CBRFC Water Supply Webinar
November 17, 2011



CBRFC Staff
(Kevin Werner, Ashley Nielson, Brenda Alcorn, Bill Reed, Tracy Cox, Greg Smith, Brent Bernard)

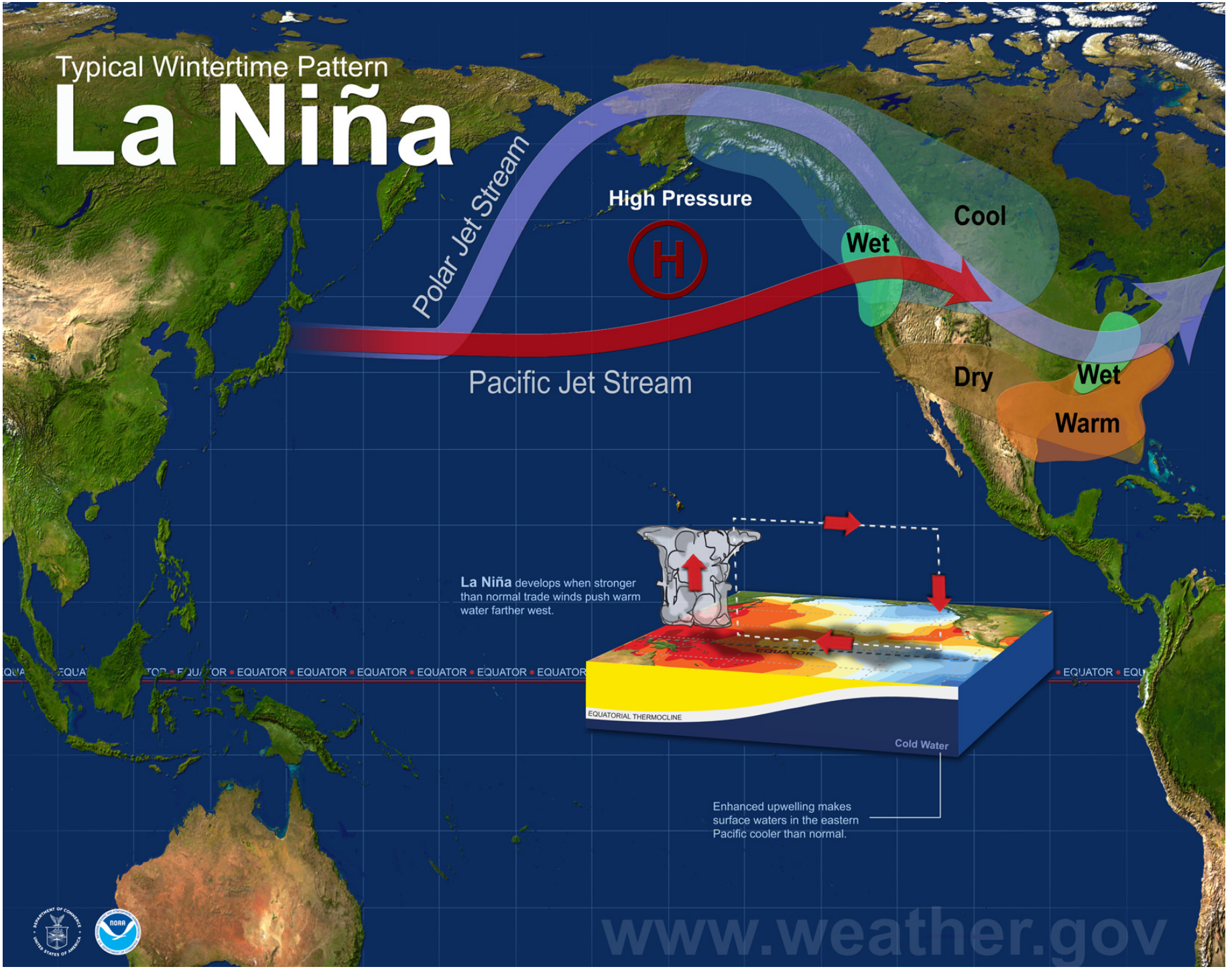
Photo: Yampa River near Steamboat
June 11, 2011
These slides: http://www.cbrfc.noaa.gov/present/present2011.cgi

Outline

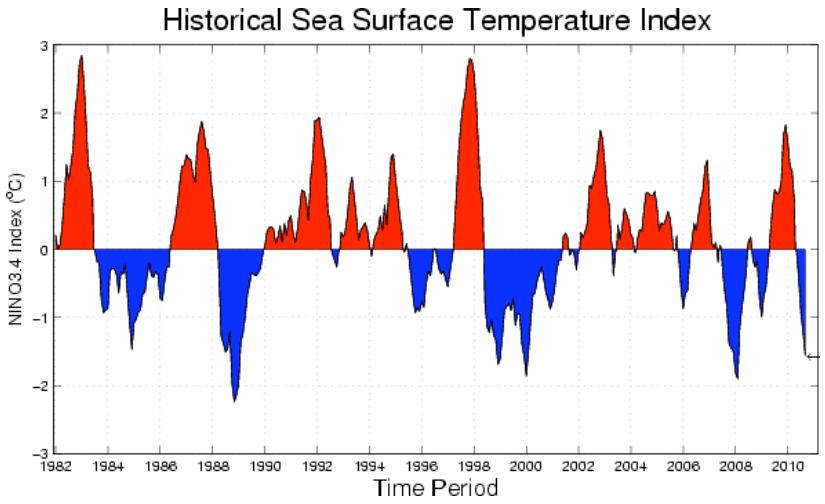
- 2011 Year in review
- 2012 Look ahead
  - Climate forecasts
  - CBRFC update

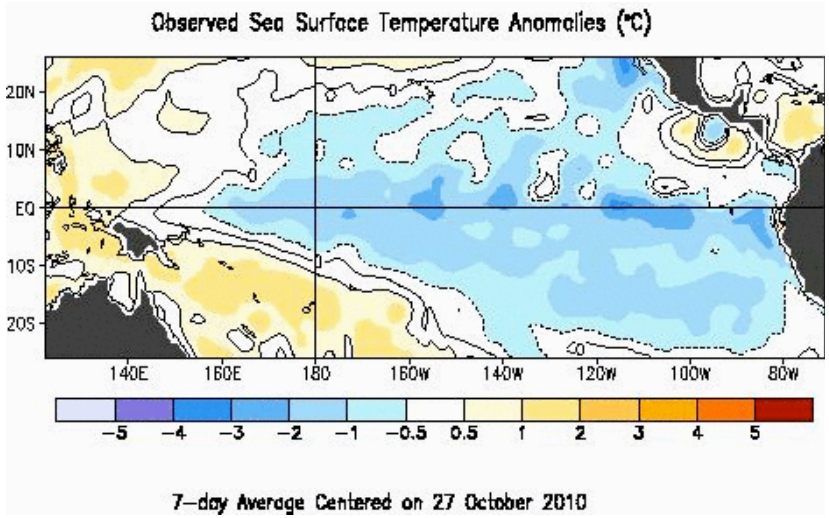
2011 Year in Review

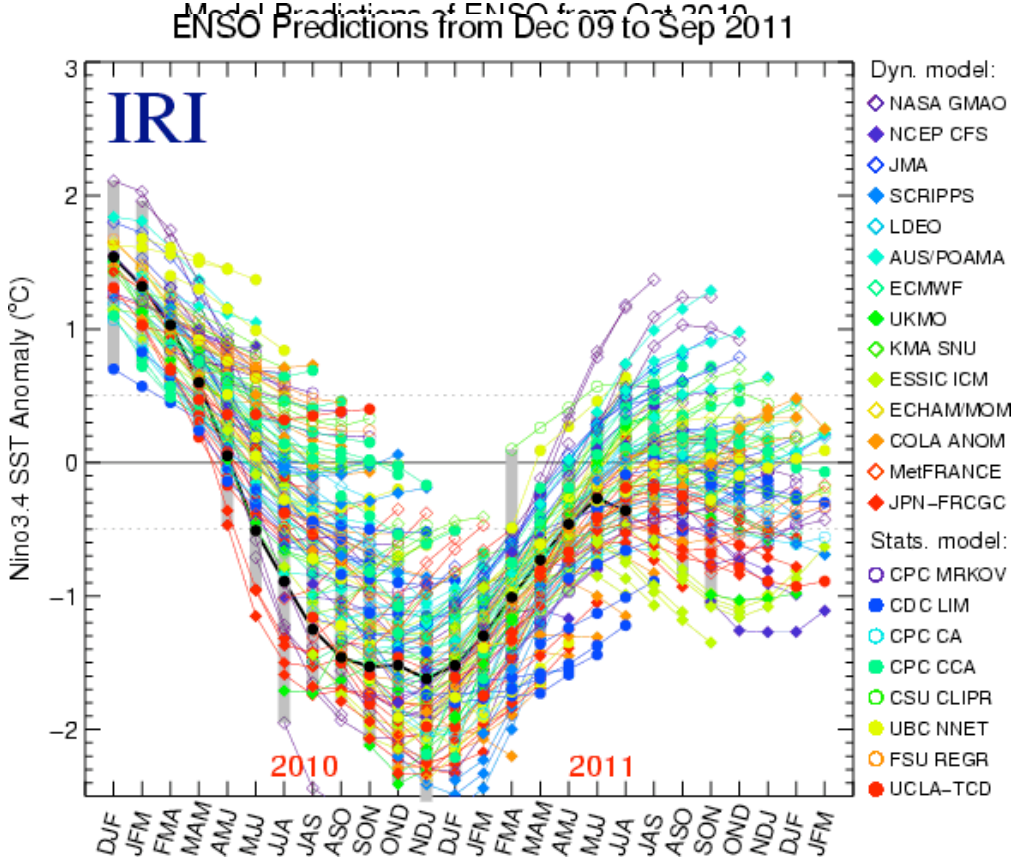
- Climate forecasts
- Precipitation, Temperature, and Snowfall Review
- Water Supply and Peak Flow Forecast Verification


Typical Wintertime Pattern
La Niña
Polar Jet Stream
High Pressure
H
Cool
Wet
Pacific Jet Stream
Dry
Wet
Warm
La Niña develops when stronger than normal trade winds push warm water farther west.
EQUATOR
EQUATORIAL THERMOCLINE
Cold Water
Enhanced upwelling makes surface waters in the eastern Pacific cooler than normal.
www.weather.gov

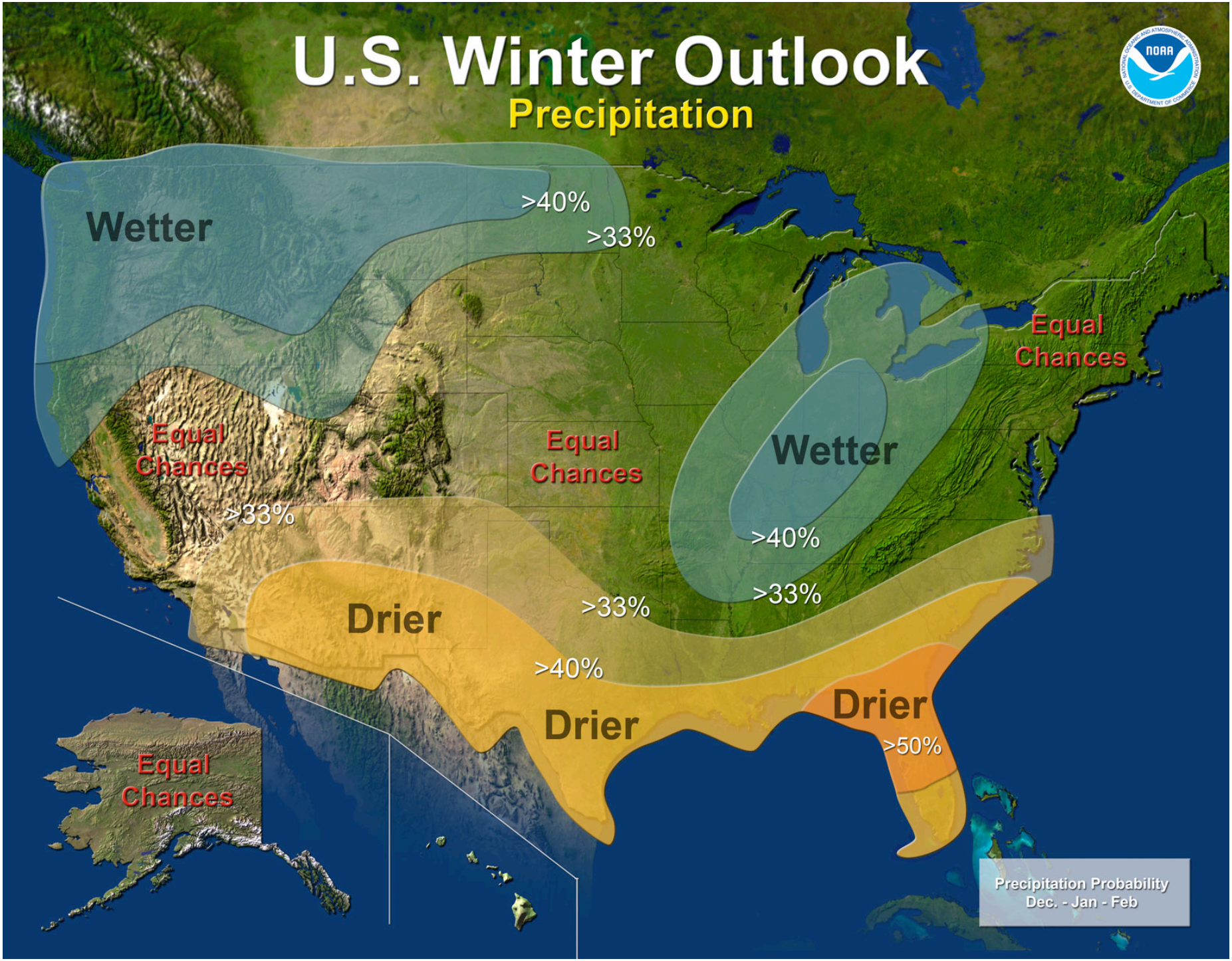
La Nina



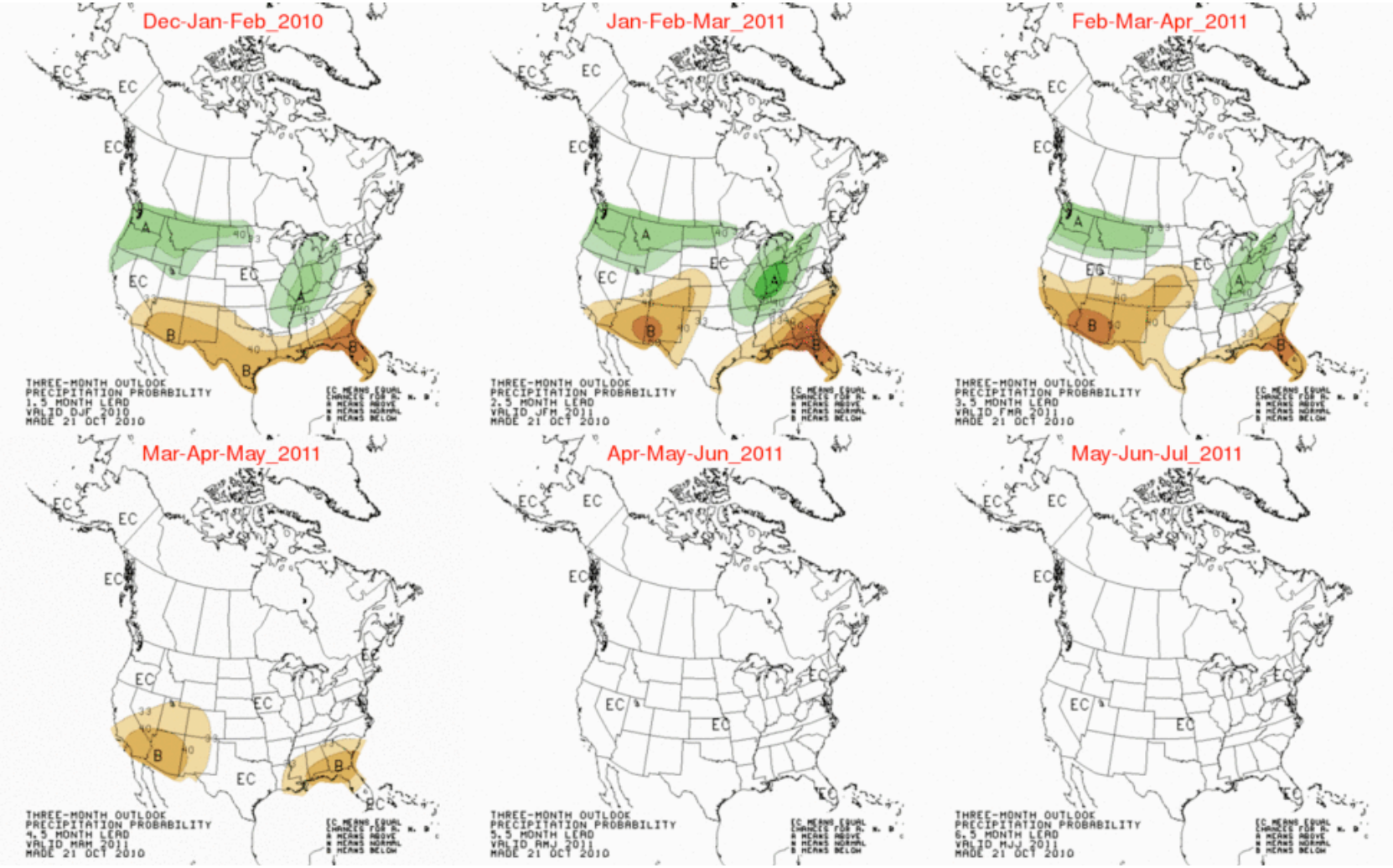




Sources: cpc.ncep.noaa.gov and iri.columbia.edu/climate/ENSO


U.S. Winter Outlook
Precipitation
Wetter
>40%
>33%
Equal Chances
Equal Chances
Equal Chances
Wetter
>33%
>40%
>33%
Drier
>33%
>40%
Drier
Drier
>50%
Equal Chances
Precipitation Probability
Dec. - Jan - Feb

CPC Precipitation Outlooks



La Nina and the Upper Colorado

- Some analyses (e.g. Klaus Wolter, right) have shown seasonal teleconnections to precipitation in the Upper Colorado basin
- Possible tendency toward drier fall and spring and wetter winters in La Nina

Credit: Klaus Wolter http://wwa.colorado.edu/IWCS/2010_October.html

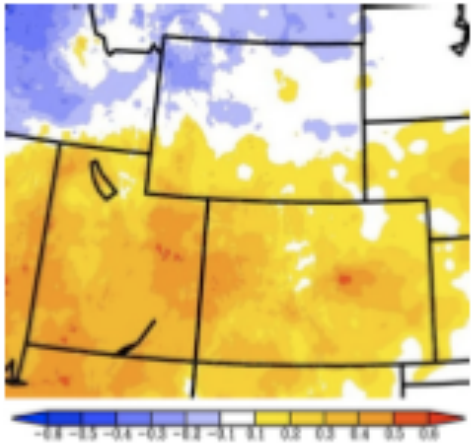


Figure 2a: Correlations between Multivariate ENSO Index (MEI) and precipitation for the Fall (September–November) season. Orange colors indicate a tendency towards wetter conditions during El Niño (positive MEI); and blue indicates a tendency towards wetter conditions during La Niña (negative MEI). (Maps by Jon Eischeid, NOAA ESRL PSD)

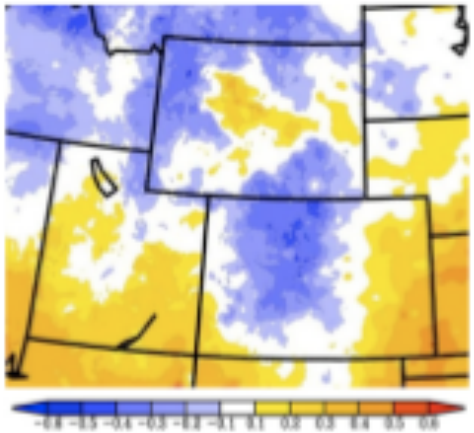


Figure 2b: Same as 2a, but for the Winter (December–February) season.

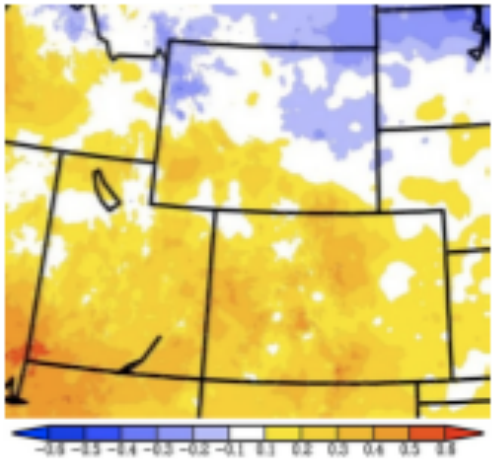
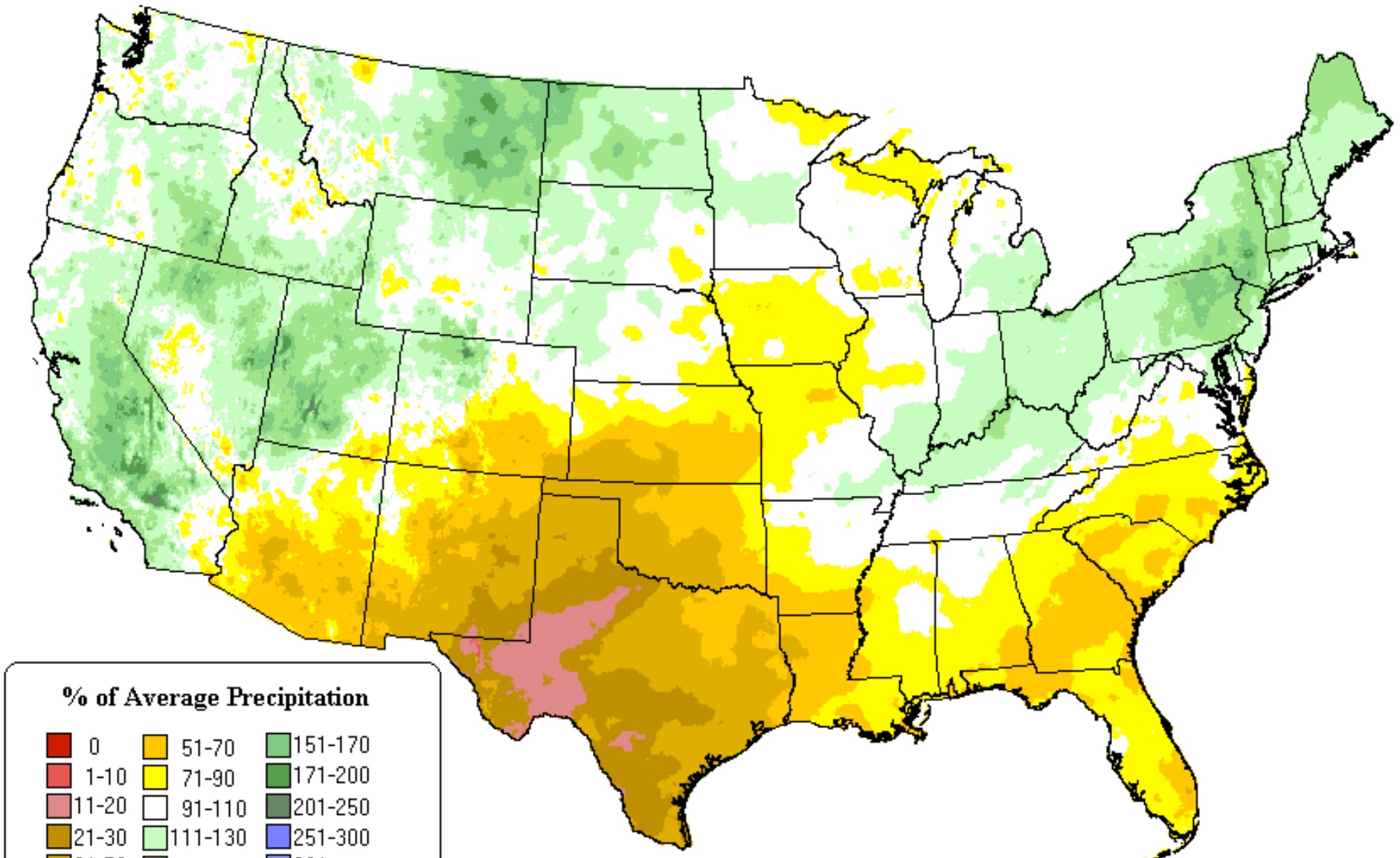


Figure 2c: Same as 2a, but for the Spring (March–May) season.

12-month Percent of Average Precipitation: Sep 2011

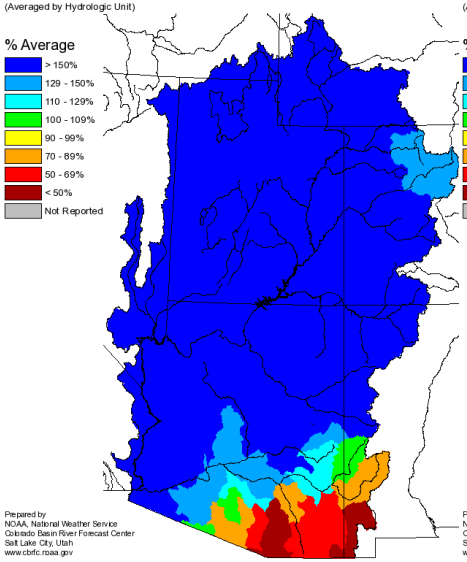
Provisional Data



Copyright (c) 2011, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Oct 10 2011

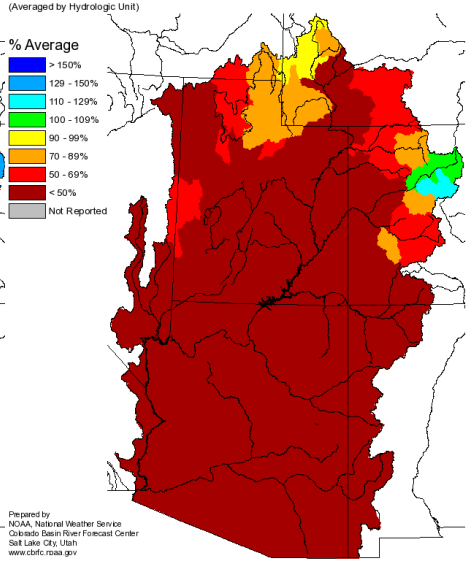
Monthly Precipitation for December 2010

(Averaged by Hydrologic Unit)



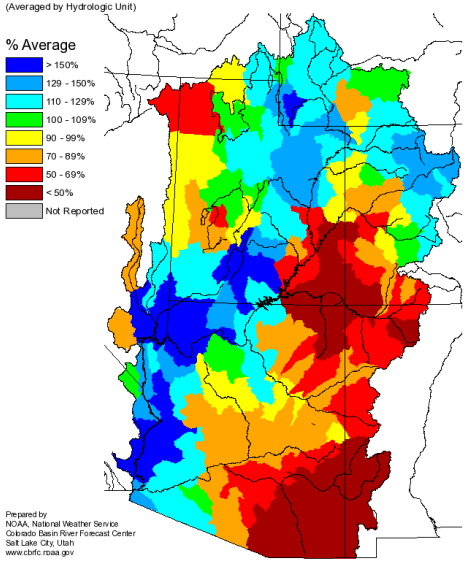
Monthly Precipitation for January 2011

(Averaged by Hydrologic Unit)



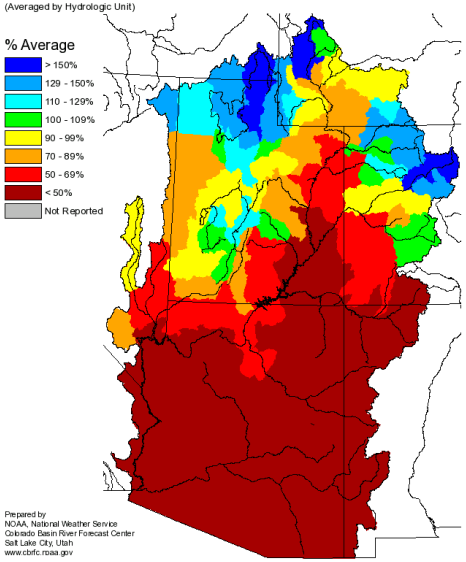
Monthly Precipitation for February 2011

(Averaged by Hydrologic Unit)



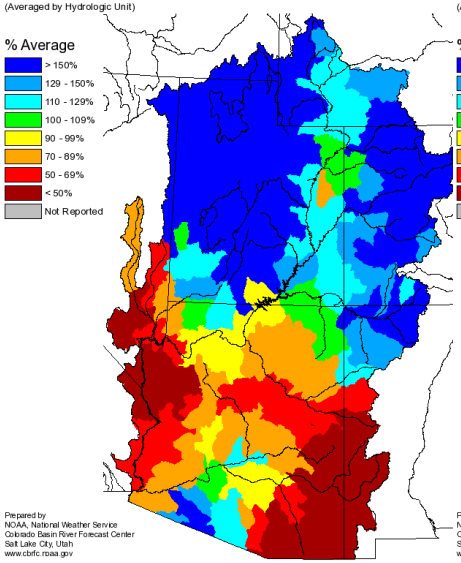
Monthly Precipitation for March 2011

(Averaged by Hydrologic Unit)



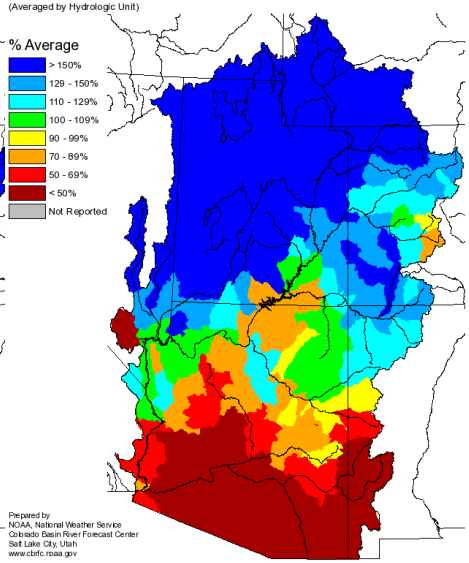
Monthly Precipitation for April 2011

(Averaged by Hydrologic Unit)



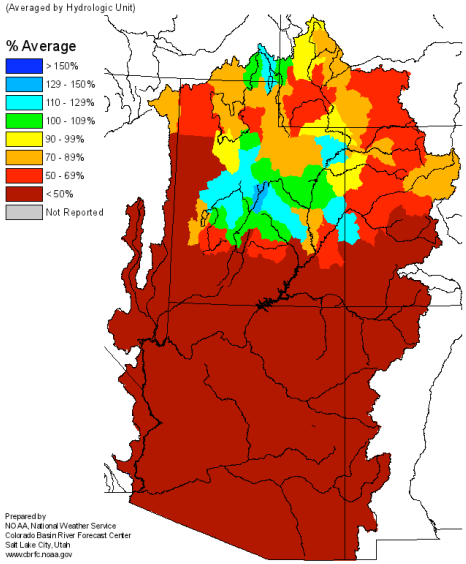
Monthly Precipitation for May 2011

(Averaged by Hydrologic Unit)



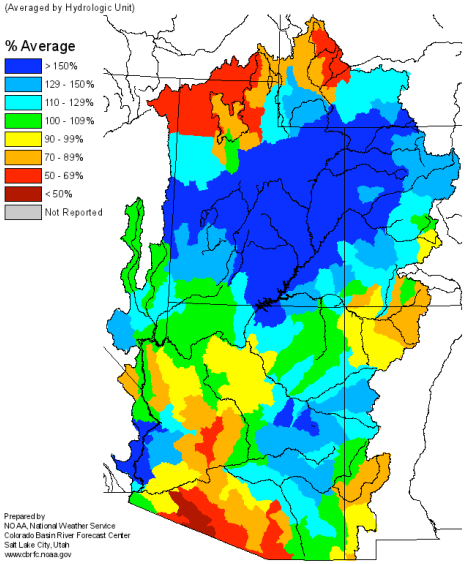
Monthly Precipitation for June 2011

(Averaged by Hydrologic Unit)

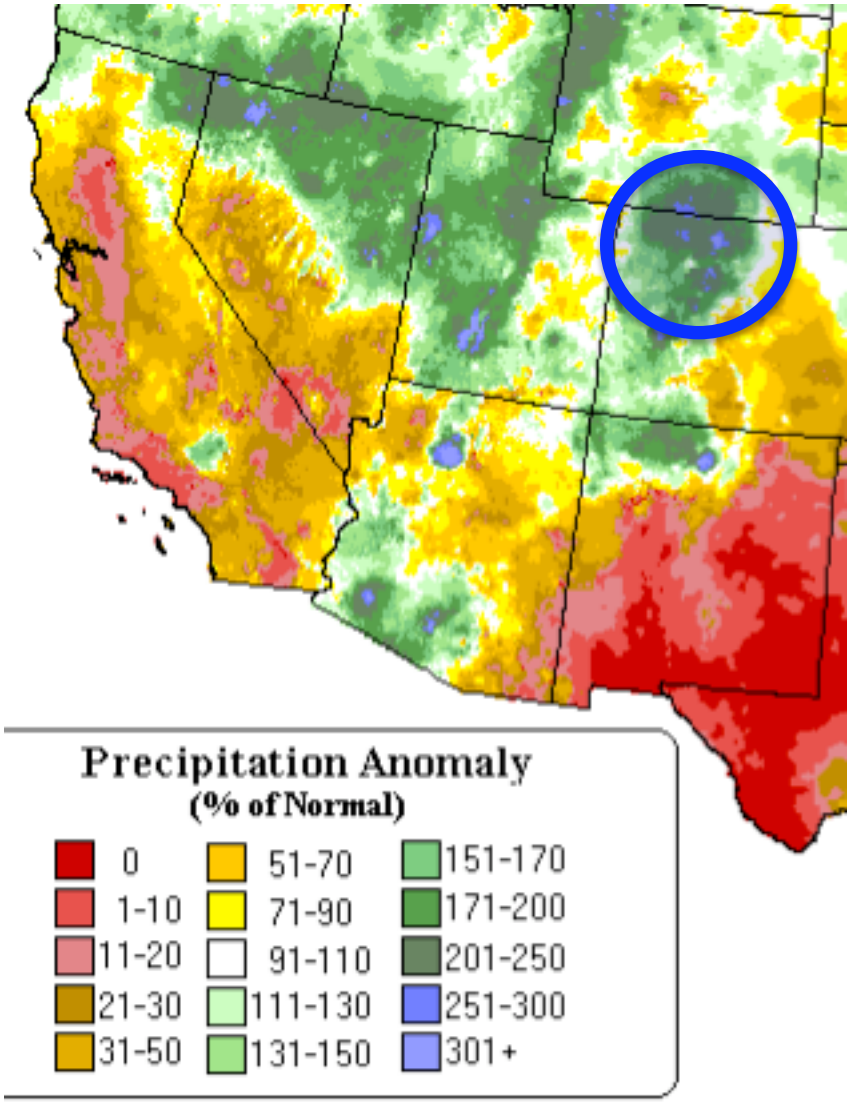


Monthly Precipitation for July 2011

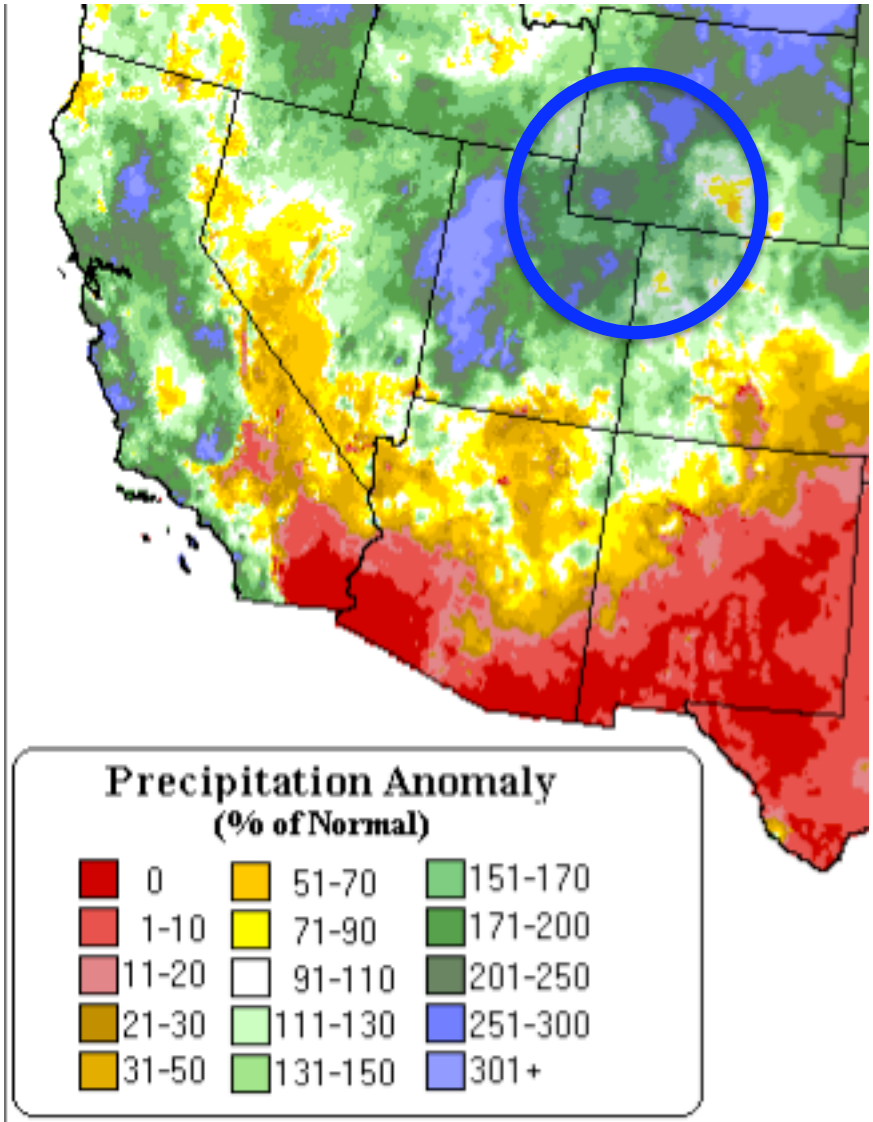
(Averaged by Hydrologic Unit)



April 2011 Precip anomalies



May 2011 Precip anomalies

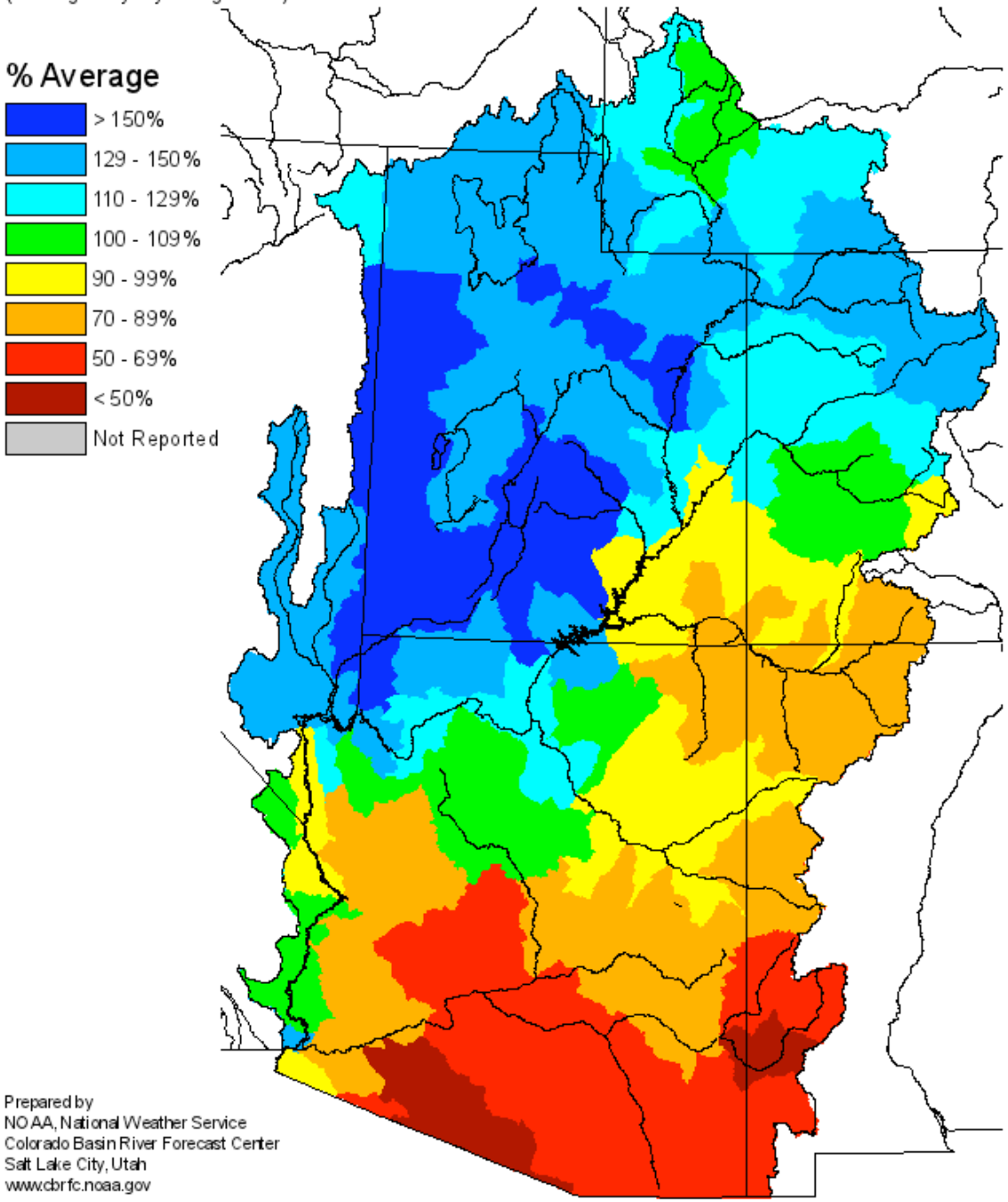


Months of April and May were critical to runoff in may northern basins with record or near record precipitation recorded in one or both months.

Source: www.prism.oregonstate.edu

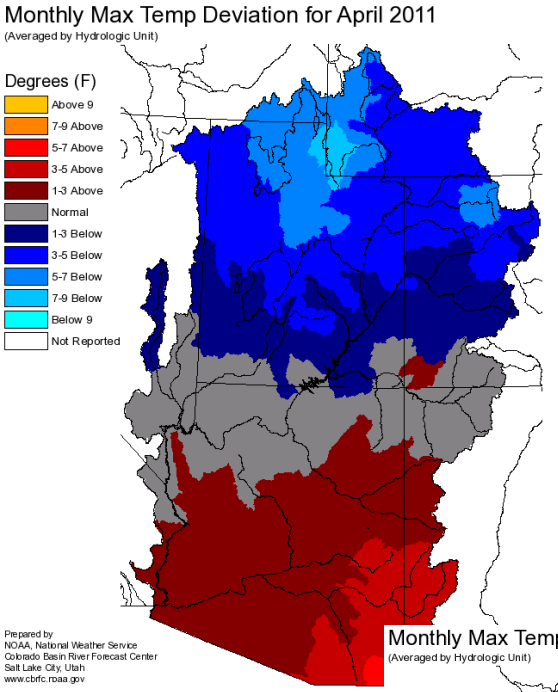
Seasonal Precipitation, October 2010 - September 2011

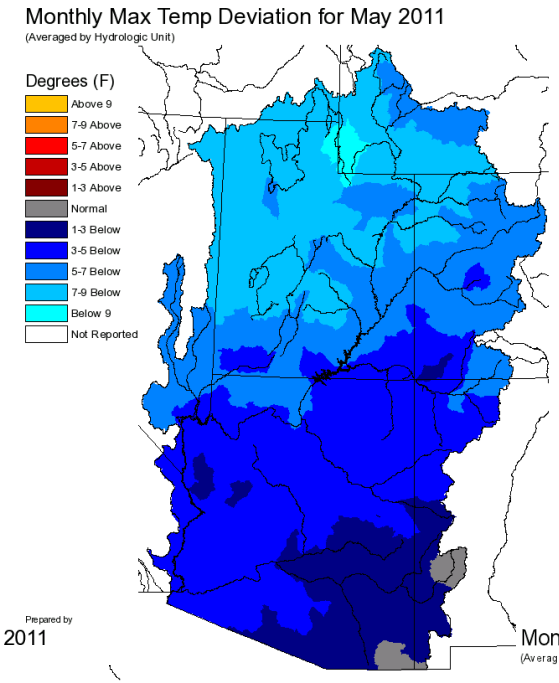
(Averaged by Hydrologic Unit)



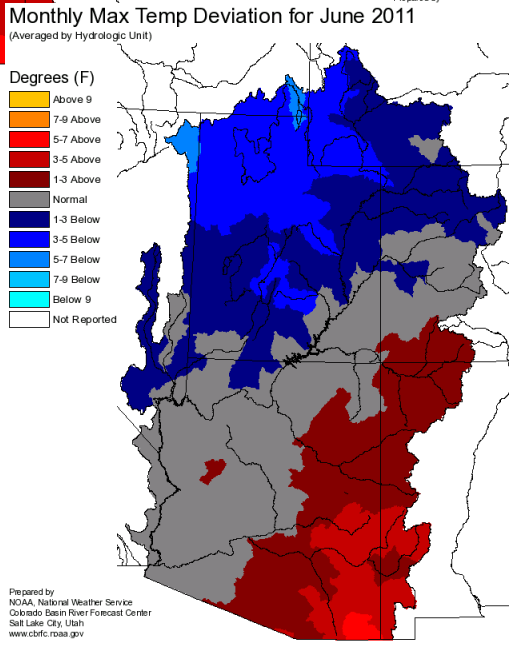
Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

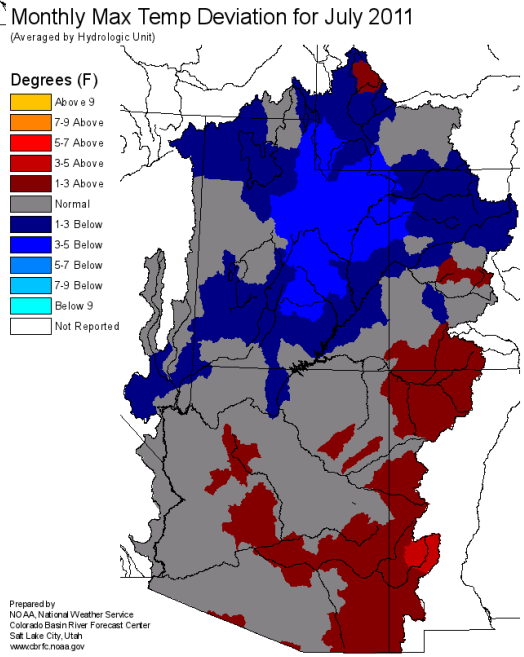
Spring and Summer Temperature Departures from Average Maximum



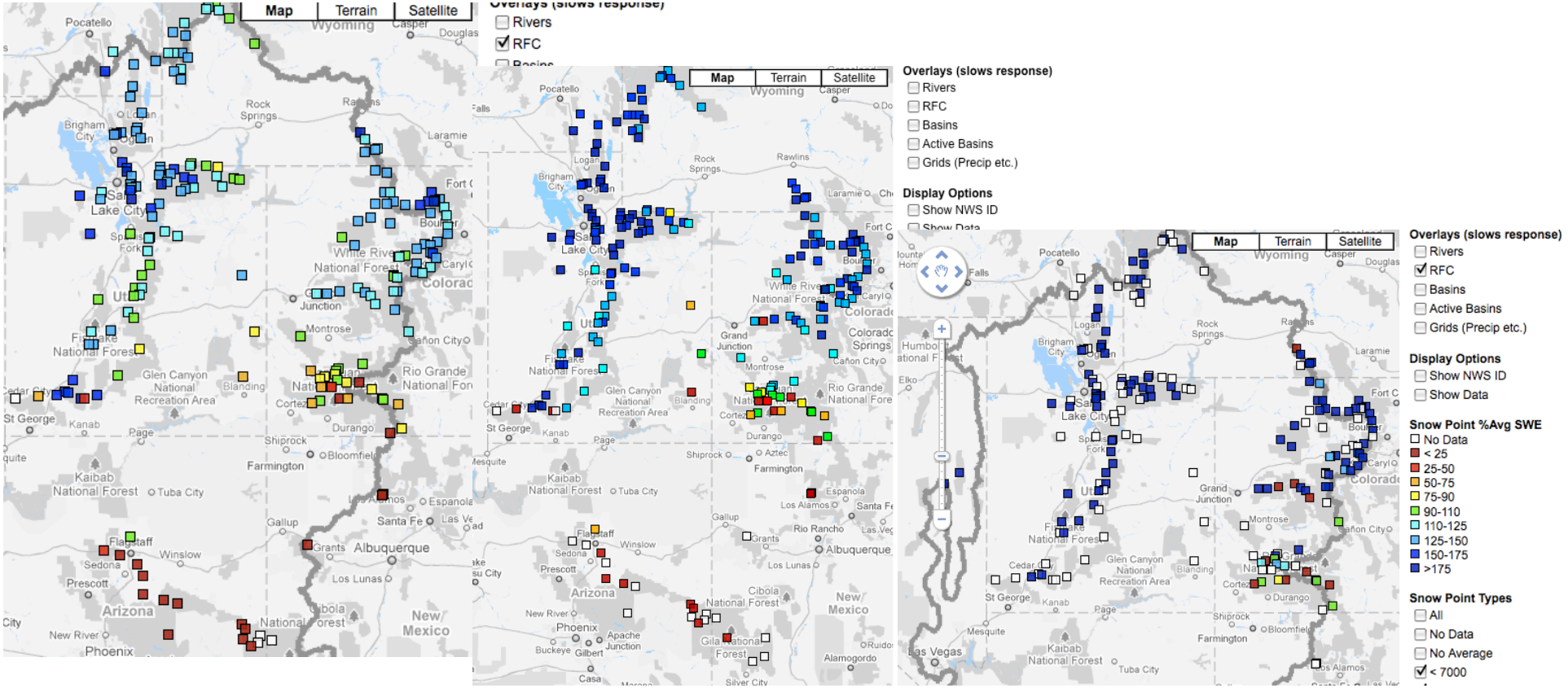


April and May departures were the most extreme at > 7 degrees F below normal. Cool temperatures continued though July.



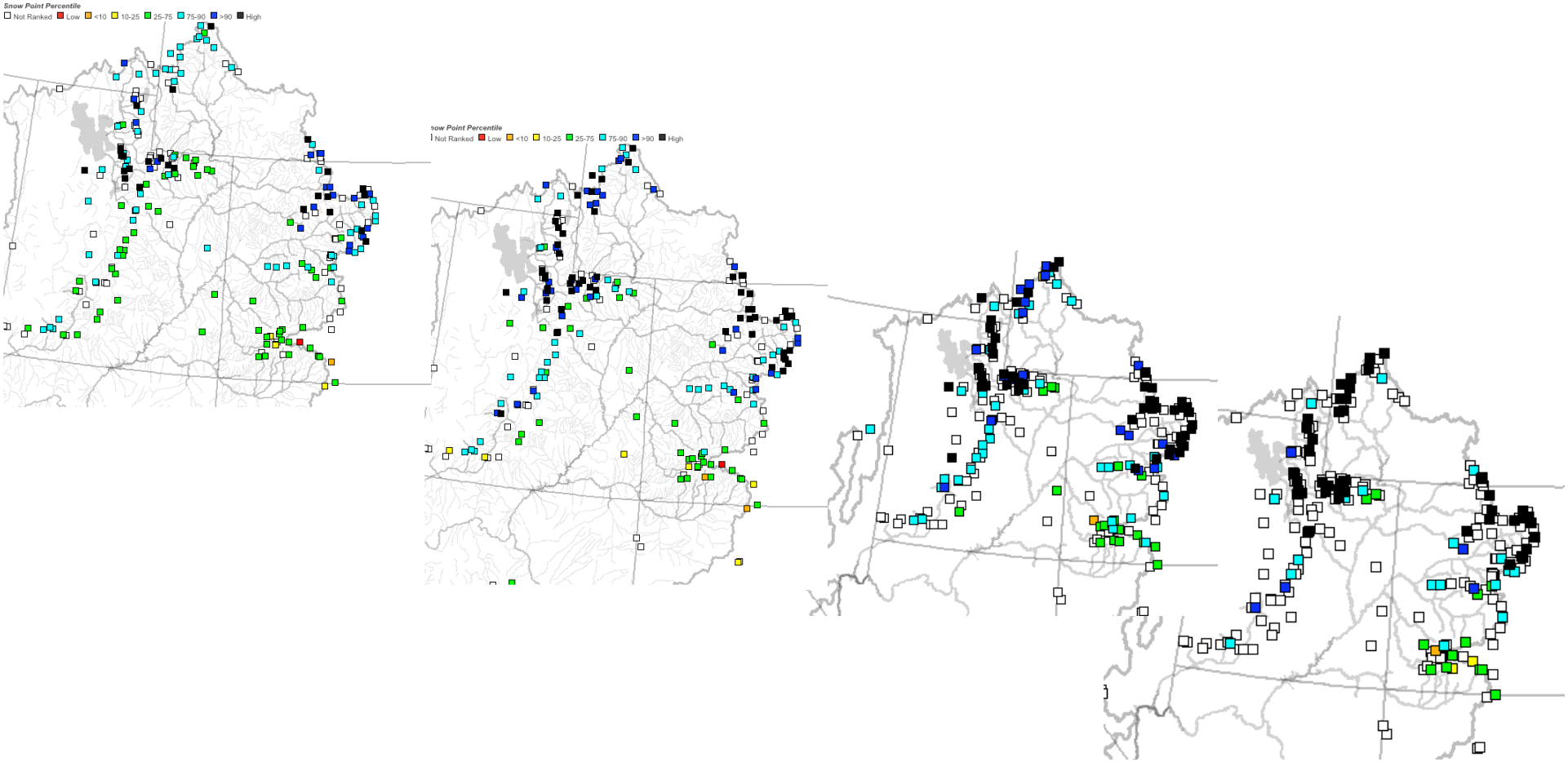


Snow

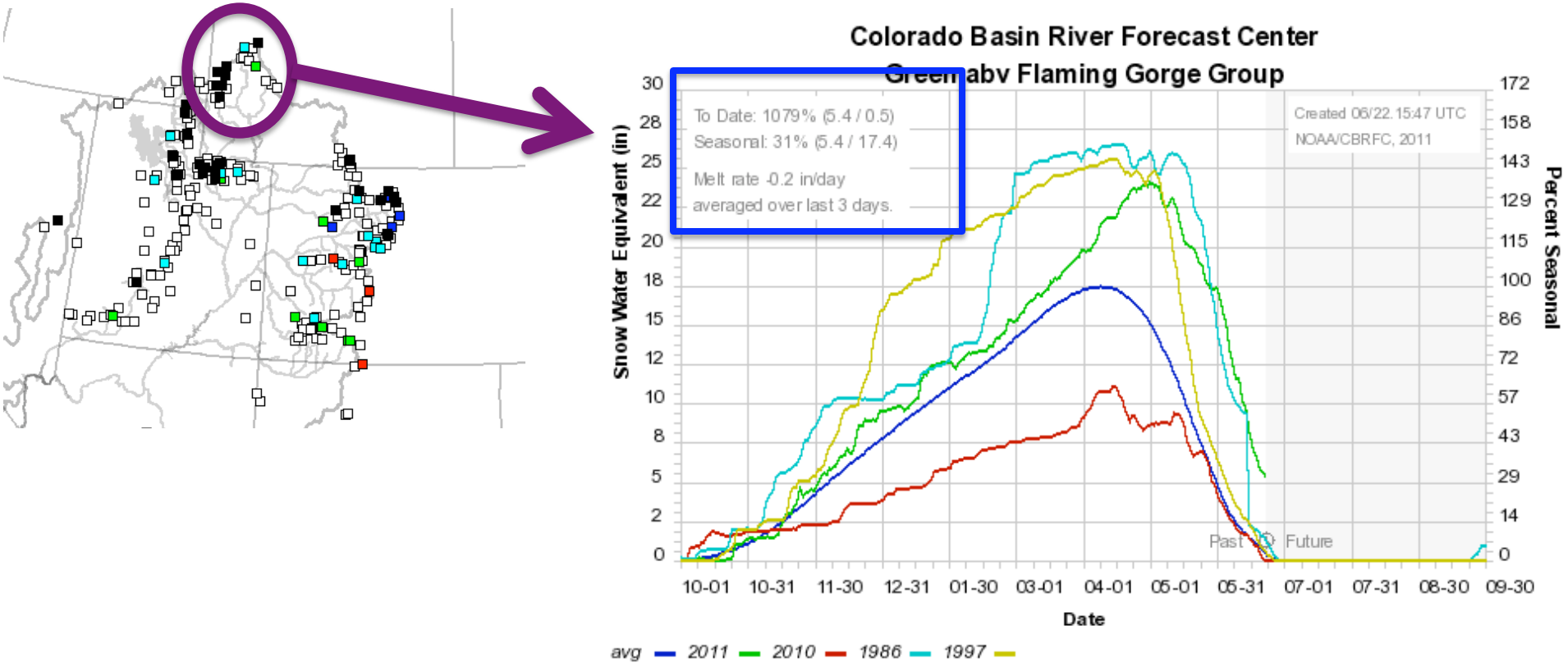


April 7 April 27 June 2

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

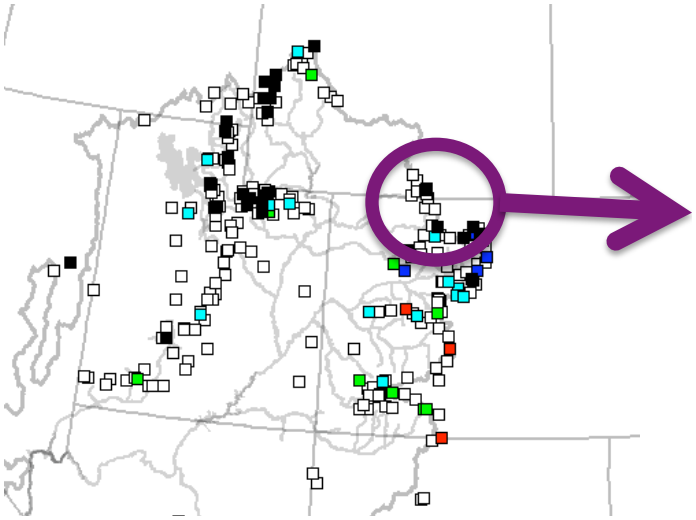

Snow Point Percentile
Not Ranked Low <10 10-25 25-75 75-90 >90 High
April 7
April 27
May 24
June 2

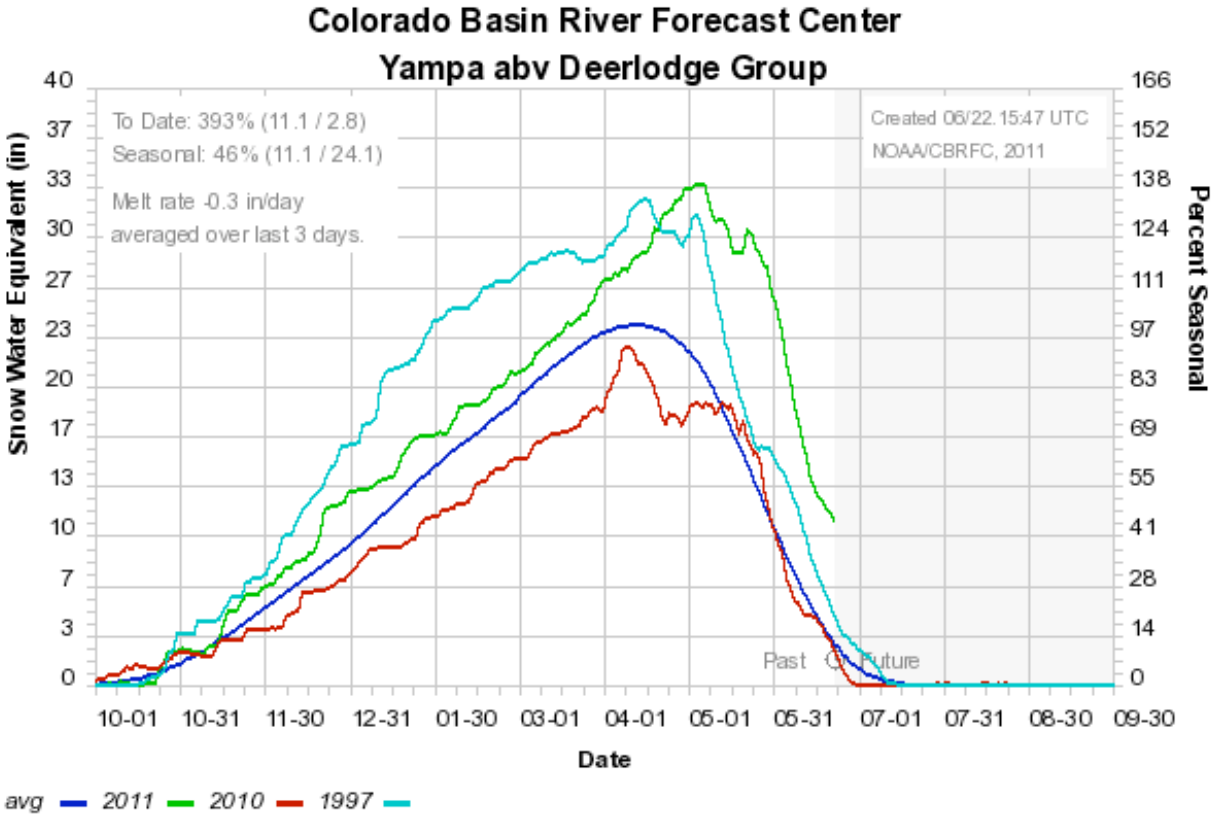
Snow:
Upper Green Basin (above Flaming Gorge)



Web Reference: http://www.cbrfc.noaa.gov/station/sweplot/sweplot.cgi???open

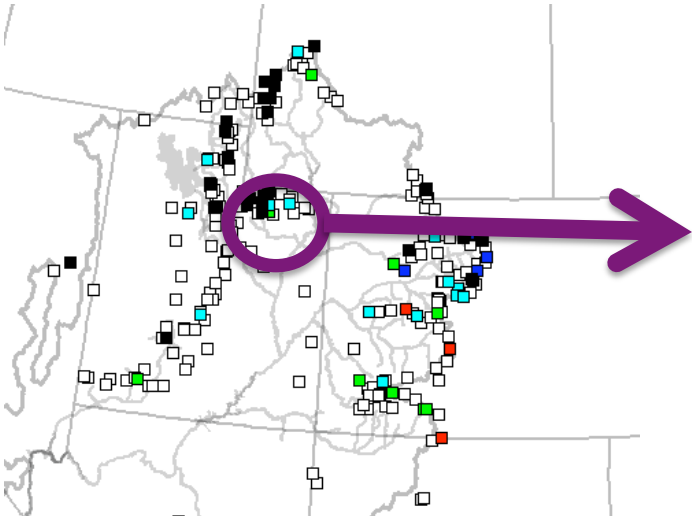
Snow:
Yampa

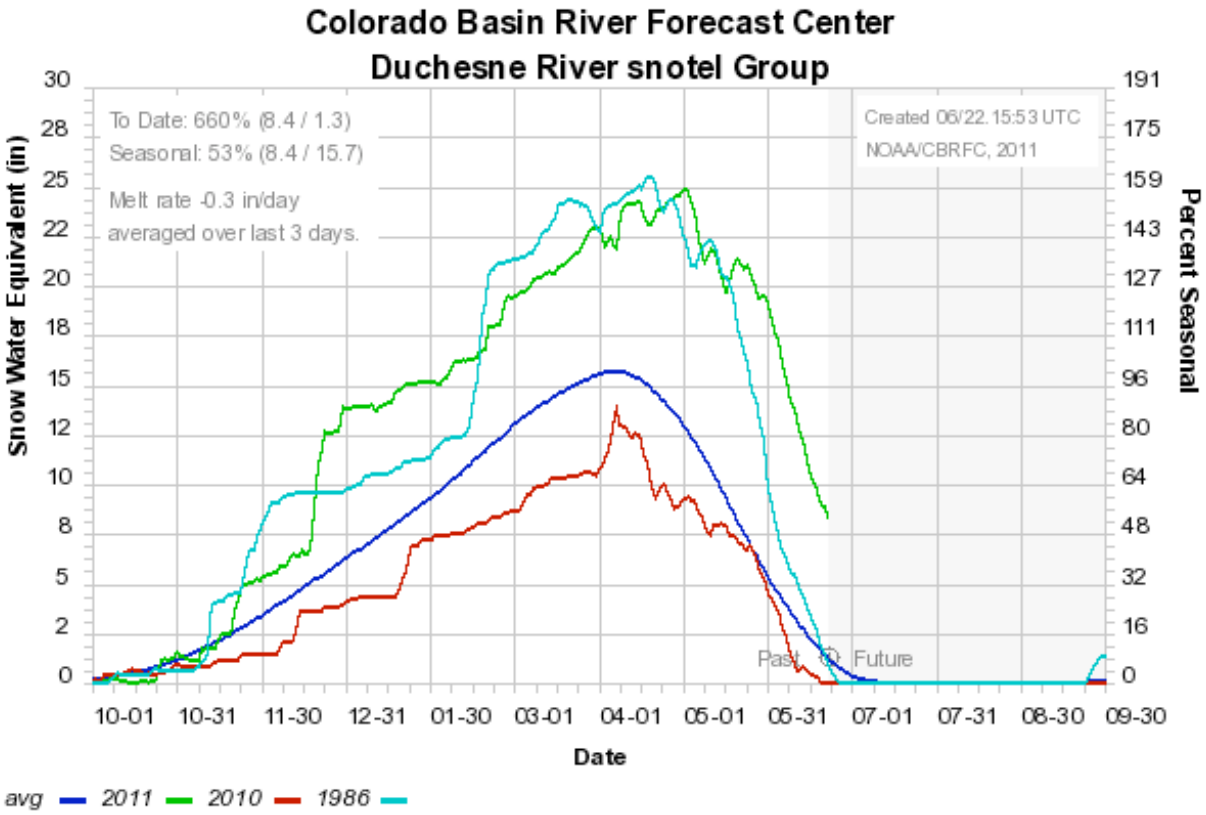




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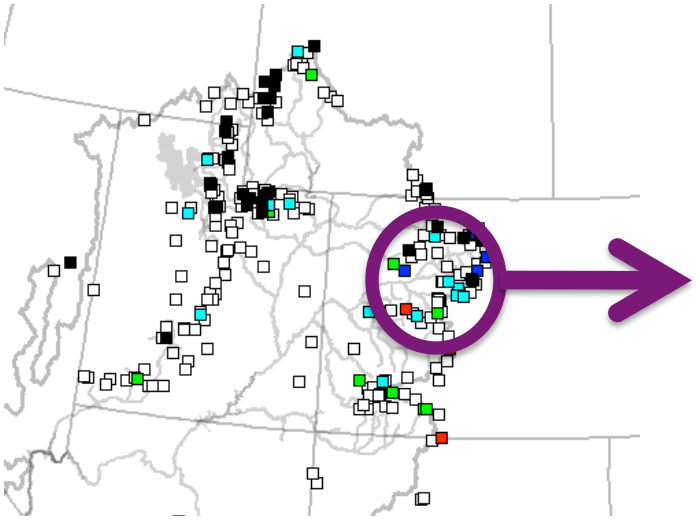
Snow:
Duchesne River Basin

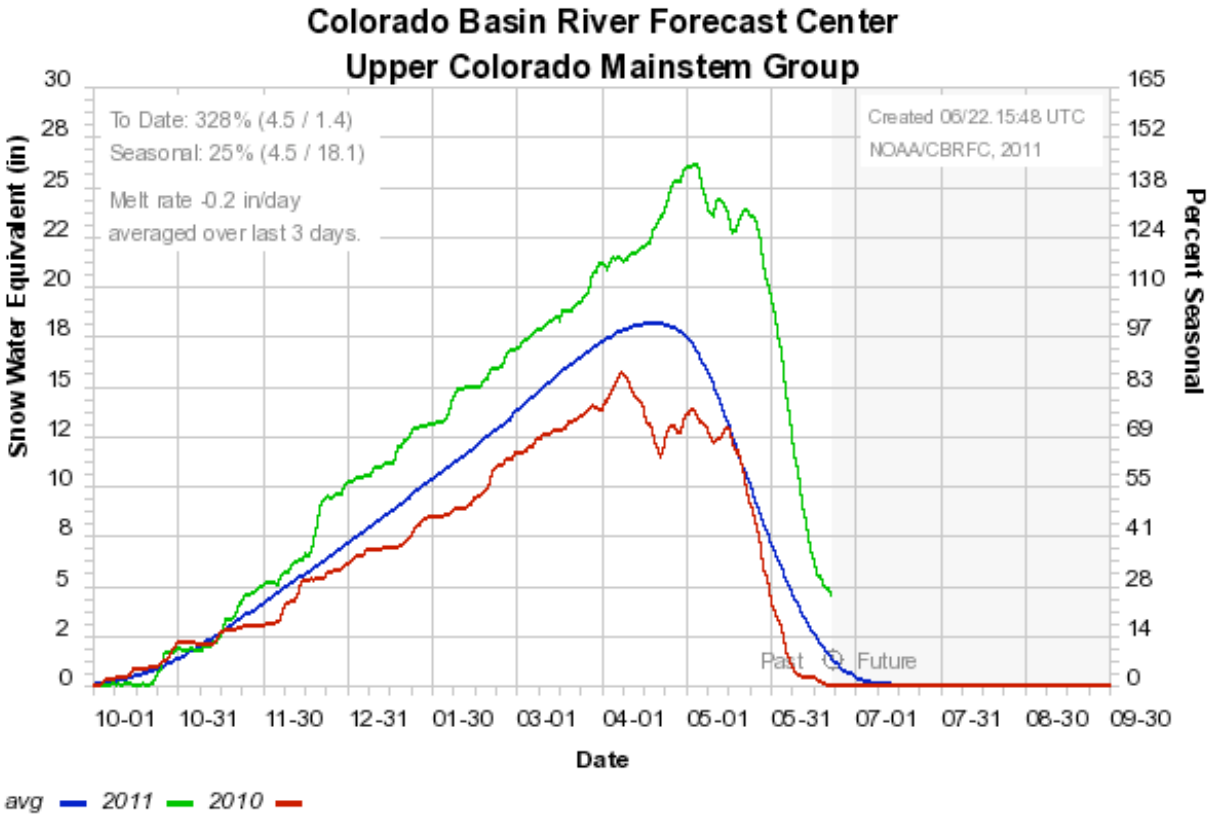




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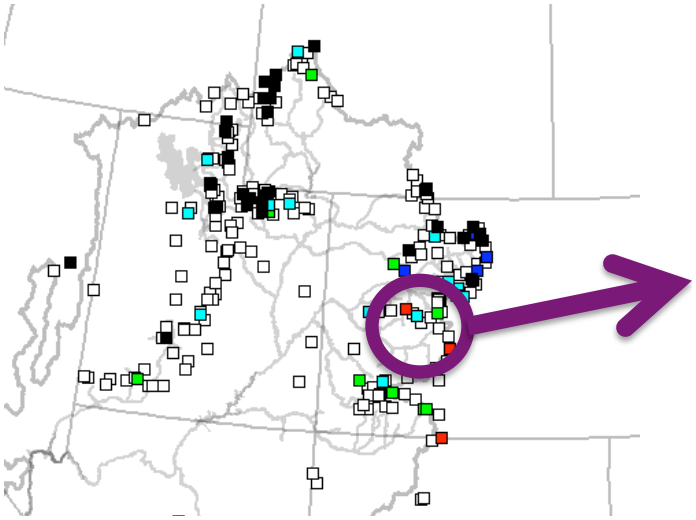
Snow:
Colorado Mainstem (above Cameo)

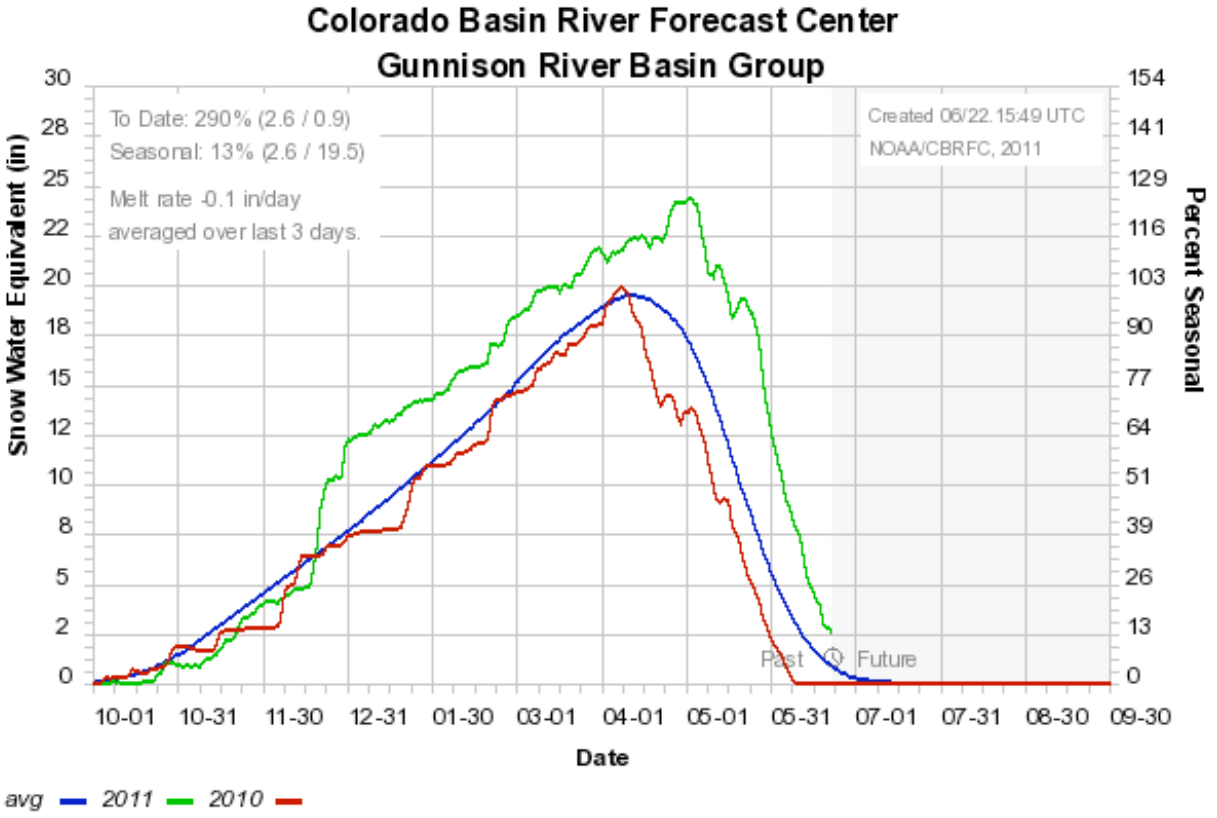




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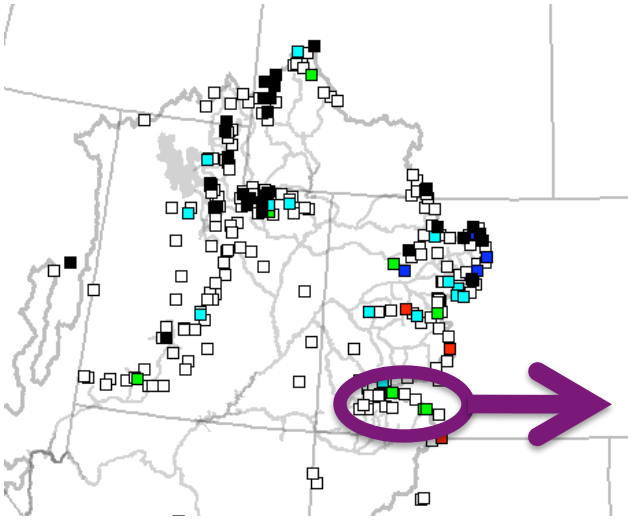
Snow:
Gunnison Basin

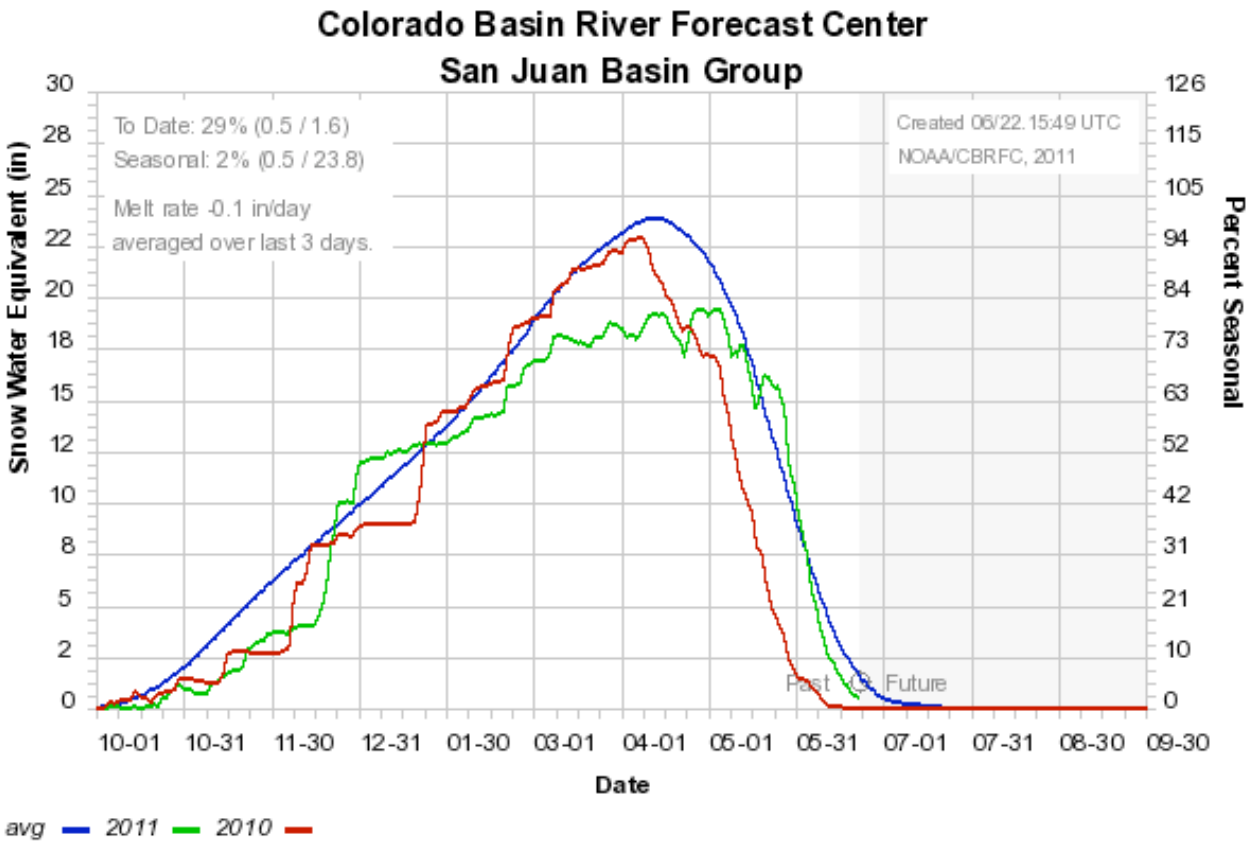




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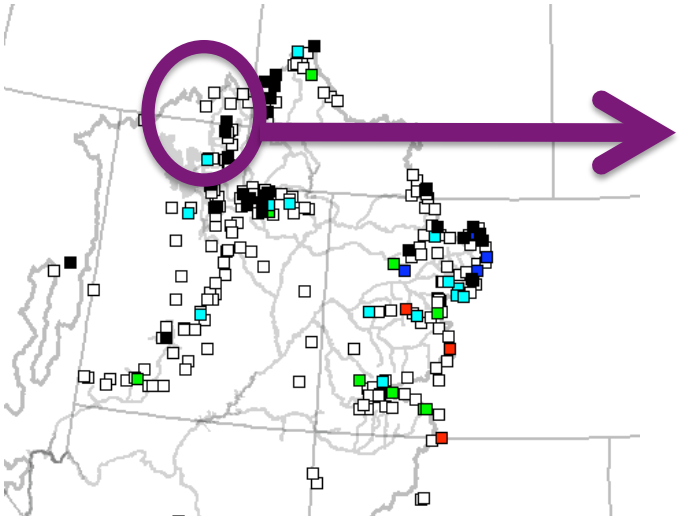
Snow:
San Juan Basin

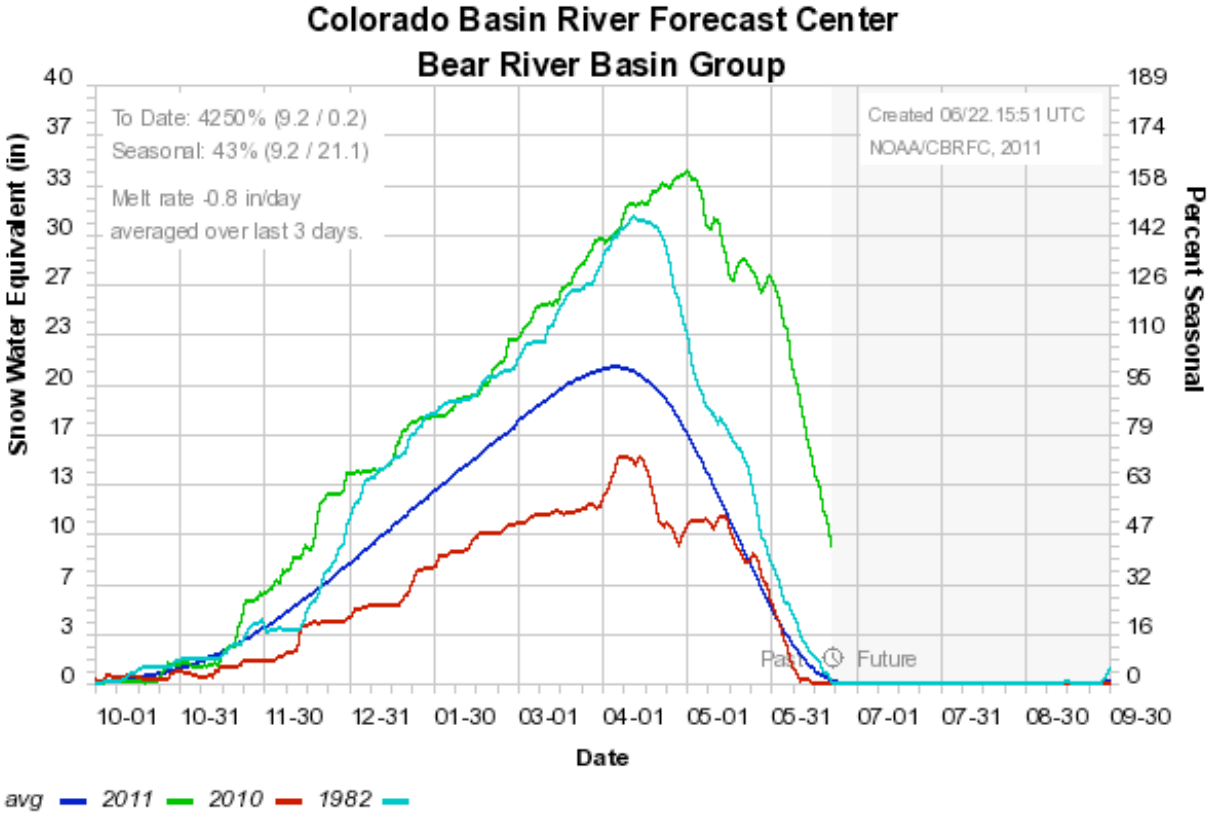




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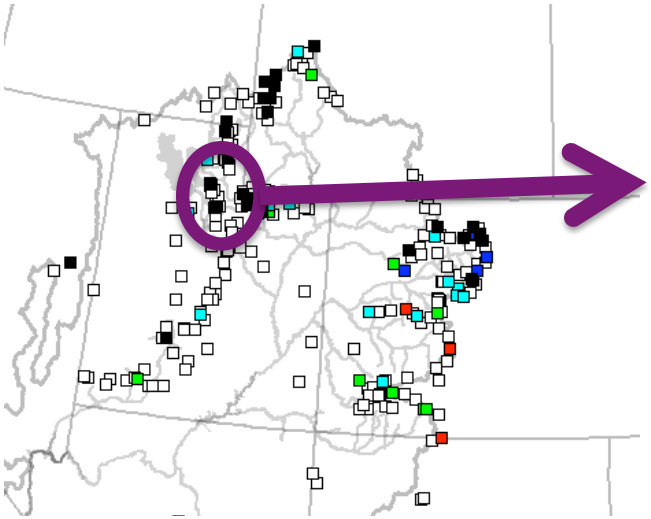
Snow:
Bear River Basin

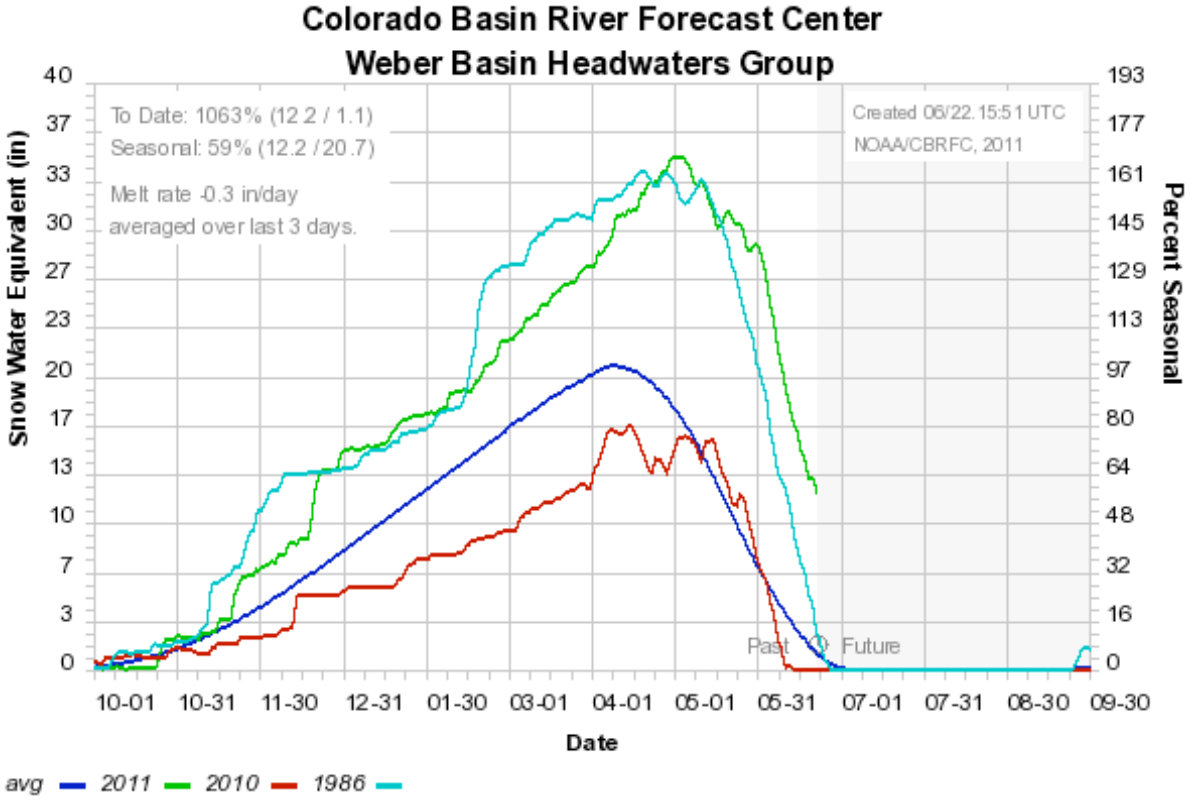




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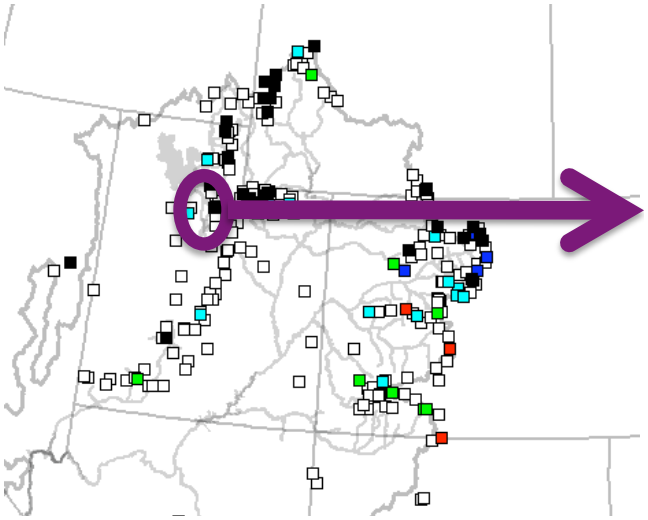
Snow:
Weber River Basin

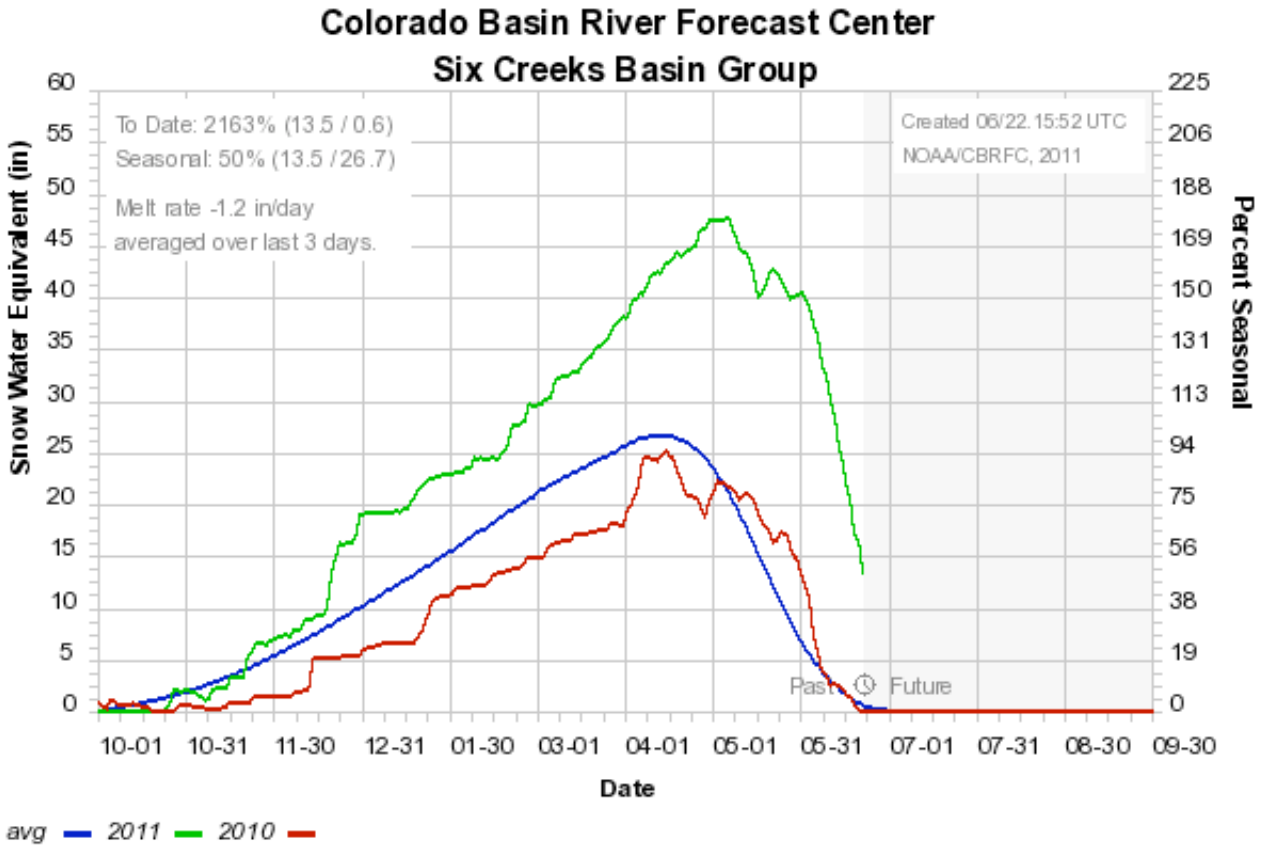




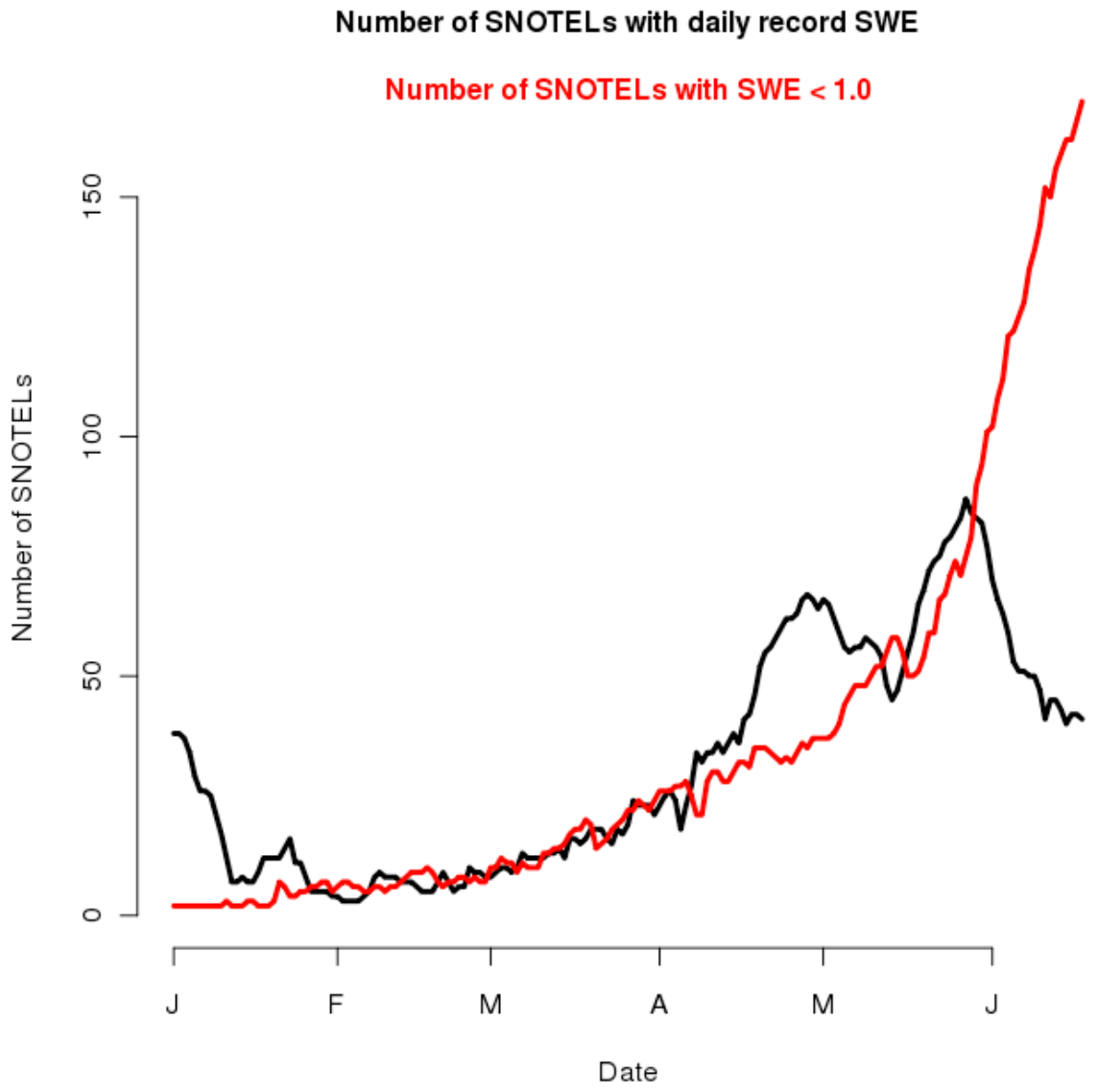
Web Reference: http://www.cbrfc.noaa.gov/station/sweplot/sweplot.cgi???open

Snow:
Six Creeks in Salt Lake County



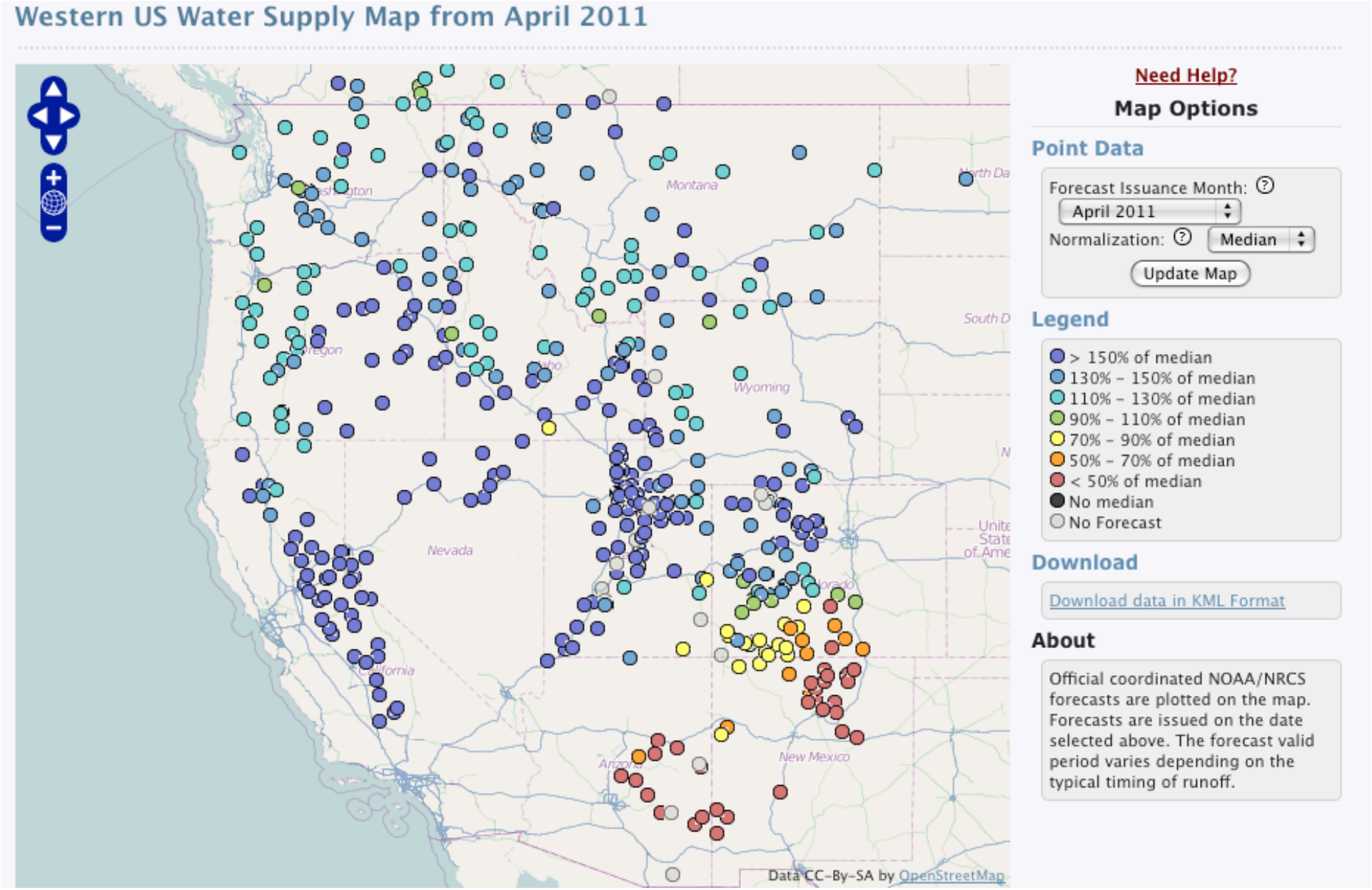


Web Reference: http://www.cbrfc.noaa.gov/station/sweplot/sweplot.cgi???open

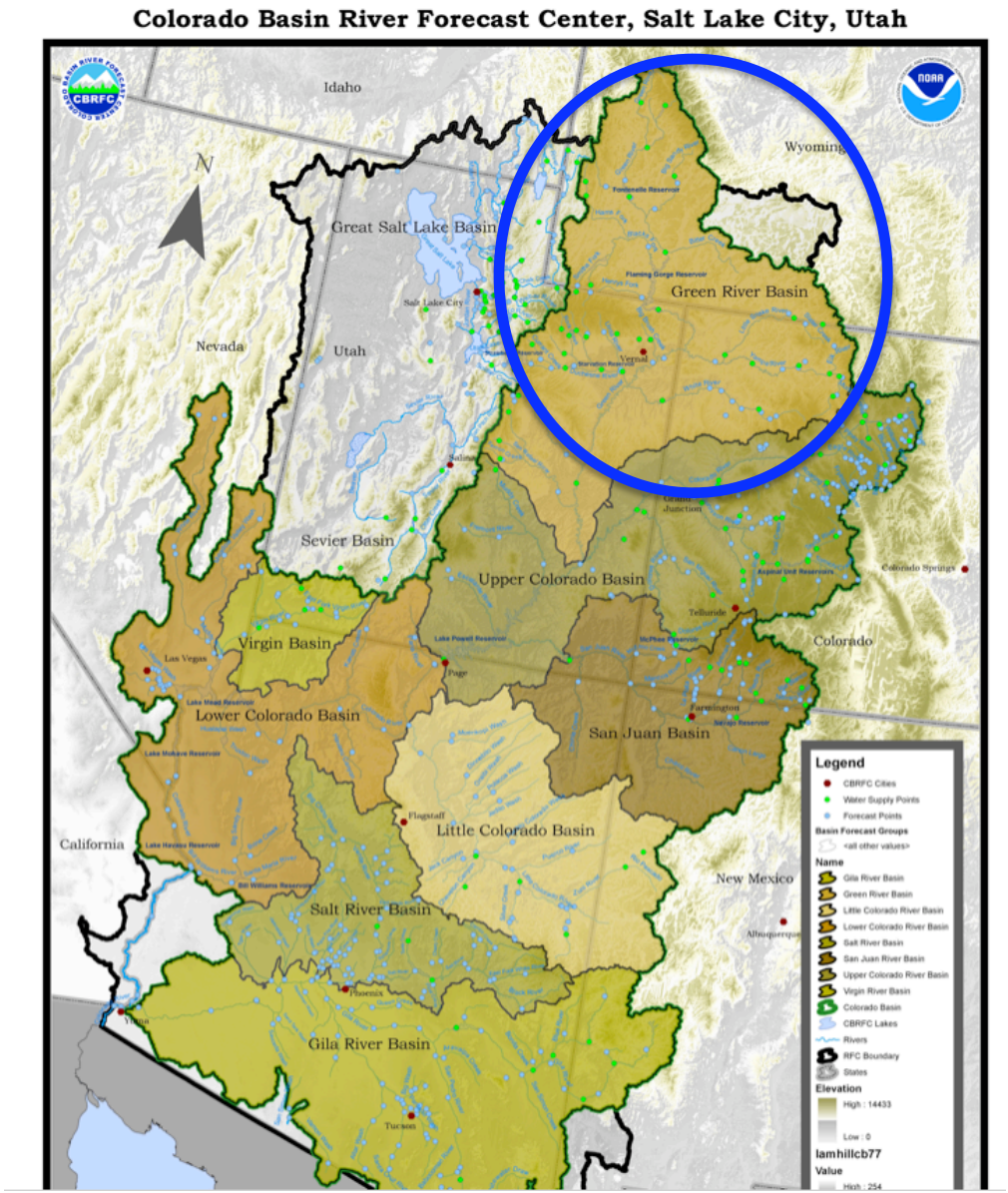


229 sites with 10+ years of record
87/229 or 38% of sites with daily record as of 5/31
170/229 sites with less than 1” SWE as of 6/22

2011 Water Supply Forecasts

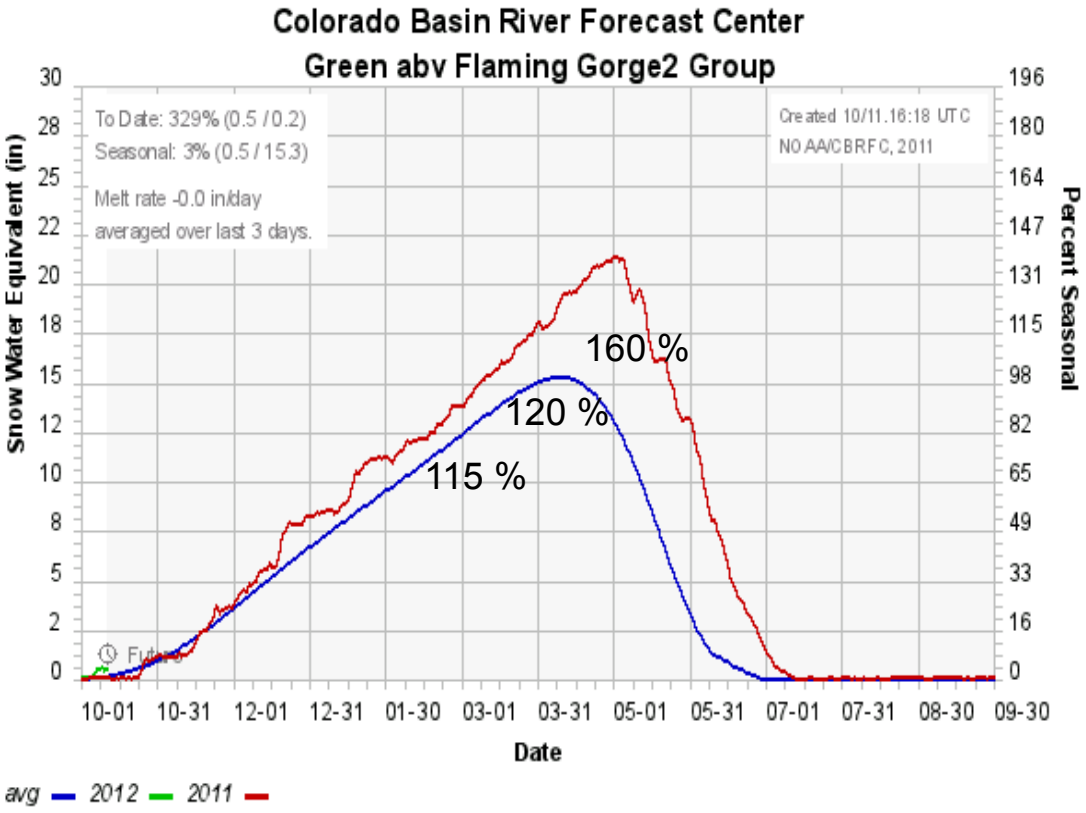


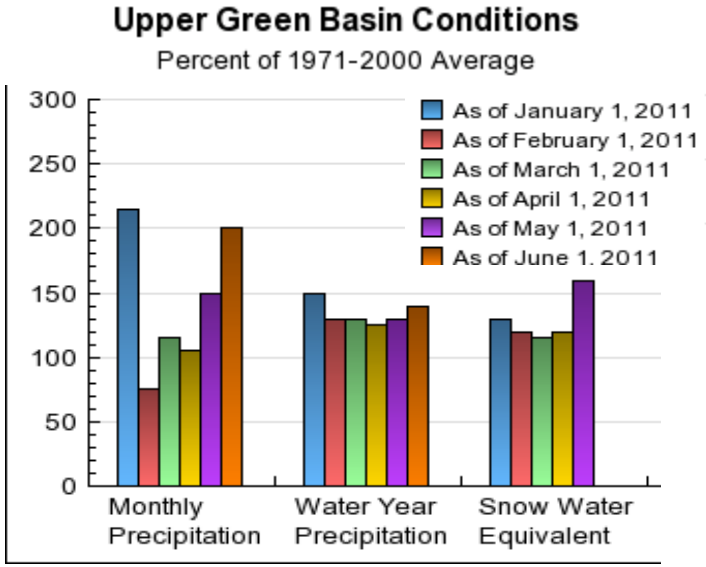
Green River Basin



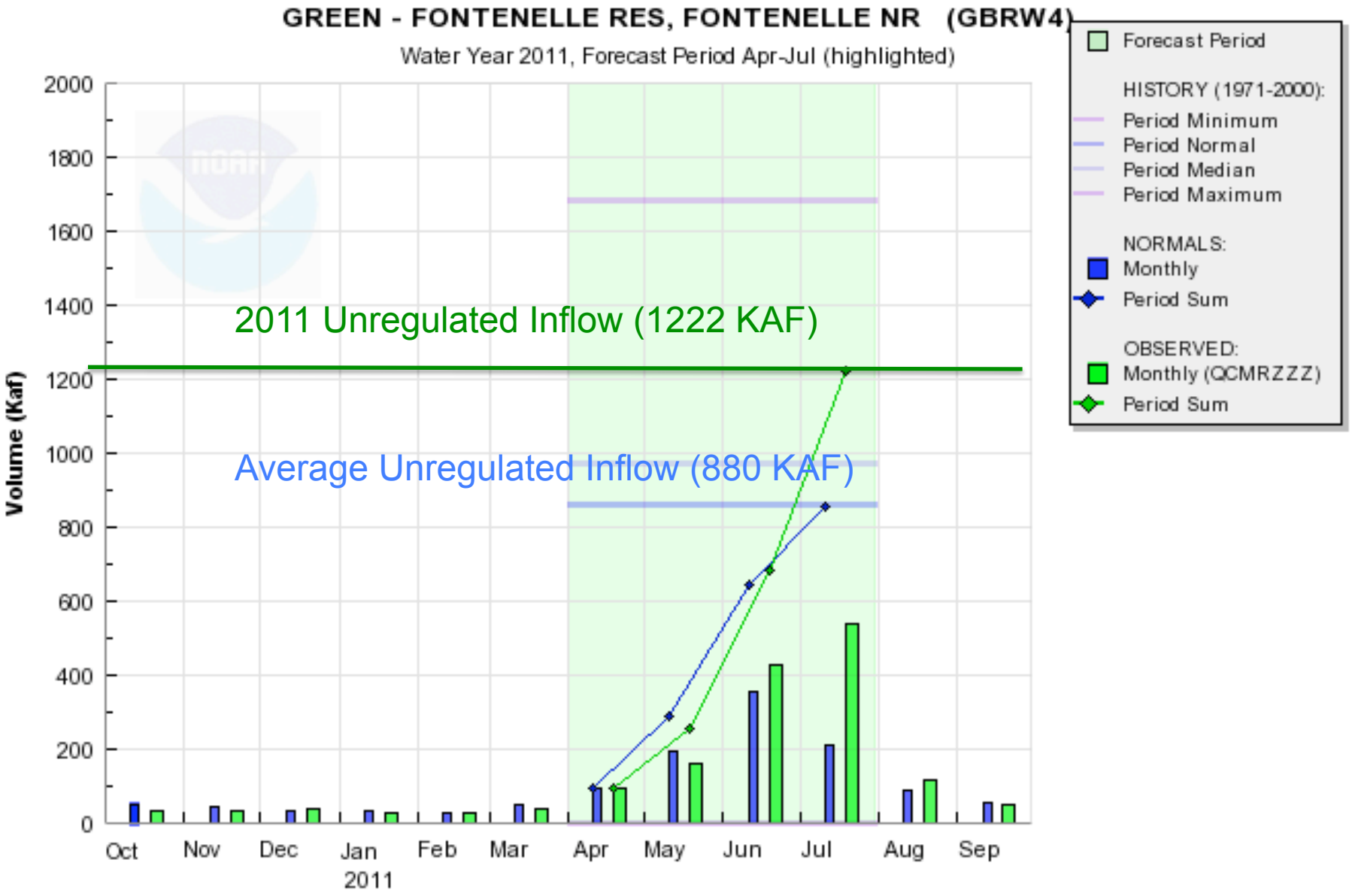
- Slightly above normal seasonal precipitation through March 2011
- Sustained cool and wet period April-June
- Runoff delayed (especially to the north and west)
- Many record or near records for precipitation, runoff volumes, etc

Upper Green
Basin Conditions

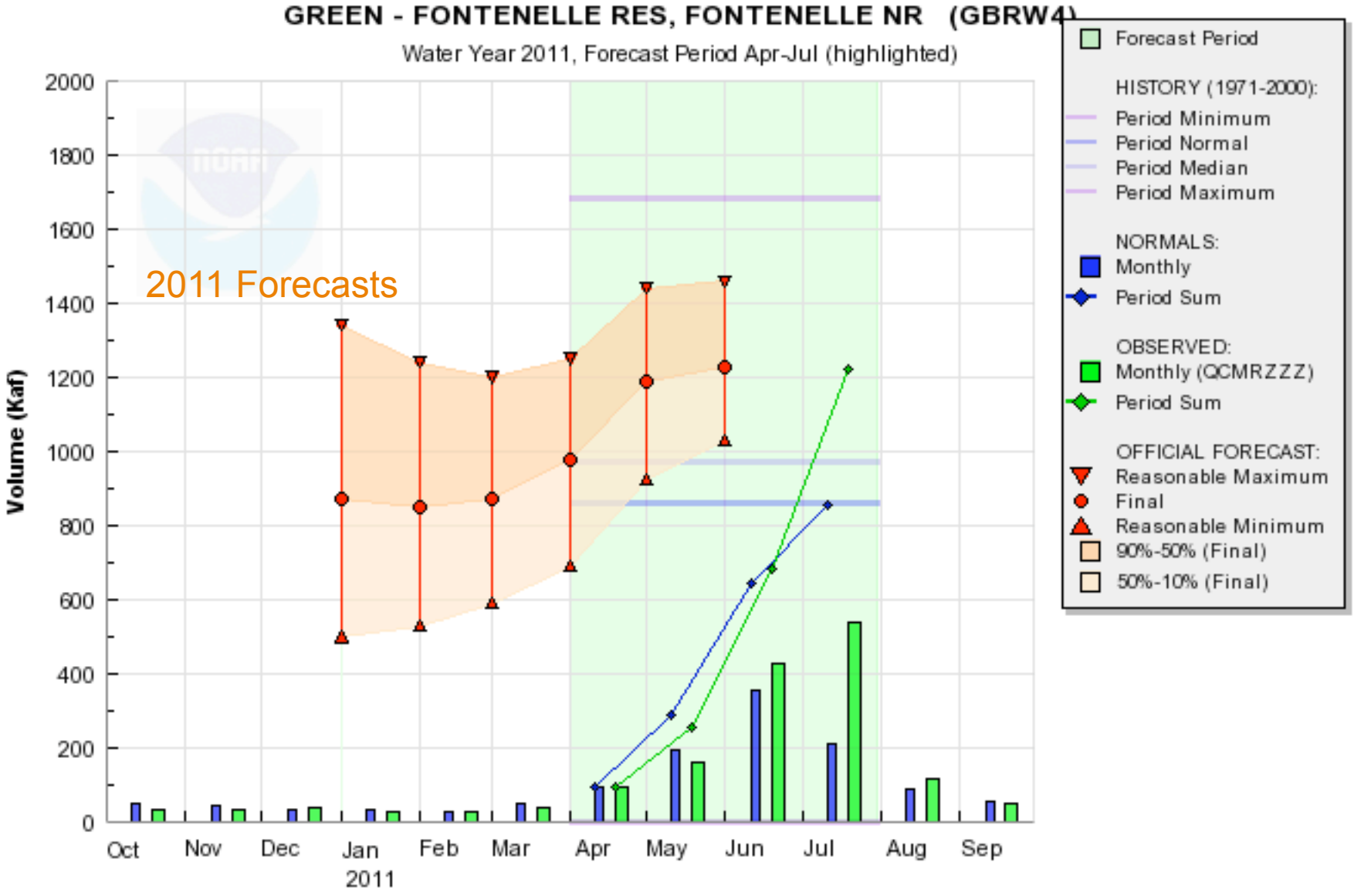




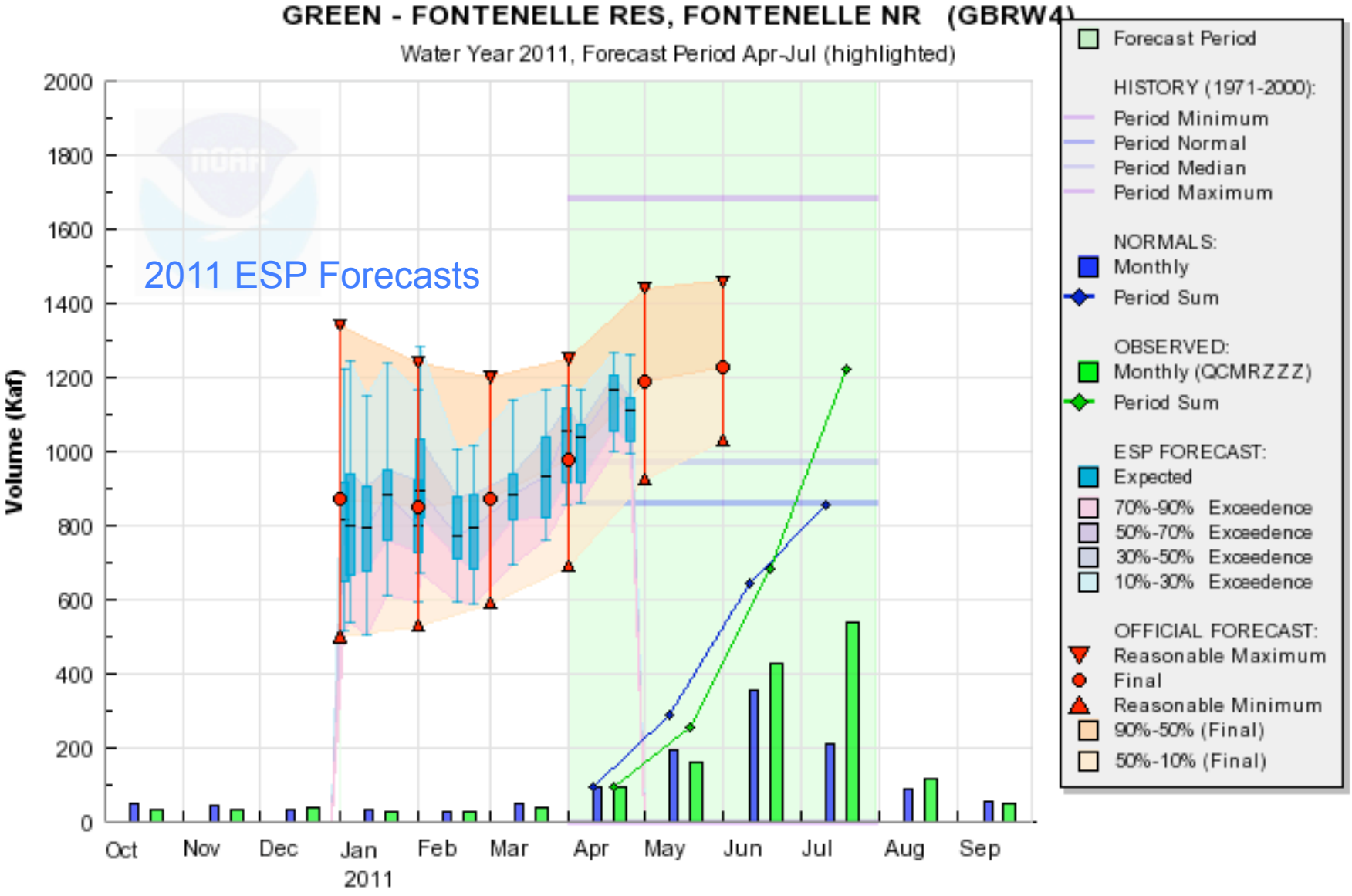
Precipitation	% of Average
January	72
February	120
March	105
April	150
May	200
June	80
July	115
Water Year	120



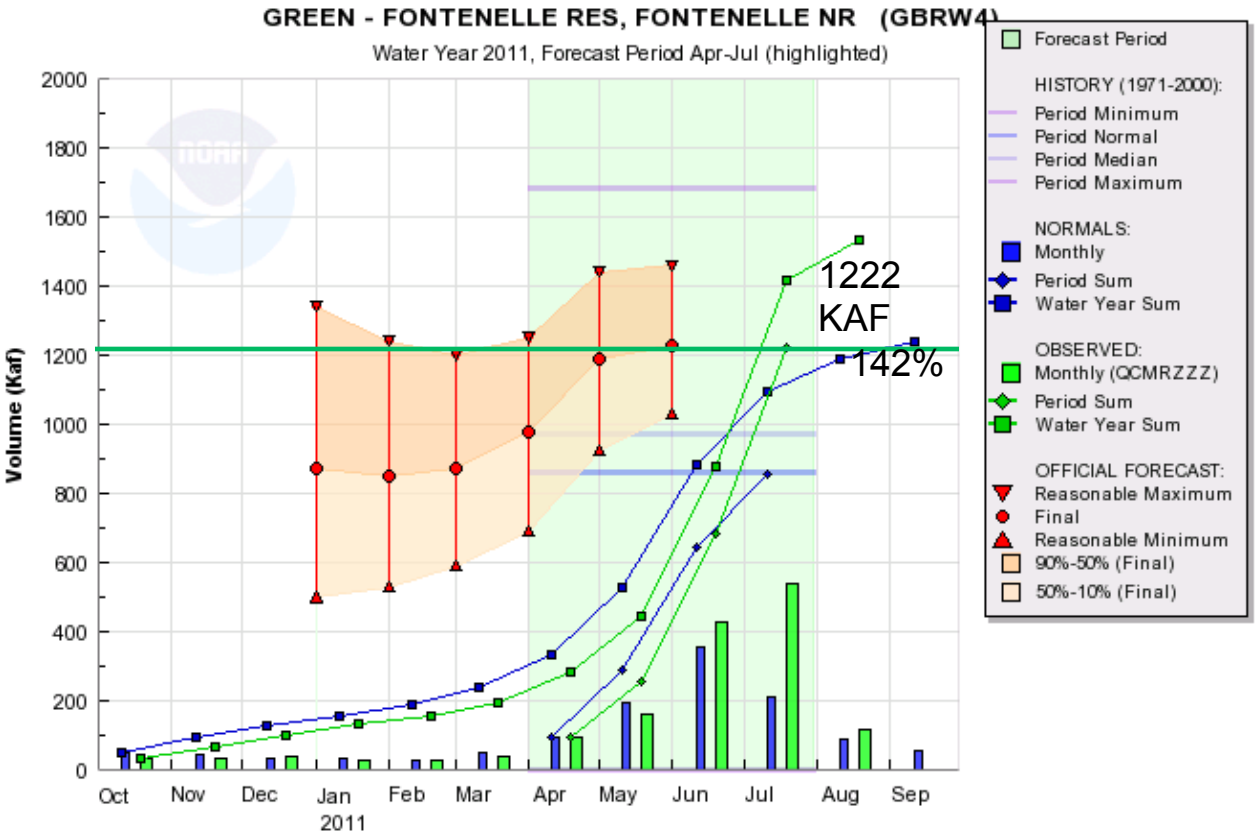
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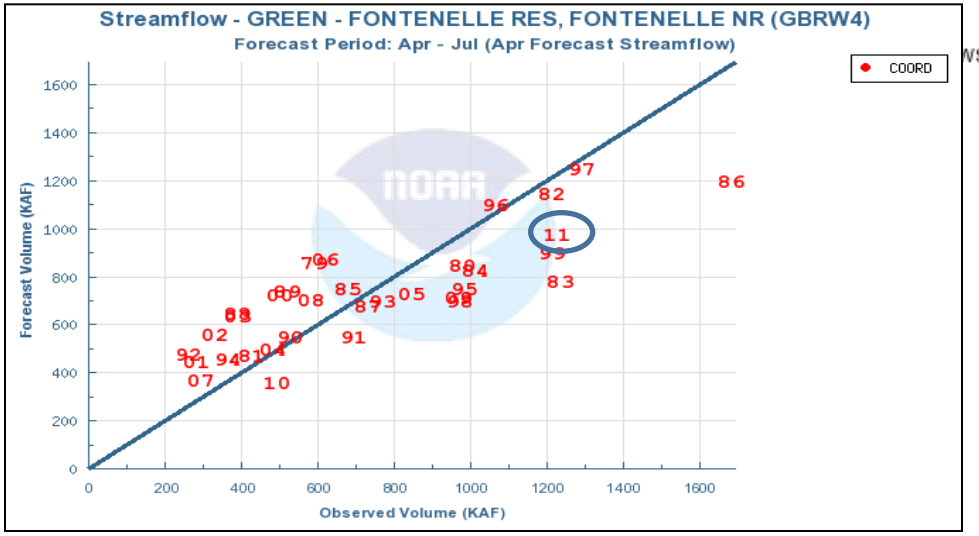
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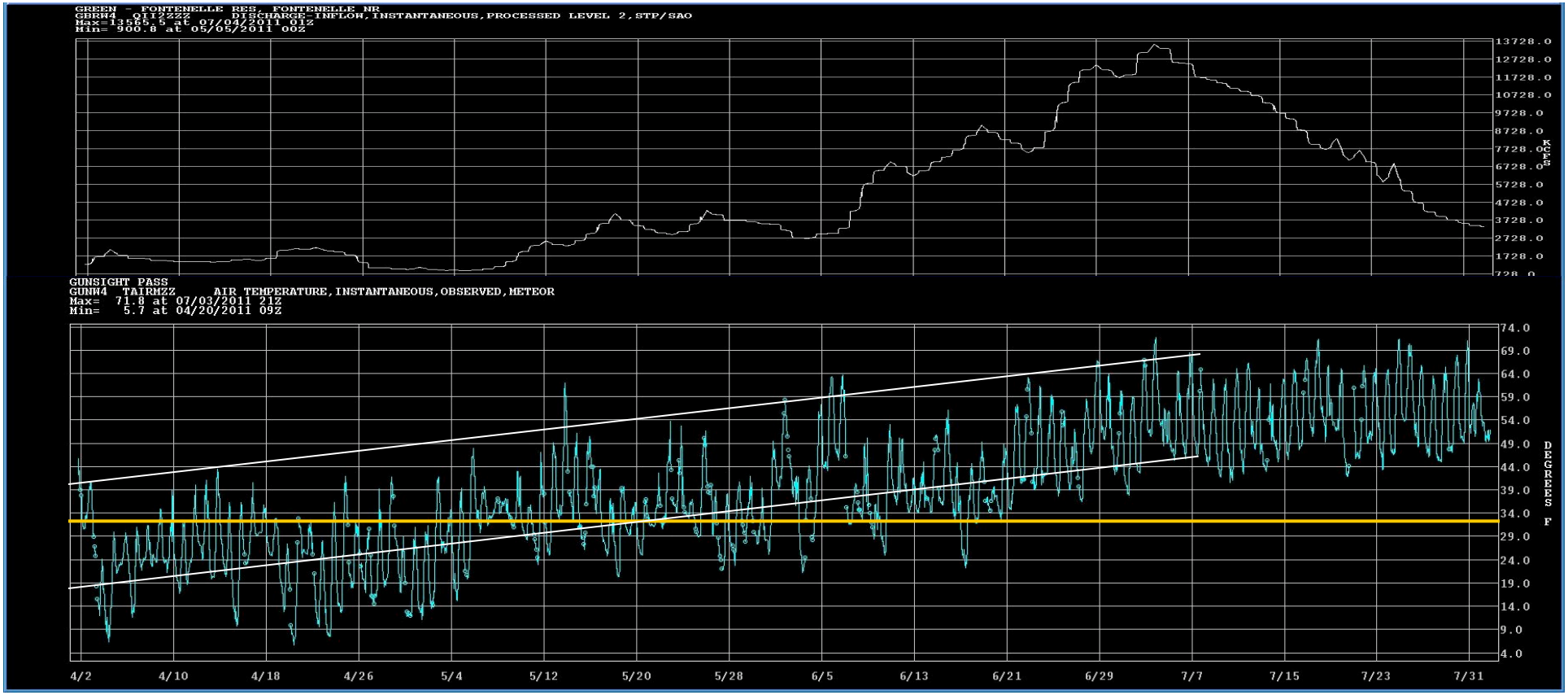
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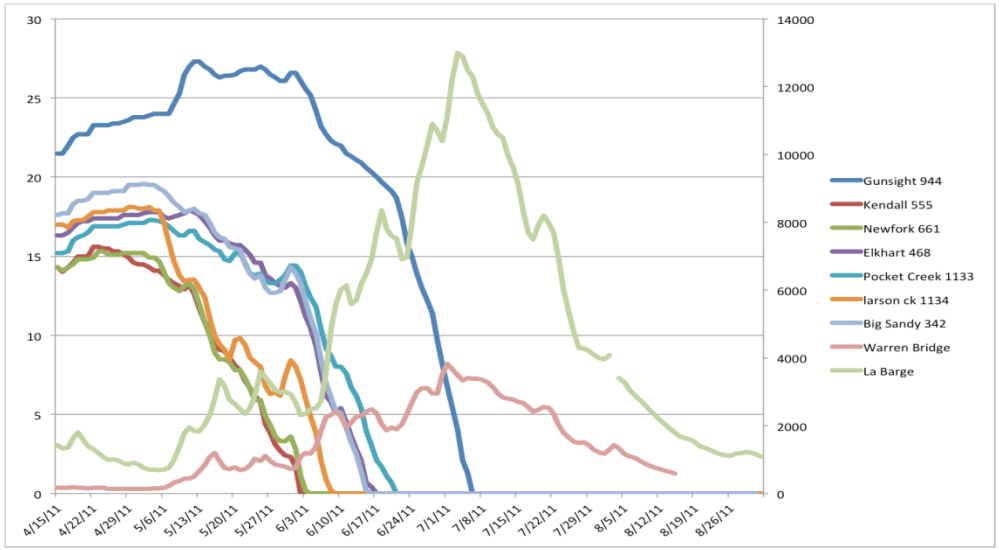


FONTENELLE RESERVOIR

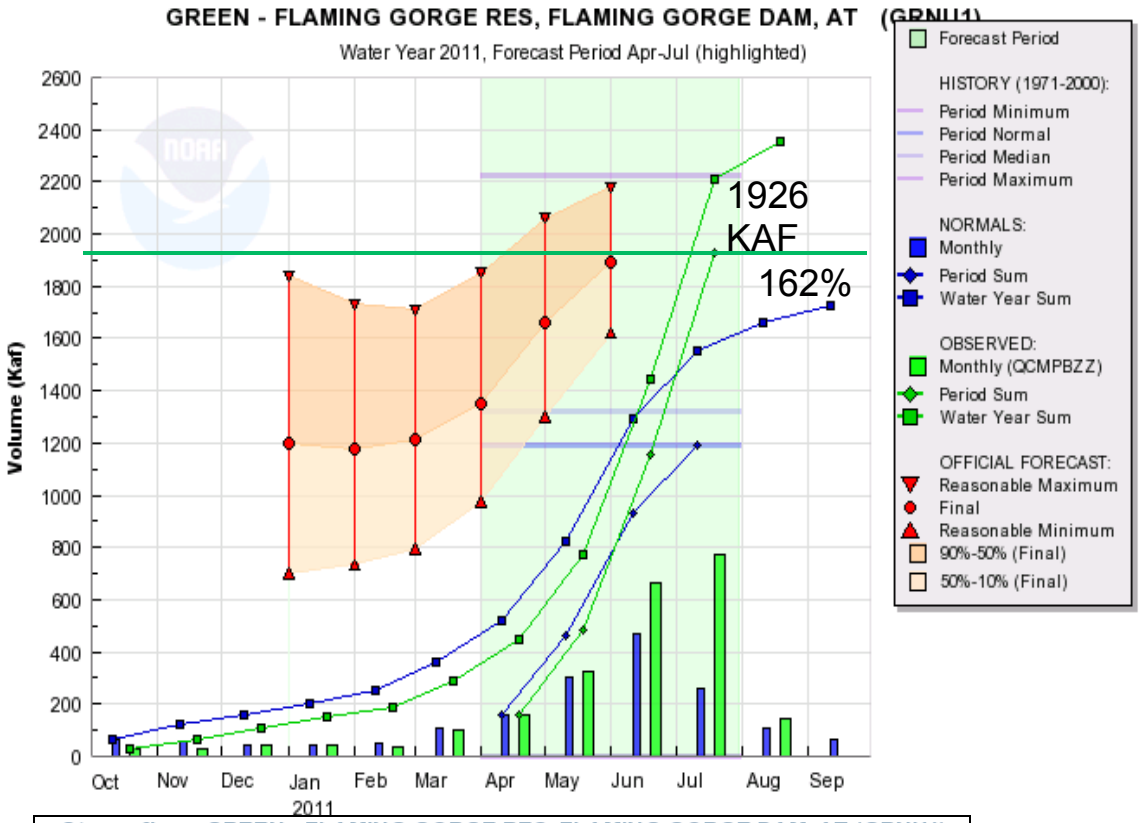


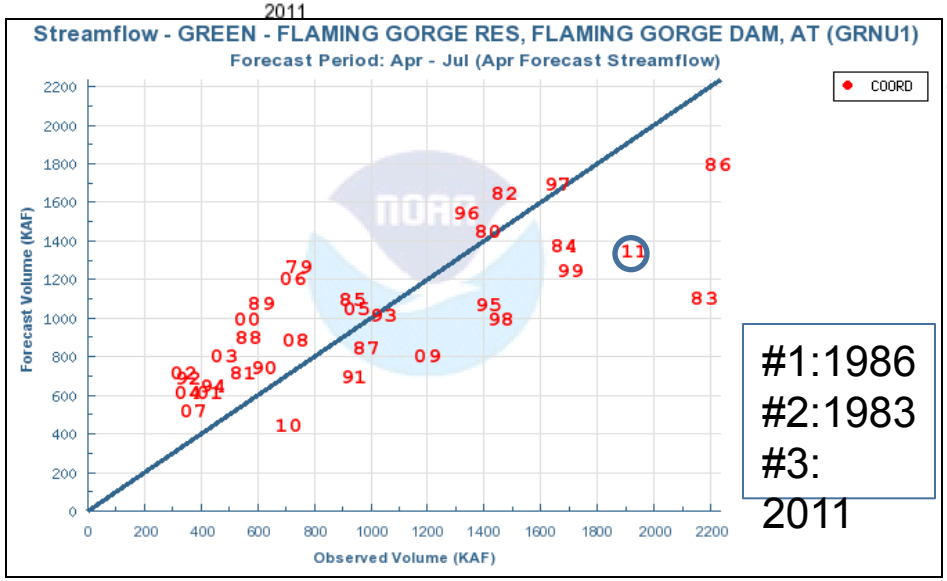
WS/NOAA 10/11/11 17:12:49 UTC





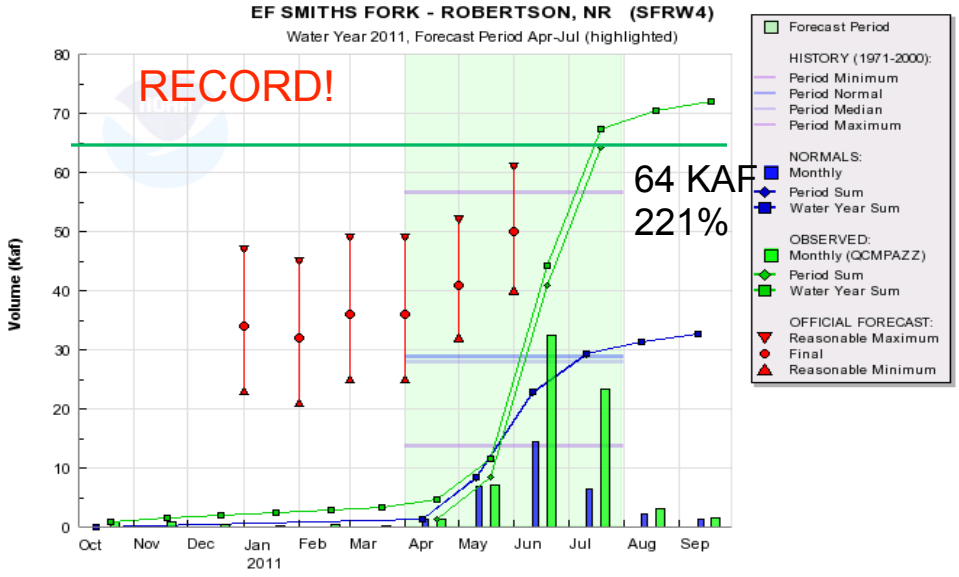
Gunsight Pass: 9820’

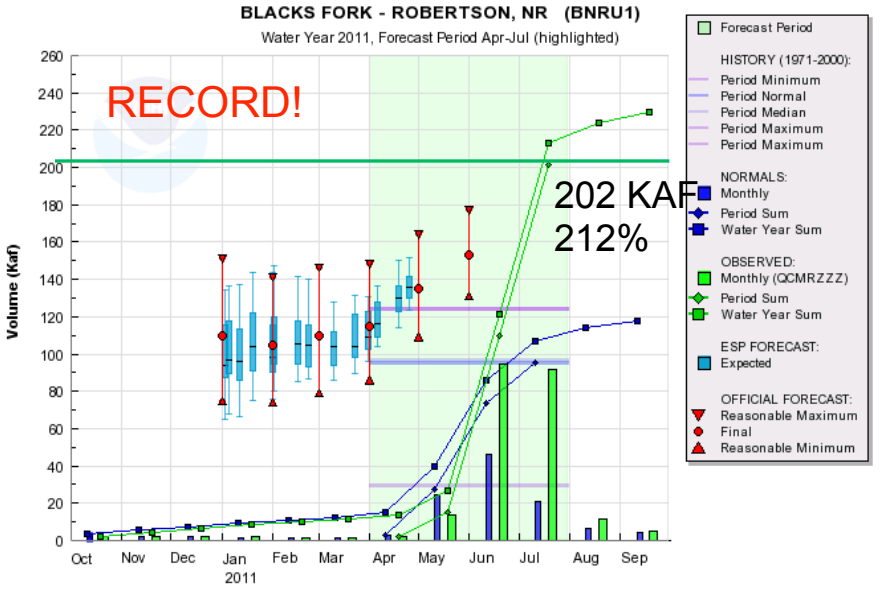


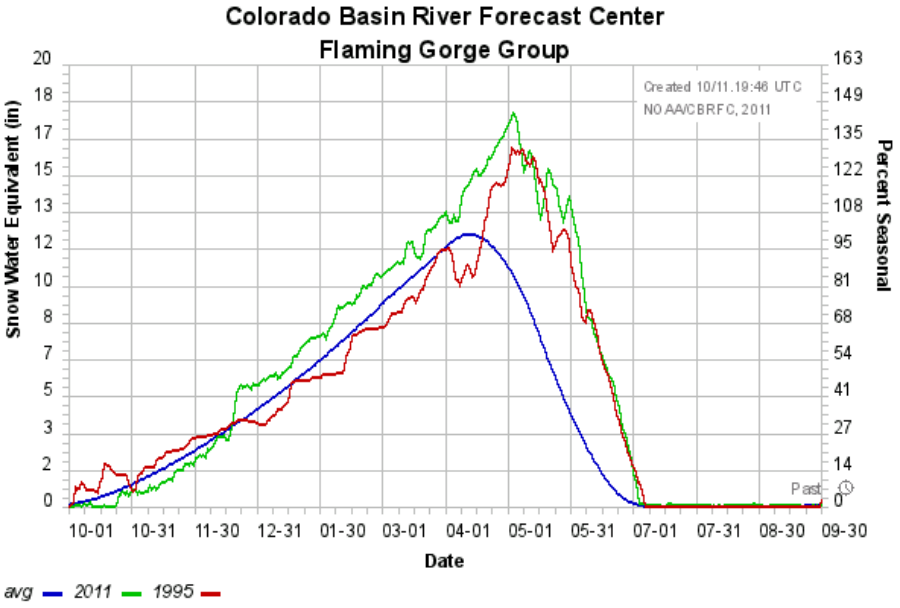


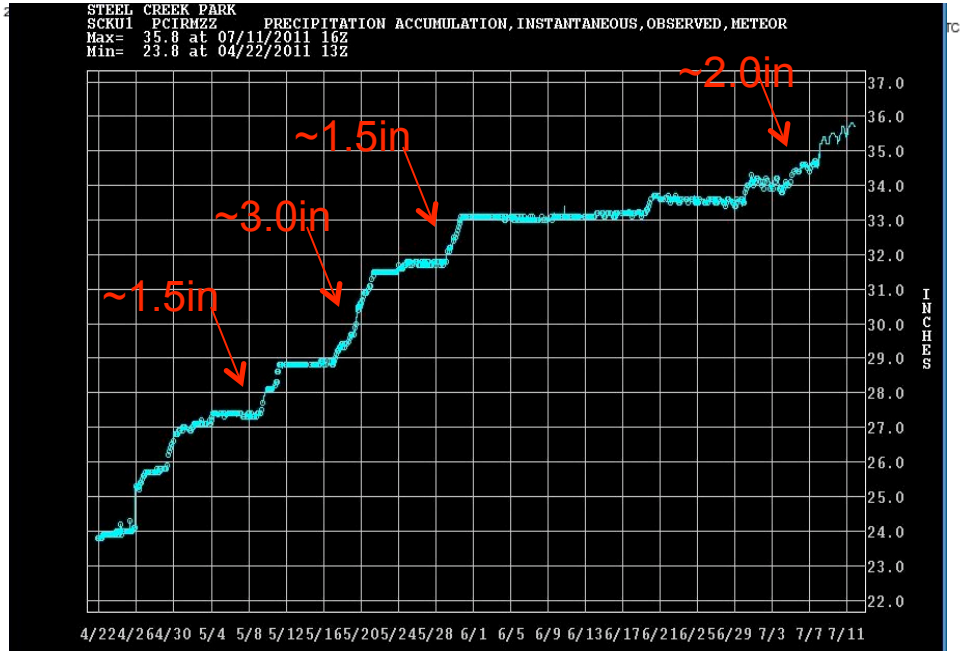
FLAMING GORGE

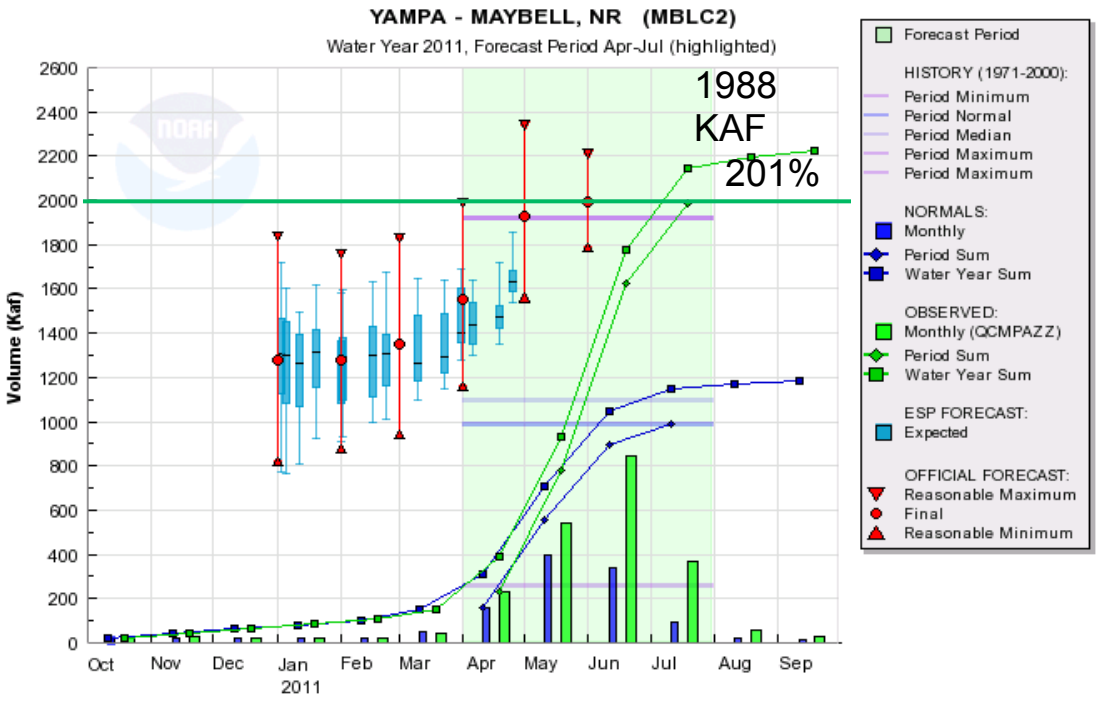
FLAMING GORGE LOCAL……..



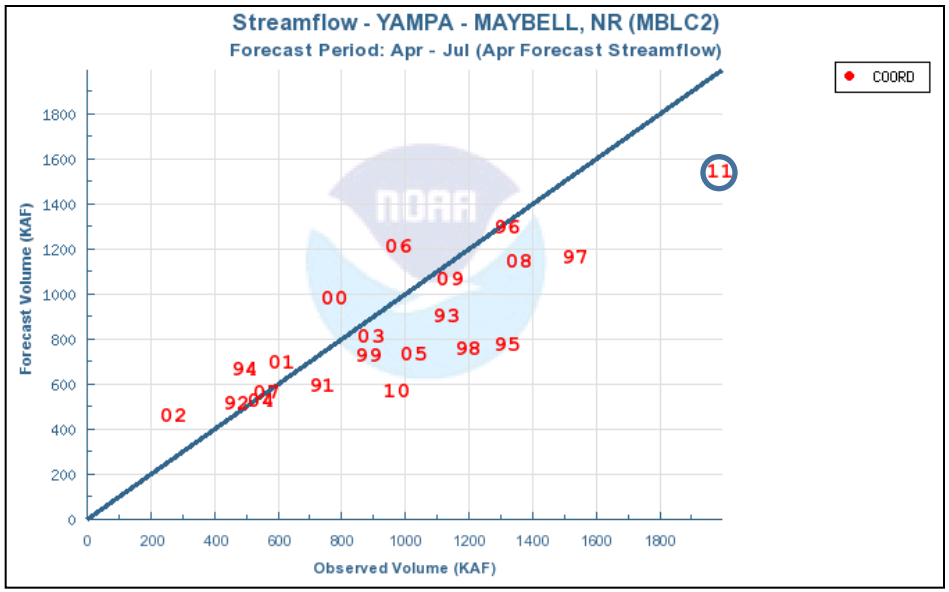








CBRFC/NWS/NOAA 10/12/11 16:24:48 UTC

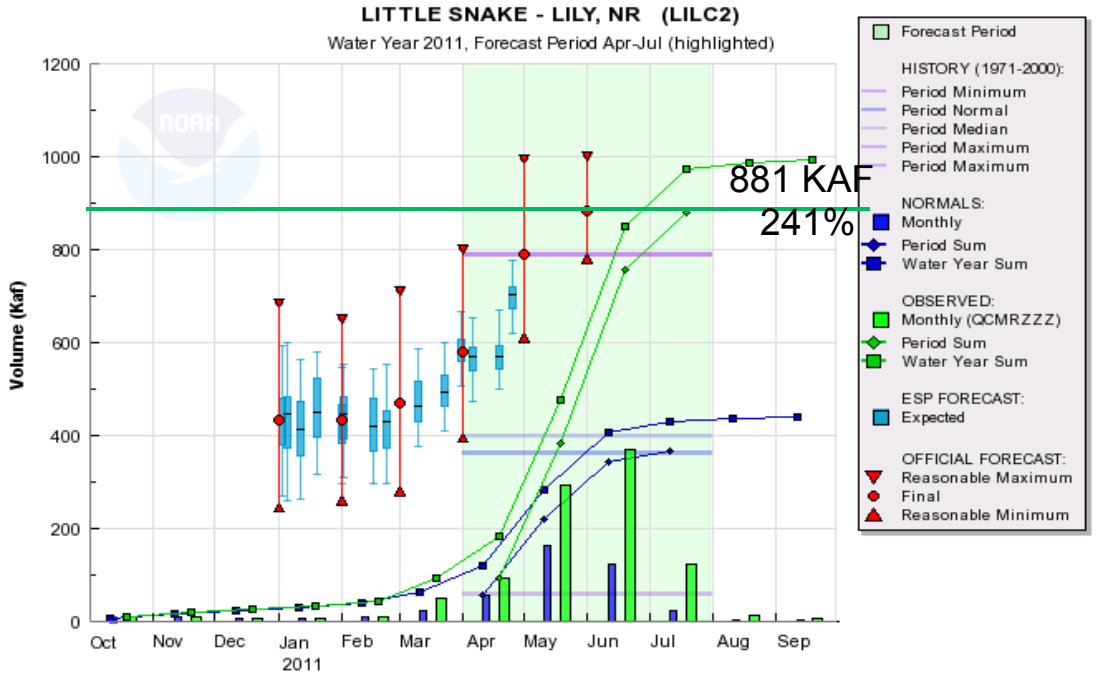


Yampa nr Maybell

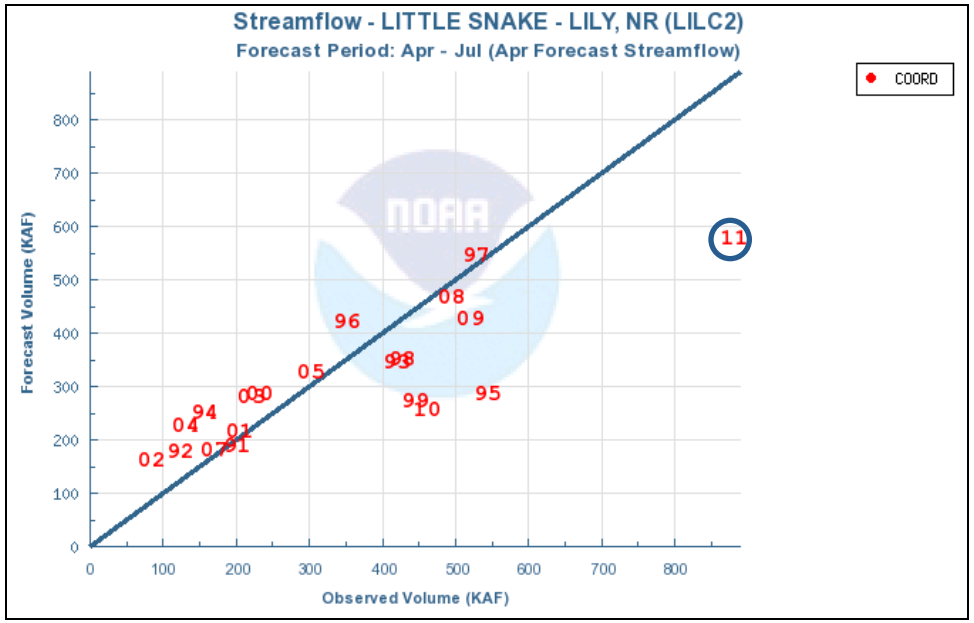
Tower SNOTEL

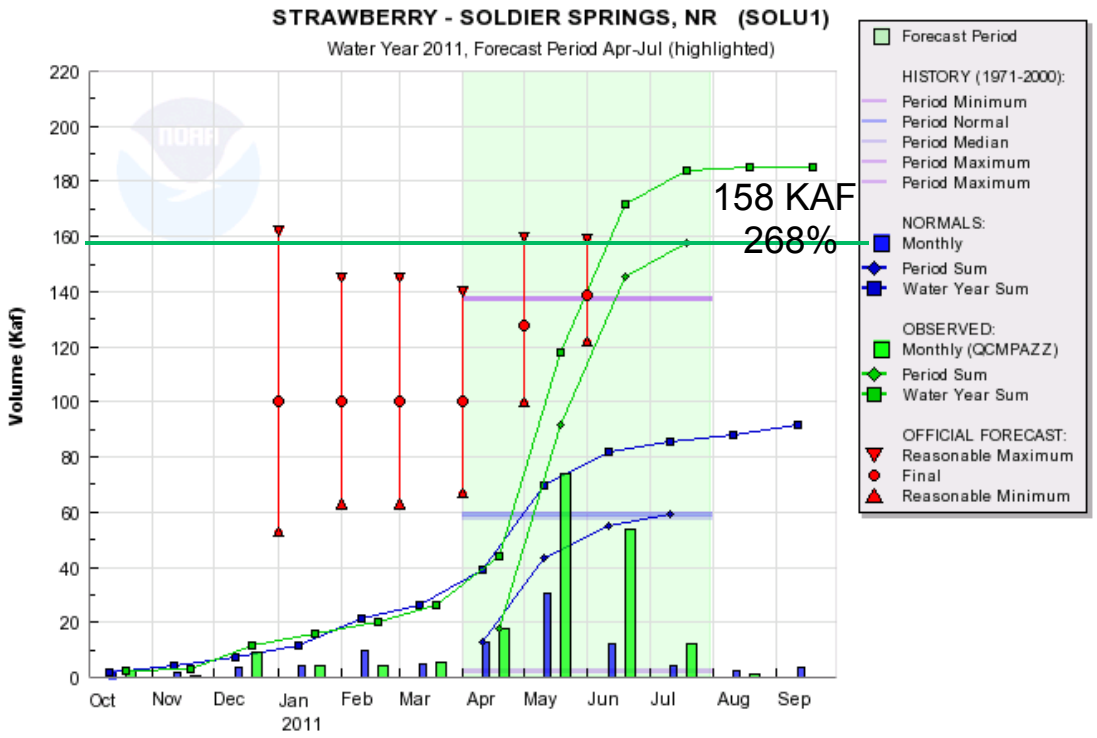
- Wettest April-June on record
- Wettest April on record (15.7”… next highest year = 10.8”!)

Little Snake nr Lily



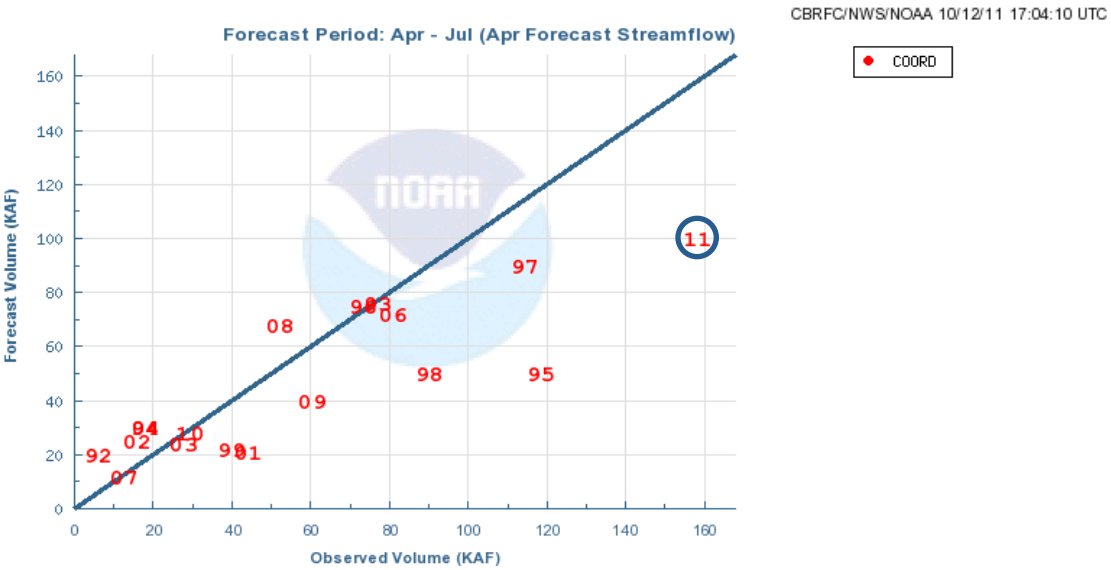
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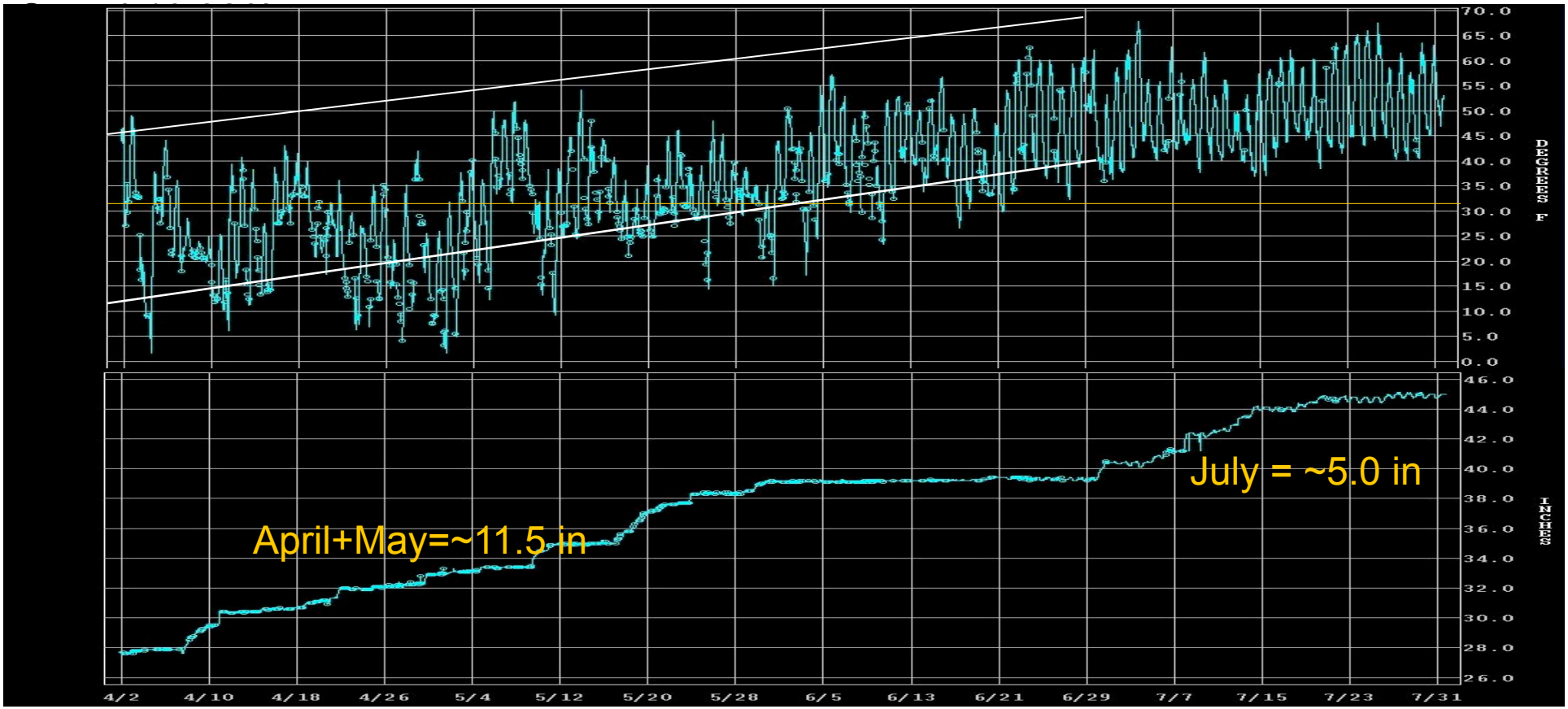


Strawberry Reservoir

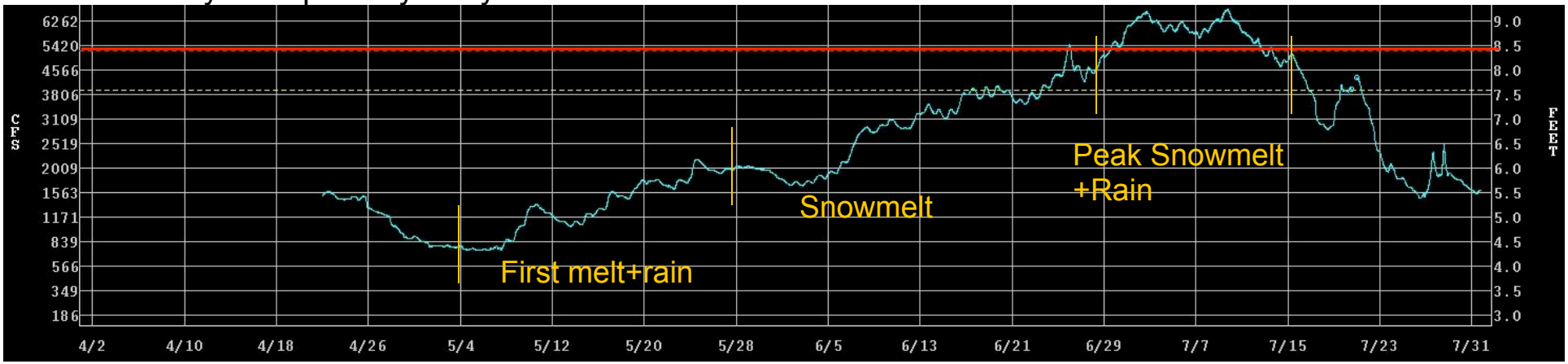
- Five Points Lake SNOTEL
- Very wet Spring:
  - Wettest April/May on record (11.5”)
  - 3rd wettest April
  - 3rd wettest May

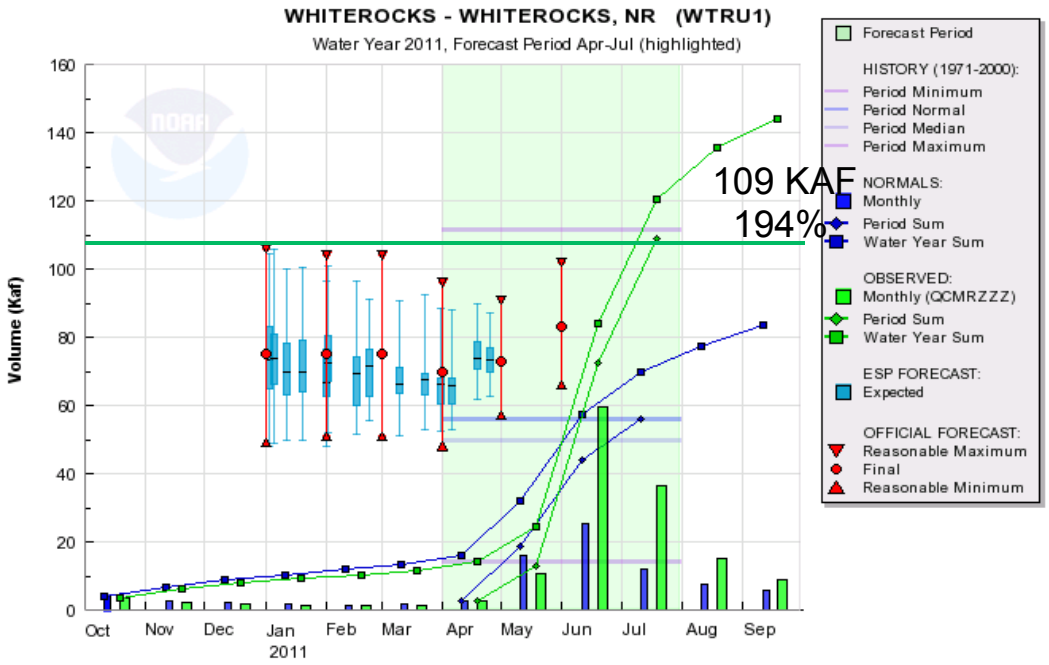


April –July Daily Temperature and Precipitation: Five Points Lake



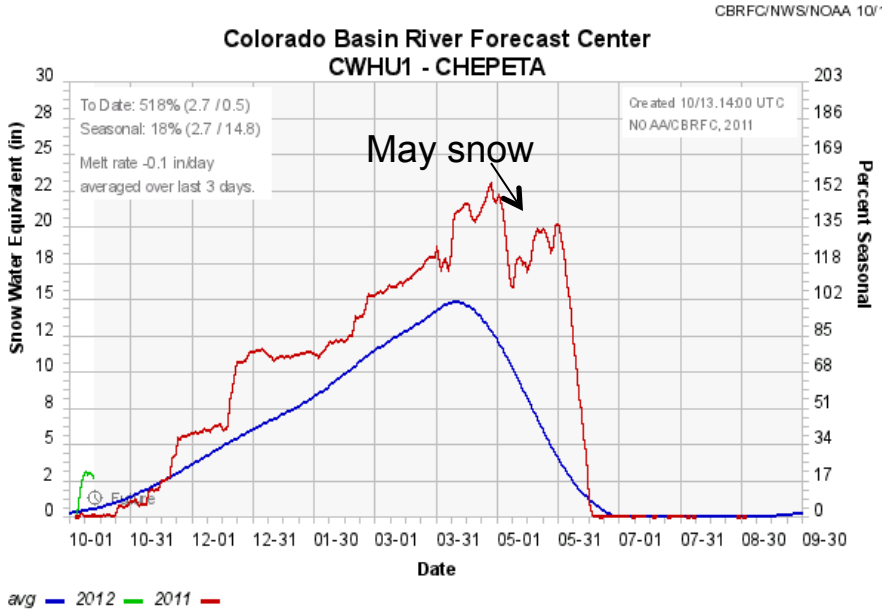
Duchesne-Myton April-July Daily Flow

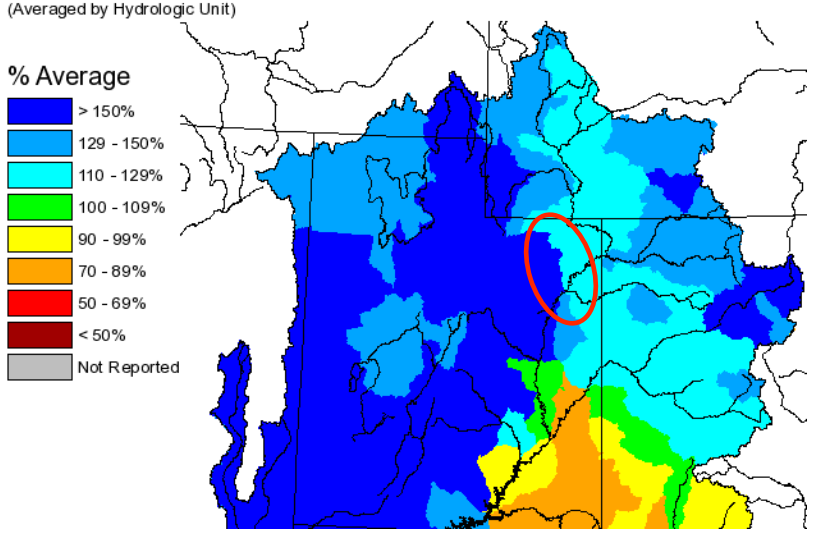




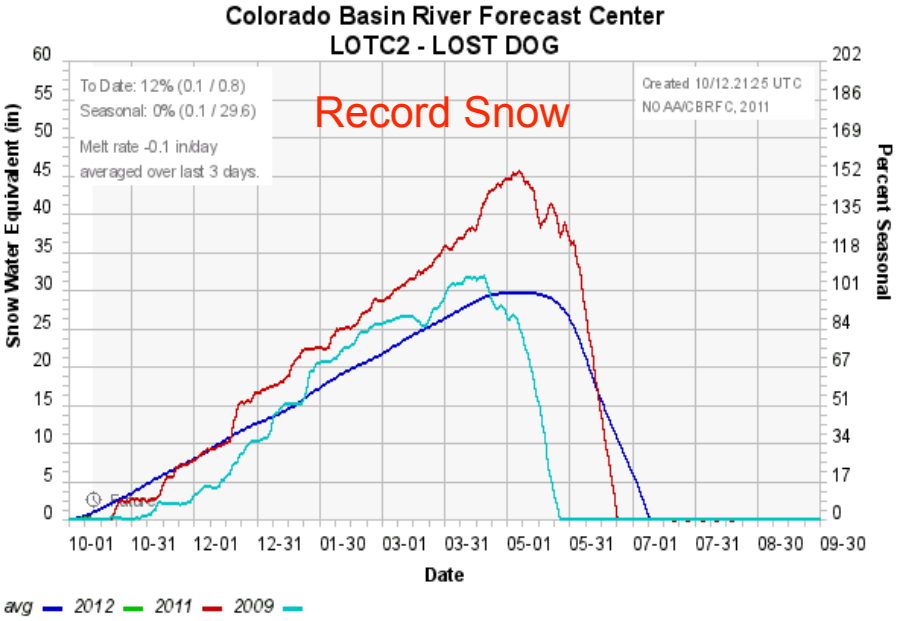
Whiterocks

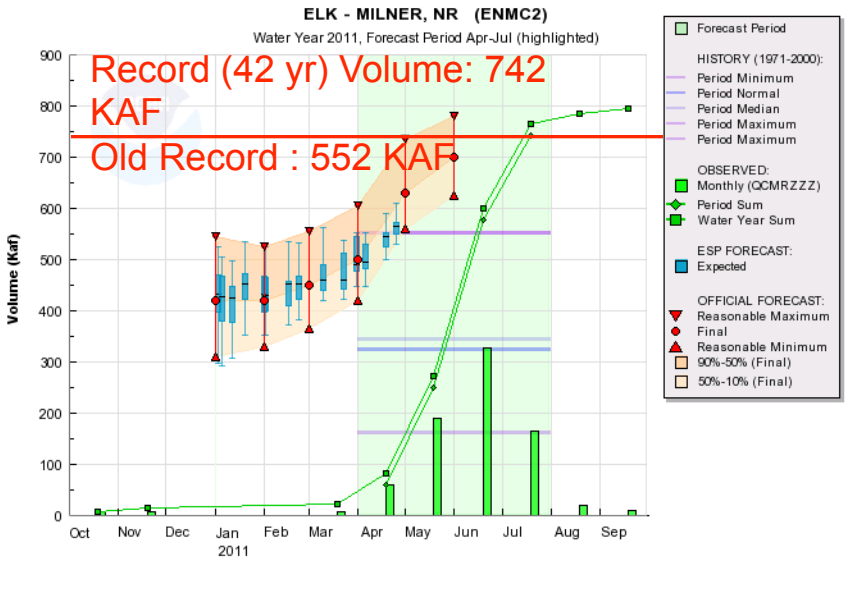
-Boundary between wet and really wet
-Very wet May, wet July



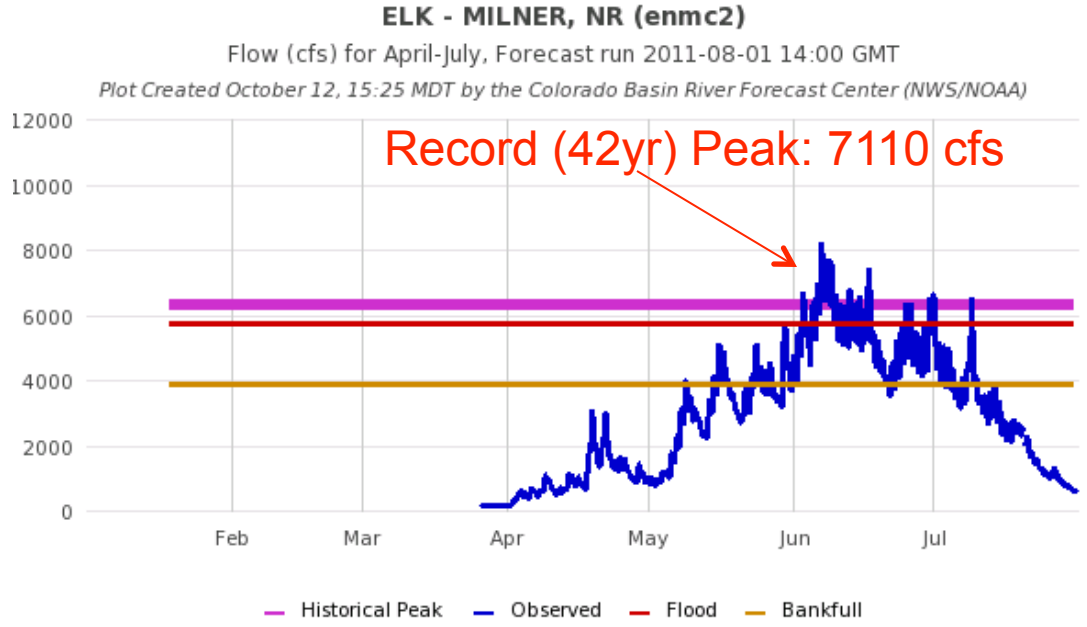


Elk River nr Milner…….the Record Breaker!!





CBRFC/NWS/NOAA 10/12/11 21:37:29 UTC



Green River Basin Records

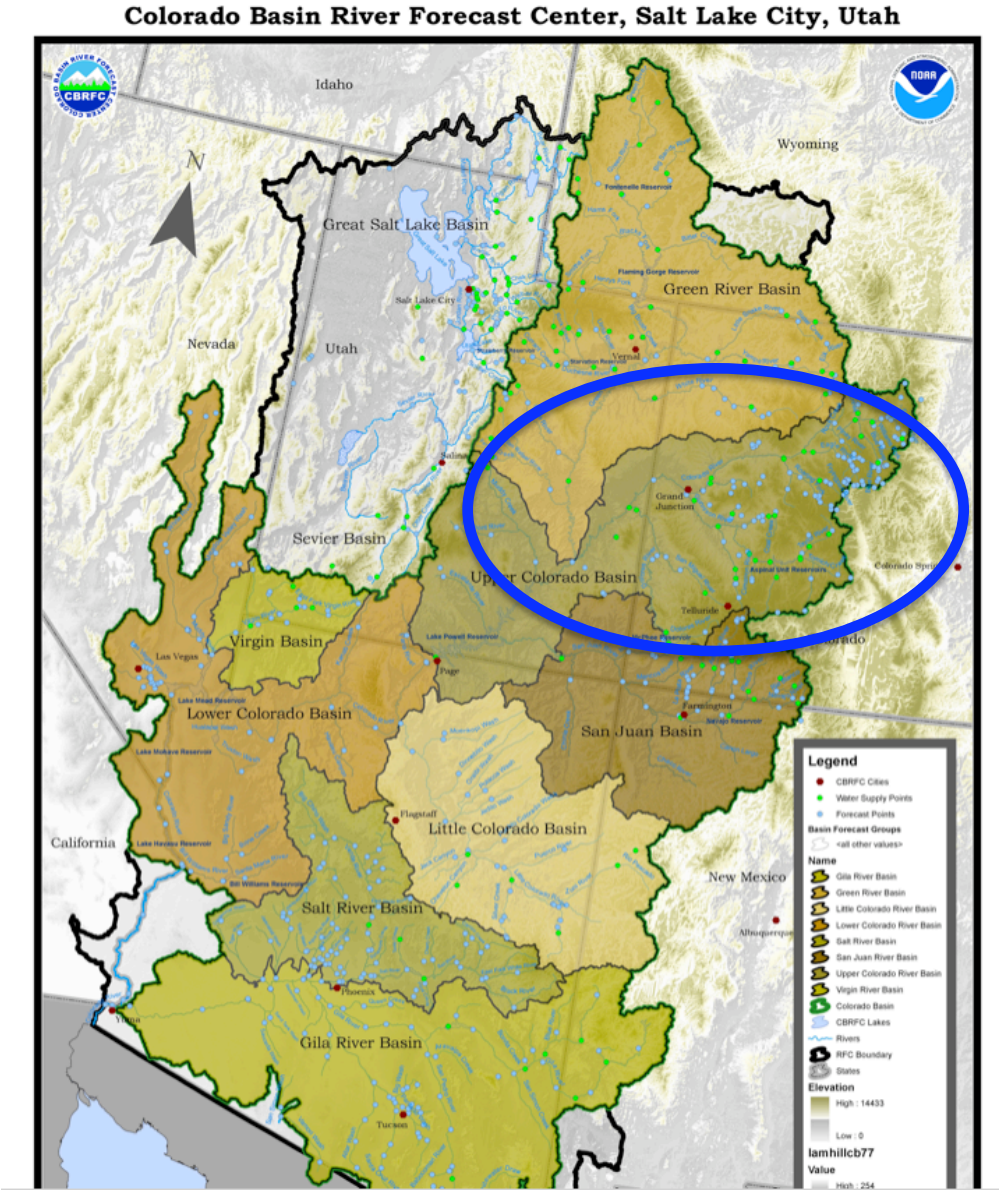
LOCATION	NEW RECORD	OLD RECORD	% DIFF	OLD RECORD YEAR
East Fork of Smiths Fork	64	57	12%	1983
Blacks Fork nr Robertson	202	125	62%	1975
Yampa abv Stagecoach	69	56	23%	1997
Yampa at Steamboat Springs	507	506	0%	1984
Elk nr Milner	742	552	34%	1917
Elk Head nr Hayden	171	119	44%	1997
Yampa at Maybell	1988	1921	3%	1984
Little Snake nr Slater	353	281	26%	1984
Little Snake at Dixon	775	754	3%	1984
Little Snake at Lily	881	790	12%	1984
White River nr Meeker	521	519	0%	1984
West Fork Duchesne	44	38	16%	1986
Duchesne nr Tabiona	217	189	15%	1952
Upper Stillwater-Rock Creek	153	136	13%	1986
Rock Creek	186	158	18%	1986
Strawberry nr Solider Springs	158	137	15%	1986
Lake Fork- Moon Lake	127	112	13%	2005
Yellowstone nr Altonah	125	114	10%	2005
Duchesne-Myton	824	766	8%	1952
Duchesne-Randlett	1011	942	7%	1983
Green River-Green River,UT	6490	5856*	11%	1983

RED=Single Month Volume > April-July Average

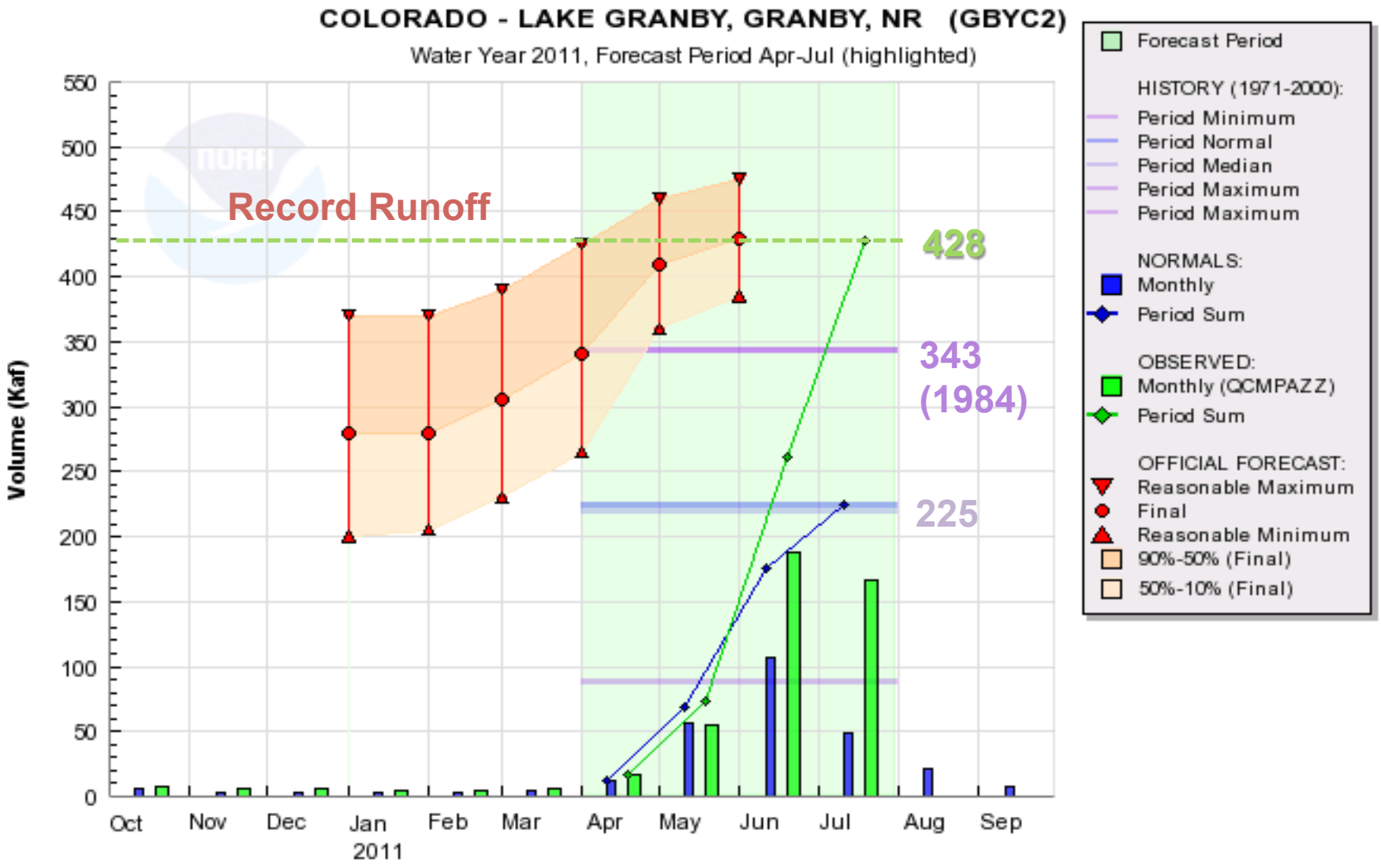
*POR after regulation

White/Yampa=10 /10
Duchesne=10/16

Upper Colorado Mainstem Basin

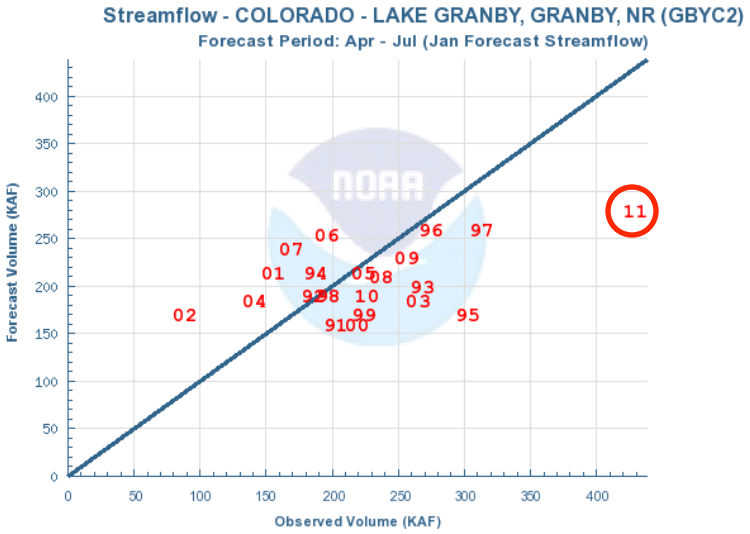


- Slightly above normal seasonal precipitation through March 2011
- Sustained cool and wet period April-June
- Many record or near records for precipitation, runoff volumes, etc
- Precipitation and runoff volumes greater to the north (e.g. Granby, Dillon, etc) and less to the south (e.g. Gunnison) and still less in the Dolores

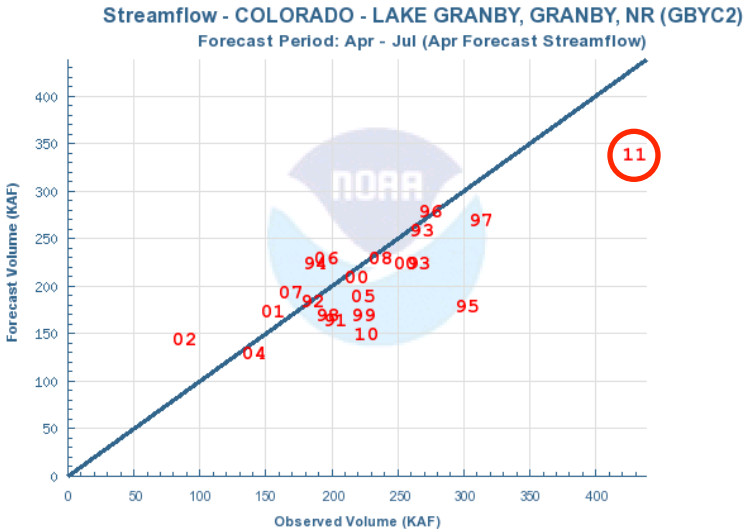


Lake Granby:
Joe Wright SNOTEL showed wettest April on record:
2011 = 13.1”
1986 (previous record) = 8.3”

January Forecasts



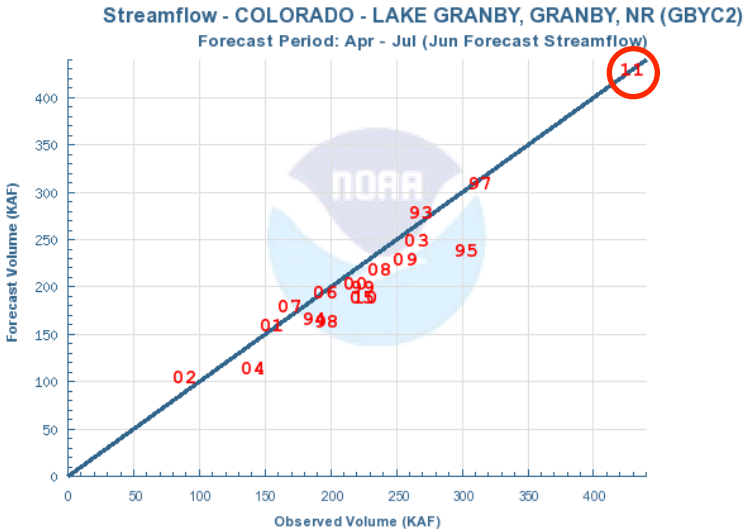
April Forecasts

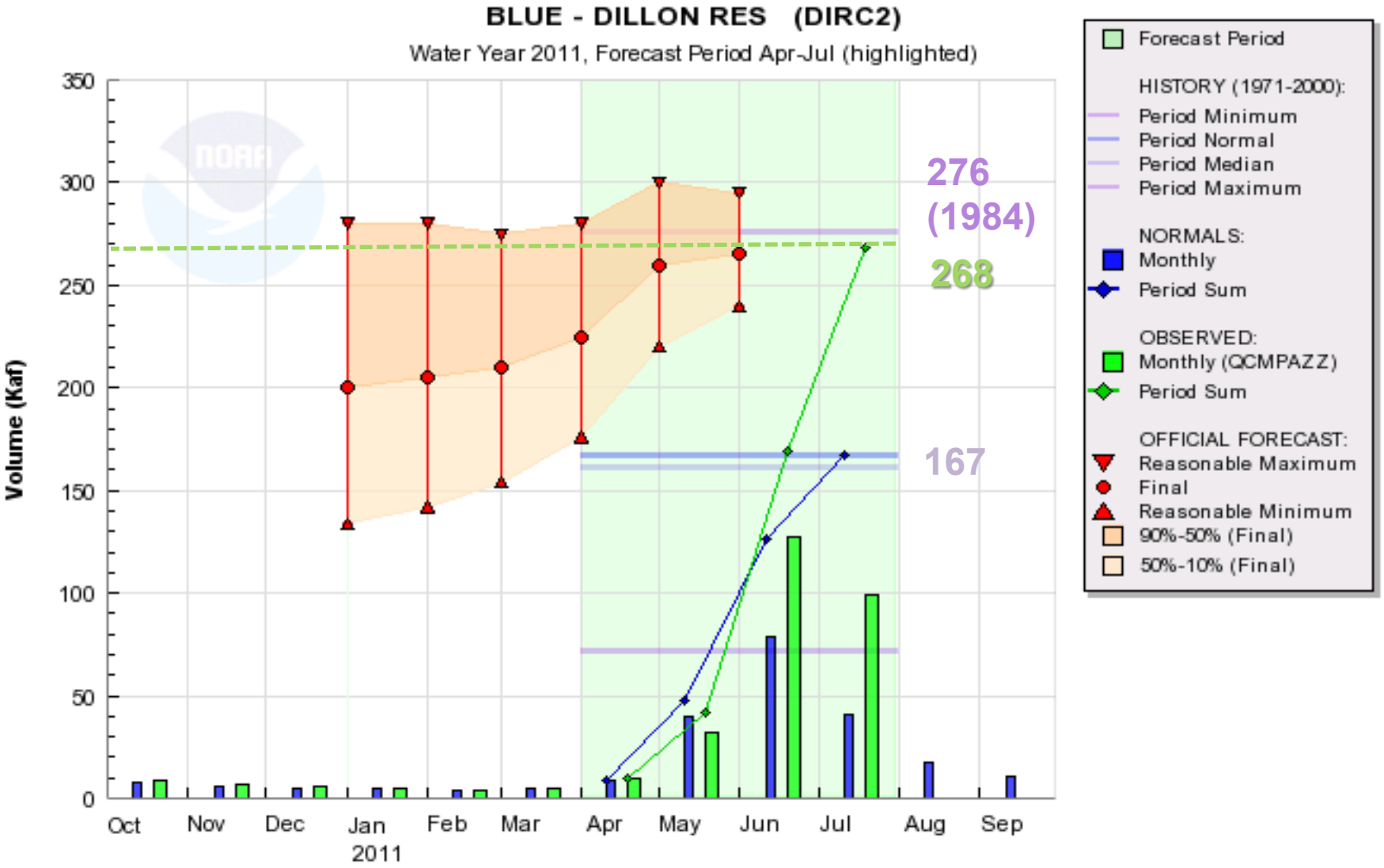


Lake Granby Streamflow Scatterplot

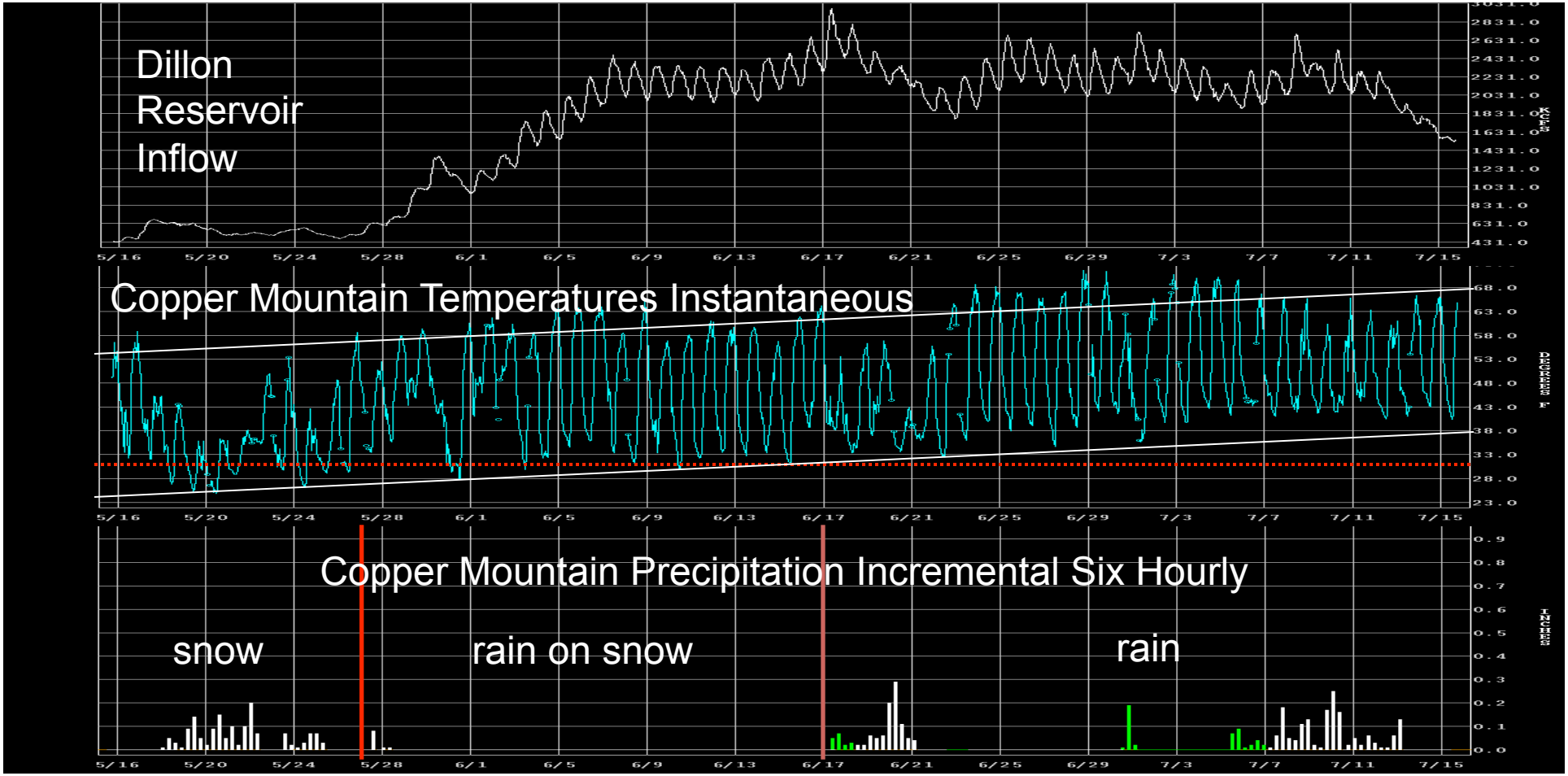
11 = 2011

June Forecasts



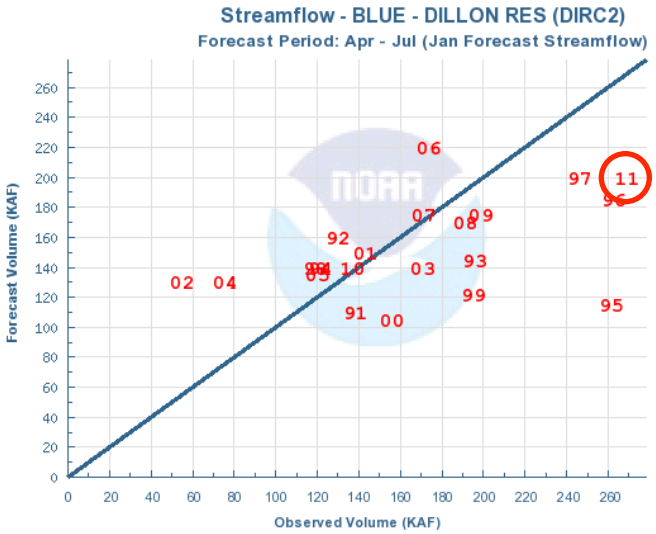


Dillon Reservoir - Forecast Evolution Plot

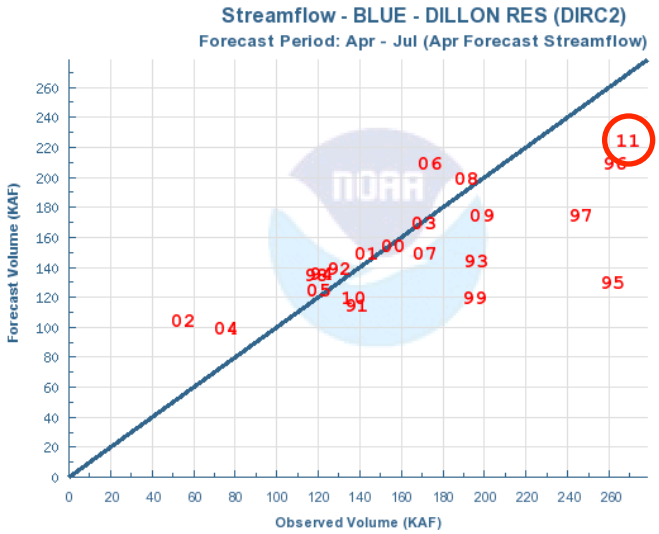


Copper Mountain Elevation 10,450 feet

January Forecasts



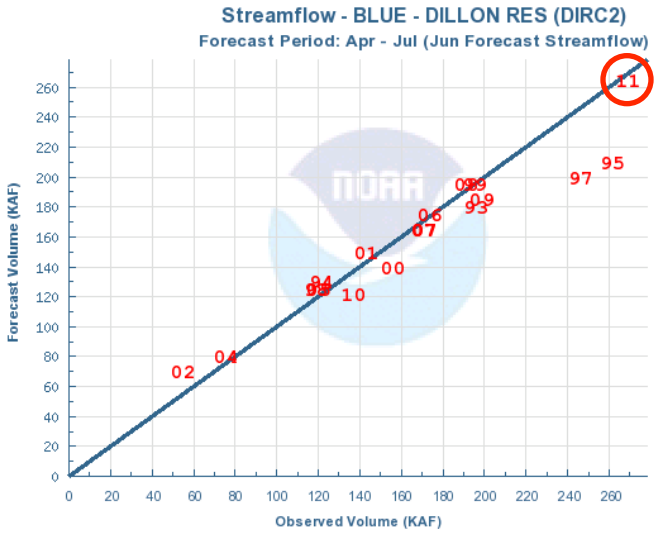
April Forecasts

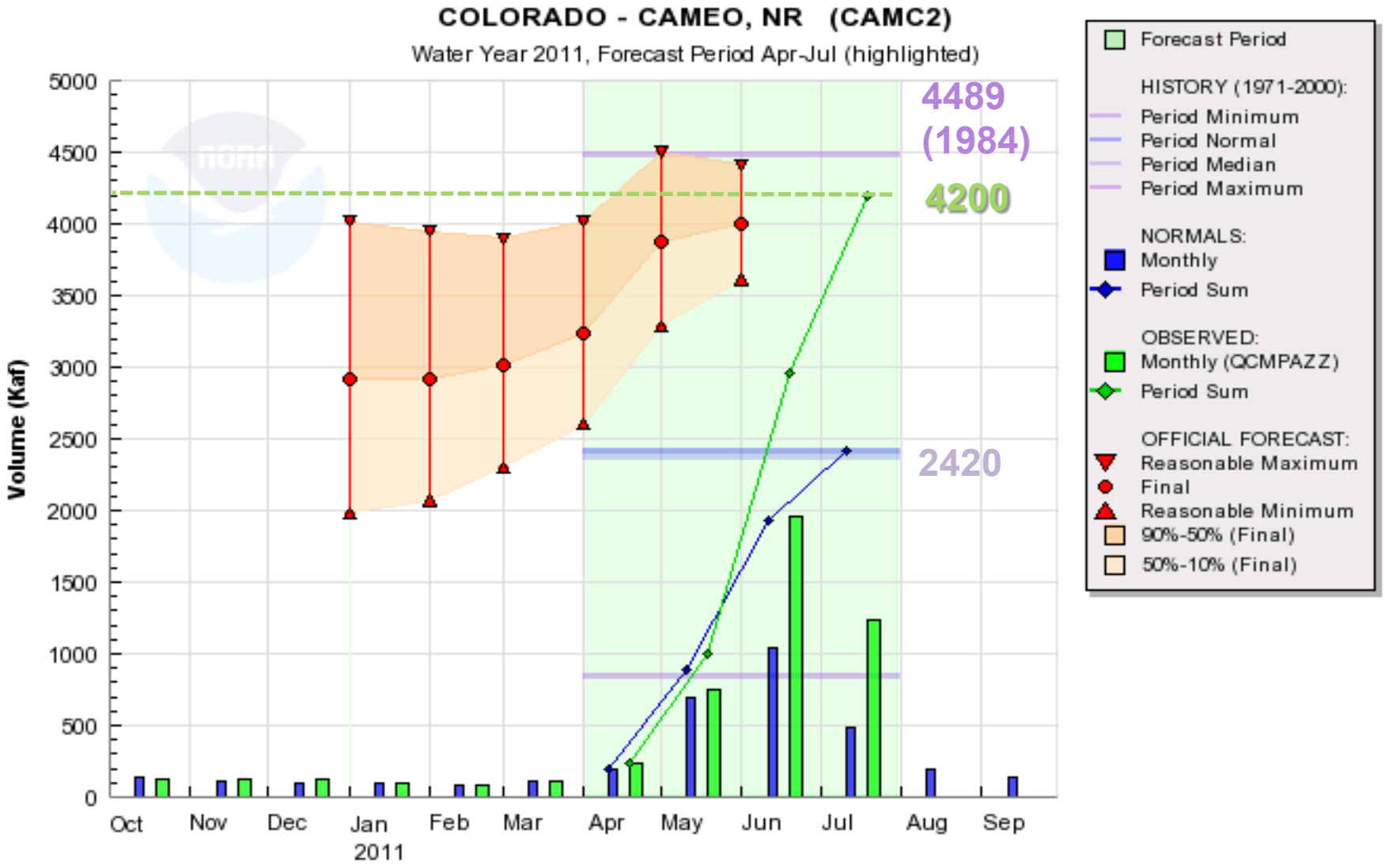


Dillon Reservoir Streamflow Scatterplot

11 = 2011

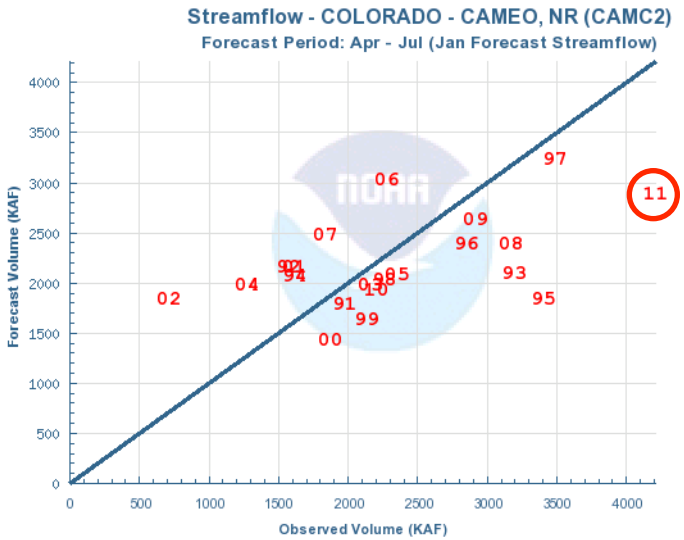
June Forecasts



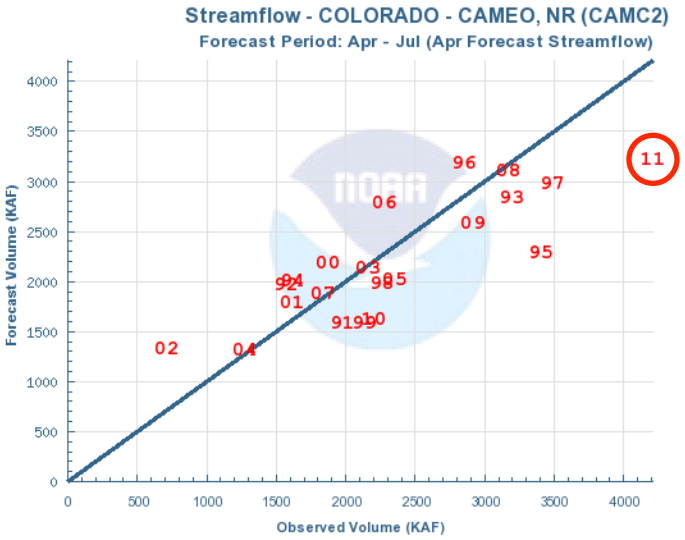


Colorado River nr Cameo - Forecast Evolution Plot

January Forecasts



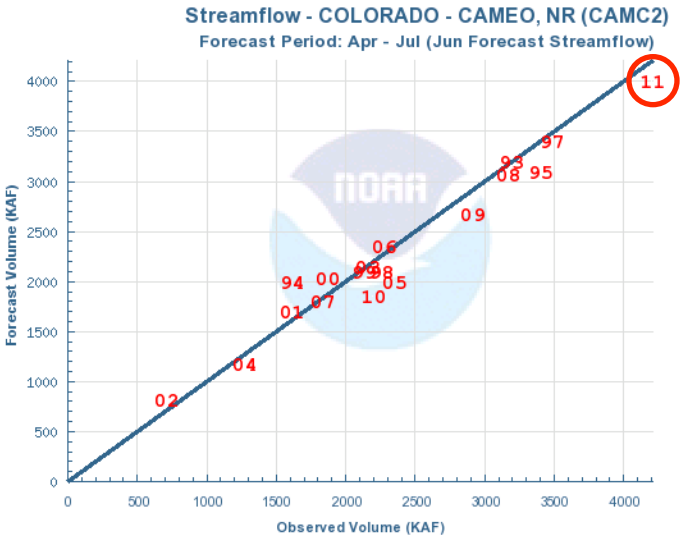
April Forecasts

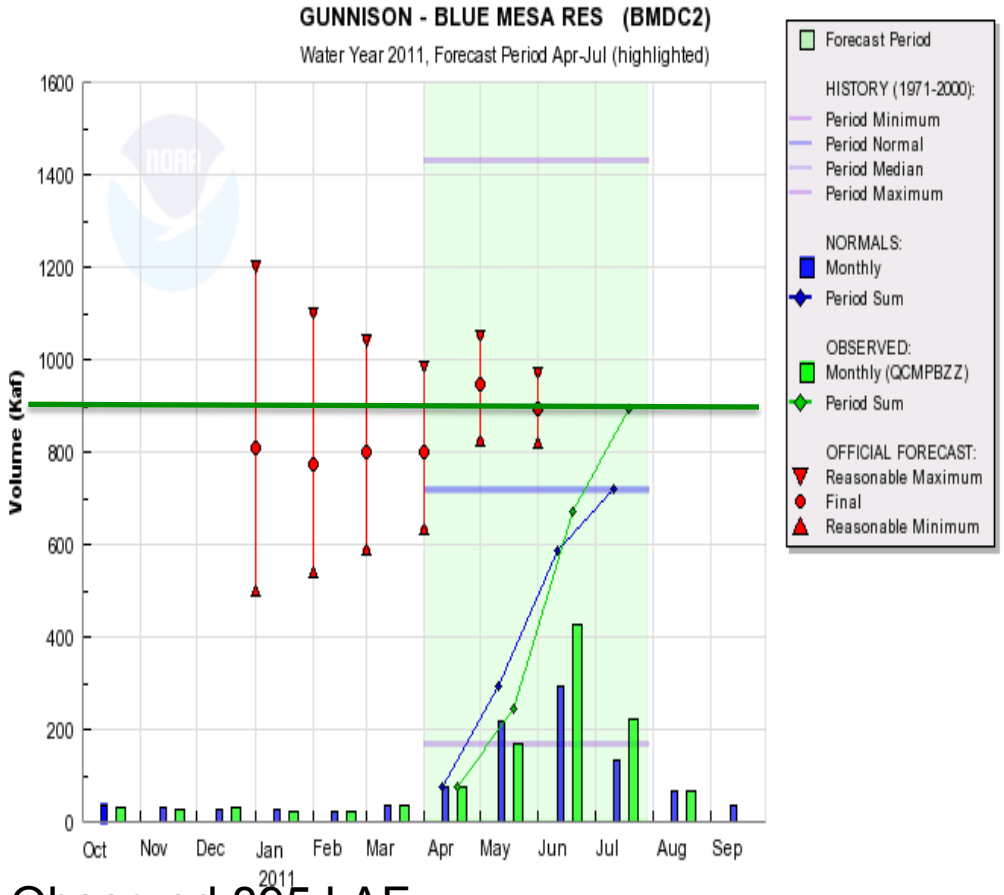


Colorado River near Cameo
Streamflow Scatterplot

= 2011

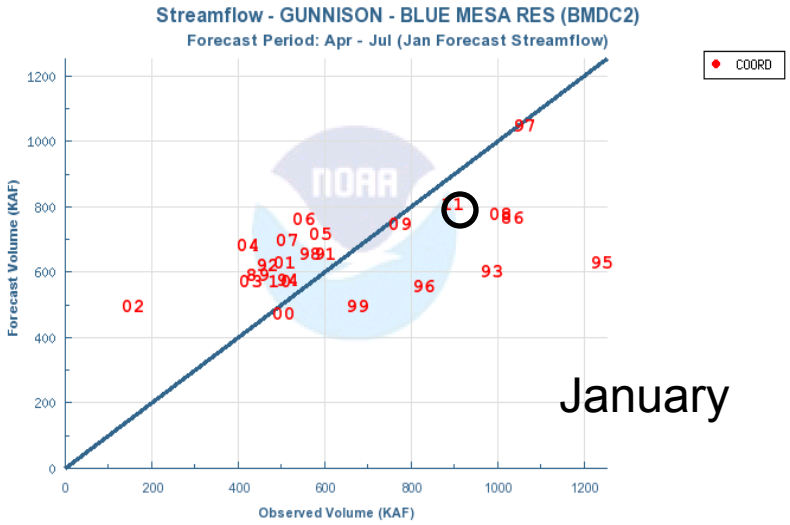
June Forecasts



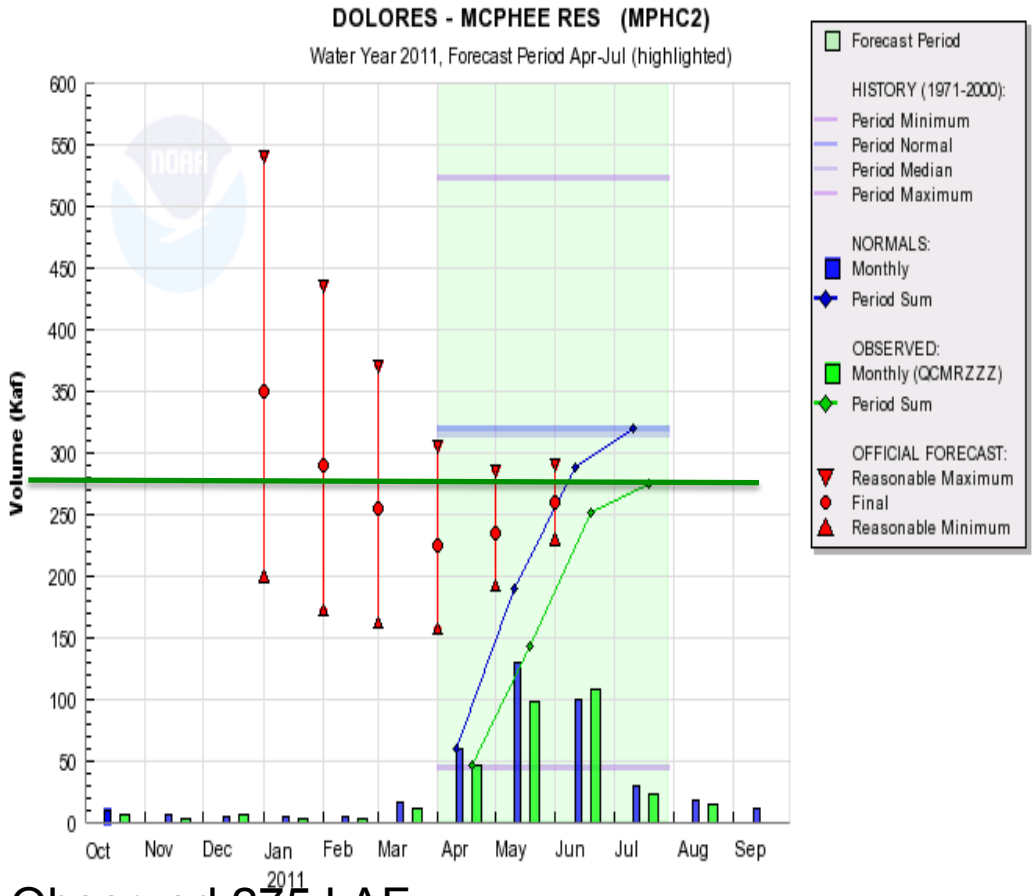


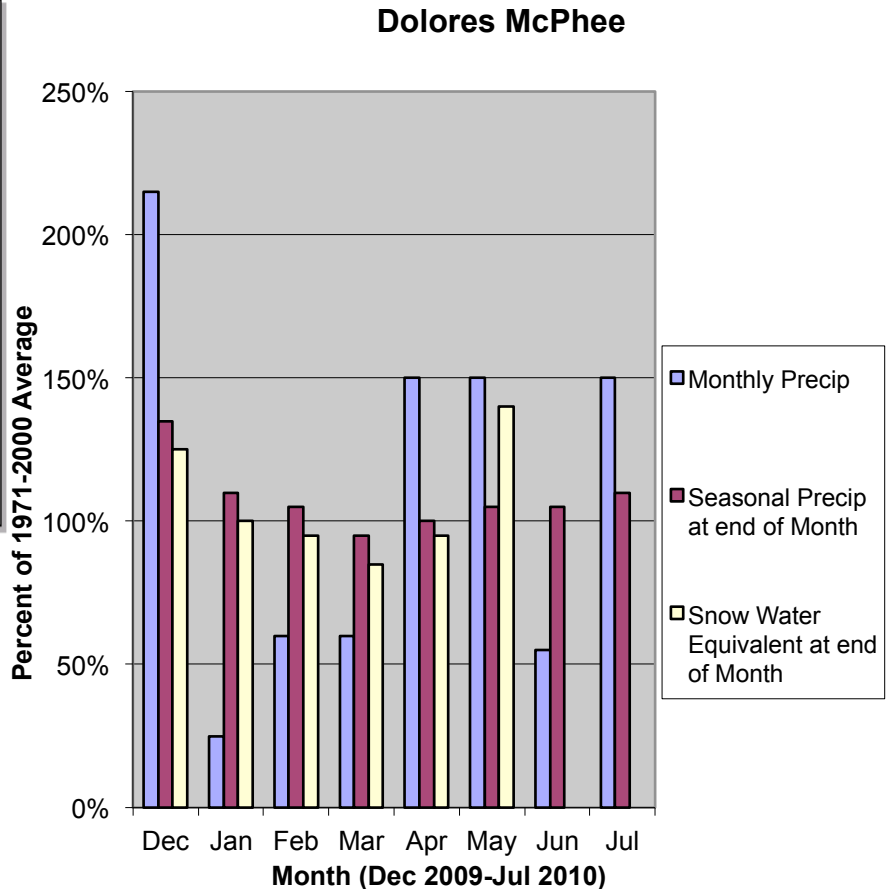
Observed 895 kAF
124% of average

CBRFC/NWS/NOAA 09/27/11 16:41:31 UTC



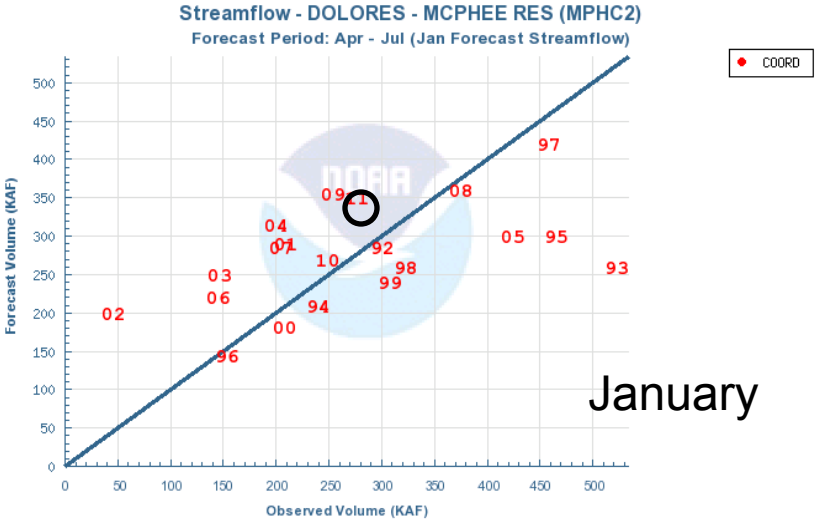
January



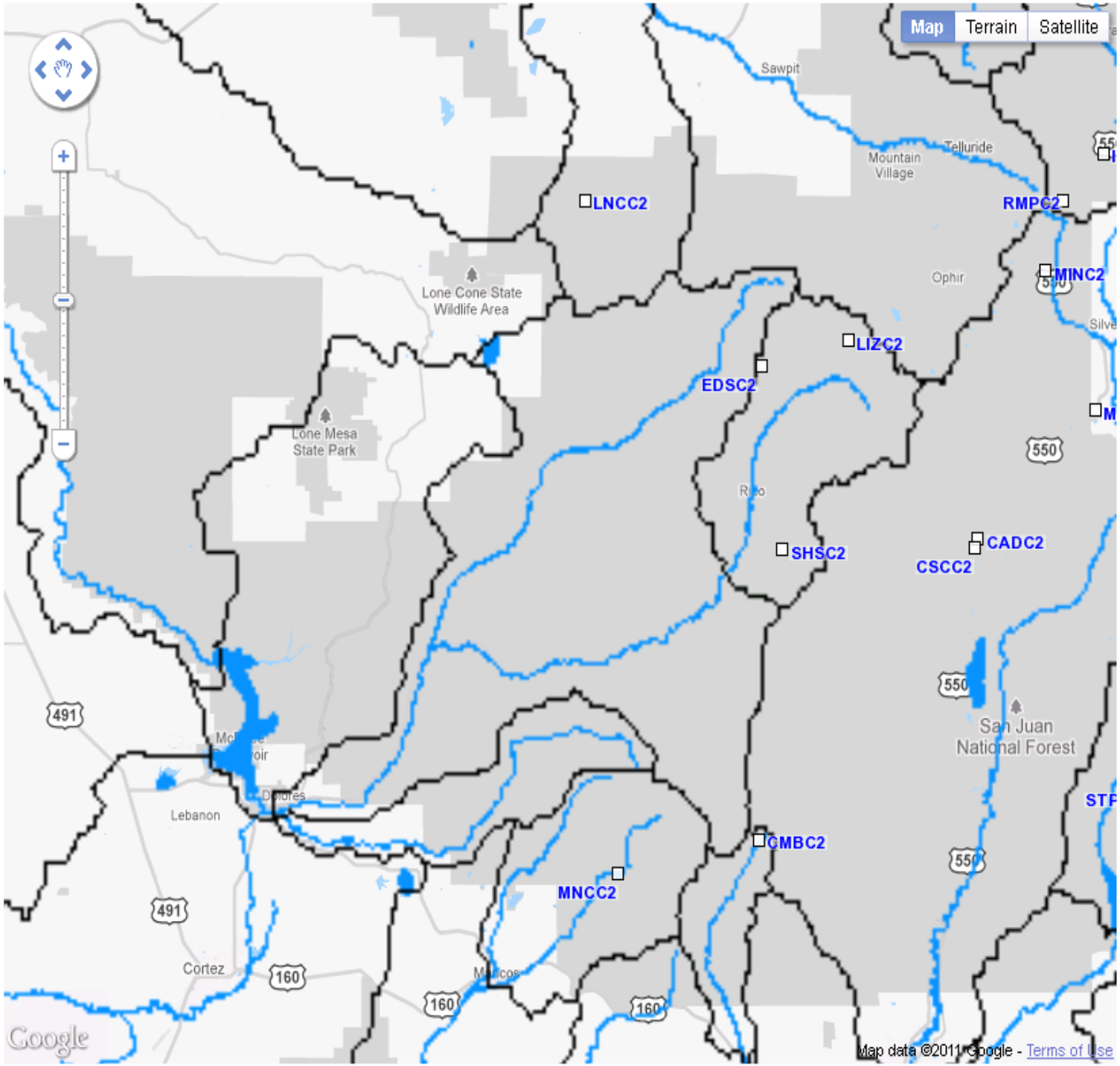


Observed 275 kAF
86% of average

CBRFC/NWS/NOAA 09/28/11 13:10:51 UTC



January



Overlays (slows response)

- [x] Rivers
- [ ] RFC
- [x] Basins
- [ ] Active Basins
- [ ] Grids (Precip etc.)

Display Options

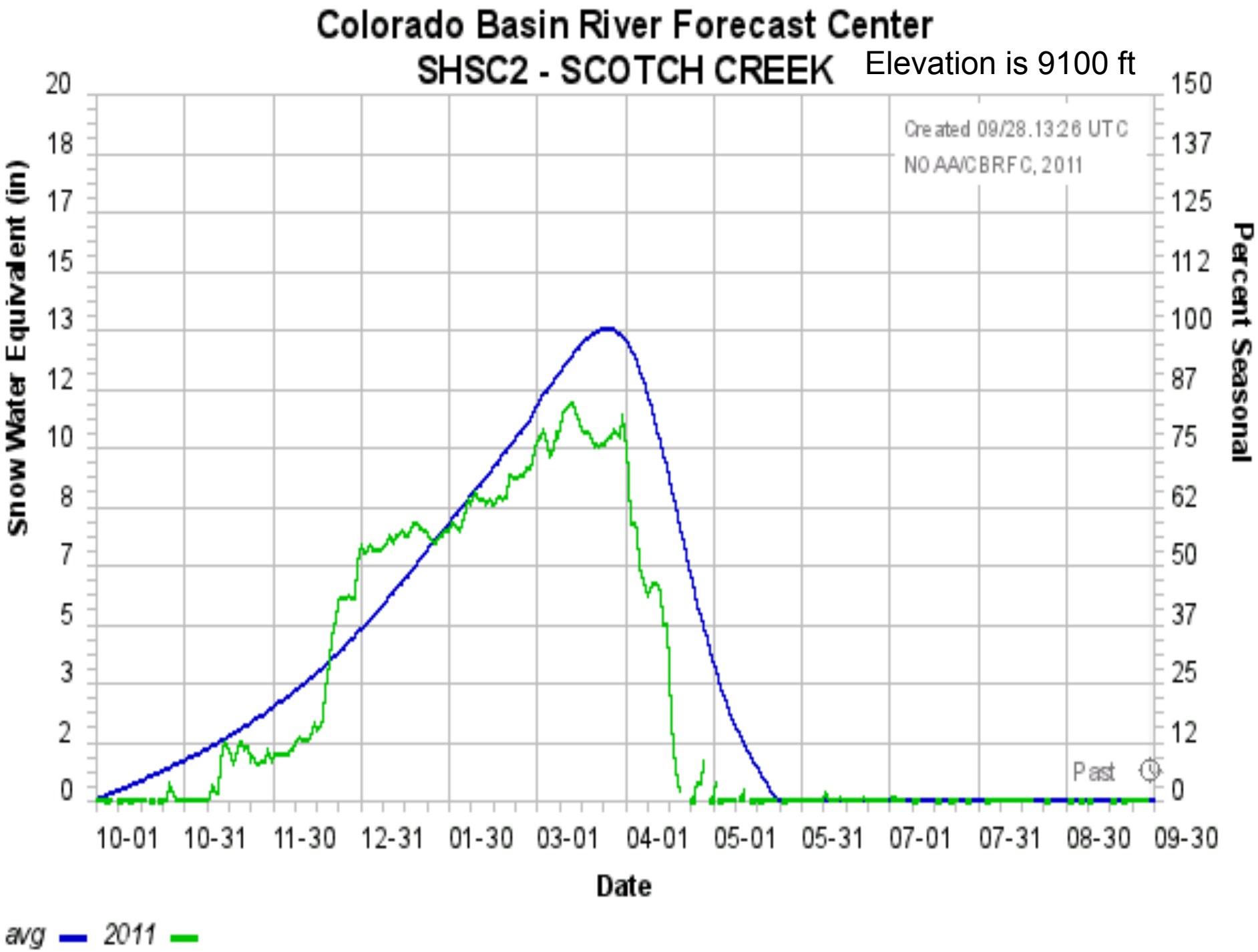
- [x] Show NWS ID
- [ ] Show Data

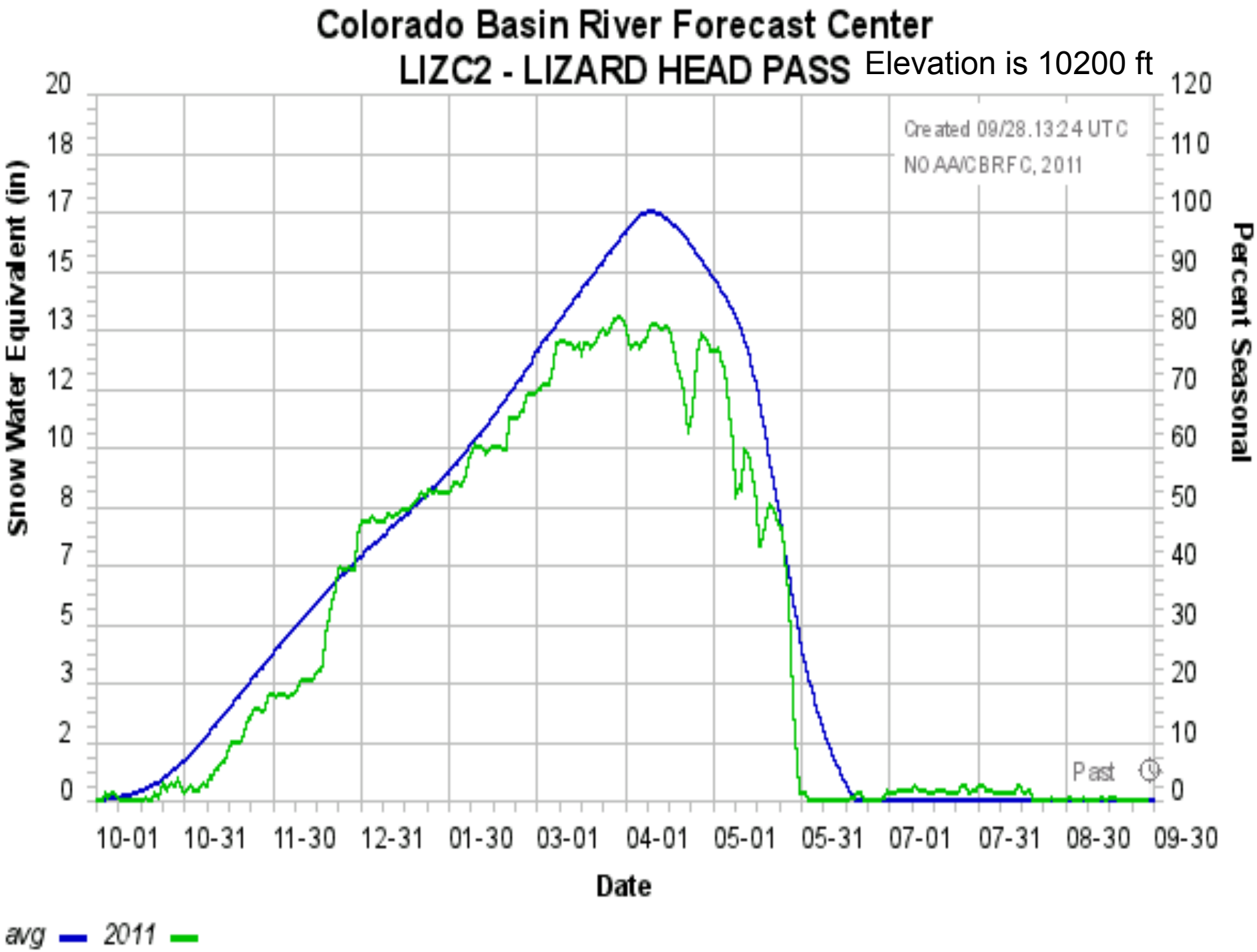
Snow Point %Avg SWE

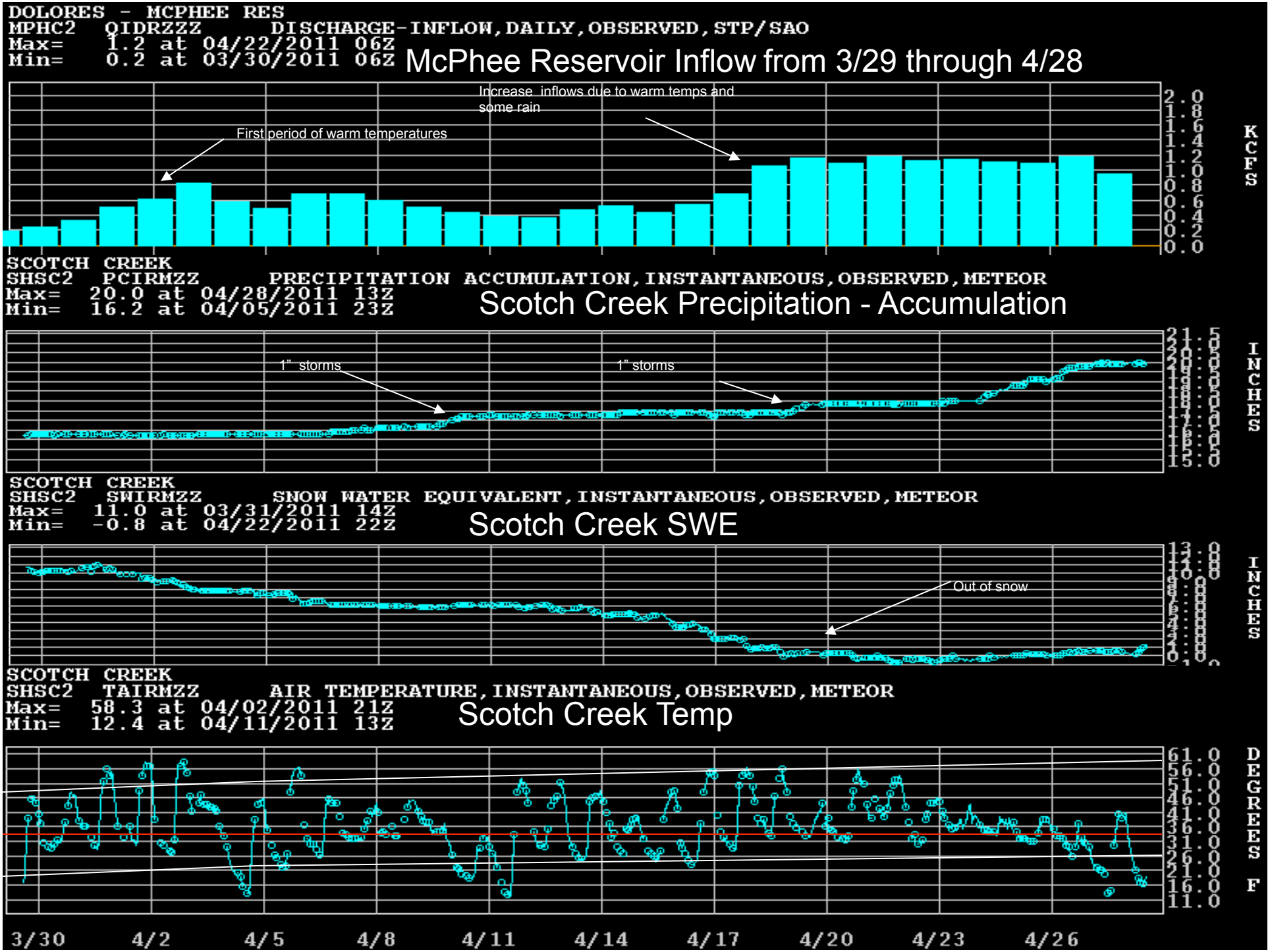
- [ ] No Data
- [ ] < 25
- [ ] 25-50
- [ ] 50-75
- [ ] 75-90
- [ ] 90-110
- [ ] 110-125
- [ ] 125-150
- [ ] 150-175
- [ ] >175

Snow Point Types

- [ ] All
- [ ] No Data
- [ ] No Average
- [x] < 7000
- [x] 7000-8000
- [x] 8000-9000
- [x] 9000-10000
- [x] > 10000

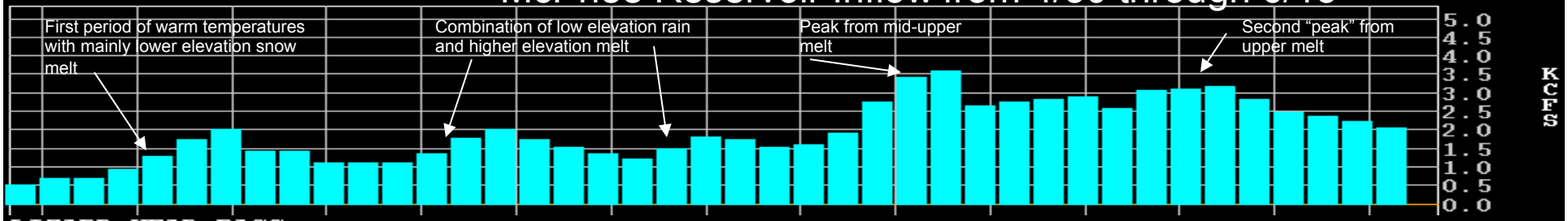

Colorado Basin River Forecast Center
SHSC2 - SCOTCH CREEK
Elevation is 9100 ft
Created 09/28.1326 UTC
NOAA/CBRFC, 2011
Past
Snow Water Equivalent (in)
Percent Seasonal
Date
20
18
17
15
13
12
10
8
7
5
3
2
0
150
137
125
112
100
87
75
62
50
37
25
12
0
10-01
10-31
11-30
12-31
01-30
03-01
04-01
05-01
05-31
07-01
07-31
08-30
09-30
avg
2011


Colorado Basin River Forecast Center
LIZC2 - LIZARD HEAD PASS
Elevation is 10200 ft
Created 09/28.1324 UTC
NOAA/CBRFC, 2011
Past
Snow Water Equivalent (in)
Percent Seasonal
Date
10-01
10-31
11-30
12-31
01-30
03-01
04-01
05-01
05-31
07-01
07-31
08-30
09-30
avg
2011


DOLORES - MCPHEE RES
MPHC2 QIDRZZZ DISCHARGE-INFLOW,DAILY,OBSERVED,STP/SAO
Max= 1.2 at 04/22/2011 06Z
Min= 0.2 at 03/30/2011 06Z
McPhee Reservoir Inflow from 3/29 through 4/28
Increase inflows due to warm temps and some rain
First period of warm temperatures
KCFS
SCOTCH CREEK
SHSC2 PCIRMZZ PRECIPITATION ACCUMULATION,INSTANTANEOUS,OBSERVED,METEOR
Max= 20.0 at 04/28/2011 13Z
Min= 16.2 at 04/05/2011 23Z
Scotch Creek Precipitation - Accumulation
1" storms
1" storms
INCHES
SCOTCH CREEK
SHSC2 SWIRMZZ SNOW WATER EQUIVALENT,INSTANTANEOUS,OBSERVED,METEOR
Max= 11.0 at 03/31/2011 14Z
Min= -0.8 at 04/22/2011 22Z
Scotch Creek SWE
Out of snow
INCHES
SCOTCH CREEK
SHSC2 TAIRMZZ AIR TEMPERATURE,INSTANTANEOUS,OBSERVED,METEOR
Max= 58.3 at 04/02/2011 21Z
Min= 12.4 at 04/11/2011 13Z
Scotch Creek Temp
DEGREES F
3/30
4/2
4/5
4/8
4/11
4/14
4/17
4/20
4/23
4/26

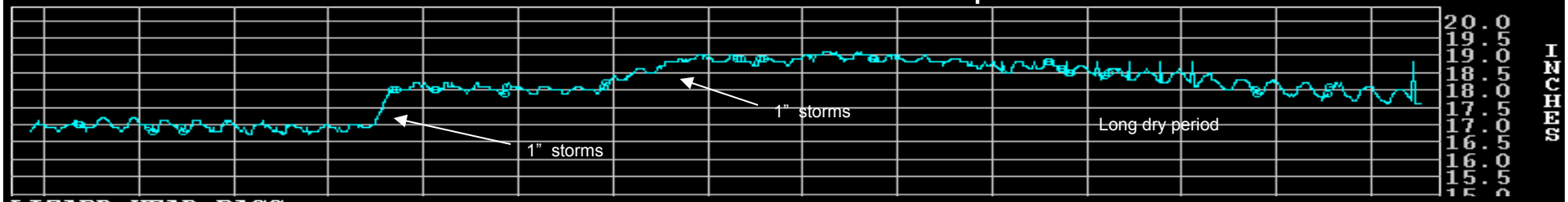
DOLORES - MCPHEE RES
MPHC2 QIDRZZZ DISCHARGE-INFLOW,DAILY,OBSERVED,STP/SAO
Max= 3.6 at 05/31/2011 06Z
Min= 0.5 at 05/04/2011 06Z

McPhee Reservoir Inflow from 4/30 through 6/13



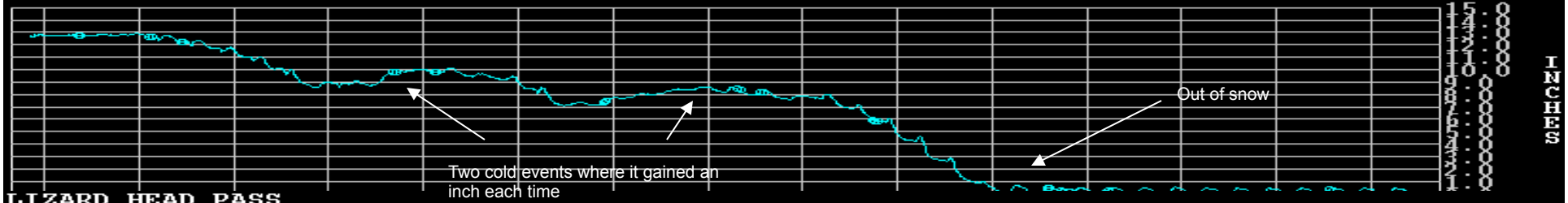
LIZARD HEAD PASS
LIZC2 PCIRMZZ PRECIPITATION ACCUMULATION,INSTANTANEOUS,OBSERVED,METEOR
Max= 19.1 at 05/26/2011 20Z
Min= 16.7 at 05/09/2011 09Z

Lizard Head Pass Precipitation - Accumulation



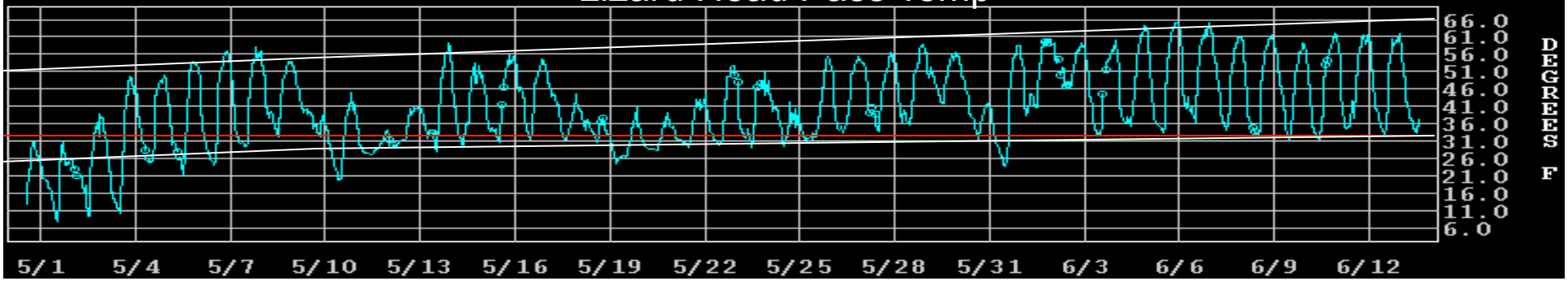
LIZARD HEAD PASS
LIZC2 SWIRMZZ SNOW WATER EQUIVALENT,INSTANTANEOUS,OBSERVED,METEOR
Max= 12.9 at 05/03/2011 23Z
Min= 0.0 at 06/13/2011 13Z

Lizard Head Pass SWE



LIZARD HEAD PASS
LIZC2 TAIRMZZ AIR TEMPERATURE,INSTANTANEOUS,OBSERVED,METEOR
Max= 65.1 at 06/06/2011 22Z
Min= 7.9 at 05/01/2011 13Z

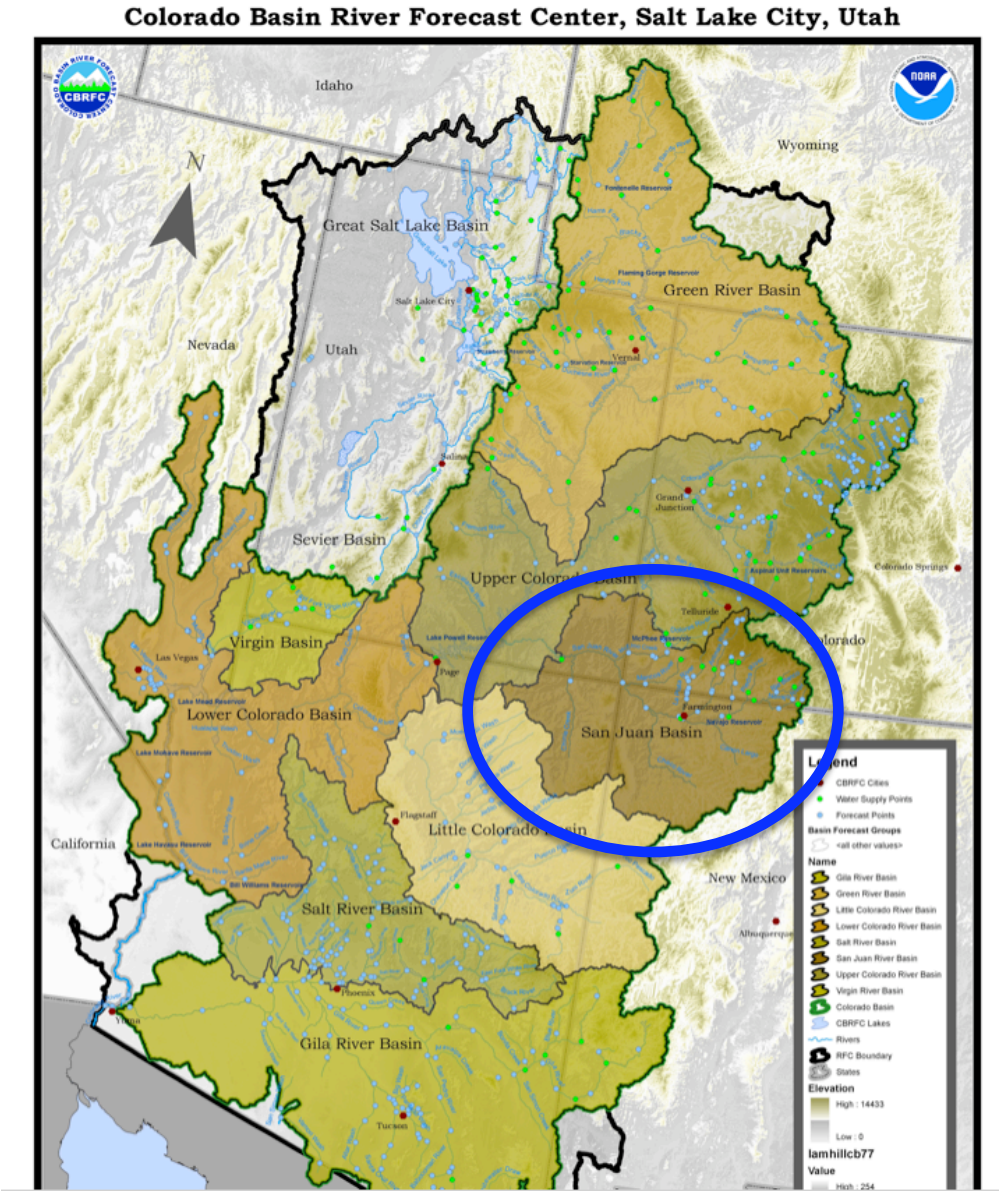
Lizard Head Pass Temp



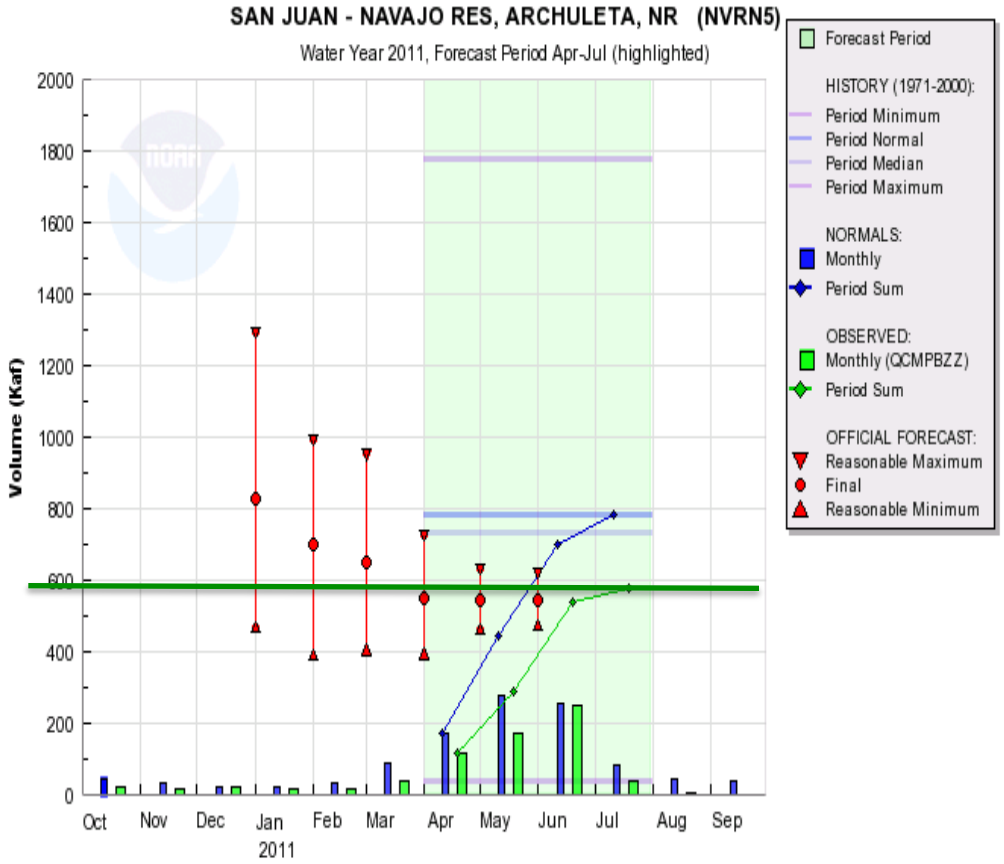
Upper Colorado 2011 Volumes

	April - July 2011			Historical	
	Volume (kaf)	% avg	Ranking	Max (kaf)	Year
Lake Granby	428	190%	1 / 84	343	1984
Willow Creek Res	125	245%	1 / 92	85	1986
Fraser - Winter Park	32	159%	2 / 41	34	1984
Williams Fork Res	155	163%	2 / 52	162	1984
Dillon Res	268	161%	2 / 52	276	1984
Green Mountain Res	468	167%	3 / 74	490	1984
Wolford Mountain Res	114	190%	1 / 30	112	1984
Colorado - Kremmling	1,767	203%	1 / 41	1,562	1984
Eagle - Gypsum	577	172%	2 / 65	608	1984
Colorado - Dotsero	2,720	189%	1 / 71	2,496	1984
Ruedi Res	218	154%	2 / 42	255	1984
Roaring Fork - Glenwood	1,026	145%	3 / 42	1,244	1984
Colorado -Glenwood	3,730	173%	1 / 55	3,716	1984
Colorado - Cameo	4,200	174%	2 / 78	4,489	1984
Platuea Ck - Cameo	164	142%	13 / 76	318	1983
Colorado - Cisco	6,894	148%	5 / 42	8,988	1984
Lake Powell	12,920	163%	3 / 48	15,406	1984

San JuanBasin

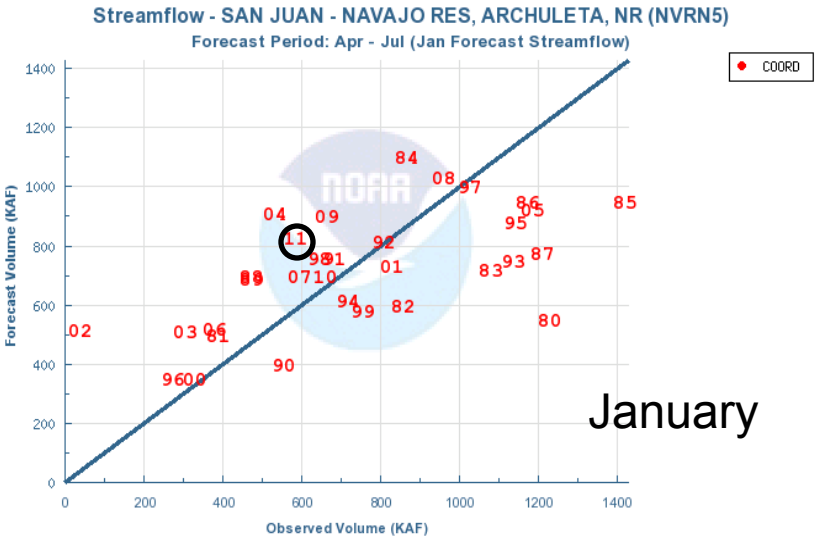


- Near to Below normal year
- Evidence of La Nina

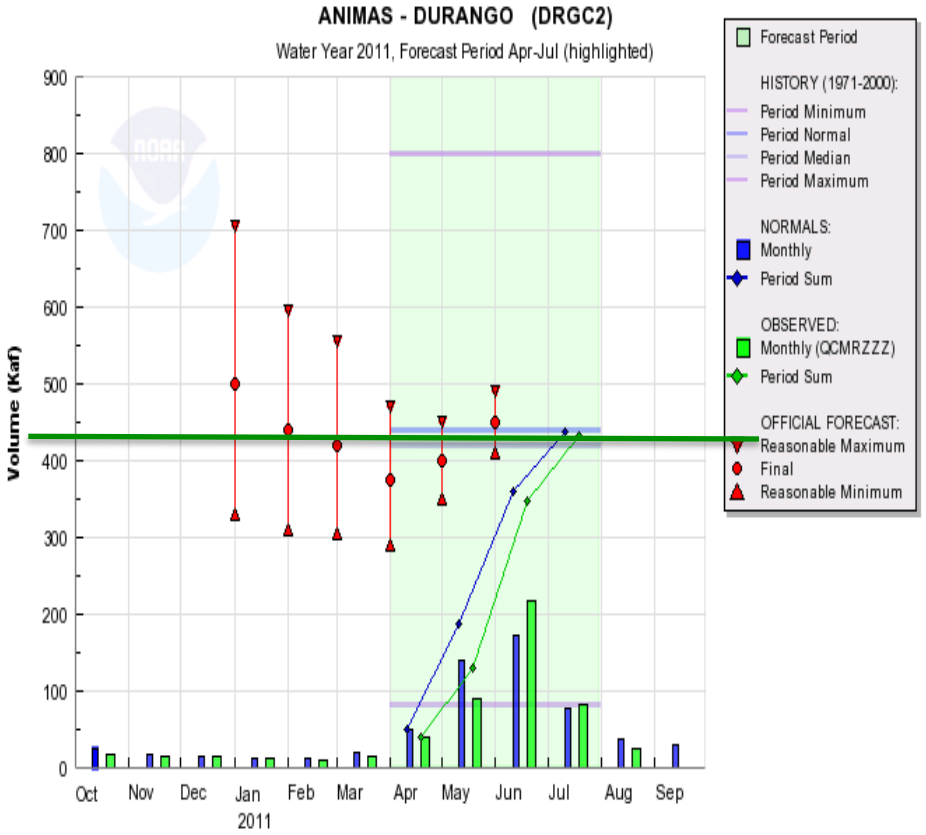


Observed 580 kAF
75% of average

CBRFC/NWS/NOAA 10/04/11 14:22:22 UTC

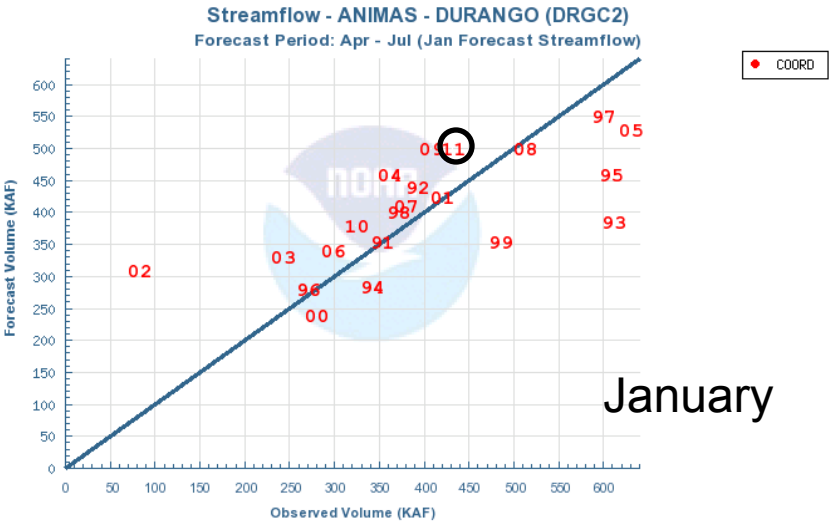


January



Observed 430 kAF
98% of average

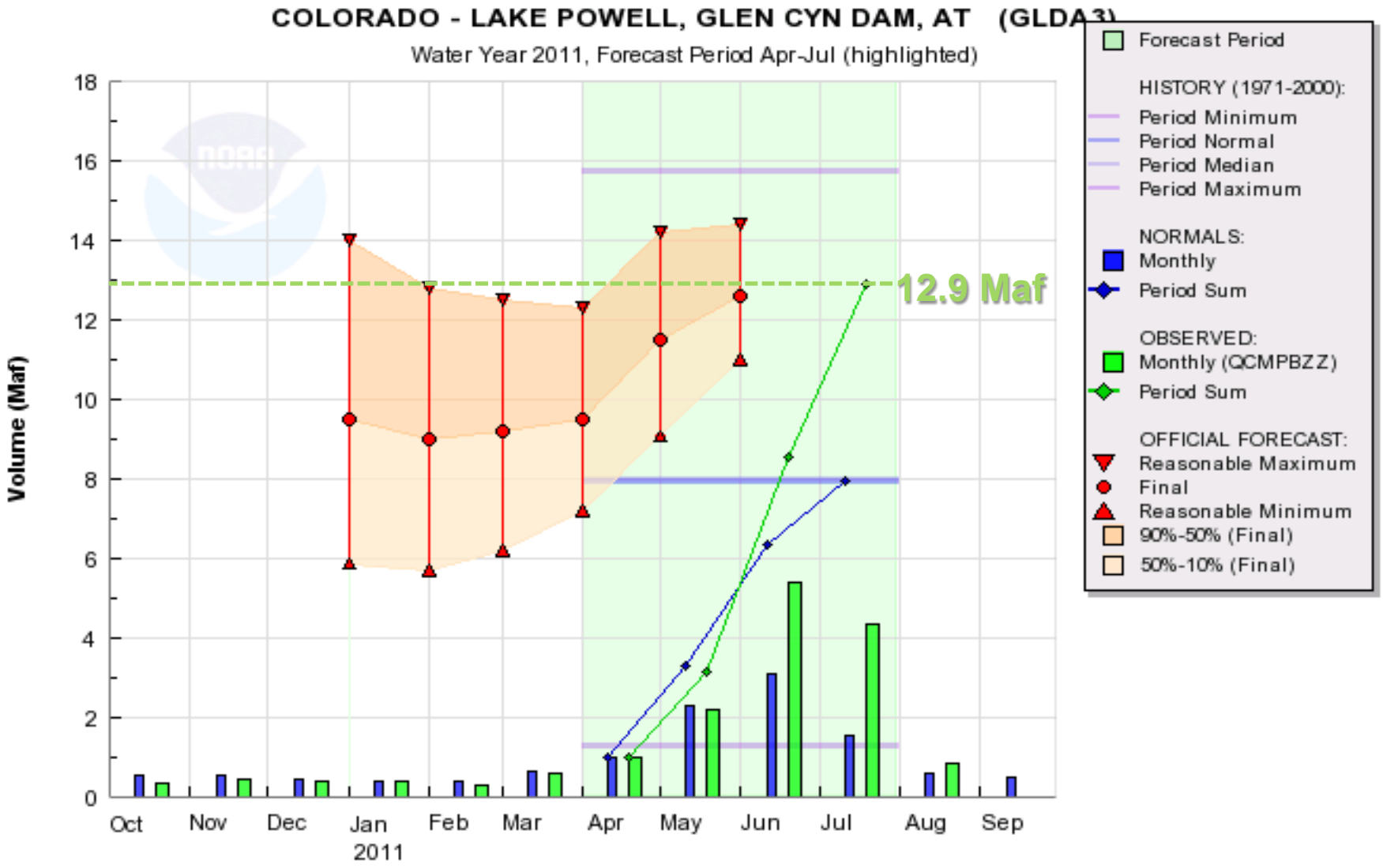
CBRFC/NWS/NOAA 10/04/11 14:27:43 UTC



January

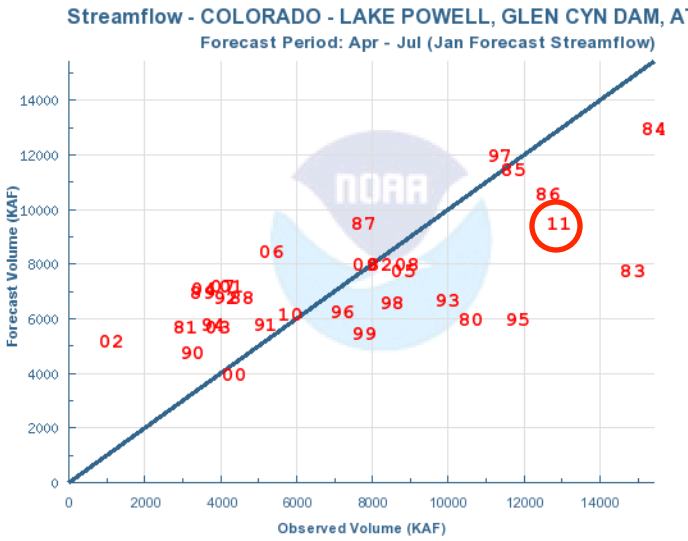
Lake Powell

Water Supply Verification



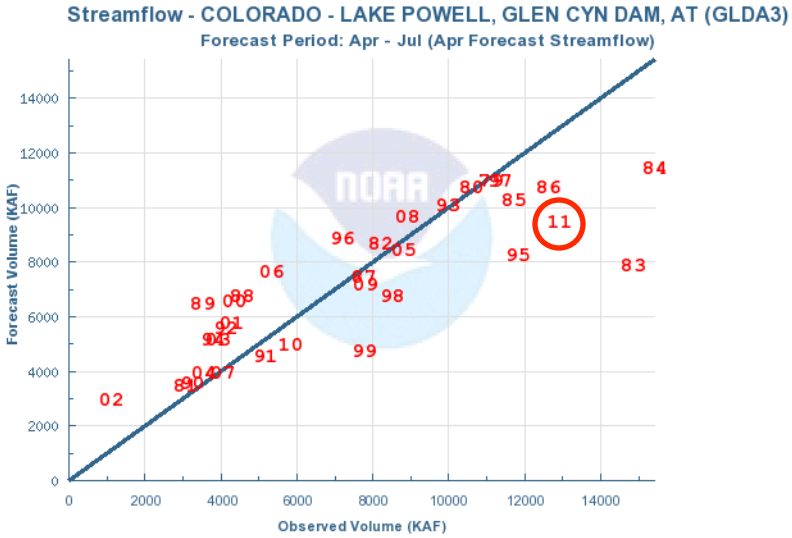
Lake Powell - Forecast Evolution Plot

January Forecasts

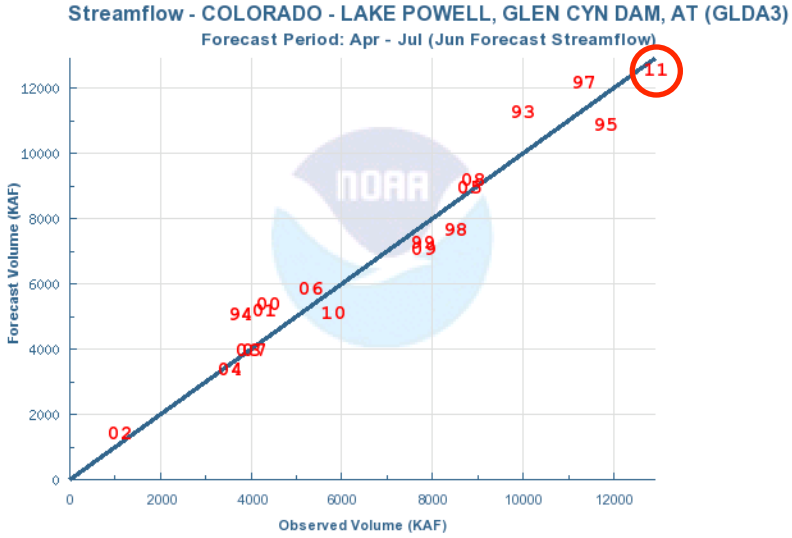


Lake Powell Streamflow Scatterplot

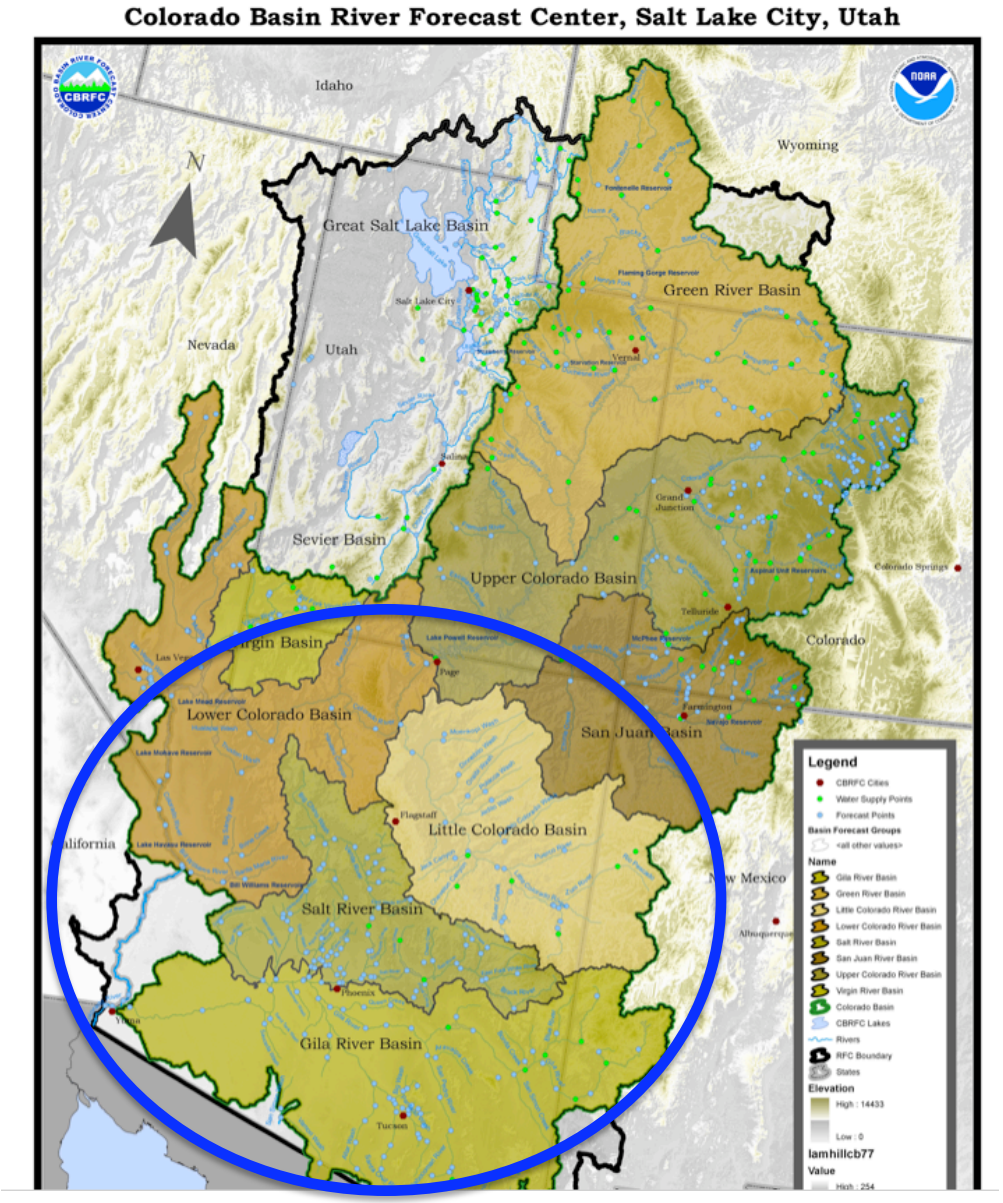
April Forecasts



June Forecasts



Lower Colorado Basin

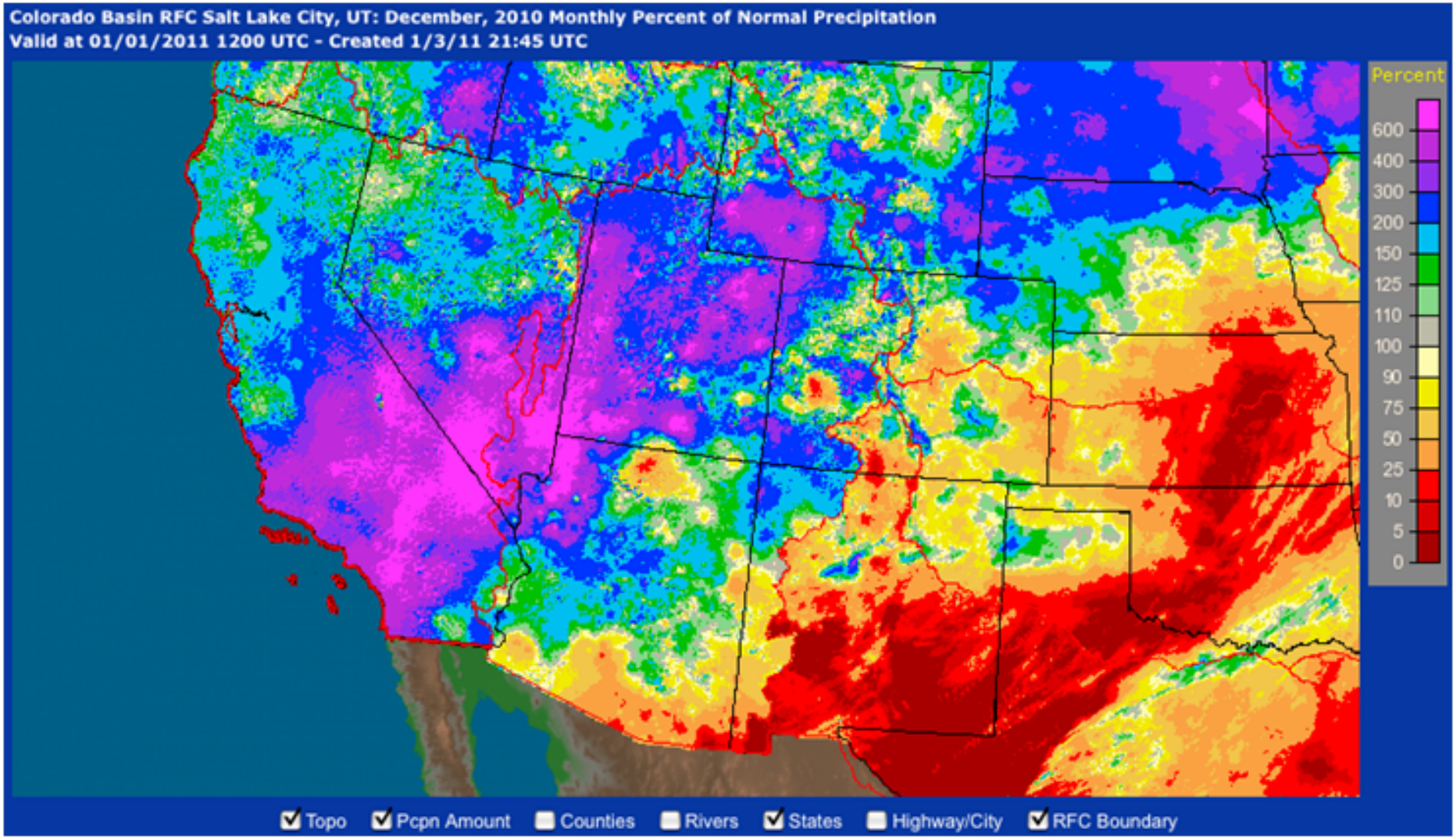


- Much below average except in northwest (e.g. Virgin, Muddy, etc)
- December 2010 storm track was important

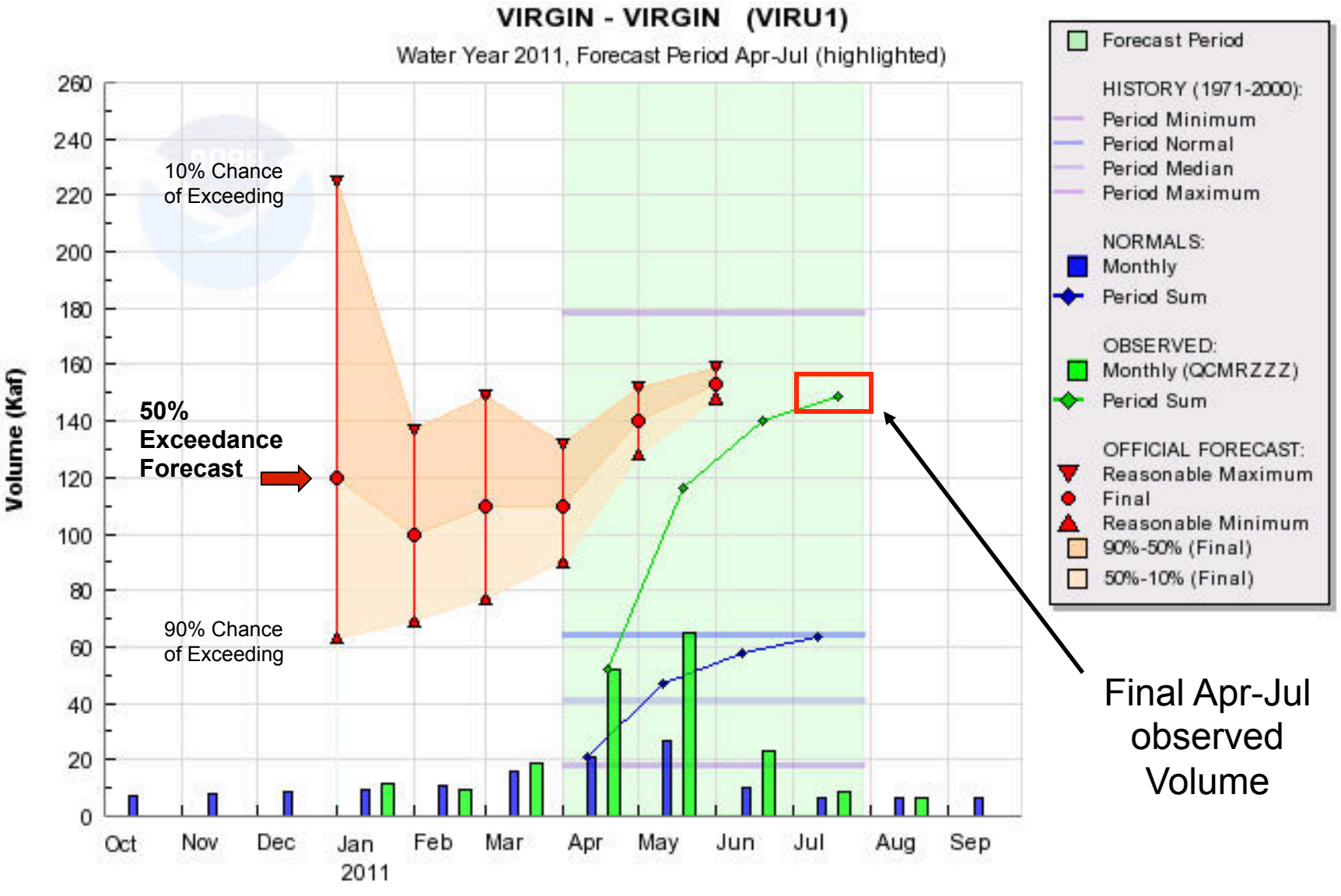


Phoenix dust storm

Precipitation for December 2010



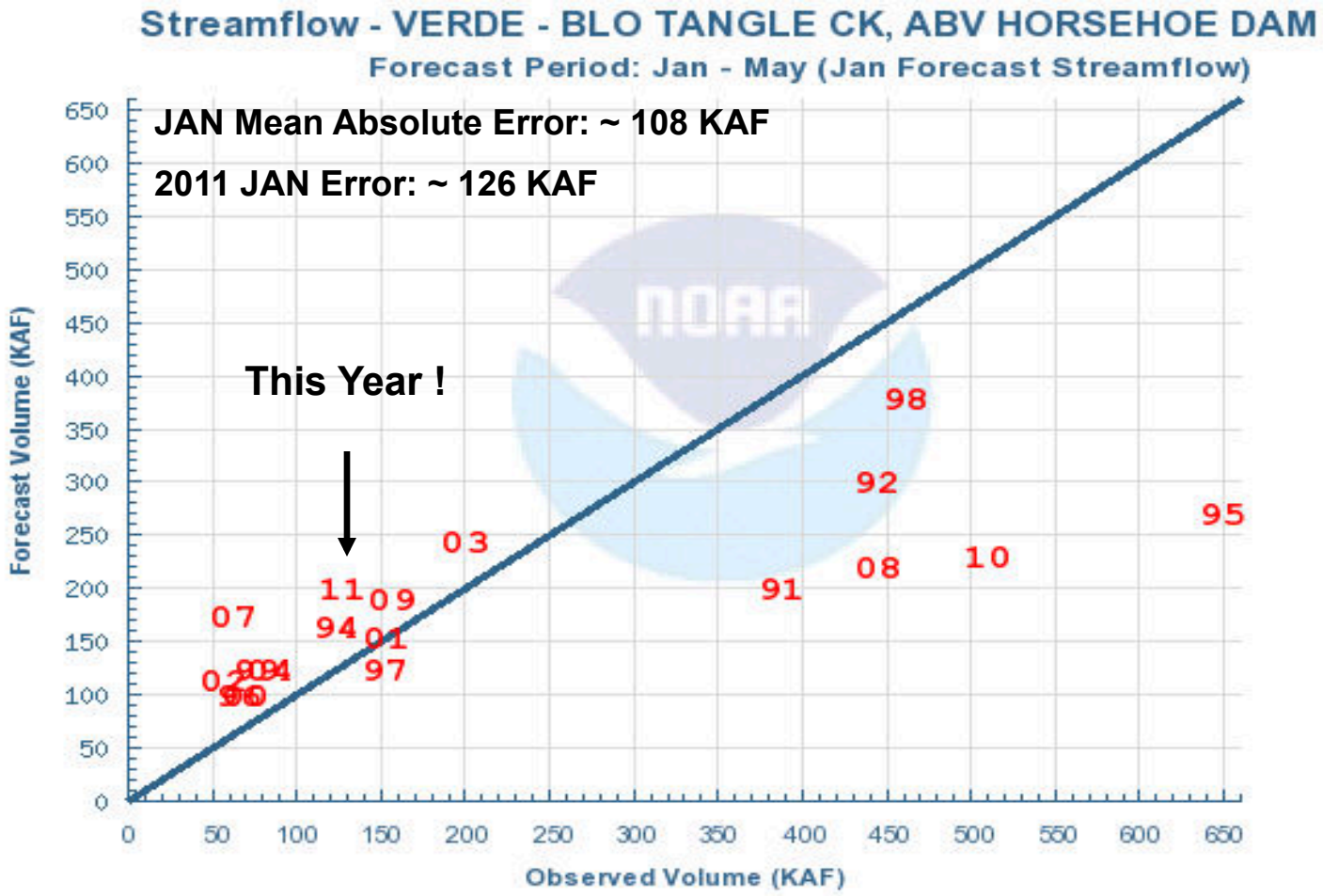
Evolution of the forecast: Virgin River



VERDE RIVER – Forecast Performance the Last ~ 20 Yrs

How did this year Compare ?

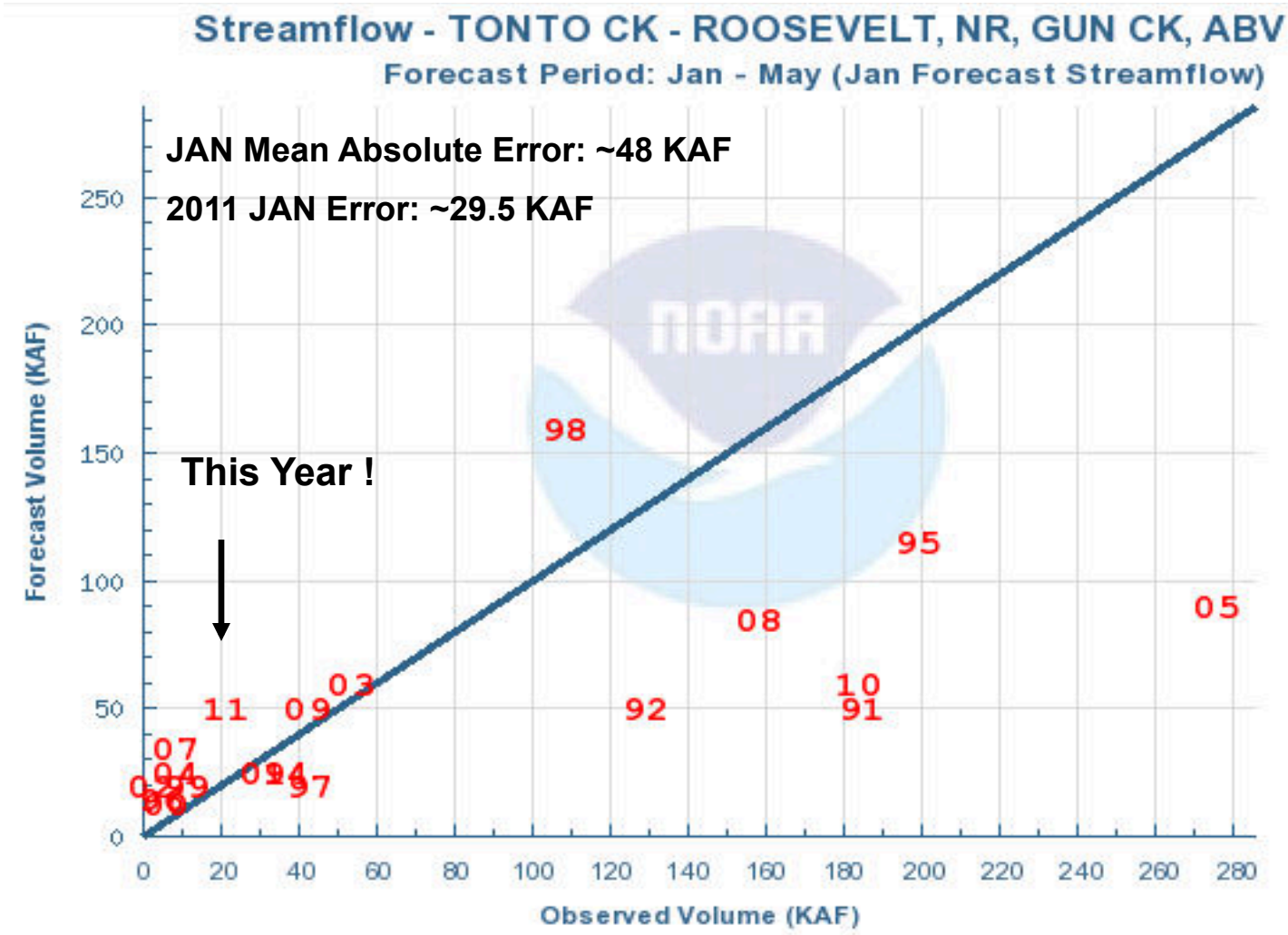
1991-2011: Exclude 1993



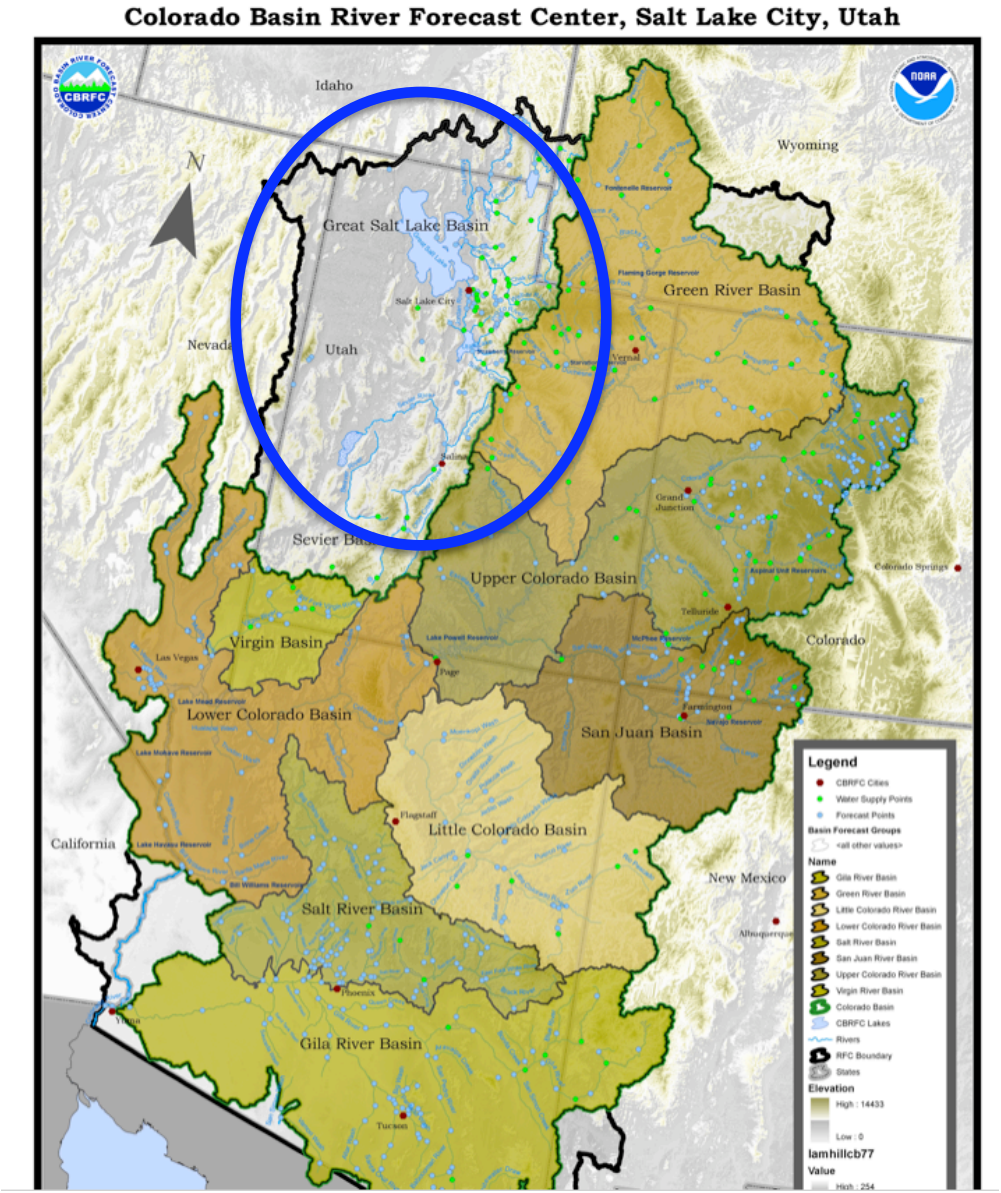
TONTO RIVER – Forecast Performance the Last ~ 20 Yrs

How did this year Compare ?

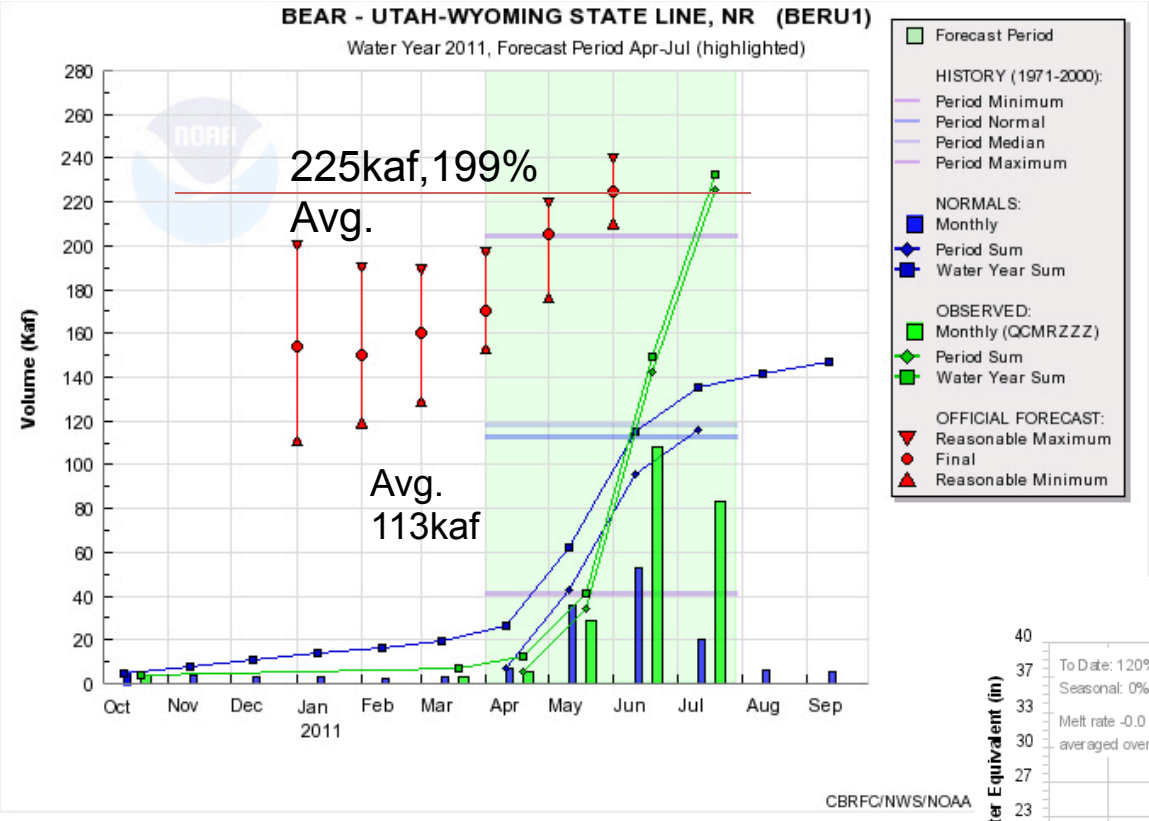
1991-2011: Exclude 1993



Great Basin

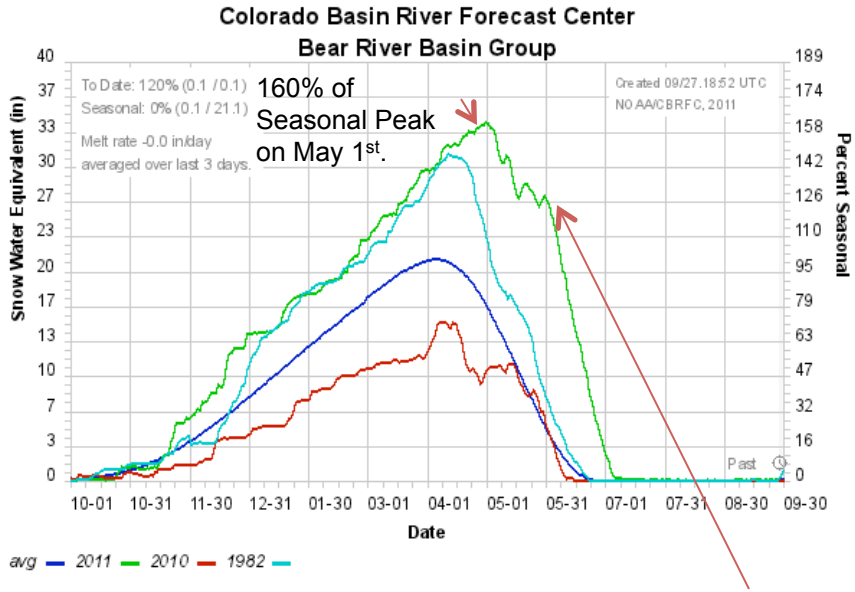


- Extremely wet spring
- Similar to Green River but wetter May than April



New Record April-July Volume. Avg. A-J flow exceeded in June and July. Consistently "under forecast" throughout the period.

No new record for Peak Flows as temperatures were consistently below average until June 30th.



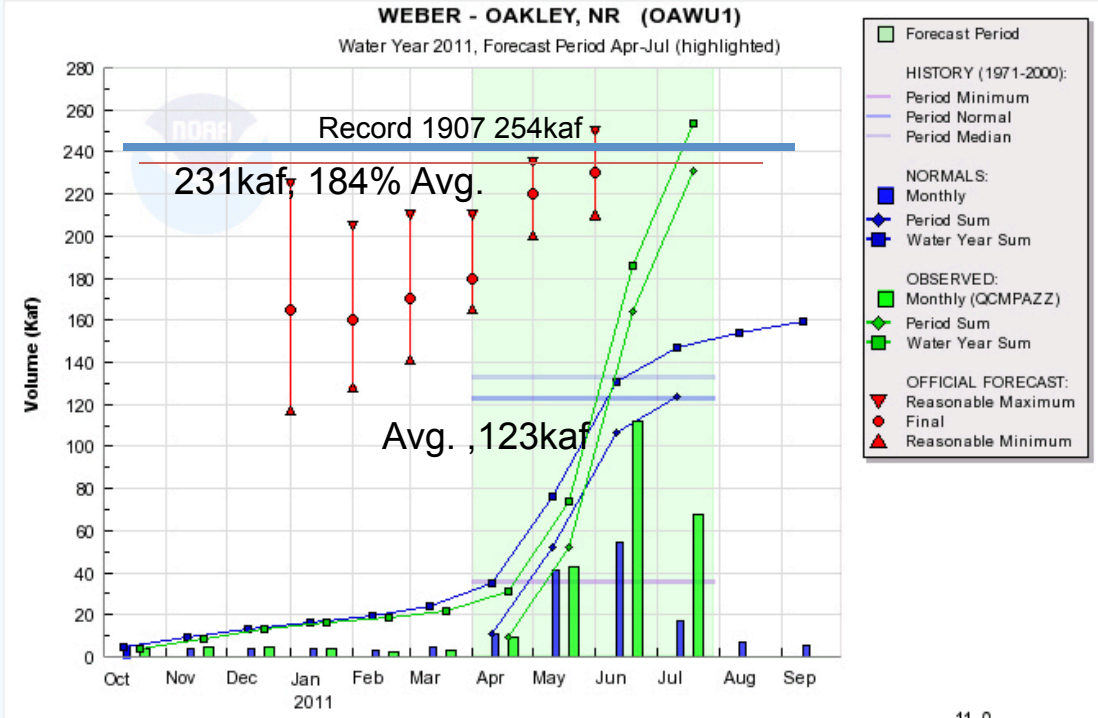
Cool Wet Period April though May with only minor melt from May 1–June 1st.

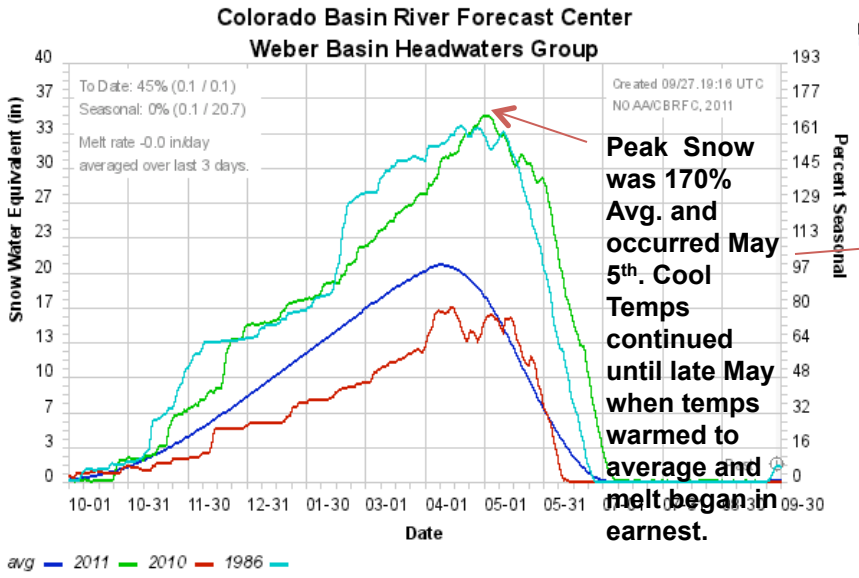
Largest snowpack on record since 1982.

Forecast Evolution Plot

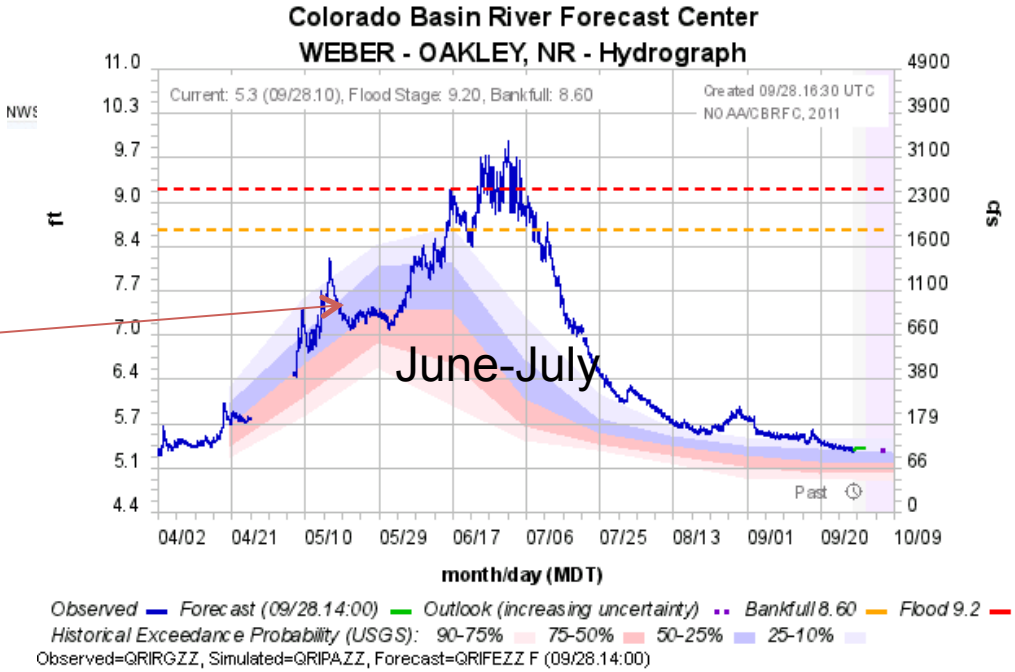
Weber River near Webe

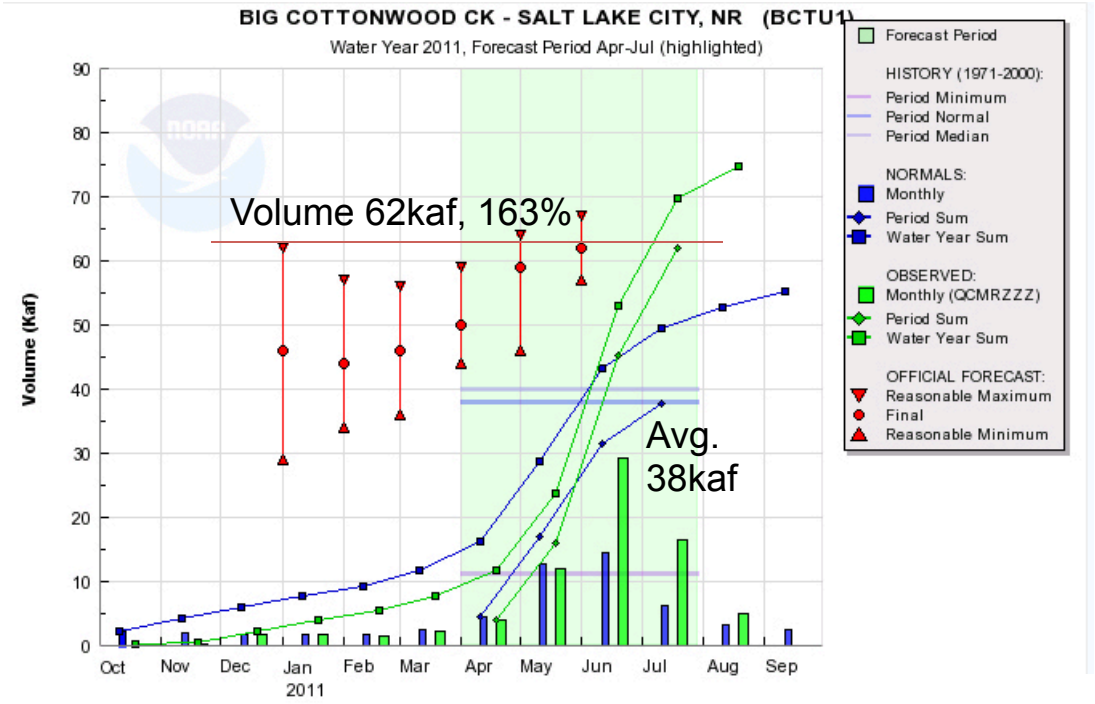
#2 Ranking for 2011 Flow



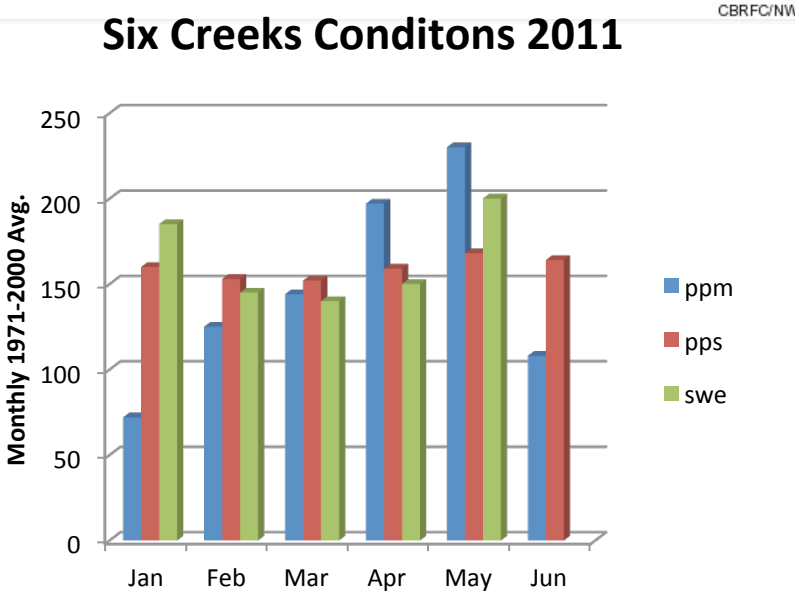


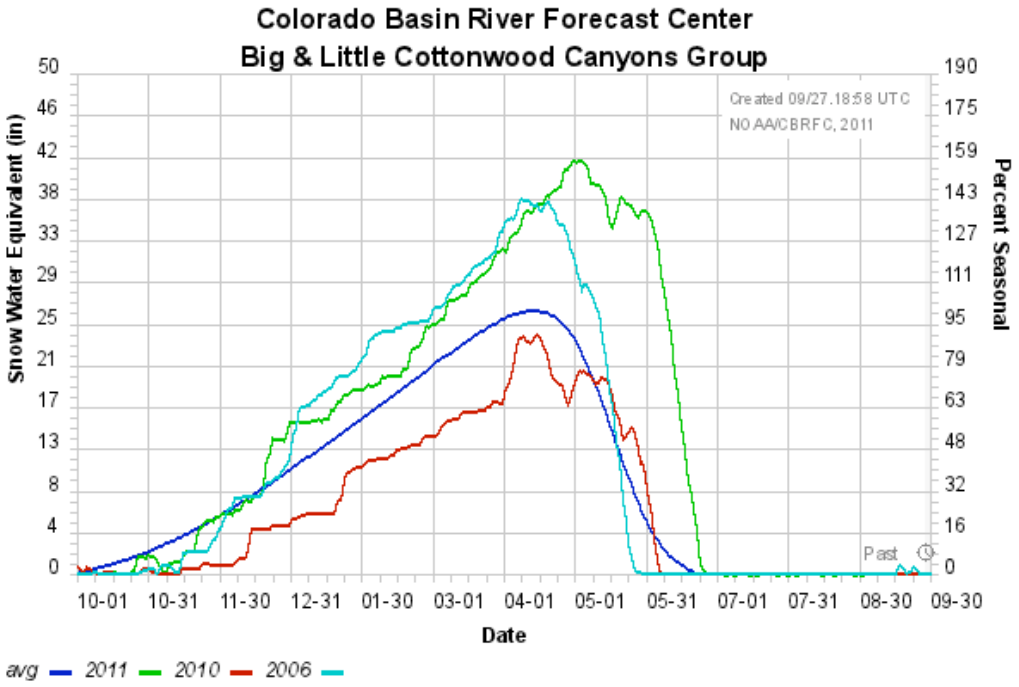
Peak Snow was 170% Avg. and occurred May 5th. Cool Temps continued until late May when temps warmed to average and melt began in earnest.





Brighton SWE Ranked #1 since it's installation in 1987.

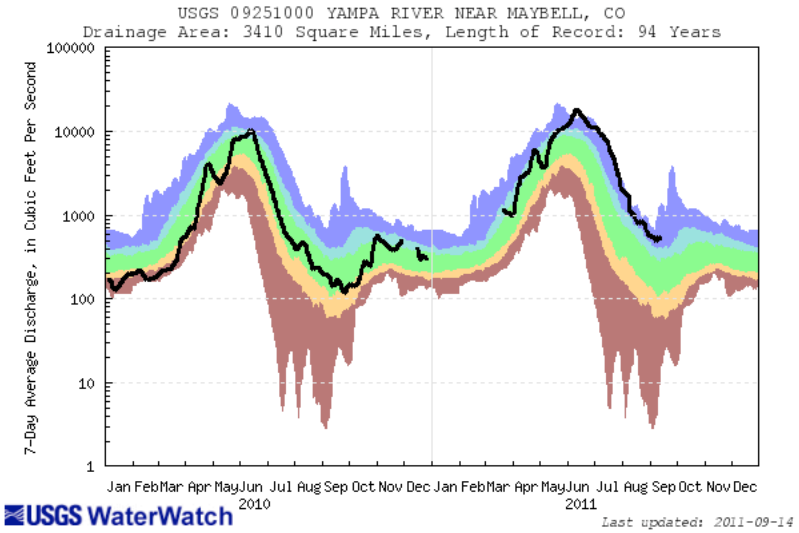


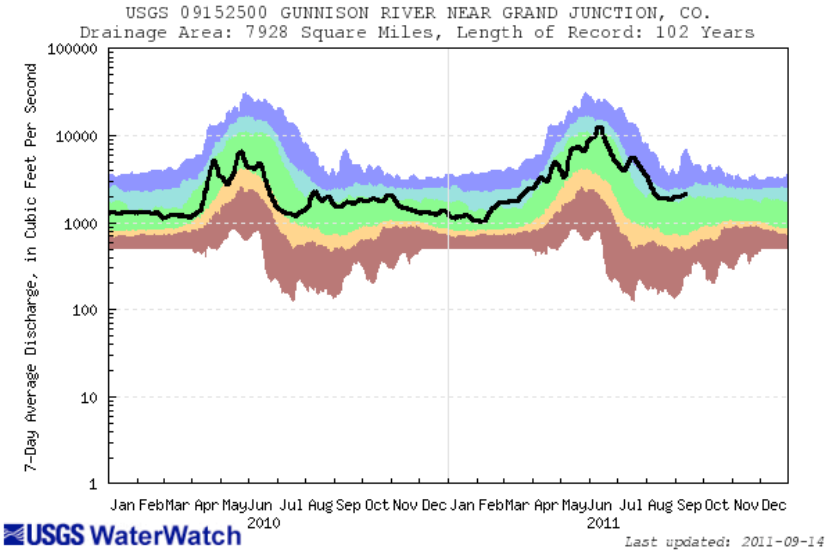


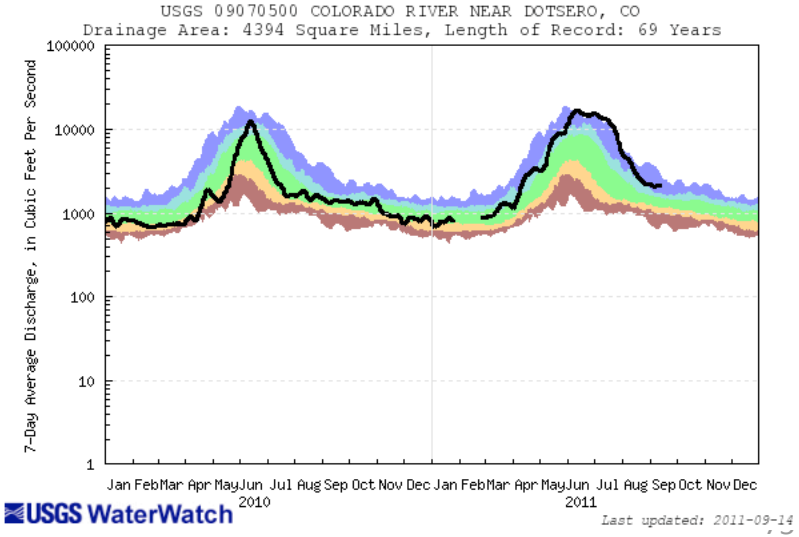
Peak Flow Forecasts

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

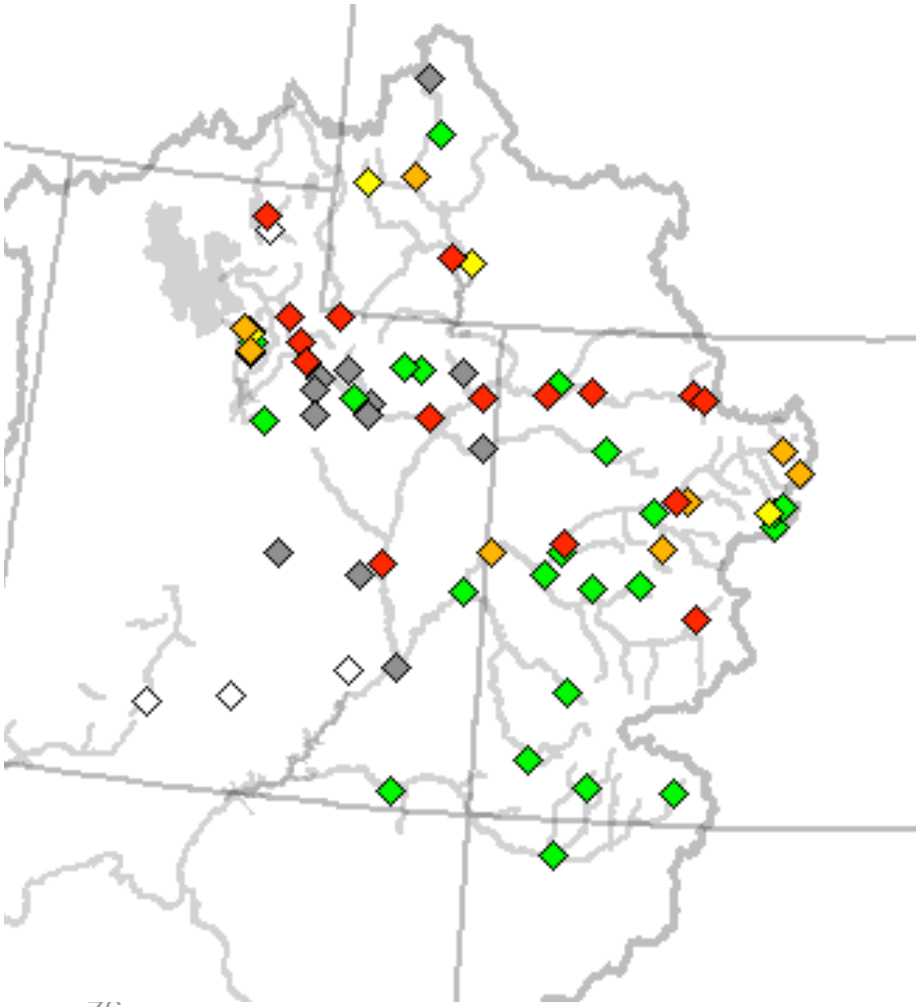




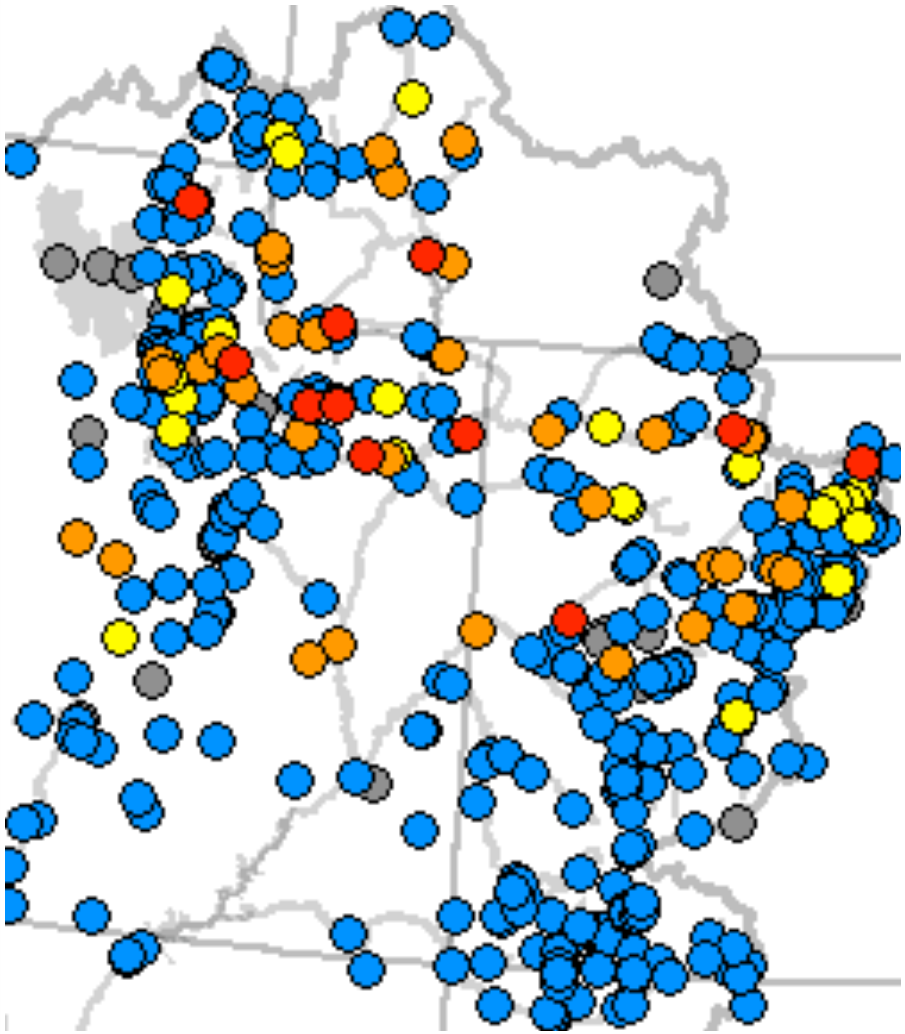


Peak Flow Forecasts

Long Lead Peak Flow Forecasts



Daily Forecasts

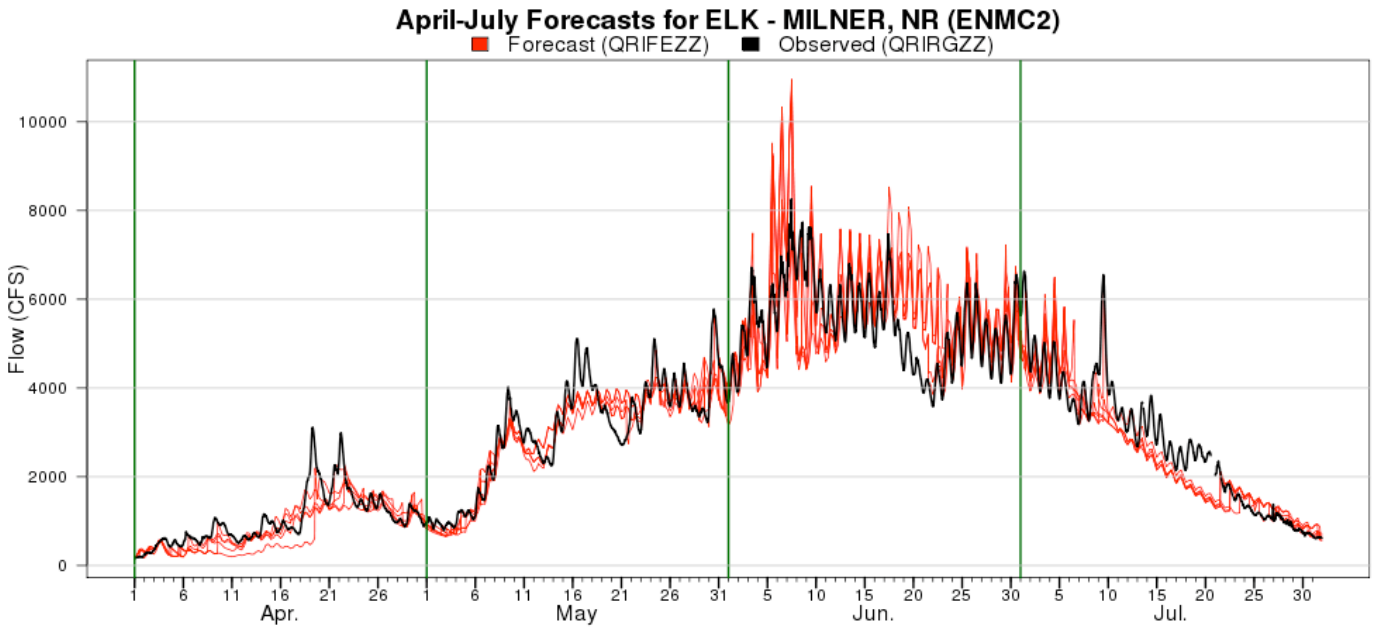


Yampa: Daily Forecasts

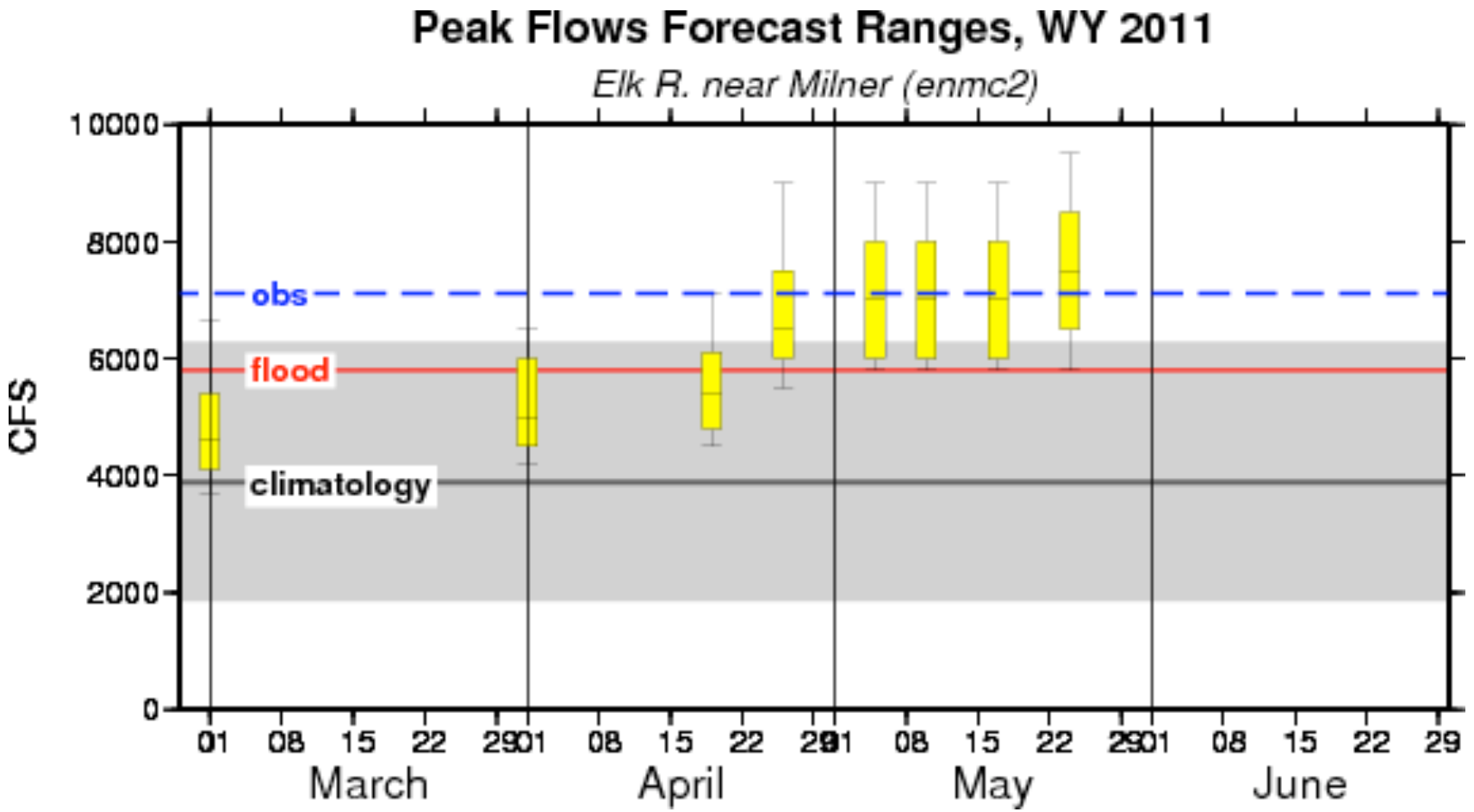
Yampa / White Rivers generally peaked in June

Very high (many records) snowpack

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



Yampa: Long Lead Peak Forecasts

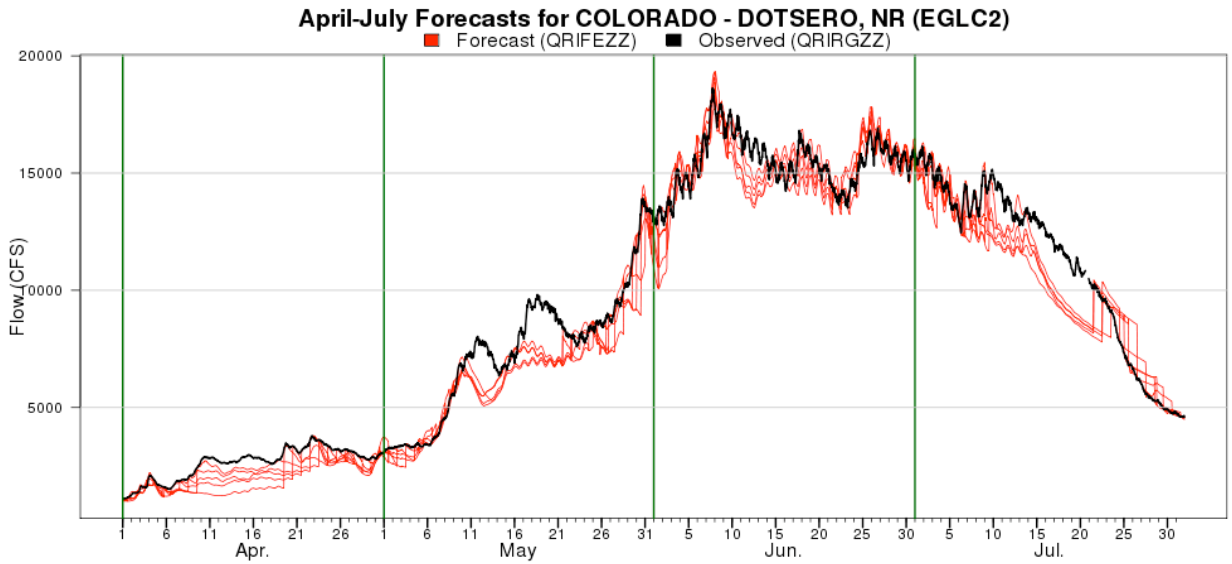


Upper Colorado

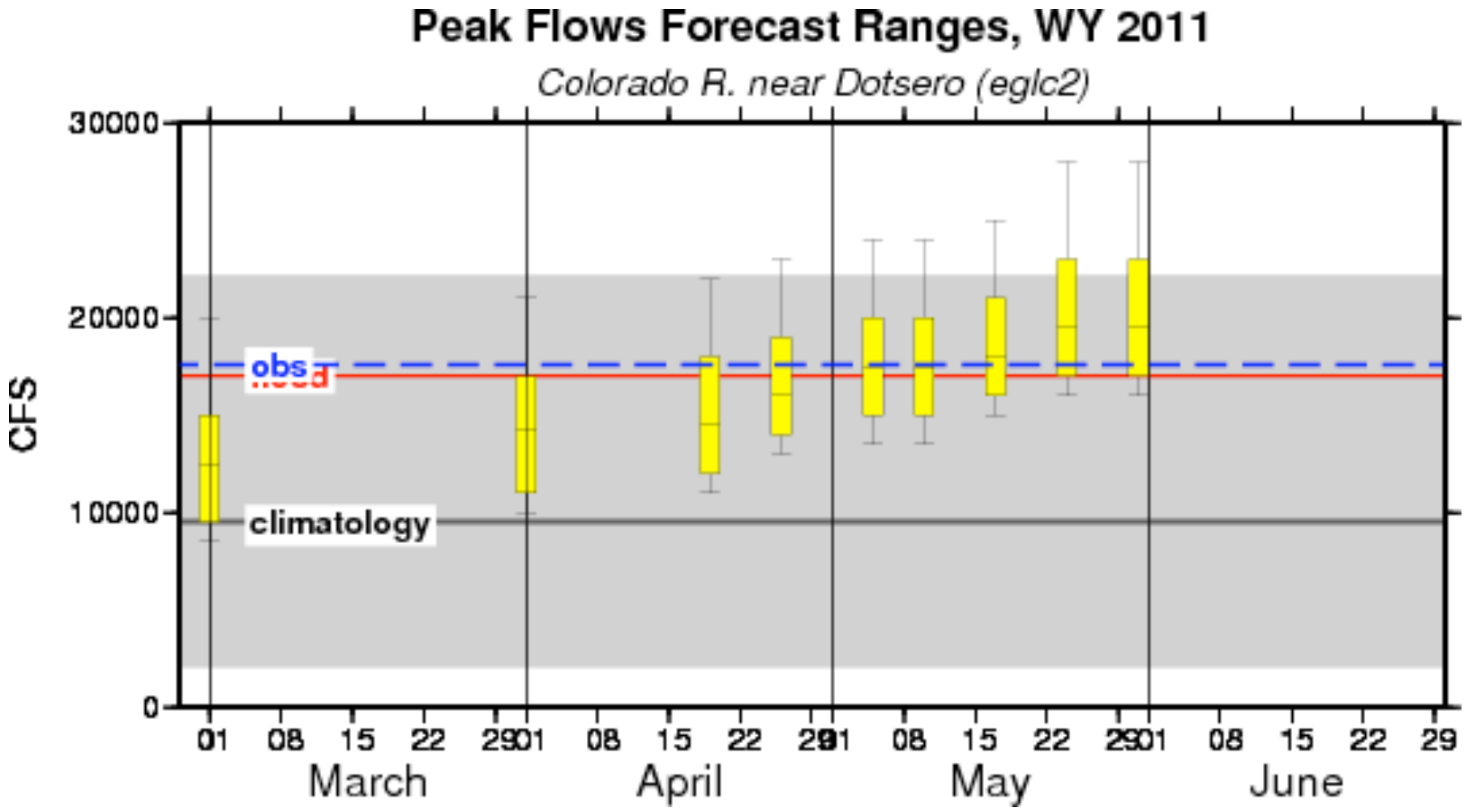
Upper Colorado includes many high elevation basins that peaked late into June or early July

Near record snowpack caused high flows

High flows were mitigated by cool June temperatures



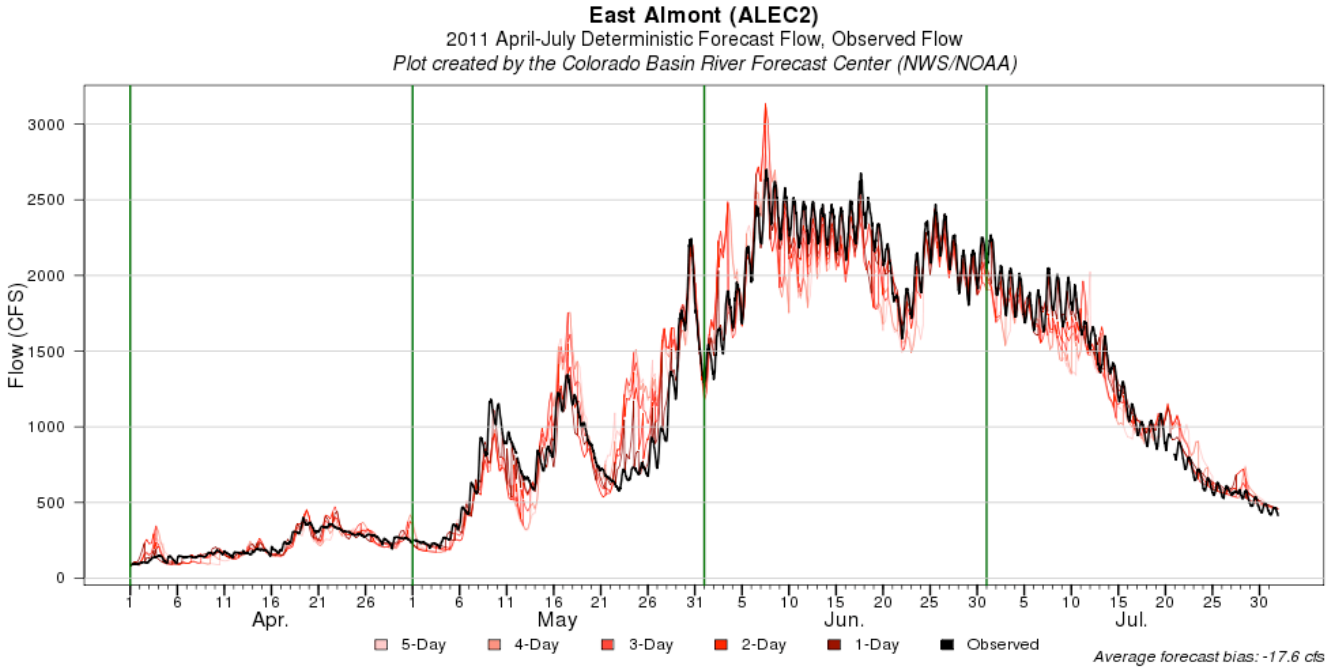
Upper Colorado: Long Lead Peak Forecasts



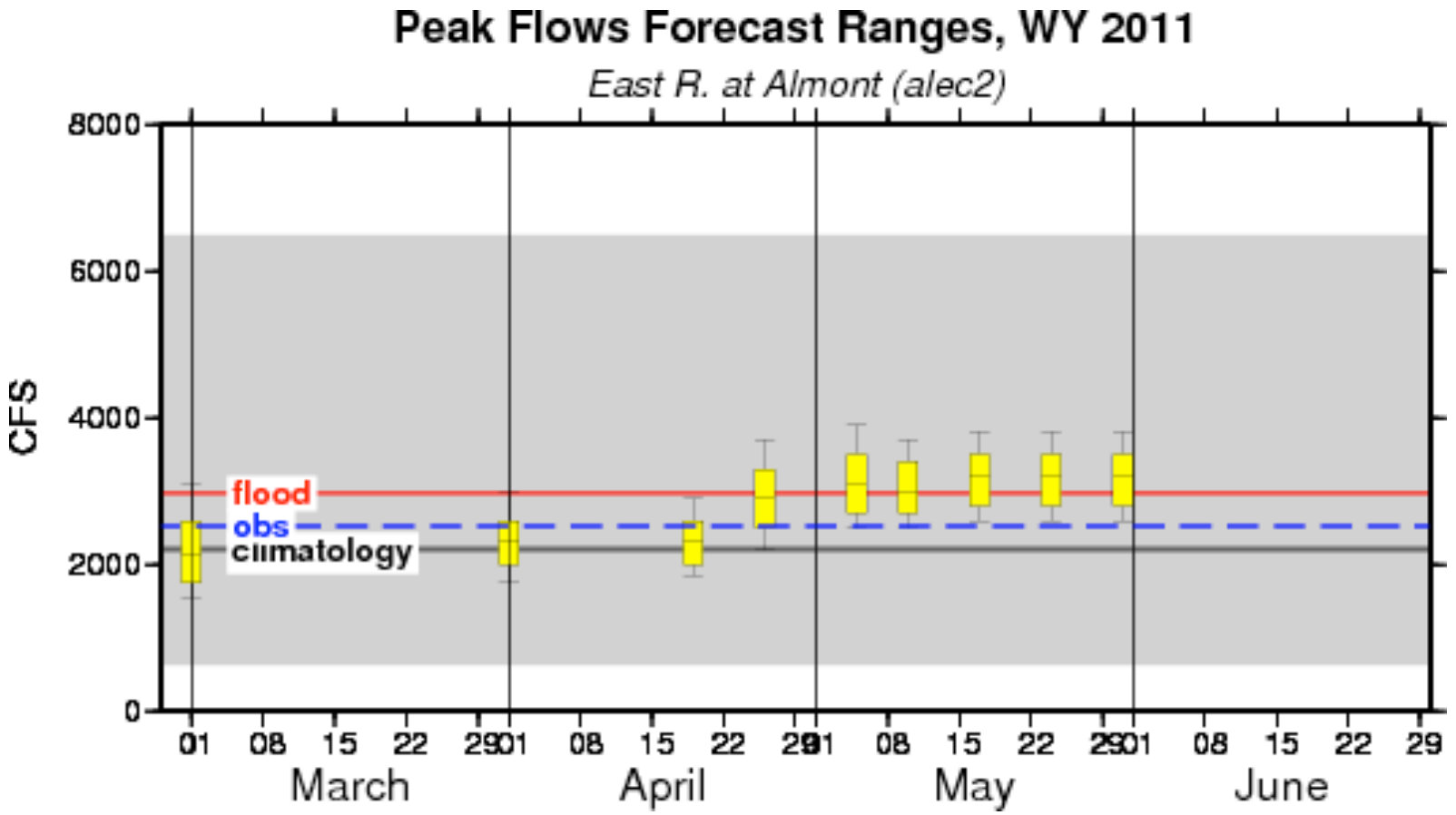
Gunnison

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



2011 Summary

- Extremely wet in the north and dry in the south – dryness in the south was consistent with La Nina
- Volume forecasts generally started too low in the north and too high in the south
- Extremes are difficult to predict but many forecasts this year were for extremes.

- Forecast Issues
  - Struggled with some reservoir release plans in some cases
  - Days 5-10 temperature forecasts in late May / early June were much too high causing streamflow forecasts to be too high

2012 Look Ahead

- Outlook and current situation:
  - Generally good antecedent conditions in the north (not so much in the south)
  - Climate Forecasts and ENSO
- CBRFC updates
  - Weekly ESP
  - Lake Powell Probability of Exceedence
  - Webinars
  - 30 year average change

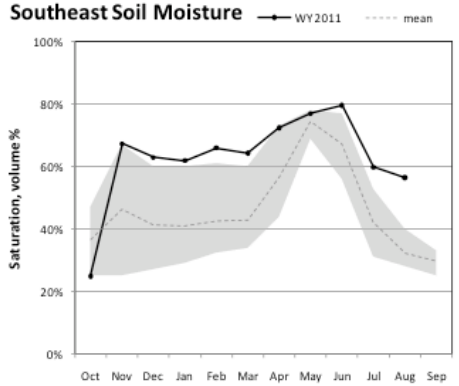
Soil Moisture

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Soil Moisture Conditions by Watershed

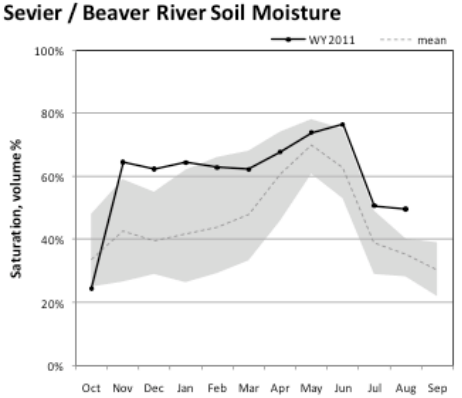
Snowpack Telemetry (SNOTEL)

Southeast Soil Moisture



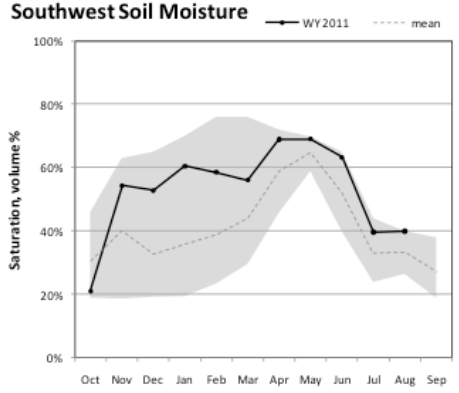
Percent saturation is calculated using the weighted average of volumetric soil moisture content at 2, 8, and 20-inch depths. Saturation is estimated as 40% volumetric water content. The gray area represents the range in saturation values since 2005.

Sevier / Beaver River Soil Moisture



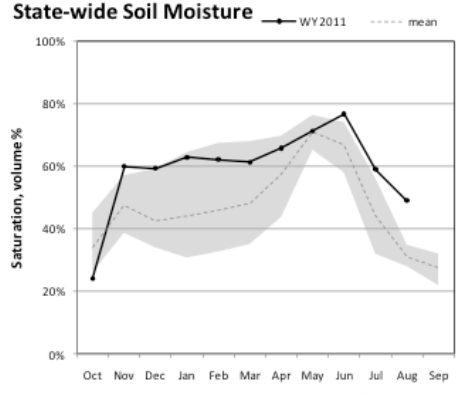
Percent saturation is calculated using the weighted average of volumetric soil moisture content at 2, 8, and 20-inch depths. Saturation is estimated as 40% volumetric water content. The gray area represents the range in saturation values since 2005.

Southwest Soil Moisture



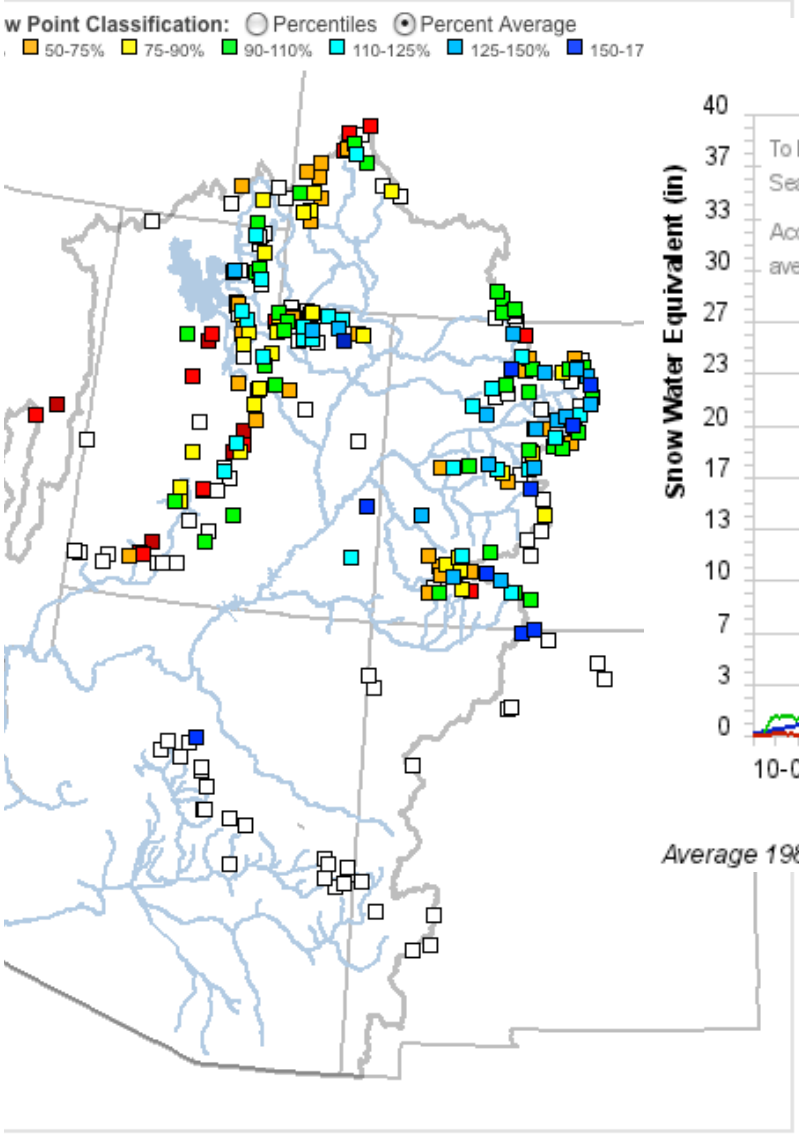
Percent saturation is calculated using the weighted average of volumetric soil moisture content at 2, 8, and 20-inch depths. Saturation is estimated as 40% volumetric water content. The gray area represents the range in saturation values since 2005.

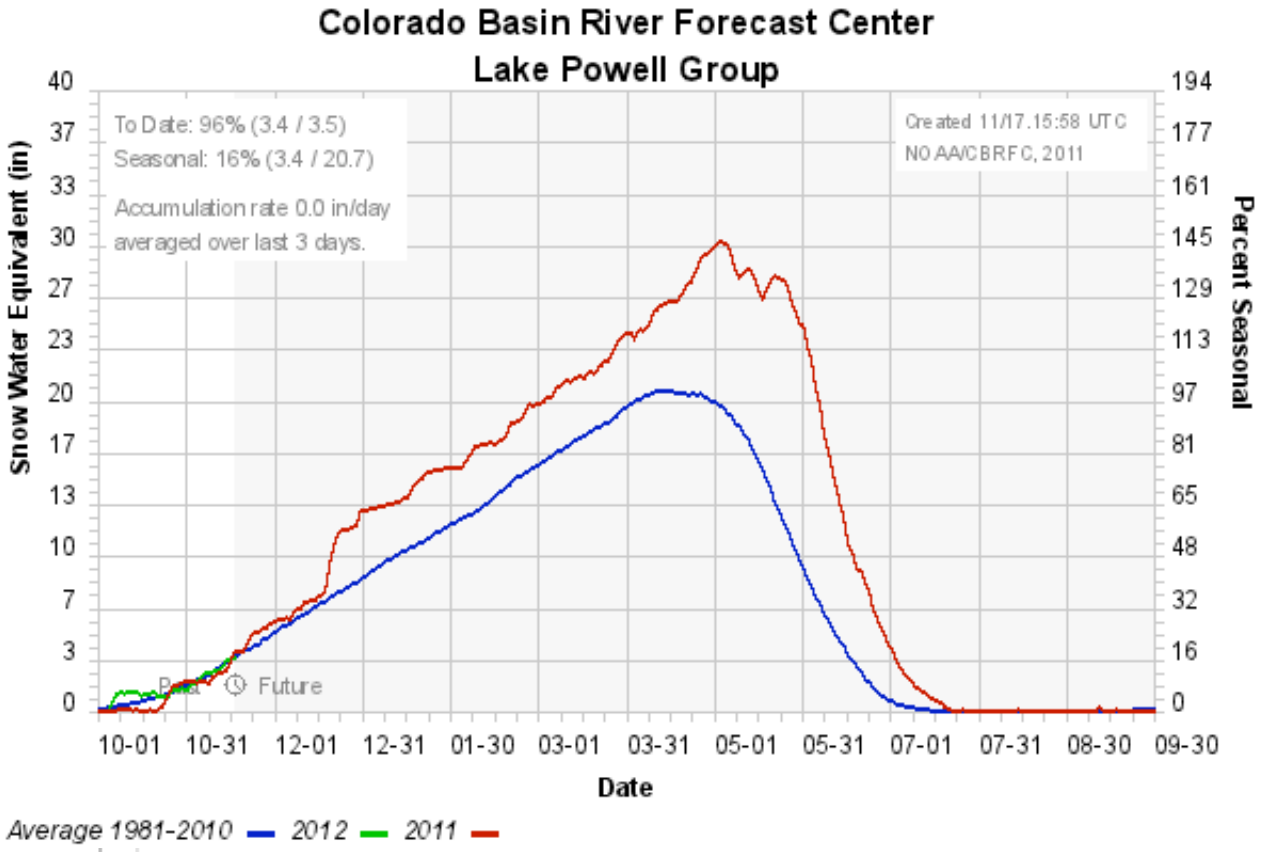
State-wide Soil Moisture

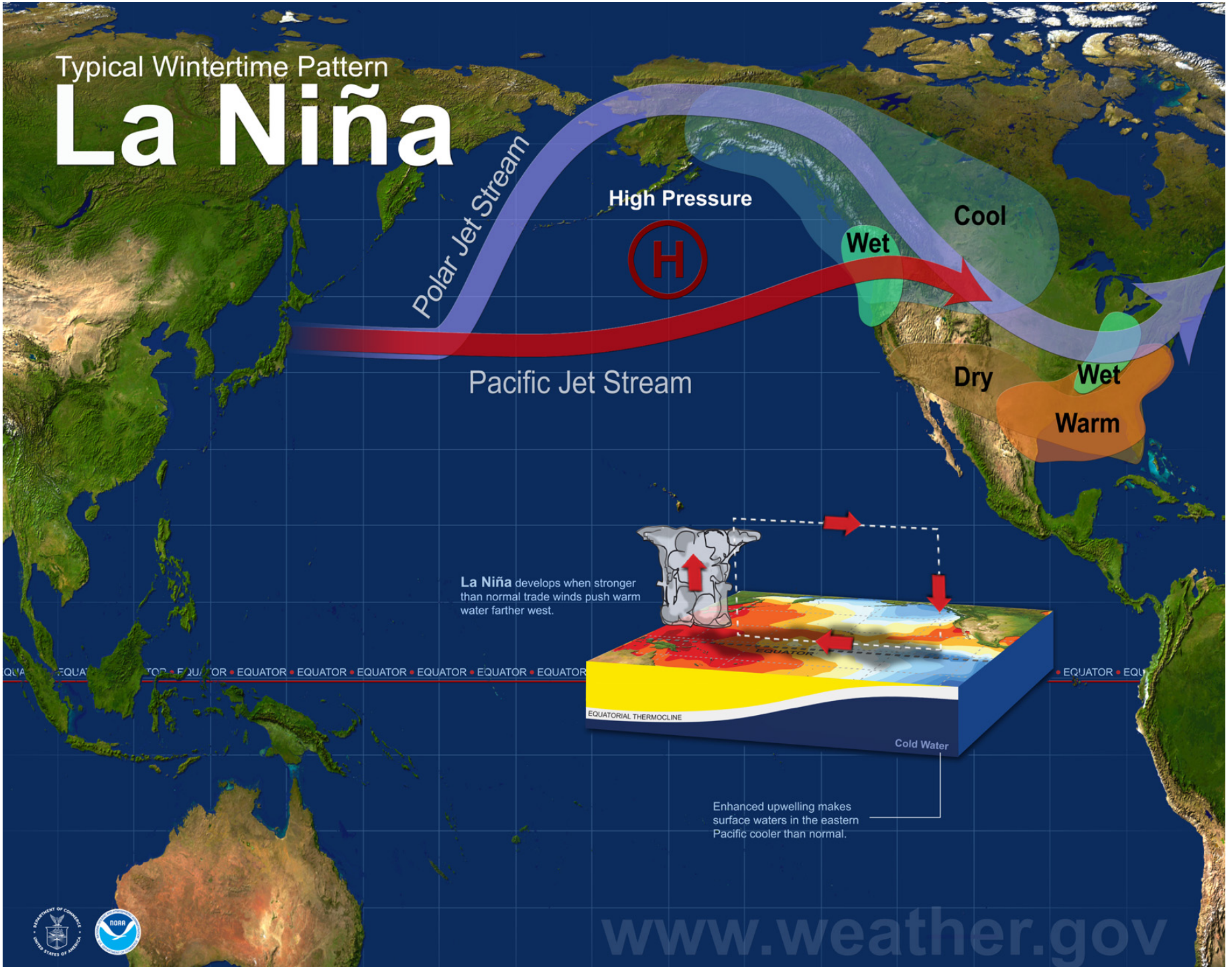


Percent saturation is calculated using the weighted average of volumetric soil moisture content at 2, 8, and 20-inch depths. Saturation is estimated as 40% volumetric water content. The gray area represents the range in saturation values since 2005.

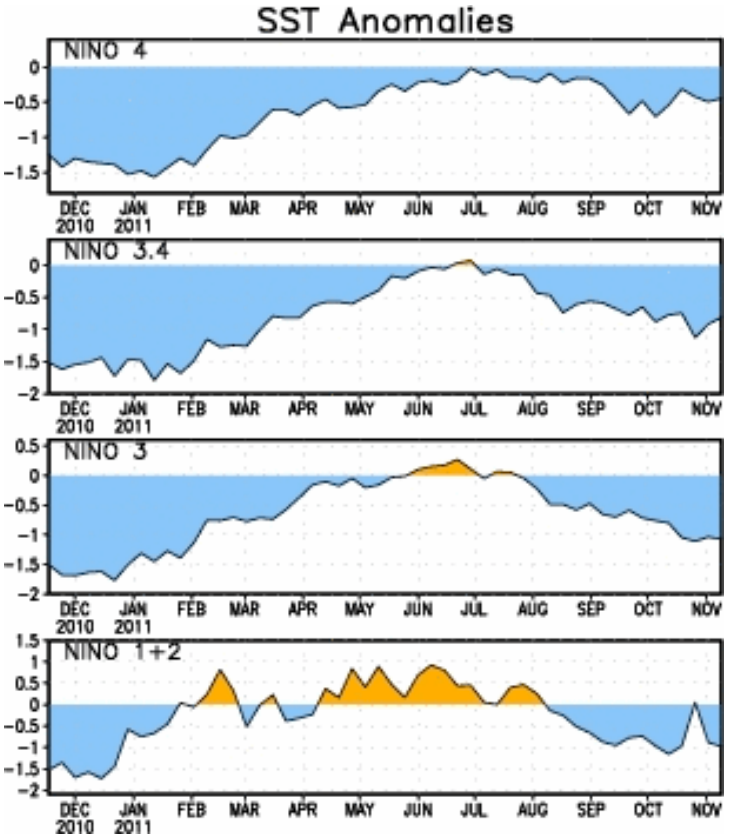
Over Point For Details, Click Point For Plot

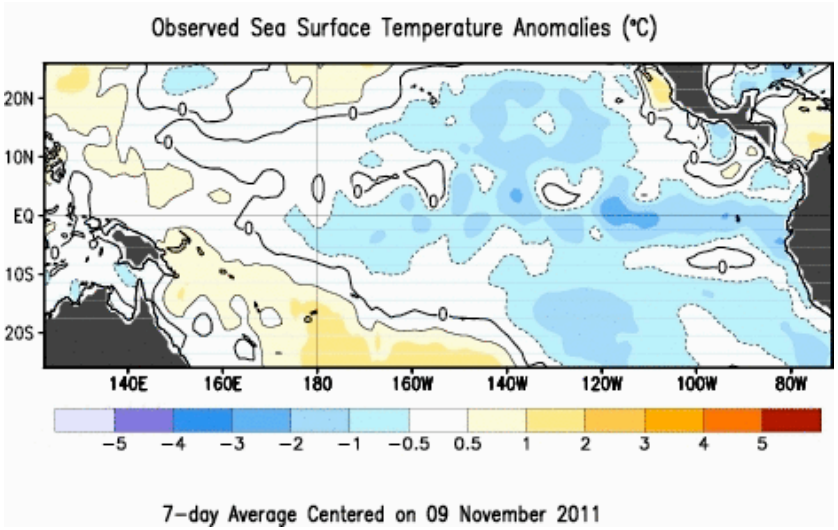


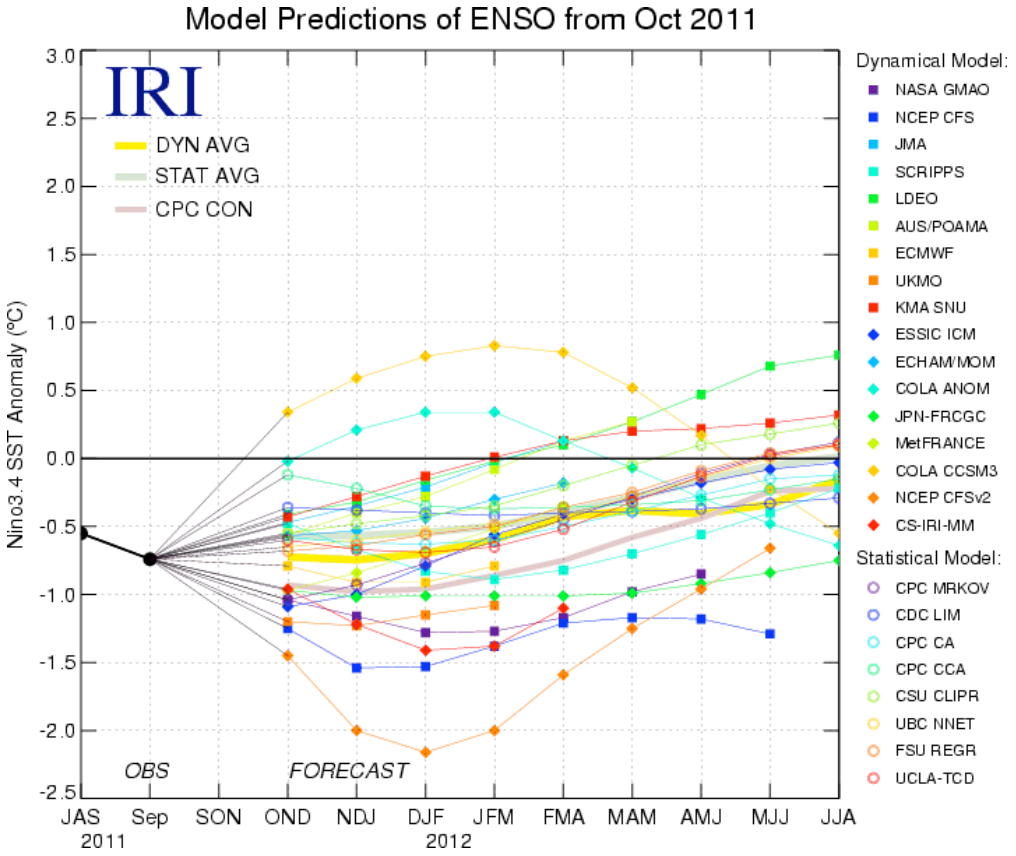



Typical Wintertime Pattern
La Niña
Polar Jet Stream
High Pressure
H
Cool
Wet
Pacific Jet Stream
Dry
Wet
Warm
La Niña develops when stronger than normal trade winds push warm water farther west.
EQUATOR
EQUATORIAL THERMOCLINE
Cold Water
Enhanced upwelling makes surface waters in the eastern Pacific cooler than normal.
www.weather.gov

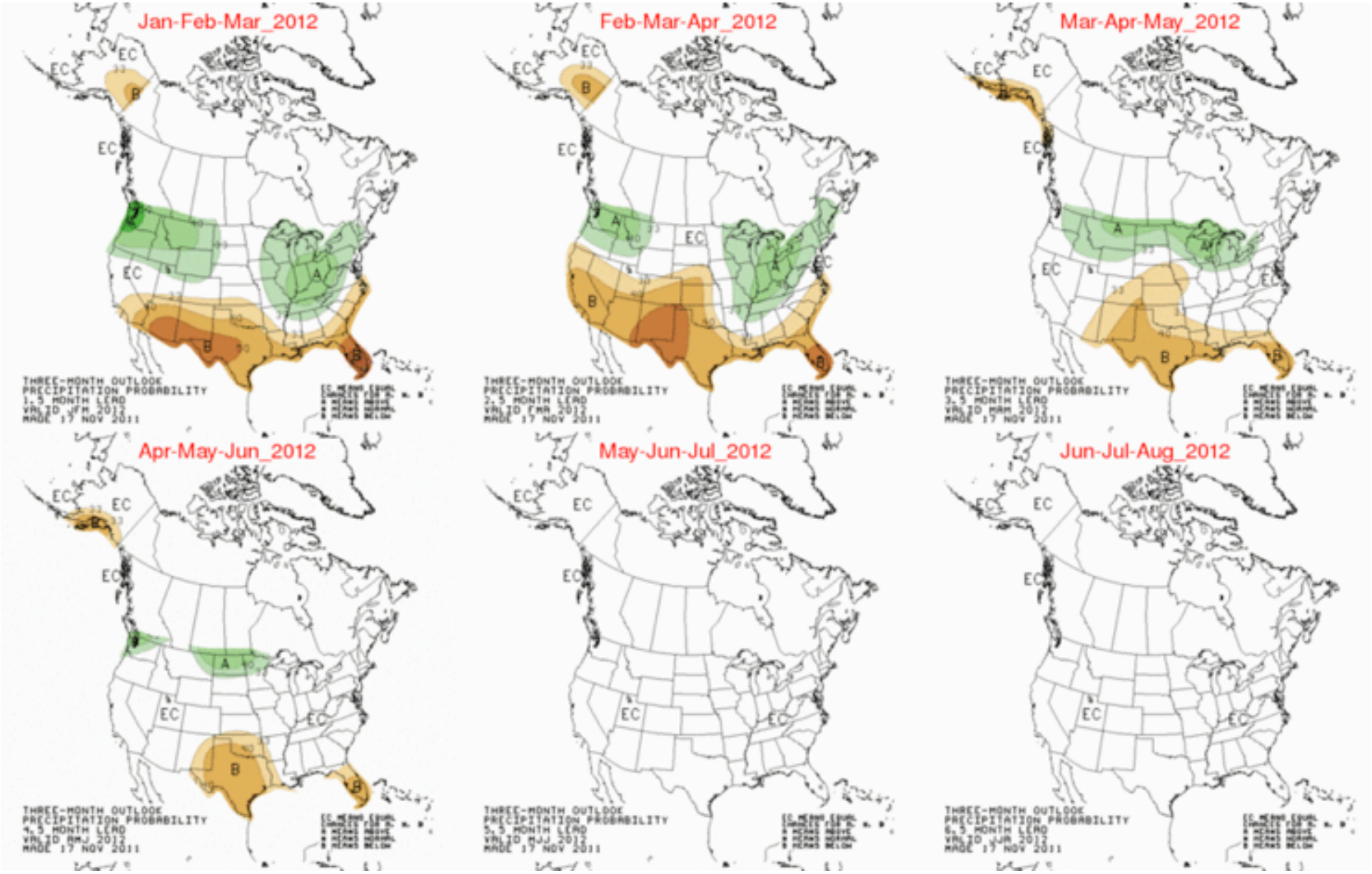
La Nina





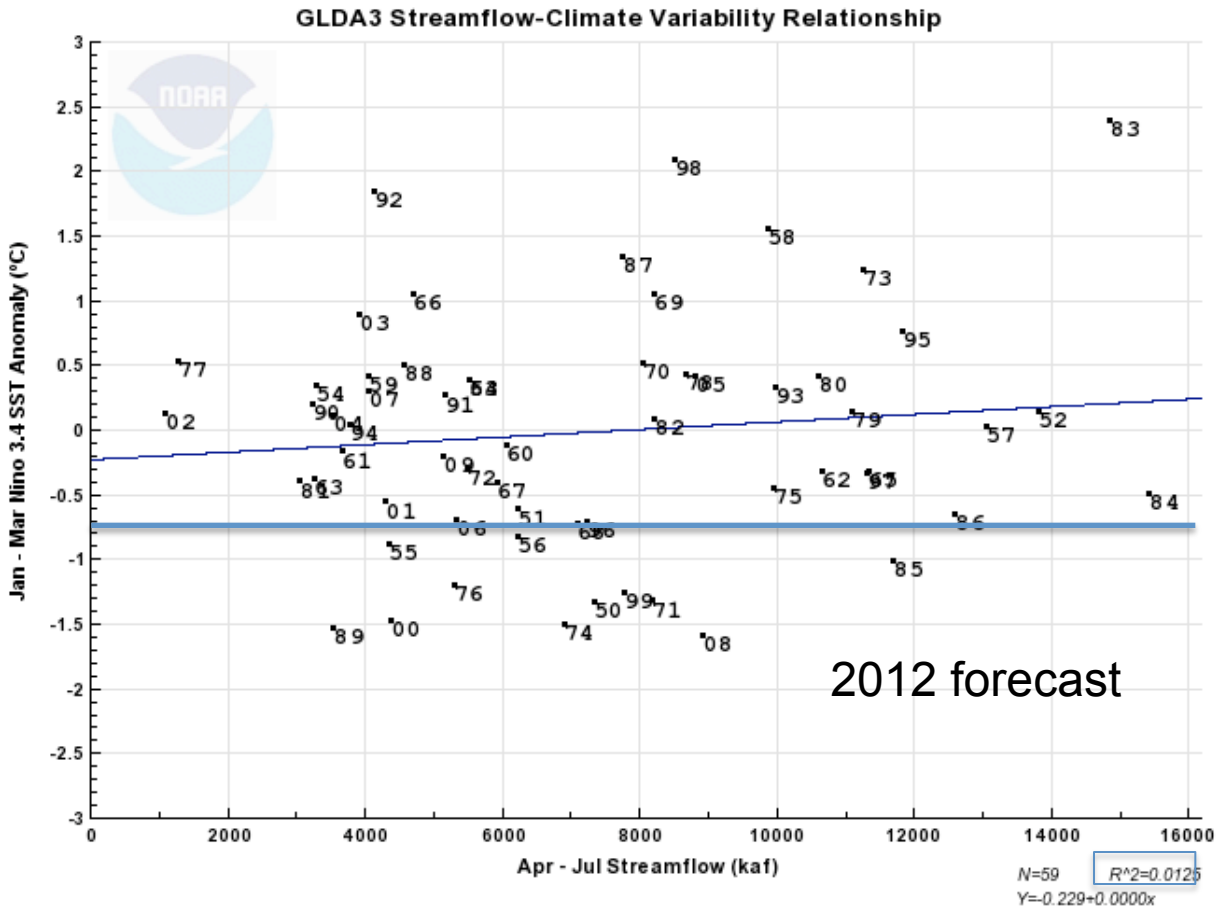


Sources: cpc.ncep.noaa.gov and iri.columbia.edu/climate/ENSO


Jan-Feb-Mar_2012
Feb-Mar-Apr_2012
Mar-Apr-May_2012
Apr-May-Jun_2012
May-Jun-Jul_2012
Jun-Jul-Aug_2012
EC
A
B
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
1.5 MONTH LEAD
VALID JFM 2012
MADE 17 NOV 2011
2.5 MONTH LEAD
VALID FMA 2012
MADE 17 NOV 2011
3.5 MONTH LEAD
VALID MAM 2012
MADE 17 NOV 2011
4.5 MONTH LEAD
VALID AMJ 2012
MADE 17 NOV 2011
5.5 MONTH LEAD
VALID MJJ 2012
MADE 17 NOV 2011
6.5 MONTH LEAD
VALID JJA 2012
MADE 17 NOV 2011

La Nina and Streamflow

- Very low correlations in most of upper basin (right: Lake Powell)
- La Nina correlated with low streamflow in lower basin at around 0.2 – 0.3
- Weaker correlations for San Juan Basin with low streamflow and Upper Green with high streamflow



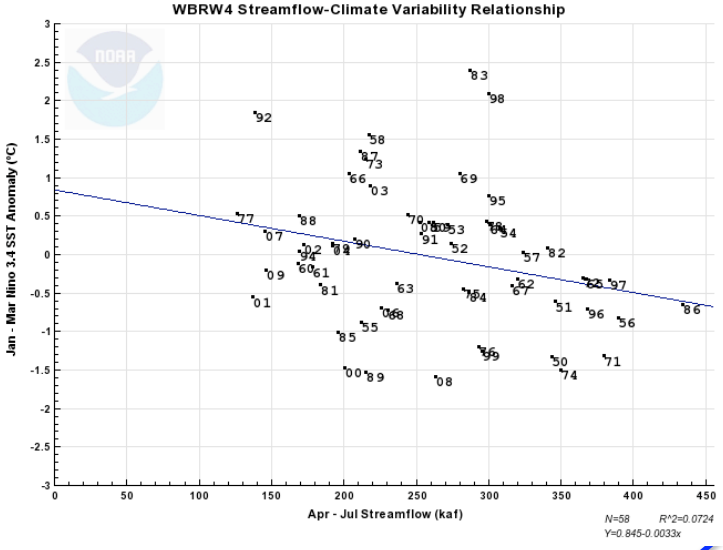
Lowest ONI Values during
Historical La Nina Events

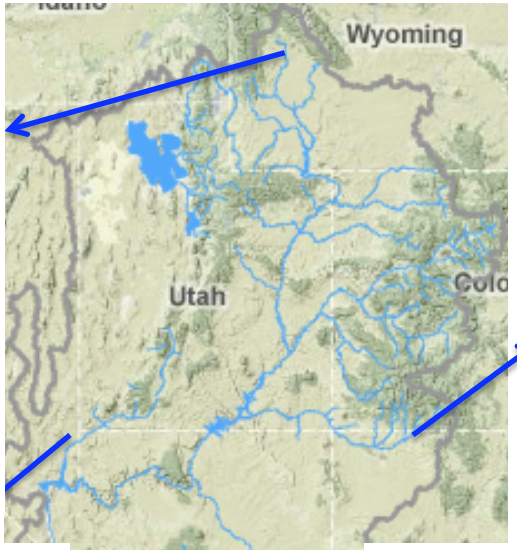
ASO 1949 – FMA 1951	-1.7
MAM 1954 – DJF 1956/57	-2.1
ASO 1962 – DJF 1962/63	-0.8
MAM 1964 – DJF 1964/65	-1.1
NDJ 1967/68 – MAM 1968	-0.9
JJA 1970 – DJF 1971/72	-1.3
AMJ 1973 – MAM 1976	-2.0
SON 1984 – ASO 1985	-1.0
AMJ 1988 – AMJ 1989	-1.9
ASO 1995 – FMA 1996	-0.7
JJA 1998 – MJJ 2000	-1.6
SON 2000 – JFM 2001	-0.7
ASO 2007 – AMJ 2008	- 1.4
2010-2011	-1.4

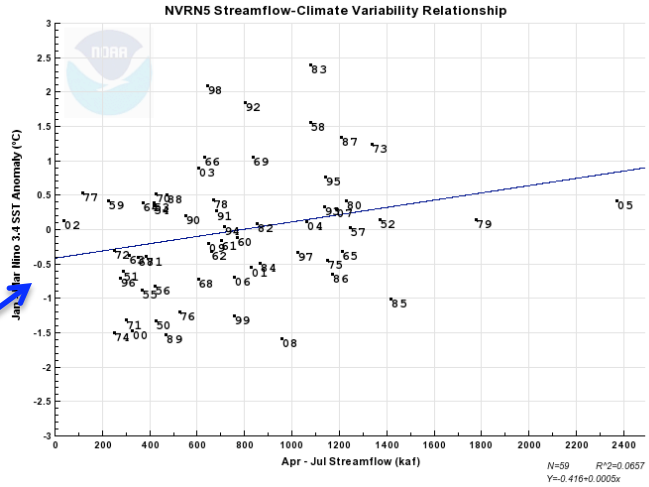
Historical Observed Apr-Jul Volumes (kaf)
1970-2010 (winter ENSO status)

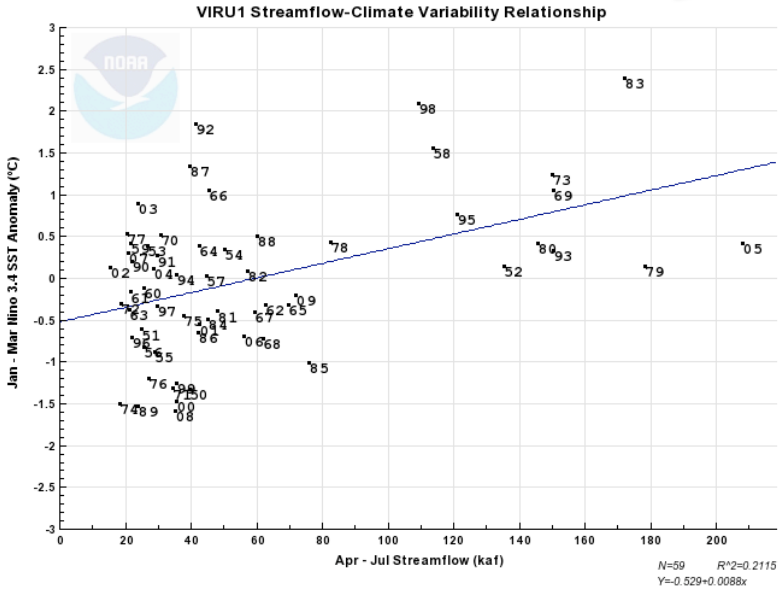
(1) - 1984 -	15406.41	(neutral)
(2) - 1983 -	14838.93	(el nino)
(3) - 1986 -	12601.21	(neutral)
(4) - 1995 -	11833.18	(el nino)
(5) - 1985 -	11701.11	(la nina)
(6) - 1997 -	11320.89	(neutral)
(7) - 1973 -	11262.74	(el nino)
(8) - 1979 -	11104.25	(neutral)
(9) - 1980 -	10606.60	(neutral)
(10) - 1993 -	9984.42	(neutral)
(11) - 1975 -	9953.16	(la nina 2)
(12) - 2008 -	8908.50	(la nina)
(13) - 2005 -	8844.02	(el nino)
(14) - 1978 -	8678.09	(el nino 2)
(15) - 1998 -	8510.14	(el nino)
(16) - 1982 -	8210.63	(neutral)
(17) - 1971 -	8180.35	(la nina)
(18) - 1970 -	8037.76	(neutral)
(19) - 2009 -	7806.72	(neutral)
(20) - 1999 -	7788.09	(la nina)
(21) - 1987 -	7758.54	(el nino)
(22) - 1996 -	7233.47	(la nina)
(23) - 1974 -	6915.13	(la nina)
(24) - 2010 -	5795.43	(el nino)
(25) - 1972 -	5494.26	(neutral)
(26) - 2006 -	5319.56	(neutral)
(27) - 1976 -	5297.75	(la nina 3)
(28) - 1991 -	5159.33	(el nino)
(29) - 1988 -	4567.47	(el nino 2)
(30) - 2000 -	4367.05	(la nina 2)
(31) - 2001 -	4320.62	(la nina 3)
(32) - 1992 -	4124.42	(neutral)
(33) - 2007 -	4053.47	(el nino)
(34) - 2003 -	3910.17	(el nino)
(35) - 1994 -	3766.48	(neutral)
(36) - 2004 -	3542.00	(neutral)
(37) - 1989 -	3524.63	(la nina)
(38) - 1990 -	3228.85	(neutral)
(39) - 1981 -	3058.61	(neutral)
(40) - 1977 -	1277.39	(el nino)
(41) - 2002 -	1126.76	(neutral)

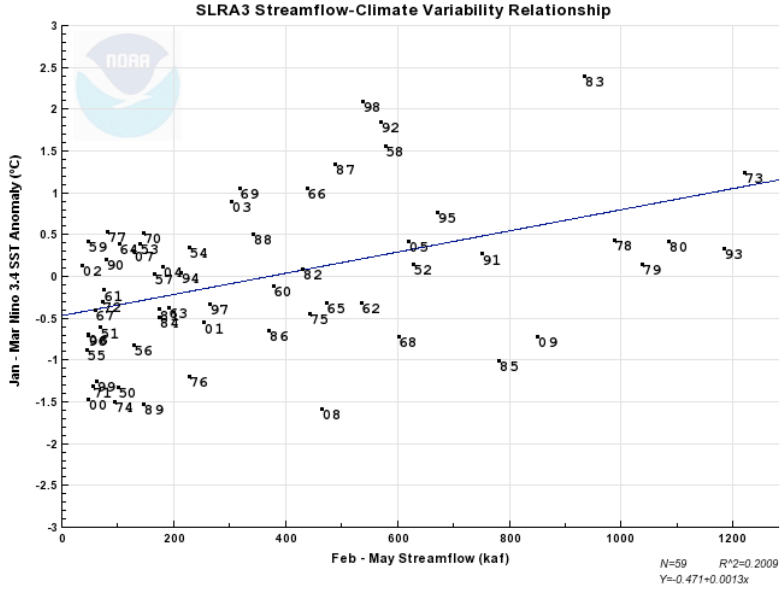
La Nina and Streamflow











What's New at CBRFC

- Basin focal points / forecasters:
  - Brenda Alcorn / John Lhotak (Upper Colorado)
  - Ashley Nielson (Green + Yampa / White)
  - Greg Smith(San Juan + Gunnison)
  - Brent Bernard (Great Basin)
  - Stacie Bender (Sevier)
  - Tracy Cox (Lower Colorado)
- Other key staff members:
  - Michelle Schmidt (Hydrologist In Charge)
  - Kevin Werner (Service Coordination Hydrologist)
  - Andy Wood (Development and Operations Hydrologist)
  - Craig Peterson (Calibrations, Operations lead, etc)
  - Cass Goodman (IT Support, web development, etc)
  - Bill Reed (dam break)
  - Kristen Yeager (student)
  - Mike Hobbins (post-doc)

Proposed Forecast Changes

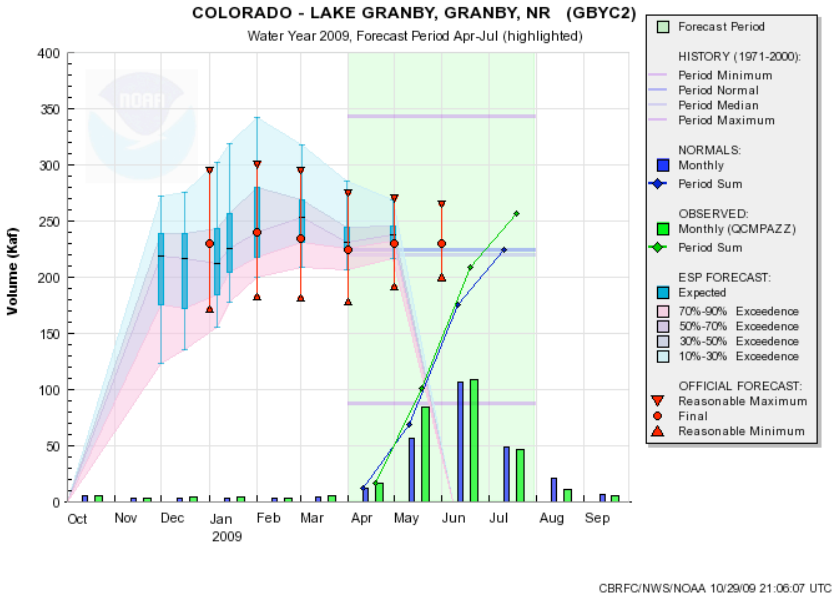
- NRCS/NWS forecast coordination – Both agencies looking toward a new forecast paradigm based on objective consolidation of forecast tools. This will allow:
  - More timely forecast updates
  - Scientific based (repeatable and testable) approach to forecasting
  - More available forecasts and supporting information
  - Shooting for 2013 implementation
- CBRFC is proposing discontinuing preliminary reservoir forecasts in 2012 to expedite final forecast issuance

Average and Recalibration Update

- 30 year averages are updated once every 10 years
- WY2011 Used:
  - 1971-2000 for averages
  - 1971-2000 for statistical prediction
  - 1976-2005 for ESP
- Update for **WY2012** will be based on 1981-2010 time series
  - New averages based on 1981-2010
    - Averages done for USBR data; mostly done elsewhere
  - New statistical prediction equations based on 1981-2010 period
    - Will be completed in Nov/Dec
  - Recalibration of 458 river basin modes to the 1981-2010 period
    - Nearly complete for Upper Colorado Basin (done early Nov)
  - CBRFC will debut all of this for January 2012 forecasts

Weekly ESP

- CBRFC will run ESP weekly for water supply forecast points beginning December 2011
- ESP forecasts will be uncoordinated and with much less forecaster analysis than the first of the month official forecasts
- ESP forecasts will be accessible from CBRFC and NWS water supply websites



ESP RAW MODEL GUIDANCE							OFFICIAL COORDINATED FORECAST				
Date Issued	Forecast Period	90% Exceedance	70% Exceedance	50% Exceedance	30% Exceedance	10% Exceedance	Date Issued	Forecast Period	90% Exceedance	50% Exceedance	10% Exceedance
1/1/2010	April-July	150	190	**235**	278	350	1/1/2010	April-July		**240**	
1/7/2010	April-July	170	200	**255**	310	410					
1/14/2010	April-July	195	210	**260**	310	420	1/14/2010	April-July		**240**	
1/21/2010	April-July	180	200	**255**	290	370					
1/28/2010	April-July	160	180	**230**	260	310					
2/3/2010	April-July	145	165	**210**	255	300	2/3/2010	April-July		**215**	

Upcoming…

- Water supply forecasts
  - Monthly January through June
  - Final forecasts published by 5th working day of the month
  - Webinar follows shortly afterwards
  - Preliminary schedule: coming soon

- Peak flow forecasts
  - Monthly (weekly?) or as needed March through June
  - Webinars as needed

- First Forecast Webinar: January 6 at 1pm MT
- Getting to know CBRFC website webinar??

More Resources

www.cbrfc.noaa.gov

Forecasts

Verification

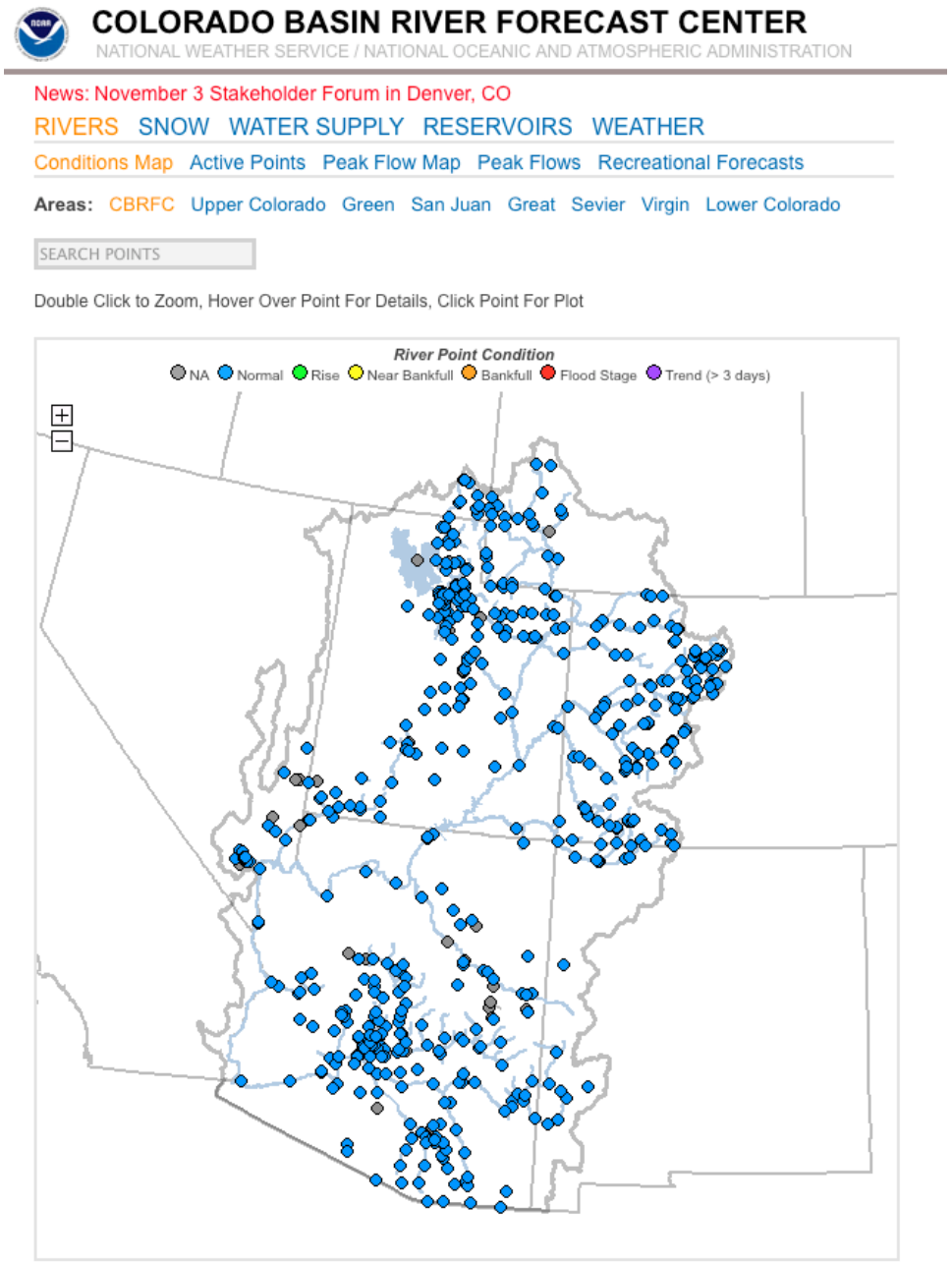
Soil moisture maps

Precipitation maps

Temperature maps

Presentations

NWS Water Supply Website



These slides: http://www.cbrfc.noaa.gov/present/present2011.cgi

CBRFC WATER YEAR OUTLOOKS

CRFS

November 8, 2011

August 2, 2011
WY2012 MONTHLY OUTLOOKS

FLAMING GORGE

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	73	62	56	48	47	80	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							2460
50%	129	260	385	184	84	62	1470
90%							815

BLUE MESA

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	46	35	30	29	25	35	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							1520
50%	81	240	285	105	55	44	1010
90%							555

NAVAJO

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	35	33	23	21	28	83	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							1660
50%	161	285	245	56	35	35	1040
90%							450

LAKE POWELL

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	700	650	550	500	450	700	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							19500
50%	1100	2600	3050	1250	550	500	12600
90%							7000

October 3, 2011
WY2012 MONTHLY OUTLOOKS

FLAMING GORGE

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	62	57	50	45	45	75	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							2340
50%	117	240	380	183	84	62	1400
90%							790

BLUE MESA

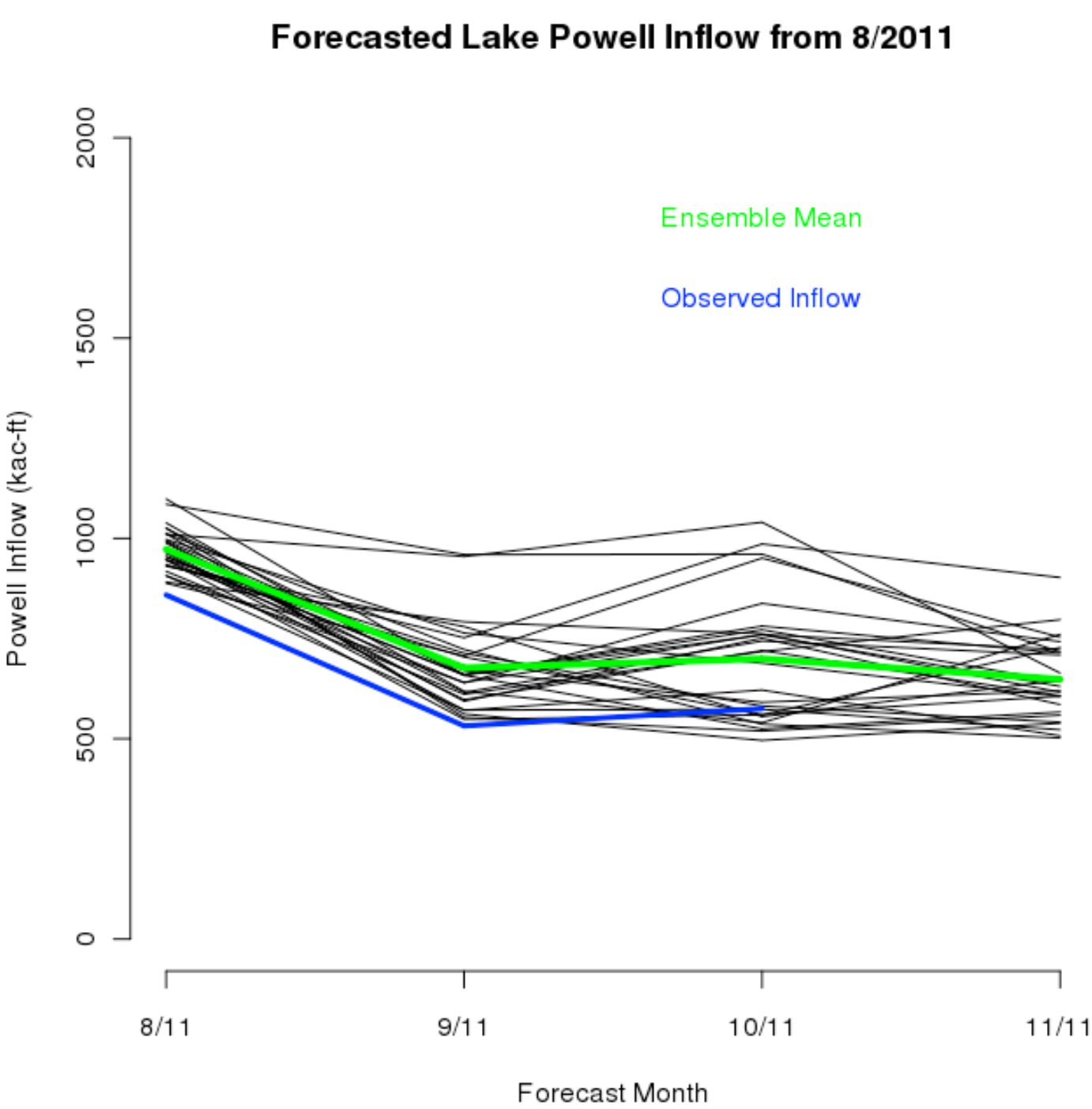
	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	41	35	32	29	25	34	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							1490
50%	78	206	255	105	52	43	935
90%							555

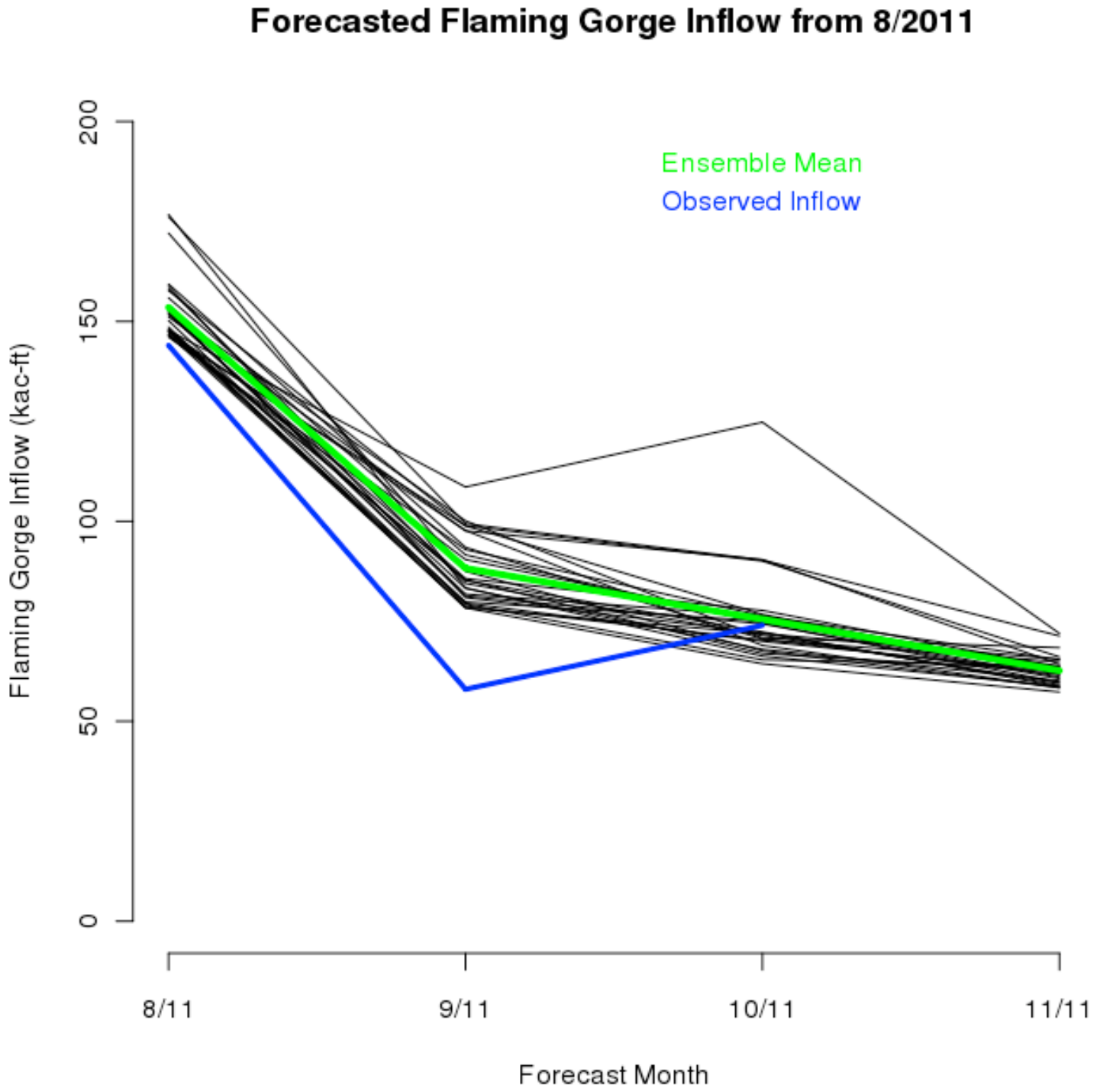
NAVAJO

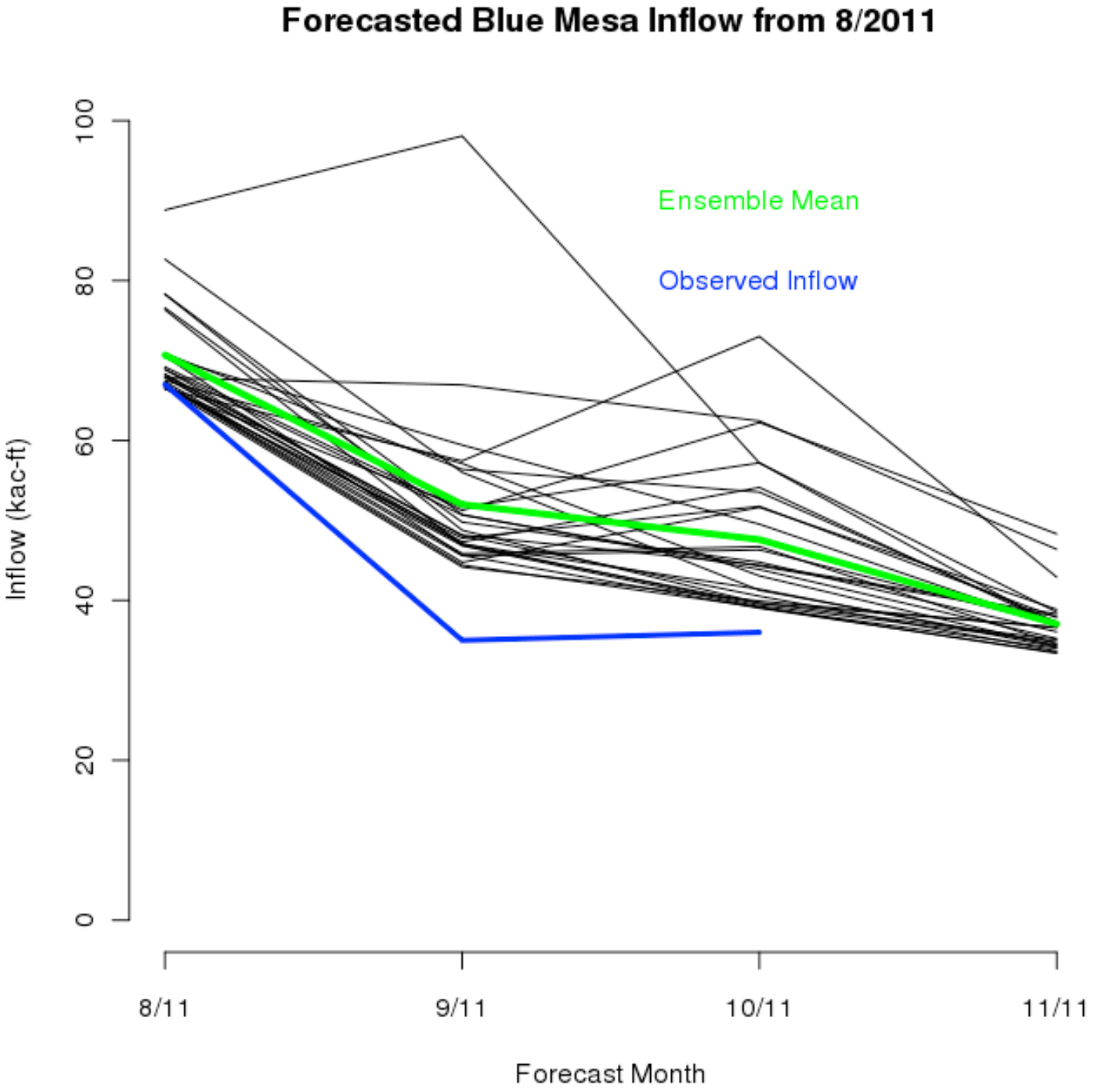
	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	26	28	20	19	25	71	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							1530
50%	136	260	230	54	29	32	930
90%							410

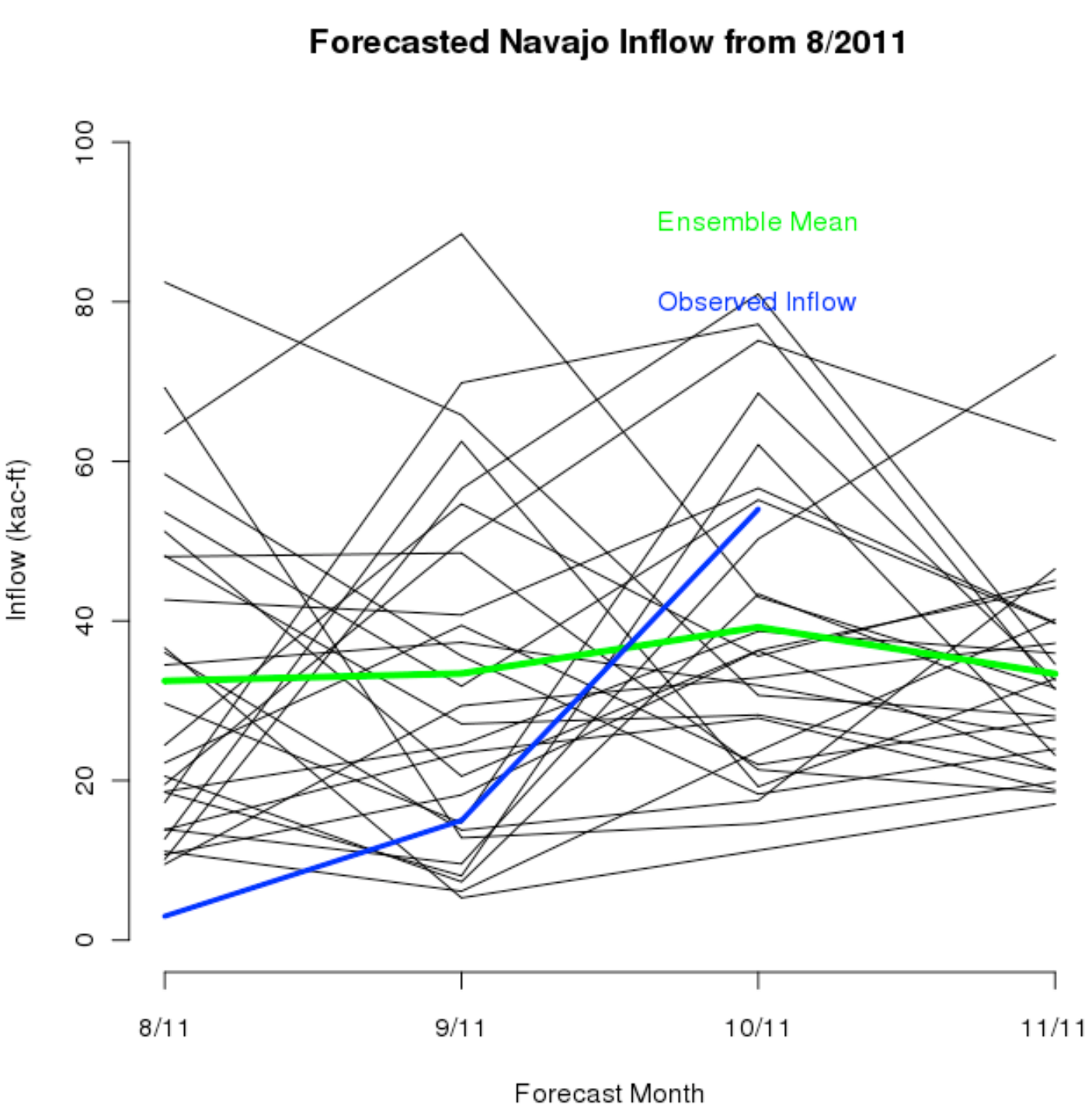
LAKE POWELL

	2011			2012			
	OCT	NOV	DEC	JAN	FEB	MAR	
50%	650	625	525	475	450	675	
	2012						
	APR	MAY	JUN	JUL	AUG	SEP	WY2012
10%							18500
50%	1050	2250	2750	1150	525	475	11600
90%							7000


Forecasted Lake Powell Inflow from 8/2011
Ensemble Mean
Observed Inflow
Powell Inflow (kac-ft)
0
500
1000
1500
2000
8/11
9/11
10/11
11/11
Forecast Month


Forecasted Flaming Gorge Inflow from 8/2011
Ensemble Mean
Observed Inflow
Flaming Gorge Inflow (kac-ft)
0
50
100
150
200
8/11
9/11
10/11
11/11
Forecast Month

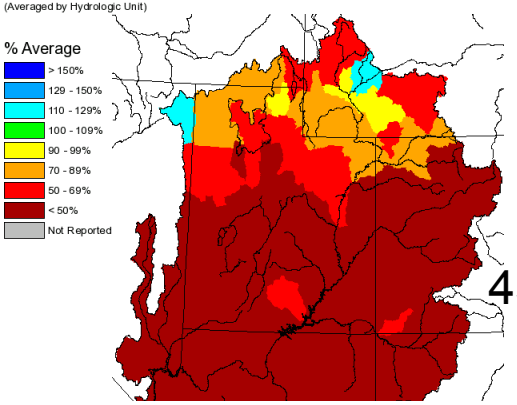

Forecasted Blue Mesa Inflow from 8/2011
Ensemble Mean
Observed Inflow
Inflow (kac-ft)
0
20
40
60
80
100
8/11
9/11
10/11
11/11
Forecast Month


Forecasted Navajo Inflow from 8/2011
Ensemble Mean
Observed Inflow
Inflow (kac-ft)
0
20
40
60
80
100
8/11
9/11
10/11
11/11
Forecast Month

- ESP starting point is current model snow and soil states.
  - Since there is generally no snow Aug 1 and Oct 1, the main difference between the two runs, besides lead time, is the starting soil moisture conditions.

Monthly Precipitation for August 2009

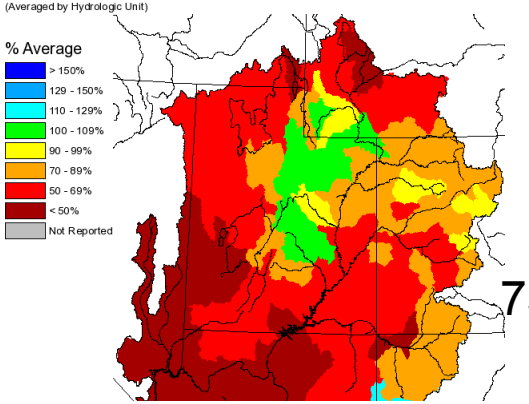
(Averaged by Hydrologic Unit)



45%

Monthly Precipitation for September 2009

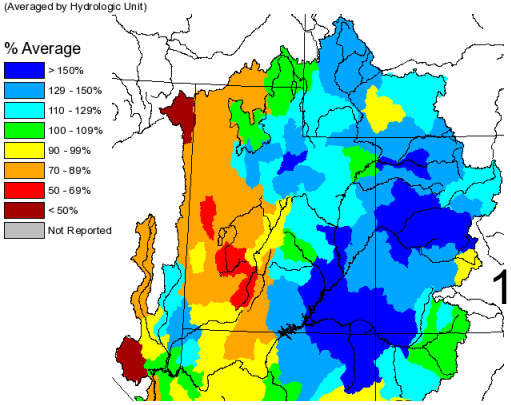
(Averaged by Hydrologic Unit)



75%

Monthly Precipitation for August 2010

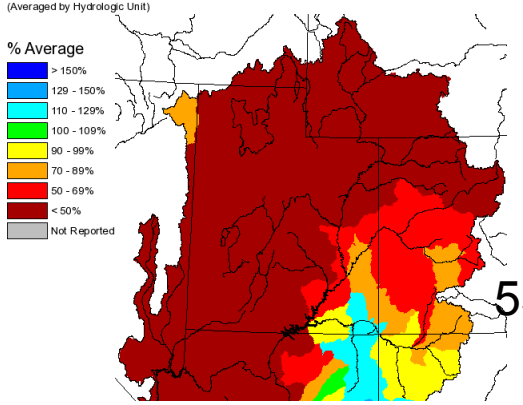
(Averaged by Hydrologic Unit)



140%

Monthly Precipitation for September 2010

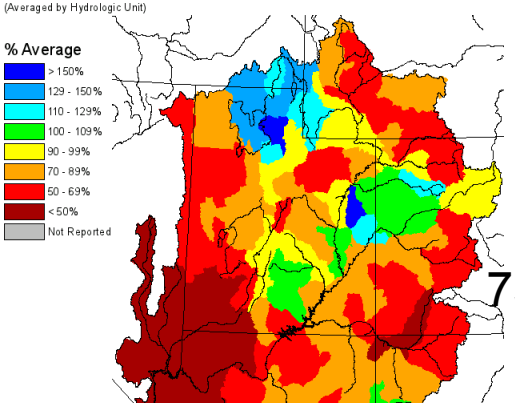
(Averaged by Hydrologic Unit)



55%

Monthly Precipitation for August 2011

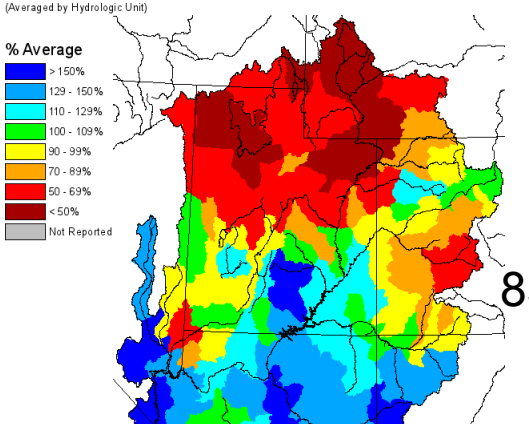
(Averaged by Hydrologic Unit)



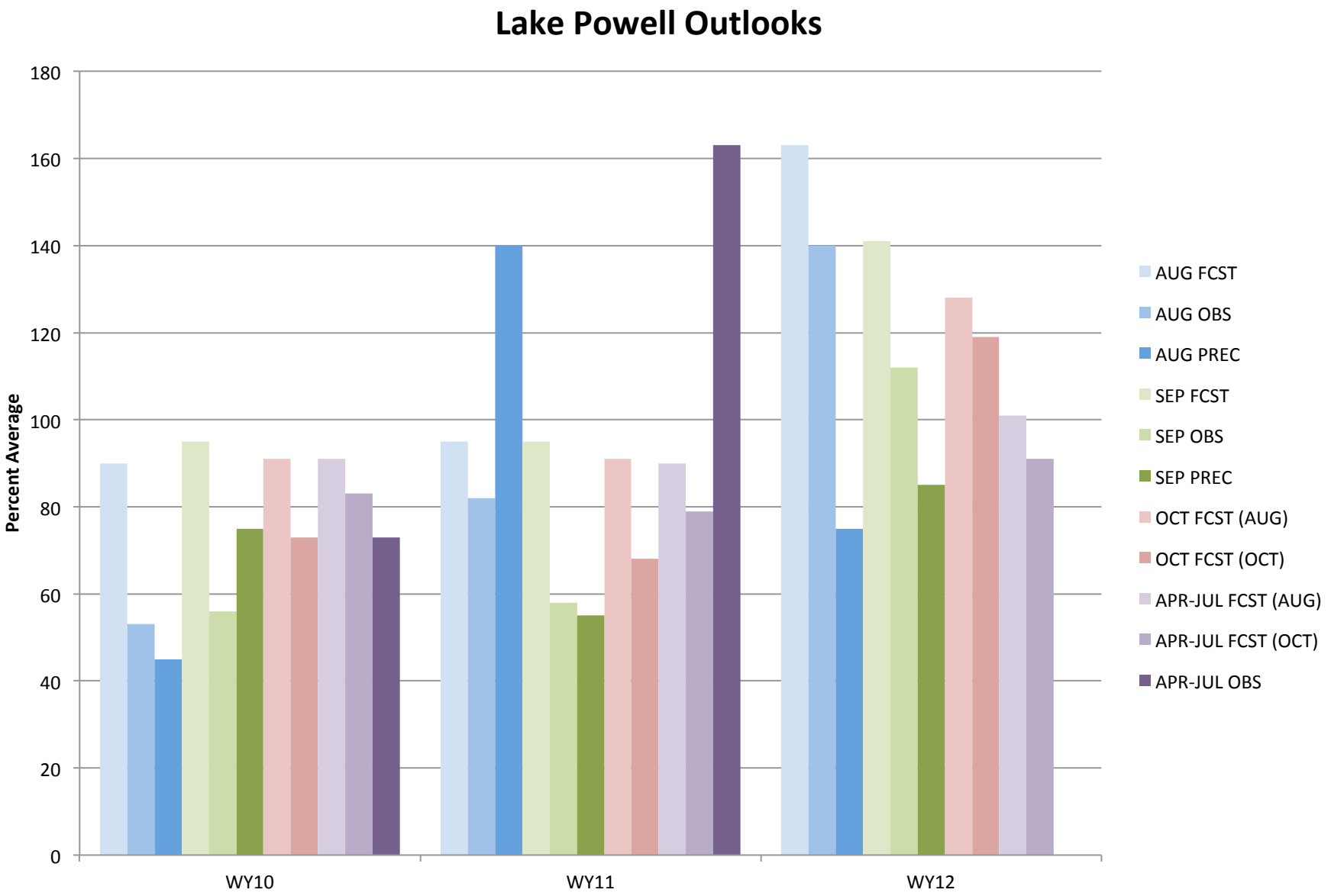
75%

Monthly Precipitation for September 2011

(Averaged by Hydrologic Unit)



85%


Lake Powell Outlooks
Percent Average
180
160
140
120
100
80
60
40
20
0
WY10
WY11
WY12
AUG FCST
AUG OBS
AUG PREC
SEP FCST
SEP OBS
SEP PREC
OCT FCST (AUG)
OCT FCST (OCT)
APR-JUL FCST (AUG)
APR-JUL FCST (OCT)
APR-JUL OBS

Contributing Factors

- Late run-off
  - Model soil moisture states very wet.
- Dry Aug-Sep
  - Model assuming ‘normal’ precipitation.
- Consumptive Use/Diversions
  - More irrigation occurring than model assumes?
    - Consumptive Use operation is fixed in how much and when water will be taken.