Spring 2011

March 15th, 2011
Webinar and Summary

Weekly Climate, Water & Drought Assessment

Today's Agenda

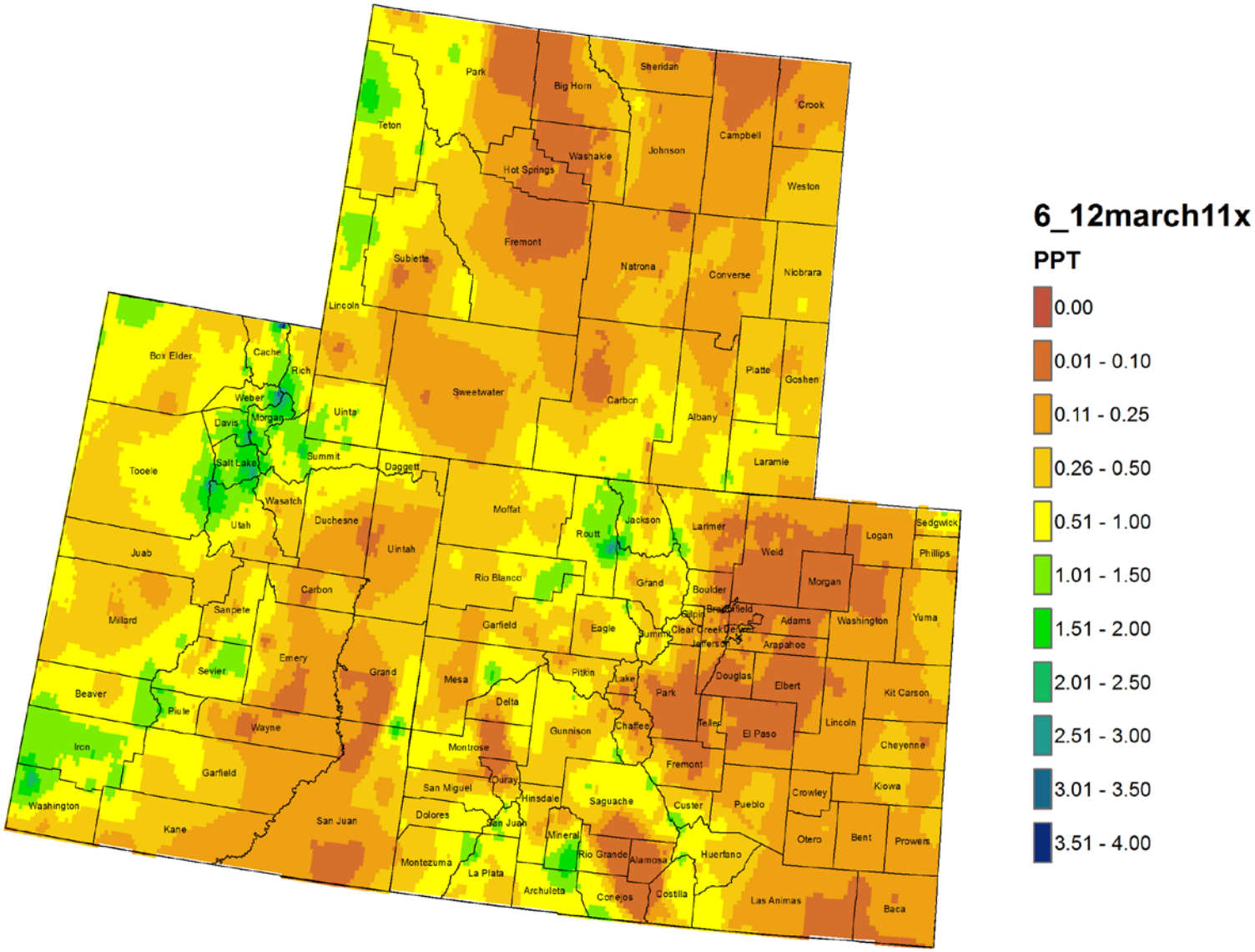
-Assessment of current water conditions

- Precipitation Forecast

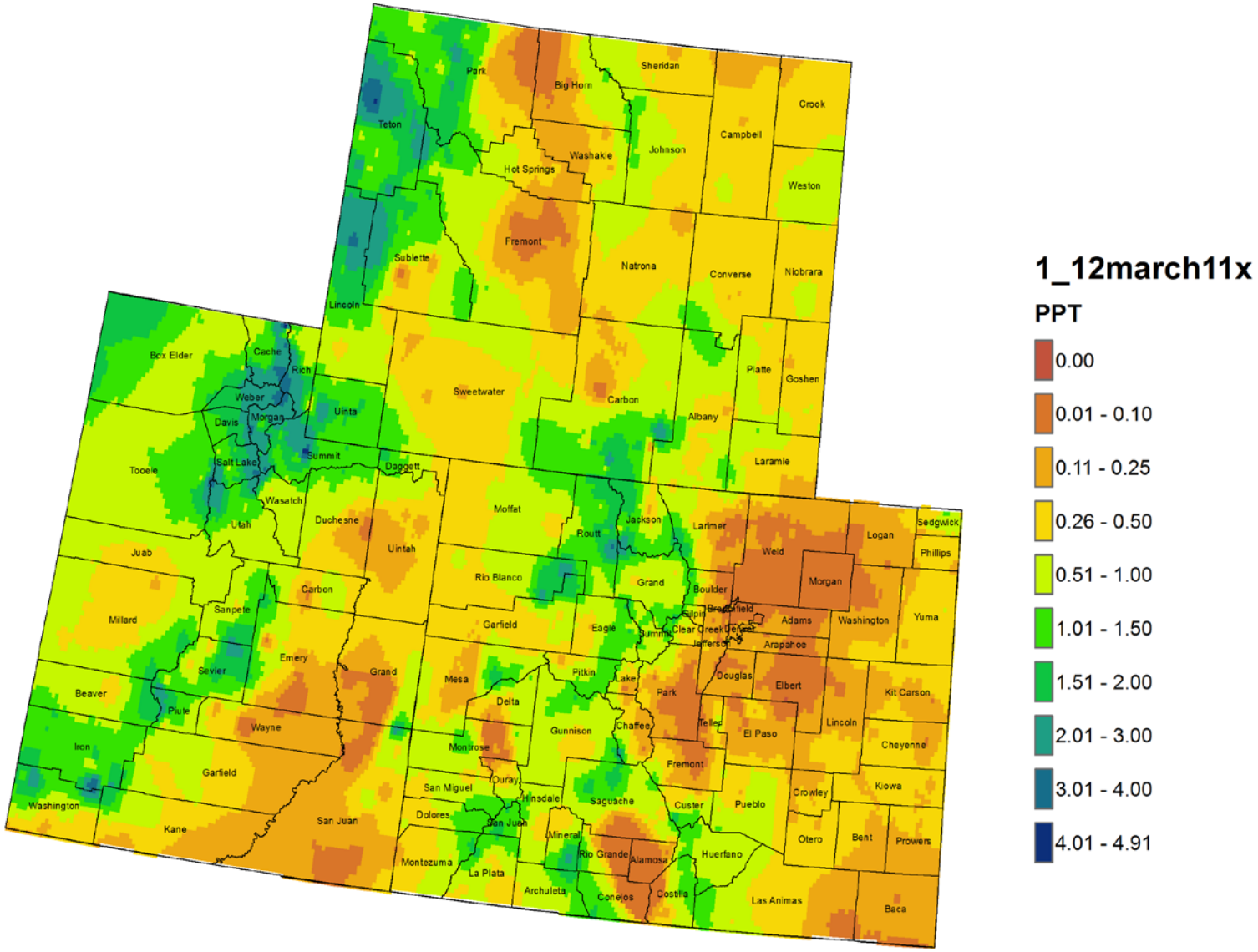
- Recommendations for Drought Monitor

Precipitation/Snowpack Update

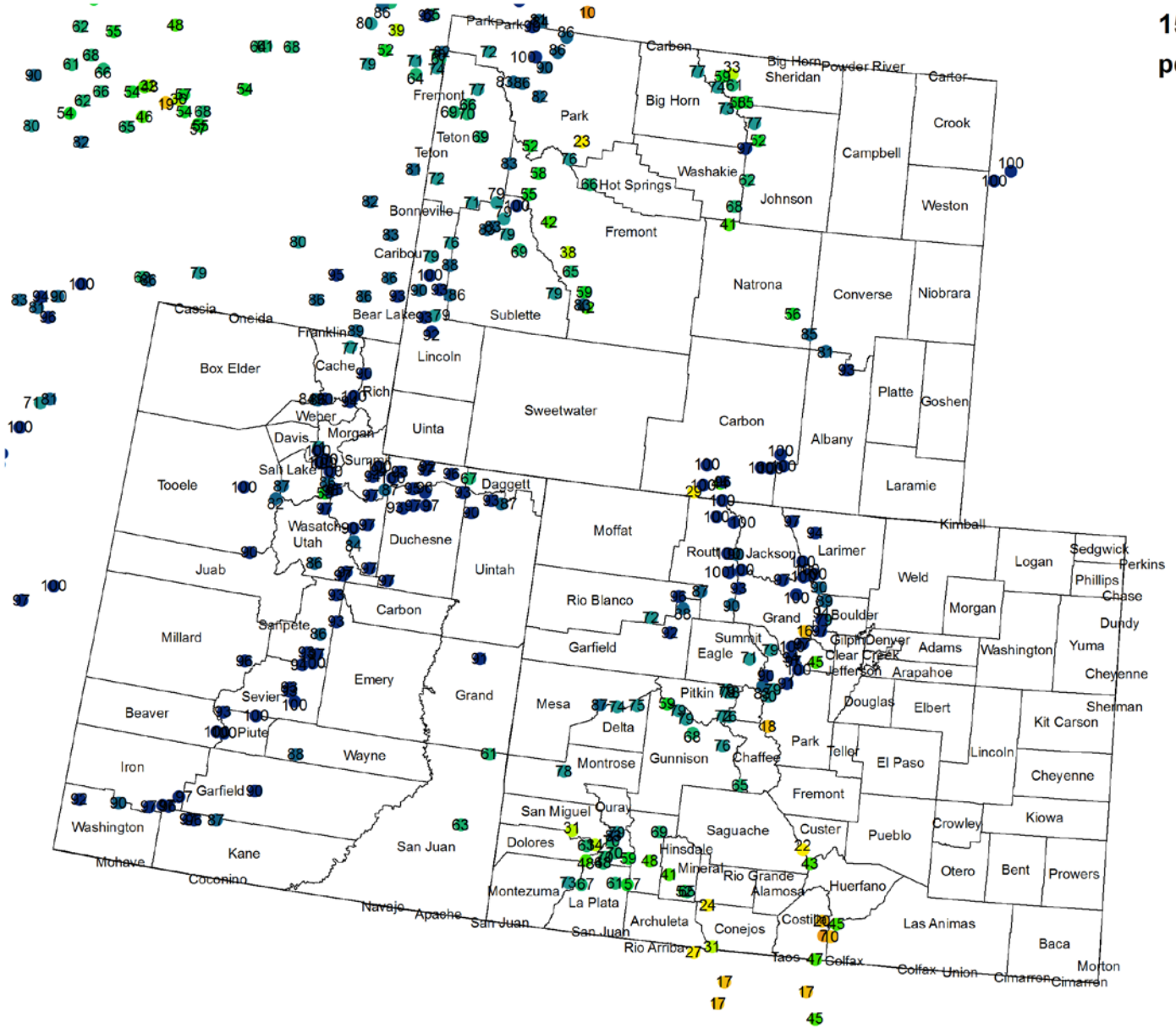
Colorado, Utah and Wyoming 7 Day Precipitation (in)
6 - 12 March 2011



Colorado, Utah and Wyoming Month to Date Precipitation (in)
1 - 12 March 2011



Snotel Water Year Precipitation Percentile Ranking
15 March 2011

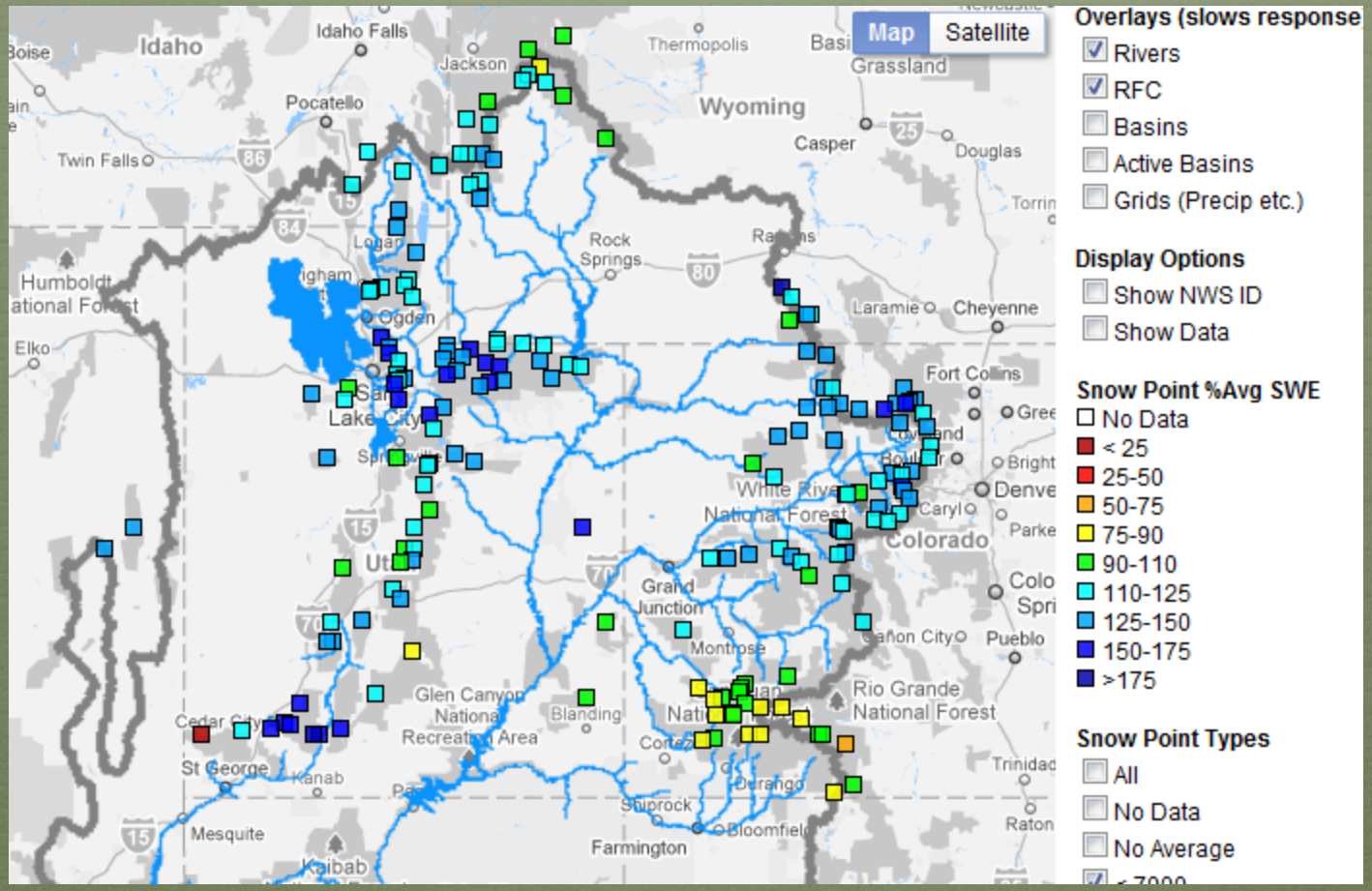


15mar_ptile.tab Events

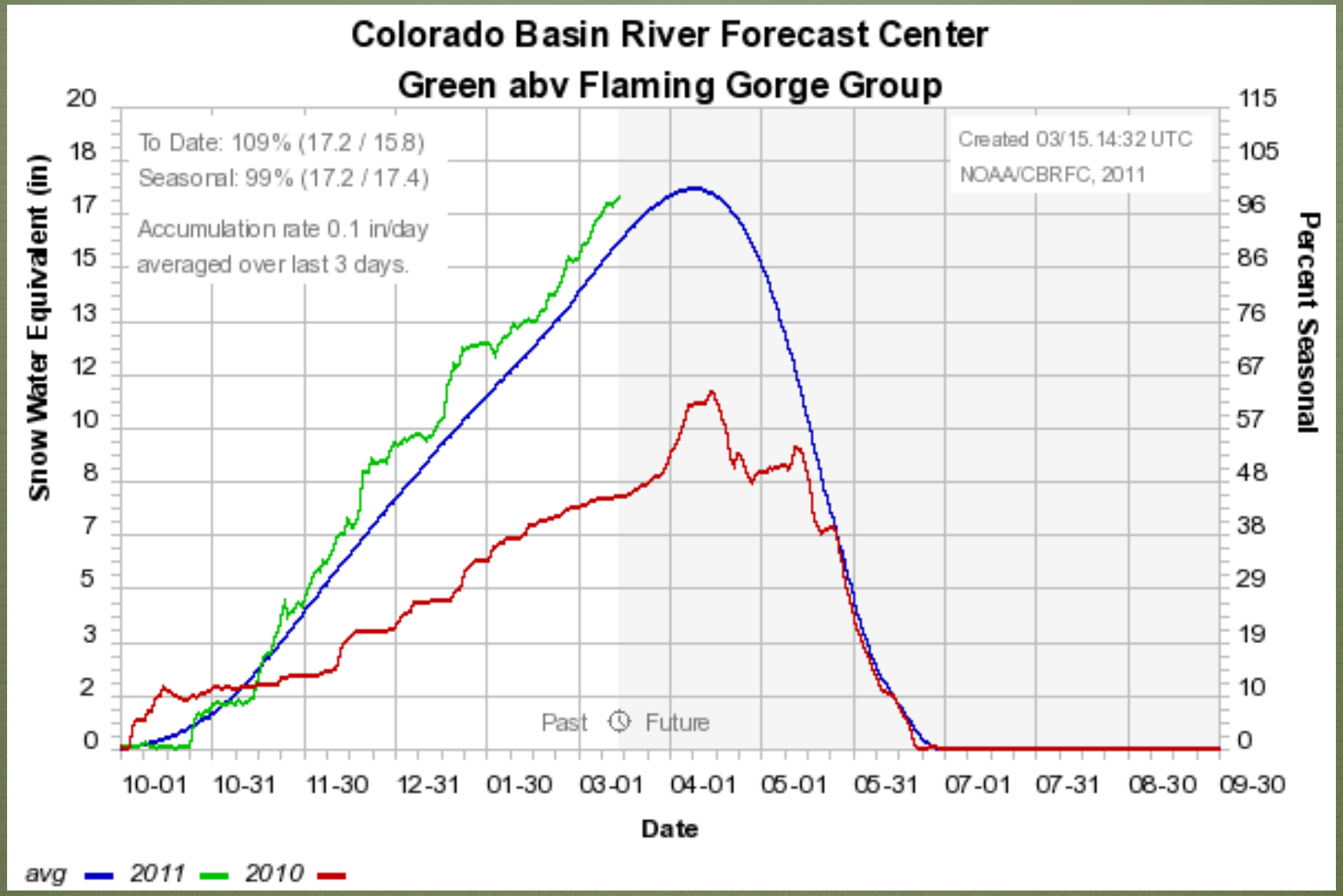
pctile

- D4: 0 - 2
- D3: 3 - 5
- D2: 6 - 10
- D1: 11 - 20
- D0: 21 - 30
- Uncategorized: 31 - 40
- Uncategorized: 41 - 50
- Uncategorized: 51 - 60
- Uncategorized: 61 - 70
- Uncategorized: 71 - 80
- Uncategorized: 81 - 90
- Uncategorized: 91 - 100

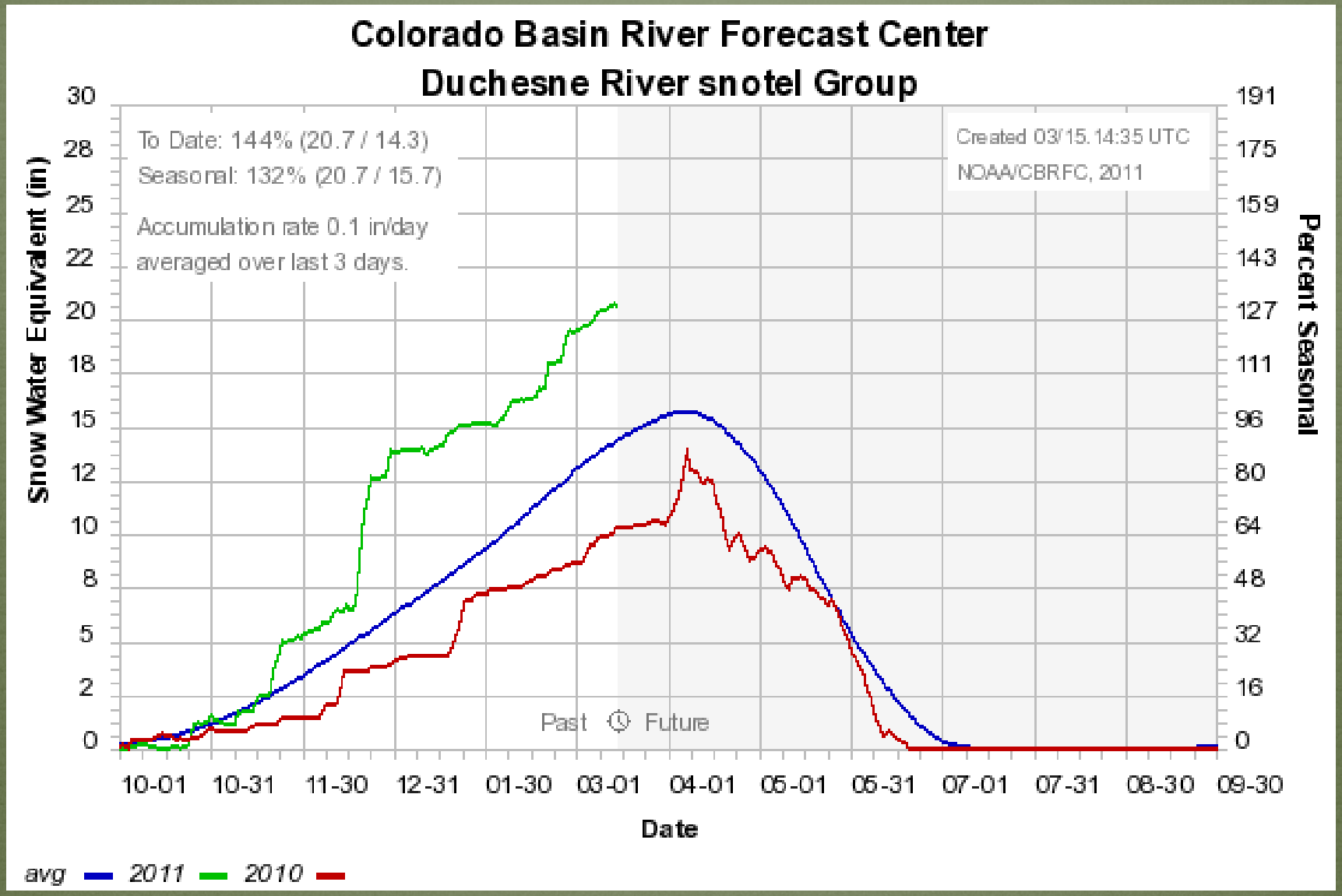
Upper Colorado River Basin Snow



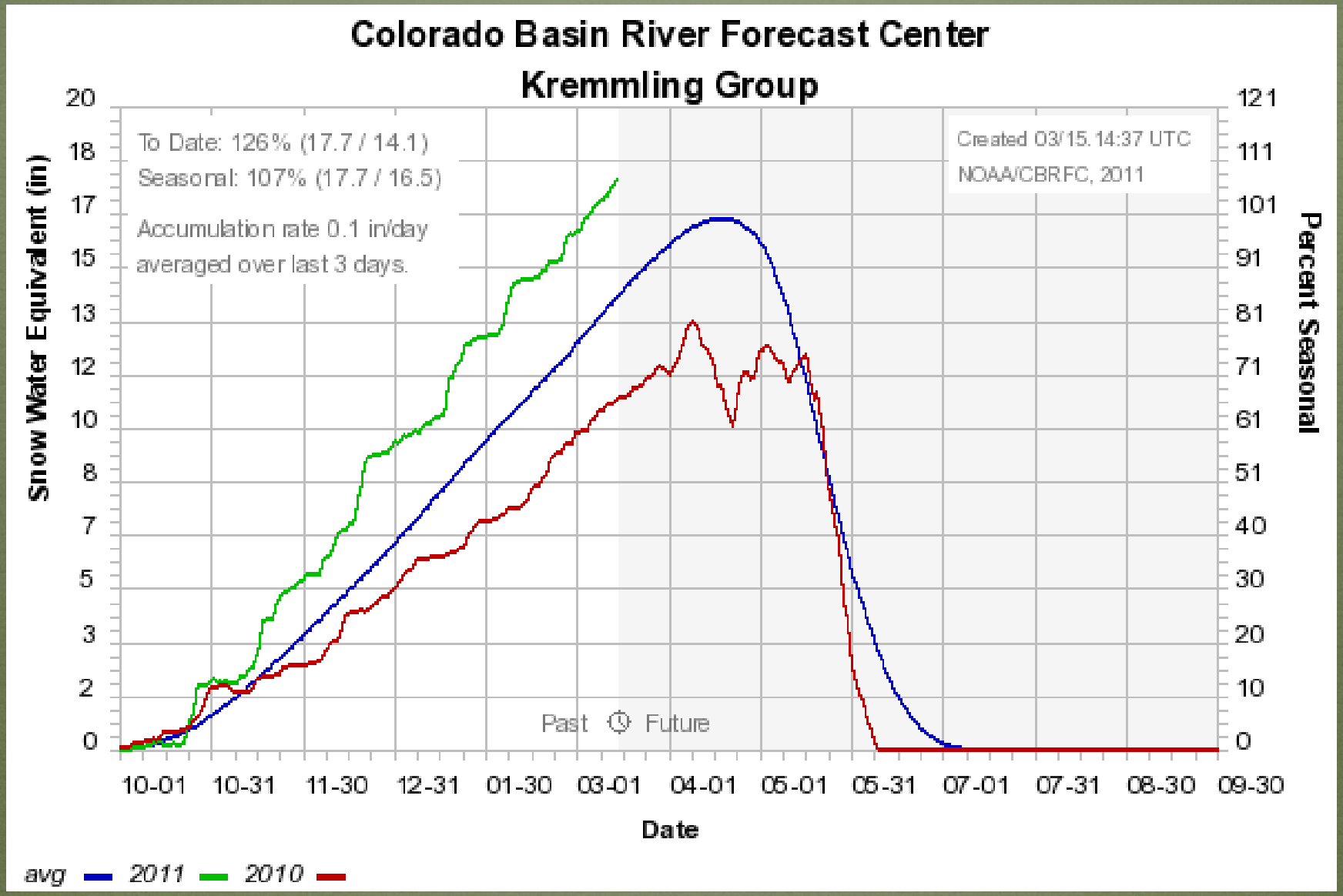
NATIONAL WEATHER SERVICE
Colorado Basin River Forecast Center



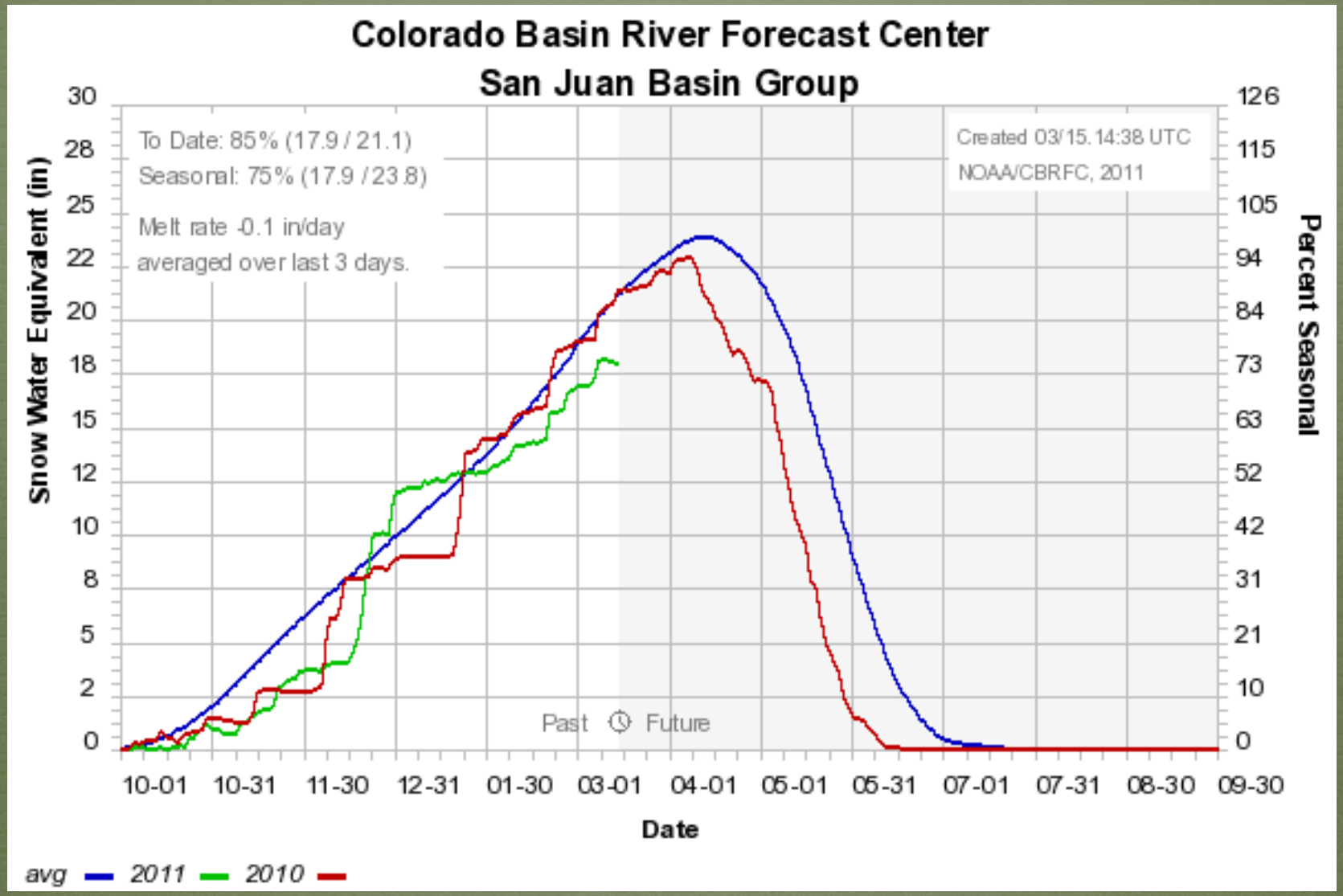
Snowpack % of average to date: 109%
Percent of average peak: 99%



Snowpack % of average to date: 144%
Percent of average peak: 132%

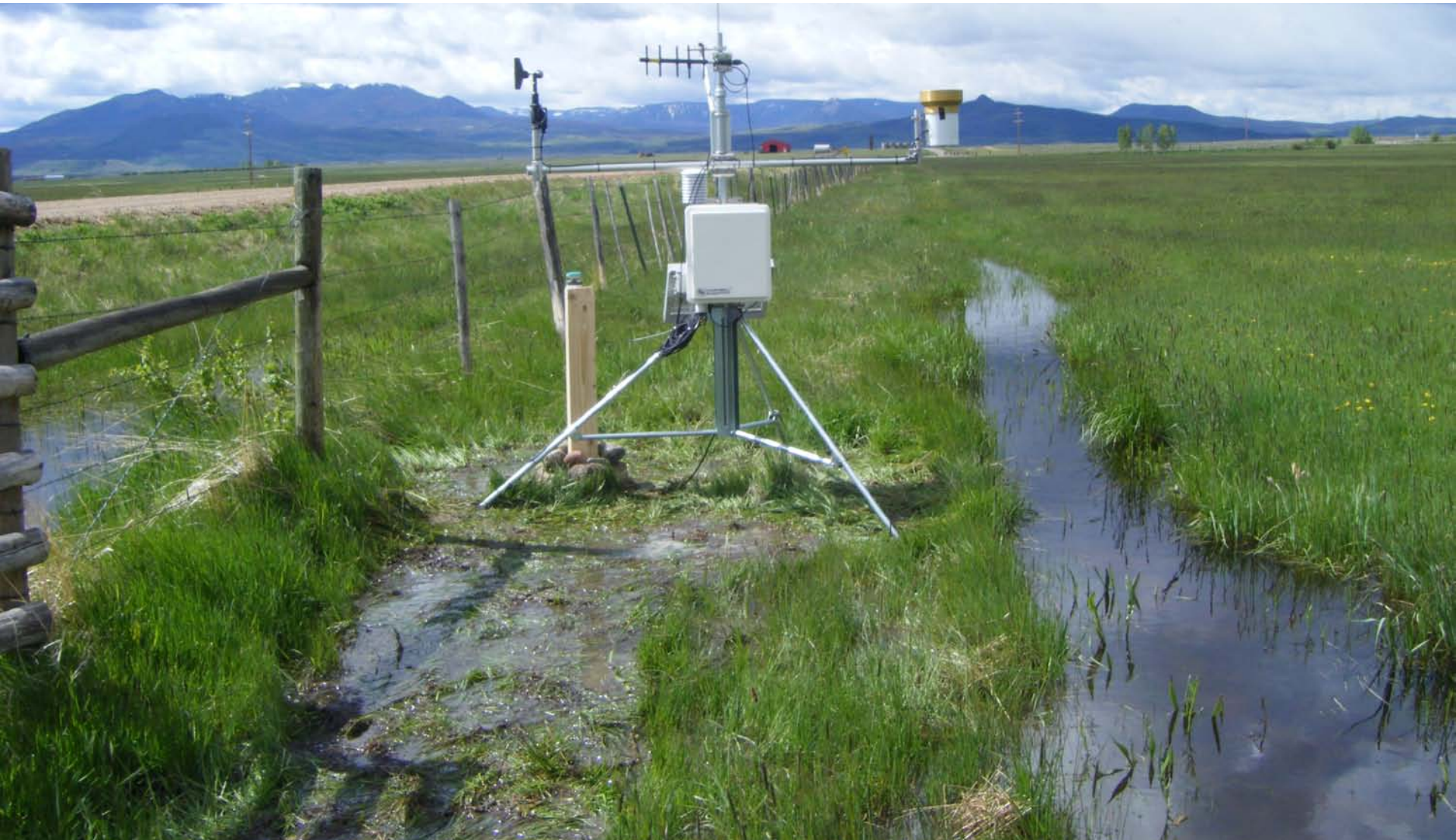


Snowpack % of average to date: 127%
Percent of average peak: 103%

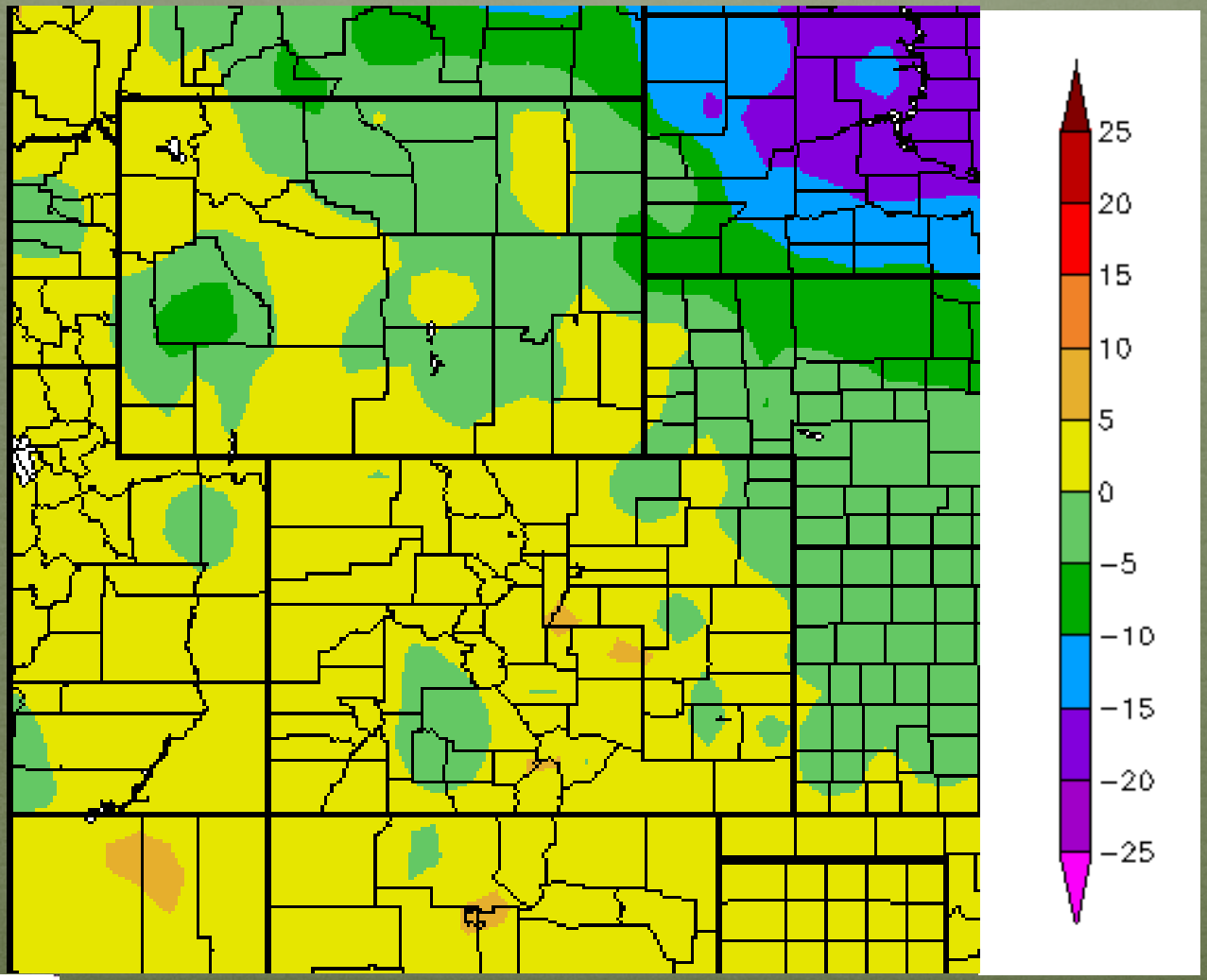


Snowpack % of average to date: 85%
Percent of average peak: 75%

Water Demand

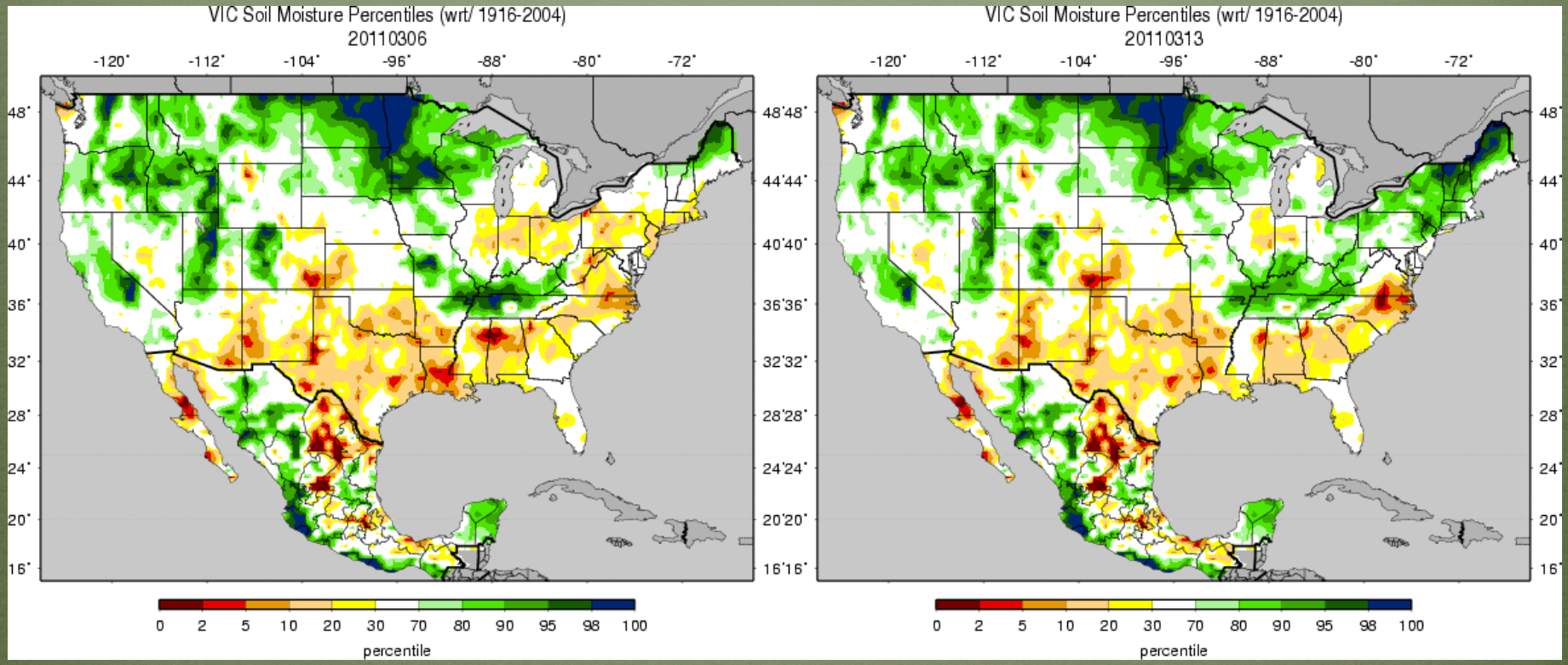


Temperature Departure from Normal
03/01/2011 – 03/14/2011



High Plains Regional Climate Center

Soil Moisture Change from March 6th, 2011



6 March 2011

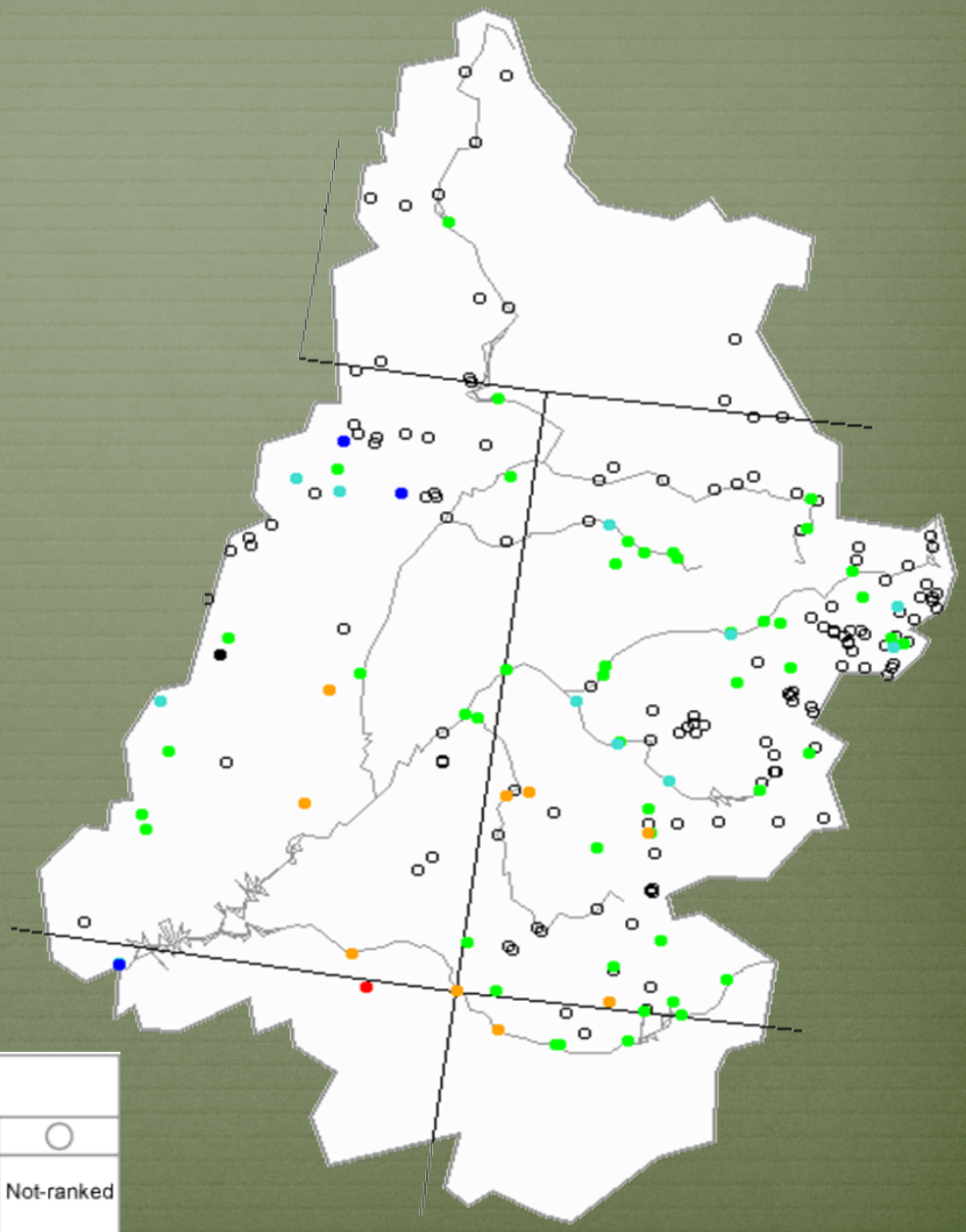
13 March 2011

Streamflow Update

Michael Lewis USGS

7-day average discharge compared to historical discharge for the day of the year (March 13th)

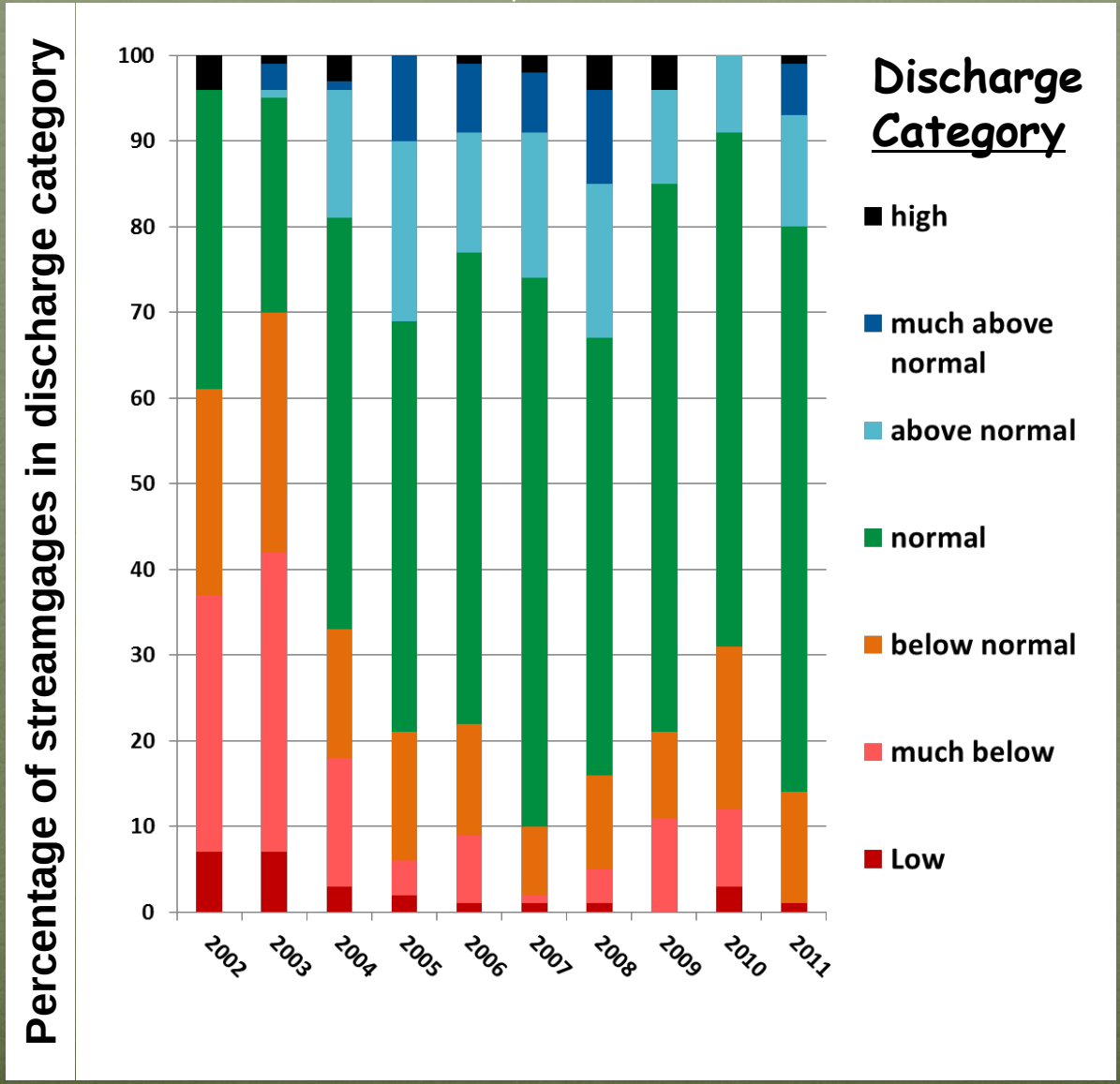
Sunday, March 13, 2011

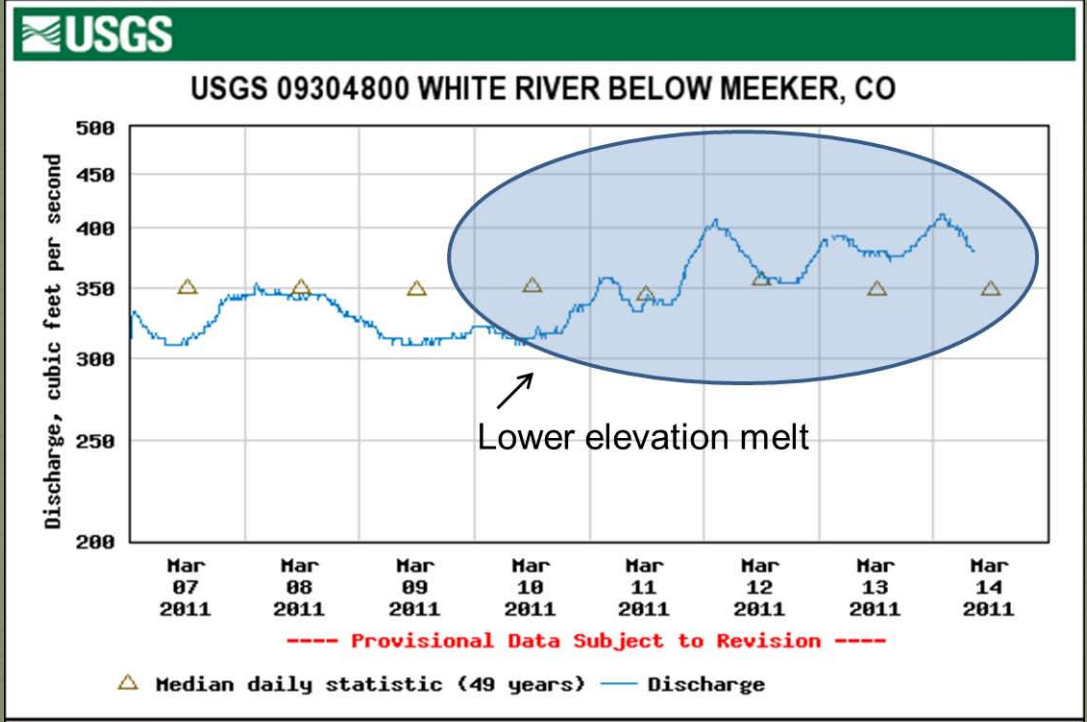


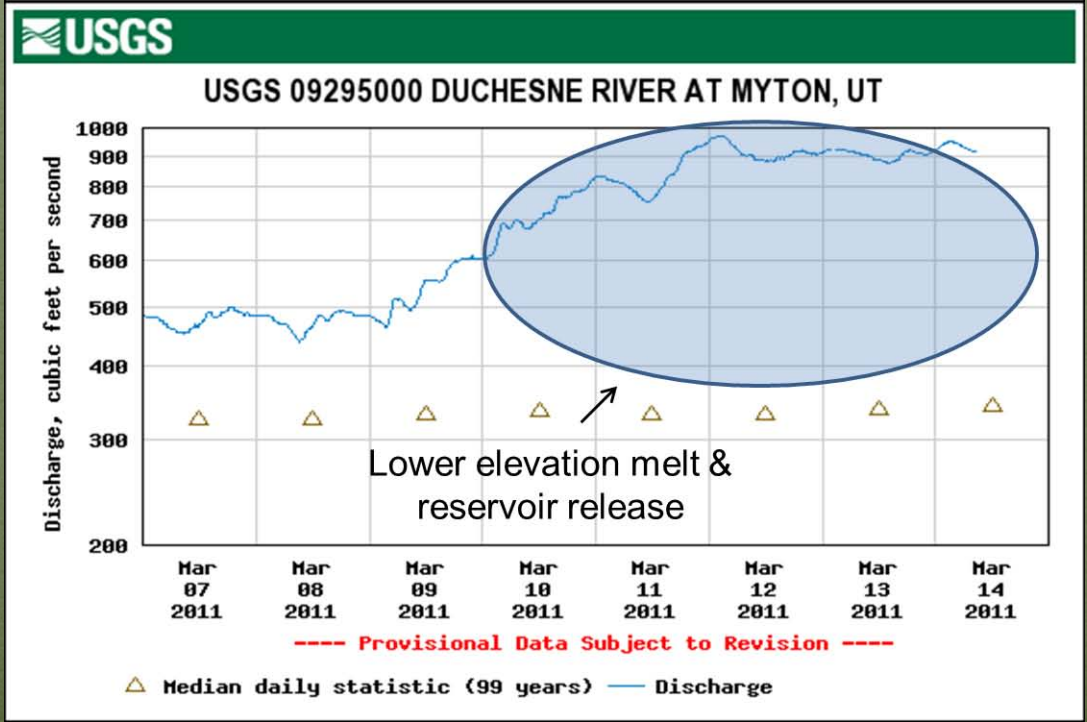
Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

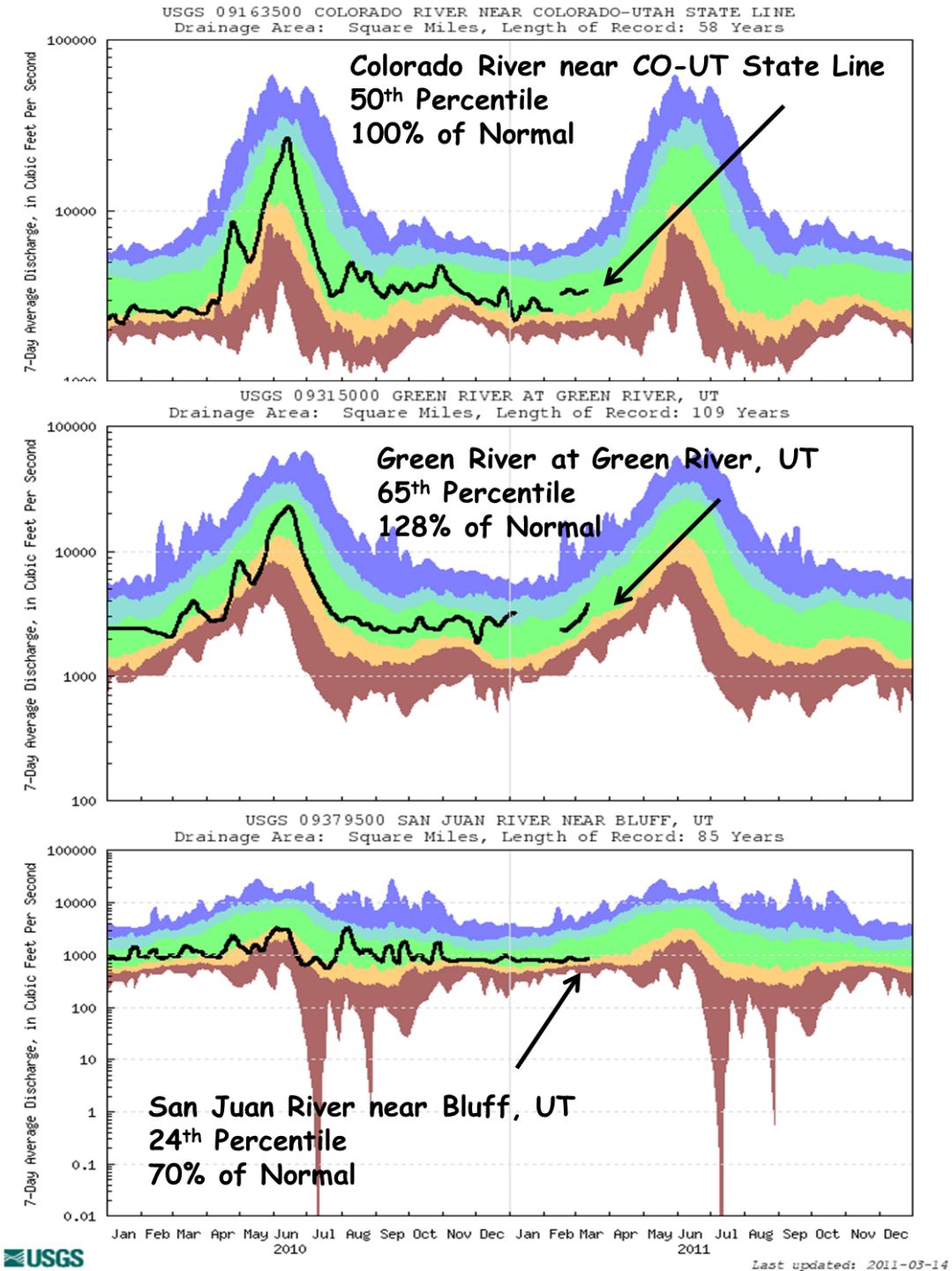
USGS

Upper Colorado River Basin- Comparison of 7-day Average Discharge March 12, 2002-2011

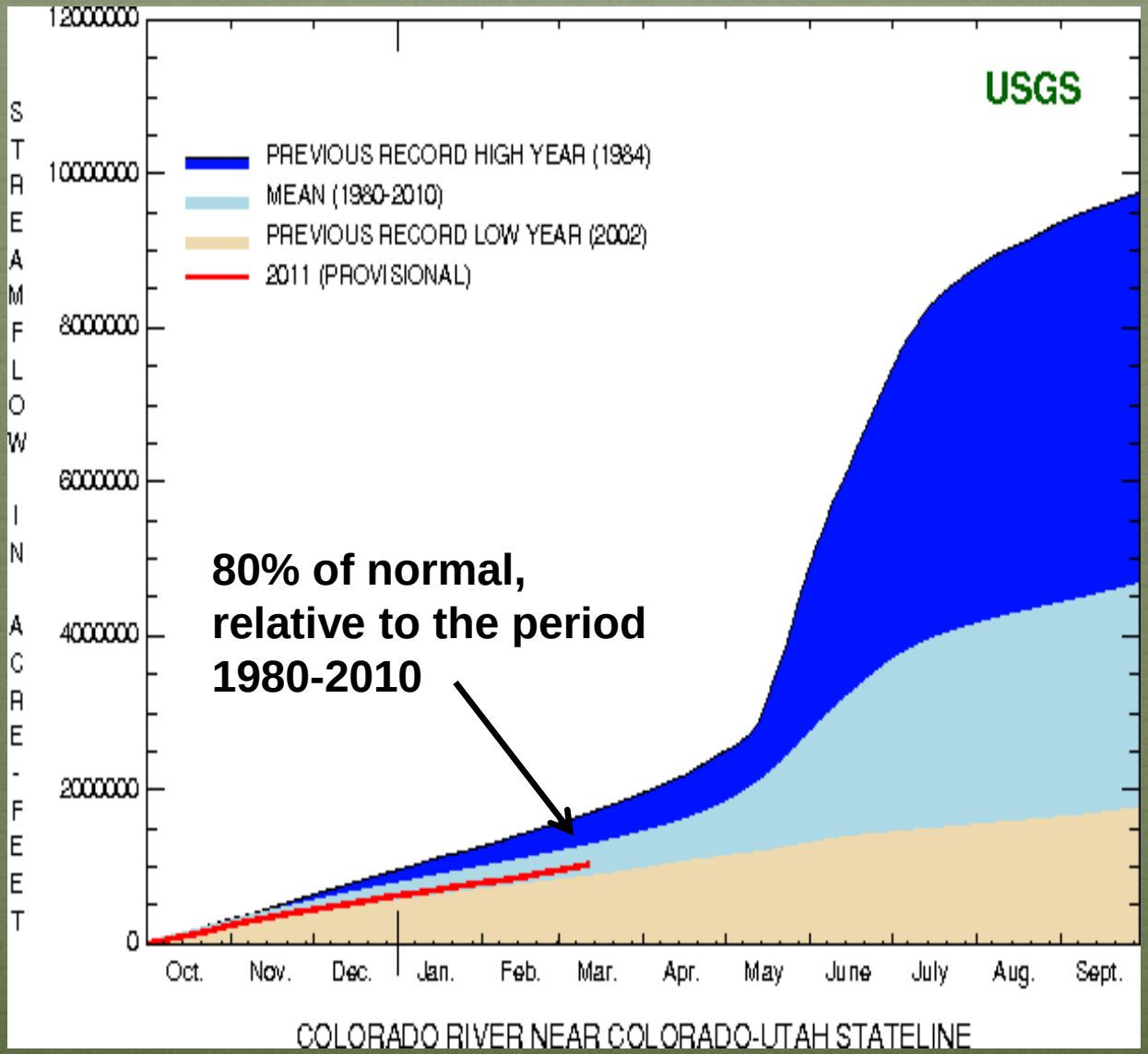



USGS
USGS 09304800 WHITE RIVER BELOW MEEKER, CO
Discharge, cubic feet per second
500
450
400
350
300
250
200
Mar 07 2011
Mar 08 2011
Mar 09 2011
Mar 10 2011
Mar 11 2011
Mar 12 2011
Mar 13 2011
Mar 14 2011
Lower elevation melt
---- Provisional Data Subject to Revision ----
Median daily statistic (49 years)
Discharge


USGS
USGS 09295000 DUCHESNE RIVER AT MYTON, UT
Discharge, cubic feet per second
1000
900
800
700
600
500
400
300
200
Mar 07 2011
Mar 08 2011
Mar 09 2011
Mar 10 2011
Mar 11 2011
Mar 12 2011
Mar 13 2011
Mar 14 2011
Lower elevation melt &
reservoir release
---- Provisional Data Subject to Revision ----
Median daily statistic (99 years)
Discharge


USGS 09163500 COLORADO RIVER NEAR COLORADO-UTAH STATE LINE
Drainage Area: Square Miles, Length of Record: 58 Years
Colorado River near CO-UT State Line
50th Percentile
100% of Normal
7-Day Average Discharge, in Cubic Feet Per Second
100000
10000
1000
USGS 09315000 GREEN RIVER AT GREEN RIVER, UT
Drainage Area: Square Miles, Length of Record: 109 Years
Green River at Green River, UT
65th Percentile
128% of Normal
7-Day Average Discharge, in Cubic Feet Per Second
100000
10000
1000
100
USGS 09379500 SAN JUAN RIVER NEAR BLUFF, UT
Drainage Area: Square Miles, Length of Record: 85 Years
San Juan River near Bluff, UT
24th Percentile
70% of Normal
7-Day Average Discharge, in Cubic Feet Per Second
100000
10000
1000
100
10
1
0.1
0.01
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2010
2011
USGS
Last updated: 2011-03-14

Cumulative Annual Runoff 2011 Water Year Colorado River nr CO-UT Stateline



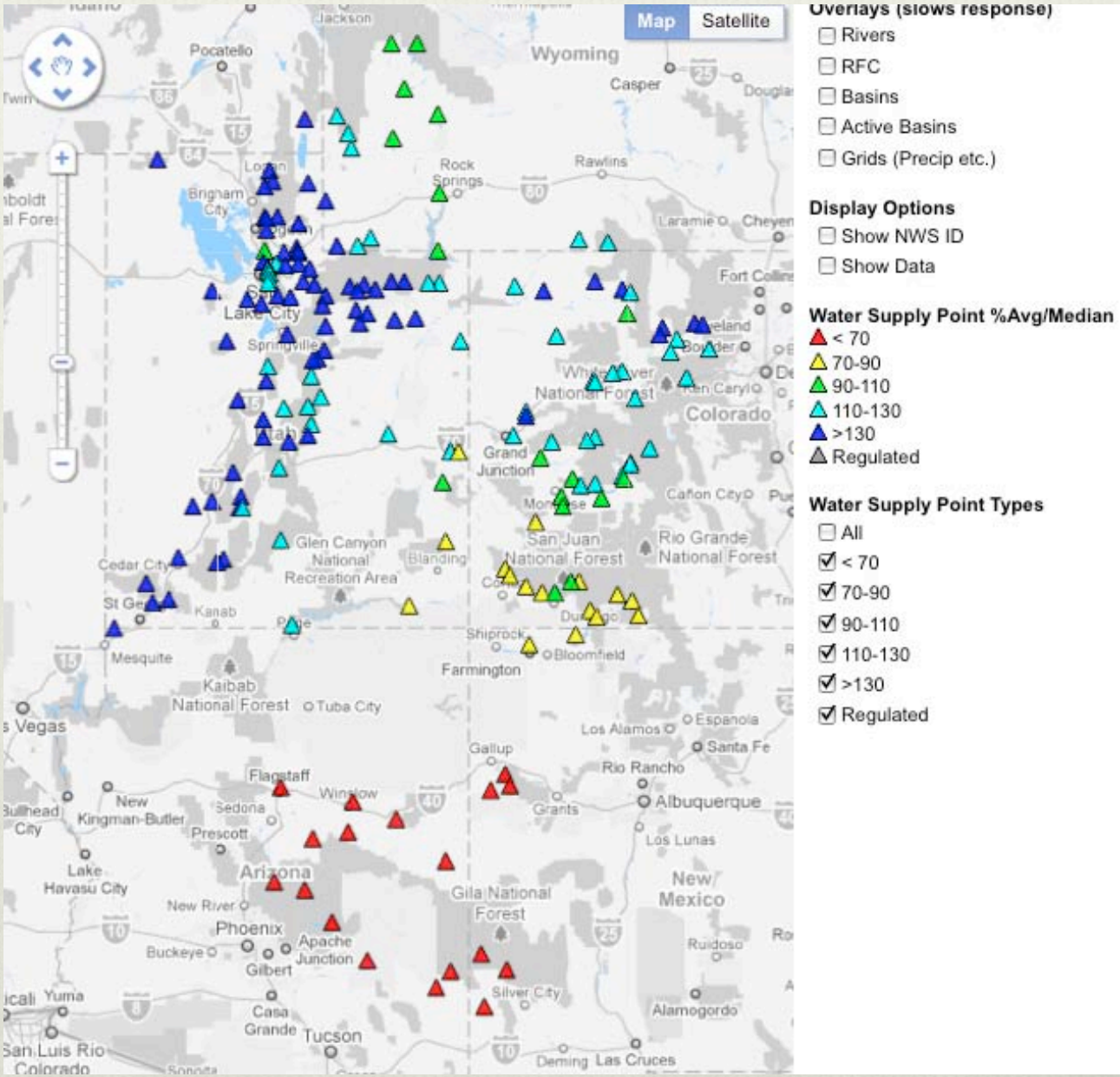
Streamflow Forecast

Michelle Schmidt, Brenda Alcorn and Kevin Werner
CBRFC

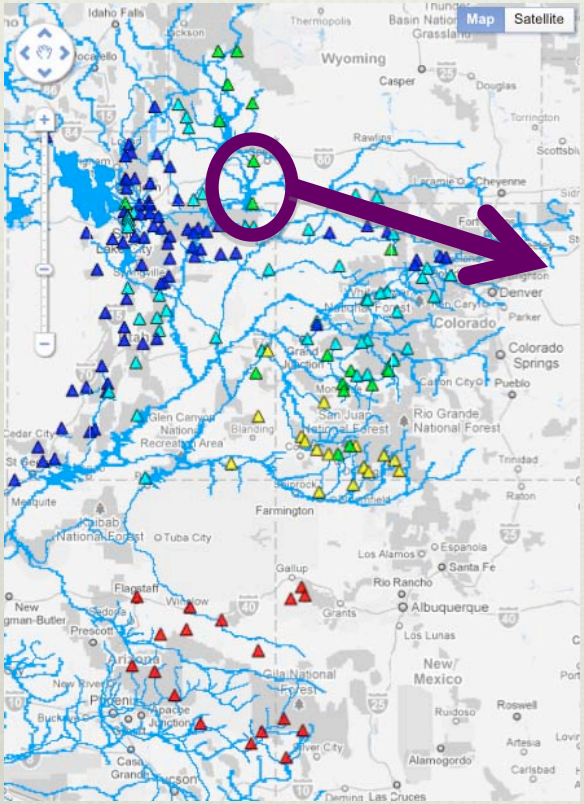
March 1, 2011 Water Supply Forecasts

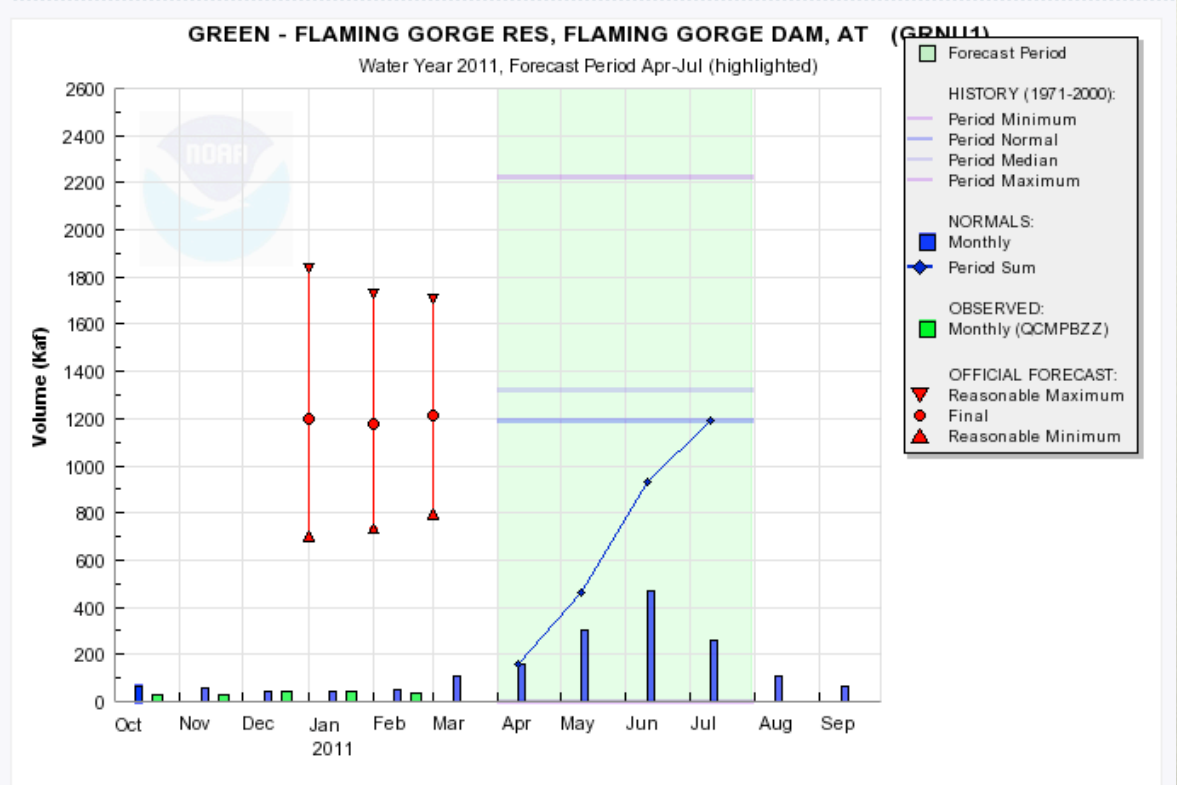
Highlights:

- **Above average forecasts across much of the Upper Colorado, slightly below average in the San Juan and Gunnison basins.**
- **Forecasts increased slightly over last month, except in the San Juan basin**



Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





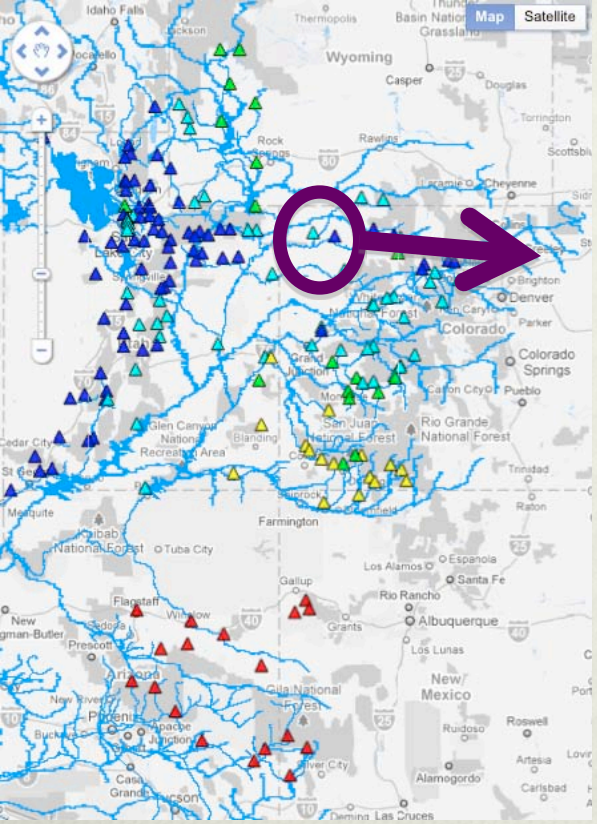
Seasonal Water Supply Forecast ⓘ **Forecast Period: Apr-Jul**

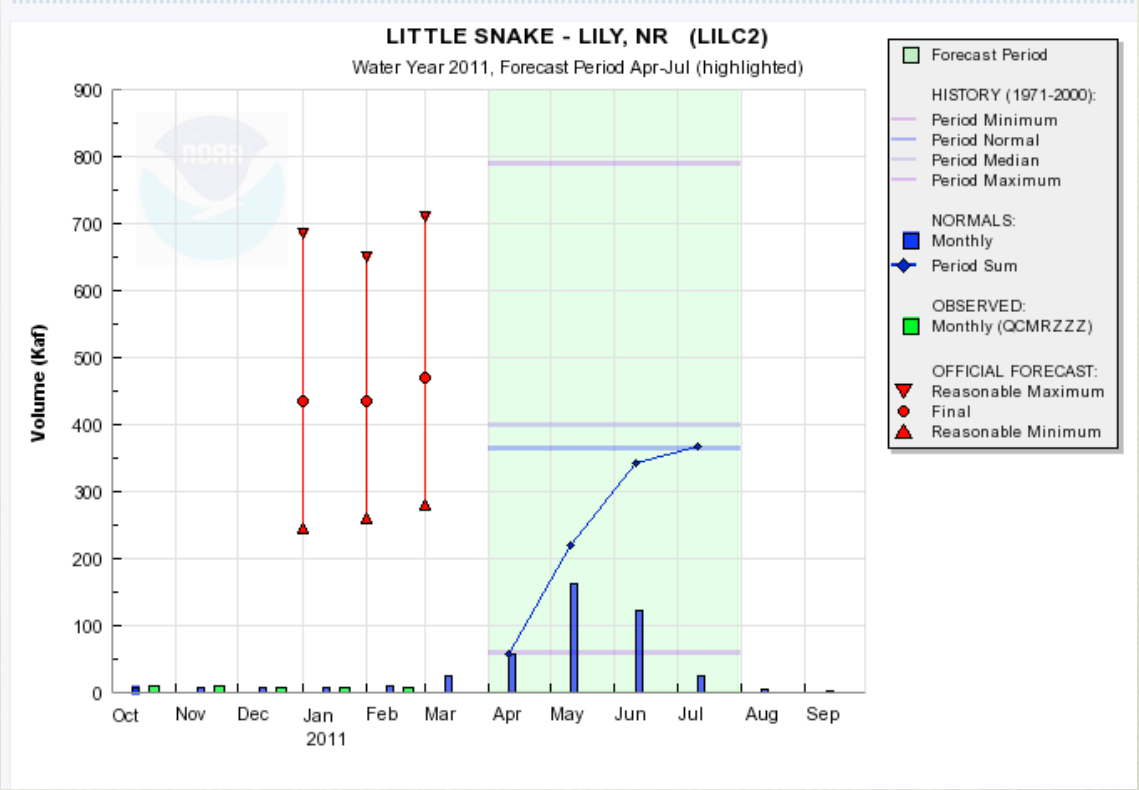
1210 kaf 50% Exceedence (Official Forecast)	**128.2%** of Historical Median	**101.7%** of Historical Mean
795 kaf 90% Exceedence	**1710 kaf** 10% Exceedence	**31st of 71** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





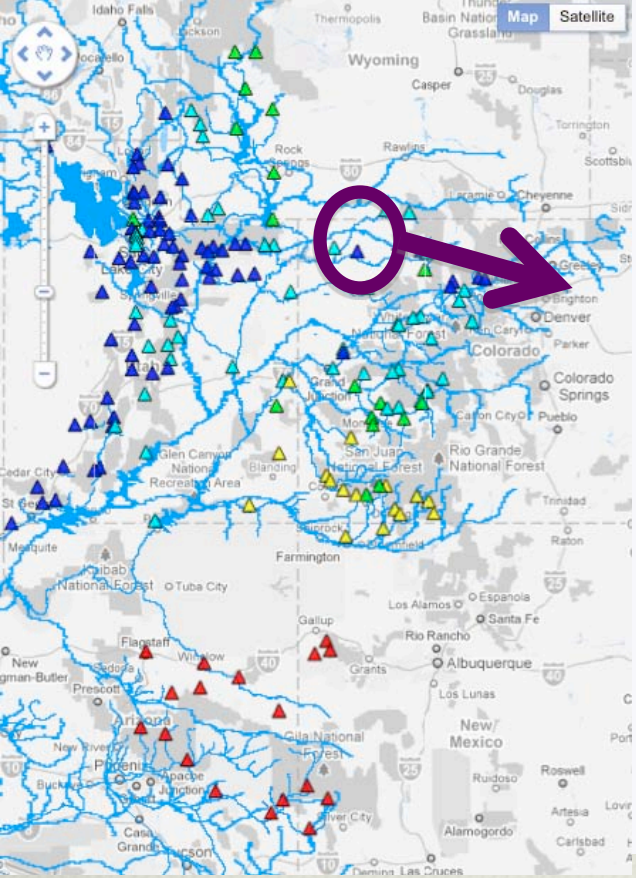
Seasonal Water Supply Forecast ⓘ **Forecast Period: Apr-Jul**

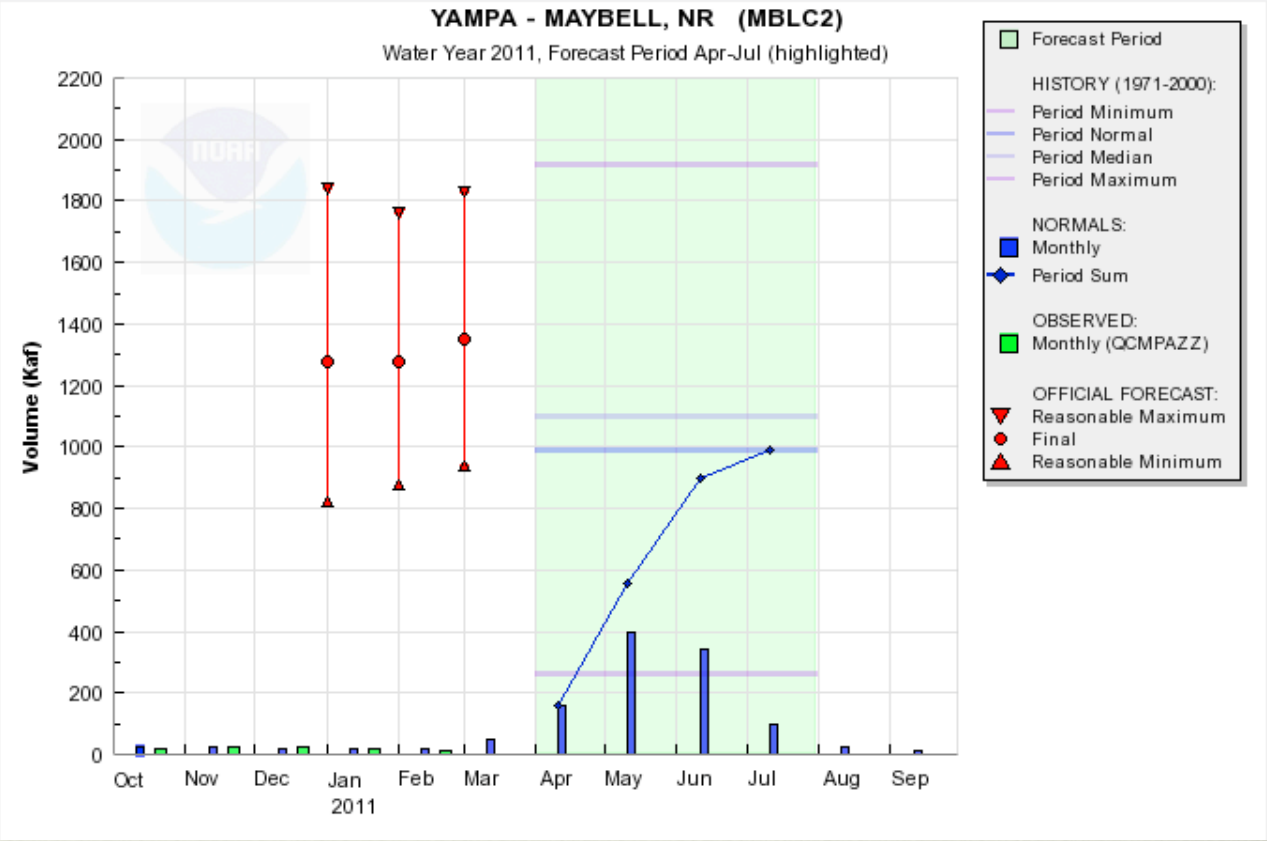
470 kaf 50% Exceedence (Official Forecast)	**142.8%** of Historical Median	**128.8%** of Historical Mean
280 kaf 90% Exceedence	**710 kaf** 10% Exceedence	**18th of 90** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





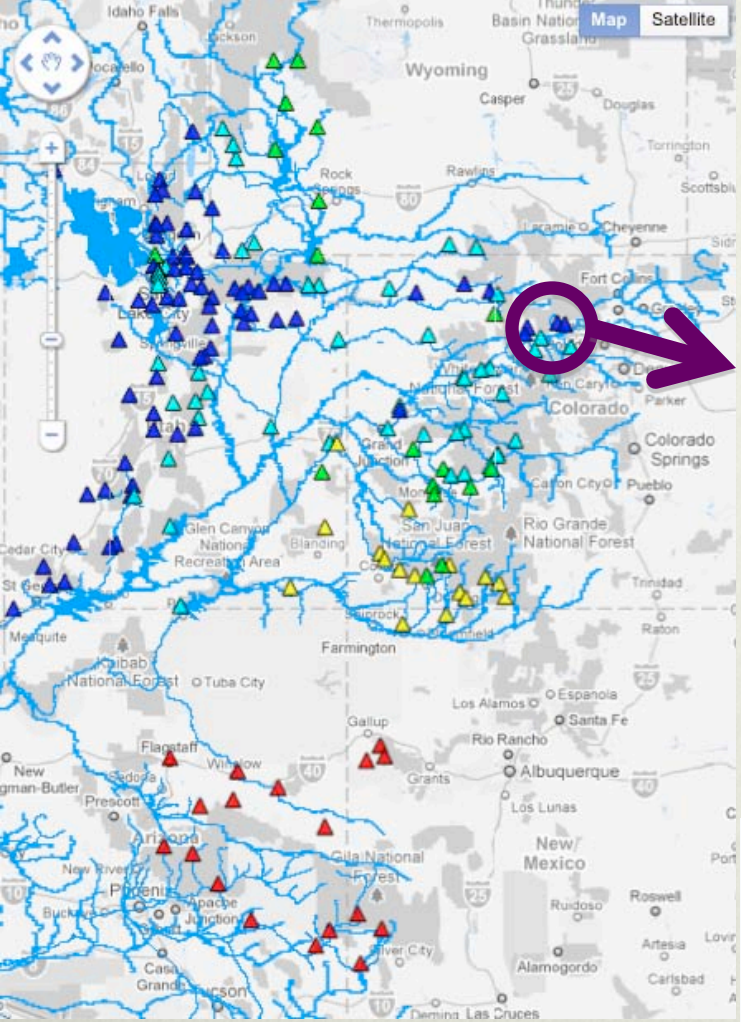
Seasonal Water Supply Forecast ⓘ **Forecast Period: Apr–Jul**

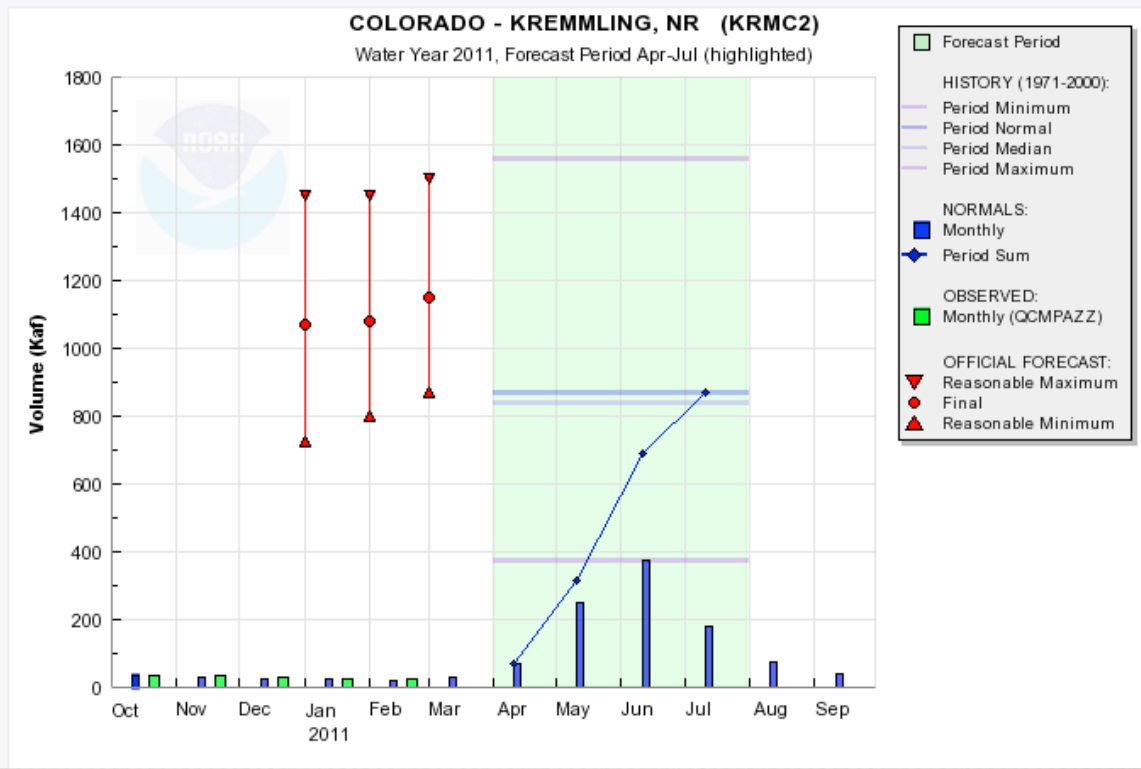
1350 kaf 50% Exceedence (Official Forecast)	**149.6%** of Historical Median	**136.4%** of Historical Mean
940 kaf 90% Exceedence	**1830 kaf** 10% Exceedence	**8th of 52** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





Seasonal Water Supply Forecast ⓘ

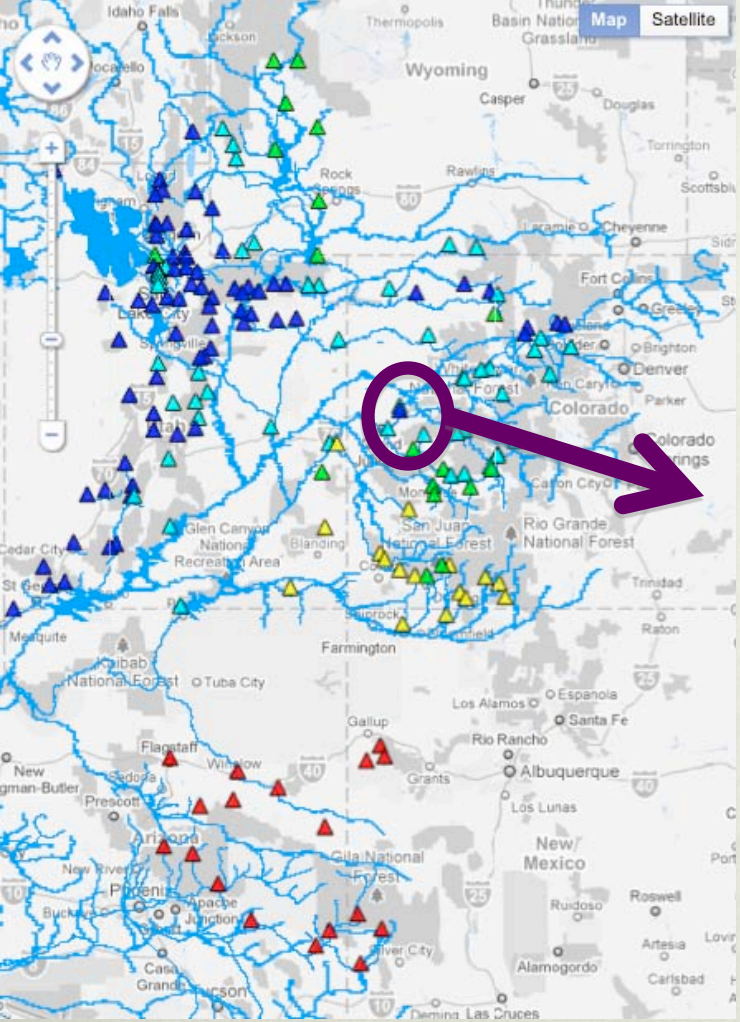
Forecast Period: Apr-Jul

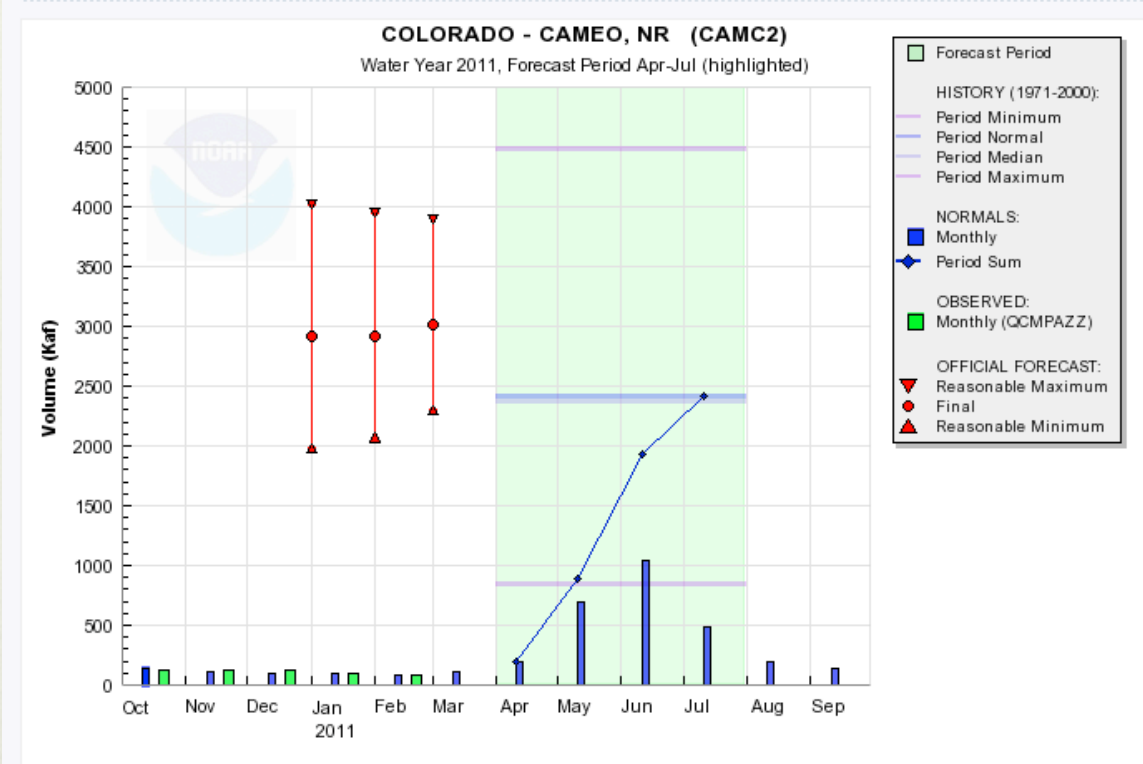
1150 kaf 50% Exceedence (Official Forecast)	**162.4%** of Historical Median	**132.2%** of Historical Mean
870 kaf 90% Exceedence	**1500 kaf** 10% Exceedence	**1st of 6** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





Seasonal Water Supply Forecast ⓘ

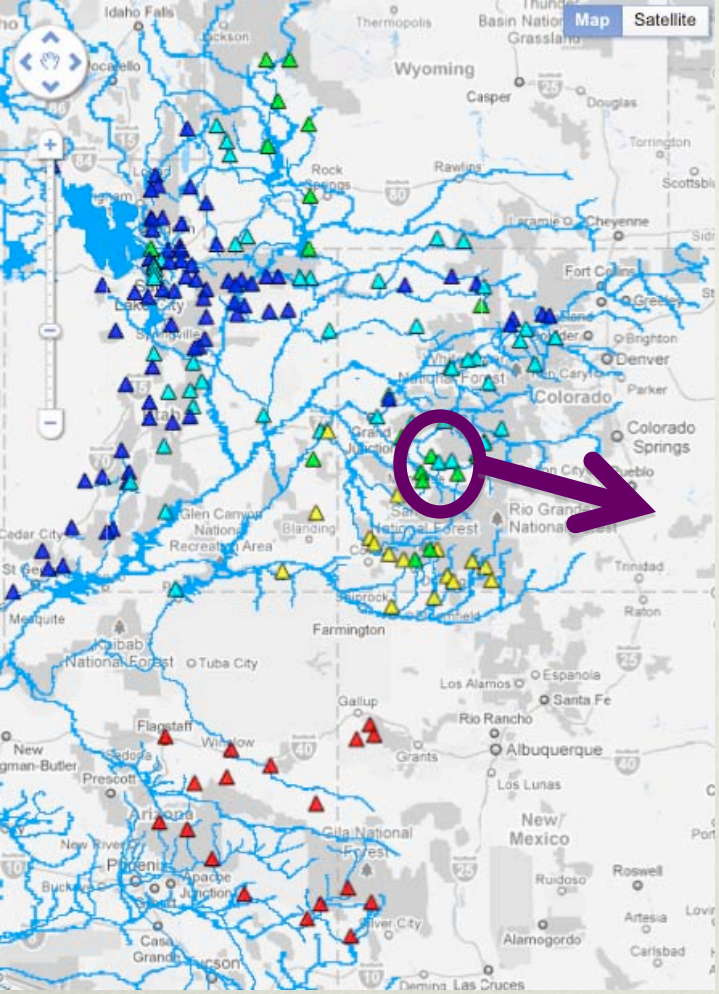
Forecast Period: Apr–Jul

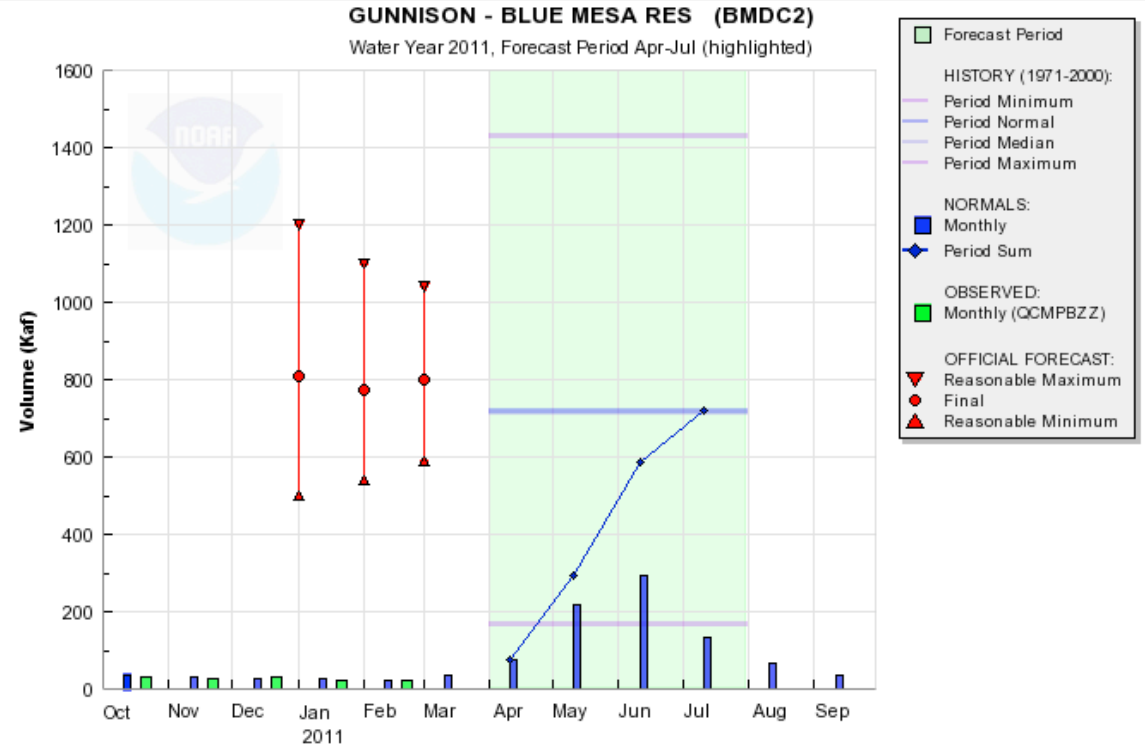
3020 kaf 50% Exceedence (Official Forecast)	**141.7%** of Historical Median	**124.8%** of Historical Mean
2300 kaf 90% Exceedence	**3900 kaf** 10% Exceedence	**13th of 78** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





Seasonal Water Supply Forecast ⓘ

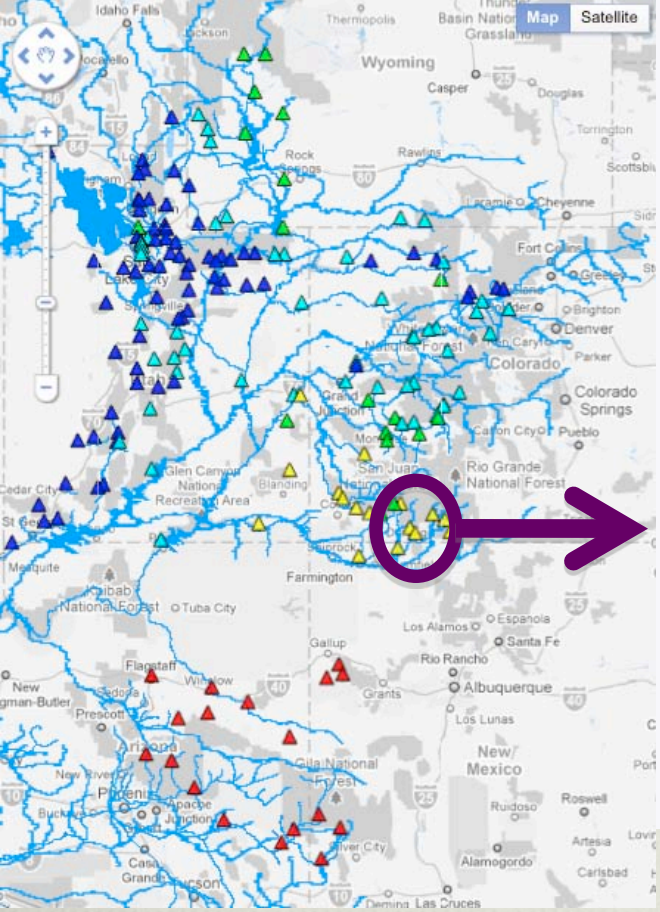
Forecast Period: Apr–Jul

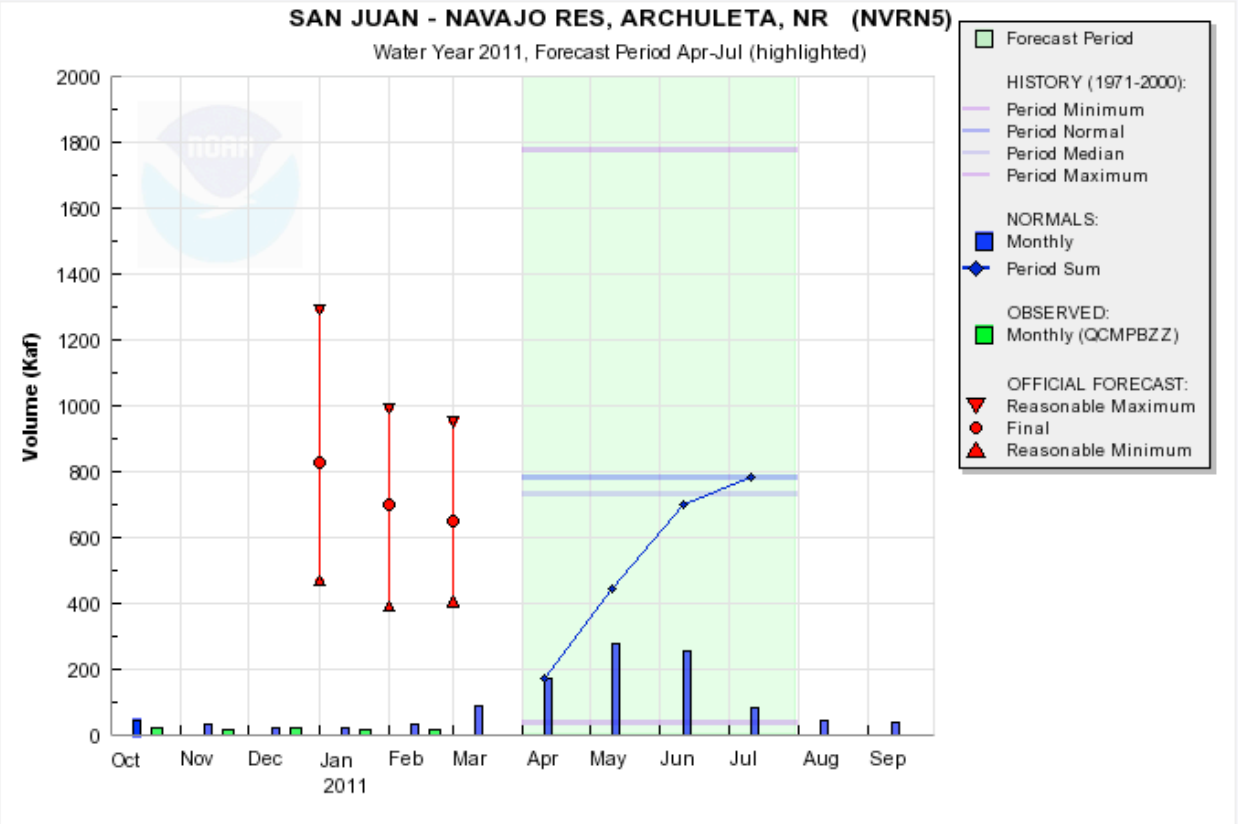
800 kaf 50% Exceedence (Official Forecast)	**136.9%** of Historical Median	**111.1%** of Historical Mean
590 kaf 90% Exceedence	**1040 kaf** 10% Exceedence	**14th of 41** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





Seasonal Water Supply Forecast ⓘ

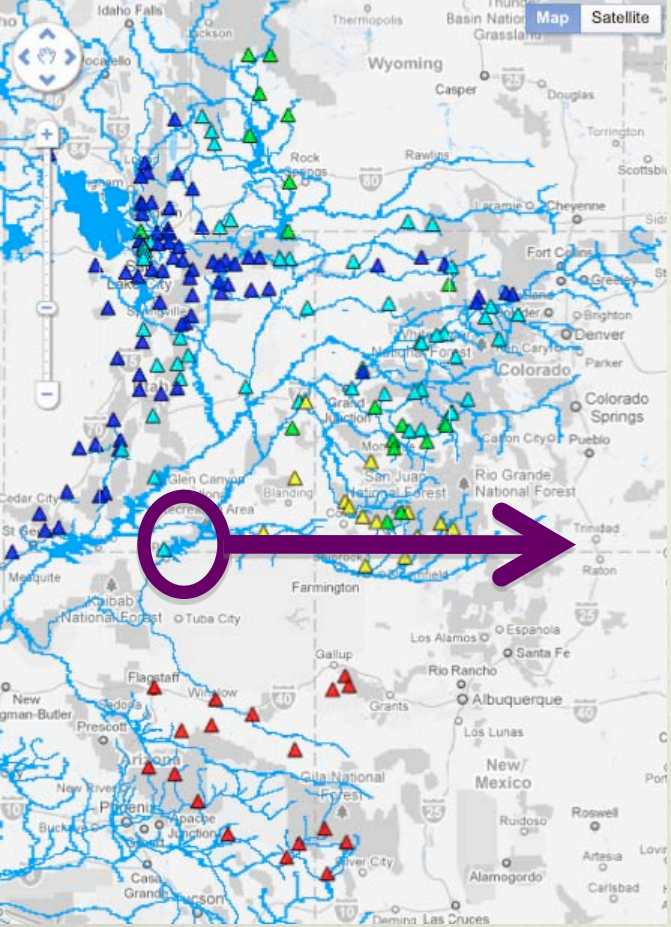
Forecast Period: Apr-Jul

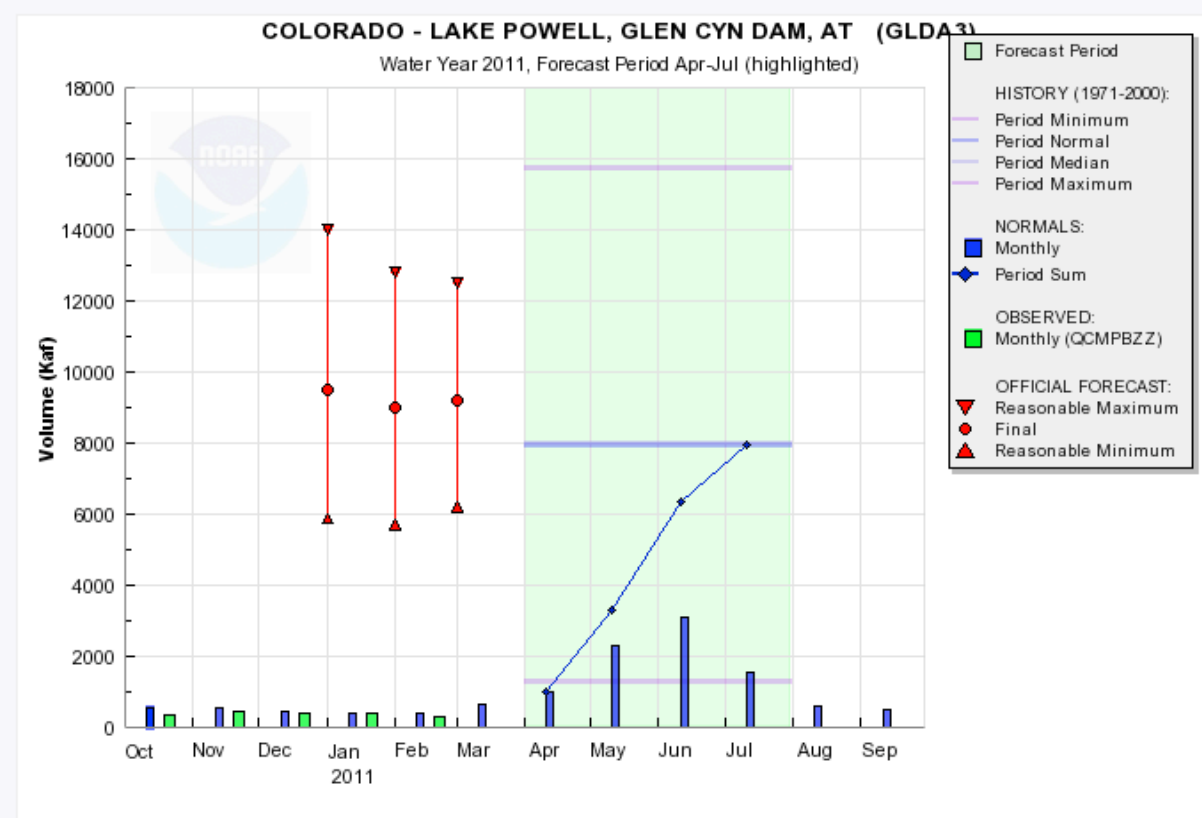
650 kaf 50% Exceedence (Official Forecast)	**108.1%** of Historical Median	**82.8%** of Historical Mean
405 kaf 90% Exceedence	**950 kaf** 10% Exceedence	**37th of 64** Official Historical Flows

Forecast Issued: Mar 1 2011

View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked





Seasonal Water Supply Forecast ⓘ

Forecast Period: Apr–Jul

9200 kaf 50% Exceedence (Official Forecast)	**119.8%** of Historical Median	**116%** of Historical Mean
6200 kaf 90% Exceedence	**12500 kaf** 10% Exceedence	**34th of 102** Official Historical Flows

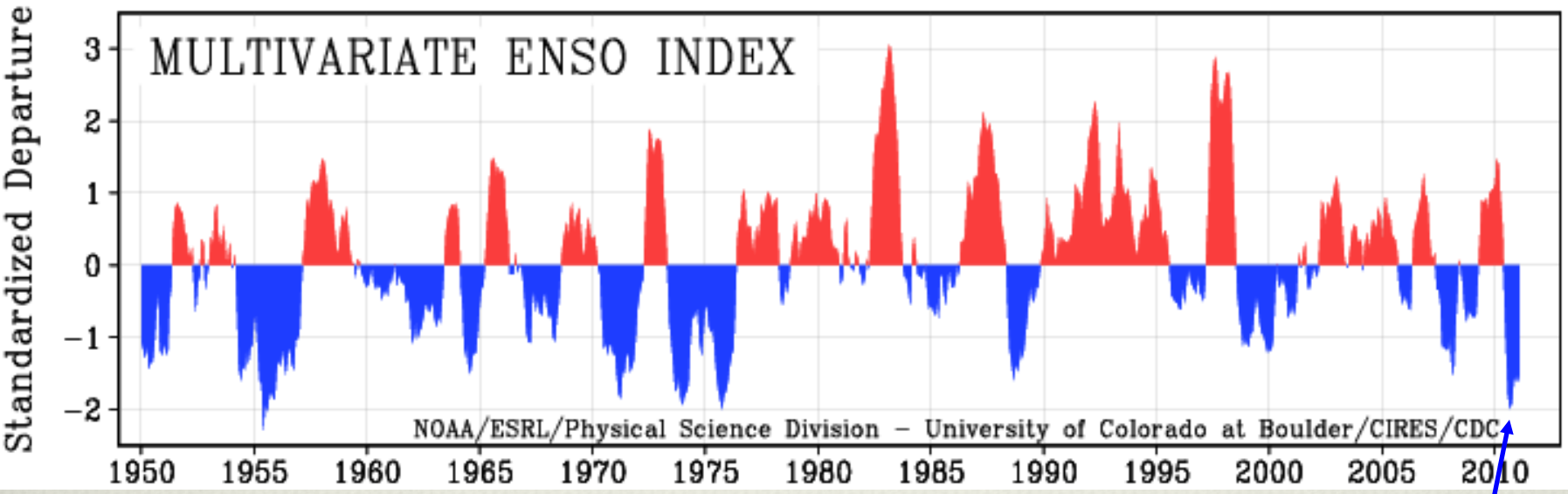
Forecast Issued: Mar 1 2011

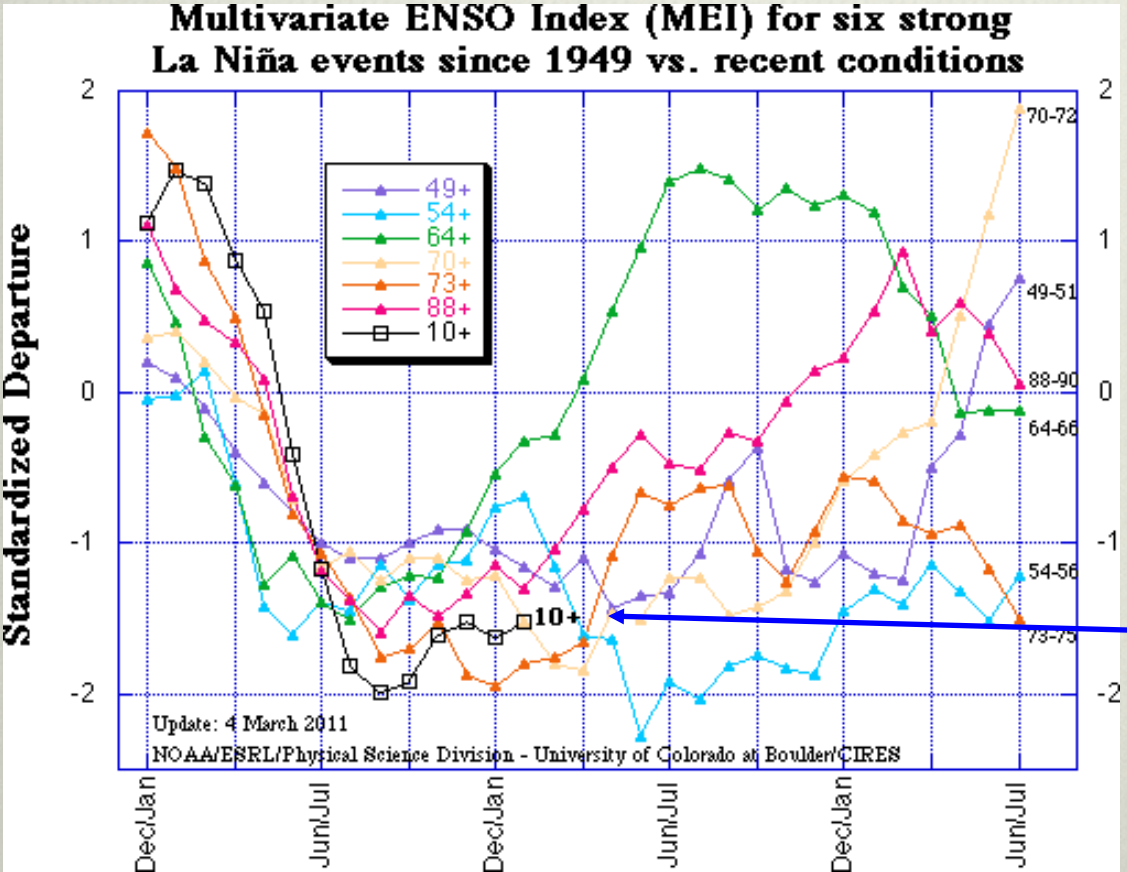
View Water Supply Forecast Plot

Web Reference: www.cbrfc.noaa.gov/gmap/gmapm.php?wcon=checked

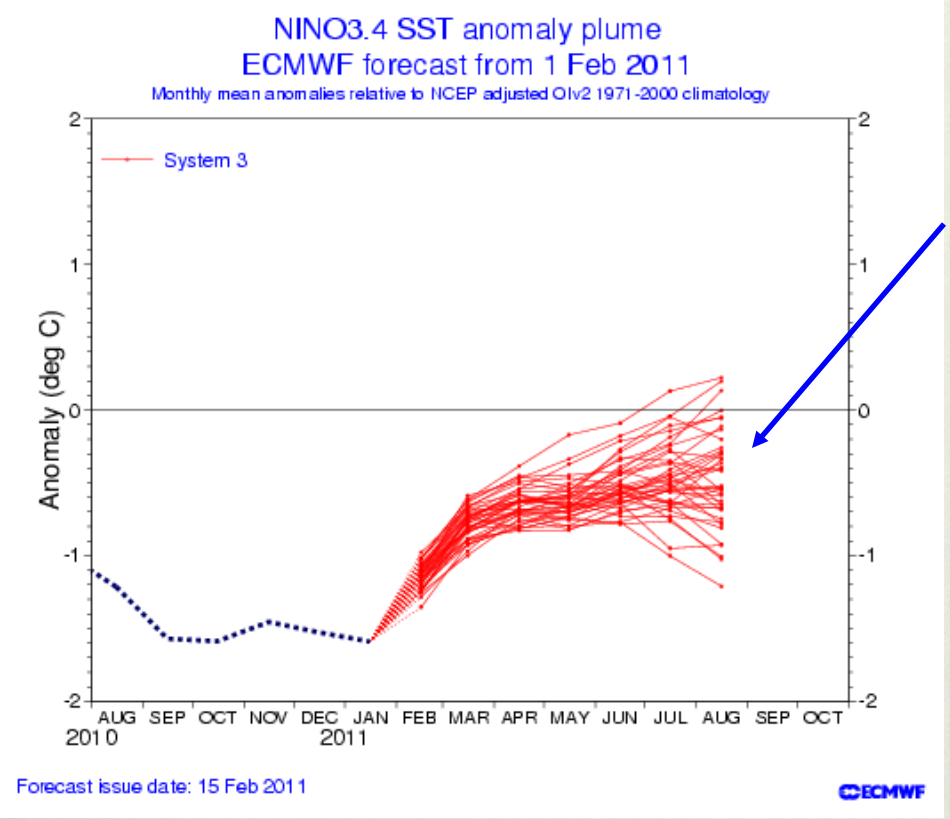
Climate Forecast

Klaus Wolter
NOAA/ESRL





Record-fast drop in 2010 from good-sized El Niño to biggest La Niña event in 35 years in just half a year;
continuing at high levels, mainly due to the atmosphere rather than the ocean.

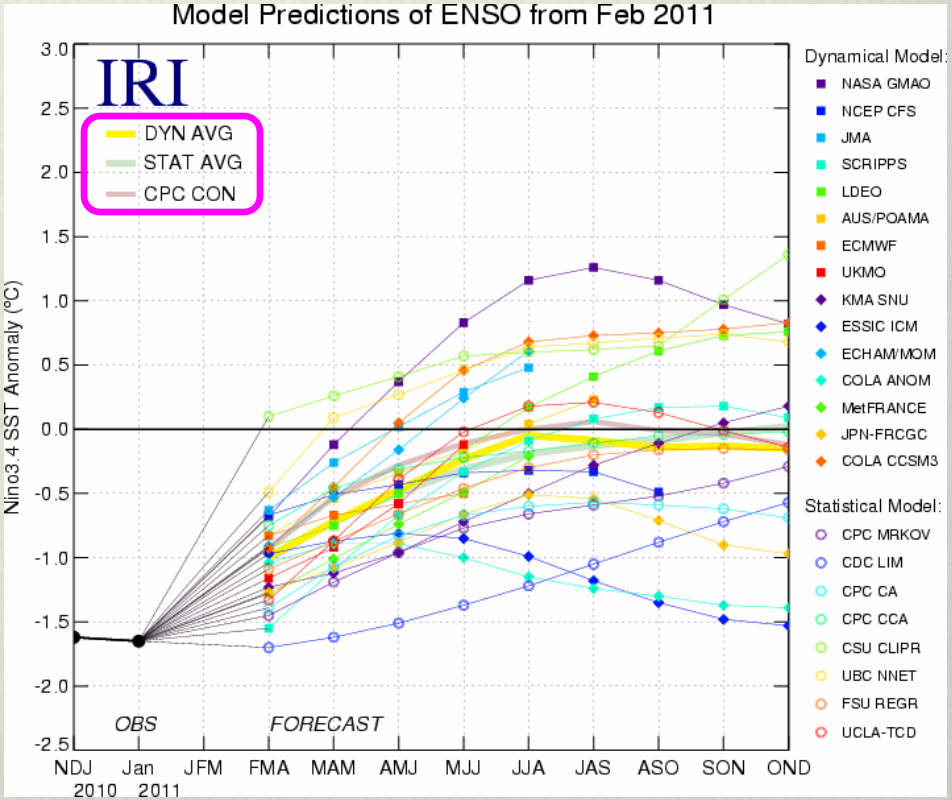


The European model's February 2011 forecast (left) kept most of its 50 ensemble members ('spaghetti plot') below 0C; once La Niña gets as big as this one, odds are increased that it ends up being a two-year event, even if it weakens during the summer.

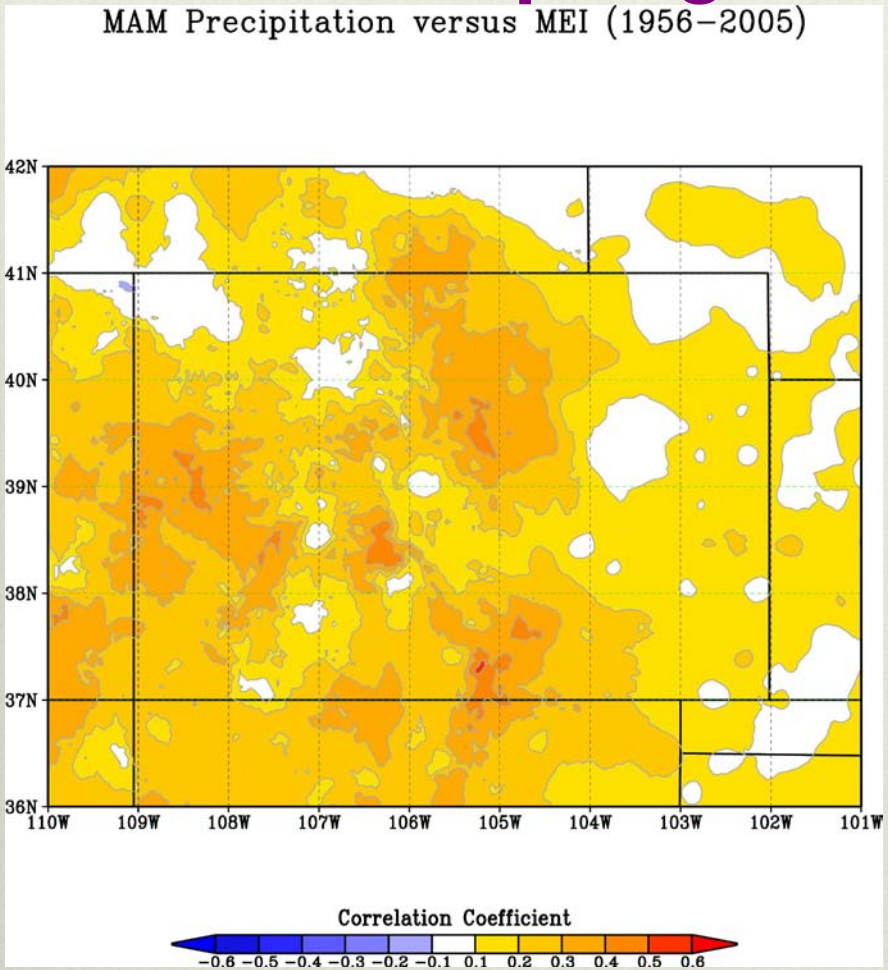
ENSO forecasts from 15 dynamical & 8 statistical forecast models (right):

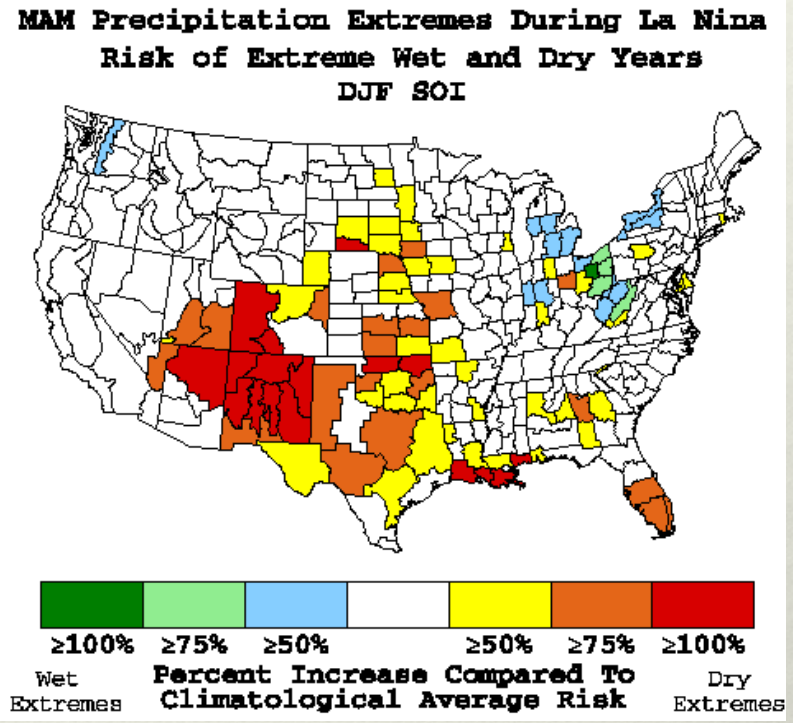
Expect weakening La Niña for next few months, then wide open outcome ('spring predictability barrier')…

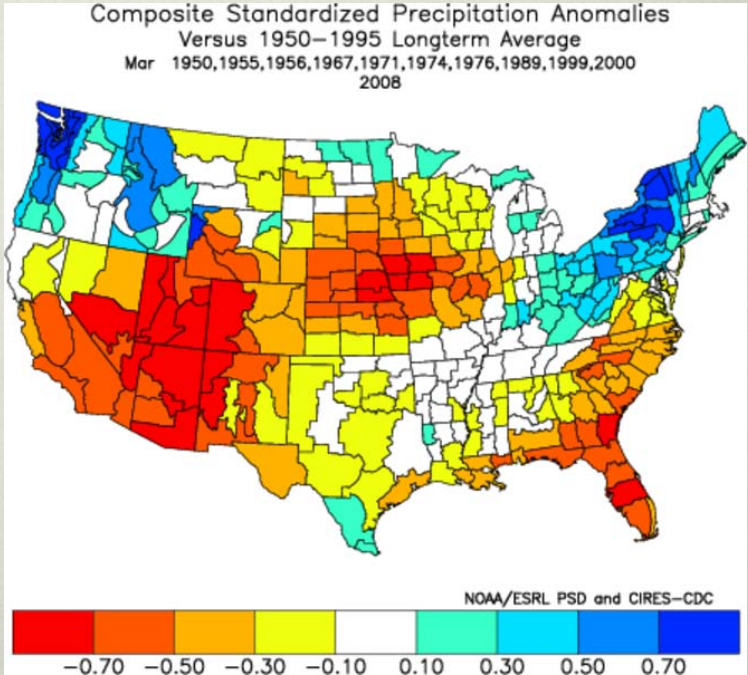
On average, insignificant differences for statistical vs. dynamical models



La Niña springs

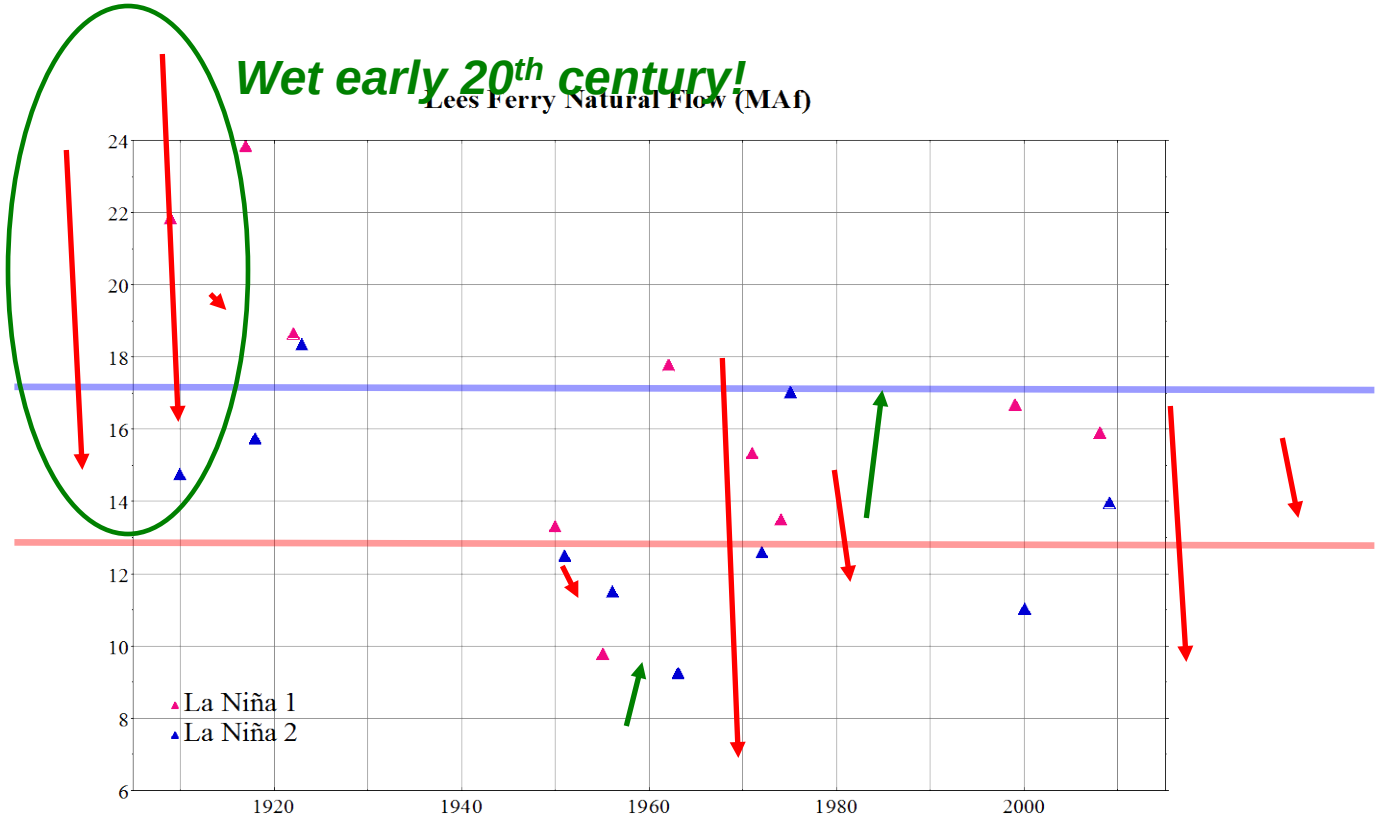






Spring is typically dry with La Niña in Colorado (left) – except for some Aprils ('71, '99). Both seasonal risk analyses (top right) and March composites (bottom right) highlight a stronger tendency for dry springs over Western rather than Eastern Colorado.

What is difference for Year 1 vs. Year 2 Las Niñas?



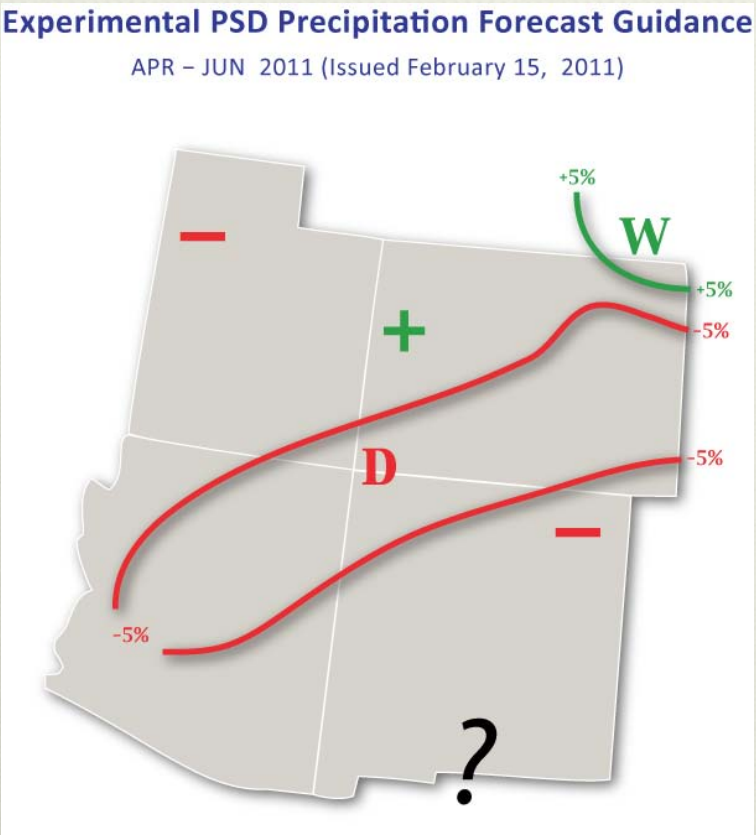
Mean flow for Year 1: 16.75 MAf (= +1.7MAf)

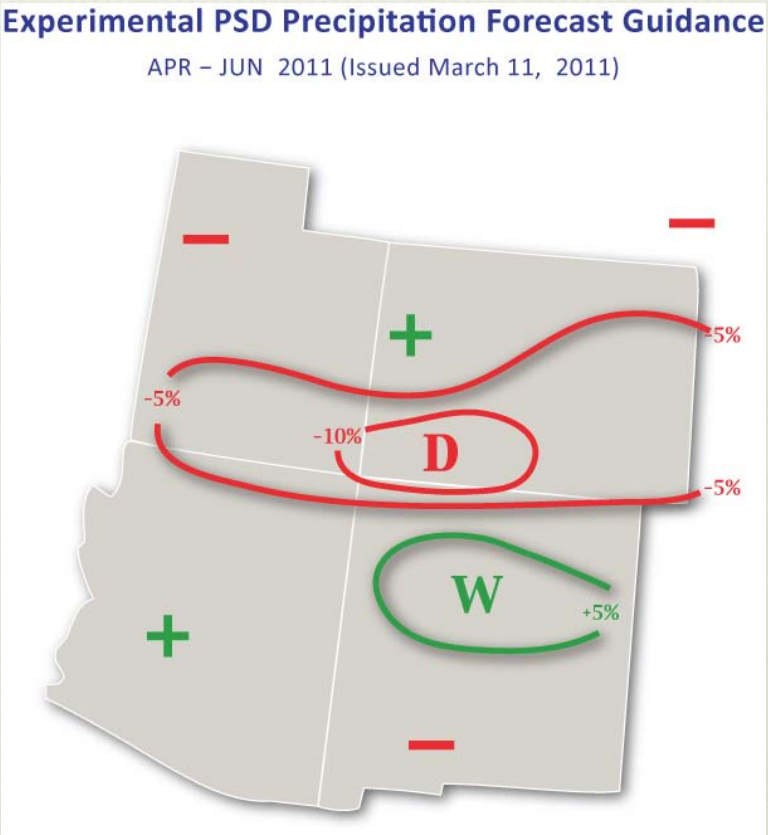
Mean flow for Year 2: 13.64 MAf (= -1.4MAf)

Difference significant, with more than 0.7 standard deviations!

In two-year La Niña events, 2nd year runoff has often been lower than 1st year runoff (8 of 10 cases) for the Colorado River. Six of 1st year runoff totals were clearly above the long-term mean, while seven of 2nd year runoff totals were clearly below that.

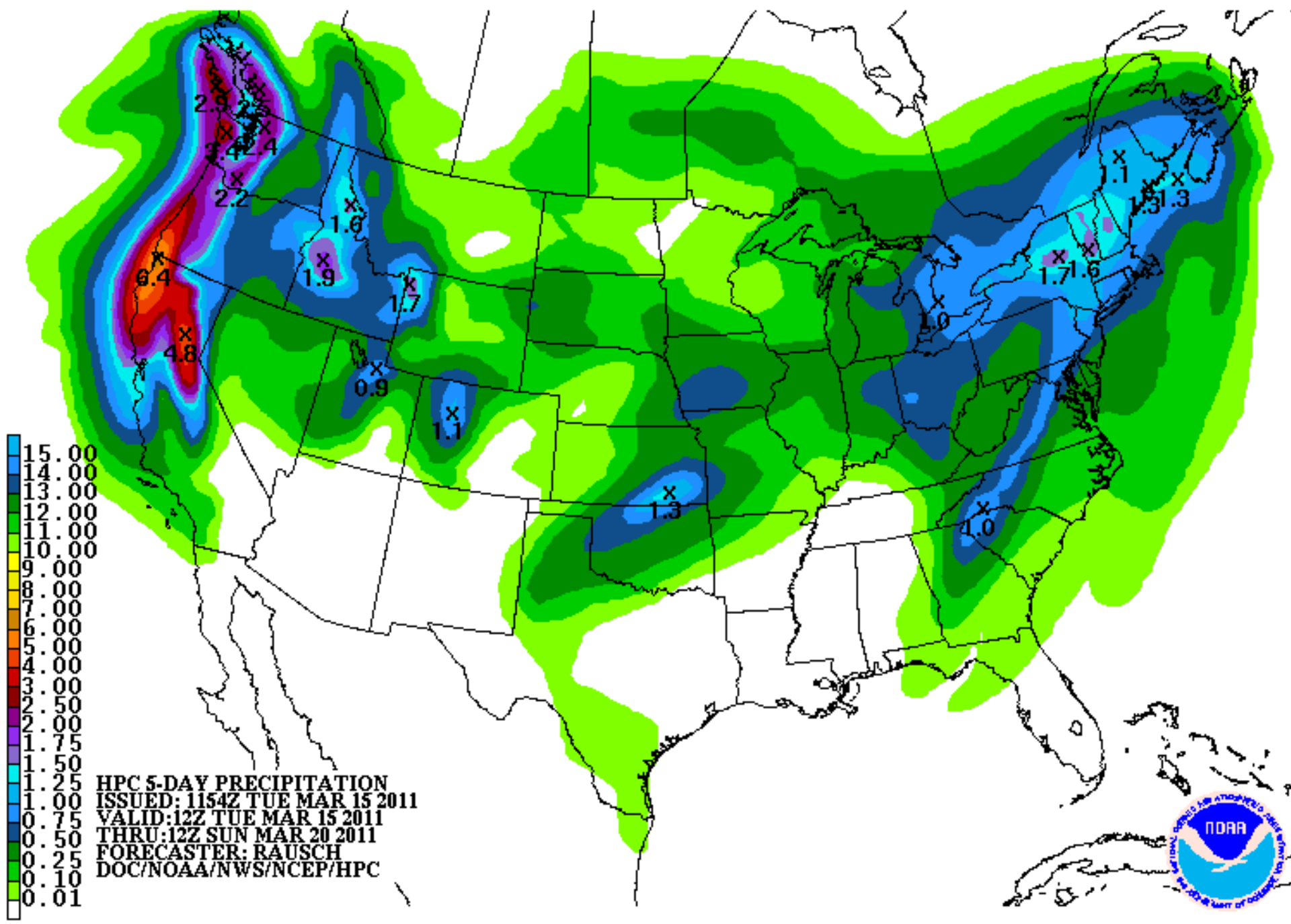
Statistical Forecast for April-June 2011





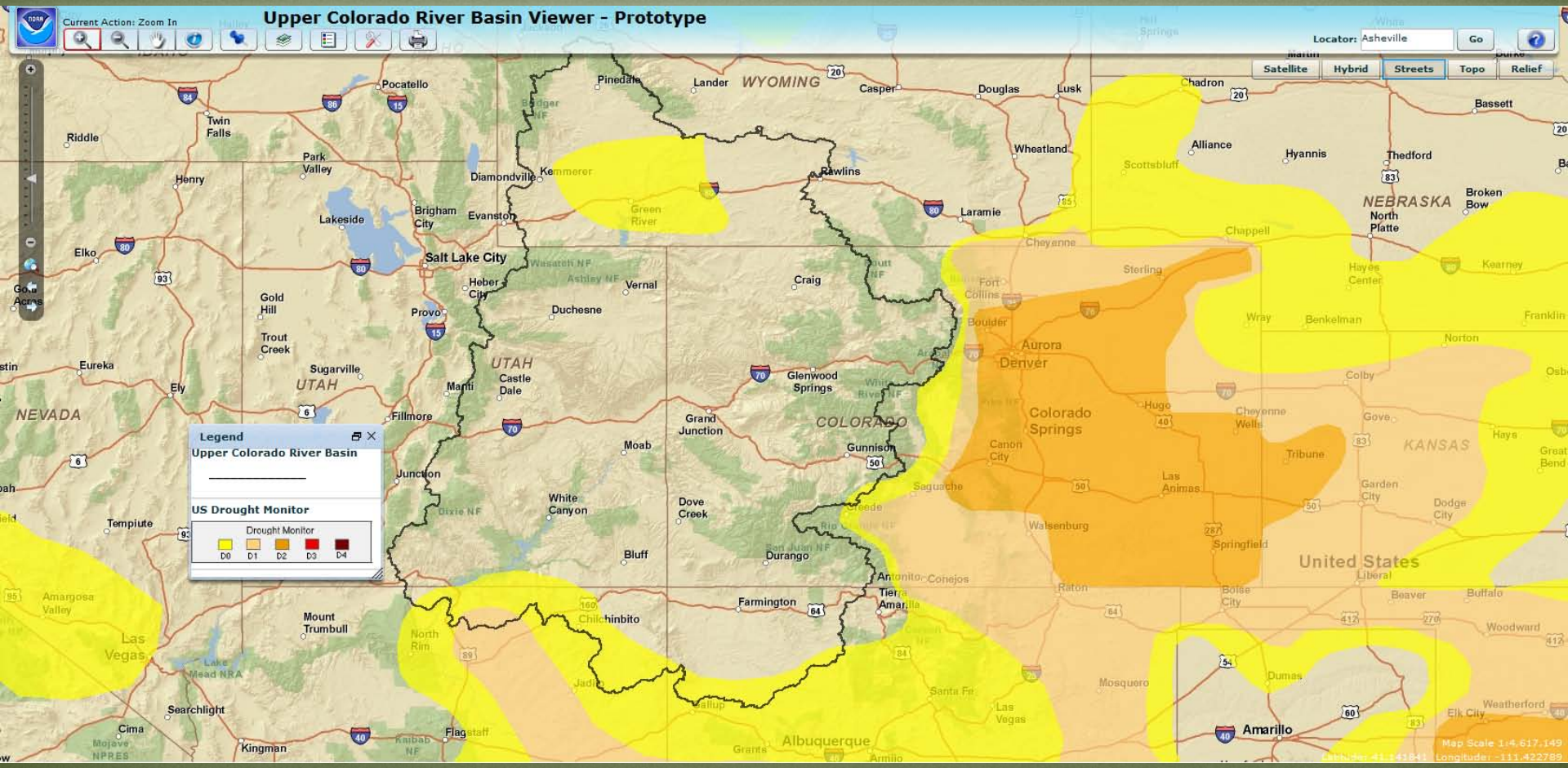
Last month's (left) and this month's (right) forecast for April-June 2011 is fairly confident that southern Colorado will see below-normal moisture. The northwestern third of our state has slightly increased chances of being wetter-than-average. ***Historical skill over the last decade of experimental forecasts has been better for Utah and Colorado than for AZ and NM.***

Precipitation Forecast



15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.50
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.10
0.01
HPC 5-DAY PRECIPITATION
ISSUED: 1154Z TUE MAR 15 2011
VALID:12Z TUE MAR 15 2011
THRU:12Z SUN MAR 20 2011
FORECASTER: RAUSCH
DOC/NOAA/NWS/NCEP/HPC
NOAA

Recommendations



INFO

For more information

NIDIS Weekly Climate, Water and Drought Assessment Summary

Upper Colorado River Basin

March 15, 2011

Precipitation and Snowpack

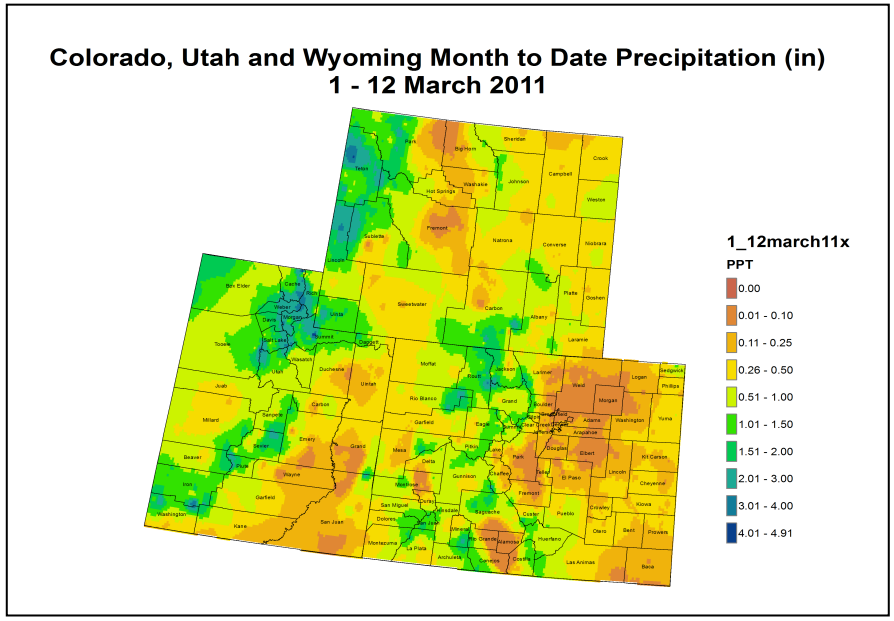


Fig. 1: March month-to-date precipitation in inches.

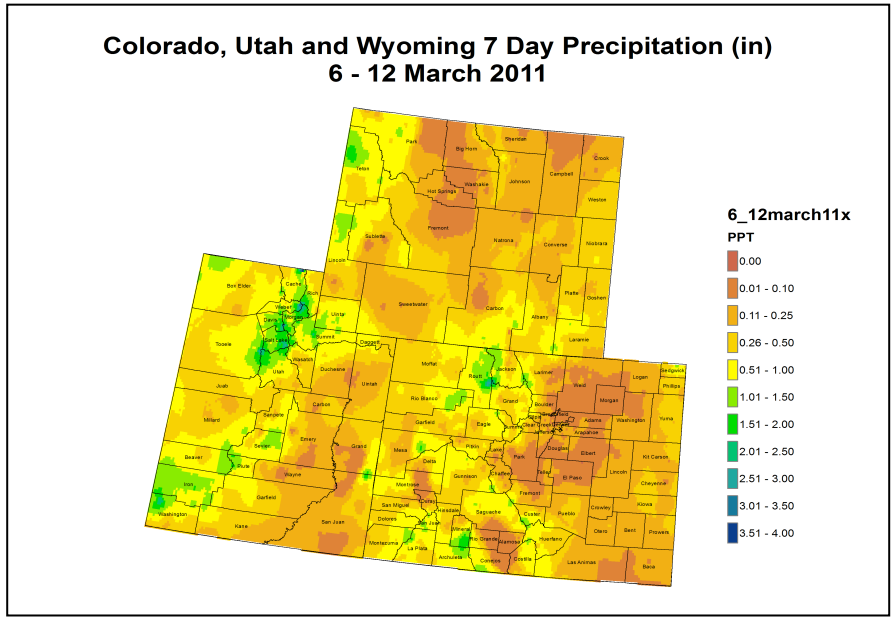


Fig. 2: March 6 – 12 precipitation in inches.

For the month of February the Wasatch and Uintas in Utah, areas of southwestern Wyoming, the Sangre de Cristos in southern Colorado and the northern mountains of Colorado received above average moisture, while the mountain valleys, Four Corners region and southeastern plains remained dry. This pattern has mostly continued for the first half of March—the northern mountains of Colorado and extending down to the Sangre de Cristos in southern Colorado have received more than an inch of precipitation over the past two weeks, and areas of the Wasatch range in Utah saw over three inches (Fig. 1).

Last week, the highest amounts of precipitation fell along the Wasatch range in Utah and in the northern mountains of Colorado with over an inch of moisture (Fig. 2). Good amounts also fell in the southern CO mountains and down into the upper Rio Grande basin, though the valleys in these regions remained fairly dry. The northern Front Range of Colorado (and the adjacent plains) and southeastern Utah remained dry over the last week, with many areas receiving less than a tenth of an inch of moisture.

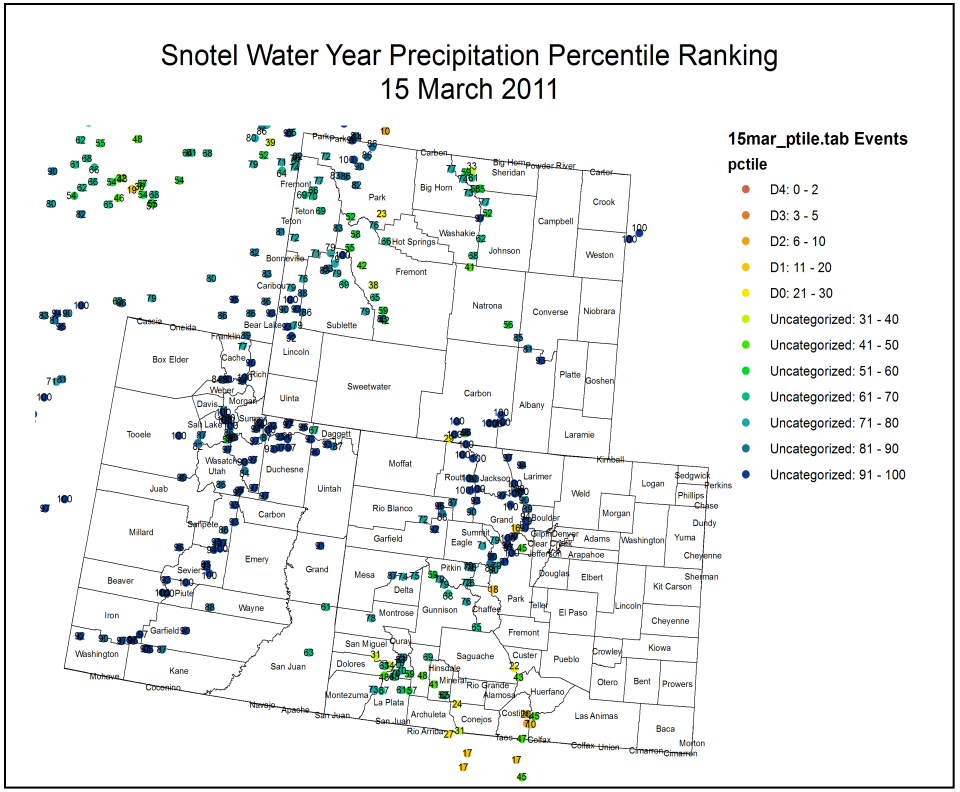


Fig. 3: SNOTEL WYTD precipitation percentiles (50% is median, 21-30% is Drought Monitor's D0 category).

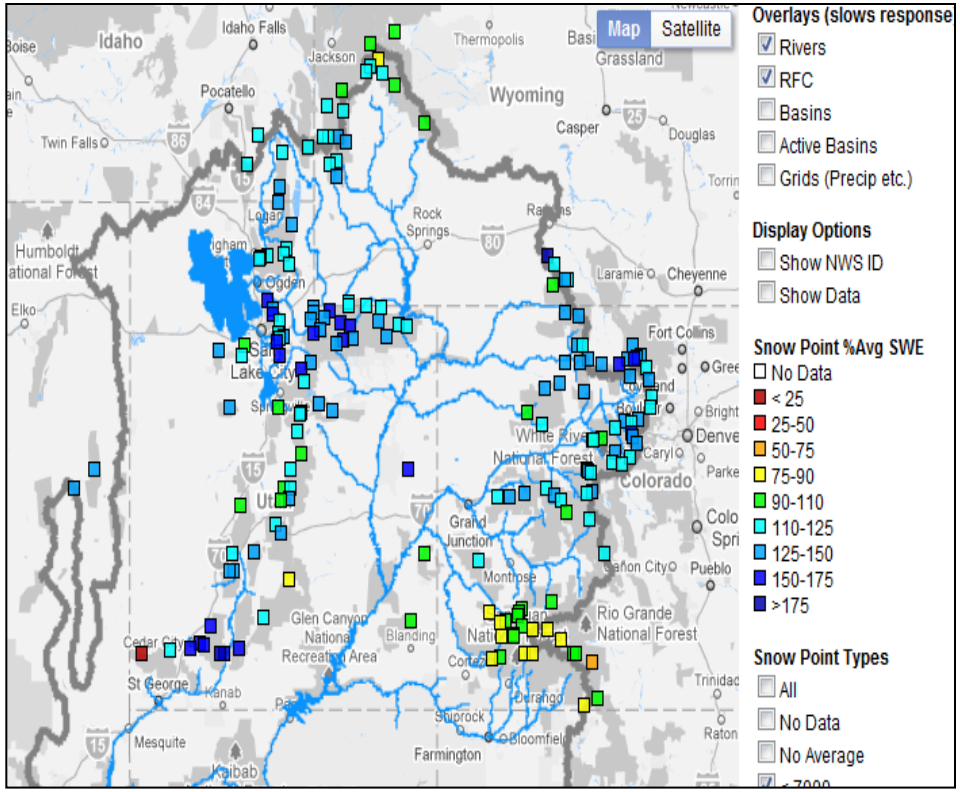


Fig. 4: SNOTEL WYTD accumulated snow water equivalent as a percent of average.

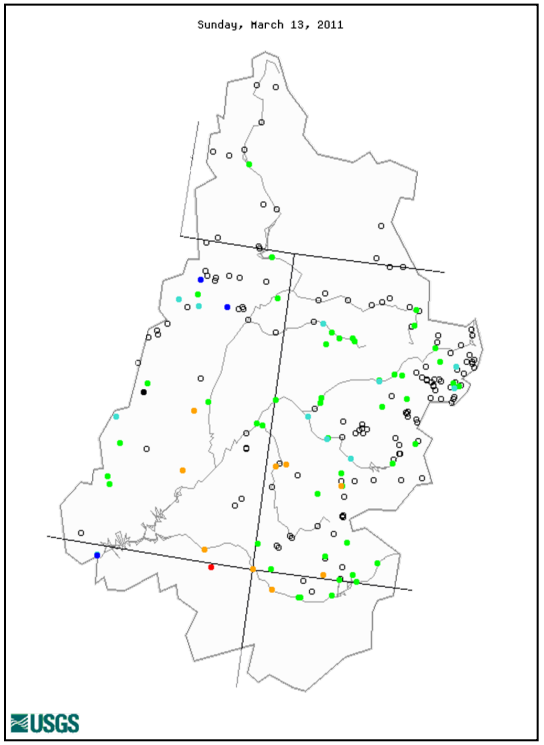
The majority of the SNOTEL sites in the Upper Colorado River Basin (UCRB) are showing high percentile rankings for water-year-to-date (WYTD) precipitation (Fig. 3). The Rio Grande and San Juan basins in southern CO are the driest, showing percentile rankings below 50%. Some of the sites in the Rio Grande basin are showing percentiles below 30% (meaning that 70% of the years have been wetter).

Snowpack around most of the UCRB is in good condition—currently snowpack for the entire basin above Lake Powell is 121% of average (Fig. 4). The northern boundary of the Upper Green River basin shows accumulated snowpack levels slightly below average. The Duchesne basin in Utah and the Upper Colorado above Kremmling have already surpassed their average seasonal snowpack peaks. The San Juan basin in southern Colorado is currently at 85% of its average snowpack and has already started to experience some snowmelt.

Streamflow

As of March 13th, about 86% of the USGS streamgages in the UCRB recorded normal (25th – 75th percentile) or above normal 7-day average streamflows (Fig. 5). There are about 77 gages in the basin currently reporting, but new gages are coming out of icy conditions on a daily basis. By the end of the month, up to 100 gages could be reporting again. A cluster of below normal streamflow gages is now showing up in the Four Corners region.

The Colorado River at the CO-UT state line is currently recording normal flows and is at the 50th percentile (Fig. 6). The Green River at Green River, UT saw an increase from last week and is recording flows at 128% of normal. The spike in the Green River streamflow from last week is due to lower elevation snowmelt currently occurring in the region. The San Juan River near Bluff, UT is now recording flows in the below normal range (10th – 24th percentile), but has increased slightly from last week, possibly due to early snowpack melting.



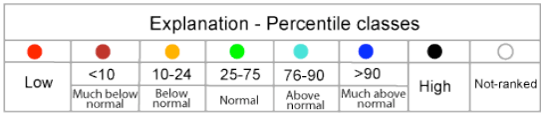


Fig. 5: USGS 7-day average streamflow compared to historical streamflow for March 13th in the UCRB.

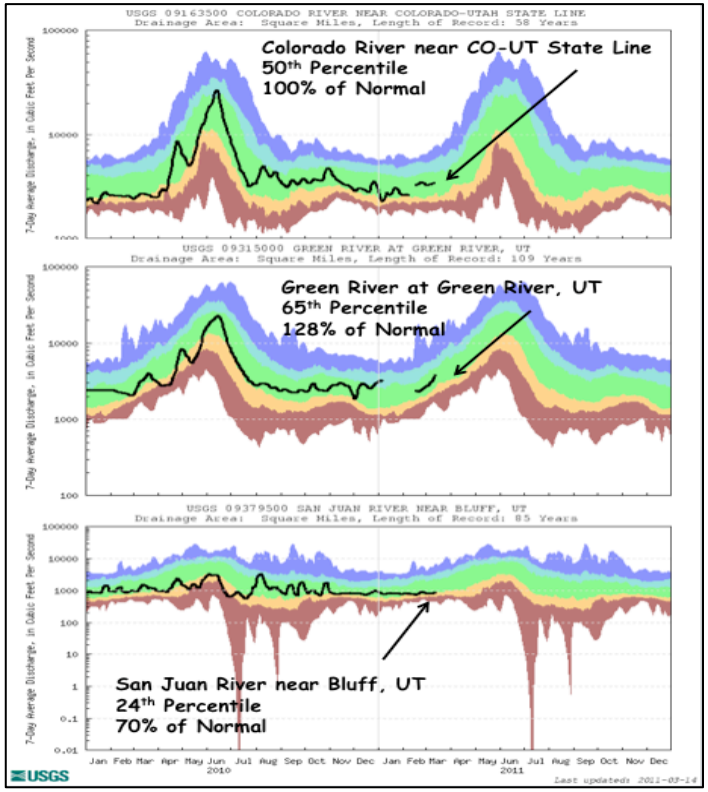


Fig. 6: USGS 7-day average discharge over time at the CO-UT state line (top), Green River, UT (middle) and Bluff, UT (bottom).

Water Demand

For the first half of March, temperatures have been mostly near average for most of the basin and surrounding areas. A small pocket of the Upper Green River basin saw below average temperatures. Lower elevations have also seen an increase in temperatures over the past couple of weeks accompanied by dry winds. Soil moisture through most of the UCRB is in good condition, with deteriorating soil moisture conditions around the Four Corners region (Fig. 7). The driest soils continue to dominate in southeastern Colorado.

Streamflow and Precipitation Forecasts

Many of the sites around the UCRB are forecast to see above average water supplies for the April – July period (Fig. 8). The San Juan and Gunnison basins in Colorado are currently reporting below average water supply forecasts. Forecasts increased for all sub-basins from last month except the San Juan basin. Forecasted inflow into Lake Powell is 9.2 million acre feet which would be 116% of average.

La Nina conditions have continued throughout the winter, though it has weakened, and several ensemble forecasts show that it will continue to weaken into the summer. Spring La Ninas are historically dry in the UCRB with the exception of a couple of anomalously wet Aprils. It is forecast that dry conditions could continue in southern Colorado and the Four Corners region, with the possibility for wetter conditions in northwest CO (Fig. 9). This is the strongest La Nina experienced over the past 35 years, and it is likely that La Nina could restrengthen for the next winter. When there are two consecutive years of La Nina, the second year is likely to be drier with lower runoff in the UCRB.

The next system will move through the northern part of the UCRB late Wednesday and into Thursday, bringing southwest flow with it. The heaviest precipitation will fall in the Wasatch range in UT, the northern CO mountains and along the Continental Divide. Dry conditions will prevail for Friday and into Saturday with the next system entering on Sunday. There is some disagreement between the models on the placement of the low, but it is a warm and moist system that could bring more moisture to the northern part of the UCRB.

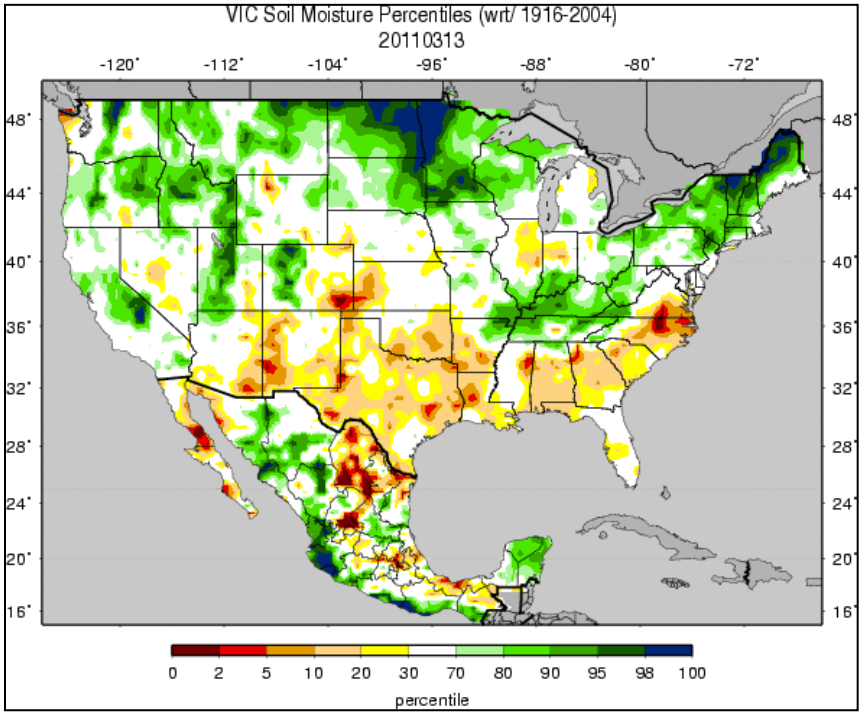


Fig. 7: VIC soil moisture as of March 13th.

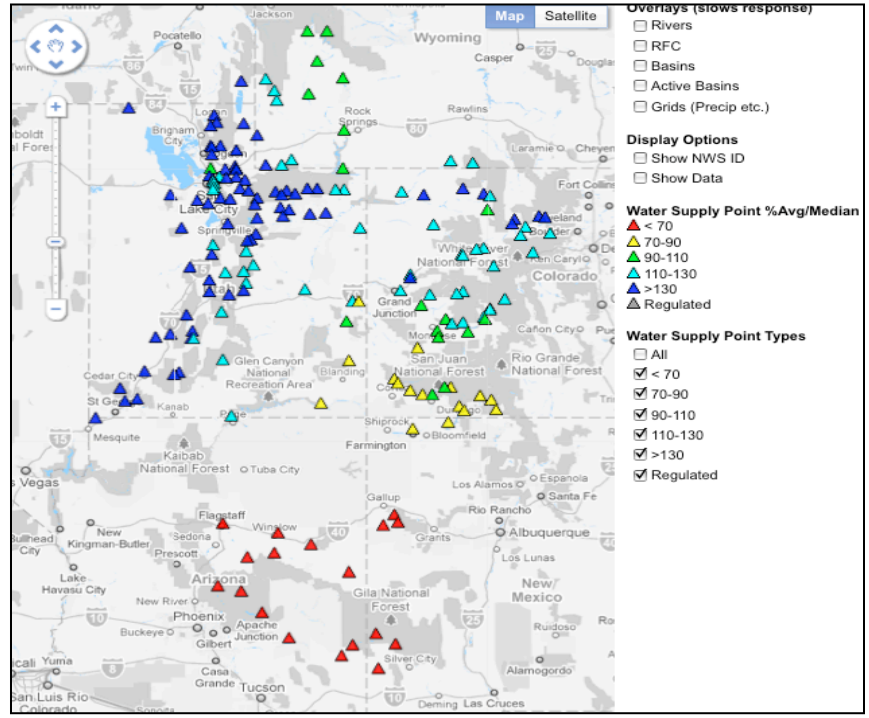


Fig. 8: March 1st water supply forecasts for April – July.

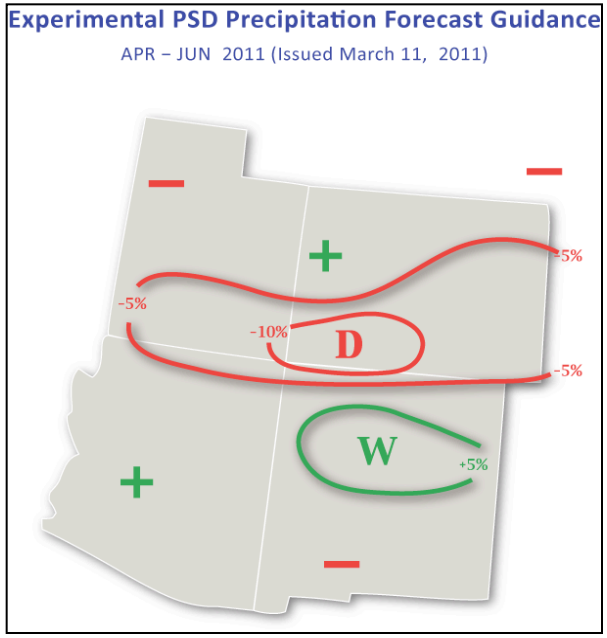


Fig. 9: March forecast for April – June precipitation (Klaus Wolter).

Drought and Water Discussion

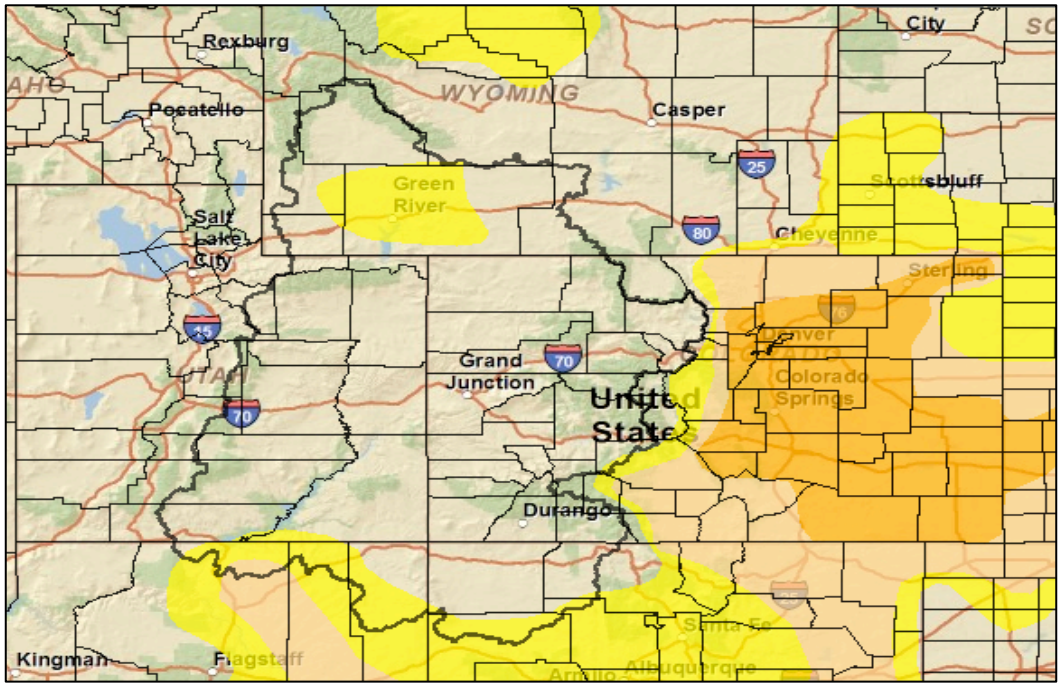


Fig. 10: March 8th release of U.S. Drought Monitor for the UCRB

Drought – Exceptional		0 to 2 (D4)
Drought – Extreme		2 to 5 (D3)
Drought – Severe		5 to 10 (D2)
Drought – Moderate		10 to 20 (D1)
Abnormally Dry		20 to 30 (D0)

Drought categories and their associated percentiles

Slight improvements have been made to the current U.S. Drought Monitor (USDM) map in southeastern Wyoming (Fig. 10). Status quo has been recommended for the eastern plains of Colorado and for much of the rest of the UCRB.

The current area of concern is the Four Corners region in the southern part of the UCRB. Snowpack and precipitation have been below average for most of the water year. Low streamflows along the San Juan River and the threat of early snowmelt are also a problem. Soils have also dried in the region over the past few weeks. The current USDM author is proposing an expansion of D0 into southeastern Utah for this week as conditions are just as poor as they are in northeastern Arizona, which is already in D0. However, there have been limited impacts in the region. Local experts have agreed to a minor expansion of D0 in San Juan County, UT that stays confined to the low elevation areas surrounding the San Juan River.