

# *Colorado's Climate and Water Resources*

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Colorado Climate Center  
Colorado State University**

**CFWE Climate Workshop  
March 7, 2014  
Denver, Colorado**

**With help from Wendy Ryan and Zach Schwalbe**



**Colorado  
State**  
University



COLORADO  
**CLIMATE**  
CENTER

**Colorado Climate** Paonia Reservoir  
August 2012

**It gives and it takes back  
Water, that is**

# Topics we will cover today

- Some history
- What do we measure and why?
- The Climate of Colorado
- The September 2013 Floods
- Where 2013 fit in the historic perspective
- Recent climate and snowpack conditions

# First -- A short background

- In 1973 the federal government abolished the “State Climatologist” program nationwide leaving Colorado without
- Later that same year, Colorado re-established the State Climate program with support through the Colorado Agricultural Experiment Station at Colorado State University.



# Our Mission

- The Colorado Climate Center at CSU 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)

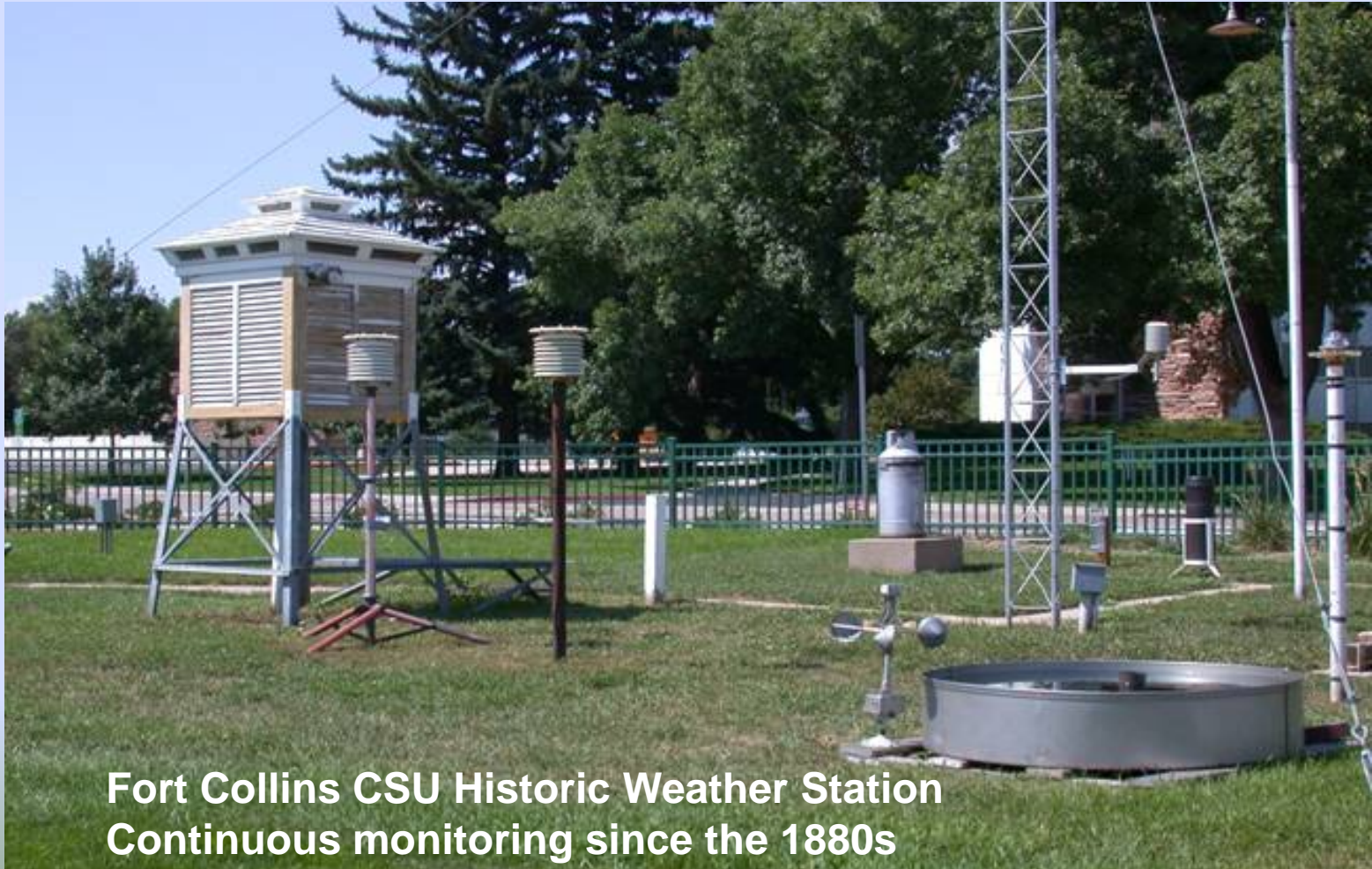
Basically, we keep track of  
numbers -- climate numbers  
-- lots and lots of numbers  
We are “Climate Accountants”

and we LOVE IT!



# 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**

# Systematic weather data collection began in Colorado in the 1870s and 1880s

(Form 4.)

**WAR DEPARTMENT.**  
**SIGNAL SERVICE, U. S. ARMY.**  
**DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.**

METEOROLOGICAL RECORD for the *Week* ending *Nov. 25th 1871* at *Denver, Col. Ter.*

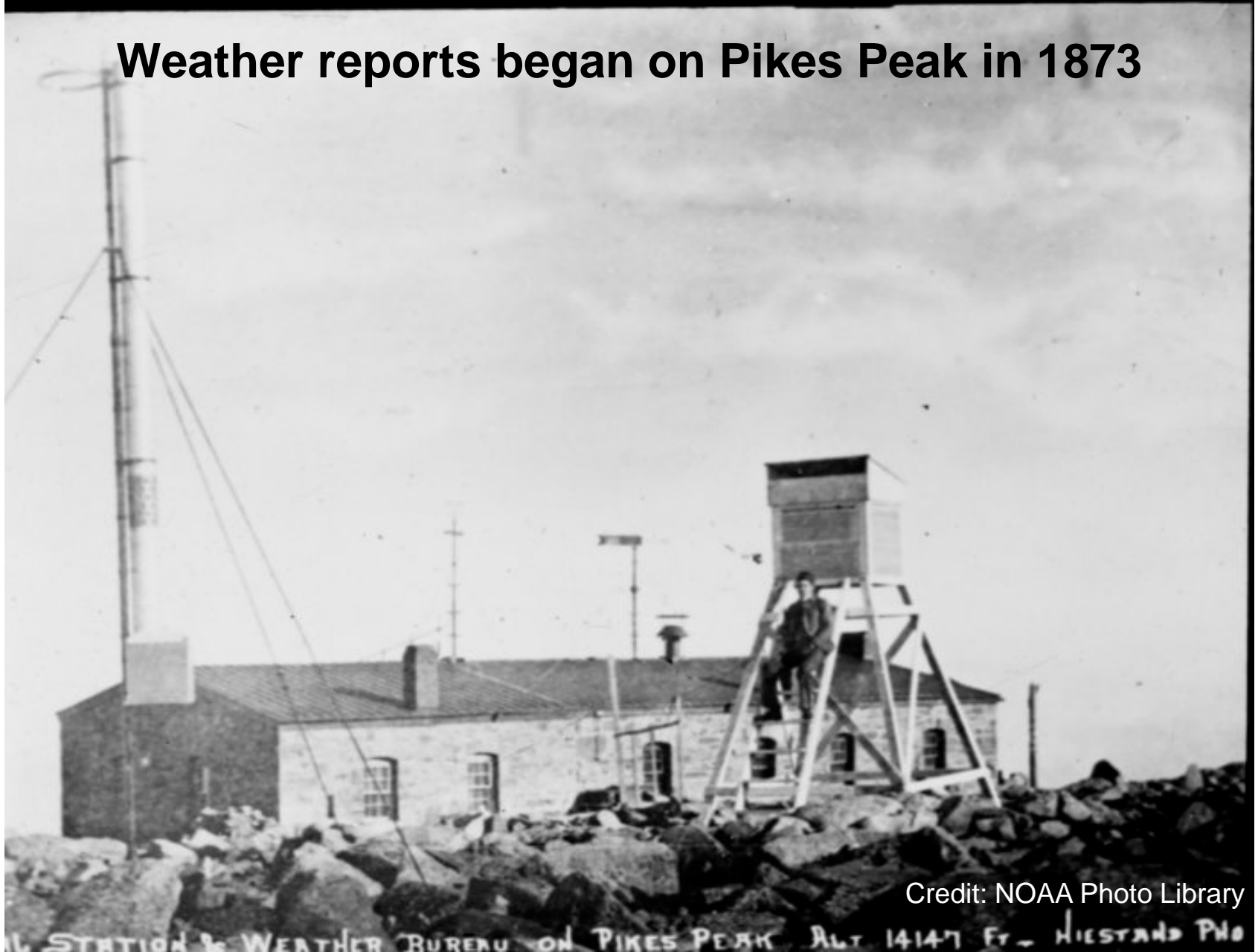
Date of Observation.	Time of Observation.	Height of Barometer.	Height of attached Thermometers <i>W. B. C. C. C.</i>	Reduced Barometer.	THERMOMETER. (OPEN AIR.) <i>Hygrometers</i>		Direction of wind.	Velocity of wind in miles per hour. <i>mph. daily</i>	Pressure of wind. Pounds per square foot.	Amount of cloud.	Direction in which upper clouds move.	Rain (or snow) commenced. (Time.)	Rain (or snow) ended. (Time.)	Amount of rain or melted snow.	<i>diff. registering thermometers</i>	REMARKS.
					Dry Bulb.	Wet Bulb.										
<i>1871</i>	<i>5:43 a.m.</i>	<i>25.00</i>	<i>57 22</i>	<i>30.07</i>	<i>22 21 46</i>	<i>16</i>	<i>S</i>	<i>0</i>	<i>0</i>	<i>4/4</i>		<i>11 a.m.</i>				<i>Light Snow-brew</i>
	<i>2:43 p.m.</i>	<i>25.09</i>	<i>63 36</i>	<i>29.97</i>	<i>36 35 64</i>	<i>12</i>	<i>S</i>	<i>2</i>	<i>.02</i>	<i>0</i>						
<i>Sunday Nov 19</i>	<i>4:43 p.m.</i>	<i>25.12</i>	<i>58 14</i>	<i>30.20</i>	<i>14 12 64</i>	<i>11</i>	<i>S</i>	<i>11</i>	<i>.60</i>	<i>0</i>						<i>to clear</i>
	<i>5:43 a.m.</i>	<i>25.00</i>	<i>57 22</i>	<i>30.07</i>	<i>22 21 46</i>	<i>16</i>	<i>S</i>	<i>0</i>	<i>0</i>	<i>4/4</i>		<i>11 a.m.</i>	<i>8 p.m.</i>	<i>Black</i>		<i>Light Snow (clear)</i>
	<i>2:43 p.m.</i>	<i>25.09</i>	<i>63 36</i>	<i>29.97</i>	<i>36 30 46</i>	<i>11</i>	<i>S</i>	<i>2</i>	<i>.02</i>	<i>0</i>	<i>72</i>					<i>to clear</i>
<i>Monday Nov 20</i>	<i>4:43 p.m.</i>	<i>25.12</i>	<i>58 14</i>	<i>30.20</i>	<i>14 12 64</i>	<i>11</i>	<i>S</i>	<i>11</i>	<i>.60</i>	<i>0</i>						<i>to clear</i>
	<i>5:43 a.m.</i>	<i>24.99</i>	<i>50 21</i>	<i>30.07</i>	<i>21 19 78</i>	<i>13</i>	<i>S</i>	<i>13</i>	<i>.84</i>	<i>1/4</i>	<i>24</i>					<i>Stratus</i>
	<i>2:43 p.m.</i>	<i>24.88</i>	<i>56 43</i>	<i>29.67</i>	<i>43 34 28</i>	<i>18</i>	<i>NW</i>	<i>18</i>	<i>1.62</i>	<i>4/4</i>	<i>103</i>					<i>Stratus</i>
<i>Tuesday Nov 21</i>	<i>4:43 p.m.</i>	<i>24.88</i>	<i>58 39</i>	<i>29.70</i>	<i>39 34 53</i>	<i>3</i>	<i>NW</i>	<i>2</i>	<i>.02</i>	<i>4/4</i>	<i>34.3</i>					<i>Stratus</i>
	<i>5:43 a.m.</i>	<i>24.70</i>	<i>55 31</i>	<i>29.59</i>	<i>34 29 79</i>	<i>4</i>	<i>S.W.</i>	<i>4</i>	<i>.08</i>	<i>4/4</i>	<i>97</i>					<i>Stratus</i>
	<i>2:43 p.m.</i>	<i>24.37</i>	<i>62 35</i>	<i>29.30</i>	<i>35 32 70</i>	<i>2</i>	<i>W</i>	<i>2</i>	<i>.02</i>	<i>4/4</i>	<i>97</i>					"
<i>Wednesday Nov 22</i>	<i>4:43 p.m.</i>	<i>24.71</i>	<i>61 31</i>	<i>29.59</i>	<i>31 30 89</i>	<i>10</i>	<i>S</i>	<i>10</i>	<i>.50</i>	<i>4/4</i>	<i>32.3</i>	<i>3 p.m.</i>				<i>Light Snow</i>
	<i>5:43 a.m.</i>	<i>24.54</i>	<i>55 25</i>	<i>29.47</i>	<i>25 24 87</i>	<i>6</i>	<i>S</i>	<i>6</i>	<i>.18</i>	<i>4/4</i>	<i>90</i>	<i>10.30 a.m.</i>		<i>.26</i>		<i>Stratus</i>
	<i>2:43 p.m.</i>	<i>24.31</i>	<i>63 34</i>	<i>29.06</i>	<i>34 33 89</i>	<i>5</i>	<i>NW</i>	<i>5</i>	<i>.12</i>	<i>4/4</i>	<i>30</i>					<i>Light Snow</i>
<i>Thursday Nov 23</i>	<i>4:43 p.m.</i>	<i>24.20</i>	<i>60 31</i>	<i>28.97</i>	<i>31 30 89</i>	<i>9</i>	<i>S</i>	<i>9</i>	<i>.40</i>	<i>3/4</i>	<i>SE</i>					"
	<i>5:43 a.m.</i>	<i>24.36</i>	<i>56 32</i>	<i>29.17</i>	<i>32 32 100</i>	<i>4</i>	<i>S.W.</i>	<i>4</i>	<i>.08</i>	<i>4/4</i>	<i>101</i>		<i>8 a.m.</i>	<i>.21</i>		<i>Cloudy</i>
	<i>2:43 p.m.</i>	<i>24.37</i>	<i>70 42</i>	<i>29.04</i>	<i>42 37 58</i>	<i>2</i>	<i>S</i>	<i>2</i>	<i>.02</i>	<i>2/4</i>	<i>33.7</i>					<i>Light Snow</i>
<i>Friday Nov 24</i>	<i>4:43 p.m.</i>	<i>24.38</i>	<i>65 27</i>	<i>29.23</i>	<i>27 27 100</i>	<i>2</i>	<i>N.W.</i>	<i>2</i>	<i>.02</i>	<i>4/4</i>						<i>Fog</i>
	<i>5:43 a.m.</i>	<i>24.37</i>	<i>58 32</i>	<i>29.17</i>	<i>32 28 64</i>	<i>7</i>	<i>S.W.</i>	<i>7</i>	<i>.24</i>	<i>1/4</i>	<i>98</i>					<i>Stratus</i>
	<i>2:43 p.m.</i>	<i>24.42</i>	<i>70 49</i>	<i>29.03</i>	<i>49 39 31</i>	<i>2</i>	<i>S.E.</i>	<i>2</i>	<i>.02</i>	<i>2/4</i>						<i>Stratus</i>
<i>Saturday Nov 25</i>	<i>4:43 p.m.</i>	<i>24.60</i>	<i>68 17</i>	<i>29.60</i>	<i>17 15 75</i>	<i>18</i>	<i>N.E.</i>	<i>18</i>	<i>1.62</i>	<i>3/4</i>	<i>32.7</i>					<i>Light scud fl</i>

**2391**

**Denver November 19-25, 1871**



# Weather reports began on Pikes Peak in 1873



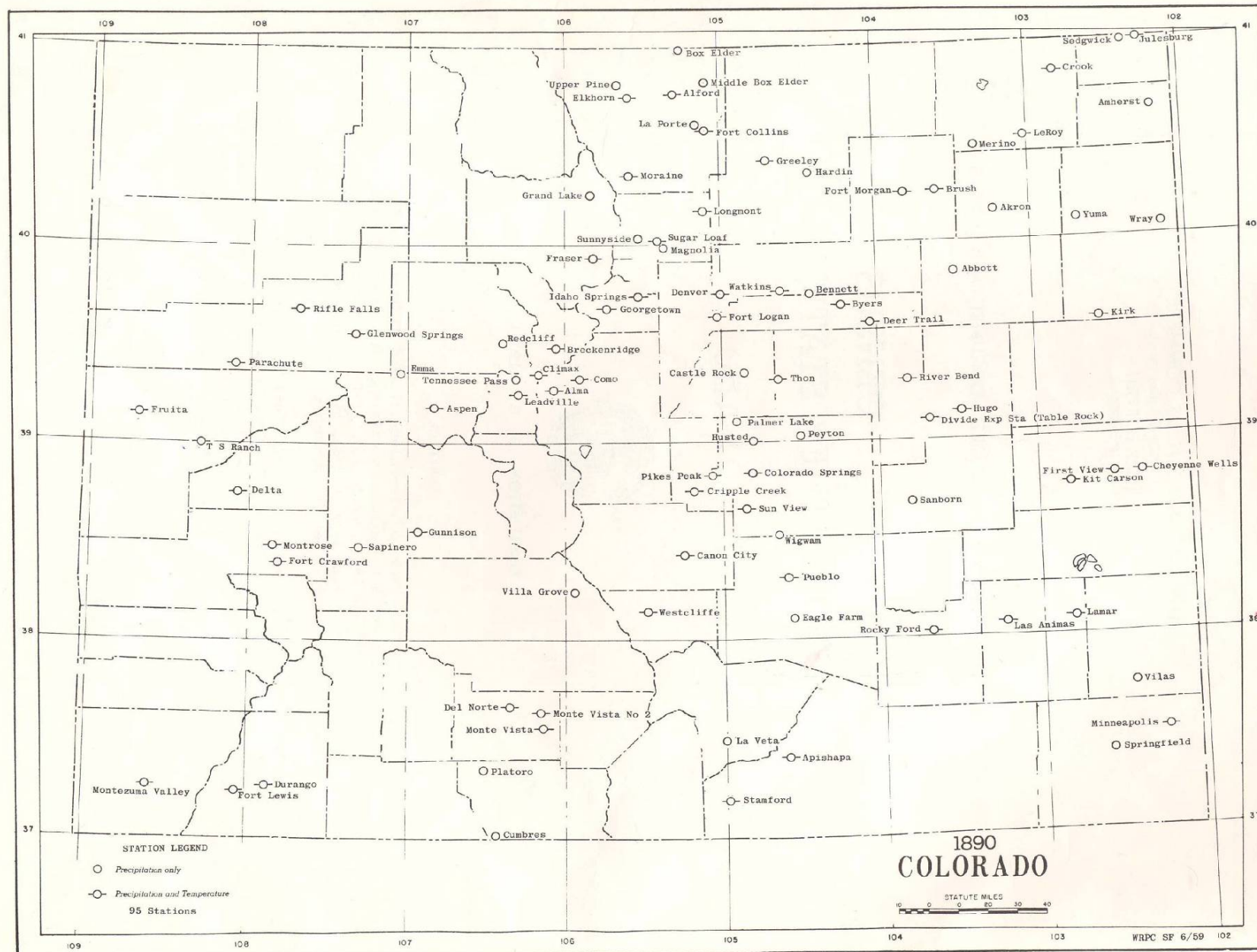
Credit: NOAA Photo Library

U. S. STATION & WEATHER BUREAU ON PIKES PEAK ALT 14147 FT - HIESTAND PHOTO

Reports were sent by telegraph every few hours

Stories abounded in the national media of the rigors of Colorado Climate

# By 1890 a robust statewide weather reporting network was in place



**Each passing year has revealed  
more about the climate of our state**

—

Spatial patterns,  
seasonal cycles,  
year to year variations  
occasional wild extremes  
Long-term changes

# By 1885 initial “climatology” of Colorado was taking shape

The semiarid and highly variable nature of Colorado was identified.



Denver Monthly Precipitation (1872 - 1885)

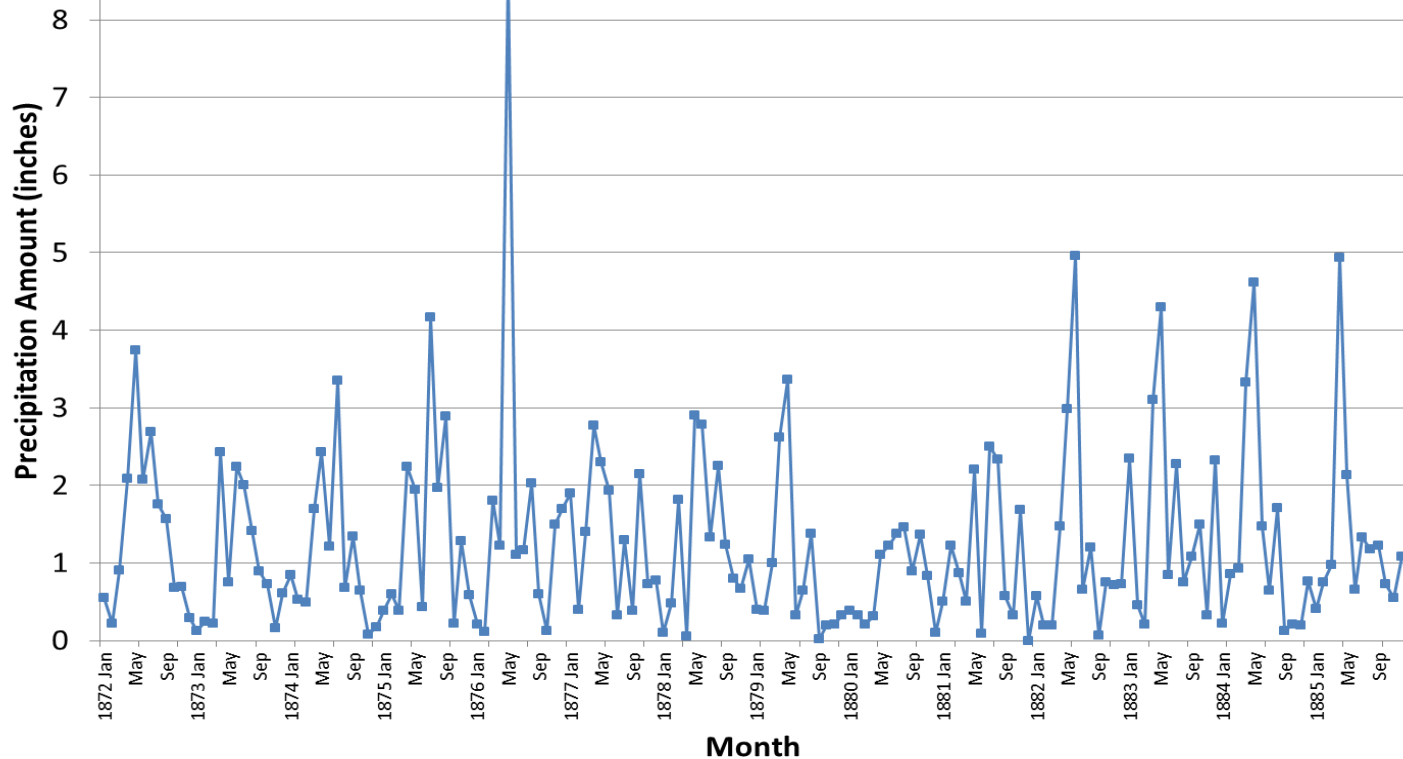
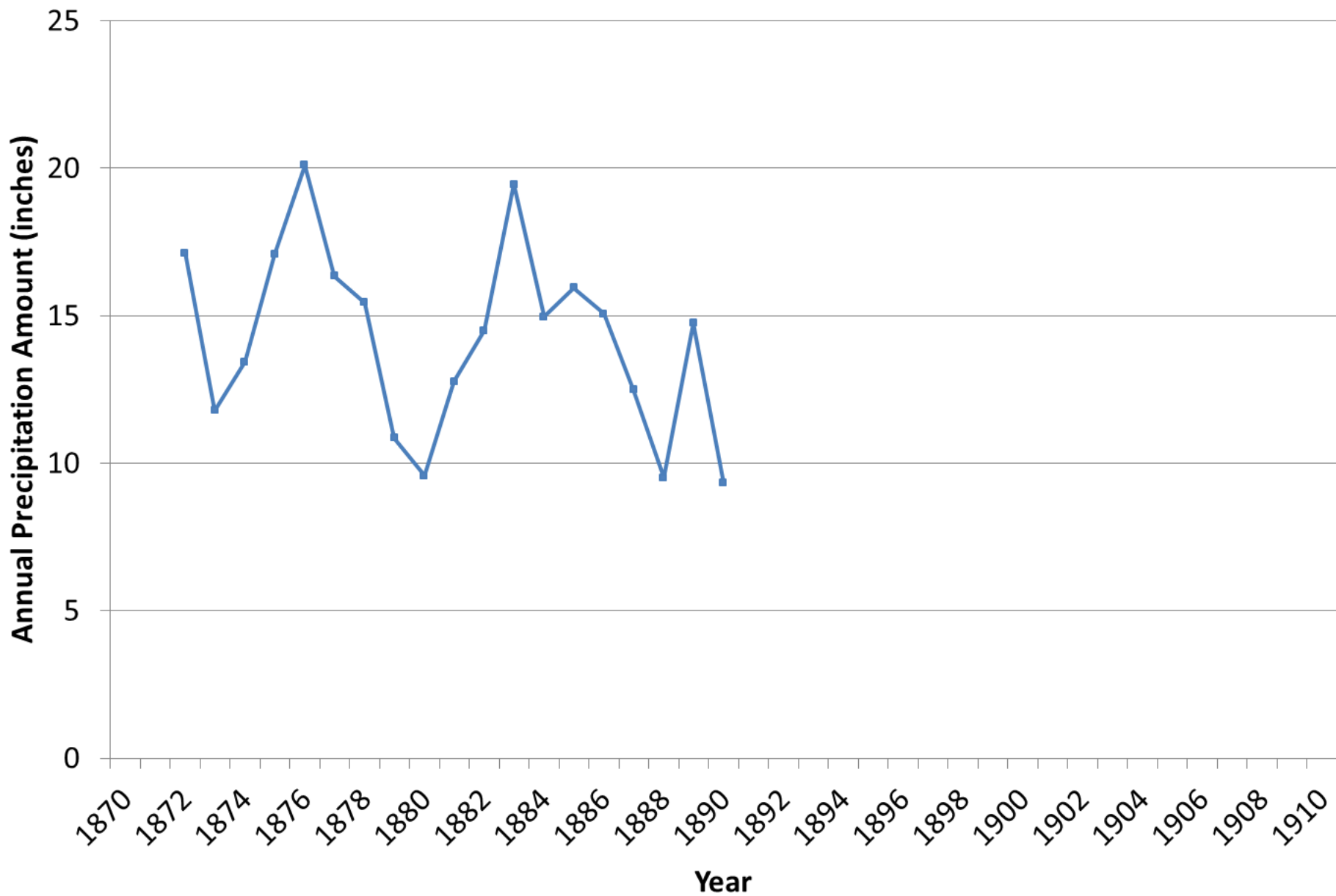
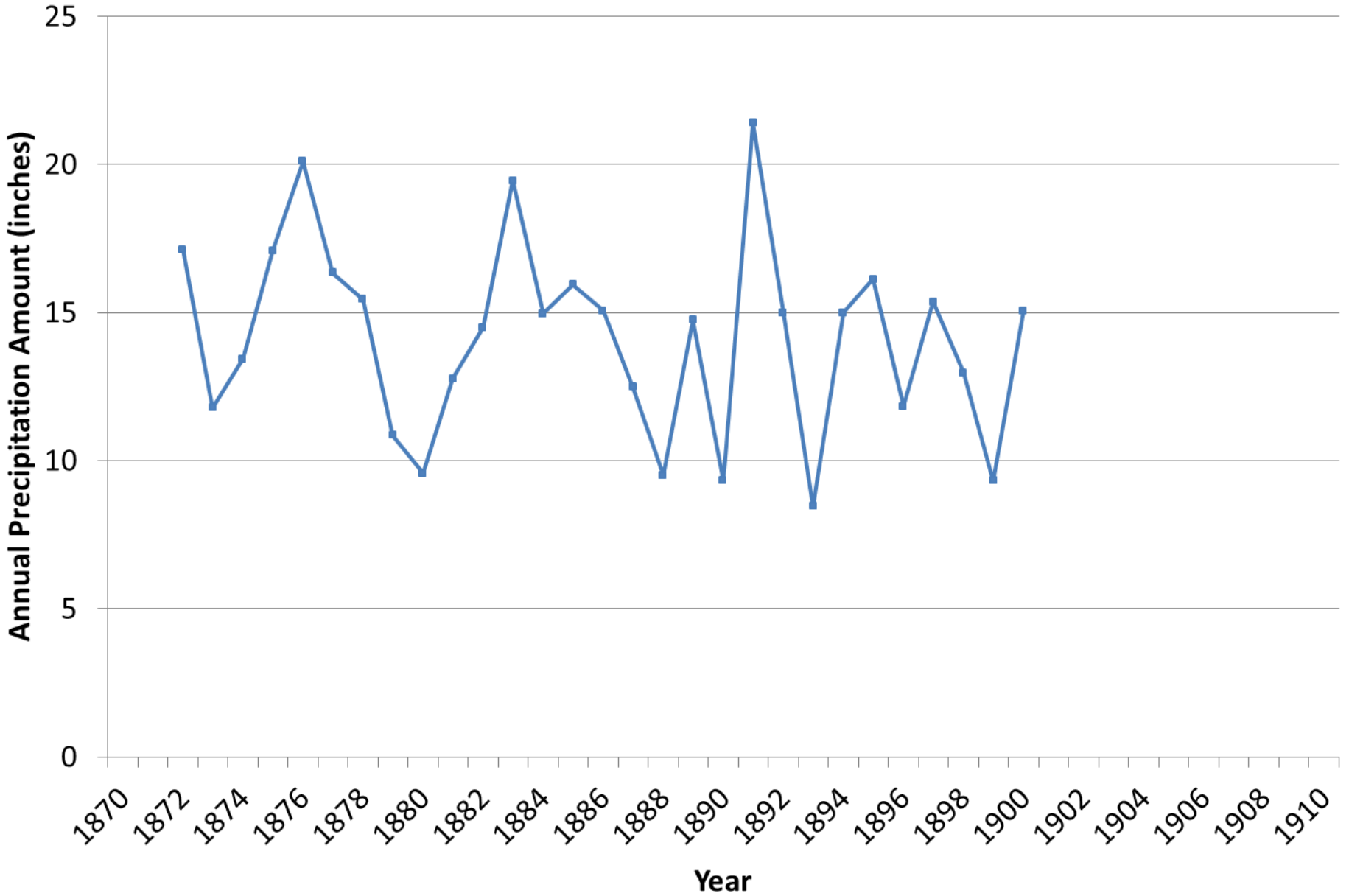


Photo Credit:  
NOAA Photo  
Library

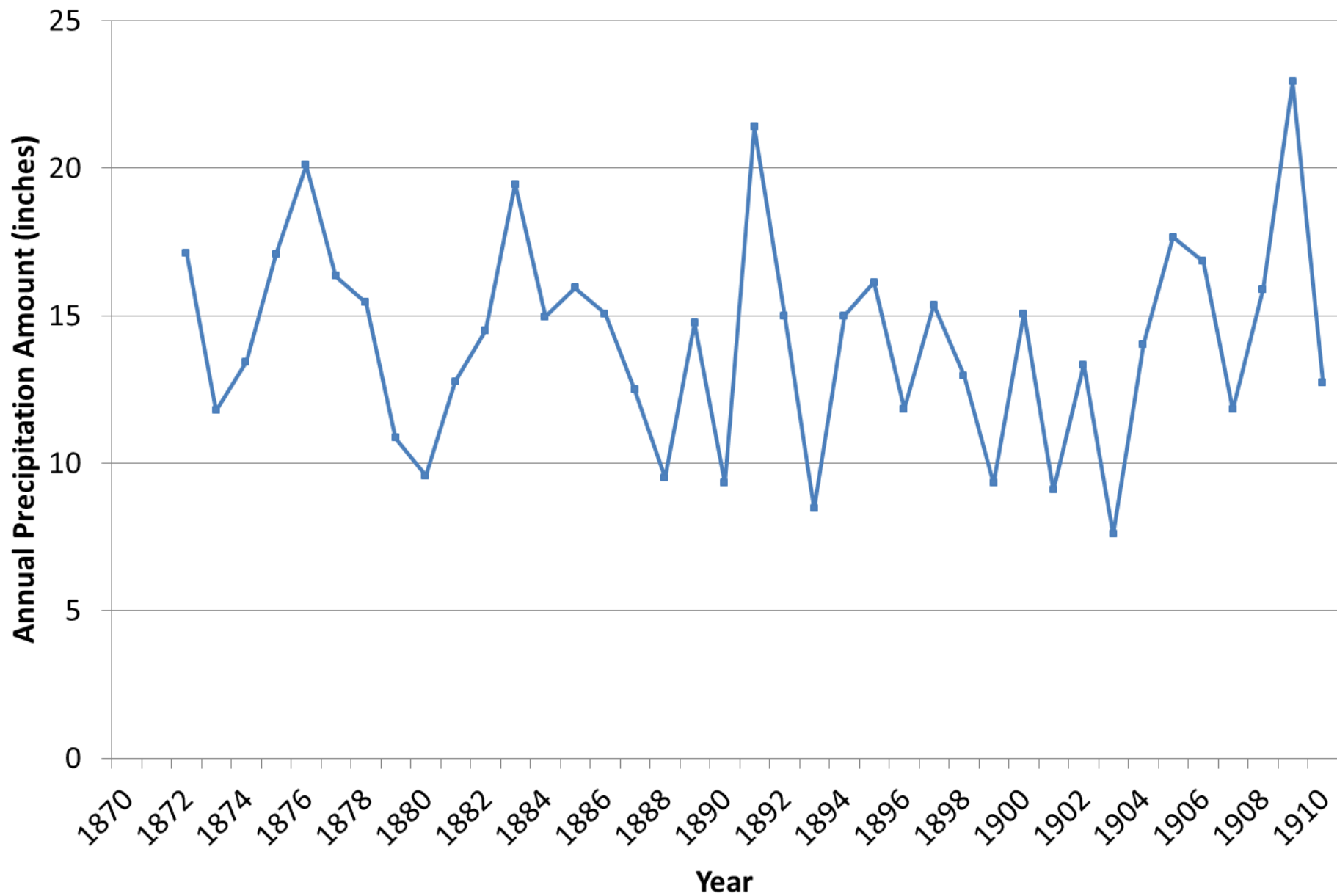
# Denver Annual Precipitation (1872-1890)



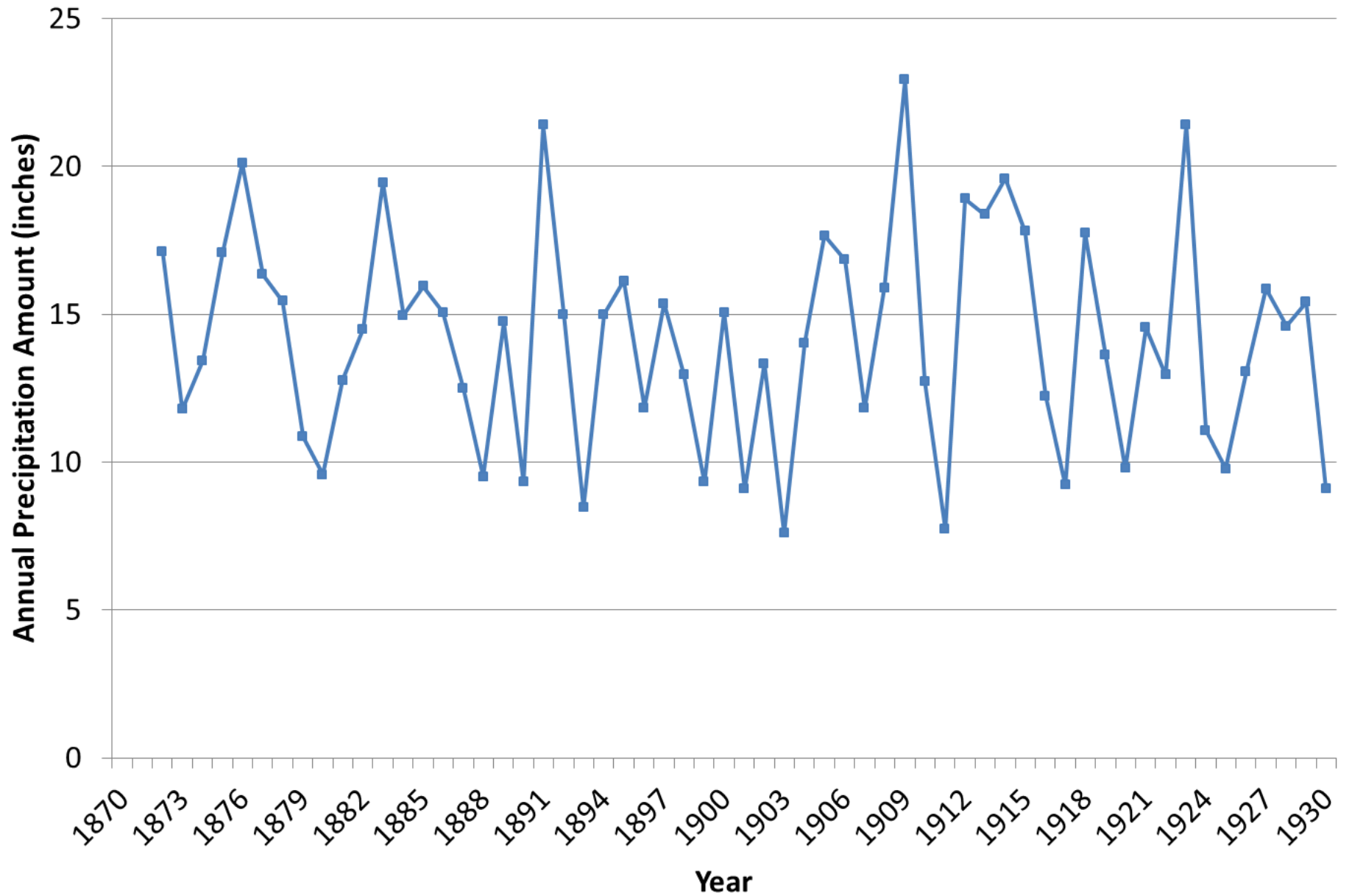
# Denver Annual Precipitation (1872-1900)



# Denver Annual Precipitation (1872-1910)



# Denver Annual Precipitation 1872-1930





Bulletin 245

June, 1918

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The Agricultural Experiment Station

OF THE

Colorado Agricultural College

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COLORADO CLIMATOLOGY

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By ROBERT E. TRIMBLE

... mean temperature of any section of the country.

Colorado being an arid state, the amount of precipitation is at all times a vital question. Liability to a marked deficiency in rainfall in any region is a matter of grave concern to those engaged in agriculture and other interests. We often hear it stated that the rainfall is changing, that the settling up of the country and the planting of trees and building of reservoirs, forming lakes and wet places throughout the country, is causing an increase in the amount of our precipitation, but long series of observations taken at different places over the world, do not bear out that claim.



YEARS OF STUDY SHOWS CLIMATE NOT CHANGING

We often hear the statement made that the climate is changing, and the popular belief that such is the case can only be explained by the generally short and defective memories of people who through exposure to a few severe storms in the past, or inconvenience, or perhaps loss from a few of them, unintentionally exaggerate the severity and frequency of their occurrence. Although large fluctuations occur in different years with some indication of periodical terms, especially in Colorado, where the range of temperature is great, there seems to be no progressive change. These fluctuations are large and often in the same direction for several successive years.

In the meteorological data for the last one hundred years, the record of some places extending still further back there

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PUBLISHED BY THE EXPERIMENT STATION  
FORT COLLINS, COLORADO  
1918



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

**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.**

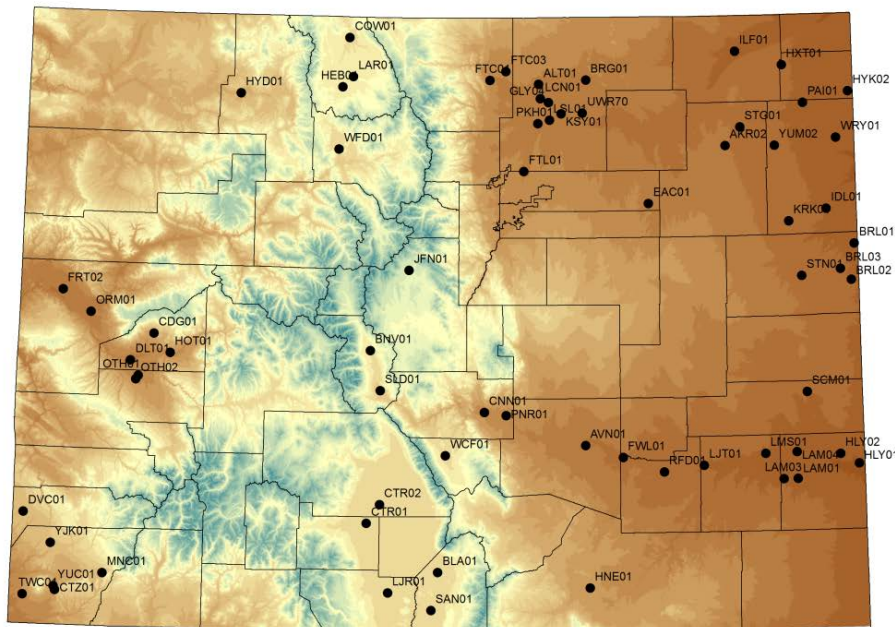


**Approximately 5000 daily max/min temperature stations, 8000 daily precipitation stations, 3000 automated hourly precipitation stations.**

# Many other sources of weather data have been added since the 1970s

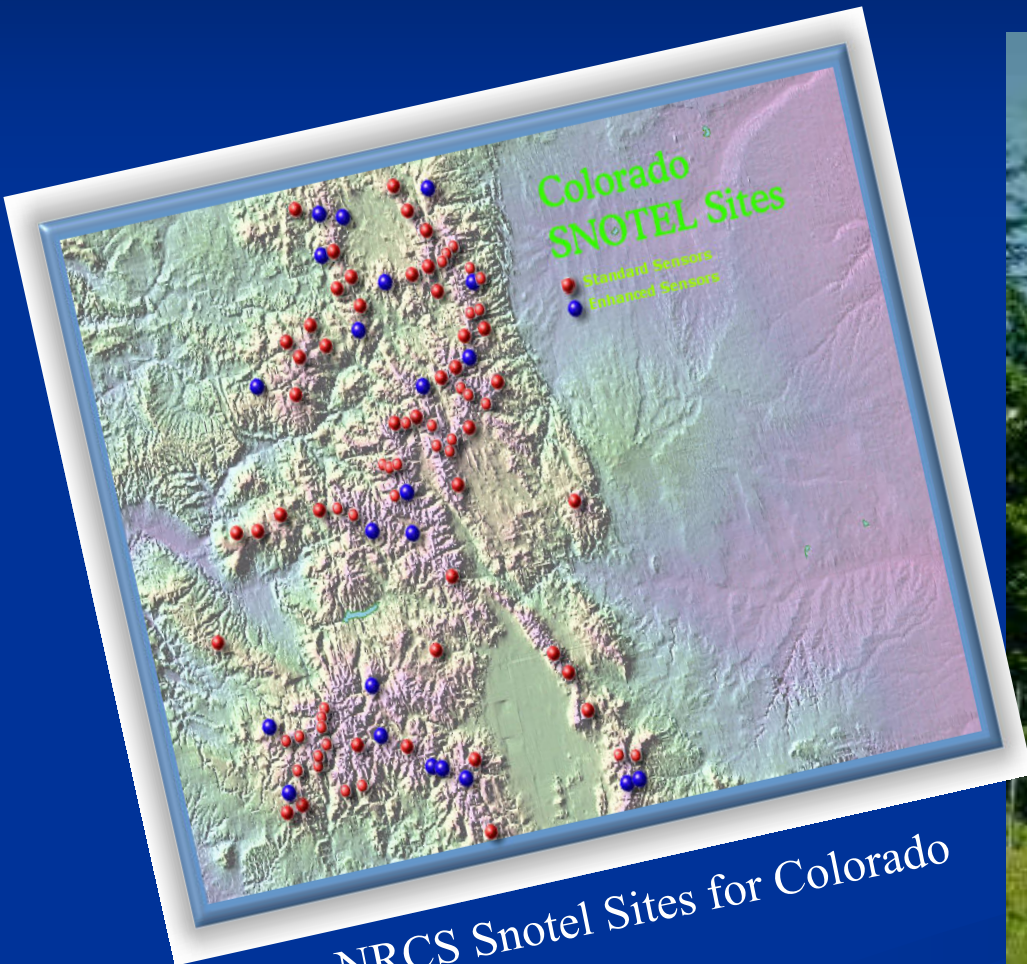
## CSU's Colorado Agricultural Meteorological Network "CoAgMet"

Current CoAgMet Station Locations - July 2012



**THANKS!! to those of You who help support CoAgMet**

# USDA, Natural Resources Conservation Service

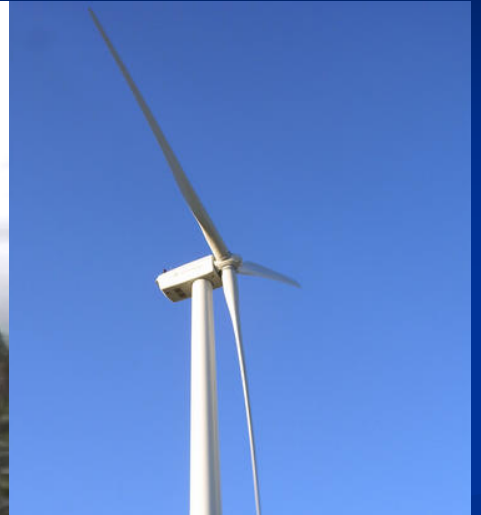


NRCS Snotel Sites for Colorado



Typical NRCS Snotel Site

# And all the others collecting weather and climate data



**What have we  
learned from 125  
years of continuous  
climate monitoring?**



# This is What Make's Our Colorado Climate

- High elevation (highest state in the Union – by far)
- Mid-Latitude location (lively seasonal changes)
- Interior Continental Location far from atmospheric moisture sources
- Complex Mountain topography
- Solar energy and seasonal cycles drive our climate



**I am happy to report that . . .**

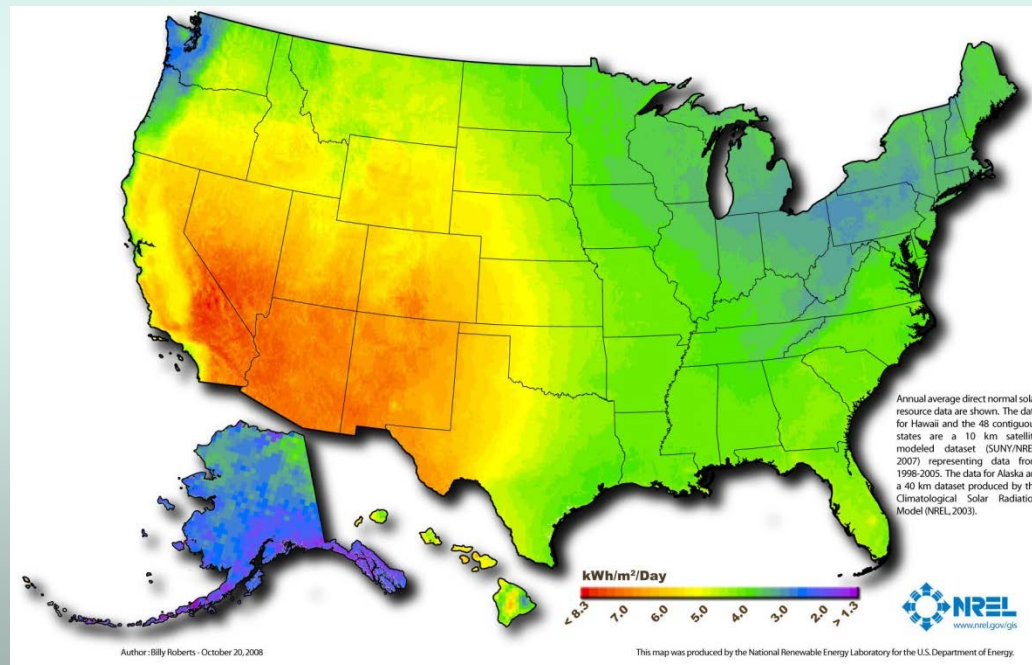
**Most aspects of our climate  
are not changing**



# Because, these remain unchanged

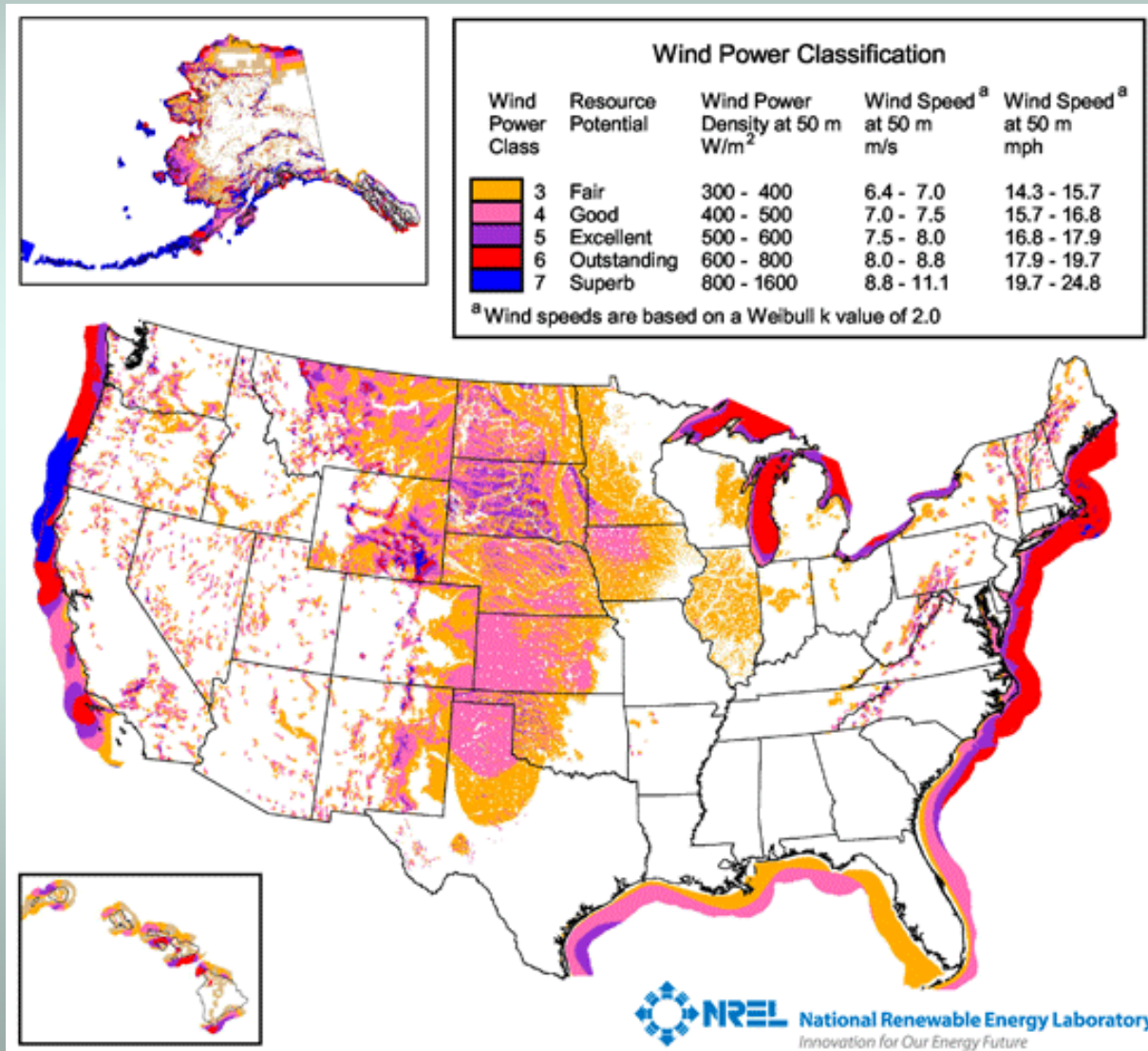
- High elevation (highest state in the Union – by far)
- Mid-Latitude location (lively seasonal changes)
- Interior Continental Location far from atmospheric moisture sources
- Complex Mountain topography
- Solar energy and seasonal cycles drive our climate

Colorado has and will continue to  
be a bright and sunny place –  
most of the time  
and we'll not be too hot or too cold  
– most of the time



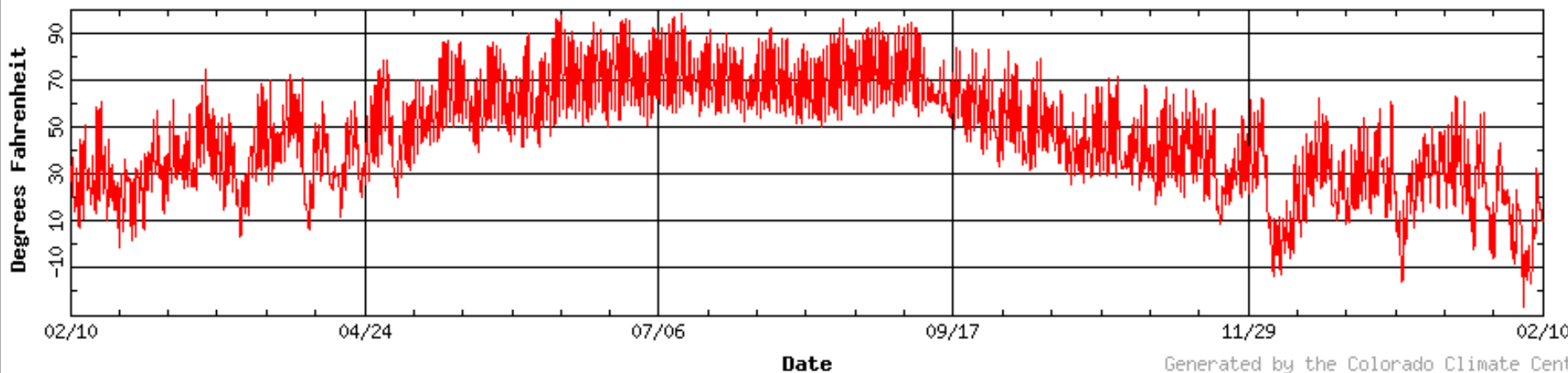
National Renewal Energy Laboratory: [www.nrel.gov](http://www.nrel.gov)

# The winds will blow, but not as much as some places





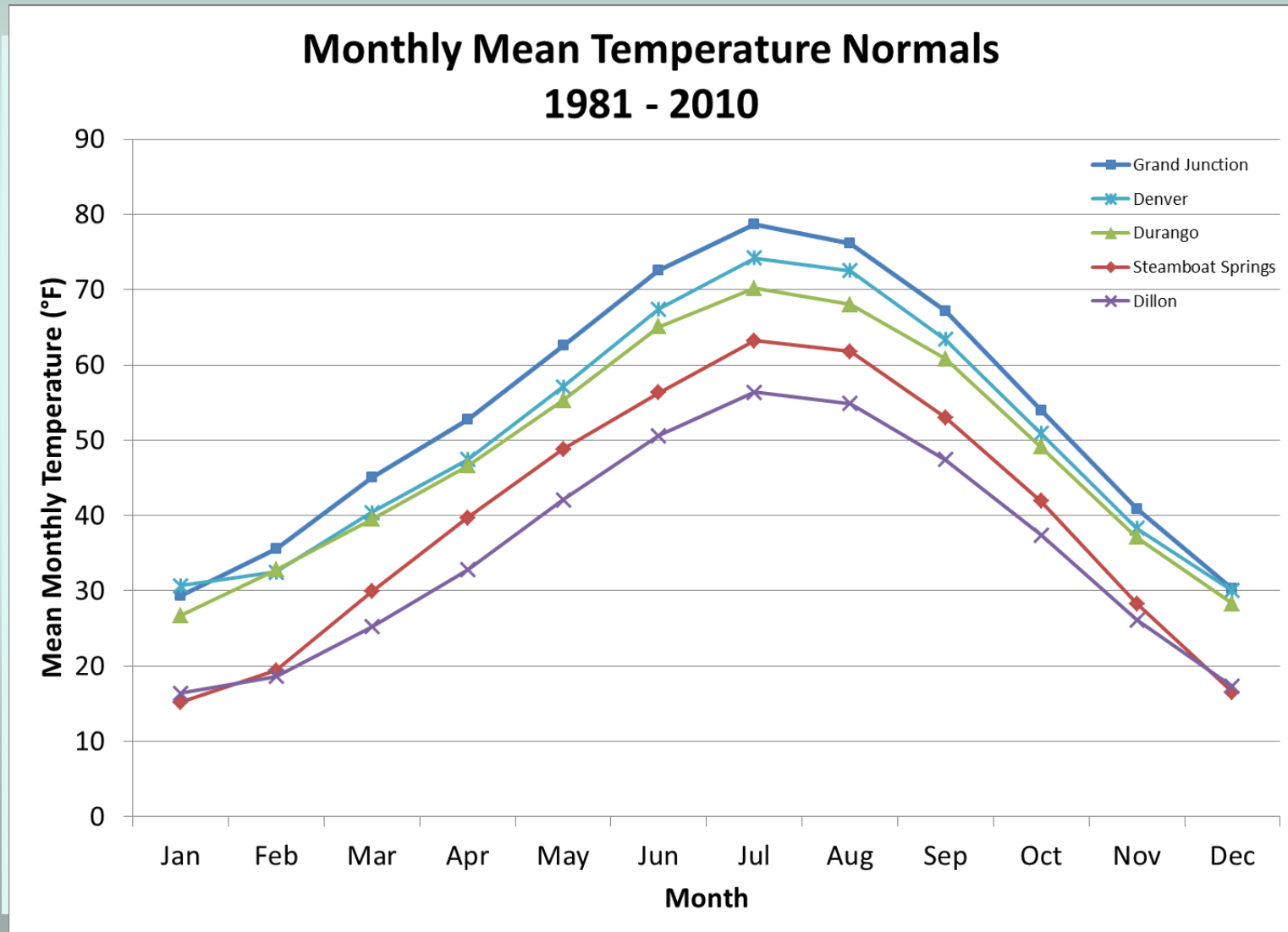
Temperature for GLY04 (02-10-2013 - 02-10-2014)



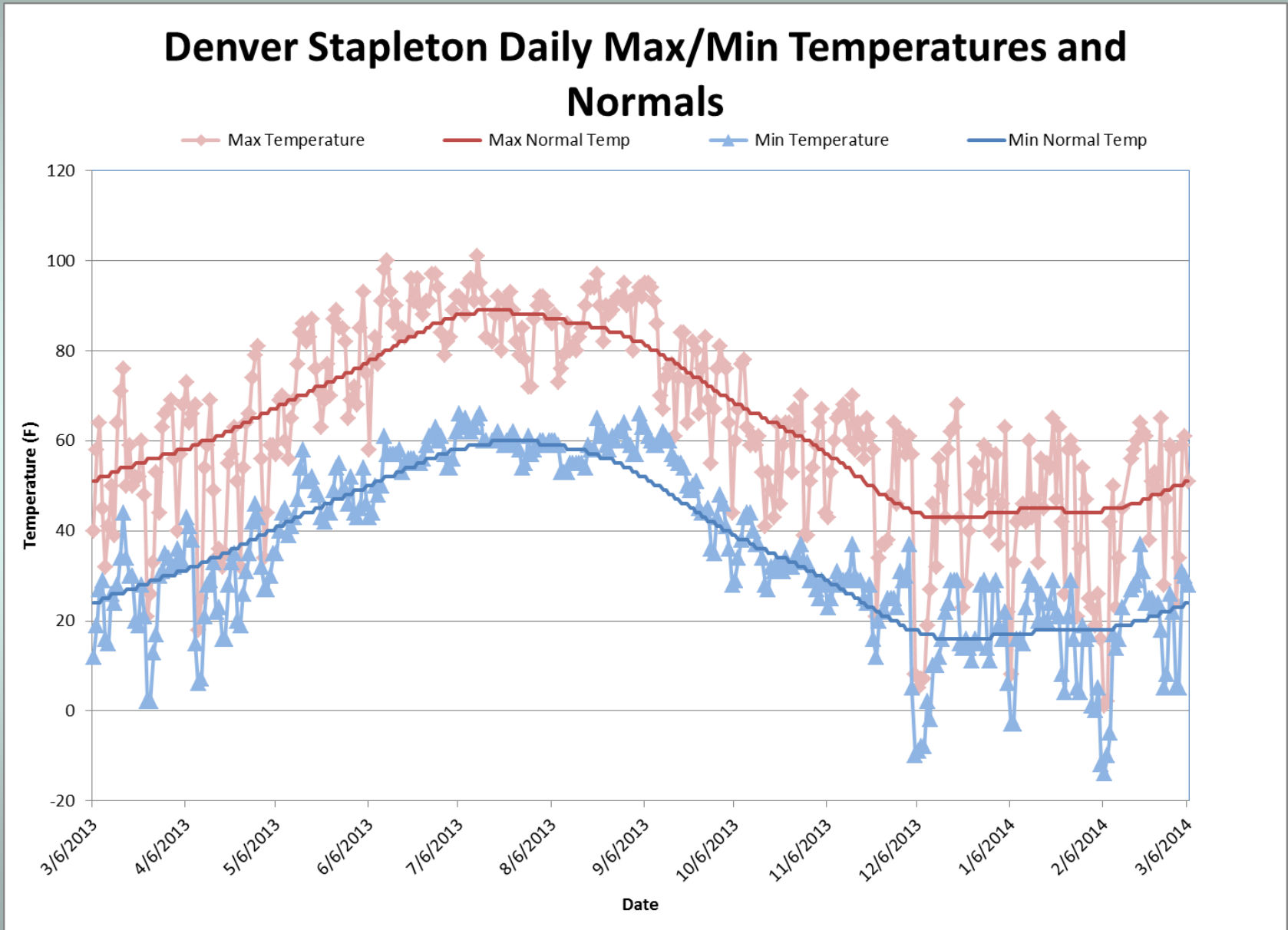
Generated by the Colorado Climate Center

**Large Seasonal and diurnal  
Temperature Variations will  
continue**

# Nice smooth graphs like this of average monthly temperatures – this is a way of looking at CLIMATE

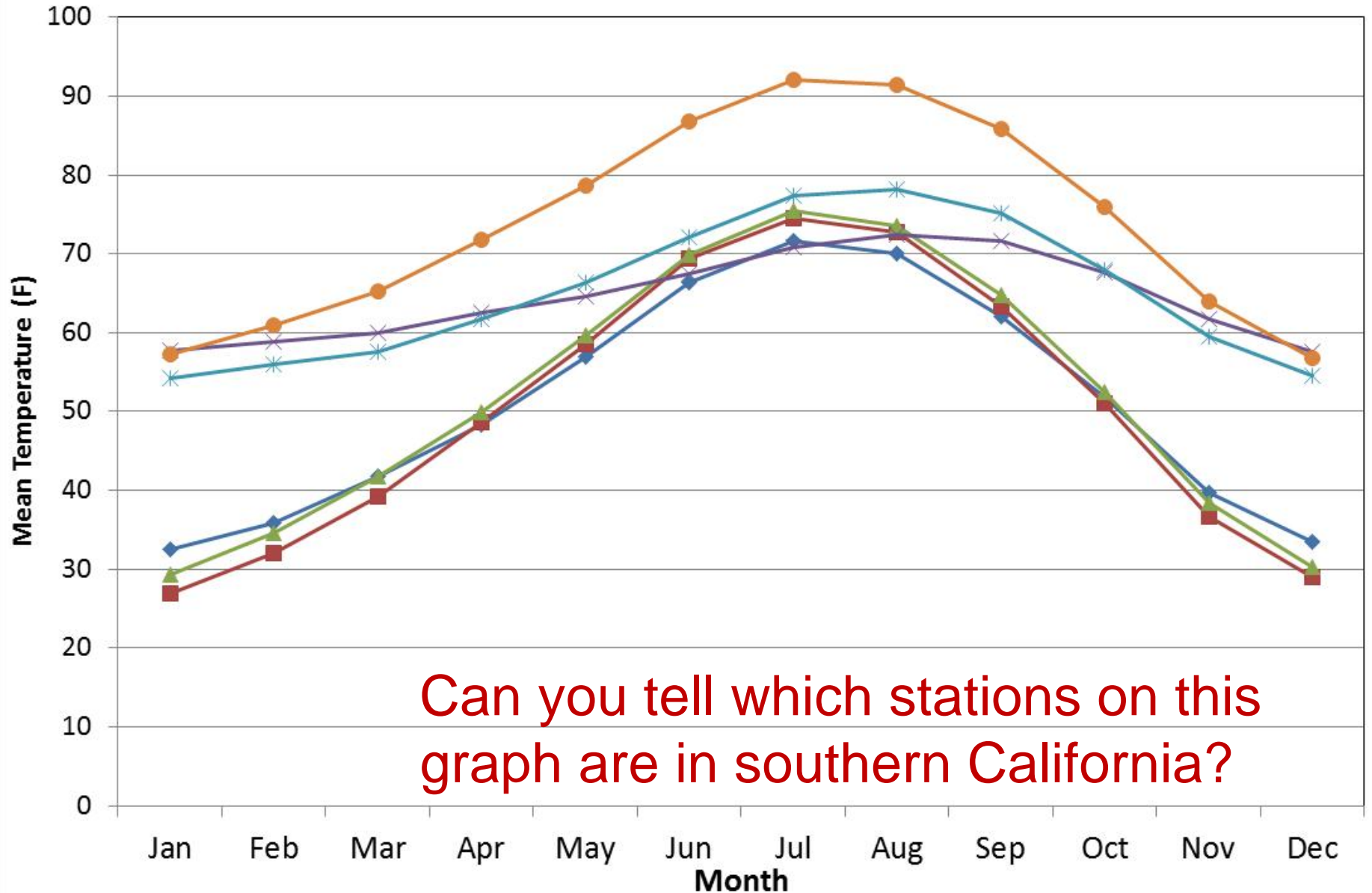


But this is how daily weather, over time, defines our climate



## Average Monthly Temperatures (F) for selected sites in CO and CA

BOULDER HOLYOKE PUEBLO AP SAN DIEGO LINDBERGH AP RIVERSIDE CITRUS EXP ST PALM SPRINGS

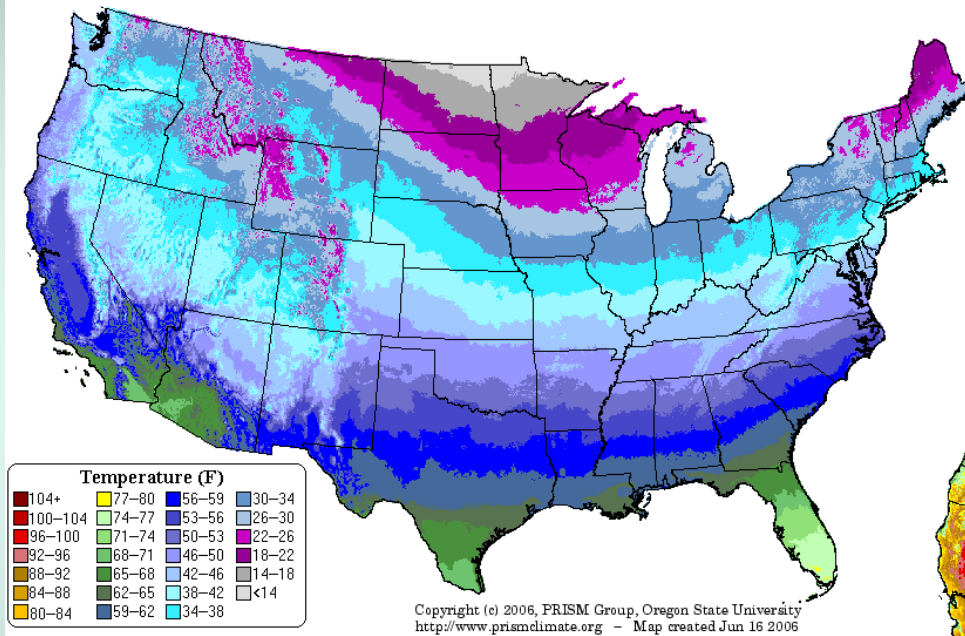


Can you tell which stations on this graph are in southern California?

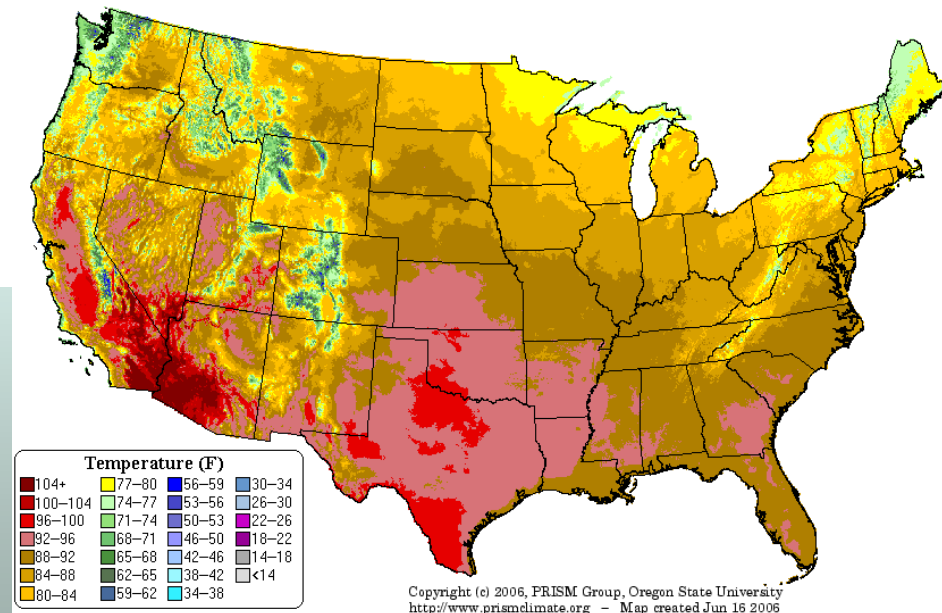


# Complex local variations due to elevation and topography

Maximum Temperature: January Climatology (1971–2000)



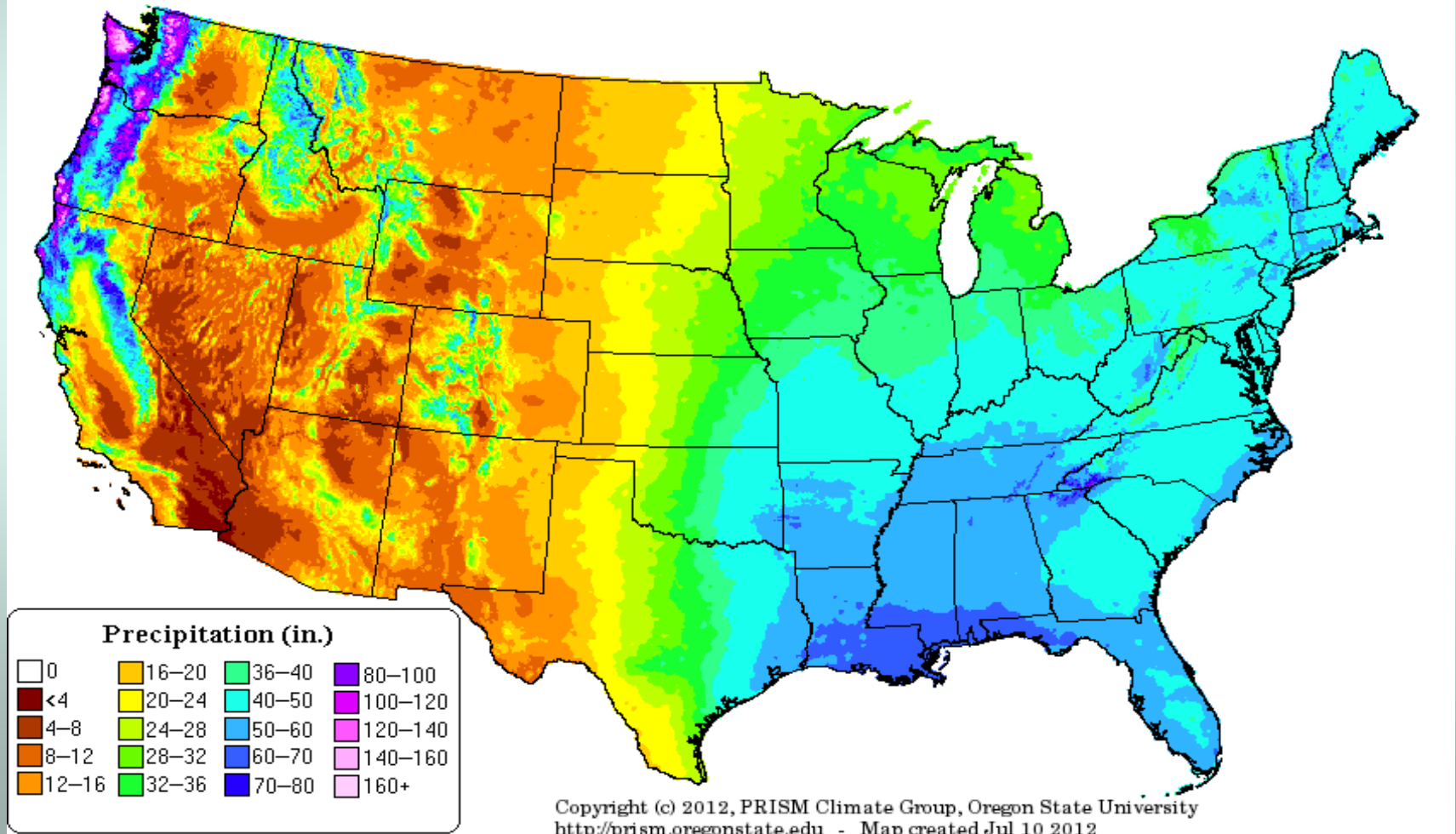
Maximum Temperature: July Climatology (1971–2000)



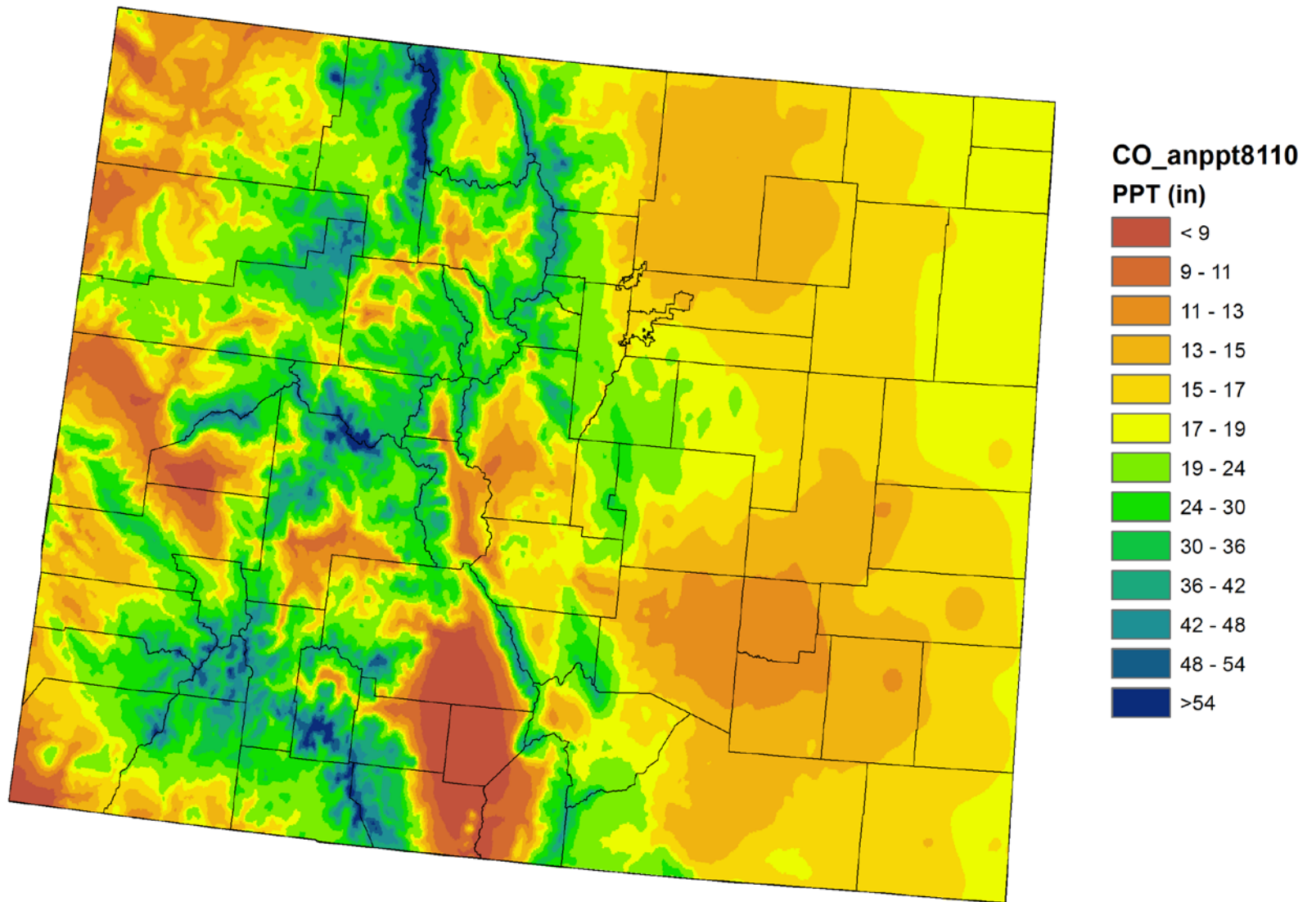
Usually colder in the mountains!

# We'll still get rain and snow – but often not enough

**Precipitation: Annual Climatology (1981-2010)**



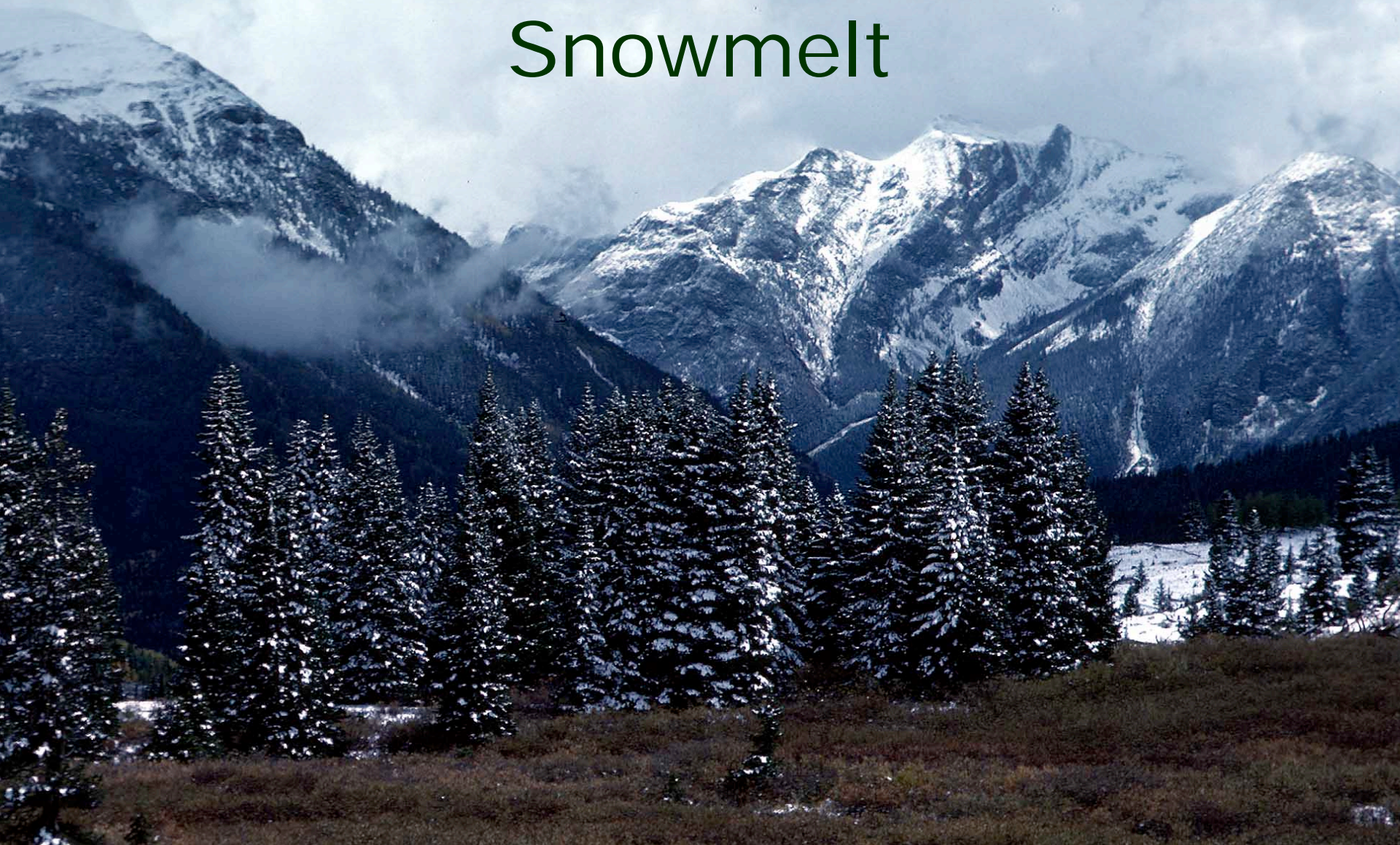
# Colorado Annual Average Precipitation (in) 1981-2010



**We'll still get some of this  
moisture as snow**

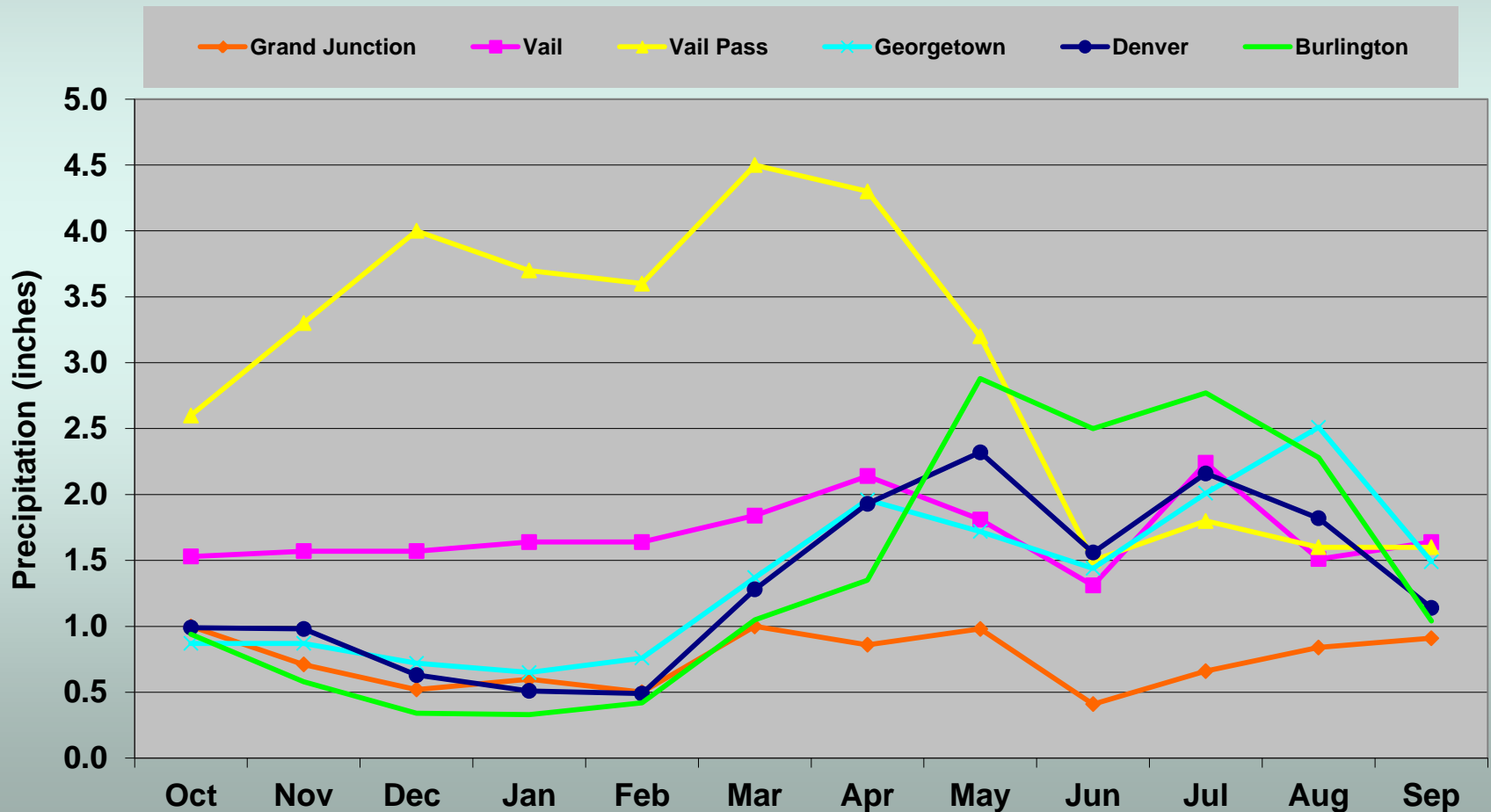


# Most Surface Water Supplies in Colorado Come From Mountain Snowmelt

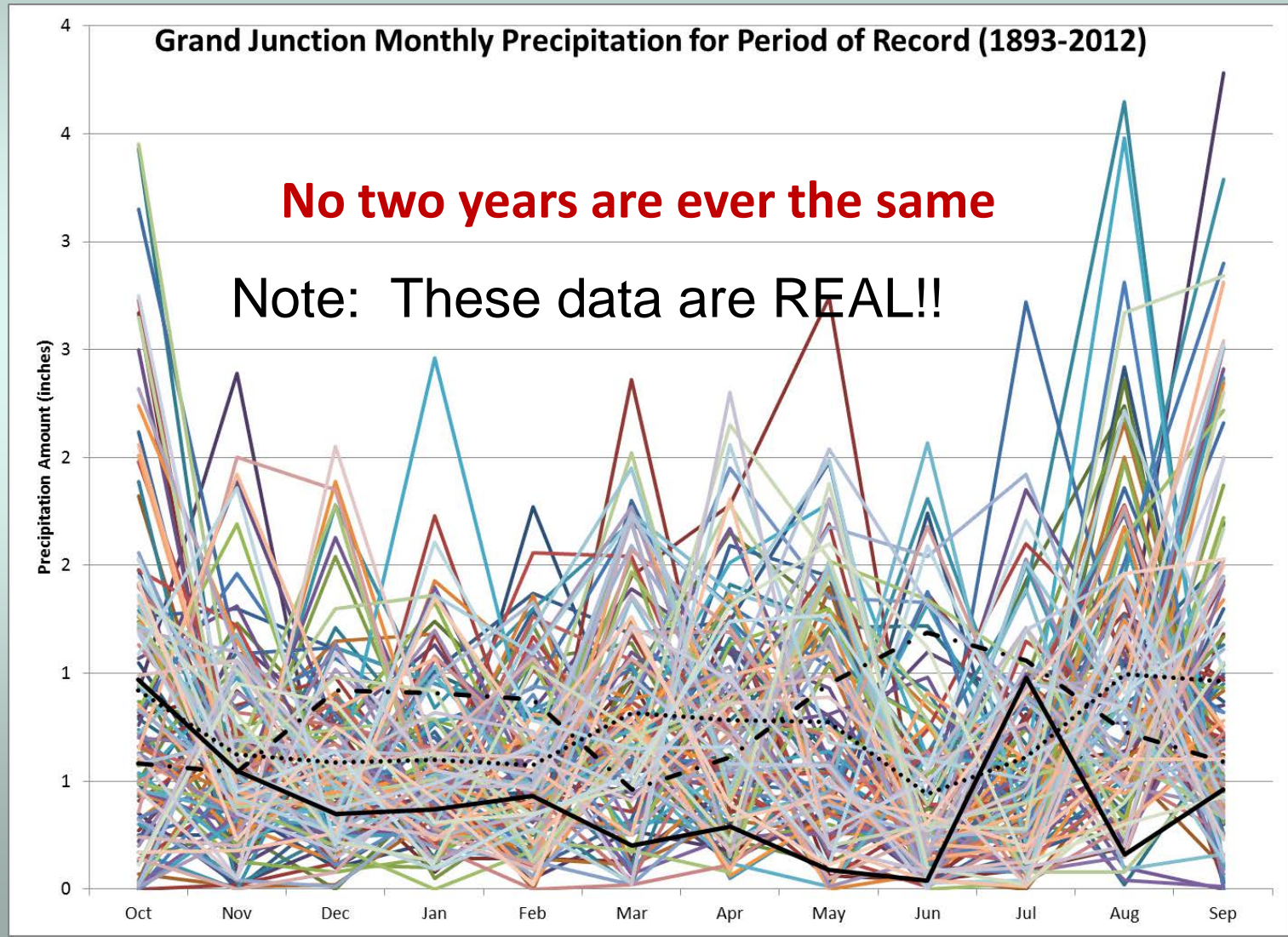


# Precipitation in Colorado will still vary greatly from place to place with changing seasons

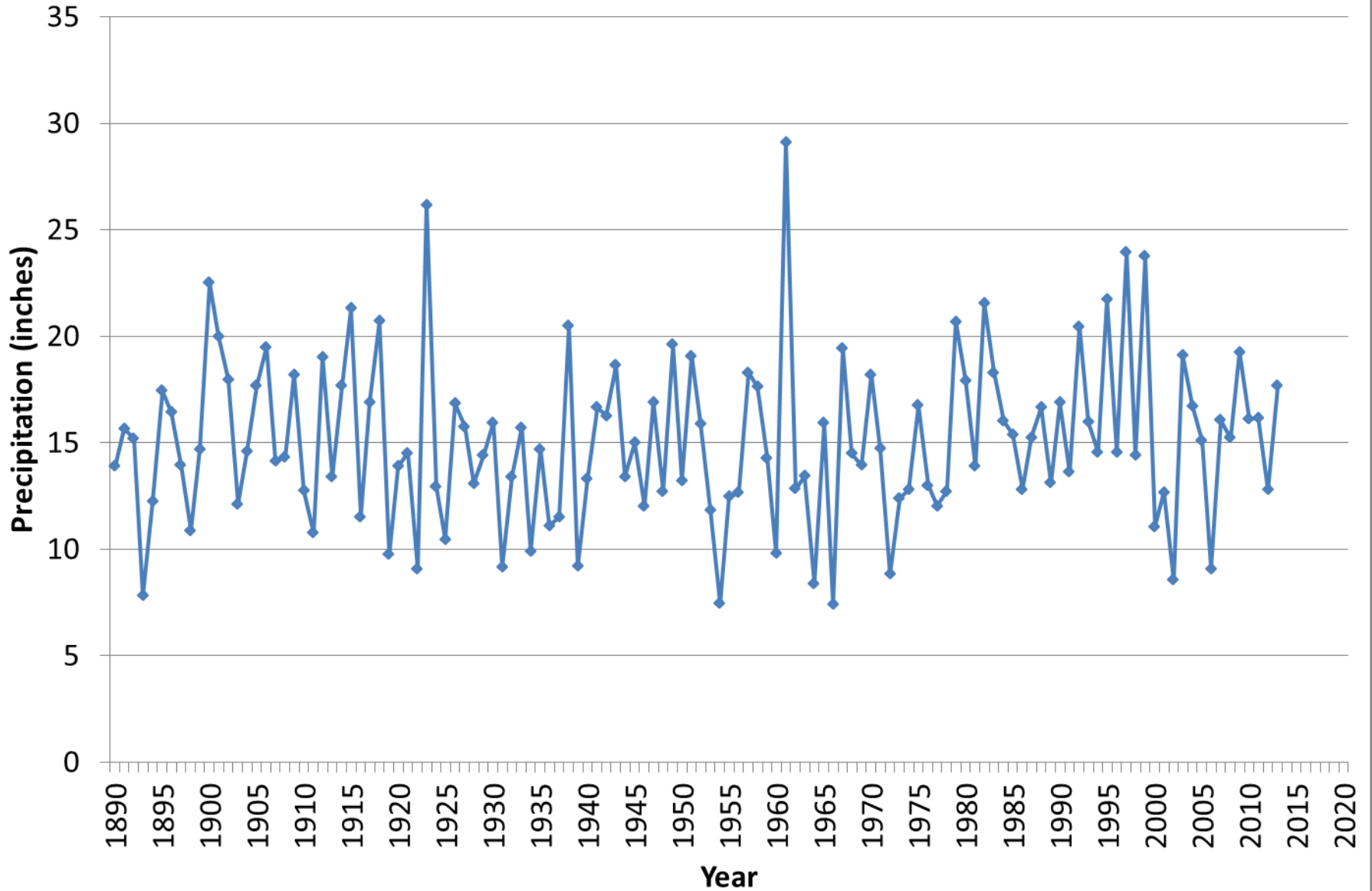
Water Year Average Precipitation for Selected Stations




# Variability will drive us crazy and keep us humble



# Fort Collins, CO Water Year Precipitation







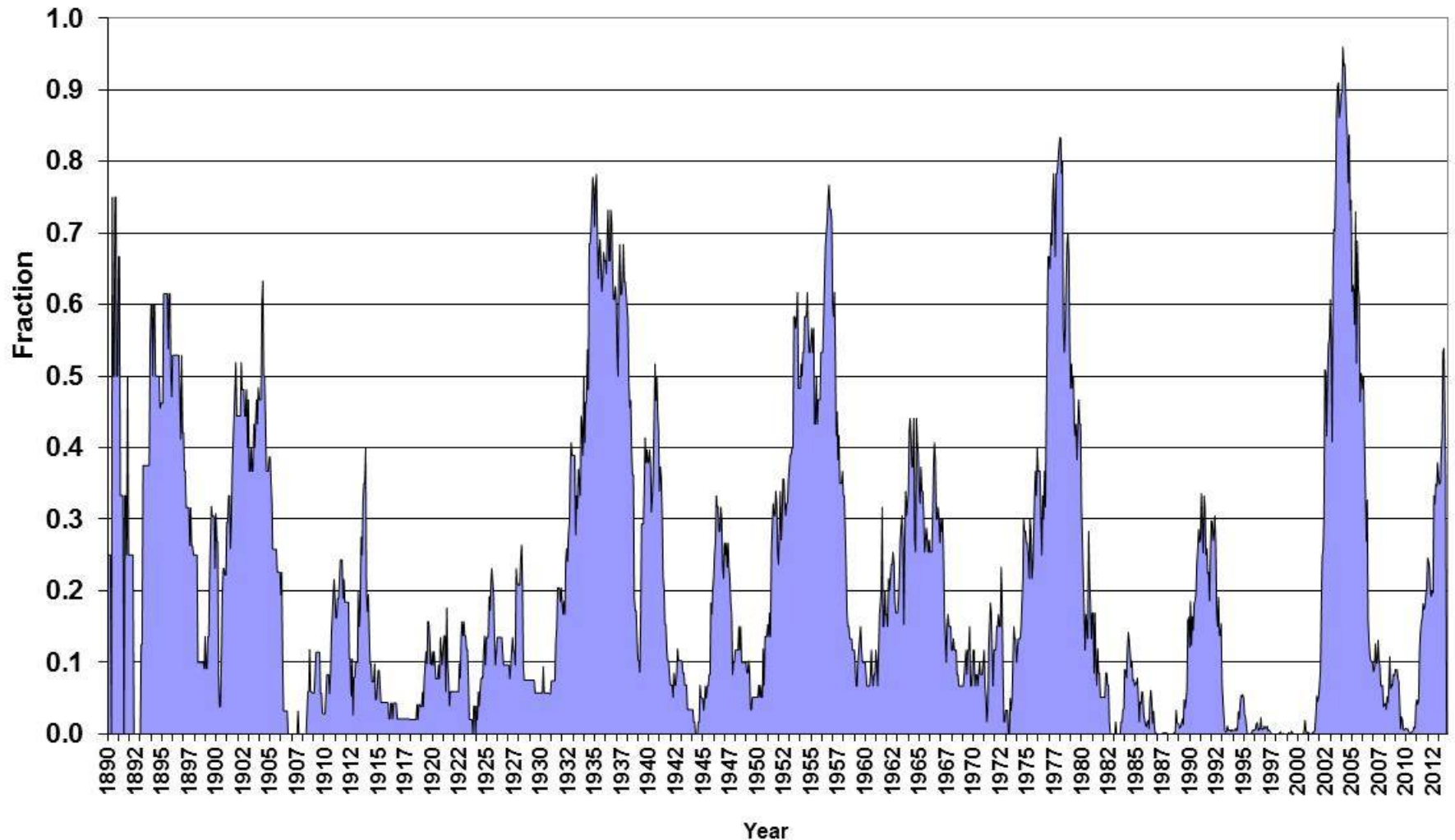
**And sometimes Drought  
will just about put us under  
and make us really irritable**

Photo by Lyric Lucero  
2013 Manzanola, CO

# Fraction of Colorado in Drought

## Based on 48 month SPI (SPI <-1)

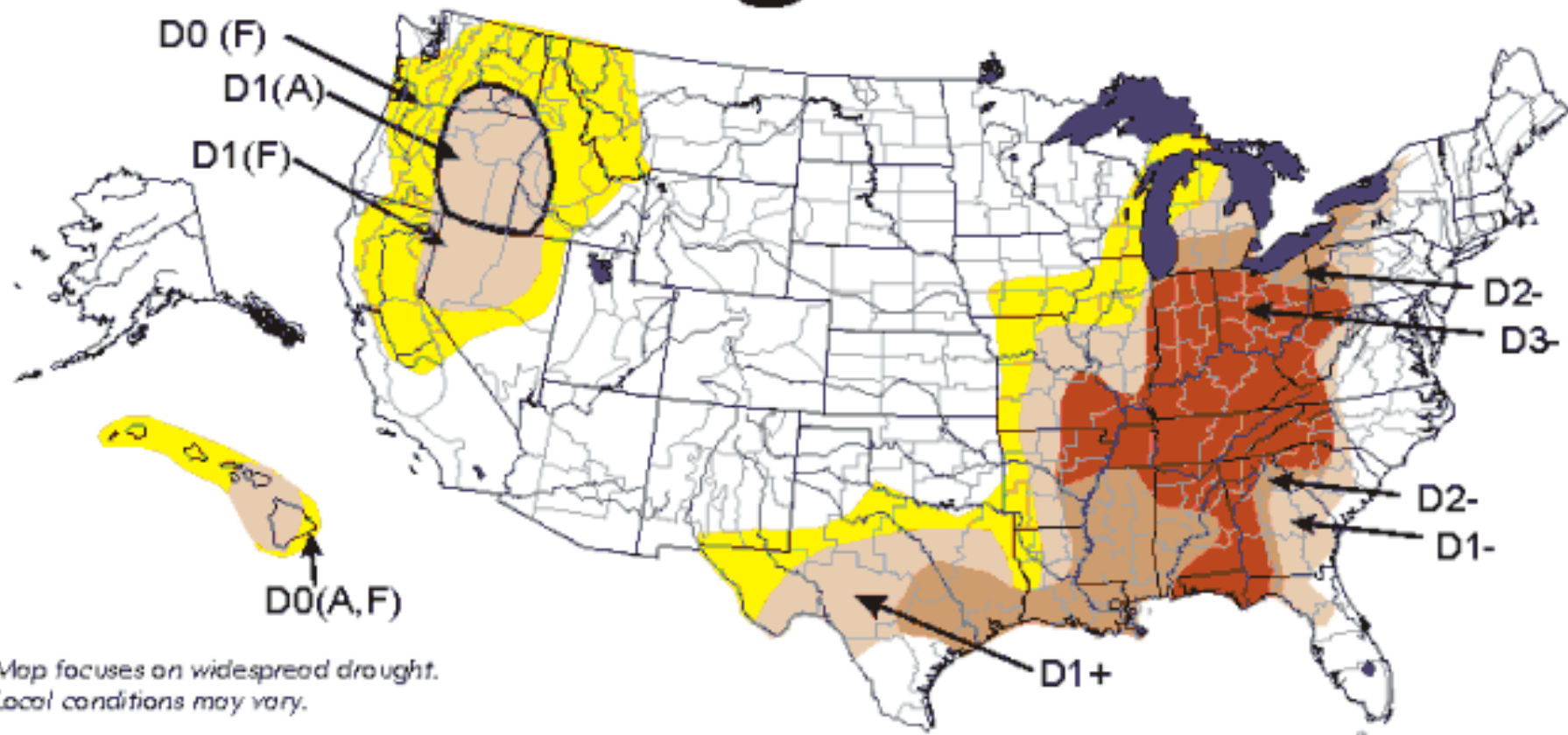
(1890 - September 2013)



**Our ongoing journey**  
**In and out of Drought**  
**by way of the U.S.**  
**Drought Monitor**

September 28, 1999

# U.S. Drought Monitor



Map focuses on widespread drought.  
Local conditions may vary.

- |                              |  |
|------------------------------|--|
| D0 Watch                     | Drought type: used only<br>when impacts differ |
| D1 Drought                   |  |
| D2 Drought—Severe            |  |
| D3 Drought—Extreme           |  |
| D4 Drought—Exceptional       |  |
| Delineates Overlapping Areas | F = Forest fire danger                         |
|                              | A = Agriculture                                |
|                              | W = Water                                      |

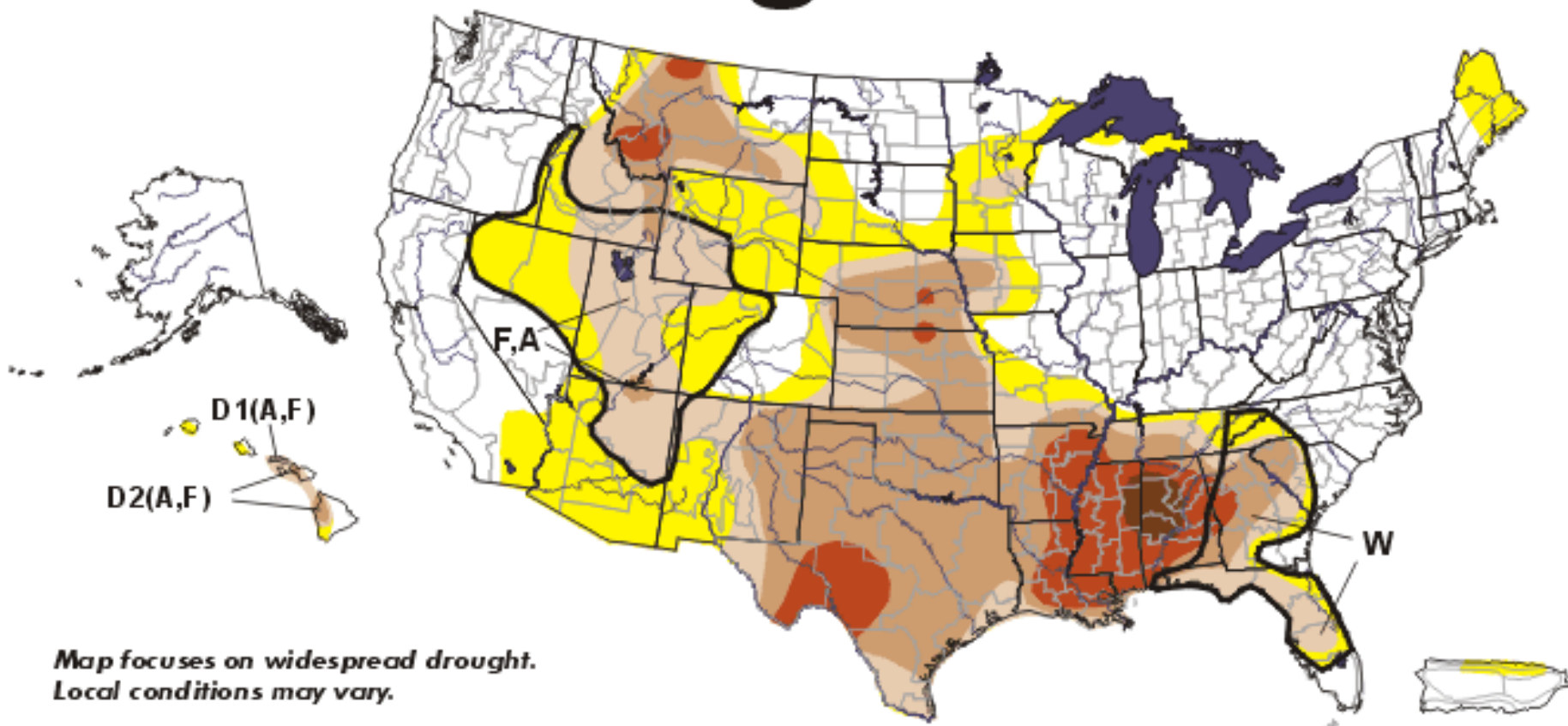


Plus (+) = Forecast to intensify next two weeks  
Minus (-) = Forecast to diminish next two weeks  
No sign = No change in drought classification forecast

• Released Thursday, Sep 30, 1999 •

October 3, 2000 Valid 8 a.m. EDT

# U.S. Drought Monitor



**Map focuses on widespread drought.  
Local conditions may vary.**

- |                              |   |
|------------------------------|---|
| D0 Abnormally Dry            | Drought type: used only when impacts differ |
| D1 Drought-First Stage       |   |
| D2 Drought-Severe            |   |
| D3 Drought-Extreme           |   |
| D4 Drought-Exceptional       |   |
| Delineates Overlapping Areas | A = Agriculture                             |
|                              | W = Water                                   |
|                              | F = Wildfire danger                         |



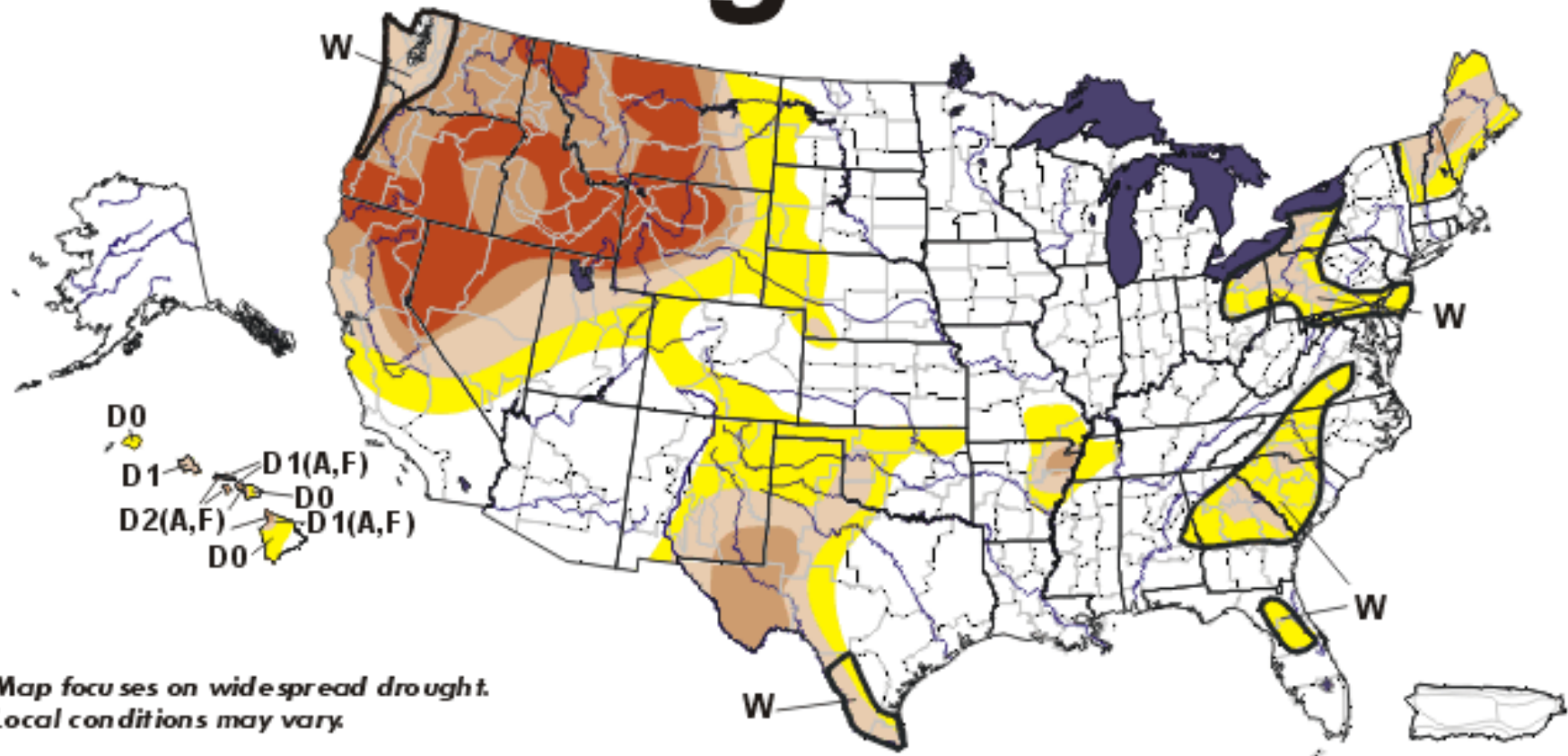
See accompanying text summary for forecast statements

<http://ens.o.unl.edu/monitor/monitor.html>

● Released Thursday, Oct. 5, 2000 ●

October 2, 2001 Valid 8 a.m. EDT

# U.S. Drought Monitor



Map focuses on widespread drought.  
Local conditions may vary.

- D0 Abnormally Dry
- D1 Drought-Moderate
- D2 Drought-Severe
- D3 Drought-Extreme
- D4 Drought-Exceptional
- Delineates Overlapping Areas

Drought Impact Types:  
A = Agriculture  
W = Water (Hydrological)  
F = Fire danger (Wildfires)  
(No type = All 3 impacts)



● Released Thursday, October 4, 2001 ●

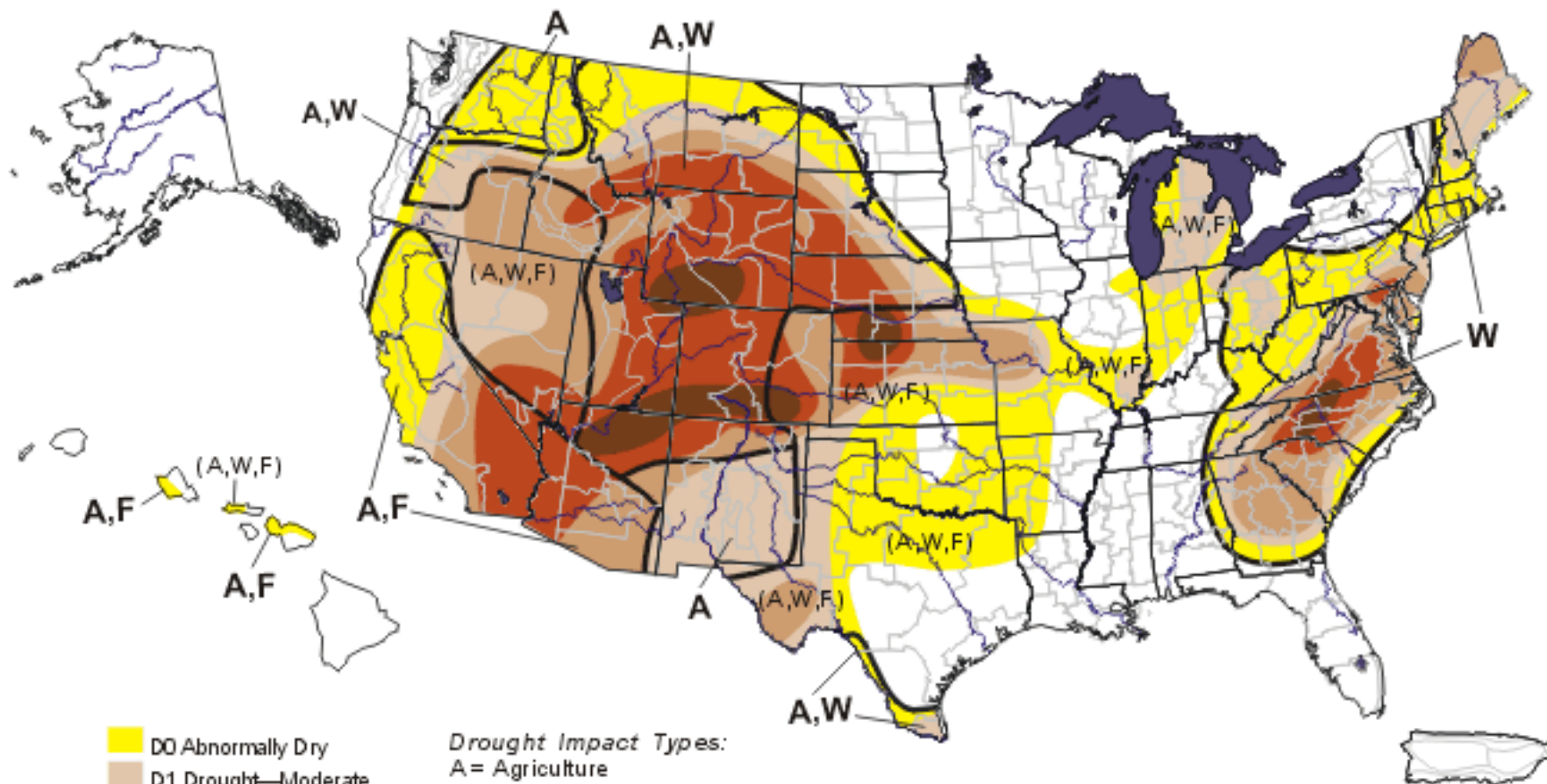
Author: Douglas Le Comte, NOAA/CPC






See accompanying text summary for forecast statements  
<http://ens0.unl.edu/monitor/monitor.html>

# U.S. Drought Monitor

October 1, 2002

Valid 8 a.m. EDT



-  D0 Abnormally Dry
-  D1 Drought—Moderate
-  D2 Drought—Severe
-  D3 Drought—Extreme
-  D4 Drought—Exceptional

*Drought Impact Types:*  
A = Agriculture  
W = Water (Hydrological)  
F = Fire danger (Wildfires)  
— Delineates dominant impacts  
(No type = All 3 impacts)

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

<http://drought.unl.edu/dm>



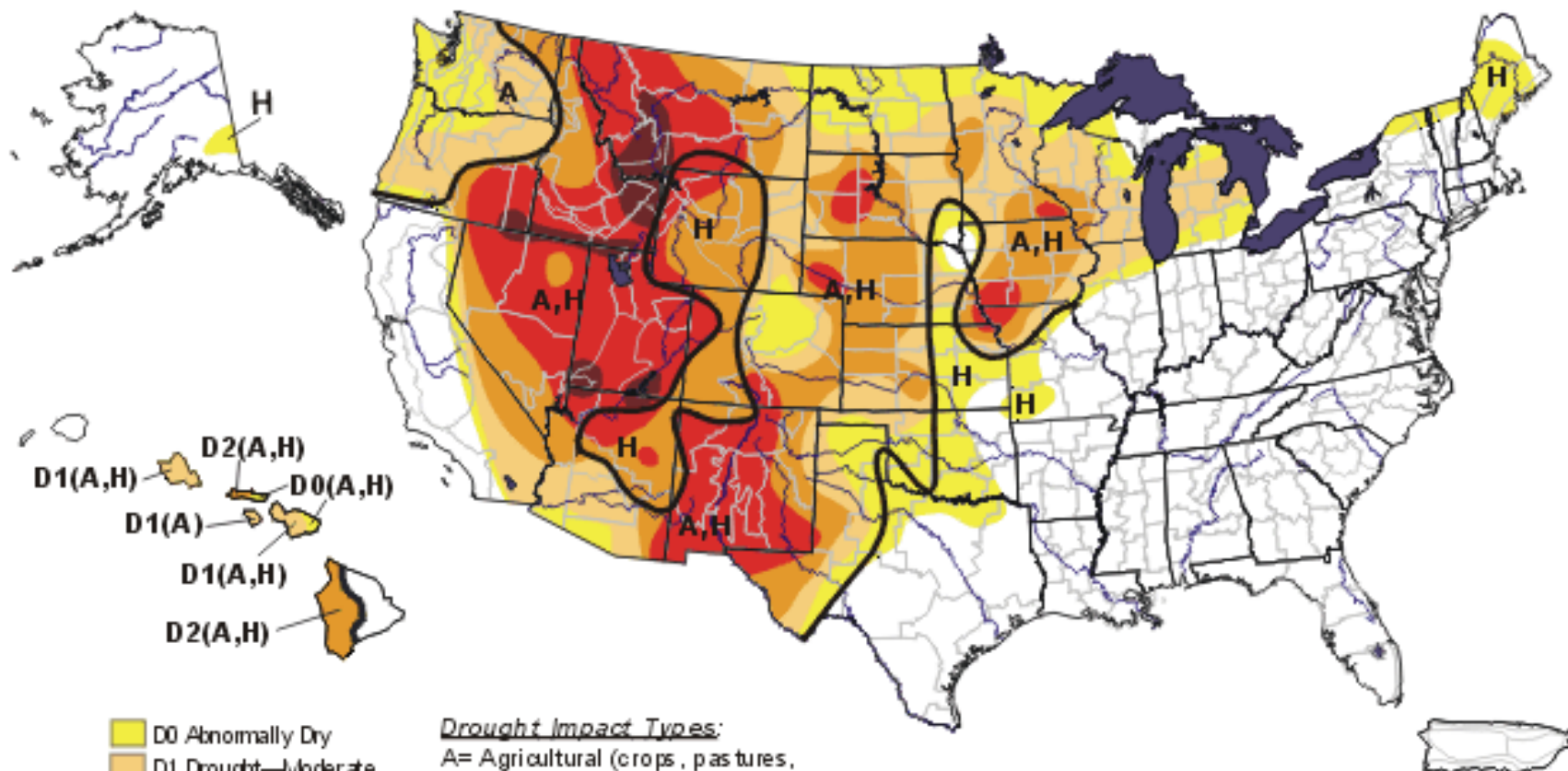
**Released Thursday, October 3, 2002**

**Author: Rich Tinker, CPC/NCEP/NWS/NOAA**

# U.S. Drought Monitor

September 30, 2003

Valid 8 a.m. EDT



- D0 Abnormally Dry
- D1 Drought—Moderate
- D2 Drought—Severe
- D3 Drought—Extreme
- D4 Drought—Exceptional

### Drought Impact Types:

A= Agricultural (crops, pastures, grasslands)

H= Hydrological (water)

No type = both impacts

Delineates dominant impacts

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

<http://drought.unl.edu/dm>



Released Thursday, October 2, 2003

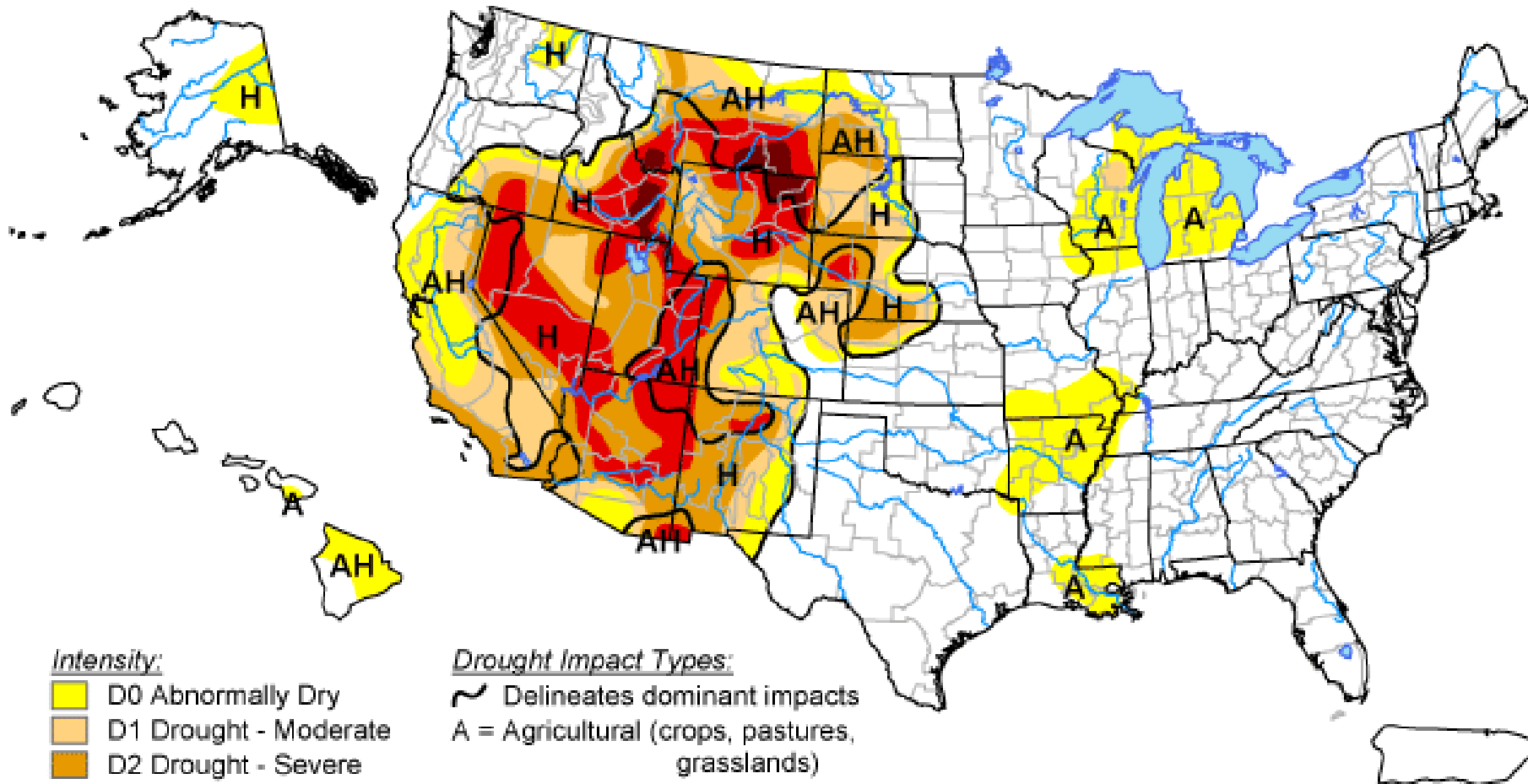
Author: Candace Tankersley/Scott Stephens, NOAA/NCDC








# U.S. Drought Monitor

September 28, 2004


Valid 8 a.m. EDT



Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)
- (No type = Both impacts)

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

<http://drought.unl.edu/dm>

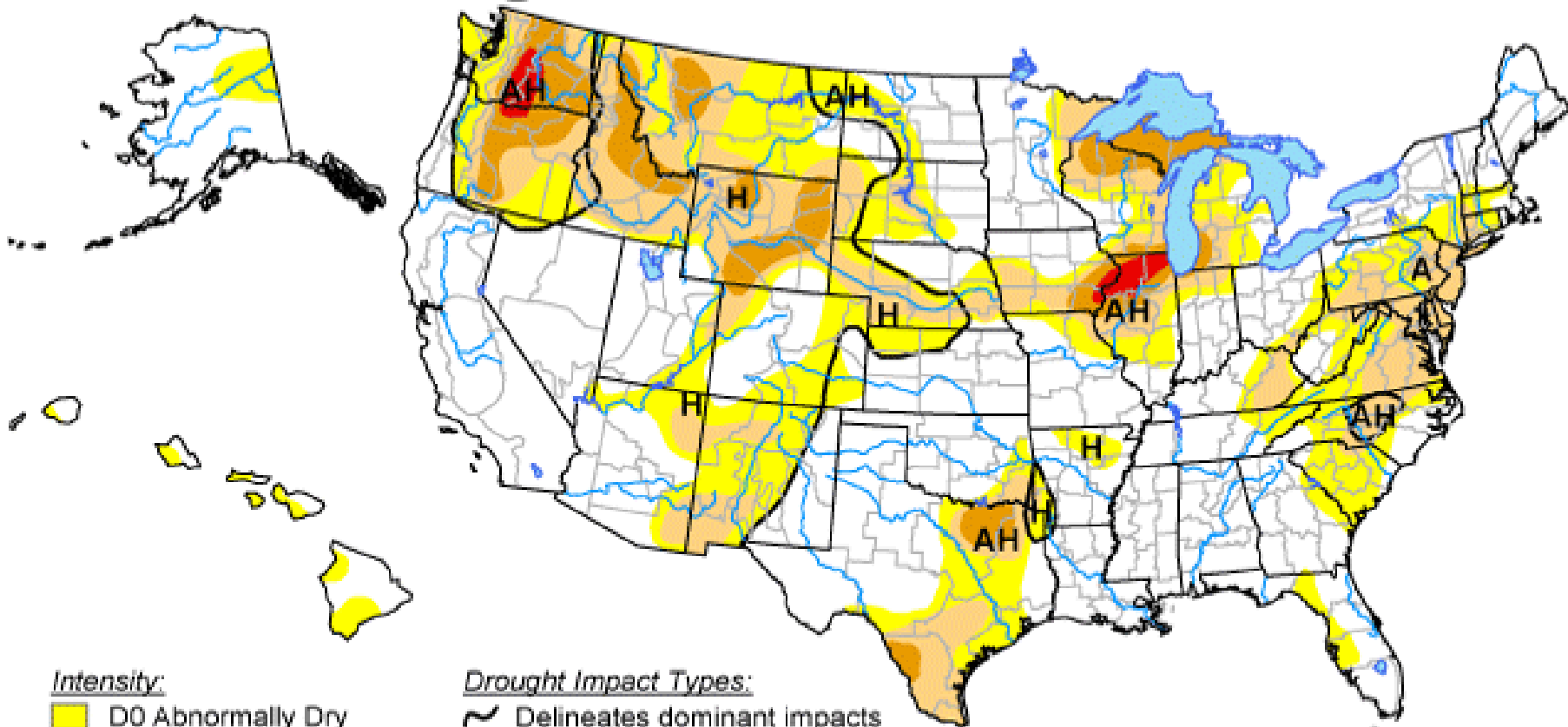


Released Thursday, September 30, 2004  
Author: Brad Rippey, U.S. Department of Agriculture






# U.S. Drought Monitor

September 27, 2005


Valid 8 a.m. EDT



### Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

### Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)
- (No type = Both impacts)

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



**Released Thursday, September 29, 2005**

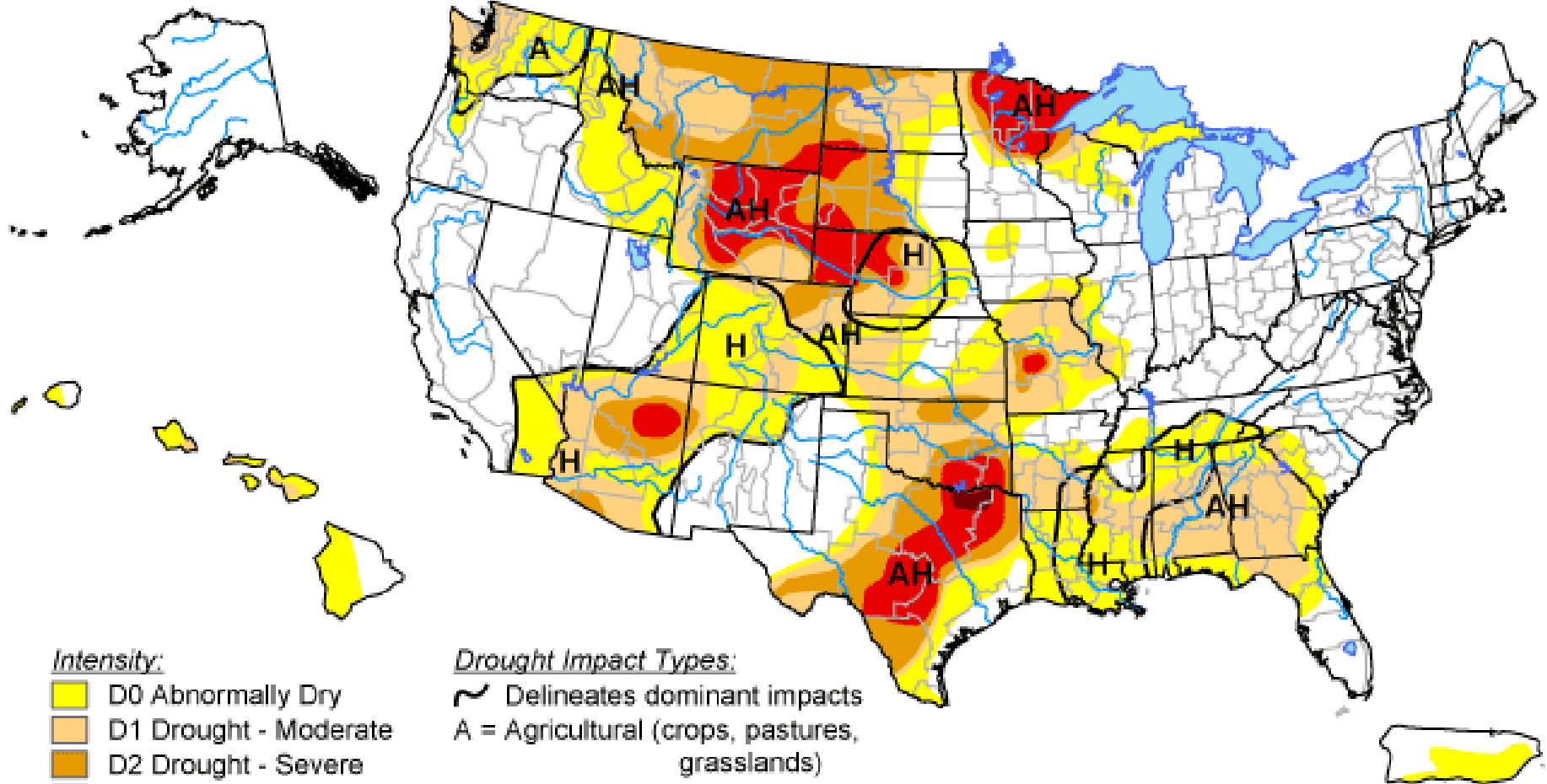
**Author: Douglas Le Comte, CPC/NOAA**

<http://drought.unl.edu/dm>






# U.S. Drought Monitor

October 3, 2006


Valid 8 a.m. EDT



## Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

## Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



**Released Thursday, October 5, 2006**

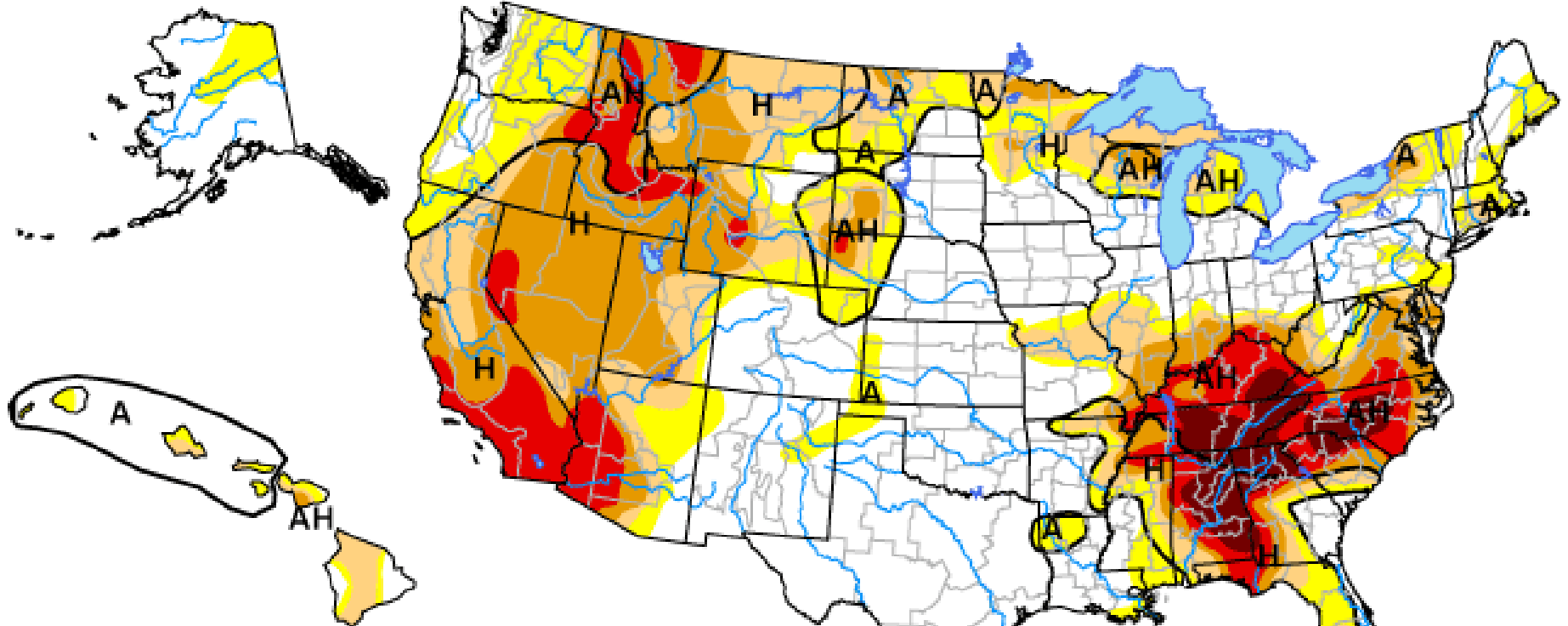
**Author: Rich Tinker, Climate Prediction Center, NOAA**

<http://drought.unl.edu/dm>






# U.S. Drought Monitor

October 2, 2007


Valid 8 a.m. EDT



Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



Released Thursday, October 4, 2007

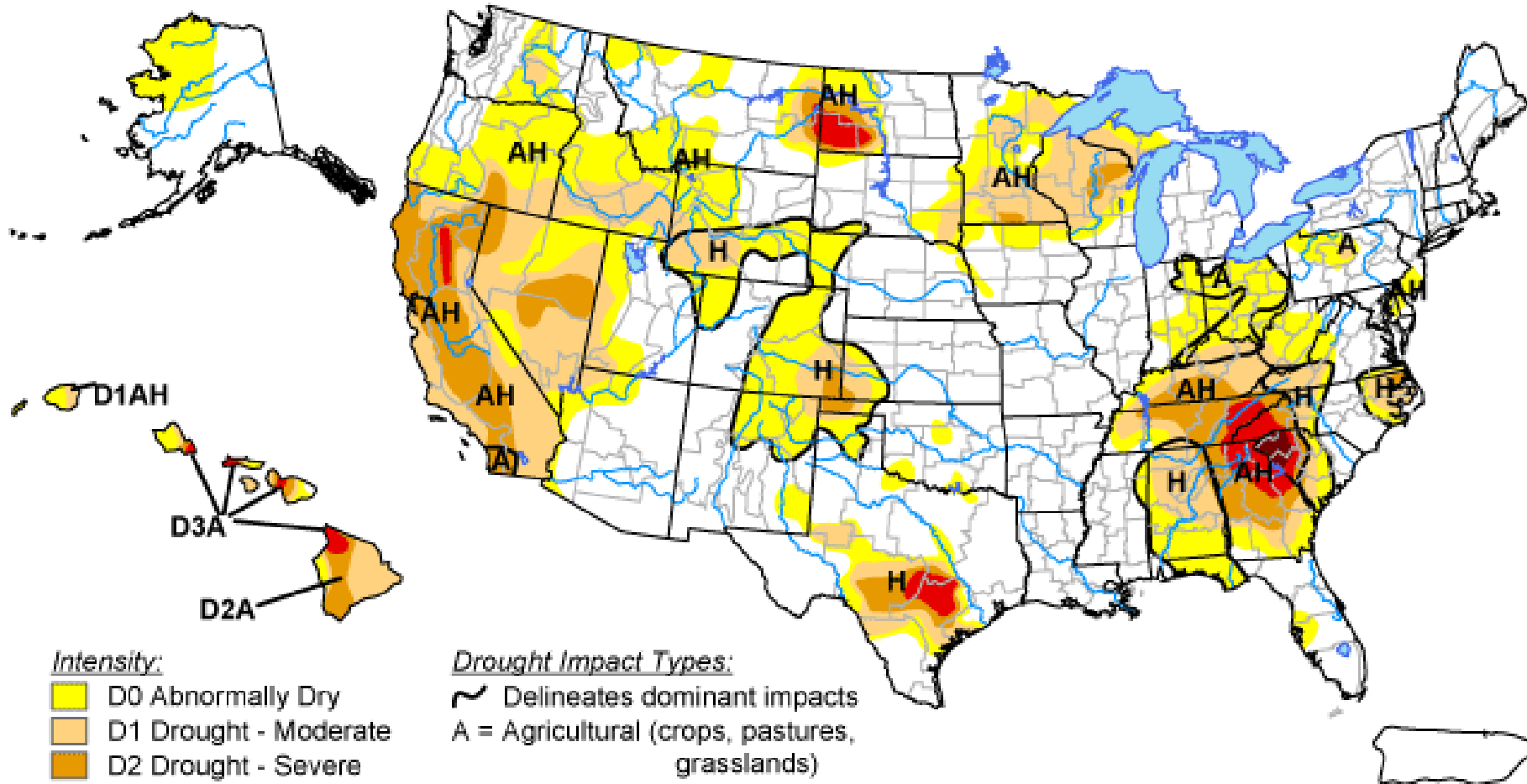
Author: Jay Lawrimore/Liz Love-Brotak, NOAA/NESDIS/NCDC

<http://drought.unl.edu/dm>






# U.S. Drought Monitor

September 30, 2008


Valid 8 a.m. EDT



## Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

## Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



Released Thursday, October 2, 2008

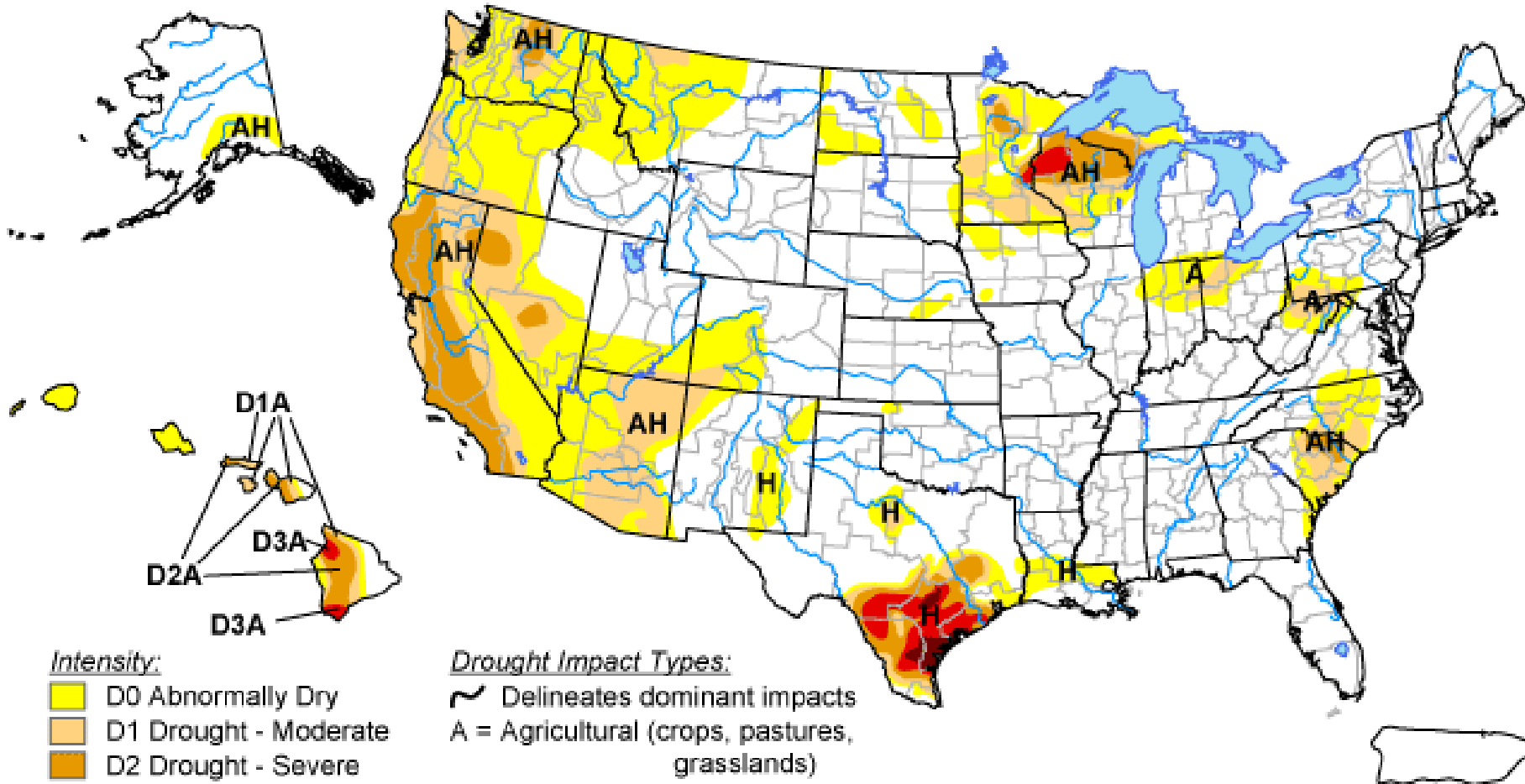
Authors: Richard Heim/Liz Love-Brotak, NOAA/NESDIS/NCDC

<http://drought.unl.edu/dm>

# U.S. Drought Monitor

September 29, 2009

Valid 8 a.m. EDT



## Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

## Drought Impact Types:

- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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

<http://drought.unl.edu/dm>



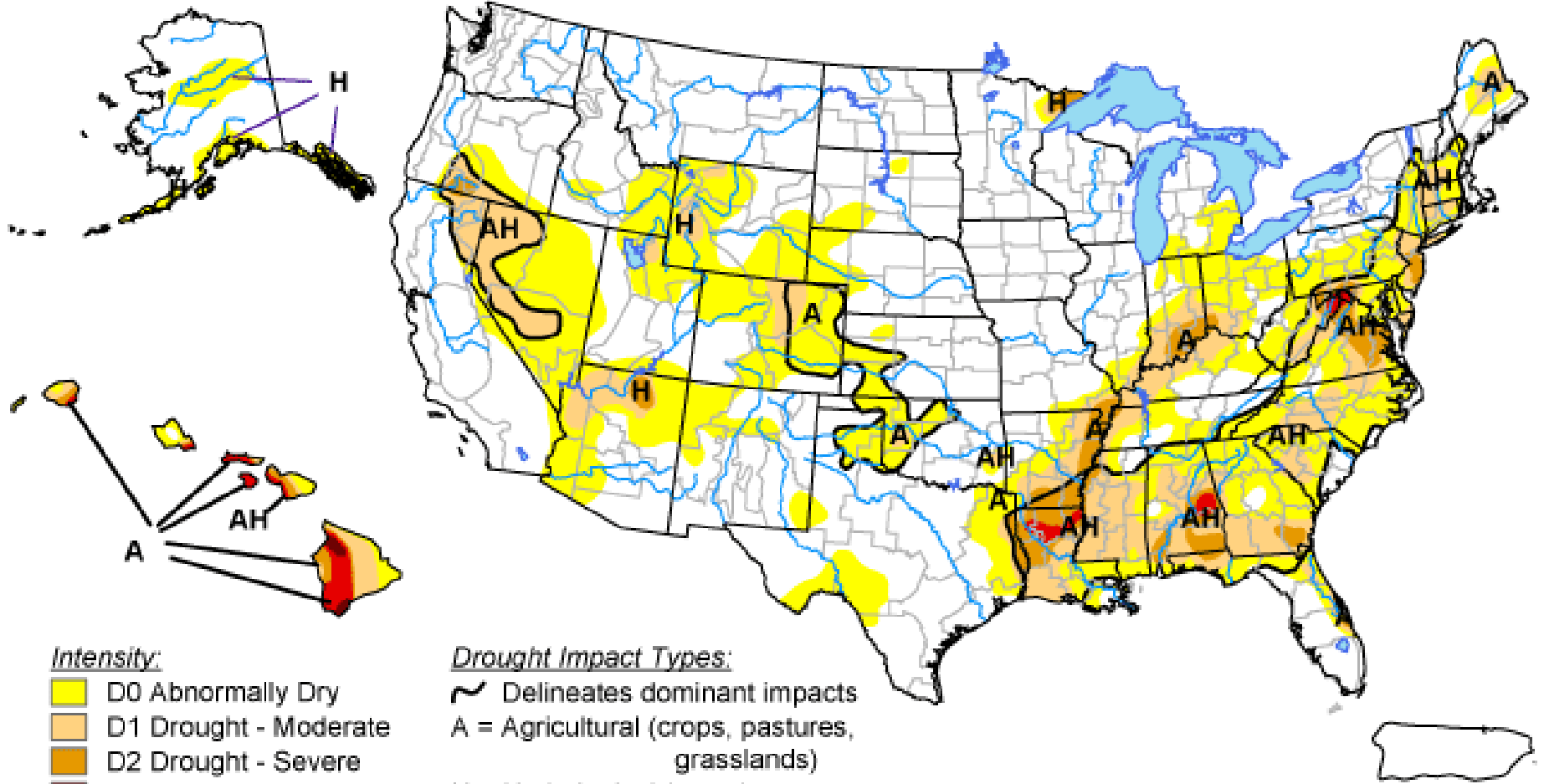
Released Thursday, October 1, 2009

Author: David Miskus, JAWF/CPC/NOAA






# U.S. Drought Monitor

September 28, 2010


Valid 8 a.m. EDT



### Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

### Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



**Released Thursday, September 30, 2010**

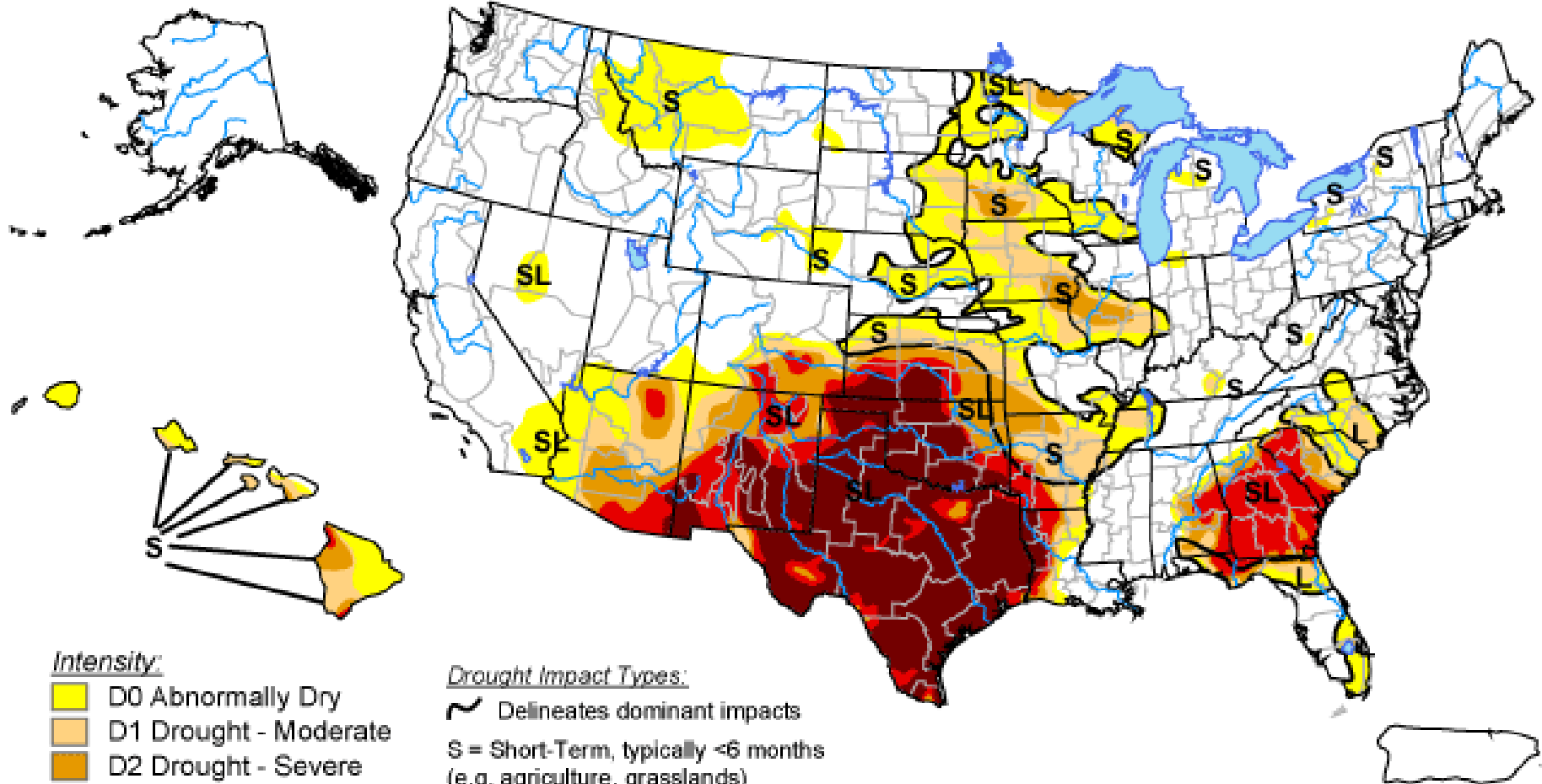
**Author: Richard Heim/Liz Love-Brotak, NOAA/NESDIS/NCDC**

<http://drought.unl.edu/dm>






# U.S. Drought Monitor

October 4, 2011


Valid 8 a.m. EDT



## Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

## Drought Impact Types:

-  Delineates dominant impacts
- S = Short-Term, typically <6 months  
(e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months  
(e.g. hydrology, ecology)

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



Released Thursday, October 6, 2011

Author: Rich Tinker, CPC/NCEP/NWS/NOAA

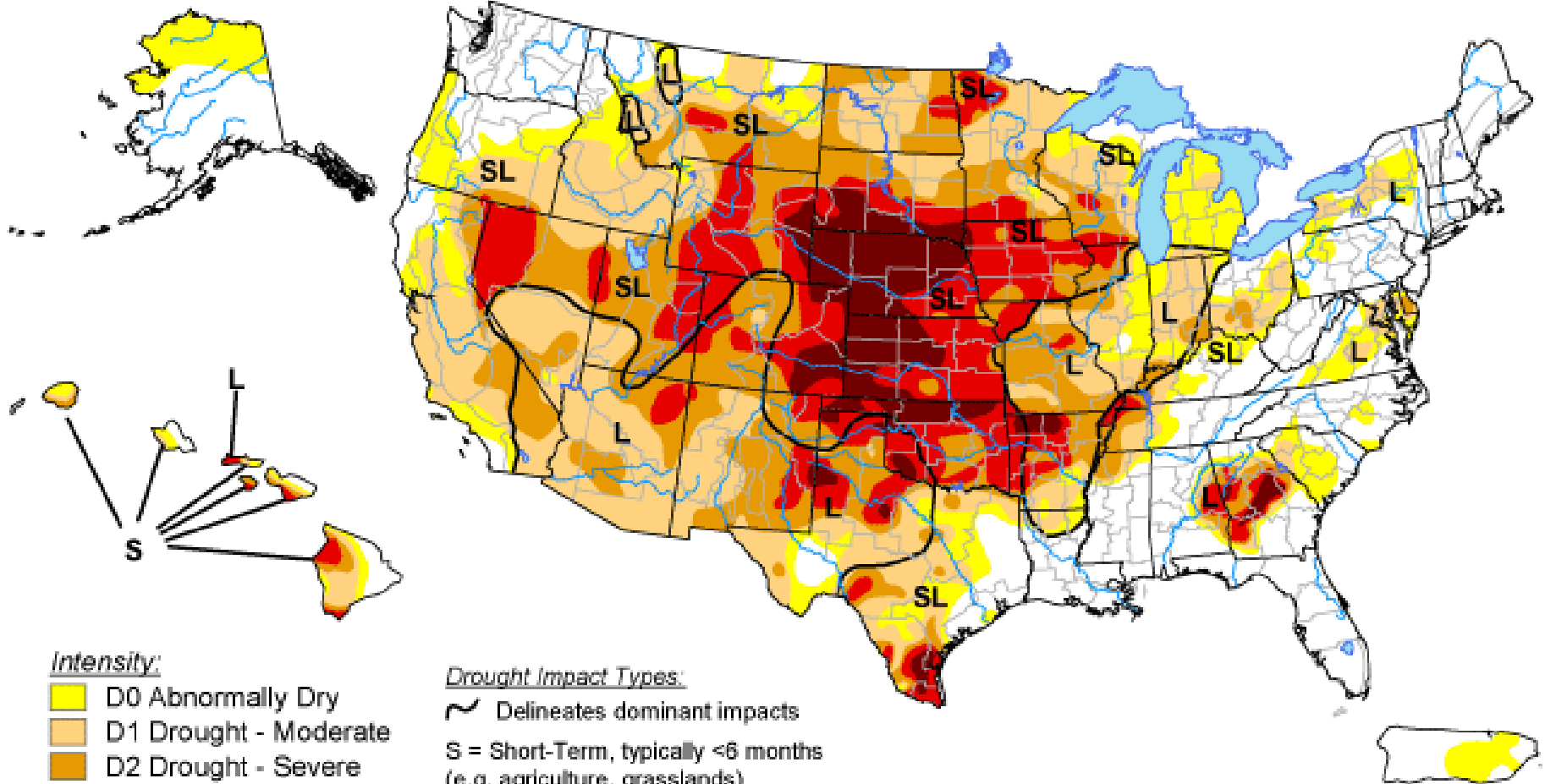
<http://droughtmonitor.unl.edu/>








# U.S. Drought Monitor

October 2, 2012


Valid 7 a.m. EDT



## Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

## Drought Impact Types:

-  Delineates dominant impacts
- S = Short-Term, typically <6 months  
(e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months  
(e.g. hydrology, ecology)

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

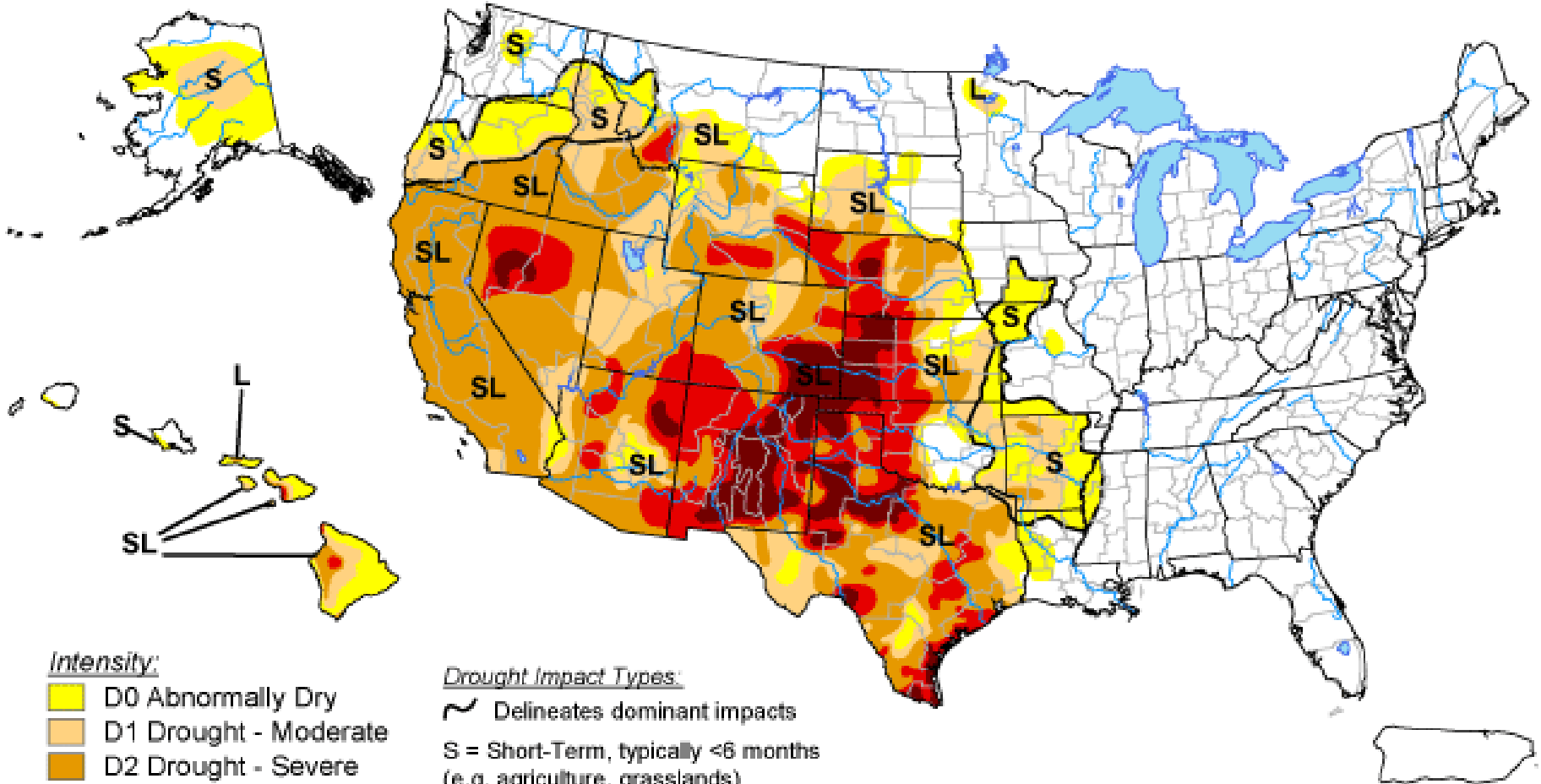
<http://droughtmonitor.unl.edu/>








Released Thursday, October 4, 2012  
Author: Anthony Artusa, NOAA/NWS/NCEP/CPC

# U.S. Drought Monitor


July 16, 2013  
Valid 7 a.m. EDT



## Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

## Drought Impact Types:

-  Delineates dominant impacts
- S = Short-Term, typically <6 months  
(e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months  
(e.g. hydrology, ecology)

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



Released Thursday, July 18, 2013  
Author: Richard Heim, NOAA/NESDIS/NCDC

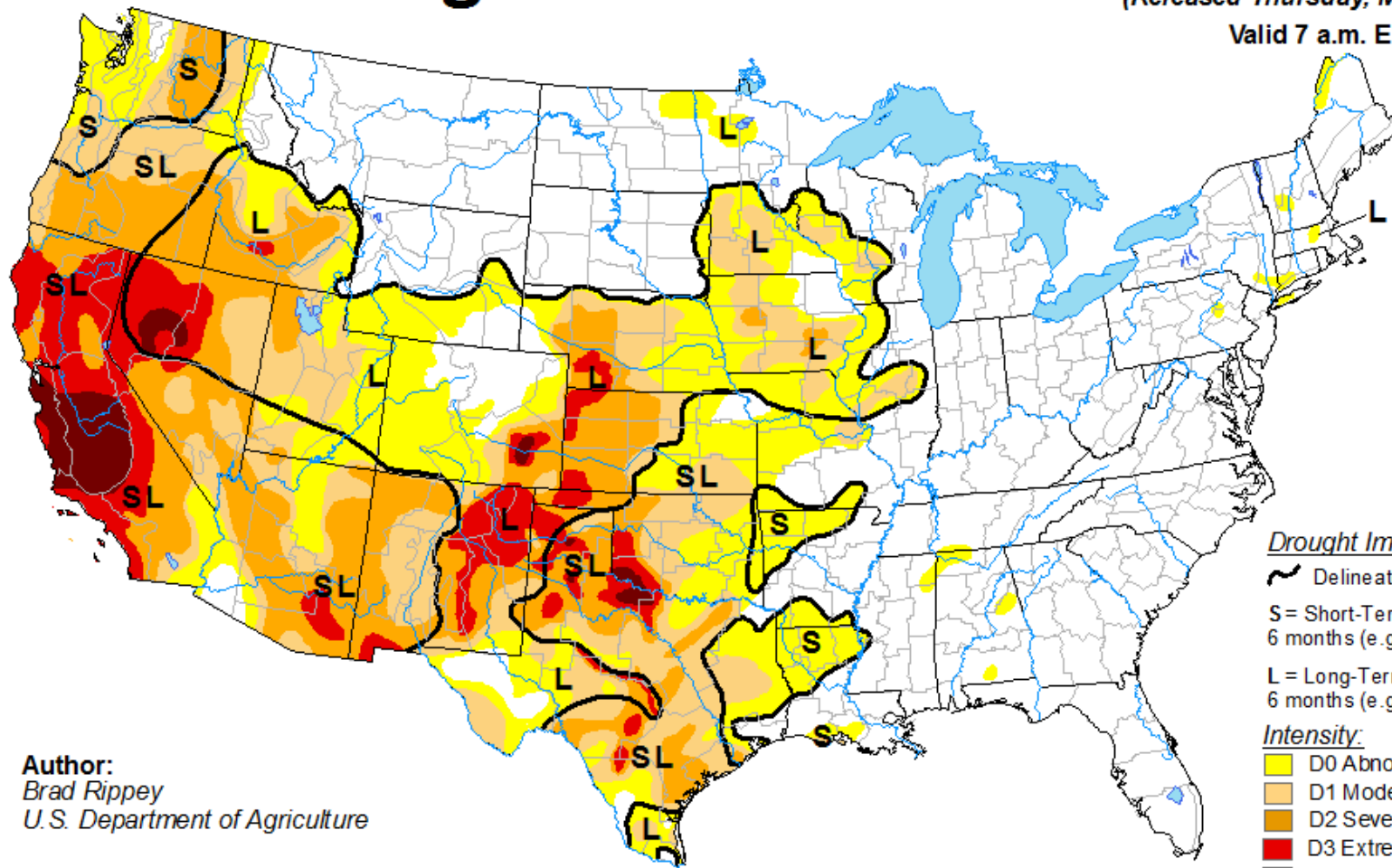
<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor

March 4, 2014

(Released Thursday, Mar. 6, 2014)

Valid 7 a.m. EST



Author:  
Brad Rippey  
U.S. Department of Agriculture

### 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

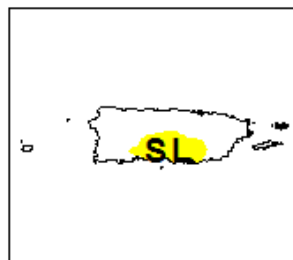
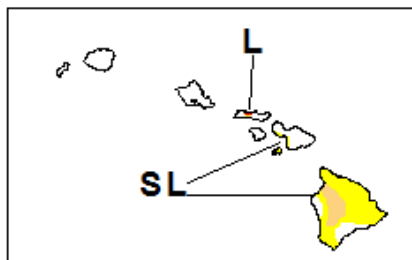
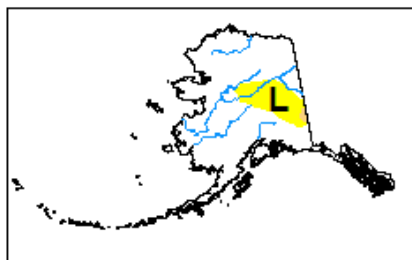
D1 Moderate Drought

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.



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

**We thought the dustbowl days  
were over,  
but . . . . .**

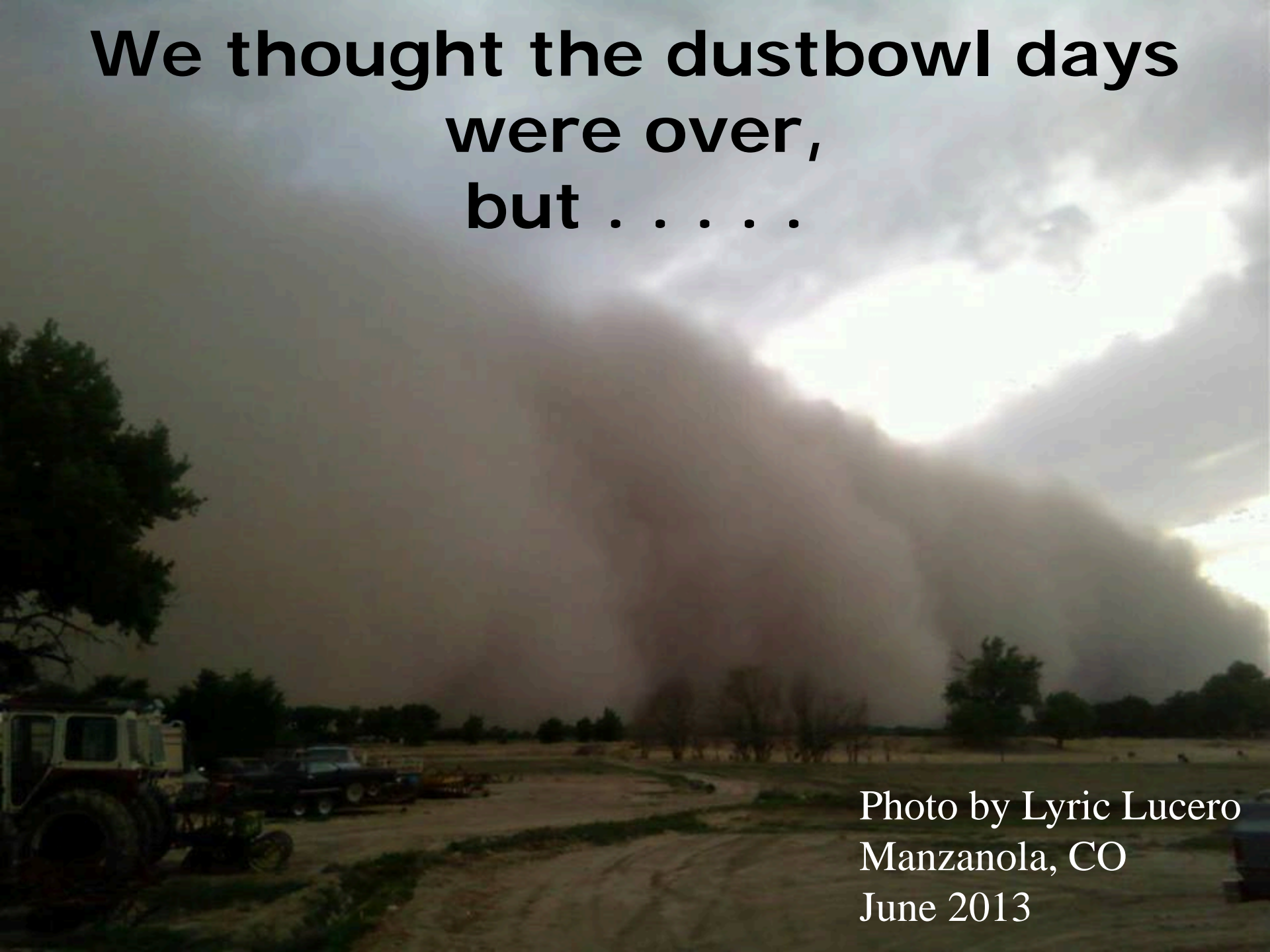


Photo by Lyric Lucero  
Manzanola, CO  
June 2013

# Highlights of the 2013 Water Year in Colorado

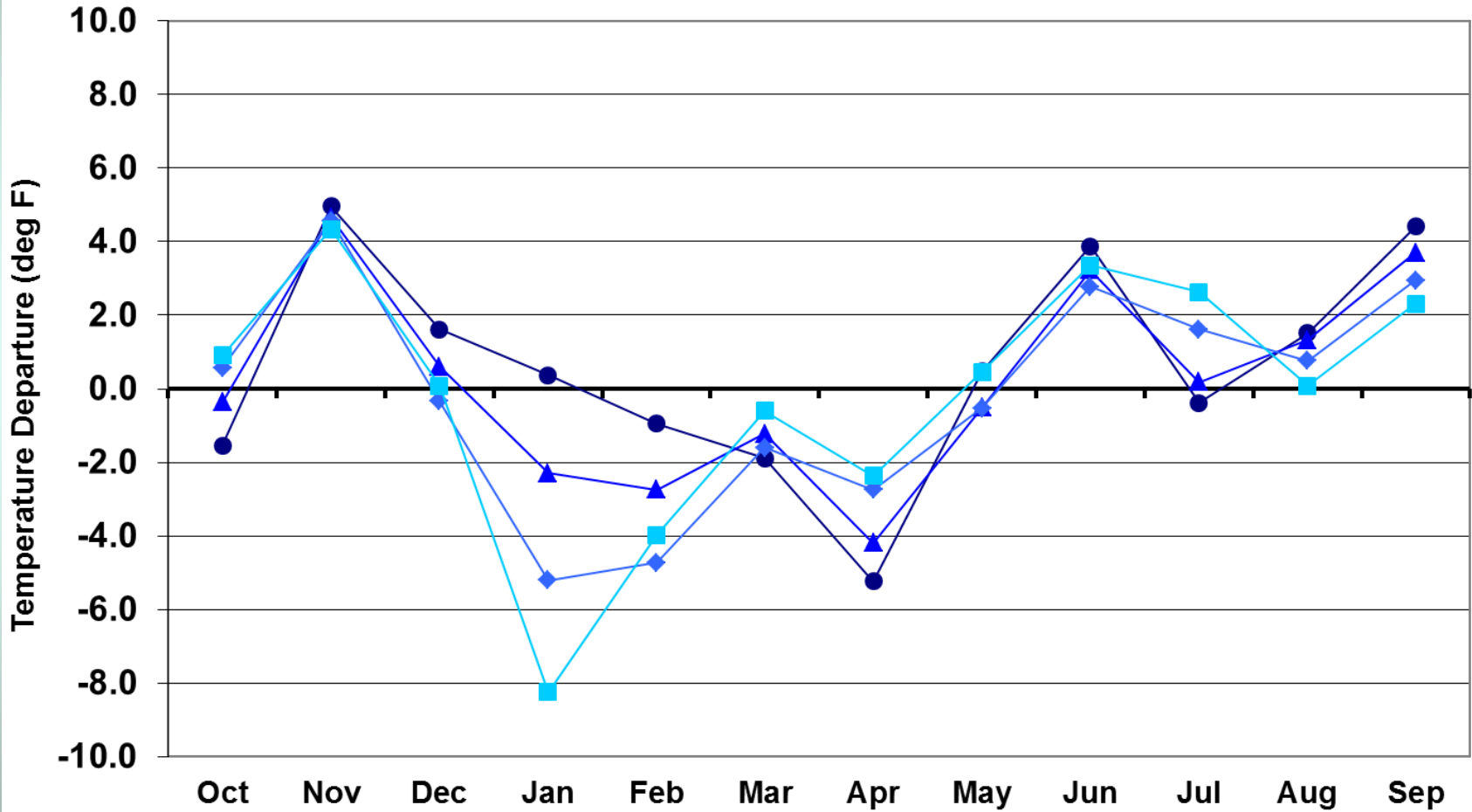
- After the wicked heat in 2012, 2013 was “back to normal”
- Dry winter in the mountains – troubles ahead?
- helpful late winter/spring snow over Northern Colorado (cool springs usually good for water and ag) but drought held firmly in S. Colorado
- Summer rains – even some rain in SE Colorado
- Floods of Sept 2013





A closer look at our climate in action

# Water Year 2013 Temperature Departures From 1981-2010 Average



● Eastern Plains

▲ Foothills

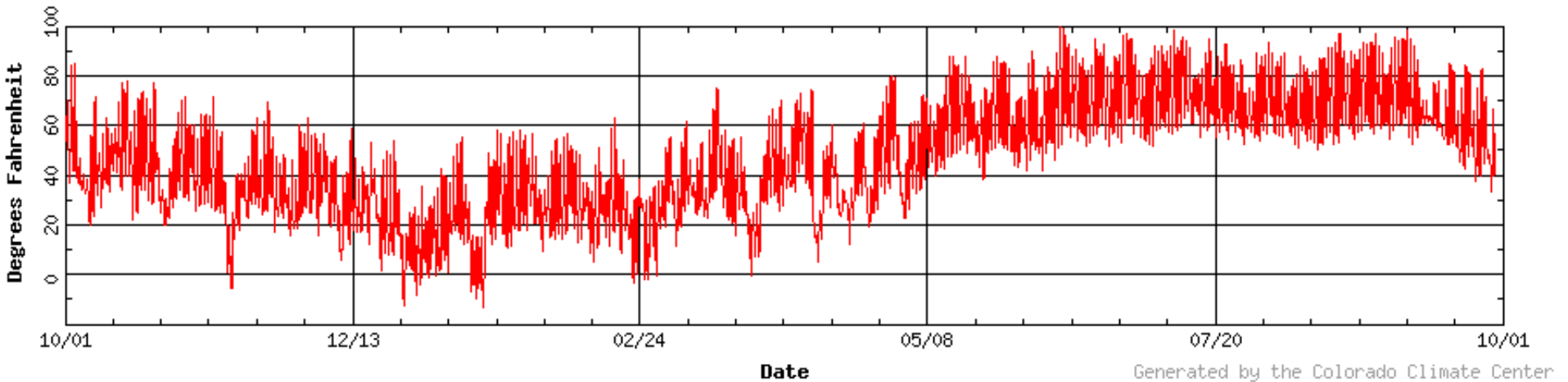
◆ Mountains

■ Western Valleys

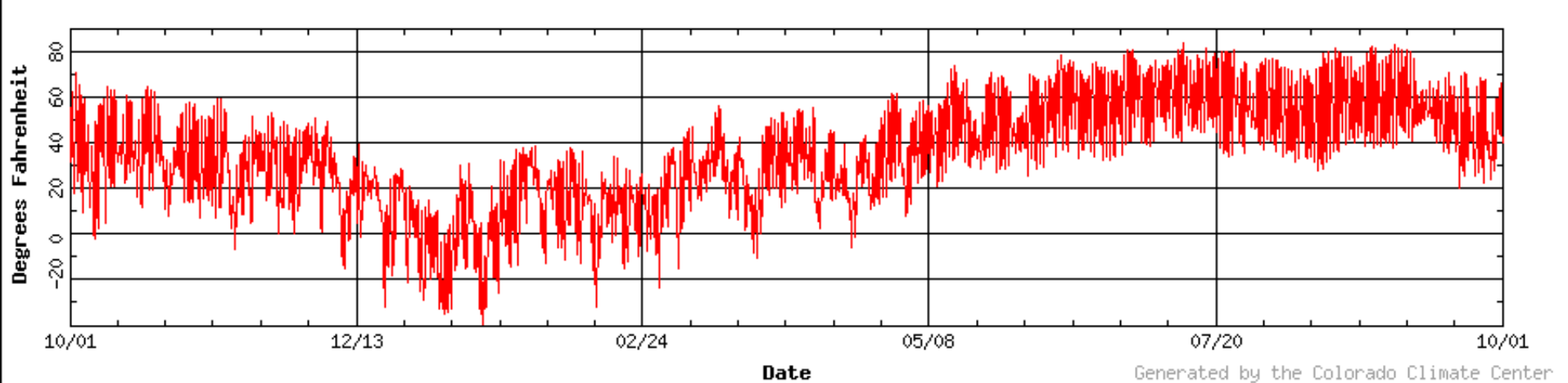


# CoAgMet Temperatures

Temperature for KSY01 (10-01-2012 - 10-01-2013)

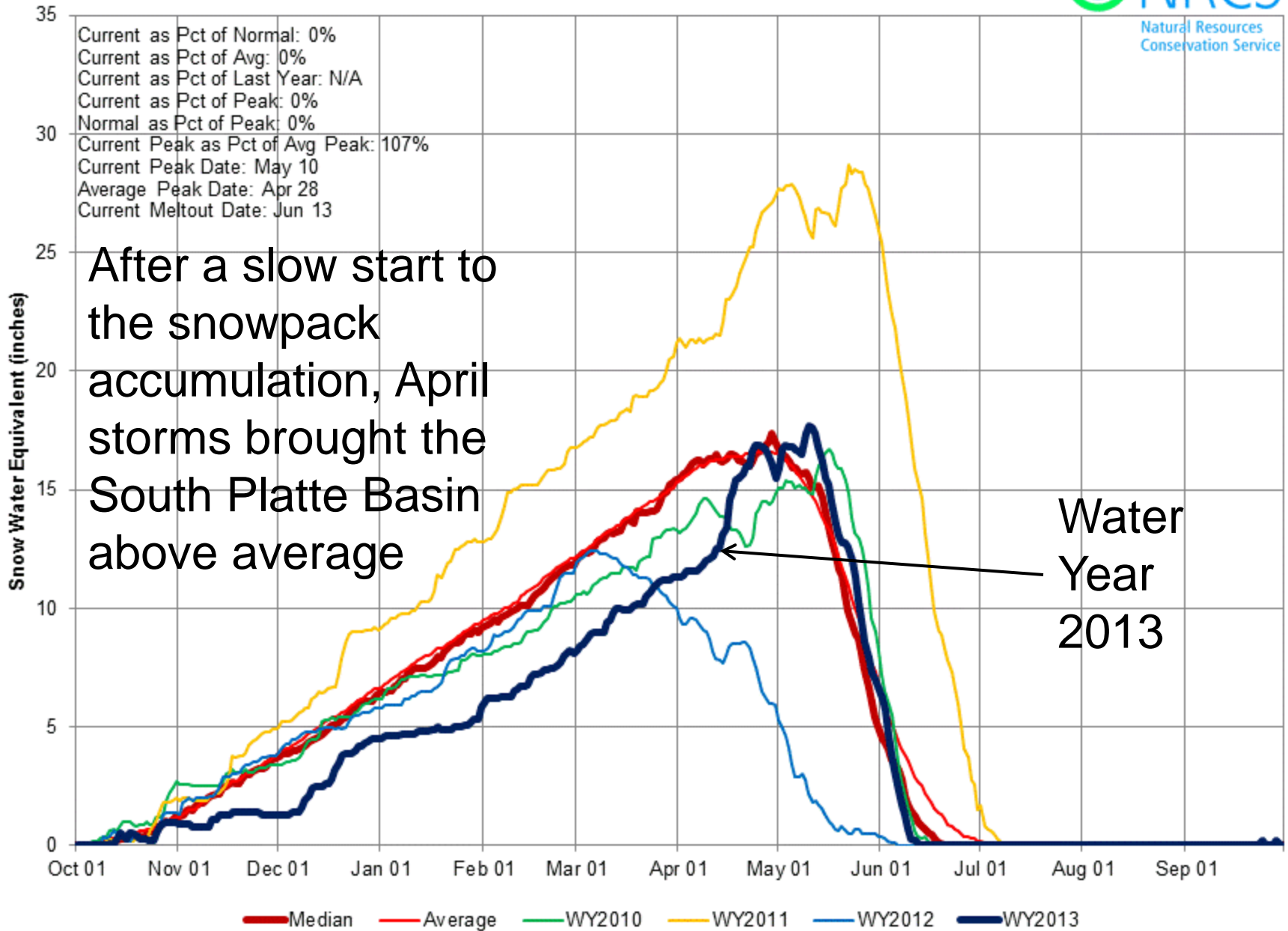


Temperature for COM01 (10-01-2012 - 10-01-2013)



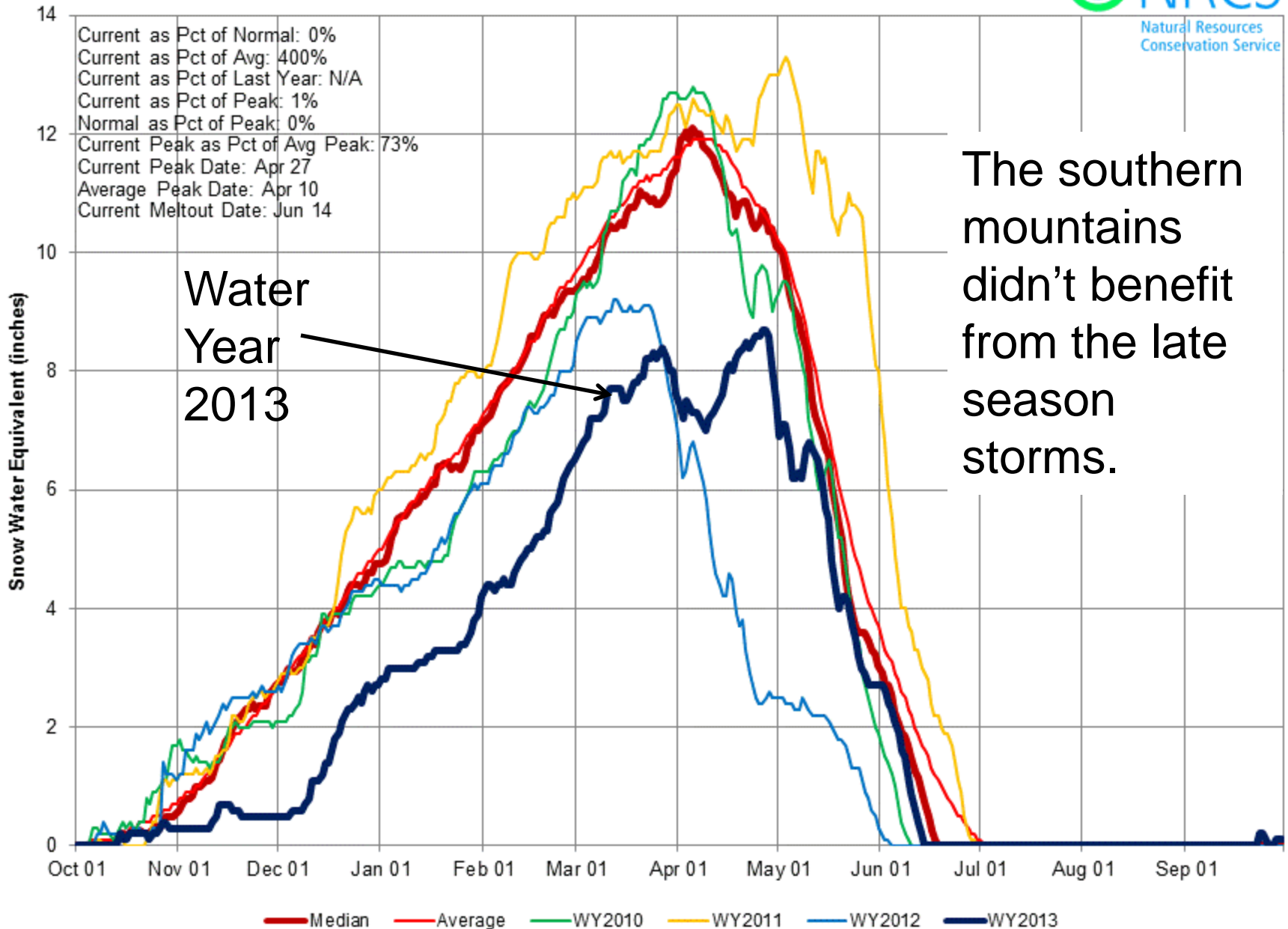
# South Platte River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Sep 30, 2013

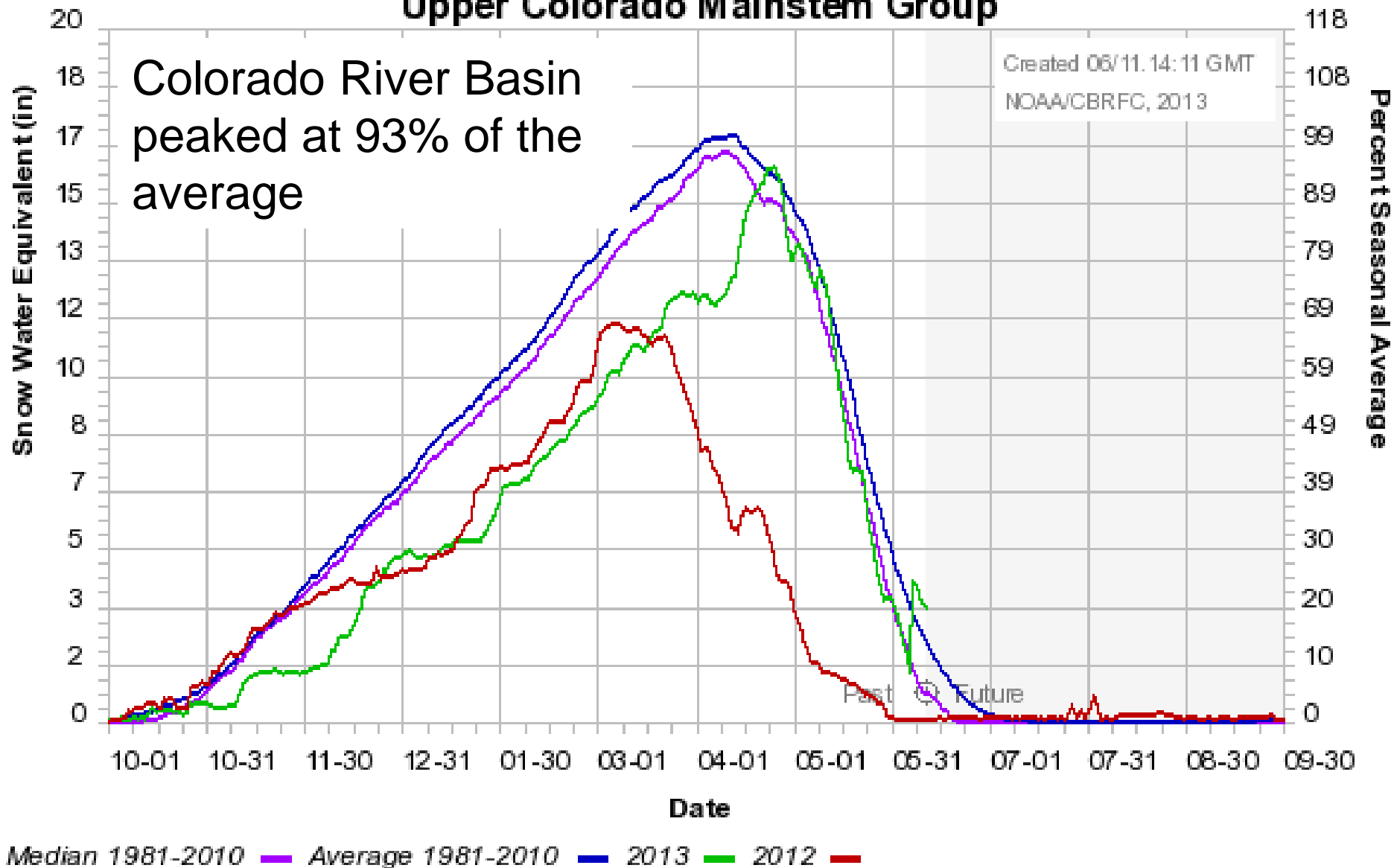


# Arkansas River Basin Time Series Snowpack Summary

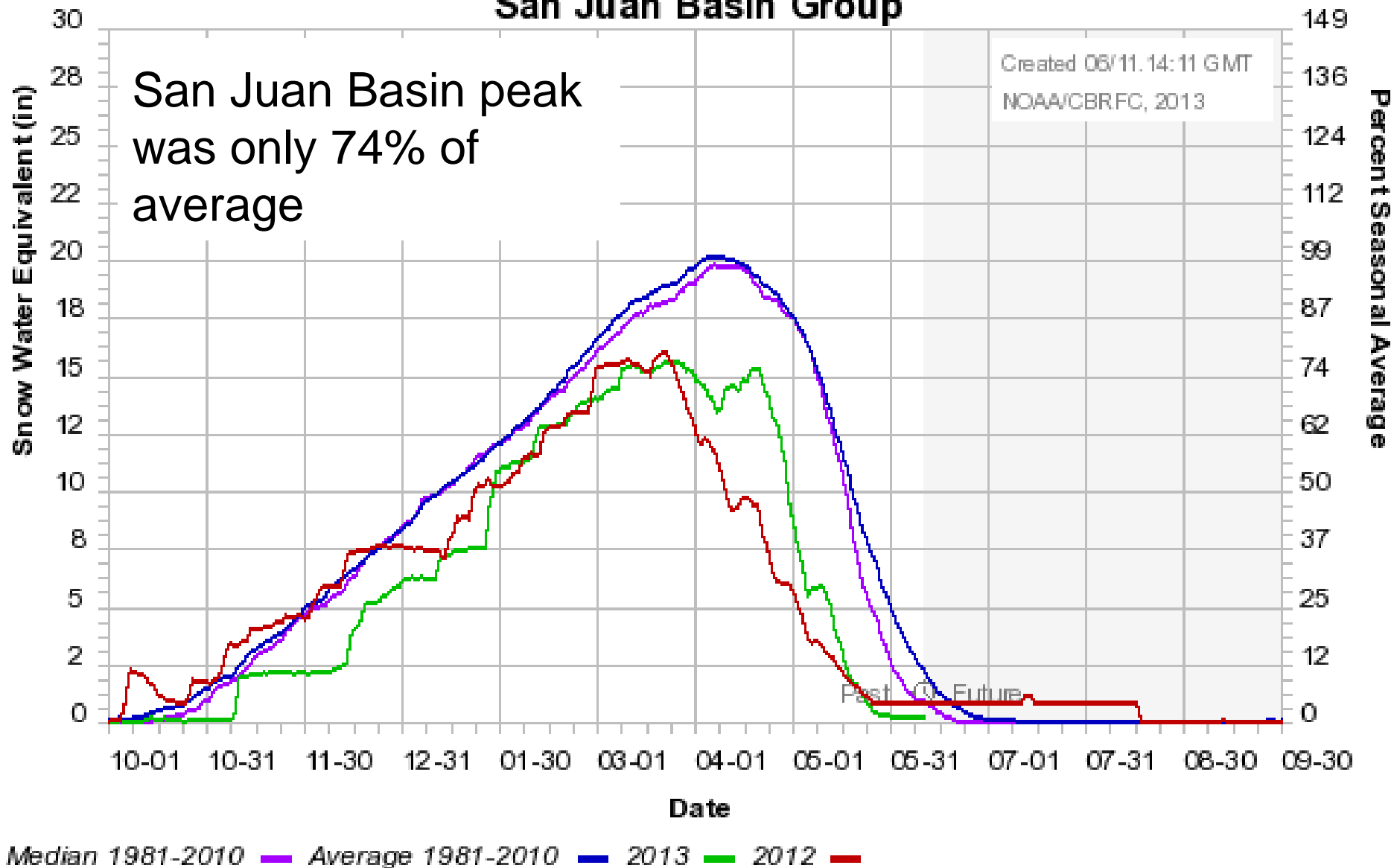
Based on Provisional SNOTEL data as of Sep 30, 2013



# Colorado Basin River Forecast Center Upper Colorado Mainstem Group



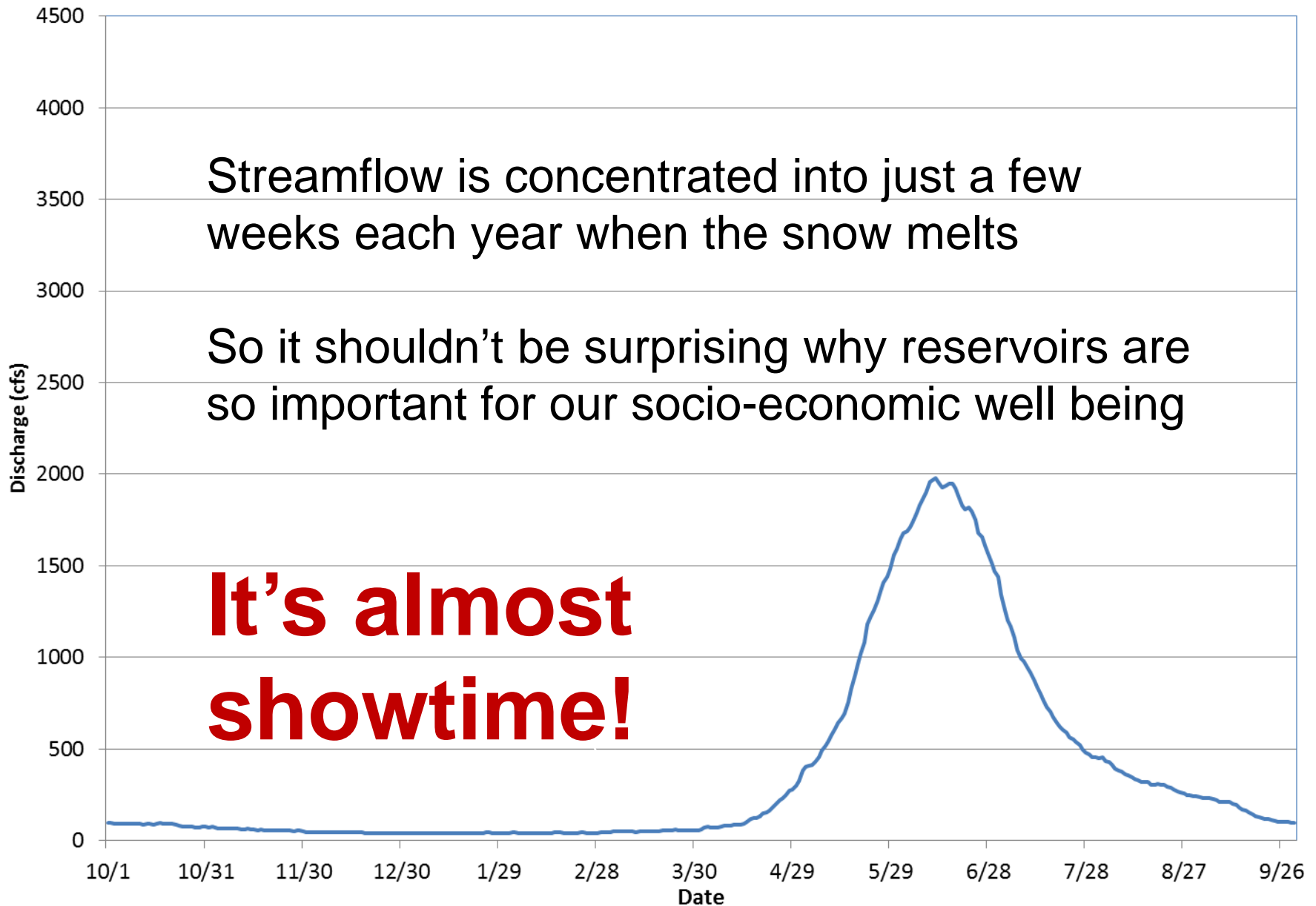
# Colorado Basin River Forecast Center San Juan Basin Group



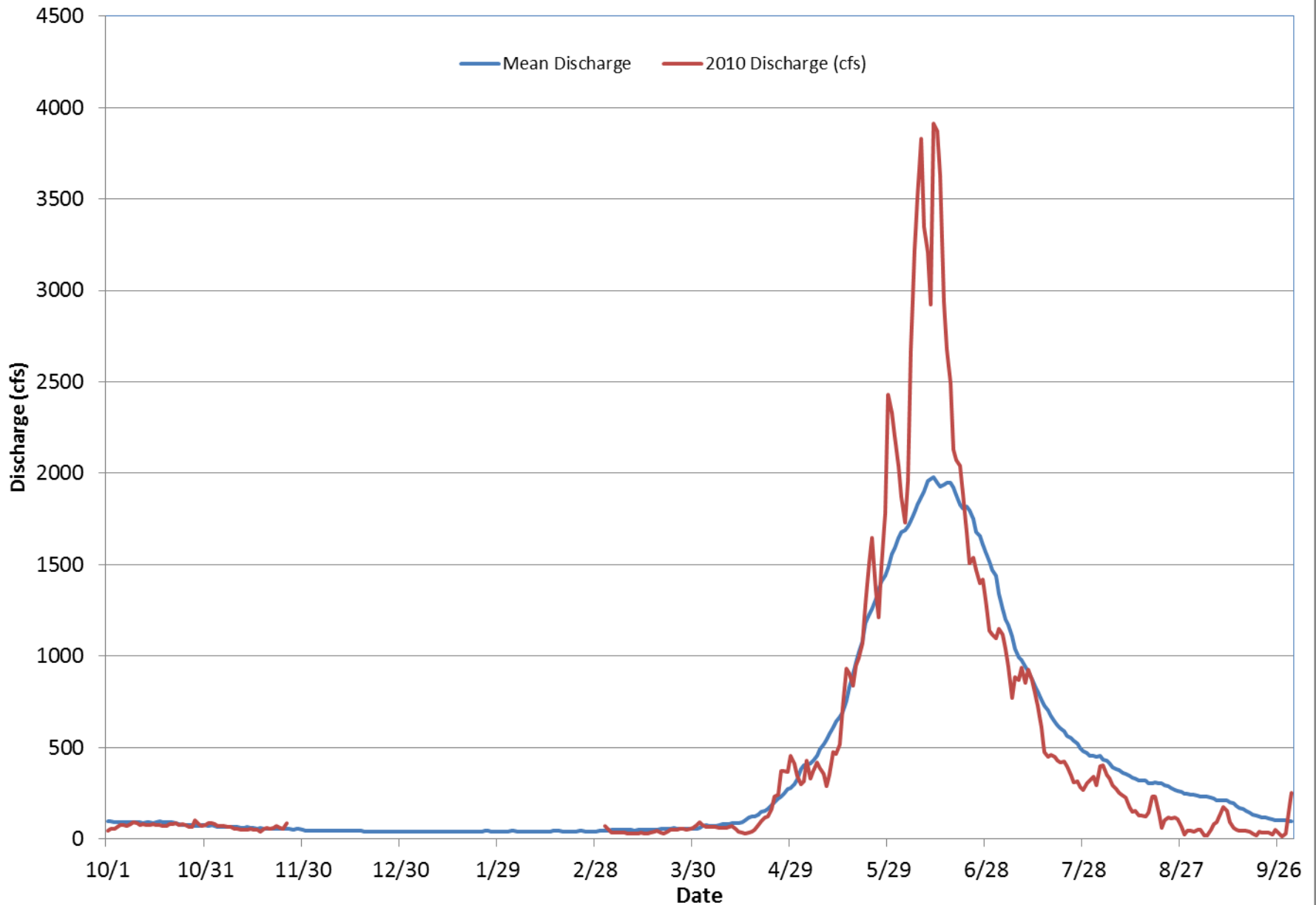
# Streamflow— the Great Climate Integrator



## Poudre River at the Canyon Mouth Mean Discharge (cfs)

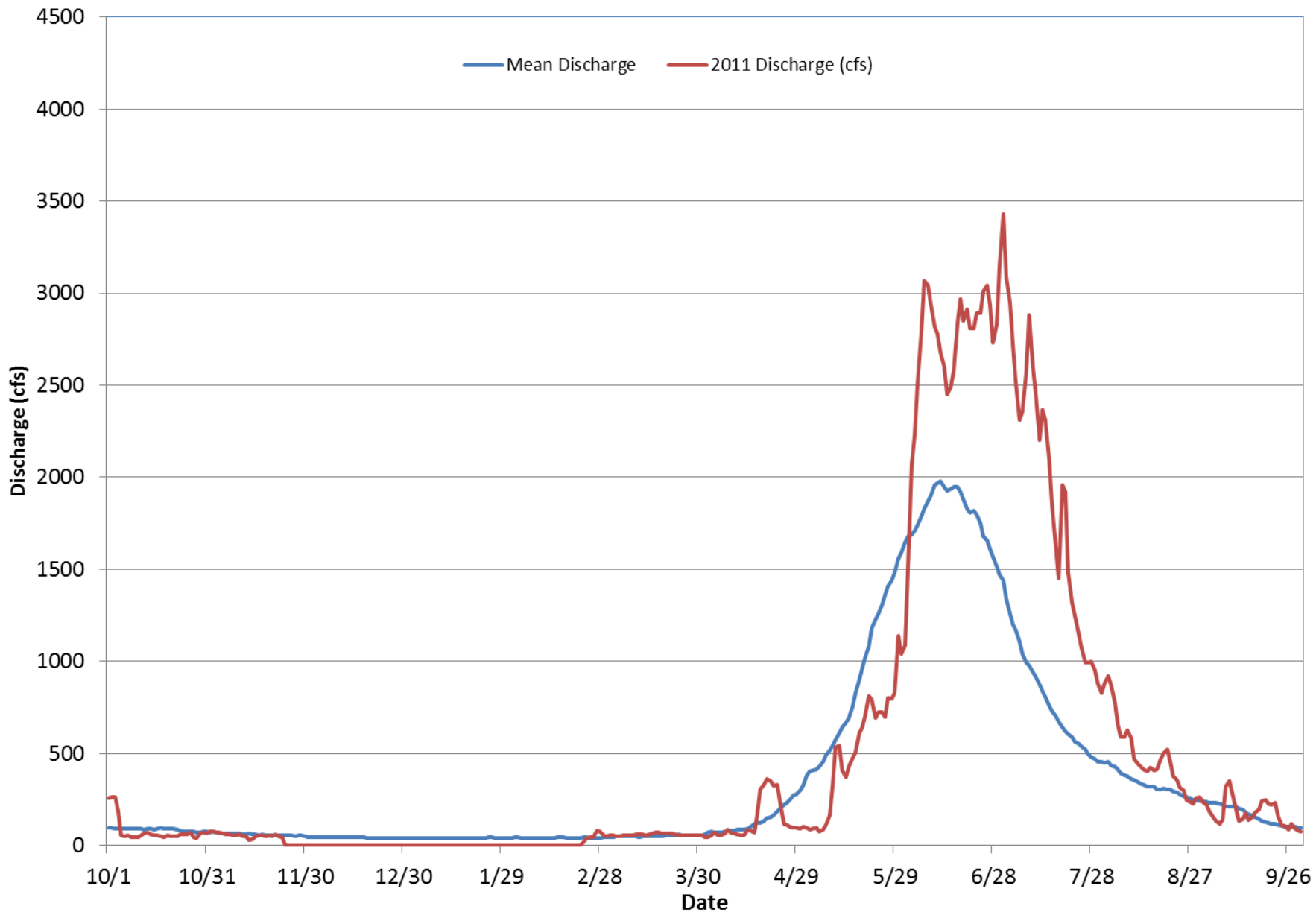


# Poudre River at the Canyon Mouth Mean and WY 2010 Discharge (cfs)

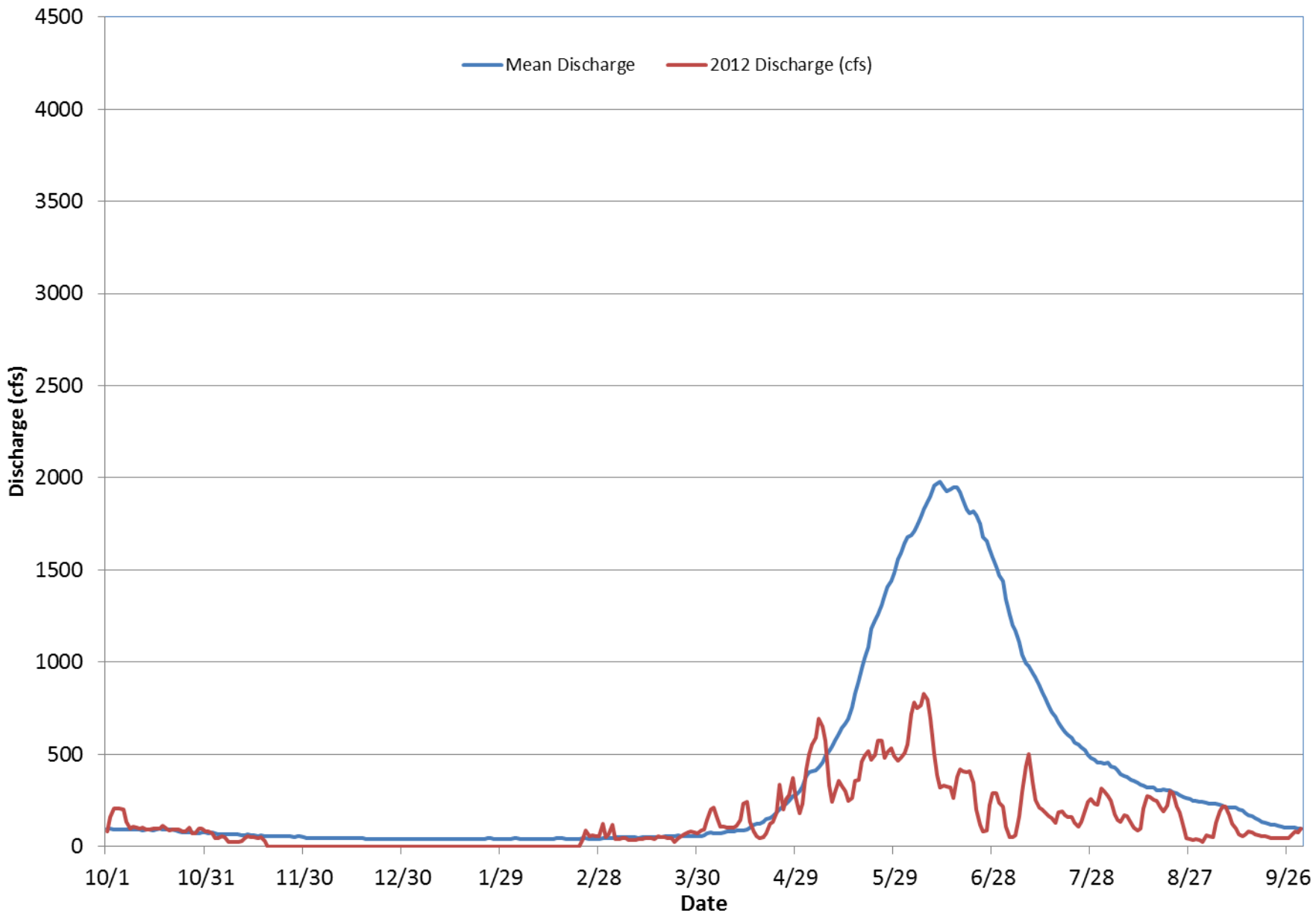




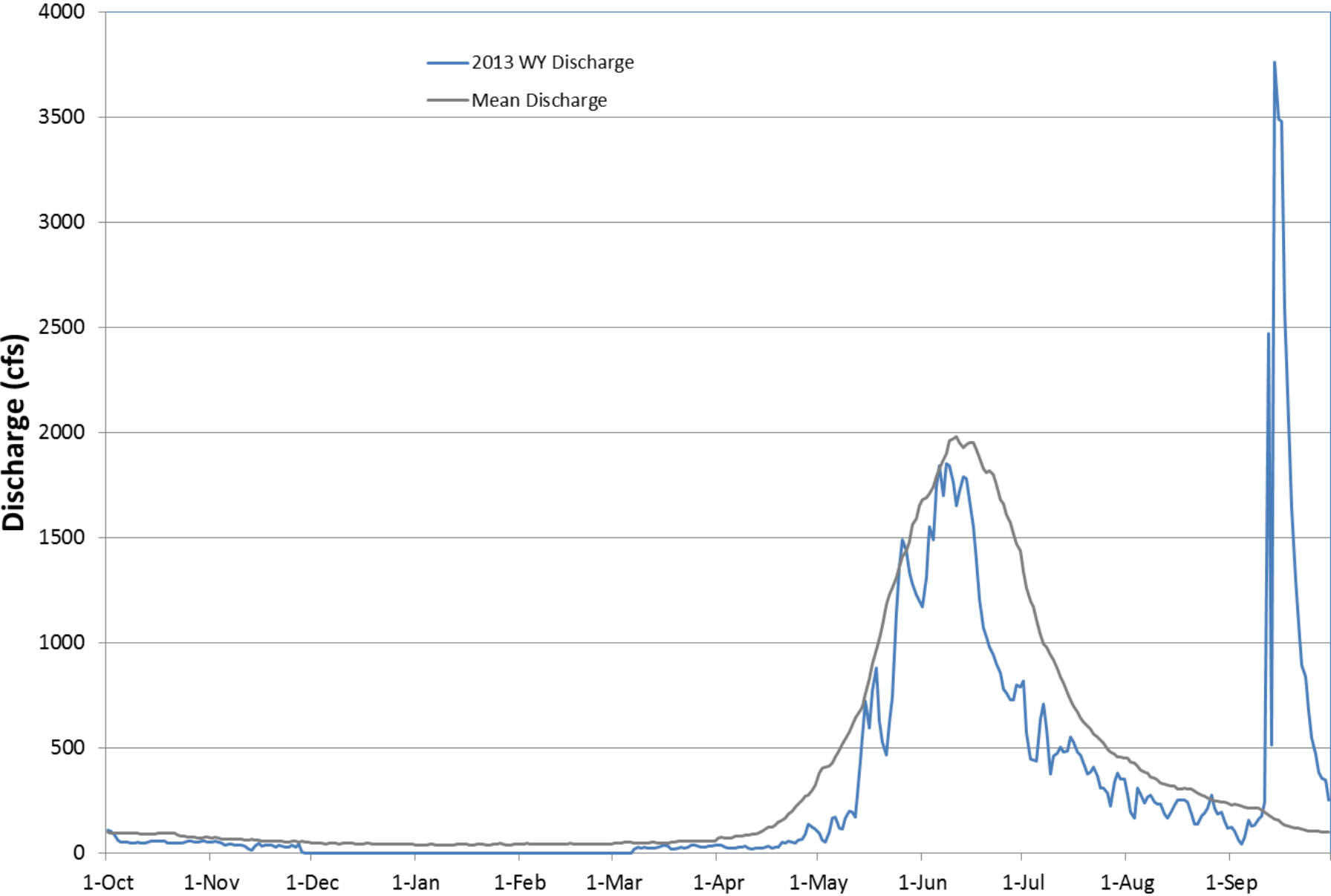
# Poudre River at the Canyon Mouth Mean and WY 2011 Discharge (cfs)



# Poudre River at the Canyon Mouth Mean and WY 2012 Discharge (cfs)



# Cache La Poudre at Canyon Mouth Near Fort Collins

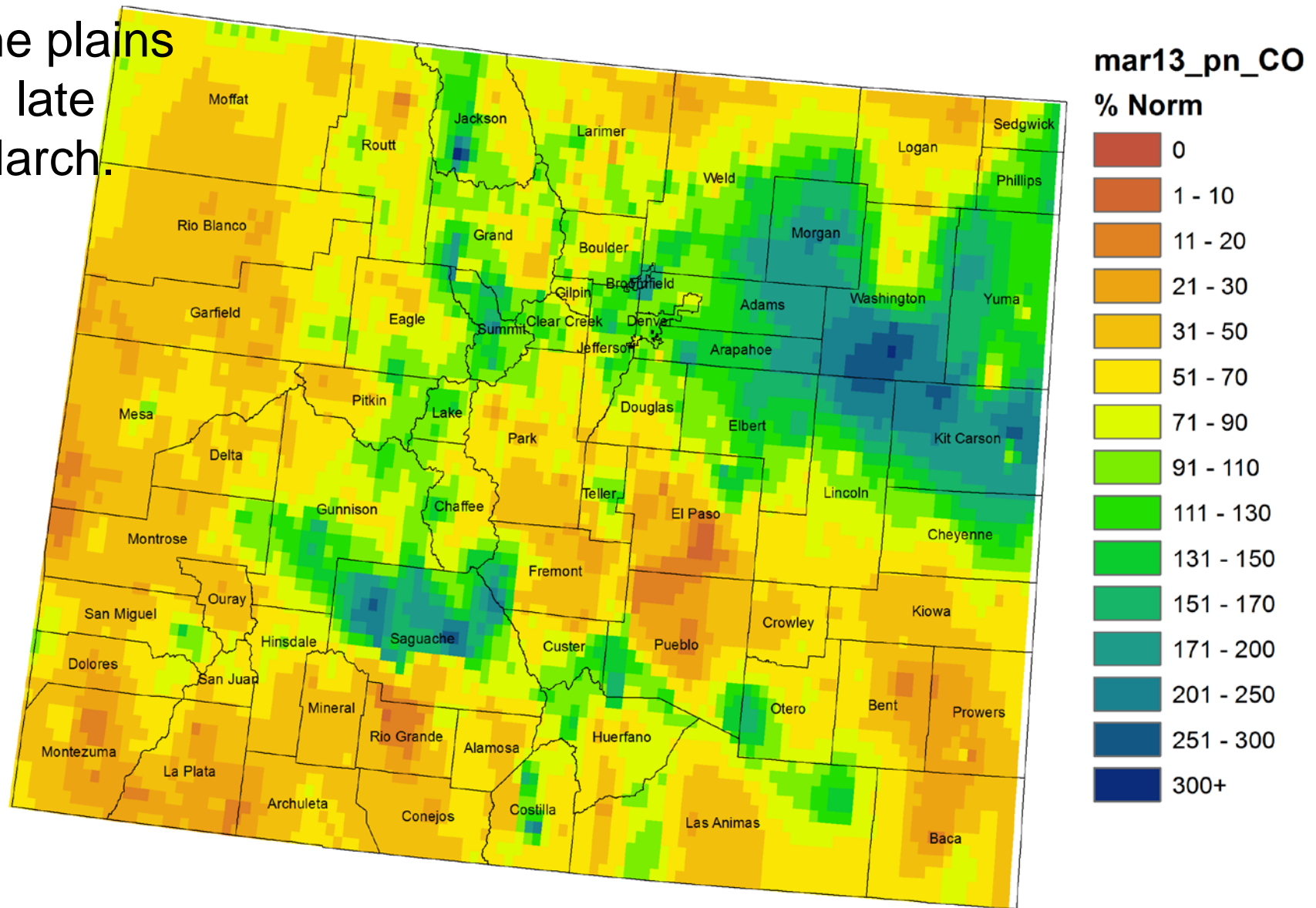


# What we learn from monitoring



Some  
beneficial  
storms hit  
the plains  
in late  
March.

## Colorado March 2013 Precipitation as Percentage of Normal



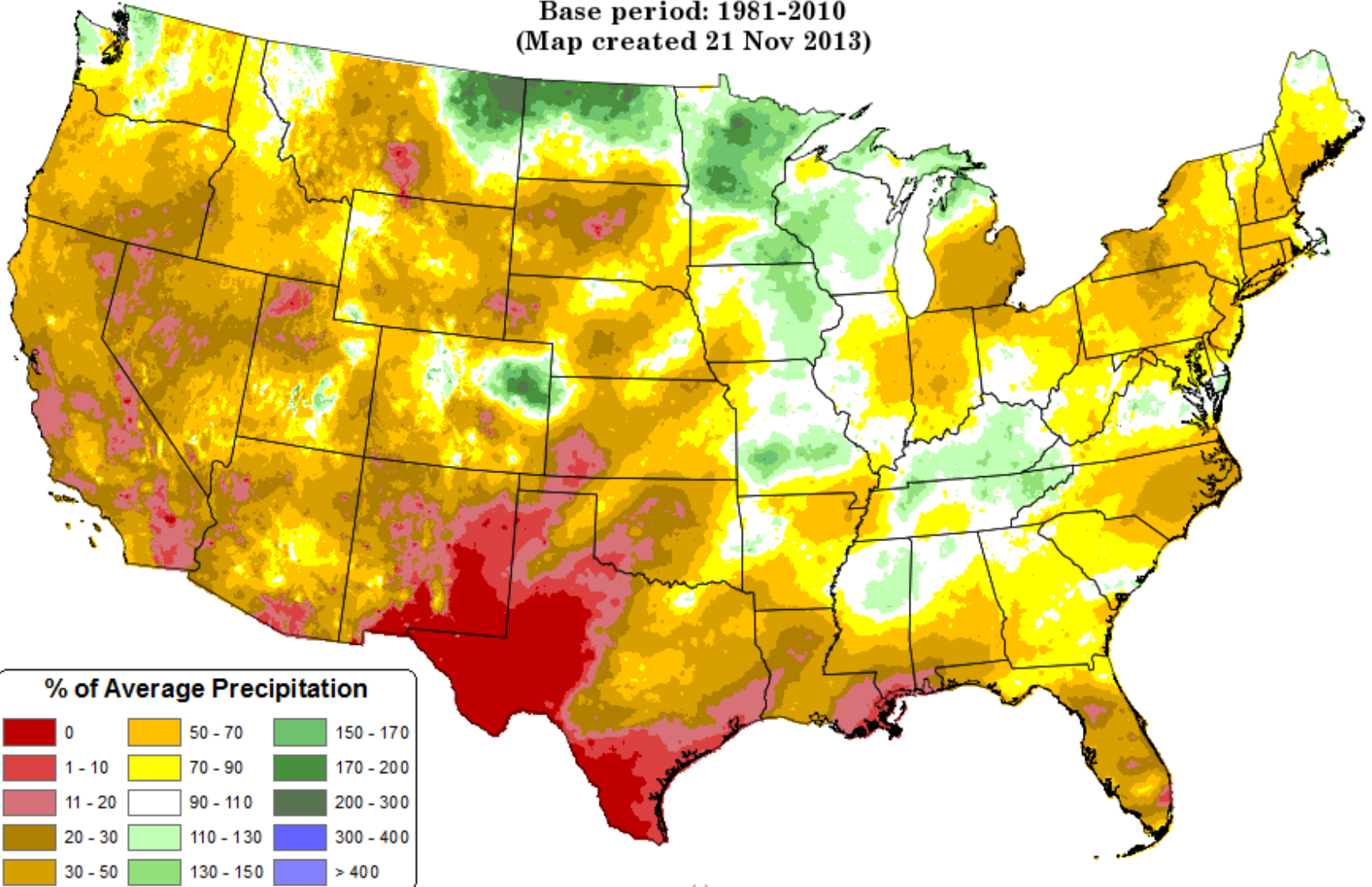
# Mar 2013 Percent of Normal

## Total Precipitation Anomaly: March 2013

Period ending 31 Mar 2013

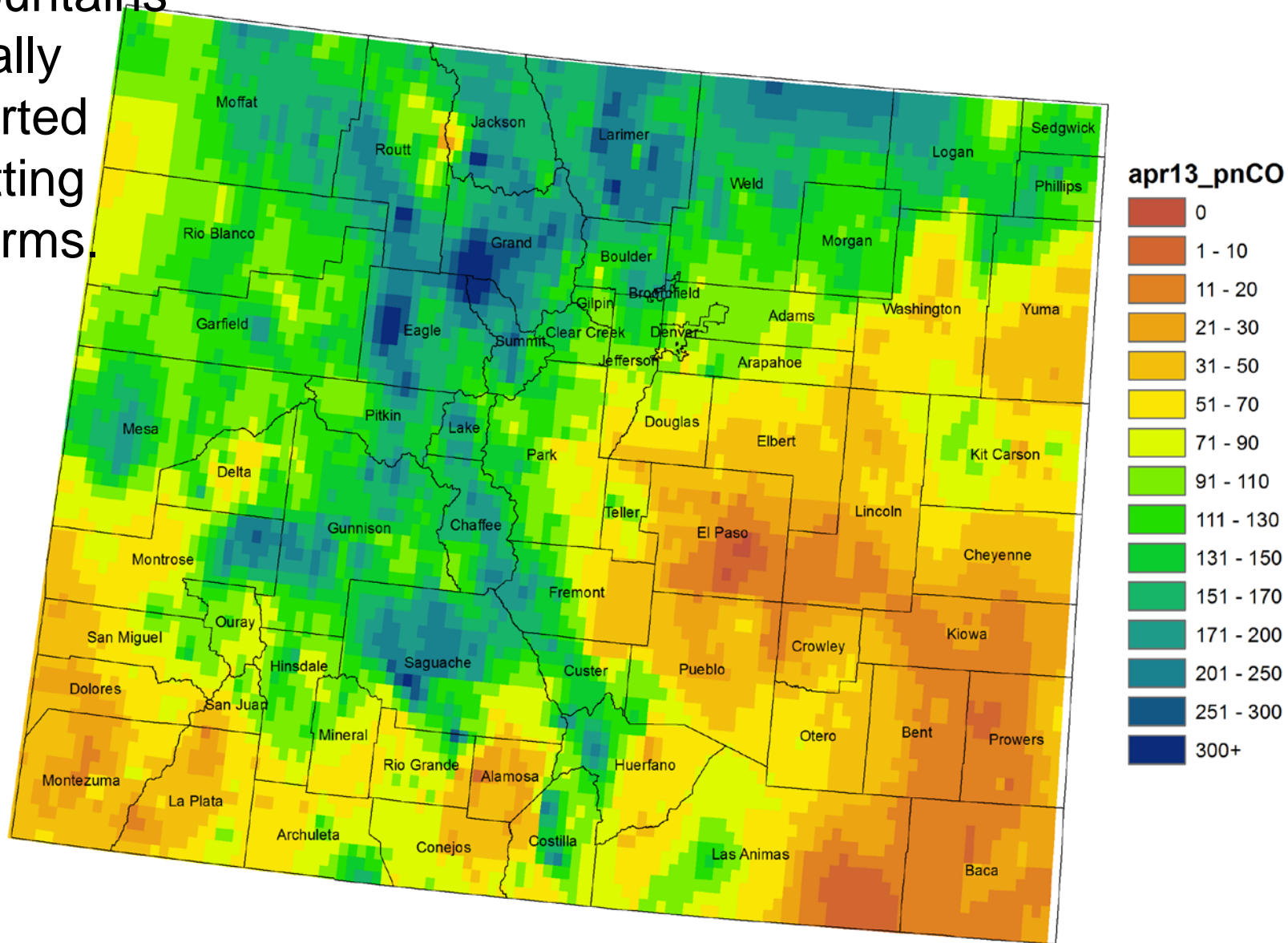
Base period: 1981-2010

(Map created 21 Nov 2013)



# Colorado April 2013 Precipitation as Percentage of Normal

April the mountains finally started getting storms.



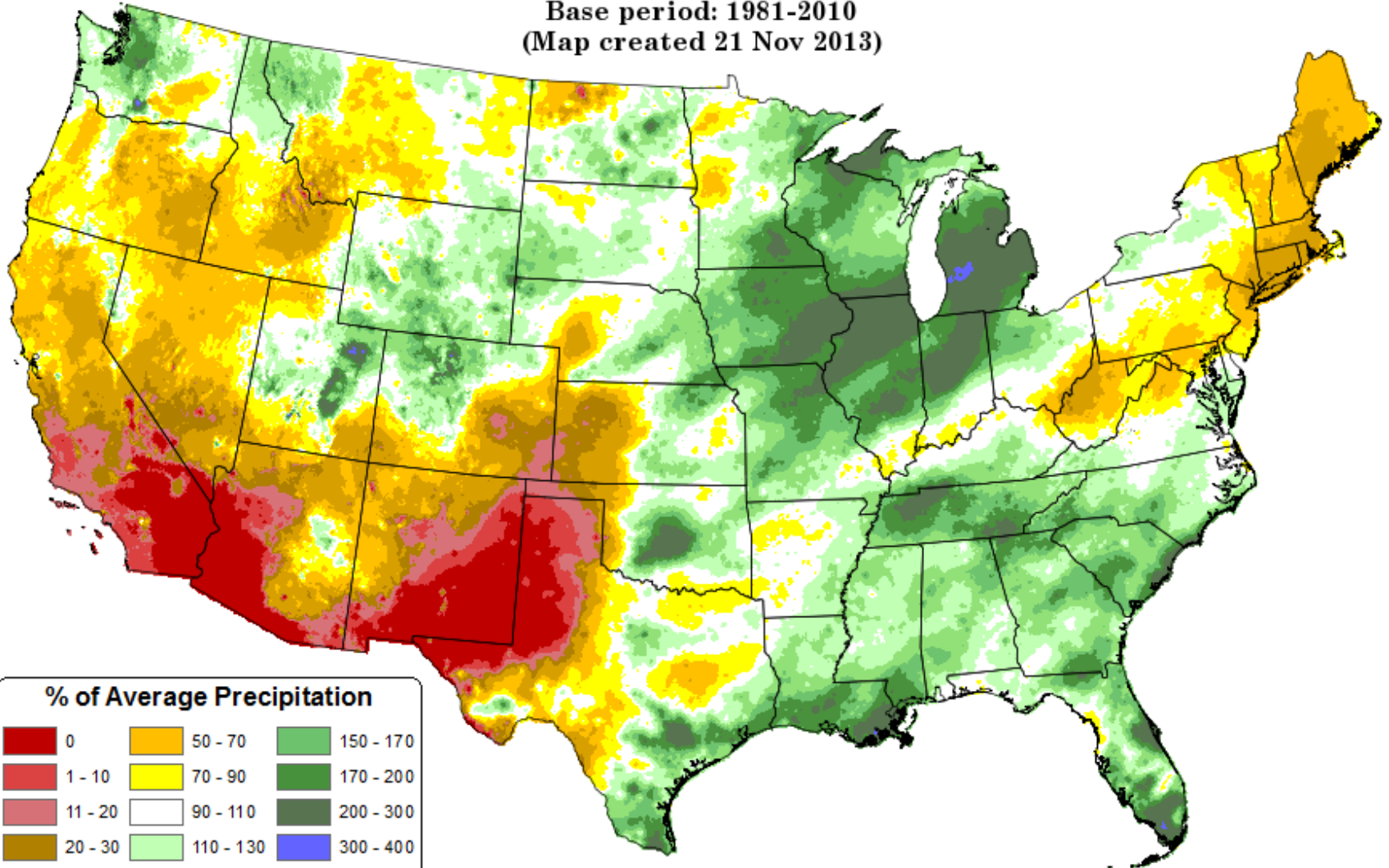
# Apr 2013 Percent of Normal

## Total Precipitation Anomaly: April 2013

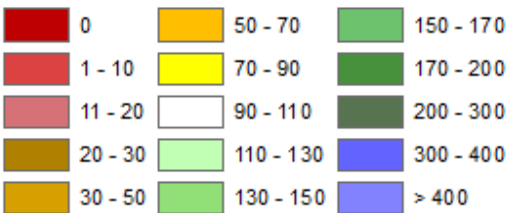
Period ending 30 Apr 2013

Base period: 1981-2010

(Map created 21 Nov 2013)



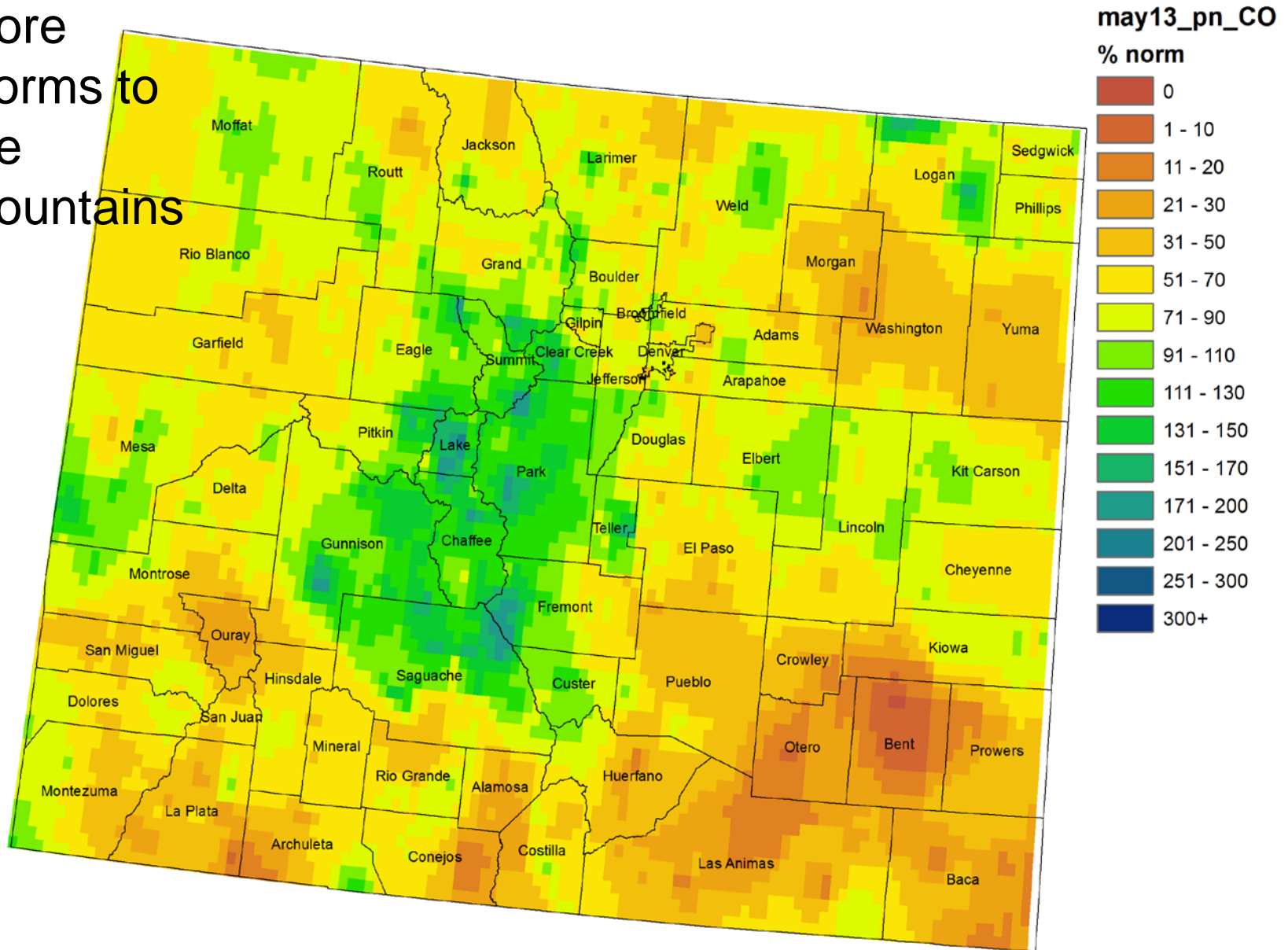
### % of Average Precipitation





Early May brought more storms to the mountains

## Colorado May 2013 Precipitation as Percentage of Normal



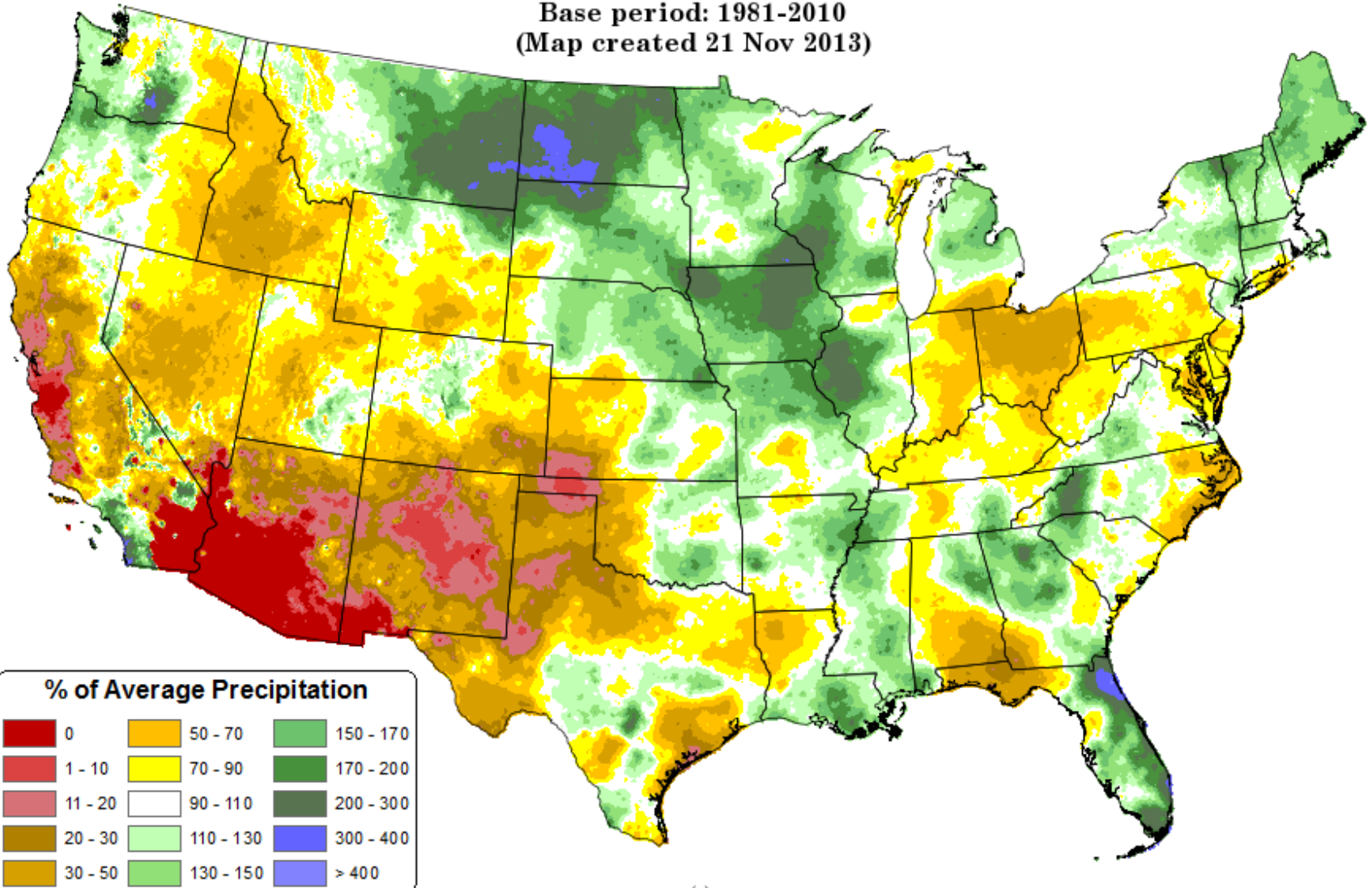
# May 2013 Percent of Normal

## Total Precipitation Anomaly: May 2013

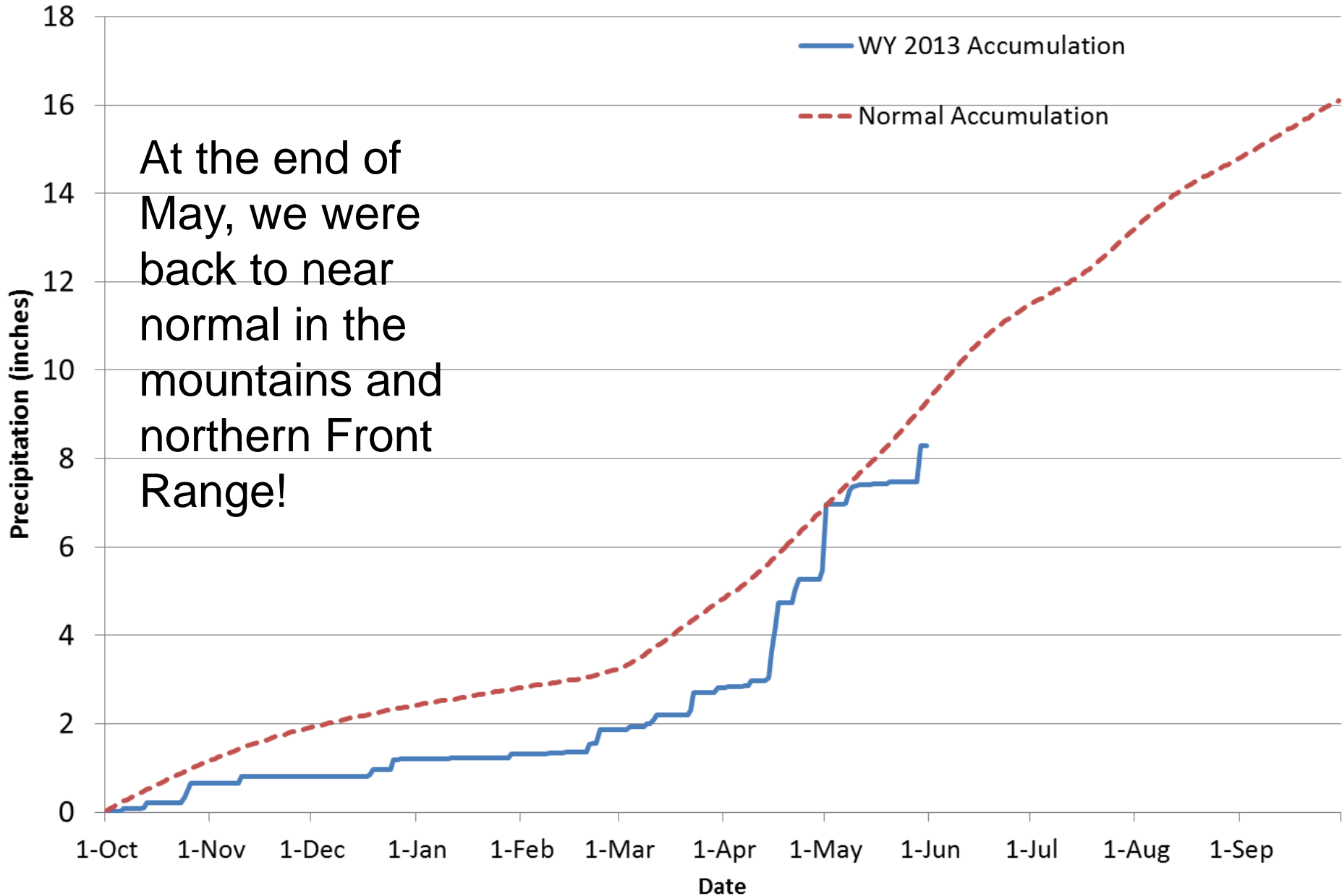
Period ending 31 May 2013

Base period: 1981-2010

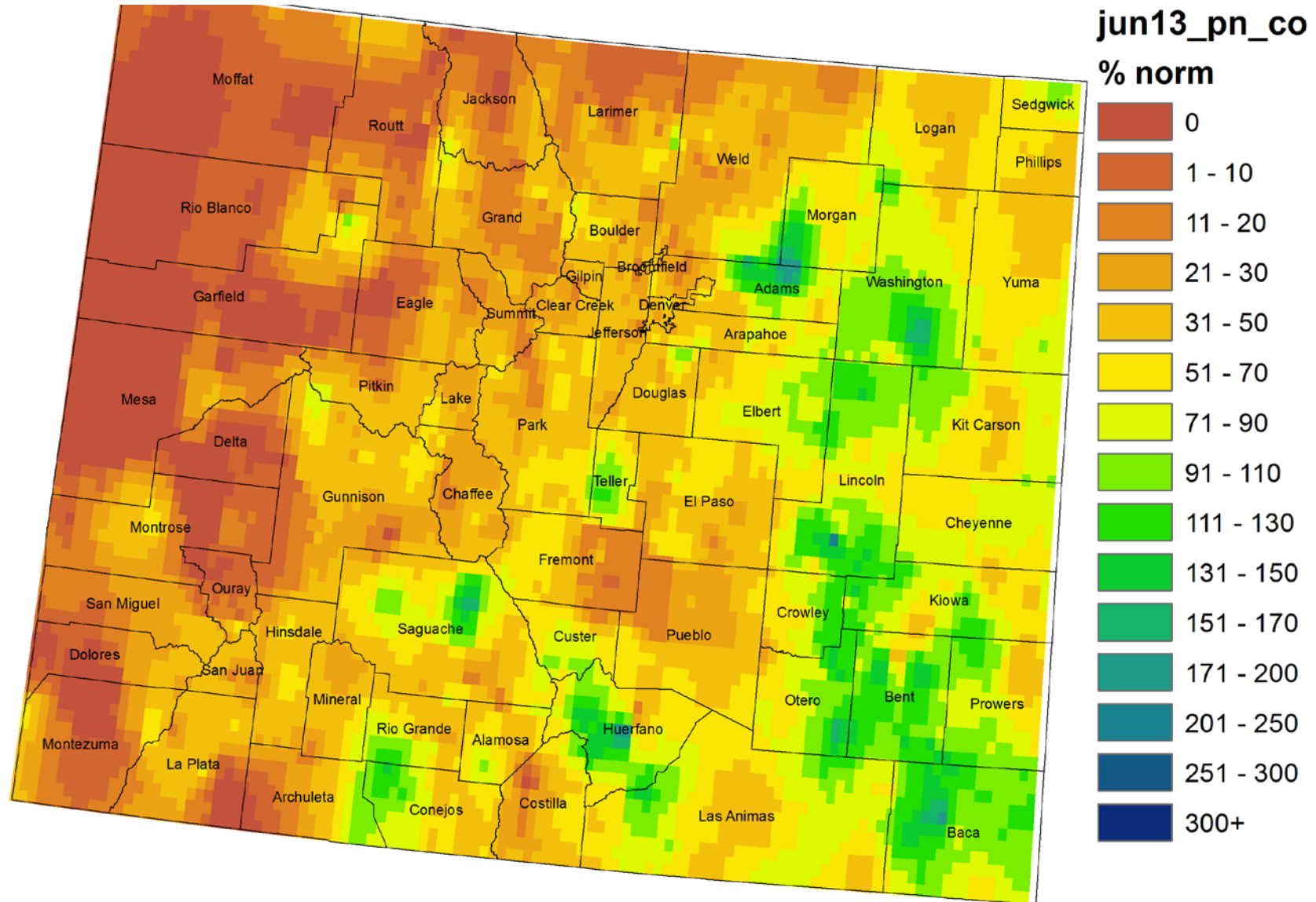
(Map created 21 Nov 2013)



# Fort Collins Water Year Daily Precipitation Accumulation



June brought another round of hot and dry weather for much of the state, while SE Colorado received some beneficial rains.



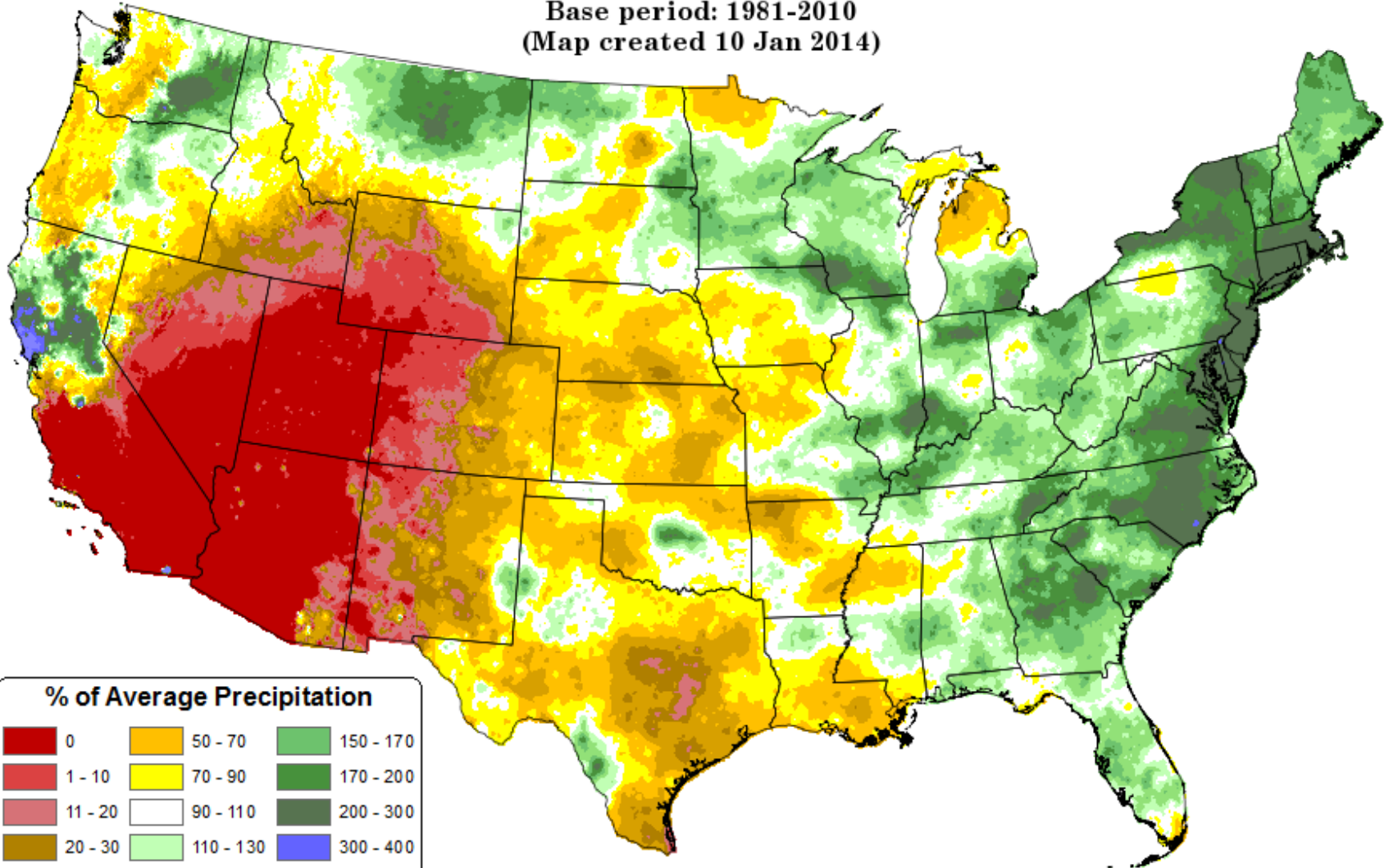
# Jun 2013 Percent of Normal

## Total Precipitation Anomaly: June 2013

Period ending 30 Jun 2013

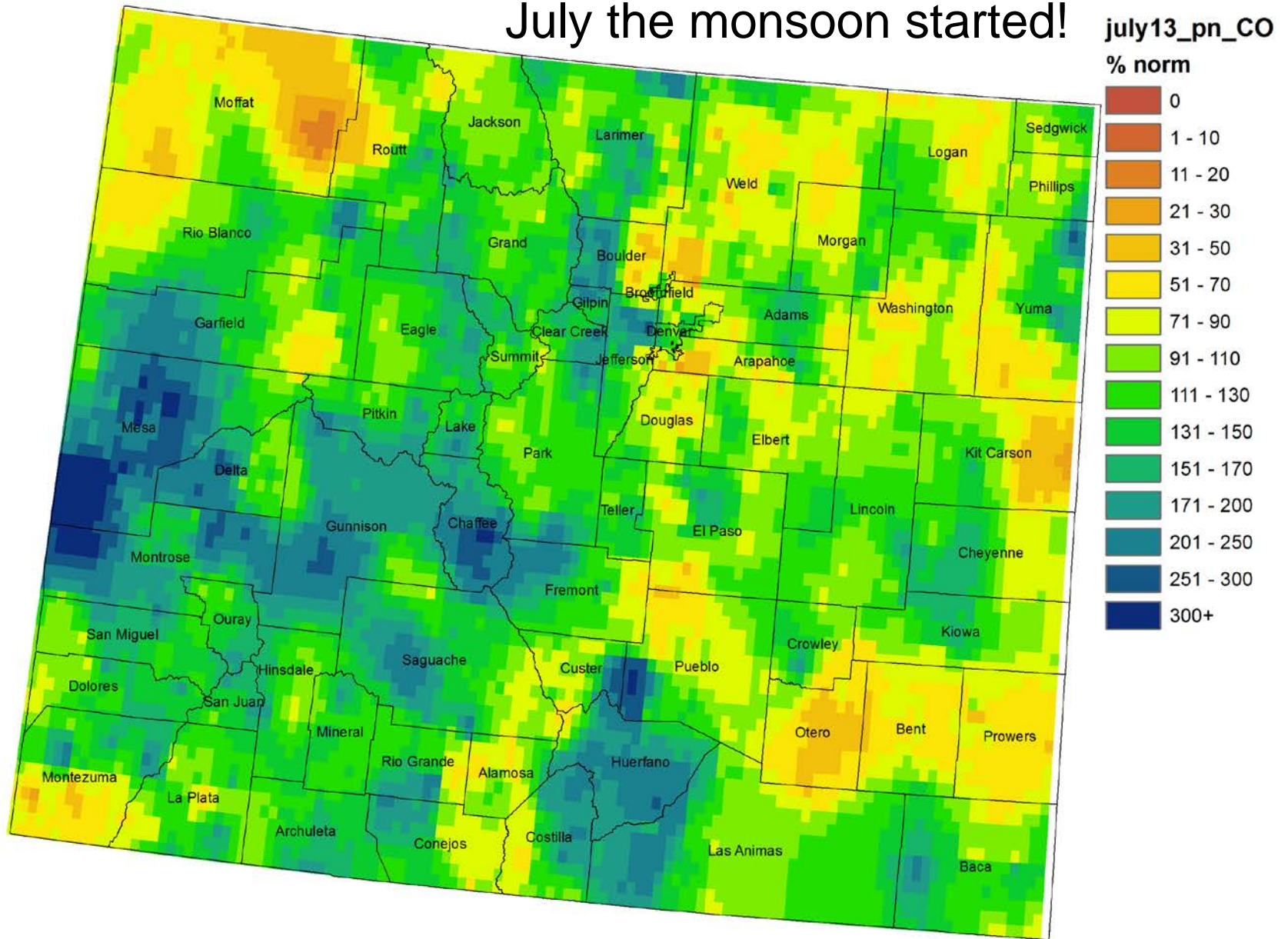
Base period: 1981-2010

(Map created 10 Jan 2014)



# Colorado July 2013 Precipitation as a Percentage of Normal

July the monsoon started!



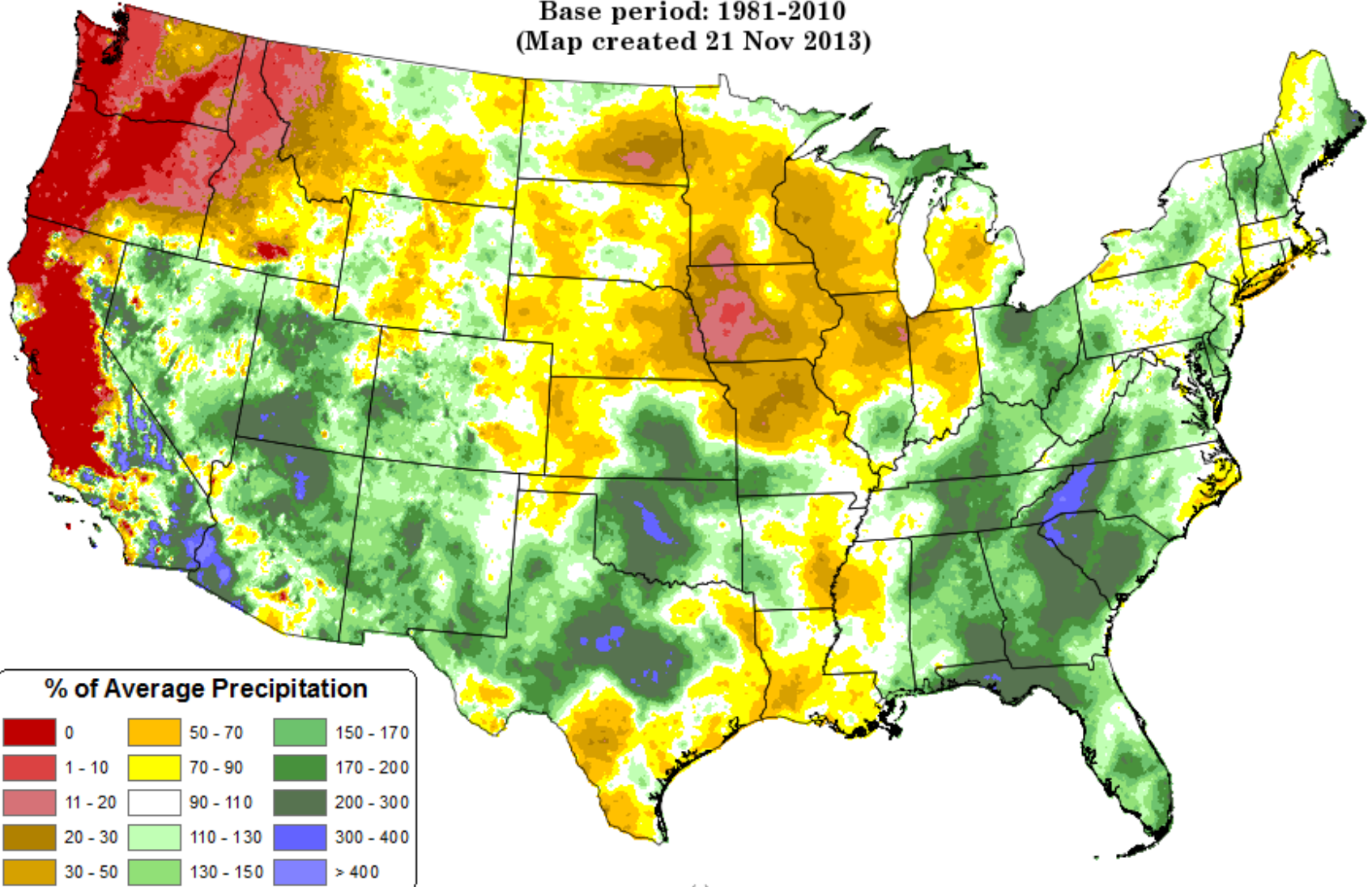
# Jul 2013 Percent of Normal

## Total Precipitation Anomaly: July 2013

Period ending 31 Jul 2013

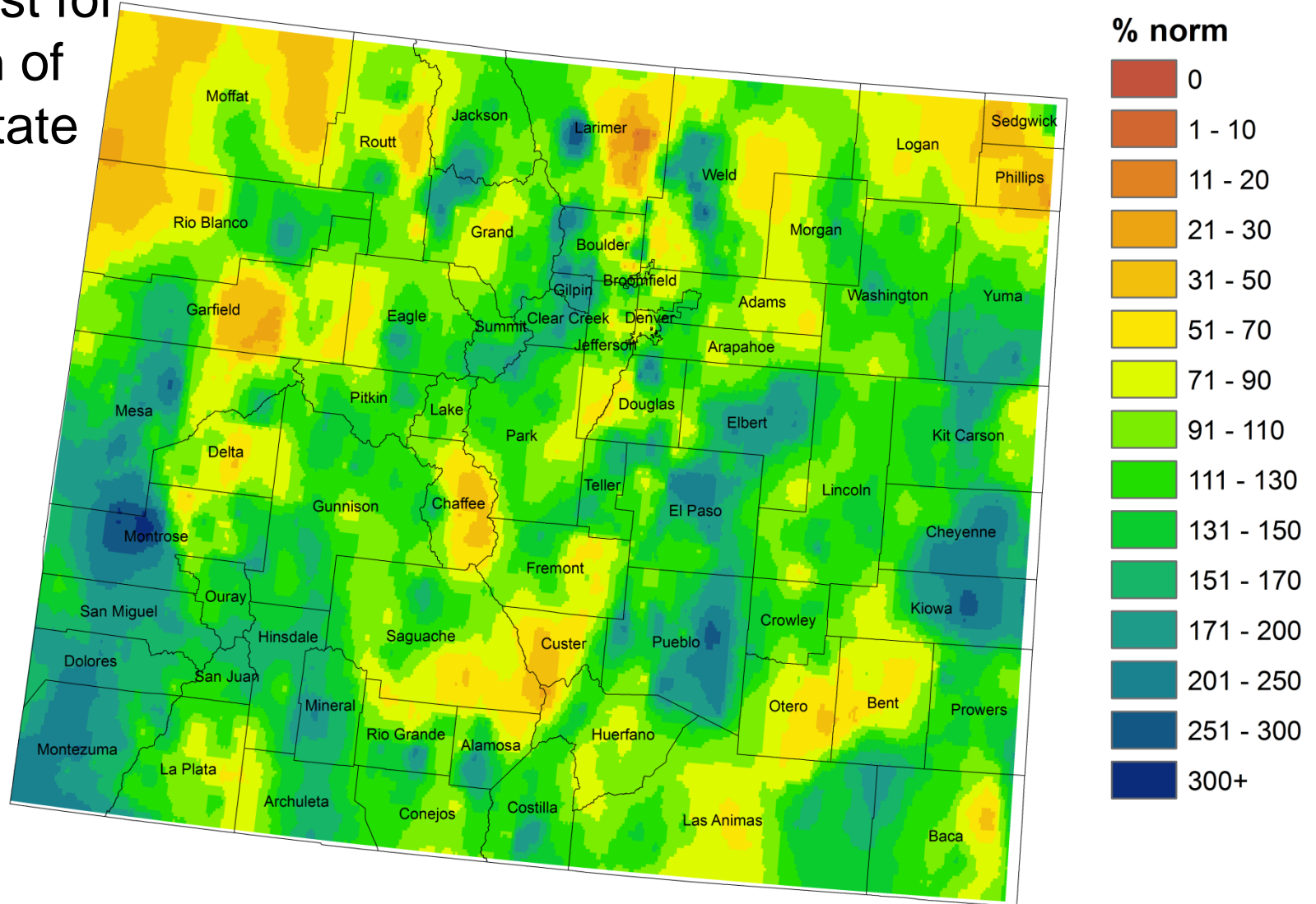
Base period: 1981-2010

(Map created 21 Nov 2013)



And continued in August for much of the state

## Colorado August 2013 Precipitation as Percentage of Normal





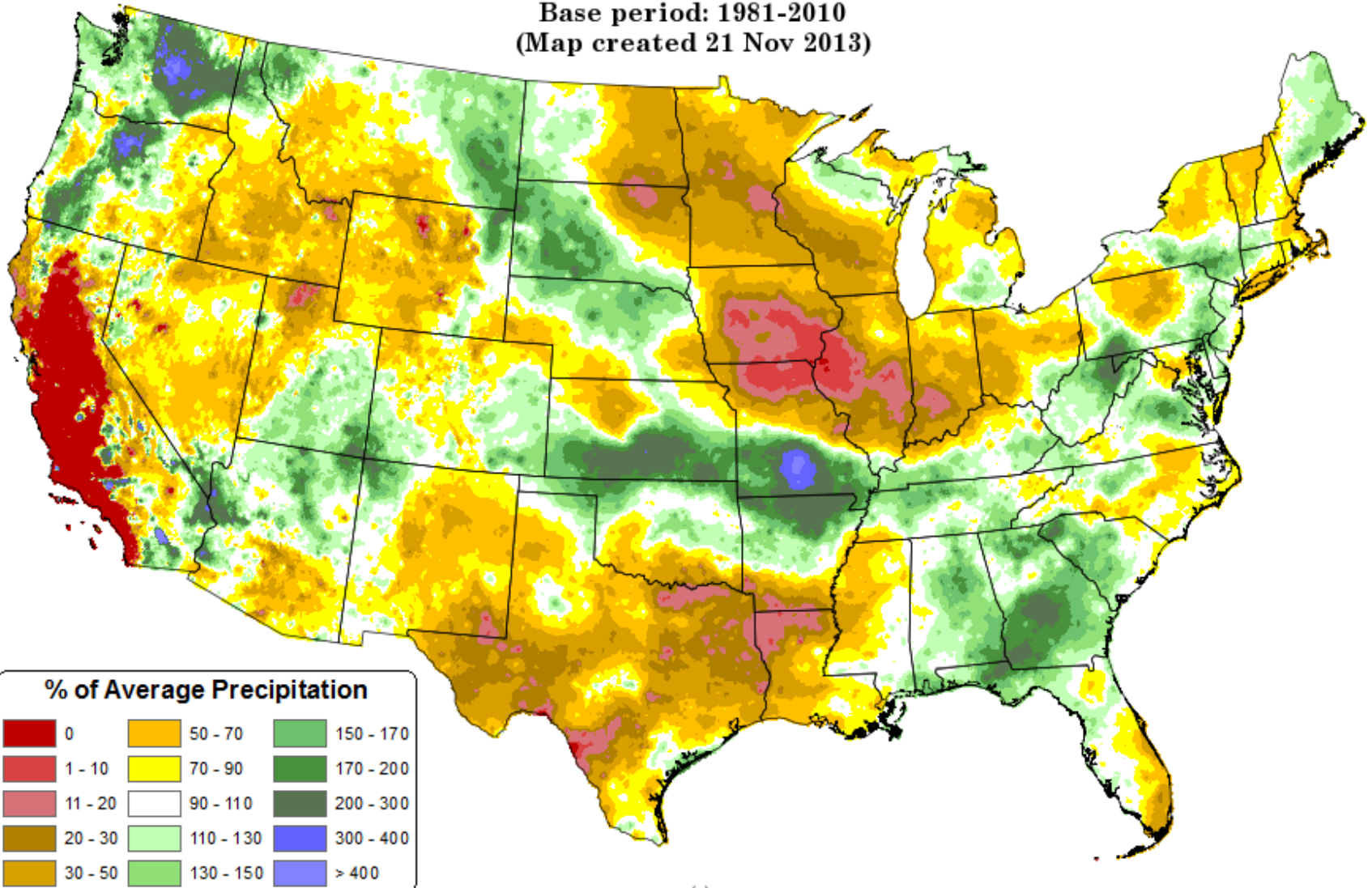
# Aug 2013 Percent of Normal

## Total Precipitation Anomaly: August 2013

Period ending 31 Aug 2013

Base period: 1981-2010

(Map created 21 Nov 2013)

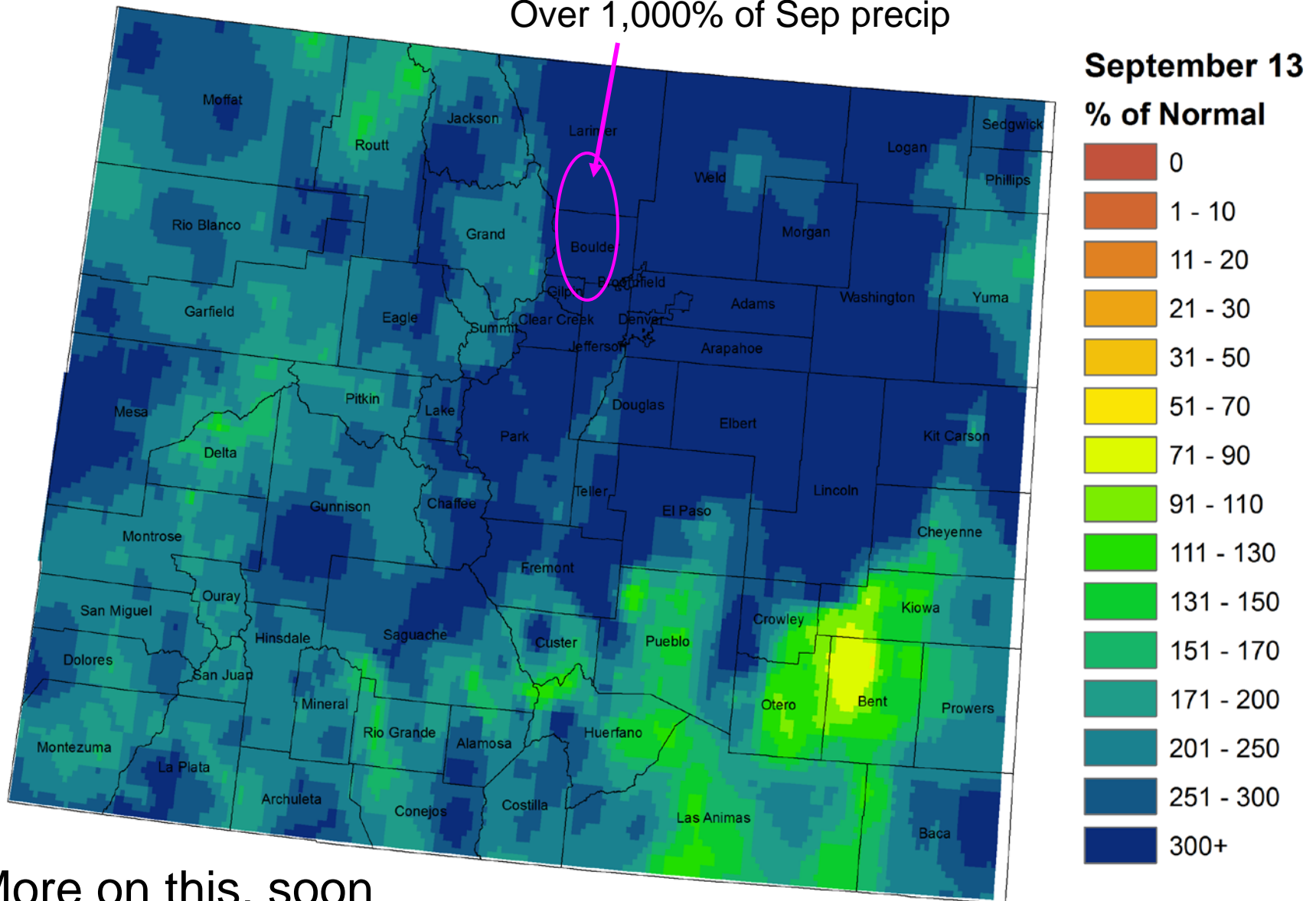


# And then -- -- -- The 2013 Colorado Floods



# Colorado September 2013 Precipitation as Percentage of Normal

Over 1,000% of Sep precip



More on this, soon

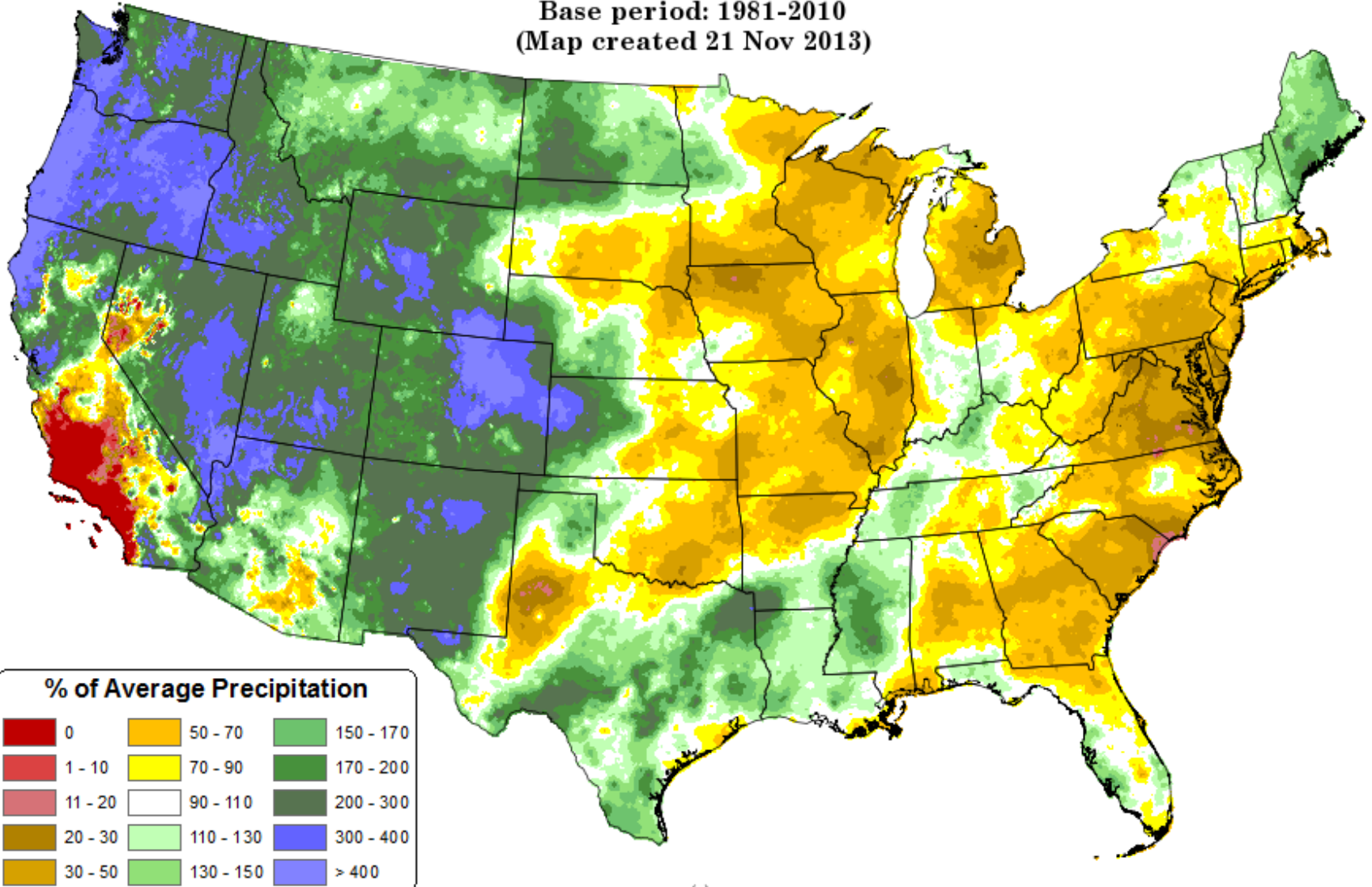
# Sep 2013 Percent of Normal

## Total Precipitation Anomaly: September 2013

Period ending 30 Sep 2013

Base period: 1981-2010

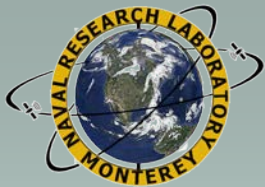
(Map created 21 Nov 2013)



Let's Look Closer at the September floods!



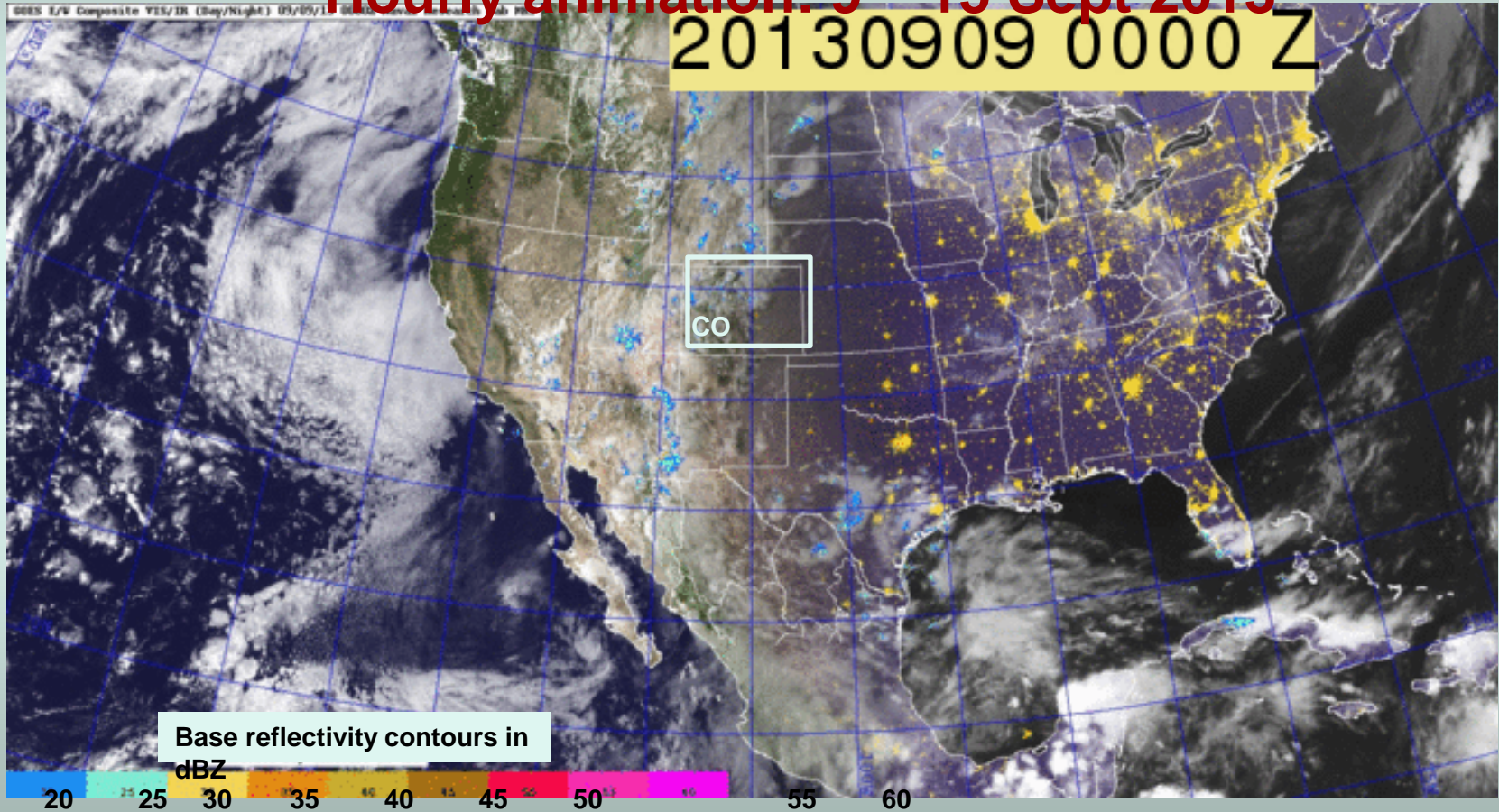
Photo Credit: Henry Reges



# Case Study of Colorado Flood Event GOES Imagery with NEXRAD Radar Overlays

Hourly animation: 9 – 15 Sept 2013

20130909 0000 Z



Rains came first to the W Slope  
Sept. 7-8 and spilled over to the  
Front Range later on the 9th



Credit:

thedenverchannel.co

# After the Sept 9 T-storms, low stratus upslope developed along the Front Range

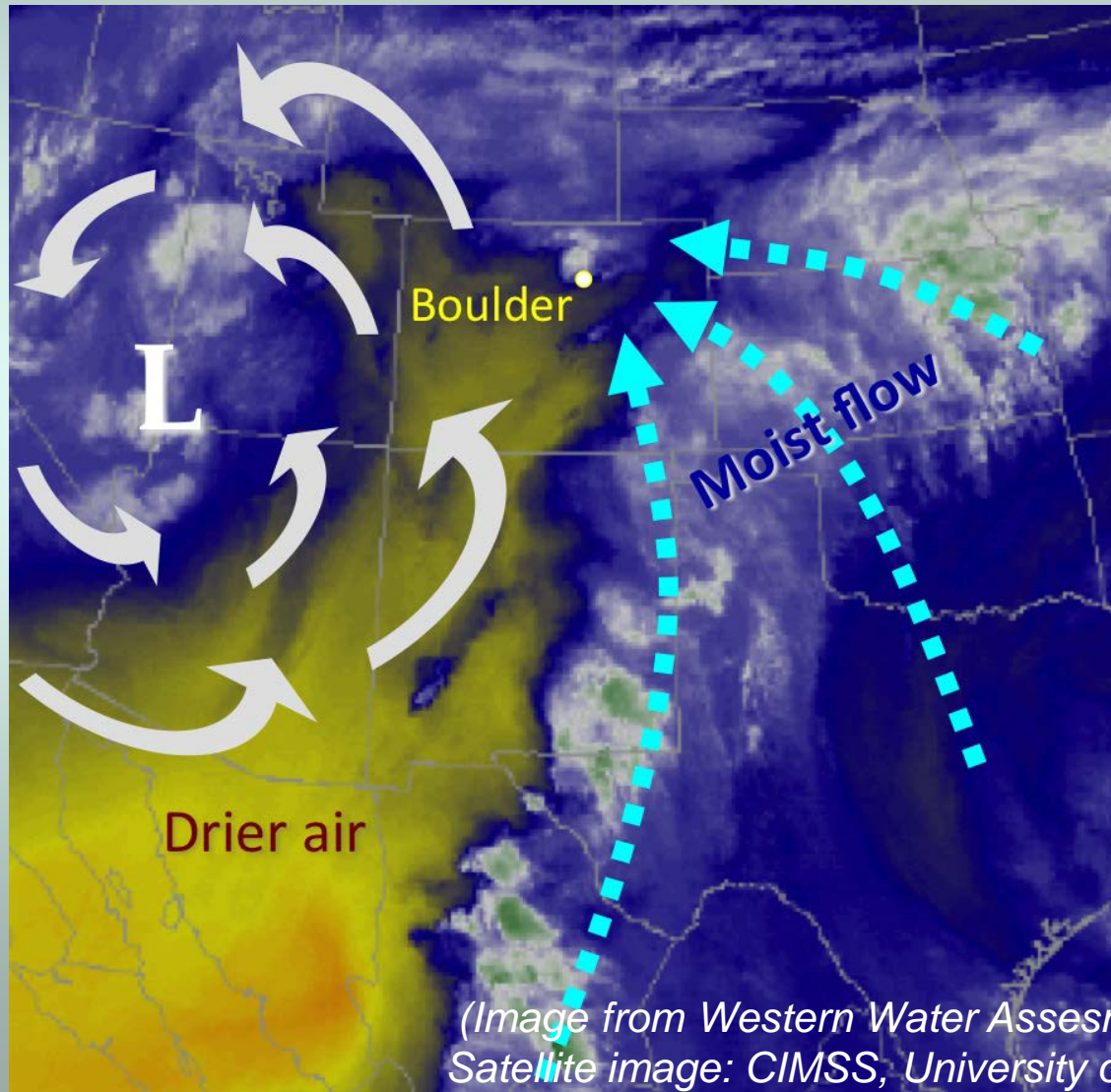
We call it  
“Upslope”



Credit: Henry  
Reges

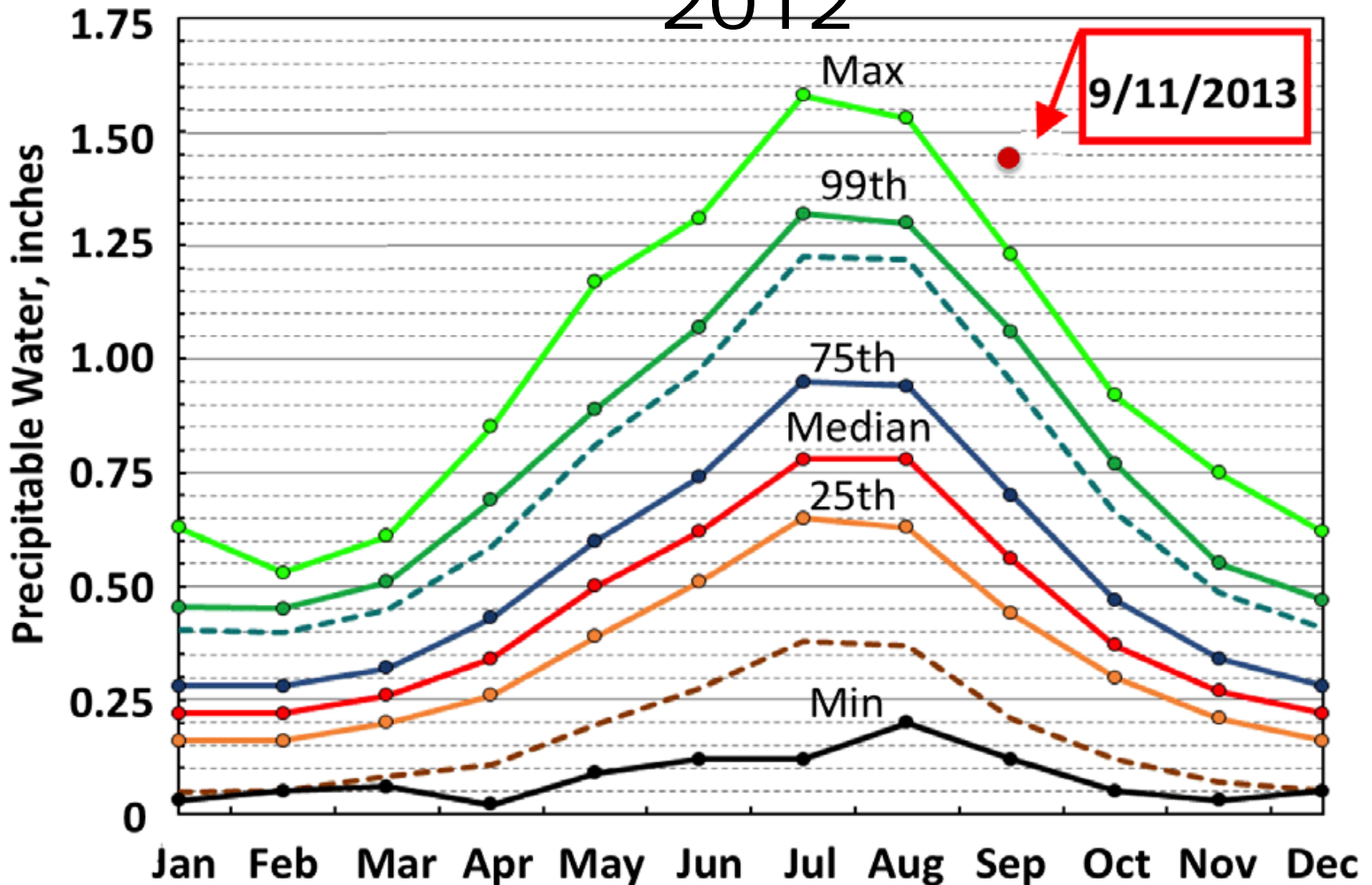


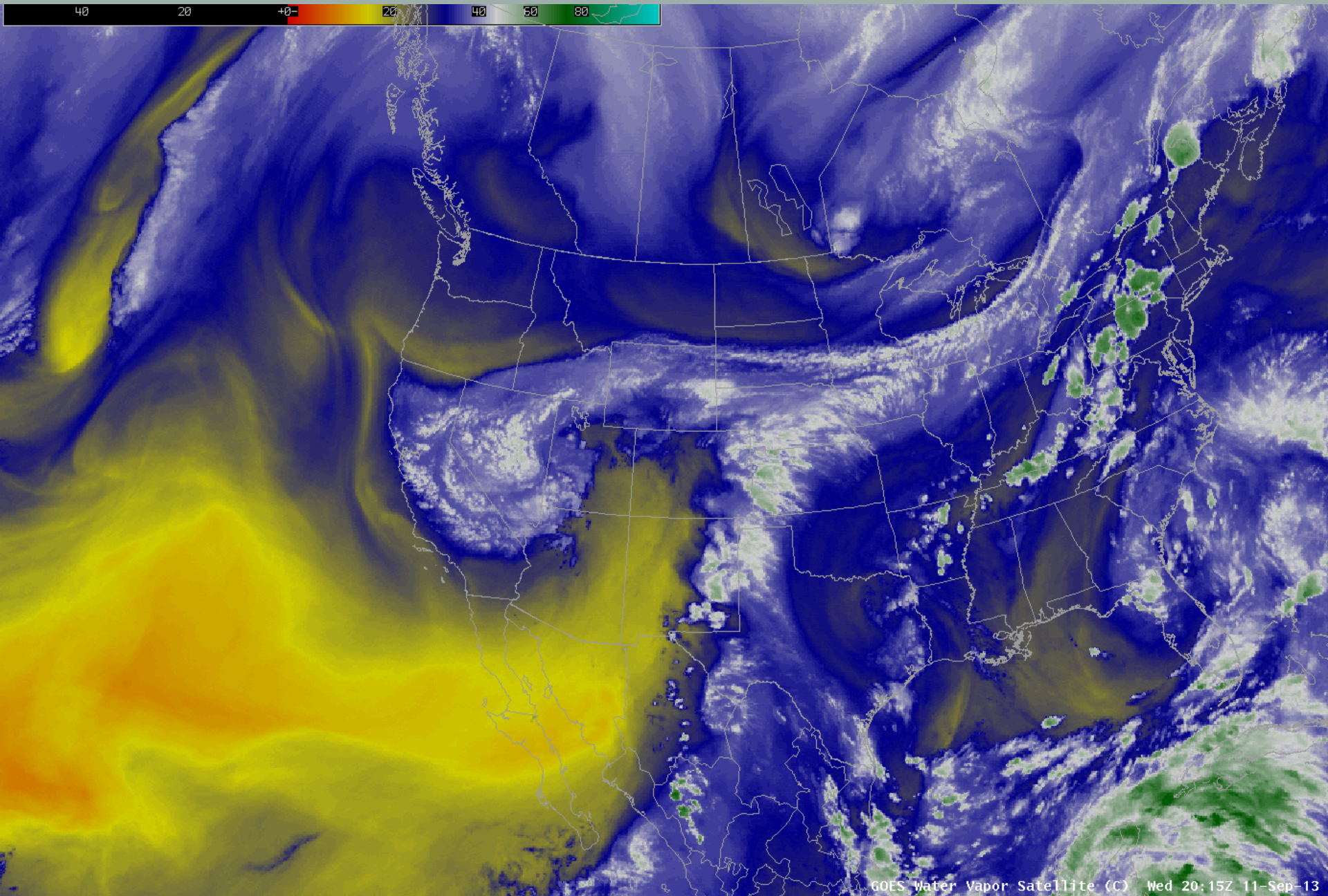
By Sept 11, 2013 ingredients for very heavy rains were in place



(Image from Western Water Assessment  
Satellite image: CIMSS, University of Wisconsin)

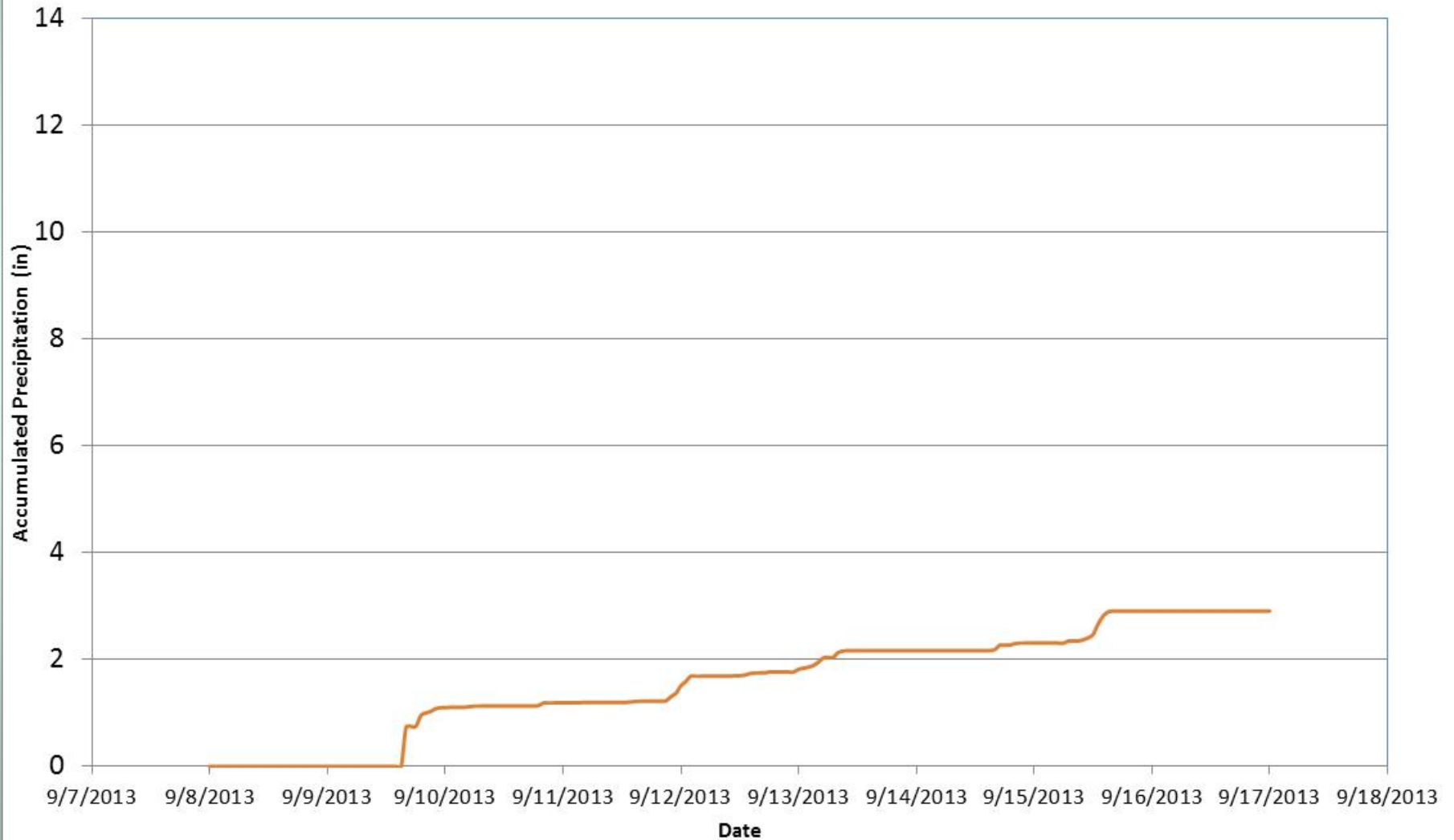
# Total Atmospheric Precipitable water over Denver from 1948 - 2012





# Hourly Accumulated Precipitation 9/8/13-9/17/13

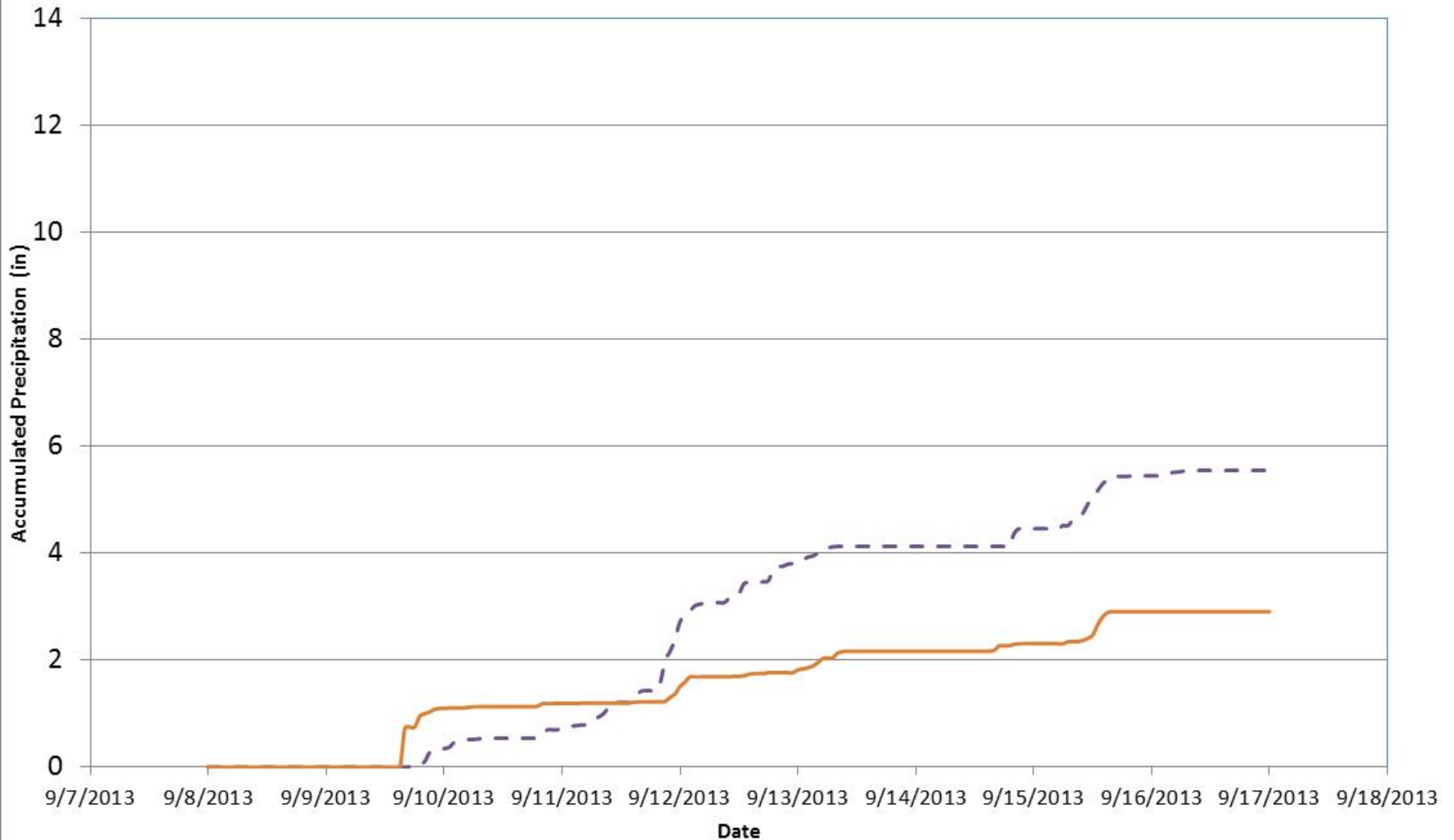
Greeley04 CoAgMet 4,683'



# Hourly Accumulated Precipitation 9/8/13-9/17/13

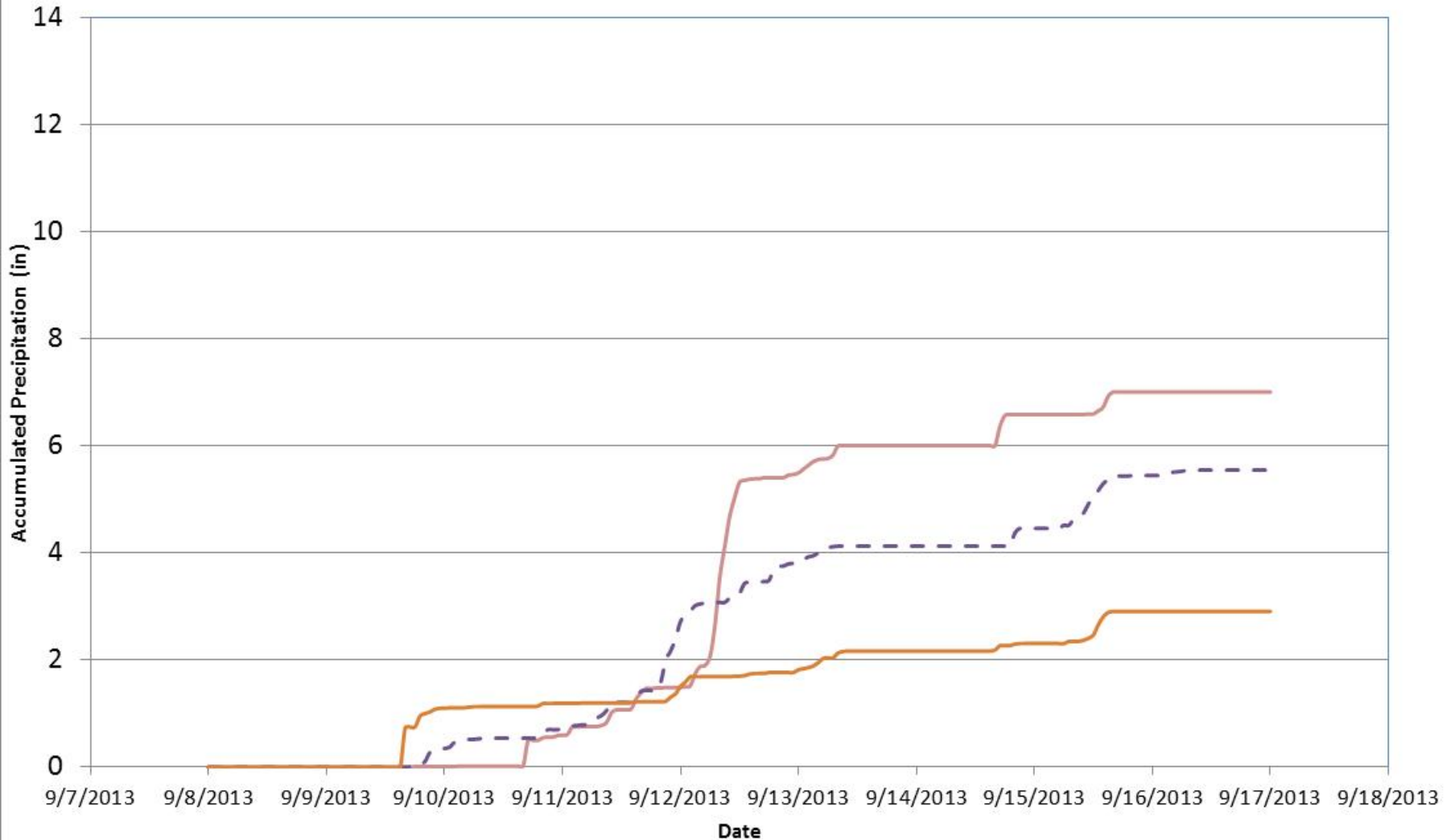
- - Fort Collins West CoAgMet (in) 5,120'

— Greeley04 CoAgMet 4,683'



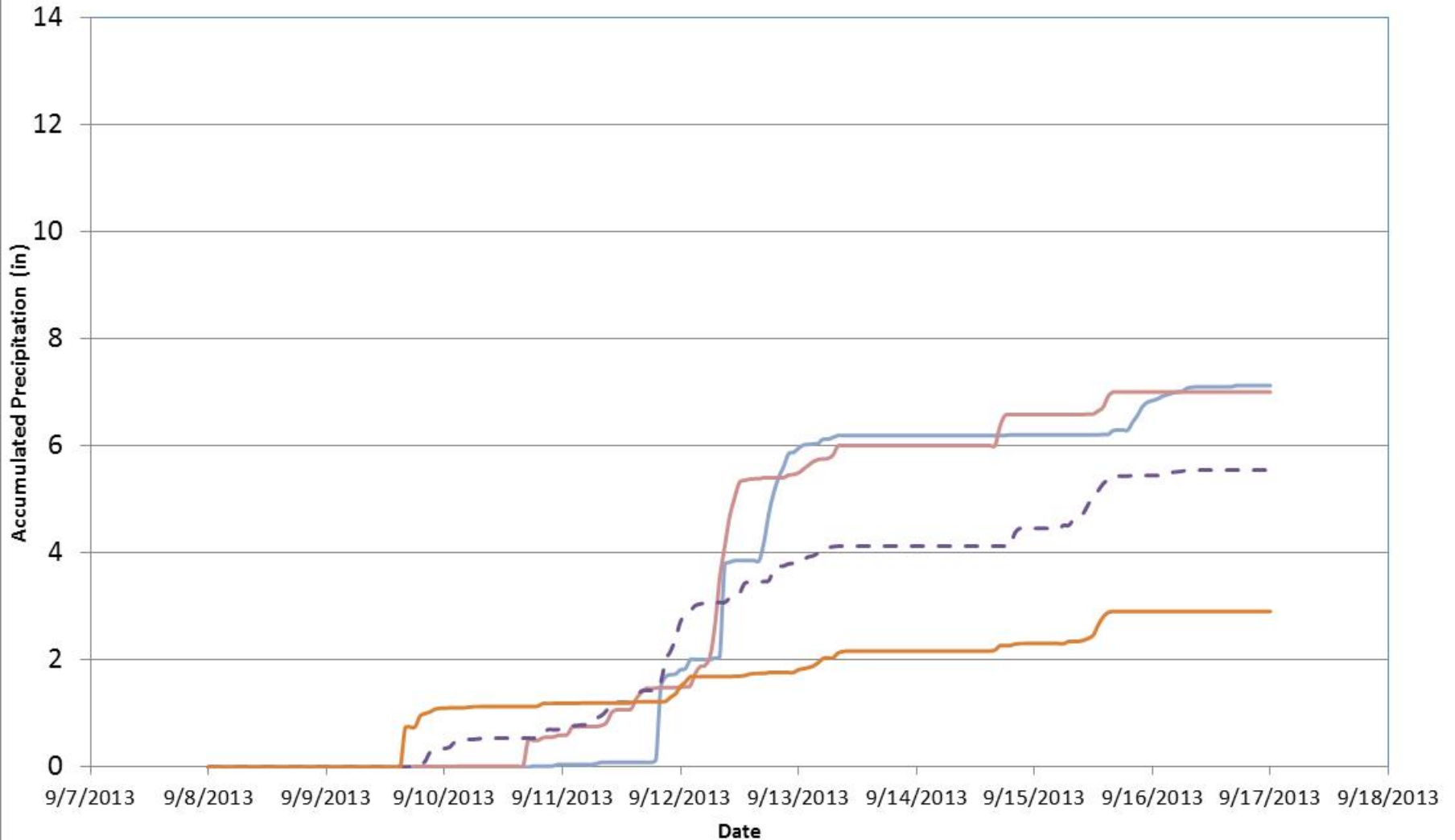
# Hourly Accumulated Precipitation 9/8/13-9/17/13

— Denver City Park 5307'    - - Fort Collins West CoAgMet (in) 5,120'    — Greeley04 CoAgMet 4,683'



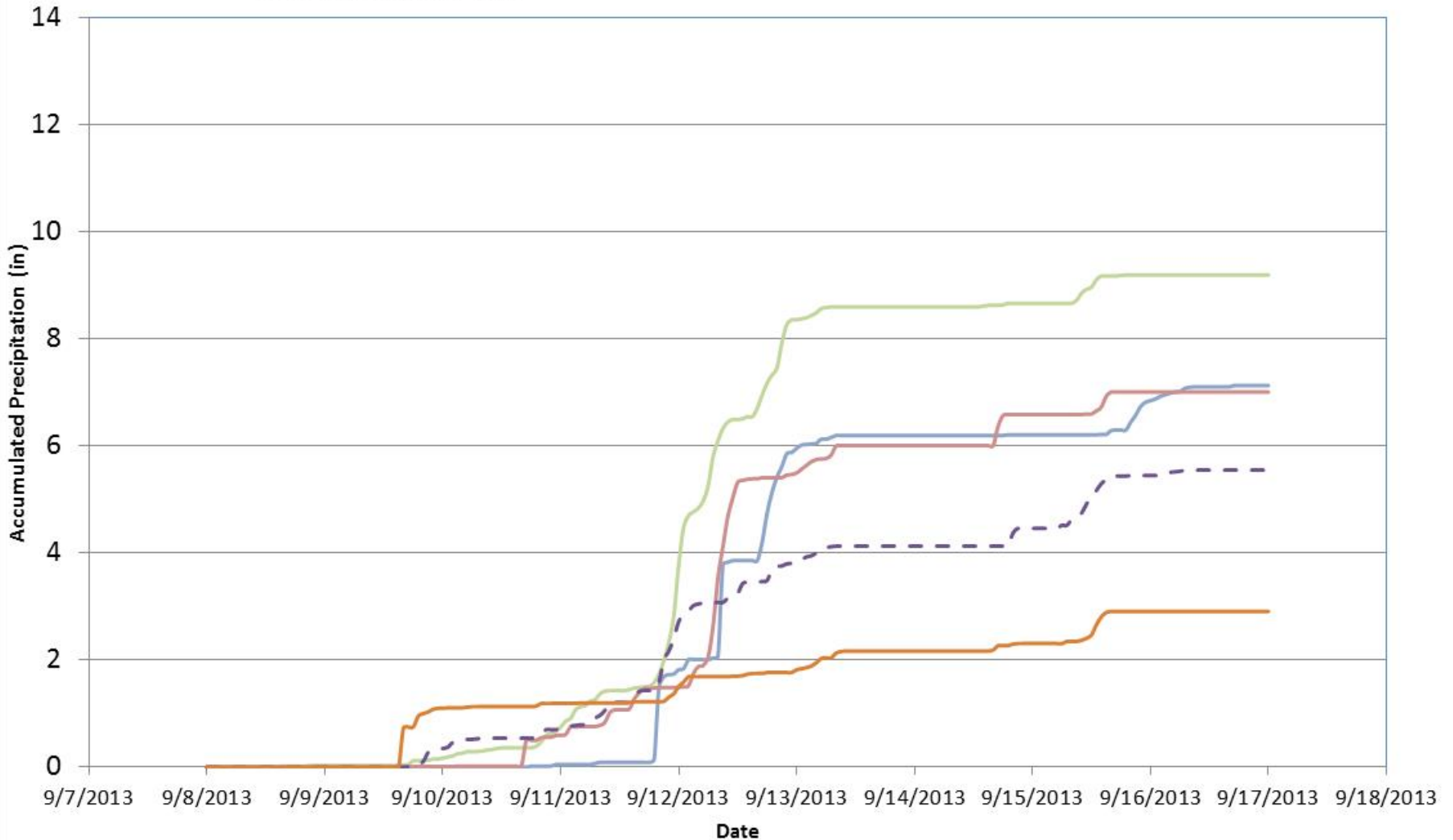
# Hourly Accumulated Precipitation 9/8/13-9/17/13

- Fort Carson RAWS 6,700'
- Denver City Park 5307'
- Fort Collins West CoAgMet (in) 5,120'
- Greeley04 CoAgMet 4,683'



# Hourly Accumulated Precipitation 9/8/13-9/17/13

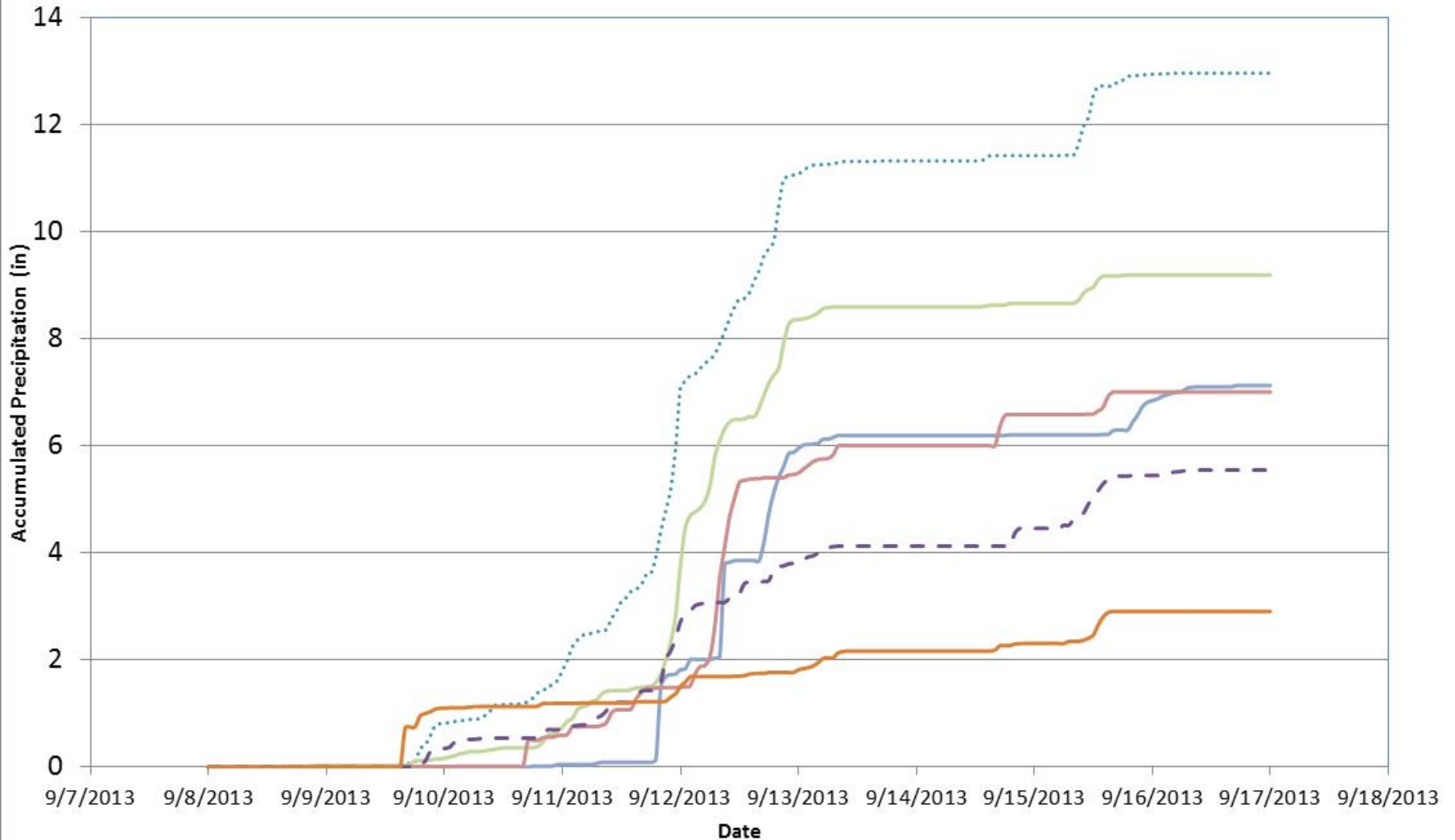
- Estes Park RAWS 7,820'
- Fort Carson RAWS 6,700'
- Denver City Park 5307'
- Fort Collins West CoAgMet (in) 5,120'
- Greeley04 CoAgMet 4,683'





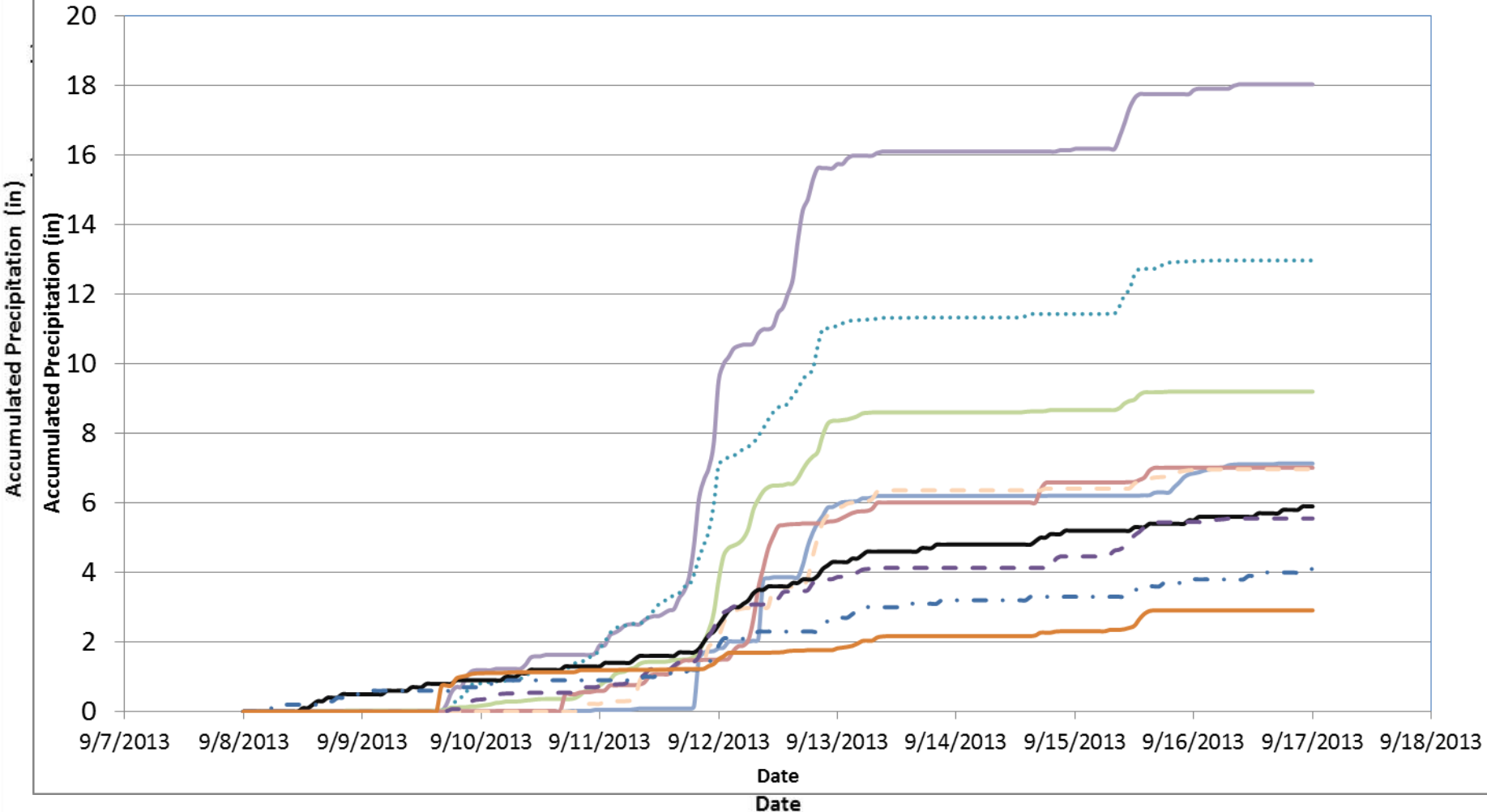
# Hourly Accumulated Precipitation 9/8/13-9/17/13

- ..... Sugarloaf (Boulder) RAWS 6,733'
- Fort Carson RAWS 6,700'
- - Fort Collins West CoAgMet (in) 5,120'
- Estes Park RAWS 7,820'
- Denver City Park 5307'
- Greeley04 CoAgMet 4,683'

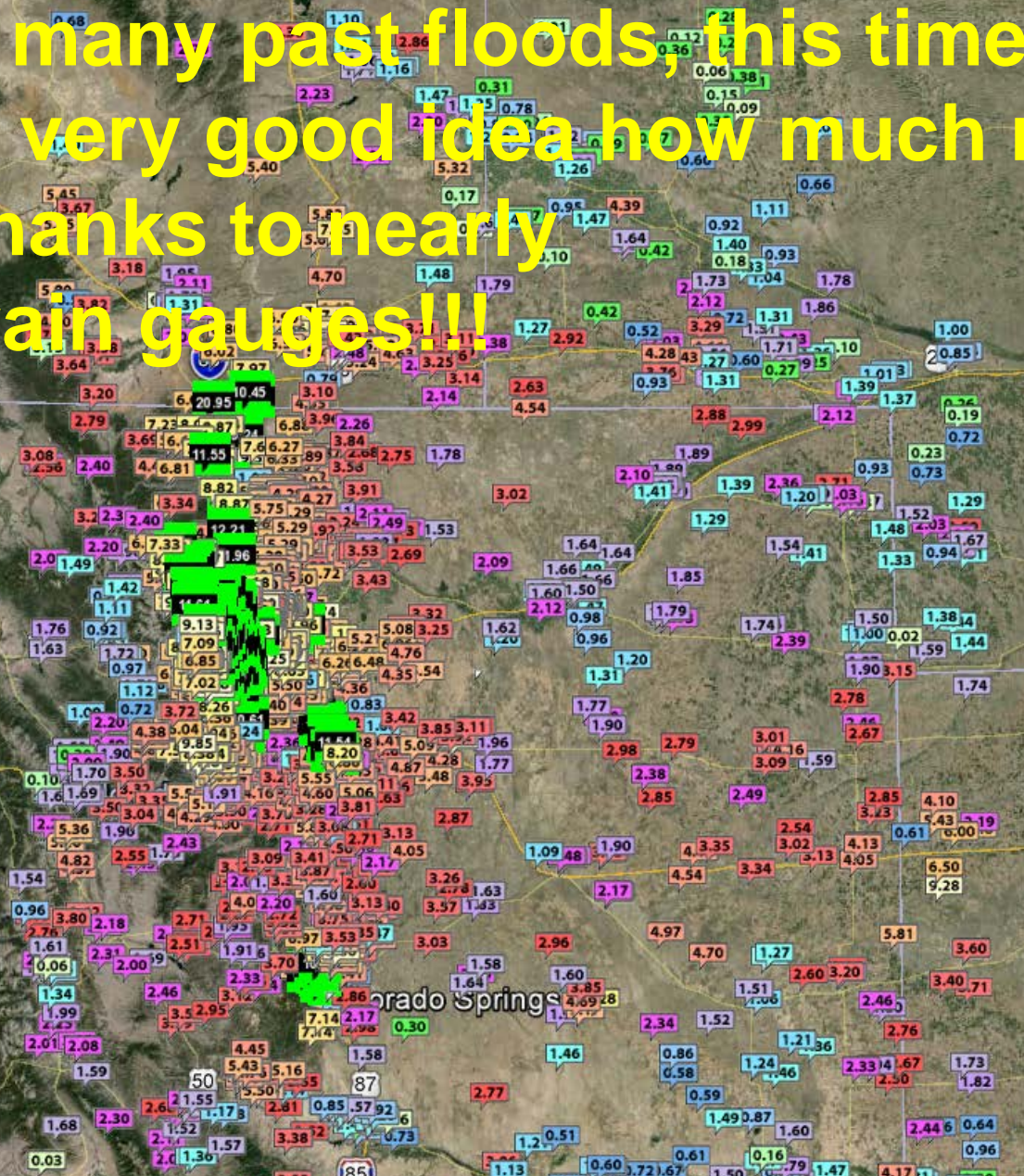


# Hourly Accumulated Precipitation 9/8/13-9/17/13

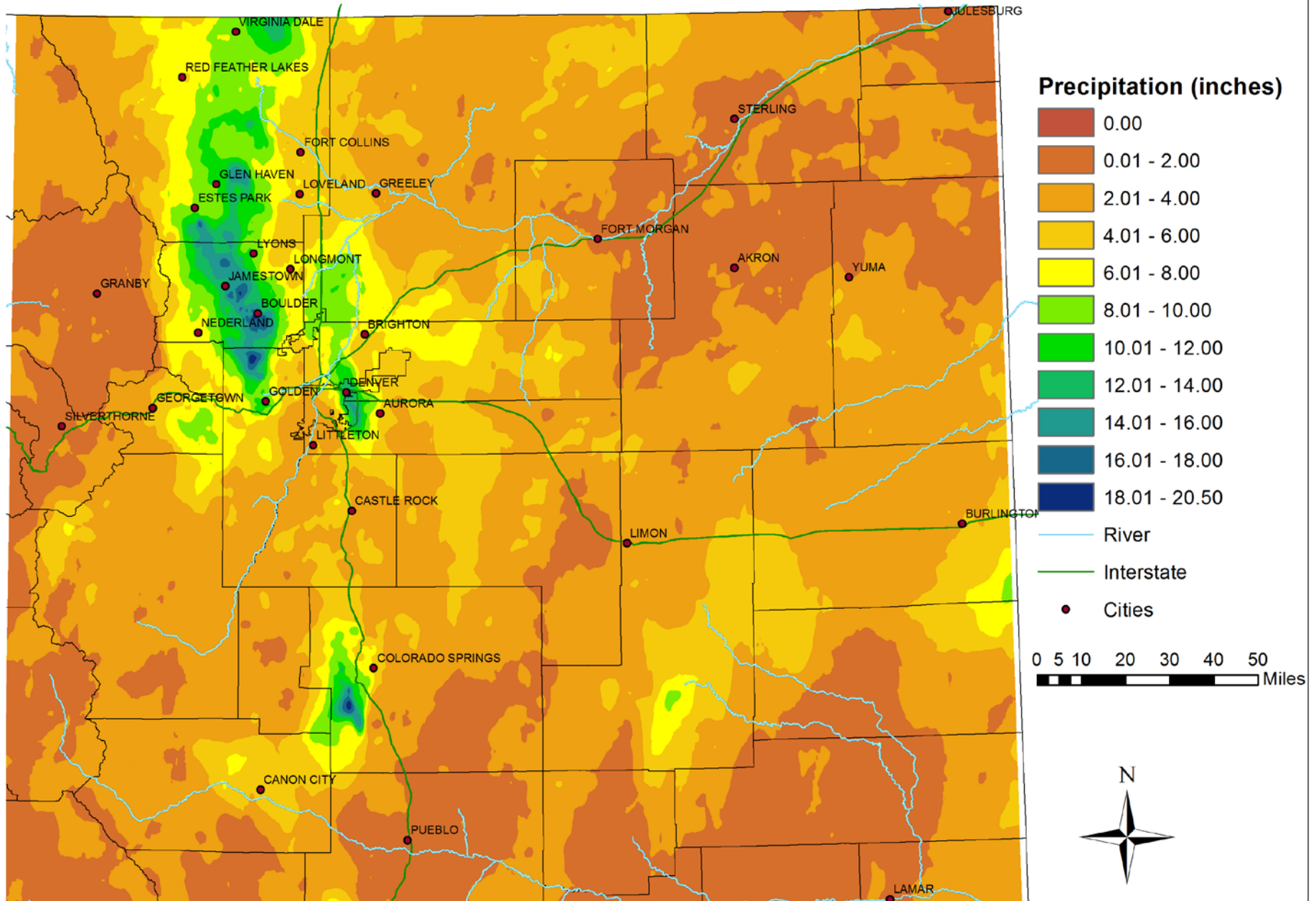
- SBC @ South Boulder Road 5350'
- Estes Park RAWS 7,820'
- Denver City Park 5307'
- Deadman Hill 10,220'
- · - Joe Wright Snotel 10,120'
- Sugarloaf (Boulder) RAWS 6,733'
- Fort Carson RAWS 6,700'
- - - Rampart Range (W. El Paso) RAWS 9,207'
- - - Fort Collins West CoAgMet (in) 5,120'
- Greeley04 CoAgMet 4,683'



Unlike many past floods, this time we have a very good idea how much rain fell – thanks to nearly 2,500 rain gauges!!



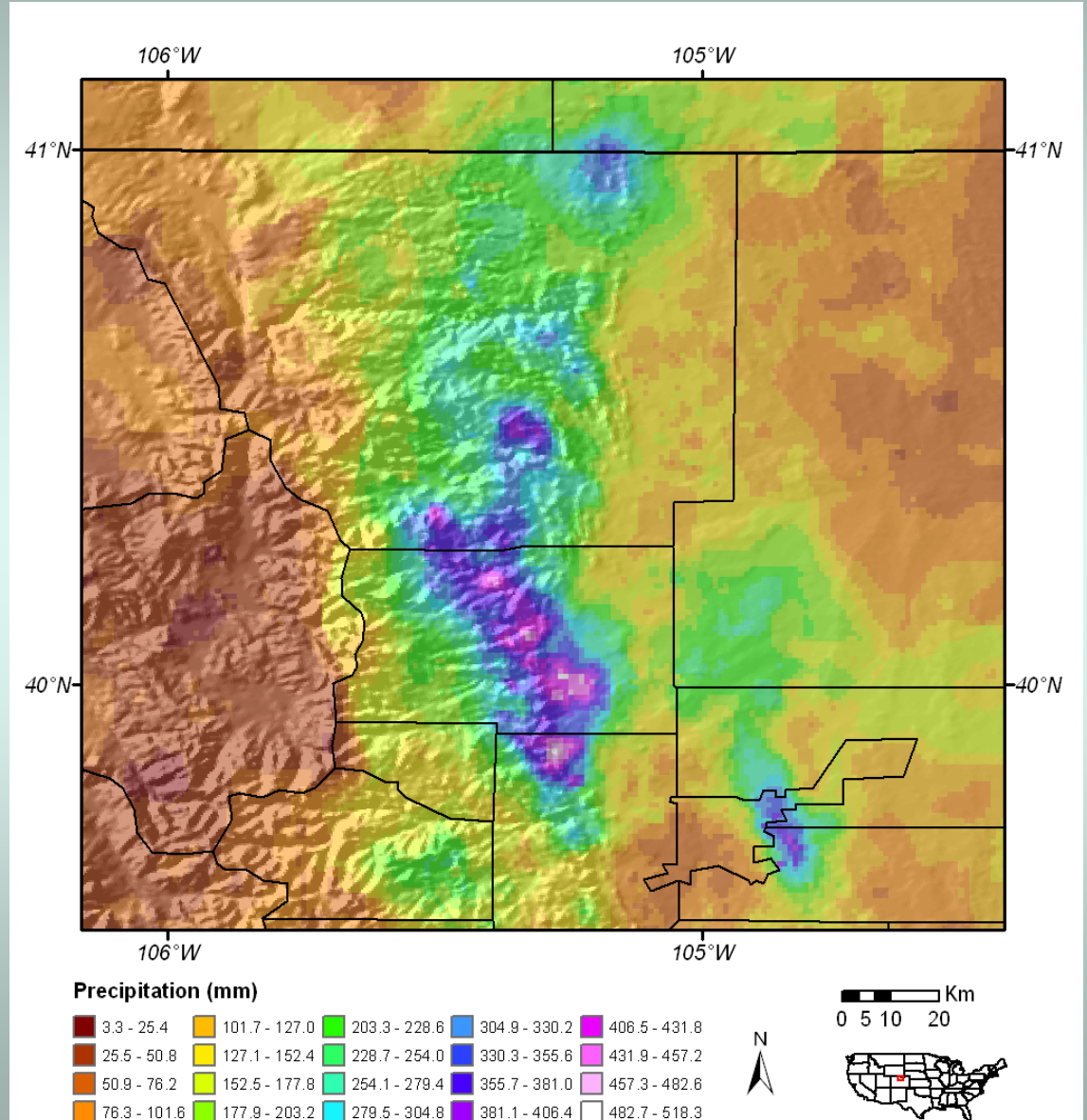
# Precipitation beginning September 8, 2013 ending 7:00 AM MST September 17, 2013



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.

# Storm-total Rainfall, north central Colorado, Sep 8-17, 2013

This storm is likely one of the 3-5 largest rain/flood events in Colorado's measured history back to the late 1890s



<b>Top Total By County</b>		
<b>Stations Exceeding 10" of Rain</b>		
<b>Sep-13</b>		
CO-BO-30	Boulder 1.9 SE	19.18
CO-LR-225	Drake 3.0 NNE	16.65
CO-AD-127	Aurora 4.2 NNW	16.63
CO-AR-270	Aurora 0.7 WSW	16.39
CO-DN-183	Denver 5.1 ENE	13.49
CO-EP-175	Manitou Springs 1.2 ESE	12.84
CO-JF-365	Golden 2.1 SW	12.64
CO-WE-203	Longmont 8.2 ESE	11.57
CO-CC-7	Idaho Springs 4.7 SSE	10.34

These day are preliminary – use only for general assessment

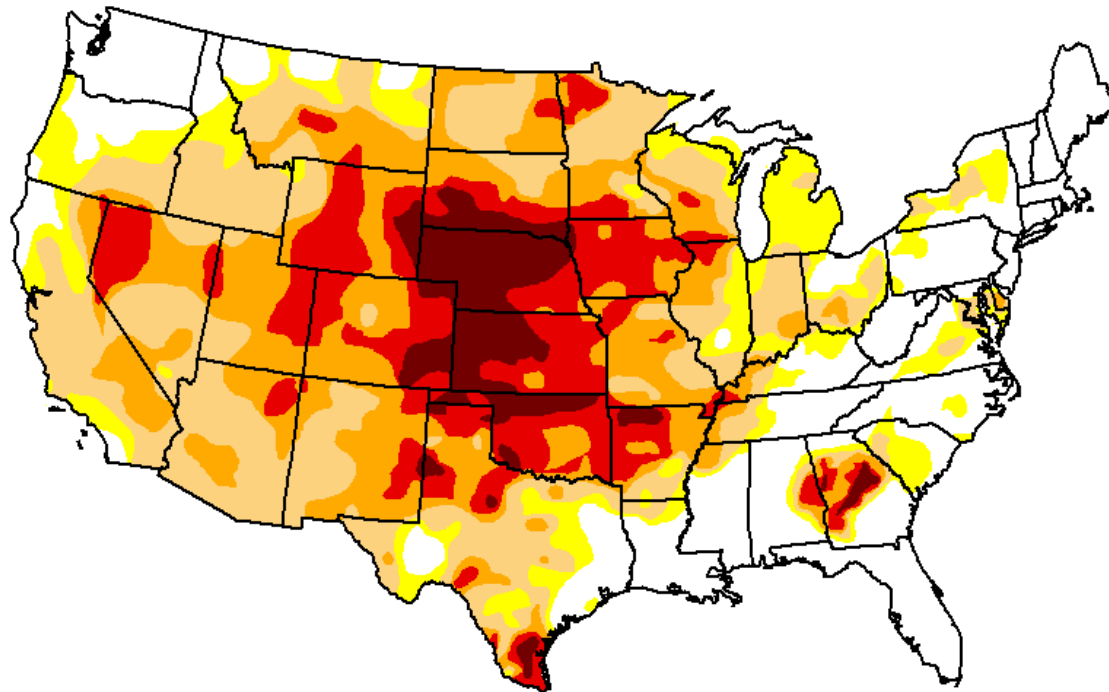
# New Colorado one-day rainfall record set 12 Sep 2013

- Fort Carson Rod and Gun observing station
  - 11.85" calendar day total
  - 12.46" for 24-hour period ending 9 AM Sep 13, 2013


For some of us this was a catastrophic life-changing event, but for most of us it was relief from drought

# U.S. Drought Monitor CONUS

October 2, 2012  
(Released Thursday, Oct. 4, 2012)  
Valid 7 a.m. EST



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:  
Anthony Artusa  
NOAA/NWS/NCEP/CPC



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

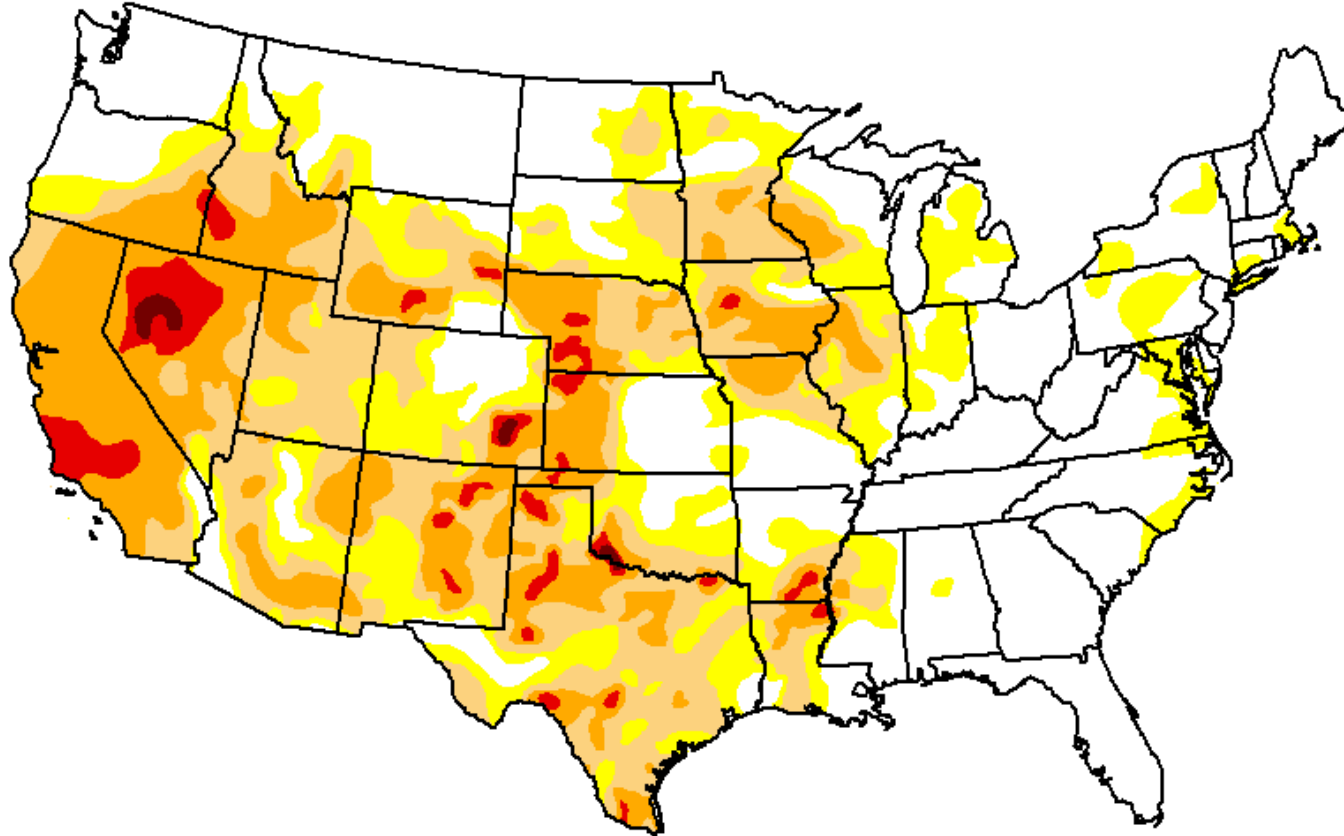


# CONUS

(Released Thursday, Oct. 3, 2013)

Valid 7 a.m. EDT

## Status at end of 2013 Water Year



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:

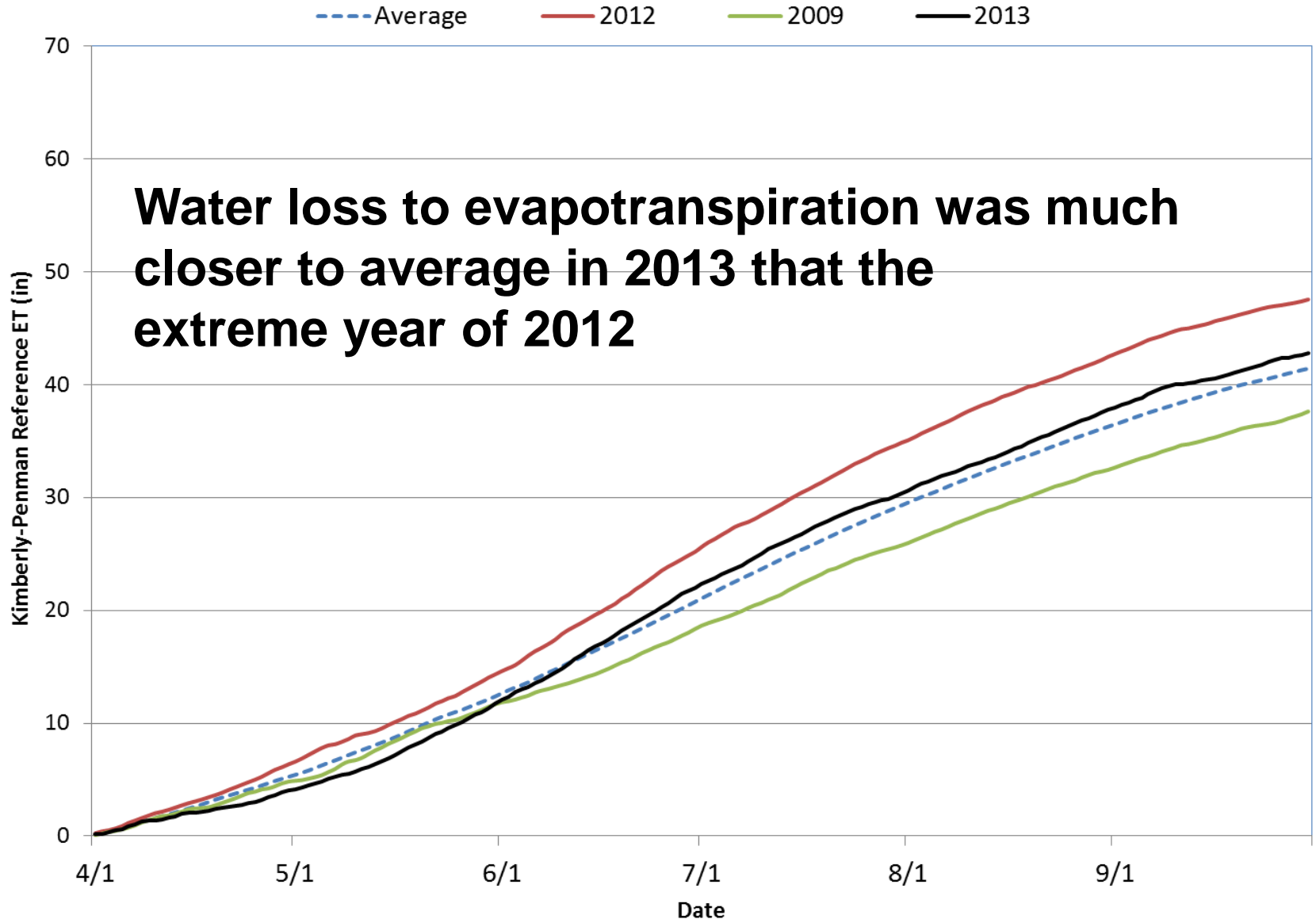
David Miskus  
NOAA/NWS/NCEP/CPC



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

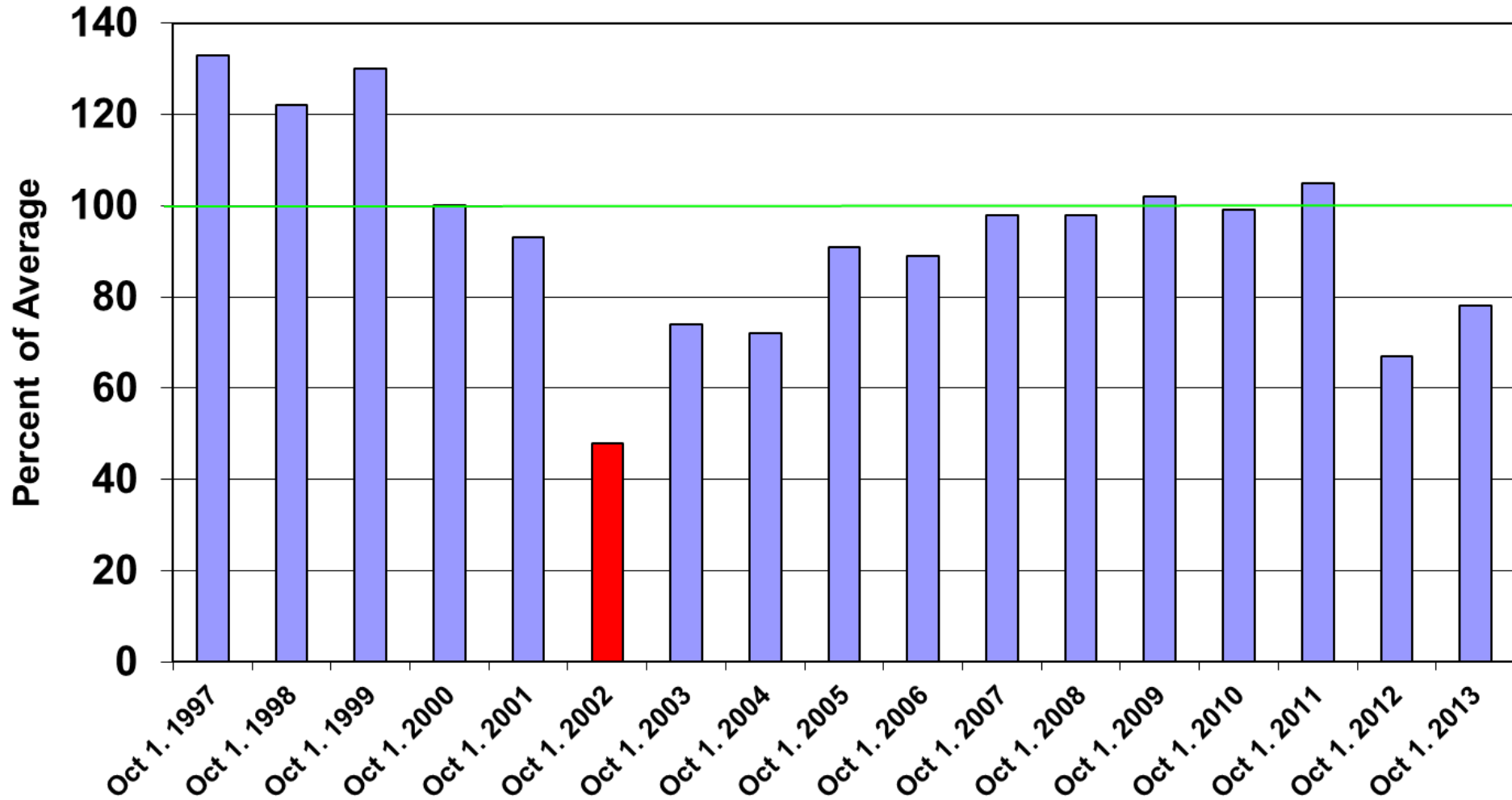
# Lucerne Reference ET

Lucerne Kimberly-Penman Reference ET (1992 - 2013)



**Water loss to evapotranspiration was much closer to average in 2013 than the extreme year of 2012**

# Colorado Statewide Reservoir Levels on October 1st for Years 1997- 2013



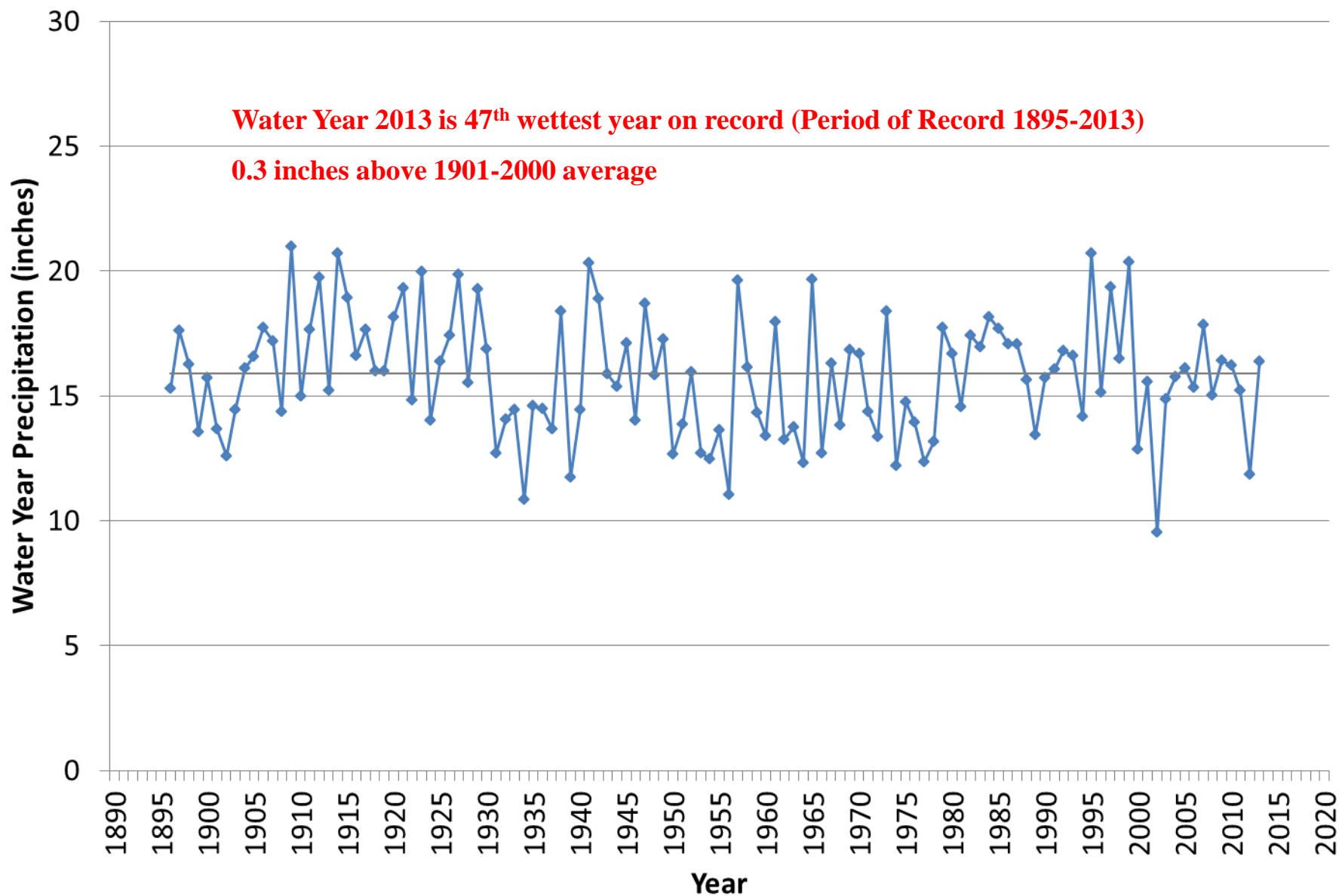
- September 2013  
Colorado Floods  
Rainfall Report  
Coming Soon

# 2013 in Historical Perspective

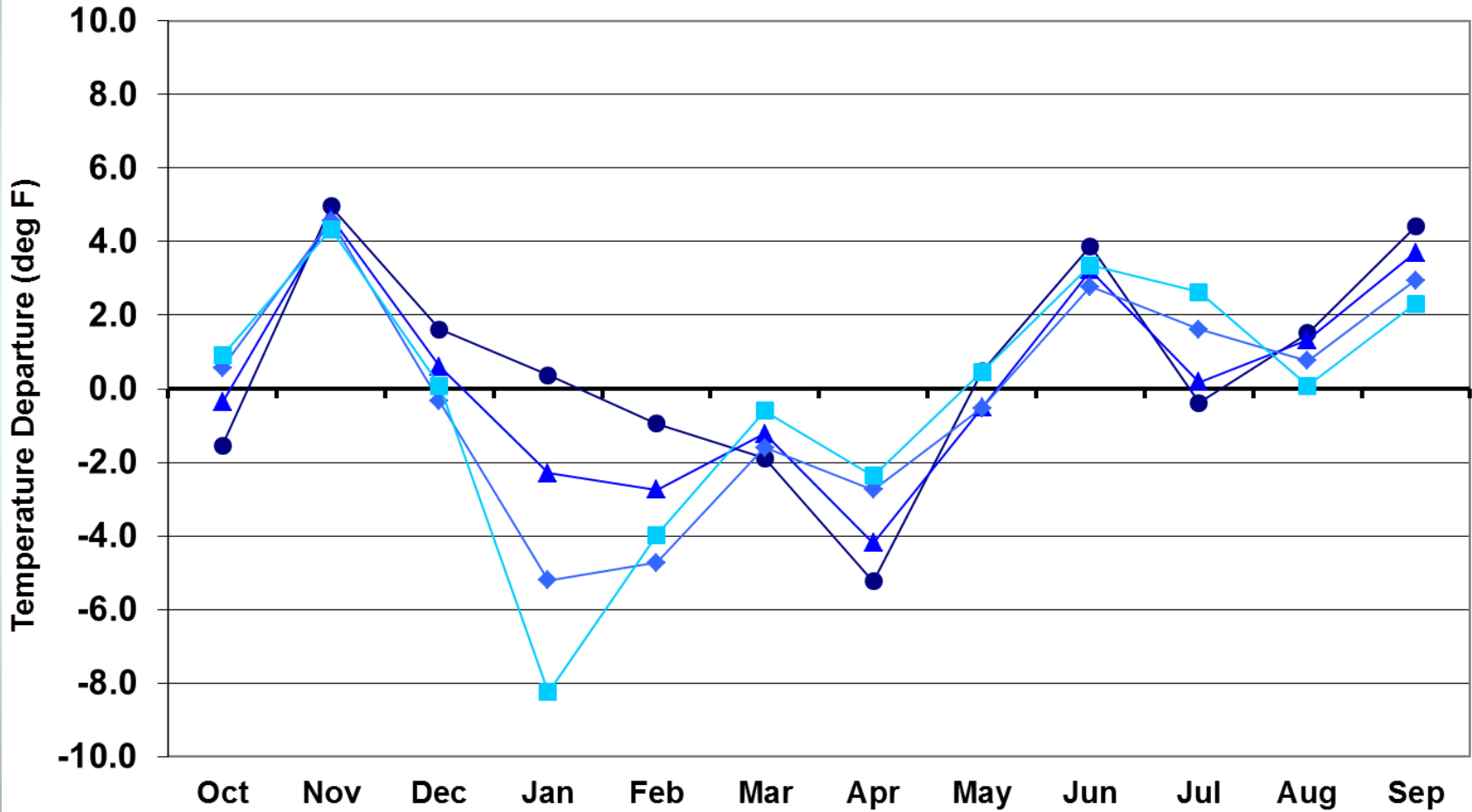


# Colorado Precipitation in Historic Perspective

## Statewide Water Year Precipitation



# How were Temperatures?



● Eastern Plains

▲ Foothills

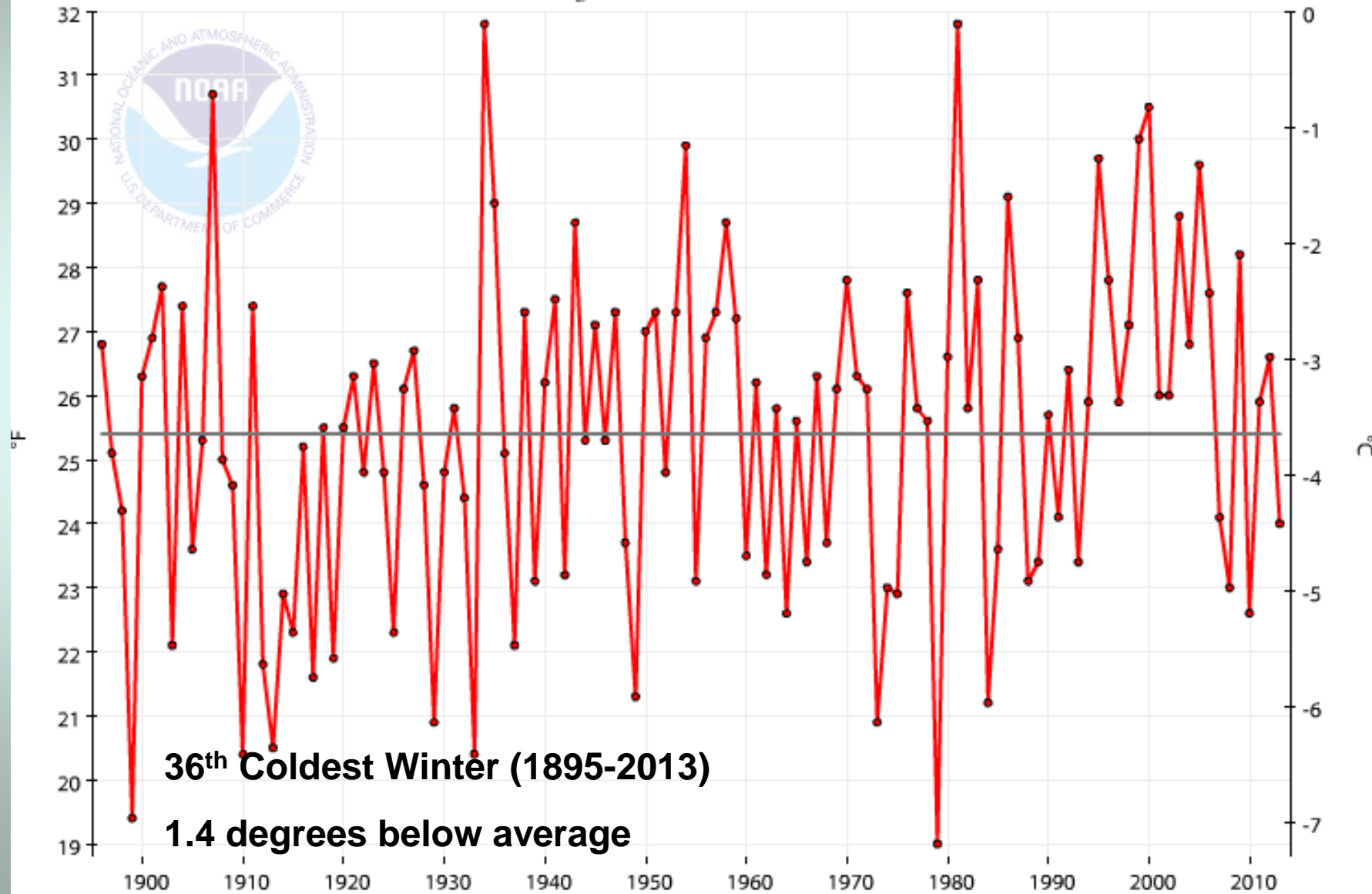
◆ Mountains

■ Western Valleys

# Colorado Mean Winter (DJF) Temperatures

Colorado, Temperature, December-February

— 1901-2000 Avg: 25.4°F      —●— Temperature



36<sup>th</sup> Coldest Winter (1895-2013)

1.4 degrees below average



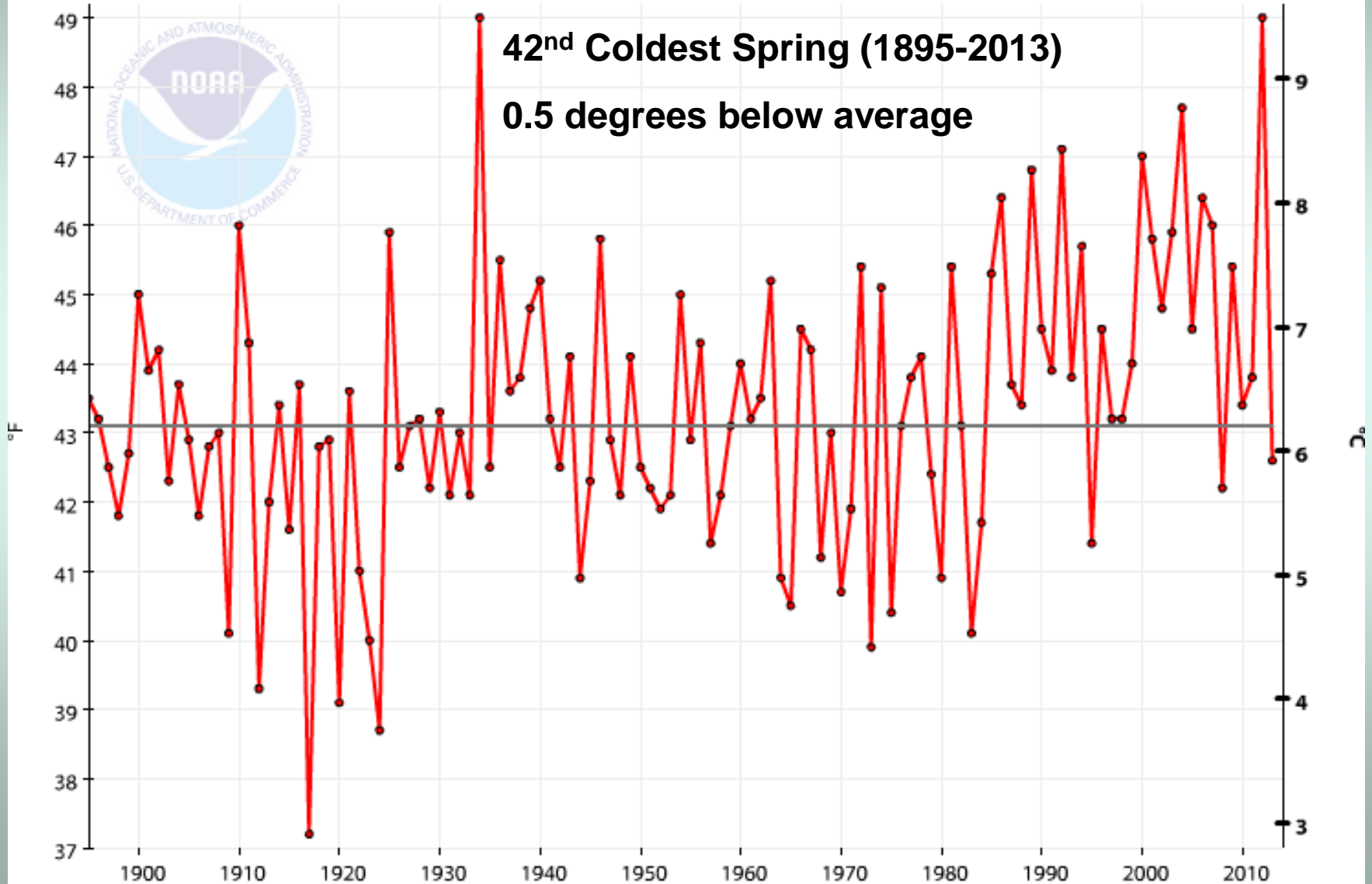
# Colorado Mean Spring (MAM) Temperatures

Colorado, Temperature, March-May

— 1901-2000 Avg: 43.1°F      ●— Temperature

**42<sup>nd</sup> Coldest Spring (1895-2013)**

**0.5 degrees below average**



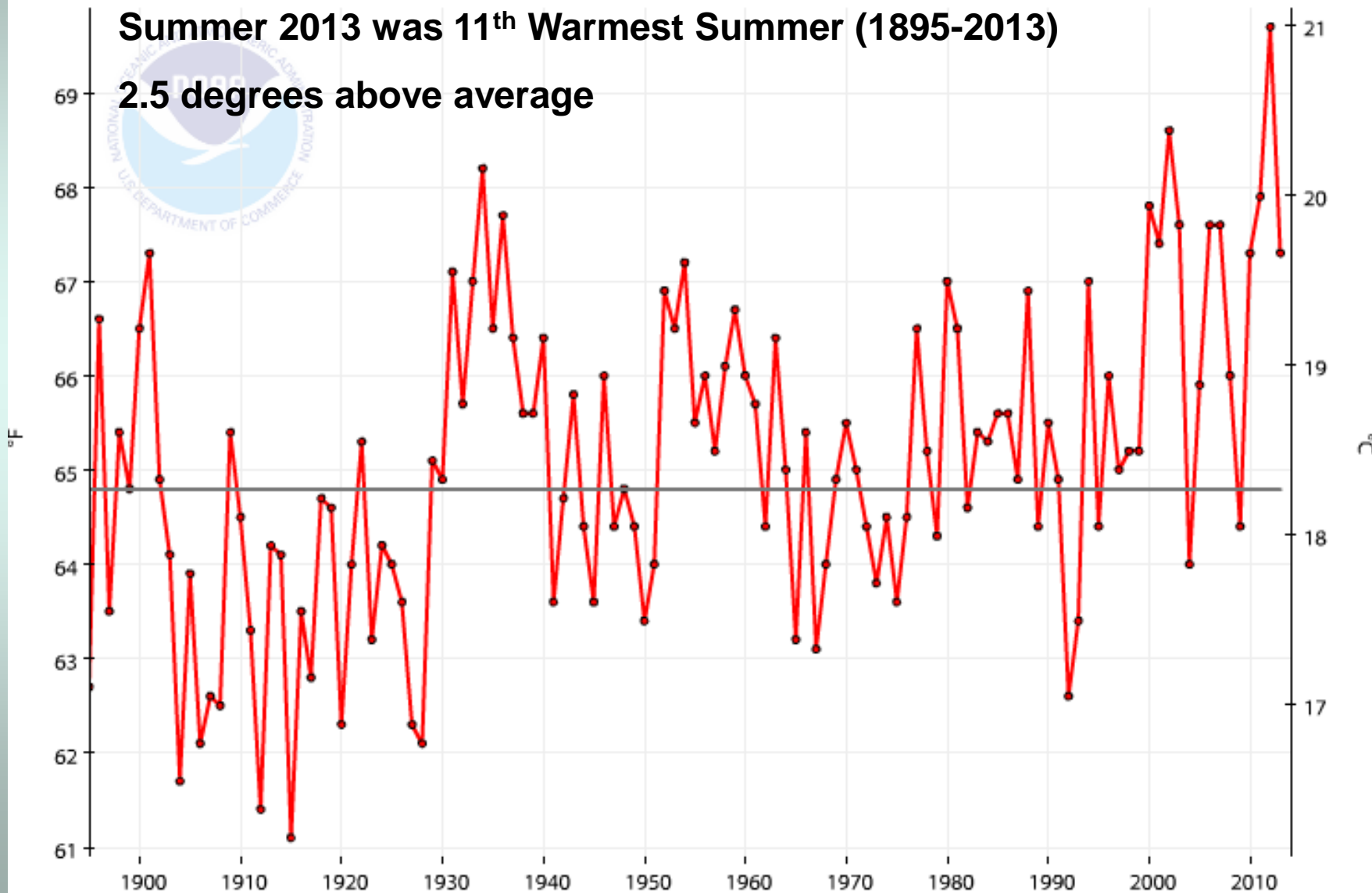
# Colorado Mean Summer (JJA) Temperatures

Colorado, Temperature, June-August

— 1901-2000 Avg: 64.8°F      ●— Temperature

**Summer 2013 was 11<sup>th</sup> Warmest Summer (1895-2013)**

**2.5 degrees above average**



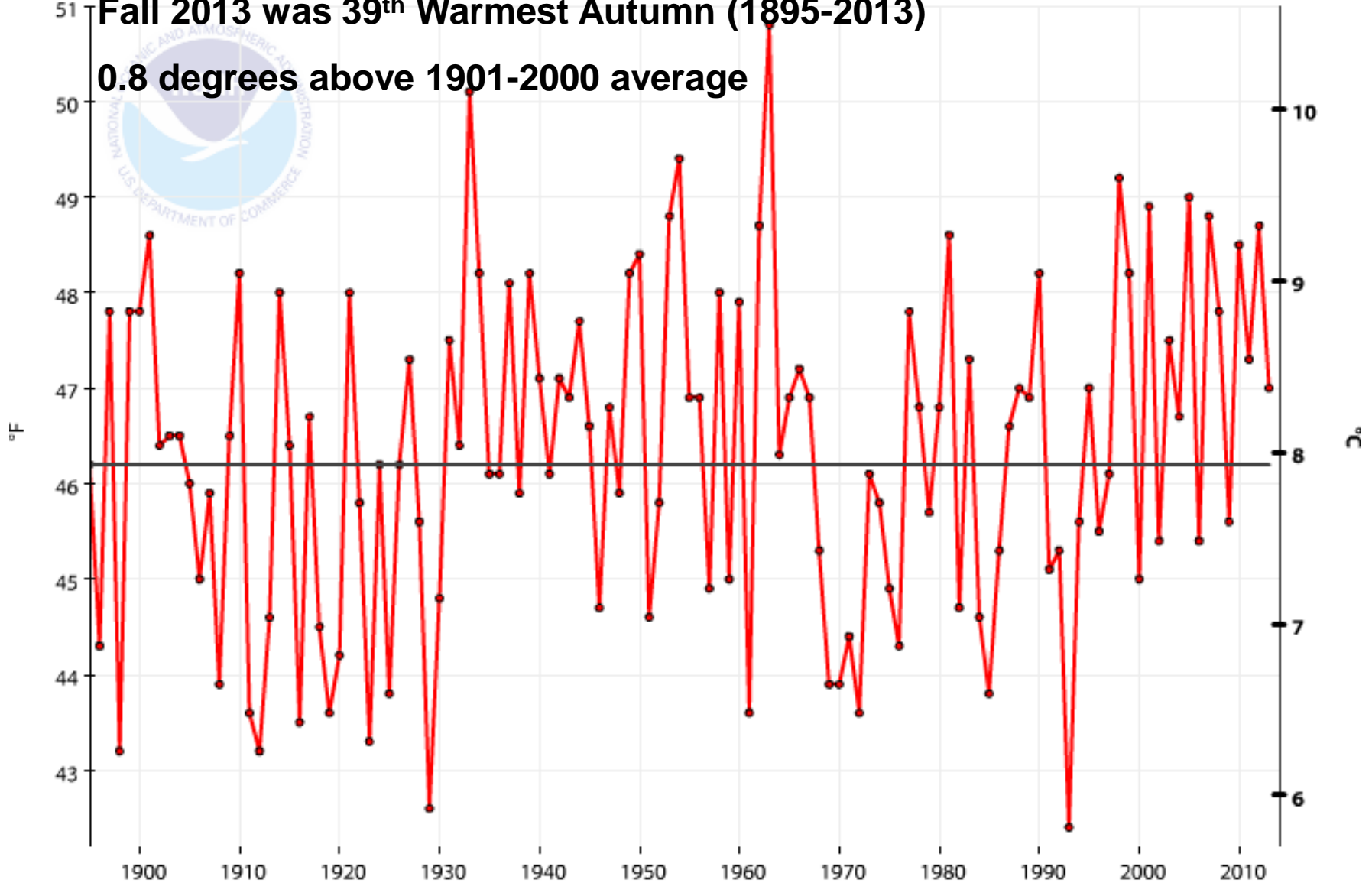
# Colorado Mean Autumn (SON) Temperatures

Colorado, Temperature, September-November

— 1901-2000 Avg: 46.2°F      —●— Temperature

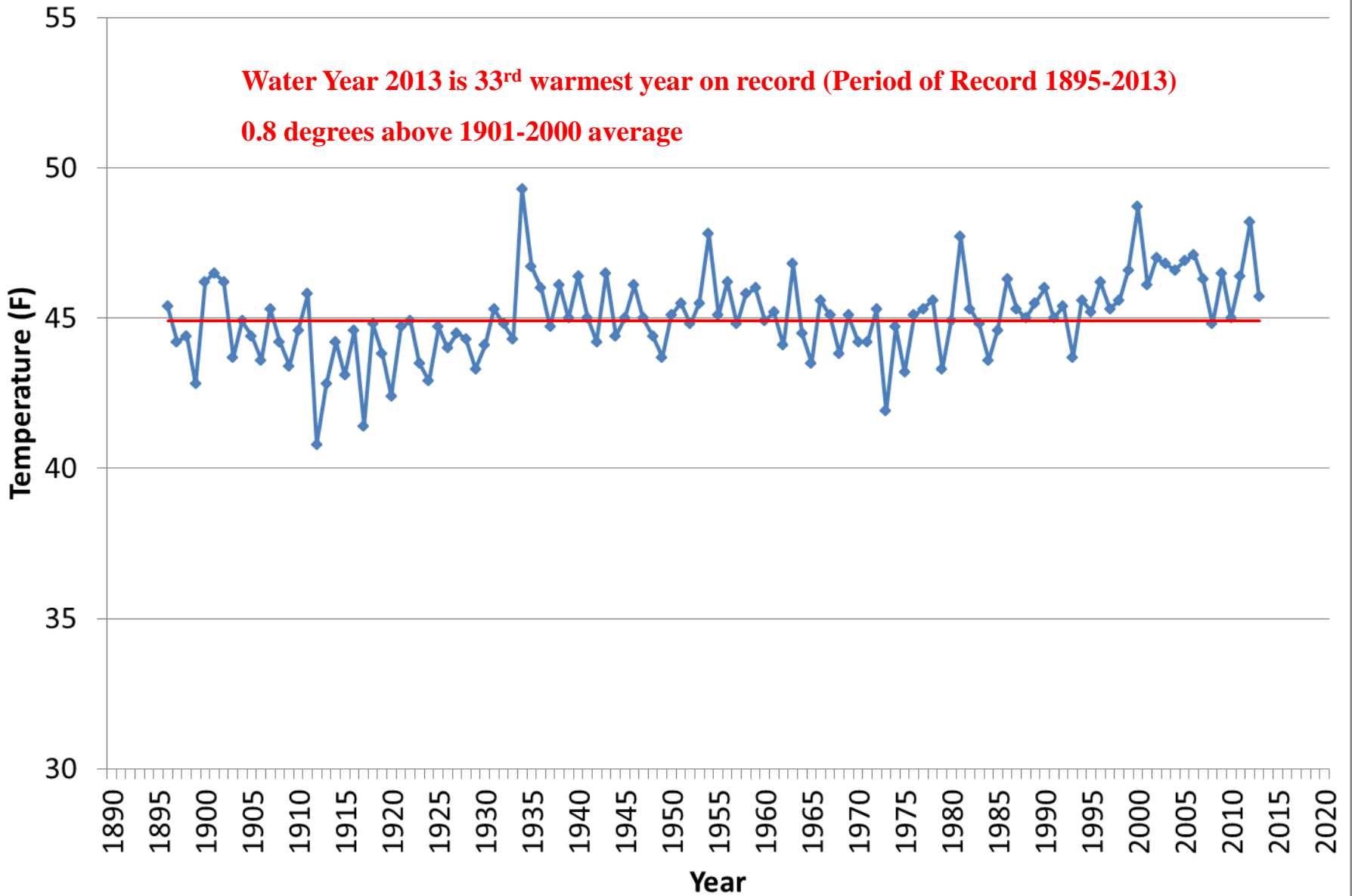
**Fall 2013 was 39<sup>th</sup> Warmest Autumn (1895-2013)**

**0.8 degrees above 1901-2000 average**

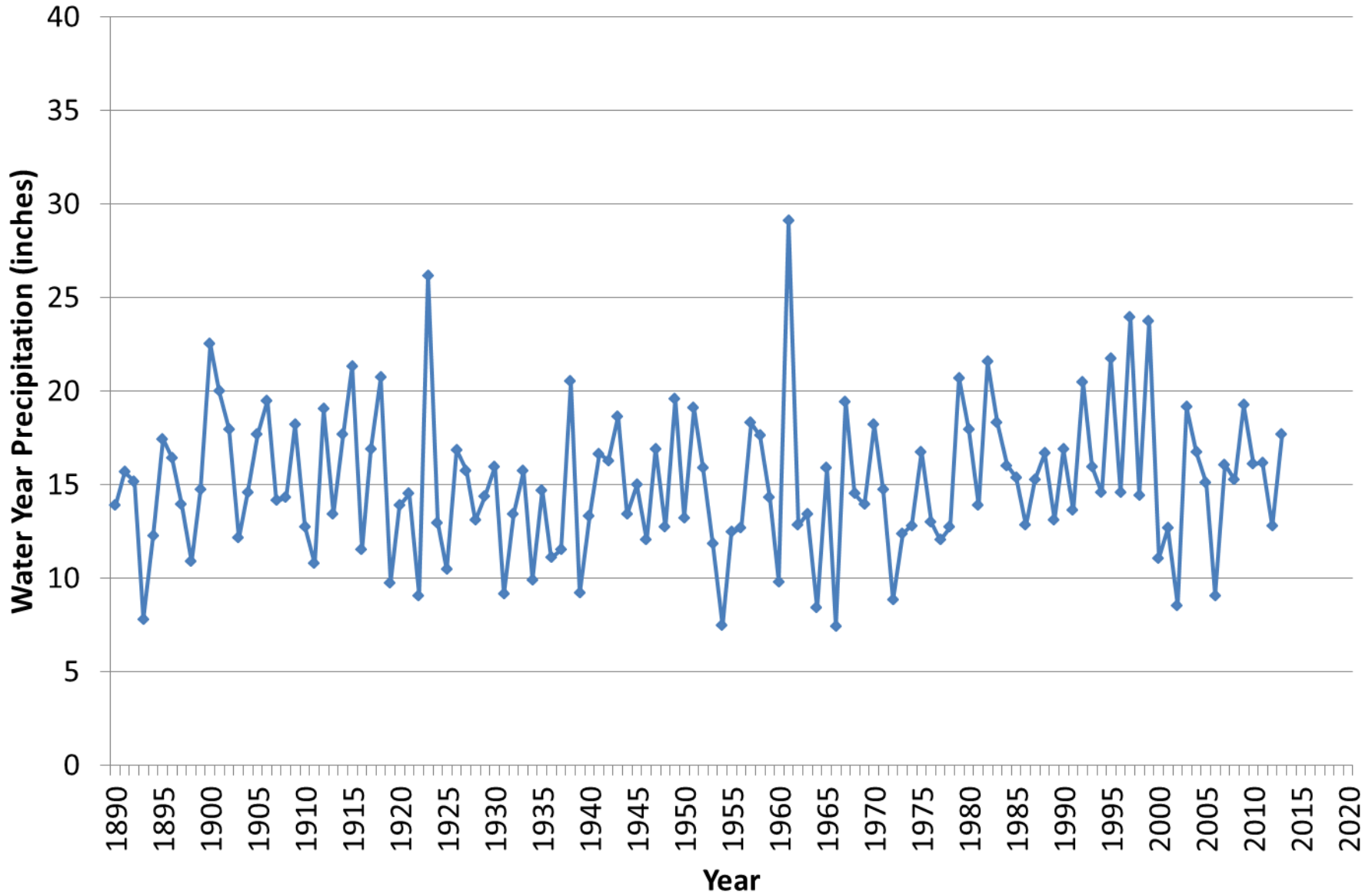


# Colorado Temperature in a historic perspective

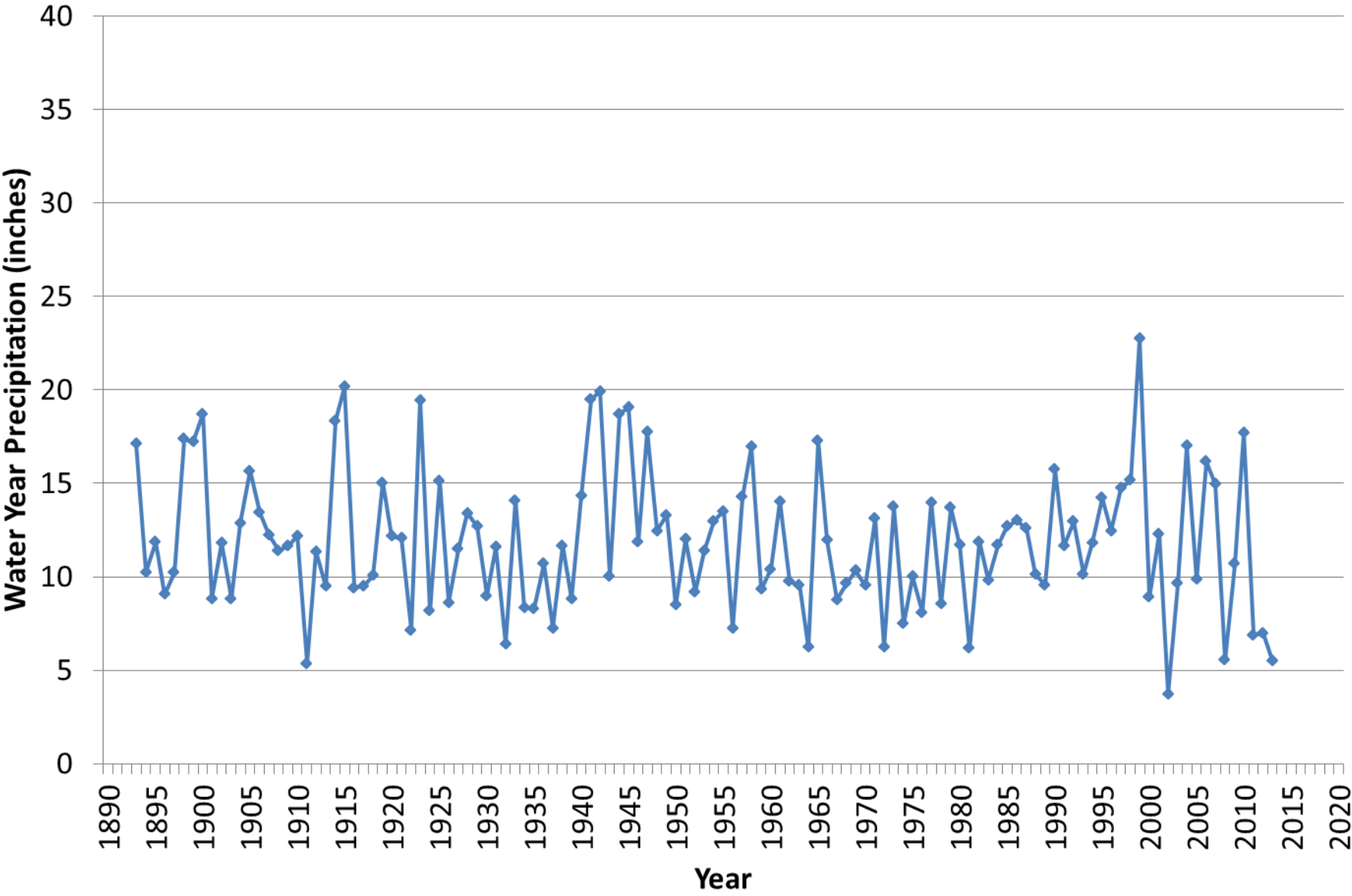
## Statewide Water Year Average Temperature



# Fort Collins, CO Water Year Precipitation

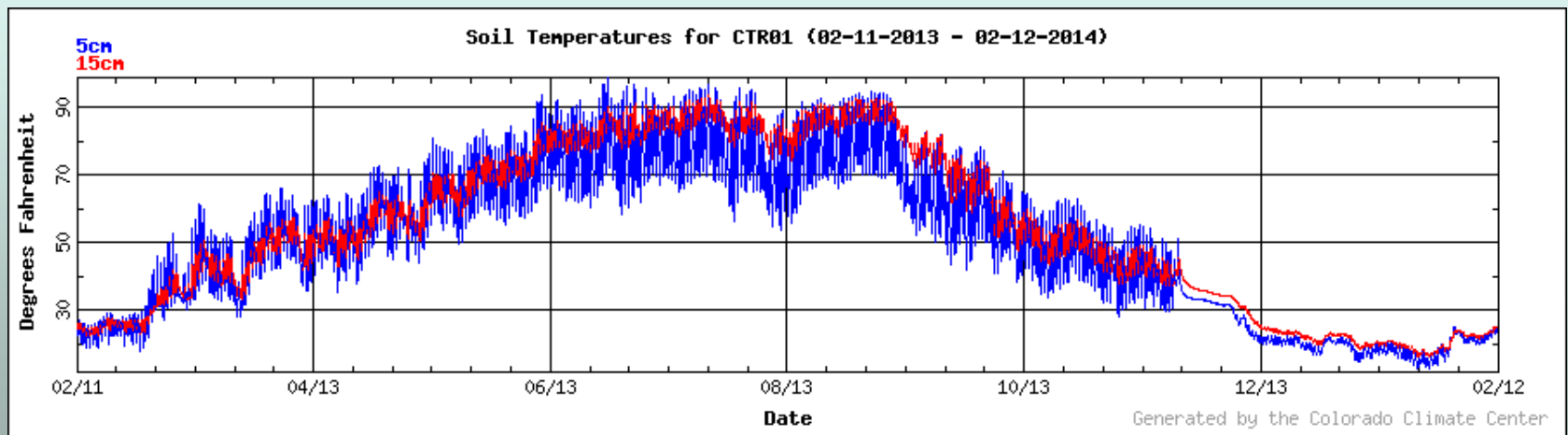
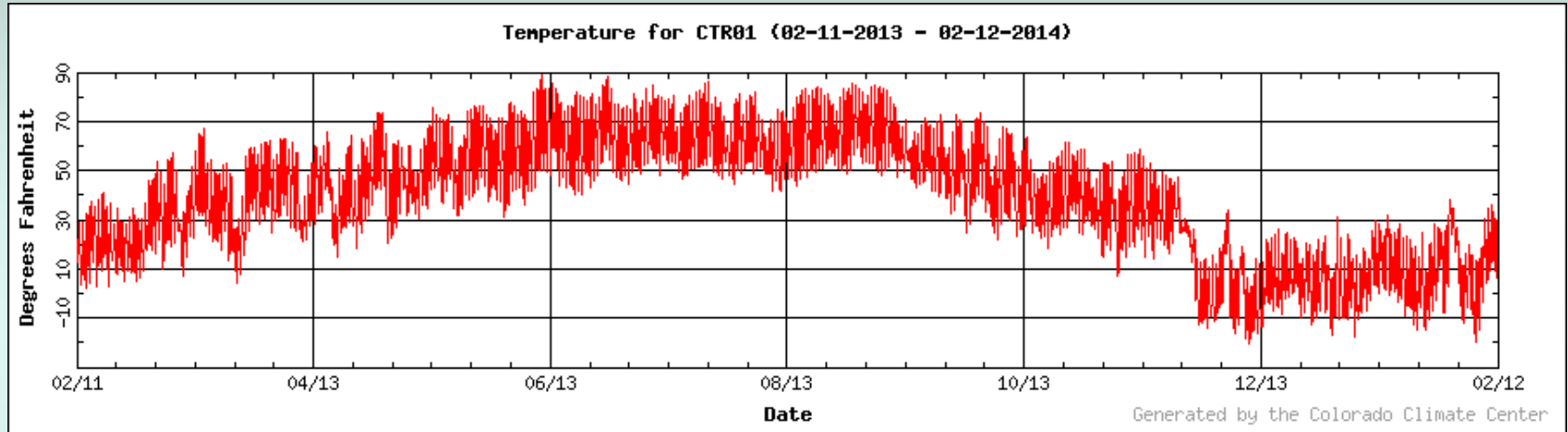


# Rocky Ford, CO Water Year Precipitation



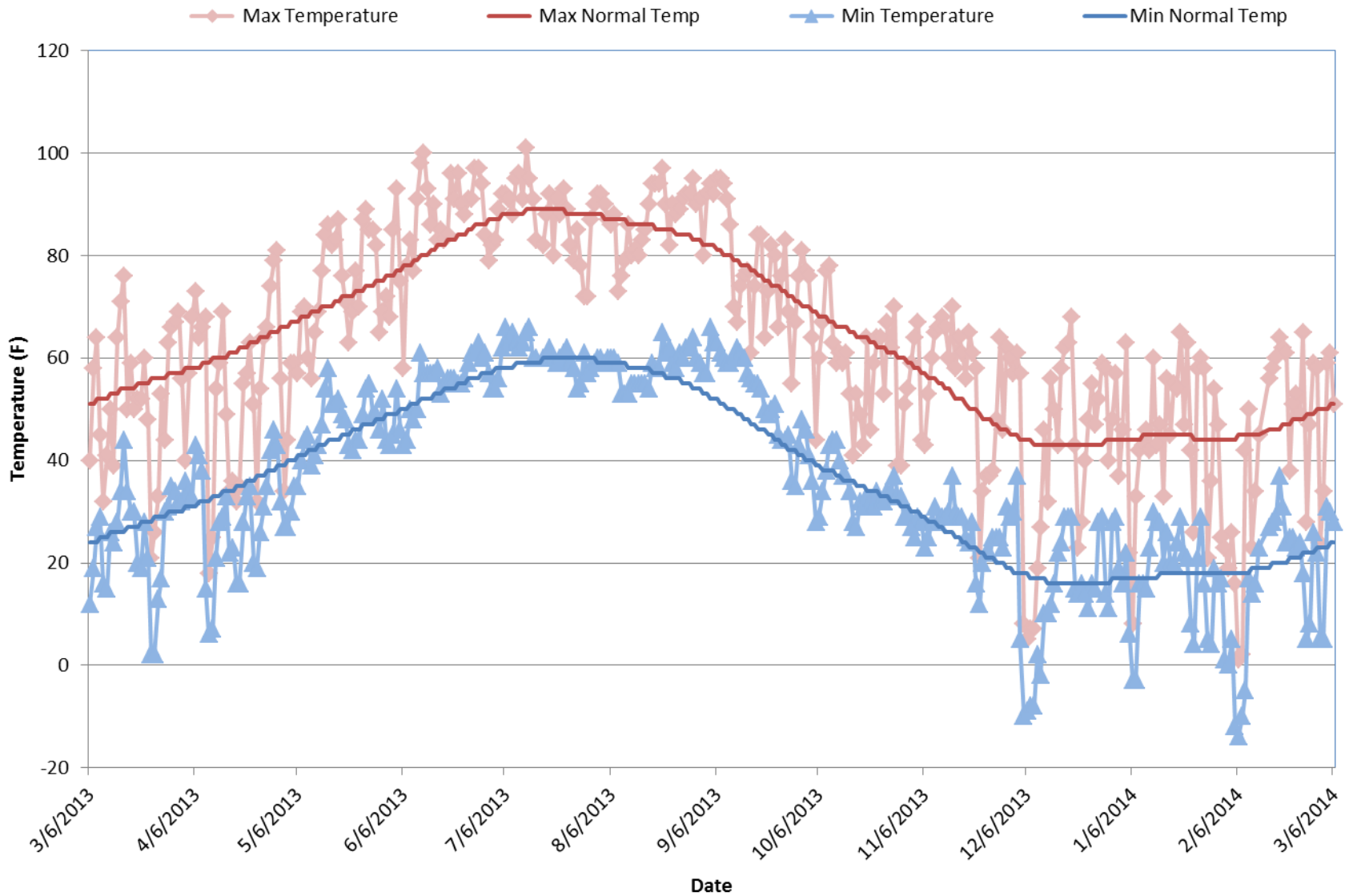
Water Year 2014 so far

# Snowcover and Temperature in SLV



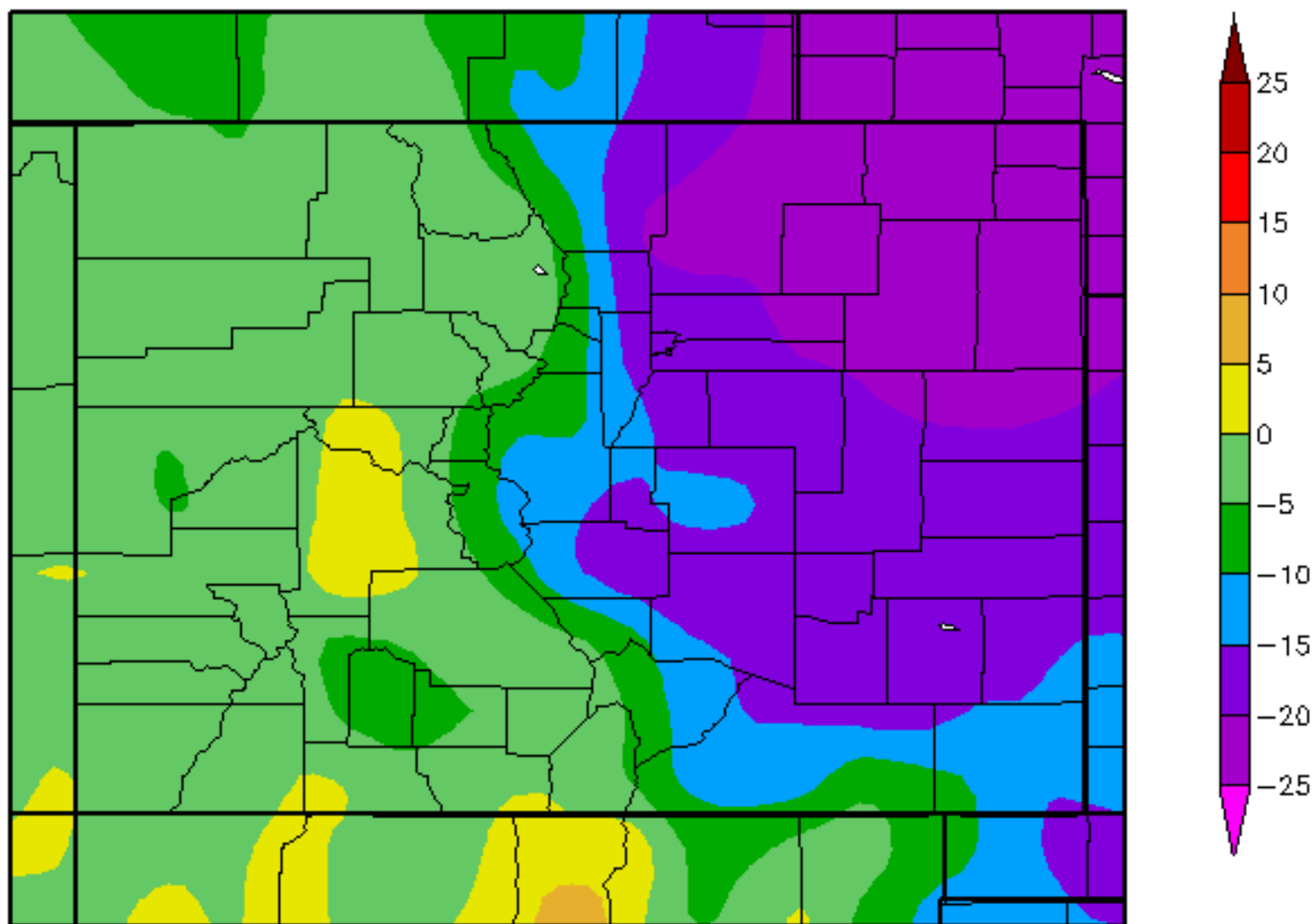


# Denver Stapleton Daily Max/Min Temperatures and Normals



# Departure from Normal Temperature (F)

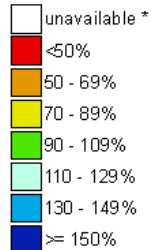
## 2/1/2014 - 2/11/2014



# Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

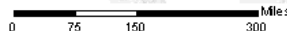
Mar 06, 2014

Current Snow Water Equivalent (SWE) Basin-wide Percent of 1981-2010 Median



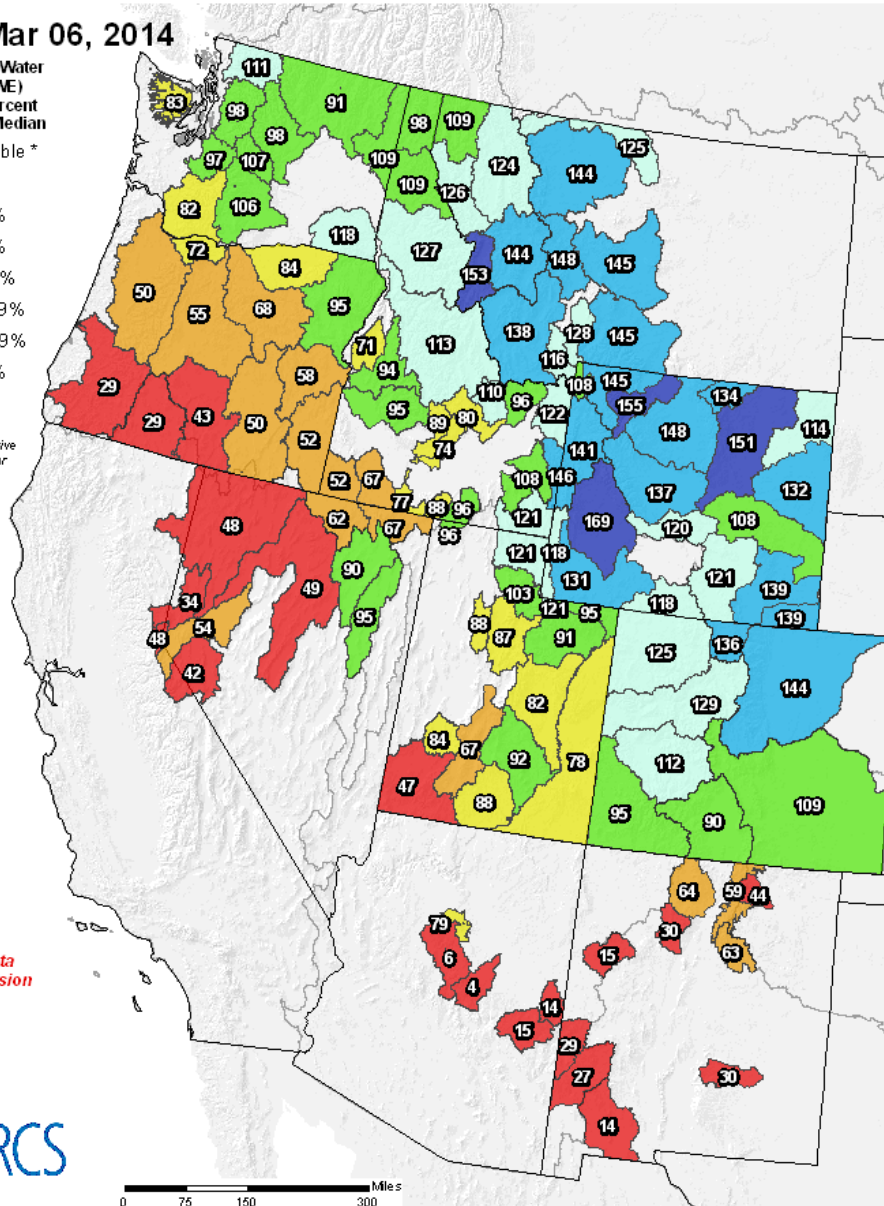
\* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional data subject to revision



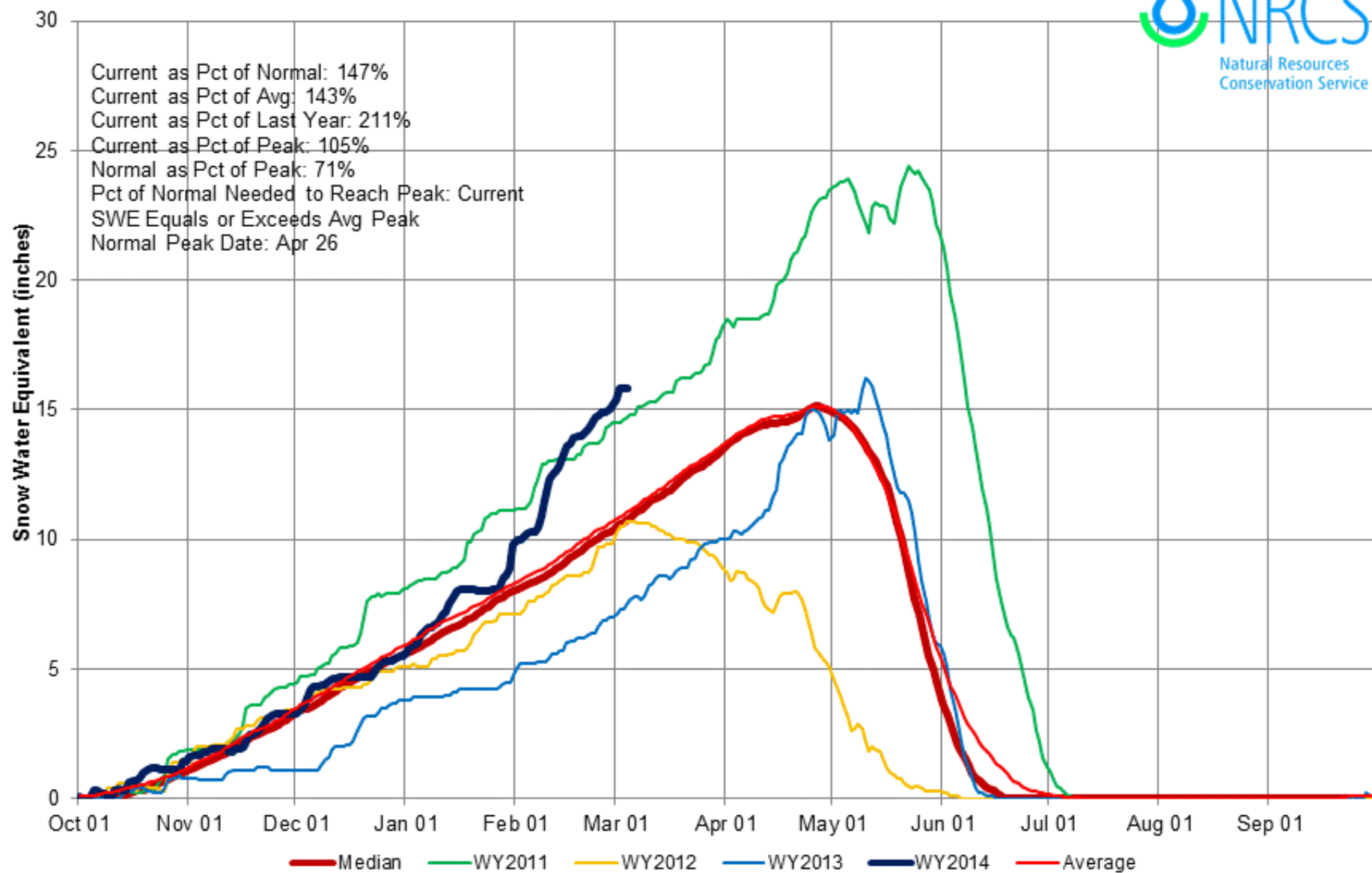
The snow water equivalent percent of normal represents the current snowwater equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by the USDA/NRCS National Water and Climate Center  
 Portland, Oregon <http://www.wcc.nrcs.usda.gov/gis/>  
 Based on data from <http://www.wcc.nrcs.usda.gov/reports/>  
 Science contact: Jim Marron@por.usda.gov 503 414 3047



# South Platte River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Mar 04, 2014

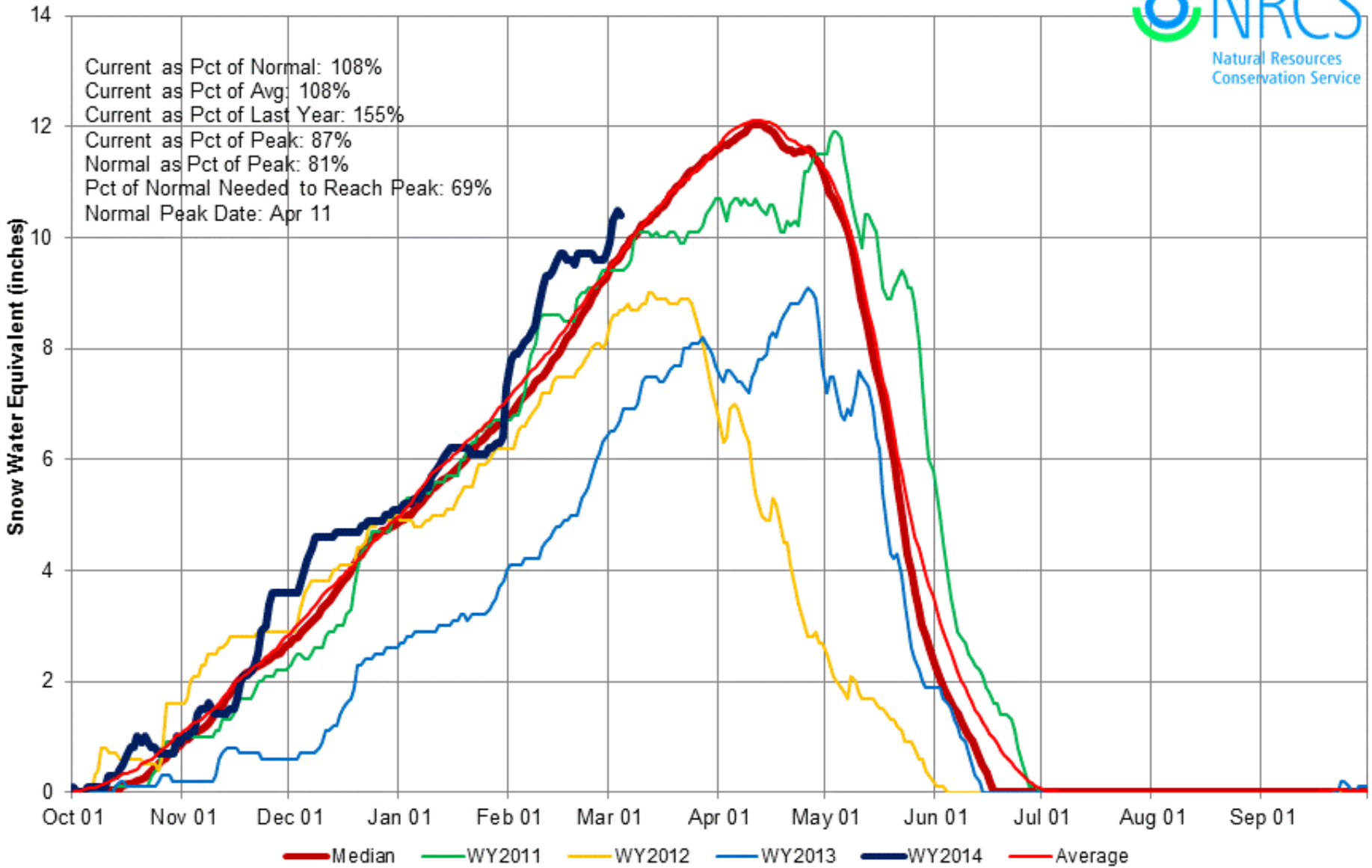


# Arkansas River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Mar 04, 2014



Current as Pct of Normal: 108%  
Current as Pct of Avg: 108%  
Current as Pct of Last Year: 155%  
Current as Pct of Peak: 87%  
Normal as Pct of Peak: 81%  
Pct of Normal Needed to Reach Peak: 69%  
Normal Peak Date: Apr 11

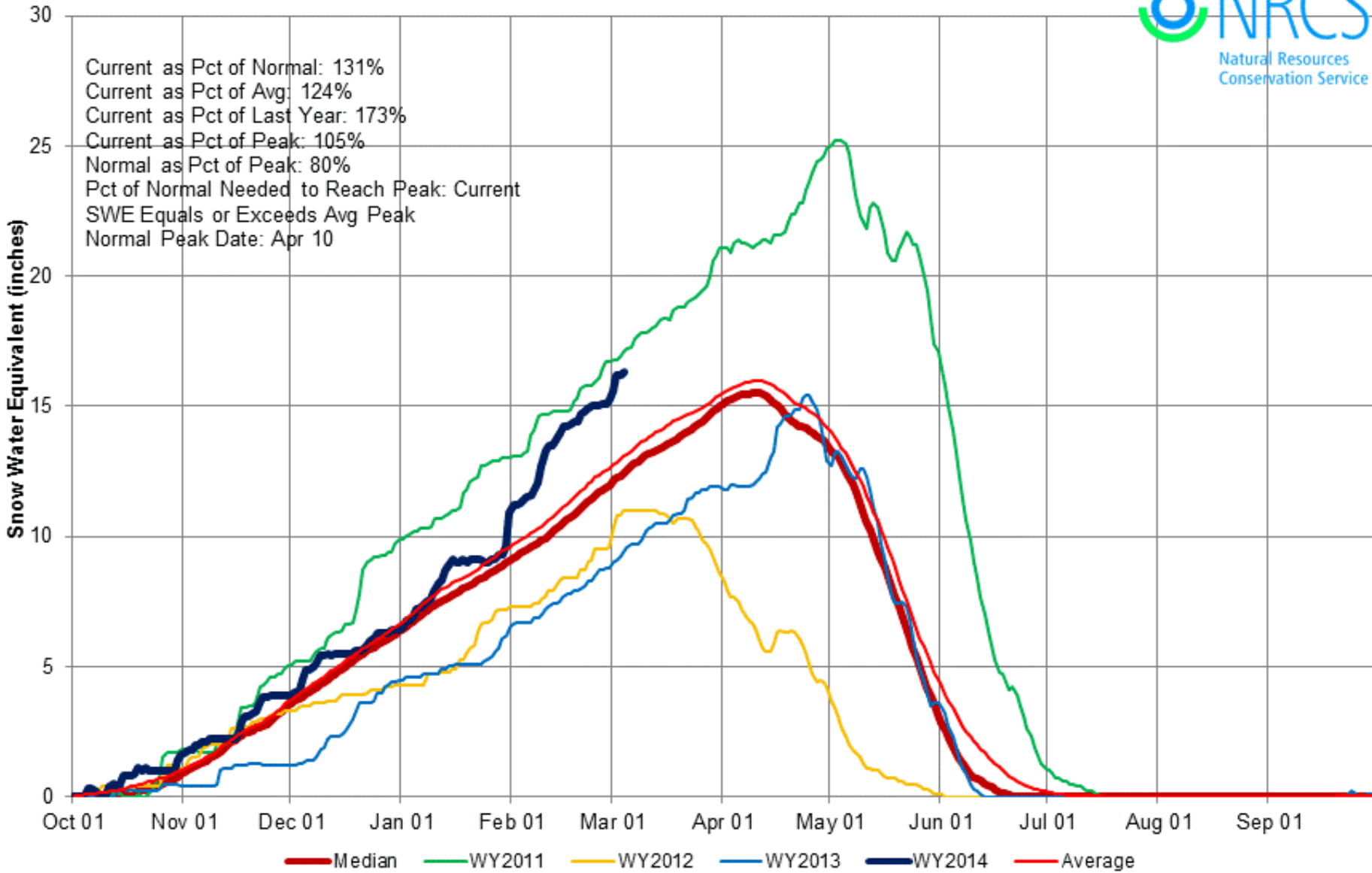


# Upper Colorado River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Mar 04, 2014



Current as Pct of Normal: 131%  
Current as Pct of Avg: 124%  
Current as Pct of Last Year: 173%  
Current as Pct of Peak: 105%  
Normal as Pct of Peak: 80%  
Pct of Normal Needed to Reach Peak: Current  
SWE Equals or Exceeds Avg Peak  
Normal Peak Date: Apr 10

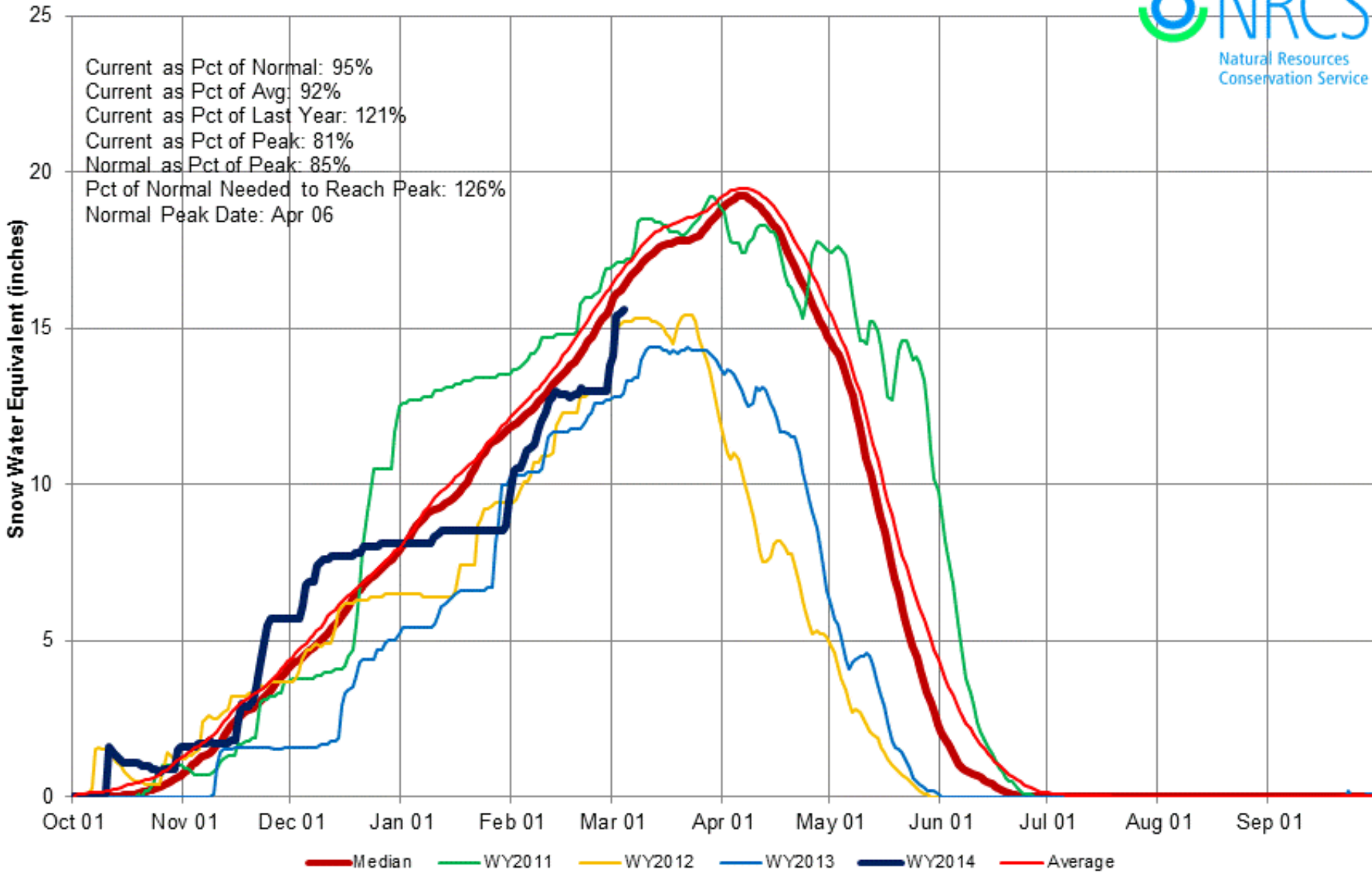


# San Miguel, Dolores, Animas and San Juan River Basins Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Mar 04, 2014

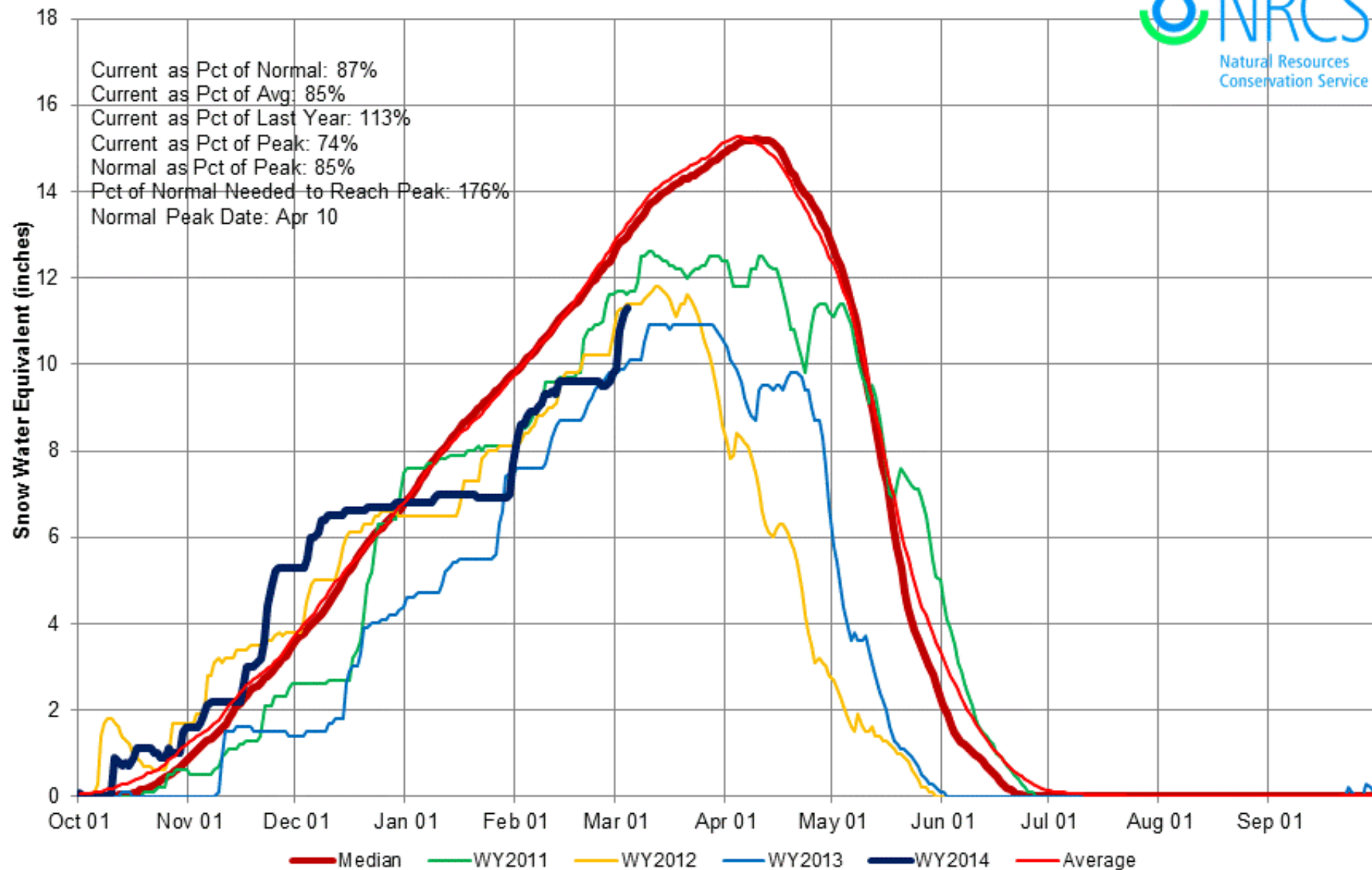


Current as Pct of Normal: 95%  
Current as Pct of Avg: 92%  
Current as Pct of Last Year: 121%  
Current as Pct of Peak: 81%  
Normal as Pct of Peak: 85%  
Pct of Normal Needed to Reach Peak: 126%  
Normal Peak Date: Apr 06



# Upper Rio Grande Basin Time Series Snowpack Summary

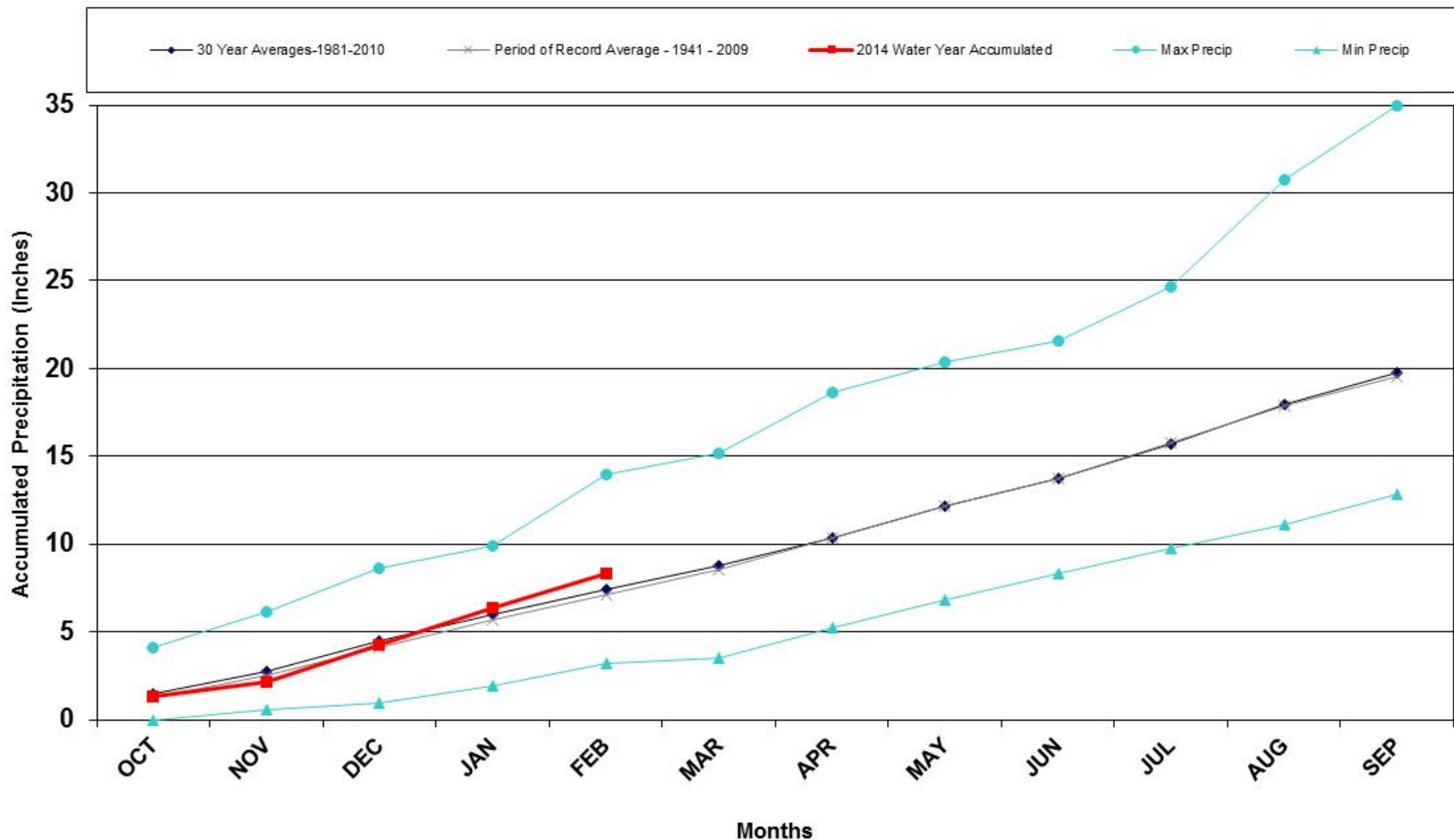
Based on Provisional SNOTEL data as of Mar 04, 2014





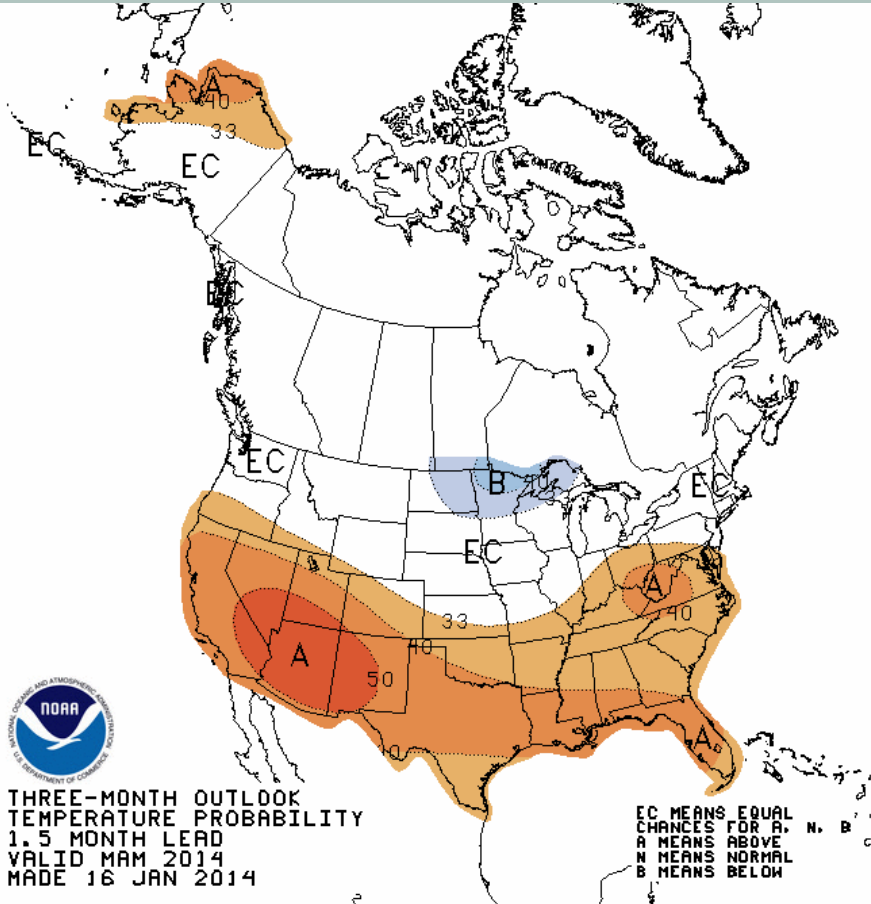
# Division 1 – Grand Lake 1NW

## Grand Lake 1 NW 2014 Water Year

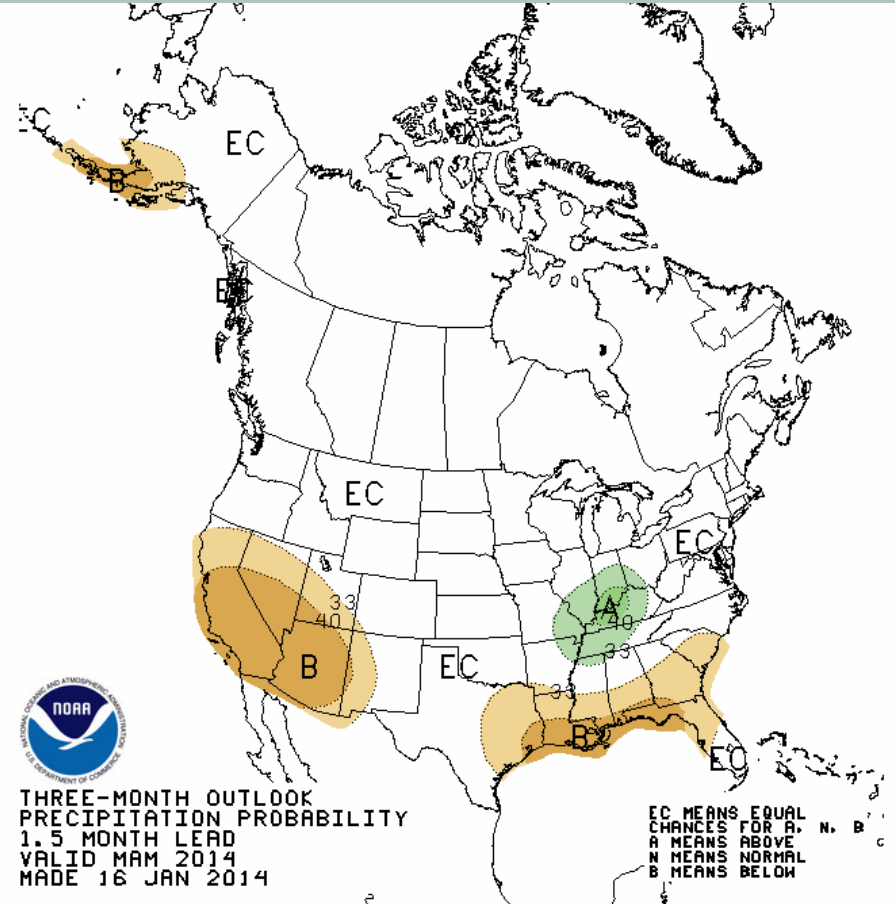


**As best we are able, we  
also try to help decision  
makers look ahead.**

# MARCH, APRIL, MAY OUTLOOK

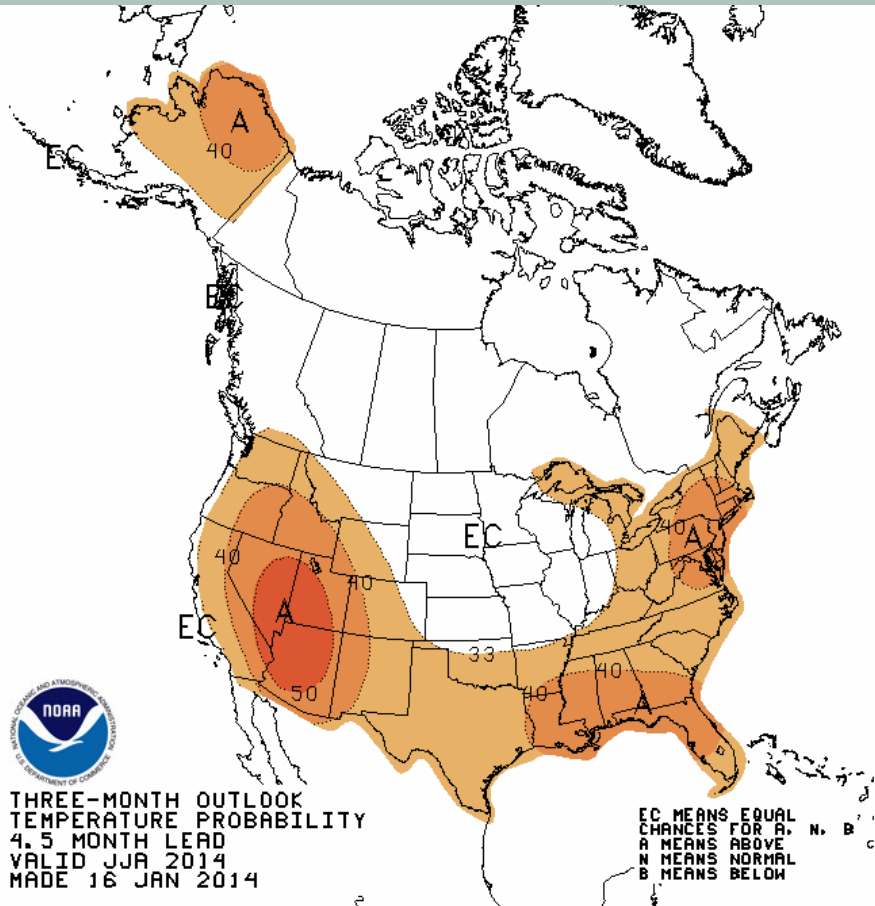


Temperature

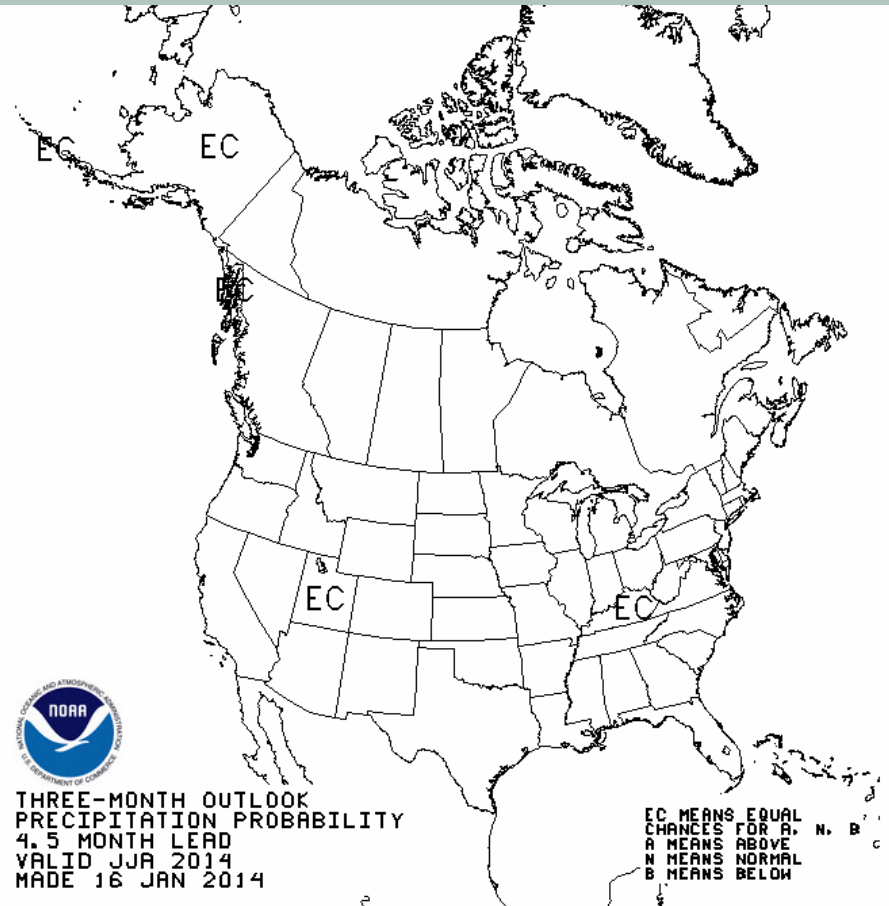


Precipitation

# JUNE, JULY, AUGUST OUTLOOK

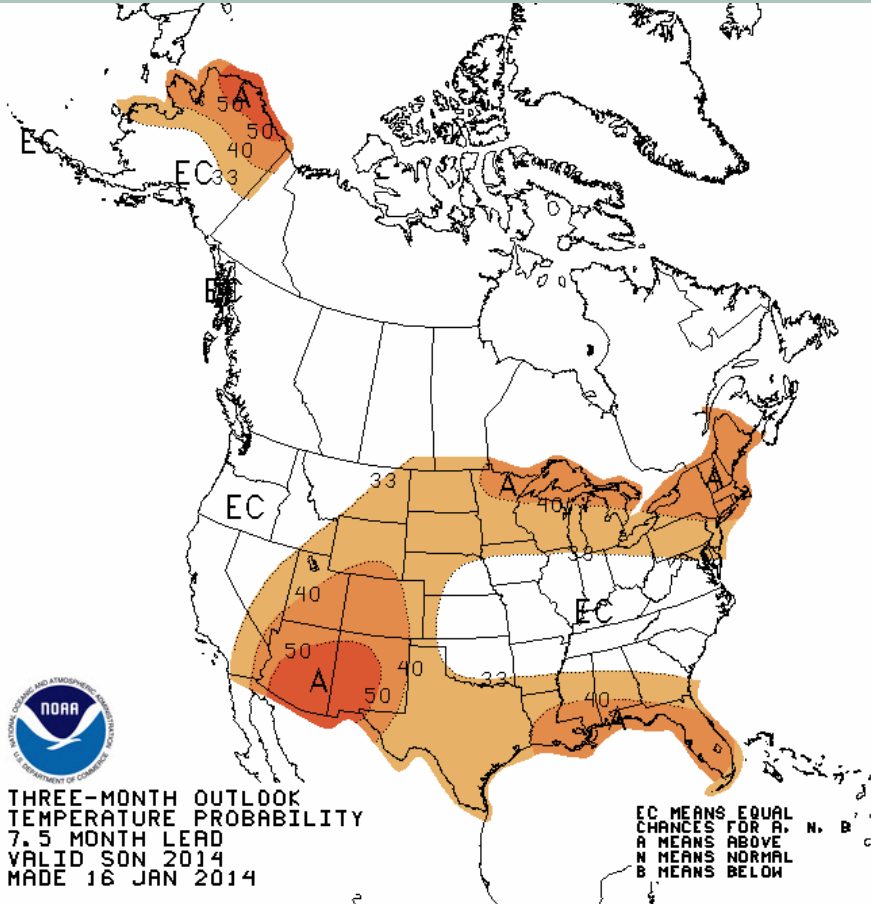


Temperature

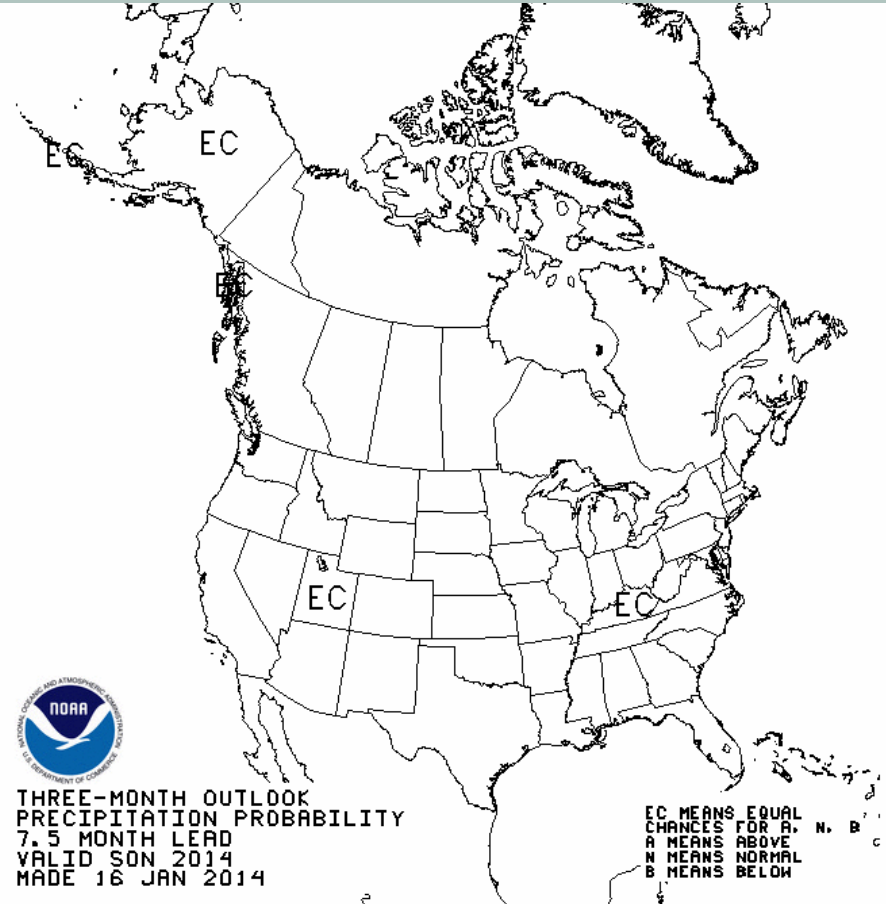


Precipitation

# SEP, OCT, NOV OUTLOOK



Temperature

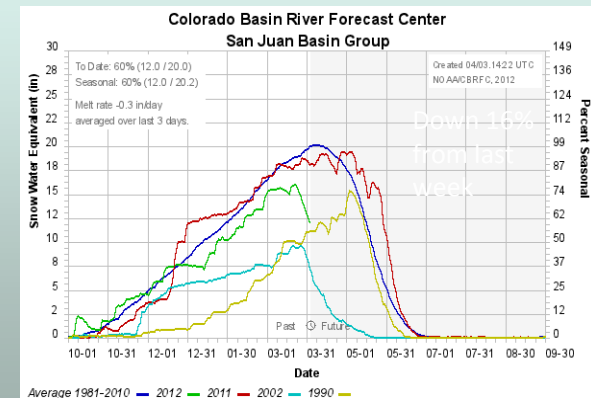
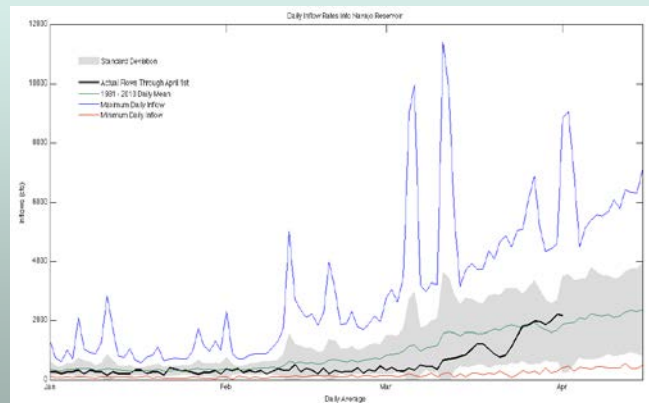
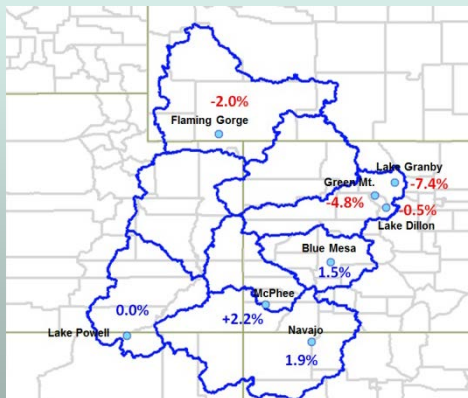
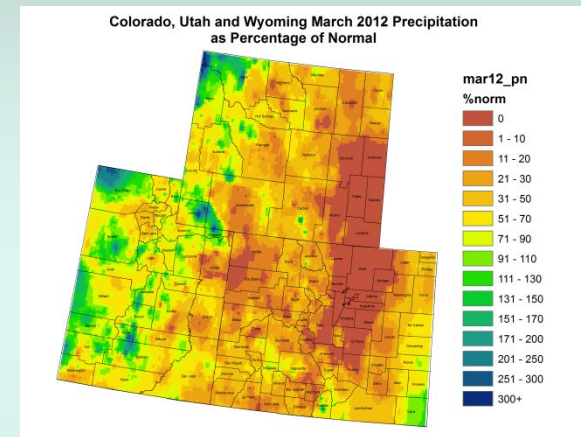
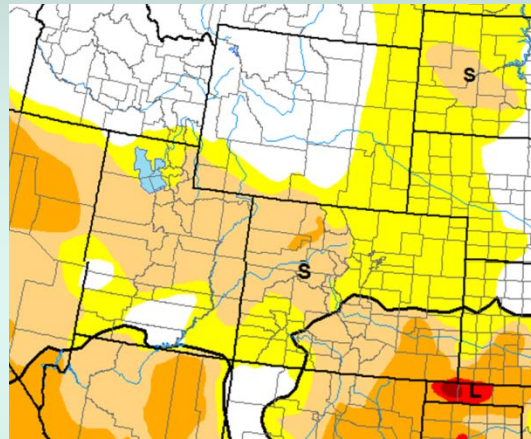
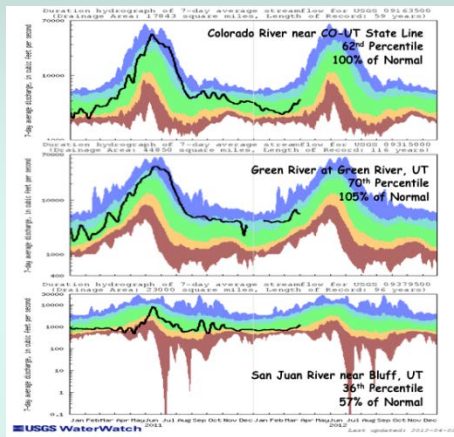


Precipitation

**WITH THE SNOW WE  
CURRENTLY HAVE ON THE  
GROUND HERE AND IN  
THE MOUNTAINS, AND  
THE UNCERTAIN SPRING  
FORECAST, IT LOOKS LIKE  
OUR WATER SUPPLY WILL  
BE OK FOR THIS YEAR.**

**NO GUARANTEES AFTER  
THAT**

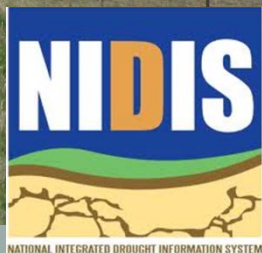
# Weekly Climate Updates Available Upper Colorado Regional Drought Early Warning





If you're tired of getting  
so few e-mails and would  
like one or two each week

Give me your business  
card today, and we can  
put you on our weekly  
update list



COLORADO  
CLIMATE  
CENTER



So . . . . .

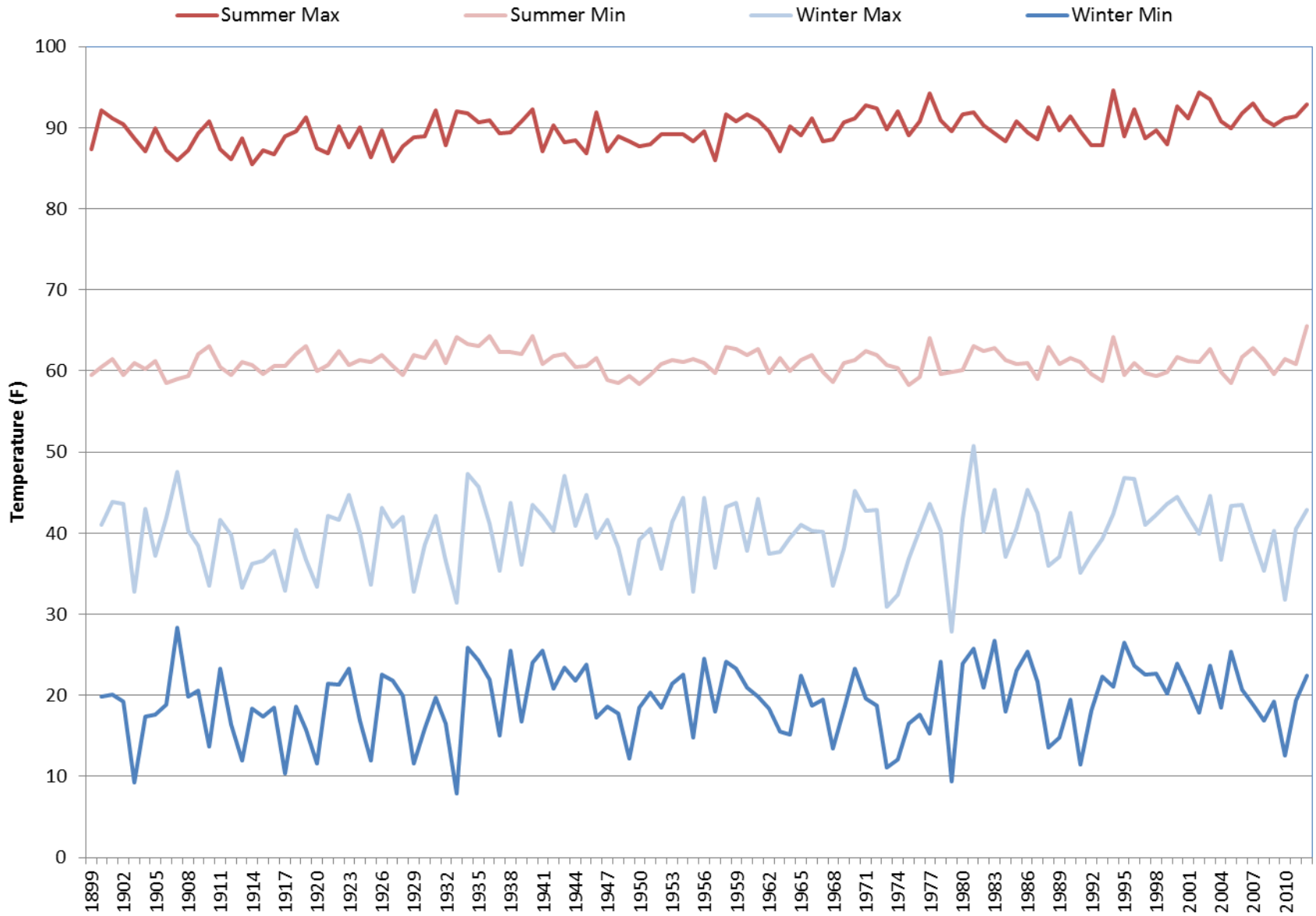
Are we seeing any long term  
changes here in Colorado?



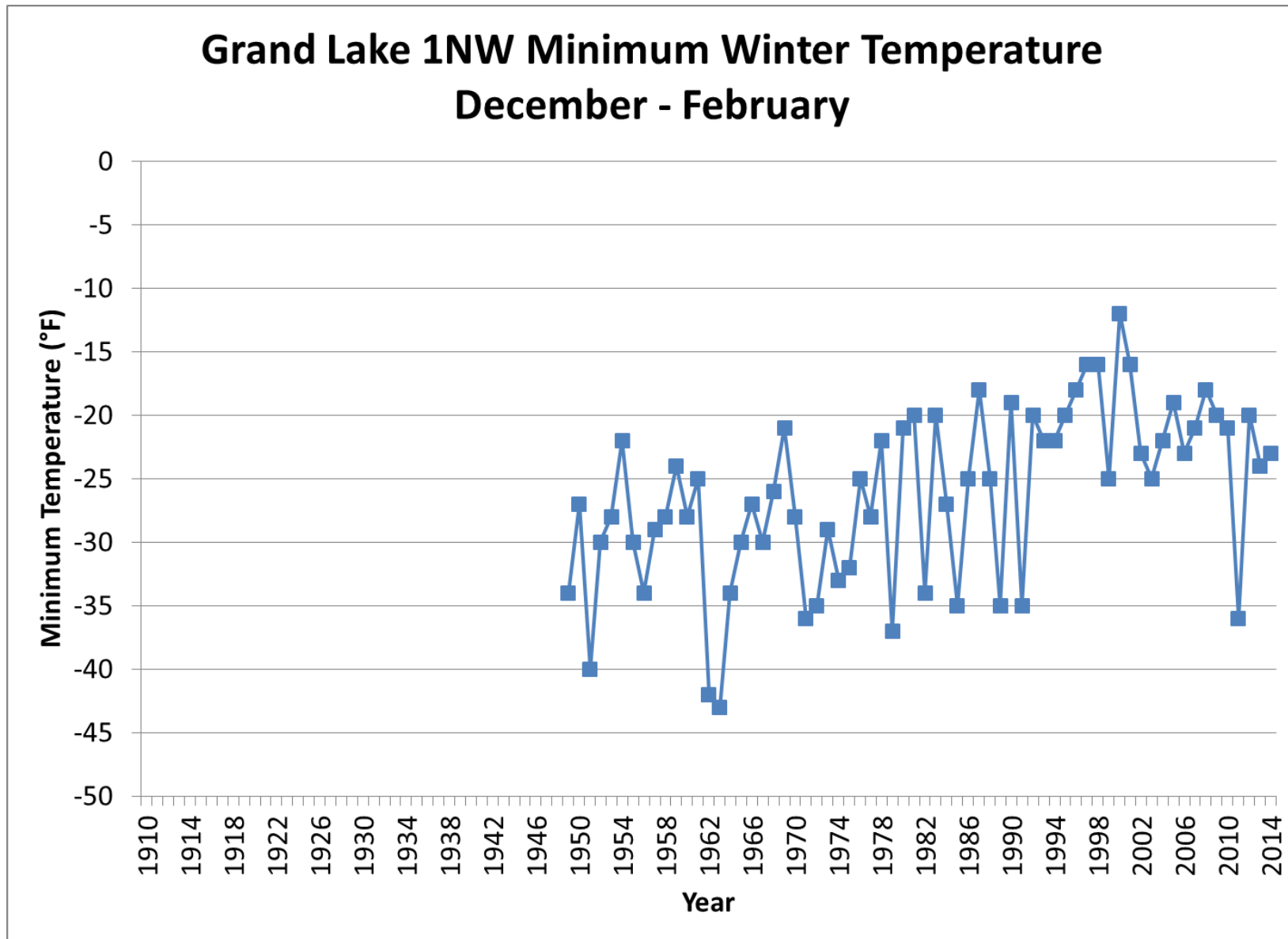
A photograph of a dirt path leading through a field of tall grass and brush towards a dense forest. The path is in the foreground, leading from the bottom center towards the middle ground. The grass is tall and green, with some brown patches. The background is a dense forest of green trees. The text is overlaid on the path and grass area.

**The changes we've observed so far in our local climate are fairly modest and masked by year to year variations**

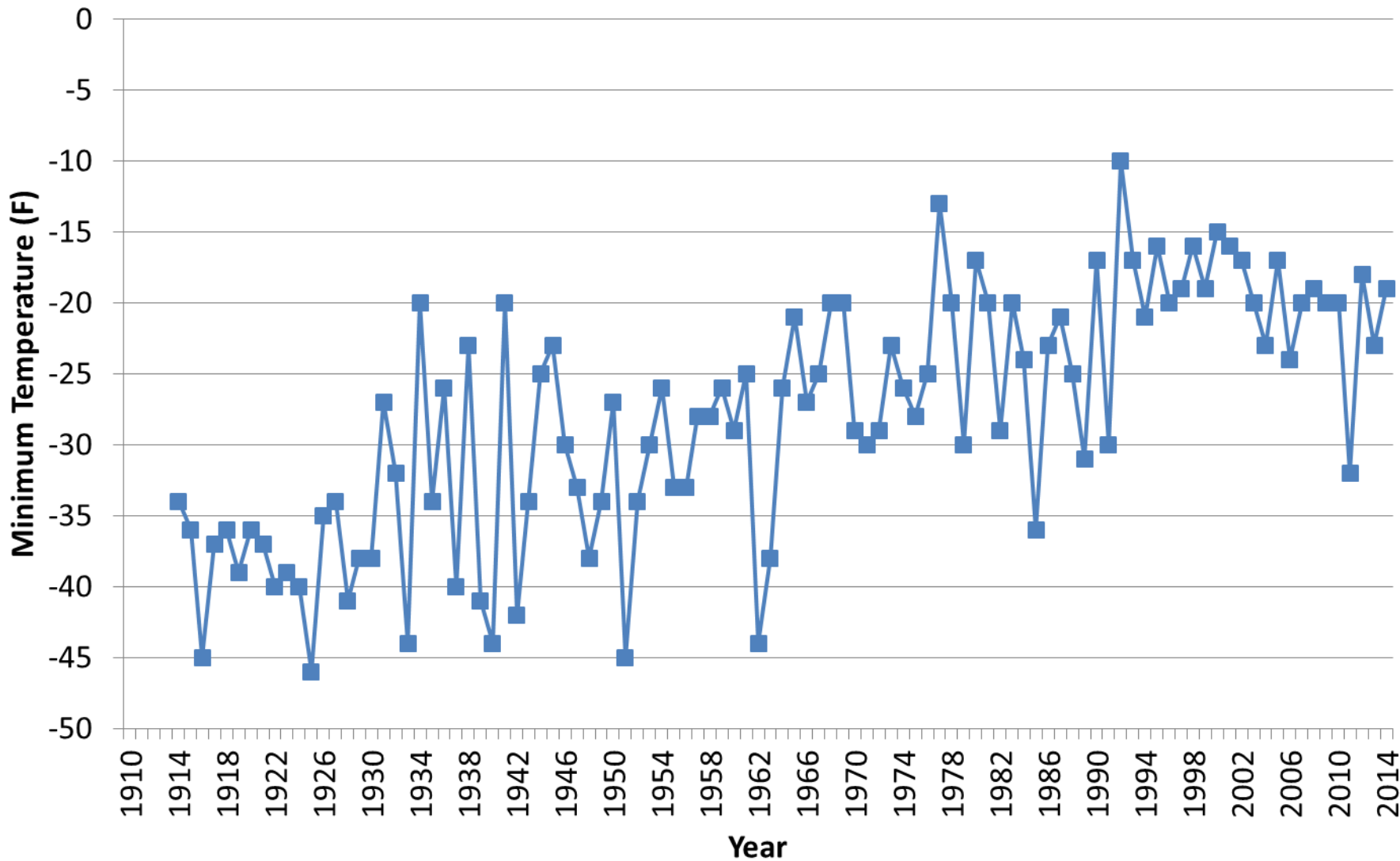
# Grand Junction Seasonal Maximum and Minimum Temperatures (1899-2012)



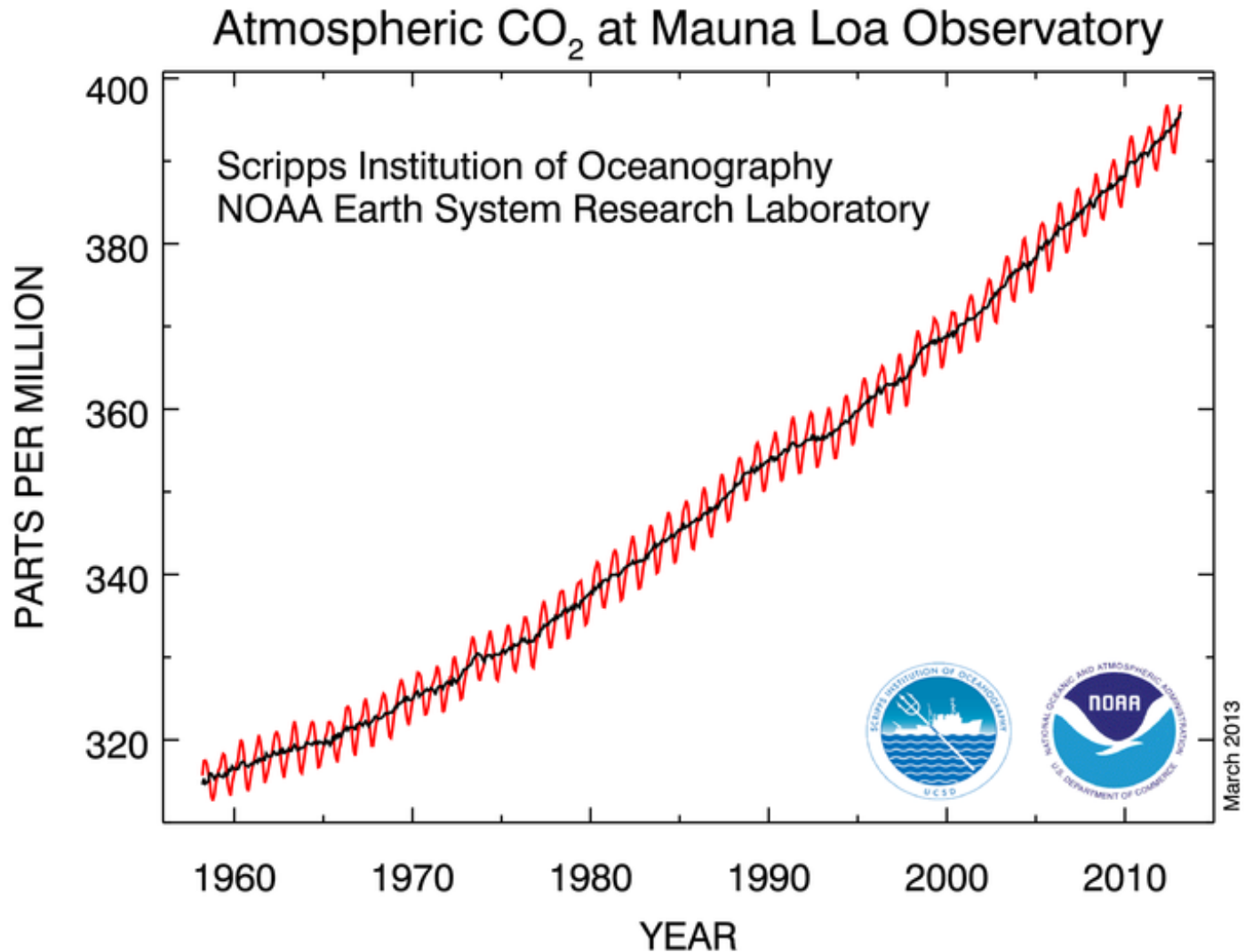
# Some trends are more attention grabbing



# Dillon Minimum Winter Temperature December - February



# But this challenge isn't going away



**And whatever comes next  
is sure to be “very interesting”**

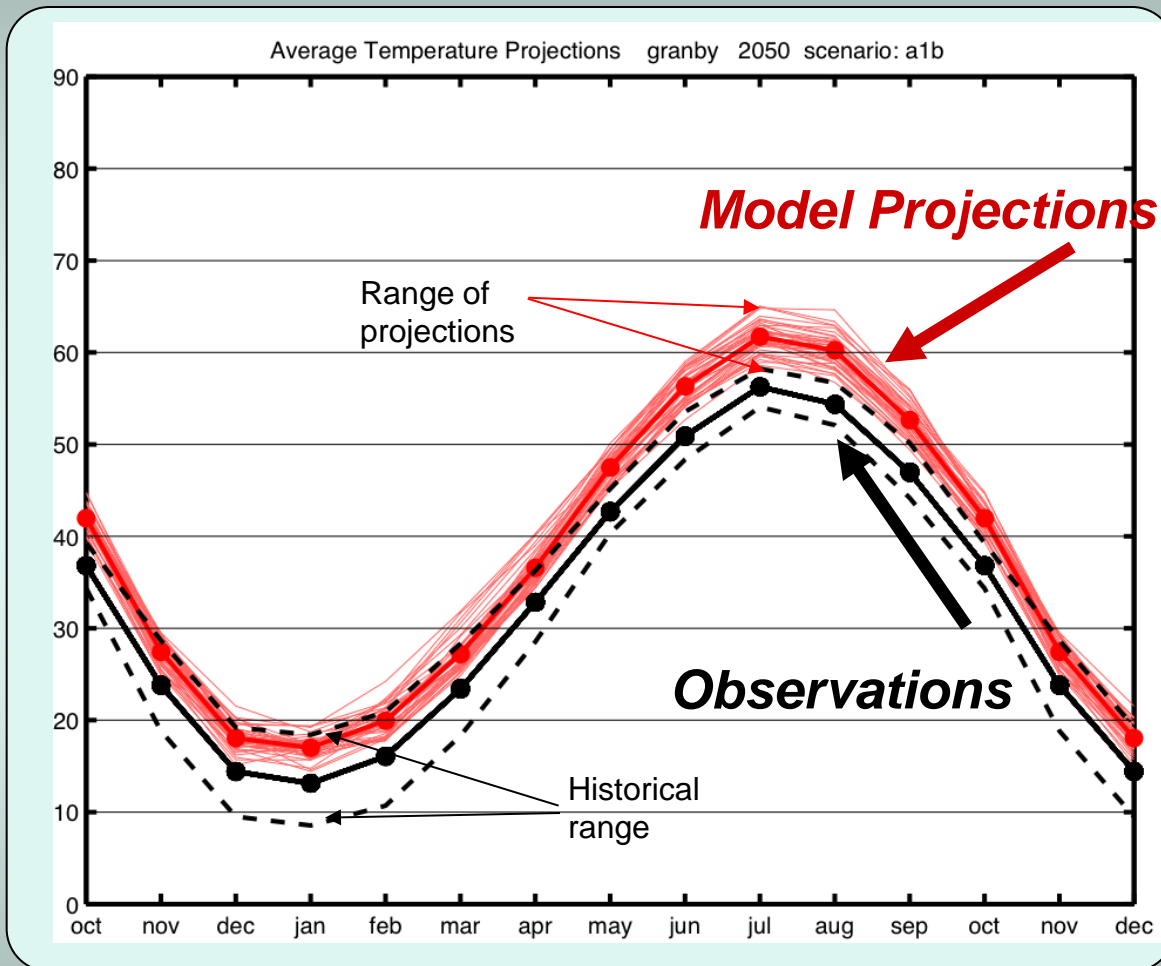






From the best available scientific understanding, warming is likely to continue and accelerate.

# Projections: Temperature near Steamboat



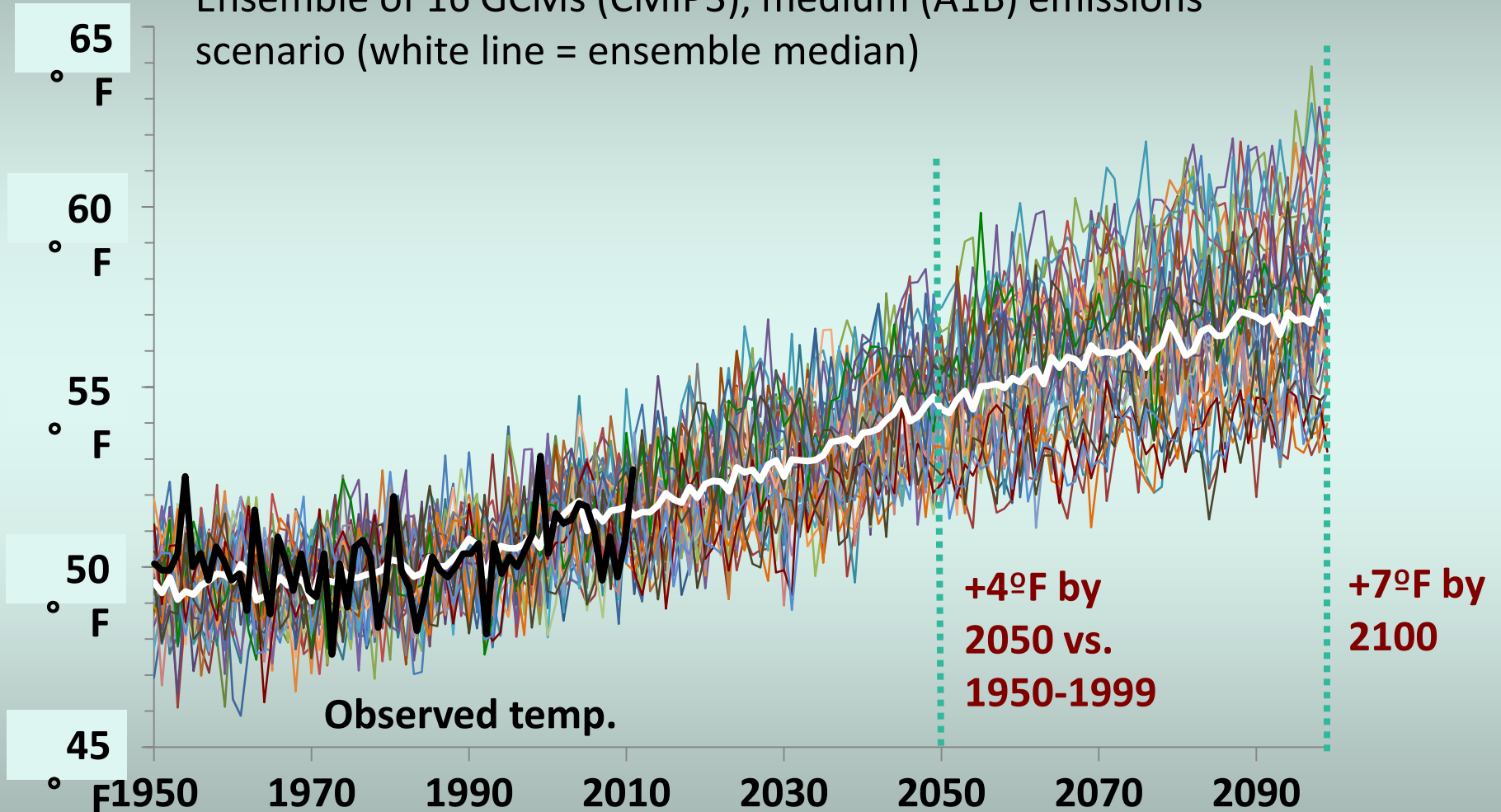
**Summers warm  
more than winters**

**Average summer  
temps similar to  
hottest days in the  
past few years**

**Earlier spring**

# Projected annual temperatures, 1950-2100 for northern Colorado, including Denver

Ensemble of 16 GCMs (CMIP3), medium (A1B) emissions scenario (white line = ensemble median)



# The future will unfold and we can observe it together

Colorado State University

## Colorado Climate Trends

[Climate Trends Home](#) | [Colorado Climate Center](#) | [CIRA](#) | [Atmospheric Science](#)

[Colorado Climate Center](#) » [Climate Trends](#) » [Home](#)

Search by Google

## Welcome to the Colorado Climate Trends Website

[Climate Trends](#) | [Station Map](#) | [Station Info](#) | [Data Access](#) | [Links + Resources](#) | [About](#)

### Climate Trends of Colorado



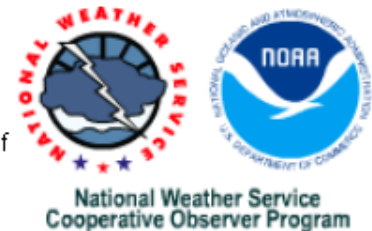
Welcome! The climate of Colorado is a valued natural resource affecting our lives and livelihoods. By nature, climate is variable. No two years are ever exactly alike. Instrumental observations of our climate dating back to the late 1800s give a sense of our average climate, typical variations, extremes and long-term trends. (For a description of historic weather observations in Colorado, [click here](#)). Tracking temperatures and precipitation through history reveal seasonal patterns, cold and warm periods, and episodes of drought and abundant water.

Today there is great interest in climate change. If our state is warming, these data will show it. This Website lets you view, graph and download historic temperature and precipitation data for selected weather stations in Colorado having the longest and most consistent historical data. Historic consistency is critical for accurately assessing climate trends. There have been hundreds of weather stations operated in Colorado since the 1890s, but very few have data that are complete and consistent. Even the best stations selected for this site are imperfect.

For each station shown here, a description of the history of the station is provided so that data users will know what factors may have affected the long-term time series. To learn more

### National Weather Service Co-op Program

Weather observations in Colorado using thermometers and rain gauges date back to the late 1800s. Some of the earliest weather stations were established in the largest cities during the 1870s by the U.S. Signal Service. In the 1880s Colorado formed a "State Weather Service" and began setting up more basic weather stations in smaller towns and rural areas. By 1890, the first nationwide civilian weather service was formed within the U.S. Department of Agriculture. State networks, such as Colorado's were combined to form a single nationwide volunteer weather observing network. This same network continues today managed by the National Weather Service. What began as a few dozen stations in the 1880s grew to over 200 in the 1940s and 50s and continues today.



<http://climatetrends.colostate.edu>

- The future of Colorado rainfall and snowfall is very uncertain!  
-- maybe wetter, maybe drier, maybe more extreme (and it's already wildly variable)

So . . . My question is  
“Do you have a rain  
gauge?”



A large, rounded snowdrift dominates the frame. The words "COCORAHHS" are written in the snow in a simple, hand-drawn style. The letters are dark, possibly from a marker or a stick. The background shows some bare branches and a clear sky, suggesting a winter setting.

COCORAHHS

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

**<http://www.cocorahhs.org>**

or see me today



**Rain!**



**Hail!**



**Snow!**

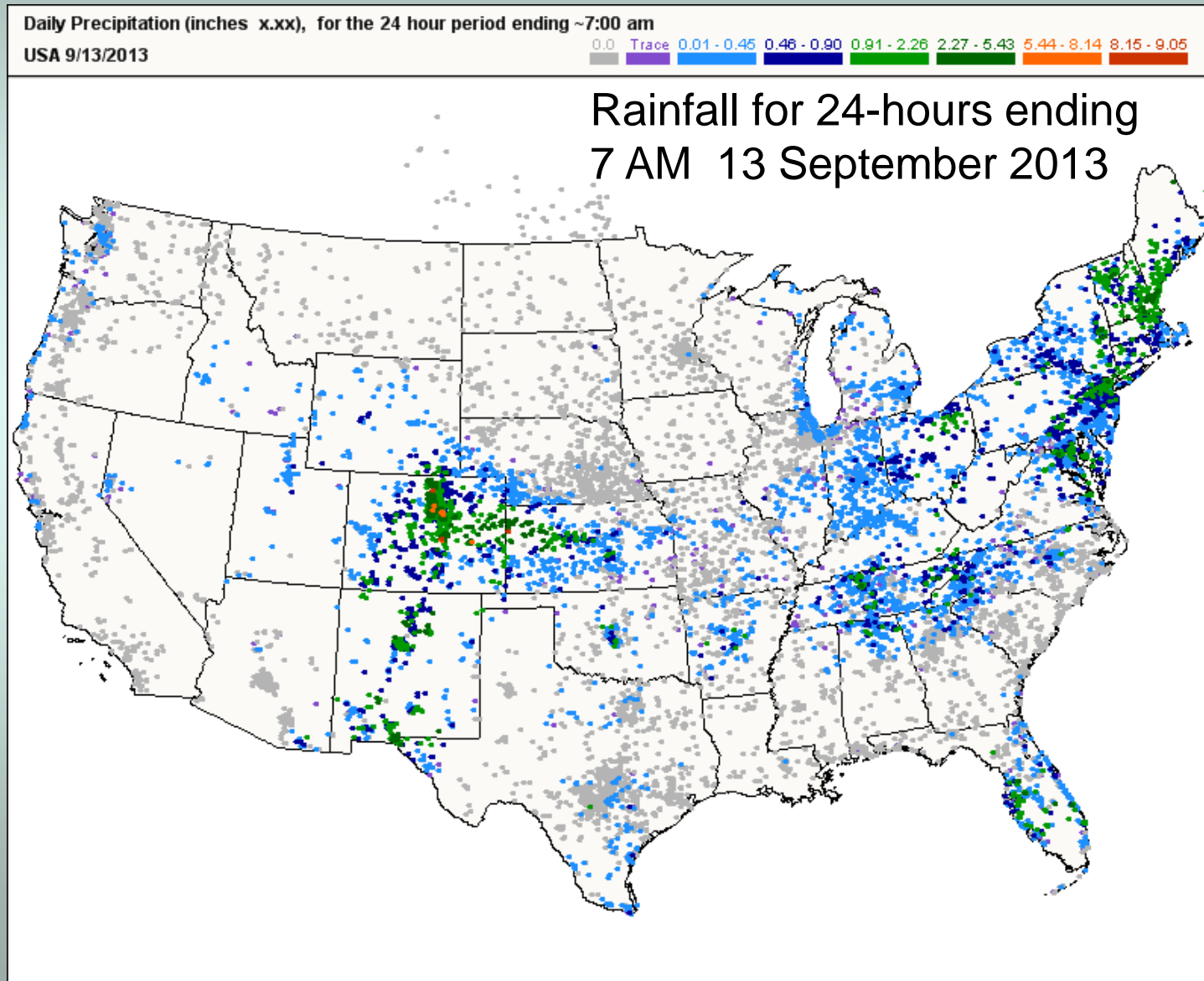
**CoCoRaHS (Community Collaborative Rain, Hail and Snow) – A simple but effective way to help scientists track our climate**



<http://www.cocorahs.org>



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



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/1998 ▾

Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/1998

0.0 Trace 0.01 - 0.03 0.04 - 0.06 0.07 - 0.16 0.17 - 0.38 0.39 - 0.57 0.58 - 0.64



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/1999 ▾

Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/1999

0.0 Trace 0.01 - 0.03 0.04 - 0.06 0.07 - 0.14 0.15 - 0.33 0.34 - 0.50 0.51 - 0.55



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2000

Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2000

0.0 Trace 0.01 - 0.02 0.03 - 0.04 0.05 - 0.10 0.11 - 0.24 0.25 - 0.36 0.37 - 0.40



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/2001 ▾

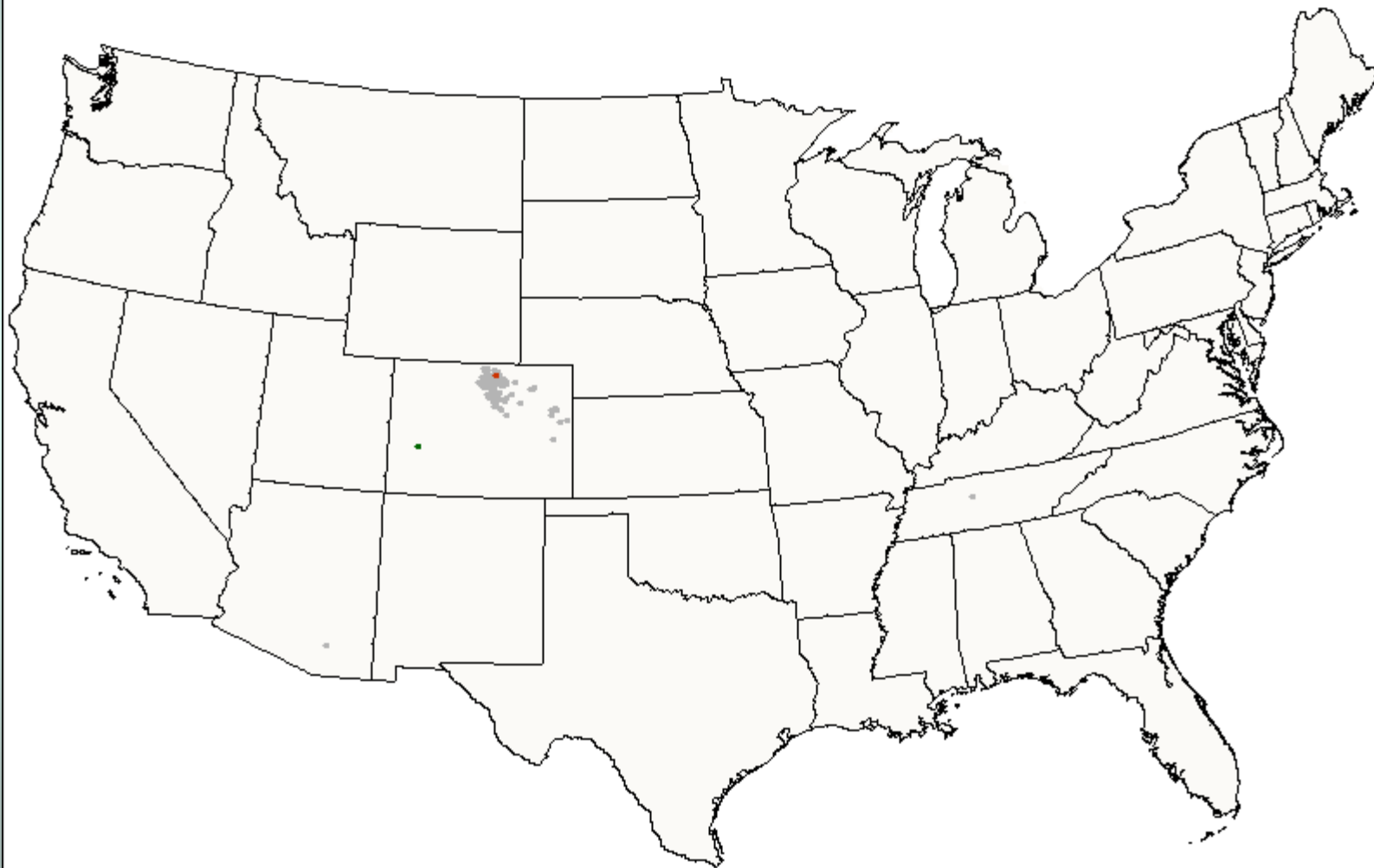
Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2001

0.0 Trace 0.01 - 0.01 0.02 - 0.02 0.03 - 0.05 0.06 - 0.12 0.13 - 0.18 0.19 - 0.21



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/2002 ▾

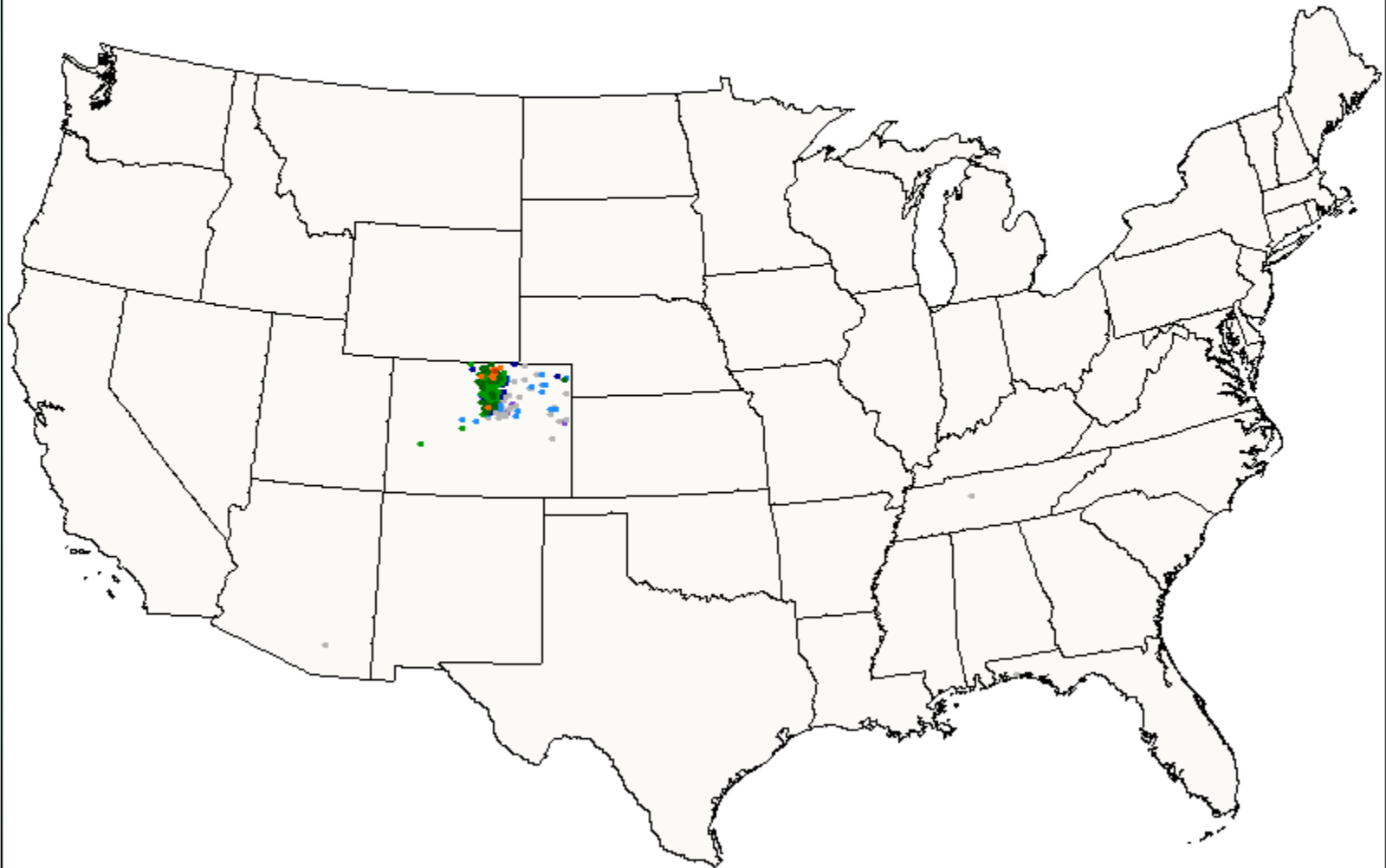
Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2002

0.0 Trace 0.01 - 0.07 0.08 - 0.14 0.15 - 0.34 0.35 - 0.80 0.81 - 1.20 1.21 - 1.32



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/2003 ▾

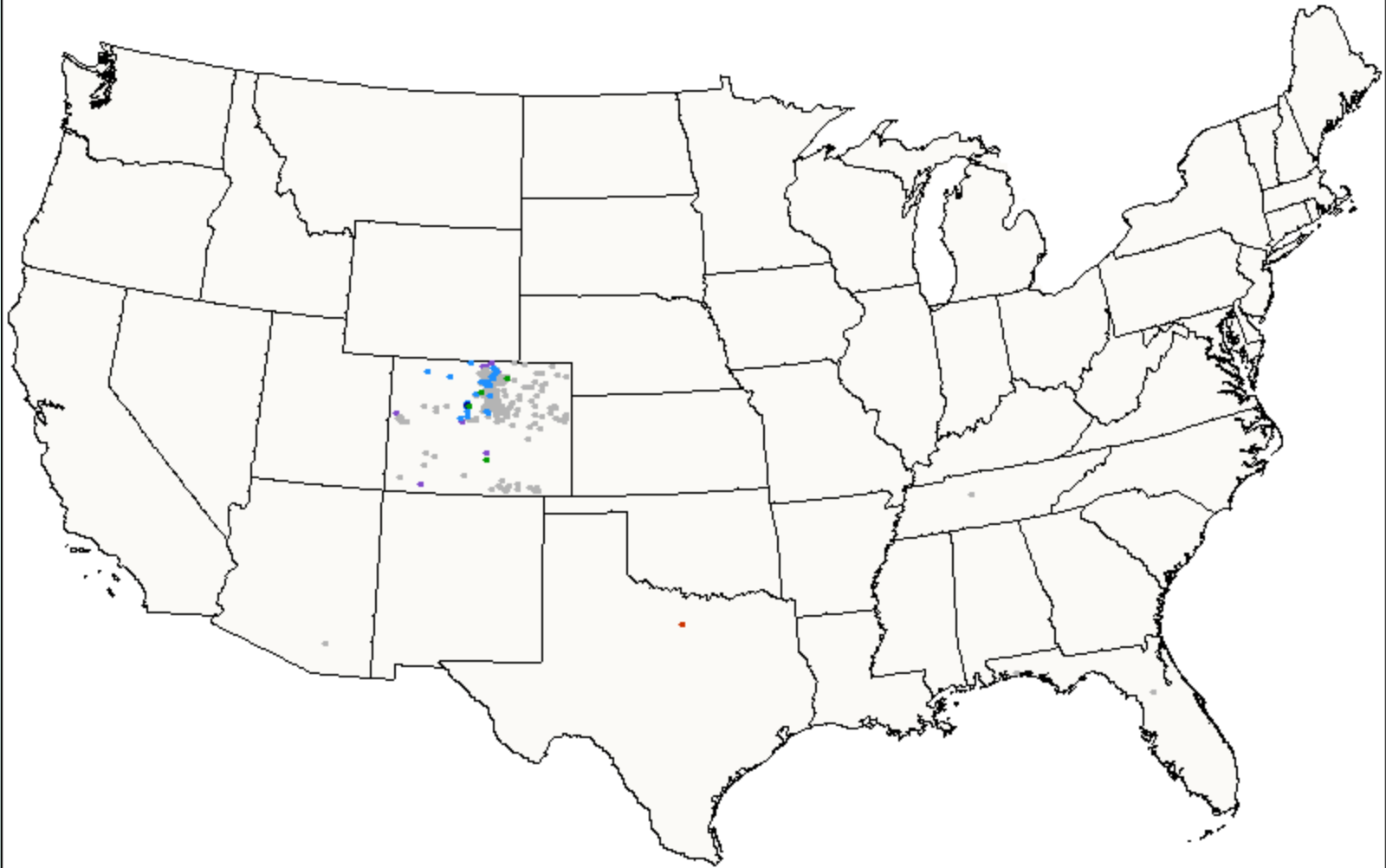
Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2003

0.0 Trace 0.01 - 0.03 0.04 - 0.06 0.07 - 0.15 0.16 - 0.36 0.37 - 0.54 0.55 - 0.61



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2004

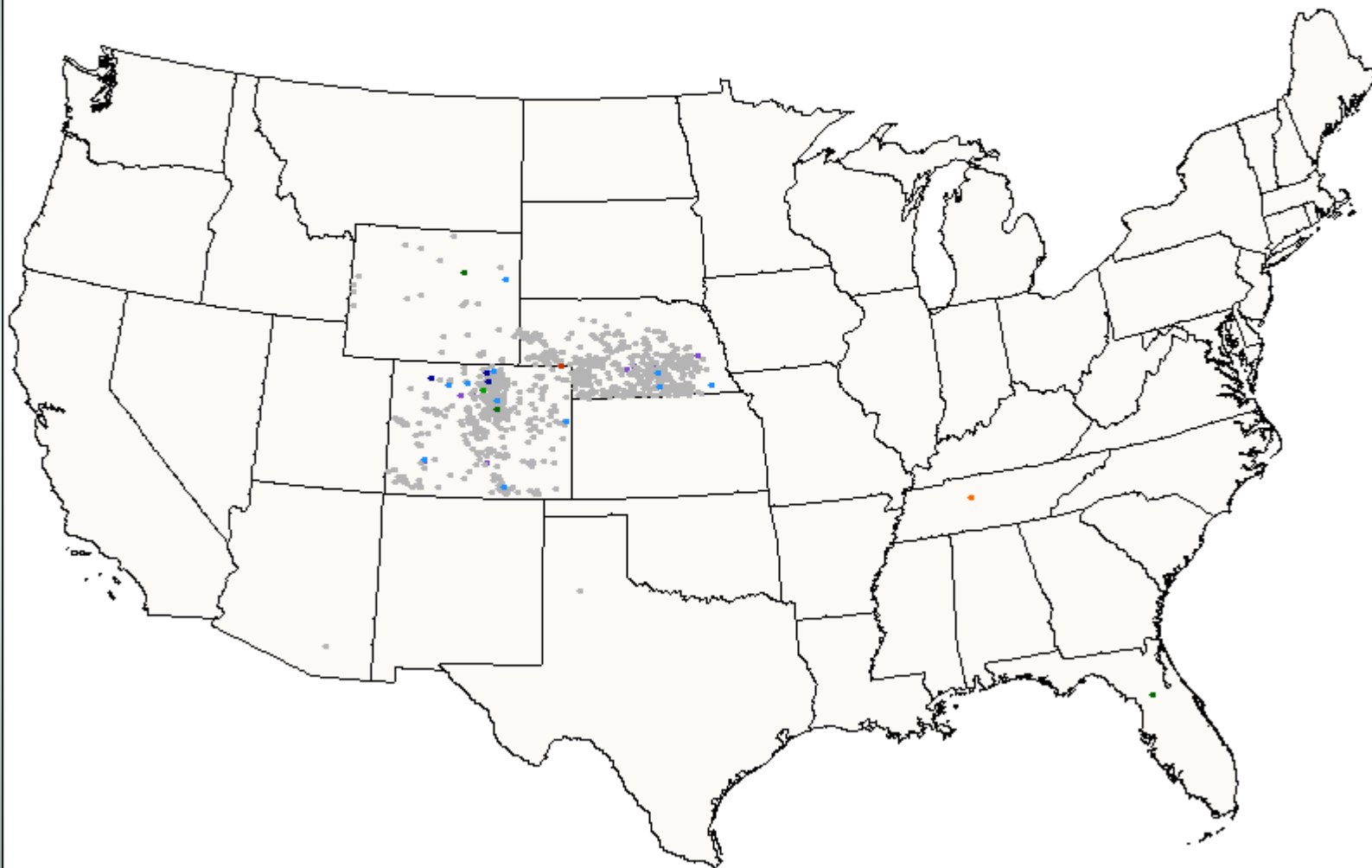
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2004

0.0 Trace 0.01 - 0.03 0.04 - 0.06 0.07 - 0.16 0.17 - 0.40 0.41 - 0.60 0.61 - 0.68





Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2005

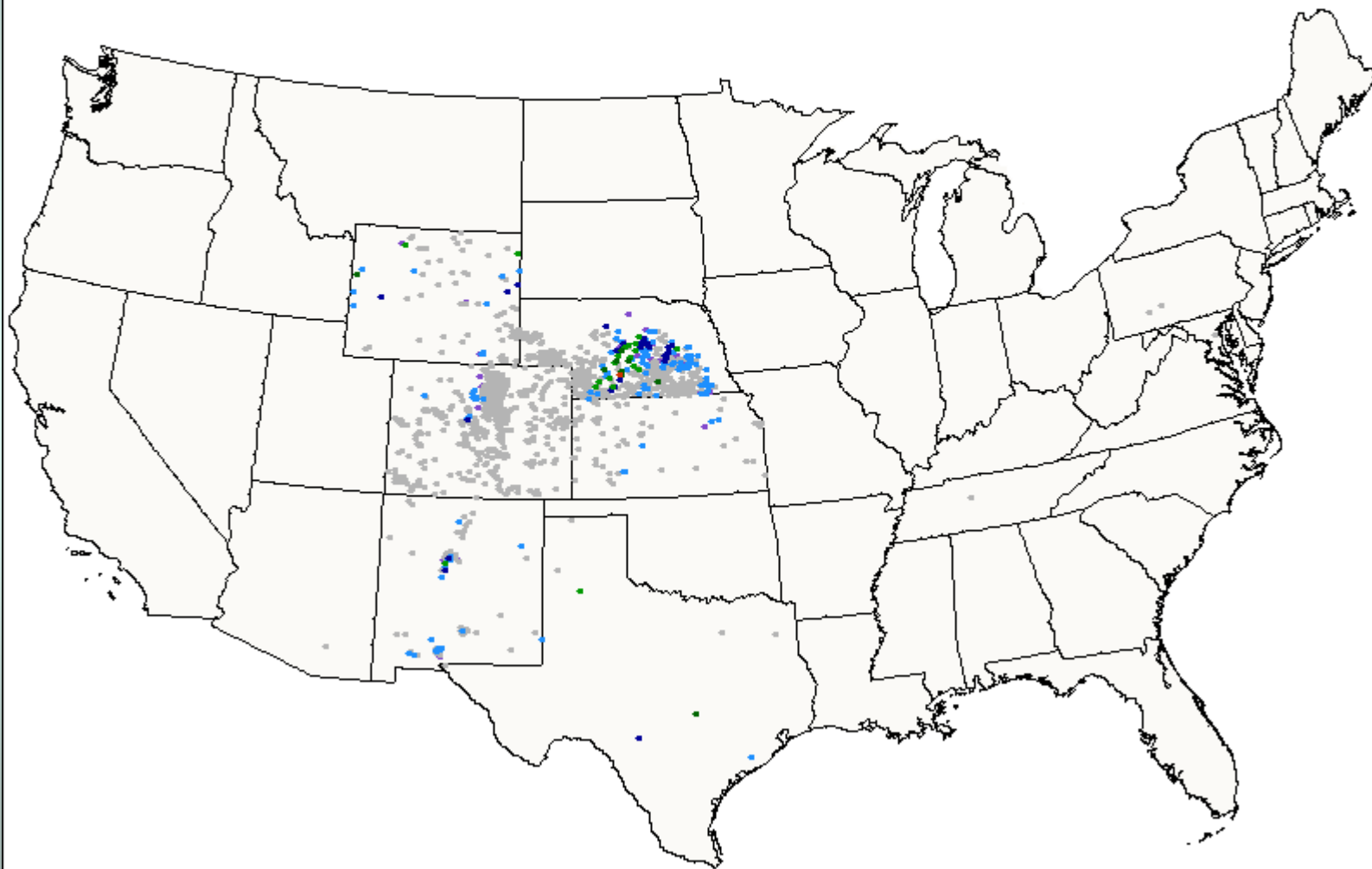
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2005

0.0 Trace 0.01 - 0.08 0.09 - 0.16 0.17 - 0.40 0.41 - 0.95 0.96 - 1.42 1.43 - 1.58



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2006

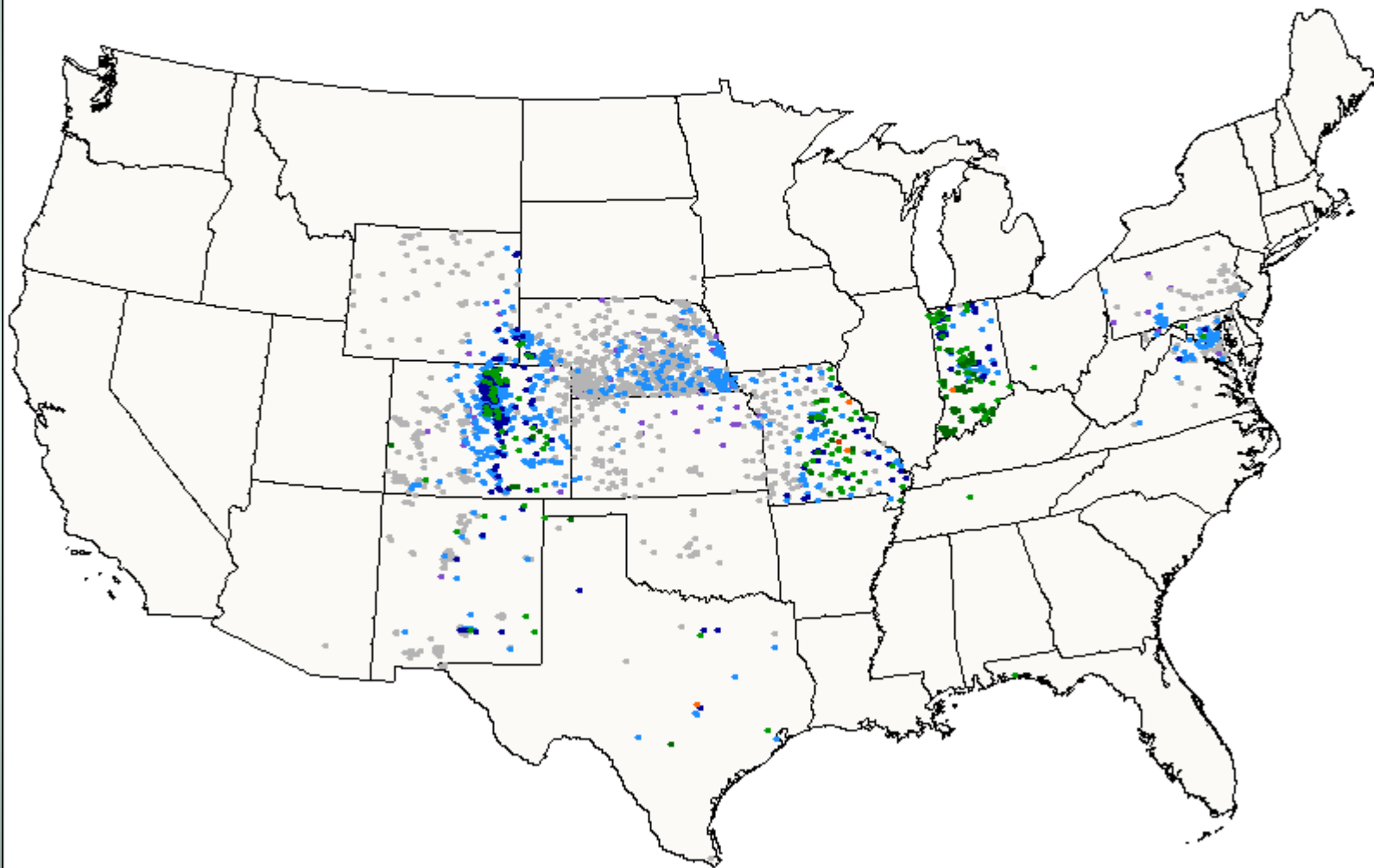
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2006

0.0 Trace 0.01 - 0.18 0.19 - 0.36 0.37 - 0.90 0.91 - 2.16 2.17 - 3.24 3.25 - 3.59



Map Type

Map Location

Date

Colors

Precipitation ▾

National ▾

No State Selected ▾

9/12/2007 ▾

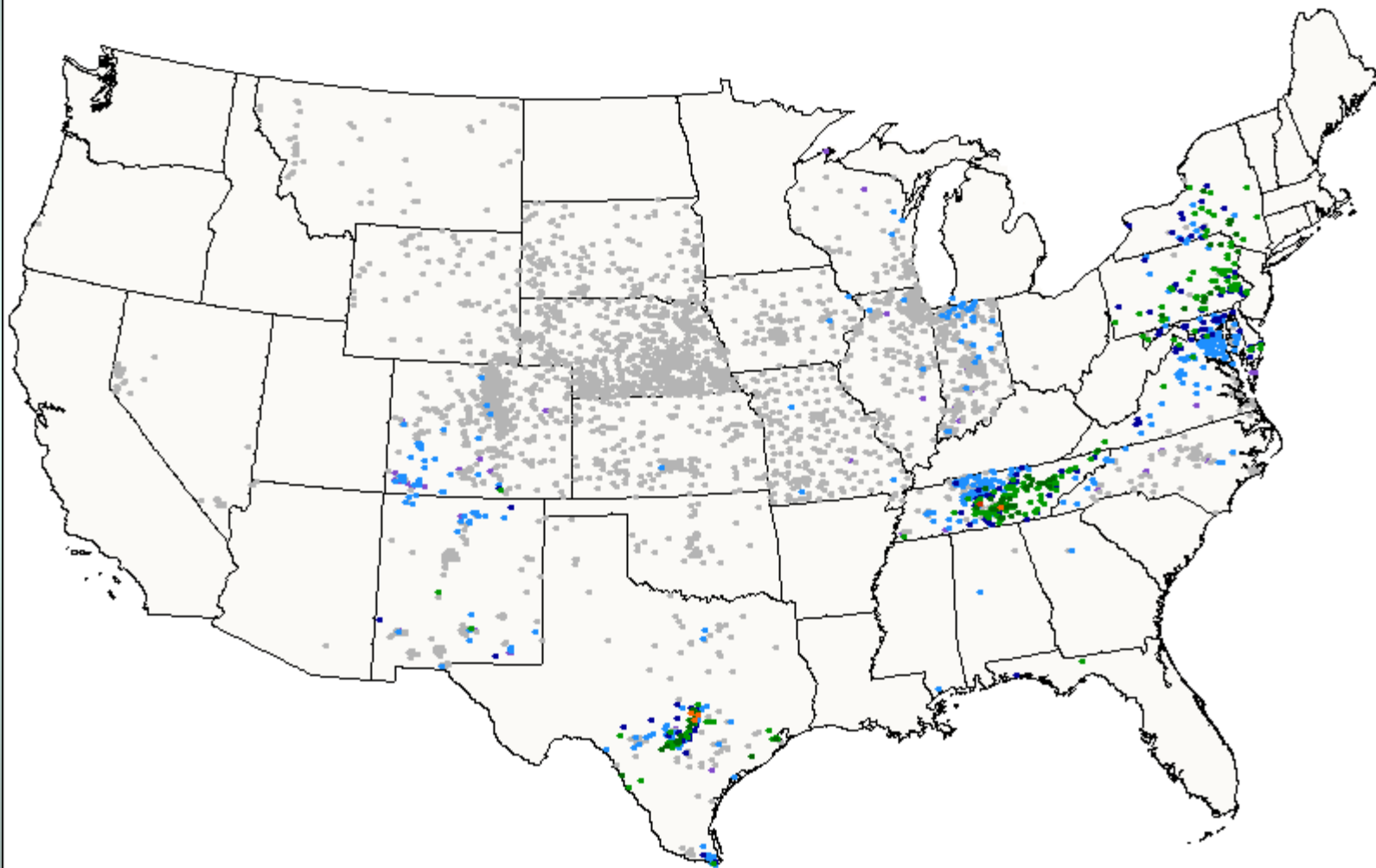
Standard ▾

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2007

0.0 Trace 0.01 - 0.18 0.19 - 0.36 0.37 - 0.92 0.93 - 2.22 2.23 - 3.33 3.34 - 3.70



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2008

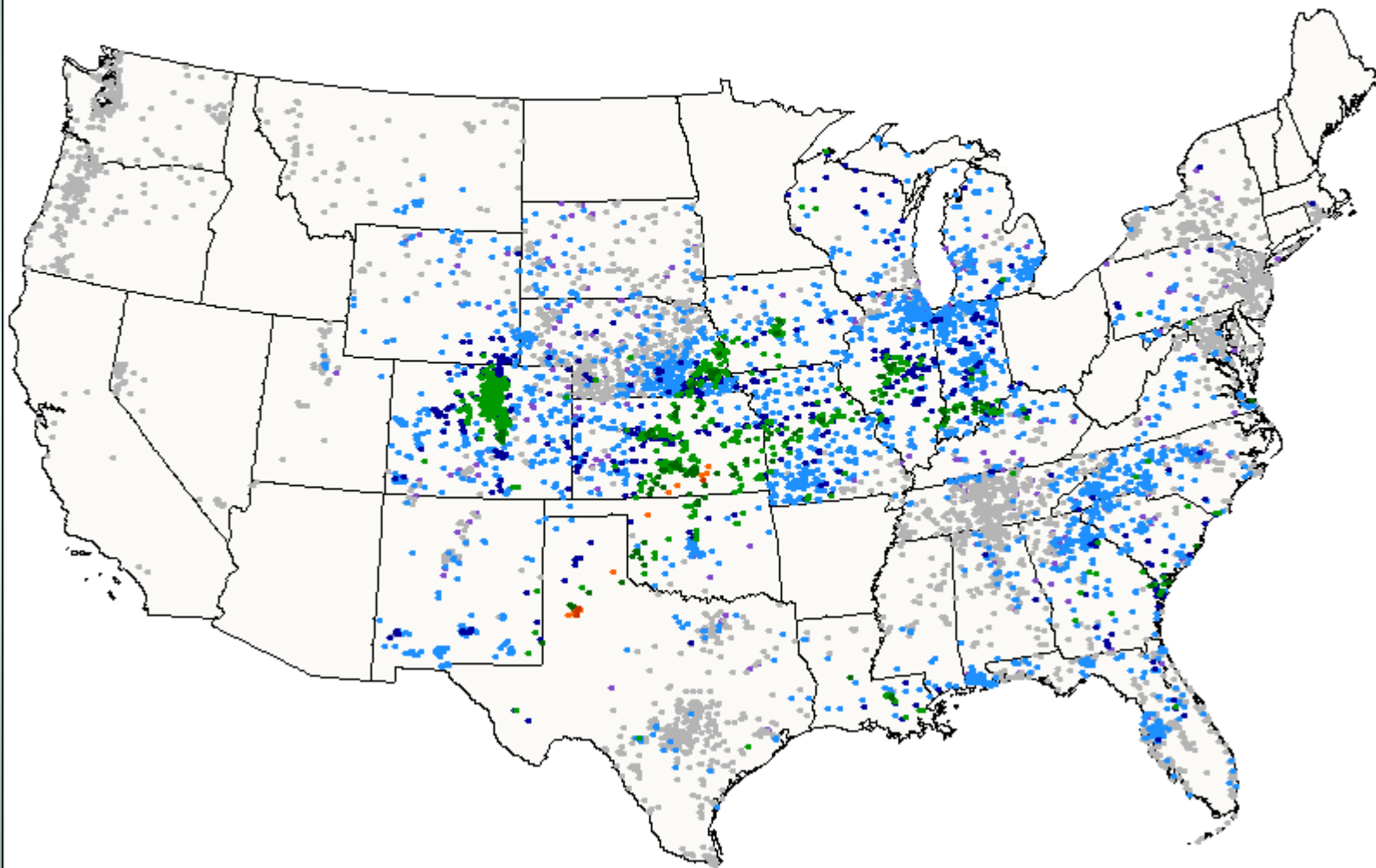
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2008

0.0 Trace 0.01 - 0.41 0.42 - 0.82 0.83 - 2.05 2.06 - 4.92 4.93 - 7.38 7.39 - 8.21



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2009

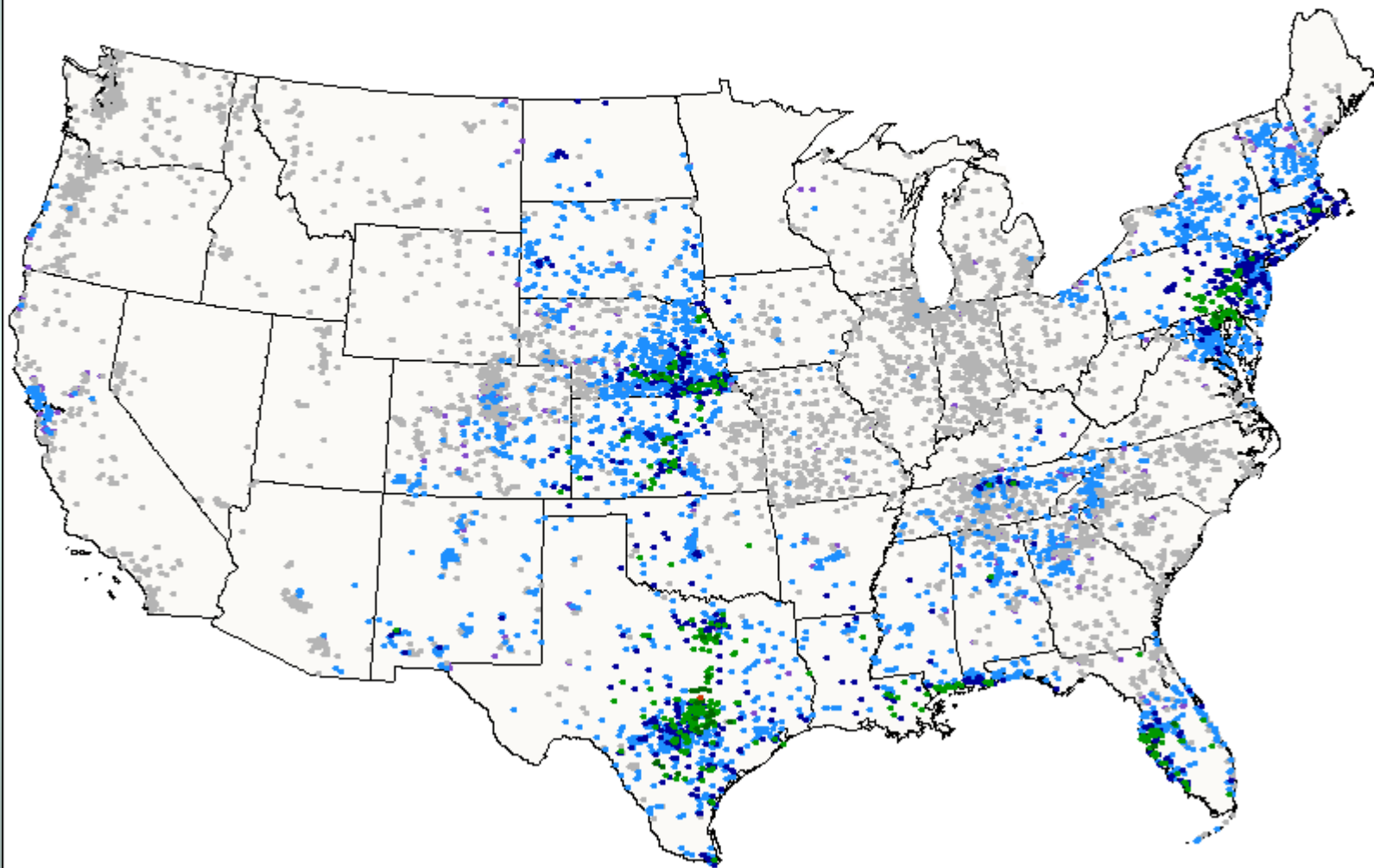
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2009

0.0 Trace 0.01 - 0.72 0.73 - 1.44 1.45 - 3.59 3.60 - 8.61 8.62 - 12.91 12.92 - 14.33



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2010

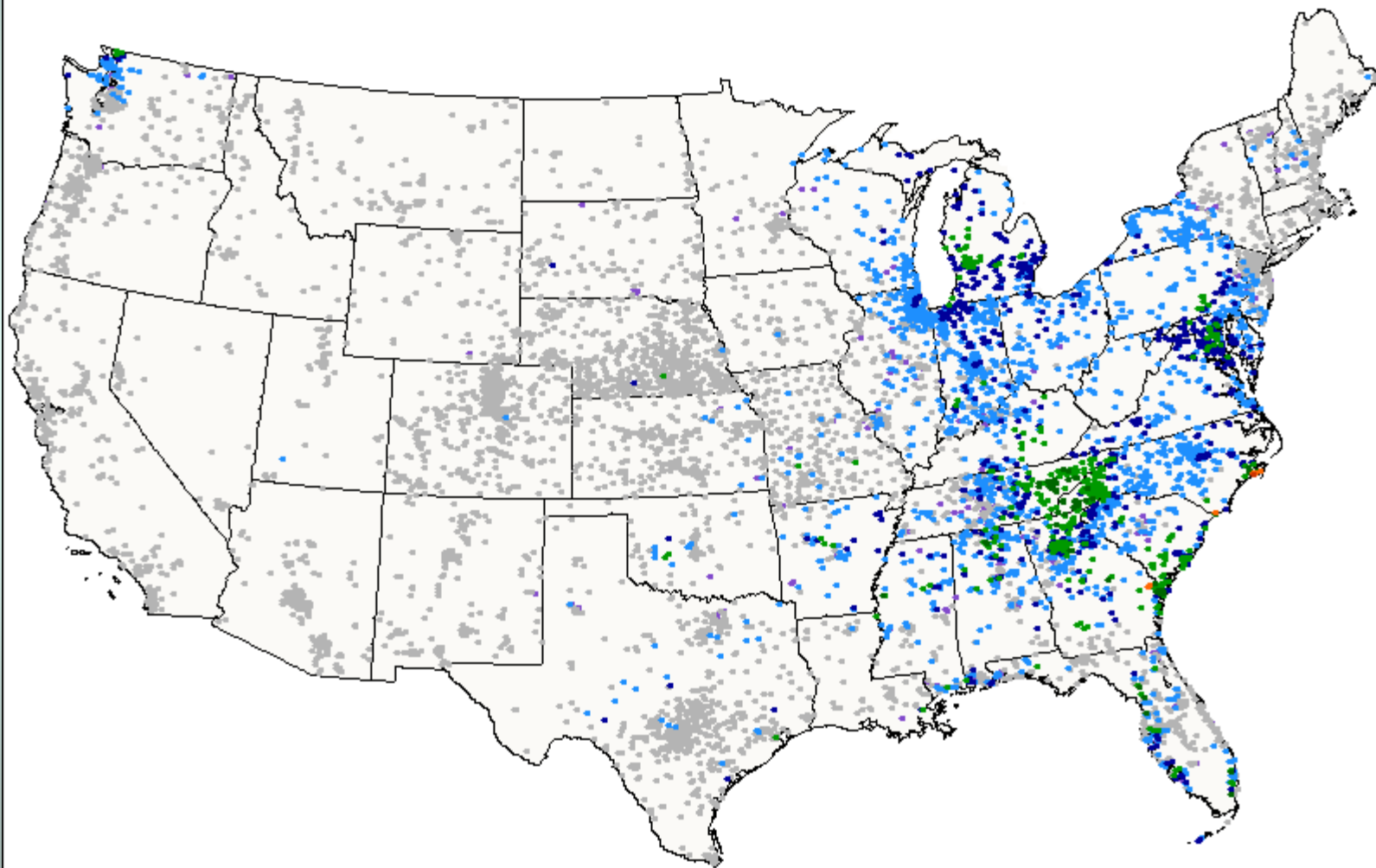
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2010

0.0 Trace 0.01 - 0.30 0.31 - 0.60 0.61 - 1.50 1.51 - 3.59 3.60 - 5.38 5.39 - 5.98



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2011

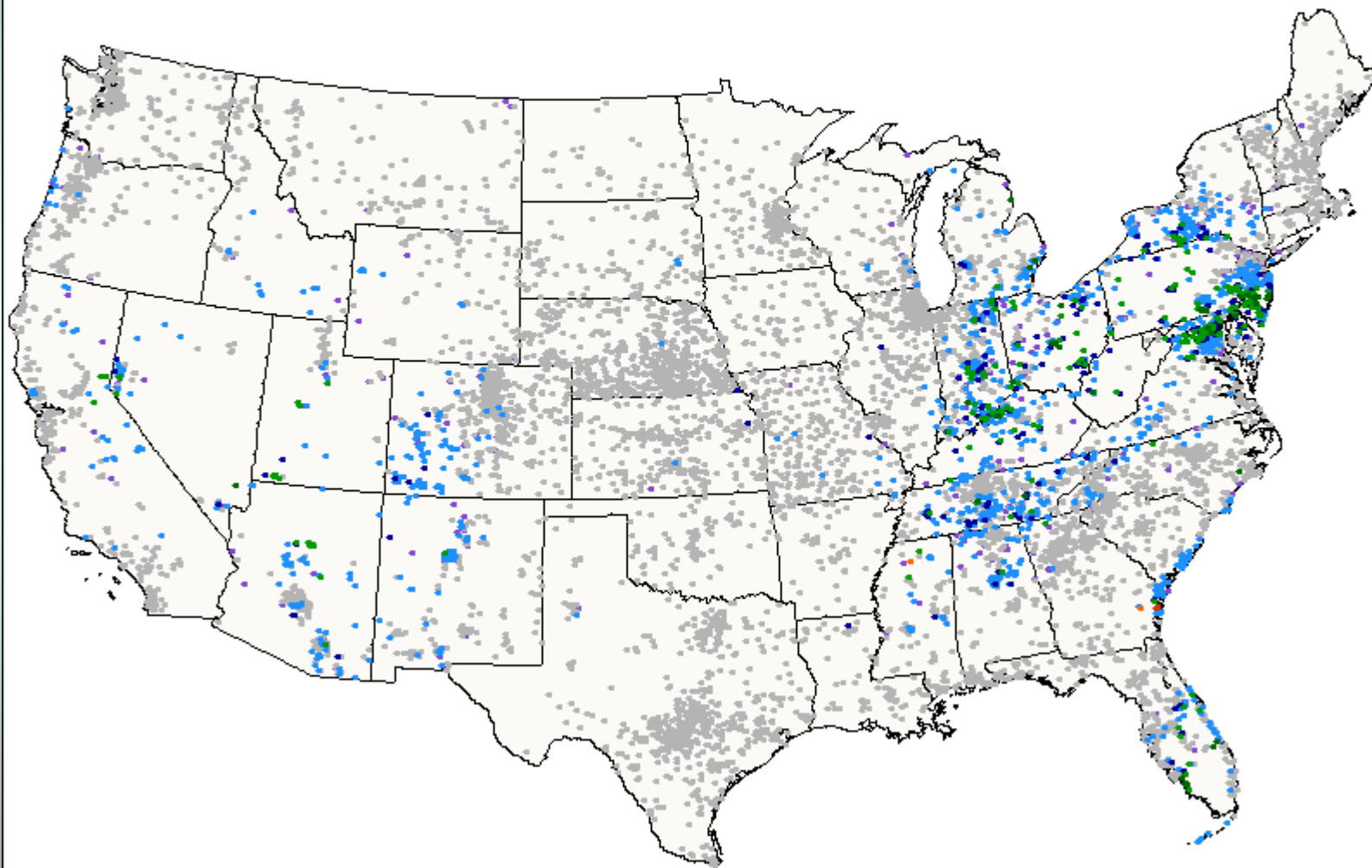
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2011

0.0 Trace 0.01 - 0.18 0.19 - 0.36 0.37 - 0.91 0.92 - 2.19 2.20 - 3.29 3.30 - 3.67



Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2012

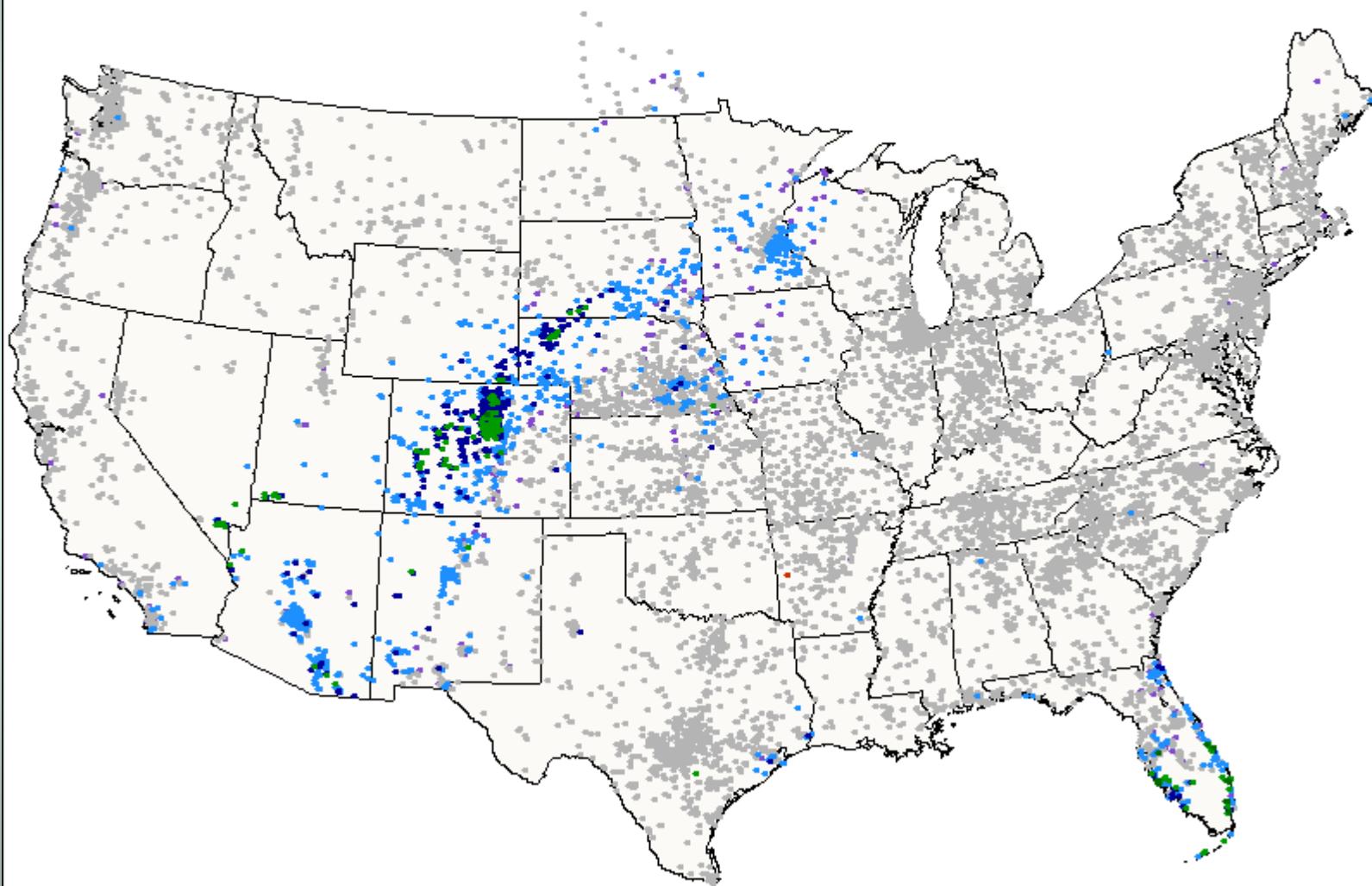
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2012

0.0 Trace 0.01 - 0.30 0.31 - 0.60 0.61 - 1.50 1.51 - 3.60 3.61 - 5.40 5.41 - 6.00





Map Type

Map Location

Date

Colors

Precipitation

National

No State Selected

9/12/2013

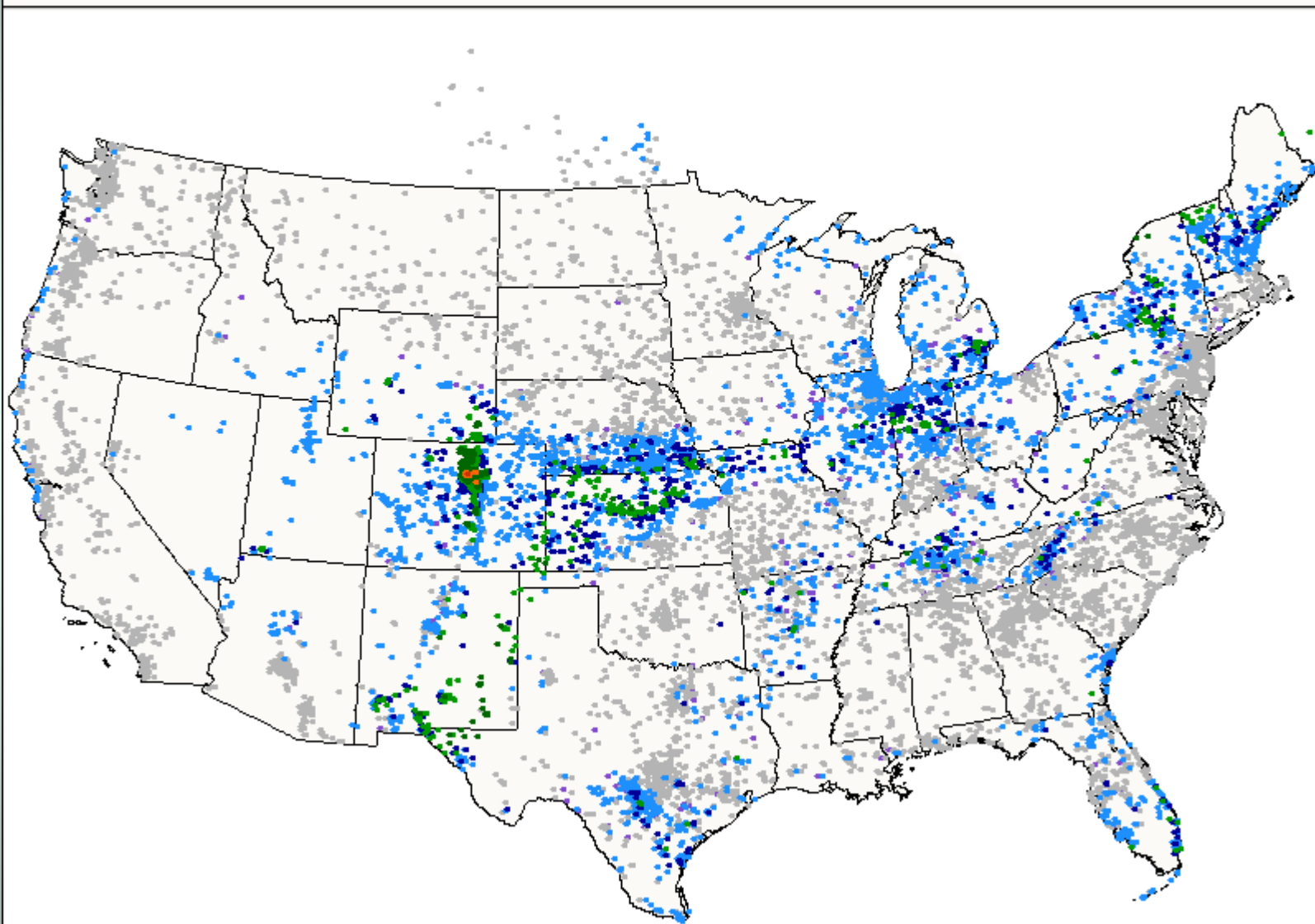
Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 9/12/2013

0.0 Trace 0.01 - 0.50 0.51 - 1.00 1.01 - 2.49 2.50 - 5.97 5.98 - 8.95 8.96 - 9.93





Join Us! Tell others!  
We need rural observers  
<http://www.cocorahs.org>

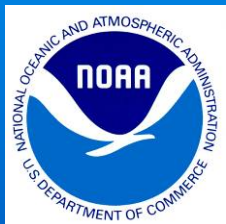


Literacy Program and many local charter sponsors. mental

For information and to  
volunteer, visit the CoCoRaHS  
Web Site



<http://www.cocorahs.org>



Support for this project provided by  
NSF Informal Science Education Program,  
NOAA Environmental Literacy Program  
and  
many local charter sponsors.

**Colorado: It's a great place  
but we have to be ready for  
anything**



Photo by Lynn Kral, Loveland, January 2006

# Colorado Climate Center

Data and Power Point Presentations  
available for downloading

<http://ccc.atmos.colostate.edu>

- Click on “Presentations”

