# CBRFC
# March 2015
# CUWCD Briefing/Meeting

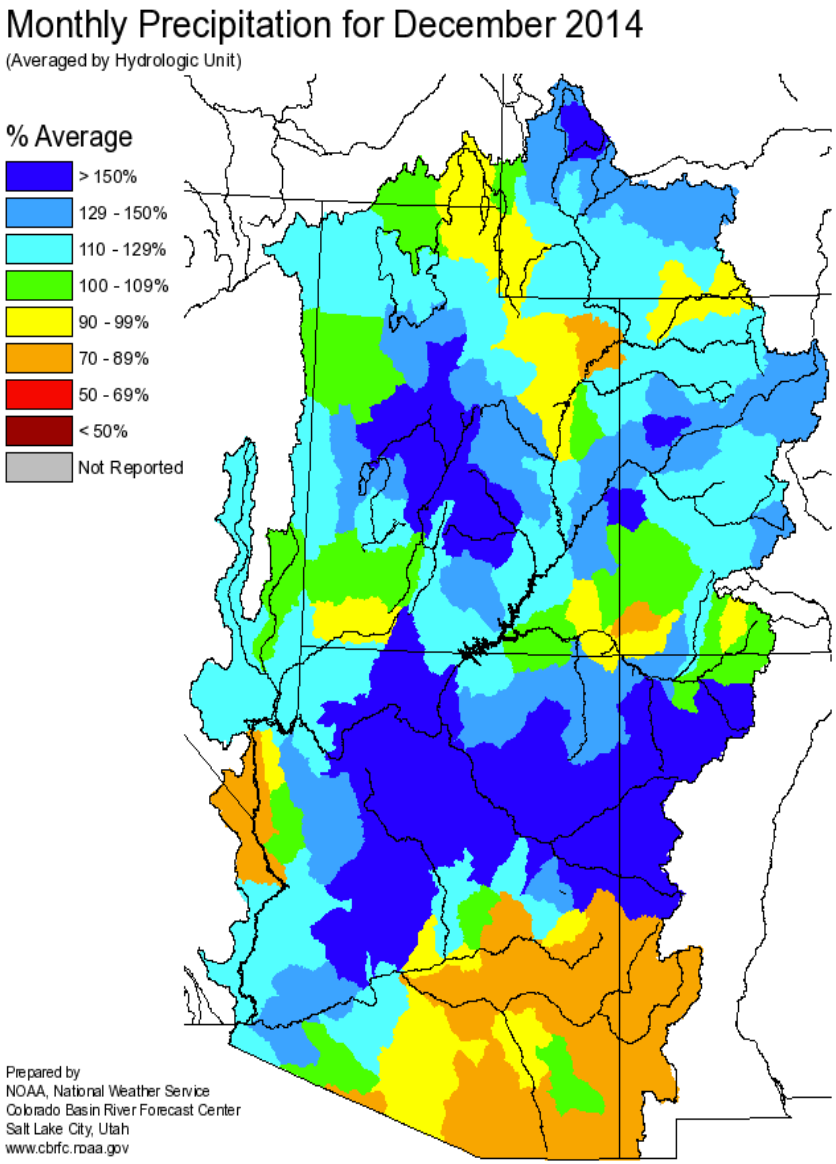
1pm March 9, 2015

Ashley Nielson

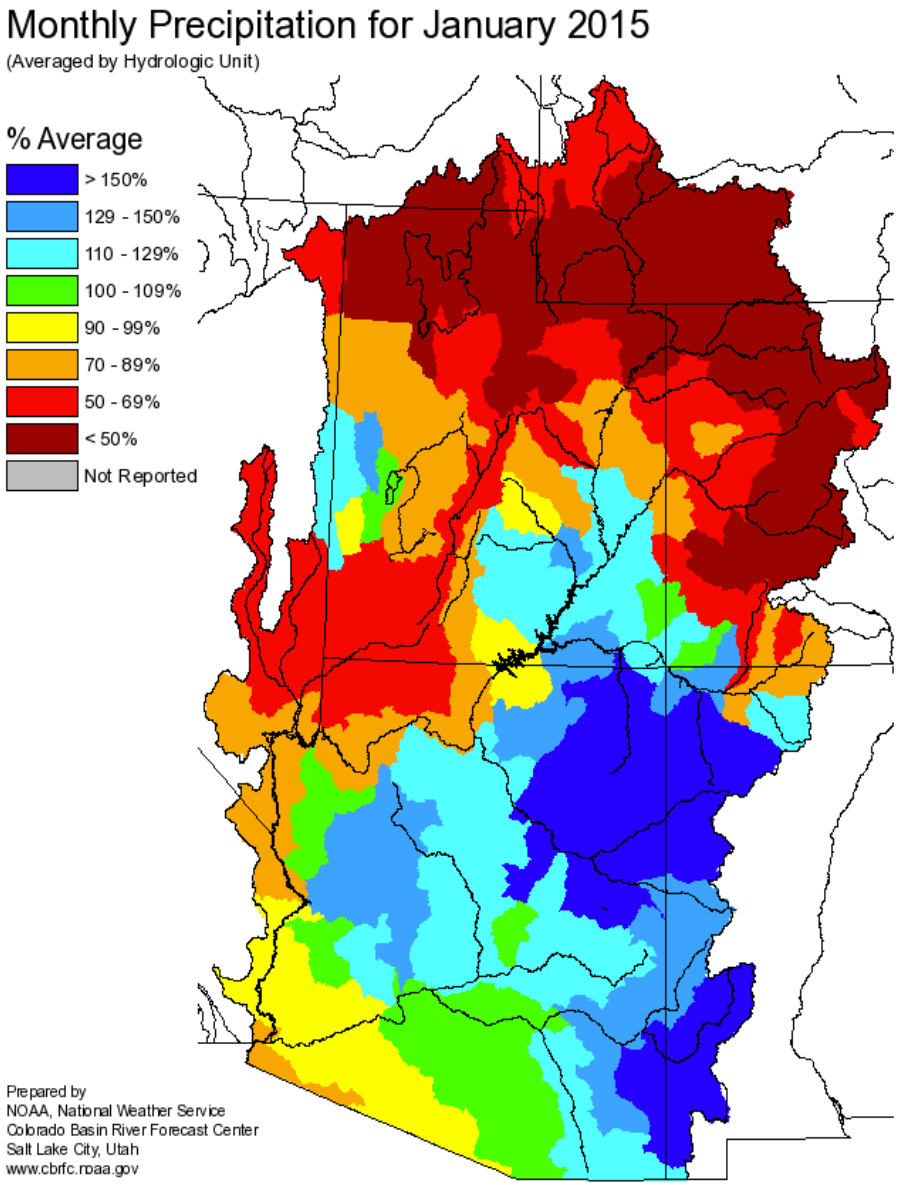
# March Call Outline

- February Weather Review
- Current conditions driving forecasts
  - Soil Moisture, Snow Conditions
- Water Supply Forecasts
- Upcoming weather (short and long range)
- Peak Flow Forecasts

# Winter Precipitation



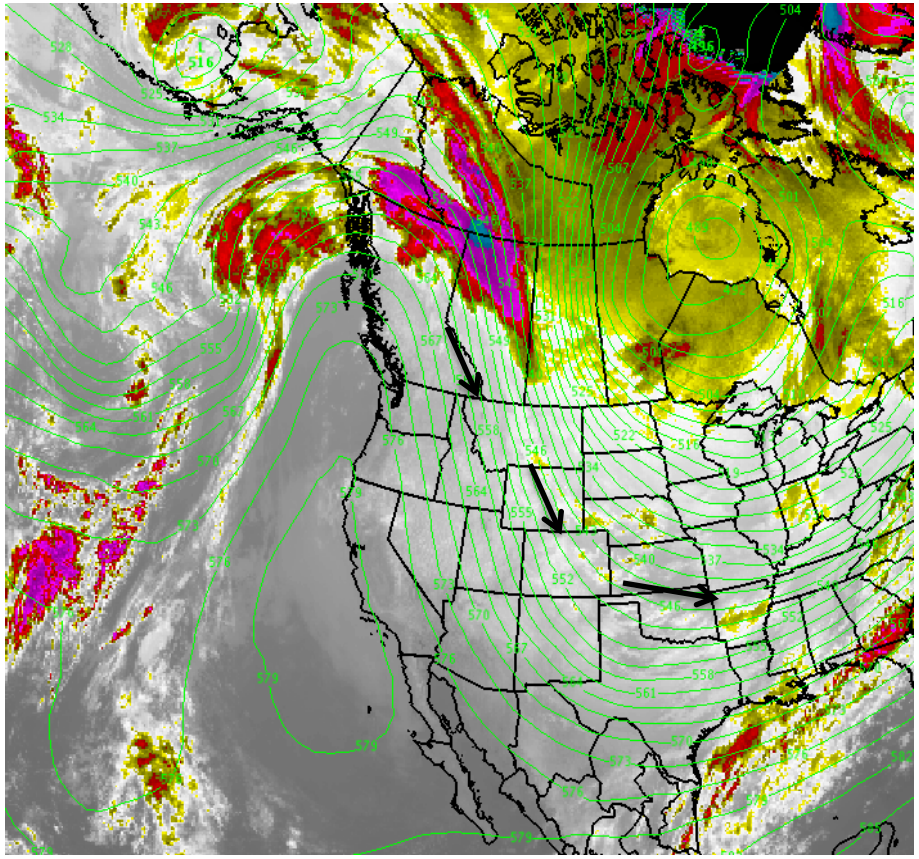

Duchesne: 105%
Provo: 120%



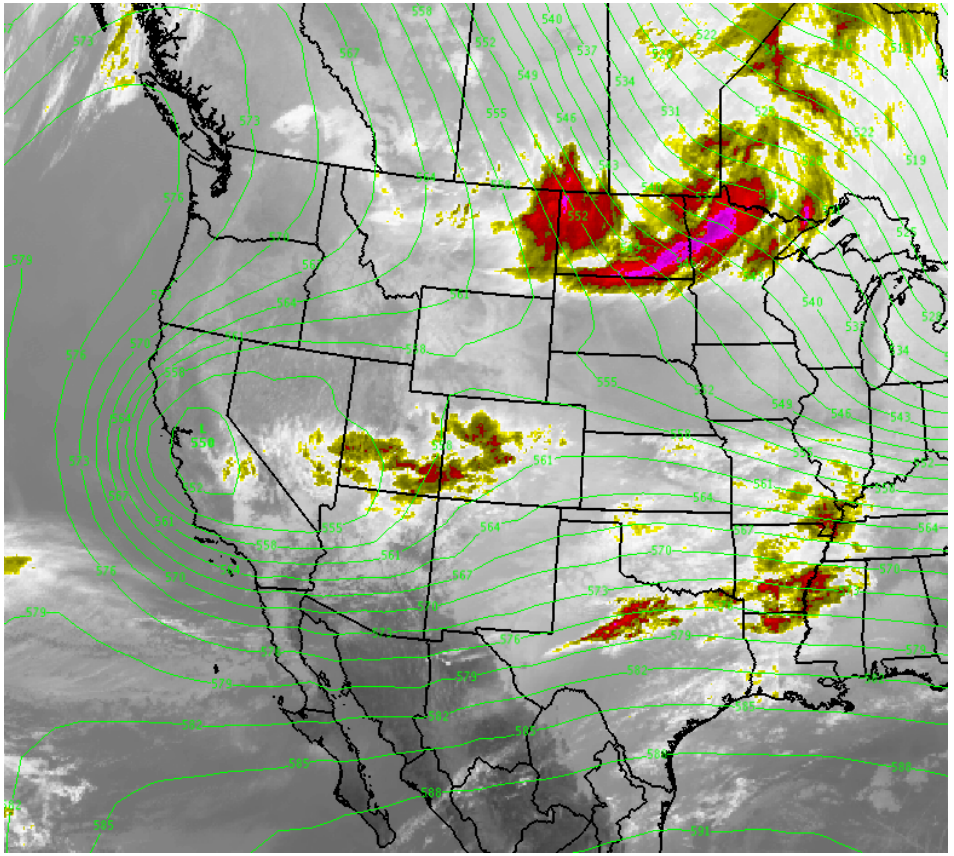

Duchesne: 45%
Provo: 50%

# FEBRUARY WEATHER

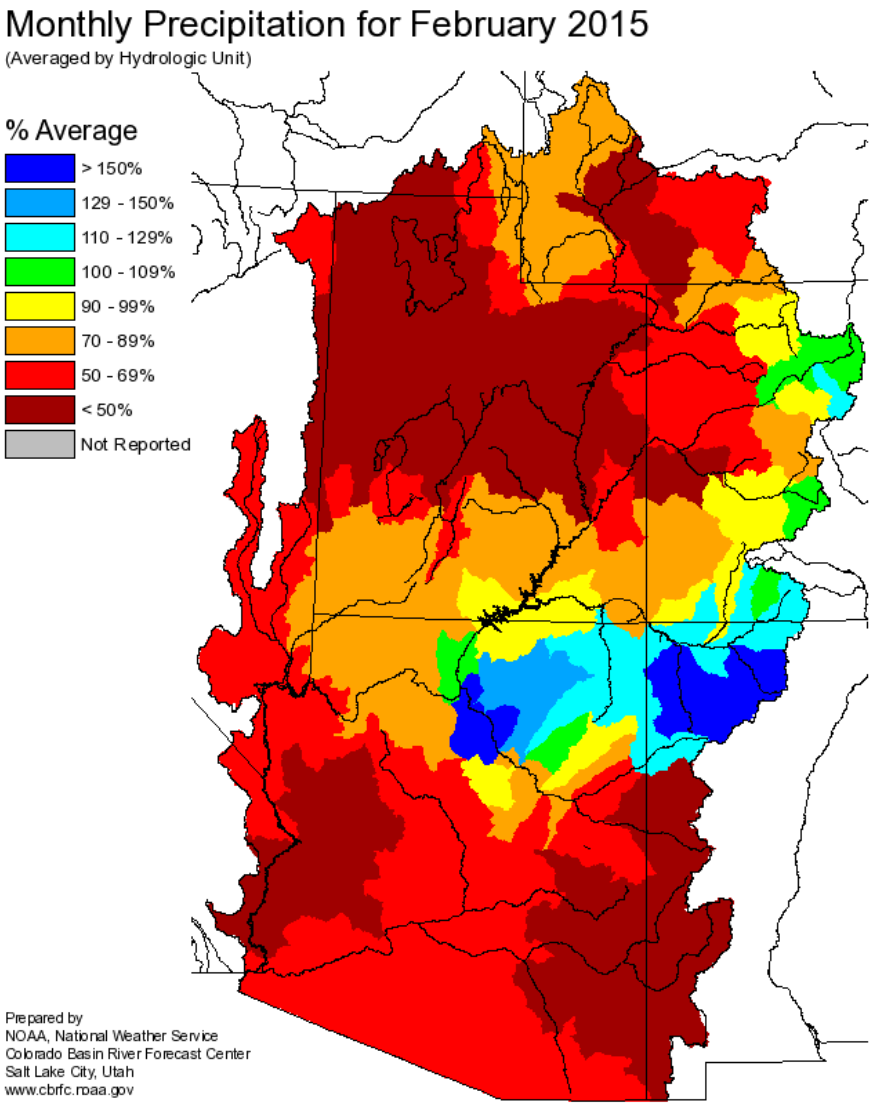
Feb 17 2015 – High Pressure Ridge



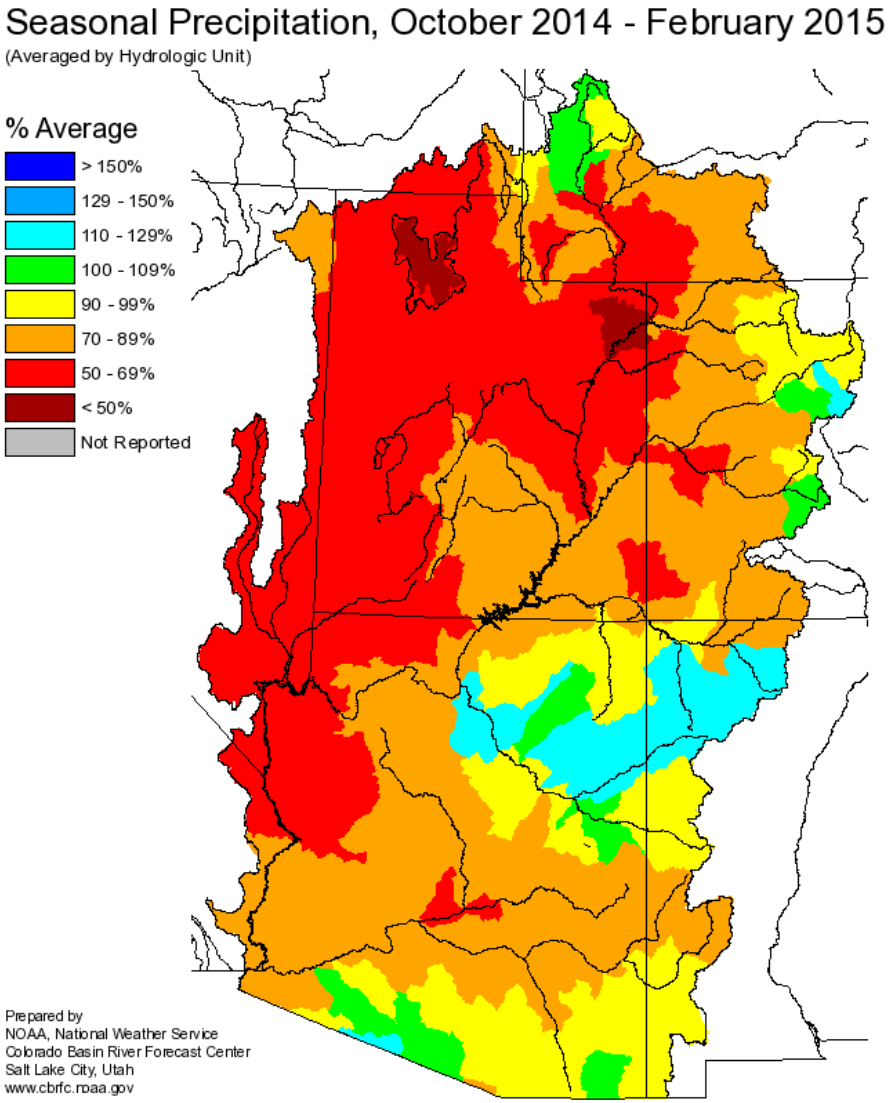
Feb 23 2015 – Pattern Change !!



# February and Seasonal Precipitation



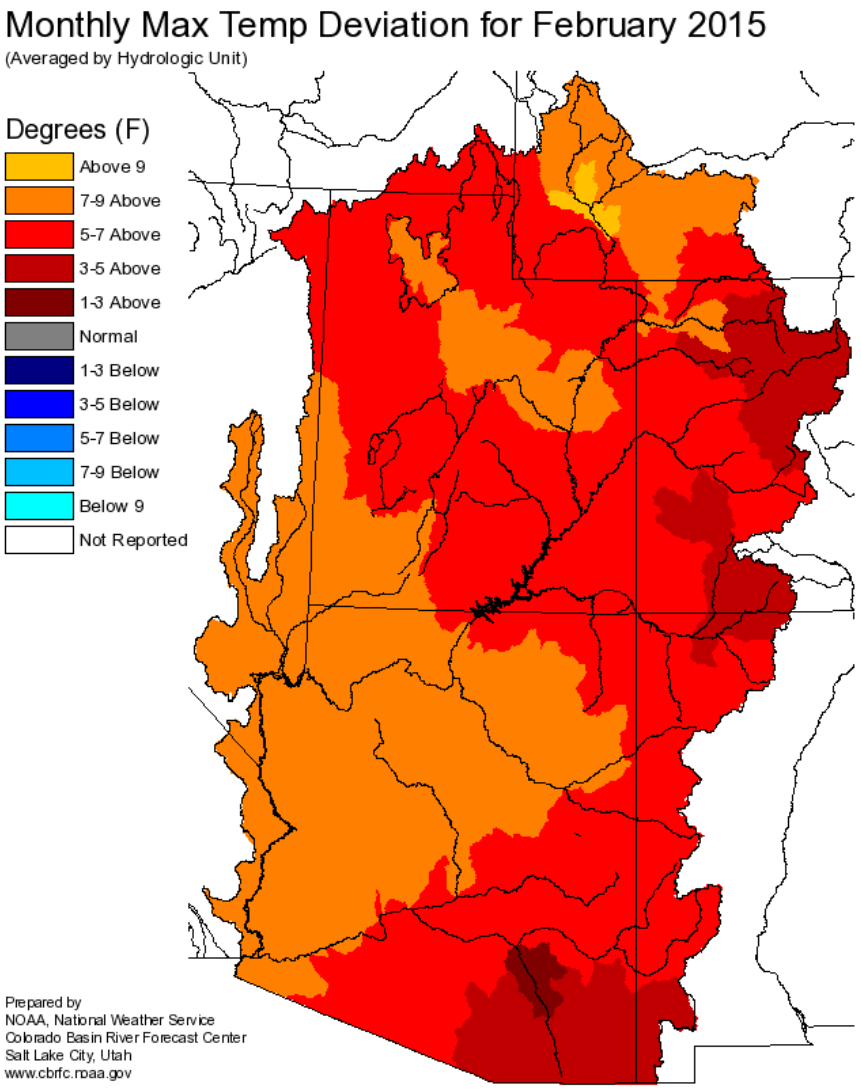

Duchesne: 34%
Provo: 31%

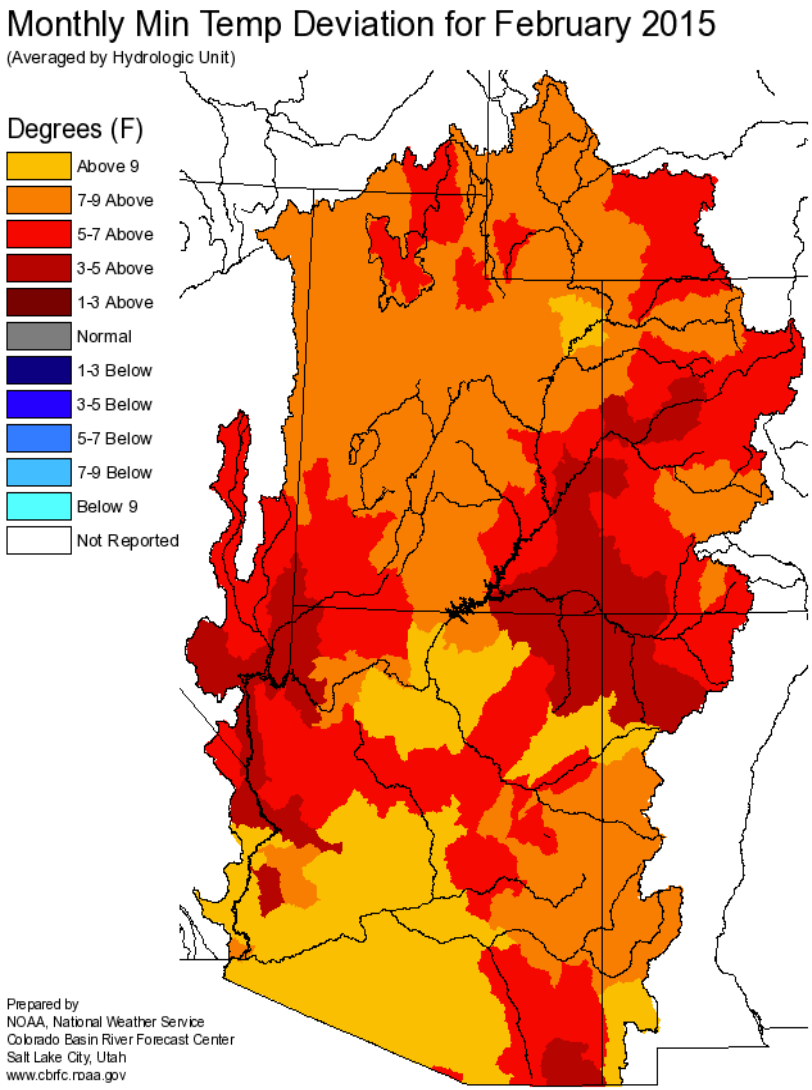



Duchesne: 58%
Provo: 62%

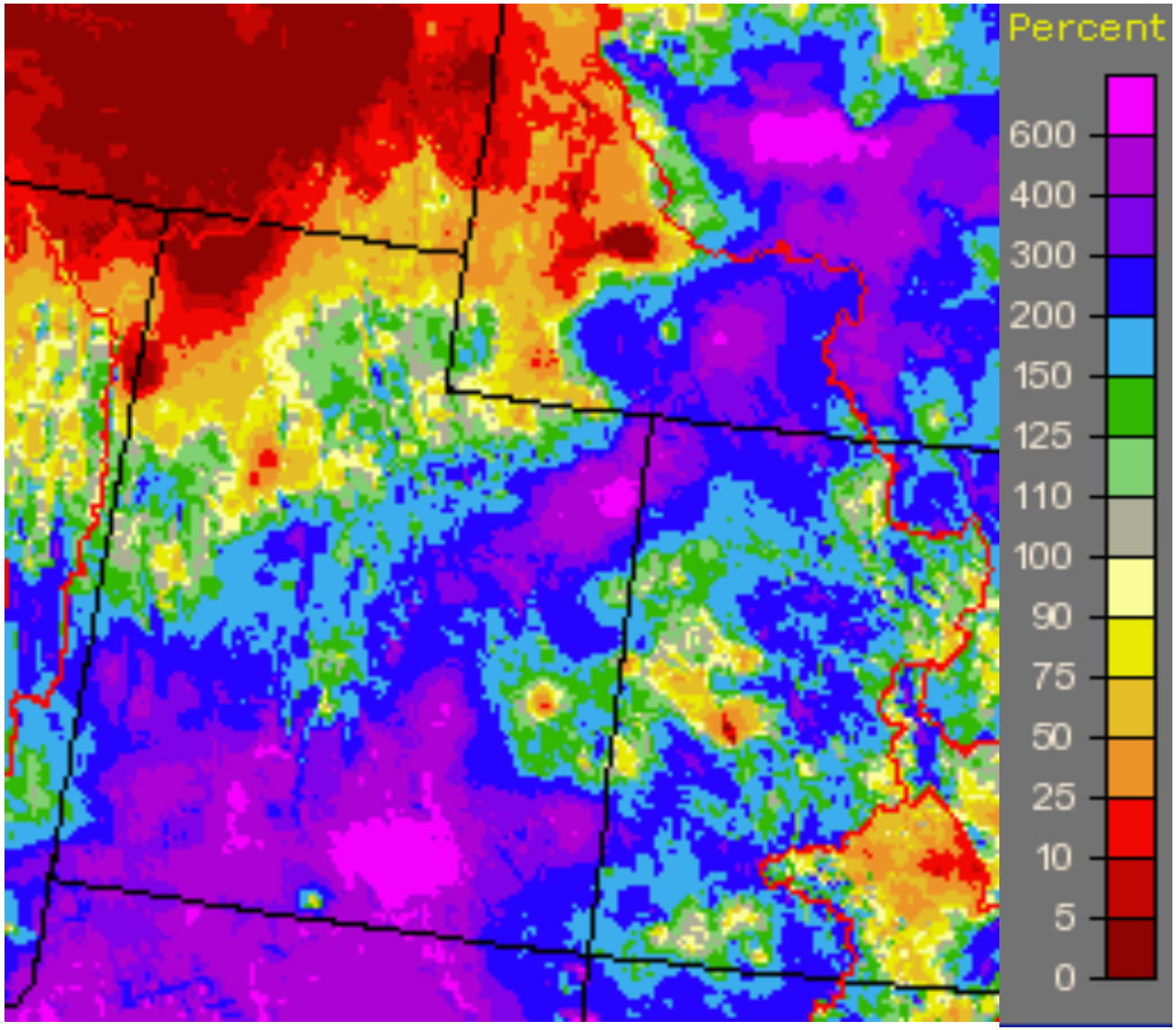
# February Temperatures

* Warmest February on Record – Several Locations *
* Snowmelt and Increased Streamflow in February *



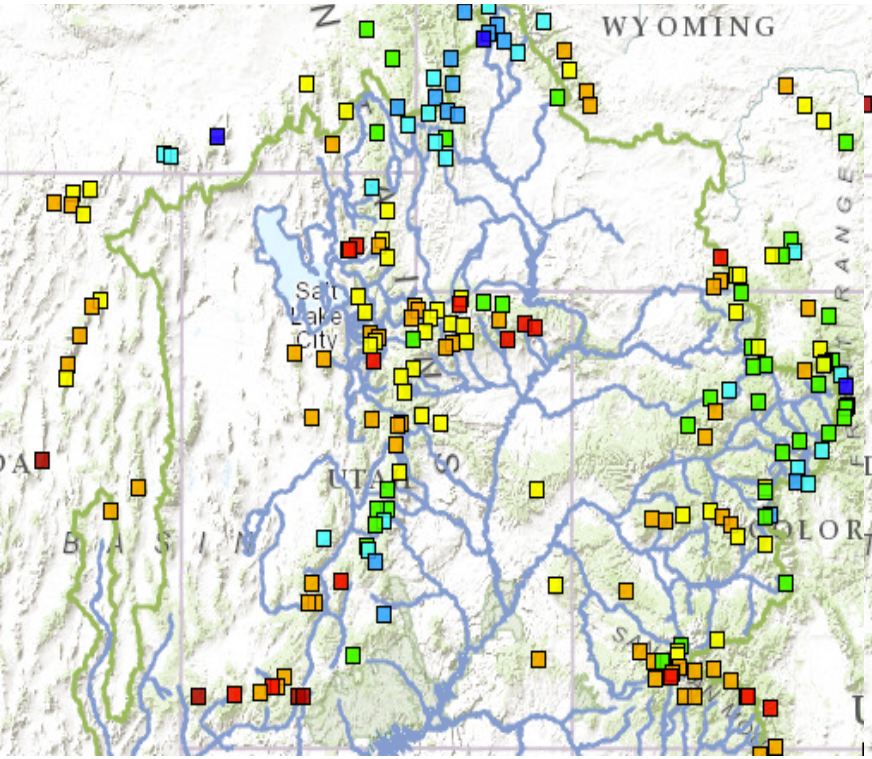
# March Precipitation



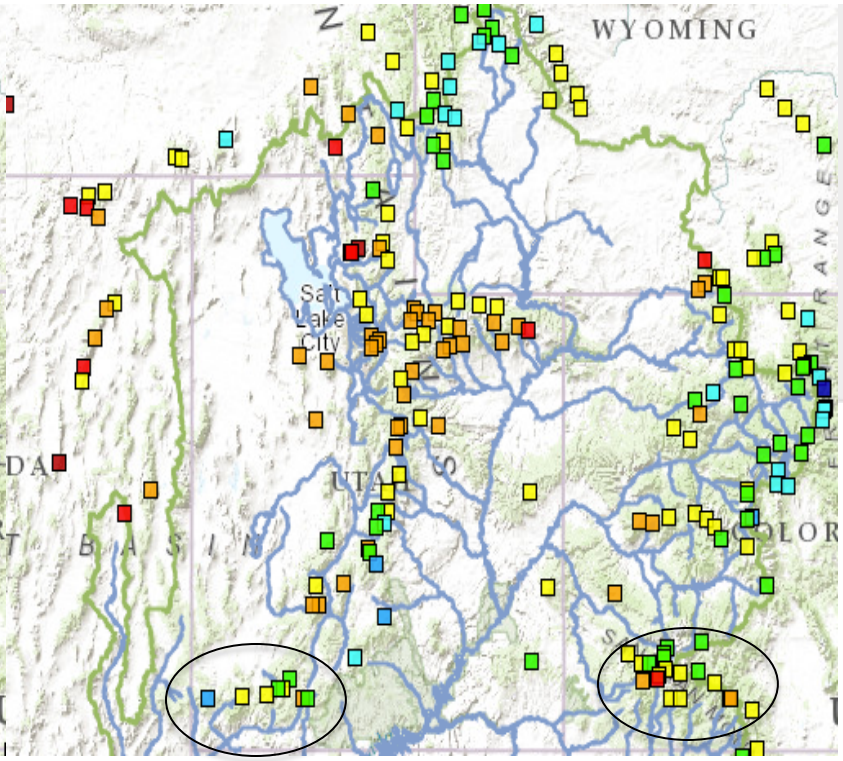

March Days 1-7 % of Normal Precipitation

# Forecast Drivers: Snow Conditions

SNOTEL SWE – FEB 10 2015




SNOTEL SWE – MAR 7 2015



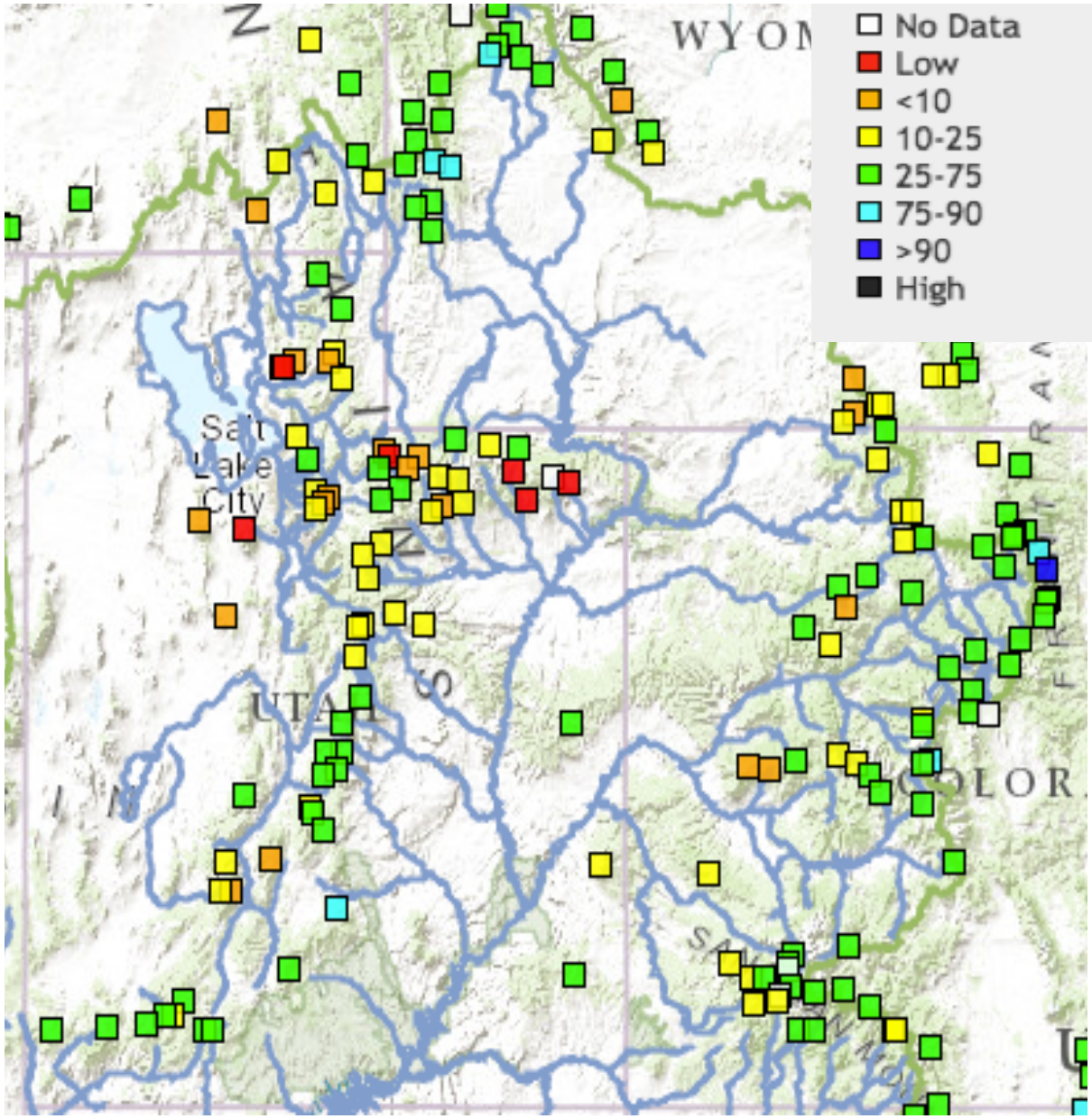
# Forecast Drivers: Snow Conditions

-Snow Rankings as of March 7th

Red – Lowest on Record

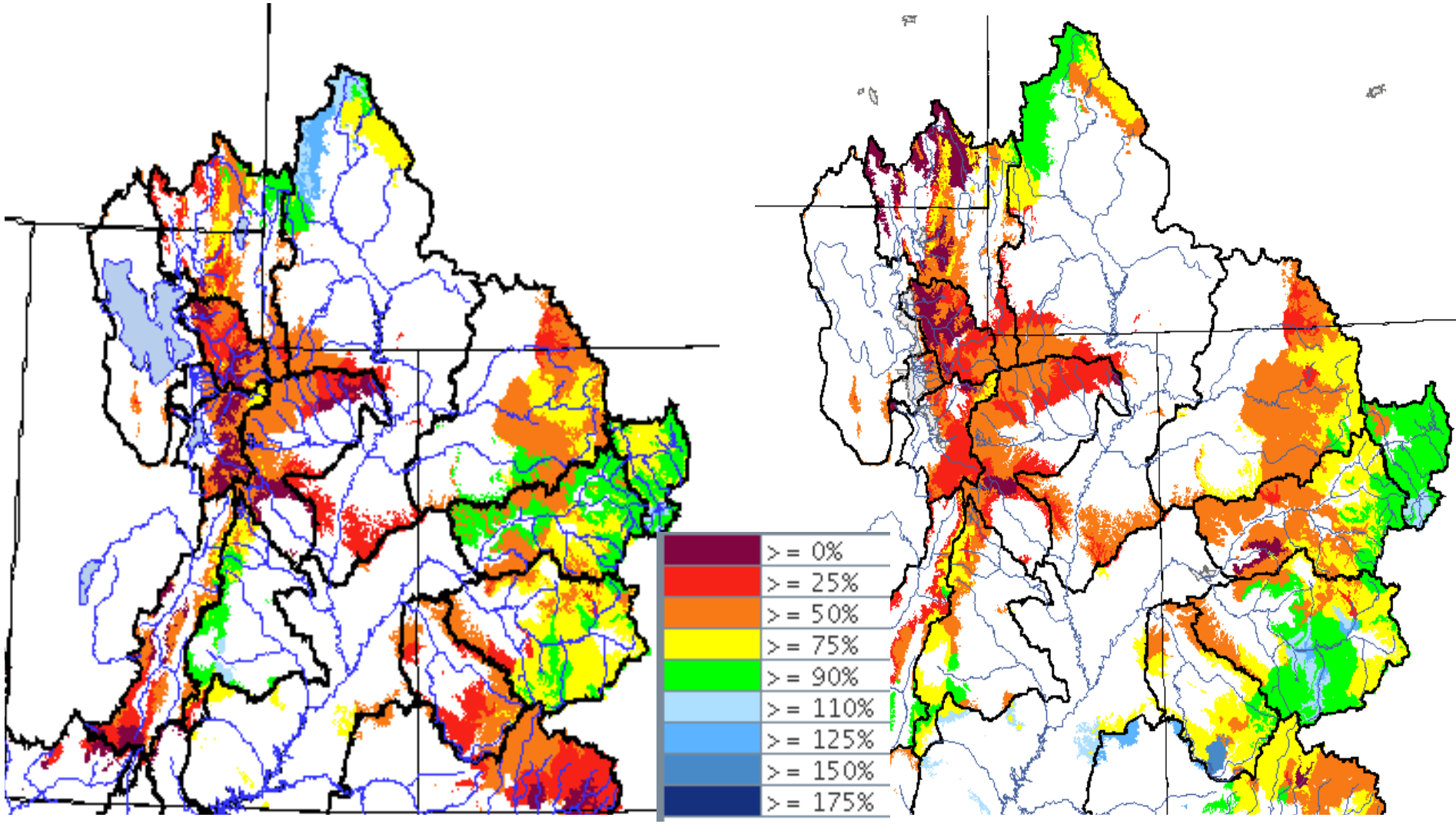
Orange – Lowest 2nd-5th on record

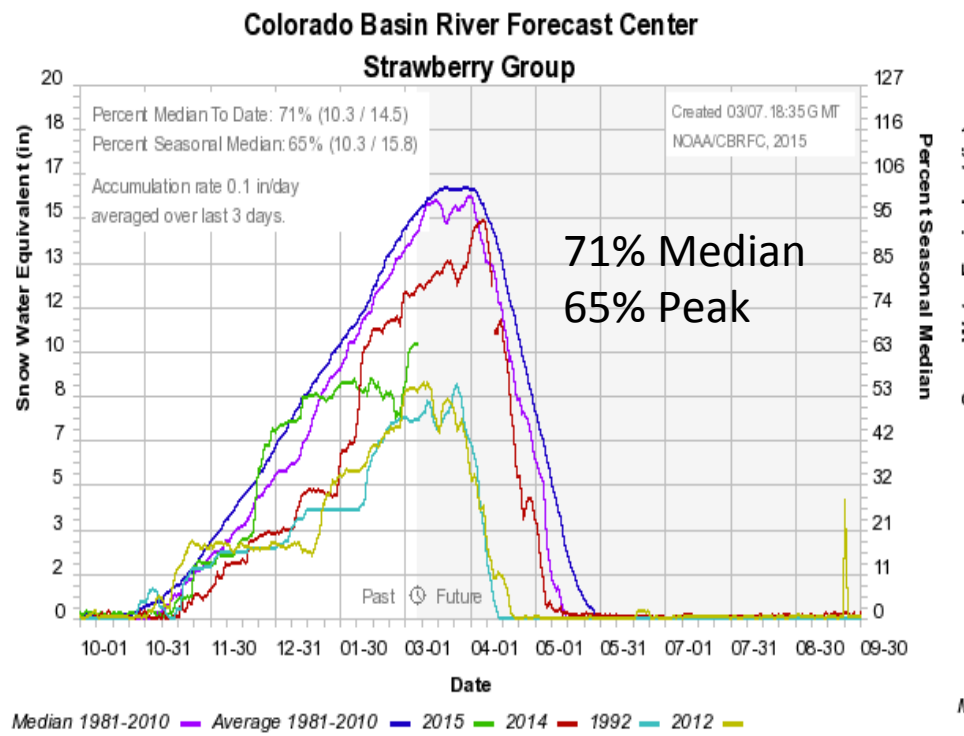
Period of Record
Most around 30-36 years

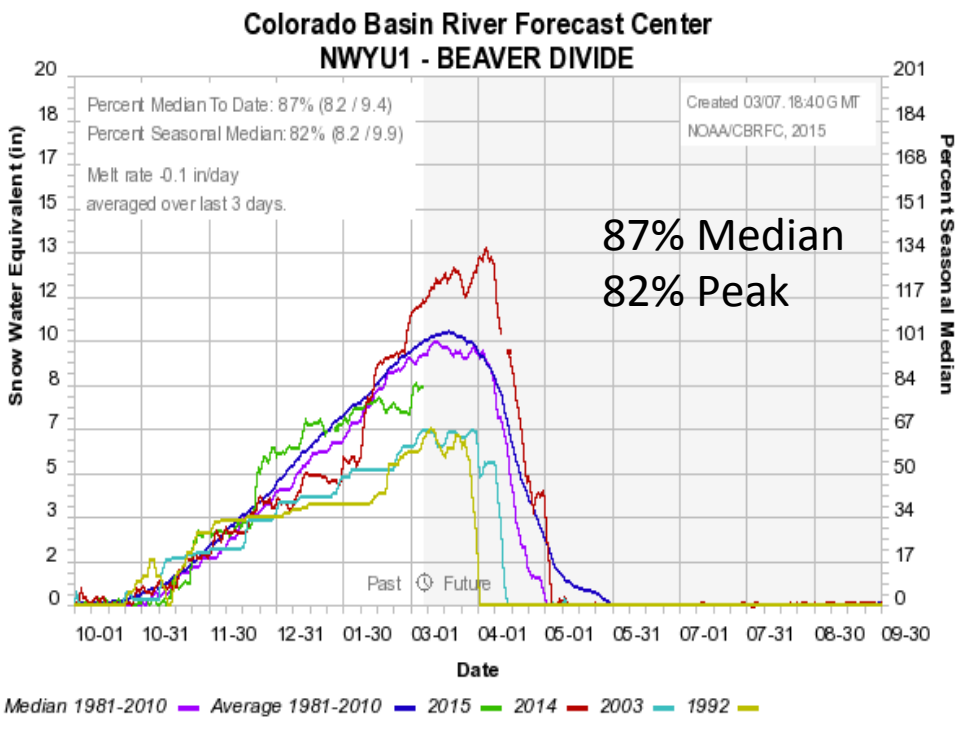


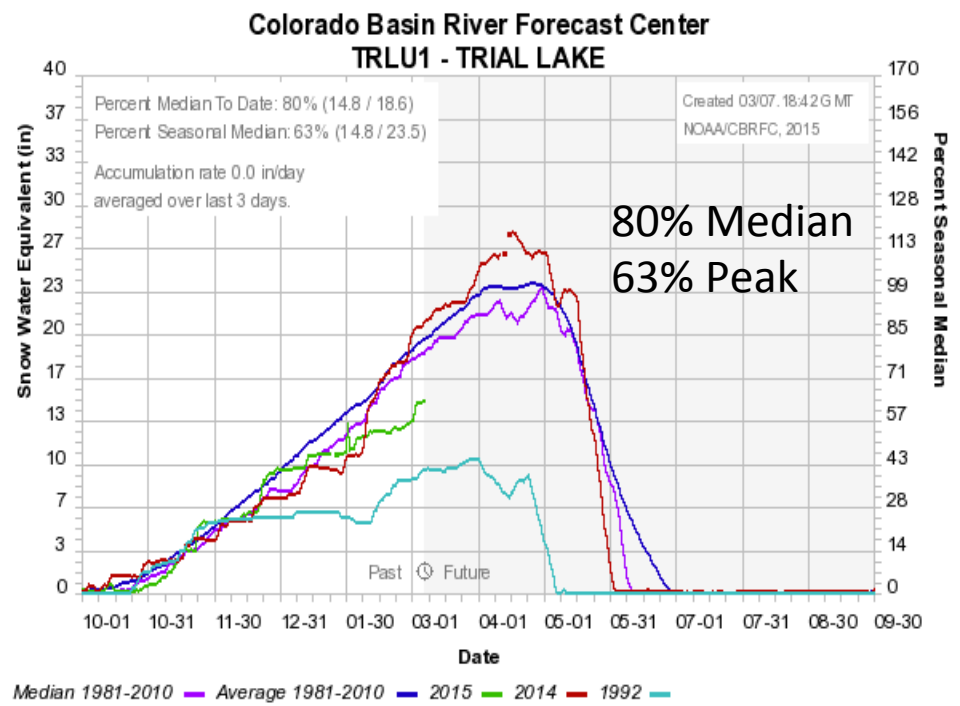
Model Snow
2/4/2015

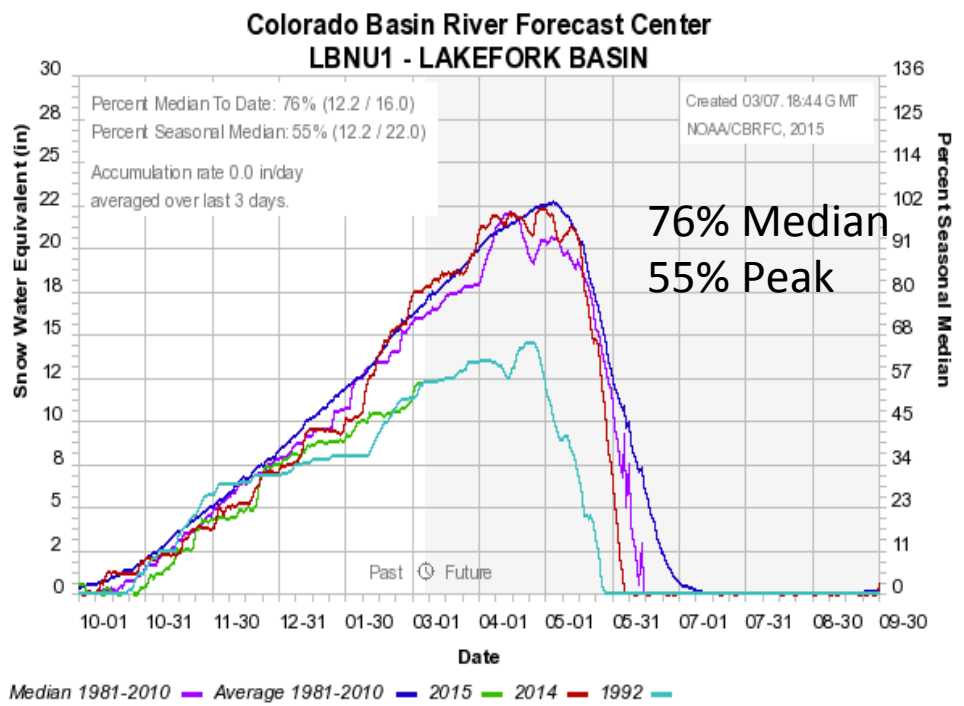
Model Snow
3/7/2015

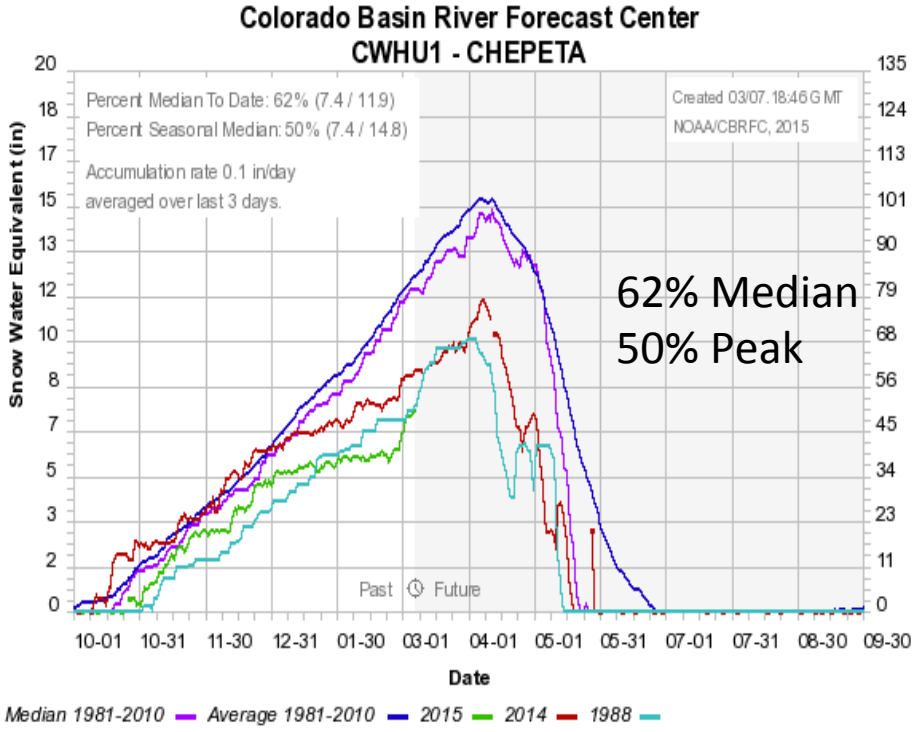


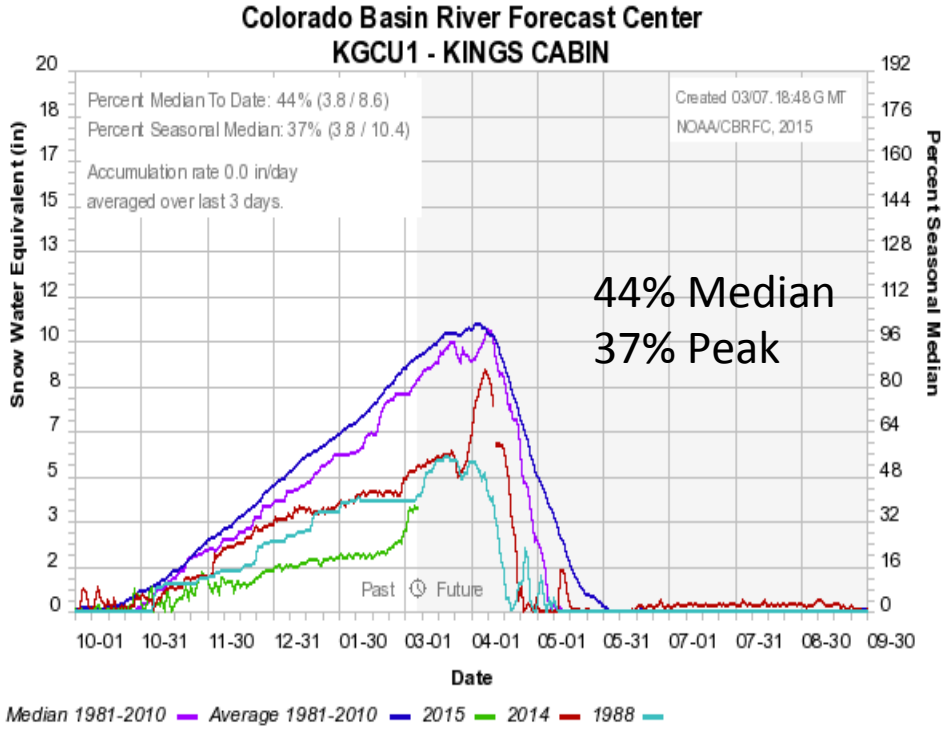

Colorado Basin River Forecast Center
Strawberry Group
Percent Median To Date: 71% (10.3 / 14.5)
Percent Seasonal Median: 65% (10.3 / 15.8)
Accumulation rate 0.1 in/day
averaged over last 3 days.
Created 03/07.18:35 G MT
NOAA/CBRFC, 2015
71% Median
65% Peak
Snow Water Equivalent (in)
Percent Seasonal Median
Past
Future
Date
Median 1981-2010
Average 1981-2010
2015
2014
1992
2012


Colorado Basin River Forecast Center
NWYU1 - BEAVER DIVIDE
Percent Median To Date: 87% (8.2 / 9.4)
Percent Seasonal Median: 82% (8.2 / 9.9)
Melt rate -0.1 in/day
averaged over last 3 days.
Created 03/07.18:40 G MT
NOAA/CBRFC, 2015
87% Median
82% Peak
Snow Water Equivalent (in)
Percent Seasonal Median
Past
Future
Date
Median 1981-2010
Average 1981-2010
2015
2014
2003
1992

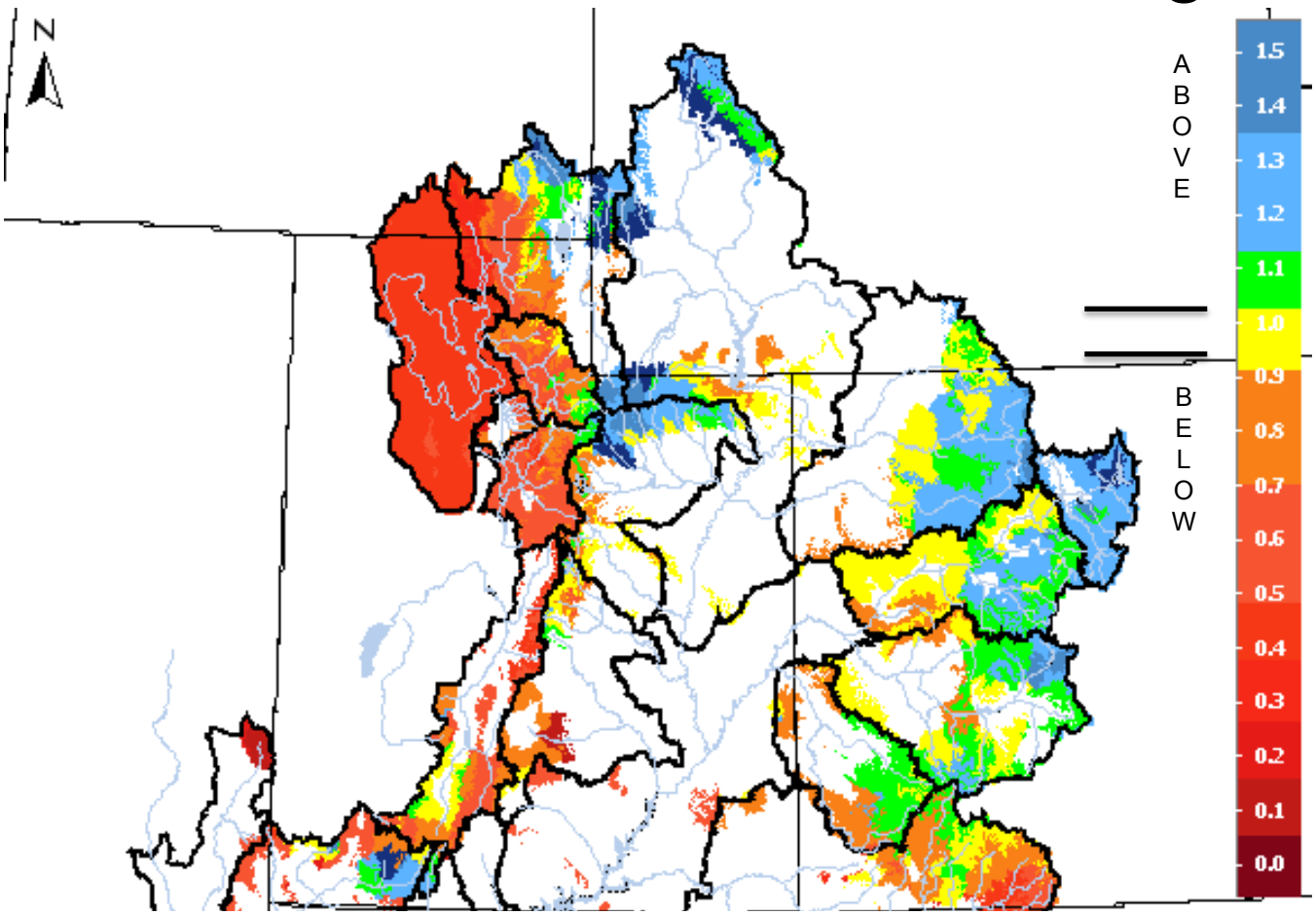

Colorado Basin River Forecast Center
TRLU1 - TRIAL LAKE
Percent Median To Date: 80% (14.8 / 18.6)
Percent Seasonal Median: 63% (14.8 / 23.5)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/07.18:42 G MT
NOAA/CBRFC, 2015
80% Median
63% Peak
Snow Water Equivalent (in)
Percent Seasonal Median
Past
Future
Date
Median 1981-2010
Average 1981-2010
2015
2014
1992


Colorado Basin River Forecast Center
LBNU1 - LAKEFORK BASIN
Percent Median To Date: 76% (12.2 / 16.0)
Percent Seasonal Median: 55% (12.2 / 22.0)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/07.18:44 G MT
NOAA/CBRFC, 2015
76% Median
55% Peak
Snow Water Equivalent (in)
Percent Seasonal Median
Past
Future
Date
Median 1981-2010
Average 1981-2010
2015
2014
1992


Colorado Basin River Forecast Center
CWHU1 - CHEPETA
Percent Median To Date: 62% (7.4 / 11.9)
Percent Seasonal Median: 50% (7.4 / 14.8)
Accumulation rate 0.1 in/day
averaged over last 3 days.
Created 03/07.18:46 G MT
NOAA/CBRFC, 2015
62% Median
50% Peak
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
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
Median 1981-2010
Average 1981-2010
2015
2014
1988


Colorado Basin River Forecast Center
KGCU1 - KINGS CABIN
Percent Median To Date: 44% (3.8 / 8.6)
Percent Seasonal Median: 37% (3.8 / 10.4)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/07.18:48 G MT
NOAA/CBRFC, 2015
44% Median
37% Peak
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
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
Median 1981-2010
Average 1981-2010
2015
2014
1988

# Forecast Drivers: Soil Moisture Entering Winter




How will this affect water supply forecasts?

Positive (+):

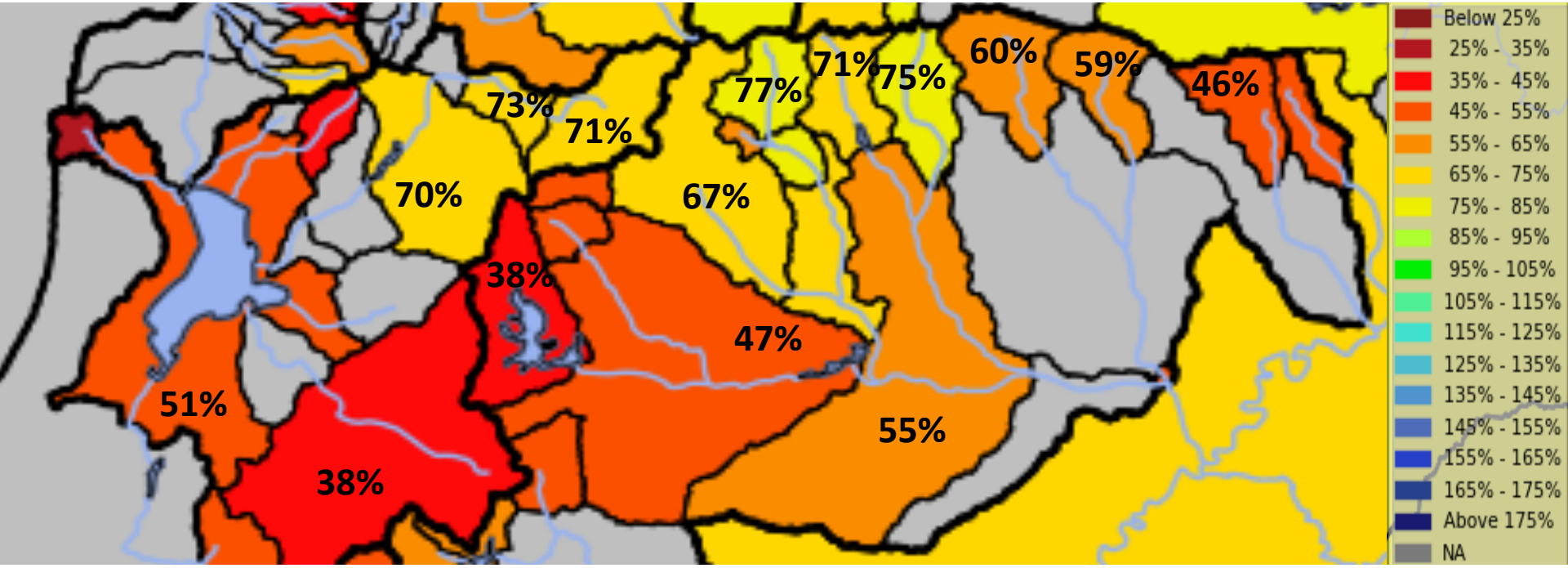
- Green above Fontenelle
- Upper Colorado/Yampa/Gunnison
- **Uinta Range (Bear, Provo, Duchesne)**

Negative (-):

- **Northern Great Basin (Weber, Provo)**
- Sevier/Virgin
- San Juan

# March 1st Water Supply Forecasts

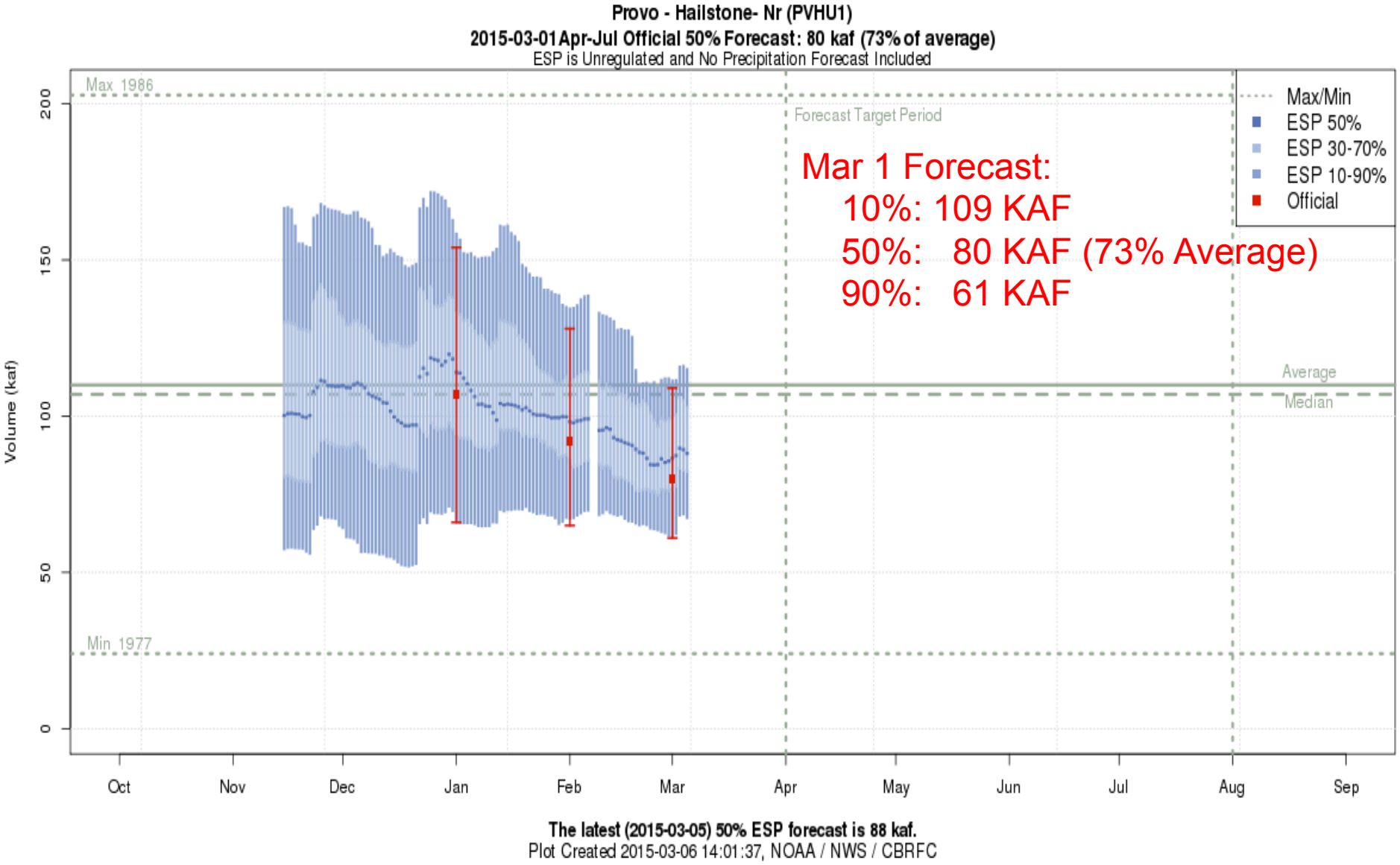
## Duchesne and Provo River Basins



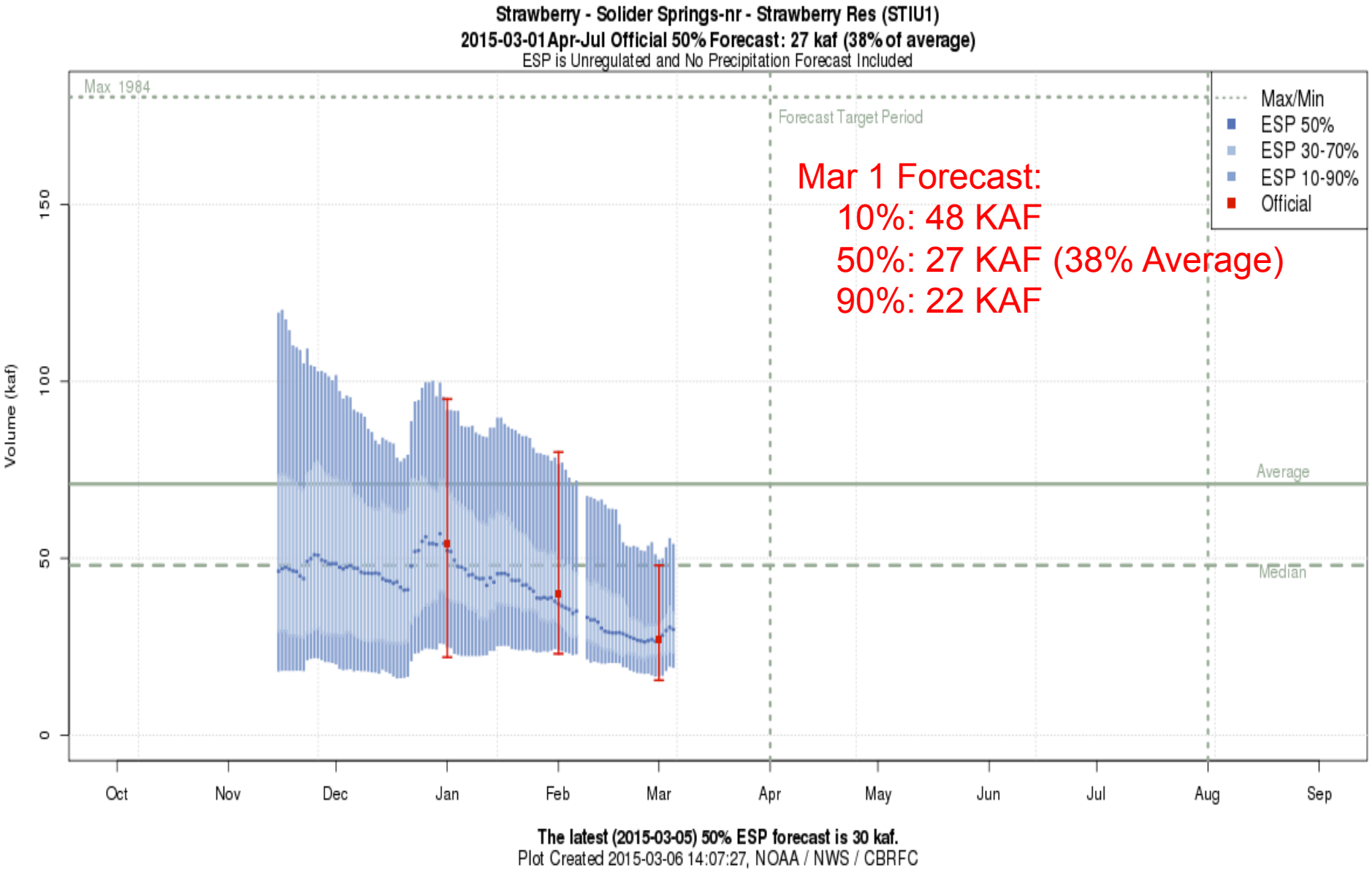

**Forecasts decreased by ~10-15% since February 1**

All March 1st April-July volume forecasts are below average

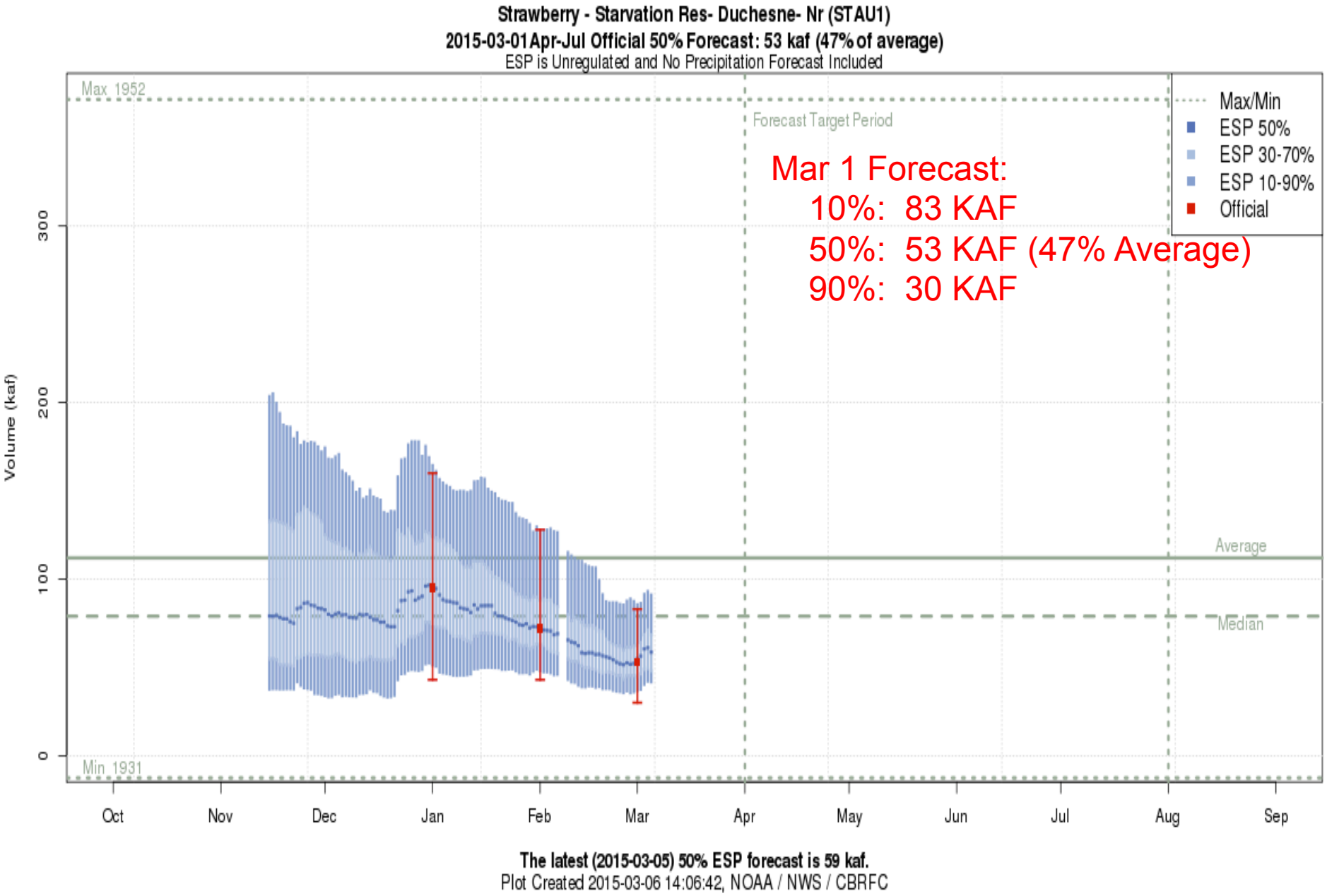
# Forecasts: Provo nr Hailstone



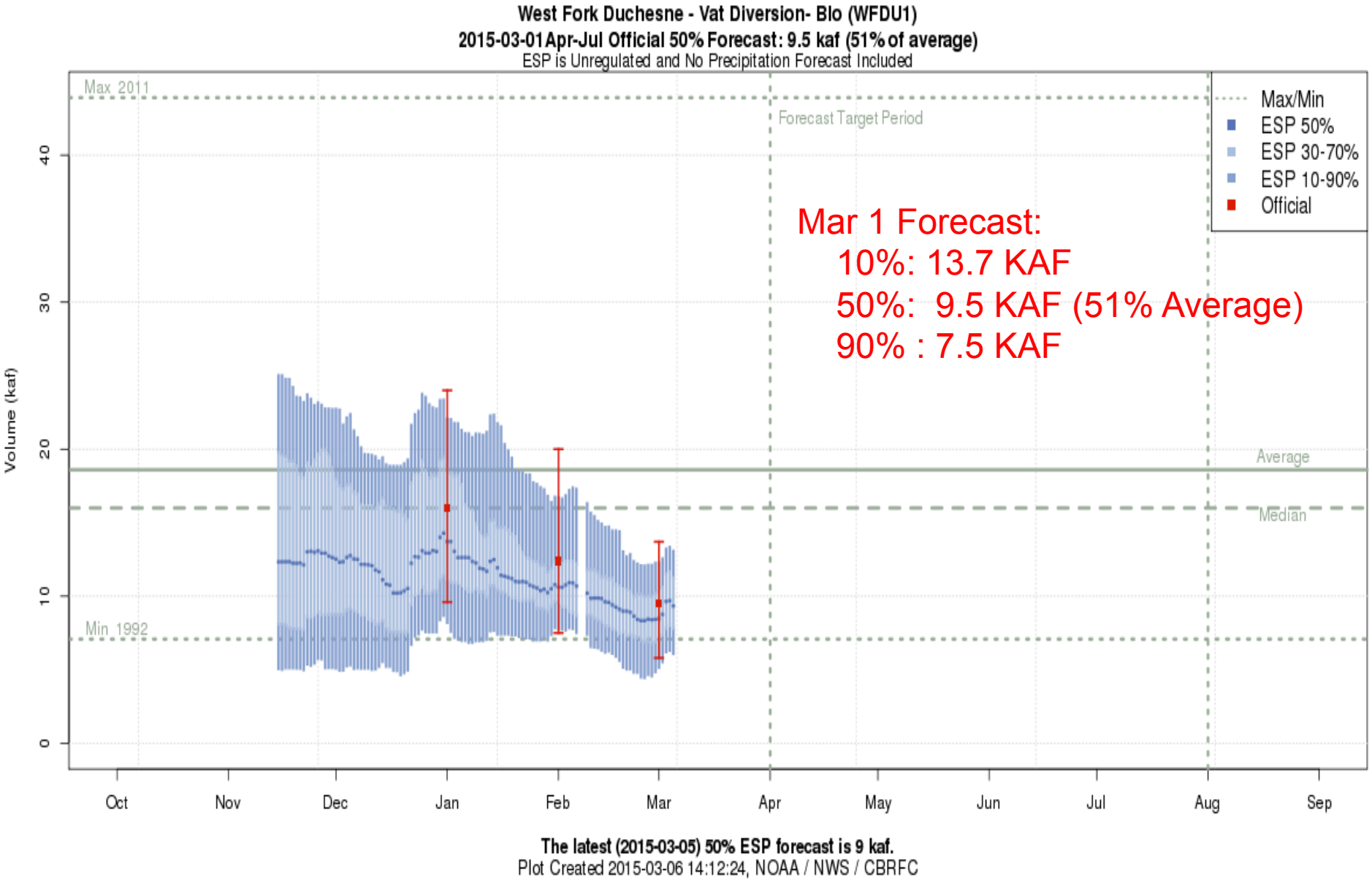
# Forecasts: Strawberry nr Solider Springs



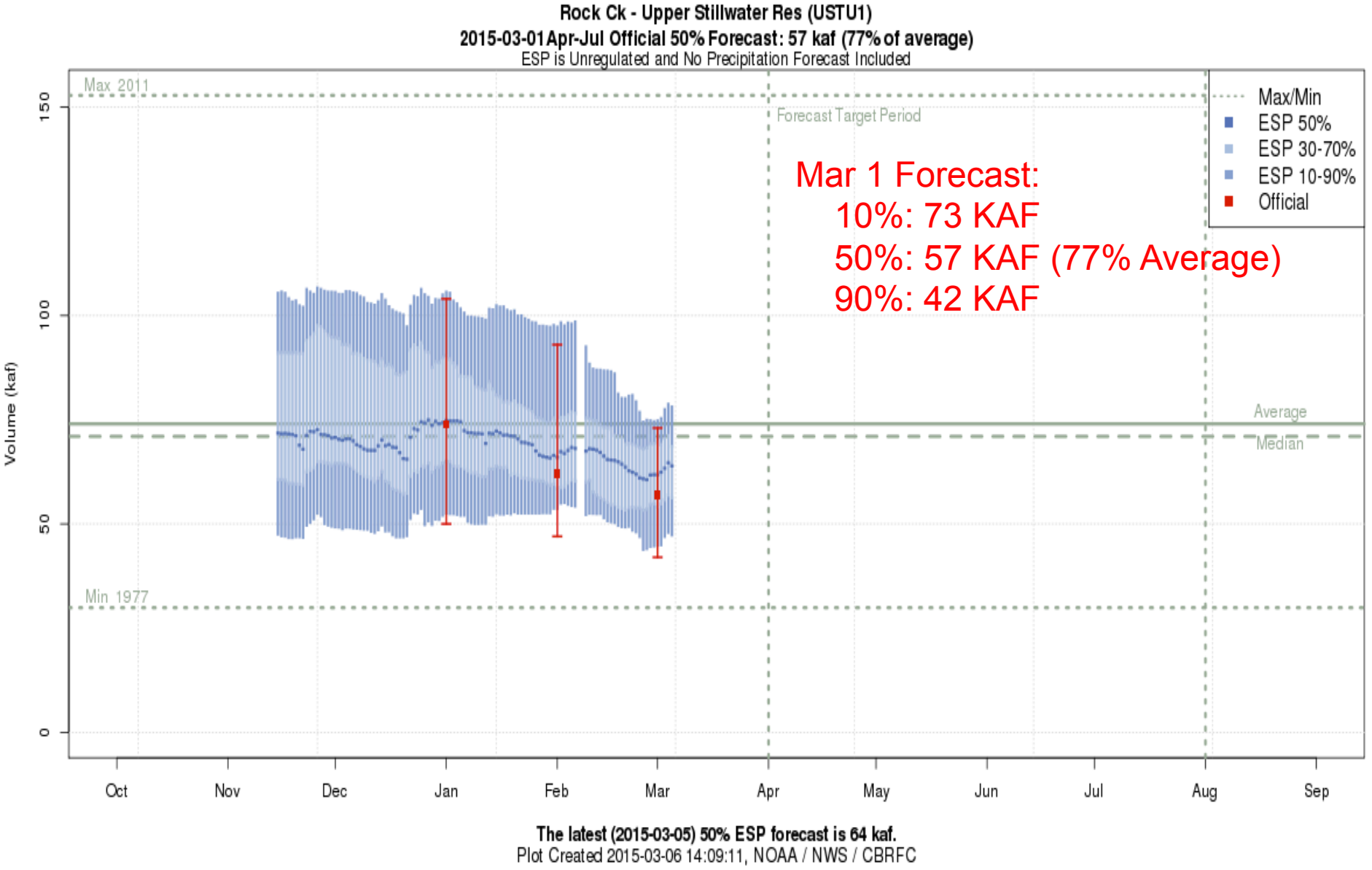
# Forecasts: Starvation Reservoir



# Forecasts: West Fork below Vat



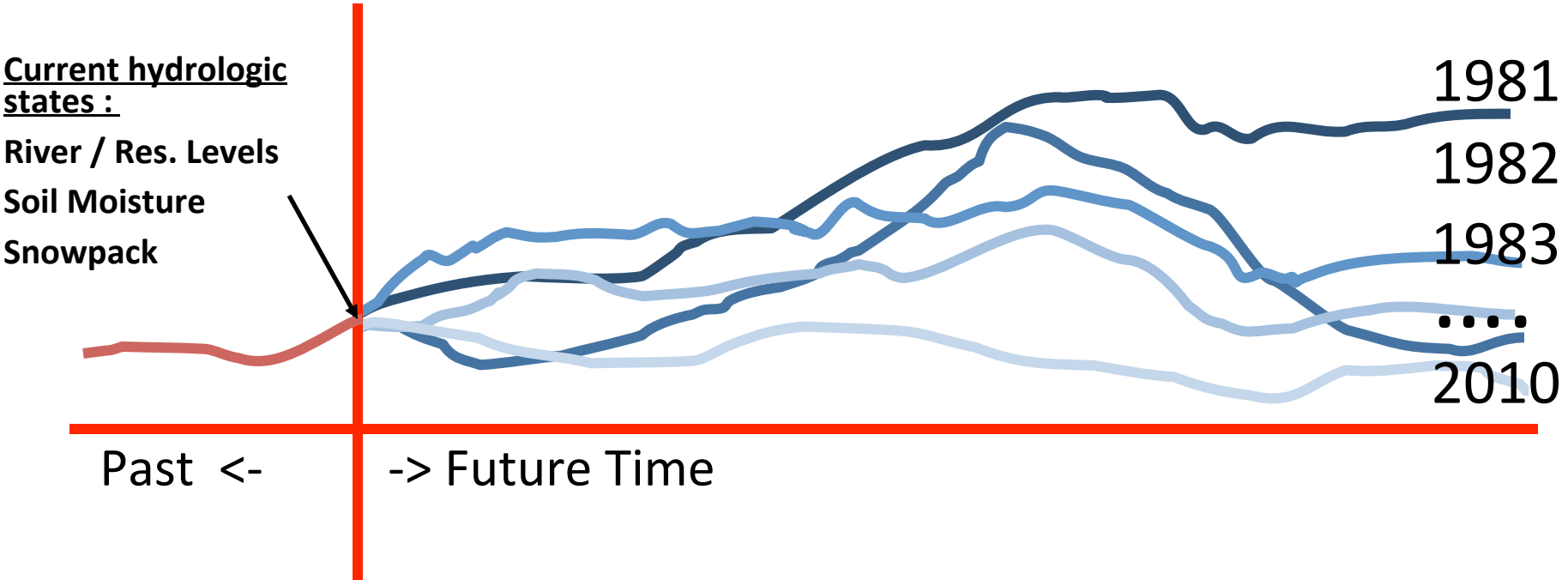
# Forecasts: Upper Stillwater Reservoir



# ESP Trace Example

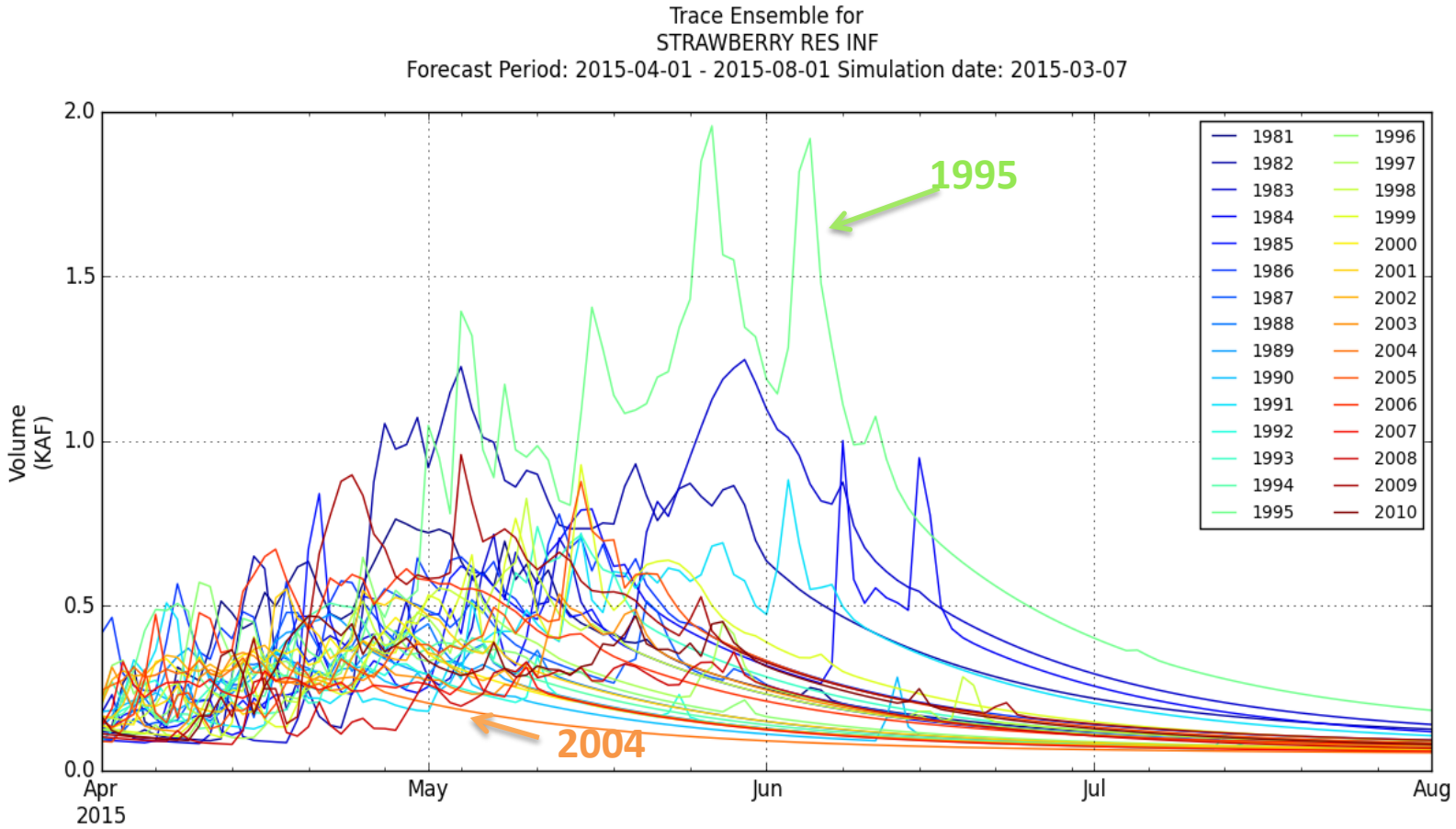
- Current forecasts assume average precipitation and temperature into the future
- **What if we want to know volume scenarios for not average weather?**

- A quick reminder of how ESP works:
  - Start with current conditions
  - Apply precipitation and temperature from each historical year (1981-2010) *going forward*
  - A forecast is generated for each of the years (1981-2010) *as if, going forward,* that year will happen
  - This creates 30 possible future streamflow patterns. Each year is given a 1/30 chance of occurring



# ESP Trace Example

- 30 possible future streamflow scenarios for Strawberry Reservoir Inflow
- Current forecasts: Sum flows into periods and calculate probabilities




If from now on we had weather like 1995 or 2004 given the current conditions:

2015 April- July Volumes:

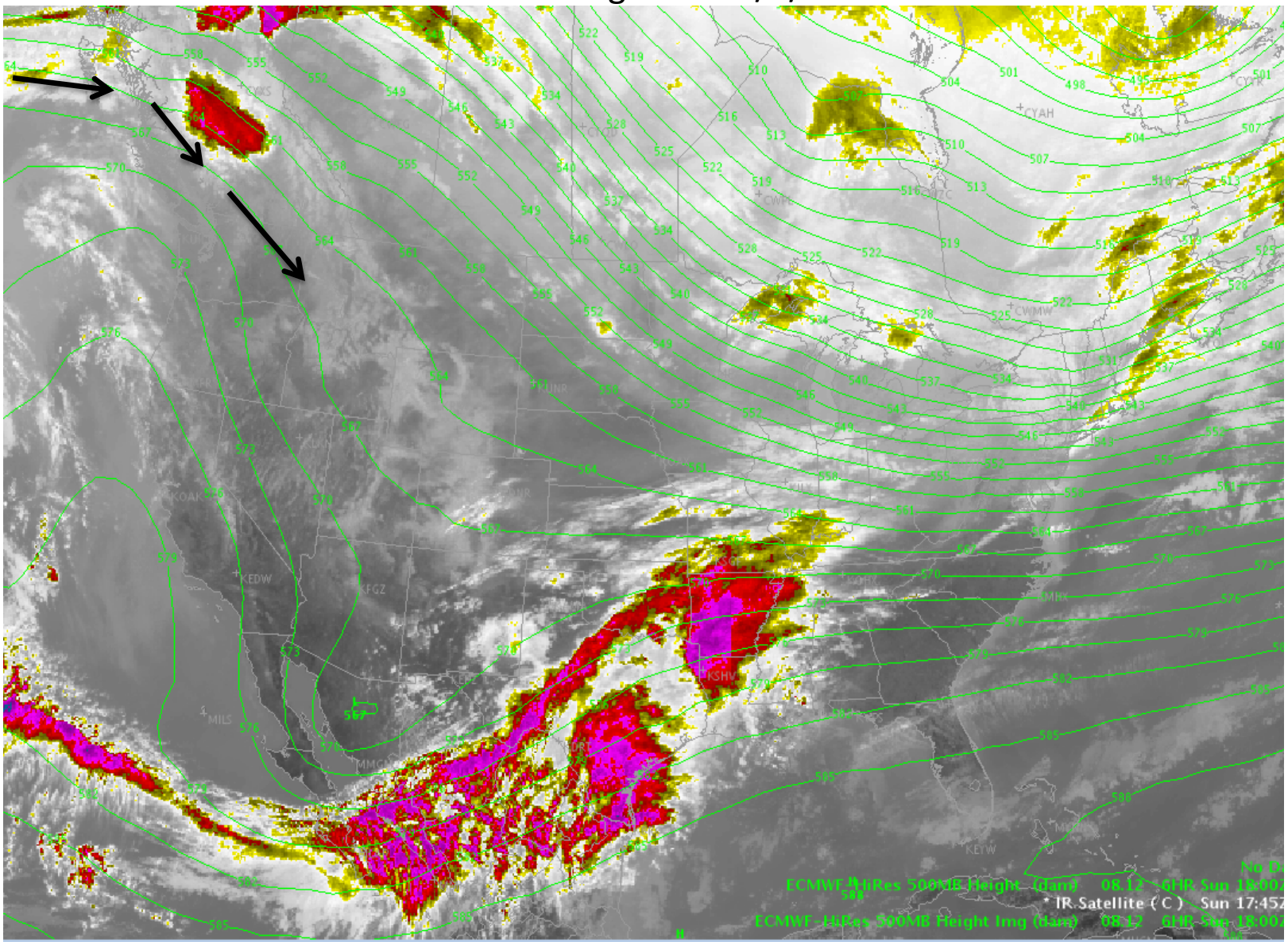
1995 Weather: 83 KAF

2004 Weather: 16.5 KAF

# Future Weather

Its Back! Ridge of High Pressure continues through Wed

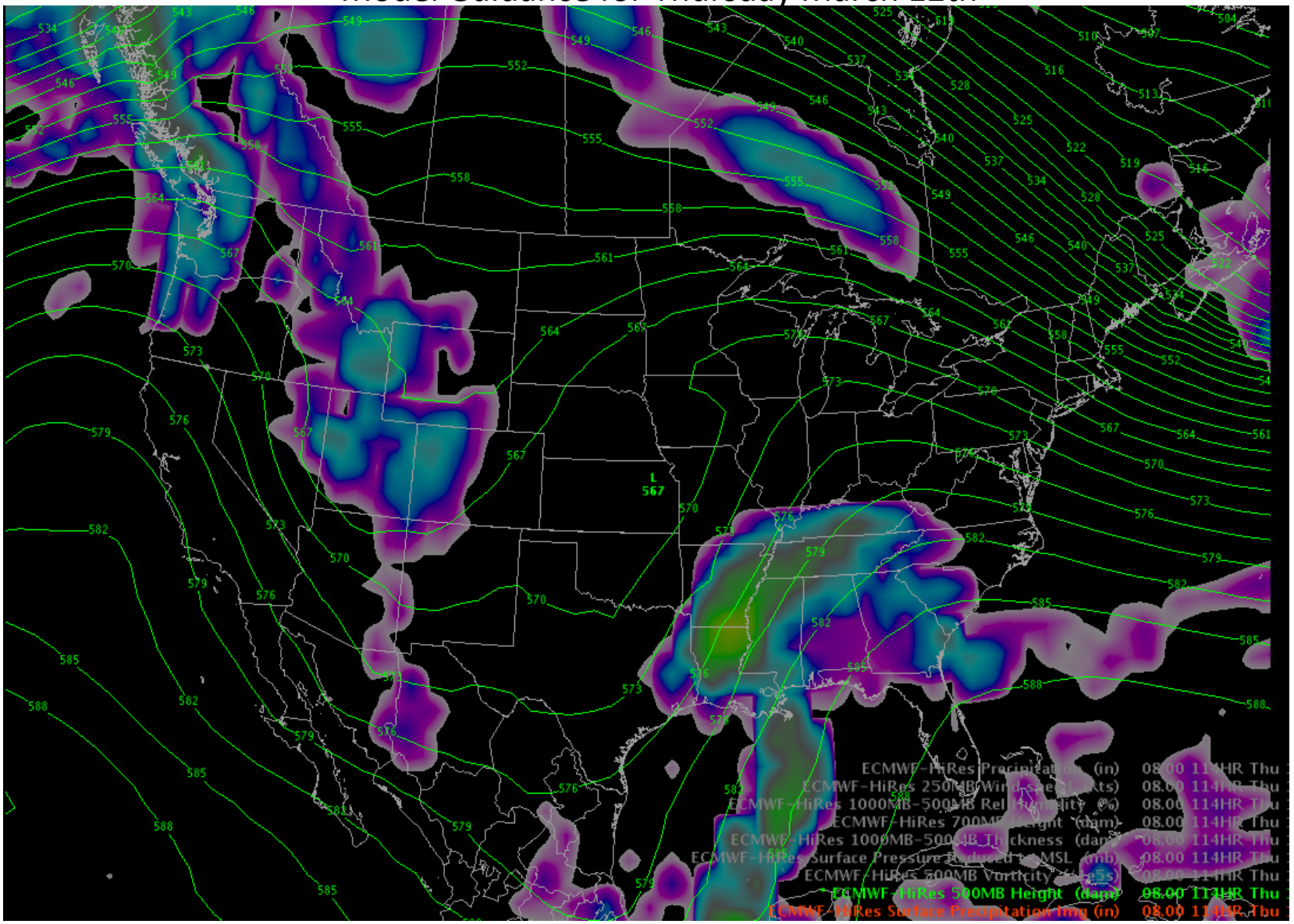
-Satellite image as of 3/8/15-



# Future Weather

Weak Storm System Late Thursday/Friday

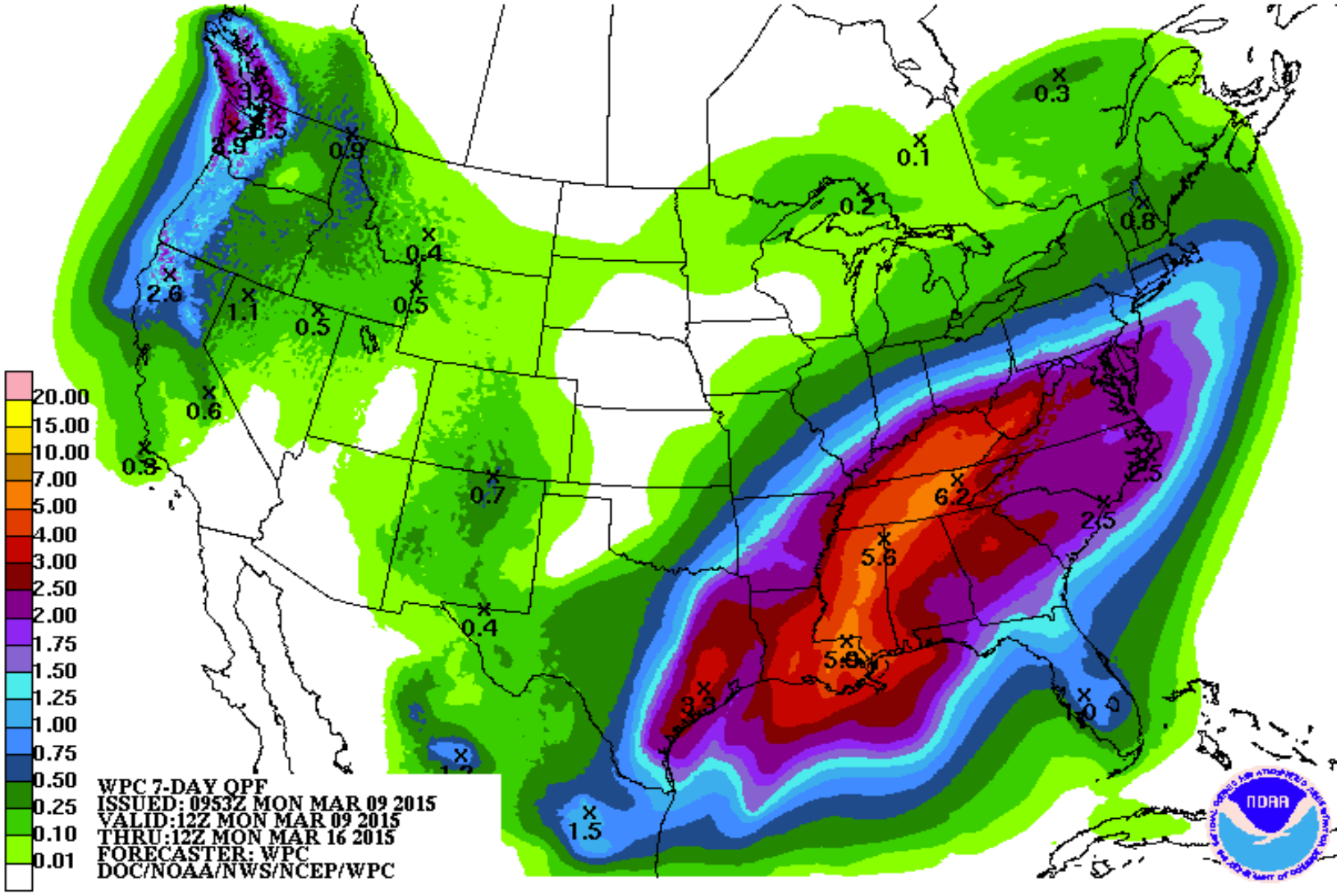
-Model Guidance for Thursday March 12th-



# Quantitative Precipitation Forecast

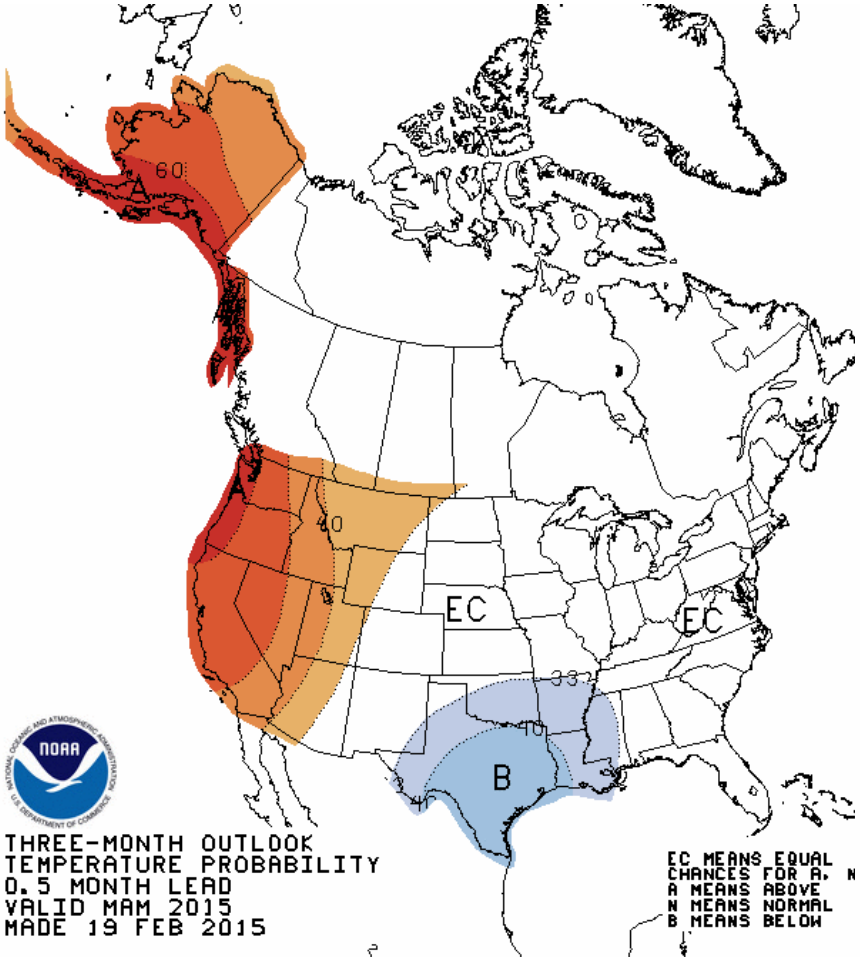
## Weather Prediction Center (WPC)

## 7 Day Total March 9-16

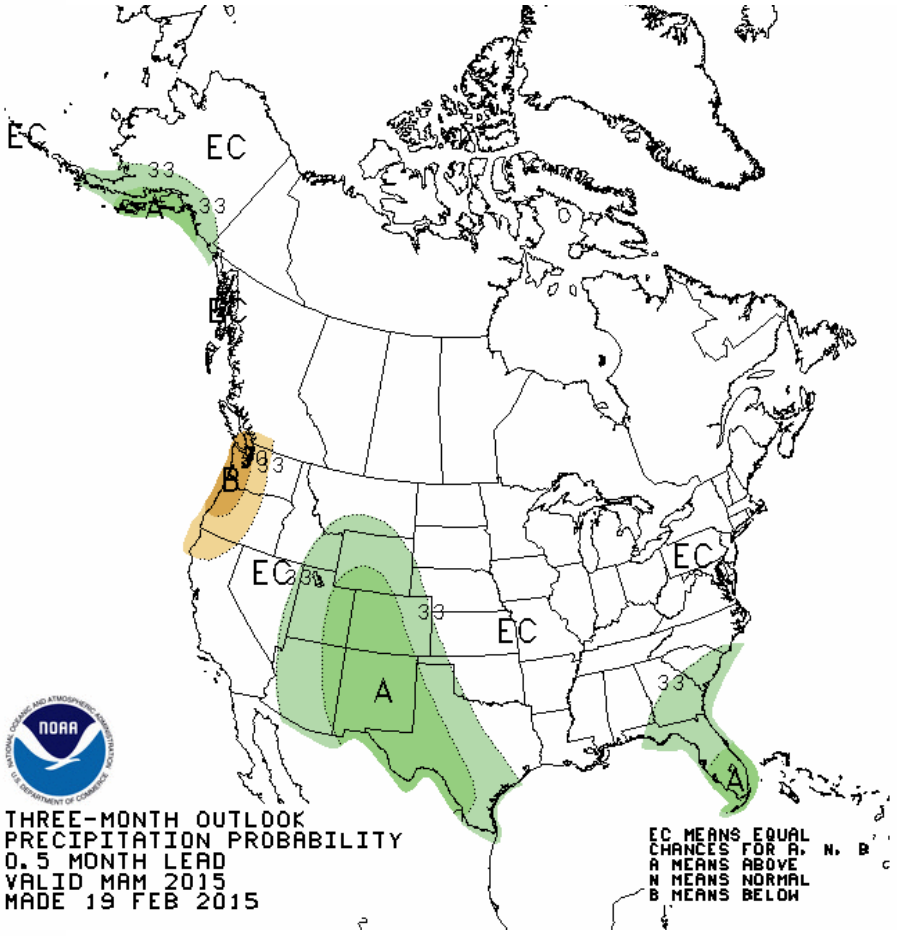


# Long Range Weather

## 90 Day Outlooks (Mar-May)



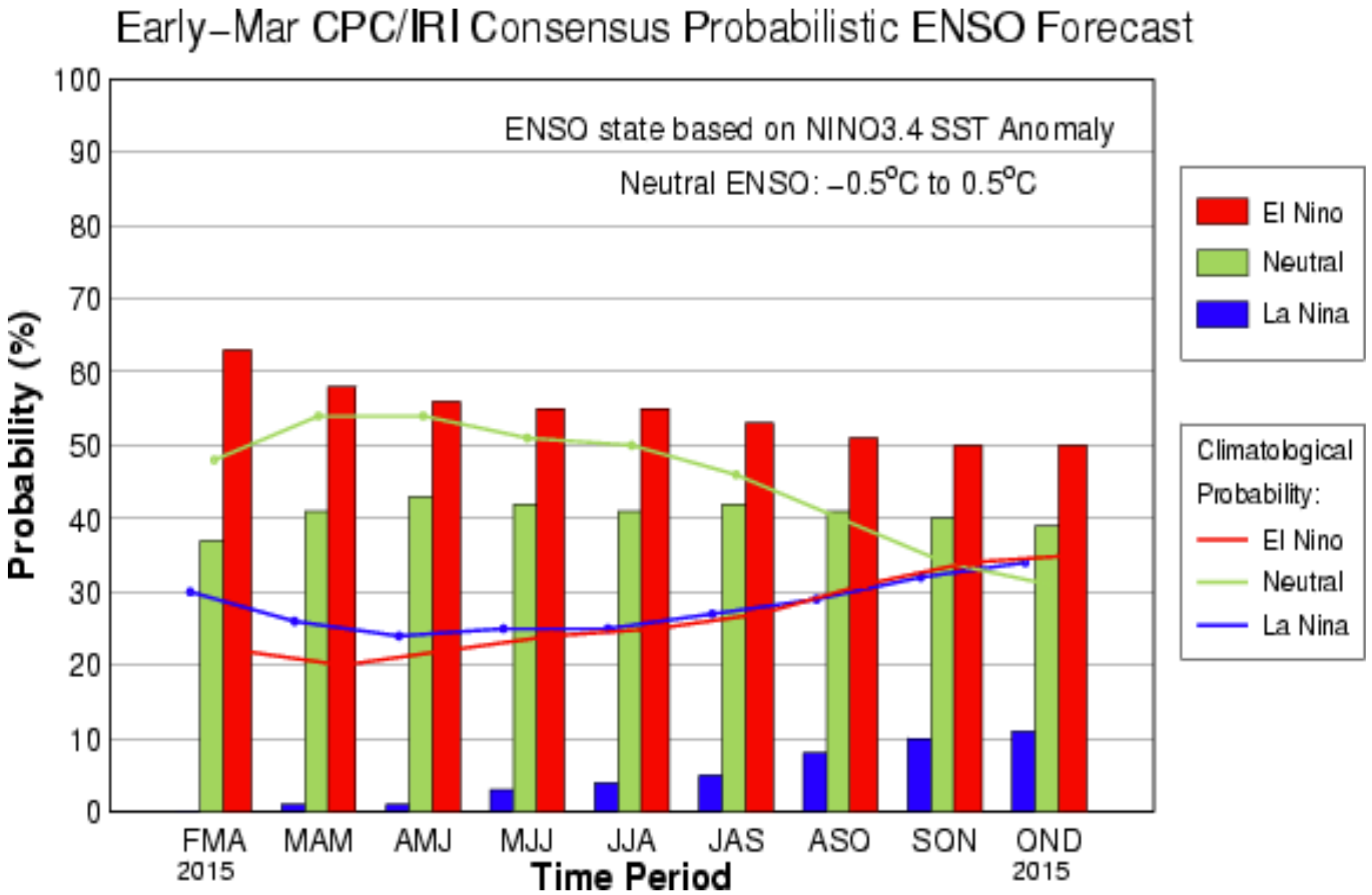

Temperature




Precipitation

# Long Range Weather

**A ~60% chance of weak El Nino conditions for February-April**



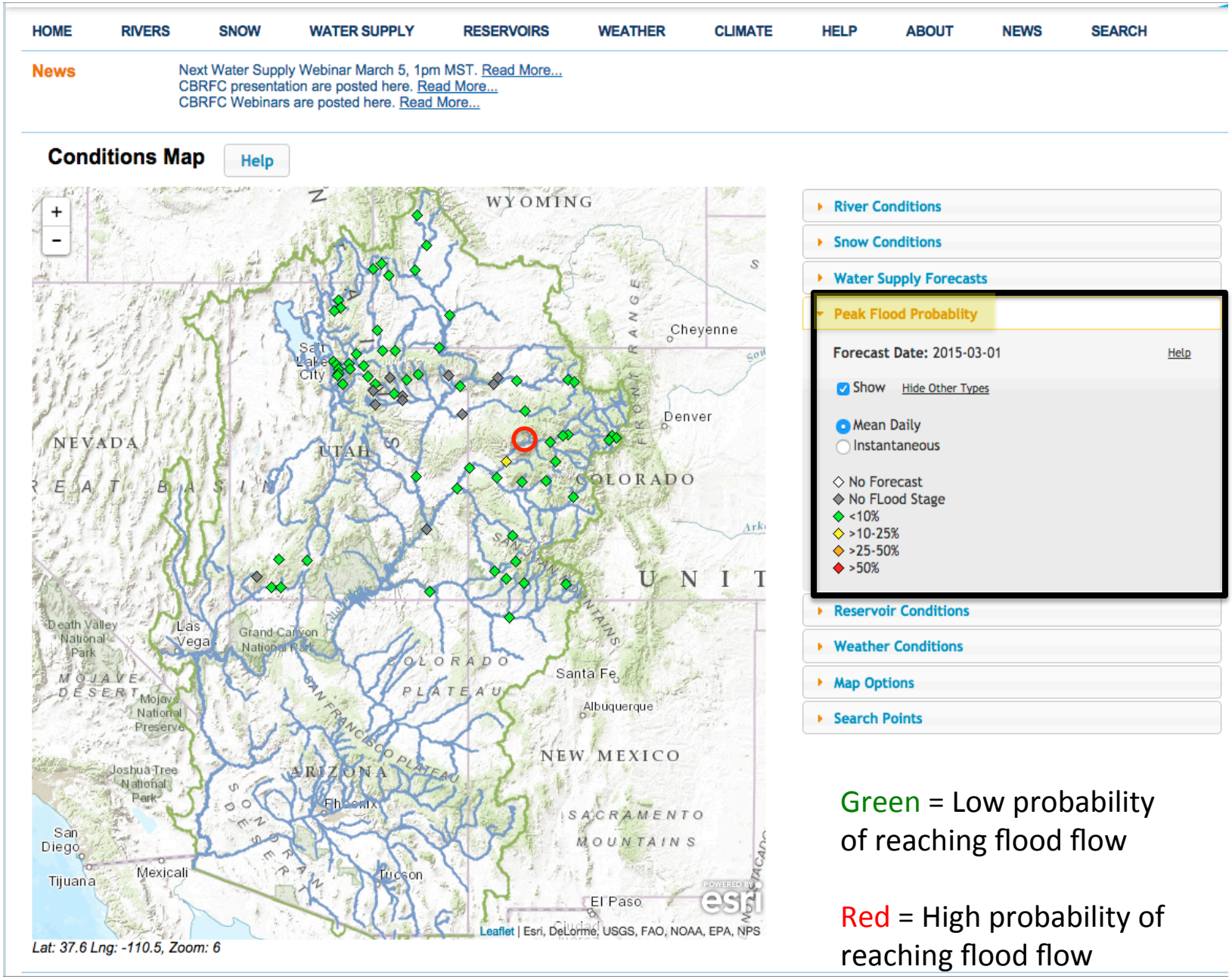
# What is a Peak Flow Forecast?

- Maximum Mean Daily Flow due to snowmelt
  - April-July
- Probabilistic Forecasts
  - Exceedence Probabilities -10%, 25%, 50%, 75%, 90%
- **Regulated flow** - accounting for reservoirs and diversions
  - Planned operations if known (hard with diversions)
  - Assumptions based on past operations
- Only forecast magnitude of peak not time of peak
- Issued twice a month

# Where to Find Peak Flow Forecasts

- Map:
  - http://www.cbrfc.noaa.gov/gmap/gmapbeta.php?interface=peak
- Special Product (Unreg/Reg)
  - http://www.cbrfc.noaa.gov/outgoing/cuwcd_peaks/cuwcd_peakfcst_20150301.txt
- List:
  - http://www.cbrfc.noaa.gov/rmap/peak/peaklist.php

# Peak Flow Forecasts




Green = Low probability of reaching flood flow

Red = High probability of reaching flood flow

# Peak Flow Forecast List

Help | Download Data | Requery | Rebuild Plots

**Peak Flood Probability Legend**

◇ No Forecast ◆ No Flood Stage ◆ <10 ◆ >10 ◆ >25 ◆ >50

**Options (on/off):** Mean Daily Forecasts Instantaneous Forecasts Plot

**Select by Area:** CBRFC Green Colorado San Juan Great Sevier Virgin Low Col

**Columns (on/off):** ID River Location Flood Flow PI Issue Date Observed Peak to Date Observed Date Historic Peak Hist Peak Date Average Peak Normal Earliest Date Normal Latest Date Date Notes Area Sub Area DS

Click column heading to sort by that data. Click ID to view point info.

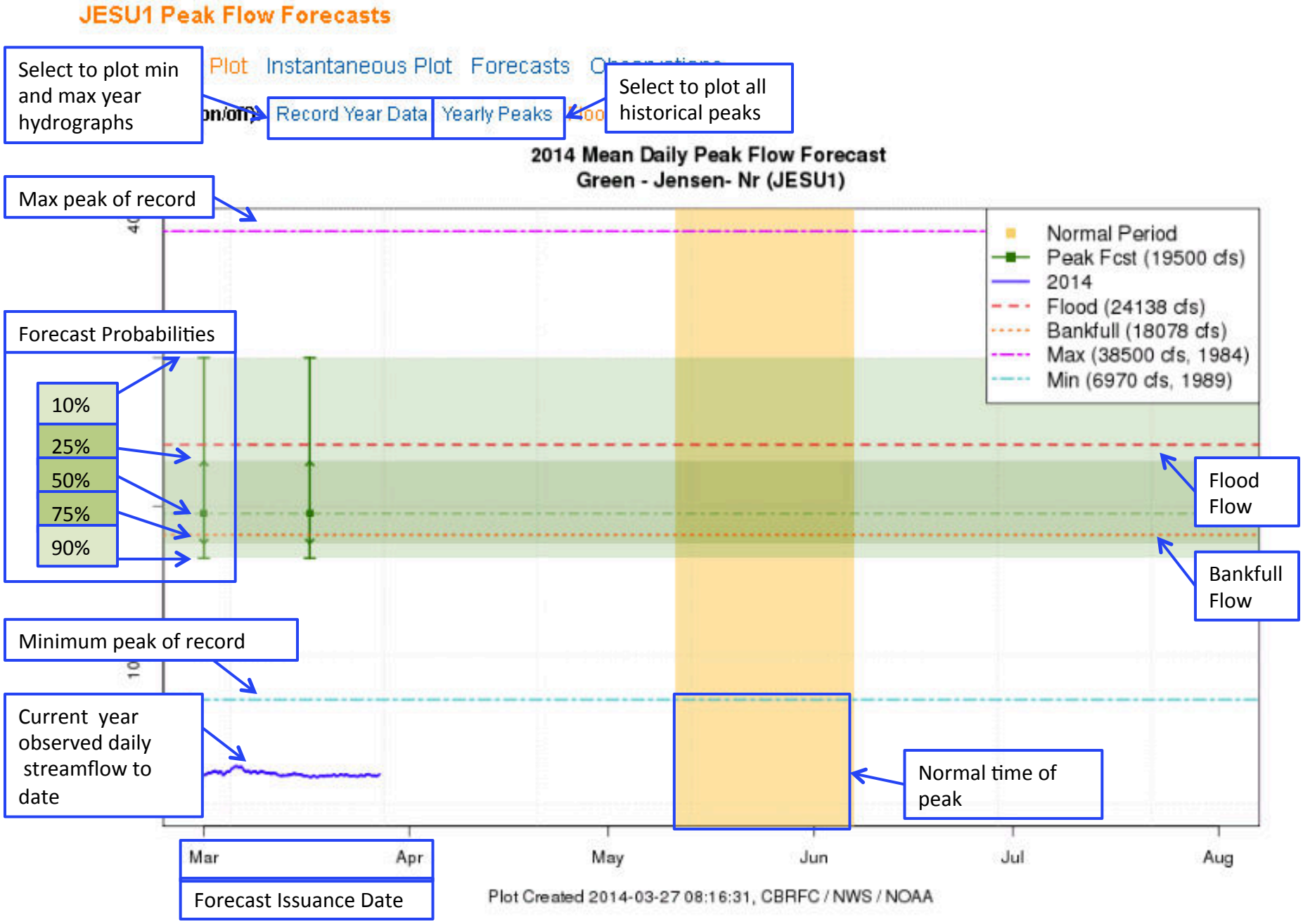
| | ID | River | Location | Flood Flow | PI | Issue Date | Mean Daily 90 | Mean Daily 75 | Mean Daily 50 | Mean Daily 25 | Mean Daily 10 | Inst 90 | Inst 75 | Inst 50 | Inst 25 | Inst 10 | Observed Peak to Date | Observed Date | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WBRW4 | Green | Daniel-Nr-Warren Bridge-At | 6100 | ◆ | 2014-03-01 | 3000 | 3500 | **4000** | 4500 | 5000 | 3100 | 3600 | 4100 | 4600 | 5100 | NA | | |
| 2 | BPNW4 | New Fork | Big Piney-Nr | 8843 | ◆ | 2014-03-01 | 4000 | 4500 | **6000** | 7000 | 7500 | 4100 | 4600 | 6200 | 7200 | 7700 | NA | | |
| 3 | LABW4 | Green | La Barge-Nr | 11498 | ◆ | 2014-03-01 | 10000 | 11000 | **13000** | 15000 | 16000 | 10000 | 11000 | 13000 | 15000 | 16000 | NA | | |
| 4 | GRRW4 | Green | Green River-Wy-Nr | 11050 | ◆ | 2014-03-01 | 9000 | 9500 | **10000** | 12000 | 14000 | 9200 | 9700 | 10000 | 12000 | 14000 | NA | | |
| 5 | HMFW4 | Hams Fork | Frontier-Nr-Pole Ck-Blo | 1794 | ◆ | 2014-03-01 | 600 | 700 | **800** | 1100 | 1300 | 640 | 750 | 860 | 1200 | 1400 | NA | | |
| 6 | BNRU1 | Blacks Fork | Robertson-Nr | 2990 | ◆ | 2014-03-01 | 800 | 1000 | **1200** | 1400 | 1600 | 980 | 1200 | 1500 | 1700 | 1900 | NA | | |
| 7 | HFMW4 | Henrys Fork | Manila-Nr | 5723 | ◆ | 2014-03-01 | 250 | 300 | **400** | 650 | 950 | NA | NA | NA | NA | NA | NA | | |
| 8 | STMC2 | Yampa | Steamboat Springs | 5930 | ◆ | 2014-03-01 | 3000 | 3500 | **4000** | 5000 | 6000 | 3300 | 3800 | 4400 | 5400 | 6400 | NA | | |
| 9 | ENMC2 | Elk | Milner-Nr | 5749 | ◆ | 2014-03-01 | 3000 | 4000 | **4500** | 5000 | 6500 | 3400 | 4500 | 5000 | 5600 | 7200 | NA | | |
| 10 | MBLC2 | Yampa | Maybell-Nr | 21200 | ◆ | 2014-03-01 | 8500 | 9000 | **10500** | 12500 | 15500 | 8800 | 9400 | 11000 | 13000 | 16000 | NA | | |
| 11 | LILC2 | Little Snake | Lily-Nr | NA | ◆ | 2014-03-01 | 3000 | 4000 | **5000** | 6000 | 7000 | 3400 | 4500 | 5600 | 6800 | 7900 | NA | | |
| 12 | YDLC2 | Yampa | Deerlodge Park | NA | ◆ | 2014-03-01 | 12000 | 13000 | **15000** | 17000 | 22000 | 12000 | 13000 | 16000 | 18000 | 23000 | NA | | |
| 13 | WRMC2 | White | Meeker-Nr | 7700 | ◆ | 2014-03-01 | 2000 | 2500 | **3000** | 3500 | 4000 | 2200 | 2700 | 3200 | 3800 | 4300 | NA | | |
| 14 | WATU1 | White | Watson-Nr | NA | ◆ | 2014-03-01 | 2000 | 2500 | **3000** | 3500 | 4500 | 2100 | 2700 | 3300 | 3800 | 5000 | NA | | |
| 15 | BRUU1 | Big Brush Ck | Vernal-Nr-Red Fleet Res-Abv | NA | ◆ | 2014-03-01 | 100 | 130 | **160** | 220 | 300 | NA | NA | NA | NA | NA | NA | | |
| 16 | TADU1 | Duchesne | Tabiona-Nr | 2700 | ◆ | 2014-03-01 | 200 | 300 | **450** | 650 | 800 | 300 | 400 | 570 | 780 | 940 | NA | | Peak Flow Forecasts Are Regulated Forecasts Based On Upstream Diversions And Regulation |

# Special Product-Unregulated/Regulated

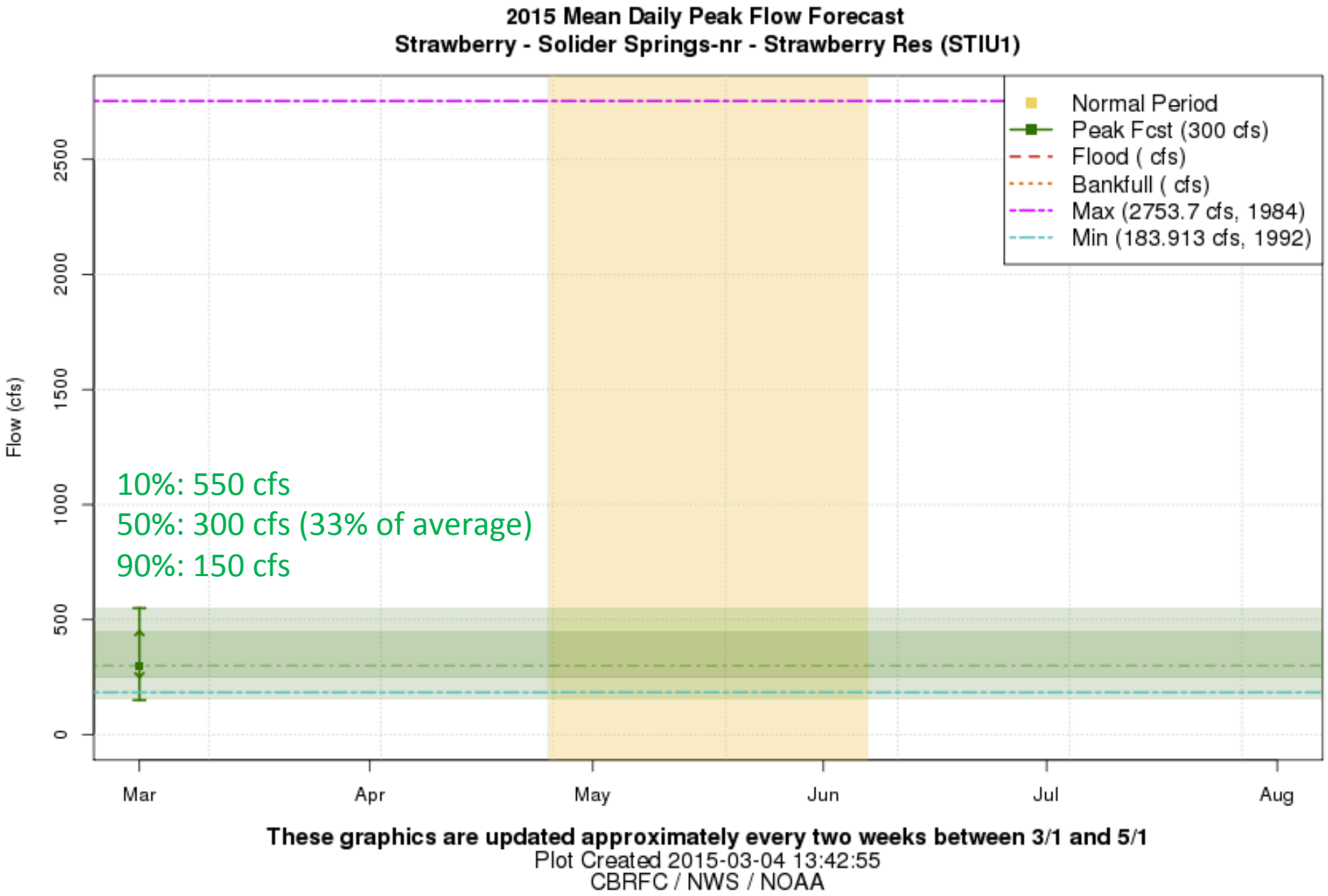
MEAN DAILY PEAK FLOW FORECASTS IN CFS

| LOCATION | FLOOD FLOW | FCST DATE | FORECAST FLOWS 90% | 75% | 50% | 25% | 10% | TYPE |
|---|---|---|---|---|---|---|---|---|
| BIG BRUSH CK - VERNAL, NR | -999 | 2015-03-01 | 60 | 100 | 150 | 200 | 280 | UNREG |
| STRAWBERRY - SOLIDER SPRI | -999 | 2015-03-01 | 150 | 250 | 300 | 450 | 550 | UNREG |
| CURRANT CK - CURRANT CK R | -999 | 2015-03-01 | 70 | 110 | 150 | 200 | 250 | UNREG |
| STRAWBERRY - STARVATION R | -999 | 2015-03-01 | 130 | 170 | 220 | 300 | 350 | REG |
| STRAWBERRY - STARVATION R | -999 | 2015-03-01 | 350 | 450 | 600 | 850 | 1050 | UNREG |
| WEST FORK DUCHESNE - VAT | 721 | 2015-03-01 | 25 | 35 | 55 | 90 | 115 | REG |
| WEST FORK DUCHESNE - VAT | 721 | 2015-03-01 | 80 | 100 | 130 | 160 | 200 | UNREG |
| DUCHESNE - TABIONA, NR | 2700 | 2015-03-01 | 125 | 200 | 350 | 550 | 650 | REG |
| DUCHESNE - TABIONA, NR | 2700 | 2015-03-01 | 600 | 700 | 850 | 1000 | 1200 | UNREG |
| ROCK CK - UPPER STILLWATE | -999 | 2015-03-01 | 600 | 700 | 850 | 1000 | 1150 | UNREG |
| DUCHESNE - DUCHESNE, NR, | -999 | 2015-03-01 | 200 | 400 | 700 | 1000 | 1300 | REG |
| DUCHESNE - DUCHESNE, NR, | -999 | 2015-03-01 | 1200 | 1400 | 1800 | 2200 | 2400 | UNREG |
| PROVO - WOODLAND, NR | 3096 | 2015-03-01 | 1100 | 1250 | 1500 | 1700 | 1900 | REG |
| PROVO - WOODLAND, NR | 3096 | 2015-03-01 | 810 | 990 | 1200 | 1400 | 1600 | UNREG |

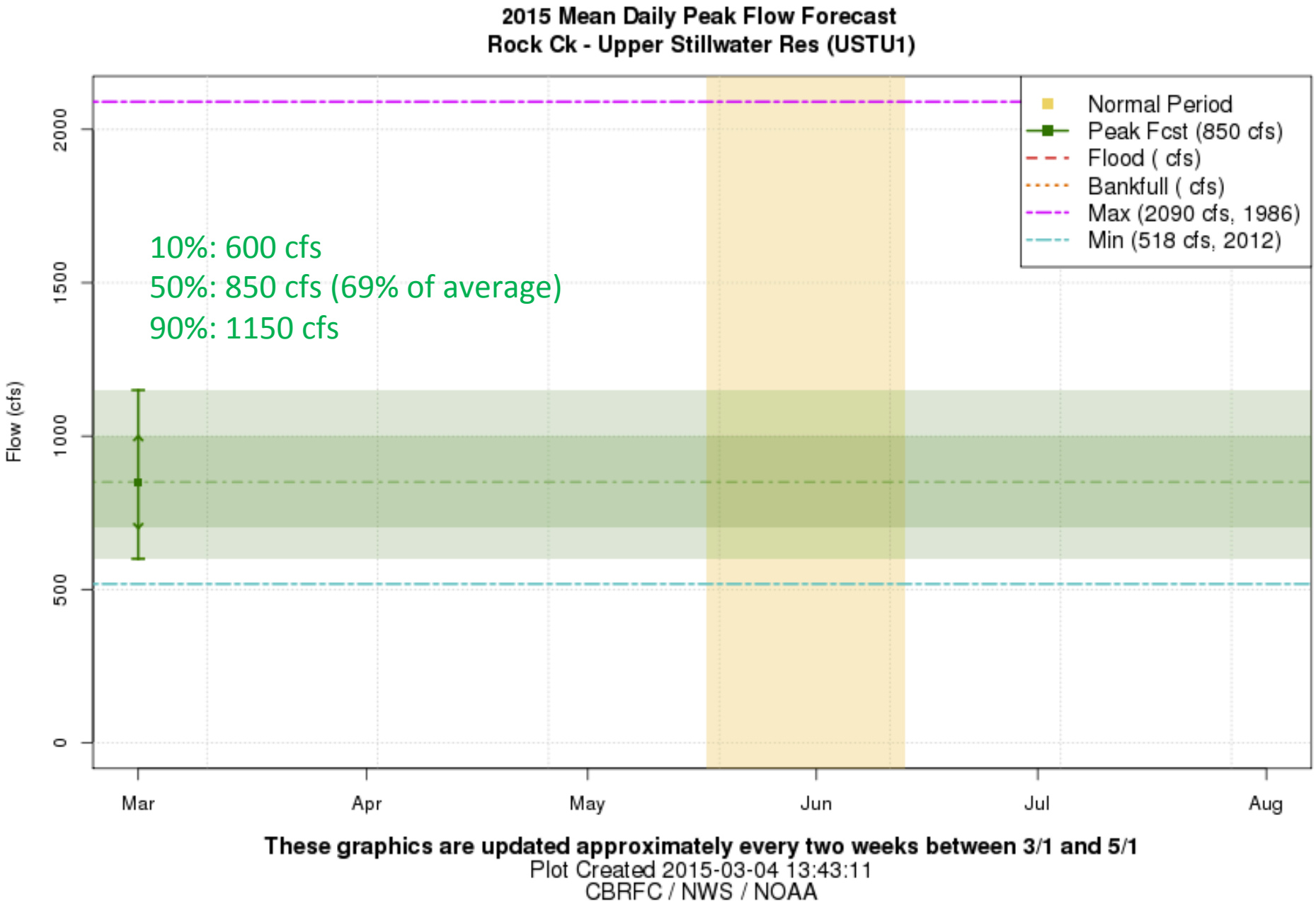
UNREG=Peak flow forecasts are unregulated and do not account for upstream diversions/regulation.
REG=Peak flow forecasts are regulated based on assumptions of upstream diversions/regulation.
FLOOD= Flood flow. -9999 = no flood flow
Regulated flow at Provo - Woodland, NR include diversions from the Duchesne Tunnel whereas unregulated flows do not.


JESU1 Peak Flow Forecasts
Select to plot min and max year hydrographs
Plot
Instantaneous Plot
Forecasts
Record Year Data
Yearly Peaks
Select to plot all historical peaks
2014 Mean Daily Peak Flow Forecast
Green - Jensen- Nr (JESU1)
Max peak of record
Forecast Probabilities
10%
25%
50%
75%
90%
Normal Period
Peak Fcst (19500 cfs)
2014
Flood (24138 cfs)
Bankfull (18078 cfs)
Max (38500 cfs, 1984)
Min (6970 cfs, 1989)
Flood Flow
Bankfull Flow
Minimum peak of record
Current year observed daily streamflow to date
Normal time of peak
Mar
Apr
May
Jun
Jul
Aug
Forecast Issuance Date
Plot Created 2014-03-27 08:16:31, CBRFC / NWS / NOAA

# Peak Flow: Strawberry nr Solider Springs



# Peak Flow: Upper Stillwater



# March Summary

## Soil Moisture Impacts

- Still impacting forecasts but not as much as earlier in the season

## Snow

- Below normal conditions
- Record low snow in several locations
- Limited low elevation snow left

## Forecasts: Volume and Peaks

- Below average volume and peak forecasts
- Decreases in volume forecasts since Feb 1
- Below average peaks, low probability of flooding at this time

## Weather

- Warm and dry conditions through mid week
- Weak storm system Thursday/Friday
- Ridge returns for weekend

# Discussion

- Forecast discussion
- Operations discussion
- Next briefing date?
  - April 8?

Feedback, Questions, Concerns always welcome….

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