

CBRFC WFO Teleconference

NOAA/NWS Colorado Basin River Forecast Center



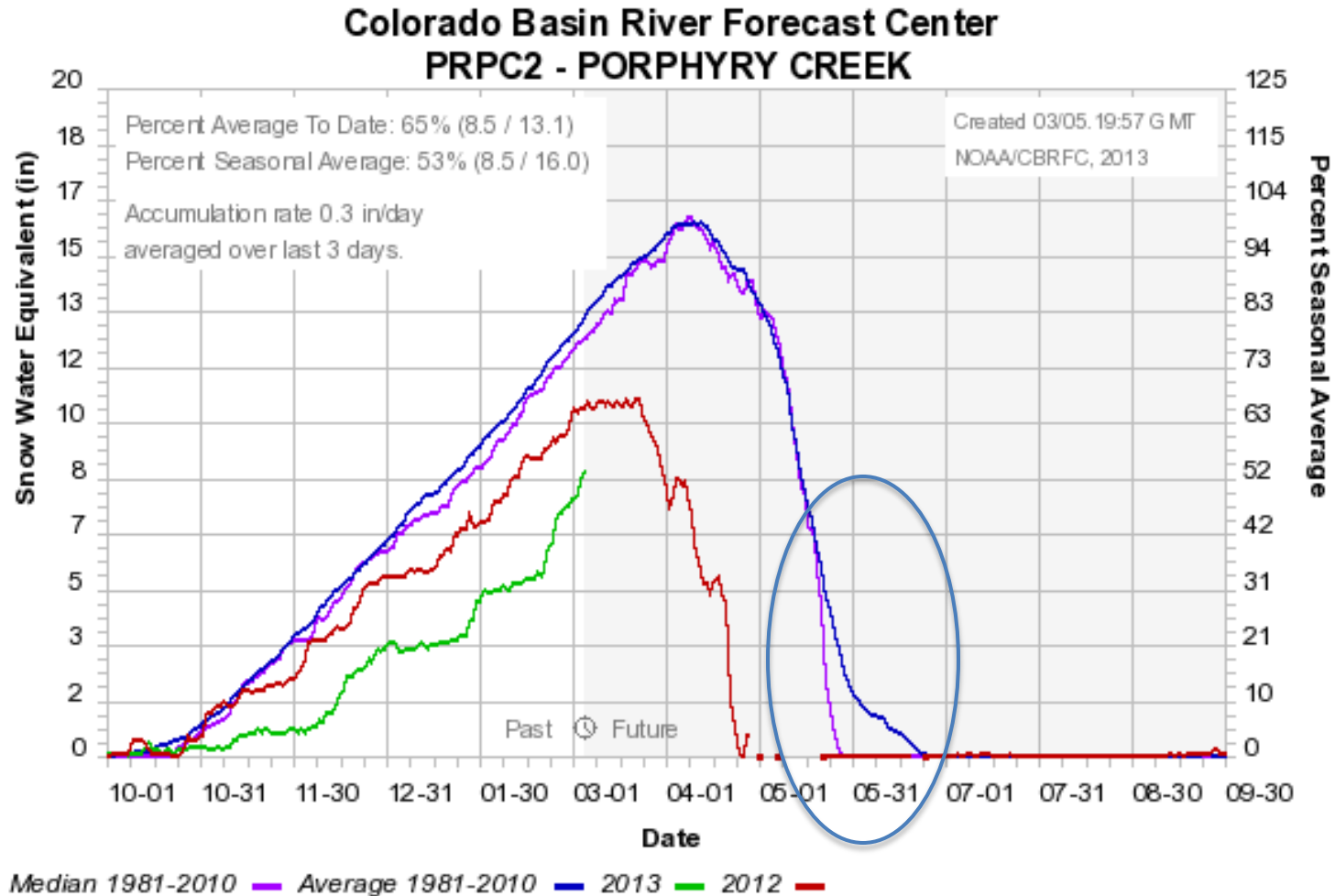
Mar 27, 2013

Outline

- Gearing up for Spring Runoff (Greg Smith – CBRFC)
- Precipitation Analysis (Paul Miller – CBRFC)
- WFO Comments/Issues?
- Future Calls

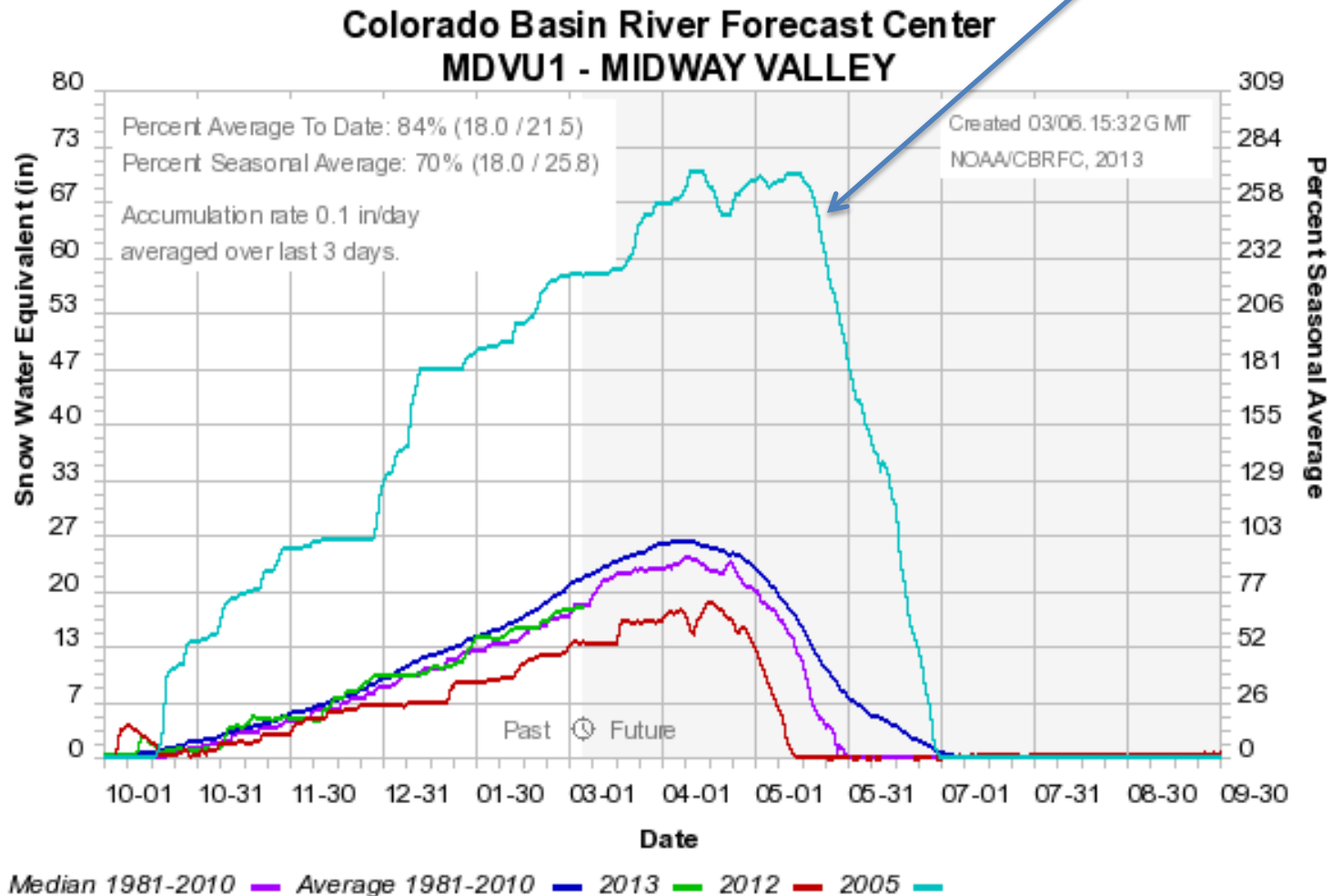
SNOW: Historical Median vs Average

Median melt out date is earlier than average date



SNOW: Historical Median vs Average

Very large years like 2005 can skew the historical average

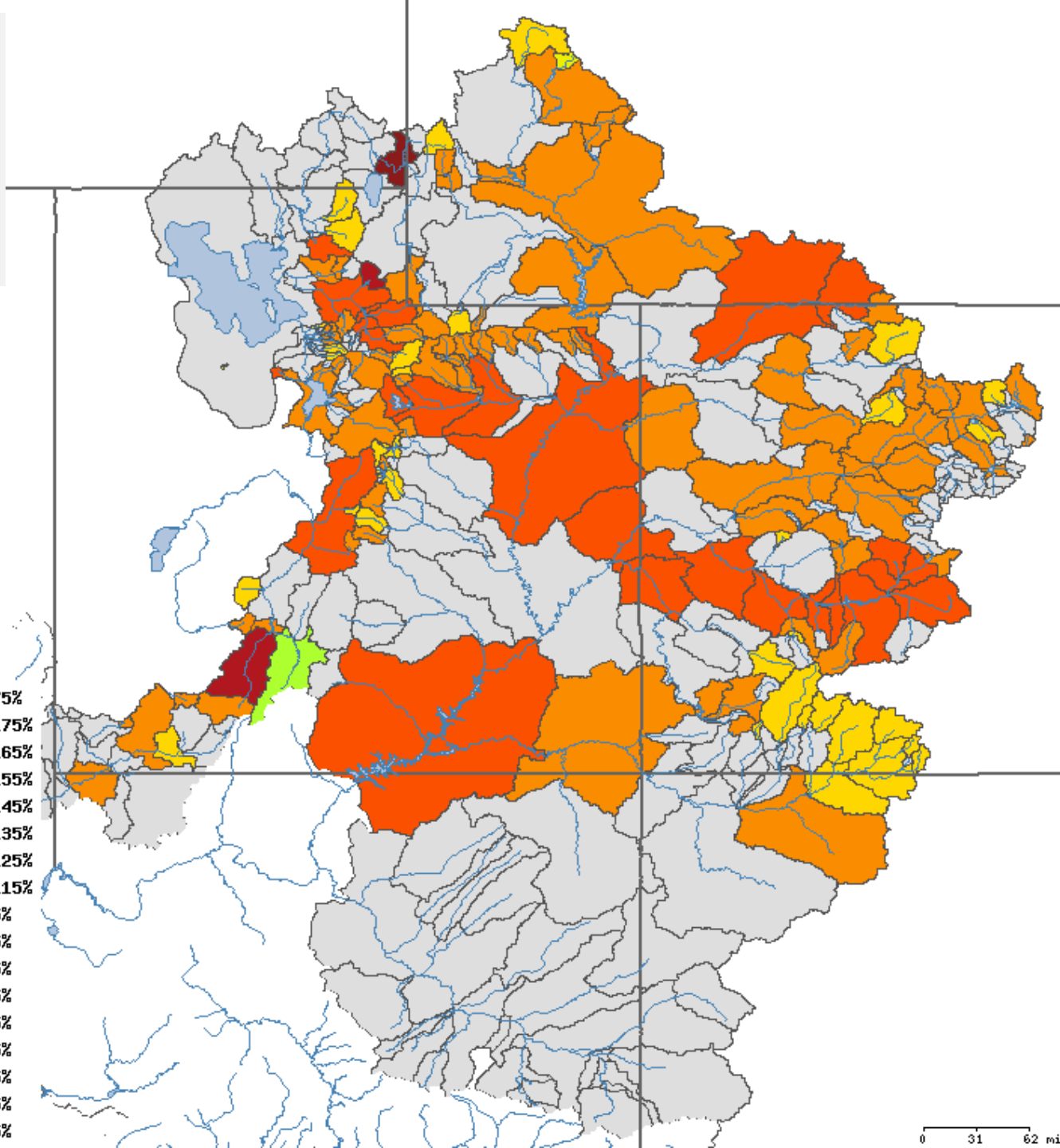
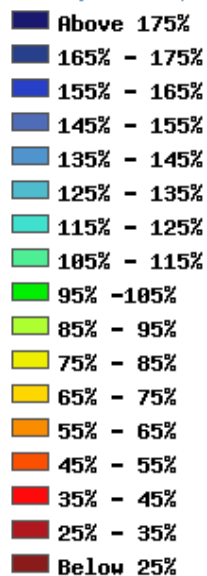


WATER YEAR 2012 vs. 2013

	WY 2012	WY 2013
Previous Apr-Jul runoff	Near record high	Near record low
Soil Moisture entering winter	Good	Poor
Winter (Nov-Feb) temperatures	Near to above average	Near to below average
March 1 SWE	~80% average	~75% average
April 1 SWE	~55% average (mid-March ~75% average)	??? (March 21 ~75% average)
Spring (Mar-May) temperatures	Above to much above average	???
Spring precipitation	Much below average	???

March 1st April-July Volume Forecasts by River Basin

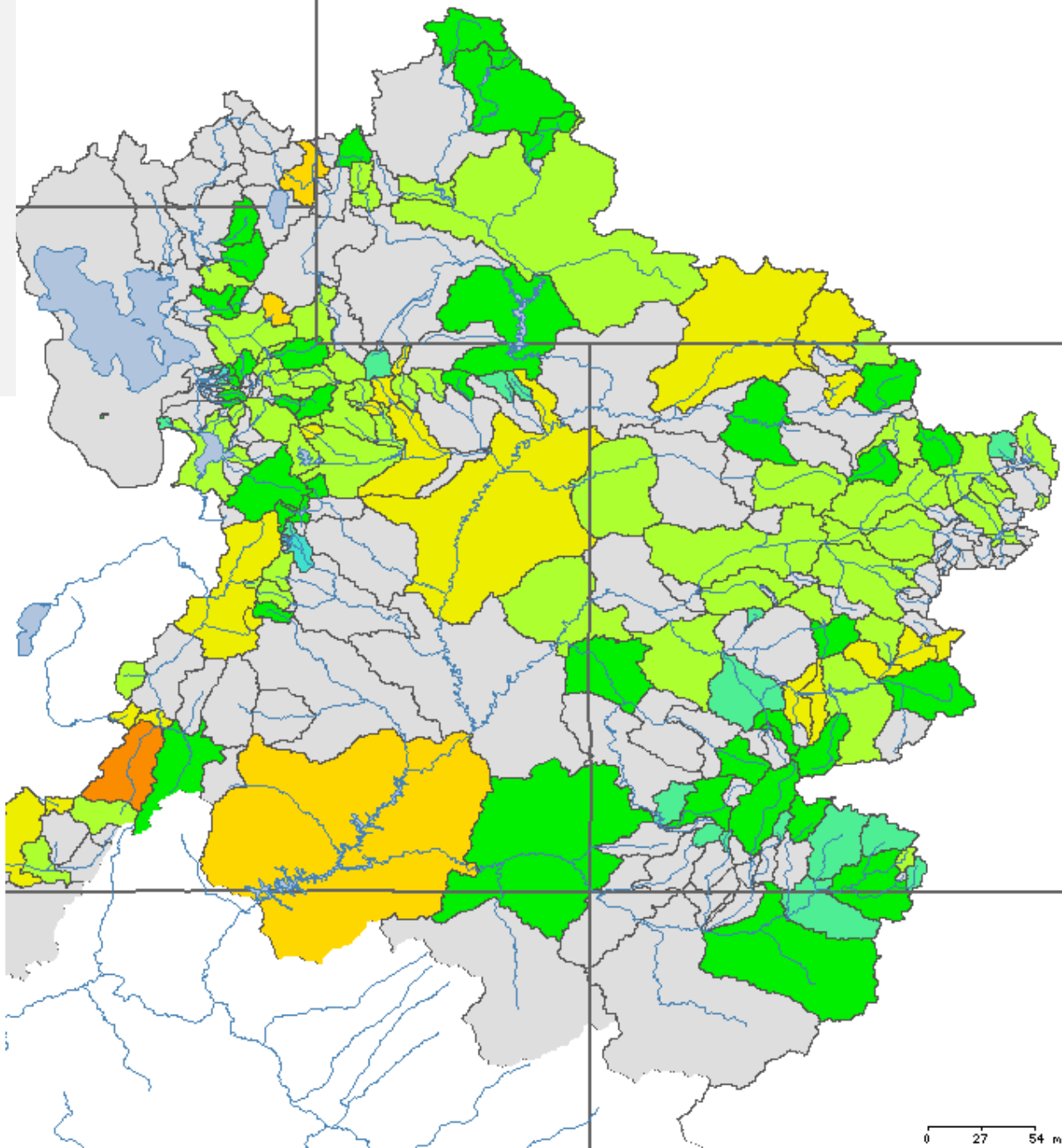
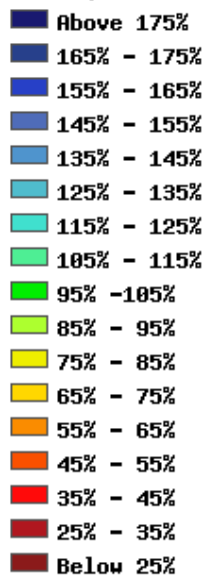
(percent of average)

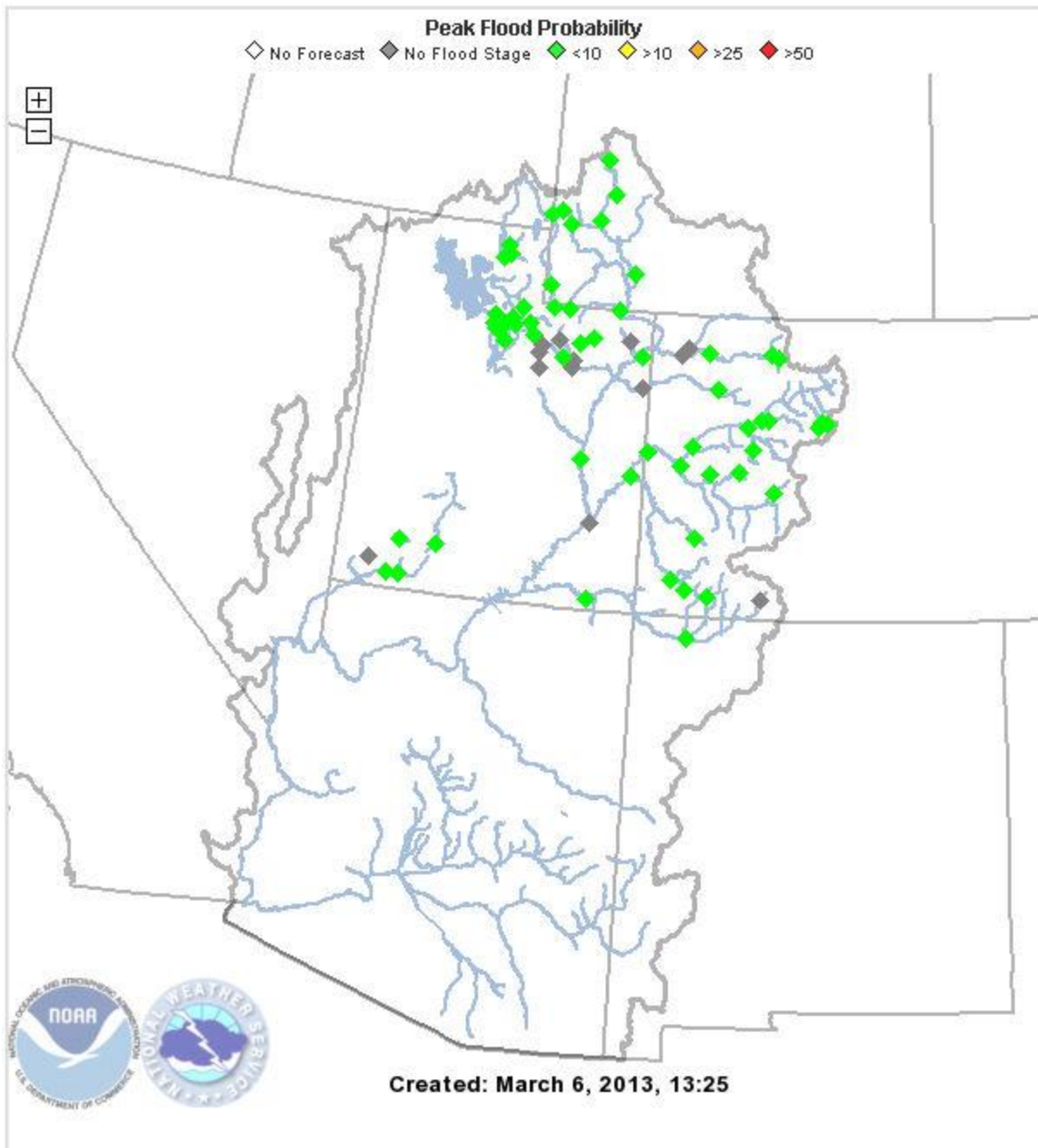


March 1st April-July Volume Forecasts

10% Exceedance Probability

(volumes as a percent of average)





[News: Recording: How to use this web page webinar](#)

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[Conditions Map](#) [Active Points](#) [Peak Map](#) [Peak List](#) [Peak Pub](#) [Recreational Forecasts](#)

Peak Flow List

New 1981-2010 Averages being used this year.

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.

Help: [Introduction](#) [Definitions](#) [River Permits](#) [Additional Information](#)

Area: [CBRFC](#) [Upper Colorado](#) [Green](#) [San Jaun](#) [Great Basin](#) [Sevier](#) [Virgin](#) [Lower Colorado](#)

SEARCH POINTS

Plots: [Auto](#) [Off](#) [On](#)

Peak Flood Probability

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

Peak Flow Information Available Through The Peak Map/Peak List Links

NWS ID	River	Location	Flood Probability	Mean Daily 90%	Instantaneous					Issue Date	Historic Peak	Average Peak	Flood	Last Year Peak	Last Year Date	Normal Earliest Date	Normal Latest Date	Observed Peak	Observed Date				
					75%	50%	25%	10%	90%											75%	50%	25%	10%
1	ALEC2	East	Almont	◆	560	630	750	900	1100	570	650	790	960	1200	04-16	5000	2000	2980	2580	06-08	05-21	06-11	-
2	ARFN5	Animas	Farmington	◆	2100	2300	2700	3200	3700						04-16	11000	4710	8810	4860	06-08	05-20	06-09	-
3	BCTU1	Big Cottonwood Ck	Salt Lake City Nr	◆	210	240	270	290	340						04-17	925	430	800	698	06-24	05-18	06-07	-
4	BERU1	Bear	Utah	◆	800	920	1020	1120	1310	950	1100	1200	1400	1600	04-17	3030	1600	3670	3030	07-01	05-15	06-14	-
5	BFFU1	San Juan	Bluff Nr	◆	6100	6600	6900	7200	7600	7100	7700	8000	8300	8700	04-16	15200	7340	33838	4300	06-01	05-15	06-28	-
6	BPNW4	New Fork	Big Piney Nr	◆	3100	3400	4100	4800	5500	3200	3500	4200	4900	5700	04-16	9110	4730	8850	7750	07-03	05-26	06-23	-
7	BRUU1	Big Brush Ck	Vernal Nr Red Fleet Res Abv	◆	80	100	120	150	210						04-01	414	235		245	06-22	05-04	06-01	-
8	BSWC2	Blue	Dillon Nr	◆	140	160	200	260	340						04-16	1160	505	1770	955	07-20	05-27	06-25	-
9	BUEC2	Blue	Blue River	◆	60	70	90	120	160						04-16	580	185	835	410	07-20	05-28	07-05	-
10	CAMC2	Colorado	Cameo Nr	◆	5000	6000	7500	9500	12500	5500	6600	8100	10000	13000	04-16	38000	17000	26000	29200	06-09	05-24	06-12	-
11	CCSU1	City Ck	Salt Lake City Nr	◆	35	40	50	60	75						04-17	262	80	210	167	06-16	05-13	06-01	-
12	CCUC2	Colorado	Co	◆	4500	6500	9000	12000	15000	5100	7100	9700	13000	16000	04-16	68300	25500	46200	46800	06-10	05-19	06-11	-

Reservoir Level – fill/spill Information



COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

News: [Water Supply Forecast Publications for March](#)

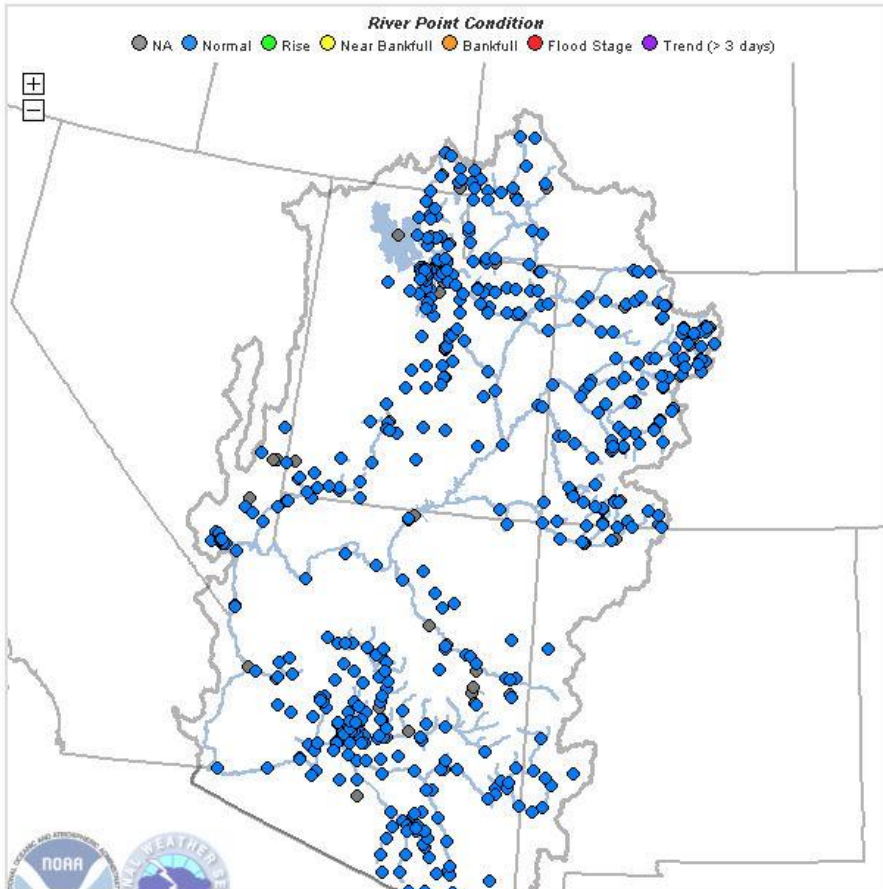
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[Conditions Map](#) [List](#) [Peak Map](#) [Peak List](#) [Recreational Forecasts](#)

Areas: [CBRFC](#) [Upper Colorado](#) [Green](#) [San Juan](#) [Great](#) [Sevier](#) [Virgin](#) [Lower Colorado](#)

SEARCH POINTS

****Changes:** Click Point for Name then Choose Option for Details, Click Map to Zoom.
Hover has been removed for touch screen compatibility.



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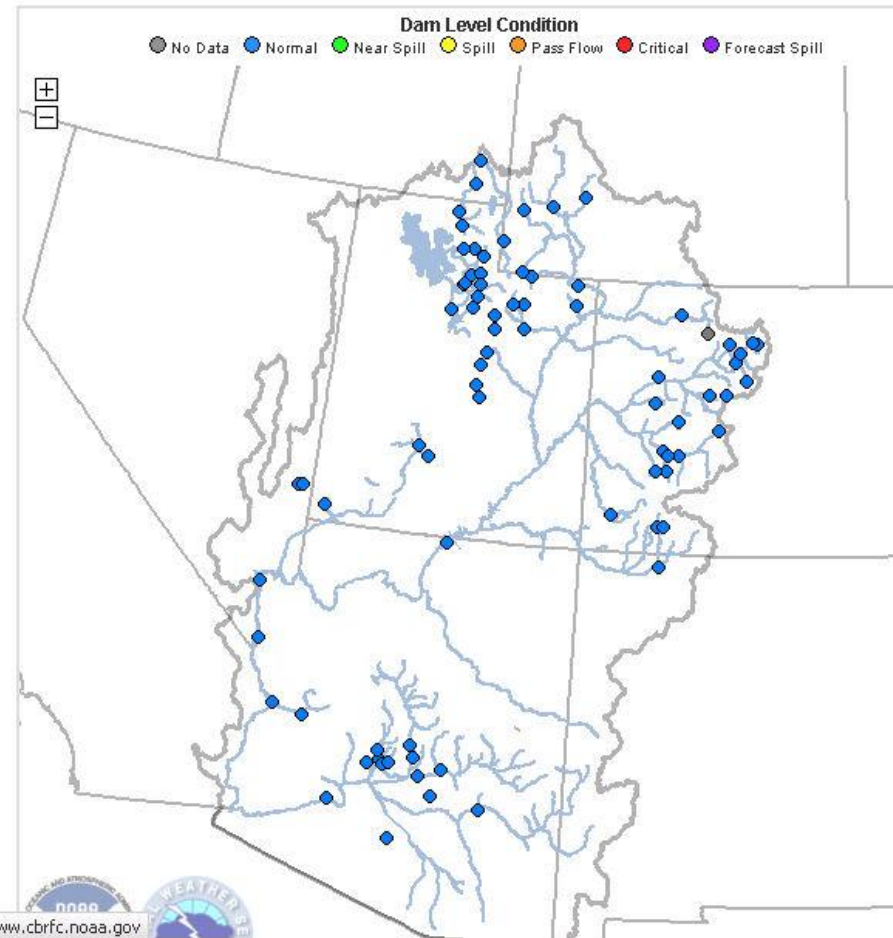
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[Conditions Map](#) [Conditions List](#) [Damcrit](#) [Webcat](#) [DamBreak](#)

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SEARCH POINTS

****Changes:** Click Point for Name then Choose Option for Details, Click Map to Zoom.
Hover has been removed for touch screen compatibility.



Dam Level Condition

● No Data
 ● Normal
 ● Near Spill
 ● Spill
 ● Pass Flow
 ● Critical
 ● Forecast Spill

	NWS ID	Location	Level Condition	Current Level	Observed Date	Forecast Peak (5 days)	Peak Date	Gate Level	Gate	Pass Flow Level	Crit Level
1	ADBA3	Adobe Dam	●	2.8	1/10 06:00	1.1	1/9 17:00	40	n		1379
2	AJUA3	Stewart Mountain Dam	●	1526	1/10 05:00	1528	1/14 16:00	1506	y		1528
3	ALMA3	Alamo Reservoir	●	1097.1	1/10 09:00	1097.2	1/9 17:00	1235	n		1237
4	BIGW4	Big Sandy - Big Sandy Res, Farson, Nr	●	6739.7	1/10 08:00	6738.1	1/14 12:00	6758	n		6759
5	BMDC2	Gunnison - Blue Mesa Res	●	7452.8	1/10 09:00	7452.8	1/10 17:00	7488	y		7516
6	BRTA3	Bartlett Reservoir	●	1766.4	1/10 08:00	1767.2	1/14 16:00	1798	y		1804
7	CBTA3	Cave Buttes Dam	●	1.7	1/10 09:00	0.7	1/9 17:00	97	n		1659
8	CLDA3	Gila - San Carlos Res, Coolidge Dam, At	●	2400.7e	1/10 05:00	2401.4	1/14 12:00	2511	n		2513
9	CLSC2	Gunnison - Crystal Res	●	6747.7	1/10 09:00	6748.7	1/10 17:00	6755	n		6757
10	CRAU1	Lost Ck - Lost Ck Res, Croydon, Nr	●	5991.4	1/10 09:00	5983.3	1/13 18:00	6005	n		6007
11	CRCU1	Bear River - Cutler Reservoir,	●	4407e	1/10 05:00	4407.3	1/9 17:00	4410	y		4410
12	CRUU1	Currant Ck - Currant Ck Res	●	7675.8	1/10 08:00	7675.8	1/10 17:00	7678	n		7680
13	CSYU1	Sf Ogden - Causey Res	●	5671.4	1/9 23:00	5664.6	1/14 14:00	5692	n		5694
14	DCRU1	Provo - Deer Ck Res	●	5404.1	1/10 08:00	5402.4	1/14 16:00	5397	y		5418
15	DELU1	Dell Fk - Little Dell Res	●	5752.5e	1/10 05:00	5752.5	1/13 03:00	5798	n		5800
16	DIRC2	Blue - Dillon Res	●	8988.9e	1/10 05:00	8988.9	1/10 17:00	9017	n		9019
17	ECBU1	Weber - Echo Res, Echo, At	●	5508.7	1/10 09:00	5509.4	1/14 12:00	5543	y	5560	5562
18	ECRU1	East Canyon Ck - East Canyon Res, Morgan, Nr	●	5665.3	1/10 09:00	5665.4	1/14 05:00	5705	n		5707
19	EHRC2	Elkhead Reservoir	●	6375.7e	1/10 05:00	6375.8	1/14 17:00	6388	n		6390
20	ELLU1	Huntington Ck - Electric Lake	●	8548.2	1/10 06:00	8547.2	1/10 17:00	8575	n		8577

Reservoir Status

RIVERS SNOW WATER SUPPLY RESERVOIRS WEATHER

Conditions Map Conditions List Damcrit Webcat DamBreak

Dam Gage Review: ALL sites with pool(ft) above category 1
Wed Mar 13 12:00:01 2013 UTC

huc 1401 COLORADO HEADWATERS

r	hb5	name	current	5 day pk	spillway	passflow	5 day pk-sig level
1	GBYC2	COLORADO - LAKE GRANBY, GRANBY, N	03/13/11Z 8224.50	03/13/13Z 8224.50	8260.0y	8279.4	54.9 below Passflow
1	WCRC2	WILLOW CK - WILLOW CK RES, GRANBY	03/13/11Z 8121.97	03/18/12Z 8122.21	8130.0n		7.8 below Spillway
1	WFDC2	WILLIAMS FORK - WILLIAMS FORK RES	03/12/06Z 7765.92	03/13/19Z 7765.92	7811.0n	7810.5	45.1 below Spillway
1	WORC2	MUDDY CK - WOLFORD MOUNTAIN RESER	03/13/11Z 7450.86	03/18/12Z 7450.92	7489.0n		38.1 below Spillway
1	DIRC2	BLUE - DILLON RES	03/12/06Z 8984.35	03/13/12Z 8984.35	9017.0n		32.7 below Spillway
1	GMRC2	BLUE - GREEN MTN RES	03/13/11Z 7890.47	03/13/16Z 7890.47	7950.0y	7949.5	59.0 below Passflow
1	HMAC2	HOMESTAKE CK - HOMESTAKE RES	03/13/10Z -1.16	03/18/12Z 1.31	215.0n		213.7 below Spillway
1	RURC2	FRYING PAN - RUEDI RES, BASALT, N	03/13/11Z 7718.56	03/13/13Z 7718.57	7766.0n		47.4 below Spillway
1	RRGC2	RIFLE CK - RIFLE GAP RESERVOIR	03/13/11Z 5938.36	03/18/12Z 5939.27	5960.0n		20.7 below Spillway
1	VEGC2	PLATEAU CK - VEGA RES, COLLEBRAN,	03/13/11Z 7945.05	03/18/12Z 7945.18	7984.0n		38.8 below Spillway

huc 1402 GUNNISON

r	hb5	name	current	5 day pk	spillway	passflow	5 day pk-sig level
1	TPIC2	TAYLOR - TAYLOR PARK RES	03/13/11Z 9301.01	03/18/12Z 9301.02	9330.0n		29.0 below Spillway
1	BMDC2	GUNNISON - BLUE MESA RES	03/13/11Z 7453.13	03/18/12Z 7453.31	7487.9y		74.7 below Crest
1	CLSC2	GUNNISON - CRYSTAL RES	03/13/11Z 6744.61	03/18/12Z 6749.08	6755.0n		5.9 below Spillway
1	MPSC2	GUNNISON - MORROW POINT RES	03/13/11Z 7142.32	03/13/14Z 7144.00	7160.0n		16.0 below Spillway
1	SJAC2	CIMARRON - SILVER JACK RES, CIMAR	03/13/11Z 8877.72	03/13/15Z 8877.76	8925.6n		47.8 below Spillway
1	PRSC2	MUDDY CK - PAONIA RES, BARDINE, N	03/13/11Z 6387.65	03/18/12Z 6388.91	6447.5n		58.6 below Spillway
1	RBSC2	UNCOMPAHGRE - RIDGEWAY RES	03/13/11Z 6843.15	03/18/12Z 6843.44	6871.3n		27.9 below Spillway

Official RVF products – Issued for official points as we approach critical levels

Peak Flow Forecast Updates: First and Middle of April and May, and early June.

** Transition to use daily deterministic model output as we near the peak **

Upcoming Presentations:

CBRFC Water Supply Webinar – April 4th at 11 am MDT

CBRFC Peak Flow Webinar – April 18th at 11 am MDT

CBRFC Spring Operational Meeting Visits (tentative):

April 23rd – BOR Navajo Unit Operations Meeting – Farmington, NM - Greg Smith

April 24th – BOR Flaming Gorge Working Group – Vernal, Utah – Brenda Alcorn

April 25th – BOR Aspinall Unit Operation Meeting – Grand Junction, CO – Greg Smith

April 25th – BOR Fontenelle Working Group – Seedskadee NWR, WY – Brent Bernard

NOAA's National Weather Service

Colorado Basin River Forecast Center

Precipitation Analysis over the Colorado River Basin

Overview

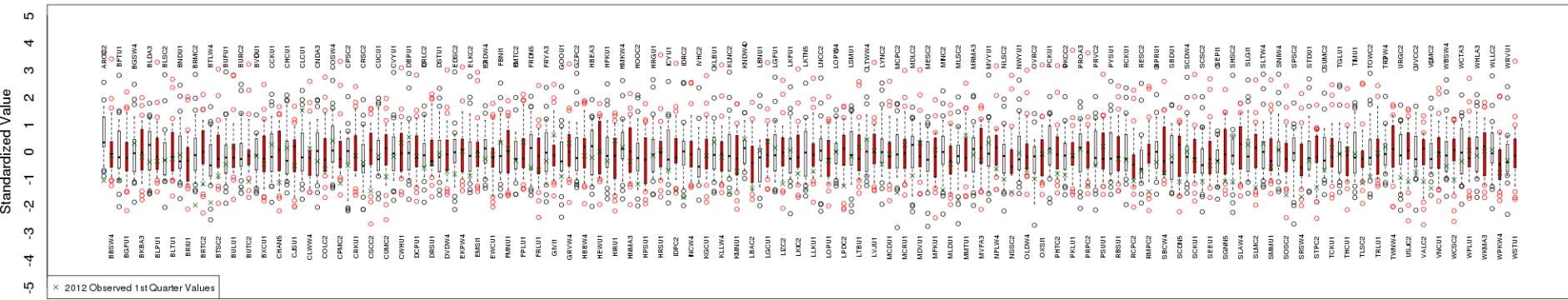
- Questions regarding the probability of precipitation reaching average conditions over the Colorado River Basin given current (dry) 1st Quarter WY (Oct-Dec) conditions have been asked.
- Initial analysis by the CBRFC and ESP model runs yielded pessimistic outlooks, so we wanted to confirm with a more detailed analysis.
- How does 1st Quarter WY conditions compare to January through May conditions?

Data

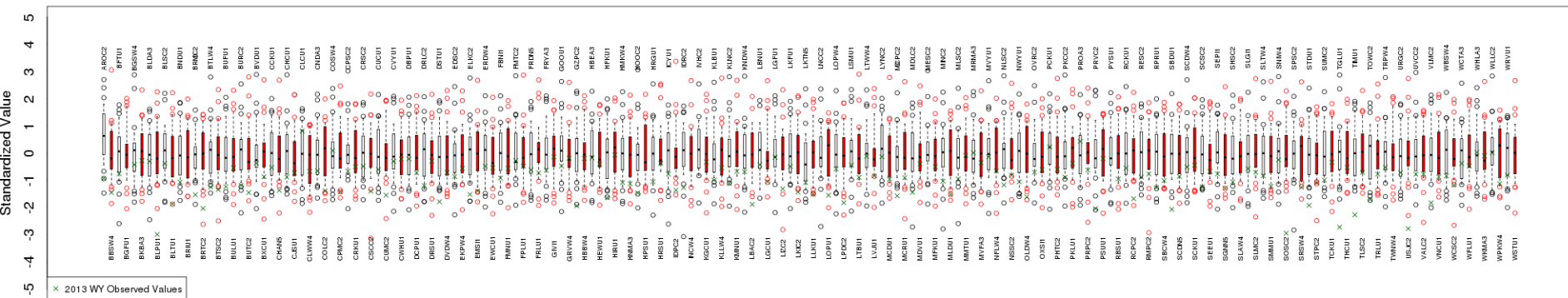
- Queried database for precipitation data from SNOTEL precipitation sensors.
 - Query resulted in 186 stations with derived averages from the calmonly table, the table within the CBRFC database which stores the data through which the model is calibrated.
 - Derived standardized values for each of these stations between water years 1981 and 2010 (30 years).
- Empirical probabilities derived here are over that historical period.

Summary of All Gage Statistics

Standardized 1st Quarter Precipitation Totals Over the Colorado River Basin



Standardized Jan-May Precipitation Totals Over the Colorado River Basin



Summary of All Gage Statistics

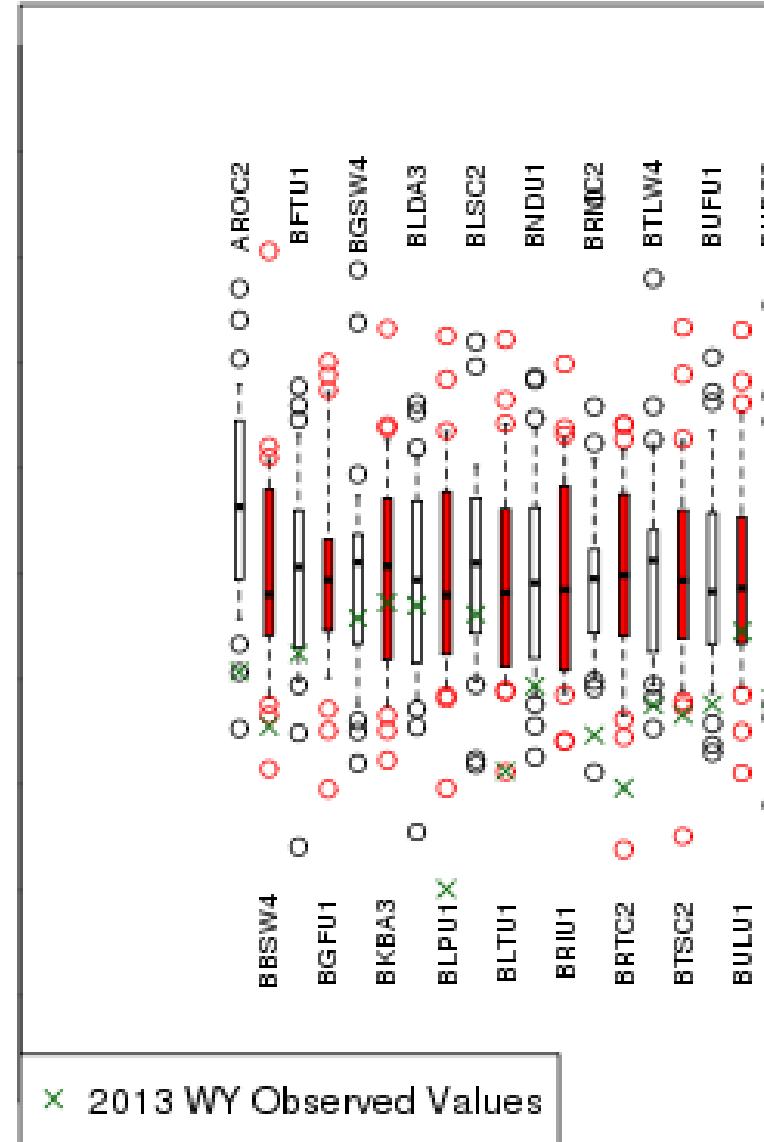
- Historic spread of all the gages is similar.
- On average, there is more variability during the January through May season than in the 1st Quarter of the Water Year.
 - Mean variance in the 1st Quarter (Oct-Dec) is 8.95
 - Mean variance in Jan-May is 16.27
- Green “X’s” in the top plot mark 2012 October through December values. These values are spread throughout.
- Green “X’s” in the bottom plot mark 2013 WY values. These values are almost all below median in the lower quartile.

Summ

- As of today, there are only 7 gages (4%) that are at or above their historical (calibration record) median.
- 11 gages are on track to end lower than any value in the historical record.

Standardized Value

-5 -4 -3 -2 -1 0 1 2 3 4 5



What is “dry”?

- Percentage values may be interpreted differently across gages. Using standardized values, we can attempt to make a more uniform comparison.
- For instance, we can set a threshold (e.g., standard deviation less than -1.0) to define “dry” conditions.
- This sort of standardizing is used in the Standardized Precipitation Index and Palmer Drought Severity Indices.

Answering the question

- Given “dry” conditions, what is the likelihood, based on historical observations, that an average Jan-May precipitation total is met or

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
1 st Quarter precipitation is ≤ -0.5	1,696	38%
1 st Quarter precipitation is ≤ -1.0	740	39%

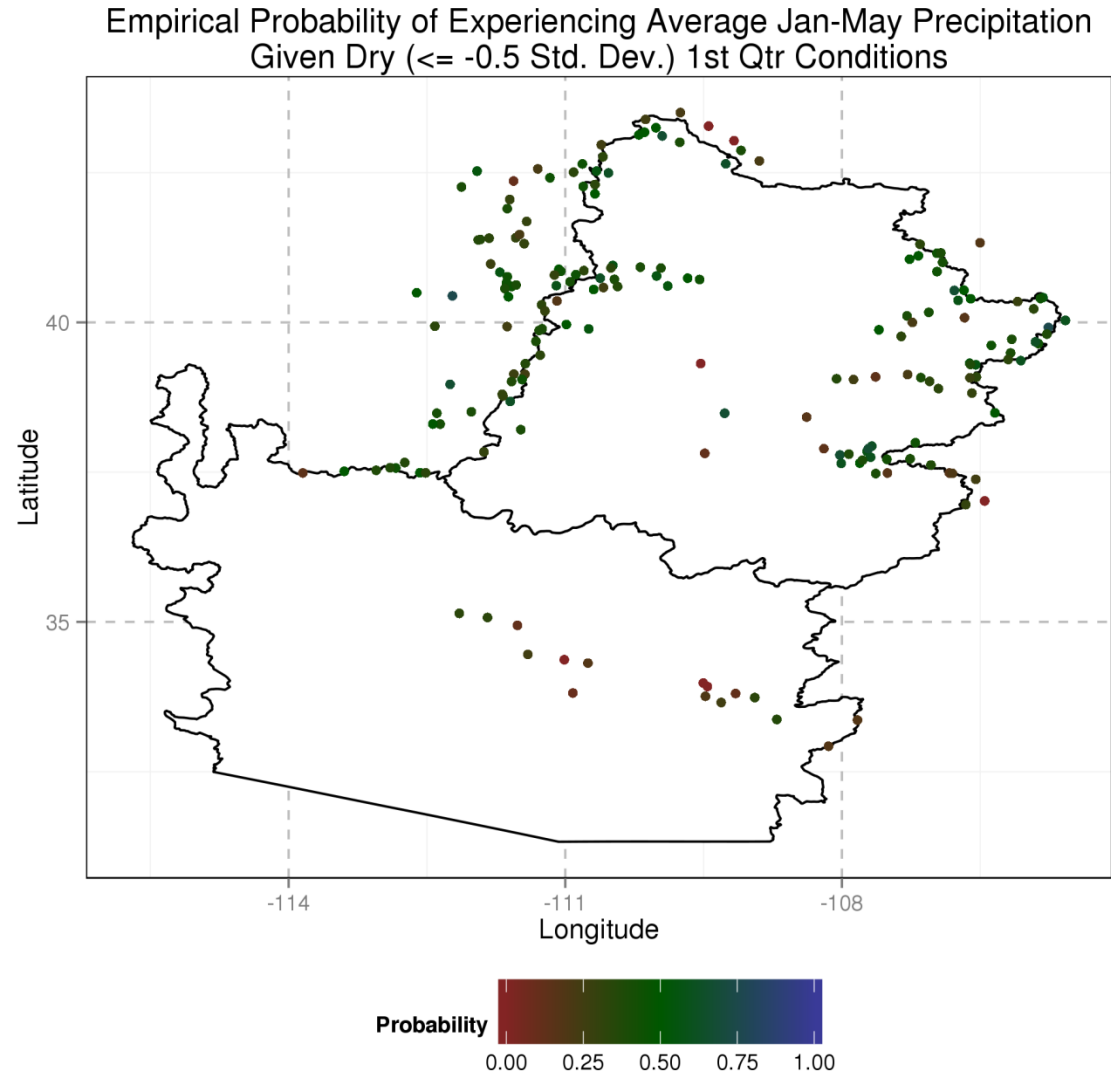
What about this year?

- Given current precipitation conditions, what is the likelihood, based on historical observations, that an average Jan-May

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
1 st Quarter precipitation is \leq current conditions	1,881	40%
1 st Quarter precipitation is $>$ current conditions	2,999	53%

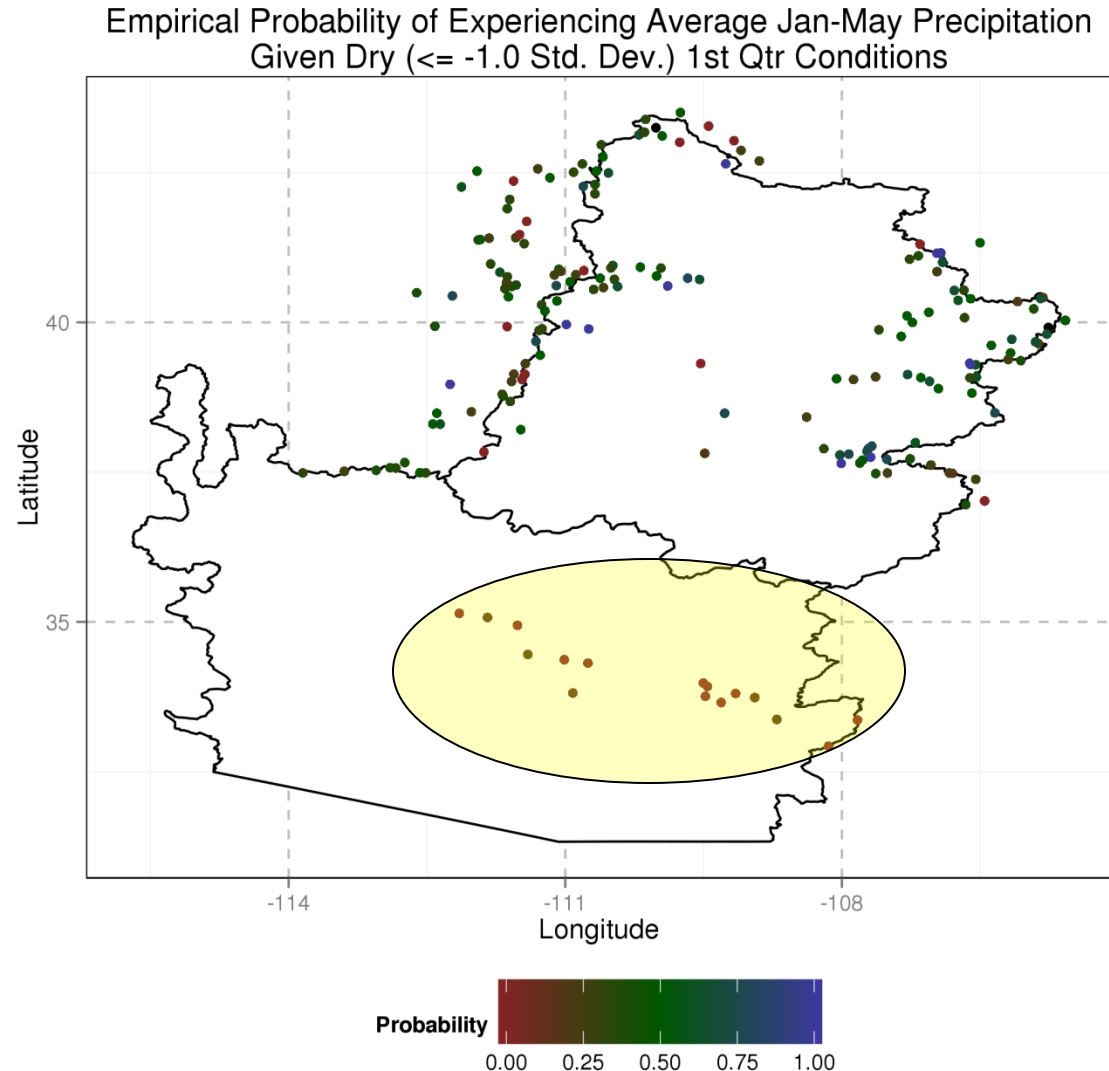
Is there a Spatial Correlation?

- This is using a threshold of -0.5.
- Probability of reaching average spring conditions is approximately 50% across the upper basin.
- Probabilities in the lower basin appear to be around 25%.



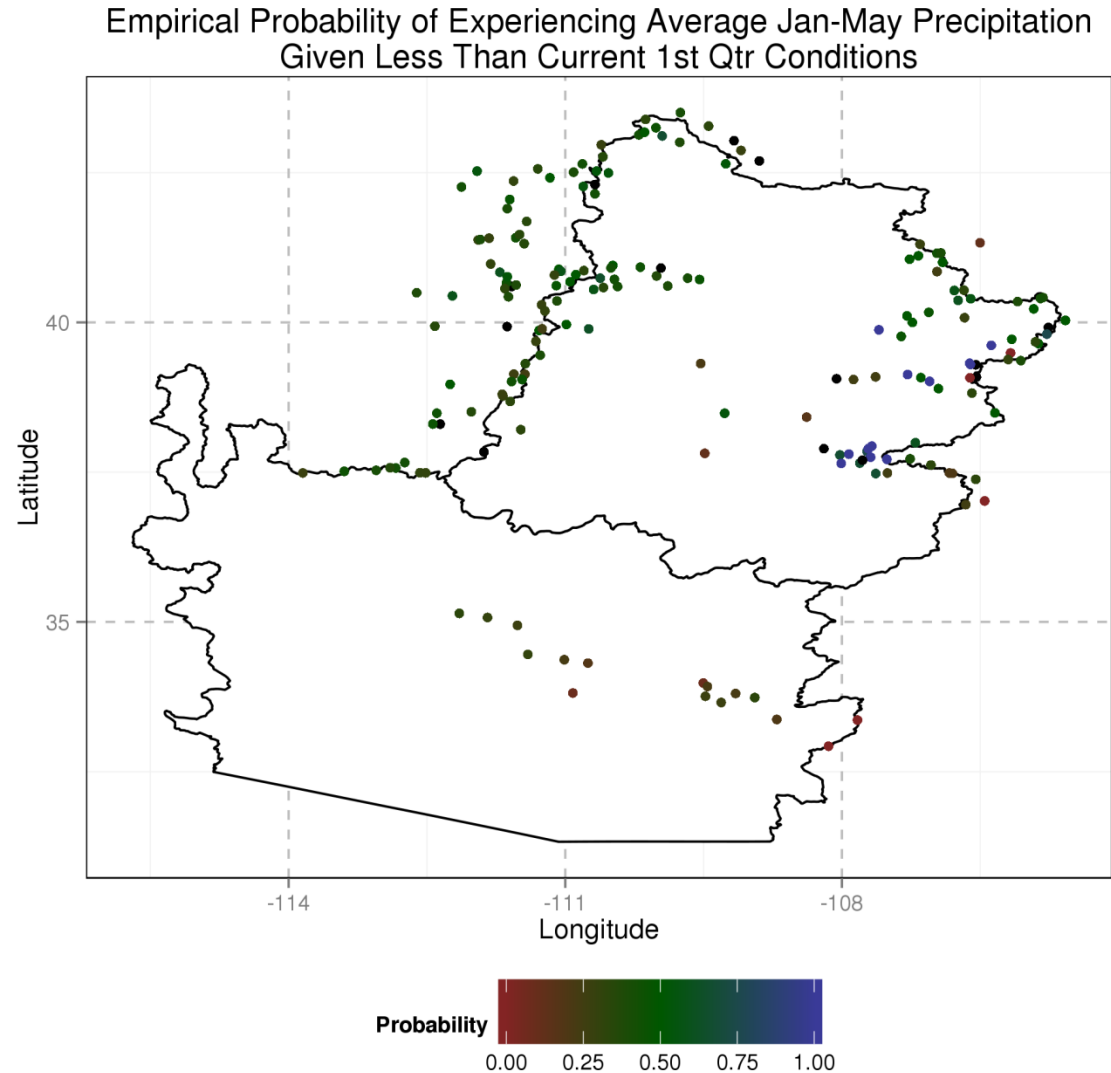
Is there a Spatial Correlation?

- This is using a threshold of -1.0.
- May be a small cluster outside of the mainstem basin with higher probabilities.
- Lower basin probabilities are much lower.



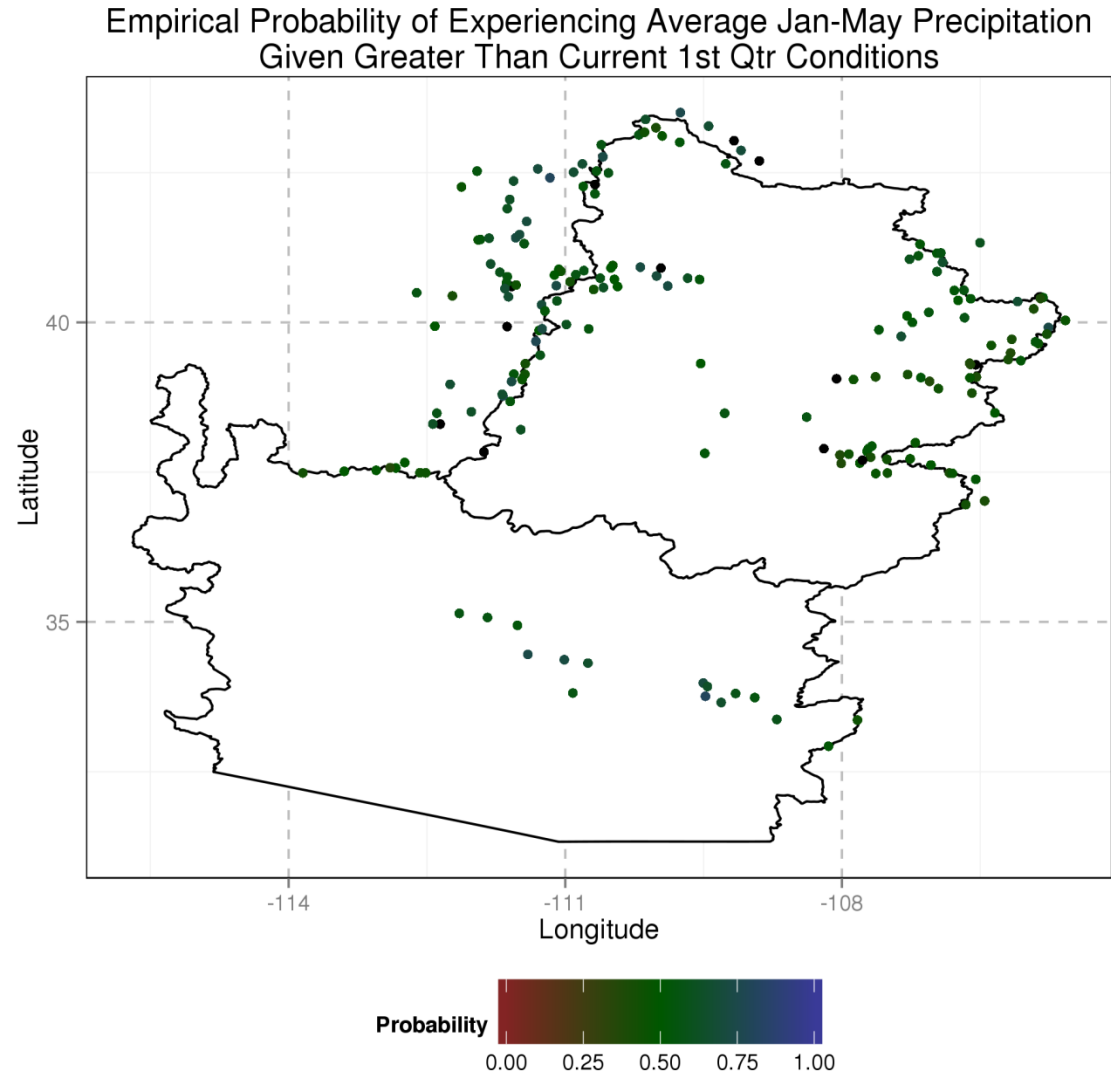
Is there a Spatial Correlation?

- This is using a threshold of \leq current conditions.
- Less than current winter conditions typically yield below average spring seasons in the lower basin.



Is there a Spatial Correlation?

- This is using a threshold of $>$ current conditions.
- With current, or greater, winter conditions, there appears to be at least a 50% chance of seeing at least an average spring.



Initial Conclusions

- 1st Quarter precipitation conditions do seem to give some indication of the type of spring season that follows, but it appears to be a weaker correlation in the upper basin than in the lower basin.
 - This makes sense, since spring precipitation is more variable on average.
 - This analysis is limited from a site to site basis, since most stations only have about 15 years worth of data to test based on the thresholds used here.
- It seems that low 1st Quarter precipitation is more indicative of below Jan-May spring conditions in the lower basin.

Continuing the Analysis

- What if we examine what the probability of seeing at least an average TOTAL October through May precipitation season, given dry 1st quarter conditions?
- Variability characteristics remain the same.
- Basically, we want to see what the likelihood is that January through May precipitation can make up for a dry 1st Quarter.

Answering the question

- Given “dry” conditions, what is the likelihood, based on historical observations, that an average October through May precipitation

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
1 st Quarter precipitation is ≤ -0.5	1,696	13%
1 st Quarter precipitation is ≤ -1.0	740	7%

What about this year?

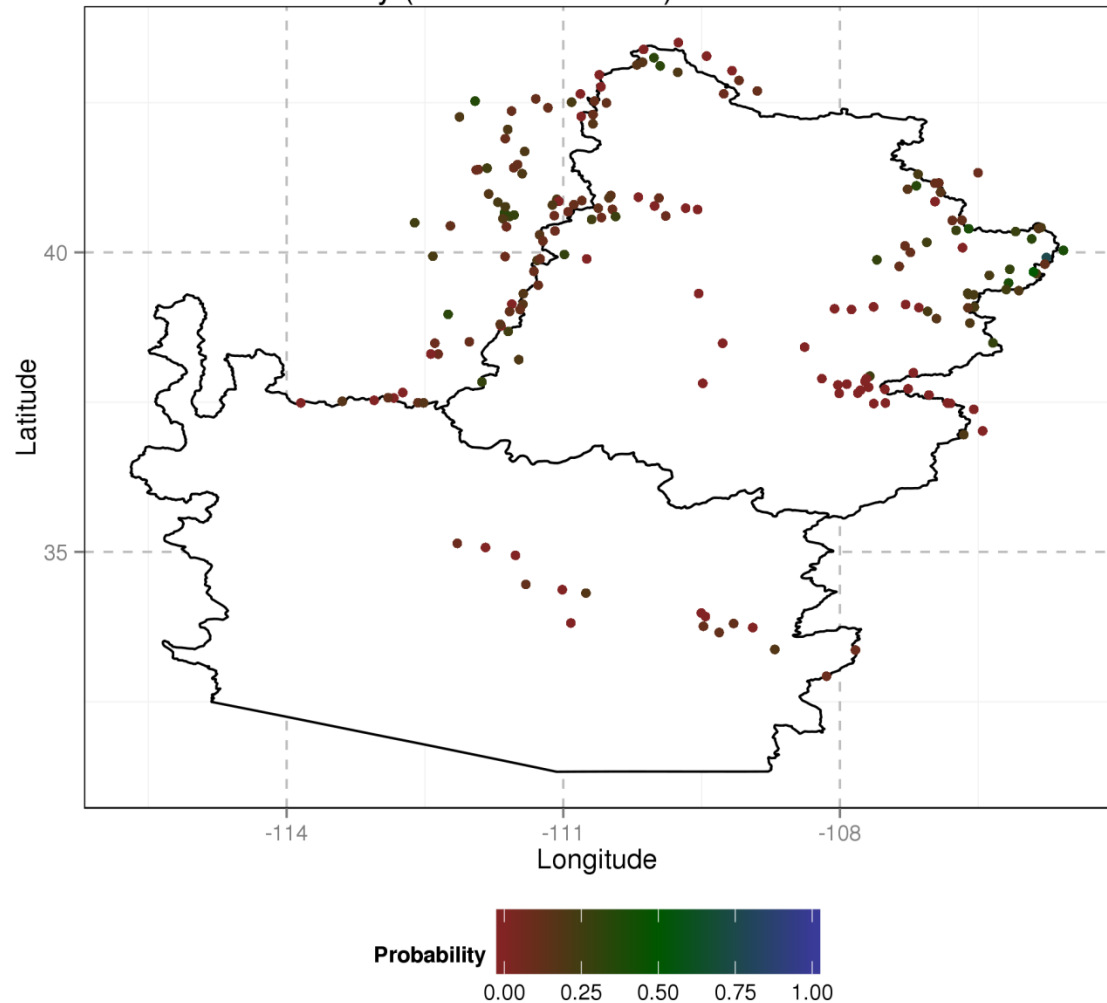
- Given current 1st Quarter conditions, what is the likelihood, based on historical observations, that an average October

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
1 st Quarter precipitation is \leq current conditions	1,881	20%
Winter precipitation is $>$ current conditions	2,999	62%

Is there a Spatial Correlation?

- This is using a threshold of -0.5.
- Probability of reaching average annual conditions is low throughout the basin.

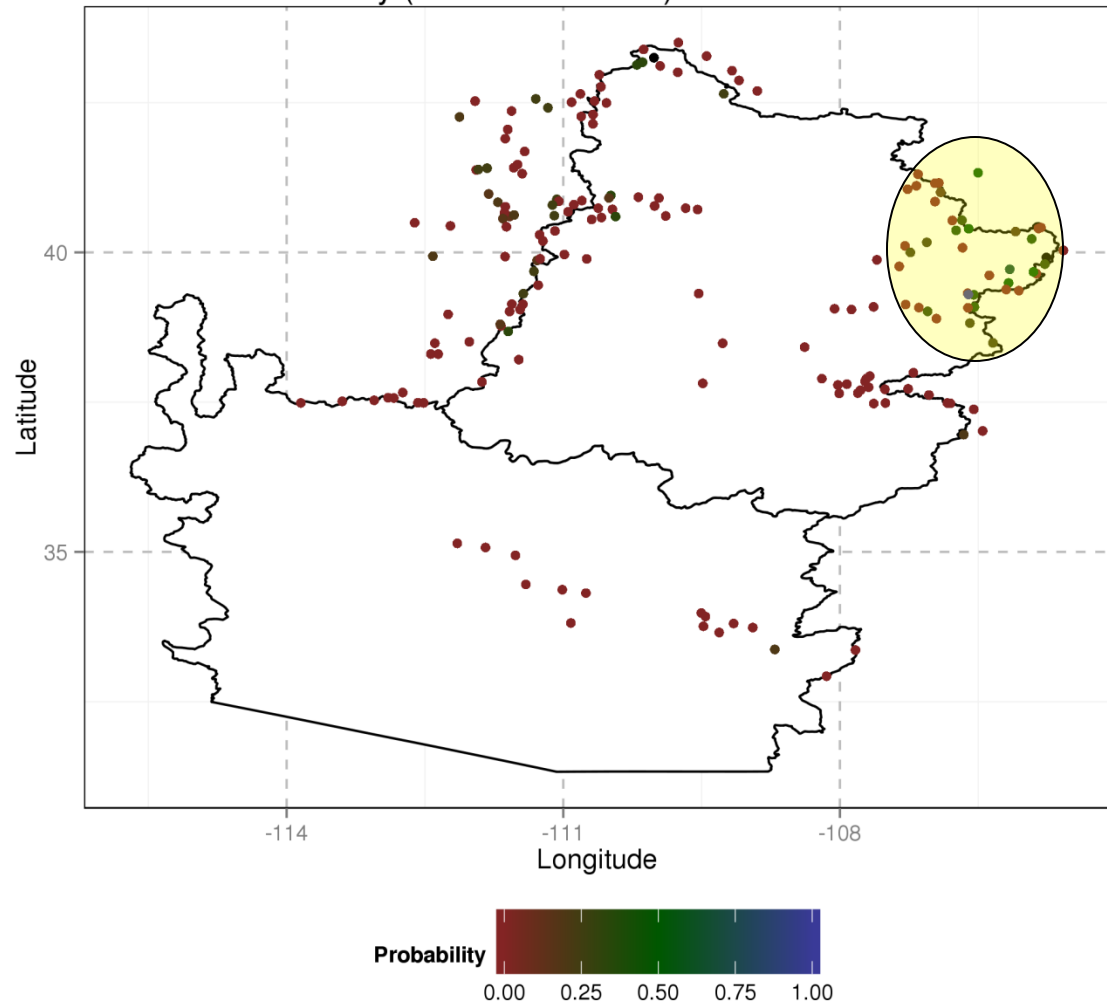
Empirical Probability of Experiencing Average Total Oct-May Precipitation Given Dry (≤ -0.5 Std. Dev.) 1st Qtr Conditions



Is there a Spatial Correlation?

- This is using a threshold of -1.0.
- May be a small cluster near the Colorado River headwaters with higher probabilities.

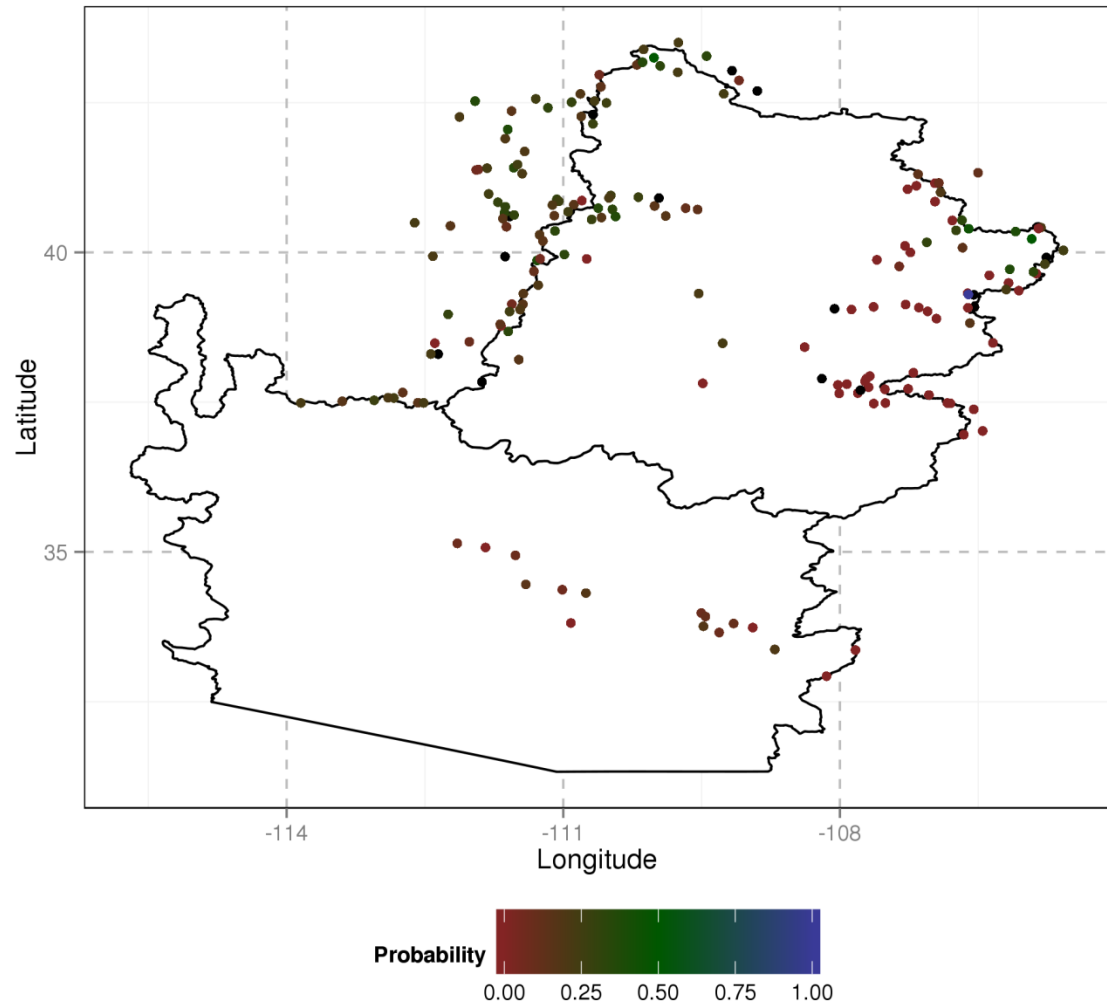
Empirical Probability of Experiencing Average Total Oct-May Precipitation Given Dry (≤ -1.0 Std. Dev.) 1st Qtr Conditions



Is there a Spatial Correlation?

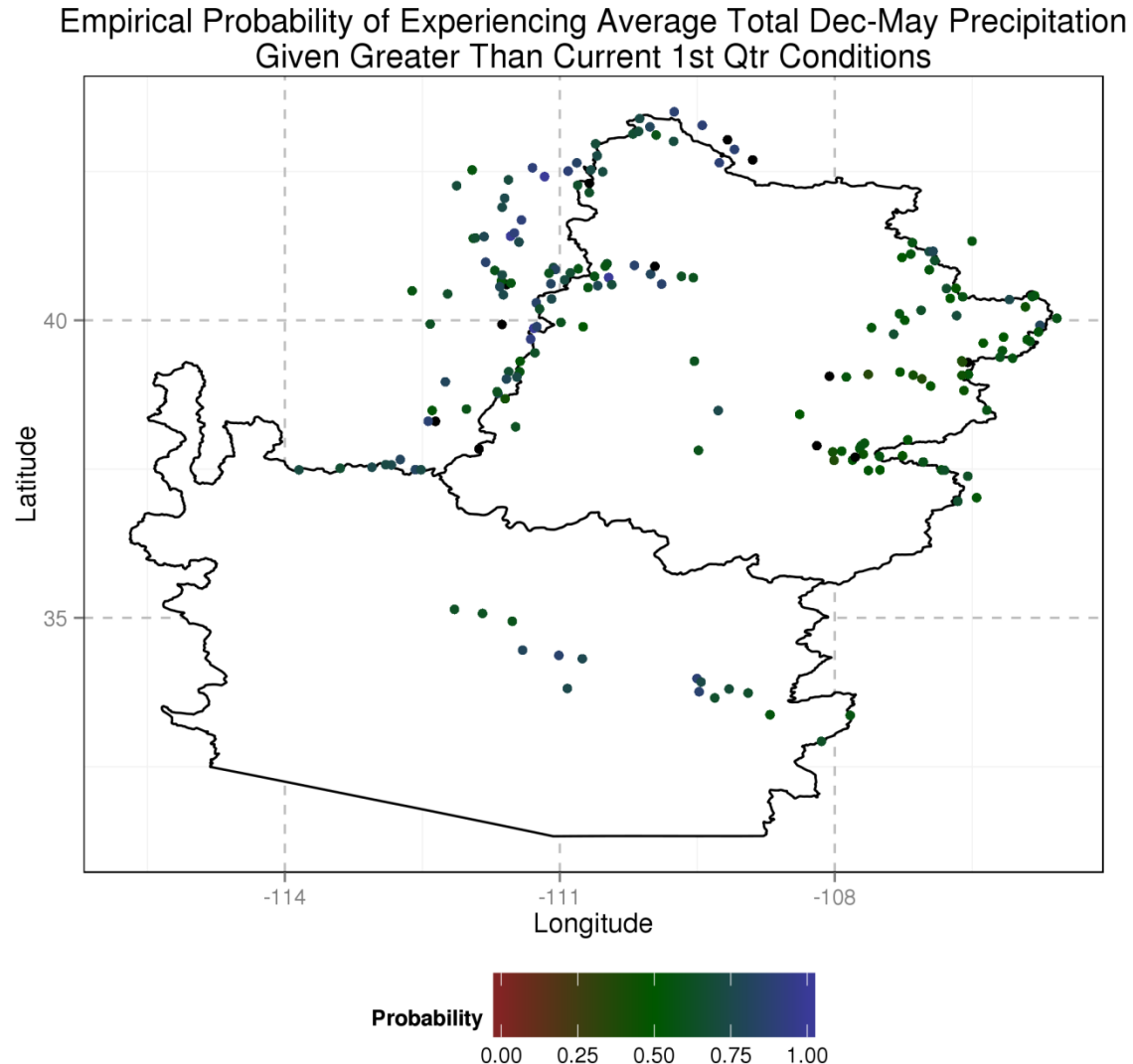
- This is using a threshold of \leq current conditions.
- Based on historical conditions, 1st Quarter precip at our current levels or lower does not typically yield average values.

Empirical Probability of Experiencing Average Total Oct-May Precipitation Given Less Than Current 1st Qtr Conditions



Is there a Spatial Correlation?

- This is using a threshold of $>$ current conditions.
- With greater 1st Quarter conditions, there appears to be about a 50% chance of at least an average Oct-May season total.



UPDATED RESULTS

Is there any hope this year?

- Given current Oct – Feb conditions, what is the likelihood, based on historical observations, that an average January through

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
Oct – Feb precipitation is \leq current conditions	1042	30%*
Oct - Feb precipitation is $>$ current conditions	3715	49%*

*March has not been considered yet. It will likely be lower.

Is there any hope this year?

- Given current Oct – Feb conditions, what is the likelihood, based on historical observations, that an average October

Threshold	Number of Occurrences over gages in history	Probability based on historical observations
Oct – Feb precipitation is \leq current conditions	1042	8%*
Oct - Feb precipitation is $>$ current conditions	3081	58%*

*March has not been considered yet. It will likely be lower.

Initial Conclusions

- Jan-May conditions seldom make up for dry 1st Quarter conditions throughout the basin
 - This analysis is limited from a site to site basis, since most stations only have about 15 years worth of data to test based on the thresholds used here.
- Dry 1st Quarter conditions are indicative of a below average Oct-May precipitation total.
- There is a very low probability that between now and May that this hydrologic deficit can be made up.

Future Calls

- Future Teleconference Schedule:
 - Mar 27th – Operational Issues for Runoff Season (CBRFC & WFO's)
 - April- No Call
 - May – (Week of May 21st)
 - Future TBD –
- TOPICS:
 - Methods to coordinate and support wildfire burn scars (data exchange/model impacts)
 - Drought and low flow (impact to RFC customers – product support)
 - Dealing with Radar derived rainfall (biases, communication, office procedures)
 - WFO topics