Redefining the New Normal? How 2002 Compares to 2012

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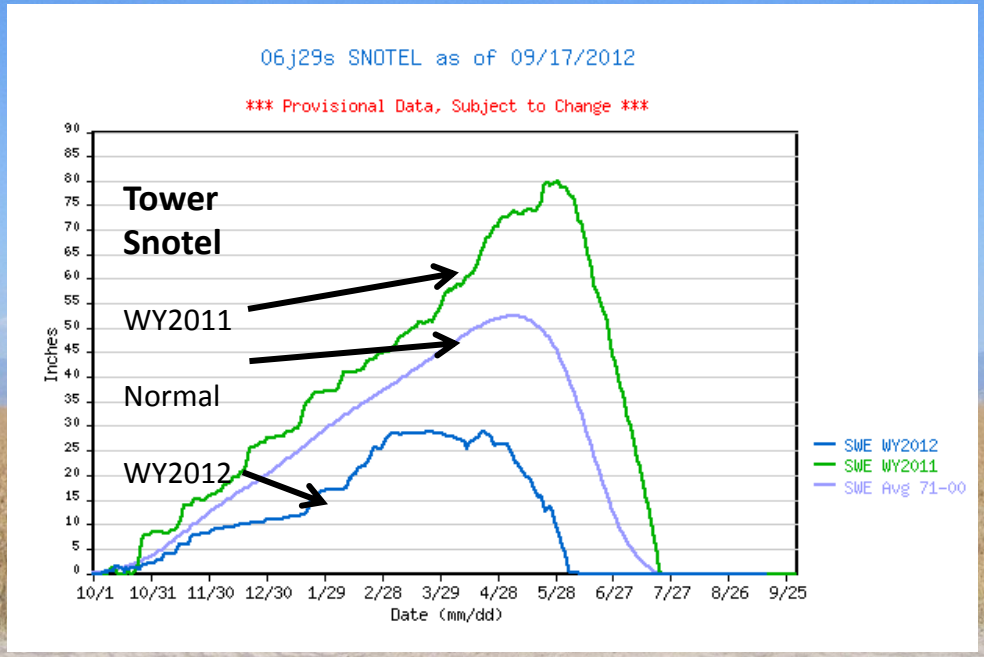
Graphics and presentation assembled by Wendy Ryan

There are several ways to tell this story

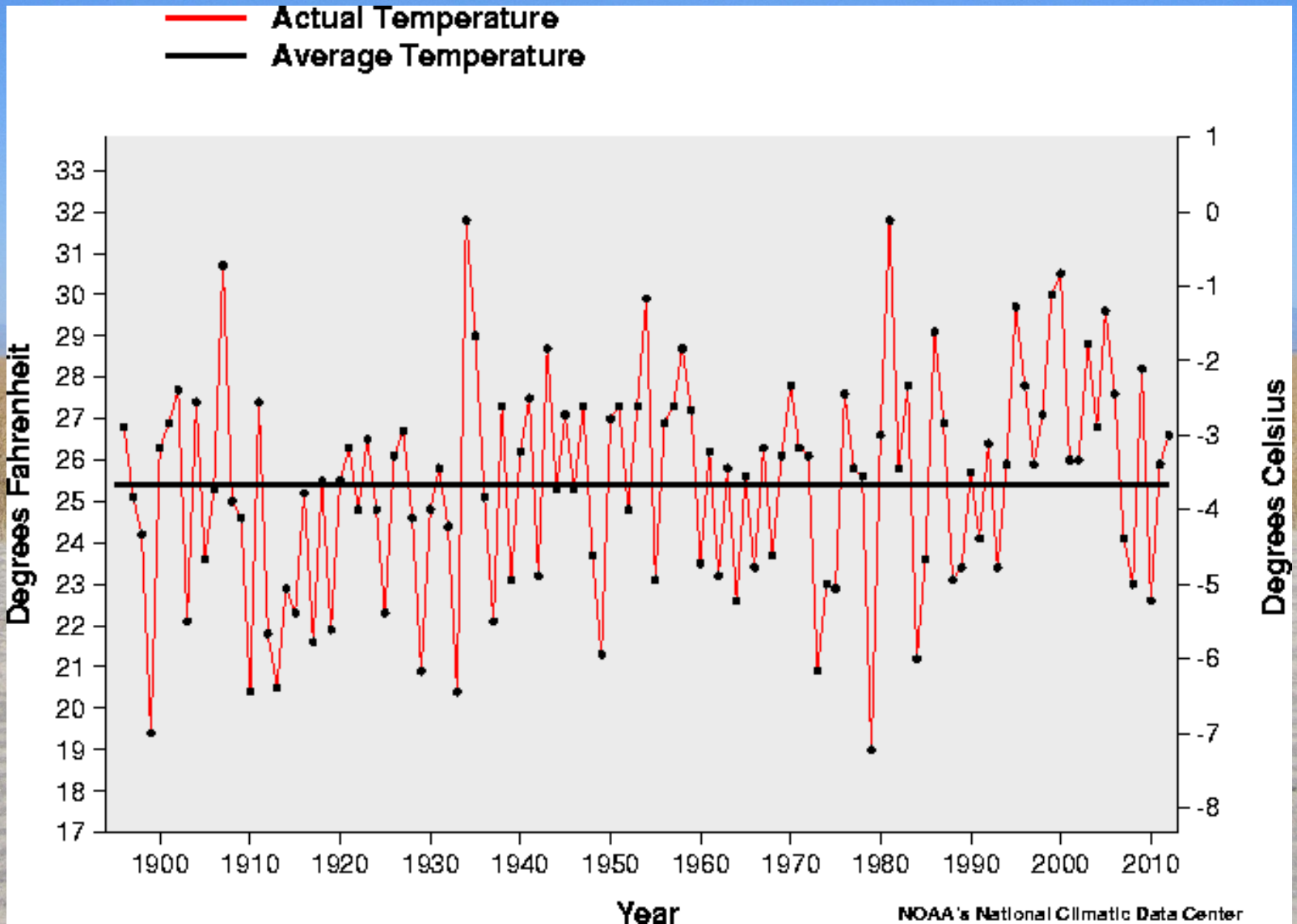
What is Normal?



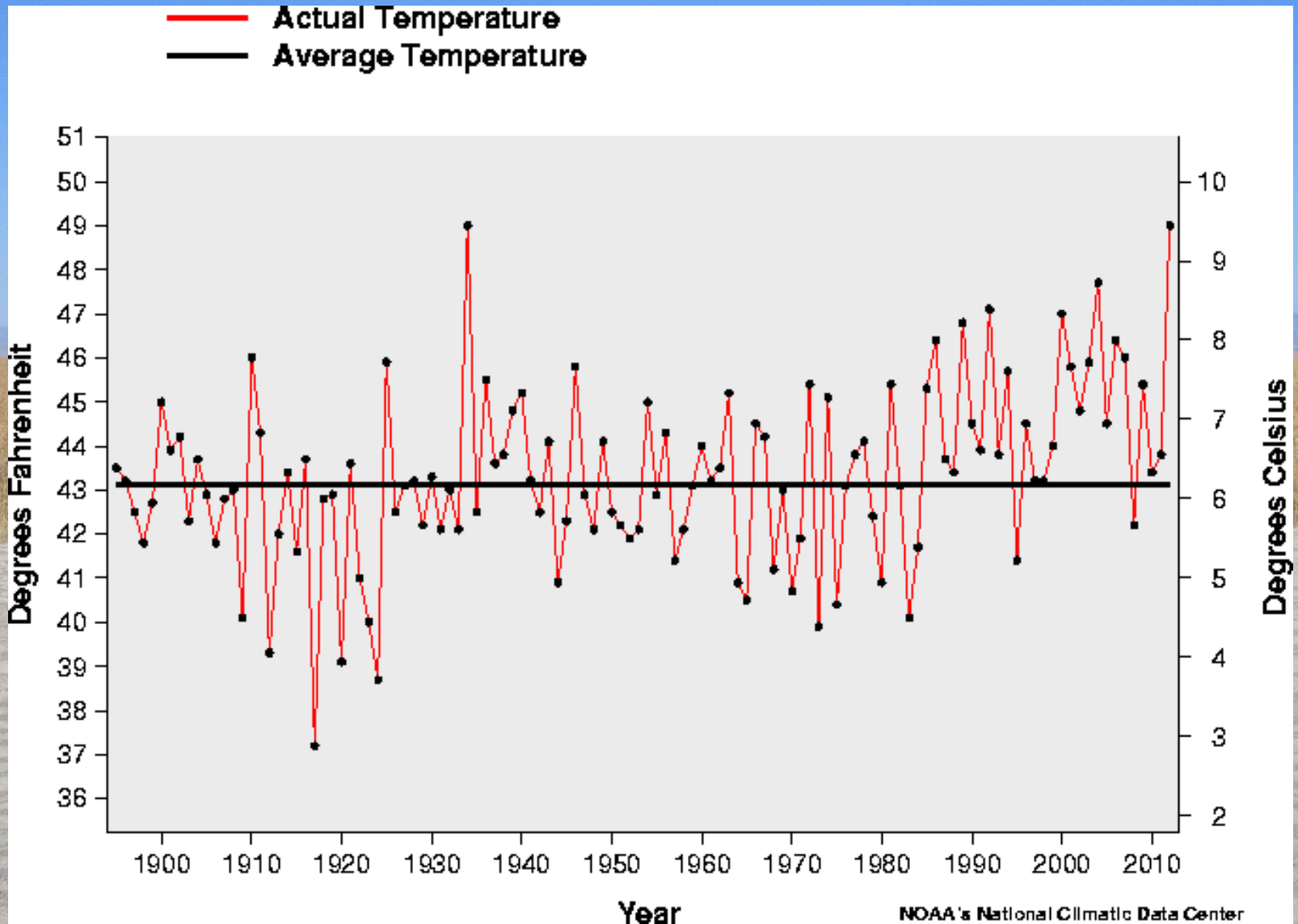
We NORMALLY see big variations in temperature and precipitation from year to year, month to month and season to season!

Let's take a look…

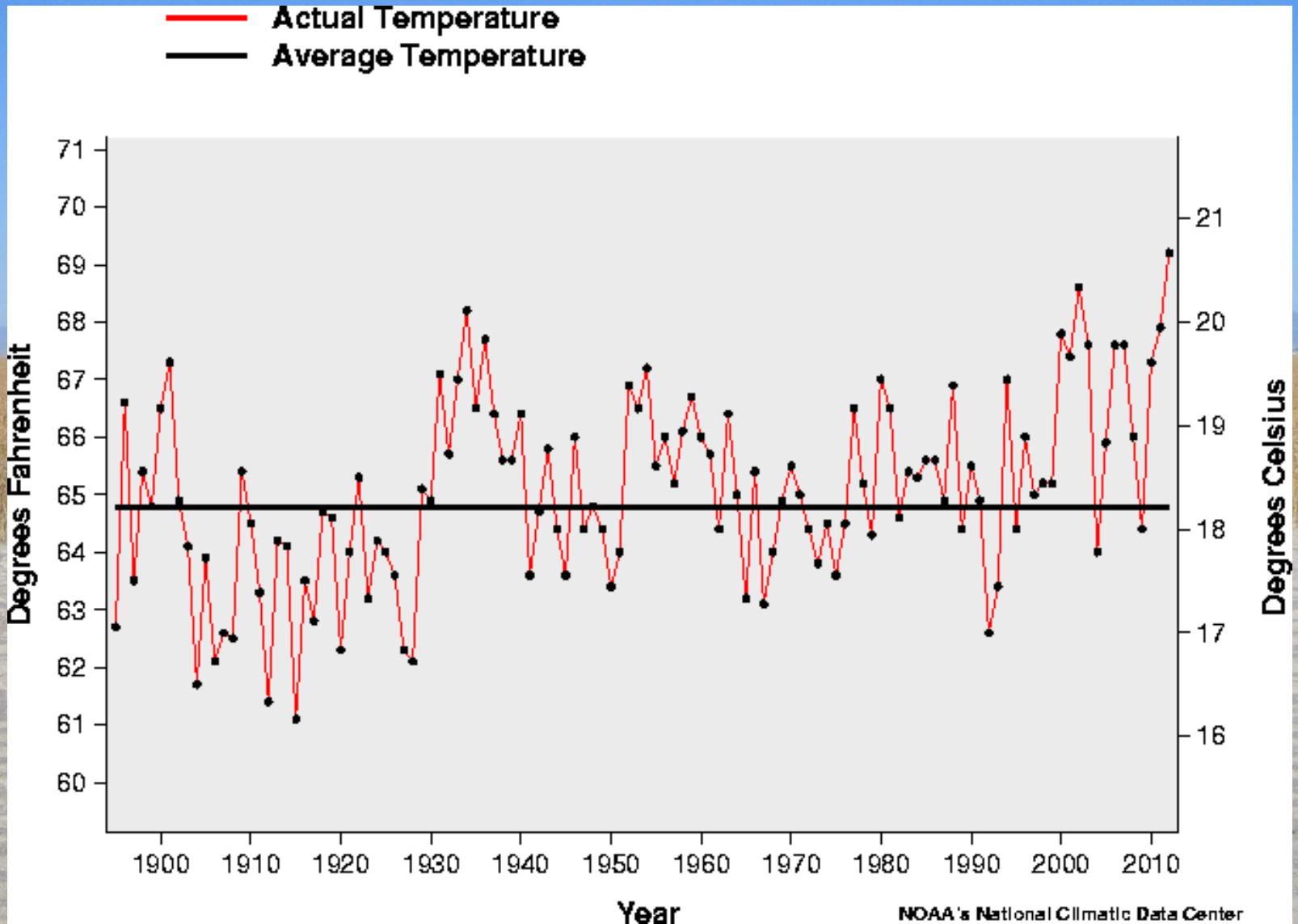
Colorado Statewide Winter (DJF) Temperatures 1895-2012



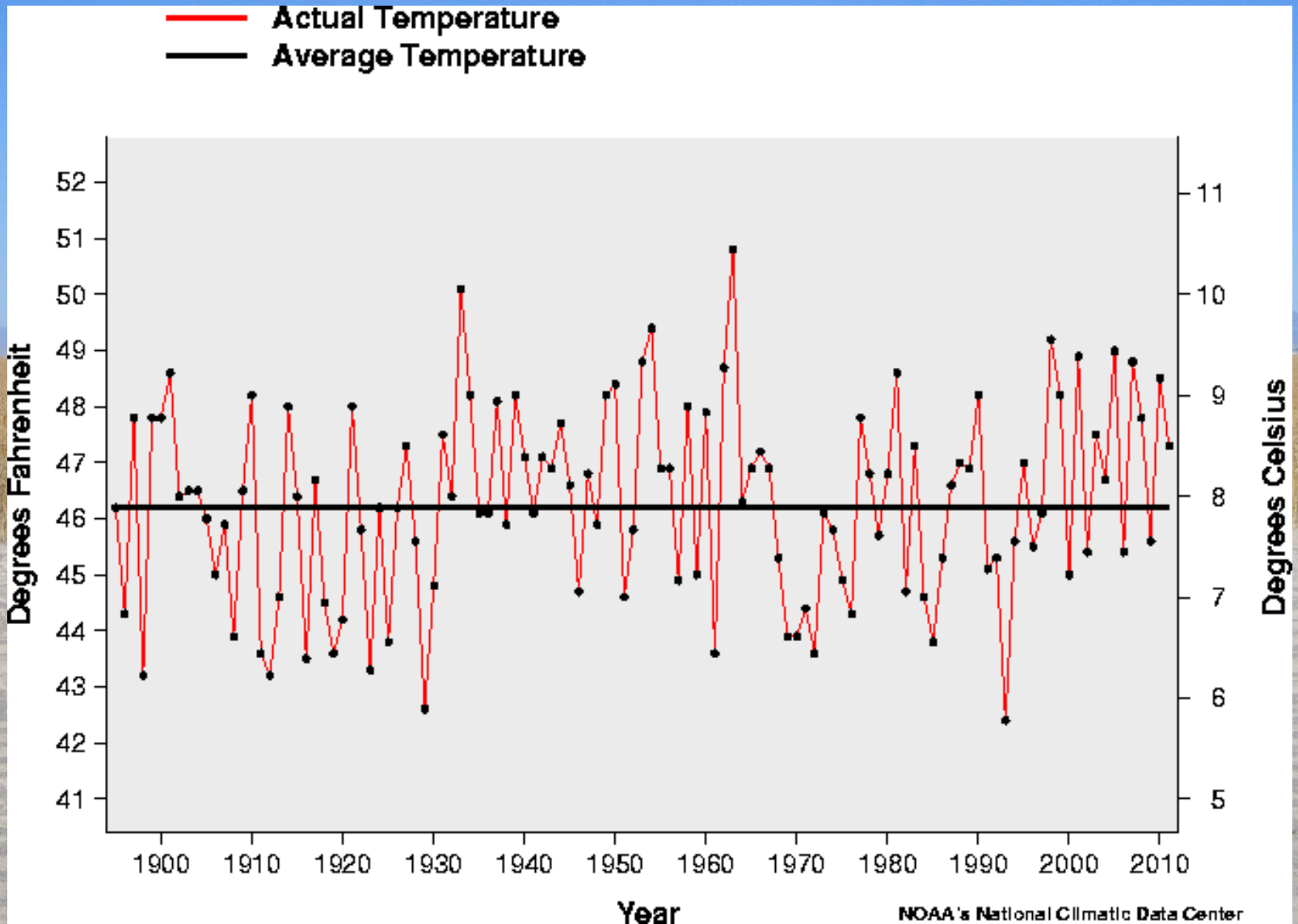
Colorado Statewide Spring (MAM) Temperatures 1895-2012



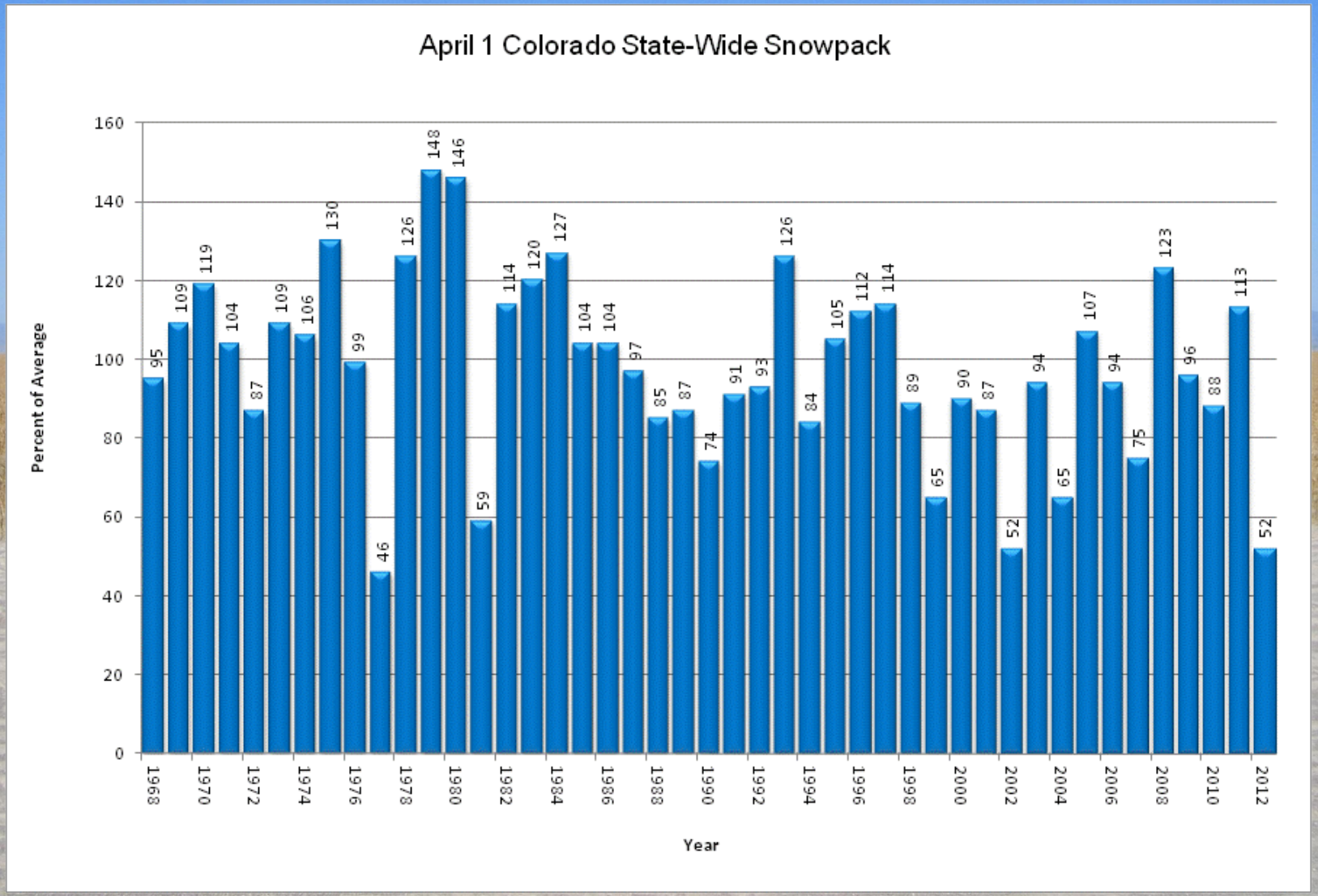
Colorado Statewide Summer (JJA) Temperatures 1895-2012



Colorado Statewide Fall (SON) Temperatures 1895-2011



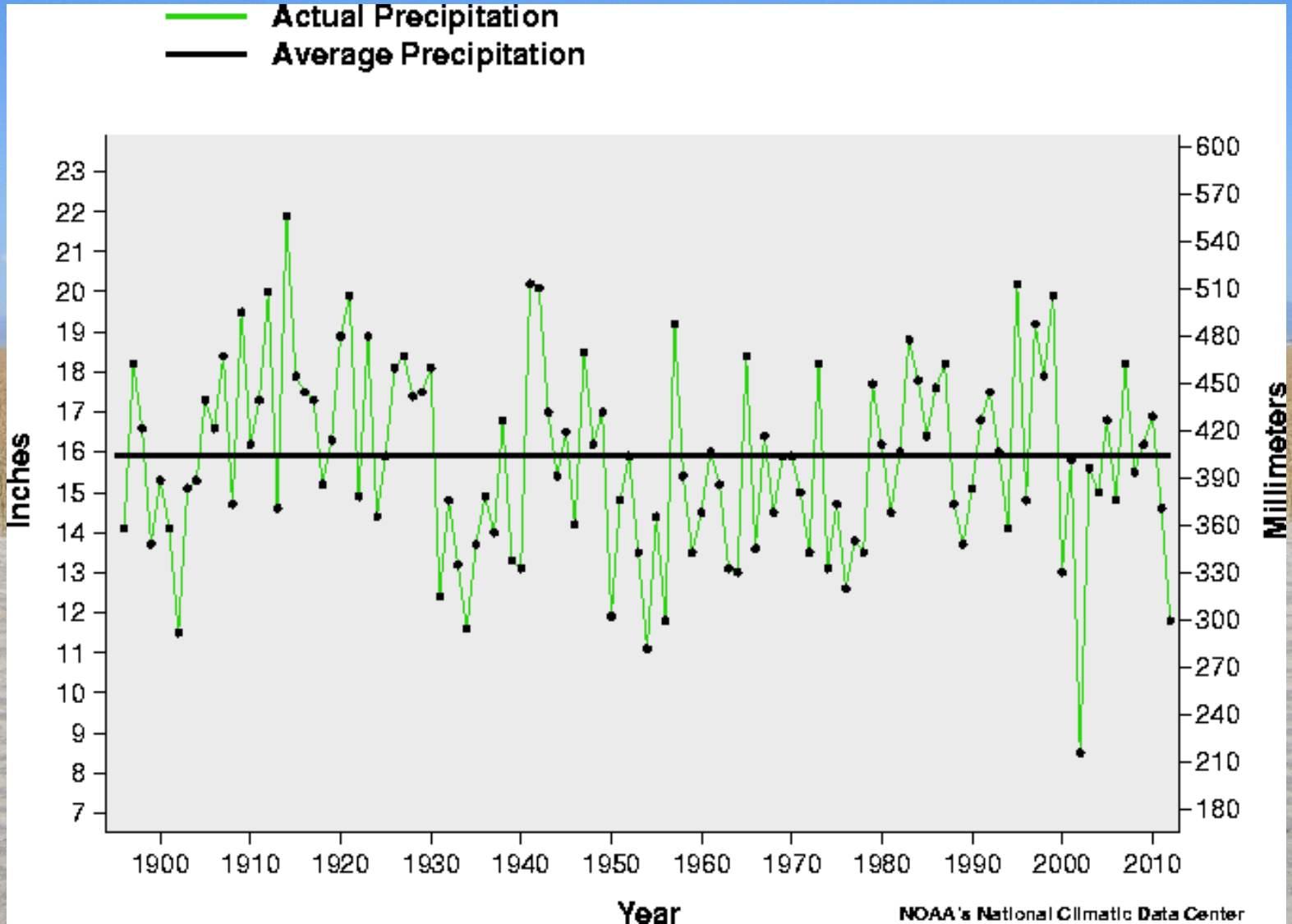
Colorado Statewide Snowpack (Snow Water Equivalent On April 1 each year -- 1968-2012



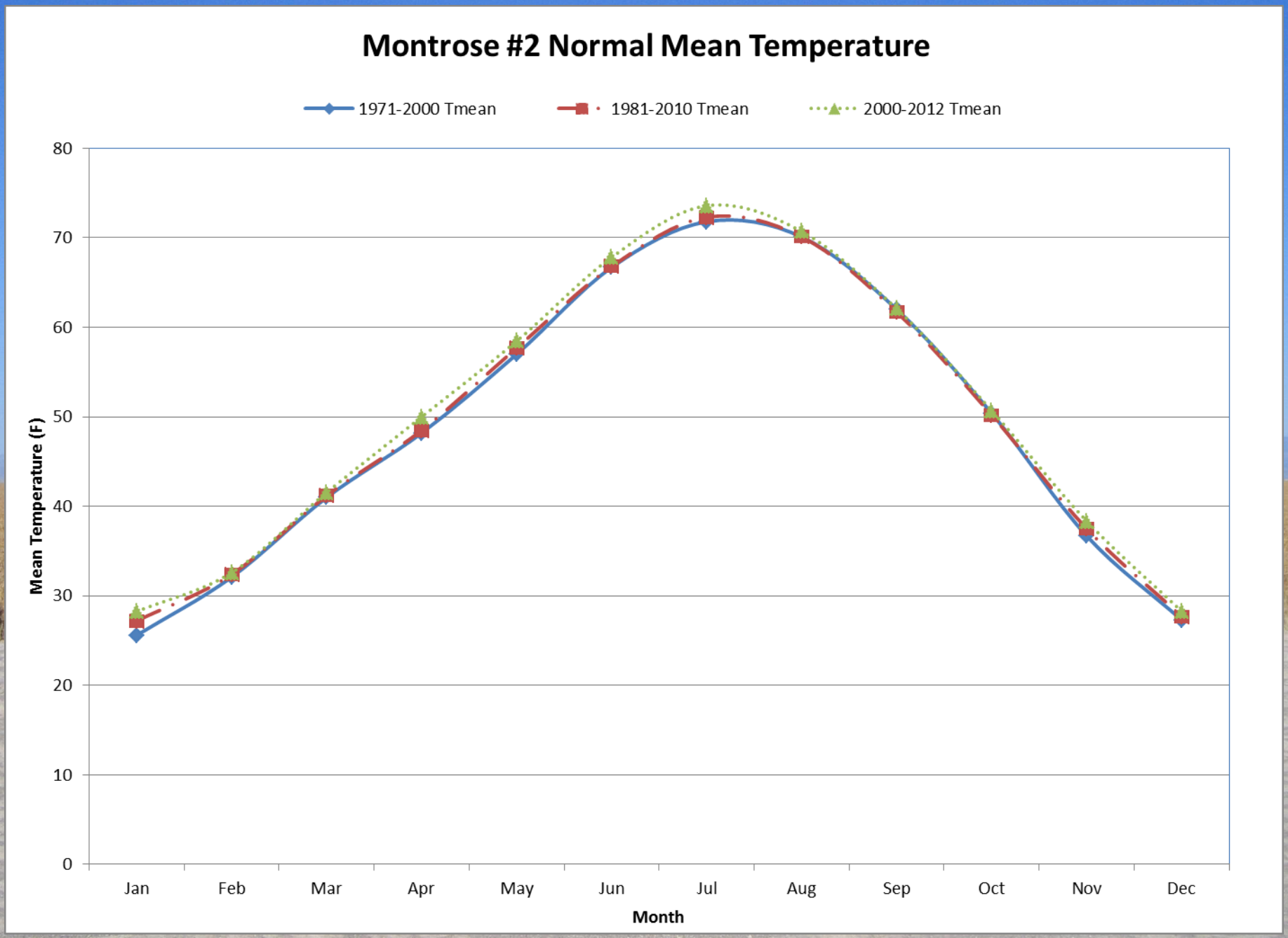
Colorado Statewide Precipitation

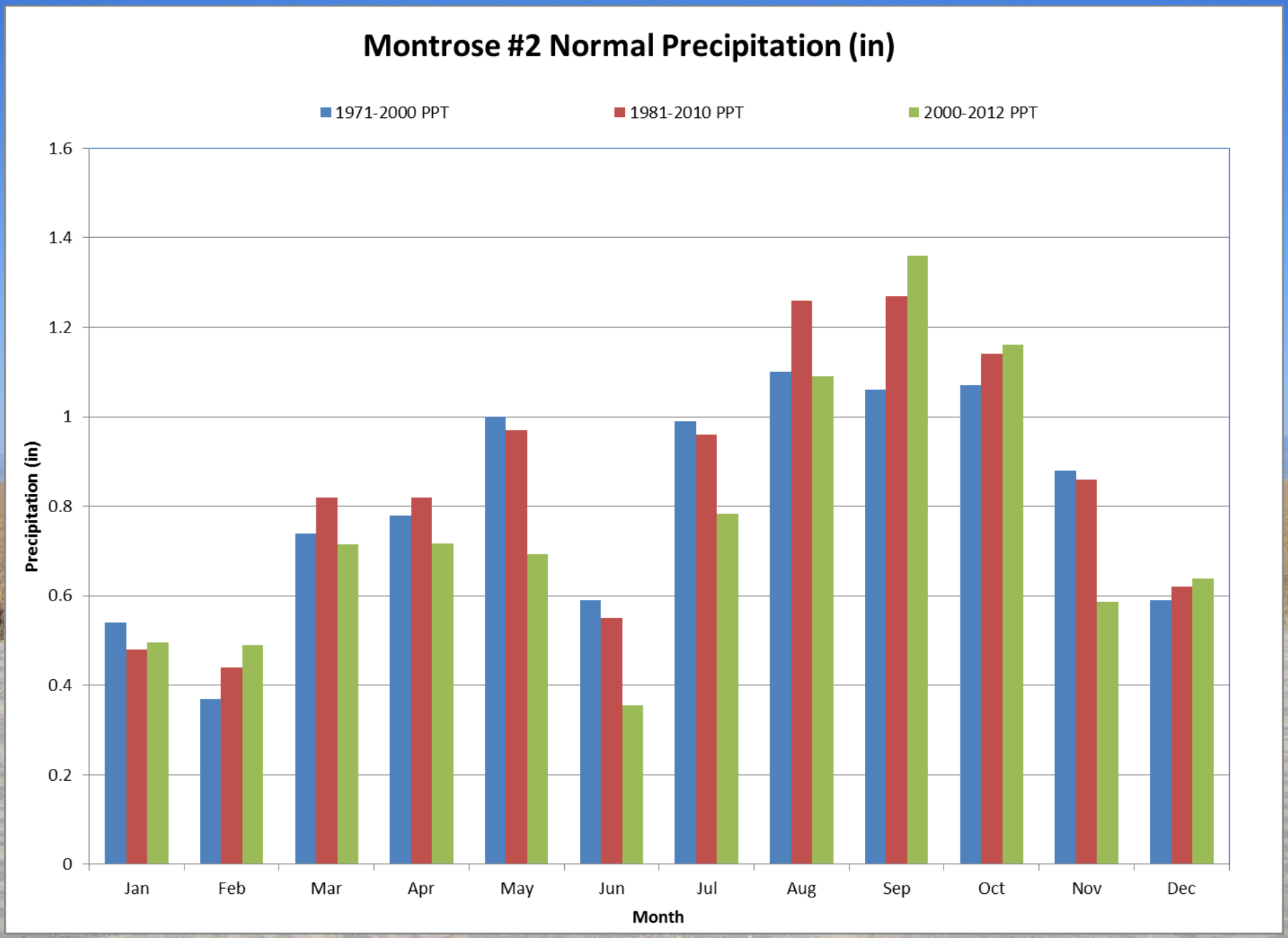
(Most recent 12 months Sept-Aug)

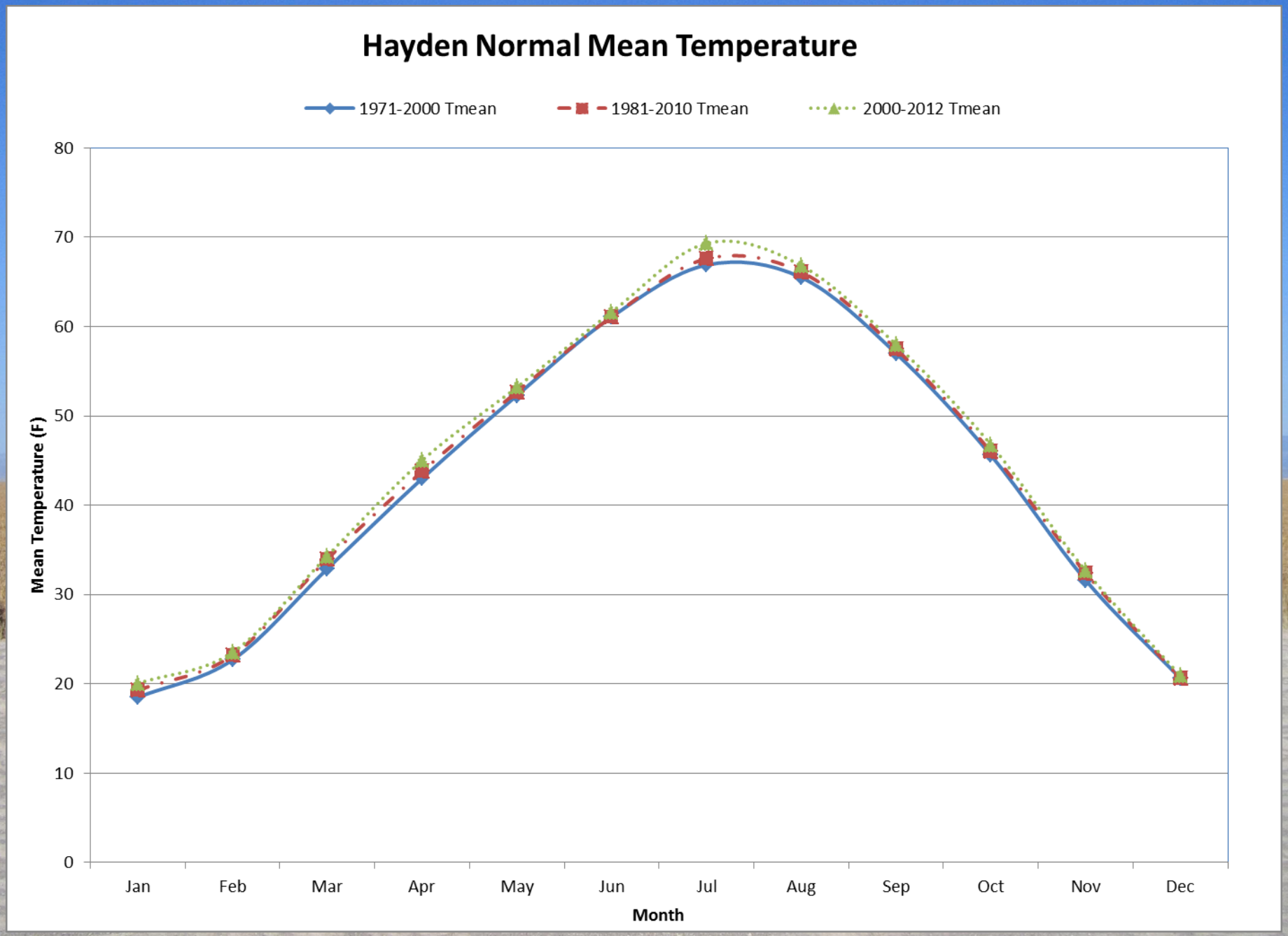
1895-2012

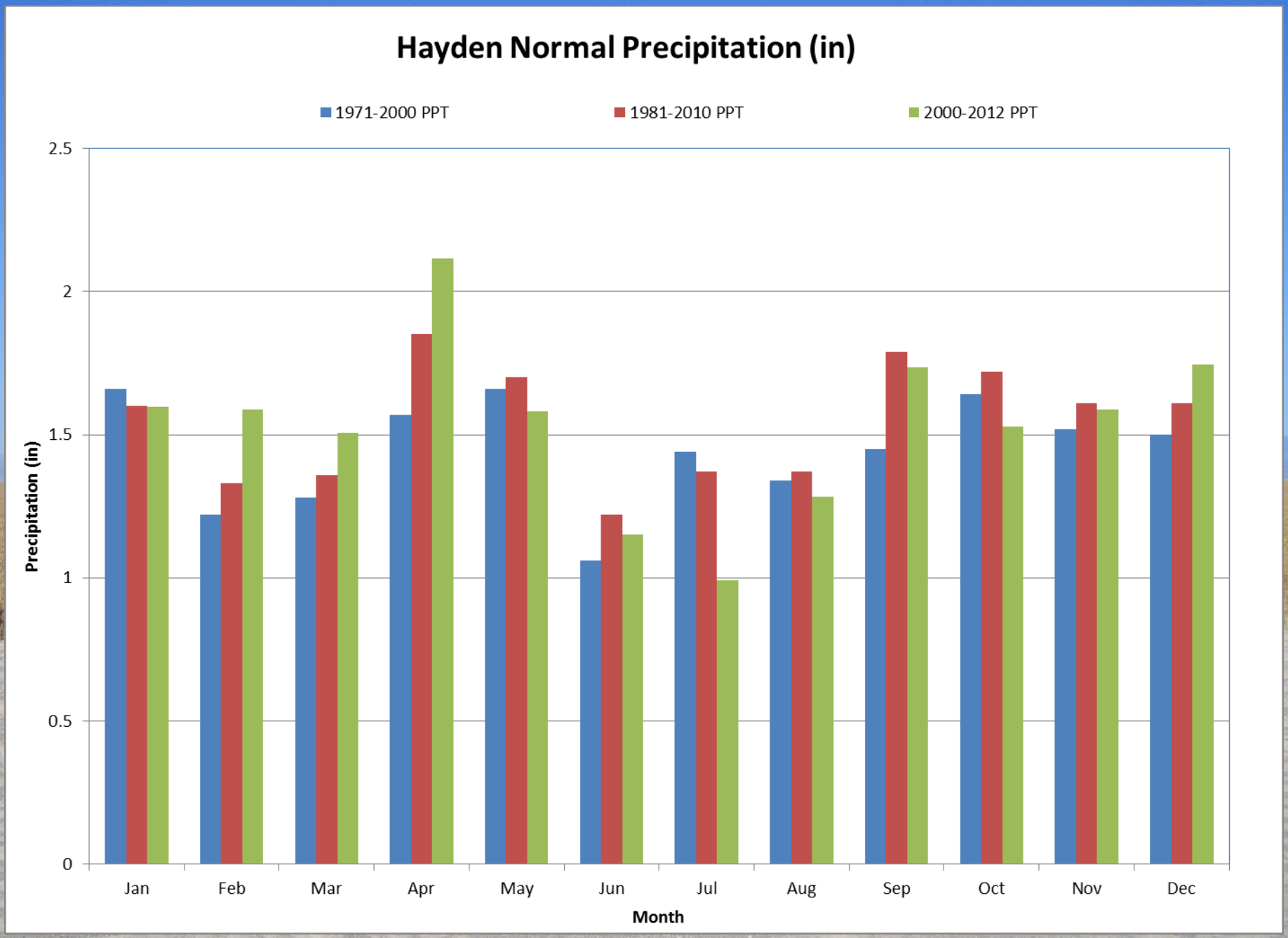


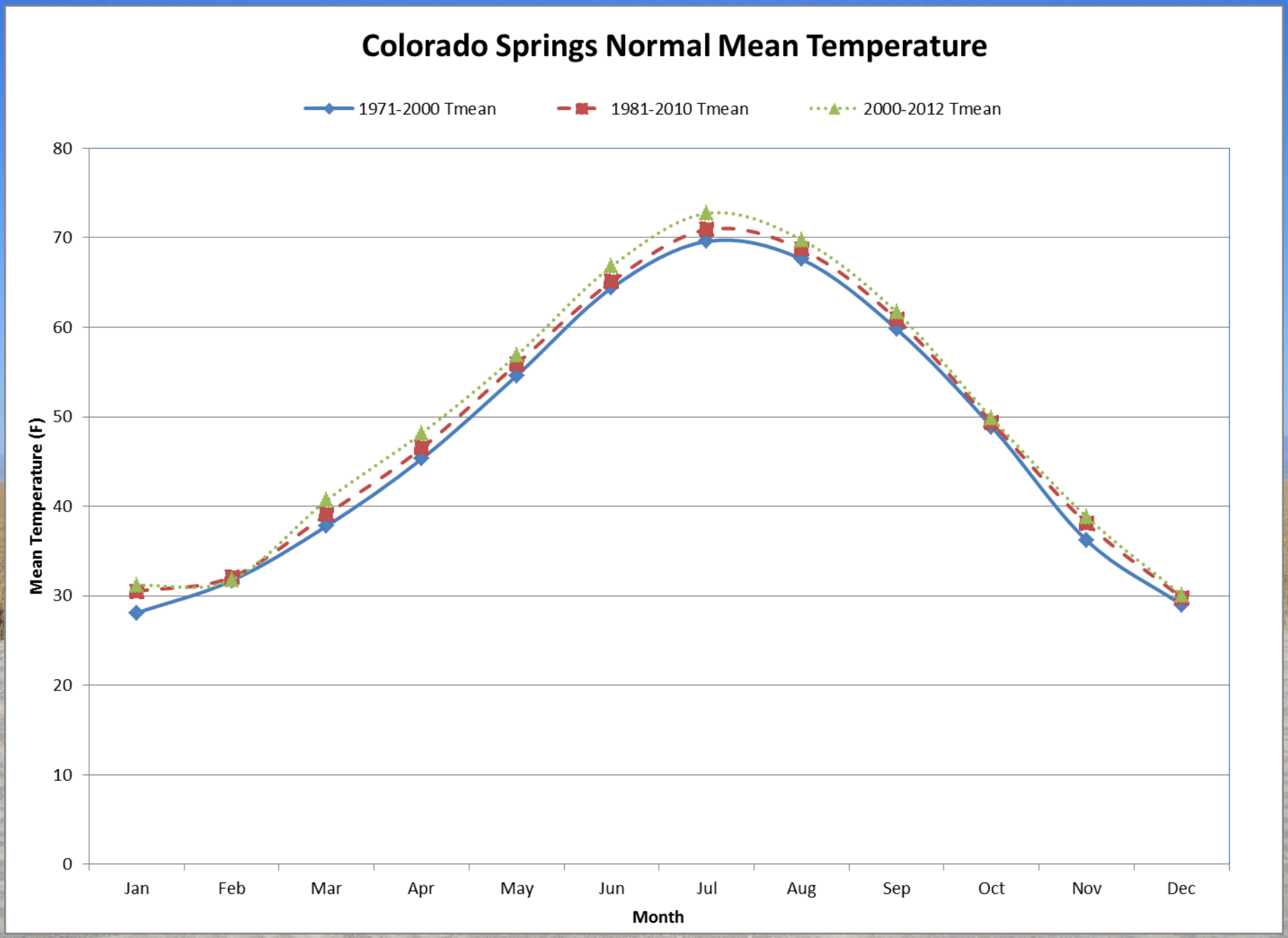
How Have our “Normals” Changed at Specific Stations?

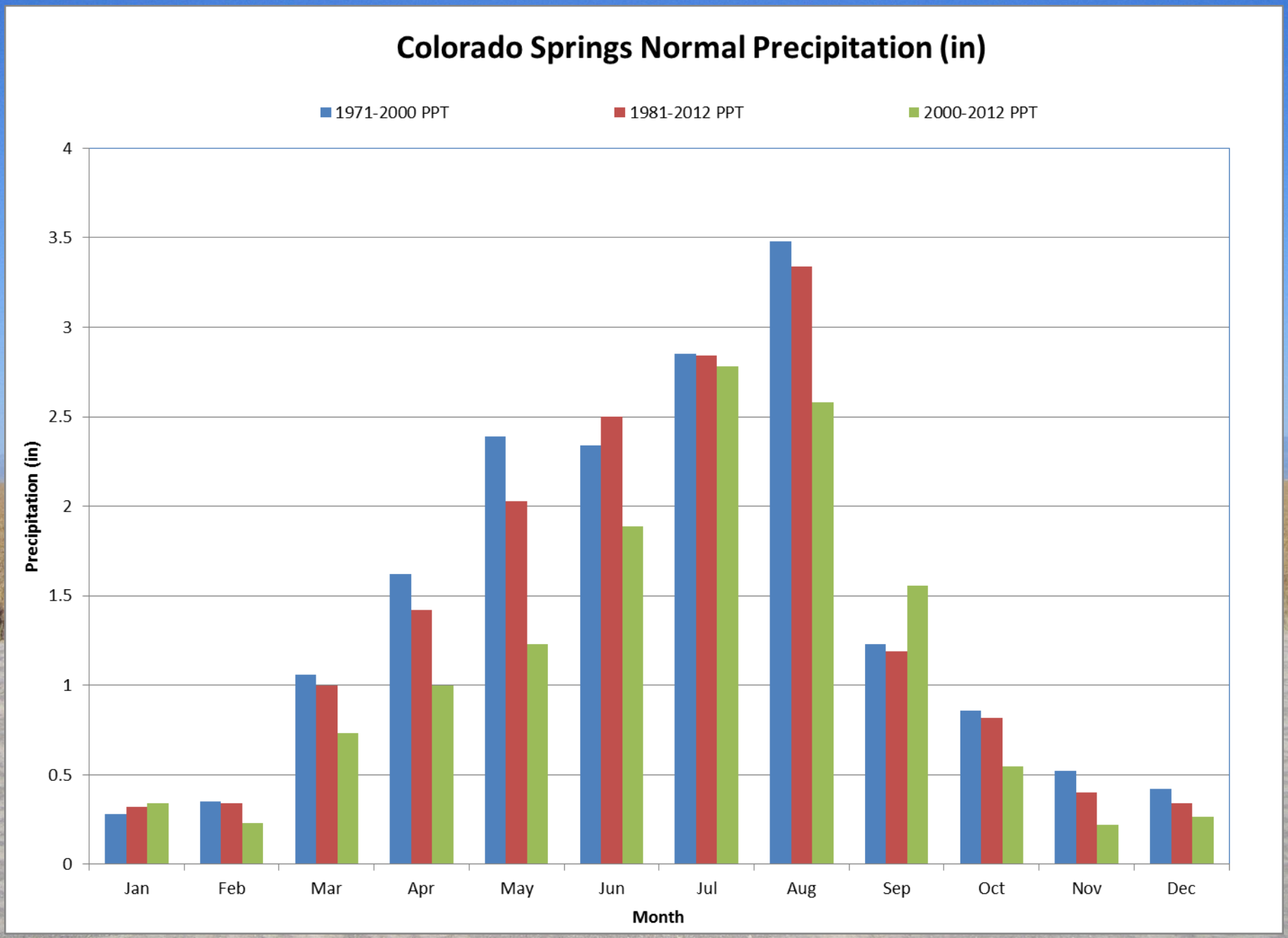

Montrose #2 Normal Mean Temperature
1971-2000 Tmean
1981-2010 Tmean
2000-2012 Tmean
80
70
60
50
40
30
20
10
0
Mean Temperature (F)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

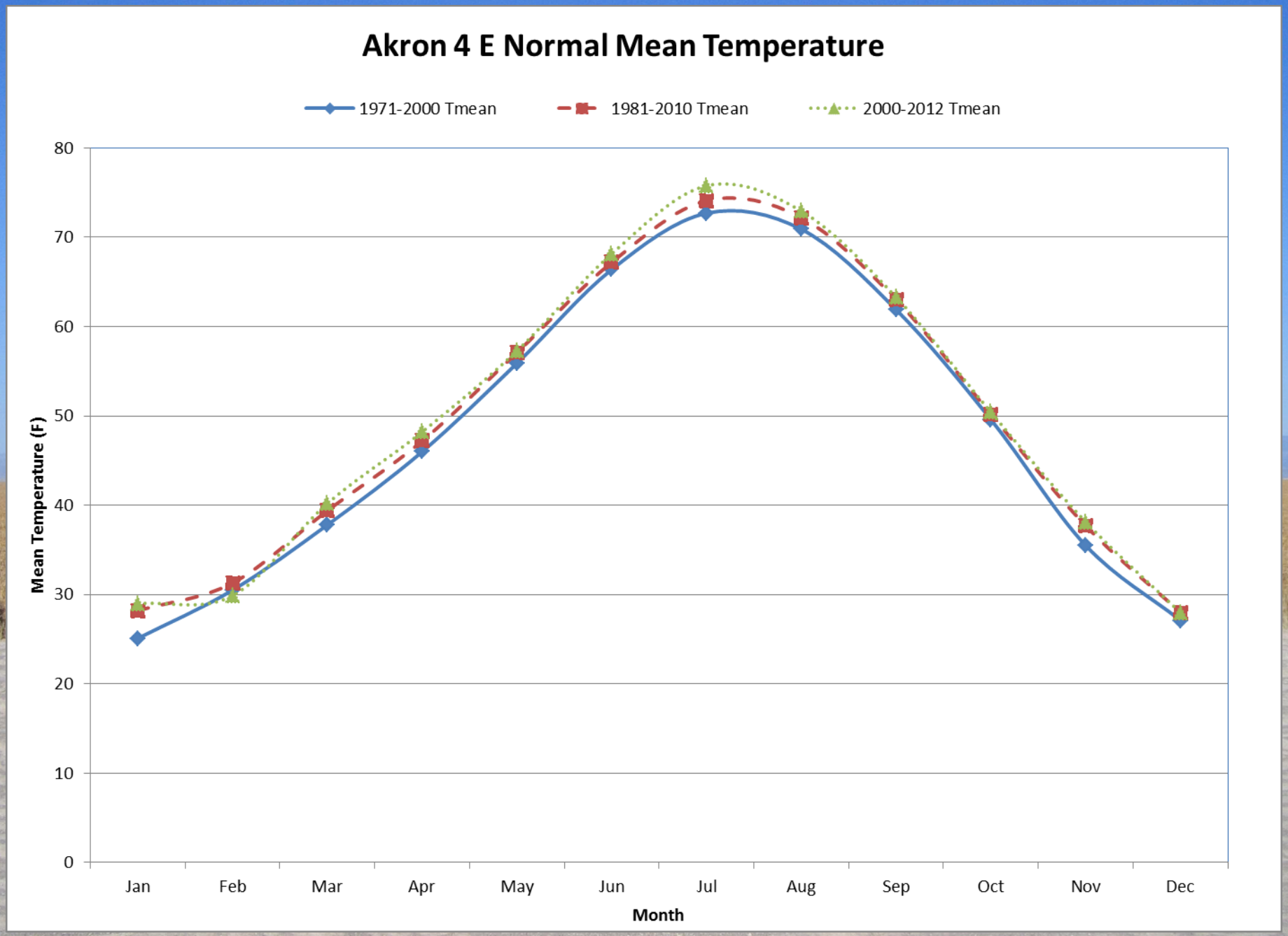

Montrose #2 Normal Precipitation (in)
1971-2000 PPT
1981-2010 PPT
2000-2012 PPT
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Precipitation (in)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

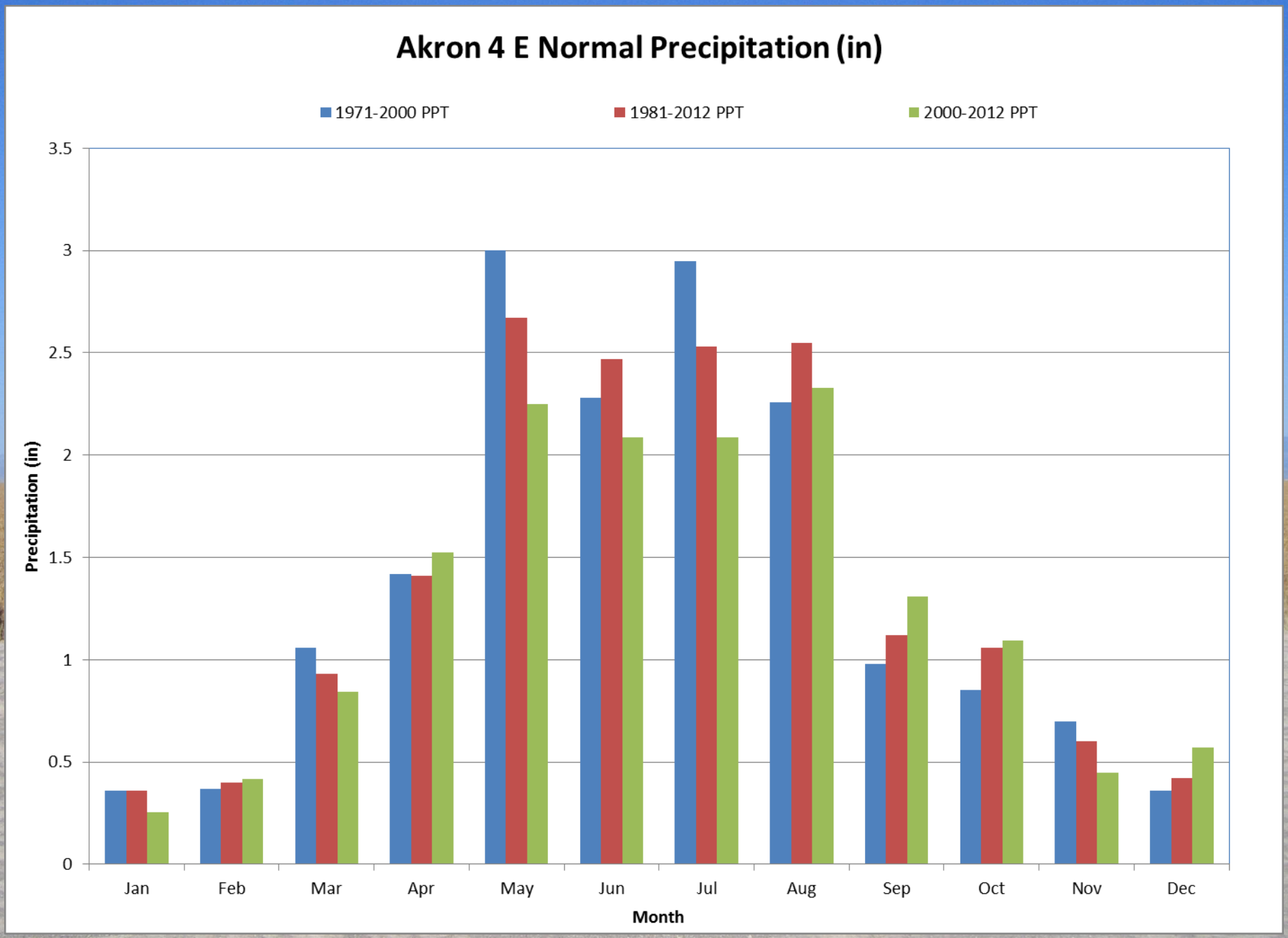

Hayden Normal Mean Temperature
1971-2000 Tmean
1981-2010 Tmean
2000-2012 Tmean
80
70
60
50
40
30
20
10
0
Mean Temperature (F)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

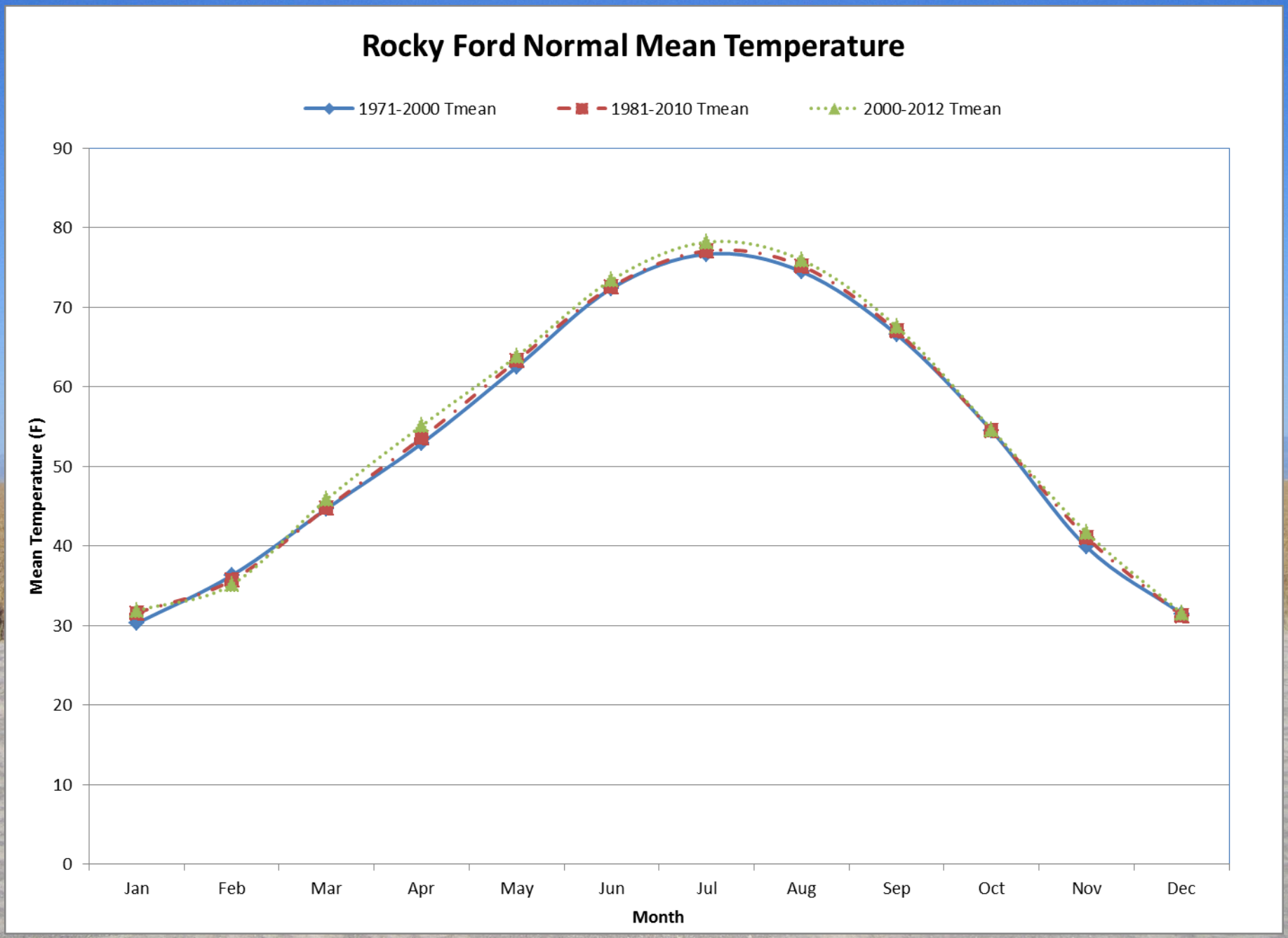

Hayden Normal Precipitation (in)
1971-2000 PPT
1981-2010 PPT
2000-2012 PPT
2.5
2
1.5
1
0.5
0
Precipitation (in)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

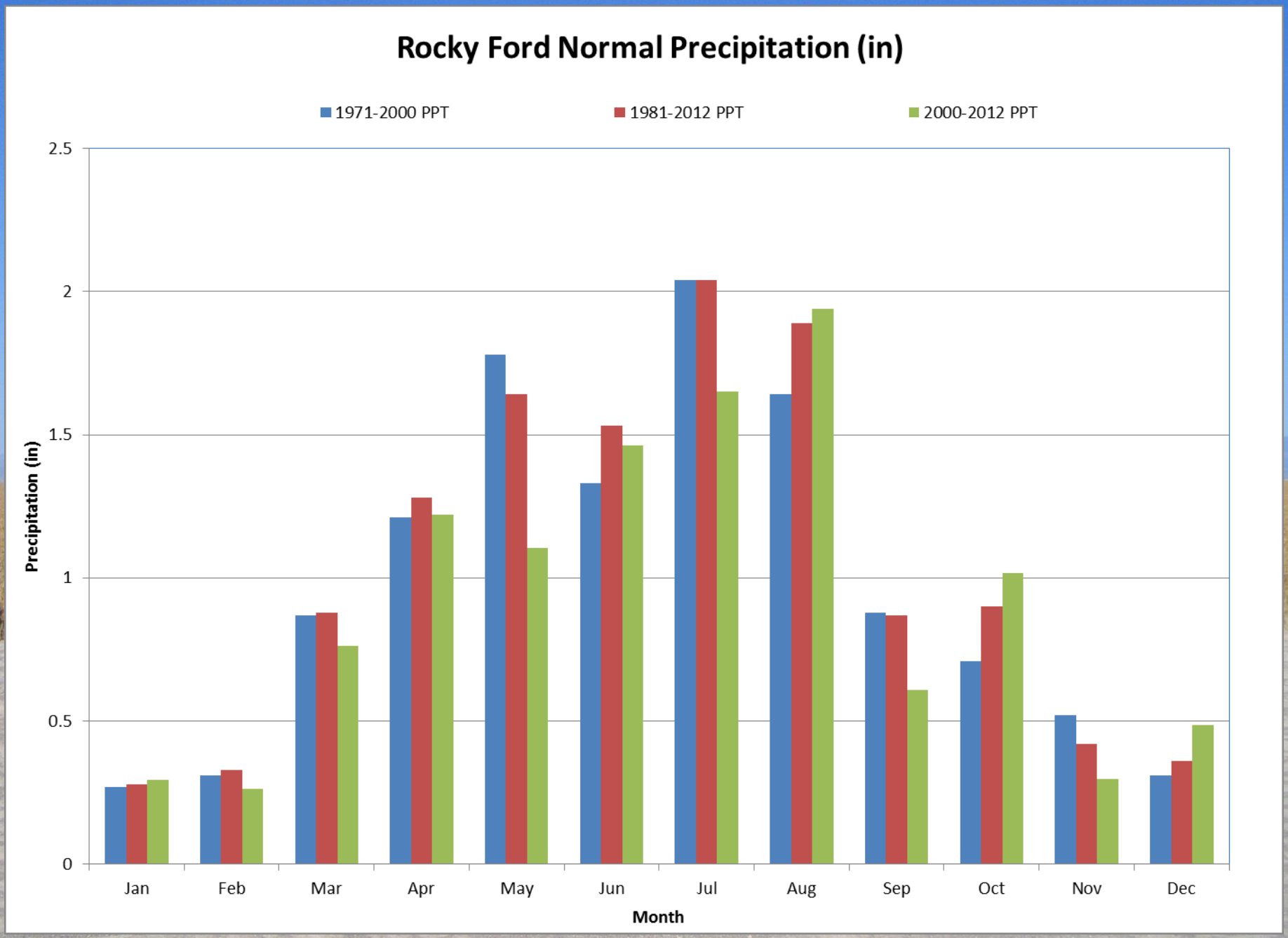

Colorado Springs Normal Mean Temperature
1971-2000 Tmean
1981-2010 Tmean
2000-2012 Tmean
Mean Temperature (F)
80
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month


Colorado Springs Normal Precipitation (in)
1971-2000 PPT
1981-2012 PPT
2000-2012 PPT
Precipitation (in)
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

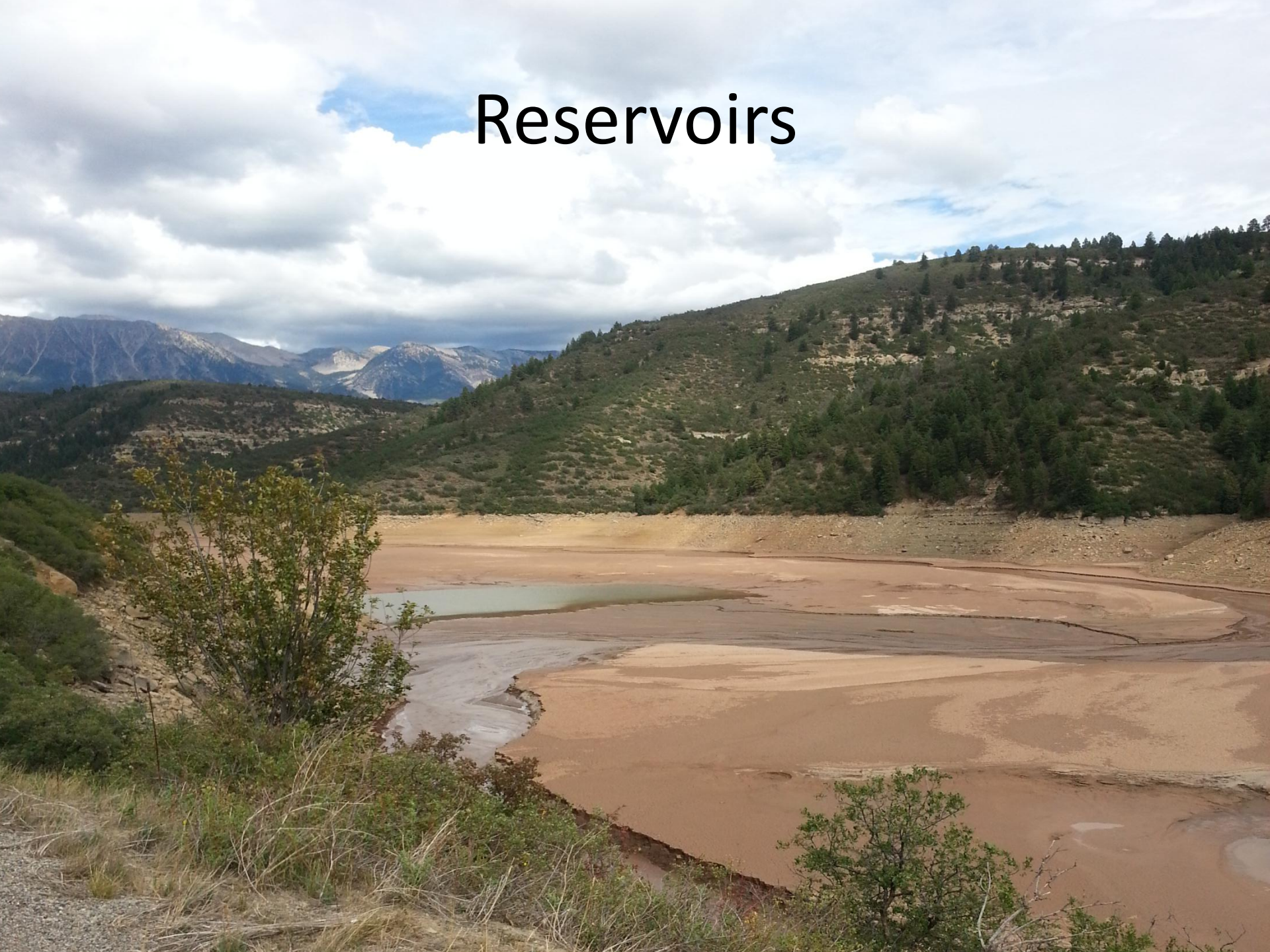

Akron 4 E Normal Mean Temperature
1971-2000 Tmean
1981-2010 Tmean
2000-2012 Tmean
Mean Temperature (F)
80
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month


Akron 4 E Normal Precipitation (in)
1971-2000 PPT
1981-2012 PPT
2000-2012 PPT
Precipitation (in)
3.5
3
2.5
2
1.5
1
0.5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

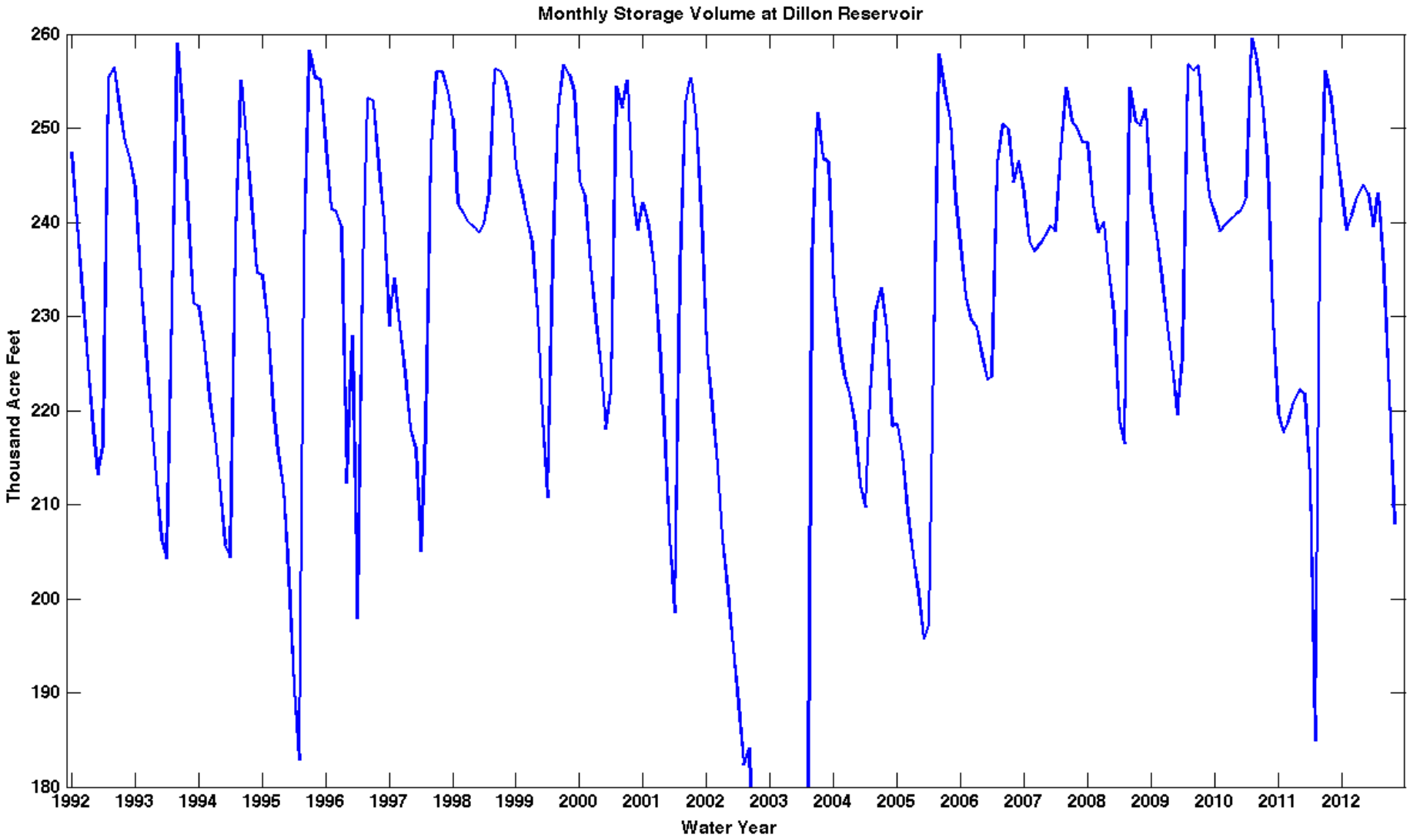

Rocky Ford Normal Mean Temperature
1971-2000 Tmean
1981-2010 Tmean
2000-2012 Tmean
Mean Temperature (F)
90
80
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month


Rocky Ford Normal Precipitation (in)
1971-2000 PPT
1981-2012 PPT
2000-2012 PPT
2.5
2
1.5
1
0.5
0
Precipitation (in)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

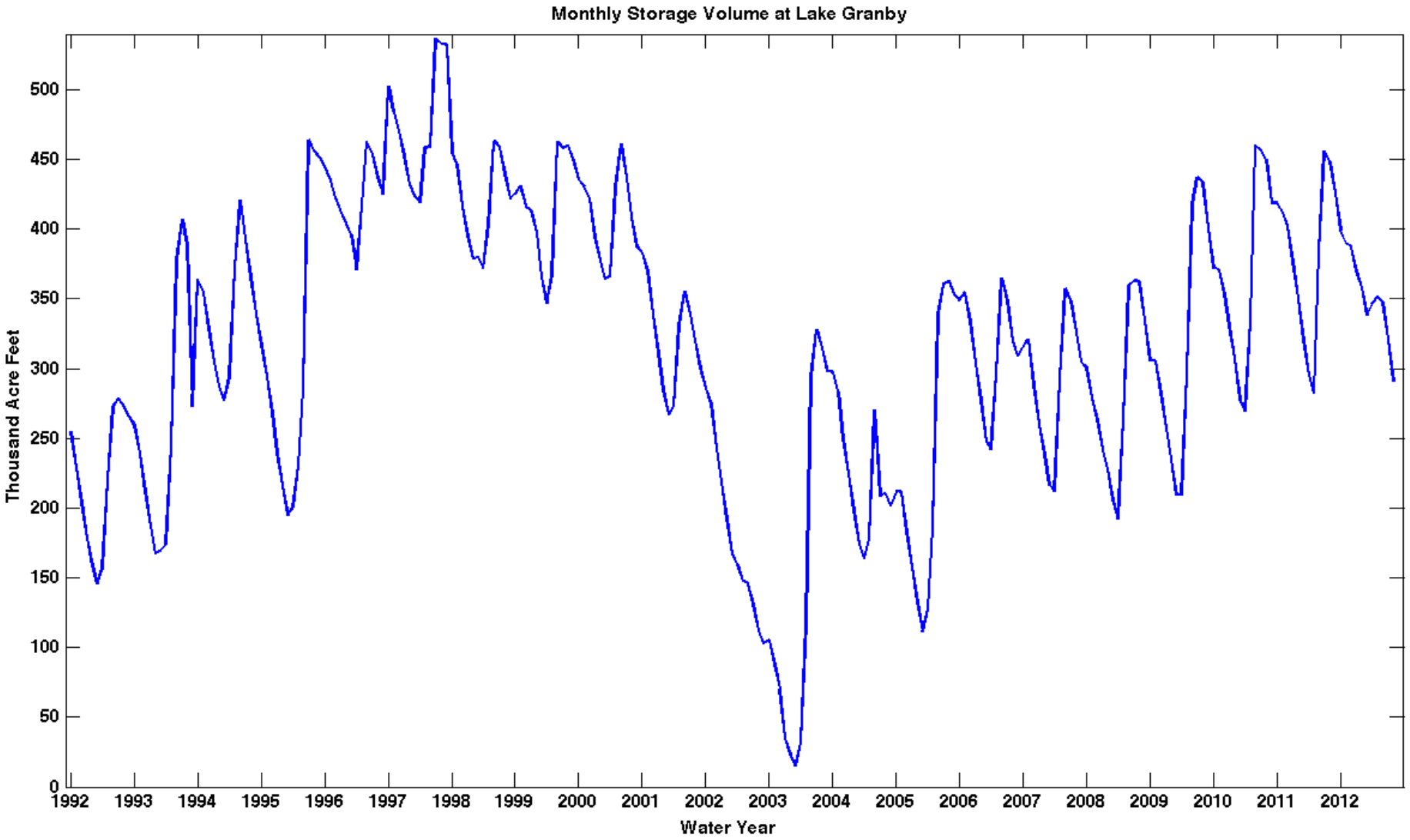
Reservoirs



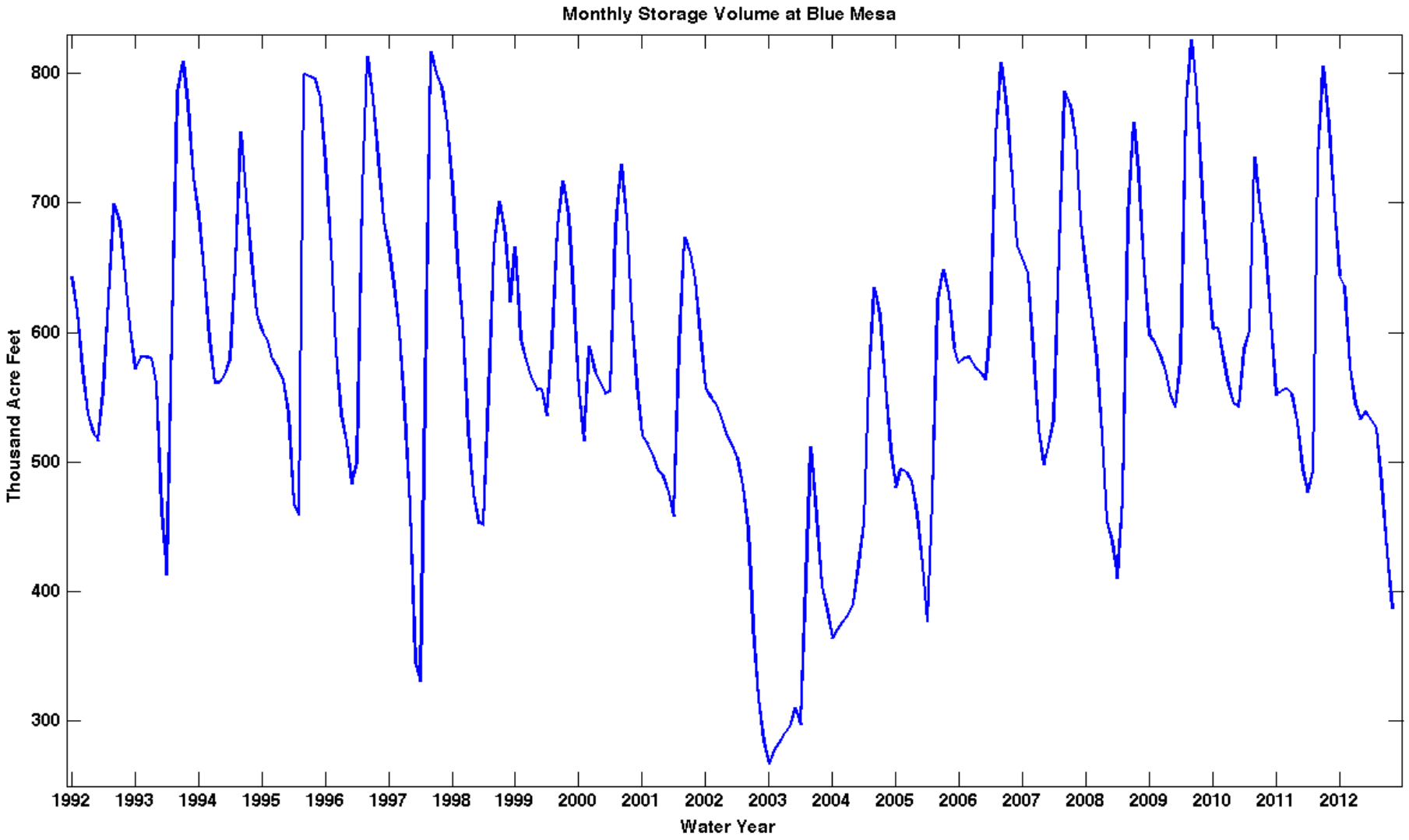
Dillon Storage Time Series



Granby Storage Time Series

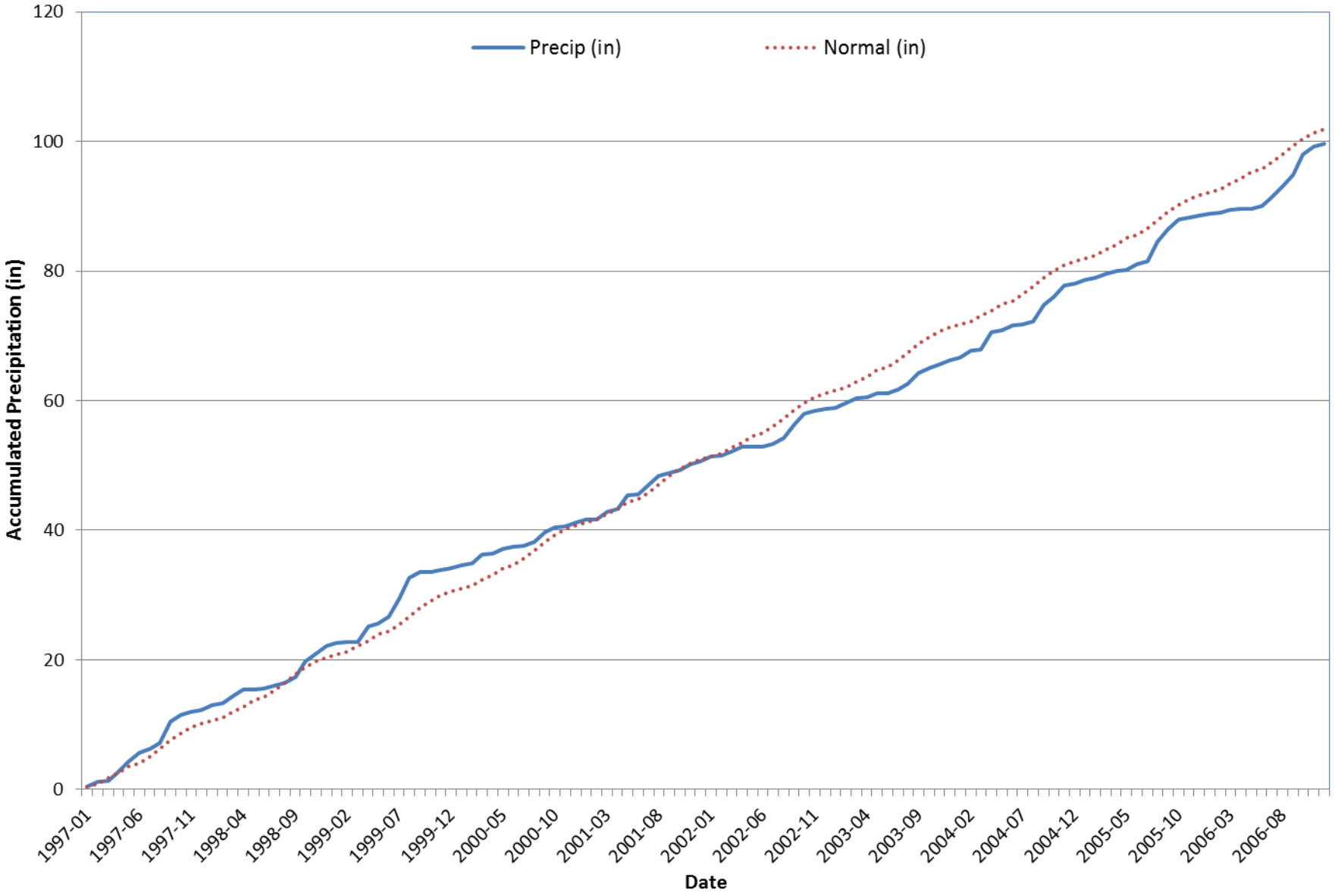


Blue Mesa Storage Volume

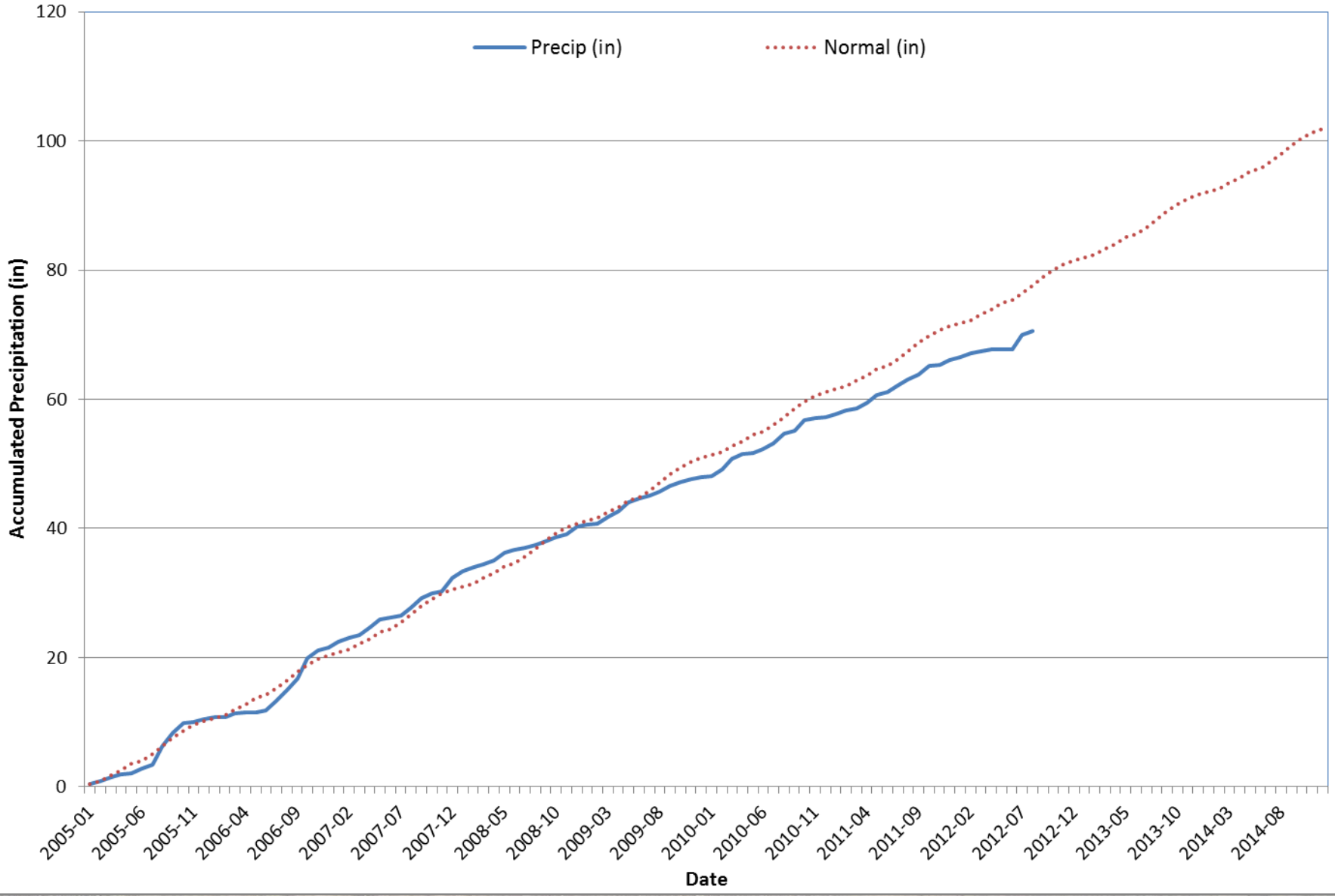


2002 Drought vs. 2012 Drought

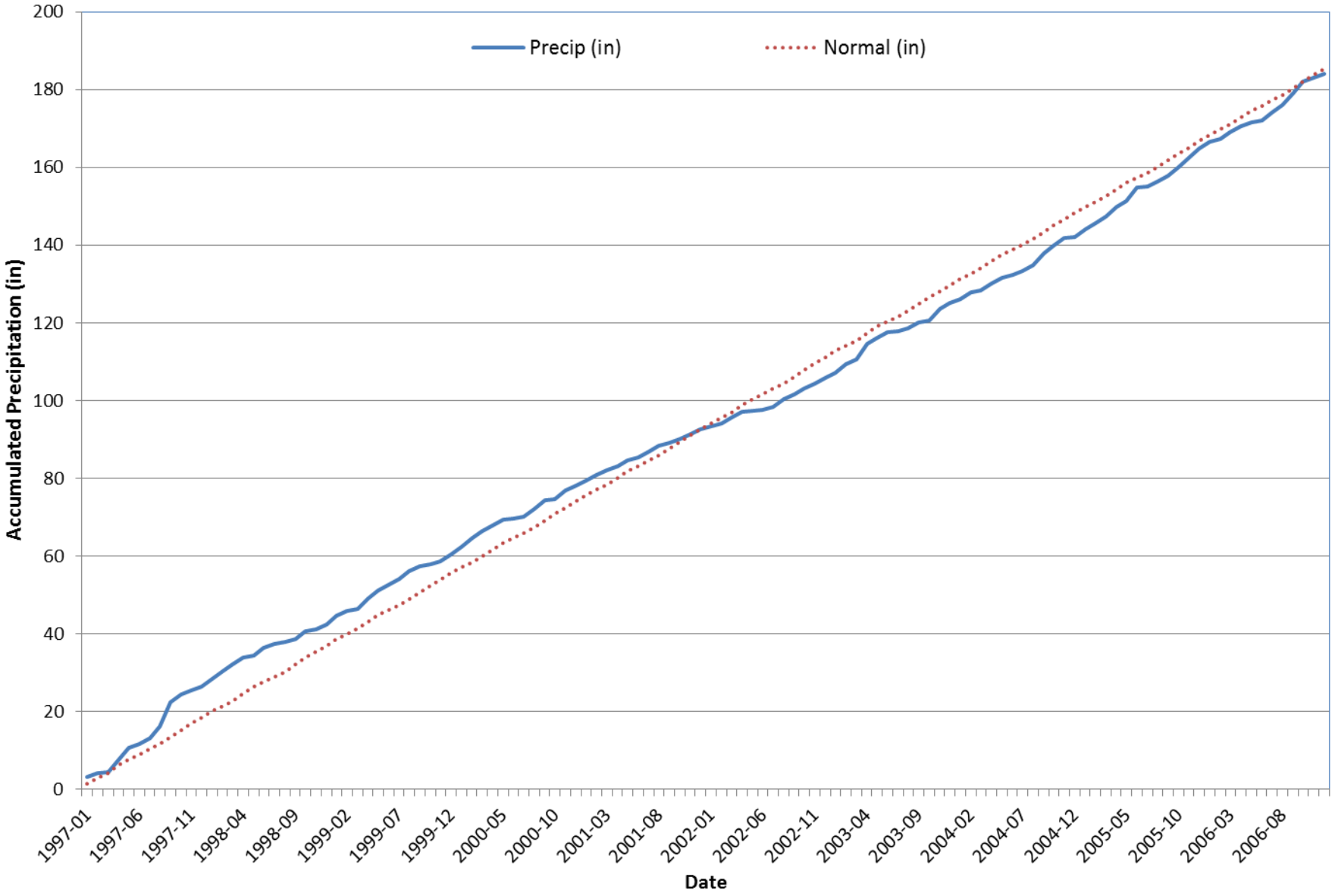
Montrose #2 Accumulated Precipitation (in) 1997-2006



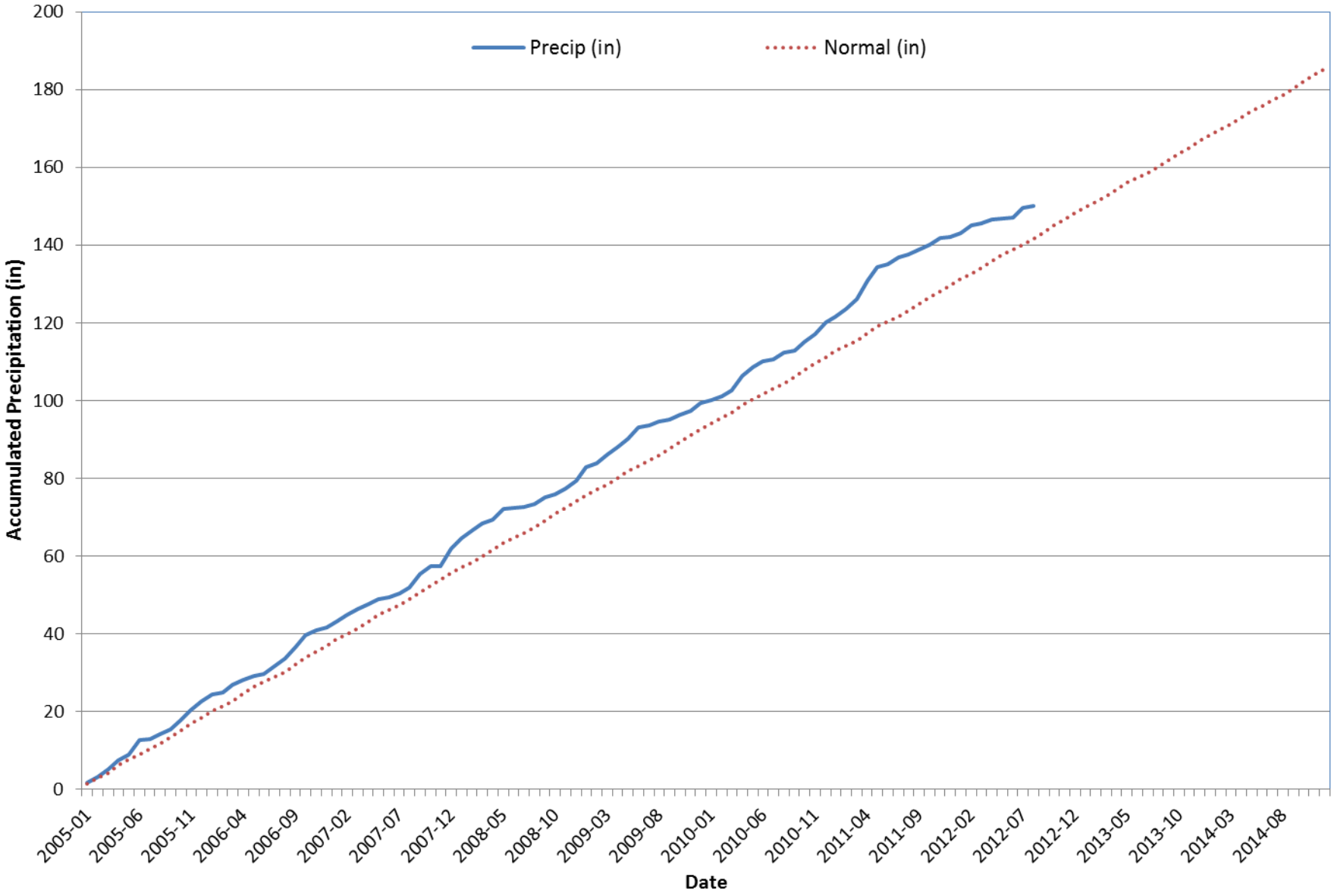
Montrose #2 Accumulated Precipitation (in) 2005-2014



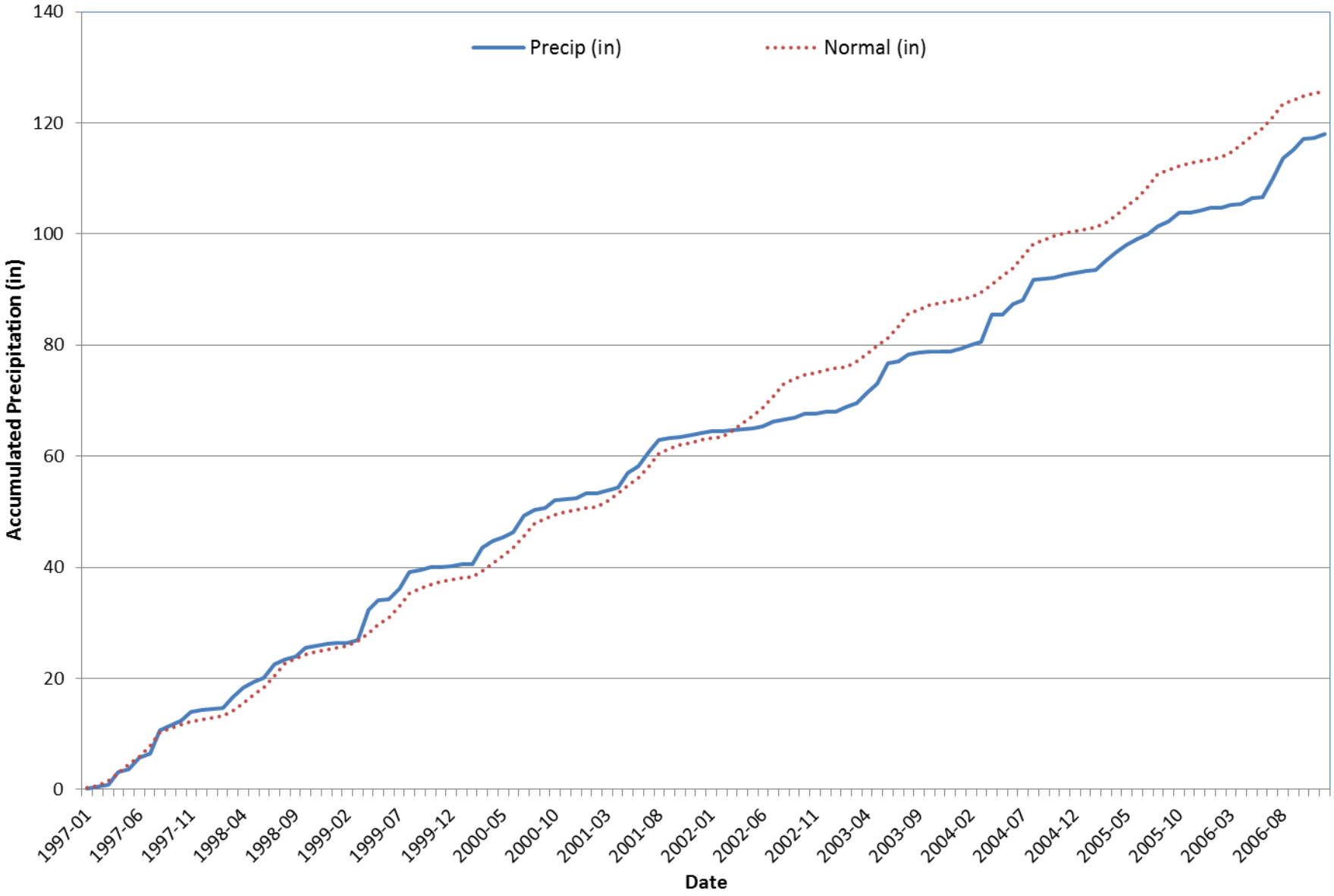
Hayden Accumulated Precipitation (in) 1997-2006



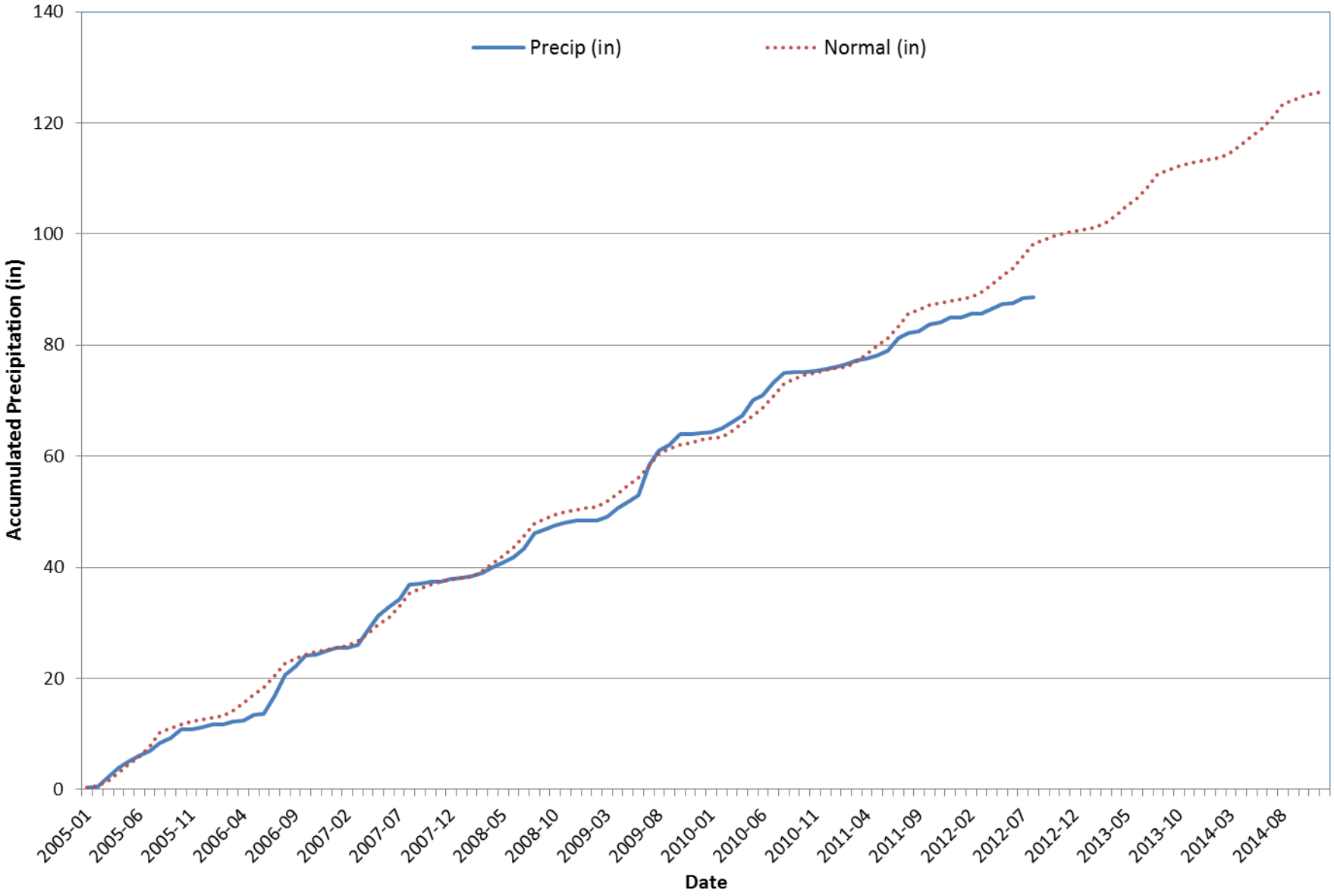
Hayden Accumulated Precipitation (in) 2005-2014



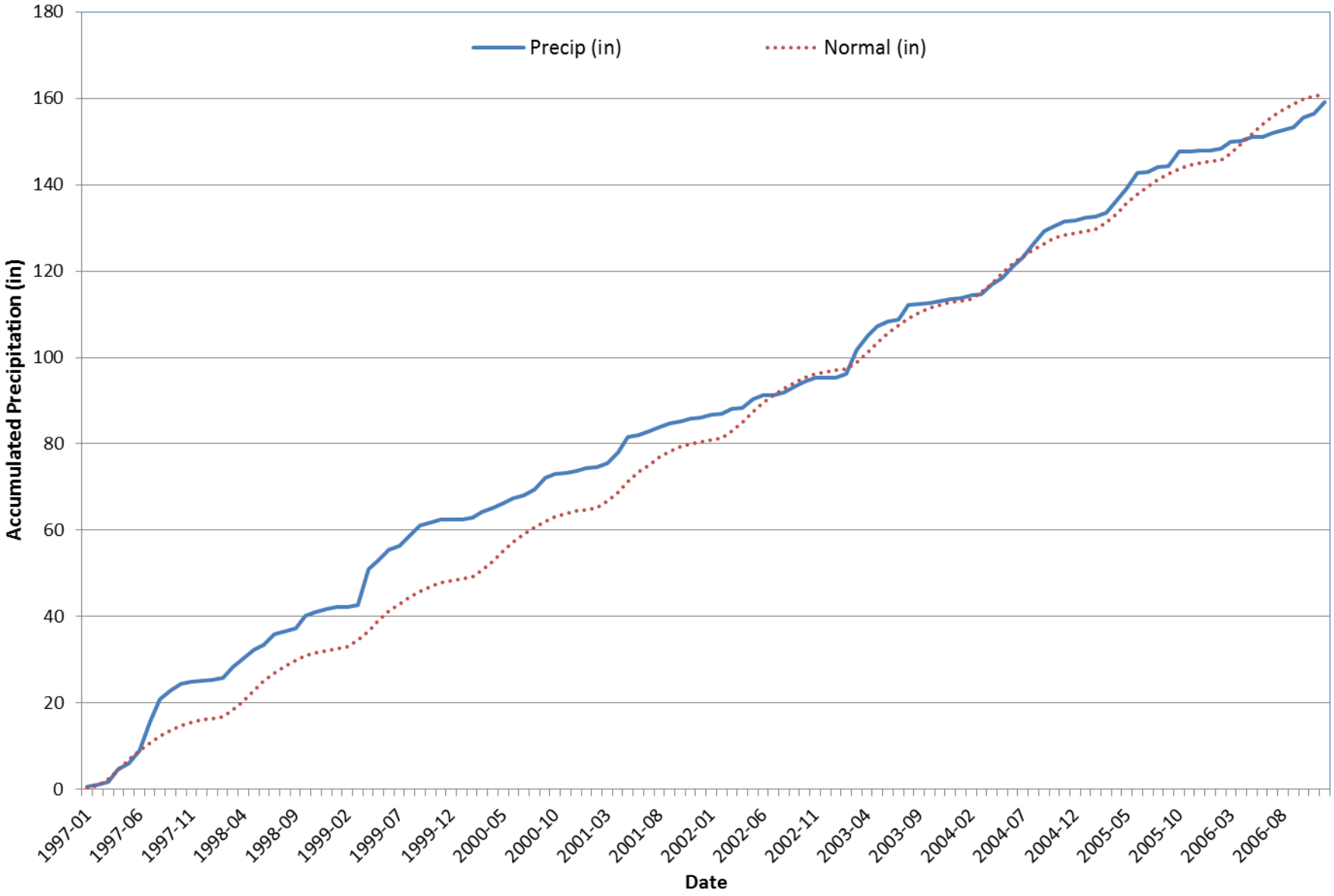
Pueblo Accumulated Precipitation (in) 1997-2006



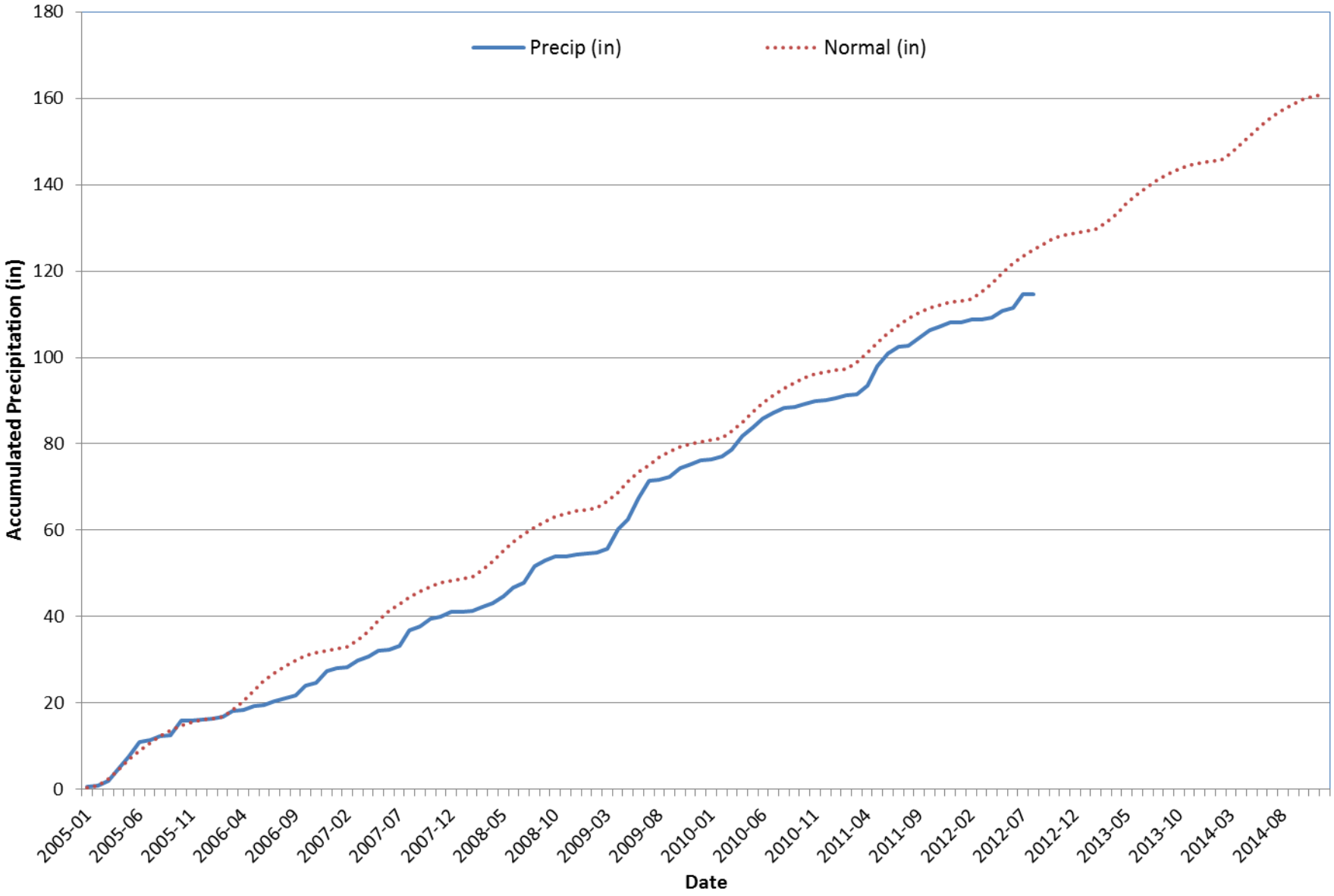
Pueblo Accumulated Precipitation (in) 2005-2014



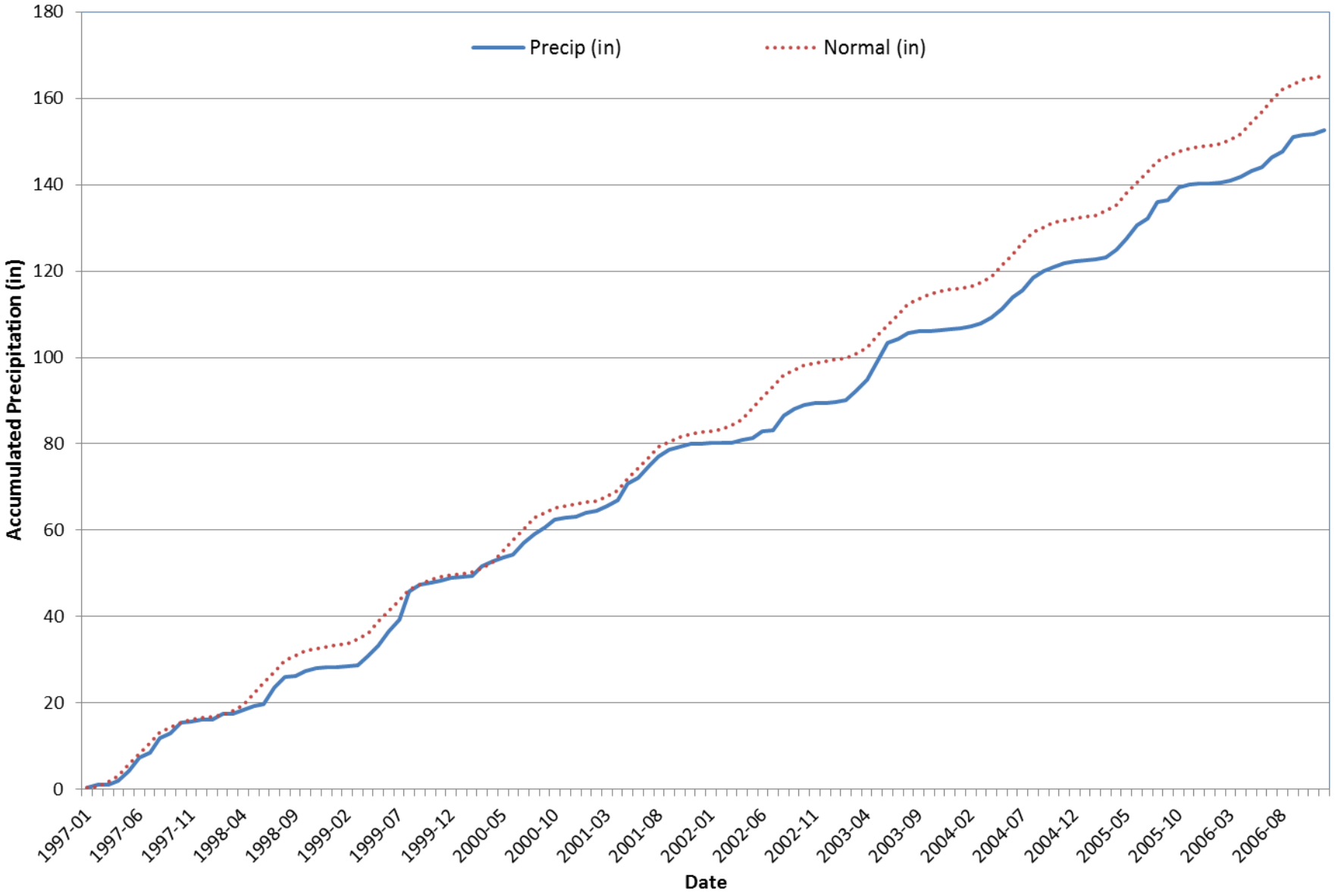
Fort Collins Accumulated Precipitation (in) 1997-2006



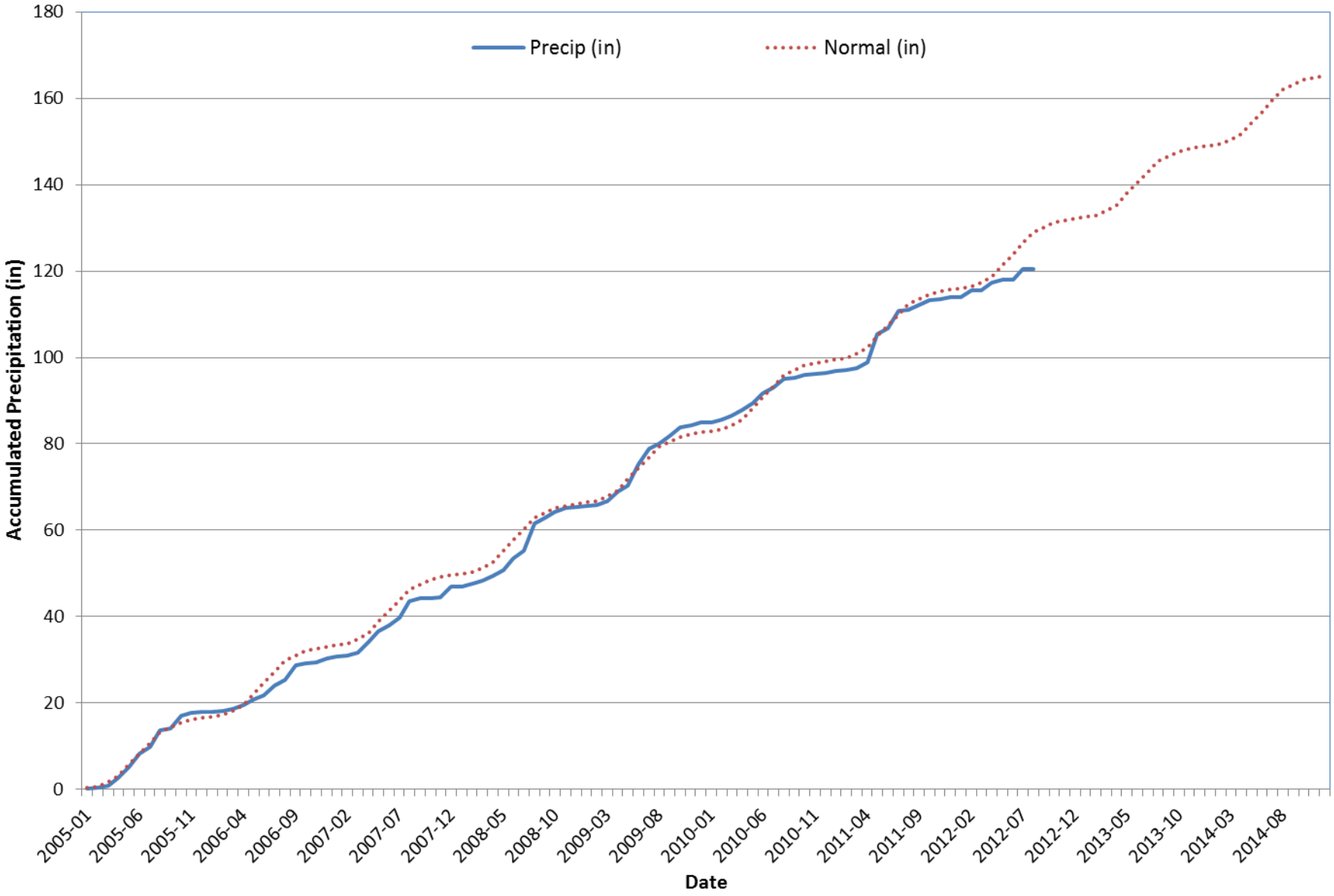
Fort Collins Accumulated Precipitation (in) 2005-2014

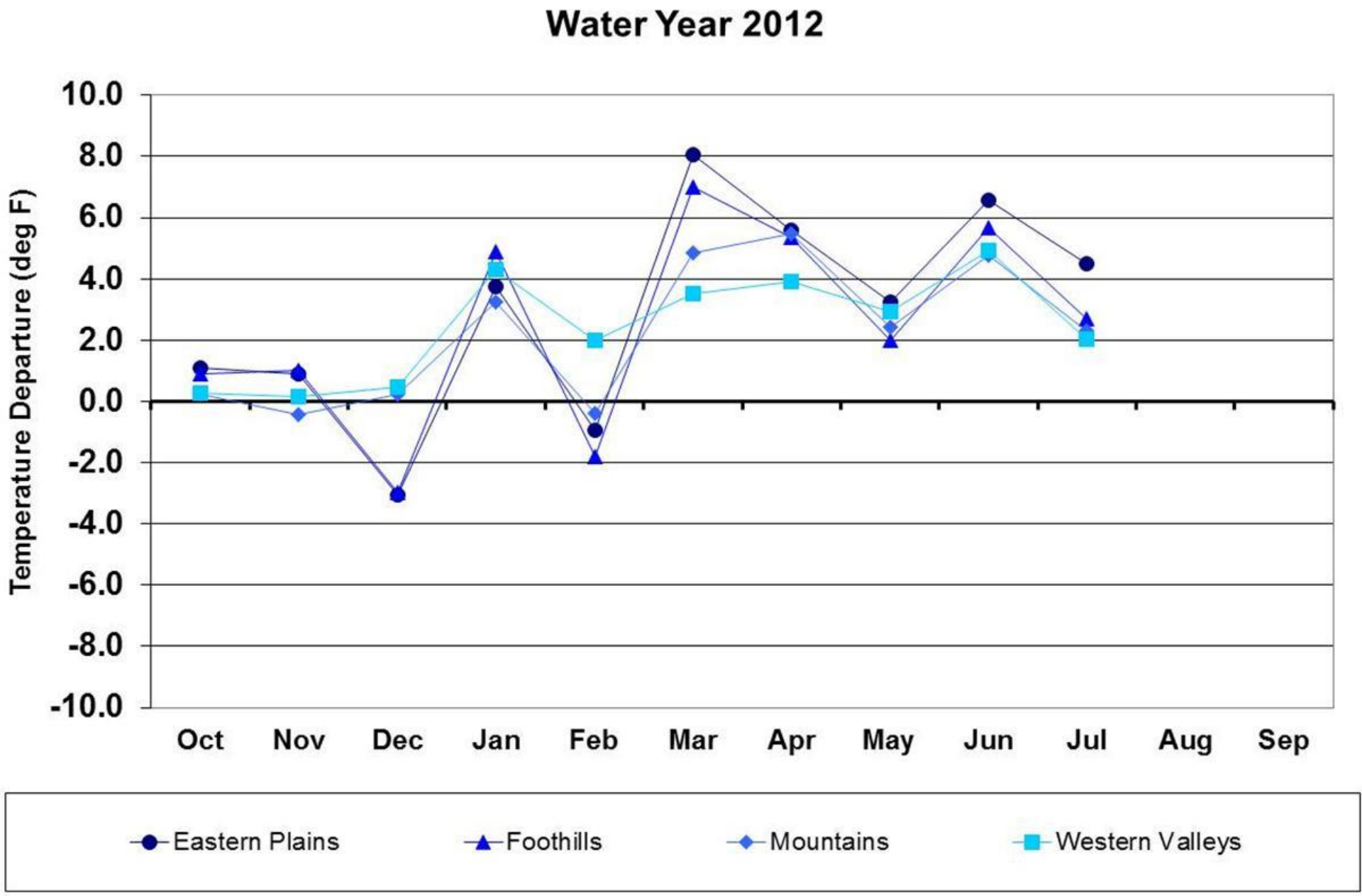


Akron Accumulated Precipitation (in) 1997-2006



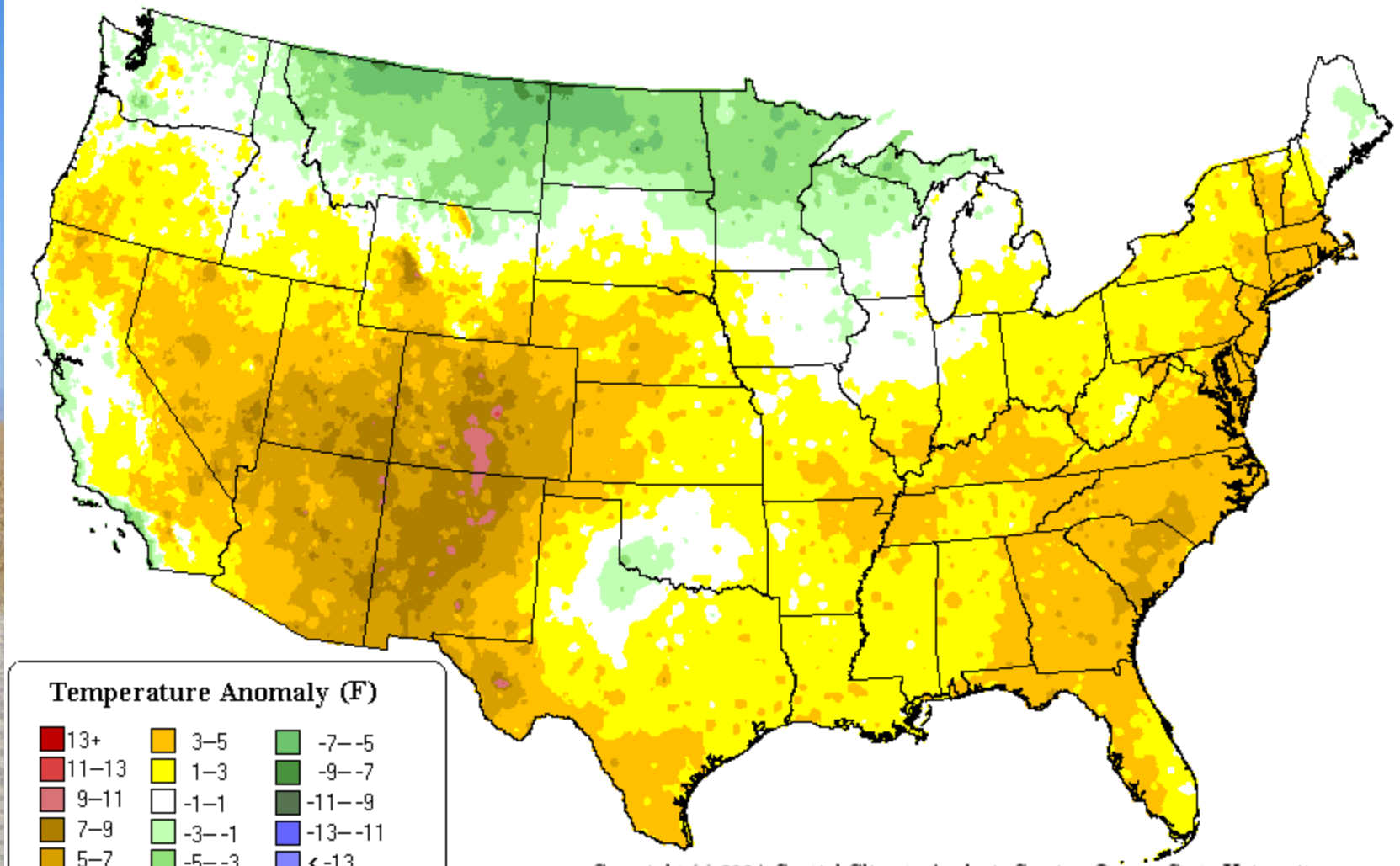
Akron Accumulated Precipitation (in) 2005-2014




Water Year 2012
Temperature Departure (deg F)
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Eastern Plains
Foothills
Mountains
Western Valleys

Maximum Temperature Anomaly: Apr 2002

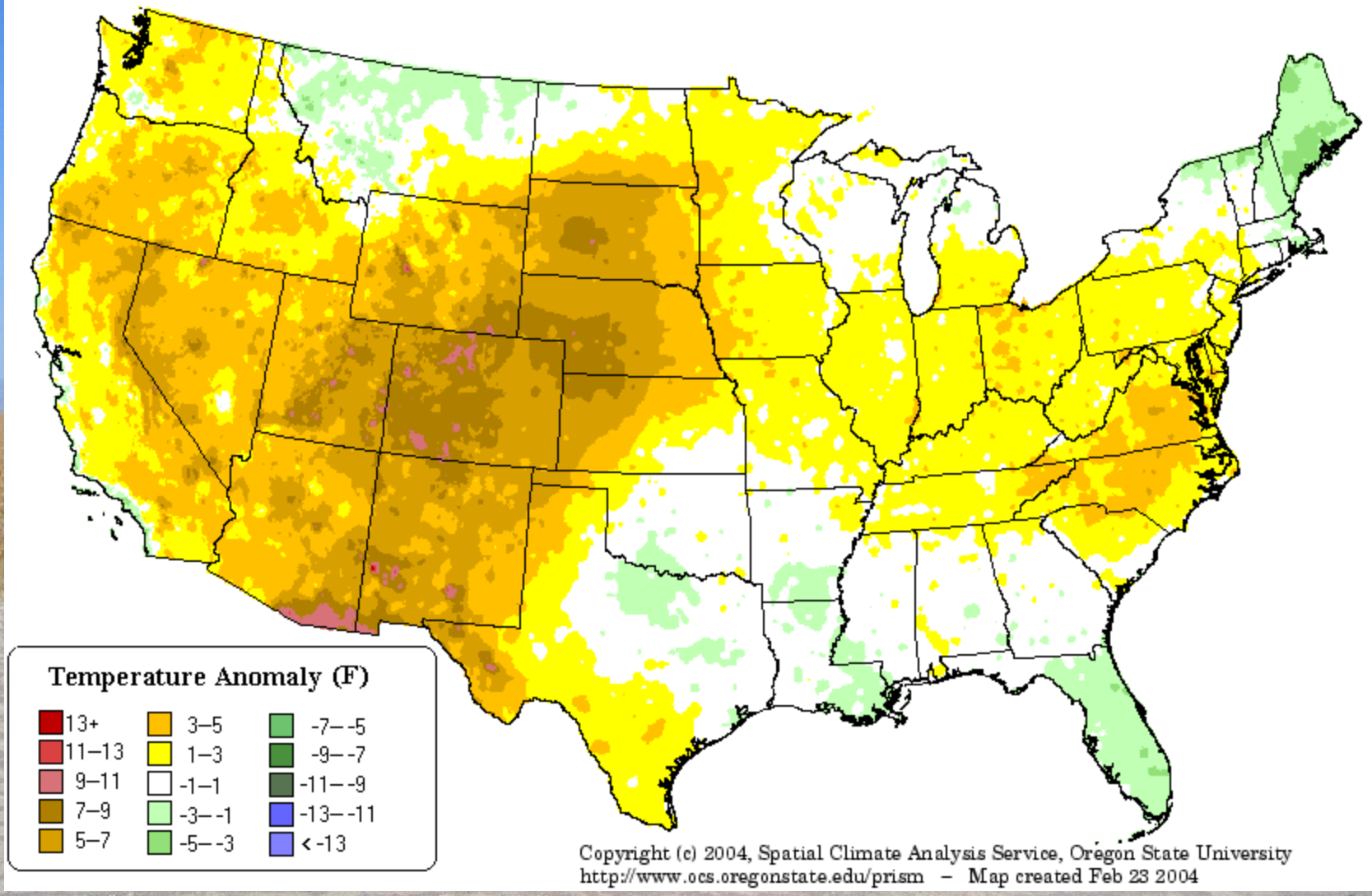
Final Data



Copyright (c) 2004, Spatial Climate Analysis Service, Oregon State University
http://www.ocs.oregonstate.edu/prism – Map created Feb 23 2004

Maximum Temperature Anomaly: Jun 2002

Final Data



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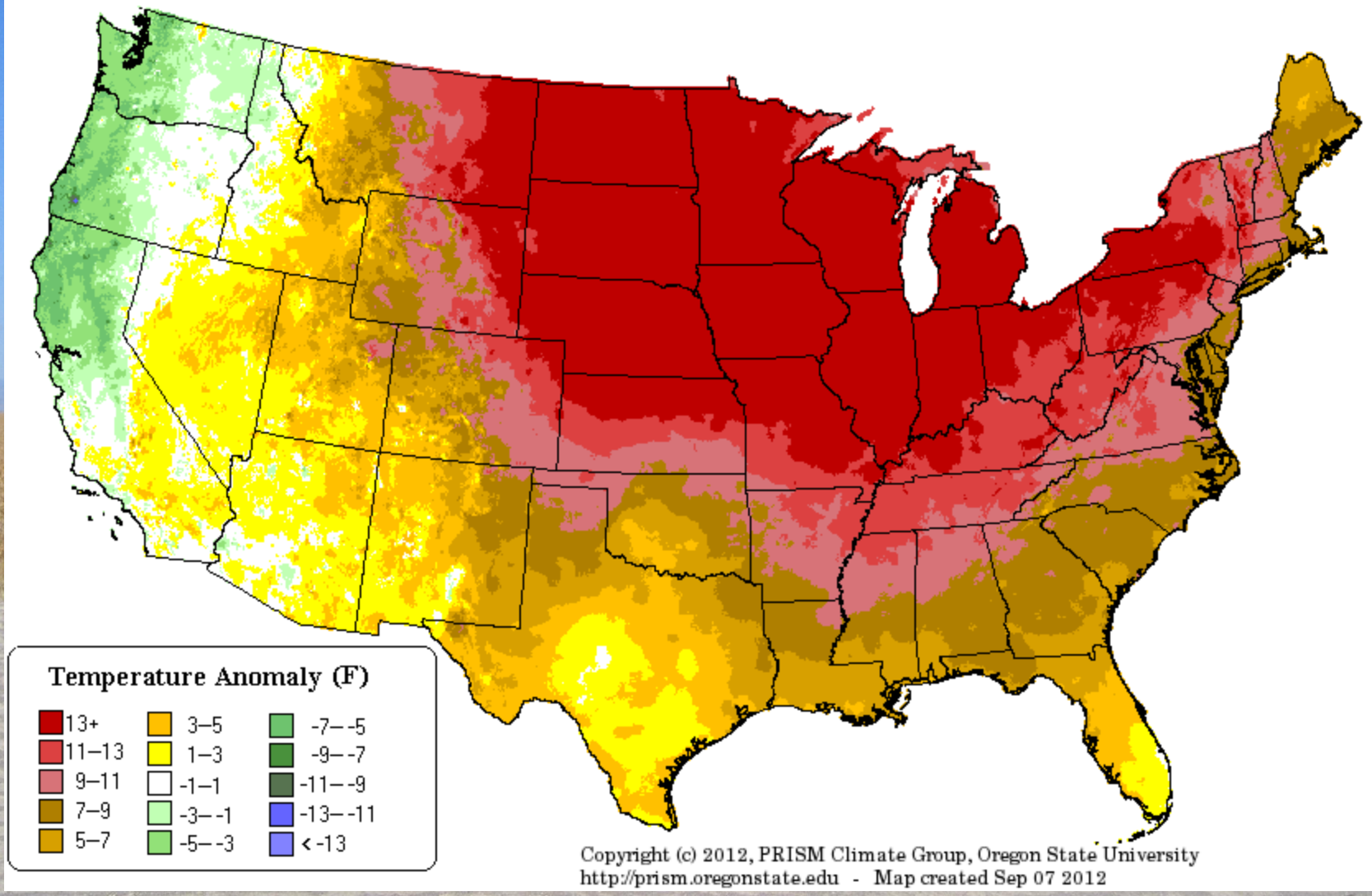
http://www.ocs.oregonstate.edu/prism – Map created Feb 23 2004

Maximum Temperature Anomaly: Mar 2012

Final Data



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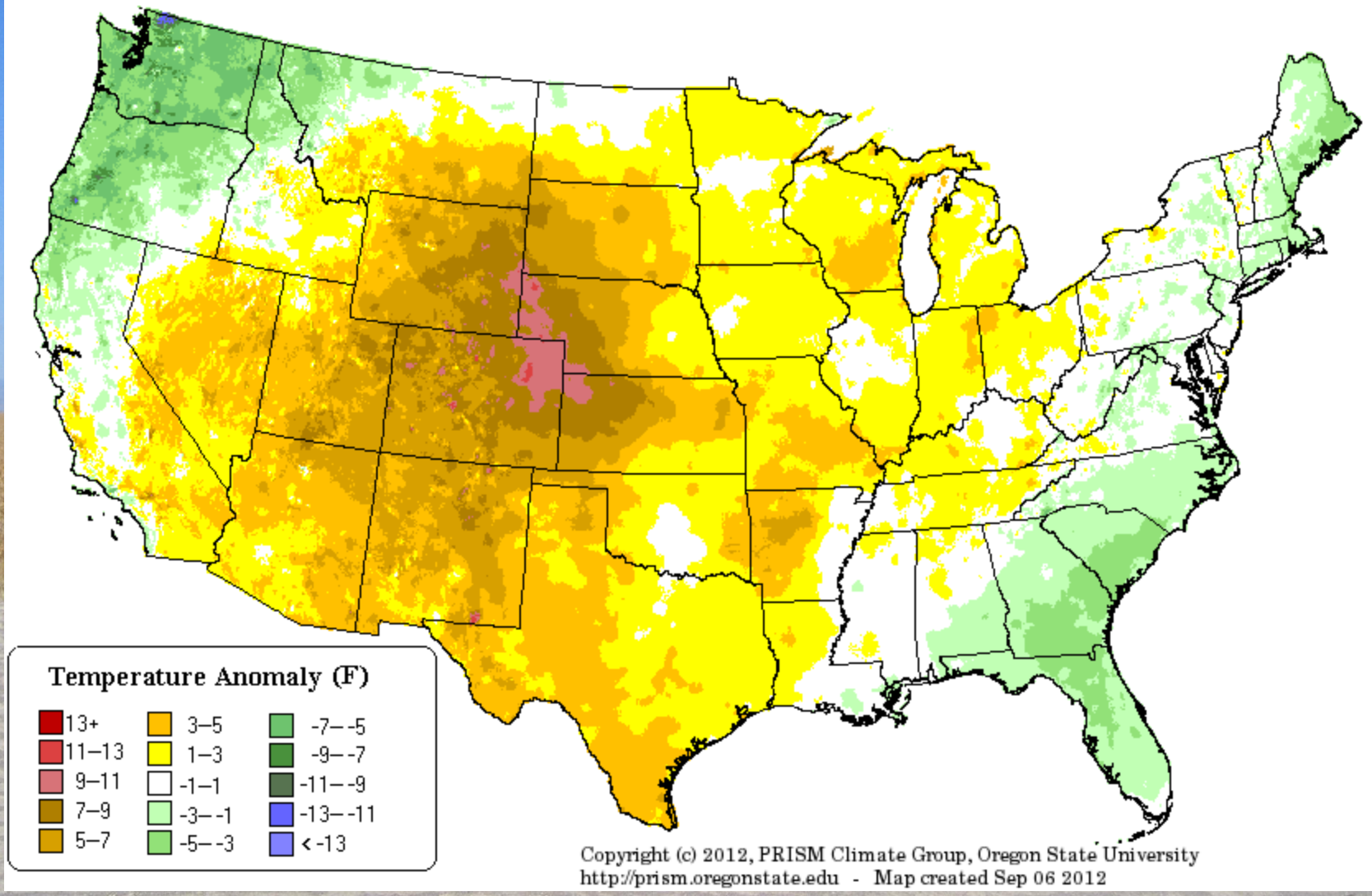
http://prism.oregonstate.edu - Map created Sep 07 2012

Maximum Temperature Anomaly: Jun 2012

Provisional Data



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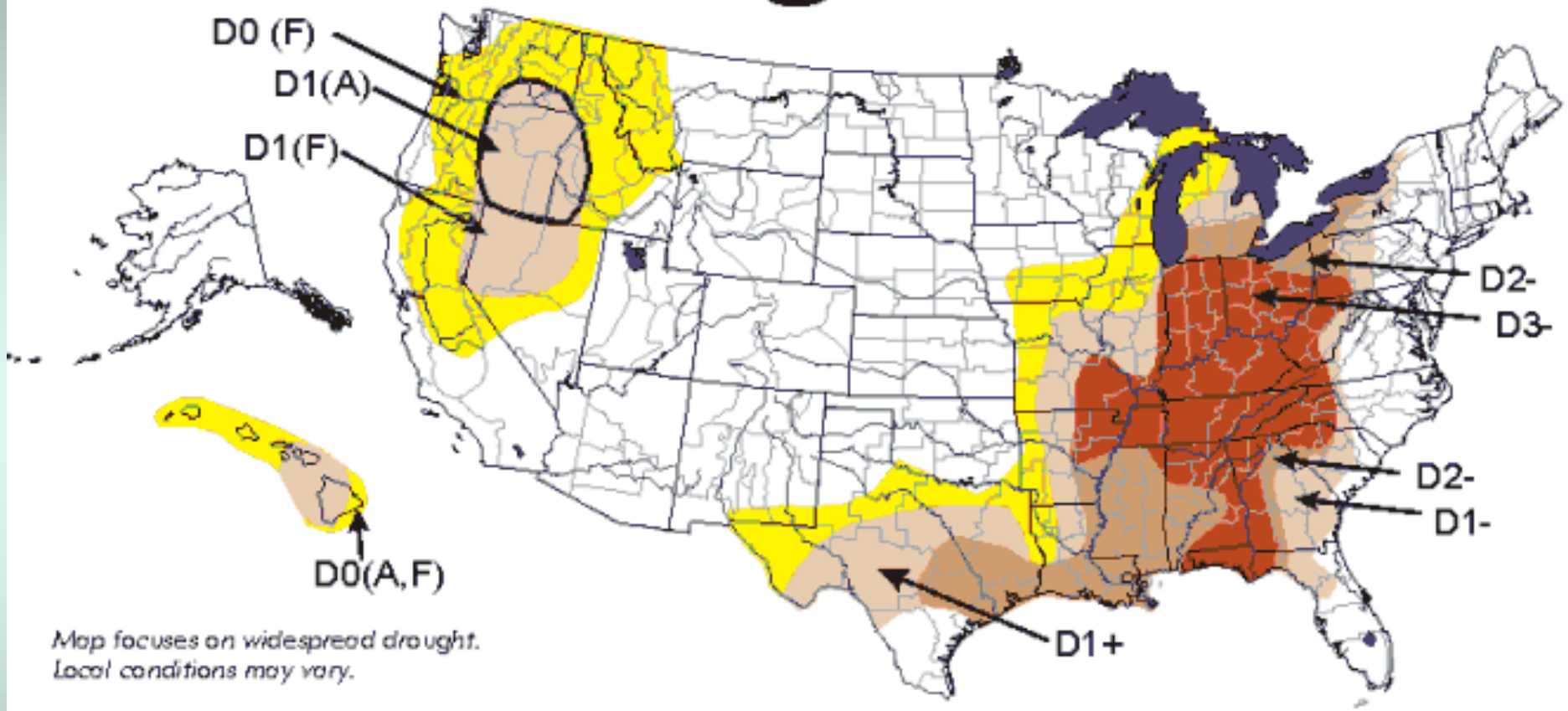
http://prism.oregonstate.edu - Map created Sep 06 2012

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

USDA

National Drought Mitigation Center

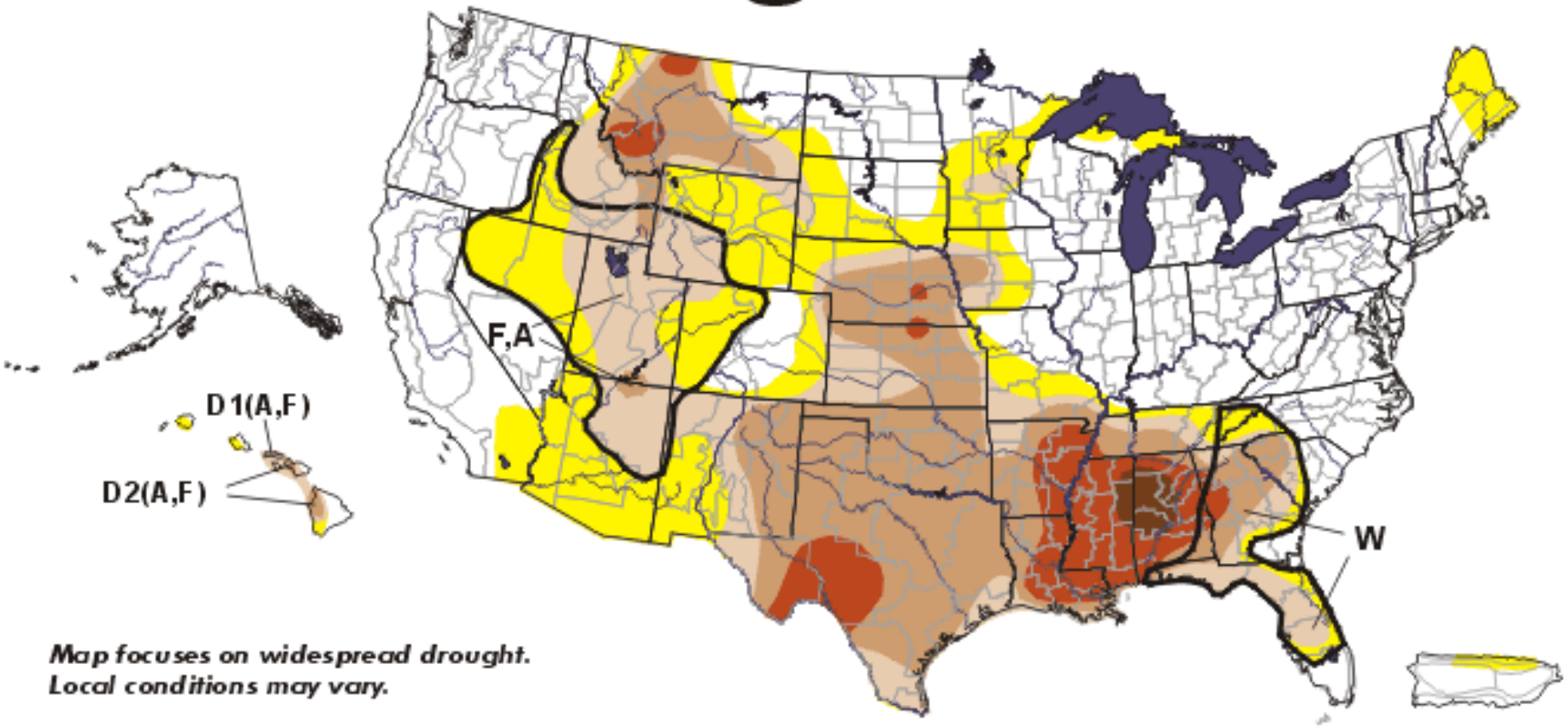
NOAA

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*** •

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

USDA | National Drought Mitigation Center | NOAA

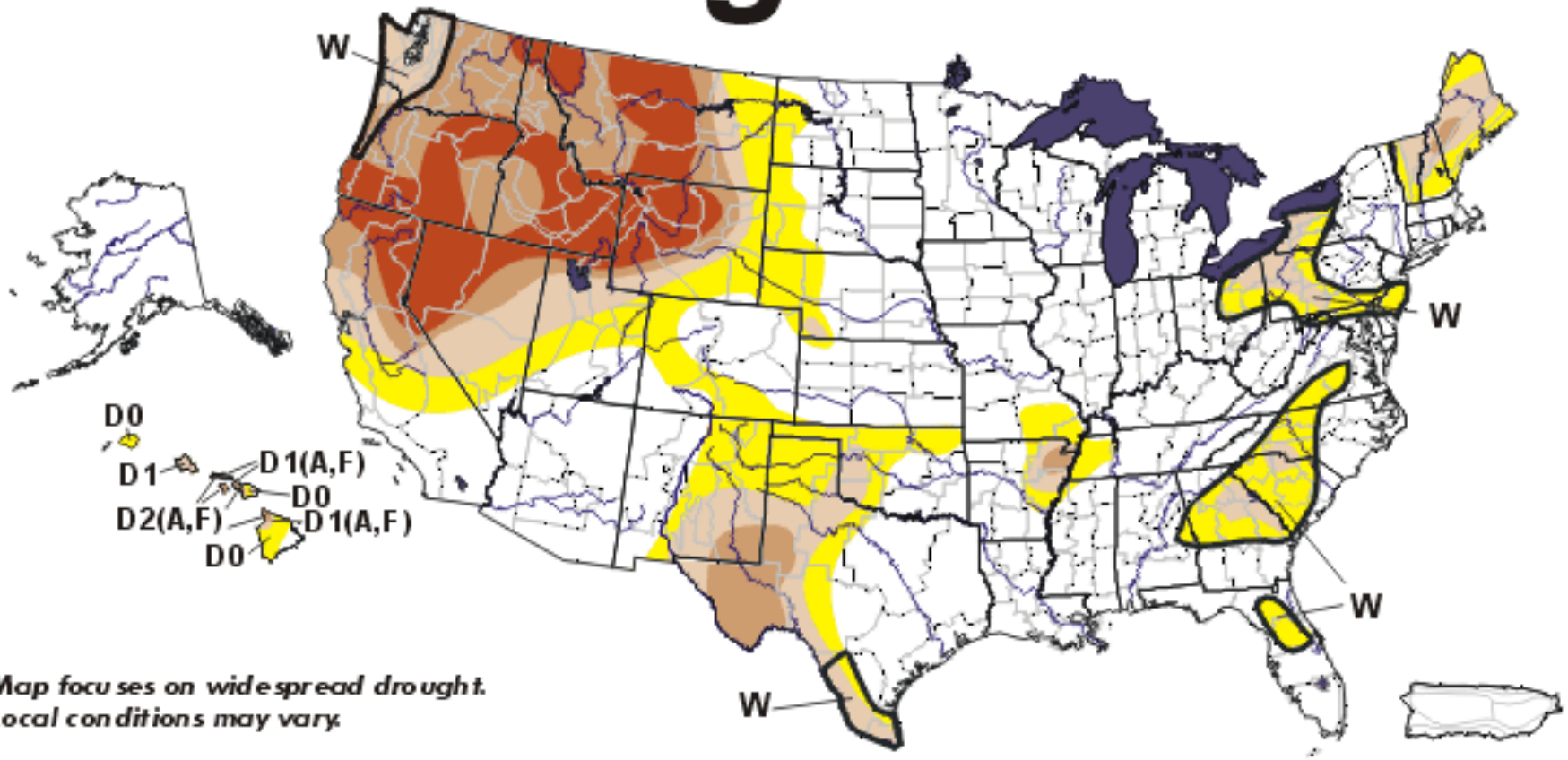
See accompanying text summary for forecast statements

http://enso.unl.edu/monitor/monitor.html

• ***Released Thursday, Oct. 5, 2000*** •

October 2, 2001 Valid 8 a.m. EDT

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

D0 Abnormally Dry
D1 Drought–Moderate
D2 Drought–Severe
D3 Drought–Extreme
D4 Drought–Exceptional
Delineates Overlapping Areas

Drought Impact Types:
A = Agriculture
W = Water (Hydrological)
F = Fire danger (Wildfires)

(No type = All 3 impacts)

USDA National Drought Mitigation Center NOAA

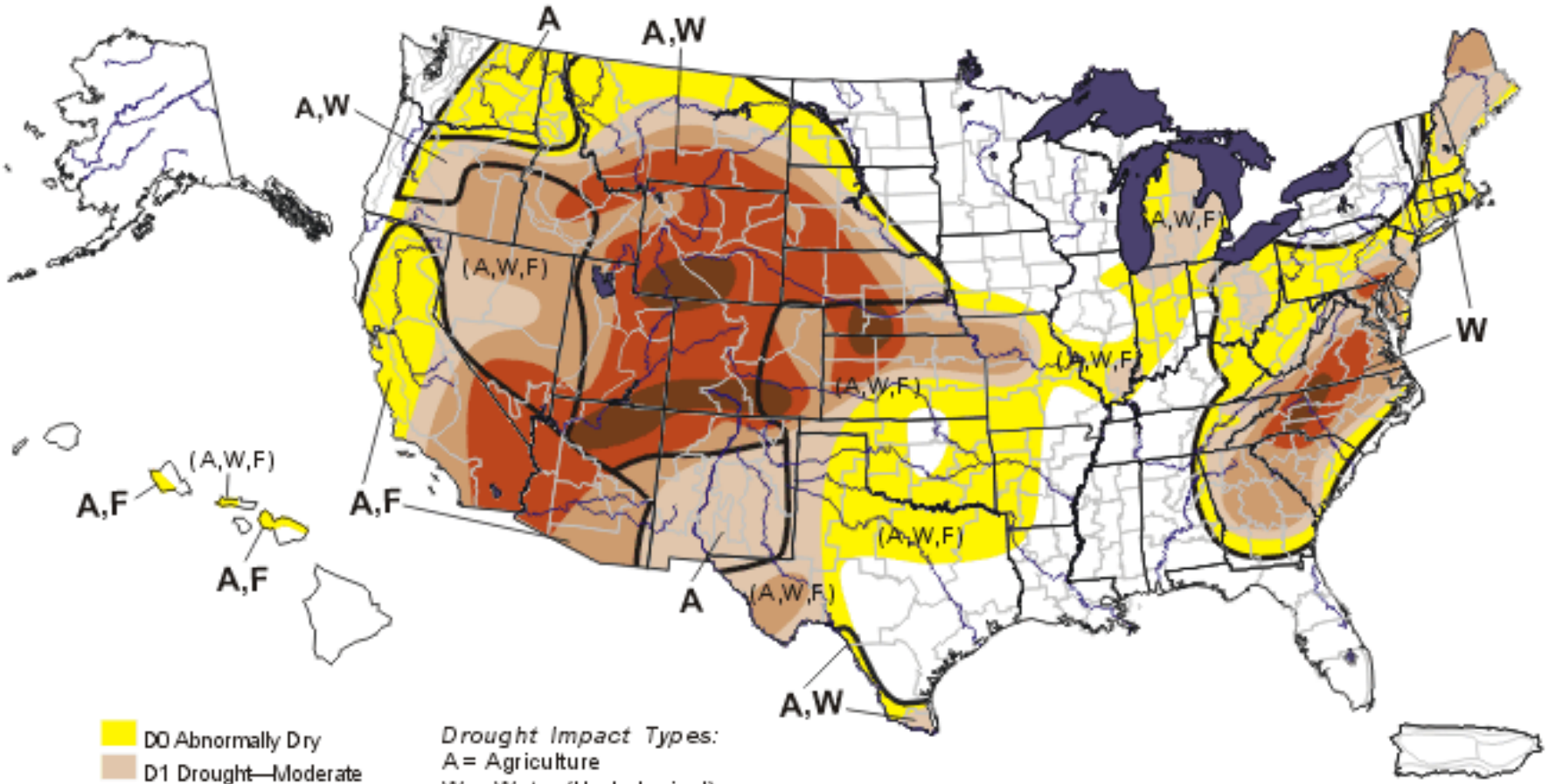
See accompanying text summary for forecast statements
http://enso.unl.edu/monitor/monitor.html

● *Released Thursday, October 4, 2001* ●

Author: *Douglas Le Comte, NOAA/CPC*

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

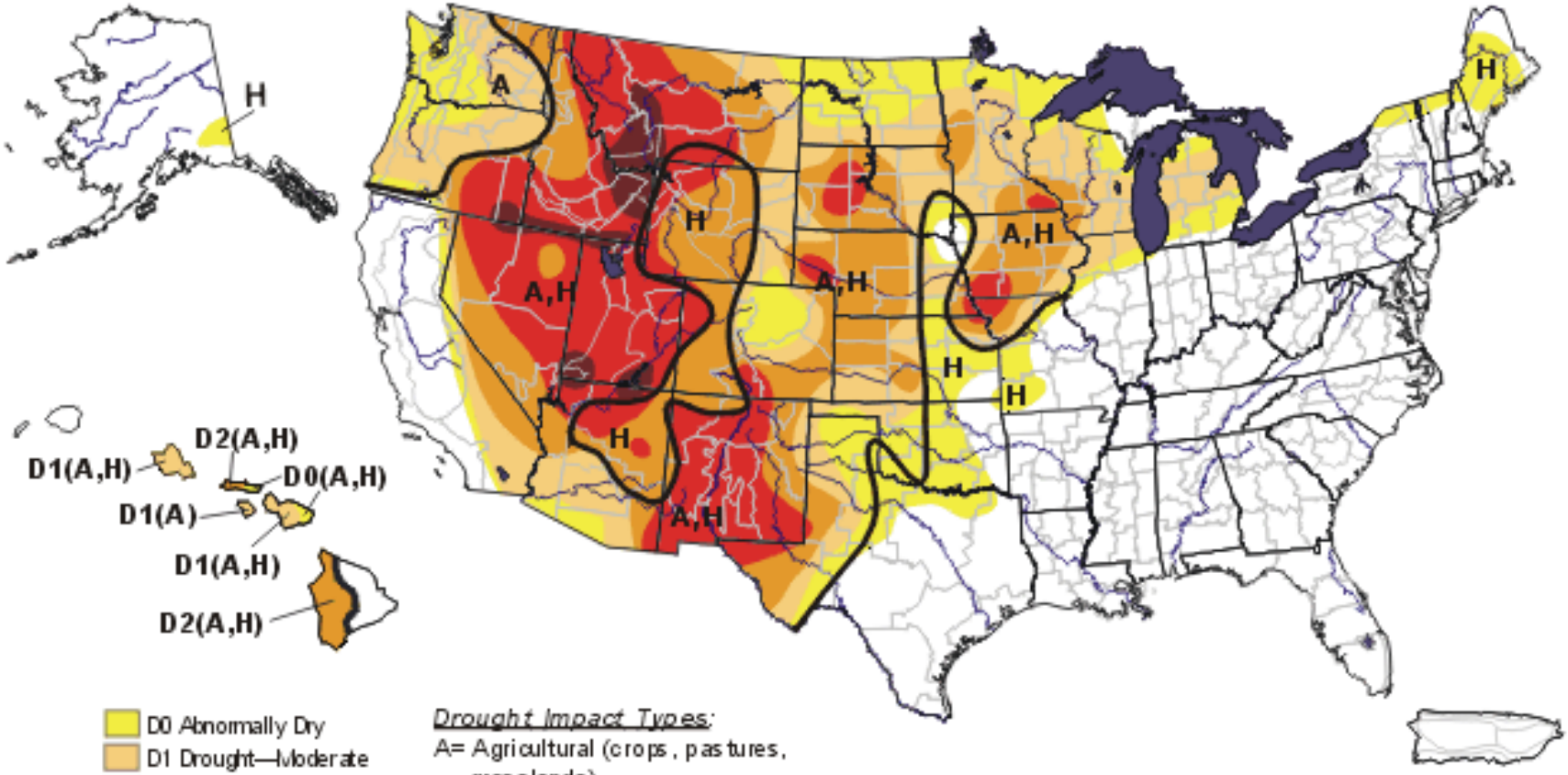
USDA | National Drought Mitigation Center | NOAA

Released Thursday, October 3, 2002

Author: *Rich Tinker, CPC/NCEP/NWS/NOAA*

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.

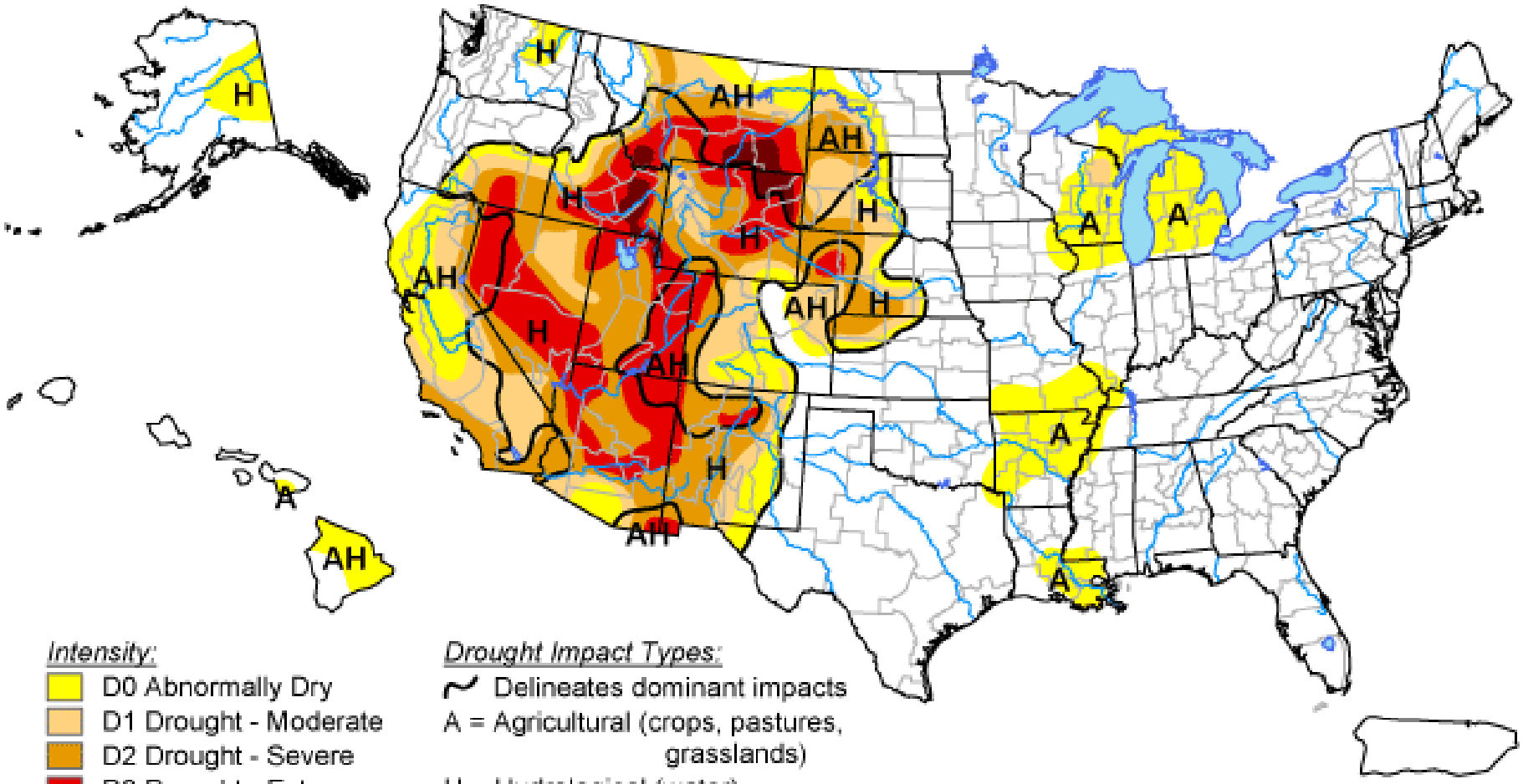
http://drought.unl.edu/dm

Released Thursday, October 2, 2003

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

U.S. Drought Monitor

September 28, 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

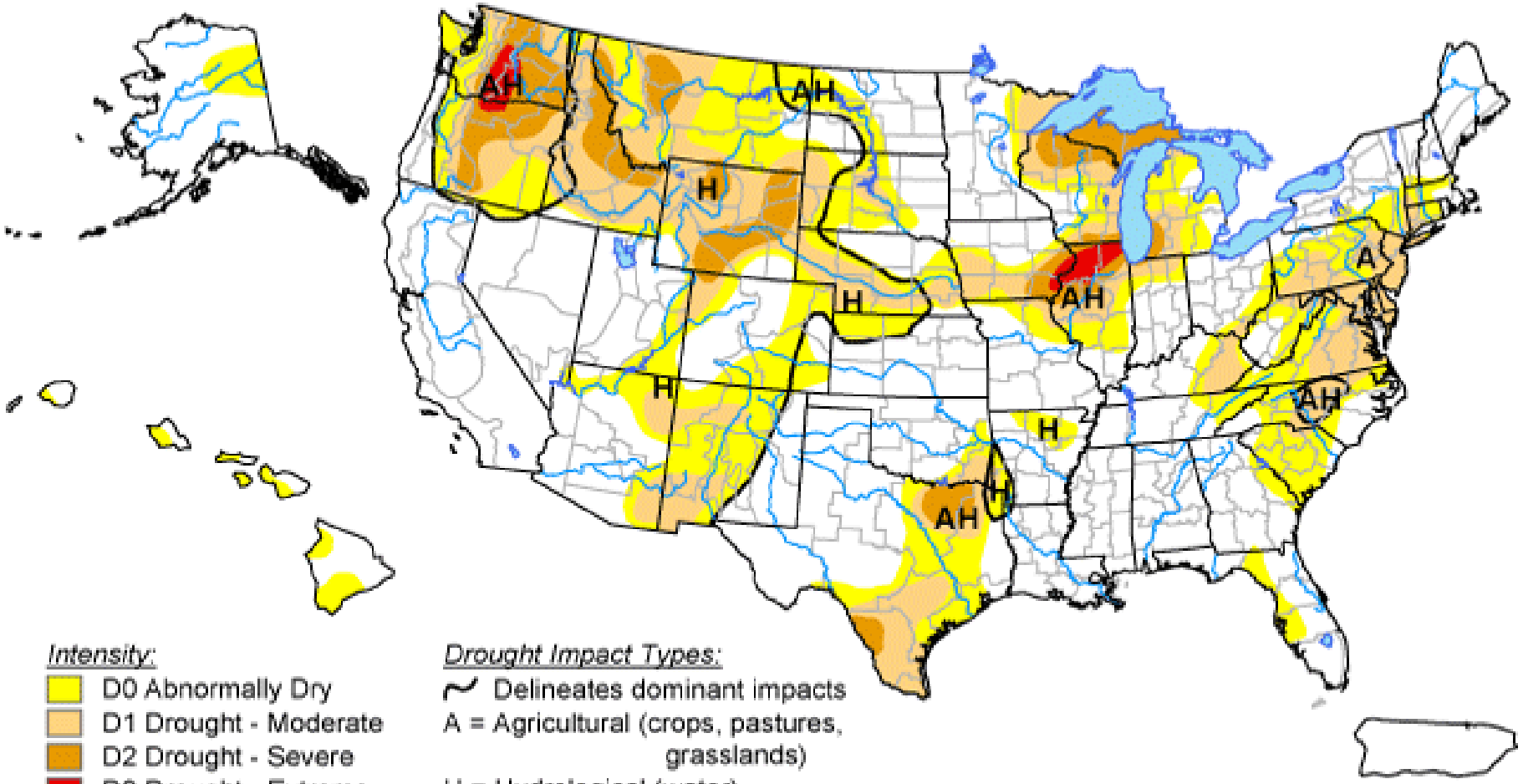
USDA National Drought Mitigation Center

Released Thursday, September 30, 2004

Author: Brad Rippey, U.S. Department of Agriculture

U.S. Drought Monitor

September 27, 2005
Valid 8 a.m. EDT



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

USDA National Drought Mitigation Center

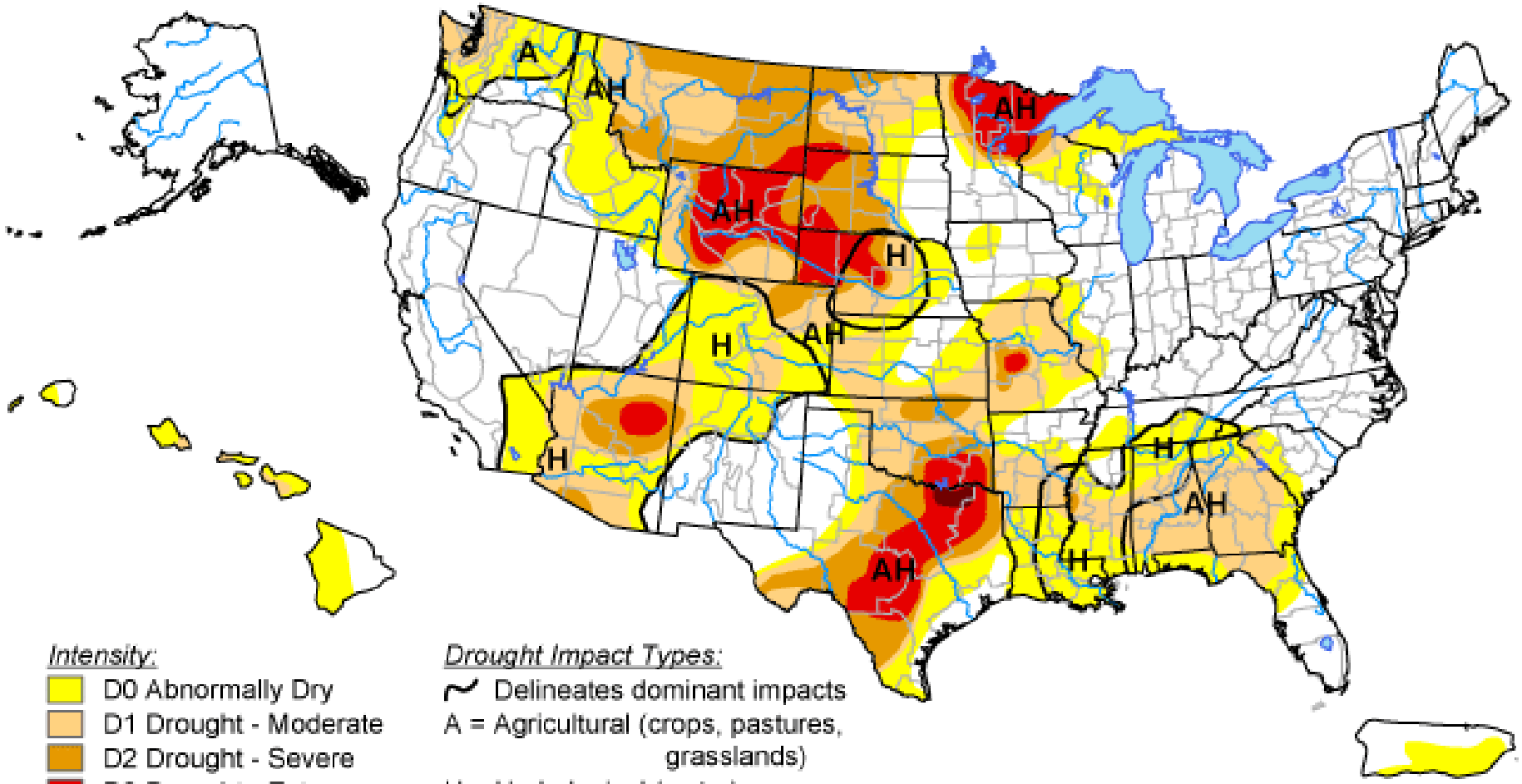
Released Thursday, September 29, 2005

Author: Douglas Le Comte, CPC/NOAA

http://drought.unl.edu/dm

U.S. Drought Monitor

October 3, 2006
Valid 8 a.m. EDT



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

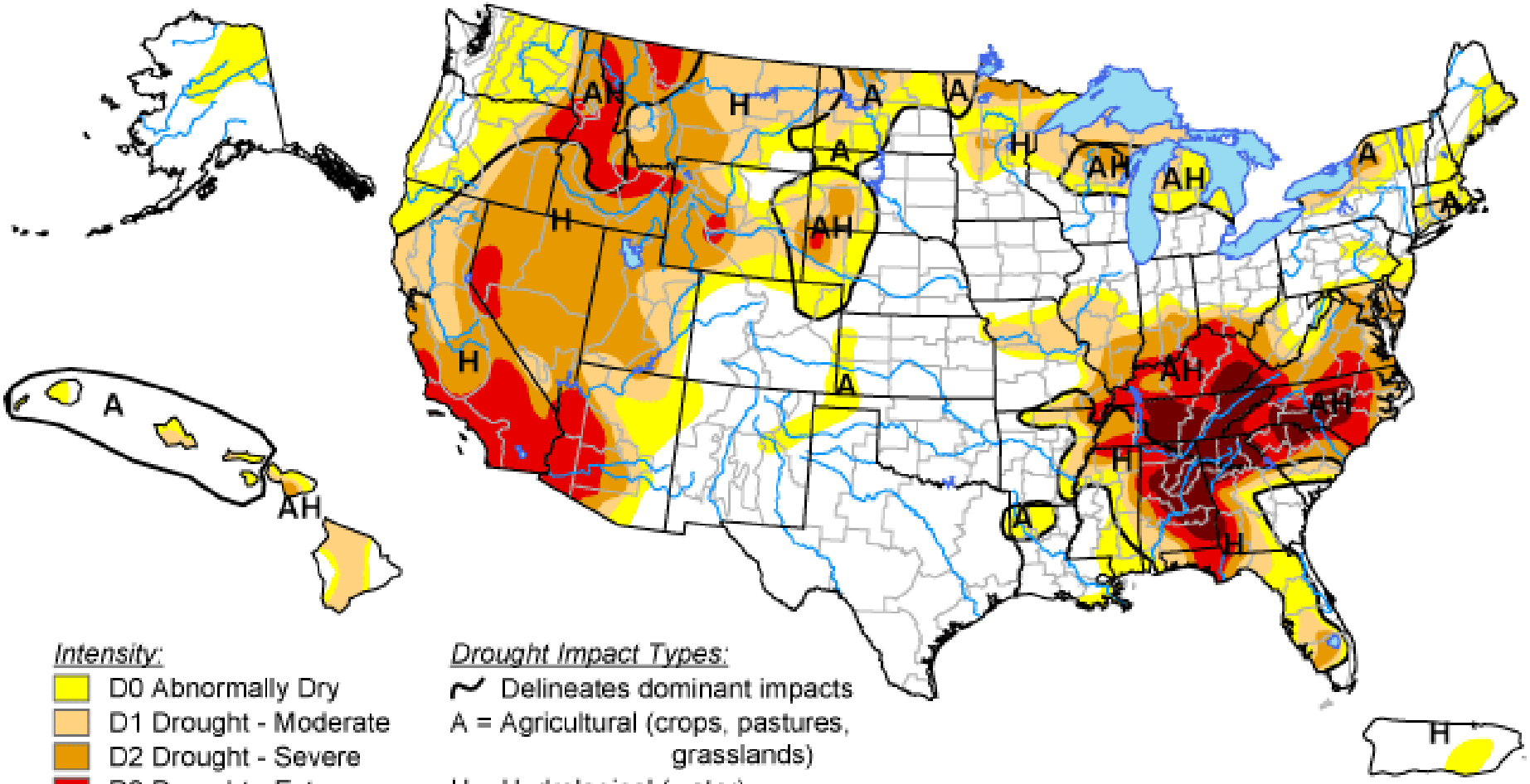
http://drought.unl.edu/dm

Released Thursday, October 5, 2006

Author: Rich Tinker, Climate Prediction Center, NOAA

U.S. Drought Monitor

October 2, 2007
Valid 8 a.m. EDT



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

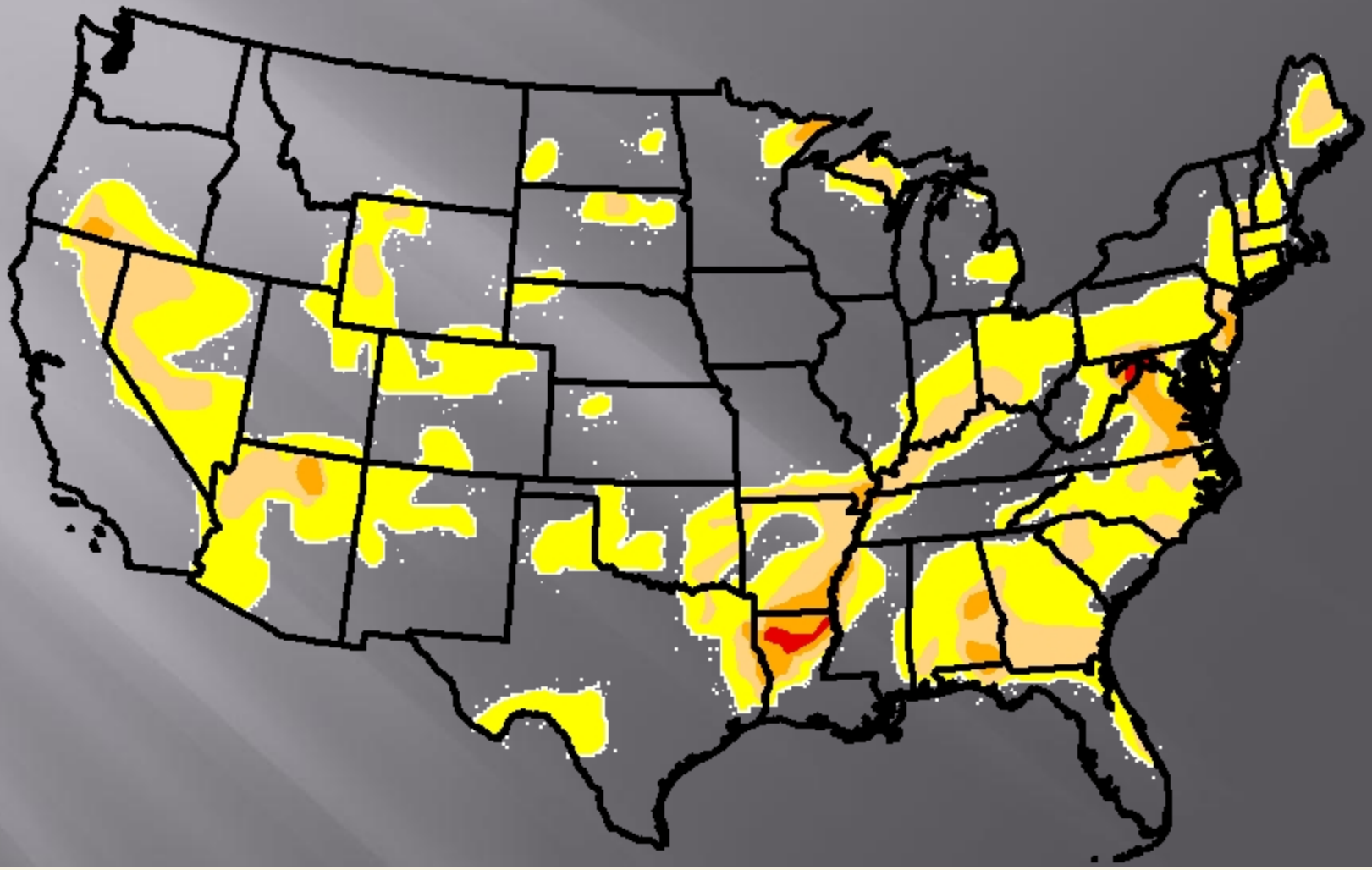
USDA National Drought Mitigation Center

Released Thursday, October 4, 2007

Author: Jay Lawrimore/Liz Love-Brotak, NOAA/NESDIS/NCDC

http://drought.unl.edu/dm

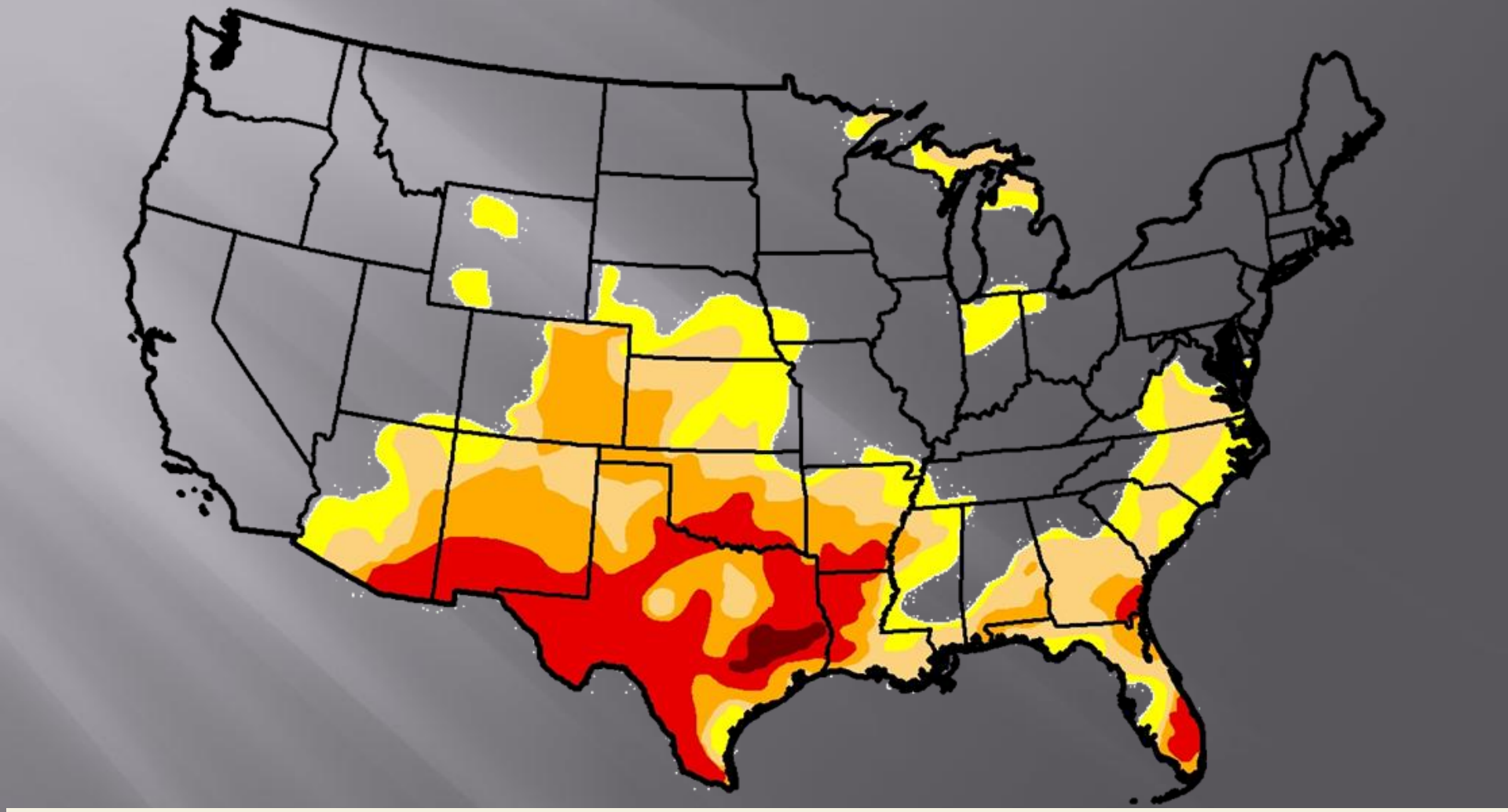
USDM: September 2010



Drought Severity

- D0 - Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

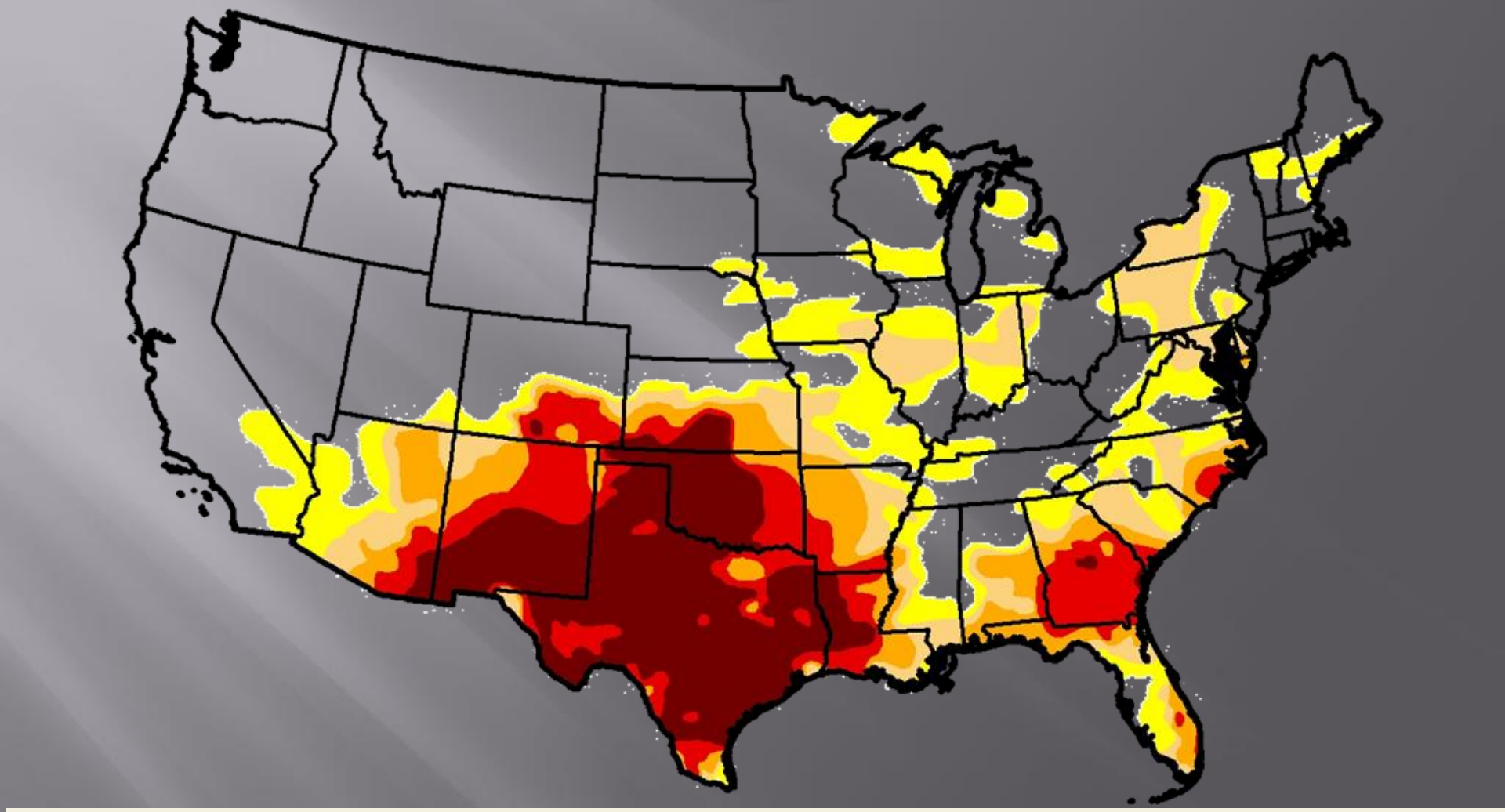
USDM: April 2011



Drought Severity

- D0 - Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

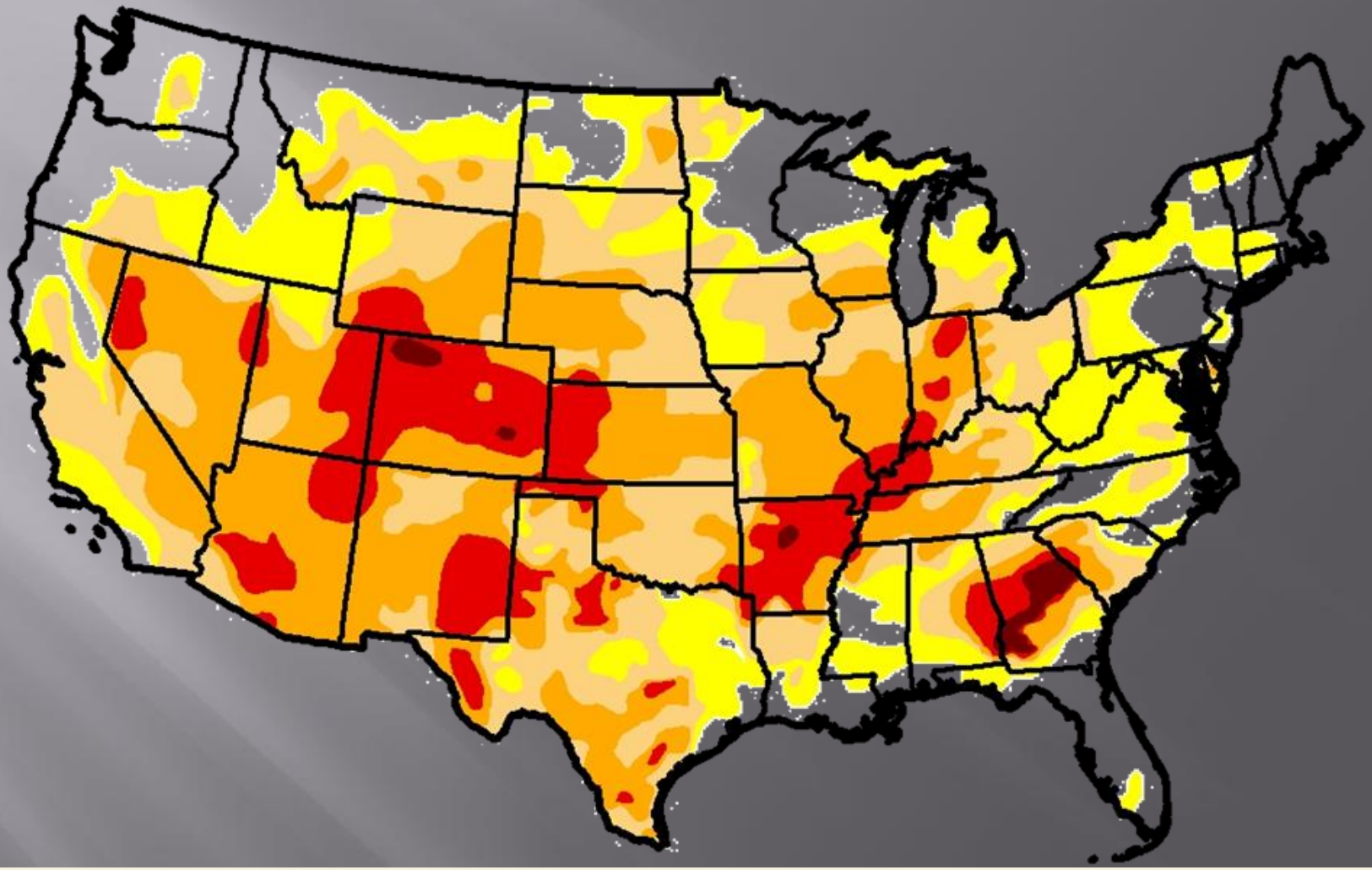
USDM: August 2011



Drought Severity

- D0 - Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

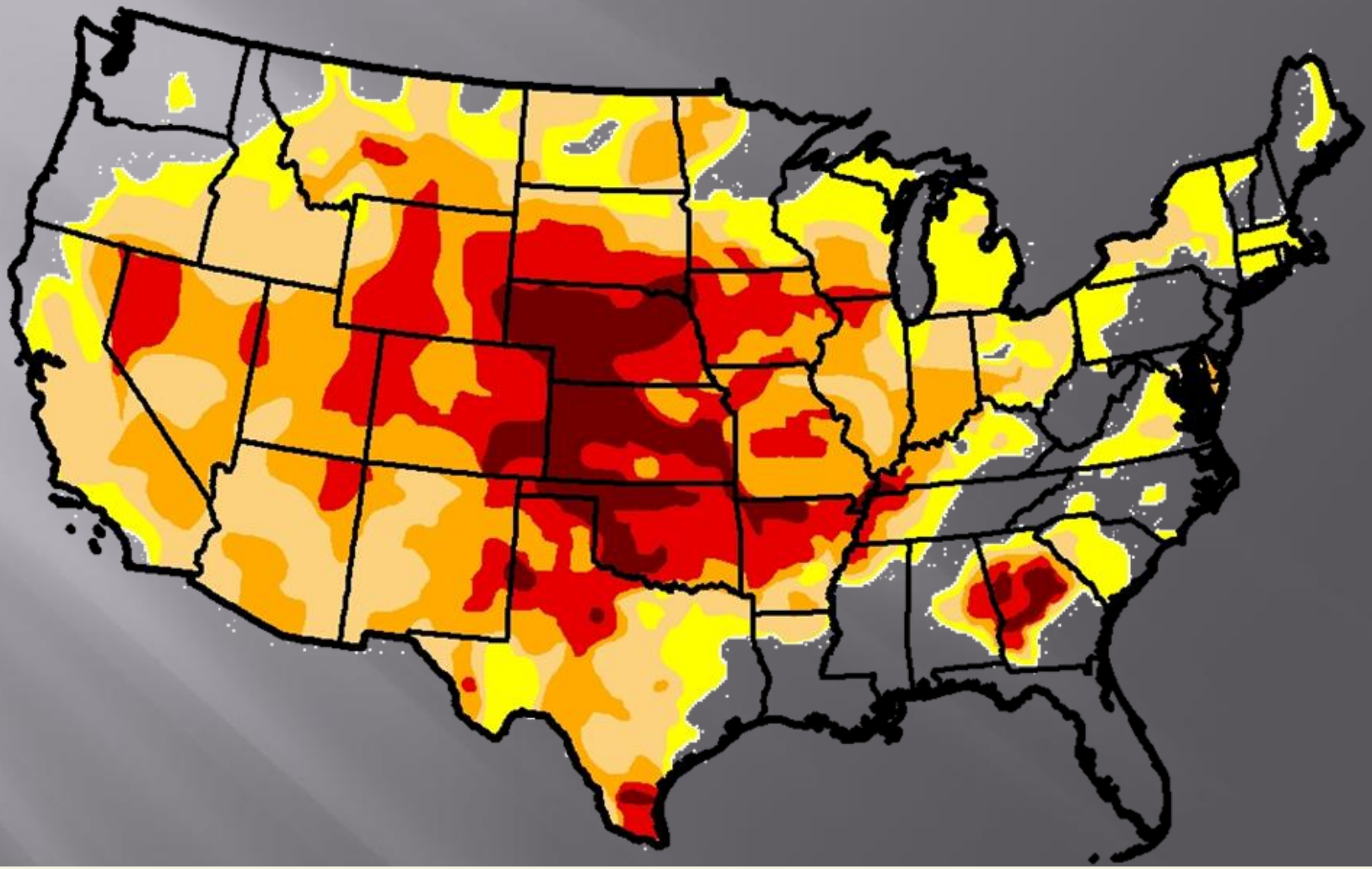
USDM: July 2012



Drought Severity

- D0 - Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

USDM: Current September 2012



Drought Severity

- D0 - Abnormally Dry
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- D2 Drought - Severe
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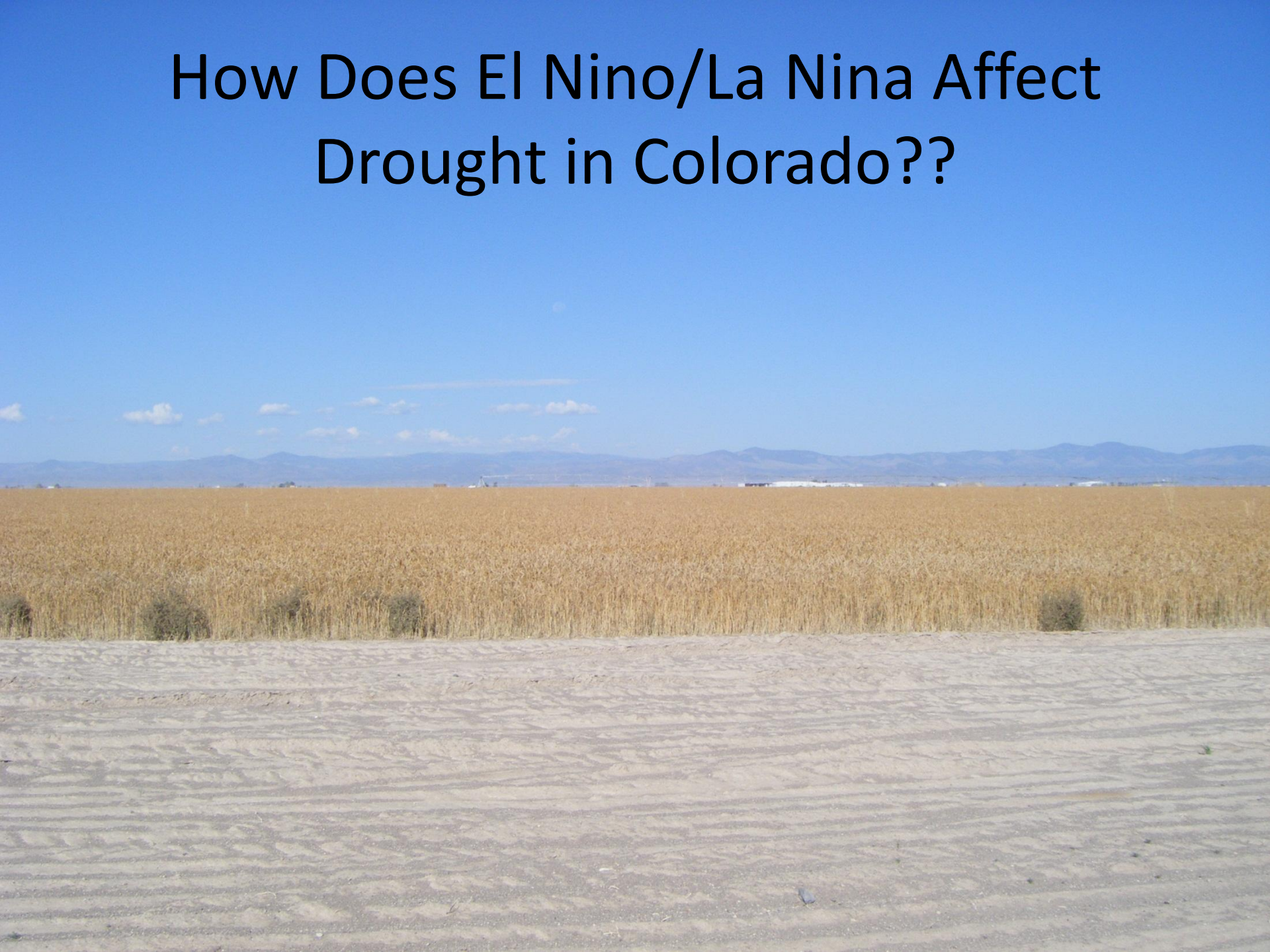
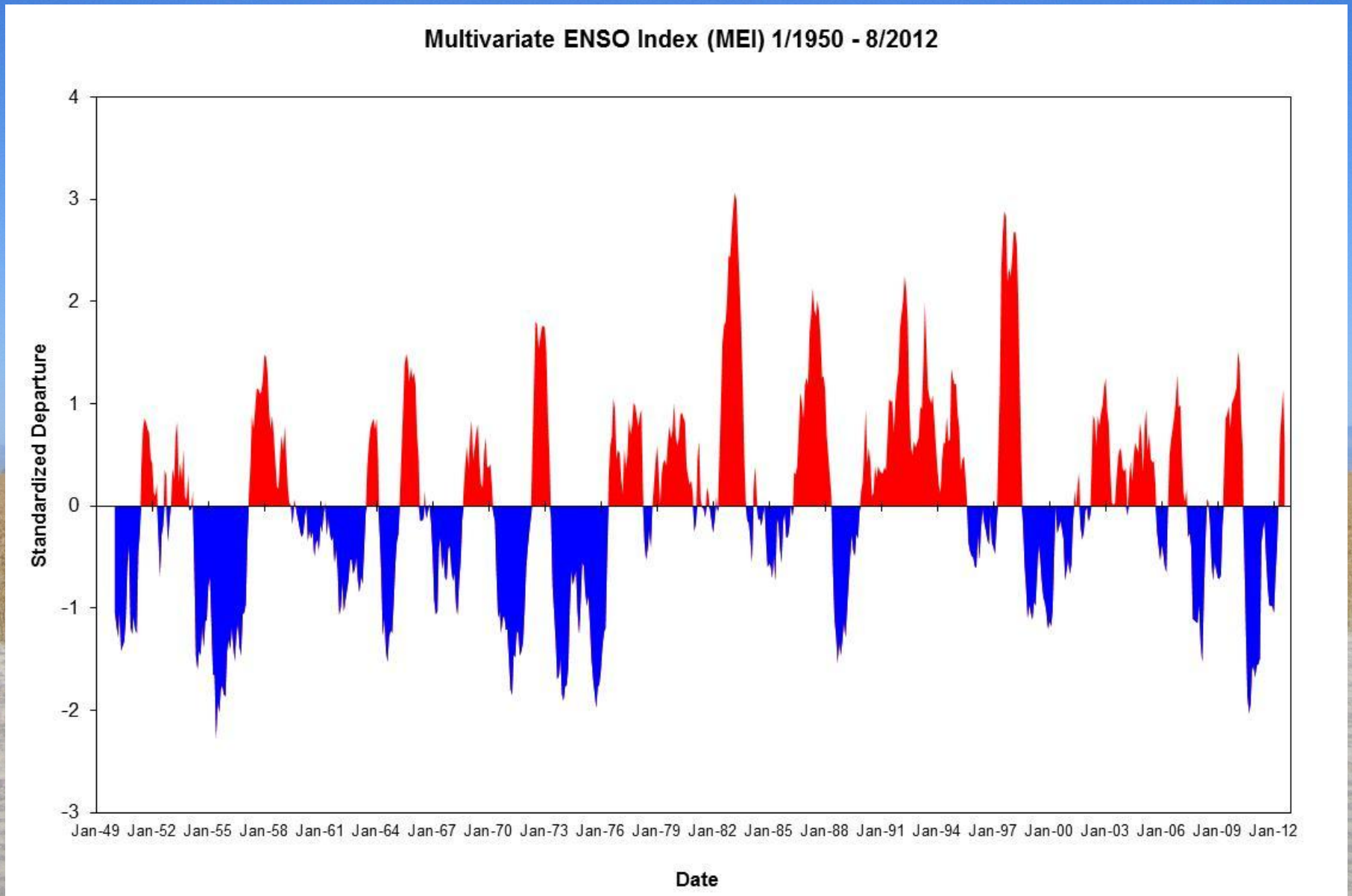
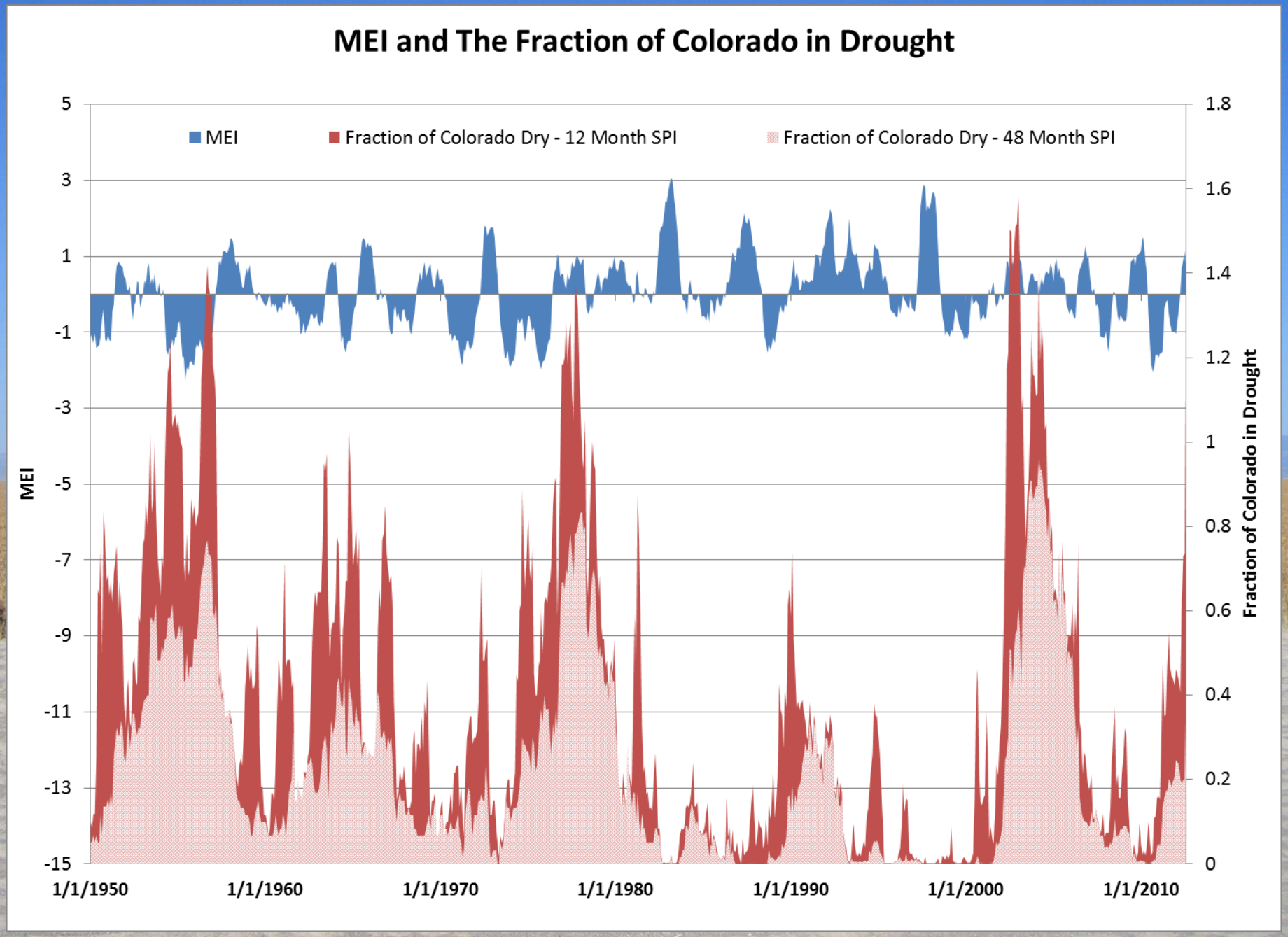
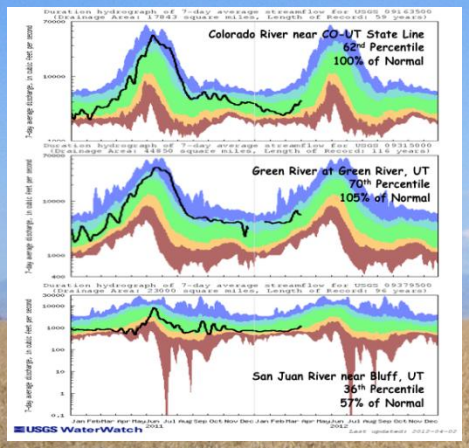
How Does El Nino/La Nina Affect Drought in Colorado??

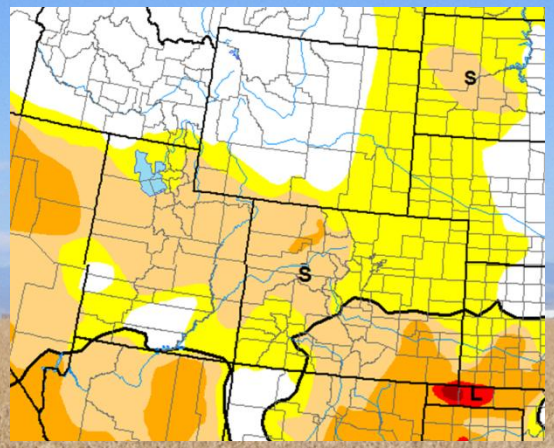


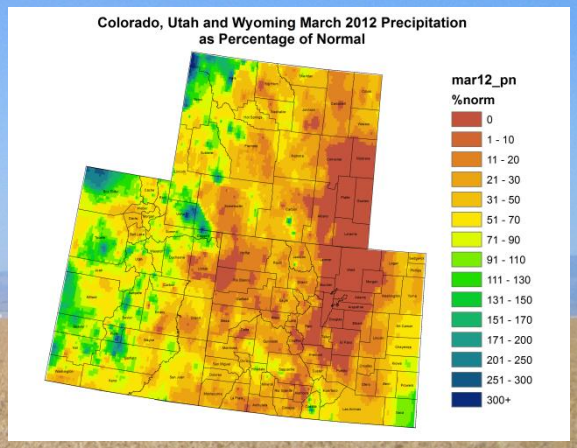

Multivariate ENSO Index (MEI) 1/1950 - 8/2012
Standardized Departure
4
3
2
1
0
-1
-2
-3
Jan-49 Jan-52 Jan-55 Jan-58 Jan-61 Jan-64 Jan-67 Jan-70 Jan-73 Jan-76 Jan-79 Jan-82 Jan-85 Jan-88 Jan-91 Jan-94 Jan-97 Jan-00 Jan-03 Jan-06 Jan-09 Jan-12
Date

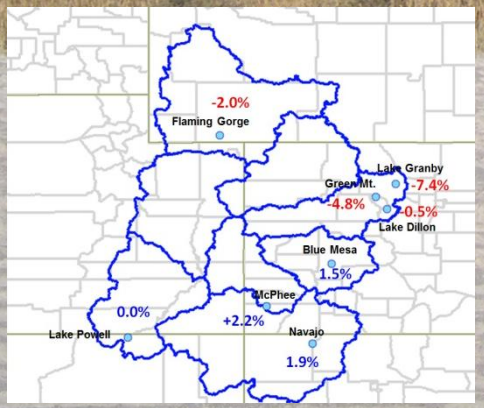

MEI and The Fraction of Colorado in Drought
MEI
Fraction of Colorado Dry - 12 Month SPI
Fraction of Colorado Dry - 48 Month SPI
5
3
1
-1
-3
-5
-7
-9
-11
-13
-15
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/1/1950
1/1/1960
1/1/1970
1/1/1980
1/1/1990
1/1/2000
1/1/2010
Fraction of Colorado in Drought

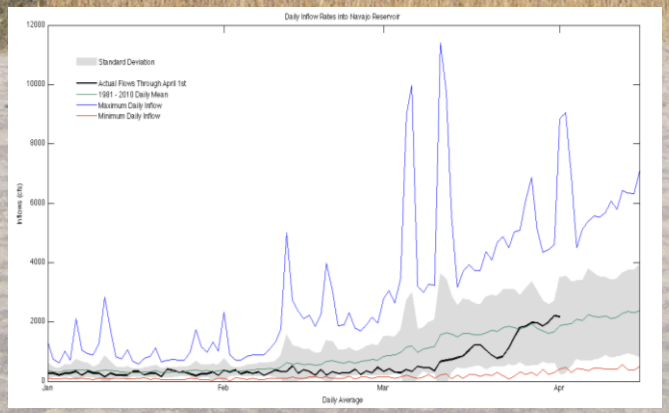
Enhanced Drought Early Warning for the Upper Colorado River Basin National Integrated Drought Information System (NIDIS)

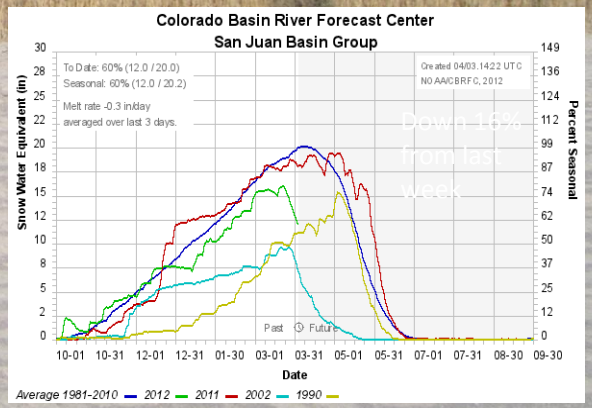












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Also, Please Help Us Monitor Colorado's Climate!

Photos by H. Reges

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http://www.cocorahs.org

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and
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Data and Power Point Presentations available for downloading

http://ccc.atmos.colostate.edu

Nolan.Doesken@Colostate.edu

Colorado State University
Knowledge to Go Places

COLORADO CLIMATE CENTER