

# 2011: A Really Big Year

**Kevin Werner**

*NWS Colorado Basin River Forecast Center*

**Colorado River District Annual Water Seminar**  
**Sept 15, 2011**  
**Grand Junction, CO**





# Outline

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- River Forecast Center overview
- 2011 runoff review
- Forecast verification
- 30 year average update



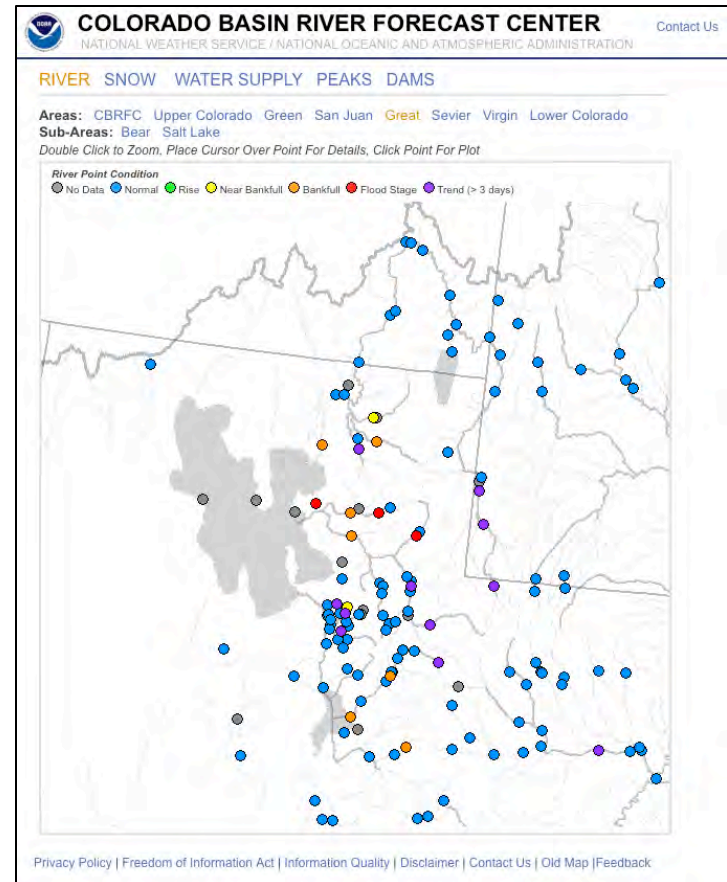
# Colorado Basin River Forecast Center



The Colorado Basin River Forecast Center (CBRFC) generates streamflow forecasts across the Colorado and Utah. The latest forecasts, data, and more are available online:

- **Daily streamflow forecasts**
- **Long lead peak flow forecasts**
- **Water supply forecasts**
- **Webinar briefings**
- **Email updates**
- **And More....**

[www.cbrfc.noaa.gov](http://www.cbrfc.noaa.gov)



# Late 2010

October 18, 2010, 2:05 PM

## Lake Mead Hits Record Low Level

By FELICITY BARRINGER



Jim Wilson/The New York Times

Bleached rock indicating a former high-water mark on outcroppings surrounding Lake Mead.



Sometime between 11 and noon on Sunday, the water level in Lake Mead, the massive reservoir whose water fills the taps of millions of people across the Southwest, fell [lower](#) than it ever has since it was filled 75 years ago.

## The New York Times



## Drought-stricken Lake Mead falls to a level not seen since 1937



K.M. CANNON/LAS VEGAS REVIEW-JOURNAL

An aerial photo taken Saturday shows the marina operations in Lake Mead's Hemenway Harbor, just down the hill from Boulder City. All of the docks shown used to be located elsewhere but had to be moved to their present locations because of the reservoir's falling water level. » [Buy this photo](#)

BY HENRY BREAN  
LAS VEGAS REVIEW-JOURNAL

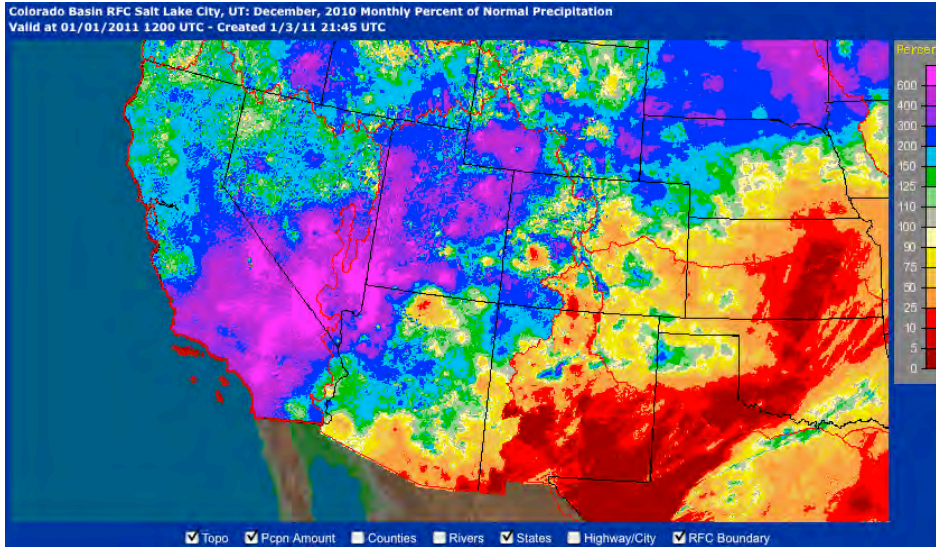
Posted: Oct. 19, 2010 | 12:00 a.m.  
Updated: Oct. 19, 2010 | 7:17 a.m.

Oddly, the drought's latest milestone arrived on a rainy day.

### Tools

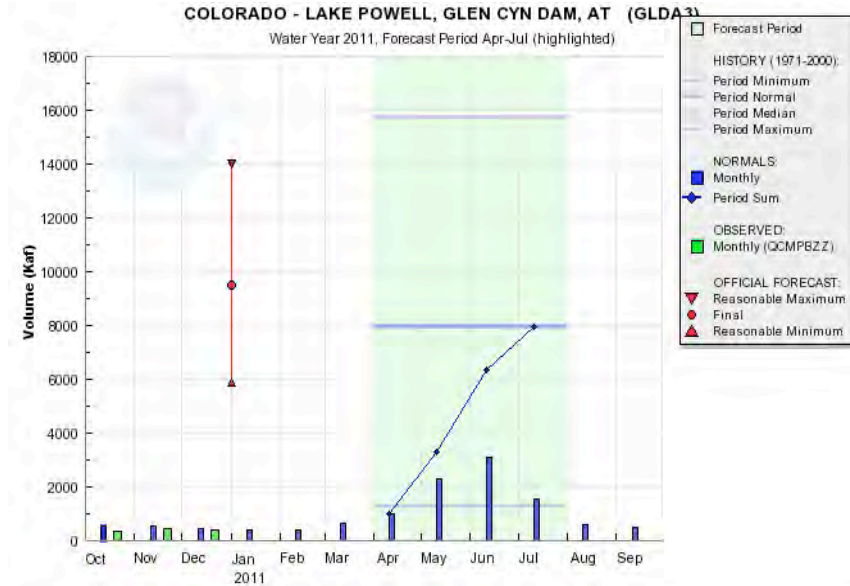
183	28
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Print	Share

# Early 2011



## Pre Holiday Storm:

- Lake Mead up ~2 feet from local runoff
- Large snow accumulation
- Forecasts reflected that....

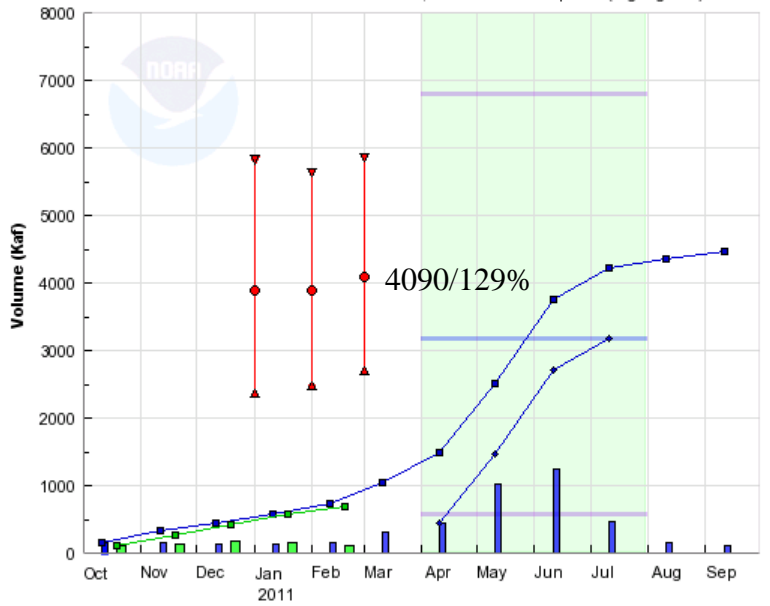


CBRFC/NWS/NOAA,01/07/11 15:21:06 UTC

**Irrational Exuberance?**



**GREEN - GREEN RIVER, UT (GRVU1)**  
Water Year 2011, Forecast Period Apr-Jul (highlighted)



Forecast Period

HISTORY (1971-2000):  
 - Period Minimum  
 - Period Normal  
 - Period Maximum

NORMALS:  
 - Monthly  
 - Period Sum  
 - Water Year Sum

OBSERVED:  
 - Monthly (OCMPAZZ)  
 - Water Year Sum

OFFICIAL FORECAST:  
 - Reasonable Maximum  
 - Final  
 - Reasonable Minimum

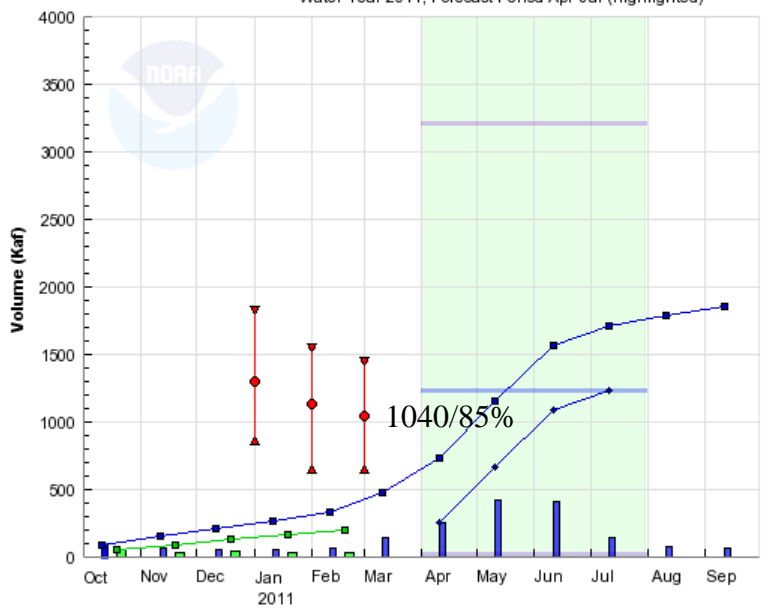
**Seasonal Water Supply Forecast**

Forecast Period: Apr-Jul

<b>9500 kaf</b> 50% Exceedence (Official Forecast)	<b>123.7%</b> of Historical Median	<b>119.8%</b> of Historical Mean
<b>7200 kaf</b> 90% Exceedence	<b>12300 kaf</b> 10% Exceedence	<b>34th of 102</b> Official Historical Flows

Forecast issued: Apr 1 2011 [View Water Supply Forecast Plot](#)

**SAN JUAN - BLUFF, NR (BFFU1)**  
Water Year 2011, Forecast Period Apr-Jul (highlighted)



Forecast Period

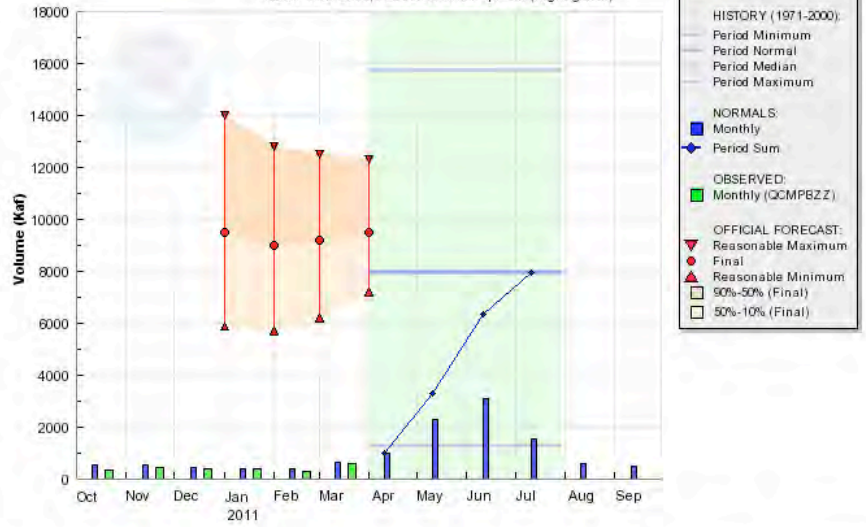
HISTORY (1971-2000):  
 - Period Minimum  
 - Period Normal  
 - Period Maximum

NORMALS:  
 - Monthly  
 - Period Sum  
 - Water Year Sum

OBSERVED:  
 - Monthly (OCMPAZZ)  
 - Water Year Sum

OFFICIAL FORECAST:  
 - Reasonable Maximum  
 - Final  
 - Reasonable Minimum

**COLORADO - LAKE POWELL, GLEN CYN DAM, AT (GLDA3)**  
Water Year 2011, Forecast Period Apr-Jul (highlighted)



Forecast Period

HISTORY (1971-2000):  
 - Period Minimum  
 - Period Normal  
 - Period Median  
 - Period Maximum

NORMALS:  
 - Monthly  
 - Period Sum

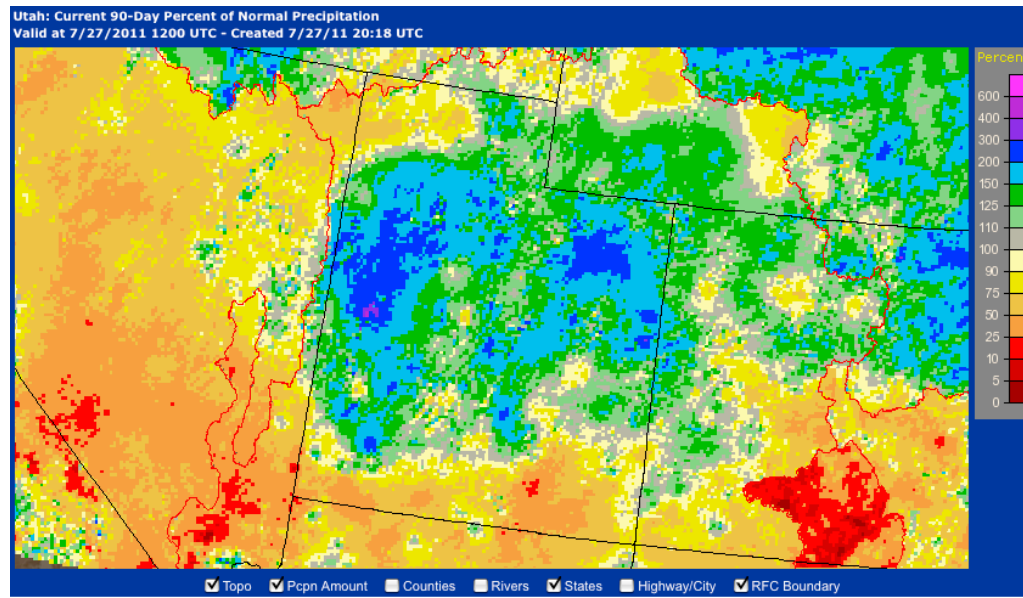
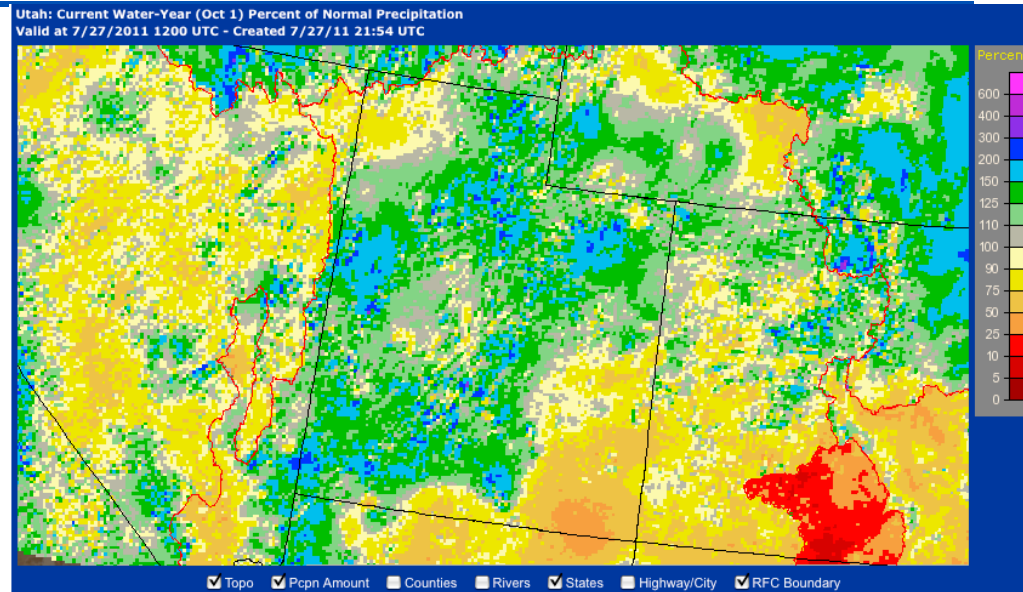
OBSERVED:  
 - Monthly (OCMPBZZ)

OFFICIAL FORECAST:  
 - Reasonable Maximum  
 - Final  
 - Reasonable Minimum  
 - 90%-50% (Final)  
 - 50%-10% (Final)

CBRFC/NWS/NOAA 04/07/11 00:16:40 UTC

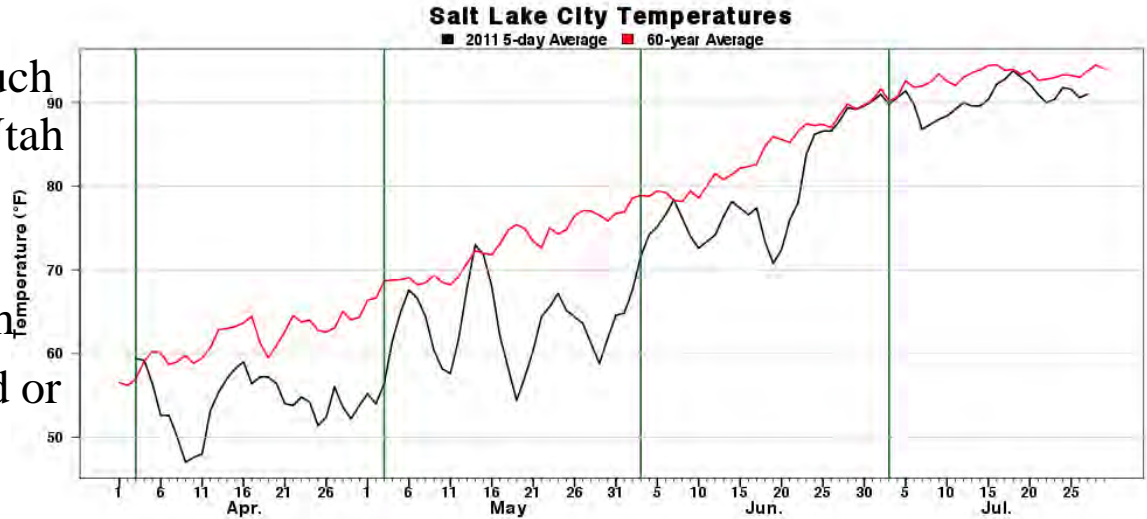
# Spring 2011

- ❏ Winter and Spring 2011 were much wetter than normal for most of Utah – especially the months of March/April/May
- ❏ Spring was very cold across Utah
- ❏ Snowpack accumulated to record or near record amounts at most SNOTEL sites
- ❏ Snow melt was delayed – and largely tempered by cool May/June weather
- ❏ Flood did occur in low elevation basins (May/June) and high elevation basins (late June/July)



# Spring 2011

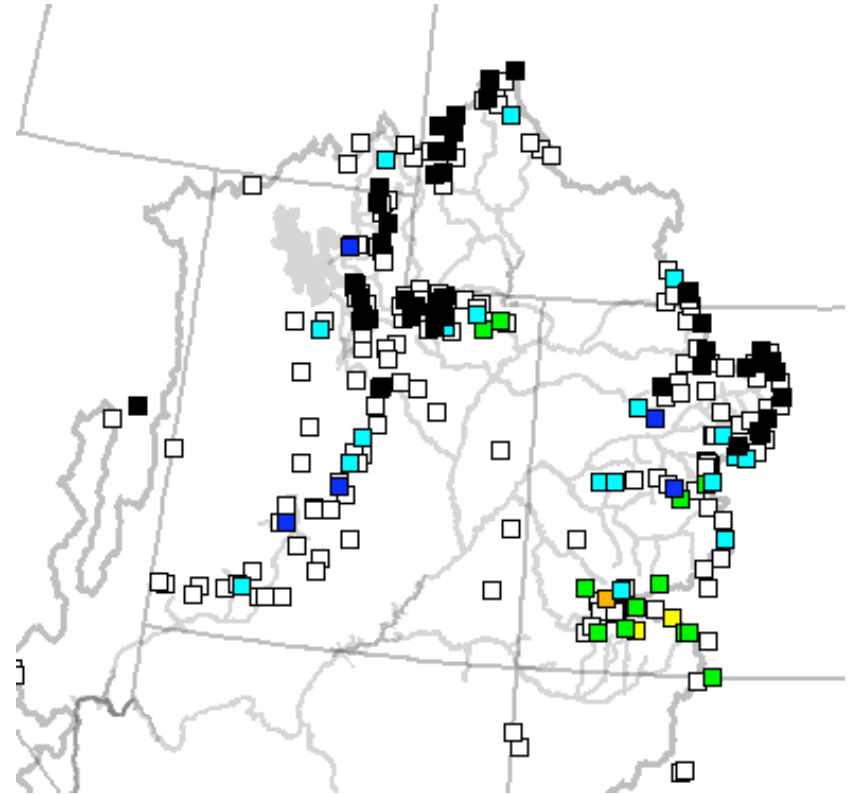
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Year	Number of Days Below Normal	Standard Deviation of Below Normal Days
2011	82	-2.55
1998	84	-1.88
1996	82	-1.84
1983	79	-1.62
1983	77	-1.48
1989	76	-1.51
1991	75	-1.34
1978	75	-1.54
1983	73	-1.19
1982	73	-1.19
2010	71	-1.05
1988	71	-1.03

Average number of days below 60-year average: 26.32 days  
Standard deviation of days below 60-year average: 13.97 days

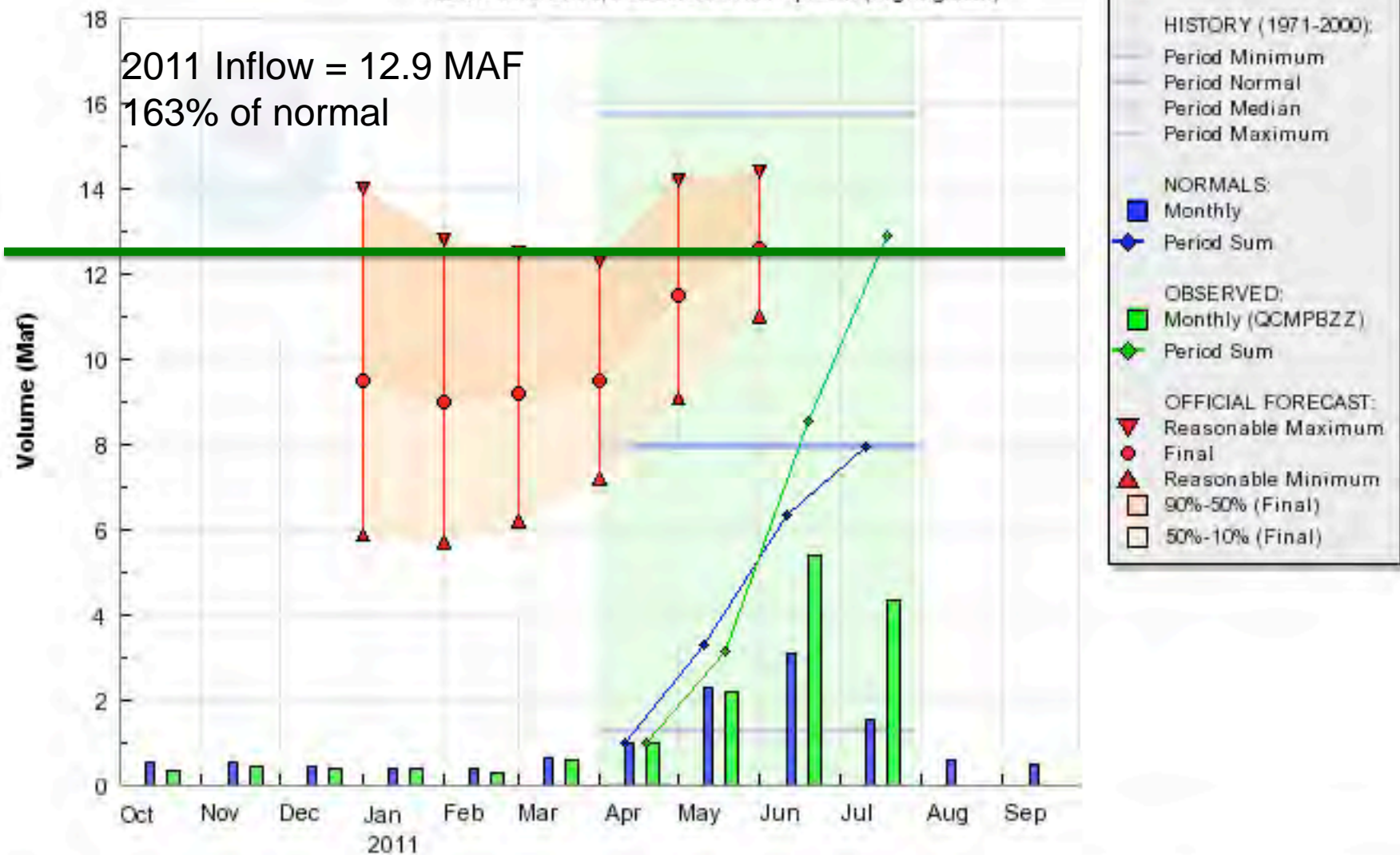
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# COLORADO - LAKE POWELL, GLEN CYN DAM, AT (GLDA3)

Water Year 2011, Forecast Period Apr-Jul (highlighted)

2011 Inflow = 12.9 MAF  
163% of normal



by cool May/June weather

10 Flood did occur in low elevation

# Flooding and High Flows

denverpost.com



## Yampa River remains steady at Steamboat Springs; flood stage hits Monday

By Matt Stensland  
Steamboat Pilot

BOOKMARK PRINT EMAIL COMMENTS

POSTED: 06/02/2011 11:09:02 AM MDT  
UPDATED: 06/02/2011 11:10:57 AM MDT

Recommend One person recommends this.

The height of the Yampa River remained steady overnight through Steamboat Springs, but it's expected to rise during the course of the day today and peak at about 7 feet tonight at the Fifth Street bridge measuring site, according to the National Weather Service in Grand Junction.



The Yampa River flows by Fish Creek Mobile Home Park on Thursday morning. Sandbags line the banks. (STEAMBOAT TODAY | Matt Stensland)

A similar trend is expected to continue into Monday, with the forecast calling for high temperatures in the 70s.

The Yampa is forecast to reach 7.7 feet at Fifth Street by 6 a.m. Monday. The flood stage at that location is 7.5 feet. The third highest recorded height at that location is 7.65 feet, set on June 3, 1997. The record crest was June 8, 1905, when the river reached 8.9 feet. A year ago the Yampa peaked at 6.72 feet on June 7.

## Colorado River still running high, causing flooding in some areas

Parts of the Colorado River are still swollen, overflowing it's banks in some spots.

Posted: 8:45 AM Jun 9, 2011  
Reporter: Cecile Juliette  
Email Address: [cecile.juliette@nbc11news.com](mailto:cecile.juliette@nbc11news.com)



Story 0 Comments

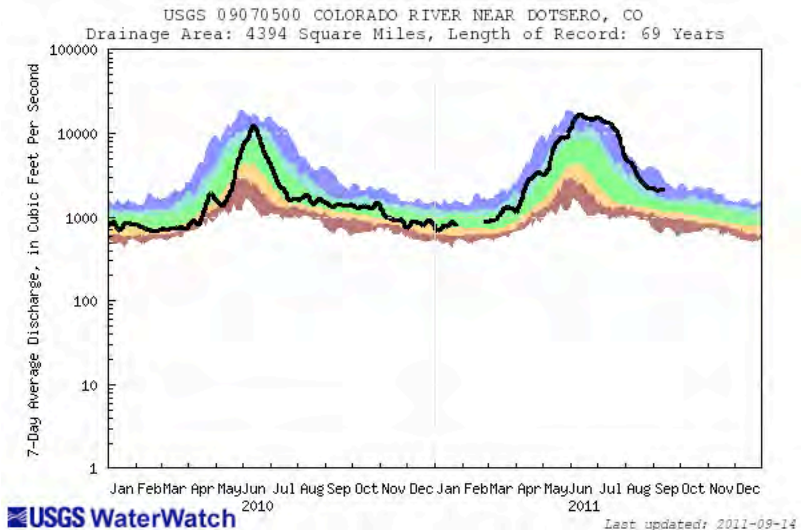
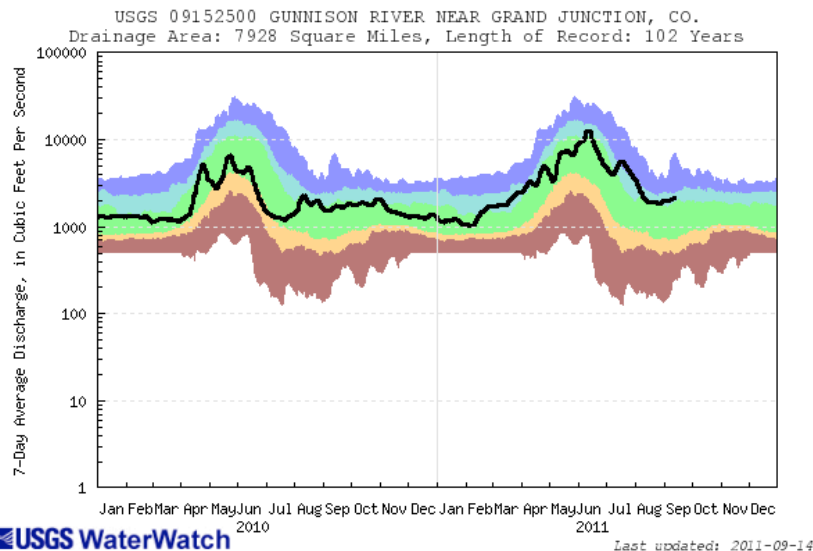
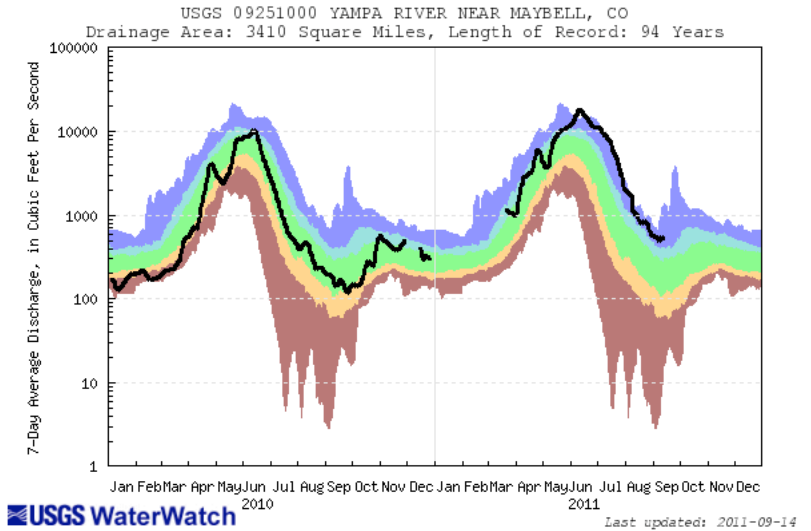
MESA COUNTY, Colo. (KKCO) - The [Colorado River](#) is still cresting in parts of Mesa County, according to the National Weather Service.

Font Size: A A A

An early morning check of the Cameo gauge on Thursday revealed that the [Colorado River](#) had receded slightly. On Wednesday it was recorded at 13.4 feet, and on Thursday it measured 13.1 feet.

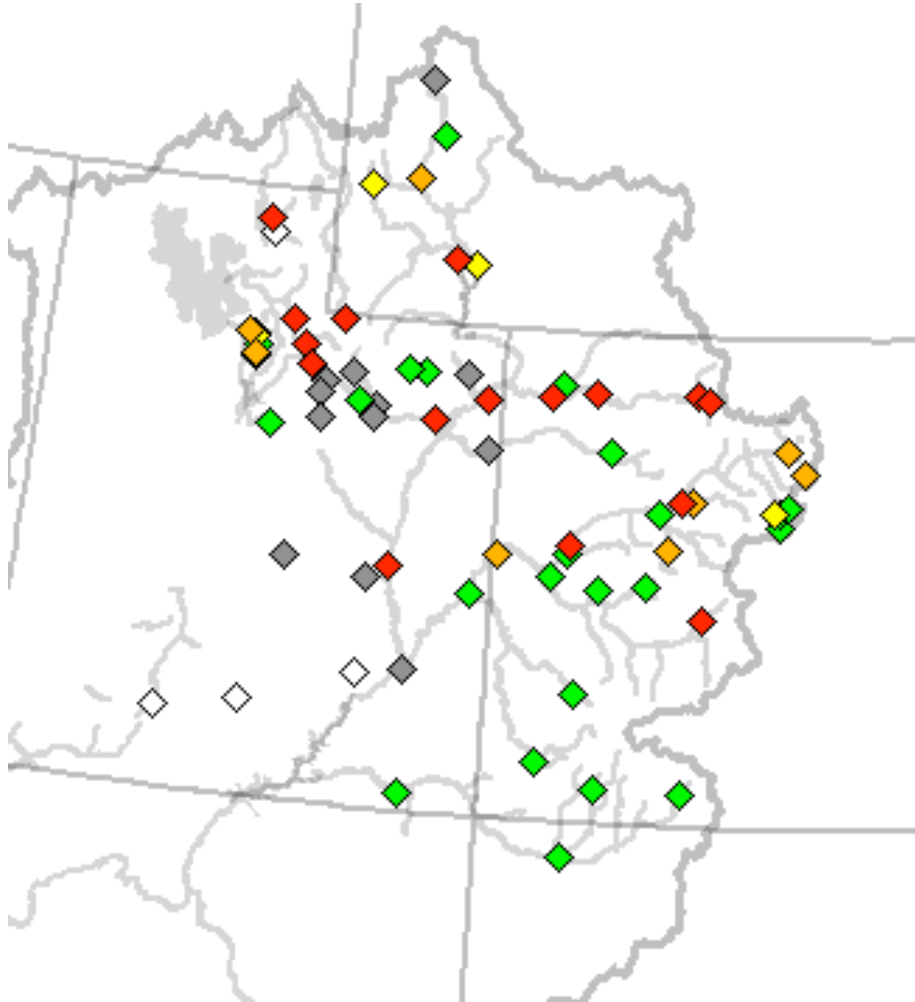
# Flooding and High Flows

Wettest area was northern Colorado  
 Upper Colorado also quite wet  
 Gunnison divided web from normal  
 Dolores, San Juan basins nearer normal

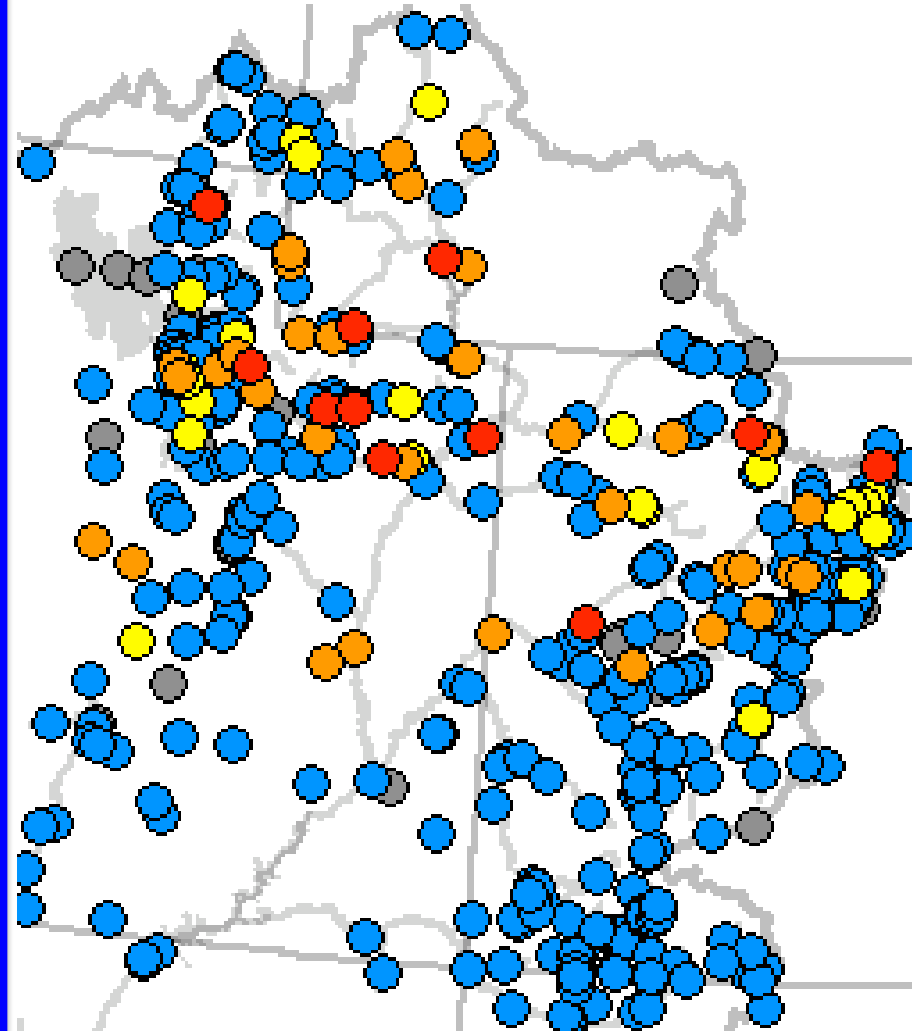


# Peak Flow Forecasts

## Long Lead Peak Flow Forecasts



## Daily Forecasts

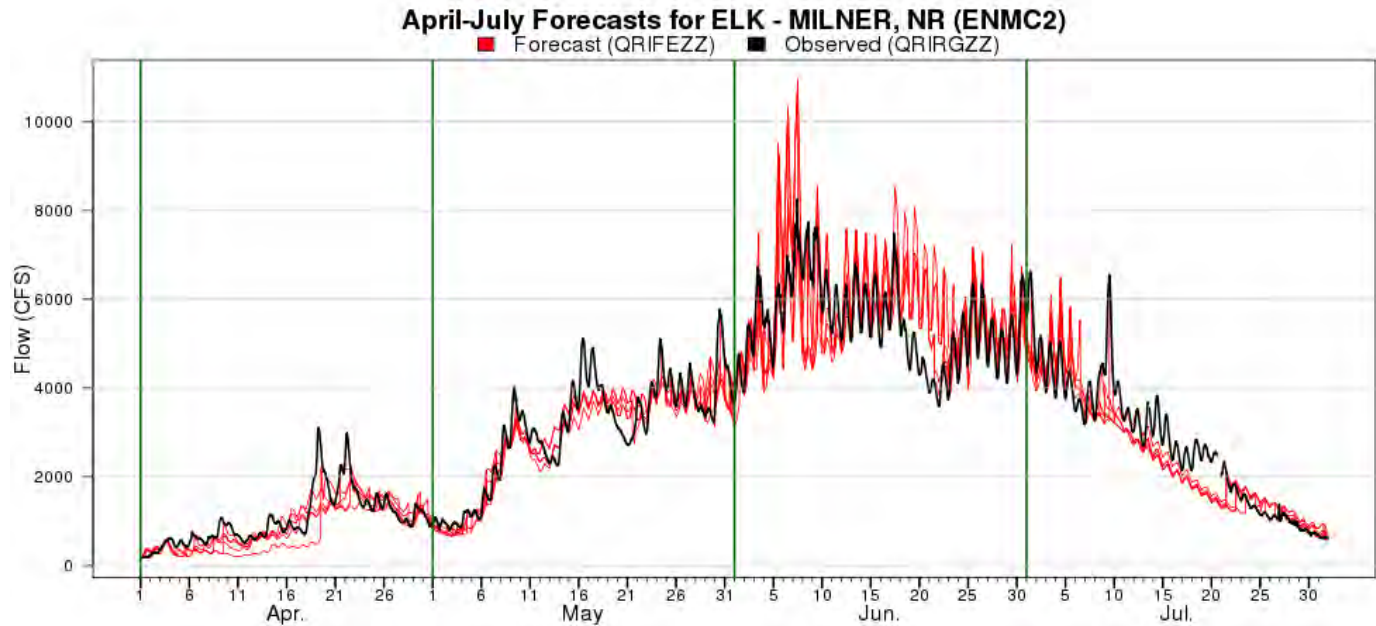


# Yampa: Daily Forecasts

Yampa / White Rivers generally peaked in June

Very high (many records) snowpack

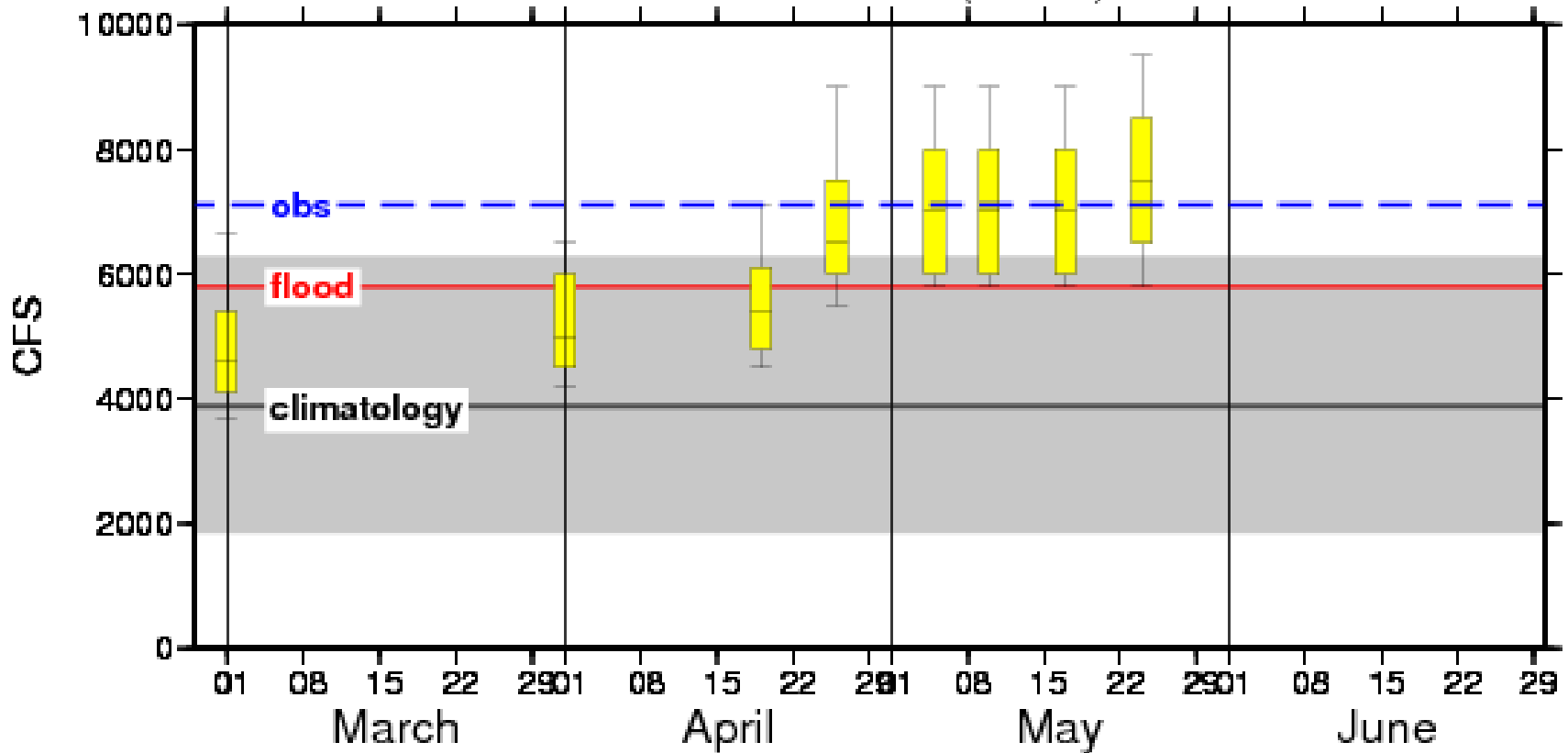
Cool June somewhat mitigated high flows although rivers flowed high for several weeks



# Yampa: Long Lead Peak Forecasts

## Peak Flows Forecast Ranges, WY 2011

*Elk R. near Milner (enmc2)*

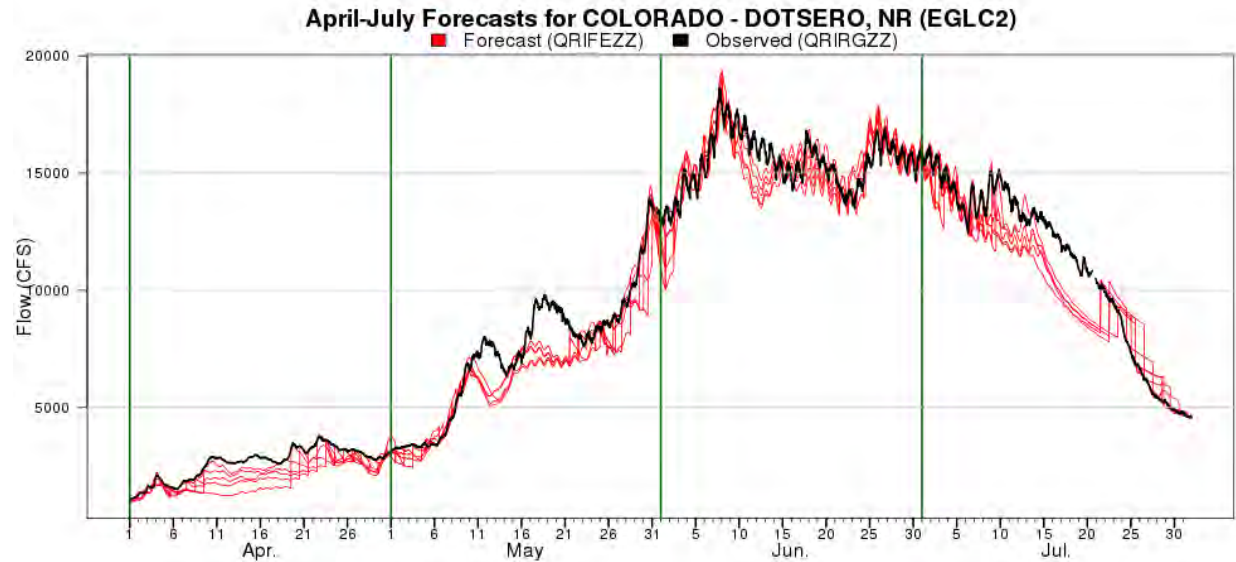


# Upper Colorado

Upper Colorado includes many high elevation basins that peaked late into June or early July

Near record snowpack caused high flows

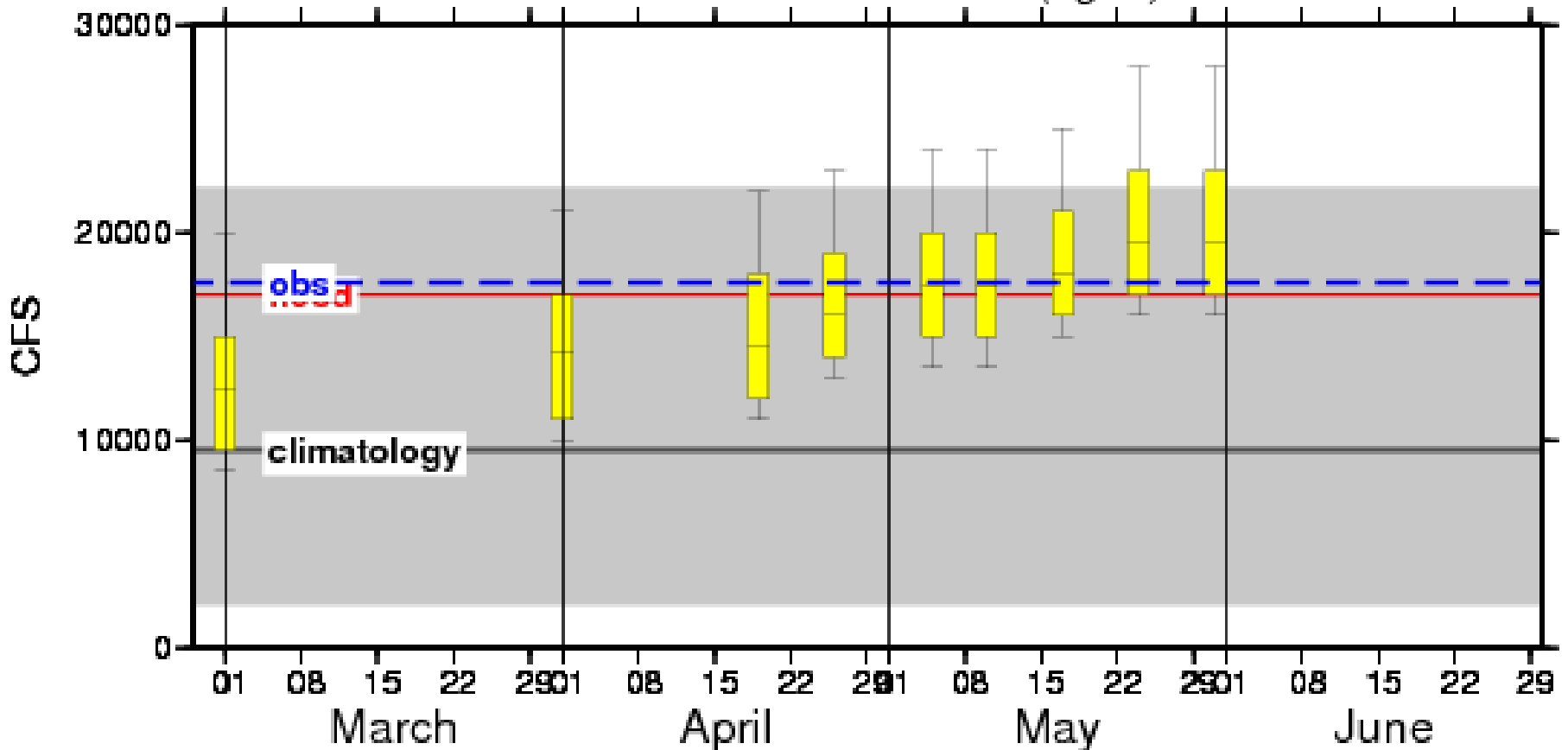
High flows were mitigated by cool June temperatures



# Upper Colorado: Long Lead Peak Forecasts

## Peak Flows Forecast Ranges, WY 2011

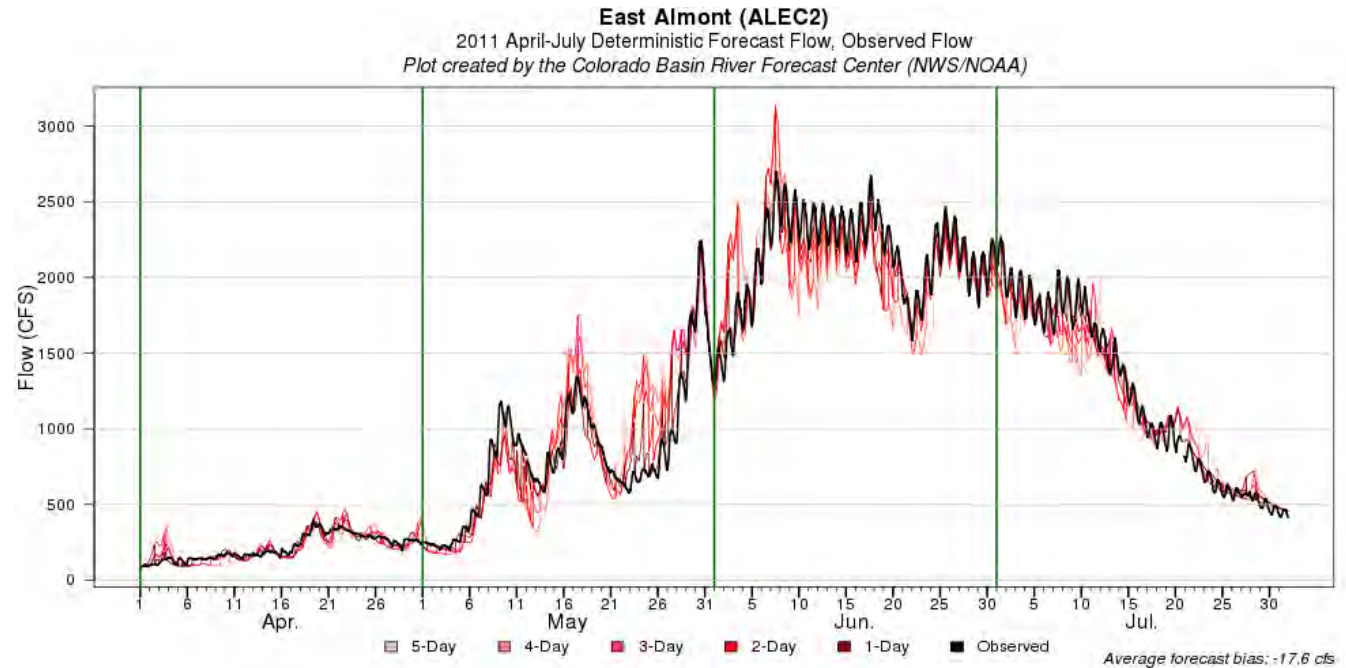
*Colorado R. near Dotsero (eglc2)*



# Gunnison

Gunnison basin divided wet conditions to the north and near average to the south. Hwy 50 was a rough dividing line

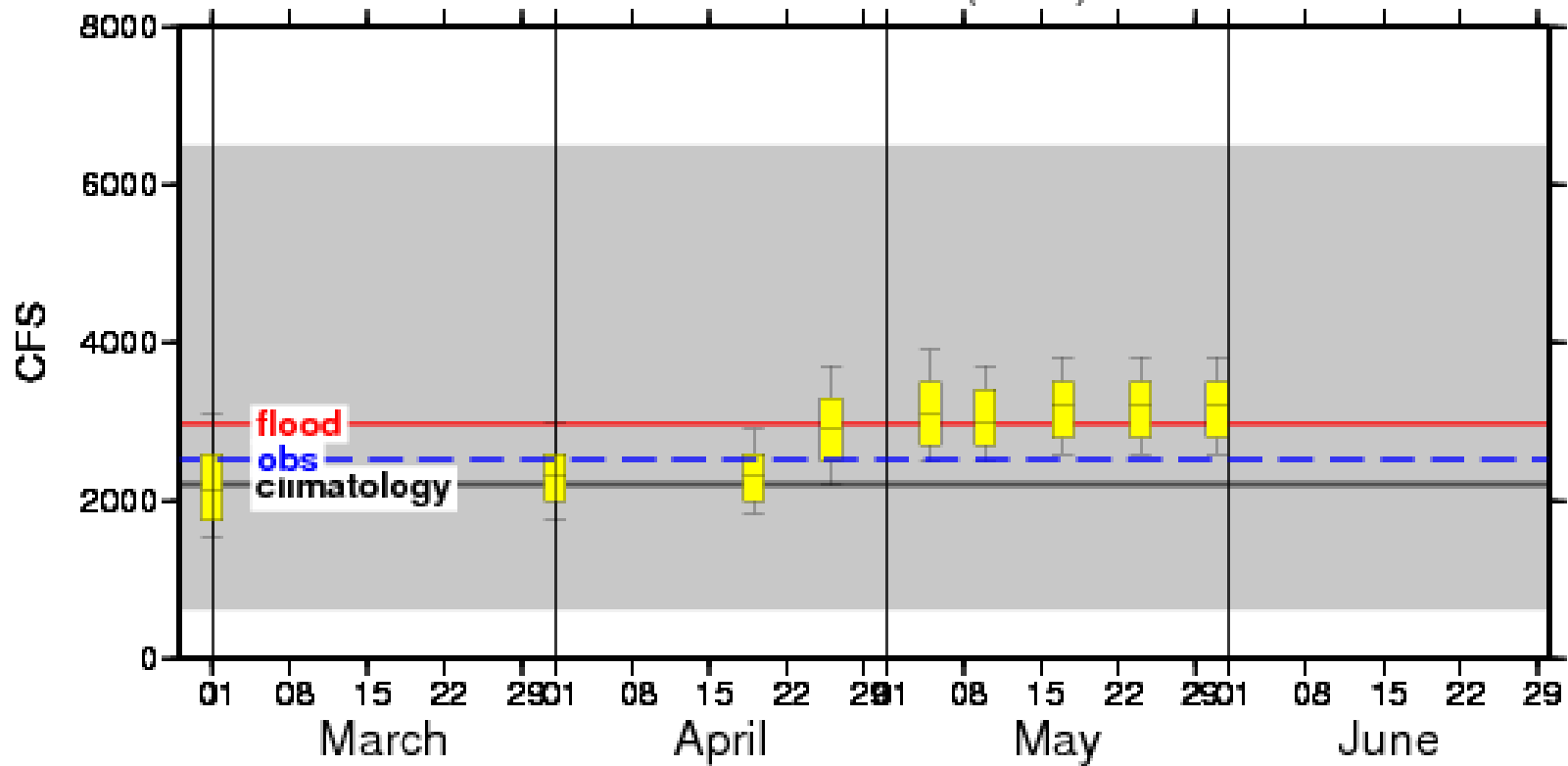
Peaks mostly in early June with continued high flows through June and even July (monsoon moisture)



# Gunnison: Long Lead Forecasts

## Peak Flows Forecast Ranges, WY 2011

*East R. at Almont (alec2)*





# 2010 Summary

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- ☑ 2011: cool and wet spring made for unique hydrology. Both long lead and daily forecasts performed relatively well.
- ☑ More forecast verification:
  - ☑ Temperature forecasts
  - ☑ Water supply forecasts
- ☑ Forecast Issues
  - ☑ Struggled with some reservoir release plans in some cases
  - ☑ Temperature forecasts in late May / early June were much too high causing streamflow forecasts to be too high
- ☑ Upcoming CBRFC activities
  - ☑ November 4 stakeholder forum – Denver, CO
  - ☑ Annual recap and outlook webinar – Oct/Nov
  - ☑ Individual meetings with water managers

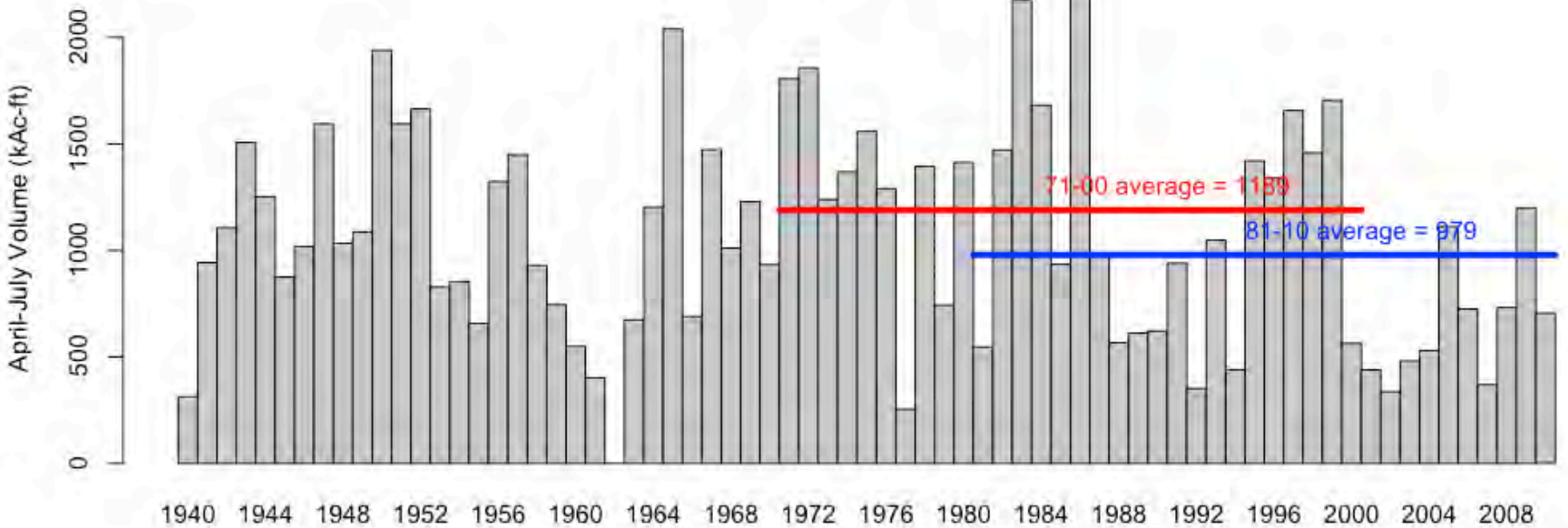


# 30 year average update

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- 30 year averages are updated once every 10 years
- Currently using
  - 1971-2000 for averages
  - 1971-2000 for statistical prediction
  - 1976-2005 for ESP
- Update for **WY2012** will be based on 1981-2010 averages
- Trends in monthly precipitation are important for ESP

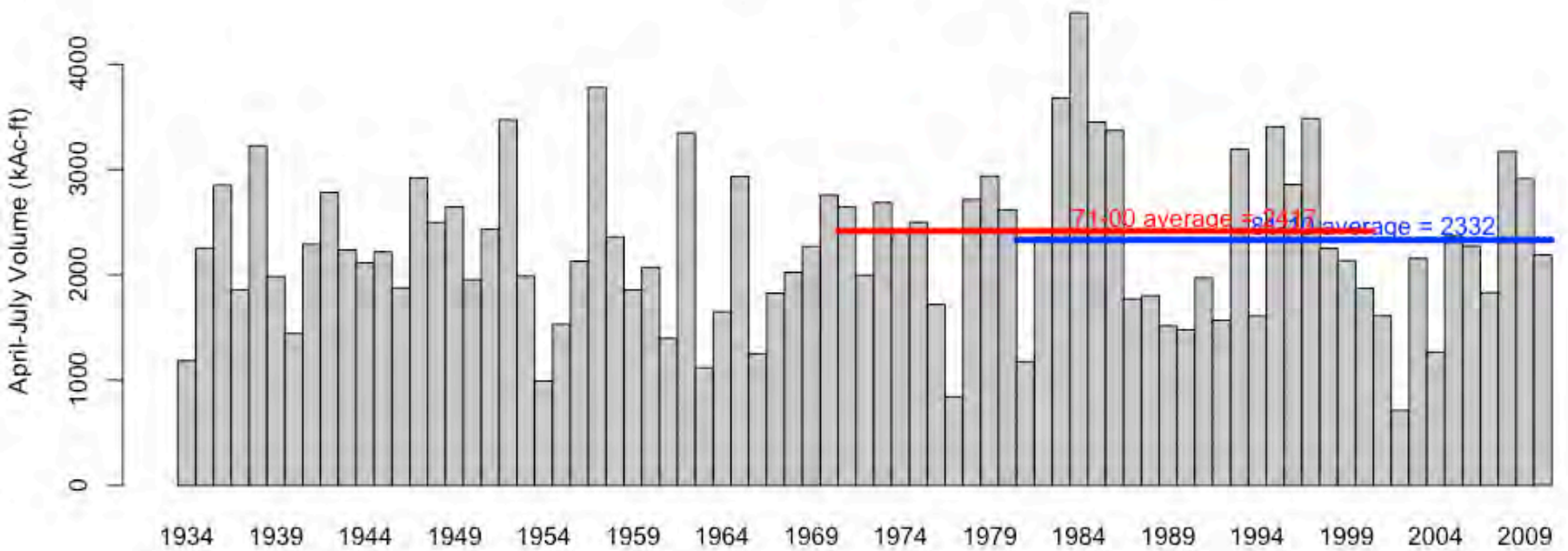
## Flaming Gorge Inflow



Preliminary Data

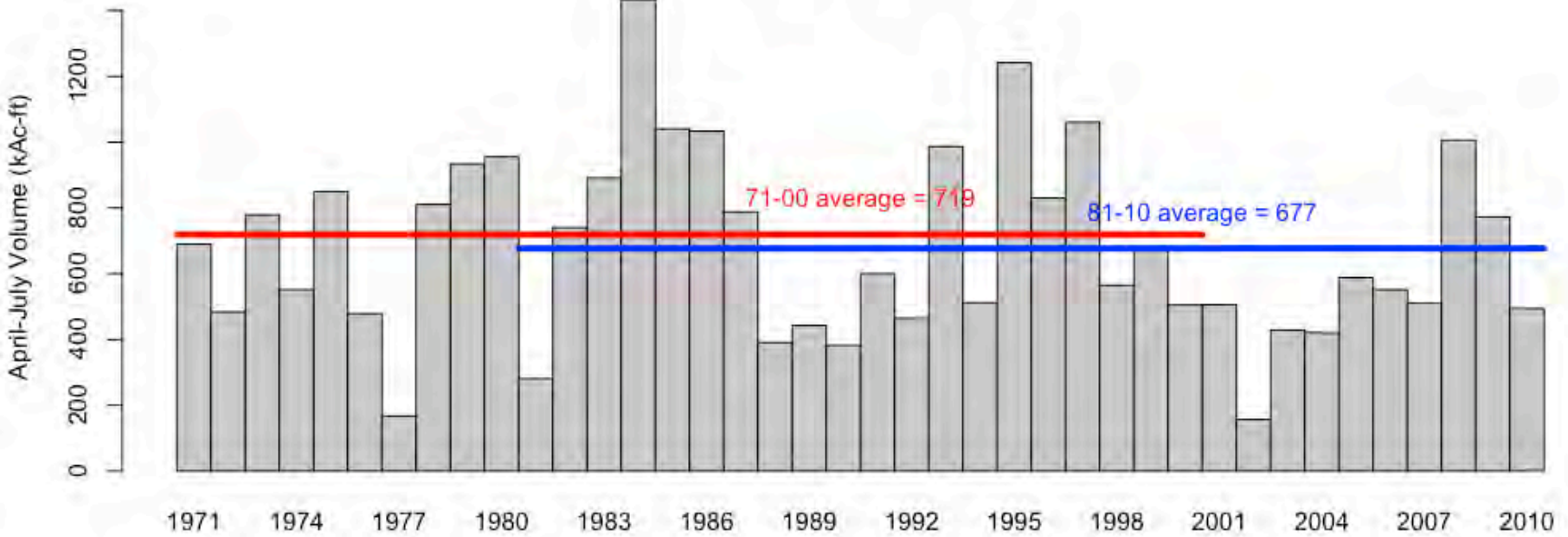
18% reduction in mean

## Colorado @ Cameo



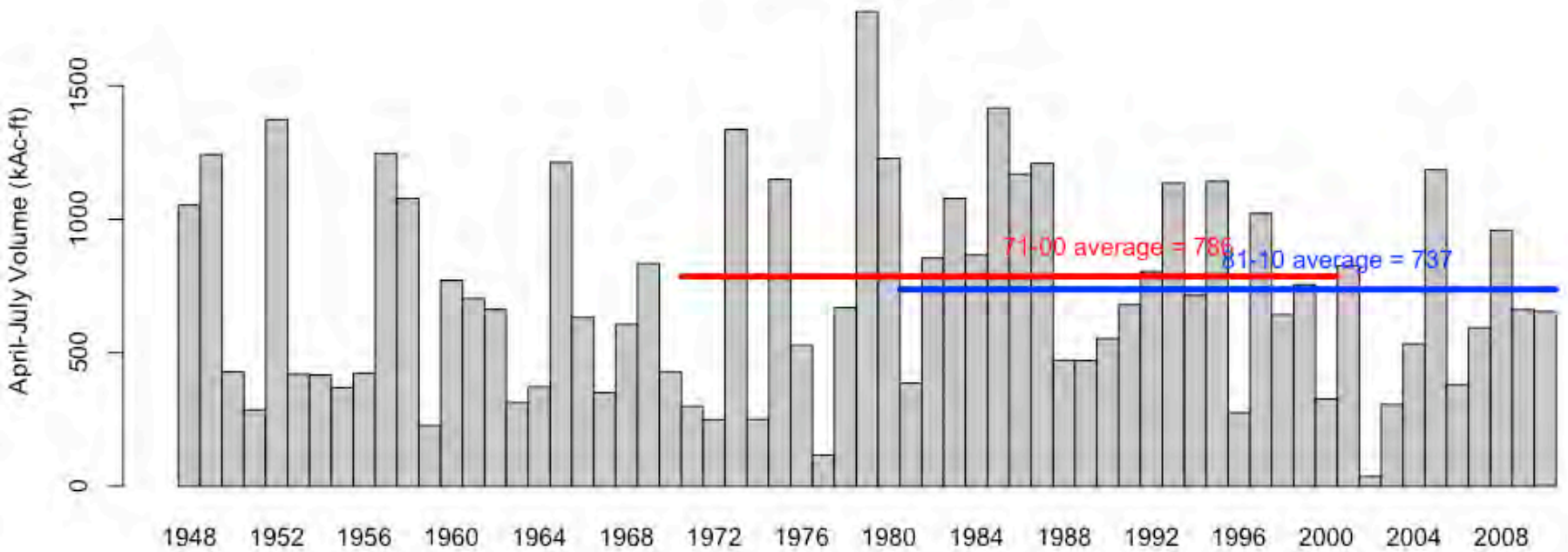
- Preliminary Data
- 4% reduction in mean

## Blue Mesa Inflow



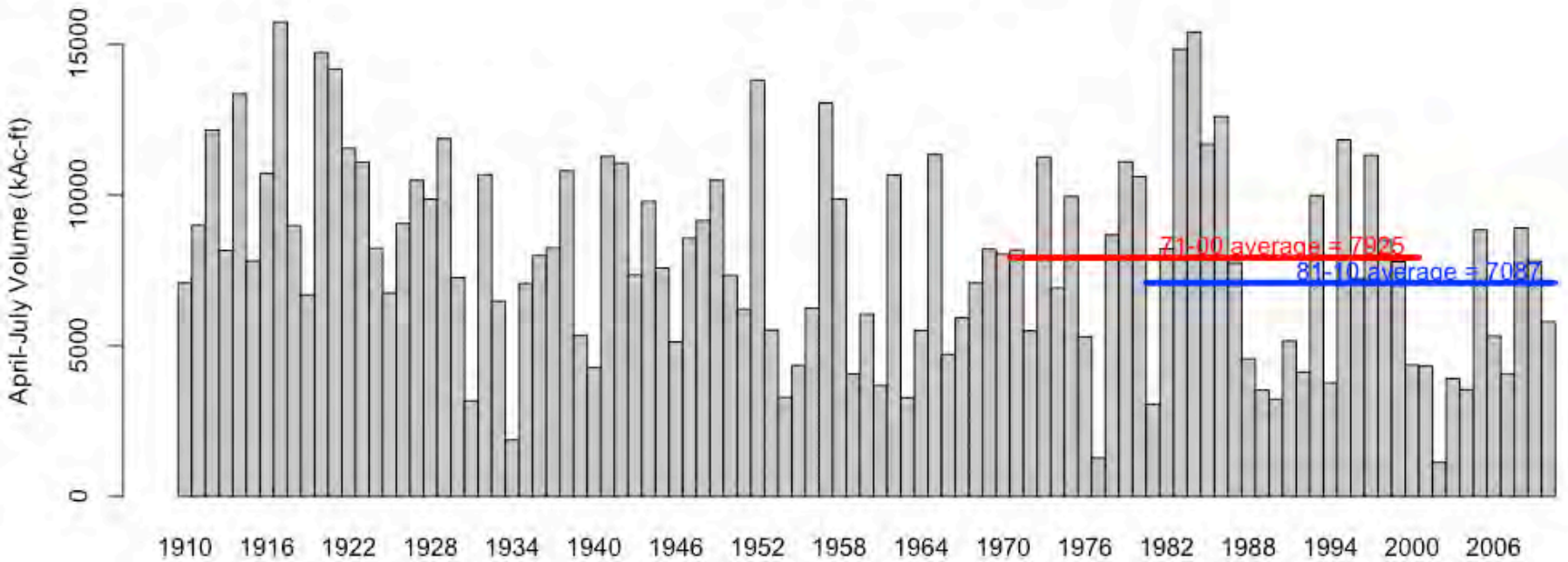
- Preliminary Data
- 6% reduction in mean

## Navaja Inflow



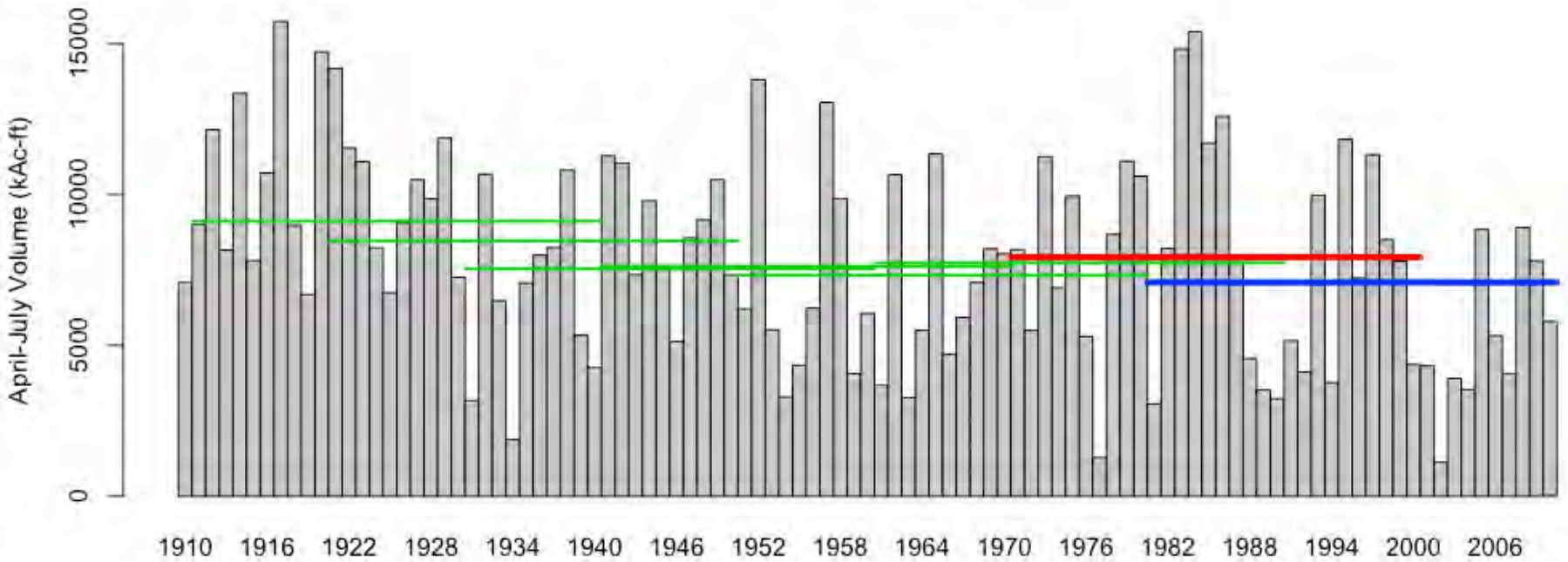
- Preliminary Data
- 6% reduction in mean

## Lake Powell Inflow



- Preliminary Data
- 11% reduction in mean

## Lake Powell Inflow



- Preliminary Data
- All 30 year means since 1911-1940

Lake Powell Inflows 30 year averages



1981-2010 is the driest 30 year period on record



# Affect on Forecasts

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- WY2011 forecasts continue to use 1971-2000 means:
  - Statistical models (SWS and NRCS) will use 1971-2000
  - Simulation model (ESP) will use 1976-2005
- WY2012 forecasts will be based on 1981-2010 inputs in both forecast models
  - ESP and SWS will both use the same period
- SNOTEL network much stronger for 1981-2010 period than in 1970s. This network is critical for forecast skill.
- All things equal, these forecasts will be lower since input data sets are drier in the 30 year average
  - **Especially true in early season forecasts**
  - Later season forecasts more controlled by observed snowpack
- Percent of normal forecast values should remain largely unchanged (since normals AND forecasts will be lower)



Feedback, Questions, Concerns always welcome....

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