

Colorado Climate Center – *WATF Climate Update*

Peter Goble, Service Climatologist

Water Availability Task Force

July 23, 2020



ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY



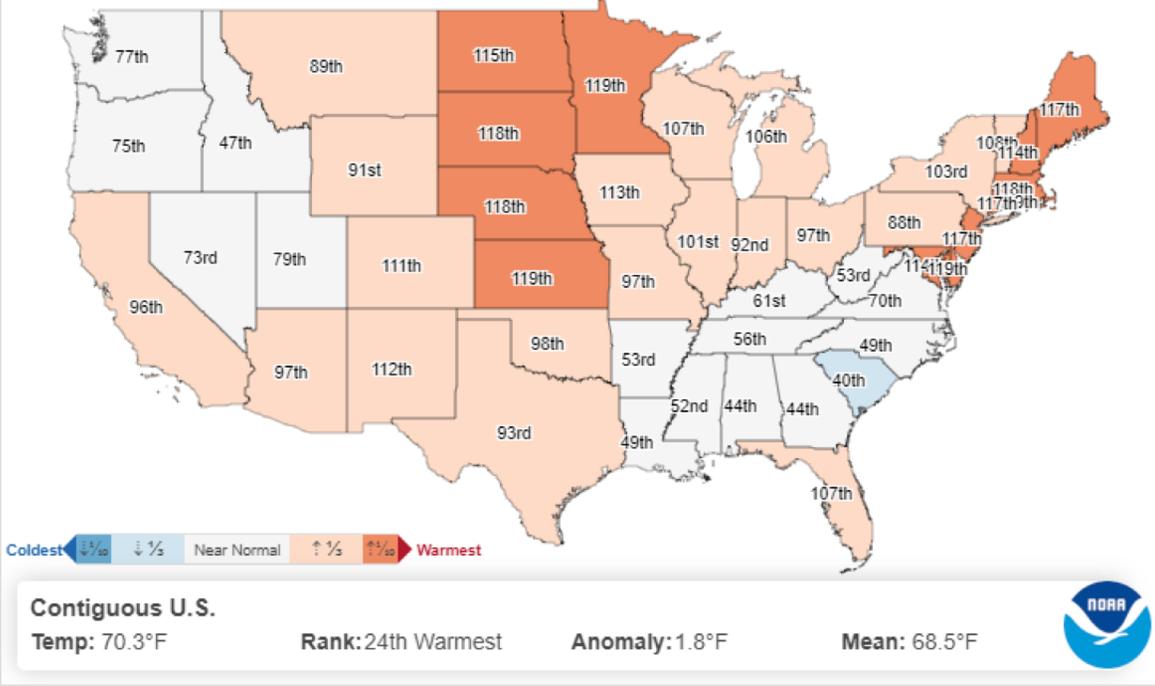
2020 Water Year To Date

temperature, precipitation,
standardized precipitation index



Statewide Average Temperature Rank (of 126 years)

June 2020



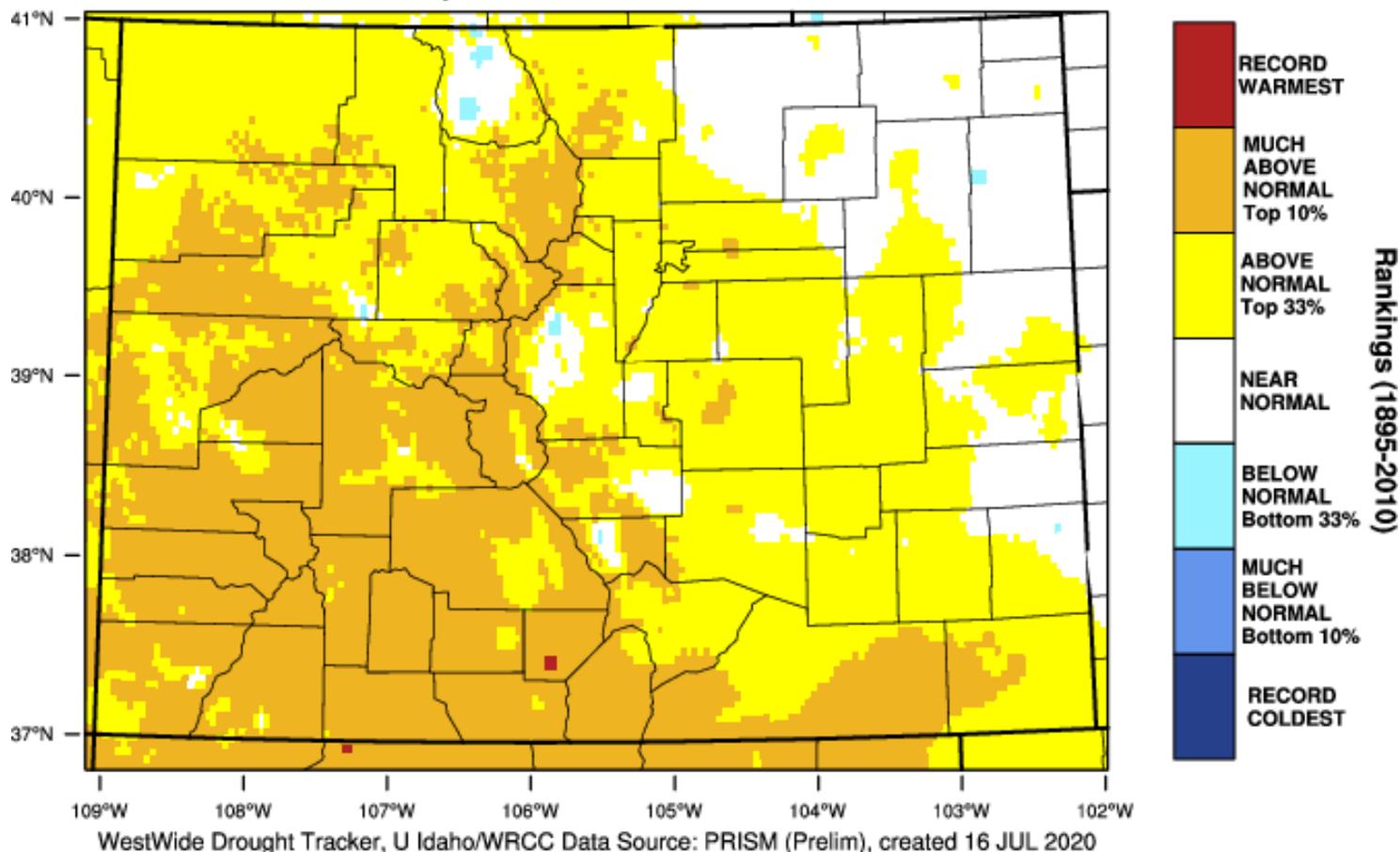
June was warm, and particularly, warm early

We had record hot and windy conditions on the eastern plains to start the month

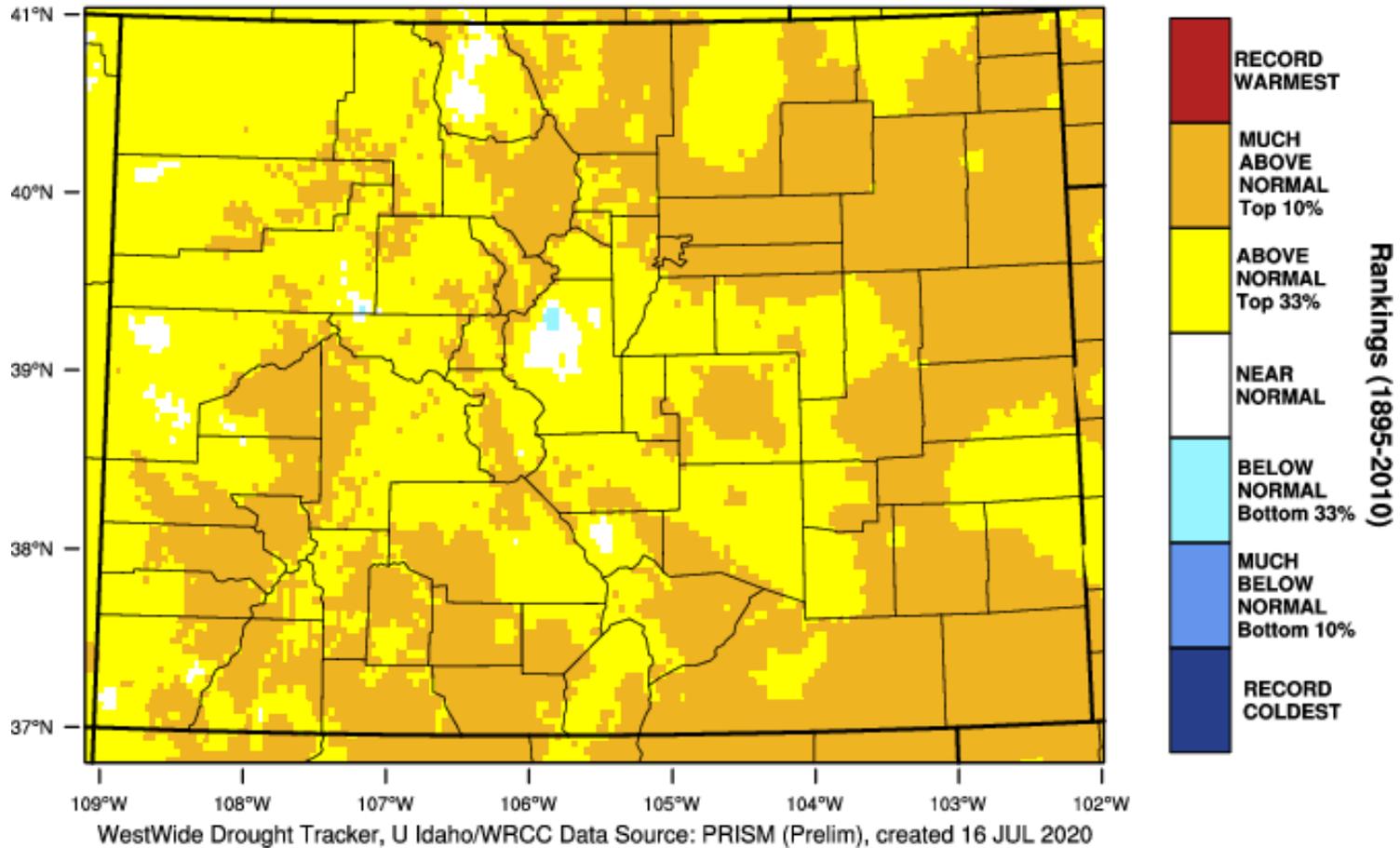
Month	T Rank (of 126 years)	Above, below, or near avg?
Oct	3 rd coolest	much below
Nov	39 th warmest	above
Dec	25 th warmest	above
Jan	26 th warmest	above
Feb	47 th coolest	average
Mar	14 th warmest	above
Apr	58 th warmest	average
May	9 th warmest	much above
Jun	16 th warmest	much above
Jul		
Aug		
Sep		



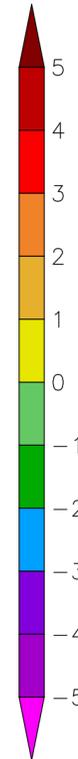
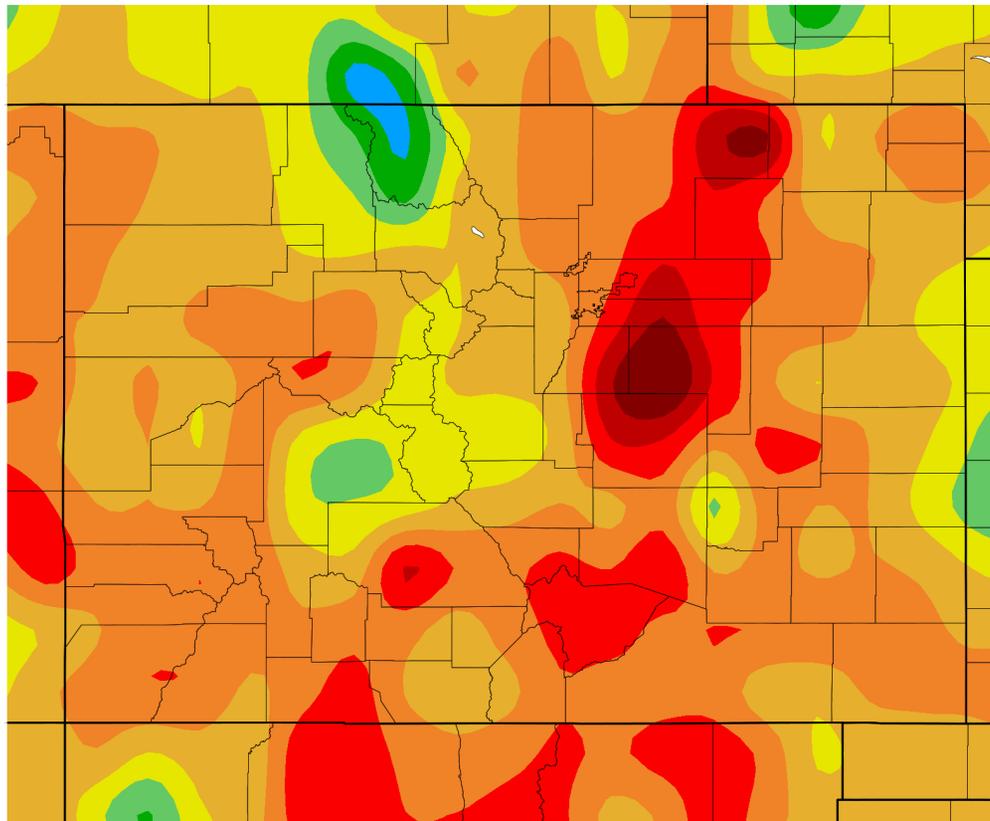
Colorado - Mean Temperature April-June 2020 Percentile



Colorado - Mean Temperature June 2020 Percentile



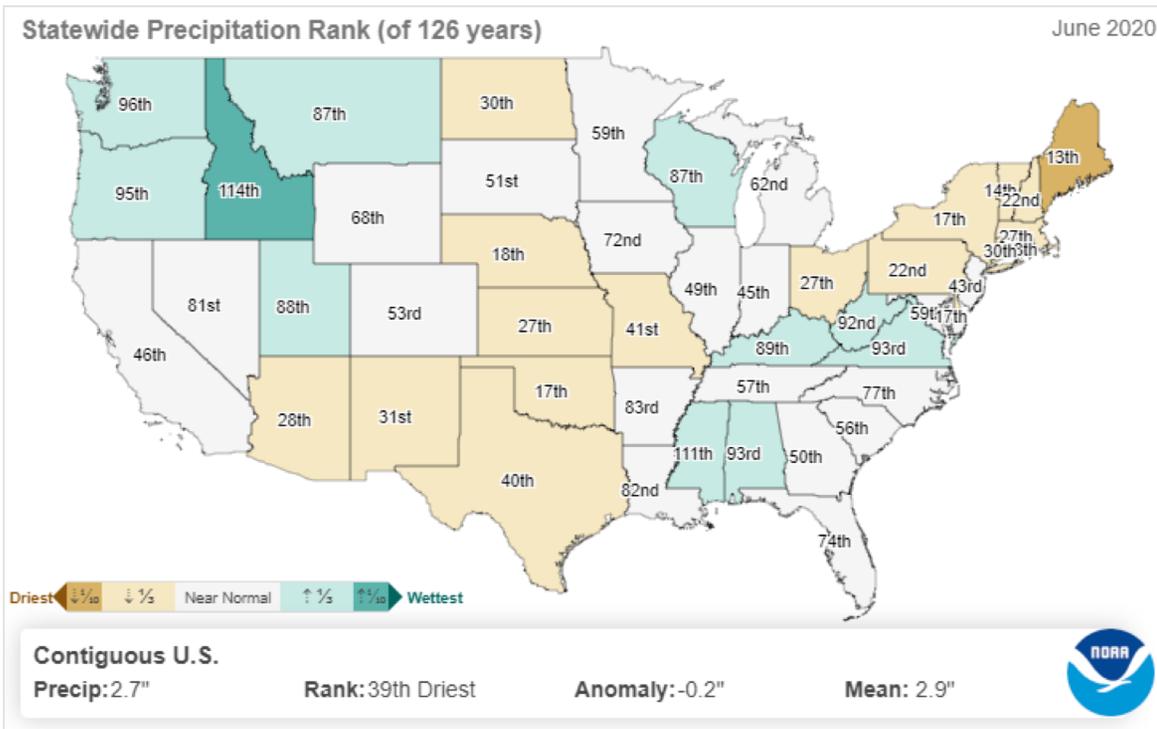
Departure from Normal Temperature (F) 7/1/2020 – 7/21/2020



Not unusual for July to be warmer than the 1981-2010 normal, but this has been the warmest July since 2012 for much of the eastern plains.

Western CO was warmer in July 2018, but the recent consistency of warmer than normal conditions has been concerning



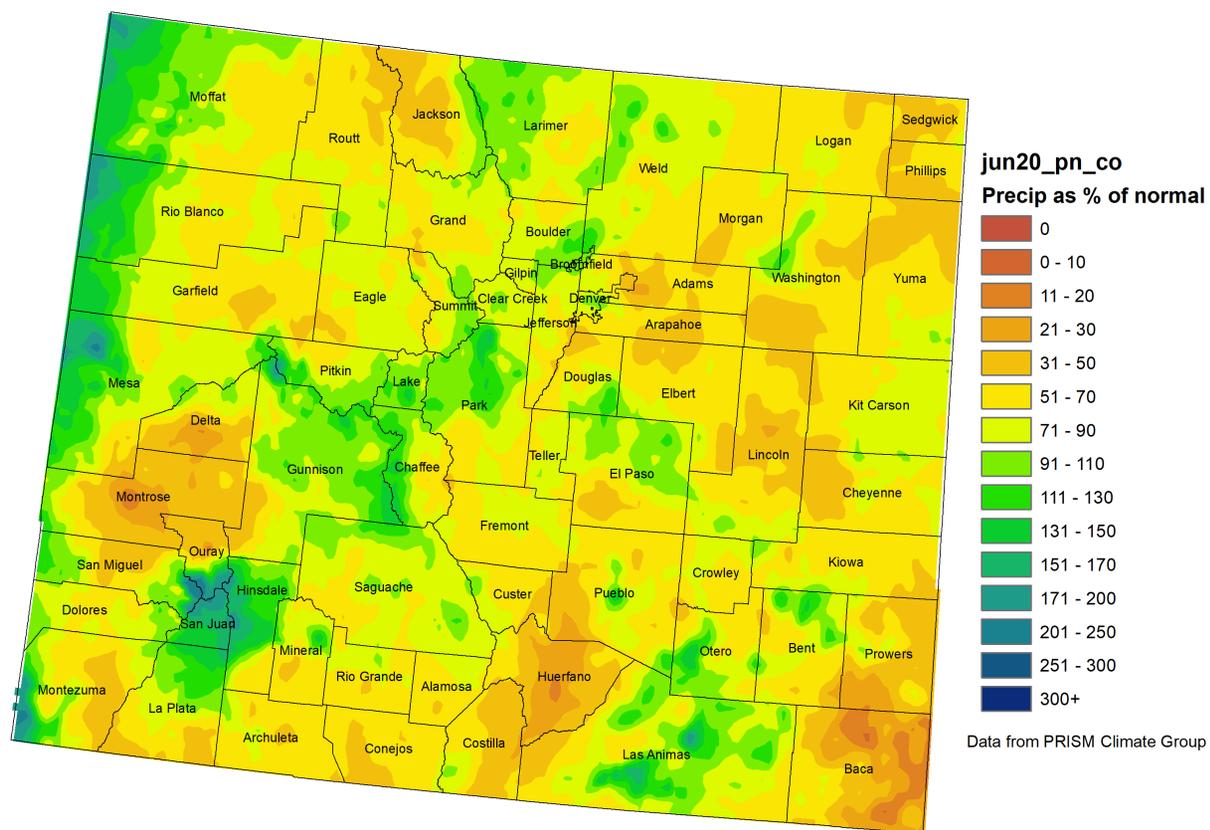


Colorado is being slowly worn down by dry conditions

Month	P Rank (of 126 years)	Above, below, or near avg?
Oct	40 th driest	below
Nov	52 nd wettest	average
Dec	41 st wettest	above
Jan	33 rd driest	below
Feb	60 th wettest	average
Mar	55 th driest	average
Apr	8 th driest	much below
May	18 th driest	below
Jun	53 rd driest	average
Jul		
Aug		
Sep		



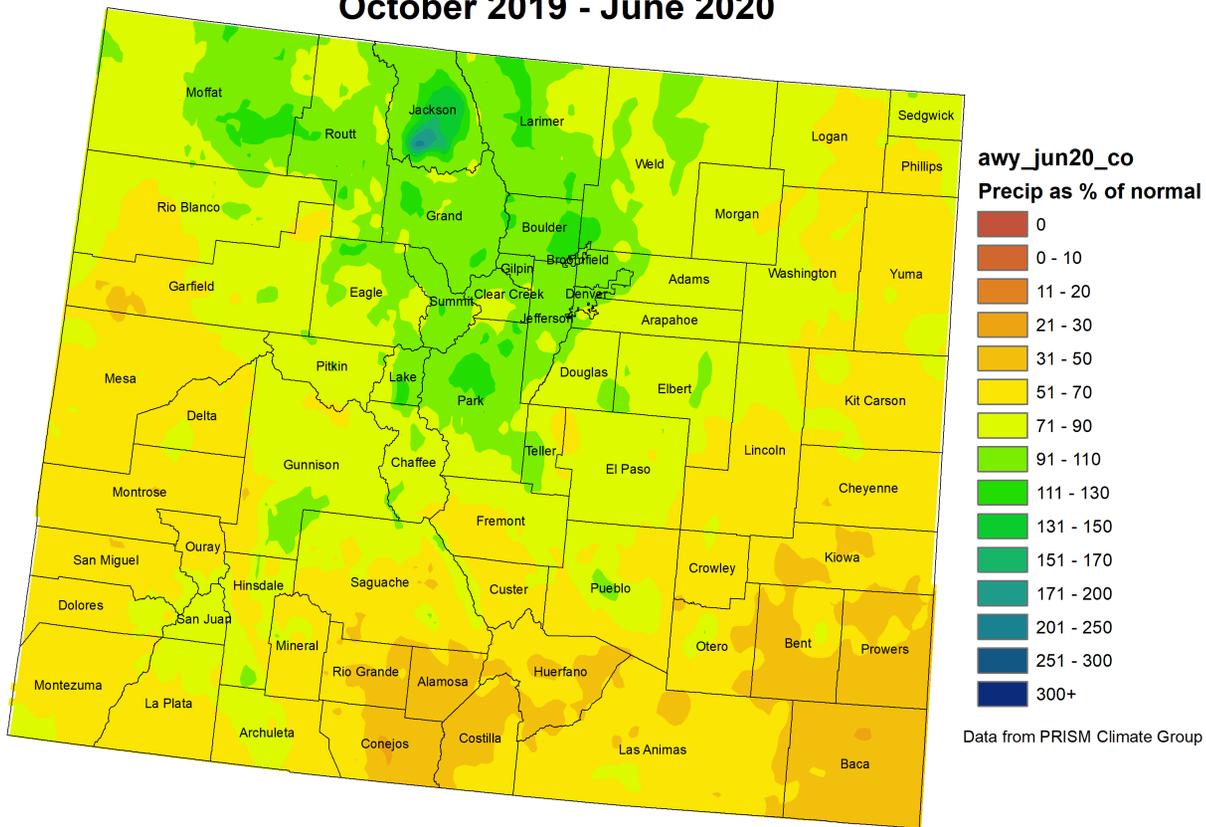
Colorado June 2020 Precipitation as a Percentage of Normal



June gave us a mix for precipitation, but most of the state leaned dry



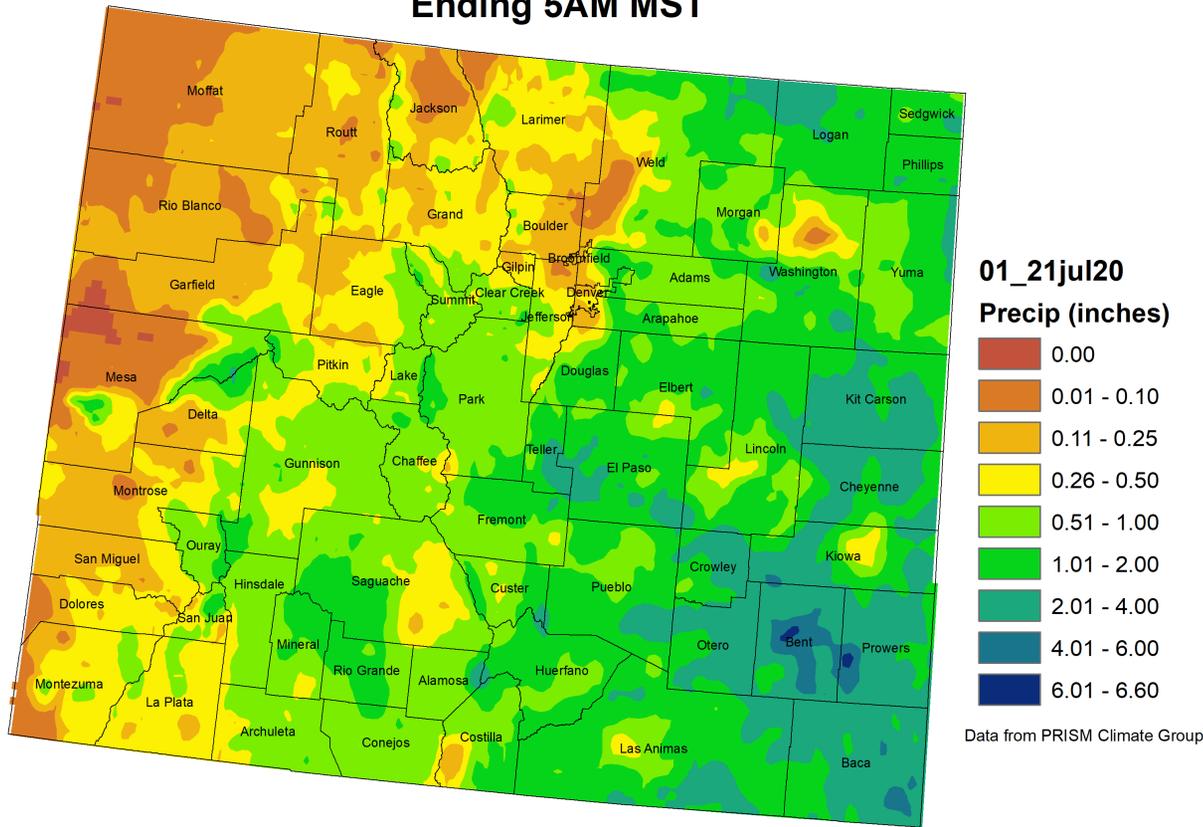
Colorado Water Year 2020 Precipitation as a Percentage of Normal October 2019 - June 2020



North central CO continues to be the luckiest part of the state for 2020, particularly in the boulder area. This is the same spatial pattern from the end of the snow season



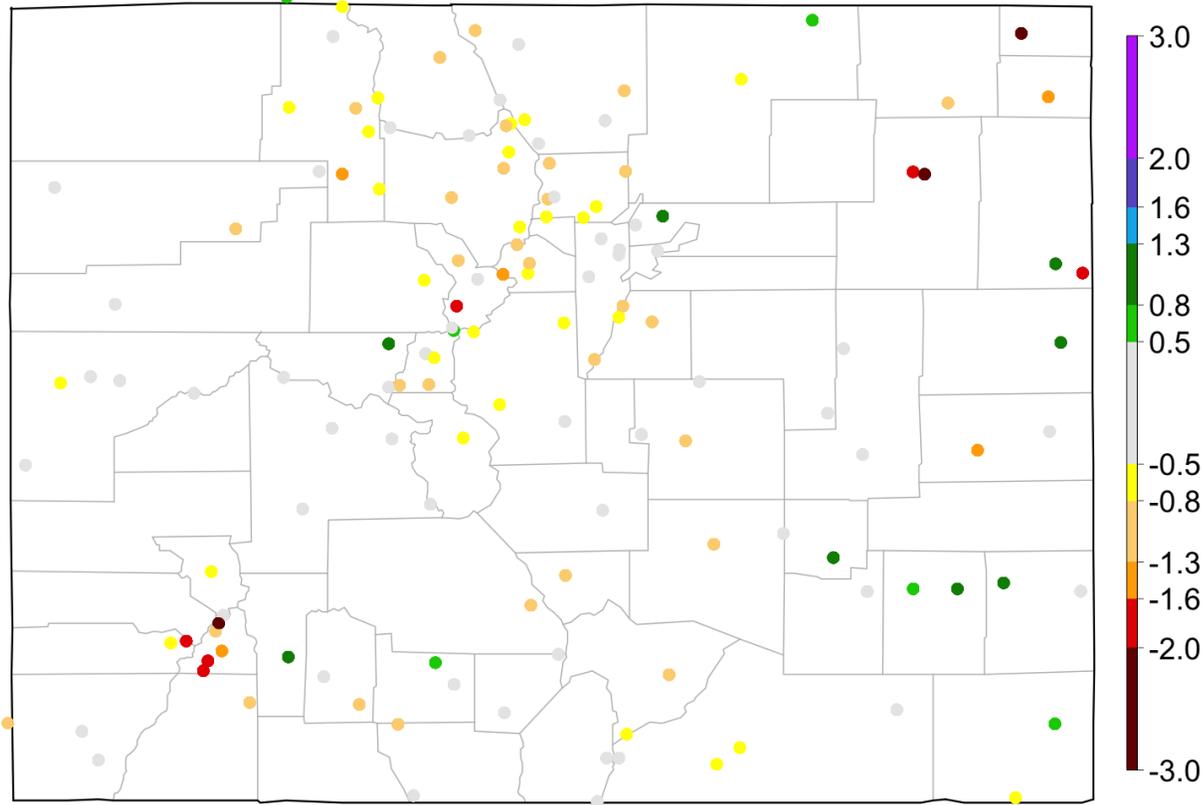
Colorado Month to Date Precipitation 1 - 21 July 2020 Ending 5AM MST



Above average MTD moisture for most of the Arkansas River Valley, but is it enough to mitigate preexisting drought impacts?



30-day SPI: 2020/06/20 - 2020/07/19



Record dry late
June/early July for
Akron

Data from High Plains Regional Climate Center and ACIS

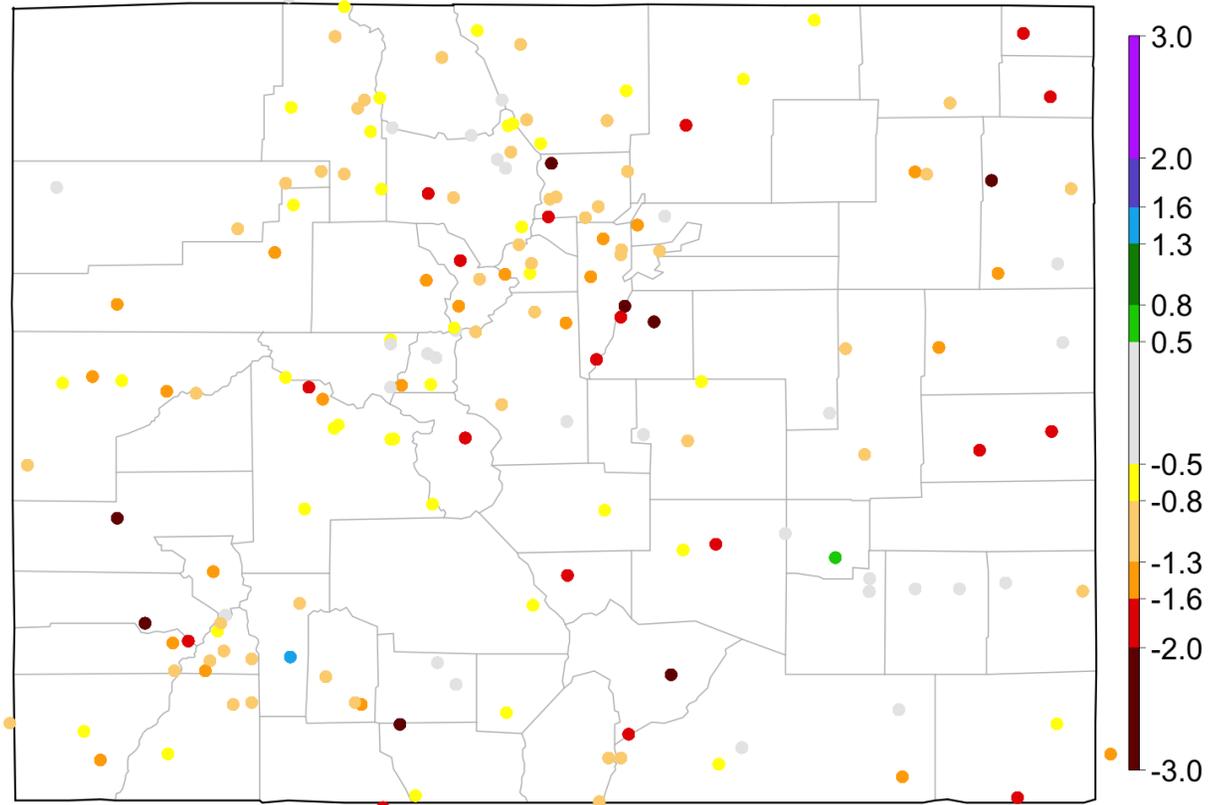
<http://climate.colostate.edu/~drought/spi.html>



COLORADO CLIMATE CENTER



90-day SPI: 2020/04/21 - 2020/07/19



Data from High Plains Regional Climate Center and ACIS

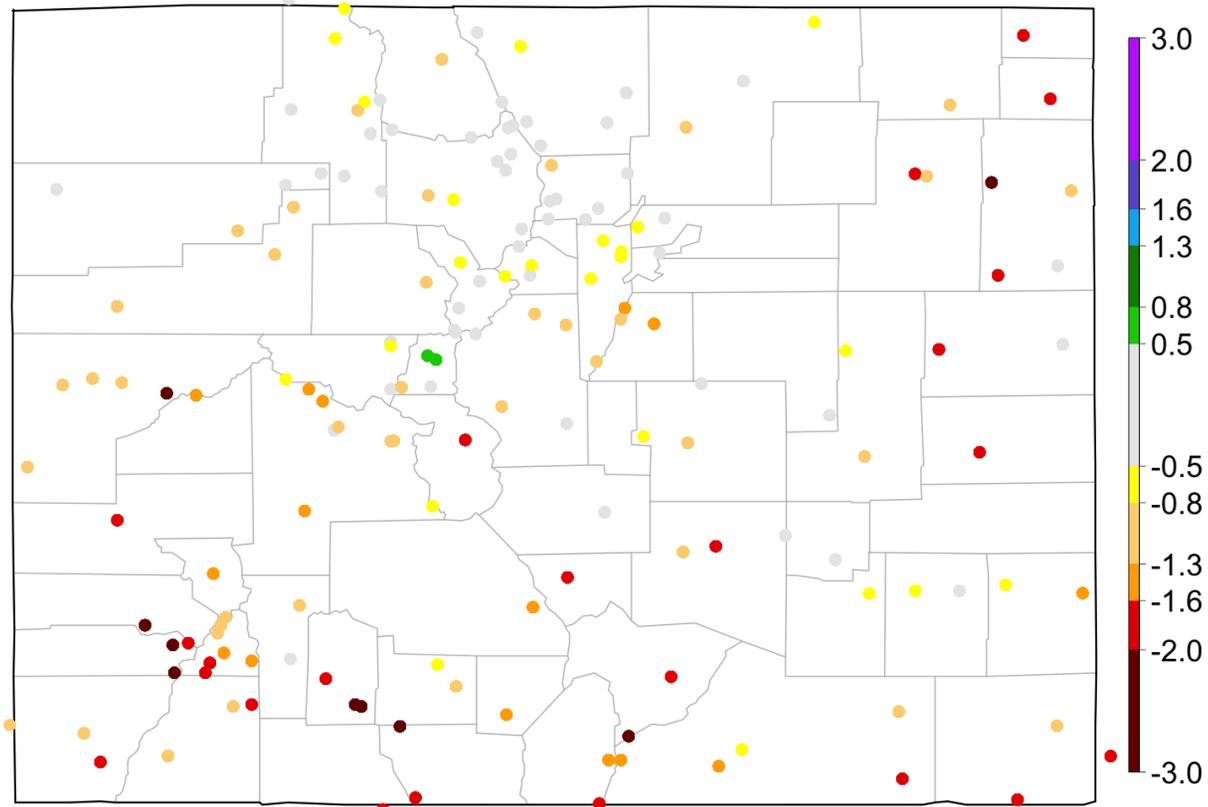
<http://climate.colostate.edu/~drought/spi.html>



COLORADO CLIMATE CENTER



6-month SPI: 2020/01/19 - 2020/07/19



Data from High Plains Regional Climate Center and ACIS

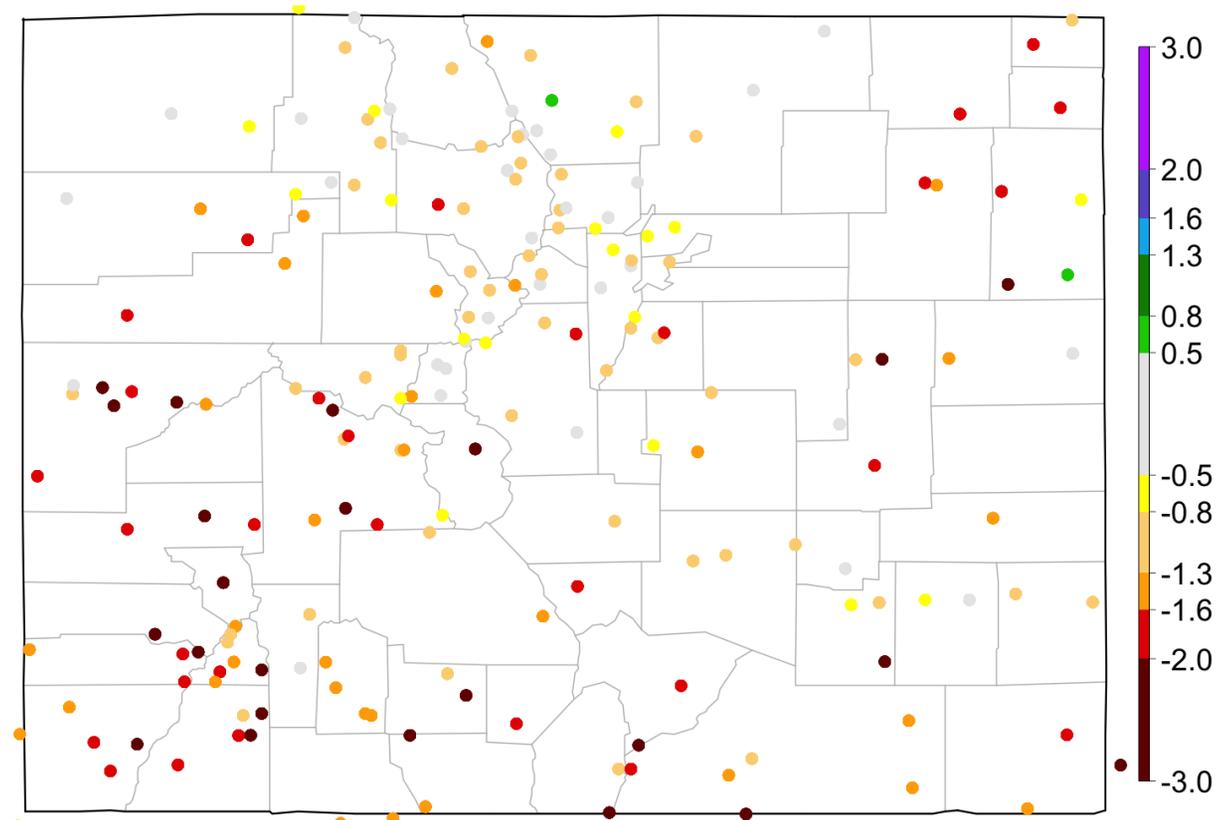
<http://climate.colostate.edu/~drought/spi.html>



COLORADO CLIMATE CENTER



12-month SPI: 2019/07/20 - 2020/07/19



Our state hasn't caught a big break since spring 2019.

Data from High Plains Regional Climate Center and ACIS

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





Drought

National Drought

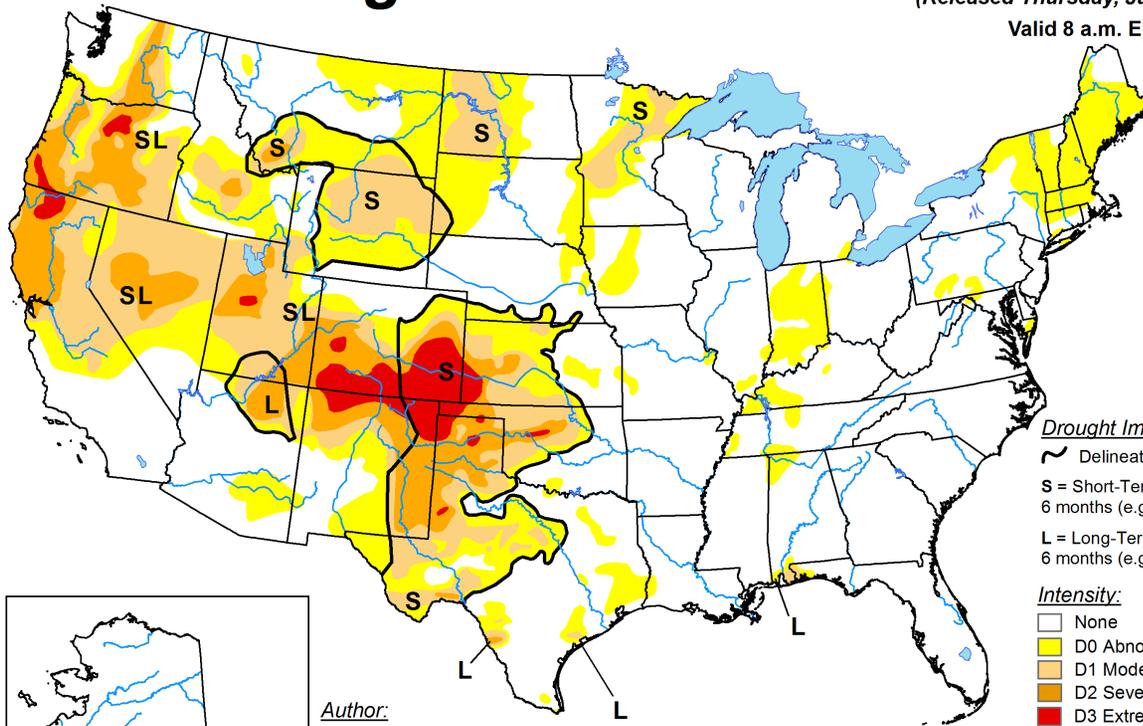
Colorado Drought

Flash Drought?



U.S. Drought Monitor

June 16, 2020
 (Released Thursday, Jun. 18, 2020)
 Valid 8 a.m. EDT

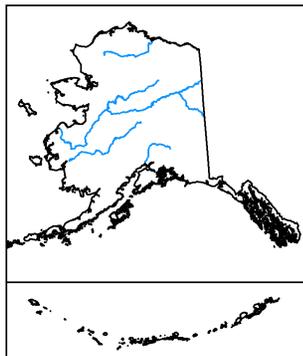


Drought Impact Types:

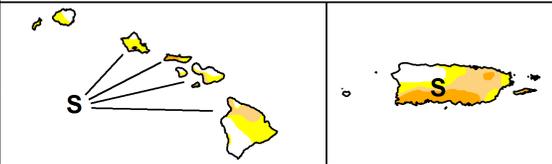
- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

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



Author:
 Richard Tinker
 CPC/NOAA/NWS/NCEP



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>

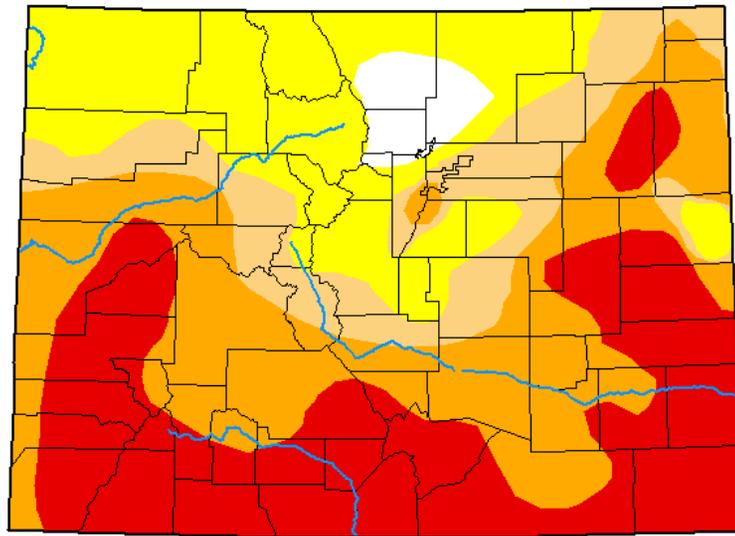


droughtmonitor.unl.edu



U.S. Drought Monitor Colorado

July 21, 2020
(Released Thursday, Jul. 23, 2020)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	2.95	97.05	73.99	60.34	31.77	0.00
Last Week 07-14-2020	4.64	95.36	70.20	57.84	36.91	0.00
3 Months Ago 04-21-2020	33.26	66.74	53.58	28.51	0.00	0.00
Start of Calendar Year 12-31-2019	31.72	68.28	51.19	20.11	0.00	0.00
Start of Water Year 10-01-2019	30.14	69.86	27.53	0.00	0.00	0.00
One Year Ago 07-23-2019	96.93	3.07	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:

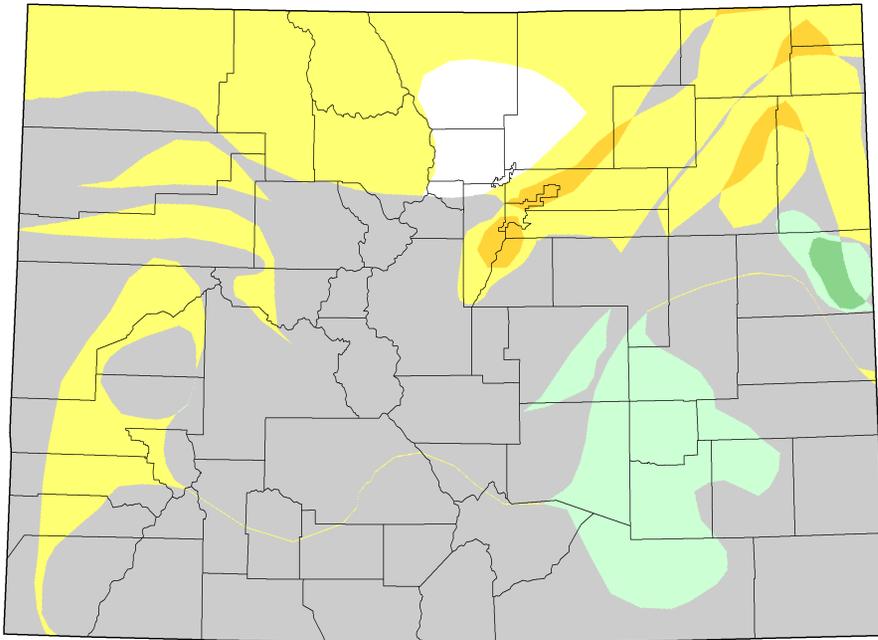
Richard Heim
NCEI/NOAA



droughtmonitor.unl.edu



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



July 21, 2020
compared to
June 23, 2020

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

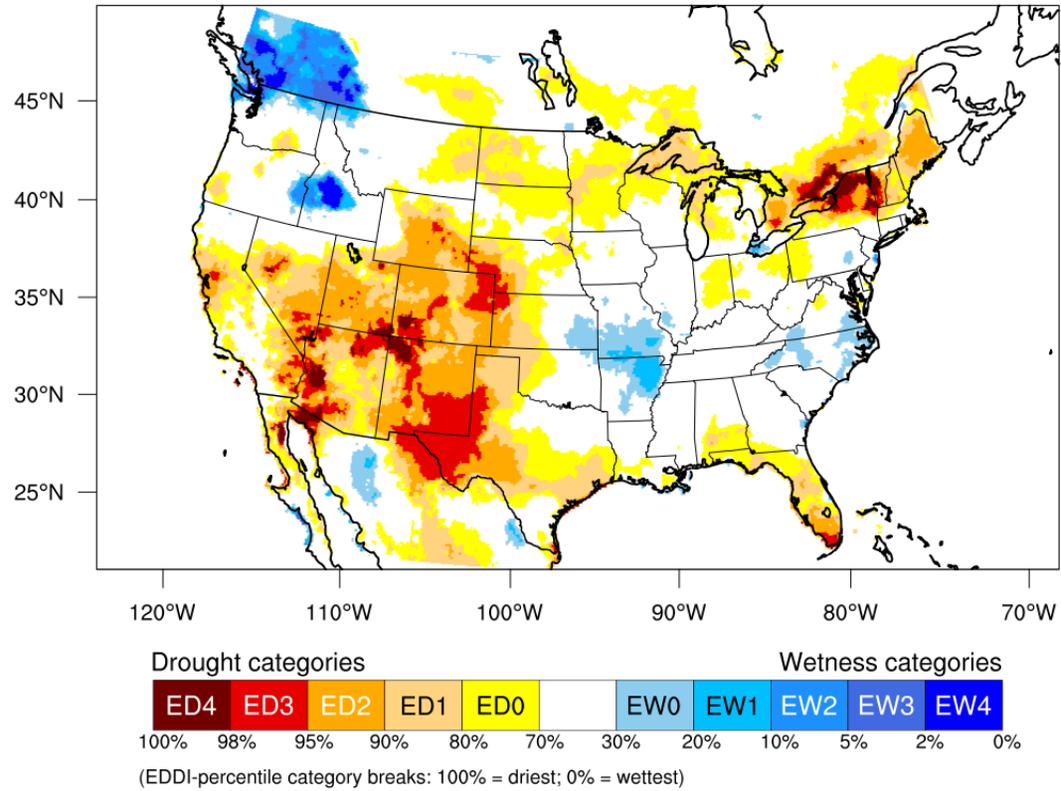
Improvements in SE CO

Degradations in NE CO

Steadily bad in W CO



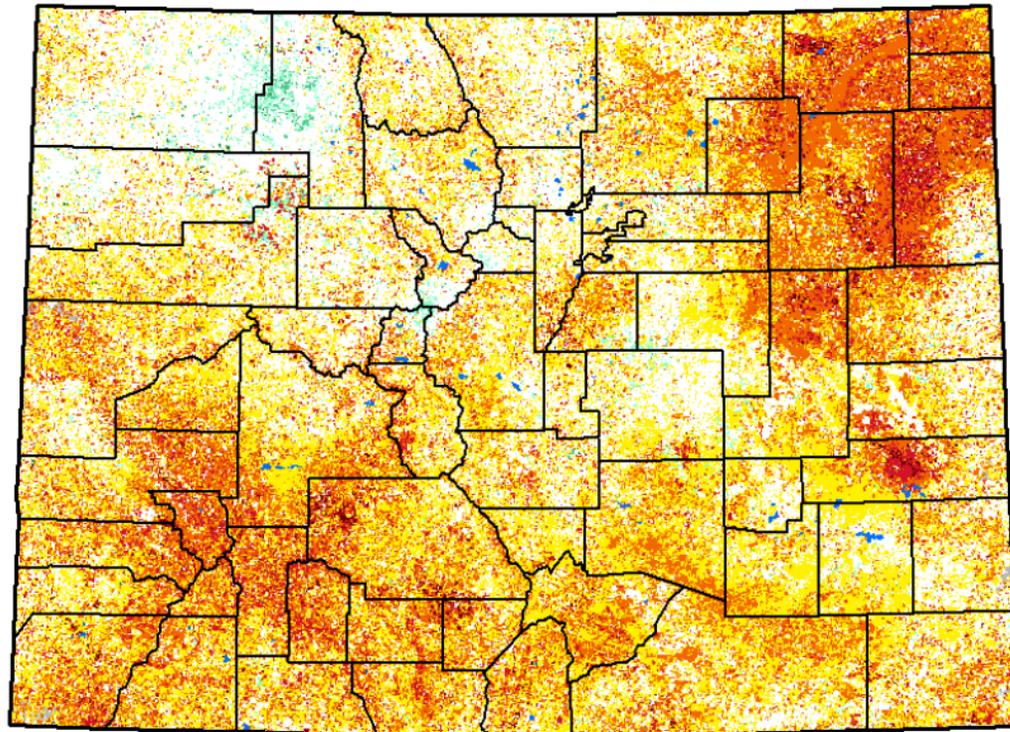
3-month EDDI categories for July 16, 2020



Generated by NOAA/ESRL/Physical Sciences Laboratory



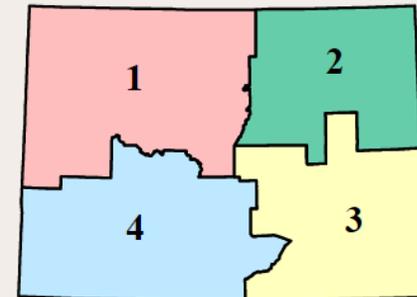
Map for Jul. 19, 2020



Vegetation Condition

- | | |
|----------------------|-------------------|
| ■ Extreme Drought | ■ Very Moist |
| ■ Severe Drought | ■ Extremely Moist |
| ■ Moderate Drought | ■ Out of Season |
| ■ Pre-drought stress | ■ Water |
| ■ Near Normal | ■ Other Landcover |
| ■ Unusually Moist | |

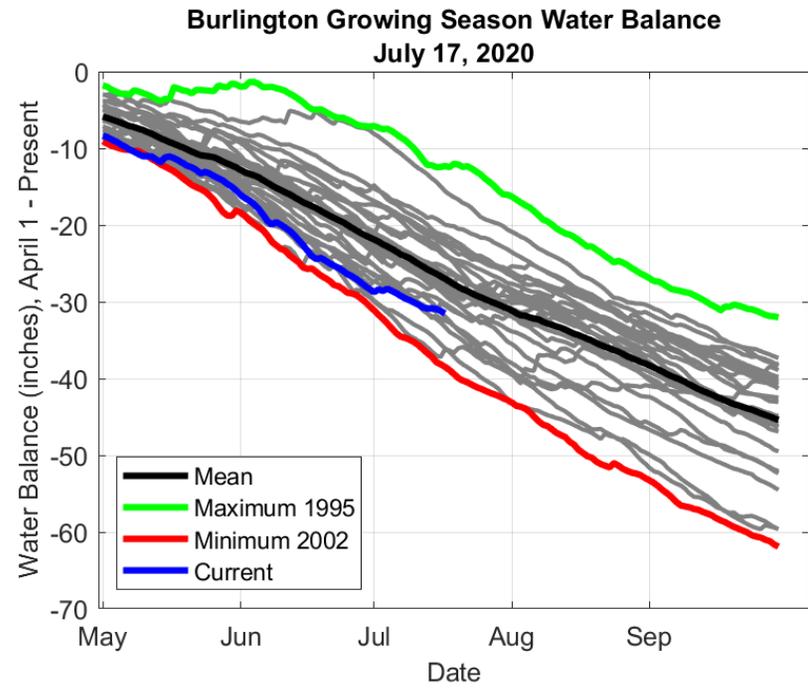
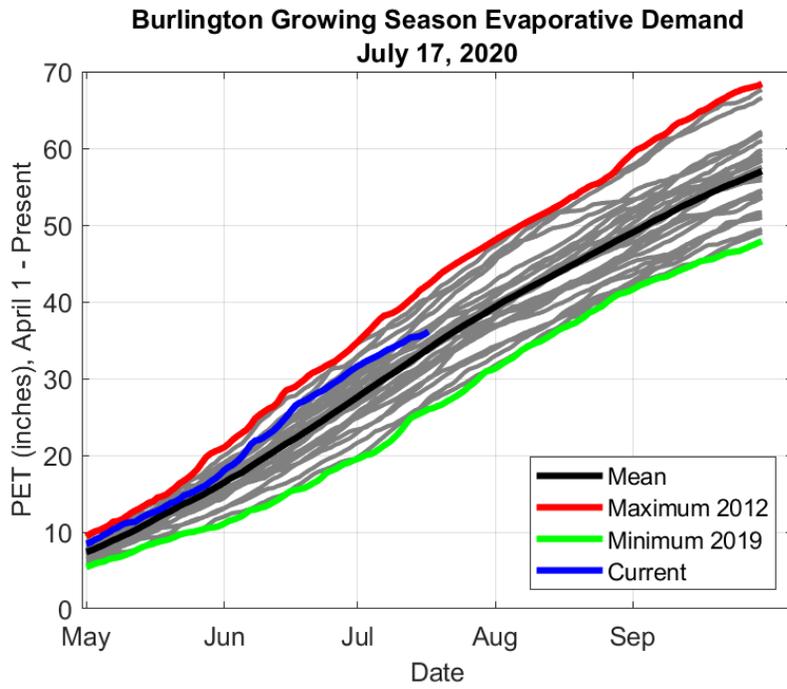
Zoom to a region



[Return to the U.S. map](#)

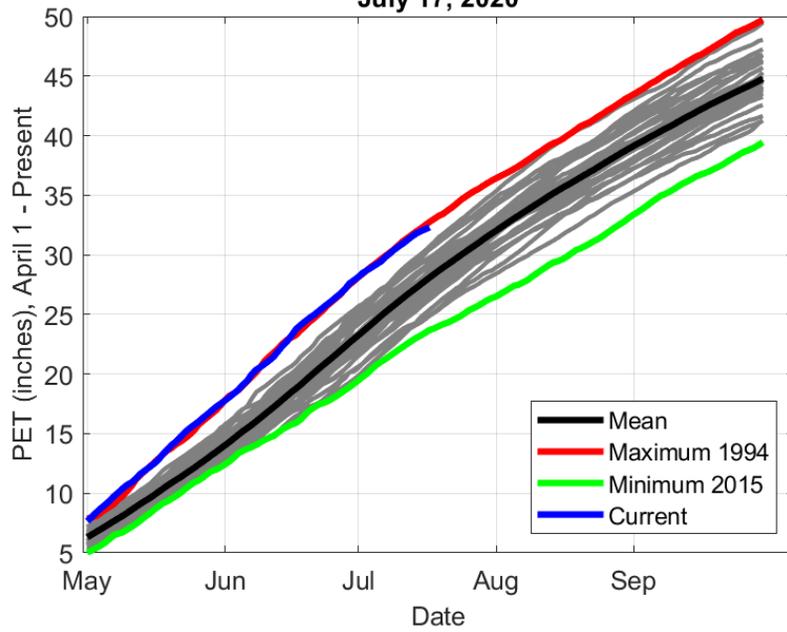
[State Statistics](#)



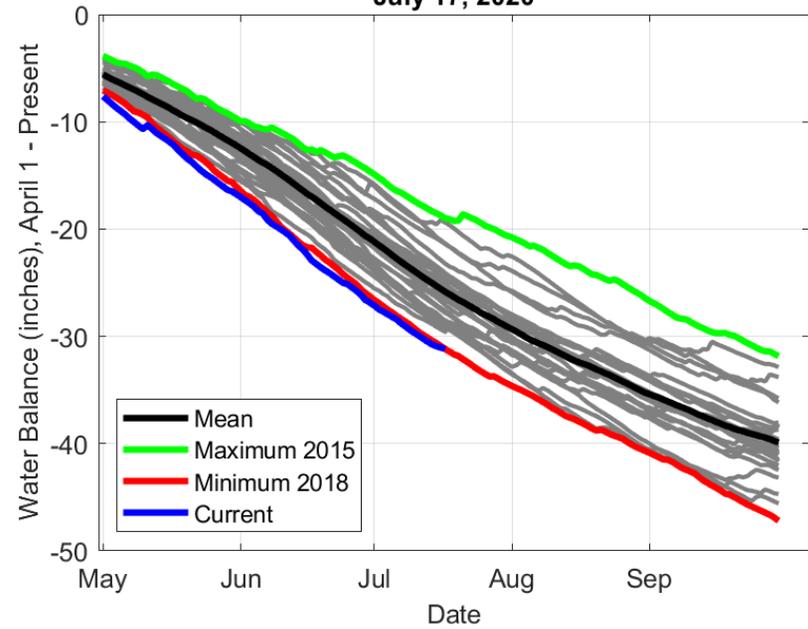


<http://climate.colostate.edu/~drought/et.php>

Olathe Growing Season Evaporative Demand
July 17, 2020



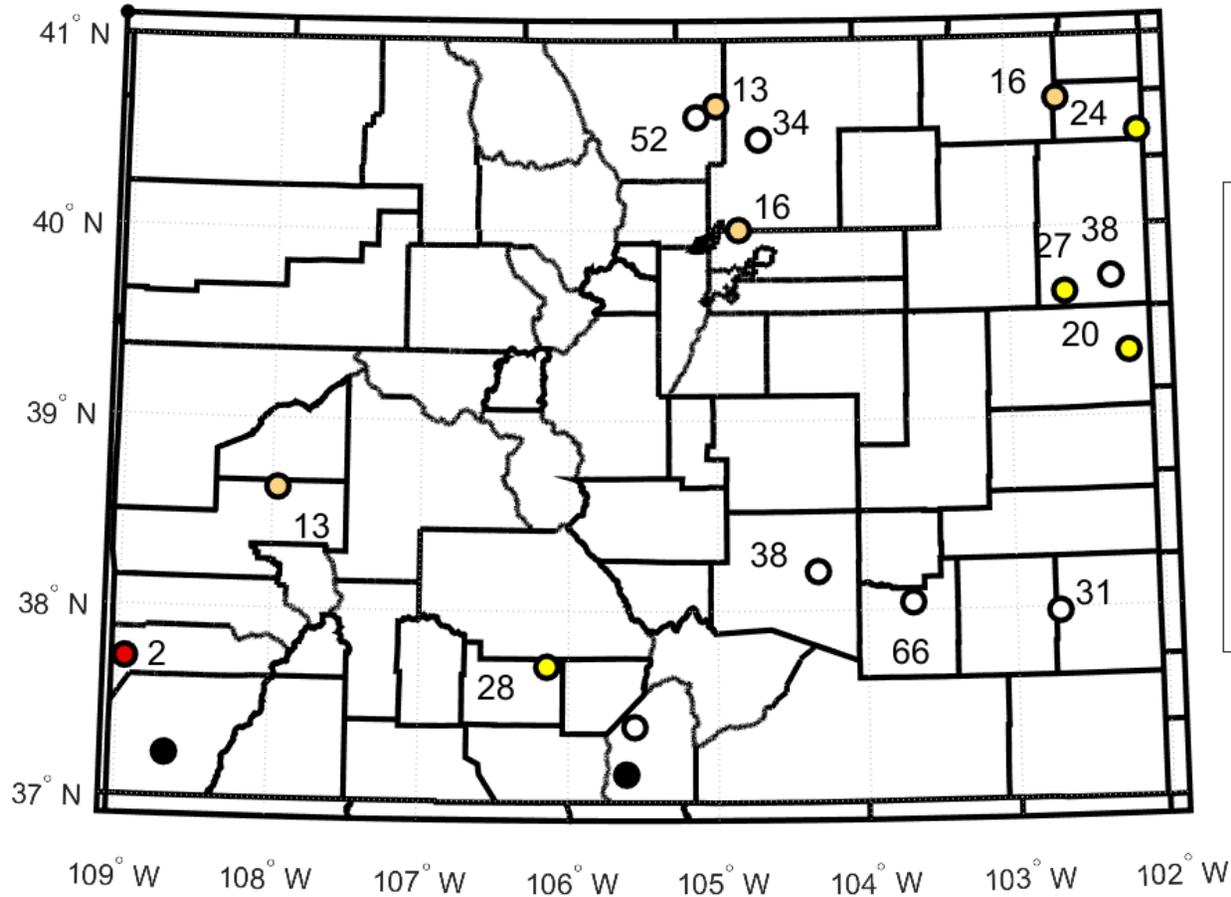
Olathe Growing Season Water Balance
July 17, 2020



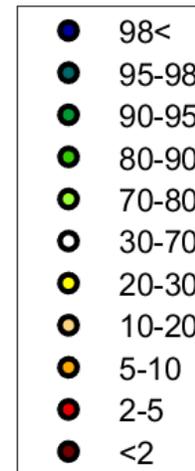
<http://climate.colostate.edu/~drought/et.php>



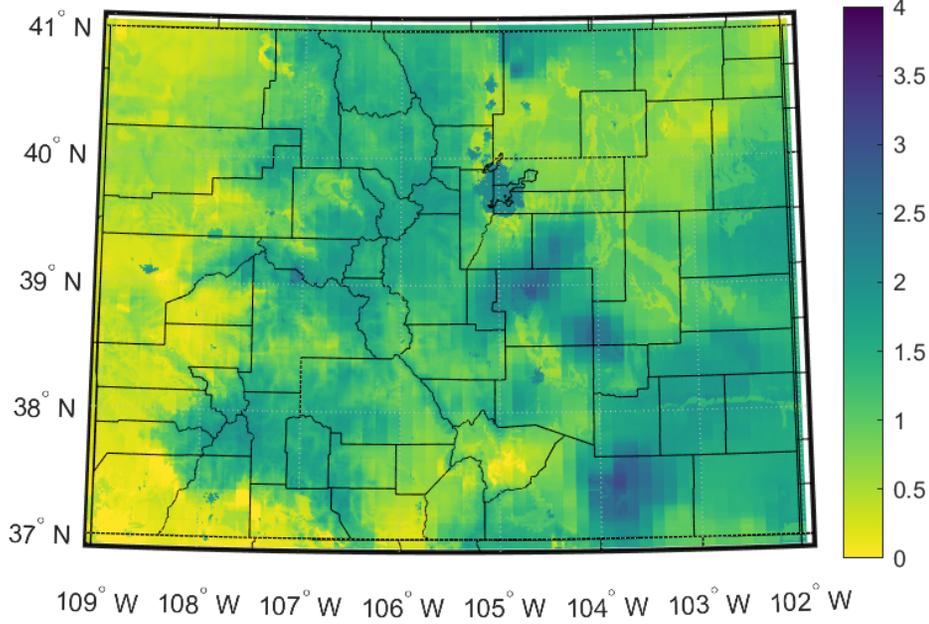
Growing Season Water Balance (P/PET) Percentiles July 17, 2020



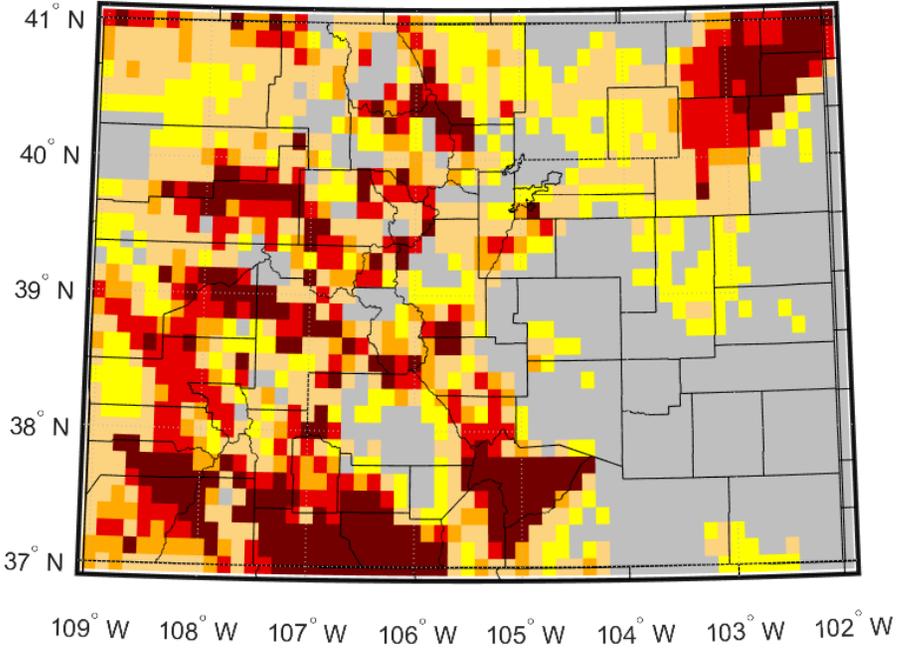
Water balance (P/PET) from CoAgMET stations shows substantial recovery in the Arkansas River Valley, particularly at Rocky Ford



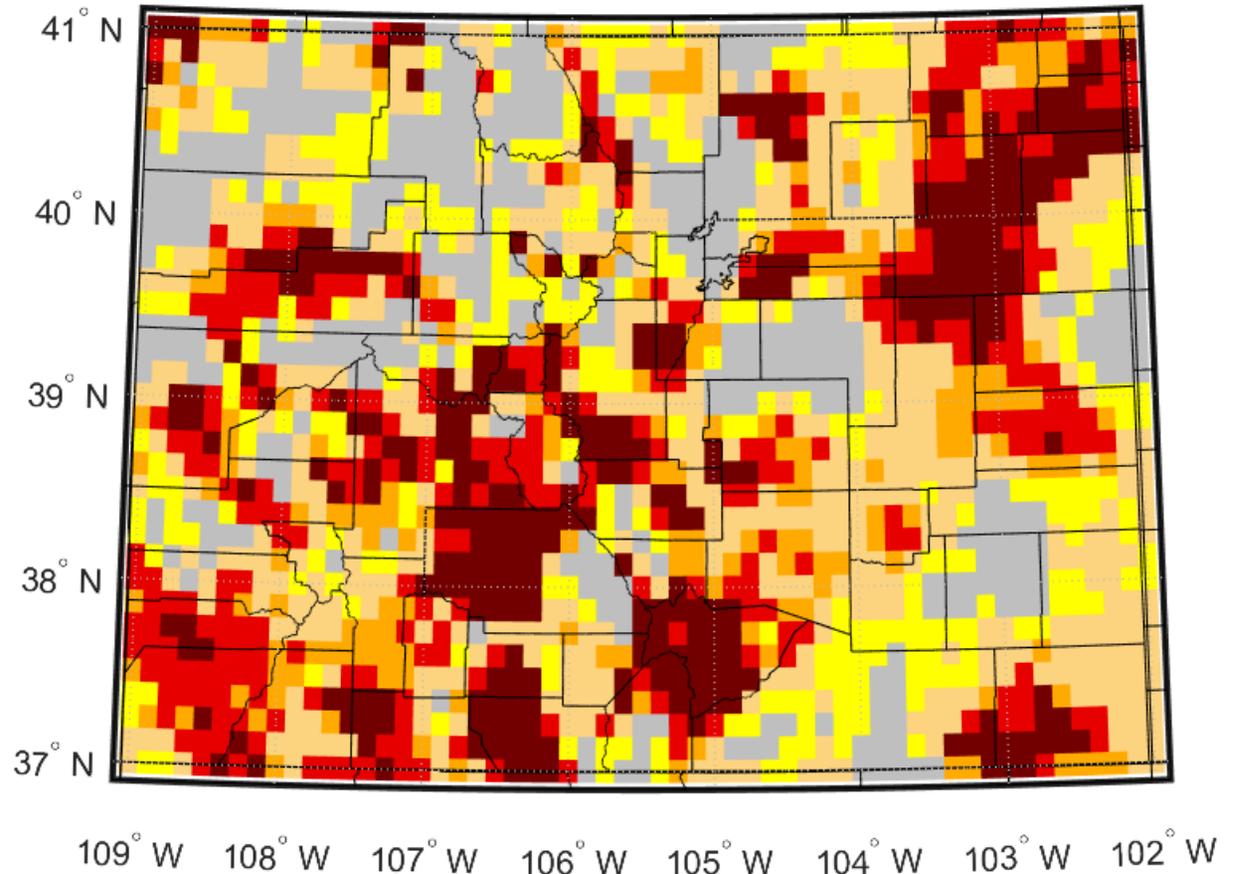
Top 10cm Available Plant Water (cm)
07/16/2020



Top 10cm Soil Moisture Drought Category
07/16/2020



Top Meter Soil Moisture Drought Category 07/16/2020



Recent rains in SE CO have recharged shallow soil moisture profiles, but if we dig deeper we still see much of the state is hurting

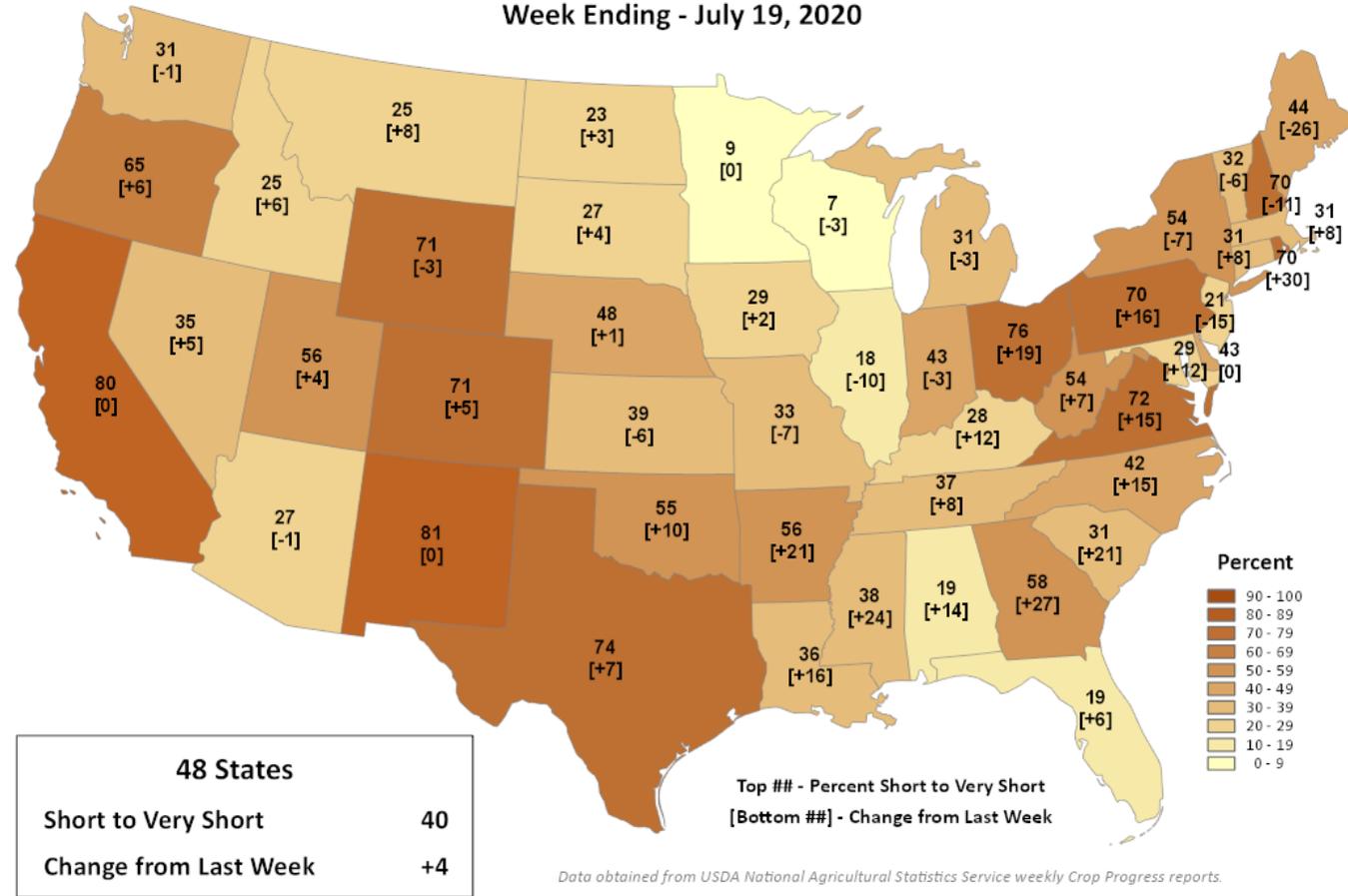
Dark red = drier than 2002, 2012, 2018



Topsoil Moisture

Percent Short to Very Short

Week Ending - July 19, 2020



Outlook

Next 7 days

CPC Outlooks

Monsoon Progression

Precipitation Projections

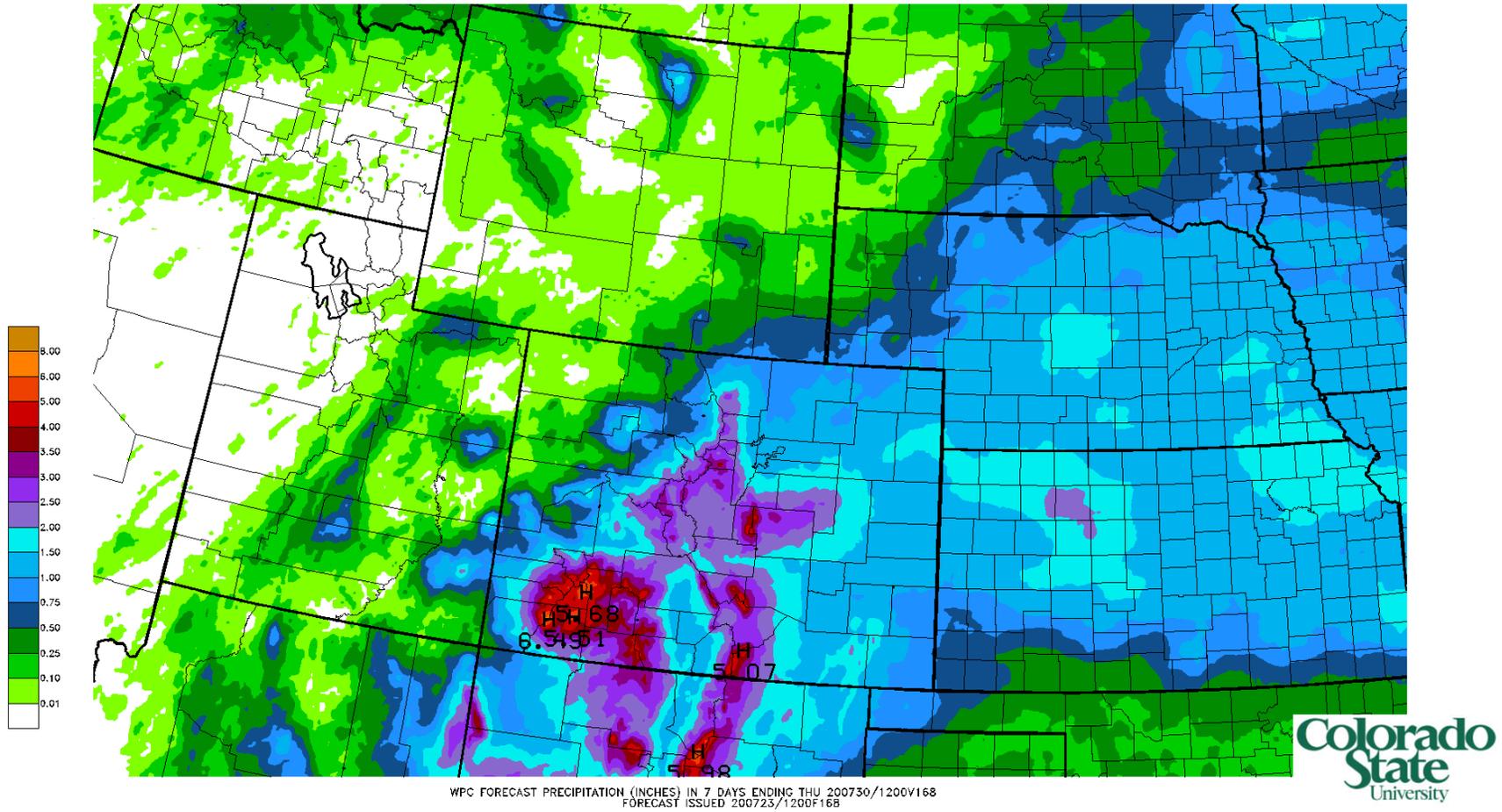
ENSO setup for fall



NOAA 7-day precip forecast

Quite the QPF this week, though it is more bullish than the American models

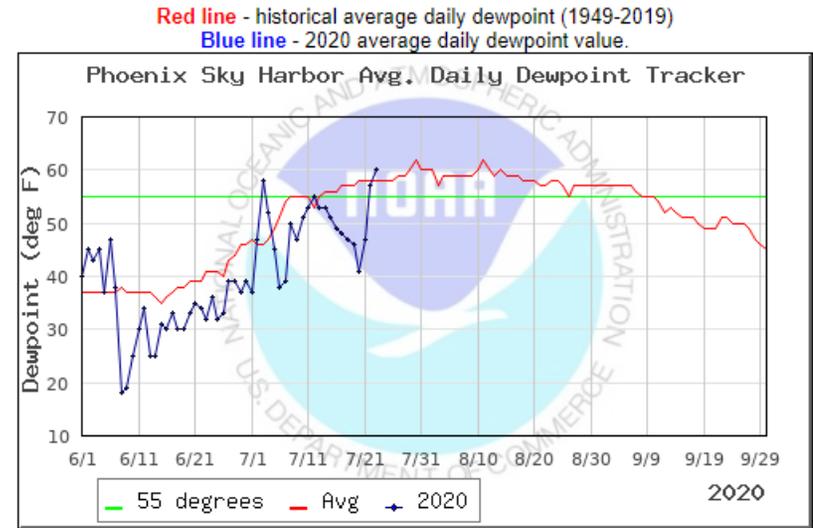
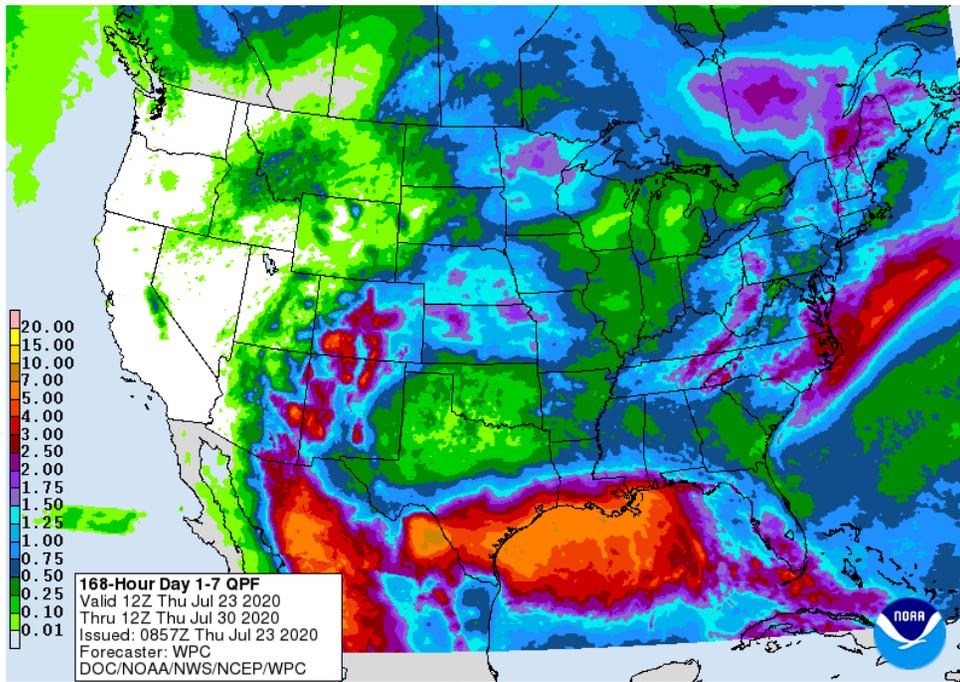
Flash flood potential



http://schumacher.atmos.colostate.edu/weather/real_time/hpc_qpf_168h_imw/hpc_qpf_168h_imw.gif



Monsoon

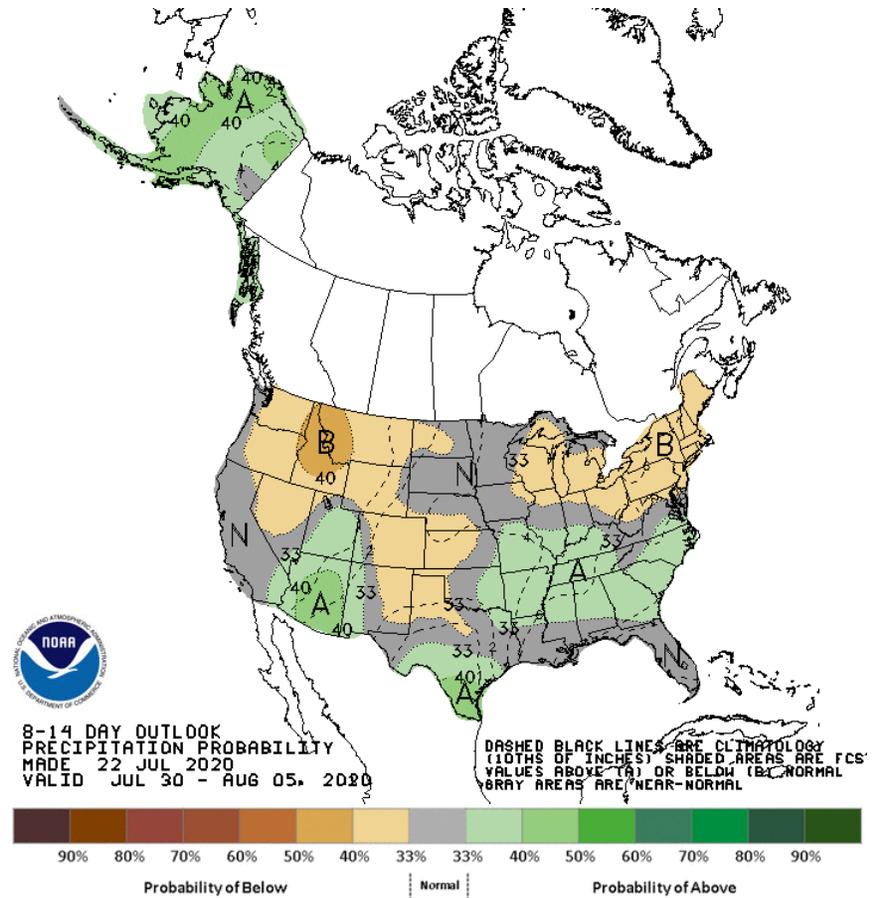
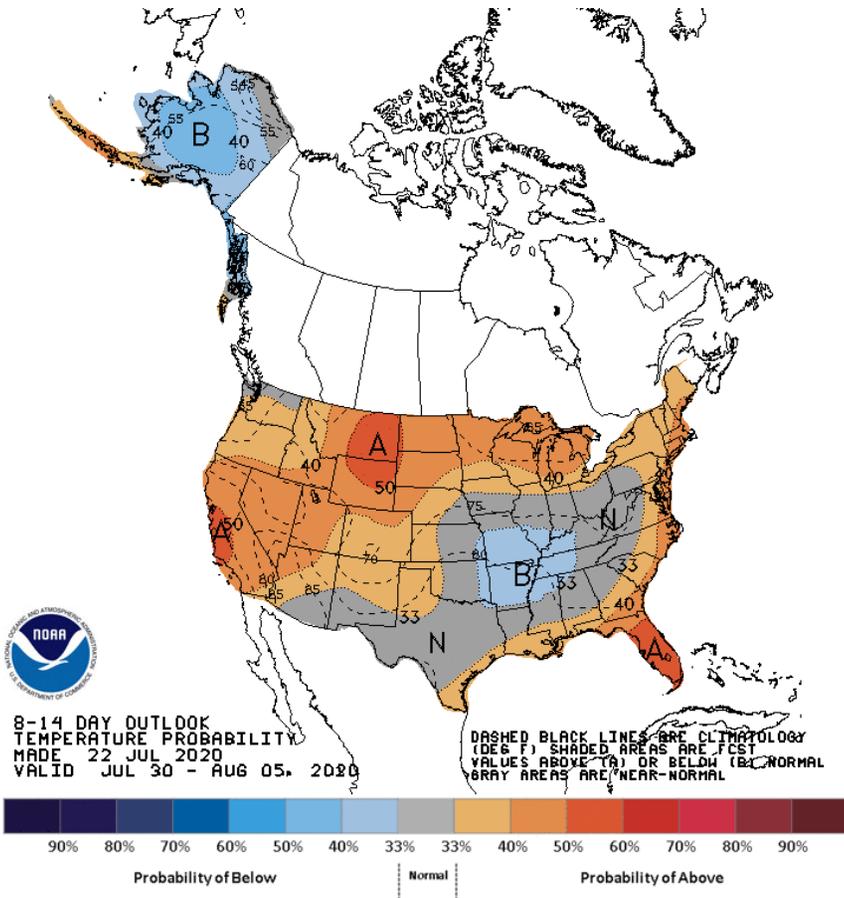


Clearly some monsoonal precipitation patterns beginning to take shape

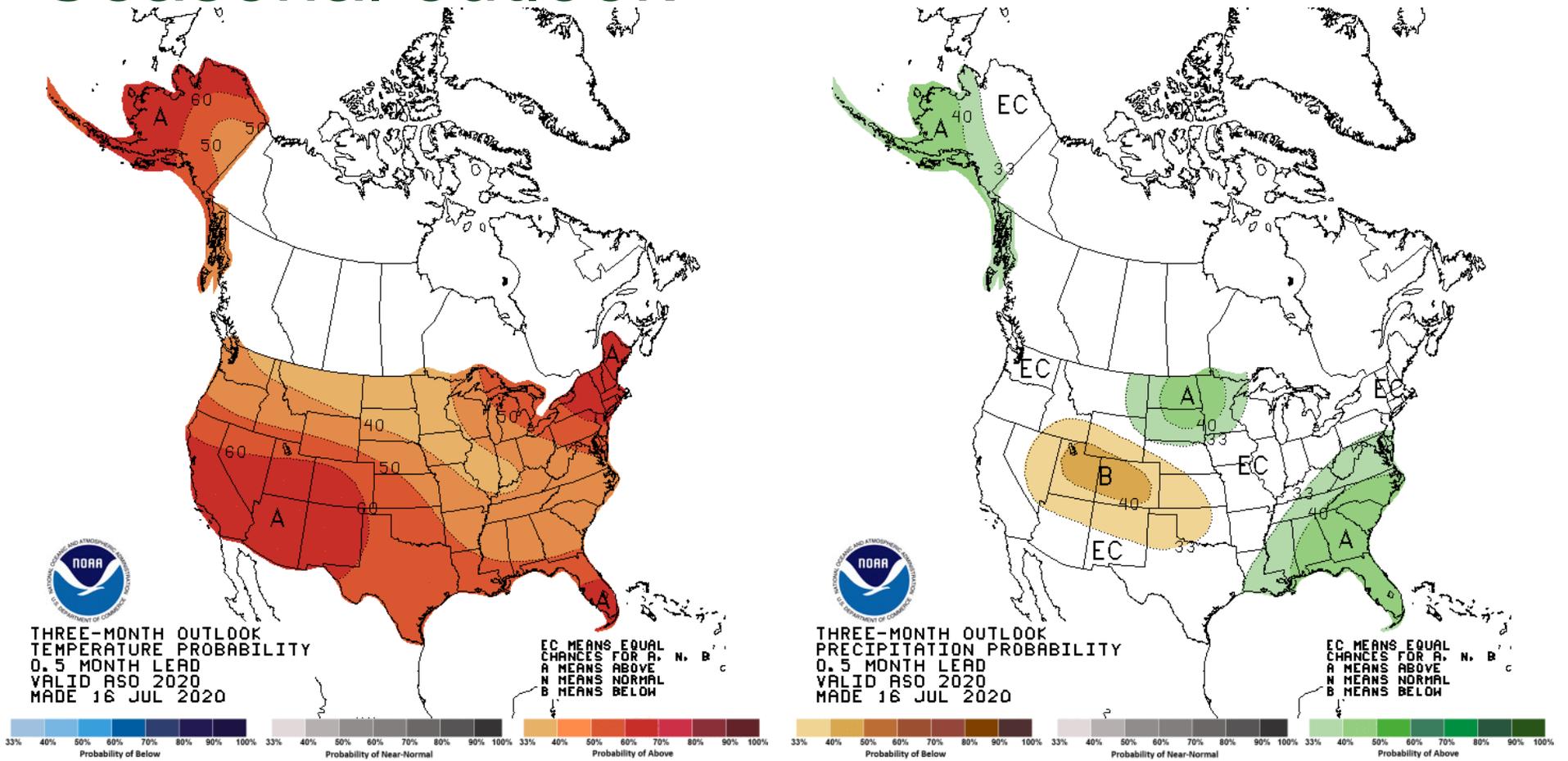
Clear monsoonal pattern this week



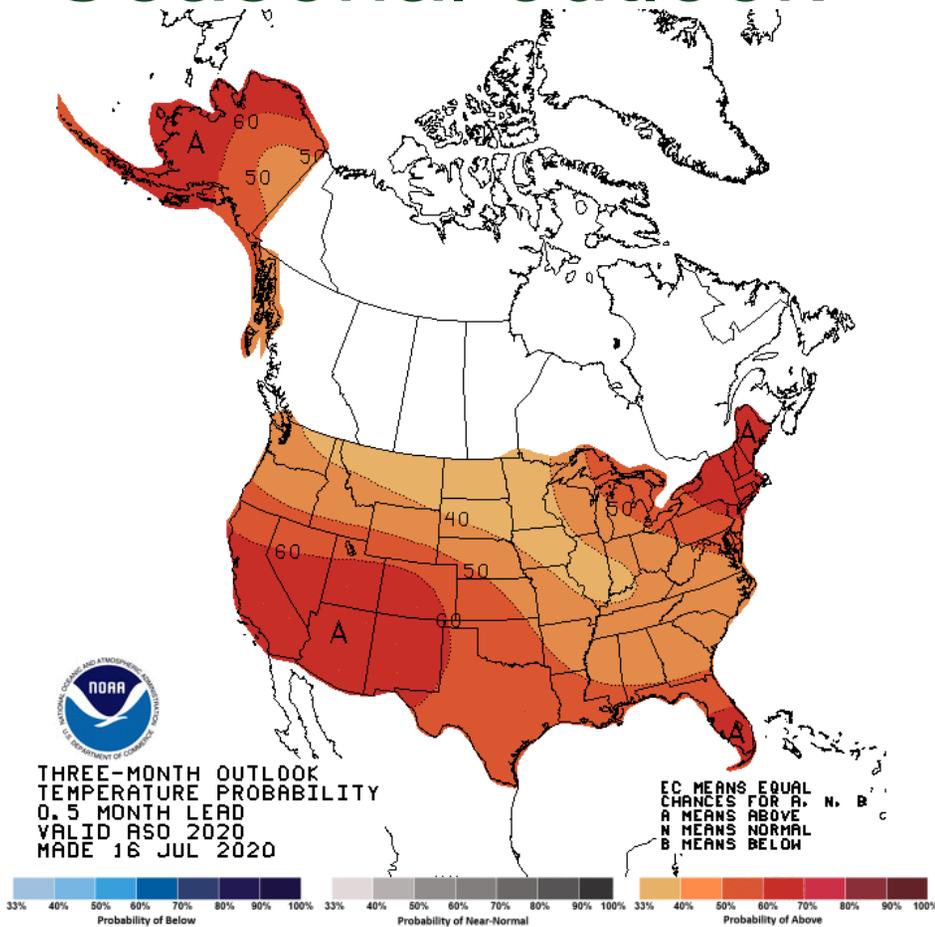
8-14 day outlook



Seasonal outlook



Seasonal outlook



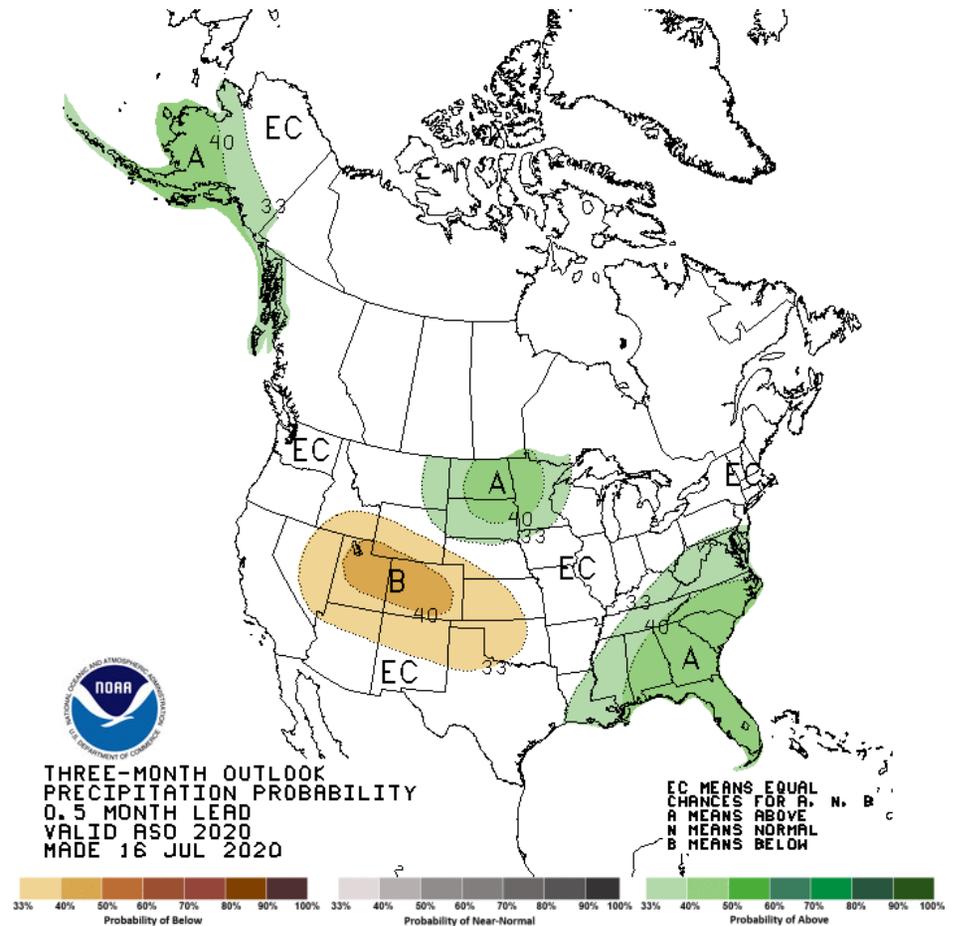
Temperature forecast driven strongly by trends with some influence from dynamical seasonal models



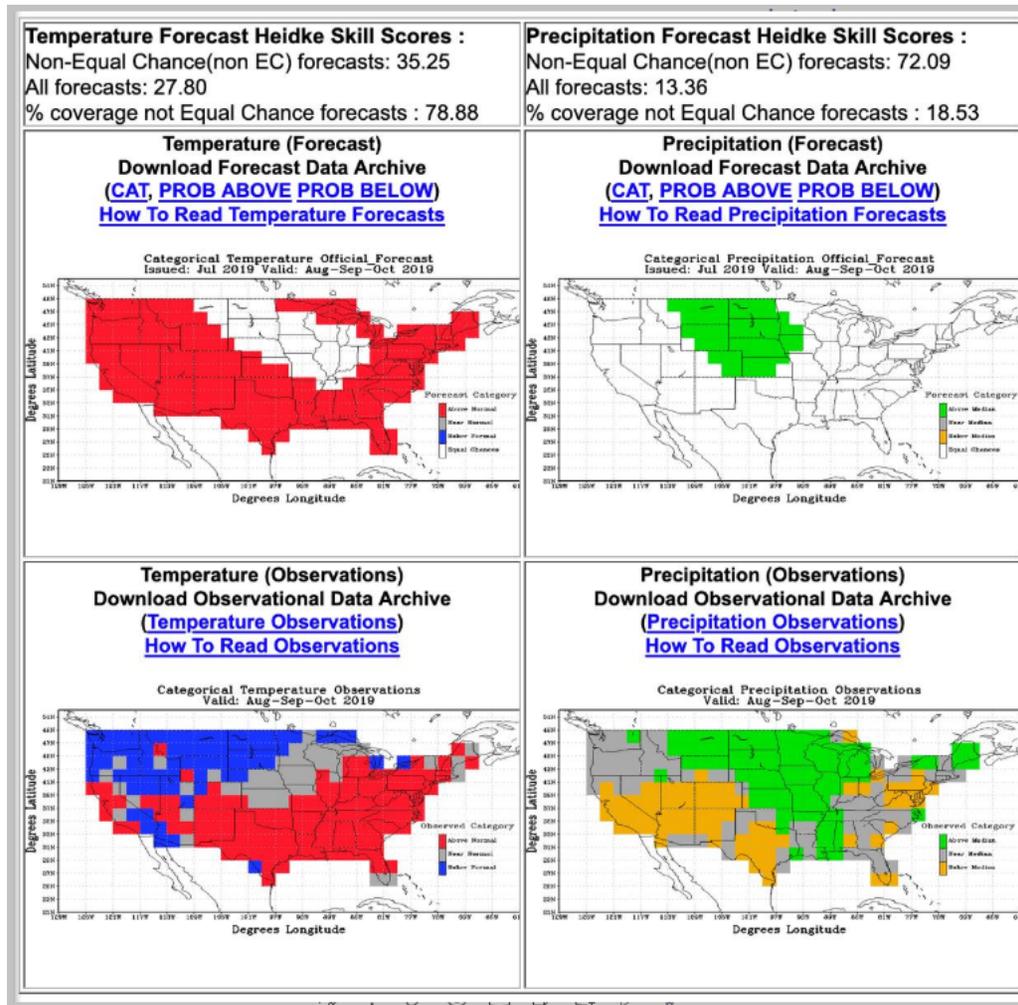
Seasonal outlook

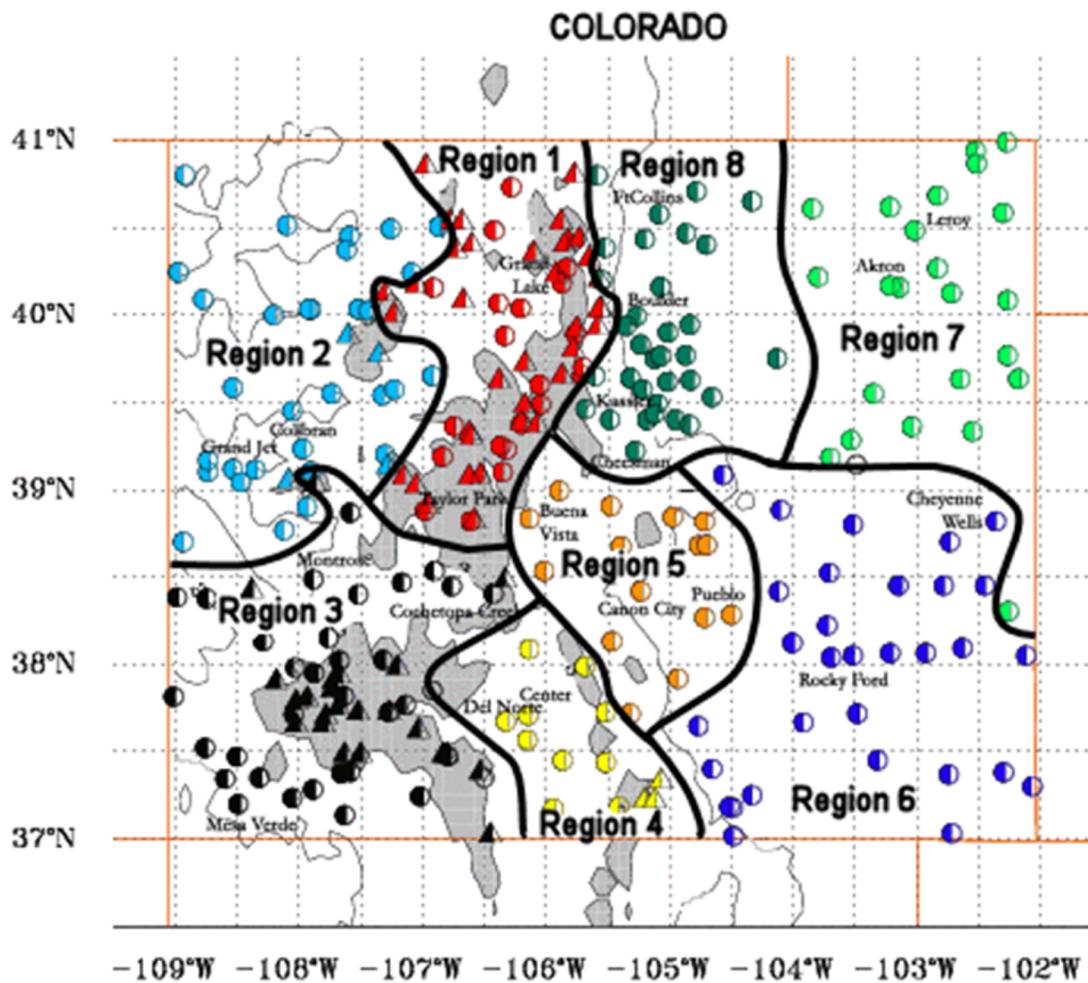
Precipitation forecast driven by current soil moisture anomalies with some influence from trend.

Low soil moisture limits the amount of local evaporation produced, in turn limiting precipitation. However, our major precip events here are not locally-forced. One wave of subtropical moisture can change things quickly.



CPC's recent monsoon season precipitation forecasts have been, how do I put this politely? Bad. So there is hope!

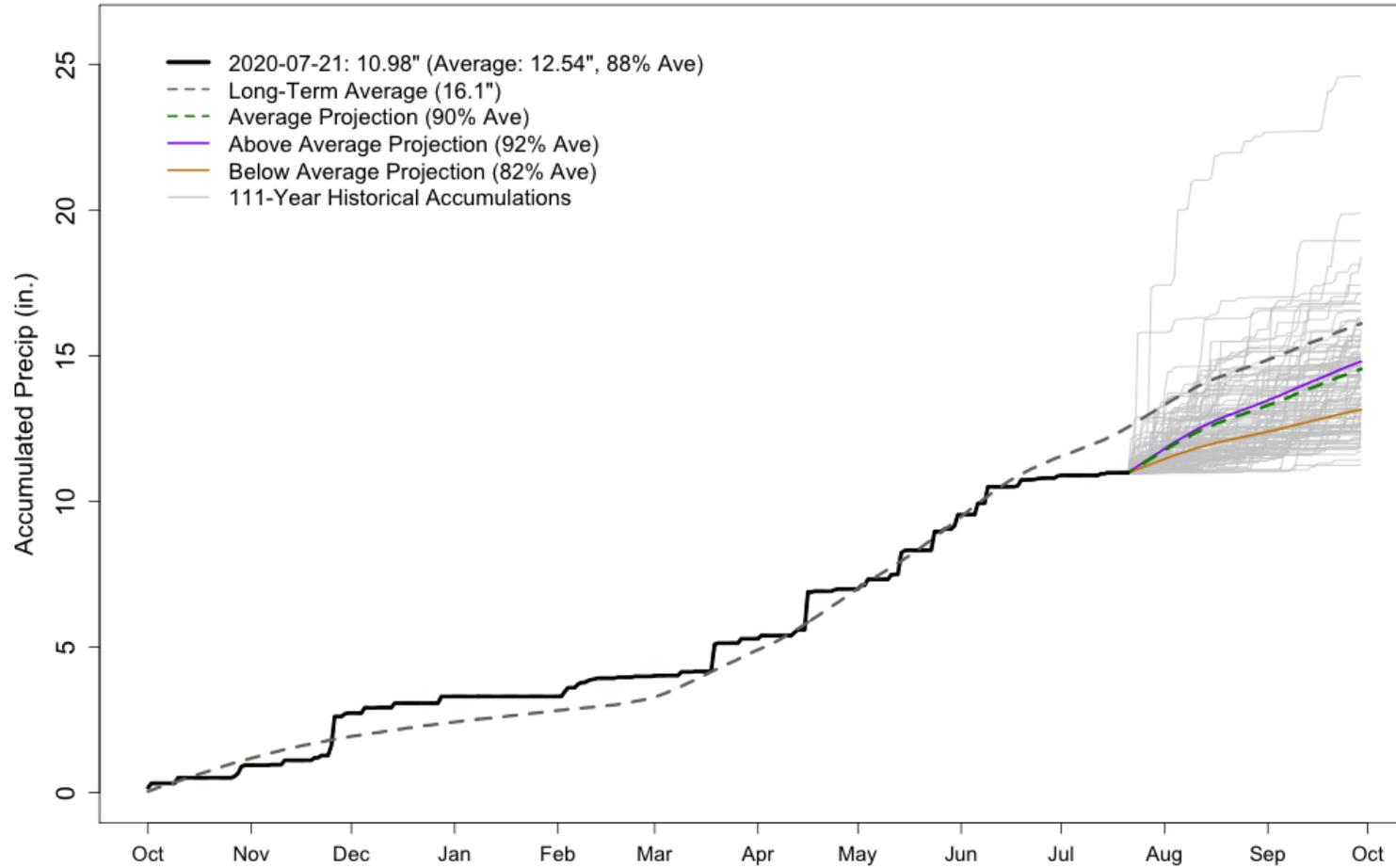




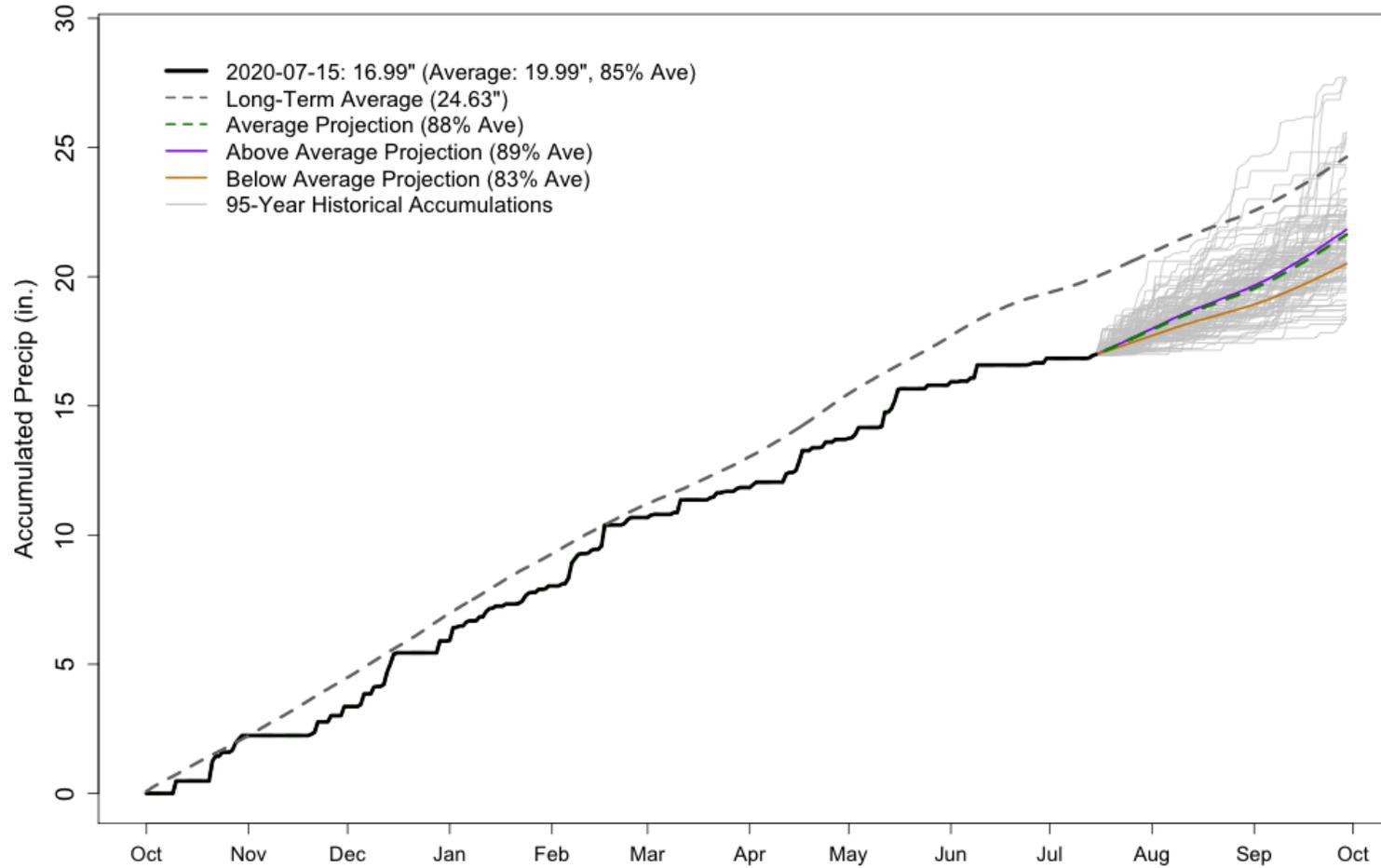
Precipitation Projections by Climate Region (credit: Klaus Wolter NOAA)



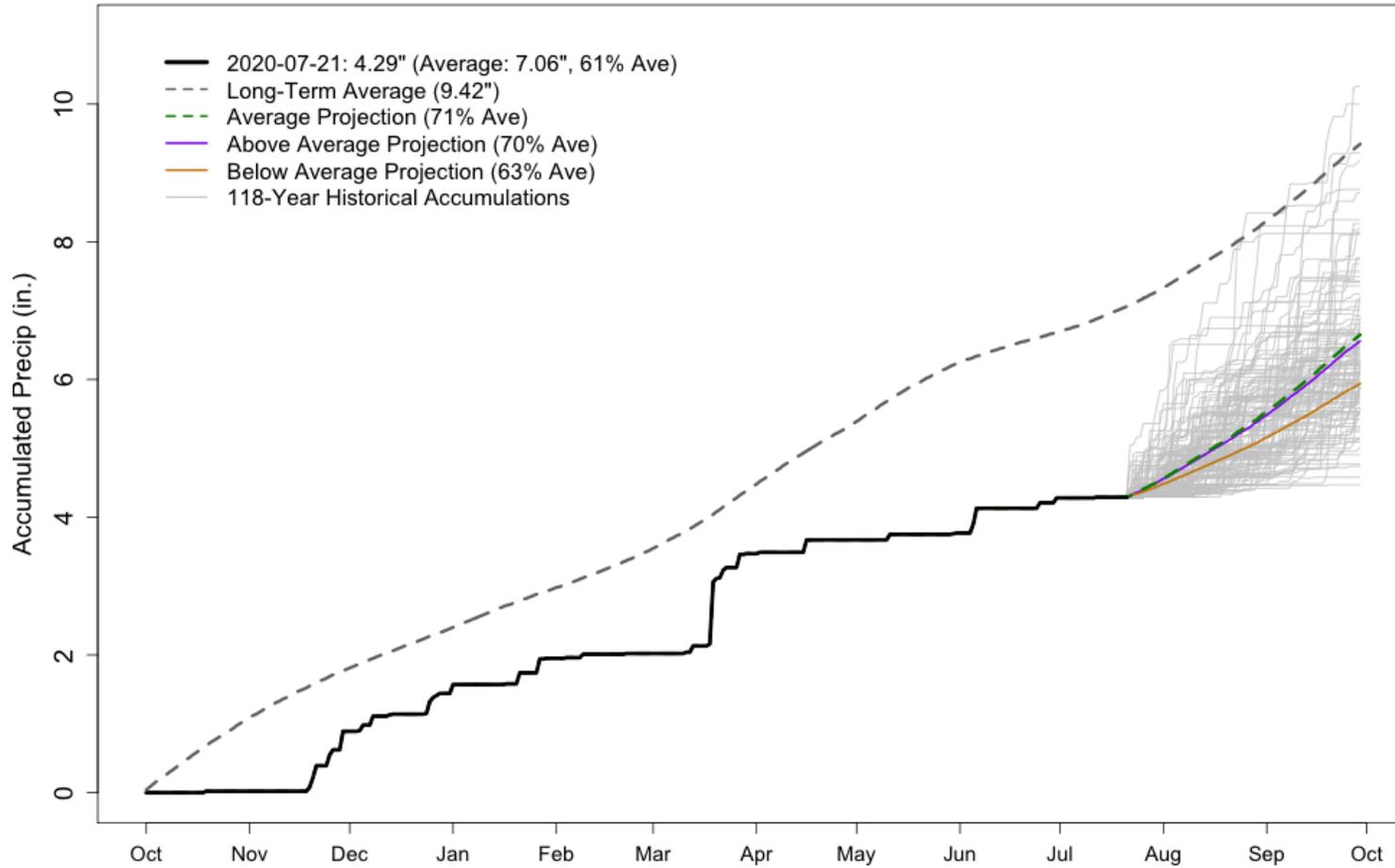
FORT COLLINS WY2020 Precipitation Projections



STEAMBOAT SPRINGS WY2020 Precipitation Projections



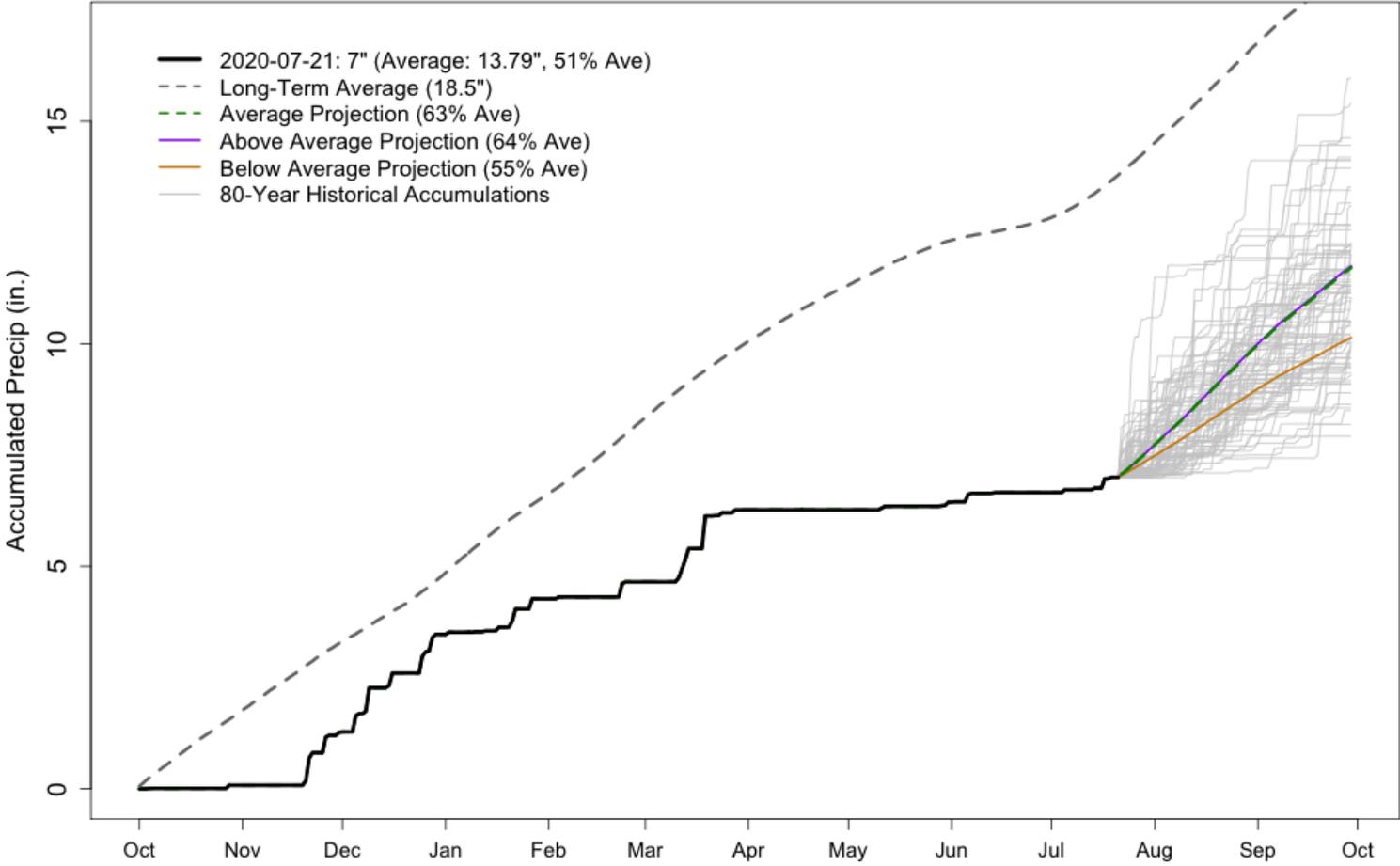
GRAND JUNCTION WALKER FIELD WY2020 Precipitation Projections



13th driest on record



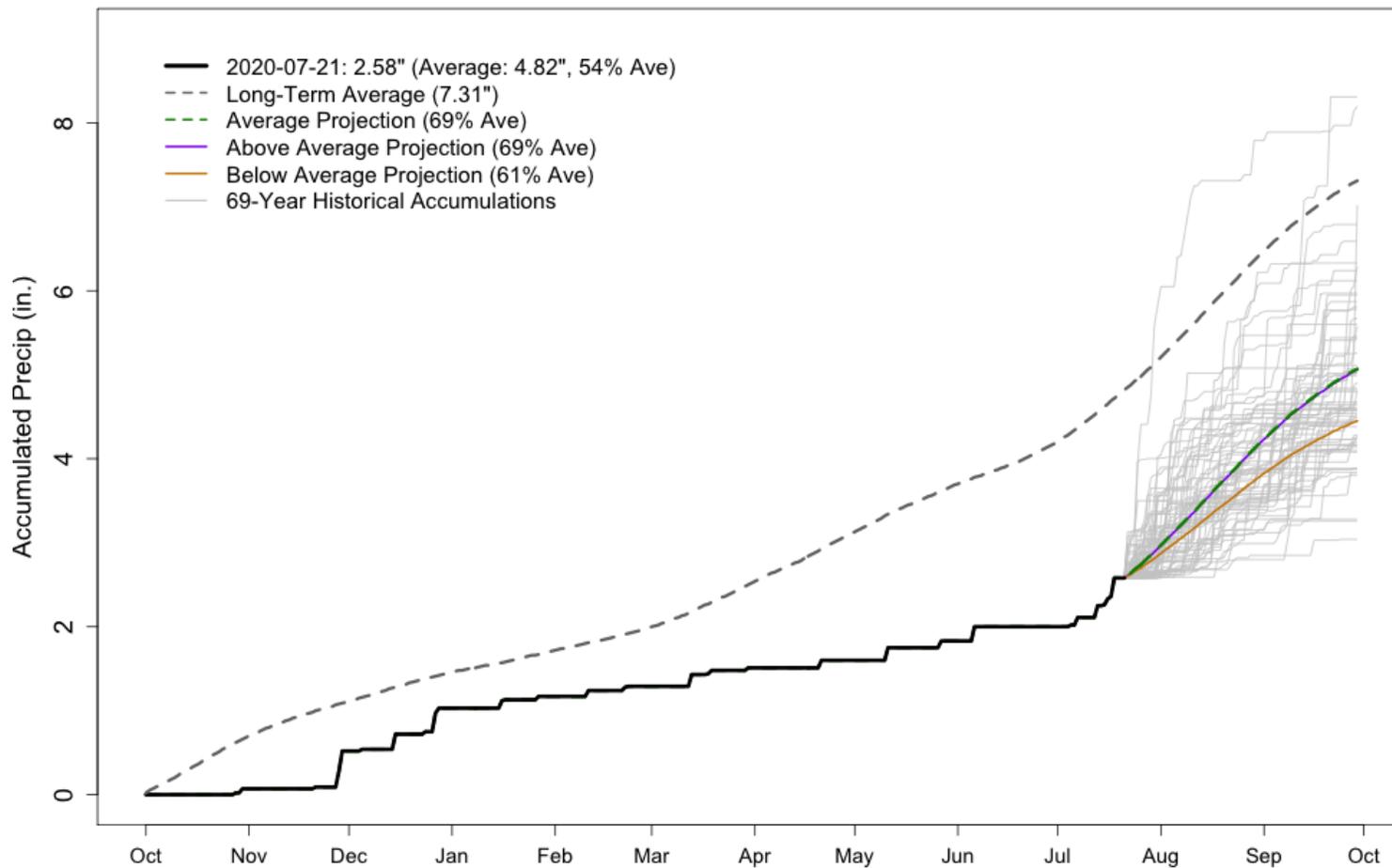
MESA VERDE NP WY2020 Precipitation Projections



4th driest on record

Still better than WY 2018

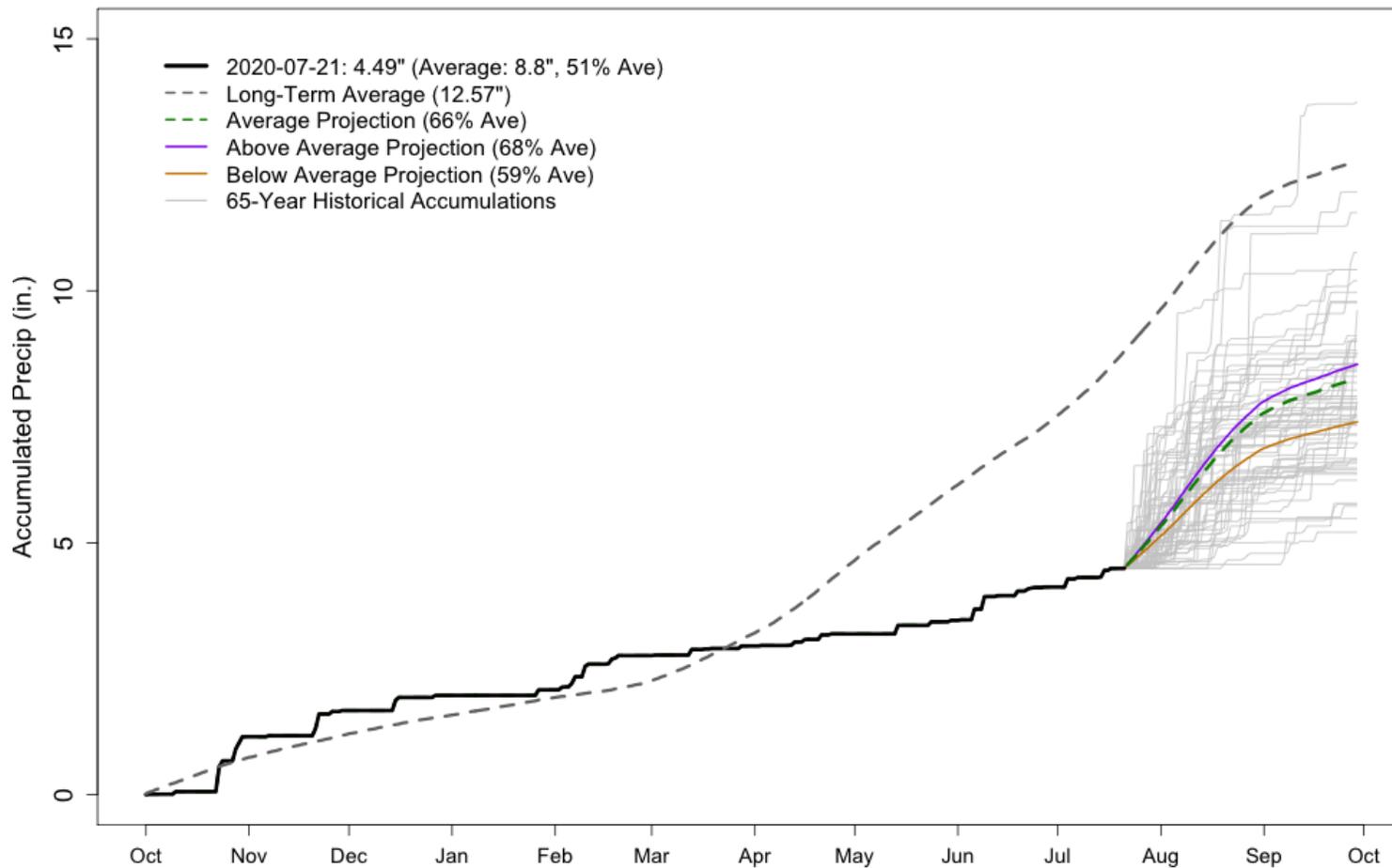
ALAMOSA-BERGMAN FIELD WY2020 Precipitation Projections



9th driest on record



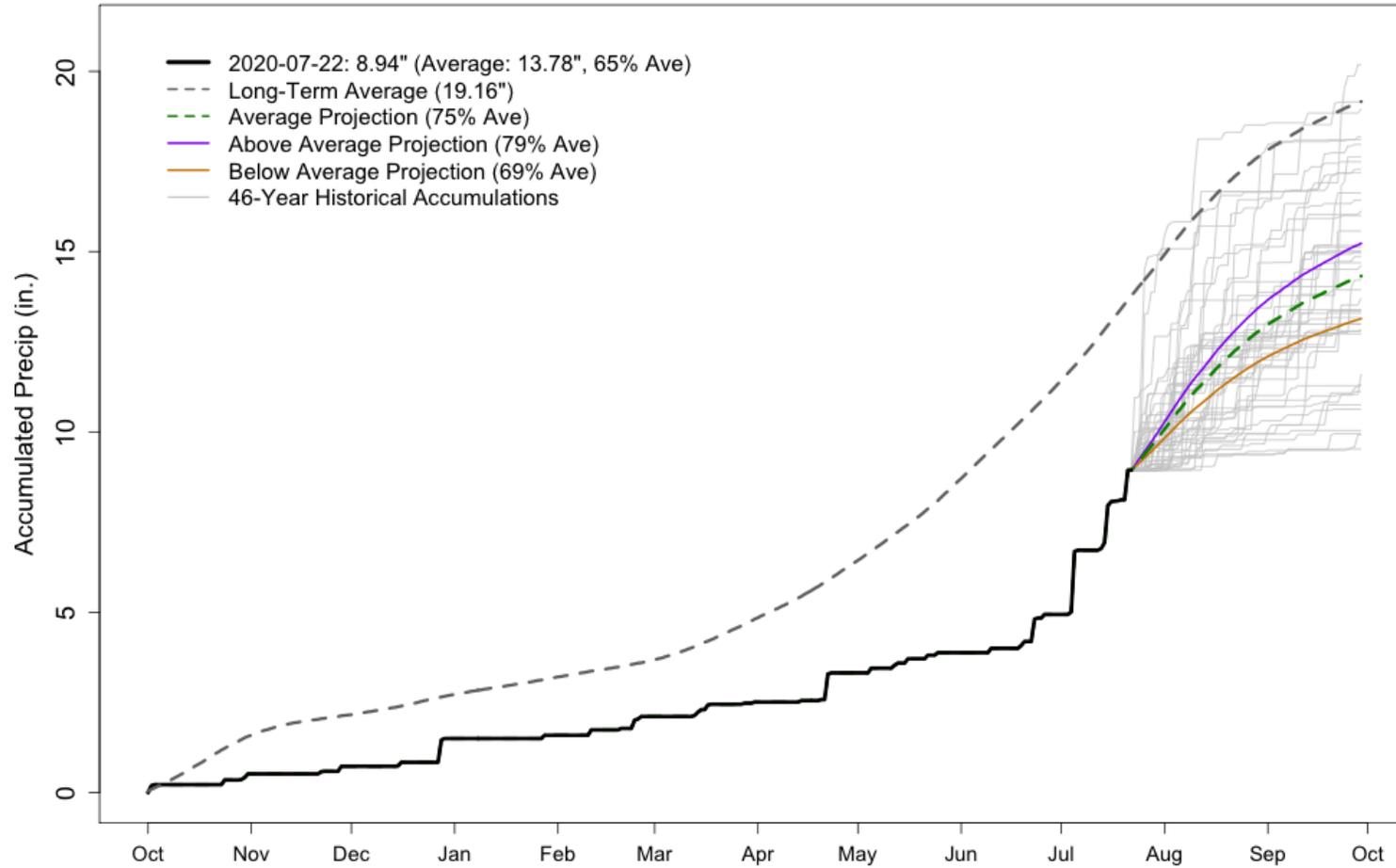
PUEBLO MEMORIAL AIRPORT WY2020 Precipitation Projections



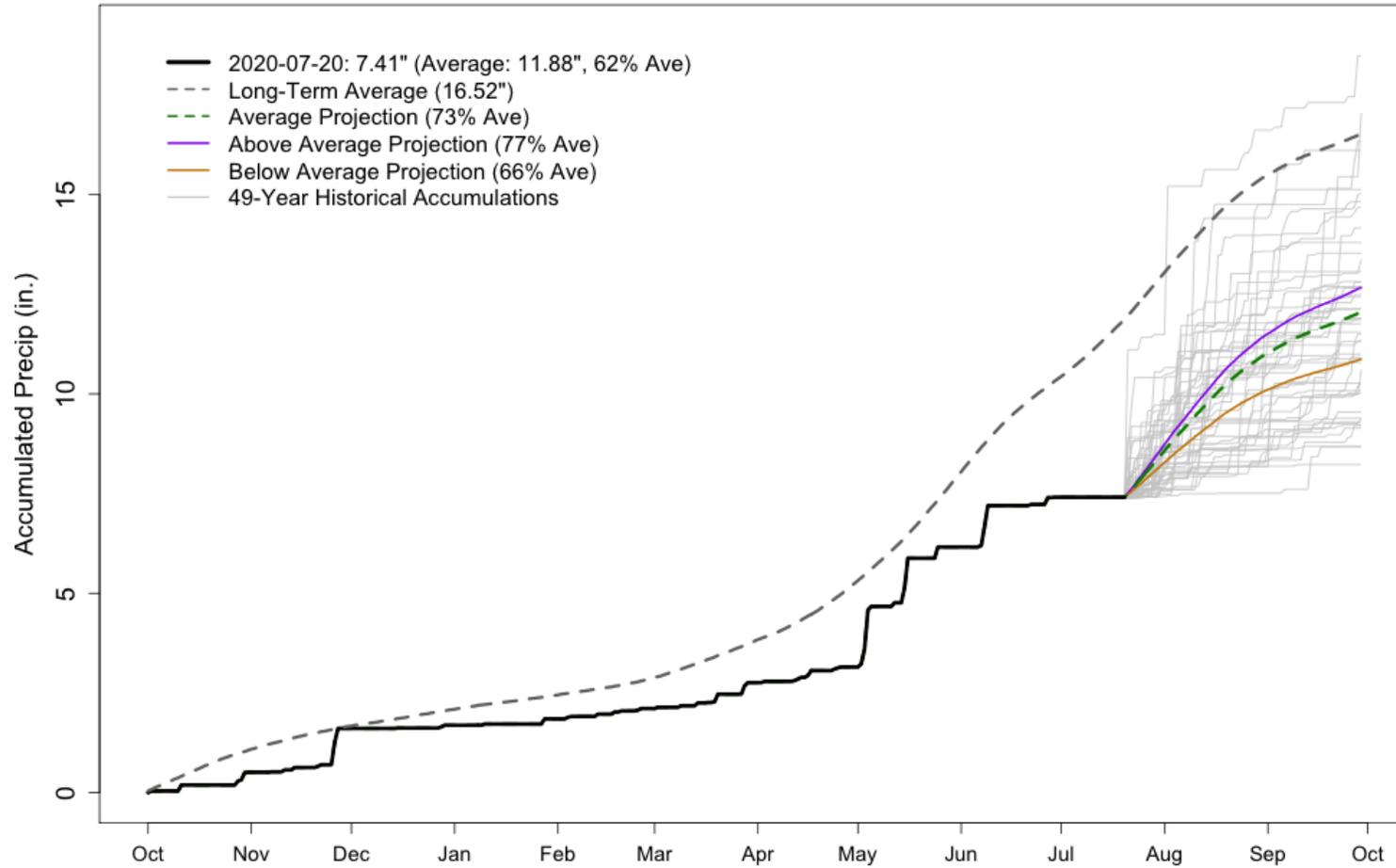
7th driest on record



WALSH 1 W WY2020 Precipitation Projections



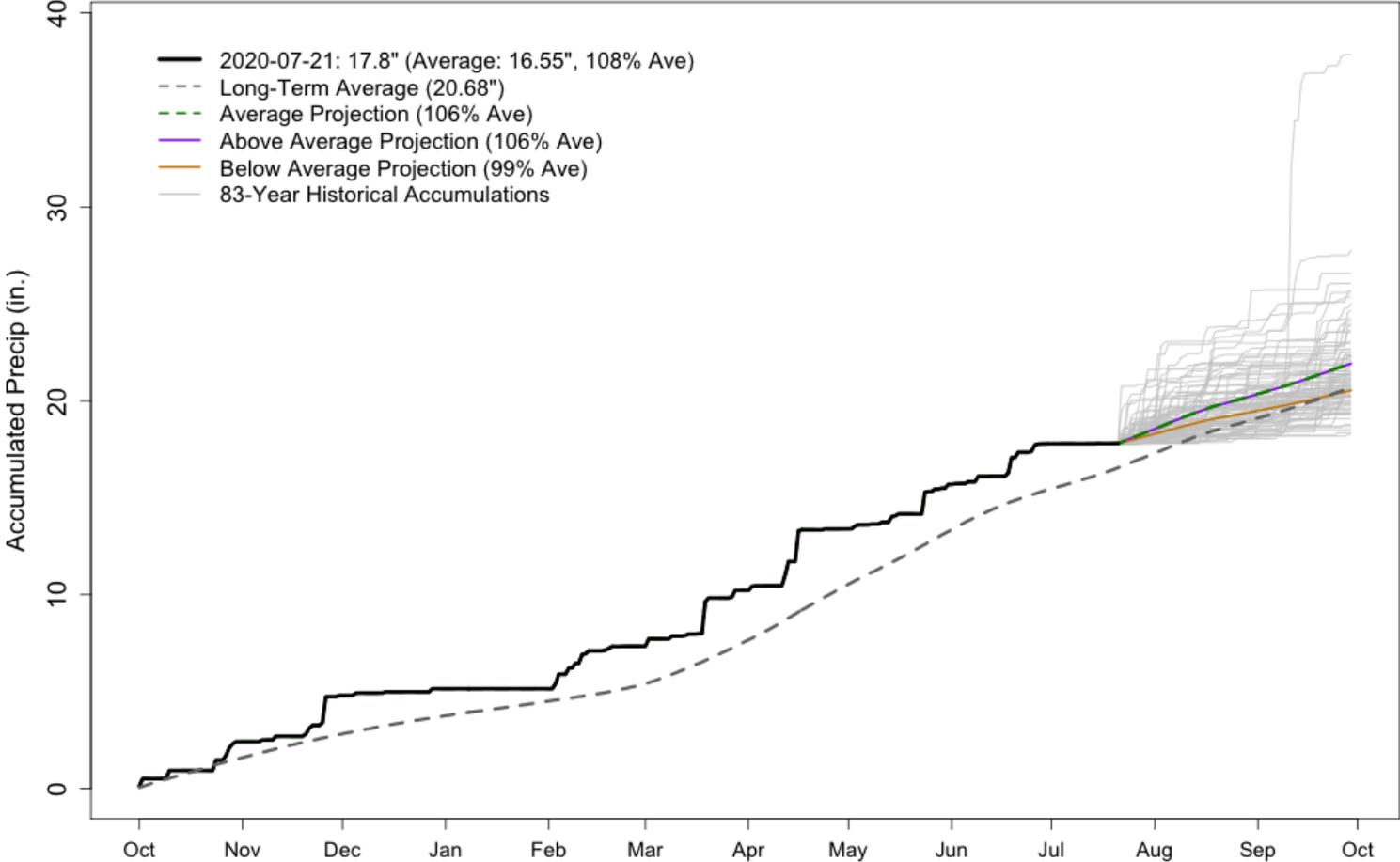
AKRON 4 E WY2020 Precipitation Projections



Slightly
lower than
2011-2012

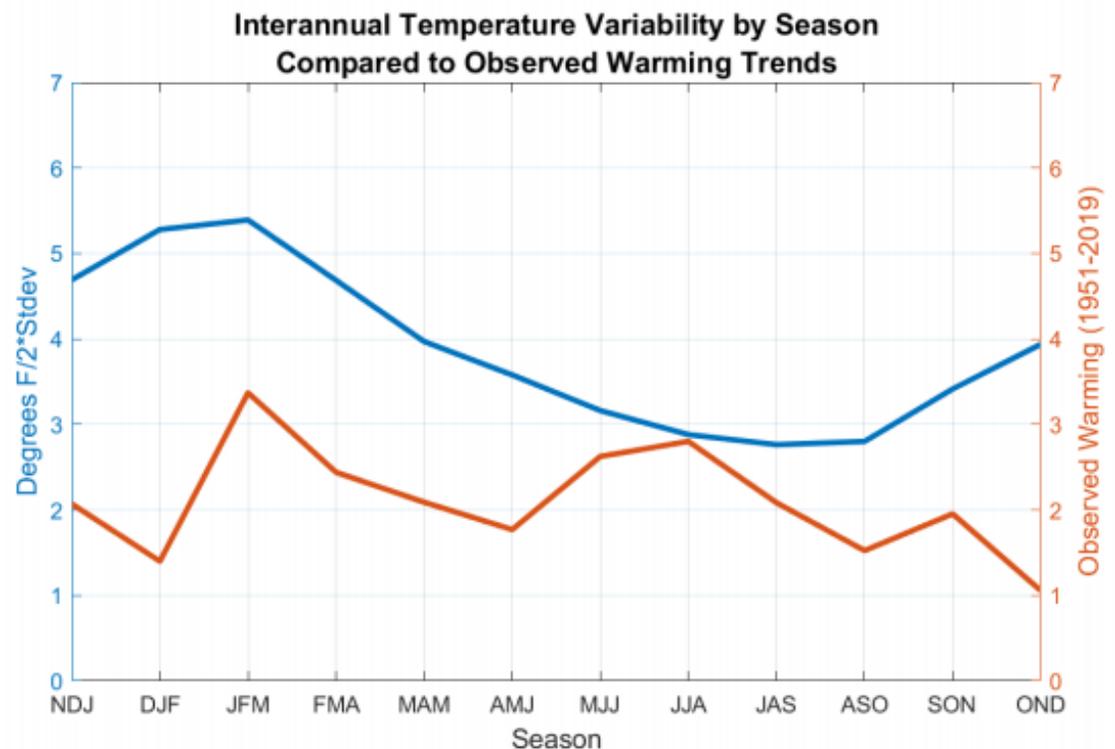


BOULDER WY2020 Precipitation Projections



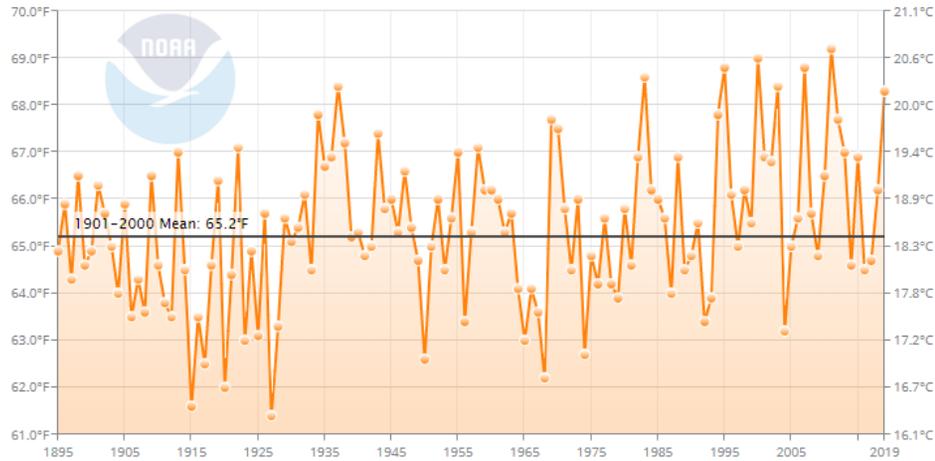
Warming Temperatures Have Most Consistent Impact on Mid-to-Late Summer

- Warming trend is fairly seasonally independent
- Natural variability is much stronger in winter/spring
- What was a warm summer 75 years ago is now a cool summer



Colorado Average Temperature

August

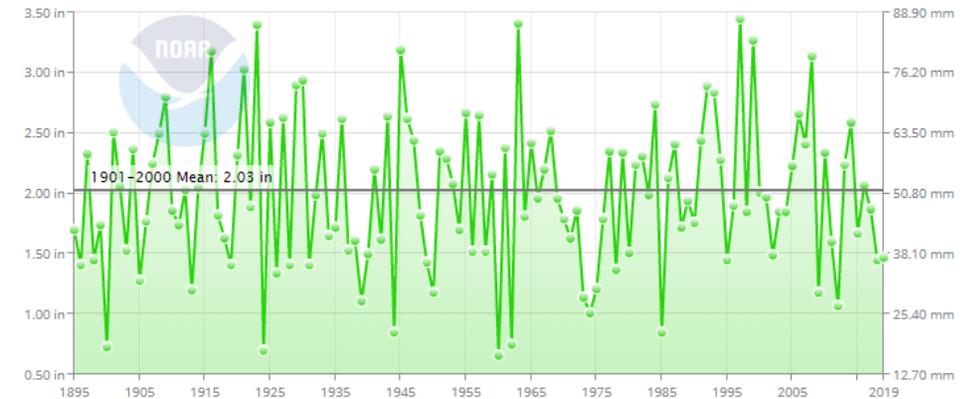


Recent Augusts have certainly trended warm, and a little bit dry.

I would certainly bet against a cool August

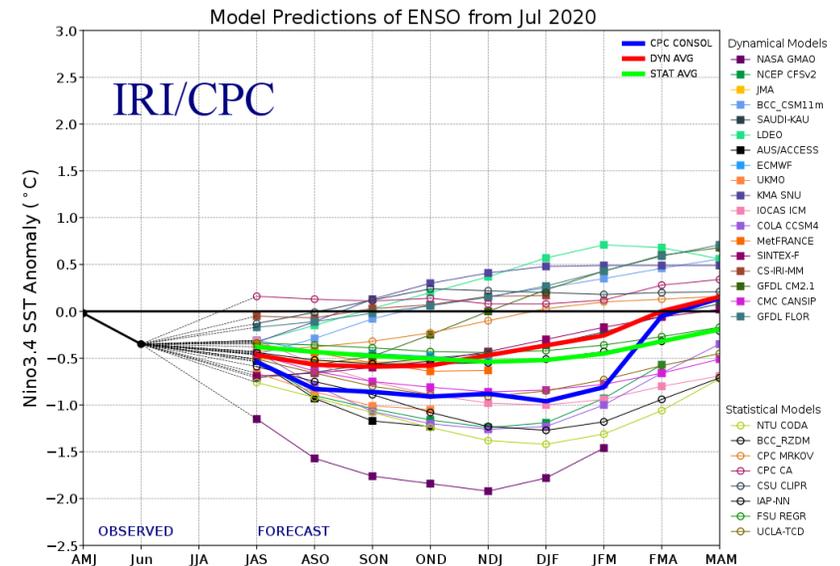
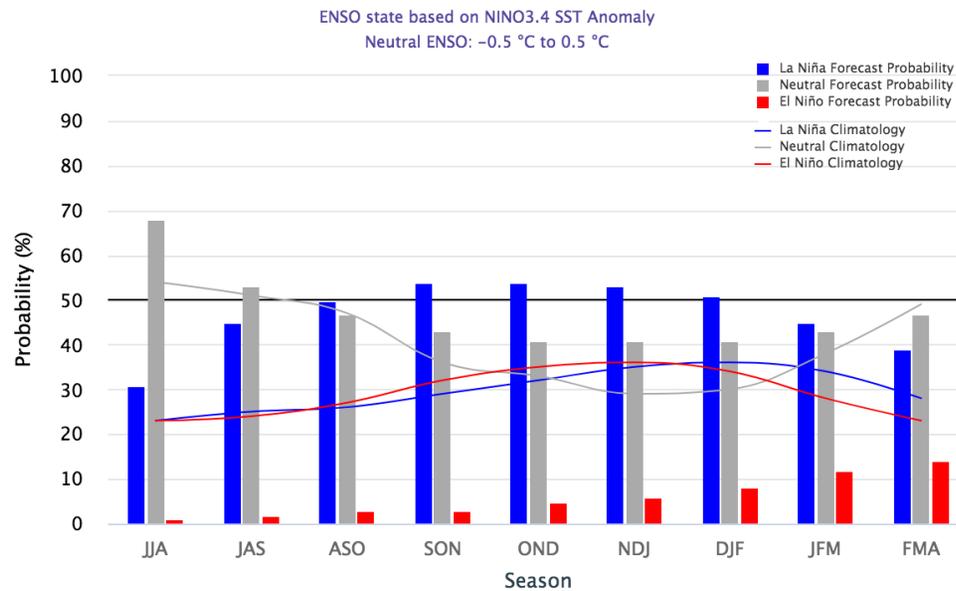
Colorado Precipitation

August



What's the El Niño forecast?

Early-July 2020 CPC/IRI Official Probabilistic ENSO Forecasts



Sea surface temperatures show borderline La Niña conditions, with the atmospheric response at weak La Niña or neutral. Outlook is for continuation of neutral through summer with equal chances neutral/La Niña in the fall and winter.



Summary points

- Colorado has spent WY 2020 falling behind slowly. Rains have fallen hardest in areas where they were desperately needed. This rain has benefitted SE CO, but it's too little too late for many applications
- Drought conditions are shifting. NE CO has been near record dry over the last month
- Expect warmer than average temperatures to continue. Late summer is when our warming trend is least escapable
- Monsoon has been slow to start, but we're looking a good monsoonal surge next week. May see partial recovery in the San Juans and San Luis Valley. Flash floods possible
- I wouldn't put a lot of weight in decision making on the seasonal precipitation forecast. I would put more weight on the temperature forecast, and the fact that our deficits are already too big to close by the end of the water year, particularly southern CO
- El Niño unlikely this winter. Neutral or La Niña conditions possible. This favors northwest CO



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

Peter.Goble@colostate.edu

Thank you!



ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY