Drought or Not?

Nolan J. Doesken
Colorado Climate Center
Colorado State University

http://ccc.atmos.colostate.edu

Presented at Horticultural Art Society meeting,
November 19, 2004, Colorado Springs, Colorado

Prepared by Odie Bliss

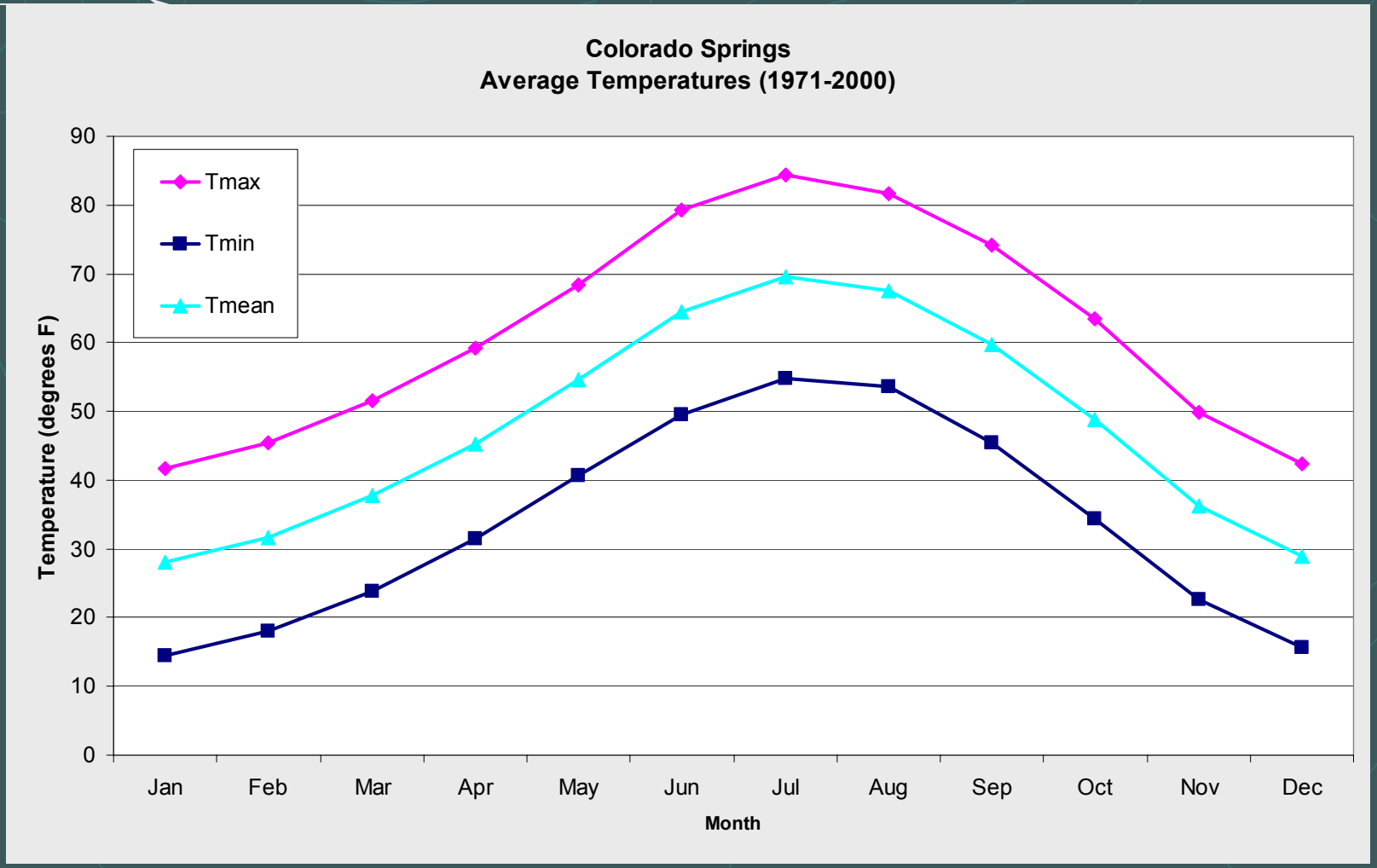
Our climate is great --

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

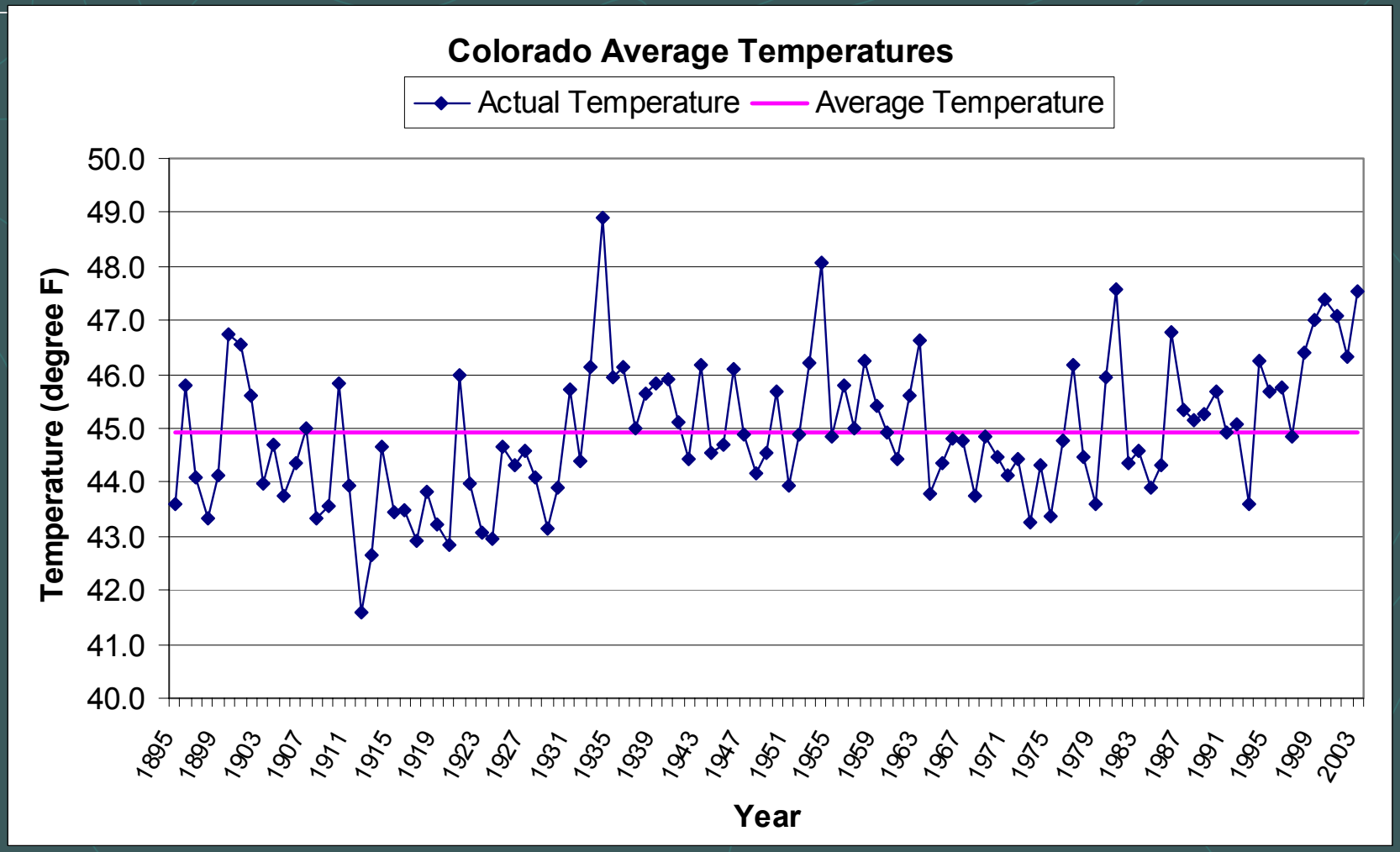
But sometimes it’s darn dry!

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

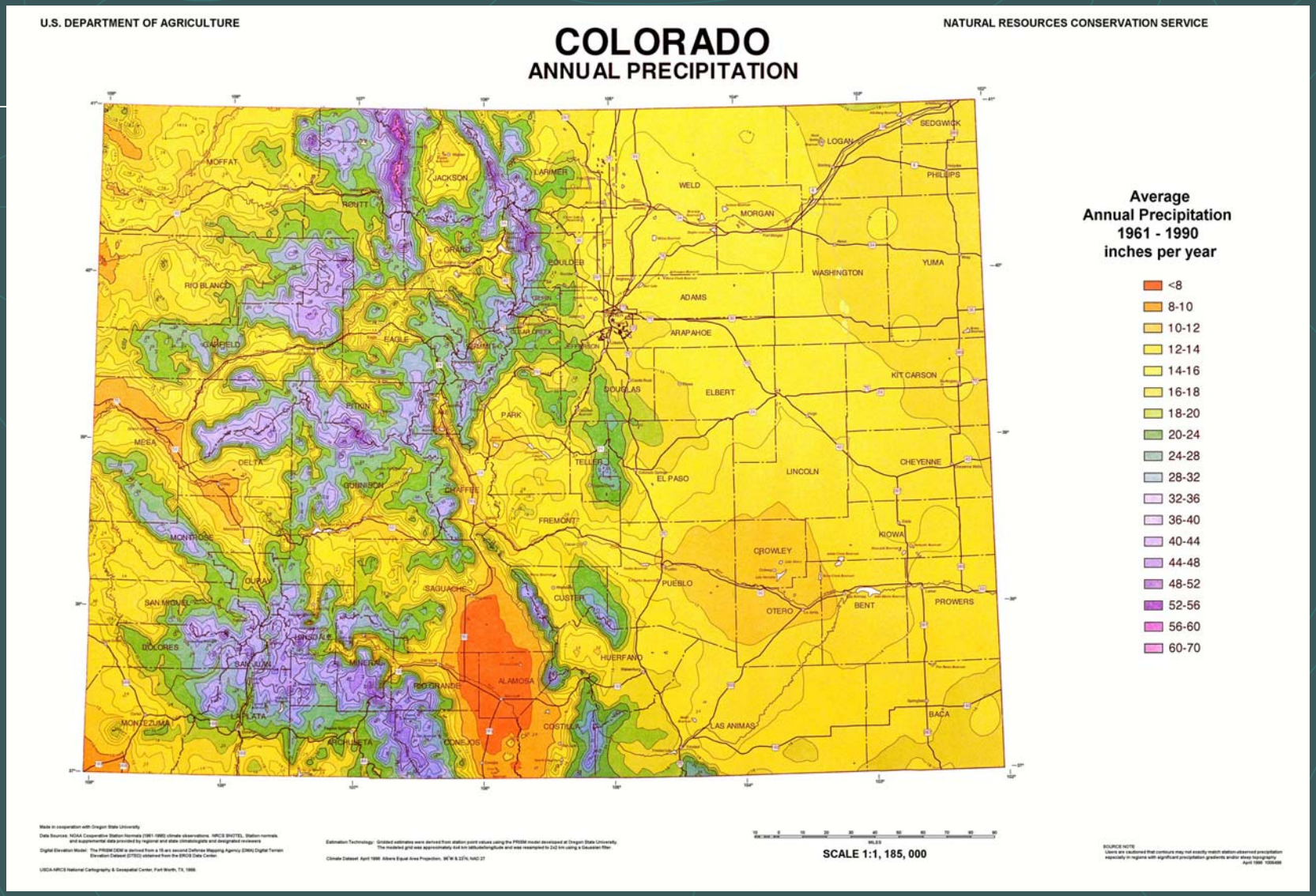
Colorado Springs Average Temperatures



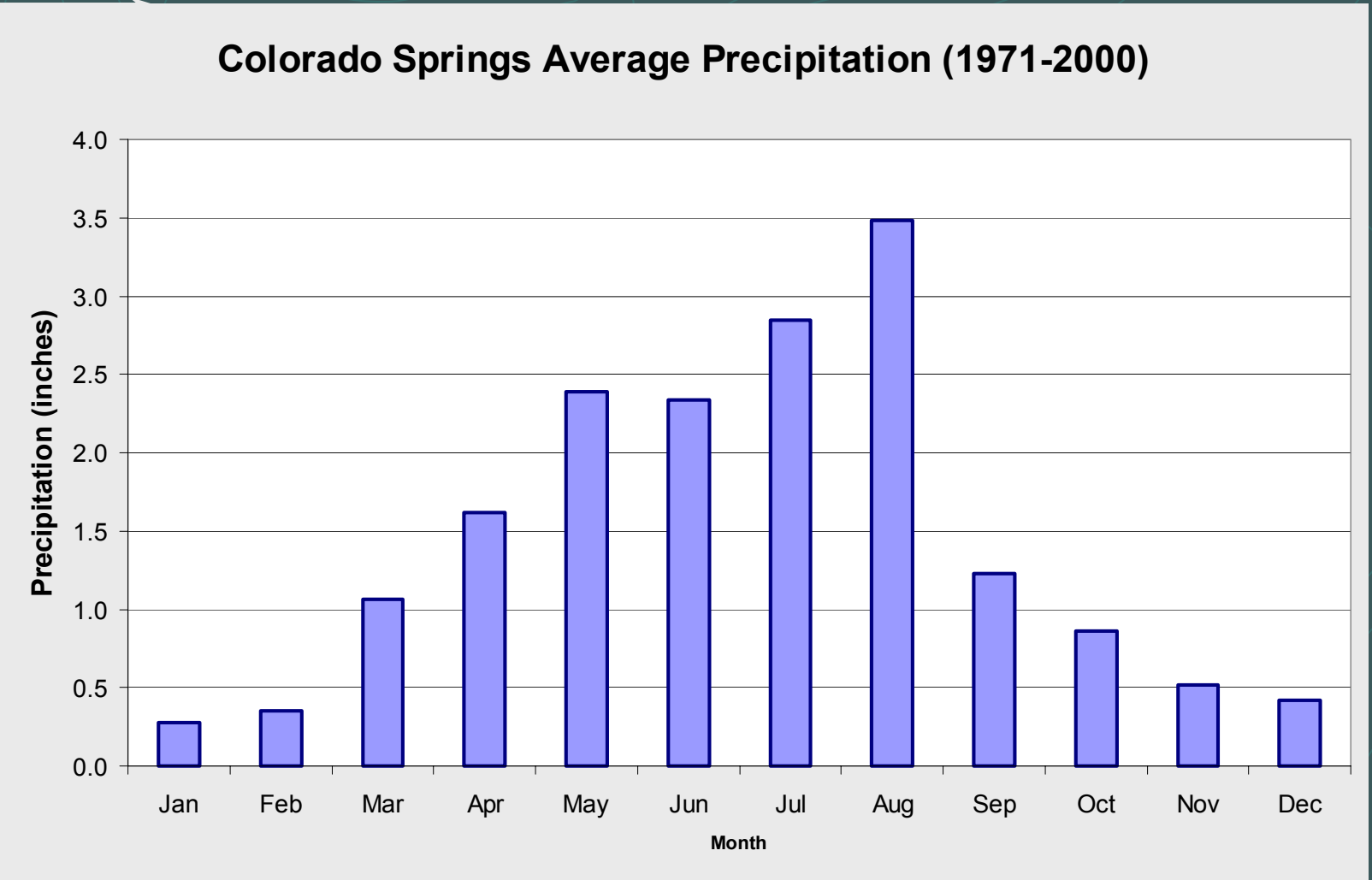
Statewide Mean Annual Temperature History



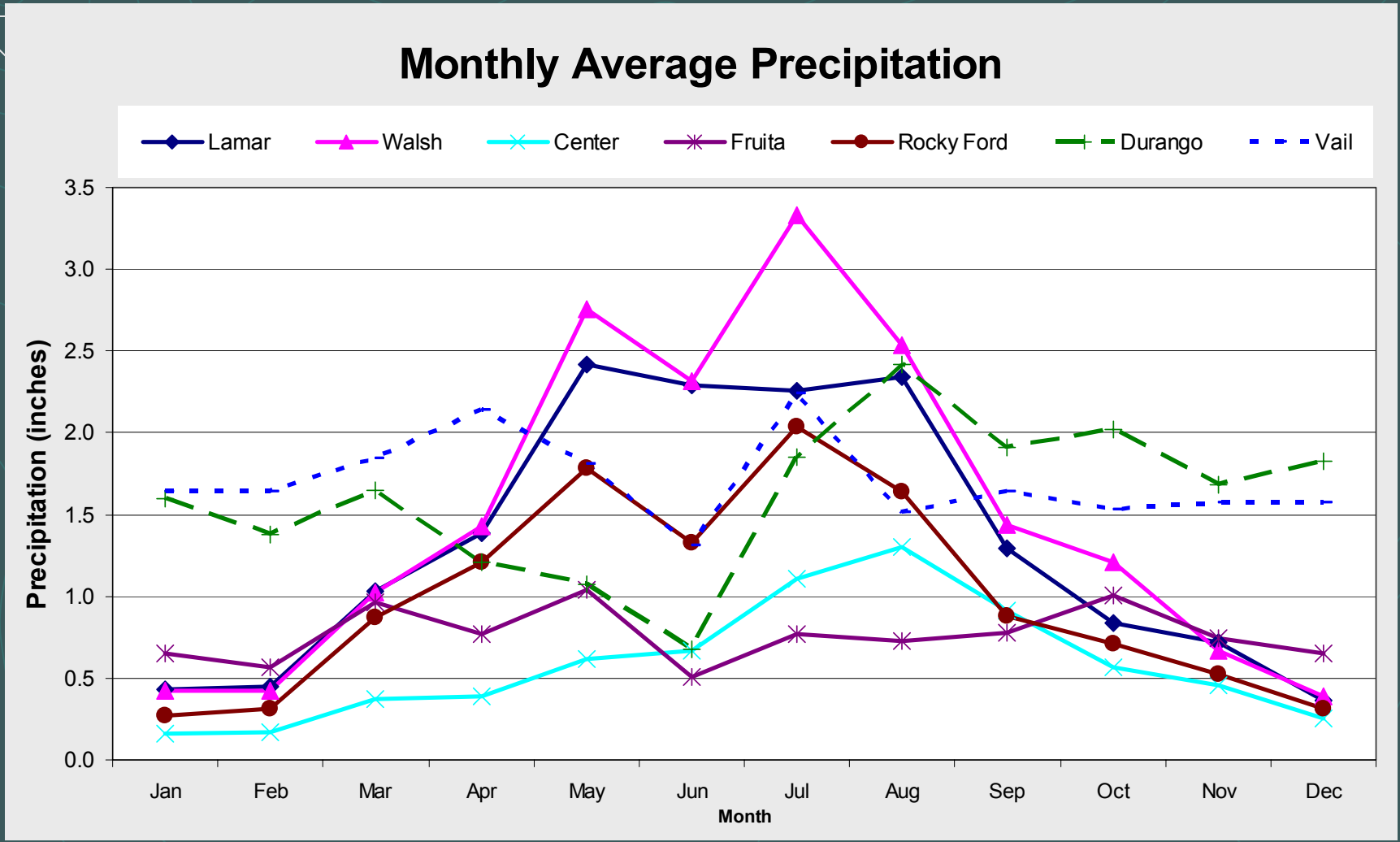
Colorado Average Precipitation



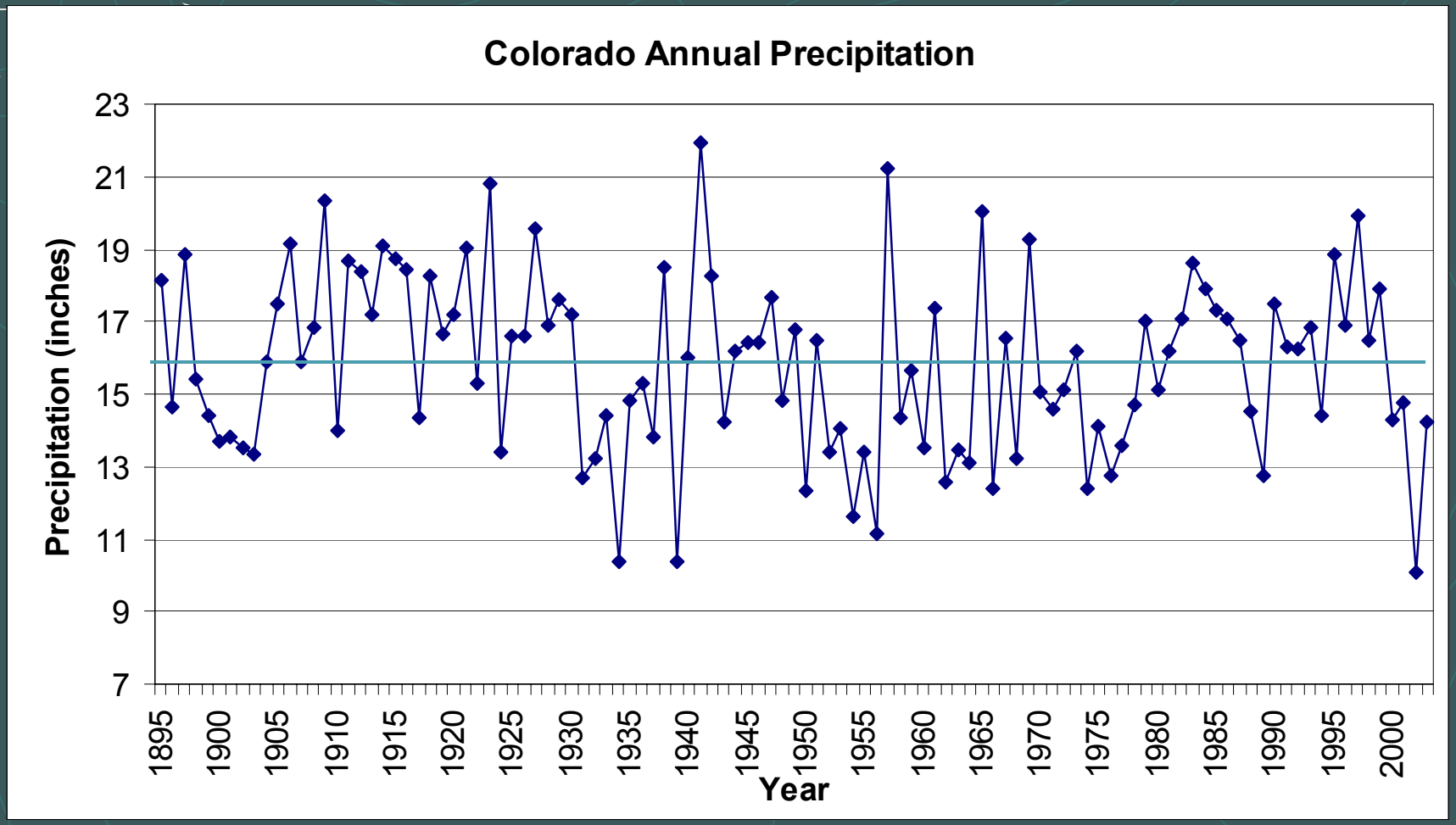
Colorado Springs Monthly Average Precipitation (1971-2000)



Average Monthly Precipitation for Selected Sites

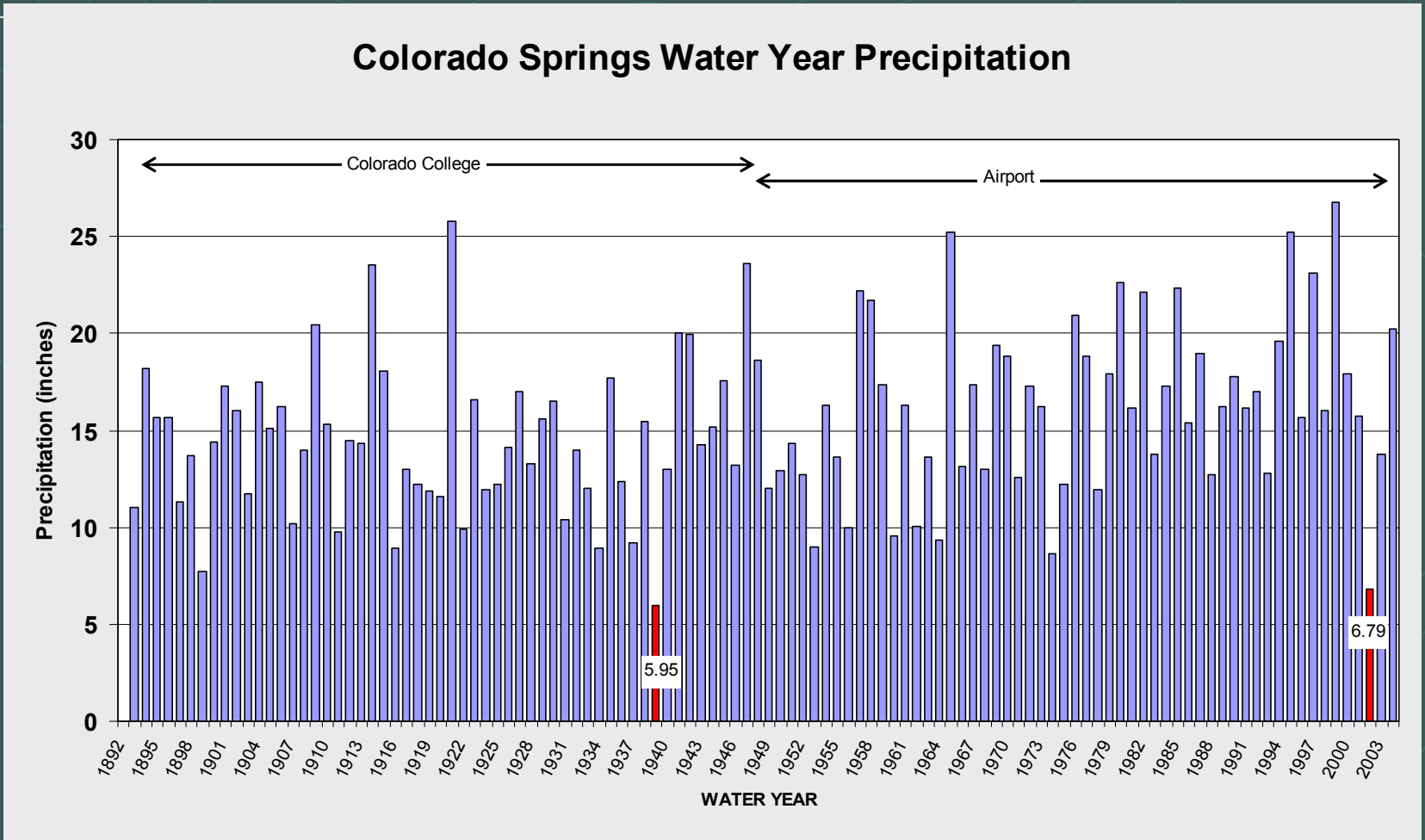


Statewide Annual Precipitation History

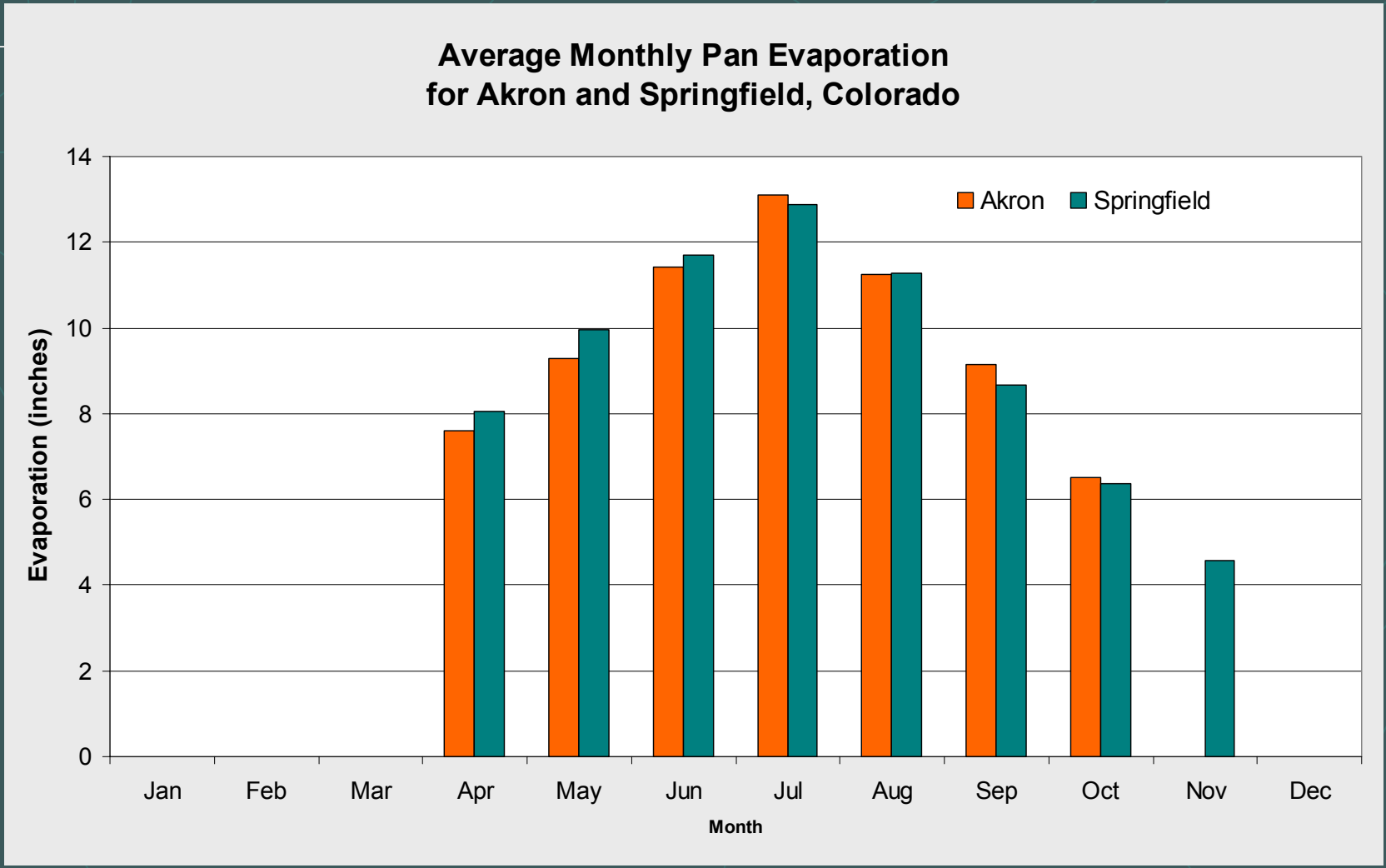


http://lwf.ncdc.noaa.gov/oa/climate/research/cag3/CO.html

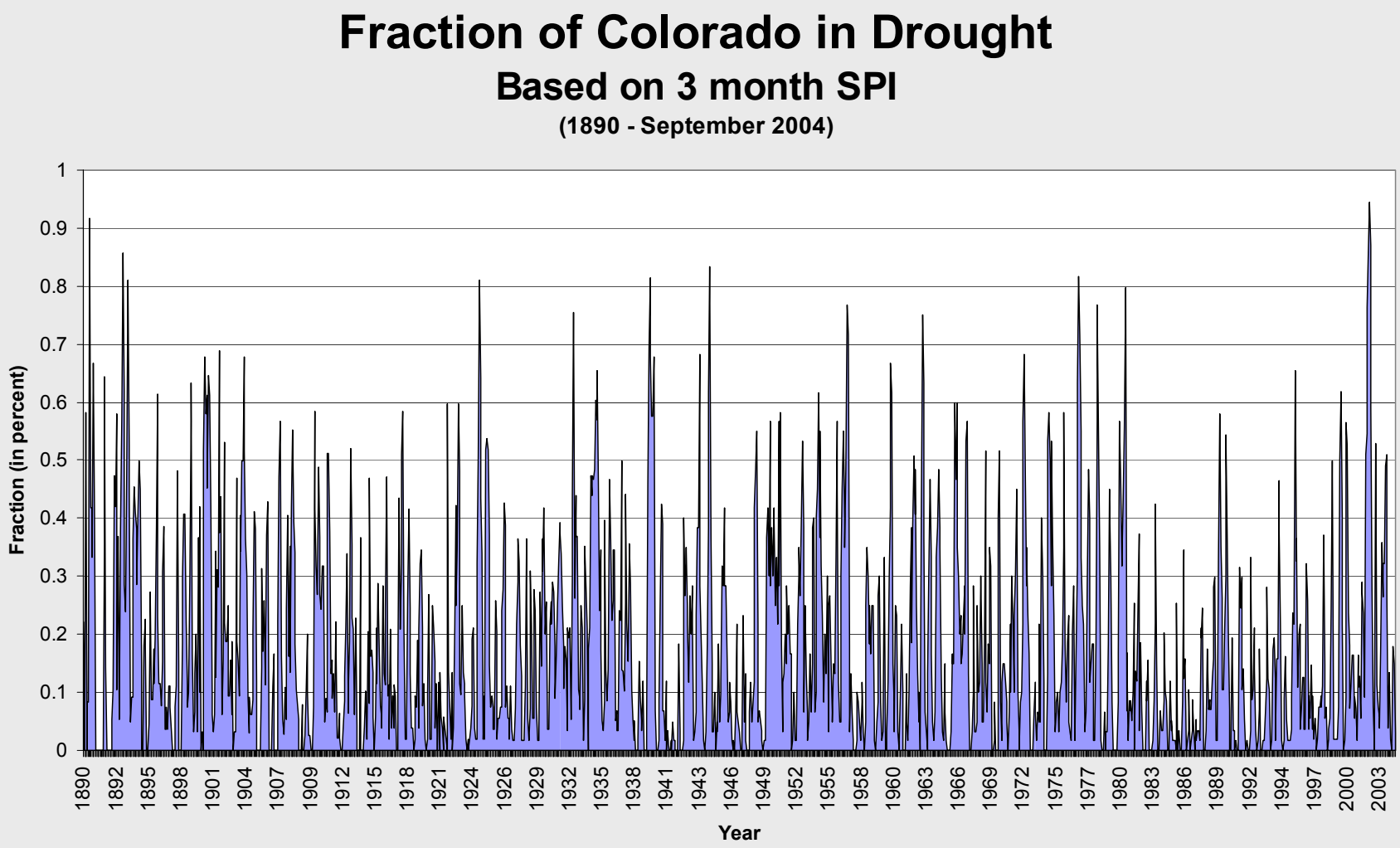
Colorado Springs Precipitation History



Monthly Average Pan Evaporation



3-Month SPI


Fraction of Colorado in Drought
Based on 3 month SPI
(1890 - September 2004)
Fraction (in percent)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1890
1892
1895
1898
1901
1904
1907
1909
1912
1915
1918
1921
1924
1926
1929
1932
1935
1938
1941
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1949
1952
1955
1958
1960
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1969
1972
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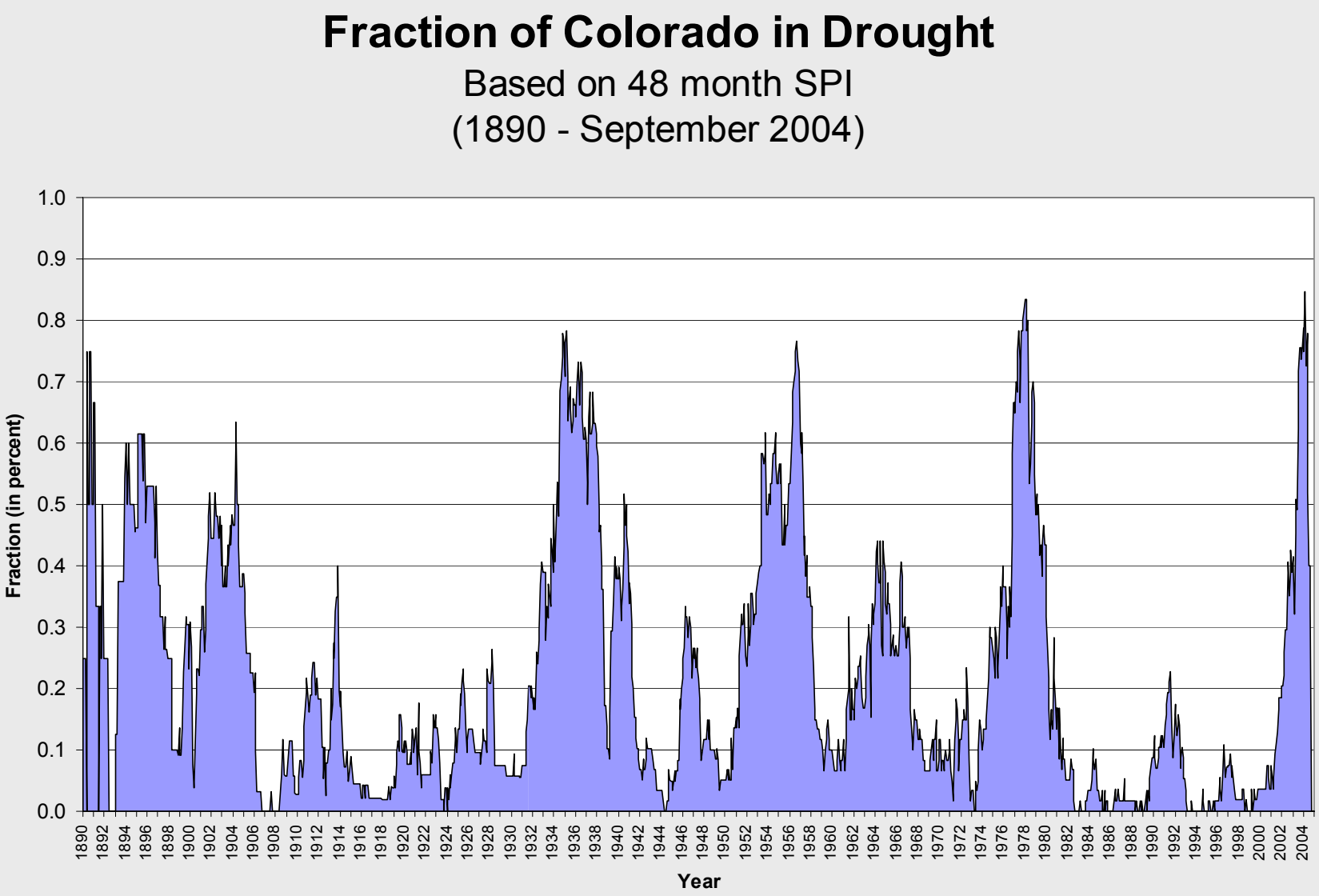
1986
1989
1992
1994
1997
2000
2003
Year

48-Month SPI


Fraction of Colorado in Drought
Based on 48 month SPI
(1890 - September 2004)
Fraction (in percent)
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1890
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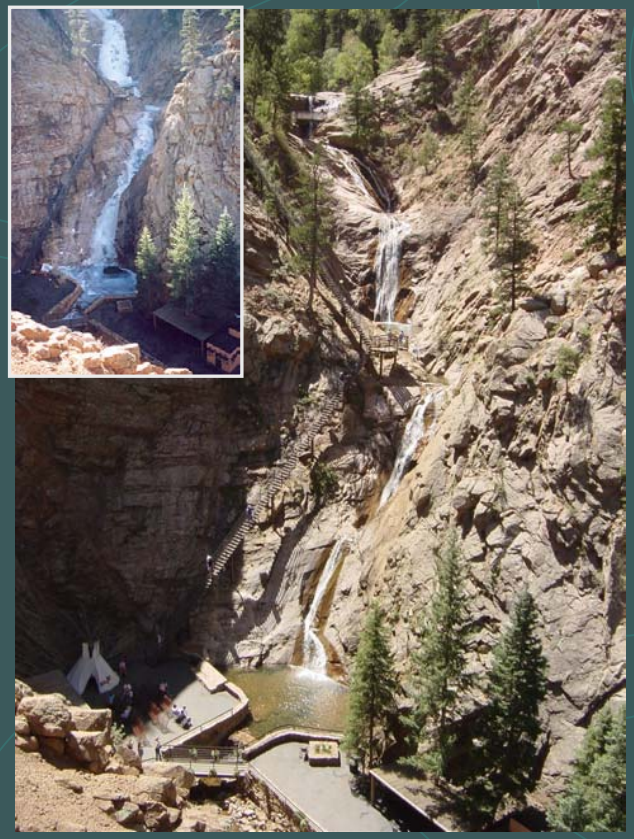
1996
1998
2000
2002
2004
Year

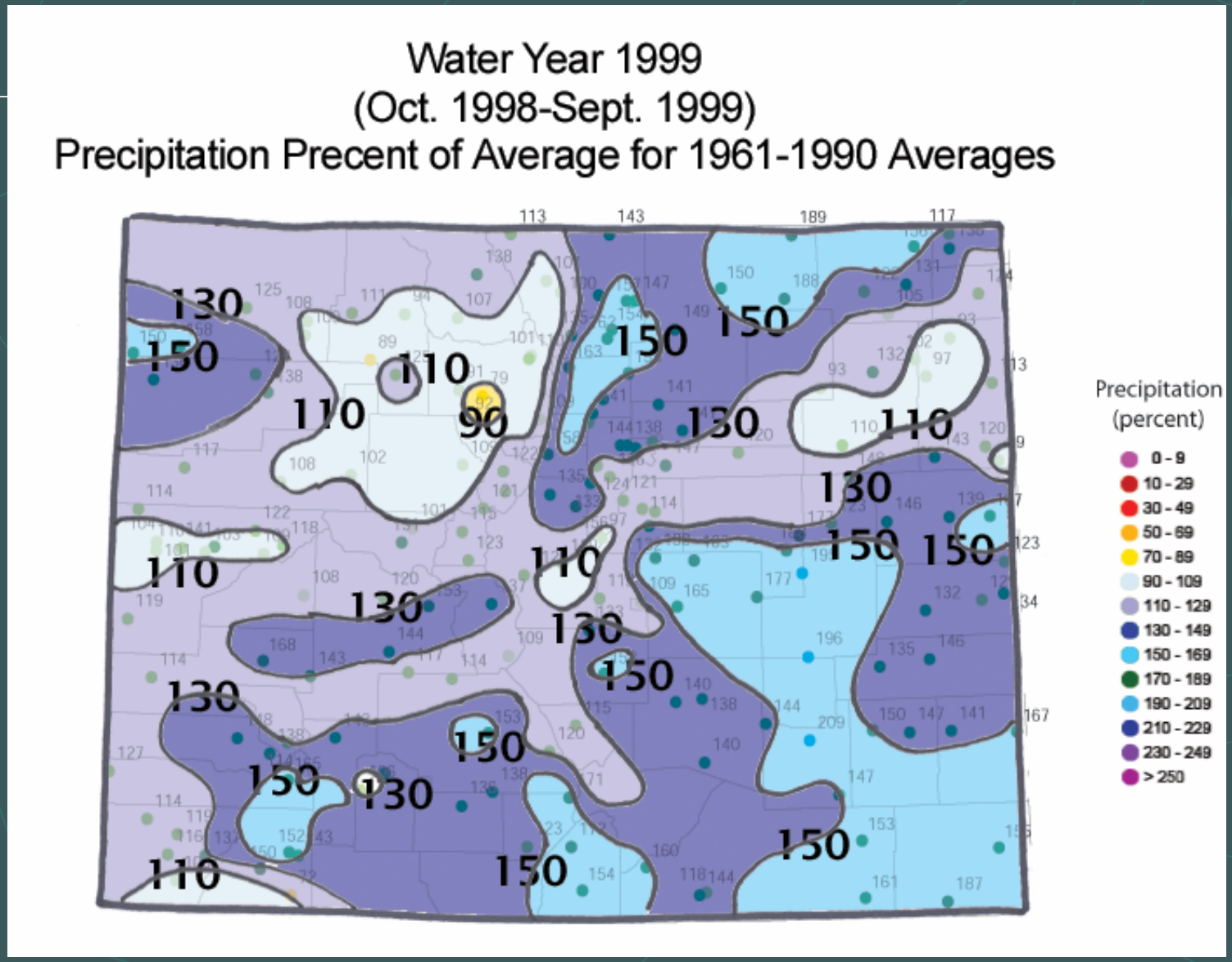
The Evolution of Our Recent Drought

Crystal Lakes serves Colorado Springs, Sept 2002

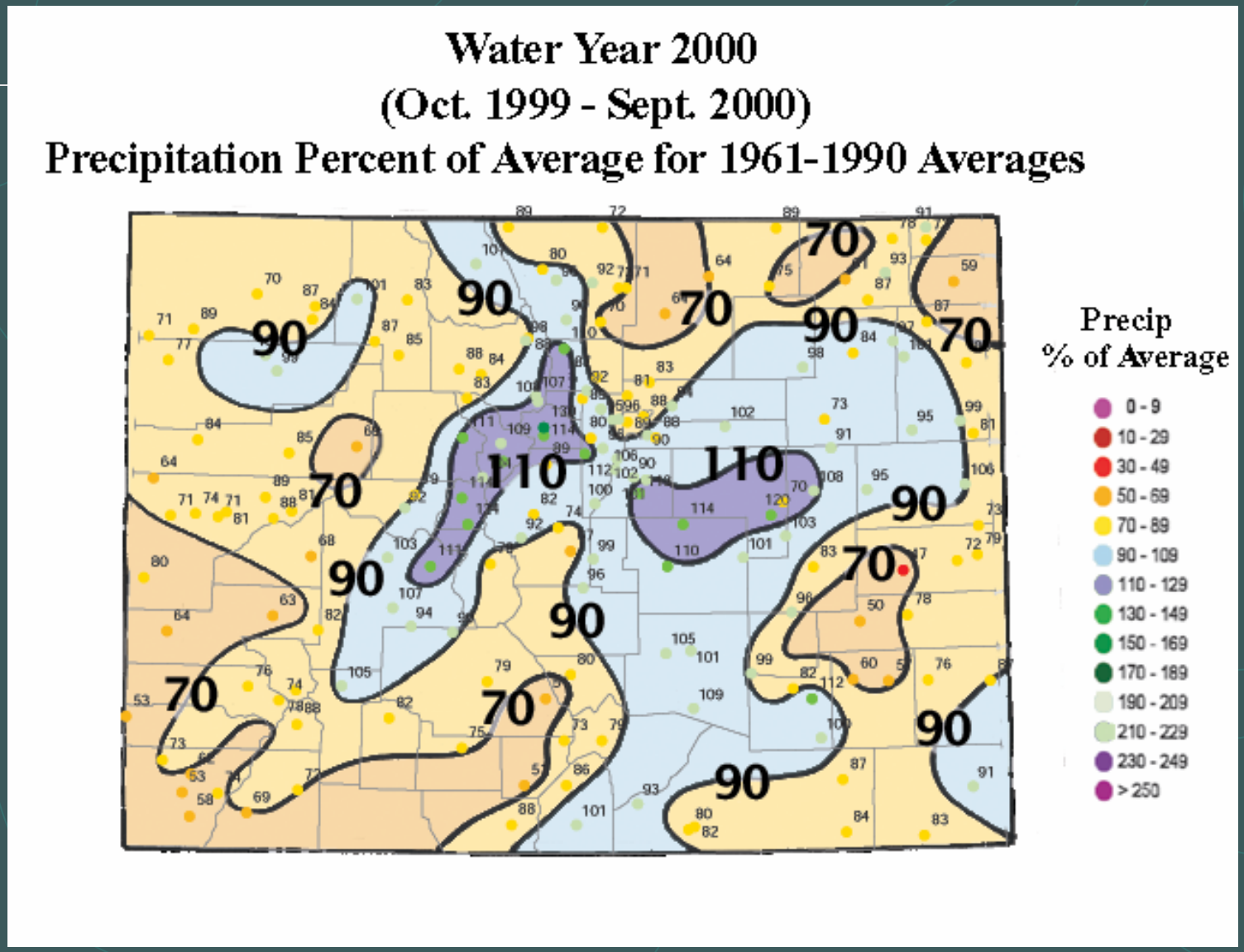


Seven Falls, during the 2002 drought water was pumped to top.

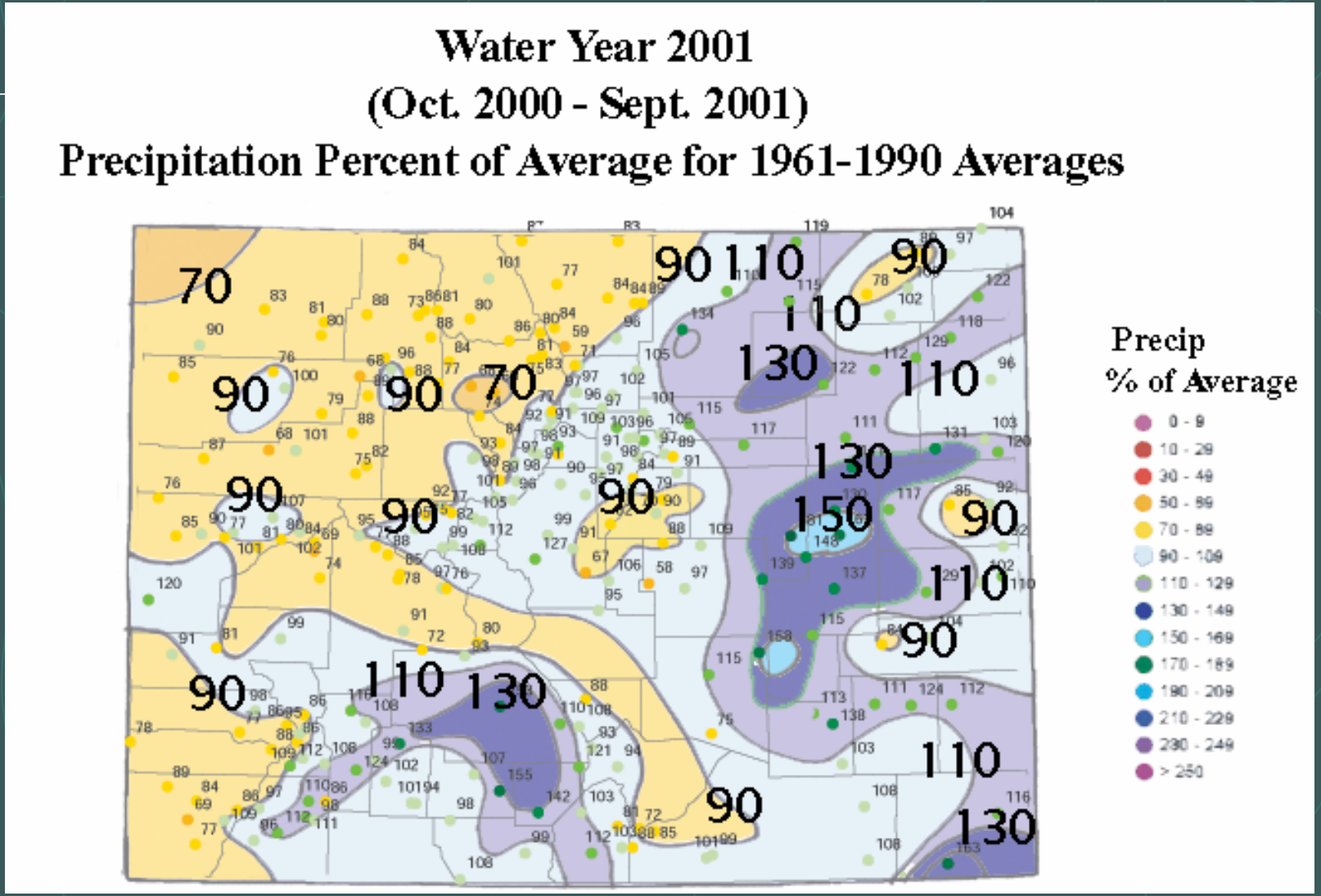
1999 Water Year Precipitation



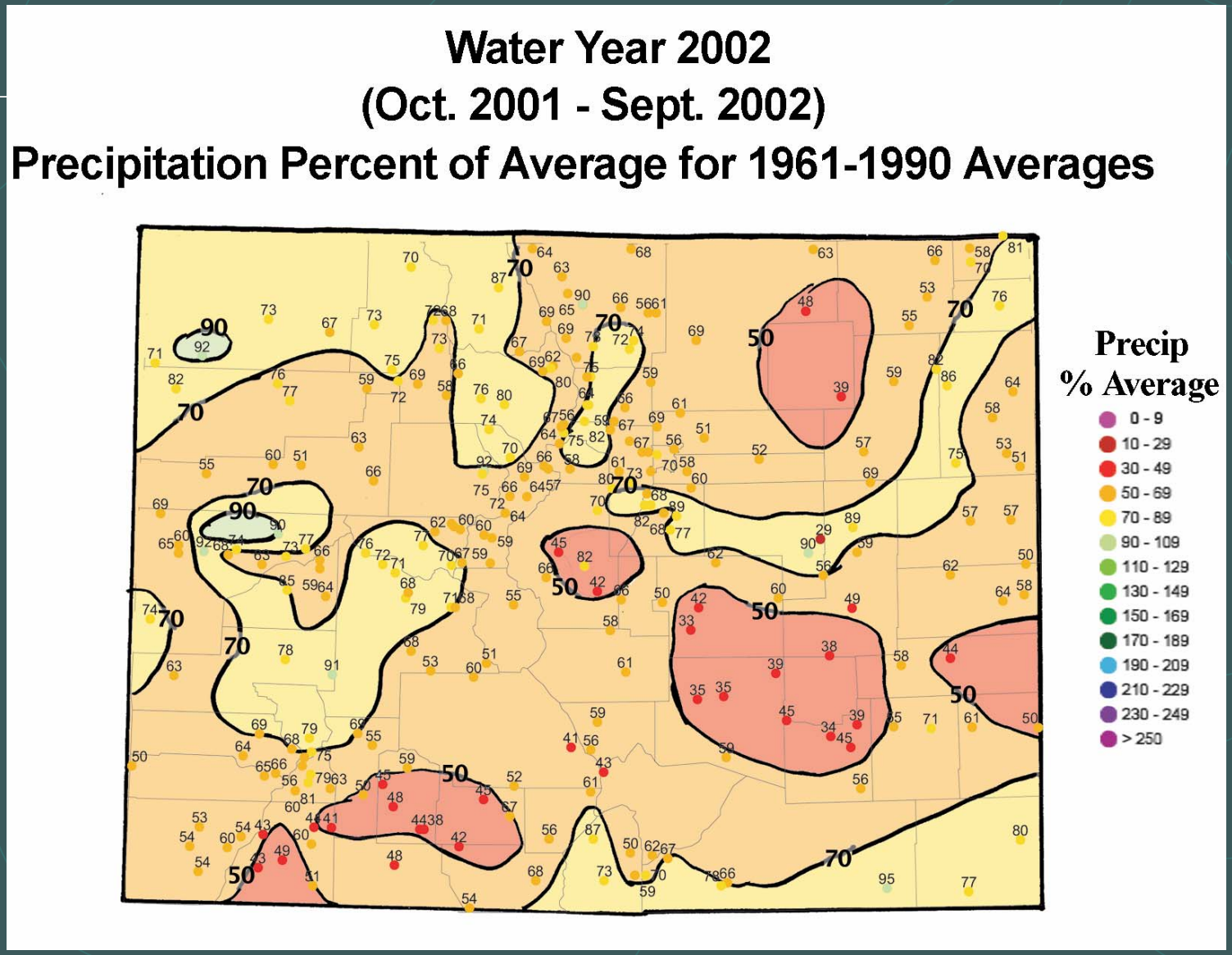
2000 Water Year Precipitation



2001 Water Year Precipitation

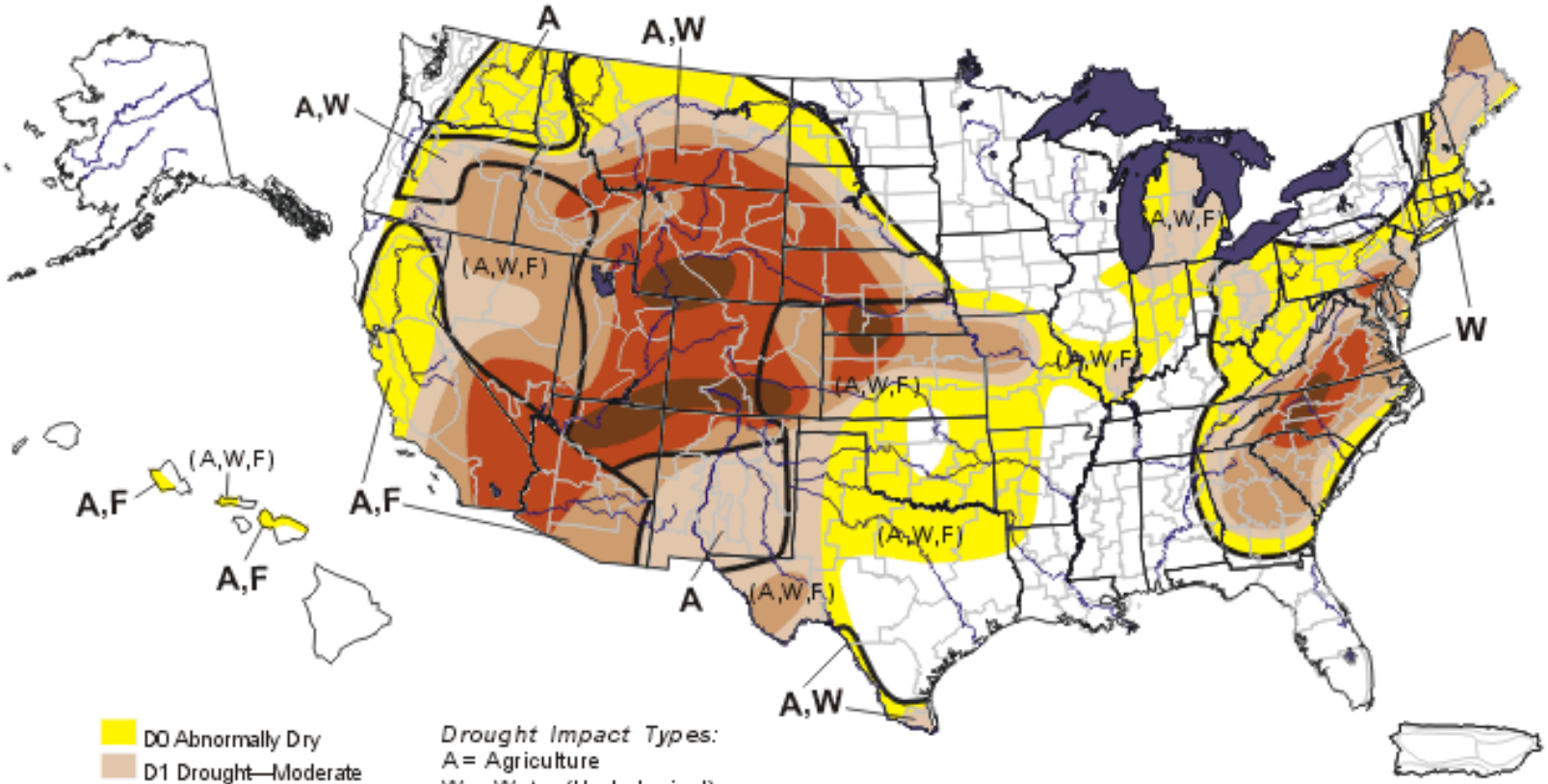


2002 Water Year Precipitation



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

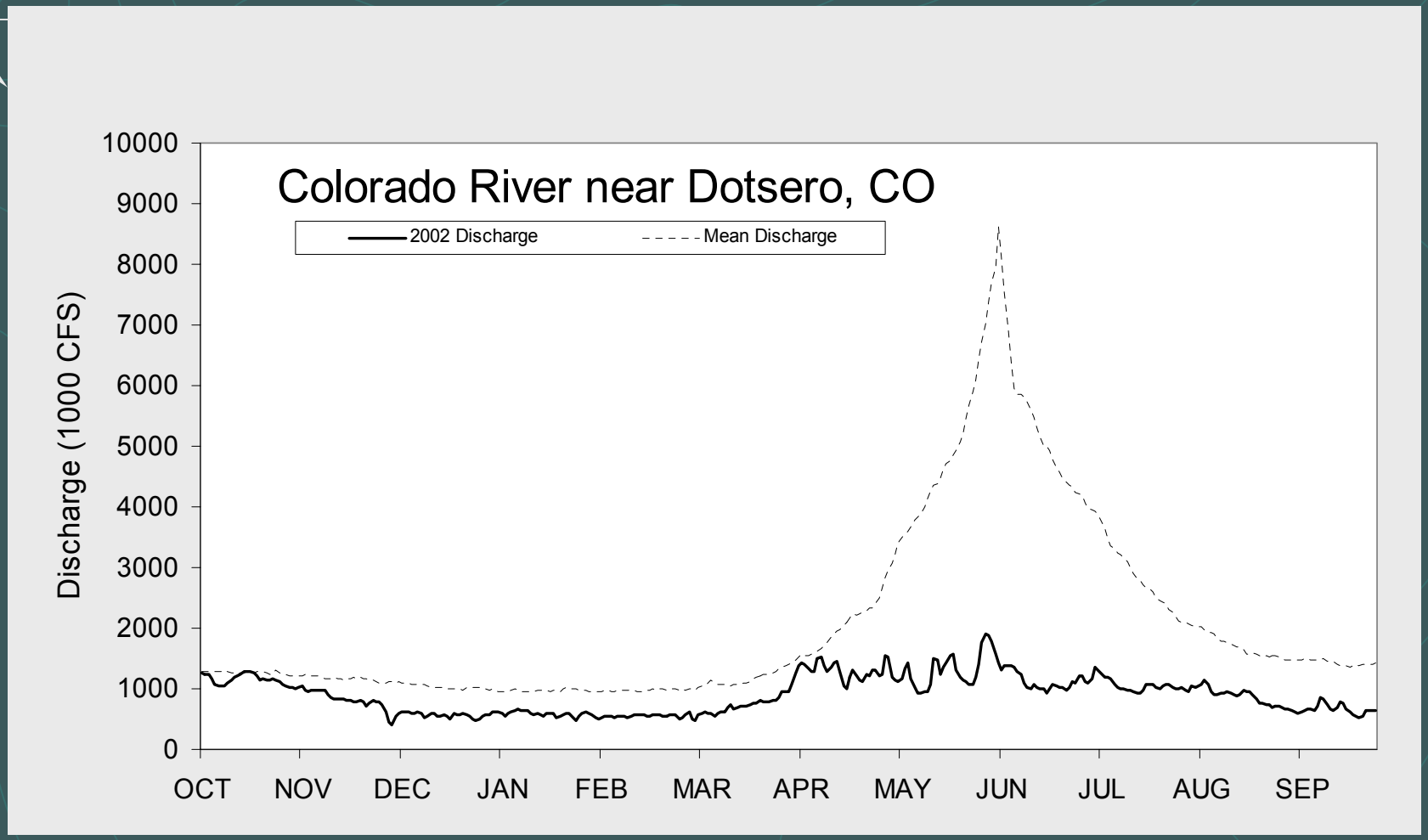
Drought Impact Types:
A = Agriculture
W = Water (Hydrological)
F = Fire danger (Wildfires)
Delineates dominant impacts
(No type = All 3 impacts)

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

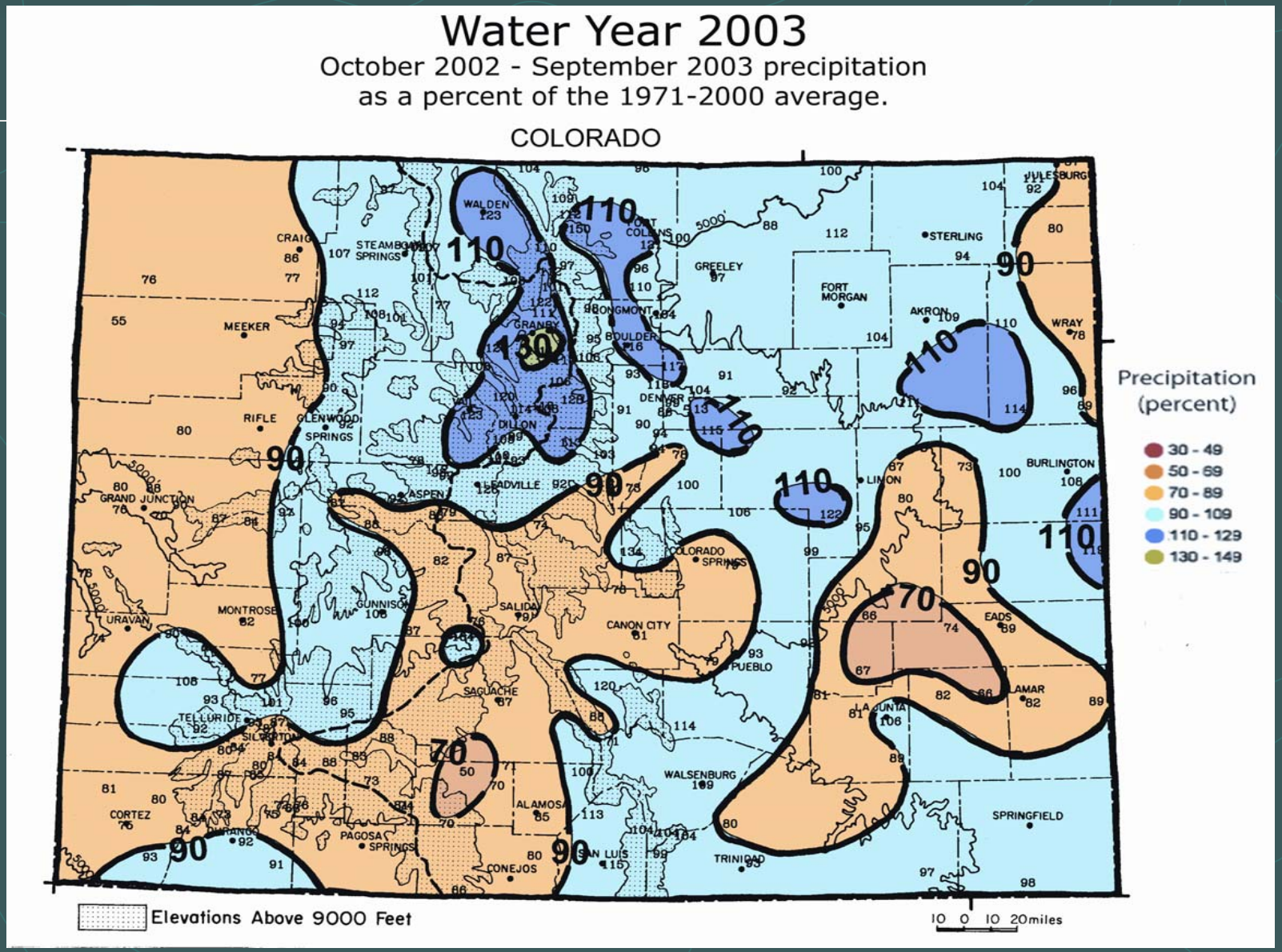
http://drought.unl.edu/dm

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

2002 Daily Streamflow

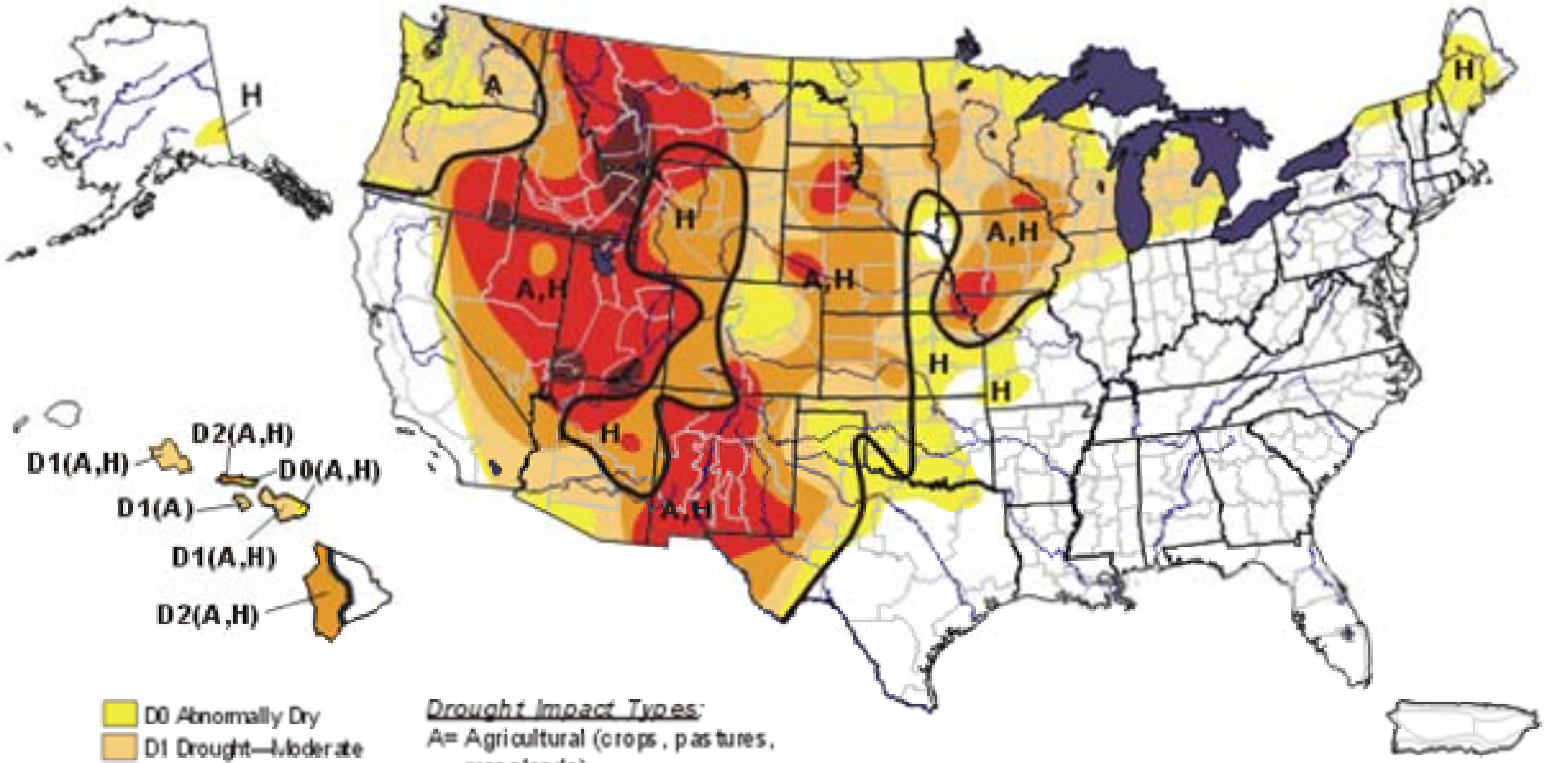


2003 Water Year Precipitation



U.S. Drought Monitor

September 30, 2003
Valid 8 a.m. EDT



D0 Abnormally Dry
D1 Drought—Moderate
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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.

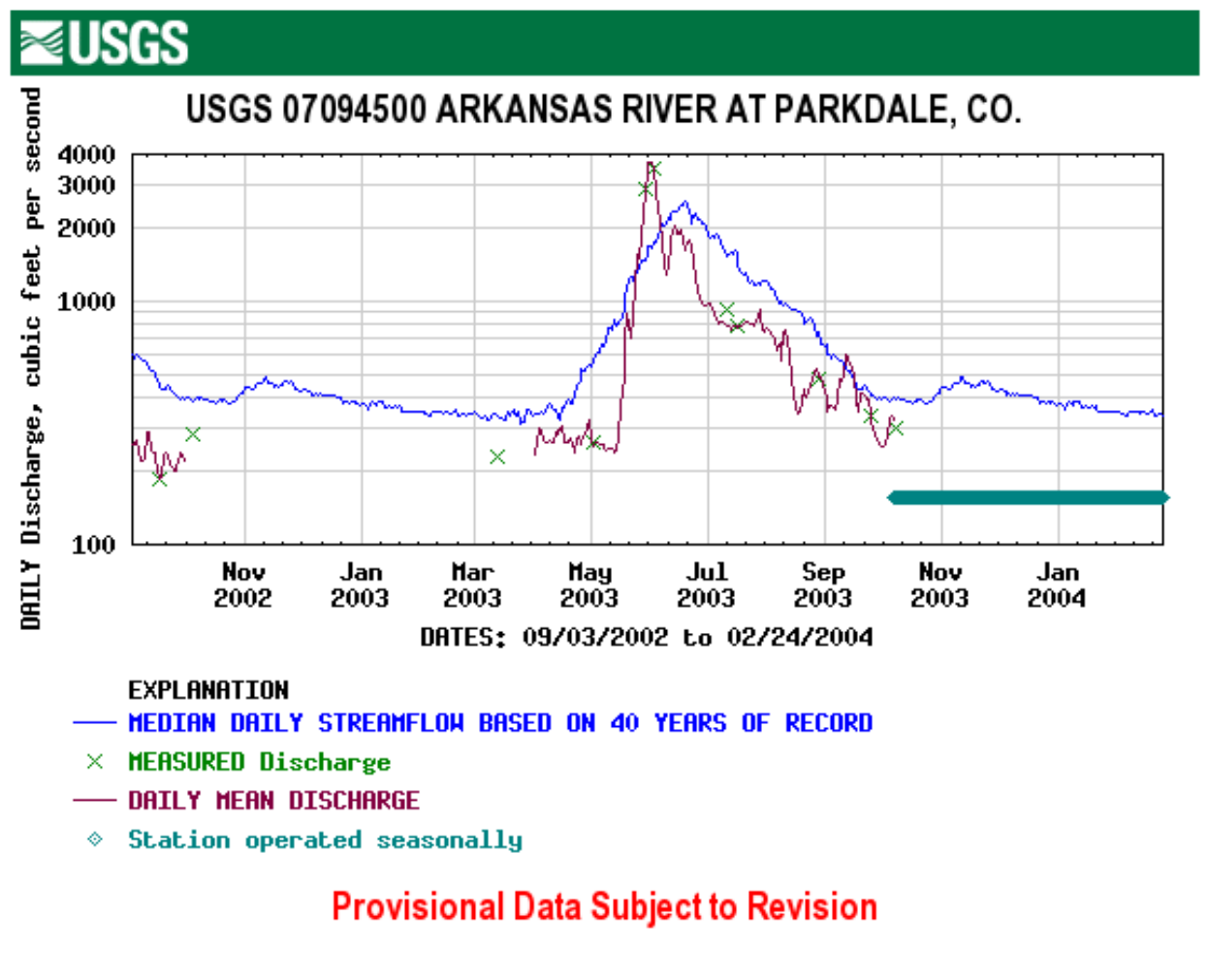
http://drought.unl.edu/dm

USDA

Released Thursday, October 2, 2003

Author: *Candace Tankersley/Scott Stephens, NOAA/NCDC*

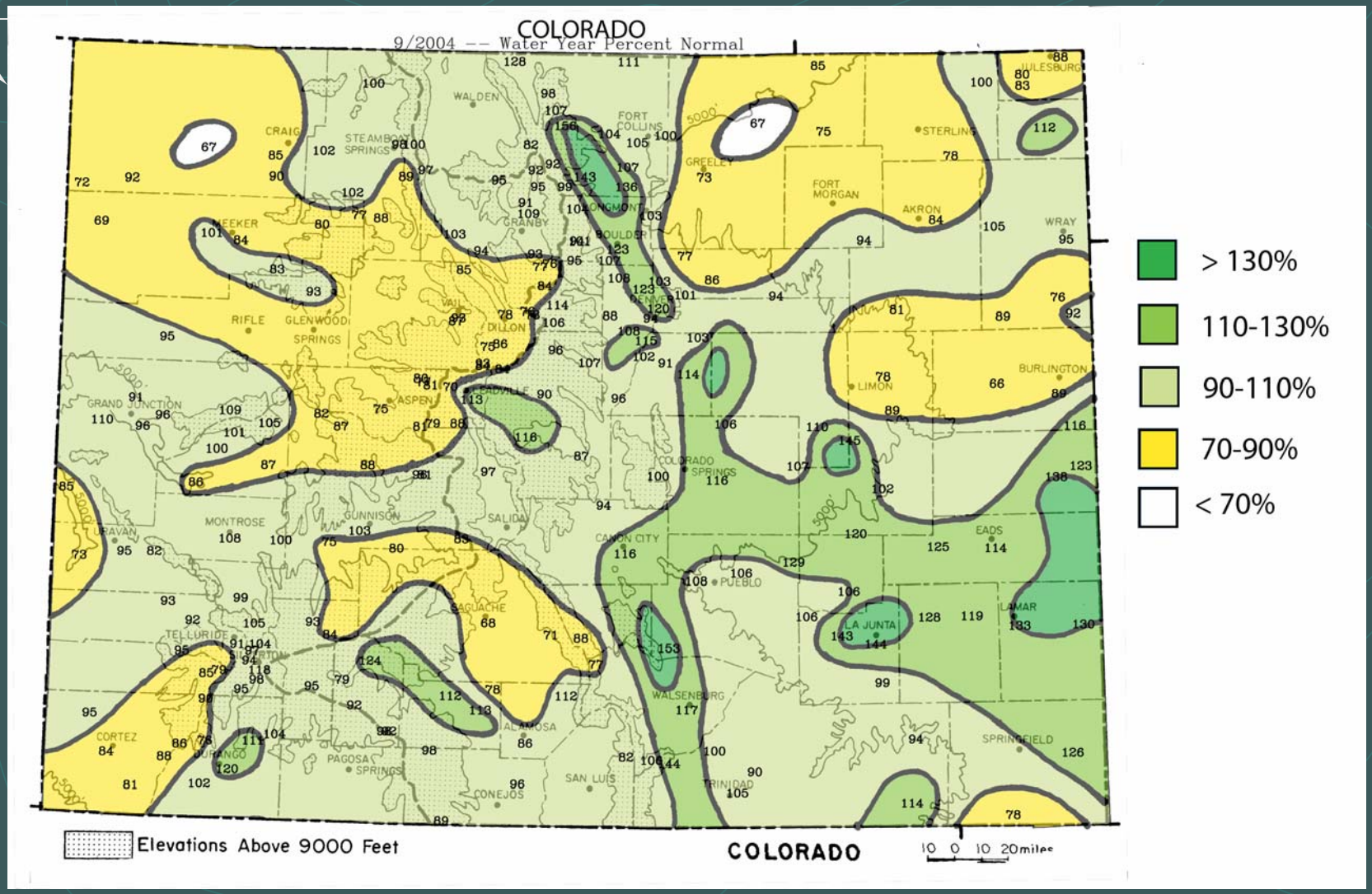
2003 Daily Streamflow



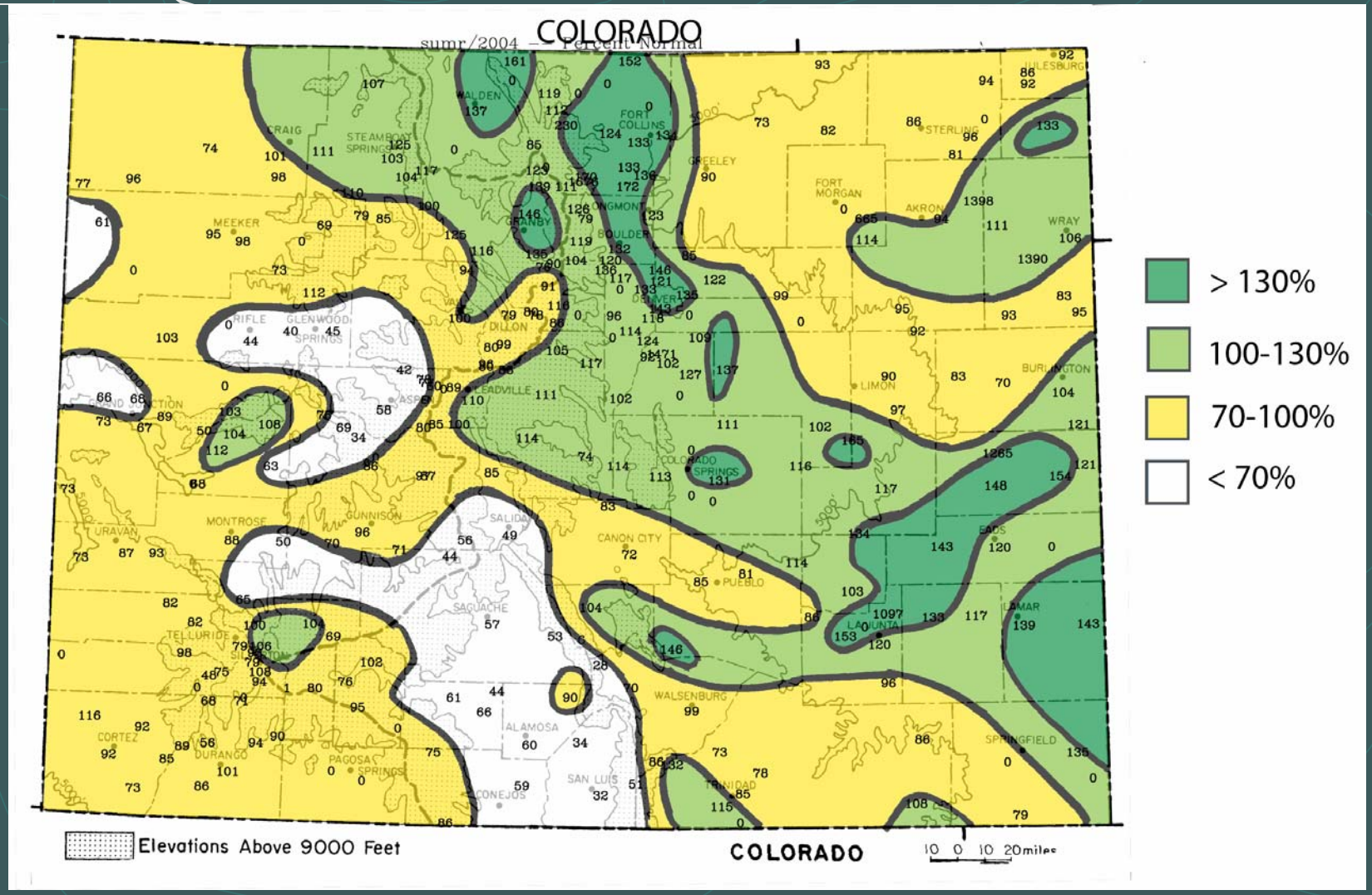
http://water.usgs.gov/cgi-bin/daily_flow?co

Where Do We Stand Now?

Water Year 2004 Precipitation as Percent of Average

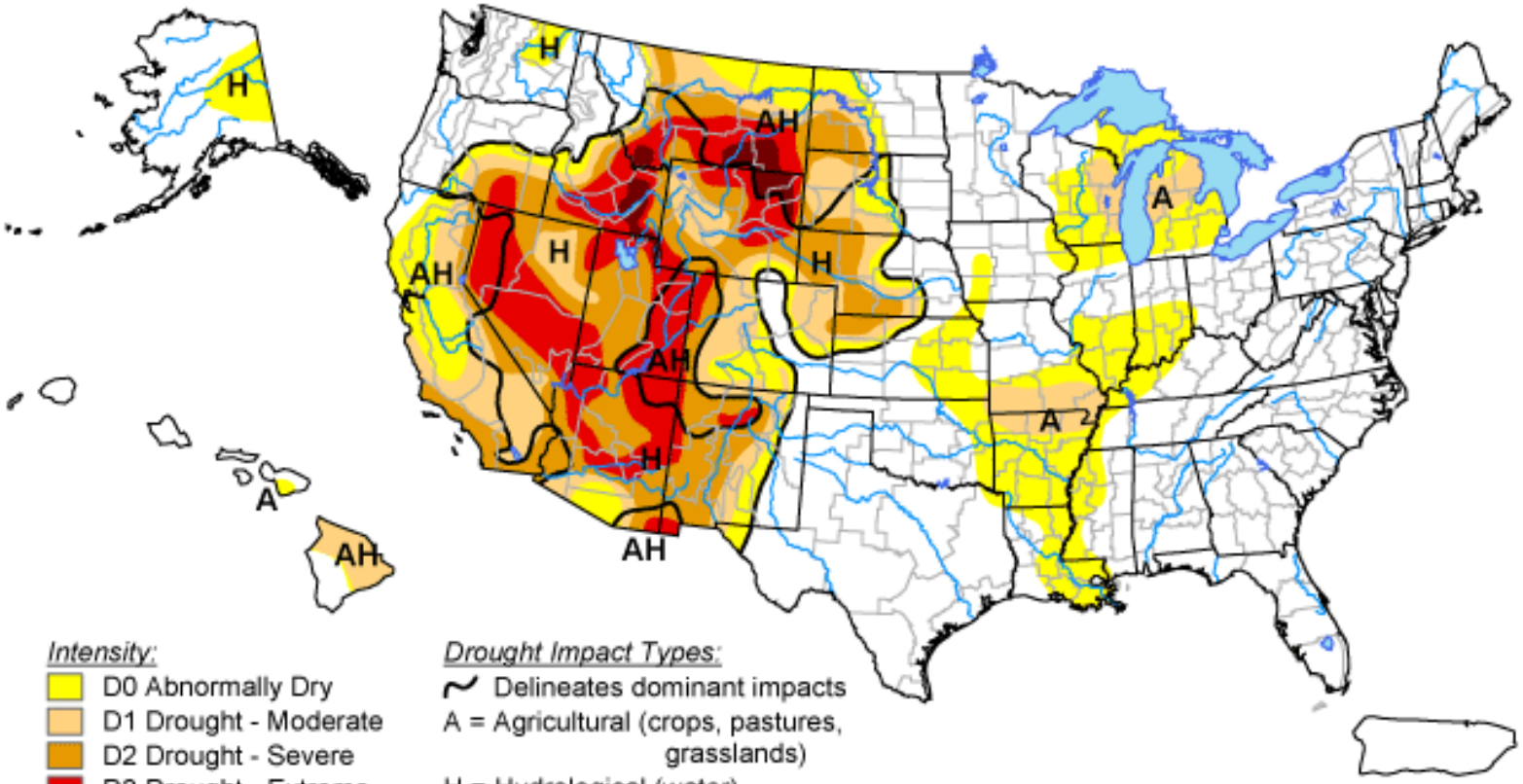


Growing Season (May-Sep) 2004 Precipitation as Percent of Average



U.S. Drought Monitor

October 5, 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)

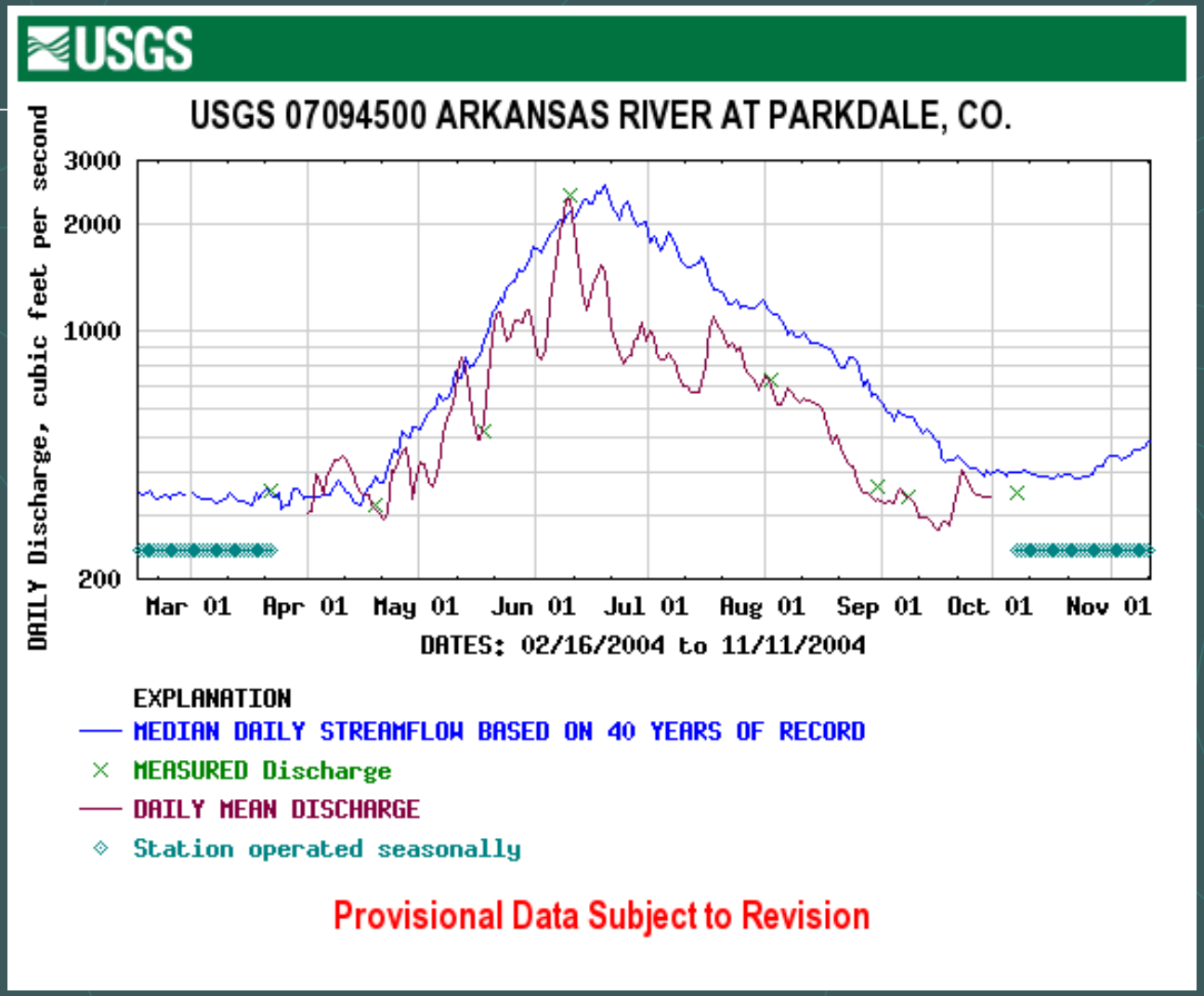
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

USDA National Drought Mitigation Center

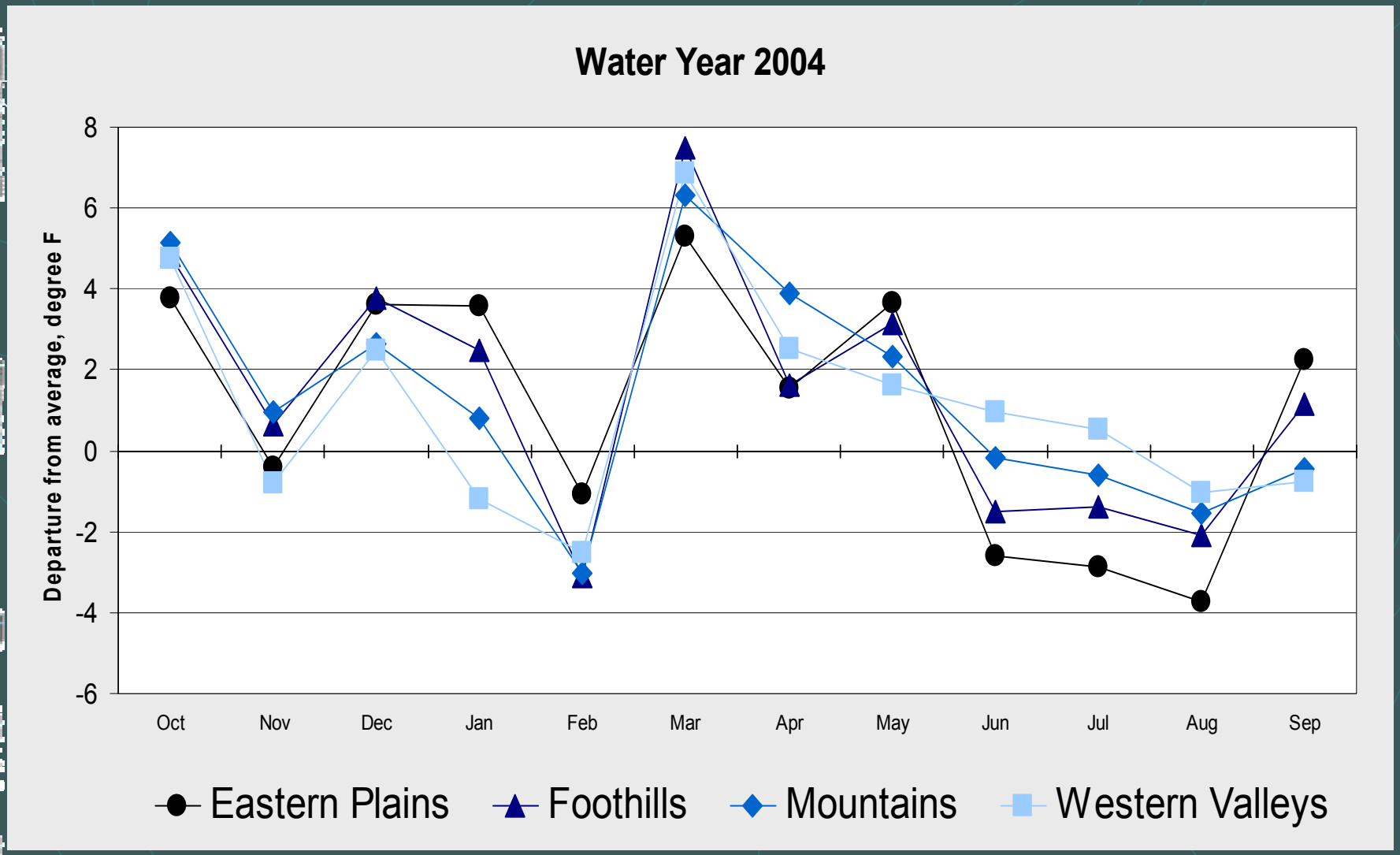
Released Thursday, October 7, 2004
Author: Michael Hayes, NDMC

2004 Daily Streamflow

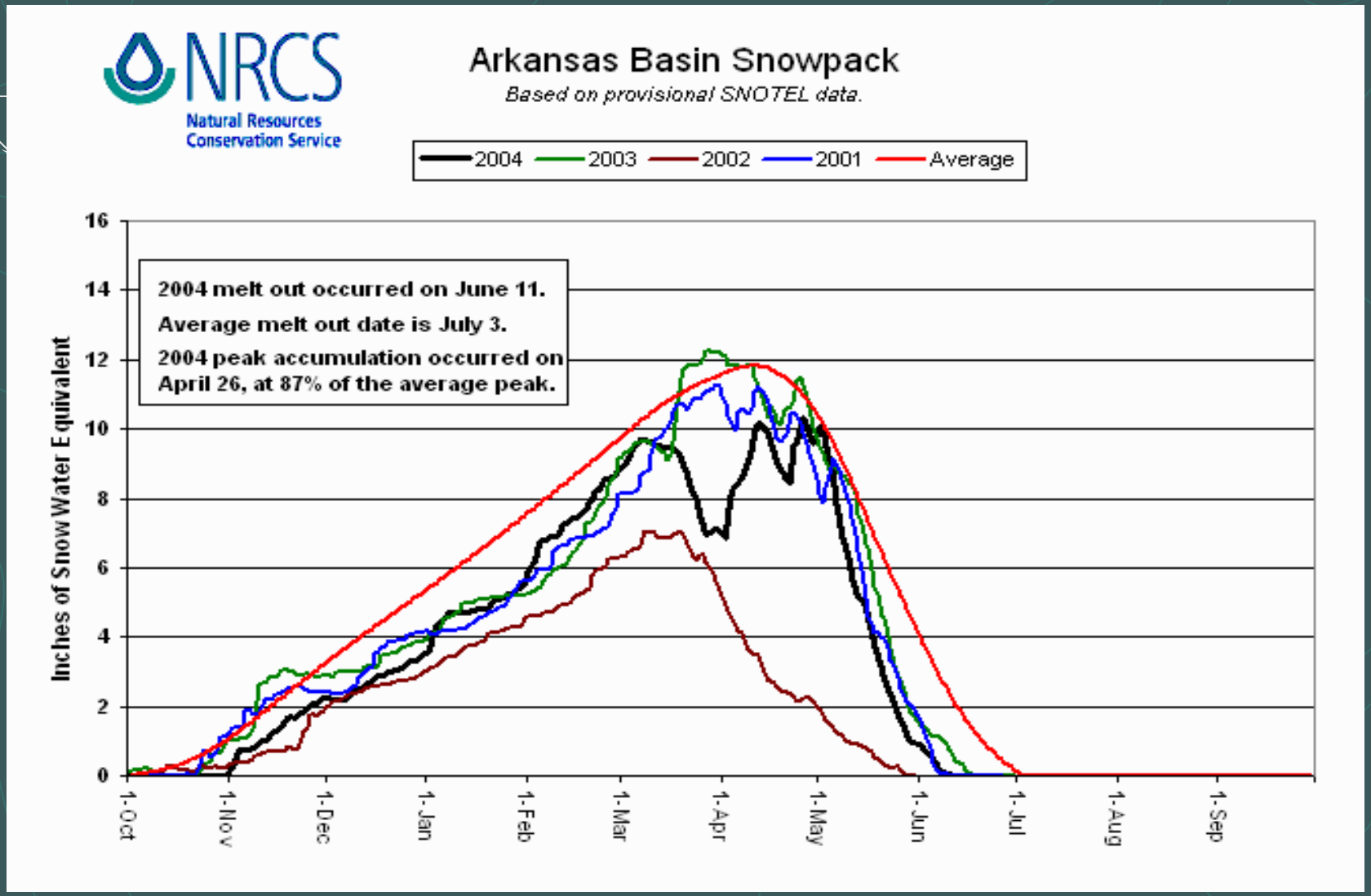


http://water.usgs.gov/cgi-bin/daily_flow?co

WY2004 Temperature Departures

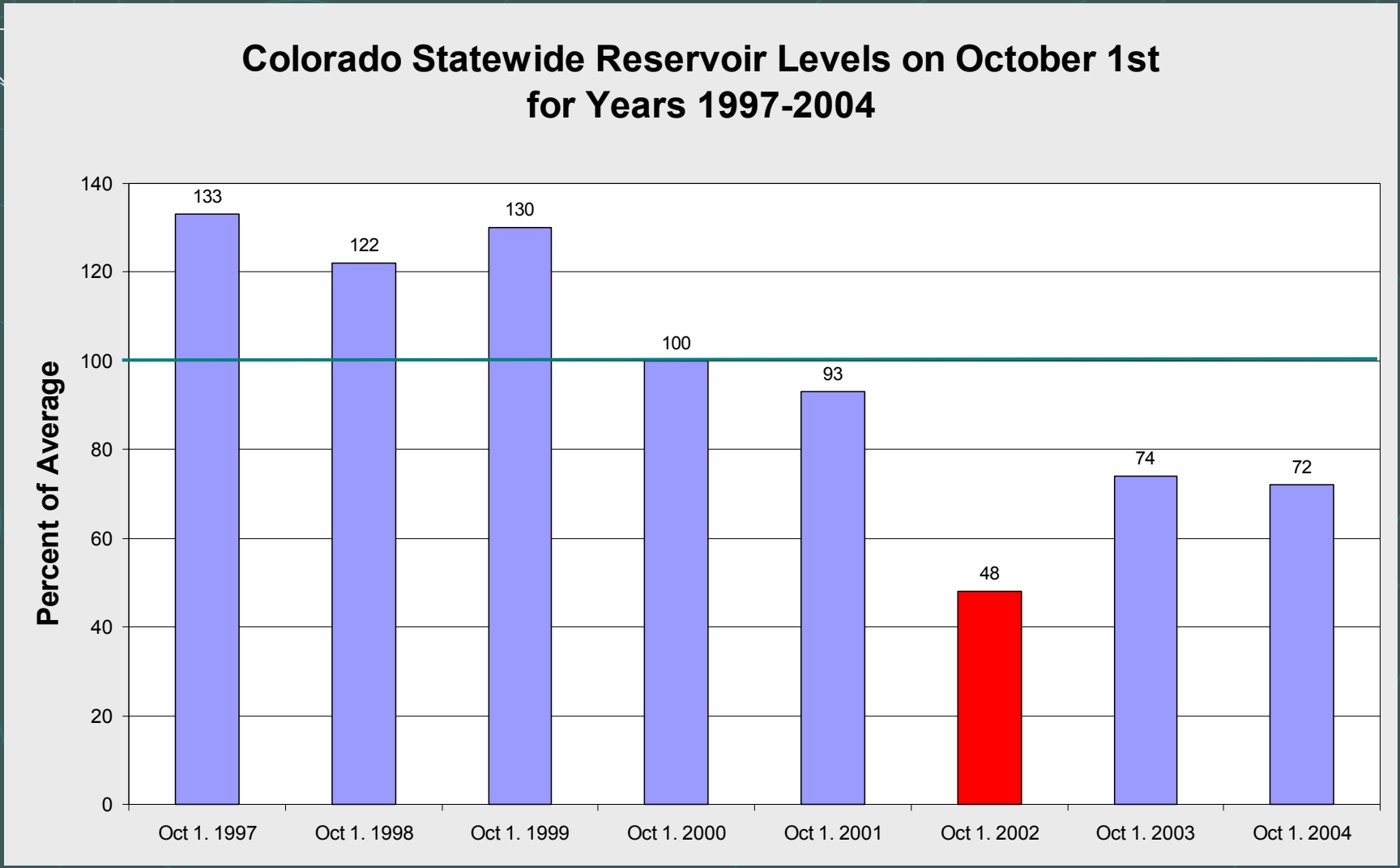


Arkansas Basin Snowpack

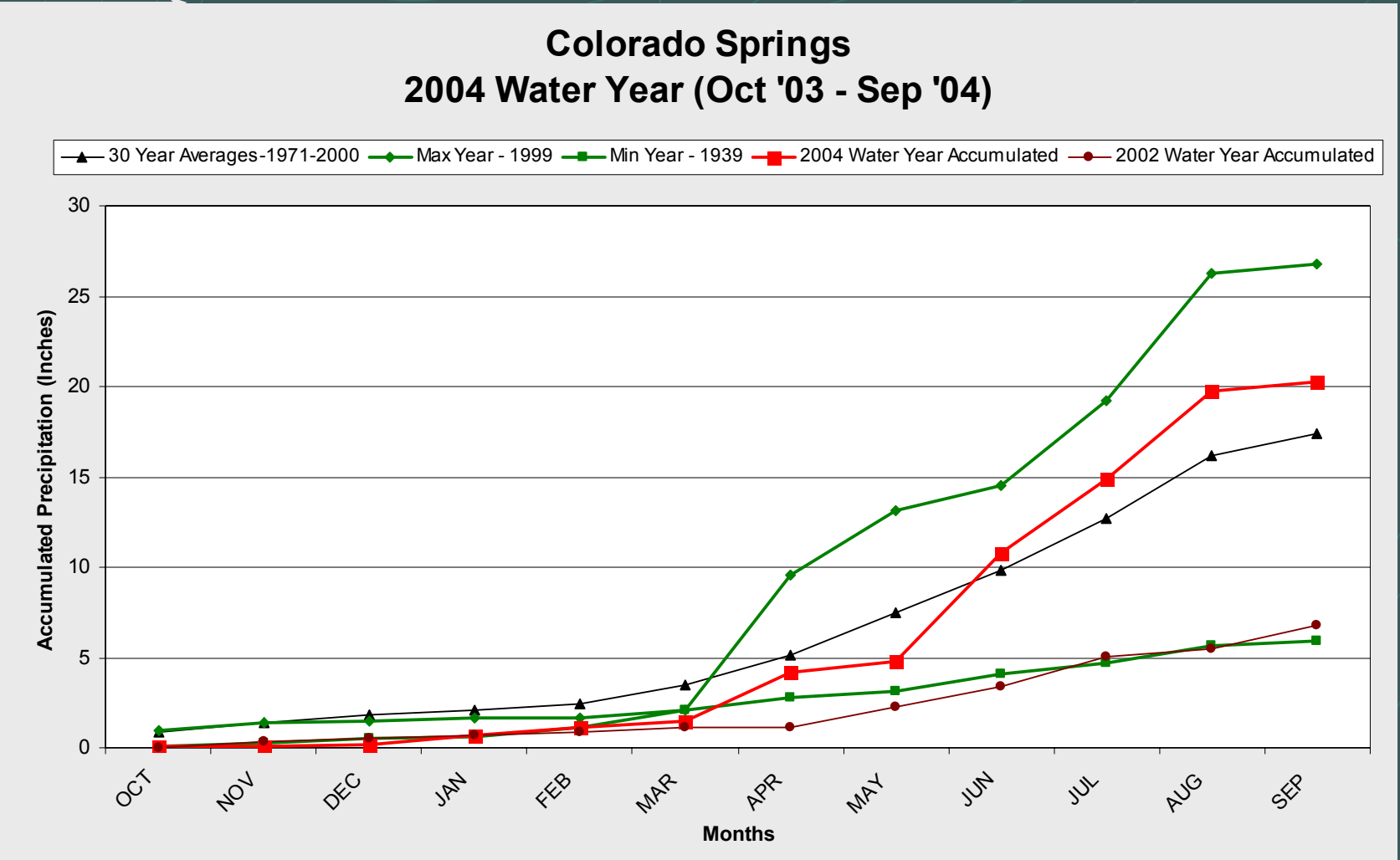


http://www.co.nrcs.usda.gov/snow/data/basins.html

Reservoir Levels

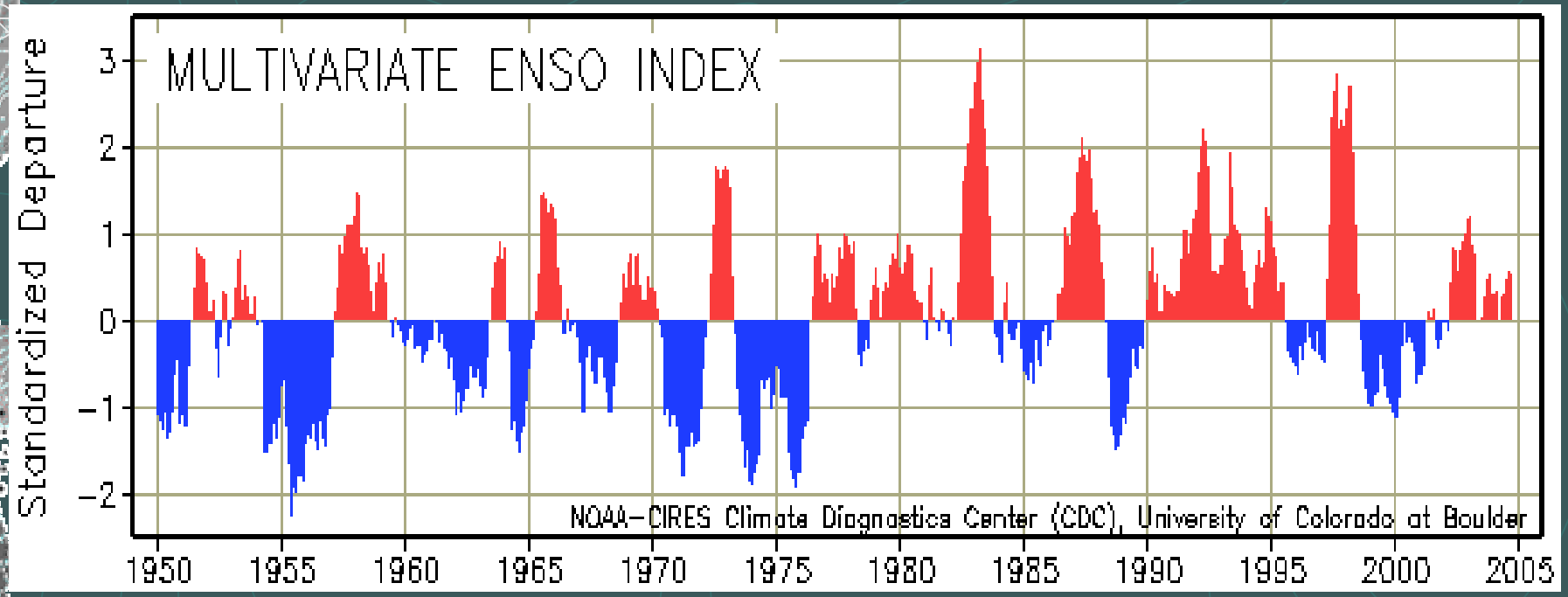


Colorado Springs 2004 Water Year Precipitation



What Comes Next?

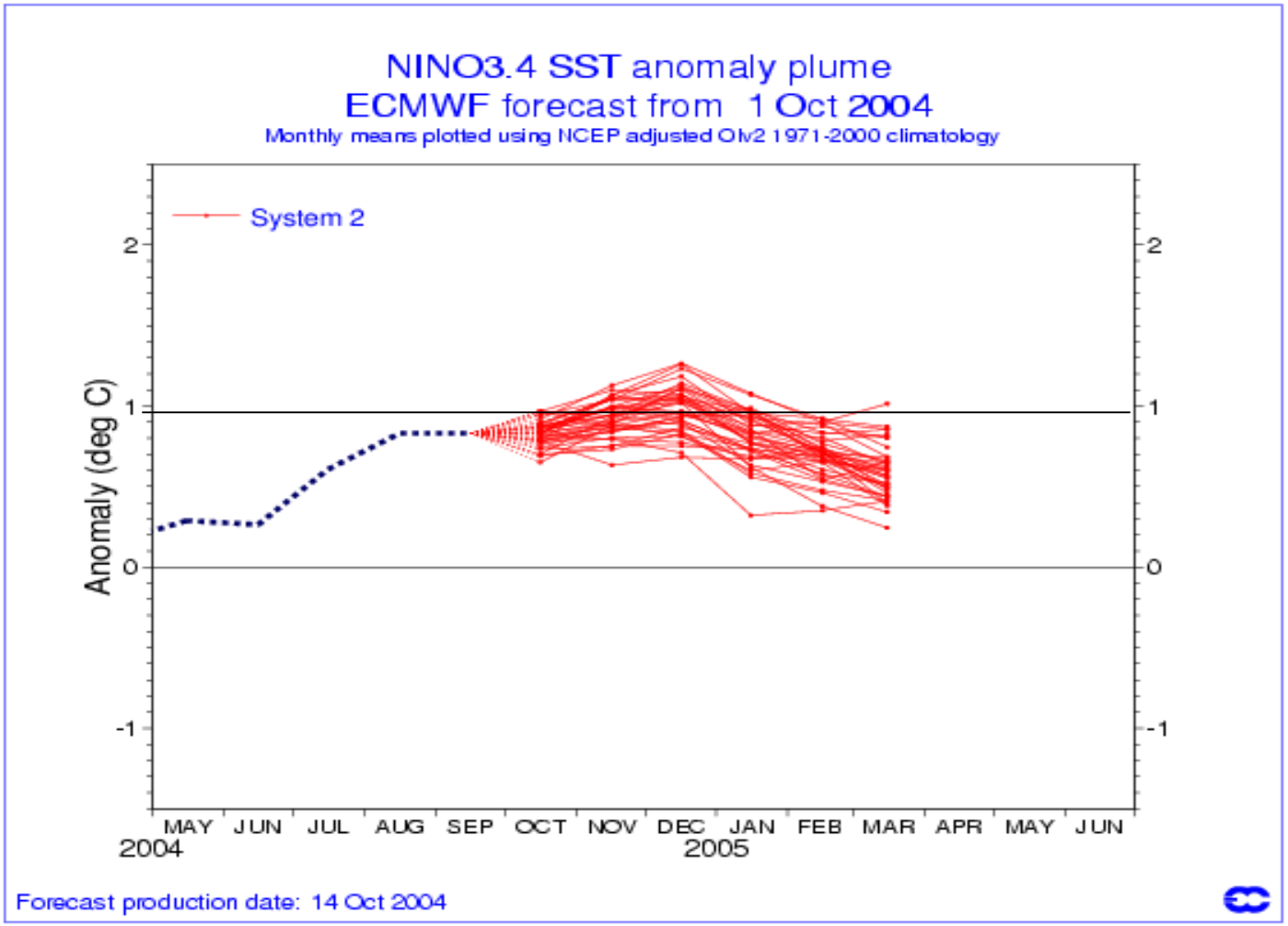
Multivariate ENSO Index (MEI)



Last update: 10 November 2004

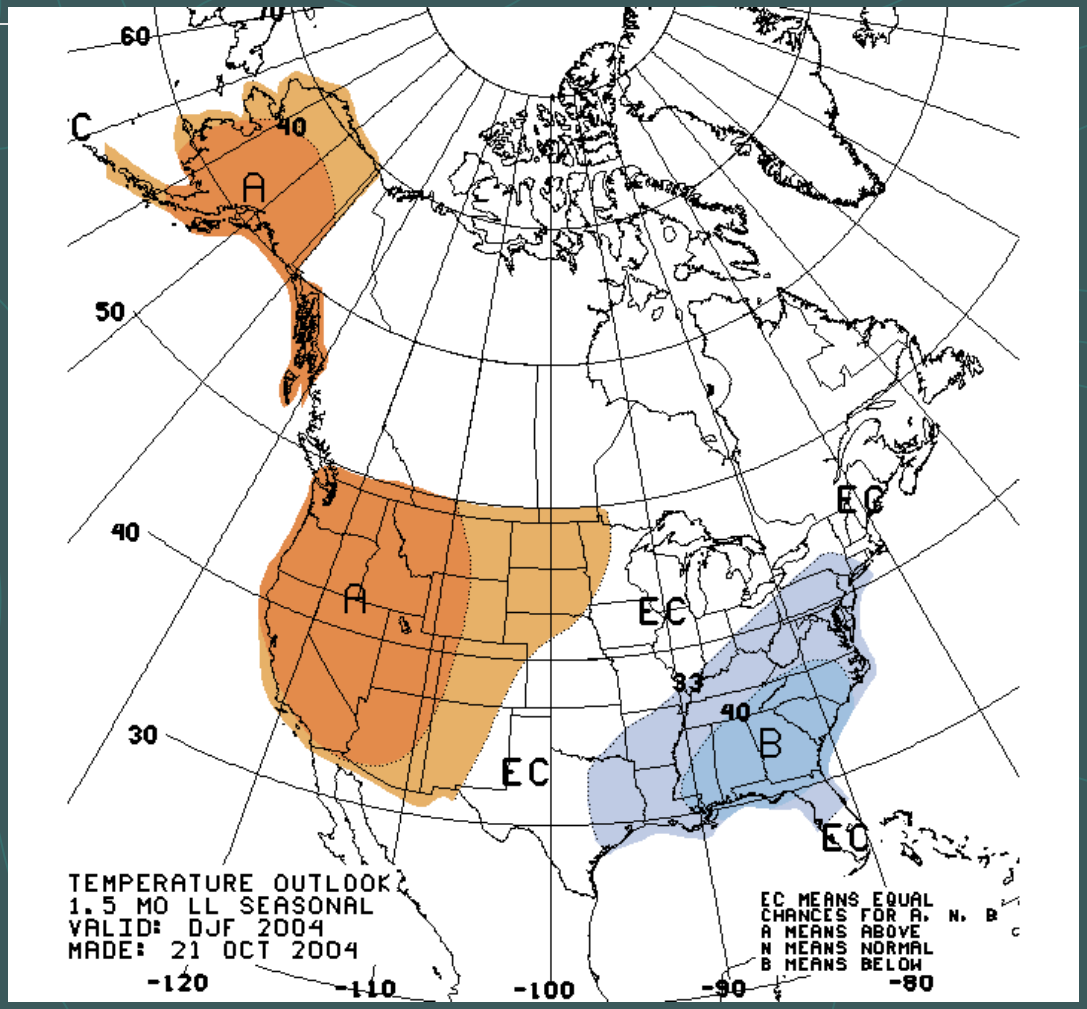
http://www.cdc.noaa.gov/people/klaus.wolter/MEI/

El Nino Forecast



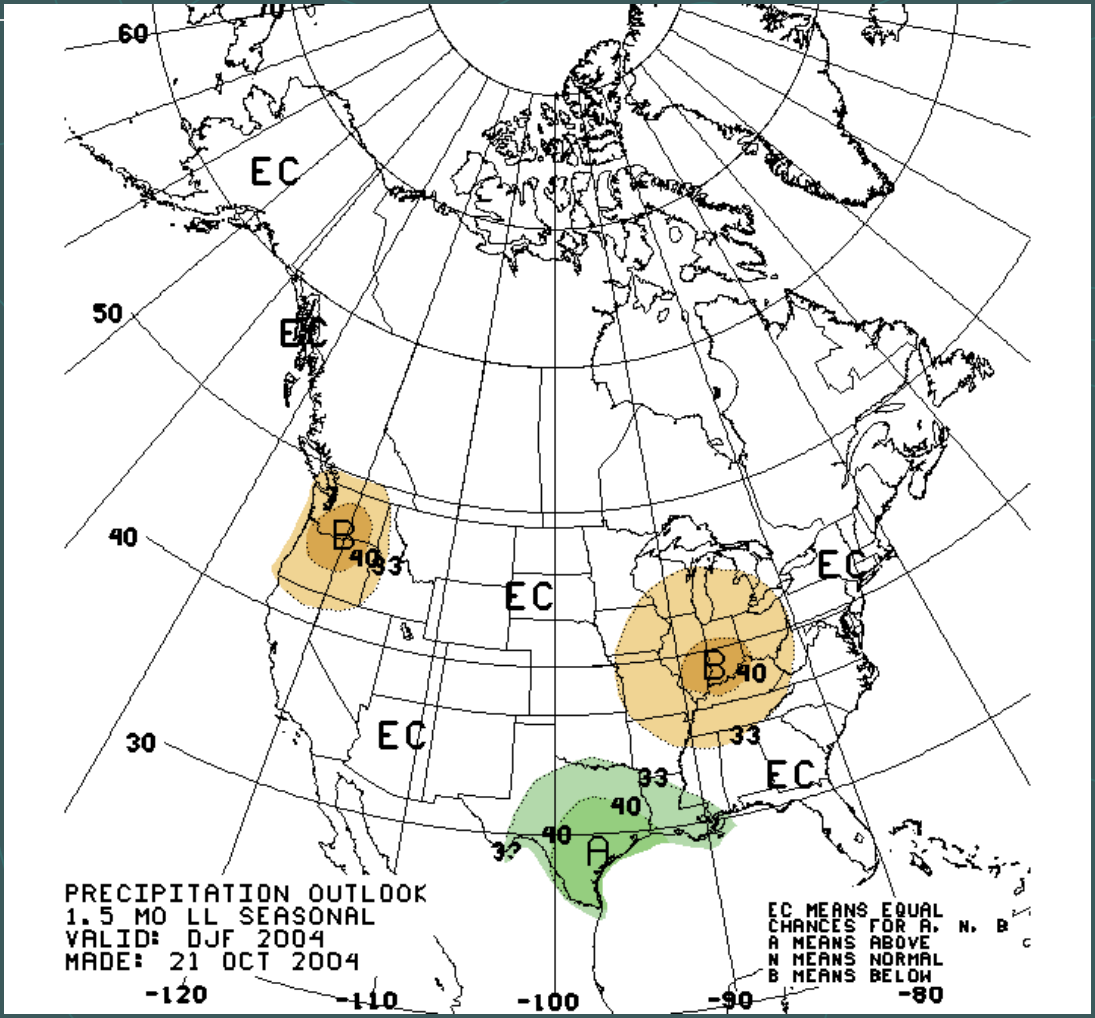
http://www.cdc.noaa.gov/people/klaus.wolter/SWcasts/

Temperature Dec-Feb 2004



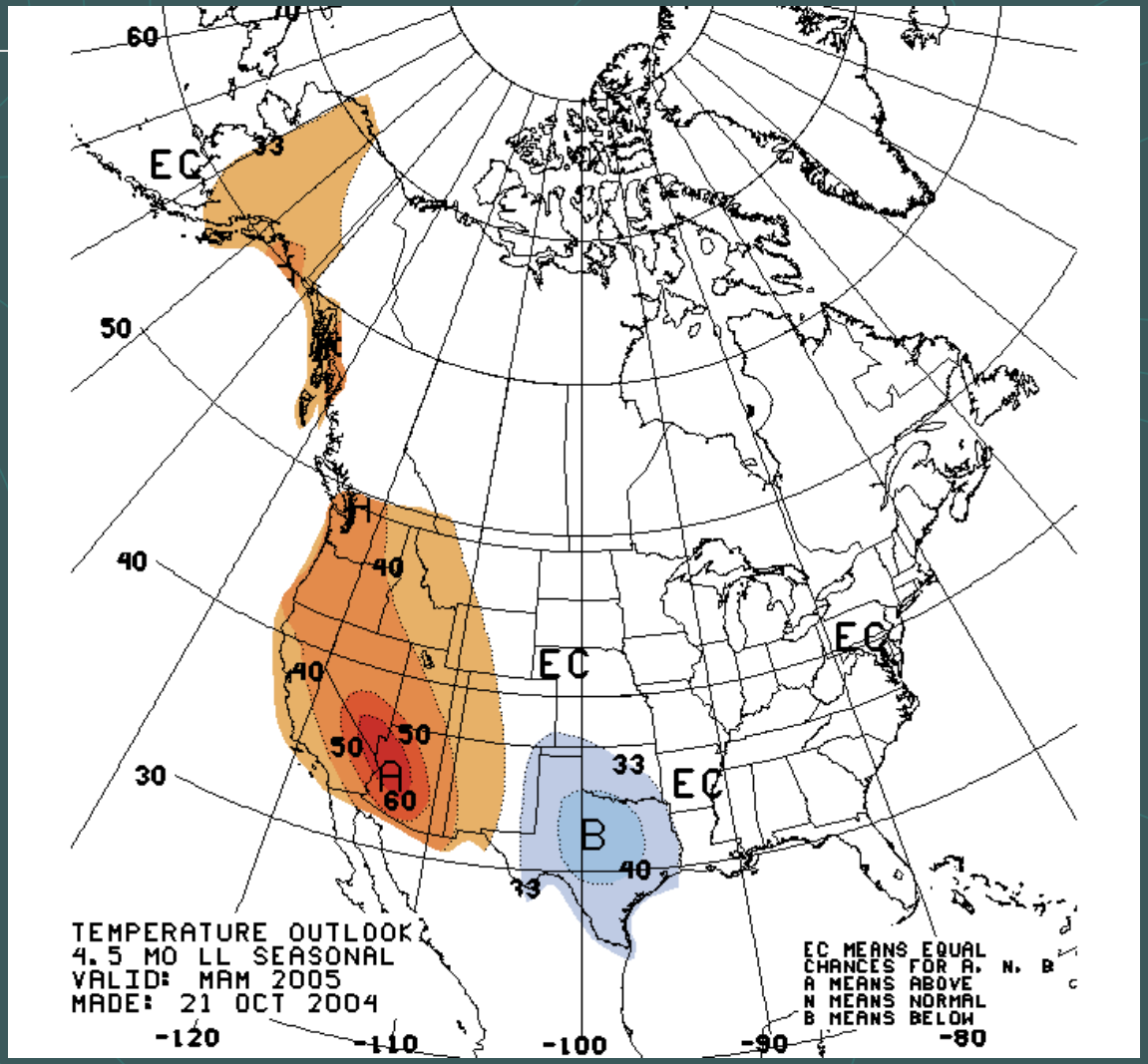
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Precipitation
Dec-Feb 2004



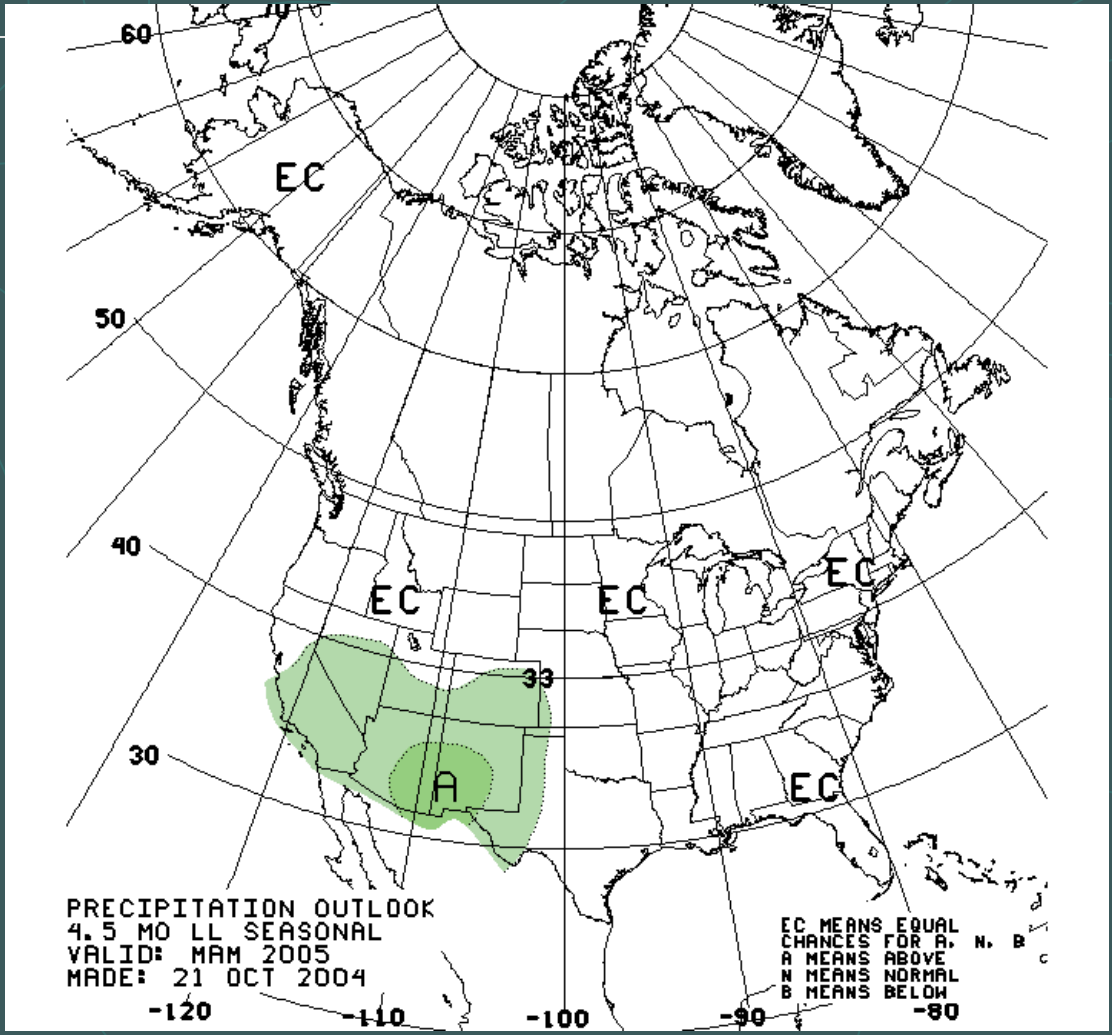
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Temperature
Mar-May 2005



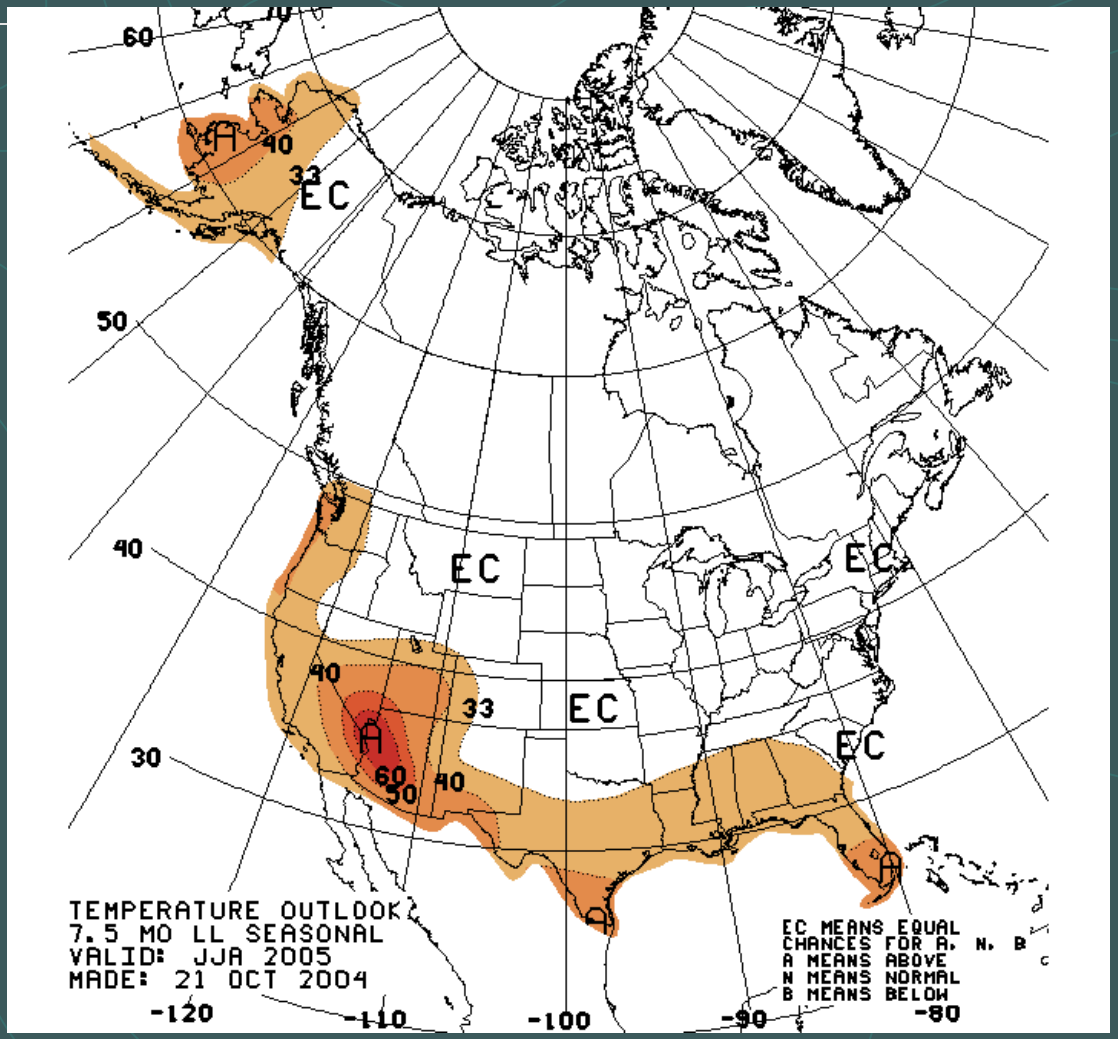
From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Precipitation
Mar-May 2005

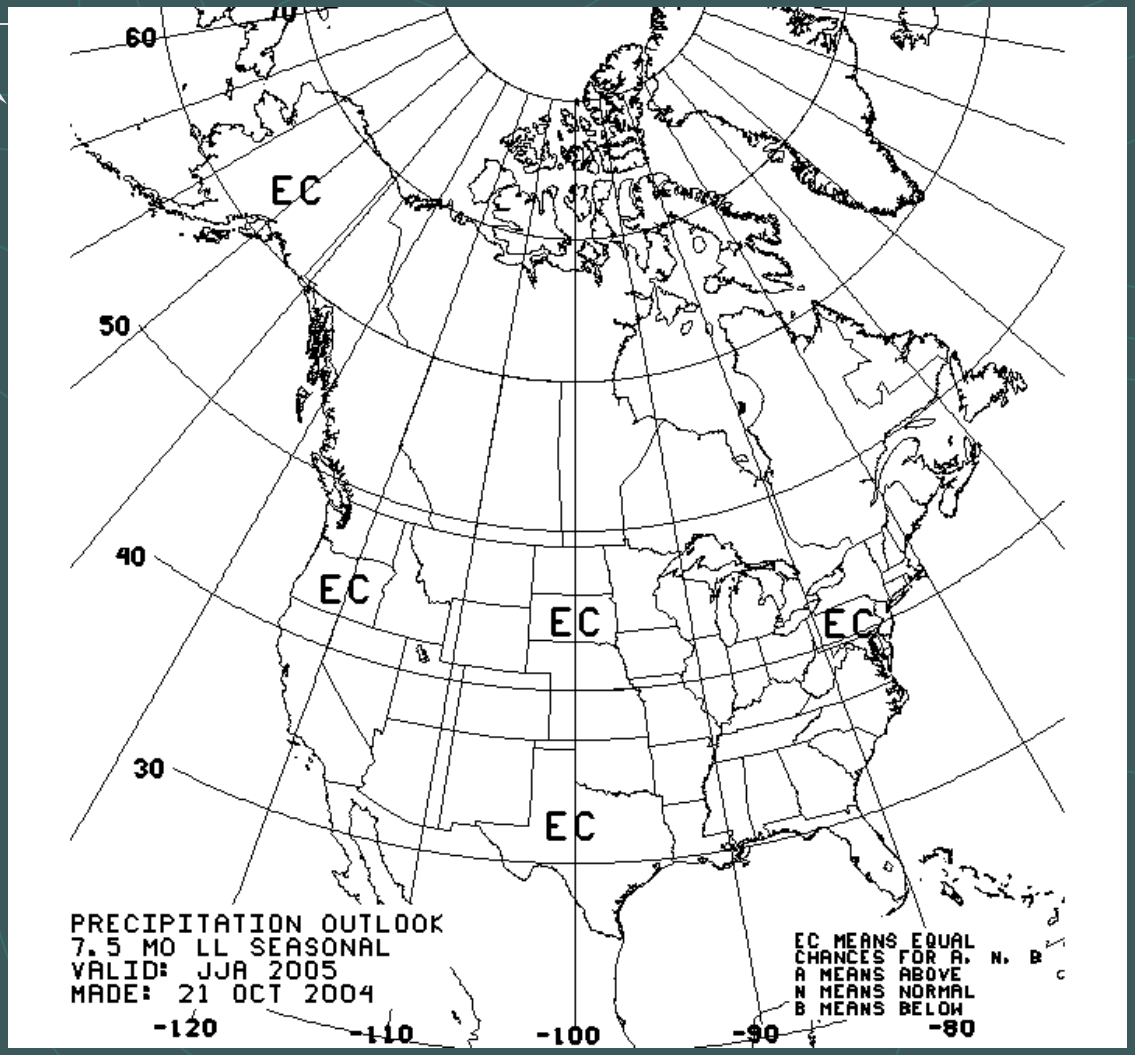


From the Colorado Prediction Center
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Temperature
Jun-Aug 2005



Precipitation
Jun-Aug 2005



For Colorado Springs,

Average Precipitation = ~ 17 inches

(WY2004 = 20.25 inches)

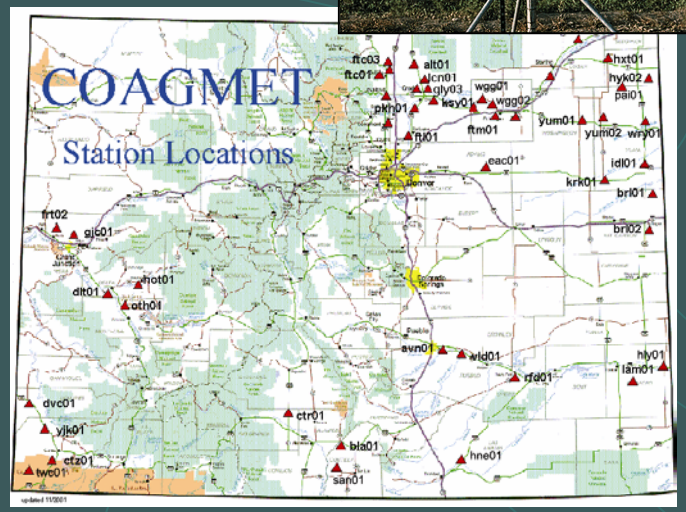
Average Evaporation = ~ > 24 inches

therefore,

Drought is **NEVER** really over.

CoAgMet
Weather Data for Agriculture

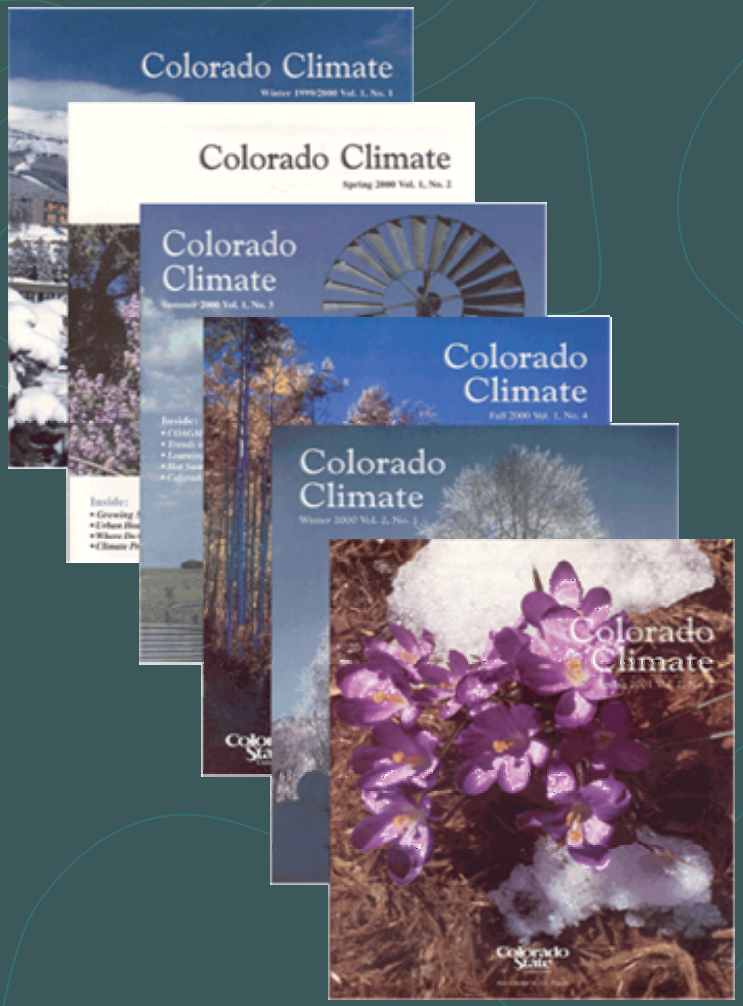
- *Automated weather stations with daily and hourly readings of:*
  - *Temperature*
  - *Humidity*
  - *Wind*
  - *Precipitation*
  - *Solar energy*
  - *Evapotranspiration*



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"

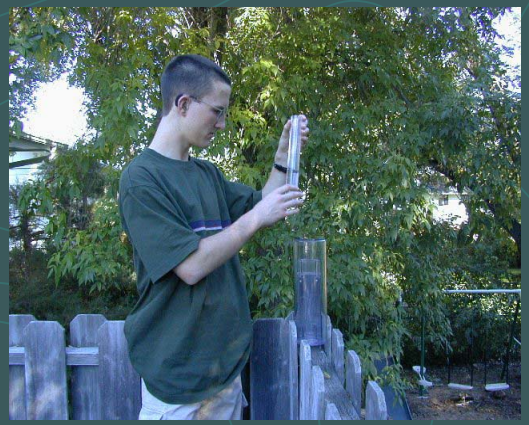
  then click on "Presentations"

CoCoRaHS

Community Collaborative Rain, Hail, & Snow Network

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.

CoCo RaHS

- Volunteers of all ages helping scientists study storms. The exploration begins in your back yard!

What does it take to be a volunteer?

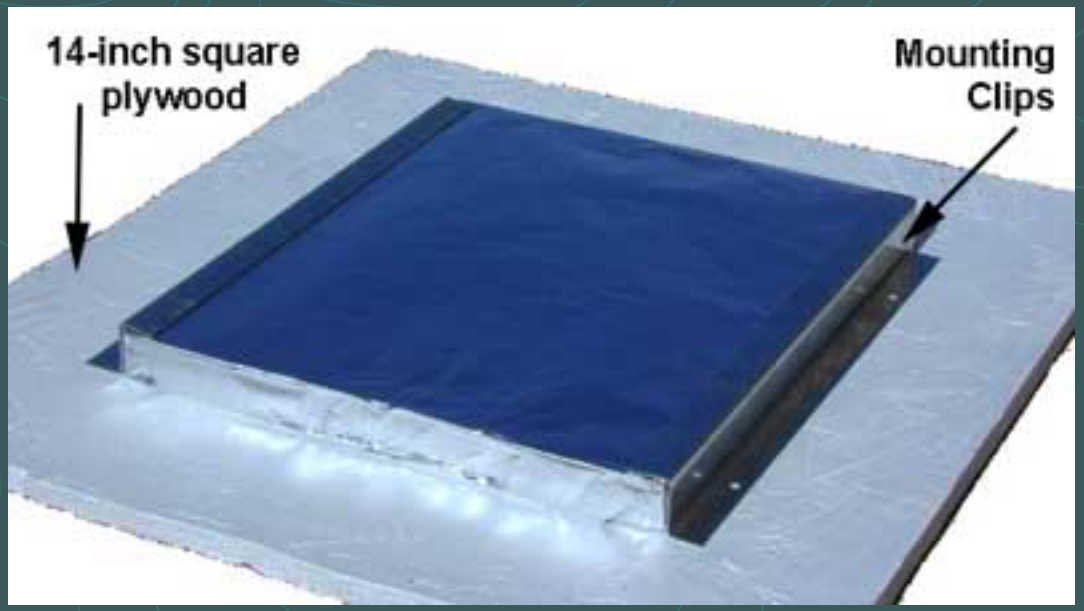
- Scientific curiosity.
- An interest in weather and an appreciation for water.
- Enough unobstructed space to install a rain gauge.
- Two minutes a day for a good cause.

CoCo RaHS
Simple Tools to Study Rain

Rain Gauge

Example Station

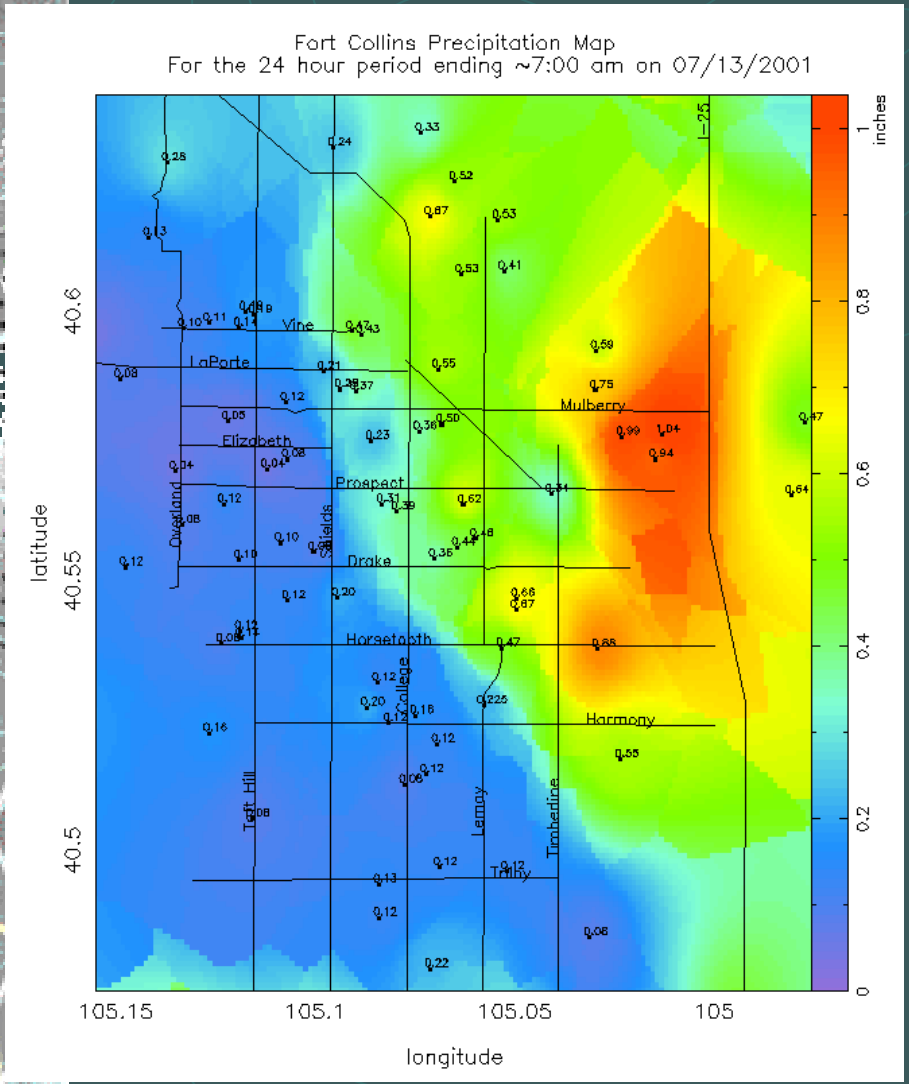
CoCo RaHS
Simple tools to study hail

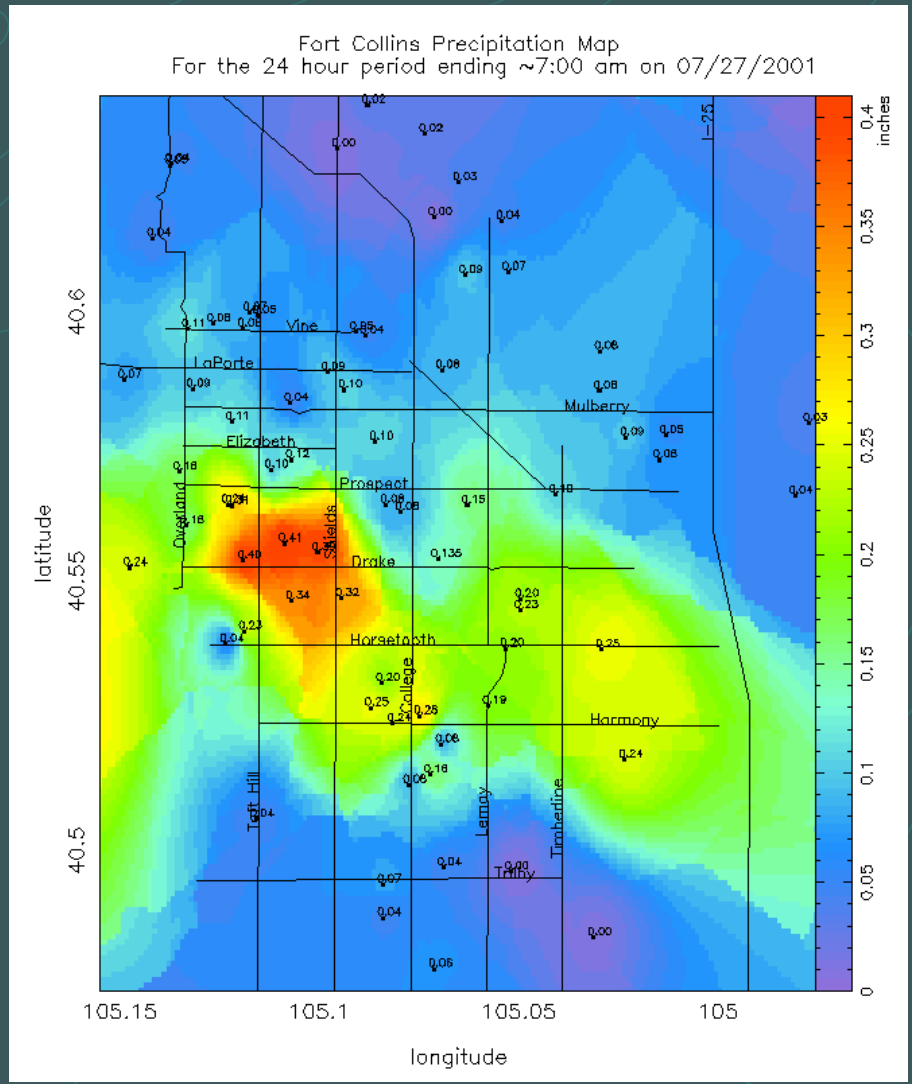


Hail Pad

Damaged Hail Pad

Fort Collins daily rainfall examples





Colorado Hailstorm

July 10, 2002, Parker, CO

Damaged Hailpad.

One of the culprits.

How many volunteers do we need?

- Our goal is at least one per square mile over urbanized areas.
- As many as we can find in rural areas.

For more information visit the CoCoRaHS Web site

http://www.cocorahs.org

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