Drought!
When Do We Know It’s Over?

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http://ccc.atmos.colostate.edu
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Appreciate our climate --

http://www.lensflare.com/~doubt/pics/garden/
But it’s darn dry!

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

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- Tmax
- Tmin
- Tmean

Month:
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

Temperature (degrees F):
- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90

Tmax and Tmin show the highest and lowest temperatures, respectively, with Tmax peaking in July and Tmin in January. Tmean, the average temperature, also peaks in July but is relatively consistent throughout the year.
Statewide Mean Annual Temperature History
Average Monthly Precipitation for Selected Sites

Monthly Average Precipitation

- Lamar
- Cheyenne Wells
- Walsh
- Center
- Fruita
- Rocky Ford
- Durango
- Vail

Month
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

Precipitation (inches)
Statewide Annual Precipitation History

http://lwf.ncdc.noaa.gov/oacityclimanter/research/cag3/CO.html
Colorado Springs Precipitation History

Colorado Springs Water Year Precipitation

Precipitation (inches)

WATER YEAR


5.95

Colorado College

Airport

6.79
Monthly Average Pan Evaporation

Average Monthly Pan Evaporation for Akron and Springfield, Colorado

Evaporation (inches)

Month

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Evaporation:

- Akron
- Springfield
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

Through 1999
Crystal Lakes serves Colorado Springs, Sept 2002

Seven Falls, during the 2002 drought water was pumped to top.
1999 Water Year Precipitation

Water Year 1999
Precipitation Percent of Average for 1961-1990 Averages

Precipitation (percent):
- 0 - 9
- 10 - 29
- 30 - 49
- 50 - 69
- 70 - 89
- 90 - 109
- 110 - 129
- 130 - 149
- 150 - 169
- 170 - 189
- 190 - 209
- 210 - 229
- 230 - 249
- > 250
2000 Water Year Precipitation

Water Year 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

[Graph showing precipitation data with percentages ranging from 70% to 130%]
2002 Snow Water Equivalent

Wolf Creek Summit SNOTEL

Water Year 2002
2002 Water Year Precipitation

Water Year 2002
Precipitation Percent of Average for 1961-1990 Averages
WY2002 Temperature Departures

Water Year 2002

Departure from average, degree F

-6 -4 -2 0 2 4 6 8

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

-Eastern Plains - Foothills - Mountains - Western Valleys
2002 Daily Streamflow

Colorado River near Dotsero, CO

Discharge (1000 CFS)
Arkansas River at Canon City Streamflow History

Arkansas River at Canon City Streamflow Values through 2001

Streamflow (Cubic Ft per Second)

Year


Arkansas River, 7-year running mean
2003 Water Year Precipitation

Water Year 2003

COLORADO

Precipitation (percent)
- 30 - 49
- 50 - 69
- 70 - 89
- 90 - 109
- 110 - 129
- 130 - 149

Elevations Above 9000 Feet

10 0 10 20 miles
2003 SWE Porphyry Creek

PORPHYRY CREEK SNOTEL for Water Year 2003

*** Provisional Data, Subject to Change ***
WY2003 Temperature Departures

Water Year 2003

Departure from average, degree F

Eastern Plains
Foothills
Mountains
Western Valleys

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
2003 Daily Streamflow

USGS 07094500 ARKANSAS RIVER AT PARKDALE, CO.

EXPLANATION
- MEDIAN DAILY STREAMFLOW BASED ON 40 YEARS OF RECORD
- MEASURED Discharge
- DAILY MEAN DISCHARGE
- Station operated seasonally

Provisional Data Subject to Revision

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

Departure from average, degree F

- Eastern Plains
- Foothills
- Mountains
- Western Valleys

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Colorado Statewide Snowpack

Based on provisional SNOTEL data.

As of Tuesday, February 24, 2004
90% of average
112% of last year’s snowpack
67% of average peak accumulation

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

As of Wednesday, February 25, 2004
91 % of average
107 % of last year’s snowpack
73 % of average peak accumulation

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

Colorado Statewide Reservoir Levels on October 1st for Years 1997-2003 and Feb 1, 2004
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
Precipitation
March – May 2004

From the Colorado Prediction Center
Temperature
June – August 2004

From the Colorado Prediction Center
Precipitation
June – August 2004

From the Colorado Prediction Center
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. Drought Monitor
February 17, 2004
Valid 7 a.m. EST

Drought 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, February 19, 2004
Author: Michael Hayes, NDMC

http://drought.unl.edu/dm
U.S. National Percent Area Severely to Extremely Dry

Percent of United States in Severe or Extreme Drought

For Colorado Springs,
Average Precipitation $= \sim 17$ inches
Average Evaporation $= \sim > 24$ 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](http://ccc.atmos.colostate.edu)
click on “Drought”
then click on “Presentations”