Drought!
When Do We Know It's Over?

Nolan J. Doesken
Colorado Climate Center
Colorado State University

http://ccc.atmos.colostate.edu

Presented at the 2004 Peak to Prairie Landscape Symposium,
February 27, 2004, Colorado Springs, Colorado
Prepared by Odie Bliss

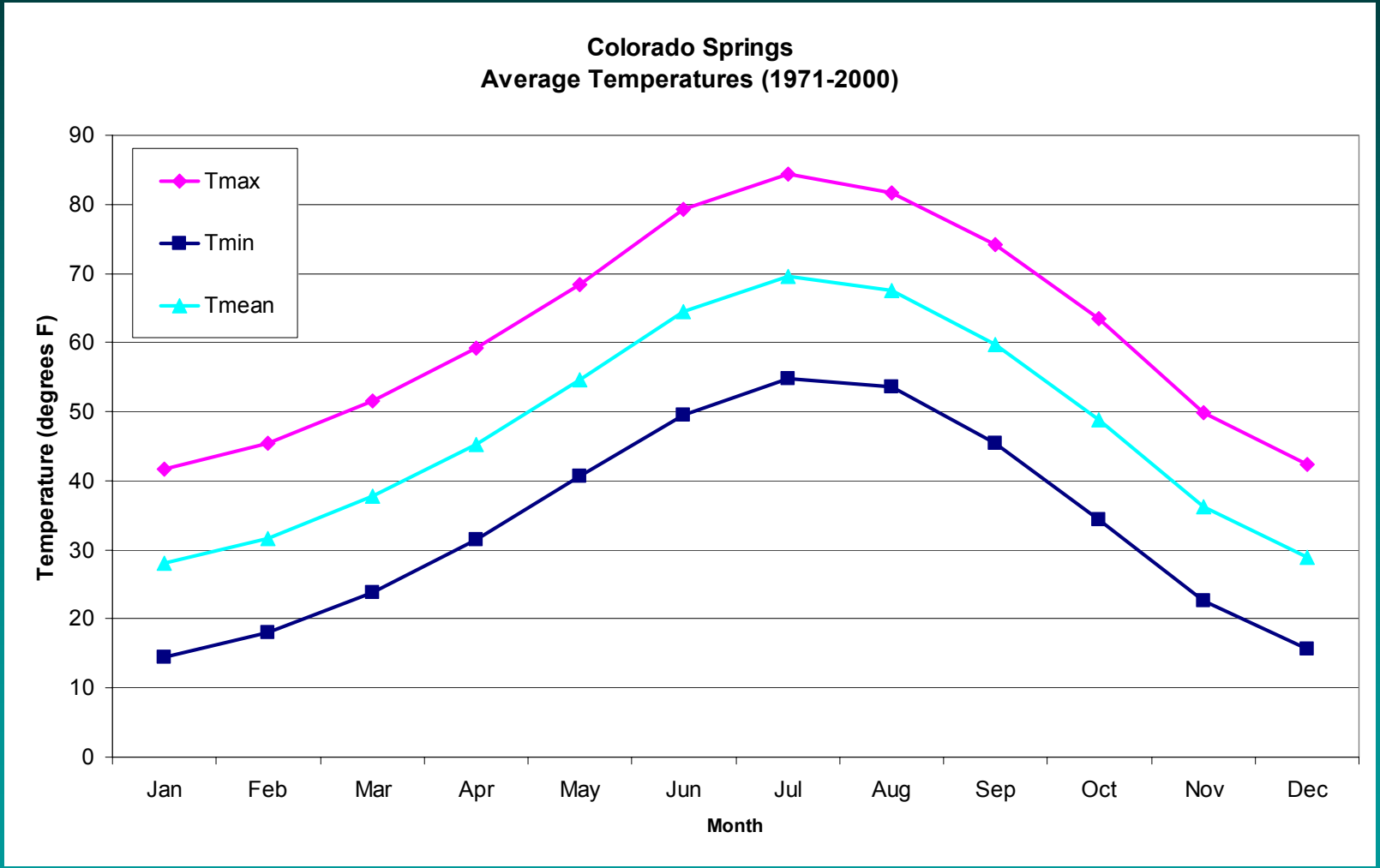
Appreciate our climate --

http://www.lensflare.com/~doubt/pics/garden/

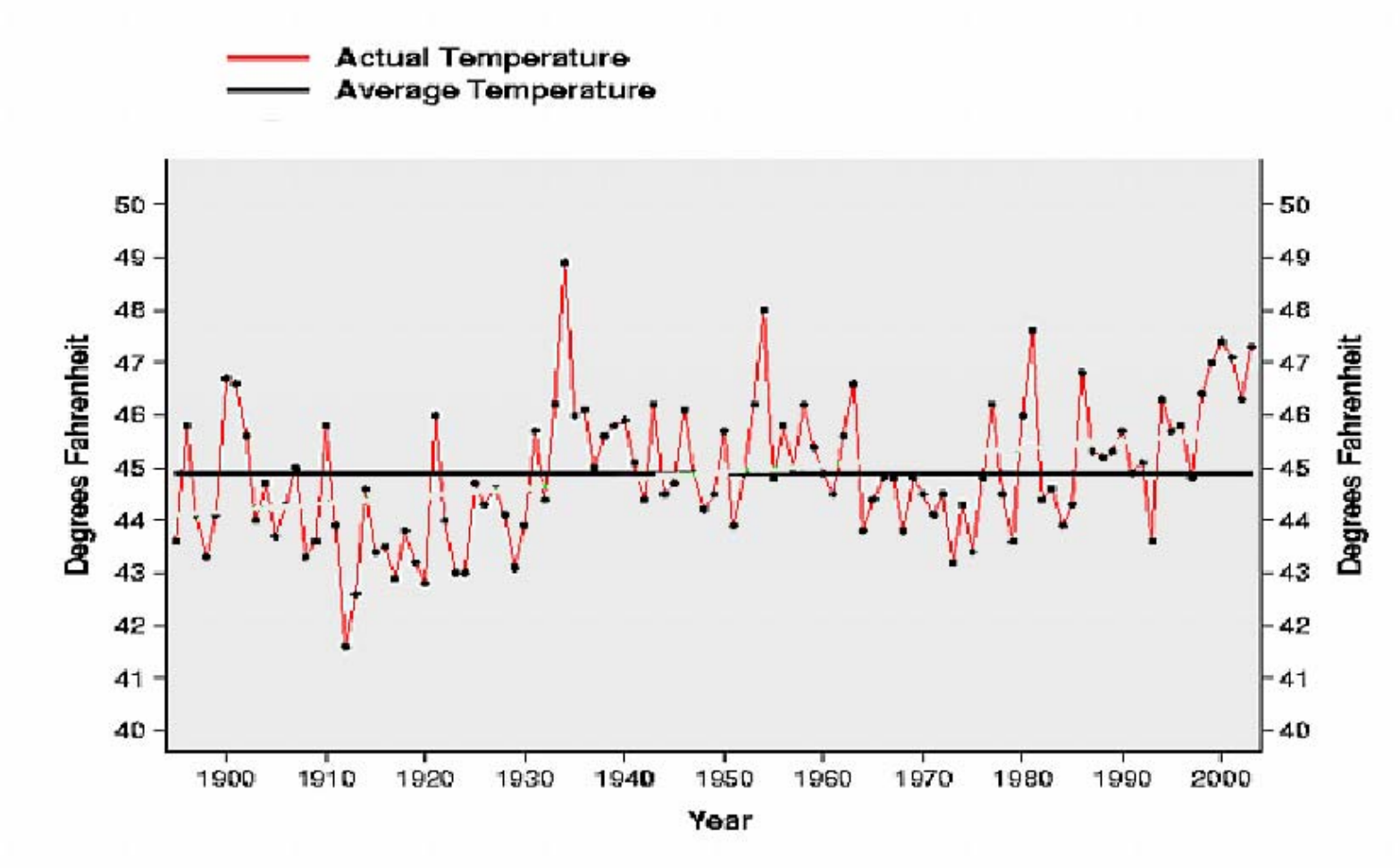
But it’s darn dry!

http://www.crh.noaa.gov/pub/gallery/wxpics.shtml

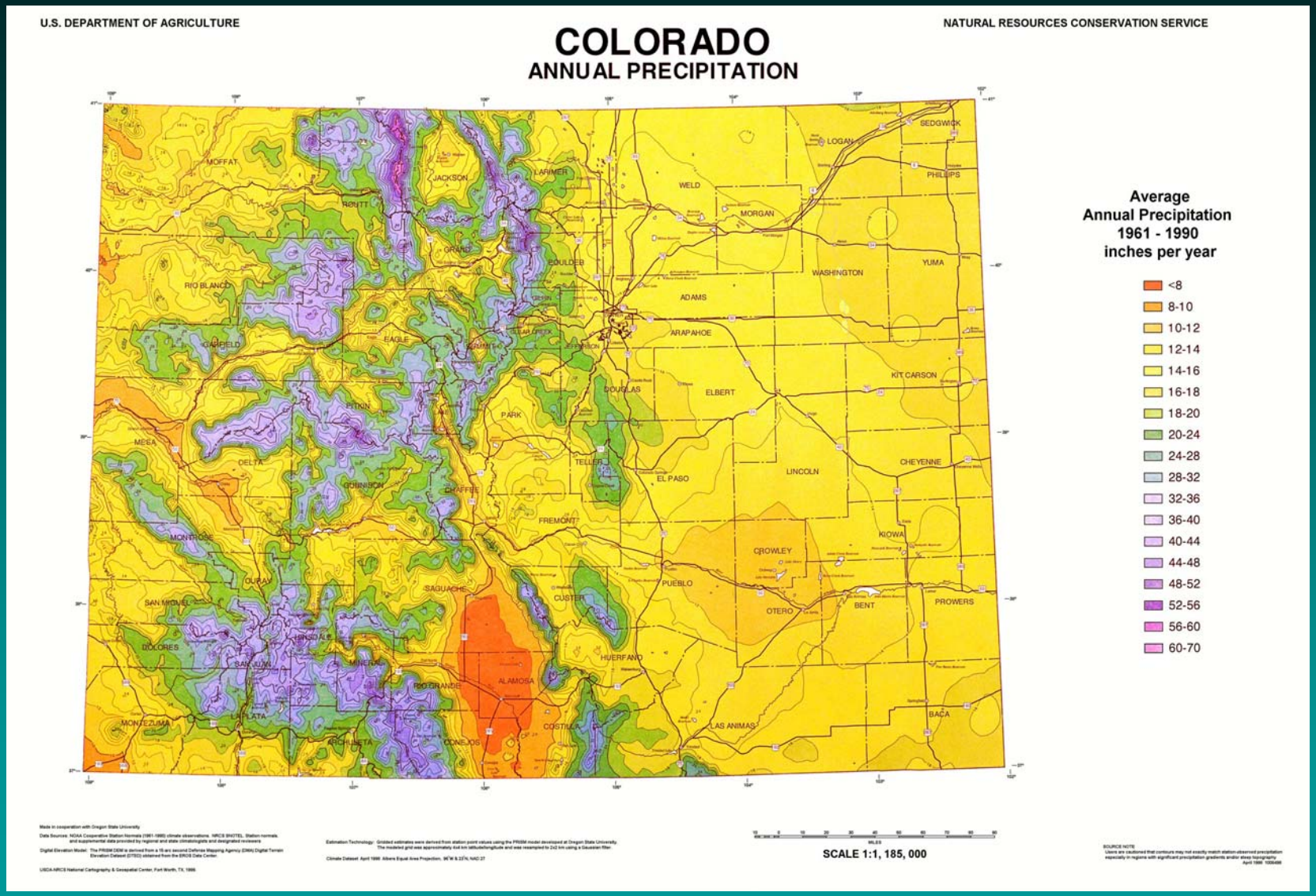
Colorado Springs Average Temperatures



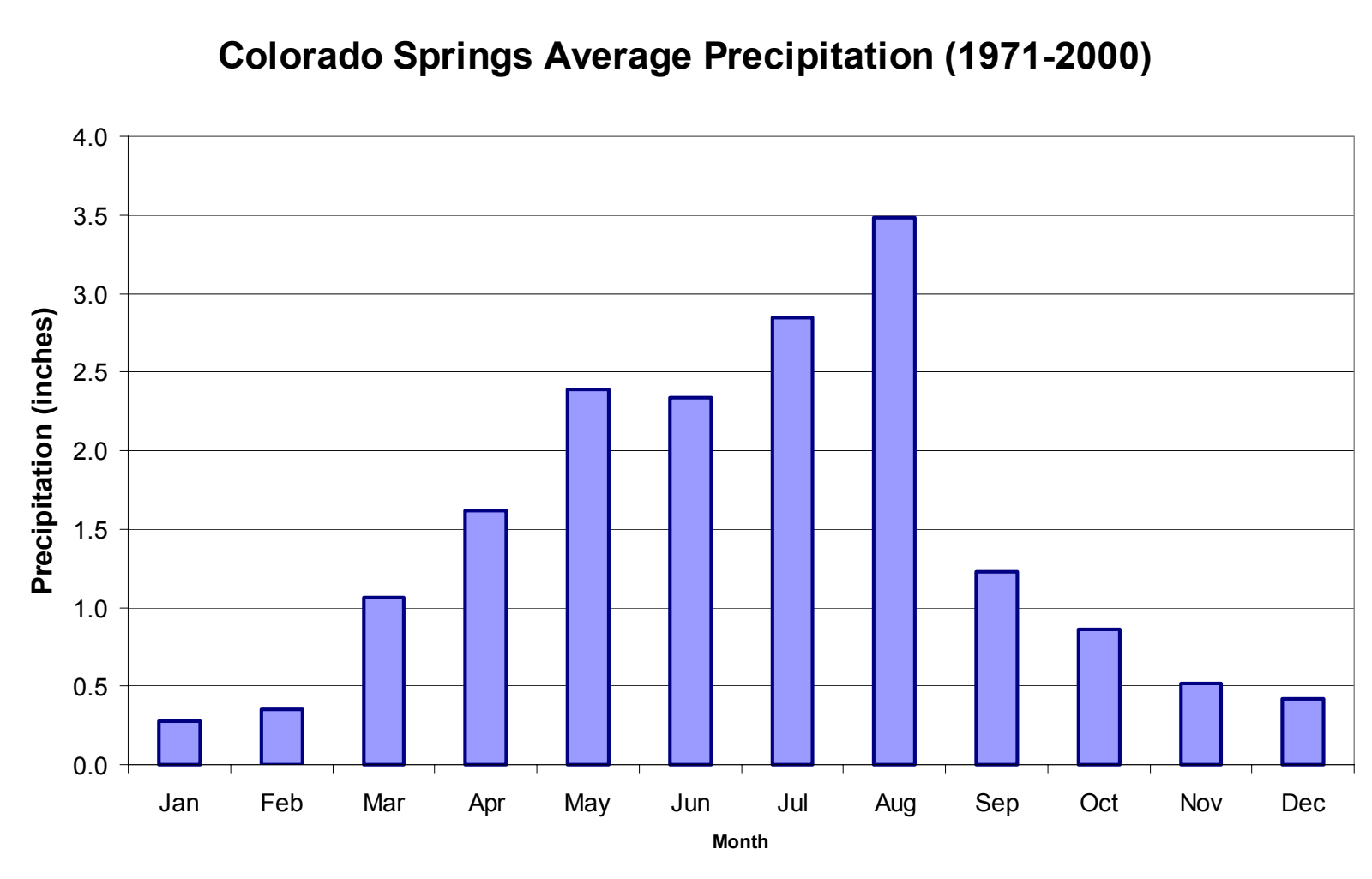
Statewide Mean Annual Temperature History



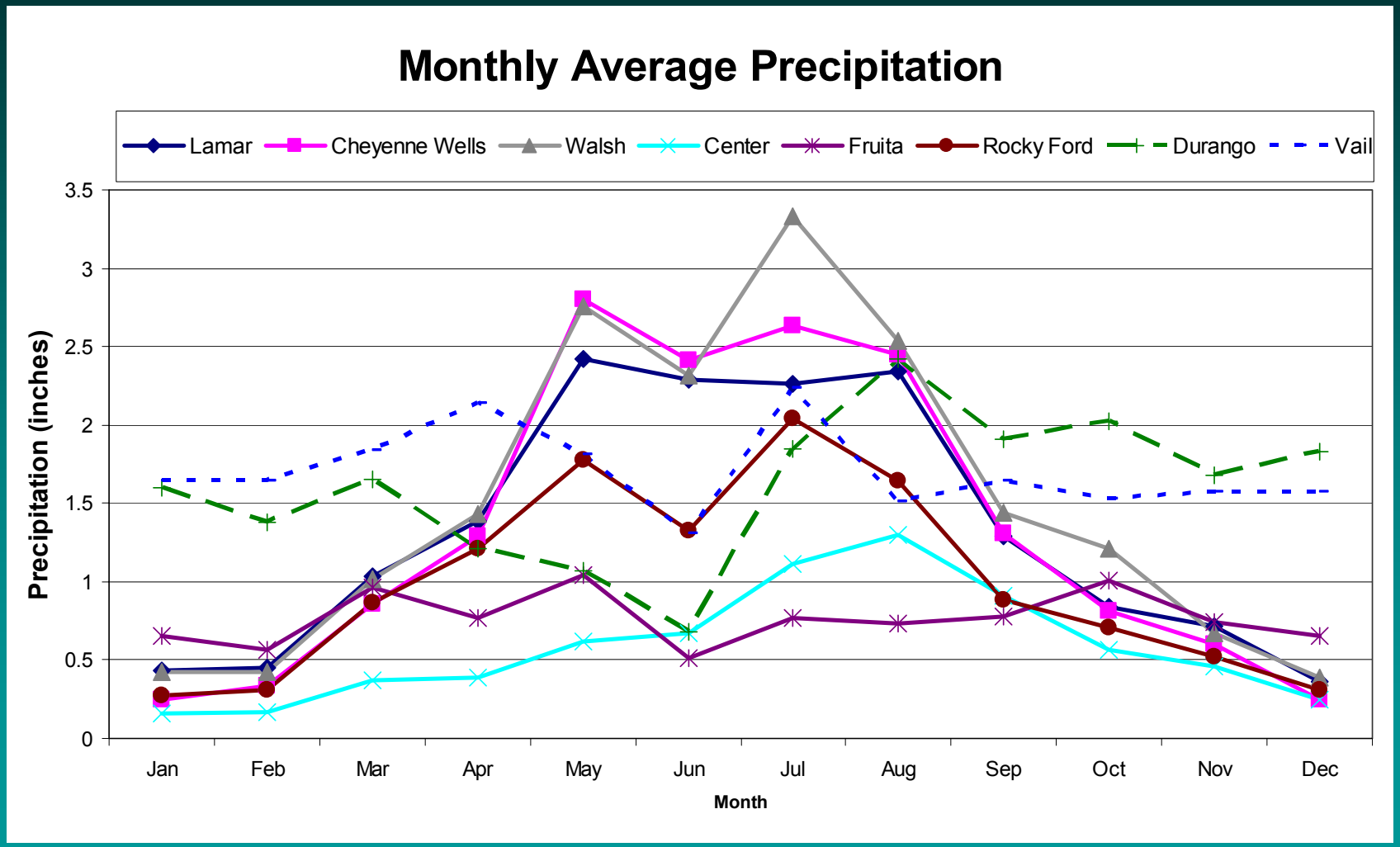
Colorado Average Precipitation



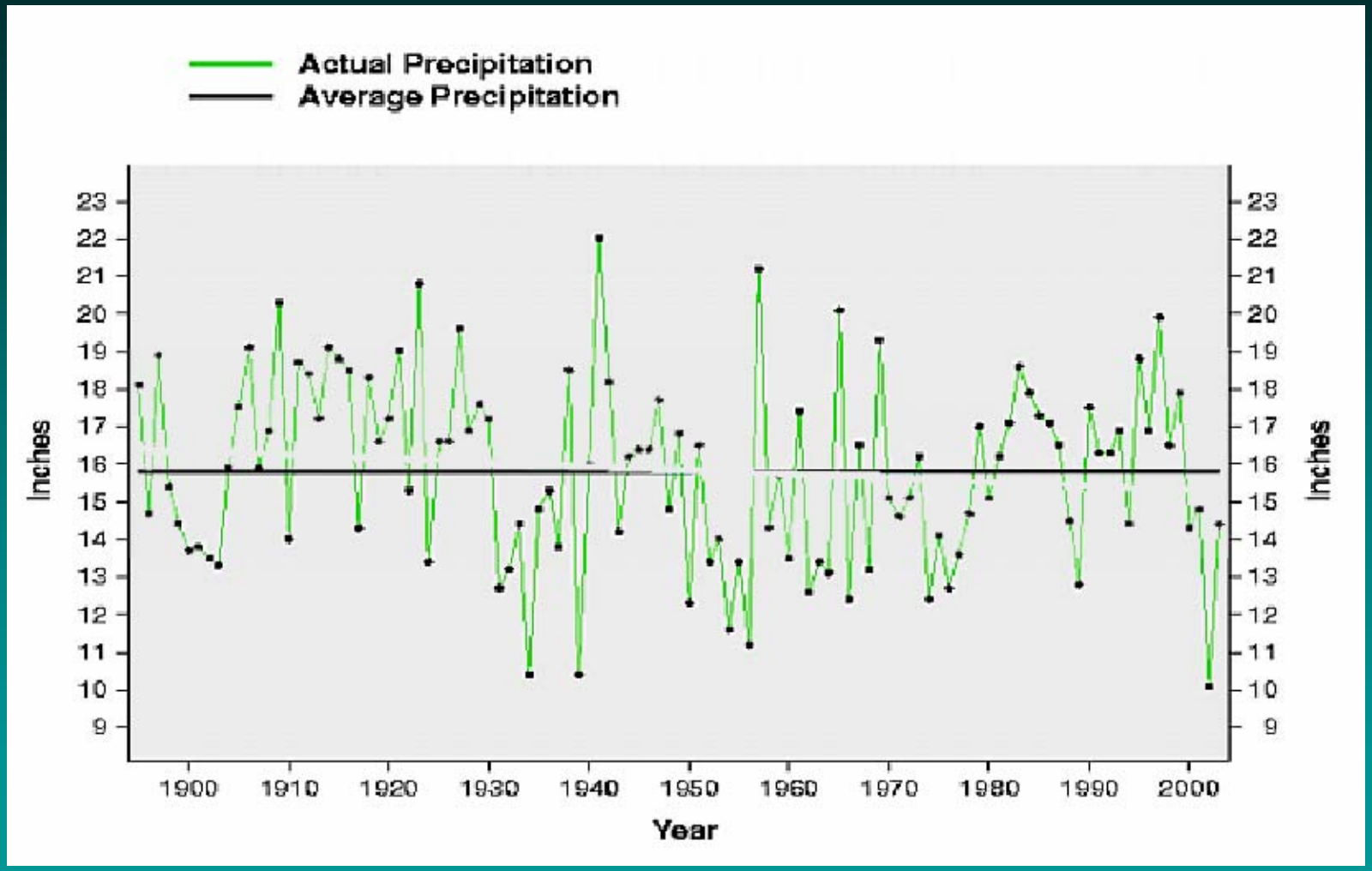
Colorado Springs Monthly Average Precipitation (1971-2000)



Average Monthly Precipitation for Selected Sites

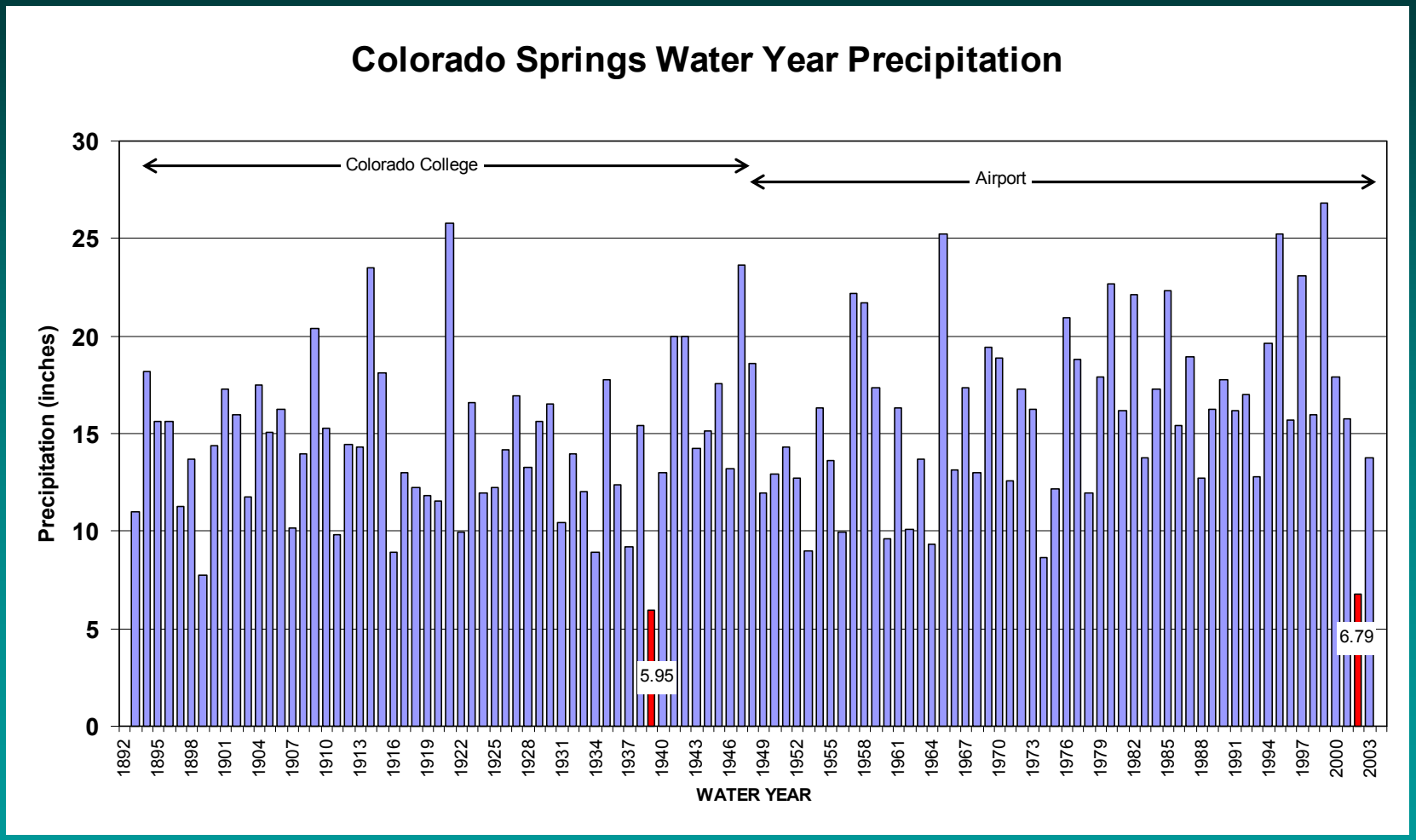


Statewide Annual Precipitation History

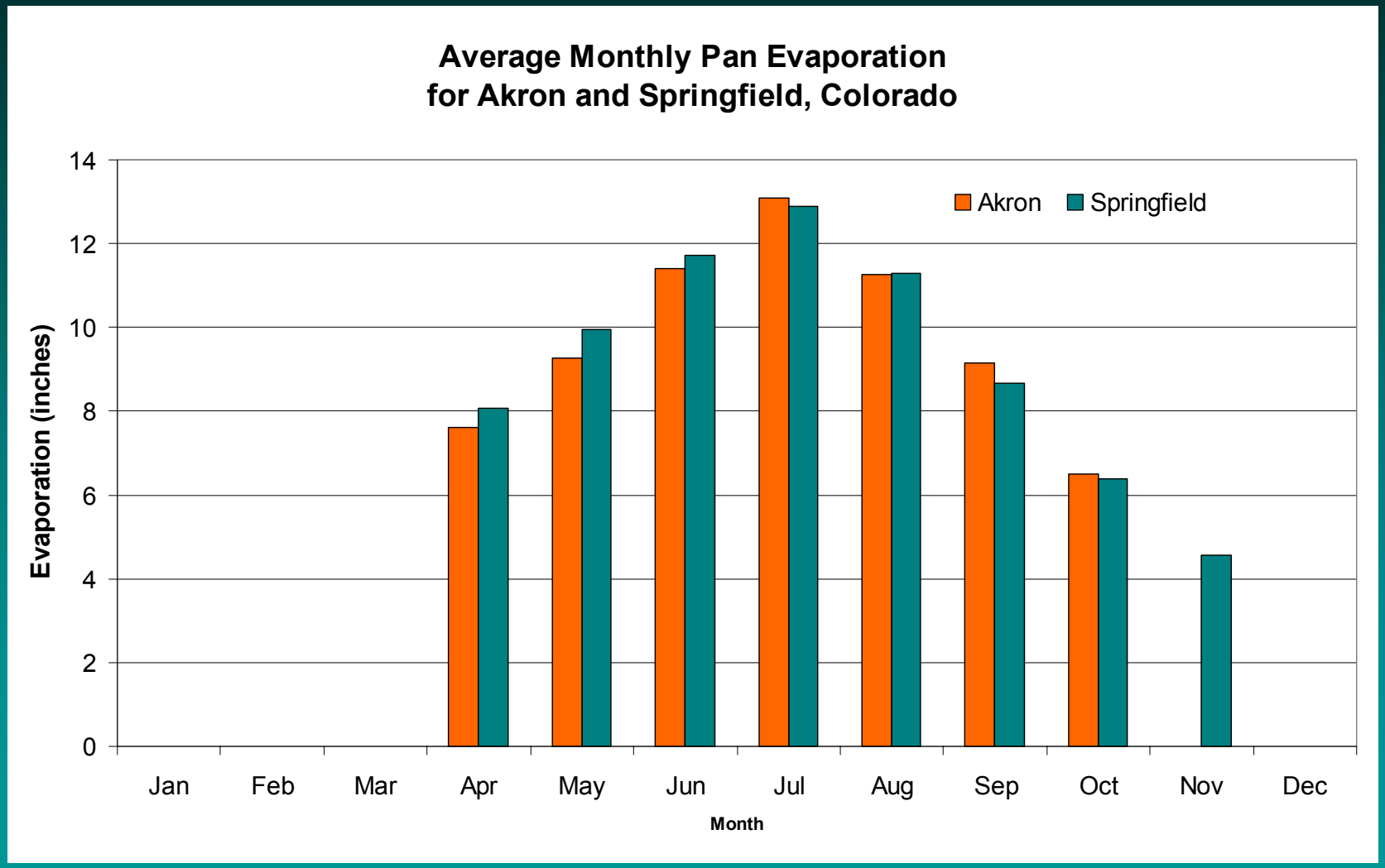


http://lwf.ncdc.noaa.gov/oa/climate/research/cag3/CO.html

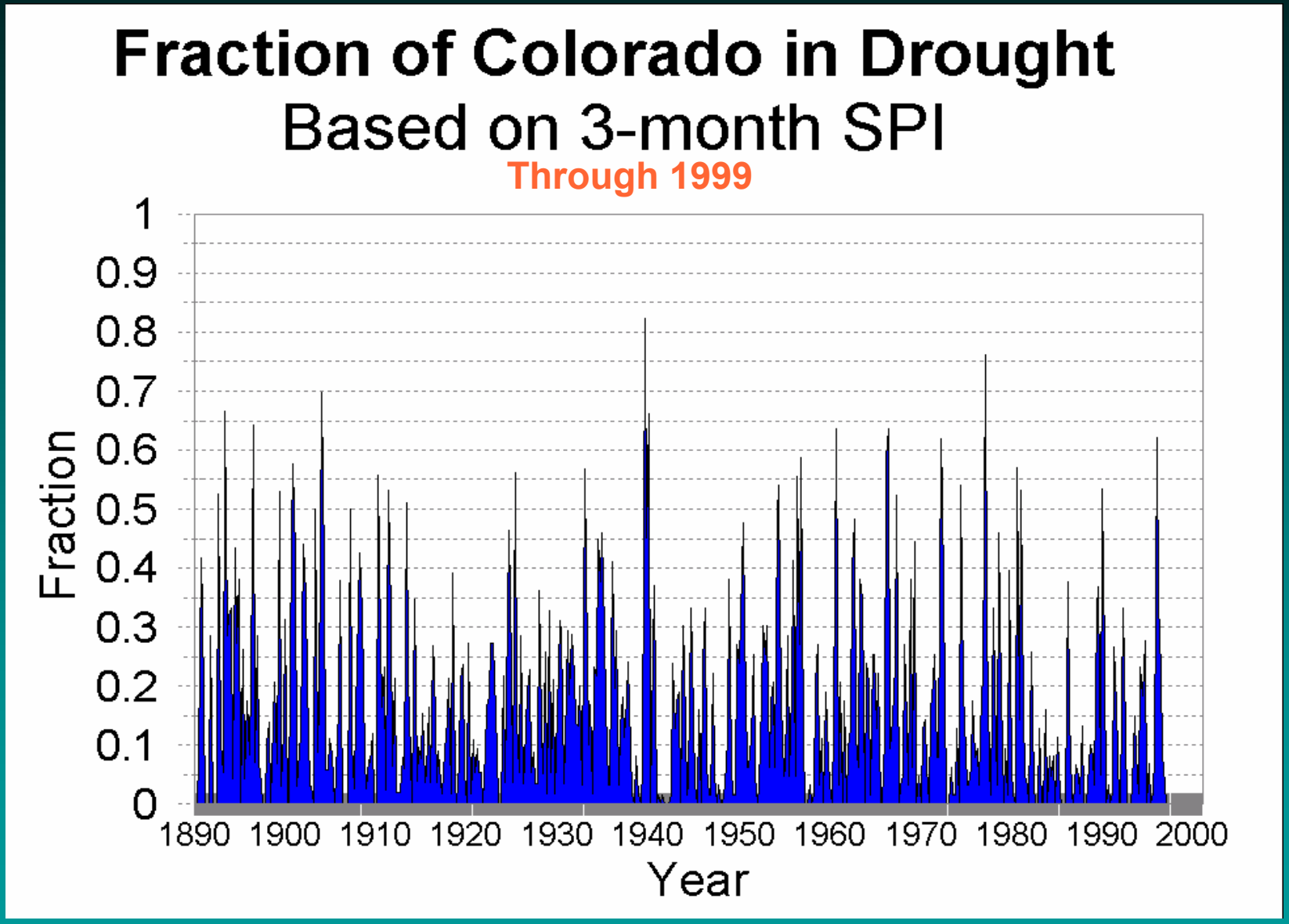
Colorado Springs Precipitation History



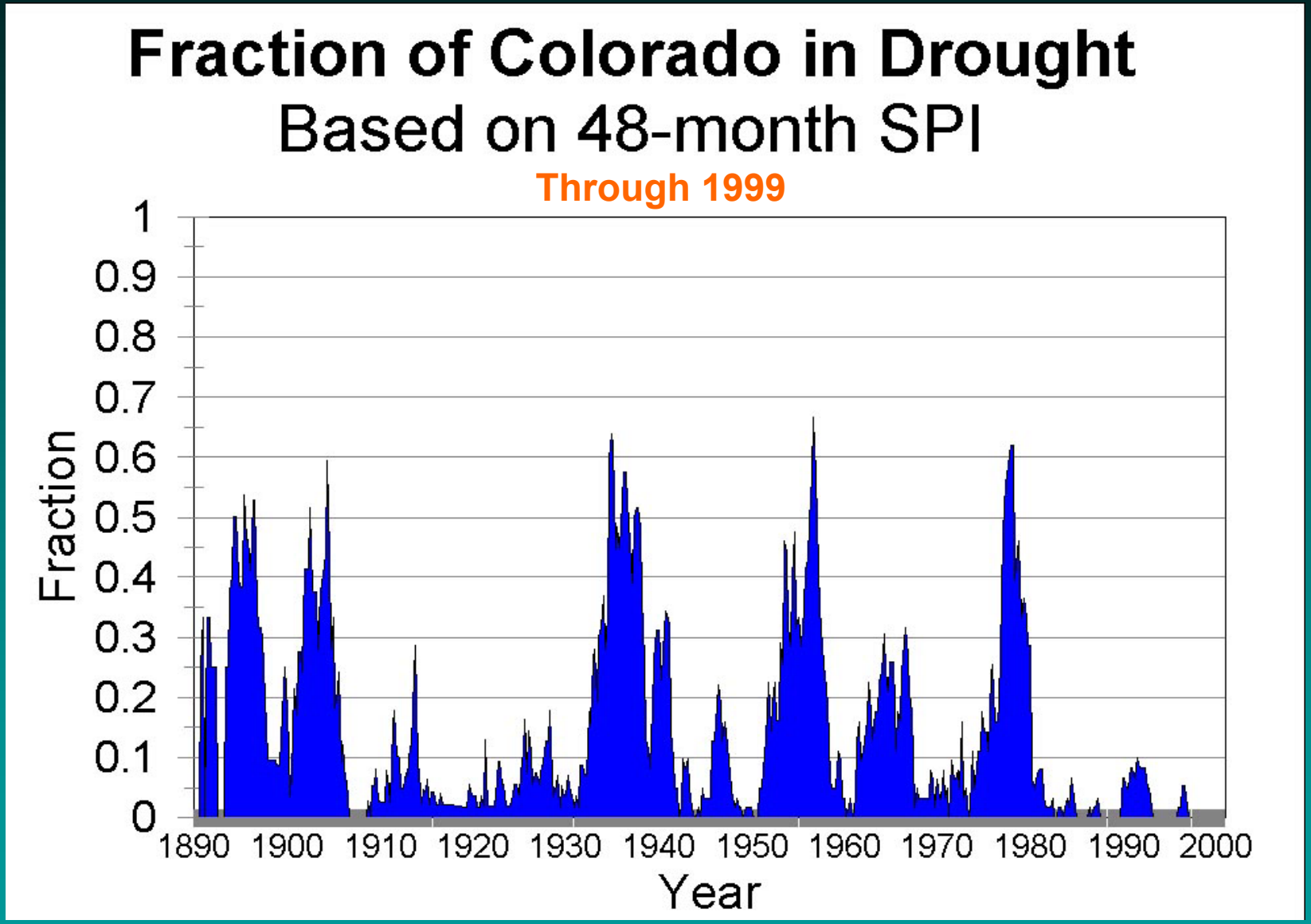
Monthly Average Pan Evaporation



3-Month SPI

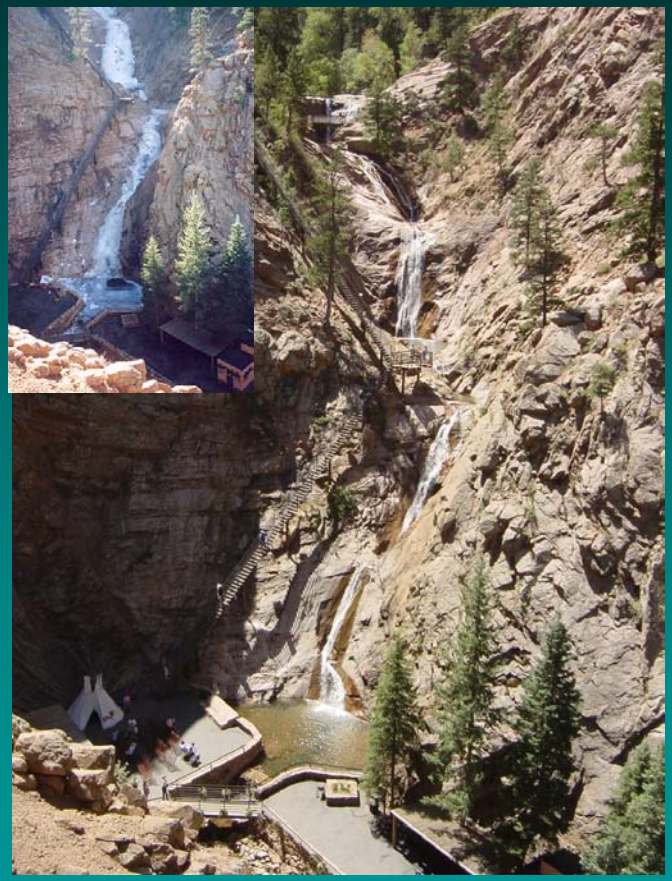

Fraction of Colorado in Drought
Based on 3-month SPI
Through 1999
Fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year

48-Month SPI


Fraction of Colorado in Drought
Based on 48-month SPI
Through 1999
Fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year

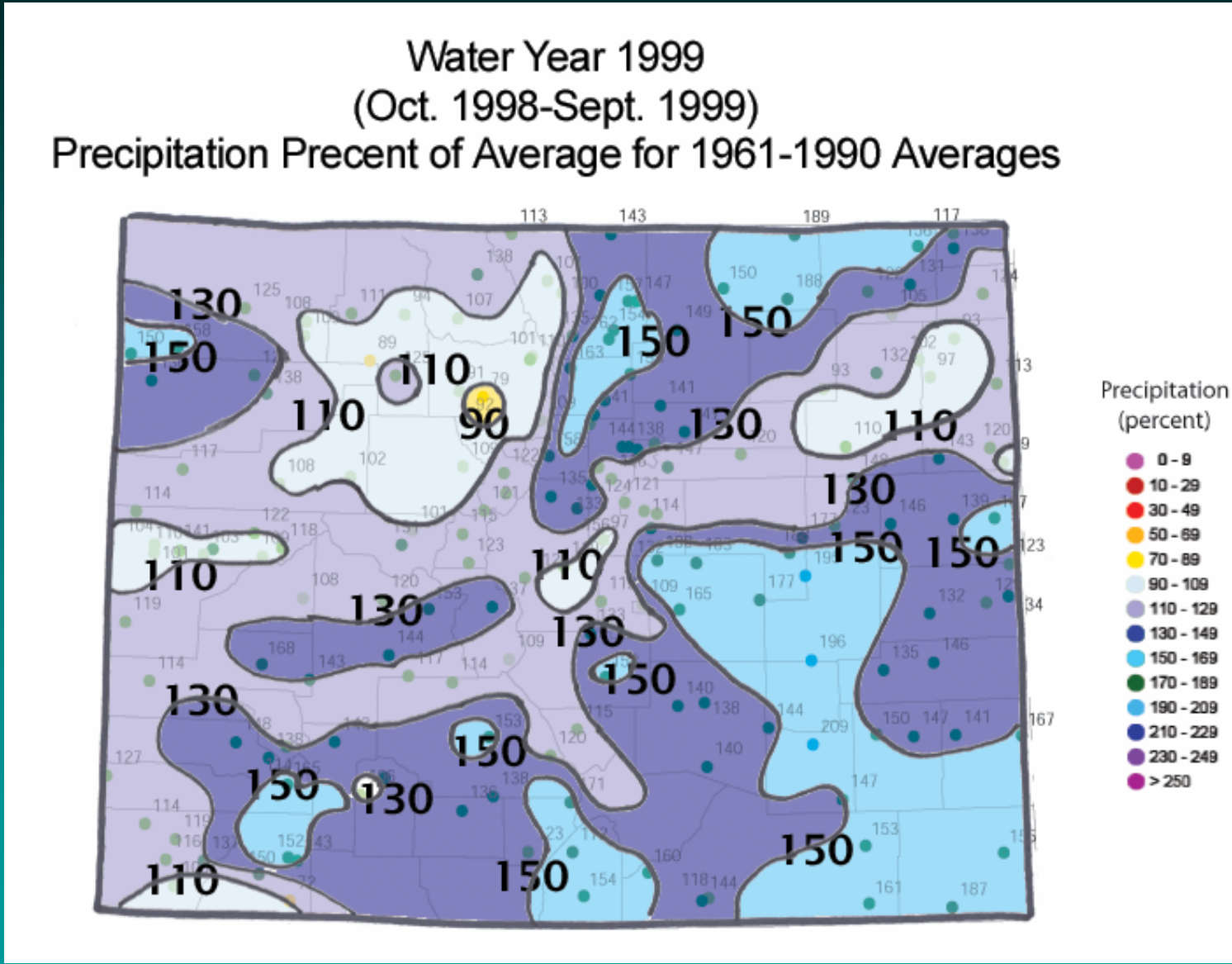
The Evolution of Our Recent Drought

Crystal Lakes serves Colorado Springs, Sept 2002

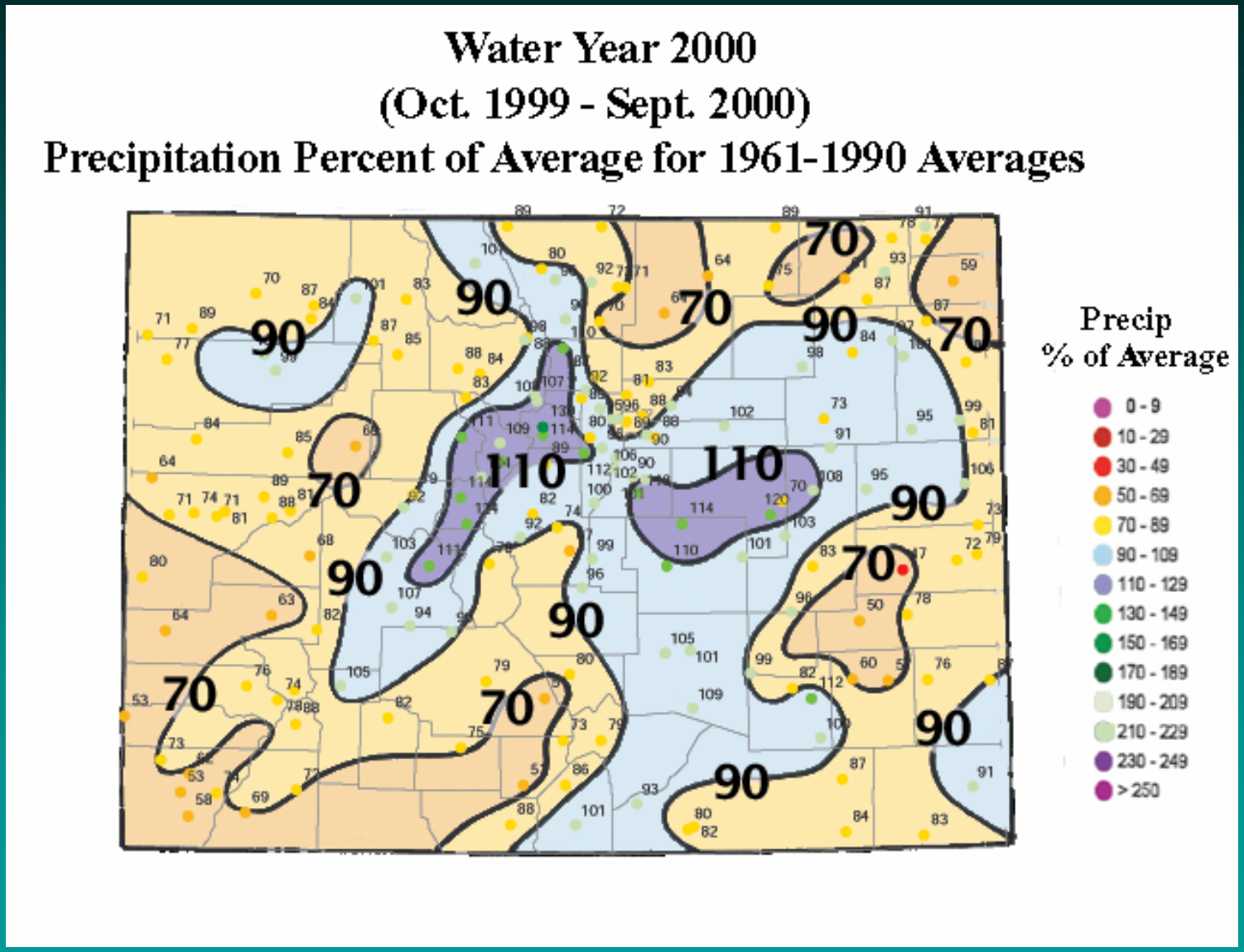


Seven Falls, during the 2002 drought water was pumped to top.

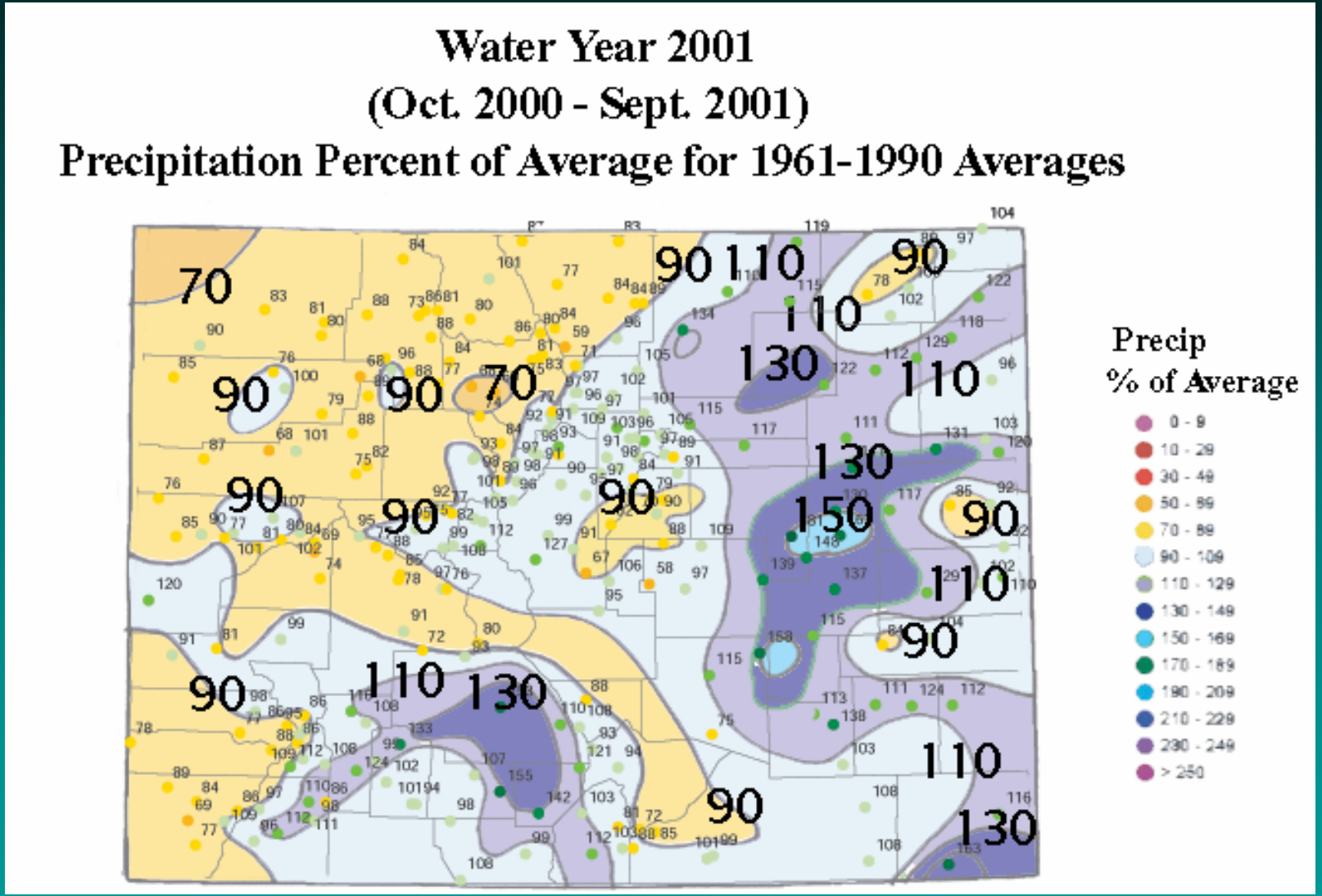
1999 Water Year Precipitation



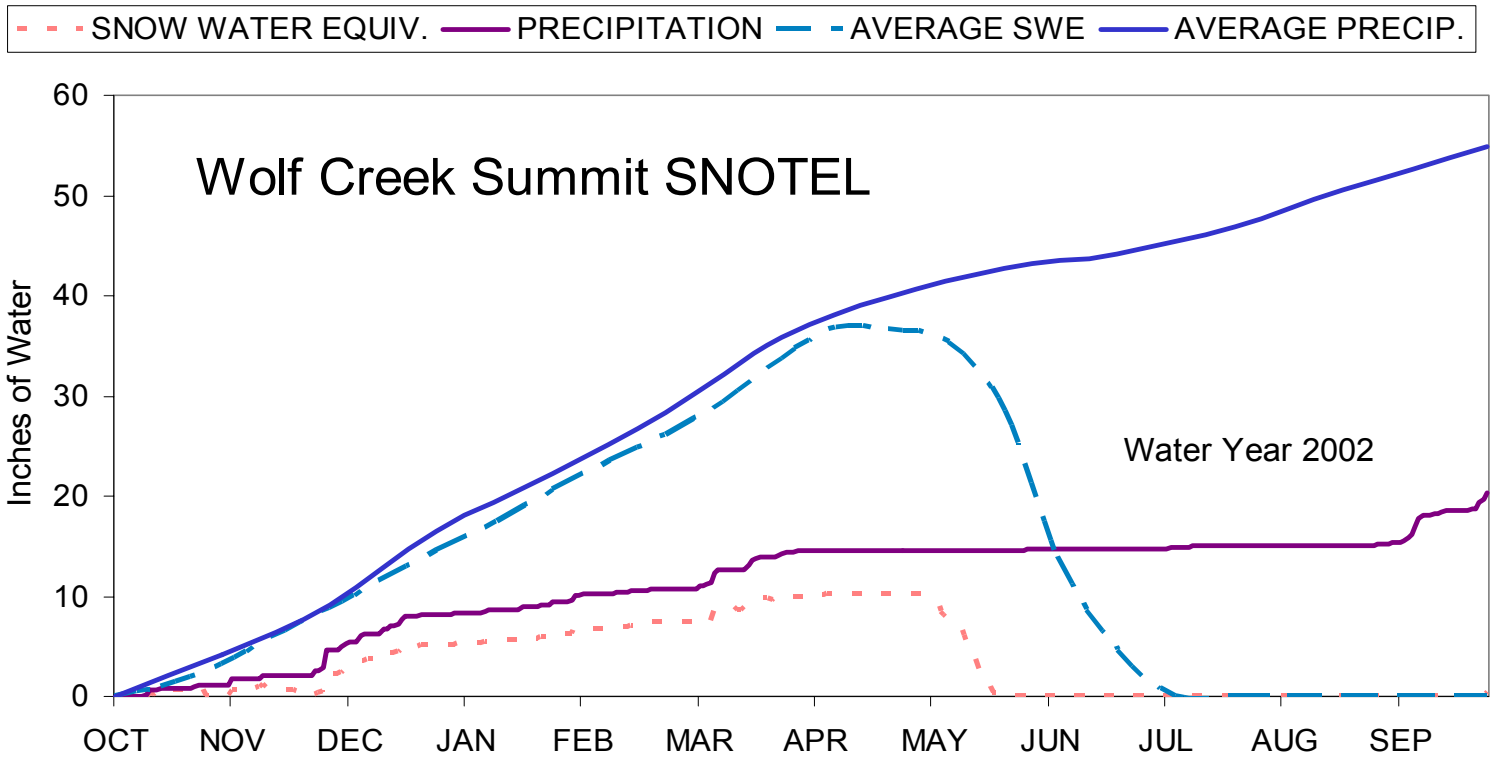
2000 Water Year Precipitation



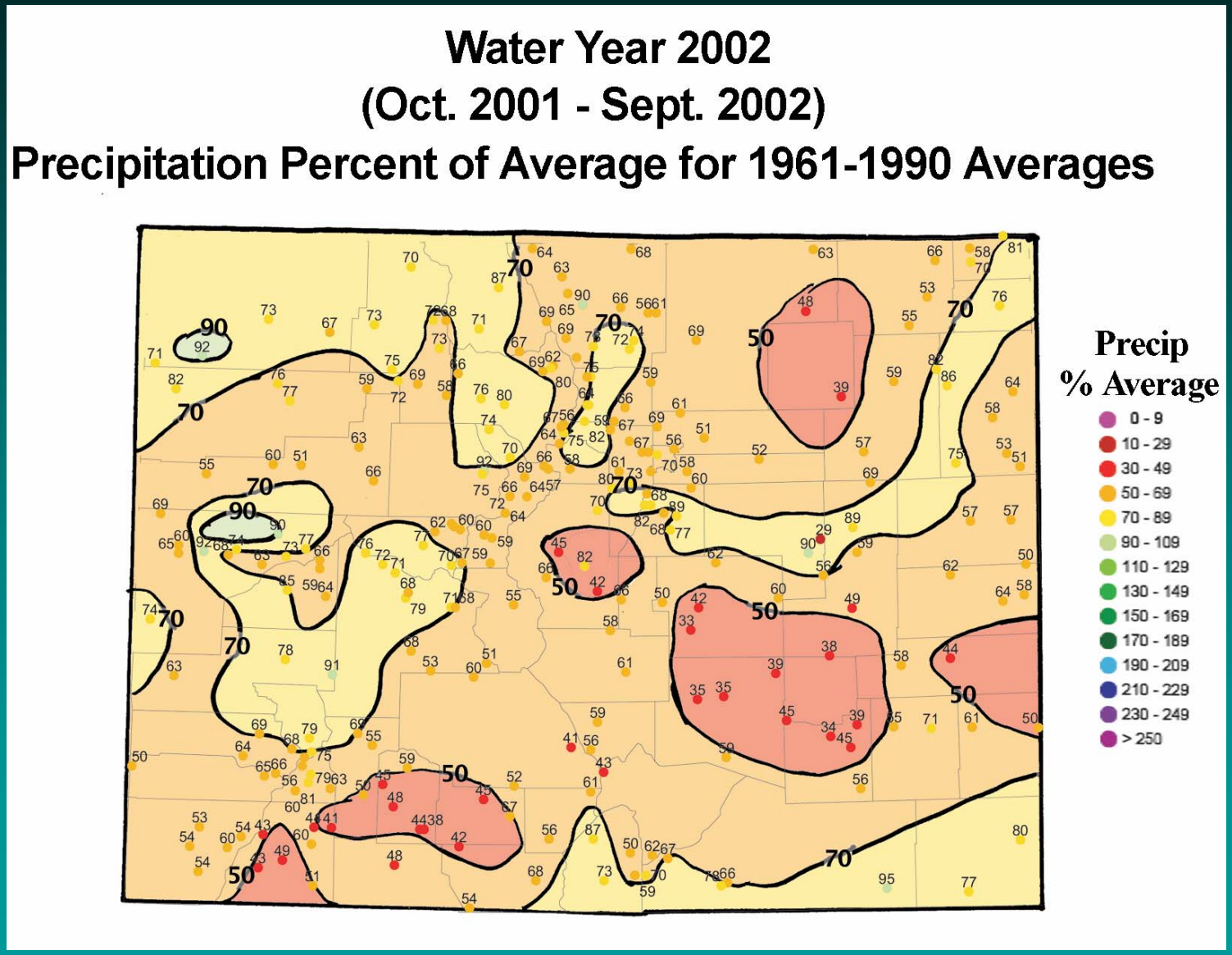
2001 Water Year Precipitation



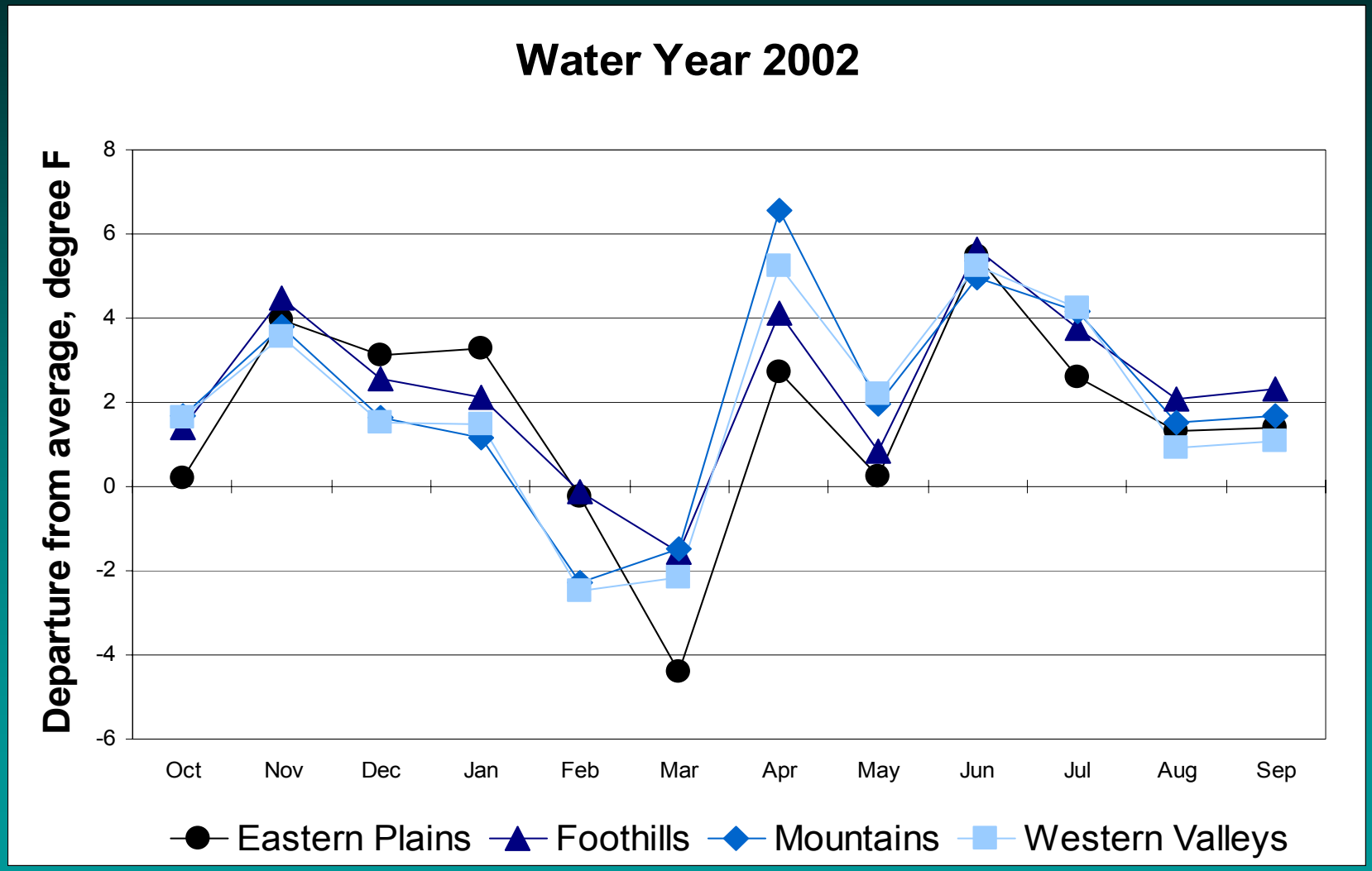
2002 Snow Water Equivalent



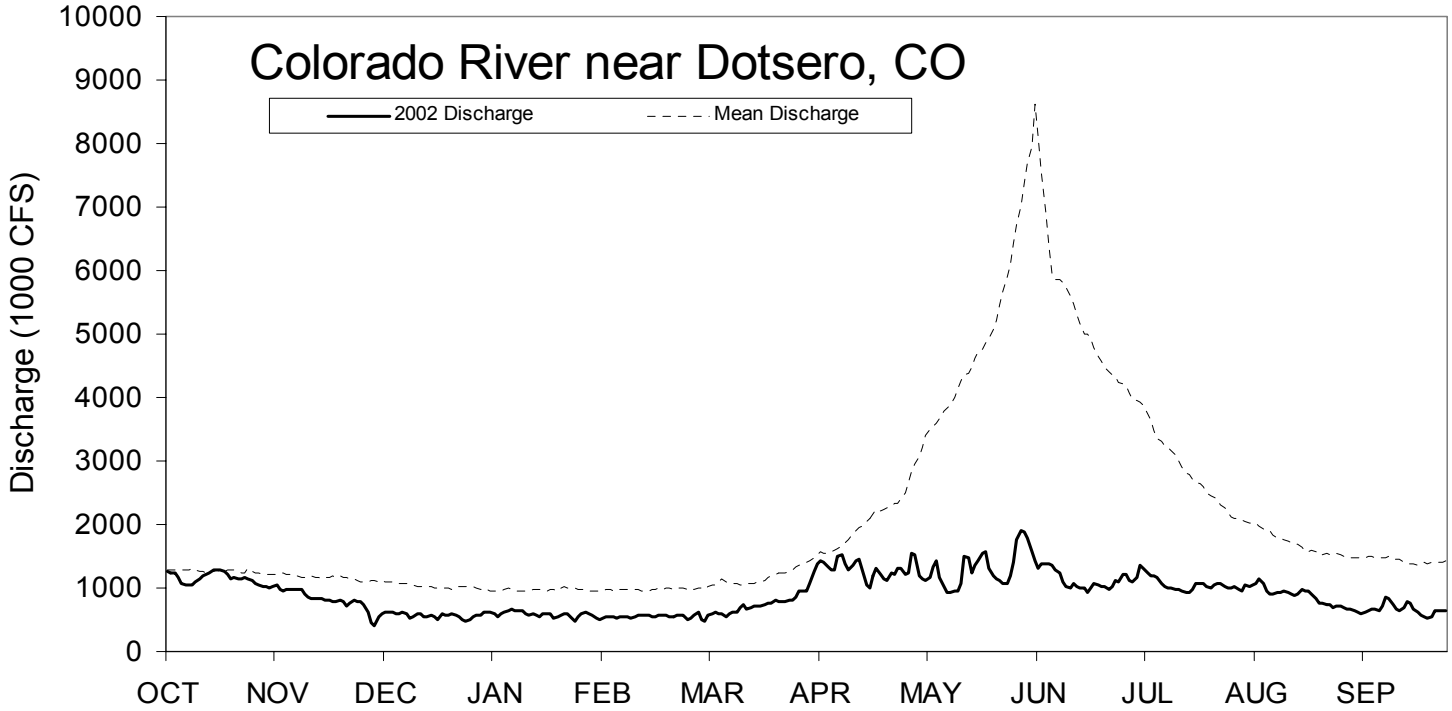
2002 Water Year Precipitation



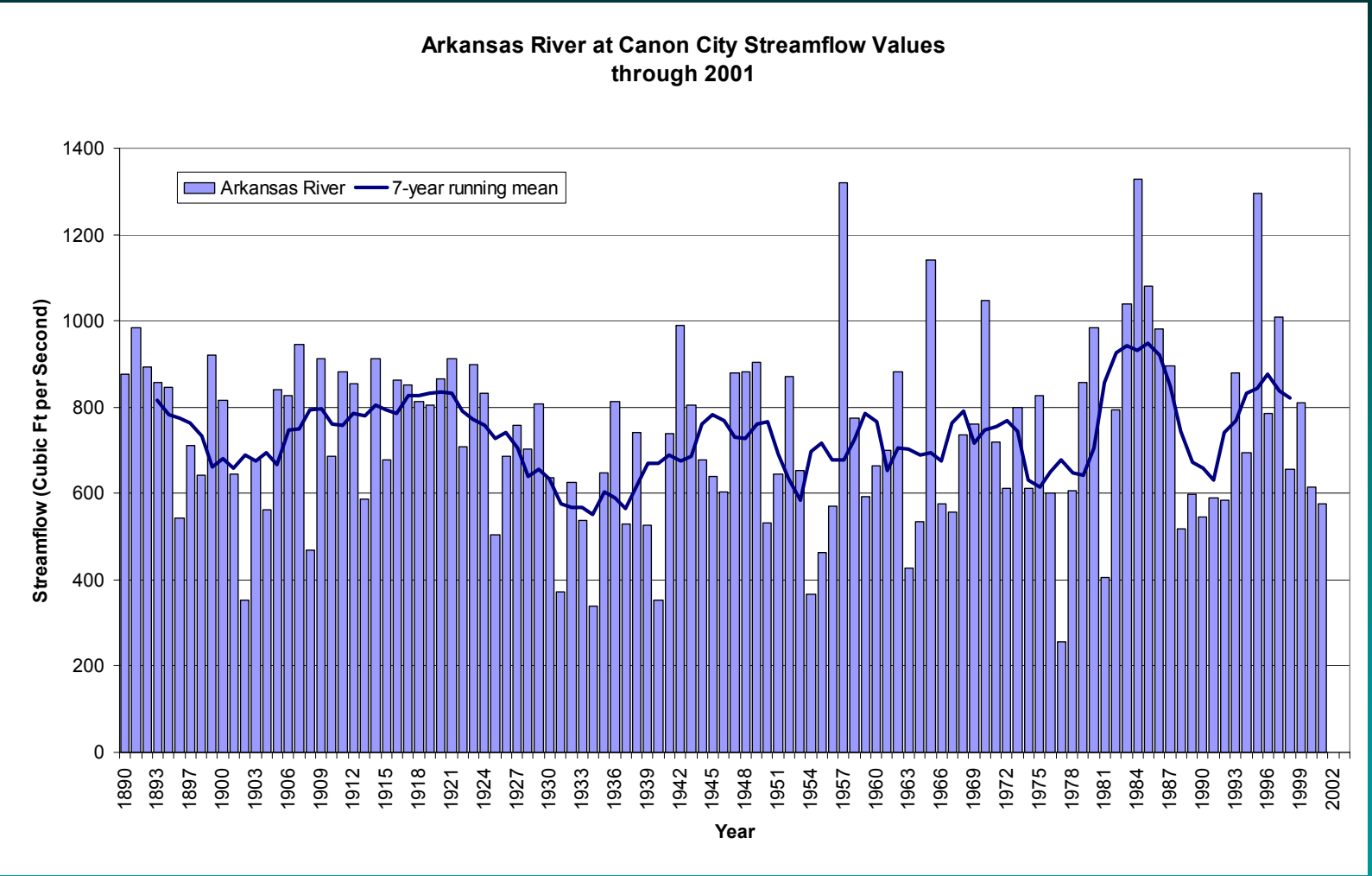
WY2002 Temperature Departures



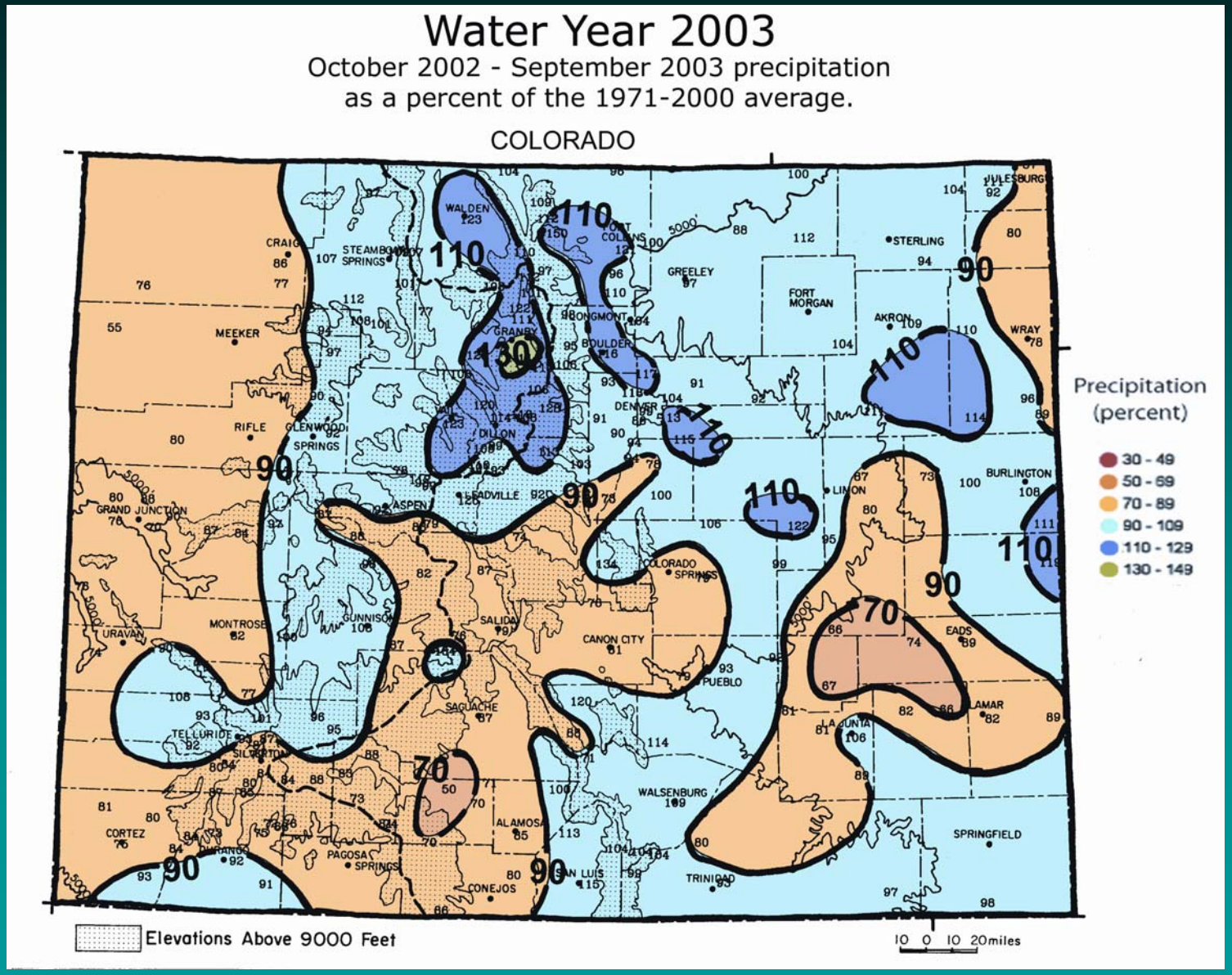
2002 Daily Streamflow



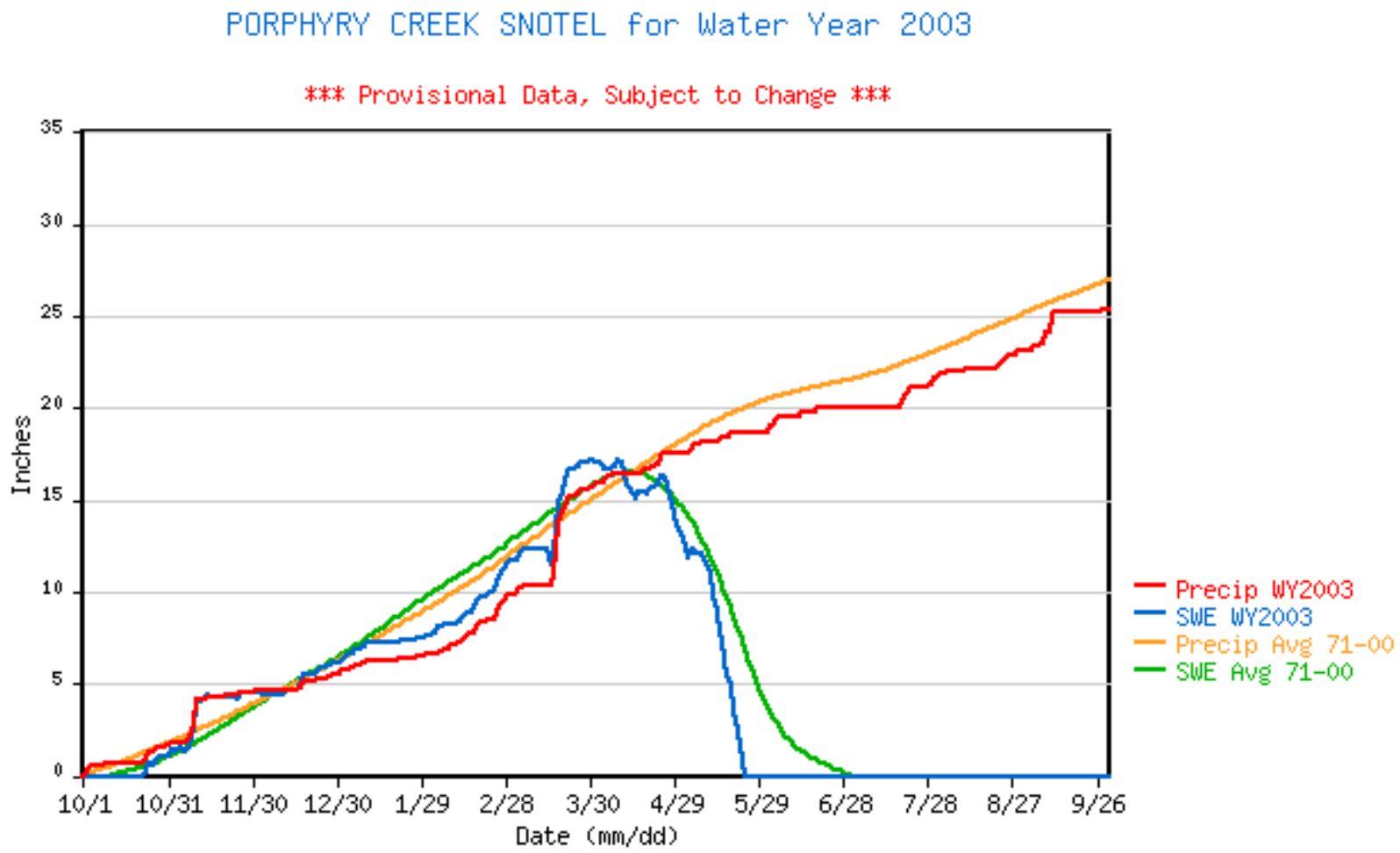
Arkansas River at Canon City Streamflow History



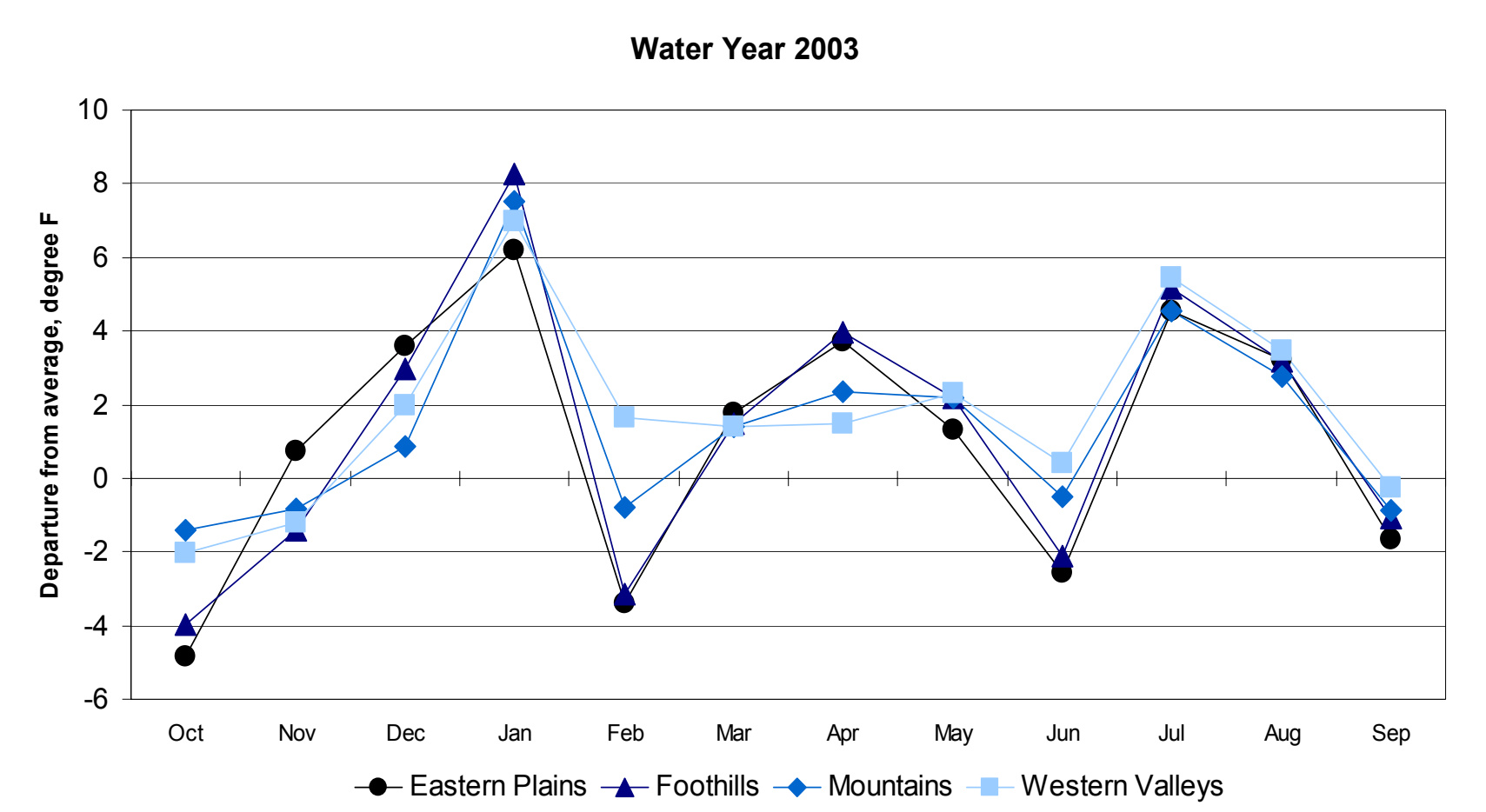
2003 Water Year Precipitation



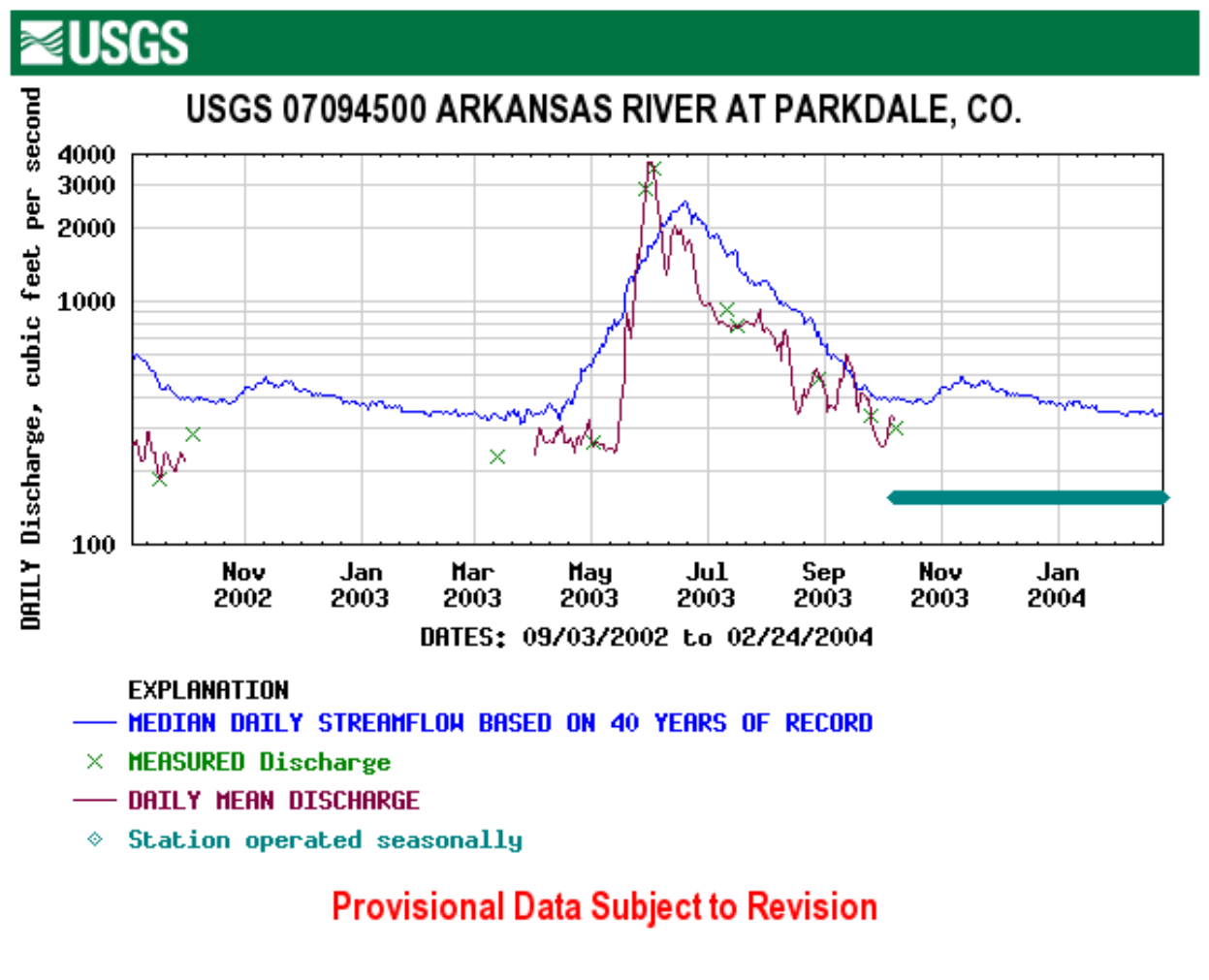
2003 SWE Porphyry Creek



WY2003 Temperature Departures



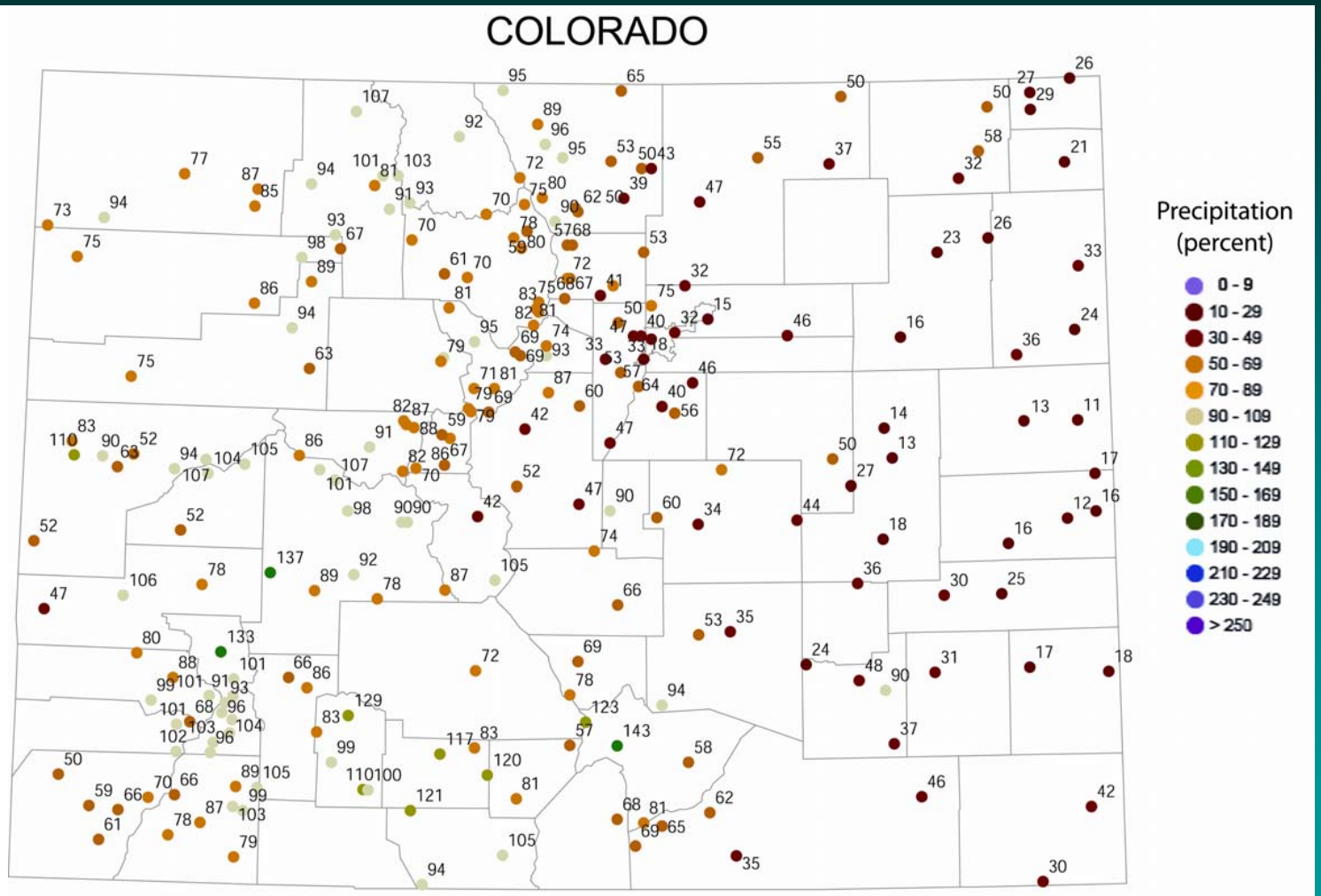
2003 Daily Streamflow



http://water.usgs.gov/cgi-bin/daily_flow?co

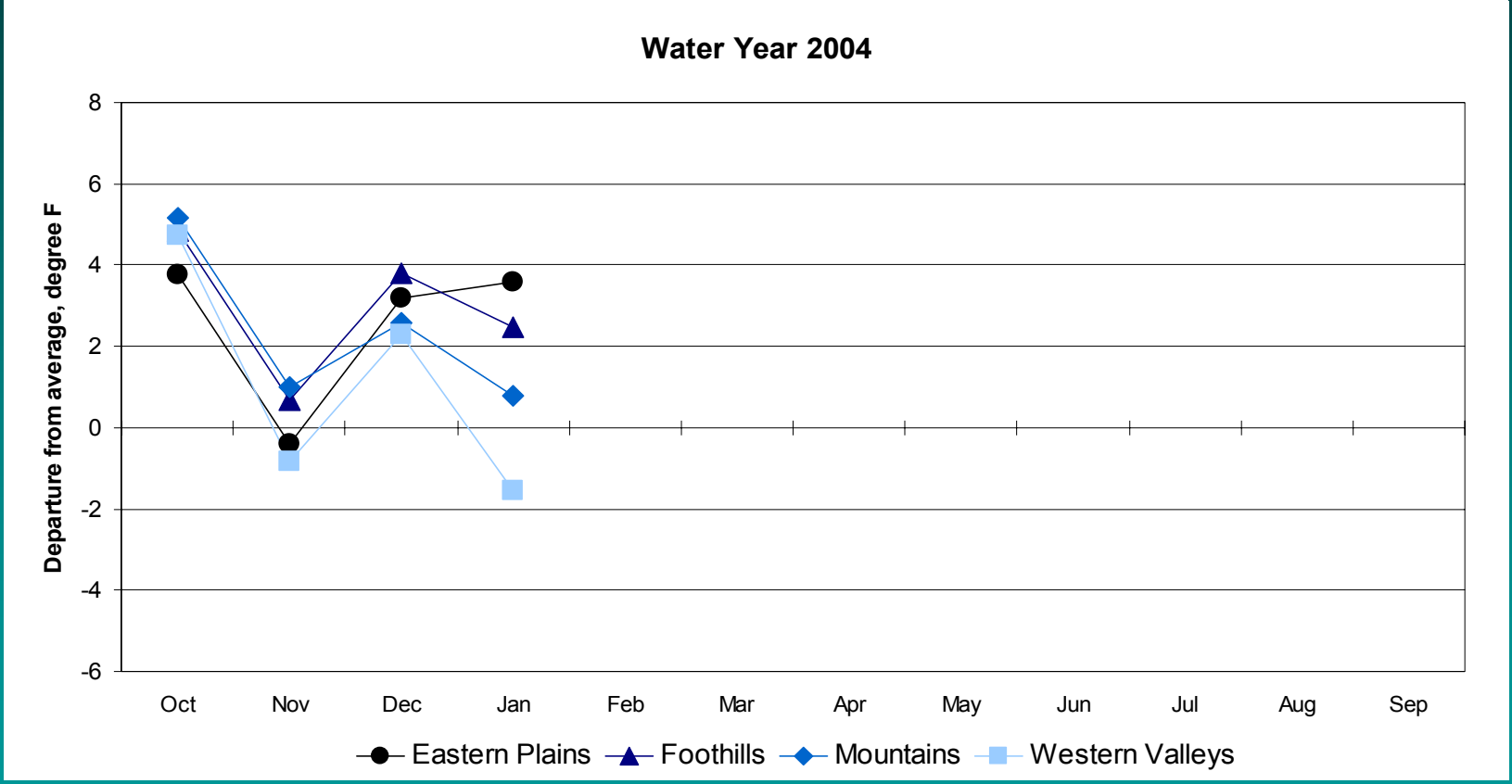
Where Do We Stand Now?

Water Year 2004 (Oct 03-Jan 04) Precipitation as Percent of Average

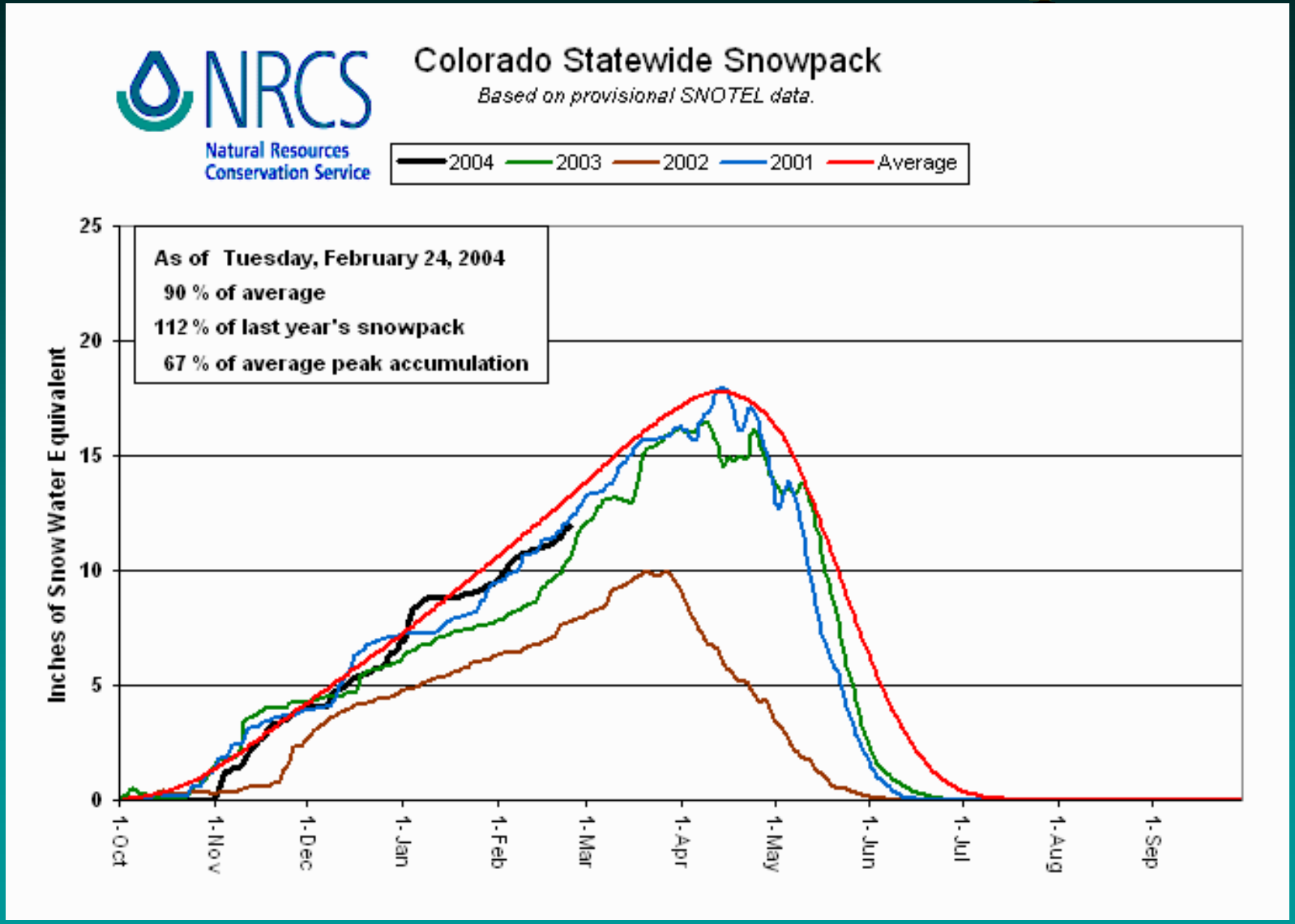


Water Year 2004 (October 2003 through January 2004) precipitation as a percent of the 1971-2000 average.

WY2004 (Oct 2003–Jan 2004) Temperature Departures

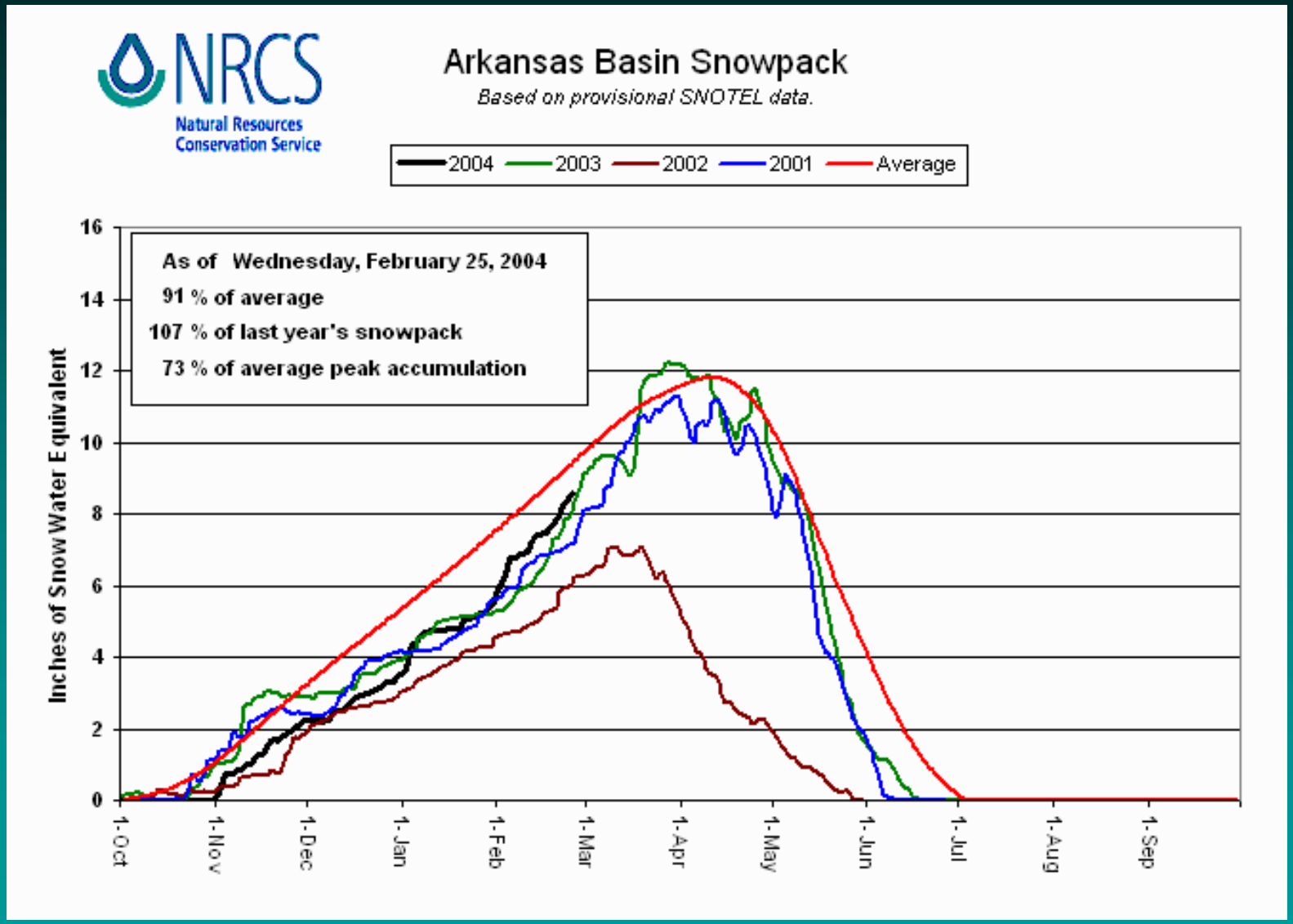


Colorado Statewide Snowpack



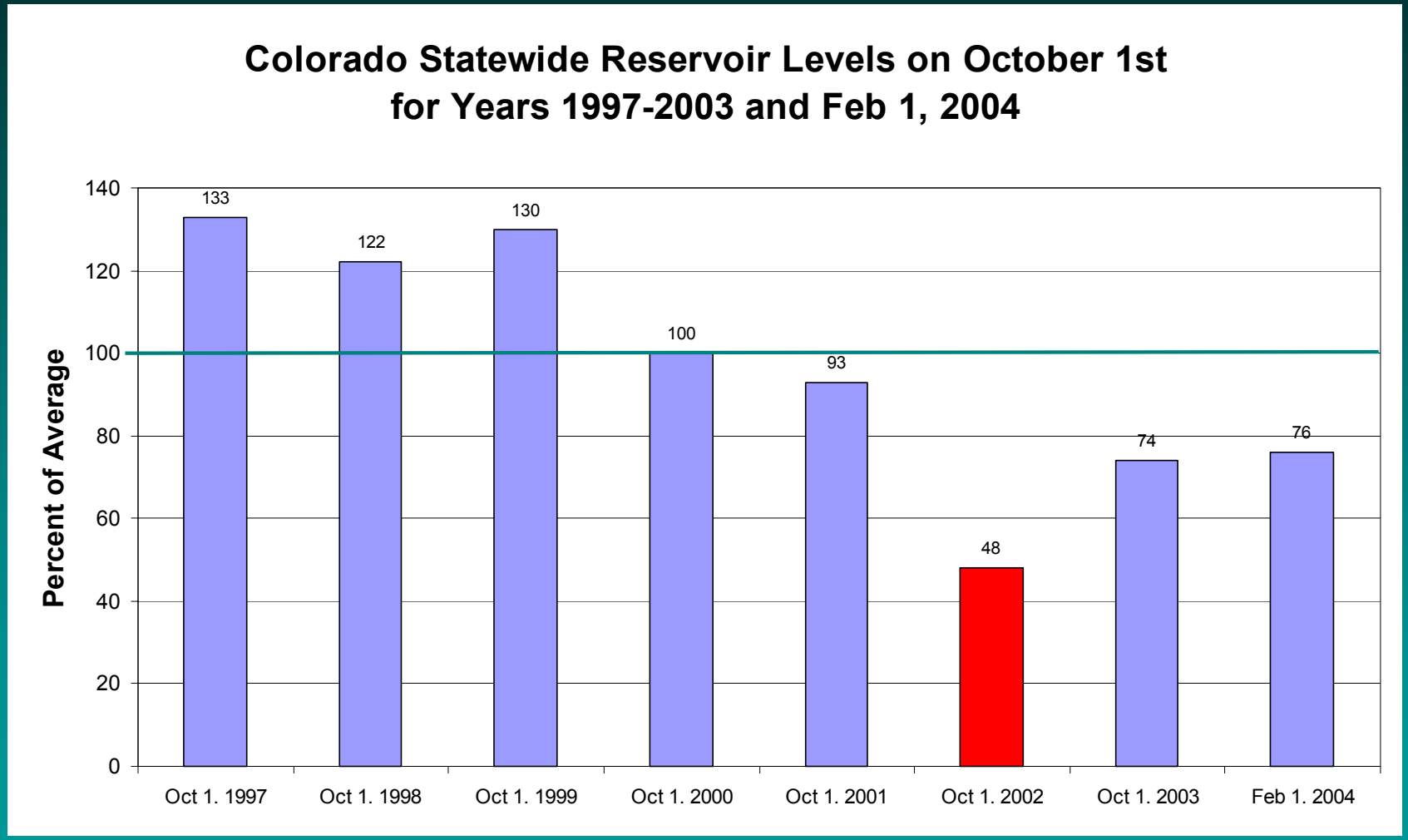
http://www.co.nrcs.usda.gov/snow/data/basins.html

Arkansas Basin Snowpack



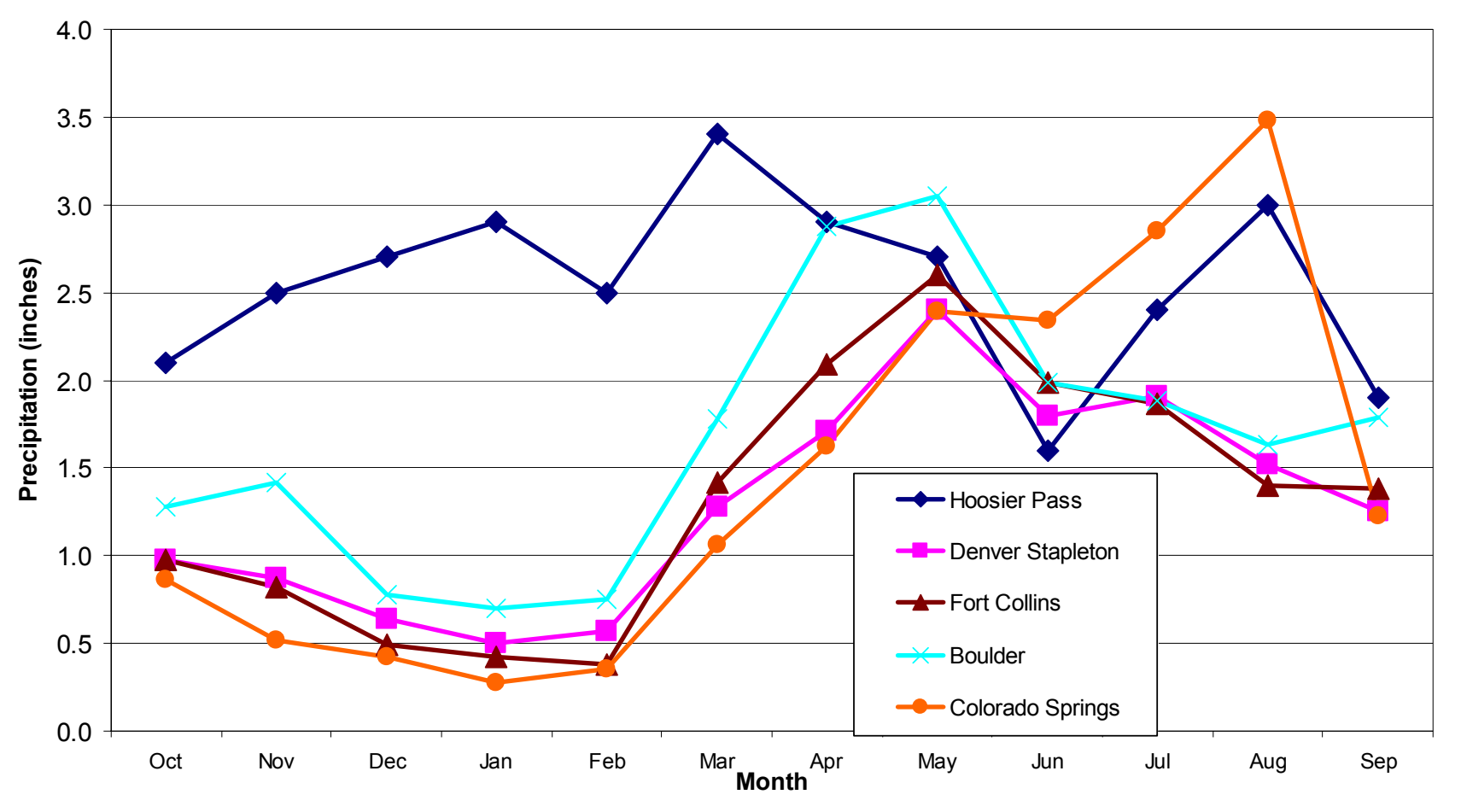
http://www.co.nrcs.usda.gov/snow/data/basins.html

Reservoir Levels



What Comes Next?

Front Range Monthly Average Precipitation



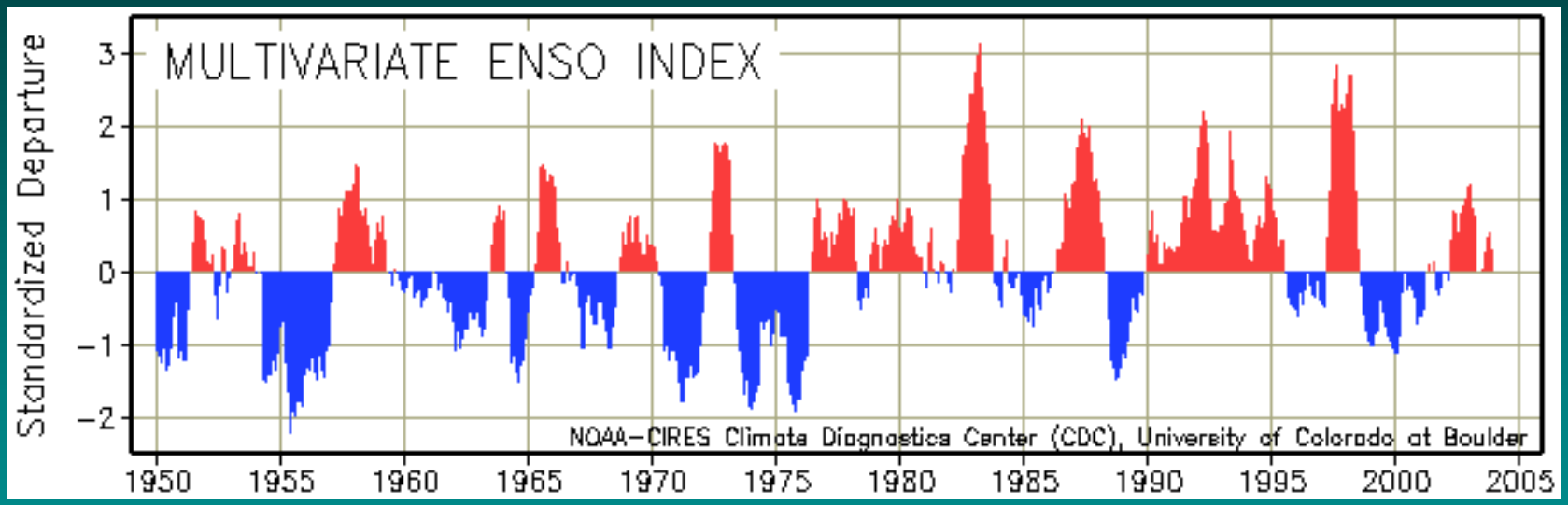
Positive Indicators

- Late winter snows
- Cool spring
- Multi-day precipitation
- Wet Snow
- Low intensity rainfall
- Light winds
- High humidity
- Abundant cloud cover

Negative Indicators

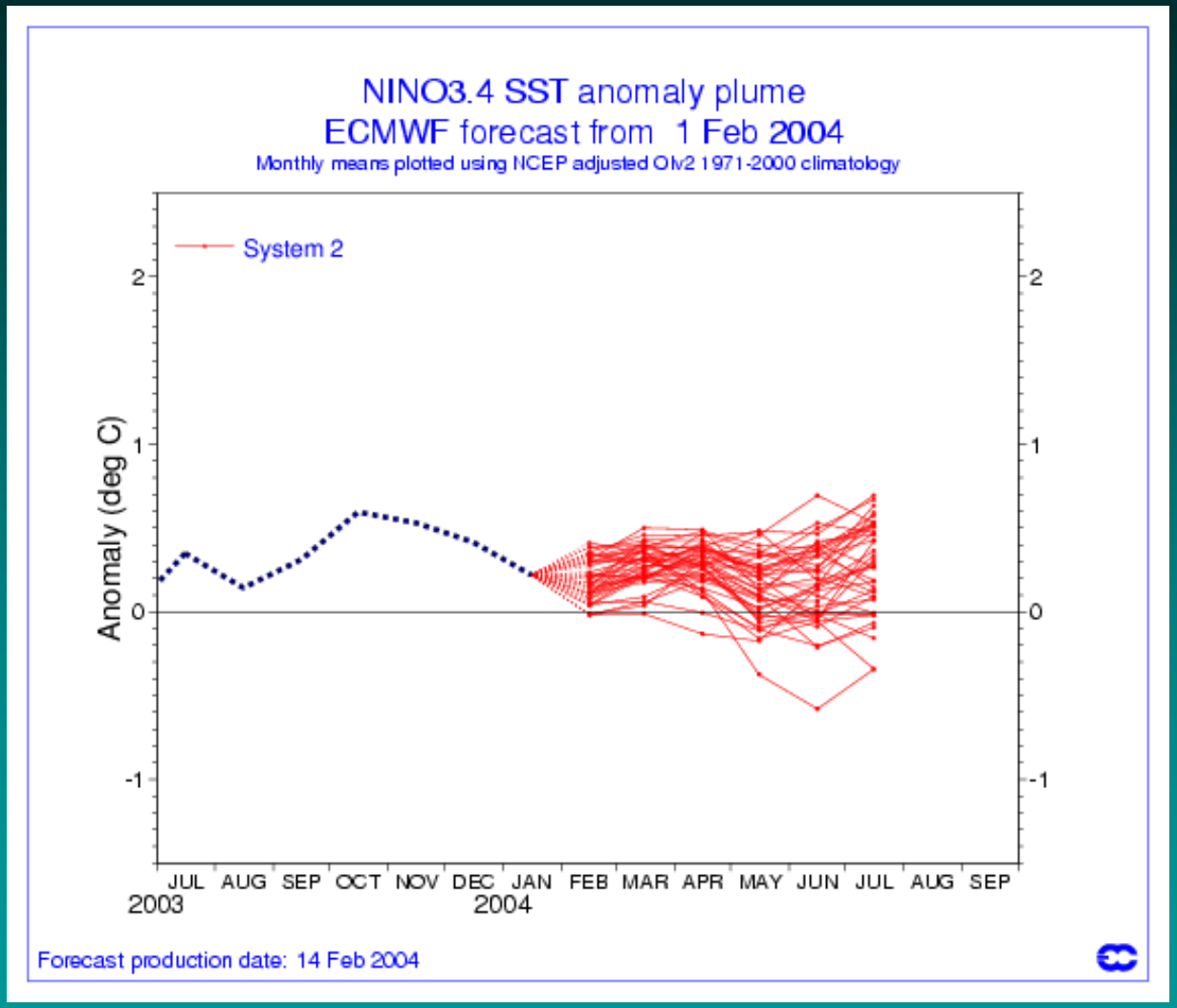
- Little late winter snow
- Missed opportunities
- Warm spring
- Brief, sporadic precipitation
- High intensity rainfall
- Frequent, strong winds
- Low humidity
- Abundant sunshine

Multivariate ENSO Index (MEI)



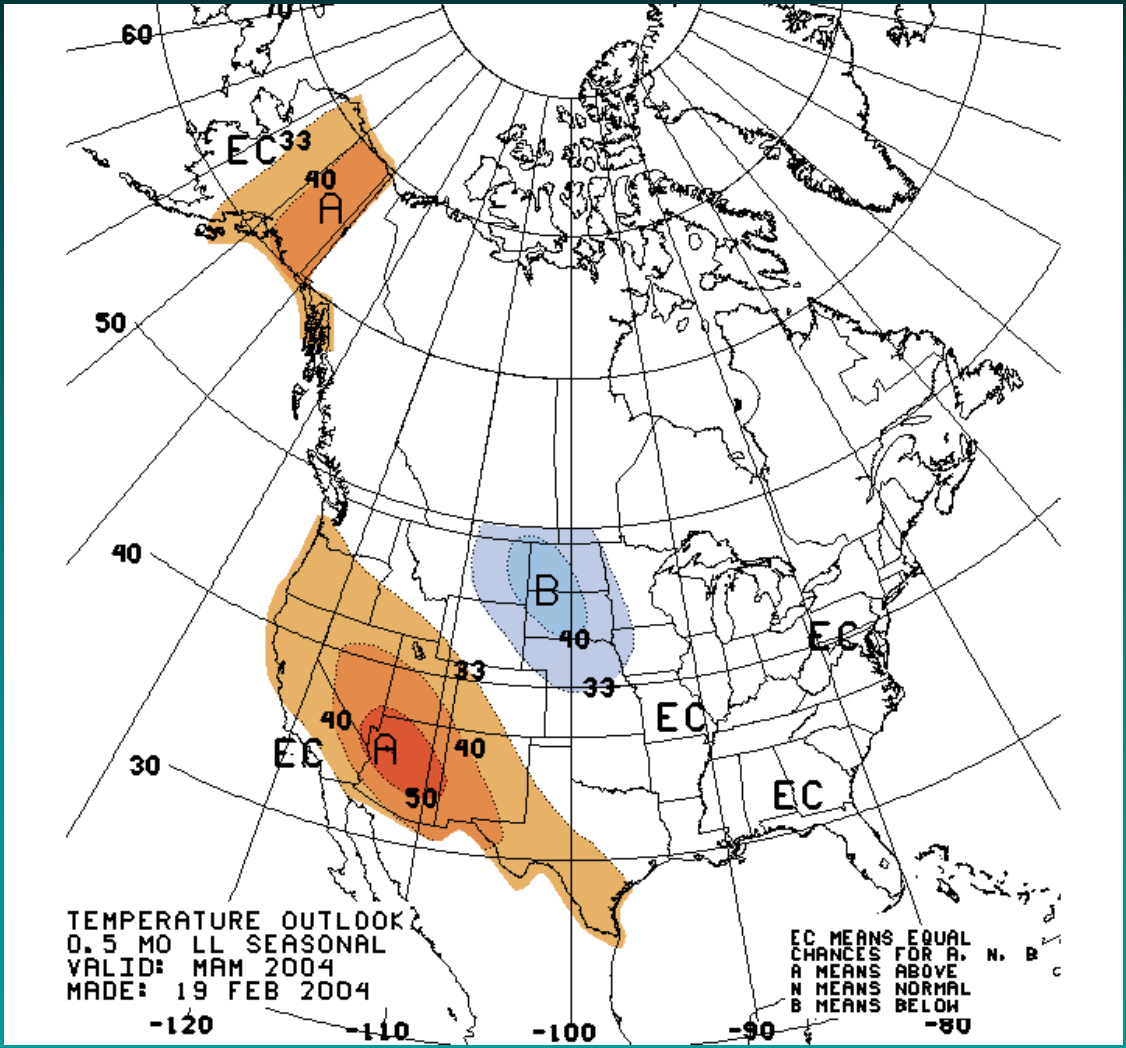
http://www.cdc.noaa.gov/~kew/MEI/

El Nino Forecast



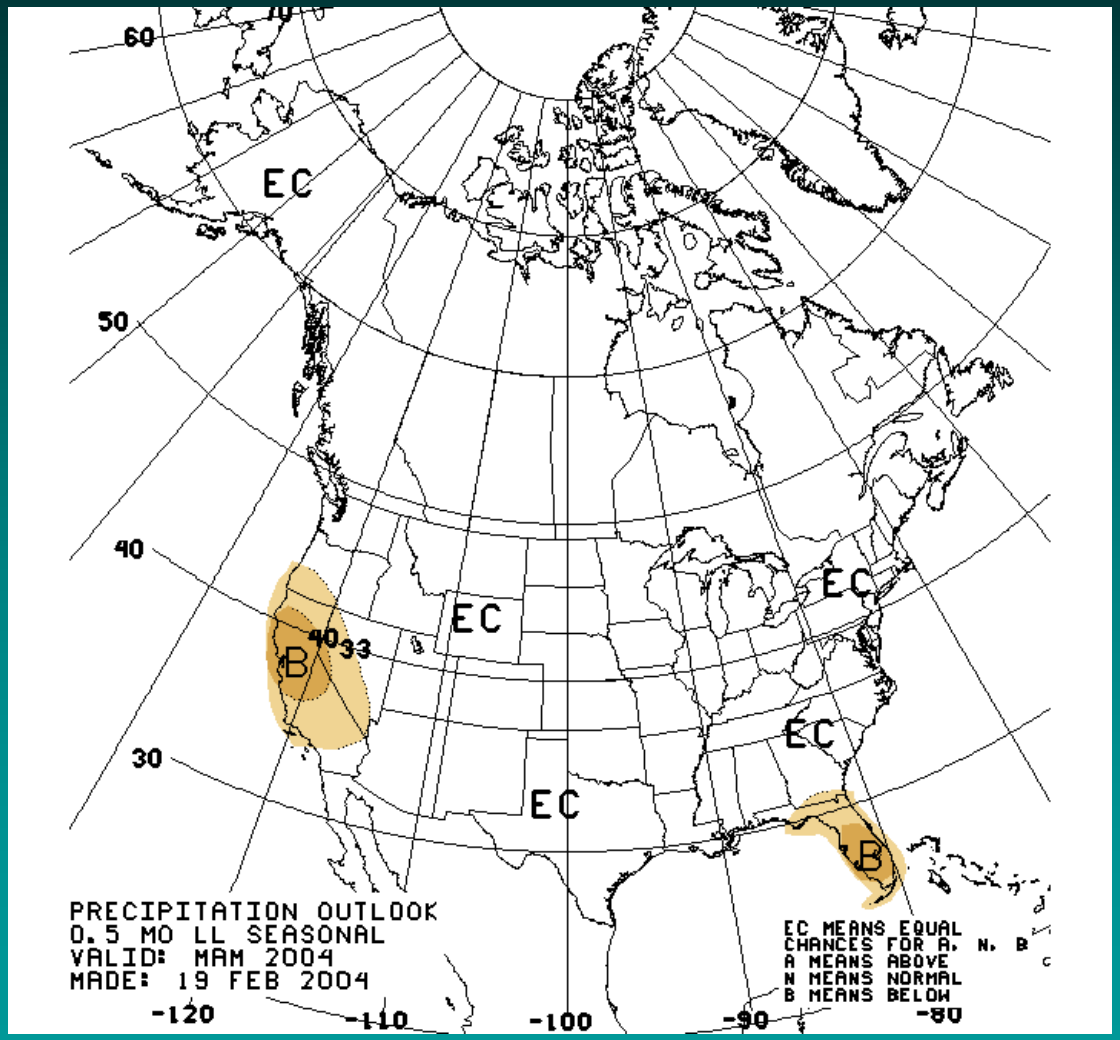
http://www.cdc.noaa.gov/~kew/SWcasts/

Temperature
March – May 2004



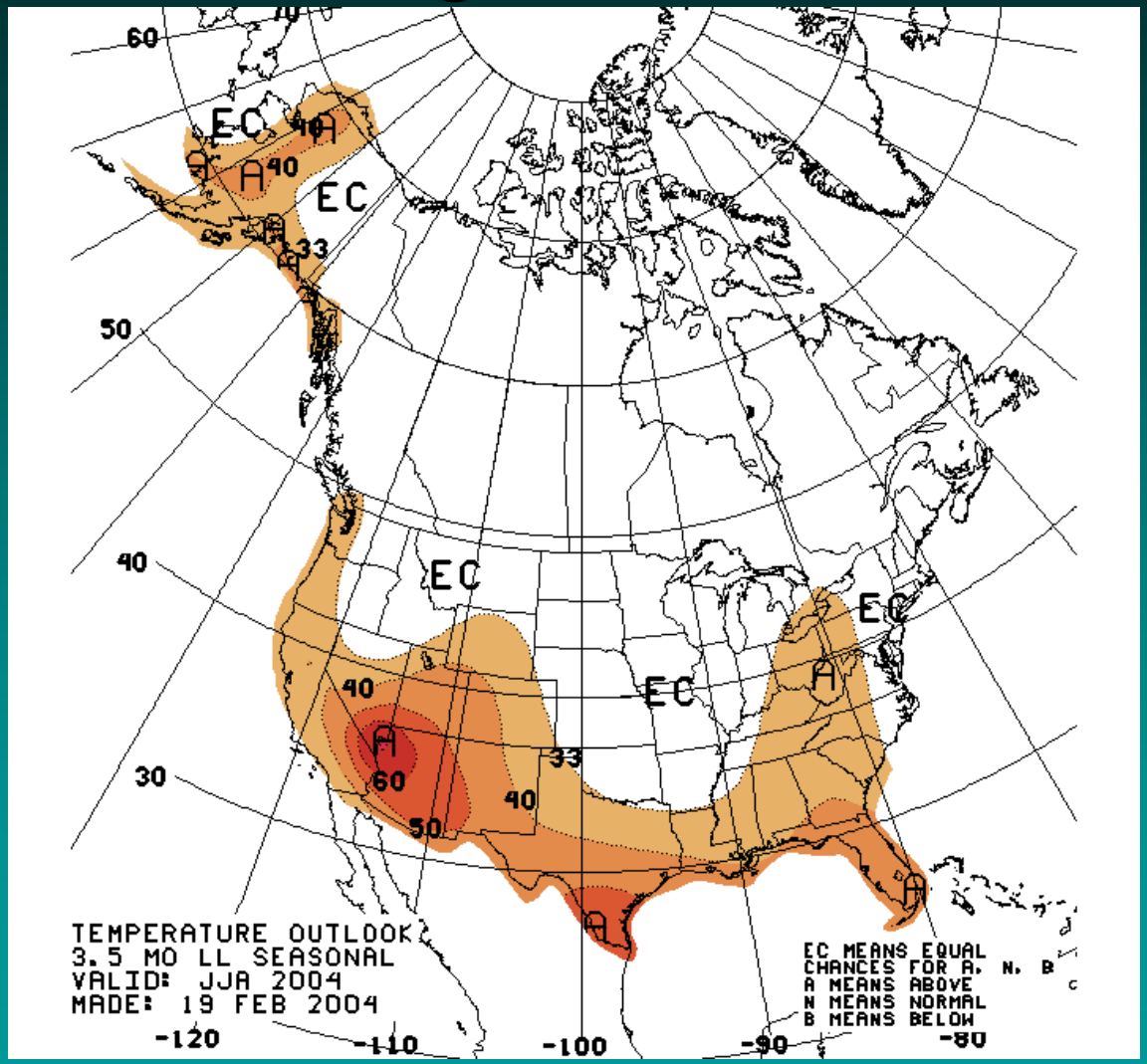
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Precipitation
March – May 2004



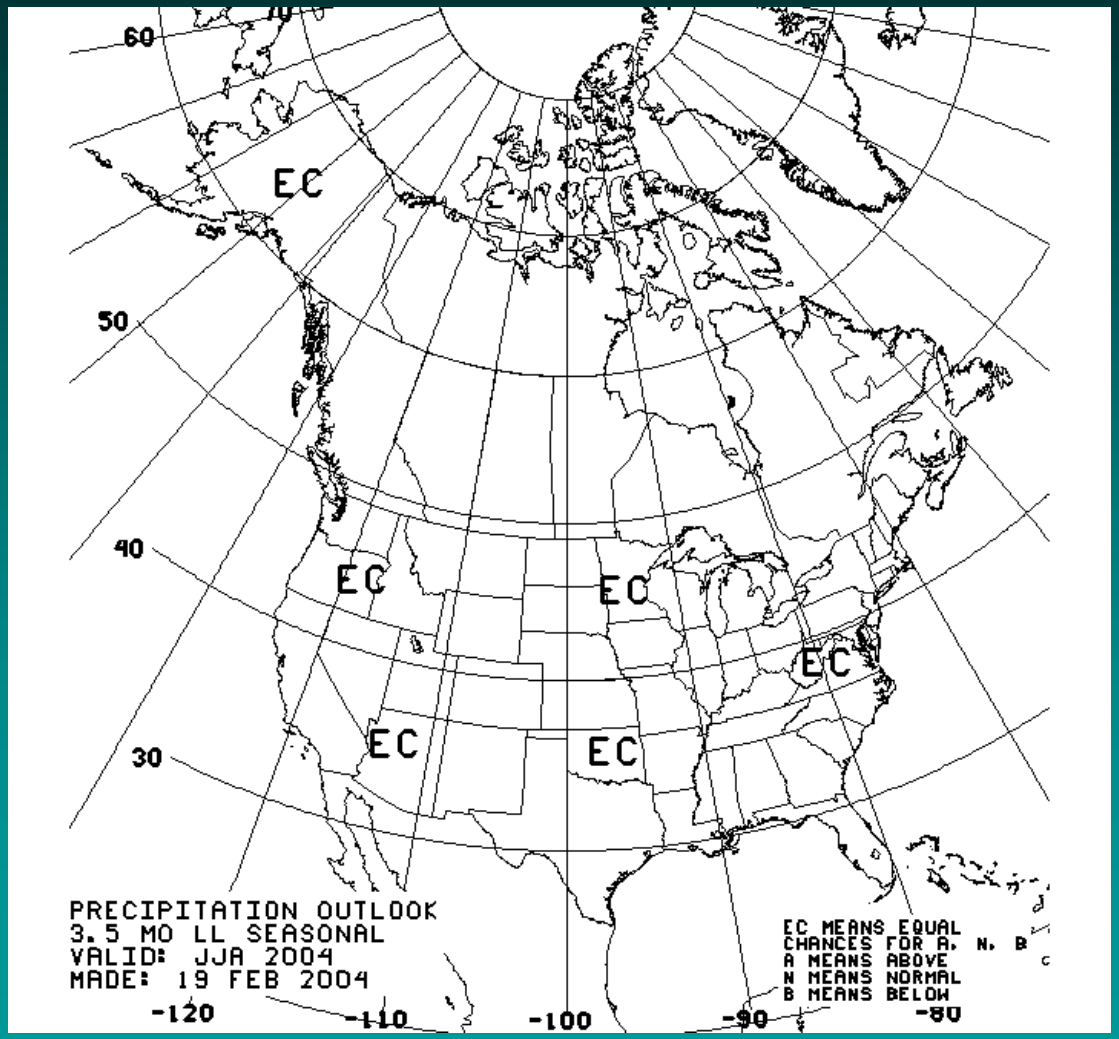
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Temperature
June – August 2004



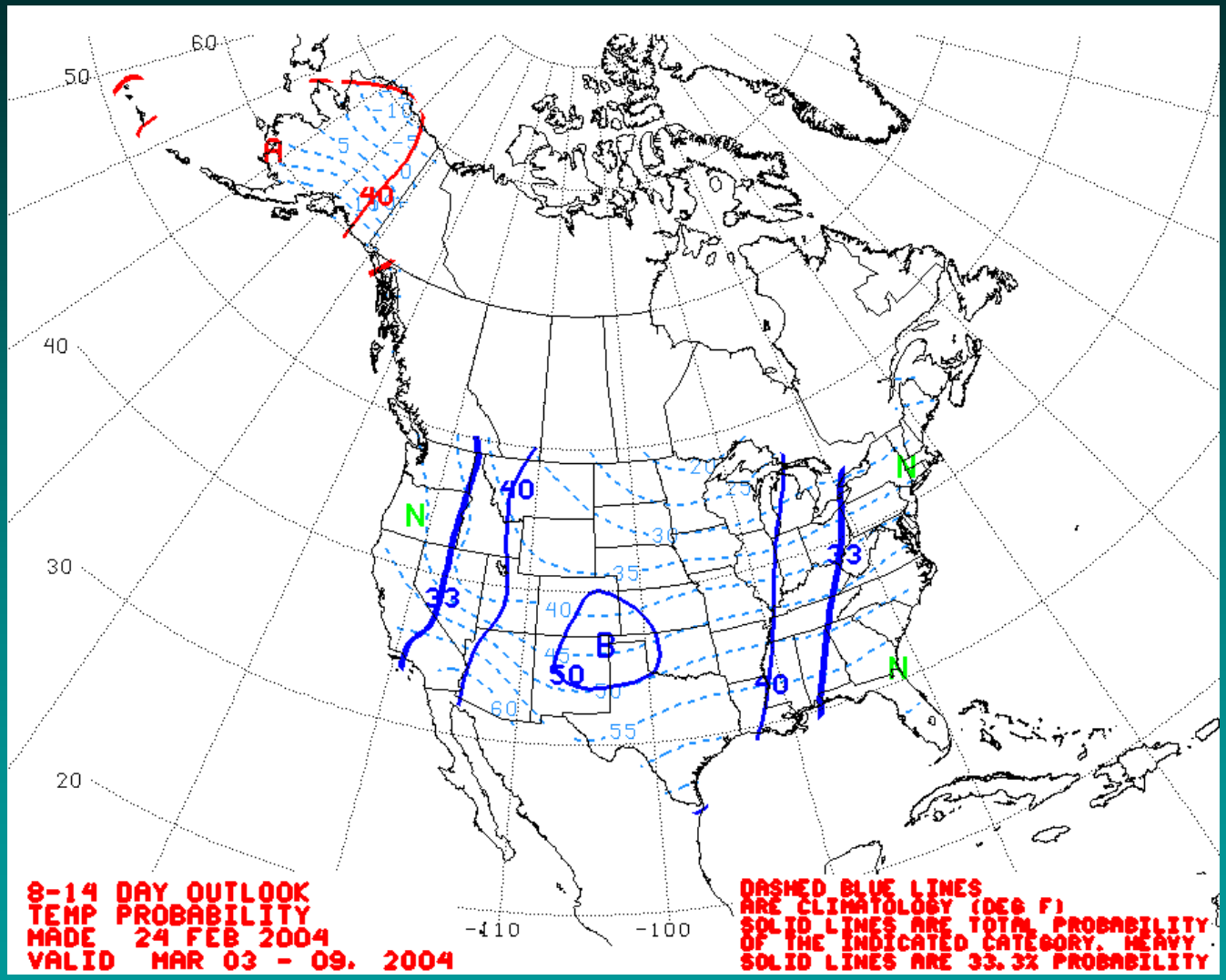
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Precipitation
June – August 2004



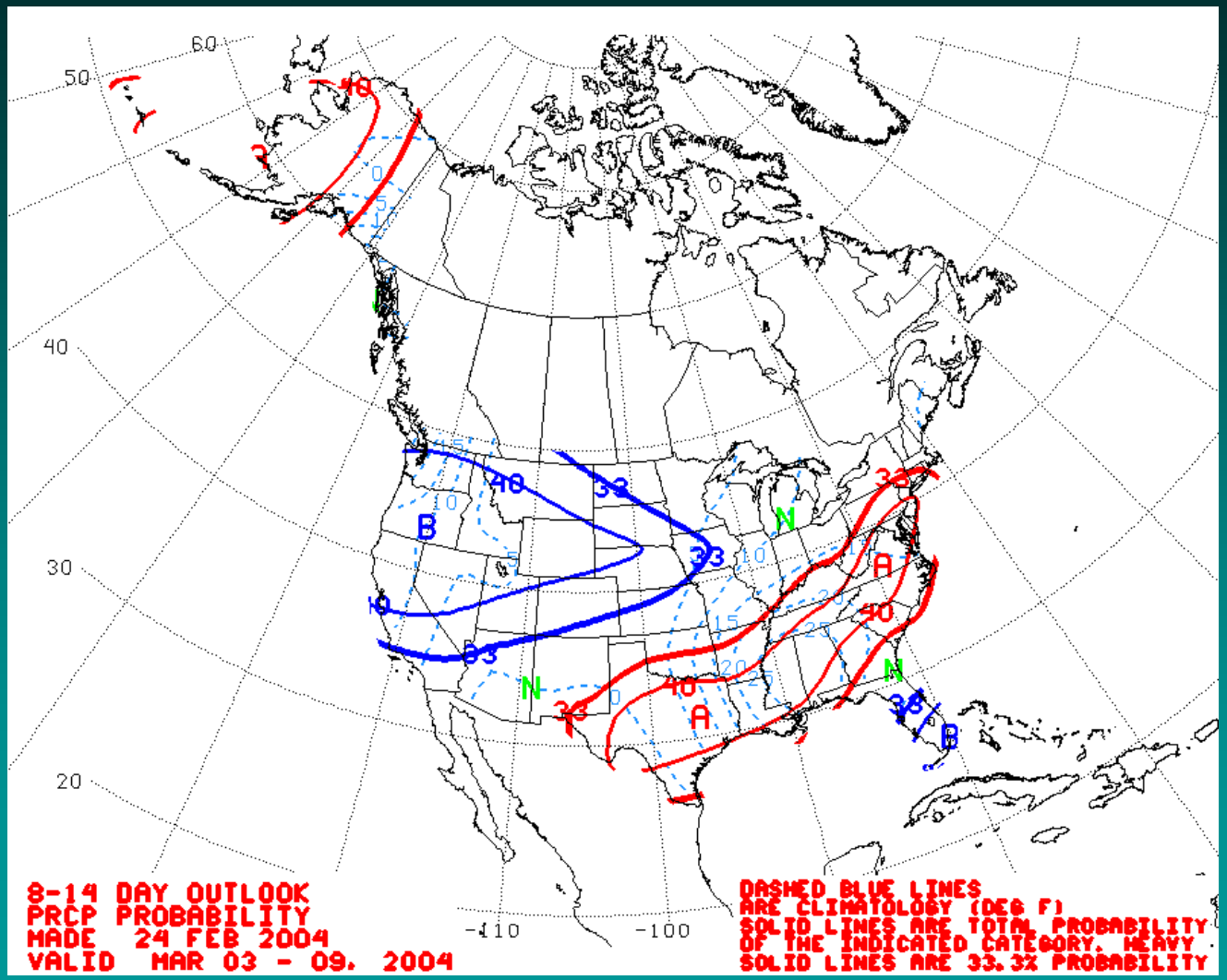
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

8-14 Day Temperature Forecast



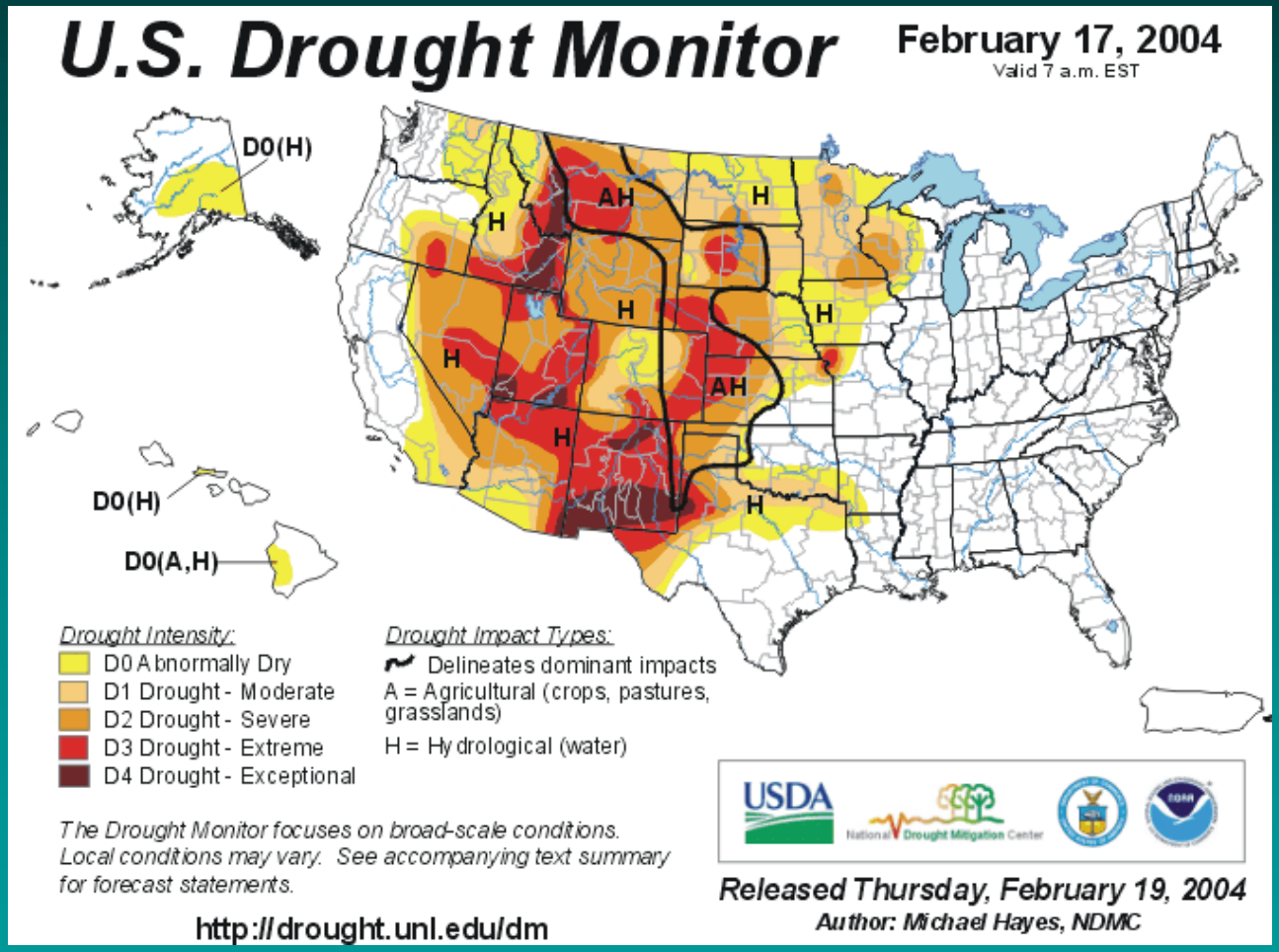
http://www.cpc.ncep.noaa.gov/products/predictions/814day/

8-14 Day Precipitation Forecast

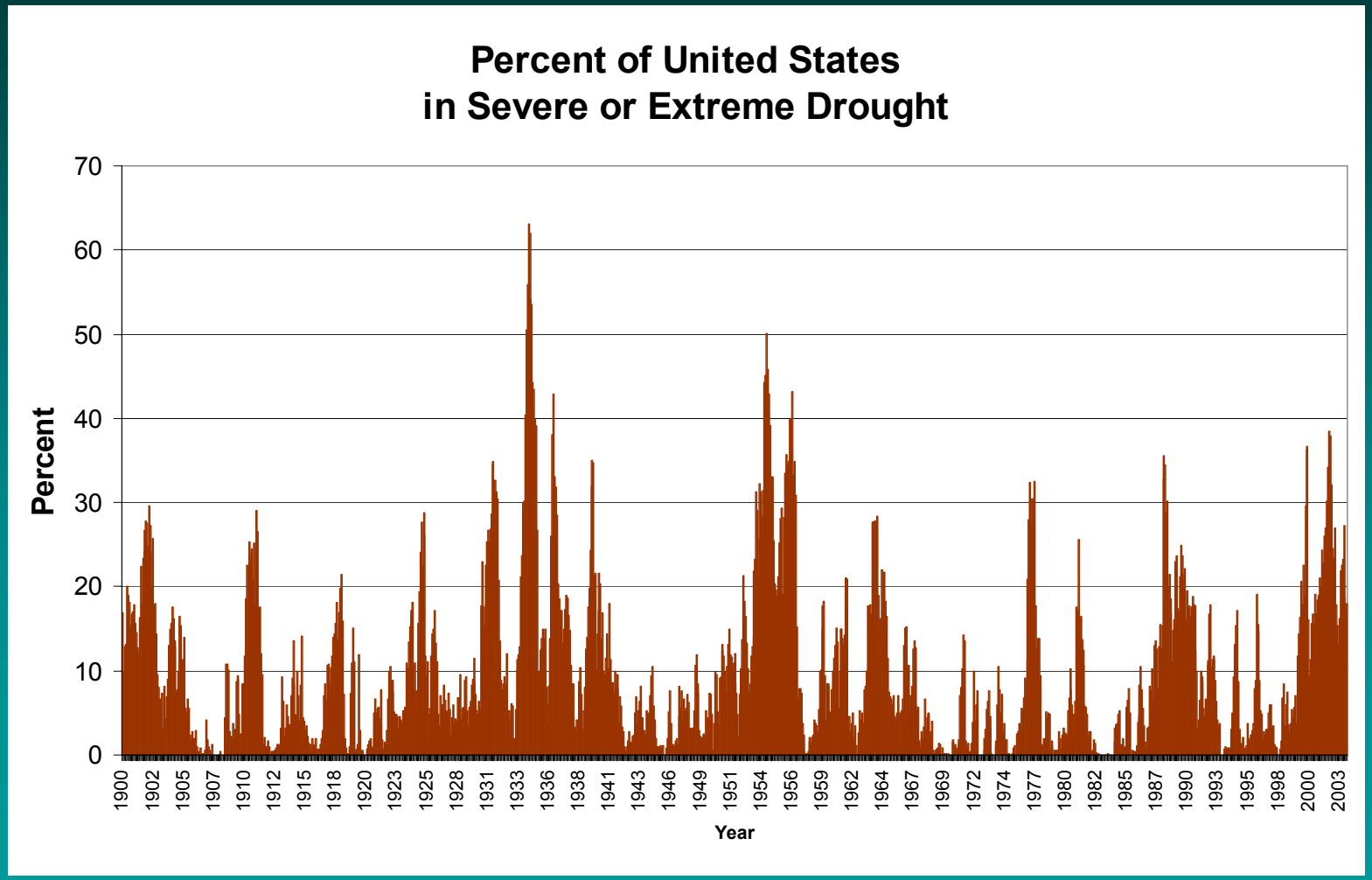


http://www.cpc.ncep.noaa.gov/products/predictions/814day/

Back to the Question -- When do we know it's over?



U.S. National Percent Area Severely to Extremely Dry



http://www.ncdc.noaa.gov/oa/climate/research/2004/jan/uspctarea-wetdry.txt

For Colorado Springs,

Average Precipitation = ~ 17 inches

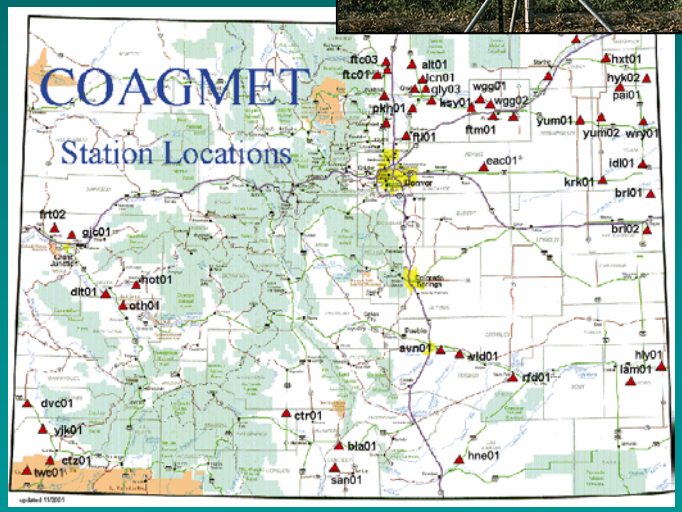
Average Evaporation = ~ > 24 inches

therefore,

Drought is NEVER really over.

CoAgMet
Weather Data for Agriculture

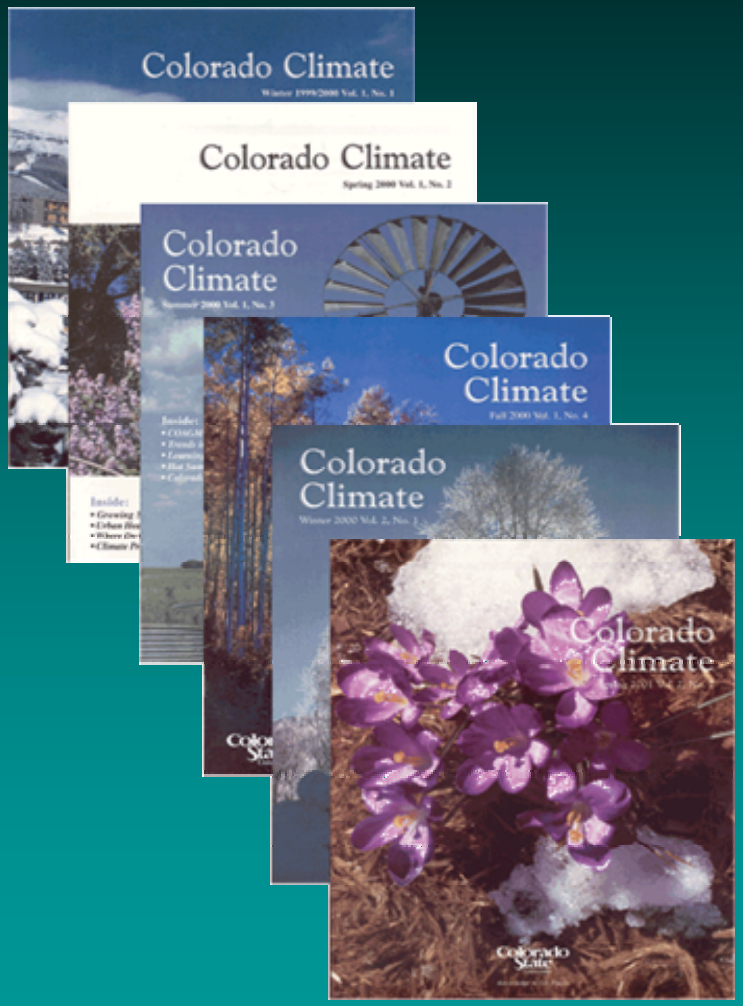
- *Automated weather stations with daily and hourly readings of:*
  - *Temperature*
  - *Humidity*
  - *Wind*
  - *Precipitation*
  - *Solar energy*
  - *Evapotranspiration*



http://www.coagmet.com

Colorado Climate Magazine

- *Good bedtime reading about the climate of Colorado -- recent and historic*
- *$15/year subscription pays printing and mailing costs*



http://ccc.atmos.colostate.edu/magazine.php

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"