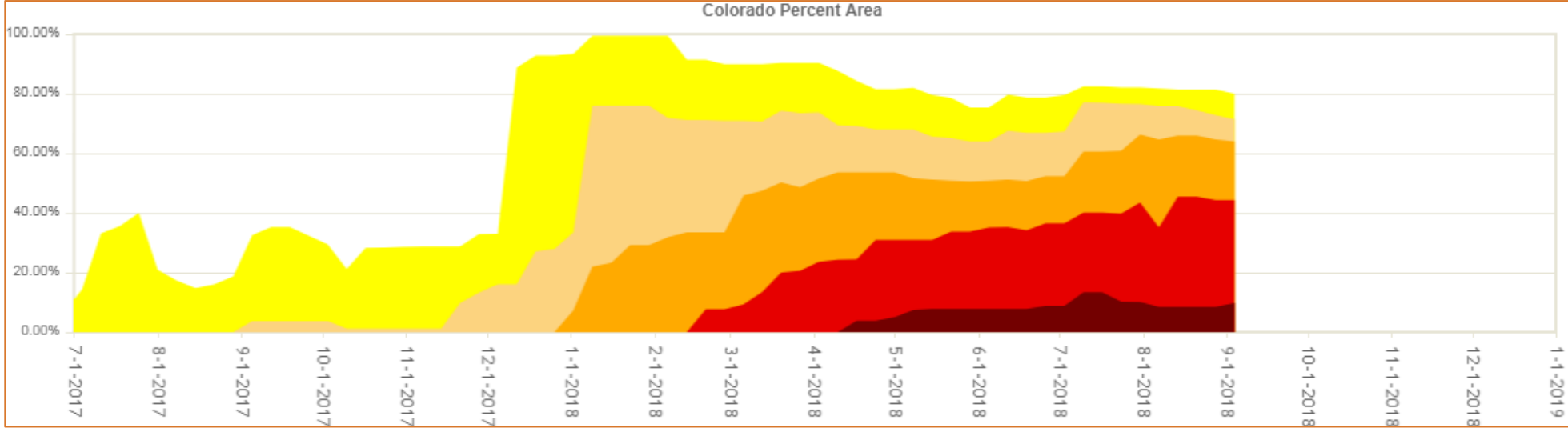


- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

September 4, 2018  
compared to  
August 7, 2018

<http://droughtmonitor.unl.edu>



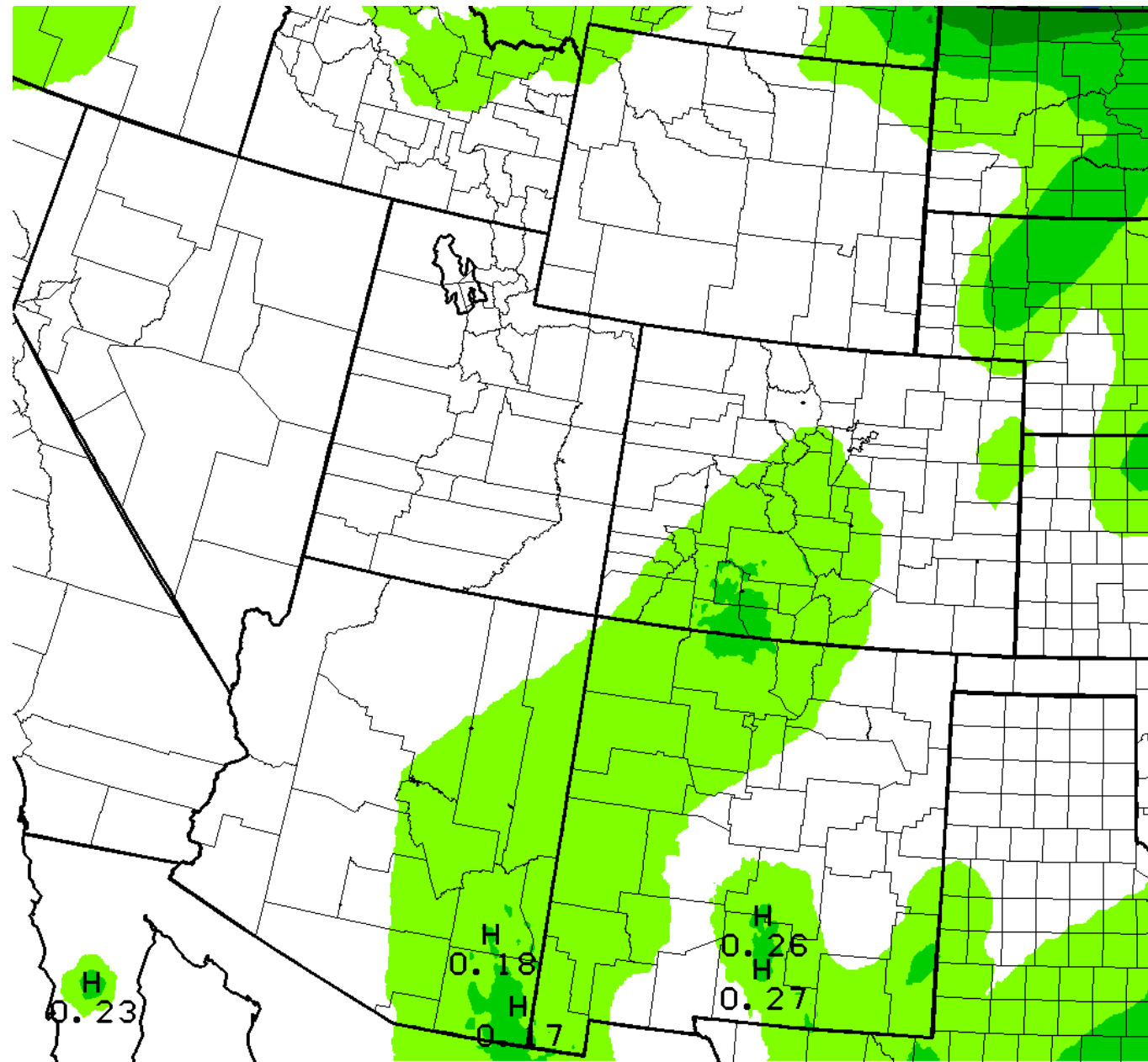
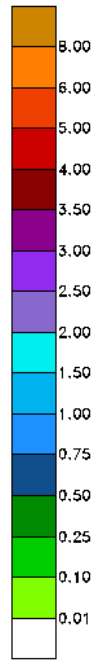




# Outlook



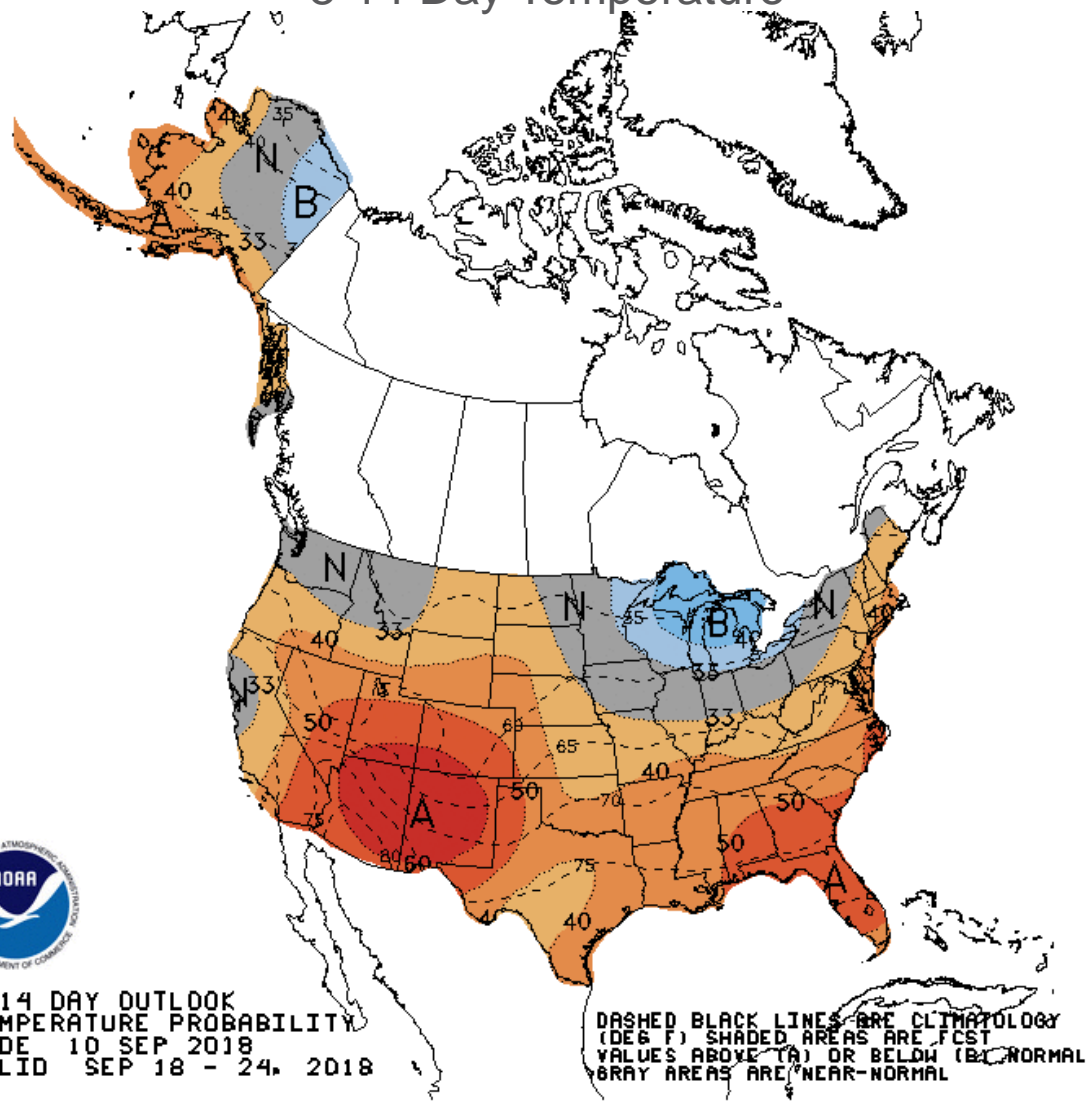
7 Day  
Precipitation  
Ending 9-17-18



WPC FORECAST PRECIPITATION (INCHES) IN 7 DAYS ENDING MON 180917/1200V168  
FORECAST ISSUED 180910/1200F168

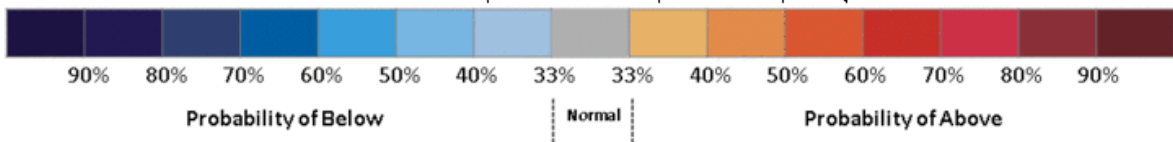


# 8-14 Day Temperature

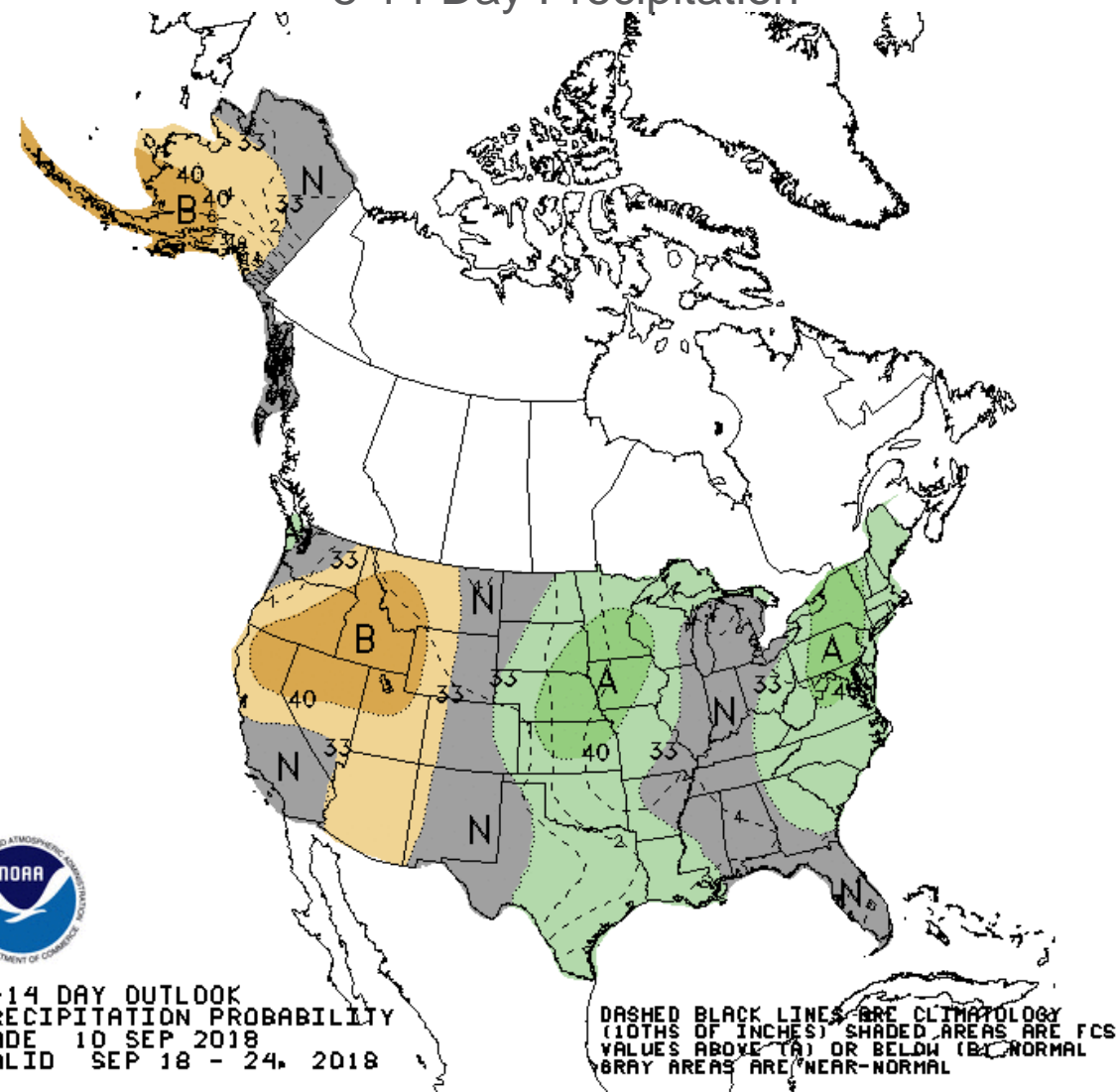


8-14 DAY OUTLOOK  
TEMPERATURE PROBABILITY  
MADE 10 SEP 2018  
VALID SEP 18 - 24, 2018

DASHED BLACK LINES ARE CLIMATOLOGY  
(DEG F) SHADED AREAS ARE FCST  
VALUES ABOVE (A) OR BELOW (B) NORMAL  
GRAY AREAS ARE NEAR-NORMAL

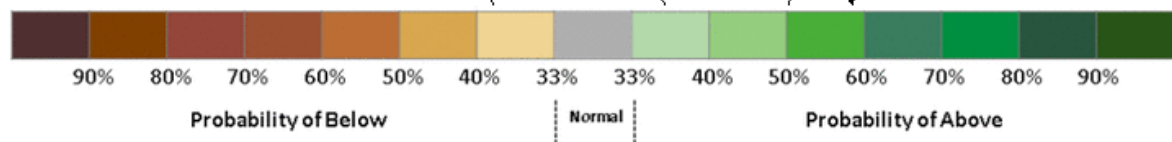


# 8-14 Day Precipitation



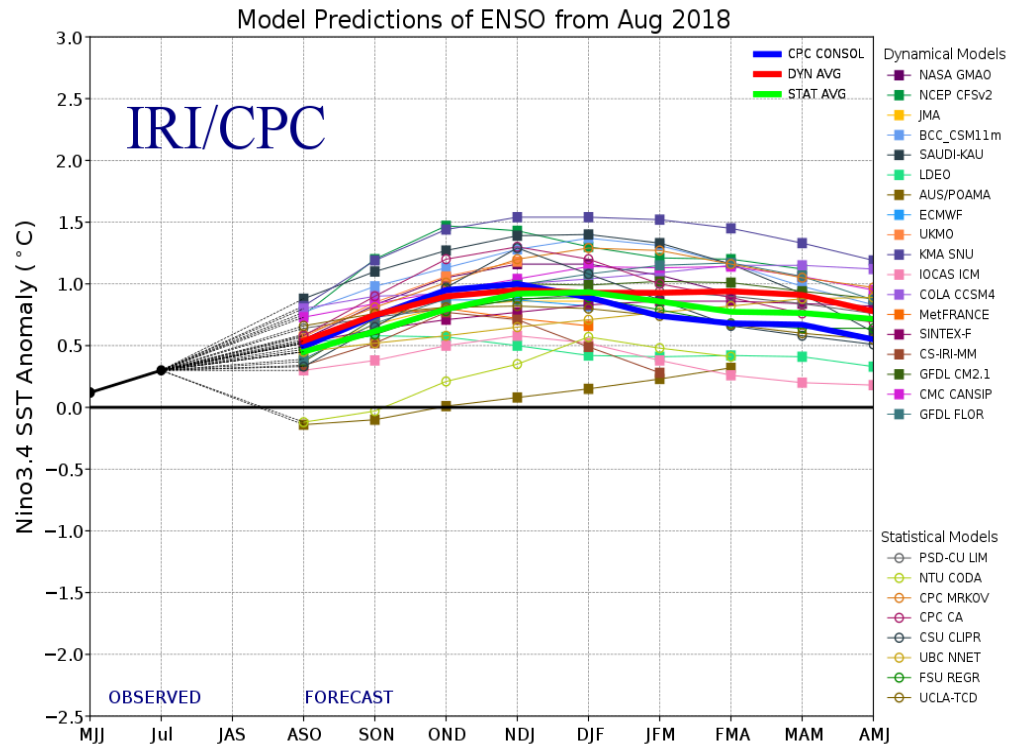
8-14 DAY OUTLOOK  
PRECIPITATION PROBABILITY  
MADE 10 SEP 2018  
VALID SEP 18 - 24, 2018

DASHED BLACK LINES ARE CLIMATOLOGY  
(10THS OF INCHES) SHADED AREAS ARE FCST  
VALUES ABOVE (A) OR BELOW (B) NORMAL  
GRAY AREAS ARE NEAR-NORMAL

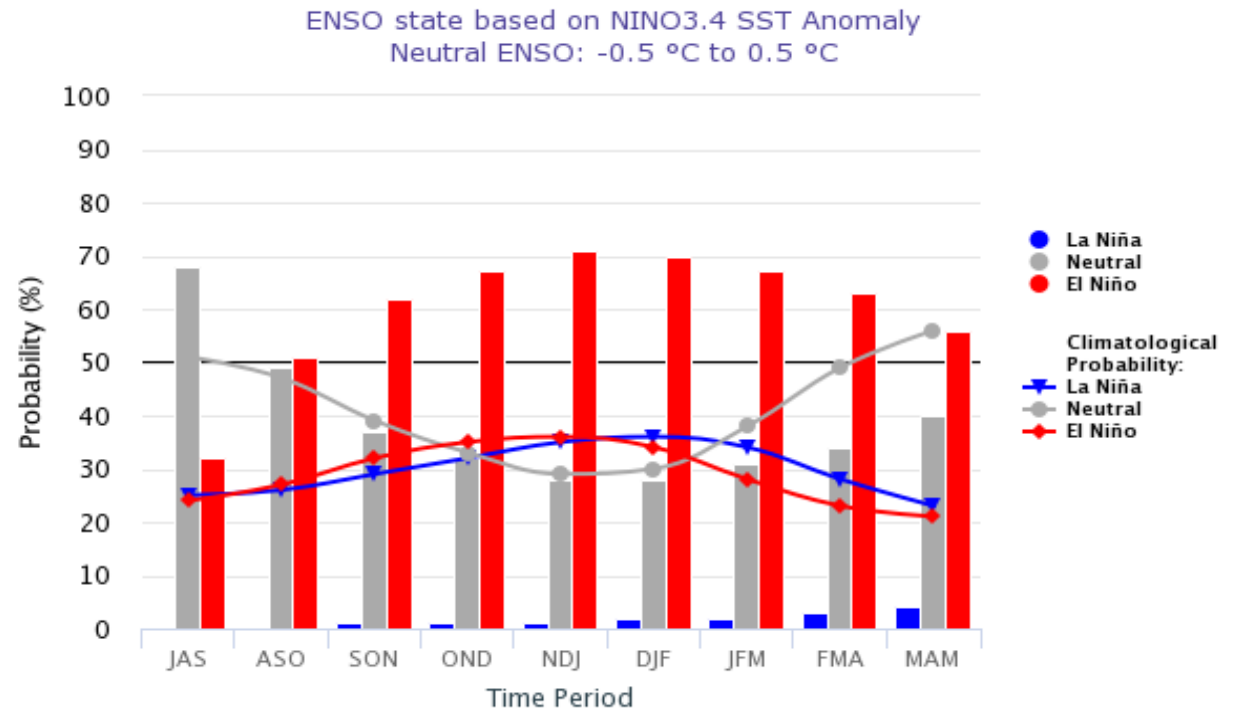




# El Niño-Southern Oscillation (ENSO)

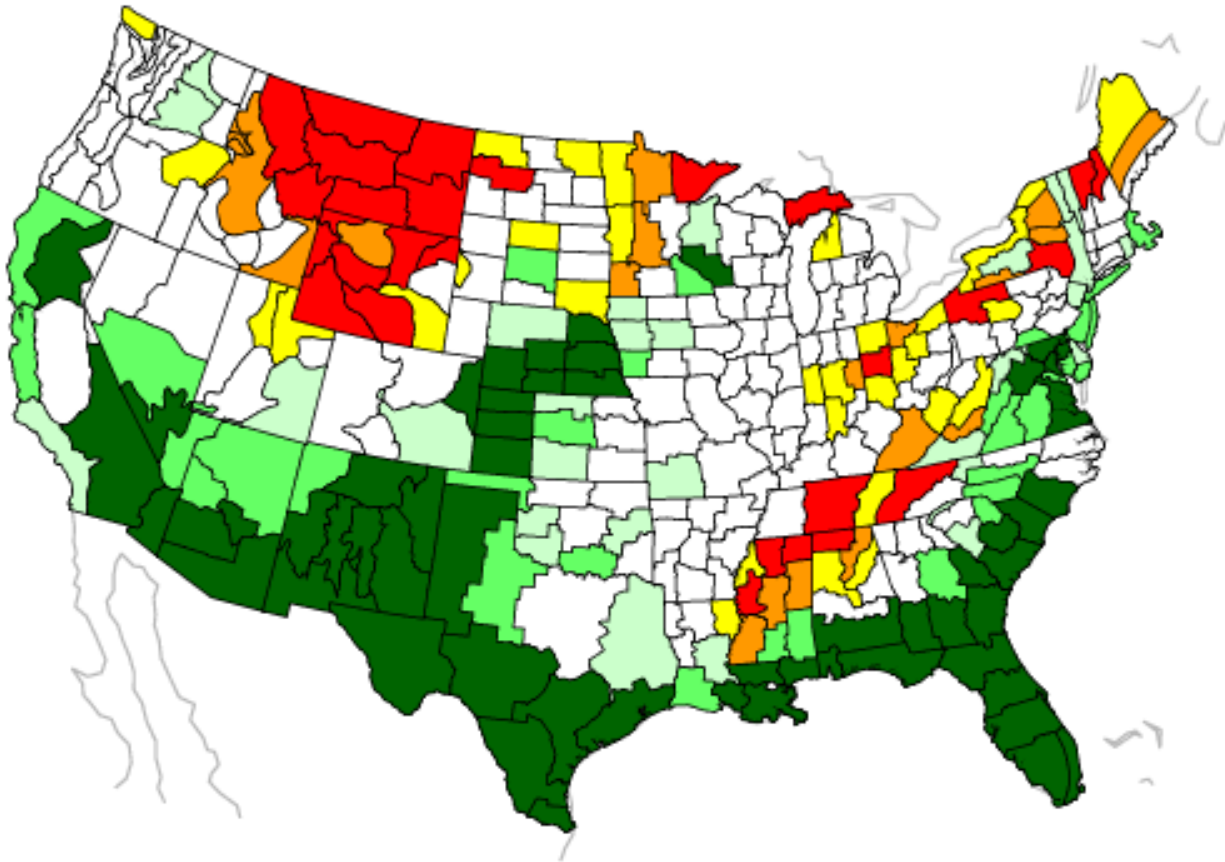


## Early-Aug CPC/IRI Official Probabilistic ENSO Forecasts

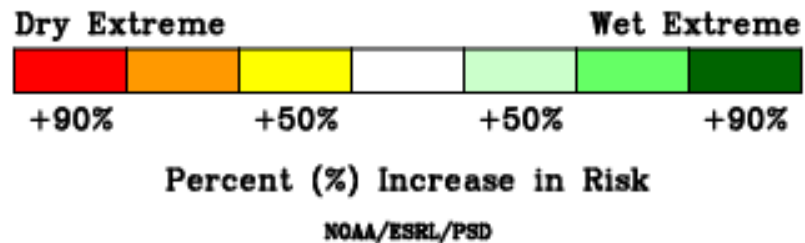


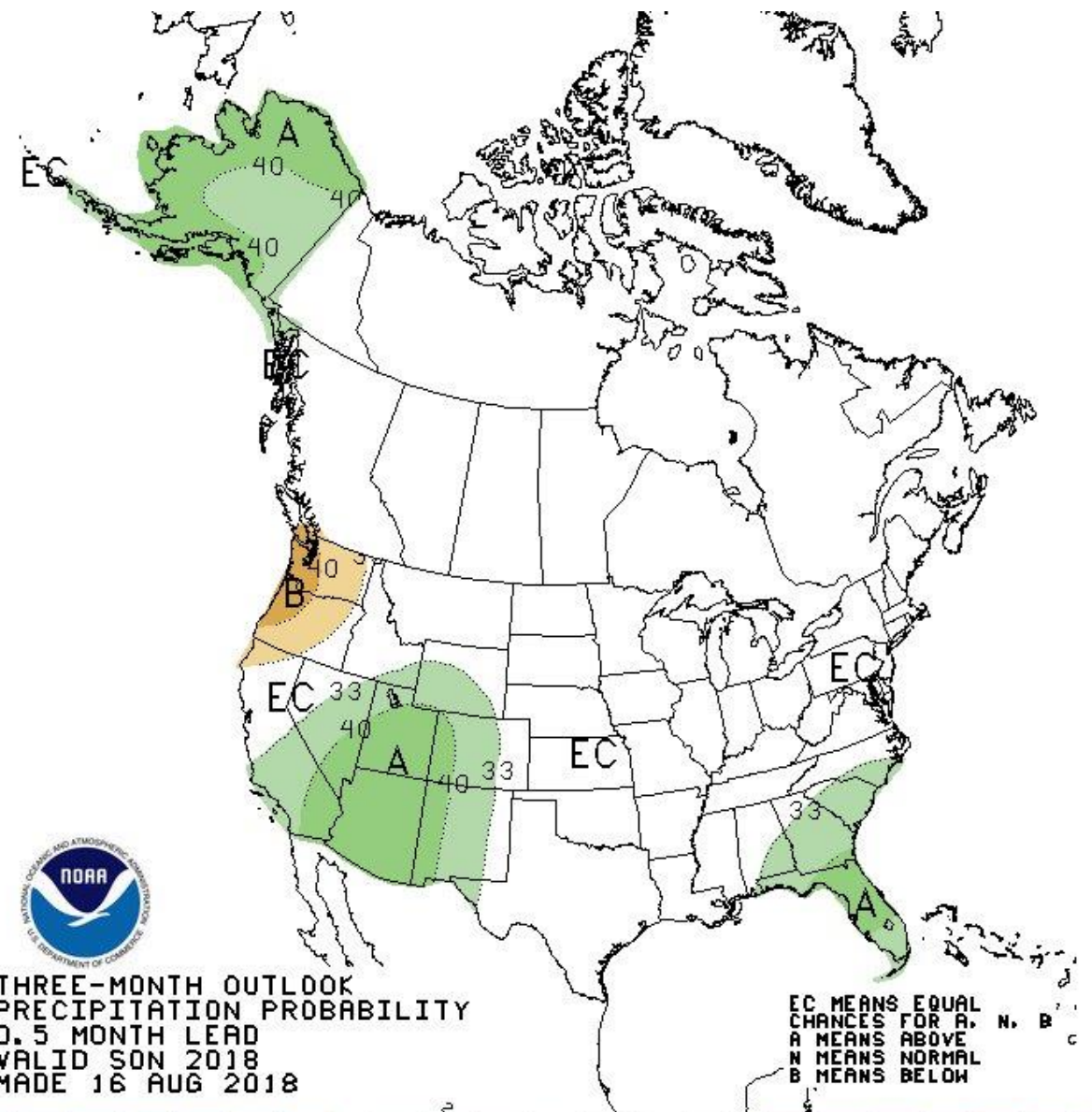
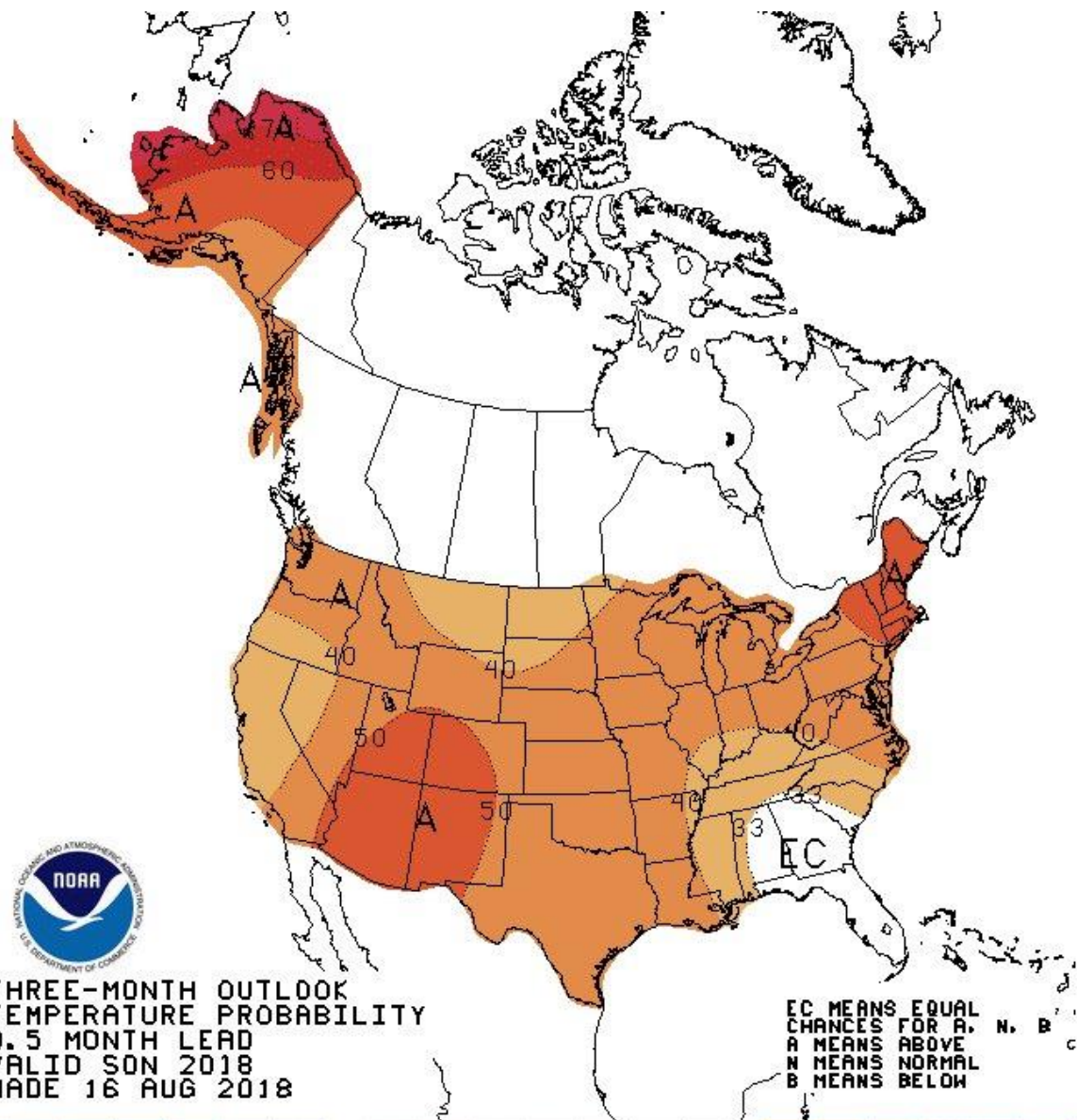
ENSO-neutral is favored through July-September 2018, with El Niño favored thereafter. Chances for El Niño are near 70% during Northern Hemisphere winter 2018-19.

DJF Precipitation During El Nino  
Increased Risk of Wet or Dry Extremes



How does El Niño tilt the odds for winter extremes in Colorado?





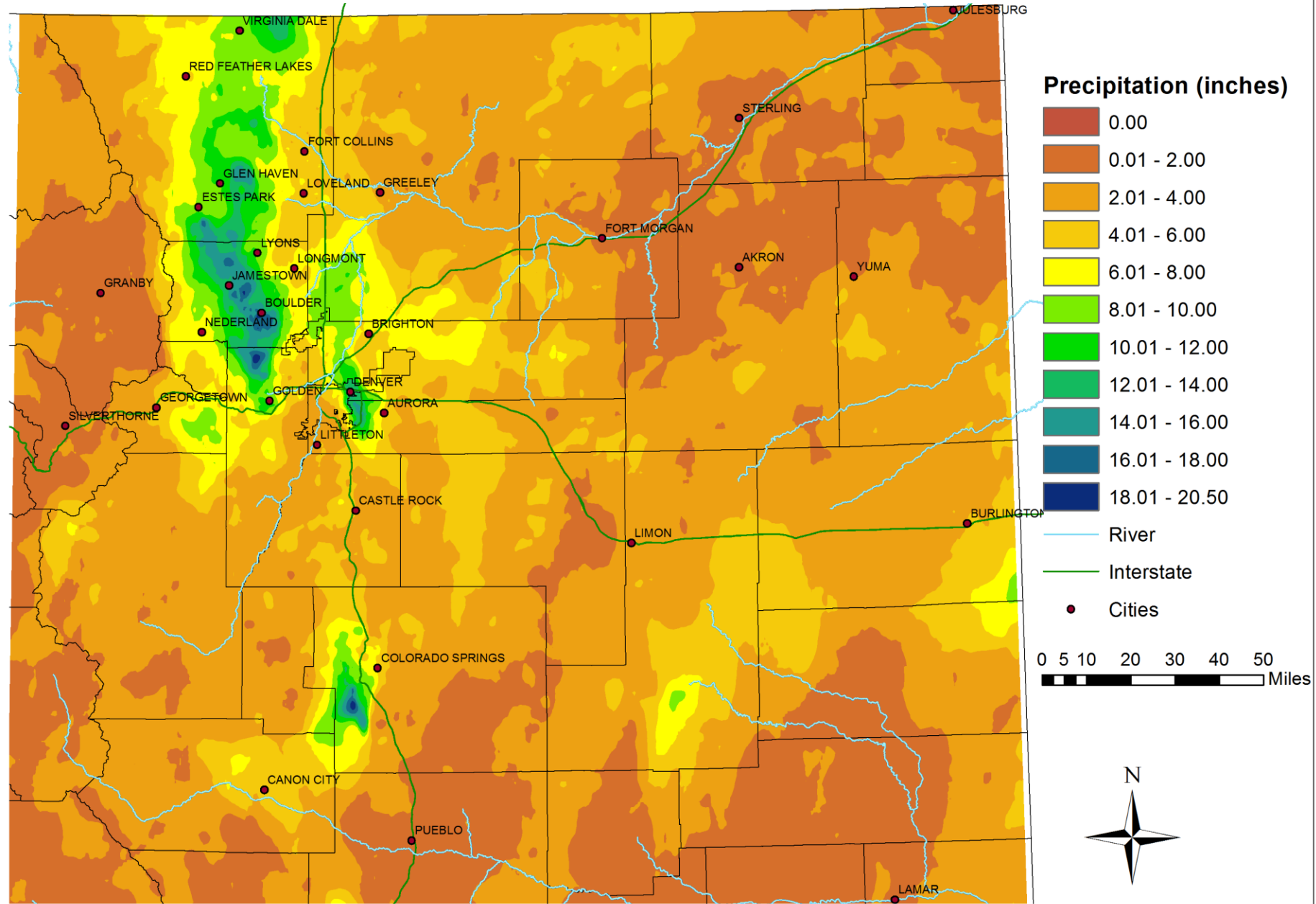


5 Years ago this week  
September 9-16, 2013





# Precipitation beginning September 8, 2013 ending 7:00 AM MST September 17, 2013



Map created with the Storm Precipitation Analysis System (SPAS) through a collaborative effort by Applied Weather Associates, LLC, MetStat, Inc. and the Colorado Climate Center. Radar data supplied by Weather Decision Technologies, Inc.

**zach.Schwalbe@colostate.edu**

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**Thank you**

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**COLORADO CLIMATE CENTER**

*Providing information and expertise on Colorado's complex climate*



**Colorado State University**