Applications/Users for Improved S2S Forecasts

Nolan Doesken
Colorado Climate Center
Colorado State University

WSWC Precipitation Forecasting Workshop
June 7-9, 2016
San Diego, CA

First -- A short background

- In 1973 the federal government abolished the “State Climatologist” program nationwide leaving Colorado and all other states without
- Later that same year, Colorado re-established the State Climate program with support through the Colorado Agricultural Experiment Station at Colorado State University. **Other states took similar action.**

Our Mission

- The Colorado Climate Center provides valuable climate expertise to the residents of the state through its threefold program of:

  1) ***Climate Monitoring*** (data acquisition, analysis, and archiving),

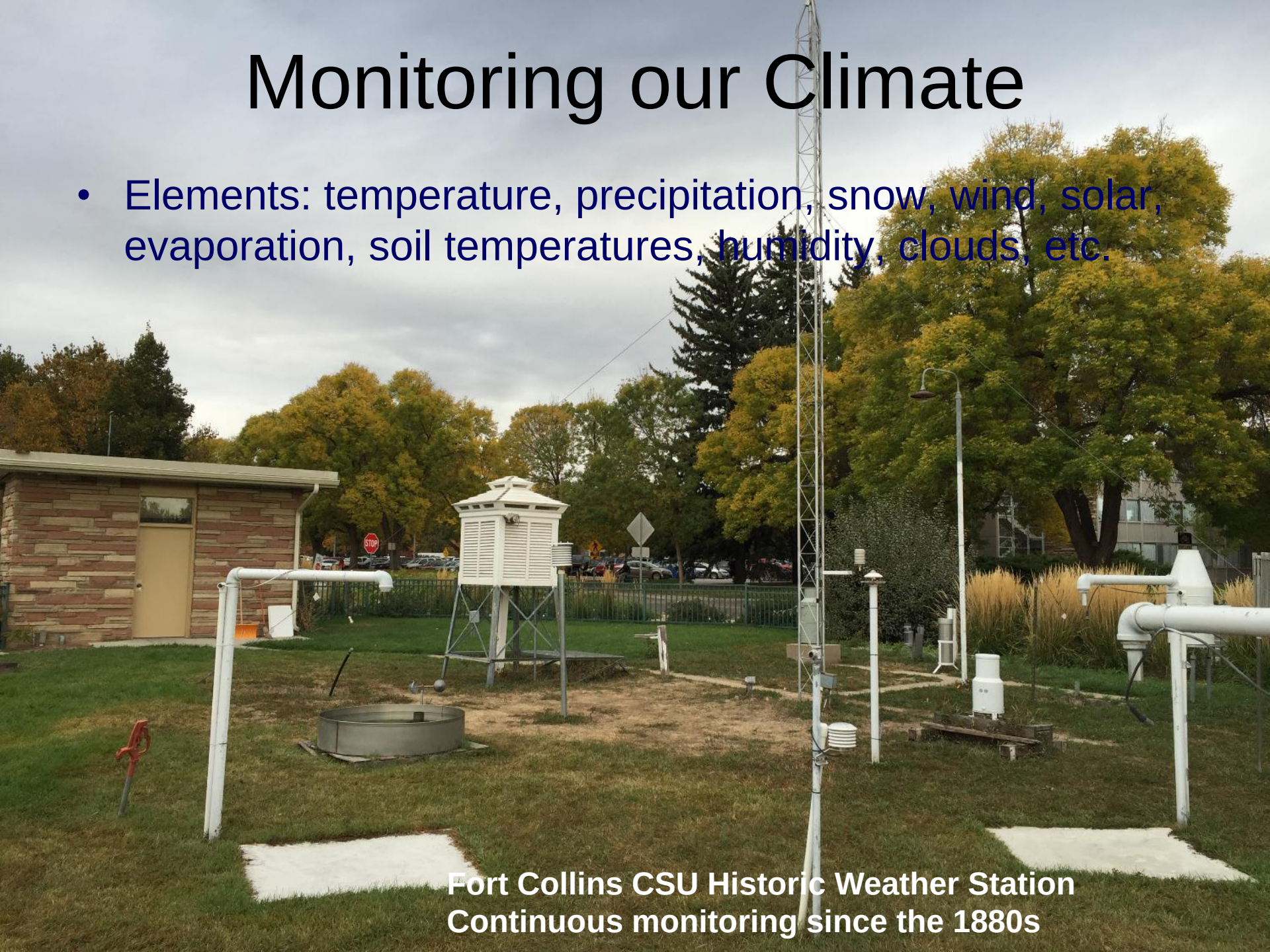
  2) ***Climate Research***

  3) ***Climate Services***.(providing data, analysis, climate education and outreach)

But many of our stakeholders also expect "prediction"

Monitoring our Climate

- Elements: temperature, precipitation, snow, wind, solar, evaporation, soil temperatures, humidity, clouds, etc.



Fort Collins CSU Historic Weather Station
Continuous monitoring since the 1880s

The National Weather Service still faithfully maintains a “taken for granted” network of weather stations in Colorado and across the country – the Cooperative Observer Network

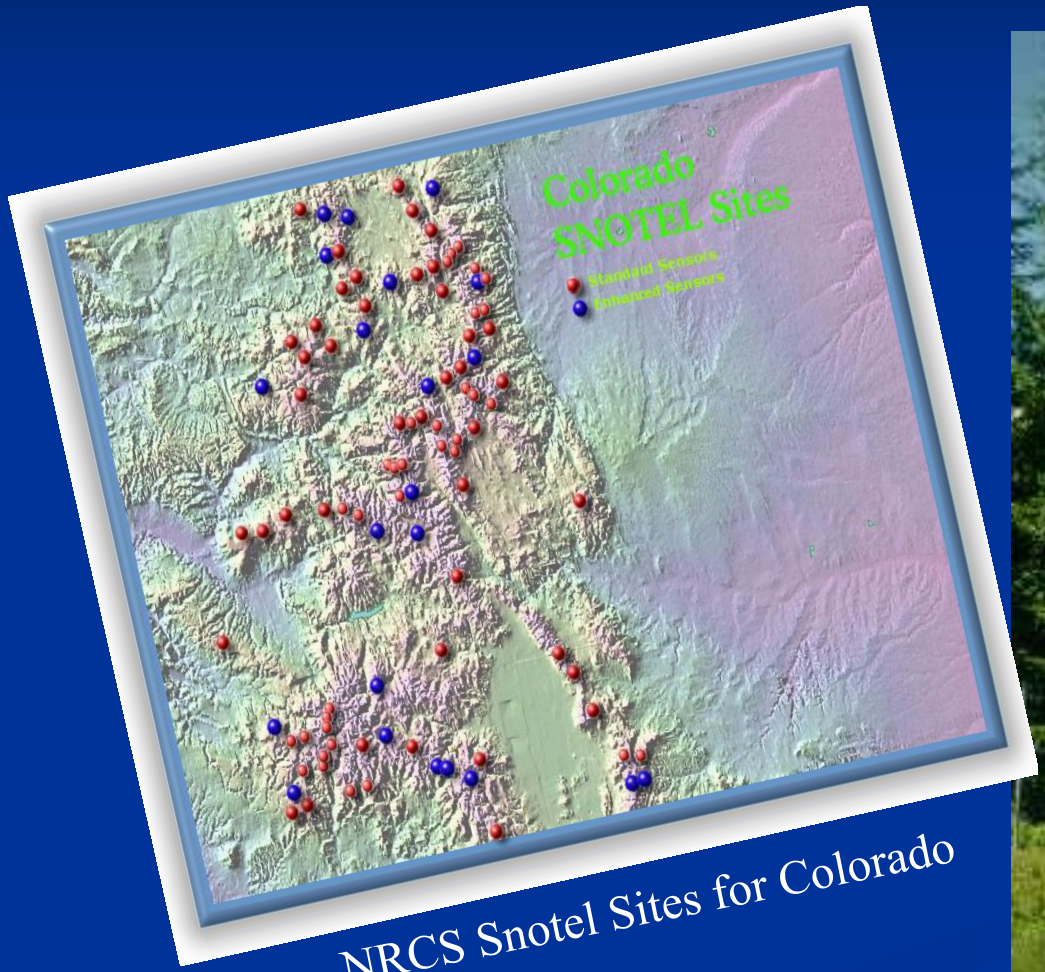
Photo by Christopher Davey

The NWS Cooperative Network is the only source of basic climate information (daily measurements of temperature and precipitation) that covers the entire country down to the local county scale with 120+ years of continuous observations.

Approximately 5000 daily max/min temperature stations, 8000 daily precipitation stations, 3000 automated hourly precipitation stations.

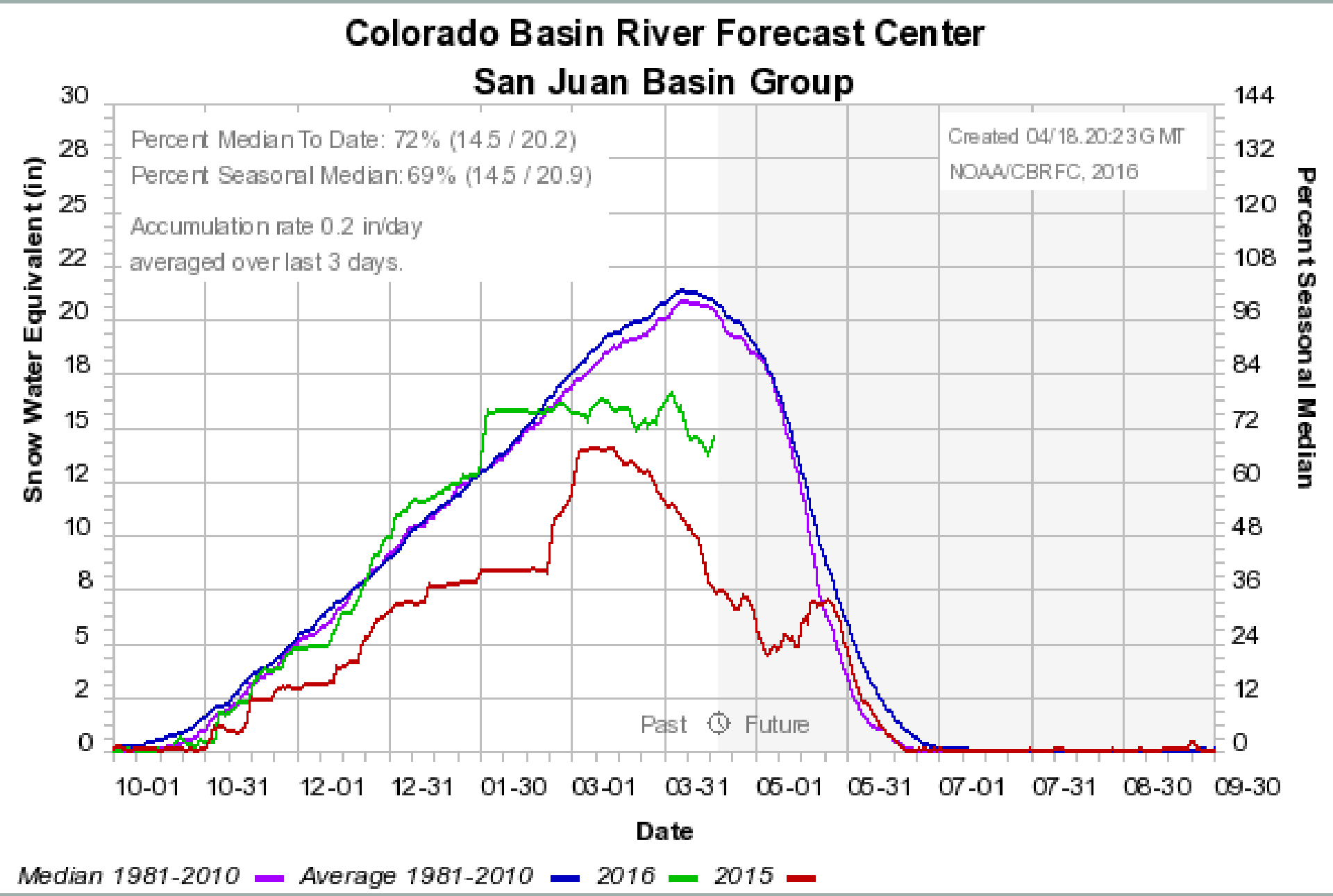
Snow surveys began in the 1930s to help predict streamflow

USDA, Natural Resources Conservation Service



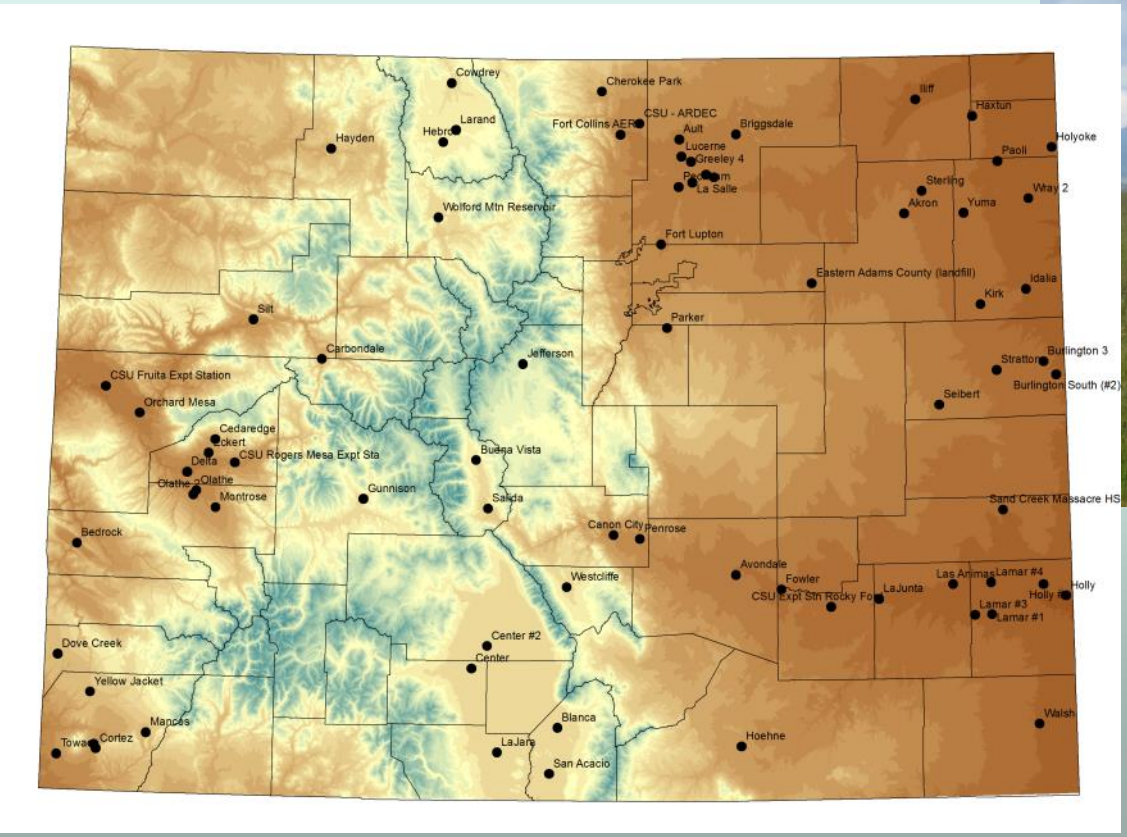
NRCS Snotel Sites for Colorado

Typical NRCS Snotel Site


Colorado Basin River Forecast Center
San Juan Basin Group
Percent Median To Date: 72% (14.5 / 20.2)
Percent Seasonal Median: 69% (14.5 / 20.9)
Accumulation rate 0.2 in/day
averaged over last 3 days.
Created 04/18.20:23 GMT
NOAA/CBRFC, 2016
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
30
28
25
22
20
18
15
12
10
8
5
2
0
144
132
120
108
96
84
72
60
48
36
24
12
0
10-01
10-31
12-01
12-31
01-30
03-01
03-31
05-01
05-31
07-01
07-31
08-30
09-30
Median 1981-2010
Average 1981-2010
2016
2015

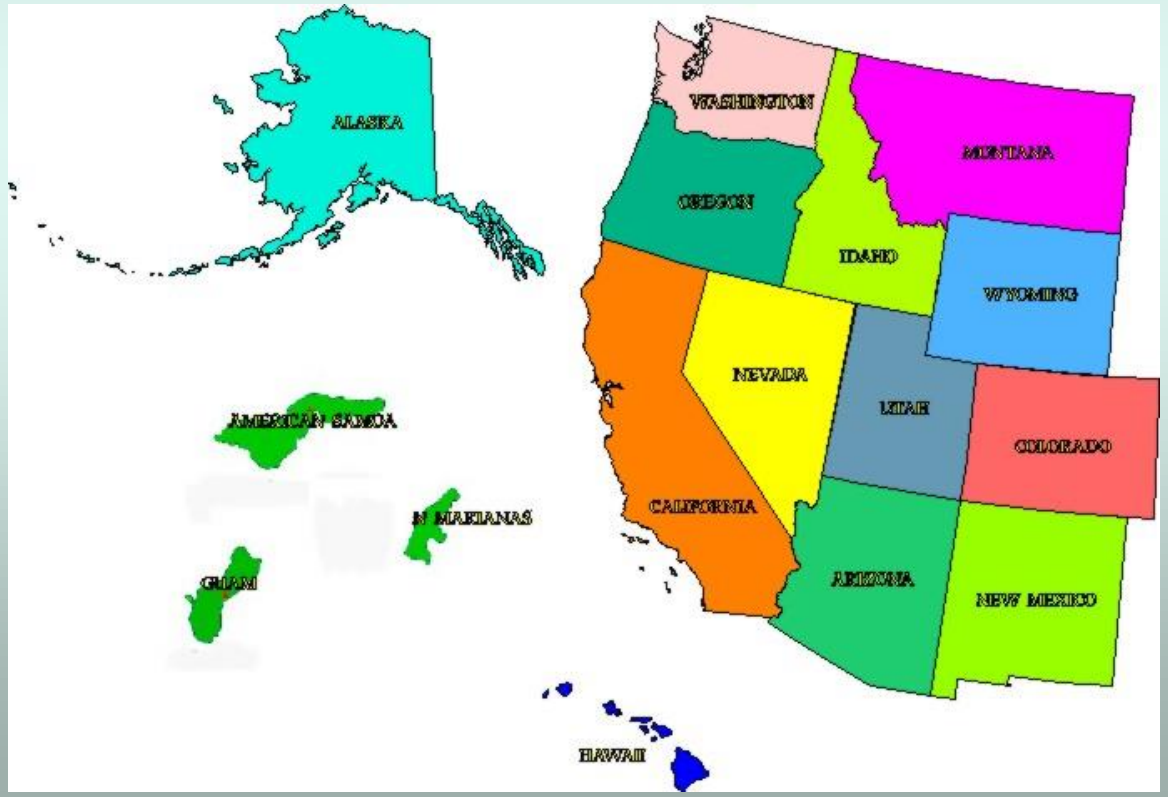
And all the others collecting weather and climate data –MANY SOURCES

CSU's **Colorado Agricultural Meteorological Network "CoAgMet"**



THANKS!! to those of You who help support CoAgMet

The Western Association of Agricultural Experiment Station Directors supports a number of regional and national multistate research and coordination projects



WERA 102 Climatic Data and Analyses for Applications in Agriculture and Natural Resources

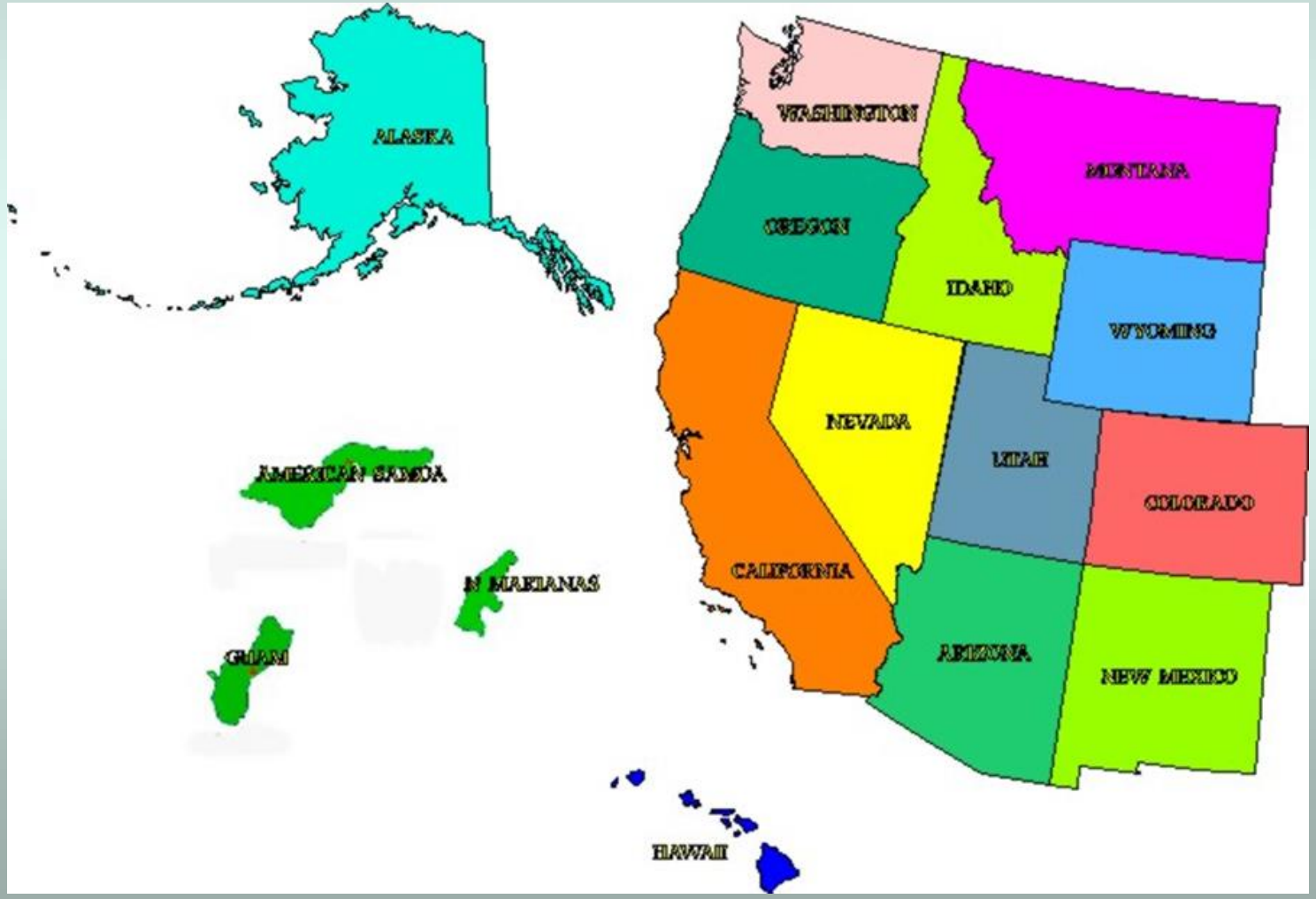
This is a long-standing and active coordinating group with a keen interest in precipitation, forecasts, and stakeholder needs


Our members/
our meetings/
our priorities
A

State Climatologists
Some state water agencies
Other University reps
Federal resource managers –
USDA ARS, NRCS, USFS
USDI BLM, USBR

Also some private sector

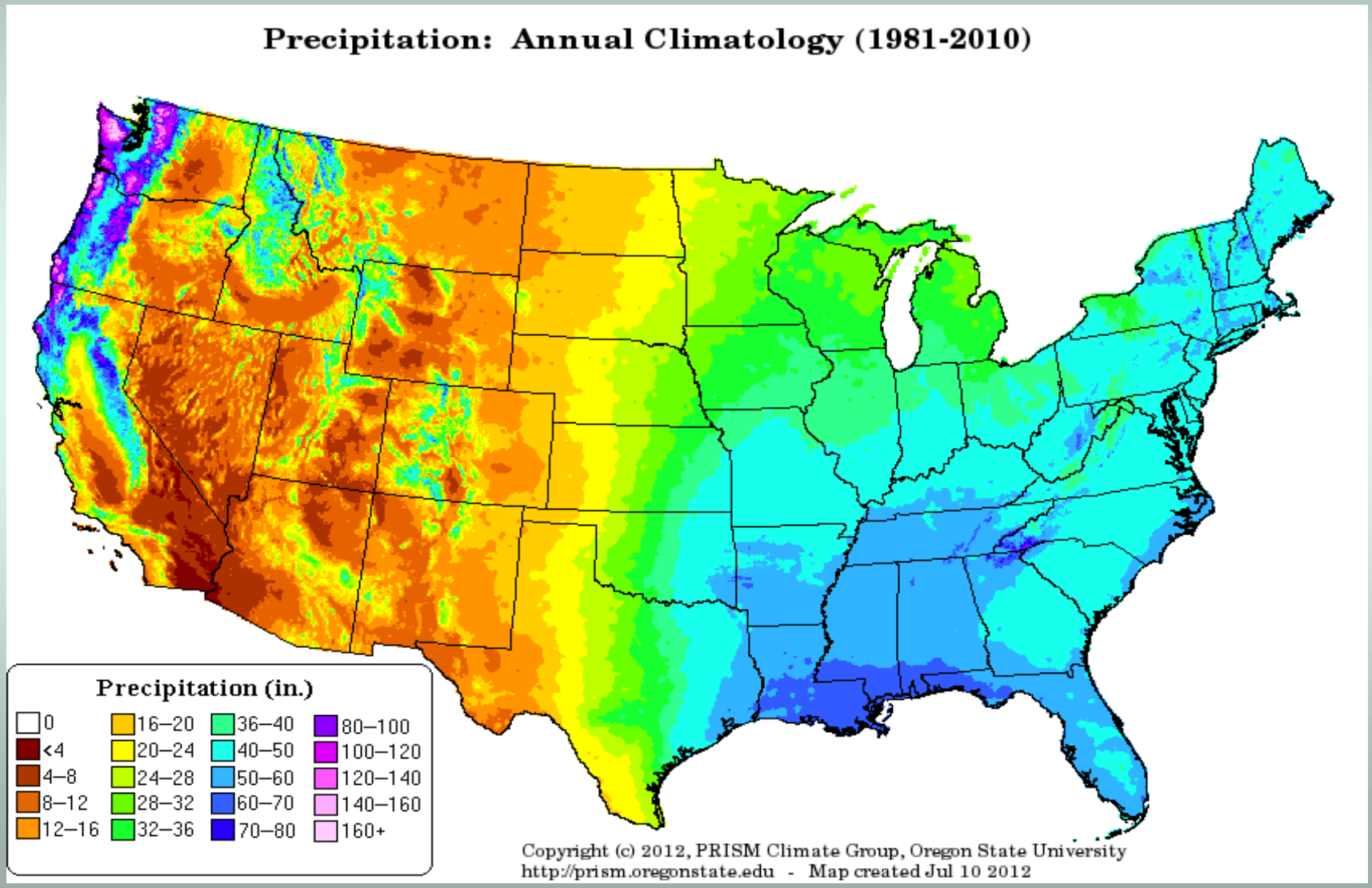
We've met almost anywhere here, but with emphasis on access, cost, and learning potential



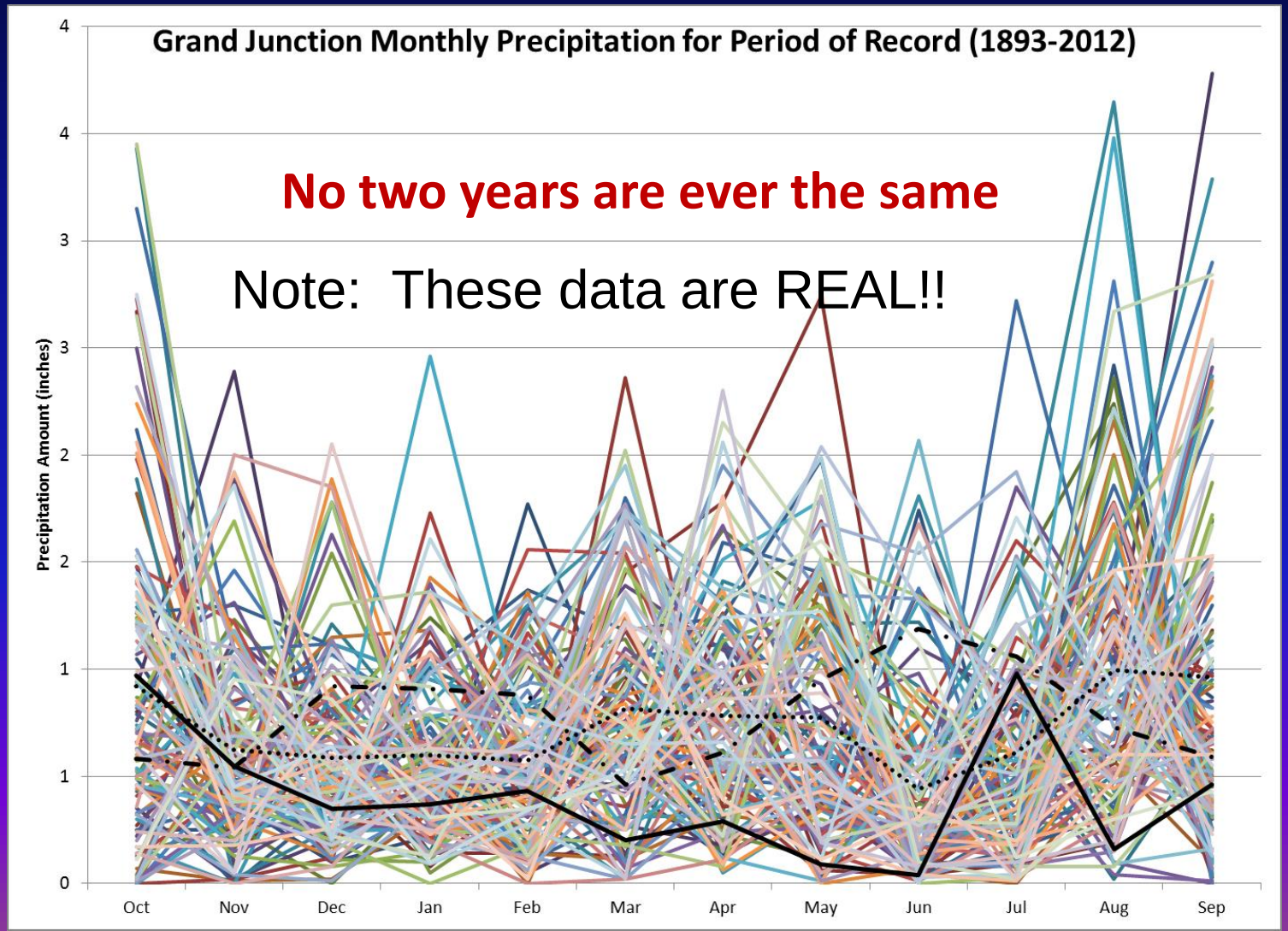
Our Priority – Work together to improve climate information for stakeholders

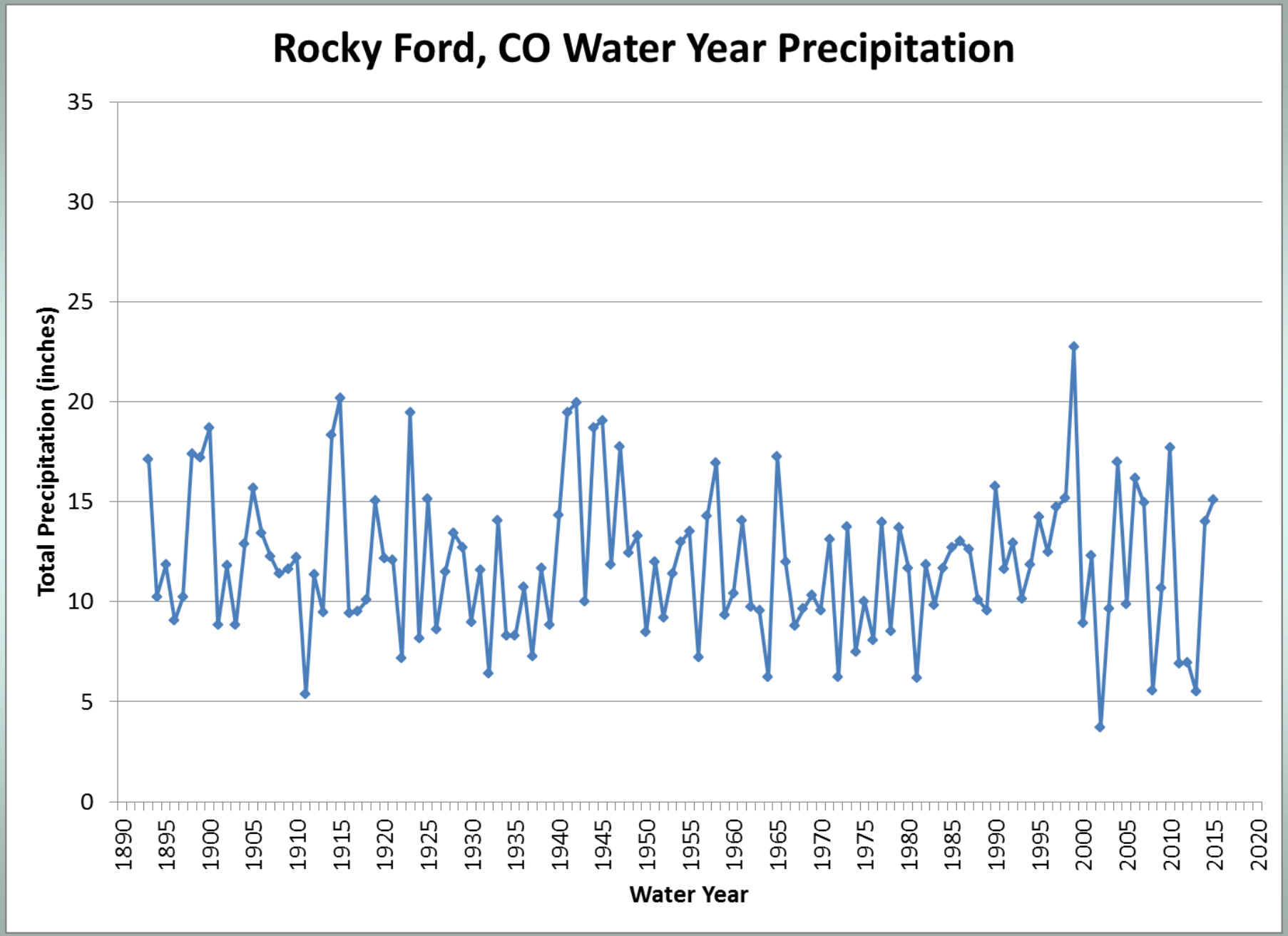

Look -- There’s one now

So much of what matters in the West relates to precipitation



And it's Darn Variability



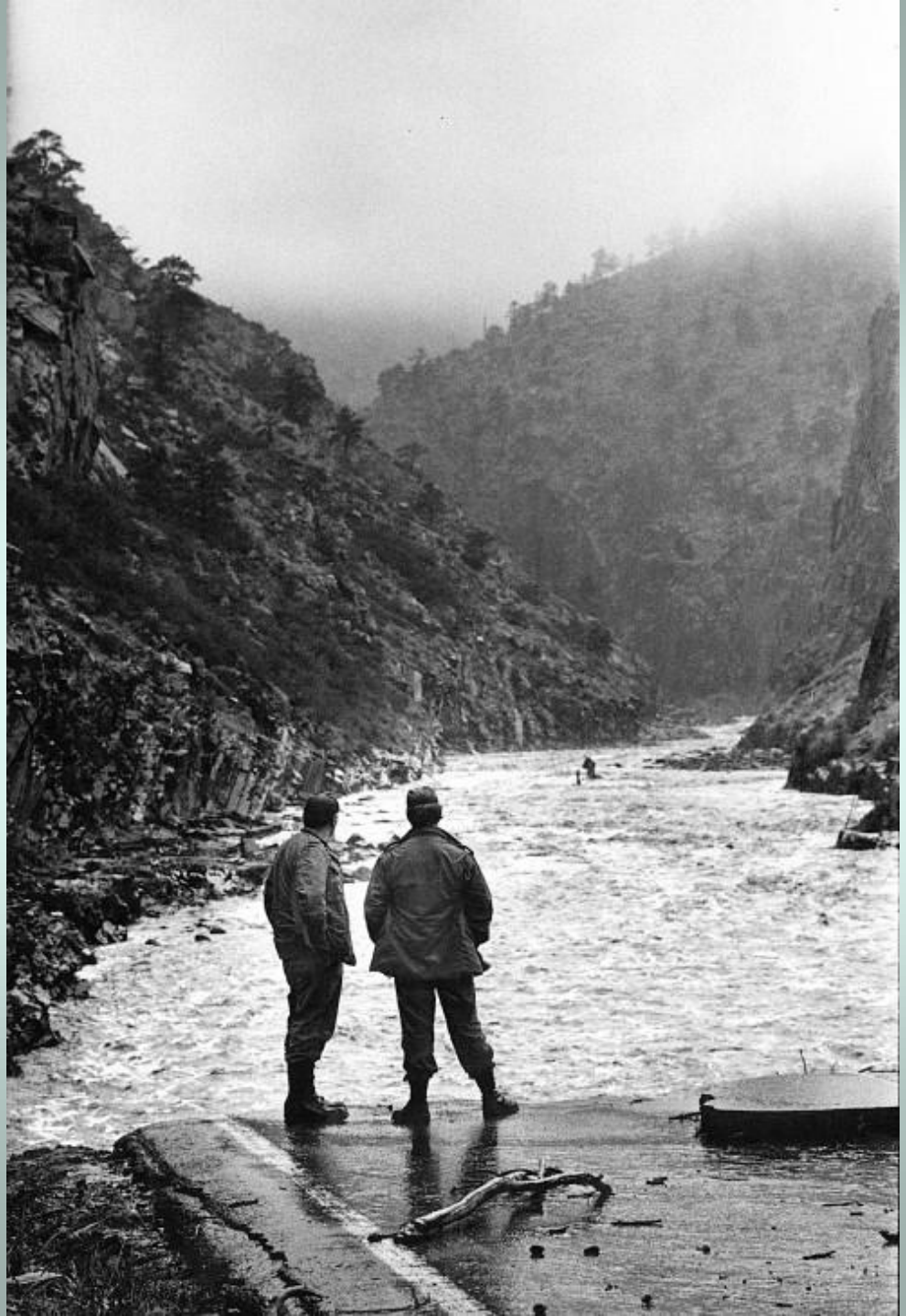

Rocky Ford, CO Water Year Precipitation
Total Precipitation (inches)
0
5
10
15
20
25
30
35
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year


And the impacts from that variability
Photo by Lyric Lucero
2013 Manzanola, CO


Paonia Reservoir
August 2012


NIDIS
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM
COLORADO
CLIMATE
CENTER
Colorado
State
University

“Chuck, Didn’t there used to be a road here?”



Credit: Denver Post

Was that forecast?

We've emphasized field trips to see first hand how climate information is collected and how it is or could be put to better use

We've contributed to progress in:

-- precipitation analysis tools

-- spatial mapping in complex terrain

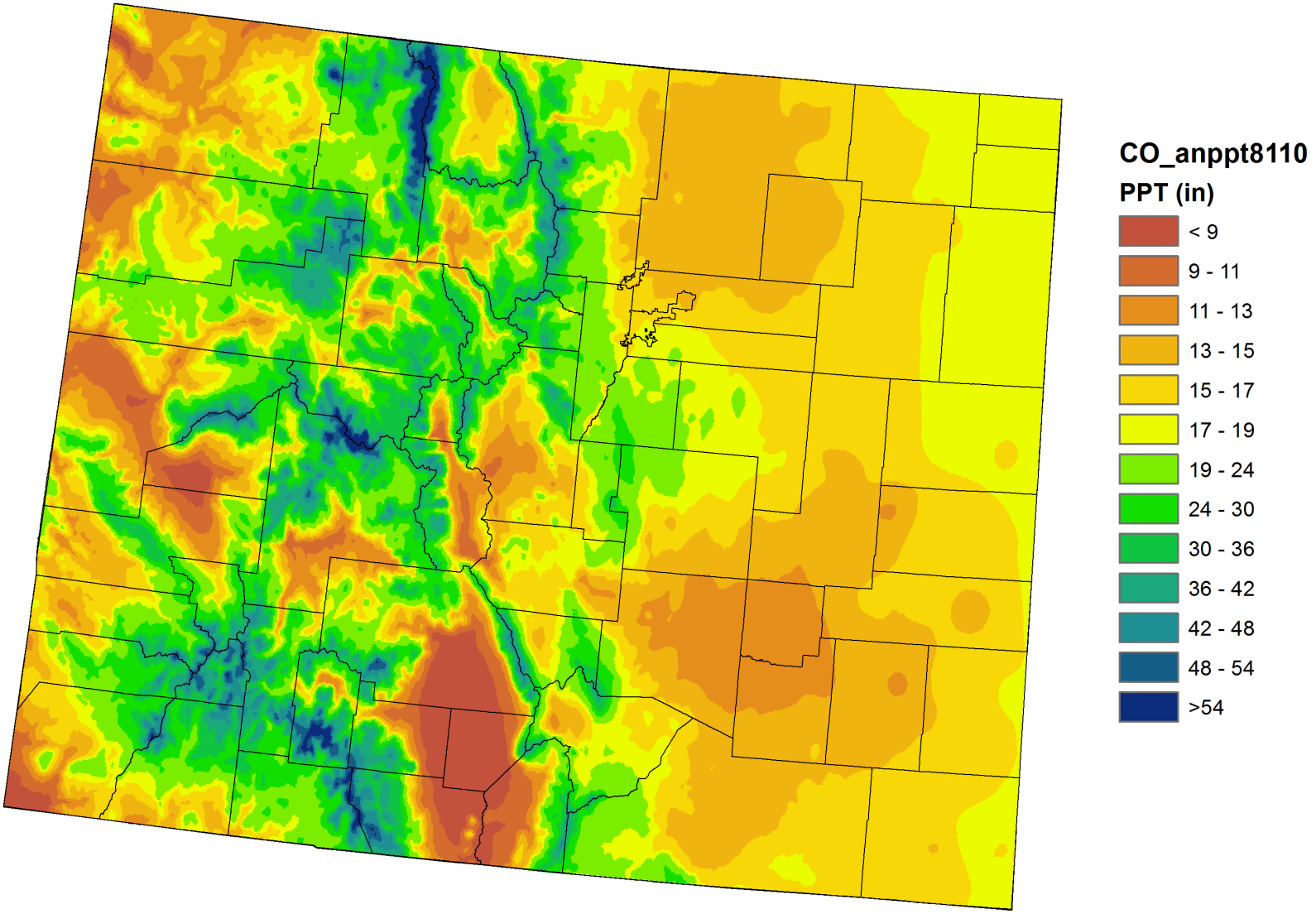
-- data collection, continuity, quality, network enhancement and preservation, gap filling, instrumentation improvements, evapotranspiration estimation

-- drought monitoring

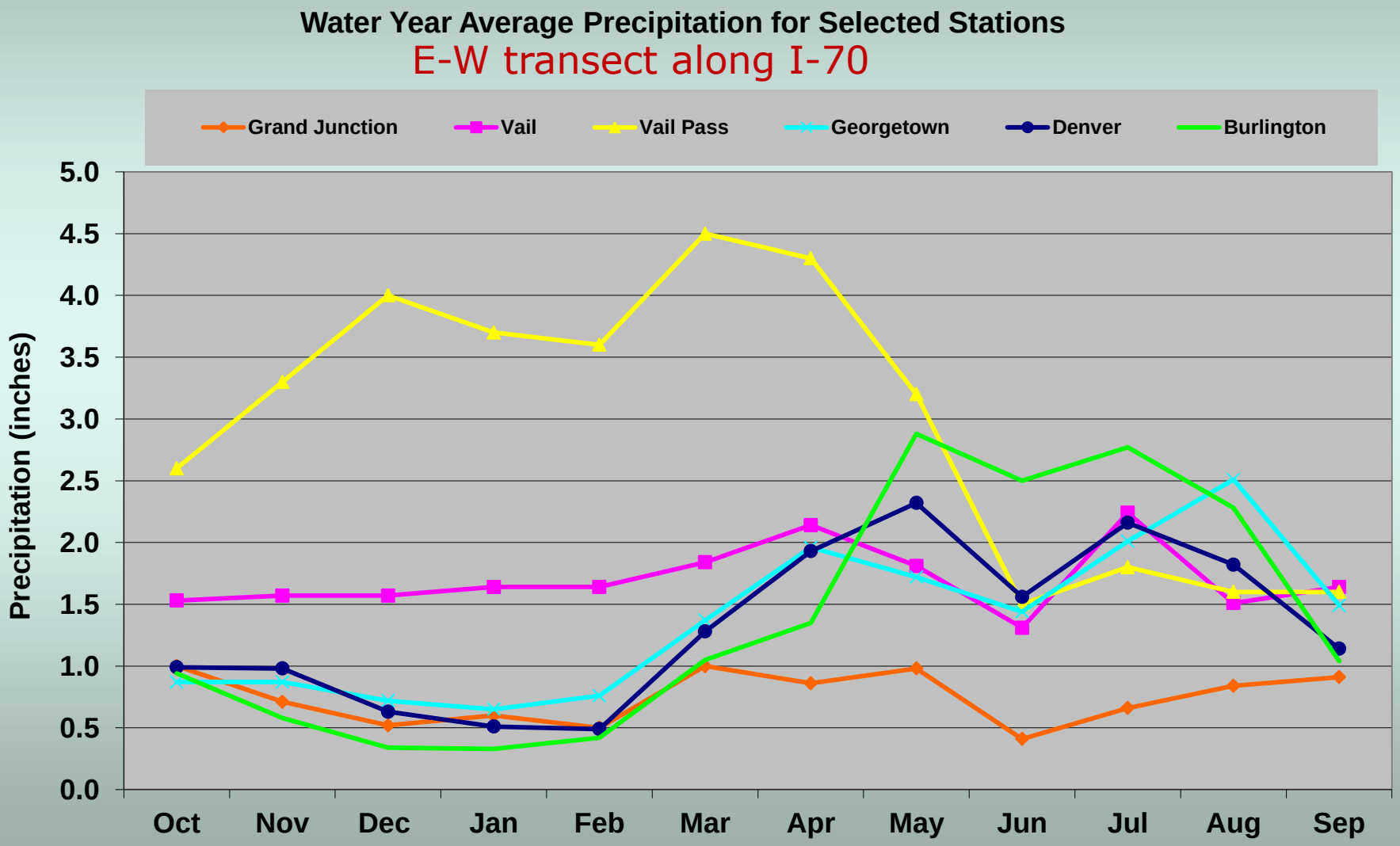
-- user needs assessments

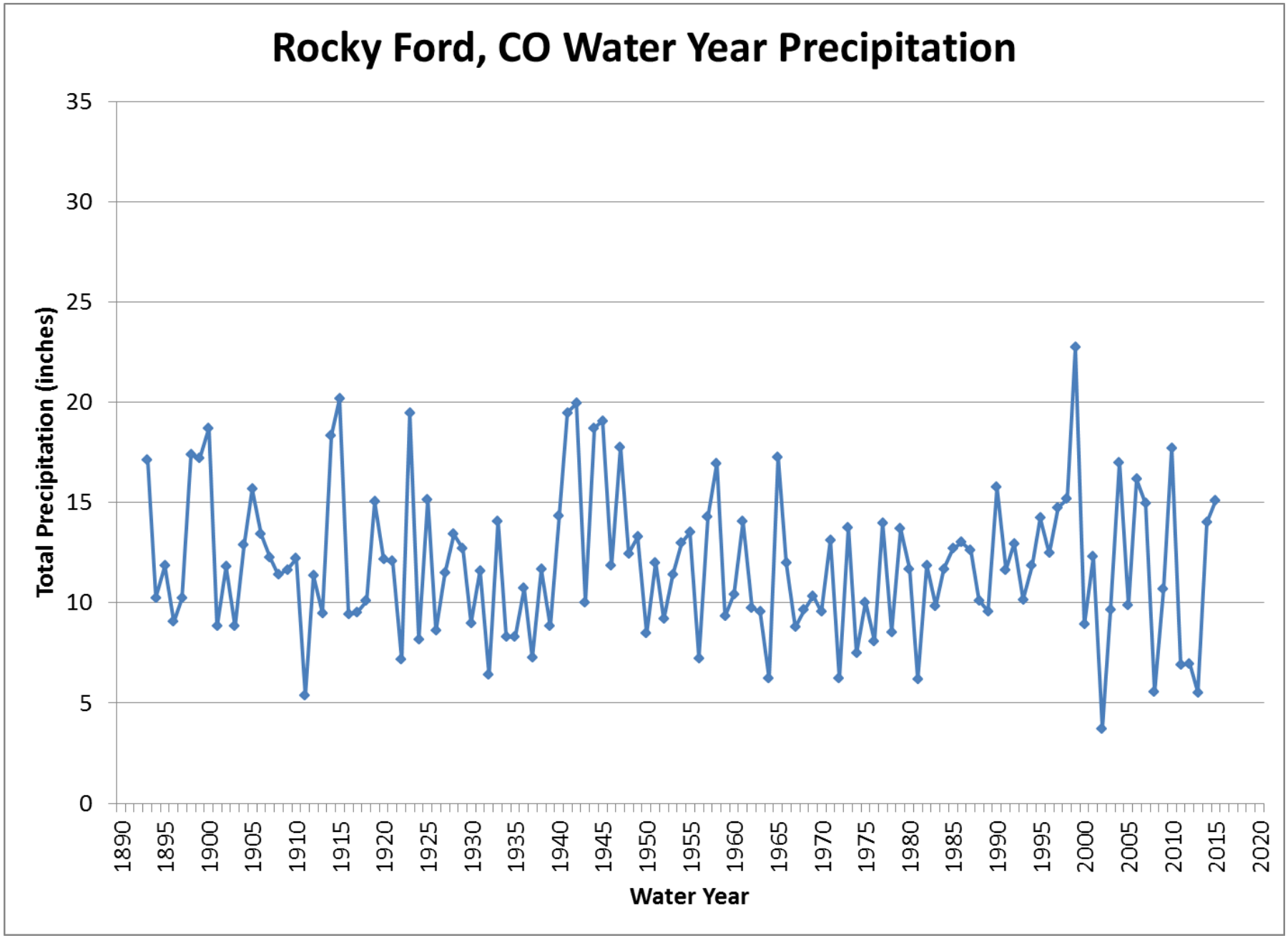
-- stakeholder engagement

Colorado Annual Average Precipitation (in) 1981-2010



Seasonal Precipitation in Colorado varies greatly from place to place

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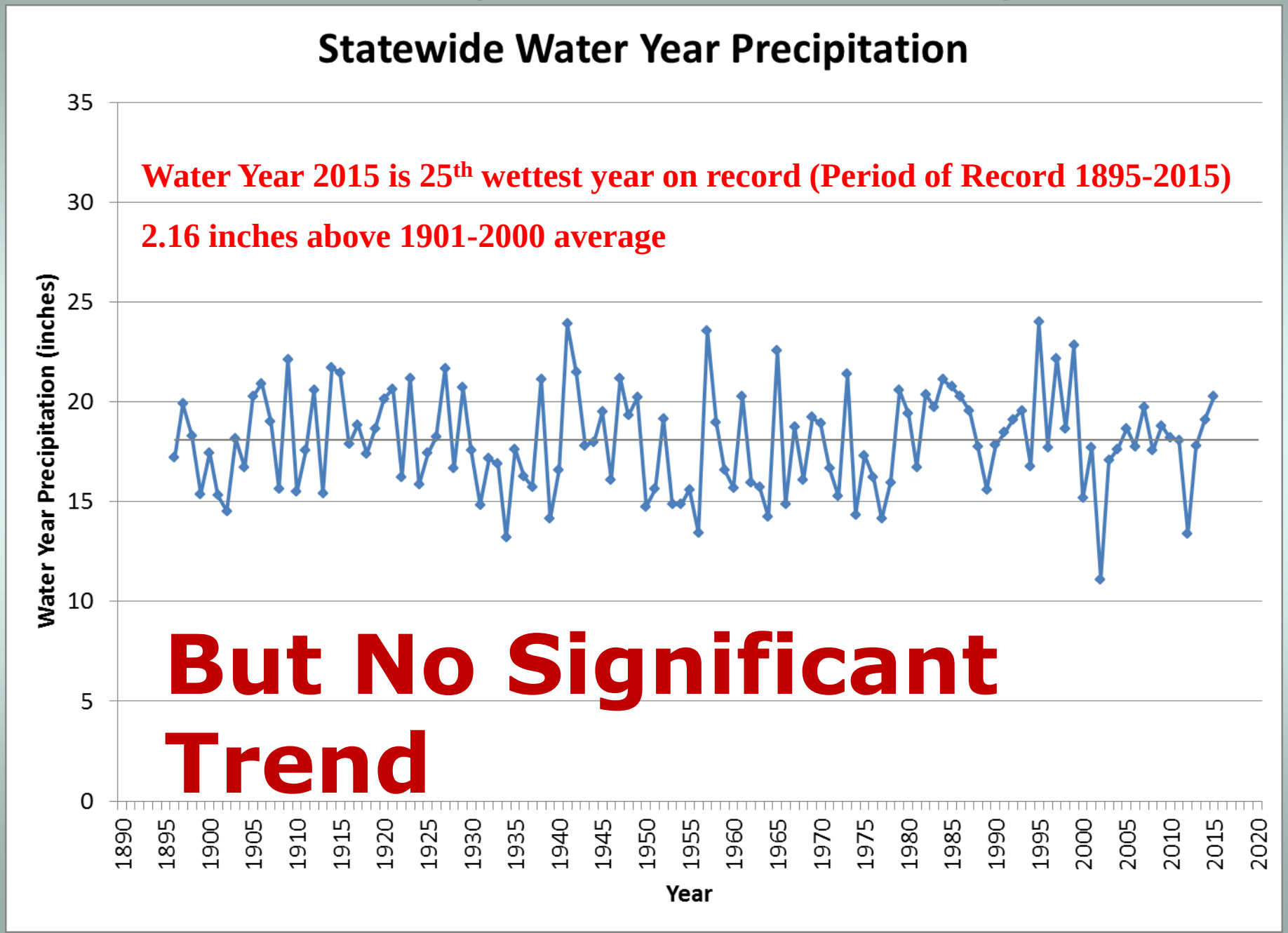
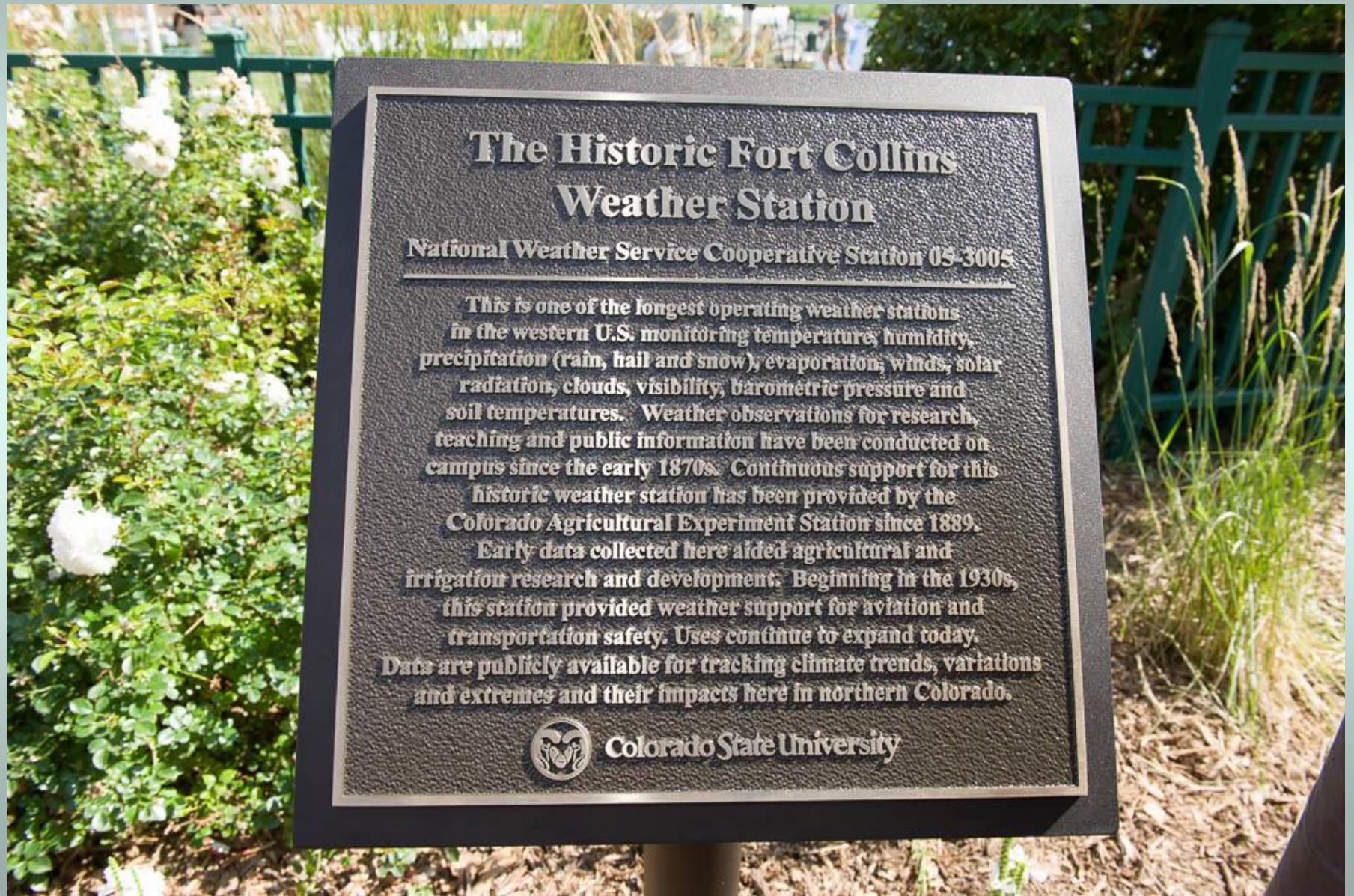
2010
2015
2020
Water Year

Colorado Precipitation in Historic Perspective



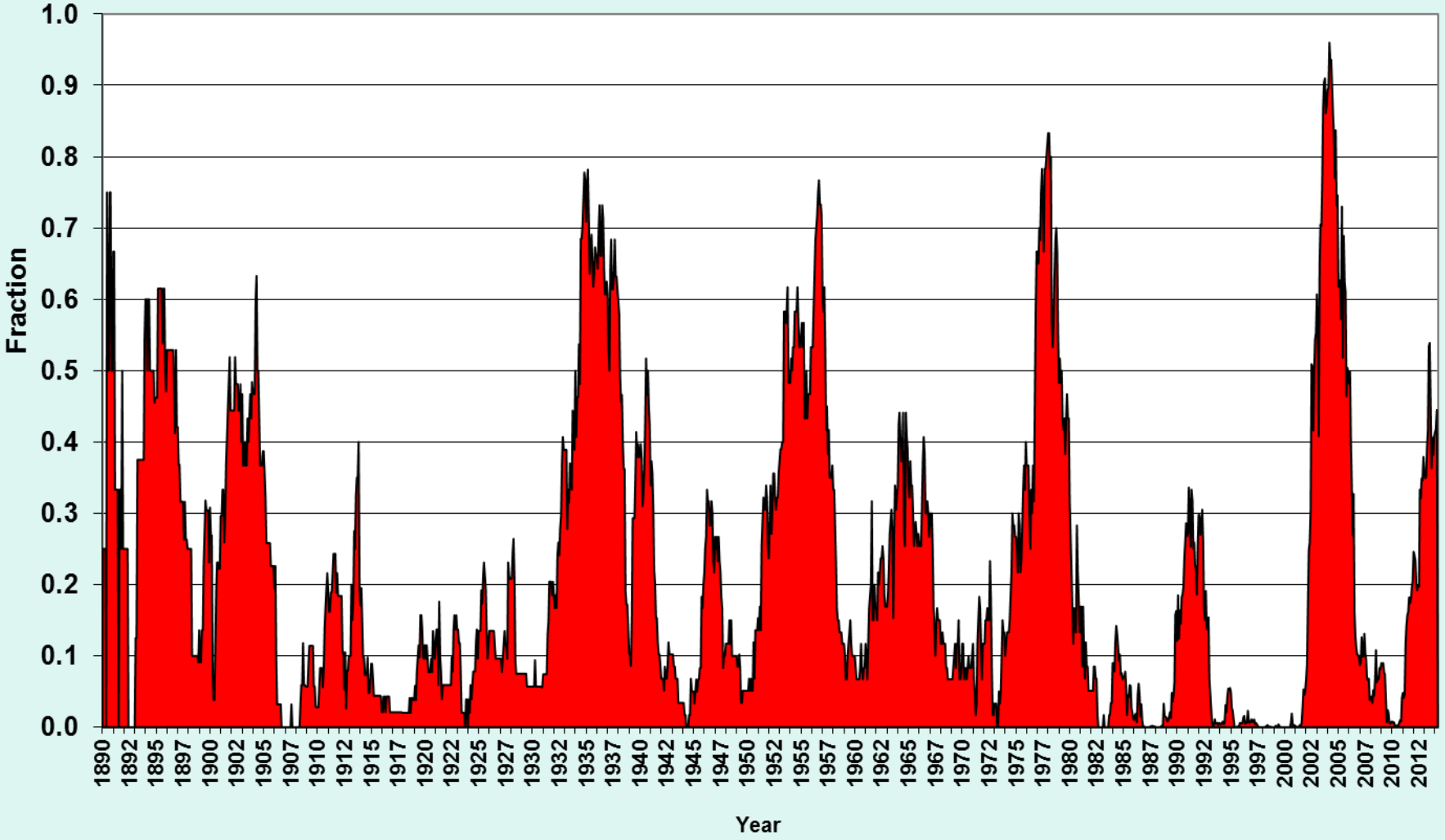
Hug your weather station!



Fraction of Colorado in Drought

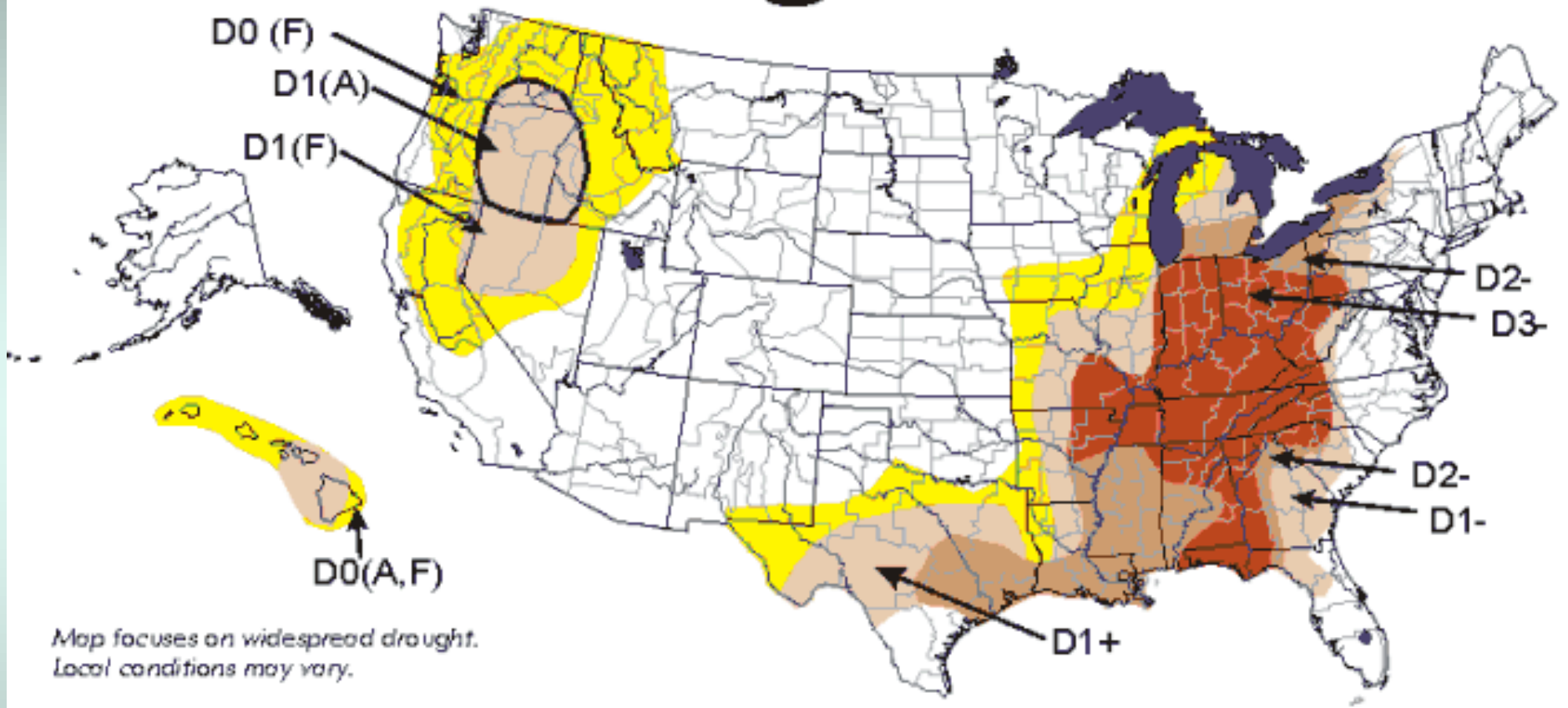
Based on 48 month SPI (SPI <-1)

(1890 - March 2014)



September 28, 1999

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

- D0 Watch
- D1 Drought
- D2 Drought–Severe
- D3 Drought–Extreme
- D4 Drought–Exceptional
- Delineates Overlapping Areas

Drought type: used only when impacts differ

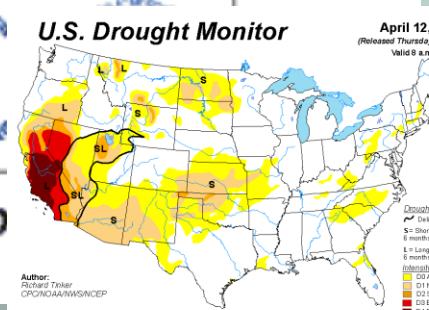
A = Agriculture
W = Water
F = Forest fire danger

Plus (+) = Forecast to intensify next two weeks
Minus (-) = Forecast to diminish next two weeks
No sign = No change in drought classification forecast

USDA

National Drought Mitigation Center

• *Released Thursday, Sep*

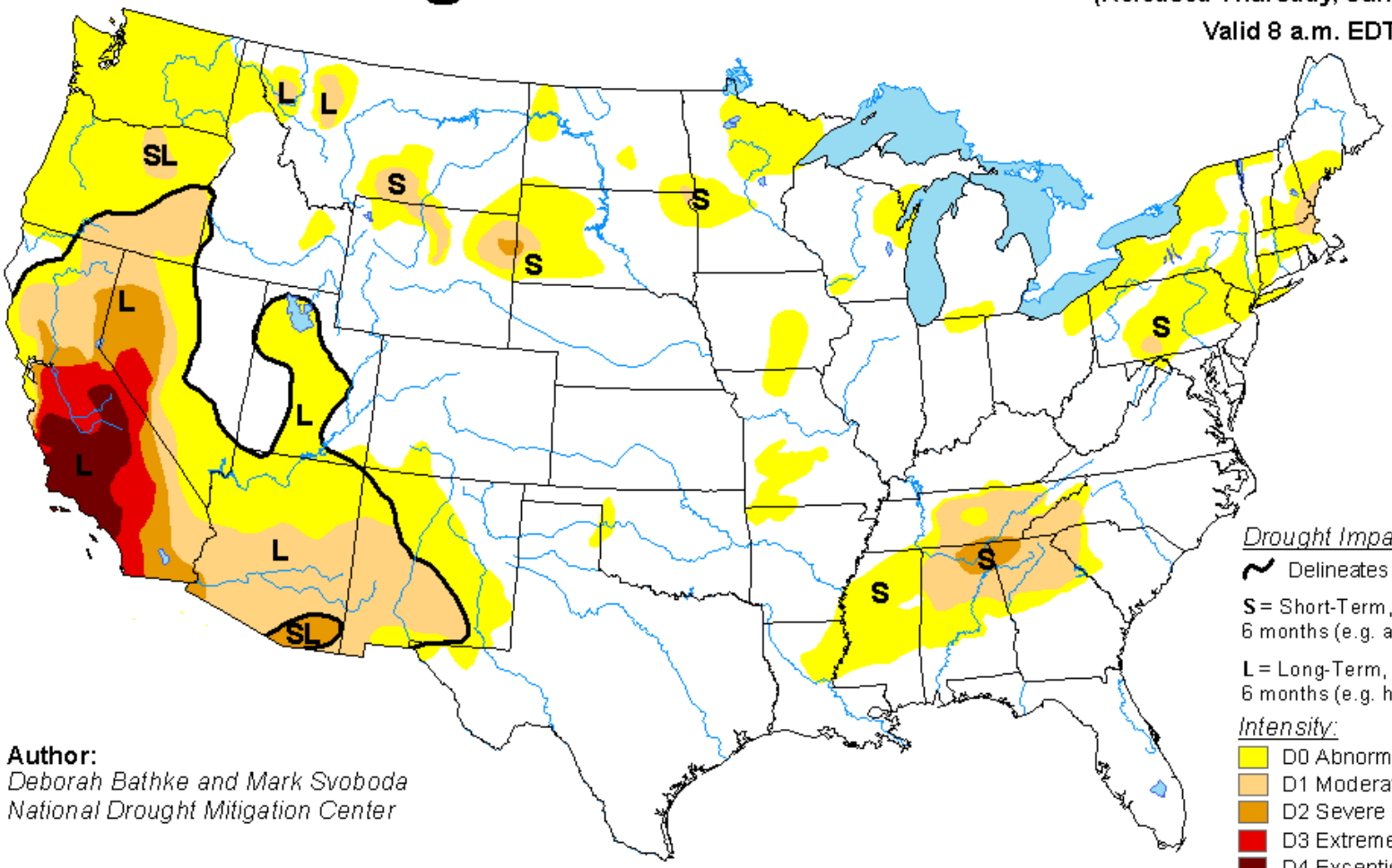


U.S. Drought Monitor

June 7, 2016

(Released Thursday, June 9, 2016)

Valid 8 a.m. EDT



Author:
Deborah Bathke and Mark Svoboda
National Drought Mitigation Center

Drought Impact Types:

~ Delineates dominant impacts

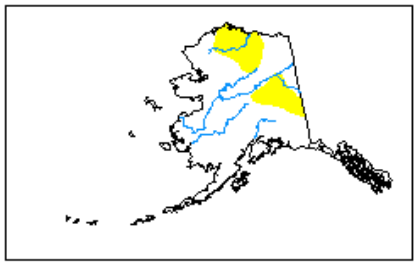
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

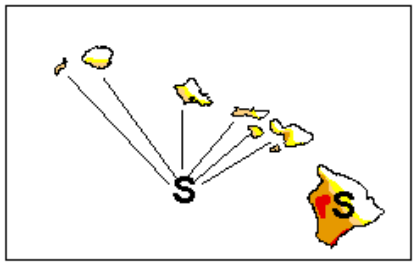
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

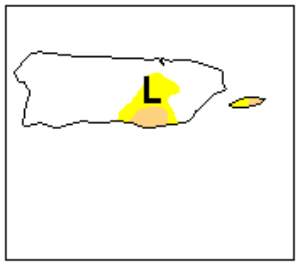
Intensity:

- 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.







USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

The committee even pushed and encouraged

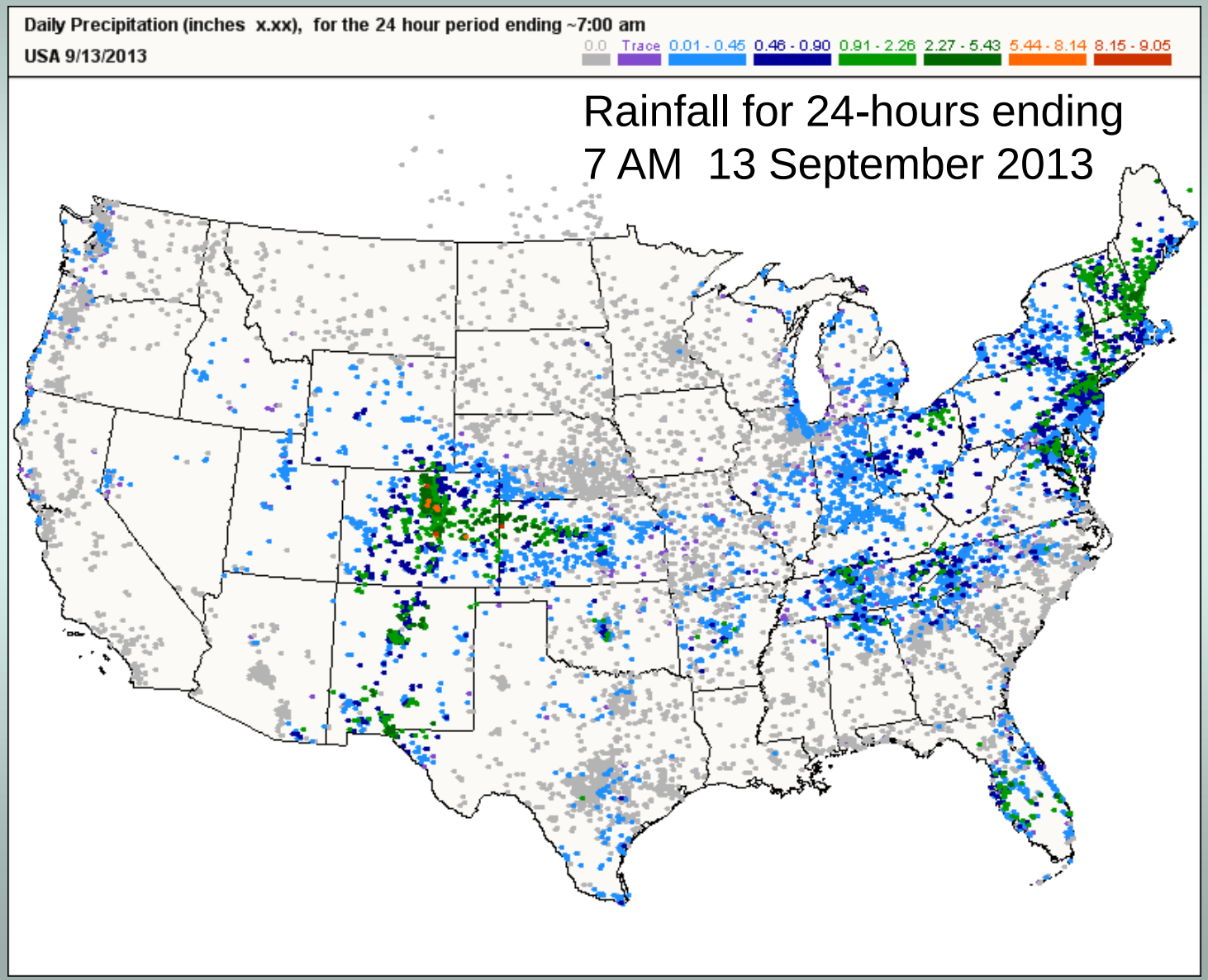
CoCoRaHS

As a cost effective approach to improving precipitation data while engaging stakeholders

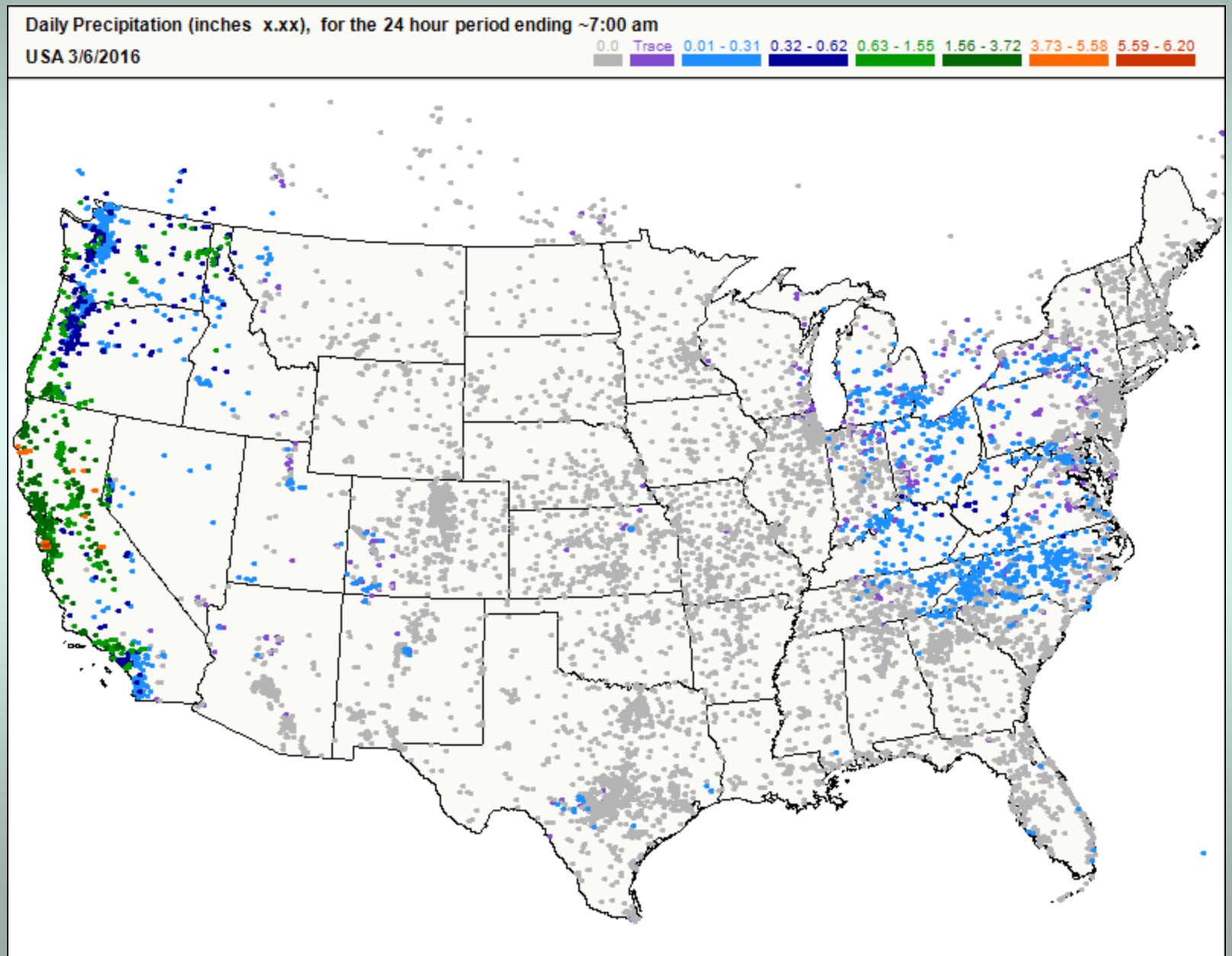
CoCoRaHS (Community Collaborative Rain, Hail and Snow) – A simple but effective way to help scientists track our climate

http://www.cocorahs.org

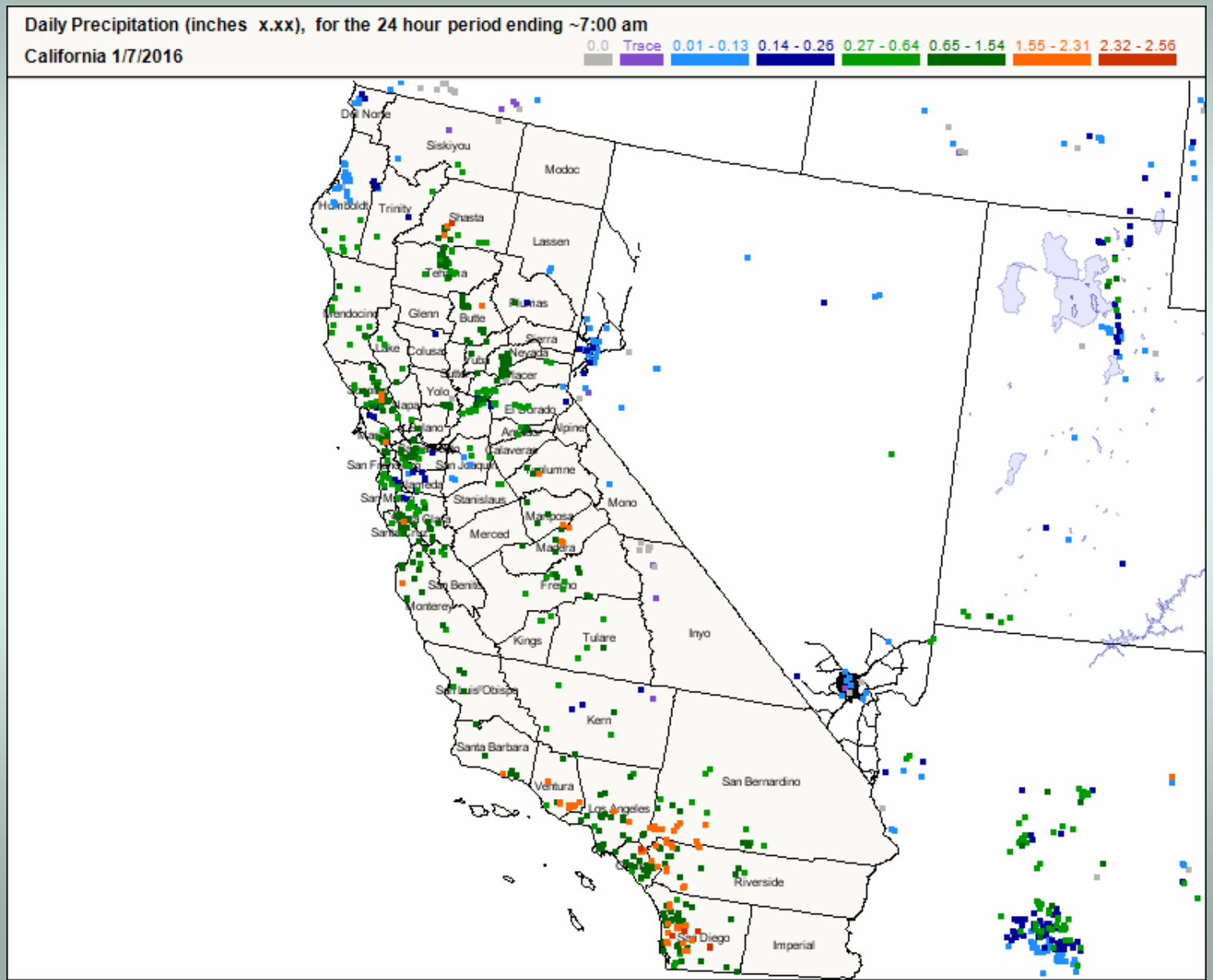
Mapping our water as it lands: -The Value of Volunteers with



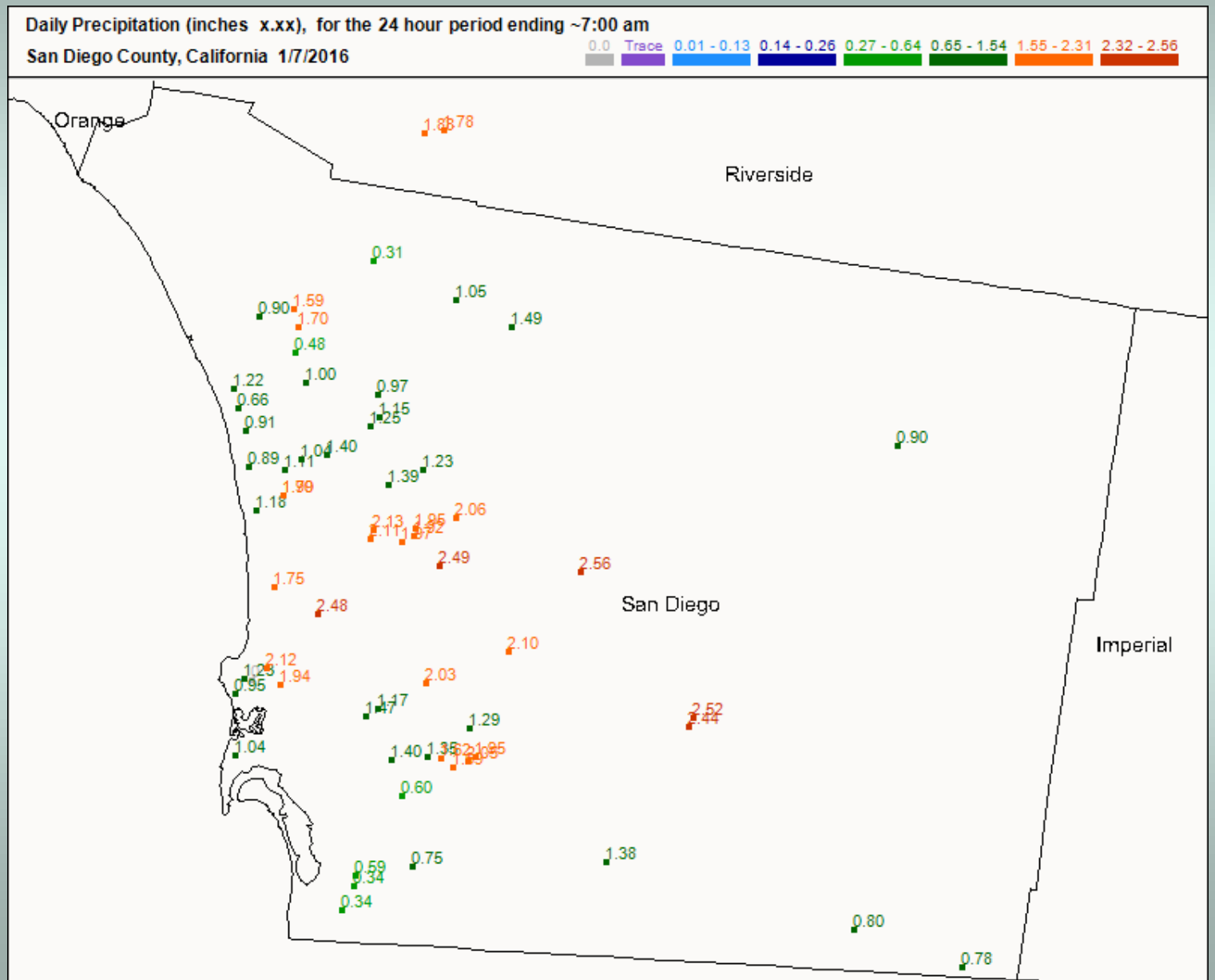
March 6, 2016 Good for CA



Jan. 6-7, 2016 Good for S. CA



And San Diego

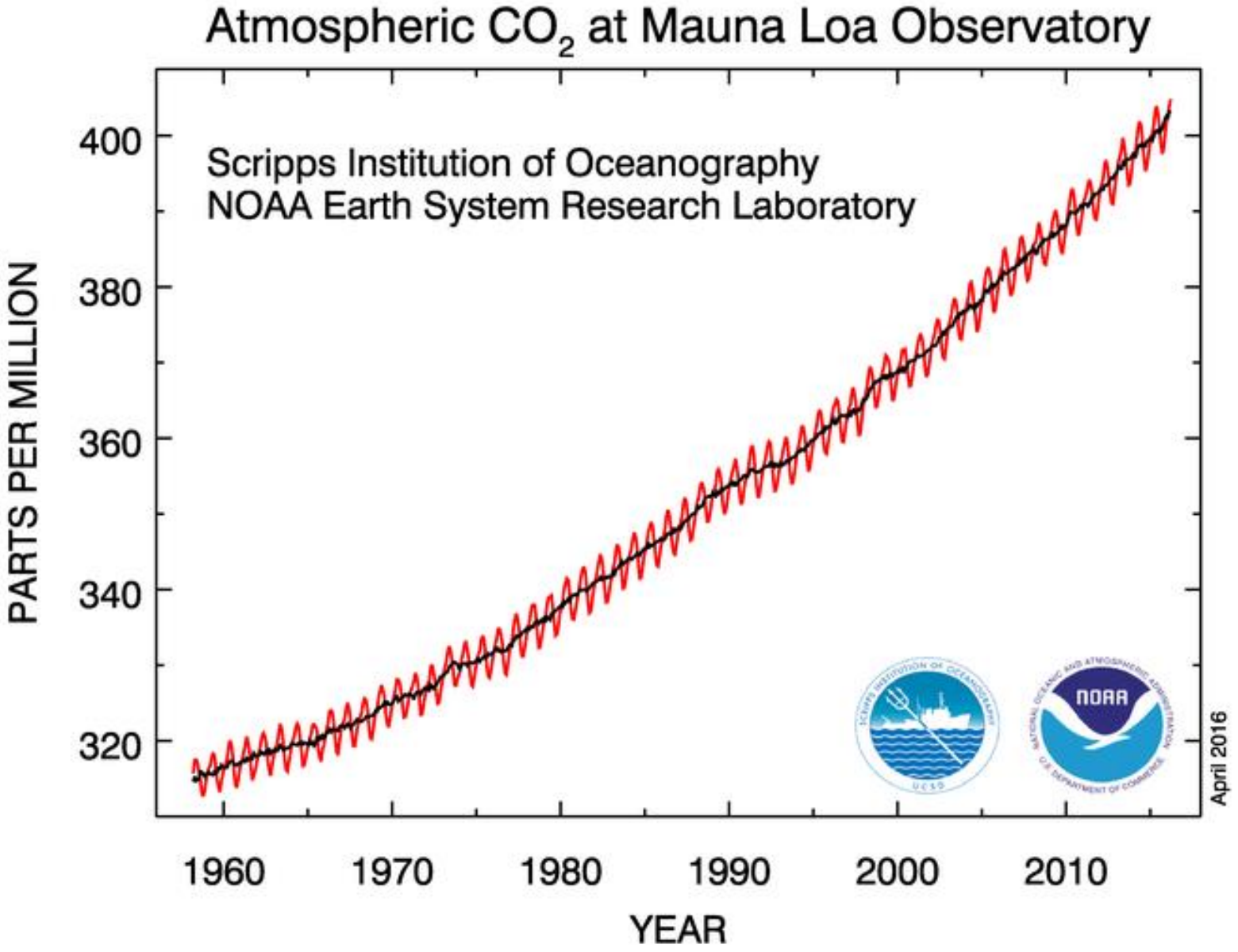


1) If you are interested in weather and the variations in precipitation, please join the Community Collaborative Rain, Hail and Snow Network

http://www.cocorahs.org

or see me today

What do we do with this?

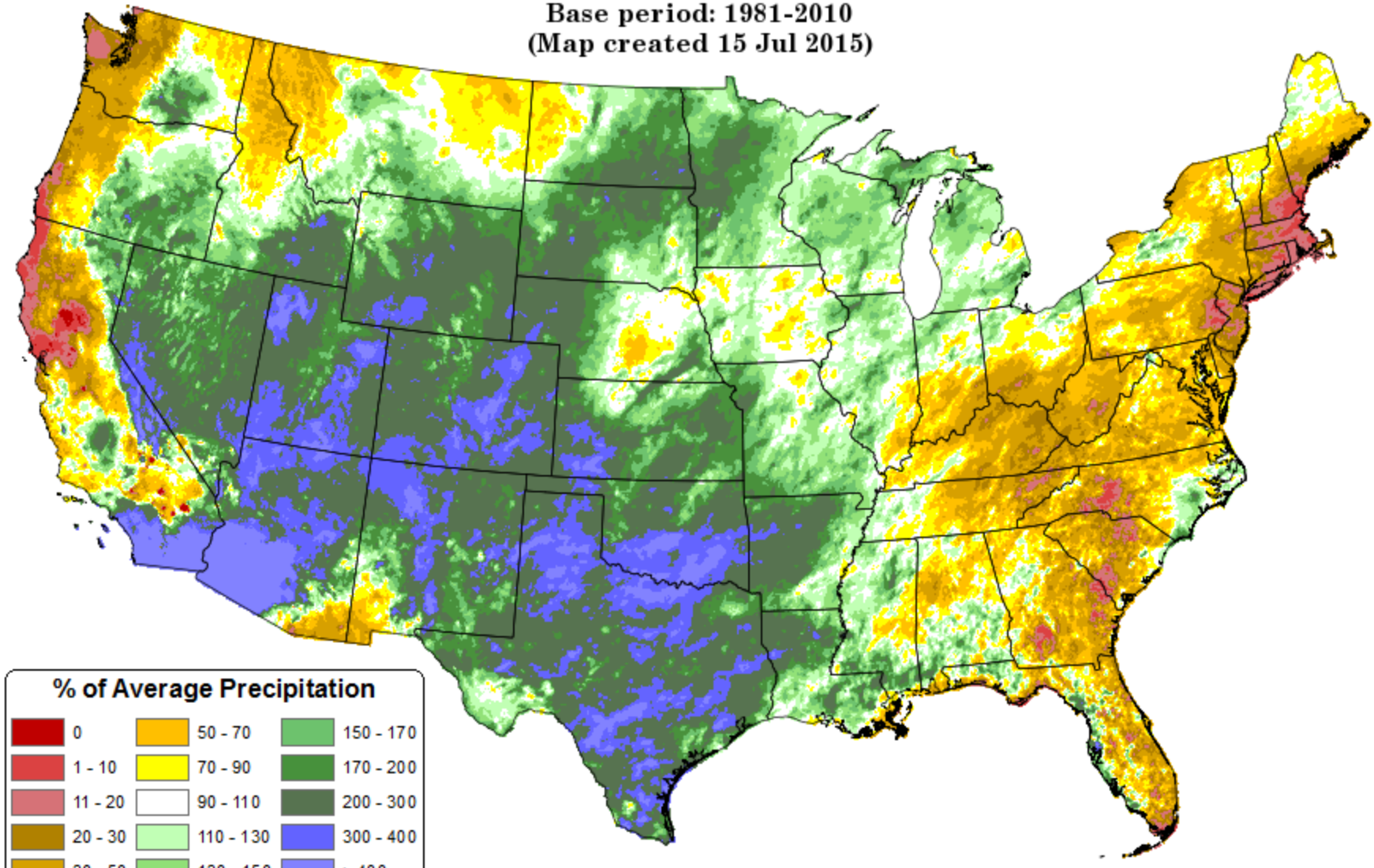


Whatever comes next is sure to be “very interesting”

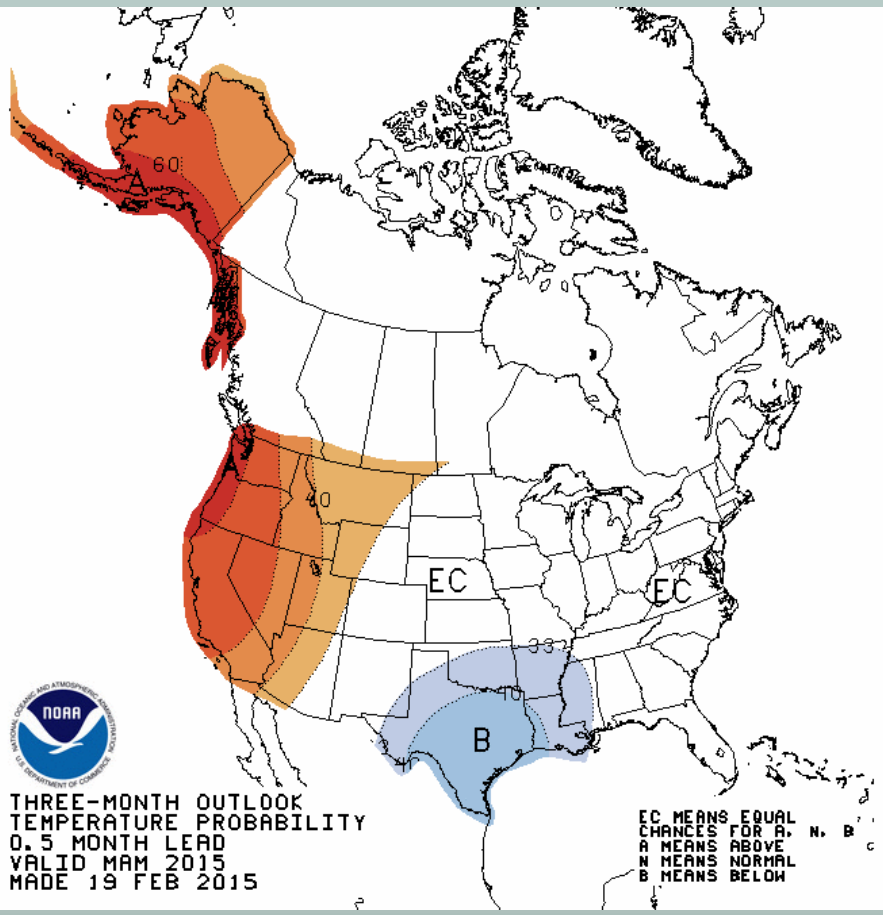
But the Holy Grail, Which believe it or not our stakeholders fully expect is reliable seasonal forecasts a few months in advance

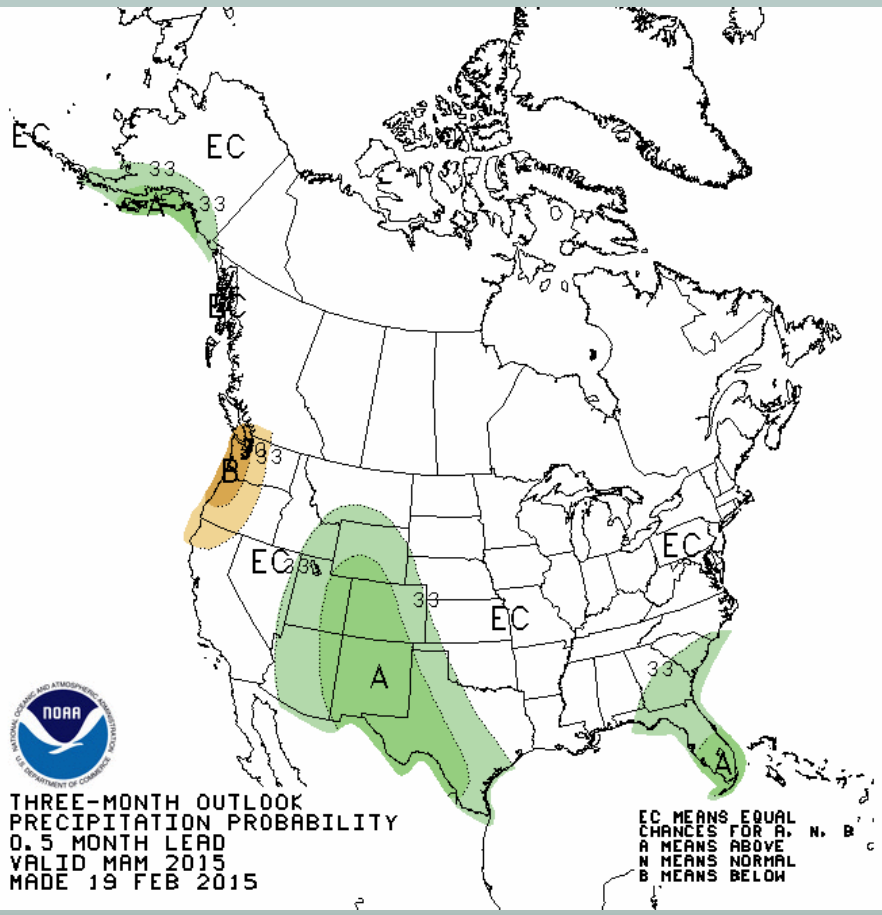
Total Precipitation Anomaly: May 2015

Period ending 31 May 2015
Base period: 1981-2010
(Map created 15 Jul 2015)



SOMETIMES "WE" GET CLOSE
2015 SPRING OUTLOOK

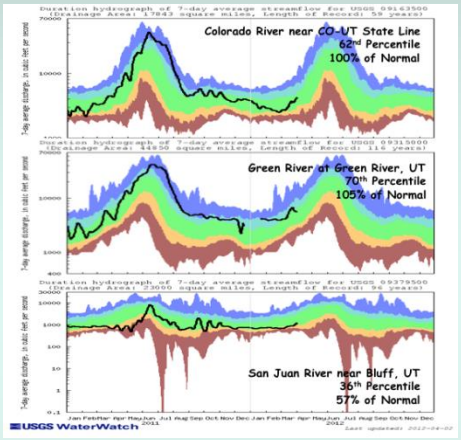


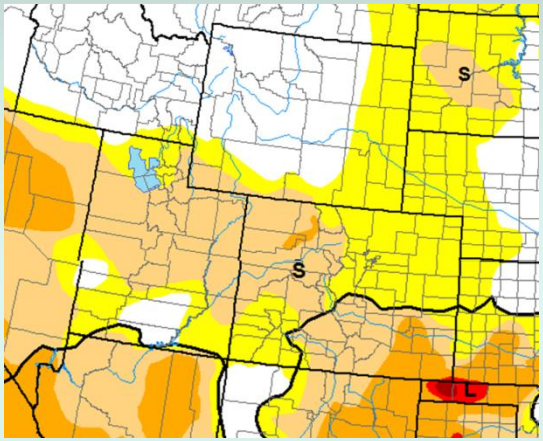


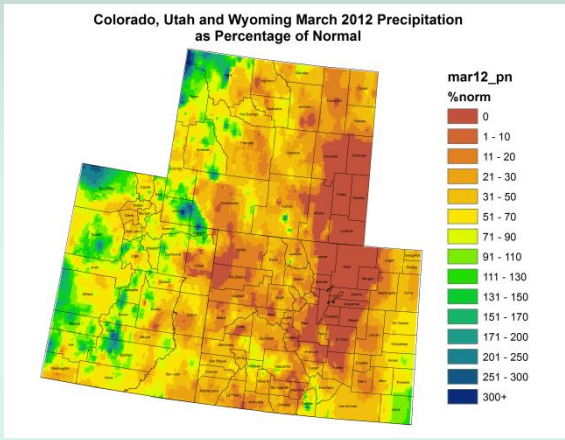
Temperature

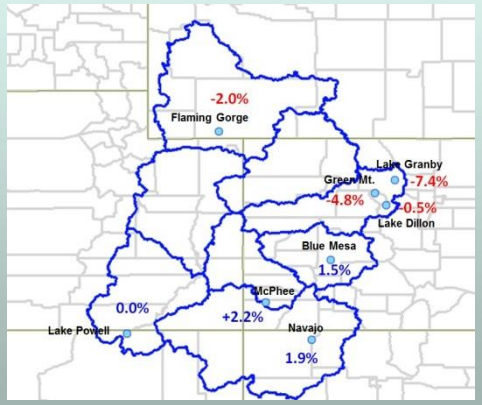
Precipitation

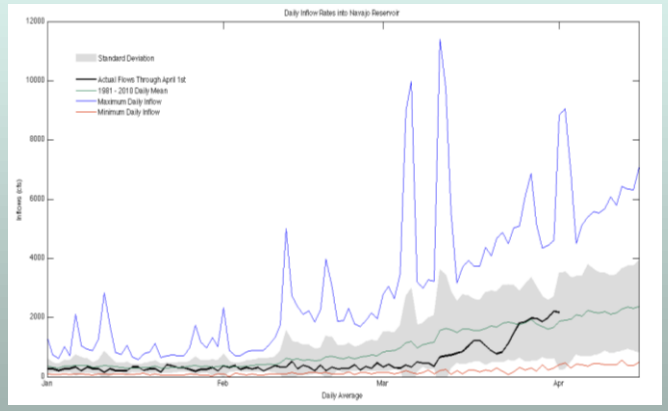
Weekly Climate Updates Available Upper Colorado Regional Drought Early Warning

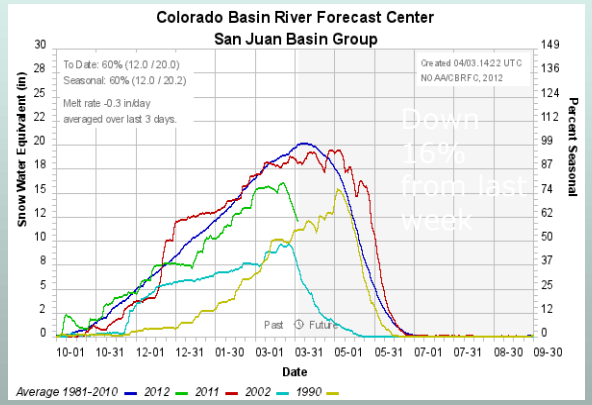












In conclusion – keep your eyes on the prise

Photo by Lynn Kral, Loveland, January 2006