Colorado Basin River Forecast Center (CBRFC) Overview

Kevin Werner

NWS Colorado Basin River Forecast Center

WFO Flagstaff Visit
June 14, 2012

Outline

Discussion: CBRFC and WFO FGZ

Colorado River Overview

2011 and 2012: Two Extremes

Forecast Methodology

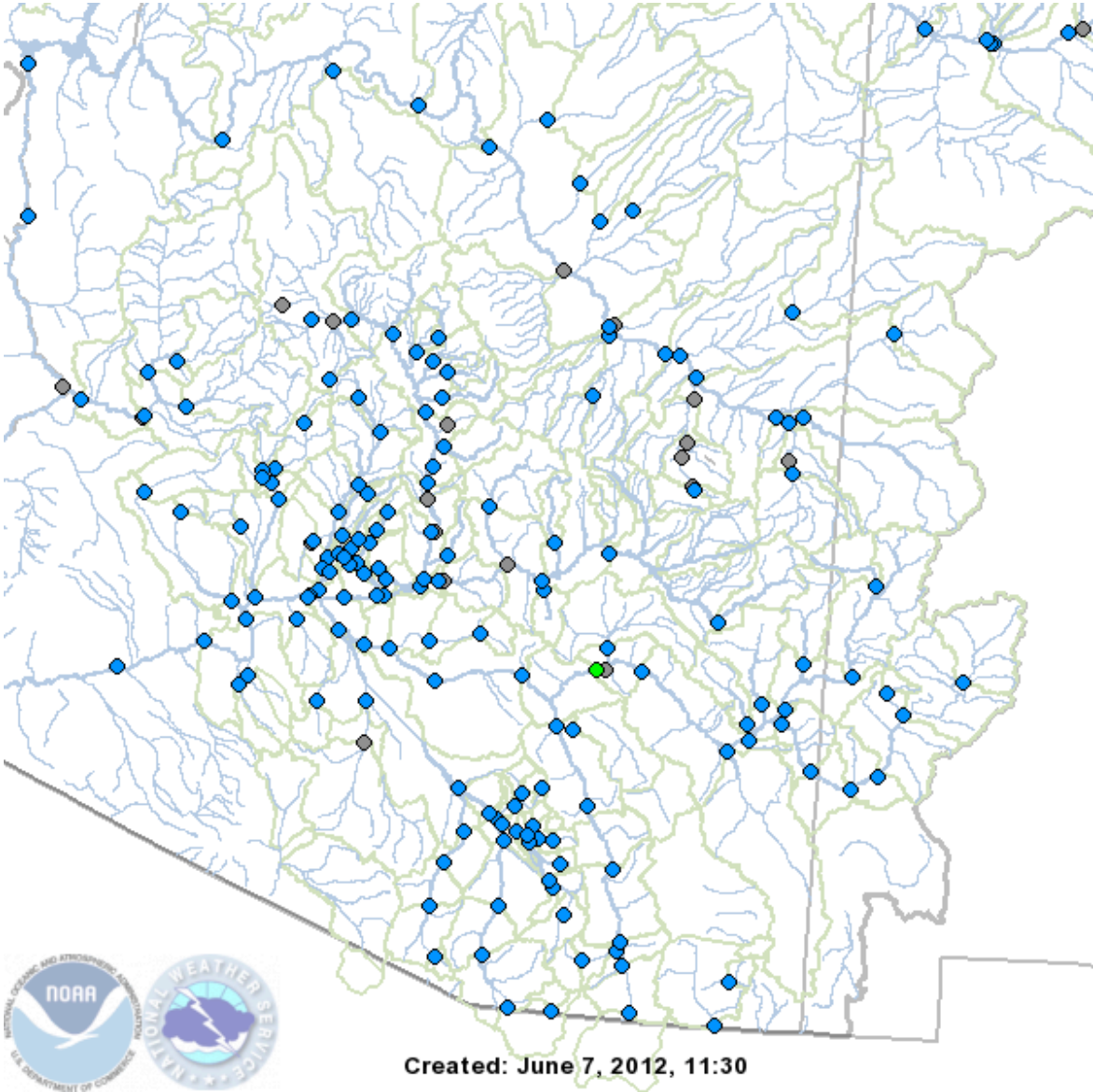
CBRFC Webpage

CBRFC and WFO FGZ

How effective is CBRFC in supporting your WFO?

What could we do more effectively?

What new challenges do you see emerging?



Who we are…

Mission: To understand and predict changes in the Earth's environment … to meet our Nation's economic, social, and environmental needs

Mission: The NWS provides weather, hydrologic, and climate forecasts and warnings … for the protection of life and property and the enhancement of the national economy

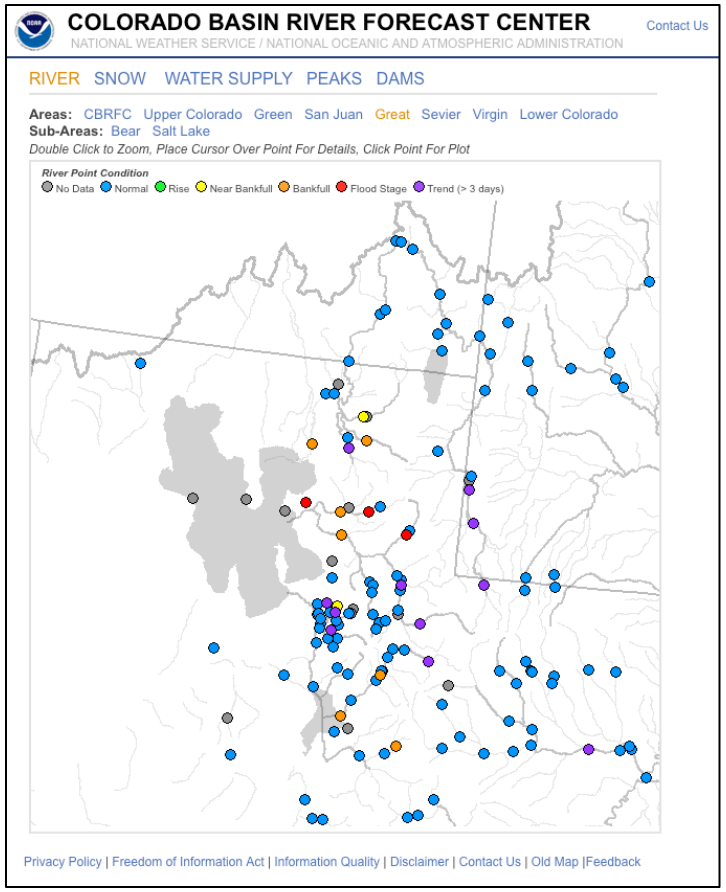
The Colorado Basin River Forecast Center generates streamflow forecasts and related datasets for the Colorado and eastern Great Basins

Colorado Basin River Forecast Center

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

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

www.cbrfc.noaa.gov



Why the Colorado River Stopped Flowing -All Things Considered, July 14, 2011

Colorado River

- 25 million people in US rely on Colorado River water
- 3.5 million acres of irrigation in US
- 85% of runoff comes from above 9000 feet
- Total mean annual flow is 15 MAF
- Storage capacity is about 60 MAF (4 times mean annual flow)
- River is fully used and little flows to ocean

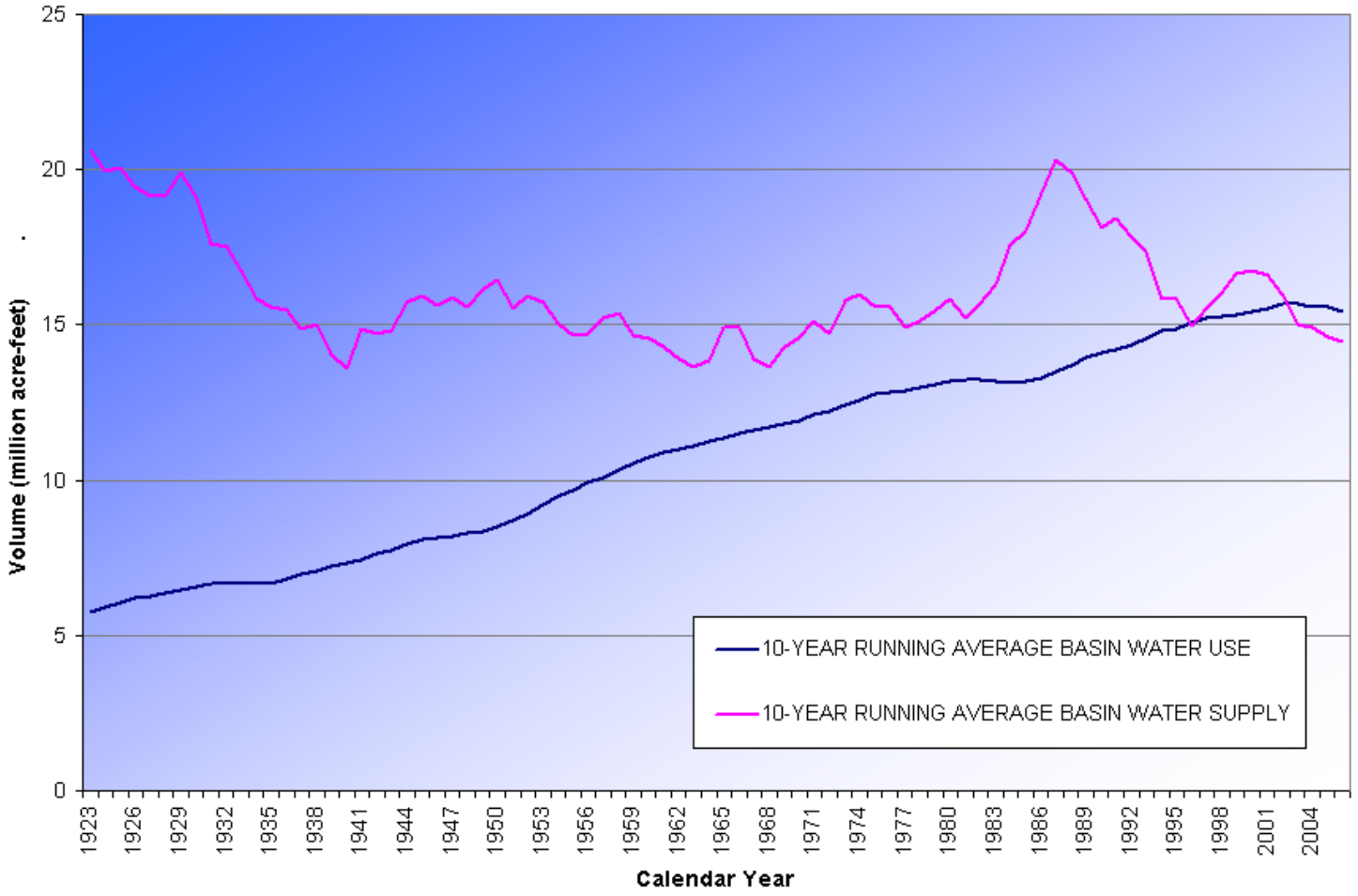
Upper Basin

- Distribution of Average Runoff in Lake Powell:
  - ½ Upper Colorado including Gunnison, Dolores
  - 1/3 Green River including Yampa, Duchesne
  - 1/6 San Juan River

Colorado River Allocation

- Colorado Compact (1922) divided water between the upper basin and lower basin – 7.5 MAF each
- Mexican Water Treaty (1944) allocated Mexico 1.5 MAF
- Arizona v. California (1964) allocated water among lower basin states
- Interim Guidelines (2007) specify shortages and surpluses through 2026 that are tied to forecasts
- Key facts:
  - River is over-allocated: original allocation (16.5 MAF) was based on a series of wet years. Actual average flow is ~15 MAF
  - Lower basin states (AZ, CA, NV) use full 7.5 MAF each year
  - Mexico uses its full 1.5 MAF
  - Upper basin states (CO, WY, UT, NM) are still “developing” their 7.5 MAF
  - No shortage has ever been declared on the river
  - Shortages would affect lower basin states first (and AZ first of all)

Long Term Supply / Demand



Interim Operating Guidelines

- Guidelines specify how shortages and surpluses will be distributed among the basin states
- USBR directed to operate reservoirs based, to a large extent, on CBRFC/NRCS official forecasts
- Most years 8.23 MAF released from Lake Powell to Lake Mead
- In wet years when Lake Mead is low (such as 2011), “extra” water can be released. This is called equalization and/or balancing.

Lake Powell

Elevation (feet)	Opertaions According to Interim Guidelines	Live Storage (MAF)
3,700	**Equalization Tier** Equalize, Avoid Spills or Release 8.23 MAF	24.3
3,636 - 3,666 (2008-2026)		15.5 - 19.3 (2008-2026)
	Upper Elevation Balancing Tier[1] Release 8.23 MAF; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 MAF	
3,575		9.5
	Mid-Elevation Release Tier Release 7.48 MAF; if Lake Mead < 1,025 feet, Release 8.23 MAF;	
3,525		5.9
3,490	**Lower Elevation Balancing Tier** Balance contents with a min/max release of 7.0 and 9.5 MAF	
3,370		

15.5 MAF
3,636
4/1/2012

Lake Mead

Elevation (feet)	Opertaions According to Interim Guidelines	Live Storage (MAF)
1,220	Flood Control, 70R or ICS Surplus	25.9
1,200		22.9
	Domestic or ICS Surplus	
1,145		15.9
1,105	Normal Operations or ICS Surplus	11.9
1,075		9.4
	Shortage 333 KAF[2]	
1,050		7.5
	Shortage 417 KAF[2]	
1,025		5.8
	Shortage 500 KAF[2] and Consultation[3]	
1,000		4.3
895		0

14.5 MAF
1,129
4/1/2012

Value

Damage from 1/10 AZ storm:	$11m[a]
Damage from 6/10 UT flooding:	$6.5m[a]
Damage from 12/10 UT/NV storm:	$35m[a]
Damage from spring 2011 UT/CO/WY flooding:	<$200m

Colorado River average runoff: 12.4 MAF

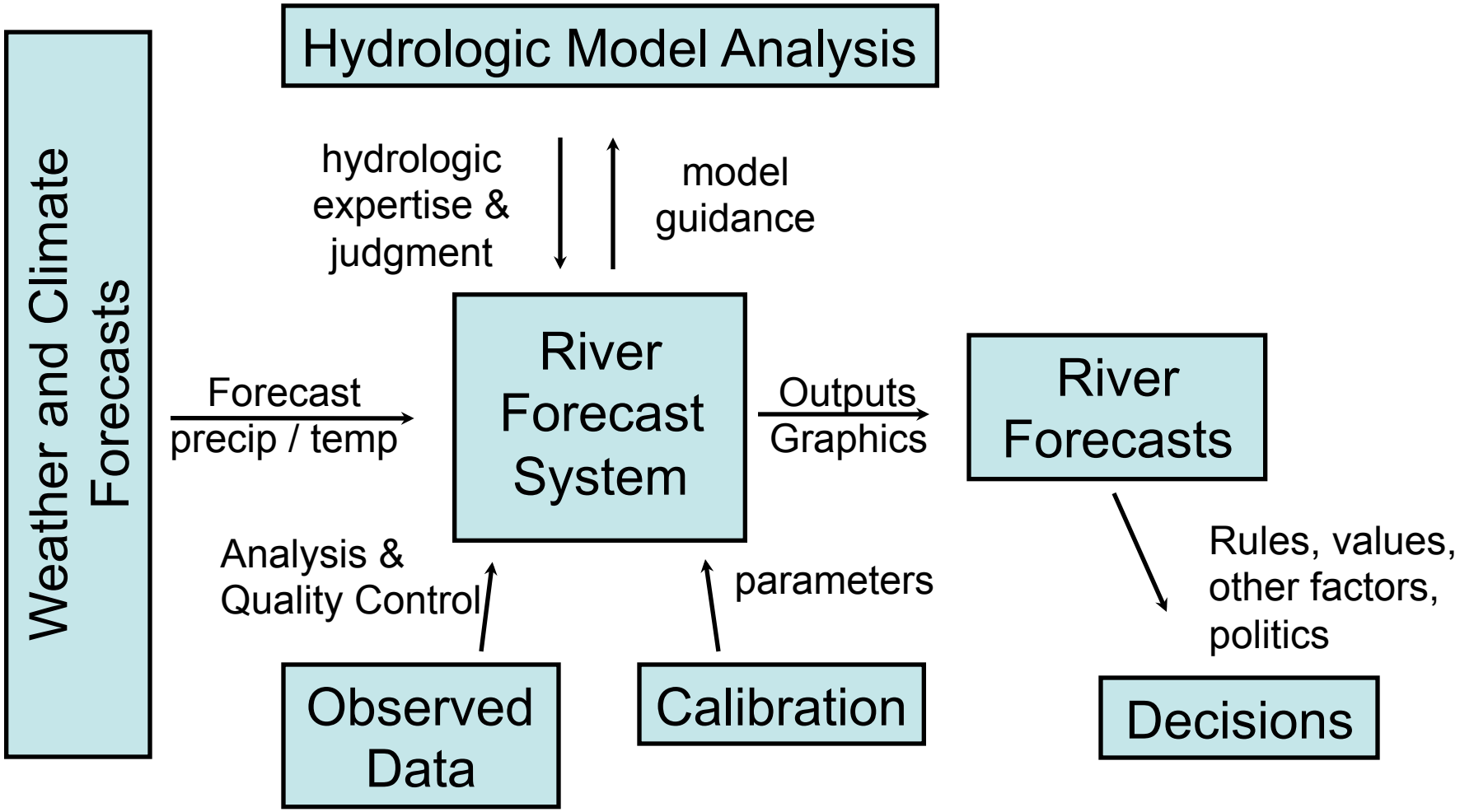
Replacement value of $200-800/AF -> $2-8b[b]

**Economic value of water resources far greater than flooding damages

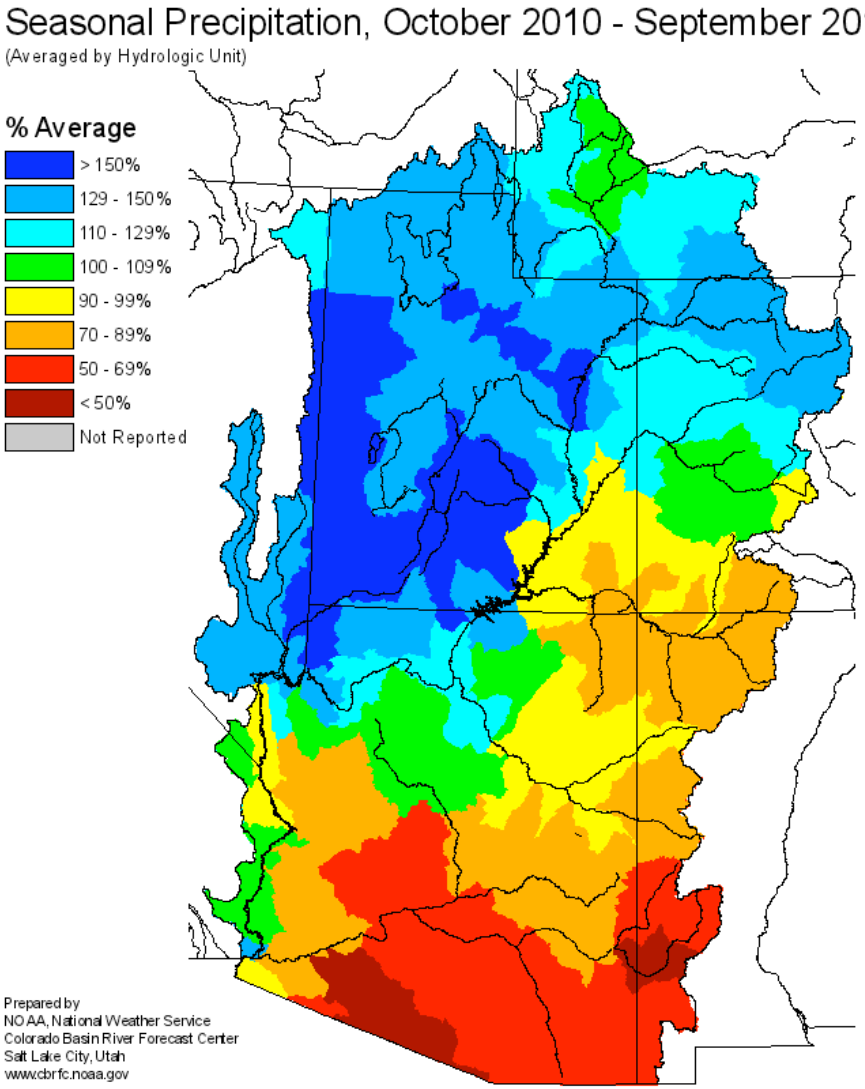
Sources:

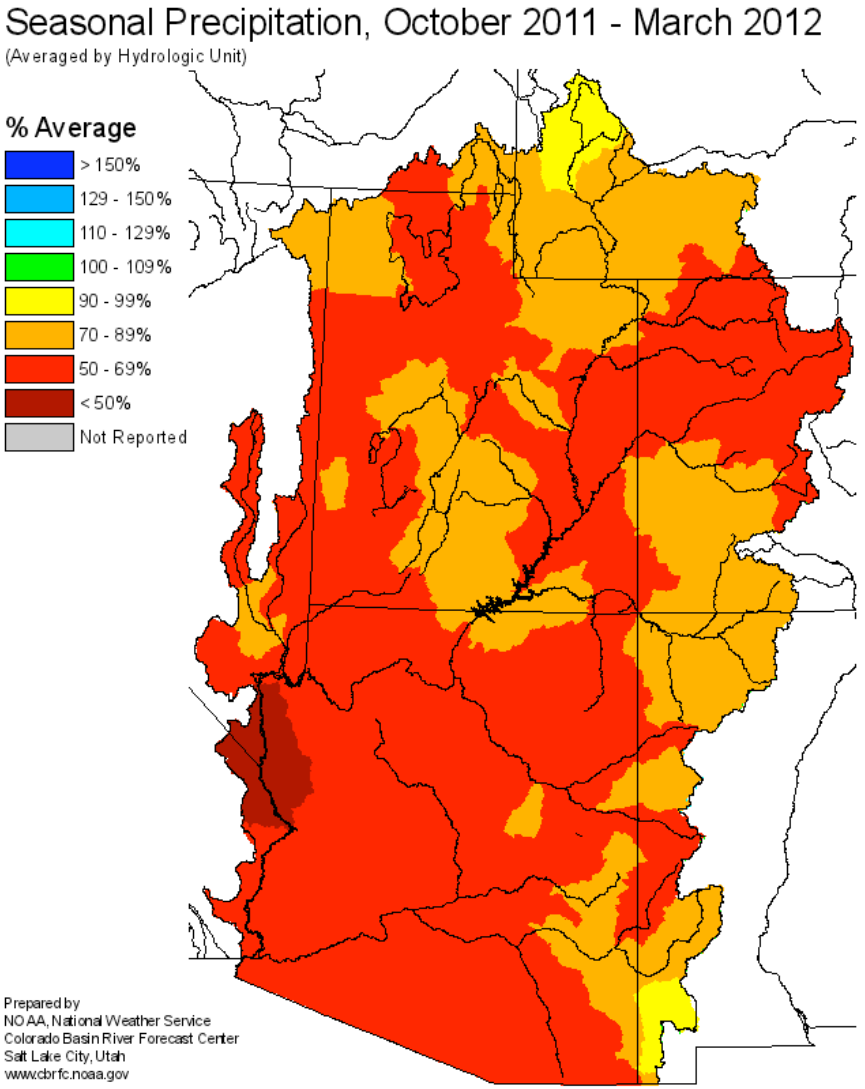
a: WFO, FEMA (via stormdata); b: Private communication with water management agencies

Forecast Process

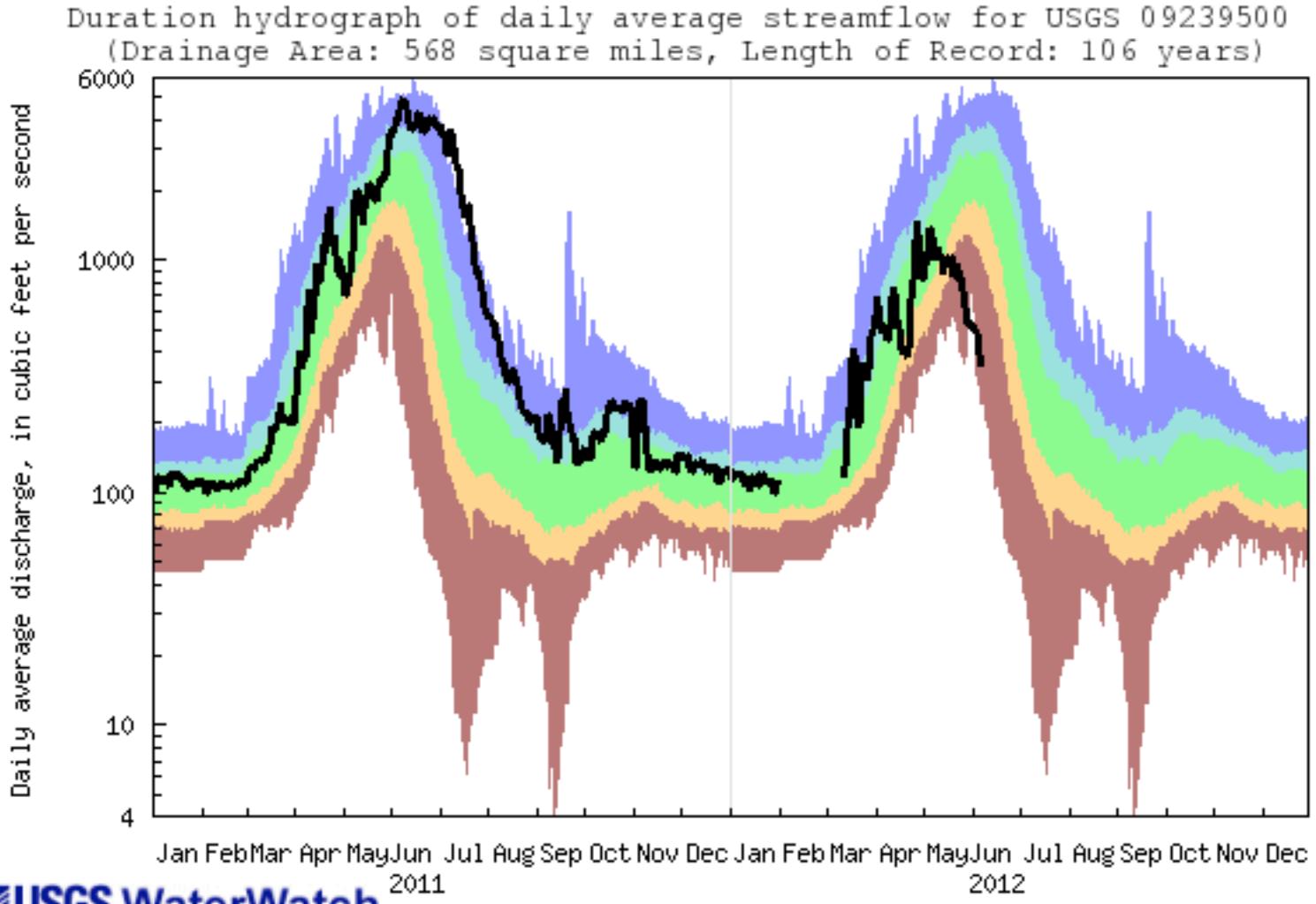


2011 vs 2012: Both Extremes





Yampa River at Steamboat Springs, CO



Late 2010

October 18, 2010, 2:05 PM

Lake Mead Hits Record Low Level

By FELICITY BARRINGER

Jim Wilson/The New York Times

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

Living

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

The New York Times

LAS VEGAS REVIEW-JOURNAL

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

K.M. CANNON/LAS VEGAS REVIEW-JOURNAL

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

BY HENRY BREAN
LAS VEGAS REVIEW-JOURNAL

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

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

Tools

183 Like

28 Tweet

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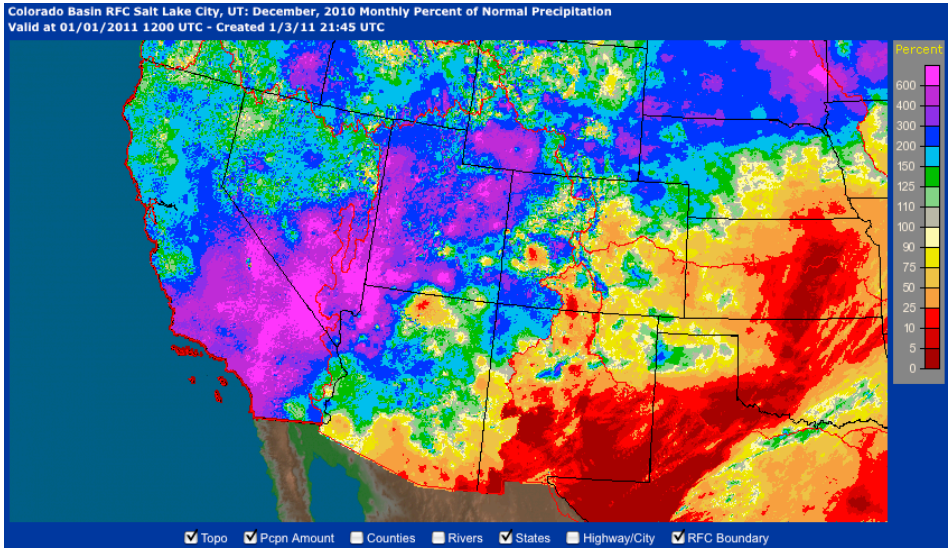
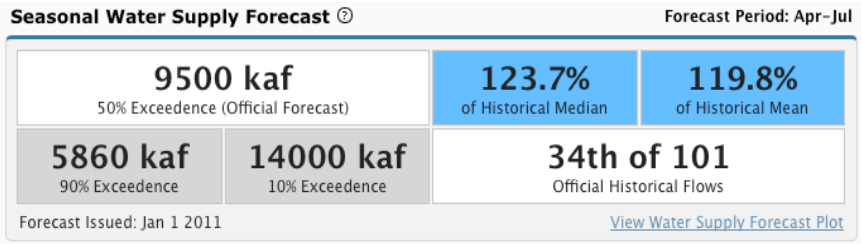
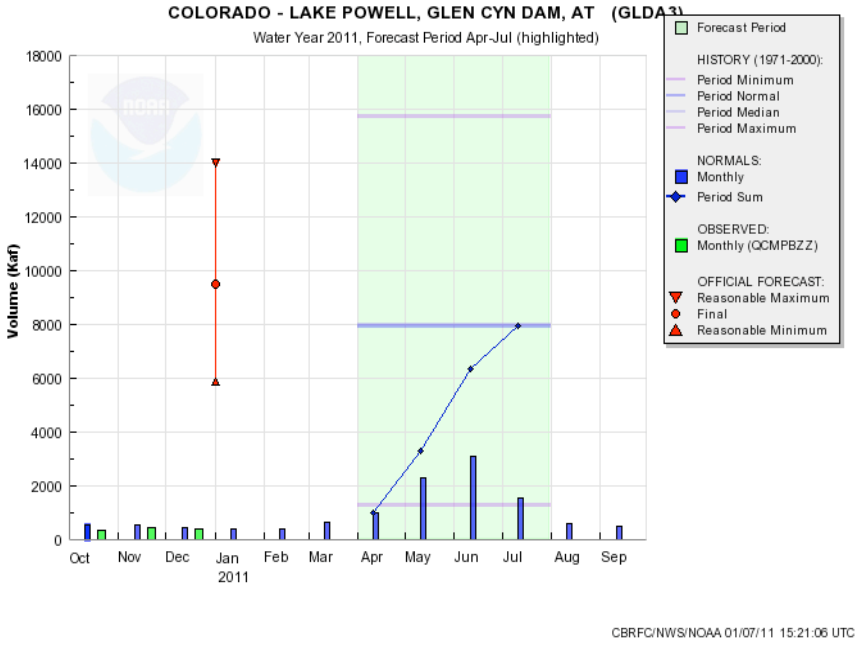
Early 2011



Pre Holiday Storm:

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



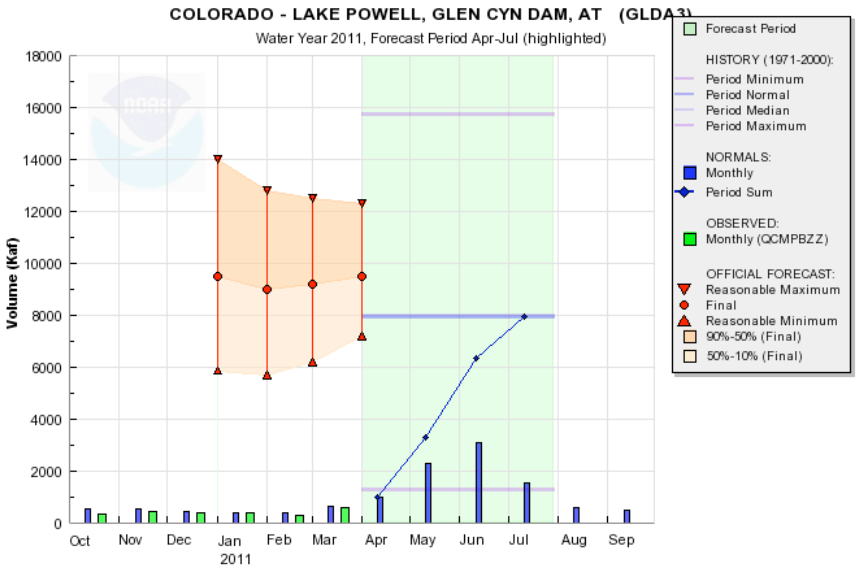


Irrational Exuberance?

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

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

Forecast Issued: Apr 1 2011 — View Water Supply Forecast Plot

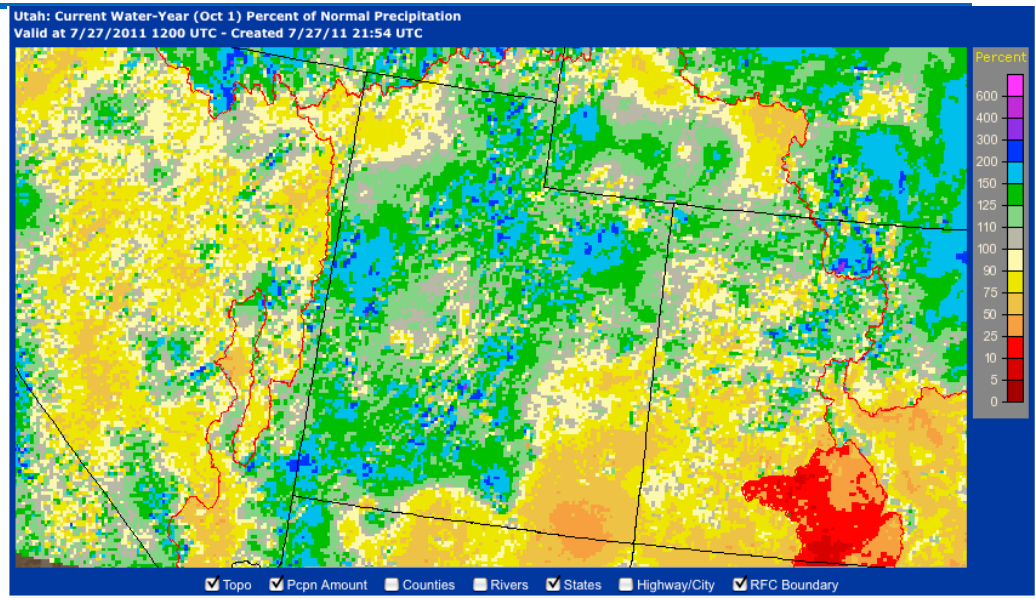


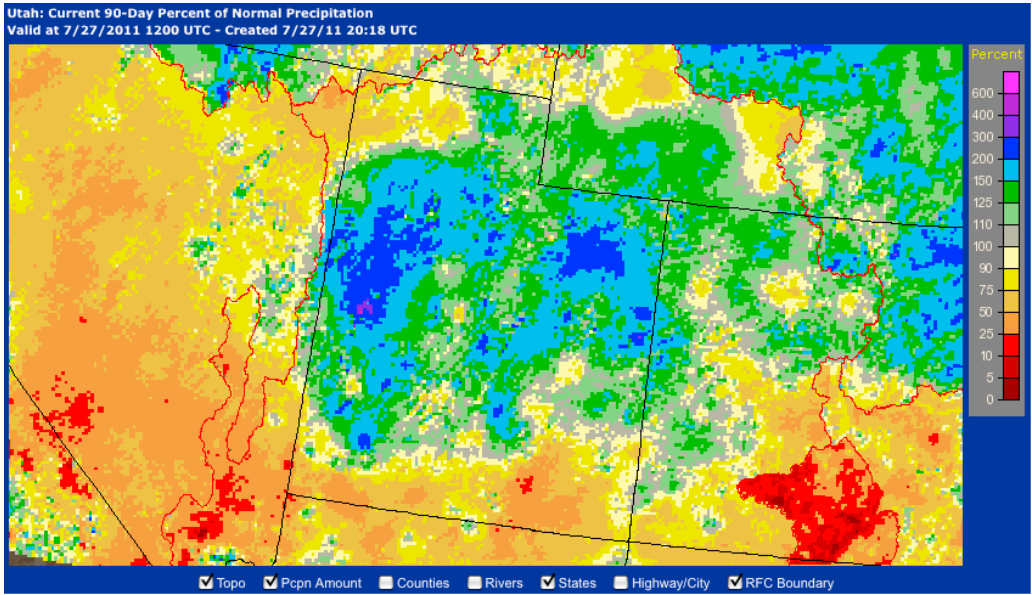
CBRFC/NWS/NOAA 04/07/11 00:16:40 UTC

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

Spring 2011

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





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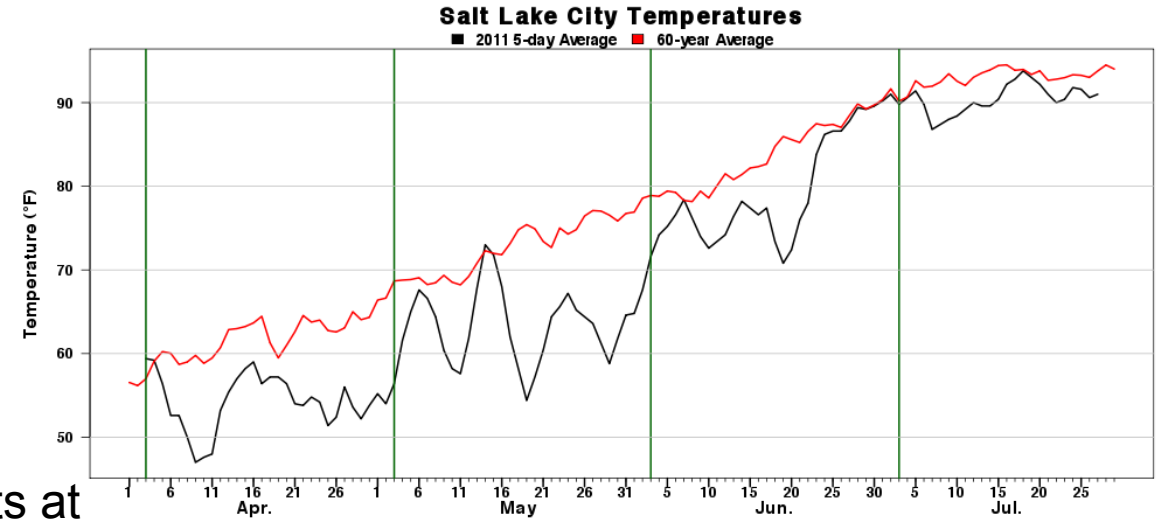

Number of Days Below 60-yr Average (April 1 – July 29)

Year	Number of Days Below Normal	Standard Deviation of Below Normal Days
2011	92	-2.55
1998	84	-1.98
1995	82	-1.84
1983	79	-1.62
1953	77	-1.48
1999	76	-1.41
1991	75	-1.34
1975	75	-.134
1993	73	-1.19
1982	73	-1.19
2010	71	-1.05
1965	71	-1.05

Average number of days below 60-year average: 56.32 days
Standard deviation of days below 60-year average: 13.97 days

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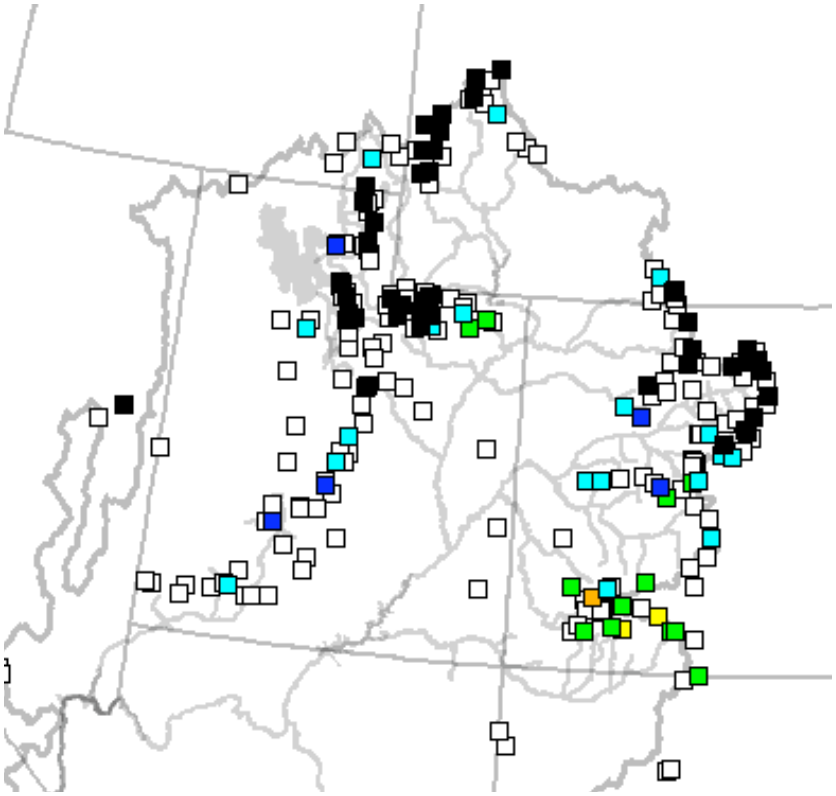


Flooding and High Flows

denverpost.com

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

BOOKMARK PRINT EMAIL 0 COMMENTS

By Matt Stensland
Steamboat Pilot

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

Recommend One person recommends this.

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

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

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

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

11NEWS

Colorado River still running high, causing flooding in some areas

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

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

Story | 0 Comments

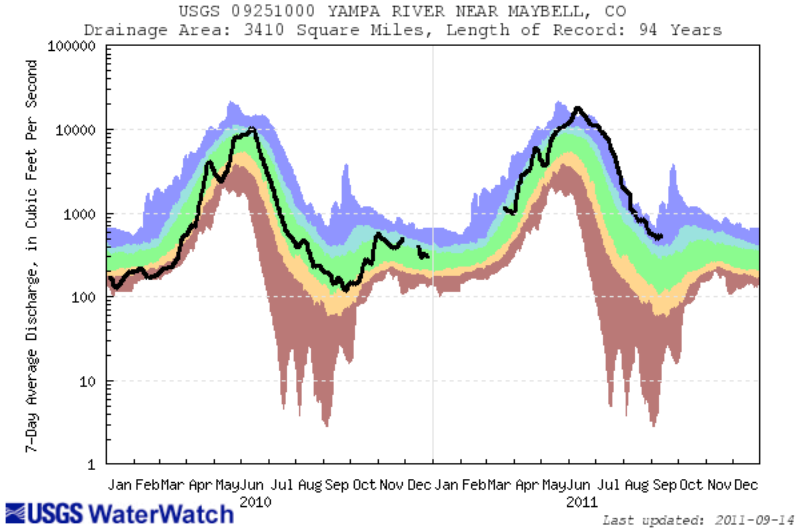
Font Size: A A A

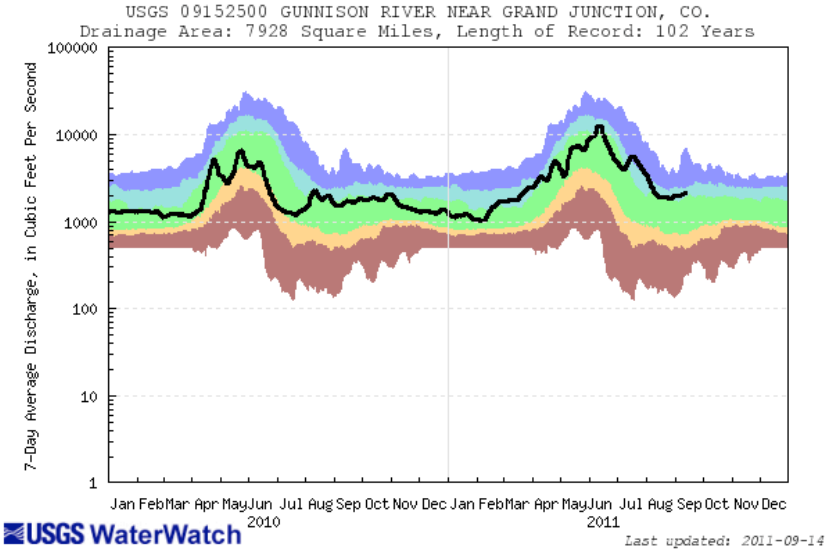
MESA COUNTY, Colo. (KKCO) - The Colorado River is still cresting in parts of Mesa County, according to the National Weather Service.

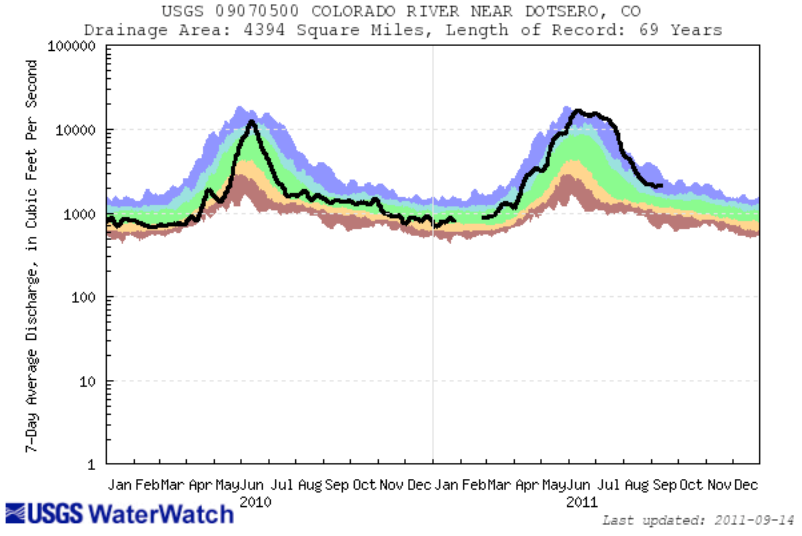
An early morning check of the Cameo gauge on Thursday revealed that the Colorado River had receded slightly. On Wednesday it was recorded at 13.4 feet, and on Thursday it measured 13.1 feet.

Flooding and High Flows

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





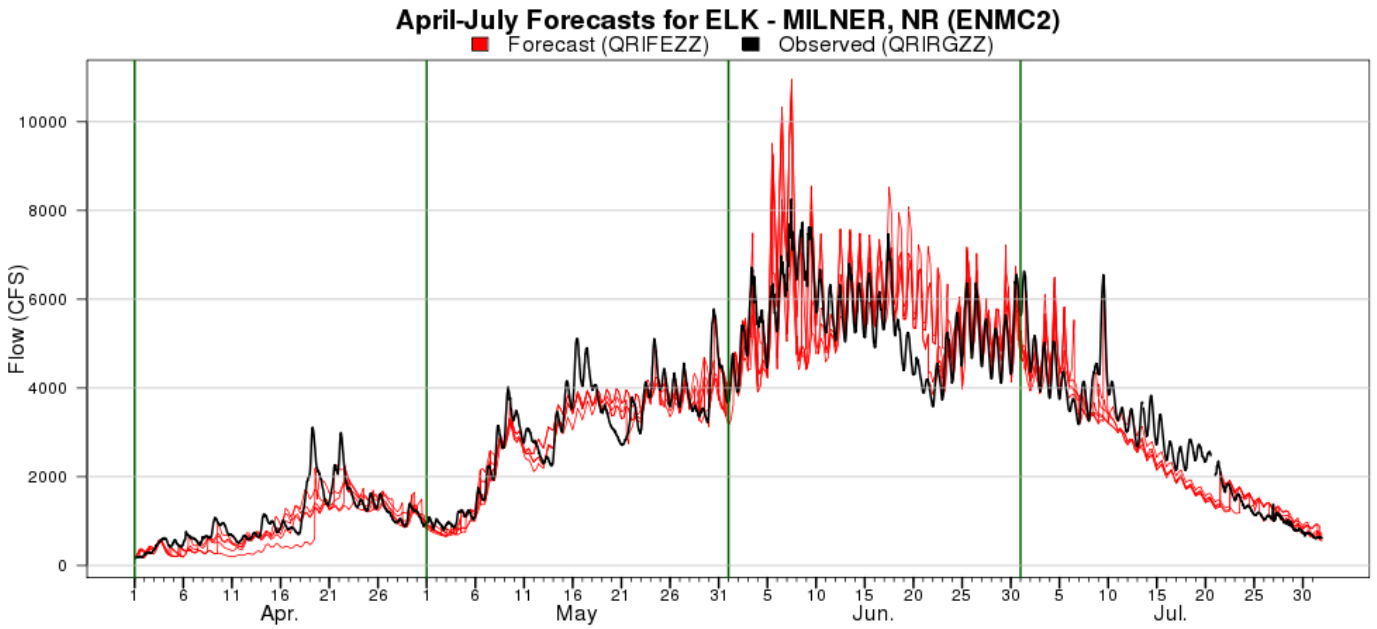


Yampa: Daily Forecasts

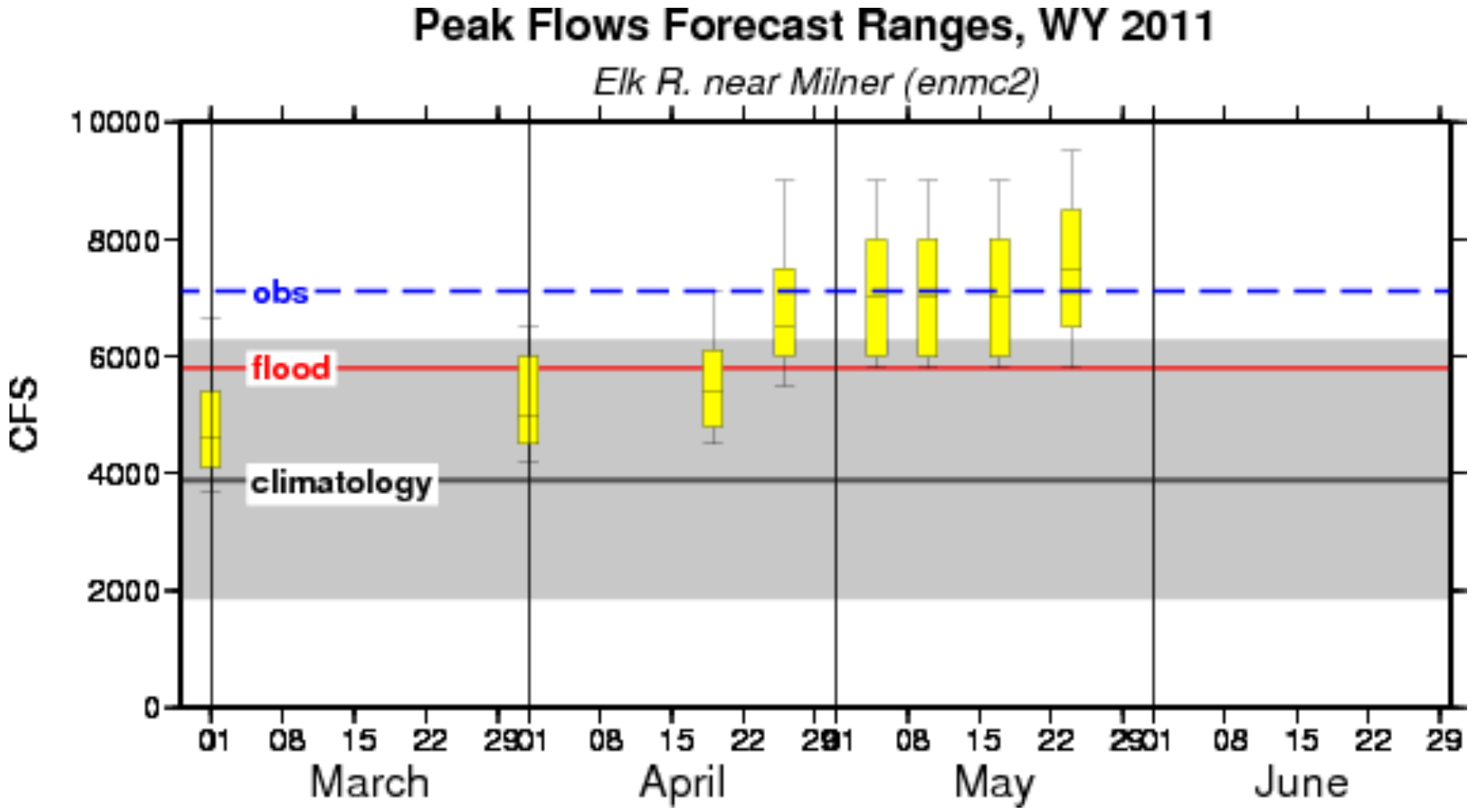
Yampa / White Rivers generally peaked in June

Very high (many records) snowpack

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



Yampa: Long Lead Peak Forecasts

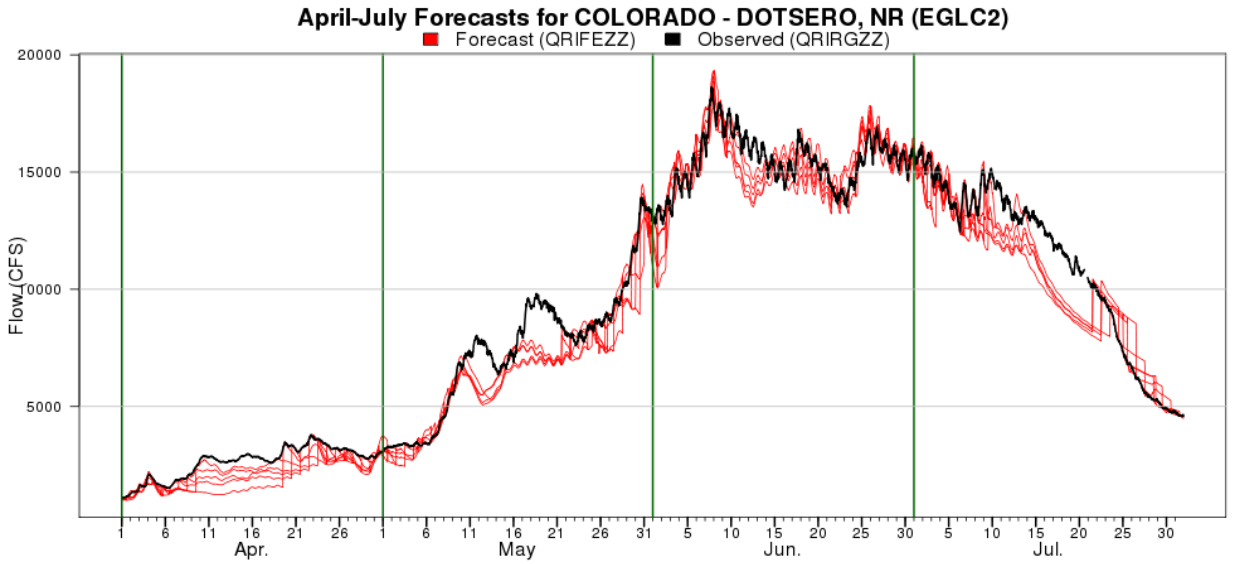


Upper Colorado

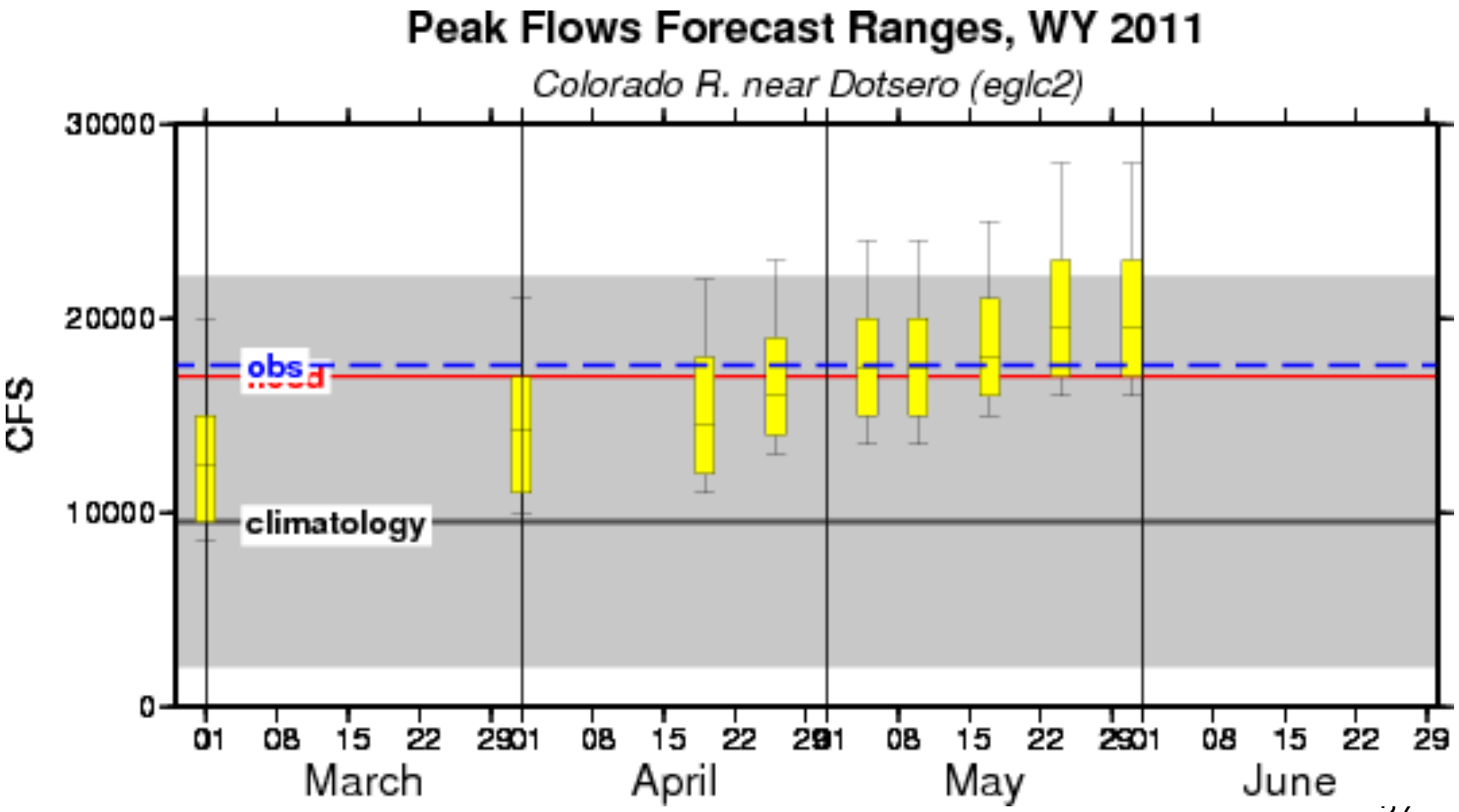
Upper Colorado includes many high elevation basins that peaked late into June or early July

Near record snowpack caused high flows

High flows were mitigated by cool June temperatures



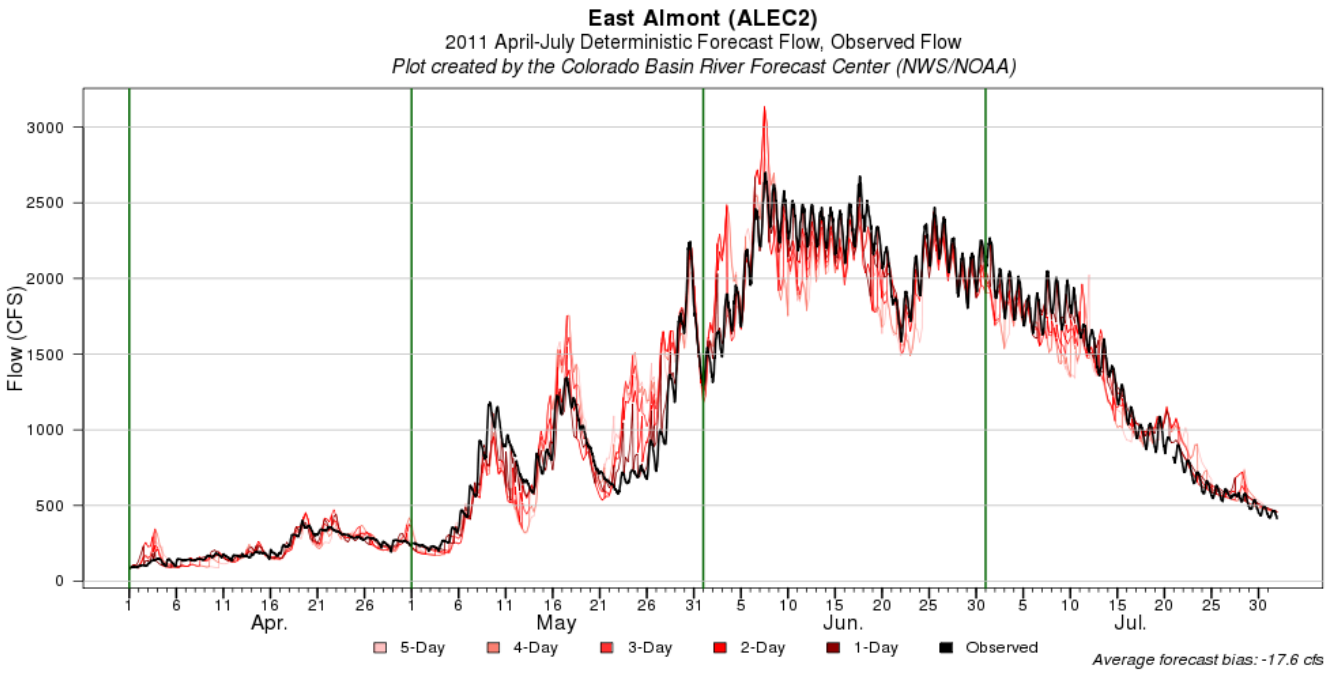
Upper Colorado: Long Lead Peak Forecasts



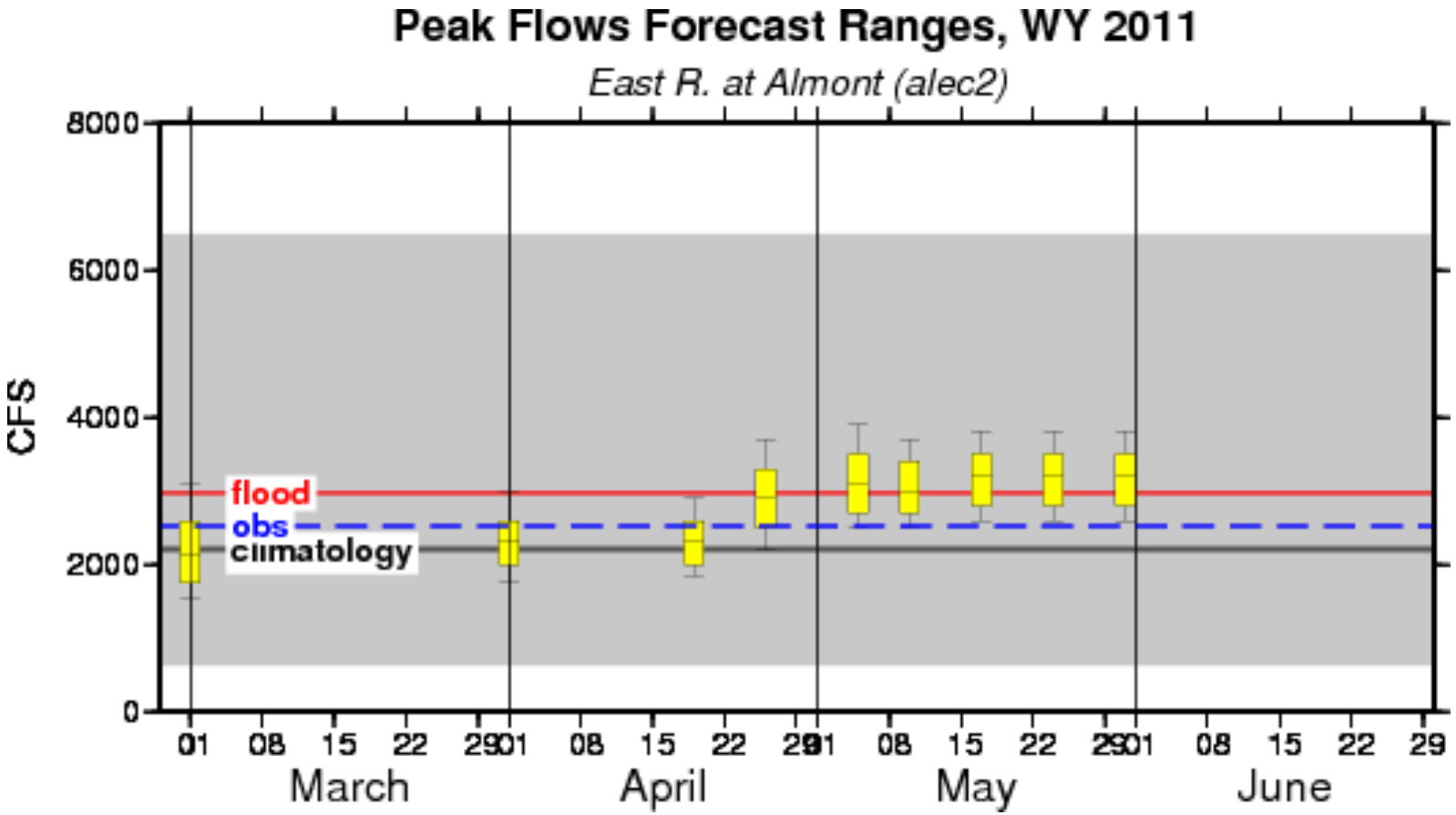
Gunnison

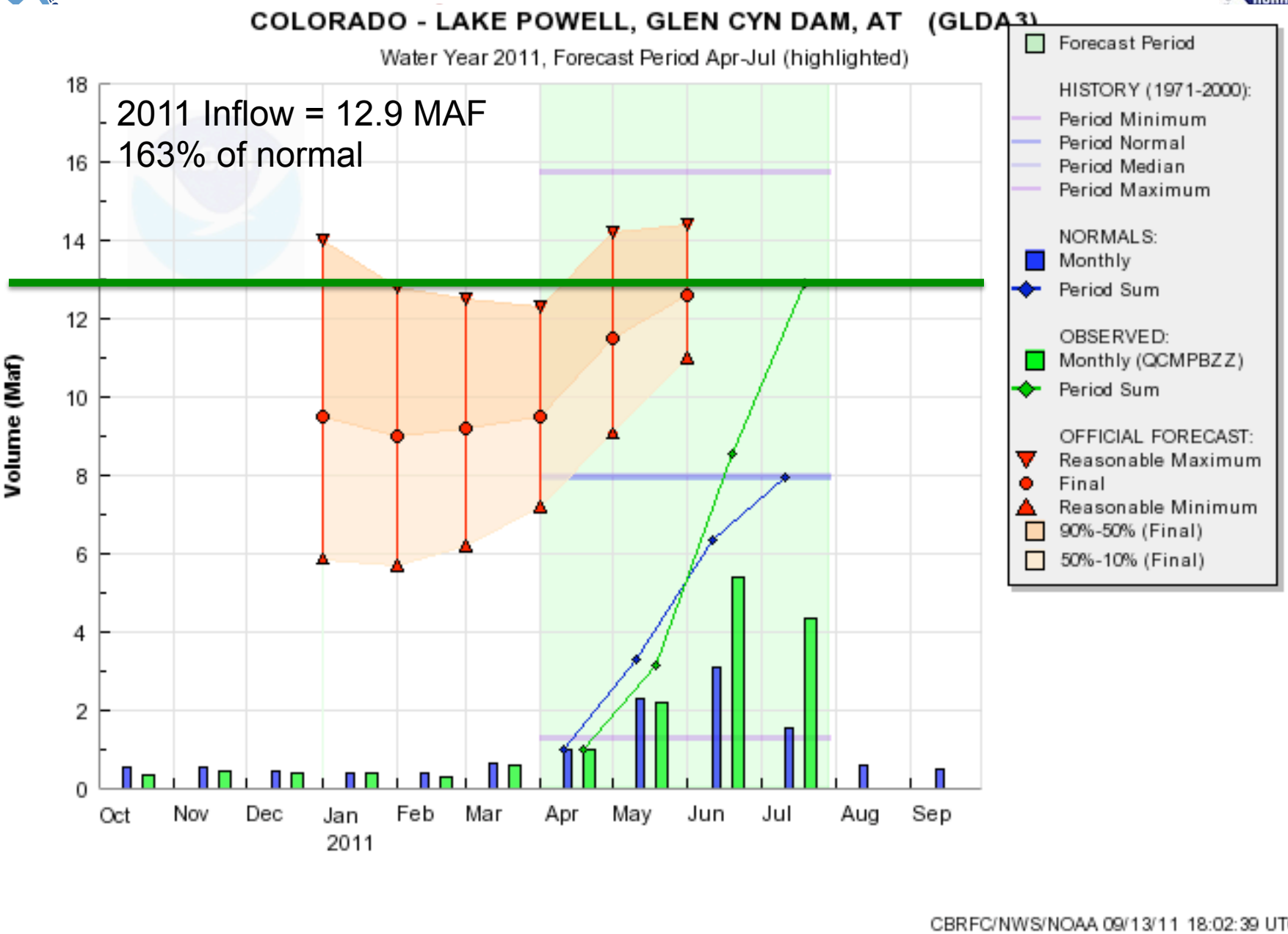
Gunnison basin divided wet conditions to the north and near average to the south. Hwy 50 was a rough dividing line

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



Gunnison: Long Lead Forecasts



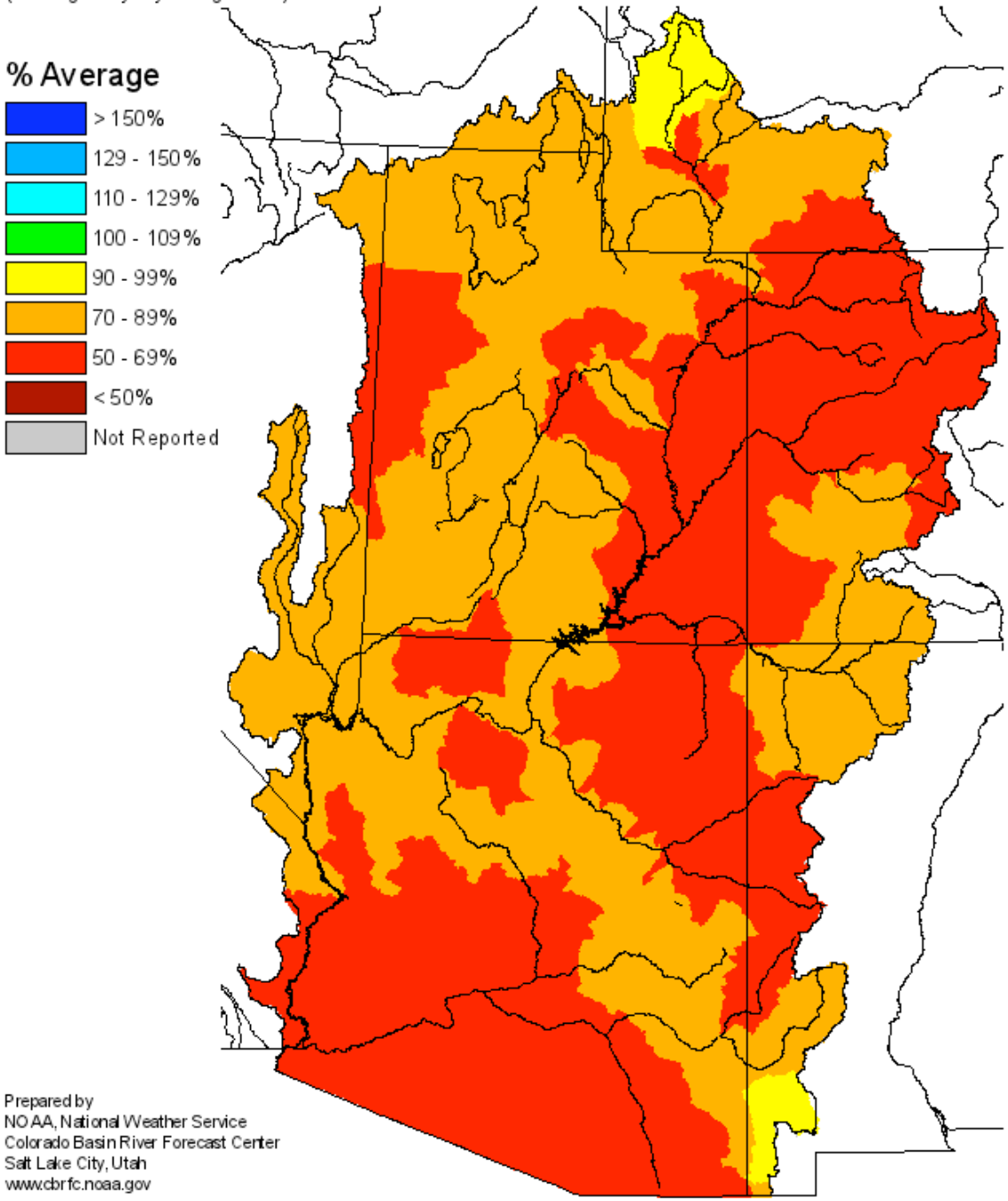


CBRFC/NWS/NOAA 09/13/11 18:02:39 UTC

2012

Seasonal Precipitation, October 2011 - May 2012

(Averaged by Hydrologic Unit)



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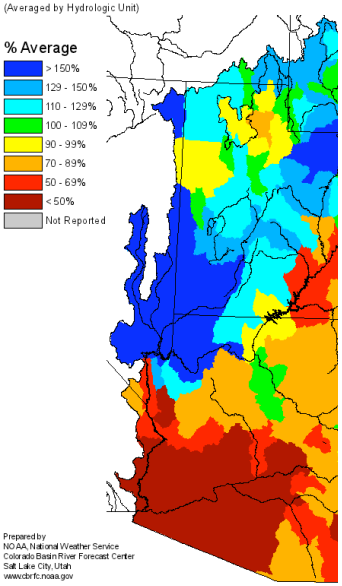
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Monthly Precipitation for October 201

(Averaged by Hydrologic Unit)



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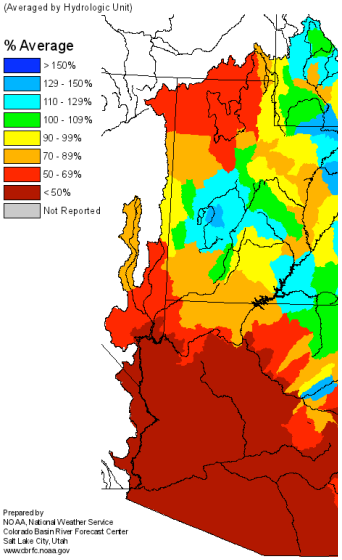
Monthly Precipitation for February 2012

(Averaged by Hydrologic Unit)



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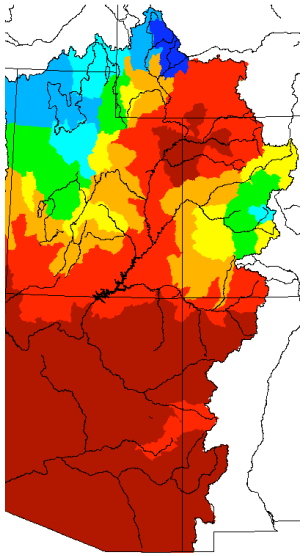
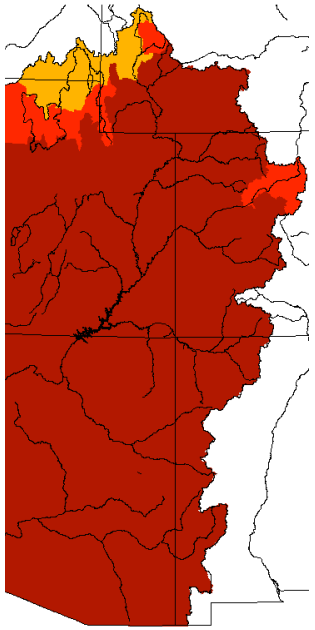
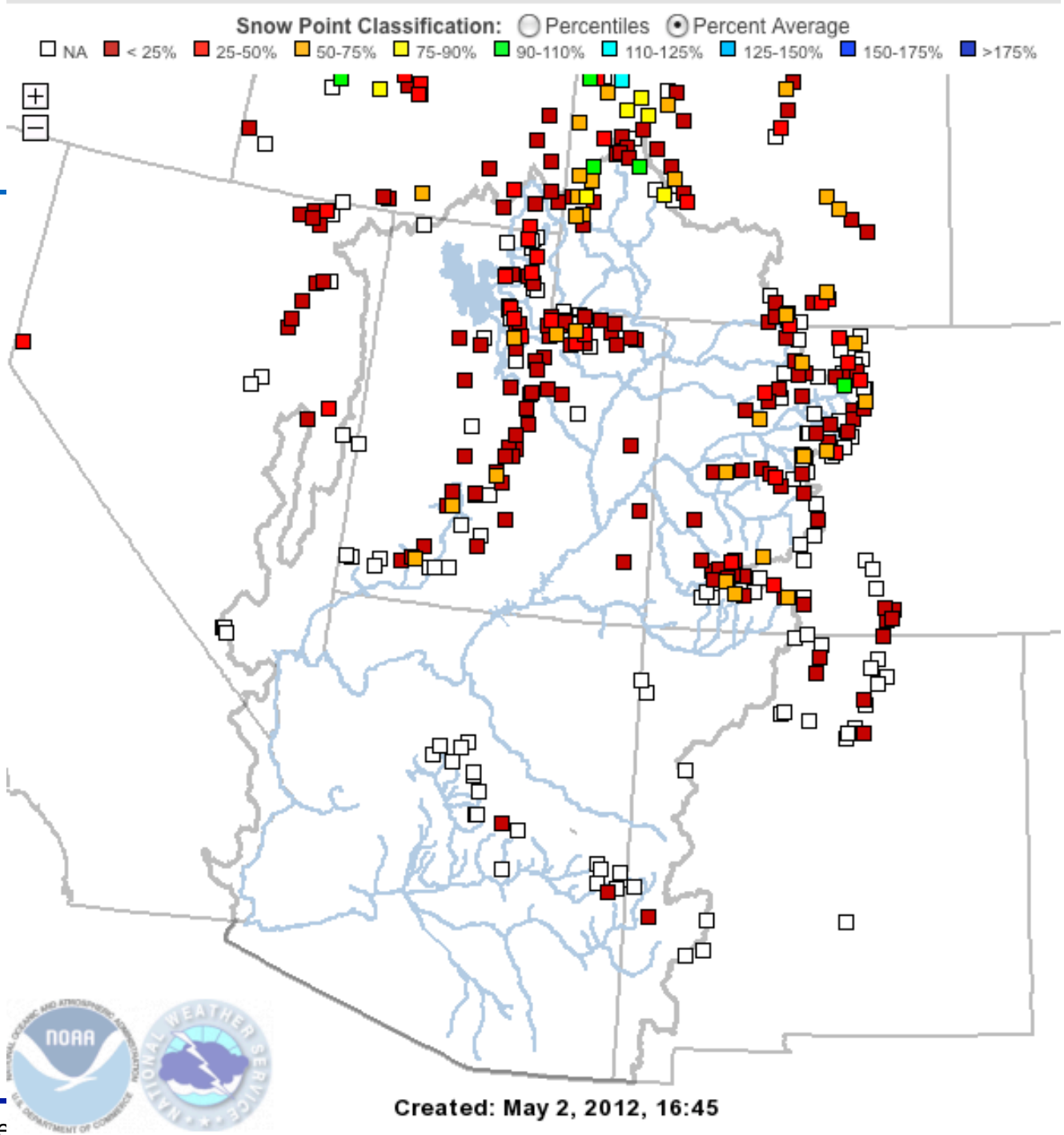
on for January 2012



or May 2012

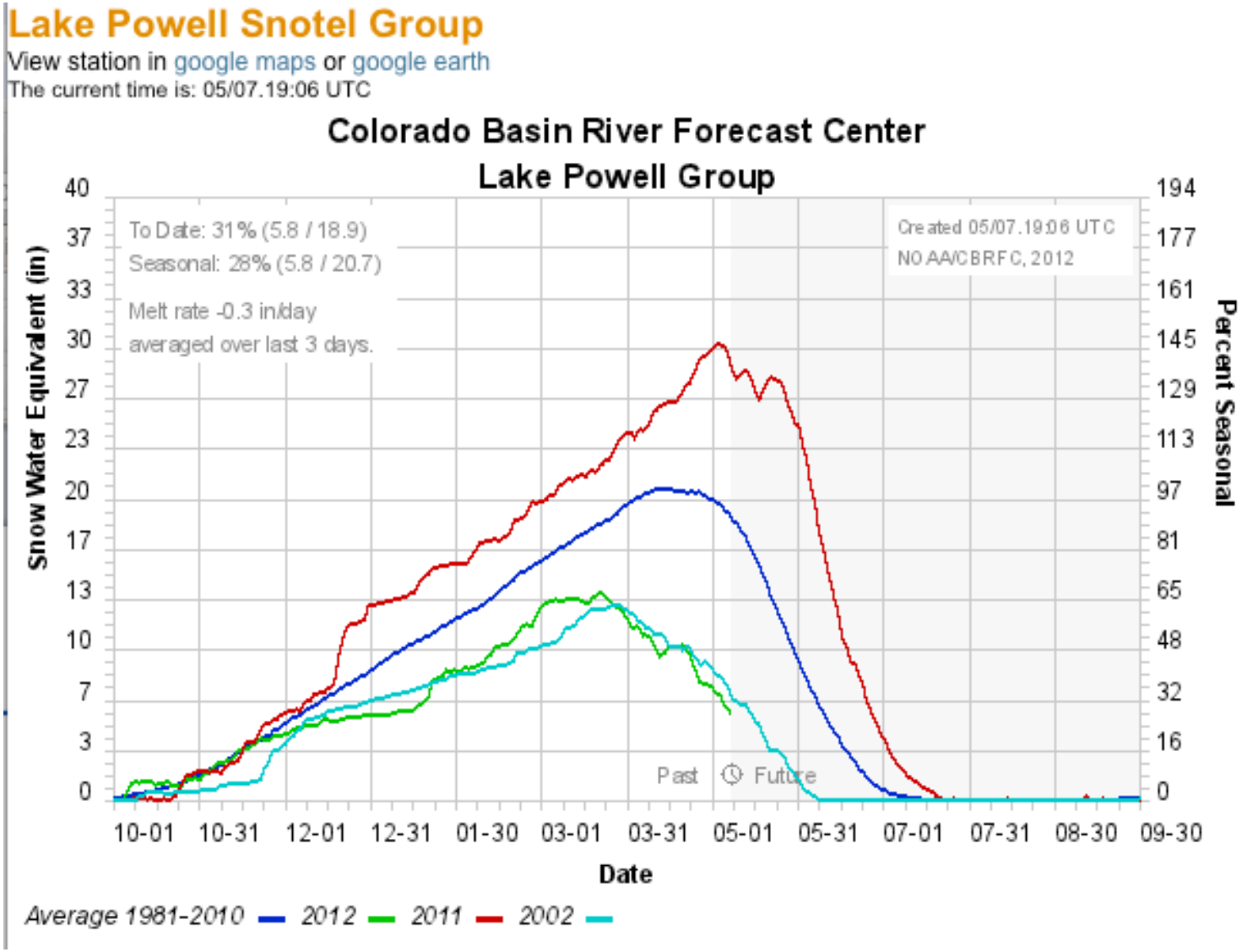


Snow



Web Reference

Snow


Lake Powell Snotel Group
View station in google maps or google earth
The current time is: 05/07.19:06 UTC
Colorado Basin River Forecast Center
Lake Powell Group
To Date: 31% (5.8 / 18.9)
Seasonal: 28% (5.8 / 20.7)
Melt rate -0.3 in/day
averaged over last 3 days.
Created 05/07.19:06 UTC
NOAA/CBRFC, 2012
Snow Water Equivalent (in)
Percent Seasonal
40
37
33
30
27
23
20
17
13
10
7
3
0
194
177
161
145
129
113
97
81
65
48
32
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Past
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10-01
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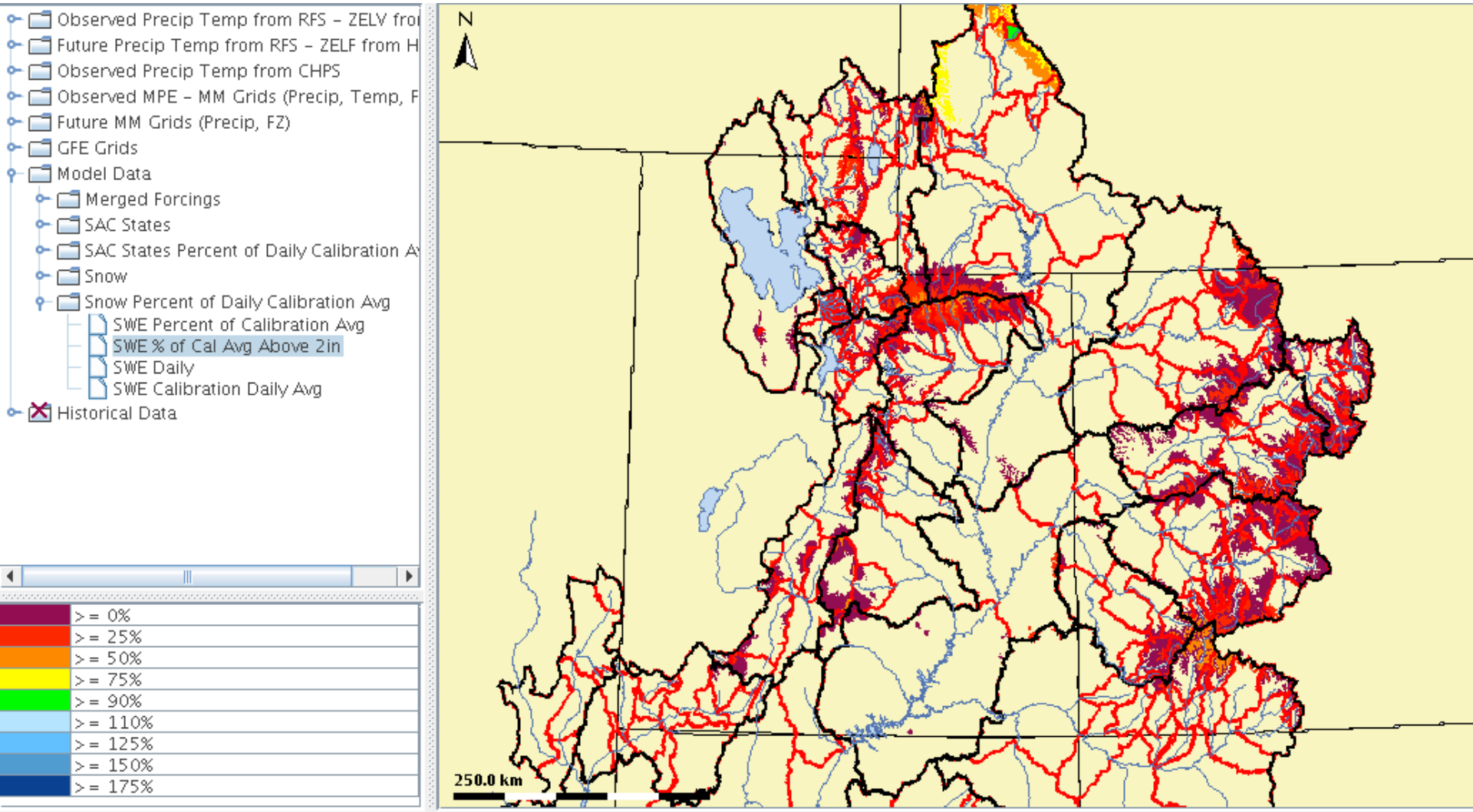
Average 1981-2010
2012
2011
2002


Observed Precip Temp from RFS – ZELV fro
Future Precip Temp from RFS – ZELF from H
Observed Precip Temp from CHPS
Observed MPE – MM Grids (Precip, Temp, F
Future MM Grids (Precip, FZ)
GFE Grids
Model Data
Merged Forcings
SAC States
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>= 0%
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>= 50%
>= 75%
>= 90%
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>= 125%
>= 150%
>= 175%
N
250.0 km

2012

Tuesday, May 1st 41° F | 7-day forecast

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Drought: Will there be a call on the Colorado River?

Send us your news

Saturday, April 28, 2012

By Janice Kurbjun
Summit Daily News

Email | Print

ENLARGE

The reduction in water levels due to drought on Lake Mead can be seen by the white ring around the shore at Hoover Dam in this Friday, July 21, 2006 file photo in Boulder City, Nev.
APfile photo

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Bloomberg Businessweek

Global Economics | Companies & Industries | Politics & Policy | Technology | Markets & Finance | Innovation | Lifestyle

THE ASSOCIATED PRESS April 24, 2012, 11:34AM ET

text size: T | T

Colorado gearing up for possible summer drought

DENVER

Colorado is preparing to tap a law that allows a water trust to lease water from willing water users to preserve wildlife and plants.

The Natural Resources Conservation Service is warning stream flows are likely to be low across the state this summer.

The law was passed in 2003 to protect waterfowl, wildlife, fish, bugs and plants.

The Colorado snowpack is down to 35 percent of the statewide average, as of Monday. The North Platte and South Platte basins in northern Colorado were in the best shape, at 48 percent of average.

MORE FROM BUSINESSWEEK

Anadarko Fights Ailing Preacher in $25 Billion EPA Toxic Lawsuit

The Worst Deal in Mutual Funds Faces a Reckoning

Indicated Dividend Yield Ranking for the S&P 500 by Industry

Indicated Dividend Yield Rankings of S&P 500 Companies

S&P 500 Analyst Estimate Revisions for April 30

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OUT WEST

Rafting Colorado rivers not so wild in 2012: Water levels could be just right for first-timers, families

PRINT | EMA
0 COMMENT
STORY STAT

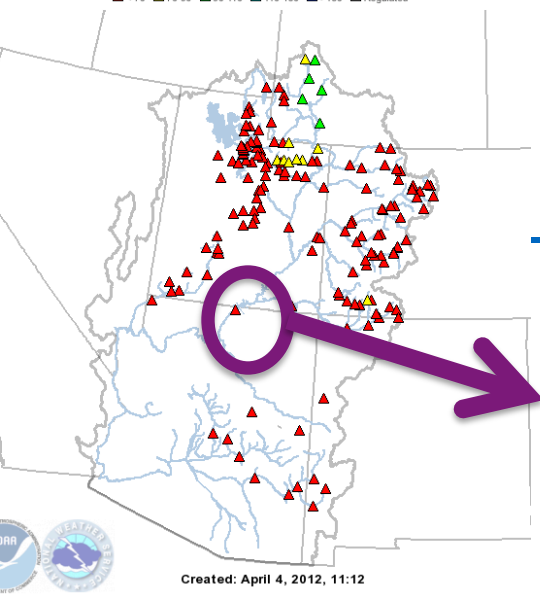
By Kyle Wagner
The Denver Post

POSTED: 05/01/2012 01:00:00 AM
UPDATED: 05/01/2012 10:52:22 AM

Boaters with Kodi Rafting ride the rapids into Seidel's Suckhole on the Arkansas River through Brown's Canyon Thursday. (*Mark Fox, Summit Daily file*)

So, Goldilocks, last year you said you didn't want to go whitewater rafting because the rivers' water levels were too high.

What's your excuse this year?



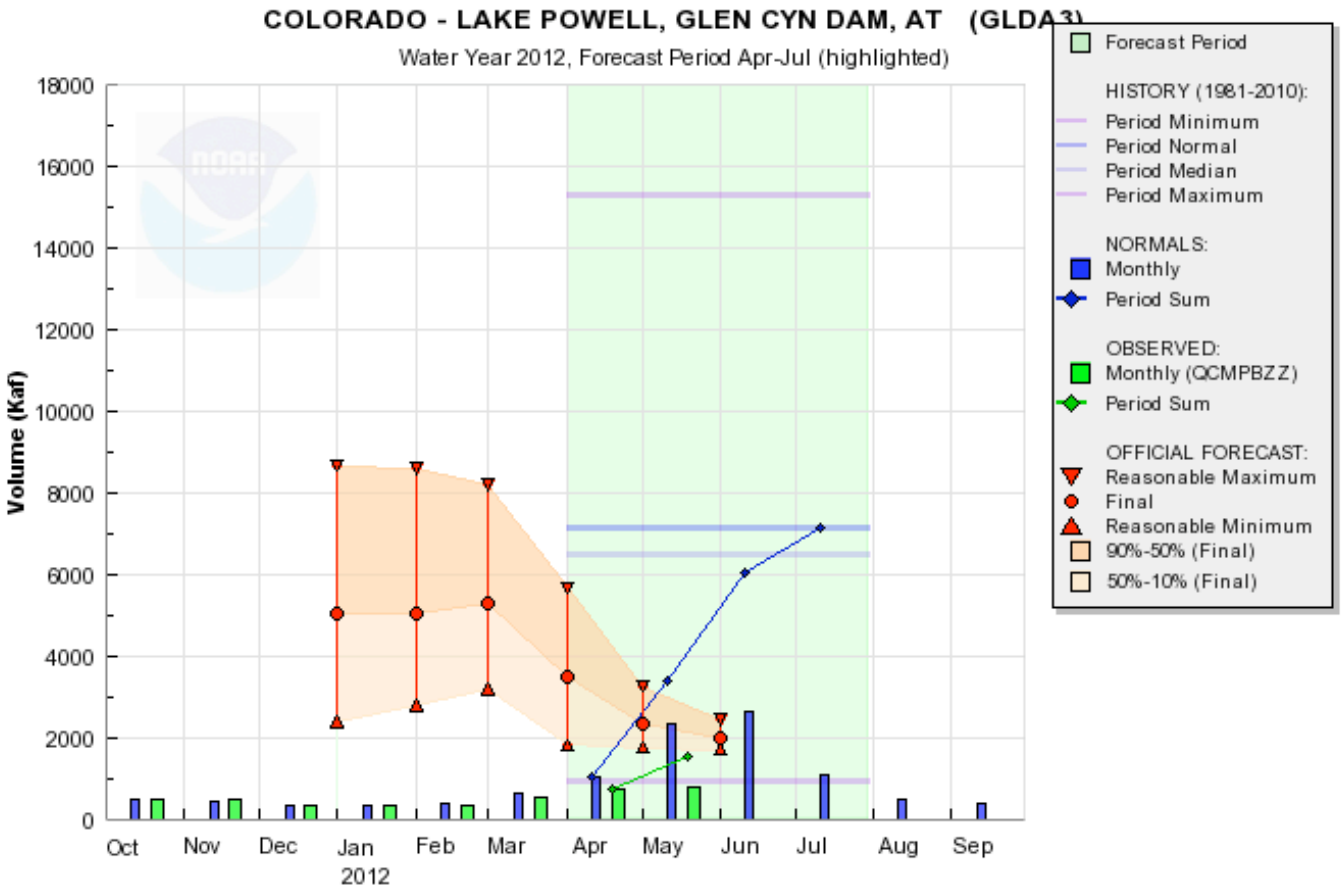
Seasonal Water Supply Forecast

Forecast Period: Apr-Jul

2010 kaf 50% Exceedence (Official Forecast)	**31%** of Historical Median	**28%** of Historical Mean
1710 kaf 90% Exceedence	**2450 kaf** 10% Exceedence	**100th of 103** Official Historical Flows

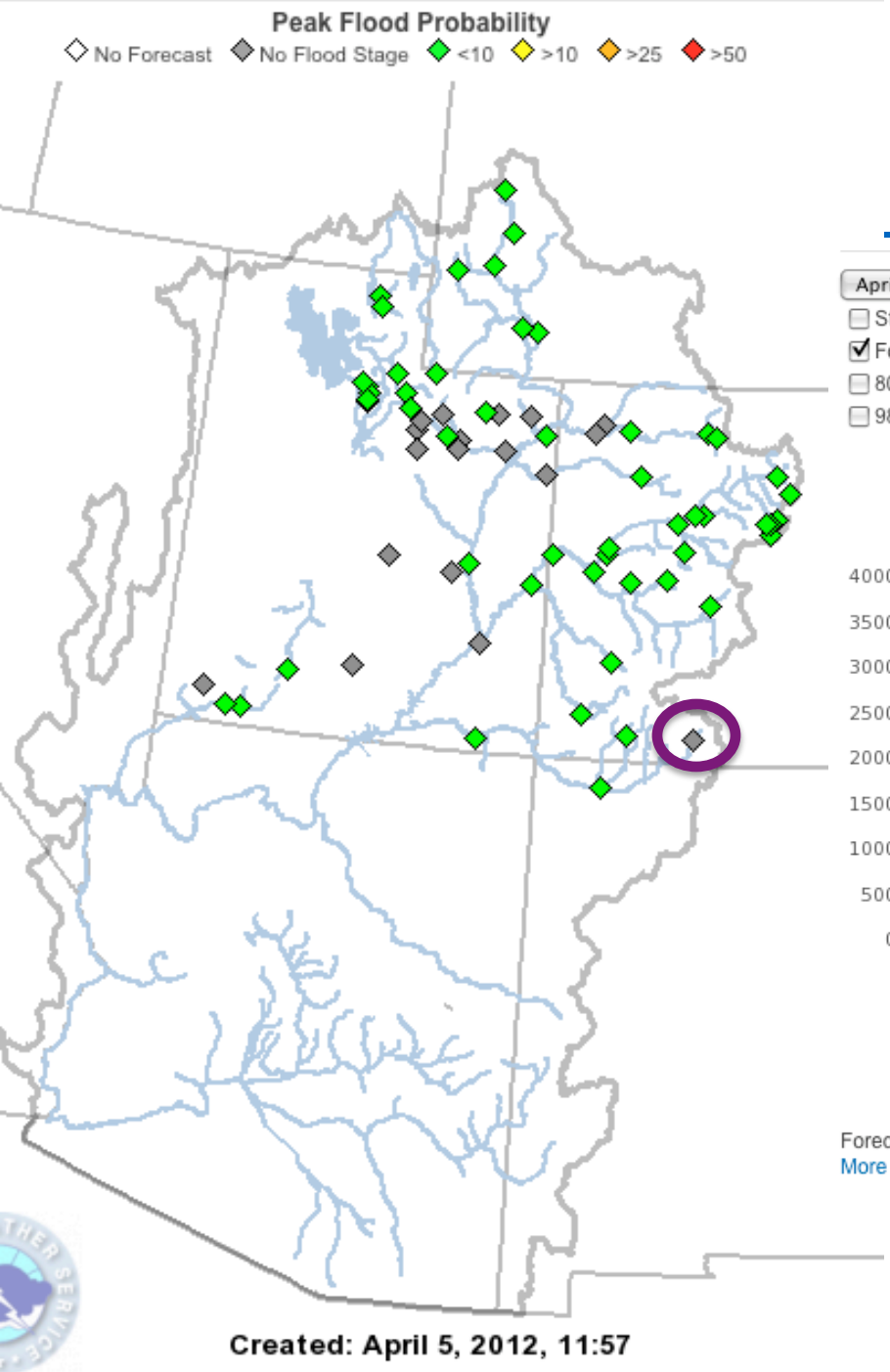
Forecast Issued: Jun 1 2012

View Water Supply Forecast Plot



CBRFC/NWS/NOAA 06/06/12 16:56:26 UTC

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



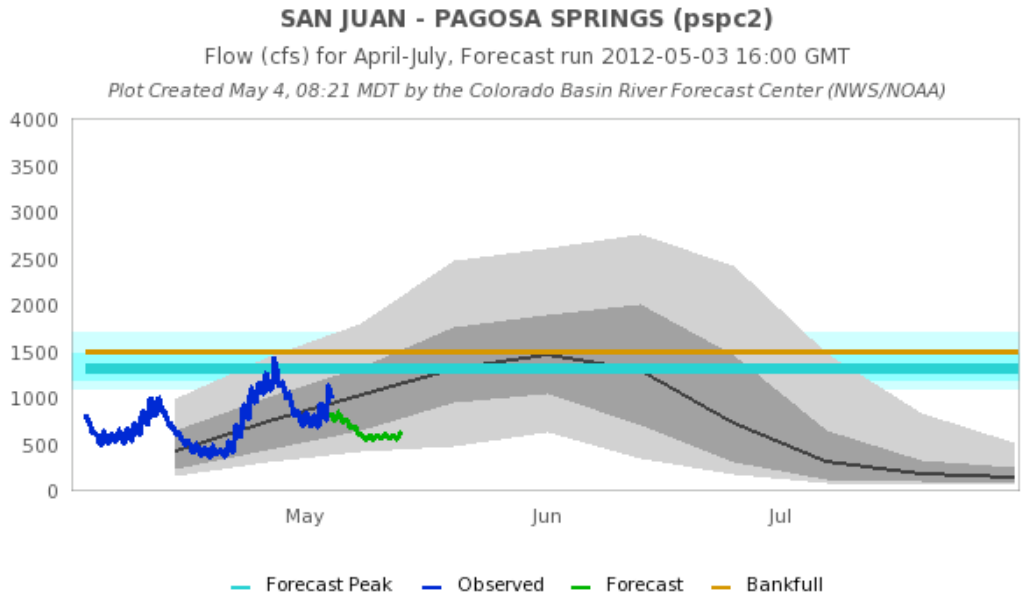
April–July

Stage Simulated Flood Statistics

Forecast Peak Historical Peak Yearly Peaks Stage vs Flow

80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97

98 99 00 01 02 03 04 05 06 07 08 09 10 11



Forecast Peaks are Mean Daily. Historical and Yearly Peaks are Instantaneous.

More Plot Options

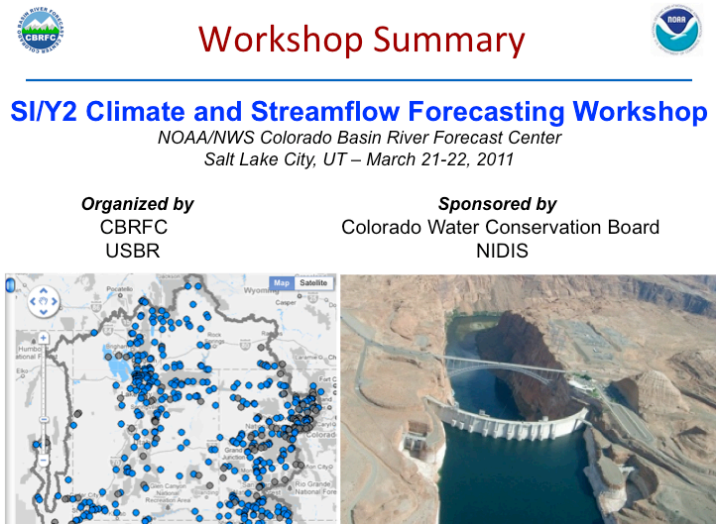
Barriers, Gaps, Chasms

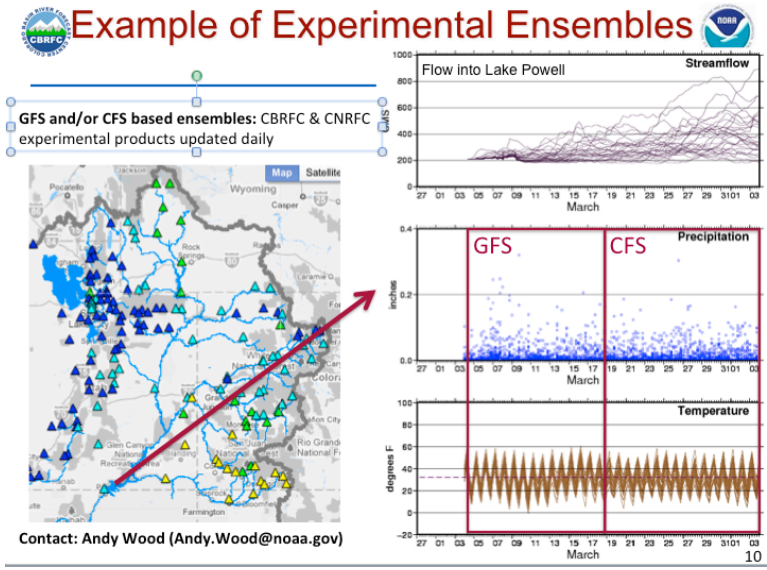
Common Stakeholder Requirements

- More frequent updates of our long lead products
- More analysis - often involving climate science plus water resources
- More metadata and data about our forecast process:
  - raw model forecasts
  - snow distribution
  - model forcing information
- Longer lead forecasts - even with minimal skill

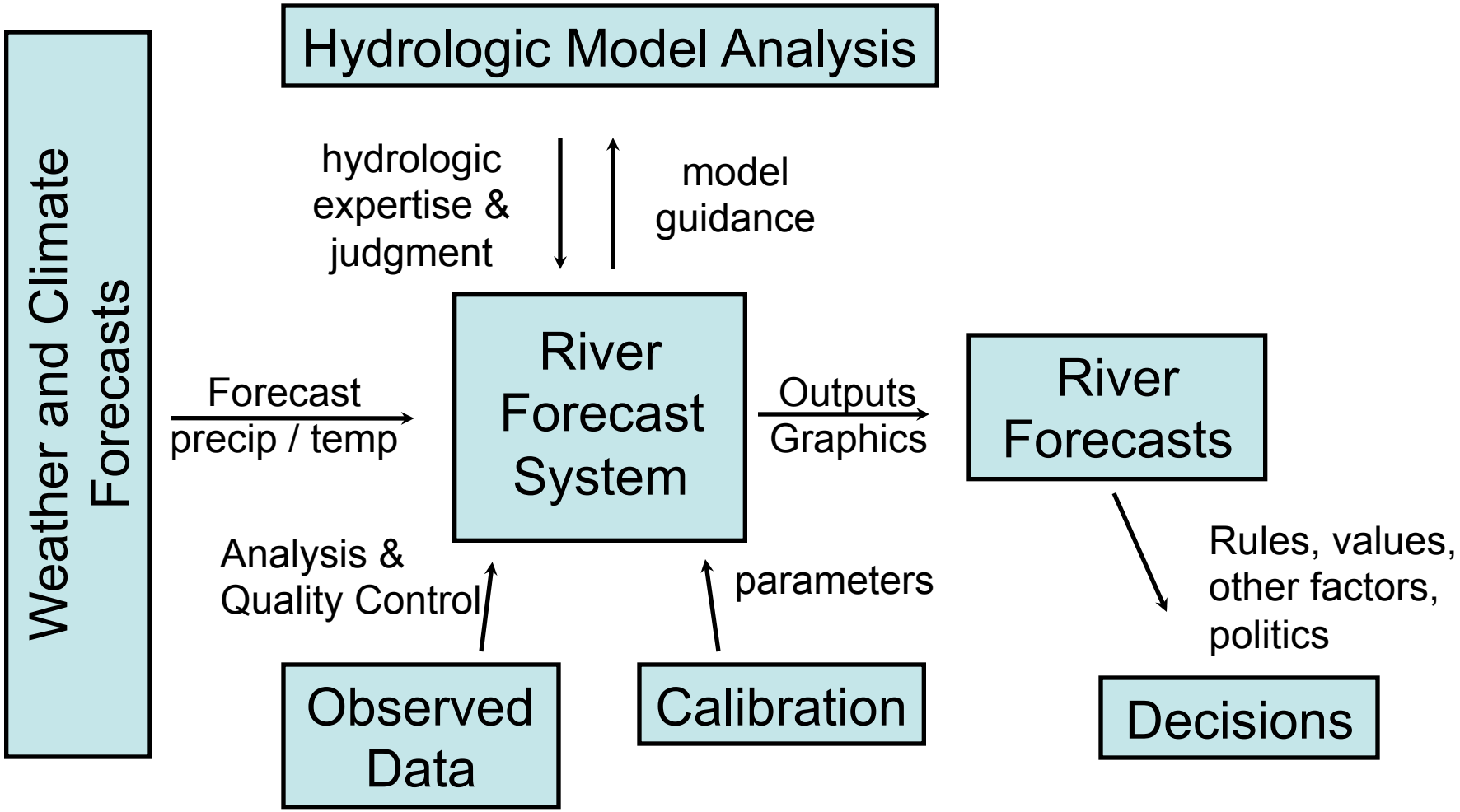
Service Gaps & Science Challenges

- Skillful seasonal forecast for Upper Colorado (minimal ENSO signal)
- 2-5 year forecasts
- Water Demand / ET forecasts
- Probabilistic streamflow forecasts across time scales
- Dust on snow
- Beetle kill
- Connecting forecasts and science to stakeholder decisions

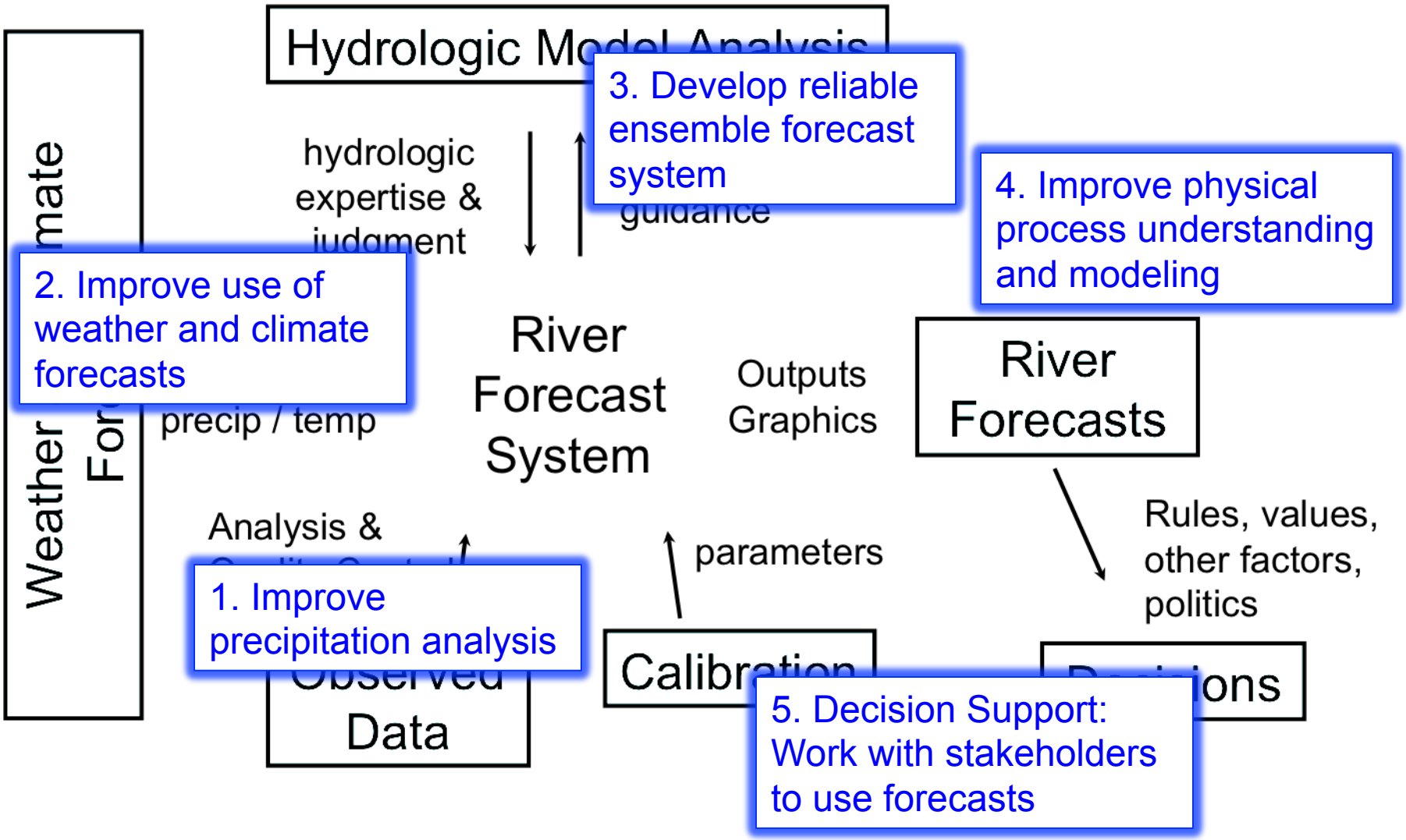




Research Needs



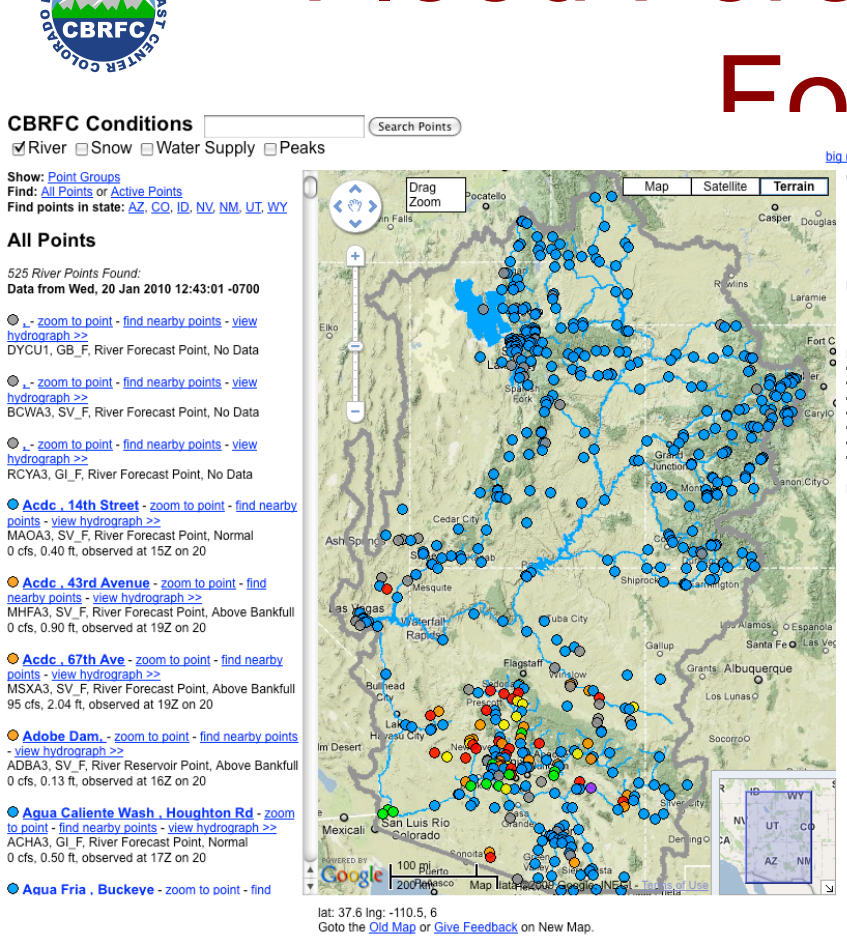
Research Needs

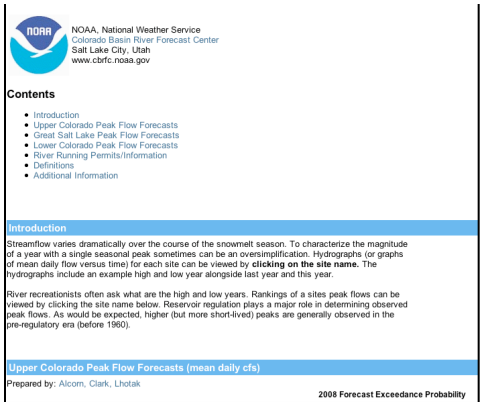


Forecast Methodology

Flood Forecasts / Routine Forecasts

- Nominally provided at ~400 points every 6 hours out to 14 days.
- Flexible web interface to forecasts and data
- Requires large amounts of data (e.g. snow, precip, temps, streamflow)




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

Contents

- Introduction
- Upper Colorado Peak Flow Forecasts
- Great Salt Lake Peak Flow Forecasts
- Lower Colorado Peak Flow Forecasts
- River Running Permits/Information
- Definitions
- Additional Information

Introduction

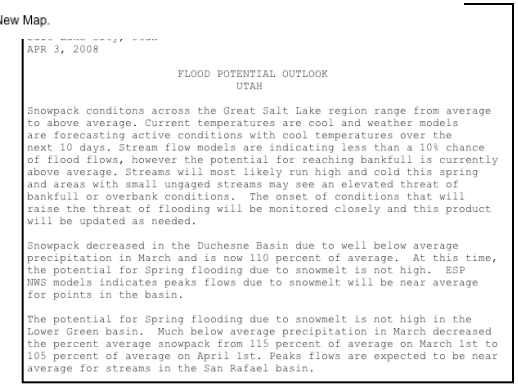
Streamflow varies dramatically over the course of the snowmelt season. To characterize the magnitude of a year with a single seasonal peak sometimes can be an oversimplification. Hydrographs (or graphs of mean daily flow versus time) for each site can be viewed by **clicking on the site name.** The hydrographs include an example high and low year alongside last year and this year.

River recreationists often ask what are the high and low years. Rankings of a sites peak flows can be viewed by clicking the site name below. Reservoir regulation plays a major role in determining observed peak flows. As would be expected, higher (but more short-lived) peaks are generally observed in the pre-regulatory era (before 1960).

Upper Colorado Peak Flow Forecasts (mean daily cfs)

Prepared by: Alcorn, Clark, Lhotak

2008 Forecast Exceedance Probability

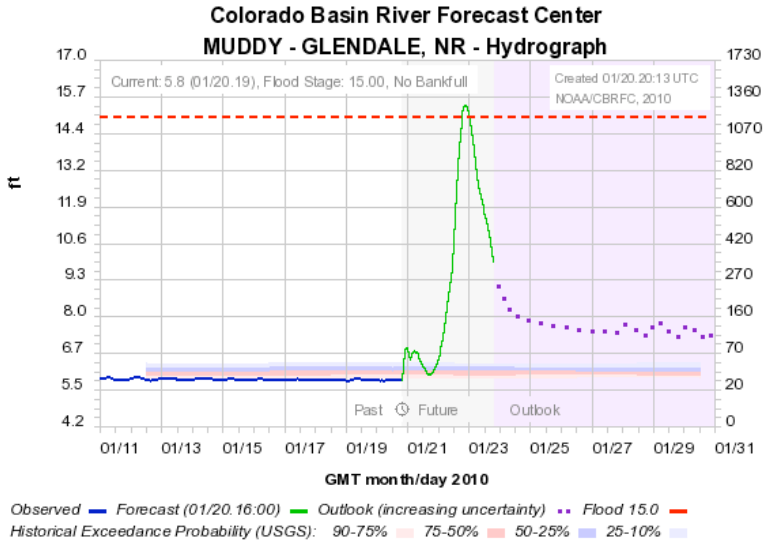

APR 3, 2008

FLOOD POTENTIAL OUTLOOK
UTAH

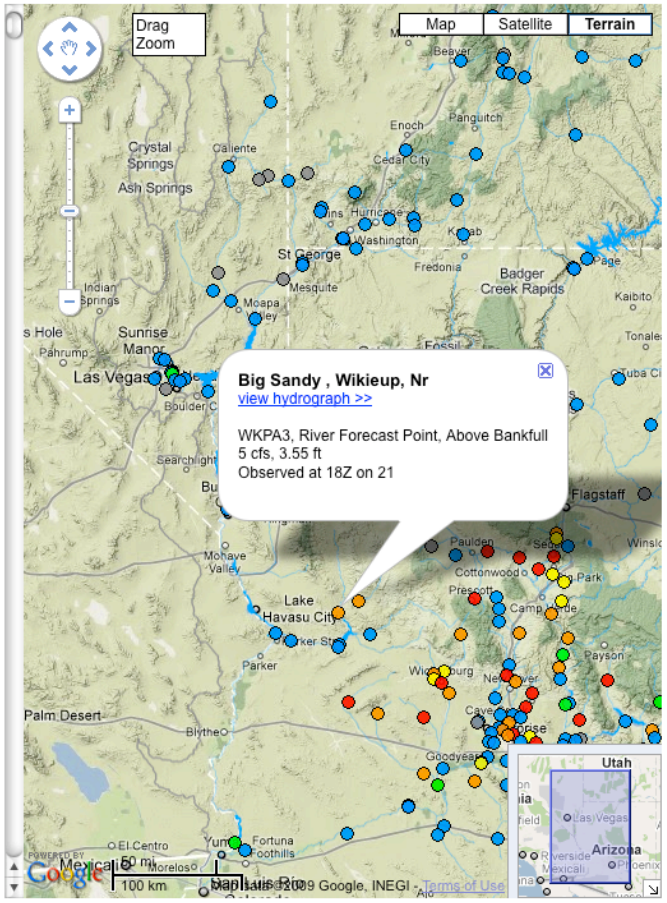
Snowpack conditons across the Great Salt Lake region range from average to above average. Current temperatures are cool and weather models are forecasting active conditions with cool temperatures over the next 10 days. Stream flow models are indicating less than a 10% chance of flood flows, however the potential for reaching bankfull is currently above average. Streams will most likely run high and cold this spring and areas with small ungaged streams may see an elevated threat of bankfull or overbank conditions. The onset of conditions that will raise the threat of flooding will be monitored closely and this product will be updated as needed.

Snowpack decreased in the Duchesne Basin due to well below average precipitation in March and is now 110 percent of average. At this time, the potential for Spring flooding due to snowmelt is not high. ESP NWS models indicates peaks flows due to snowmelt will be near average for points in the basin.

The potential for Spring flooding due to snowmelt is not high in the Lower Green basin. Much below average precipitation in March decreased the percent average snowpack from 115 percent of average on March 1st to 105 percent of average on April 1st. Peaks flows are expected to be near average for streams in the San Rafael basin.



Flood and Daily Forecasts



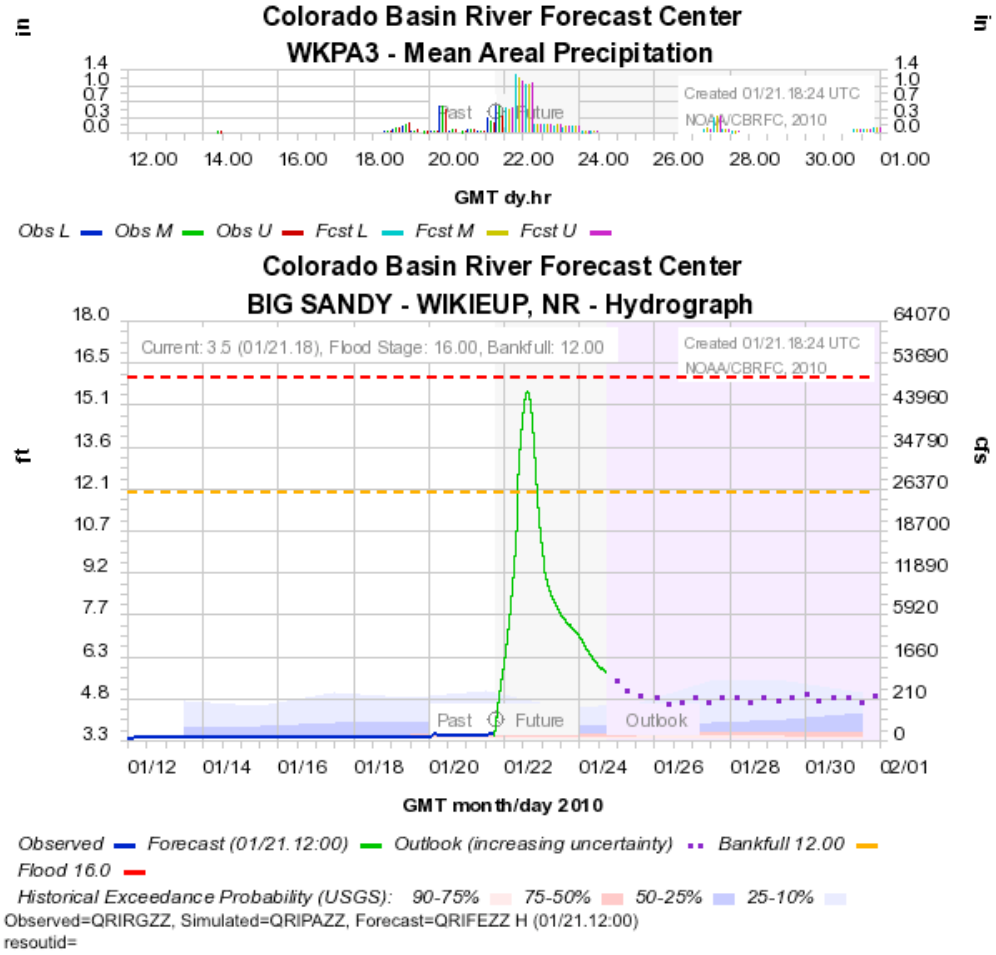
lat: 35.59 lng: -113.58, 7
Goto the Old Map or Give Feedback on New Map.

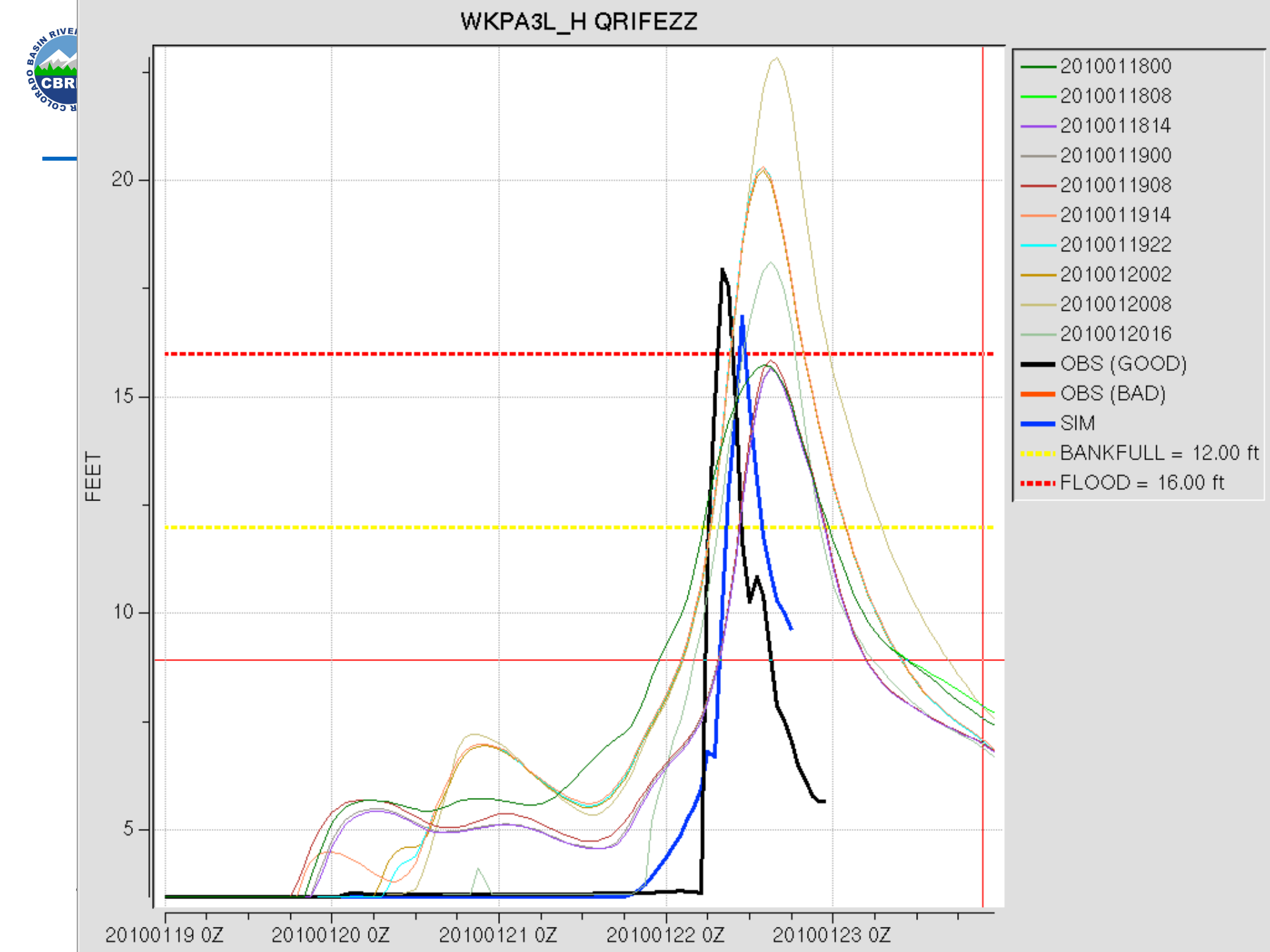
Overlays
- [x] Rivers
- [x] RFC
- [ ] Basins
- [ ] Grids (Precip etc.)

Display Options
- [ ] Show NWS ID
- [ ] Show Data

River Point Condition
- No Data
- Normal
- Significant Rise
- Near Bankfull
- Above Bankfull
- Above Flood Stage
- Outlook (> 3 days)

River Point Options
- [ ] All
- [x] Basins Above Normal
- [ ] Data Points
- [x] Forecast Points
- [x] Reservoir Points
- [x] Active Points

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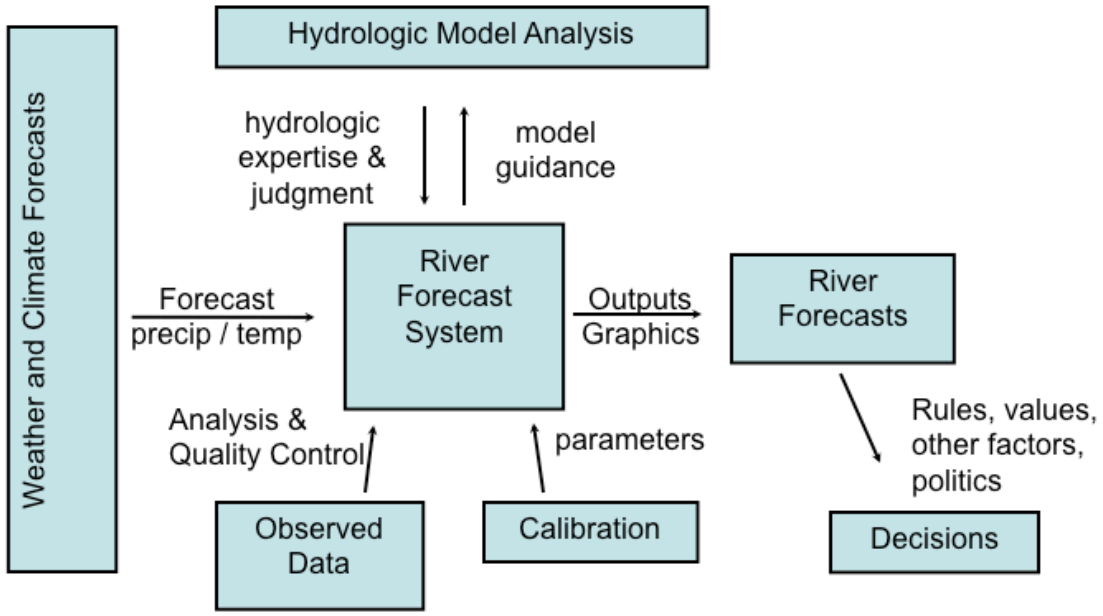
2010011814
2010011900
2010011908
2010011914
2010011922
2010012002
2010012008
2010012016
OBS (GOOD)
OBS (BAD)
SIM
BANKFULL = 12.00 ft
FLOOD = 16.00 ft

CBRFC Forecast Strategy

1. Data QA/QC
2. Weather Forecast
3. Reservoir Regulation
4. Snow and Hydrologic Model Analysis
5. Dissemination and Product Generation



Data QA/QC

- Rating Curves – Check USGS and CO updates daily
- Temperature and Precipitation Analysis (MPE and daily_qc)
- Maintain bad sensor list – check periodically and sent to WFOs every Monday

CBRFC Rating Curve Update Cycle

Every day
- Check our current stage/flow relationship against the USGS Current Conditions listing.
- If our flow is more than 5% different than USGS flow we download the latest available rating from the Rating Depot.

2x week
- Download all ratings from the USGS Rating Depot.
- Download all ratings/shifts from the Colorado Division of Water Resources.

Occasionally (not often)
- Download ratings for Arizona ALERT sites.
- Hard to find, not easy to automate download.

All new ratings are stored to the CBRFC database and copied to CHPS for use in our daily model.

Rating Curve Extension

- Stored rating tables are extended to all E-19 critical stages (bank, flood, moderate, and major).
  - Any of these values that are above the base rating obtained from the owner agency have a flow value calculated for them using a log10 extension of the rating.
  - These calculated stage-flow pairs are then added to the stored table in our database.
- On-the-fly extensions for real-time stage values above the stored table also use a log10 extension.
  - These stage values are not part of the table so the flow value at the CBRFC may be different from the WFO (don't know how IHFS handles extensions).
  - Model (CHPS) also uses a log10 extension.

Rating Transfer to WFOs

Every Monday the stored ratings from the CBRFC database are sent to the WFO's over AWIPS.

- This includes the calculated points for critical stages.
- Does not send ratings for ALERT sites.
  - Originally, all ALERT ratings were obtained from the WFO.
  - Does this need to be changed?

WFO's should be running 'Update_Ratings' on the AWIPS cron.

- Sees the file when it arrives and stores the ratings in the IHFS database.
- Don't know how this will work in AWIPS II.

Ongoing and Future Projects related to Ratings

Better way to update ALERT ratings.

Ability to store more pairs per table.

- Current max allowed is 100.

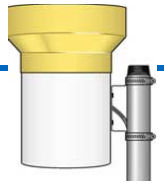
Reservoirs

- Start storing spillway curves to our database.
  - Currently only within the model.
- Update elevation-storage curves.

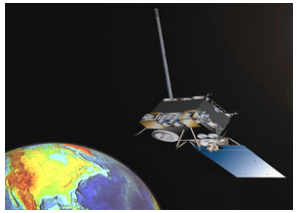
Better way to determine extensions through critical stages.

Quantitative Precipitation Estimates (QPE)

Rain Gage Measurement

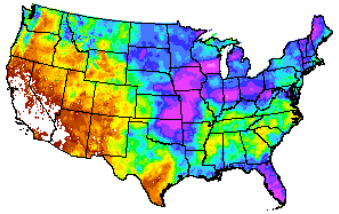


GOES Satellite Estimate



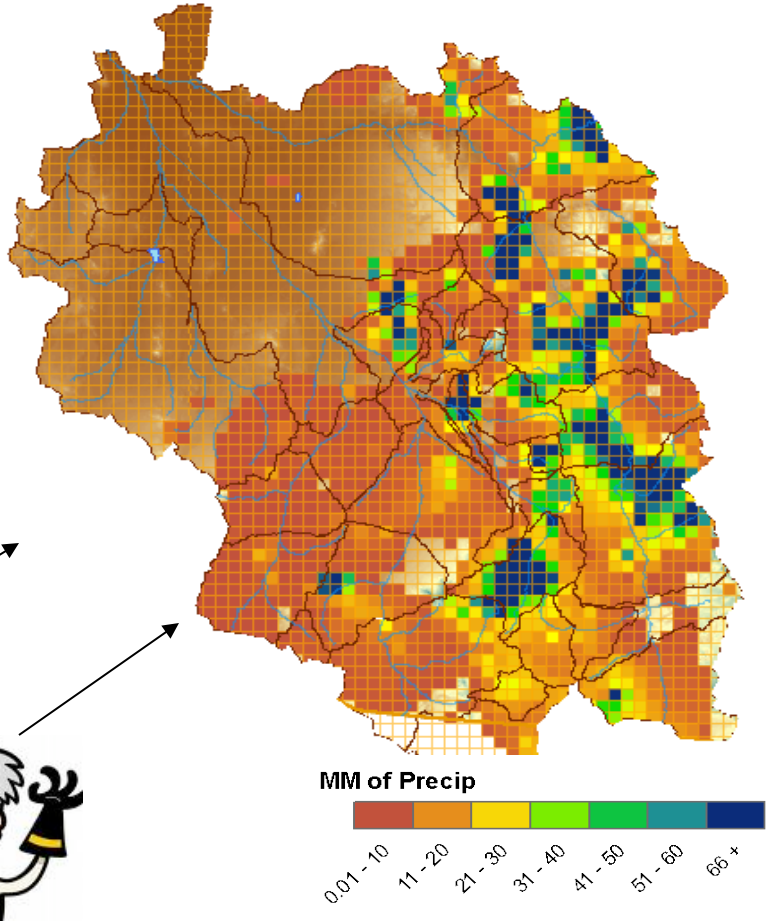
Radar Estimate

Climate patterns



Forecaster Analysis

Gridded Precipitation Estimate

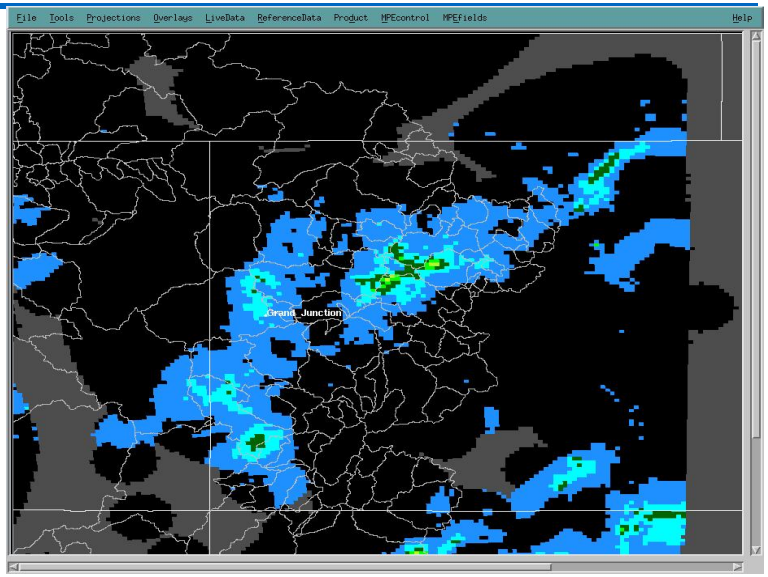


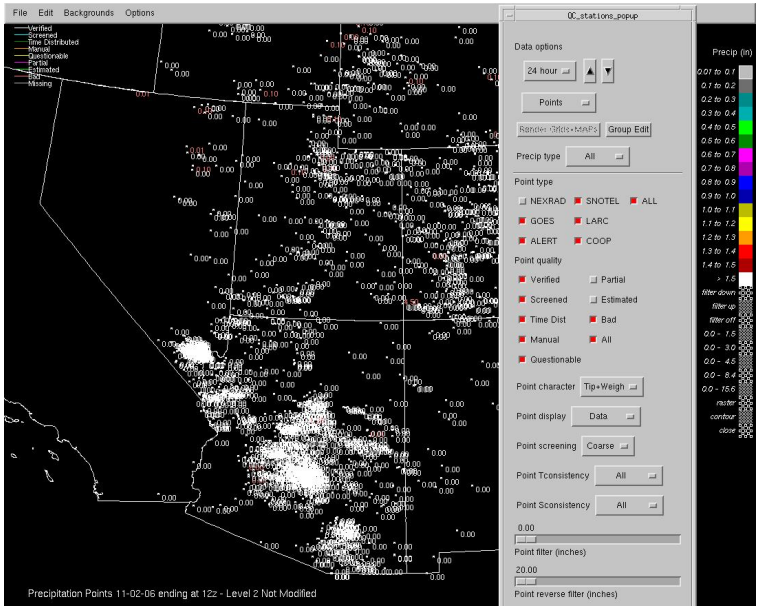
QPE (con't)

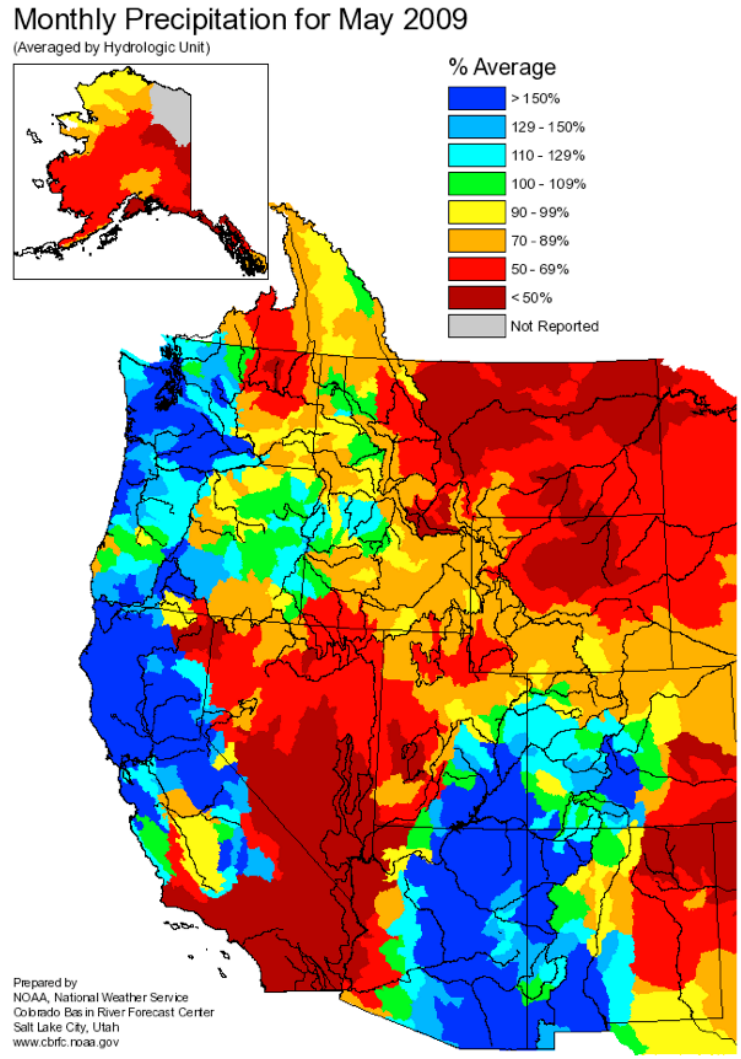
Produced hourly, daily, monthly and seasonally

Analysis procedures address bad sensors (e.g. frozen gauges)

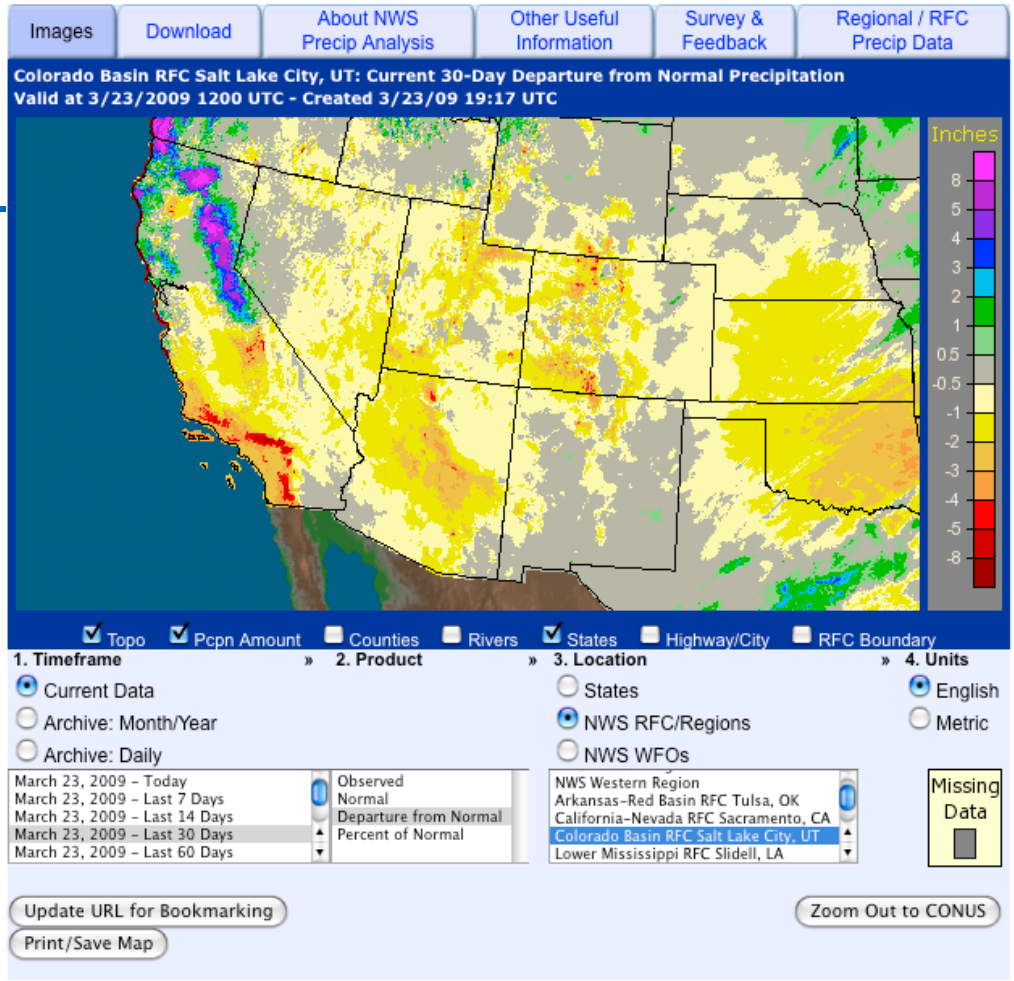
Output available through webpages…







Source: www.cbrfc.noaa.gov



Source: water.weather.gov

WFO Bad Sensor List

Sent every Monday

If you think a listed sensor is good, please contact CBRFC operations: cbrfc.operations@noaa.gov or 801.524.5130

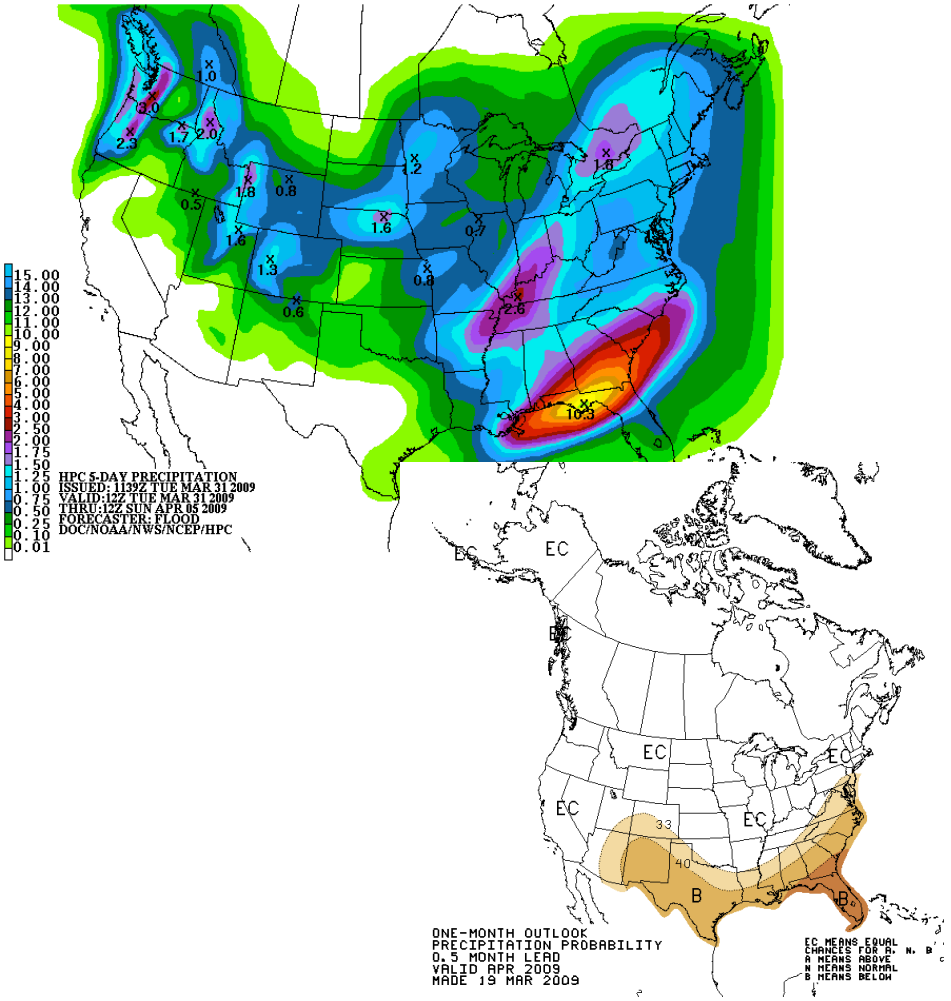
Bad Sensor listing for bou on 06/07/2012 20:57

ID	Sensor	Date	Time	Reason
20V	PPDRZZZ	01/10/09	1700GMT	always zero
BKRC2	PCIRGZZ	07/20/08	1200GMT	zero precip
BLRC2	PCIRGZZ	05/06/05	1200GMT	no precip
BUCC2	TAIRMXZ	01/13/10	1300GMT	highs 70+
COPC2	TAIRMXZ	01/26/11	0700GMT	too high - 90 in jan!
EVGC2	PCIRGZZ	09/30/10	2100GMT	bad spikes
JNPC2	TAIRMNZ	10/28/09	1400GMT	wrong climo
JNPC2	TAIRMXZ	10/28/09	1400GMT	wrong climo
JNPC2	TAIRMZZ	10/27/09	1900GMT	bad climo
KMMC2	PPDRZZZ	07/01/06	1800GMT	zero precip reports when really missing
KMMC2	TAIRZNZ	07/20/03	1600GMT	zero reports
KMMC2	TAIRZXZ	06/03/03	0000GMT	zeros
UVCC2	TAIRMXZ	01/25/11	0700GMT	too high - 90 in jan
WTPC2	TAIRZNZ	09/17/07	1300GMT	equip removed - always sends zero
WTPC2	TAIRZXZ	10/12/04	1700GMT	consistently too low

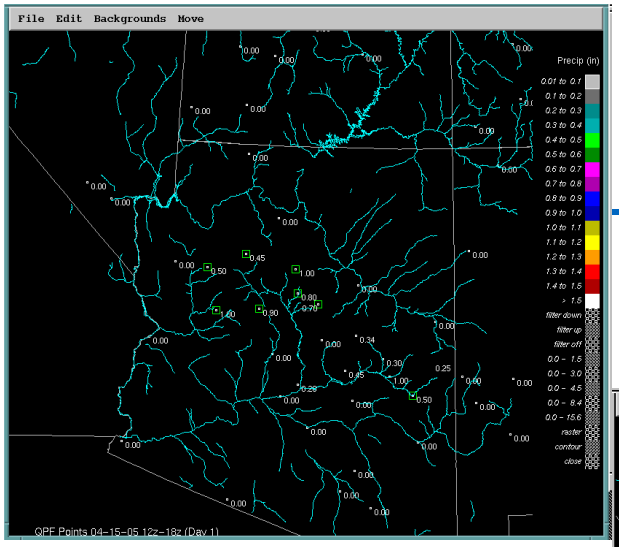
Weather and Climate Forecasts

RFC forecast system incorporates both weather and climate forecasts:

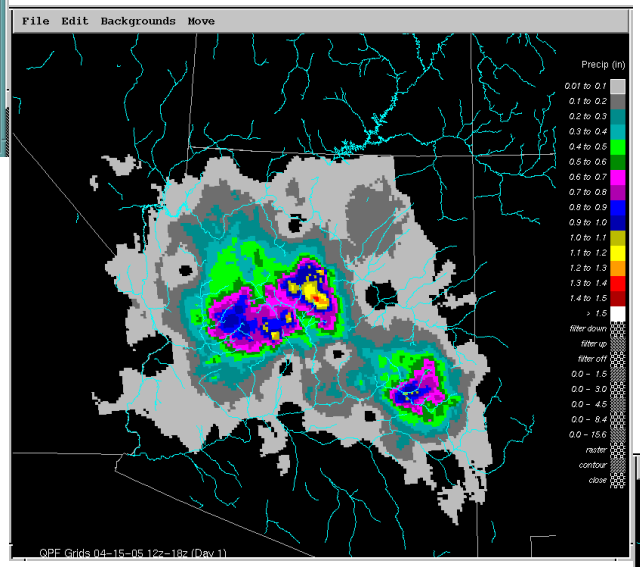
- Weather forecasts integrated into daily operations with forecaster control over point and basin average values
- Climate forecasts integrated into seasonal water supply forecasts through probability shifts of forcing ensemble



QPF

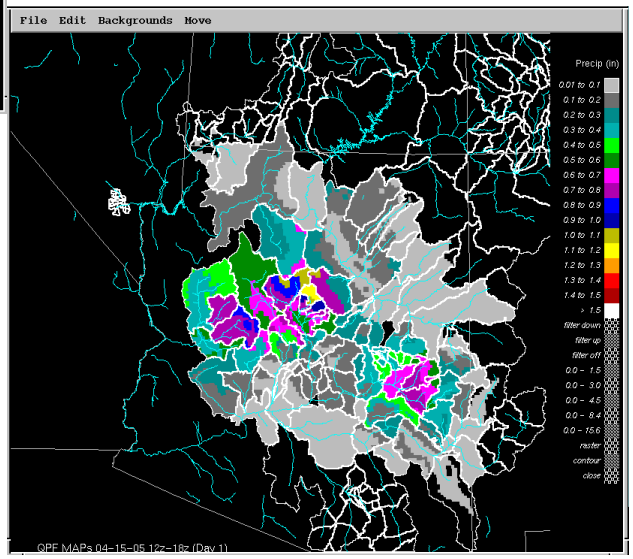


Point Values (HPC)



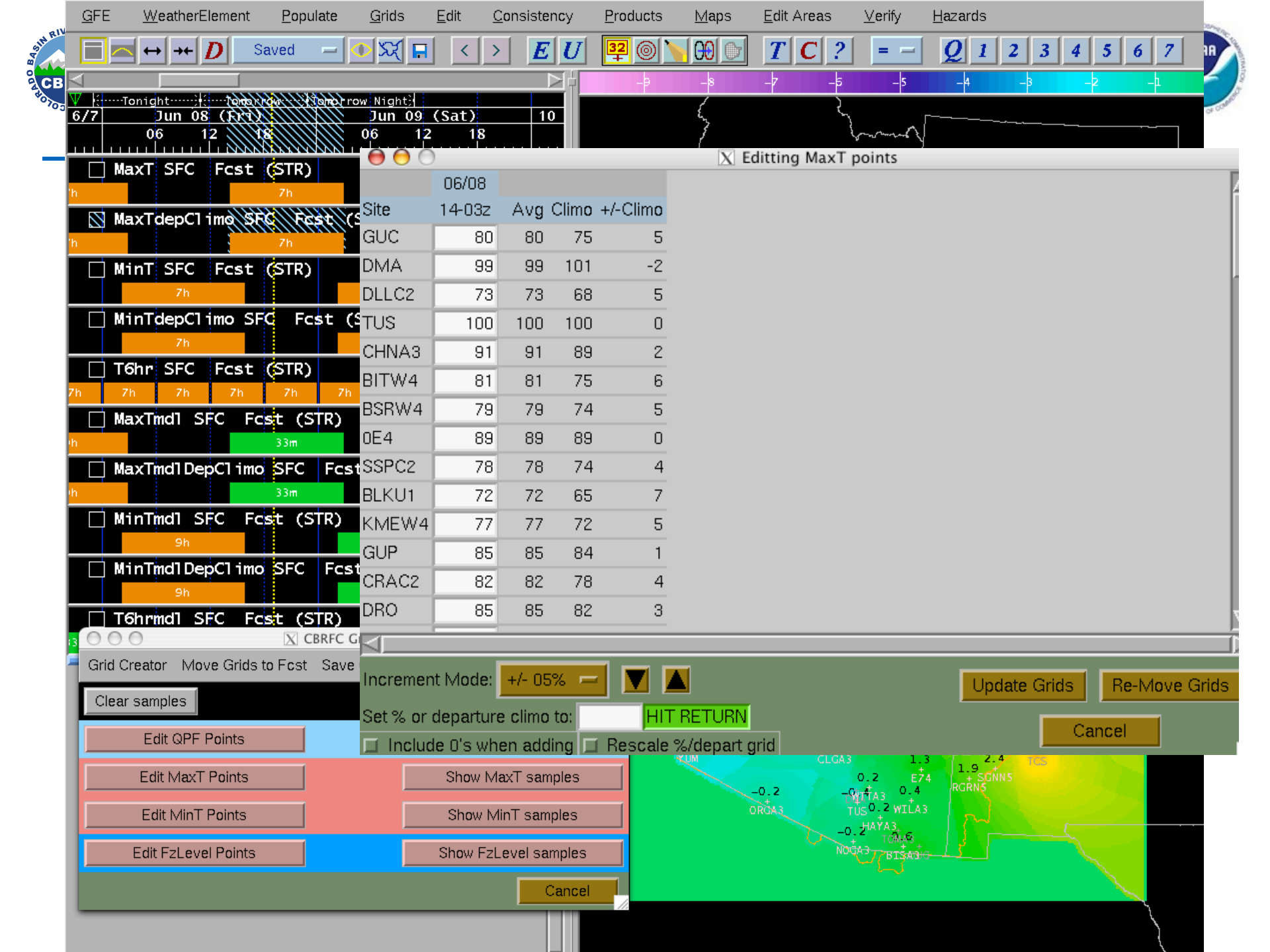
Grid Values (Prism Scaling)

Basin Values

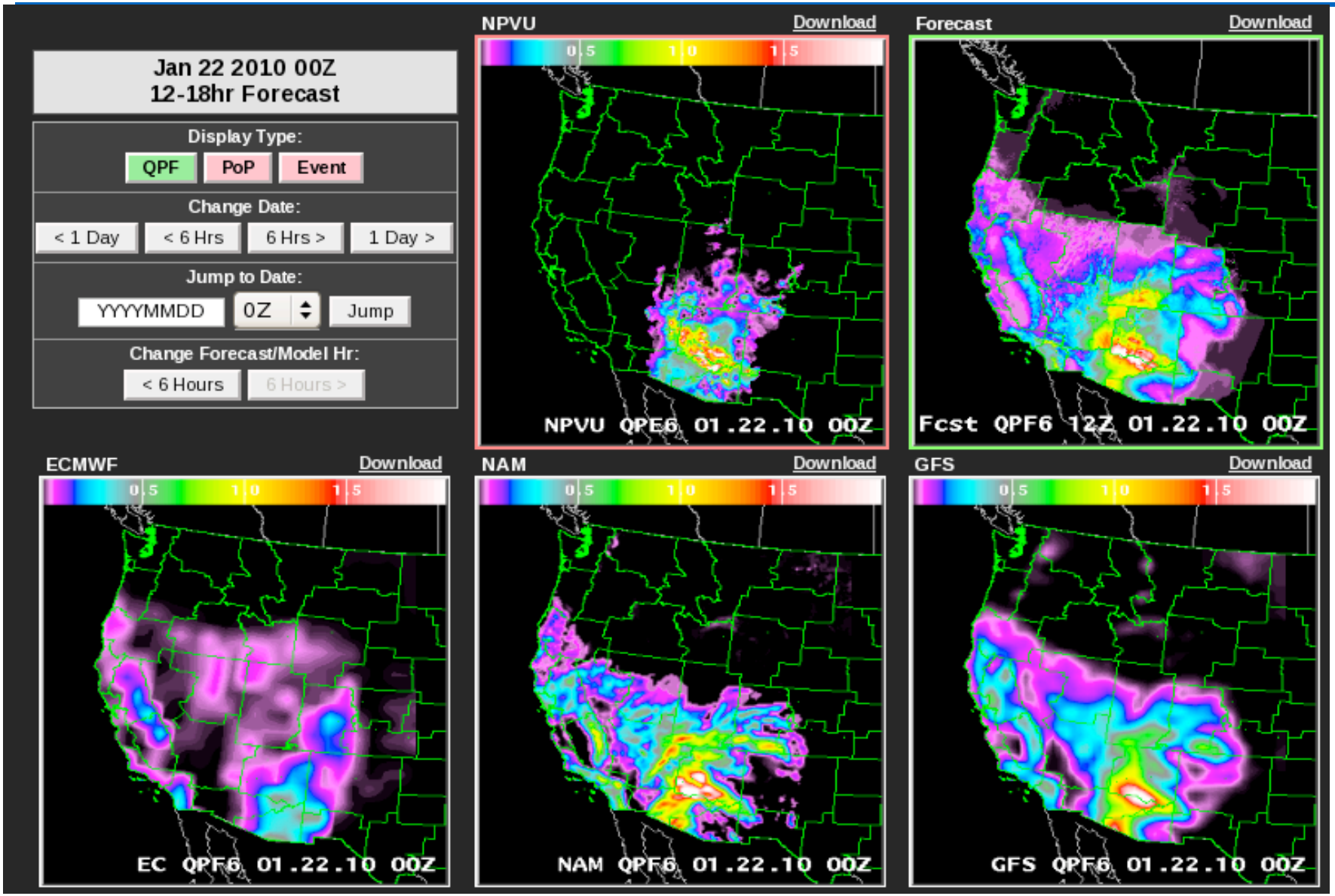


GFE

- Implemented GFE for all forecast forcings (e.g. precipitation, freezing level, temperature) operationally in May 2012
  - HPC provides QPF for days 1-10
  - MOS provides temperature forecasts
- Same tool (GFE) as WFOs
- Allow more collaboration with WFOs on forecasts – especially QPF
- Support future initiatives that require spatial data such as distributed modeling

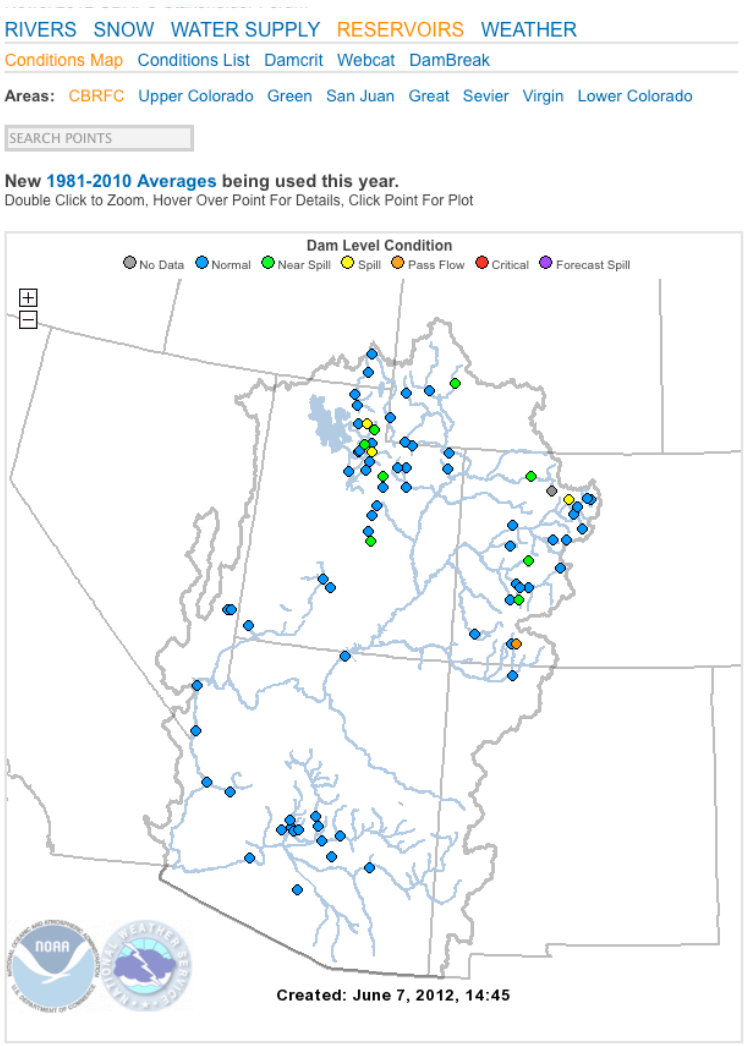

GFE
WeatherElement
Populate
Grids
Edit
Consistency
Products
Maps
Edit Areas
Verify
Hazards
Saved
Tonight
Tomorrow
Tomorrow Night
6/7
Jun 08 (Fri)
Jun 09 (Sat)
10
06
12
18
06
12
18
MaxT SFC Fcst (STR)
MaxTdepClimo SFC Fcst
MinT SFC Fcst (STR)
MinTdepClimo SFC Fcst
T6hr SFC Fcst (STR)
MaxTmdl SFC Fcst (STR)
MaxTmdlDepClimo SFC Fcst
MinTmdl SFC Fcst (STR)
MinTmdlDepClimo SFC Fcst
T6hrmdl SFC Fcst (STR)
7h
33m
9h
Editting MaxT points
06/08
Site
14-03z
Avg
Climo
+/-Climo
GUC 80 80 75 5
DMA 99 99 101 -2
DLLC2 73 73 68 5
TUS 100 100 100 0
CHNA3 91 91 89 2
BITW4 81 81 75 6
BSRW4 79 79 74 5
0E4 89 89 89 0
SSPC2 78 78 74 4
BLKU1 72 72 65 7
KMEW4 77 77 72 5
GUP 85 85 84 1
CRAC2 82 82 78 4
DRO 85 85 82 3
Increment Mode:
+/- 05%
Update Grids
Re-Move Grids
Set % or departure climo to:
HIT RETURN
Cancel
Include 0's when adding
Rescale %/depart grid
CBRFC G
Grid Creator
Move Grids to Fcst
Save
Clear samples
Edit QPF Points
Edit MaxT Points
Show MaxT samples
Edit MinT Points
Show MinT samples
Edit FzLevel Points
Show FzLevel samples
Cancel
YUM
CLGA3
ORQA3
TUS
WILA3
HAYA3
NOGA3
TCS
SCNN5
RGRN5
E74

Verification Example

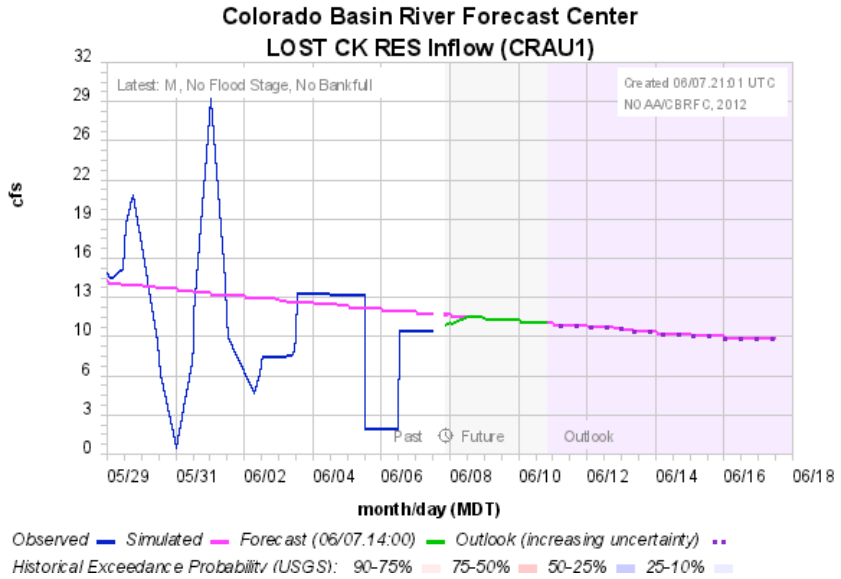


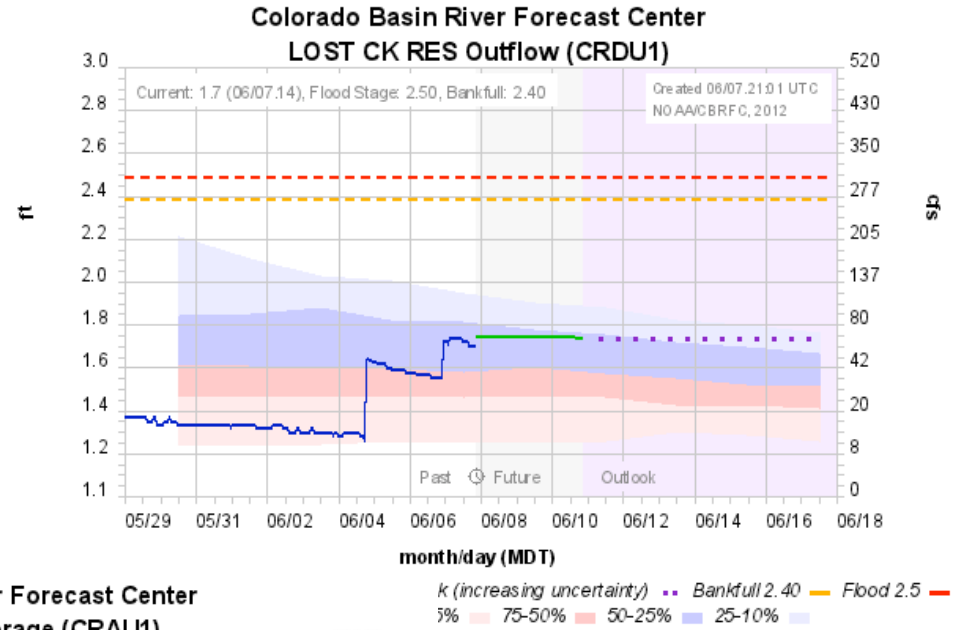
Reservoir Regulation

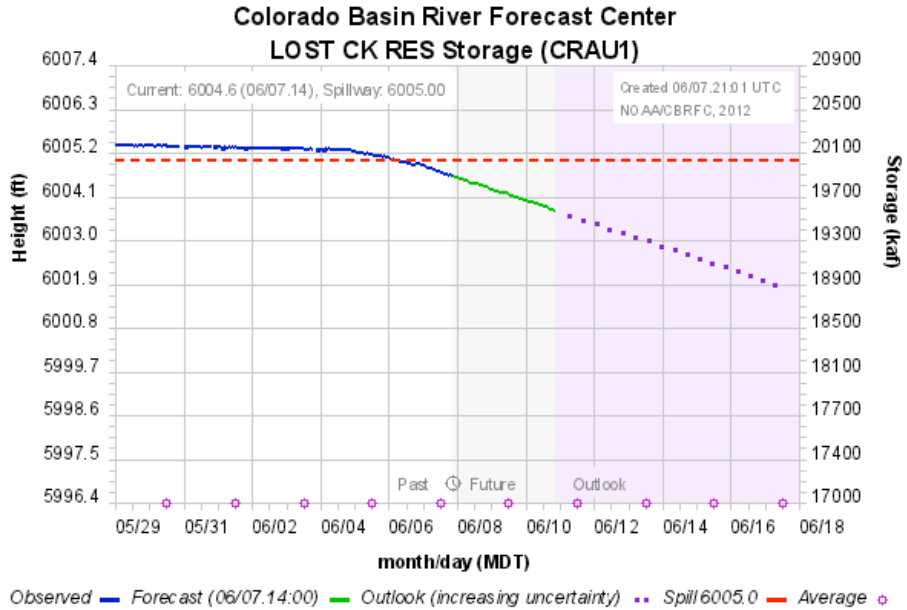
- CBRFC models major reservoirs. This includes inflow, outflow, and reservoir status. This requires:
  - Reservoir releases (past and future)
  - Spillway curve for spilling reservoirs
  - Operation rules (for long lead forecasting and when we don't have current data)



Reservoirs (con't)





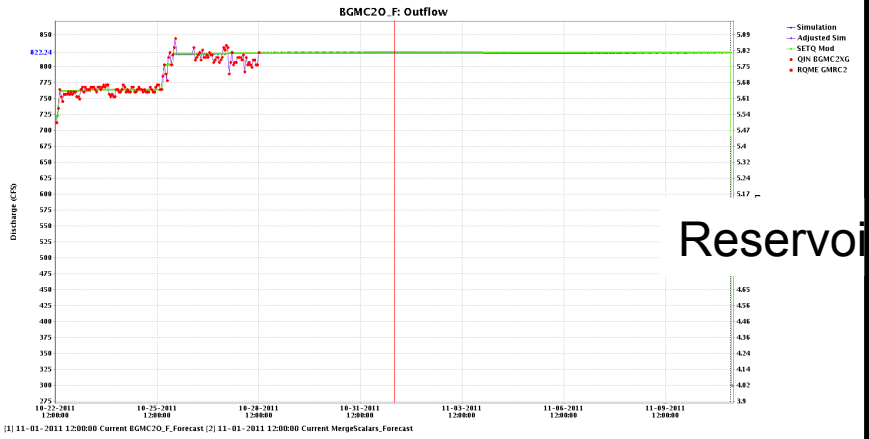


Reservoirs: What We Need

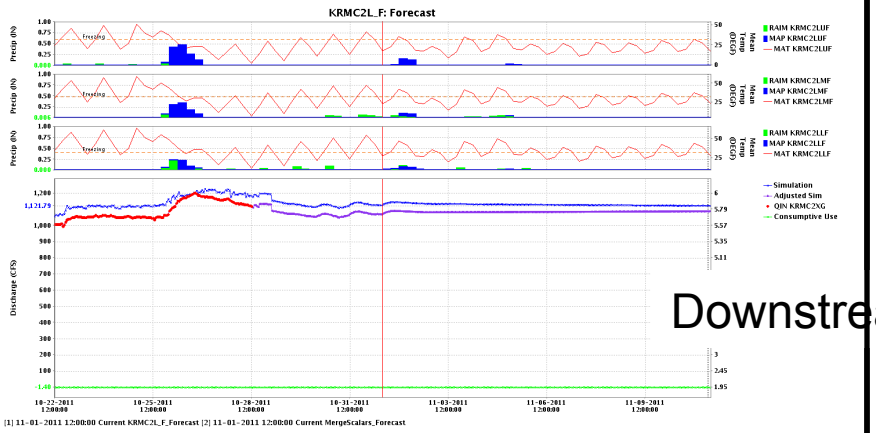
- Real time observed data for reservoirs and diversions.
  - Make sure our starting conditions are correct.
- Short term (~10 day) reservoir release schedules and diversion plans.
  - Help with daily forecasting.
    - We assume current releases will remain constant if we have no other information (and not spilling).
    - Assume either current diversion levels or constant flow left in the river.
  - Especially important when reservoir is getting close to spill, but reservoir operations are planned to avoid/ reduce spill.
    - Our forecasts will show big rises downstream due to expected spill.

Daily Forecasts – Releases

No Release Schedule

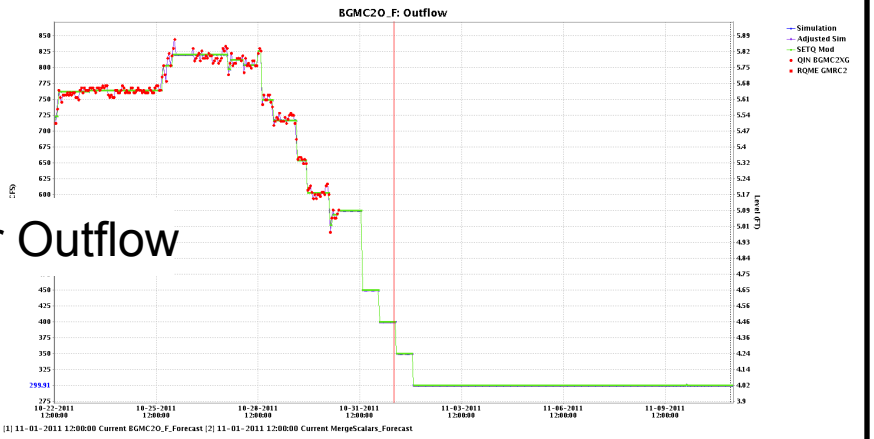


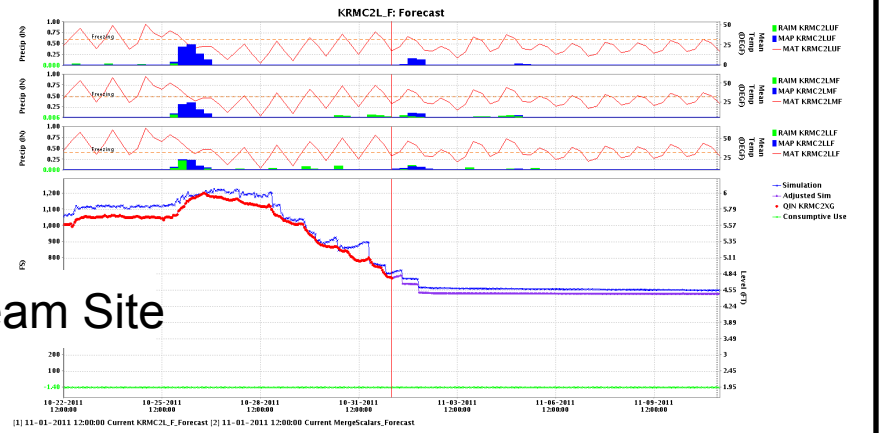
Reservoir Outflow



Downstream Site

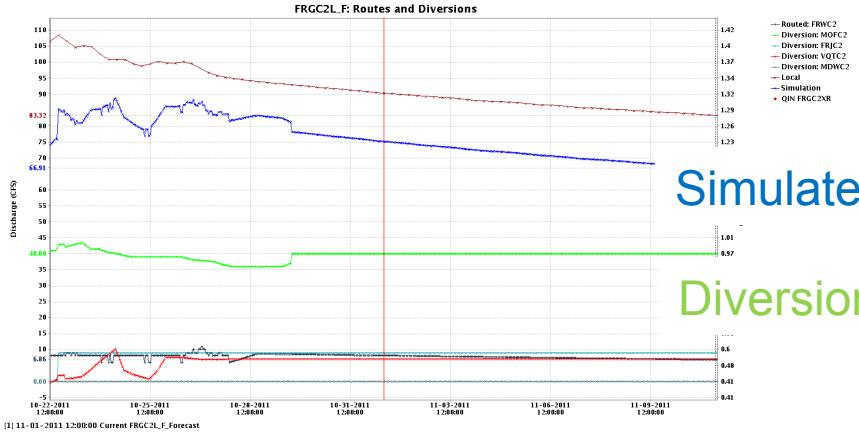
Release Schedule



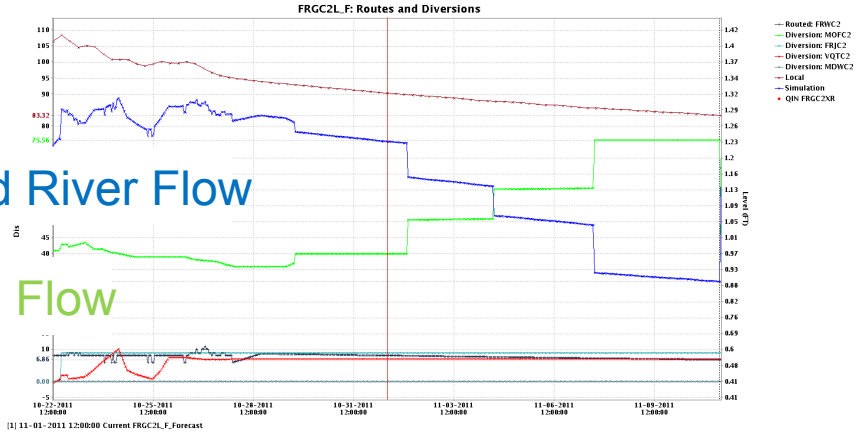


Daily Forecasts – Diversions

Steady Diversion



Changing Diversion



Simulated River Flow

Diversion Flow

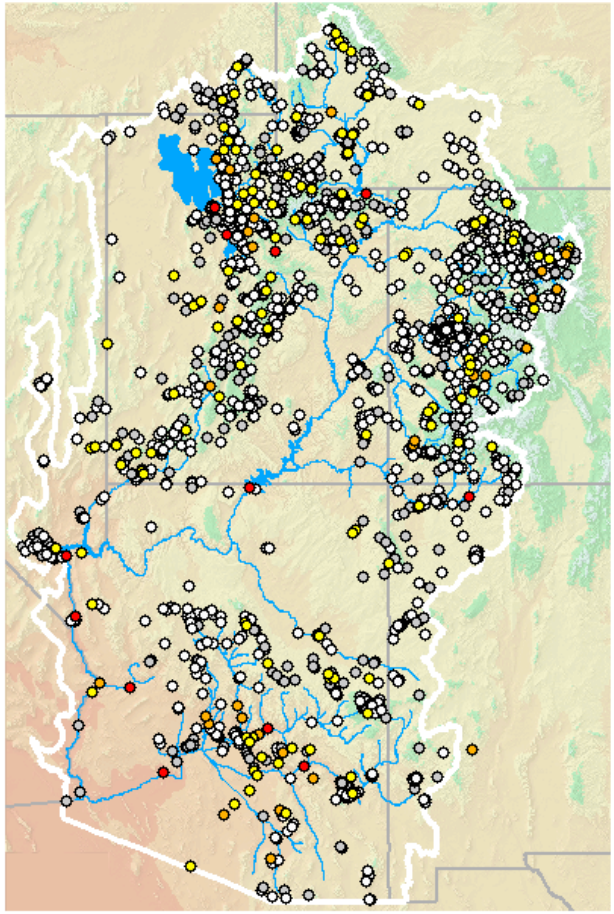
Dam Break Support

CBRFC Main > Dam2

Graphic | Selection List | Dambreak Procedures | Dambreak Prebreak Info | Issueing Forecast Over AWIPS

Dams

Try the New Beta Map Interface



Data Type: River | Snow
Click: Select | *Zoom*
Zoom: *1x* | 4x | 8x |

Display Options

- [x] Topography
- [x] States
- [x] RFC
- [x] Rivers
- [ ] HSAs
- [ ] Basins
- [x] Data Points
- [ ] Station Labels

Apply

Legend
Volume (ac-ft)

- < 1000
- 1000-10E4
- 10E4-10E5
- 10E5-10E6
- > 10E6

Map data updated 08/17.13:44 UTC, 08/17.07:44 MDT.
Click map to zoom.

CBRFC Main > Dam2

Graphic | Selection List | Dambreak Procedures | Dambreak Prebreak Info | Issueing Forecast Over AWIPS

EAST CANYON - UT10119 Dam Catalog Interface

View: *Record* | Model Run | Maps
Table: *Info* | Inputs | Downstream Points | Cross Section Pairs | Outputs | Elevations

Dam

NID ID UT10119
Dam Name EAST CANYON
Other Dam Name
Former Dam Name
State ID 0
River EAST CANYON CREEK
County MORGAN
Latitude 40.92 (40 55 12)
Longitude -111.6 (111 36 0)
Elevation 5697.36
Topo Map SALT LAKE CITY
Return Flow Region 4
Drainage Area 145
Emergency Action Plan 0 (None)
Comments 'Used dambatch.tcl'
Updated 07/03/2002

Offices

HSA SLC
RFC CBRFC

Construction

Dam Type CNVA
Dam Height 185
Structural Height 260
Hydraulic Height 195
NID Height 260
NID Storage 58350
Max Storage 58350
Normal Storage 51200
Dam Length 436
Surface Area 747
Max Discharge 6200
Volume Material 35716
Core BLANK
Foundation BLANK
Spillway Type U
Spillway Width 50
Outlet Gates
Number Locks
Length of Locks
Width of Locks

Regulatory

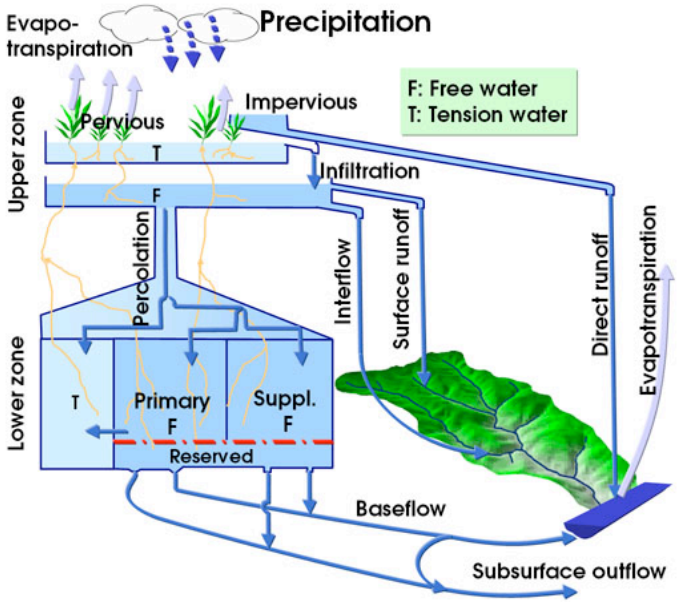
Owner Name DOI BR
Owner Type F
Year Completed 1966

RFC Models

RFC forecast uses a snow model and a rainfall-runoff model:

- SNOW-17: Temperature index model for simulating snowpack accumulation and melt
- Sacramento Soil Moisture Accounting Model: Conceptual hydrologic model used to generate runoff

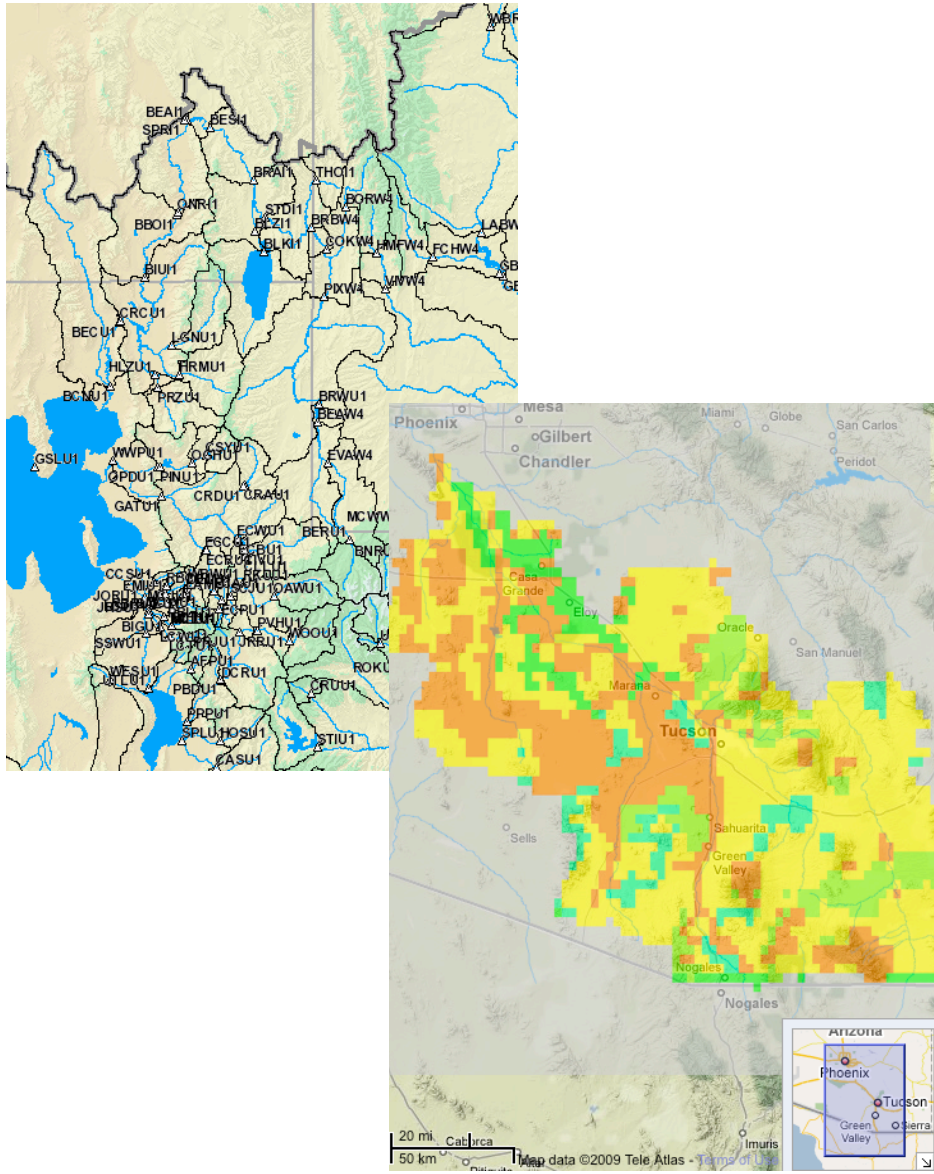
Snow Model: SNOW-17
Temperature Index Snow model



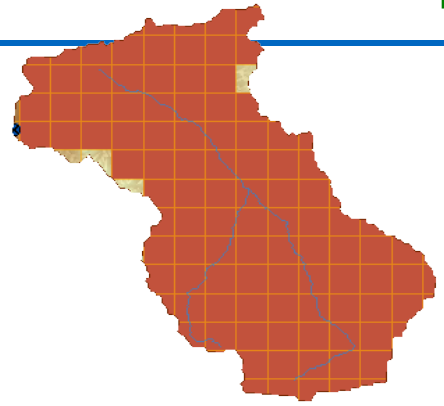
Model Structure

Geographic:

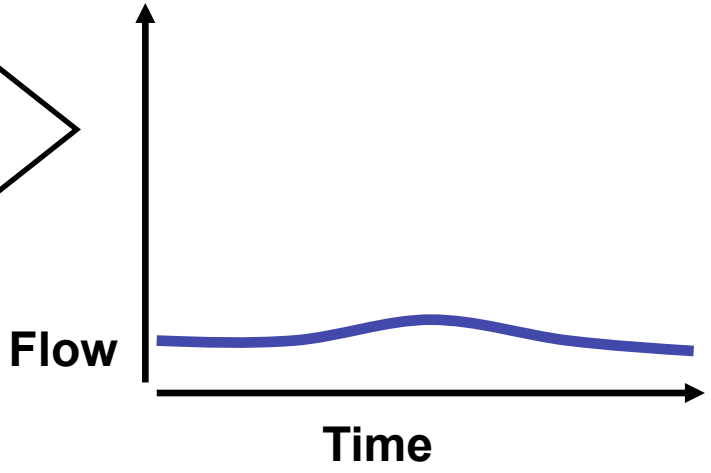
- Lumped over a basin – Traditional RFC models treat entire basin above a gauge as a discrete unit
- Spatially distributed – Many models – including RFC experimental models – model hydrology in geographic grids

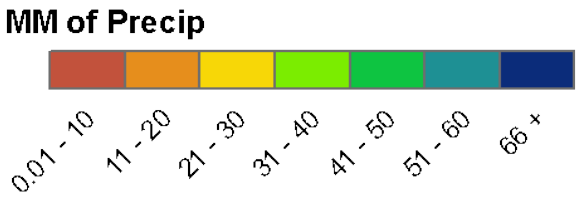


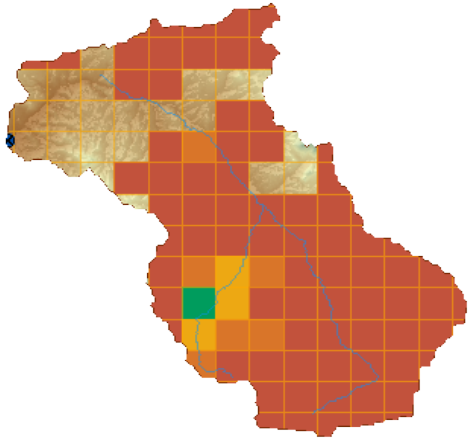
Lumped Vs Distributed Precipitation and Model Response to Non-uniform Basin Precipitation



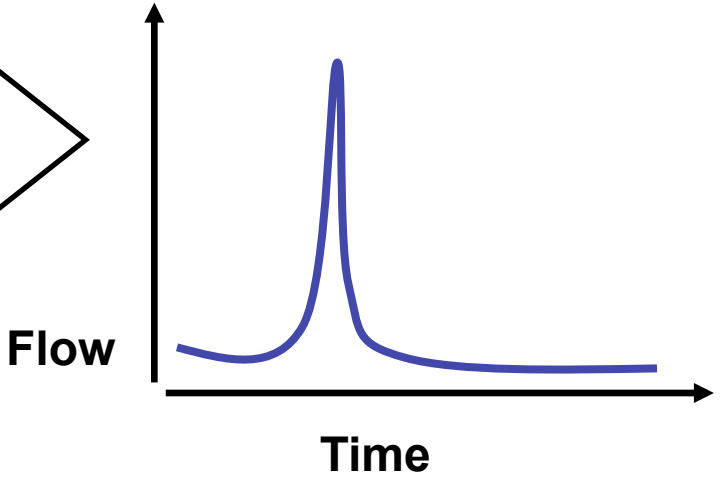
Lumped

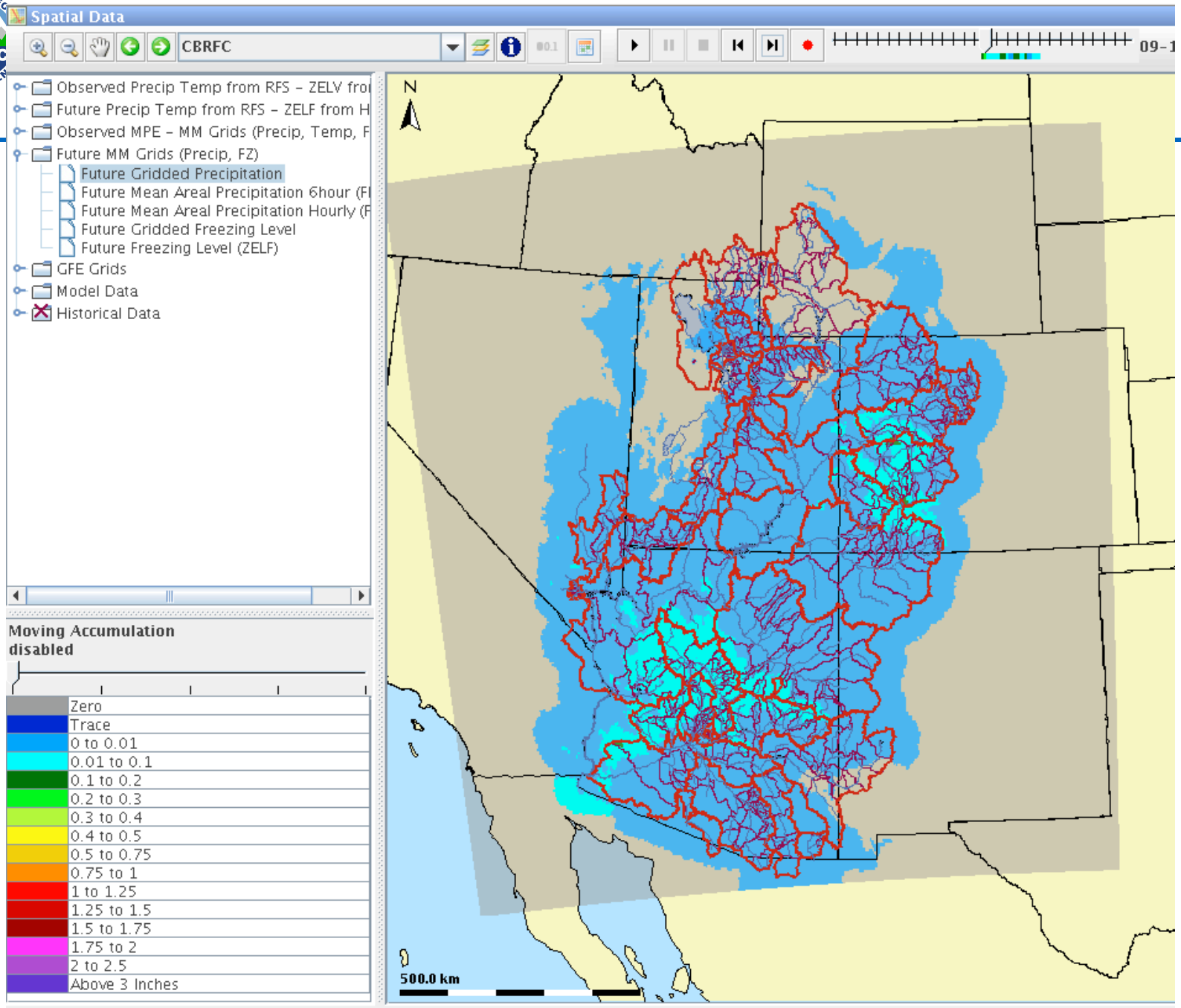


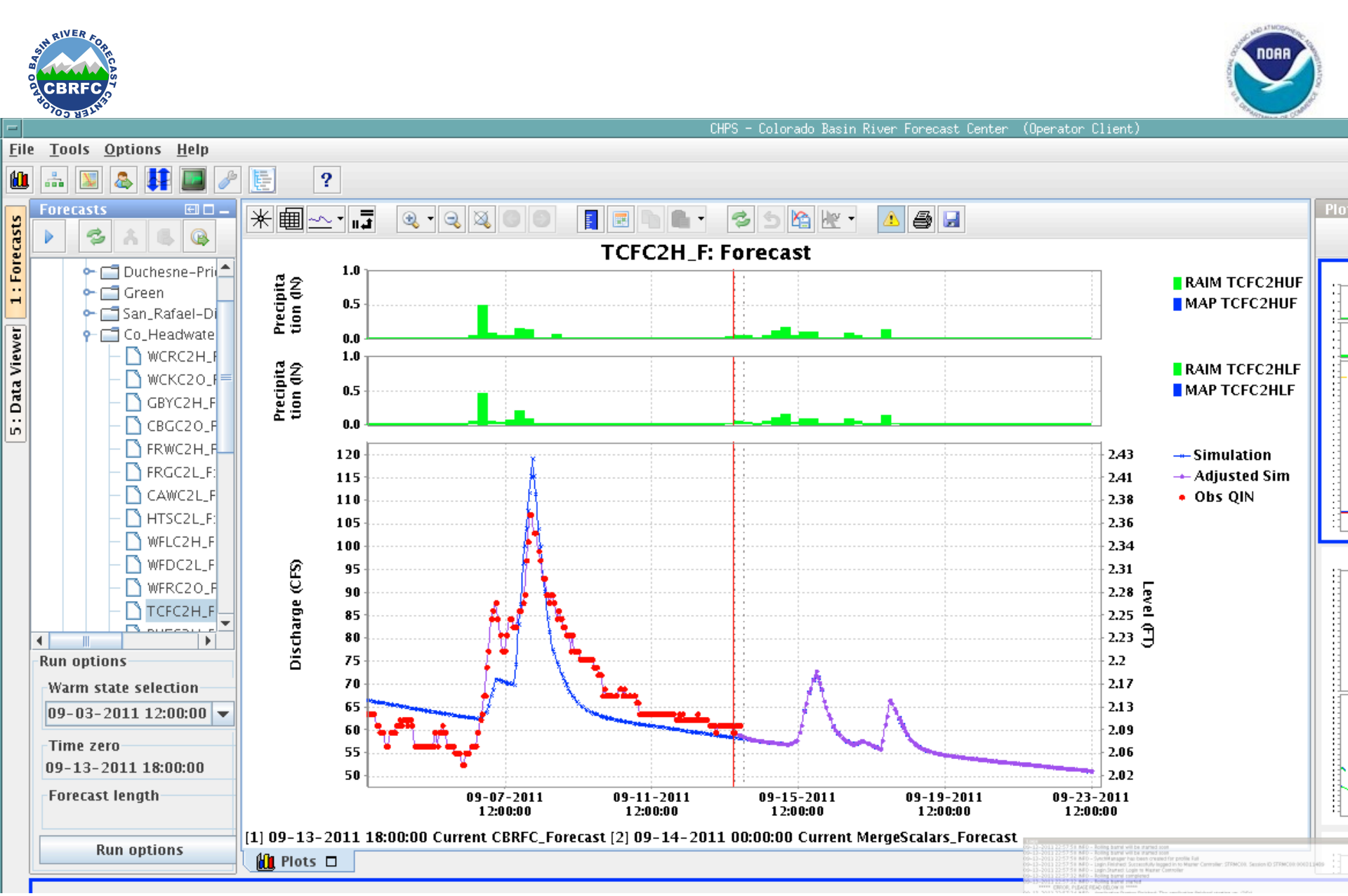


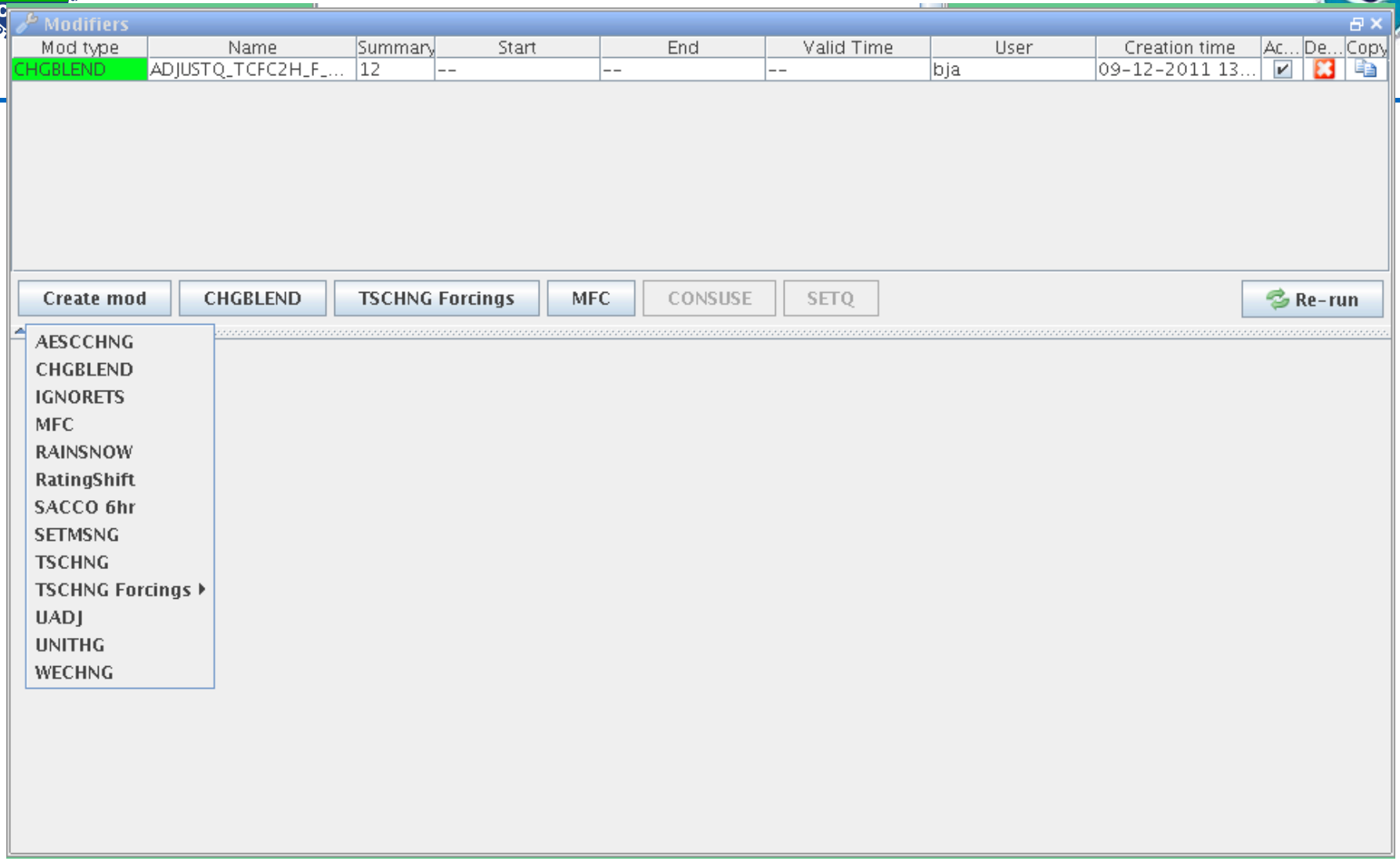


Distributed

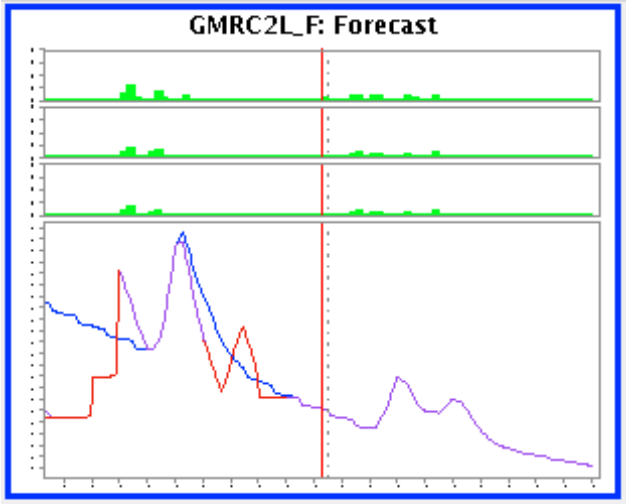


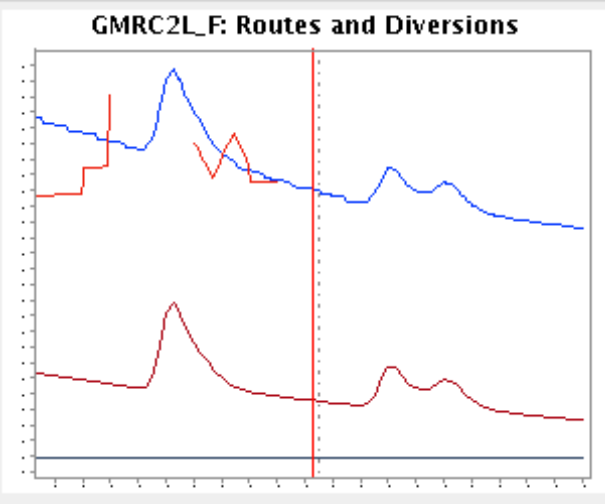

Spatial Data
CBRFC
Observed Precip Temp from RFS – ZELV fro
Future Precip Temp from RFS – ZELF from H
Observed MPE – MM Grids (Precip, Temp, F
Future MM Grids (Precip, FZ)
Future Gridded Precipitation
Future Mean Areal Precipitation 6hour (F
Future Mean Areal Precipitation Hourly (F
Future Gridded Freezing Level
Future Freezing Level (ZELF)
GFE Grids
Model Data
Historical Data
Moving Accumulation
disabled
Zero
Trace
0 to 0.01
0.01 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.75
0.75 to 1
1 to 1.25
1.25 to 1.5
1.5 to 1.75
1.75 to 2
2 to 2.5
Above 3 Inches
N
500.0 km

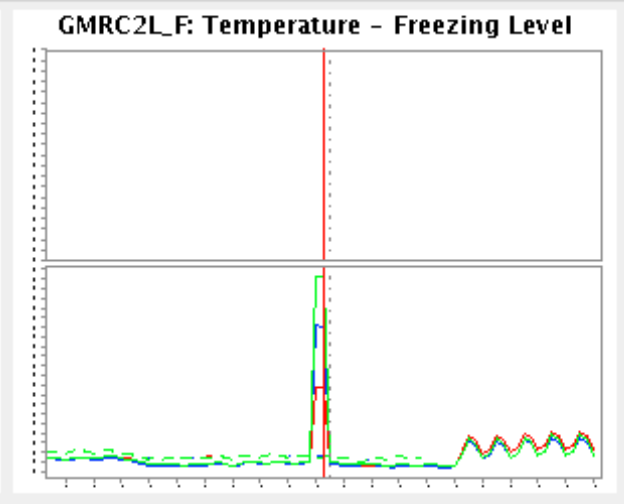

CHPS - Colorado Basin River Forecast Center (Operator Client)
File Tools Options Help
Forecasts
1 : Forecasts
5 : Data Viewer
Duchesne-Pri
Green
San_Rafael-Di
Co_Headwate
WCRC2H_F
WCKC2O_F
GBYC2H_F
CBGC2O_F
FRWC2H_F
FRGC2L_F
CAWC2L_F
HTSC2L_F
WFLC2H_F
WFDC2L_F
WFRC2O_F
TCFC2H_F
Run options
Warm state selection
09-03-2011 12:00:00
Time zero
09-13-2011 18:00:00
Forecast length
Run options
TCFC2H_F: Forecast
Precipitation (IN)
1.0
0.5
0.0
RAIM TCFC2HUF
MAP TCFC2HUF
Precipitation (IN)
1.0
0.5
0.0
RAIM TCFC2HLF
MAP TCFC2HLF
Discharge (CFS)
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
Level (FT)
2.43
2.41
2.38
2.36
2.34
2.31
2.28
2.25
2.23
2.2
2.17
2.13
2.09
2.06
2.02
Simulation
Adjusted Sim
Obs QIN
09-07-2011 12:00:00
09-11-2011 12:00:00
09-15-2011 12:00:00
09-19-2011 12:00:00
09-23-2011 12:00:00
[1] 09-13-2011 18:00:00 Current CBRFC_Forecast [2] 09-14-2011 00:00:00 Current MergeScalars_Forecast
Plots

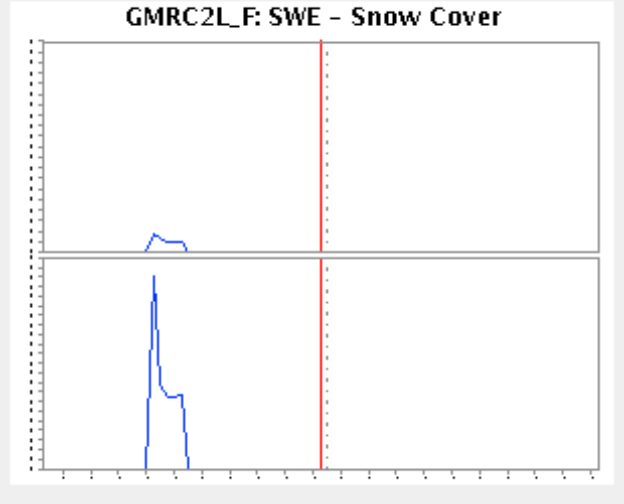

Modifiers
Mod type
Name
Summary
Start
End
Valid Time
User
Creation time
Ac...
De...
Copy
CHGBLEND
ADJUSTQ_TCFC2H_F_...
12
--
--
--
bja
09-12-2011 13...
Create mod
CHGBLEND
TSCHNG Forcings
MFC
CONSUSE
SETQ
Re-run
AESCCHNG
CHGBLEND
IGNORETS
MFC
RAINSNOW
RatingShift
SACCO 6hr
SETMSNG
TSCHNG
TSCHNG Forcings
UADJ
UNITHG
WECHNG

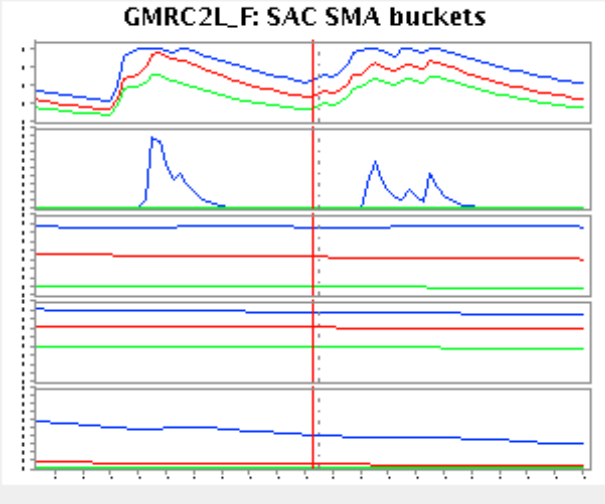
Plot Overview

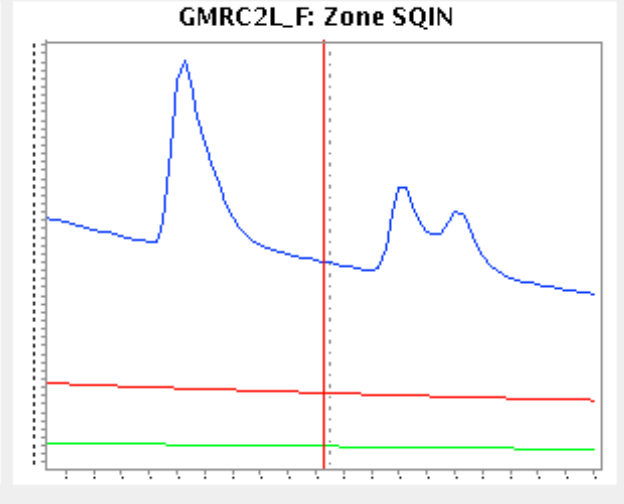






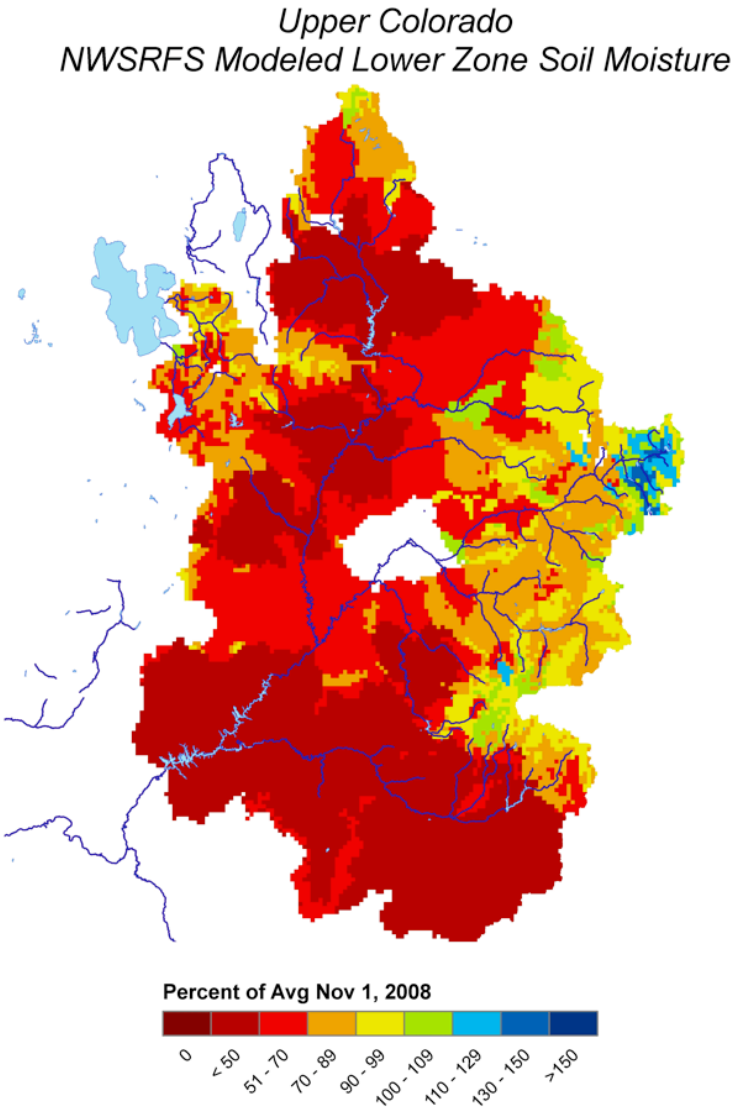






Soil Moisture

- Soil moisture and snow states initialize hydrologic models
- RFCs continually adjust simulated model states to force models to match observed streamflow
- Traditional RFC models are basin scale. However, new generation of models is spatially gridded



Dissemination

- Text Products
- Recreation Report
- Water Management
  - Forecasts
- Web Page

River Forecast Center Issued Products

The current time is: 06/07.15:05 MDT, 06/07.21:05 UTC.

	Albuqerque	Boulder	Cheyenne	El Paso	Flagstaff	Grand Junction	Elko	Pocatello	Phoenix	Pueblo	Riverton	Salt Lake City	Tucson	Las Vegas
River Recreation (RVR)	11:36	-	-	-	11:36	11:36	-	-	-	-	11:36	11:36	-	-
Forecast Summary (RVFMCT)	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40	09:40
Major Reservoir (ESPSTR)	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05	Jun 05
Water Supply Outlook (ESP)	Jun 05	Jun 05	Jun 06	Jun 05	Apr, 2012	Jun 05	-	-	Apr, 2012	Jun 05	Jun 06	Jun 06	Apr, 2012	-
Flood Potential Outlook (ESG)	May, 2012	May, 2012	Jun 06	May, 2012	Mar, 2012	May, 2012	-	-	Mar, 2012	May, 2012	Jun 06	May, 2012	Mar, 2012	-
Arizona Rivers (RVFAZ)	-	-	-	-	09:37	-	-	-	09:37	-	-	-	09:37	-
Upper Colorado above Lake Powell (RVFUPC)	-	Jun 06	-	-	Jun 06	Jun 06	-	-	-	-	-	-	-	-
Lower Colorado below Lake Powell (RFVLCM)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gila River above Coolidge (RVFUG)	Jun, 2011	-	-	Jun, 2011	-	-	-	-	-	-	-	-	Jun, 2011	-
Gila River below Coolidge (RVFLG)	-	-	-	-	Sep, 2011	-	-	-	Sep, 2011	-	-	-	-	-
Green River in Colorado (RVFGCO)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Green River in Utah (RVFGUT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Green River in Wyoming (RVFGWY)	-	-	09:39	-	-	09:39	-	-	-	-	09:39	-	-	-
Salt, Verde, Tonto Basins (RVFSA)	-	-	-	-	Jan, 2010	-	-	-	Jan, 2010	-	-	-	-	-
San Juan Basin (RVFSJB)	May 22	-	-	-	-	May 22	-	-	-	-	-	-	-	-
Utah Rivers (RVFUT)	-	-	-	-	-	Jul, 2011	-	-	-	-	-	Jul, 2011	-	-
Dambreak/High Water Messages (RVFSTR)	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006	Aug, 2006

Dissemination

- Text Products
- Recreation Report
- Water Management
  - Forecasts
- Web Page

Recreational River Report

Provided by the Colorado Basin River Forecast Center
For voice recording of the Recreational Report call: **801-539-1311**

This morning's river flows in cubic feet per second for
Thursday, June 07, 2012. Forecast trend for the next 24 hours.
Please note that all data are provisional.

View Map or Report Archive.
Jump to: Colorado | Utah | Wyoming | Arizona
Click basin name to view forecast hydrographs.
Forecast Flow Color: Green=*Rise*, Black=*Little Change*, Red=*Fall*.

- Colorado -

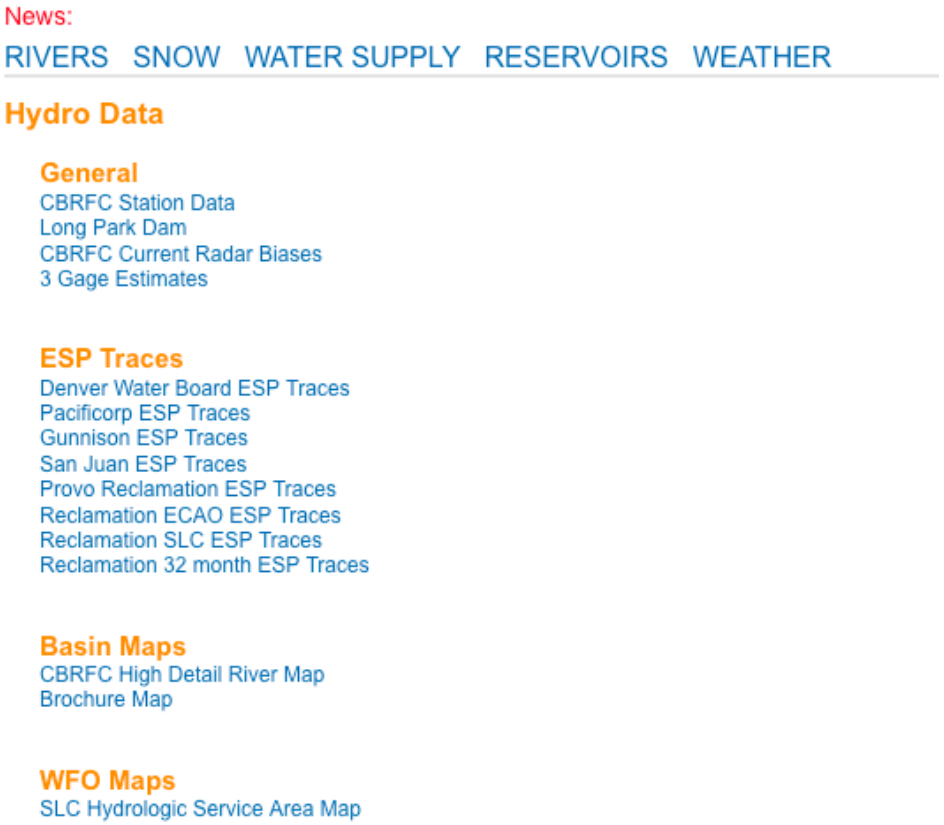
Basin	*Flow (cfs)*	*24 Hour Forecast Trend*
-Colorado Basin-		
Colorado nr Kremmling	**310**	Forecast Little Change
Crystal nr Redstone	**680**	Forecast Little Change
Colorado blo Glenwood Spgs	**3350**	Forecast Little Change
Gunnison blo Gunnison Tun	**490**	Forecast Little Change
Colorado at Westwater	**3750**	Forecast Fall to 3300
Dolores blo Mcphee	**65**	Regulated
Dolores nr Bedrock	**50**	Forecast Little Change
Dolores nr Cisco	**300**	Forecast Rise to 410
-Green River Basin-		
Yampa nr Steamboat Spgs	**310**	Forecast Fall to 270
Yampa at Maybell	**1550**	Forecast Fall to 1200
Little Snake nr Lily	**280**	Forecast Little Change
-San Juan Basin-		
Animas nr Durango	**1200**	Forecast Little Change
Piedra nr Arboles	**270**	Forecast Little Change
San Juan nr Archuleta	**490**	Regulated

- Utah -

Basin	*Flow (cfs)*	*24 Hour Forecast Trend*
-Colorado Basin-		
Colorado at Westwater	**3750**	Forecast Fall to 3300
Dolores nr Cisco	**300**	Forecast Rise to 410
Colorado nr Cisco	**3850**	Forecast Little Change
Cataract Canyon	**e7950**	Forecast Little Change
NF Virgin nr Springdale	**40**	Forecast Little Change
Virgin nr Virgin	**65**	Forecast Little Change
Virgin nr Littlefield	**45**	Forecast Little Change
Colorado at Lees Ferry	**9300**	Regulated

Dissemination

- Text Products
- Recreation Report
- Water Management Forecasts
- Web Page



Webpage Update

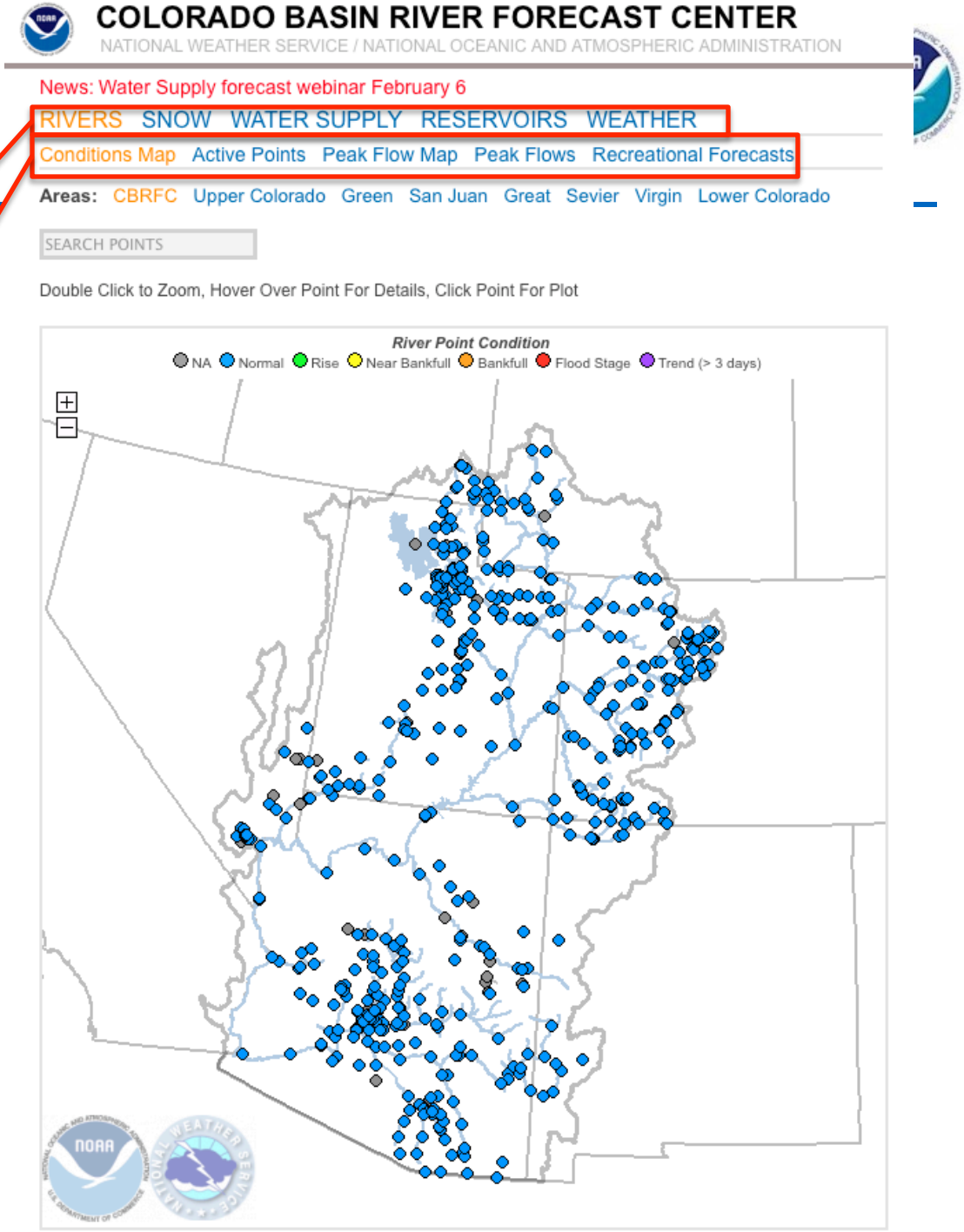
New webpage debuted in December 2011

Goals:

- Speed and accessibility (including mobile devices)
- Develop easy-to-understand graphics to communicate forecasts
- Respond to stakeholder requirements and requests
- Drop reliance on google maps
- Consistency in access of disparate CBRFC datasets and forecasts
- Alignment with future NWS corporate web interface

Major services provided by CBRFC

Second level information



COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: Water Supply forecast webinar February 6

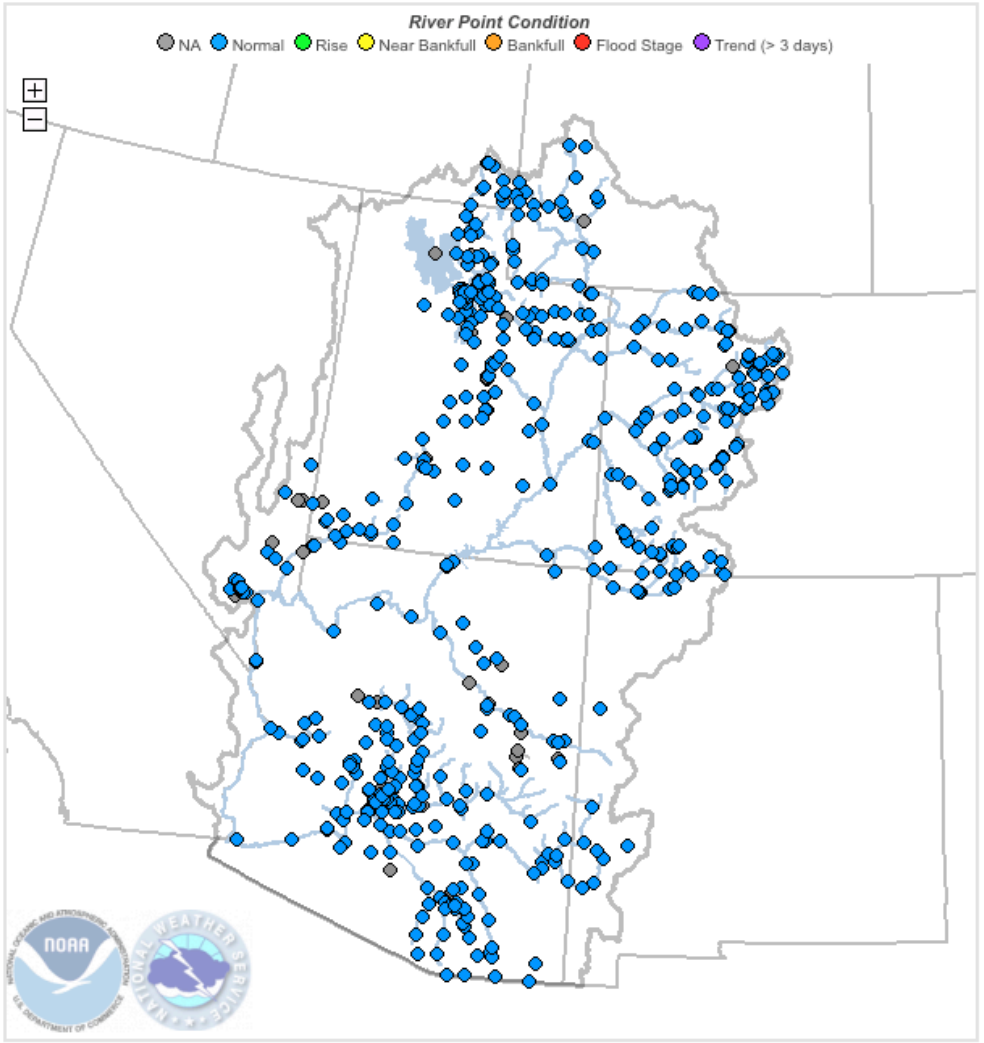
RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Conditions Map Active Points Peak Flow Map Peak Flows Recreational Forecasts

Areas: CBRFC Upper Colorado Green San Juan Great Sevier Virgin Lower Colorado

SEARCH POINTS

Double Click to Zoom, Hover Over Point For Details, Click Point For Plot



COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: Water Supply forecast webinar February 6

RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Conditions Map Active Points Peak Flow Map Peak Flows Recreational Forecasts

Areas: CBRFC Upper Colorado Green San Juan Great Sevier Virgin Lower Colorado
Sub-Areas: Upper Colorado Mainstem Gunnison Dolores White-Yampa Lake Powell

SEARCH POINTS

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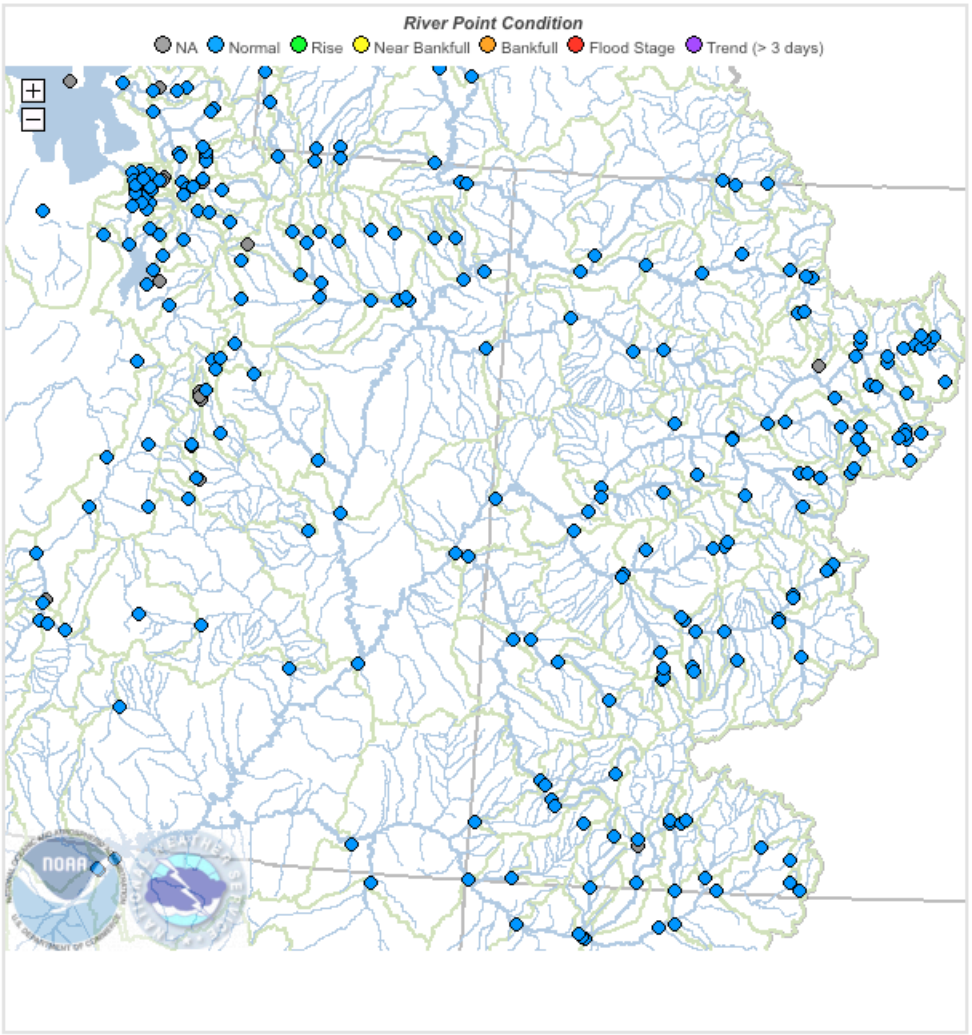

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News: How to use this web page webinar: January 30

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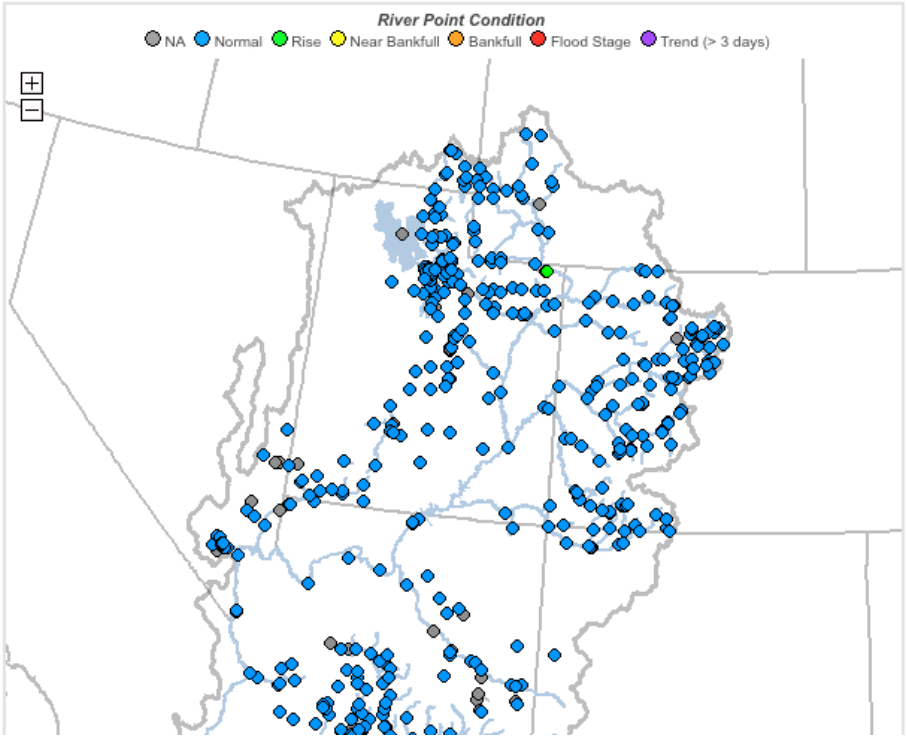


Virgin , Virgin

Plot Maps Verification Gage

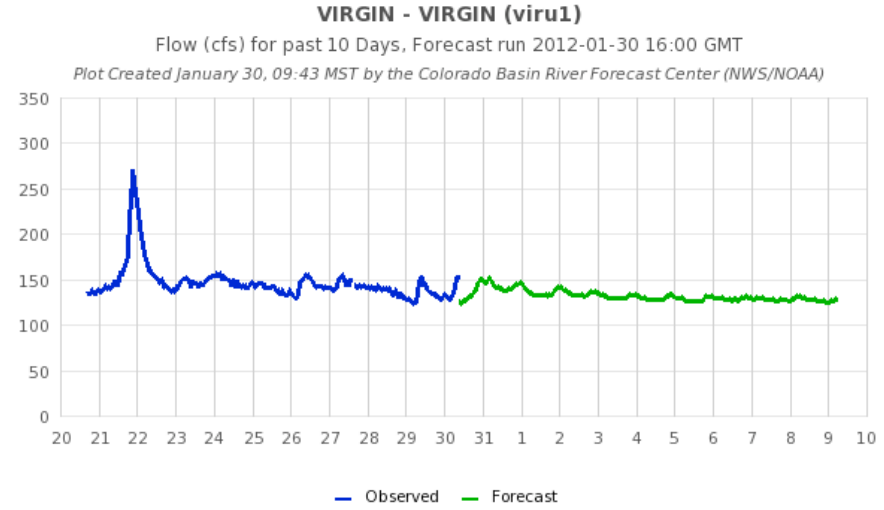
Past 10 days

Stage Simulated Flood Statistics

Forecast Peak Historical Peak Yearly Peaks Stage vs Flow

80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97

98 99 00 01 02 03 04 05 06 07 08 09 10 11



More Plot Options

Virgin , Virgin

Plot Maps Verification Gage

Past 10 days

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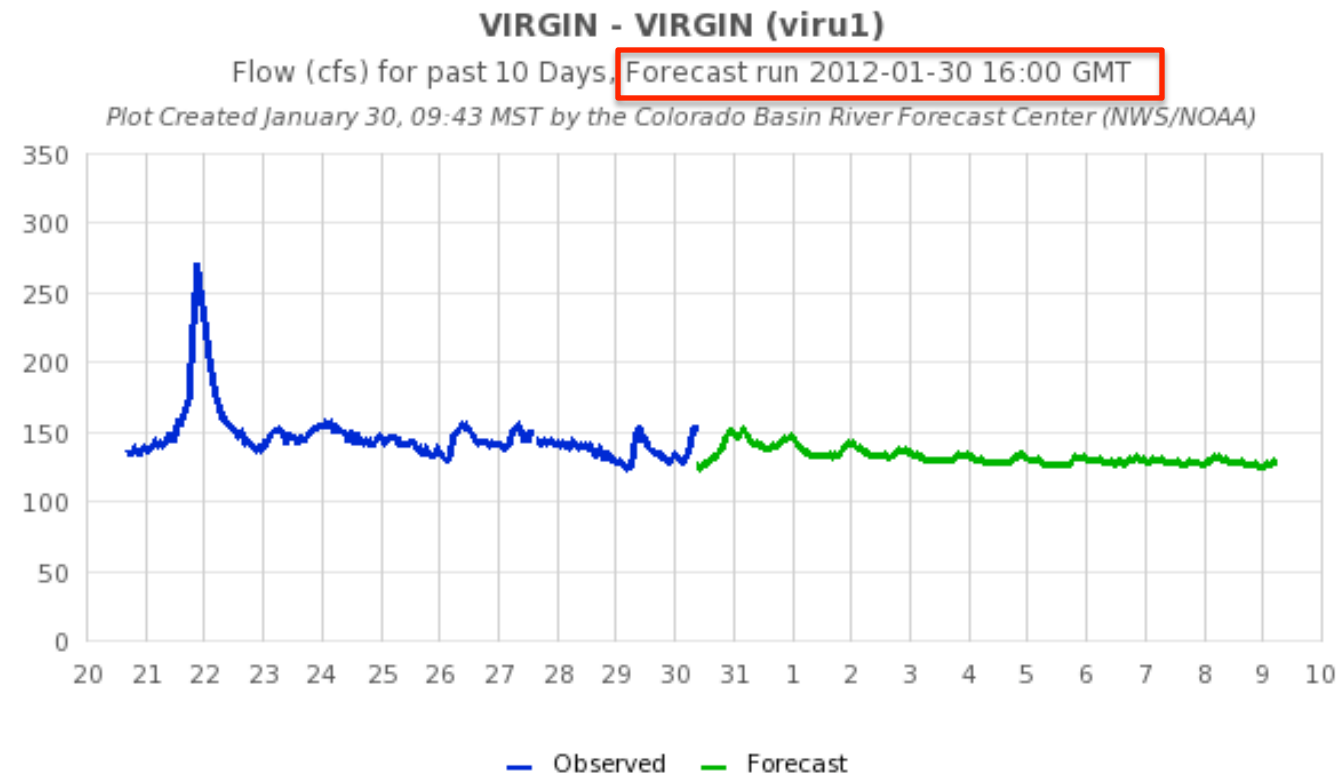
98 99 00 01 02 03 04 05 06 07 08 09 10 11



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Virgin , Virgin

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Past 10 days

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Forecast Peak Historical Peak Yearly Peaks Stage vs Flow

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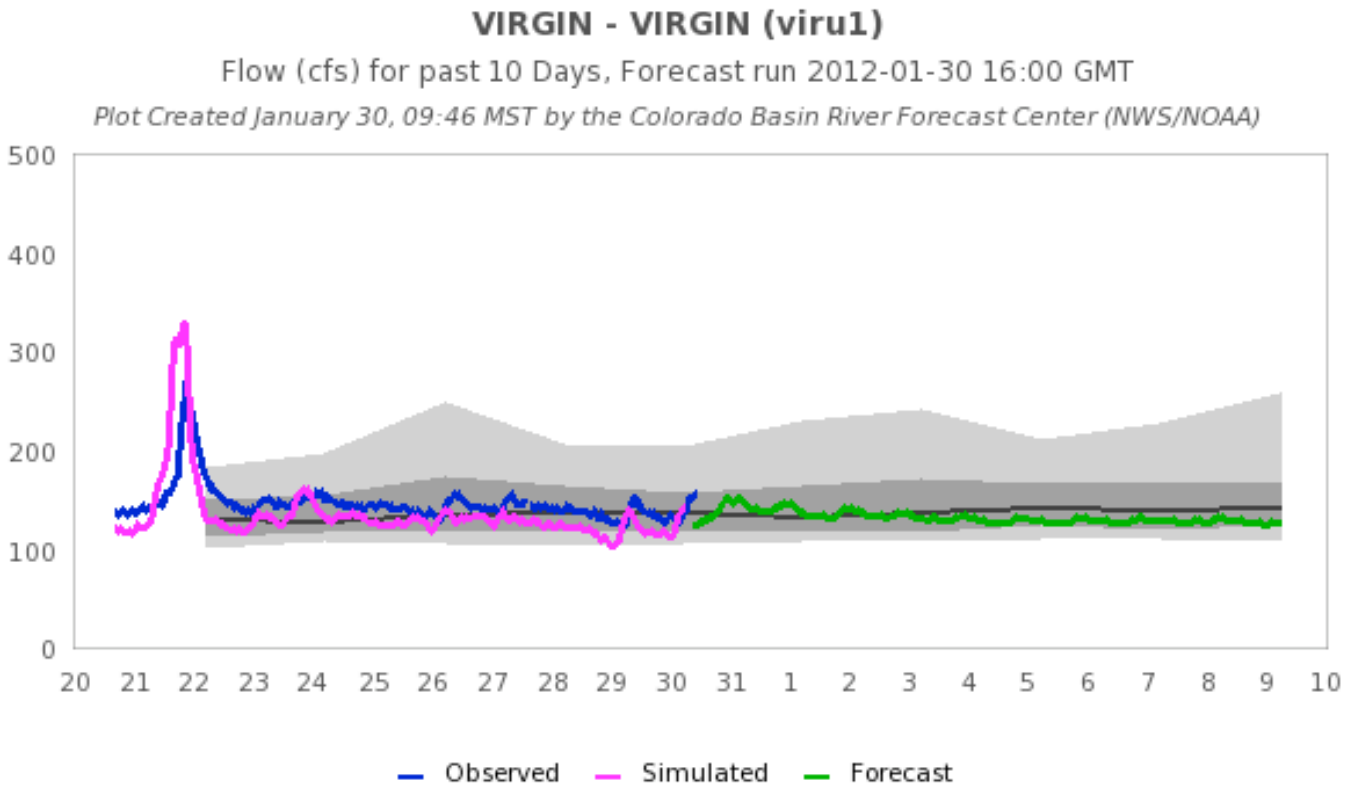
98 99 00 01 02 03 04 05 06 07 08 09 10 11



More Plot Options

Virgin , Virgin

Plot Maps Verification Gage

Past 30 days

Stage Simulated Flood Statistics

Forecast Peak Historical Peak Yearly Peaks Stage vs Flow

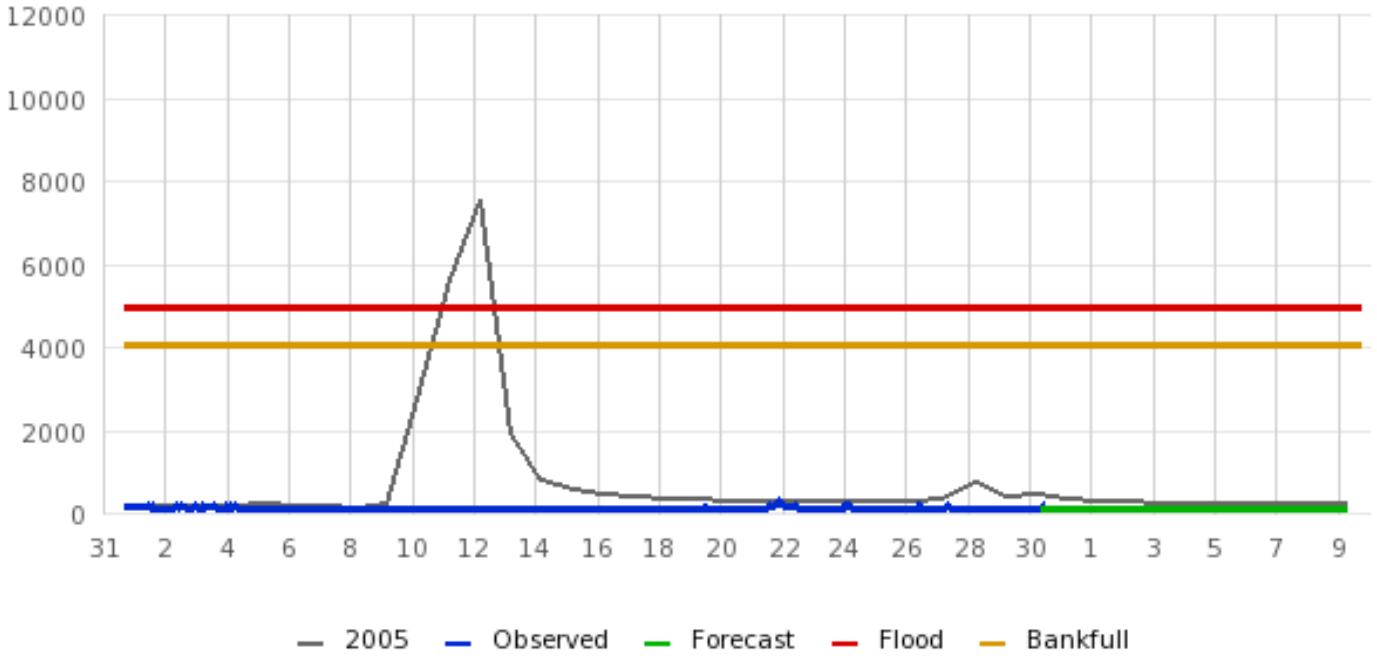
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97

98 99 00 01 02 03 04 05 06 07 08 09 10 11

VIRGIN - VIRGIN (viru1)

Flow (cfs) for past 30 Days, Forecast run 2012-01-30 16:00 GMT

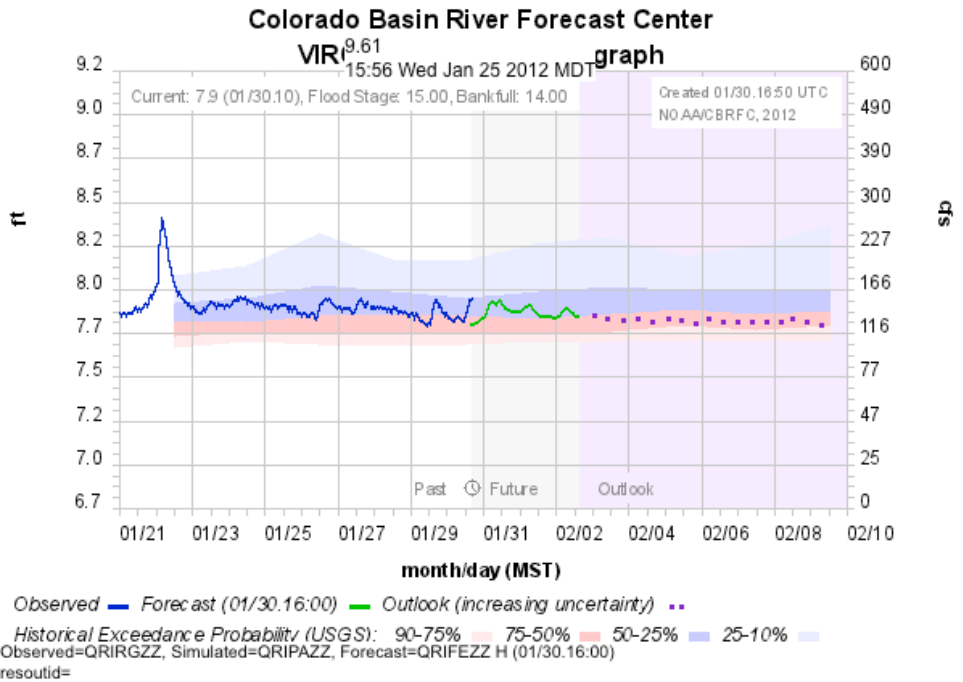
Plot Created January 30, 09:50 MST by the Colorado Basin River Forecast Center (NWS/NOAA)



More Plot Options

VIRGIN - VIRGIN (VIRU1)

Forecasts are guidance only. Click here for official warnings and forecasts.
View station on Conditions Map or Download KML



Hydrograph Options

- [ ] Critical Stages
- [ ] Simulated
- [ ] Raw Data
- [ ] Six Hour
- [ ] Linear Flow
- [ ] Mean Daily Values
- [ ] Forecast Peak
- [ ] Historical Peak
- [ ] Yearly Peaks
- [ ] Daily Maxima
- [x] Statistics
- [ ] Contingency
- [ ] Adjust
- [ ] Requery
- [ ] Forecasts

Years: 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918

Date: 01/30/12

Past Days: 10

Future Days: 10

ESP: Off

Analog Years: Off

Analog Years Period: Off

Apply and Redisplay

Graphs

- [ ] Precipitation
- [ ] Temperature
- [ ] Freezing Level
- [ ] Snow
- [ ] Soil Moisture
- [ ] Rating Table
- [x] Hydrograph

Tabular Data

- [ ] Precipitation
- [ ] Temperature
- [ ] Freezing Level
- [ ] Snow
- [ ] Soil Moisture
- [ ] Rating Table
- [ ] Critical Stages
- [ ] Peaks
- [ ] Flows

Information

- [ ] Gage Info
- [ ] Basin/Location Maps
- [ ] Aerial/Topo 16 mpp
- [ ] Photos

Up/Downstream

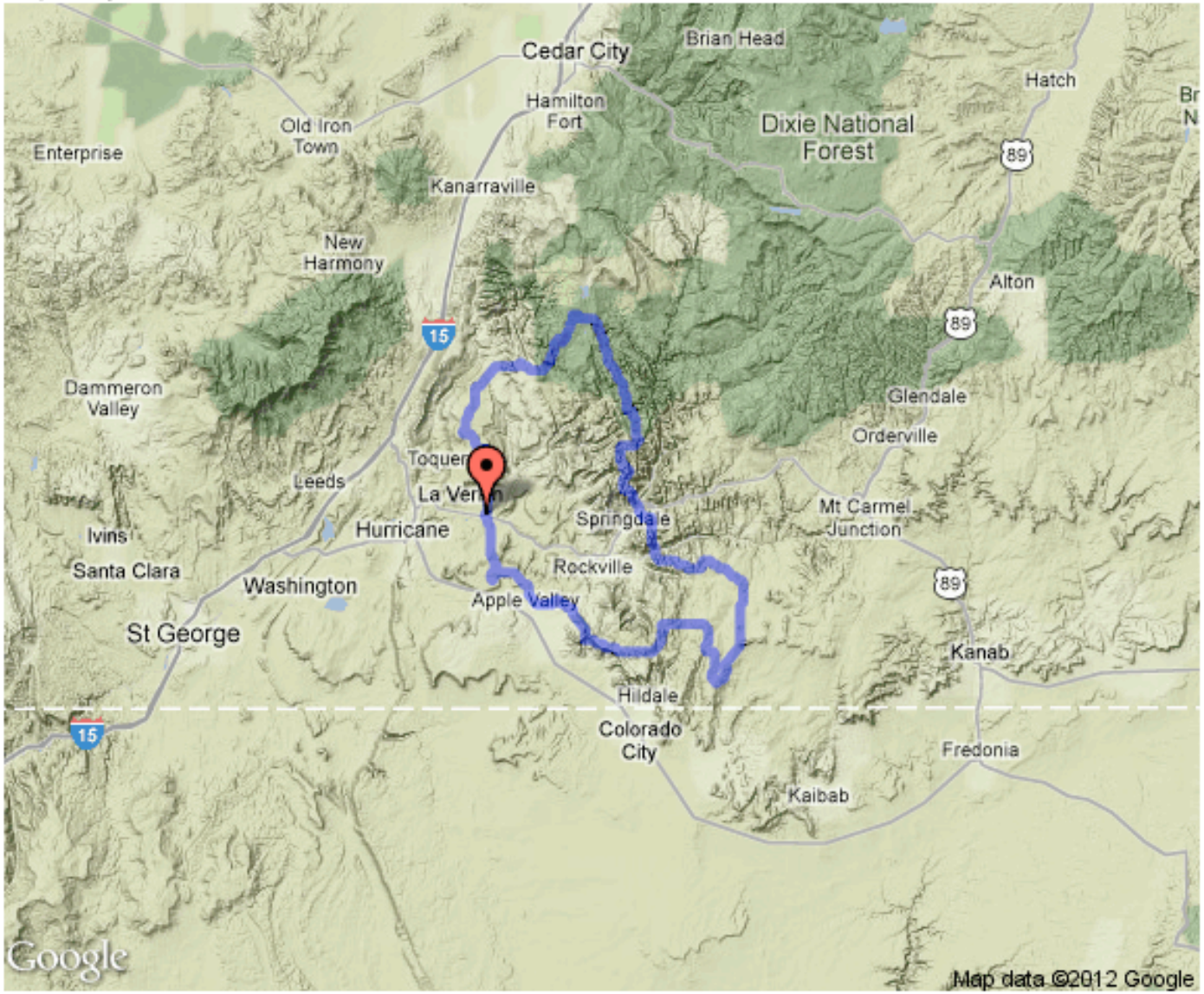
-Upstream- Go

Virgin , Virgin

Plot Maps Verification Gage

Terrain Satellite Road Map Hybrid

Maps may take a few seconds to load.

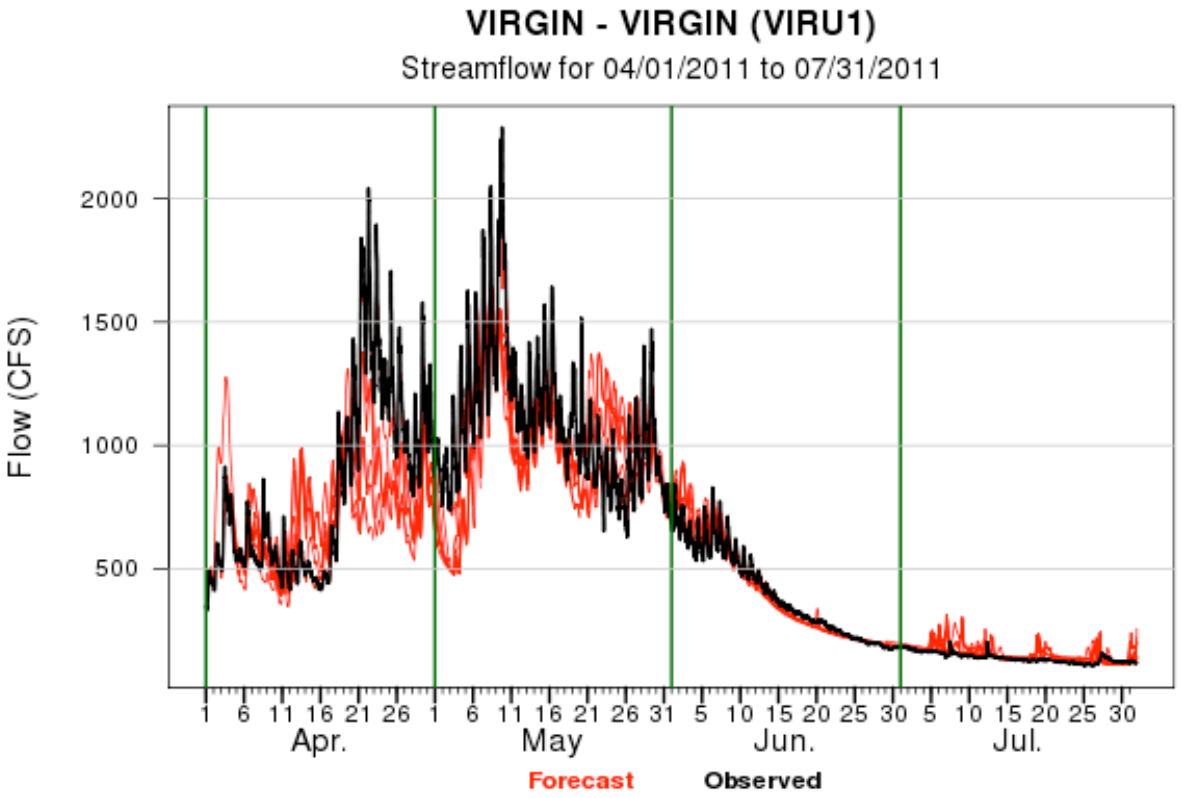


Virgin , Virgin

Plot Maps Verification Gage

Recent Season

Forecasts made during the 2011 runoff season are shown in comparison with the observed flow. For clarity, only the first 5 day lead times are included. The verification statistics provided below the plot are calculated for the data shown in the plot. This plot is not available for all locations. Please contact CBRFC for additional information, for the data in the plot, or with other verification requests



	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	OVERALL
MEAN ERROR (cfs):	-20.1	-33.2	-39.3	-53.6	-66	-42.4
MEAN ABSOLUTE ERROR (cfs):	63.9	103.5	110.7	120.9	133	106.4
RELATIVE ABSOLUTE ERROR (%):	11.7	16.4	16.1	16.1	17.1	15.5

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NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: How to use this web page webinar: January 30

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Conditions Map Active Points Peak Flow Map Peak Flows Recreational Forecasts

River List

Click point type or enter search to change points displayed. Click column heading to sort by that data. Click ID to show plot for point.
Download pipe-delimited file of displayed points.

SEARCH POINTS

Points: Active Forecast Reservoir Non-Forecast All
Plots: Auto Off On

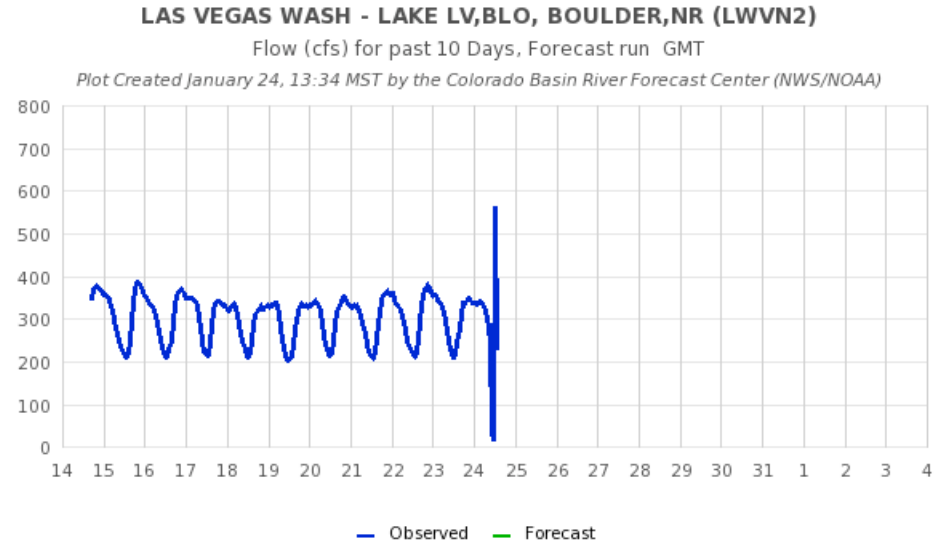
River Point Condition

NA Normal Rise Near Bankfull Bankfull Flood Stage Trend (> 3 days)

River Point Types

0-Data 1-Forecast 2-Reservoir

	NWS ID	River	Location	Forecast Condition	Point Type	Observed Date (Day, Time)	Latest Flow	Latest Stage	Flood Stage	Bankfull Stage	Latitude	Longitude	HUC	State	HSA	Elevation	Forecast Group	Segment
1	LWVN2	Las Vegas Wash	Lake Lv,blo, Boulder,nr		0	24, 20:00	228	4.6			36.12	-114.9	15010015	NV	VEF	1280		



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SEARCH POINTS

Downloadable!

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1	ACHA3	Agua Caliente Wash	Houghton Rd		1	24, 17:00	0	0.5		4.6	32.25	-110.77	15050302	AZ	TWC	2635	GI_F	37
2	ACJU1	Ashley Ck	Jensen, Nr, Union Canal, Blo		1	24, 12:00	45	0		10.2	40.36	-109.39	14060002	UT	GJT	4740	GN_F	68
3	AFHA3	Agua Fria	Humbolt, Blo		1	24, 20:00	2	2.8		15.4	34.49	-112.24	15070102	AZ	FGZ	4400	SV_F	60
4	AFMA3	Agua Fria	Mayer, Nr		1	24, 20:00	1	2.3		14.8	34.32	-112.06	15070102	AZ	FGZ	3434	SV_F	62
5	AFPU1	American Fork	American Fork, Nr, Up Pwrplnt, Abv		1	24, 20:00	e26	e6.20	8.5	8	40.45	-111.68	16020201	UT	SLC	5950	GB_F	11
6	AFRA3	Agua Fria	Rock Spgs, Nr		1	24, 20:00	0	1.2	16	15	34.02	-112.17	15070102	AZ	PSR	1800	SV_F	64
7	ALEC2	East	Almont		1	24, 20:00	e71	e2.54	7	6.5	38.68	-106.85	14020001	CO	GJT	8006	UC_F	53
8	ALTC2	Taylor	Almont		1	24, 20:00	e118	e1.53		5	38.66	-106.84	14020001	CO	GJT	8011	UC_F	52
9	APNC2	Roaring Fork	Aspen, Nr		1	24, 19:00	e35	e0.83	5	4	39.18	-106.8	14010004	CO	GJT	8014	UC_F	34
10	ARCN5	San Juan	Archuleta		1	24, 20:00	481	3.2	7	6.5	36.8	-107.7	14080101	NM	ABQ	5655	SJ_F	11
11	ARFN5	Animas	Farmington		1	24, 19:00	234	4.5	10	9	36.72	-108.2	14080104	NM	ABQ	5280	SJ_F	17
12	ARVA3	Aravaipa Ck	Mammoth		1	24, 20:00	15	0.51	15	14	32.84	-110.62	15050203	AZ	TWC	2345	GI_F	27
13	ASHU1	Ashley Ck	Vernal, Nr		1	24, 12:00	20	1.6		4.2	40.58	-109.62	14060002	UT	GJT	6231	GN_F	67
14	ATPA3	Altar Wash	Three Points, Nr		1	24, 20:00	0	1.6		10	31.84	-111.4	15050304	AZ	TWC	2975	GI_F	59
15	AVCA3	Arivaca Ck	Arivaca		1	24, 20:00	0	0.51		4	31.57	-111.33	15050304	AZ	TWC	3580	GI_F	58
16	AVOA3	Agua Fria	Buckeye		1	24, 18:00	0	1.3		8	33.44	-112.33	15070102	AZ	PSR	970	SV_F	71
17	BABA3	Babocomari	Tombstone, Nr		1	24, 20:00	0	0.43		4	31.7	-110.23	15050202	AZ	TWC	3980	GI_F	23
18	BBOI1	Bear R Blo Ut P&I @ Oneida			1	24, 12:00	426	0			42.27	-111.75	16010202	ID	PIH	4800	GB_F	79
19	BCBA3	Burro Ck	Bagdad, Nr, Old Us 93 Bridge		1	24, 20:00	1	4.4		14.2	34.54	-113.44	15030202	AZ	VEF	1880	LC_F	78
20	BCNU1	Bear	Corinne, Nr		1	24, 19:00	3444	10.4	15.5	13.4	41.58	-112.1	16010204	UT	SLC	4205	GB_F	88
21	BCTU1	Big Cottonwood Ck	Salt Lake City, Nr		1	24, 12:00	1	0	4.2	3.7	40.62	-111.78	16020204	UT	SLC	4990	GB_F	21
22	BCWU1	Big Cottonwood Ck	300 West		1	24, 19:00	e12	e0.00			40.68	-111.9	16020204	UT	SLC	4248	GB_F	23
23	BDWU1	Beaver Dam Wash	Enterprise, Nr		1	24, 20:00	2	4.7		9.1	37.47	-114.05	15010010	UT	SLC	4740	LC_F	13

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News: January Water Supply Forecasts

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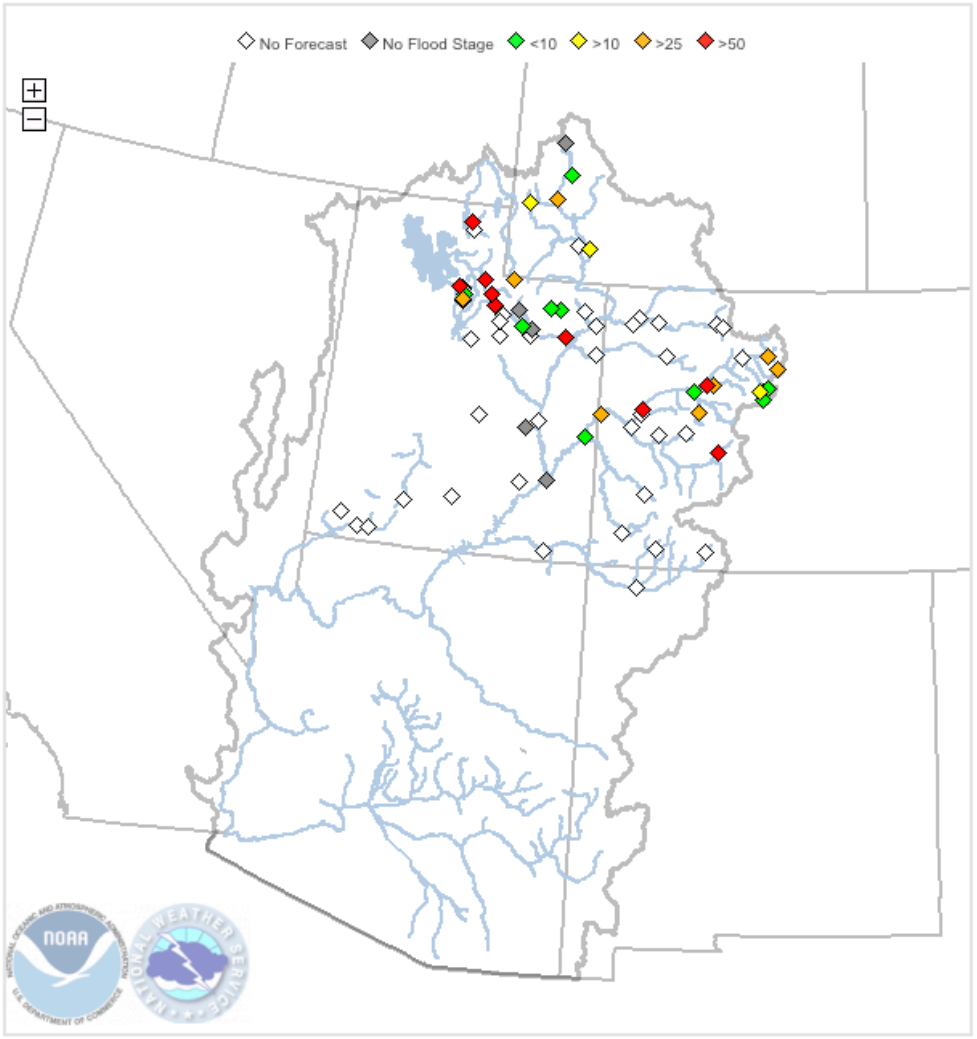

Recreational River Report

Provided by the Colorado Basin River Forecast Center
For voice recording of the Recreational Report call: **801-539-1311**

This morning's river flows in cubic feet per second for
Tuesday, January 24, 2012. Forecast trend for the next 24 hours.
Please note that all data are provisional.

View Map or Report Archive.
Jump to: Colorado | Utah | Wyoming | Arizona
Click basin name to view forecast hydrographs.
Forecast Flow Color: Green=*Rise*, Black=*Little Change*, Red=*Fall*.

- Colorado -

Basin	*Flow (cfs)*	*24 Hour Forecast Trend*
-Colorado Basin-		
Colorado nr Kremmling	**e470**	Forecast Little Change
Crystal nr Redstone	**e55**	Forecast Little Change
Colorado blo Glenwood Spgs	**1550**	Forecast Little Change
Gunnison blo Gunnison Tun	**710**	Forecast Little Change
Colorado at Westwater	**3100**	Forecast Little Change
Dolores blo Mcphee	**25**	Regulated
Dolores nr Bedrock	**e35**	Forecast Little Change
Dolores nr Cisco	**e120**	Forecast Little Change
-Green River Basin-		
Yampa nr Steamboat Spgs	**e95**	Forecast Little Change
Yampa at Maybell	**e290**	Forecast Little Change
Little Snake nr Lily	**e150**	Forecast Little Change
-San Juan Basin-		
Animas nr Durango	**160**	Forecast Little Change
Piedra nr Arboles	**e65**	Forecast Little Change
San Juan nr Archuleta	**480**	Regulated

- Utah -

Basin	*Flow (cfs)*	*24 Hour Forecast Trend*
-Colorado Basin-		
Colorado at Westwater	**3100**	Forecast Little Change
Dolores nr Cisco	**e120**	Forecast Little Change
Colorado nr Cisco	**3350**	Forecast Little Change
Cataract Canyon	**e7650**	Forecast Little Change
NF Virgin nr Springdale	**70**	Forecast Little Change
Virgin nr Virgin	**150**	Forecast Little Change
Virgin nr Littlefield	**240**	Forecast Little Change
Colorado at Lees Ferry	**9550-17550**	Power Releases

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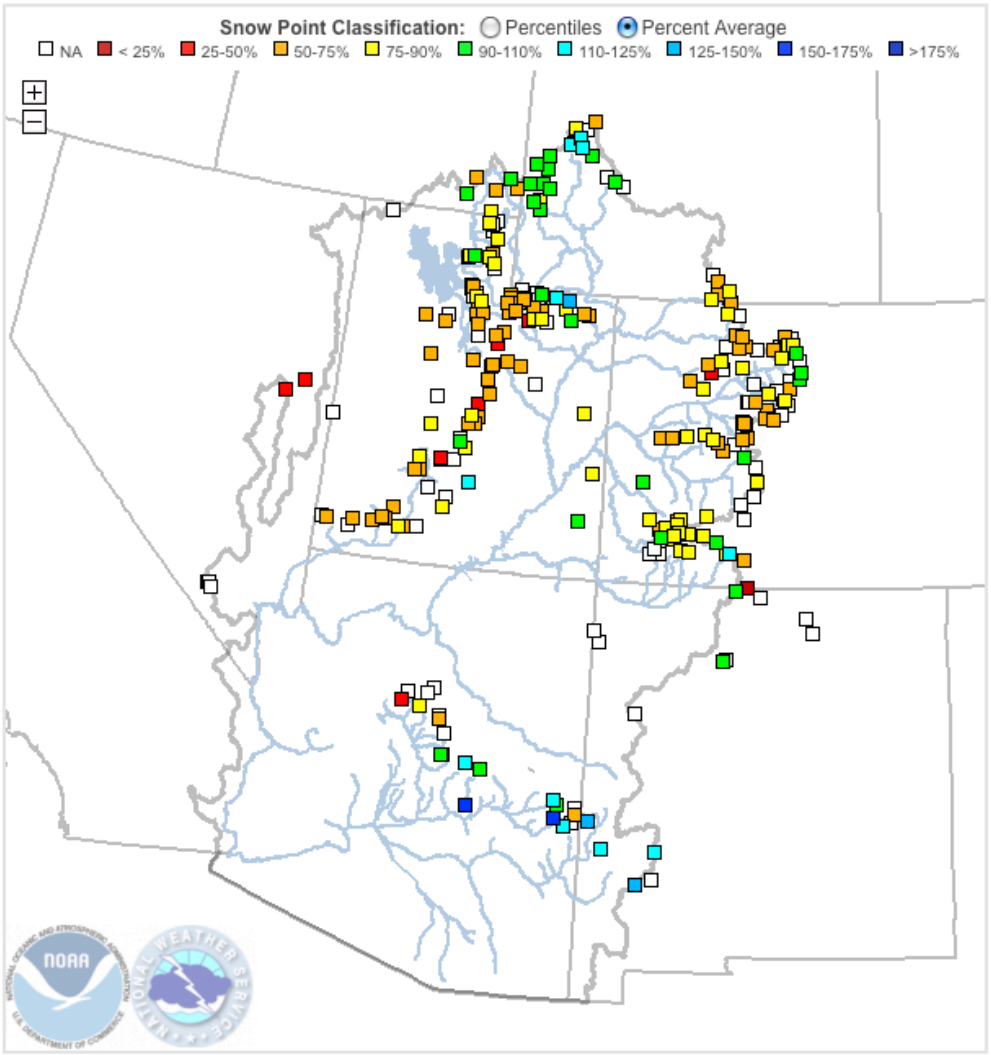

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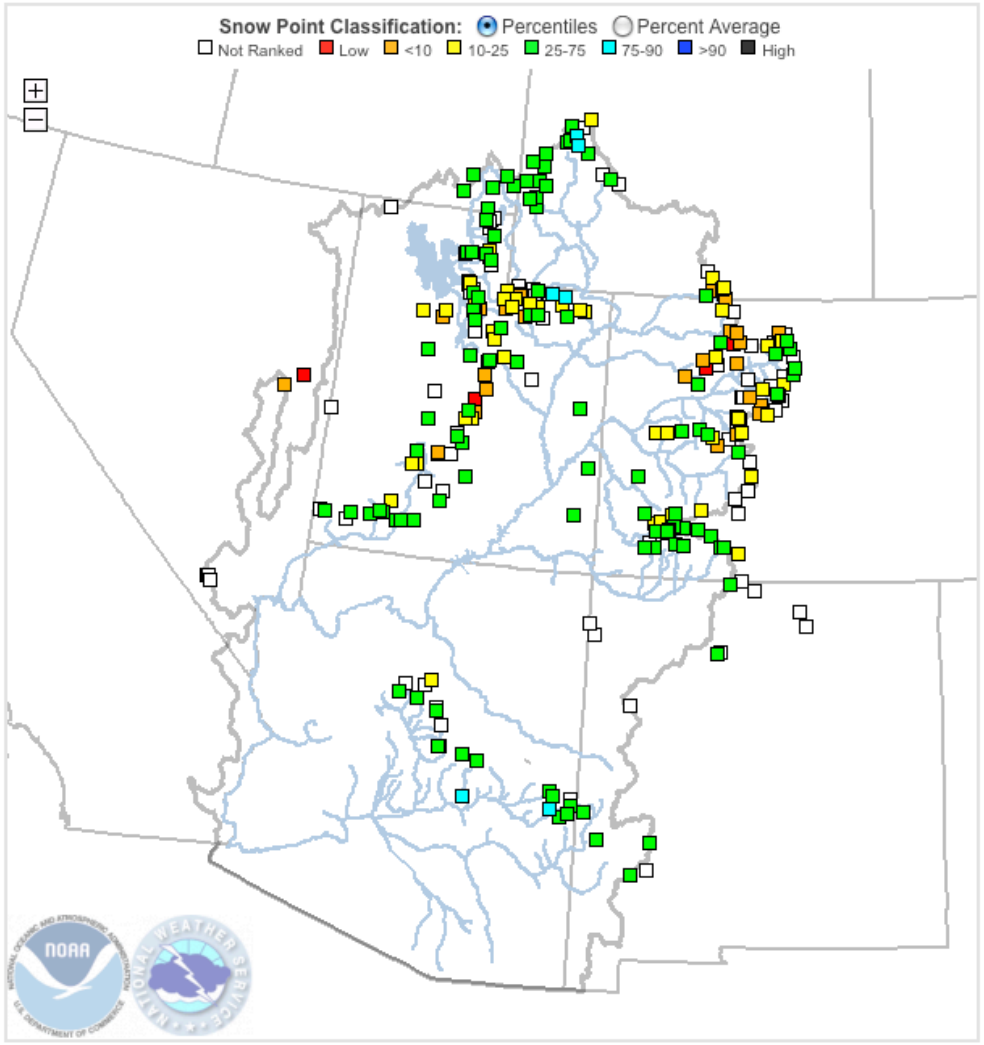

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Snow List

Click point type or enter search to change points displayed. Click column heading to sort by that data. Click ID to show plot for point.
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SEARCH POINTS

Plots: Auto Off On

Percent Average

NA | < 25% | 25-50% | 50-75% | 75-90% | 90-110% | 110-125% | 125-150% | 150-175% | >175%

Percentile

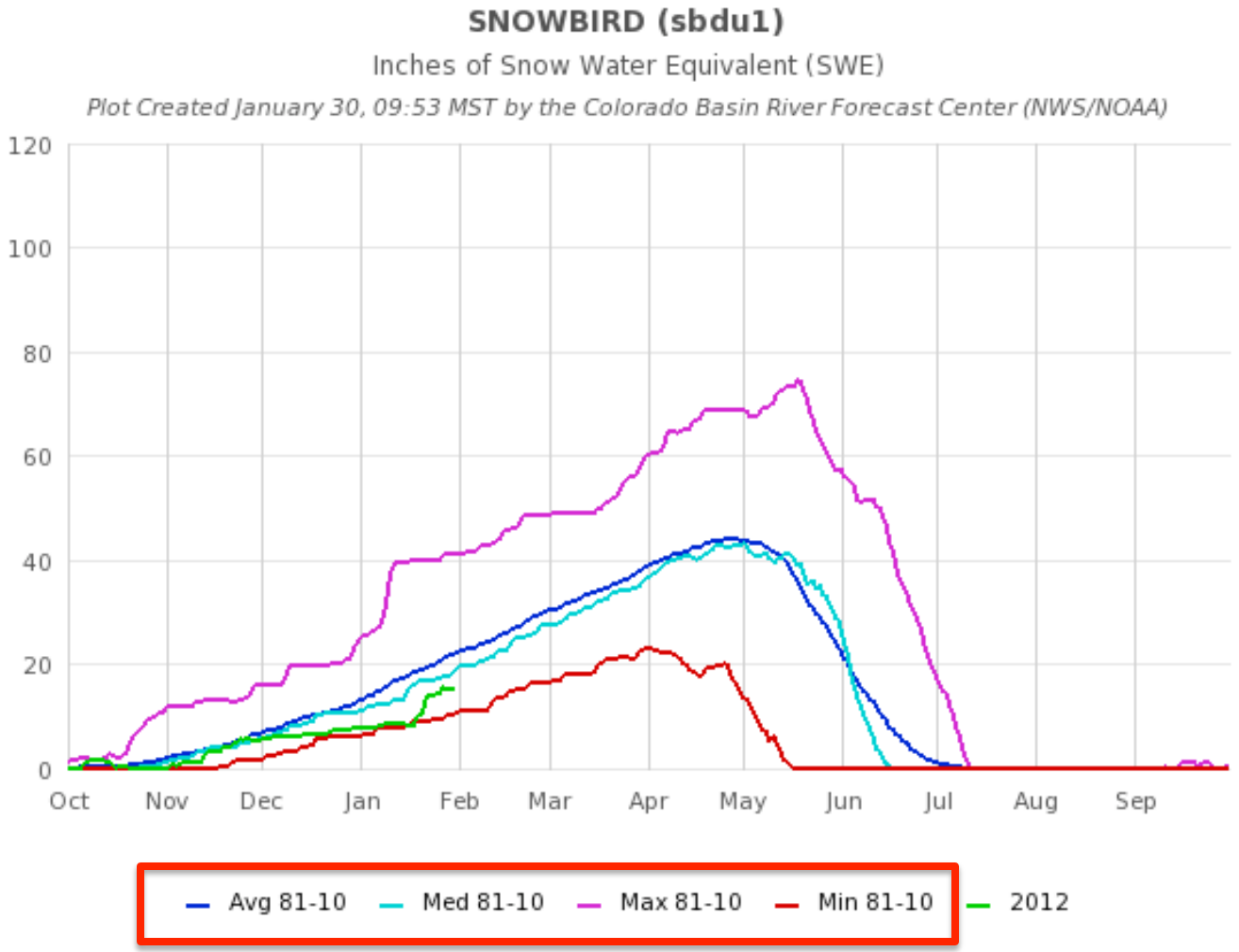
Not Ranked | Low | <10 | 10-25 | 25-75 | 75-90 | >90 | High

	NWS ID	Location	Percent Average	Percentile	Observed Date (Day)	SWE (in)	Average	%Average	Wet Rank	Dry Rank	Total Years	Percentile	Day Rate	Week Rate	Latitude	Longitude	HUC	Elevation	State	HSA
1	ARPC2	Arapaho Ridge	☐	☐	24	10.6					10		0.1	0.3	40.35	-106.38	14010001	10960	CO	GJT
2	AROC2	Arrow	☐	☐	1		8						0.0	0.0	39.92	-105.76	14010001	9680	CO	GJT
3	BBSA3	Baker Butte Summit	☐	☐	24	8.6					3		0.3	0.0	34.46	-111.38	15060203	7700	AZ	SLC
4	BRRC2	Bear River	☐	☐	24	4.7					8		0.1	0.1	40.06	-107.01	14050001	9080	CO	BOU
5	BCVC2	Beaver Ck Village	☐	☐	24	5					8		0.3	0.2	39.6	-106.51	14010003	8500	CO	RIW
6	BVRA3	Beaver Spring	☐	☐	24	4.5					2		0.6	0.2	36.33	-109.06	14080204	9200	AZ	SLC
7	BLJU1	Blacks Fork Junction Snowcourse	☐	☐	24	3					1		0.3	0.2	40.97	-110.58	14040107	8930	UT	SLC
8	BRSN2	Bristlecone Trail	☐	☐	1								0.0	0.0	36.32	-115.7	15010015	8979	NV	RIW
9	MRHU1	Burts Miller Ranch	☐	☐	24	0.2							0.0	-0.2	40.99	-110.85	16010101	8000	UT	FGZ
10	CAMU1	Cascade Mountain Snotel	☐	☐	24	6.3					9		0.4	0.5	40.27	-111.6	16020203	7768	UT	FGZ
11	CDRA3	Chalender	☐	☐	24	1.4					3		0.1	0.0	35.26	-112.06	15060202	7100	AZ	BOU
12	HAPC2	Chapman Tunnel	☐	☐	24	5.4					5		0.0	0.2	39.26	-106.63	14010004	10110	CO	SLC
13	CSPU1	Clayton Springs	☐	☐	24	5.7					12		0.3	0.2	37.97	-111.83	16030002	10000	UT	GJT
14	CZSC2	Cochetopa Pass	☐	☐	24	2					8		0.1	0.0	38.16	-106.6		10020	CO	SLC
15	CUMC2	Cumbres Trestle	■	☐	24	-3.3	14.8	-22.3					-0.1	-2.1	37.02	-106.45	13020102	10020	CO	SLC
16	EFBU1	East Fork - Blacks Fork G.s.	☐	☐	24	2					1		0.2	0.3	40.88	-110.53	14040107	9340	UT	LKN
17	ELRC2	Elliot Ridge	☐	☐	24	7.1					3		0.1	0.2	39.86	-106.42	14010002	10520	CO	SLC
18	FARU1	Farmington Lower Snotel	☐	☐	24	10.5					9		0.8	0.9	40.99	-111.82	16020102	6889	UT	PUB
19	FLSU1	Fish Lake Snowc Nr Loa	☐	☐	24	2.7					1		0.3	0.1	38.5	-111.77	14070003	8700	UT	GJT
20	FRVA3	Fort Valley	☐	☐	24	0.4							0.3	0.0	35.27	-111.75	15020015	7350	AZ	CYS
21	GDSU1	Garden City Summit	☐	☐	24	9.6					3		0.1	0.6	41.92	-111.47	16010201	7600	UT	BOU
22	GAPU1	Gardner Peak	☐	☐	24	4.8					8		0.3	0.2	37.4	-113.46	15010008	8350	UT	GJT
23	GARU1	Garrison	☐	☐	1								0.0	0.0	38.93	-114.03	16020301	5275	UT	SLC

Snowbird

Plot Maps Verification Gage

81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98
99 00 01 02 03 04 05 06 07 08 09 10 11

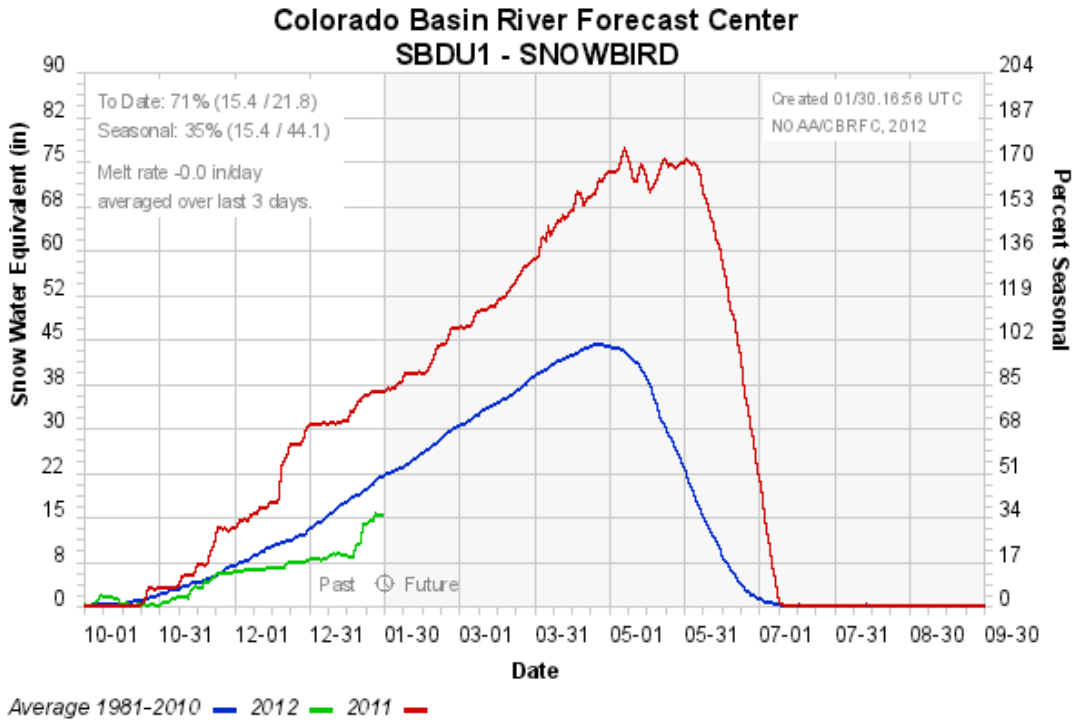


More Plot Options

CBRFC calculated values and require site to have 20 or more years of record; will update with NRCS calculated values when available

SBDU1 Snotel Plot

View station in google maps or google earth
Maps/Info. The current time is: 01/30.16:56 UTC



Select multiple years and/or stations. Be sure to use your systems key-click combination to avoid inadvertent deselection.

Years

avg
2012
2011
avg2
2010
2009
2008
2007
2006
2005
2004
2003
2002
2001
2000

Stations

SBDU1 SNOWBIRD
AGUU1 AGUA CANYON
AROC2 ARROW
ARPC2 ARAPAHO RIDGE
BBSA3 BAKER BUTTE SUMMIT
BBSW4 BLIND BULL SUM
BCVC2 BEAVER CK VILLAGE
BFTU1 BLACK FLAT-U.M. CK
BGFU1 BIG FLAT
BGSW4 BIG SANDY OPENING
BKBA3 BAKER BUTTE
BLDA3 BALDY
BLJU1 BLACKS FORK JUNCTION SNOWCOURSE
BLKC2 BEAR LAKE
BLPU1 BEN LOMOND PEAK

Data Type

Daily Data
Monthly Data

Y axis

Percent Seasonal
Percent to Date

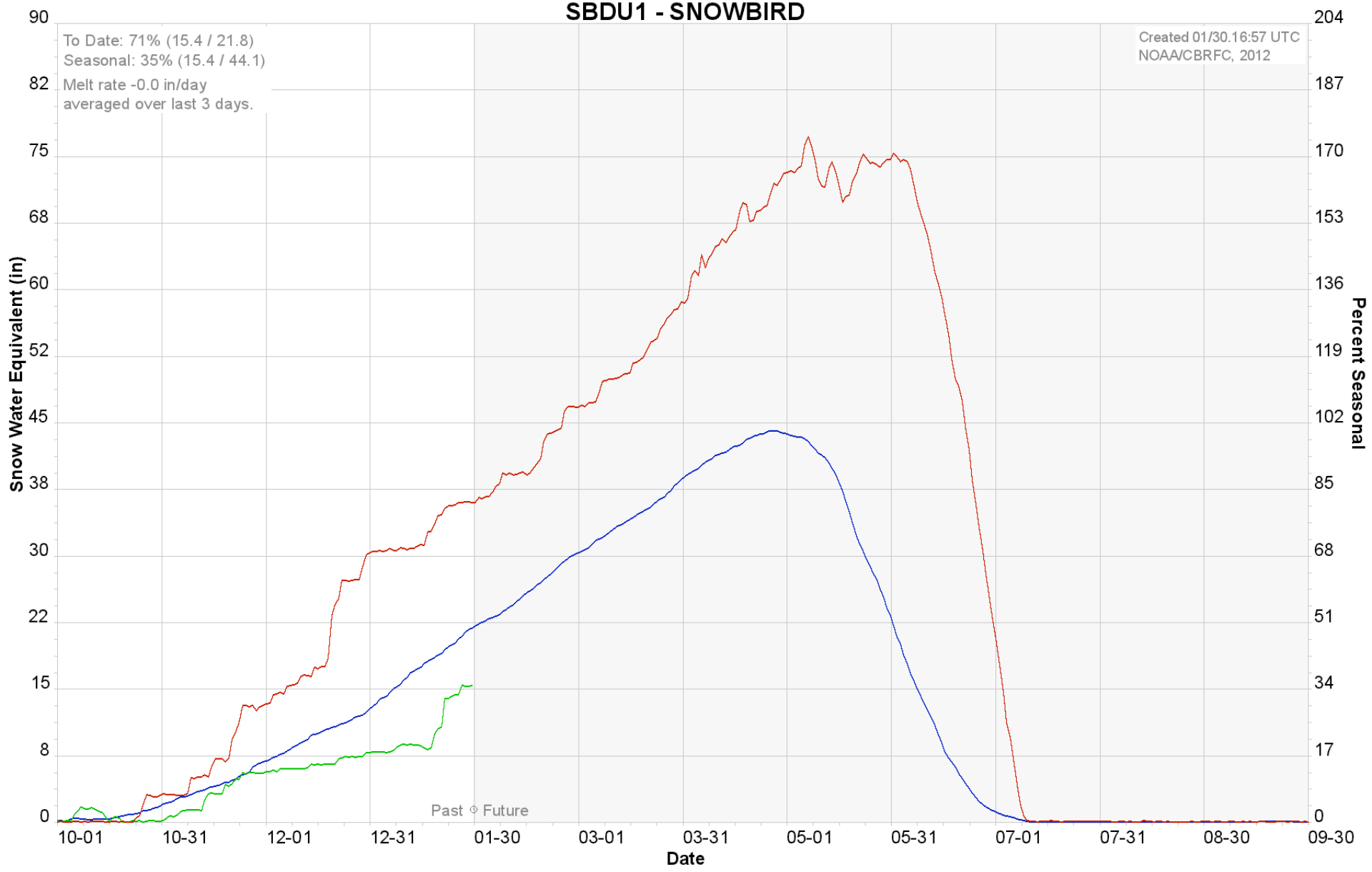
Similar/Historical Years

Off
Closest Pattern
Peak to Date
Current Observation
Highest Year
Lowest Year

☐ High Resolution
☐ Show Tabular Data

Apply

Colorado Basin River Forecast Center
SBDU1 - SNOWBIRD



Average 1981-2010 – *2012* – *2011* –

Snow Groups

Raw SNOTEL data from NRCS.

Great Basin

Bear River Drainage (bulu1 fbni1 hfku1 kllw4 llku1 lbnu1 ltbu1 mcru1 tglu1 oxsi1 sepi1 dpbu1)
Bear River Headwaters (hfku1 llku1 chcu1)
Bear River below Woodruff (dbpu1 mcru1 bulu1 kllw4 givi1 fbni1)
Beaver Minersville (bgfu1 mvyu1)
Clear Creek Sevier (kmnu1)
Cottonwood Canyons (mldu1 briu1 sbdu1)
Logan BlacksFork Little Bear Basins (bulu1 tglu1 fbni1)
Ogden River Drainage (blpu1 bltu1 dbpu1 hrgu1 ltbu1 mcru1)
Provo River Basin (trlu1 dstu1 nwyu1 stdu1 timu1)
Sevier River Basin Blo Piute (mcdu1 rpru1 seeu1 bvdu1 pklu1)
Sevier River Basin Headwaters (wflu1 mdvu1 cvyu1 lvju1 hrsu1 wstu1 bgfu1)
Sevier River Drainage (mdvu1 bxcu1 frlu1 pklu1 cvyu1 wstu1 kmnu1 pcku1 mcdu1 bvdu1 hrsu1 lvju1)
Six Creeks Headwaters (lopu1 psuu1 mldu1 briu1 sbdu1 thcu1 timu1 rbsu1)
Smith Fork Bear Basin (cllw4 sltw4 kllw4 incw4)
Spanish Fork Drainage (clcu1 crku1 pysu1 wrvu1 stdu1)
Utah Lake Drainage (clcu1 crku1 cucu1 dstu1 nwyu1 pysu1 rbsu1 timu1 trlu1 wrvu1)
Weber Basin Headwaters (smmu1 trlu1 ccku1 chcu1)
Weber River Drainage (blpu1 bltu1 ccku1 chcu1 dbpu1 hrgu1 ltbu1 fmnu1 mcru1)

Lower Colorado

Central Mogollon Rim (proa3 bkba3)
Gila River (cnda3 frdn5 scdn5 lktn5 sgnn5 hnma3)
LC Southern Headwaters (bbsa3 blda3 hbea3 mvfa3)
Little Colorado River (bkba3 blda3 mvfa3 mbea3 proa3)
Lower Colorado (whla3 frya3 mrma3 bkba3 proa3 wkma3 blda3 mvfa3 wcta3 hnma3 cnda3 sgnn5 lktn5)
Salt (mvfa3 cnda3 wcta3 xbha3)
Salt River (blda3 cnda3 hnma3 mvfa3 wcta3)
San Francisco (frdn5 cnda3 xbha3)
Upper Gila (scdn5 lktn5 sgnn5)
Upper Salt (mvfa3 cnda3 wcta3 xbha3)
Verde (whla3 bkba3 frya3 mrma3)
Verde River (bkba3 frya3 mrma3 whla3)
virgin (cvyu1 hrsu1 lgcu1 lgfu1 mdvu1)

Green River

Duchesne River (bndu1 cucu1 cwhu1 dstu1 fplu1 icyu1 lbnu1 lkfu1 mmtu1 rcku1 stdu1 trlu1 wrvu1 kgcu1 tcku1)
Flaming Gorge-North Slope (hewu1 hiru1 hpsu1 scku1)
Green River Basin (kndw4 hmkw4 erdw4 sniw4 kllw4 lopw4 nflw4 trpw4 grvw4 scdw4 bgsw4 kgcu1 hpsu1 hiru1 ekpw4 incw4 tcku1 hewu1 scku1 rcku1 cucu1 dstu1 stdu1 wrvu1 kgcu1 icyu1 mmtu1 trlu1 lkfu1 cwhu1 bndu1 fplu1 lbnu1 btlw4 blsc2 burc2 colc2 crsc2 dvdw4 drlc2 elkc2 lync2 oldw4 resc2 rcpc2 srsw4 towc2 tlsc2 wpkw4 seeu1 bufu1 rpru1 clcu1 mcdu1 wrvu1)
Green abv Fontenelle (bbsw4 ekpw4 grvw4 kndw4 lopw4 nflw4 scdw4 sniw4 trpw4 erdw4)
Ham's Fork (kllw4 hmkw4 incw4)
Little Snake (btlw4 dvdw4 oldw4 srsw4 wpkw4)

COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: How to use this web page webinar: January 30

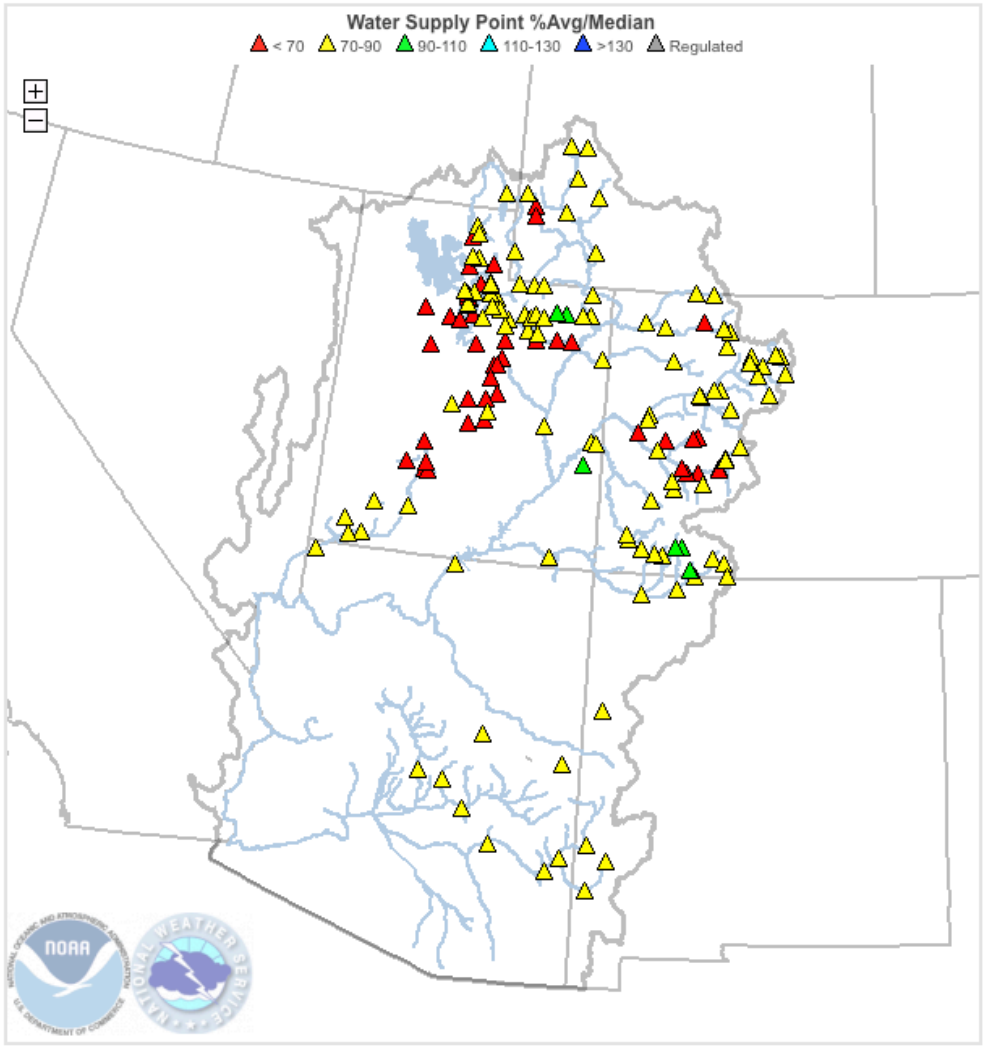
RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Forecast Map Forecast List Current Publication Publication Archive Weekly ESP

Areas: CBRFC Upper Colorado Green San Juan Great Sevier Virgin Lower Colorado

SEARCH POINTS

Double Click to Zoom, Hover Over Point For Details, Click Point For Plot



COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: January Water Supply Forecasts

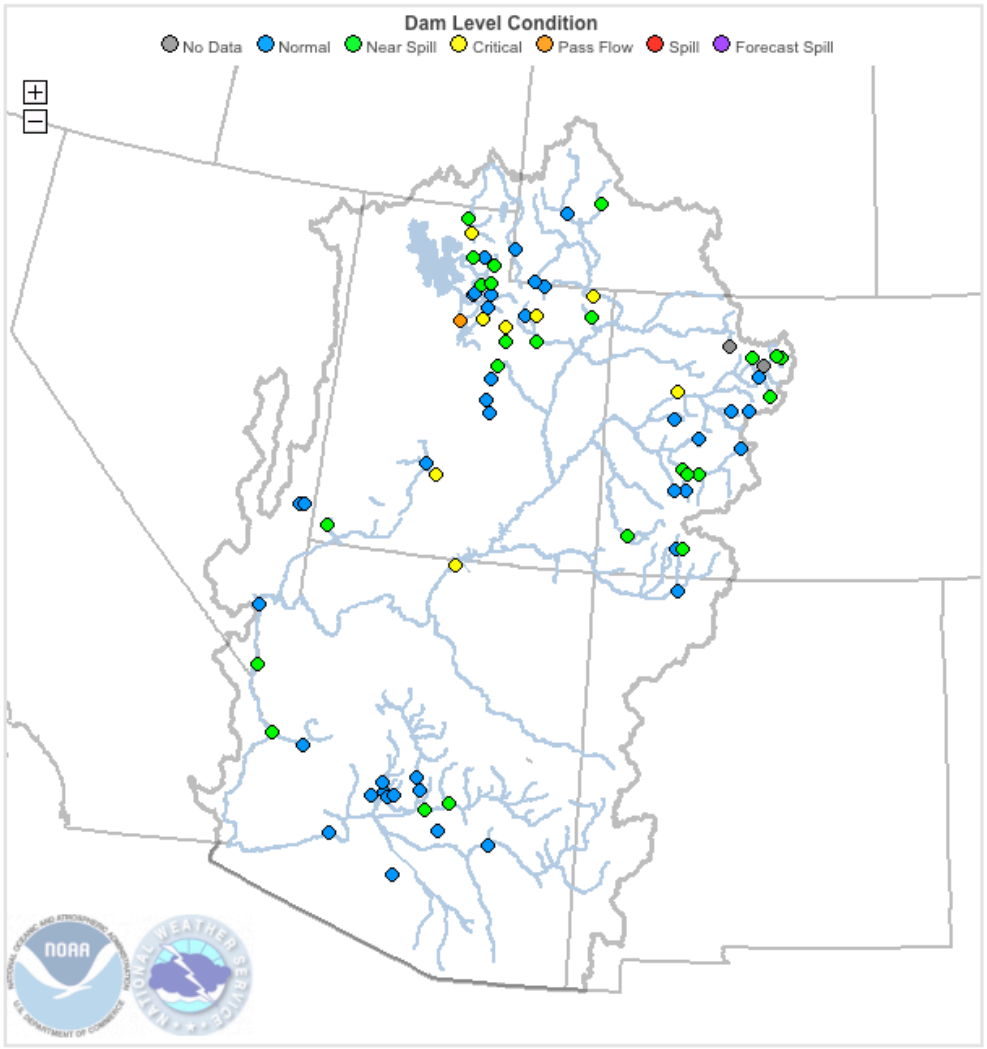
RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Conditions Map Conditions List Damcrit Webcat DamBreak

Areas: CBRFC Upper Colorado Green San Juan Great Sevier Virgin Lower Colorado

SEARCH POINTS

Double Click to Zoom, Hover Over Point For Details, Click Point For Plot



Observed Weather

Select Month, Day , and Year with arrows. Maps may take a few seconds to load. Click map for larger version. More precip images available from water.weather.gov.

Month: January

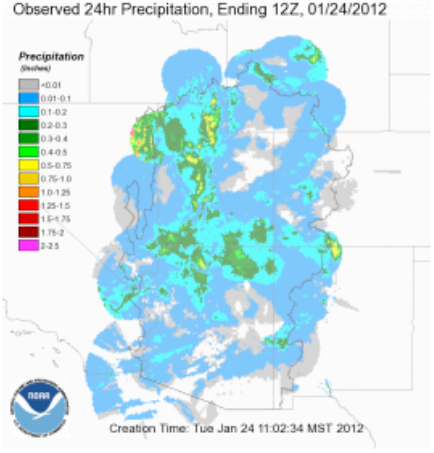
Day: 24

Year: 2012

24 Hour Observed Weather -- Ending 12Z Tuesday, January 24

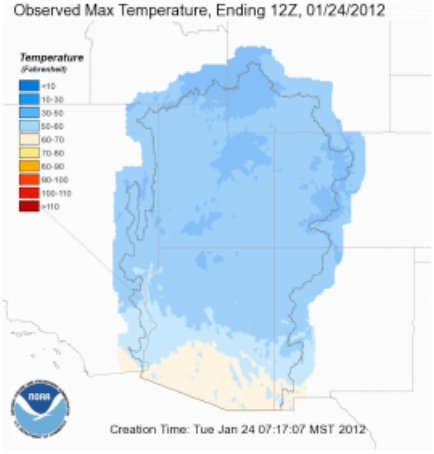
Precipitation 01/24/2012

Observed 24hr Precipitation, Ending 12Z, 01/24/2012



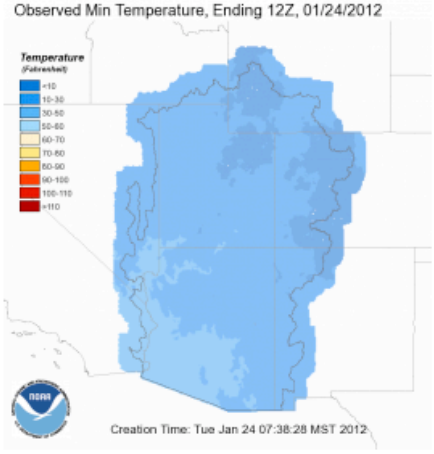
Max Temperature 01/24/2012

Observed Max Temperature, Ending 12Z, 01/24/2012



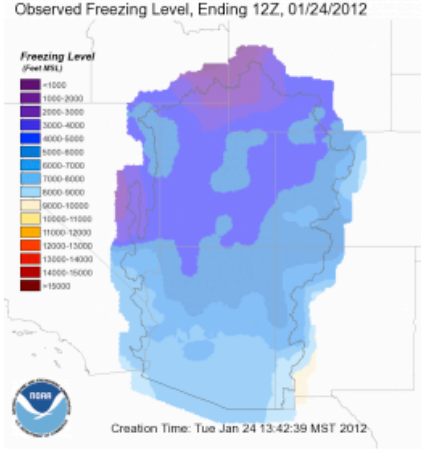
Min Temperature 01/24/2012

Observed Min Temperature, Ending 12Z, 01/24/2012



Freezing Level 01/24/2012

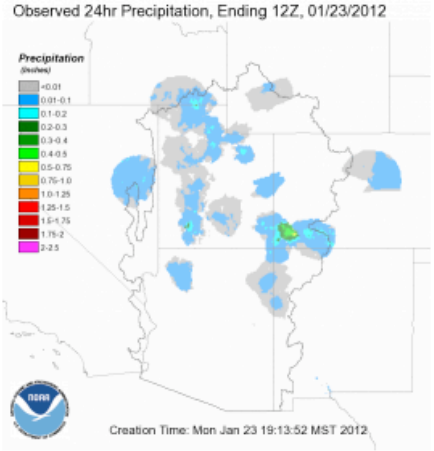
Observed Freezing Level, Ending 12Z, 01/24/2012



24 Hour Observed Weather -- Ending 12Z Monday, January 23

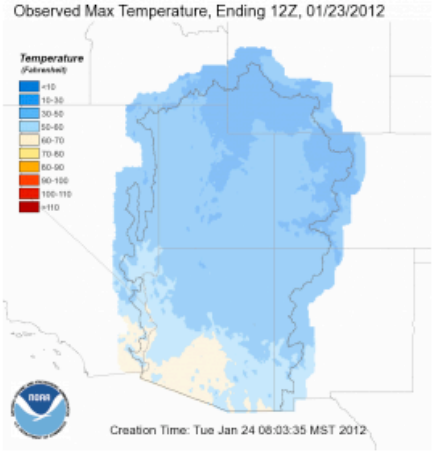
Precipitation 01/23/2012

Observed 24hr Precipitation, Ending 12Z, 01/23/2012



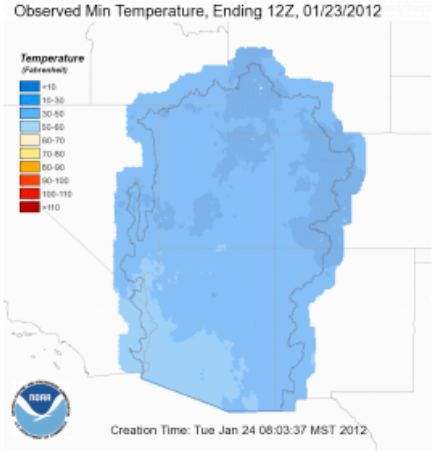
Max Temperature 01/23/2012

Observed Max Temperature, Ending 12Z, 01/23/2012



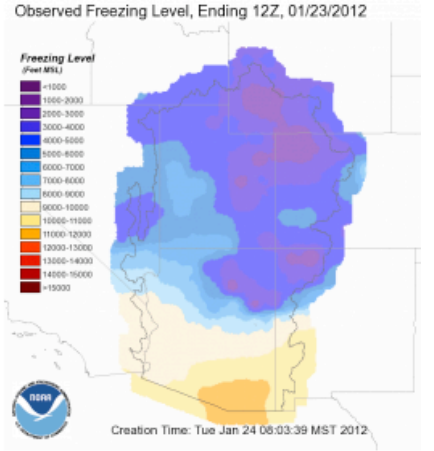
Min Temperature 01/23/2012

Observed Min Temperature, Ending 12Z, 01/23/2012



Freezing Level 01/23/2012

Observed Freezing Level, Ending 12Z, 01/23/2012



COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Observed Forecast Radar Satellite

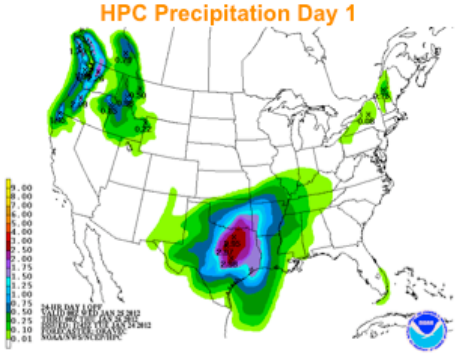
Forecast Weather

Images may take a few seconds to load. Click image to zoom.

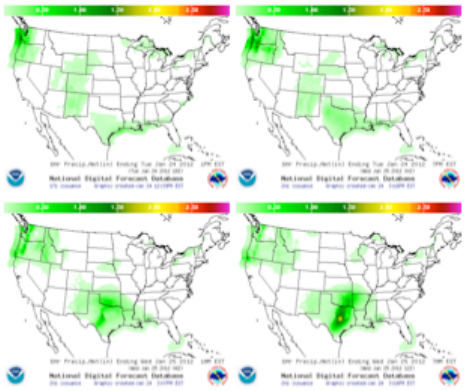
View more HPC Forecasts. View more NDFD Forecasts.

NDFD Area: National Central-Rockies South-Rockies Arizona Colorado Idaho Nevada New Mexico Utah Wyoming

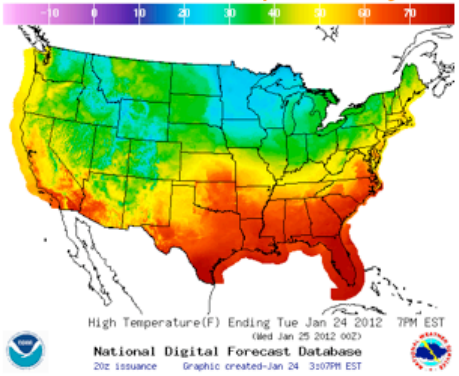
HPC Precipitation Day 1



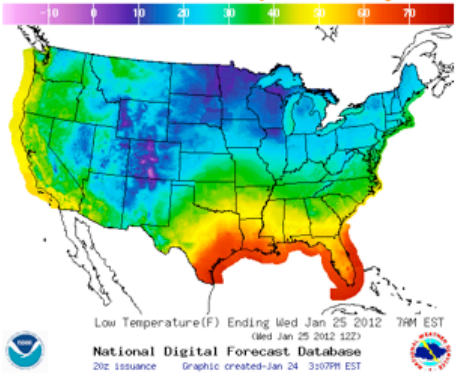
NDFD Precipitation Day 1



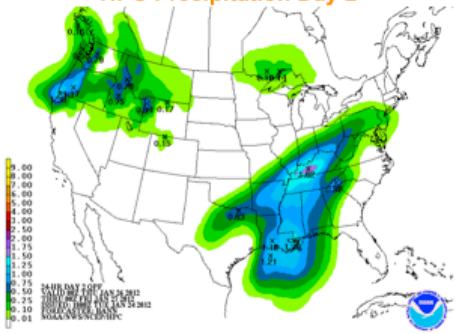
NDFD Maximum Temperature Day 1



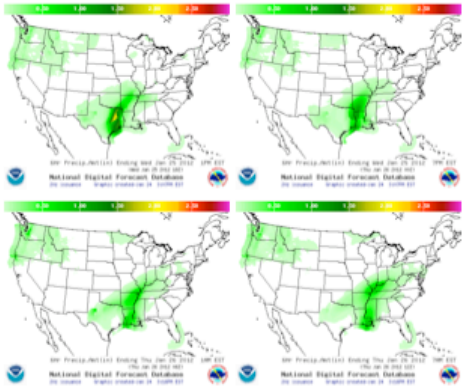
NDFD Minimum Temperature Day 1



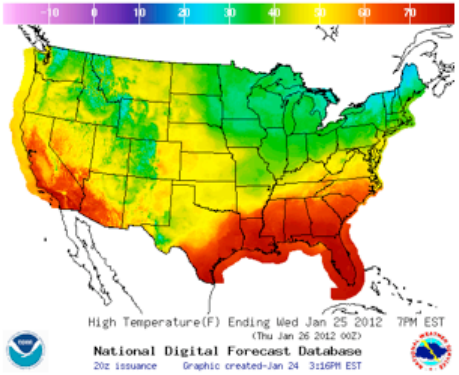
HPC Precipitation Day 2



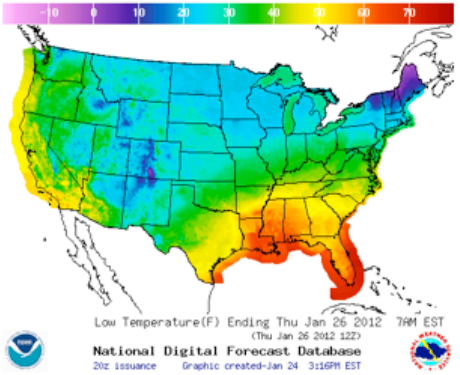
NDFD Precipitation Day 2



NDFD Maximum Temperature Day 2



NDFD Minimum Temperature Day 2



RIVERS
- Conditons Map
- Active Points
- Peak Flow Map
- Peak Flows
- Recreational Forecasts
- Text Products
- 5 Day Flood Outlook
- Hydro Data
- AHPS

SNOW
- Conditions Map
- Conditions List
- Snow Groups

WATER SUPPLY
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- Forecast List
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- Hydroclimatology

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- Old SDM

National Oceanic and Atmospheric Administration
National Weather Service
Colorado Basin River Forecast Center
2242 West North Temple
Salt Lake City, Utah 84116

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Freedom of Information Act
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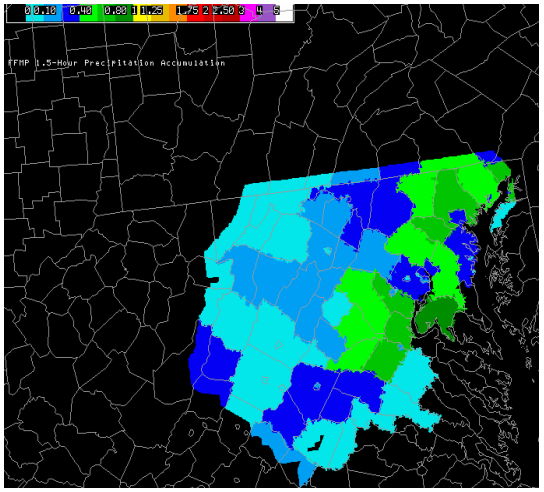
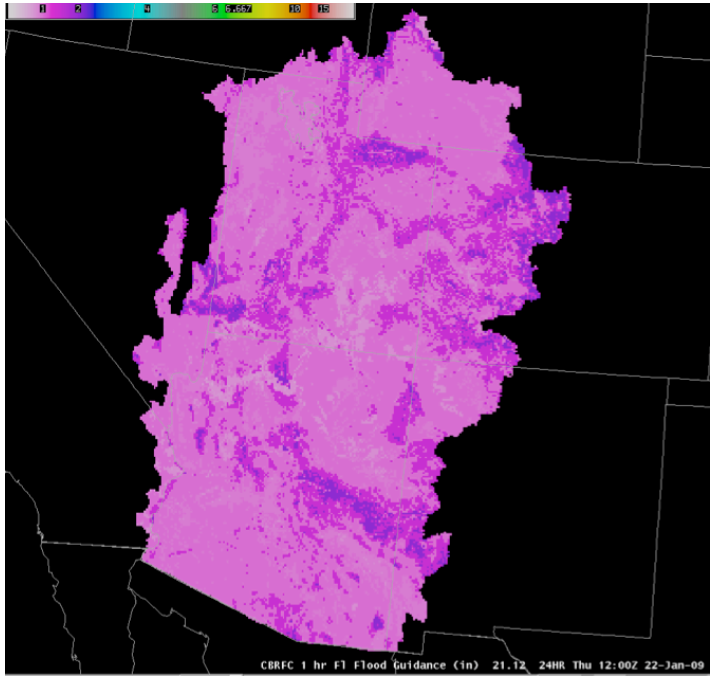
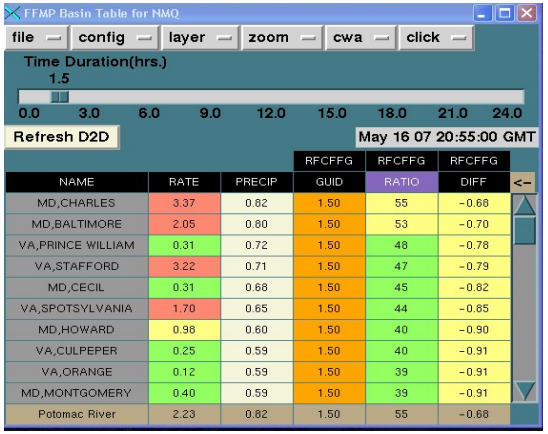
Original Map, Google Map
CBRFC/NOAA Access

Flash Flood Support

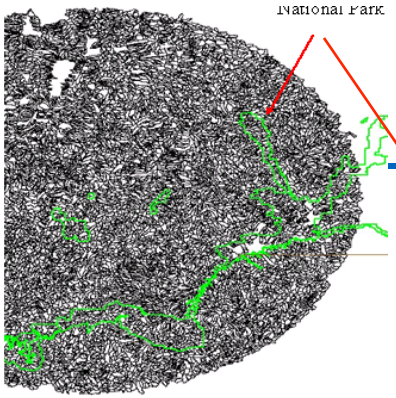
Support NWS flash flood program at WFOs through innovative flash flood guidance and (eventually) distributed model





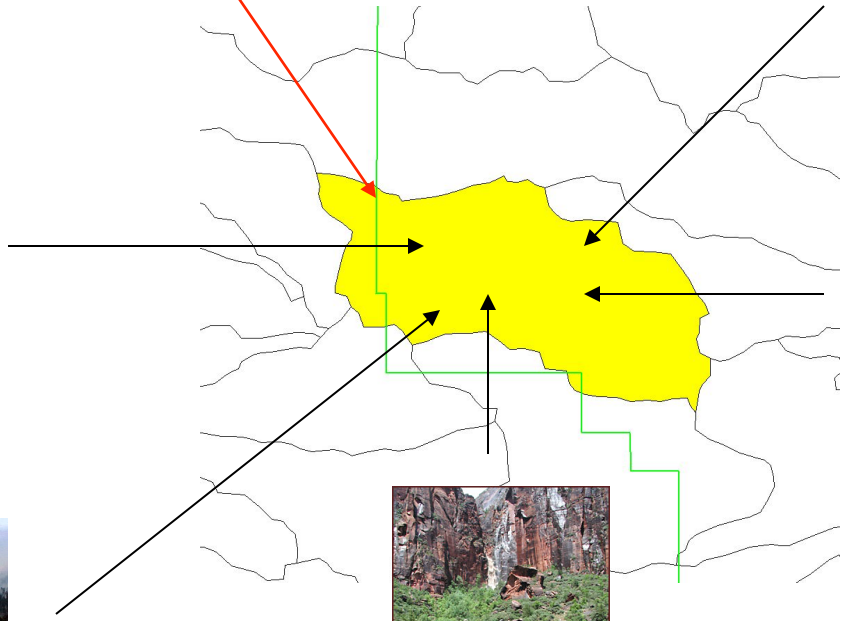


Flash Flood Potential Index concept



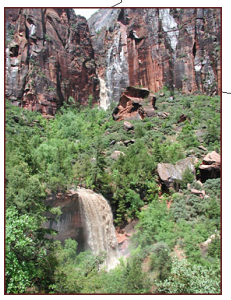
Land Use ?

Soil type ?



Vegetation type and density ?

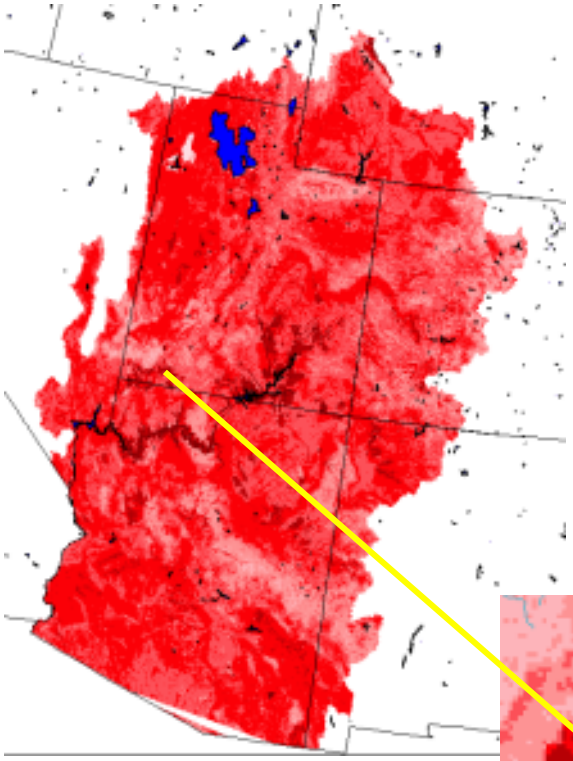
Fire activity ?

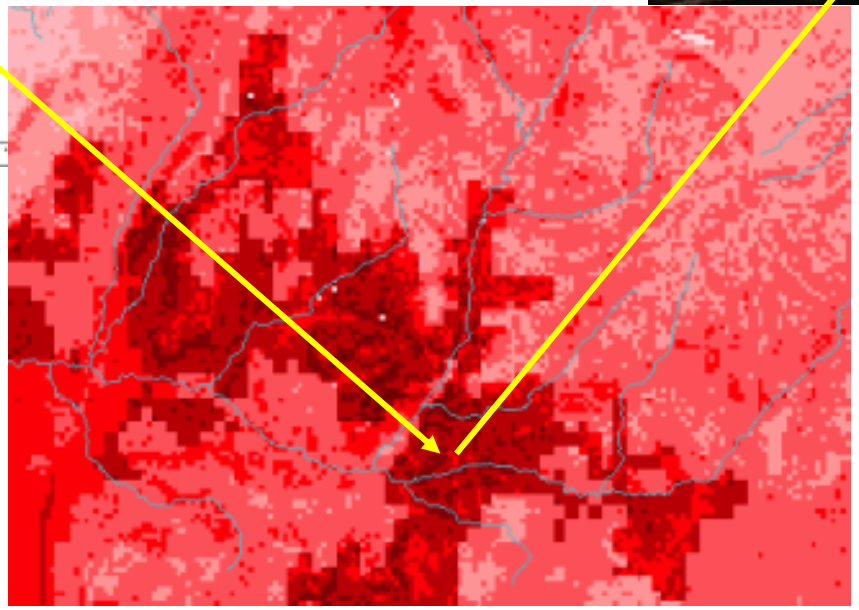


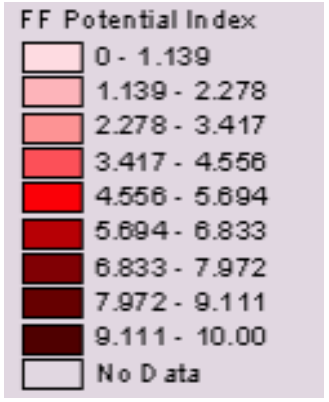
Slopes?

Try to qualify the flash flood threat

FFPI is designed to highlight flash flood prone locations







CBRFC FFPI / FFG Relationship:

Start with reasonable average FFG values of

- **1 inch in 1 hour**

Assign these values to grid cells with the mean FFPI value of 4

Incrementally adjust the FFG values up or down as FFPI varies

Limit the range of FFG values to climatologically reasonable values

Verify results by comparing to archived flash flood events

The FFPI values range from 1 to 9 with a mean value for the CBRFC near 4

- If FFPI = 4: FFG is 1.00
- If FFPI = 5: FFG is .90
- If FFPI = 6: FFG is . 80
- If FFPI = 7: FFG is .70
- if FFPI = 8: FFG is .60
- if FFPI = 9: FFG is .55
- if FFPI = 3: FFG is 1.45
- if FFPI = 2: FFG is 2.00
- if FFPI = 1: FFG is 2.25

CBRFC Staff

Michelle Stokes	HIC
Kevin Werner	SCH
Vacant	DOH
Craig Peterson	Calibrations
Brenda Alcorn	Upper Colorado Basin, NWSRFS and database
Greg Smith	San Juan and Gunnison
Cass Goodman	IT
John Lhotak	Acting DOH
Brent Bernard	Great Basin
Tracy Cox	Lower Colorado
Ashley Nielson	Green Basin
Stacie Bender	Virgin and Sevier
Mike Hobbins	CPC/OHD/CBRFC post-doc
Valerie Offutt	ASA

Summary

Colorado River Overview

2011 and 2012: Two Extremes

Forecast Methodology

CBRFC and WFO FGZ

Questions?

Kevin Werner

CBRFC Service Coordination Hydrologist
Phone: 801.524.5130
Email: kevin.werner@noaa.gov