

Climate Update

**Nolan Doesken,
State Climatologist**

**Atmospheric Science Department
Colorado State University**

**Presented to Water Availability and Flood
Task Force, Denver, CO, March 17, 2008**

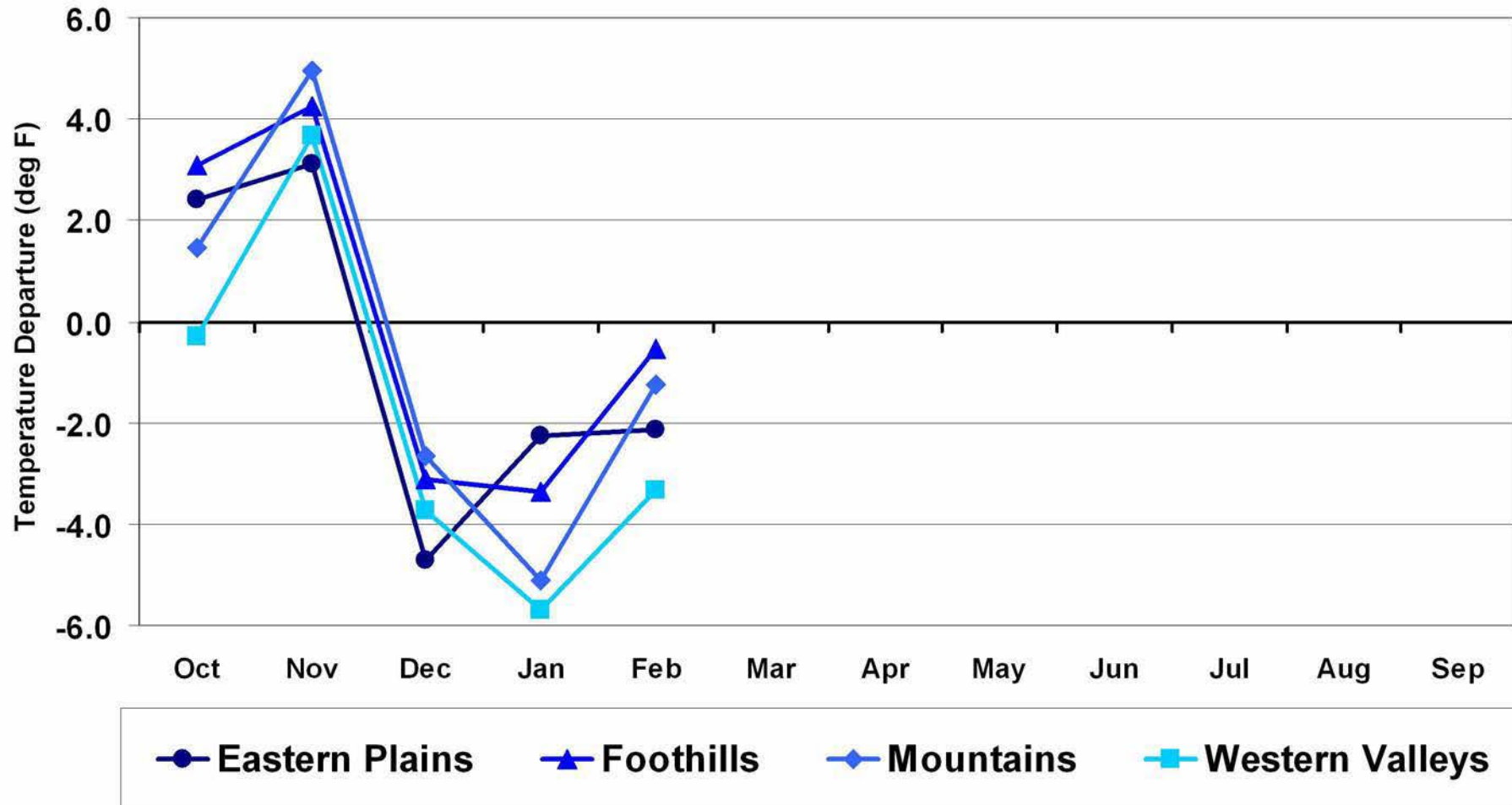


**Colorado
State
University**
Knowledge to Go Places

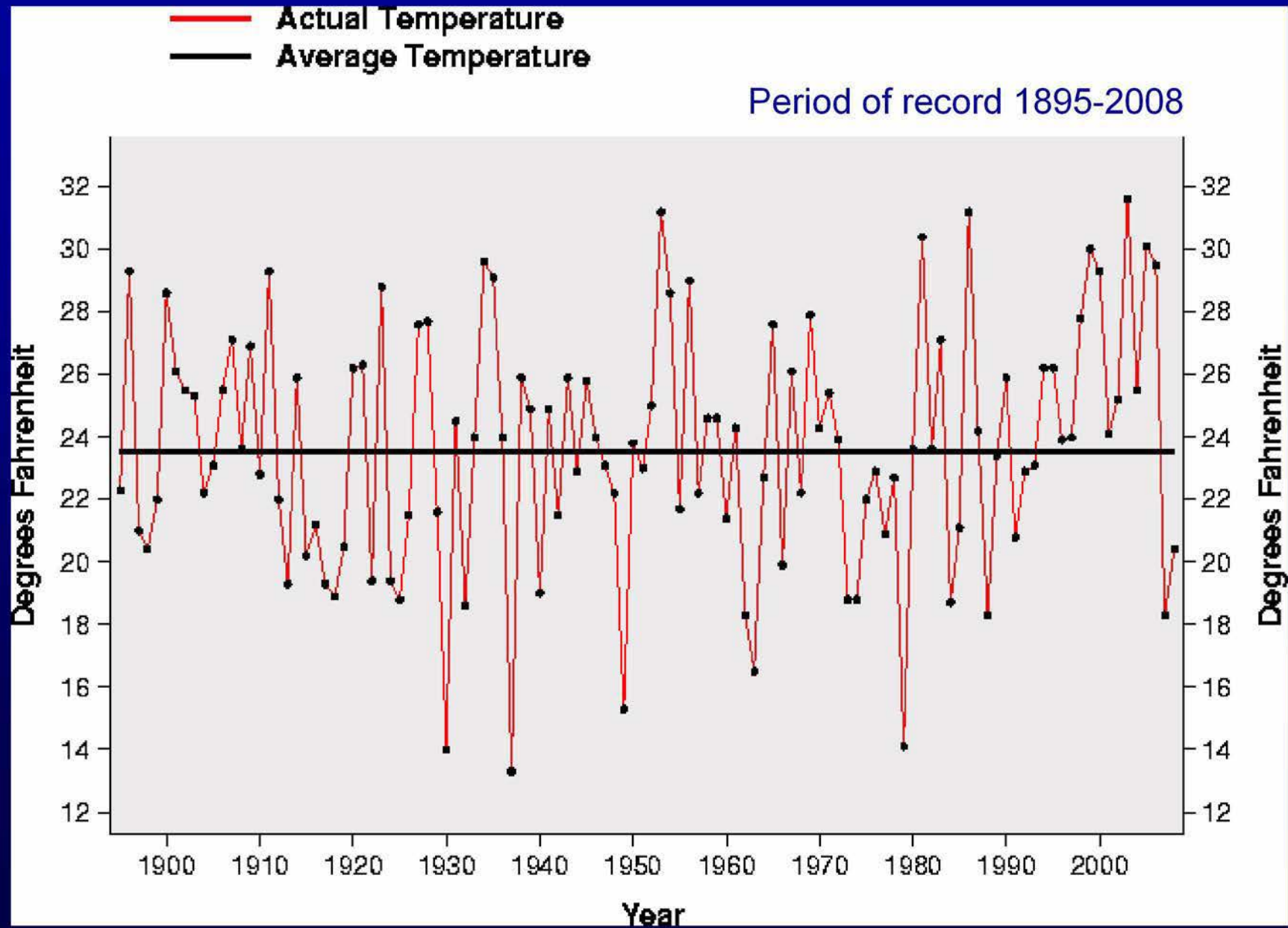
Prepared by Odie Bliss

Water Year 2008 Temperature Departures

Water Year 2008

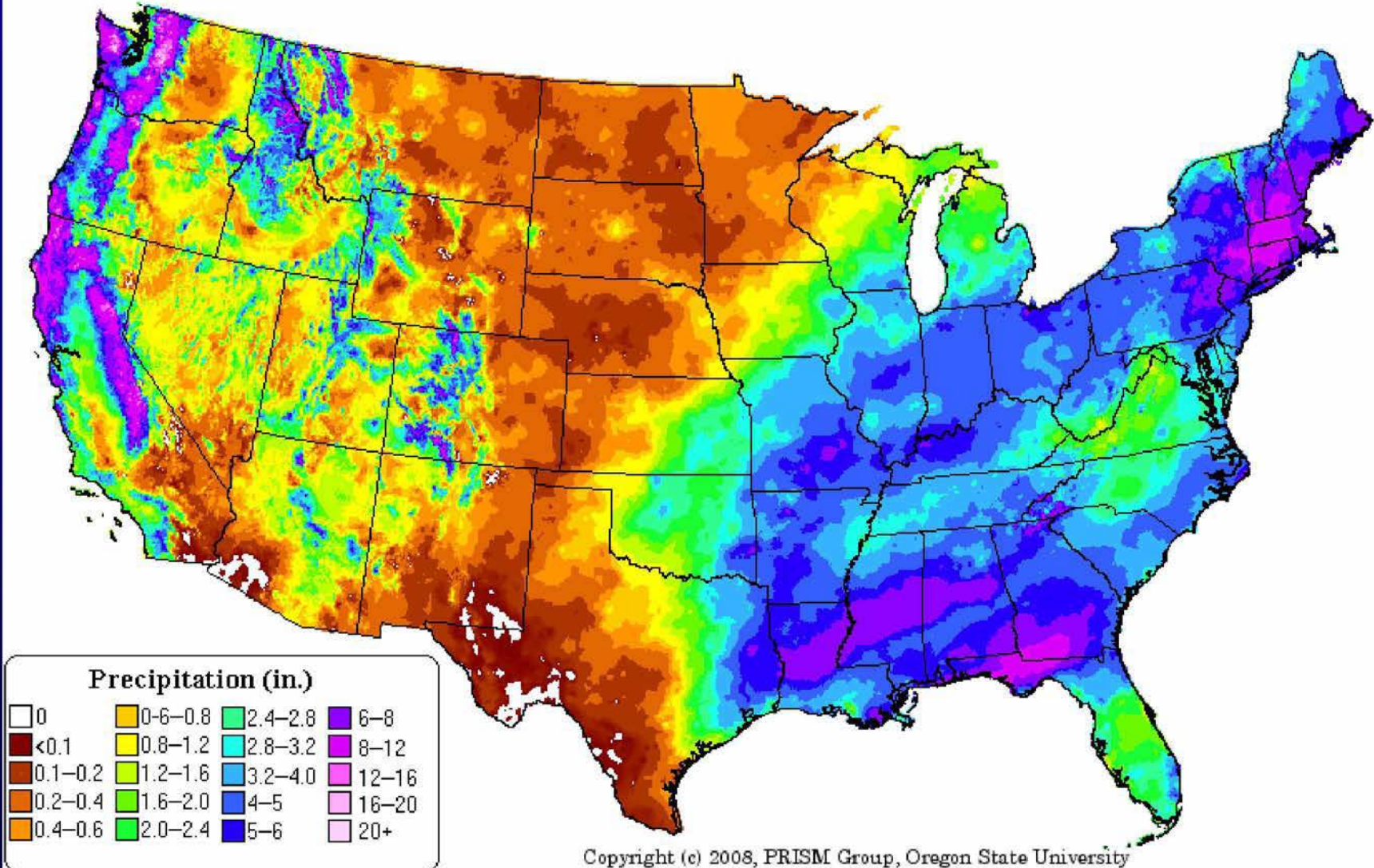


February Average Temperature History for Colorado (NCDC)



February 2008 Precipitation (inches)

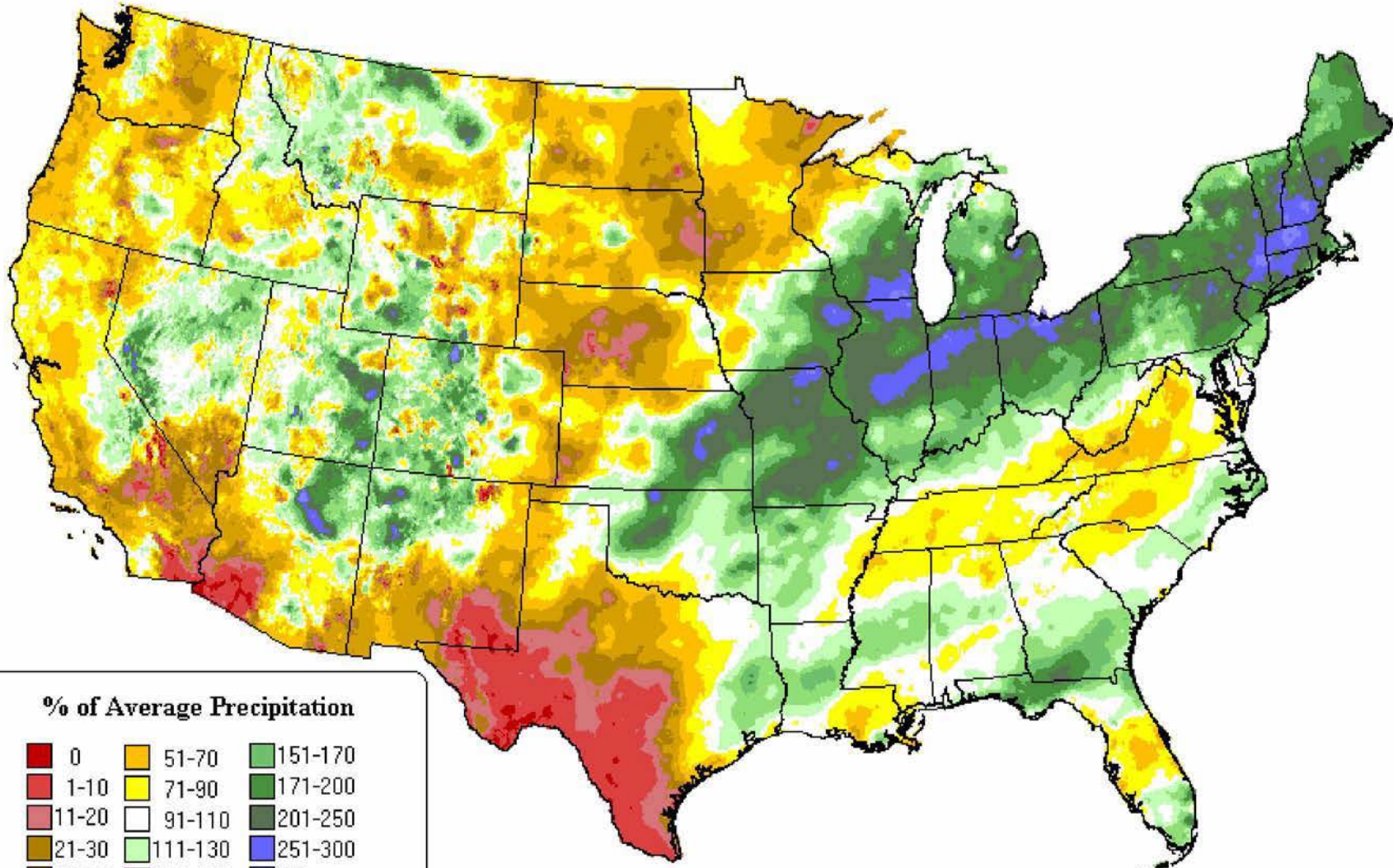
Precipitation: Feb 2008
Provisional Data



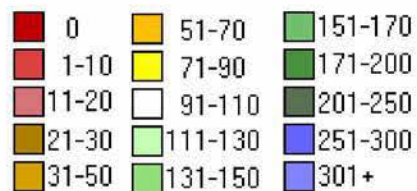
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<http://www.prismclimate.org> - Map created Mar 12 2008

February 2008 Percent of Average (Prism)

1-month Percent of Average Precipitation: Feb 2008
Provisional Data

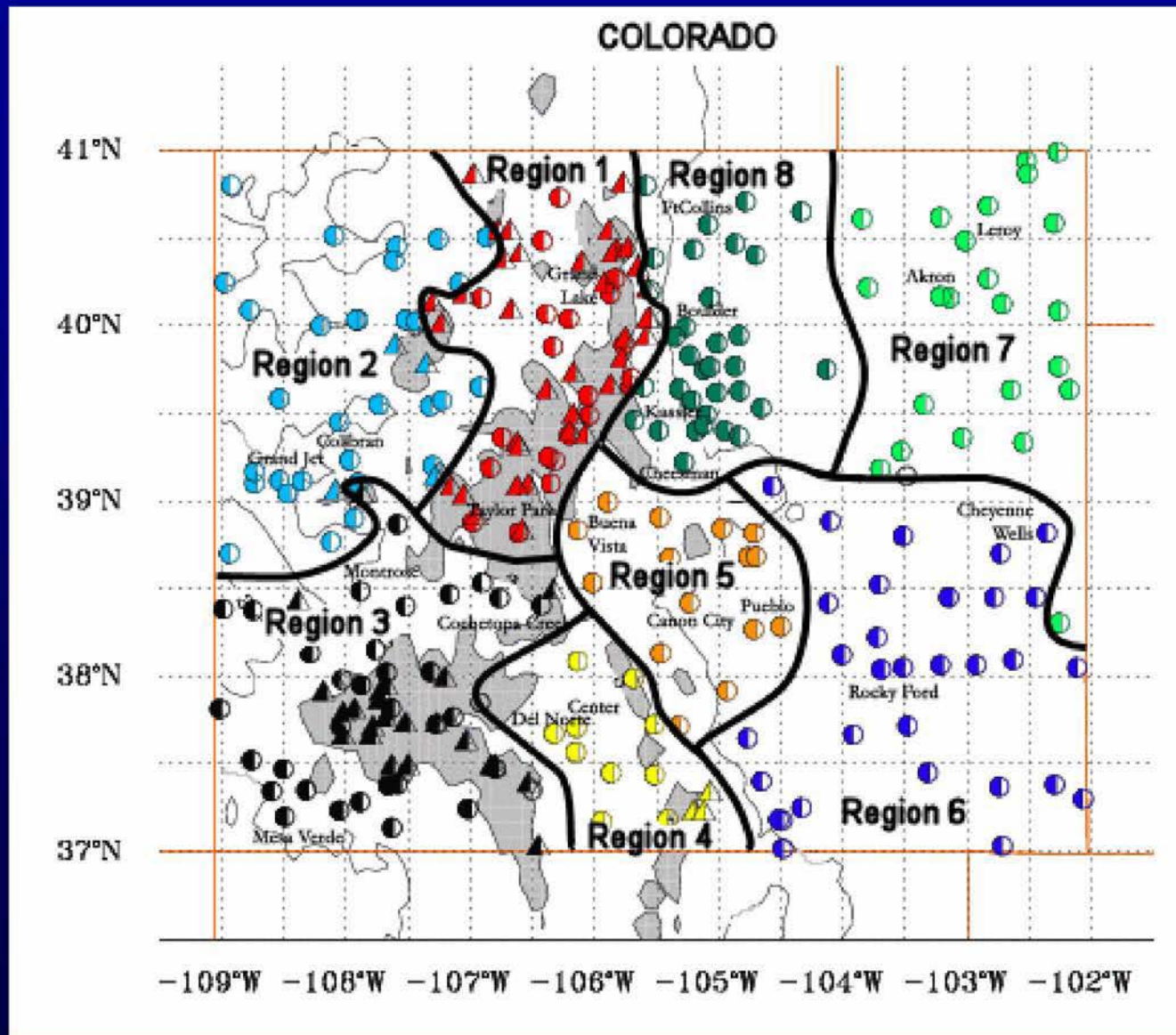


% of Average Precipitation



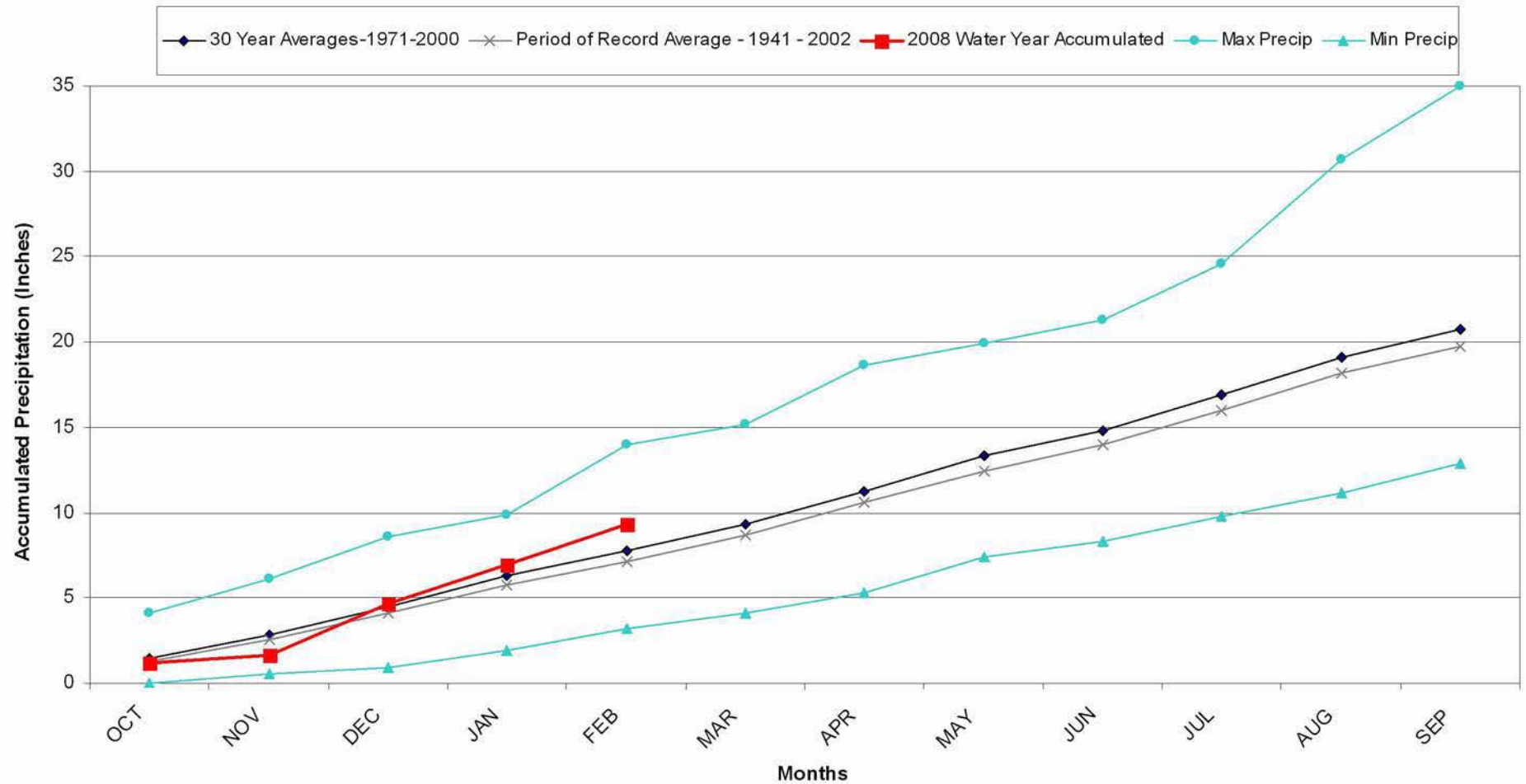
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<http://www.prismclimate.org> - Map created Mar 13 2008

Climate divisions defined by Dr. Klaus Wolter of NOAA's Climate Diagnostic Center in Boulder, CO



Division 1 – Grand Lake 1NW

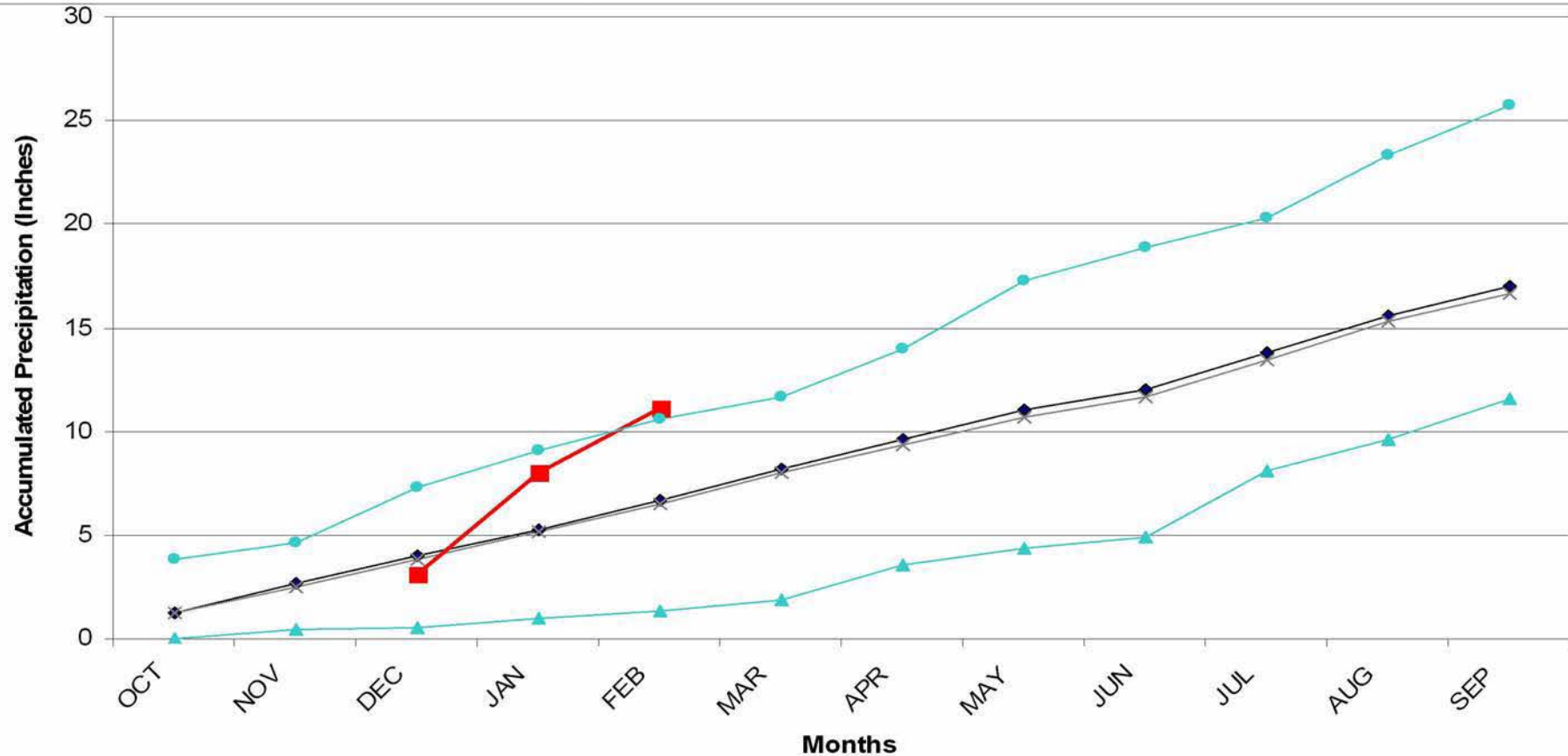
Grand Lake 1 NW 2008 Water Year



Division 1 – Taylor Park

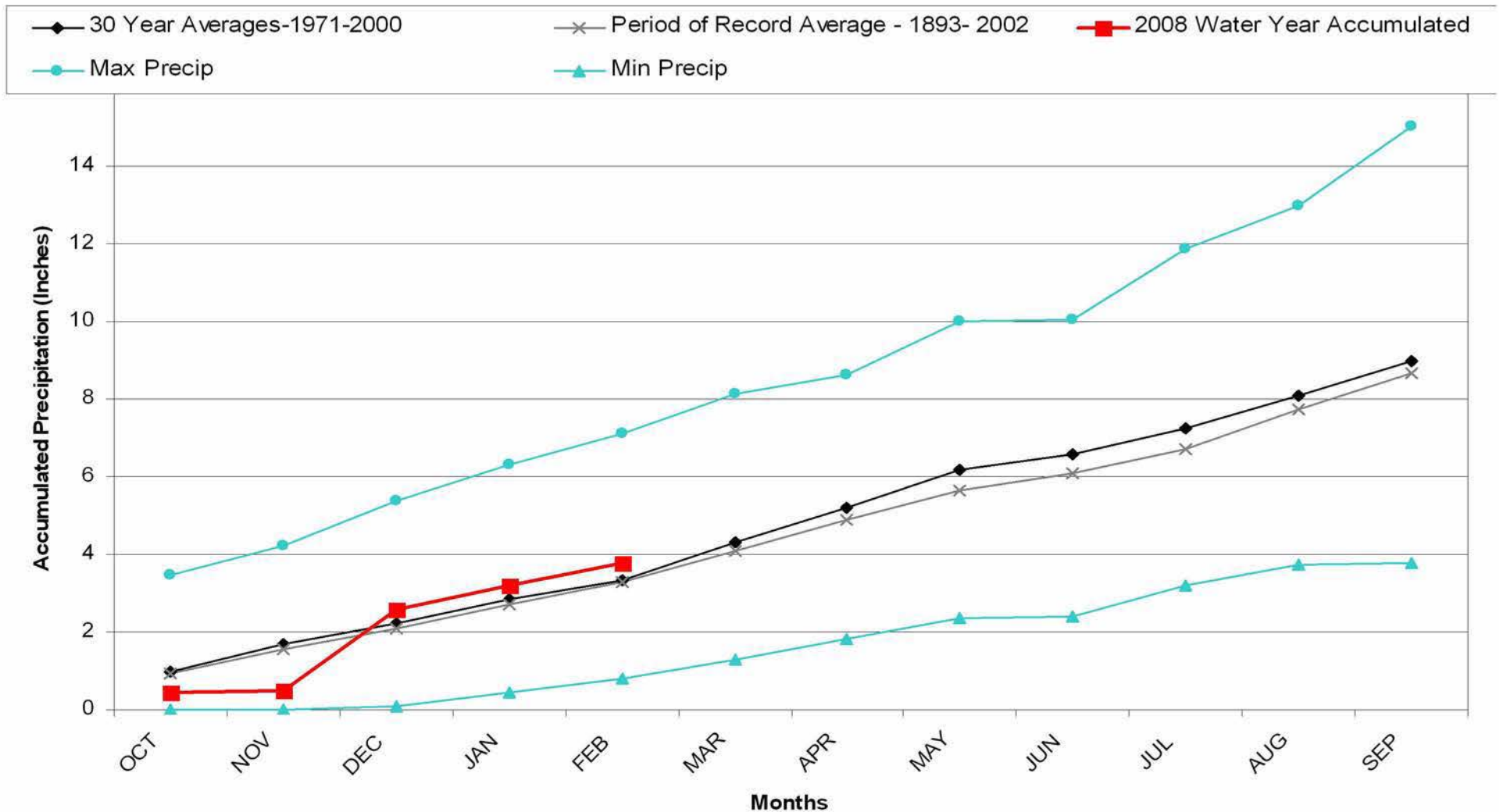
Taylor Park 2008 Water Year

◆ 30 Year Averages-1971-2000 ✕ Period of Record Average - 1942 - 2002 ■ 2008 Water Year Accumulated
● Max Precip ▲ Min Precip



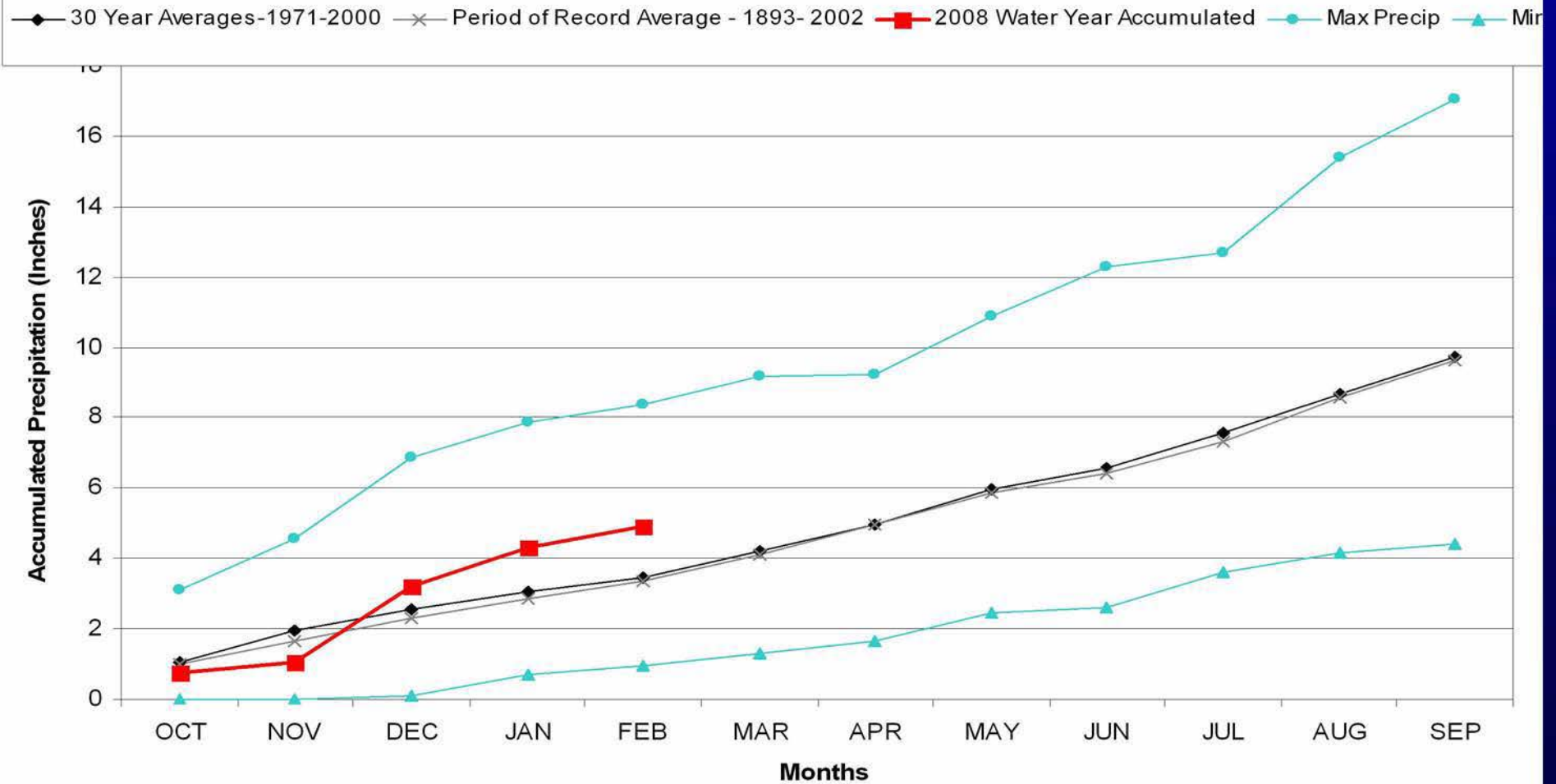
Division 2 – Grand Junction

Grand Junction WSFO 2008 Water Year Accumulated



Division 3 – Montrose

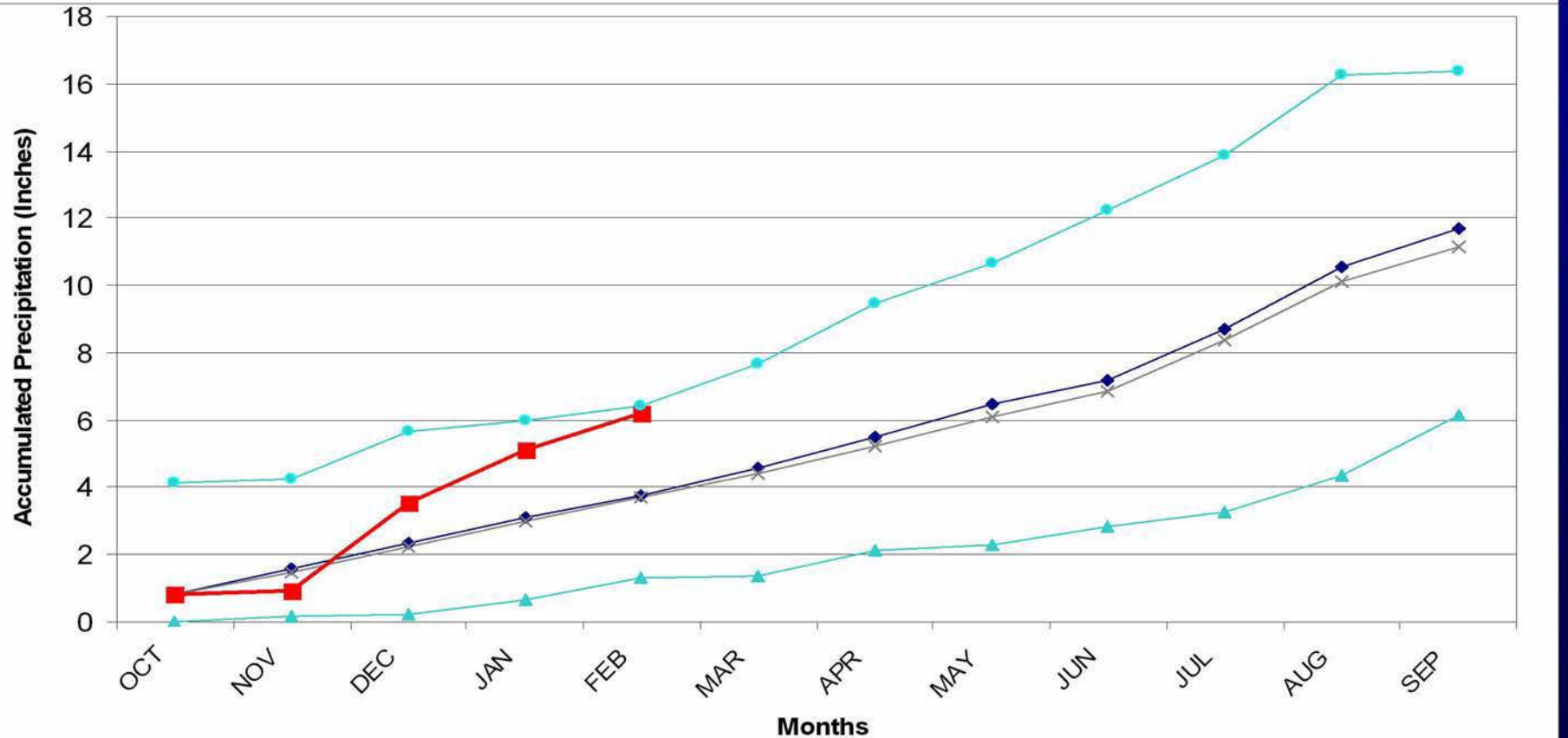
Montrose #2 2008 Water Year



Division 3 – Cochetopa Creek

Cochetopa Creek 2008 Water Year

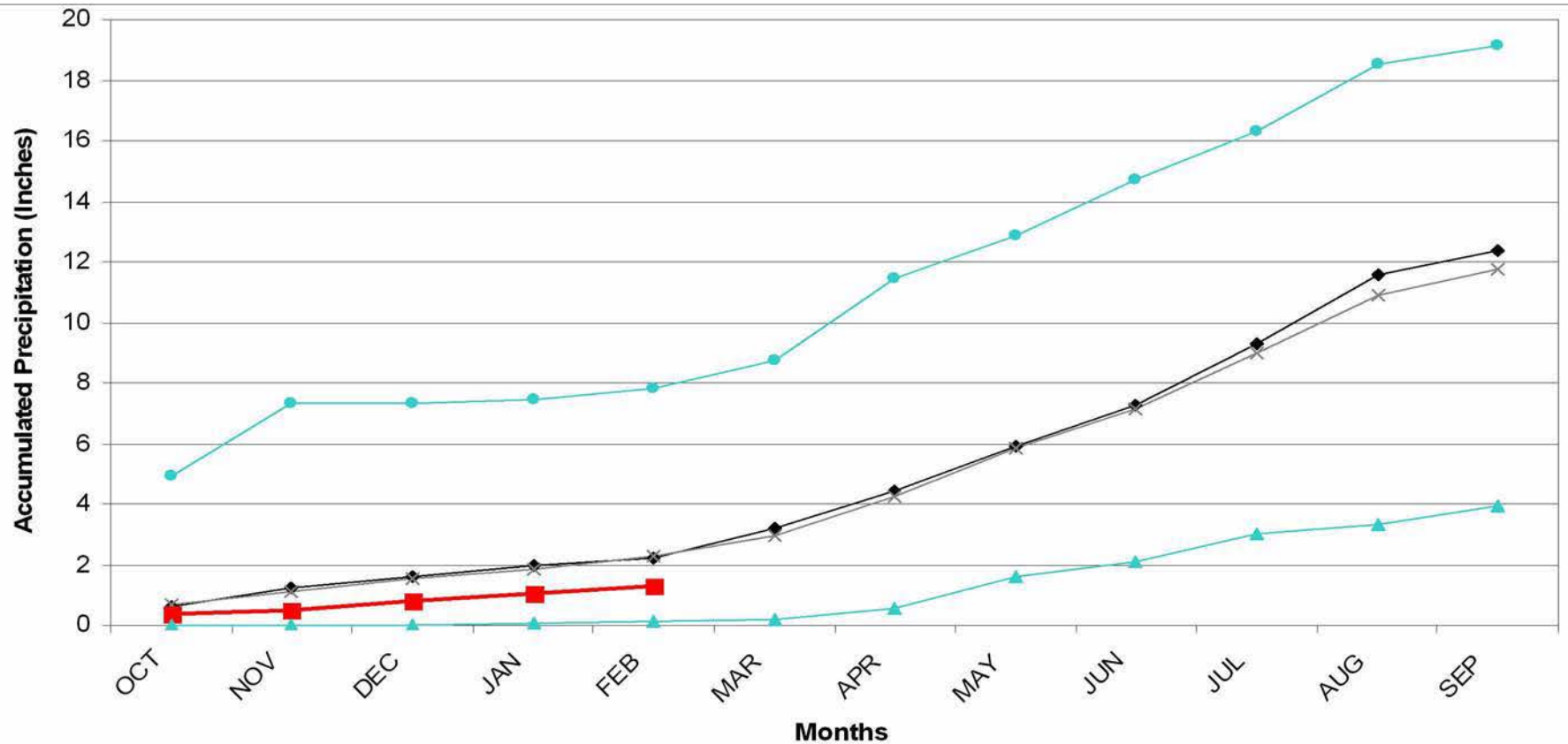
◆ 30 Year Averages-1971-2000 × Period of Record Average - 1949 - 2002 ■ 2008 Water Year ● Max Precip ▲ Min Precip



Division 5 – Pueblo

Pueblo WSO 2008 Water Year

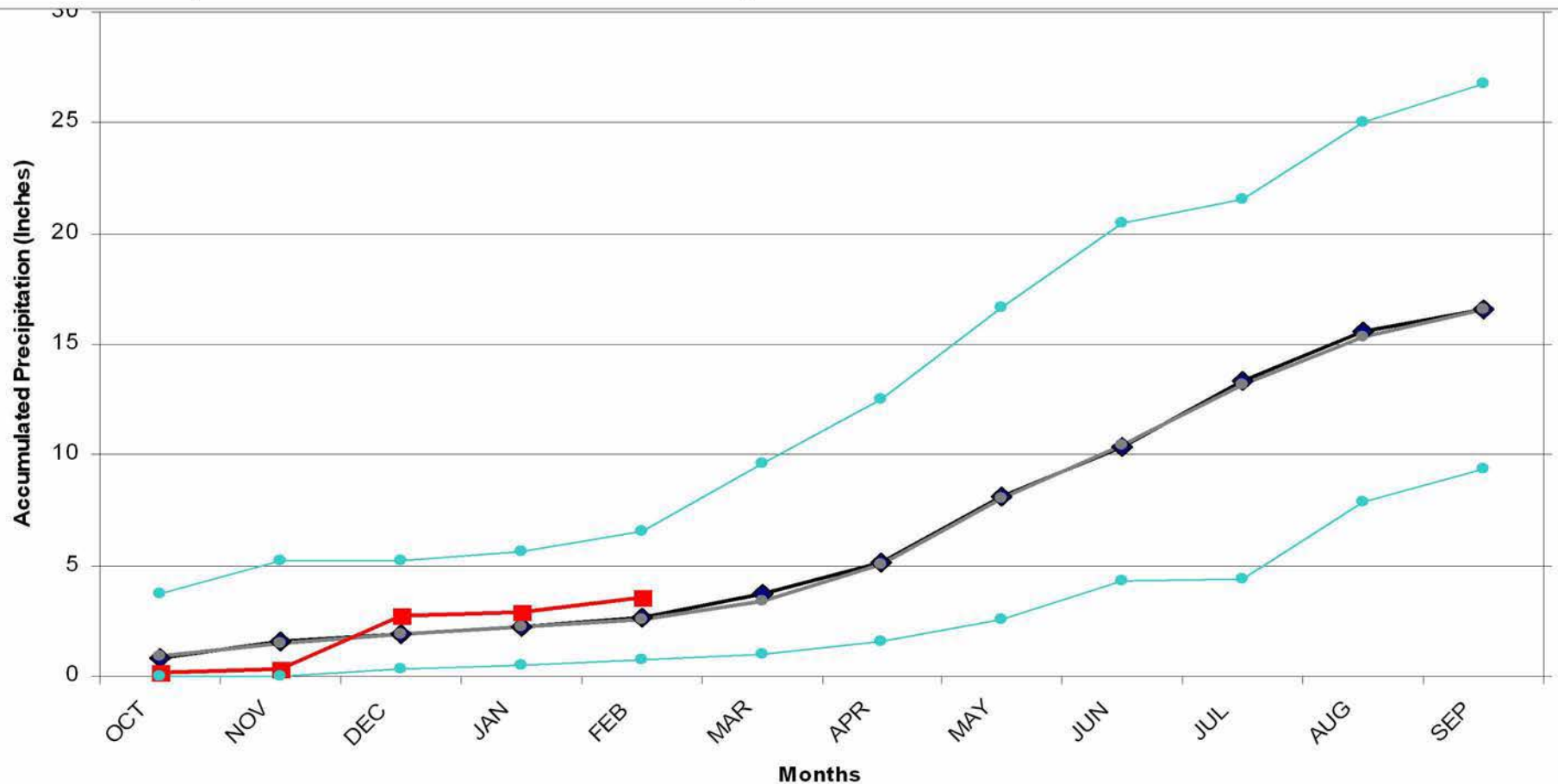
◆ 30 Year Averages-1971-2000 ✕ Period of Record Average - 1874-2000 ■ 2008 Water Year Accumulated ● Max Precip ▲ Min



Division 7 – Akron

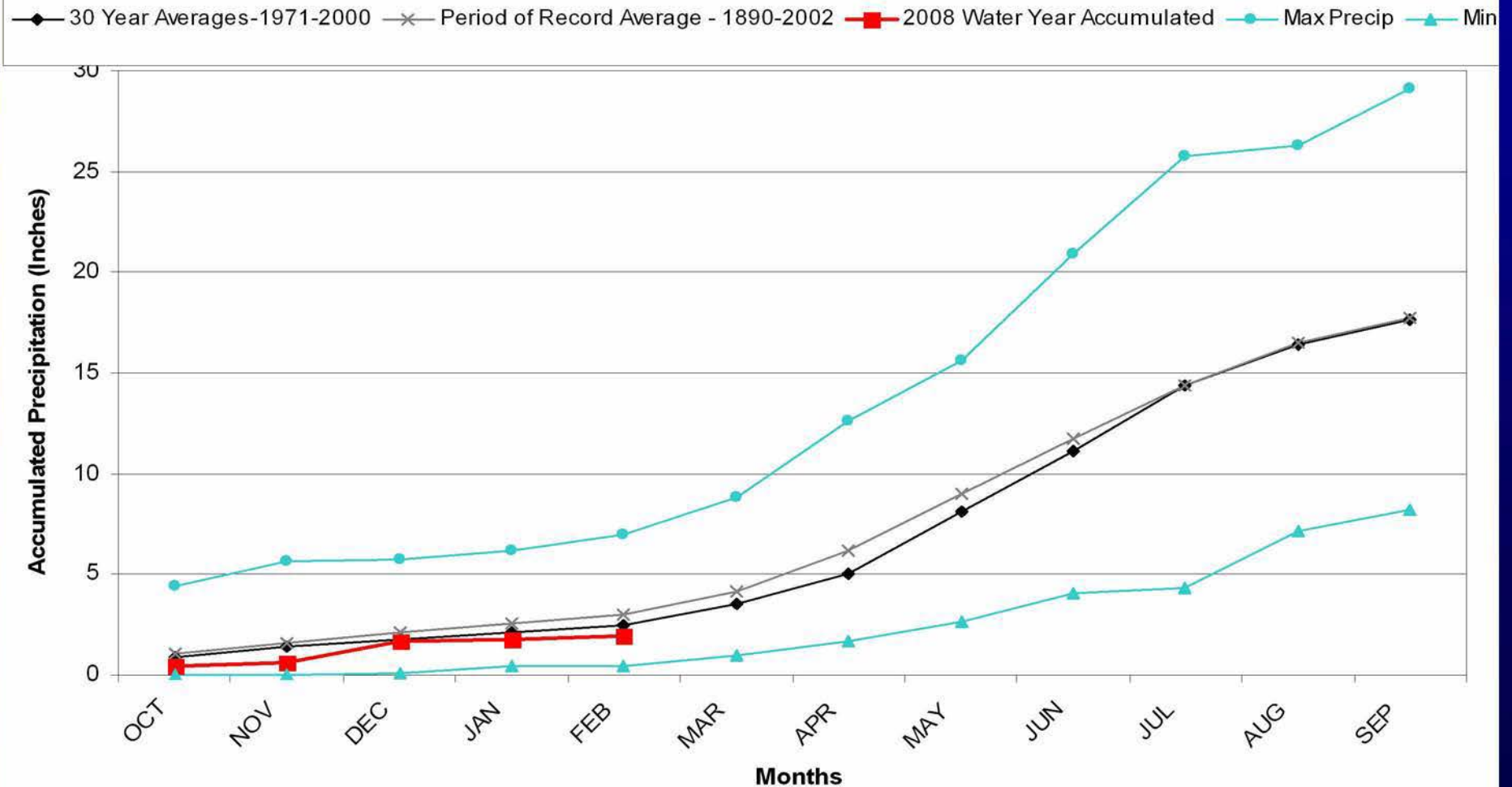
Akron 4E 2008 Water Year

◆ 30 Year Averages-1971-2000 ● Period of Record Average - 1906 - 2002 ■ 2008 Water Year Accumulated
● Max Precip ● Min Precip Year of Max



Division 7 – Leroy

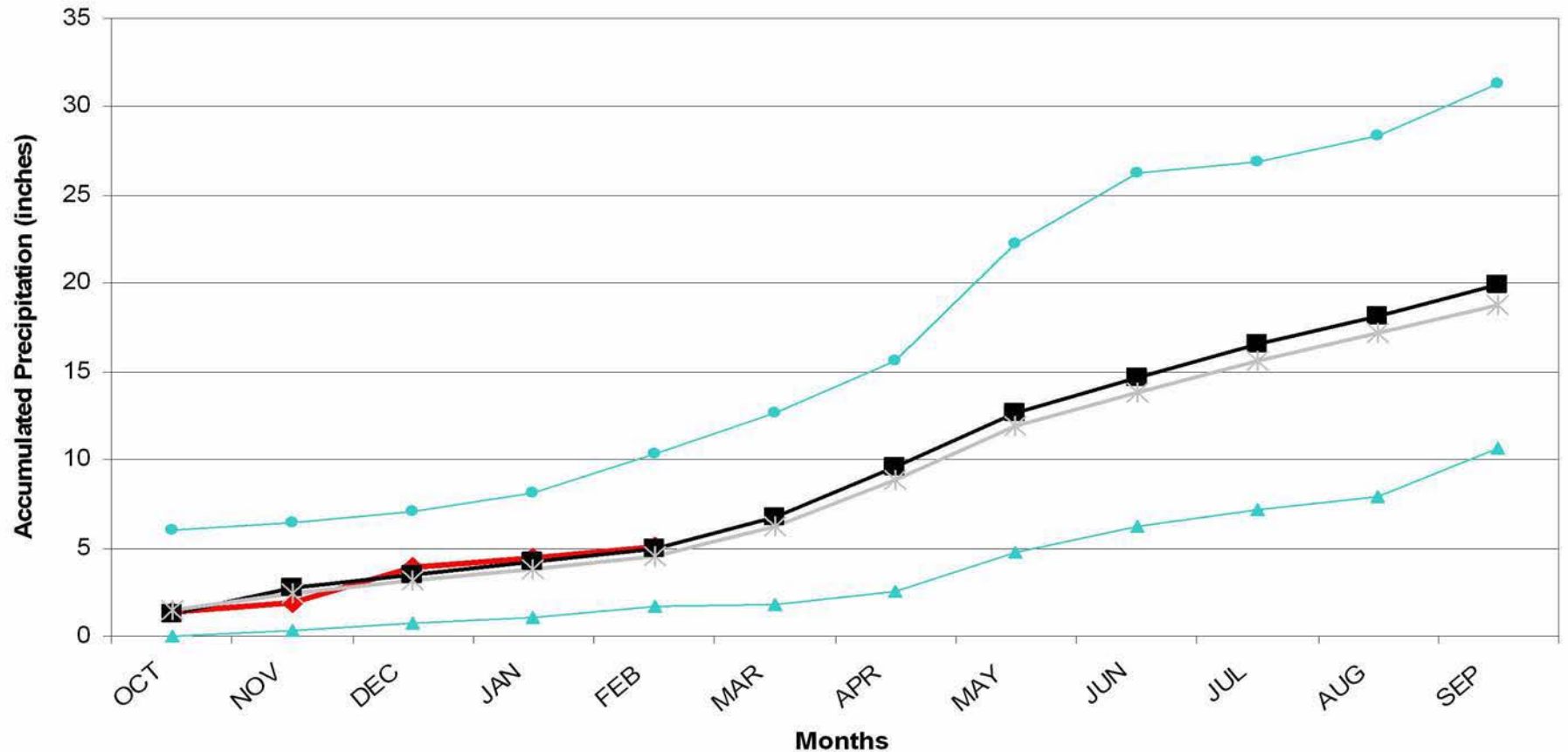
Leroy 5SW 2008 Water Year



Division 8 – Boulder

Boulder 2008 Water Year

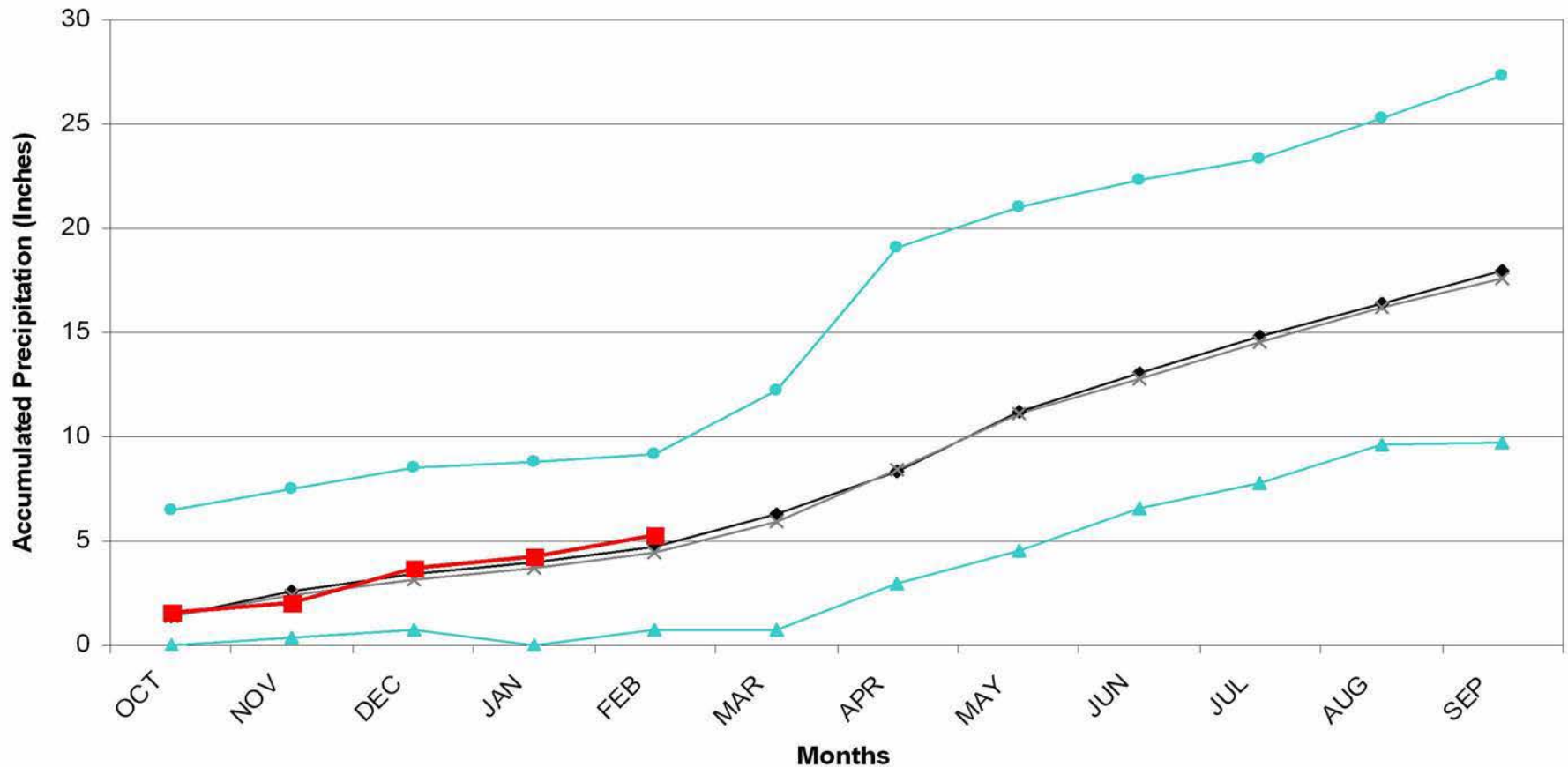
2008 Water Year 30 Year Averages-1971-2000 Period of Record Average - 1894-2002 Max Precip Min Pr



Division 8 – Kassler

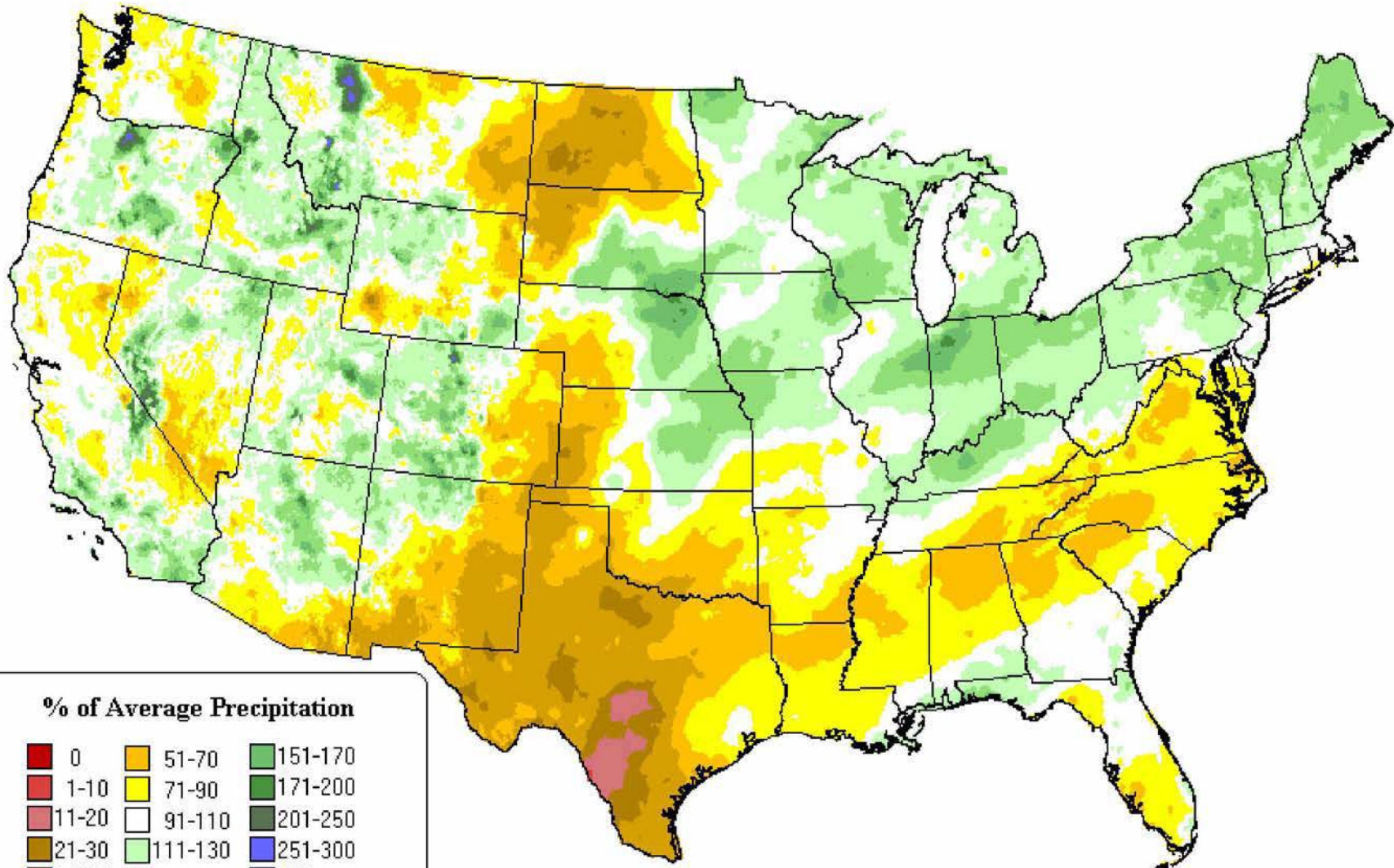
Kassler 2008 Water Year

◆ 30 Year Averages-1971-2000 ✕ Period of Record Average - 1899 - 2002 ■ 2008 Water Year Accumulated
● Max Precip ▲ Min Precip

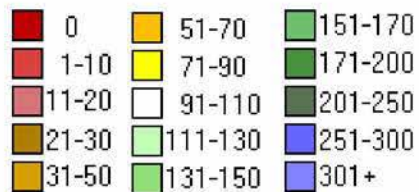


Water Year 2008 (Oct 07-Feb 08) Prism

5-month Percent of Average Precipitation: Feb 2008
Provisional Data



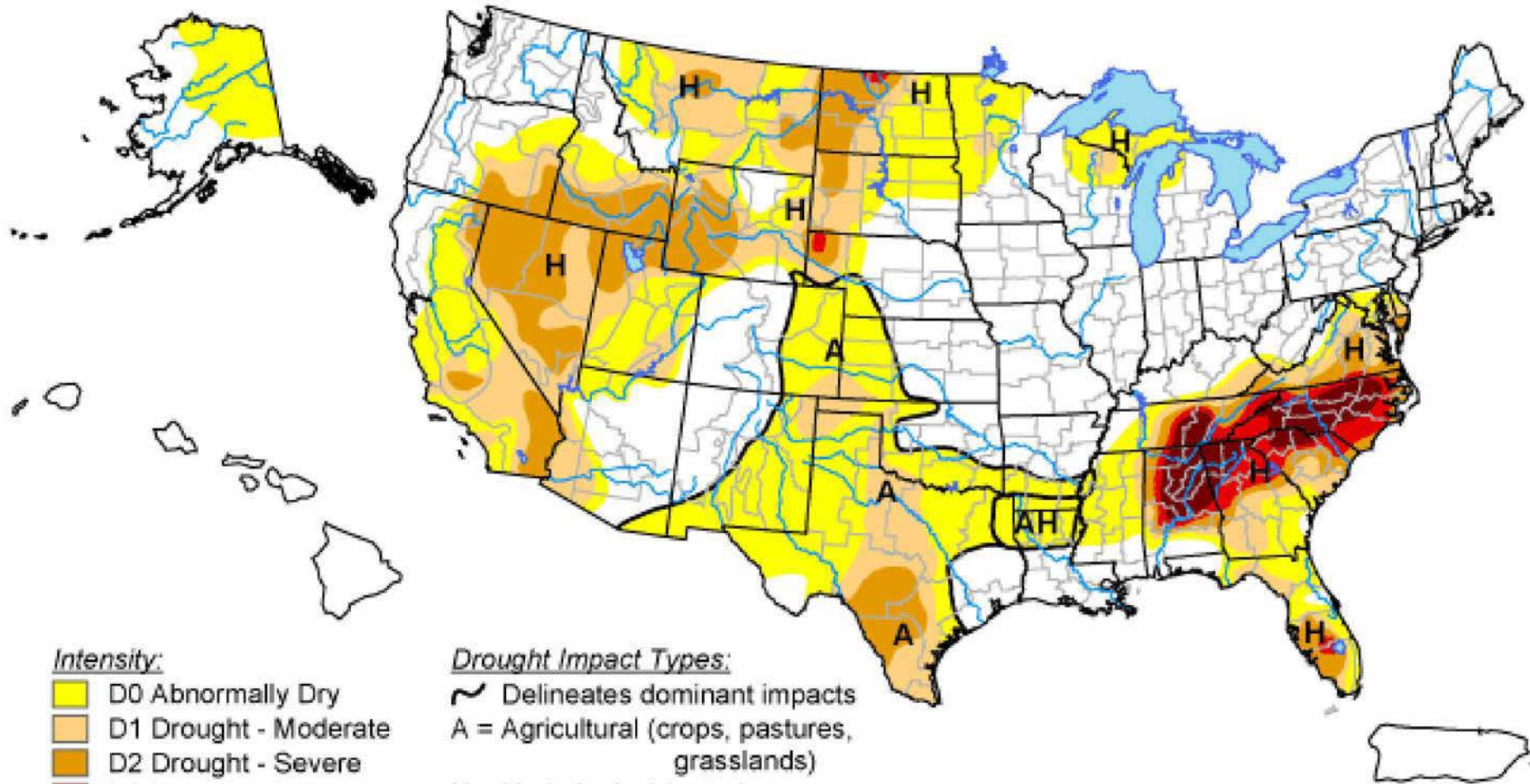
% of Average Precipitation








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<http://www.prismclimate.org> - Map created Mar 13 2008

U.S. Drought Monitor


February 12, 2008
Valid 7 a.m. EST



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.

<http://drought.unl.edu/dm>



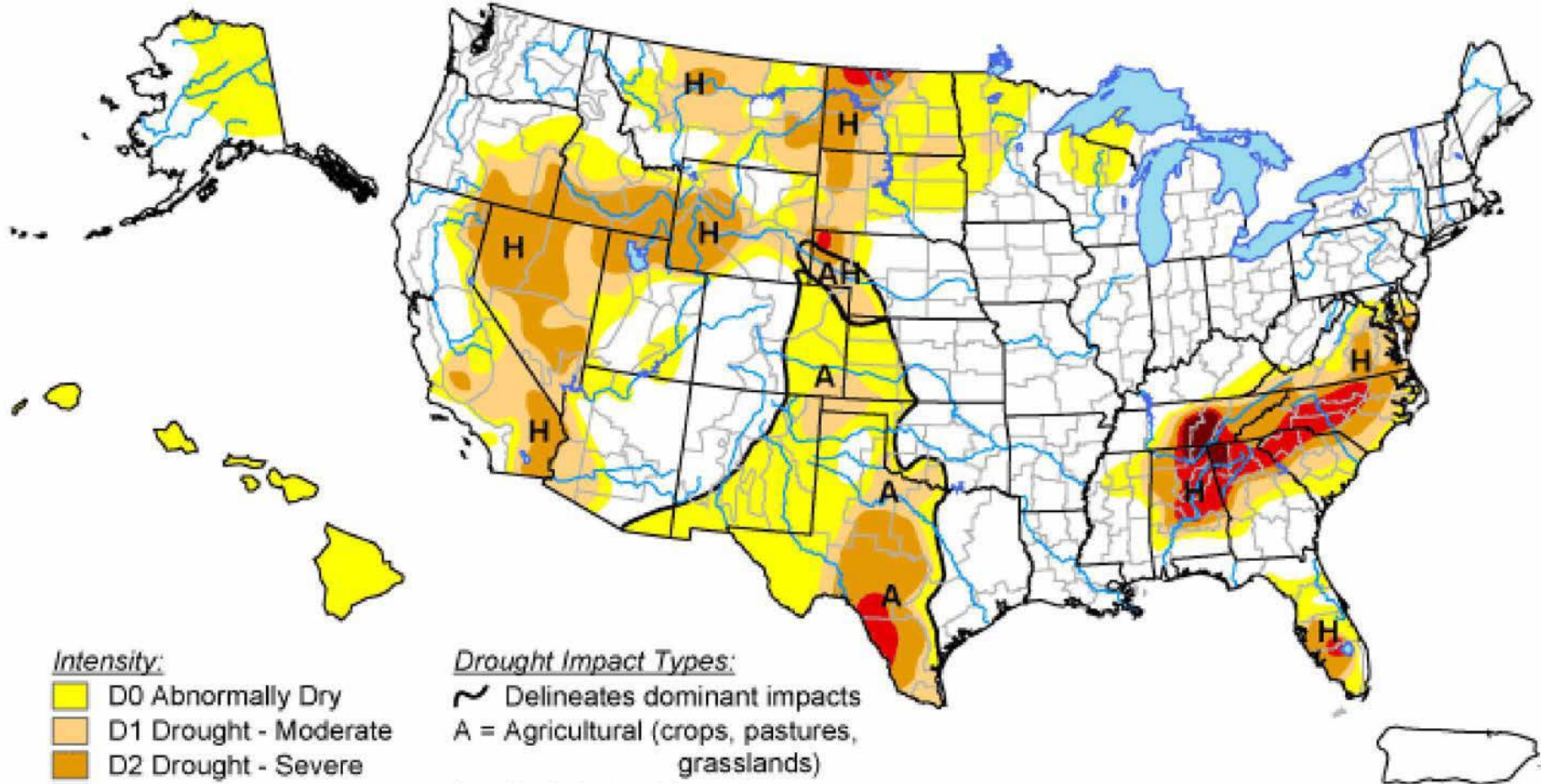
Released Thursday, February 14, 2008

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






U.S. Drought Monitor

March 11, 2008


Valid 8 a.m. EDT



Intensity:

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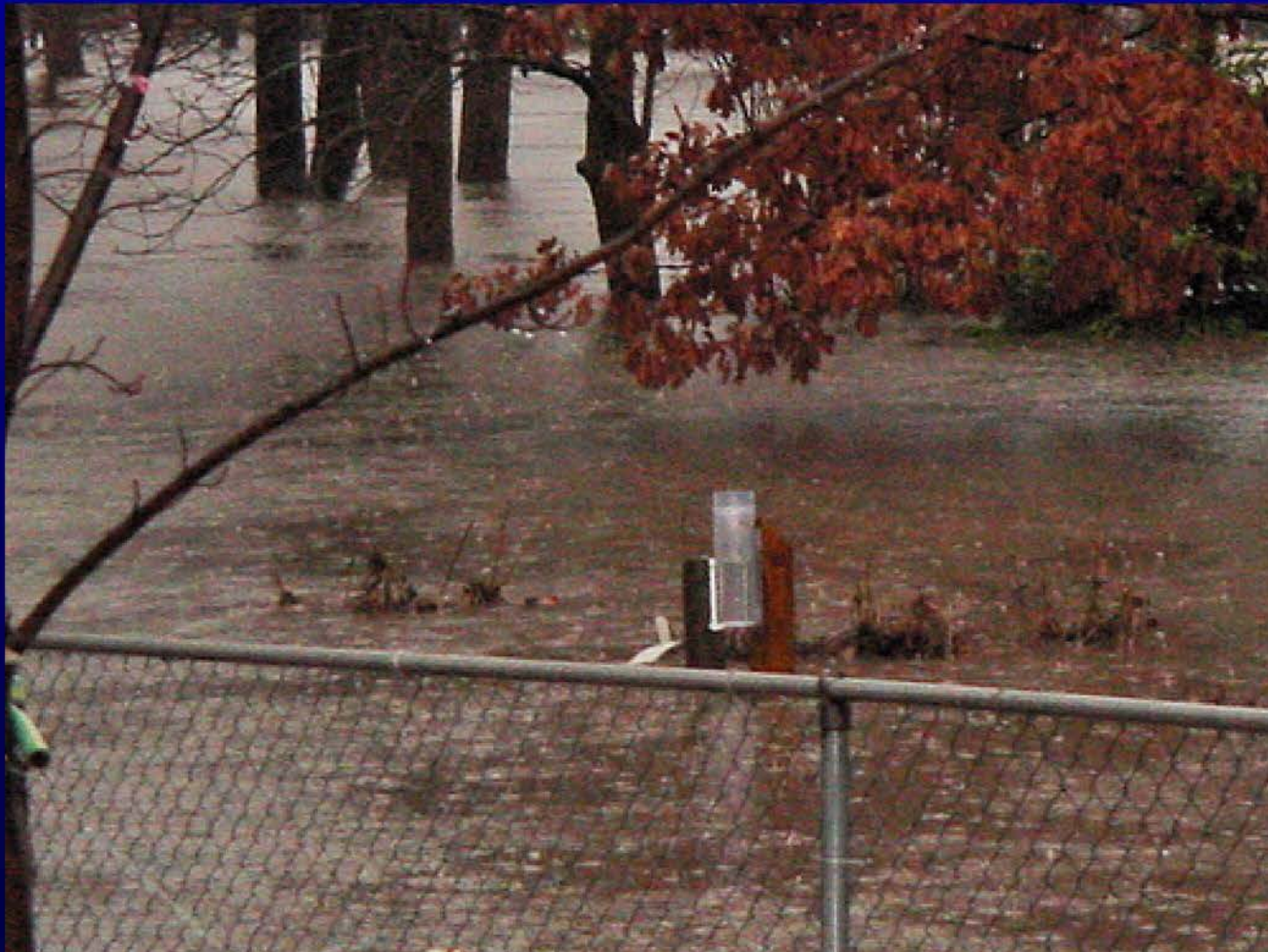


Released Thursday, March 13, 2008

Author: Brian Fuchs, National Drought Mitigation Center

<http://drought.unl.edu/dm>

Climatological Perspectives on Flooding in Colorado



Colorado is also known for periodic and sometimes extreme floods!

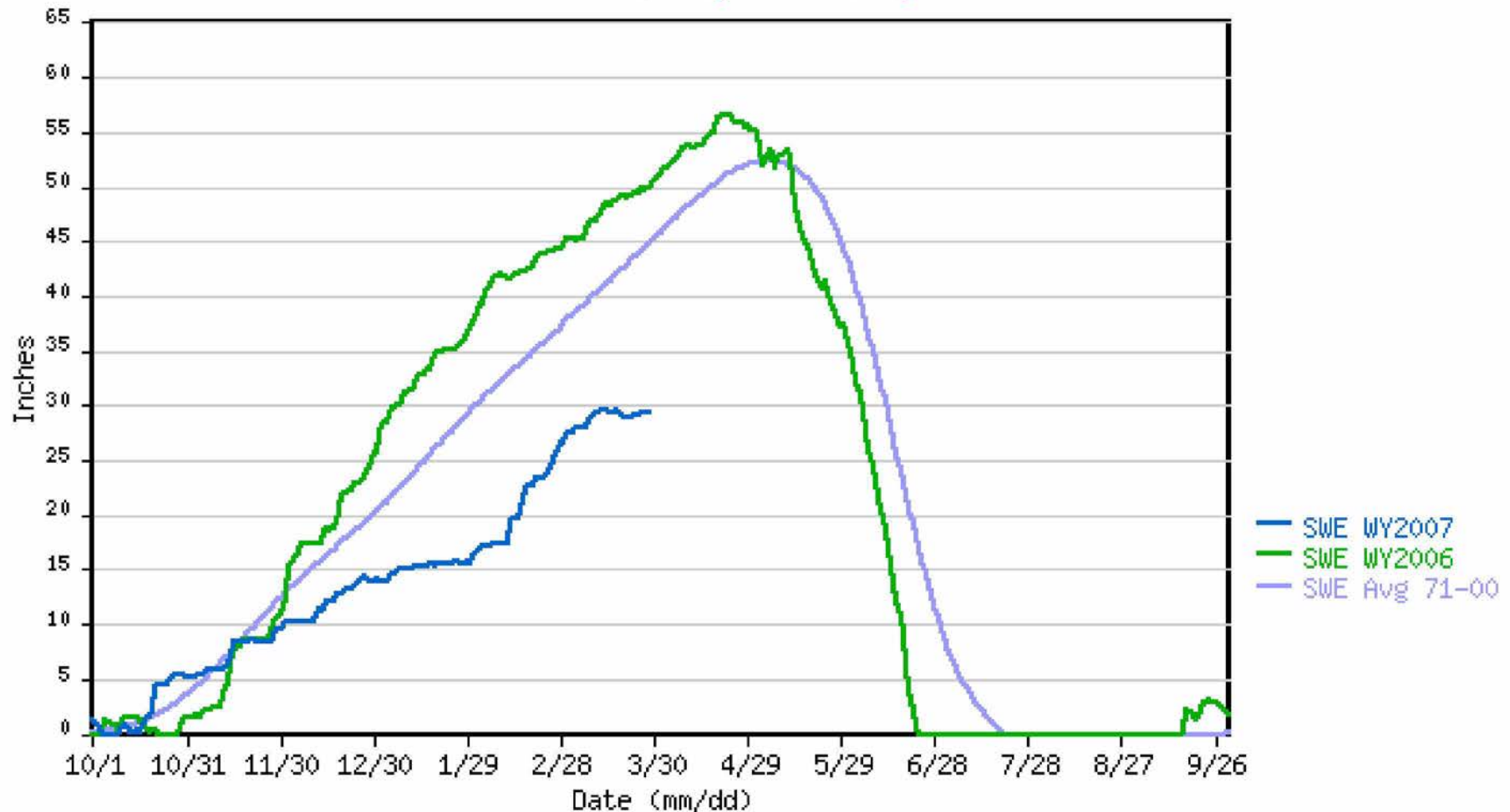


Spring Creek Flood, photo by John Weaver

Snowpack accumulates like this – and melts at a predictable time of year

TOWER SNOTEL as of 03/28/2007

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



Rain comes in infrequent but occasionally very large events

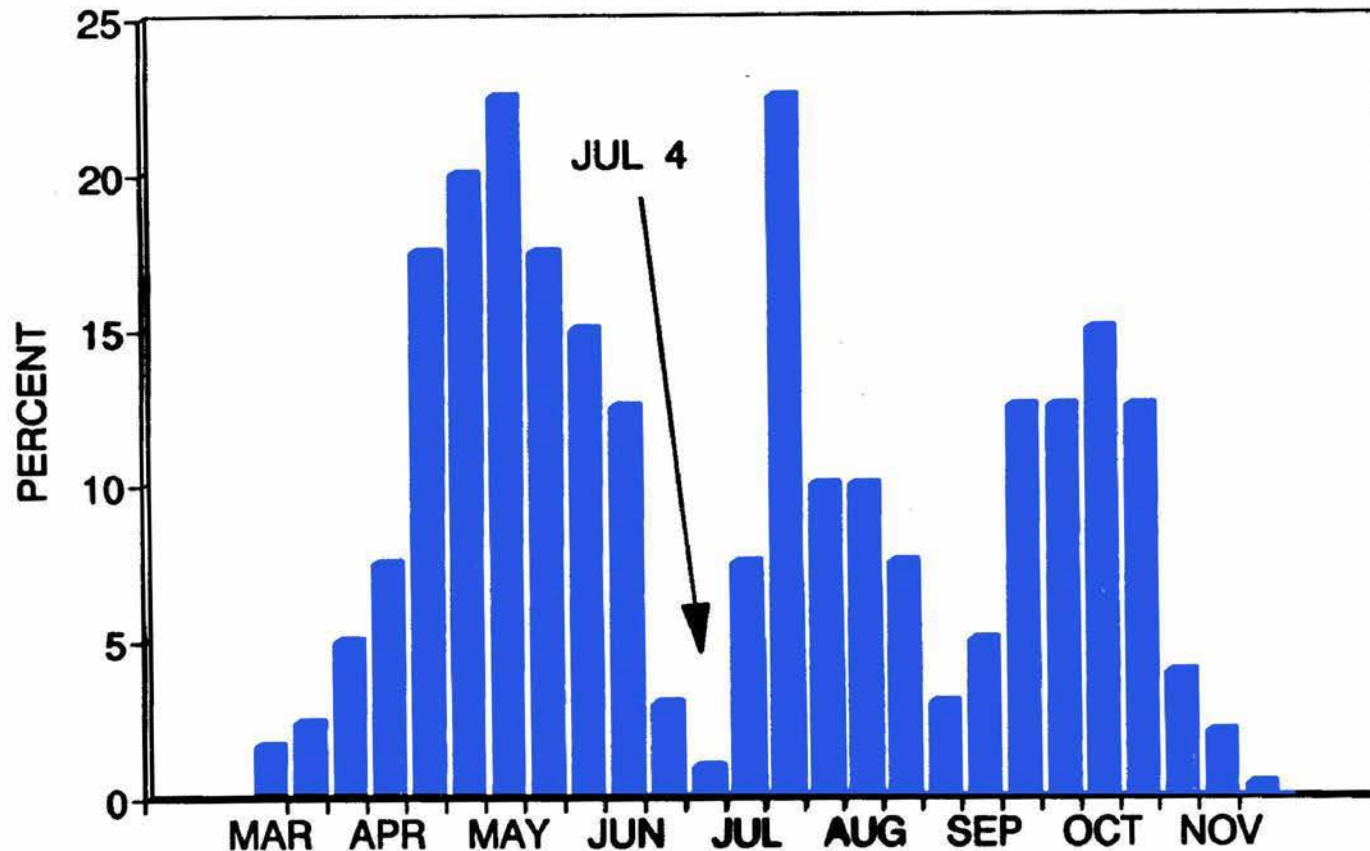


A small fraction of storms contribute a large fraction of our annual precipitation, especially at lower elevations



We know when heavy rains are most likely

HEAVY RAIN PROBABILITIES
> 2" IN 24 HOURS SOMEWHERE IN COLORADO
DURING CONSECUTIVE 10-DAY PERIOD





**Some Points to
Remember:**

Really big floods are not that uncommon (usually at least once per decade). Most would not have been anticipated 1-2 weeks in advance even with today's forecasting skill.

Colorado Snowmelt Usually is Well Behaved



Deep and widespread
snowpack increases the
likelihood for snow melt flooding



Snowmelt floods usually require prolonged very warm temperatures and/or widespread late-season snowpack including snow on south facing slopes

Rain on Snow is "usually" not a problem – but ??





Most of Colorado's worst floods are
rainfall floods

Flash floods are especially problematic over sparsely vegetated sloped surfaces



Floods and drought are NOT mutually exclusive



Intense rains
are often highly
localized

Fort Collins
Rainfall
Jul 27, 4pm to
Jul 28, 11pm
1997

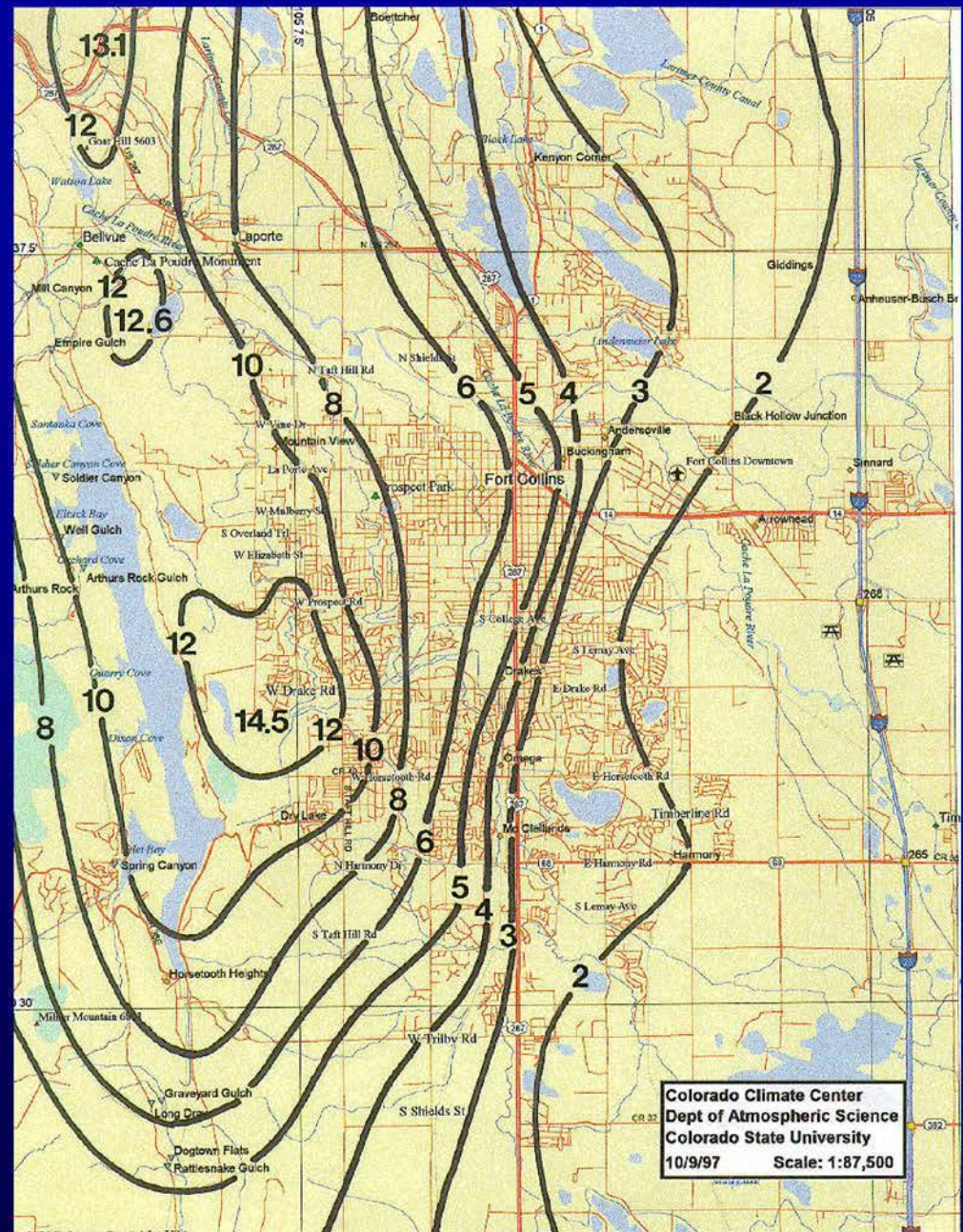
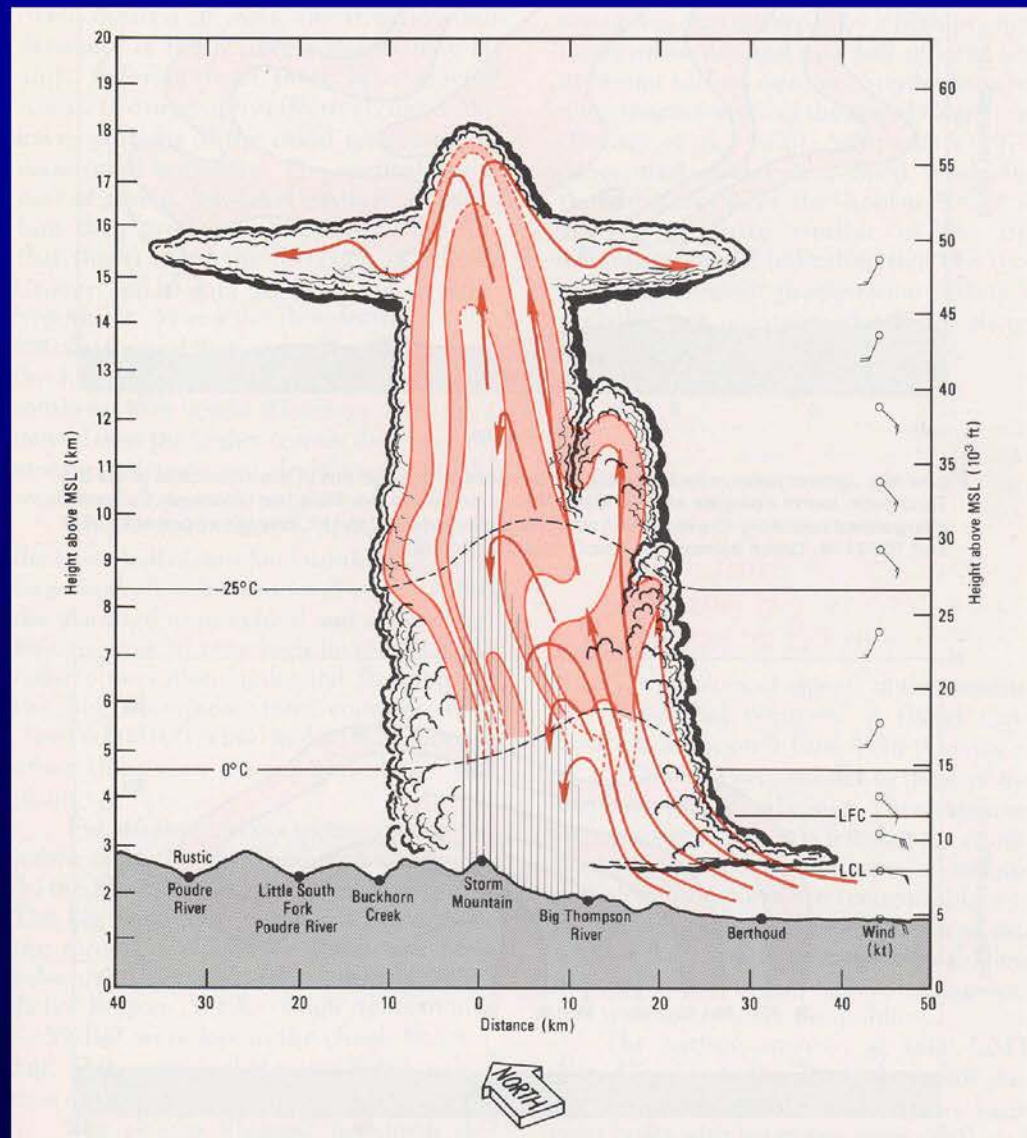


Figure 14. Rainfall (inches) for Fort Collins, Colorado, for 4:00 p.m. MDT July 27, 1997 through 11:00 p.m. MDT for July 28, 1997

If it rains hard enough, everything is in the
“flood plain”

Big Thompson Flood

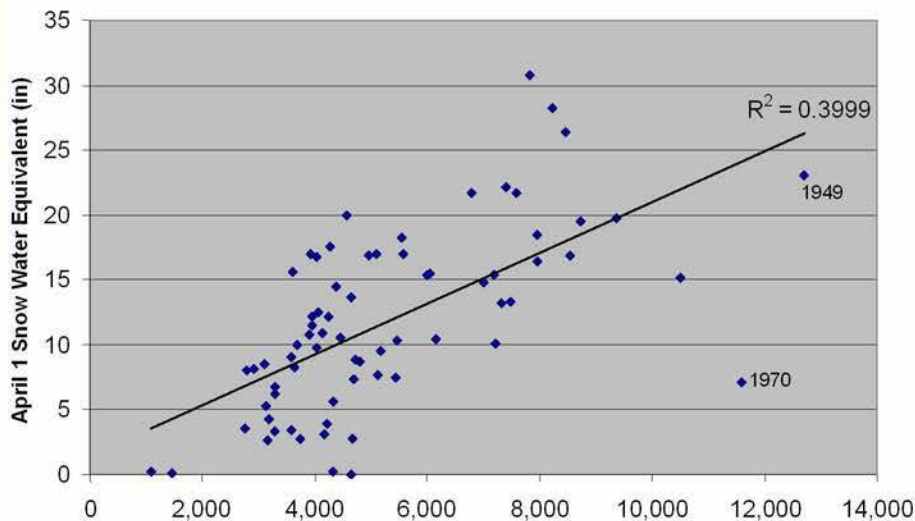


Late April through Mid June is our main season for "volume" floods

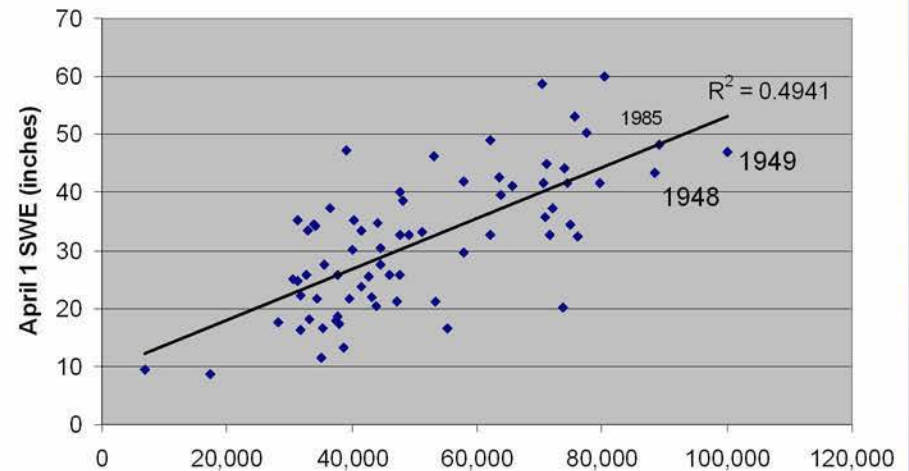


What do we know about how Spring Snowpack relates to Peak Streamflow?

Animas@Durango Peak Streamflow vs. Cascade Mtn
April 1 SWE



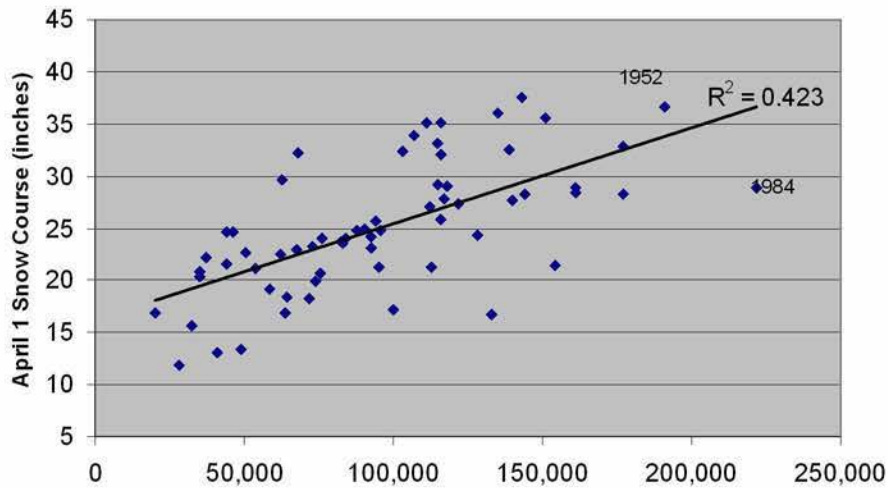
Rio Grande@Del Norte Peak Streamflow vs. Upper San Juan
April 1 SWE



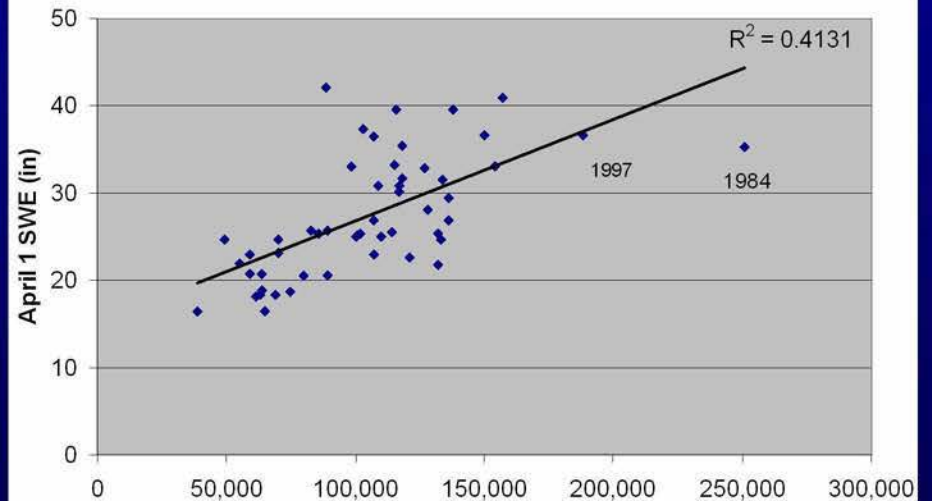
Peak Water Year Streamflow in cfs vs.
April 1 Snow Water Equivalent (SWE) in inches

Peak Streamflow vs. April 1 SWE

ColoRiver@Dotsero Peak Streamflow vs. Lake Irene April 1 SWE

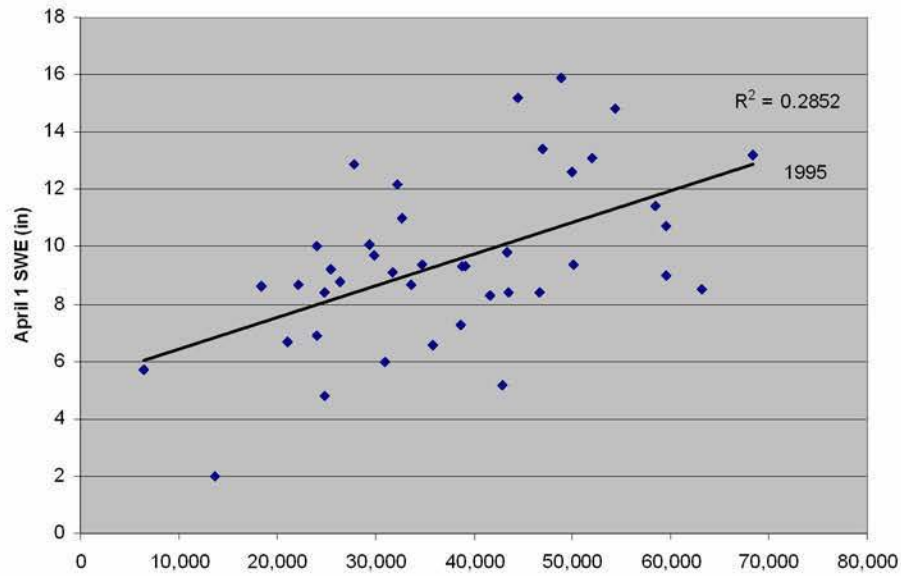


Yampa@Maybell Peak Streamflow vs. Rabbit Ears April 1 SWE

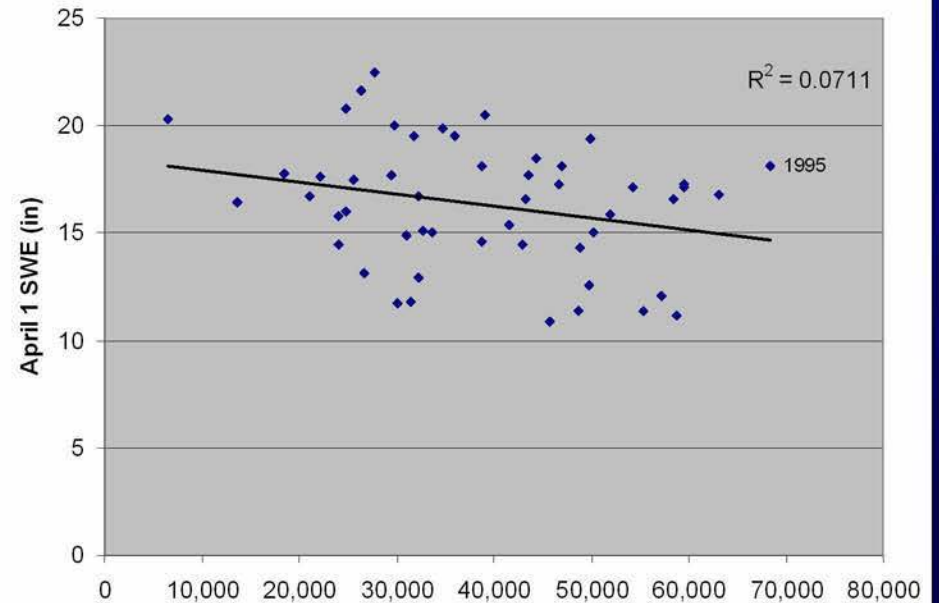


Peak Streamflow vs. April 1 SWE

Arkansas@Parkdale Peak Streamflow vs. Brumley April 1 SWE

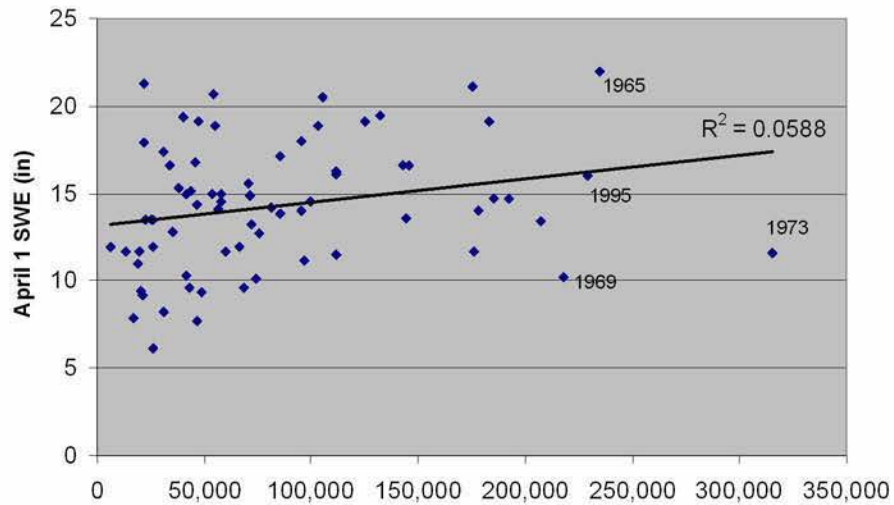


Arkansas@Parkdale Peak Streamflow vs. Porphyry Creek April 1 SWE

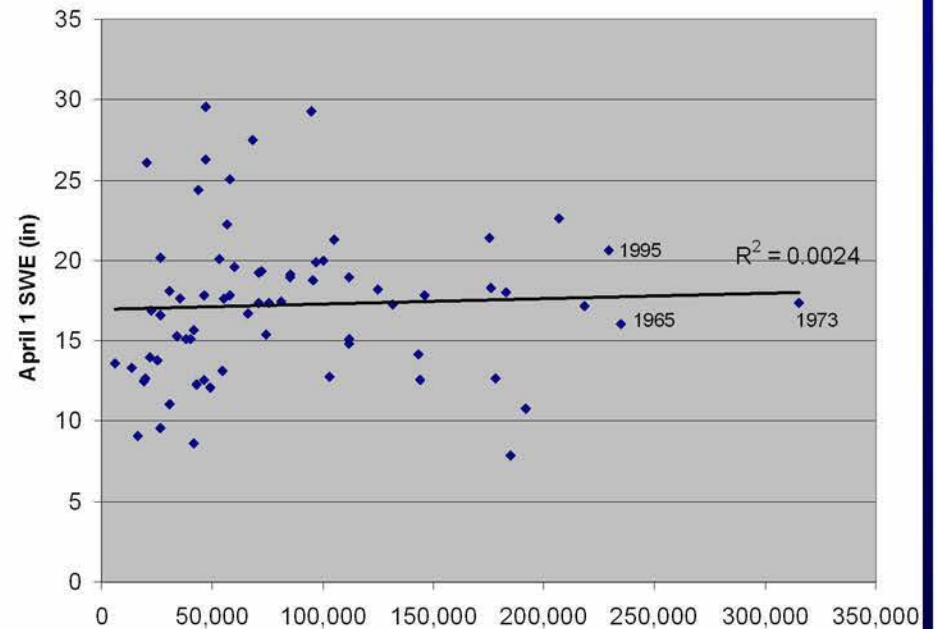


Peak Streamflow vs. April 1 SWE

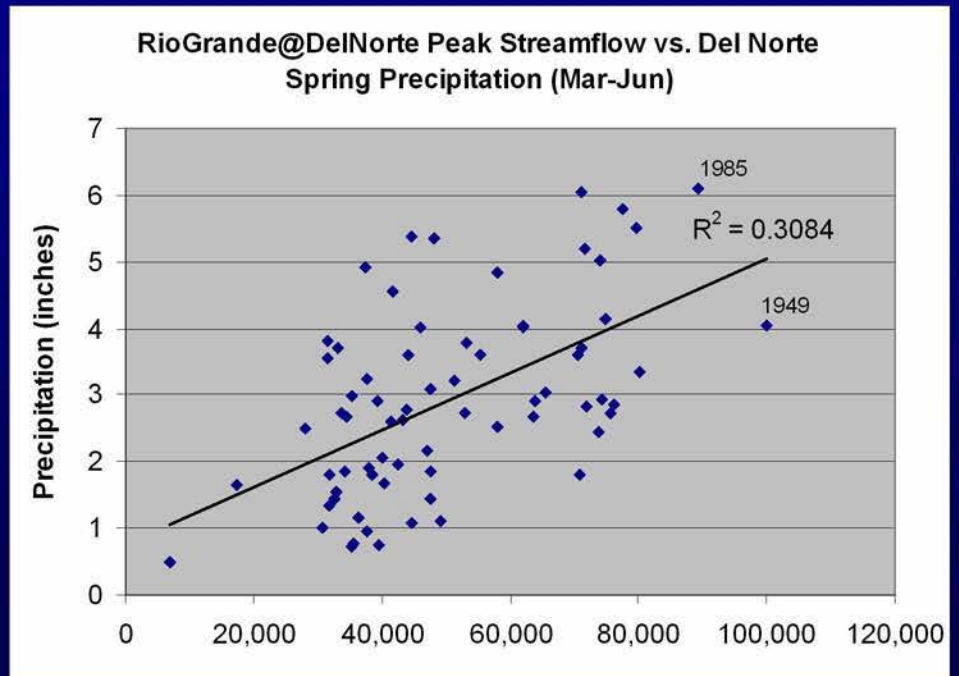
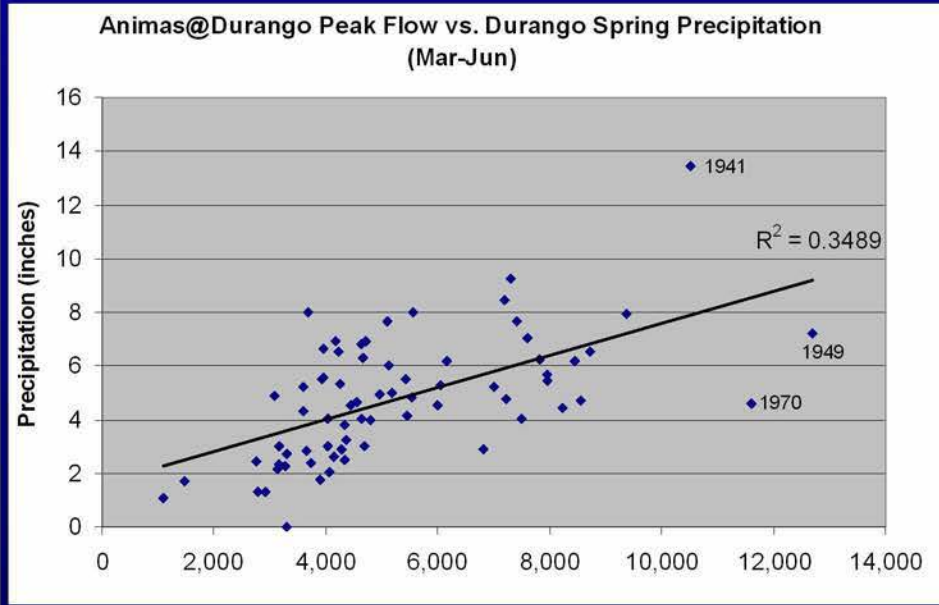
SoPlatte@Kersey Peak Streamflow vs. Hoosier Pass April 1 SWE



SoPlatte@Kersey Peak Streamflow vs. University Camp April 1 SWE

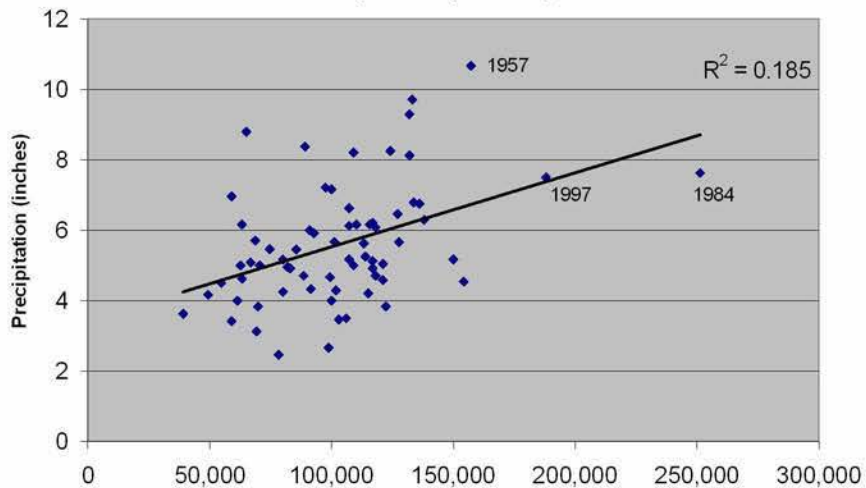


How about Peak Streamflow vs. Spring Precipitation?

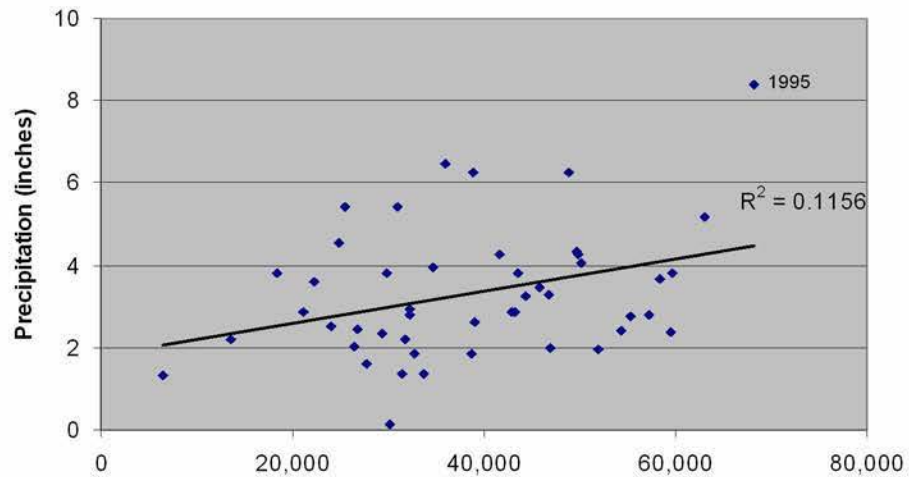


Peak Water Year Streamflow in cfs vs. Spring Precipitation (Mar-June) in inches

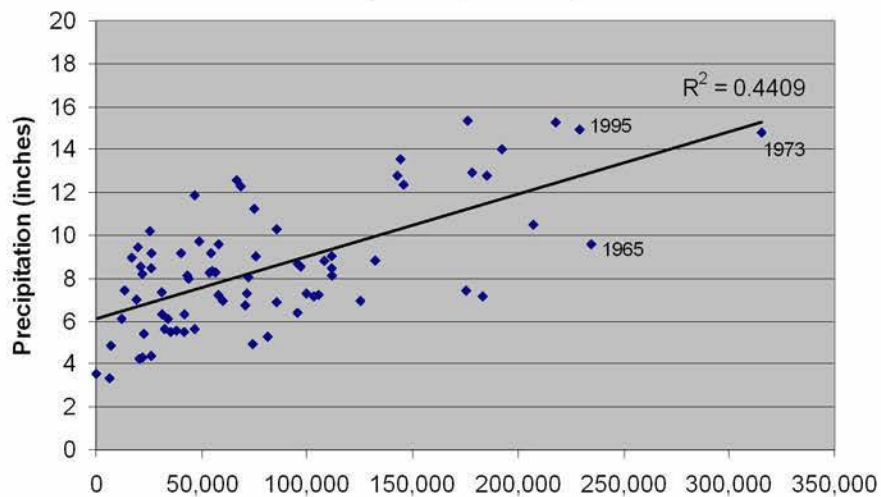
YampaRiver@Maybell Peak Streamflow vs. Hayden Spring Precipitation (Mar-Jun)



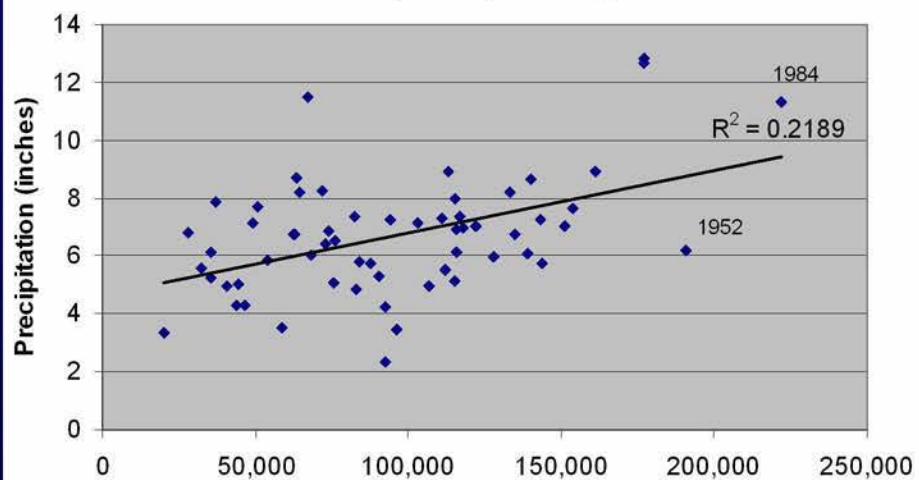
Arkansas@Parkdale Peak Streamflow vs. Buena Vista Precipitation (Mar-Jun)



SoPlatte@Kersey Peak Streamflow vs. Kassler Spring Precipitation (Mar-June)

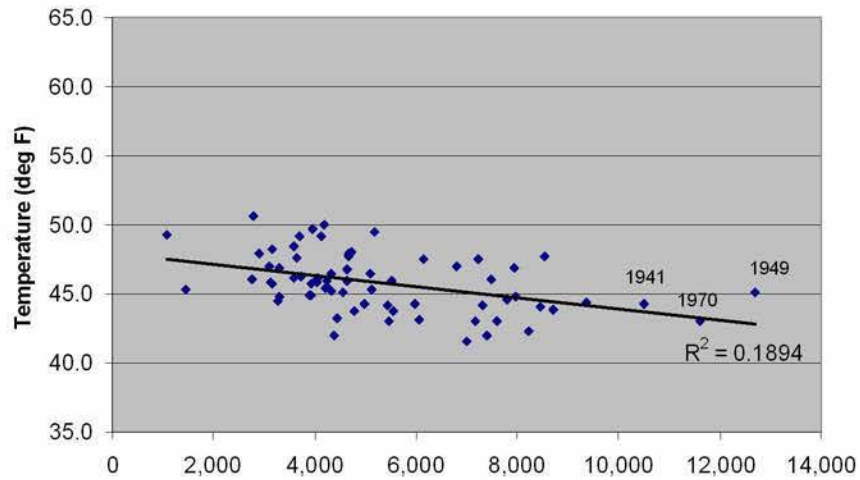


Colo@Dotsero Peak Streamflow vs. Grand Lake 1NW Spring Precipitation (Mar-June)

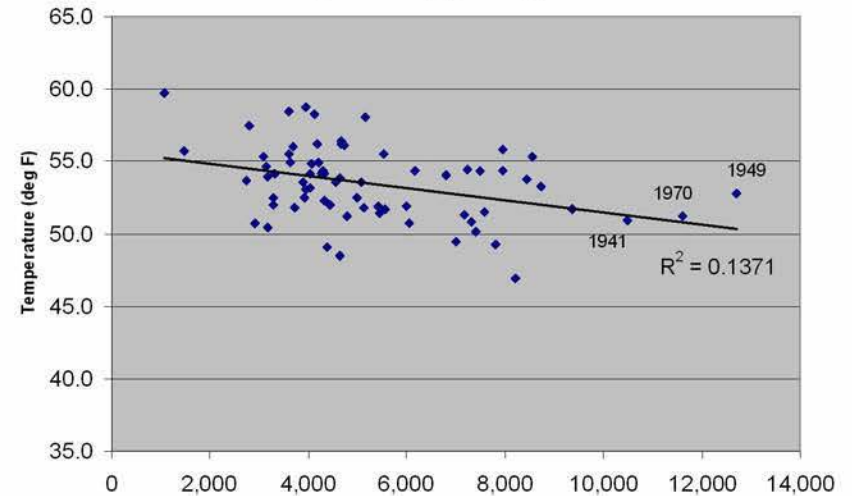


Animas Peak Streamflow vs. Durango Ave Temps

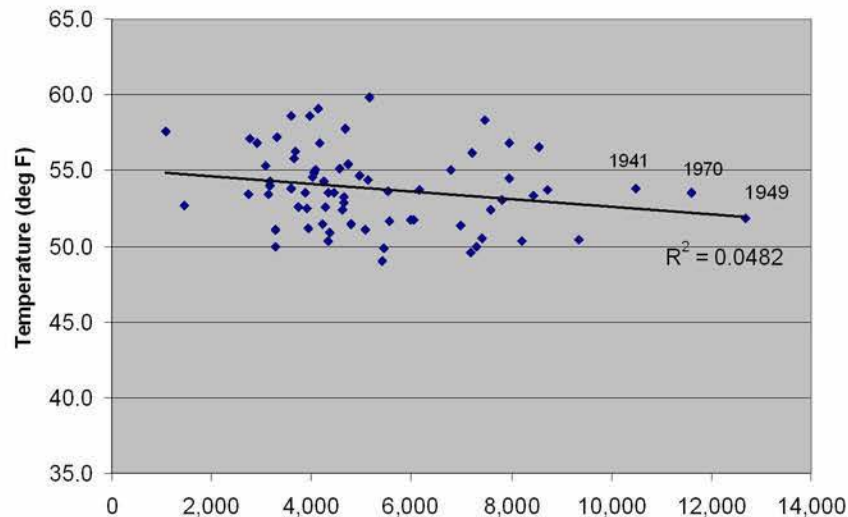
Animas@Durango Peak Flow vs. Durango Average Spring Temperature (Mar-May)



Animas@Durango Peak Flow vs. Durango Average Spring Temperatures (April-May)



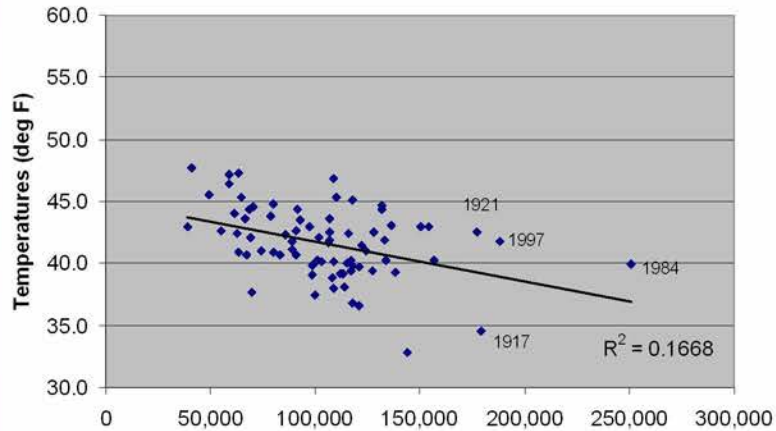
Animas@Durango Peak Flow vs. Durango Average Spring Temperatures (May)



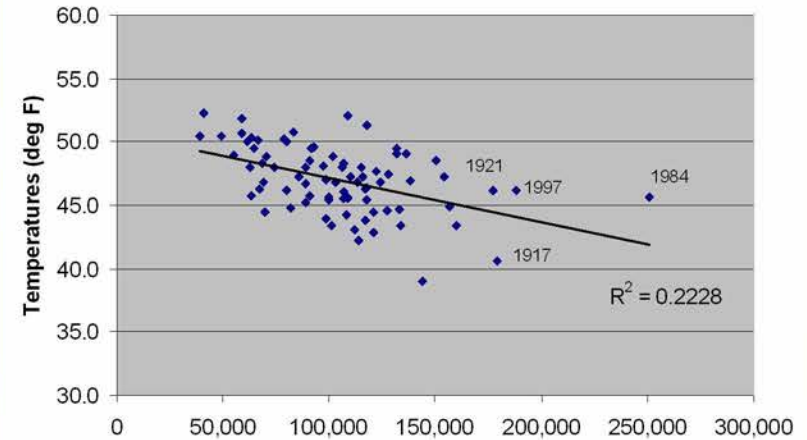
Peak Water Year Streamflow in cfs vs. Average Temperatures in degrees F

Yampa Peak Streamflow vs. Hayden Ave Temps

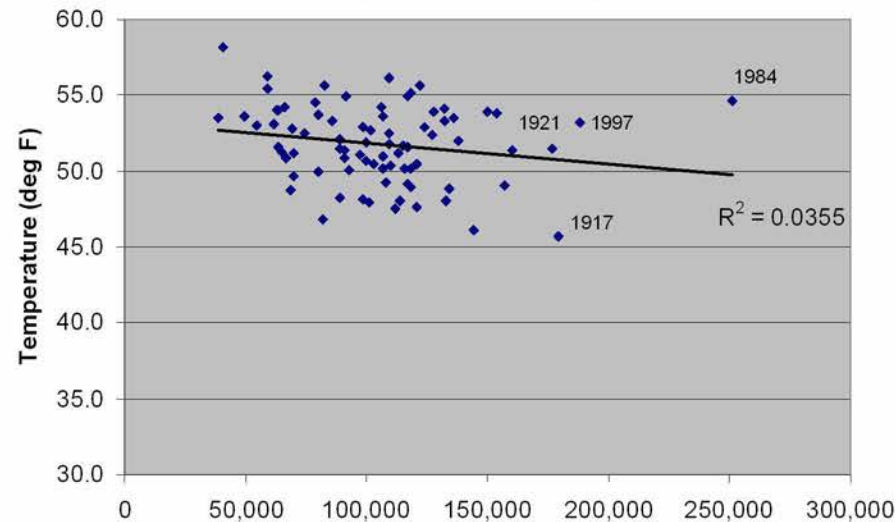
YampaRiver@Maybell Peak Streamflow vs. Hayden Average Spring Temperatures (Mar-May)



YampaRiver@Maybell Peak Streamflow vs. Hayden Average Spring Temperatures (April-May)

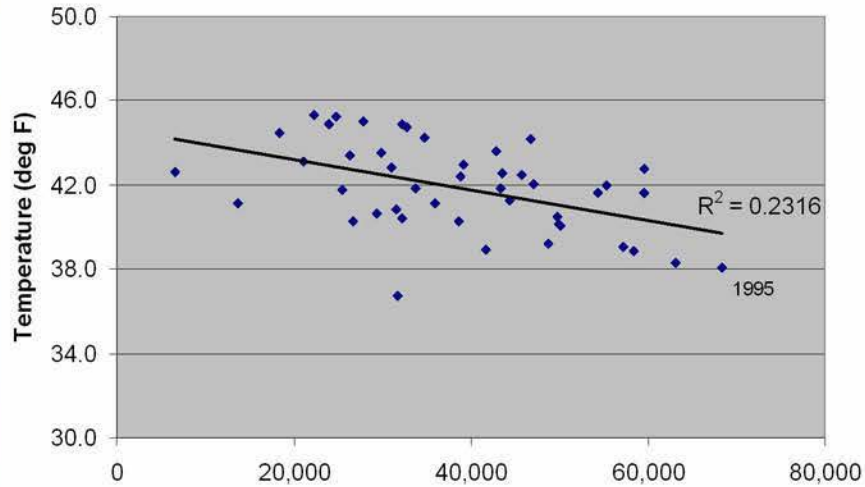


YampaRiver@Maybell Peak Streamflow vs. Hayden Average Spring Temperatures (May)

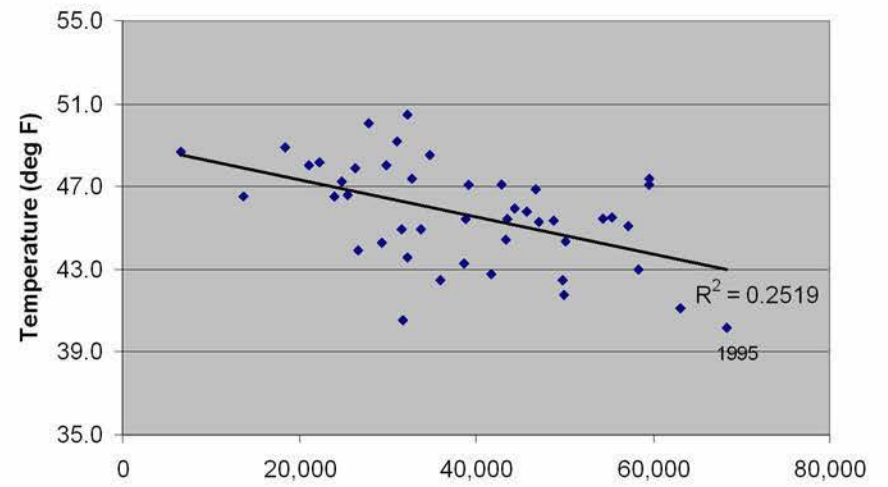


Arkansas Peak Streamflow vs. Buena Vista Ave Temps

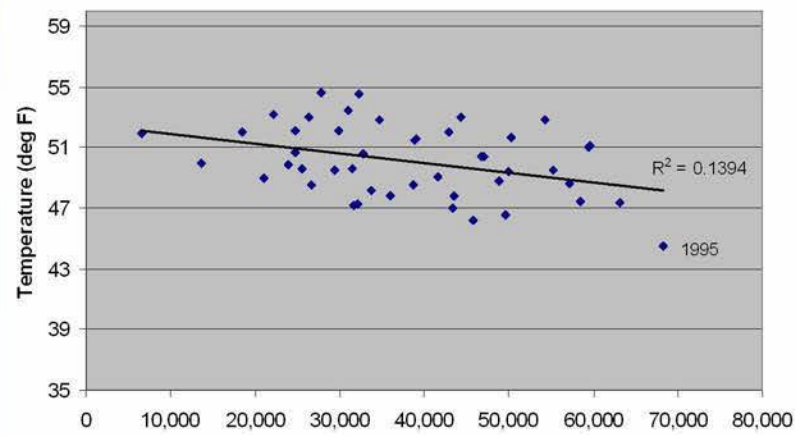
Arkansas@Parkdale Peak Streamflow vs. Buena Vista Average Spring Temps (Mar-May)



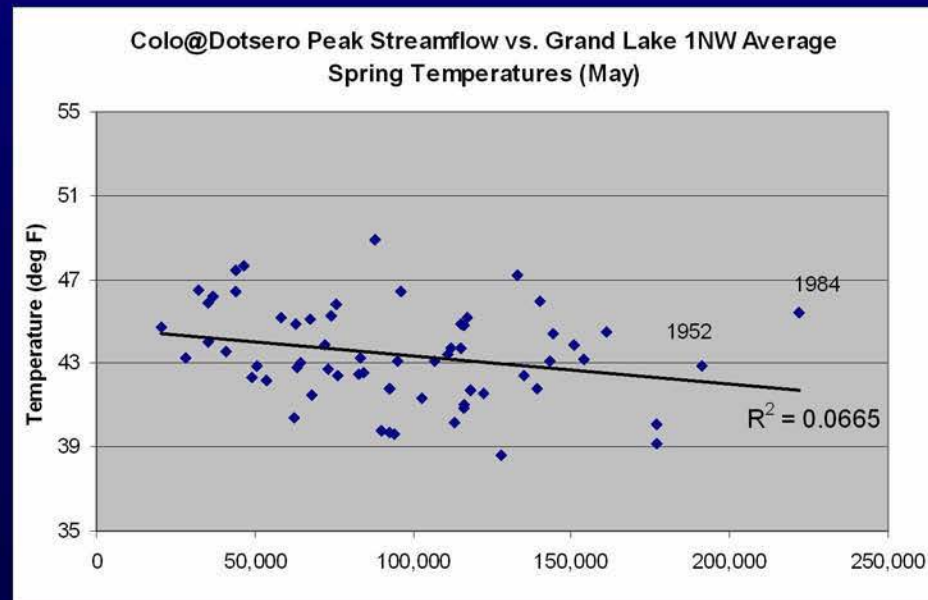
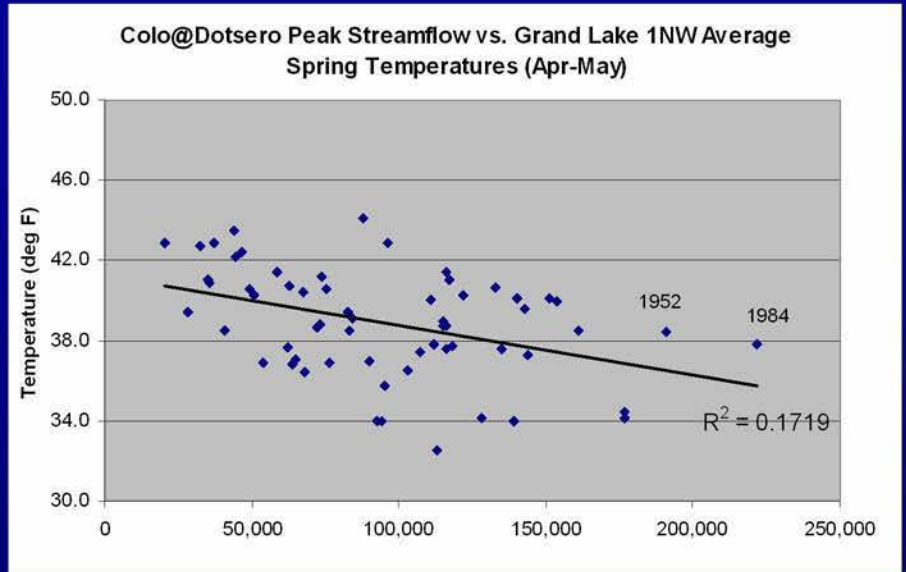
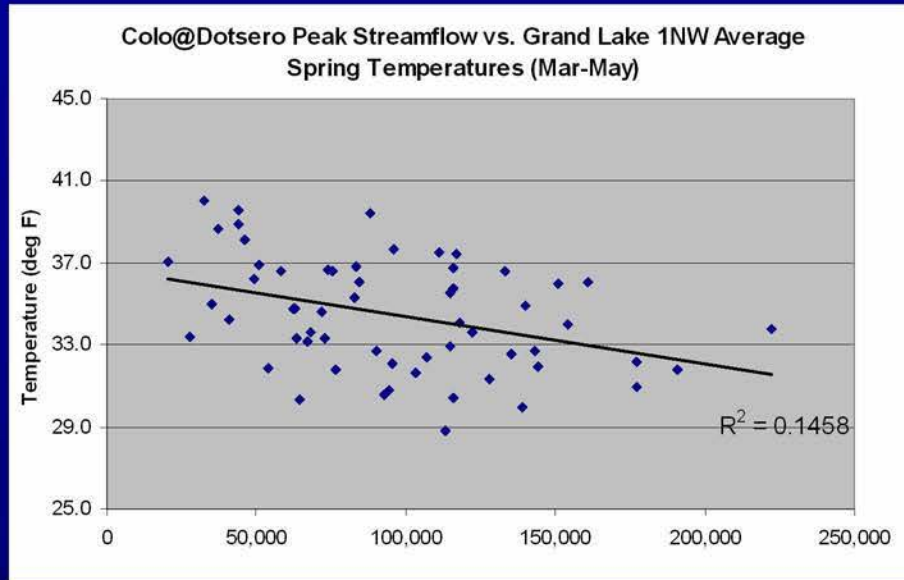
Arkansas@Parkdale Peak Streamflow vs. Buena Vista Average Spring Temps (Apr-May)



Arkansas@Parkdale Peak Streamflow vs. Buena Vista Average Spring Temps (May)

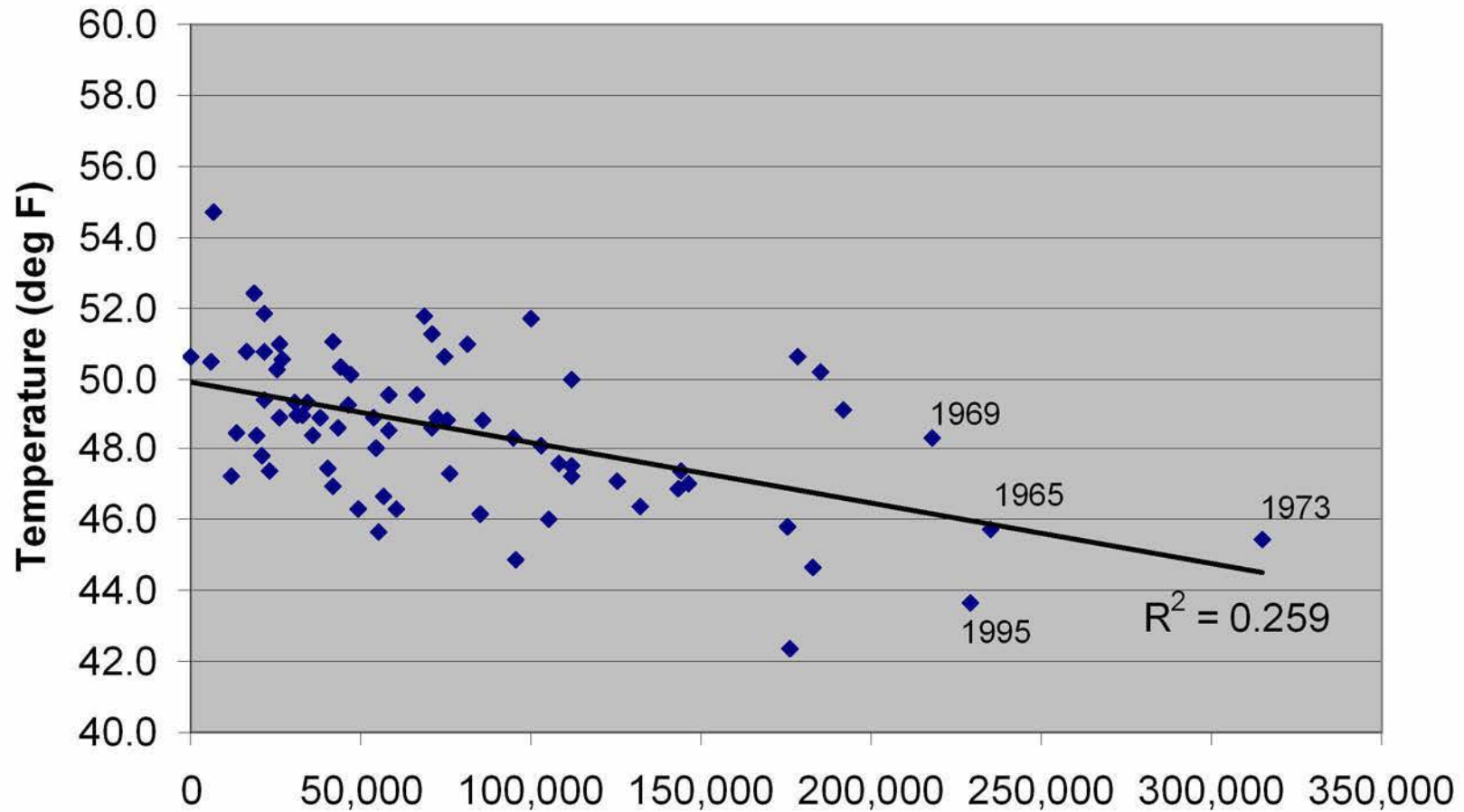


Colorado Peak Streamflow vs. Grand Lake 1NW Ave Temps



South Platte Streamflow vs. Kessler Ave Temps

SoPlatte@Kersey Peak Streamflow vs. Kessler Average Spring Temperatures (Mar-May)



Colorado Climate Center

**Data and Power Point Presentations
available for downloading**

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

- **click on “Drought”**
- **then click on “Presentations”**