

Drought and the Climate of Colorado: An Overview

Nolan J. Doesken

Colorado Climate Center

Colorado State University

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

Presented to the Ditch and Reservoir Company Alliance,
February 26, 2004, Greeley, Colorado

Prepared by Odie Bliss





The Evolution of Our Recent Drought



Lake Granby, 2002 drought

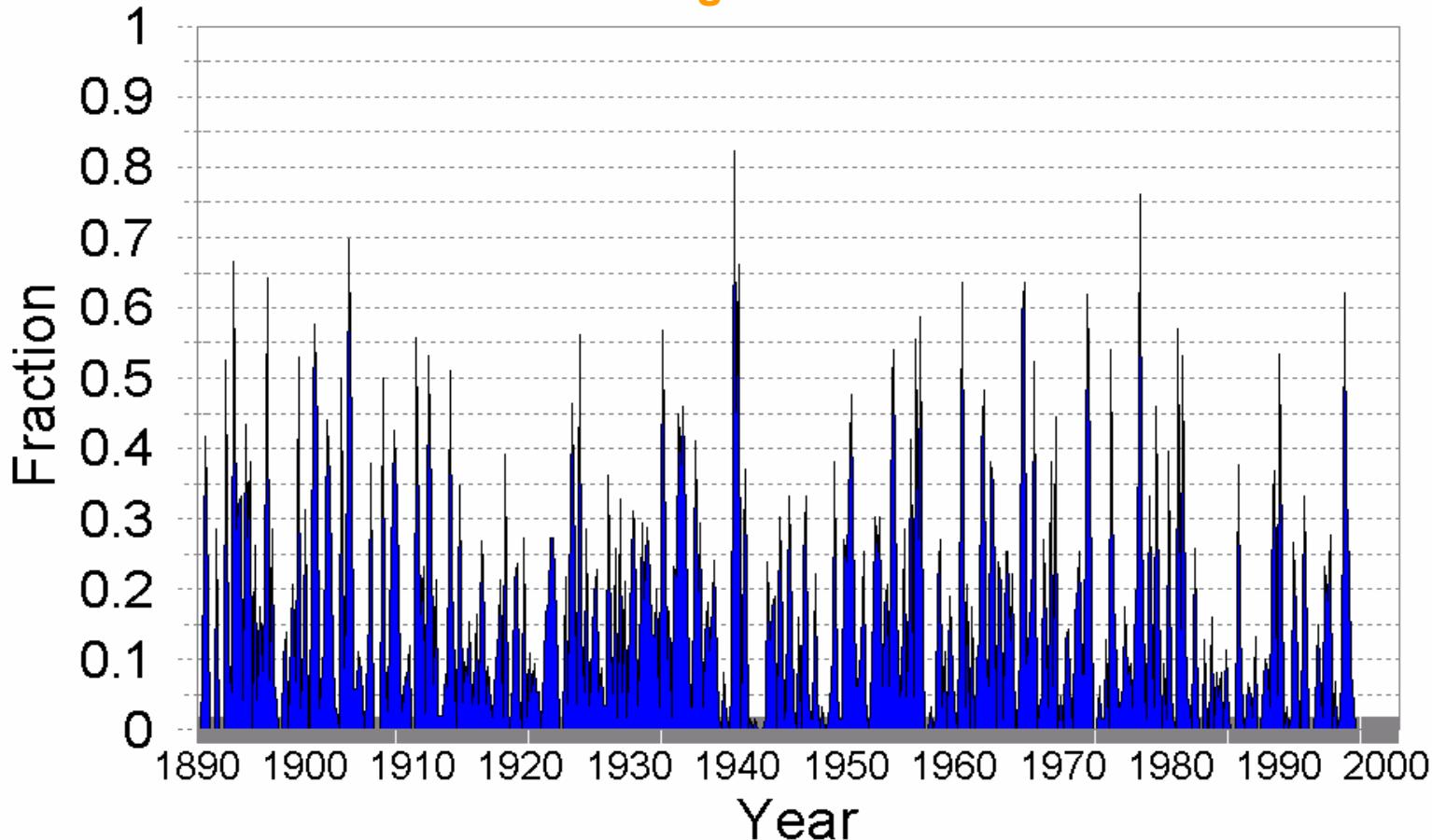


Grand Ditch, 2002 drought

3-Month SPI

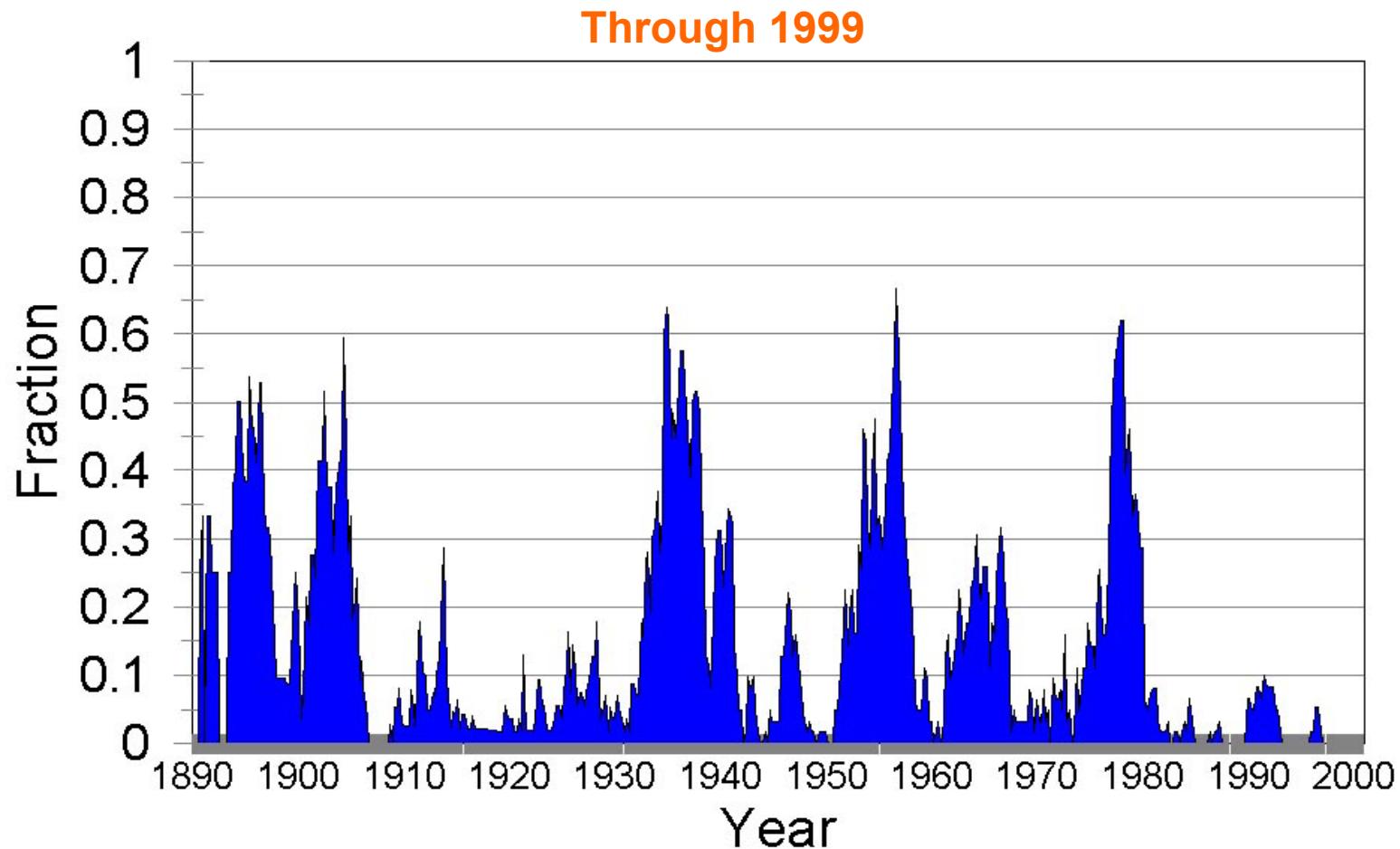
Fraction of Colorado in Drought Based on 3-month SPI

Through 1999

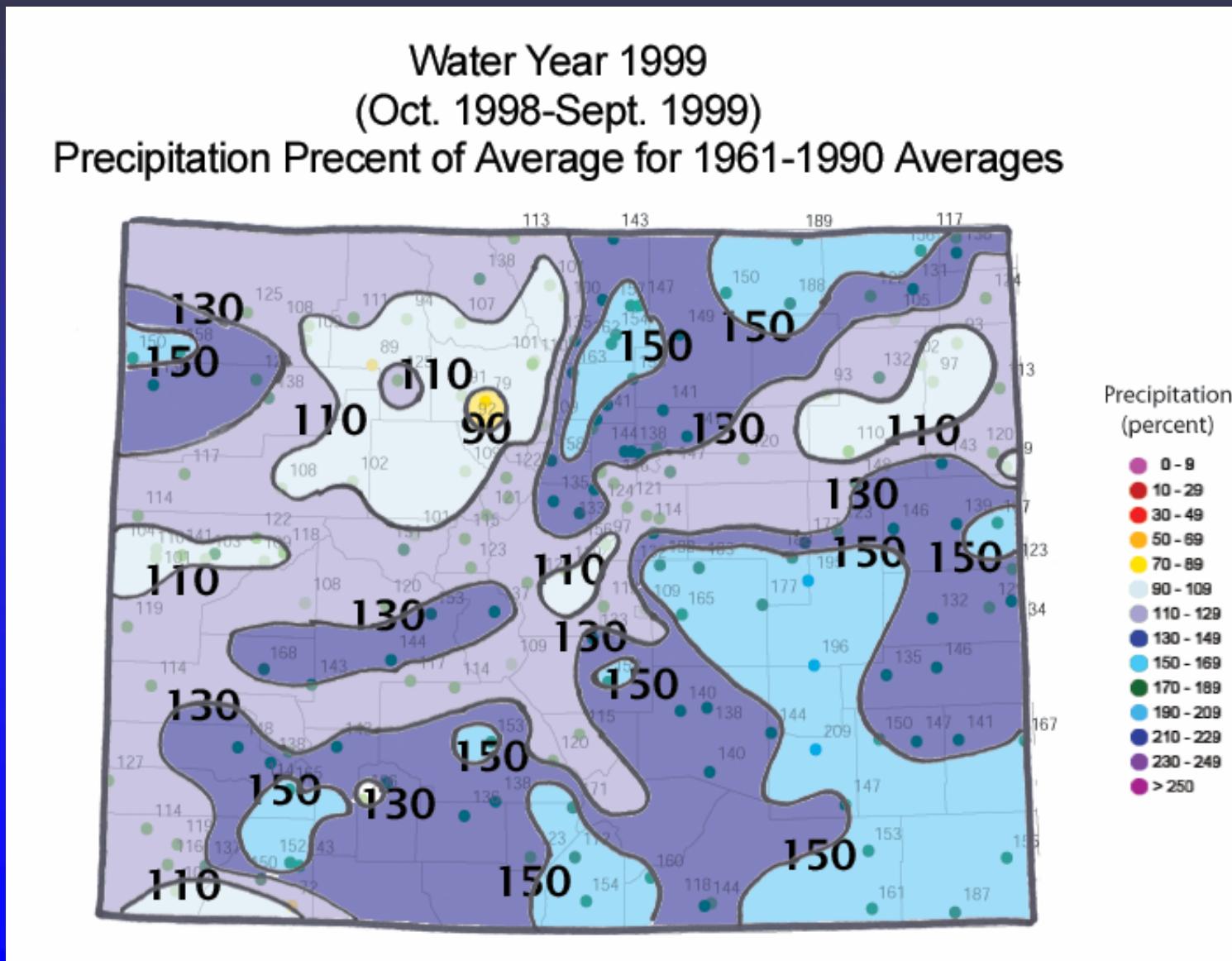


48-Month SPI

Fraction of Colorado in Drought Based on 48-month SPI



1999 Water Year Precipitation

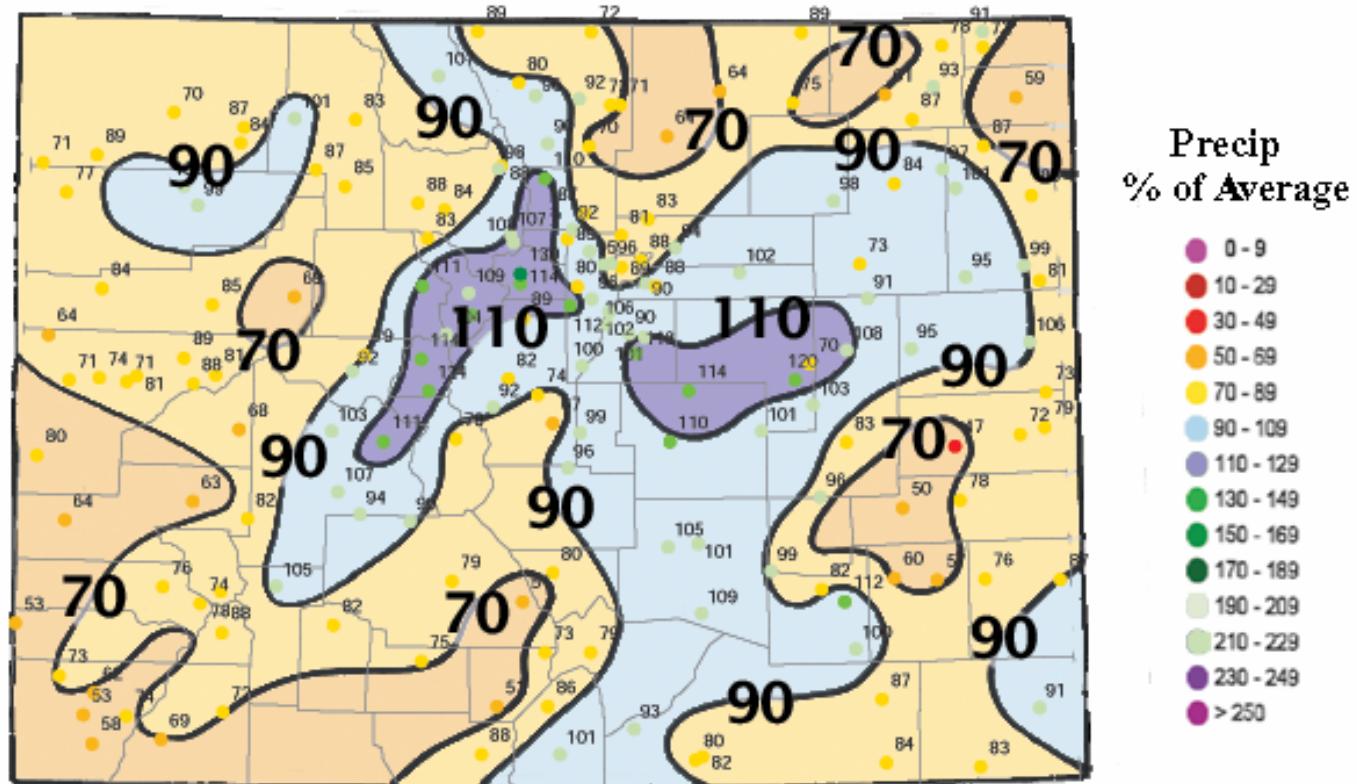




2000 Water Year Precipitation

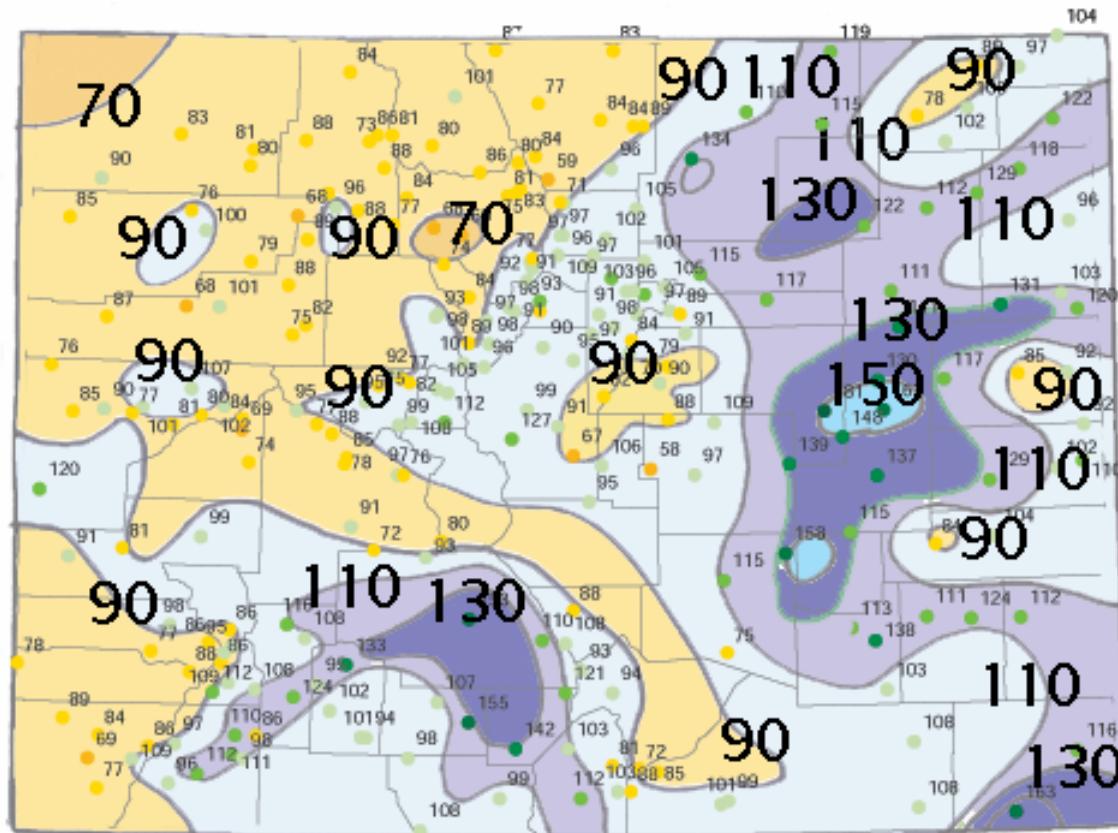
Water Year 2000 (Oct. 1999 - Sept. 2000)

Precipitation Percent of Average for 1961-1990 Averages



2001 Water Year Precipitation

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



Precip
% of Average



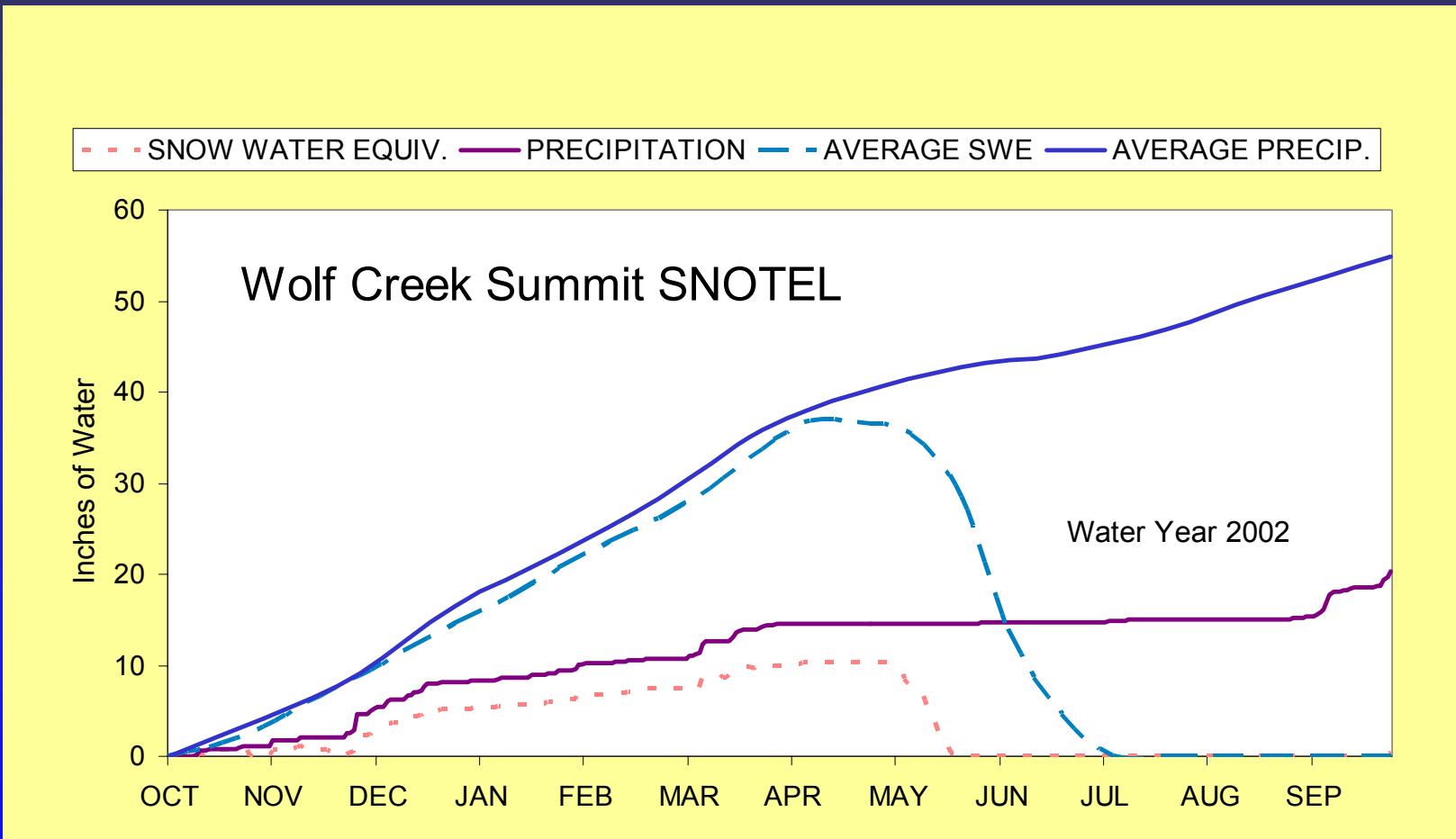
Negative Indicators



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



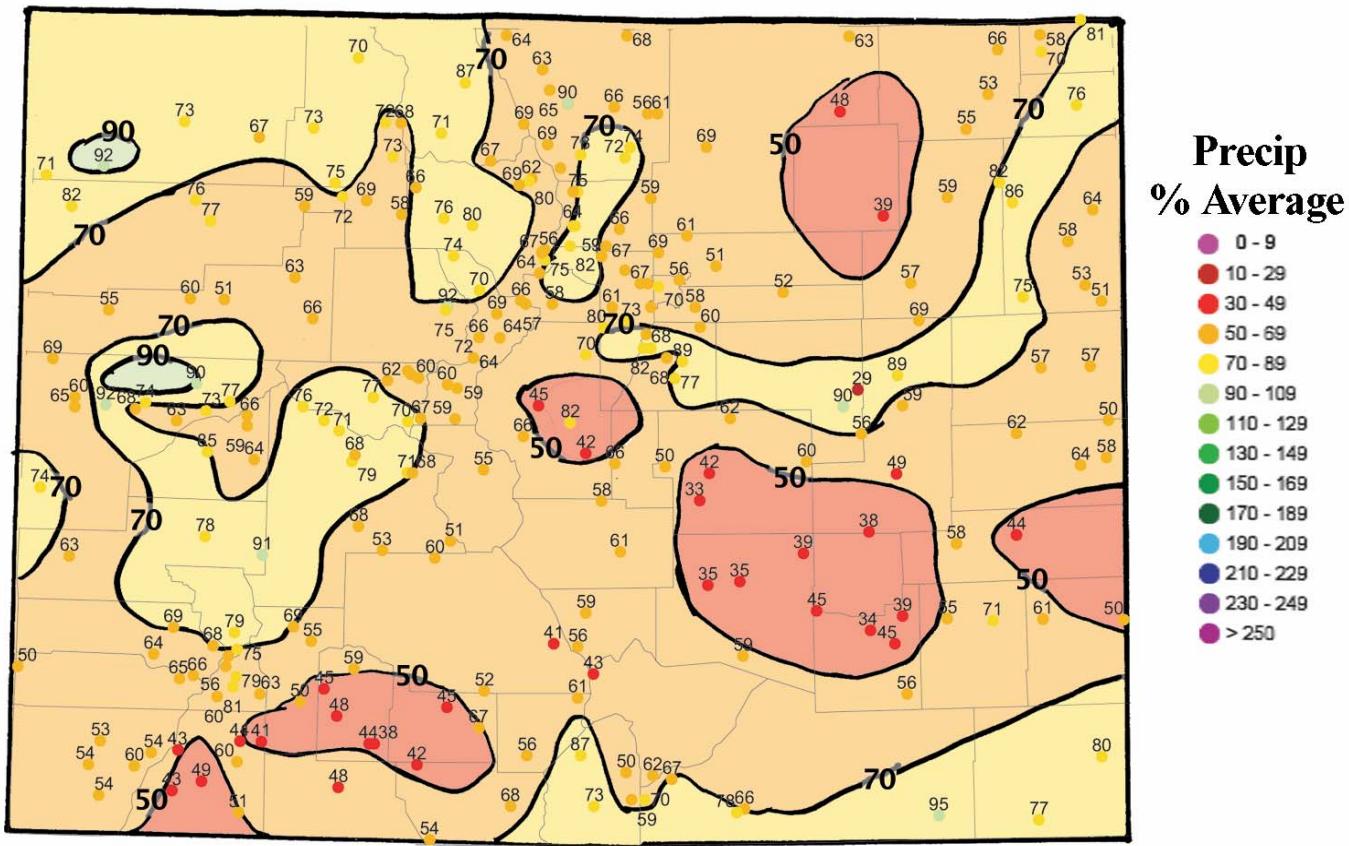
2002 Snow Water Equivalent



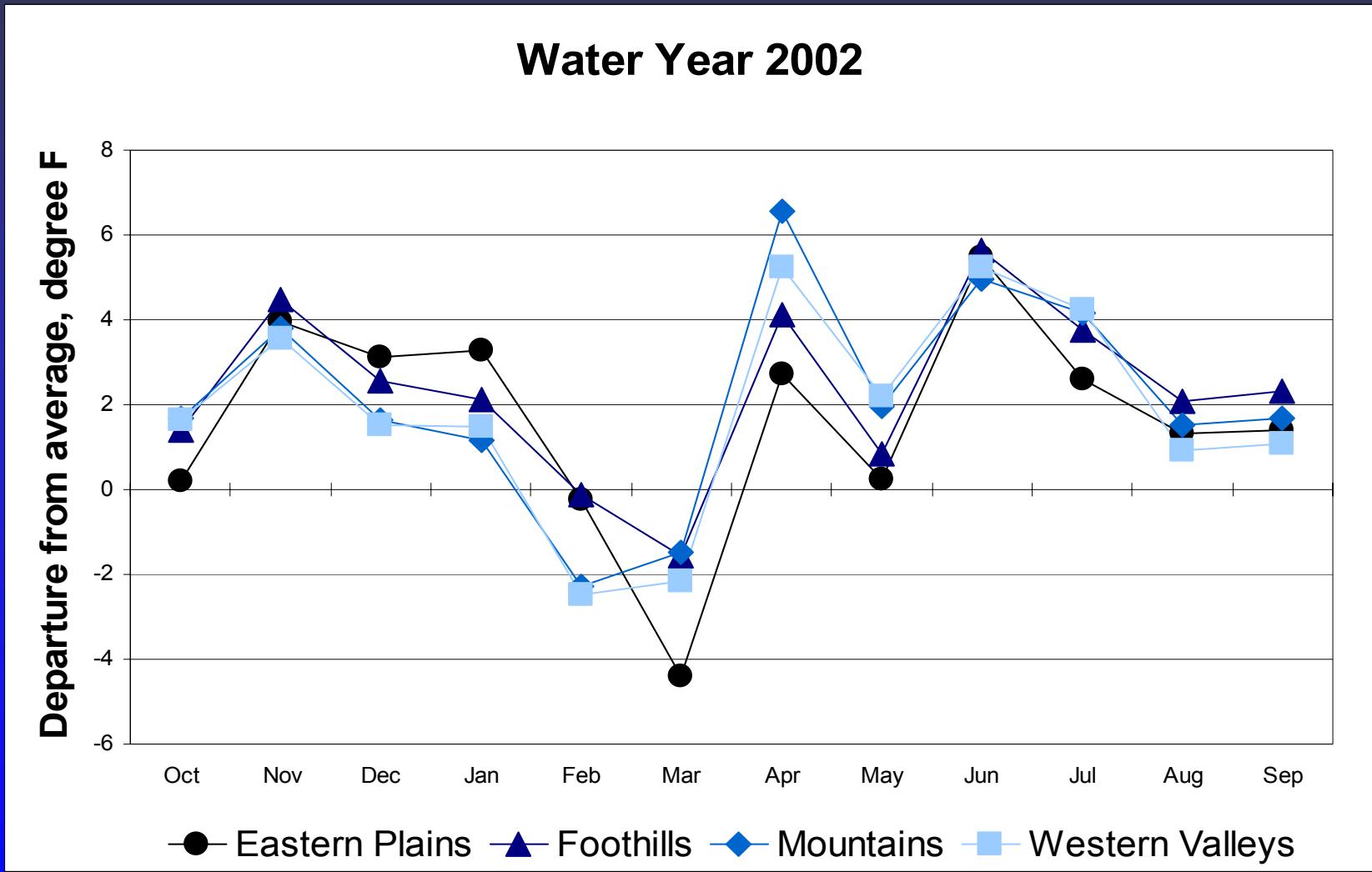
2002 Water Year Precipitation

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

Precipitation Percent of Average for 1961-1990 Averages

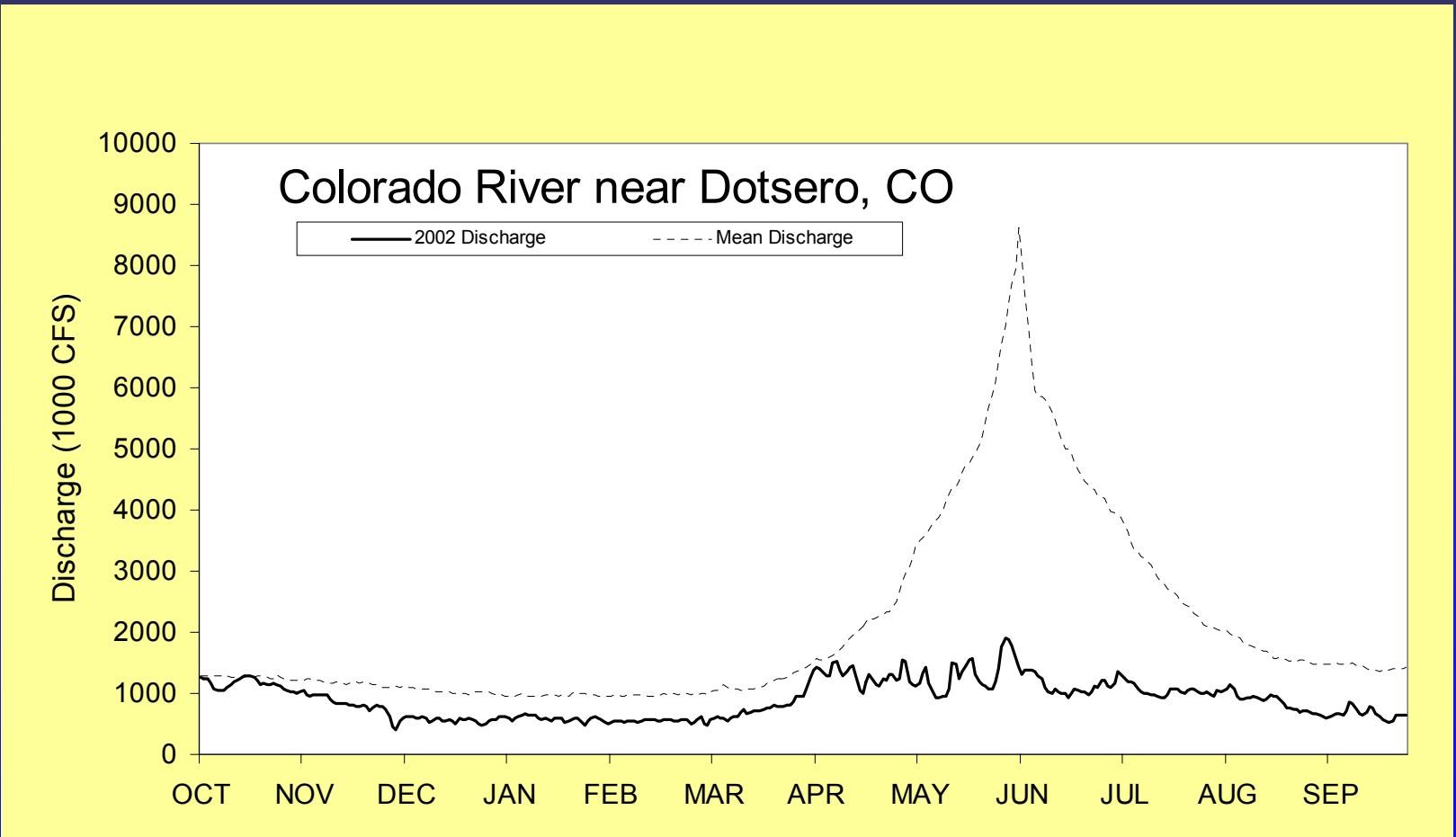


WY2002 Temperature Departures



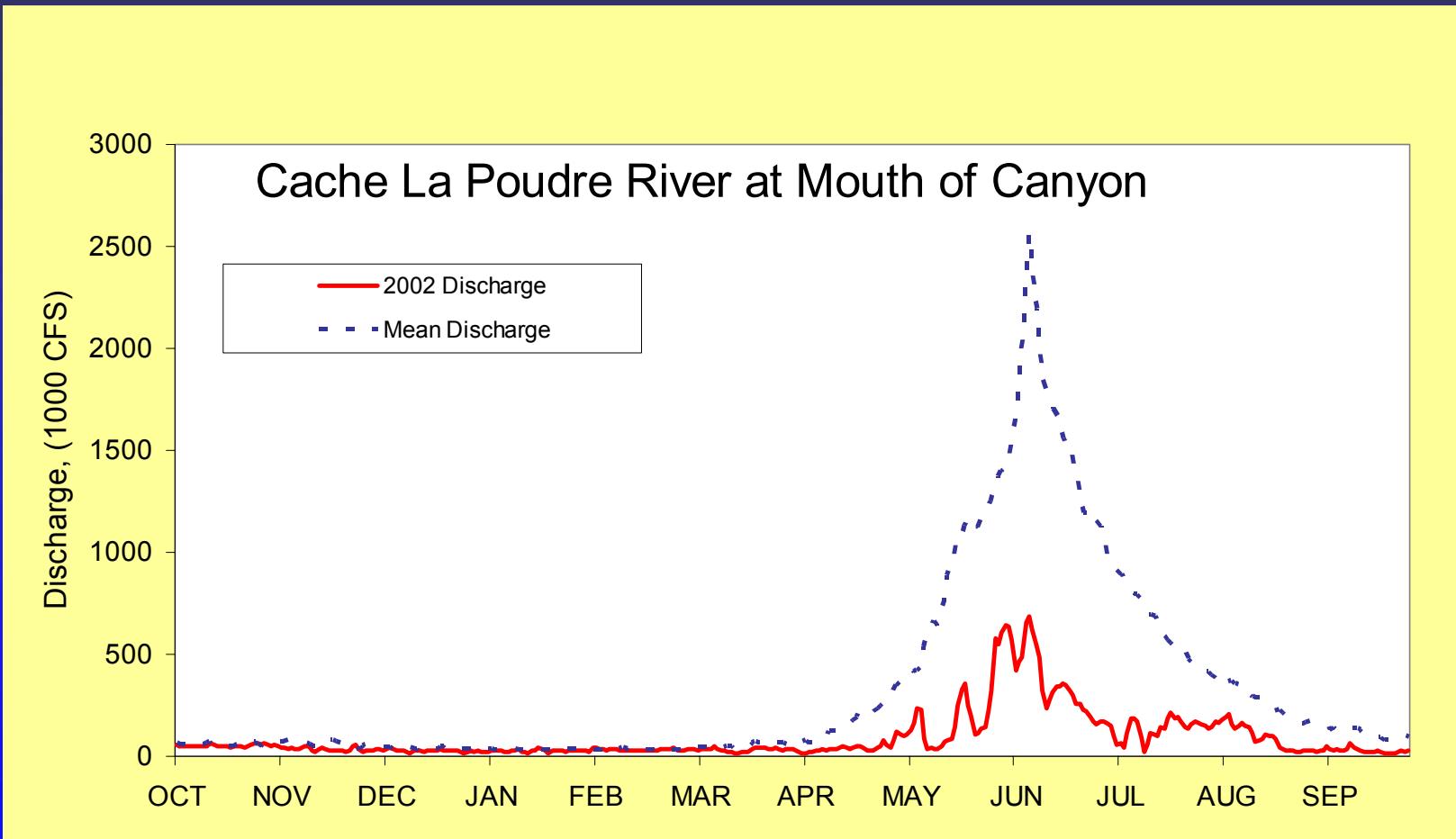


2002 Daily Streamflow

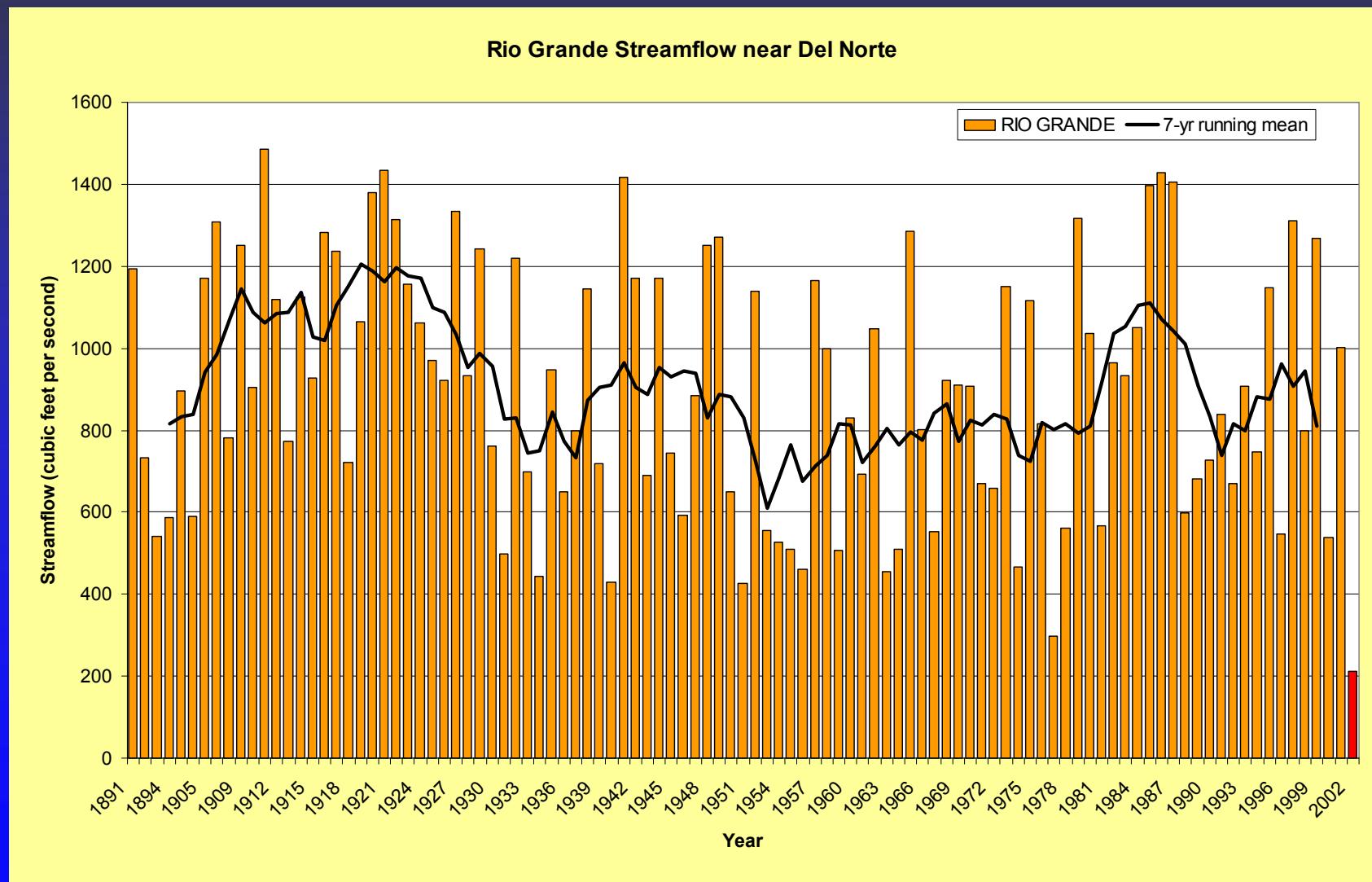




2002 Daily Streamflow

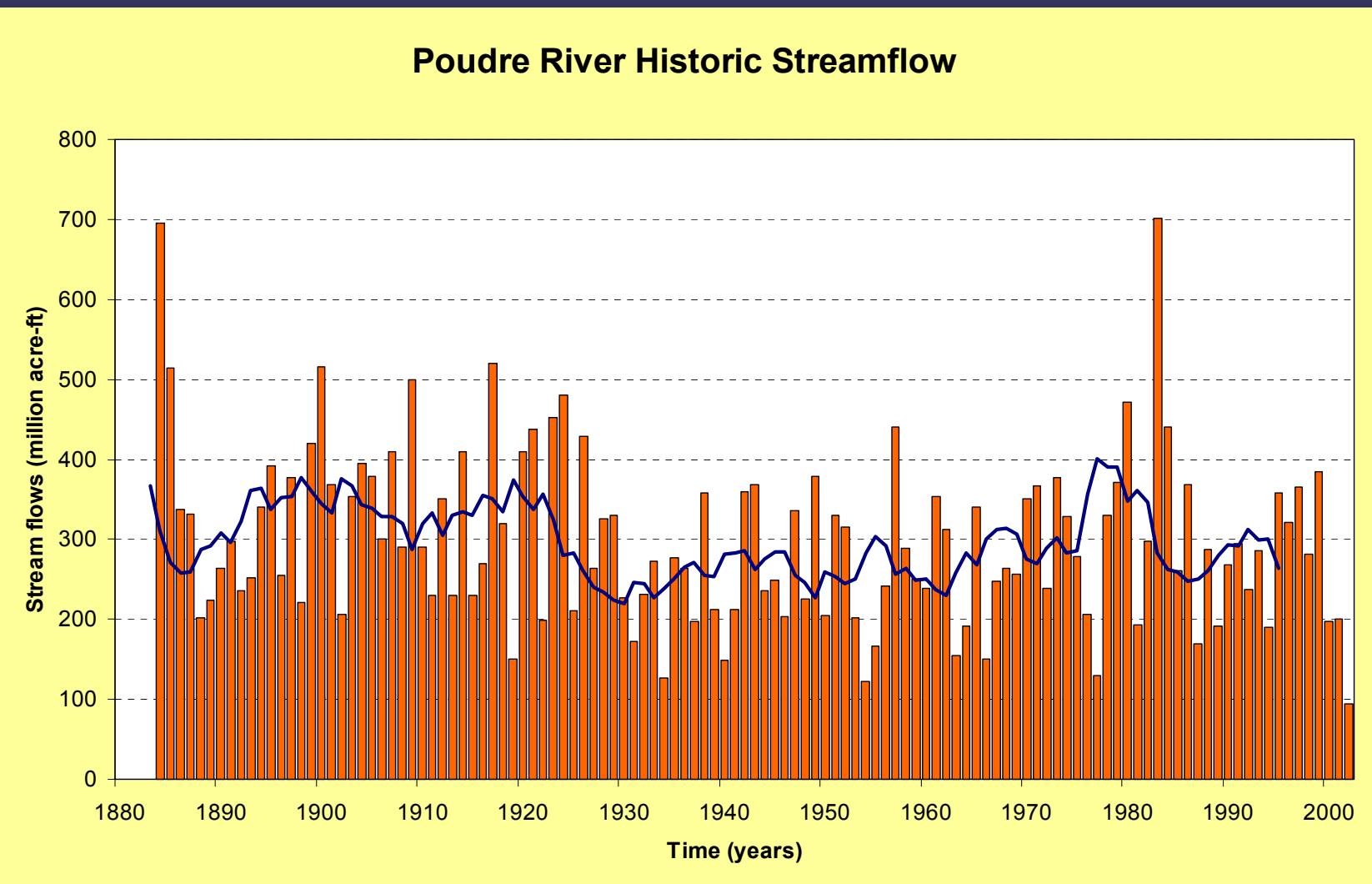


Rio Grande Streamflow History

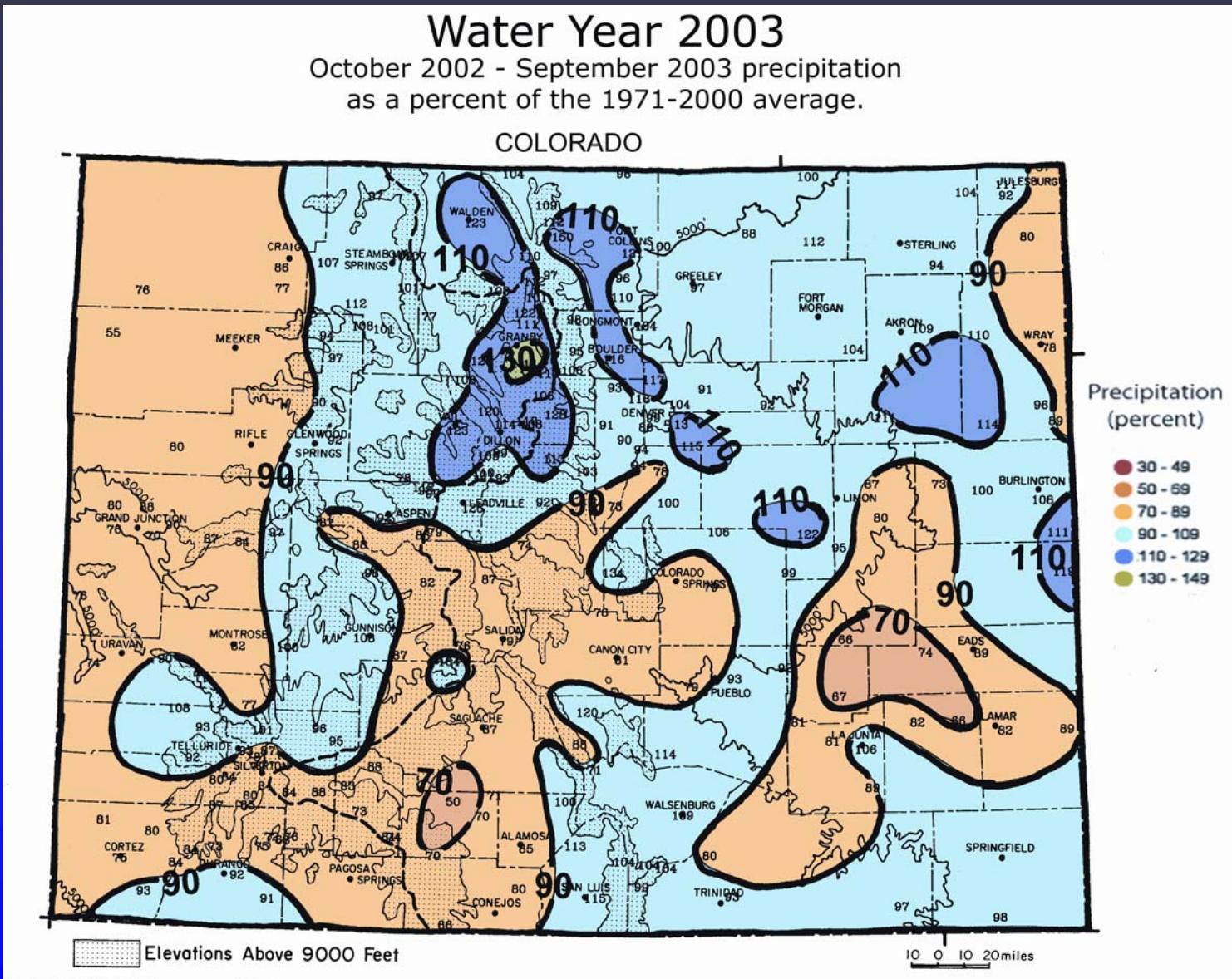




Poudre River Streamflow History



2003 Water Year Precipitation



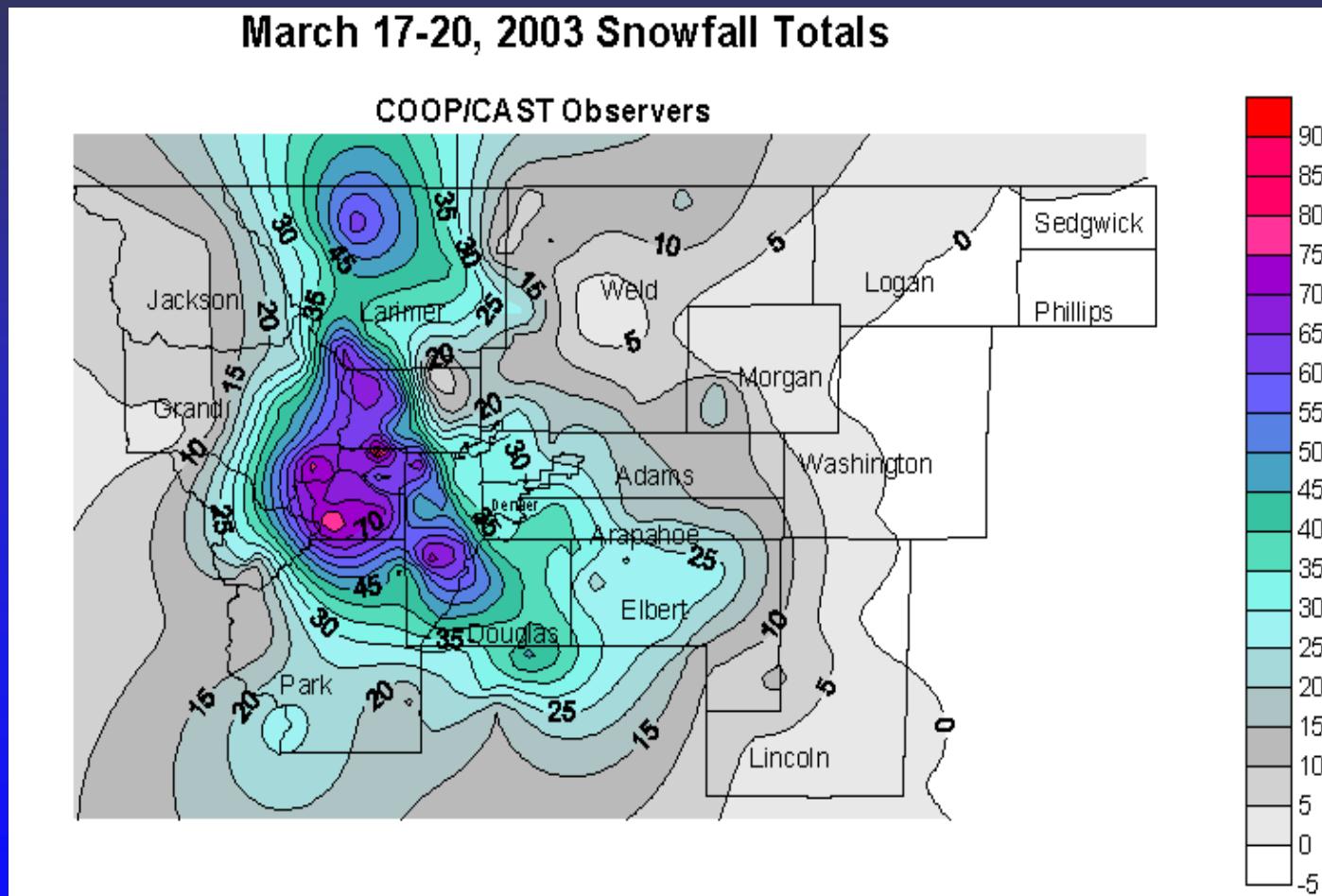


March 2003 Snowstorm





March 2003 Snowfall Totals

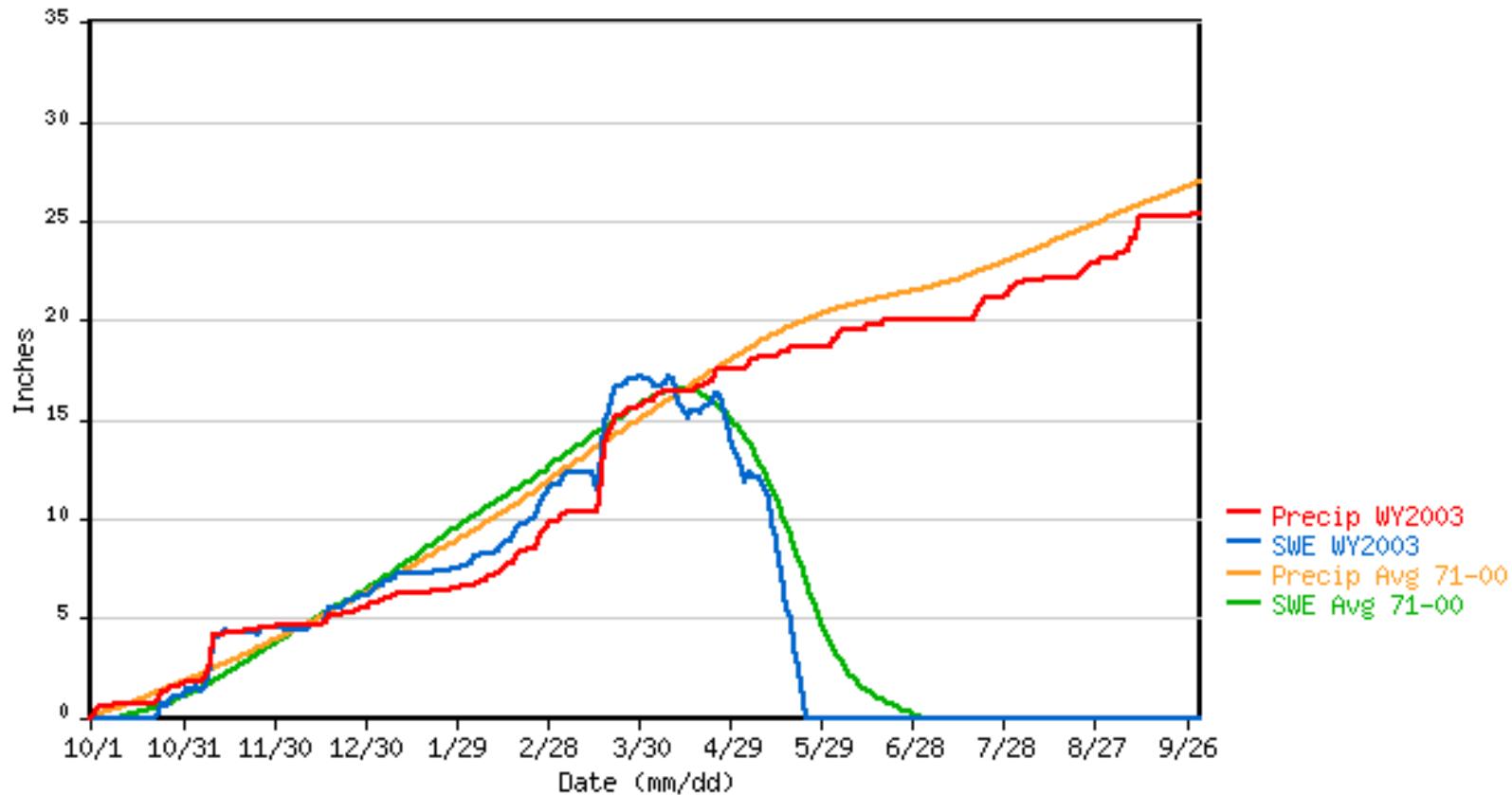




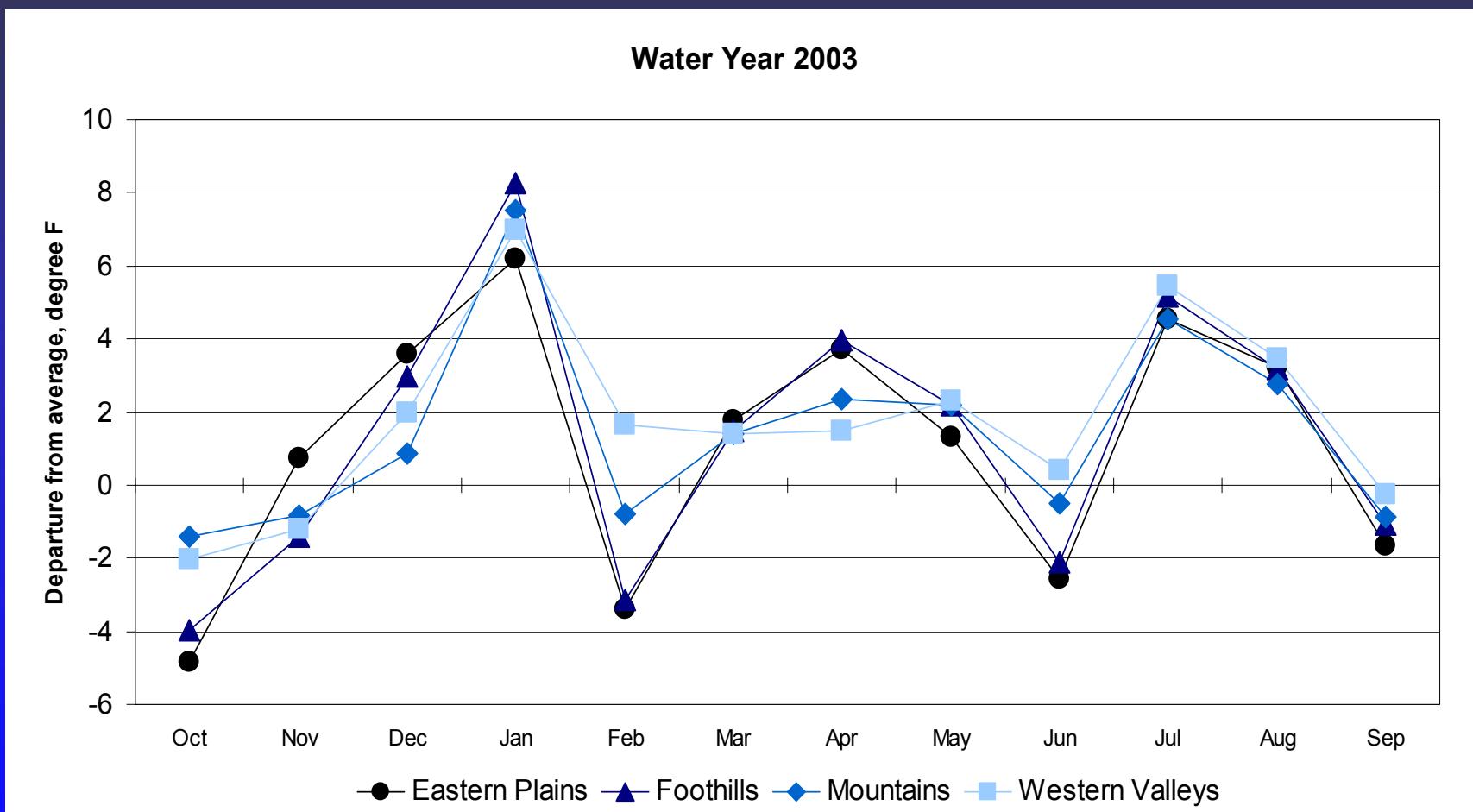
2003 SWE Porphyry Creek

PORPHYRY CREEK SNOTEL for Water Year 2003

*** Provisional Data, Subject to Change ***

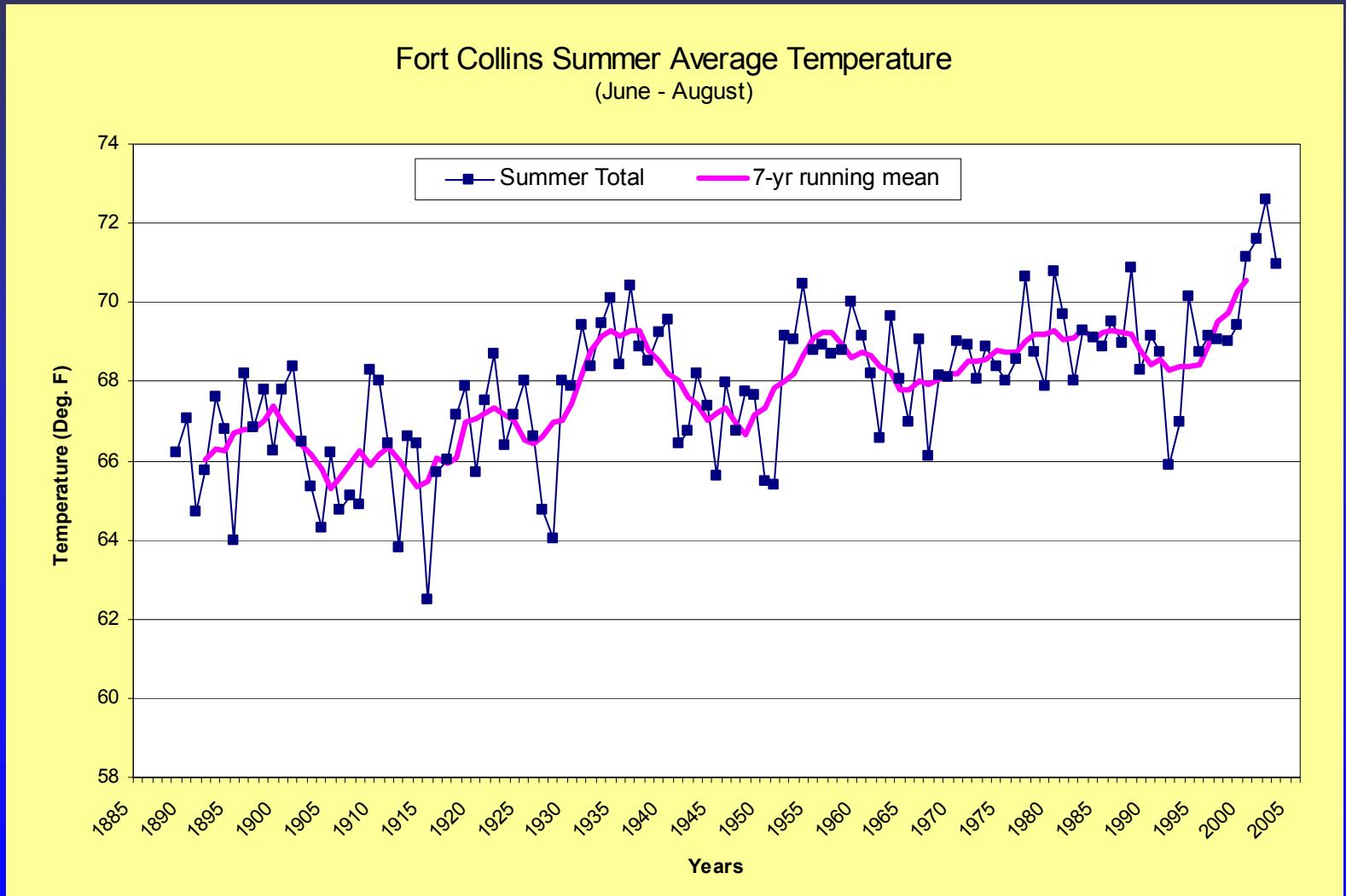


WY2003 Temperature Departures

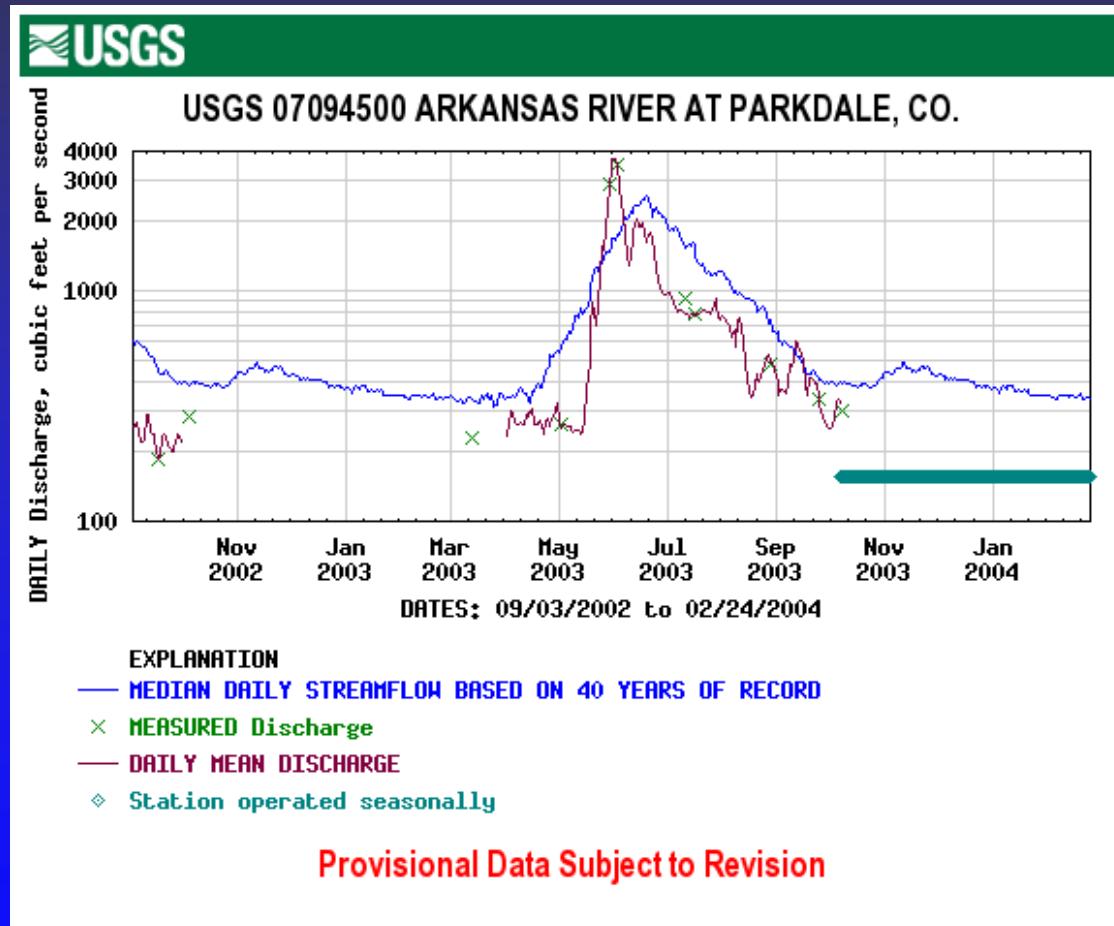




Fort Collins Summer Temperatures

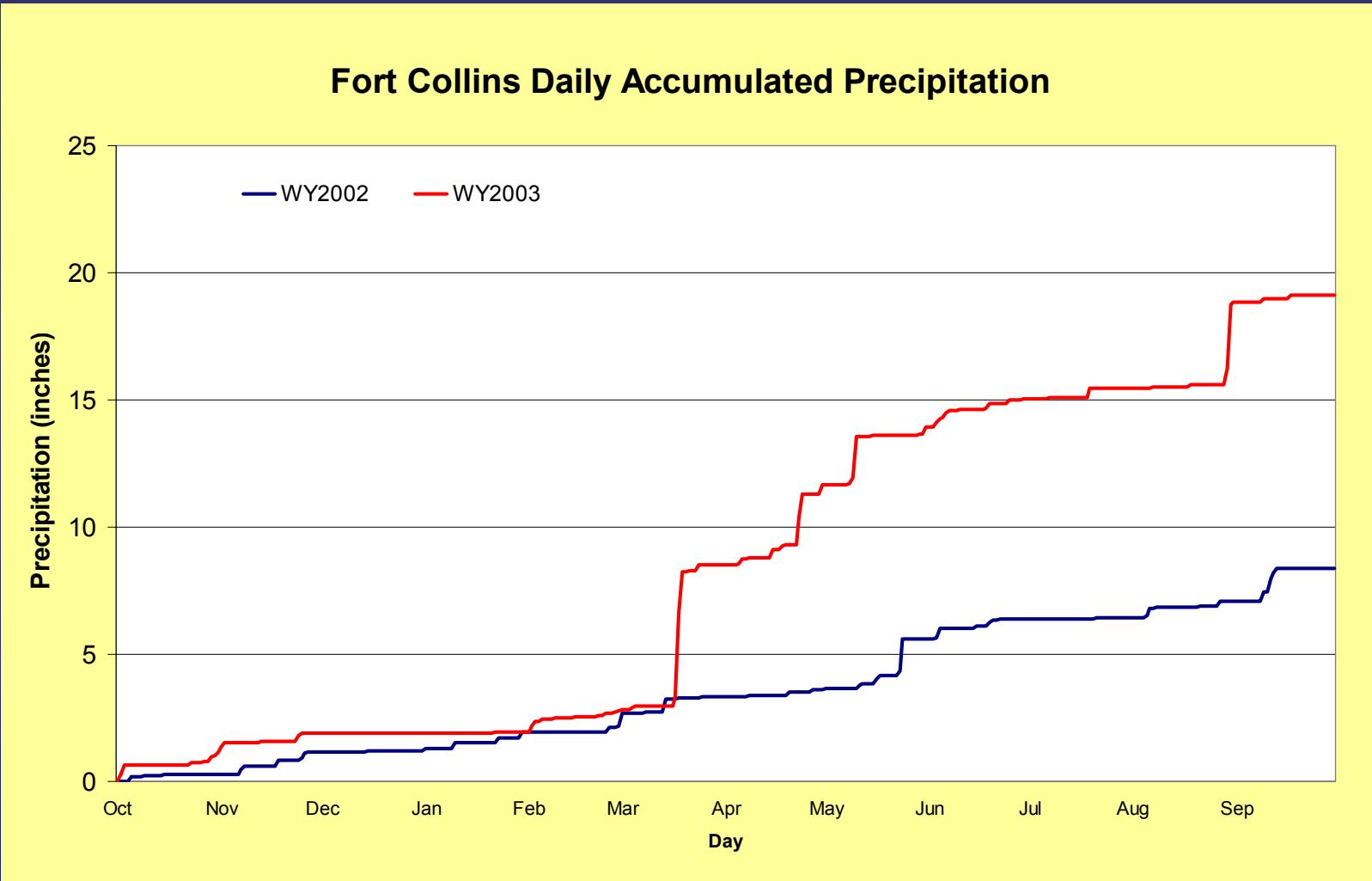


2003 Daily Streamflow



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

Fort Collins Daily Accumulated Precipitation for WY2002 and WY2003

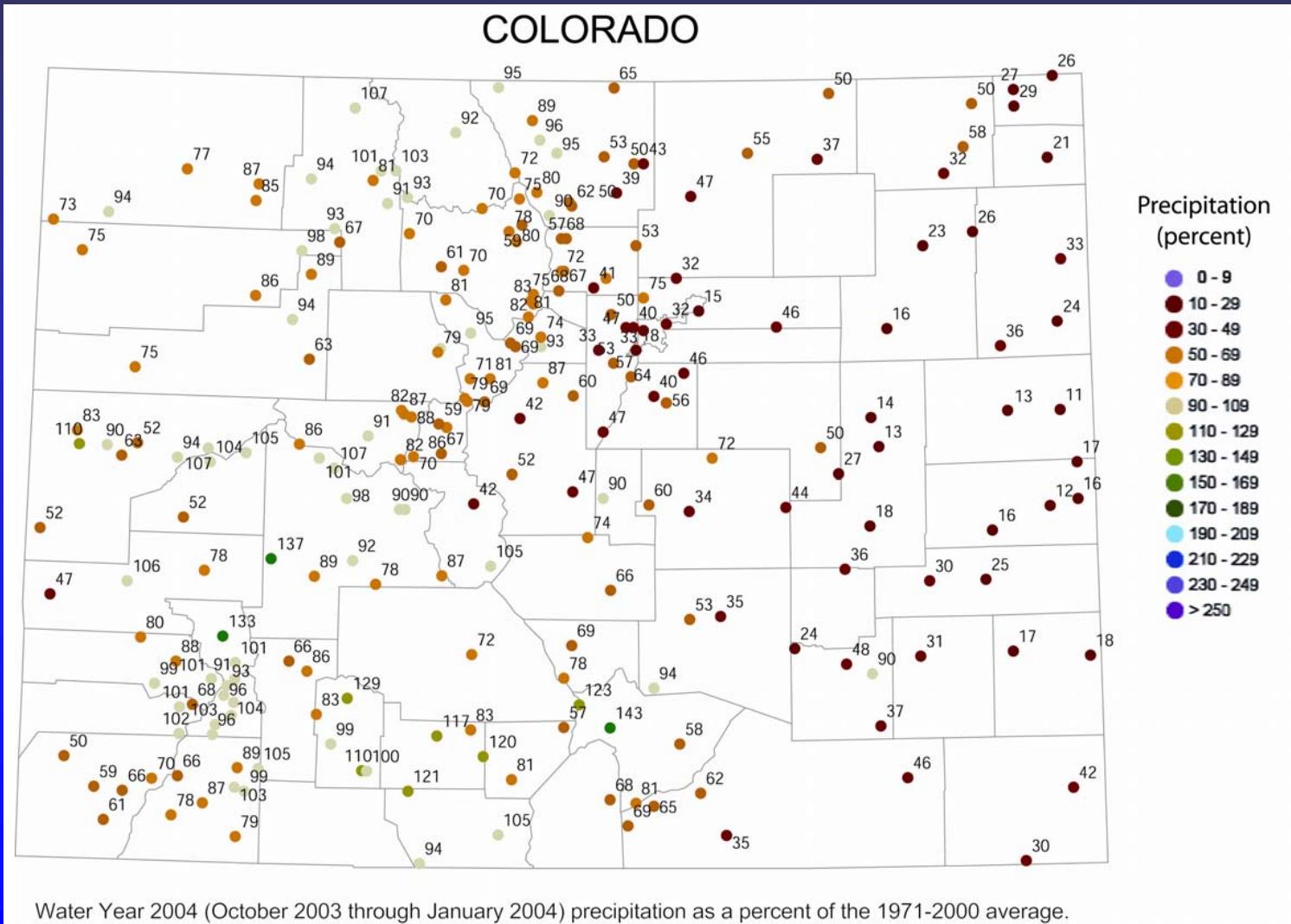




Where Do We Stand Now?

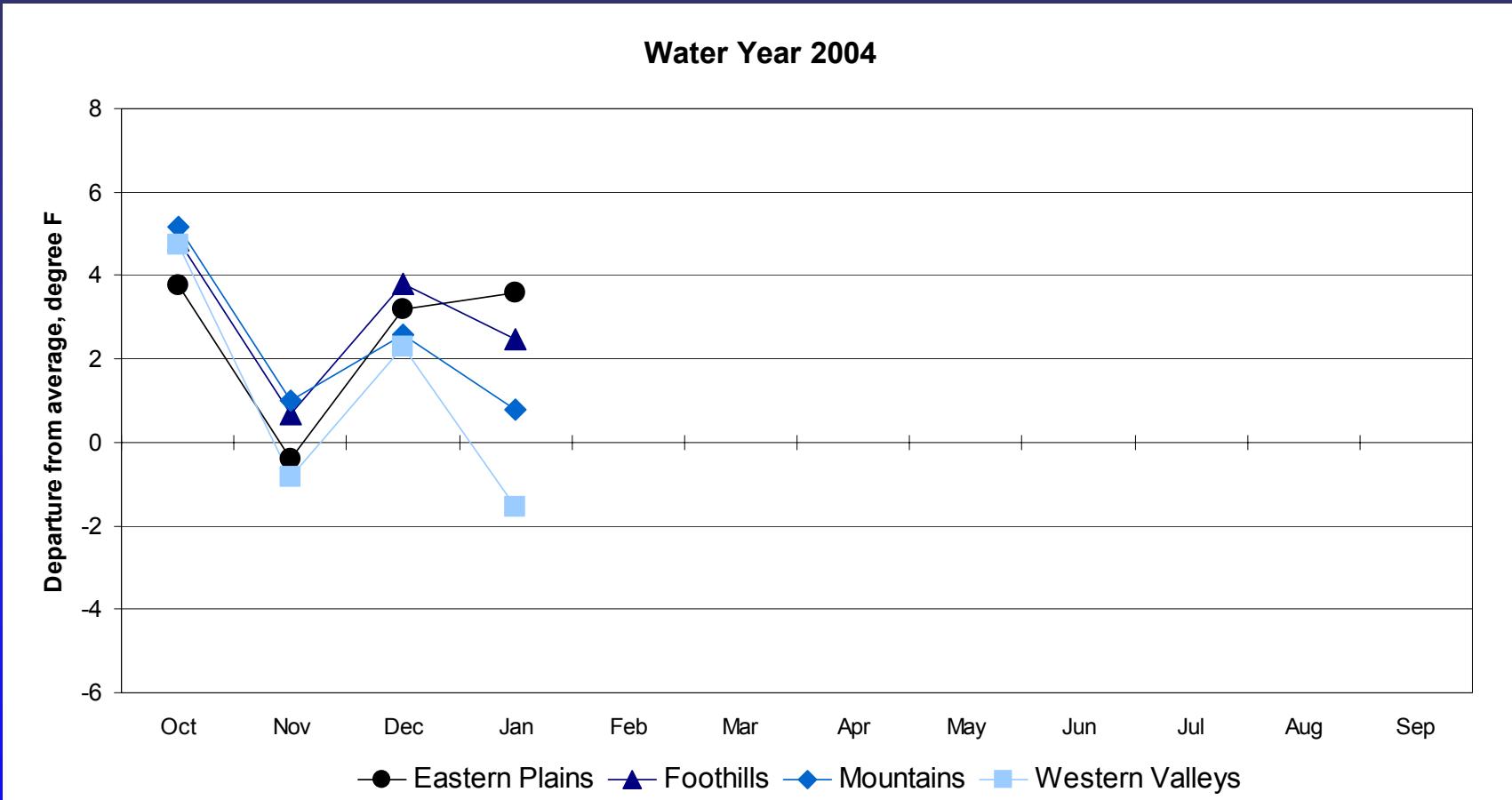


Water Year 2004 (Oct 03-Jan 04) Precipitation as Percent of Average





WY2004 (Oct 2003–Jan 2004) Temperature Departures



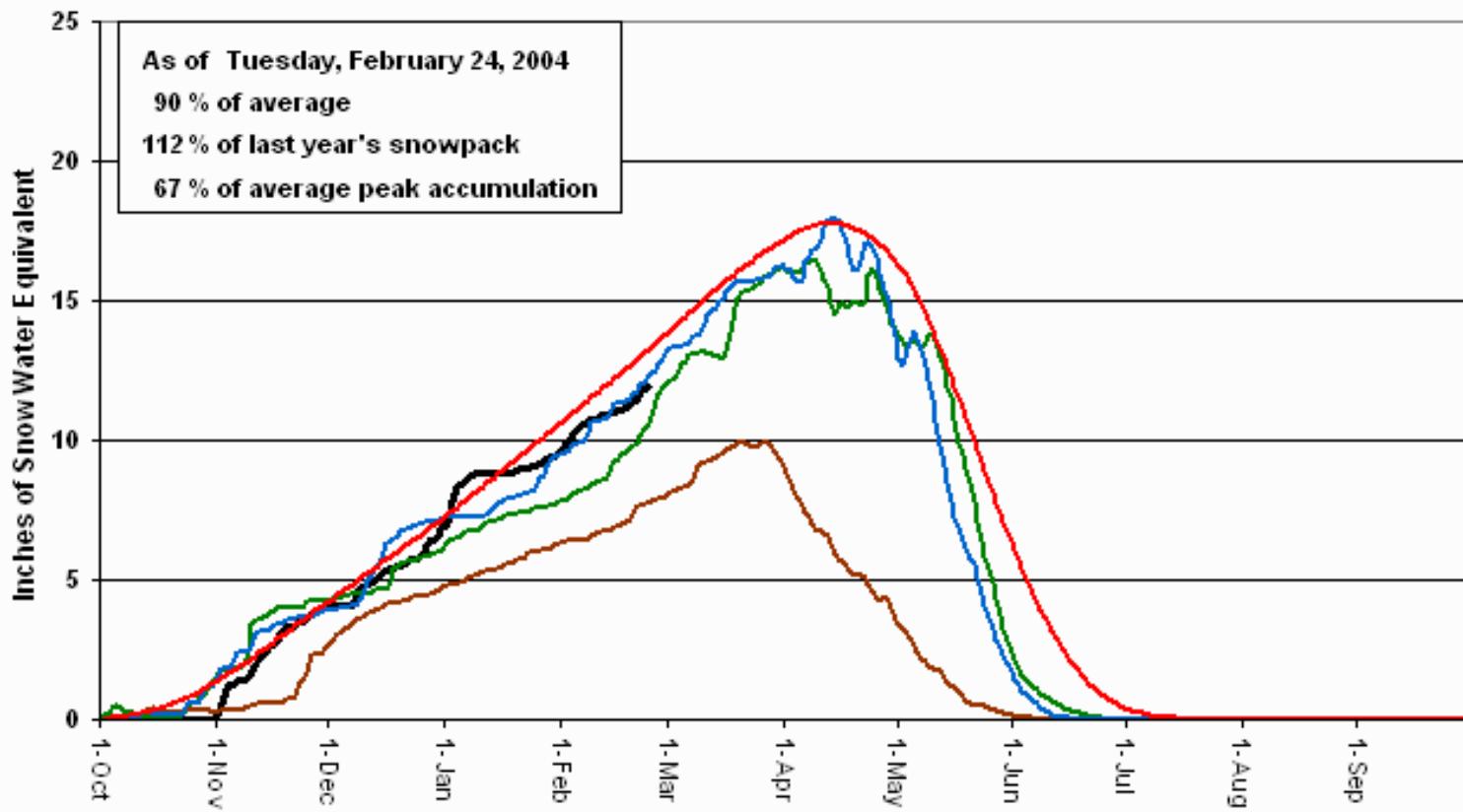
Colorado Statewide Snowpack



Colorado Statewide Snowpack

Based on provisional SNOTEL data.

— 2004 — 2003 — 2002 — 2001 — Average



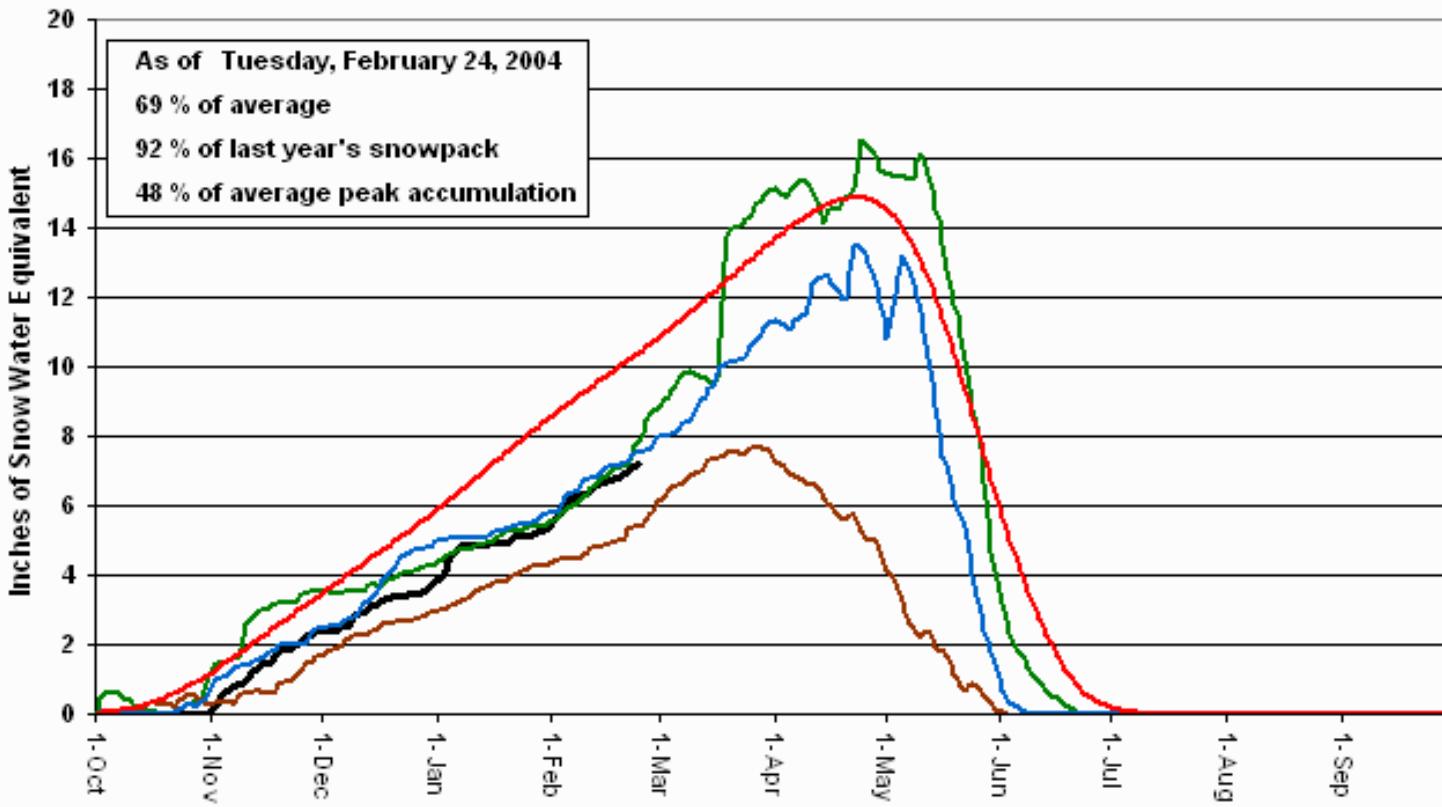
South Platte Snowpack



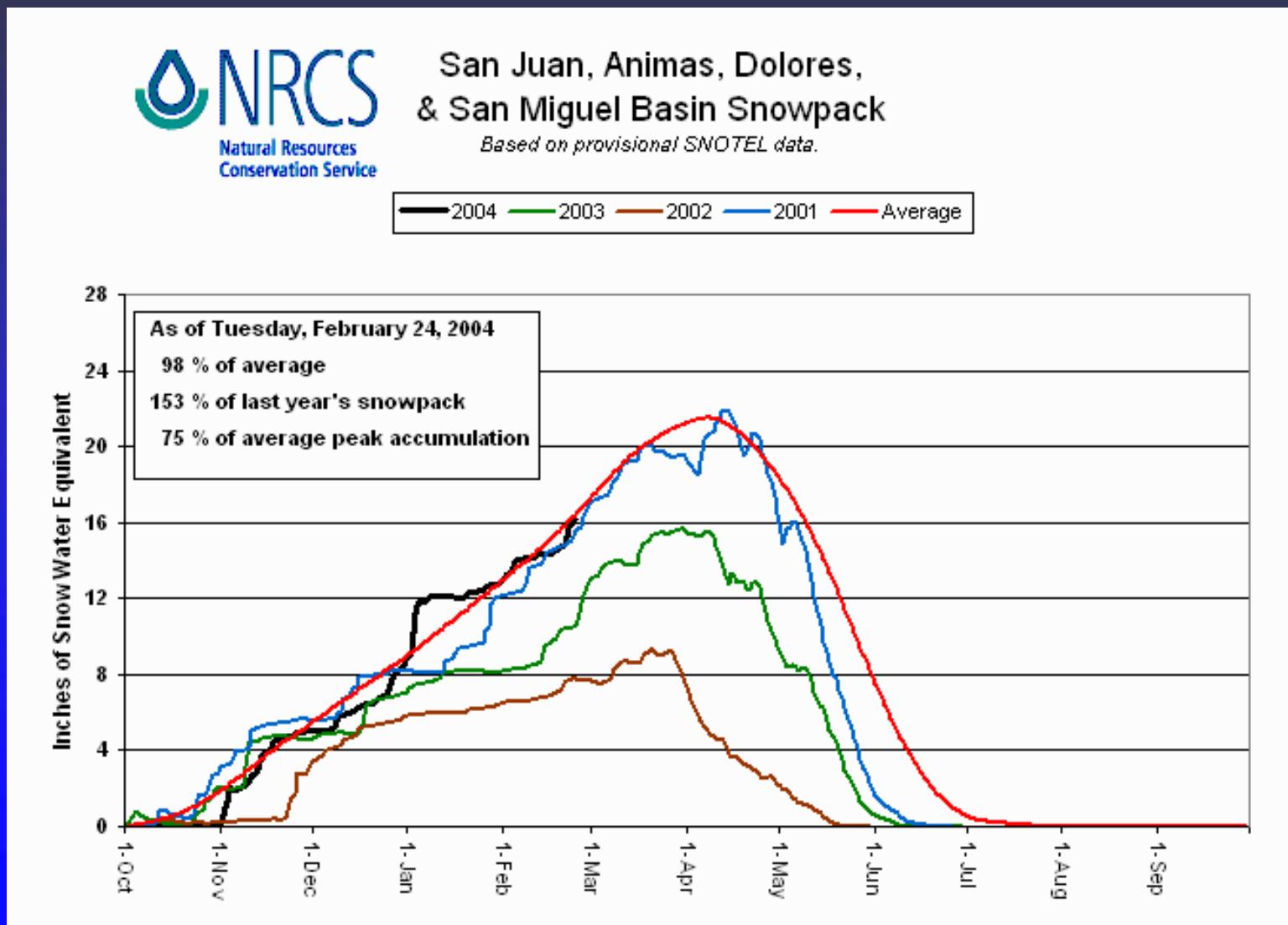
South Platte Basin Snowpack

Based on provisional SNOTEL data.

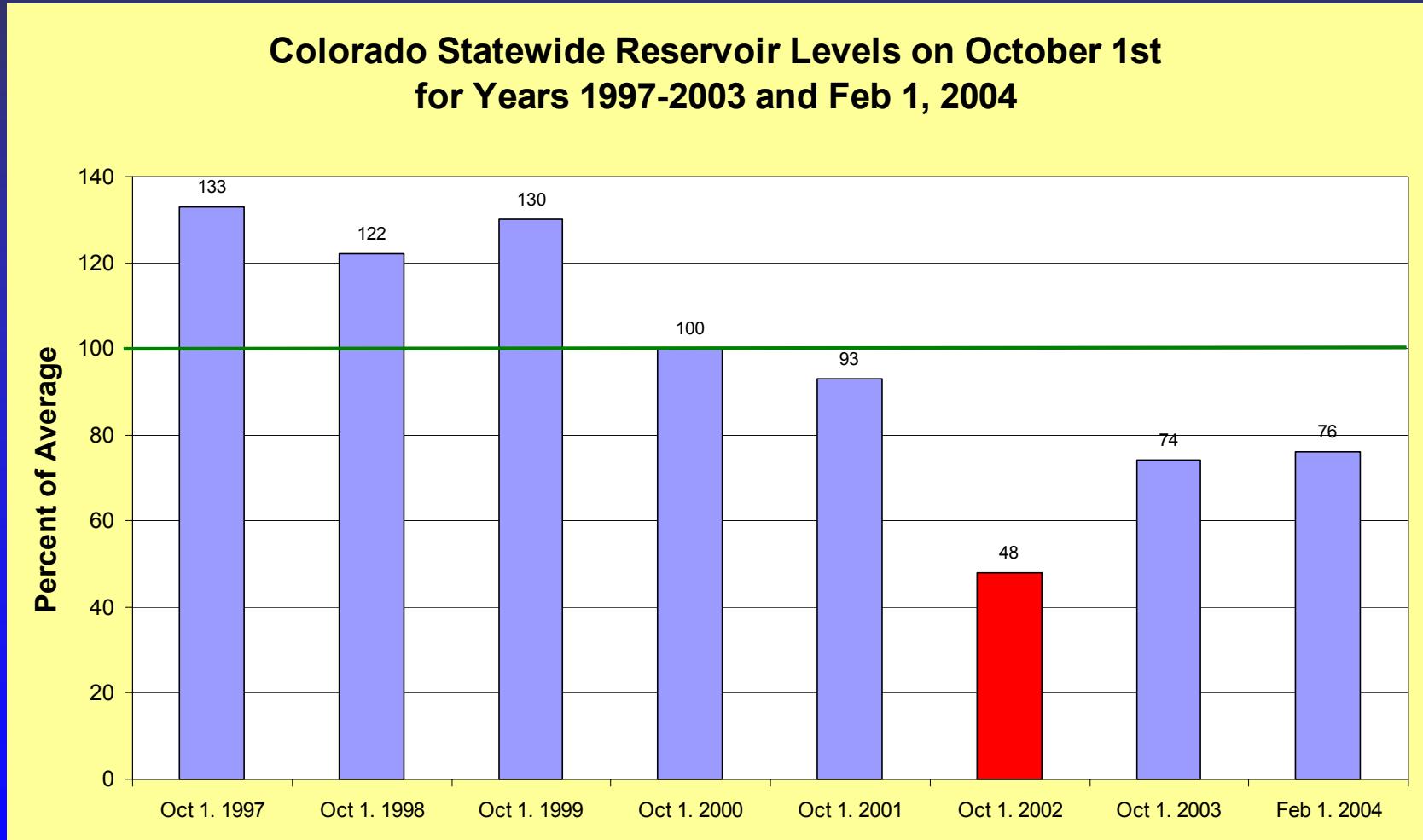
— 2004 — 2003 — 2002 — 2001 — Average



San Juan-Dolores-Animas Snowpack



Reservoir Levels





What Comes Next?

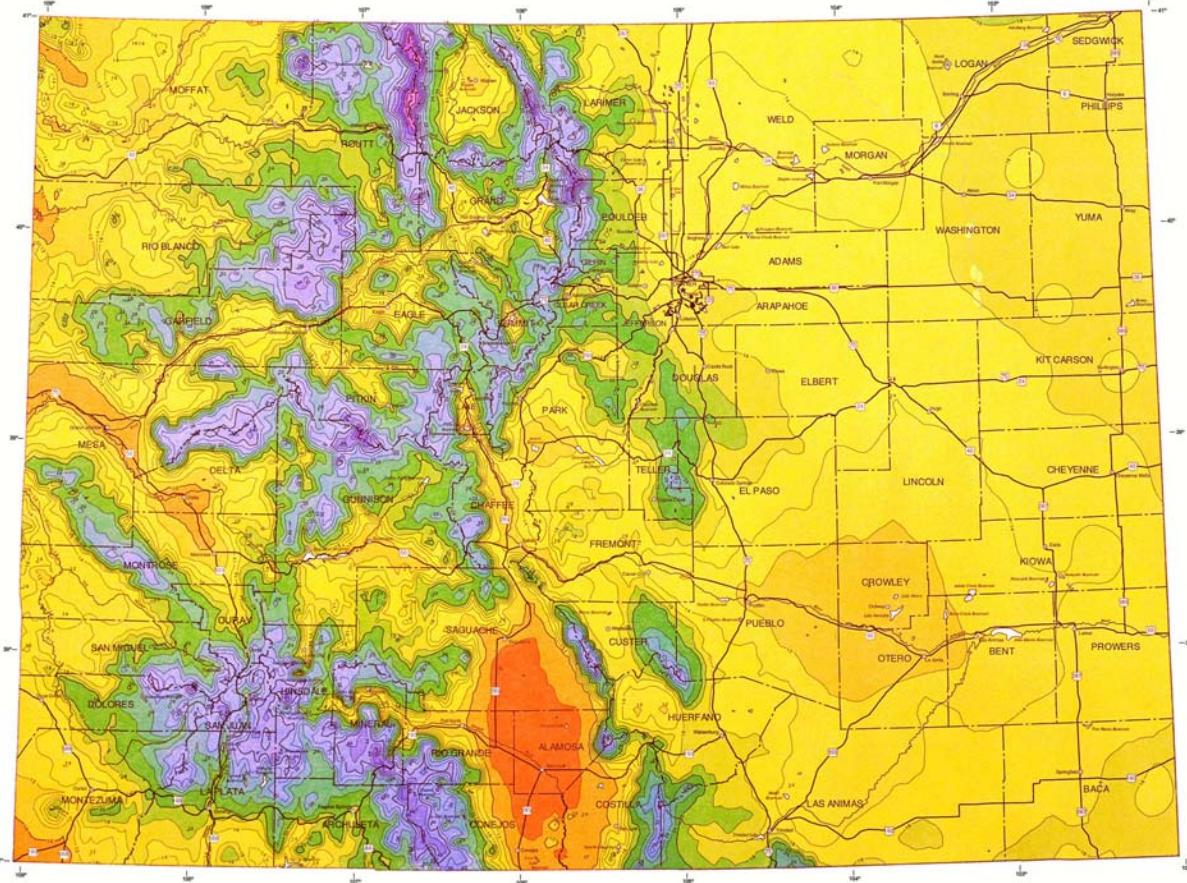


Colorado Average Precipitation

U.S. DEPARTMENT OF AGRICULTURE

NATIONAL RESOURCES CONSERVATION SERVICE

COLORADO ANNUAL PRECIPITATION



Average
Annual Precipitation
1961 - 1990
inches per year

- <8
- 8-10
- 10-12
- 12-14
- 14-16
- 16-18
- 18-20
- 20-24
- 24-28
- 28-32
- 32-36
- 36-40
- 40-44
- 44-48
- 48-52
- 52-56
- 56-60
- 60-70

Map in cooperation with Oregon State University.
Data Source: NRCS Cooperating Stations (1961-1989) climate observation network, NRCS SHATEL Station normals.
Digital Elevation Model: Digital Elevation Model (DEM) derived from a 1/3 arc second Defense Mapping Agency (DMA) Digital Terrain Elevation Dataset (DTED) Version 2.0, derived from the EROS Data Center.

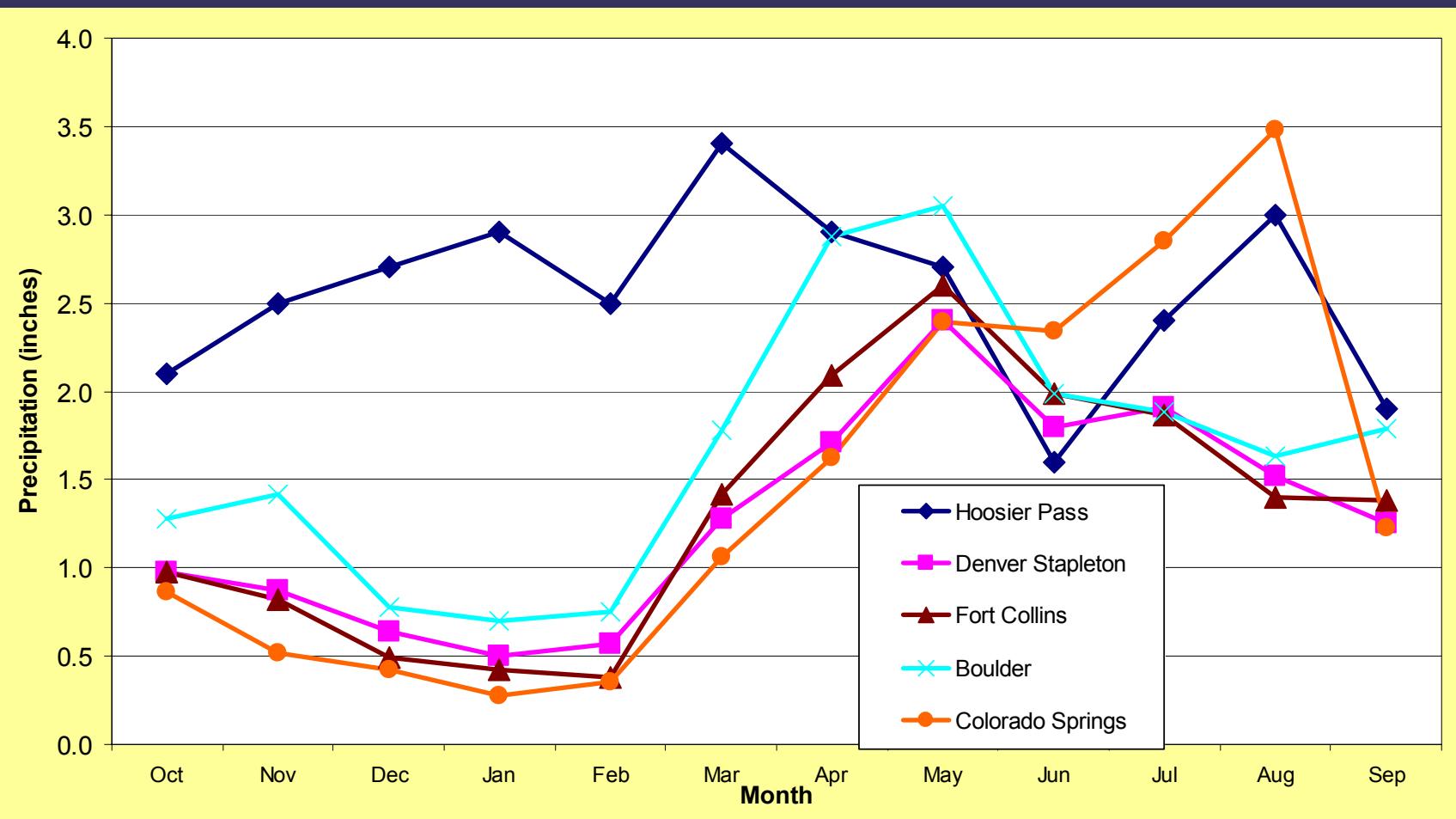
Estimation Technique: Gridded estimates were derived from station point values using the PRISM model developed at Oregon State University. The modeled grid was approximately 1 km resolution and was resampled to 2 km using a Gaussian filter.
Climate Dataset: April 1989 Albers Equal Area Projection, NAD 1983, HARN 27.

USDA NRCS National Cartography & Geospatial Center, Fort Worth, TX, 1989.

SCALE 1:1, 185,000

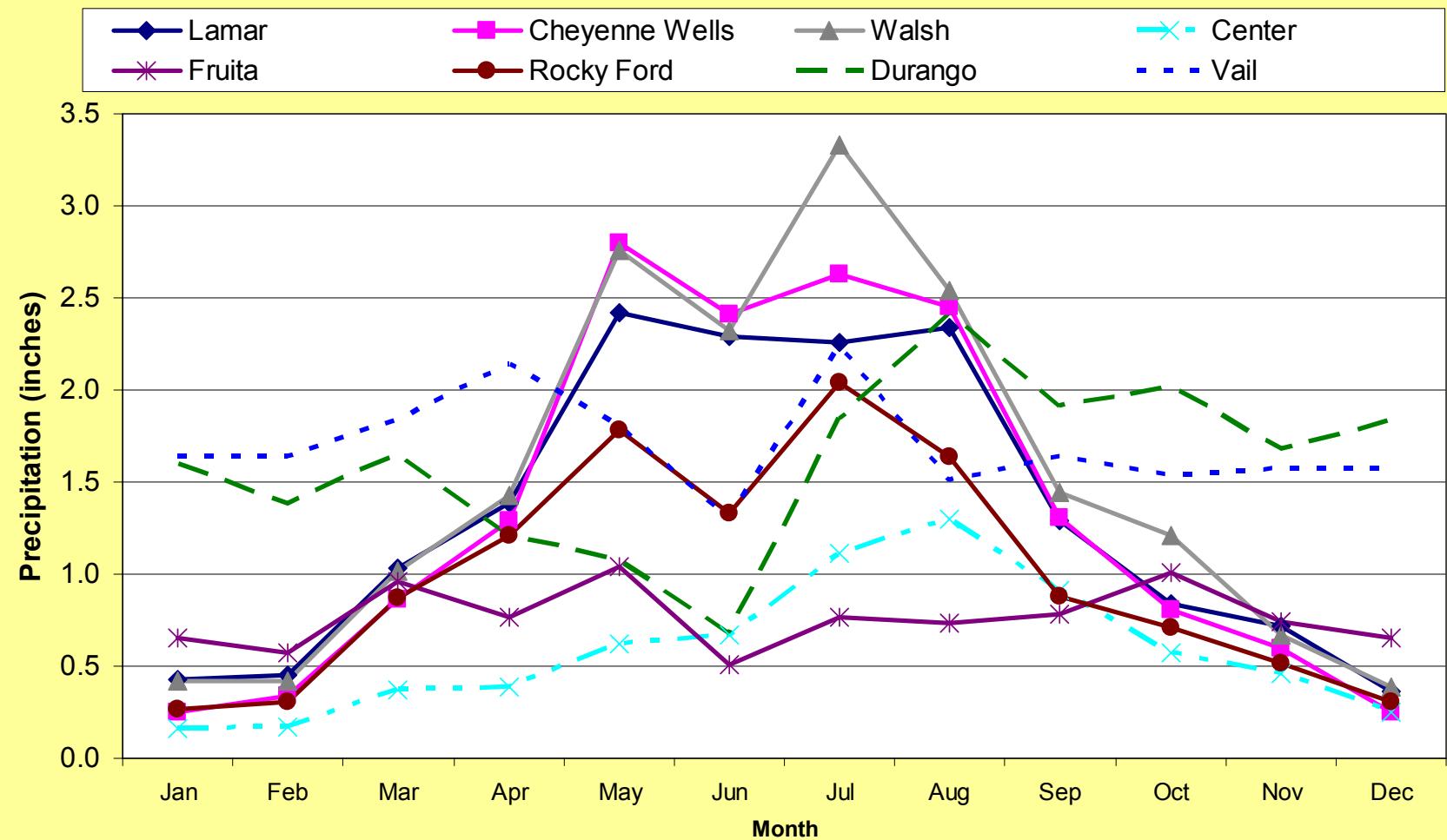
SOURCE NOTE:
Users are cautioned that contours may not exactly match station-observed precipitation especially in regions with significant precipitation gradients and/or terrain effects.
April 1989, 1989.

Front Range Monthly Average Precipitation

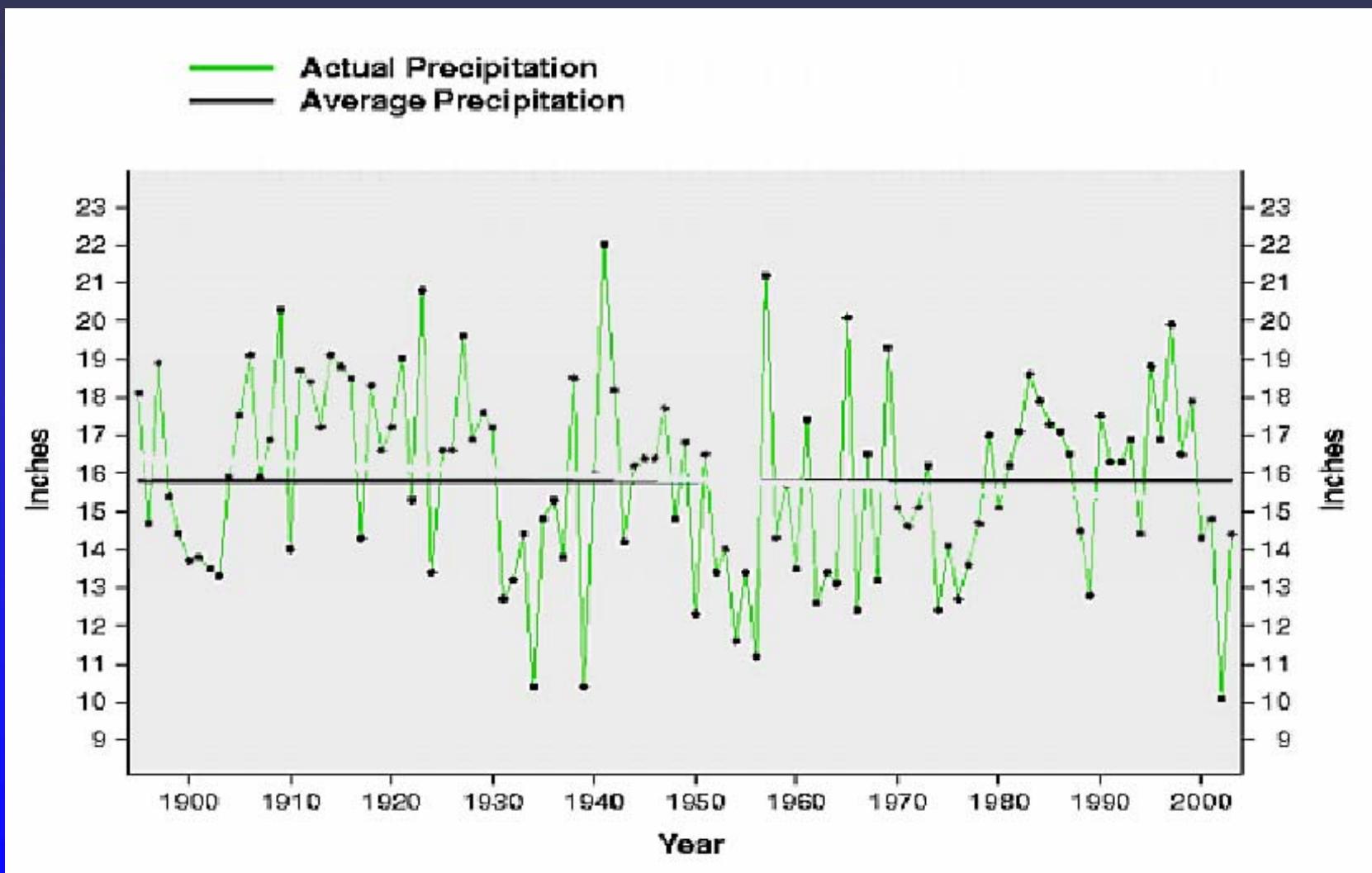


Average Precipitation for Selected Sites

Monthly Average Precipitation

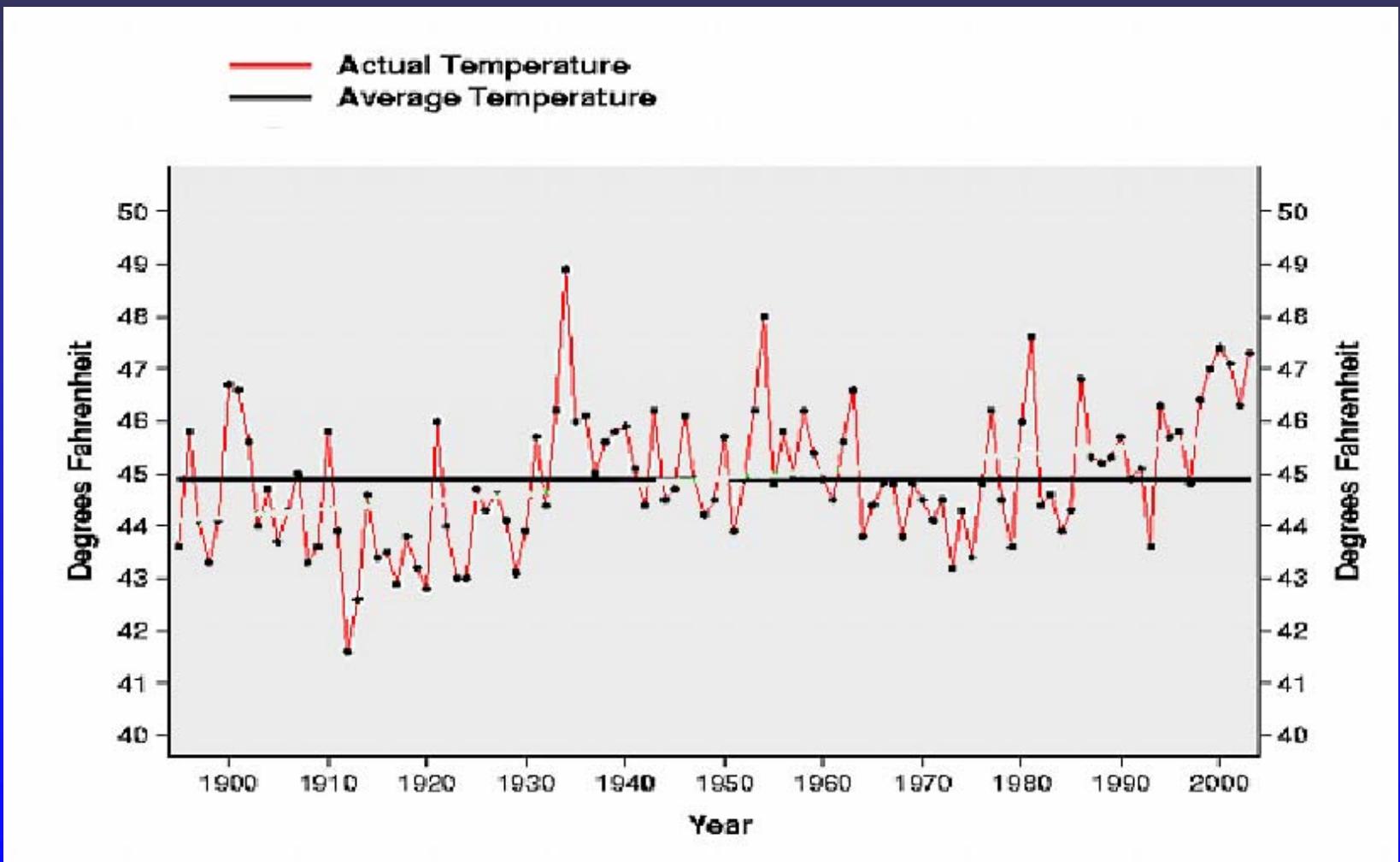


Statewide Annual Precipitation History

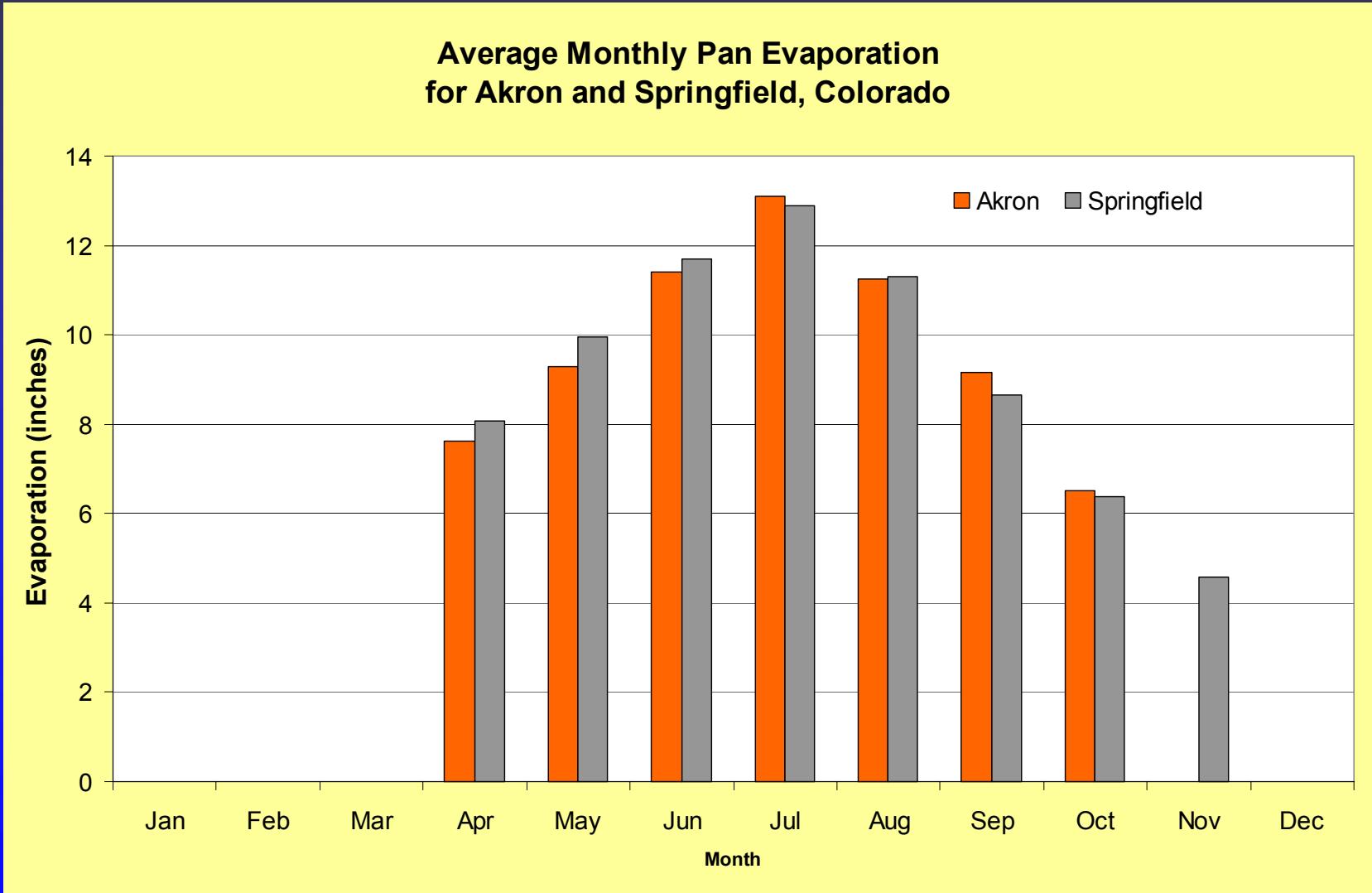




Statewide Mean Annual Temperature



Monthly Average Pan Evaporation





Positive Indicators

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

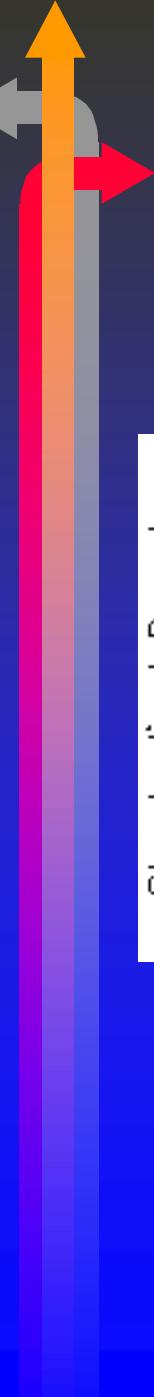




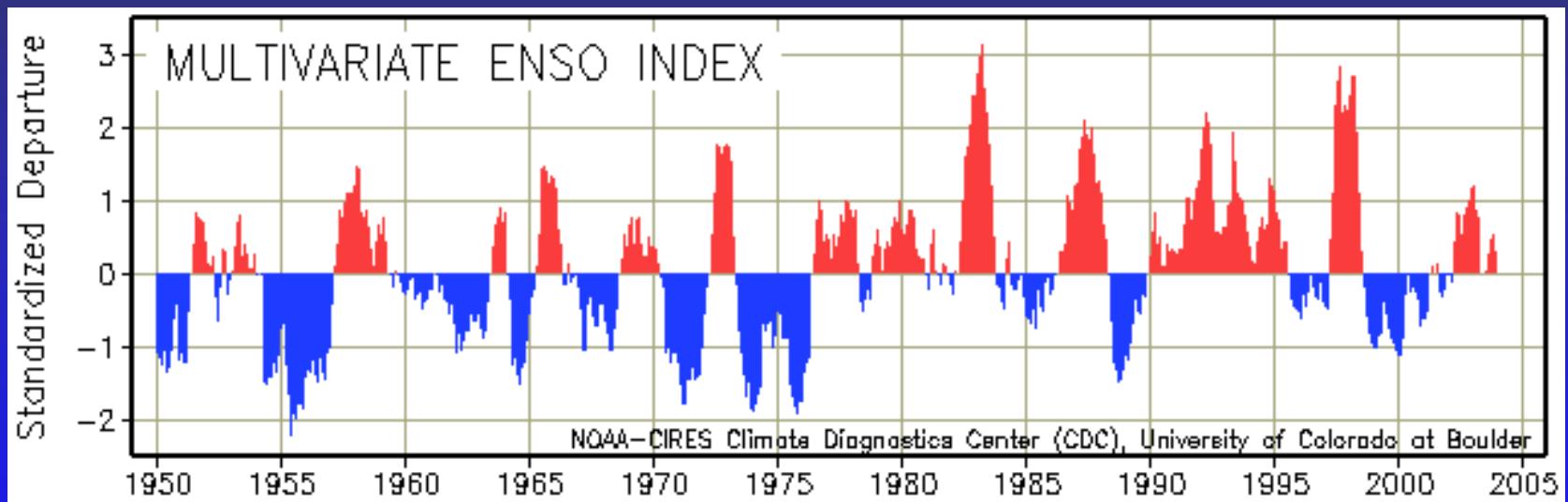
Negative Indicators



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



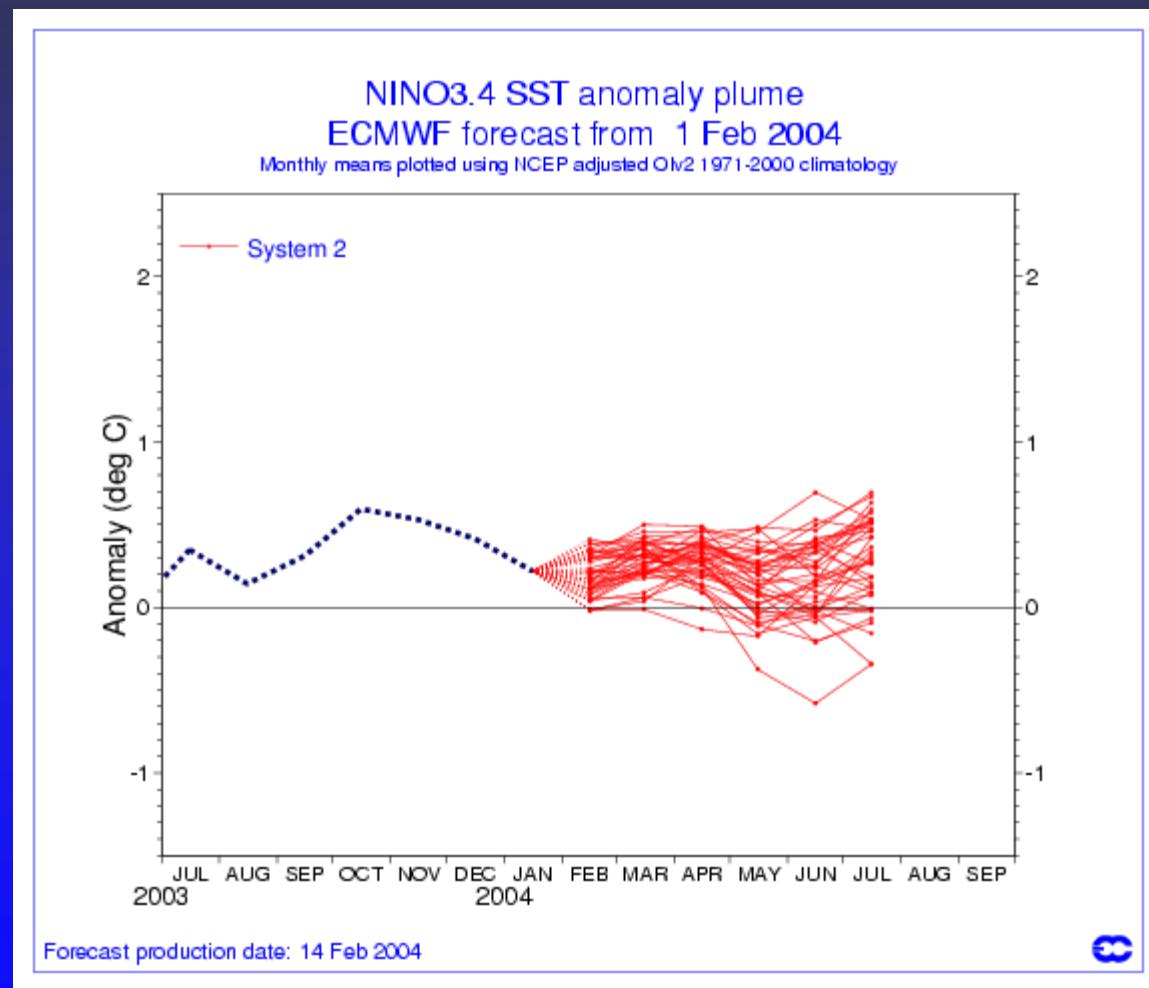
Multivariate ENSO Index (MEI)



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

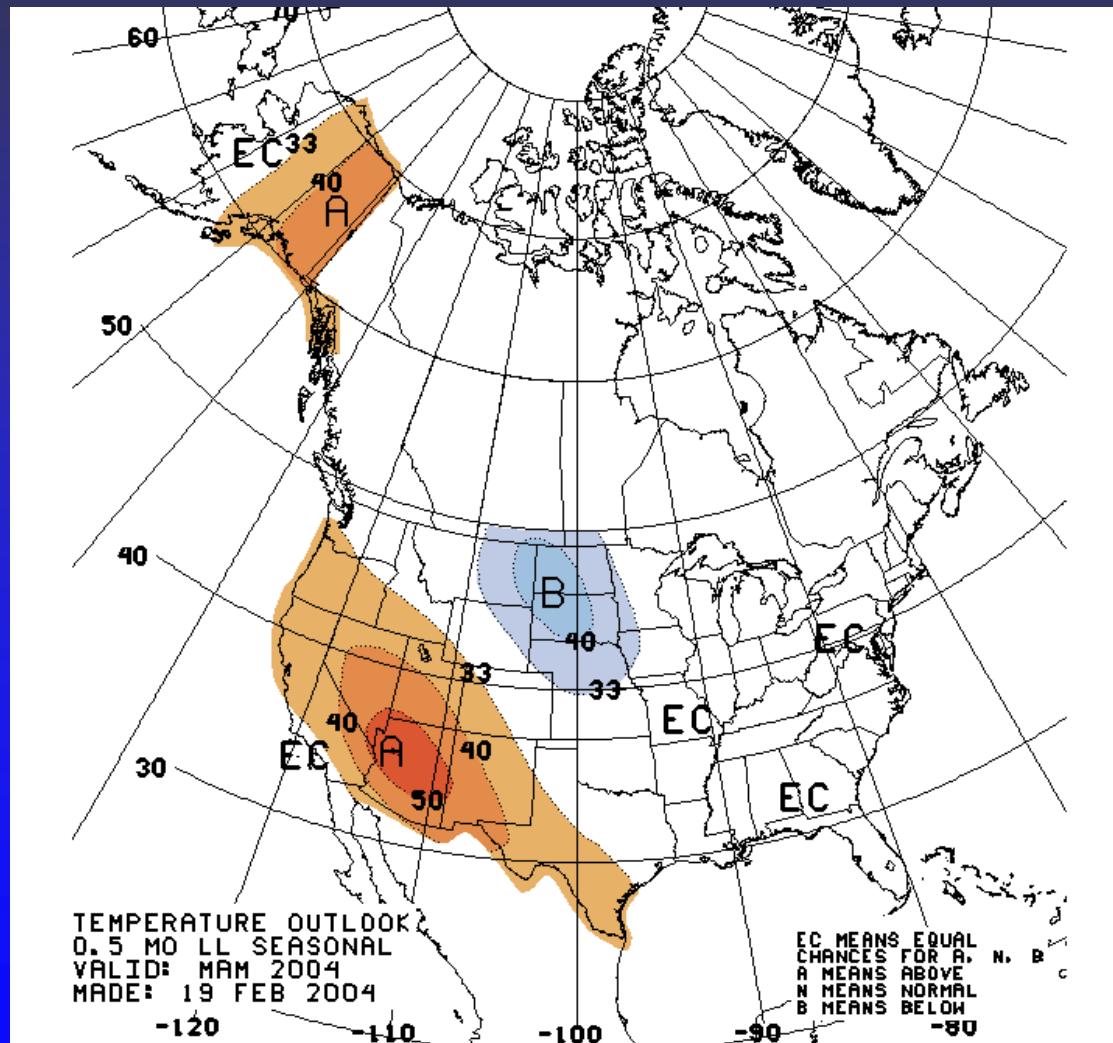


El Nino Forecast



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

Temperature March – May 2004

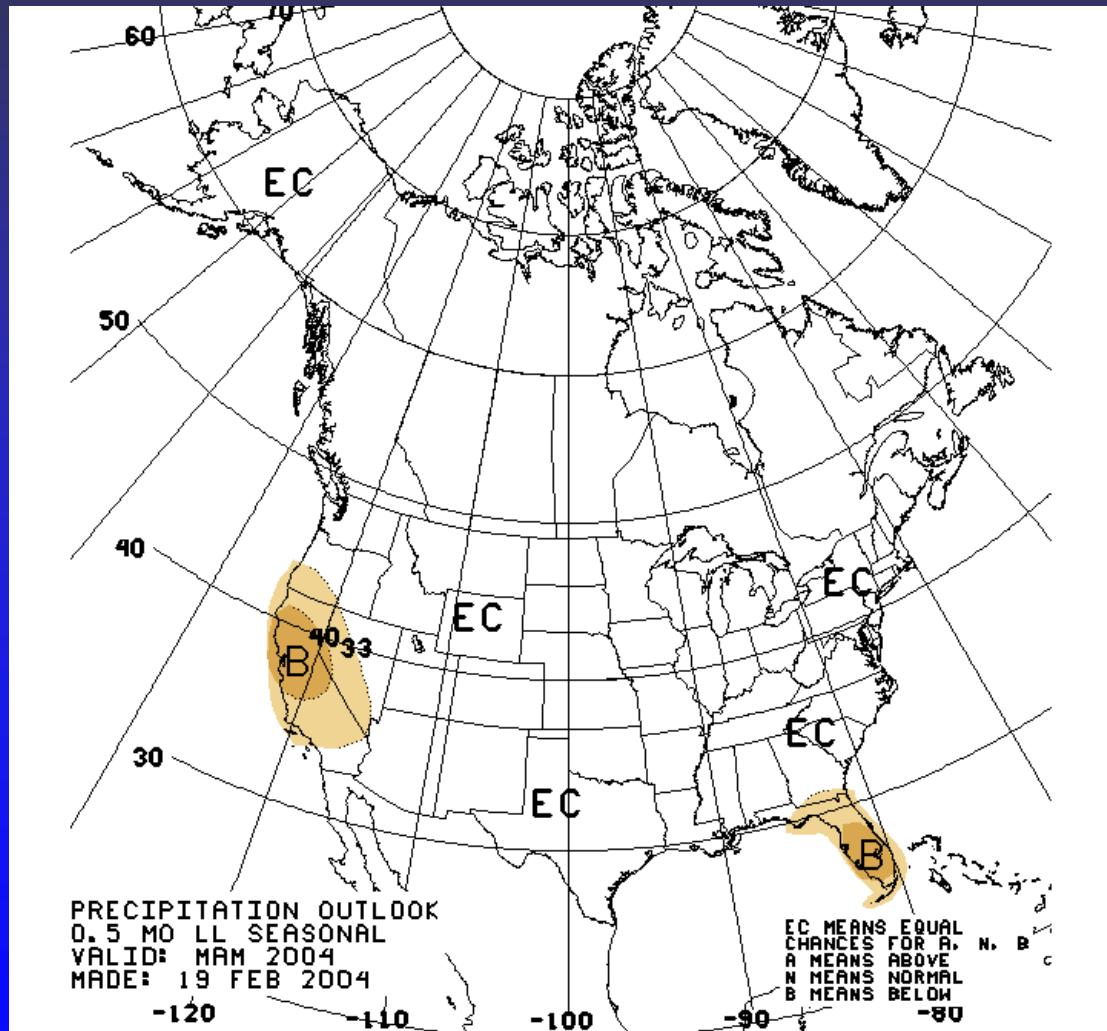


From the Colorado Prediction Center

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

Precipitation

March – May 2004

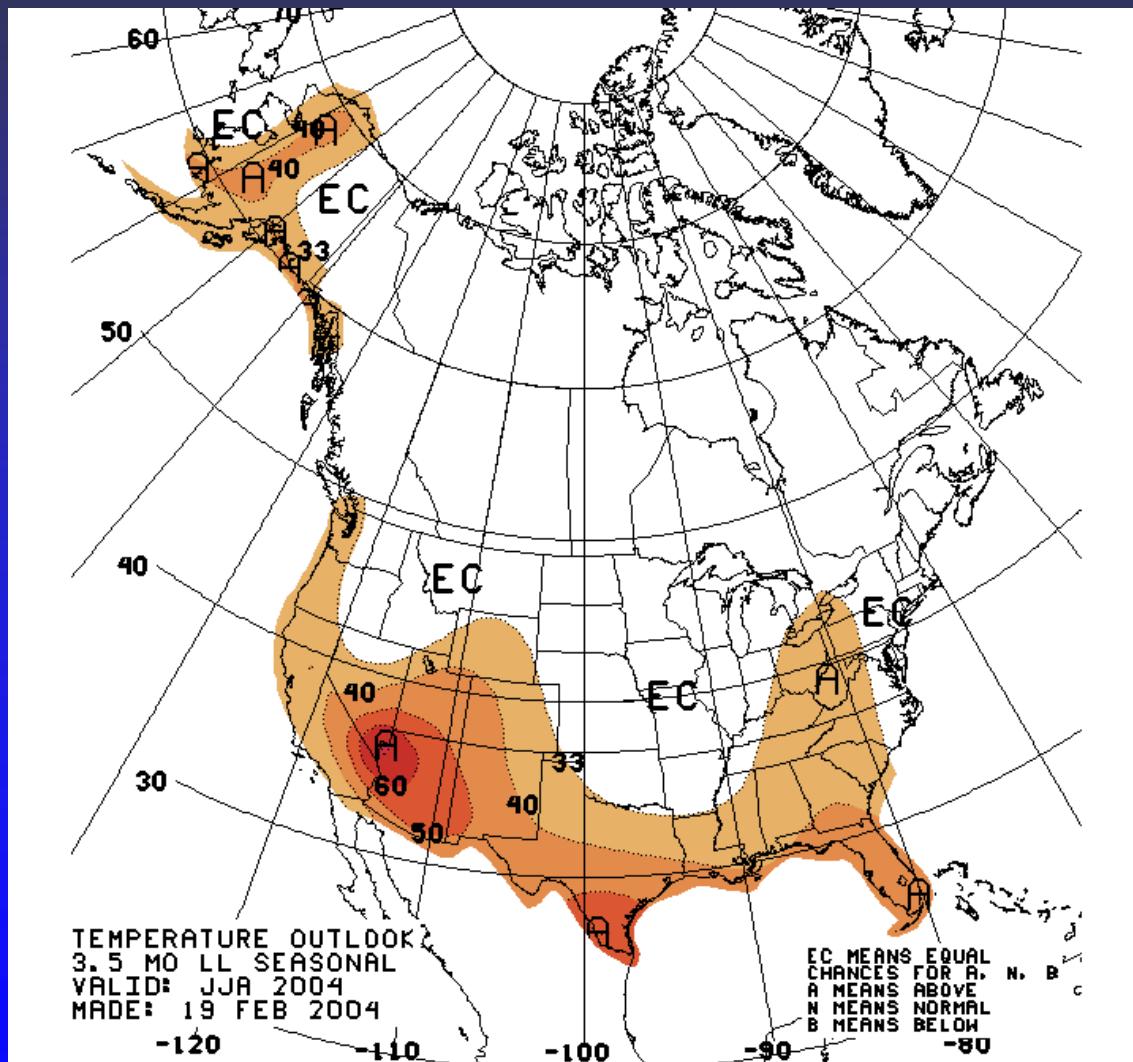


From the Colorado Prediction Center

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

Temperature

June – August 2004

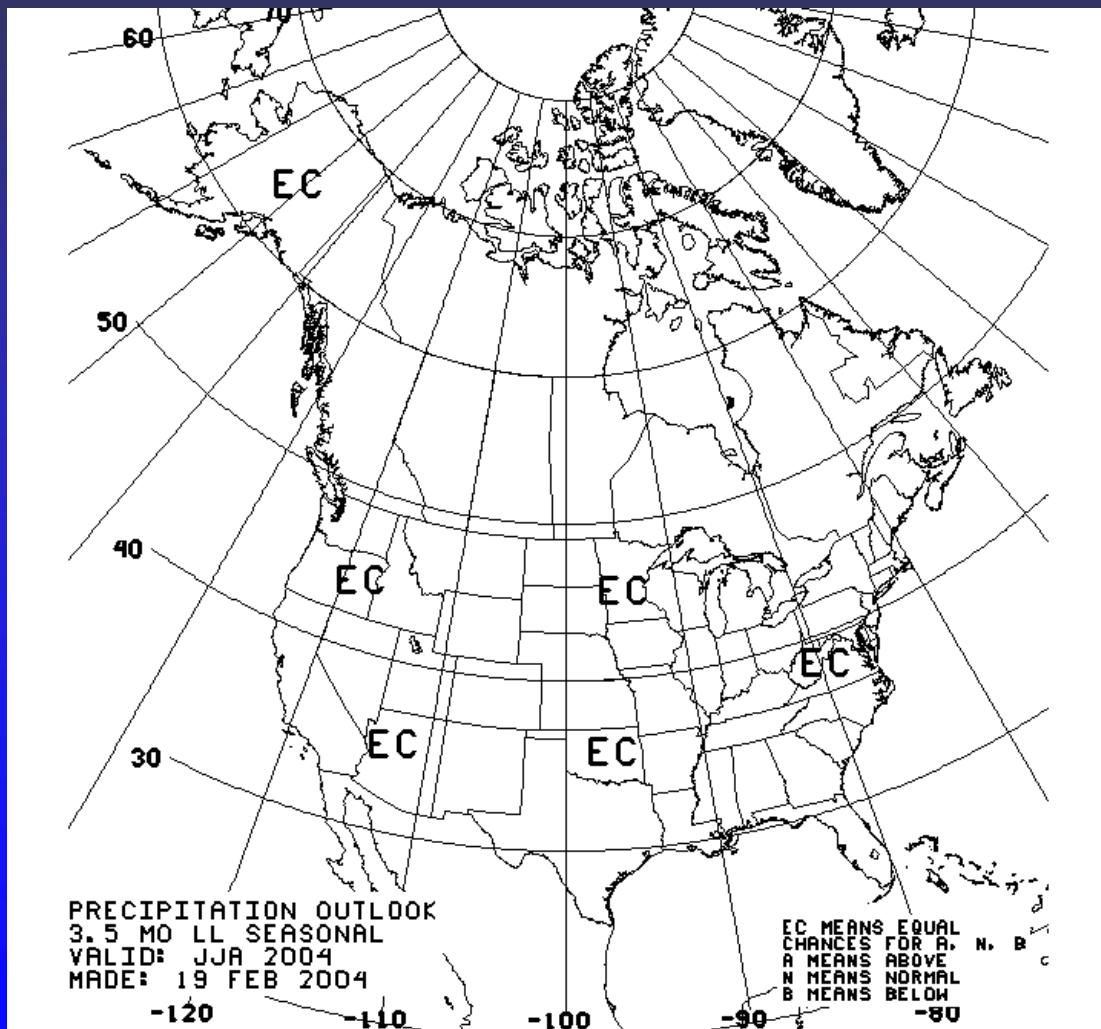


From the Colorado Prediction Center

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

Precipitation

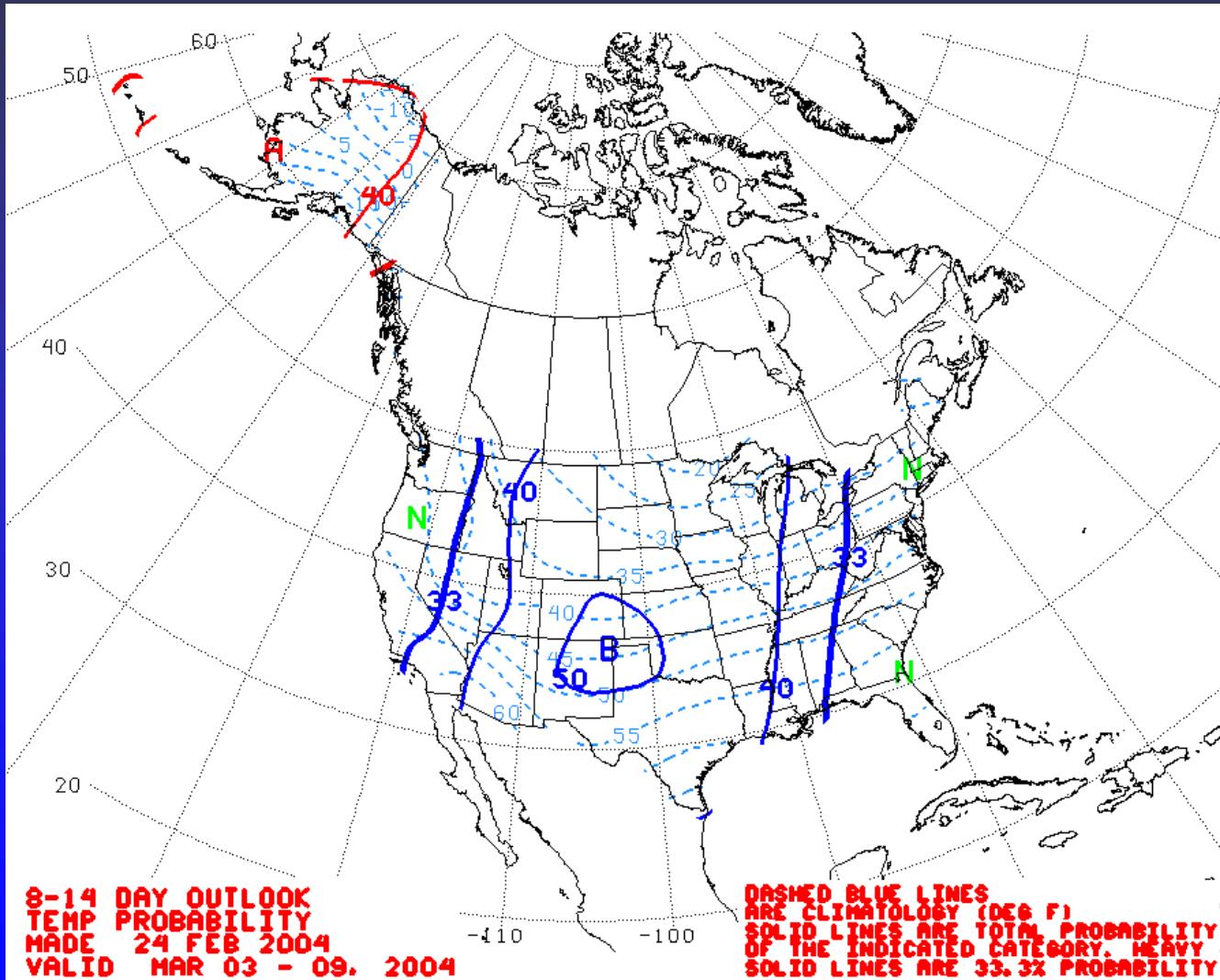
June – August 2004



From the Colorado Prediction Center

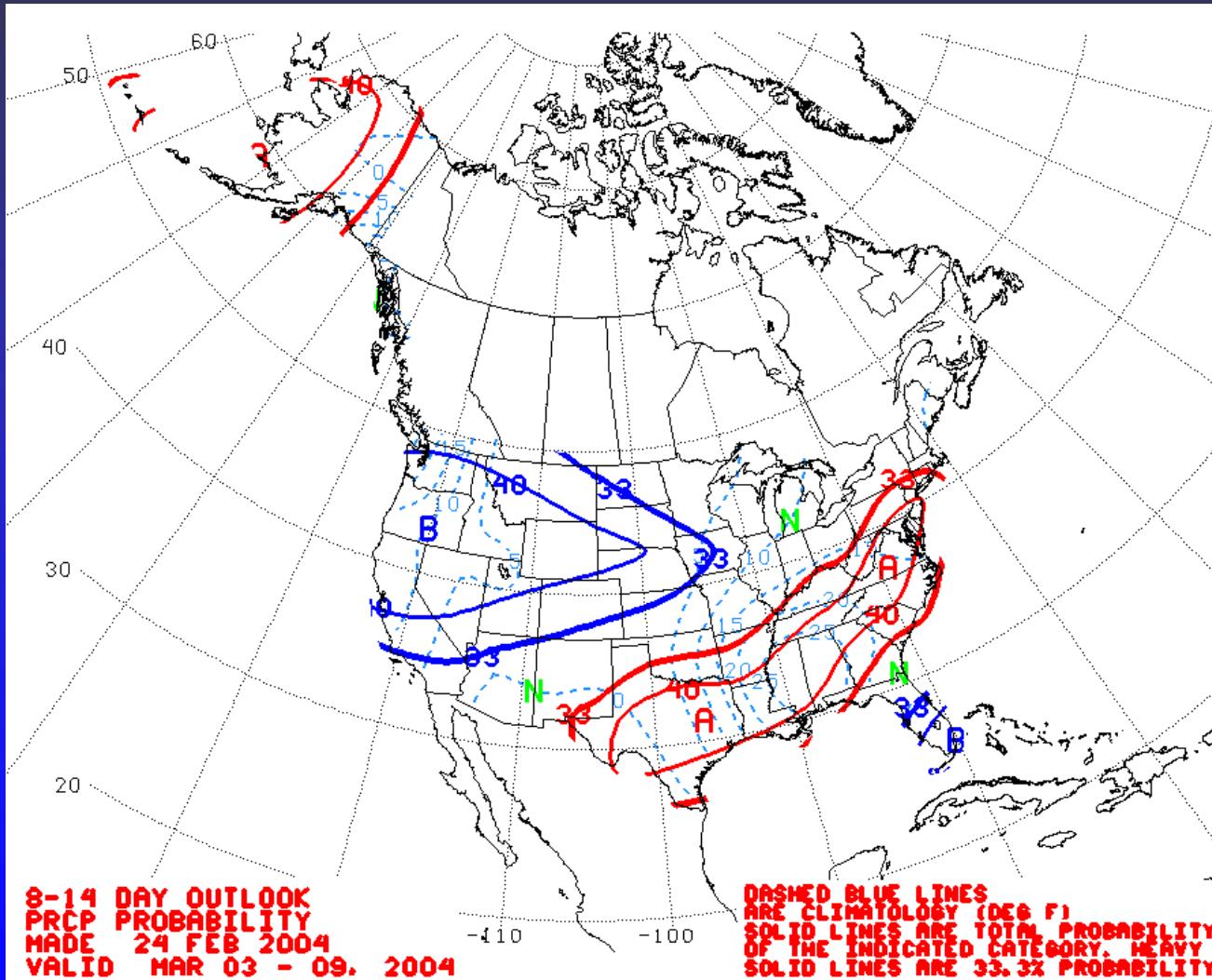
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

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/>



CoCo RaHS

Community Collaborative
Rain and Hail Study

YOU CAN HELP!



<http://www.cocorahs.org>



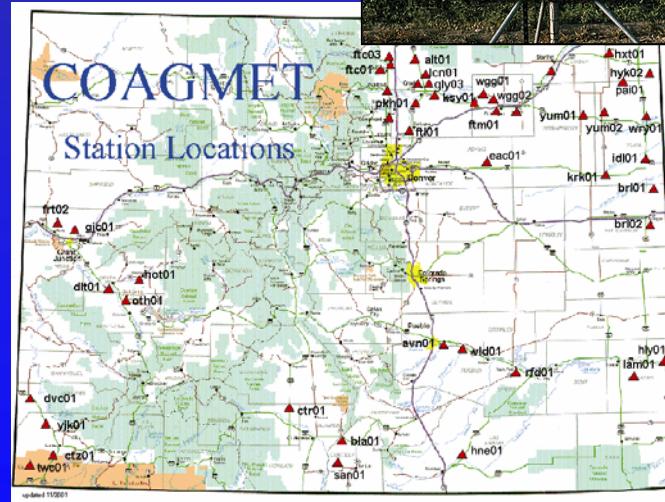
Sponsored in part by National Science Foundation



CoAgMet

Weather Data for Agriculture

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

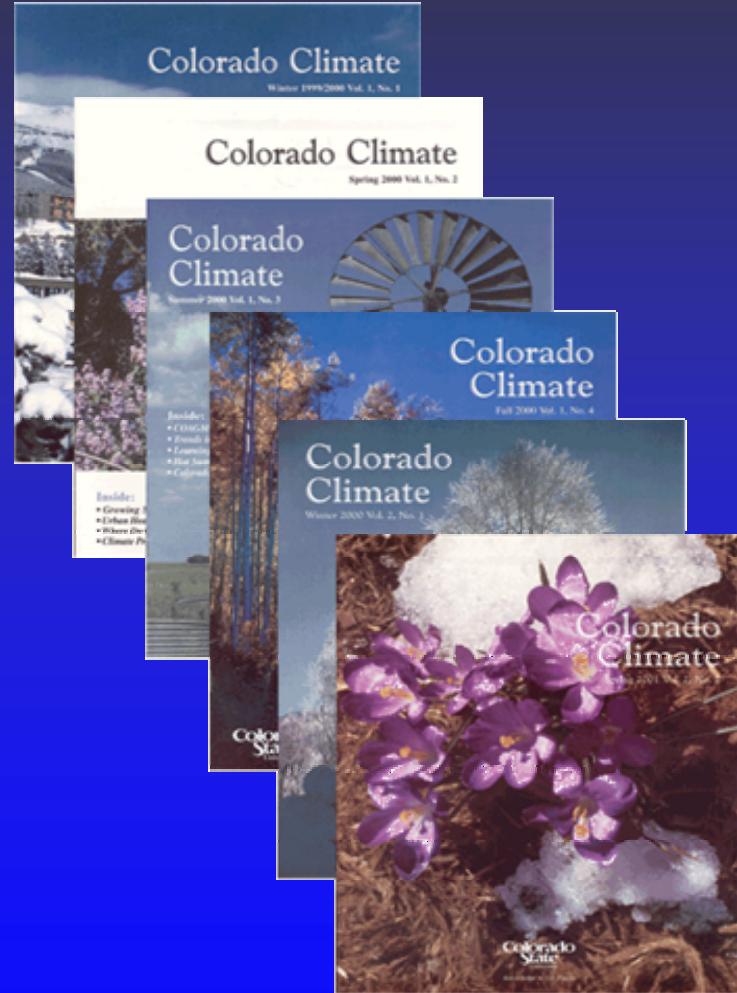


<http://www.coagmet.com>

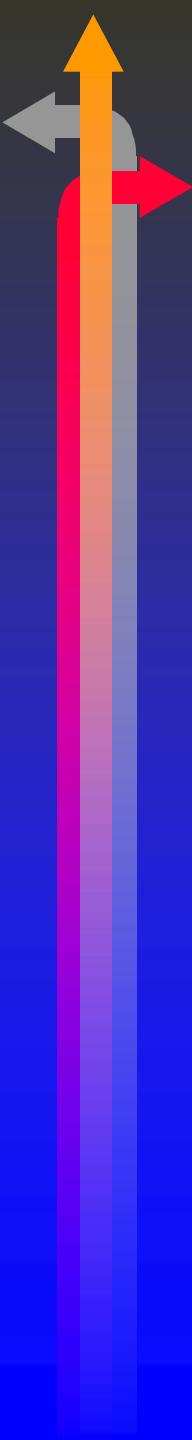


Colorado Climate Magazine

- *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”

