

DROUGHT: An update and status report



**Nolan Doesken
Colorado Climate Center**

**Presented to: Colorado Conservation Tillage Association,
Greeley, CO, February 1, 2006**

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

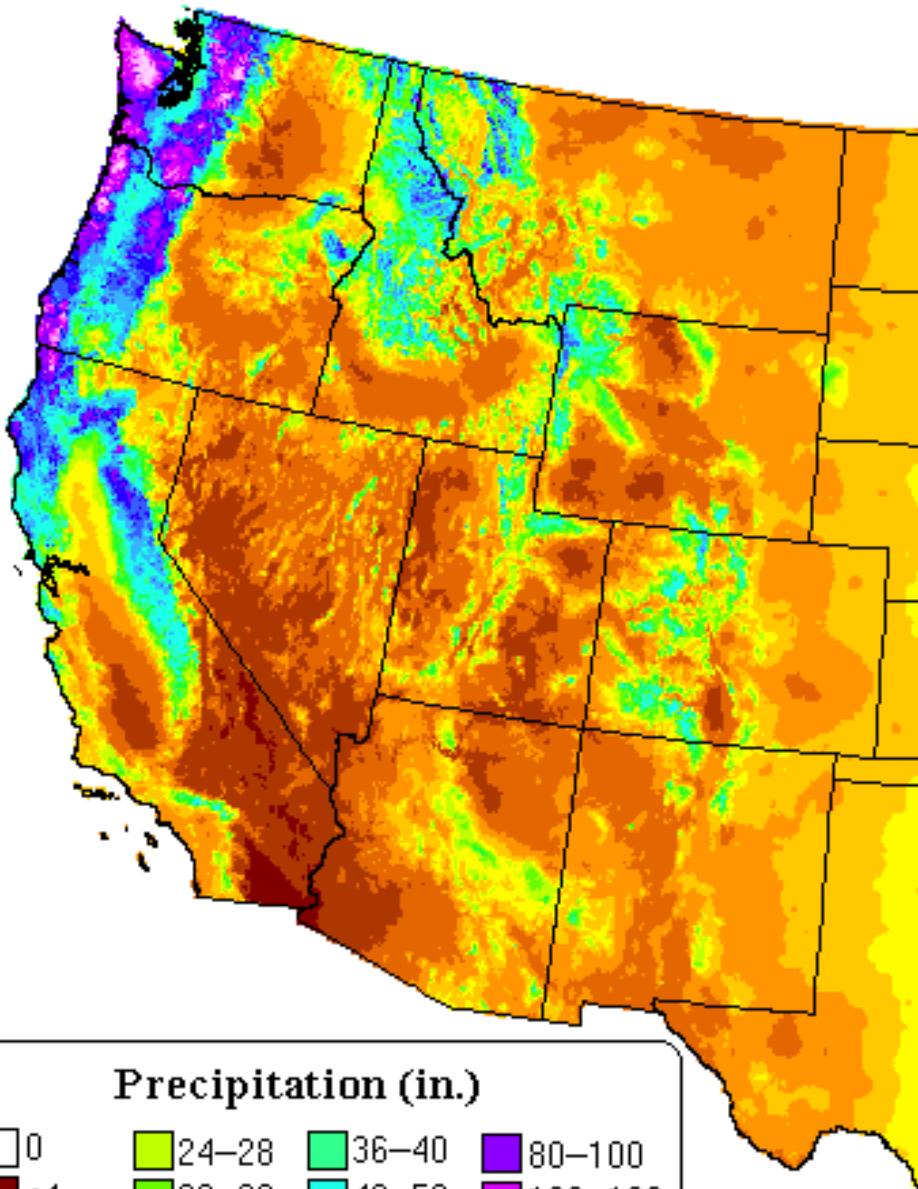
Prepared by Odie Bliss



Let's Talk About Precipitation

A wide-angle photograph of a severe thunderstorm. The sky is filled with dark, billowing cumulonimbus clouds. A prominent, funnel-shaped cloud base extends from the left side of the frame towards the right, casting a shadow over a dry, brown field. In the far distance, a few small buildings are visible on a low horizon under a hazy sky.

Strasburg, Colo, Photo by Ian Wittmeyer

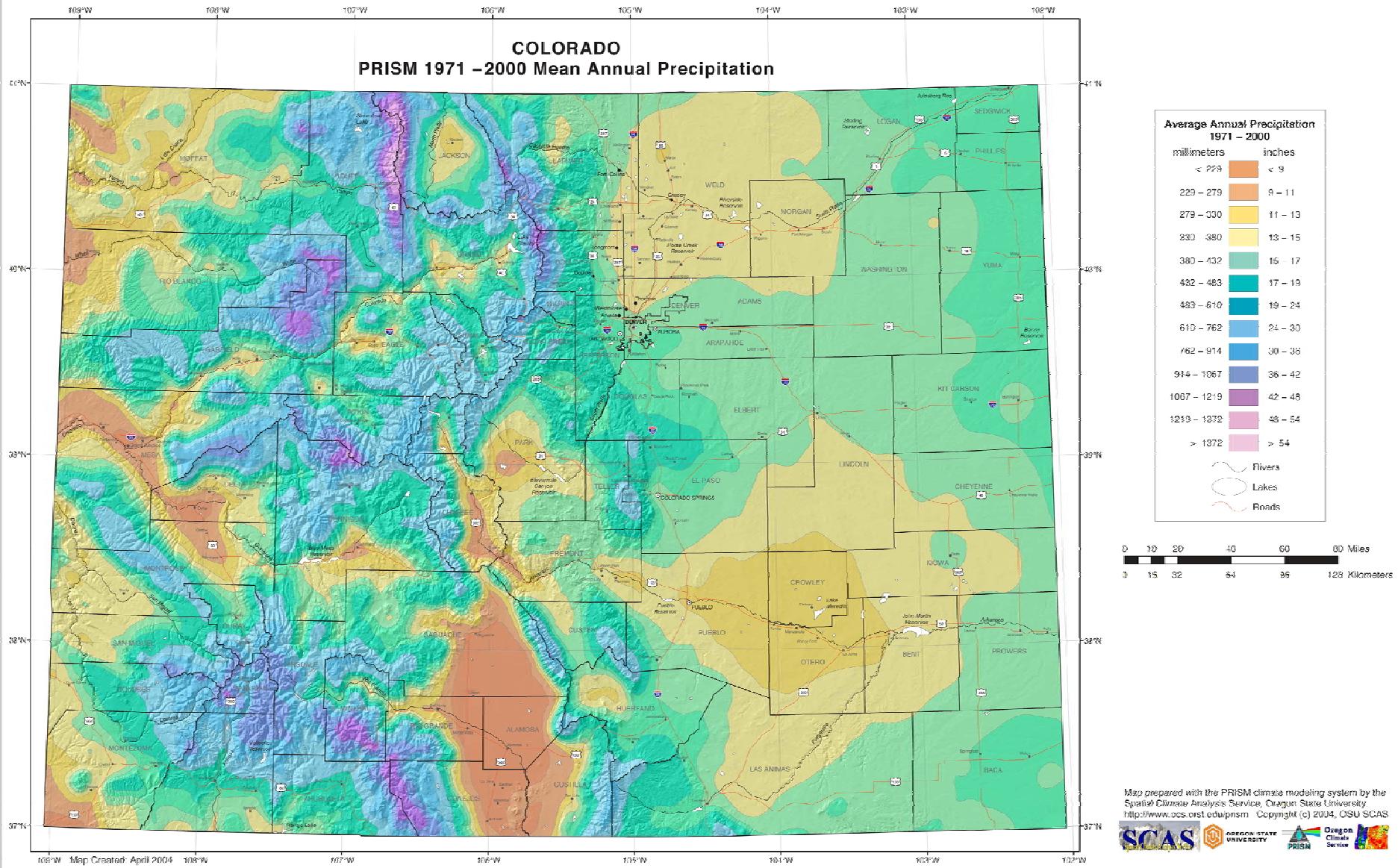


Precipitation (in.)

0	24–28	36–40	80–100
<4	28–32	40–50	100–120
4–8	32–36	50–60	120–140
8–12	16–20	60–70	140–160
12–16	20–24	70–80	160+

Precipitation: Annual Climatology (1971-2000)

Colorado Average Annual Precipitation

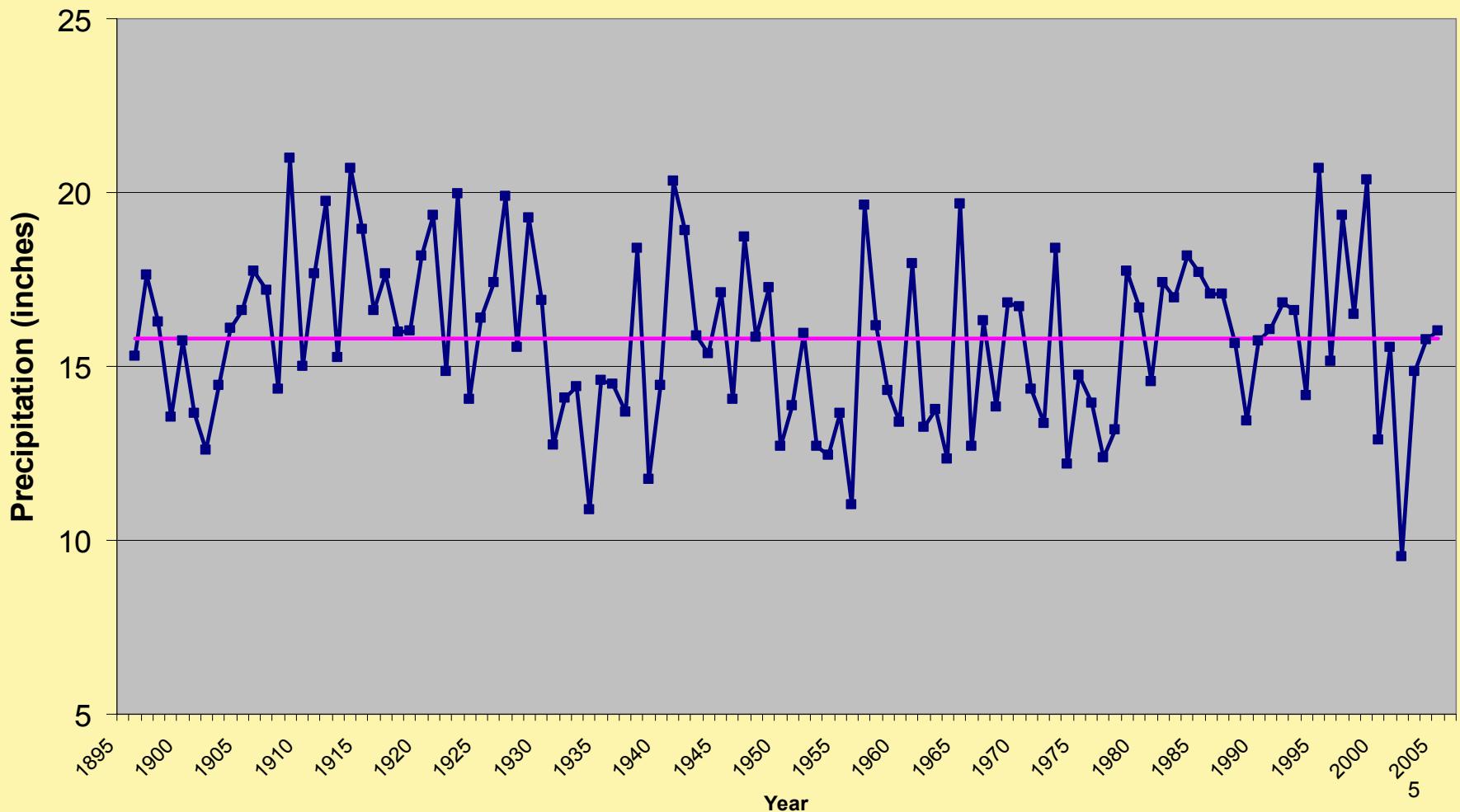




Have We Been Average?

NO!

Colorado Statewide Water Year (Oct-Sep) Precipitation
from 1896 - 2005

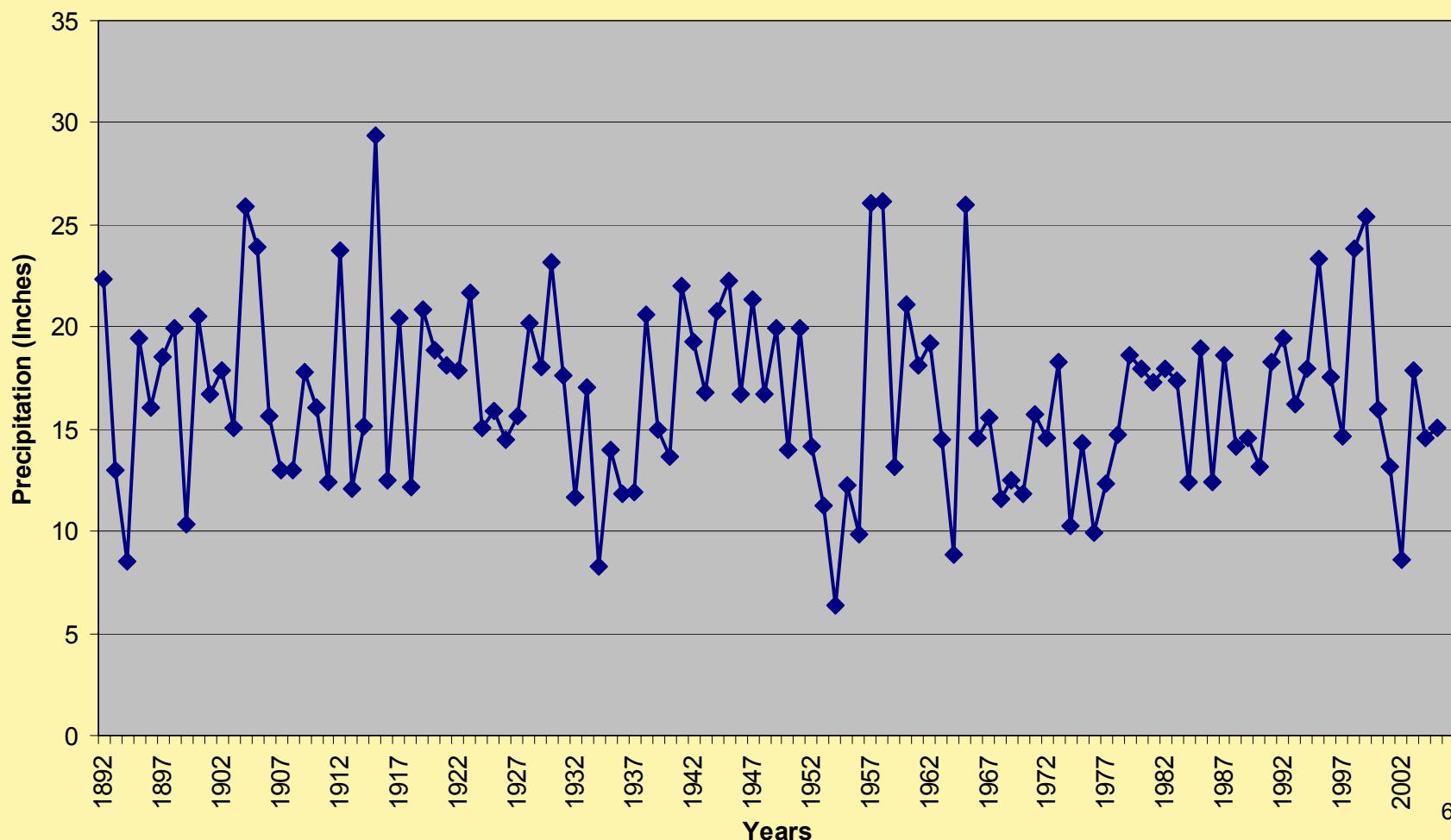




Burlington Water Year Precipitation

Burlington Water Year (Oct-Sep) Precipitation

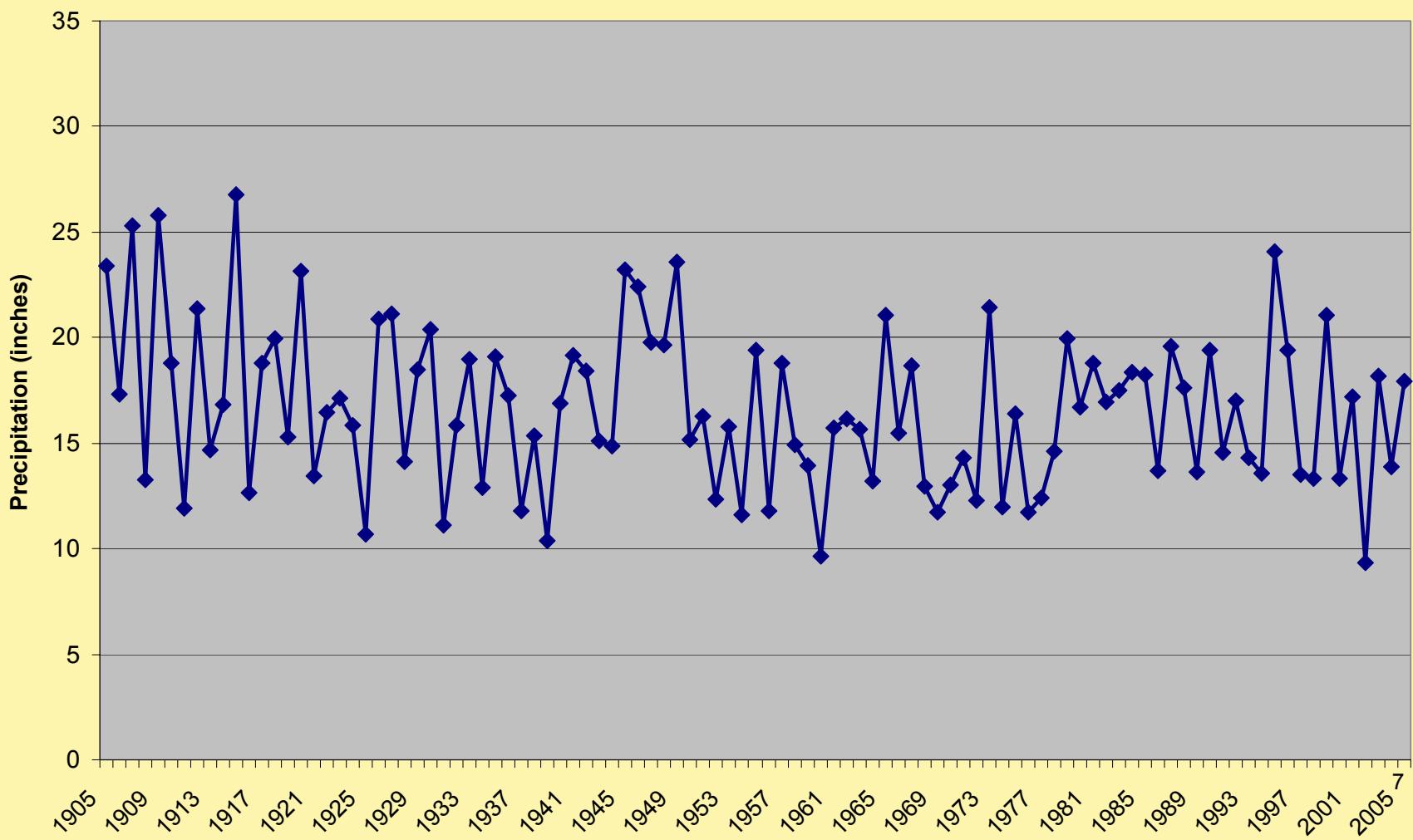
for Years 1892-2005





Akron Water Year Precipitation

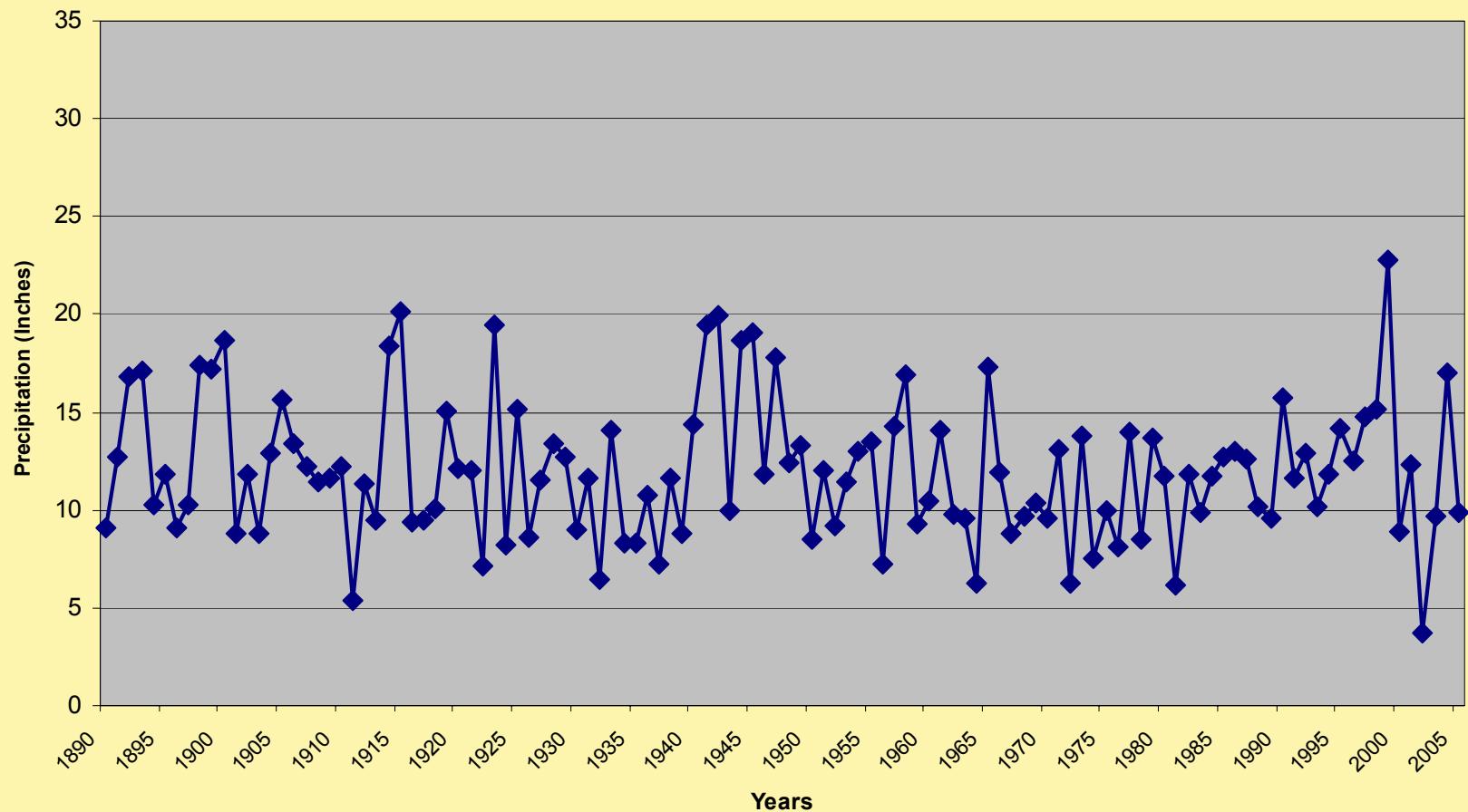
Akron Water Year (Oct-Sep) Precipitation
from 1905-2005





Rocky Ford Water Year Precipitation

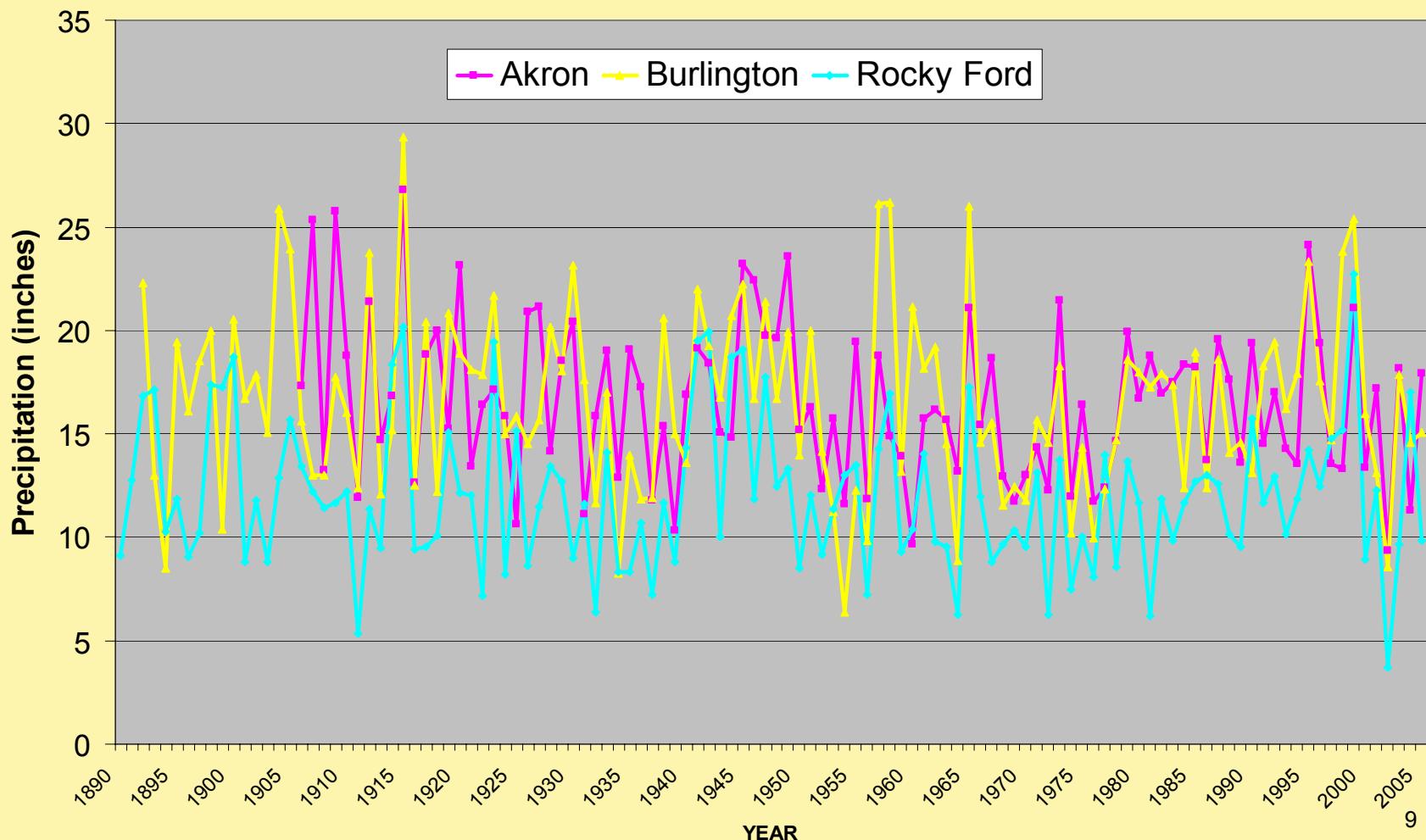
Rocky Ford Water Year (Oct-Sep) Precipitation
from 1890-2005



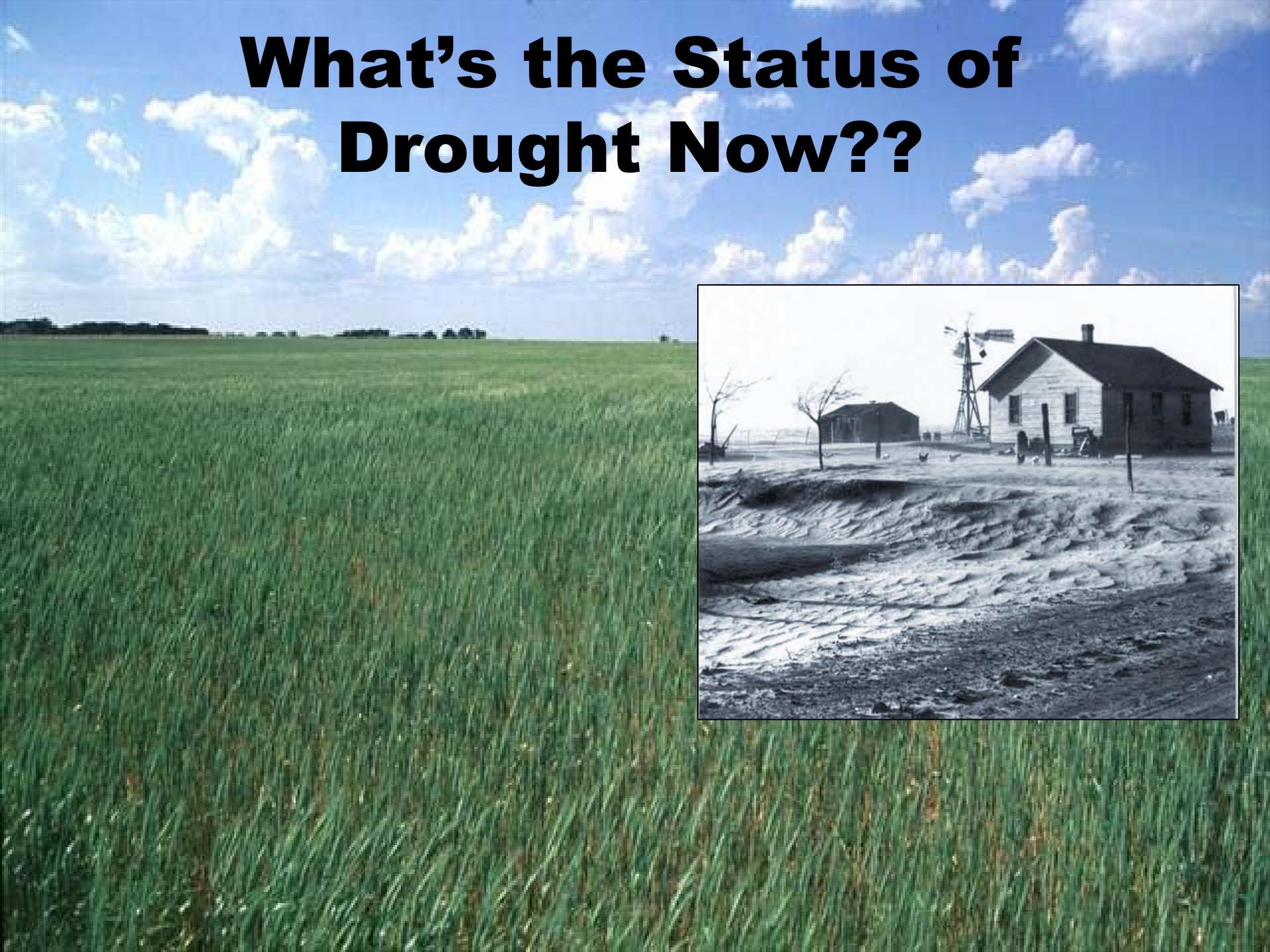


All 3 Sites Comparison

Water Year (Oct-Sep) Precipitation Comparison
for Akron, Burlington, and Rocky Ford



What's the Status of Drought Now??

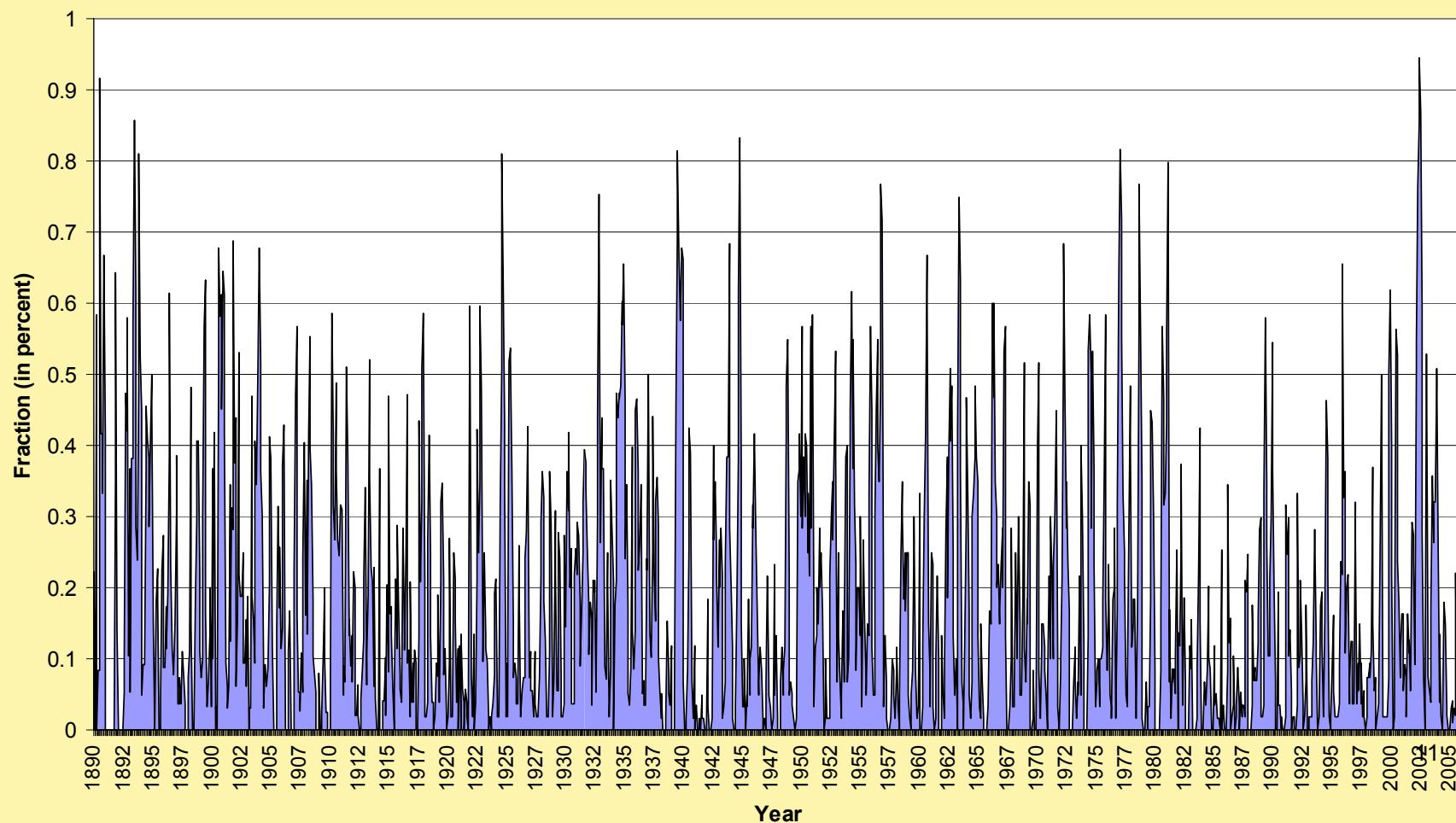




3-Month SPI

Fraction of Colorado in Drought
Based on 3 month SPI

(1890 - 2005)

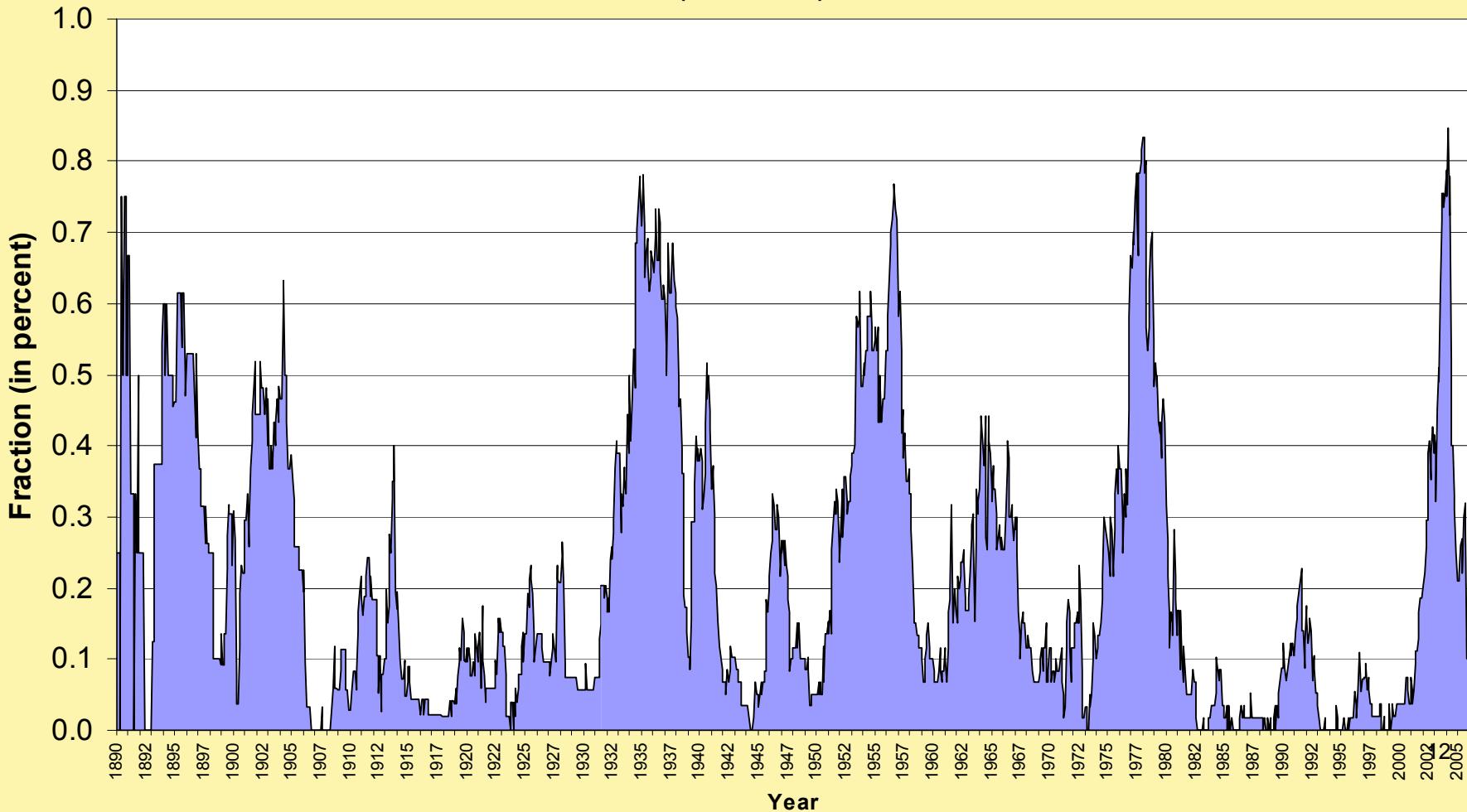




48-Month SPI

Fraction of Colorado in Drought Based on 48 month SPI

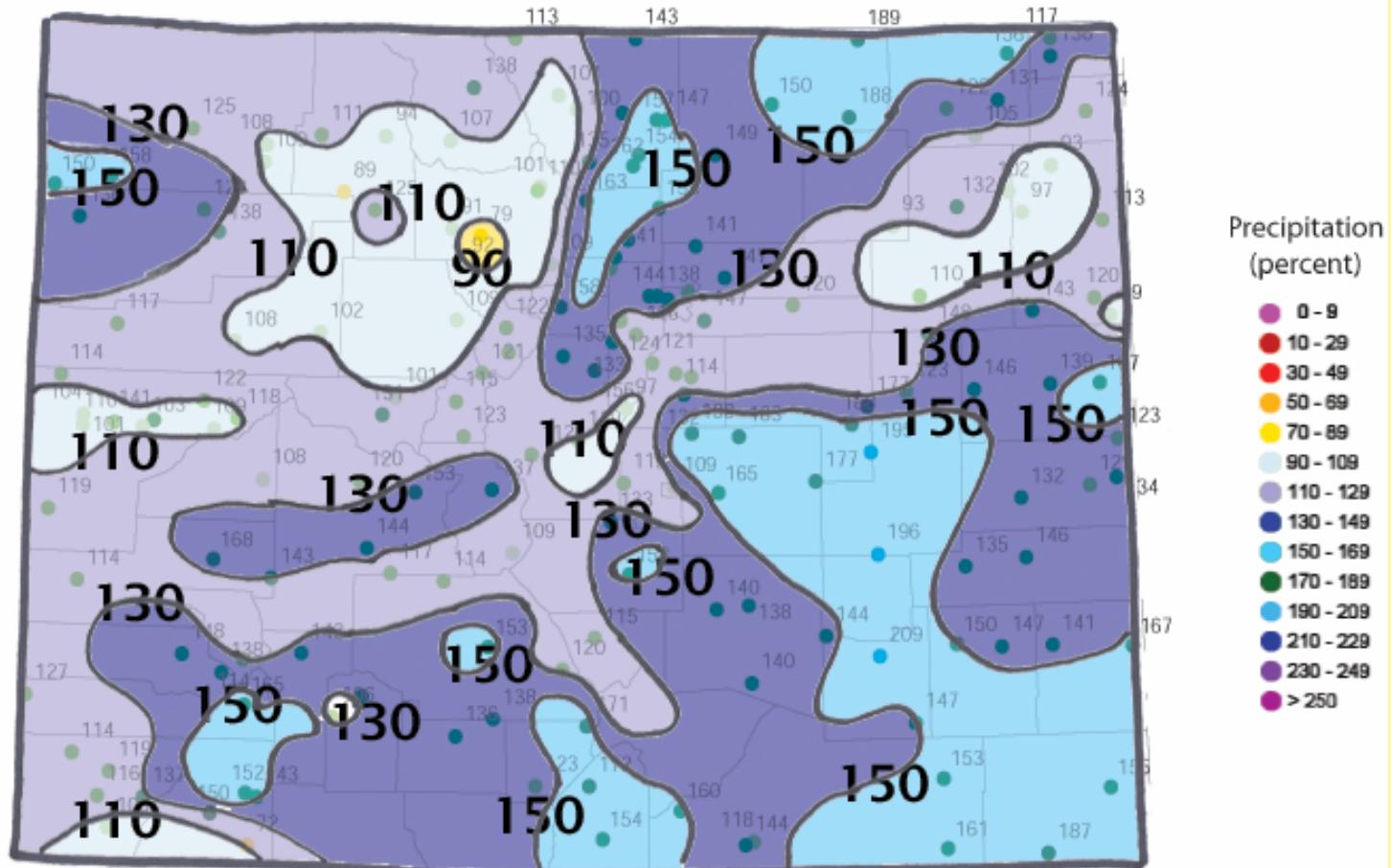
(1890 - 2005)





1999 Water Year Precipitation

Water Year 1999
(Oct. 1998-Sept. 1999)
Precipitation Percent of Average for 1961-1990 Averages

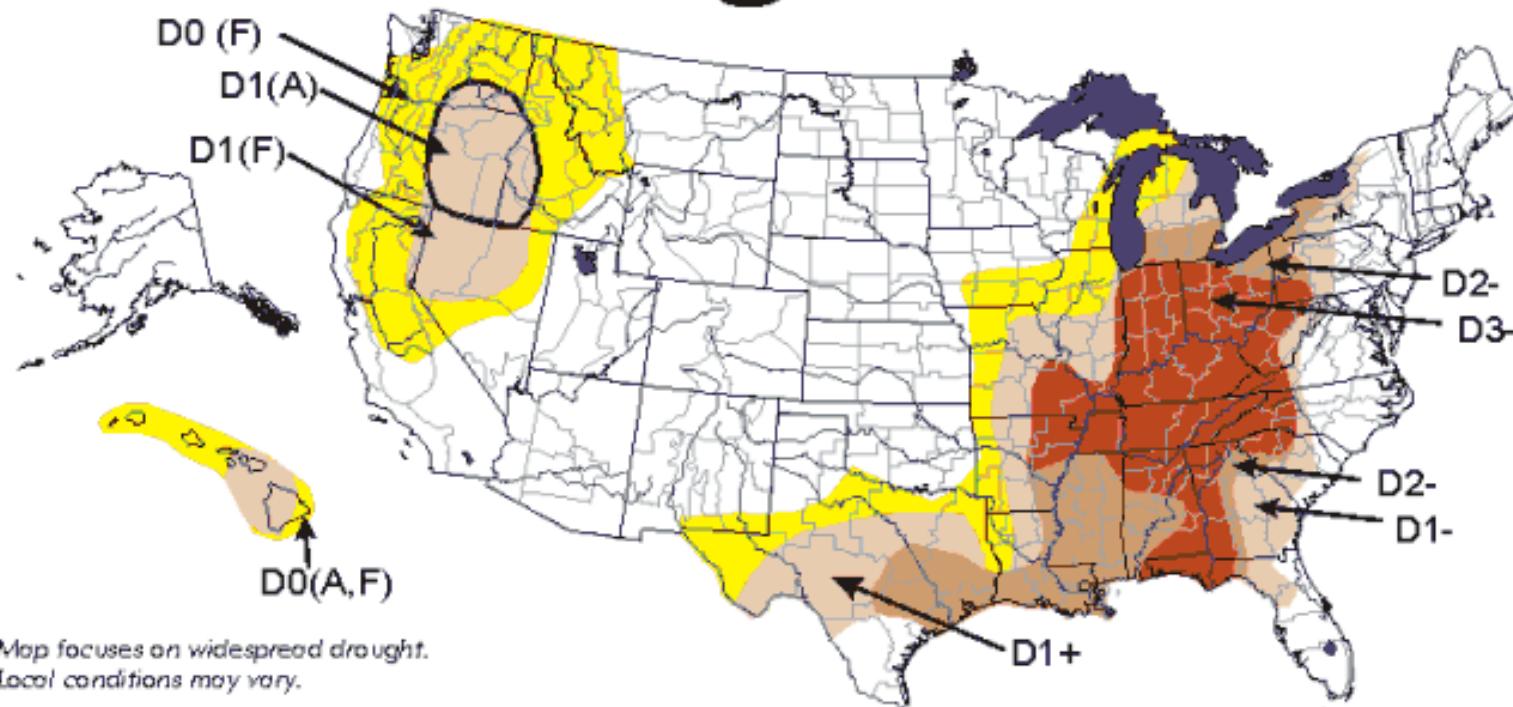




Sept 1999 Drought Monitor Map

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



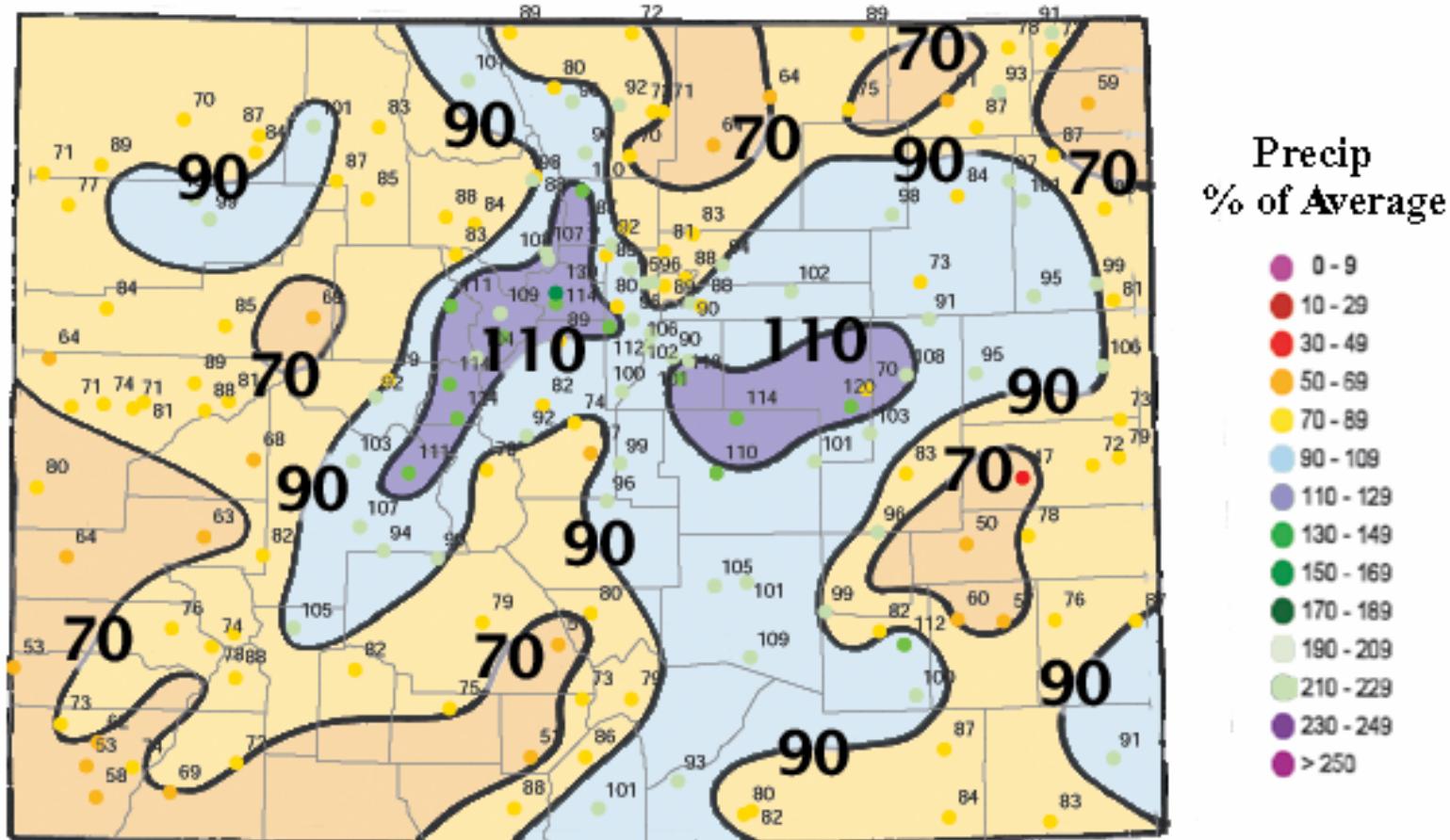
Plus (+) = Forecast to intensify next two weeks
Minus (-) = Forecast to diminish next two weeks
No sign = No change in drought classification forecast

• Released Thursday, Sep 30, 1999 •



2000 Water Year Precipitation

Water Year 2000
(Oct. 1999 - Sept. 2000)
Precipitation Percent of Average for 1961-1990 Averages

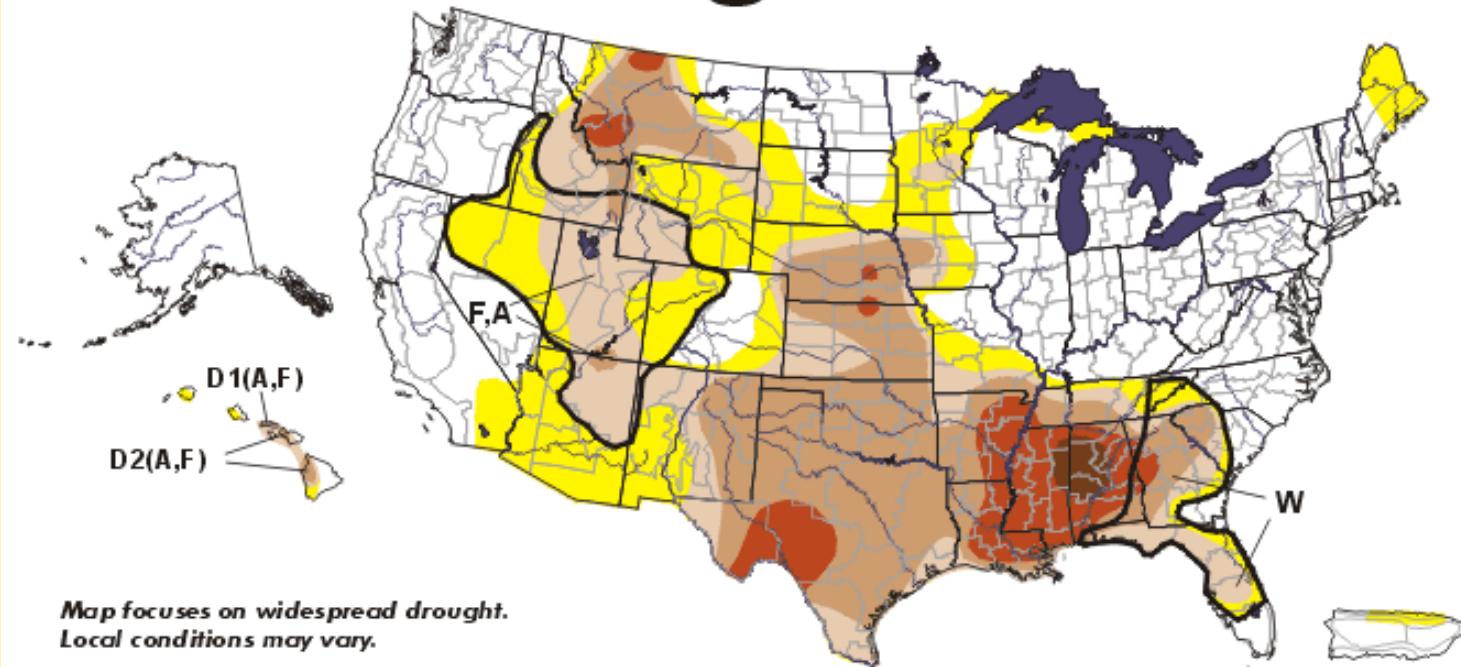




October 2000 Drought Monitor Map

October 3, 2000 Valid 8 a.m. EDT

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

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

- Drought type: used only when impacts differ
- A = Agriculture
- W = Water
- F = Wildfire danger

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

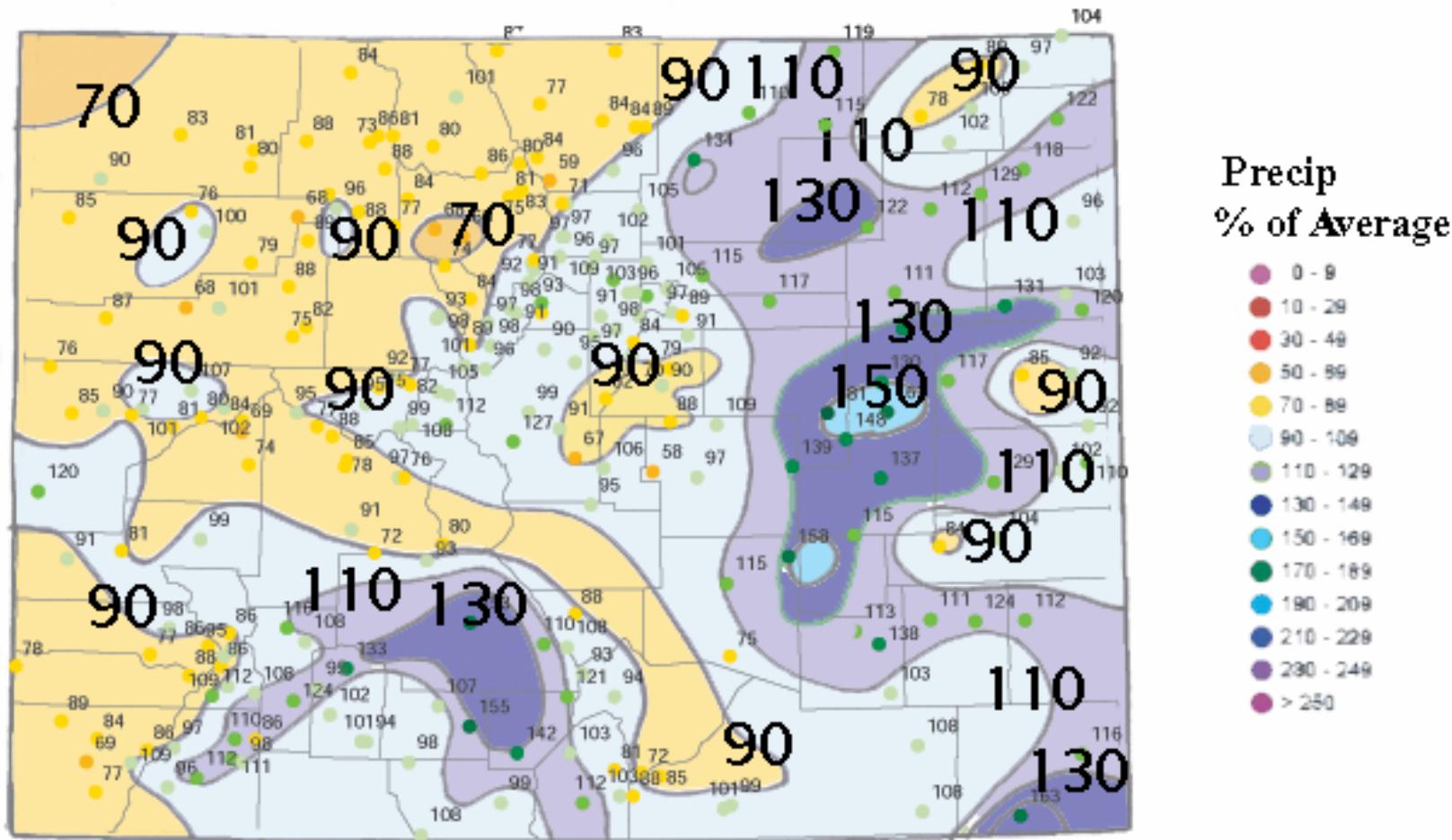


• Released Thursday, Oct. 5, 2000 •



2001 Water Year Precipitation

Water Year 2001
(Oct. 2000 - Sept. 2001)
Precipitation Percent of Average for 1961-1990 Averages

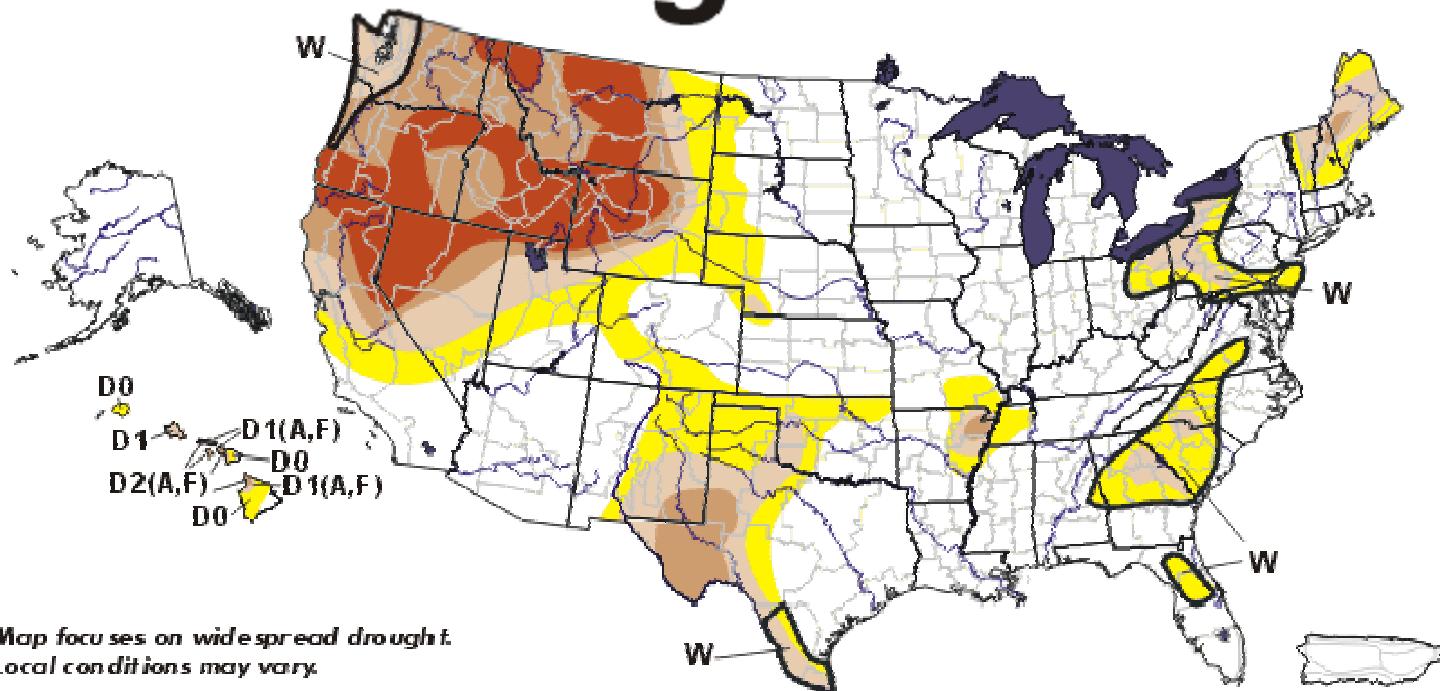




October 2001 Drought Monitor Map

October 2, 2001 Valid 8 a.m. EDT

U.S. Drought Monitor



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

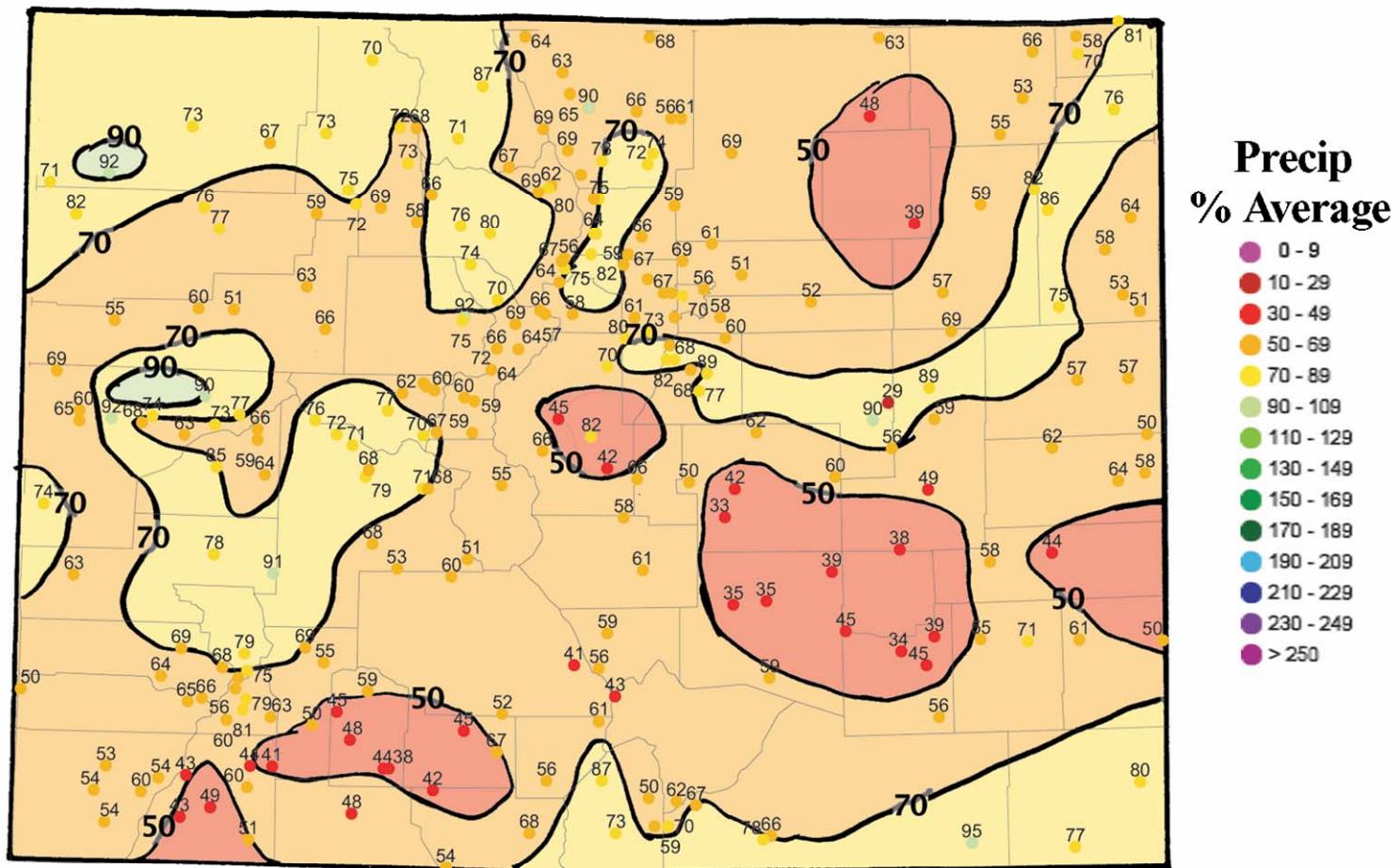
• Released Thursday, October 4, 2001 •
Author: Douglas Le Comte, NOAA/CPC



2002 Water Year Precipitation

Water Year 2002 (Oct. 2001 - Sept. 2002)

Precipitation Percent of Average for 1961-1990 Averages

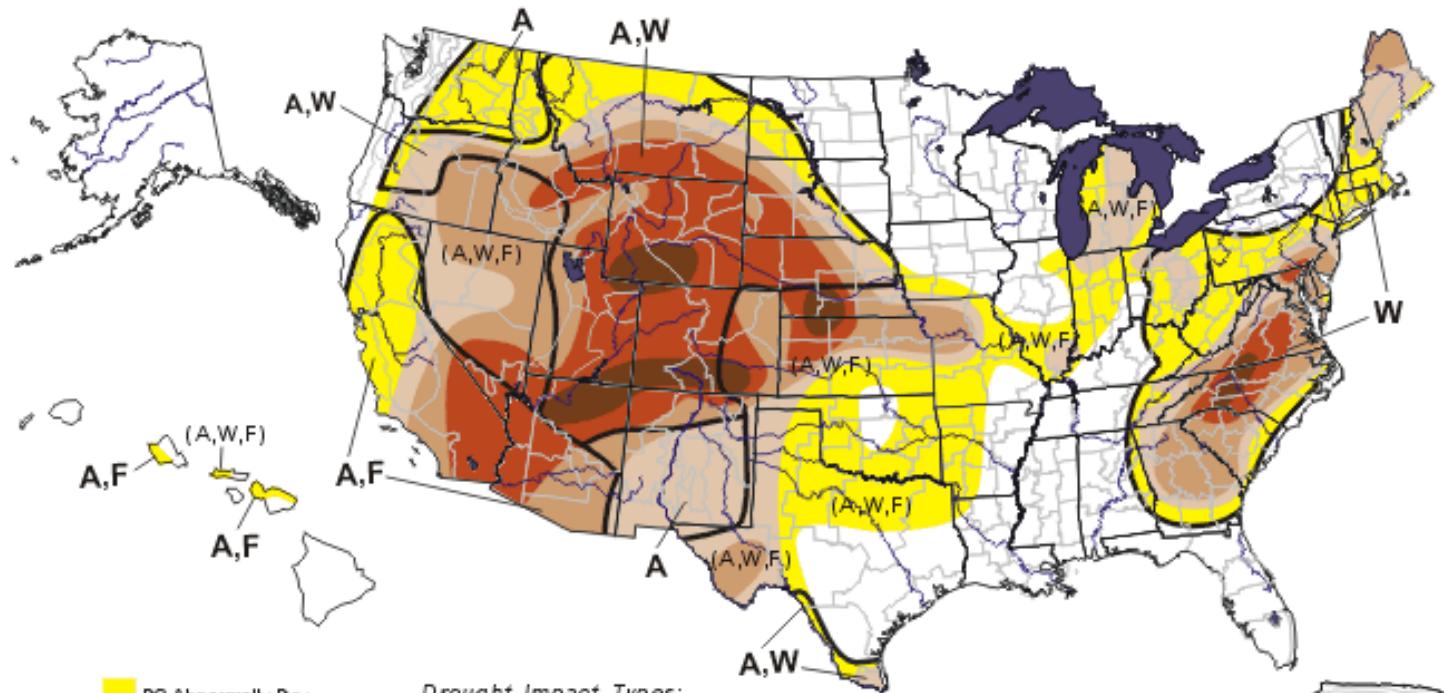




October 2002 Drought Monitor Map

U.S. Drought Monitor

October 1, 2002
Valid 8 a.m. EDT



- Yellow: D0 Abnormally Dry
- Brown shades: 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>



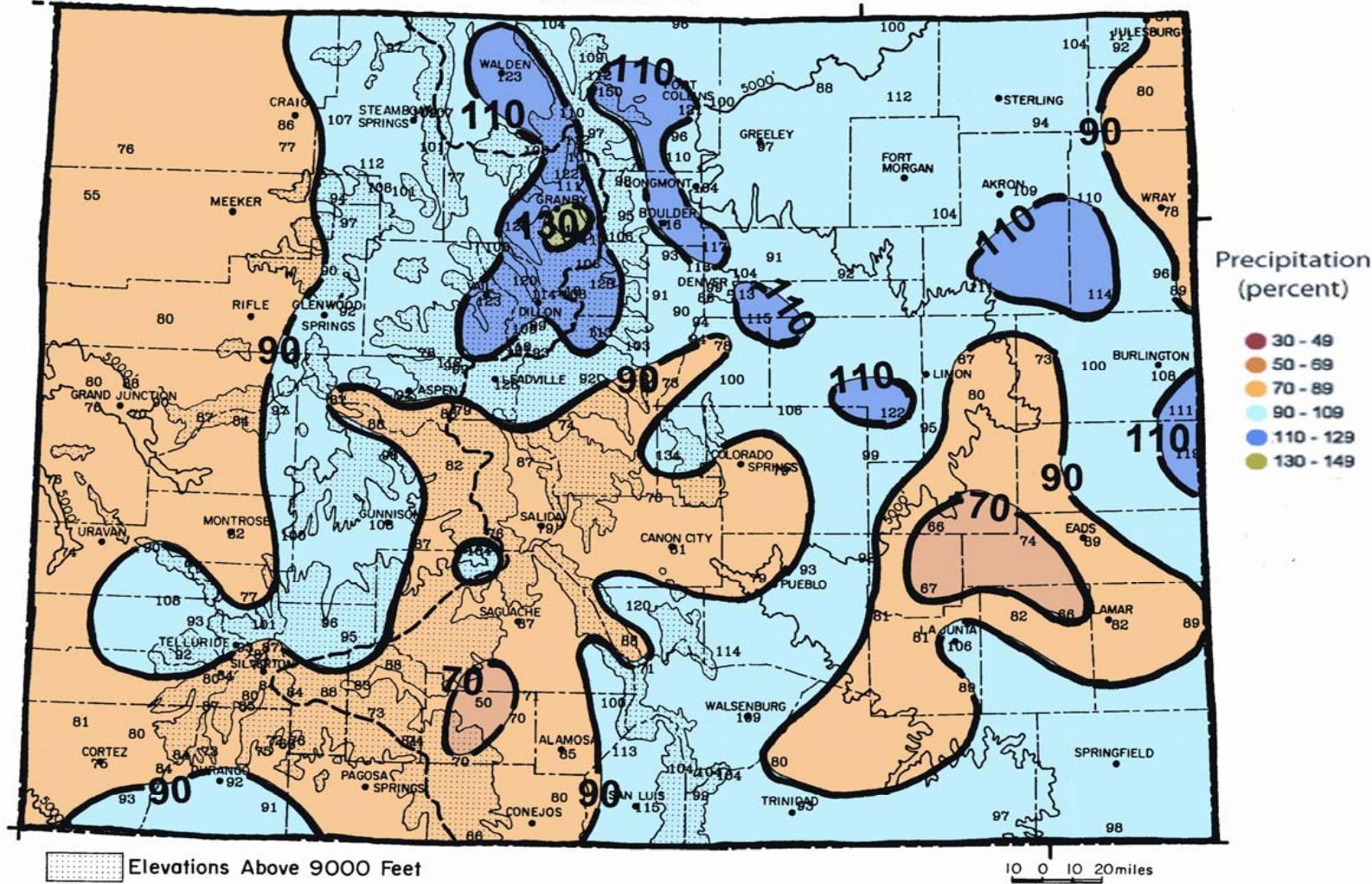
Released Thursday, October 3, 2002
Author: Rich Tinker, CPC/NCEP/NWS/NOAA

2003 Water Year Precipitation

Water Year 2003

October 2002 - September 2003 precipitation
as a percent of the 1971-2000 average.

COLORADO

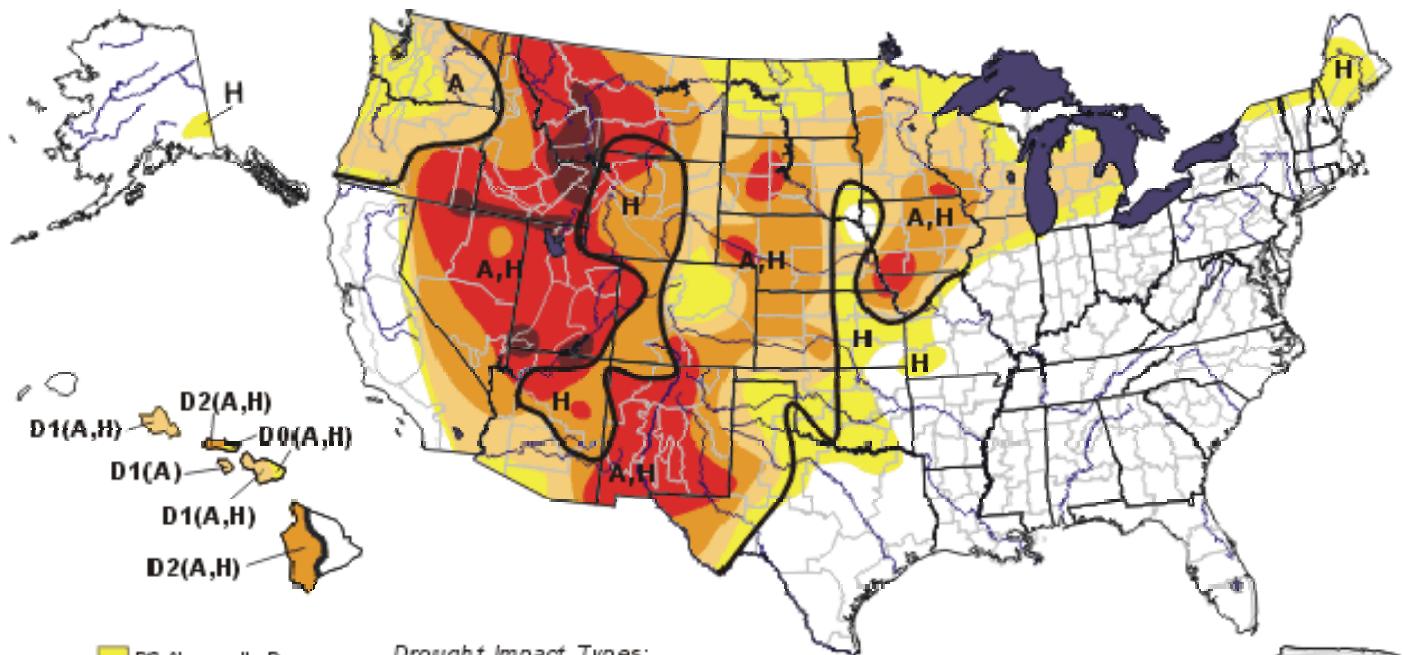




September 2003 Drought Monitor Map

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

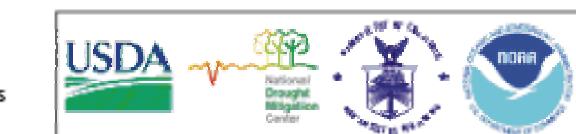
Drought Impact Types:

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

✓ Delineates dominant impacts

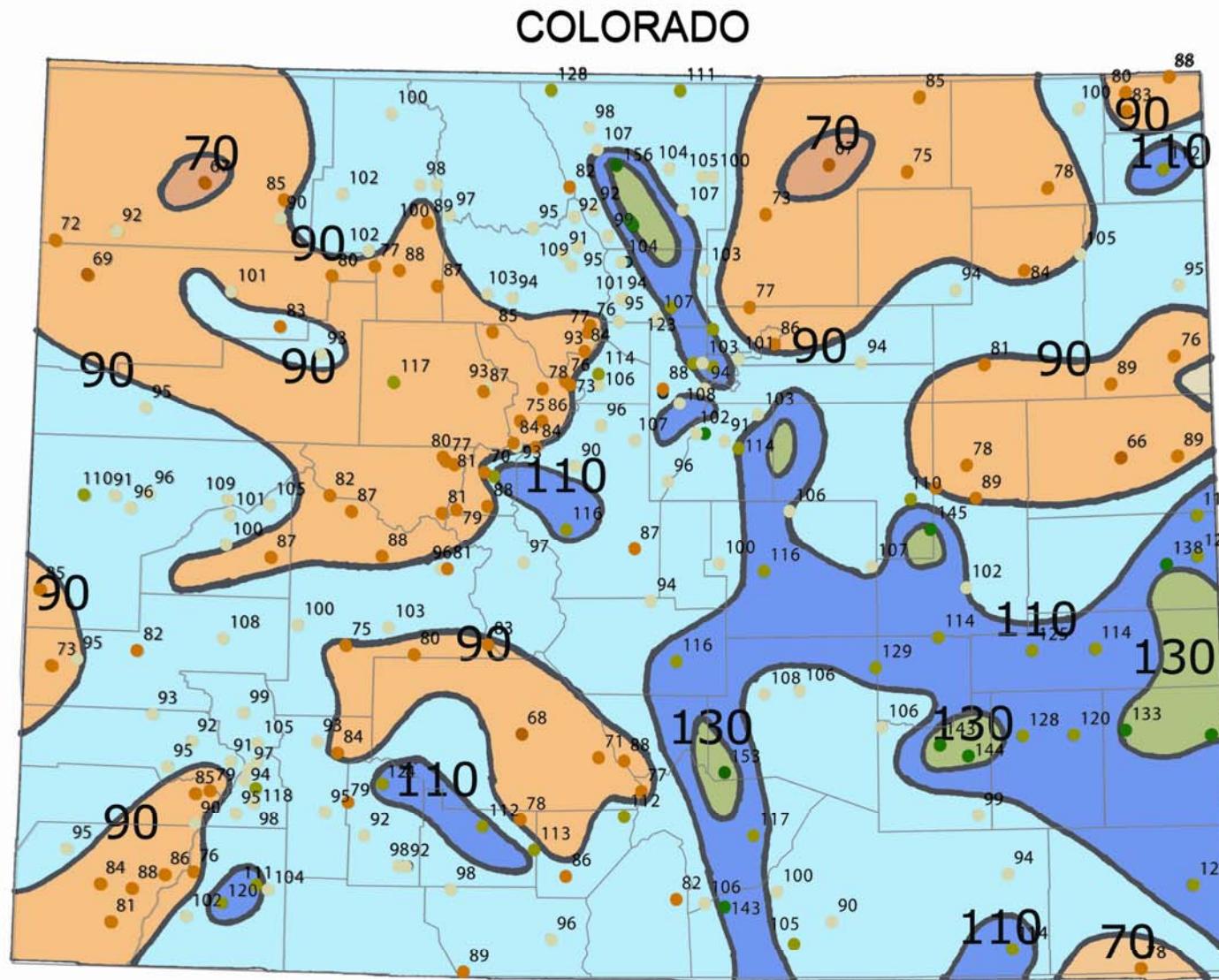
The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.

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



Released Thursday, October 2, 2003
Author: Candace Tankersley/Scott Stephens, NOAA/NCDC

2004 Water Year Precipitation

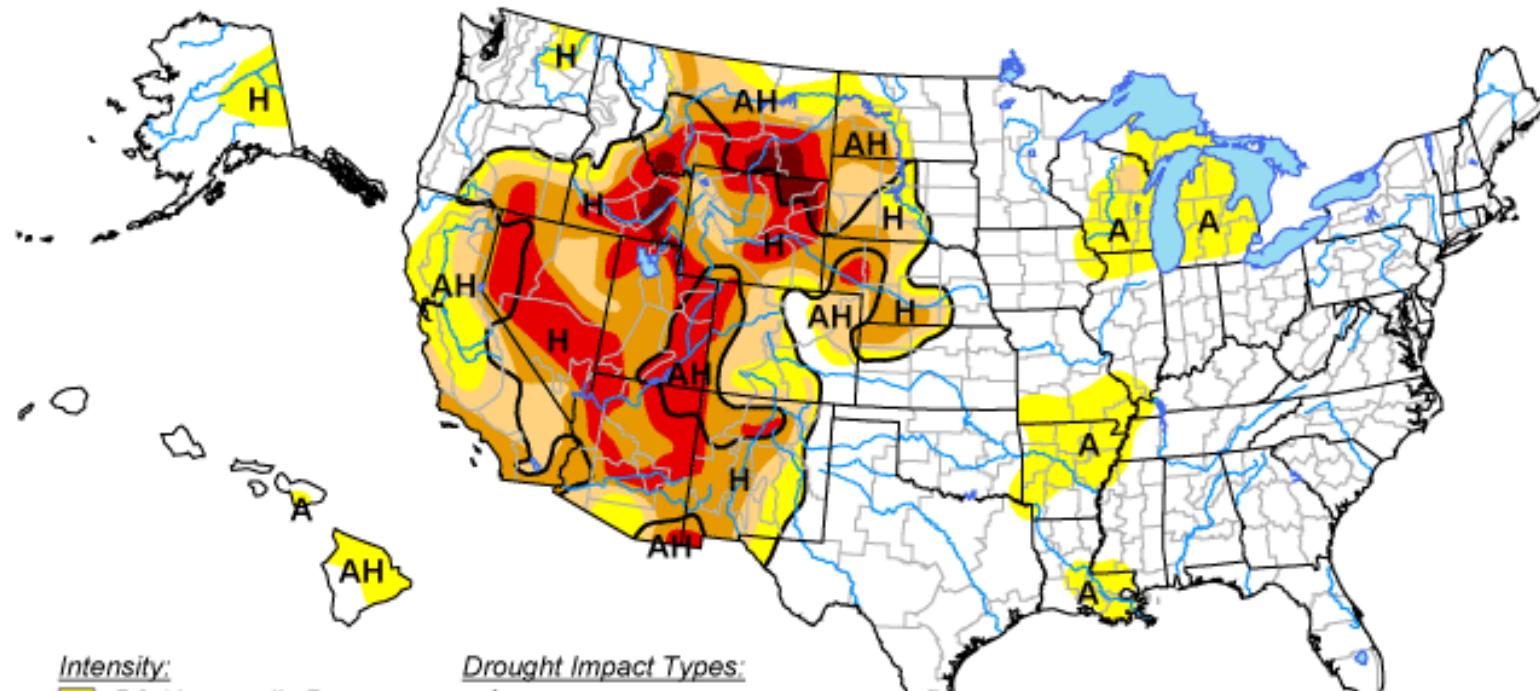




September 2004 Drought Monitor Map

U.S. Drought Monitor

September 28, 2004
Valid 8 a.m. EDT



Intensity:

- [Yellow square] D0 Abnormally Dry
- [Light orange square] D1 Drought - Moderate
- [Orange square] D2 Drought - Severe
- [Red square] D3 Drought - Extreme
- [Dark red square] D4 Drought - Exceptional

Drought Impact Types:

- [Blue wavy line symbol] Delineates dominant impacts
- [Yellow A symbol] Agricultural (crops, pastures, grasslands)
- [Yellow H symbol] 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.

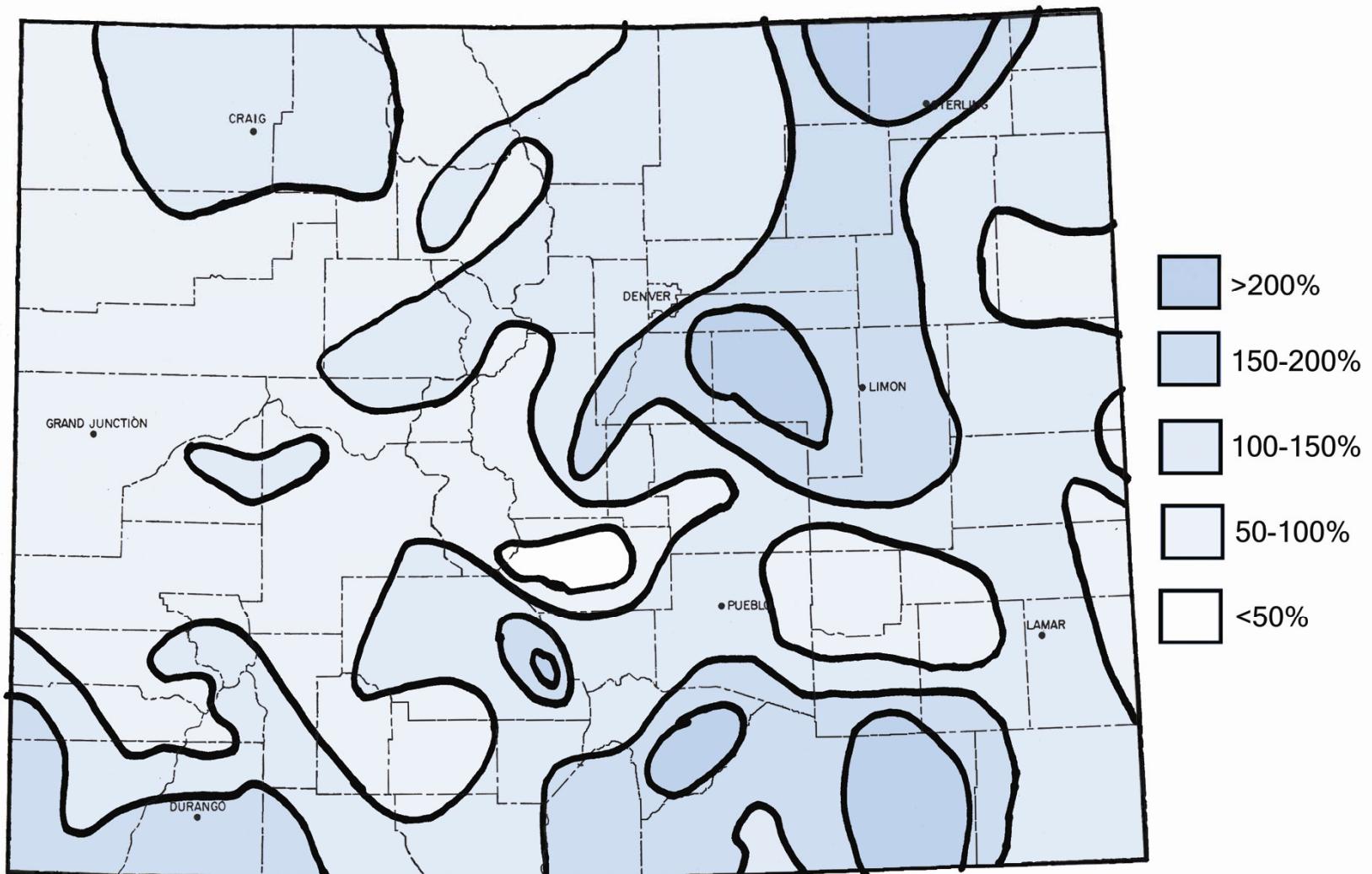
<http://drought.unl.edu/dm>



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



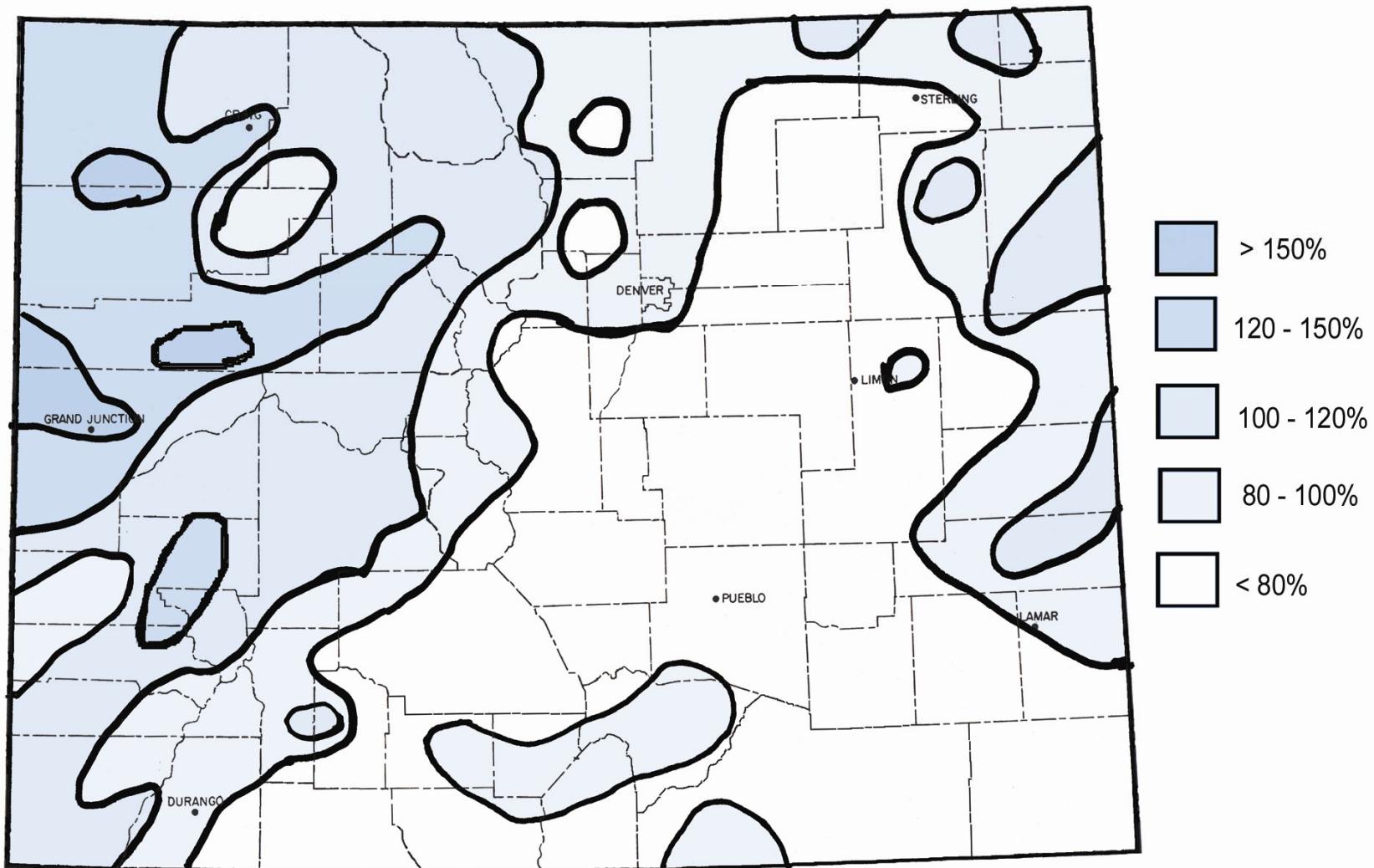
Winter (Oct 2004 – April 2005) 2005 Precipitation Percent of Average



Winter 2005 (Oct 04 - April 05) precipitation as a percent of the 1971-2000 average.



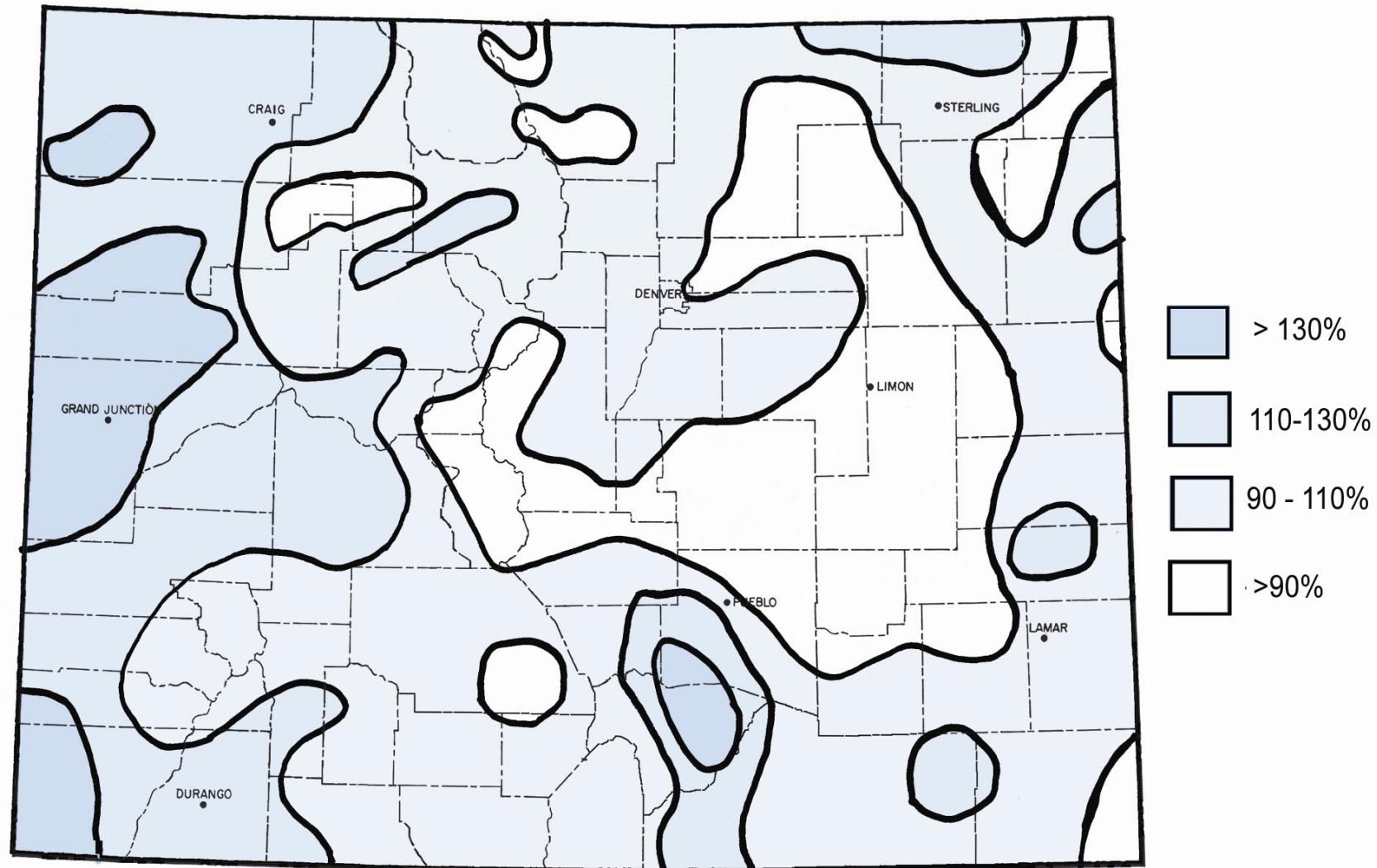
Summer (May – Sep) 2005 precipitation as percent of average



Summer (May - September) 2005 precipitation as a percent of the 1971-2000 average.



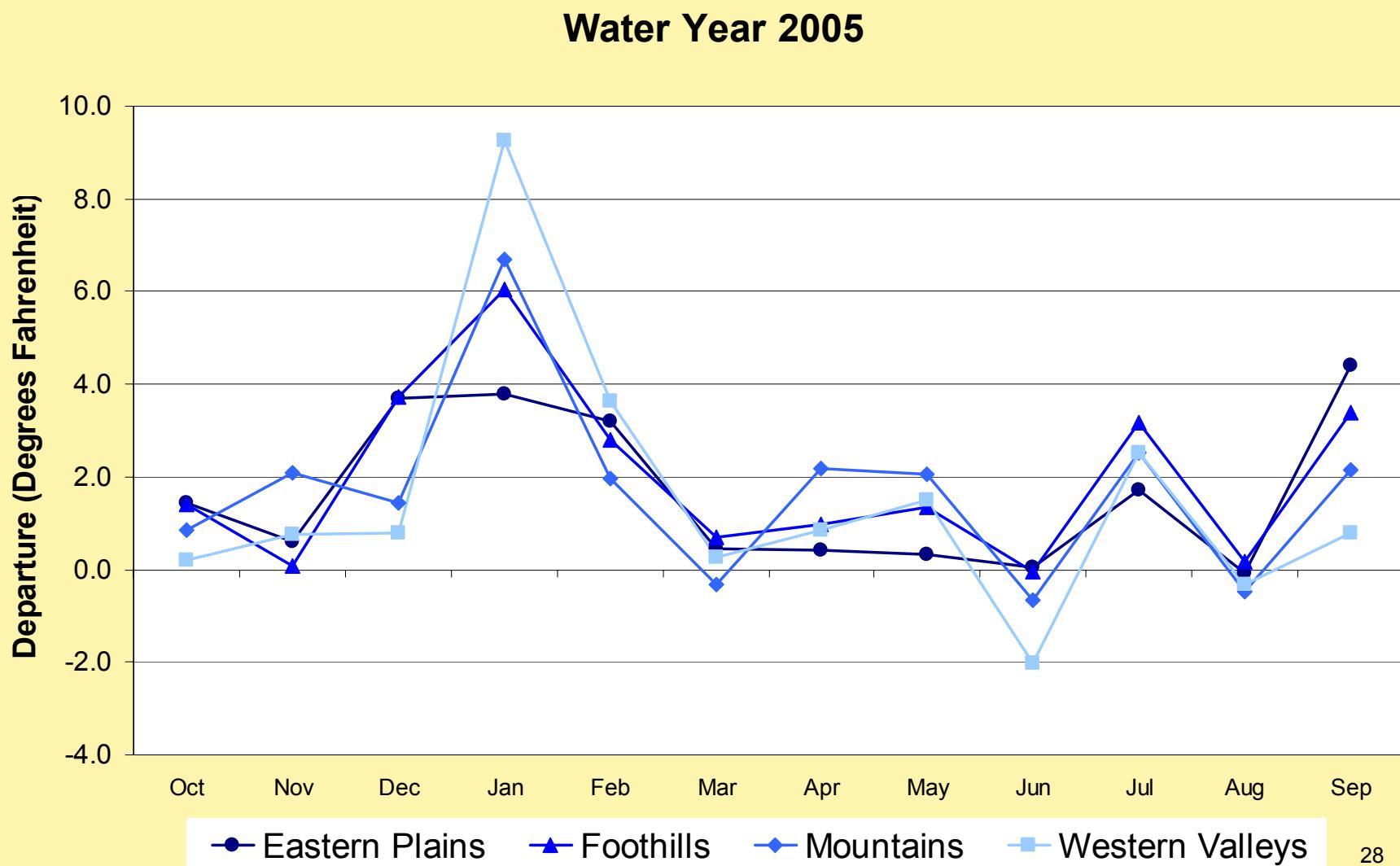
2005 Water Year Precipitation as Percent of Average



Water Year 2005 (Oct 04 - Sept. 05) precipitation as a percent of the 1971-2000 average.



Water Year 2005 temperature departures from 1971-2000 average





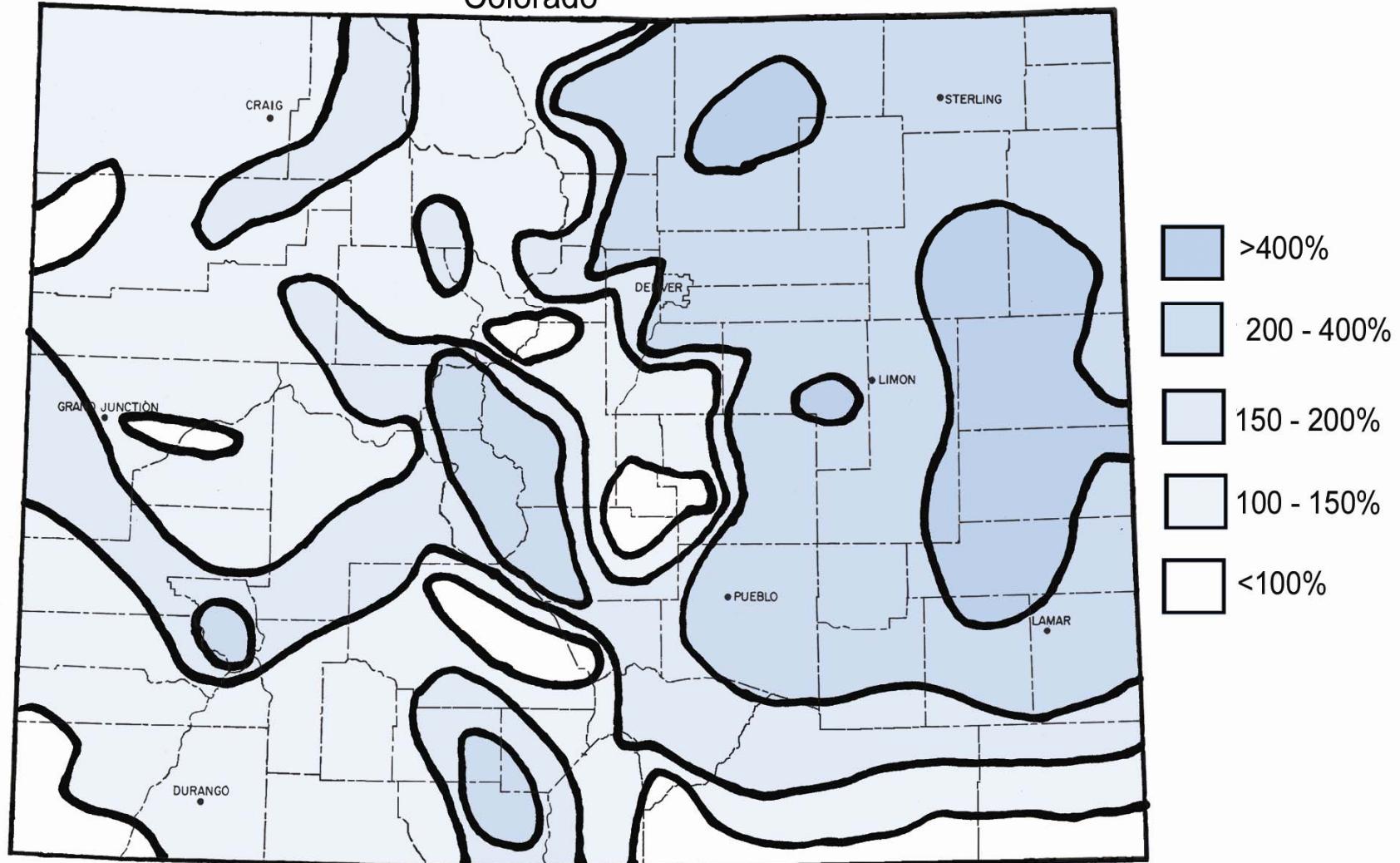
WY2005 Highlights

- **Snow blitz across southern Rockies.**
- **Near-average snowpack in the South Platte basin.**
- **Mild winter (12th in a row).**
- **Beneficial April and early June precipitation.**
- **A hot and dry July.**
- **Below average growing season precipitation.**
- **A saving Denver-metro rain August 3-5th.**
- **Overall – Above average temperature, near to slightly below average precipitation.**
- **October 2005 – Great moisture on the Plains!**



Oct 2005 map of precipitation as percent of average

Colorado



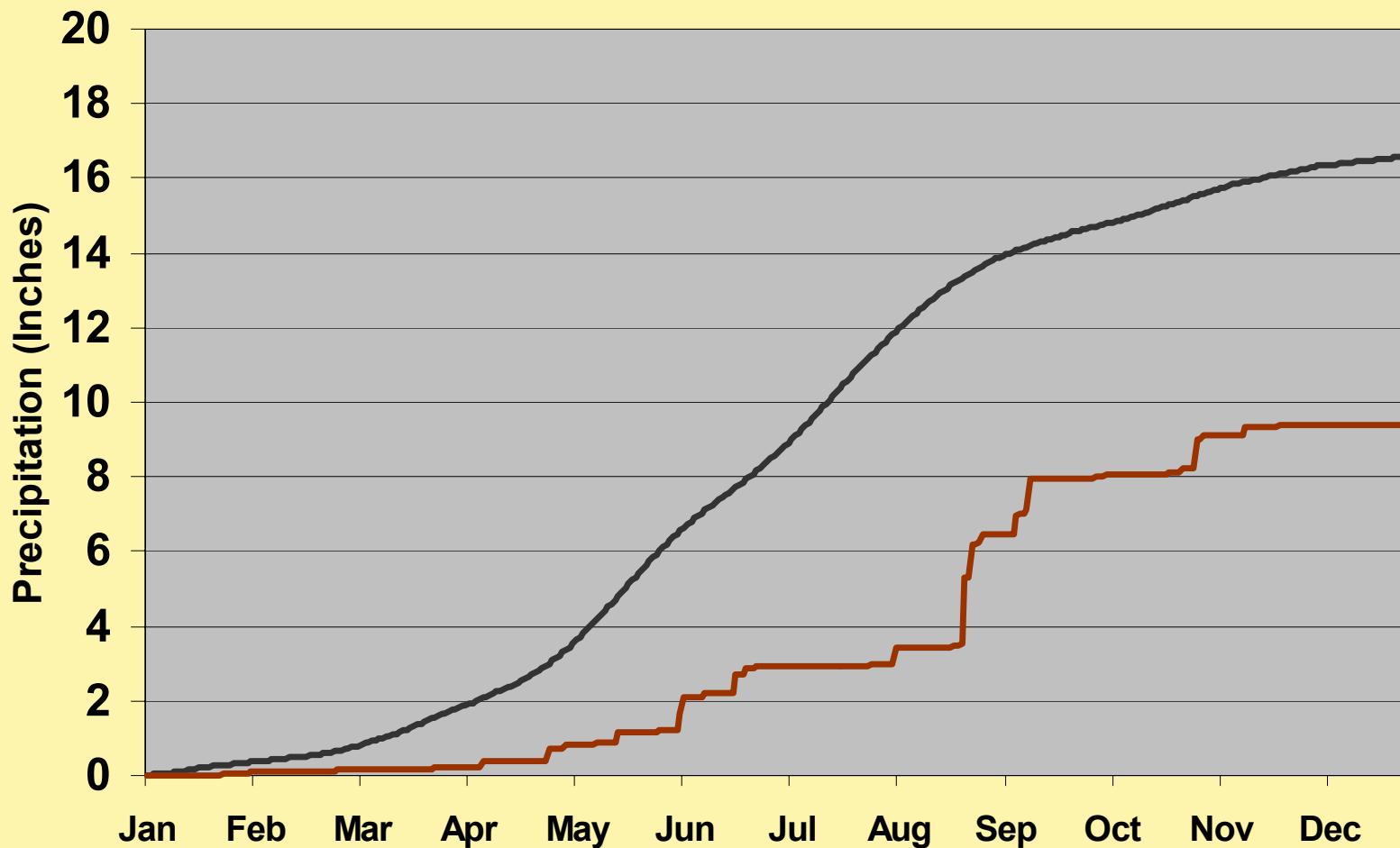
October 2005 precipitation as a percent of the 1971 - 2000 average.



2002 Akron Daily Accumulated Precipitation

Akron 4E

Daily Accumulated Precipitation for
Year 2002 and 30-Year Average

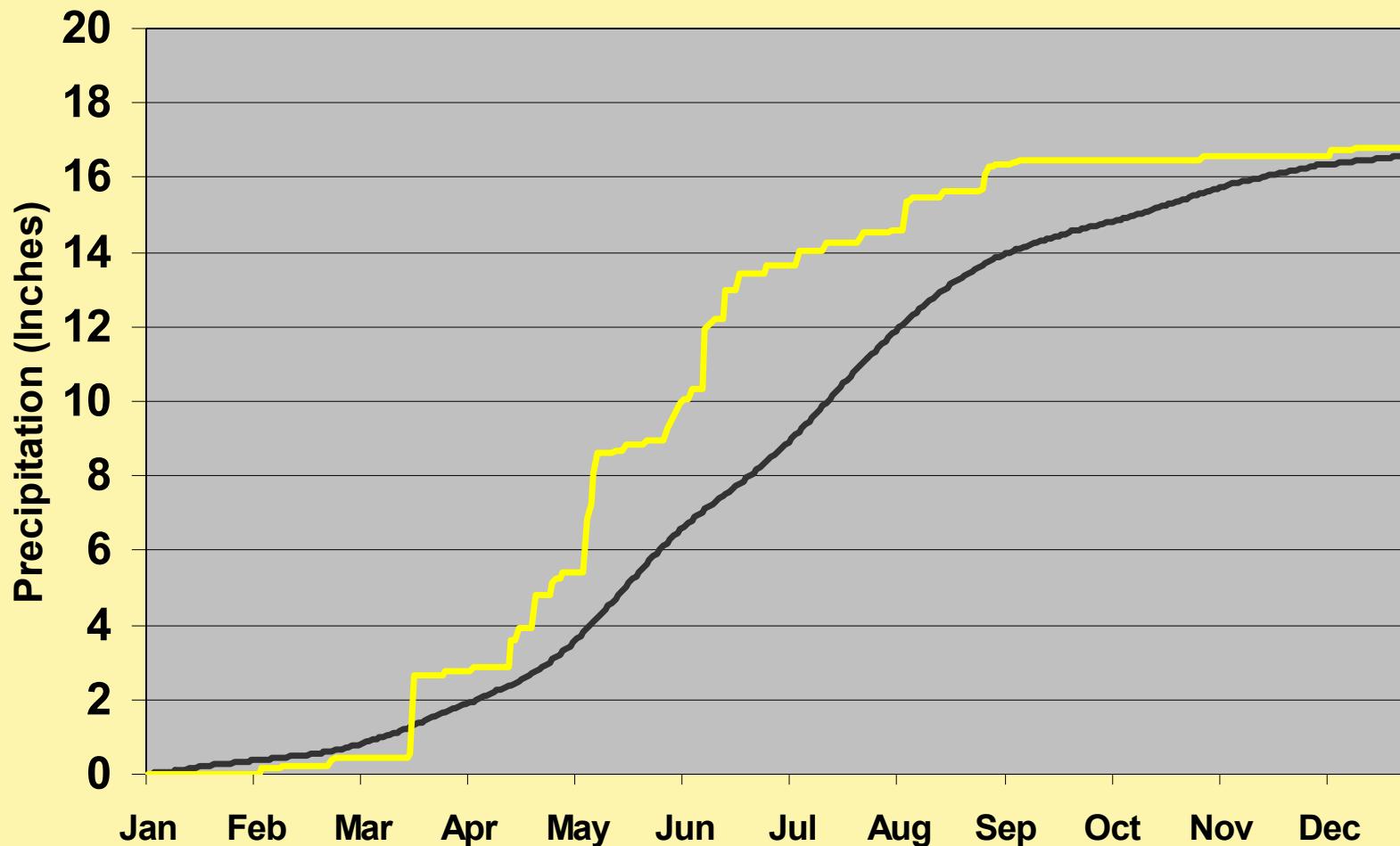




Akron 2003 daily precipitation compared to daily average

Akron 4E

Daily Accumulated Precipitation for
Year 2003 and 30-Year Average

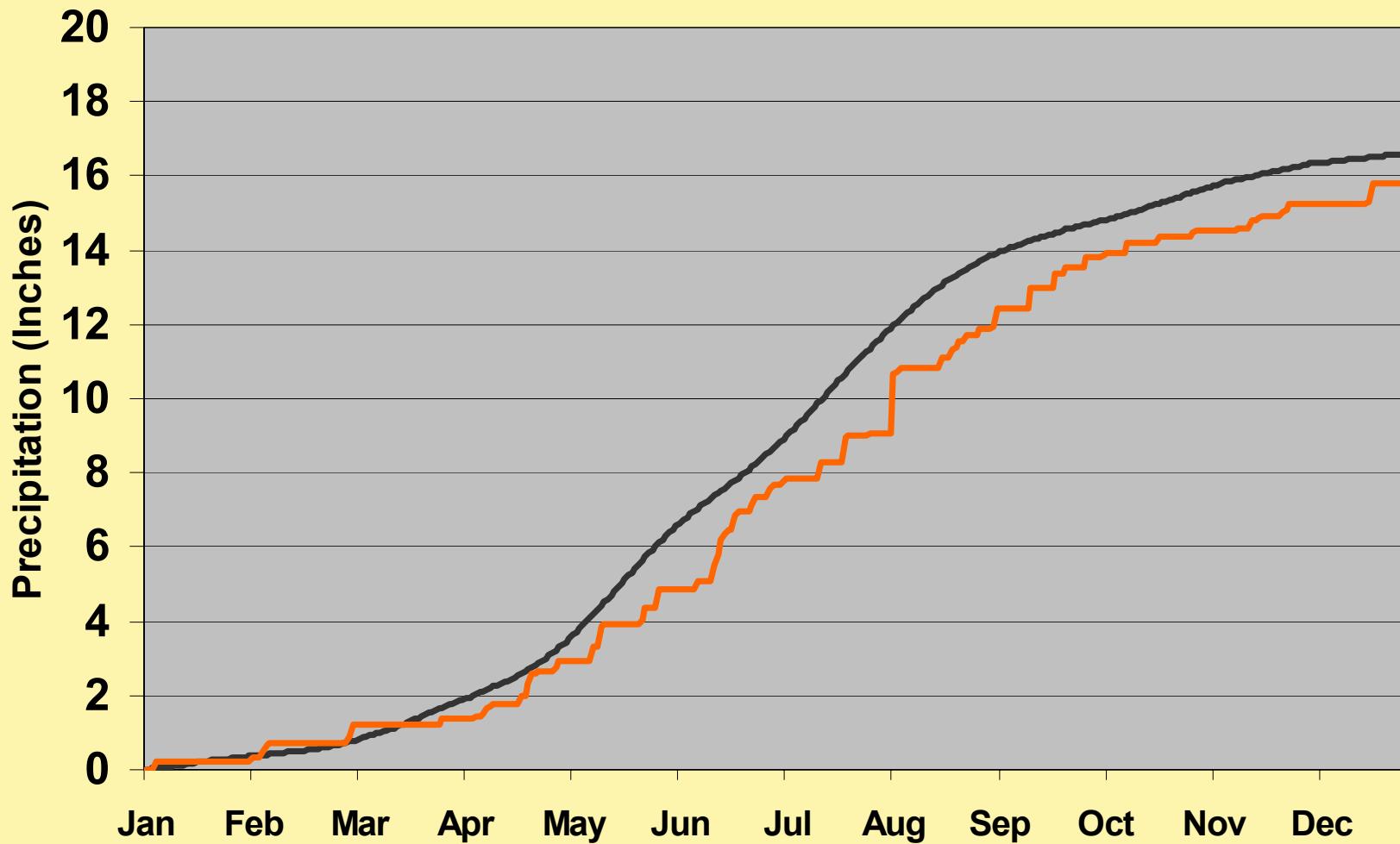




Akron 2004 daily precipitation compared to daily average

Akron 4E

Daily Accumulated Precipitation for
Year 2004 and 30-Year Average

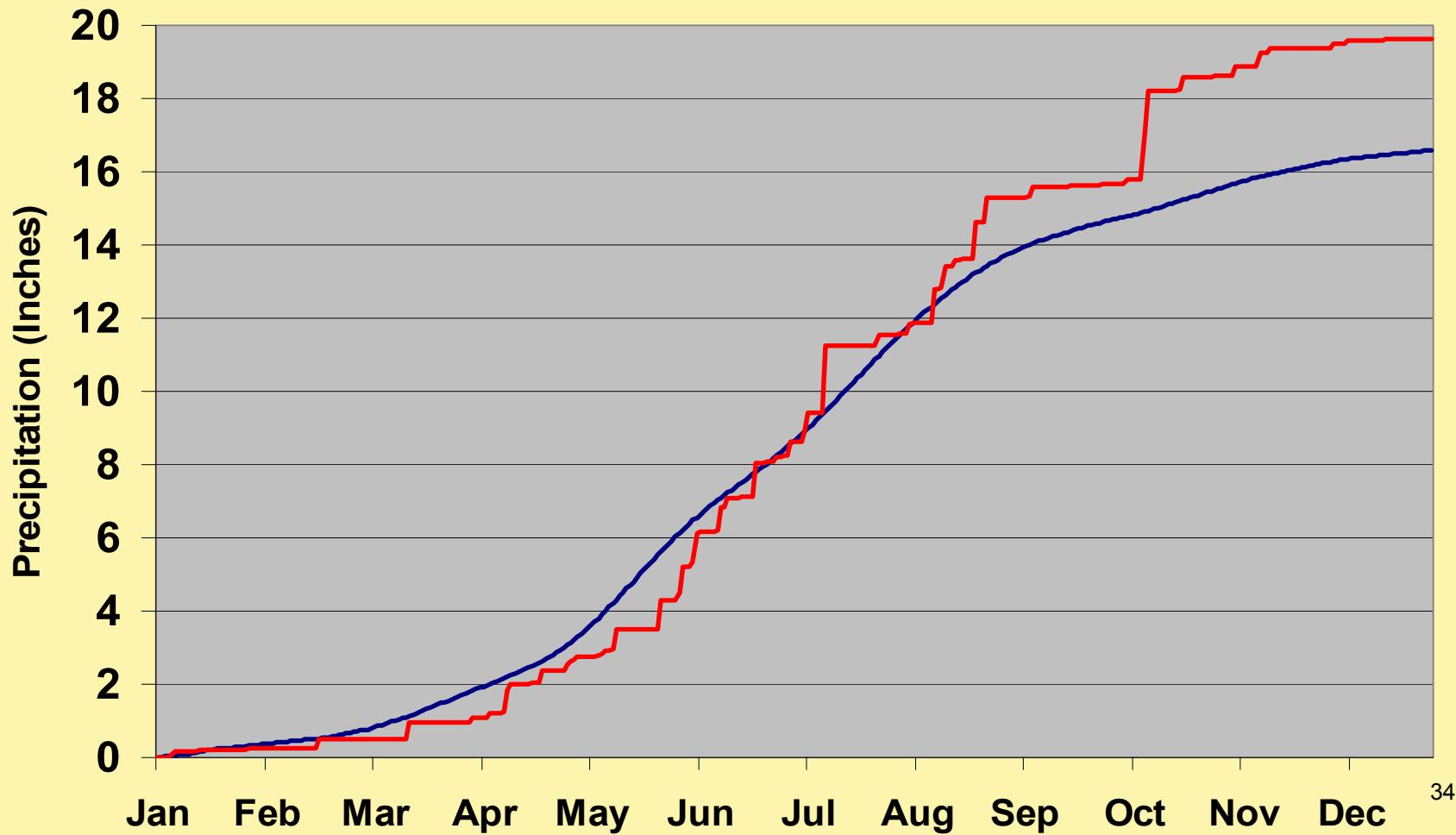




Akron 2005 daily precipitation compared to daily average

Akron 4E

Daily Accumulated Precipitation for
Year 2005 and 30-Year Average

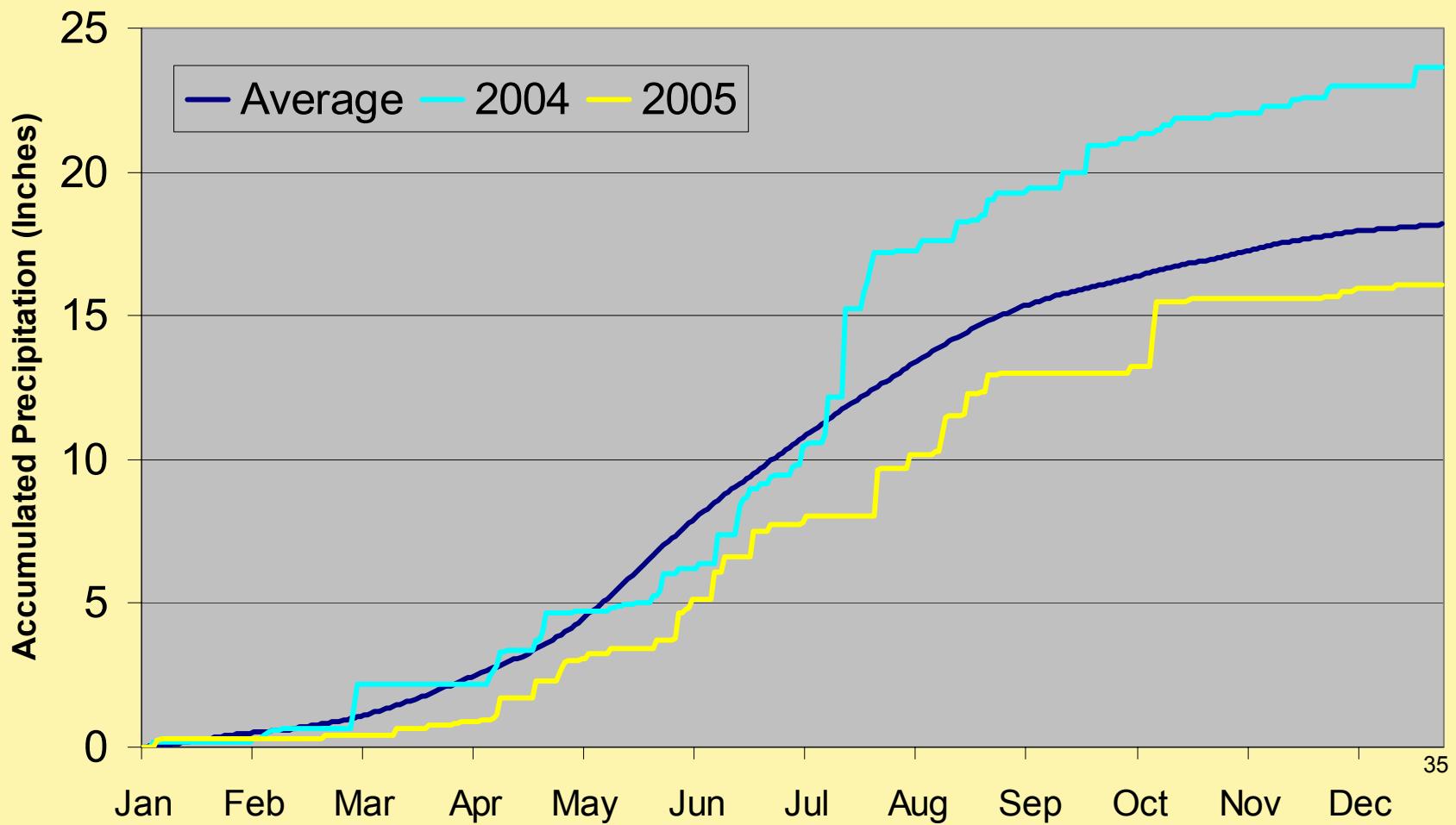




Holyoke, 2004 & 2005 daily accumulated precipitation compared to daily average

Holyoke

Daily Accumulated Precipitation
for 2004, 2005 and 30-year average



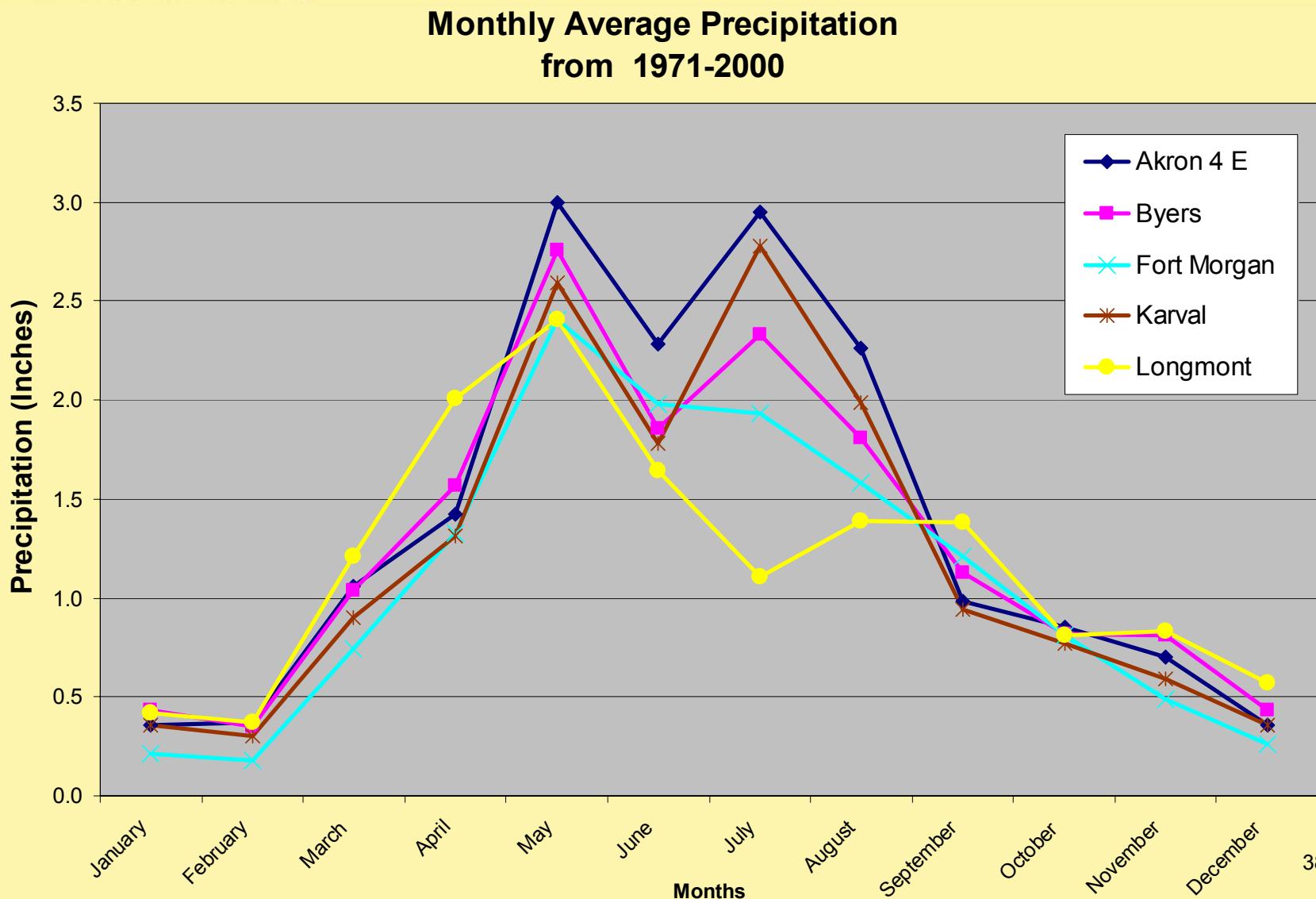
What Comes Next?





**To predict the future,
take another look at
the past.**

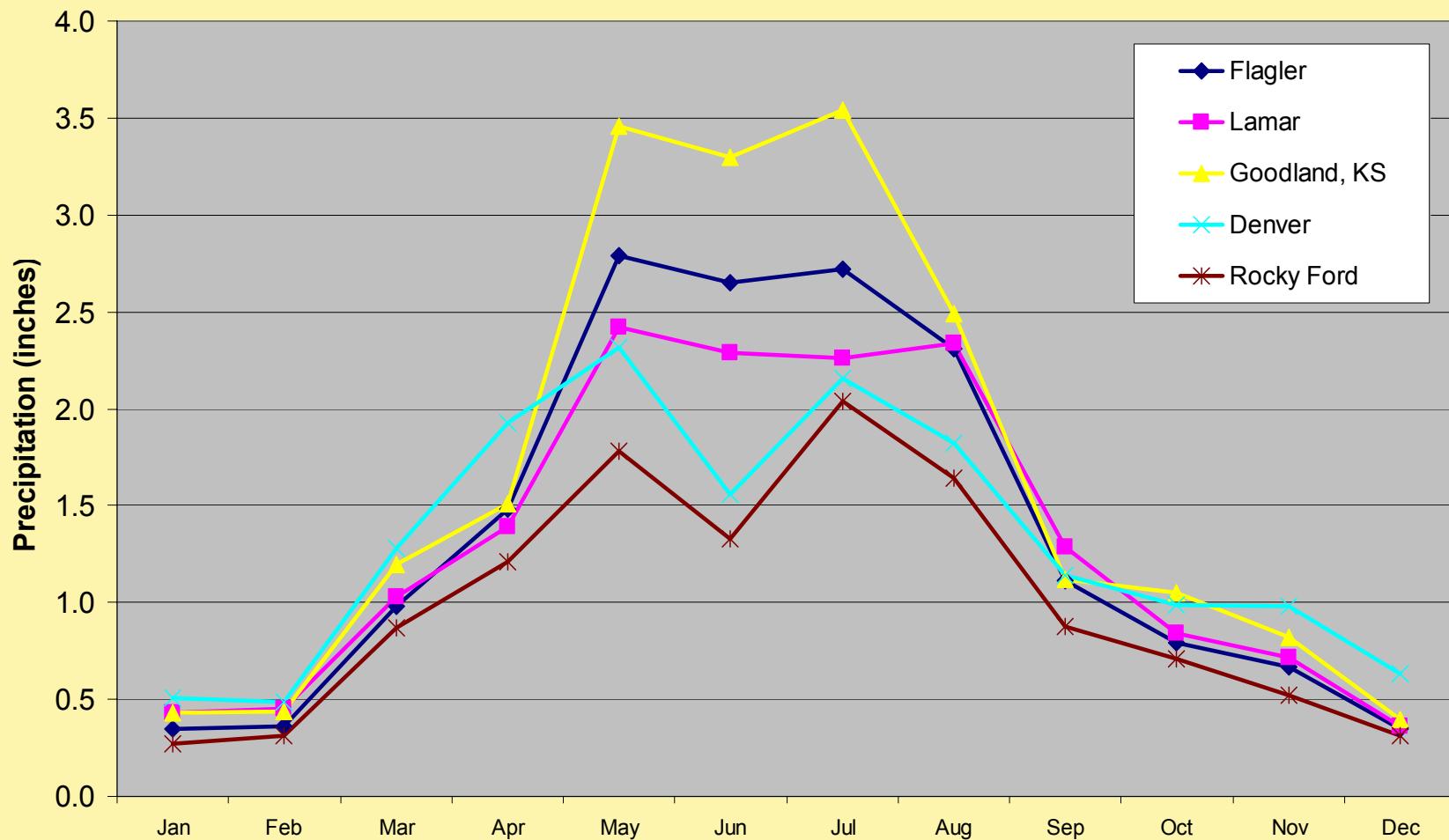
Precipitation Averages for Selected Sites





Precipitation Averages for Selected Sites

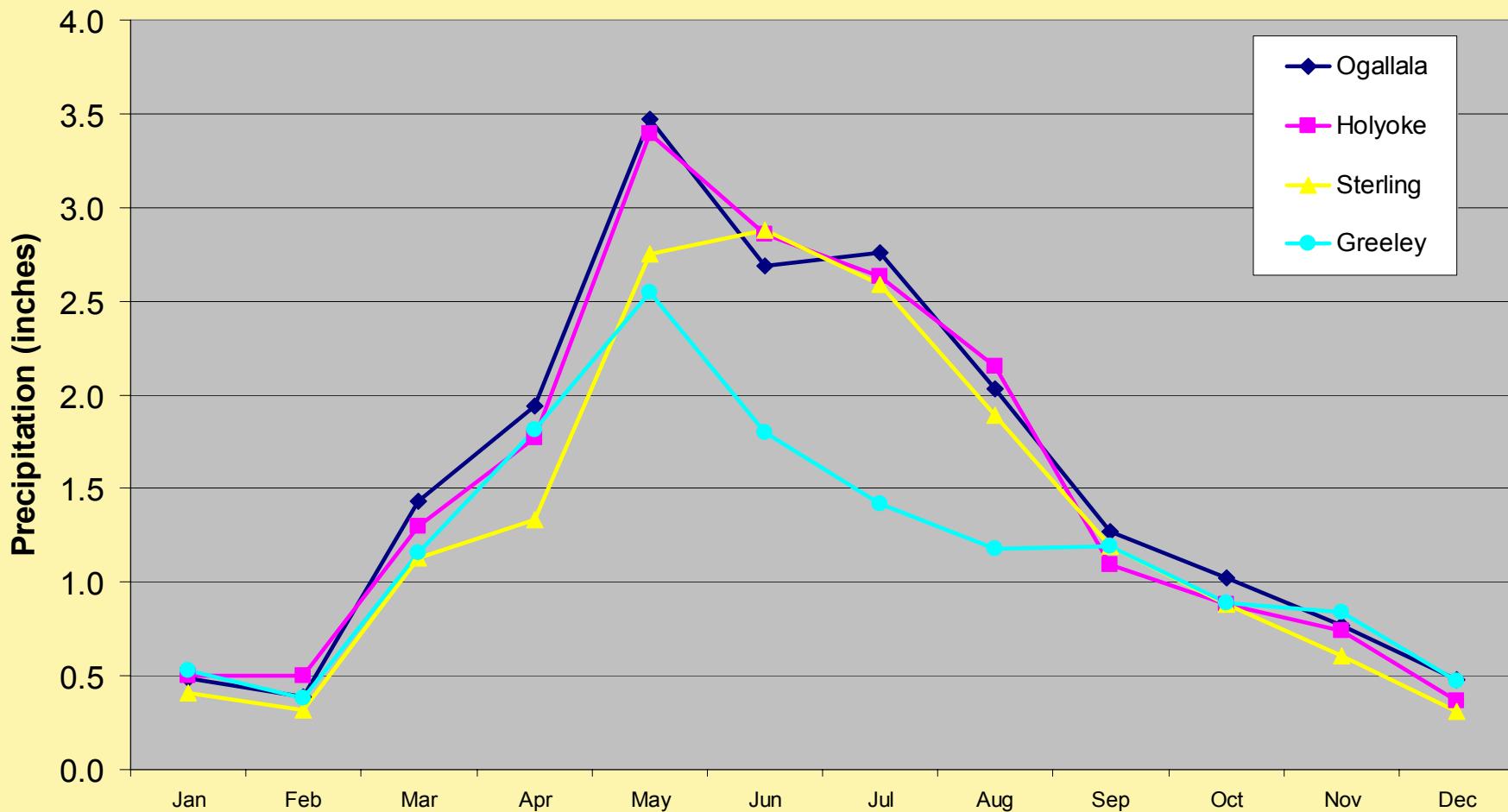
Comparison Monthly Precipitation for Selected Sites
(1971-2000 averages)





Precipitation Averages for Selected Sites

Monthly Precipitation Averages for Selected Sites (1971-2000 averages)



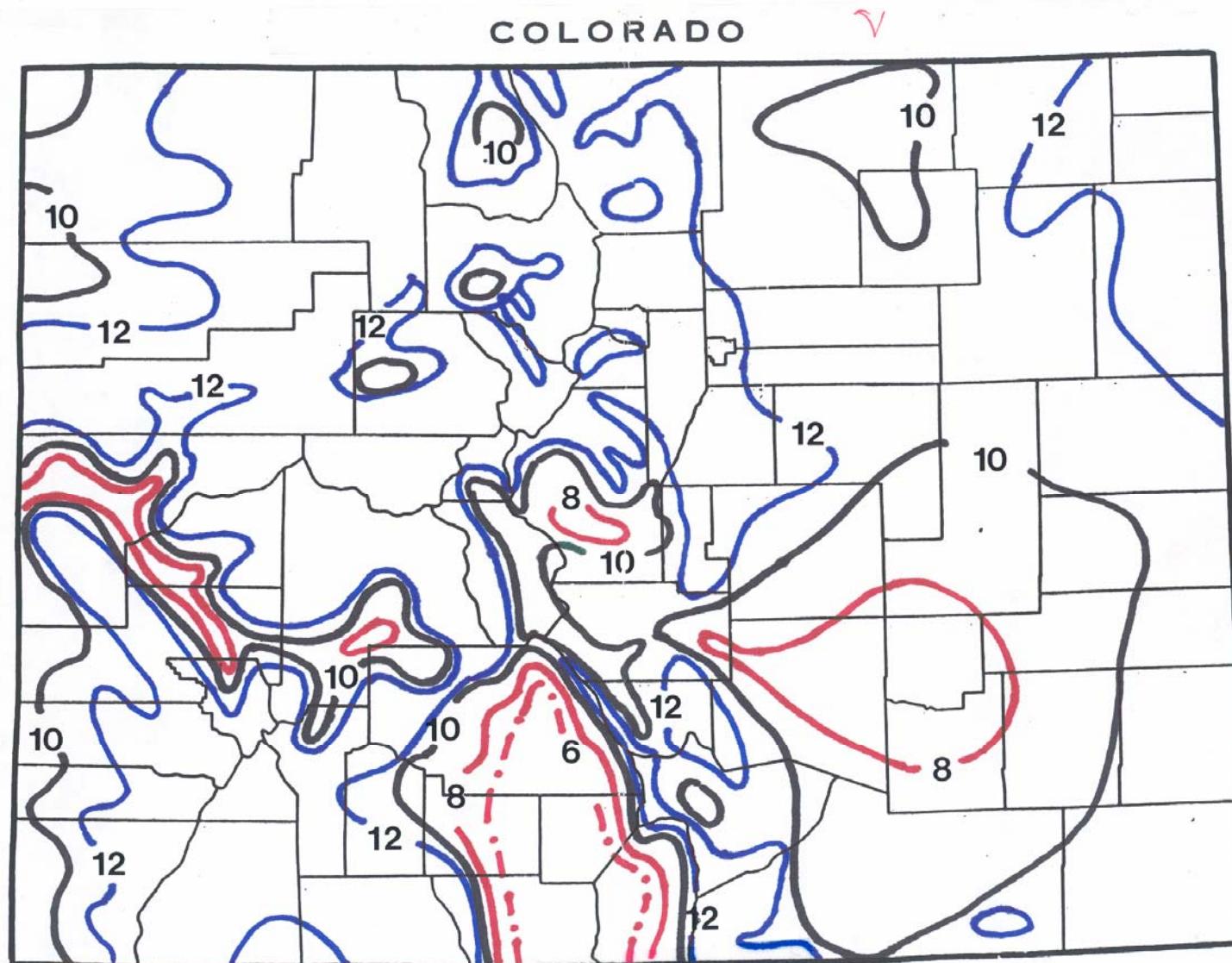
Precipitation

A photograph of a flooded road. The water covers the asphalt, and there are utility poles and power lines visible against a clear blue sky. The surrounding area appears to be a mix of green vegetation and flooded fields.

- A few storms contribute a large fraction of annual precipitation while many small events contribute a small fraction.

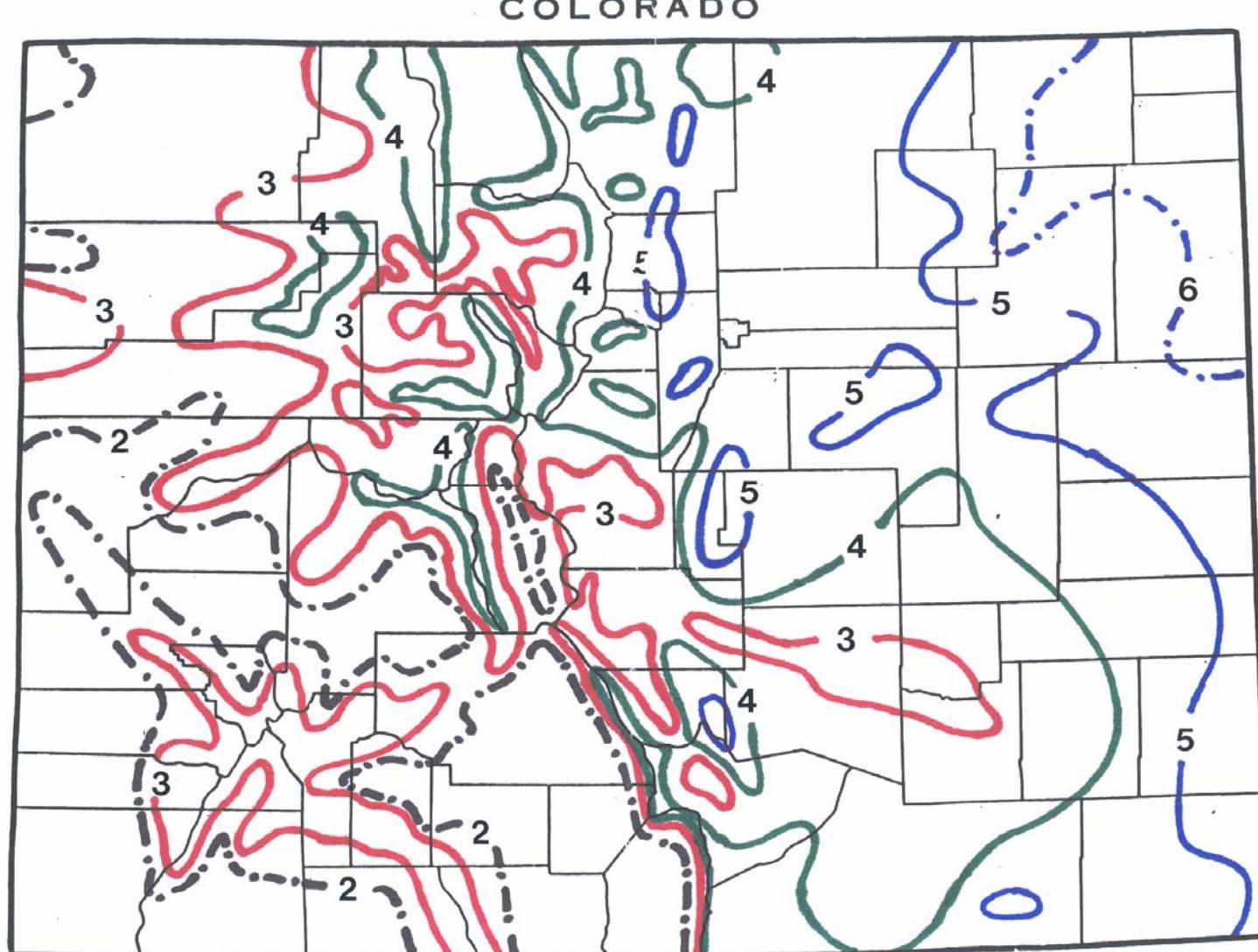


Average Wheat-Season Precipitation September – June (Inches) (Based on 1961-90 observed data)



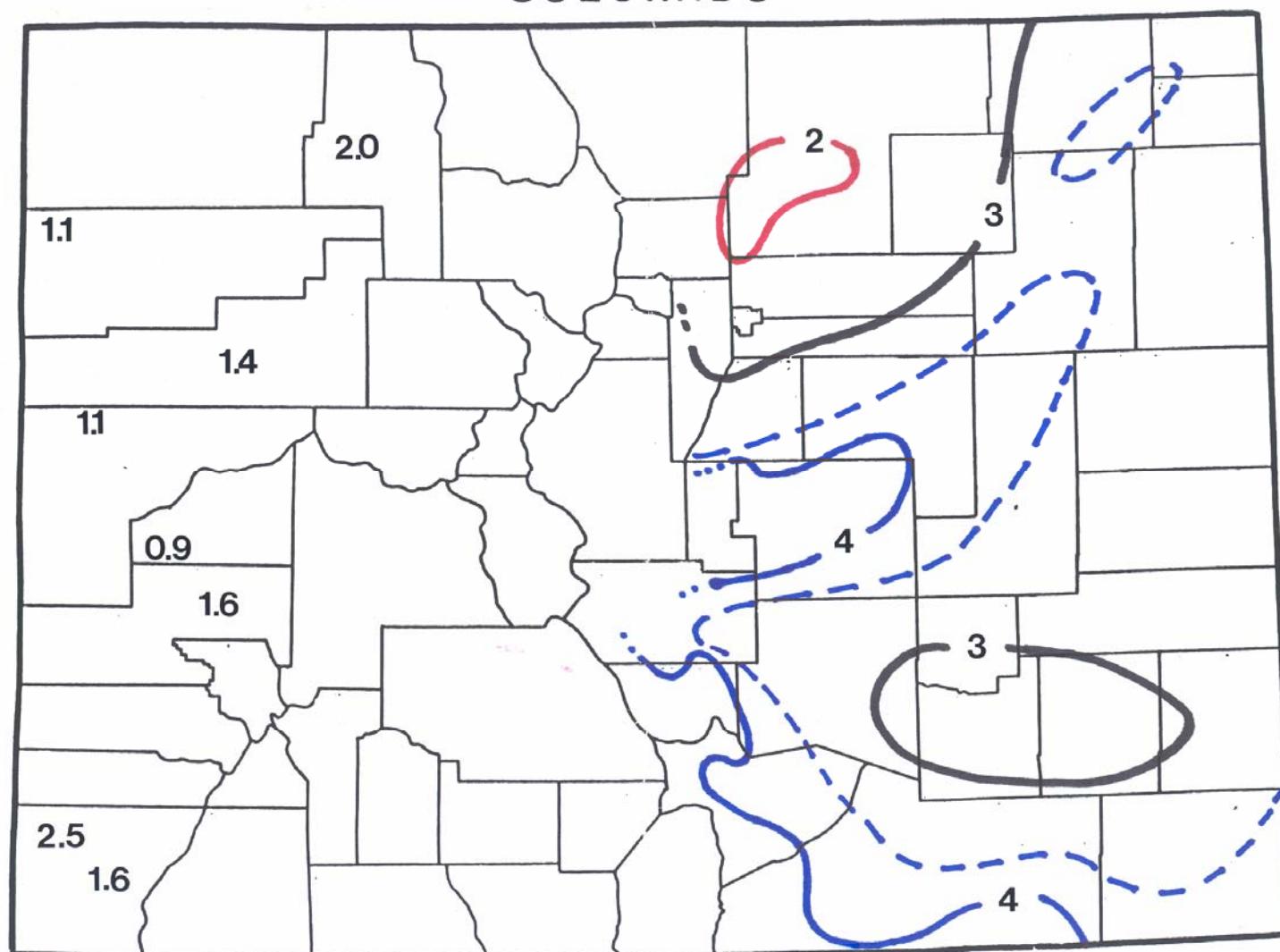


Average May-June Precipitation (Inches) (Based on 1961-90 observed data)





Average Precipitation (Inches) For the Period 15 July – 25 August (Based on 1961-1990 observed data)

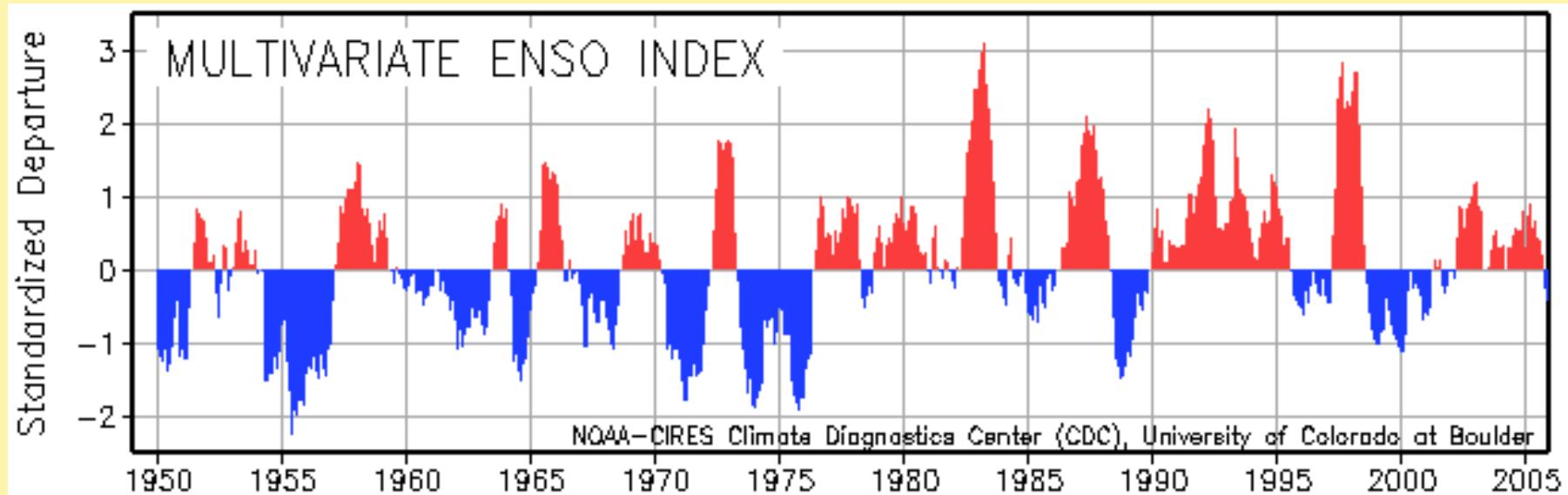


Drought or Flood?





Multivariate ENSO Index (MEI)



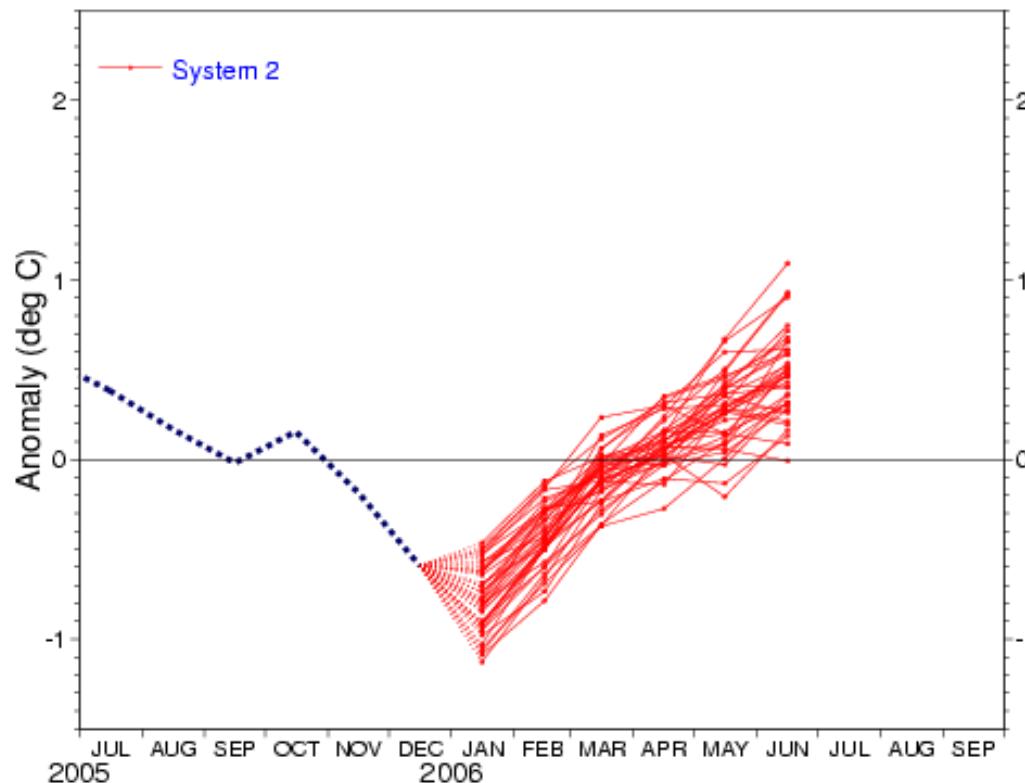
Last update: January 10, 2006

<http://www.cdc.noaa.gov/people/klaus.wolter/MEI/>



El Nino Forecast

NINO3.4 SST anomaly plume
ECMWF forecast from 1 Jan 2006
Monthly means plotted using NCEP adjusted OIv2 1971-2000 climatology

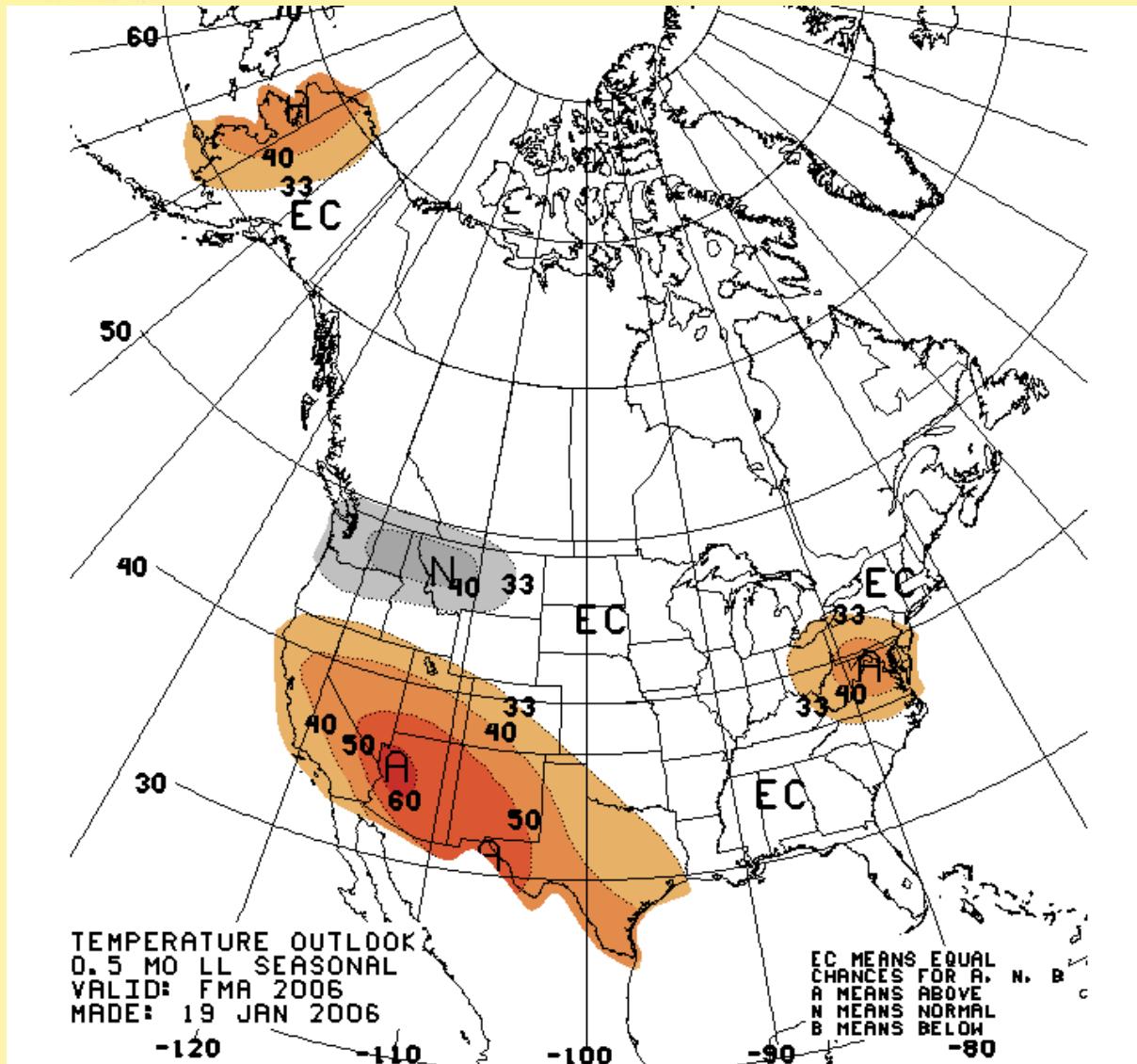


Forecast production date: 14 Jan 2006



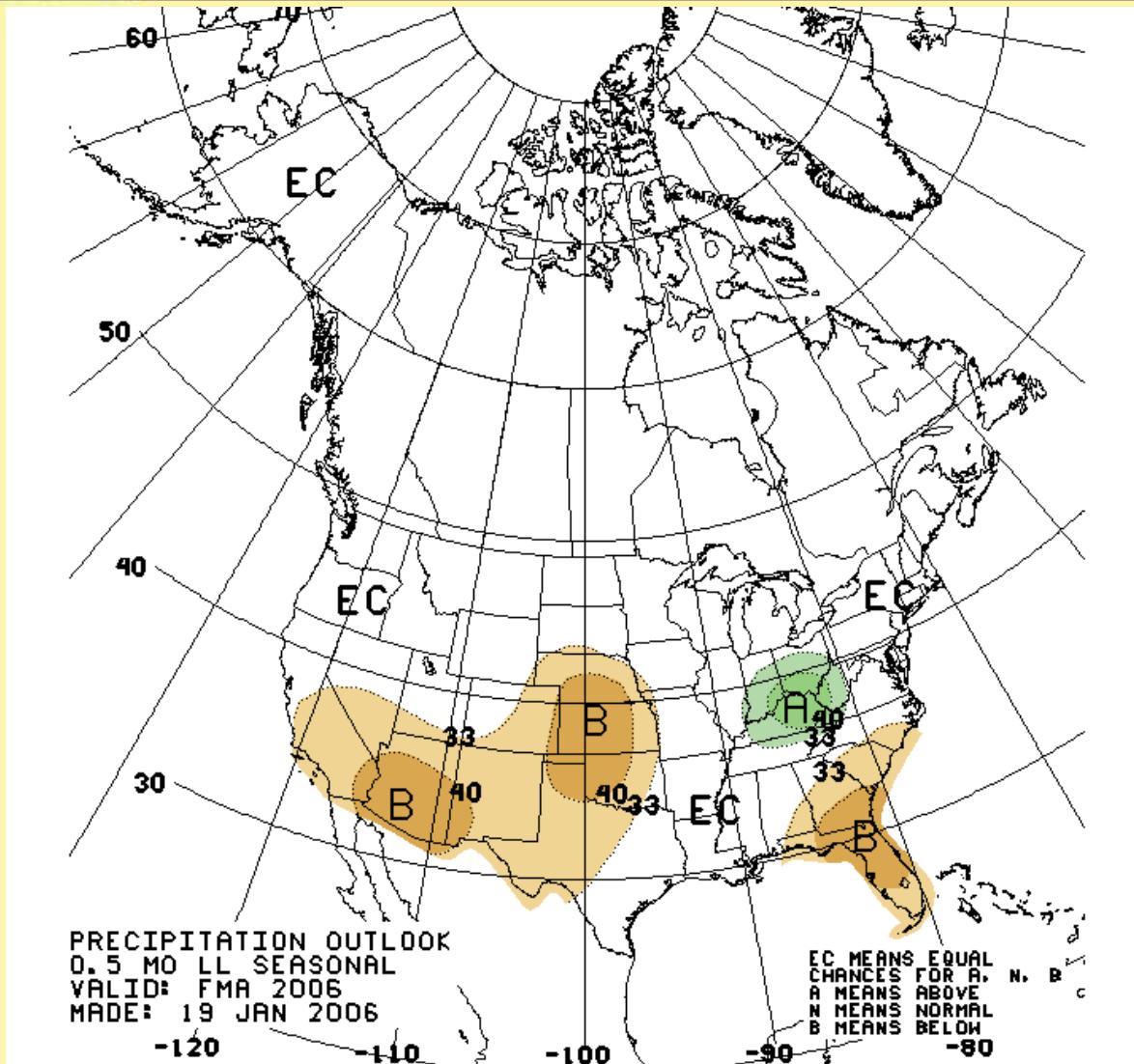


Temperature Feb-Apr 2006

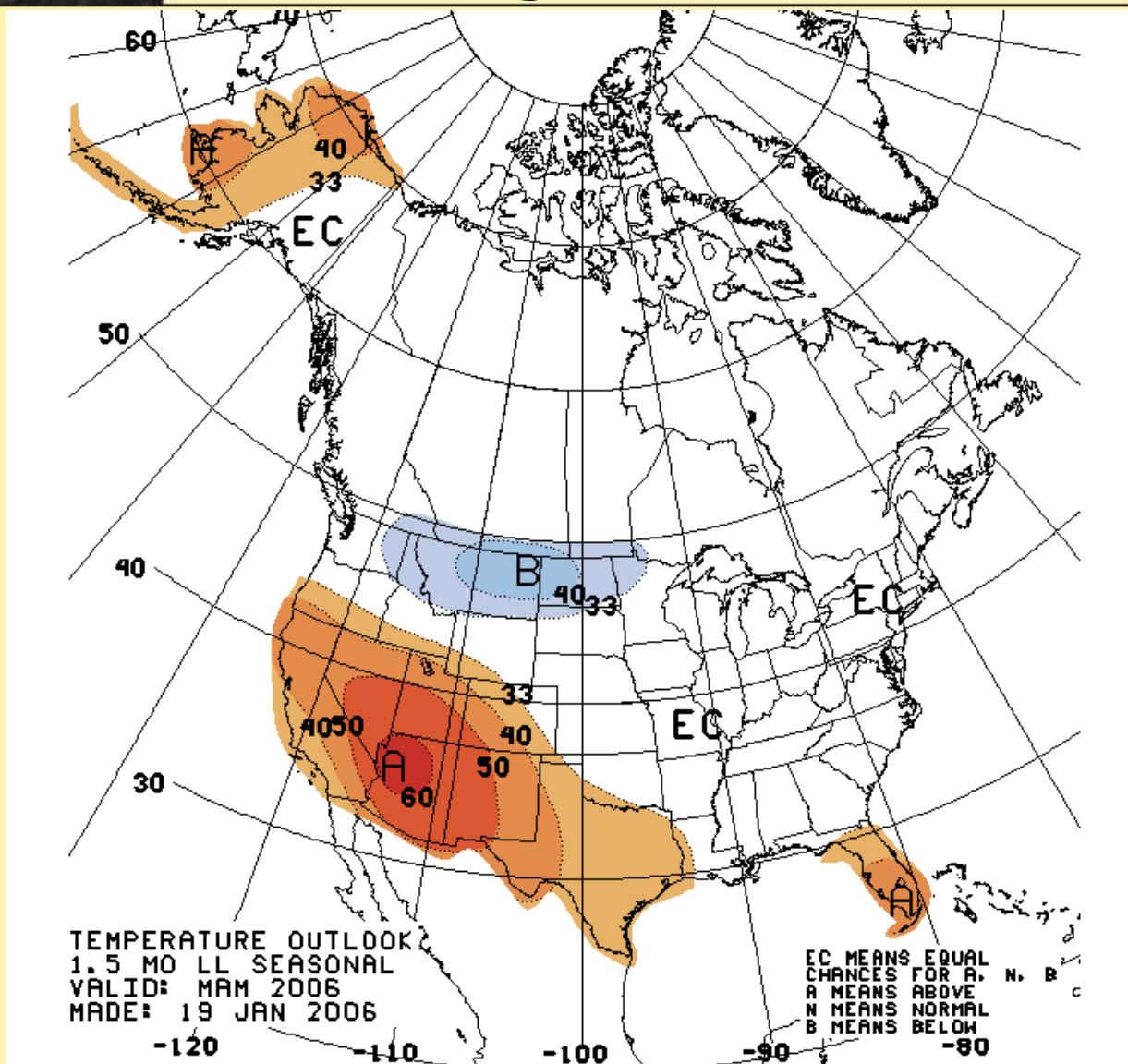




Precipitation Feb-Apr 2006

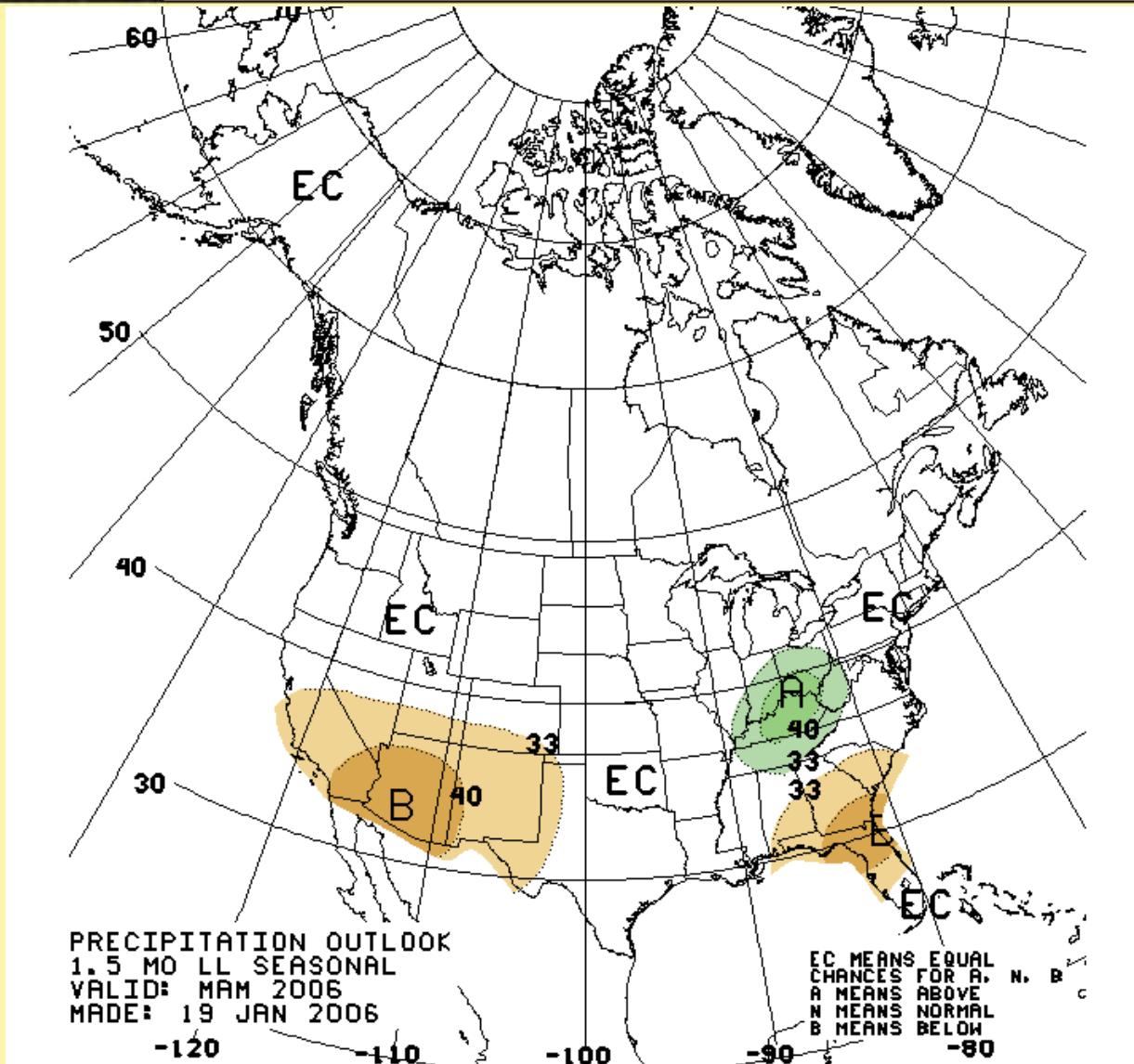


Temperature Mar-May 2006



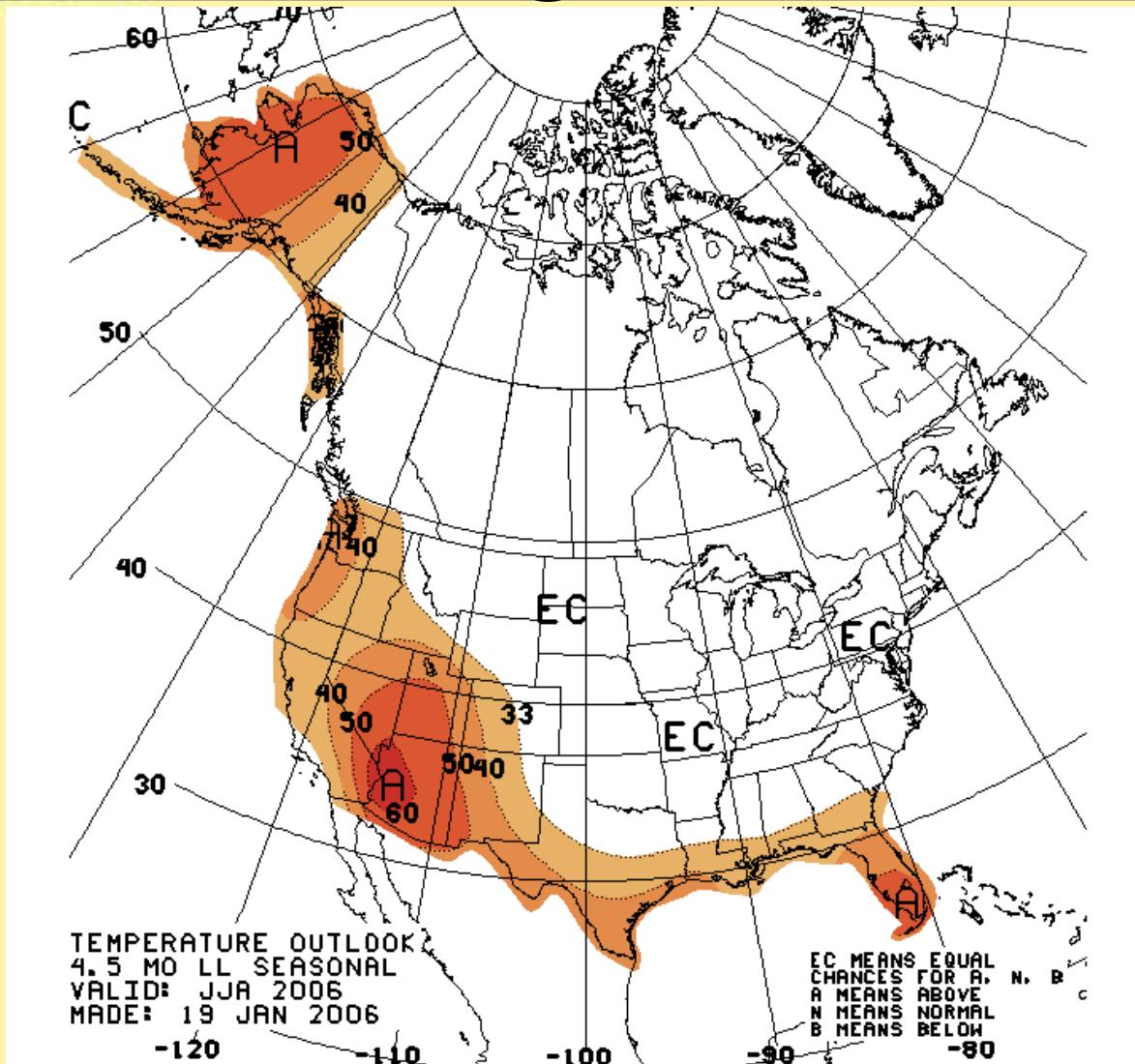


Precipitation Mar-May 2006





Temperature Jun-Aug 2006



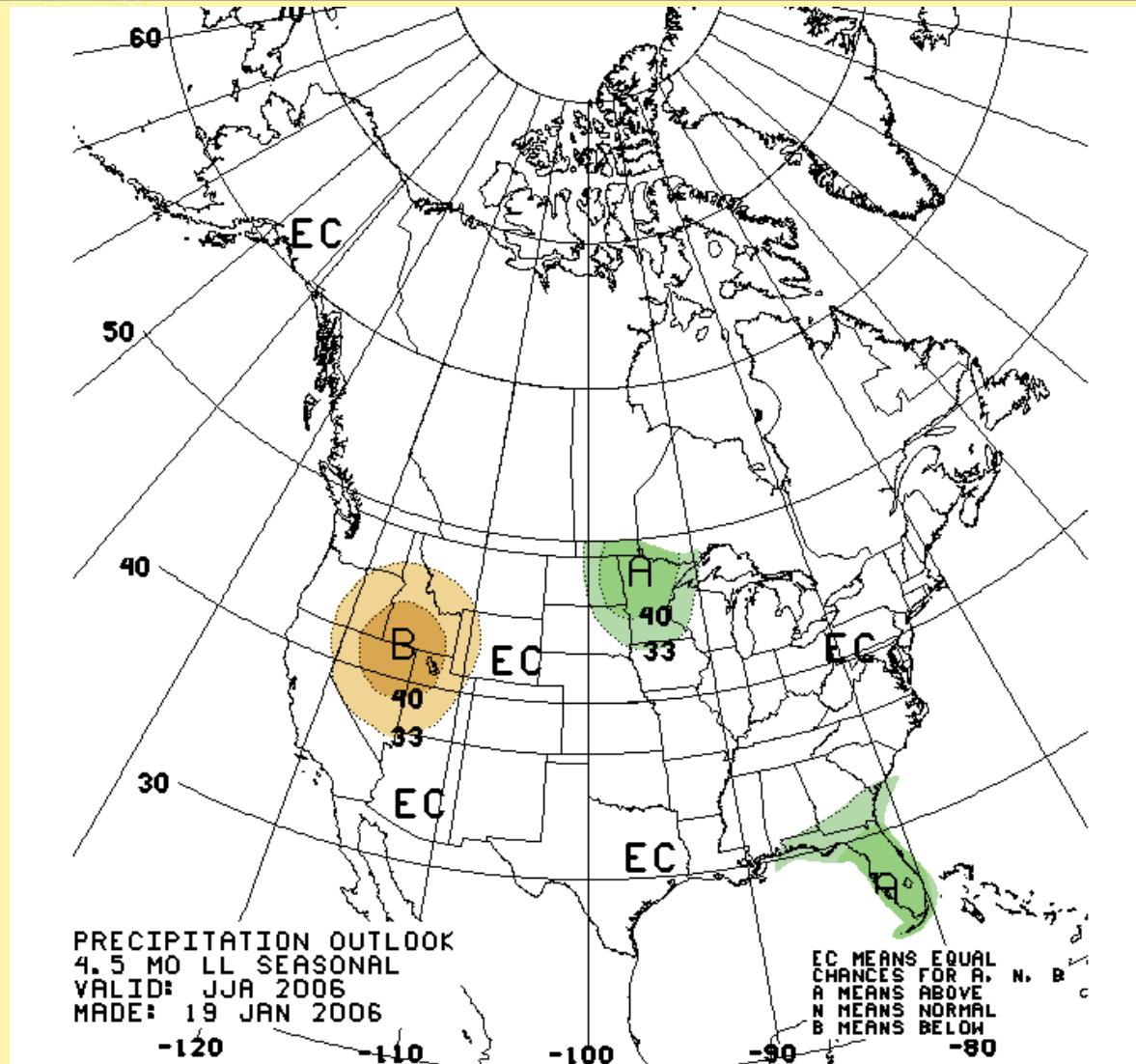
52

From the Colorado Prediction Center

http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html



Precipitation Jun-Aug 2006



From the Colorado Prediction Center

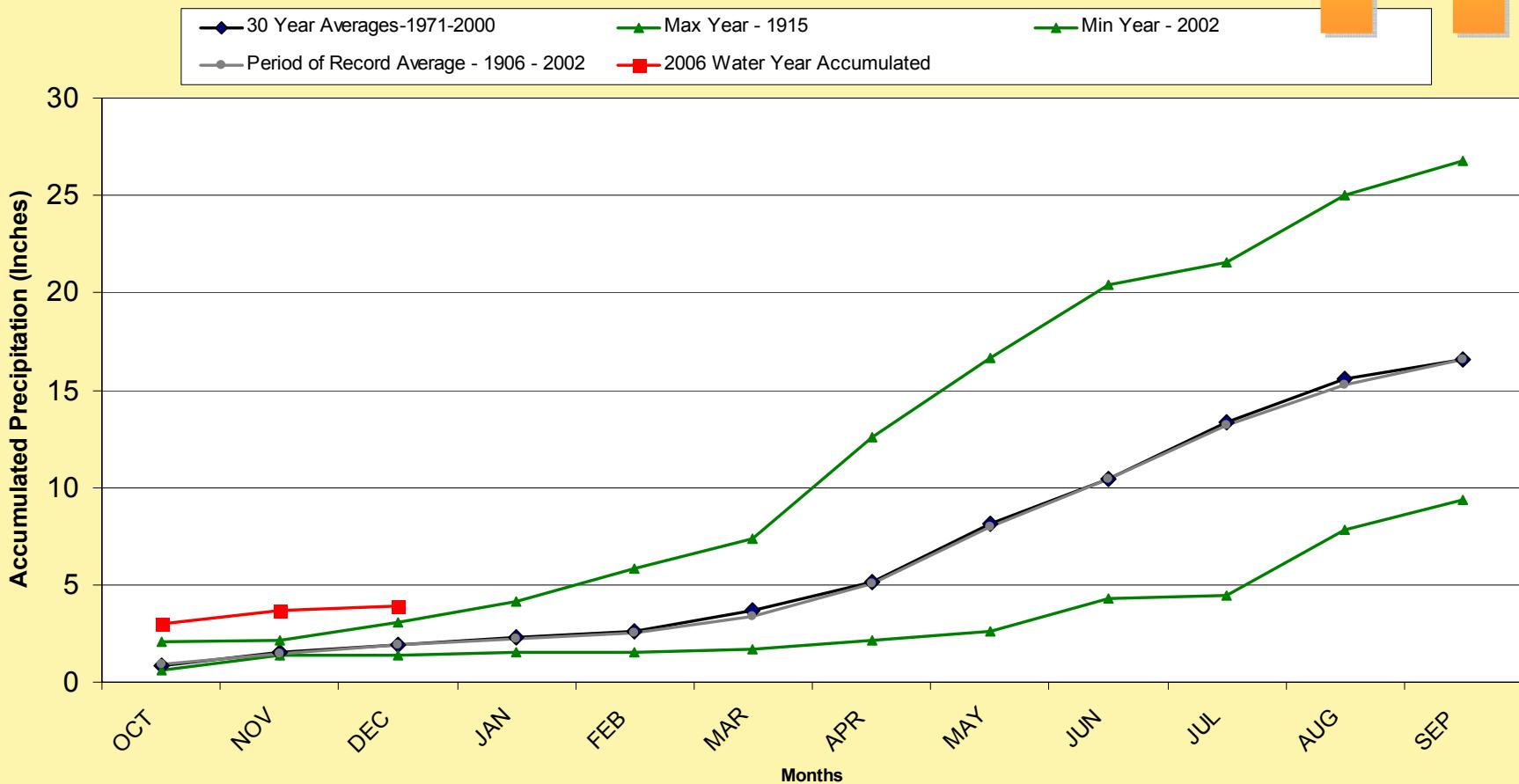
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html



Our Path For 2006



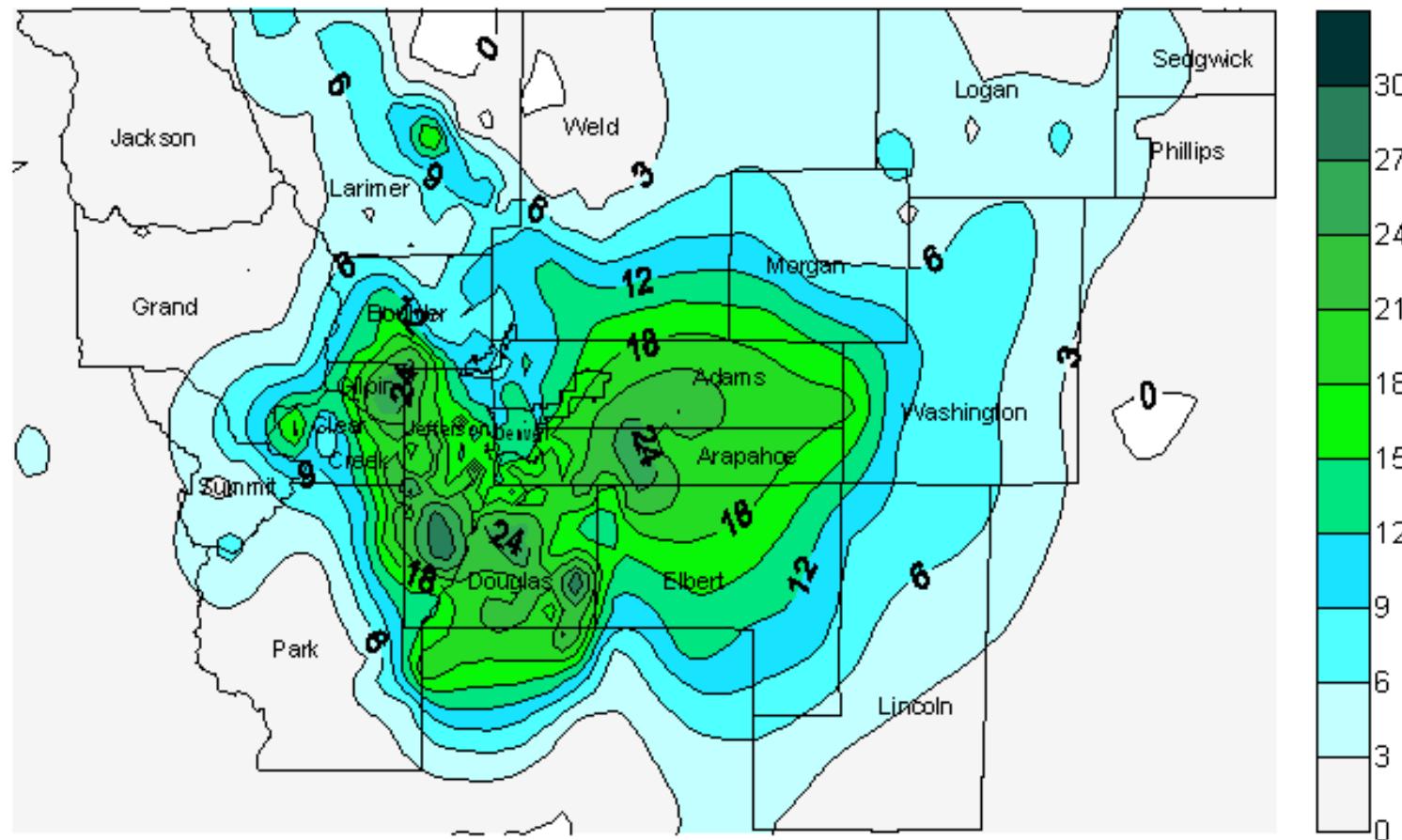
Akron 4E
2006 Water Year





If we can't predict it, at least we can track it!

April 10-11, 2005 Storm Total Snowfall



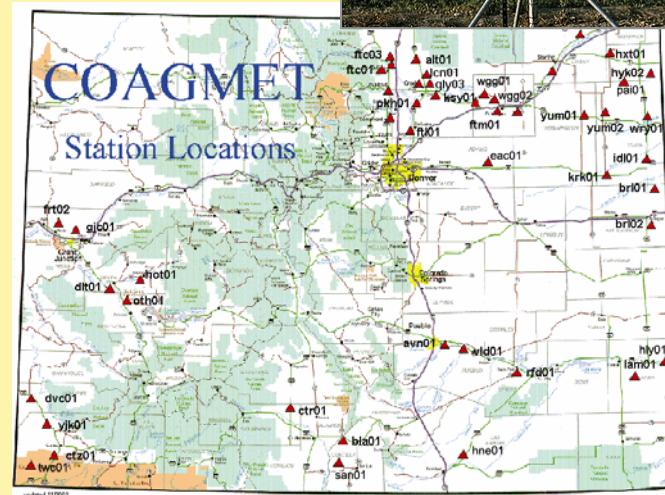
Data Courtesy of CoCoRahs and NWS COOP, CAST, and volunteer observers



CoAgMet

Weather Data for Agriculture

- *Automated weather stations with daily and hourly readings of:*
 - Temperature
 - Humidity
 - Wind
 - Precipitation
 - Solar Energy
 - Evapotranspiration



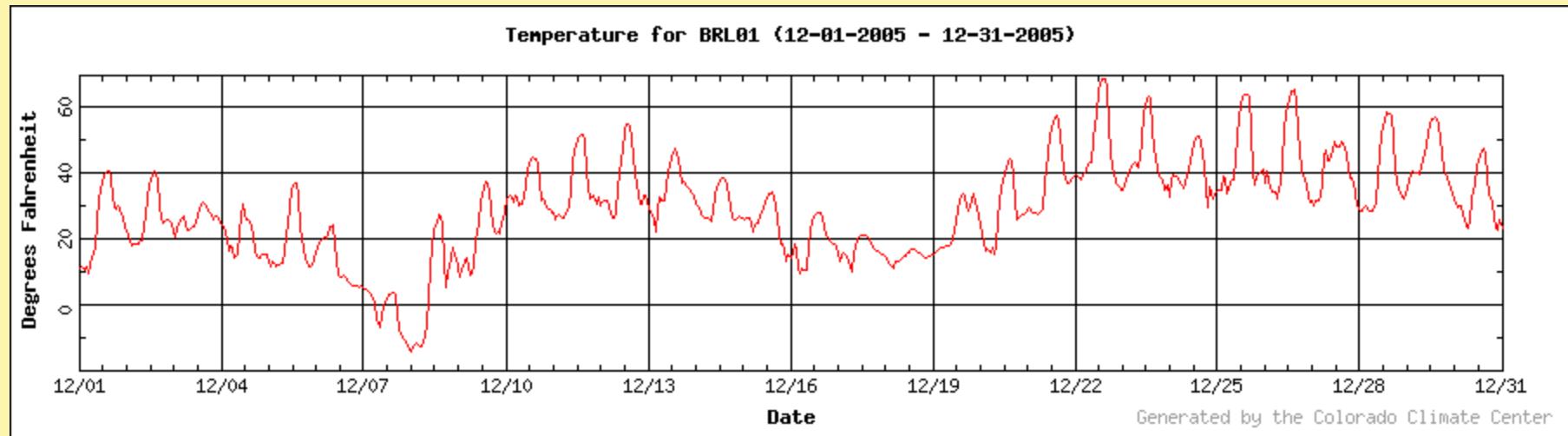
<http://www.coagmet.com>



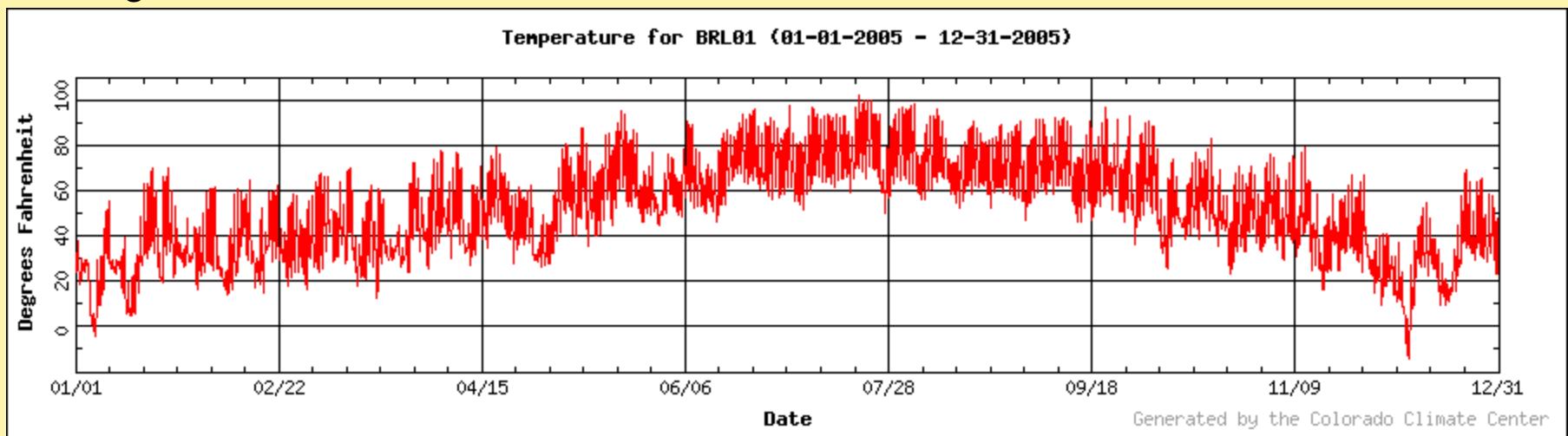
Temperature 2005

CoAgMet graph

Burlington, Dec 1-31, 2005



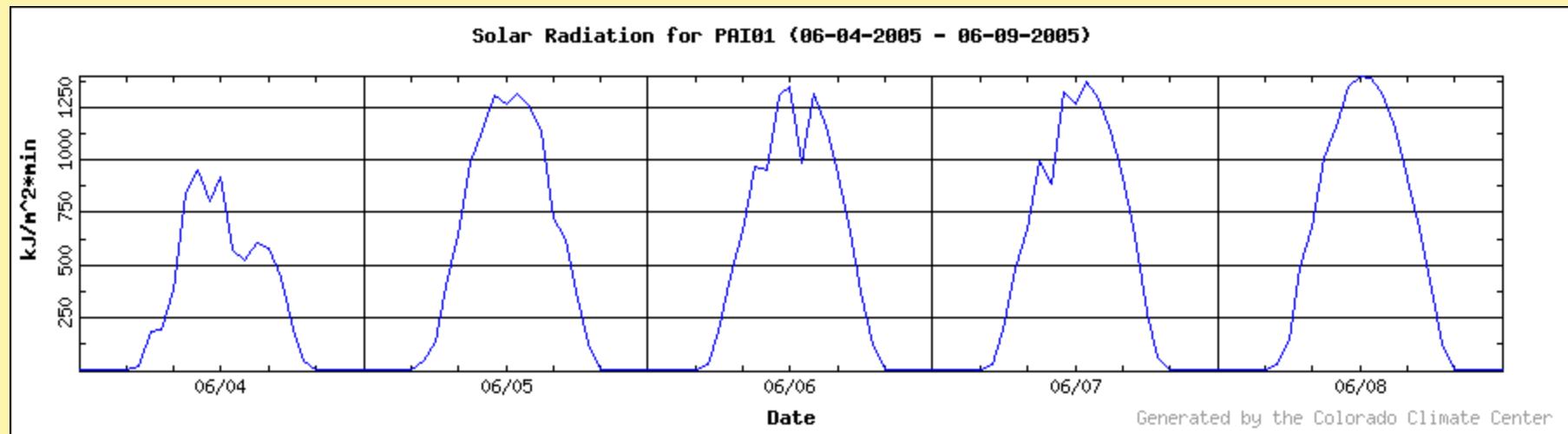
Burlington, Jan–Dec 2005



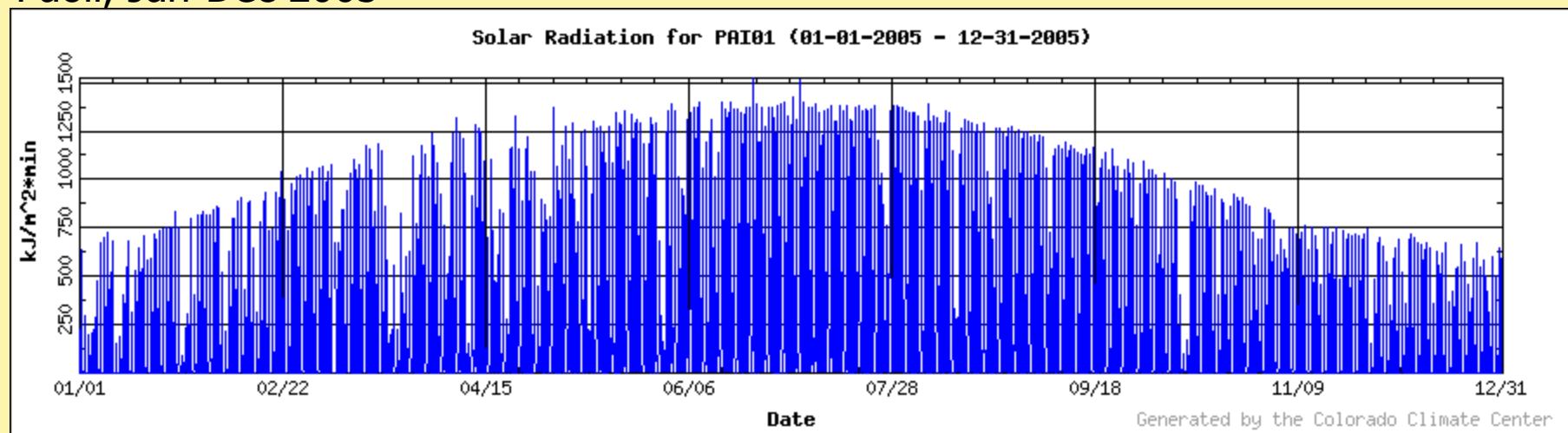


Solar Energy

Paoli, June 4 – 8, 2005



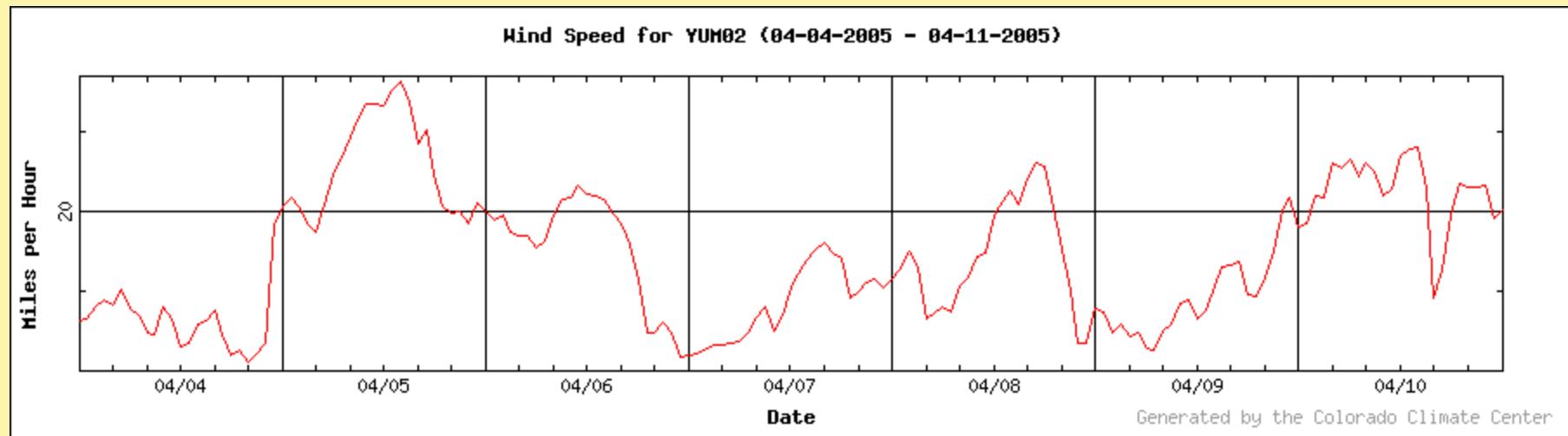
Paoli, Jan-Dec 2005



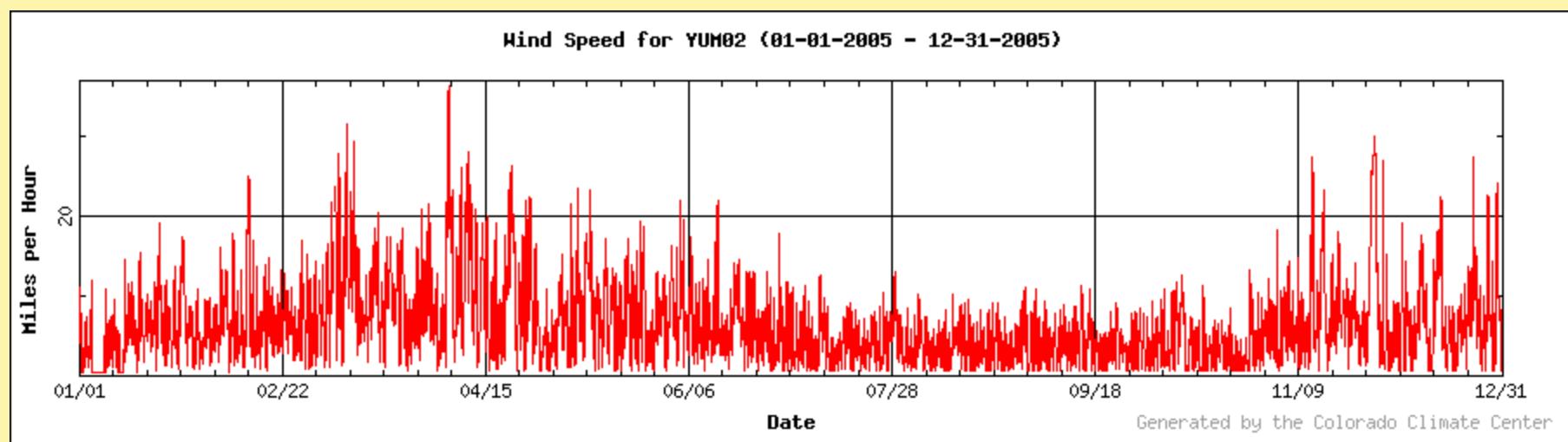


Wind Speed

Yuma, April 4-11, 2005



Yuma, Jan-Dec 2005



And you can help too!





CoCoRaHS

Community Collaborative Rain, Hail, and Snow Network



<http://www.cocorahs.org>

- Over 1,000 volunteers participate in rain, hail and snow measurements.
- More accurate maps, verifies forecasting, radar research, crop damage, drought/flooding, educational purposes.



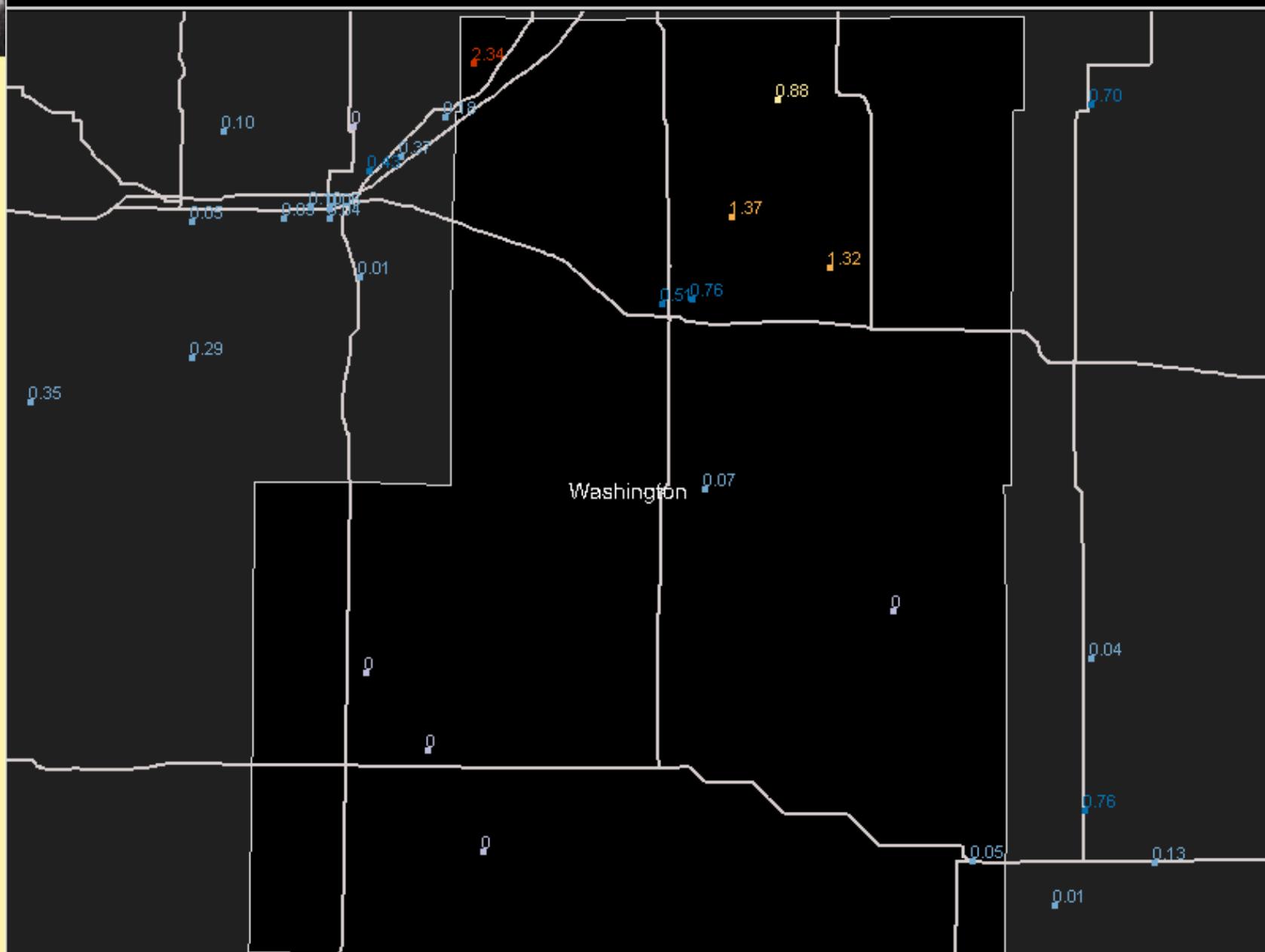
Support for this project provided by Informal Science Education Program, National Science Foundation and many local charter sponsors.

Washington County 5/25/05

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

Washington County, Colorado 5/25/2005

0.0 Trace 0.01 - 0.39 0.39 - 0.78 0.78 - 1.17 1.17 - 1.56 1.56 - 1.95 1.95 - 2.34

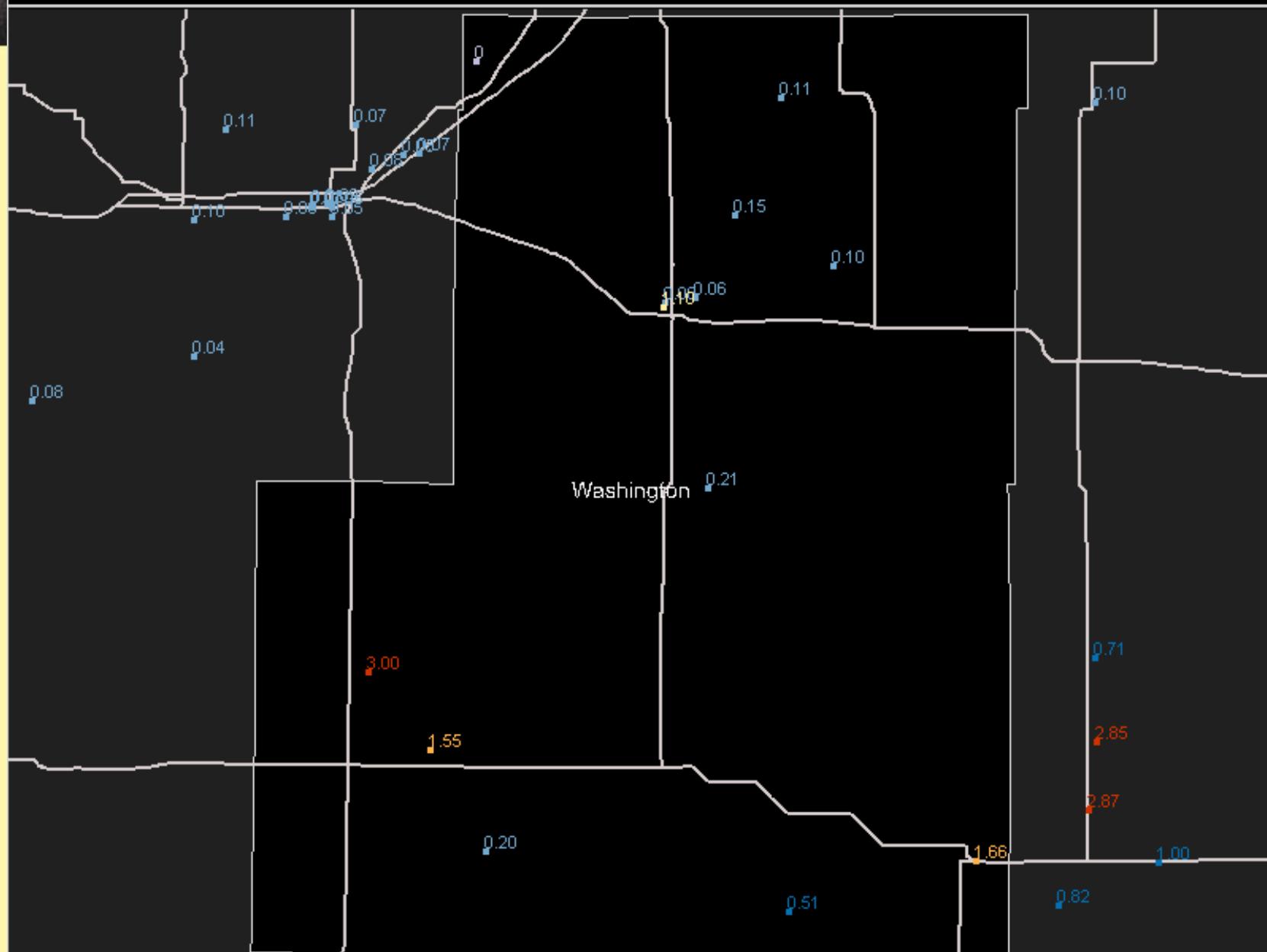


Washington County 6/3/05

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

Washington County, Colorado 6/3/2005

0.0 Trace 0.01 - 0.50 0.50 - 1.00 1.00 - 1.50 1.50 - 2.00 2.00 - 2.50 2.50 - 3.00

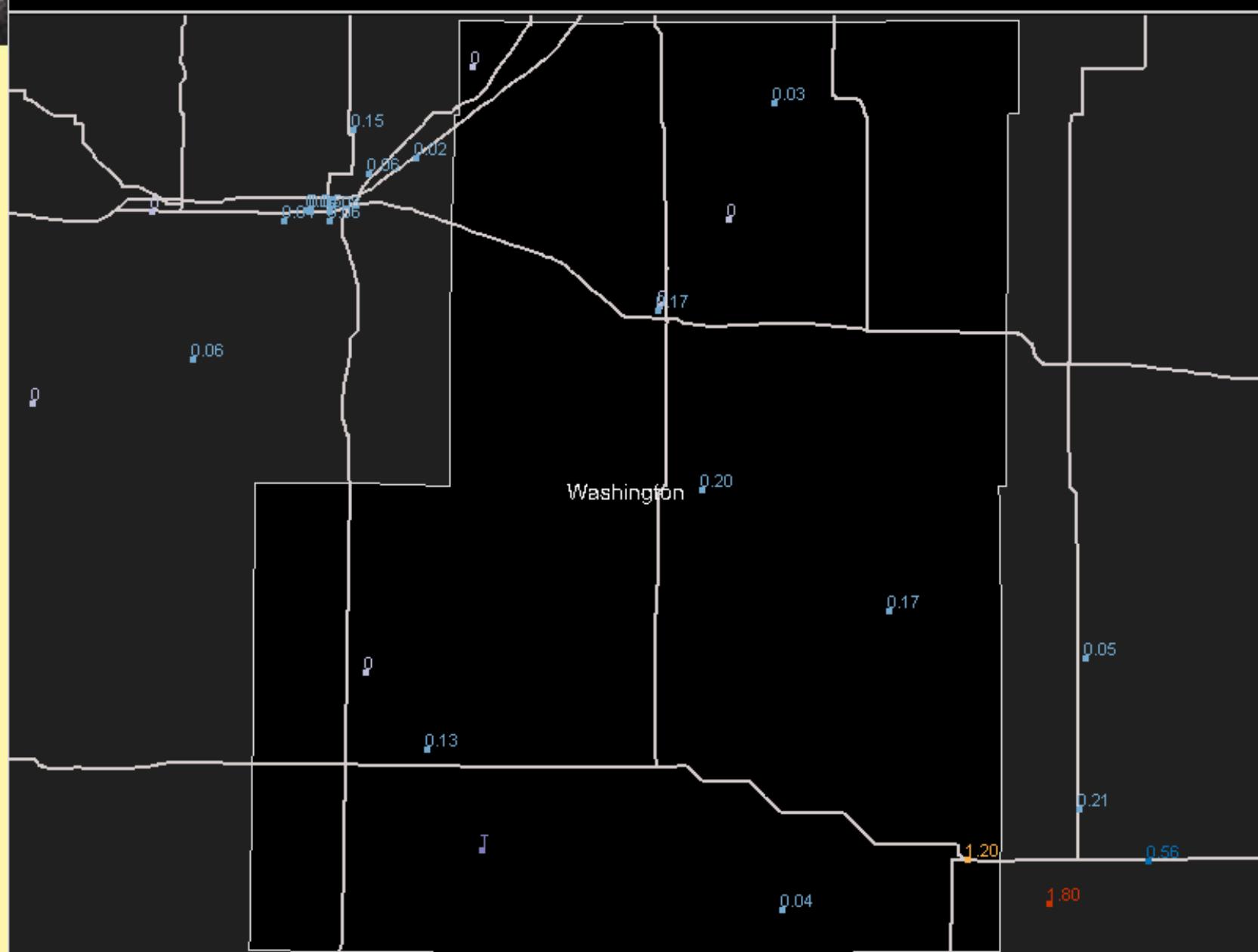


Washington County 6/25/05

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

Washington County, Colorado 6/25/2005

0.0 Trace 0.01 - 0.30 0.30 - 0.60 0.60 - 0.90 0.90 - 1.20 1.20 - 1.50 1.50 - 1.80

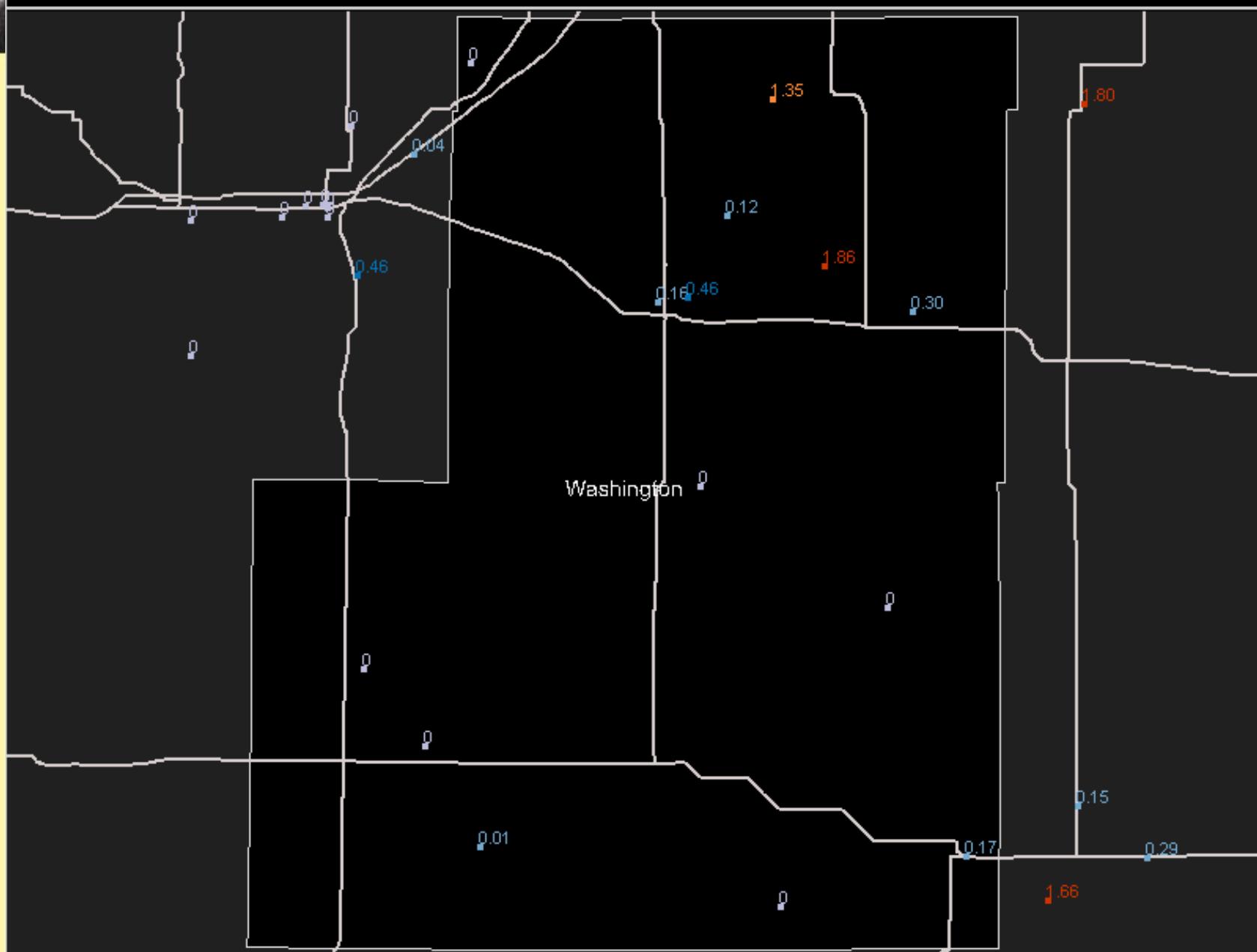


Washington County 8/23/05

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

Washington County, Colorado 8/23/2005

0.0 Trace 0.01 - 0.31 0.31 - 0.62 0.62 - 0.93 0.93 - 1.24 1.24 - 1.55 1.55 - 1.86

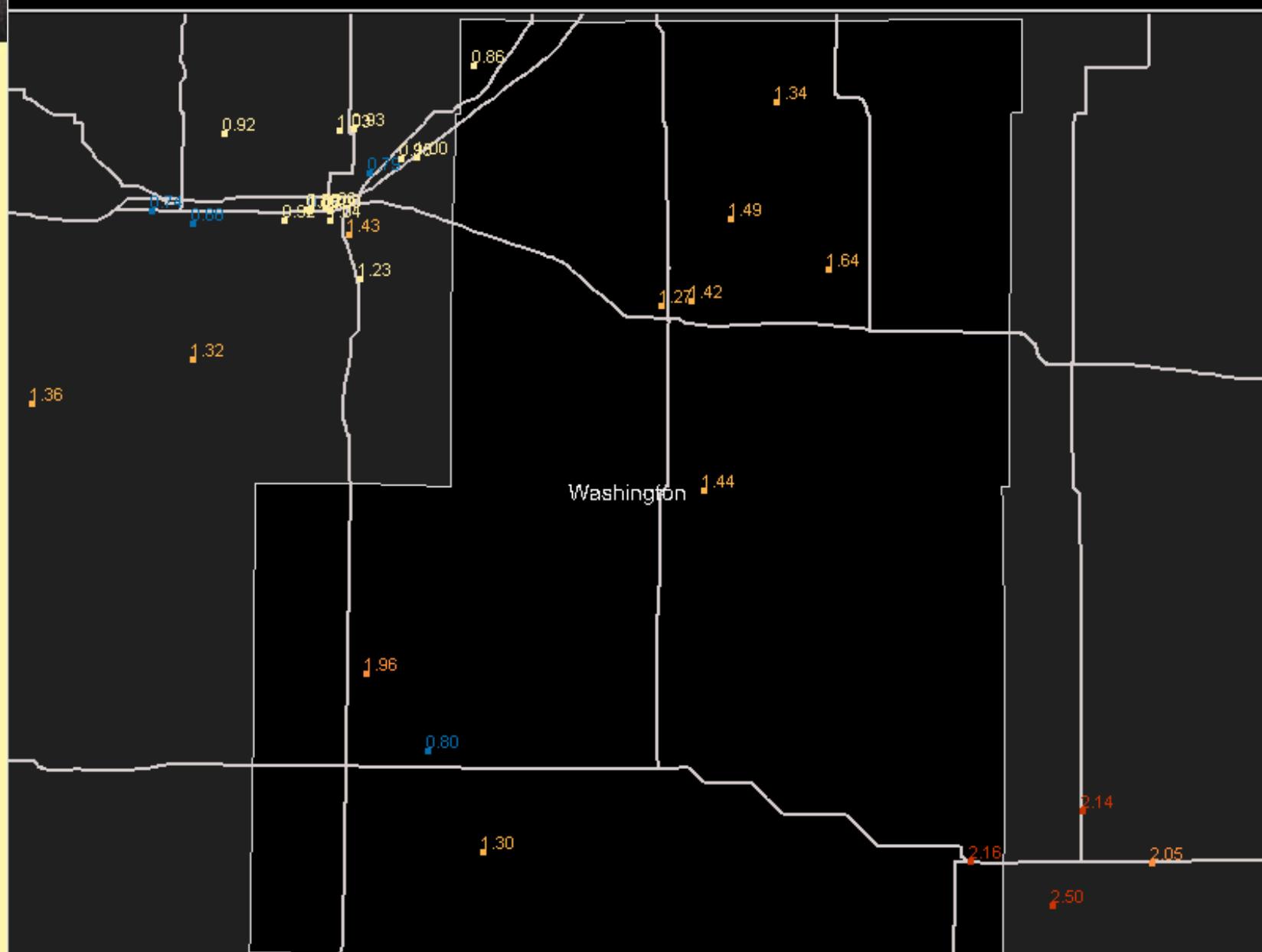


Washington County 10/10/05

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

Washington County, Colorado 10/10/2005

0.0 Trace 0.01 - 0.42 0.42 - 0.83 0.83 - 1.25 1.25 - 1.67 1.67 - 2.08 2.08 - 2.50

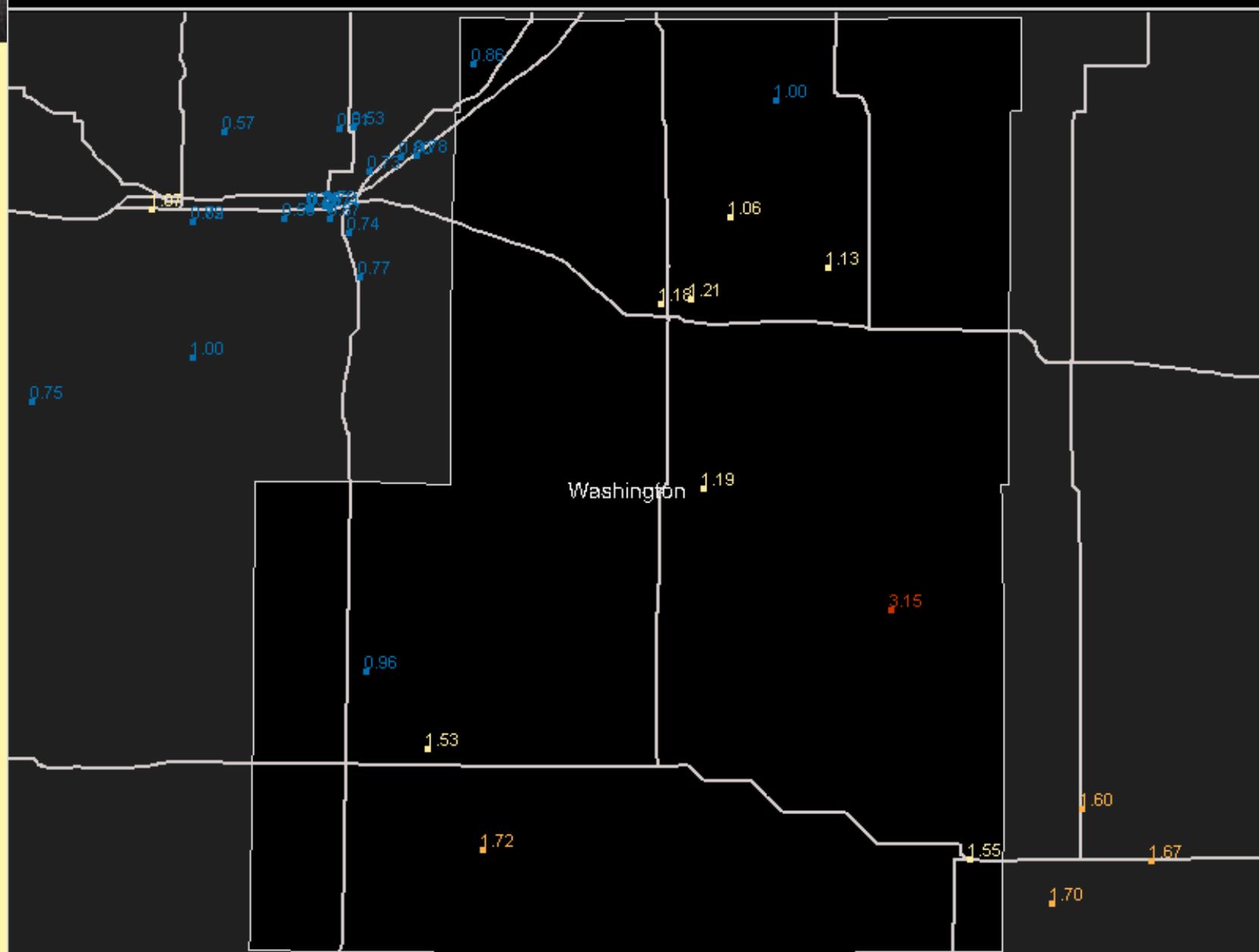


Washington County 10/11/05

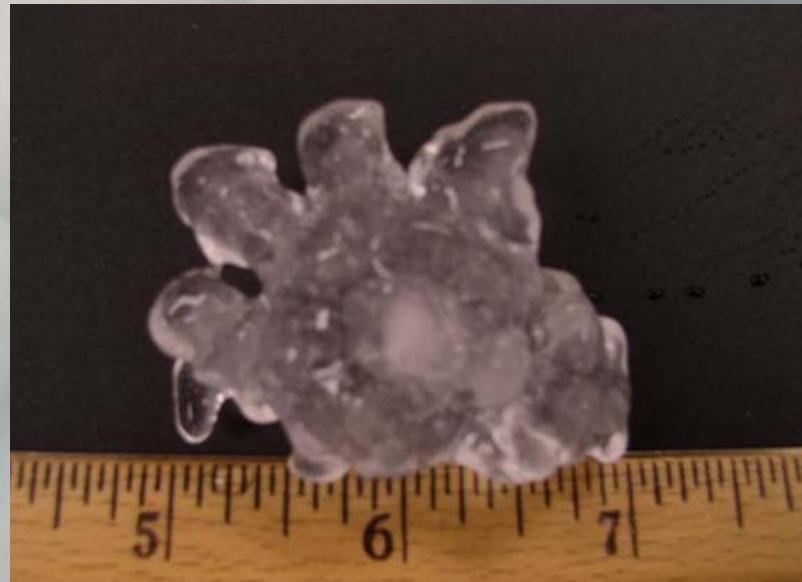
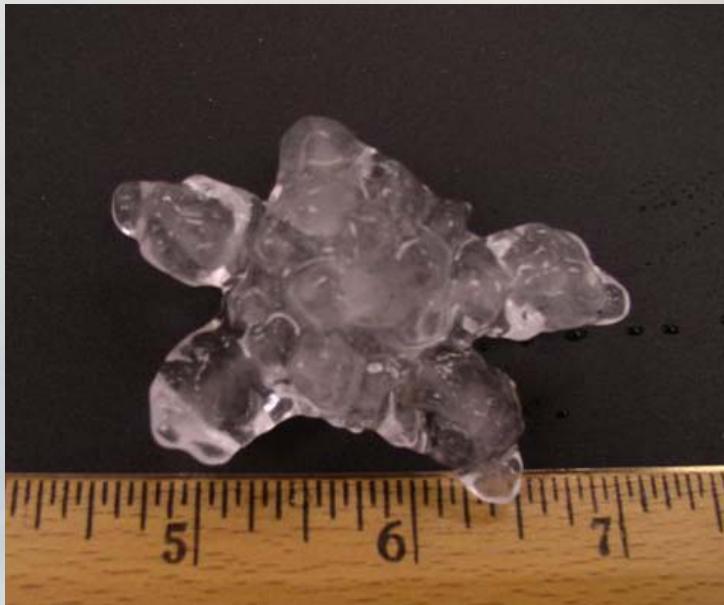
Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

Washington County, Colorado 10/11/2005

0.0 Trace 0.01 - 0.53 0.53 - 1.05 1.05 - 1.58 1.58 - 2.10 2.10 - 2.63 2.63 - 3.15



Clear Hail Stones



Photos courtesy of CoCoRaHS observer.



Colorado Climate Center

Colorado State University

- *Data and Power Point Presentations available for downloading*
- <http://ccc.atmos.colostate.edu>
*click on “Drought”
then click on “Presentations”*

